

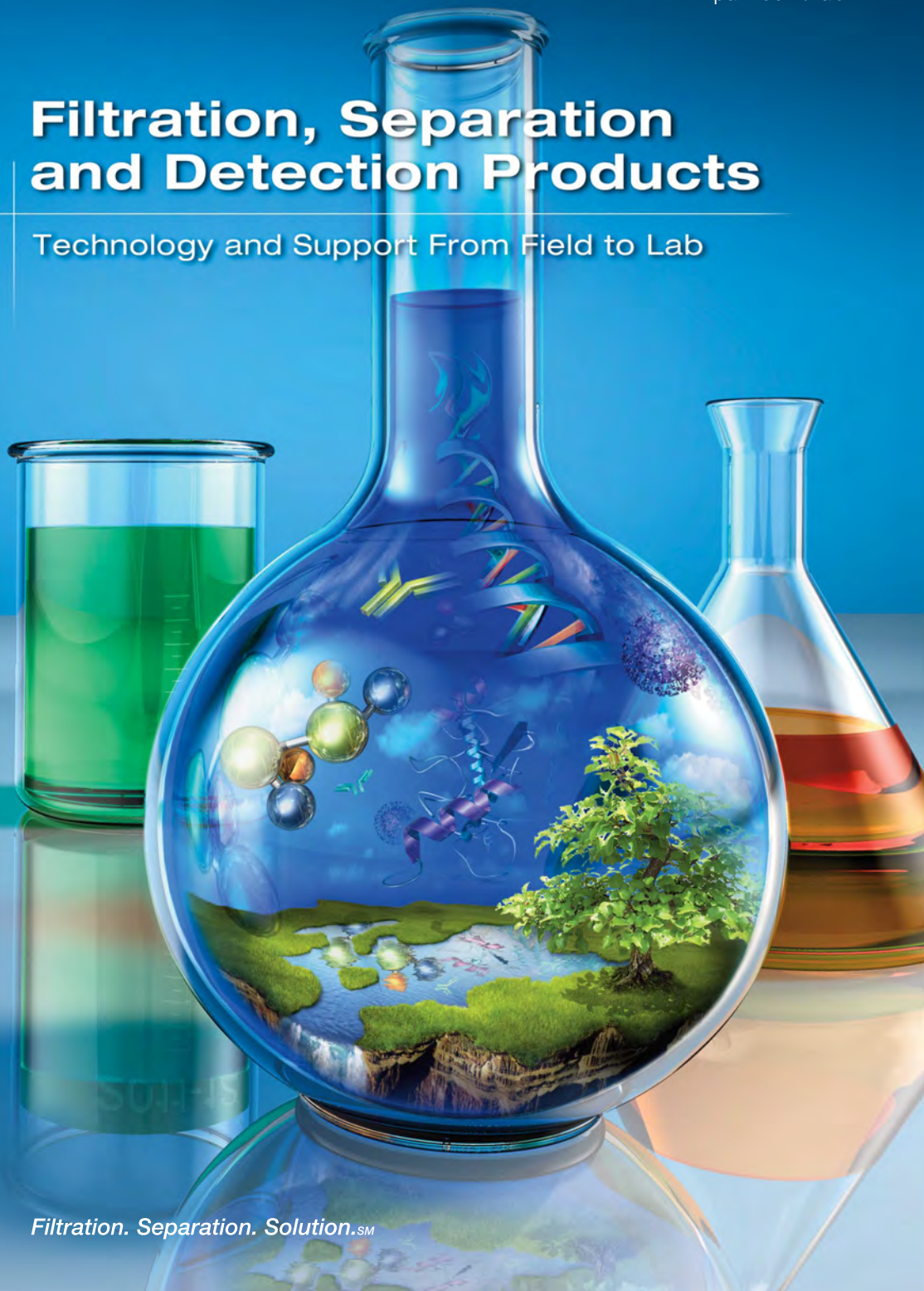


Life Sciences

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Filtration, Separation and Detection Products

Technology and Support From Field to Lab



Filtration. Separation. Solution.SM

From Field to Lab

See Life From a New Perspective With Pall Technologies



from field to lab

INTRODUCTION

What's your point of view?

Does your work take you to the field, gathering and analyzing water, air or other environmental samples? Perhaps you walk the halls of academia or private industry, conducting research or ensuring quality control. From university to industry to CRO, the requirements of laboratories are unique and diverse.

Whatever your point of view – from the field to the lab – Pall Life Sciences is with you every step of the way, providing innovative technologies that can help you see life from a new perspective.

Our extensive product portfolio, practical knowledge, and technical expertise enable us to deliver filtration, separation, and purification products and services that help you realize the full potential of your applications. Our solutions-oriented approach ensures a steady stream of new products designed to simplify and improve your processes. And our global technical support team helps you optimize product selection and use. From explorations in the field to analysis in the lab, look to Pall to support your point of view.

Laboratory Technical Support

To help you optimize your results using any of the thousands of Pall products that appear in this catalog, Pall offers experienced technical support from specialists in filtration, separation, and purification.

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web

This logo indicates pages where New Products appear. Look for the  next to the New Product part numbers.



Catalog Contents

Every process has its unique set of filtration, separation or detection challenges. That's why our Laboratory Catalog is organized by applications. Located at the beginning of each application section, you will find our new, user-friendly application selectors. These handy guides are designed specifically to help you identify the best filtration, separation or detection products for your processes. Locate your application of interest at the top of the chart and view a list of all recommended Pall products in the column below. If your application is not listed, send us your process requirements, and we'll be happy to recommend the best products to ensure confident results. Just e-mail us at LabSupport@pall.com.

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*See Microbiology Quality Control for disposable filter funnels.

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Total Fluid ManagementSM

Enhancing Productivity and Profitability

Pall Corporation is the largest and most diverse filtration and separation company in the world, and the global leader in the development of new filtration, separation, and purification technologies. The breadth of our product line and scientific resources makes us uniquely qualified to deliver the best product technologies for each application we support.

At Pall, **Total Fluid Management** means supporting a process horizontally throughout the entire product life-cycle – enabling discovery, manufacturing, delivery, and safety. It also means supporting a process vertically – enhancing the reliability and simplifying the work for each individual who contributes to the final product. The diagram on page 3 provides an overview of our Total Fluid Management approach.

Partnering with Pall, you can count on:

Manufacturing Excellence

Pall manufactures under precise, highly controlled conditions to ensure product quality. Applying a unique blend of Lean Manufacturing and Six-Sigma principles, our quality assurance procedures result in superior products with exceptional lot-to-lot reproducibility. Pall is one of the few companies to control device manufacturing through all stages – from media production to housing material selection to final device assembly. This gives us a distinct quality advantage, allowing us to maximize processing accuracy, speed, safety, and reliability.

Lab-to-Process Scalability

Whether you are processing a single sample or detecting thousands of samples, Pall offers a variety of device configurations to support your techniques. And when scale up is a factor, Pall offers product platforms that incorporate the same membranes and materials of construction to allow precise scale up of processing volumes. Look for the UpScaleSM logo throughout this catalog for products that are scalable.



Customer Focus

With confidence in the scope and quality of our product portfolio, our global technical and customer support teams are able to focus on what's most important... *you, our customer*. Pall builds partnerships with customers, listens closely to understand your application parameters, and stays flexible to constantly changing market conditions. This makes it possible for us to develop products and technologies to solve your real-world application challenges.

Technical Support

At Pall, we're on the job when you are. Our global, live laboratory technical team delivers support that is fast and knowledgeable. We're ready when you need us, helping you select and optimize the best products for your applications.

Global Accessibility

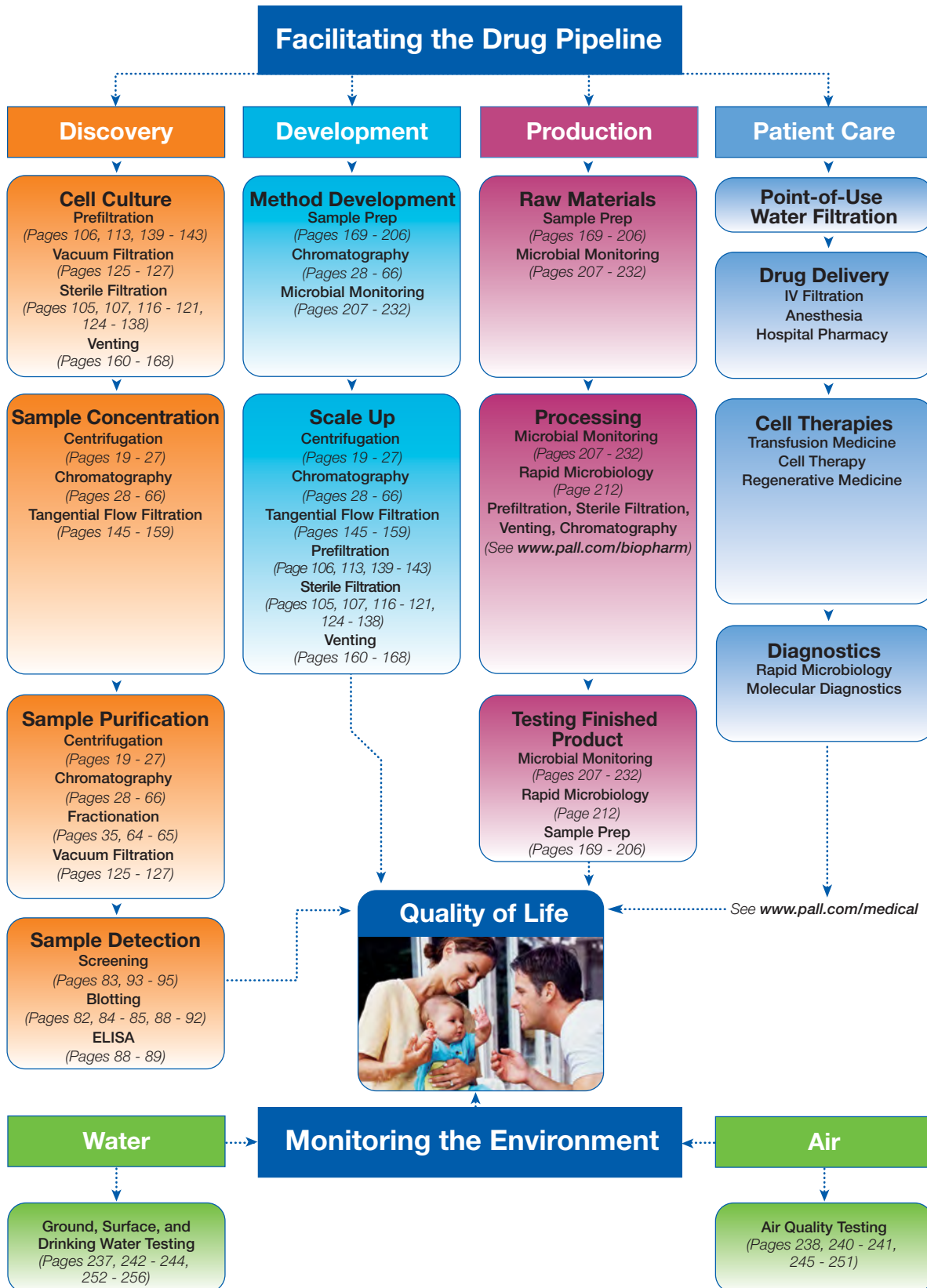
Pall understands the critical nature of your business and ensures convenient, rapid access to our products. Our global manufacturing facilities and distribution network ensure product availability, easy ordering, and fast delivery anywhere in the world.

See page 309 for contact information, or visit www.pall.com/contact.

OEM Partnerships

Across virtually every industry, design engineers and scientists are confronted with the increasingly difficult challenge of creating superior products that can be priced to succeed in today's highly competitive marketplace. Pall supplies OEM solutions for a range of applications in the life sciences, biopharmaceutical, and medical sectors. We offer the largest selection of membranes and devices for these applications, and maintain a proven track record in technology innovation, manufacturing excellence, and regulatory compliance. At Pall, we listen carefully to understand the design challenges you face and develop exceptional products that result in total product quality, greater efficiency, and lower project costs.





total fluid management

INTRODUCTION

How to Choose Media for Your Application

Several parameters need to be considered when selecting the appropriate product for your applications. Key areas to explore include sample size and the media needed to drive your application. This discussion focuses on selecting the proper media. The media is the “active” part of the product, or the part of the product that does the work. Understanding media properties will allow you to select the best media for your application. Following is an overview of some of our most widely used media.

HYDROPHILIC MEDIA

GHP (Hydrophilic Polypropylene) Membrane

Pall's GHP media is a “universal” membrane that can be used for many applications. Its hydrophilic nature allows it to be employed in applications that use both aqueous and organic solutions. The strong chemical compatibility of the polypropylene membrane allows its use in environments and applications that require strong organics.

GHP membrane has been tested and certified for use in HPLC applications, which means that the membrane will not leach unwanted extractables into the sample being tested. This feature eliminates the concern over contamination due to extractables coming off the membrane.

GHP membrane also has an extremely low autofluorescence level, so the membrane does not contribute to background “noise” in applications such as Time Resolved Fluorescence. GHP is a non-binding membrane that prevents non-specifically binding biomolecules of interest.

Applications that are well-suited for use with GHP membrane include:

- ▶ Any that require the use of strong organics
- ▶ High throughput screening
- ▶ Receptor:ligand screens
- ▶ Combi-chem library screening
- ▶ HPLC sample prep
- ▶ Cleavage reactions
- ▶ Metabolic studies
- ▶ General sample prep

GHP membrane is available in 0.2 and 0.45 μm pore sizes.

Supor® (Hydrophilic Polyethersulfone) Membrane

Supor and Supor MachV membrane is a low protein binding polyethersulfone (PES) membrane that has been optimized for biological, pharmaceutical, and sterilizing filtration requirements. Supor membrane is low protein binding so it is an excellent choice when minute amounts of sample need to be recovered. Supor membrane has extensive drug compatibility and moderate chemical resistance/compatibility.

Characteristics of Supor membrane include: fast filtration with superior flow rates and high throughputs; low protein binding; the ability to be sterilized (autoclaved); low extractables; and high consistency.

Applications that are well-suited for use with Supor membrane include:

- ▶ Newborn metabolic screening
- ▶ Bead-/resin-based applications
- ▶ Receptor:ligand assays
- ▶ Lysate clearance
- ▶ General sample prep

Supor membrane is available in 0.1, 0.2, 0.45, 0.8, and 1.2 μm pore sizes.

Nylon Membrane

Pall offers a wide variety of nylon membranes to cover a broad range of applications. Membrane variation and modifications optimize the grades of nylon for high or low binding capacity, environmental air monitoring, and even analytical sample preparation.

Biodyne® nylon transfer membranes are optimized for biomolecular binding and are compatible with radioactive and non-radioactive detection systems. Bio-Inert® membrane is a low binding membrane – as much as 25-50 times lower than traditional nylon blotting membranes. Nylasorb™ membrane has long been used for acidic dry deposition (acid rain) measurements. Nylaflo™ membrane is a clean membrane ideal for analytical sample preparation prior to HPLC analysis.

Applications that are well-suited for use with nylon membrane include:

- ▶ Sample preparation
- ▶ Environmental monitoring for acid dry deposition
- ▶ Bead-based assays
- ▶ Drug binding studies
- ▶ Clean-up of nucleic acid samples cut from acrylamide gels

Nylon membrane is available in 0.2, 0.45, 1 (nominal), and 1.2 μm pore sizes.



HYDROPHOBIC MEDIA

PTFE (Hydrophobic PTFE on Polypropylene Support) Membrane

PTFE membrane is a hydrophobic media that is used in many general sample preparation and filtration applications. PTFE membrane can be used when hydrophobicity is needed to prevent aqueous flow but allow passage of air or gas. PTFE membrane is widely used for venting applications. The membrane will not allow liquid flow until it is “wetted out.” PTFE membrane provides an excellent barrier to passive flow in applications that require an incubation step.

Applications that are well-suited for use with PTFE membrane include:

- ▶ Molecular synthesis reactions
- ▶ Drug synthesis reactions
- ▶ Organic sample prep
- ▶ Venting of fermentation tanks and carboys

PTFE membrane is available in 0.2, 0.45, and 1 μm pore sizes.

PREFILTRATION MEDIA

Prefilter Media/Supor® Membrane

A variety of prefilter media over Supor membrane configurations are available to provide increased flow rates and particulate removal for clarification assays. The prefilter media has a larger pore that aids in removal of particulate and cell debris. Supor membrane has the same non-binding characteristics previously listed.

Applications that are well-suited for use with a prefilter media over Supor membrane include:

- ▶ Clarification of cell lysates
- ▶ Plasmid preparation
- ▶ Preparation of particulate-laden samples
- ▶ Preparation of proteinaceous solutions

Prefilter media/Supor membrane is available in a wide range of configurations.

How to Choose Media for Your Application (continued)



MOLECULAR SEPARATION (ULTRAFILTRATION) MEDIA

Omega™ Ultrafiltration (Modified Polyethersulfone) Membrane

Omega ultrafiltration membrane is a polyethersulfone membrane specifically modified to minimize protein and nucleic acid binding.

Omega membrane works on the premise of size exclusion, where samples are fractionated by molecular weight. In size exclusion, larger molecules are separated from smaller molecules by selecting the appropriate molecular weight cut-off (MWCO) membrane and filtering the sample either by vacuum or centrifugation. The modification to the membrane prevents biomolecules from binding to the membrane, and facilitates the concentration of the larger molecules on top of the membrane.

The low binding nature of Omega ultrafiltration membrane offers numerous benefits, including high recoveries of low concentrations of biomolecules and less surface fouling, which can cause retention performance to decay.

In general, the same rules apply to selecting the appropriate MWCO as is used in the centrifugal device line. An MWCO that is three to six times smaller than the molecular weight of the retained biomolecule should be chosen. For example, if the protein of interest has a molecular weight of 60K, then a 10K membrane should be selected.

Applications that are well-suited for use with Omega membrane include:

- ▶ Concentration, purification, and desalting peptides, proteins, oligonucleotides, DNA, and RNA
- ▶ Clean-up labeling and PCR reactions
- ▶ Isolation of DNA from agarose gel slices
- ▶ Size exclusion

Available MWCO options include 1K, 3K, 5K, 10K, 30K, 50K, 100K, and 300K. Please inquire about the availability of additional MWCOs. See page 20 for MWCO selection guidelines.

BIOMOLECULE BINDING MEDIA

Glass Fiber With Polypropylene Support

The glass fiber media used in AcroPrep™ filter plates provides an economic means for removing particulate matter while maintaining sample integrity. It is an excellent choice for low cost, gross sample prep. The glass fiber media is a binder-free borosilicate glass, which eliminates the possibility of contaminants leaching into the sample.

The glass fiber media is supported by a polypropylene support layer. This support layer will not leach extractables and helps to prevent shedding of the glass fiber into the sample.

Applications that are well-suited for use with glass fiber include:

- ▶ Cell-based assays
- ▶ Gross fractionation
- ▶ Receptor:ligand binding assays
- ▶ DNA binding
- ▶ Plasmid DNA isolation

Available (nominal) pore sizes include 1.0 and 3.0 μm.

Mustang® Q Anion Exchange Membrane

Mustang Q membrane is a proprietary membrane that has strong anion exchange capabilities. The membrane exhibits fast flow rates that do not affect binding and recovery. The typical binding capacity per well is 0.38 mg/well of BSA. Mustang Q membrane is available in filter plate and syringe filter format.

Applications that are well-suited for use with Mustang Q membrane include:

- ▶ DNA purification
- ▶ Viral particle removal
- ▶ Binding and elution of negatively-charged proteins

Mustang® S Cation Exchange Membrane

Mustang S membrane is a proprietary membrane that has strong cation exchange capabilities. The membrane exhibits fast flow rates that do not affect binding and recovery. The typical binding capacity per well is 0.29 mg/well of Lysozyme. Mustang S membrane is available in filter plate and syringe filter format.

Applications that are well-suited for use with Mustang S membrane include:

- ▶ Kinase assays
- ▶ Binding and elution of positively-charged proteins

BioTrace™ NT (Pure Nitrocellulose) Membrane

BioTrace NT membrane is a 0.2 µm, 100% pure unsupported nitrocellulose membrane that has excellent durability and high binding capacity for proteins and nucleic acids. The binding interaction of the BioTrace NT membrane is hydrophobic and electrostatic, which makes it excellent for protein and nucleic acid dot blots.

BioTrace NT membrane is also versatile in that it can be used with chemiluminescent, fluorescent, colorimetric, and radioisotopic detection.

Applications that are well-suited for use with BioTrace NT membrane include:

- ▶ Nucleic acid transfer and detection
- ▶ Solid phase ELISA
- ▶ Radioimmunoassays
- ▶ Fluorescent or chemiluminescent detection

BioTrace PVDF (Polyvinylidene Fluoride) Membrane

BioTrace PVDF membrane is a versatile membrane for both nucleic acid and protein binding applications. The membrane has a 0.45 µm pore size and a broad compatibility with commonly-used solvents. BioTrace PVDF membrane also has very low background when used with chemiluminescent detection systems. It will not discolor during use, and its high strength makes it very durable.

The binding interaction of BioTrace PVDF membrane is hydrophobic, and the biomolecules can be immobilized on the membrane via UV crosslinking or alkaline fixation.

BioTrace PVDF membrane is also a good choice for chromogenic detection because the membrane will not discolor.

Applications that are well-suited for use with BioTrace PVDF membrane include:

- ▶ Protein:nucleic acid interaction studies
- ▶ Western blots
- ▶ Solid phase ELISA
- ▶ Radioimmunoassays
- ▶ Fluorescent or chemiluminescent detection
- ▶ Drug discovery using bound biomolecules
- ▶ ELISpots

CHROMATOGRAPHY SORBENTS

Pall's line of chromatography sorbents greatly simplifies protein purification and fractionation. Sorbents can be used in varying-sized chromatography columns, such as with our pre-packed AcroSep™ columns. Sorbents may also be used in batch mode for single prep or high-throughput applications using Pall's spin devices and multi-well filter plates. The base sorbent varies depending on targeted applications. These versatile sorbent products exhibit superior performance in a range of chromatography applications, including:

- ▶ Affinity
- ▶ Ion exchange
- ▶ Mixed-mode
- ▶ Size exclusion
- ▶ Solvent-detergent removal

For detailed information and product selection assistance with Pall's chromatography sorbents, see pages 28 - 36.

Pall Life Sciences Media Application Guide

Filtration

	Medium	Page Numbers
Bio-Inert® membrane	Modified nylon	21, 76 - 77
Emflon® II membrane	Hydrophobic PVDF	164
Fluorodyne® membrane	Hydrophilic PVDF	109, 118, 130, 135
GH Polypro (GHP) membrane	Hydrophilic polypropylene	21, 74 - 77, 98, 177 - 178, 186, 200, 203, 251
GLA-5000 membrane	Polyvinyl chloride (PVC)	245
Glass Fiber	Borosilicate glass	69 - 70, 74 - 77, 93, 95, 122, 162, 199, 242
GN-4 MetriceI® MCE membrane	Mixed cellulose esters	227, 248, 250 - 251
GN-6 MetriceI MCE membrane	Mixed cellulose esters	213, 218 - 222, 225, 227, 248
HT Tuffryn® membrane	Polysulfone	112, 119, 122, 138, 197
MetriceI Black membrane	Hydrophilic modified polyethersulfone	214, 218 - 220, 225, 227
Nylaflo™ membrane	Nylon	177, 179
Nylasorb™ membrane	Nylon	246
Omega™ ultrafiltration membrane	Modified polyethersulfone	21 - 27, 73 - 77, 115, 148, 152, 154 - 158
Pallflex® media	Glass fiber, quartz	240
Posidyne® membrane	Positively-charged Nylon 6,6	109, 118
PTFE membrane	PTFE	72, 76 - 77, 161, 163, 165 - 167, 177, 180, 184, 192, 200, 246
PVDF membrane	Hydrophilic polyvinylidene fluoride	177, 181, 188, 200
Seitz® depth media	Cellulose fibers and filter aids	139 - 140
Supor® and Supor EKV membranes	Hydrophilic polyethersulfone	23 - 25, 70 - 71, 74 - 77, 93 - 95, 109 - 110, 116 - 118, 122 - 129, 131 - 133, 136, 156 - 158, 194, 198, 204 - 205, 215, 218 - 222, 225, 252, 254
Ultipor® membrane	Nylon 6,6	109, 118
Versapor® membrane	Acrylic copolymer	113, 120, 122, 168, 196, 252 - 253

Chromatography

Blue Trisacryl® M sorbent	Synthetic matrix	38, 53
Ceramic HyperD® sorbents (Q, S, DEAE, and CM)	Composite material (ceramic)	40, 58
HA Ultrogel® sorbent	Hydroxyapatite/agarose composite	52
HEA HyperCel™ sorbent	High porosity cross-linked cellulose	42, 62
Heparin HyperD M sorbent	Composite (ceramic)	54
IMAC HyperCel sorbent	High porosity cross-linked cellulose	38, 55
Lysine HyperD sorbent	Composite (ceramic)	56
MEP HyperCel sorbent	High-porosity cross-linked cellulose	42, 63
Mustang® E membrane	Polyethersulfone	50
Mustang Q and S membranes	Modified polyethersulfone	48, 71, 76 - 77
PPA HyperCel sorbent	High porosity cross-linked cellulose	42, 62
Protein A Ceramic HyperD F sorbent	Composite (ceramic)	38, 57
Q and S HyperCel sorbent	High porosity cross-linked cellulose	44, 60
SDR HyperD sorbent	Composite material (silica)	37, 66

Binding

BioDyne® A, B, C, and Plus membranes	Nylon 6,6	88
BioTrace™ NT membrane	Nitrocellulose	74, 90
BioTrace PVDF membrane	Hydrophilic PVDF	91
FluoroTrans® PVDF, W membranes	Hydrophobic PVDF	92

Catalog Application Sections

Protein and DNA Purification	Detection and Screening	Laboratory Bioprocessing	HPLC and Chromatography Sample Prep	Microbiology Quality Control	Environmental Water and Air
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media application guide

INTRODUCTION



Protecting the

environment

and enabling a greener, safer future

There is no greater calling or opportunity for a fluid management company than today's challenge – helping customers protect people, the environment, and our natural resources. Together, we are implementing technologies that purify and conserve water, consume less energy, make alternative energy sources possible and practical, advance medicine, and minimize emissions and waste. Our collective efforts are enabling a greener, safer, more sustainable future.

Protecting the Future

Our commitment to green practices extends to every aspect of our company. It encompasses how we partner with customers, the products we make, and how we support our local and global communities. We are continually implementing new practices to increase and strengthen our own green initiatives, and those of our customers.

Seeing the Results

In recognition of our environmental initiatives, Pall has been named one of the top 50 greenest big companies in America by *Newsweek* magazine. The publication based its ranking on each company's environmental impact, green policies, and reputation among its peers and environmental experts.



To learn more about how Pall is working to promote a greener future – visit us online at www.pall.com/green.



Life Sciences

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Environmental Global Solutions

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Protein and DNA Purification



In the accelerated world of drug discovery – where proven technologies, high quality products, and reproducible results have become the standards in sample preparation and detection – Pall innovations make the difference. We offer a broad portfolio of dedicated products for applications in drug discovery and basic research. From the discovery and development stages of new drugs, through production and delivery of therapies, you can count on Pall to deliver products that perform better and faster for you. Pall's laboratory products are engineered to improve your processes and increase the accuracy and speed of your research.

Content

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 - 19** How to Choose
 - 21** Products
- 28** Chromatography
 - 28** How to Choose
 - 37** Products – Columns
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 - 52** Products – Sorbents
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 - 67** How to Choose
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Protein Purification Application Selector

	Page Number	Abundant Protein Removal	Concentration, Desalting, and Buffer Exchange	Diafiltration	Fractionation/Purification
Centrifugal Devices					
Jumbosep™ centrifugal devices with Omega™ membrane	26		•	•	•
Macrosep® Advance centrifugal devices with Omega membrane	24		•	•	•
Microsep™ Advance centrifugal devices with Omega membrane	23		•	•	•
Nanosep® centrifugal devices with Omega membrane	21		•	•	•
Nanosep MF centrifugal devices with GHP or Bio-Inert® membrane	21				•
Chromatography Columns (Pre-Packed)					
AcroSep® affinity chromatography columns	38				•
AcroSep ion exchange chromatography columns	40				•
AcroSep mixed-mode chromatography columns	37, 42				•
PRC chromatography columns	44				•
Chromatography Sorbents					
Blue Trisacryl® M sorbent	53	•			•
Ceramic HyperD® ion exchange sorbents (Q, S, DEAE, and CM)	58				•
HA Ultrogel® sorbent	52				•
HEA HyperCel™ sorbent	62				•
Heparin HyperD M sorbent	54				•
Lysine HyperD sorbent	56				•
MEP HyperCel sorbent	63				•
PPA HyperCel sorbent	62				•
Q and S HyperCel sorbents	60				•
SDR HyperD sorbent	66				•
Filter Plates					
AcroPrep™ 384-well filter plates with Omega membrane	74		•	•	•
AcroPrep Advance 96-well filter plates for protein purification	71		•	•	•
AcroPrep Advance 96-well filter plates for ultrafiltration	73		•	•	•
Filtration Syringe Filters					
Acrodisc® syringe filters with HT Tuffryn® membrane, sterile	119				•
Acrodisc syringe filters with Supor® membrane, sterile	116 - 118				•
Acrodisc syringe filters with Versapor® membrane, sterile	120				•
Acrodisc unit with Mustang® E membrane	50				•
Acrodisc unit with Mustang Q membrane	48				•
Acrodisc unit with Mustang S membrane	48				•
Tangential Flow Filtration					
Centramate™ TFF cassettes and holders	158		•	•	•
Minimate™ TFF capsules and systems	148 - 150		•	•	•
Ultrasette™ lab TFF devices (disposable)	152		•	•	•
Hardware					
Multi-well plate vacuum manifold	78, 276		•	•	•
Vacuum/pressure pumps	279		•	•	•

Chromatography Application Selector

	Page Number	Affinity Chromatography	Ion Exchange Chromatography	Mixed-Mode Chromatography	Size Exclusion Chromatography
Chromatography Columns (Pre-Packed)					
AcroSep™ chromatography columns with Blue Trisacryl® M sorbent	38	•			
AcroSep chromatography columns with Ceramic HyperD® F sorbents (Q, S, CM, DEAE)	40		•		
AcroSep chromatography columns with HEA HyperCel™ sorbent	42			•	
AcroSep chromatography columns with IMAC HyperCel sorbent	38	•			
AcroSep chromatography columns with MEP HyperCel sorbent	42			•	
AcroSep chromatography columns with PPA HyperCel sorbent	42			•	
AcroSep chromatography columns with Protein A Ceramic HyperD F sorbent	38	•			
AcroSep chromatography columns with SDR HyperD sorbent	37			•	
PRC chromatography columns	44		•	•	
Chromatography Sorbents					
Blue Trisacryl M sorbent	53	•			
Ceramic HyperD ion exchange sorbents (Q, S, DEAE, CM)	58		•		
HA Ultrogel® sorbent	52			•	
HEA HyperCel sorbent	62			•	
Heparin HyperD M sorbent	54	•			
IMAC HyperCel sorbent	55	•			
Lysine HyperD sorbent	56	•			
MEP HyperCel sorbent	63			•	
PPA HyperCel sorbent	62			•	
Protein A Ceramic HyperD F sorbent	57	•			
Q and S HyperCel sorbents	60		•		
SDR HyperD sorbent	66			•	
Filter Plates					
AcroPrep™ 384-well filter plates with GHP membrane	74	•	•	•	•
AcroPrep 384-well filter plates with Supor® membrane	74	•	•	•	•
AcroPrep Advance 96-well filter plates for protein purification	71	•	•	•	•
AcroPrep Advance 96-well filter plates for ultrafiltration	73				•
Filtration Syringe Filters					
Acrodisc® PSF GxP syringe filters with GHP membrane	186	•	•	•	•
Acrodisc PSF syringe filters with GHP membrane	186	•	•	•	•
Acrodisc unit with Mustang® Q membrane	48		•		
Acrodisc unit with Mustang S membrane	48		•		
Hardware					
Multi-well plate vacuum manifold	78, 276	•	•	•	•
Vacuum/pressure pumps	279	•	•	•	•

DNA Purification Application Selector

	Page Number	Dideoxy-Labeled DNA Dye-Terminator Clean-Up	DNA Recovery From Agarose Gels	Fractionation/Purification	gDNA Isolation	Labeled DNA-Removal of Unincorporated Label
Centrifugal Devices						
Jumbosep™ centrifugal devices with Omega™ membrane	26			•		•
Macrosep® Advance centrifugal devices with Omega membrane	24			•		•
Microsep™ Advance centrifugal devices with Omega membrane	23			•		•
Nanosep® centrifugal devices with Omega membrane	21	•	•	•		•
Nanosep MF centrifugal devices with GHP or Bio-Inert® membrane	21		•	•		•
Chromatography Columns (Pre-Packed)						
AcroSep™ ion exchange chromatography columns	40			•		
PRC chromatography columns	44			•		
Chromatography Sorbents						
Ceramic HyperD® ion exchange sorbents (Q, S, DEAE, and CM)	58			•		
Q and S HyperCel™ sorbents	60			•		
Ultrogel® AcA sorbents	64	•		•		•
Filter Plates						
AcroPrep™ 384-well filter plates with glass fiber	74				•	
AcroPrep 384-well filter plates with Omega membrane	74	•		•		•
AcroPrep 384-well filter plates with Supor® membrane	74	•				•
AcroPrep Advance 96-well filter plates for aqueous filtration	93	•	•			•
AcroPrep Advance 96-well filter plates for DNA purification	69		•	•	•	•
AcroPrep Advance 96-well filter plates for lysate clearance	70			•		
AcroPrep Advance 96-well filter plates for protein purification	71			•		
AcroPrep Advance 96-well filter plates for ultrafiltration	73	•		•		•
Filtration Syringe Filters						
Acrodisc unit with Mustang® Q membrane	48			•		
Tangential Flow Filtration						
Minimate™ TFF capsules with Omega membrane	148			•		
Mimimate TFF systems	150			•		
Hardware						
Multi-well plate vacuum manifold	78, 276	•	•	•	•	•
Vacuum/pressure pumps	279	•	•	•	•	•

Lysate Clearance	Nucleic Acid Sample Prep	Oligonucleotides Desalting	PCR Product Clean-Up	Plasmid Purification	RNA Isolation
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application selector

PROTEIN AND DNA PURIFICATION



▶ www.pall.com/lab

Protein Purification

Inspiring Confidence in Critical Proteomic Steps

Pall offers a large portfolio of media chemistries, giving us the unique ability to create the best products for your protein sample preparation and purification applications. Our products include membranes for microfiltration and ultrafiltration, and membranes and sorbents for a variety of chromatographic processes.

Pall is one of the few resources to offer true scalability. The sorbents we offer for small-scale discovery applications are the same products we offer to our customers manufacturing drugs. The ability to scale up is essential for those working in drug discovery, development, and ultimately drug manufacturing.

From processing a single sample to thousands of samples, Pall also offers a variety of device configurations.

Continuously Improving Application Support

Partnering with Pall for your proteomic needs gives you access to:

- ▶ Live technical support. The demanding and ever-changing requirements of protein sample preparation applications necessitate support that is fast, knowledgeable, and readily available. From assisting with routine processes to guiding customers in proper product selection, Pall's Laboratory Technical Support team helps customers worldwide realize the full potential of their applications.
- ▶ Optimized products created from our extensive knowledge and long history of developing uniform membrane materials to ensure consistent, reproducible results.
- ▶ Scalable technologies in a wide variety of device configurations for single- or multi-sample processing on a small or large scale.
- ▶ In-house consultation services provided by our scientists to aid in scale-up and optimization of your unique protein purification applications.

Pall is constantly striving to deliver new products to enhance your research needs. This section contains a variety of new products including AcroPrep™ Advance filter plates, Microsep™ Advance and Macrosep® Advance centrifugal devices, PRC and LRC chromatography columns, and Q and S HyperCel™ sorbents. All of these products are designed to advance your sample prep process to the next level.

Separation Technologies

Well-established membrane-based separation technologies offer distinctive advantages for purifying proteins. The combination of different separation techniques provides flexibility and a range of separation mechanism options throughout the entire process.



AcroSep™ columns incorporate Pall's chromatography sorbents in a convenient column format.

Microfiltration is the preferred method to remove particles or cell debris. Multi-well filter plates with low binding membranes are ideal for handling bead-based separation systems such as IMAC for His-tagged protein purification separation employing vacuum or centrifugation.

Ultrafiltration is separating molecules by size. Desalting, concentration, and size fractionation are main applications for ultrafiltration devices. This is a mechanical separation not requiring harsh chemicals; thus it is gentle on proteins.

Chromatography Technologies

Chromatography continues to be an essential technology for the purification of biomolecules. In chromatography, a complex sample is passed through a chromatographic matrix that consists of a solid support with specific characteristics defined by the support's make-up and/or chemistry. The type of support chosen will depend on the nature of the purification desired.

Pall offers an extensive portfolio of media for affinity, ion exchange, size exclusion, mixed-mode, and hydroxyapatite chromatography. We offer products to cover research needs, scale-up, and polishing. Depending on the specific application, Pall offers chromatography solutions in a sorbent and membrane form. We provide flat sheet membrane, bulk sorbents, or media incorporated into specific product housings, including pre-packed, small-scale chromatography columns and empty glass columns that can be packed with sorbents. Our chromatography media can be used for purification of biomolecules (such as nucleic acids, proteins, etc.) and compounds on the research and process scale. Sorbents are useful in proteomic sample preparation applications, as well as laboratory bioprocessing development and scale-up work.

DNA Purification

Providing Fast, Gentle, High-Yield Concentration and Purification

DNA PURIFICATION METHODS

Binding to Microporous Matrices

Examples of this method are:

- ▶ The use of high salt concentrations in the suspension buffer to bind DNA to silica matrices followed by elution using low salt concentrations in the elution buffer.
- ▶ Ion exchange chromatography using anion exchange membranes.

Pall has developed a unique membrane technology in the form of Mustang® anionic and cationic membrane adsorbers, which allows purification of nucleic acids and proteins using ion exchange chromatography. The Mustang product line is already established as the technology of choice for nucleic acid removal from process streams, such as in part of DNA clearance from therapeutic products like vaccines. The utility of Mustang membrane adsorber modules has also been demonstrated for the purification of plasmid DNA used in gene therapy products. (For detailed information about Mustang ion exchange membranes, see pages 6 - 7.)

Another novel product developed by Pall to streamline nucleic acid purification is the DNA binding plate which allows for purification of plasmid DNA (see page 69).

Size Exclusion

Ultrafiltration is a membrane separation technique used to separate extremely small particles and dissolved molecules in fluids. The primary basis for separation is molecular size, although other factors such as molecule shape and charge can also play a role. Compared to non-membrane processes, ultrafiltration is gentle, fast, and relatively inexpensive. (For more information on the fundamentals of ultrafiltration, see pages 19 - 20.)

Methods for purifying nucleic acids using the Pall Nanosep® device, which contains a membrane operating by molecular weight size exclusion, are well established and covered in the application guide, "Nanosep Centrifugal Devices – Protocols for Use," available online in our Literature Library. The methods described allow rapid, simple recovery of high yields of purified DNA. The same technology is also available in multi-well plate formats for parallel processing of biological samples requiring purification.

Chemical Extraction

These methods use solvents such as chloroform/phenol to solubilize cellular material and partition the DNA for subsequent purification, e.g., using density gradient centrifugation. The limitation of this method is the disposal issue created by the extraction solvents used and the purity and yield of the DNA recovered.



Protein and DNA Purification – Online Reference Library

Pall's website offers an extensive collection of product, technical, and application information. This valuable online reference library features hundreds of technical articles, posters, podcasts, application notes, and more that can help you get the most out of your process. To view the following titles online – and many others – click the Literature Library link on the left sidebar when you visit www.pall.com/lab.

- ▶ A New Method for Antibody Purification
- ▶ Abundant Protein Removal Using Pall Chromatography Sorbents
- ▶ AcroSep™ HEA and PPA Mixed-Mode Sorbents Offer Multi-Dimensional Separation in a Single Step
- ▶ Affinity Separations Using Heparin HyperD® Sorbent
- ▶ Affinity Separations Using Lysine HyperD Sorbent
- ▶ Affinity Separations Using Protein A Ceramic HyperD F Sorbent
- ▶ Automated Plate ELISA and Dot-Blot Assays Using AcroWell™ 96 Filter Plates and a Robotic Workstation with Integrated Plate Reader
- ▶ Buffer Exchange, Desalting, and Concentration – Using Centrifugal Devices
- ▶ Characteristics of Pall's Protein Sample Preparation and Analysis Media
- ▶ Chemical Compatibility Guide for Pall's Protein Sample Preparation and Analysis Media (Chart)
- ▶ Clarification of Plasma or Serum Samples to Remove Cryoprecipitate Using Acrodisc® Syringe Filters With a Prefilter
- ▶ Clarification of Samples by Microporous Filtration (Particulate Removal) Introduction
- ▶ Column Scale-Up to Pilot Process Applications
- ▶ Desalting and Buffer Exchange of Samples (< 1 mL) in an AcroPrep™ 96 and 384 Multi-Well Filter Plate
- ▶ Detergent Removal for Protein Samples Using SDR HyperD Sorbent and Mass Spectrometry Based Detection
- ▶ Efficient Multi-Well Protein Purification Strategies
- ▶ Evaluation of Chromatography Column Packing Efficiency
- ▶ Fast and Efficient Elution of Proteins From Polyacrylamide Gels Using Nanosep® Centrifugal Devices
- ▶ Genomic DNA Isolation From Whole Blood Using AcroPrep Advance 96-Well DNA Binding Plates on an Automated Liquid-Handling Robot
- ▶ High Throughput Genomic and Proteomic Sample Preparation
- ▶ Membrane Adsorbers as a Tool for Rapid Purification of Gene Therapy Products
- ▶ Nanosep Centrifugal Ultrafiltration Devices and PCR: Before and After
- ▶ Novel Mixed-Mode Chromatography Media for Protein Separations Using New 1 mL AcroSep Columns
- ▶ Phosphopeptide Enrichment Using IMAC HyperCel™ Sorbent
- ▶ Protein Fractionation Using Ceramic HyperD Ion Exchange Chromatography Sorbent
- ▶ Protein Fractionation Using HA Ultrogel Sorbent
- ▶ Protein Fractionation Using Mustang® Ion Exchange Membrane
- ▶ Protein Purification Using Blue Trisacryl M Chromatography Sorbent
- ▶ Protein Purification Using Ceramic HyperD Ion Exchange Chromatography Sorbent
- ▶ Protein Purification Using HA Ultrogel Chromatography Sorbent
- ▶ Protein Purification Using Ultrogel AcA Size Exclusion Chromatography Sorbent
- ▶ Protocols for SDR HyperD Solvent-Detergent Removal Chromatography Sorbent
- ▶ Purification of Polyhistidine-Tagged Recombinant Proteins With IMAC HyperCel Sorbent Using AcroPrep 96-Well Filter Plates or Nanosep Centrifugal Devices
- ▶ Rapid Protein Separations Using 1 mL Pre-Packed AcroSep Ion Exchange Chromatography Columns
- ▶ Screening of Chromatographic Sorbent in an AcroPrep Multi-Well Plate Format
- ▶ Single-Tube DNA Purification and Cloning Using Ultrafiltration Devices
- ▶ Streamlined Purification of Plasmid DNA From Prokaryotic Cultures
- ▶ Use of Heparin HyperD M Affinity Sorbent for Batch Mode Protein Purification From Plasma
- ▶ Use of Ion Exchange Membranes for Protein Recovery From Organic Solvents
- ▶ Using IMAC HyperCel Chromatography Sorbent for Immobilized Metal Ion Affinity Chromatography
- ▶ Using MEP HyperCel Sorbent for Purification of Antibodies by Hydrophobic Charge Induction Chromatography (HCIC)

How to Choose a Centrifugal Device

Pall's centrifugal devices simplify many common nucleic acid and protein handling procedures. In just minutes, these devices provide efficient concentration and salt removal from 50 μ L to 60 mL samples. Choose from membranes that have been developed to assure low non-specific biomolecule binding and provide consistent, high recovery of target molecules – typically > 90%.

Ultrafiltration Method

Ultrafiltration is a membrane separation technique used to separate extremely small particles and dissolved molecules in fluids. The primary basis for separation is molecular size, although other factors such as molecular shape and charge can also play a role. Molecules larger than the membrane pores will be retained at the surface of the membrane (not in the polymer matrix as they are retained in microporous membranes) and concentrated during the ultrafiltration process.

Compared to non-membrane processes (chromatography, dialysis, solvent extraction, or centrifugation), ultrafiltration offers the following benefits:

- ▶ Is far gentler to the molecules being processed.
- ▶ Does not require an organic extraction which may denature labile proteins.
- ▶ Maintains the ionic and pH conditions.
- ▶ Is fast and relatively inexpensive.
- ▶ Can be performed at low temperatures (for example, in the cold room).
- ▶ Is very efficient and can simultaneously concentrate and purify molecules.



The retention properties of ultrafiltration membranes are expressed as molecular weight cut-off (MWCO). This value refers to the approximate molecular weight of a dilute globular solute (i.e., a typical protein) which is 90% retained by the membrane. However, a molecule's shape can have a direct effect on its retention by a membrane. For example, linear molecules like DNA may find their way through pores that will retain a globular species of the same molecular weight.

There are three generic applications for ultrafiltration:

1. **Concentration** – Ultrafiltration is a very convenient method for the concentration of dilute protein or DNA/RNA samples. It is gentle (does not shear DNA as large as 100 Kb or cause loss of enzymatic activity in proteins) and very efficient (typically > 90% recovery).
2. **Desalting and buffer exchange (diafiltration)** – Ultrafiltration provides a convenient and efficient way to remove or exchange salts, remove detergents, separate free from bound molecules, remove low molecular weight materials, or rapidly change the ionic or pH environment.
3. **Fractionation** – Ultrafiltration will not accomplish a sharp separation of two molecules with similar molecular weights. The molecules to be separated should differ by at least one order of magnitude (10X) in size for effective separation. Fractionation using ultrafiltration is effective in applications, such as the preparation of protein-free filtrates, the separation of unbound or unincorporated label from DNA and protein samples, and the purification of PCR products from synthesis reactions.

Device Selection Based on Volume

Device	Sample Volume
AcroPrep™ 384 filter plate	< 100 μ L
AcroPrep Advance filter plate	< 1 mL
Nanosep® device	< 0.5 mL
Microsep™ Advance device	0.5 - 5 mL
Macrosep® Advance device	5 - 20 mL
Jumbosep™ device	20 - 60 mL

Membrane Selection Based on Application

These membranes meet the challenges of a wide range of applications with superior performance and stability:

- ▶ Omega™ polyethersulfone ultrafiltration membrane for rapid concentrating and desalting.
- ▶ Bio-Inert® modified nylon, Supor® polyethersulfone, and GHP hydrophilic polypropylene (patented) microfiltration membranes for removing particulate.

How to Choose a Centrifugal Device (continued)

Choosing the Correct MWCO

Once sample volume is determined, the next step is to select the appropriate MWCO (for ultrafiltration) or pore size (for microfiltration). MWCOs are nominal ratings based on the ability to retain > 90% of a solute of a known molecular weight (in Kilodaltons). The table to the right provides retention characteristics of different MWCO membranes for some solutes. For proteins, it is recommended that an MWCO be selected that is three to six times smaller than the molecular weight of the solute being retained. If flow rate is a consideration, choose a membrane with an MWCO at the lower end of this range (3X); if the main concern is retention, choose a tighter membrane (6X).

It is important to recognize that retention of a molecule by an ultrafiltration membrane is determined by a variety of factors, among which its molecular weight serves only as a general indicator. Therefore, choosing the appropriate MWCO for a specific application requires the consideration of many factors including molecular shape, electrical charge, sample concentration, sample composition, and operating conditions.

Because different manufacturers use different molecules to define the MWCO of their membranes, it is important to perform pilot experiments to verify membrane performance in a particular application.

Common Variables That Increase Molecule Passage:

- ▶ Sample concentration less than 1 mg/mL.
- ▶ Linear versus globular molecules.
- ▶ High transmembrane pressure created by g-force in centrifugal concentrators. (This is especially important in the case of linear molecules, for example DNA fragments. Decreasing the g-force can increase retention of molecules by a membrane.)
- ▶ Buffer composition that favors breakup of molecules.
- ▶ pH and ionic conditions that change the molecule (for example, cause conformational changes or aggregation).

Common Variables That Decrease Molecule Passage:

- ▶ Sample concentration higher than 10 mg/mL.
- ▶ Buffer conditions that permit molecules to aggregate.
- ▶ Presence of other molecules that increase sample concentration.
- ▶ Lower transmembrane pressure (in the case of centrifugal concentrators, lower g-force).
- ▶ Adsorption to the membrane or device.
- ▶ Low temperature (4 °C versus 24 °C).

Centrifugal devices from Pall Life Sciences are available in a range of MWCOs and are color-coded for easy identification.

MWCO Selection for Protein Applications

MWCO	Membrane Nominal Pore Size*	Biomolecule Size	Biomolecule Molecular Weight
3K	–	–	10K - 30K
10K	–	–	30K - 90K
30K	–	–	90K - 300K
100K	10 nm	30 - 90 nm	300K - 900K
300K	35 nm	90 - 200 nm	900K - 3,000K

MWCO Selection for Nucleic Acid Applications

MWCO	Base Pairs (DS)	Bases (SS)
3K	16 - 50 Bp	32 - 95 Bs
10K	50 - 145 Bp	95 - 285 Bs
30K	145 - 475 Bp	285 - 950 Bs
100K	475 - 1,450 Bp	950 - 2,900 Bs
300K	1,450 - 9,500 Bp	2,900 - 9,500 Bs

MWCO Selection for Virus Applications

MWCO	Membrane Nominal Pore Size*	Virus or Particle Diameter
100K	10 nm	30 - 90 nm
300K	35 nm	90 - 200 nm

*Nominal pore size as measured by electron microscopy.

Nanosep® and Nanosep MF Centrifugal Devices

Simple, reliable concentrating and desalting of 50 to 500 µL samples



- ▶ Ensures rapid processing of samples.
- ▶ Typical recoveries are > 90%. Available with low protein-binding Omega™, Bio-Inert®, and GHP membranes.
- ▶ A wide range of MWCOs, color-coded for easy identification.
- ▶ Constructed of low-binding polypropylene.
- ▶ Ultrasonically welded seals prevent bypass or seal failure.
- ▶ Fits standard centrifuge rotors that accept 1.5 mL tubes.

Applications

- ▶ Concentrate, purify, and desalt oligonucleotides, DNA, RNA, and proteins.
- ▶ Clean up labeling and PCR reactions.
- ▶ Isolate DNA from agarose gel slices.
- ▶ Separate oligonucleotides and RNA from acrylamide gels.
- ▶ Concentrate PCR products regardless of size with 30K device if primer removal is required.

Specifications

Materials of Construction

Nanosep Devices

Filter Media: Omega (modified polyethersulfone) ultrafiltration membrane

Sample Reservoir, Membrane Support Base, and Filtrate Receiver: Polypropylene

Nanosep MF Devices

Filter Media: Bio-Inert (modified nylon) and GH Polypro (GHP, hydrophilic polypropylene) membranes

Sample Reservoir, Membrane Support Base, and Filtrate Receiver: Polypropylene

Effective Filtration Area

0.3 cm²

Dimensions

Overall Length (Fully Assembled With Cap): 4.5 cm (1.8 in.)

Capacities

Maximum Sample Volume: 500 µL

Final Concentrate Volume: 15 µL

Filtrate Receiver Volume: 500 µL

Hold-Up Volume (Membrane/Support): < 5 µL

Operating Temperature Range

0 - 40 °C (32 - 104 °F)

pH Range

Nanosep Devices: 1 - 14

Nanosep MF Devices: 3 - 14

Maximum Centrifugal Force

14,000 x g

Centrifuge

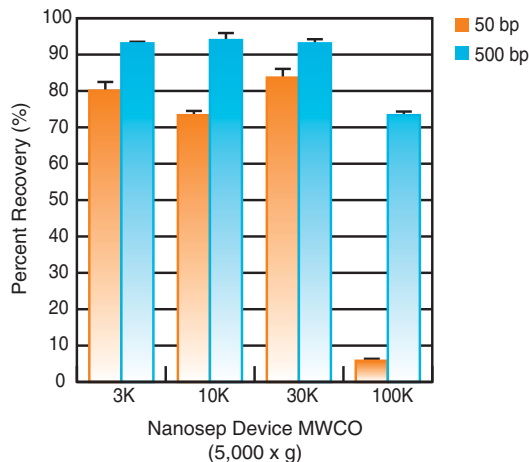
Fits rotors that accept 1.5 mL tubes

Sanitization

Provided non-sterile. May be sanitized by filtering 70% ethanol through the device prior to use.

Performance

DNA Recovery as a Function of Device MWCO

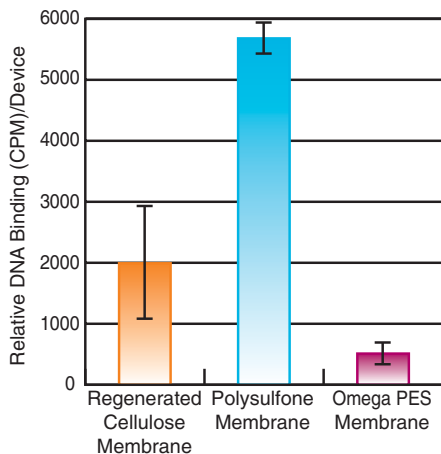


A 500 µL sample of a 100 µg/mL DNA fragment solution containing 50 and 500 bp double-stranded DNA fragments was centrifuged at 5,000 x g in Nanosep devices to a final volume of 50 µL. Recovered samples were quantitated using absorbance at 260 nm. The 100K device was able to differentiate between the sizes of the DNA fragments.

Nanosep® and Nanosep MF Centrifugal Devices (continued)

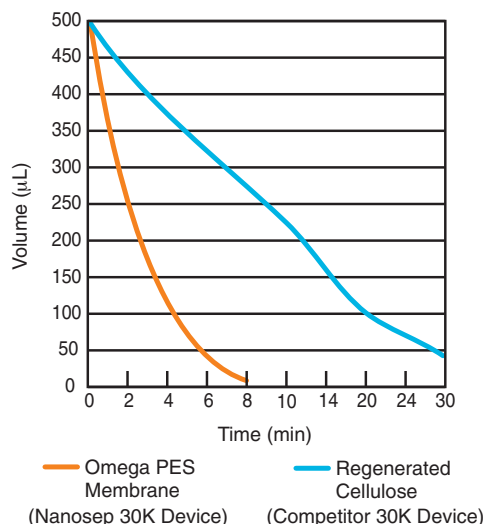
Performance

Omega™ Membrane Has the Lowest Non-Specific DNA Binding



A 500 μL sample of a ^{32}P -labeled PCR product (400 bp, 50 ng/mL) was centrifuged at 5,000 x g in a 100K Nanosep or competitive device. The retained DNA was recovered in 40 μL TE (10 mM Tris, 1 mM EDTA, pH 8). The remaining radioactivity in the device was counted in a scintillation counter. A value at 1000 CPM roughly corresponds to 1% of the total radioactive sample. Omega membrane has the lowest non-specific binding, resulting in highest DNA recoveries. In general, DNA molecular weights do not correspond well with the MWCO because DNA is a long linear molecule. Effective retention of DNA by an ultrafiltration membrane requires a reduction in g-force to 5,000 x g. Otherwise, DNA can be forced through many MWCO membranes regardless of size.

Centrifugal Device Spin Times



centrifugal devices

PROTEIN AND DNA PURIFICATION

Ordering Information

Nanosep Centrifugal Devices With Omega Membrane

Part Number	Description	Pkg
OD003C33	3K, gray	24/pkg
OD003C34	3K, gray	100/pkg
OD003C35	3K, gray	500/pkg
OD010C33	10K, blue	24/pkg
OD010C34	10K, blue	100/pkg
OD010C35	10K, blue	500/pkg
OD030C33	30K, red	24/pkg
OD030C34	30K, red	100/pkg
OD030C35	30K, red	500/pkg
OD100C33	100K, clear	24/pkg
OD100C34	100K, clear	100/pkg
OD100C35	100K, clear	500/pkg
OD300C33	300K, orange	24/pkg
OD300C34	300K, orange	100/pkg
OD300C35	300K, orange	500/pkg

Nanosep MF Centrifugal Devices With Bio-Inert® Membrane

Part Number	Description	Pkg
ODM02C33	0.2 μm , aqua	24/pkg
ODM02C34	0.2 μm , aqua	100/pkg
ODM02C35	0.2 μm , aqua	500/pkg
ODM45C33	0.45 μm , wildberry	24/pkg
ODM45C34	0.45 μm , wildberry	100/pkg
ODM45C35	0.45 μm , wildberry	500/pkg

Nanosep MF Centrifugal Devices With GHP Membrane

Part Number	Description	Pkg
ODGHPC34	0.45 μm , clear	100/pkg
ODGHPC35	0.45 μm , clear	500/pkg

Microsep™ Advance Centrifugal Devices

Precise, quick recovery of microliter volumes



- ▶ Achieve 50X concentration and > 90% recovery in just minutes.
- ▶ Deadstop feature prevents samples from spinning to dryness.
- ▶ Versatile Omega™ membrane is available in a variety of MWCOs.
- ▶ Color-coded and laser etched for easy identification.

Applications

Ultrafiltration

- ▶ Concentrate dilute protein samples prior to electrophoresis.
- ▶ Exchange buffer and remove salt in samples.
- ▶ Isolate low molecular weight compounds from fermentation broths for natural product screening.
- ▶ Recover biomolecules from cell culture supernatants or lysates.

Microfiltration

- ▶ Clarify samples with gross particulate.
- ▶ Remove particulate from samples for HPLC analysis of drugs, amino acids, and antibodies.

Specifications

Materials of Construction

Filter Media: Omega (modified polyethersulfone) and Supor® (polyethersulfone) membranes
 Sample Reservoir, Filtrate Receiver, and Cap: Polypropylene
 Paddle: Polyethylene

Effective Filtration Area

3.3 cm²

Dimensions

Diameter: 17 mm (0.7 in.)

Length: 12.0 cm (4.9 in.)

Capacities

Maximum Sample Volume: 5.0 mL

Final Concentrate Volume:

65 µL (swinging bucket)

80 µL (45° angle rotor)

100 µL (34° angle rotor)

Filtrate Receiver Volume: 6.5 mL

Hold-Up Volume: 40 µL (membrane and paddle)

Operating Temperature Range

0 - 40 °C (32 - 104 °F)

pH Range

1 - 14

Maximum Centrifugal Force

7,500 x g (ultrafiltration)

14,000 x g (microfiltration)

Centrifuge

A fixed angle rotor or swinging bucket that accepts standard 17 x 100 mm tubes and is capable of 3,000 to 14,000 x g

Sanitization

Provided non-sterile. May be sanitized by filtering 70% ethanol through the device prior to use.

Ordering Information

Microsep Advance Centrifugal Devices With Omega Membrane

Part Number	Description	Pkg
MCP003C41	3K, gray	24/pkg
MCP003C46	3K, gray	100/pkg
MCP010C41	10K, blue	24/pkg
MCP010C46	10K, blue	100/pkg
MCP030C41	30K, red	24/pkg
MCP030C46	30K, red	100/pkg
MCP100C41	100K, clear	24/pkg
MCP100C46	100K, clear	100/pkg

Microsep Advance Centrifugal Devices With Supor Membrane

Part Number	Description	Pkg
MCPM02C67	0.2 µm, aqua	24/pkg
MCPM02C68	0.2 µm, aqua	100/pkg
MCPM45C67	0.45 µm, wildberry	24/pkg
MCPM45C68	0.45 µm, wildberry	100/pkg

Macrosep® Advance Centrifugal Devices

Quickly concentrates up to 20 mL of biological sample



- ▶ Rapidly concentrates 20 mL sample volumes to 0.5 mL.
- ▶ Provides high recoveries, typically > 90%.
- ▶ Low protein-binding Omega™ membrane and polypropylene housing minimize losses due to non-specific binding.
- ▶ Versatile Omega membrane is available in a variety of MWCOs.
- ▶ Built-in deadstop prevents spinning to dryness.
- ▶ Color-coded for easy identification.

Applications

Ultrafiltration

- ▶ Concentrate and desalt proteins.
- ▶ Exchange buffer or remove salt of chromatography eluates and gradient fractions.
- ▶ Recover proteins or other molecules from cell culture supernatants.

Microfiltration

- ▶ Remove particulate from aqueous solutions and clinical samples.

Specifications

Materials of Construction

Filter Media: Omega (modified polyethersulfone) and Supor® (polyethersulfone) membranes
Sample Reservoir, Filtrate Receiver, and Cap: Polypropylene
Paddle: Polyethylene

Effective Filtration Area

7.2 cm²

Dimensions

Diameter: 29 mm (1.2 in.)

Length: 12.0 cm (4.7 in.)

Operating Temperature Range

0 - 40 °C (32 - 104 °F)

Capacities

Maximum Sample Volume: 20 mL

Final Concentrate Volume:

450 µL (swinging bucket)

1.2 - 1.5 mL (45° angle rotor)

1.5 mL (34° angle rotor)

Filtrate Receiver Volume: 22 mL

Hold-Up Volume: 80 µL (membrane and paddle)

pH Range

1 - 14

Maximum Centrifugal Force

5,000 x g (ultrafiltration)

14,000 x g (microfiltration)

Centrifuge

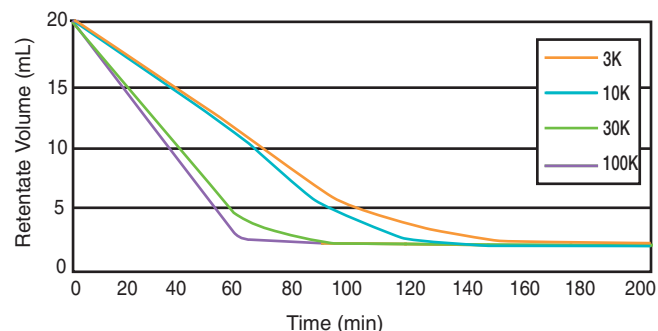
Fits centrifuges that accept standard 50 mL conical end tubes

Sanitization

Provided non-sterile. May be sanitized by filtering 70% ethanol through the device prior to use.

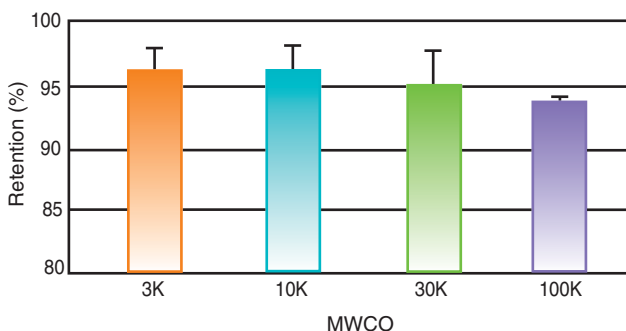
Performance

Macrosep® Advance Centrifugal Devices: Reduced Spin Time



Protein solutions were processed in each of the Macrosep Advance devices. Average time (minutes) is plotted against mL of remaining product to be filtered using a swinging bucket rotor at 5,000 x g. Solutions are 3K: Protamine Sulfate, 0.1% in 1X PBS; 10K: Cytochrome C, 0.025% in 1X PBS; 30K: IgG, 0.1% in 1X PBS; and 100K: Apoferritin, 0.1% in 1X PBS.

Macrosep Advance Centrifugal Devices: Retention Efficiency



Protein solutions were processed in each of the Macrosep Advance devices. Average percent retention using a swinging bucket rotor at 5,000 x g is displayed for each MWCO. Solutions were 3K: Protamine Sulfate, 0.1% 1X PBS; 10K: Cytochrome C, 0.025% in 1X PBS; 30K: IgG, 0.1% in 1X PBS; and 100K: Apoferritin, 0.1% in 1X PBS.

Ordering Information

Macrosep Advance Centrifugal Devices With Omega™ Membrane

Part Number	Description	Pkg
MAP003C36	3K, gray	6/pkg
MAP003C37	3K, gray	24/pkg
MAP003C38	3K, gray	100/pkg
MAP010C36	10K, blue	6/pkg
MAP010C37	10K, blue	24/pkg
MAP010C38	10K, blue	100/pkg
MAP030C36	30K, red	6/pkg
MAP030C37	30K, red	24/pkg
MAP030C38	30K, red	100/pkg
MAP100C36	100K, clear	6/pkg
MAP100C37	100K, clear	24/pkg
MAP100C38	100K, clear	100/pkg

Macrosep Advance Centrifugal Devices With Supor® Membrane

Part Number	Description	Pkg
MAPM02C67	0.2 µm, aqua	24/pkg
MAPM02C68	0.2 µm, aqua	100/pkg
MAPM45C67	0.45 µm, wildberry	24/pkg
MAPM45C68	0.45 µm, wildberry	100/pkg

Jumbosep™ Centrifugal Devices

Convenient and reliable concentration, purification, and diafiltration of 20 to 60 mL biological samples



- ▶ Typically concentrates 60 mL sample volumes to 5 mL in 30 minutes.
- ▶ Provides high recoveries, typically > 90%.
- ▶ Low protein-binding Omega™ membrane and polysulfone housing minimize losses due to non-specific binding.
- ▶ Versatile Omega membrane is available in a variety of MWCOs, color-coded for easy identification.
- ▶ Built-in deadstop prevents spinning to dryness.
- ▶ Unique sealing mechanism prevents retentate leakage and filtrate contamination.
- ▶ Economical. Sample reservoir and filtrate receiver can be sanitized or autoclaved, and reused.

Applications

Replaces dialysis, chemical precipitation, and lyophilization in the following applications:

- ▶ Concentrating and desalting proteins.
- ▶ Exchanging buffer or removing salt from chromatography eluates and gradient fractions.
- ▶ Separating biomolecules from cell culture supernatants.
- ▶ Concentrating or removing viruses.
- ▶ Performing crude fractionation of protein mixtures.
- ▶ Removing debris and particulates from cell lysates.

Specifications

Materials of Construction

Filter Media: Omega (modified polyethersulfone) membrane
Sample Reservoir and Filtrate Receiver: Polysulfone
Sample Reservoir Cap: Polyethylene
Insert Without Membrane: High density polyethylene
Filtrate Receiver Cap and Insert Release: Polypropylene

Effective Filtration Area

15.2 cm²

Dimensions

Outside Diameter (Maximum): 6 cm (2.4 in.)
Overall Height (Fully Assembled With Cap): 11.3 cm (4.5 in.)

Capacities

Maximum Sample Volume: 60 mL
Final Concentrate Volume: 3.5 - 4 mL
Maximum Filtrate Receiver Volume: 60 mL
Hold-Up Volume (Membrane/Support): 0.2 mL

Operating Temperature Range

0 - 40 °C (32 - 104 °F)

pH Range

1 - 14

Centrifuge

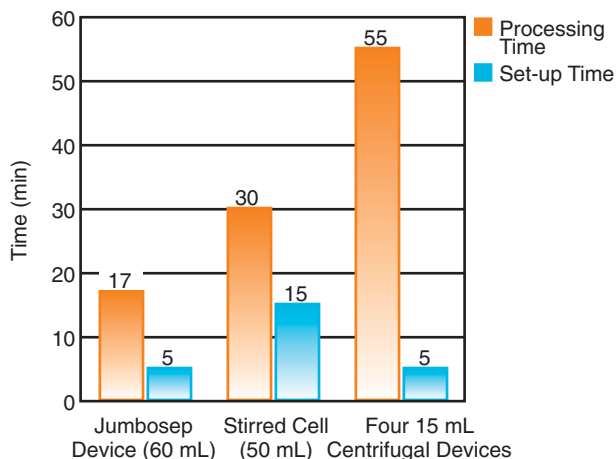
Swinging bucket rotor is required that accepts flat-bottomed 250 mL bottles and is capable of spinning at up to 3,000 x g

Sanitization

Provided non-sterile. May be sanitized by filtering 70% ethanol through the device prior to use.

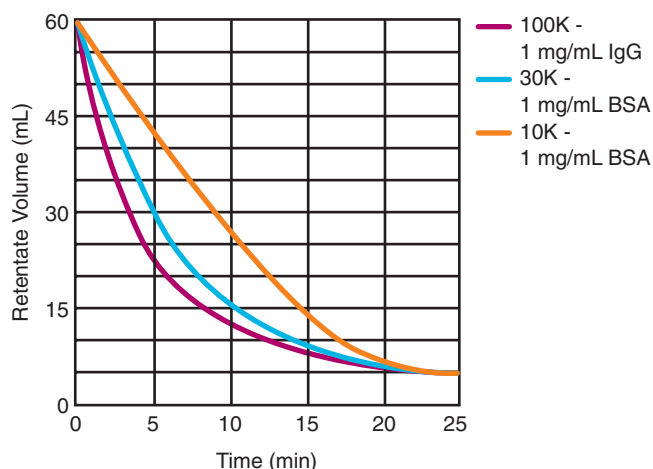
Performance

Jumbosep™ Device Reduces Processing Time Over Other Devices



1 mg/mL BSA solution was processed in each of the above devices until a 15-fold concentration was achieved.

Concentration Time



Concentrate dilute protein samples in less than 30 minutes with 10, 30, and 100K Jumbosep devices.

Ordering Information

The generic starter kit includes four holders, cups, and caps. Membrane inserts sold separately. The starter kits include four holders, cups, caps, and membrane inserts.

Jumbosep Centrifugal Device Starter Kits

Part Number	Description	Pkg
FD000K65	Generic starter kit, (no membrane inserts)	4/pkg
FD003K65	3K starter kit, gray	4/pkg
FD010K65	10K starter kit, blue	4/pkg
FD030K65	30K starter kit, red	4/pkg
FD100K65	100K starter kit, clear	4/pkg
FD300K65	300K starter kit, orange	4/pkg

Jumbosep Centrifugal Device Membrane Inserts

Part Number	Description	Pkg
OD003C65	3K membrane insert, gray	12/pkg
OD010C65	10K membrane insert, blue	12/pkg
OD030C65	30K membrane insert, red	12/pkg
OD100C65	100K membrane insert, clear	12/pkg
OD300C65	300K membrane insert, orange	12/pkg

Accessories and Replacement Parts

Part Number	Description	Pkg
FD001X65	Filtrate receiver and cap	12/pkg
FD002X65	Sample reservoir and cap	12/pkg
FD003X65	Insert release	24/pkg

How to Choose a Chromatography Product for Your Application

Pall offers a comprehensive, versatile, and targeted range of chromatography sorbents and membranes to support your protein purifications. Our portfolio of products facilitates

applications ranging from research, to process development and scale up, to full-scale process manufacturing.

Affinity and Metal Chelate Chromatography

Sorbent	Ligand	Average Particle Size (µm)	Working / Cleaning pH	Applications
Protein A Ceramic HyperD® F sorbent	Recombinant Protein A	50	2 – 11 / 2 – 13	<ul style="list-style-type: none"> • Immunoglobulins • MAb
Blue Trisacryl M sorbent	Blue dye	60	1 – 10 / 1 – 10	<ul style="list-style-type: none"> • Albumin, enzymes • Growth hormones • Growth factors • Interferon • Coagulation factors • Lipoproteins
Heparin HyperD M sorbent	Porcine heparin	80	3 – 13 / 3 – 13	<ul style="list-style-type: none"> • Coagulation factors • Growth hormones • Enzymes • Lipoproteins • Nucleic acid
Lysine HyperD sorbent	L-lysine	70	3 – 13 / 3 – 13	<ul style="list-style-type: none"> • Plasminogen • Glycoproteins
IMAC HyperCel™ sorbent	Iminodiacetic acid (IDA)	90	3 – 12 / 3 – 14	<ul style="list-style-type: none"> • Immobilized metal affinity chromatography (IMAC)

Ion Exchange Chromatography

Sorbent	Chemical Group	Average Particle Size (µm)	Working / Cleaning pH	Applications
Q, S HyperCel™ sorbents	Quaternary amine (Q) Sulfonic acid (S)	75	1 – 13 / 1 – 14	<ul style="list-style-type: none"> • High productivity separation • Recombinant proteins • Monoclonal antibodies (MAbs) • Plasma derivatives • Biosimilars • Vaccines • Polypeptides • Plasmid purification • High resolution for recombinant proteins
Q, S, DEAE, CM Ceramic HyperD F sorbents	Quaternary amine (Q) Sulfopropyl (S) Diethylaminoethyl (DEAE) Carboxymethyl (CM)	50	2 – 12 / 1 – 14	<ul style="list-style-type: none"> • Recombinant proteins • Plasmid purification • Proteins, vaccines • MAb • Capture step • Immunoglobulin purification
Membrane	Chemical Group	Typical DBC	Available Format	Applications
Mustang® Q membrane	Quaternary amine (Q)	70 mg/mL BSA 30 mg/mL DNA	Single-use capsules, reusable XT capsules, AcroPrep™ filter plates, Acrodisc® syringe filters	<ul style="list-style-type: none"> • Contaminant removal in polishing applications (DNA, HCP, viruses, endotoxins) • Plasmid, virus, high molecular weight protein capture, and oligonucleotide purification • Column guard to enhance selectivity of subsequent chromatography steps
Mustang S membrane	Sulfonic acid (S)	60 mg/mL human IgG	Single-use capsules, AcroPrep filter plates, Acrodisc syringe filters	<ul style="list-style-type: none"> • Specific capture (baculoviruses) • Aggregate polishing from MAb feedstream

Mixed-Mode Chromatography

Sorbent	Ligand	Average Particle Size (µm)	Working / Cleaning pH	Applications
MEP HyperCel sorbent	4-Mercaptoethyl-pyridine	90	2 – 12 / 2 – 14	<ul style="list-style-type: none"> • Direct capture of polyclonal and monoclonal antibodies of most classes, sub-classes, and species • Enzymes and recombinant proteins • Capture of recombinant antibody fragments • Separation of monomeric IgG from aggregates • Direct capture of proteins in low salt concentration
HEA HyperCel sorbent	Hexylamine	90	2 – 12 / 1 – 14	
PPA HyperCel sorbent	Phenylpropylamine	90	2 – 12 / 1 – 14	
SDR HyperD sorbent	Hydrophobic polymer moiety	70	2 – 12 / 2 – 12	

Membrane	Nature	Typical DBC	Available Format	Applications
Mustang E membrane	Positively-charged modified hydrophilic polyethersulfone (200 nm pore size) (E)	4 x 10 ⁶ EU/mL	Single-use capsules, Acrodisc syringe filters, membrane	<ul style="list-style-type: none"> • Endotoxin removal from buffers, water, saline, and process streams

Detergent Removal Chromatography

Sorbent	Ligand	Average Particle Size (µm)	Working / Cleaning pH	Applications
SDR HyperD sorbent	Hydrophobic polymer moiety	70	2 – 12 / 2 – 12	<ul style="list-style-type: none"> • Elimination of solvent and detergent from biological fluids

Hydroxyapatite Chromatography

Sorbent	Nature	Average Particle Size (µm)	Working / Cleaning pH	Applications
HA Ultrogel® sorbent	Hydroxyapatite crystals	120	5 – 13 / 5 – 14	<ul style="list-style-type: none"> • Immunoglobulin separation • Glycoproteins, vaccines

Chromatography Products Expand Separation Options

Affinity Chromatography

Affinity chromatography separates compounds based on the properties of chosen ligands with specific affinity to the molecule being selected for attachment to the solid matrices. Often, the binding between the molecule and the ligand can be reversed after the selection step. This is done, for example, through buffer, salt concentration, or pH change.

Pall offers bottled sorbents, packaged kits, and pre-packed columns for affinity chromatography. Pall bottled sorbents can be used for small and large sample sizes, and for single use and high throughput methods of purification. Our base sorbent varies depending on targeted application.

Protein A Ceramic HyperD® F Sorbent is a high capacity affinity sorbent designed for process-scale purification of immunoglobulin G. The sorbent combines ease of use with high binding capacity and excellent scalability. Protein A Ceramic HyperD F sorbent is prepared using a rigid proprietary ceramic bead. Recombinant Protein A is immobilized to a specially formulated hydrogel within the porous ceramic bead. (See page 53.)

Blue Trisacryl® M Sorbent is an affinity chromatography sorbent used for the purification of a wide variety of enzymes and proteins such as kinases, albumin, interferons, and some coagulation factors. The base matrix is Trisacryl GF2000, a macroporous non-ionic sorbent on which Cibacron® Blue is covalently immobilized. Cibacron Blue F3GA dye is strongly bound to the matrix through a six carbon spacer arm. The reaction is performed with the EEDQ coupling agent. This type of coupling prevents any leakage of the dye in normal working conditions. (See page 49.)

Heparin HyperD M Sorbent is a high capacity affinity preparative sorbent for the purification of biological molecules that bind to heparin, such as coagulation factors, growth factors, lipoproteins, etc. Heparin HyperD M affinity sorbent employs a high-capacity hydrogel polymerized within the large pores of a rigid bead. This design combines the desirable characteristics of a soft, high capacity hydrogel with the high dimensional stability of a rigid bead. (See page 50.)

Lysine HyperD Sorbent is a high capacity affinity preparative sorbent for the purification of biological molecules that bind to lysine such as plasminogen from human or animal species plasma. Lysine HyperD affinity sorbent employs a high-capacity hydrogel polymerized within the large pores of a rigid bead. This design combines the desirable characteristics of a soft, high capacity hydrogel with the high dimensional stability of a rigid bead. (See page 52.)

Type of Affinity Purification

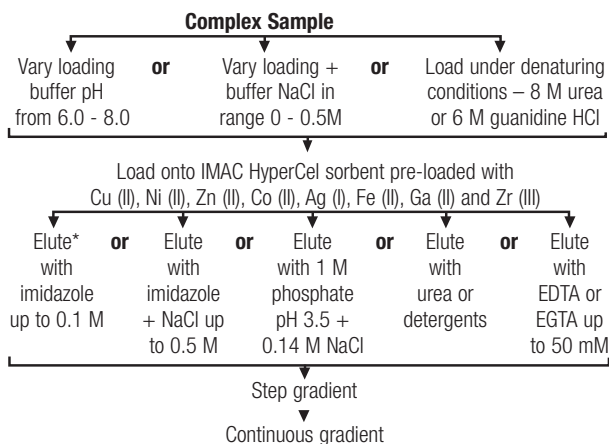
Type of Affinity Purification	Ligand(s)	Pall Product
Albumin Depletion	Blue Dye	Blue Trisacryl M Chromatography Sorbent
IgG Purification	Protein A MEP [†]	Protein A Ceramic HyperD Chromatography Sorbent, MEP HyperCel™ Chromatography Sorbent
Lipoprotein Purification	Heparin	Heparin HyperD M Chromatography Sorbent
Glycoprotein Purification	Lysine Hydroxy-apatite	Lysine HyperD Chromatography Sorbent HA Ultrogel® Chromatography Sorbent

Metal Chelate Affinity Chromatography

Metal chelate affinity chromatography exploits the affinity of proteins or other molecules for metal ions. The affinity is derived from the formation of coordination bonds between the metal ions and certain exposed side chains of protein amino acids. Histidine, present in many proteins, forms complexes with transition metal ions such as Cu, Zn²⁺, Ni²⁺ or Fe³⁺.

IMAC HyperCel Sorbent uses tridentate IDA (iminodiacetic acid) as a chelating ligand agent. This ligand is immobilized on the HyperCel base sorbent, a stable, robust, and well-known sorbent used for both research and industrial-scale protein separations. (See page 51.)

Summary of Pre-Fractionation Options for IMAC HyperCel Sorbent



*Elution may require several steps, such as imidazole, pH, salt, EDTA, or EGTA and detergents linked together to achieve efficient recovery of bound material.

Ion Exchange Chromatography

Ion exchange chromatography separates compounds based on net surface charge. Molecules are classified as either anions (having a negative charge) or cations (having a positive charge). Some molecules (e.g., proteins) may have both an anionic and cationic group. A positively-charged support (anion exchanger) will bind a compound with an overall negative charge. Conversely, a negatively-charged support (cation exchanger) will bind a compound with an overall positive charge. Ion exchange matrices can be further categorized as either strong or weak. Strong ion exchange matrices are charged (ionized) across a wide range of pH levels. Weak ion exchange matrices are ionized within a narrower pH range. The four most common ion exchange chemistries are shown below.

Type of Ion Exchanger	Common Abbreviation	Functional Group	Pall Product	See Page
Strong Anion	Q	Quarternary Ammonium	Q HyperCel™	56
			Acrodisc® with Mustang® Q	44
			Q Ceramic HyperD®	54
			Acrodisc with Mustang Q	44
			AcroPrep™ Advance with Mustang Q	69
			AcroSep™ with Q Ceramic HyperD	40
Weak Anion	DEAE	Diethyl-aminoethyl	DEAE Ceramic HyperD	54
			AcroSep with DEAE Ceramic HyperD	40
Strong Cation	S	Sulfonic Acid	S HyperCel	56
			Acrodisc with Mustang S	44
			S Ceramic HyperD	54
			Acrodisc with Mustang S	44
			AcroPrep Advance with Mustang S	69
			AcroSep with S Ceramic HyperD	40
Weak Cation	CM	Carboxy-methyl	CM Ceramic HyperD	54
			AcroSep with CM Ceramic HyperD	40

Pall offers ion exchange sorbents, pre-packed columns, and membranes. In many areas, chromatography sorbents are the media of choice for chromatography applications, but in some cases where sorbent-based methods have limitations (e.g., purification of viruses or large molecules) membranes have proven to be a robust, scalable, and economic alternative. Membranes perform well in such applications because of their faster flow rates compared to sorbents.

What Flow Rate to Use?

Mustang membrane chromatography devices are designed to run at flow rates of at least 10 column volumes per minute. Initial optimization of buffer selection, pH, capacity, and elution

conditions can all be performed at this flow rate. Faster flow rates for equilibration, loading, and washing will give better throughput; a slower flow rate during binding and elution may give better resolution for some processes. The open structure of Mustang membranes does not require diffusion into pores, and therefore normally permits high flow rates.

What Buffer to Use?

Typically, ion exchange chromatography matrices are loaded in low ionic strength buffers. Under these conditions, charged macromolecules will be retained by the stationary phase bearing the opposite charge. Macromolecules bearing the same charge as the stationary phase will simply flow through without binding. The ion exchange matrix is washed with additional low ionic strength buffer to completely wash out any remaining unbound species, and the bound species are differentially eluted by buffers containing increasing amounts of salt. As the ionic strength of the mobile phase increases, salt ions compete for binding to the charges on the ion exchange matrix, displacing the bound macromolecule, and allowing them to elute from the matrix. To avoid difficulty, use anionic (negatively-charged) buffers for cation exchange, and cationic (positively-charged) buffers for anion exchange.

What pH to Use?

Although pH does not influence the charge of a strong ion exchange matrix, it will influence the charge on the macromolecules in solution. The operating pH in ion exchange chromatography is selected to maximize the resolution of the target molecule from the contaminant background. In some cases, a pH is selected to provide maximum binding of the target molecule and minimum binding of the contaminants (positive mode). Elution of the target molecule is accomplished by increasing the salt concentration. In other cases, a pH is selected to provide maximum binding of the contaminants and minimal or no binding of the target molecule (negative mode). The target molecule ends up in the flow through, and the contaminants are separated away by binding to the matrix. Through careful selection of both the ion exchange matrix and the operating pH, both yield and purity can be maximized in a single step. However, it is never possible to achieve 100% purity in a single step, which is why multiple steps must be sequenced together to take advantage of the variety of chemical differences between the target molecule and background contaminants.

What Salt to Use for Elution?

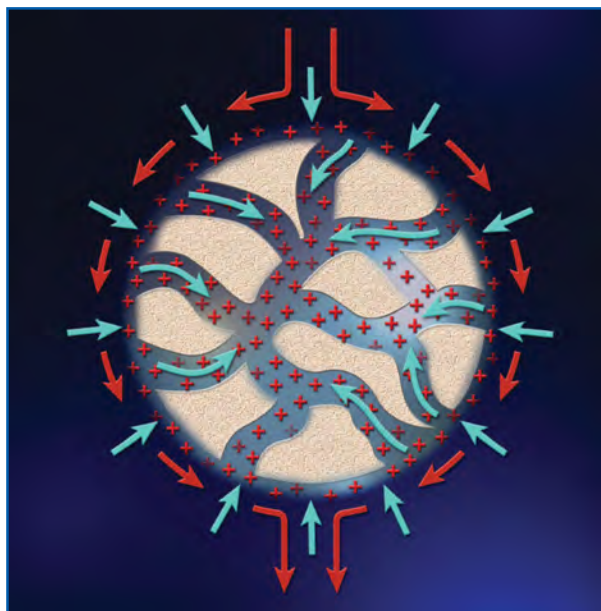
After binding, salt concentrations for elution are chosen so the target molecule does not co-elute with contaminants that have also bound to the ion exchange matrix. Ions of the eluting salt must displace other molecules from the charged groups on the stationary phase with either a gradient or step in the 0 to 1.0 M range. The effectiveness of displacement for commonly used cations is: $\text{Ca}^{2+} > \text{Mg}^{2+} > \text{Na}^+ > \text{K}^+ > \text{NH}_4^+$.

Ion Exchange Chromatography (continued)

The order of displacement effectiveness for commonly-used anions is: $\text{PO}_4^{3-} > \text{SO}_4^{2-} > \text{COO}^- > \text{Cl}^-$. These rankings correlate with the Hofmeister series, and the strongest eluting salt is not always best. Ideally, several salts should be tested, and finding optimum elution conditions often involves trial and error. Most users will start with either NaCl or KCl simply because they are readily available in the lab. However, CaCl_2 or MgCl_2 may be used. For some proteins, those salts may actually end up being a better choice. Regardless of eluting salt selection, the effect on the purity, stability, and activity of the target molecule will have to be assessed.

Gel-in-a-Shell Technology: The Enhanced Diffusion Concept

Traditional macroporous ion exchangers operate on the basis of classical pore diffusion. Pore diffusion is characterized by rapidly decreasing binding capacity with increasing flow rate. In contrast, the unique structure of Pall's Ceramic HyperD® sorbent supports a more rapid mechanism of mass transfer, known as enhanced diffusion. Rapid mass transfer overcomes classical flow rate dependence. Because product is bound throughout the gel-filled pore (not merely at the interior surface of the pore), total binding capacity is enhanced.



Using enhanced diffusion, Pall's gel-in-a-shell technology binds product throughout the gel-filled pore, enhancing total binding capacity.

Binding of protein within the hydrogel carries an extraordinarily high concentration of ion exchange functional groups: 150 - 400 $\mu\text{eq/mL}$. The average distance between charged sites on the hydrogel is $\sim 20 \text{ \AA}$. Thus, a protein molecule within the gel is simultaneously in contact with a large number of ion exchange sites. It remains in contact with a similar number of sites no matter where it moves within the three-dimensional structure of the hydrogel. As a result, the protein is energetically unconstrained and may migrate freely. Protein diffuses rapidly within the hydrogel to give a homogeneous distribution, facilitating uptake of additional material from the solution. Under binding conditions, strong attractive electrostatic forces between the highly substituted hydrogel and the protein drive entry of protein into the gel. The table below demonstrates the high dynamic binding capacity of various Ceramic HyperD sorbents.

Ceramic HyperD sorbents are available in bulk as bottled sorbents, or pre-packed into Pall's AcroSep™ chromatography columns. (See pages 40, 54.)

Pall Ion Exchange Sorbents Exhibit Extremely High Dynamic Binding Capacity While Maintaining Fast Flow Rates

Media	Flow Rate (mL/min)		
	1	5	10
Q Ceramic HyperD 20	106.0 mg/mL	91.5 mg/mL	82.5 mg/mL
DEAE Ceramic HyperD F	101.5 mg/mL	87.5 mg/mL	77.5 mg/mL
S Ceramic HyperD F	80.5 mg/mL	61.5 mg/mL	53.5 mg/mL
S Ceramic HyperD 20	98.0 mg/mL	89.5 mg/mL	83.5 mg/mL
CM Ceramic HyperD F	108.0 mg/mL	87.5 mg/mL	73.5 mg/mL

The HyperD line of ion exchange sorbents shows high dynamic binding capacity (50-110 mg BSA/mL of sorbent for sorbents tested here). Dynamic binding capacity is measured in a 1 mL packed column by pumping BSA (anion) or lysozyme (cation) at 5 mg/mL in a suitable binding buffer until the column capacity is exceeded. The capacity is then calculated by estimating the volume of protein required to achieve this "breakthrough" and expressed as mg/mL media volume. Anion and cation chemistries are available in both 50 μm (HyperD F sorbents) and 20 μm (HyperD 20 sorbents) particle sizes for improved resolution.



Using Mustang® Membranes for Ion Exchange Chromatography

Membranes are recommended in chromatography applications when there is a need to purify large molecules or in situations where faster flow is needed. Membrane chromatography is extremely economical because flow rates are significantly faster than traditional sorbent chromatography, decreasing cycle time and increasing throughput. Pall's Mustang membranes possess large convective pores and have dynamic binding capacities that are relatively insensitive to the effects of high flow rates, even for large molecules such as plasmids and viruses. Pall's membrane devices for ion exchange chromatography offer:

- ▶ **True scalability** – For laboratory-scale applications, Mustang membranes are available in Acrodisc® units for single samples and AcroPrep™ Advance filter plates for higher sample processing. Devices with Mustang Q and S membranes can be scaled up to larger-capacity capsules and cartridges from Pall.
- ▶ **Application-specific membrane chemistries** – Mustang Q membrane is a strong anion exchanger that effectively binds plasmid DNA, negatively-charged proteins, and viral particles. Mustang S membrane is a strong cation exchanger that effectively binds positively-charged proteins and viral particles.
- ▶ **High binding capacities and fast flow rates** – Mustang membranes withstand high flow rates to render faster purification without affecting recovery rates.

Mustang Q Membrane for Anion Exchange

Mustang Q membrane is an anion exchanger with a polyethersulfone (PES) base modified with quaternary amines. Mustang Q membrane delivers efficient and rapid flow rates with a convective pore structure combined with high dynamic binding capacity for plasmid DNA (3.6 mg/Acrodisc unit), negatively-charged proteins (10 mg), and viruses (10^{12} viral particles). Processing time is much shorter and more efficient than the conventional bead- or sorbent-based technology. Mustang devices have throughputs of up to 100 times that of traditional columns, with no associated loss of binding capacity. The syringe filter and multi-well plate formats can directly scale up to larger-scale capsules and cartridges for larger-volume applications.

Mustang S Membrane for Cation Exchange

High capacity Mustang S membrane is a cation exchanger with a polyethersulfone (PES) base modified with sulfonic acid groups. Mustang S membrane delivers efficient and rapid flow rates with a convective pore structure combined with high dynamic binding capacity for positively-charged proteins and viruses. Processing time is much shorter and more efficient than the conventional bead or sorbent-based technology. The syringe filter and multi-well plate formats can directly scale up to larger-scale capsules and cartridges for larger-volume applications.

See pages 44 - 45 for resolution and dynamic binding data for Mustang Q and S membranes in Acrodisc units.



Mustang membrane is available in Acrodisc units for single sample processing.

Mixed-Mode Chromatography

Hydrophobic Charge Interaction Chromatography (HCIC)

HCIC is based on the pH-dependent behavior of ionizable, dual-mode ligands. Adsorption is based on mild hydrophobic interaction and is achieved without addition of lyotropic or other salts. Desorption is based on charge repulsion. It is performed by reducing pH.

MEP HyperCel™ sorbent is a high capacity, high selectivity sorbent designed for the capture and purification of monoclonal and polyclonal antibodies. HCIC is based on the pH dependent behavior of ionizable, dual-mode ligands. MEP HyperCel sorbent carries an antibody-selective ligand, 4-Mercapto-Ethyl-Pyridine (4-MEP). Adsorption is based on mild hydrophobic interaction and is achieved without addition of lyotropic or other salts. Desorption is based on charge repulsion. It is performed by reducing the pH. (See page 63.)

HEA and PPA HyperCel sorbents are novel industry scalable chromatography sorbents designed for protein capture and impurity removal in a biopharmaceutical environment. Operating on a "mixed-mode" mechanism, their chromatographic behavior is based on a combination of electrostatic and hydrophobic properties of the protein and ligands. HEA and PPA HyperCel sorbents provide unique and different selectivities not accessible with traditional ion exchange or HIC, that can be screened to facilitate process development. For example, the mixed-mode interaction mechanism can be exploited to achieve discrimination of proteins having similar or very close isoelectric points, a separation which cannot be performed by methods like ion exchange. (See page 62.)

Hydroxyapatite Chromatography

Hydroxyapatite chromatography is considered to be a "pseudo-affinity" chromatography, or "mixed-mode", ion exchange. It has proven to be an effective purification mechanism in a variety of processes, providing biomolecule selectivity complementary to more traditional ion exchange or hydrophobic interaction techniques. HA Ultrogel® is easily scalable and is currently used in research scale to multi-liter column applications.

HA Ultrogel sorbent available from Pall is a hydroxyapatite agarose composite sorbent for the separation of biomolecules from research and development scale to manufacturing. HA Ultrogel is a cross-linked tri-dimensional composite based on spherical agarose beads with entrapped microcrystals of hydroxyapatite. (See page 52.)

Detergent-Removal Chromatography

Plasma preparations may contain viruses that are effectively removed and inactivated by combining nanofiltration (for size exclusion removal of non-lipid enveloped viruses) and treatment with non-ionic solvents and detergents (effective for lipid-coated viruses). The elimination of solvent and detergent from biological fractions is necessary, and can be achieved by various methods including sorbent partitioning, size exclusion, affinity, or batch extraction with vegetable oils combined with reverse phase chromatography on C18.

SDR HyperD® sorbent is a unique sorbent designed to eliminate solvent and detergent from biological fluids. SDR HyperD sorbent is made of silica beads in which the pore volume is filled with a three-dimensional cross-linked hydrophobic polymer. The particle size distribution (40 - 100 µm), the small pore size of the silica beads, and the hydrophobic nature of the chemical groups make SDR HyperD sorbent an excellent tool for specific solvent and detergent removal from biological liquids. (See page 66.)



Bulk chromatography sorbents are available in various packaging configurations for use in differently-sized chromatography columns.

Size Exclusion Chromatography

Size exclusion chromatography (also known as gel filtration) separates molecules based on molecular size. This chromatography can be applied using sorbents or membrane. With membranes, the smaller molecules pass through while the larger molecules (above a certain size cut-off) are held above the membrane. With sorbents, the larger molecules pass/flow through the sorbent and are collected first while the smaller molecules take longer to flow through because these smaller particles get held up within the pores of the sorbents. Therefore, with sorbents, the sample passes through the sorbent in decreasing molecular weight. Common size exclusion applications include concentration, fractionation, desalting, and buffer exchange.

Size exclusion is one of the easiest chromatography methods to perform because samples are processed using an isocratic elution. In its analytical form, size exclusion can distinguish between molecules (e.g. proteins) with a molecular weight difference of less than a factor of two times. In this application, the porosity of the filtration media to be used is selected to provide high resolution in the molecular weight range of interest.

Size Exclusion Applications

Application	Pall Products
Nucleic Acid Concentration	AcroPrep™ Advance filter plates with ultrafiltration membranes
Nucleic Acid Desalting/ Buffer Exchange	Centrifugal devices with ultrafiltration membranes
Protein Buffer Exchange	Minimate™ TFF system AcroPrep™ Advance filter plates with ultrafiltration membranes

How to Choose an AcroSep™ Pre-Packed Chromatography Column

Chromatography may be the most important separation tool in today's arsenal of protein purification techniques. Pre-packed columns and other formats of sorbent-containing devices are becoming more valuable to researchers because they save time and provide reliable, efficient results. Today, sorbent-containing technologies are available with many different sorbent types, and ion exchange is one of the most popular. Using ion exchange, proteins can be fractionated and separated very precisely. Proteins can be separated with high resolution even if there is only a small difference in charge by method optimization. Affinity chromatography involves specific interactions between biomolecules. Ligands are covalently bound to a support matrix and the biomolecules of interest will adhere to the ligands in the column, resulting in a very pure separation.

Pall is continuing to expand our line of chromatography sorbents for laboratory applications to include both bulk sorbents and pre-packed columns. Documented reliability, outstanding quality, and ease of use make Pall chromatography products an outstanding choice for protein purification applications.

User-Friendly Column Design in Multiple Chemistries

Pre-packed AcroSep columns feature convenient, color-coded collars to help end users easily identify the sorbent type. These collars are hexagonally-shaped to prevent the columns from rolling off a table surface.

AcroSep Selection Guide and Color Coding

Type of Purification	Sorbent	1 mL AcroSep Column	Color
Ion Exchange, Weak Cation	CM Ceramic HyperD® F	Page 40	Green
Ion Exchange, Strong Cation	S Ceramic HyperD F	Page 40	Sky Blue
Ion Exchange, Strong Anion	Q Ceramic HyperD F	Page 40	Red
Ion Exchange, Weak Anion	DEAE Ceramic HyperD F	Page 40	Orange
Affinity	Protein A Ceramic HyperD F	Page 38	Pearl
Affinity	IMAC HyperCel™	Page 38	Cobalt Blue
Affinity	Blue Trisacryl® M	Page 38	Dark Blue
Mixed-Mode	MEP HyperCel	Page 42	Purple
Mixed-Mode	HEA HyperCel	Page 42	Black
Mixed-Mode	PPA HyperCel	Page 42	Yellow
Detergent Removal	SDR HyperD	Page 37	Natural

AcroSep columns are provided with luer inlet and outlet fittings to facilitate ease of use with a syringe, pump, or chromatography system.

AcroSep ion exchange columns feature Pall's patented ceramic HyperD sorbent with "gel-in-a-shell" technology

for rapid protein purification with high capacity and good resolution. Users can obtain high speed runs (1 - 4 mL/min) with very little loss in binding capacity and resolution, which allows more samples to be processed per day. These columns are useful for:

- ▶ Screening multiple IEX chemistries for use in protein purification.
- ▶ Optimizing studies of protein purification schemes using small sample volumes prior to scale-up.

See pages 40 - 41 for performance and ordering information.

AcroSep columns with SDR HyperD detergent removal sorbent provide high dynamic binding capacity for fast and efficient removal of many different detergents. The columns exhibit high recovery of proteins (exclusion limit 10 kDa) and high adsorption capacity for small hydrophobic molecules. The SDR sorbent is stable in acidic, polar organic, and oxidizing solutions. Use these columns for:

- ▶ Removing various (anionic, cationic, and non-ionic) detergents from proteomics samples.
- ▶ Removing detergents commonly used in membrane protein solubilization.

See page 37 for performance and ordering information.

Continuing Advancements

AcroSep chromatography columns for affinity purification provide high dynamic binding capacity when purifying a variety of biomolecules. The enhanced coupling mechanism removes concerns of ligands leaching into purified samples. These columns are ideal for:

- ▶ IgG affinity purification from multiple sample types.
- ▶ Purification of His-tagged proteins.
- ▶ Depletion of albumin from plasma and serum samples.

See page 38 - 39 for performance and ordering information.

AcroSep chromatography columns for mixed-mode feature Pall's HyperCel sorbent, which provides high porosity, chemical stability, and low non-specific interaction. Binding of target molecules typically occurs at physiological pH and removes the need for high salt concentration used in conventional hydrophobic interaction chromatography. Use these columns for:

- ▶ Antibody capture and purification.
- ▶ Direct hydrophobic capture and purification.
- ▶ Separation of proteins with similar isoelectric points.

See page 42 - 43 for performance and ordering information.

AcroSep™ Chromatography Columns with SDR HyperD® Detergent Removal Sorbent

Fast and efficient detergent removal in a convenient column format



- ▶ High dynamic binding capacity facilitates fast and efficient removal of many different detergents.
- ▶ Columns come with luer inlet and outlet to simplify use with a syringe.
- ▶ Provides high recovery of proteins.
- ▶ Offers high adsorption capacity for small hydrophobic molecules.
- ▶ Stable in acidic, polar organic, and oxidizing solutions.

Applications

- ▶ Ideal for fast and simple removal of various (anionic, cationic, and non-ionic) detergents from protein samples.
- ▶ Removes SDS for improved enzymatic activity during protein digestion.
- ▶ Removes detergents commonly used in membrane solubilization.

Specifications

Materials of Construction

Column Housing, Cap, Plug, and Adapter: Polypropylene
Column Frit: Polyethylene

Media	Color Code	Average Particle Size	Working pH	Capacity
SDR HyperD	Natural	70 µm	2 - 12	> 90 mg/mL ⁽¹⁾

(1) DBC determined using 5 mg/mL Triton® X-100 at flow rate 3.5 mL/min (300 cm/hr) in PBS pH 7.2.

Column Geometry

Column Volume: 1.04 mL
Bed Height: 1.48 cm (0.58 in.)
Bed Diameter: 0.94 cm (0.37 in.)

Device Dimensions

Diameter: 1.6 cm (0.6 in.)
Length (Without Plugs): 4.8 cm (1.9 in.)

Connections

Inlet: Threaded female luer lock
Outlet: Rotating male luer locking hub

Recommended Flow Rates

1 - 5 mL/min

Back Pressure

Maximum: 3 bar (300 kPa, 43.5 psi)

Storage

2 - 30 °C (36 - 86 °F)
2 - 8 °C (36 - 46 °F) after opening

Performance

Detergent Removal Efficiency and Protein Recovery

Detergent	% Removal Efficiency	% Protein Recovery
Triton X-100	100	> 96
NP 40	> 99	> 86
SDS	> 86	> 94
Tween® 20	100	> 98
CHAPS	> 98	99

Data generated by syringe method using 0.5% detergent protein concentration at 2 mL/min with 2.5 mL injection. Protein recovery is measured by BCA assay or at 280 nm.

Ordering Information

AcroSep Chromatography Columns With SDR HyperD Detergent Removal Sorbent

Part Number	Description	Pkg
20033-C001	SDR HyperD detergent removal sorbent, natural	5/pkg

Related Products

SDR HyperD Detergent Removal Chromatography Sorbent. 66

AcroSep™ Chromatography Columns for Affinity Purification

For the purification of a wide variety of proteins and antibodies



Protein A Ceramic HyperD® F Sorbent

- ▶ Achieves > 90% recovery of IgG in a single step.
- ▶ Recombinant Protein A immobilized to specially formulated hydrogel within a ceramic bead offers high selectivity with low non-specific binding and low levels of Protein A leaching.

IMAC HyperCel™ Sorbent

- ▶ Provides single-step purity under both native and denaturing conditions.
- ▶ IMAC HyperCel sorbent uses tridentate IDA (iminodiacetic acid) chelating ligand immobilized on the HyperCel bead resulting in a stable and robust sorbent for small-to-large scale protein separation.
- ▶ Flexible, uncharged IMAC HyperCel sorbent offers the option to select specific metal ions to achieve high purity and yield of target proteins.

Blue Trisacryl® M Sorbent

- ▶ Trisacryl macroporous base matrix allows good diffusion and improves exchange kinetics.
- ▶ Cibacron® blue dye ligand selective for enzymes and albumin.
- ▶ Enhanced stability due to ligand coupling mechanism prevents dye leakage.

Applications

Protein A Ceramic HyperD F Sorbent

- ▶ Designed for IgG affinity purification from multiple sample types.
- ▶ Purification of Fc fusion and Ab-like proteins.
- ▶ Depletion of IgG from plasma and serum.

IMAC HyperCel Sorbent

- ▶ Ideal for purification of His-tagged proteins.
- ▶ Purification of metal binding proteins or other proteins capable of metal ion coordination.

Blue Trisacryl M Sorbent

- ▶ Optimized for depletion of albumin from plasma and serum samples.
- ▶ Good for purification of enzymes.

Specifications

Materials of Construction

Column Housing, Cap, Plug, and Adapter: Polypropylene
Column Frit: Polyethylene

Media	Color	Average Particle Size	Working pH	Capacity
Protein A Ceramic HyperD F	Pearl	50 µm	2 - 11	> 30 mg/mL ¹
IMAC HyperCel	Cobalt blue	90 µm	3 - 12	40 - 70 µmol Cu ²⁺ /mL
Blue Trisacryl M	Dark blue	60 µm	1 - 10	10 - 15 mg/mL ²

(1) 10% breakthrough, 100 cm/hr, determined using 10 mg/mL human IgG in PBS, pH 7.4, elution in 0.1 M sodium citrate, pH 2.5, column 4.6 ID x 100 mm.

(2) Binding capacity using 5 mg/mL human albumin in PBS. Column dimensions – 1.6 cm ID x 3 cm bed height; residence time (Tr) = 7.26 min.

Column Geometry

Column Volume: 1.04 mL
Bed Height: 1.48 cm (0.58 in.)
Bed Diameter: 0.94 cm (0.37 in.)

Device Dimensions

Diameter: 1.6 cm (0.6 in.)
Length (Without Plugs): 4.8 cm (1.9 in.)

Connections

Inlet: Threaded female luer lock
Outlet: Rotating male luer locking hub

Recommended Flow Rates

Protein A Ceramic HyperD F:
0.2 - 1 mL/min
IMAC-Metal Loading Step: 3 - 6 mL/min
IMAC-Protein Capture Step:
0.5 - 1 mL/min
Blue Trisacryl M: 0.2 - 1.0 mL/min

Back Pressure

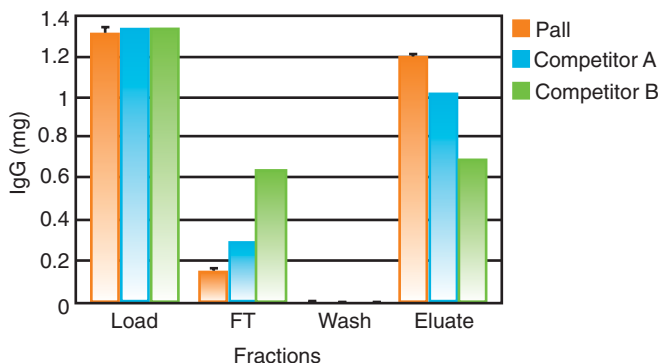
Maximum: 3 bar (300 kPa, 43.5 psi)

Storage

2 - 8 °C (36 - 46 °C)

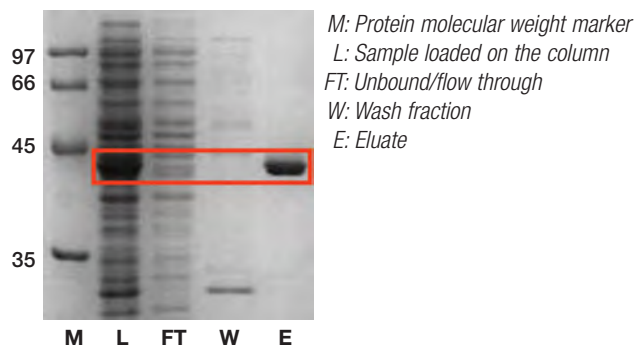
Performance

AcroSep™ Columns Provide Greater Capacity of IgG Compared to Competitive Columns



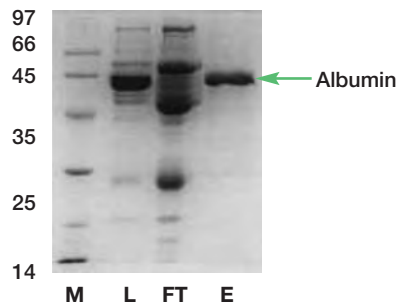
Recovery of IgG from human plasma quantified by ELISA. Data shows higher recovery of IgG with AcroSep Protein A Ceramic HyperD® F columns as compared to competitive columns. Average value is derived from duplicate readings. (Flow rate: 0.2 mL/min for loading, 1 mL/min all other steps.)

High Purity Protein in a Single Step Using Native Conditions



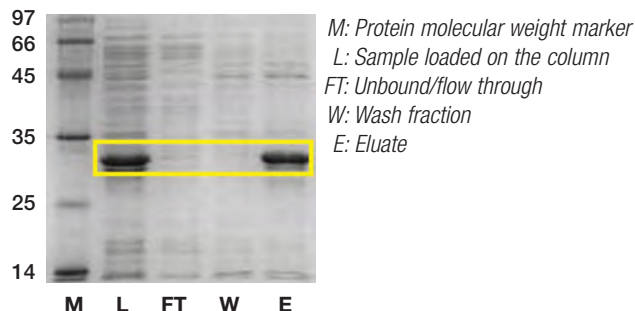
Marked area on gel demonstrates single-step affinity purification of His-tagged protein purified under native conditions on IMAC HyperCel™.

Purification of Albumin From Human Plasma



Total protein (0.3 mL plasma) was bound to the Blue Trisacryl® M AcroSep column in 20 mM PBS, pH 7.2. Bound proteins were eluted with a gradient of 3 M NaCl in PBS.

High Purity Protein in a Single Step Using Native Conditions



Marked area on gel demonstrates single-step affinity purification of His-tagged protein purified under denaturing conditions on IMAC HyperCel.

Ordering Information

AcroSep Chromatography Columns for Affinity Purification, 1 mL

Part Number	Description	Pkg
20078-C001	Protein A Ceramic HyperD F, pearl	5/pkg
20093-C001	IMAC HyperCel, cobalt blue	5/pkg
25896-C001	Blue Trisacryl M, dark blue	5/pkg

Related Products

Blue Trisacryl M Chromatography Sorbent	53
IMAC HyperCel Chromatography Sorbent	55
Protein A Ceramic HyperD F Chromatography Sorbent	57

AcroSep™ Ion Exchange Chromatography Columns

Rapid, high capacity protein purification in a user-friendly format



chromatography columns

PROTEIN AND DNA PURIFICATION

- ▶ Patented Ceramic HyperD® ion exchange chromatography sorbent features “gel-in-a-shell” technology, providing rapid protein purification with high capacity and good resolution.
- ▶ Rapid and efficient. Obtains high speed runs (1 - 4 mL/min) with very little loss in binding capacity and resolution, allowing more samples to be processed per day.
- ▶ Higher resolution for 1 mL columns. Columns provide distinct separation of proteins for better purification.
- ▶ Luer lock inlet and outlet allows convenient use with syringe, pump, or automated chromatography system.
- ▶ User-friendly column design is color-coded and labeled by chemistry type. Collar is hexagonal so columns will not unexpectedly roll off lab surface.

Applications

- ▶ Screen multiple IEX chemistries for use in protein purification.
- ▶ Ideal for optimization studies of protein purification schemes using small sample volumes prior to scale-up.
- ▶ Efficient and reliable small scale purification of proteins for structural, functional, and yield analysis.

Specifications

Materials of Construction

Column Housing, Cap, Plug,
and Adapter: Polypropylene
Column Frit: Polyethylene

Media	Function	Color Code	Average Particle Size	Working pH	Ion Exchange Capacity ¹
CM Ceramic HyperD F	Weak cation exchanger	Green	50 µm	2 - 12	> 60 mg/mL ²
DEAE Ceramic HyperD F	Weak anion exchanger	Orange	50 µm	2 - 12	> 85 mg/mL ³
Q Ceramic HyperD F	Strong anion exchanger	Red	50 µm	2 - 12	> 85 mg/mL ³
S Ceramic HyperD F	Strong cation exchanger	Sky Blue	50 µm	2 - 12	> 75 mg/mL ⁴

(1) Dynamic binding capacity determined at 10% breakthrough, 200 cm/h with 1.66 mL sorbent packed in a column of 4.6 mm ID and 100 mm height using the following:

(2) 5 mg/mL human IgG in 50 mM sodium acetate buffer, 100 mM NaCl, pH 4.7.

(3) 5 mg/mL BSA in 50 mM Tris-HCl buffer, pH 8.6.

(4) 5 mg/mL lysozyme in 50 mM sodium acetate buffer, pH 4.5.

Column Geometry

Column Volume: 1.04 mL
Bed Height: 1.48 cm (0.58 in.)
Bed Diameter: 0.94 cm (0.37 in.)

Recommended Flow Rates

1 - 4 mL/min

Back Pressure

Maximum: 3 bar (300 kPa, 43.5 psi)

Device Dimensions

Diameter: 1.6 cm (0.6 in.)
Length (Without Plugs): 4.8 cm (1.9 in.)

Storage

2 - 30 °C (36 - 86 °F)
2 - 8 °C (36 - 46 °F) after opening

Connections

Inlet: Threaded female luer lock
Outlet: Rotating male luer locking hub

Ordering Information

AcroSep Ion Exchange Chromatography Columns, 1 mL

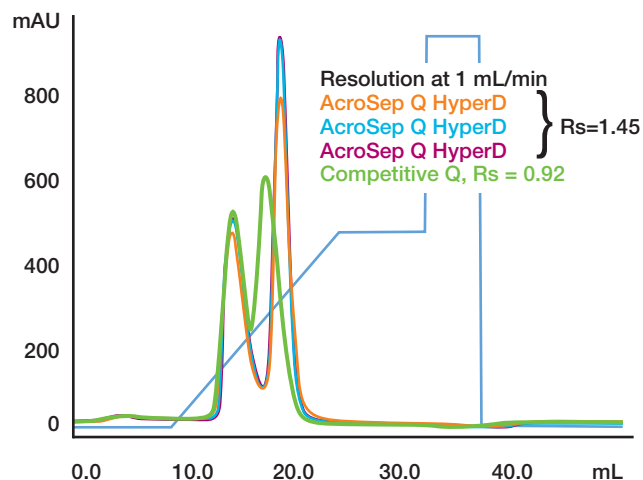
Part Number	Description	Pkg
20050-C001	CM Ceramic HyperD F, green	5/pkg
20062-C001	S Ceramic HyperD F, sky blue	5/pkg
20066-C001	Q Ceramic HyperD F, red	5/pkg
20067-C001	DEAE Ceramic HyperD F, orange	5/pkg
IEXVP-C001	(1) each: Q, S, CM, and DEAE Ceramic HyperD F	4/pkg

Related Products

Ceramic HyperD Ion Exchange Chromatography Sorbents (Q, S, DEAE, and CM) 59

Performance

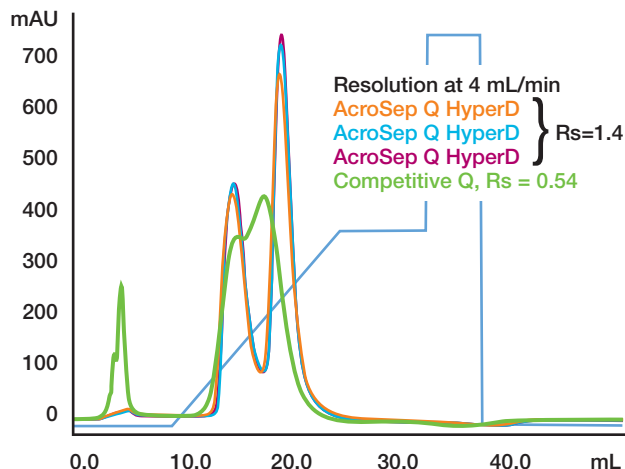
Resolution Comparison of AcroSep™ Columns With Q HyperD® F and Competitive Q at Flow Rate of 1 mL/min



Resolution was calculated using default algorithm on AKTA* chromatography system.

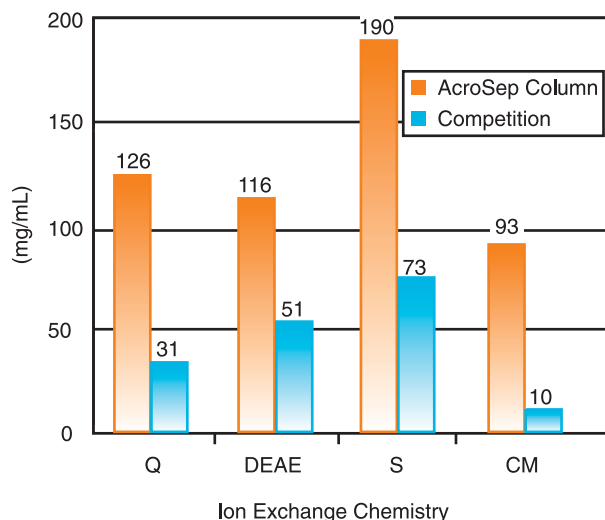
The chromatogram above is an illustration of resolution between BSA and Conalbumin using three replicates of Pall's AcroSep Q column and a competitive Q column. This separation was run at 1 mL/min. Resolution of the AcroSep columns is clearly illustrated in this chromatogram. The competitive column is represented by the green line.

Resolution Comparison of AcroSep Columns With Q HyperD F and Competitive Q at Flow Rate of 4 mL/min



The above chromatogram is an illustration of the resolution of the AcroSep Q column and the competitive column when the flow rate is elevated to 4 mL/min. It demonstrates that at 4 mL/min there is little, if any, change in protein separation on the AcroSep column, while the competitor performance degrades significantly with increased flow rate.

1 mL AcroSep Column Average Dynamic Binding Capacity at High Flow Rate (10% Breakthrough)



The above illustrates dynamic binding capacity for each of our four ion exchange chemistries when run at 3.56 mL/min. Data shows higher dynamic binding capacities of Pall AcroSep columns over competitive columns at higher flow rates. Each average is derived from three replicates of ≥ 8 AcroSep columns or three replicates of two competitive columns. The proteins were at a concentration of 5 mg/mL and the choices were BSA for Q and DEAE, Lysozyme for S, and IgG for CM.

AcroSep™ Chromatography Columns for Mixed-Mode

Flexible chemistries provide better selectivity and more purification options



MEP HyperCel™ Sorbent

- ▶ Stability of sorbent and ligand allows up to 200 cycles of purification.
- ▶ Broad species and isotype binding capabilities for antibodies.
- ▶ Elution at milder pH as compared to conventional antibody purification with Protein A.
- ▶ Ligand structure and density of MEP HyperCel sorbent provides effective binding in the absence of lyotropic agents or salts.

HEA and PPA HyperCel Sorbents

- ▶ HyperCel cellulose bead provides high porosity, chemical stability, and low non-specific interaction.
- ▶ Binding based on hydrophobic interactions and elution on the basis of electrostatic repulsion.
- ▶ Binding typically at physiological pH with no need to use high salt, unlike conventional hydrophobic interaction chromatography (HIC).
- ▶ HEA and PPA HyperCel sorbents offer effective discrimination of proteins having similar or very close isoelectric points.

Applications

MEP HyperCel Sorbent

- ▶ Antibody capture and purification.
- ▶ Purification of Fc fusion proteins and Ab-like molecules.
- ▶ Easily screen multiple mixed-mode chemistries.

HEA and PPA HyperCel Sorbents

- ▶ Direct hydrophobic capture and purification.
- ▶ Compatible upstream and downstream of ion exchange and other chemistries for enhanced purification.
- ▶ Easily screen multiple mixed-mode chemistries.

Specifications

Materials of Construction

Column Housing, Cap, Plug, and Adapter: Polypropylene
Column Frit: Polyethylene

Media	Color Code	Average Particle Size	Working pH	Capacity
MEP HyperCel	Purple	90 µm	2 - 12	> 20 mg/mL ¹
HEA HyperCel	Black	90 µm	2 - 12	40 mg/mL ²
PPA HyperCel	Yellow	90 µm	2 - 12	40 mg/mL ²

(1) DBC determined using 5 mg/mL IgG in PBS; flow rate 60 cm/hr.; column dimension = 1.1 cm ID x 7 cm column; residence time (Tr) = 5.68 min.

(2) DBC at 10% breakthrough; 5 mg/mL BSA in PBS; flow rate 50 cm/hr.; column dimension = 1.6 cm ID x 3.75 cm; (Tr) = 4.51 min.

Column Geometry

Column Volume: 1.04 mL
Bed Height: 1.48 cm (0.58 in.)
Bed Diameter: 0.94 cm (0.37 in.)

Recommended Flow Rates

0.2 - 4.0 mL/min

Back Pressure

Maximum: 3 bar (300 kPa, 43.5 psi)

Device Dimensions

Diameter: 1.6 cm (0.6 in.)
Length (Without Plugs): 4.8 cm (1.9 in.)

Storage

2 - 8 °C (36 - 46 °C)

Connections

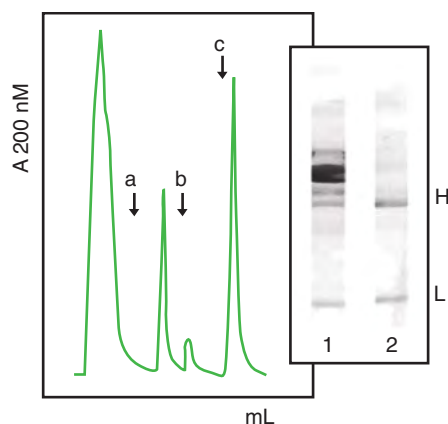
Inlet: Threaded female luer lock
Outlet: Rotating male luer locking hub

Related Products

HEA and PPA HyperCel Mixed-Mode Chromatography Sorbents	62
MEP HyperCel Mixed-Mode Chromatography Sorbent	63

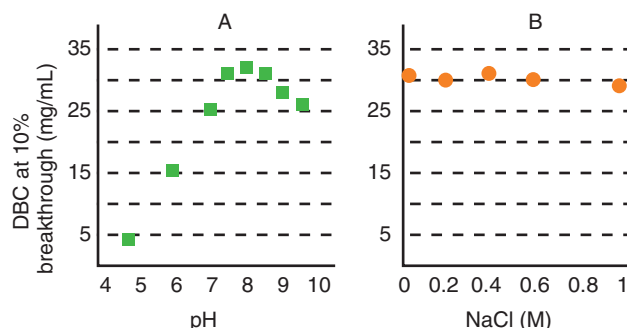
Performance

High Purity of Monoclonal IgG From Ascites Fluid Using MEP HyperCel™ Sorbent



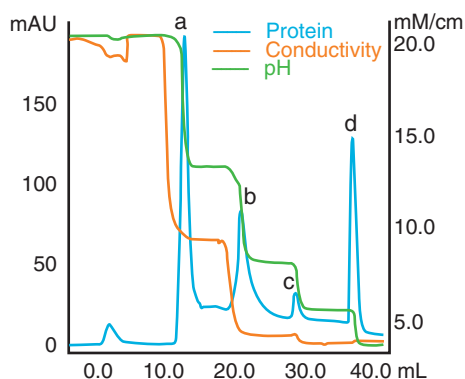
Column run at flow rate of 70 cm/h with 50 mM Tris-HCl, pH 8 used for binding and 50 mM acetate, pH 4 used for elution. In the curve, arrows indicate water (a) and sodium caprylate (b) washes. Arrow c indicates start of elution buffer. SDS-PAGE analysis (reduced conditions): 1 = crude sample; 2 = purified; H = heavy chain; L = light chain.

Influence of pH and Ionic Strength on the Binding Capacity of MEP HyperCel Sorbent



IgG capacities obtained at 10% breakthrough on MEP HyperCel sorbent vs. pH (A) and ionic strength (B) of the binding buffer. Experimental conditions: column = 1.1 cm (0.4 in.) ID X 9 cm (3.5 in.); sample = IgG (2 mg/mL); flow rate = 90 cm/hr; Tr = 7.8 min.

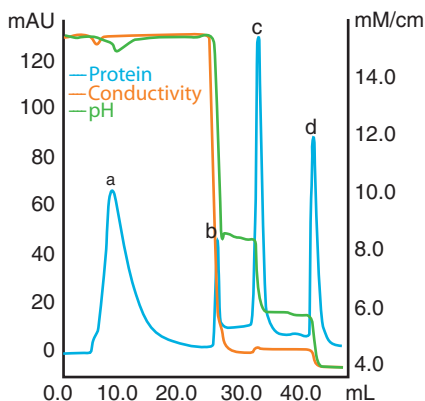
Distinct Separation of Standard Protein Mixture Using AcroSep™ HEA Columns



Peak a - Lysozyme
Peak b - α -Chymotrypsinogen A
Peak c - α -Chymotrypsinogen B
Peak d - BSA

Flow rate: 0.2 mL/min for sample injection and 0.5 mL/min for other steps. Carbonate buffer, pH 10.0 with 150 mM salt used for binding. Elution using mixed phosphate and citrate buffers of desired pH.

Distinct Separation of Standard Protein Mixture Using AcroSep PPA Columns



Peak a - Lysozyme
Peak b - α -Chymotrypsinogen A
Peak c - α -Chymotrypsinogen B
Peak d - BSA

Sample injection occurred at 0.2 mL/min then increased to 0.5 mL/min for the remainder of the procedure. PBS, pH 7.2 used for binding of proteins. Elution carried out using citrate buffers of respective pH and conductance as shown.

Ordering Information

AcroSep Chromatography Columns for Mixed-Mode, 1 mL

Part Number	Description	Pkg
12035-C001	MEP HyperCel, purple	5/pkg
20250-C001	HEA HyperCel, black	5/pkg

Part Number	Description	Pkg
20260-C001	PPA HyperCel, yellow	5/pkg

PRC Pre-Packed Chromatography Columns

For ion exchange and mixed-mode chromatography laboratory applications



- ▶ Convenient, ready-to-use 1 and 5 mL pre-packed columns.
- ▶ Direct connection to commonly-used laboratory chromatography systems, such as ÄKTA* systems.
- ▶ Screen Pall ion exchange and mixed-mode chromatography sorbents under reliable and reproducible conditions.
- ▶ Two or more columns can be connected in series to increase the column height and model real pilot scale conditions or scale-down applications.

Applications

Ion Exchange Chromatography

- ▶ Native and recombinant proteins
- ▶ Plasmids
- ▶ Vaccines
- ▶ Monoclonal and polyclonal antibodies
- ▶ Plasma derivatives
- ▶ Biopharmaceuticals

Mixed-Mode Chromatography

MEP HyperCel sorbent

- ▶ Antibody capture
 - ▶ Alternative to conventional hydrophobic interaction
- MEP, HEA, and PPA HyperCel sorbents
- ▶ No salt/low salt alternative to hydrophobic interaction

Specifications

Materials of Construction

Body and End Caps: Molded polypropylene
17 µm Frit: PP/PE (polypropylene/polyethylene)

Outer Dimensions

1 mL: 10 x 100 mm
5 mL: 11.5 x 140 mm

Connections

Built-in 10-32 fittings
For HPLC/MPLC/ÄKTA systems, direct connection with 1/16 in. tubing and 10-32 fittings. For connecting to systems with M6 or 1/4-28 fittings, consult the appropriate system manual for necessary fittings and adapters.

Maximum Operating Pressure

1 mL: 20 barg (290 psig)
5 mL: 30 barg (435 psig)

Volume

1 mL: 5 mm ID x 50 mm
5 mL: 8 mm ID x 100 mm

Storage Solution

HyperCel Sorbent: 30% isopropanol/100 mM sodium phosphate, pH 4.3
Ceramic HyperD F Sorbent: 20% ethanol/150 mM NaCl

Working Pressure

HyperCel Sorbent: < 0.5 barg (7 psig)
Ceramic HyperD F Sorbent: < 1.5 barg (22 psig)
Pressure at 600 cm/h equivalent to 2 mL/min in 0.1 M NaCl.

Ion Exchange	Chemistry	Average Particle Size	Ionizable Groups (µEq/mL)	Dynamic Capacity (mg/mL) ¹
Q HyperCel	Quaternary amine	75 µm	99-138	≥ 160 ²
S HyperCel	Sulfonic acid	75 µm	59-84	≥ 135 ³
Q Ceramic HyperD F	Quaternary amine	50 µm	≥ 250	≥ 85 ⁴
CM Ceramic HyperD F	Carboxymethyl	50 µm	≥ 250	≥ 60 ⁵

Mixed-Mode	Ligand	Average Particle Size (µm)	Ligand Density (µmole/mL)	Dynamic Capacity (mg/mL) ¹
MEP HyperCel	4-mercapto-ethyl-pyridine (pKa = 4.8)	90	80-125	≥ 20 ⁶
HEA HyperCel	Hexylamine (aliphatic) (pKa = 8.0)	90	58-84	≥ 40 ⁷
PPA HyperCel	Phenylpropylamine (aromatic) (pKa = 8.0)	90	58-80	≥ 40 ⁷

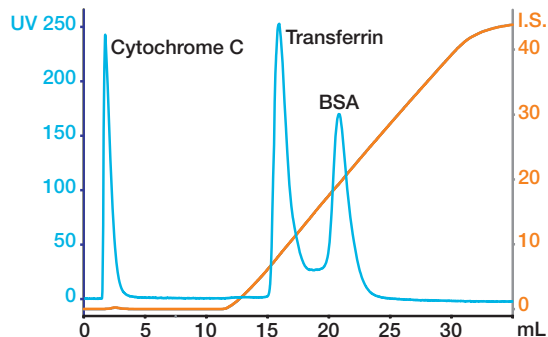
- (1) Determined at 10% breakthrough using:
(2) 5 mg/mL BSA in 50 mM Tris-HCl, pH 8.5 at 2 minute residence time.
(3) 5 mg/mL human IgG in 50 mM sodium acetate, pH 4.5 at 2 minute residence time.
(4) 5 mg/mL BSA in 50 mM Tris-HCl buffer, pH 8.6, flow rate 200 cm/h.
(5) 5 mg/mL human IgG in 50 mM sodium acetate buffer, 100 mM NaCl, pH 4.7, flow rate 200 cm/h.
(6) 5 mg/mL human IgG in PBS, flow rate 60 cm/h.
(7) 5 mg/mL BSA in PBS, flow rate 100 cm/h.

Related Products

Acrodisc® Units with Mustang® Membrane	48-51
AcroSep™ Chromatography Columns	37-43
LRC Chromatography Columns	47

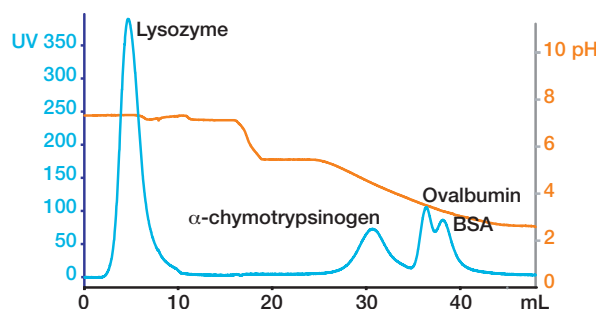
Performance

Separation of Cytochrome C, BSA, and Human Transferrin on a PRC Q Ceramic HyperD F Pre-Packed Column



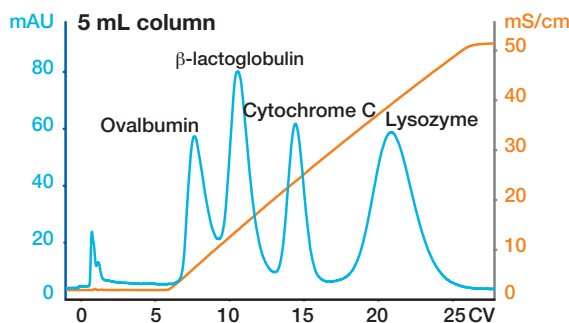
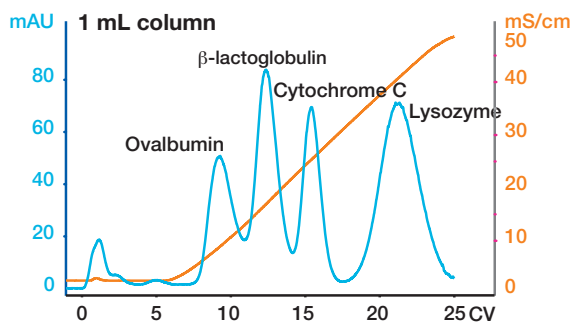
Column: Q Ceramic HyperD F PRC pre-packed column (5 mm ID x 50 mm). Volume: 1 mL linear flow rate: 150 cm/h. Equilibration and wash: 50 mM Tris-HCl, pH 8.6. Load: 100 μ L (5 mg/mL cytochrome C, 20 mg/mL BSA, and 20 mg/mL human transferrin in equilibration buffer). Elution: 50 mM Tris-HCl, pH 8.6 + 0.5 M NaCl by linear gradient from 0 to 100% in 60 minutes.

Separation of Lysozyme, α -Chymotrypsinogen, Ovalbumin, and BSA on a PRC PPA HyperCel Pre-Packed Column



Column: PPA HyperCel PRC pre-packed column (5 mm ID x 50 mm). Volume: 1 mL linear flow rate: 75 cm/h. Equilibration and wash: PBS, pH 7.4. Load: 500 μ L (lysozyme, α -chymotrypsinogen, ovalbumin, and BSA, all at 2 mg/mL in equilibration buffer). Elution: by pH step gradient in phosphate/citrate buffer, pH 7.0, 5.4, and 2.6.

Separation of Model Proteins (Ovalbumin, β -lactoglobulin, Cytochrome C, and Lysozyme) on 1 mL PRC S HyperCel Pre-Packed Columns and Scale Up on 5 mL Column, Constant Residence Time of 2 Minutes



Columns: S HyperCel PRC pre-packed columns of 1 mL (5 mm ID x 50 mm) and 5 mL (8 mm ID x 100 mm). Load: for 1 mL column – 100 μ L ovalbumin (10 mg/mL), β -lactoglobulin (10 mg/mL), cytochrome C (2.5 mg/mL), and lysozyme (5 mg/mL). For 5 mL column – 500 μ L of same proteins. Equilibration: 50 mM Na acetate, pH 4.5. Elution: 50 mM Na acetate, pH 4.5 + 0.5 M NaCl by linear gradient from 0 to 100%.

Ordering Information

PRC Pre-Packed Chromatography Columns with Ion Exchange Sorbents

Part Number	Description	Pkg
PRC05X050QHCEL01	Q HyperCel sorbent, 5 x 50	1 mL
PRC05X050SHCEL01	S HyperCel sorbent, 5 x 50	1 mL
PRC05X050QCHDF01	Q Ceramic HyperD F sorbent, 5 x 50	1 mL
PRC05X050CMCHDF01	CM Ceramic HyperD F sorbent, 5 x 50	1 mL
PRC08X100QHCEL01	Q HyperCel sorbent, 8 x 100	5 mL
PRC08X100SHCEL01	S HyperCel sorbent, 8 x 100	5 mL

PRC Pre-Packed Chromatography Columns with Mixed-Mode Sorbents

Part Number	Description	Pkg
PRC05X050MEPHCEL01	MEP HyperCel sorbent, 5 x 50	1 mL
PRC05X050HEAHCEL01	HEA HyperCel sorbent, 5 x 50	1 mL
PRC05X050PPAHCEL01	PPA HyperCel sorbent, 5 x 50	1 mL
PRC08X100MEPHCEL01	MEP HyperCel sorbent, 8 X 100	5 mL
PRC08X100HEAHCEL01	HEA HyperCel sorbent, 8 x 100	5 mL
PRC08X100PPAHCEL01	PPA HyperCel sorbent, 8 x 100	5 mL

LRC Chromatography Columns

Empty glass columns for preparative and process optimization applications



- ▶ Even flow distribution with no hold-up volume behind the frits and high pressure resistance across the complete range of column diameters and bed heights.
- ▶ Convenient fittings are compatible with or adaptable to any liquid chromatography system.
- ▶ Simple disassembly of end fittings with quick, easy frit replacement.
- ▶ Rapid coarse adjustment and precise fine adjustment of pistons possible with the screw-lock system.
- ▶ Extended pressure capabilities and wide working temperature range.
- ▶ Use one or two adjustable pistons for coverage of the complete range of bed heights from 0-750 mm.

Applications

- ▶ Drug development
- ▶ Protein purification
- ▶ Vaccines
- ▶ Plasma derivativ

Specifications

Column Components and Materials of Construction

Description	Materials of Construction
Column Tube [1]	Borosilicate glass
Pistons: 1 adjustable [2] and 1 fixed [3] Each with:	
- Internal central screw [4]	POM ^a
- Seal actuation nut [5]	POM
- Central screw [6]	POM
- Counter nut [7] and screw [10]	POM
- Washer [8]	POM
- Spring washer [9]	Steel
- O-ring seal [11]	FPM ^b
- 10 µm frit (pressed into column piston) [12]	Sintered glass
- Standard union (1/4-28 UNF both sides) [13] ^c	Polypropylene

Parts Included in Column Package

Quantity	Description	Materials of Construction
2	Fitting (ferrule with nut)	POM and Tefzel ^d *
1	Connection tubing (1/16 in. or 1/8 in. OD)	FEP ^d
1	Frit ejector	POM and steel
1	User Guide No. USD 2482	-

^a POM: Polyoxymethylene (acetal)

^b Fluoroelastomer polymer

^c Only on columns of ID 10 and 15 mm

^d Fluorinated ethylene propylene

Bed Height Range

0-750 mm

Internal Diameter

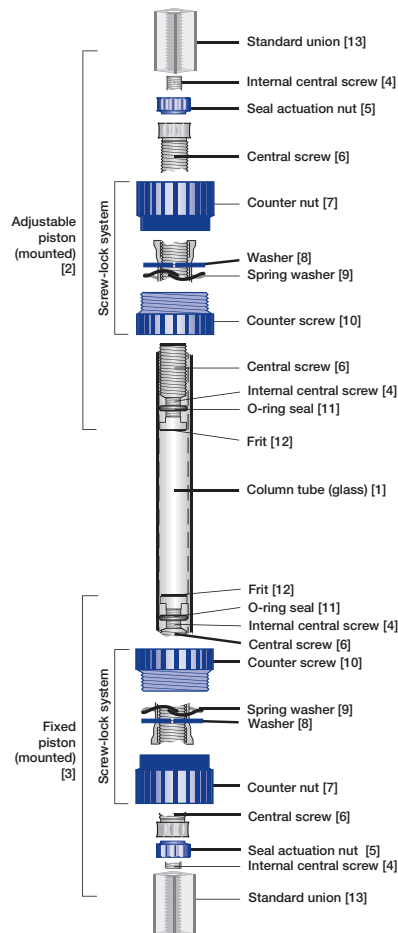
10, 15, 25, and 50 mm

Volume Range

0-900 mL

Connections

¼-28 UNF



Temperature Range

4-40 °C (39-104 °F)

Maximum Operating Pressure

10-30 barg (145-435 psig)

See Performance section for more information.

Performance

LRC Column	ID (mm)	Equipped with 1 Adjustable Piston		Equipped with 2 Adjustable Pistons		Maximum Pressure Tested	
		Height (mm) min – max	Bed Volume (mL) min – max	Height (mm) min – max	Bed Volume (mL) min – max	(bar)	(psi)
LRC Column 10/0 – 120	10	0 – 120	0 – 9	0 – 120	0 – 9	30	435
LRC Column 10/80 – 200	10	80 – 200	6 – 16	0 – 200	0 – 16	30	435
LRC Column 10/330 – 450	10	330 – 450	26 – 35	210 – 450	17 – 35	30	435
LRC Column 15/80 – 200	15	80 – 200	14 – 35	0 – 200	0 – 35	25	360
LRC Column 15/330 – 450	15	330 – 450	58 – 80	210 – 450	37 – 80	25	360
LRC Column 15/630 – 750	15	630 – 750	111 – 133	510 – 750	90 – 133	25	360
LRC Column 25/80 – 200	25	80 – 200	39 – 98	0 – 200	0 – 98	15	215
LRC Column 25/330 – 450	25	330 – 450	162 – 221	210 – 450	103 – 221	15	215
LRC Column 25/630 – 750	25	630 – 750	309 – 368	510 – 750	250 – 368	15	215
LRC Column 50/80 – 200	50	80 – 200	157 – 393	0 – 200	0 – 393	10	145
LRC Column 50/330 – 450	50	330 – 450	648 – 884	210 – 450	412 – 884	10	145

Ordering Information

LRC Chromatography Columns

Part Number	Description	Pkg
LRC10X000-120V01	10/0 – 120	1/pkg
LRC10X080-200V01	10/80 – 200	1/pkg
LRC10X330-450V01	10/330 – 450	1/pkg
LRC15X080-200V01	15/80 – 200	1/pkg
LRC15X330-450V01	15/330 – 450	1/pkg
LRC15X630-750V01	15/630 – 750	1/pkg
LRC25X080-200V01	25/80 – 200	1/pkg
LRC25X330-450V01	25/330 – 450	1/pkg
LRC25X630-750V01	25/630 – 750	1/pkg
LRC50X080-200V01	50/80 – 200	1/pkg
LRC50X330-450V01	50/330 – 450	1/pkg

LRC Glass Tubes

Part Number	Description	Pkg
LRC10XTUBE000-120	10/0 – 120	1/pkg
LRC10XTUBE080-200	10/80 – 200	1/pkg
LRC10XTUBE330-450	10/330 – 450	1/pkg
LRC15XTUBE080-200	15/80 – 200	1/pkg
LRC15XTUBE330-450	15/330 – 450	1/pkg
LRC15XTUBE630-750	15/630 – 750	1/pkg
LRC25XTUBE080-200	25/80 – 200	1/pkg
LRC25XTUBE330-450	25/330 – 450	1/pkg
LRC25XTUBE630-750	25/630 – 750	1/pkg
LRC50XTUBE080-200	50/80 – 200	1/pkg
LRC50XTUBE330-450	50/330 – 450	1/pkg

LRC Spare Part Kits¹

Part Number	Description	Pkg
LRC10KITV01	For column ID10	1/pkg
LRC15KITV01	For column ID15	1/pkg
LRC25KITV01	For column ID25	1/pkg
LRC50KITV01	For column ID50	1/pkg

(1) One spare kit includes: 4 O-rings, 4 frits of 10 µm, 1 m tubing.

LRC Adjustable Pistons

Part Number	Description	Pkg
LRC10ADJPLUNGERSV01	For column ID10	1/pkg
LRC15ADJPLUNGERSV01	For column ID15	1/pkg
LRC25ADJPLUNGERSV01	For column ID25	1/pkg
LRC50ADJPLUNGERSV01	For column ID50	1/pkg

LRC Column Couplers²

Part Number	Description	Pkg
LRC10XCOUPLERSV01	For column ID10	1/pkg
LRC15XCOUPLERSV01	For column ID15	1/pkg
LRC25XCOUPLERSV01	For column ID25	1/pkg
LRC50XCOUPLERSV01	For column ID50	1/pkg

(2) For a reservoir, order a glass tube and a column coupler.

Related Products

Acrodisc® Units with Mustang® Membrane	48-51
AcroSep™ Chromatography Columns	37-43
PRC Chromatography Columns	45

Acrodisc® Units With Mustang® Q and S Membranes



Disposable chromatography units with high binding capacities and fast flow rates



membrane chromatography

- ▶ Fast flow rates. Recommended flow rates of 1 to 4 mL/min do not affect recovery rates.
- ▶ Mustang Q membrane is a strong anion exchanger that effectively binds plasmid DNA, negatively-charged proteins, and viral particles.
- ▶ Mustang S membrane is a strong cation exchanger that effectively binds positively-charged proteins and viral particles.
- ▶ Disposable 25 mm units are designed for single laboratory use only.
- ▶ Direct scale up to capsules with Mustang Q and S membranes for larger-volume applications.

Applications

Mustang Q Membrane

- ▶ Provides contaminant removal such as DNA viral particle, host cell proteins, or endotoxin.
- ▶ Ideal for isolation via capture and release of plasmid DNA, virus, or target protein from a complex mixture.
- ▶ Offers protein polishing for negatively-charged proteins.
- ▶ Purifies virus and oligonucleotides.

Mustang S Membrane

- ▶ Purifies and concentrates positively-charged proteins and viral particles.
- ▶ Ideal for evaluation, process development, and validation.

Specifications

Materials of Construction

Filter Media: Mustang Q and Mustang S membranes
Housing: Polypropylene

Pore Size

0.8 µm

Membrane Bed Volume

0.18 mL

Inlet/Outlet Connections

Female luer lock inlet, male slip luer outlet

Maximum Operating Pressure

5.5 bar (550 kPa, 80 psi) at ambient temperature 21 - 24 °C (70 - 75 °F)

Biological Safety

Passes United States Pharmacopeia (USP) Biological Reactivity Test, In Vivo <88>. Mustang Q membrane testing performed at 72 °C (161 °F) and Mustang S membrane at 50 °C (122 °F) after preconditioning.

Typical Operating Temperature

21 - 24 °C (70 - 75 °F)

Recommended Flow Rate

1 - 4 mL/min; flow rate will vary with type of solutions, concentration of proteins, and other components.

Typical Mean Dynamic Binding Capacity*

Mustang Q Membrane

DNA: 3.6 mg/Acrodisc unit or 30 mg/mL membrane volume (mv)
BSA: 10 mg/Acrodisc unit or 70 mg/mL membrane volume (mv)

Mustang S Membrane

Lysozyme: 8 mg per Acrodisc unit or 47 mg/mL membrane volume (mv)
Human IgG: 11 mg per Acrodisc unit or 60 mg/mL membrane volume (mv)

*Note on optimization: The yield is contingent on type of DNA, size and copy number of plasmid, concentration of protein, ionic strength, and pH of buffer.

Ordering Information

Acrodisc Unit With Mustang Q Membrane

Part Number	Description	Pkg
MSTG25Q6	Acrodisc unit with Mustang Q membrane, 0.8 µm, 25 mm, non-sterile	10/pkg (blister packs)

Acrodisc Unit With Mustang S Membrane

Part Number	Description	Pkg
MSTG25S6	Acrodisc unit with Mustang S membrane, 0.8 µm, 25 mm, non-sterile	10/pkg (blister packs)

Acrodisc Units With Mustang Membranes Kit

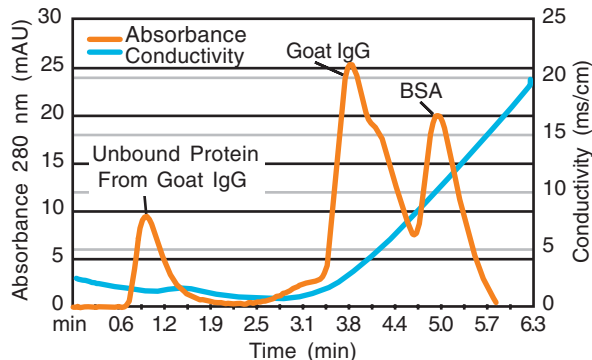
Part Number	Description	Pkg
MSTG25KIT	Kit includes: (4) Acrodisc unit with Mustang Q membrane (non-sterile); (4) Acrodisc unit with Mustang S membrane (non-sterile); and (2) Acrodisc unit with Mustang E membrane (sterile)	10/pkg

Related Products

AcroPrep™ Advance 96-Well Filter Plates for Protein Purification 71

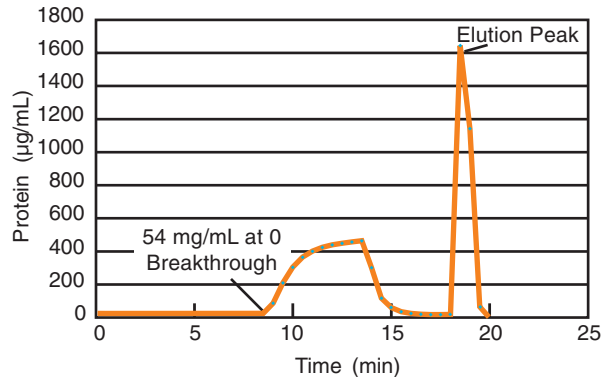
Performance

Acrodisc® Unit With Mustang® Q Membrane: Resolution With BSA and Goat IgG



The conditions used to generate data for the resolution graph above include buffer: 25 mM Tris, pH 8.0; salt: 1 M NaCl in 25 mM Tris, pH 8.0; gradient: 0 to 0.5 M NaCl in 50 column volume (CV); flow rate: 2.3 mL/min (13 cv/min); sample loading: 4% of total binding capacity.

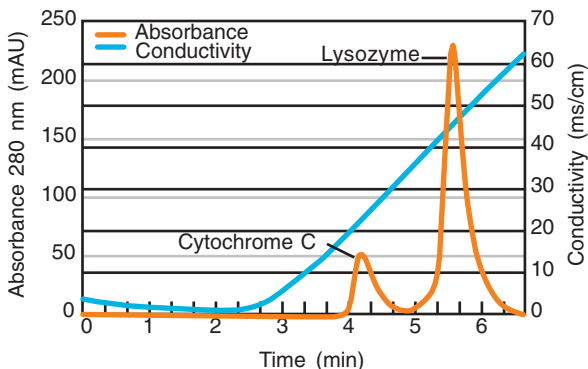
Acrodisc Unit With Mustang Q Membrane: Dynamic Binding With BSA



A solution of 0.524 mg/mL BSA was pumped through the Acrodisc unit at 2.3 mL/min. Breakthrough occurred at 8.1 minutes and was calculated as 54 mg/mL using:

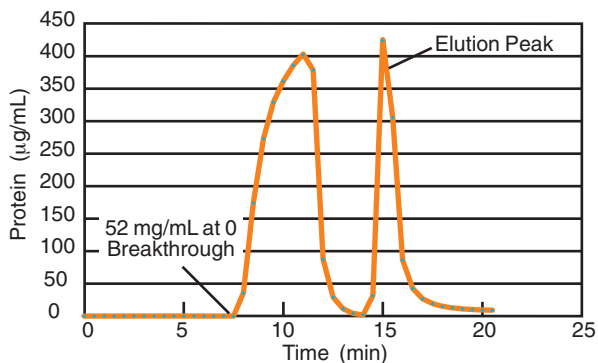
$$\frac{\text{flow rate (2.3 mL/min)} \times \text{initial protein BSA concentration (0.524 mg/mL)} \times \text{time (8.1 min)}}{\text{membrane bed volume of Mustang Q membrane in 25 mm Acrodisc unit (0.18 mL)}}$$

Acrodisc Unit With Mustang S Membrane: Resolution With Cytochrome C and Lysozyme



The conditions used to generate data for the graph above include buffer: 10 mM MES, pH 5.5; salt: 1 M NaCl in 10 mM MES, pH 5.5; gradient: 0 to 1 M NaCl in 50 CV; flow rate: 2.3 mL/min (13 cv/min).

Acrodisc Unit With Mustang S Membrane: Dynamic Binding With Lysozyme



A solution of 0.512 mg/mL Lysozyme was pumped through the Acrodisc unit at 2.3 mL/min. Breakthrough occurred at 8.0 minutes and was calculated as 52 mg/mL using:

$$\frac{\text{flow rate (2.3 mL/min)} \times \text{initial protein Lysozyme concentration (0.512 mg/mL)} \times \text{time (8.0 min)}}{\text{membrane bed volume of Mustang S membrane in 25 mm Acrodisc unit (0.18 mL)}}$$

Acrodisc® Unit With Mustang® E Membrane

Remove endotoxin from water, buffer, neutral sugars, and certain biological solutions



- ▶ Ideal for evaluation and proof of concept.
- ▶ High flow rates of 1 to 4 mL/min or 10 to 35 membrane volume (MV)/minute.
- ▶ Disposable 25 mm units are designed for laboratory single use only.

Applications

- ▶ Reduction of endotoxins in water, buffer, neutral sugars, and certain biological solutions.

Specifications

Materials of Construction

Filter Media: Mustang E membrane
Housing: Polypropylene

Pore Size

0.2 μ m

Inlet/Outlet Connections

Female luer lock inlet, male slip luer outlet

Membrane Bed Volume

0.12 mL

Maximum Operating Temperature and Pressure

2.1 bar (210 kPa, 30 psi) at 60 °C (140 °F) or 5.5 bar (550 kPa, 80 psi) at 21 - 24 °C (70 - 75 °F)

Typical Differential Pressure

< 0.07 bar (7 kPa, 1 psi) @ 1 mL/min

Mean Flow Rate

1 - 4 mL/min; flow rate will vary with type of solutions, concentration of proteins, and other components

Typical Endotoxin Removal Capacity*

500,000 EU/Acrodisc unit from saline under the following conditions: 0.9% sodium chloride; Minimum challenge level: 10,000 EU/mL; Minimum challenge volume: 60 mL; Endotoxin source: Escherichia coli strain 055:B5 (no dispersing agents)

*The endotoxin removal capacity may vary by flow rate, protein surface charge, type and concentration of protein, pH, salt concentration, or other components of the sample solution such as surfactants and glycols.

Biological Safety

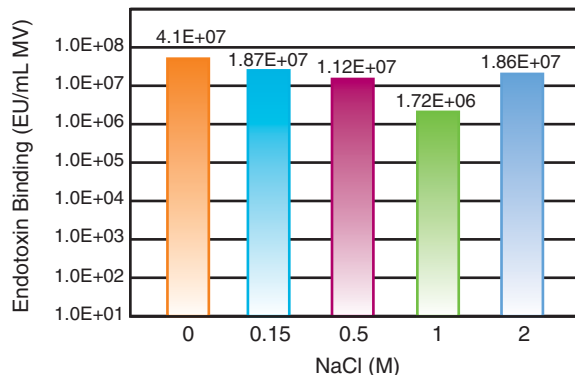
Passes United States Pharmacopeia (USP) Biological Reactivity Test, In Vivo <88>

Sterilization

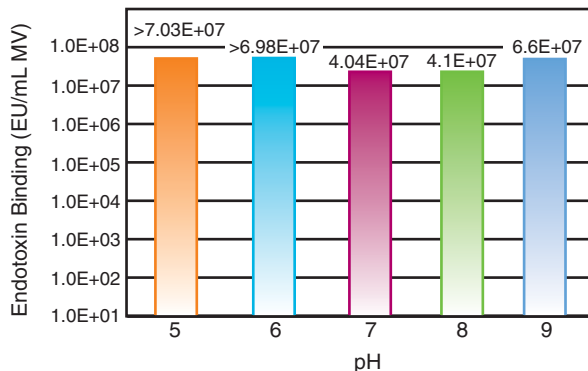
Sterilized by gamma irradiation and individually packaged.

Performance

Effect of NaCl Concentration in 25mM Tris (pH 8) on Endotoxin Dynamic Binding Capacity to Acrodisc Unit With Mustang E Membrane



Effect of pH on Endotoxin Dynamic Binding Capacity to Acrodisc Unit With Mustang E Membrane



Ordering Information

Acrodisc Unit With Mustang E Membrane

Part Number	Description	Pkg	Part Number	Description	Pkg
MSTG25E3	0.2 µm, 25 mm, sterile	10/pkg (blister packs)	MSTG25KIT	Kit includes: (4) Acrodisc units with Mustang Q membrane (non-sterile); (4) Acrodisc units with Mustang S membrane (non-sterile); and (2) Acrodisc units with Mustang E membrane (sterile)	10/pkg

HA Ultrogel® Hydroxyapatite Chromatography Sorbent



For the separation of proteins, peptides, and nucleic acids



Specifications

Average Particle Size
120 µm

Hydroxyapatite Content (Weight/Volume)
40%

Agarose (Weight/Volume)
4%

Exclusion Limit
> 5,000,000 Da

Capacity for Cytochrome C*
≥ 7 mg/mL

Capacity for BSA**
≤ 7 mg/mL

Working pH

5 - 13 (Note: Do not use < pH 4.0.)

Storage Temperature

2 - 30 °C (36 - 86 °F)
2 - 8 °C (36 - 46 °F) after opening

*Determined at 50% breakthrough using 5 mg/mL Cytochrome C diluted 50/50 in 10 mM PBS, pH 6.8 at 30 cm/h.

**Determined at 50% breakthrough using 1 mg/mL BSA diluted 50/50 in 10 mM PBS, pH 6.8 at 12.5 cm/h.

chromatography sorbents

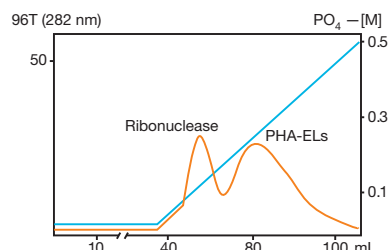
- ▶ High binding capacity and high flow rates.
- ▶ Structure provides excellent rigidity and stability to pH and ionic strength changes, as well as to high temperature.
- ▶ Easy cleaning with sodium hydroxide.
- ▶ Scalable from research and development to manufacturing.

Applications

- ▶ Separation of basic proteins (Cytochrome C, Lysozyme, etc.).
- ▶ Separation of human serum proteins and plant proteins such as lectins, glycoproteins, transferases, kinases, and trehalases.
- ▶ Separation of phosphate dependent proteins and enzymes as well as DNA-dependent enzymes.
- ▶ Can be used to remove DNA and endotoxins.

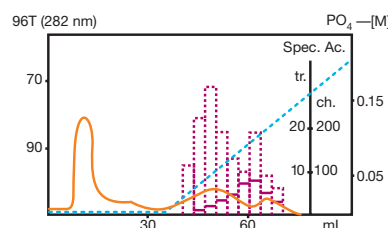
Performance

Separation of a Mixture of Ribonuclease and Phytohemagglutinins (PHA-EL)



Column: 1.6 x 6.5 cm; Sample: 1 mg of protein mixture composed of ribonuclease (MW 14,700) and PHA-ELs (Erythroagglutinating and lymphostimulating Phytohemagglutinin) (MW 128,000) from *Phaseolus vulgaris*, in 1 mL of 5 mM potassium phosphate, pH 6.8; Elution gradient: 5 mM to 500 mM potassium phosphate, pH 6.8; Flow rate: 14.4 cm/h.

Separation of Trypsin and Chymotrypsin From a Porcine Pancreatic Enzyme Extract



Column: 1.6 x 5 cm; Sample: 30 mg protein in 1 mL of 5 mM phosphate buffer, pH 6.8; Gradient: 5 to 200 mM sodium phosphate, pH 6.8; Flow rate: 10 cm/h; Temperature: 10 °C; Histogram with broken line: trypsin activity; Histogram with solid line: chymotrypsin activity. Spec. Ac.: specific activity in U/mg, tr: trypsin, ch: chymotrypsin. Trypsin activity was primarily found in the peak eluted by 50 mM phosphate where the chymotrypsin was eluted by 100 mM phosphate. The final yield was approximately 50%.

Ordering Information

HA Ultrogel Hydroxyapatite Chromatography Sorbent

Part Number	Description	Pkg
24775-075	HA Ultrogel Hydroxyapatite	5 mL
24775-082	HA Ultrogel Hydroxyapatite	25 mL
24775-025	HA Ultrogel Hydroxyapatite	100 mL
24775-017	HA Ultrogel Hydroxyapatite	500 mL
24775-041	HA Ultrogel Hydroxyapatite	1000 mL

PROTEIN AND DNA PURIFICATION

Blue Trisacryl® M Chromatography Sorbent

For the purification of a wide variety of enzymes and proteins



Specifications

Average Particle Size
60 µm

Exclusion Limit
10⁷ Da

Capacity for Human Albumin*
10 - 15 mg/mL

Capacity for Bovine Albumin*
5 - 7 mg/mL

Working pH
1 - 10

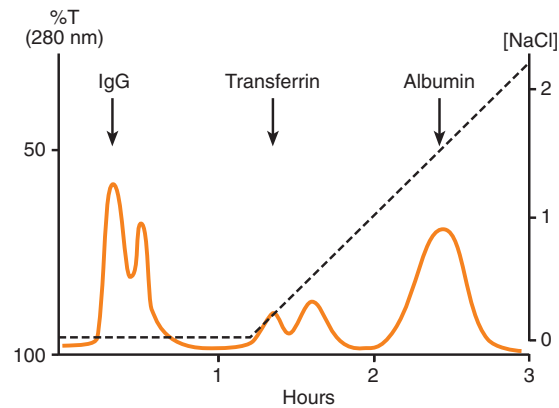
Pressure Resistance
Up to 3 bar (300 kPa, 44 psi)

Storage Temperature
2 - 8 °C (36 - 46 °F)

*Capacity determined in phosphate buffer saline (PBS) using 5 mg/mL.

Performance

Analytical Separation of Human Plasma Proteins on Blue Trisacryl M Chromatography Sorbent



Column: 1.6 cm I.D. x 10 cm; Buffer: 0.05 M Tris-HCl, pH 8.8; Elution performed by a continuous sodium chloride gradient from 0 to 3 M; Flow rate: 100 cm/h; Separation time: 180 min; Temperature: 20 °C.

- ▶ Strong bond of dye-to-sorbent prevents leakage of the dye in normal working conditions.
- ▶ Excellent chemical stability is attributed to the synthetic nature of Trisacryl sorbent and the enhanced stability of the ligand coupling mechanism.
- ▶ Excellent mechanical stability allows high flow rates with working pressures up to 3 bar (300 kPa, 45 psi).
- ▶ Basic matrix is Trisacryl GF2000, a macroporous non-ionic sorbent. Cibacron® Blue F3GA dye is strongly bound to the matrix through a six-carbon spacer arm.

Applications

- ▶ Albumin removal increases the resolution of both 1D and 2D electrophoresis.
- ▶ Designed for the purification of a wide variety of enzymes and proteins such as kinases, interferons, and some coagulation factors.
- ▶ The interaction mechanism between Cibacron Blue F3GA and proteins involves one or more of the following: stereospecific recognition of NAD analogs; electrostatic and hydrophobic interaction; and/or electron exchange.

Ordering Information

Blue Trisacryl M Chromatography Sorbent

Part Number	Description	Pkg
25896-051	Blue Trisacryl M	5 mL
25896-045	Blue Trisacryl M	25 mL
25896-010	Blue Trisacryl M	100 mL
25896-028	Blue Trisacryl M	1000 mL

Related Products

AcroSep™ Chromatography Columns for Affinity Purification 39

Chromatography sorbents

PROTEIN AND DNA PURIFICATION

Heparin HyperD[®] M Chromatography Sorbent



High speed, high capacity affinity preparative sorbent for the purification of biological molecules that bind to heparin



Specifications

Average Particle Size

80 μ m

Dynamic Binding Capacity for Human ATIII (10% Breakthrough)*

> 25 mg/mL

Ligand

Porcine heparin

Immobilized Heparin/mL Sorbent

5 - 10 mg/mL

Working pH

3 - 13

Pressure Resistance

70 bar (7,000 kPa, 1,000 psi)

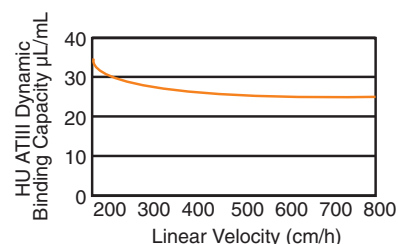
Storage Temperature

2 - 8 °C (36 - 46 °F)

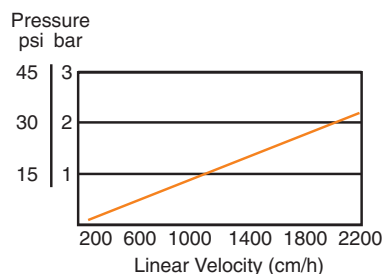
*Determined using Human ATIII at 72.5 μ L/mL in 20 mM TrisHCl, 0.3 M NaCl, pH 7.4. Elution with 20 mM Tris HCl, 2 M NaCl, pH 7.4 at a flow rate of 600 cm/h, 10 cm (4 in.) bed height.

Performance

Dynamic Binding Capacity vs. Linear Velocity



Pressure vs. Linear Flow Velocity



Column dimensions: 0.46 cm I.D. x 10 cm; Sample: HU ATIII at 72.5 μ L/mL; Equilibration buffer: 20 mM Tris-HCl containing 0.3 M NaCl, pH 7.4.

Column dimensions: 0.46 cm I.D. x 10 cm; Buffer: 20 mM Tris-HCl containing 0.3 M NaCl, pH 7.4.

Ordering Information

Heparin HyperD M Chromatography Sorbent

Part Number	Description	Pkg
20029-062	Heparin HyperD M	5 mL
20029-039	Heparin HyperD M	25 mL
20029-021	Heparin HyperD M	100 mL
20029-013	Heparin HyperD M	1000 mL

- ▶ Design combines the desirable characteristics of a soft, high speed, high capacity hydrogel with the high dimensional stability of a rigid bead.
- ▶ Leakage is minimized due to the stable chemical link of the heparin molecule to the sorbent.
- ▶ Rapid packing due to the high density of the bead.
- ▶ Can be packed in a variety of column sizes.

Applications

For the purification of:

- ▶ Enzymes (lipoprotein lipase, coagulation enzymes, superoxide dismutase).
- ▶ Growth factors (fibroblast growth factor, Schwann cell growth factor).
- ▶ Extracellular matrix proteins (fibronectin, vitronectin).
- ▶ Nucleic acid binding protein, hormone receptors, and lipoproteins.

IMAC HyperCel™ Sorbent for Immobilized Metal Affinity Chromatography (IMAC)



Ideal for tagged biomolecule purification using IMAC



Specifications

Average Particle Size
90 µm

Typical Working Pressure
< 1 bar (100 kPa, 14 psi)

Capacity for Metal Ions
40 - 70 µmol Cu²⁺ per mL of sorbent

Ionic Capacity
90 - 140 µeq/mL

Regeneration
0.5 - 1.0 M NaOH

Pressure Resistance
< 3 bar (300 kPa, 44 psi)

Working pH
3 - 12

Storage Temperature
2 - 8 °C (36 - 46 °F)

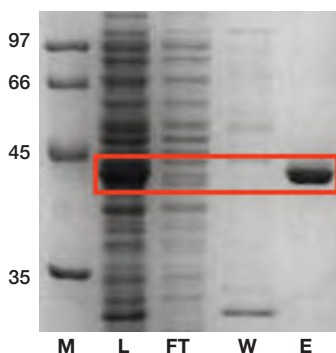
Performance

- ▶ Metal chelate affinity chromatography exploits the affinity of proteins or other molecules for metal ions.
- ▶ Can be used in combination with standard chromatography columns, disposable gravity flow columns, disposable Nanosep® centrifugal devices, and AcroPrep™ multi-well filter plates.
- ▶ Uses tridentate IDA (iminodiacetic acid) as a chelating ligand agent. This ligand is immobilized on the HyperCel base sorbent, a stable, robust and well-known sorbent used for both research and industrial-scale protein separations.
- ▶ Prior to use, metal ions can be immobilized on the IMAC HyperCel sorbent.

Applications

- ▶ Purification of His-tagged proteins.
- ▶ Purification of phosphoproteins and phosphopeptides.
- ▶ Purification of antibodies.
- ▶ Fractionation of complex protein mixtures.

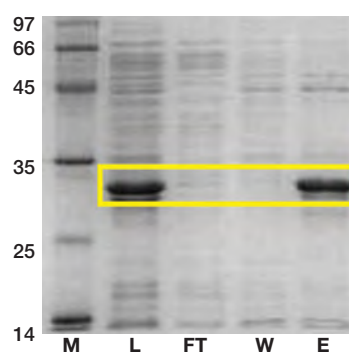
High Purity Protein in a Single Step Using Native Conditions



M: Protein molecular weight marker
L: Sample loaded on the column
FT: Unbound/flow through
W: Wash fraction
E: Eluate

Marked area on gel demonstrates single-step affinity purification of His-tagged protein purified under native conditions.

High Purity Protein in a Single Step Using Denaturing Conditions



M: Protein molecular weight marker
L: Sample loaded on the column
FT: Unbound/flow through
W: Wash fraction
E: Eluate

Marked area on gel demonstrates single-step affinity purification of His-tagged protein purified under denaturing conditions.

Ordering Information

IMAC HyperCel Affinity Chromatography Sorbent

Part Number	Description	Pkg
20093-069	IMAC HyperCel	5 mL
20093-010	IMAC HyperCel	25 mL
20093-028	IMAC HyperCel	100 mL
20093-036	IMAC HyperCel	1000 mL

Related Products

AcroSep™ Chromatography Columns for Affinity Purification 39

Chromatography sorbents

PROTEIN AND DNA PURIFICATION

Lysine HyperD® Chromatography Sorbent



High speed, high capacity affinity preparative sorbent for the purification of biological molecules that bind to lysine



Specifications

Average Particle Size

70 µm

Pressure Resistance

70 bar (7,000 kPa, 1,000 psi)

Ligand

Immobilized L-lysine

Storage Temperature

2 - 30 °C (36 - 86 °F)

2 - 8 °C (36 - 46 °F) after opening

Working pH

3 - 13

Ordering Information

Lysine HyperD Chromatography Sorbent

Part Number	Description	Pkg
20059-058	Lysine HyperD	5 mL
20059-036	Lysine HyperD	25 mL
20059-028	Lysine HyperD	100 mL
20059-010	Lysine HyperD	1000 mL

- ▶ Design combines the desirable characteristics of a soft, high speed, high capacity hydrogel with the high dimensional stability of a rigid bead.
- ▶ Rigid sorbent allows the use of high flow rates without pressure increase or shrinking or swelling of the sorbent.
- ▶ Rapid packing due to the high density of the bead.
- ▶ Can be packed in a variety of column sizes.

Applications

- ▶ Purification of proteins associated with blood clotting such as plasminogen and plasminogen activator protein.
- ▶ Purification of Cytochrome C oxidase and Fibrinogen from human plasma.

Protein A Ceramic HyperD® F Chromatography Sorbent

High capacity affinity sorbent for IgG purification



- ▶ High binding capacity for human and murine IgGs.
- ▶ High selectivity without non-specific binding.
- ▶ Column packing is easier and faster than with conventional agarose beads.
- ▶ Unique, multi-point coupling chemistry provides a sorbent that exhibits very low leakage of recombinant Protein A.
- ▶ Excellent scalability.
- ▶ Rigid ceramic bead can withstand high flow rates/pressure during regeneration.

Applications

- ▶ Purification of humanized or mouse monoclonal antibodies.
- ▶ Isolation and purification of IgG from ascites fluid, cell culture supernatant, transgenic milk, and various animal sera.
- ▶ Separation of IgG subclasses (Protein A does not interfere with human IgG3).
- ▶ Separation of Fc fragments from a mixture of Fc and Fab fragments obtained after enzymatic hydrolysis.
- ▶ Separation of immune complexes.
- ▶ Purification of enzyme conjugates.

Specifications

Average Particle Size
50 µm

Dynamic Binding Capacity (10% Breakthrough)*
> 30 mg/mL Human IgG

Ligand
Recombinant Protein A

Immobilized Protein A
3 - 5 mg/mL of sorbent

Working pH
2 - 11

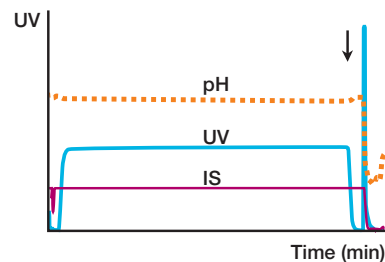
Pressure Resistance
70 bar (7,000 kPa, 1,000 psi)

Storage Temperature
2 - 30 °C (36 - 86 °F)

*Determined using 10 mg/mL human IgG in PBS, pH 7.4; elution with 0.1 M sodium citrate, pH 2.5, 100 cm/h, column 4.6 ID x 100 mm.

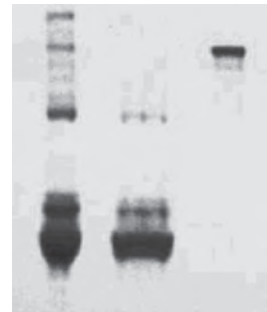
Performance

Isolation of IgG1 From Serum-Containing Cell Culture Supernatant on Protein A Ceramic HyperD F Sorbent



Column dimensions: 3 mm ID x 100 mm. Loading and wash: 1 M glycine/2 M NaCl, pH 8.9. Elution: 100 mM acetate buffer, pH 4.6. Linear velocity: 300 cm/h. Sample: 50 mL cell culture supernatant. (The arrow indicates introduction of elution and buffer.)

SDS-PAGE Analysis of Tissue Culture Fluid, Flow Through and Eluted IgG1 Fractions



Analysis of tissue culture fluid (Lane 1), flow through (Lane 2), and eluted IgG1 (Lane 3).

Ordering Information

Protein A Ceramic HyperD F Affinity Chromatography Sorbent

Part Number	Description	Pkg
20078-036	Protein A Ceramic HyperD F	5 mL
20078-028	Protein A Ceramic HyperD F	25 mL
20078-010	Protein A Ceramic HyperD F	100 mL
20078-044	Protein A Ceramic HyperD F	1000 mL

Related Products

AcroSep™ Chromatography Columns for Affinity Purification 39

Ceramic HyperD[®] Ion Exchange Chromatography Sorbents (Q, S, DEAE, and CM)



Preparative sorbents for the purification of biomolecules by charge



chromatography sorbents

PROTEIN AND DNA PURIFICATION

- ▶ High binding capacity. “Gel-in-a-shell” design delivers outstanding dynamic capacity and exceptional dimensional stability for unsurpassed productivity.
- ▶ High flow rates. Proteins diffuse rapidly within the hydrogel, facilitating rapid uptake of product. This mechanism of mass transfer (known as “enhanced diffusion”) allows the sorbents to operate free of constraints.
- ▶ Abundant ion exchange sites in the hydrogel are highly accessible to protein molecules.
- ▶ Does not shrink or swell in response to changes in pH, ionic strength, or flow rate.
- ▶ Rigid, non-compressible sorbents are easy to pack.
- ▶ Easy cleaning with sodium hydroxide.
- ▶ Scalable from research and development to manufacturing.

Applications

- ▶ Direct capture of biomolecules from a variety of feedstocks.
- ▶ Purification of polypeptides, IgG, and albumin.
- ▶ Large-scale purifications.
- ▶ Purification of monoclonal antibodies from ascites or cell culture.
- ▶ Plasmid purification.
- ▶ Process polishing steps.

Specifications

Type of Ceramic HyperD Sorbent	Q	S	DEAE	CM
Grade	F	F	F	F
Average Particle Size (µm)	50	50	50	50
Dynamic Binding Capacity (mg/mL)	BSA	Lysozyme	BSA	IgG
10% Breakthrough at 200 cm/h	85*	75**	85*	60***
Amount of Ionic Groups (µeq/mL)	250	150	200	250 - 400
Working pH	2 - 12	2 - 12	2 - 12	2 - 12
Volume Changes Due to pH and Ionic Strength	Non-compressible			
Pressure Resistance	F grade: > 70 bar (7,000 kPa, 1,015 psi)			
Storage Temperature	2 - 30 °C (36 - 86 °F) 2 - 8 °C (36 - 46 °F) after opening			

* Sample: 5 mg/mL BSA in 50 mM Tris-HCl buffer, pH 8.6.

** Sample: 5 mg/mL lysozyme in 50 mM sodium acetate, pH 4.5.

*** Sample: 5 mg/mL Human IgG in 50 mM sodium acetate, 100 mM NaCl, pH 4.7.

Performance

Dynamic Binding Capacity of Ceramic HyperD Ion Exchange Sorbent Packed in 1 mL Chromatography Glass Columns at a Range of Flow Rates (Linear Velocities)

Media	Dynamic Binding Capacity (mg/mL)*		
	1 mL/min (258 cm/h)	5 mL/min (1290 cm/h)	10 mL/min (2580 cm/h)
HyperD F DEAE	101.5	87.5	77.5
HyperD F S	80.5	61.5	53.5
HyperD F CM	108.0	87.5	73.5

*Dynamic binding capacity measured by breakthrough curve analysis at 10% of media saturation; a 1 mL volume column of ion exchange sorbent was packed and equilibrated with 25 mM Tris HCl pH 8.5 (anion ion exchange) or 10 mM MES-NaOH pH 5.5 (cation ion exchange) at the flow rates of 1, 5, or 10 mL/min. For anion ion exchange, 5 mg/mL BSA in the above buffer was then pumped onto the column until a breakthrough in absorbance at 280 nm was seen. The flow was continued until a plateau in absorbance was achieved corresponding to 100% protein feed. Dynamic binding capacity was then calculated at 10% of the plateau value, correcting for any “dead volume” in the system and expressed as mg BSA/mL media volume. For cation ion exchange, 5 mg/mL lysozyme was used to test these sorbents in a similar manner to the anion ion exchange media.

Ordering Information

Ceramic HyperD Ion Exchange Chromatography Sorbents

Part Number	Description	Pkg	Part Number	Description	Pkg
20066-098	Q Ceramic HyperD F	5 mL	20062-089	S Ceramic HyperD F	5 mL
20066-031	Q Ceramic HyperD F	25 mL	20062-030	S Ceramic HyperD F	25 mL
20066-023	Q Ceramic HyperD F	100 mL	20062-022	S Ceramic HyperD F	100 mL
20066-015	Q Ceramic HyperD F	1000 mL	20062-014	S Ceramic HyperD F	1000 mL
20067-070	DEAE Ceramic HyperD F	5 mL	20050-084	CM Ceramic HyperD F	5 mL
20067-039	DEAE Ceramic HyperD F	25 mL	20050-035	CM Ceramic HyperD F	25 mL
20067-021	DEAE Ceramic HyperD F	100 mL	20050-027	CM Ceramic HyperD F	100 mL
20067-013	DEAE Ceramic HyperD F	1000 mL	20050-019	CM Ceramic HyperD F	1000 mL

Related Products

AcroSep™ Ion Exchange Chromatography Columns 41

Q and S HyperCel™ Sorbents

High productivity ion exchangers for protein capture and separation



chromatography sorbents

PROTEIN AND DNA PURIFICATION

- ▶ Smaller columns, lower buffer requirements, and faster operations offer high dynamic binding capacity for enhanced process productivity.
- ▶ Excellent flow properties and easy packing/unpacking.
- ▶ Small re-equilibration volumes for buffer savings.
- ▶ Different selectivity and salt sensitivity for capture or intermediate purification steps.

Applications

- ▶ Direct capture of biomolecules from a variety of feedstocks.
- ▶ Purification of polypeptides, IgG, and albumin.
- ▶ Large-scale purifications.
- ▶ Purification of monoclonal antibodies from ascites or cell culture.
- ▶ Purification of vaccines.
- ▶ Process polishing steps.

Specifications

Average Particle Size
75 µm

Ionic Groups
Q HyperCel
99 - 138 µeq/mL

S HyperCel
59 - 84 µeq/mL

Dynamic Binding Capacity*

Q HyperCel
160 - 198 mg/mL

S HyperCel
134 - 190 mg/mL

Working Pressure**

Q HyperCel
< 1.2 bar (17 psi)

S HyperCel
< 1.3 bar (19 psi)

Working pH

1 - 13

Recommended Cleaning Conditions***

0.5 - 1 M NaOH

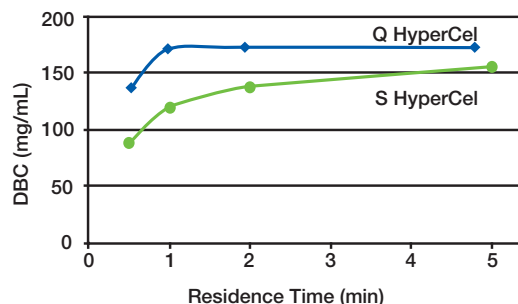
*Q HyperCel: Determined using 5 mg/mL BSA in 50 mM Tris-HCl, pH 8.5 at 2-minute residence time.
S HyperCel: Determined using 5 mg/mL hlgG in 50 mM sodium acetate, pH 4.5 at 2-minute residence time.

**Measured at 1,000 cm/h in a Pall LRC column (1.5 cm ID x 20 cm height) in above mentioned buffers.

***Injection of 5 column volumes (CV) of 0.5 - 1 M NaOH, 1 hour contact time.

Performance

Dynamic Binding Capacity vs. Residence Time of Q and S HyperCel Sorbents

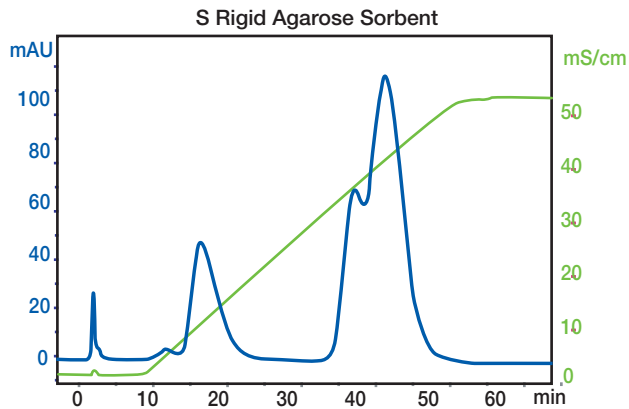
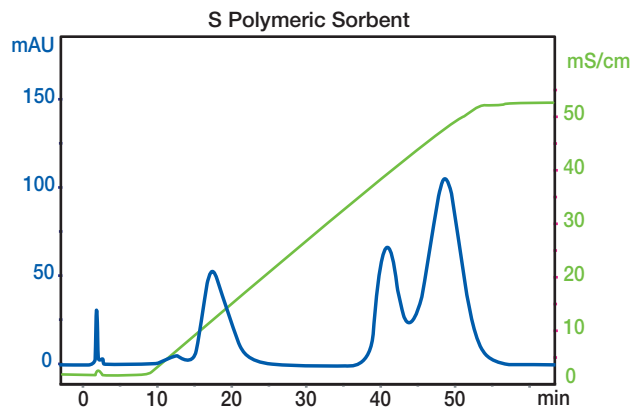
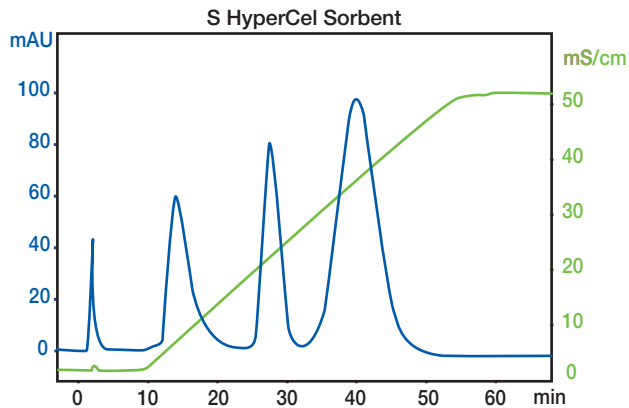


DBC for BSA for Q HyperCel sorbent - for hlgG for S HyperCel sorbent, determined at 10 % breakthrough in: 50 mM Tris-HCl buffer, pH 8.5 for Q HyperCel sorbent; 50 mM sodium acetate buffer, pH 4.5 for S HyperCel sorbent. Column: LRC column of 1 cm ID x 10 cm length.

High binding capacity facilitates operation using columns of moderate volume and footprint, allowing to reduce further buffer-volume requirements, and leads to equipment savings and reduced investment costs on sorbents. Binding pH and feedstock conductivity have an important influence on the dynamic binding capacity of both Q and S HyperCel sorbents, and the highest capacities are usually obtained with feedstock of conductivity below 5 mS/cm.

Performance

Separation of a Protein Mix on S HyperCel™ Sorbent and Comparison With a Highly Cross-Linked S Agarose, and With an S Polymeric Sorbent



Sample: Ovalbumin, Cytochrome C, Lysozyme

Chromatograms above illustrate the difference of selectivity between S HyperCel sorbent and two commercially available cation exchangers.

Due to their moderate ionic charge density, Q and S HyperCel sorbents give efficient ligand utilization while minimizing the concentration of salt required to desorb bound proteins. Bound proteins are eluted under low salt conditions, which means that less subsequent processing is required for the next downstream processing step, e.g., buffer exchange, dilution or diafiltration.

Ordering Information

Q HyperCel Sorbent

Part Number	Description	Pkg
20196-012	Q HyperCel sorbent	5 mL
20196-024	Q HyperCel sorbent	25 mL
20196-036	Q HyperCel sorbent	100 mL
20196-048	Q HyperCel sorbent	1 L

S HyperCel Sorbent

Part Number	Description	Pkg
20195-013	S HyperCel sorbent	5 mL
20195-025	S HyperCel sorbent	25 mL
20195-037	S HyperCel sorbent	100 mL
20195-049	S HyperCel sorbent	1 L

HEA and PPA HyperCel™ Mixed-Mode Chromatography Sorbents

For unique and different selectivities not accessible with traditional ion exchange or HIC



chromatography sorbents

- ▶ Chromatographic behavior is “mixed-mode” based on a combination of electrostatic and hydrophobic properties of the protein and ligands.
- ▶ Provides direct hydrophobic capture of proteins at low ionic strength.
- ▶ Can be exploited to achieve discrimination of proteins having similar or very close isoelectric points, a separation that cannot be performed by methods like ion exchange.
- ▶ Can be used in a “physiological-like” environment. (No need for pH adjustment of the feedstream; no, or limited, addition of salt.)
- ▶ Orthogonal to ion exchange or other chromatography steps.

Applications

- ▶ Fractionation of a protein mix.
- ▶ Separation of partially-purified polyclonal IgG from major plasma impurities.
- ▶ Process polishing steps.

Related Products

AcroSep™ Chromatography Columns for Mixed-Mode42

Specifications

Average Particle Size

90 µm

Bead Composition

High porosity cross-linked cellulose

Dynamic Binding Capacity (10% Breakthrough)*

40 - 60 mg/mL BSA

Ligand

Aliphatic (HEA): Hexylamine
Aromatic (PPA): Phenylpropylamine

Adsorption pH

7 - 9

Elution pH

By gradient or step elution, e.g., 7.0 - 2.6

Working pH

2 - 12

Pressure Resistance

< 3 bar (300 kPa, 44 psi)

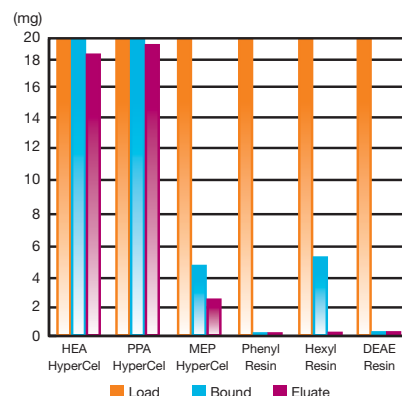
Storage Temperature

2 - 8 °C (36 - 46 °F)

*Determined using 5 mg/mL BSA in PBS; flow rate: 100 cm/h.

Performance

Comparison Between HEA and PPA HyperCel, MEP HyperCel, Conventional HIC, and Anion Exchange Sorbents



Adsorption/desorption of Bovine Serum Albumin (BSA), in PBS buffer, pH 7.4. Data shows that BSA is efficiently retained on both HEA and PPA HyperCel sorbents, but is poorly retained on MEP HyperCel sorbent (as this ligand is antibody-selective). In PBS, without lyotropic salt addition, low binding of BSA to both Phenyl and Hexyl HIC sorbents is observed. The anion exchange (DEAE) sorbent also did not bind BSA at these non-optimal conditions (pH 7.4 and too high salt concentration).

Ordering Information

HEA HyperCel Mixed-Mode Chromatography Sorbent

Part Number	Description	Pkg
20250-012	HEA HyperCel	5 mL
20250-026	HEA HyperCel	25 mL
20250-033	HEA HyperCel	100 mL
20250-041	HEA HyperCel	1000 mL

PPA HyperCel Mixed-Mode Chromatography Sorbent

Part Number	Description	Pkg
20260-015	PPA HyperCel	5 mL
20260-025	PPA HyperCel	25 mL
20260-030	PPA HyperCel	100 mL
20260-040	PPA HyperCel	1000 mL

PROTEIN AND DNA PURIFICATION

MEP HyperCel™ Mixed-Mode Chromatography Sorbent

For the capture and purification of monoclonal and polyclonal antibodies



Specifications

Average Particle Size

90 µm

Bead Composition

High porosity cross-linked cellulose

Dynamic Binding Capacity for Human IgG (10% Breakthrough)*

≥ 20 mg/mL

Ligand

4-Mercaptoethylpyridine (4-MEP)

Ligand Density

80 - 125 µmol/mL

Working pH

2 - 12

Pressure Resistance

< 3 bar (300 kPa, 44 psi)

Storage Temperature

2 - 8 °C (36 - 46 °F)

*Determined using 5 mg/mL human IgG in PBS, flow rate 60 cm/h.

- ▶ High purity in a single step. Product purities of 70% to 90% or greater are typically achieved.
- ▶ Rapid sample processing. Dynamic binding capacities of > 30 mg IgG per mL of sorbent (at 10% breakthrough) are routinely achieved.
- ▶ Exhibits high IgG capacity, independent of sub-class or species.
- ▶ Allows direct sample loading without adjustment of pH or ionic strength.
- ▶ Effective capture, even with feedstocks as dilute as 50 to 100 µg IgG/mL.
- ▶ Offers easy cleaning with sodium hydroxide.

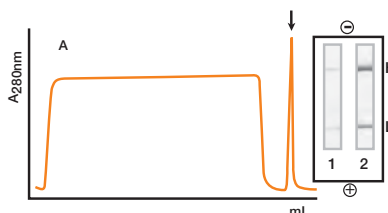
Applications

- ▶ Capture and purification of antibodies from a broad range of sources such as animal sera, ascites fluid, and cell culture supernatant.
- ▶ Independent of subclass or species. Weakly-binding variants (e.g., murine IgG, rat IgG) are well retained.
- ▶ Alternative to traditional HIC sorbents for capture of hydrophobic molecules.
- ▶ Has been studied in a broad range of applications including isolation of antibodies from sweet-whey and colostrum; isolation of antibodies from transgenic plant and animal sources; and, isolation of IgA and selected fusion proteins.

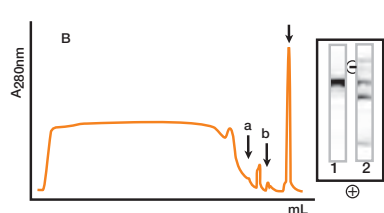
Performance

Monoclonal Antibodies Purification on MEP HyperCel Sorbent From Cell Culture Supernatants

Panel A: Serum-Free Cell Culture Media



Panel B: 5% Serum-Supplemented Cell Culture Media



Sample A = 300 mL protein-free cell culture supernatant. Sample B = 300 mL cell culture supernatant containing 5% fetal bovine serum; Equilibration: 50 mM Tris-HCl, pH 8; Elution: 50 mM acetate, pH 4; Flow rate: 70 cm/h. In curve B, (a) and (b) are respectively water and 25 mM sodium caprylate washings; SDS-PAGE (reduced conditions): (1) = crude sample; (2) = purified IgG; (H) = heavy chain; (L) = light chain.

Ordering Information

MEP HyperCel Mixed-Mode Chromatography Sorbent

Part Number	Description	Pkg
12035-069	MEP HyperCel	5 mL
12035-010	MEP HyperCel	25 mL
12035-028	MEP HyperCel	100 mL
12035-036	MEP HyperCel	1000 mL

Related Products

AcroSep™ Chromatography Columns for Mixed-Mode 43

Chromatography sorbents

PROTEIN AND DNA PURIFICATION

Ultrogel® AcA Size Exclusion Chromatography Sorbents



A range of composite sorbents for size exclusion of biological macromolecules



Specifications

	AcA 34	AcA 44	AcA 54	AcA 202
Average Particle Size	100 µm	100 µm	100 µm	100 µm
Acrylamide (%)	3	4	5	20
Agarose (%)	4	4	4	2
Exclusion Limit (Da)	750,000	200,000	90,000	22,000
Linear Fractionation Range (Da)	20,000 - 350,000	10,000 - 130,000	5,000 - 70,000	1,000 - 15,000
Resolution Power	1,500	1,500	1,500	3,000

This product is no longer available. Please contact Technical Service for a recommended alternative at:

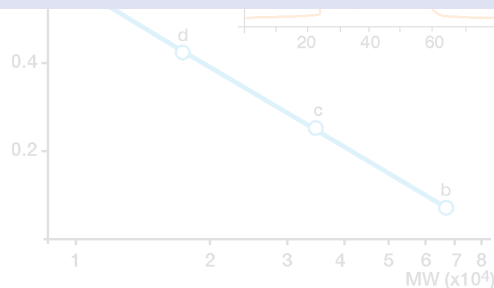
- 1.800.521.1520 (USA and Canada)
- (+)PALL.LIFE (Outside USA and Canada)
- LabSupport@pall.com

chromatography sorbents

- ▶ High resolution
- ▶ Semi-rigid particles
- ▶ Sorbents feature a narrow particle size distribution and a uniform pore size distribution.
- ▶ Four different pore sizes are available, allowing fractionation of a wide range of molecules with molecular weights from 1,000 to 350,000 Da.
- ▶ Suitable for large-scale applications.

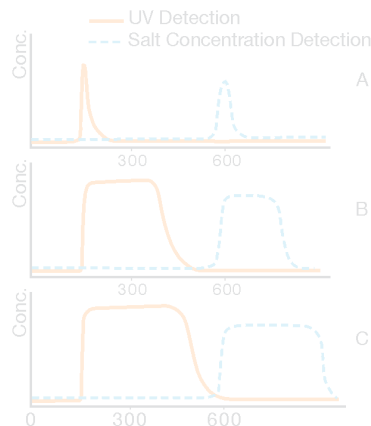
Applications

- ▶ Fractionation and purification of biological molecules by size exclusion.
- ▶ Determination of molecular weights.
- ▶ Desalting of proteins and nucleotides.



Column dimensions: 6 x 40 cm; eluent: 0.1 M NaCl, pH 7.0; flow rate: 1 mL/min; sample volume: 0.1 mL sodium dodecyl sulfate substituted of 2% for the determination of the void volume (V₀); bovine serum albumin (b) (MW 68,000); B-lactoglobulin (c) (MW 35,000); Myoglobin (d) (MW 17,800); Cytochrome c (e) (MW 12,400); Sample volume: 0.6 mL; Flow rate: 4.8 cm/h. The insert represents the elution profile of the above protein standards from the above column.

Large-Scale Desalting on Ultrogel AcA 202 Sorbent



Column dimensions: 5 x 37 cm; volume: 730 mL; Sample: bovine serum albumin (5 mg/mL) containing NaCl (6.5 mg/mL); Flow rate: 7 cm/h (i.e. 140 mL/h). Sample volumes: A = 36 mL (5% of sorbent volume); B = 220 mL (30% of sorbent volume); C = 327 mL (45% of sorbent volume); 280 nm UV detection.

PROTEIN AND DNA PURIFICATION



Performance

Gravity Flow Column Desalting With Ultrogel® AcA 202 Sorbent

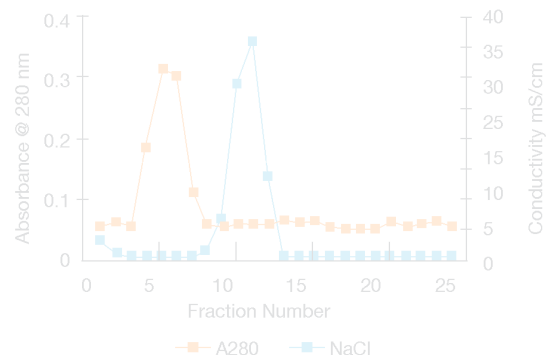
Desalting in a gravity drip column format was evaluated with Ultrogel AcA 202 sorbent against competitive agarose and dextran-based pre-packed columns following manufacturers' directions. The resulting desalting curves plotting protein (absorbance at 280 nm) and salt elution (m or $\mu\text{S}/\text{cm}$, measured using a Horiba micro-volume conductivity meter) are summarized below. The results all show excellent

separation between the excluded protein peak and the retained salt. Ultrogel AcA 202 gave the best separation between the void fraction containing the proteins of interest and the salt or included peak elution, suggesting that a higher volume of sample could have been loaded on this 10 mL column compared to other sorbents.

Panel A, Ultrogel AcA 202 Sorbent



Panel C, Competitor Dextran-Based Sorbent



Gravity flow (10 mL) columns were poured with Ultrogel AcA 202 sorbent and two competitive agarose and dextran-based media. A 1 mL protein sample [5 mg/mL human serum albumin (HSA) in 1 M NaCl] was then applied and fractions of 1 mL collected after elution with high purity water. Absorbance was measured at 280 nm and conductivity was measured using a Horiba micro-volume meter.

Ordering Information

Ultrogel AcA Size Exclusion Chromatography Sorbents

Part Number	Description	Pkg	Part Number	Description	Pkg
23015-025	Ultrogel AcA 34	100 mL	23019-023	Ultrogel AcA 54	100 mL
23015-019	Ultrogel AcA 34	1000 mL	23019-011	Ultrogel AcA 54	1000 mL
23022-024	Ultrogel AcA 44	100 mL	24892-022	Ultrogel AcA 202	100 mL
23022-015	Ultrogel AcA 44	1000 mL	24892-010	Ultrogel AcA 202	1000 mL



SDR HyperD® Detergent Removal Chromatography Sorbent



Unique sorbent designed to eliminate detergent from biological fluids



PROTEIN AND DNA PURIFICATION chromatography sorbents

- ▶ High dynamic binding capacity for many different detergents.
- ▶ High recovery for proteins.
- ▶ High adsorption capacity for small, hydrophobic molecules.
- ▶ Stable in acid, polar organic, and oxidizing solutions.
- ▶ Composed of silica beads in which the pore volume is filled with a three-dimensional cross-linked hydrophobic polymer. The small pore size, particle size distribution (40 to 100 µm), and hydrophobic nature of the chemical groups make SDR HyperD sorbent ideal for detergent removal.

Applications

- ▶ Binds detergent molecules typically used in viral inactivation processes [i.e., Tri-n-Butyl Phosphate (TnBP) and Triton® X-100].
- ▶ Removal of both ionic and zwitter ionic detergents from biological solutions.

Specifications

Average Particle Size

70 µm

Nature of Polymer

Hydrophobic, long aliphatic chains bind solvents.

Recommended Residence Time

5 - 15 min

Binding Capacity for Triton X-100

60 - 80 mg/mL*

Working pH

2 - 12

Pressure Resistance

70 bar (7,000 kPa, 1,000 psi)

Storage Temperature

2 - 30 °C (36 - 86 °F)

2 - 8 °C (36 - 46 °F) after opening

Do not freeze.

*Determined using 5 mg/mL Triton X-100 in PBS, pH 7.4, 10% breakthrough, 300 cm/h.

Performance

SDR HyperD Detergent Removal: Spin Column Format (< 0.2 mL Volume)

Detergent Volume (Wt./v)	Removal Efficiency From a Protein Sample ¹		
	+ 1%	+ 5%	+ 10%
ASB-14	> 99%	> 99%	80 - 90%
ASB-14 + 6M urea	> 99%	80 - 90%	NR
CHAPS	> 99%	> 99%	> 99%
CHAPS + 6M urea	> 99%	> 99%	80 - 90%
SDS	> 99%	> 99%	> 99%
SDS + 0.1 M NaCl	> 99%	> 99%	> 99%

¹0.2 mL of 5 mg/mL BSA in the presence of detergents (Wt./v). Bio-Rad dye binding assay used to follow removal of detergents. NR denotes "Not Recommended" as this detergent loading would exceed the column capacity.

Using a rapid spin column format, the binding capacity of SDR for detergents is still very high. In all cases, > 99% of detergent removed from 0.2 mL of a 1% solution.

Ordering Information

SDR HyperD Detergent Removal Chromatography Sorbent

Part Number	Description	Pkg
20033-065	SDR HyperD	5 mL
20033-031	SDR HyperD	25 mL
20033-023	SDR HyperD	100 mL
20033-015	SDR HyperD	1000 mL

Related Products

AcroSep™ Chromatography Columns With SDR HyperD Detergent Removal Sorbent 37

How to Choose a Filter Plate for Your Application

As samples get smaller and more numerous, the need for novel methods to purify samples and improve assays has led Pall Life Sciences to develop a broad line of multi-well filter plate platforms targeting specific application challenges. The AcroPrep™ Advance and AcroPrep families of filter plates feature individually-sealed membranes that eliminate crosstalk and solution weeping. The proprietary sealing technology allows Pall to seal virtually any type of membrane or media configuration into these device platforms to meet ever-changing industry needs.

Broad selection to suit your application – Available in 96- or 384-well formats with a variety of single- and multi-layer membranes, plate color choices, well volumes, and outlet tip lengths for use in a multitude of sample preparation and detection processes.

Automation-friendly – Designed in accordance with the standards of the ANSI and SBS. Rigid construction enables the plates to be easily maneuvered by robotic equipment and assures that the plates do not flex and jam detectors or other instrumentation.

Low binding, chemically resistant – Polypropylene housing assembly is compatible with a broad range of aqueous and organic liquids, and is noted for its low biomolecule binding, which minimizes non-specific adsorption to the plate.

Serialized barcodes – Labels allow for the use of automated tracking systems.

No crosstalk – Specially engineered fluid directors and outlet tips on the bottom of the AcroPrep Advance plate are designed to reduce the potential for crosstalk. Elimination of crosstalk is assured through individually sealing a membrane in each well using a proprietary sealing technology.

DESIGN ADVANTAGES FOR ACROPREP ADVANCE FILTER PLATES



Membranes are individually cut, placed, and sealed in the wells.

NEW DESIGN

- ▶ Plates can be used in both filtrate- and retentate-based applications.
- ▶ Plates have short fluid directors to direct the flow of the filtrate without cross-contamination.
- ▶ Proprietary sealing process allows flexibility in sealing a wide range of membrane in single and multiple layers.
- ▶ Available in a wide range of configurations to meet various application challenges.

How to Choose a Filter Plate for Your Application (continued)

OUTLET TIP TYPES

AcroPrep™ Advance
96-well



Use for purification and diagnostic assay applications without concerns of cross-contamination.

AcroPrep 384-well
Long Tip



Use for both filtrate- and retentate-based applications. Outlet tips extend beyond the skirt of the plate and pilot into the wells of a receiving plate.

AcroPrep 384-well
Short Tip



Use for both filtrate- and retentate-based applications. Outlet tips are recessed beneath the skirt of the plate.

METHODOLOGY: FILTRATION VERSUS RETENTION



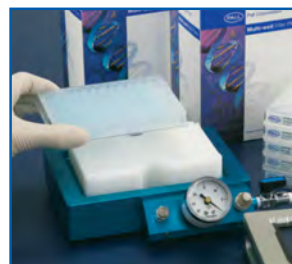
1. Place plate on vacuum manifold or hold the plate so the outlets on the bottom of the plate are not touched.



2. Add sample and incubate. Apply vacuum (or centrifuge).



3A. Release vacuum from the manifold. Remove filter plate and retained sample for further processing. (OR)



3B. Release vacuum from the manifold. Remove filter plate. Remove collection (receiver) plate and utilize collected filtrate in downstream applications.

AcroPrep™ Advance 96-Well Filter Plates for DNA Purification

Maximum yields of high quality nucleic acid



- ▶ Optimized for maximum binding and yield of DNA from a variety of sample types.
- ▶ New well geometry results in reduced hold-up volume and higher recovery of DNA.
- ▶ Enhanced media ensures high yields of contaminant-free DNA for downstream applications, such as PCR and sequencing.
- ▶ Manufactured in accordance with SBS guidelines, allowing entire DNA purification process to be performed on automated equipment.

Applications

- ▶ Plasmid DNA purification.
- ▶ Genomic DNA purification.
- ▶ Plant RNA purification.

Specifications

Materials of Construction

Filter Media: DNA binding (borosilicate glass without binder) media
 Plate Housing: Polypropylene
 Lid: Polystyrene

Dimensions

Length: 12.8 cm (5.0 in.)
 Width: 8.6 cm (3.4 in.)
 Height With Lid: 1.8 cm (0.7 in.)
 (350 µL only)
 Height Without Lid: 350 µL, 1.4 cm
 (0.6 in.); 1 mL: 3.3 cm (1.3 in.)

Well-Bottom Area

0.25 cm²

Recommended Working Volume

350 µL: ≤ 300 µL
 1 mL: ≤ 900 µL

Recommended Operating Vacuum

≥ 25.4 cm Hg (10 in. Hg)

Recommended Centrifugal Force

1,500 x g

Typical Processing Time

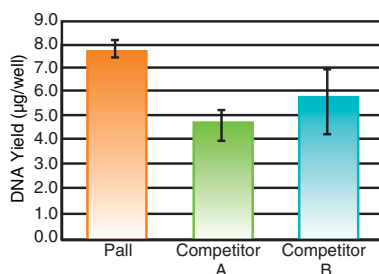
Vacuum: 2 seconds
 Centrifuge: < 2 minutes

Typical Hold-Up Volume

Vacuum: 19 µL

Performance

Plasmid DNA Yield Superior to Competitive Plates



pCAT plasmid DNA yield (OD₂₆₀) using indicated DNA purification plates starting with 1 mL (Pall and Competitor B) or 1.5 mL (Competitor A) overnight culture DH5α. Purification using plate manufacturer's recommended protocol using 350 µL plates. Error bars indicate standard error (n ≥ 6).

Quality DNA Consistently Purified

Company	Elution Volume (µL)	Recovered Volume (µL)	OD _{260/280}	Concentration (ng/µL)	Total Yield (µg/well)
Pall	70	55 - 65	1.95 ± 0.01	131	7.7
Competitor A	50	30	1.98 ± 0.01	155	4.6
Competitor B	70	45 - 60	2.04 ± 0.05	108	5.6

OD_{260/280} of pooled purified pDNA (n ≥ 6). High quality DNA has an OD_{260/280} value between 1.7 - 2.0.

Ordering Information

AcroPrep Advance 96-Well Filter Plates for DNA Purification

Part Number	Description	Pkg
8032	350 µL, DNA binding	10/pkg
8132	1 mL, DNA binding	5/pkg

Accessories and Replacement Parts

Part Number	Description	Pkg
5017	Multi-well plate vacuum manifold	1/pkg
5225	Adapter collar for centrifugation	2/pkg
5226	Adapter for PCR receiver plate	2/pkg
5230	Cap mat for incubation	5/pkg
8001	AcroPrep Advance multi-well plate lids	10/pkg

AcroPrep™ Advance 96-Well Filter Plates for Lysate Clearance

Integrated prefilter provides efficient clarification of highly particulated samples



- ▶ Integrated prefilter yields consistent filtration of samples with high levels of gross particulate.
- ▶ Innovative outlet tip geometry provides direct flow of samples into receiver plate without concerns of cross-contamination.
- ▶ Manufactured with biologically inert materials that allow clarification of most types of lysates without loss of target molecules.

Applications

- ▶ Removal of bacterial debris prior to plasmid purification.
- ▶ Removal of bacterial and cellular debris prior to protein purification.
- ▶ Clearance of gross particulates.

Specifications

Materials of Construction

Filter Media: 3 µm glass fiber/0.2 µm Supor® membrane and 3 µm glass fiber/1.2 µm Supor membrane
 Plate Housing: Polypropylene
 Lid: Polystyrene

Dimensions

Length: 12.8 cm (5.0 in.)
 Width: 8.6 cm (3.4 in.)
 Height With Lid: 1.8 cm (0.7 in.) (350 µL only)
 Height Without Lid: 350 µL, 1.4 cm (0.6 in.); 1 mL: 3.3 cm (1.3 in.); 2 mL: 4.7 cm (1.9 in.)

Well-Bottom Area

0.25 cm²

Recommended Working Volume

350 µL: ≤ 300 µL
 1 mL: ≤ 900 µL
 2 mL: ≤ 1.9 mL

Recommended Operating Vacuum
 ≥ 25.4 cm Hg (10 in. Hg)

Recommended Centrifugal Force
 1,500 x g

Typical Processing Time

PN 8040
 Vacuum: 2 seconds
 Centrifuge: < 2 minutes

PN 8075, 8175, 8275

Vacuum: 9 seconds
 Centrifuge: < 2 minutes

Typical Hold-Up Volume

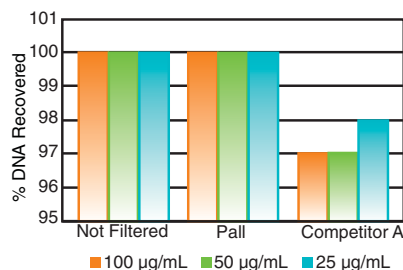
PN 8040
 Vacuum: 17 µL

PN 8075, 8175, 8275

Vacuum: 13 µL

Performance

Glass Fiber and Supor Membrane Allow Complete Recovery of Plasmid DNA From *E. coli* Lysates



Purified pCAT plasmid DNA was spiked in TE buffer at 25 µg/mL, 50 µg/mL, and 100 µg/mL and filtered through Pall and Competitor A's prefilter plates. Percent recovery was calculated by comparing OD₂₆₀ post-filtration to a standard curve of unfiltered samples.

Ordering Information

AcroPrep Advance 96-Well Filter Plates for Lysate Clearance

Part Number	Description	Pkg
8075	350 µL, 3.0 µm glass fiber/0.2 µm Supor membrane	10/pkg
8040	350 µL, 3.0 µm glass fiber/1.2 µm Supor membrane	10/pkg
8175	1 mL, 3.0 µm glass fiber/0.2 µm Supor membrane	5/pkg
8275	2 mL, 3.0 µm glass fiber/0.2 µm Supor membrane	5/pkg

Accessories and Replacement Parts

Part Number	Description	Pkg
5017	Multi-well plate vacuum manifold	1/pkg
5225	Adapter collar for centrifugation	2/pkg
5226	Adapter for PCR receiver plate	2/pkg
5230	Cap mat for incubation	5/pkg
8001	AcroPrep Advance multi-well plate lids	10/pkg

AcroPrep™ Advance 96-Well Filter Plates for Protein Purification

Versatile format for multiple purification strategies



- ▶ High performance Supor® membrane offers optimal support to retain chromatography sorbents while allowing smooth flow of buffers.
- ▶ Ion exchange Mustang® membrane is able to withstand high flow rates to render fast purification of biomolecules.
- ▶ New well design results in faster, more uniform filtration rates across the plate with reduced hold-up volume.
- ▶ New outlet tip geometry minimizes sample leakage and loss during incubation steps.
- ▶ Intrinsic plate properties prevent target molecules from binding to the plate.

Applications

- ▶ High throughput protein purification.
- ▶ Screening of chromatography sorbents and conditions.
- ▶ Protein fractionation.
- ▶ Antibody purification.

Specifications

Materials of Construction
Filter Media: Supor (polyethersulfone), Mustang Q (anion exchange), and Mustang S (cation exchange) membranes

Plate Housing: Polypropylene
Lid: Polystyrene

Dimensions
Length: 12.8 cm (5.0 in.)
Width: 8.6 cm (3.4 in.)
Height With Lid: 1.8 cm (0.7 in.) (350 µL only)
Height Without Lid: 350 µL, 1.4 cm (0.6 in.); 1 mL: 3.3 cm (1.3 in.)

Well-Bottom Area
0.25 cm²

Recommended Working Volume
350 µL: ≤ 300 µL
1 mL: ≤ 900 µL

Recommended Operating Vacuum
≥ 25.4 cm Hg (10 in. Hg)

Recommended Centrifugal Force
1,500 x g

Typical Processing Time
PN 8029, 8039, 8129, 8130
Vacuum: 2 seconds
Centrifuge: < 2 minutes

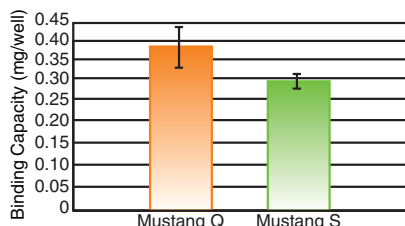
PN 8071, 8072, 8171, 8172
Vacuum: 14 seconds
Centrifuge: < 2 minutes

Typical Hold-Up Volume
PN 8029, 8039, 8129, 8130
Vacuum: 5 µL
Centrifuge: 3 µL

PN 8071, 8072, 8171, 8172
Vacuum: 21 µL
Centrifuge: 12 µL

Performance

Mustang Q and S Membrane Provide a High Protein Binding Capacity



Binding capacity of Mustang Q membrane, 0.38 mg/well (n=5), was determined with BSA in 50 mM Tris, pH 8.5. Mustang S membrane binding capacity, 0.29 mg/well (n=6), was determined using Lysozyme in 10 mM MES, pH 5.5.

Ordering Information

AcroPrep Advance 96-Well Filter Plates for Protein Purification

Part Number	Description	Pkg
8029	350 µL, 0.45 µm Supor membrane	10/pkg
8039	350 µL, 1.2 µm Supor membrane	10/pkg
8071	350 µL, Mustang Q membrane	10/pkg
8022	350 µL, Mustang Q membrane, white	10/pkg
8072	350 µL, Mustang S membrane	10/pkg
8129	1 mL, 0.45 µm Supor membrane	5/pkg
8130	1 mL, 1.2 µm Supor membrane	5/pkg
8171	1 mL, Mustang Q membrane	5/pkg
8172	1 mL, Mustang S membrane	5/pkg

Accessories and Replacement Parts

Part Number	Description	Pkg
5017	Multi-well plate vacuum manifold	1/pkg
5225	Adapter collar for centrifugation	2/pkg
5226	Adapter for PCR receiver plate	2/pkg
5230	Cap mat for incubation	5/pkg
8001	AcroPrep Advance multi-well plate lids	10/pkg

▶ www.pall.com/lab

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filter plates

PROTEIN AND DNA PURIFICATION

AcroPrep™ Advance 96-Well Filter Plates for Solvent Filtration

Versatile chemical compatibility with harsh organics and/or aqueous solvents



- ▶ Chemically resistant materials provide a stable platform to process samples in organic solvents.
- ▶ Inert materials of construction ensure complete recovery of samples and low non-specific binding.
- ▶ New well design results in faster, more uniform filtration rates across the plate and reduces hold-up volume.
- ▶ Innovative outlet tip geometry provides direct flow of samples into receiver plate without concerns of cross-contamination.

Applications

- ▶ Metabolic studies.
- ▶ Molecular or drug synthesis reactions.
- ▶ Sample prep using solvents.
- ▶ Aggressive filtration applications.

Specifications

Materials of Construction

Filter Media: PTFE (polytetrafluoroethylene) and GHP (hydrophilic polypropylene) membrane
 Plate Housing: Polypropylene
 Lid: Polystyrene

Dimensions

Length: 12.8 cm (5.0 in.)
 Width: 8.6 cm (3.4 in.)
 Height With Lid: 1.8 cm (0.7 in.) (350 µL only)
 Height Without Lid: 350 µL, 1.4 cm (0.6 in.); 1 mL: 3.3 cm (1.3 in.); 2 mL: 4.7 cm (1.9 in.)

Well-Bottom Area

0.25 cm²

Recommended Working Volume

350 µL: ≤ 300 µL
 1 mL: ≤ 900 µL
 2 mL: ≤ 1.9 mL

Recommended Operating Vacuum

≥ 25.4 cm Hg (10 in. Hg)

Recommended Centrifugal Force

1,500 x g

Typical Vacuum Filtration

Performance for 350 µL Filter Plates

Membrane	Processing Time (sec.)	Hold-Up Volume (µL)
0.2 µm GHP	9	12
0.45 µm GHP	6	12
0.2 µm PTFE	52	14
0.45 µm PTFE	19	15

Typical Centrifugal Filtration

Performance for 350 µL Filter Plates

Membrane	Processing Time (min.)	Hold-Up Volume (µL)
0.2 µm GHP	< 2	3
0.45 µm GHP	< 2	3
0.2 µm PTFE	< 2	2
0.45 µm PTFE	< 2	1

Ordering Information

AcroPrep Advance 96-Well Filter Plates for Solvent Filtration

Part Number	Description	Pkg
8082	350 µL, 0.2 µm GHP membrane	10/pkg
8084	350 µL, 0.45 µm GHP membrane	10/pkg
8182	1 mL, 0.2 µm GHP membrane	5/pkg
8184	1 mL, 0.45 µm GHP membrane	5/pkg
8282	2 mL, 0.2 µm GHP membrane	5/pkg
8284	2 mL, 0.45 µm GHP membrane	5/pkg
8047	350 µL, 0.2 µm PTFE membrane	10/pkg
8048	350 µL, 0.45 µm PTFE membrane	10/pkg
8147	1 mL, 0.2 µm PTFE membrane	5/pkg
8148	1 mL, 0.45 µm PTFE membrane	5/pkg
8247	2 mL, 0.2 µm PTFE membrane	5/pkg
8248	2 mL, 0.45 µm PTFE membrane	5/pkg

Accessories and Replacement Parts

Part Number	Description	Pkg
5017	Multi-well plate vacuum manifold	1/pkg
5225	Adapter collar for centrifugation	2/pkg
5226	Adapter for PCR receiver plate	2/pkg
5230	Cap mat for incubation	5/pkg
8001	AcroPrep Advance multi-well plate lids	10/pkg

AcroPrep™ Advance 96-Well Filter Plates for Ultrafiltration

Provides rapid, efficient separation of biomolecules



- ▶ Omega™ membrane provides high recovery and typically results in $\geq 90\%$ recovery of target biomolecules.
- ▶ New well design results in faster, more uniform filtration rates across the plate with reduced hold-up volume for maximum sample recovery.
- ▶ Intrinsic plate and membrane properties prevent target molecules from binding to the plate.

Applications

- ▶ Size exclusion.
- ▶ PCR clean-up.
- ▶ Nucleic acid purification.
- ▶ Protein separation.

Specifications

Materials of Construction

Filter Media: Omega (modified polyethersulfone) membrane
 Plate Housing: Polypropylene
 Lid: Polystyrene

Dimensions

Length: 12.8 cm (5.0 in.)
 Width: 8.6 cm (3.4 in.)
 Height With Lid: 1.8 cm (0.7 in.) (350 μ L only)
 Height Without Lid: 350 μ L, 1.4 cm (0.6 in.); 1 mL: 3.3 cm (1.3 in.)

Well-Bottom Area

0.25 cm²

Recommended Working Volume

350 μ L: $\leq 300 \mu$ L
 1 mL: $\leq 900 \mu$ L

Recommended Operating Vacuum

≥ 25.4 cm Hg (10 in. Hg)

Recommended Centrifugal Force

1,500 x g

Typical Vacuum Filtration Performance

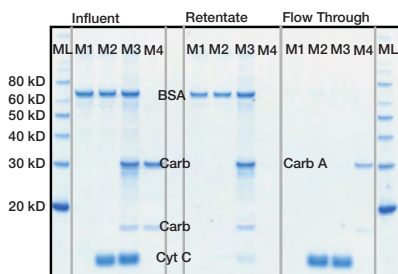
Membrane	Processing Time (min)	Hold-Up Volume (μ L)
10K Omega	20	5
30K Omega	8	6
100K Omega	4	7

Typical Centrifugal Filtration Performance

Membrane	Processing Time (min)	Hold-Up Volume (μ L)
3K Omega	45	2
10K Omega	8	2
30K Omega	8	2
100K Omega	5	2

Performance

Separation of Proteins With Omega Membrane Using Vacuum Filtration



SDS-PAGE analysis of reduced samples from 30K Omega membrane plate using vacuum separation method, 5 μ L/lane. 75 μ L protein mix/well subjected to ~ 20 in. Hg vacuum for ~ 8 minutes. Each protein at 100 μ g/mL in initial mix. ML = Marker Ladder; M1 = BSA; M2 = BSA + Cyt C; M3 = BSA, Carbonic Anhydrase, and Cyto C; M4 = Carbonic Anhydrase. GelCode® Blue stain used.

Ordering Information

AcroPrep Advance 96-Well Filter Plates for Ultrafiltration

Part Number	Description	Pkg
8033	350 μ L, Omega 3K MWCO	10/pkg
8034	350 μ L, Omega 10K MWCO	10/pkg
8035	350 μ L, Omega 30K MWCO	10/pkg
8036	350 μ L, Omega 100K MWCO	10/pkg
8163	1 mL, Omega 3K MWCO	5/pkg
8164	1 mL, Omega 10K MWCO	5/pkg
8165	1 mL, Omega 30K MWCO	5/pkg
8166	1 mL, Omega 100K MWCO	5/pkg

Accessories and Replacement Parts

Part Number	Description	Pkg
5017	Multi-well plate vacuum manifold	1/pkg
5225	Adapter collar for centrifugation	2/pkg
5226	Adapter for PCR receiver plate	2/pkg
5230	Cap mat for incubation	5/pkg
8001	AcroPrep Advance multi-well plate lids	10/pkg

AcroPrep™ 384-Well Filter Plates, 100 µL

Ideal for use in high volume, high throughput sample prep applications



- ▶ Plates are constructed from chemically-resistant, biologically-inert polypropylene with a clear polystyrene lid.
- ▶ Robotic-friendly design has single-piece construction, designed in accordance with the ANSI/SBS X-2004 standards. Plates are stackable with and without lids.
- ▶ Eliminates crosstalk between wells. Membranes are individually sealed in each well with a proprietary sealing process and each well has a fluid director.
- ▶ A serialized barcode label allows the use of automated tracking systems and identifies the membrane type.
- ▶ Available in a variety of membrane configurations to meet the requirements of numerous applications.

Applications

BioTrace NT Membrane

- ▶ Solid phase ELISA.
 - ▶ Drug discovery using bound molecules.
- ### GHP Membrane
- ▶ Bead-/sor bent-based purification.
 - ▶ Plasmid lysate clearing.
 - ▶ Isolate DNA from agarose gel slices.

Glass Fiber Media

- ▶ Lysate clarification.
- ▶ Isolation of RNA, gDNA, and plasmids from culture.

Omega™ Membrane

- ▶ Concentrate, desalt, and purify DNA, RNA, oligonucleotides, and proteins.
- ▶ Nucleic acid purification.

Supor® Membrane

- ▶ Lysate clearance.
- ▶ Bead retention.
- ▶ Multiplex assays.

Specifications

Materials of Construction

Filter Media: BioTrace™ NT (nitrocellulose), GHP (hydrophilic polypropylene), glass fiber (borosilicate glass), Omega (modified PES), and Supor (PES) membranes
Plate Housing: Polypropylene
Lid: Polystyrene

Dimensions

Height (With Short Tips): 1.7 cm (0.7 in.) with lid and 1.4 cm (0.6 in.) without lid
Height (With Long Tips): 2.1 cm (0.8 in.) with lid and 1.9 cm (0.7 in.) without lid
Length: 12.8 cm (5.0 in.)
Width: 8.6 cm (3.4 in.)

Well-Bottom Area

0.05 cm²

Maximum Well Volume

100 µL

Recommended Maximum Working Volume

80 µL

Recommended Operating Vacuum

25.4 cm Hg (10 in. Hg) or greater

Filtration by Centrifugation

500 - 3,000 x g

Typical Hold-Up Volume

< 4 µL per well

Performance



AcroPrep™ 384-Well, Long Tip
Can be used for both filtrate- and retentate-based applications. Outlet tips extend beyond the skirt of the plate and pilot into the wells of a receiving plate.



AcroPrep 384-Well, Short Tip
Can be used for both filtrate- and retentate-based applications. Outlet tips are recessed beneath the skirt of the plate.

Ordering Information

AcroPrep 384-Well Filter Plates, 100 µL

Part Number	Description	Pkg
5076	10K, Omega™ membrane, long tips, natural	10/pkg
5077	10K, Omega membrane, short tips, natural	10/pkg
5078	30K, Omega membrane, long tips, natural	10/pkg
5079	30K, Omega membrane, short tips, natural	10/pkg
5080	100K, Omega membrane, long tips, natural	10/pkg
5081	100K, Omega membrane, short tips, natural	10/pkg
5086	0.2 µm, BioTrace™ NT, short tips, white	10/pkg
5070	0.45 µm, GHP membrane, long tips, natural	10/pkg
5071	0.45 µm, GHP membrane, short tips, natural	10/pkg

Part Number	Description	Pkg
5072	1.0 µm, glass fiber, long tips, natural	10/pkg
5072W	1.0 µm, glass fiber, long tips, white	10/pkg
5073	1.0 µm, glass fiber, short tips, natural	10/pkg
5073W	1.0 µm, glass fiber, short tips, white	10/pkg
5084	1.2 µm, Supor® membrane, long tips, natural	10/pkg
5085	1.2 µm, Supor membrane, short tips, natural	10/pkg

Accessories and Replacement Parts

Part Number	Description	Pkg
5017	Multi-well plate vacuum manifold	1/pkg
5231	Multi-well plate lids	10/pkg

AcroPrep™ 96-Well Filter Plates, 350 µL

Excellent for use in high throughput sample prep applications



- ▶ Plates are constructed of chemically-resistant, biologically-inert polypropylene with a clear polystyrene lid.
- ▶ Robotic-friendly design has single-piece construction, designed in accordance with the ANSI/SBS X-2004 standards. Plates are stackable with and without lids.
- ▶ Eliminates crosstalk between wells. Membranes are individually sealed in each well with a proprietary sealing process and each well has a fluid director.
- ▶ A serialized barcode label allows use in automated tracking systems and identifies the membrane type.

Applications

- ▶ Prefiltration.
- ▶ Particulate removal.
- ▶ Cell harvesting.

*Each plate comes with an individual lid.
If you are working with specific receiver plates, contact your local Pall office for the appropriate adapter.

Specifications

Materials of Construction

Filter Media: Bio-Inert® (modified low protein-binding nylon), GHP (hydrophilic polypropylene), glass fiber (borosilicate glass), Mustang® Q, Mustang S, Omega™ (modified PES), PTFE (polytetrafluoroethylene), PP/PE non-woven (polypropylene/polyethylene), and Supor® (PES) membranes

Plate Housing: Polypropylene

Lid: Polystyrene

Dimensions

Height: 1.7 cm (0.7 in.) with lid and 1.4 cm (0.6 in.) without lid

Length: 12.8 cm (5.0 in.)

Width: 8.6 cm (3.4 in.)

Well-Bottom Area

0.25 cm²

Maximum Well Volume

350 µL

Recommended Maximum Working Volume

300 µL

Recommended Operating Vacuum

25.4 cm Hg (10 in. Hg) or greater

Filtration by Centrifugation

500 - 3,000 x g

Typical Hold-Up Volume

< 14 µL per well

Ordering Information

AcroPrep 96-Well Filter Plates, 350 µL

Part Number	Description	Pkg
5033	3K, Omega membrane, natural	10/pkg
5034	10K, Omega membrane, natural	10/pkg
5035	30K, Omega membrane, natural	10/pkg
5036	100K, Omega membrane, natural	10/pkg
5045	0.2 µm, GHP membrane, natural	10/pkg
5030	0.45 µm, GHP membrane, natural	10/pkg
5043	0.45 µm, GHP membrane, white	10/pkg
5044	0.45 µm, GHP membrane, black	10/pkg
5031	1.0 µm, glass fiber, natural	10/pkg
5031L*	1.0 µm, glass fiber, natural	10/pkg
5032	1.0 µm, glass fiber, white	10/pkg
5029	0.45 µm, Supor membrane, natural	10/pkg
5039	1.2 µm, Supor membrane, natural	10/pkg
5039L*	1.2 µm, Supor membrane, natural	10/pkg
5041	PP/1.2 µm, Supor membrane, natural	10/pkg
5042	0.2 µm, Bio-Inert membrane, natural	10/pkg
5046	3.0 µm glass fiber/0.2 µm, Bio-Inert membrane, natural	10/pkg
5037	0.2 µm, PTFE membrane, natural	10/pkg
5038	0.45 µm, PTFE membrane, natural	10/pkg
5047	0.8 µm Mustang Q membrane, natural	10/pkg
5048	0.8 µm Mustang S membrane, natural	10/pkg
7267	30 - 40 µm, PP/PE non-woven media, natural	10/pkg

AcroPrep™ 96-Well Filter Plates, 1 mL

Optimized for a variety of applications requiring larger per well volume processing



- ▶ Plates are constructed of chemically-resistant, biologically-inert polypropylene.
- ▶ Robotics-friendly design has single-piece construction, designed in accordance with the ANSI/SBS X-2004 specifications.
- ▶ A serialized barcode label allows use in automated tracking systems.
- ▶ Proprietary sealing technology individually seals each well, eliminating crosstalk.
- ▶ Available in a variety of membrane configurations.
- ▶ Extended flow directors eliminate splattering and crosstalk of filtrate.

Applications

- GHP Membrane**
 - ▶ Bead-/sorbent-based applications.
 - ▶ Protein precipitation.
- Glass Fiber Media**
 - ▶ Lysate clarification.
 - ▶ Isolation of RNA, gDNA, and plasmids from culture.
- Glass Fiber Over Bio-Inert® Membrane**
 - ▶ Clarification of cell lysates and tissue homogenates.
 - ▶ Applications that require prefiltration.
- Mustang® Ion Exchange Membrane**
 - ▶ Plasmid purification.
 - ▶ Ion exchange applications.
 - ▶ Oligonucleotide purification.
- Omega™ Membrane**
 - ▶ Concentrate, desalt, and purify DNA, RNA, oligonucleotides, and proteins.
 - ▶ Nucleic acid purification.
- PTFE Membrane**
 - ▶ Sample prep using solvents.
 - ▶ Aggressive filtration applications.
- Supor® Membrane**
 - ▶ Lysate clearance.
 - ▶ Bead retention.

Specifications

Materials of Construction

Filter Media: Bio-Inert (modified low protein-binding nylon), GHP (hydrophilic polypropylene), glass fiber (borosilicate glass without binder), Mustang Q, Mustang S, Omega (modified PES), PTFE (polytetrafluoroethylene), and Supor (PES) membranes
 Plate Housing: Polypropylene
 Lid: Polystyrene

Dimensions

Length: 12.8 cm (5.0 in.)
 Width: 8.6 cm (3.4 in.)
 Height: 3.3 cm (1.3 in.)
 Tip Length: 0.5 cm (0.2 in.)

Well-Bottom Area

0.25 cm²

Maximum Well Volume

1 mL

Recommended Working Volume

900 µL

Recommended Operating Vacuum

25.4 cm Hg (10 in. Hg)

Filtration by Centrifugation

1,000 - 3,000 x g

Typical Hold-Up Volume

(starting volume of 900 µL)
 < 18 µL/well

Ordering Information

AcroPrep 96-Well Filter Plates, 1 mL, Natural

Part Number	Description	Pkg
5052	0.2 µm, GHP membrane	5/pkg
5054	0.45 µm, GHP membrane	5/pkg
5052VM	0.2 µm, GHP membrane, valve mat	5/pkg
5054VM	0.45 µm, GHP membrane, valve mat	5/pkg
5051	1.0 µm, glass fiber media	5/pkg
5053	3.0 µm glass fiber media/0.2 µm Bio-Inert membrane	5/pkg
5062	0.8 µm, Mustang Q membrane	5/pkg
5063	0.8 µm, Mustang S membrane	5/pkg
5055	0.2 µm, PTFE membrane	5/pkg
5056	0.45 µm, PTFE membrane	5/pkg
5065	1.2 µm, Supor membrane, valve mat	5/pkg
5066	3K, Omega membrane	5/pkg

Accessories and Replacement Parts

Part Number	Description	Pkg
5017	Multi-well plate vacuum manifold	1/pkg
5225	Adapter collar for centrifugation	2/pkg
5226	Adapter for PCR receiver plate	2/pkg
5230	Cap mat for incubation	5/pkg
5231	Multi-well plate lids	10/pkg

All accessories and replacement parts are compatible with 350 µL AcroPrep 96-well filter plates.

Vacuum Manifold and Accessories

Designed to perfectly fit SBS-conforming filter plates



Specifications

Materials of Construction

Vacuum Manifold: Anodized aluminum
 Gasket: EDPM (ethylene propylene)
 O-Ring: Silicone
 Spacer Block: Delrin plastic
 Adapter Collar: Stainless steel

Dimensions

Length: 17.48 cm (6.88 in.)
 Width: 12.37 cm (4.87 in.)
 Height: 8.05 cm (3.17 in.)
 Weight: 2.85 kg (6.27 lb.)

Maximum Operating Vacuum

71.12 cm Hg (28 in. Hg)

Note: Pall's vacuum manifold can be used with multi-well filter plates that meet the specifications set forth by the ANSI/SBS X-2004.

- ▶ Comes complete with the necessary O-ring and gasket. The control block includes the vacuum pressure gauge, vacuum metering valve, vacuum release valve, and 1/4 in. hose barb for vacuum line attachment.
- ▶ Includes a Delrin spacer block designed for standard 350 µL receiver plates. The spacer block has been optimized to reduce the space between the receiver plate and the filter plate during vacuum filtration.
- ▶ Optional spacer block available for use with 1 mL receiver plates.
- ▶ Adapter collar holds filter plates tightly to receiver plates for centrifugation.

Methodology



1. Place plate on vacuum manifold or hold the plate so the outlets on the bottom of the plate are not touched.



2. Add sample and incubate. Apply vacuum.



3A. Release vacuum from the manifold. Remove filter plate and retained sample for further processing.



(OR) 3B. Release vacuum from the manifold. Remove filter plate. Remove collection (receiver) plate and utilize collected filtrate in downstream applications.

Applications

- ▶ For vacuum filtration specifically using AcroPrep™ Advance and AcroPrep multi-well filter plates.

Ordering Information

Vacuum Manifold and Accessories

Part Number	Description	Pkg
5017	Multi-well plate vacuum manifold	1/pkg
5014	1 mL receiver plate spacer block	1/pkg
5015	350 µL receiver plate spacer block	1/pkg
5016	Replacement accessory kit (includes O-ring, gasket and allen wrench)	1/pkg
5028	Waste drain adapter	1/pkg

Detection and Screening



In early stage research and development of new drugs, using the right products and solutions designed for your particular needs can grant significant time and cost savings. Pall provides several purification and detection technologies to address the continuously increasing demands of high throughput screening applications and the diversified requirements of scientists. When it comes to drug screening and diagnostic assays, you can depend on Pall Life Sciences to meet the most stringent sample preparation requirements while lowering the expenses associated with sample loss and contamination.

Content

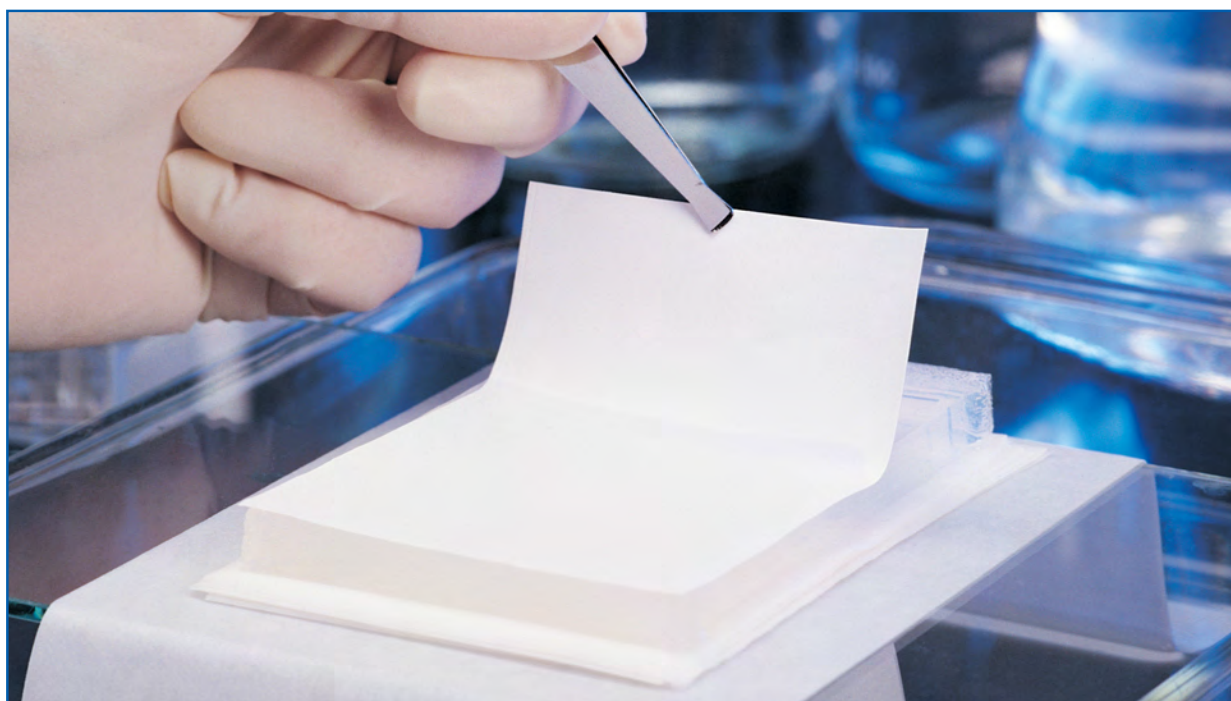
- 80** Drug Screening and Diagnostic Assays Application Selector
- 81** Detection Application Selector
- 82** Obtaining the Highest Sensitivities for Detection and Screening
- 84** Detection Membrane Quick Selection Guide
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Drug Screening and Diagnostic Assays Application Selector

	Page Number	Drug Binding Studies	Kinase Assays	Multiplexing Assays	Neonatal Screening
Filter Plates					
AcroPrep™ 384-well filter plates with GHP membrane	74	•	•		
AcroPrep 384-well filter plates with glass fiber	74	•	•		
AcroPrep 384-well filter plates with Omega™ membrane	74	•			
AcroPrep 384-well filter plates with Supor® membrane	74			•	
AcroPrep Advance 96-well filter plates for multiplexing	94			•	•
AcroPrep Advance 96-well filter plates for neonatal screening	95				•
AcroPrep Advance 96-well filter plates for protein purification	71		•		
AcroPrep Advance 96-well filter plates for solvent filtration	72	•			•
AcroPrep Advance 96-well filter plates for ultrafiltration	73	•			
Chromatography Sorbents					
Blue Trisacryl® M sorbent	53	•			
Ceramic HyperD® ion exchange sorbents (Q, S, DEAE, and CM)	58	•			
HA Ultrogel® sorbent	52	•			
HEA HyperCel™ sorbent	62	•			
Heparin HyperD M sorbent	54	•			
IMAC HyperCel sorbent	55	•			
Lysine HyperD sorbent	56	•			
MEP HyperCel sorbent	63	•			
PPA HyperCel sorbent	62	•			
Protein A Ceramic HyperD F sorbent	57	•			
Q and S HyperCel sorbents	60	•			
SDR HyperD sorbent	66	•			
Hardware					
Multi-well plate vacuum manifold	78, 276	•	•	•	•
Vacuum/pressure pumps	279	•	•	•	•

Detection Application Selector

	Page Number	Colony and Plaque Lifts	Protein Binding	Nucleic Acid Detection	ELISA	Macro Arrays	DNA Fingerprinting
Transfer and Detection Membranes							
Biodyne® A membranes	88	•		•	•		•
Biodyne B membranes	88	•		•		•	•
Biodyne C membranes	88		•		•	•	
Biodyne Plus membranes	88	•		•			•
BioTrace™ NT Nitrocellulose transfer membranes	90	•	•	•			
BioTrace PVDF transfer membranes	91		•	•			
FluoroTrans® PVDF transfer membranes	92		•				
FluoroTrans W PVDF transfer membranes	92		•				



Obtaining the Highest Sensitivities for Detection and Screening

PROTEIN AND DNA DETECTION

Membrane Overview

Biomolecules bind to membranes primarily through hydrophobic interactions. Even though a membrane may be hydrophilic (such as nylon), hydrophobic domains in the polymer are available to align with hydrophobic domains on the biomolecule. Charge interactions also play a role, allowing the highest level of sensitivity for nucleic acids to be achieved on positively-charged nylon membrane. This relationship is complex, and is often dependent on interactions with the detection reagents. Similarly, the highest levels of protein binding are also found on PVDF membranes. These membranes offer little opportunity for charge interactions, but are very hydrophobic.

Pall Corporation manufactures membranes made from nitrocellulose, nylon, and PVDF for molecular detection applications. Nylon membranes are available with neutral, positive, or negative surface charge. Activated surfaces designed for covalent attachment of proteins and nucleic acids are also available.

Binding Capacity Versus Avidity

In Pall's product literature, a great deal of information is available regarding the "binding capacity" of different membranes. These specifications are typically greater than 100 $\mu\text{g}/\text{cm}^2$, or as much as 500 $\mu\text{g}/\text{cm}^2$, and far exceed what can be effectively used for detection. Often, the highest signal with immobilized protein or nucleic acid occurs at approximately 1 $\mu\text{g}/\mu\text{L}$ (about 10 $\mu\text{g}/\text{cm}^2$), and greater amounts actually result in decreased signal (prozone phenomenon in classic protein terminology). The most important factor to consider is not the maximum amount of protein that can be loaded onto a membrane surface, but the smallest amount that can be detected. This is related to the membrane's affinity and avidity, and is commonly expressed as sensitivity.

Blocking

Membranes with high affinity for biomolecules enable easy immobilization. At the same time, they will also adsorb detection reagents. Early blocking schemes used BSA and gelatin, which were found to be effective for polystyrene used in microplate ELISA assays. Because of physical binding properties, these reagents are insufficient for blocking nylon and PVDF membranes. They can, however, still be used with nitrocellulose. The best blocking agent for all membranes has been found to be milk casein, commonly used in buffers as either 2% dried milk or 0.5% Hammersten grade casein. These agents will work with proteins and nucleic acids and will usually provide excellent backgrounds with all detection systems.



Non-Specific Background

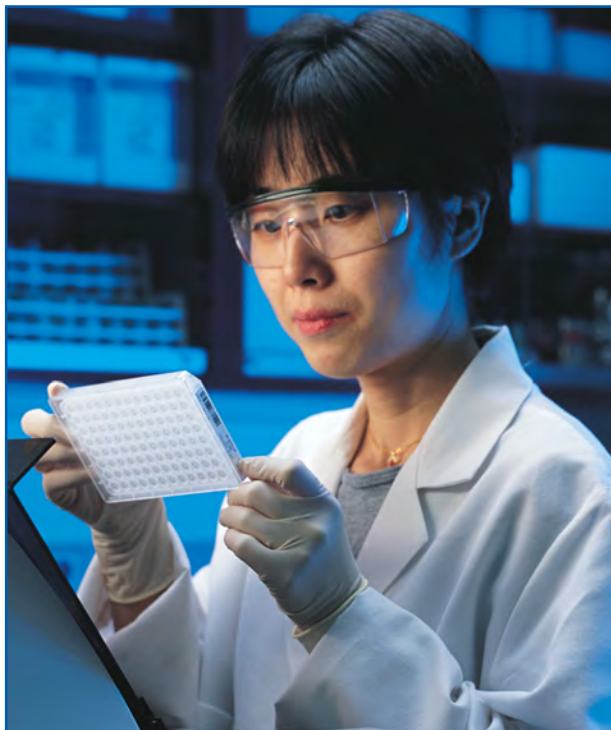
In some cases, background signal persists despite blocking with casein. The amount of background generated is usually tied to the detection reagents used. Background can be decreased by a variety of means, including decreasing probe and conjugate concentration, changing substrates or changing membrane type. The Pall website has several articles devoted to optimizing procedures and membrane choice in order to obtain the best balance between sensitivity and background.

DRUG SCREENING

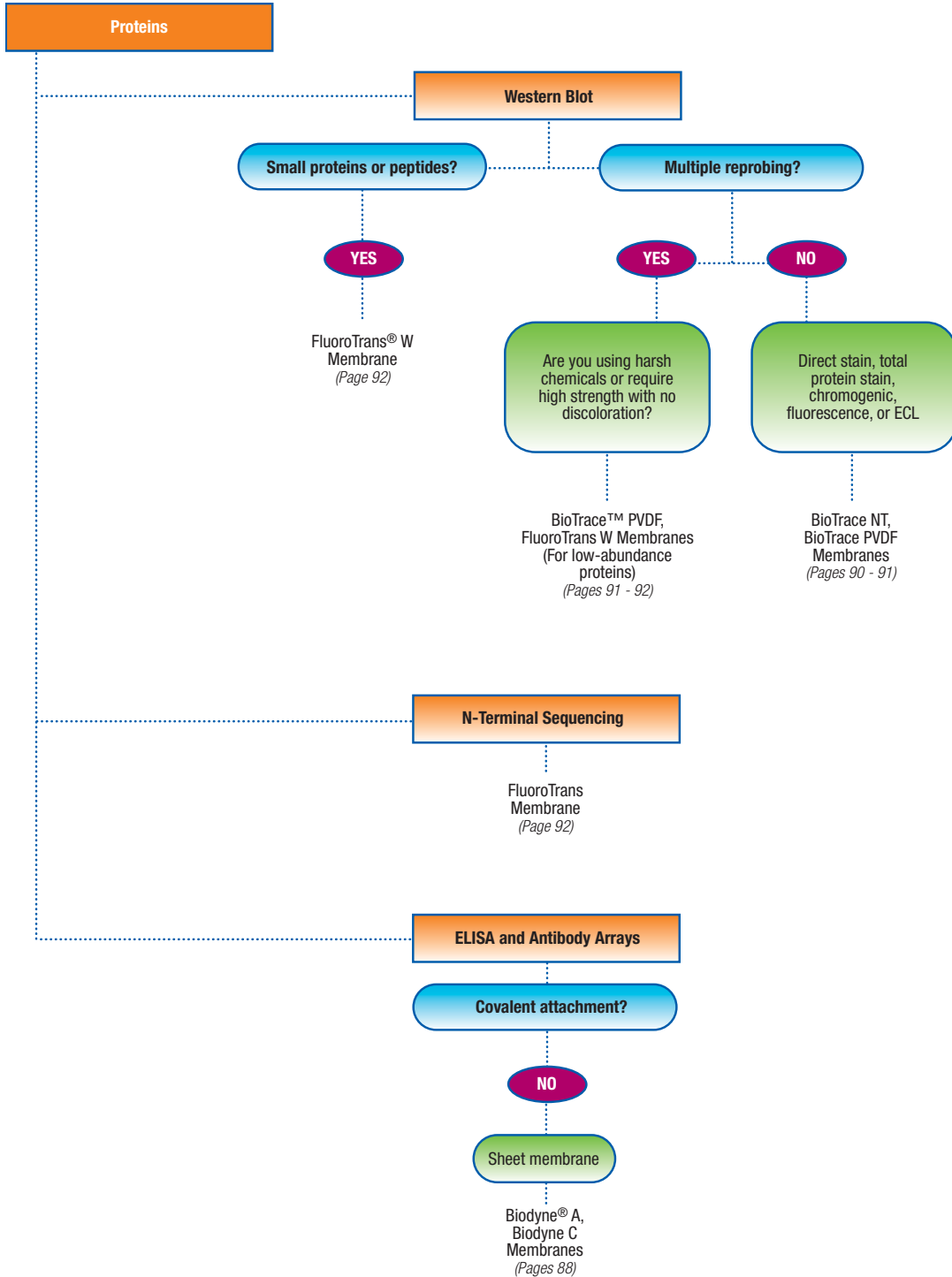
In early stage research and development of new drugs (i.e., combinatorial chemistry and high throughput screening), multi-well filter plates can grant significant time and cost savings. Pall provides several purification and detection technologies to address the continuously increasing demands of high throughput screening and the diversified requirements of scientists.

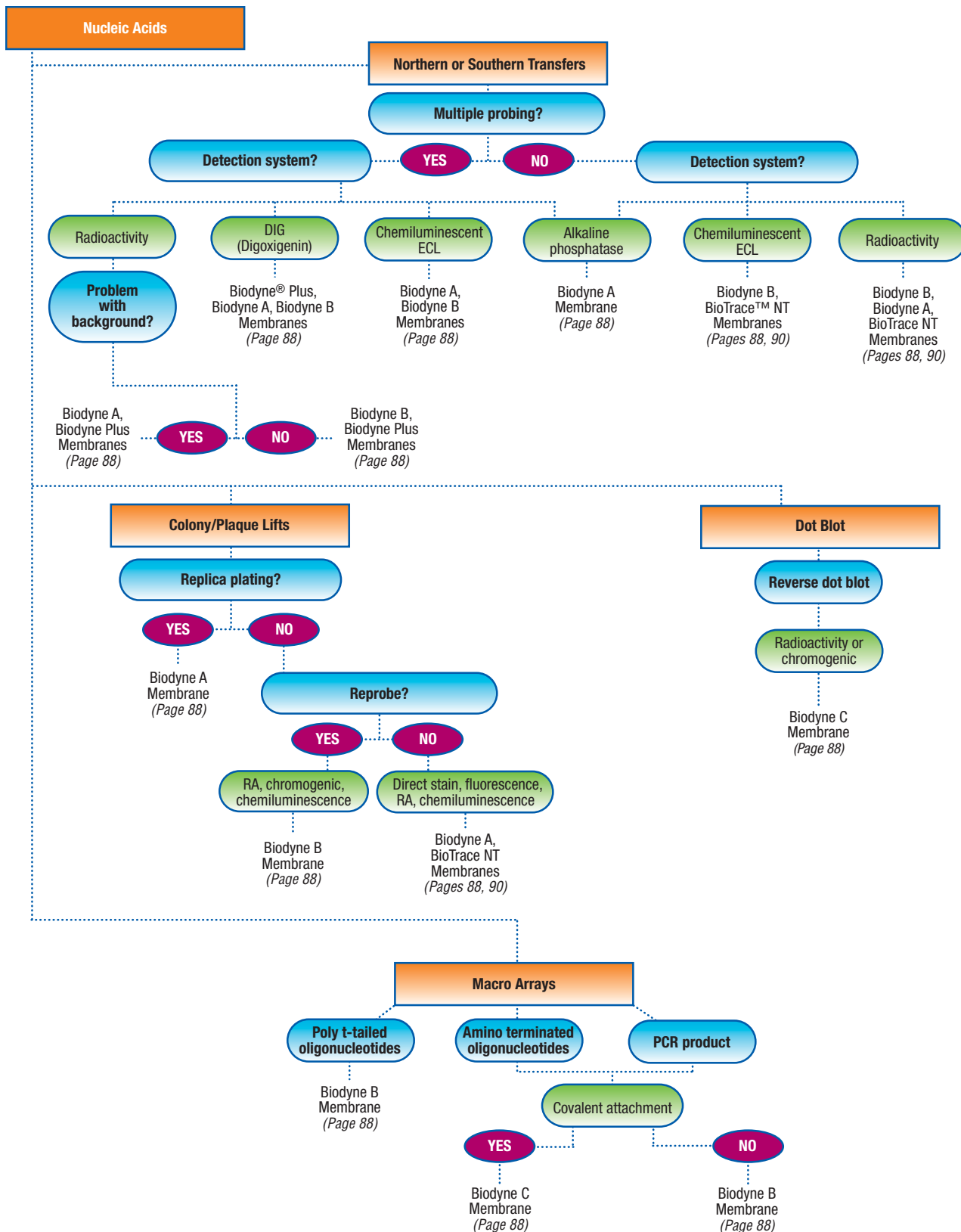
AcroPrep™ Advance and AcroPrep filter plates are designed in accordance with the requirements of the Society of Biomolecular Screening (SBS) to ensure safe robotic processing. This will minimize offline handling times. A rigid polypropylene housing and a serial bar code on each plate allow for worry-free and completely traceable sample processing with automated stackers, grippers, and plate readers. Unique, patented GHP (hydrophilic polypropylene) membrane allows users to perform radio-labeled cell assays with much lower cell density than traditional glass fiber matrices. In addition, the same membrane has very low fluorescent background. This presents additional application possibilities for more sensitive fluorescent assays such as time-resolved fluorescence (TRF) assays used in PerkinElmer's Delfia® System.

The large number of membrane and housing selections in 96- and 384-well configurations opens unlimited opportunities, including purification of combinatorial libraries, receptor: ligand assays, multiplexing assays such as Luminex® bead systems, or even protein-drug binding assays using Omega™ ultrafiltration membranes.



Detection Membrane Quick Selection Guide





Hydrophobic Nylon and PVDF Membranes Have a High Affinity for Proteins

Membrane Structure

An examination of the molecular structure of nylon and PVDF membranes shows how hydrophobic bonds can form in membranes that are wet with water:

Nylon Membranes

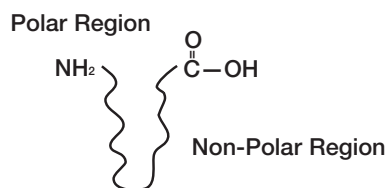
Pall nylon membranes are cast from Nylon 6,6:



The polymer structure is mostly non-polar with terminal amino and carboxyl groups. When formed into a membrane, the molecule can exhibit a structure like the one shown in Figure 1. The hydrophobic regions fold away from the surface of the pores so that the terminal polar groups are exposed. In this manner, a hydrophilic membrane can be formed from hydrophobic molecules.

Figure 1

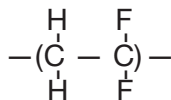
Probable Conformation of Nylon 6,6 Polymer Cast into a Water-Wettable Membrane



PVDF Membranes

Unmodified polyvinylidene fluoride (PVDF) membrane is hydrophobic and contains no charged groups for electrostatic interaction. Before use, air in the pore structure must be displaced using a low surface tension liquid (methyl alcohol), which can then be exchanged to water or buffer.

Polyvinylidene Fluoride:



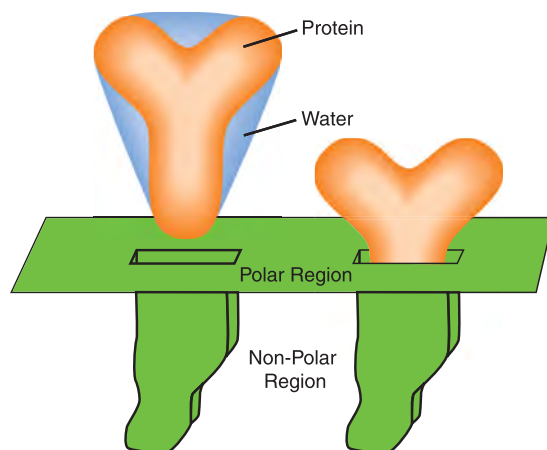
A Molecular Model

Biomolecules having secondary and tertiary structure are transported to the membrane surface by diffusion. When a structured molecule makes contact with the membrane, interactions occur between hydrophobic areas on the membrane and on the biomolecule (see following image). As this happens, the water layers surrounding the biomolecule and the membrane are squeezed out. As this occurs, the biomolecule loses structure. Large hydrophobic domains on both the biomolecule and the membrane can result in very strong associations.

This model is easier to visualize for proteins, which normally exist in globular shapes and contain complex combinations of charged groups, than for nucleic acids.

Nucleic acids have a regular structure and a negative charge at neutral pH. Despite this, nucleic acids bind to membranes in the same manner as proteins. There is enough secondary structure in the nucleic acid to favor hydrophobic binding when the molecules are brought into close contact with the membrane surface.

Association Between Protein and Nylon Membrane



Conclusions

A molecular model based primarily on hydrophobic interactions is consistent with all of the test data for both protein and DNA binding. The model consists of the following steps:

1. Transport of the biomolecules to the membrane surface by diffusion.
2. Alignment of hydrophobic domains on the biomolecule and the membrane.
3. Penetration of hydrophobic regions on the biomolecule into hydrophobic regions in the membrane.
4. Elimination of layers of hydration surrounding these regions on both the membrane and biomolecule.

The model explains the high affinity of hydrophobic PVDF membranes for proteins and nucleic acids, as well as the high bond strength. The model also predicts low binding to hydroxyl modified membranes, and how biomolecules can be forced to attach to intrinsically low binding membranes by removing water.

In this model, the term binding capacity is replaced with binding affinity. A membrane will have an affinity for biomolecules dependent on its hydrophobic components and, to a much lesser extent, surface chemistry. These factors are predictive of how "sticky" a membrane is, and how it is likely to perform in biological applications.

Detection and Screening – Online Reference Library

Pall's website offers an extensive collection of product, technical, and application information. This valuable online reference library features hundreds of technical articles, posters, podcasts, application notes, and more that can help you get the most out of your process. To view the following titles online – and many others – click the Literature Library link on the left sidebar when you visit www.pall.com/lab.

- ▶ Activation Protocol for Biodyne® C Membrane for Subsequent Covalent Linking of Ligands
- ▶ Affinity Activated or Activatable Membranes – Introduction
- ▶ Chemiluminescent Detection of Protein Binding
- ▶ Desalting/Buffer Exchange for Biomolecules Using AcroPrep™ 96 Ultrafiltration Filter Plates
- ▶ Efficient Multi-Well Protein Purification Strategies
- ▶ High Throughput Genomic and Proteomic Sample Preparation
- ▶ Hybridization Procedures for Biodyne Membranes
- ▶ IMAC Purification of Polyhistidine-tagged Protein Using the AcroPrep 96 Filter Plate
- ▶ Streamlined Purification of Plasmid DNA From Prokaryotic Cultures
- ▶ Transfer and Detection Procedures for Pall Life Sciences Membranes
- ▶ Using Membranes to Obtain High Sensitivities in Nucleic Acid and Protein Detection



Enhancing capabilities in
diagnostics

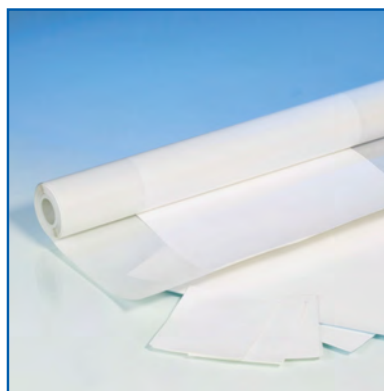
From sample collection to preparation to analysis, Pall has diagnostic materials and devices to meet your application needs. Our proven track record of technology innovation, manufacturing excellence, regulatory compliance, and product support provides you with a reliable business partner you can trust.

As a market-leading supplier for IVD manufacturing, Pall helps our customers achieve consistency and maintain quality standards through our comprehensive portfolio of diagnostic materials and devices. Contact us today to learn more.

www.pall.com/diagnostics

Biodyne® Nylon Transfer Membranes

High sensitivity and low background for enhanced detection and resolution



- ▶ Will not crack, shrink, or tear when subjected to multiple cycles of hybridization, stripping, and reprobing.
- ▶ Membranes are intrinsically hydrophilic for easy wetting.
- ▶ Offers superior performance with radioactive (Biodyne B membrane) and non-radioactive (Biodyne A membrane) detection systems.

Applications

Four chemistries provide versatile adsorption properties:

Biodyne A Membrane

(Amphoteric Nylon 6,6) Membrane zeta potential can be modulated by changes in pH. Ideal for single probe or multiple rehybridizations, and applications where background is troublesome.

Biodyne B Membrane

(Positively-charged Nylon 6,6) Pore surfaces are populated by a high density of quaternary ammonium groups. Our highest sensitivity nylon membrane for nucleic acid applications.

Biodyne C Membrane

(Negatively-charged Nylon 6,6) Can be derivatized by coupling reactions through the carboxyl groups on the pore surfaces.

Biodyne Plus Membrane

(Positively-charged Nylon 6,6 with an extremely high isoelectric point) With certain non-radioactive detection systems, it is more sensitive than Biodyne A membrane while exhibiting lower background than Biodyne B membrane.

Specifications

Filter Media

Biodyne A Membrane: Amphoteric Nylon 6,6

Biodyne B and Plus Membranes: Positively-charged Nylon 6,6

Biodyne C Membrane: Negatively-charged Nylon 6,6

Pore Size

0.2, 0.45, and 1.2 μm

Typical Thickness

Membrane	μm	mils
Biodyne A	5.5 - 7.0	139.7 - 177.8
Biodyne B	5.7 - 6.7	144.8 - 170.2
Biodyne Plus	5.7 - 6.7	144.8 - 170.2
Biodyne C	11.0 - 13.0*	279.4 - 330.2

*Dual layer measurements

Solvent Compatibility

Resistant to common solvents such as acetone, alcohol, chlorinated aliphatic hydrocarbons, formamide, 2M NaOH, DMSO, and dimethylformamide. Not compatible with concentrated formic acid (> 50%), HCl (> 4M), oxidizing agents, and long exposures (days to weeks) to pH < 2.

Ordering Information

Biodyne A Membrane

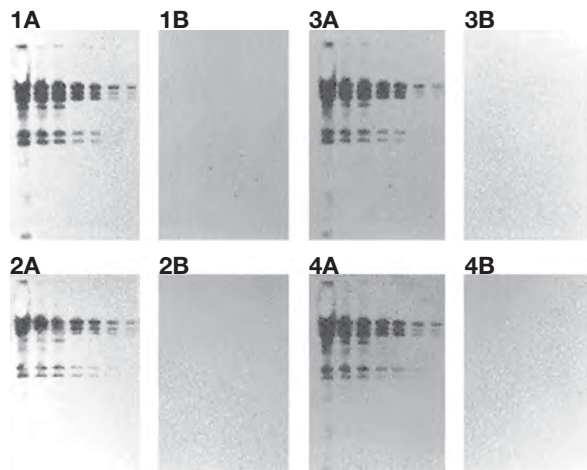
Part Number	Description	Pkg
60113	0.2 μm , 30 cm x 3 m roll	1/pkg
60102	0.45 μm , 82 mm discs	50/pkg
60103	0.45 μm , 85 mm discs	50/pkg
60104	0.45 μm , 132 mm discs	50/pkg
60105	0.45 μm , 137 mm discs	50/pkg
60101	0.45 μm , 7 x 8.5 cm sheets	10/pkg
60100	0.45 μm , 20 x 20 cm sheets	10/pkg
60120	0.45 μm , 20 cm x 3 m roll	1/pkg
60106	0.45 μm , 30 cm x 3 m roll	1/pkg
60108	1.2 μm , 30 cm x 3 m roll	1/pkg

Biodyne B Membrane, 0.45 μm

Part Number	Description	Pkg
60202	82 mm discs	50/pkg
60203	85 mm discs	50/pkg
60204	132 mm discs	50/pkg
60205	137 mm discs	50/pkg
60201	7 x 8.5 cm sheets	10/pkg
60200	20 x 20 cm sheets	10/pkg
60209	20 cm x 1 m roll	1/pkg
60208	20 cm x 3 m roll	1/pkg
60207	30 cm x 3 m roll	1/pkg

Performance

Biodyne® B Membrane Withstands Multiple Cycles of Stripping and Reprobing

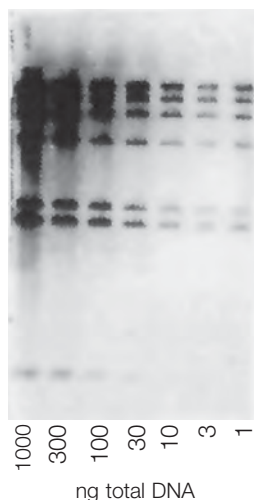


Lambda-HindIII fragments were separated in an agarose gel and transferred to Biodyne B membrane using the Pall Improved Alkaline Transfer. The blot was stripped completely and reprobbed four times without loss of signal intensity. Bands were detected using a chemiluminescent detection system.

1A - 4A: blot after (re)probing

1B - 4B: blot after stripping, prior to (re)probing

Fluorescent Detection of DNA Using Biodyne Plus Membrane



Dilutions of HindIII-digested λ -DNA (1000 - 1 ng/lane) were separated in an agarose gel and transferred to Biodyne Plus membrane. Signal was generated using a fluorescein-labeled probe, anti-fluorescein-alkaline phosphatase conjugate, and precipitating substrate. The image was generated by scanning the blot with a FluorImager* system.

Ordering Information

Biodyne C Membrane, 0.45 μ m

Part Number	Description	Pkg
60316	82 mm discs	50/pkg
60317	85 mm discs	50/pkg
60318	132 mm discs	50/pkg
60319	137 mm discs	50/pkg
60315	7 x 8.5 cm sheets	10/pkg
60314	20 x 20 cm sheets	10/pkg

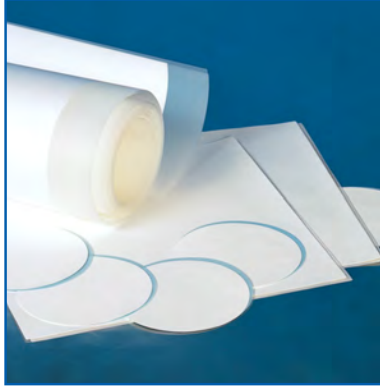
In addition to standard sizes, these membranes are available in custom-cut sizes. For information on sizes and cuts, call your local Pall Life Sciences office.

Biodyne Plus Membrane, 0.45 μ m

Part Number	Description	Pkg
60402	82 mm discs	50/pkg
60403	85 mm discs	50/pkg
60404	132 mm discs	50/pkg
60405	137 mm discs	50/pkg
60401	7 x 8.5 cm sheets	10/pkg
60400	20 x 20 cm sheets	10/pkg
60406	30 cm x 3 m roll	1/pkg

BioTrace™ NT Nitrocellulose Transfer Membrane

Pure, unsupported nitrocellulose membrane for nucleic acid and protein detection



- ▶ High binding capacity for proteins and nucleic acids.
- ▶ Lower protein burnthrough than competitors in electrophoretic transfers.

Applications

- ▶ Colony/plaque lifts.
- ▶ Protein transfers.

Specifications

Filter Media

BioTrace NT (nitrocellulose)

Typical Thickness

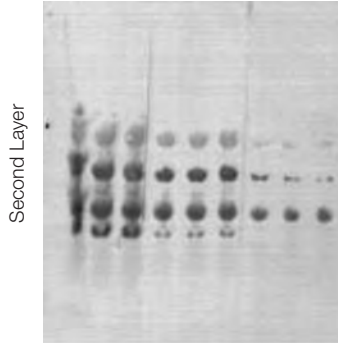
101.6 - 190.5 µm (4.0 - 7.5 mils)

Pore Size

0.2 µm

Performance

Low Burnthrough With Nitrocellulose Membranes



Brand A Membrane Brand B Membrane BioTrace NT Membrane

Prestained proteins were separated in a polyacrylamide gel and electrophoretically transferred to the indicated nitrocellulose membranes. A double layer of membrane was used, one directly against the gel, followed by the second layer. Signal intensity on the second layer is indicative of burnthrough, which can lead to loss of signal.

Ordering Information

BioTrace NT Nitrocellulose Transfer Membrane

Part Number	Description	Pkg
66487	82 mm discs	50/pkg
66595	85 mm discs (gamma irradiated)	50/pkg
66518	132 mm discs	50/pkg
66488	137 mm discs	50/pkg
66593	7 x 8.5 cm sheets	10/pkg
66489	20 x 20 cm sheets	10/pkg
66485	30 cm x 3 m roll	1/pkg

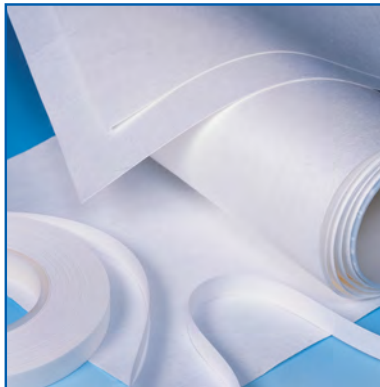
Related Products

AcroWell™ 96-Well Membrane-Bottom Filter Plates With BioTrace NT Membrane	97
Stainless Steel Forceps	230, 280



BioTrace™ PVDF Transfer Membrane

Ideally suited for Western Transfers with total protein stain



- ▶ Low background with chemiluminescent detection systems.
- ▶ Broad compatibility with commonly used solvents.

Applications

- ▶ Ideal for protein sequencing.

Specifications

Filter Media

BioTrace PVDF (hydrophobic polyvinylidene fluoride)

Pore Size

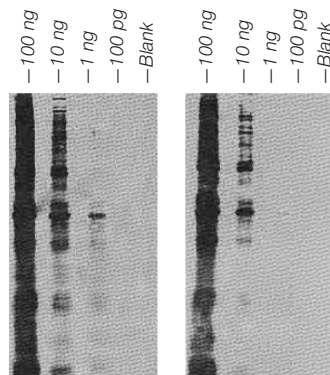
0.45 µm

Typical Thickness

147 µm (5.8 mils)

Performance

Western Transfer to BioTrace PVDF Membrane

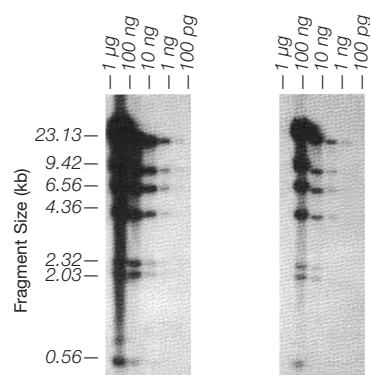


BioTrace PVDF Membrane

Brand A PVDF Membrane

Serial dilutions of *E. coli* lysates were transferred from a 10 to 20% gradient gel to BioTrace PVDF and a competitive PVDF membrane, then probed with rabbit anti-*E. coli* antibodies. Proteins were visualized using peroxidase-conjugated goat anti-rabbit antibodies and 4-chloro-1-naphthol substrate solution.

Southern Transfer to BioTrace PVDF Membrane



BioTrace PVDF Membrane

Brand A PVDF Membrane

Dilutions of λ -DNA HindIII fragments were separated electrophoretically on a 0.8% agarose gel and transferred under alkaline conditions to Pall Life Sciences BioTrace PVDF membrane, as well as a competitive PVDF membrane. The DNA was fixed by baking at 80 °C (176 °F) for 1 hour and the fragments identified with a ^{32}P λ -DNA probe hybridized at 65 °C (149 °F) for 16 hours.

Ordering Information

BioTrace PVDF Transfer Membrane

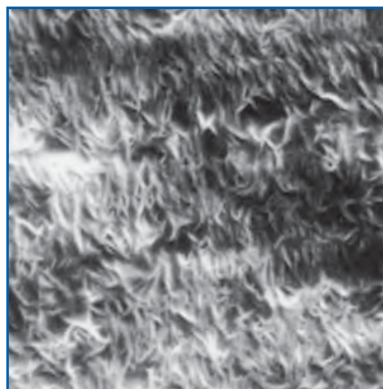
Part Number	Description	Pkg
66594	7 x 8.5 cm sheets	10/pkg
66542	20 x 20 cm sheets	10/pkg
66547	20 cm x 1 m roll	1/pkg
66543	30 cm x 3 m roll	1/pkg

Related Products

AcroWell™ 96-Well Membrane-Bottom Filter Plates With BioTrace NT Membrane	97
Stainless Steel Forceps	230, 280

FluoroTrans® PVDF Transfer Membranes

Sensitive protein detection with low background and very low burnthrough



- ▶ Naturally hydrophobic polyvinylidene fluoride is ideal for a wide variety of protein-analysis applications. The family of FluoroTrans media are white, microporous solid phase supports that bind proteins tenaciously via hydrophobic interactions.
- ▶ High sensitivity for small peptides.
- ▶ High protein binding capacity. Typically absorbs 50% more protein than nylon or nitrocellulose.
- ▶ FluoroTrans PVDF membrane is optimized for N-terminal protein sequencing. The medium demonstrates good signal-to-noise ratios with standard detection systems, and immobilized proteins can be used directly for sequencing, or visually detected with common staining reagents including Amido Black, Ponceau S, and colloidal gold.
- ▶ FluoroTrans W membrane is optimized for Western transfer applications. This membrane allows for sensitive protein detection with low background and very low protein burnthrough. Immobilized proteins can be visually detected with Coomassie® blue, Amido Black, Ponceau S, and colloidal gold.

Applications

- FluoroTrans W Membrane
 - ▶ Southern transfers.
- FluoroTrans PVDF Membrane
 - ▶ N-terminal protein sequencing.
 - ▶ Fluorescent western transfers.
- ▶ FluoroTrans media have high tensile strength and will not tear, crack, or curl during handling. This allows for easy removal of target bands for protein sequencing applications.

Specifications

Filter Media	Typical Thickness
FluoroTrans PVDF (hydrophobic polyvinylidene fluoride)	127 µm (5.0 mills)
Pore Size	
0.2 µm	

Performance

FluoroTrans Membrane Has Excellent Sensitivity, Signal, and Background in Western Transfers



Rabbit reticulocyte lysate (Amersham) was loaded in lanes of polyacrylamide gels at f.s., 1/3 and 1/10 dilutions. After electrophoresis, proteins were transferred to membranes. Membranes were stained with 0.1% Amido Black, 45% methanol, and 2% acetic acid for 4 minutes; then destained for 5 minutes with two changes of 90% methanol and 2% acetic acid. Stained membranes were rinsed in water and air dried.

Ordering Information

FluoroTrans PVDF Transfer Membrane

Part Number	Description	Pkg
PVM020C-160	7 x 8.4 cm sheets	10/pkg
PVM020C-195	8.5 x 9 cm sheets	20/pkg
PVM020C1015	10 x 15 cm sheets	10/pkg
PVM020C-196	13 x 14 cm sheets	10/pkg
PVM020C2020	20 x 20 cm sheets	10/pkg
PVM020C-099	26 cm x 3.3 m roll	1/pkg

FluoroTrans W PVDF Transfer Membrane

Part Number	Description	Pkg
BSP0158	7 x 9 cm sheets	10/pkg
BSP0157	10 x 15 cm sheets	10/pkg
BSP0159	20 x 20 cm sheets	10/pkg
BSP0161	26 cm x 3.3 m roll	1/pkg

AcroPrep™ Advance 96-Well Filter Plates for Aqueous Filtration

Fast processing with efficient removal of particulates



- ▶ New well geometry results in faster, more uniform filtration rates across the plate with reduced hold-up volume.
- ▶ New outlet tip geometry facilitates direct flow of samples into receiver plate without concerns of cross-contamination.
- ▶ Varied membrane and pore size selection offers efficient particulate removal.
- ▶ Manufactured in accordance with SBS guidelines, allowing plates to be run in manual, semi-automated and automated processes.
- ▶ Smooth top surface and textured window allow for easy labeling on the plates.

Applications

- ▶ General sample prep.
- ▶ Gross fractionation.
- ▶ Cell harvesting.
- ▶ Cell-based assays.

Specifications

Materials of Construction

Filter Media: Supor® (polyethersulfone), glass fiber (borosilicate glass without binder), and PP/PE non-woven (polypropylene/polyethylene) media
 Plate Housing: Polypropylene
 Lid: Polystyrene

Dimensions

Length: 12.8 cm (5.0 in.)
 Width: 8.6 cm (3.4 in.)
 Height With Lid: 1.8 cm (0.7 in.) (350 µL only)
 Height Without Lid: 350 µL, 1.4 cm (0.6 in.); 1 mL: 3.3 cm (1.3 in.); 2 mL: 4.7 cm (1.9 in.)

Well-Bottom Area

0.25 cm²

Recommended Working Volume

350 µL: ≤ 300 µL
 1 mL: ≤ 900 µL
 2 mL: ≤ 1.9 mL

Recommended Operating Vacuum

≥ 25.4 cm Hg (10 in. Hg)

Recommended Centrifugal Force

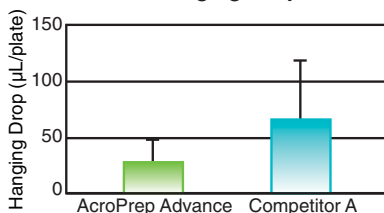
1,500 x g

Typical Vacuum Filtration Performance

Membrane	Processing Time (sec)	Hold-Up Volume (µL)
0.2 µm Supor	9	8
0.45 µm Supor	5	6
1.2 µm Supor	2	5
1.0 µm Glass Fiber	2	19
30-40 µm PP/PE	1	4

Performance

Reduction of Hanging Drops Reduces Potential Cross-Contamination



Hanging drops were measured by evacuating wells of fluid, weighing the plate, and then blotting and re-weighing the plate. Three plates of each type (350 µL well volume) were tested and the averages calculated.

Ordering Information

AcroPrep Advance 96-Well Filter Plates for Aqueous Filtration

Part Number	Description	Pkg
8019	350 µL, 0.2 µm Supor membrane	10/pkg
8029	350 µL, 0.45 µm Supor membrane	10/pkg
8039	350 µL, 1.2 µm Supor membrane	10/pkg
8027	350 µL, 30-40 µm PP/PE non-woven media	10/pkg
8031	350 µL, 1.0 µm glass fiber	10/pkg
8119	1 mL, 0.2 µm Supor membrane	5/pkg
8129	1 mL, 0.45 µm Supor membrane	5/pkg
8130	1 mL, 1.2 µm Supor membrane	5/pkg
8131	1 mL, 1.0 µm glass fiber	5/pkg
8127	1 mL, 30-40 µm PP/PE non-woven media	5/pkg
8231	2 mL, 1.0 µm glass fiber	5/pkg
8227	2 mL, 30-40 µm PP/PE non-woven media	5/pkg

Accessories and Replacement Parts

Part Number	Description	Pkg
5017	Multi-well plate vacuum manifold	1/pkg
5225	Adapter collar for centrifugation	2/pkg
5226	Adapter for PCR receiver plate	2/pkg
5230	Cap mat for incubation	5/pkg
8001	AcroPrep Advance multi-well plate lids	10/pkg

▶ www.pall.com/lab

93

filter plates
DETECTION AND SCREENING

AcroPrep™ Advance 96-Well Filter Plates for Multiplexing

Superior bead recovery and low levels of false positives ensure assay reproducibility



- ▶ Smooth well wall provides efficient bead recovery, ensuring reproducible results lot after lot.
- ▶ High performance membrane does not trap microspheres in the membrane matrix.
- ▶ In serological assays, Supor® membrane effectively removes IgG complexes, thus reducing non-specific reactivity of the microspheres and reducing false positives.
- ▶ New well design results in faster, more uniform filtration rates across the plate with reduced hold-up volume.
- ▶ New outlet tip geometry minimizes sample leakage and loss during incubation steps so that acquisition times are not affected.
- ▶ Intrinsic plate and membrane properties minimize target loss from non-specific binding.

Applications

- ▶ Bead-based multiplexing assays.
- ▶ Flow cytometry.

Specifications

Materials of Construction

Filter Media: PP/PE non-woven (polypropylene/polyethylene) and Supor (polyethersulfone) membrane
 Plate Housing: Polypropylene
 Lid: Polystyrene

Dimensions

Length: 12.8 cm (5.0 in.)
 Width: 8.6 cm (3.4 in.)
 Height With Lid: 1.8 cm (0.7 in.)
 Height Without Lid: 350 µL, 1.4 cm (0.6 in.)

Well-Bottom Area

0.25 cm²

Recommended Working Volume

350 µL: ≤ 300 µL

Recommended Operating Vacuum

≥ 25.4 cm Hg (10 in. Hg)

Recommended Centrifugal Force

1,500 x g

Typical Processing Time

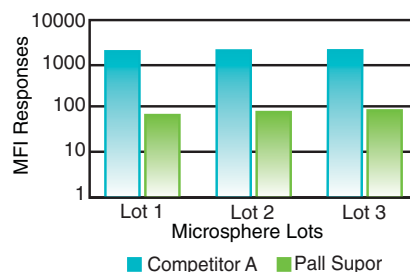
Vacuum: 1 second (8027)
 Vacuum: 2 seconds (8049, 8029)
 Vacuum: 9 seconds (8019)
 Centrifuge: < 2 minutes (8049, 8029)

Typical Hold-Up Volume

Vacuum: 4 µL (8027)
 Vacuum: 5 µL (8049, 8029)
 Vacuum: 8 µL (8019)
 Centrifuge: 3 µL (8049, 8029)

Performance

Pall Supor Membrane Reduces the Occurrence of False Positive Results



The serological immunoassays were performed with multiple lots of xMAP microspheres in both the Pall Supor and Competitor A filter plates. The results from these filter plates were read with one Luminex® LX100 Instrument. The responses represent the reactivity toward microspheres without proteins coupled to them to maximize the indications of false positive “non-specific” reactivity by the microspheres. In all lots of microspheres tested, the Pall Supor filter plates exhibited a marked reduction in non-specific reactivity than competitive plates. Data generated in conjunction with Luminex Software, Inc.

Ordering Information

AcroPrep Advance 96-Well Filter Plates for Multiplexing

Part Number	Description	Pkg
8019	350 µL, 0.2 µm Supor membrane	10/pkg
8029	350 µL, 0.45 µm Supor membrane	10/pkg
8049	For multiplex assays	10/pkg
8027	350 µL, 30 - 40 µm PP/PE non-woven media	10/pkg

Accessories and Replacement Parts

Part Number	Description	Pkg
5017	Multi-well plate manifold	1/pkg
5225	Adapter collar for centrifugation	2/pkg
5230	Cap mat for incubation	5/pkg
8001	AcroPrep Advance multi-well plate lids	10/pkg

AcroPrep™ Advance 96-Well Filter Plates for Neonatal Screening

Consistent performance ensures accurate results



- ▶ High performance membrane effectively holds back fibers from dried blood spots which can interfere with optical density readings.
- ▶ New outlet tip geometry minimizes sample leakage and loss during incubation steps, decreasing the time required for sample retesting and second screens.
- ▶ Optimized well design provides consistency in filtration times, ensuring reproducibility lot after lot.
- ▶ New outlet tip design reduces the presence of hanging drops following filtration and minimizes sample cross-contamination.

Applications

- ▶ Screening of functional and genetic disorders on newborn babies.
- ▶ Sample preparation for assays such as BIOT, GALT, and TGAL.

Specifications

Materials of Construction

Filter Media: Supor® (polyethersulfone) membrane and glass fiber/Supor membrane
 Plate Housing: Polypropylene
 Lid: Polystyrene

Dimensions

Length: 12.8 cm (5.0 in.)
 Width: 8.6 cm (3.4 in.)
 Height With Lid: 1.8 cm (0.7 in.)
 Height Without Lid: 350 µL, 1.4 cm (0.6 in.)

Well-Bottom Area

0.25 cm²

Recommended Working Volume

350 µL: ≤ 300 µL

Recommended Operating Vacuum

≥ 25.4 cm Hg (10 in. Hg)

Recommended Centrifugal Force

1,500 x g

Typical Processing Time

Vacuum: 2 seconds
 Centrifuge: < 2 minutes

Typical Hold-Up Volume

Filter plate was filled with 300 µL of water and filtered at 10 in. Hg

PN 8079

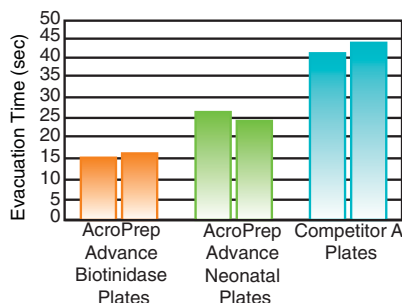
Vacuum: 5 µL

PN 8060

Vacuum: 17 µL

Performance

Efficient Filtration Times With Optimized Membrane Configurations



Evacuation times of different filter plates were tested for use in the SPOTCHECK[®] 2 Biotinidase Microplate assay (data performed in duplicate). Both AcroPrep Advance filter plates showed decreased processing times compared to Competitor A allowing for increased throughput, especially on automated instrument platforms. Data generated in conjunction with Astoria-Pacific International.

Ordering Information

AcroPrep Advance 96-Well Filter Plates for Neonatal Screening

Part Number	Description	Pkg
8060	For biotinidase assays	10/pkg
8079	For neonatal screening	10/pkg

Accessories and Replacement Parts

Part Number	Description	Pkg
5017	Multi-well plate manifold	1/pkg
5225	Adapter collar for centrifugation	2/pkg
5230	Cap mat for incubation	5/pkg
8001	AcroPrep Advance multi-well plate lids	10/pkg

filter plates

DETECTION AND SCREENING



Laboratory Bioprocessing



Pall has traditionally provided many of the tools used for laboratory bioprocessing applications, offering more than 50 years of experience supporting the life sciences. We currently provide more membrane choices for bioprocessing than any other company, and foster an ongoing commitment to improve purification technologies for these complex applications. You can depend on Pall to manufacture the highest quality membranes and devices used to sterilize liquid reagents, remove particulate contamination, and clarify solutions prior to further processing. Our quality system represents the most comprehensive and rigorous standard in the ISO 9000 series.

Pall products are optimized for biological, pharmaceutical, and sterilizing filtration requirements. And, Pall is one of the few companies in the world to offer true product scalability by incorporating the same membranes and materials of construction to allow precise linear scale-up of processing volumes from lab to process scale.

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Laboratory Bioprocessing Application Selector

	Page Number	Cell Culture/ Cell Harvesting (Disposable)	Cell Culture/ Cell Harvesting (Autoclavable)	Biological Fluid/ Biopharm Fluid/ Buffer Purification	Biopharm R&D (Sterile Filtration)	Media/Additive Preparation (Sterile Filtration)
Filtration Membranes						
HT Tuffryn® polysulfone membrane disc filters	112		•	•		
Membrane stack disc filters	109		•	•		
Omega™ ultrafiltration membrane disc filters	115	•		•		
Polypropylene/polyethylene separator disc filters	114		•	•		
Supor® and Supor EKV polyethersulfone membrane disc filters	109 - 110		•	•	•	•
Versapor® acrylic copolymer membrane disc filters	113		•	•		
Filtration Syringe Filters						
Acrodisc® syringe filters optimized for scale up	118	•		•	•	•
Acrodisc syringe filters with glass fiber media	122	•		•		
Acrodisc syringe filters with HT Tuffryn membrane, sterile	119	•		•	•	•
Acrodisc syringe filters with Supor EKV membrane, sterile	118	•		•	•	•
Acrodisc syringe filters with Supor membrane, sterile	116	•		•	•	•
DMSO-safe Acrodisc syringe filter, sterile	121	•		•		
Filtration Devices and Capsules						
AcroCap™ positive pressure devices	124	•		•	•	•
AcroPak™ capsules with Fluorodyne® II membrane	130, 135	•		•	•	•
AcroPak capsules with Supor EKV membrane	128, 131, 133	•		•	•	•
AcroPak capsules with Supor membrane	129, 132, 136	•		•	•	•
AcroVac filter units with Supor membrane	125	•		•	•	•
VacuCap® devices with Supor membrane	126	•		•	•	•
Filtration Capsules (Prefiltration)						
Mini Profile® capsules	142	•		•		
Polypure® capsules	143	•		•		
Supracap® capsules with Seitz® depth filter media	139 - 140	•		•		

	Page Number	Cell Culture/ Cell Harvesting (Disposable)	Cell Culture/ Cell Harvesting (Autoclavable)	Biological Fluid/ Biopharm Fluid/ Buffer Purification	Biopharm R&D (Sterile Filtration)	Media/Additive Preparation (Sterile Filtration)
Tangential Flow Filtration						
Centramate™ and Centramate PE cassettes and holders	158	•		•		
LV Centramate cassettes and holders	156	•		•		
Minimate™ capsules and systems	148 - 150	•		•		
Ultralab™ systems and Ultrareservoir™ containers	153	•		•		
Ultrasette™ devices	152	•		•		

Vent Filters

Acro® 37 TF vent devices with PTFE membrane	161	•	•	•	•	•
Acro 50 vent devices with Emflon® II membrane	164	•	•		•	•
Acro 50 vent devices with PTFE membrane	163	•	•		•	•
AcroPak™ 300 capsules with PTFE membrane	167	•	•			
Bacterial air vents	162	•	•			
HEPA capsule	168	•				
Vacushield™ vent device	165	•				

Hardware


13 mm Swinney filter holder, Delrin® plastic and stainless steel	266		•	•		
25 and 47 mm in-line filter holders, stainless steel	270		•	•		
25 mm easy pressure syringe filter holder, Delrin plastic	267		•	•		
25 mm in-line filter holder, Delrin plastic	268		•	•		
47 mm filter funnels, glass	265		•	•		
142 and 293 mm disc filter holders, stainless steel	274		•	•		
Stainless steel forceps	230, 280		•	•		



Laboratory Bioprocessing – Online Reference Library

Pall's website offers an extensive collection of product, technical, and application information. This valuable online reference library features hundreds of technical articles, posters, podcasts, application notes, and more that can help you get the most out of your process. To view the following titles online – and many others – click the Literature Library link on the left sidebar when you visit www.pall.com/lab.

- ▶ AcroPrep™ 96 Filter Plates Reduce the Presence of False Positive Results in Serological Based Immunoassays with Luminex® xMAP® Technology
- ▶ Clarification of Plasma or Serum Samples to Remove Cryoprecipitate Using Acrodisc® Syringe Filters with a Prefilter
- ▶ Clarification of Samples (< 1 mL) in Spin Filters (Nanosep® Centrifugal Devices)
- ▶ Comparison of Diafiltration and Tangential Flow Filtration for Purification
- ▶ Desalting and Buffer Exchange by Dialysis, Gel Filtration, or Diafiltration
- ▶ Diafiltration: A Fast, Efficient Method for Desalting or Buffer Exchange of Biological Samples
- ▶ Filter Sterilization of Samples (1-100 mL) in Sterile Acrodisc Syringe Filters
- ▶ Filtration of Dilute Protein and DNA Solutions
- ▶ Filtration of Reagents (> 50 mL) with a VacuCap® Vacuum Filtration Device
- ▶ Increased Productivity Using Minimate™ Capsules to Replace Stirred Cell Systems
- ▶ Introduction to Tangential Flow Filtration for Laboratory and Process Development Applications
- ▶ Mycoplasma Contamination: A Critical Concern in Tissue Culture Applications
- ▶ Overview of Chromatography in Biopurification
- ▶ The Partnership of the Minimate TFF Capsule with Liquid Chromatography Systems Facilitates Lab-Scale Purifications and Process Development Through In-Line Monitoring
- ▶ VacuCap Devices for Sterile Vacuum Filtration Video
- ▶ What is an Ultrafiltration Membrane?



Enhancing capabilities in
scale up



Pall's UpScaleSM program includes the industry's most comprehensive range of scalable products for direct flow filtration, tangential flow filtration,

and chromatography. The UpScale program can simplify scale up to save you time and money. It will allow you to get pharmaceuticals to market faster by providing products with the same media and consistent materials of construction for all phases of development, from R & D to pilot to full-scale production.

Laboratory products that are part of Pall's UpScale program are identified throughout this catalog by the UpScale logo. This indicates that the products can be scaled up to larger capacity products from Pall. Contact us today to learn more.

www.pall.com/lab

Sterile Filtration

Eliminating Contaminants and Optimizing Your Processes

All too frequently, days or even weeks of cell culture work can be lost when bacterial, fungal, or yeast contaminants are unknowingly introduced. Unfortunately, the same nutrient media that is used to grow cell cultures is often ideal for promoting the growth of these contaminants, which can quickly ruin your cultures. While there is no substitute for aseptic technique, sterilization of liquids used during cell culture assures you that media and reagents are not a source of contaminants. Heat sterilization (autoclaving) is not an option for many liquids as autoclaving may destroy critical cell culture media components and biomolecules needed for normal cell growth. Filtration, therefore, is the method of choice for sterilizing cell culture media and additives. Filters capable of ambient sterilization are also useful for the general clarification and purification of cellular lysates as a means to enhance the recovery of target biomolecules.

Pall manufactures membranes that are used to sterilize liquid reagents, remove particulate contamination, and clarify solutions prior to further processing. These products are optimized for biological, pharmaceutical, and sterilizing filtration requirements.

Whether you are preparing small volumes of reagents, individual bottles of buffers or media, or developing pharmaceutical processes, we have the products to optimize your sterile filtration applications. We can help you:

- ▶ Reduce filtration time.
- ▶ Increase throughput.
- ▶ Reduce the need for multiple filter changes.
- ▶ Save in overall filtration costs.

Stringent Quality Specifications

At Pall, quality and ease of use are engineered into every device. We manufacture our own membranes to ensure consistent performance from lot to lot. Examples of our stringent quality specifications include:

- ▶ **Sterilization by gamma irradiation** – Products with Supor®, Fluorodyne® II, Versapor®, and HT Tuffryn® membranes are presterilized by gamma irradiation to eliminate potential cytotoxic residuals associated with EtO sterilization. These presterilized devices are individually packaged for convenience.
- ▶ **Biological safety** – Passes United States Pharmacopeia (USP) Biological Reactivity Test, *In Vivo* <88>.
- ▶ **Non-pyrogenic** – Products are tested for bacterial endotoxin using the Limulus Amoebocyte Lysate (LAL) test to ensure safety.
- ▶ **Low extractables** – Products are optimized to reduce extractables, ensuring that unwanted materials are not introduced into filtered liquids.



Non-Sterile, General Filtration

When filtration requires use of prefilters, matching the proper filter media to the application is critical. Pall offers the broadest range of filtration and separation media to assure the best fit for your needs. Whether you want to remove particulate for visual appearance, protect your food and beverage product

from spoilage organisms, remove suspended solids prior to analytical testing, or remove coarse materials such as cell debris or particulate to improve performance, Pall can supply the best product solution.

Applications

- ▶ Sample clean-up prior to protein purification
- ▶ Removal of cellular debris
- ▶ Prefiltration of biologicals
- ▶ Chemicals, inks, coatings, and plastics
- ▶ Solvent filtration
- ▶ Particulate removal
- ▶ Health and beauty products
- ▶ Beverages
- ▶ Dairy products
- ▶ Environmental and agricultural samples
- ▶ Groundwater samples
- ▶ Food and beverage or dairy products

Reason

- Remove coarse particulate
- Enhance visual appearance for analysis
- Remove suspended solids prior to analytical testing
- Remove spoilage organisms

Choose from these Pall Life Sciences products, optimized for non-critical and coarse filtration:

Flatstock Membrane

- ▶ Supor® Membrane Disc Filters 110
- ▶ Versapor® Membrane Disc Filters 113
- ▶ Glass Fiber Filters 242 - 244

Syringe Filters

- ▶ Acrodisc® Syringe Filters 122

Capsules

- ▶ AcroPak™ Capsules with Supor Membrane 128 - 129, 131 - 134, 136 - 137
- ▶ Supracap® Capsules 139 - 141
- ▶ Polypure® Capsules 143
- ▶ Mini Profile® Capsules 142
- ▶ Acro® 37 TF Device 161
- ▶ Acro 50 Device with PTFE Membrane 163
- ▶ AcroPak 300 Capsule with PTFE Membrane 167
- ▶ Carbon Capsule 144

How to Choose a Filter for Your Application

Pall offers the widest selection of products to meet your specific filtration needs. Our filtration membranes are available in laboratory device configurations that process volumes from < 5 mL to hundreds of liters. Choose one of our scalable membranes for easier batch processing at the pilot level. When selecting the appropriate device for your application, consider the following:

Consider Filtration Volume

Selecting the most appropriate Effective Filtration Area (EFA) will maximize throughput and minimize filter changes. The greater the volume being filtered, the larger the filter diameter you should choose. However, because hold-up volume (fluid retained in the filter) increases with filter diameter, smaller-volume devices should be used for small-volume or expensive samples.

For small sample volumes, gamma-irradiated syringe filters are available. Gamma-irradiated syringe filters have a luer lock inlet that will connect directly onto a syringe for easy filtration of your sample. These devices can rapidly filter small volumes and are available with diameters of 13, 25, 32, or 37 mm.

For filtration up to a few liters, a range of medium-size filters are available. These are typically a flat membrane in a 50 mm or larger diameter device, and are available in configurations for either positive pressure filtration or vacuum filtration.

Larger volumes (> 5 liters) may require a capsule filter with pleated membrane. A capsule filter incorporates a larger surface by using a pleated membrane design. This larger membrane surface area allows for both faster filtration and higher volumes to be filtered. Capsule filters are ideal for positive pressure filtration and can operate at higher pressures.

The volume recommendations presented below are intended as a general guide to selecting the most appropriate device.

Throughput, EFA, and Hold-Up Relationship

Throughput*	Device	EFA	Hold-Up**
1 - 10 mL	13 mm Acrodisc® syringe filter	1.0 cm ²	< 30 µL
5 - 100 mL	25 mm Acrodisc syringe filter	2.8 cm ²	< 70 µL
20 - 150 mL	32 mm Acrodisc syringe filter	5.8 cm ²	< 100 µL
20 - 200 mL	37 mm Acrodisc syringe filter	7.5 cm ²	< 100 µL
10 mL - 1 L	AcroCap™ device	15 cm ²	< 2 mL
100 mL - 5 L	AcroPak™ 20 device	20 cm ²	< 2.5 mL
100 mL - 5 L	VacuCap® 60 device	30 cm ²	< 1.2 mL
100 mL - 5 L	VacuCap 90 device	60 cm ²	< 3.4 mL
5 - 25 L	AcroPak 200 capsule	200 cm ²	< 6 mL
10 - 100 L	AcroPak 500 capsule	500 cm ²	< 30 mL
10 - 100 L	AcroPak 1000 capsule	1000 cm ²	< 45 mL
10 - 1500 L	AcroPak 1500 capsule	1500 cm ²	n/a

* Total throughput (capacity) of a filter depends on the characteristics of the fluid being filtered, such as the extent of microbial contamination, viscosity, and particulate load.

** With air purge.

Consider Fluid Characteristics

When selecting a filtration membrane, consider the fluid characteristics of your sample and the degree of filtration required. Our membranes are developed to meet a wide range of filtration challenges with special features, including:

- ▶ **Prefiltration** – The more particulate-laden and/or the higher the protein concentration in a solution, the more difficult it is to filter. These types of liquids may clog filters prematurely, and multiple filters may be needed to process single batches, increasing the cost of filtration. The most efficient way to filter these solutions is to choose a filter with a built-in prefilter or a filter with more EFA. Pall Life Sciences can recommend an efficient filter for your toughest application needs.
- ▶ **Low protein binding** – To minimize protein loss during filtration of proteinaceous solutions, choose our Supor® membrane that exhibits low non-specific protein binding.
- ▶ **Low extractables** – Products are optimized to reduce extractables, ensuring that unwanted materials are not introduced into filtered liquids.
- ▶ **DMSO-safe** – Even if all of the other components of your freezing media have been filter sterilized, DMSO can add contaminants that may not be detected until after the cells are removed from storage and thawed. Many commonly-used filter materials are unstable in DMSO because it is an aggressive solvent. The DMSO-safe Acrodisc syringe filter can be used to filter sterilize solutions containing DMSO to eliminate surprise contamination when thawing cells.
- ▶ **Mycoplasma reduction** – Devices with 0.1 µm pore size have been validated for the reduction of mycoplasma.

Consider Process Scale-Up



For process development applications, choose products from Pall's UpScaleSM program. Look for this icon on the product pages to indicate scalability.

Pall's UpScale program helps shorten development time by providing products with the same media and consistent materials of construction for all phases of development, from R&D to pilot to full-scale production. Pall's range of scalable products provides consistent, reproducible, and predictable results regardless of scale. You can reduce evaluation bottlenecks and free up resources to concentrate on process optimization or other research. Our separation and filtration products will meet your needs at the laboratory level and as you move into production.

Mycoplasma Contamination: A Critical Concern in Tissue Culture Applications

What is Mycoplasma?

Mycoplasma is a very small type of bacterium characterized by its lack of a rigid cell wall. This cell wall deficiency results in organisms that have a characteristic elasticity allowing them to form a variety of different shapes ranging from spheres to branched filaments, and sizes varying from 0.15 to 0.3 μm in diameter. This elasticity allows mycoplasma to pass through 0.2 μm (bacterial retentive) filters. In addition, mycoplasma's lack of a cell wall causes it to be resistant to certain antibiotics, such as penicillin, which interfere with bacterial cell wall synthesis.

Why Should We Be Concerned With Mycoplasma?

Mycoplasma is a common contaminant of cell cultures. Because of the extremely small size and slow growth rate, the contamination is not readily discernable by routine laboratory methods. Mycoplasma, however, can have an insidious effect on any cell cultures they infect. Cultures containing one million mammalian cells, for example, may be infected with as many as five hundred million mycoplasma (Stanbridge, 1981). The presence of such a large number of contaminants can have drastic effects on the structure and function of the infected host cells such as:

- ▶ Alterations in cell growth rate.
- ▶ Inhibited or stimulated cellular transformations.
- ▶ Potentially harmful morphological changes.
- ▶ Altered DNA, RNA, and protein synthesis.
- ▶ Altered enzyme actions.

- ▶ Chromosomal abnormalities.
- ▶ Reduced or increased virus yields.
- ▶ Depleted nutrients from growth media.
- ▶ Altered cell surface antigenic characteristics.
- ▶ Decreased malignancy of tumor cells.

These potentially negative effects of mycoplasma contamination on cultured cells make it clear that any data derived from mycoplasma infected cell cultures are of questionable accuracy and should be treated with caution and suspicion (Stanbridge, 1981).

References: Stanbridge, Eric J. Mycoplasma Detection – an Obligation to Scientific Accuracy. Israel J Med Sci 17: 563-568 (1981).

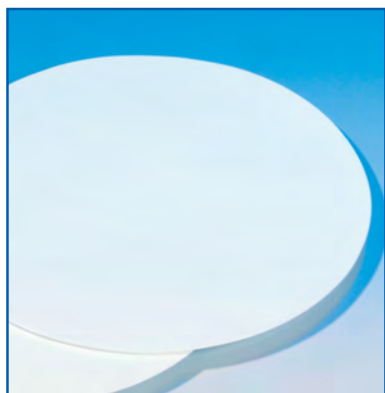
Which Pore Size Will Remove Mycoplasma?

Mycoplasma can be retained by filtration with 0.1 μm filters. Pall Life Sciences manufactures 0.1 μm Supor® membrane, an inherently hydrophilic polyethersulfone membrane that removes mycoplasma. We incorporate this membrane into many laboratory filter products ideal for tissue and cell culture applications. Using Pall's Supor 0.1 μm membrane is your best assurance that mycoplasma are not introduced into your cultures by serum or serum-containing media. Pall's 0.1 μm Supor membrane is available in 25 and 32 mm Acrodisc® syringe filters, AcroCap™ devices, VacuCap® devices, and AcroPak™ capsules.



Membrane Stack Disc Filters Optimized for Scale-Up

For initial filterability and compatibility studies



- ▶ Used for a wide variety of applications including clarification and prefiltration, sterile filtration, and virus removal.
- ▶ Membranes contain the same materials of construction as larger capsule and cartridge filters. Simplify scale up and minimize requalification; no need to change materials during transitions to pilot or production scale.
- ▶ Five membrane types offered to assure compatibility with a wide range of fluids and applications:
 - ▶ Fluorodyne® II membrane offers high flow rates and is ideal for applications where low protein binding is necessary. Not recommended with some ethers.
 - ▶ Supor® and Supor EKV membranes have high flow rates and throughputs and are ideal for solutions where low protein binding is required. Not recommended with some ketones.
 - ▶ Ultipor® membrane provides broad solvent and chemical compatibility and low extractables.
 - ▶ Posidyne® membrane enhances bioburden and pyrogen removal from aqueous solutions.
 - ▶ Preflow™ media is ideal for the prefiltration of biological fluids including cell culture media, serum-based products, and protein solutions.

Applications

- ▶ Filtration of small volumes.
- ▶ Drug development studies.
- ▶ Validation studies.
- ▶ Determination of product compatibility.

Specifications

Materials of Construction

Filter Media: Fluorodyne II (hydrophilic PVDF), Supor [hydrophilic polyethersulfone (PES)], Supor EKV (hydrophilic polyethersulfone), Ultipor (Nylon 6,6), and Posidyne (positively-charged Nylon 6,6) membranes, and Preflow media (resin-bonded glass fiber)

Support and Drainage Layers:
 PN 61300, 61301, 61302, and 61309: Polypropylene
 PN 61303, 61304, 61306, and 61307: Polyester

Pore Size

0.1, 0.2, 0.45, and 0.8/0.2 µm

Diameter

Filter Media: 47 mm
 Support Layer: 37 mm

Filter Area*

9.6 cm²

Recommended Integrity Test Minimum Bubble Point – Water

PN 61300, 61304, and 61303:
 3.2 bar (320 kPa, 46 psi)
 PN 61302: 3.5 bar (350 kPa, 51 psi)
 PN 61309: 3.32 bar (332 kPa, 48 psi)

Bacterial Retention

Lot samples retain a minimum of 10⁷ cfu/cm² of *B. diminuta* per modified ASTM F838, current revision

*When used with Pall Life Sciences laboratory filter holder PN 2220; exact filter area will depend on the filter holder configuration.

Ordering Information

Membrane Stack Disc Filters

Part Number	Description	Pkg
61301	0.1 µm, Fluorodyne II membrane	5/pkg
61300	0.2 µm, Fluorodyne II membrane	5/pkg
61302	0.8/0.2 µm, Supor membrane	5/pkg
61303	0.2 µm, Ultipor membrane	5/pkg
61304	0.2 µm, Posidyne membrane	5/pkg
61306	0.2 µm, Preflow UUA media	5/pkg
61307	0.45 µm, Preflow UB media	5/pkg
61309	0.2 µm, Supor EKV membrane	5/pkg

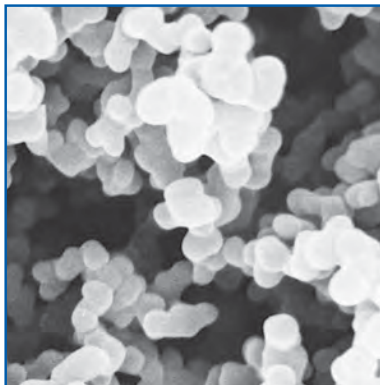
Related Products

Acrodisc® Syringe Filters Optimized for Scale-Up 118
 Capsules for Scale-Up 128 - 137, 139 - 142

filtration membranes LABORATORY BIOPROCESSING

Supor® PES Membrane Disc Filters

High flow rate membrane optimized for biological, pharmaceutical, and sterilizing filtration requirements



- ▶ Fast filtration with superior flow rates and high throughputs.
- ▶ Low protein binding and extensive drug compatibility for critical applications.
- ▶ Saves time and money with fewer filter changes per sample volume.
- ▶ 142 and 293 mm discs feature printed tab for instant recognition of pore size and lot number.
- ▶ May be sterilized by gamma irradiation, EtO, or autoclaving.

Applications

- ▶ Suited for biological, pharmaceutical, and sterilizing filtration requirements.
- ▶ Available for microbiological analysis in individual gamma-irradiated packaging.

Specifications

Filter Media

Hydrophilic polyethersulfone (PES)

Pore Size

0.1, 0.2, 0.45, and 0.8 μm

Diameter

13 - 293 mm

Typical Thickness

0.1 μm : 132 μm (5.2 mils)

0.2 μm : 145 μm (5.7 mils)

0.45 and 0.8 μm : 140 μm (5.5 mils)

Typical Water Flow Rate

mL/min/cm² at 0.7 bar (70 kPa, 10 psi)

0.1 μm : 5

0.2 μm : 26

0.45 μm : 58

0.8 μm : 165

Maximum Operating Temperature - Water

100 °C (212 °F)

Extractables - Soxhlet Extraction

< 4%

Minimum Bubble Point - Water

0.2 μm : 3.5 bar (350 kPa, 51 psi)

0.45 μm : 2.5 bar (250 kPa, 36 psi)

0.8 μm : 1.0 bar (100 kPa, 15 psi)

60% IPA/40% H₂O (v:v)

0.1 μm : 2.4 bar (240 kPa, 35 psi)

Biological Safety

Passes United States Pharmacopeia (USP) Biological Reactivity Test, *In Vivo* <88>

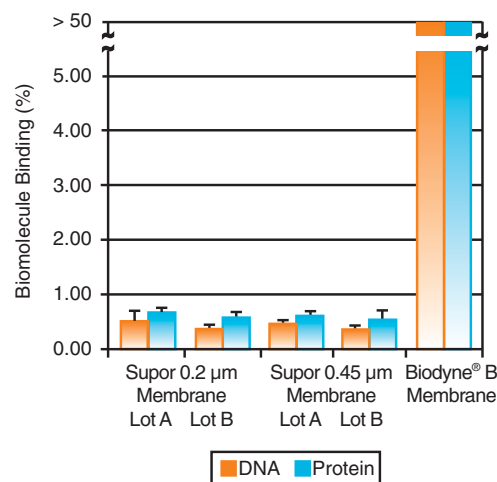
Sterilization

Provided non-sterile. Can be sterilized by autoclaving at 121 - 123 °C (250 - 253 °F) for 30 min.

PN 63025, 60043, 65472, 5010, and 66234 are provided gamma-irradiated.

Performance

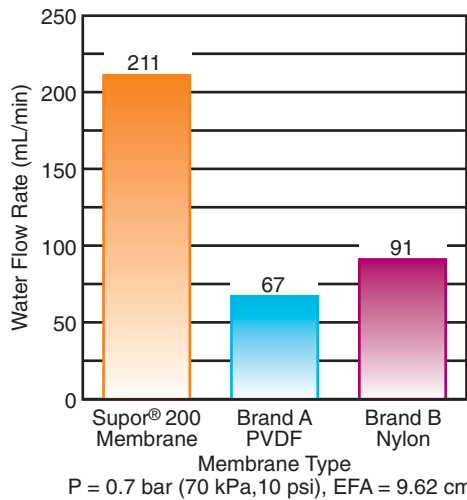
Supor Membrane is Low in Biomolecule Binding



¹²⁵I-labeled BSA (1.6 μg) or ³²P-labeled DNA (500 ng) was diluted to 5 mL in PBS (BSA) or Tris-EDTA (DNA) and filtered through a 13 mm disc of the indicated membrane. Filtration was carried out using a 10 mL syringe at a flow rate of 1.0 mL/minute. Binding was determined by comparing the amount of radioactivity remaining in the membrane (triplicate) to the activity of the starting material by counting the disc or solution in a scintillation counter. Biodyne B membrane is designed for biomolecule binding and was used as a positive control.

Performance (continued)

Membrane Water Flow Rate



Supor polyethersulfone membrane flow rate outperforms nylon and PVDF membranes of the same pore size (0.2 µm).

Ordering Information

Supor 100 Membrane Disc Filters, 0.1 µm

Part Number	Description	Pkg
60309	25 mm, plain	100/pkg
60310	47 mm, plain	100/pkg
60311	90 mm, plain	100/pkg
60312	142 mm, tabbed	25/pkg
66551	142 mm, no tab	25/pkg
60313	293 mm, tabbed	25/pkg
66552	293 mm, no tab	25/pkg

Supor 200 Membrane Disc Filters, 0.2 µm

Part Number	Description	Pkg
60298	13 mm, plain	100/pkg
60300	25 mm, plain	100/pkg
60301	47 mm, plain	100/pkg
66234	47 mm, grid, individual gamma-irradiated pack (S-pack)	200/pkg
60334	90 mm, plain	100/pkg
66549	142 mm, no tab	25/pkg
60305	142 mm, tabbed	25/pkg
60307	293 mm, tabbed	25/pkg
66550	293 mm, no tab	25/pkg

Supor 450 Membrane Disc Filters, 0.45 µm

Part Number	Description	Pkg
60170	13 mm, plain	100/pkg
60172	25 mm, plain	100/pkg
60173	47 mm, plain	100/pkg
61854	47 mm, grid	100/pkg
60043	47 mm, grid, individual-gamma irradiated pack (S-pack)	200/pkg
60174	50 mm, plain	100/pkg
60206	90 mm, plain	100/pkg
60177	142 mm, tabbed	25/pkg
66553	142 mm, no tab	25/pkg
60179	293 mm, tabbed	25/pkg
66554	293 mm, no tab	25/pkg

Supor 800 Membrane Disc Filters, 0.8 µm

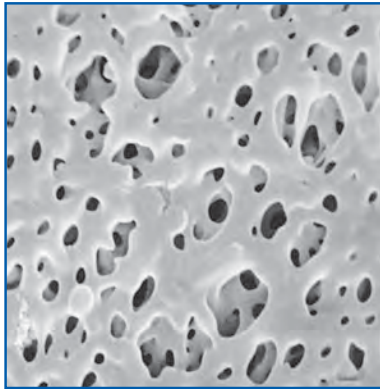
Part Number	Description	Pkg
60109	25 mm, plain	100/pkg
65472	47 mm, grid, individual gamma-irradiated pack (S-pack)	200/pkg
60110	47 mm, plain	100/pkg
60112	90 mm, plain	100/pkg
60114	142 mm, tabbed	25/pkg
66555	142 mm, no tab	25/pkg
60116	293 mm, tabbed	25/pkg
66556	293 mm, no tab	25/pkg

Related Products

Hardware..... 257

HT Tuffryn® Polysulfone Membrane Disc Filters

Proven performance in critical applications



- ▶ Durable and easy to handle.
- ▶ Withstands high temperature applications.
- ▶ Versatile. Useful for a wide range of applications.
- ▶ Chemically compatible with harsh aqueous solutions and alcohols.
- ▶ May be sterilized by autoclaving.

Applications

- ▶ Ideal for biological, pharmaceutical, and sterilizing filtration requirements.
- ▶ For use in disc holders.
- ▶ Suitable for applications requiring low protein binding; maximizes recovery of critical media components.

Specifications

Filter Media
Hydrophilic polysulfone

Pore Size
0.2 and 0.45 µm

Diameter
25 - 293 mm

Typical Thickness
0.2 µm: 152 µm (6.0 mils)
0.45 µm: 145 µm (5.7 mils)

Typical Water Flow Rate
mL/min/cm² at 0.7 bar
(70 kPa, 10 psi)
0.2 µm: 14
0.45 µm: 33

Maximum Operating Temperature - Water

121 °C (250 °F)

Extractables - Boiling Water
< 3.5%

Minimum Bubble Point - Water
0.2 µm: 2.5 bar (250 kPa, 36 psi)
0.45 µm: 1.5 bar (150 kPa, 22 psi)

Biological Safety
Passes United States Pharmacopeia (USP) Biological Reactivity Test, *In Vivo* <88>

Sterilization
Provided non-sterile. Autoclavable if desired.

Ordering Information

HT Tuffryn 200 Membrane Disc Filters, 0.2 µm

Part Number	Description	Pkg
66197	25 mm	100/pkg
66199	47 mm	100/pkg
66204	142 mm	25/pkg
66205	293 mm	25/pkg

HT Tuffryn 450 Membrane Disc Filters, 0.45 µm

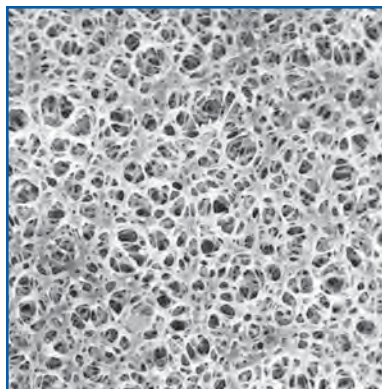
Part Number	Description	Pkg
66221	25 mm	100/pkg
66223	47 mm	100/pkg
66228	142 mm	25/pkg
66229	293 mm	25/pkg

Related Products

142 and 293 mm Disc Filter Holders, Stainless Steel	275
In-line Filter Holders	268 - 272
Stainless Steel Forceps	230, 280
Vacuum/Pressure Pumps	279

Versapor® Acrylic Copolymer Membrane Disc Filters

Ideal for prefiltration of difficult-to-filter solutions and serum



- ▶ Reduces clogging of final filters. Can be used upstream of a sterilizing filter for viscous solutions.
- ▶ Strong and flexible while both wet or dry.
- ▶ Excellent throughput with high liquid flow rates at low differential pressures.

Applications

- ▶ Designed to be used in applications requiring excellent retention properties combined with tensile strengths in excess of 200 bar (20,000 kPa, 3000 psi).

Specifications

Filter Media

Hydrophilic acrylic copolymer on a non-woven support

Pore Size

0.2, 0.45, 0.8, 1.2, 3, and 5 μm

Diameter

25 - 293 mm

Typical Thickness

94 μm (3.7 mils)

Typical Water Flow Rate

mL/min/cm² at 0.7 bar (70 kPa, 10 psi)

0.2 μm : 16

0.45 μm : 75

0.8 μm : 142

1.2 μm : 315

3 μm : 518

5 μm : 778

Maximum Operating Temperature - Water

88 °C (190 °F)

Minimum Bubble Point - Water

0.2 μm : 2.0 bar (200 kPa, 30 psi)

0.45 μm : 1.1 bar (110 kPa, 16 psi)

0.8 μm : 0.6 bar (60 kPa, 8 psi)

1.2 μm : 0.4 bar (40 kPa, 6 psi)

3 μm : 0.2 bar (20 kPa, 3 psi)

5 μm : 0.1 bar (10 kPa, 2 psi)

Biological Safety

Passes United States Pharmacopeia (USP) Biological Reactivity Test, *In Vivo* <88>

Sterilization

Provided non-sterile. If desired, sterilize by gamma irradiation or sanitize with 70% ethanol.

Ordering Information

Versapor 200 Membrane Disc Filters, 0.2 μm

Part Number	Description	Pkg
66414	25 mm	100/pkg
66415	47 mm	100/pkg

Versapor 450 Membrane Disc Filters, 0.45 μm

Part Number	Description	Pkg
66407	25 mm	100/pkg
66408	47 mm	100/pkg
66410	142 mm	25/pkg
66411	293 mm	25/pkg

Versapor 800 Membrane Disc Filters, 0.8 μm

Part Number	Description	Pkg
66400	25 mm	100/pkg
66331	37 mm	100/pkg
66401	47 mm	100/pkg
60098	102 mm	25/pkg
66403	142 mm	25/pkg
66404	293 mm	25/pkg

Versapor 1200 Membrane Disc Filters, 1.2 μm

Part Number	Description	Pkg
66393	25 mm	100/pkg
66394	47 mm	100/pkg
66396	142 mm	25/pkg
66397	293 mm	25/pkg

Versapor 3000 Membrane Disc Filters, 3 μm

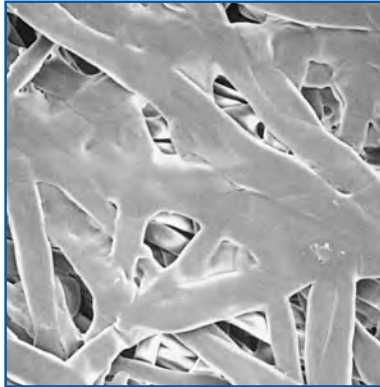
Part Number	Description	Pkg
66386	25 mm	100/pkg
66387	47 mm	100/pkg
66389	142 mm	25/pkg

Versapor 5000 Membrane Disc Filters, 5 μm

Part Number	Description	Pkg
66332	37 mm	100/pkg
60178	47 mm	100/pkg

Polypropylene/Polyethylene Separator Disc Filters

Virtually inert to chemical and biological agents



- ▶ Outstanding wet strength.
- ▶ High chemical resistance.
- ▶ Provides a channeling effect for liquid, increasing overall filter flow rate when used in series with submicron membrane filters.
- ▶ Ensures stability when filtering concentrated acids, alkalis, or oxidizers.

Applications

- ▶ Good prefilter for heavily particulate-laden and viscous fluids.
- ▶ Can be folded or handled the same as laboratory paper.
- ▶ Can be used as separators between stacked discs in a single filter holder during serial filtration.

Specifications

Filter Media
Polypropylene/polyethylene

Pore Size
10 µm (nominal)

Typical Thickness
127 µm (5 mils)

Maximum Operating Temperature - Water
107 °C (225 °F)

Sterilization
Provided non-sterile; autoclavable if desired.

Ordering Information

Polypropylene/Polyethylene Separator Disc Filters, 10 µm

Part Number	Description	Pkg
60343	25 mm	500/pkg
60344	47 mm	100/pkg
60340	90 mm	100/pkg
60346	127 mm	100/pkg
60341	142 mm	100/pkg
60345	265 mm	100/pkg
60342	293 mm	100/pkg

Related Products

13 mm Swinney Filter Holders	266
25 and 47 mm In-Line Filter Holders, Stainless Steel	271
25 mm Easy Pressure Syringe Filter Holder, Delrin® Plastic	267
142 and 293 mm Disc Filter Holders, Stainless Steel	275

Omega™ Ultrafiltration Membrane Disc Filters

High performance and stability for users of conventional, non-disposable stirred cells



- Polyethersulfone membrane provides higher flow rates and lower protein binding than competitive regenerated cellulose. This results in lower processing times and the highest possible recoveries.
- Discs can be washed and reused.

Applications

- Replacement membranes for other stirred cell systems.
- Concentration, fractionation, purification, buffer exchange, or desalting of protein, cell broths, and other biomolecules.

Specifications

Filter Media

Omega membrane (low protein-binding modified polyethersulfone)

Effective Filtration Area*

25 mm: 4.1 cm²
 43 mm: 13.4 cm²
 47 mm: 17.3 cm²
 50 mm: 19.6 cm²
 62 mm: 28.7 cm²
 76 mm: 41.8 cm²
 90 mm: 63 cm²
 150 mm: 162 cm²

pH Range

1 - 14

Operating Temperature Range

0 - 40 °C (32 - 104 °F)

Sanitization

Provided non-sterile. May be sanitized using 70% ethanol or 200 ppm sodium hypochlorite.

* Actual effective filtration area is dependent on the filter holder used.

Performance

Deionized Water and Solute Flow Rates

Filter Type (MWC0)	Water Flux* (mL/min/cm ²)	Solute Flux (mL/min/cm ²)	Solute Type
1K	0.01 - 0.1	0.01 - 0.08	Bacitracin
3K	0.1 - 0.25	0.06 - 0.2	Albumin ⁺⁺
5K	0.25 - 0.5	0.18 - 0.21	Albumin
10K	0.7 - 1.9	0.2 - 0.32	Albumin
30K	1.9 - 4	0.21 - 0.26	Albumin
50K	2.3 - 4.5	0.23 - 0.28	Albumin
100K	5 - 14	1.5 - 6.5	Albumin
300K ⁺⁺⁺	1 - 3	0.4 - 3	Albumin

+ Deionized water at 25 °C (77 °F) and 3.7 bar (370 kPa, 55 psi)
 ++ 0.2% saline buffer solution at 25 °C (77 °F) and 3.7 bar (370 kPa, 55 psi)
 +++ 0.7 bar (70 kPa, 10 psi)

Data derived using Omega membrane stirred cells. When using tangential flow filtration cassette systems, solute fluxes will be higher and water fluxes will be lower.

Ordering Information

Omega Membrane Disc Filters (25, 43, 47, 50, 62, and 76 mm Provided 12/pkg; 90 and 150 mm Provided 6/pkg)

MWC0	25 mm	43 mm	47 mm	50 mm	62 mm	76 mm	90 mm	150 mm
1K	OM001025	OM001043	OM001047	OM001050	OM001062	OM001076	OM001090	OM001150
3K	OM003025	OM003043	OM003047	OM003050	OM003062	OM003076	OM003090	OM003150
5K	OM005025	OM005043	OM005047	OM005050	OM005062	OM005076	OM005090	OM005150
10K	OM010025	OM010043	OM010047	OM010050	OM010062	OM010076	OM010090	OM010150
30K	OM030025	OM030043	OM030047	OM030050	OM030062	OM030076	OM030090	OM030150
50K	OM050025	OM050043	OM050047	OM050050	OM050062	OM050076	OM050090	OM050150
100K	OM100025	OM100043	OM100047	OM100050	OM100062	OM100076	OM100090	OM100150
300K	OM300025	OM300043	OM300047	OM300050	OM300062	OM300076	OM300090	OM300150

Acrodisc® Syringe Filters With Supor® Membrane

High flow rates with low protein binding



- ▶ Superior flow rates and higher throughputs than competitive devices.
- ▶ Low protein binding to minimize sample loss.
- ▶ Pre-sterilized products are sterilized by gamma irradiation to eliminate potential contamination by EtO residuals.
- ▶ A range of sizes (13 to 37 mm) accommodates sample volumes from < 10 to 150 mL.
- ▶ Acrodisc PF and Serum Acrodisc syringe filters feature built-in prefilter for increased throughput of difficult-to-filter liquids.
- ▶ Reduces mycoplasma with the use of 0.1 µm pore size.

Applications

- ▶ 0.1 and 0.2 µm pore sizes provide sterilization of small volumes of buffers, culture media, and additives.
- ▶ Acrodisc PF and Serum Acrodisc syringe filters are ideal for clarification/sterilization of viscous or particulate-laden solutions.
- ▶ Use larger pore size filters for prefiltration and particulate removal.

Specifications

Materials of Construction

Filter Media: Supor membrane [hydrophilic polyethersulfone (PES)]
Serum Acrodisc Prefilter Media: Binder-free borosilicate glass
Acrodisc Housing:
13 mm: Polypropylene
25 and 32 mm: Modified acrylic
37 mm: Polypropylene
Serum Acrodisc Housing: ABS

Effective Filtration Area

13 mm: 1.0 cm²
25 mm: 2.8 cm²
32 mm: 5.8 cm²
37 mm: 7.5 cm²

Inlet/Outlet Connections

Female luer lock inlet, male slip luer outlet

Typical Hold-Up Volume

(with air purge)
13 mm: ≤ 28 µL
25 mm: ≤ 70 µL
32 and 37 mm: ≤ 100 µL

Maximum Operating Temperature

55 °C (131 °F)

Maximum Operating Pressure

5.2 bar (520 kPa, 75 psi)

Typical Water Flow Rate

mL/min at 3.1 bar (310 kPa, 45 psi)
0.1 µm, 25 mm: 35
0.1 µm, 32 mm: 100
0.2 µm, 13 mm: 22
0.2 µm, 25 mm: 175
0.2 µm, 32 mm: 490
0.45 µm, 13 mm: 35
0.45 µm, 25 mm: 300
0.45 µm, 32 mm: 700
0.8 µm, 13 mm: 150
0.8 µm, 25 mm: 700
0.8/0.2 µm, 25 mm: 145
0.8/0.2 µm, 32 mm: 440
1.2 µm, 32 mm: 1700
5 µm, 32 mm: 1750
GF/0.2 µm, 37 mm (Serum Acrodisc Filter): 425

Endotoxin Level

< 0.25 EU/mL using Limulus Amoebocyte Lysate (LAL) test

Biological Safety

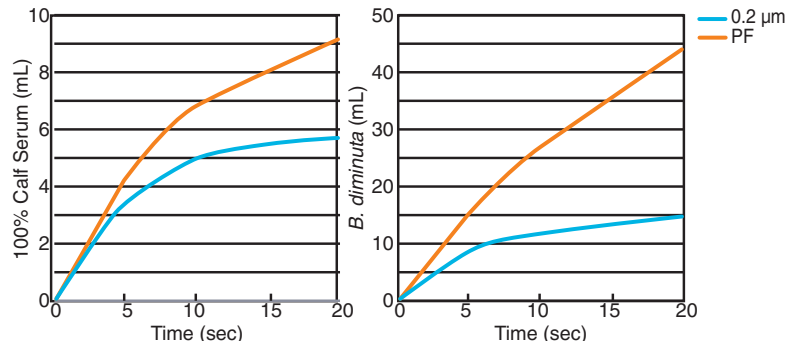
Passes United States Pharmacopeia (USP) Biological Reactivity Test, *In Vivo* <88>

Sterilization

Sterilized by gamma irradiation and individually blister packaged. All bulk packages provided non-sterile including PN 4504, 4506, 4508, 4509, 4655, 4653, 4659, 4660, 4661, 4662, 4668, and 4692.

Performance

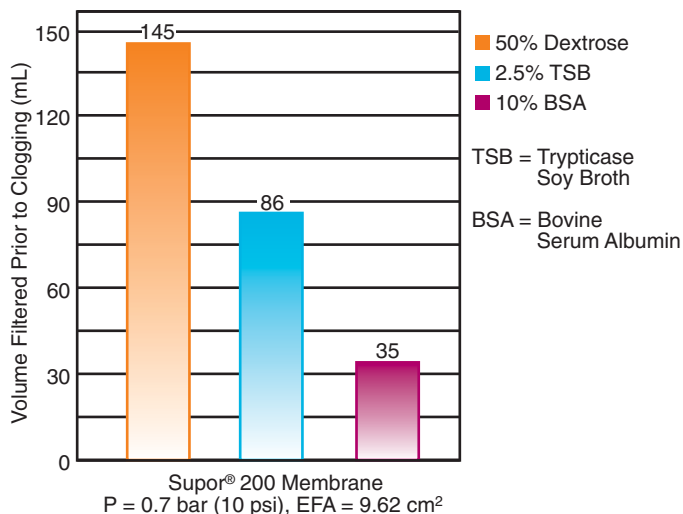
Built-In Prefilter Enhances Throughput of Viscous, Particulate-Laden, or Proteinaceous Solutions



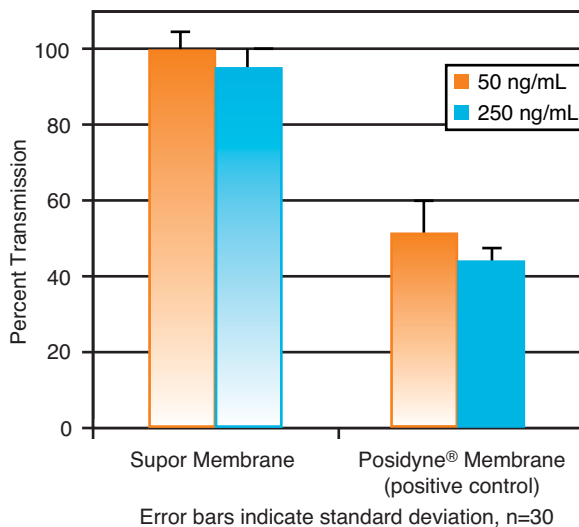
Acrodisc and Acrodisc PF syringe filters with 0.2 µm Supor membrane were challenged with bovine serum or a bacterial culture (10⁷ cfu/mL) at a constant pressure of 1.4 bar (140 kPa, 20 psi).

Performance (continued)

Membrane Filtration Throughput 0.2 µm Rated Membranes



¹²⁵I BSA Protein Transmission Through 25 mm Acrodisc® Syringe Filters



Ordering Information

Acrodisc Syringe Filters With Supor Membrane, Sterile

Part Number	Description	Pkg
4602	0.2 µm, 13 mm	75/pkg
4604	0.45 µm, 13 mm	75/pkg
4608	0.8 µm, 13 mm	75/pkg
4611	0.1 µm, 25 mm	50/pkg
4612	0.2 µm, 25 mm	50/pkg
4614	0.45 µm, 25 mm	50/pkg
4618	0.8 µm, 25 mm	50/pkg
4651	0.1 µm, 32 mm	50/pkg
4652	0.2 µm, 32 mm	50/pkg
4654	0.45 µm, 32 mm	50/pkg
4656	1.2 µm, 32 mm	50/pkg
4650	5 µm, 32 mm	50/pkg

Acrodisc PF Syringe Filters With Supor Membrane, Sterile

Part Number	Description	Pkg
4187	0.8/0.2 µm, 25 mm	50/pkg
4658	0.8/0.2 µm, 32 mm	50/pkg

Serum Acrodisc Syringe Filter With Supor Membrane, Sterile

Part Number	Description	Pkg
4525	GF/0.2 µm, 37 mm	20/pkg

Acrodisc Syringe Filters With Supor Membrane, Non-Sterile Bulk Packaging

Part Number	Description	Pkg
4692	0.2 µm, 13 mm	1000/pkg
4668	0.1 µm, 25 mm	1000/pkg
4506	0.2 µm, 25 mm	1000/pkg
4504	0.8/0.2 µm, 25 mm	1000/pkg
4508	0.45 µm, 25 mm	1000/pkg
4509	0.8 µm, 25 mm	1000/pkg
4655	0.2 µm, 32 mm	1000/pkg
4659	0.8/0.2 µm, 32 mm	1000/pkg
4653	0.45 µm, 32 mm	1000/pkg
4661	1.2 µm/0.45 µm, 32 mm	1000/pkg
4660	1.2 µm, 32 mm	1000/pkg
4662	5 µm, 32 mm	1000/pkg

Related Products

AcroCap™ Positive Pressure Devices	124
AcroPak™ Capsules with Supor Membrane	129, 132, 137
Supor Membrane Disc Filters	111
VacuCap® Vacuum Filtration Devices	127

Acrodisc® Syringe Filters Optimized for Scale-Up



Laboratory devices containing the same materials of construction as larger-capacity capsules and cartridges



LABORATORY BIOPROCESSING filtration syringe filters

- ▶ Simplifies scale-up and minimizes revalidation; no need to change membrane materials during transition to pilot or production.
- ▶ Four membrane chemistries assure compatibility with a wide range of fluids:
 - ▶ Supor® membrane has high flow rates and throughputs, and is ideal for solutions where low protein binding is required. Not recommended with some ketones.
 - ▶ Fluorodyne® II membrane offers high flow rates and is ideal for applications where PVDF membrane is specified. Not recommended with some ethers.
 - ▶ Ultipor® membrane provides broad solvent and chemical compatibility, and low extractables.
 - ▶ Posidyne® membrane enhances bioburden and pyrogen removal from aqueous solutions.
- ▶ Integrity testable (water bubble point).
- ▶ Bacterial retention tested.
- ▶ Sterilized by gamma irradiation to eliminate potential contamination by EtO residuals.

Applications

- ▶ Drug development studies.
- ▶ Preliminary filterability testing.
- ▶ Determination of product compatibility and recovery.
- ▶ Small-volume liquid sterilization.

Specifications

Materials of Construction

Filter Media: Supor [hydrophilic polyethersulfone (PES)], Fluorodyne II (hydrophilic PVDF), Ultipor (Nylon 6,6), and Posidyne (positively-charged Nylon 6,6) membranes
Housing: Polypropylene

Effective Filtration Area

2.8 cm²

Inlet/Outlet Connections

Female luer lock inlet, male slip luer outlet

Typical Hold-Up Volume

≤ 100 µL

Maximum Operating Temperature

60 °C (140 °F) at 2.1 bar (210 kPa, 30 psi)

Maximum Operating Pressure

5.4 bar (540 kPa, 80 psi) at ambient temperature

Typical Water Flow Rate

mL/min at 2.1 bar (210 kPa, 30 psi)
PN 4905: 130
PN 4906: 78
PN 4907: 130
PN 4908: 77

Recommended Integrity Test Minimum Bubble Point - Water

PN 4905: 3.5 bar (350 kPa, 51 psi)
PN 4906, 4908, and 4907: 3.2 bar (320 kPa, 46 psi)
PN 4902: 3.32 bar (332 kPa, 48 psi)

Bacterial Retention

Lot samples retain a minimum of 10⁷ cfu/cm² of *B. diminuta* per modified ASTM F838-05, current revision

Endotoxin Level

< 0.25 EU/mL using Limulus Amoebocyte Lysate (LAL) test

Biological Safety

Passes United States Pharmacopeia (USP) Biological Reactivity Test, *In Vivo* <88>

Sterilization

Sterilized by gamma irradiation and individually packaged.

Ordering Information

Acrodisc Syringe Filters, 25 mm

Part Number	Description	Pkg
4905	0.8/0.2 µm, Supor membrane, sterile	50/pkg
4907	0.2 µm, Fluorodyne II membrane, sterile	50/pkg
4906	0.2 µm, Ultipor membrane, sterile	50/pkg
4908	0.2 µm, Posidyne membrane, sterile	50/pkg
4902	MachV asymmetric prefilter/0.2 µm Supor EKV membrane, sterile	50/pkg

Related Products

AcroPak™ Capsules 128 - 137

Acrodisc® Syringe Filters With HT Tuffryn® Membrane

Reliable performance in proven applications



- ▶ Suitable for dilute biological fluids.
- ▶ Features low protein binding membrane.
- ▶ Pre-sterilized products are sterilized by gamma irradiation to eliminate potential contamination by EtO residuals.
- ▶ Available non-sterile for analytical preparation of biologicals.

Applications

- ▶ Sterile products for applications using dilute solutions.

Specifications

Materials of Construction

Filter Media: HT Tuffryn membrane (polysulfone)

Housing: 13 mm: Polypropylene
25 mm: Modified acrylic

Effective Filtration Area

13 mm: 1.0 cm²
25 mm: 2.8 cm²

Inlet/Outlet Connections

13 and 25 mm: Female luer lock inlet, male slip luer outlet

Typical Hold-Up Volume (with air purge)

13 mm: < 10 µL
0.2 µm, 25 mm: < 40 µL
0.45 µm, 25 mm: < 30 µL

Maximum Operating Temperature

13 and 25 mm: 55 °C (131 °F)

Maximum Operating Pressure

13 and 25 mm: 5.2 bar (520 kPa, 75 psi)

Typical Water Flow Rate

mL/min at 3.1 bar (310 kPa, 45 psi)
0.2 µm, 13 mm: 12
0.2 µm, 25 mm: 110
0.45 µm, 25 mm: 250

Endotoxin Level

< 0.25 EU/mL using Limulus Amoebocyte Lysate (LAL) test

Biological Safety

Passes United States Pharmacopeia (USP) Biological Reactivity Test, *In Vivo* <88>

Sterilization

Sterilized by gamma irradiation and individually packaged. PN 4496, 4214, 4497, and 4784 provided non-sterile.

Ordering Information

Acrodisc Syringe Filters With HT Tuffryn Membrane, Sterile

Part Number	Description	Pkg
4454	0.2 µm, 13 mm	75/pkg
4192	0.2 µm, 25 mm	50/pkg
4184	0.45 µm, 25 mm	50/pkg

Acrodisc Syringe Filters With HT Tuffryn Membrane, Non-Sterile

Part Number	Description	Pkg
4496	0.2 µm, 25 mm	75/pkg 300/cs
4214	0.2 µm, 25 mm	1000/pkg
4497	0.45 µm, 25 mm	75/pkg 300/cs
4784	0.45 µm, 25 mm	1000/pkg

Related Products

HT Tuffryn Polysulfone Membrane Disc Filters 112

filtration syringe filters

LABORATORY BIOPROCESSING

Acrodisc® Syringe Filters With Versapor® Membrane

Meets all prefiltration and clarification requirements



- ▶ Certified non-pyrogenic and biologically safe.
- ▶ Available in a variety of diameters and pore sizes.

Applications

- ▶ Useful for prefiltration of particulate-laden samples, serum filtration, and dissolution testing.
- ▶ Protects instrumentation against particulate build up.

Related Products

Versapor Acrylic Copolymer Membrane Disc Filters113

Specifications

Materials of Construction

Filter Media: Versapor membrane (acrylic copolymer on a non-woven support)
 4 and 13 mm Housing: Polypropylene
 25 mm Housing: Modified acrylic

Effective Filtration Area

4 mm: 0.3 cm²
 13 mm: 1.0 cm²
 25 mm: 2.8 cm²

Inlet/Outlet Connections

4, 13, and 25 mm: Female luer lock inlet, male slip luer outlet

Typical Hold-Up Volume (with air purge)

4 mm: < 7.5 µL
 13 mm: < 28 µL
 25 mm: < 50 µL

Maximum Operating Temperature

4, 13, and 25 mm: 55 °C (131 °F)

Maximum Operating Pressure

4, 13, and 25 mm: 5.2 bar (520 kPa, 75 psi)

Typical Water Flow Rate

mL/min at 3.1 bar (310 kPa, 45 psi)
 0.45 µm, 4 mm: 3
 0.8 µm, 13 mm: 180
 0.45 µm, 25 mm: 225
 0.8 µm, 25 mm: 600
 1.2 µm, 25 mm: 660
 5 µm, 25 mm: 970

Endotoxin Level

< 0.25 EU/mL using Limulus Amoebocyte Lysate (LAL) test

Biological Safety

Passes United States Pharmacopeia (USP) Biological Reactivity Test, *In Vivo* <88>

Sterilization

PN 4188, 4190, 4199 sterilized by gamma irradiation and individually blister packaged.

Ordering Information

Acrodisc Syringe Filters With Versapor Membrane, Sterile

Part Number	Description	Pkg
4188	0.8 µm, 25 mm	50/pkg
4190	1.2 µm, 25 mm	50/pkg
4199	5 µm, 25 mm	50/pkg

Acrodisc Syringe Filters With Versapor Membrane, Non-Sterile

Part Number	Description	Pkg
4473	0.45 µm, 4 mm	250/pkg 750/cs
4459	0.8 µm, 13 mm	100/pkg 300/cs
4487	0.45 µm, 25 mm	75/pkg 300/cs
4189	0.8 µm, 25 mm	75/pkg 300/cs
4568	0.8 µm, 25 mm	1000/pkg
4488	1.2 µm, 25 mm	75/pkg 300/cs
4489	5 µm, 25 mm	75/pkg 300/cs

DMSO-Safe Acrodisc® Syringe Filter

Compatible with DMSO



- ▶ Polypropylene housing and nylon membrane are compatible with solutions containing DMSO.
- ▶ Excellent chemical compatibility with esters, bases, and alcohols.

Applications

- ▶ Sterilization of media used for cell cryopreservation.
- ▶ Offers broad chemical resistance to common solvents.

Specifications

Materials of Construction

Filter Media: Nylon
Housing: Polypropylene

Effective Filtration Area

2.8 cm²

Inlet/Outlet Connections

Female luer lock inlet, male slip luer outlet

Typical Hold-Up Volume

(with air purge) ≤ 50 µL

Maximum Operating Temperature

55 °C (131 °F)

Maximum Operating Pressure

6.2 bar (620 kPa, 90 psi)

Typical Water Flow Rate

60 mL/min at 2.1 bar (210 kPa, 30 psi)

Endotoxin Level

< 0.25 EU/mL using Limulus Amoebocyte Lysate (LAL) test

Sterilization

Sterilized by ethylene oxide and individually packaged.

Ordering Information

DMSO-Safe Acrodisc Syringe Filter

Part Number	Description	Pkg
4433	0.2 µm, 25 mm, sterile	50/pkg

Acrodisc® Syringe Filters for General Aqueous and Particulate-Laden Samples

Variety of pore sizes and membrane types for prefiltration and clarification



- ▶ Meets virtually all aqueous sample filtration needs.
- ▶ Widely used in dissolution testing.
- ▶ The GxF multi-layered prefilter provides two to four times the throughput of standard glass fiber prefilter devices, allowing for quick and easy filtration of your most difficult-to-filter samples.
- ▶ Glass fiber reduces clogging. Use alone or in series with final membrane filter to increase flow rate and throughput.
- ▶ Large, 37 mm size filters available for very dirty samples.
- ▶ Provided non-sterile.

Applications

- ▶ > 0.8 µm pore sizes are excellent for difficult-to-filter dissolution samples.
- ▶ Recommended for aqueous samples only.
- ▶ For high throughput prefiltration of extremely viscous or particulate-laden samples use Acrodisc PSF GxF syringe filters.

Specifications

Materials of Construction

Filter Media: Versapor® (hydrophilic acrylic copolymer on a nonwoven support), HT Tuffryn® (hydrophilic polysulfone), and Supor® [hydrophilic polyethersulfone (PES)] membranes, or borosilicate glass fiber

25 and 32 mm Housing:

Modified acrylic

13, 25 PSF, and 37 mm Housing:

Polypropylene

Membrane Pore Size

0.2, 0.45, 0.8, 1.2, 5, and 10 µm

GxF Prefilter: 40 - 1 µm

Glass Fiber: 1 µm

Effective Filtration Area

13 mm: 1.0 cm²

25 mm: 2.8 cm²

25 mm PSF: 3.9 cm²

32 mm: 5.8 cm²

37 mm: 7.5 cm²

Sample Volume

13 mm: < 10 mL

25 mm: < 100 mL

25 mm PSF: < 150 mL

32 mm: < 175 mL

37 mm: < 200 mL

Inlet/Outlet Connections

Female luer lock inlet, male slip luer outlet

Typical Hold-Up Volume

(with air purge)

13 mm: < 30 µL

25 mm: < 70 µL

25 mm PSF: < 125 µL

32 mm: < 100 µL

37 mm: < 500 µL

Maximum Operating Temperature

55 °C (131 °F)

Glass Fiber: 135 °C (275 °F)

Maximum Operating Pressure

13, 25, 32 mm: 5.2 bar (520 kPa, 75 psi)

25 mm PSF: 4.1 bar (410 kPa, 60 psi) at 21 - 24 °C (70 - 75 °F)

Ordering Information

Acrodisc Syringe Filters With Supor® Membrane, Non-Sterile

Part Number	Description	Pkg
4692	0.2 µm, 13 mm	1000/pkg
4668	0.1 µm, 25 mm, modified acrylic housing	1000/pkg
4506	0.2 µm, 25 mm, modified acrylic housing	1000/pkg
4504	0.8/0.2 µm, 25 mm, modified acrylic housing	1000/pkg
4508	0.45 µm, 25 mm, modified acrylic housing	1000/pkg
4509	0.8 µm, 25 mm, modified acrylic housing	1000/pkg
4655	0.2 µm, 32 mm, modified acrylic housing	1000/pkg
4659	0.8/0.2 µm, 32 mm, modified acrylic housing	1000/pkg
4653	0.45 µm, 32 mm, modified acrylic housing	1000/pkg
4661	1.2/0.45 µm, 32 mm, modified acrylic housing	1000/pkg
4660	1.2 µm, 32 mm, modified acrylic housing	1000/pkg
4662	5 µm, 32 mm, modified acrylic housing	1000/pkg

Ordering Information

Acrodisc® Syringe Filters With HT Tuffryn® Membrane, Non-Sterile

Part Number	Description	Pkg
4496	0.2 µm, 25 mm, modified acrylic housing	75/pkg 300/cs
4214	0.2 µm, 25 mm, modified acrylic housing	1000/pkg
4497	0.45 µm, 25 mm, modified acrylic housing	75/pkg 300/cs
4784	0.45 µm, 25 mm, modified acrylic housing	1000/pkg

Acrodisc Syringe Filters With Versapor® Membrane, Non-Sterile

Part Number	Description	Pkg
4473	0.45 µm, 4 mm	250/pkg, 750/cs
4459	0.8 µm, 13 mm, polypropylene housing	300/cs
4487	0.45 µm, 25 mm, modified acrylic housing	75/pkg 300/cs
4189	0.8 µm, 25 mm, modified acrylic housing	75/pkg 300/cs
4568	0.8 µm, 25 mm, modified acrylic housing	1000/pkg
4488	1.2 µm, 25 mm, modified acrylic housing	75/pkg 300/cs
4489	5 µm, 25 mm, modified acrylic housing	75/pkg 300/cs

Acrodisc Syringe Filter With Glass Fiber

Part Number	Description	Pkg
4524	1 µm (nominal), 37 mm, polypropylene housing	15/pkg 60/cs

Zymark* and SOTAX* Automation Certified Acrodisc PSF GxS Syringe Filters

Part Number	Description	Pkg
AP-4527	GxF/Glass, 25 mm, polypropylene housing, AutoPack™ tubes	25/pkg 200/cs
AP-4523	GxF/Glass, 25 mm, polypropylene housing	50/pkg 200/cs
AP-4529	GxF/Glass, 25 mm, polypropylene housing	1000/pkg

Zymark and SOTAX Automation Certified Acrodisc PSF Syringe Filters With HT Tuffryn Membrane

Part Number	Description	Pkg
AP-4498	0.45 µm, 25 mm, polypropylene housing, AutoPack tubes	25/pkg 200/cs
AP-4497	0.45 µm, 25 mm, polypropylene housing	50/pkg 200/cs
AP-4784	0.45 µm, 25 mm, polypropylene housing	1000/pkg

Zymark and SOTAX Automation Certified Acrodisc PSF GxS Syringe Filters With Supor® Membrane

Part Number	Description	Pkg
AP-4798	GxF/0.2 µm, 25 mm, AutoPack Tubes	25/pkg 200/cs
AP-4799	GxF/0.2 µm, 25 mm	50/pkg 200/cs
AP-4800	GxF/0.2 µm, 25 mm	1000/pkg
AP-4424	GxF/0.45 µm, 25 mm, AutoPack Tubes	25/pkg 200/cs
AP-4425	GxF/0.45 µm, 25 mm	50/pkg 200/cs
AP-4426	GxF/0.45 µm, 25 mm	1000/pkg

Zymark and SOTAX Automation Certified Acrodisc PSF Syringe Filters With Versapor Membrane

Part Number	Description	Pkg
AP-4190	0.8 µm, 25 mm, polypropylene housing, AutoPack tubes	25/pkg 200/cs
AP-4189	0.8 µm, 25 mm, polypropylene housing	50/pkg 200/cs
AP-4568	0.8 µm, 25 mm, polypropylene housing	1000/pkg
AP-4000	10 µm, 25 mm, polypropylene housing, AutoPack tubes	25/pkg 200/cs
AP-4001	10 µm, 25 mm, polypropylene housing	50/pkg 200/cs
AP-4002	10 µm, 25 mm, polypropylene housing	1000/pkg

AcroCap™ Positive Pressure Devices

Fast, positive-pressure filtration of aqueous solutions up to 3 L



- ▶ Integral hydrophobic vent prevents air lock.
- ▶ Sterilization by gamma irradiation eliminates the risk of cytotoxic residuals from EtO sterilization.
- ▶ Reduce mycoplasma. Choose 0.1 µm pore size Supor® membrane.
- ▶ Compatible with most positive-pressure systems. Inlet accepts 6.4 mm (1/4 in.) tubing or any male slip luer.

Applications

- ▶ For sterilization or clarification of up to three liters of serum-free cell and tissue culture media, media additives, and other aqueous solutions.
- ▶ Ideal for sterilization of solutions that tend to foam when filtered under vacuum.

Related Products

Acrodisc® Syringe Filters with Supor Membrane	117, 118, 123
VacuCap® Vacuum Filtration Devices	127
AcroPak™ Capsules.....	128 - 137
Supor Membrane Disc Filters	111

Specifications

Materials of Construction

Filter Media: Supor [hydrophilic polyethersulfone (PES)] membrane
 Housing: Modified acrylic
 Vent: 0.02 µm PTFE
 Filling Bell: Modified acrylic

Effective Filtration Area

15 cm²

Inlet/Outlet Connections

6.4 mm (1/4 in.) hose barb, inner taper accepts male slip luer; removable filling bell attached to outlet

Typical Hold-Up Volume

(with air purge)
 ≤ 2 mL

Maximum Operating Temperature

55 °C (131 °F)

Maximum Operating Pressure

2.1 bar (210 kPa, 30 psi)

Typical Water Flow Rate

mL/min at 1.0 bar (100 kPa, 15 psi)
 0.1 µm: 90
 0.2 µm: 220
 0.45 µm: 500

Endotoxin Level

< 0.25 EU/mL using Limulus Amoebocyte Lysate (LAL) test

Biological Safety

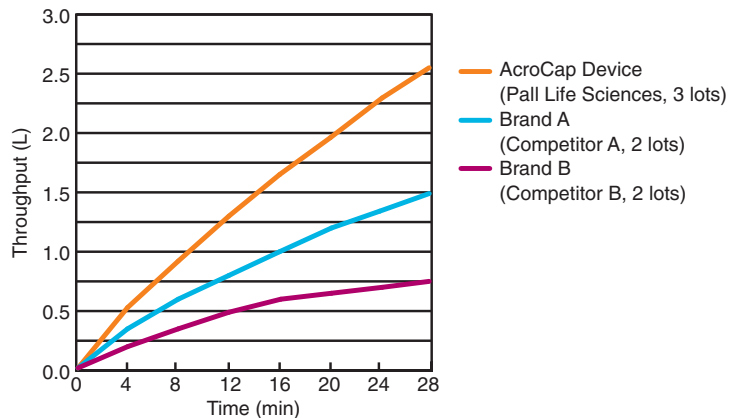
Passes United States Pharmacopeia (USP) Biological Reactivity Test, *In Vivo* <88>

Sterilization

Sterilized by gamma irradiation and individually packaged.

Performance

Comparative Throughput of AcroCap Devices Against Competitor Devices - Basal Medium Eagle With 10% Fetal Bovine Serum



Ordering Information

AcroCap Positive Pressure Devices

Part Number	Description	Pkg
4481	0.1 µm, gamma-irradiated	10/pkg
4480	0.2 µm, gamma-irradiated	10/pkg
4482	0.45 µm, gamma-irradiated	10/pkg

All products include one filter holder per package.

AcroVac™ Filter Units

Fast vacuum filtration with an ergonomic design



- ▶ Large membrane area speeds up sample processing.
- ▶ Low center of gravity improves filtration system stability and reduces risk of system tipping during the filtration process.
- ▶ Ergonomic design features curved sides molded into the reservoir, allowing easy grasping and holding.
- ▶ Convenient finger tabs on the funnel base and storage cap allow for easy removal and tightening. Finger tabs on the cap create a broad surface profile allowing convenient stacking of collection reservoirs and minimizing storage space.
- ▶ Patented Supor® polyethersulfone (PES) membrane allows fast flow rates and is ideal for cell culture and media prep, buffers and other aqueous solutions.
- ▶ Complete system includes the filtration funnel, vacuum port, lid, collection reservoir, and cap for storage. Solution can be stored in the collection reservoir until needed.

Applications

- ▶ Designed for vacuum filtration of aqueous solutions including cell culture media, buffer, tissue culture additives, and other biological fluids.

Specifications

Materials of Construction

Filter Media: Supor [polyethersulfone (PES)] membrane
Plastic Funnel: Polystyrene
Collection Reservoir: Copolyester
Lid, Funnel Base, Storage Cap, and Vacuum Port: Polypropylene
Funnel Base Gasket and Storage Cap Gasket: Polyethylene-coated foam

Cytotoxicity

Systems are non-cytotoxic and meet the requirements of the Elution Test, ISO 10993-5, 1999

Endotoxin Level

< 0.25 EU/mL utilizing Limulus Amoebocyte Lysate (LAL) test

Typical Water Flow Rate

Time to filter 500 mL of 0.2 µm filtered water at 380 mm Hg (15 in. Hg), ambient temperature:

Pore Size	PES Membrane
0.2 µm	< 45 sec
0.45 µm	< 28 sec

Bacterial Retention

Samples of 0.2 µm pore size systems retain a minimum of 10⁷ cfu/cm² of *B. diminuta* per modified ASTM F838, current revision

Recommended Operating Vacuum

380 mm Hg (15 in. Hg)

Operating Temperature Range

4 - 37 °C (39 - 98 °F), do not autoclave

Bottle Storage

-4 - 50 °C (24 - 122 °F) cold storage at lower temperature should be evaluated by the end user to determine suitability of the solution in the collection reservoir.

Sterilization

Individually bagged and sterilized by gamma irradiation.

Ordering Information

AcroVac Filter Units With Supor Membrane

Part Number	Description	Pkg
AVFP02S	0.2 µm, gamma-irradiated, 250 mL	12/pkg
AVFP02M	0.2 µm, gamma-irradiated, 500 mL	12/pkg
AVFP02L	0.2 µm, gamma-irradiated, 1L	12/pkg
AVFP04S	0.45 µm, gamma-irradiated, 250 mL	12/pkg
AVFP04M	0.45 µm, gamma-irradiated, 500 mL	12/pkg
AVFP04L	0.45 µm, gamma-irradiated, 1L	12/pkg

VacuCap® and VacuCap PF Vacuum Filtration Devices

Innovative bottle-top filters for fast vacuum filtration of 100 mL to 5 L of aqueous solutions



- ▶ Filter faster. Supor® membrane provides high flow rates.
- ▶ No need to constantly refill upper fluid reservoir. Draws directly from the mixing reservoir.
- ▶ Eliminates the possibility of contamination from transfer steps. Filters directly into the desired container.
- ▶ Match filter to sample volume by choosing from two sizes.
- ▶ Available built-in prefilter increases throughput of particulate-laden solutions such as serum-containing media.
- ▶ Environmentally-friendly with minimal plastic waste.
- ▶ Patented small design accepts a variety of collection vessels and reduces storage space and waste.
- ▶ TA version available with tubing attached to each device for maximum convenience.
- ▶ Sterilization by gamma irradiation eliminates potential contamination by EtO residuals.

Applications

- ▶ Excellent device for cell culture media preparation.
- ▶ PF version is useful for sterilization of hard-to-filter solutions.
- ▶ Reduce mycoplasma with the 0.1 µm pore size.

Specifications

Materials of Construction

Filter Media: Supor [hydrophilic polyethersulfone (PES)] membrane
Housing: Modified acrylic
Membrane Support Material: Polyester
Sinker Material: Glass-filled polyurethane elastomer
Inlet Tubing: Polyvinyl chloride (PVC) medical-grade tubing
Gasket Seal Material: Polyethylene

Pore Size

0.1, 0.2, 0.45, and 0.8/0.2 µm

Effective Filtration Area

VacuCap 60 Devices: 30 cm²

VacuCap 90 Devices: 60 cm²

Typical Throughput

(RPMI + 10% newborn calf serum)

VacuCap 60 Devices, 0.2 µm: 1 L

VacuCap 90 Devices, 0.2 µm: 5 L

(RPMI + 10% calf serum)

VacuCap 60 PF Devices: 500 mL

VacuCap 90 PF Devices: 1 L

Collection Vessel

VacuCap 60 Devices: Can be used on receptacles with openings ranging from 2 - 5 cm (0.8 - 1.9 in.)

VacuCap 90 Devices: Can be used on receptacles with openings ranging from 2 - 6.5 cm (0.8 - 2.5 in.)

WARNING

Collection vessels should be vacuum rated. Implosion may result.

Maximum Operating Temperature

55 °C (131 °F)

Typical Water Flow Rate

mL/min at 25.4 cm Hg (10 in. Hg)

VacuCap 60 Devices

0.1 µm: 50

0.2 µm: 200

0.45 µm: 280

PF: 200

VacuCap 90 Devices

0.1 µm: 100

0.2 µm: 400

0.45 µm: 560

PF: 400

Maximum Vacuum

63.5 cm Hg (25 in. Hg)

Endotoxin Level

< 0.25 EU/mL using Limulus Amoebocyte Lysate (LAL) test

Biological Safety

Passes United States Pharmacopeia (USP) Biological Reactivity Test, *In Vivo* <88>

Sterilization

Sterilized by gamma irradiation and individually packaged.

Basic Procedures



1. Connect the feed tubing to the port marked "INLET" on the VacuCap® device. Place the opposite end of the tubing in the unfiltered fluid to be drawn.
2. Connect the vacuum tubing to the port marked "VACUUM" on the VacuCap device. Refer to the product insert for safety precautions.
3. While holding the VacuCap device securely onto the filtrate container, start the vacuum. The VacuCap device will seal securely to the container top and fluid will be drawn.
4. When filtration is complete, switch off the vacuum pump allowing the vacuum inside the receiving container to dissipate. Refer to the product insert for complete instructions.

Ordering Information

VacuCap 60 Devices

Part Number	Description	Pkg
4631	0.1 µm, 60 mm, gamma-irradiated	10/pkg
4632	0.2 µm, 60 mm, gamma-irradiated	10/pkg
4634	0.45 µm, 60 mm, gamma-irradiated	10/pkg
TA4632	0.2 µm, 60 mm (supplied with individually attached tubing for each filter device), gamma-irradiated	10/pkg

VacuCap 60 PF Device

Part Number	Description	Pkg
4638	0.8/0.2 µm, 60 mm, gamma-irradiated	10/pkg

VacuCap 90 Devices

Part Number	Description	Pkg
4621	0.1 µm, 90 mm, gamma-irradiated	10/pkg
4622	0.2 µm, 90 mm, gamma-irradiated	10/pkg
4624	0.45 µm, 90 mm, gamma-irradiated	10/pkg
TA4622	0.2 µm, 90 mm (supplied with individually attached tubing for each filter device), gamma-irradiated	10/pkg
TA4624	0.45 µm, 90 mm (supplied with individually attached tubing for each filter device), gamma-irradiated	10/pkg

VacuCap 90 PF Device

Part Number	Description	Pkg
4628	0.8/0.2 µm, 90 mm, gamma-irradiated	10/pkg

Accessories and Replacement Parts

Part Number	Description	Pkg
4623	Feedline accessory kit	1/pkg

Related Products

AcroCap™ Positive Pressure Devices	124
Acrodisc® Syringe Filters with Supor® Membrane	117, 118, 123
AcroPak™ Capsules with Supor Membrane	129, 132, 137
Supor Membrane Disc Filters	111
Vacushield™ Vent Device	165

AcroPak™ 20 Filters With Supor® EKV Membrane



Designed for convenient small- and medium-volume filtration



- ▶ Built-in MachV asymmetric prefilter layer for maximum flow and throughput performance.
- ▶ Disposable for reduced labor and associated costs.
- ▶ Significantly reduces the cost of repeat testing when scaling up your filtration system.

Applications

- ▶ Ideal for filtering aqueous solutions, cell culture media, and serum.
- ▶ Small- to medium-volume sterile filtration, typically up to 2 L.
- ▶ Suitable for use with fluids containing dilute proteins, preservatives, or other critical components.
- ▶ Sterile filtration of media and buffers.

Specifications

Materials of Construction

Filter Media: Supor EKV [hydrophilic polyethersulfone (PES)] membrane
Housing, Vent Plug, and Support Material: Polypropylene
Filling Bell: Polycarbonate
Sealing Technology: Thermal bonding without adhesives

Pore Size

0.2 µm

Effective Filtration Area

20 cm²

Dimensions

Housing Length: 8.3 cm (3.3 in.)
Housing Diameter: 6.7 cm (2.7 in.)

Inlet/Outlet Connections

Stepped hose barbs 6.4 - 12.7 mm (1/4 - 1/2 in.) diameter with female slip luer ID in the hose barb

Typical Hold-Up Volume

(with 10 psi air purge)
< 2.5 mL

Maximum Operating Temperature

60 °C (140 °F) at 1.0 bar (100 kPa, 15 psi)

Maximum Operating Pressure

4.1 bar (410 kPa, 60 psi) at 21 - 24 °C (70 - 75 °F)

Recommended Integrity Test Minimum Bubble Point - Water

3.32 bar (332 kPa, 48 psi)

Bacterial Retention

Lot samples retain a minimum of 10⁷ cfu/cm² of *B. diminuta* per modified ASTM F838, current revision

Endotoxin Level

< 0.25 EU/mL using Limulus Amoebocyte Lysate (LAL) test

Biological Safety

Passes United States Pharmacopeia (USP) Biological Reactivity Test, *In Vivo* <88>

Sterilization

Can withstand one autoclave cycle at 125 °C (257 °F) for 60 minutes; water wet capsule prior to autoclaving. PN 12247 is sterilized by gamma irradiation and individually packaged.

Ordering Information

AcroPak 20 Filters With Supor EKV Membrane

Part Number	Description	Pkg
12246	0.2 µm, non-sterile	3/pkg
12247	0.2 µm, gamma-irradiated	3/pkg

Related Products

AcroPak 200 Capsules With Supor EKV Membrane	131
AcroPak 400, 800, and 1500 Capsules With Supor EKV Membrane	134

AcroPak™ 20 Filters With Supor® Membrane

Efficient processing of liquid volumes up to 2 L



- ▶ Supor membrane has high flow rates and throughputs, and is ideal for solutions where low protein binding is required. Not recommended for use with some ketones.
- ▶ Efficiently processes up to 2 L of chemical and biological fluids.
- ▶ Sterilization by gamma irradiation eliminates potential contamination by EtO residuals.
- ▶ Upstream vent prevents vapor lock.
- ▶ Built-in prefilter extends filter life when particulate-laden solutions such as serum-containing media are processed.

Applications

- ▶ Designed to add convenience to small- and medium-volume filtration (sterile and non-sterile).
- ▶ Suitable for use with fluids containing dilute proteins, preservatives, or other critical components.
- ▶ Sterile filtration of media and buffers.

Specifications

Materials of Construction

Filter Media: Supor [hydrophilic polyethersulfone (PES)] membrane
 Housing, Vent Plug: Polypropylene
 Sealing Technology: Thermal bonding
 Filling Bell: Polycarbonate

Pore Size

0.8/0.2 µm

Effective Filtration Area

20 cm²

Dimensions

Housing Length: 8.3 cm (3.3 in.)
 Housing Diameter: 6.7 cm (2.7 in.)

Inlet/Outlet Connections

6.4 - 12.7 mm (1/4 - 1/2 in.) diameter stepped hose barb with female luer slip interior and filling bell outlet

Typical Hold-Up Volume

(with 10 psi air purge)
 ≤ 2.5 mL

Maximum Operating Temperature and Pressure

60 °C (140 °F) at 1.0 bar (100 kPa, 15 psi)
 4.1 bar (410 kPa, 60 psi) at 21 - 24 °C (70 - 75 °F)

Recommended Integrity Test

Minimum Bubble Point - Water
 3.5 bar (350 kPa, 51 psi)

Typical Water Flow Rate

mL/min at 0.1 bar (10 kPa): 40
 mL/min/psi: 28

Bacterial Retention

Lot samples retain a minimum of 10⁷ cfu/cm² of *B. diminuta* per modified ASTM F838, current revision

Endotoxin Level

< 0.25 EU/mL using Limulus Amoebocyte Lysate (LAL) test

Biological Safety

Passes United States Pharmacopeia (USP) Biological Reactivity Test, *In Vivo* <88>

Sterilization

Can withstand one autoclave cycle at 125 °C (257 °F) for 60 minutes; water wet capsule prior to autoclaving. PN 12203 is sterilized by gamma irradiation and individually packaged.

Ordering Information

AcroPak 20 Filters With Supor Membrane

Part Number	Description	Pkg
12202	0.8/0.2 µm, non-sterile, with filling bell	3/pkg
12203	0.8/0.2 µm, gamma-irradiated, with filling bell	3/pkg

Related Products

AcroCap™ Positive Pressure Devices	124
Acrodisc® Syringe Filters With Supor Membrane	117, 118, 123
AcroPak™ Sterile Capsules With Supor Membrane	132, 137
Supor Membrane Disc Filters	111
VacuCap® Vacuum Filtration Devices	127

AcroPak™ 20 Filters and AcroPak 200 Capsule With Fluorodyne® II Membrane



Efficient processing of liquid volumes typically up to 20 L



- ▶ Fluorodyne II membrane is compatible with aqueous and many organic solvents.
- ▶ AcroPak 20 filters are designed to add convenience to small- and medium-volume filtrations.
- ▶ AcroPak 200 Fluorodyne II capsules provide fast processing of clean batches.
- ▶ Double layer sterilizing membrane enhances reliability.
- ▶ Upstream air vent prevents vapor lock.
- ▶ Manufactured without the use of adhesives to minimize extractables.
- ▶ Pre-sterilized by gamma irradiation.

Applications

- ▶ Sterile filtration of media and buffers.
- ▶ Point-of-use filtration for lab water.
- ▶ Suitable for viscous, particulate solutions, and serum-containing media.
- ▶ Applicable for many fluids containing dilute proteins or preservatives.
- ▶ Scalable.

Specifications

Materials of Construction

Filter Media: Fluorodyne II membrane (hydrophilic PVDF)
 Housing, Vent Plug: Polypropylene
 Sealing Technology: Thermal bonding
 Filling Bell: Polycarbonate

Pore Size

0.1 and 0.2 µm

Effective Filtration Area

20 and 200 cm²

Dimensions (Nominal)

AcroPak 20 Filters

Housing Length: 8.3 cm (3.3 in.)
 Housing Diameter: 6.7 cm (2.7 in.)

AcroPak 200 Capsule

Overall Length: 10.5 cm (4.1 in.)
 Housing Diameter With Vent:
 6.7 cm (2.6 in.)
 Housing Diameter Without Vent:
 5.3 cm (2.1 in.)

Inlet/Outlet Connections

6.4 - 12.7 mm (1/4 - 1/2 in.) diameter stepped hose barb with female luer slip interior and filling bell outlet

Typical Hold-Up Volume

(with 10 psi air purge)

AcroPak 20 Filters

≤ 2.5 mL

AcroPak 200 Capsule

≤ 6 mL

Recommended Integrity Test Minimum Bubble Point – Water

0.2 µm Fluorodyne II membrane:
 3.2 bar (320 kPa, 46 psi)

Maximum Operating Temperature and Pressure

60 °C (140 °F) at 1.0 bar (100 kPa, 15 psi)
 4.1 bar (410 kPa, 60 psi) at 21 - 24 °C (70 - 75 °F)

60% IPA/40% H₂O (v:v)

0.1 µm Fluorodyne II membrane:
 1.8 bar (180 kPa, 26 psi)

Typical Water Flow Rate

mL/min at 0.1 bar (10 kPa)
 [mL/min/psi]

AcroPak 20 Filters

0.1 µm Fluorodyne II Membrane: 13 (9)
 0.2 µm Fluorodyne II Membrane: 26 (18)

AcroPak 200 Capsule

0.2 µm Fluorodyne II Membrane:
 240 (170)

Bacterial Retention

Lot samples retain a minimum of 10⁷ cfu/cm² of *B. diminuta* per modified ASTM F838, current revision

Endotoxin Level

< 0.25 EU/mL using Limulus Amoebocyte Lysate (LAL) test

Biological Safety

Passes United States Pharmacopeia (USP) Biological Reactivity Test, *In Vivo* <88>

Sterilization

Sterilized by gamma irradiation and individually packaged. AcroPak 20 filters can withstand one autoclave cycle at 131 °C (268 °F) for 30 min.

Ordering Information

AcroPak 20 Filters With Fluorodyne II Membrane, With Filling Bell

Part Number	Description	Pkg
12208	0.1 µm, non-sterile	3/pkg
12209	0.1 µm, gamma-irradiated	3/pkg
12200	0.2 µm, non-sterile	3/pkg
12201	0.2 µm, gamma-irradiated	3/pkg

AcroPak 200 Capsule With Fluorodyne II Membrane, With Filling Bell

Part Number	Description	Pkg
12069	0.2 µm, gamma-irradiated	3/pkg

AcroPak™ 200 Capsules With Supor® EKV Membrane

For buffers, tissue culture media, and other biological fluids



- ▶ Newer technology recommended for simplified scale-up.
- ▶ High filtration area and compact size are ideal for upscale trials.
- ▶ Minimal hold-up volume.
- ▶ Good wettability for reliable integrity test.
- ▶ Sealed membrane and housing uses fusion technology to eliminate potential extractables.
- ▶ Gamma sterilized, non-pyrogenic, and provided with a removable filling bell (except sanitary flange option).
- ▶ Hydrophilic polyethersulfone membrane for low adsorption and wide chemical compatibility.
- ▶ Very high flow rates and consistently higher total solution throughputs due to superior porosity over other membranes.

Applications

- ▶ Designed to quickly process difficult-to-filter solutions within 5-21 L, such as serum, serum-supplemented culture media, and ascites fluid.
- ▶ Ideal in situations where rapid filtration or short processing times are essential.

Specifications

Materials of Construction

Filter Media: Supor EKV [hydrophilic polyethersulfone (PES)] membrane
Housing, Vent Plug, and Support Material: Polypropylene
Filling Bell: Polycarbonate (no filling bell on sanitary option)
Sealing Technology: Thermal bonding without adhesives

Pore Size

0.2 µm

Effective Filtration Area

220 cm²

Dimensions

Housing Length: 12094: 10.5 cm (4.1 in.); 12095: 7.3 cm (2.9 in.)
Housing Diameter: 5.3 cm (2.1 in.) without vent, 6.7 cm (2.6 in.) with vent

Inlet/Outlet Connections

12094: 6.4 - 12.7 mm (1/4 - 1/2 in.) stepped hose barb inlet and outlet
12095: 13 mm (1/2 in.) sanitary flange inlet/outlet

Typical Hold-Up Volume

(with 10 psi air purge)
< 6 mL

Maximum Operating Temperature

60 °C (140 °F) at 2.1 bar (210 kPa, 30 psi)

Maximum Operating Pressure

4.1 bar (410 kPa, 60 psi) at ambient temperature

Recommended Integrity Test Minimum Bubble Point - Water

≥ 3.32 bar (332 kPa, 48 psi)

Typical Liquid Flow Rate

350 mL/min/0.1 bar (241 mL/min/psi)

Bacterial Retention

Lot samples retain a minimum of 10⁷ cfu/cm² of *B. diminuta* per modified ASTM F838, current revision

Endotoxin Level

< 0.25 EU/mL using Limulus Amoebocyte Lysate (LAL) test

Biological Safety

Passes United States Pharmacopeia (USP) Biological Reactivity Test, *In Vivo* <88>

Sterilization

Sterilized by gamma irradiation and individually packaged. If desired, autoclave once at 131 °C (268 °F) for 30 minutes. Water wet capsule prior to autoclaving.

Ordering Information

AcroPak 200 Capsules With Supor EKV Membrane

Part Number	Description	Pkg
12094	0.2 µm, stepped hose barb inlet/stepped hose barb outlet with filling bell	3/pkg
12095	0.2 µm, 13 mm (1/2 in.) sanitary flange inlet/outlet connection	3/pkg

Related Products

AcroPak 20 Filters With Supor EKV Membrane	128
AcroPak 400, 800, and 1500 Capsules With Supor EKV Membrane	134

AcroPak™ 200 Capsules With Supor® Membrane

Efficient processing of liquid volumes up to 20 L



LABORATORY BIOPROCESSING filtration capsules

- ▶ Supor membrane has high flow rates and throughputs, and is ideal for solutions where low protein binding is required. Not recommended for use with some ketones.
- ▶ Built-in prefilter extends filter life when particulate-laden solutions, such as serum-containing media, are processed.
- ▶ Upstream vent prevents vapor lock.
- ▶ Manufactured without the use of adhesives to minimize extractables.
- ▶ Sterilization by gamma irradiation eliminates potential contamination by EtO residuals.

Applications

- ▶ Small- to medium-volume sterile filtration.
- ▶ Suitable for use with fluids containing dilute proteins, preservatives, or other critical components.
- ▶ Sterile filtration of media and buffers.
- ▶ Point-of-use filtration for laboratory water.

Specifications

Materials of Construction

Filter Media: Supor [hydrophilic polyethersulfone (PES)] membrane
Housing, Vent Plug, and Support Material: Polypropylene
Sealing Technology: Thermal bonding
Filling Bell: Polycarbonate

Pore Size

0.8/0.2 µm

Effective Filtration Area

200 cm²

Dimensions (Nominal)

Overall Length: 10.5 cm (4.1 in.)
Housing Diameter With Vent: 6.7 cm (2.6 in.)
Housing Diameter Without Vent: 5.3 cm (2.1 in.)

Inlet/Outlet Connections

6.4 - 12.7 mm (1/4 - 1/2 in.) stepped hose barb with filling bell on outlet

Typical Hold-Up Volume

(with 10 psi air purge)
≤ 6 mL

Maximum Operating Temperature

60 °C (140 °F) at 2.1 bar (210 kPa, 30 psi)

Maximum Operating Pressure

4.1 bar (410 kPa, 60 psi) at ambient temperature

Recommended Integrity Test Minimum Bubble Point – Water

3.5 bar (350 kPa, 51 psi)

Typical Water Flow Rate (1 cp)

mL/min at 0.1 bar (10 kPa): 300
mL/min/psi: 207

Bacterial Retention

Lot samples retain a minimum 10⁷ cfu/cm² of *B. diminuta* per modified ASTM F838, current revision

Endotoxin Level

< 0.25 EU/mL using Limulus Amoebocyte Lysate (LAL) test

Biological Safety

Passes United States Pharmacopeia (USP) Biological Reactivity Test, *In Vivo* <88>

Sterilization

Sterilized by gamma irradiation and individually packaged.

Ordering Information

AcroPak 200 Capsules With Supor Membrane

Part Number	Description	Pkg
12941	0.8/0.2 µm, gamma-irradiated, with filling bell	3/pkg
12093	0.8/0.2 µm, gamma-irradiated, with filling bell (1/4 in. MNPT inlet, 1/4 - 1/2 in. stepped barb outlet)	3/pkg

Related Products

AcroCap™ Positive Pressure Devices	124
Acrodisc® Syringe Filters with Supor Membrane	117, 118, 123
AcroPak Capsules with Supor Membrane	129, 137
Stainless Steel Pressure Vessels	283
Supor Membrane Disc Filters	111
VacuCap® Vacuum Filtration Devices	127

AcroPak™ 400, 800, and 1500 Capsules With Supor® EKV Membrane



For cost-effective filtration of buffers, tissue culture media, and other biological solutions



- ▶ Newer technology recommended for simplified scale-up.
- ▶ Disposable design reduces labor costs associated with assembling, cleaning, and testing stainless steel filter holders.
- ▶ Encapsulated format for ease of use.
- ▶ Extended life with built-in MachV asymmetric prefilter layer for maximum flow and throughput performance.
- ▶ Low adsorption and high chemical compatibility with hydrophilic polyethersulfone membrane for high compatibility over the entire pH range and low protein binding.
- ▶ Gamma-irradiated, non-pyrogenic, and non-cytotoxic.
- ▶ Inherently hydrophilic for reliable integrity testing.

Applications

- ▶ Suitable for sterile filtration of a wide range of fluids, including:
 - Buffers
 - Biological fluids
 - Cell culture media
 - Ophthalmic products

Specifications

Materials of Construction

Filter Media: Supor EKV [hydrophilic polyethersulfone (PES)] membrane
Housing, Vent Plug, and Support Material: Polypropylene
Filling Bell: Polycarbonate (no filling bell on sanitary flange option)
Sealing Technology: Thermal bonding without adhesives

Pore Size

0.2 µm

Effective Filtration Area

400 Series: 375 cm²
800 Series: 750 cm²
1500 Series: 1500 cm²

Dimensions

Housing Diameter (including valves):
9.4 cm (3.7 in.)

400 Series

Housing Length: 12460: 11.7 cm (4.6 in.)
12461: 15.7 cm (6.2 in.)

800 Series

Housing Length: 12463: 15.7 cm (6.2 in.)
12464: 19.7 cm (7.7 in.)

1500 Series

Housing Length: 12466: 17.4 cm (6.8 in.)
12467: 21.0 cm (8.3 in.)

Inlet/Outlet Connections

400 Series

12460: 25 - 38 mm (1 - 1.5 in.) sanitary flange inlet/outlet connection
12461: 13 mm (1/2 in.) hose barb inlet/outlet connection

800 Series

12463: 25 - 38 mm (1 - 1.5 in.) sanitary flange inlet/outlet connection
12464: 13 mm (1/2 in.) hose barb inlet/outlet connection

1500 Series

12466: 25 - 38 mm (1 - 1.5 in.) sanitary flange inlet/outlet connection
12467: 13 mm (1/2 in.) hose barb inlet/outlet connection

Maximum Operating Temperature

40 °C (104 °F) at 4.0 bar (400 kPa, 58 psi)

Maximum Operating Pressure

5.2 bar (520 kPa, 75 psi) at 20 °C (68 °F)

Recommended Integrity Test Minimum Bubble Point - Water

3.32 bar (332 kPa, 48 psi)

Typical Water Flow Rate

400 Series

700 mL/min/0.1 bar (483 mL/min/psi)

800 Series

1.5 L/min/0.1 bar (1.0 L/min/psi)

1500 Series

3.2 L/min/0.1 bar (2.2 L/min/psi)

Bacterial Retention

Lot samples retain a minimum of 10⁷ cfu/cm² of *B. diminuta* per modified ASTM F838, current revision

Endotoxin Level

< 0.25 EU/mL using Limulus Amoebocyte Lysate (LAL) test

Biological Safety

Passes United States Pharmacopeia (USP) Biological Reactivity Test, *In Vivo* <88>

Sterilization

Sterilized by gamma irradiation and individually packaged.

AcroPak™ 400, 800, and 1500 Capsules With Supor® EKV Membrane (continued)

Ordering Information

AcroPak 400 Capsules With Supor EKV Membrane

Part Number	Description	Pkg
12460	0.2 µm, 2.5 - 3.8 cm (1 - 1 1/2 in.) sanitary flange inlet/outlet connection, gamma-irradiated	1/pkg
12461	0.2 µm, 13 mm (1/2 in.) hose barb inlet/outlet connection with filling bell on outlet, gamma-irradiated	1/pkg

AcroPak 1500 Capsules With Supor EKV Membrane

Part Number	Description	Pkg
12466	0.2 µm, 2.5 - 3.8 cm (1 - 1 1/2 in.) sanitary flange inlet/outlet connection, gamma-irradiated	1/pkg
12467	0.2 µm, 13 mm (1/2 in.) hose barb inlet/outlet connection with filling bell on outlet, gamma-irradiated	1/pkg

AcroPak 800 Capsules With Supor EKV Membrane

Part Number	Description	Pkg
12463	0.2 µm, 2.5 - 3.8 cm (1 - 1 1/2 in.) sanitary flange inlet/outlet connection, gamma-irradiated	1/pkg
12464	0.2 µm, 13 mm (1/2 in.) hose barb inlet/outlet connection with filling bell on outlet, gamma-irradiated	1/pkg

Related Products

AcroPak 20 Filters With Supor EKV Membrane	128
AcroPak 200 Capsules With Supor EKV Membrane	131

AcroPak™ 400 and 800 Capsules With Fluorodyne® II Membrane

Designed for processing volumes up to 100 L



▶ Fluorodyne II membrane is a hydrophilic polyvinylidene fluoride (PVDF) that offers higher flow rates with low protein and preservative binding, and broad chemical and temperature resistance.

Applications

- ▶ Suitable for biological, pharmaceutical, and sterilizing filtration requirements.
- ▶ Scalable.

Pall's UpScaleSM Program

From drug discovery and basic research, through process development and production, Pall Corporation is the single source for all of your filtration and separation needs. Our UpScale program provides you with the scalable filtration products and support you need to bring new products to market faster.

UpScale direct flow filtration products include: Acrodisc® syringe filters, AcroPak capsules, and Kleenpak™ capsules. These products use the same membranes in larger or smaller effective filtration areas.

Specifications

Materials of Construction

Filter Media: Fluorodyne II membrane (hydrophilic PVDF)
 Housing and Vent Plug: Polypropylene
 Sealing Methods: Thermal bonding
 Filling Bell: Polycarbonate

Pore Size

0.1 and 0.2 μm

Effective Filtration Area

PN 12478, 12472: 400 cm²
 PN 12471, 12473: 800 cm²

Dimensions

Housing Diameter: 6.1 cm (2.4 in.)
 Approximate Length With Filling Bell:
 PN 12478, 12472: 19 cm (7.5 in.)
 PN 12471, 12473: 22.5 cm (8.9 in.)

Inlet/Outlet Connections

PN 12478, 12471: 6.4 - 12.7 mm (1/4 - 1/2 in.) stepped hose barb with filling bell on outlet
 PN 12472, 12473: 14 mm (9/16 in.) hose barb

Maximum Operating Temperature and Pressure

5.2 bar (520 kPa, 75 psi) at 40 °C (100 °F)

Maximum Differential Pressure

4.1 bar (410 kPa, 60 psi) at 40 °C (100 °F)

Recommended Integrity Test

Minimum Bubble Point – Water

0.2 μm: 3.2 bar (320 kPa, 46 psi)
60% IPA/40% H₂O (v:v)
 0.1 μm: 1.8 bar (180 kPa, 26 psi)

Typical Water Flow Rate

L/min at 0.1 bar (10 kPa)
 [L/min/psi]
 PN 12472: 0.3 [0.2]
 PN 12478: 0.5 [0.3]
 PN 12473: 0.6 [0.4]
 PN 12471: 0.9 [0.6]

Bacterial Retention

Lot samples retain 10⁷ cfu/cm² of *B. diminuta* per modified ASTM F838, current revision. Additionally, 0.1 μm capsules have a typical T_R of 10⁸ for *Acholeplasma laidlawii* (mycoplasma).

Endotoxin Level

< 0.25 EU/mL using Limulus Amoebocyte Lysate (LAL) test

Biological Safety

Passes United States Pharmacopeia (USP) Biological Reactivity Test, *In Vivo* <88>

Sterilization

Sterilized by gamma irradiation and individually packaged.

Ordering Information

AcroPak 400 Capsules With Fluorodyne II Membrane

Part Number	Description	Pkg
12472	0.1 μm, gamma-irradiated	1/pkg
12478	0.2 μm, gamma-irradiated	1/pkg

AcroPak 800 Capsules With Fluorodyne II Membrane

Part Number	Description	Pkg
12473	0.1 μm, gamma-irradiated	1/pkg
12471	0.2 μm, gamma-irradiated	1/pkg

filtration capsules

LABORATORY BIOPROCESSING

AcroPak™ 500, 1000, and 1500 Capsules With Supor® Membrane



Fast, final filtration and high throughputs for liquid volumes up to 150 L



- ▶ Provides higher throughputs and faster flow rates than similarly-sized competitive devices.
- ▶ Ideal for solutions requiring low protein binding.
- ▶ Saves money by increasing throughput with available built-in prefilter.
- ▶ 100% integrity testing assures sterile filtrate.
- ▶ 0.1 µm Supor membrane version ensures sterile, mycoplasma-free cell culture media.
- ▶ Fusion-welded components eliminate the potential for release of extractables from sealing adhesives.
- ▶ Sterilization by gamma irradiation eliminates potential contamination by EtO residuals.

Applications

- ▶ Large-volume media preparation.
- ▶ Pilot-scale manufacturing.
- ▶ Liquids requiring prefiltration such as serum-containing media.
- ▶ Sterile filtration of buffers.
- ▶ Point-of-use filtration for laboratory water.
- ▶ Reduce mycoplasma with the 0.1 µm pore size.

Specifications

Materials of Construction

Filter Media: Supor [hydrophilic polyethersulfone (PES)] membrane
Housing, Vent Plug, and Filter Support: Polypropylene
Sealing Technology: Thermal bonding
Filling Bell: Polycarbonate

Pore Size

0.1/0.1, 0.2/0.2, 0.8/0.2, and 0.8/0.45 µm

Effective Filtration Area

500 Series: 500 cm²
1000 Series: 1000 cm²
1500 Series: 1500 cm²

Dimensions

Housing Diameter: 6.9 cm (2.7 in.)
Overall Length (Without Filling Bell):
500 Series: 14.5 cm (5.7 in.)
1000 Series: 19.3 cm (7.6 in.)
1500 Series: 22.9 cm (9.0 in.)

Inlet/Outlet Connections

500 and 1000 Series

6.4 - 12.7 mm (1/4 - 1/2 in.) stepped hose barb with filling bell on outlet

1500 Series

12.7 mm (1/2 in.) straight hose barb, no filling bell on outlet

Typical Hold-Up Volume

(with 10 psi air purge)
500 Series: 30 mL
1000 Series: 45 mL

Maximum Operating Temperature

60 °C (140 °F) at 2.1 bar (210 kPa, 30 psi)

Maximum Operating Pressure

Continuous: 4.1 bar (410 kPa, 60 psi) at ambient temperature

Recommended Integrity Test

Minimum Bubble Point – Water

0.2 µm: 3.5 bar (350 kPa, 51 psi)
0.45 µm: 1.7 bar (170 kPa, 24 psi)
60% IPA/40% H₂O (v:v)
0.1 µm: 2.4 bar (240 kPa, 35 psi)

Typical Water Flow Rate

Lpm at 0.1 bar (10 kPa)
[Lpm/psi]:

Pore Size	500 series	1000 series	1500 series
0.1/0.1 µm	0.2 [0.2]	0.4 [0.3]	–
0.2/0.2 µm	0.6 [0.4]	1.1 [0.8]	1.6 [1.1]
0.8/0.2 µm	1.1 [0.8]	1.6 [1.1]	2.2 [1.5]
0.8/0.45 µm	1.3 [0.9]	2.5 [1.7]	–

Bacterial Retention

0.1/0.1 µm Capsules: Lot samples retain a minimum of 10⁷ cfu/cm² of *A. laidlawii* challenge per modified ASTM F838, current revision
0.2 µm Capsules: Lot samples retain a minimum of 10⁷ cfu/cm² of *B. diminuta* per modified ASTM F838, current revision

Endotoxin Level

< 0.25 EU/mL using Limulus Amoebocyte Lysate (LAL) test

Biological Safety

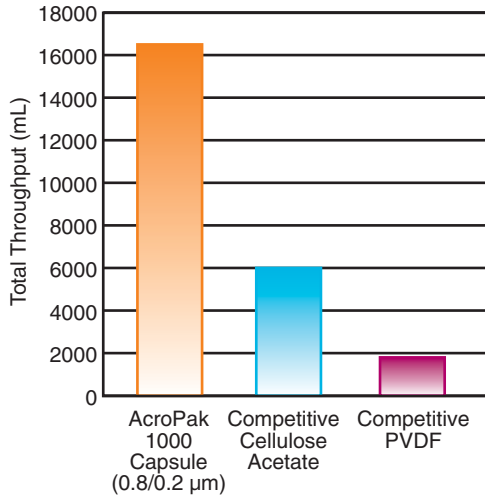
Passes United States Pharmacopeia (USP) Biological Reactivity Test, *In Vivo* <88>

Sterilization

Sterilized by gamma irradiation. If desired, autoclave once only prior to use at 121 - 123 °C (250 - 253 °F) for a maximum of 20 min.

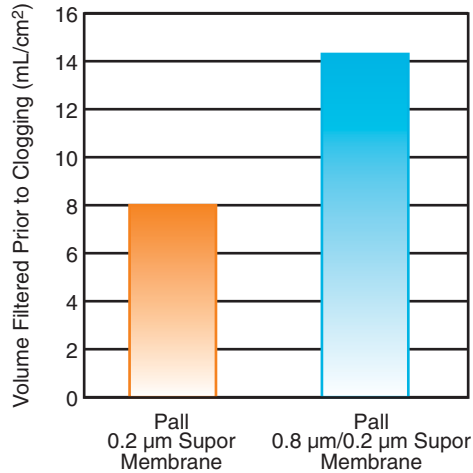
Performance

Total Throughput Recorded for Devices With an EFA of Up to 1000 cm²



Throughput determined using 3% TSB.

Built-In Prefilter Enhances Total Throughput



Membrane Type: 47 mm disc
Throughput determined using 2.5% TSB.

Ordering Information

AcroPak 500 Capsules With Supor Membrane

Part Number	Description	Pkg
12997	0.1/0.1 µm, gamma-irradiated	1/pkg
12995	0.2/0.2 µm, gamma-irradiated	1/pkg
12991	0.8/0.2 µm, gamma-irradiated	1/pkg
12993	0.8/0.45 µm, gamma-irradiated	1/pkg

AcroPak 1500 Capsules With Supor Membrane

Part Number	Description	Pkg
12686	0.2/0.2 µm, gamma-irradiated	1/pkg
12675	0.8/0.2 µm, gamma-irradiated	1/pkg

AcroPak 1000 Capsules With Supor Membrane

Part Number	Description	Pkg
12999	0.1/0.1 µm, gamma-irradiated	1/pkg
12996	0.2/0.2 µm, gamma-irradiated	1/pkg
12992	0.8/0.2 µm, gamma-irradiated	1/pkg
12994	0.8/0.45 µm, gamma-irradiated	1/pkg

Related Products

AcroCap™ Positive Pressure Devices	124
Acrodisc® Syringe Filters with Supor Membrane	117, 118, 123
AcroPak 200 Capsules	131 -132
Stainless Steel Pressure Vessels	283
VacuCap® Vacuum Filtration Devices	127

Capsules With HT Tuffryn® Membrane

Membrane filters for proven applications



- ▶ Obtain accurate fills, uniform flow, and good throughput. Built-in air vent allows elimination of trapped air bubbles.
- ▶ Integrity testable to ensure product and system integrity.
- ▶ Sterilization by gamma irradiation eliminates potential contamination by EtO residuals.

Applications

- ▶ Use for filtration of batches ranging from 1 to 10 L (Micro Culture Capsule) and 10 to 20 L (Culture and Maxi Culture Capsules) of buffers and cell culture media.

Specifications

Materials of Construction

Filter Media: HT Tuffryn membrane (polysulfone)
 Housing and Filling Bell: Polycarbonate
 Vent Plug and Core: Polypropylene
 Filter Support: Polyester
 Sealing Materials: Polyurethane

Effective Filtration Area

PN 12158: 300 cm²
 PN 12140 and 12170: 500 cm²
 PN 12141: 1290 cm²

Inlet/Outlet Connections

PN 12140, 12170, and 12141: Hose barb fittings accept 12.7 mm (1/2 in.) ID tubing
 PN 12158: Stepped hose barbs 6.4 - 9.5 mm (1/4 - 3/8 in.) diameter

Typical Hold-Up Volume

with 0.7 bar (70 kPa, 10 psi) air purge
 PN 12158: 15 mL
 PN 12140 and 12170: 25 mL
 PN 12141: 113 mL

Maximum Operating Temperature

100 °C (212 °F)

Maximum Operating Pressure

3.4 bar (340 kPa, 50 psi) at ambient

temperature

Recommended Integrity Test Minimum Bubble Point – Water

2.4 bar (240 kPa, 35 psi)

Typical Water Flow Rate

L/min at 0.7 bar (70 kPa, 10 psi)
 PN 12158: 1.2
 PN 12140, and 12170: 2.0
 PN 12141: 5.2

Bacterial Retention

Lot samples retain a minimum of 10⁷ cfu/cm² of *B. diminuta* per modified ASTM F838, current revision

Endotoxin Level

< 0.5 EU/mL using Limulus Amoebocyte Lysate (LAL) test

Biological Safety

Passes United States Pharmacopeia (USP) Biological Reactivity Test, *In Vivo* <88>

Sterilization

Sterilized by gamma irradiation. If desired, autoclave once only prior to use at 121 - 123 °C (250 - 253 °F) for a maximum of 20 min.

Ordering Information

Capsules With HT Tuffryn Membrane

Part Number	Description	Pkg
12158	Micro Culture capsule with filling bell, 0.2/0.2 µm, 300 cm ² , gamma-irradiated	1/pkg
12140	Culture capsule, 0.2/0.2 µm, 500 cm ² , gamma-irradiated	1/pkg
12170	Culture capsule with filling bell, 0.2/0.2 µm, 500 cm ² , gamma-irradiated	1/pkg
12141	Maxi Culture capsule, 0.2/0.2 µm, 1290 cm ² , gamma-irradiated	1/pkg

Accessories and Replacement Parts

Part Number	Description	Pkg
4227	Filling bell, sterile	5/pkg

Related Products

HT Tuffryn Polysulfone Membrane Disc Filters 112

Supracap™ 50 Depth Filter Capsules

Scalable capsule with Seitz® high performance depth filter media



- ▶ Low hold-up volume allows for increased product recovery and requires low post-use rinse volumes. For filtration of 1 - 3 L.
- ▶ Offers greater flexibility and assurance of application success from development to production scale. Scalable to Pall's entire line of traditional SUPRADisc™ modules, as well as Stax™ capsules.
- ▶ Seitz BIO 20 media is ideal for ion sensitive products, such as parenteral solutions, therapeutic proteins, dialysis solutions, and protein-based diagnostics.
- ▶ Seitz P900 media applications include course filtration in the biotechnological industries.
- ▶ Seitz HP-Series media performs exceptionally well in low viability, high solids-containing applications, and with wider distribution of particle sizes in biotech applications.

Applications

- ▶ Cell harvesting.
- ▶ Clarification of fermentation broth.
- ▶ Antibiotics.
- ▶ Vaccines.
- ▶ Blood plasma proteins and serum.
- ▶ Media.

Specifications

Materials of Construction

Capsule: Polycarbonate

Vent: Polypropylene

Media:

Seitz BIO 20

Highly purified natural and modified celluloses, free from inorganic materials

Seitz P-Series

Comprised of cellulose fibers, filter aids (diatomaceous earth and perlite), and resins

Seitz HP-Series

Two distinct layers of Seitz P-Series depth filter sheets that feature a more permeable layer followed by a less permeable layer (PDD1, PDE2, PDH4, and PDK5)

Effective Filtration Area

22 cm² (0.024 ft²)

Nominal Dimensions

Maximum Height (Single Layer):

42 mm (1.65 in.)

Maximum Height (HP Media):

52 mm (2.05 in.)

Maximum Diameter: 64 mm (2.52 in.)

Ordering Information

Supracap 50 Depth Filter Capsules

Part Number	Description	Pkg
SC050B020	0.4 - 1.0 µm, Seitz BIO 20 media	1/pkg
SC050P100	1.0 - 3.0 µm, Seitz P100 media	1/pkg
SC050P200	3.0 - 6.0 µm, Seitz P200 media	1/pkg
SC050P250	4.0 - 9.0 µm, Seitz P250 media	1/pkg
SC050P700	6.0 - 15.0 µm, Seitz P700 media	1/pkg
SC050P900	8.0 - 20.0 µm, Seitz P900 media	1/pkg
SC050PDD1	0.1 - 0.85 µm, Seitz PDD1 media	1/pkg
SC050PDE2	0.2 - 3.5 µm, Seitz PDE2 media	1/pkg
SC050PDH4	0.5 - 15.0 µm, Seitz PDH4 media	1/pkg
SC050PDK5	1.5 - 20 µm, Seitz PDK5 media	1/pkg
SC050XAK7	Seitz AKS7 media (activated carbon)	1/pkg

Maximum Operating

Temperature and Pressure*

3 bar (300 kPa, 44 psi) at 40 °C (140 °F)

Maximum Differential Pressure*

1.5 bar (22 psi) @ 25 °C (77 °F)

Sterilization

Autoclave 1 cycle: 125 °C (248 °F)

for 30 min.

Biological Safety

All plastic components used in construction meet the specifications for Biological Reactivity Tests *In Vivo* for Class VI Plastics (121 °C) as described in the current United States Pharmacopoeia (USP).

*In compatible fluids that do not soften, swell, or adversely affect the filter or its materials of construction.

Supracap™ 100 Depth Filter Capsules

Scalable capsule with Seitz® high performance depth filter media



- ▶ Flexible choices in filter media for prefiltration and removal of coarse particulate.
- ▶ Low hold-up volume allows for increased product recovery and requires low post-use rinse volumes. For filtration of 3 to 100 L.
- ▶ Mechanically robust design provides unobstructed process flows, consistent and scalable filtration results, and high filter media integrity.
- ▶ Completely disposable technology eliminates the need for cleaning and cleaning validation.
- ▶ Encapsulated design reduces operator exposure to potential biohazards.
- ▶ Tested and certified. Manufactured under a Quality Management System certified to ISO 9000 and ISO 9001, and an Environmental Management System certified to ISO 14001.
- ▶ Offers flexibility and assurance of application success from development to production scale. Scalable to Pall's entire line of traditional SUPRADisc™ modules, as well as Stax™ capsules.

Applications

- ▶ Biopharmaceuticals.
- ▶ Mammalian cell cultures.
- ▶ Therapeutic proteins.
- ▶ *E.coli* lysates and refolds.
- ▶ Vaccines.
- ▶ Blood plasma proteins and serum.
- ▶ Media.
- ▶ Yeast.

Specifications

Materials of Construction

Housing Bowl: Polypropylene

Housing Head*: Polypropylene

O-rings: Silicon elastomers

Media:

Seitz Bio 20

Highly purified natural and modified celluloses, free from inorganic materials

Seitz P-Series

Comprised of cellulose fibers, filter aids (diatomaceous earth and perlite), and resins

Seitz HP-Series

Two distinct layers of Seitz P-Series depth filter sheets that feature a more permeable layer followed by a less permeable layer (PDD1, PDE2, PDH4, and PDK5)

Effective Filtration Area

NP5L Single Layer: 0.05 m² (0.54 ft²)

NP5L HP-version: 0.025 m² (0.27 ft²)

NP6 Single Layer: 0.1 m² (1.08 ft²)

NP6 HP-version: 0.05 m² (0.54 ft²)

Nominal Dimensions

NP5 and NP6 Maximum Diameter:
154 mm (6.1 in.)

NP5 Maximum Height With Hose Barb
Inlet/Outlet: 263 mm (10.4 in.)

NP6 Maximum Height With Hose Barb
Inlet/Outlet: 397 mm (15.6 in.)

NP5 Maximum Height With Sanitary
Inlet/Outlet: 213 mm (8.4 in.)

NP6 Maximum Height With Sanitary
Inlet/Outlet: 335 mm (13.2 in.)

Maximum Operating Temperature and Pressure**

3 bar (300 kPa, 44 psi) at 40 °C (104 °F)

Maximum Differential Pressure**

2.4 bar (35 psi)

Sterilization

Autoclave 1 cycle: 125 °C (257 °F) for 60 min.

Biological Safety

All plastic components used in construction meet the specifications for Biological Reactivity Tests *In Vivo* for Class VI Plastics (121 °C) as described in the current United States Pharmacopoeia (USP).

* Formulated with TiO₂ whitener, which does not contribute to organic extractables.

** In compatible fluids that do not soften, swell, or adversely affect the filter or its materials of construction.

Ordering Information

Supracap 100 Capsules, 5 in.

Part Number	Description	Pkg
NP5LB0201*	0.4 - 1.0 µm, Bio 20 media	1/pkg
NP5LB0206**	0.4 - 1.0 µm, Bio 20 media	1/pkg
NP5LP1001*	1.0 - 3.0 µm, P100 media	1/pkg
NP5LP1006**	1.0 - 3.0 µm, P100 media	1/pkg
NP5LP2001*	3.0 - 6.0 µm, P200 media	1/pkg
NP5LP2006**	3.0 - 6.0 µm, P200 media	1/pkg
NP5LP2501*	4.0 - 9.0 µm, P250 media	1/pkg
NP5LP2506**	4.0 - 9.0 µm, P250 media	1/pkg
NP5LP7001*	6.0 - 15.0 µm, P700 media	1/pkg
NP5LP7006**	6.0 - 15.0 µm, P700 media	1/pkg
NP5LP9001*	8.0 - 20.0 µm, P900 media	1/pkg
NP5LP9006**	8.0 - 20.0 µm, P900 media	1/pkg
NP5LPDD11*	0.1 - 0.85 µm, PDD1 media	1/pkg
NP5LPDD16**	0.1 - 0.85 µm, PDD1 media	1/pkg
NP5LPDE21*	0.2 - 3.5 µm, PDE2 media	1/pkg
NP5LPDE26**	0.2 - 3.5 µm, PDE2 media	1/pkg
NP5LPDH41*	0.5 - 15.0 µm, PDH4 media,	1/pkg
NP5LPDH46**	0.5 - 15.0 µm, PDH4 media	1/pkg
NP5LPDK51*	1.5 - 20.0 µm, PDK5 media	1/pkg
NP5LPDK56**	1.5 - 20.0 µm, PDK5 media	1/pkg

*All part numbers ending in "1" have a 1 - 1-1/2 in. sanitary flange inlet/outlet.

**All part numbers ending in "6" have a 13 mm (1/2 in.) single hose barb inlet/outlet.

Supracap 100 Capsules, 10 in.

Part Number	Description	Pkg
NP6B0201*	0.4 - 1.0 µm, Bio 20 media	1/pkg
NP6B0206**	0.4 - 1.0 µm, Bio 20 media	1/pkg
NP6P1001*	1.0 - 3.0 µm, P100 media	1/pkg
NP6P1006**	1.0 - 3.0 µm, P100 media	1/pkg
NP6P2001*	3.0 - 6.0 µm, P200 media	1/pkg
NP6P2006**	3.0 - 6.0 µm, P200 media	1/pkg
NP6P2501*	4.0 - 9.0 µm, P250 media	1/pkg
NP6P2506**	4.0 - 9.0 µm, P250 media	1/pkg
NP6P7001*	6.0 - 15.0 µm, P700 media	1/pkg
NP6P7006**	6.0 - 15.0 µm, P700 media	1/pkg
NP6P9001*	8.0 - 20.0 µm, P900 media	1/pkg
NP6P9006**	8.0 - 20.0 µm, P900 media	1/pkg
NP6PDD11*	0.1 - 0.85 µm, PDD1 media	1/pkg
NP6PDD16**	0.1 - 0.85 µm, PDD1 media	1/pkg
NP6PDE21*	0.2 - 3.5 µm, PDE2 media	1/pkg
NP6PDE26**	0.2 - 3.5 µm, PDE2 media	1/pkg
NP6PDH41*	0.5 - 15.0 µm, PDH4 media	1/pkg
NP6PDH46**	0.5 - 15.0 µm, PDH4 media	1/pkg
NP6PDK51*	1.5 - 20.0 µm, PDK5 media	1/pkg
NP6PDK56**	1.5 - 20.0 µm, PDK5 media	1/pkg

Mini Profile® Capsules

Scalable depth capsules for prefiltration and clarification



- ▶ High capacity depth medium is absolute particle rated for reliability.
- ▶ Filter materials offer broad chemical compatibilities.
- ▶ Optimized for viscous fluids.
- ▶ Mini Profile II filters have a thick depth structure, providing high capacity for larger solids and gels as well as for fine particles.
- ▶ Profile Star filters feature high area star-shaped pleated construction. The patented design combines the advantages of thick depth filters with those of traditional high area pleated filters.

Applications

- ▶ Designed for small-volume production and scale-up evaluation.
- ▶ Can be used for the clarification of biological products.
- ▶ Optimized for viscous fluids.
- ▶ Excellent for gel removal.

Specifications

Materials of Construction

Filter Media, Core/End Caps, and Housing: Polypropylene
13 mm Single Hose Barb Adapter: Acetal

Absolute Removal Ratings (Liquid)

99.98% by modified OSU-F2 Beta test.
For further details contact Pall.

Effective Filtration Area

Profile II Filter: 46 cm² (7.1 in.²)
Profile Star Filter: 90 cm² (14.5 in.²)

Inlet/Outlet Connections

13 mm (9/16 in.) hose barb

Maximum Operating Temperature and Pressure

(in compatible fluids that do not adversely affect the filter or materials of construction)

Profile II Filter

30 °C (86 °F) at 4.1 bar
410 kPa, 60 psi)
50 °C (122 °F) at 3.4 bar
(340 kPa, 50 psi)

Profile Star Filter

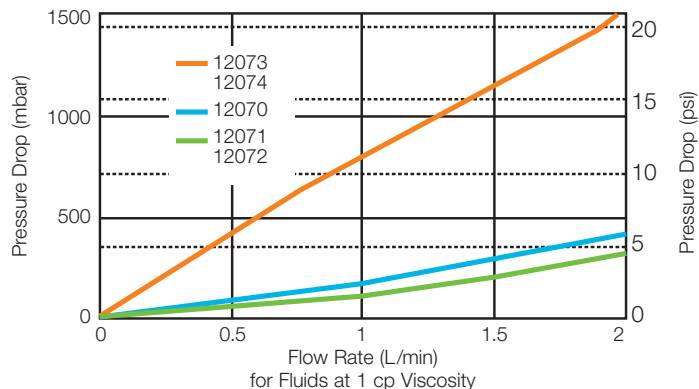
50 °C (122 °F) at 5.0 bar
(500 kPa, 75 psi)

Sterilization

Provided non-sterile. Can be autoclaved up to 3 cycles at 125 °C (257 °F) for 30 min.

Performance

Typical Water Flow Rate



Ordering Information

Mini Profile Capsules

Part Number	Description	Pkg
12073	Profile II filter, 0.5 µm	3/pkg
12074	Profile II filter, 1 µm	3/pkg
12070	Profile Star filter, 1.5 µm	3/pkg
12071	Profile Star filter, 3 µm	3/pkg
12072	Profile Star filter, 5 µm	3/pkg

Polypure® Capsules

All-polypropylene-graded density prefilters extend final filter life



- ▶ All-polypropylene components provide superior chemical compatibility and low levels of extractables.
- ▶ Melt-blown media and thermally bonded construction protect purity and integrity of filtered solutions.
- ▶ High dirt-holding capacity improves throughput and extends the life of your final filters, especially when working with viscous solutions.
- ▶ Listed as acceptable for food contact according to the Code of Federal Regulations, Title 21.
- ▶ Provides excellent flow rates.

Applications

- ▶ Excellent flow rates make capsules ideal for prefiltration of biologicals, serum-based products, beverages, plating solutions, ink, syrup, water, and a wide range of solvents.
- ▶ Ideal in situations where rapid filtration or short processing times are essential.
- ▶ Broad chemical compatibility of capsules makes general clarification of fluids easy.
- ▶ Can be used for compressed air and gas filtration.

Specifications

Materials of Construction

Filter Media: Graded-density non-woven polypropylene
Housing, Vent Plug, and Filter Support: Polypropylene
Sealing Technology: Thermal bonding

Effective Filtration Area

1500 cm²

Housing Length

22.9 cm (9.0 in.)

Inlet/Outlet Connection

12.7 mm (1/2 in.) straight hose barb

Housing Diameter

6.9 cm (2.7 in.)

Typical Water Flow Rate

24.0 L/min/0.1 bar (10 kPa)
(16.7 L/min/psi)

Maximum Operating Pressure

4.1 bar (410 kPa, 60 psi) at ambient temperature

Maximum Operating Temperature

82 °C (180 °F) at 0.7 bar
(70 kPa, 10 psi)

Biological Safety

Passes United States Pharmacopeia (USP) Biological Reactivity Test, *In Vivo* <88>

Sterilization

Autoclave 121 °C (250 °F) at 1 bar
(10 kPa, 15 psi) for 20 min.

Ordering Information

Polypure Capsules

Part Number	Description	Pkg
12075	1 µm	1/pkg
12076	5 µm	1/pkg
12077	10 µm	1/pkg

Related Products

AcroPak™ Capsules with Supor® Membrane 129, 132, 137

Carbon Capsule

Removes odor, colloids, and organics from liquids using activated carbon



- ▶ Finely divided carbon provides an active surface area of 70,000 m².
- ▶ Ready to use and disposable.

Applications

- ▶ For laboratory and reagent-grade water and chemical filtration.
- ▶ Protects laboratory from organic solvent odor.

Specifications

Materials of Construction

Filter Media: 100 g activated carbon
Housing: Polycarbonate
Upstream/Downstream Supports:
Nylon felt pad
Adapters: Nylon

Typical Effective Surface Area

70,000 m² of carbon

Dimensions

Housing Length: 18.7 cm (7.4 in.)
Overall Length: 25.4 cm (10 in.)
Diameter: 5.8 cm (2.3 in.)

Inlet/Outlet Connections

3/8 in. FNPT; includes optional hose barb fittings to accept 12.7 mm (1/2 in.) ID tubing

Maximum Operating Temperature

80 °C (176 °F)

Maximum Operating Pressure

3.4 bar (340 kPa, 50 psi) at ambient temperature

Ordering Information

Carbon Capsule

Part Number	Description	Pkg
12011	Carbon capsule	1/pkg

Tangential Flow Filtration

Ensuring Fast, Efficient Biomolecule Processing

Tangential flow filtration (TFF) is a rapid and efficient method for separation and purification of biomolecules. It can be applied to a wide range of biological fields such as immunology, protein chemistry, molecular biology, biochemistry, and microbiology. TFF can be used to concentrate and desalt sample solutions ranging in volume from 10 mL to thousands of liters. It can be used to fractionate large from small biomolecules, harvest cell suspensions, and clarify fermentation broths and cell lysates.

Why Use Tangential Flow Filtration?

1. **Easy to set up and use** – Simply connect the TFF device to a pump and pressure gauge(s) with tubing and a few fittings, add your sample to the reservoir, and begin filtration.
2. **Fast and efficient** – It is easier to set up and much faster than dialysis. Higher concentrations can be achieved in less time than when using centrifugal devices or stirred cells.
3. **Perform two steps with one system** – Concentrate and diafilter a sample on the same system, saving time and avoiding product loss.
4. **Can be scaled up or scaled down** – Materials of construction and cassette path length allow conditions established during pilot-scale trials to be applied to process-scale applications. TFF devices that can process sample volumes as small as 10 mL or as large as thousands of liters are available.
5. **Economical** – TFF devices and cassettes can be cleaned and reused, or disposed of after single use. A simple integrity test can be performed to confirm that membrane and seals are intact.

For easy product selection, consider the following application variables.

Consider the Biomolecule of Interest

Your biomolecule of interest, or product, can be retained and separated from the low molecular weight contaminants, or it can be passed and purified from higher molecular weight contaminants and particles.

In general, a membrane with a molecular weight cut-off (MWCO) should be selected that is three to six times smaller than the molecular weight of the protein to be retained. Other factors can also impact the selection of the appropriate MWCO. For example, if flow rate (or processing time) is a major consideration, selection of a membrane with an MWCO toward the lower end of this range (3x) will yield higher flow rates. If recovery is the primary concern, selection of a tighter membrane (6x) will yield maximum recovery (with a slower flow rate). These values should be used as a general guide, as solute retention and selectivity can vary depending on many factors, such as transmembrane pressure, molecular shape or structure, solute concentration, presence of other solutes, and ionic conditions. See page 20 for MWCO selection charts.

Our membranes are highly selective and typically achieve recoveries in the range of 95 to 99%. The narrow pore size distribution of these membranes results in minimal molecule retention of molecular weights below the MWCO of the membrane. For information on MWCO of specific molecules, visit www.pall.com/lab.

Consider Fluid Characteristics

Sample concentration and viscosity determine the type of channel that is required for the process run. Pall's lab-scale TFF devices are available in screen or suspended screen configurations. Typically, screen channel configuration is used for clarified, dilute solutions free of particulate or aggregates. Suspended screen channel TFF cassettes provide better performance with highly viscous or particulate-laden solutions.

Consider the Sample Volume and Processing Time

Choosing the appropriate cassette or device size depends on the total sample volume, the required process time, and the desired final sample volume.

Pall's Minimate™ system works with the Minimate capsules to easily process sample volumes up to 1000 mL. Ultrasette™ Lab Tangential Flow Filtration devices provide optimal processing of 200 mL to 5 L. For process development and scale-up applications, Pall Life Sciences offers an extensive line of TFF holders and cassettes. With these products, a complete TFF system for full production can be optimized using the volumes typically generated in the development or discovery lab.



Minimate TFF systems feature a simple “plug-n-play” design that streamlines lab-scale concentration, desalting, and buffer exchange processes.

Introduction to Tangential Flow Filtration

How Does TFF Separate Biomolecules?

In TFF, also known as crossflow filtration, liquid is pumped across the membrane surface, minimizing fouling by sweeping retained molecules off the surface. Filtration is achieved by creating pressure against the membrane in the retentate stream, causing solute and small molecules to pass through the membrane. An analogy for understanding the theory behind TFF can be seen in trying to separate sand from pebbles using a sifting screen. The holes in the screen represent the pores in the membrane while the sand and pebbles represent the molecules to be separated. In direct flow filtration (DFF), the sand and pebble mixture is forced toward the holes in the screen. As some smaller sand grains fall through the pores in the screen, the larger pebbles form a layer on the surface of the screen. This prevents sand grains at the top of the mixture from moving to and through the holes. With DFF, increasing the pressure simply compresses the mixture without increasing the separation. In contrast, operating in a TFF mode prevents the formation of a restrictive layer by recirculating the mixture. The process acts like a shaking sifter to remove the pebbles that block the holes in the screen, allowing the sand grains at the top of the mixture to fall toward and through the holes in the screen. Therefore, TFF may be a more efficient method to separate biomolecules resulting in faster concentration or diafiltration processes.

Key Applications for TFF

The primary applications for TFF are concentration, diafiltration (desalting and buffer exchange), and fractionation of large from small biomolecules. In addition, it can be used for clarification and removal of cells, as well as cellular debris from fermentation or cell culture broths.

Concentration

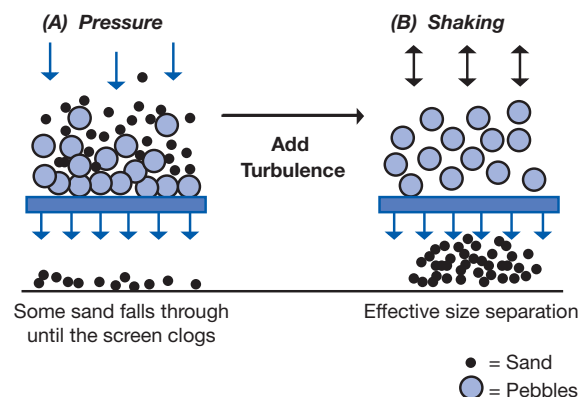
Concentration is a simple process that involves removing fluid from a solution while retaining the solute molecules. The concentration of the solute increases in direct proportion to the decrease in solution volume (i.e., halving the volume effectively doubles the concentration). To concentrate a sample, choose an ultrafiltration (UF) membrane with an MWCO that is substantially lower than the molecular weight of the molecules to be retained. This is important in order to assure complete retention and high recovery of the target molecule.

Diafiltration

Diafiltration is the fractionation process that washes smaller molecules through a membrane and leaves larger molecules in the retentate without ultimately changing concentration. It can be used to remove salts or exchange buffers. It can remove ethanol or other small solvents or additives.

There are several ways to perform diafiltration. In continuous diafiltration, the diafiltration solution (water or buffer) is added to the sample feed reservoir at the same rate as filtrate is generated. In this way, the volume in the sample reservoir remains constant, but the small molecules (e.g., salts) that can freely permeate through the membrane are washed away. Using salt removal as an example, each additional diafiltration volume (DV) reduces the salt concentration further. (Adding a volume of water or buffer to the feed reservoir equal to the volume of product in the system, then concentrating back to the starting volume constitutes one diafiltration volume. For example, if you have a 500 mL sample to start, 1 DV = 500 mL.) Using 5 DV will reduce the ionic strength by ~99% with continuous diafiltration.

Separation of Sand and Pebbles Using a Sifting Screen



(A) Applying direct pressure to the mixture allows the sand grains at the bottom to fall through the screen. A layer of pebbles builds up at the screen surface preventing sand grains at the top from moving to and through the screen.

(B) Shaking the screen breaks up the aggregated pebble layer at the bottom of the mixture and allows for complete fractionation. The crossflow dynamic of the feed stream in TFF serves the same purpose as shaking in this example.

In discontinuous diafiltration, the solution is first diluted and then concentrated back to the starting volume. This process is then repeated until the required concentration of small molecules (e.g., salts) remaining in the reservoir is reached. Each additional DV reduces the salt concentration further. Using 5 DV will reduce the ionic strength by ~96% with discontinuous diafiltration. Continuous diafiltration requires less filtrate volume to achieve the same degree of salt reduction as discontinuous diafiltration, as illustrated in the table on the right. By first concentrating a sample, the amount of diafiltration solution required to achieve a specified ionic strength can be substantially reduced. To reduce the ionic strength of a 1 liter sample by 96% using discontinuous diafiltration requires 5 DV or, in this case, 5 liters. If the sample is first concentrated ten fold to 100 mL, then 5 DV is now only 500 mL. This represents a substantial savings in buffer and time.

Comparison of Continuous vs. Discontinuous Diafiltration

Diafiltration Volumes (DV)	Continuous Percent Removal (%)	Discontinuous Percent Removal
1	63.2	50.0
2	86.5	75.0
3	95.0	87.5
4	98.2	93.8
5	99.3	96.9
6	99.8	98.4
7	99.9	99.2



tangential flow filtration

LABORATORY BIOPROCESSING

Minimate™ Tangential Flow Filtration Capsules



Disposable TFF device for bioprocessing applications accelerates and simplifies processing of up to 1 L



- ▶ Efficient processing. Concentration and diafiltration (desalting or buffer exchange) processes can be performed on the same system with minimal user intervention.
- ▶ Achieves high concentration factors in a single step due to the low hold-up volume of the device. Process sample volumes up to 1 L or more and efficiently concentrate samples to as little as 5 mL.
- ▶ Minimate TFF capsule includes all fittings and tubing to simplify installation into filtration setups. This versatile, self-contained device works with a variety of positive pressure laboratory pumps.
- ▶ Cost-effective design for non-critical applications. The plastic construction of the Minimate TFF capsule and chemical compatibility of the Omega™ PES ultrafiltration membrane facilitate cleaning and reuse.
- ▶ Scalable. Several Minimate TFF capsules may be connected in parallel for increased membrane area. (For more information, contact Pall Technical Service.) Minimate TFF capsules have the same path length and materials of construction as larger Pall Centramate™ and Centrasette™ cassette systems used in pilot and production plants. Predictable performance saves time when scaling up a process.

- ▶ High product recovery. Optimized flow path design coupled with low protein binding Omega membrane minimize non-specific binding.
- ▶ Disposable, economically-priced device can be dedicated to a single batch or process eliminating the time required for cleaning and validation.
- ▶ Each pharmaceutical-grade Minimate capsule is 100% integrity tested during manufacture to ensure reliable performance. For critical applications, the user can re-test the integrity after initial use. A Certificate of Quality is included with each capsule.

Applications

- ▶ Concentrate and desalt proteins, peptides, or nucleic acids (DNA, RNA, oligonucleotides).
- ▶ Recover antibodies or recombinant proteins from clarified cell culture media.
- ▶ Process metal sensitive enzymes and molecules.
- ▶ Separate (fractionate) large from small biomolecules.
- ▶ Concentrate viruses or gene therapy vectors.
- ▶ Prepare samples before, after, or between steps to column chromatography.
- ▶ Concentrate samples after gel filtration.
- ▶ Depyrogenate water, buffers, and media solutions.

Specifications

Materials of Construction

Filter Media: Omega membrane (modified polyethersulfone)
Housing: Polypropylene, glass reinforced
Screens, Housing, Housing Sealing Ring, Fittings: Polypropylene
Membrane Plate/Filtrate Channels: Polyethylene
Internal Gasket: Ethylene propylene elastomer

Effective Filtration Area

50 cm² (0.05 ft²)

Dimensions (Nominal)

20 cm x 3.8 cm x 1.8 cm
(8 in. x 1.5 in. x 0.7 in.)

Recommended Crossflow

30 - 80 mL/min (0.6 - 1.6 L/min/ft²)

Product Hold-Up Volume (Feed/Retentate)

Approximately 1.6 mL

Operating Temperature Range

5 - 50 °C (41 - 122 °F)

Maximum Operating Pressure

4 bar (400 kPa, 60 psi) @ 20 °C (68 °F)

pH Range

1 - 14

Forward Flow Air Integrity Value

≤ 7 mL/min @ 0.7 bar
(70 kPa, 10 psi)

Pall's UpScaleSM Program

From drug discovery and basic research through process development and production, Pall Corporation is the single source for all of your filtration and separation needs. Our UpScale program provides you with the scalable filtration products and support you need to bring new products to market faster.

Other filters with the same membranes in larger effective filtration areas include CentramateTM and CentrasetteTM cassette systems.

Ordering Information

MinimateTM TFF Capsules With OmegaTM Membrane

Part Number	Description	Pkg
OAD65C12	650D	1/pkg
OA001C12	1K	1/pkg
OA003C12	3K	1/pkg
OA005C12	5K	1/pkg
OA010C12	10K	1/pkg
OA030C12	30K	1/pkg
OA050C12	50K	1/pkg
OA070C12	70K	1/pkg
OA100C12	100K	1/pkg
OA300C12	300K	1/pkg
OA500C12	500K	1/pkg
OA990C12	1000K	1/pkg

*One Minimate TFF accessory kit is included in each Minimate TFF capsule package.

Accessories and Replacement Parts

Part Number	Description	Pkg
88216	Minimate Fitting Kit* Contains: Male luer to 3.2 mm (1/8 in.) hose barb, female luer to 3.2 mm (1/8 in.) hose barb, 3.2 mm (1/8 in.) i.d. tubing, tubing screw clamp, tubing clamps, adhesive strips (loop and hook)	1/pkg

Related Products

Minimate Tangential Flow Filtration Systems	151
Ultrasette TM Lab Tangential Flow Filtration Devices	152

Minimate™ Tangential Flow Filtration Systems

Streamline laboratory-scale concentration, desalting, and buffer exchange processes



- ▶ Plug-n-play design. Plug in a Minimate TFF capsule, add sample, and turn on the pump to start processing. The Minimate TFF system includes all the hardware, tubing, and fittings needed to get your TFF process up and running quickly.
- ▶ High concentration factors. The low system working volume achieved through the use of a conical bottom reservoir and compact design enables high concentration factors from up to 1 L or more of sample to be achieved. Concentrate your sample down to as little as 5 mL.
- ▶ All wetted components are made from low protein binding, chemically resistant, biologically safe materials.
- ▶ Minimal sample carryover. The system has a very low volume and interior fluid contact area. Fluid does not pass through and is not retained in the pump mechanism.
- ▶ Roller head peristaltic pumps provide gentle processing and are the choice for critical applications such as fragile biomolecules.
- ▶ System components are designed for easy assembly and disassembly; no tools required. Tubing and fitting replacement is simple and quick. Slip nuts for luer locks eliminate tubing kinks.

Applications

- ▶ Concentrate and desalt proteins, peptides, or nucleic acids (DNA, RNA, oligonucleotides).
- ▶ Recover antibodies or recombinant proteins from clarified cell culture media.
- ▶ Process metal sensitive enzymes and molecules.
- ▶ Separate (fractionate) large from small biomolecules.
- ▶ Concentrate viruses or gene therapy vectors.
- ▶ Prepare samples prior to column chromatography.
- ▶ Concentrate samples after gel filtration.
- ▶ Depyrogenate water, buffers, and media solutions.

Specifications

Materials of Construction

Reservoir: Polysulfone
 Reservoir Cover: Polypropylene
 Reservoir O-Ring: Buna*-N rubber (nitrile)
 Magnetic Stir Bar: PTFE coated
 Gauge Wetted Parts: Type 316L stainless steel

SS Fitting O-ring: EPDM rubber
 Gauge Mounting Block: Polypropylene
 Luer Fittings: Polypropylene and stainless steel
 Tubing: PharMed* #16
 Three-Way Valves: Polycarbonate body, acetal core
 Drip Tray: Urethane

	Minimate TFF System	Minimate TFF Reservoir Assembly Only*
Includes	Peristaltic pump, pump head pressure gauge, valves, reservoir with stir bar, built-in stir plate on a drip tray	Pressure gauge, valves, reservoir with stir bar, built-in stir plate on a drip tray
Dimensions	30.7 cm W x 48.2 cm D x 20.8 cm H (12.1 in. W x 19 in. D x 8.2 in. H)	30.7 cm W x 20.3 cm D x 20.8 cm H (12.1 in. W x 8.0 in. D x 8.2 in. H)
Weight	6.0 kg (13.2 lbs.)	1.0 kg (2.2 lbs.)
Maximum Inlet Pressure	4.1 bar (410 kPa, 60 psi)	4.1 bar (410 kPa, 60 psi)
Operating Temperature Range	0 - 50 °C (0 - 106 °F)	0 - 50 °C (0 - 106 °F)
Recirculation Flow Rate	10 - 240 mL/min	10 - 240 mL/min
Minimum System Working Volume	< 5 mL	< 5 mL

User will need to supply a MasterFlex L/S* variable-speed pump with Easy-Load* pump head or equivalent.

Designed to work with the Minimate™ TFF Capsule, this easy-to-use system can process sample volumes up to 1 L or more and efficiently concentrate samples to as little as 5 mL. Subsequent desalting or buffer exchange steps can be run on the same system with minimal user intervention.

The ready-to-use Minimate TFF System includes a Masterflex® L/S® variable speed peristaltic pump, Masterflex L/S Easy-Load® pump head, as well as a 0 - 4 bar (0 - 60 psi) pressure gauge, valves, 500 mL reservoir with magnetic

stir bar, and stir plate all assembled on a compact drip tray. The use of a peristaltic pump with disposable tubing and fittings minimizes sample cross contamination while providing gentle processing for biomolecules. All wetted parts meet United States Pharmacopeia (USP) Biological Reactivity Test, *In Vivo* <88>.

The reservoir is designed to hold up to 500 mL of sample and provides efficient mixing of product. The tapered bottom and optimally located feed and return ports reduce the system

hold-up volume, which allows high concentration factors to be achieved. The reservoir lid seals tightly allowing additional sample volume or diafiltration solution to be drawn directly into the reservoir without the need of a transfer pump. Vacuum is created as filtrate is generated through the TFF device allowing continuous diafiltration to be performed. When it's time to retrieve your sample, simply open the valve on the reservoir outlet and pump out your sample.

Ordering Information

Minimate TFF Systems

Part Number	Description	Pkg
OAPMP110	115 V AC 50/60 Hz	1/pkg
OAPMP220	230 V AC 50/60 Hz	1/pkg
OAPMP220UK	230 V AC 50/60 Hz with U.K. plug	1/pkg

Minimate TFF Reservoir Assemblies

Part Number	Description	Pkg
OARES110	Reservoir assembly 115 V AC 50/60 Hz	1/pkg
OARES220	Reservoir assembly 230 V AC 50/60 Hz	1/pkg
OARES220UK	Reservoir assembly 230 V AC 50/60 Hz with U.K. plug	1/pkg



Ultrasette™ Lab Tangential Flow Filtration Devices

Self-contained devices for optimal processing of 200 mL to 5 L



- ▶ Fast sample processing with large membrane area.
- ▶ Choice of two flow channel separators for maximum control of filtration performance.
- ▶ Ideal for processing biohazardous samples. Self-contained devices minimize opportunities for contamination or membrane damage.
- ▶ Reusable or disposable. Can be cleaned for reuse.

Applications

- ▶ Concentrate and desalt metal sensitive enzymes, antibodies, growth factors, and lymphokines.
- ▶ Purify recombinant proteins in conditioned media.
- ▶ Remove debris or particulate from cell lysates.
- ▶ Continuous fermentation sampling.

Specifications

Materials of Construction

Membrane Assembly: Omega™ membrane (low protein-binding, modified polyethersulfone) bonded to polyolefin substrate, separated, and supported by polyester screen and/or suspended screen channel
Outer Housing: Styrene acrylonitrile (SAN)

Effective Filtration Area

Screen Channel: 836 cm²
Suspended Screen: 700 cm²

Dimensions

13.5 W x 13 D x 7.6 H cm
(5.3 W x 5.1 D x 3 H in.)

Capacities

Sample Starting Volume: 200 - 5,000 mL
Typical Final Concentrate Volume:
40 - 50 mL
Device Hold-up Volume: < 10 mL

Operating Temperature Range

4 - 50 °C (39 - 122 °F)

Operating Pressure Range

0 - 4.0 bar (400 kPa, 60 psi)

Typical Operating Pressure

0.7 bar (70 kPa, 10 psi) -
2.7 bar (270 kPa, 40 psi)

Typical Cross Flow Rate

Screen Channel: 1 - 2 L/min (Use with a clean-filtered 0.2 µm solution, free of particles or aggregates.)
Suspended Screen: 1.5 - 2.5 L/min (Better performance with highly viscous or particulate-laden solutions.)

Pump Selection

Use the Ultralab™ system to deliver 1 - 2.5 L/min flow rate and operate between 0.3 bar (30 kPa, 5 psi) and 4.0 bar (400 kPa, 60 psi).

Ordering Information

Device packages include (1) device in the MWCO of your choice, (2) storage caps for feed/retentate, filtrate outlet cap, (2) tubing clamps, and 0.6 m (24 in.) of 4.8 mm (3/16 in.) tubing.

Ultrasette Lab TFF Devices With Omega Membrane

MWCO	Part Number	
	Screen Channel	Suspended Screen
1K, yellow	OS001C70	OS001C72
3K, gray	OS003C70	OS003C72
5K, tan	OS005C70	OS005C72
10K, blue	OS010C70	OS010C72
30K, red	OS030C70	OS030C72
50K, green	OS050C70	N/A
70K, brown	OS070C70	N/A
100K, clear	OS100C70	OS100C72
300K, orange	OS300C70	OS300C72

Accessories and Replacement Parts

Part Number	Description	Pkg
FS002X70	Accessory kit consists of 1.8 m (6 ft.) of PharMed* #24 feed/retentate tubing, 0.6 m (24 in.) of 4.8 mm (3/16 in.) Tygon* filtrate tubing, (8) stainless steel tubing clamps, and (1) screw clamp	1/pkg
FS005X70	Gauge fitting package consists of (1) 0 - 4.1 bar (0 - 60 psi) 3.2 mm (1/8 in.) NPT pressure gauge, (2) 6.4 mm (1/4 in.) O.D. polypropylene barbed tube to 3.2 mm (1/8 in.) NPT connectors, (1) 3.2 mm (1/8 in.) threaded polypropylene tee, (1) screw clamp, and (2) stainless steel tubing clamps	1/pkg
FS001X70	Mounting bracket holds Ultrasette device securely during operation; suction cups on the bottom of the bracket allow for placement on smooth surfaces	1/pkg

Ultralab™ Systems and Ultrareservoir™ Containers

Simplify processing of 100 mL to 5 L volumes when using the Ultrasette™ device



- ▶ Self-contained siphoning units allow continuous buffer exchange.
- ▶ Uses less liquid with less handling and mess than conventional dialysis systems.
- ▶ Constructed of clear acrylic with easy-to-read volume graduations.
- ▶ Connections located in base plate for easy access and minimal sample hold-up.
- ▶ Feed pressure gauge monitors sample processing.
- ▶ Three-way sampling valve allows maximum sample recovery without decanting.
- ▶ Peristaltic pump action minimizes shear of sensitive molecules, eliminates air in the system, and reduces foaming.
- ▶ A variable speed controller allows precise adjustment of crossflow during sample processing.

Applications

- ▶ For concentration of dilute sample volumes of up to 5 L.
- ▶ For use in diafiltration procedures which are faster and more efficient than dialysis for buffer exchange and desalting.

Specifications

Ultrareservoir Containers

Total Volume	500 mL	2 L	5 L
Materials of Construction			
Sample Reservoir	Acrylic	Acrylic	Acrylic
Valves, Lid, and Barb Connectors	Polypropylene	Polypropylene	Polypropylene
O-Ring (Lid)	EPR*	EPR*	EPR*
Gauge	Stainless steel	Stainless steel	Stainless steel
Dimensions (Excluding Valves)			
	12.7 W x 12.7 D x 19.1 H cm (5 W x 5 D x 7.5 H in.)	15.2 W x 15.2 D x 22.9 H cm (6 W x 6 D x 9 H in.)	20.3 W x 20.3 D x 27.9 H cm (8 W x 8 D x 11 H in.)
Typical Hold-Up Volume			
	< 2 mL	< 2 mL	< 5 mL
Minimum Recirculating Volume			
	15 - 20 mL	20 - 30 mL	20 - 30 mL
Inlet/Outlet Connections			
	4.0 mm (5/32 in.)	6.4 mm (1/4 in.)	6.4 mm (1/4 in.)
Weight			
	0.9 kg (2 lb.)	1.8 kg (4 lb.)	3.0 kg (6.6 lb.)

*Ethylene Propylene Rubber

Ordering Information

Ultralab Systems With 115 V Pump

Part Number	Description	Pkg
FS006X75	2 L Ultralab system (consists of an Ultrareservoir container, Masterflex® L/S® variable speed peristaltic pump, and Mini Ultrasette accessory kit; connects to Ultrasette device sold separately)	1/pkg
FS007X70	5 L Ultralab system (consists of an Ultrareservoir container, Masterflex L/S variable speed peristaltic pump and Ultrasette accessory kit; connects to Ultrasette device sold separately)	1/pkg

Ultralab Systems With 230 V Pump

Part Number	Description	Pkg
FS016X75	2 L Ultralab system (consists of an Ultrareservoir container, Masterflex L/S variable speed peristaltic pump, and Mini Ultrasette accessory kit; connects to Ultrasette device sold separately)	1/pkg
FS017X70	5 L Ultralab system (consists of an Ultrareservoir container, Masterflex L/S variable speed peristaltic pump, and Ultrasette accessory kit; connects to Ultrasette device sold separately)	1/pkg

Ultrareservoir Containers

Part Number	Description	Pkg
FS005X75	2 L container (includes 0 - 4.2 bar pressure gauge, assorted fittings, and 3-way valve); suitable for use with Ultrasette device	1/pkg
FS006X70	5 L container (includes 0 - 4.2 bar pressure gauge, assorted fittings, and 3-way valve); suitable for use with Ultrasette device; fittings supplied are 6.4 mm	1/pkg
FS007X75	500 mL container (includes 0 - 4.2 bar pressure gauge, assorted fittings, and 3-way valve)	1/pkg

tangential flow filtration

LABORATORY BIOPROCESSING

T-Series TFF Cassettes With Omega™ Membrane

Delivers highly reliable fluid dynamics and improved process economics



LABORATORY BIOPROCESSING tangential flow filtration

LABORATORY BIOPROCESSING

- ▶ Easy implementation into your process.
- ▶ Increased safety, reliability, and reproducibility featuring durable and stable materials with very low extractables and broad chemical compatibility.
- ▶ Omega PES membrane offers high flux, high selectivity, and low protein binding.
- ▶ Improved process performance featuring optimal mass transfer for improved process economics.
- ▶ Easy scale-up for robust purification processes.
- ▶ Meets biopharmaceutical and regulatory standards (such as biological reactivity, extractables, and TOC) that are backed by extensive validation documentation.

Applications

- ▶ Vaccine and conjugate concentration and diafiltration.
- ▶ Purification and recovery of monoclonal antibodies (mAb) or recombinant proteins.
- ▶ Blood plasma fractionation and purification.

Specifications

Materials of Construction

Filter Media: Omega (polyethersulfone) membrane
Support: Polyolefin
Screens: Polypropylene
Encapsulant: Polyurethane with white pigment (TiO₂)
Permeate Seals: Platinum-cured silicone
Gaskets: Medical grade, platinum-cured silicone

Maximum Operating Pressure*

6 barg (90 psig) @ 23 °C (73 °F)
4 barg (60 psig) @ 55 °C (131 °F)

Maximum TMP

4 barg (60 psig) @ 55 °C (131 °F)

Temperature Range**

-5 - 55 °C (23 - 131 °F)

pH Range

2 - 14

Typical Operating Parameters

Cross Flow Rate for Processing

5 - 7 L/min/m² (0.5 - 0.7 L/min/ft²)

Cross Flow Rate for Cleaning

8 - 10 L/min/m² (0.8 - 1.0 L/min/ft²)

Integrity Test

Test Pressure: 2 barg (30 psig)

Maximum Air Forward Flow

< 1600 sccm/m² (< 150 sccm/ft²)

Shelf Life

The shelf life of cassettes packaged in 0.3 N sodium hydroxide is expected to be one year from the date of manufacture when the cassettes are stored unopened in the original packaging at 4 - 25 °C (39 - 77 °F) and protected from direct light. Extended shelf life studies are ongoing.

Biological Safety

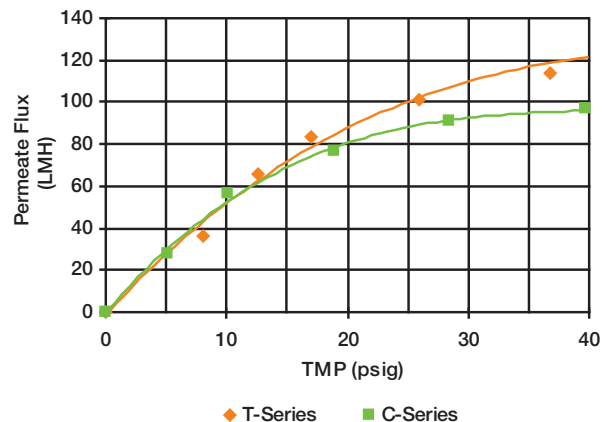
Passes United States Pharmacopeia (USP) Biological Reactivity Test, *In Vivo* <88> at 70 °C (158 °F).

*Pressure rating will be dependent on rating of the lowest system component.

**Cassettes must not be allowed to freeze.

Performance

Omega 10 kD Membrane, Centramate C-Series vs. T-Series Membrane Cassettes at a 5 L/min/m² Cross Flow Rate



Ordering Information

Omega™ Low Protein Binding Modified Polyethersulfone Membrane, Centramate 0.02 m² (0.2 ft²) Screen Channel Cassette for LV Centramate Holder

Part Number	NMWC
OS001T02	1 kD
OS005T02	5 kD
OS010T02	10 kD
OS030T02	30 kD
OS050T02	50 kD
OS070T02	70 kD
OS100T02	100 kD
OS300T02	300 kD

Omega Low Protein Binding Modified Polyethersulfone Membrane, Centramate 0.1 m² (1.1 ft²) Screen Channel Cassette for Centramate or Centramate PE Holder

Part Number	NMWC
OS001T12	1 kD
OS005T12	5 kD
OS010T12	10 kD
OS030T12	30 kD
OS050T12	50 kD
OS070T12	70 kD
OS100T12	100 kD
OS300T12	300 kD

Our new T-Series TFF cassettes replace the C-Series cassettes used in our Centramate™ System. For assistance, contact our Technical Service group.

Related Products

AcroCap™ Positive Pressure Devices	124
Acrodisc® Syringe Filters with Supor® Membrane	117, 118, 123
AcroPak™ Capsules with Supor Membrane	129, 132, 137
Stainless Steel Pressure Vessels	283
Supor Membrane Disc Filters	111
VacuCap® Vacuum Filtration Devices	127

LV Centramate™ Lab Tangential Flow Filtration System



Designed for maximum product recovery for lab-scale or scale-up process volumes up to 4 L



LABORATORY BIOPROCESSING tangential flow filtration

- ▶ Scale-up/scale-down device for development of tangential flow filtration (TFF) processes, biopharmaceutical small batch production, scale-down investigations, and production of materials for safety and efficacy studies (Phase I clinicals).
- ▶ Identical path lengths provide linear scale-up to Pall Centramate and Centrasette™ cassette holders. The LV Centramate holder may be attached to other laboratory TFF systems to improve their scalability characteristics.
- ▶ Low hold-up volume allows high concentration factors to be achieved from small starting volumes. A complete TFF system scalable to full production plant can be optimized using the volumes typically generated in the development or discovery lab.
- ▶ Easy connections through luer lock fitted ports with polished 316L stainless steel to ensure the same compatibility characteristics as production-scale Centrasette holders.
- ▶ All product-wetted parts comply with pharmaceutical standards.

Applications

- ▶ Concentration of biomolecules.
- ▶ Recovery and purification of biomolecules from cell culture supernatants and lysates.
- ▶ Diafiltration, desalting, and buffer exchange of biomolecules.
- ▶ Fractionation of mixed molecule solutions.

Specifications

Materials of Construction

Membrane Cassette

Filter Media: Supor® [hydrophilic polyethersulfone (PES)], and Omega™ (low protein-binding, modified PES) membranes

Cassette Hardware

Cassette Holder Top and Bottom
Plates: Type 316L stainless steel
Tie Rods and Washers: Type 304 stainless steel
Nuts: Bronze

Dimensions

Length: 22.8 cm (9 in.)
Width: 8.3 cm (3.3 in.)

Typical Starting Volume

0.02 m² (0.2 ft²) cassette: 60 - 4,000 mL

Typical Hold-Up Volume

< 1 mL

Maximum Operating Temperature

121 °C (250 °F)

Maximum Operating Pressure

5 bar (500 kPa, 75 psi)

Typical Cross Flow Rate

	Per 0.02 m ² (0.2 ft ²) Cassette (L/min)
Suspended Screen	0.2 - 0.4
Screen	0.12 - 0.16

Screen Selection Guideline

- Suspended screen for light-to-moderate particle load solutions.
- Screen for optimized processing of particle-free protein solutions to high concentrations.

Ordering Information

LV Centramate™ cassette holder comes with flow distribution manifold with tie-rods, stainless steel top plate, (4) stainless steel washers, (4) bronze nuts, torque wrench with a 11/16 in. deep socket, user guides, and instructions.

LV Centramate Cassette Holder

Part Number	Description	Pkg
WH039249	LV Centramate cassette holder	1/pkg

Replacement Parts

Part Number	Description	Pkg
FS007X01	Bronze nuts and washers	4/pkg

Supor® Membrane Centramate Cassettes for LV Centramate Cassette Holder [0.02 m² (0.2 ft²)]

Suspended Screen Part Number	Pore Size	Pkg
PSM10C11P2	0.1 µm	1/pkg
PSM20C11P2	0.2 µm	1/pkg
PSM45C11P2	0.45 µm	1/pkg
PSM65C11P2	0.65 µm	1/pkg

Omega™ Membrane Centramate Cassettes for LV Centramate Cassette Holder [0.02 m² (0.2 ft²)]

Screen Part Number	Suspended Screen Part Number	MWCO
OS001T02	OS001C11P2	1K
OS005T02	OS005C11P2	5K
OS010T02	–	10K
OS030T02	OS030C11P2	30K
OS050T02	OS050C11P2	50K
OS070T02	OS070C11P2	70K
OS100T02	–	100K
OS300T02	OS300C11P2	300K

Centramate™ and Centramate PE Lab Tangential Flow Filtration Systems



Suitable for process development and small-scale production of 1 to 125 L



LABORATORY BIOPROCESSING tangential flow filtration

- ▶ Filtration area is easily expanded by adding additional membrane cassettes.
- ▶ Identical fluid path lengths provide precise linear scale-up to larger process systems available from Pall Corporation.
- ▶ Cassettes can be easily removed without disassembling system plumbing.
- ▶ Systems are available with Type 316L stainless steel (Centramate system) or economically priced, extremely durable, ultra-high molecular weight polyethylene (Centramate PE system).
- ▶ Variety of membrane types provide versatility to the systems.

Applications

- ▶ Perform laboratory trials and pilot scale processing.
- ▶ Concentration of biomolecules.
- ▶ Recovery and purification of biomolecules.
- ▶ Diafiltration and desalting.
- ▶ Fractionation of mixed molecule solutions.

Specifications

Materials of Construction

Membrane Cassette

Filter Media: Supor® [hydrophilic polyethersulfone (PES)], Omega™ (low protein-binding, modified PES) membranes

Encapsulant: Polyurethane

Gasket: Silicone

Cassette Hardware

Wetted Parts:

[Centramate Systems](#)

Type 316L stainless steel

[Centramate PE Systems](#)

Ultra-high molecular weight polyethylene

Tie Rods: Stainless steel

Nuts: Bronze

Dimensions

[Centramate Systems](#)

13.2 x 22.6 x 16.7 cm (5.2 x 8.9 x 6.6 in.)

[Centramate PE Systems](#)

9.4 x 25.1 x 19.3 cm (3.7 x 9.4 x 7.6 in.)

Typical Hold-Up Volume

< 20 mL (per cassette)

Piping Connections

Feed, Retentate, and Filtrate:

[Centramate Systems](#)

12.7 mm (1/2 in.) sanitary connections

[Centramate PE Systems](#)

6.4 mm (1/4 in.) pipe

Maximum Operating Temperature

Hardware:

[Centramate Systems](#)

121 °C (250 °F)

[Centramate PE Systems](#)

70 °C (158 °F)

Cassettes: 60 °C (140 °F)

Recommended Operating Pressure

0.3 bar (30 kPa, 5 psi) –

5.2 bar (520 kPa, 75 psi)

Shipping Weight

[Centramate Systems](#)

7.7 kg (17 lb.)

[Centramate PE Systems](#)

6.4 kg (14 lb.)

Typical Cross Flow Rate

	Per 0.09 m ² (1.0 ft ²) Cassette (L/min)
Screen	0.6 - 0.8
Suspended screen	1.0 - 2.0

Screen Selection Guideline

- Screen for optimized processing of particle-free protein solutions to high concentrations.
- Suspended screen for light to moderate particle load solutions.

Ordering Information

Centramate™ Cassette Holder, Sanitary Flange

Part Number	Description	Pkg
FS001K10	Includes stainless steel Centramate cassette holder, assorted fittings, torque wrench, and socket	1/pkg

Sanitary Gauge Fitting Package

Part Number	Description	Pkg
FS005K10	2-gauge fitting package consists of (8) 1/2 in. EPDM gaskets, (2) 1-1/2 in. EPDM gaskets, (2) 1/2 in. x 1-1/2 in. TC tees, (3) 1/2 in. TC to 1/4 in. ID tube barbed fittings, (8) 1/2 in. TC clamps, (1) 1/2 in. diaphragm valve, (1) filtrate manifold, (2) 0-60 PSIG glycerin-filled gauges, (3) 3/4 in. TC to 1/2 in. ID tube barbed fittings, and (2) 1-1/2 in. TC sanitary clamps	1/pkg

Centramate System, Sanitary Flange

Part Number	Description	Pkg
FS010K10	Centramate cassette holder, sanitary flange, and 2-gauge fitting package (PN FS001K10 and FS005K10)	1/pkg

Centramate PE Cassette Holder

Part Number	Description	Pkg
FS002K10	Includes polyethylene holder with Centramate cassette stainless steel top and bottom brace plates, assorted fittings, torque wrench, and socket	1/pkg

Centramate PE Fitting Package

Part Number	Description	Pkg
FS007K10	2-gauge fitting package consists of (2) 1/4 in. NPT nipples, (2) 1/4 in. NPT tees, (2) 1/4 in. NPT to 1/4 in. barbed fittings, (1) 1/4 in. NPT to 1/4 in. barbed elbow fitting, (2) PSIG glycerin-filled gauges, (1) 1/4 in. ID tubing, (2) 1/4 in. NPT to 1/2 in. barbed fittings, (5) stainless steel hose clamps, and (1) 1/4 in. NPT to 1/4 in. barbed tee fitting	1/pkg

Centramate PE System

Part Number	Description	Pkg
FS012K10	Centramate PE holder and Centramate PE fitting package, 2-gauge (PN FS002K10 and FS007K10)	1/pkg

Centramate Cassettes With Omega™ Membrane

Screen Part Number	Suspended Screen Part Number	MWCO	Pkg
OS001T12	–	1K	1/pkg
OS005T12	–	5K	1/pkg
OS010T12	–	10K	1/pkg
OS030T12	–	30K	1/pkg
OS050T12	–	50K	1/pkg
OS070T12	–	70K	1/pkg
OS100T12	–	100K	1/pkg
OS300T12	OS300C11	300K	1/pkg

Centramate Cassettes With Supor® Membrane

Suspended Screen Part Number	Pore Size	Pkg
PSM10C11	0.1 µm	1/pkg
PSM20C11	0.2 µm	1/pkg
PSM45C11	0.45 µm	1/pkg
PSM65C11	0.65 µm	1/pkg

Venting

Protecting Your Lab Environment

Vent filters can provide a sterile barrier for air or gases entering or exiting vessels such as bioreactors, fermentation tanks, or carboys. These filters maintain the sterility of the interior environment and protect the atmosphere from contaminants within the vessel.

Pall Life Sciences vent devices contain hydrophobic membranes that prevent the entry of water and aerosols into sensitive equipment; thereby reducing repairs and prolonging the life of the equipment. Vent devices also protect the lab environment; from aerosolized pathogens. For the protection of the laboratory environment and prevention of culture contamination, always use a Pall Life Sciences vent filter.

Pall offers self-contained, compact filter devices for high efficiency removal of airborne bacteria and particulate under dry or moist conditions.

The most important considerations when selecting a gas or vent filter are air flow rate and particulate or microorganism retention. The membrane material in the filter must provide sufficient surface area or open space to accommodate the air flow required by the system.

Venting Applications

- ▶ Receiving vessels
- ▶ Isolation or environmental chambers
- ▶ Bioreactors
- ▶ Fermentation tanks
- ▶ Carboys
- ▶ Other small containers

In-Line, Low-Pressure Air/Gas Applications

- ▶ Delivery to instruments and culture vessels
- ▶ Bioisolation of a vacuum source
- ▶ Flushing instruments
- ▶ Cleaning parts



Acro® 37 TF Vent Device With PTFE Membrane

Multi-purpose filter for small-volume venting and gas filtration



- ▶ Ideal for use with small bioreactors and fermenters.
- ▶ PTFE membrane and polypropylene housing have broad chemical compatibility.
- ▶ Disposable. Eliminates the cost and labor associated with disc-loaded stainless steel filter holders.
- ▶ Autoclavable.
- ▶ Economical. Available in bulk packaging.

Applications

- ▶ Use in-line for air/gas delivery to instruments and culture vessels, for bioisolation of a vacuum source, or for flushing instruments and cleaning parts.
- ▶ Can be used to filter small volumes of liquid solvents.

Specifications

Materials of Construction

Filter Media: PTFE on a polypropylene support

Housing: Polypropylene

Effective Filtration Area

7.5 cm²

Dimensions

Overall Length: 5.3 cm (2.1 in.)

Diameter: 4.5 cm (1.8 in.)

Inlet/Outlet Connections

Stepped hose barbs, 6.4 - 9.5 mm (1/4 - 3/8 in.) diameter

Maximum Operating Temperature

100 °C (212 °F)

Maximum Operating Pressure

4.1 bar (410 kPa, 60 psi)

Minimum Water Breakthrough

2.1 bar (210 kPa, 30 psi), bi-directional

Typical Methanol Flow Rate

70 mL/min at 0.7 bar (70 kPa, 10 psi)

Typical Air Flow Rate

3.58 L/min at 0.2 bar (20 kPa, 3 psi)

Sterilization

Provided non-sterile. Autoclavable if desired at 121 - 123 °C (250 - 253 °F) for a maximum of 20 min.

Ordering Information

Acro 37 TF Vent Device With PTFE Membrane

Part Number	Description	Pkg
4464	0.2 µm, 37 mm	24/pkg
4465	0.2 µm, 37 mm	200/pkg

Bacterial Air Vents

Economical, disposable depth filter for venting applications



- ▶ Hydrophobic filter prevents the passage of aerosols, protecting equipment and staff.
- ▶ Versatile. Can be used for in-line barrier on culture vessels or for bioisolation of vacuum sources.
- ▶ High pressure rating ensures product integrity during pressure surges.

Applications

- ▶ Use as a vent device for receiving vessels and small isolation or environmental chambers.
- ▶ Recommended for small-volume venting and degassing.

Specifications

Materials of Construction

Filter Media: Hydrophobic glass laminate (polyester/glass fiber/polyester)
Housing: Polypropylene

Effective Filtration Area

7.5 cm²

Dimensions

Overall Length: 5.3 cm (2.1 in.)
Diameter: 4.5 cm (1.8 in.)

Inlet/Outlet Connections

Stepped hose barbs, 6.4 - 9.5 mm (1/4 - 3/8 in.)

Maximum Operating Temperature

121 °C (250 °F) at 1.0 bar (100 kPa, 15 psi)

Maximum Operating Pressure

5.2 bar (520 kPa, 75 psi) at ambient temperatures

Typical Air Flow Rate

40 L/min at 0.4 bar (40 kPa, 5.5 psi)

Typical Aerosol Retention*

99.97% 0.3 µm (aerosolized DOP) at 32 L/min/100 cm²

Sterilization

Provided non-sterile. Autoclavable if desired at 121 - 123 °C (250 - 253 °F) for a maximum of 15 min. PN 4308 sterilized by gamma irradiation.

*Following ASTM D 2986-95A

Ordering Information

Bacterial Air Vents

Part Number	Description	Pkg
4210	1 µm (nominal), 37 mm	24/pkg
4308	1 µm (nominal), 37 mm, gamma-irradiated	10/pkg

Acro® 50 Vent Devices With PTFE Membrane

50 mm filters with superior performance for demanding applications



- ▶ Reusable and autoclavable.
- ▶ PTFE membrane and polypropylene housing have broad chemical resistance.
- ▶ Large surface area provides greater throughput and high air flow rate.
- ▶ Available with a variety of inlet and outlet connectors.

Applications

- ▶ Venting bioreactors, fermentation tanks, and carboys.
- ▶ Sterile gas purging of culture vessels.
- ▶ Filtering aggressive solvents.

Also Available

Integrity Test Kit

- ▶ Verifies device integrity using one-minute water breakthrough or bubble point tests.
- ▶ Non-destructive test performed either *in situ* or in the lab.
- ▶ For use with Acro 50 vent devices.

Specifications

Materials of Construction

Filter Media: PTFE on a polypropylene support

Housing: Polypropylene

Effective Filtration Area

19.6 cm²

Dimensions

Overall Length: 8.2 cm (3.2 in.)

Diameter: 7.3 cm (2.9 in.)

Inlet/Outlet Connections

Stepped hose bars 6.4 - 12.7 mm (1/4 - 1/2 in.) diameter, 1/8 in. MNPT, 9.5 mm (3/8 in.) straight pipe

Maximum Operating Pressure

4.1 bar (410 kPa, 60 psi) at ambient temperature

Recommended Integrity Test

Minimum Bubble Point – Methanol

0.2 µm: 0.9 bar (90 kPa, 13 psi)

0.45 µm: 0.3 bar (34 kPa, 5 psi)

1 µm: 0.2 bar (20 kPa, 3 psi)

Typical Air Flow Rates

L/min at 0.2 bar (20 kPa, 3 psi)

0.2 µm: 8

0.45 µm: 12

1 µm: 15

Biological Safety

Passes United States Pharmacopeia (USP) Biological Reactivity Test,

In Vivo <88>

Sterilization

Provided non-sterile. All are individually packaged (except PN 4250). Can be sterilized by autoclaving at 121 - 123 °C (250 - 253 °F) for 20 min. Integrity should be verified after each autoclave cycle and before use.

Ordering Information

Acro 50 Vent Devices With PTFE Membrane

Part Number	Description	Pkg
4251	0.2 µm, hose barb	18/pkg
4250	0.2 µm, hose barb	72/pkg
4400	0.2 µm, 1/8 in. MNPT	18/pkg
4401	0.2 µm, 9.5 mm (3/8 in.) straight pipe	18/pkg
4256	0.45 µm, hose barb	18/pkg
4258	1 µm, hose barb	18/pkg
4003	1 µm, 1/8 in. MNPT	18/pkg

Integrity Test Kit

Part Number	Description	Pkg
4252	Includes pressure gauge, three-way valve, and 10 mL syringe	1/pkg

Acro® 50 Vent Devices With Emflon® II Membrane

Ideal for use in air/gas and vent applications with proprietary, low pressure drop hydrophobic PVDF membrane



- ▶ Emflon II membrane filters have a removal rating of 0.2 µm in liquid service and less than 0.02 µm particulate for air/gas applications.
- ▶ Connects easily to hoses of various sizes in-line or as a final filter.
- ▶ Light weight (< 27 grams) prevents crimping of tubing.
- ▶ Stable with gamma irradiation.
- ▶ Excellent for disposable systems. Eliminates cleaning validation.

Applications

- ▶ Venting of bioreactors, fermentation tanks, and carboys.
- ▶ Gas purging of culture vessels.
- ▶ Ideal for attachment to disposable systems that need to undergo gamma irradiation.

Also Available

Integrity Test Kit

- ▶ Verifies device integrity using one-minute water breakthrough or bubble point tests.
- ▶ Non-destructive test performed either *in situ* or in the lab.
- ▶ For use with Acro 50 vent devices.

Specifications

Materials of Construction

Filter Media: Emflon II membrane (hydrophobic PVDF)
Housing: Polypropylene

Effective Filtration Area

20 cm²

Inlet/Outlet Connections

Stepped hose barbs, 6.4 - 12.7 mm (1/4 - 1/2 in.) diameter with slip luer ID in the hose barb

Maximum Operating Temperature

60 °C (140 °F)

Maximum Operating Pressure

4.1 bar (410 kPa, 60 psi) at ambient temperature

Recommended Integrity Test

Minimum Bubble Point - 60% IPA/40% Water (v:v)

0.8 bar (80 kPa, 12 psi)

Typical Air Flow Rate

27 L/min at 1.0 bar (100 kPa, 15 psi)

Endotoxin Level

< 0.25 EU/mL using Limulus Amoebocyte Lysate (LAL) test

Biological Safety

Passes United States Pharmacopeia (USP) Biological Reactivity Test, *In Vivo* <88>

Bacterial Retention

Lot samples retain a minimum of 10⁷ cfu/cm² of *B. diminuta* per modified ASTM F838, current revision

Sterilization

Provided non-sterile. Stable with gamma irradiation up to 50 kilogray. Can be sterilized by autoclaving at 121 °C (250 °F) for 20 min. Maximum autoclave stability, three cycles at 131 °C (268 °F) for 30 min.

Ordering Information

Acro 50 Vent Devices With Emflon II Membrane

Part Number	Description	Pkg
A50V002P2NV	Hose barb, no vent, 0.2 µm, 100% integrity tested during manufacturing	100/pkg
A50V002P2	Hose barb with vent, 0.2 µm, 100% integrity tested during manufacturing	3/pkg

Integrity Test Kit

Part Number	Description	Pkg
4252	Includes pressure gauge, three-way valve, and 10 mL syringe	1/pkg

Vacushield™ Vent Device

Protects valves and pump components from damage due to liquids



- ▶ Incorporates a hydrophobic PTFE membrane.
- ▶ Allows air and gases to pass through freely while blocking aqueous solutions and aerosol contaminants.
- ▶ Offers highly effective retention of bacteria with minimal restriction of pump performance.

Applications

- ▶ Use between a pump and receiving vessel to protect valves and pump components from damage by aqueous solutions.
- ▶ Protects laboratory personnel from potential biohazards, airborne contaminants, and aerosolized oil.

Specifications

Materials of Construction

Filter Media: PTFE on a polypropylene support

Housing: Polypropylene

Effective Filtration Area

19.6 cm²

Dimensions

Overall Length: 8.2 cm (3.2 in.)

Diameter: 7.3 cm (2.9 in.)

Inlet/Outlet Connections

Stepped hose barbs 6.4 - 12.7 mm (1/4 - 1/2 in.) diameter; internal taper accepts standard male luer

Maximum Operating Temperature

130 °C (266 °F)

Maximum Operating Pressure

1.0 bar (100 kPa, 15 psi)

Typical Air Flow Rate

8 L/min at 0.2 bar (20 kPa, 3 psi)

Typical Aerosol Retention*

99.97% 0.3 µm (DOP) at 32 L/min/100 cm²

*Following ASTM D 2986-95A

Ordering Information

Vacushield Vent Device

Part Number	Description	Pkg
4402	50 mm, hose barb	3/pkg

Related Products

Vacuum Pressure Pumps 279

AcroVent® Device

Economical, disposable 50 mm device for routine venting



- ▶ Decreases contamination risks. Ideal for gas lines for CO₂ incubators.

Applications

- ▶ Can be used for routine, non-critical venting applications.
- ▶ Place on fermentor exhaust outlets to prevent biohazardous gases from venting into surrounding areas.

Specifications

Materials of Construction

Filter Media: 0.2 µm PTFE on a polypropylene support

Housing: Polypropylene

Effective Filtration Area

19.6 cm²

Dimensions

Overall Length: 8.2 cm (3.2 in.)

Diameter: 7.3 cm (2.9 in.)

Inlet/Outlet Connections

Stepped hose barbs,
6.4 - 12.7 mm (1/4 - 1/2 in.) diameter

Maximum Operating Pressure

4.1 bar (410 kPa, 60 psi)

Typical Air Flow Rate

8 L/min at 0.2 bar (20 kPa, 3 psi)

Sterilization

Provided non-sterile. Autoclaving not recommended.

Ordering Information

AcroVent Device

Part Number	Description	Pkg
4249	0.2 µm, hose barb	10/pkg

AcroPak™ 300 Capsule With PTFE Membrane

High air flow rate venting applications



- ▶ Offers broad chemical compatibility with PTFE membrane and polypropylene housing.
- ▶ 100% integrity-tested to provide the high level of confidence you require.

Applications

- ▶ Recommended for bioreactor venting requiring high air flow rates.
- ▶ Useful device for chemical and solvent filtration.

Specifications

Materials of Construction

Filter Media: PTFE on a polypropylene support

Housing: Polypropylene

Effective Filtration Area

280 cm²

Dimensions

Length: 10.5 cm (4.1 in.) with hose barbs

Housing Diameter With Vent:

6.7 cm (2.6 in.)

Housing Diameter Without Vent:

5.3 cm (2.1 in.)

Inlet/Outlet Connections

Stepped hose barbs 6.4 - 12.7 mm (1/4 - 1/2 in.) diameter

Typical Hold-Up Volume

< 6 mL

Maximum Operating Temperature

60 °C (140 °F) at 2.1 bar (210 kPa, 30 psi)

Maximum Operating Pressure

4.1 bar (410 kPa, 60 psi) at ambient temperature

Recommended Integrity Test

Minimum Bubble Point -

60% IPA/40% H₂O (v:v)

1.2 bar (120 kPa, 18 psi)

Typical Liquid Flow Rate (1 cp)

0.8 L/min/0.1 bar (10 kPa)

0.6 L/min/psi

Typical Air Flow Rate

32 L/min/0.07 bar (7 kPa, 1 psi)

Bacterial Retention

Lot samples retain a minimum of 10⁷ cfu/cm² of *B. diminuta* per modified ASTM F838, current revision

Endotoxin Level

< 0.25 EU/mL using Limulus Amoebocyte Lysate (LAL) test

Biological Safety

Passes United States Pharmacopeia (USP) Biological Reactivity Test, *In Vivo* <88>

Sterilization

Provided non-sterile. Can withstand 10 autoclave cycles at 121 - 123 °C (250 - 253 °F) for a maximum of 20 min. Integrity should be verified after each autoclave cycle and before use.

Ordering Information

AcroPak 300 Capsule With PTFE Membrane

Part Number	Description	Pkg
12082	0.2 µm, stepped hose barb	3/pkg
12085	0.2 µm, stepped hose barb	100/pkg

vent filters

LABORATORY BIOPROCESSING

HEPA Capsule

Ensures high efficiency particulate-free air (HEPA)



- ▶ Porous membrane delivers high air flow rates at low differential pressure and extends filter life.
- ▶ Ensures particulate-free air with 99.97% retention of 0.3 µm DOP aerosol.*

Applications

- ▶ Designed to provide bacteria-free air for sterile applications.
- ▶ Can be used for non-sterilizing liquid prefiltration.

Specifications

Materials of Construction

Filter Media: Versapor® membrane (acrylic copolymer on a non-woven support)
Housing: Polypropylene
Filter Support: Polyester
Adapters: Nylon
Membrane Sealing Material: Polyurethane
Housing Sealing Material: Polypropylene-encapsulated stainless steel

Pore Size

Liquid Filtration: 1.2 µm
Air/Gas Filtration: 99.97% retention of 0.3 µm DOP aerosol*

Effective Filtration Area

860 cm²

Dimensions

Housing Length: 19.3 cm (7.6 in.)
Overall Length: 26.9 cm (11 in.)
Diameter: 6.3 cm (2.5 in.)

Inlet/Outlet Connections

3/8 in. FNPT; includes optional hose barb fittings to accept 12.7 mm (1/2 in.) ID tubing

Maximum Operating Temperature

88 °C (190 °F)

Maximum Operating Pressure

3.4 bar (340 kPa, 50 psi)

Biological Safety

Passes United States Pharmacopeia (USP) Biological Reactivity Test, *In Vivo* <88>

*Following ASTM D 2986-95A.

Ordering Information

HEPA Capsule

Part Number	Description	Pkg
12144	HEPA capsule	1/pkg

HPLC and Chromatography Sample Prep



As the world's largest producer of membrane filters, Pall offers more types of membranes for quality control testing than any other company. Our patented GH Polypro (GHP) membrane, with its uniquely broad solvent compatibility, is globally recognized as the universal membrane for HPLC sample preparation applications. Our diversified portfolio of membranes enables us to select the most appropriate materials and optimize them for each unique application. That's why you can depend on Pall to consistently provide dependable products that deliver superior performance for confident decisions.

Content

- 170** General HPLC and Chromatography Sample Prep Application Selector
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General HPLC and Chromatography Sample Prep Application Selector

	Page Number	Sample Filtration HPLC (0.45 µm)	Sample Filtration UHPLC (0.2 µm)	HPLC (0.45 µm) Mobile Phase/UHPLC (0.2 µm) Mobile Phase	Sample Filtration Gas Chromatography	Sample Filtration Ion Chromatography	Sample Clarification (1 µm and Larger)	Cell Reduction
Membranes								
GH Polypro (GHP) membrane disc filters	178			•				•
HPLC mobile phase filtration membranes	177			•				•
Nyloflo™ membrane disc filters	179			•				•
PTFE membrane disc filters	180			•				•
PVDF membrane disc filters	181			•				•
Syringe Filters								
Acrodisc® MS syringe filter	184		•		•			•
Acrodisc PSF GxF syringe filters with glass/GHP membrane	186	•	•		•			•
Acrodisc PSF GxF syringe filters with glass/glass fiber	199				•		•	•
Acrodisc PSF GxF syringe filters with glass/nylon membrane	190	•	•		•			•
Acrodisc PSF GxF syringe filters with glass/PTFE membrane	192	•	•		•			•
Acrodisc PSF GxF syringe filters with glass/PVDF membrane	188	•	•		•			•
Acrodisc PSF GxF syringe filters with glass/Supor® membrane	198	•	•		•			•
Acrodisc PSF syringe filters with GHP membrane	186	•	•		•			•
Acrodisc PSF syringe filters with HT Tuffryn® membrane	197	•			•			•
Acrodisc PSF syringe filters with nylon membrane	190	•	•		•			•
Acrodisc PSF syringe filters with PTFE membrane	192	•	•		•			•
Acrodisc PSF syringe filters with PVDF membrane	188	•	•		•			•
Acrodisc PSF syringe filters with Versapor® membrane	196	•			•		•	•
Acrodisc syringe filters with glass fiber	199				•		•	•
Acrodisc syringe filters with GHP membrane	186	•	•		•			•
Acrodisc syringe filters with nylon membrane	190	•	•		•			•
Acrodisc syringe filters with PTFE membrane	192	•	•		•		•	•
Acrodisc syringe filters with PVDF membrane	188	•	•		•			•
Acrodisc syringe filters with Versapor membrane	196	•			•		•	•
Ion Chromatography (PES) Acrodisc syringe filters	194		•			•		•
Ion Chromatography (PES) Acrodisc PSF syringe filters	194	•	•			•		•
Centrifugal Devices								
Macrosep® Advance centrifugal devices with Supor membrane	205	•	•		•			•
Microsep™ Advance centrifugal devices with Supor membrane	204	•	•		•			•
Nanosep MF centrifugal devices with GHP membrane	203	•			•			•
Filter Plates								
AcroPrep™ 24 filtration system	200	•	•					•
AcroPrep Advance 96-well filter plates, 1 mL	69 - 73	•	•				•	•
AcroPrep Advance 96-well filter plates, 350 µL	69 - 73	•	•				•	•
Hardware								
47 mm filter funnels, glass	206			•				
AcroPrep 24 filtration system	200	•	•					
SolVac® filter holder	182			•				
Stainless steel forceps	230, 280			•				

Solid Oral Dosage Sample Filtration Application Selector*

	Page Number	Aqueous - Acidic	Aqueous - Basic	Organic - Strong	Organic - Weak
Membranes					
GH Polypro (GHP) membrane disc filters	178	•	•	•	•
Nylaflo™ membrane disc filters	179			•	•
PTFE membrane disc filters	180			•	•
PVDF membrane disc filters	181	•			•
Syringe Filters					
Acrodisc MS syringe filter	184	•	•	•	•
Acrodisc PSF GxF syringe filters with glass/GHP membrane	186	•	•	•	•
Acrodisc PSF GxF syringe filters with glass/glass fiber	199	•	•	•	•
Acrodisc PSF GxF syringe filters with glass/nylon membrane	190			•	•
Acrodisc PSF GxF syringe filters with glass/PTFE membrane	192			•	•
Acrodisc PSF GxF syringe filters with glass/PVDF membrane	188	•			•
Acrodisc PSF GxF syringe filters with glass/Supor® membrane	198	•	•		•
Acrodisc PSF syringe filters with GHP membrane	186	•	•	•	•
Acrodisc PSF syringe filters with HT Tuffryn® membrane	197	•	•		
Acrodisc PSF syringe filters with nylon membrane	190			•	•
Acrodisc PSF syringe filters with PTFE membrane	192			•	•
Acrodisc PSF syringe filters with PVDF membrane	188	•			•
Acrodisc PSF syringe filters with Versapor® membrane	196		•		•
Acrodisc syringe filters with GHP membrane	186	•	•	•	•
Acrodisc syringe filters with glass fiber	199	•	•	•	•
Acrodisc syringe filters with nylon membrane	190			•	•
Acrodisc syringe filters with PTFE membrane	192			•	•
Acrodisc syringe filters with PVDF membrane	188	•			•
Acrodisc syringe filters with Versapor® membrane	196		•		•
Ion Chromatography (PES) Acrodisc syringe filters	194	•	•		•
Ion Chromatography (PES) Acrodisc PSF syringe filters	194	•	•		•
Centrifugal Devices					
Macrosep® Advance centrifugal devices with Supor membrane	205	•	•		•
Microsep™ Advance centrifugal devices with Supor membrane	204	•	•		•
Nanosep MF centrifugal devices with GHP membrane	203	•	•	•	•
Hardware					
47 mm filter funnels, glass	206	•	•	•	•
SolVac® filter holder	182	•	•	•	•
Stainless steel forceps	230, 280	•	•	•	•

*Pall's analytical quality control filters are used in typical HPLC applications including dissolution, content uniformity, pharmaceutical finished product, pharmaceutical raw material, and food and beverage testing. The choice of membrane filters for these tests is based on chemical compatibility of the membrane and the liquid being filtered. For additional guidance, review the Chemical Compatibility guide on page 292 - 293. Active Pharmaceutical Ingredients (API) adsorption should also be a consideration when making your selection.

HPLC and Chromatography Sample Prep

Supporting the Integrity of Your Sample Prep Results

Whether you are pursuing goals in the life sciences, pharmaceutical methods, research and development, quality control, or specialty environmental applications, Pall's HPLC and chromatography sample prep products offer unfailing quality in a range of processing volumes. Our superior media separation technology ensures:

- ▶ Accurate pore size ratings for better chromatography, and instrument and column protection.
- ▶ Uniform membrane materials (lot-to-lot) for consistent analytical results.
- ▶ Low extractable materials for less chromatographic interference.
- ▶ Materials of construction selected specifically for analytical analysis with lower extractables and lower API adsorption.

Multiple Sample Processing

AcroPrep™ Advance 96-Well Filter Plates

AcroPrep Advance filter plates are excellent for sample clean-up in sample prep or molecular biology applications. These plates alleviate the most common problems of filter-bottom plates with special design features:

- ▶ Optimized outlet tips minimize sample leakage during incubation steps and reduce the presence of hanging drops following filtration.
- ▶ Automation compatible. Manufactured in accordance with SBS guidelines, allowing plates to be run in manual, semi-automated, and automated processes.
- ▶ Polypropylene filter plate assembly is chemically resistant and low biomolecule binding.

See page 65 for information on how to select a filter plate for your application.

AcroPrep 24 Filtration System

The AcroPrep 24 filtration system accelerates sample preparation and reduces labor by simultaneously filtering up to 24 samples:

- ▶ Designed for use with Waters' Alliance♦ HPLC systems.
- ▶ Eliminates the need for individually-wrapped syringes.
- ▶ System is economical and requires less bench space compared to the traditional syringe filter technique.
- ▶ HPLC certified to ensure analytical results will not be compromised by extractable materials.
- ▶ No cross-contamination because each well is individually sealed.



The AcroPrep 24 filtration system simultaneously processes up to 24 samples.

Single Sample Processing

Acrodisc® MS Syringe Filters

LCMS is a very sensitive analysis technique. It requires careful sample preparation to maintain sample purity. The Acrodisc MS syringe filter is the first syringe filter to be LCMS-certified low in extractables.

- ▶ LCMS-certified low in extractables provides confidence in your results.
- ▶ Low matrix effects means quicker, more accurate results.
- ▶ WWPTFE (water wettable PTFE) membrane provides chemical compatibility with aqueous and organic samples.

Acrodisc PSF Syringe Filters

Acrodisc PSF syringe filters are available in many membrane types, sizes, and packaging configurations to fit all applications ensuring:

- ▶ Smooth operation and worry-free performance in automated applications with smooth filter-to-filter release, consistent turret advancement, exceptional housing strength, and strict outside filter geometry.
- ▶ Best protection for HPLC columns – extend column life as much as 46 times.
- ▶ Maximum throughput with the GxF multi-layer prefilter.

Nanosep® MF Centrifugal Devices

Centrifugal devices are a simple-to-use alternative for analytical sample preparation, especially when your application calls for maximum filtrate recovery from limited sample volumes. These devices provide:

- ▶ Rapid and high recovery (96.5%) of critical proteins.
- ▶ Low extractables. Our HPLC-grade centrifugal devices are certified to be low in UV extractables.
- ▶ Low hold-up volume (< 5 µL) makes these devices ideal for expensive samples.
- ▶ High g-force ratings. Can be spun at 14,000 x g assuring rapid sample processing.

How to Choose a Filter for Your Application

When selecting the best filter for your application, four main considerations need to be addressed:

1. Is an automation-certified filter required?
2. What is the filter's chemical compatibility?
 - ▶ Resistance of membrane to fluid contact
 - ▶ Extractables
 - ▶ Adsorption
3. What Effective Filtration Area (EFA) is needed for filtration?
4. What pore size rating is optimal for sample clean-up?

AUTOMATION CERTIFICATION IS IMPORTANT

Pall Life Sciences has specifically designed and certified our Acrodisc® PSF syringe filters to be fully compatible and reliable for use with automated equipment. The following special features make our syringe filters reliable for worry-free performance 24 hours a day:

- ▶ Smooth filter-to-filter release
- ▶ Consistent turret advancement
- ▶ Exceptional housing strength
- ▶ Strict “outside filter geometry”



Acrodisc PSF syringe filters from Pall Life Sciences are the only syringe filters to receive the SOTAX♦ and Zymark♦ Automation Certified guarantee. This certification is only granted to syringe filters that meet the stringent requirements for automated dispensing and robotic handling. Pall works in close partnership with the SOTAX AG manufacturing and engineering teams to ensure proper fit, function, and compatibility with SOTAX and Zymark workstations.



Pall's Acrodisc PSF syringe filters work best with SOTAX AG's Zymark TPW♦, APW♦, and MultiDose♦ workstations. Pall's standard Acrodisc syringe filters work best with SOTAX's AT-70 SMART♦, CTS, and FS workstations. These robotic workstations are all uniquely designed to work with SOTAX and Zymark Automation Certified filters for proper operation.

CONSIDER CHEMICAL COMPATIBILITY

Does the filter need to be resistant to bases, acids, or organic solvents? Chemical compatibility is a critical consideration when selecting the sample prep syringe filter or mobile phase disc filter for your application. The following broad guidelines can be used for basic information. Please refer to the Chemical Compatibility charts on pages 286 - 289 to determine which filter is best for your application.

Aqueous Samples

Hydrophilic membranes, which have an affinity for water, are preferable when filtering aqueous samples. Use Pall Life Sciences filters with GHP, PVDF, nylon, or PES membranes.

Gases and Aggressive Organic Solvents

Hydrophobic membranes repel water and are inert to aggressive organic solvents, making them ideal for gases and organic solvents. Choose Pall Life Sciences filters with PTFE membrane.

Aqueous and Organic Solvent Solutions

Different polymeric membranes have different chemical compatibilities. Based on the application and chemical compatibility, there may be one or several membrane and Acrodisc syringe filter possibilities. Generally, one filter type will not function for all applications due to limitations in hydrophobicity/hydrophilicity and chemical compatibility. However, Pall Life Sciences patented hydrophilic polypropylene (GHP) membrane is a universal membrane for both aqueous and organic applications.

Exceptionally Low Extractable Levels

A filter is designed to increase accuracy by removing unwanted particles. However, the wrong filter can be a source of contaminants in the form of extractables that elute into the sample from the filter device. These undesired artifacts can jeopardize analytical results. Some extractable concerns include coelution, false quantitation, and extraneous peaks.

Pall Life Sciences specifically selects the highest grade of materials and performs rigorous extraction methods on our membrane products to reduce undesired artifacts.

HPLC Certified for Low Extractables

Pall Life Sciences HPLC certification ensures that analytical results will not be compromised by extractable filter materials. To verify low levels of UV-detectable extractables, samples of the HPLC Acrodisc syringe filter line are randomly taken and tested for compatibility with common HPLC solvents using standard HPLC conditions.

How to Choose a Filter for Your Application (continued)

IC Certified for Low Levels of Inorganic Extractables

Pall Life Sciences certifies that Ion Chromatography (IC) Acrodisc® syringe filters have been tested using a highly sensitive IC protocol to monitor inorganic extractables. For IC applications, only the IC Acrodisc (PES) syringe filter is certified for low levels of inorganic extractables. Actual background levels of filter extractables are typically less than 20 ppb for chloride, 6 ppb for nitrate, 1 ppb for phosphate, and 10 ppb for sulfate.

Sample Adsorption

Choose a low adsorbing filter such as the Acrodisc syringe filter with GHP membrane. GHP membrane is extremely low in biomolecule binding. Typical binding levels are far below 1%.

Easy Identification

All analytical sample prep Acrodisc syringe filters and their packaging have color-coded printing with membrane type and pore size on each filter:

- GHP
- PTFE
- PVDF
- Nylon
- Glass Fiber
- Polyethersulfone (PES)

CONSIDER EFFECTIVE FILTRATION AREA

The particulate contained within a fluid affects the life of a filter. As particles are removed from the fluid, they block pores and reduce the useable portion of the filter. Particulate-laden fluids plug a filter more quickly than "clean" fluids. Increasing the EFA can lengthen the life of a filter.

Filters come in a variety of sizes ranging from the area within a single well of a 96-well plate, to spin filters and syringe filters.

Acrodisc syringe filters are available in 25 mm Acrodisc PSF syringe filters as well as in 13 and 4 mm diameters for smaller sample volumes. All are available in a variety of membrane and pore size choices.

Hold-Up Volume

Another aspect of choosing the right filter size is the hold-up volume. This is the volume of liquid remaining in the filter after use. A filter with a low hold-up volume is recommended for use with expensive fluids or those with limited availability. What device size will assure complete sample filtration with minimal hold-up volumes? Pall Life Sciences offers a broad range of device sizes. The minispikes outlet, available on the 13 mm device, allows for minimal sample hold-up and easy dispensing into autosampler vials. Additional options include the 4 mm Acrodisc syringe filter, the Nanosep® MF centrifugal device, and the AcroPrep™ filter plate.

The table below outlines general guidelines to the appropriate filter size for different volumes of fluid.

Volume to be Filtered	Filter Type	Typical Hold-Up Volume
< 500 µL	Nanosep MF Device	< 2 µL
< 900 µL	AcroPrep 96 1 mL Filter Plate	< 18 µL/well
< 2 mL	4 mm Acrodisc Syringe Filter	< 10 µL
< 2 mL	AcroPrep 24 Filter Plate	< 50 µL/well
< 10 mL	13 mm Acrodisc Syringe Filter (Minispikes)	< 14 µL
< 10 mL	13 mm Acrodisc Syringe Filter	< 30 µL
< 125 mL	25 mm Acrodisc PSF Syringe Filter	< 200 µL

Prefiltration

For difficult-to-filter samples, it is best to use a product with a glass fiber prefilter over the membrane. The Acrodisc PSF syringe filter with Gx® multi-layered glass fiber prefilter is the best option for extremely particulate-laden samples. Our traditional Acrodisc syringe filters with GHP and nylon membranes are also available with a single layer glass fiber prefilter.

Acrodisc PSF Filter Design Extends Filter Life

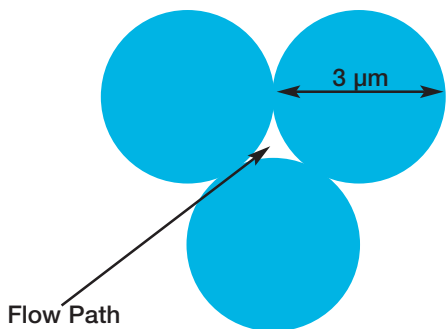
- *Special rib design and proprietary weld ensure robust seal under high operating pressures.*
- *Free-floating prefilter prevents premature clogging.*
- *Multi-layered prefilter traps heterogeneous particulate throughout the matrix and on the surface, extending filter life.*
- *Ample headspace for filter cake to build providing optimal throughput.*
- *Heat sealed final membrane ensures particulate retention with no chance of breakthrough.*

The Acrodisc PSF Gx® syringe filter has a serial glass fiber (Gx®) prefilter to allow for maximum throughput and faster flow rates than standard glass fiber prefilter devices. The multi-layered prefilter, rated from > 40 to 1 µm, traps particulate, thereby extending filter life.

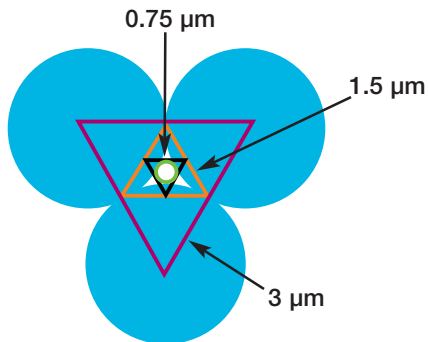
CONSIDER PORE SIZE

Assumption: it is desirable to extend the life of your HPLC column and reduce maintenance due to particulate in the pumping system; thereby giving more analyses per dollar spent.

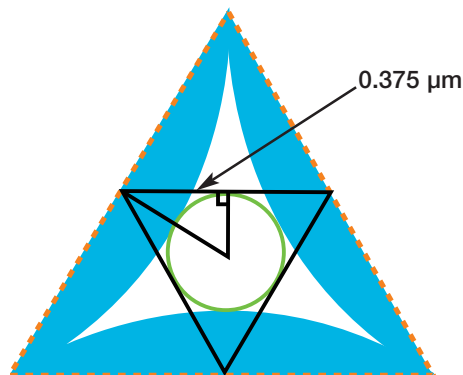
Given this assumption, the filter pore size should be determined based on the column packing size. As you can see below, the column packing particles touch each other. Ideally, you would not want contamination to fit into the space between the particles of packing. This space (labeled Flow Path) is identified below. The recommendation is to find out how large that space is and remove particles of that size.



For example, start with a 3 µm packing size and draw a few well-placed equilateral triangles as suggested in the image below. Determine the largest particle capable of fitting through the column by circumscribing an equilateral triangle with a side length of 0.75 µm.



Now enlarge the diagram and look further. Visualize a series of equilateral triangles whose side length gets down to 0.75 µm. The following image illustrates a right triangle whose short side describes the radius of the sphere. The angle is one half of 60°, or 30°. The horizontal side of this new right triangle has a length of 0.375 µm (half of 0.75 µm). Calculating the tangent of 30° gives the ratio of the length of the opposite side over the adjacent side, in this case 0.58. This means that the short side of the triangle is equal to 0.58 x 0.375 or 0.217 µm. Coincidentally, this is also the radius of the particle. So, if the column packing is 3 µm in diameter, the flow path is 0.43 µm.



When an HPLC column has a packing size of 3 µm or smaller, you should use a 0.2 µm filter because a 0.45 µm filter may let particles through that will plug the column.

Are You Concerned About Accurate Retention of Particulate?

For liquid chromatography systems using columns with larger than 3 µm packings, the filtration industry standard is 0.45 µm for syringe filters and mobile phase membranes. For columns with 3 µm or smaller packings, including UHPLC, microbore columns, or when concerned about microbial growth, a 0.2 µm filter is recommended.

Once the best pore size rating is chosen for the application, you must rely on the filter manufacturer to provide an accurate pore size rating. For more information on the importance of accurate pore size rating – and how to prolong the life of your HPLC column – please visit www.pall.com/lab and access our Literature Library online.

HPLC and Chromatography Sample Prep – Online Reference Library

Pall's website offers an extensive collection of product, technical, and application information. This valuable online reference library features hundreds of technical articles, posters, podcasts, application notes, and more that can help you get the most out of your process. To view the following titles online – and many others – click the Literature Library link in the left sidebar when you visit www.pall.com/lab.

- ▶ Acrodisc® MS Syringe Filter Video
- ▶ Acrodisc Syringe Filters for Analytical Sample Preparation: Quality Assurance and Certifications
- ▶ Analytical Sample Prep Filters
- ▶ Certification of Pall Acrodisc PSF Syringe Filters for Use with Zymark® Workstations
- ▶ Chemical Compatibility Guide and Life Expectancy for the SolVac® Filter Holder
- ▶ Clarification of 0.1-1.0 mL Samples Using AcroPrep™ 96 and 384 Multi-Well Filter Plates
- ▶ Clarification of Samples (< 1 mL) by MF Filtration in Nanosep® Spin Filters
- ▶ Clarification of Samples (1-100 mL) in an Acrodisc Syringe Filter
- ▶ Exploring IC Syringe Filters
- ▶ Filtration: Preventative Maintenance for HPLC
- ▶ Getting More Life and Better Performance From Your HPLC Column
- ▶ Instantly Increase Your HPLC Column Life - Up to 46 Times
- ▶ Low Extractable Syringe Filters for LCMS Applications
- ▶ Maintaining Analytical Integrity During Sample Preparation
- ▶ Reduction of Matrix Effects from Filter Effluents Using Pall Acrodisc MS Syringe Filters for LCMS Sample Preparation
- ▶ Suitability of Various Filters for Sample Preparation in Dissolution Testing, Based on Drug Binding
- ▶ Syringe Filter Efficiency and the Effect of Filtration on HPLC Column Life
- ▶ Use of Acrodisc Syringe Filters for Analytical Sample Preparation, Including HPLC and Dissolution Testing
- ▶ Using the SolVac Filter Holder for Mobile Phase Filtration



HPLC Mobile Phase Filtration Membranes

Membranes designed specifically for the stringent requirements of mobile phase filtration



- ▶ Membranes are identical in composition and quality to those used in Pall's HPLC-certified Acrodisc® syringe filters.
- ▶ HPLC certification assures that the filters will not add artifacts to your analysis.
- ▶ GH Polypro membrane is the best choice for filtering mobile phases.
- ▶ PTFE membrane provides the ultimate in chemical compatibility for filtering harsh chemicals and HPLC mobile phases.

Applications

- ▶ Purification and degassing of mobile phase solvents used in liquid chromatography applications.

Specifications

Filter Media

GH Polypro (GHP, hydrophilic polypropylene), TF (PTFE, hydrophobic polytetrafluoroethylene), PVDF (hydrophilic polyvinylidene fluoride), and Nylaflo™ (hydrophilic nylon) membranes

Pore Size

0.2 and 0.45 µm

Typical Thickness

GHP Membrane

0.2 µm: 101 µm (4.0 mils)
0.45 µm: 114 µm (4.5 mils)

TF (PTFE) Membrane

0.2 µm: 139 µm (5.5 mils)
0.45 µm: 135 µm (5.3 mils)

PVDF Membrane

0.2 µm: 140 µm (5.5 mils)
0.45 µm: 127 µm (5.0 mils)

Nylaflo Membrane

0.2 and 0.45 µm: 127 µm (5.0 mils)

Maximum Operating Temperature

GHP Membrane

55 °C (131 °F)

PVDF, TF (PTFE), and Nylaflo Membranes

100 °C (212 °F)

Minimum Bubble Point – Water

GHP Membrane

0.2 µm: 2.9 bar (290 kPa, 42 psi)
0.45 µm: 1.38 bar (138 kPa, 20 psi)

PVDF Membrane

0.2 µm: 2.3 bar (230 kPa, 34 psi)
0.45 µm: 1.1 bar (110 kPa, 16 psi)

Nylaflo Membrane

0.2 µm: 3.4 bar (340 kPa, 49 psi)
0.45 µm: 2.6 bar (260 kPa, 37 psi)

Minimum Bubble Point - IPA

TF (PTFE) Membrane

0.2 µm: 1.0 bar (100 kPa, 15 psi)
0.45 µm: 0.4 bar (40 kPa, 6 psi)

Ordering Information

HPLC Mobile Phase Filtration Membranes, 47 mm

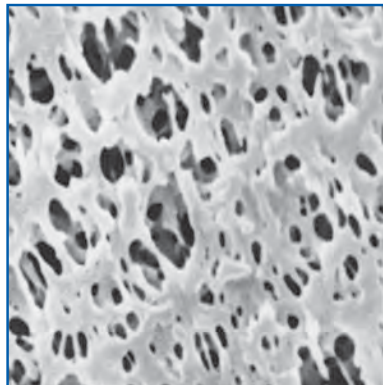
Part Number	Description	Pkg
66557	0.2 µm, GH Polypro (PP) membrane	100/pkg
66548	0.45 µm, GH Polypro (PP) membrane	100/pkg
66143	0.2 µm, TF (PTFE) membrane	100/pkg
66149	0.45 µm, TF (PTFE) membrane	100/pkg
66477	0.2 µm, PVDF membrane	100/pkg
66480	0.45 µm, PVDF membrane	100/pkg
66602	0.2 µm, Nylaflo (nylon) membrane	100/pkg
66608	0.45 µm, Nylaflo (nylon) membrane	100/pkg

Related Products

47 mm Filter Funnels, Glass	206
SolVac® Filter Holder	183
Stainless Steel Forceps	230, 280
Vacuum/Pressure Pumps	279

GH Polypro (GHP) Membrane Disc Filters

All purpose, universal membrane with maximum chemical compatibility for both aqueous solutions and aggressive solvents



- ▶ Maximum versatility. Filters aqueous solutions or aggressive chemicals.
- ▶ Low protein binding membrane gives high recovery of critical proteinaceous samples.
- ▶ HPLC certified. Provides assurance that the filter will not add artifacts to your analysis.
- ▶ Low API adsorption.

Applications

- ▶ Our number-one choice for filtering HPLC mobile phases.
- ▶ Available in 0.2 µm for UHPLC.
- ▶ Suitable for pharmaceutical HPLC applications.

Specifications

Filter Media
Hydrophilic polypropylene

Pore Size
0.2 and 0.45 µm

Typical Thickness
0.2 µm: 101 µm (4.0 mils)
0.45 µm: 114 µm (4.5 mils)

Typical Water Flow Rate
mL/min/cm² at 0.7 bar
(70 kPa, 10 psi)
0.2 µm: 20
0.45 µm: 31

Maximum Operating Temperature
55 °C (131 °F)

Minimum Bubble Point - Water
0.2 µm: 2.9 bar (290 kPa, 42 psi)
0.45 µm: 1.38 bar (138 kPa, 20 psi)

Performance

GHP Membrane is Virtually a Universal Membrane for All Applications

Membrane	Proteinaceous	General Aqueous	Non-Aggressive Organic	Aggressive Organic
GHP	++	++	++	++
PTFE	-	-	++	++
PVDF	++	++	+	-
Nylon	+*	++	+	-

++ Recommended
+ Suitable
- Not Recommended
* Dependent on protein type and concentration.

Ordering Information

GHP Polypro (GHP) Membrane Disc Filters

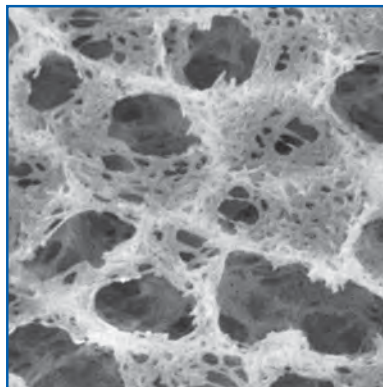
Part Number	Description	Pkg
60189	0.2 µm, 25 mm	100/pkg
66557	0.2 µm, 47 mm	100/pkg
66628	0.2 µm, 50 mm	100/pkg
66629	0.45 µm, 13 mm	100/pkg
66340	0.45 µm, 25 mm	100/pkg
66640	0.45 µm, 37 mm	100/pkg
66548	0.45 µm, 47 mm	100/pkg
66625	0.45 µm, 50 mm	100/pkg
66626	0.45 µm, 90 mm	100/pkg

Related Products

47 mm Filter Funnels, Glass	206
SolVac® Filter Holder	183
Stainless Steel Forceps	230, 280
Vacuum/Pressure Pumps	279

Nylaflor™ Membrane Disc Filters

A highly versatile laboratory membrane filter



- ▶ Excellent chemical compatibility with esters, bases, and alcohols.
- ▶ Naturally hydrophilic.
- ▶ Available in 0.2 and 0.45 µm pore sizes, in diameters ranging from 13 to 142 mm.
- ▶ HPLC certified. Provides assurance that the filter will not add artifacts to your analysis.

Applications

- ▶ Useful for a wide range of applications. Offers broad chemical resistance to common solvents.
- ▶ Not recommended for acids > 1N or halogenated solvents.

Specifications

Filter Media

Hydrophilic nylon

Pore Size

0.2 and 0.45 µm

Typical Thickness

127 µm (5 mils)

Typical Water Flow Rate

mL/min/cm² at 0.7 bar

(70 kPa, 10 psi)

0.2 µm: 12

0.45 µm: 16

Maximum Operating Temperature - Water

100 °C (212 °F)

Minimum Bubble Point - Water

0.2 µm: 3.4 bar (340 kPa, 49 psi)

0.45 µm: 2.6 bar (260 kPa, 37 psi)

Ordering Information

Nylaflor Membrane Disc Filters, 0.2 µm

Part Number	Description	Pkg
66600	13 mm	100/pkg
66601	25 mm	100/pkg
66602	47 mm	100/pkg
66603	90 mm	100/pkg
66604	142 mm	25/pkg

Nylaflor Membrane Disc Filters, 0.45 µm

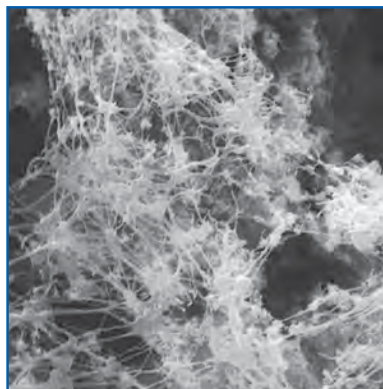
Part Number	Description	Pkg
66606	13 mm	100/pkg
66607	25 mm	100/pkg
66608	47 mm	100/pkg
66609	90 mm	100/pkg
66610	142 mm	25/pkg

Related Products

47 mm Filter Funnels, Glass	206
142 mm Disc Filter Holder, Stainless Steel	275
SolVac® Filter Holder	183
Stainless Steel Forceps	230, 280
Vacuum/Pressure Pumps	279

PTFE Membrane Disc Filters

Strong, chemically resistant membranes for solvent and HPLC mobile phase filtration



- ▶ Low chemical background permits highly sensitive, interference-free determinations.
- ▶ Ideal for filtration of gas and/or organic solvents.

Applications

- ▶ Ultimate in chemical compatibility for filtering harsh chemicals and HPLC mobile phases that destroy other membrane materials.

Specifications

Filter Media

Hydrophobic polytetrafluoroethylene (PTFE) on a polypropylene support

Pore Size

0.2, 0.45 μm , and 1 μm

Typical Thickness

0.2 μm : 139 μm (5.5 mils)
0.45 and 1 μm : 135 μm (5.3 mils)

Typical Air Flow Rate

L/min/cm² at 0.7 bar (70 kPa, 10 psi)
0.2 μm : 2
0.45 μm : 3
1 μm : 7

Maximum Operating Temperature

100 °C (212 °F)

Minimum Bubble Point - IPA

0.2 μm : 1.0 bar (100 kPa, 15 psi)
0.45 μm : 0.4 bar (40 kPa, 6 psi)
1 μm : 0.1 bar (10 kPa, 2 psi)

Ordering Information

TF (PTFE) Membrane Disc Filters

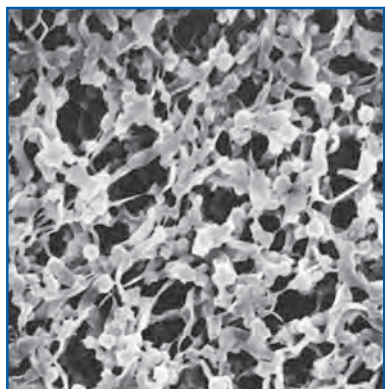
Part Number	Description	Pkg
66141	TF 200, 0.2 μm , 13 mm	100/pkg
66142	TF 200, 0.2 μm , 25 mm	100/pkg
66143	TF 200, 0.2 μm , 47 mm	100/pkg
66630	TF 200, 0.2 μm , 50 mm	100/pkg
66145	TF 200, 0.2 μm , 142 mm	25/pkg
66146	TF 200, 0.2 μm , 293 mm	25/pkg
66147	TF 450, 0.45 μm , 13 mm	100/pkg
66148	TF 450, 0.45 μm , 25 mm	100/pkg
66149	TF 450, 0.45 μm , 47 mm	100/pkg
66631	TF 450, 0.45 μm , 50 mm	100/pkg
66151	TF 450, 0.45 μm , 142 mm	25/pkg
66152	TF 450, 0.45 μm , 293 mm	25/pkg
66153	TF 1000, 1 μm , 13 mm	100/pkg
66154	TF 1000, 1 μm , 25 mm	100/pkg
66159	TF 1000, 1 μm , 37 mm, with support pads	100/pkg
66155	TF 1000, 1 μm , 47 mm	100/pkg
66158	TF 1000, 1 μm , 293 mm	25/pkg

Related Products

47 mm Filter Funnels, Glass	206
SolVac® Filter Holder	183
Stainless Steel Forceps	230, 280
Vacuum/Pressure Pumps	279

PVDF Membrane Disc Filters

Compatible with aggressive and non-aggressive solvent-based solutions



- ▶ Useful for a wide range of applications including aggressive and non-aggressive solvent-based mobile phase.
- ▶ HPLC certified. Provides assurance that the filter will not add artifacts to your analysis.
- ▶ Membrane is autoclavable.

Applications

- ▶ Offers excellent chemical compatibility, even with aggressive acids and alcohols.
- ▶ Not recommended for acetone, DMF, DMSO, or bases > 6N.

Specifications

Filter Media

Hydrophilic polyvinylidene fluoride (PVDF)

Pore Size

0.2 and 0.45 μm

Typical Thickness

0.2 μm : 140 μm (5.5 mils)
0.45 μm : 127 μm (5.0 mils)

Typical Water Flow Rate

mL/min/cm² at 0.7 bar
(70 kPa, 10 psi)

0.2 μm : 5
0.45 μm : 26

Maximum Operating Temperature - Water

100 °C (212 °F)

Minimum Bubble Point - Water

0.2 μm : 2.3 bar (230 kPa, 34 psi)
0.45 μm : 1.1 bar (110 kPa, 16 psi)

Sterilization

Provided non-sterile. Autoclavable if desired.

Ordering Information

PVDF 200 Membrane Disc Filters, 0.2 μm

Part Number	Description	Pkg
66475	13 mm	100/pkg
66476	25 mm	100/pkg
66477	47 mm	100/pkg

PVDF 450 Membrane Disc Filters, 0.45 μm

Part Number	Description	Pkg
66478	13 mm	100/pkg
66479	25 mm	100/pkg
66480	47 mm	100/pkg

Related Products

47 mm Filter Funnels, Glass	206
SolVac® Filter Holder	183
Stainless Steel Forceps	230, 280
Vacuum/Pressure Pumps	279

SolVac® Filter Holder

Magnetic filter holder simplifies clean-up and degassing of mobile phase solvents and other solutions



- ▶ Versatile design fits most HPLC bottles, flasks, and containers, and eliminates the added steps of washing flasks and transferring mobile phase solvent from flask to reservoir.
- ▶ Draws directly from HPLC solvent bottle. Less likely to spill aggressive solvents than glass funnels or disposable cups.
- ▶ Durable plastic construction is less likely to break than glass funnels, assemblies, or adapters.
- ▶ Patented magnetic seal is reliable and leak proof. Eliminates the possibility of membrane shifting or tearing which can occur with aluminum clamps or threaded holders.
- ▶ Reusable, chemically resistant polypropylene construction is resistant to common HPLC mobile phase solvents such as methanol, acetonitrile, and tetrahydrofuran.

Applications

- ▶ Remove contaminating particulate from mobile phase or other solutions.
- ▶ De-gas mobile phase solvents and solutions.
- ▶ Eliminate pour-and-wait filtration.
- ▶ Remove microbial growth every 24 hours from aqueous buffer mobile phases.

Specifications

Materials of Construction

Upper Housing, Housing Base: Polypropylene
Feedline Tubing: Ultra chemical-resistant Tygon®, 4.8 mm (3/16 in.) ID
Thumb Clamp: Celcon®
Feedline Sinker: PTFE
Vacuum Port Adapter, Membrane Seal Gasket, and Seal Gasket: Polyethylene

Effective Filtration Area

10.2 cm²

Filter Size

Accepts 47 mm filter

Inlet/Outlet Connections

Tapered inlet accepts 3.2 - 6.4 mm (1/8 - 1/4 in.) ID tubing; outlet seals to bottles with openings 17.8 mm (0.7 in.) ID to 48.3 mm (1.9 in.) OD

Vacuum Port Adapter

4.8 - 7.9 mm (3/16 - 5/16 in.) tapered hose barb

Maximum Vacuum

63.5 cm Hg (25 in. Hg)

Operating Temperature

Ambient; not to exceed 38 °C (100 °F); not autoclavable

Chemical Compatibility

For detailed information about chemical compatibility by membrane type, see the Chemical Compatibility Chart on pages 286 - 287.

Ordering Information

SolVac Filter Holder

Part Number	Description	Pkg
4020	SolVac holder with 61 cm (2 ft.) feedline tubing, thumb clamp, sinker, vacuum port adapter, 2 membrane seal gaskets, and 2 seal gaskets	1/pkg

Accessories and Replacement Parts

Part Number	Description	Pkg
4022	122 cm (4 ft.) replacement feedline tubing	1/pkg
4023	Replacement seal gaskets	10/pkg
4025	Membrane seal gasket kit	10/pkg
4026	Sinker replacement kit	2/pkg
4028	Clamp replacement kit	2/pkg

Related Products

GH Polypro (GHP) Membrane Disc Filters	178
Stainless Steel Forceps	230, 280
Vacushield™ Vent Device	165
Vacuum/Pressure Pumps	279

Instructions for Use



1. Place base on the receiving vessel. Place the membrane on the clean, dry filter support.



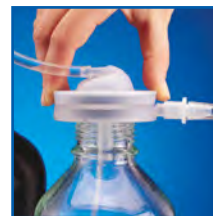
2. Attach inlet feedline tubing to the upper housing. Place upper housing onto housing base to securely seal the membrane.



3. Attach vacuum tubing from vacuum source to the vacuum port adapter on the housing base.



4. Place feedline tubing into solvent to be filtered.



5. Apply vacuum to pull liquid through the filter.

Always use a safety-coated receiving vessel that is less than 4 L and rated for vacuum applications. Failure to do so may result in implosion of the receiving vessel and potential injury to the user.

HPLC Mobile Phase Filtration Membranes

Membrane	Mobile Phase Application	Technical Information
TF (PTFE)	Recommended for use with all organic liquids	Page 180
GH Polypro (GHP, polypropylene)	Recommended for use with organic and aqueous liquids	Page 178
Nylaflor™ (nylon)	Not recommended for use with some acidic solutions	Page 179
PVDF	Not recommended for use with some basic solutions	Page 181

Acrodisc® MS Syringe Filter

Certified syringe filters for LCMS



- ▶ Minimize interference in your LCMS results with the first LCMS-certified filter with extremely low levels of extractables.
- ▶ Reduce the need for retesting. The Acrodisc MS syringe filters will not contribute extractables that will interfere with the ionization process.
- ▶ Protective packaging design saves money and prevents downtime due to accidental contamination. Packaged into separate tubes.
- ▶ The WWPTFE (water wettable polytetrafluoroethylene) membrane can be used with both organic and aqueous solvents. When coupled with a polyethylene housing, this filter offers excellent chemical resistance.
- ▶ Low protein binding gives accurate and confident quantitative results. No minimal protein adsorption.
- ▶ Protects your columns and instrument from particulate build-up, making your columns last longer and your LCMS perform more consistently.

Applications

- ▶ Molecular identification
- ▶ Structural determination
- ▶ Pharmacokinetics
- ▶ Drug discovery and development
- ▶ Drug testing
- ▶ Environmental monitoring
- ▶ Food safety monitoring
- ▶ Oil composition determination

Specifications

Materials of Construction

Filter Media: WWPTFE (water-wettable polytetrafluoroethylene) membrane
Housing: HDPE (high density polyethylene)

Pore size

0.2 µm

Effective Filtration Area

13 mm: 1.0 cm²
25 mm: 3.9 cm²

Typical Sample Volume

13 mm: ≤ 10 mL
25 mm: < 150 mL

Inlet/Outlet Connections

13 mm: Female threaded luer inlet, minispike outlet
25 mm: Female threaded luer inlet, male slip luer outlet

Maximum Operating Pressure/Temperature

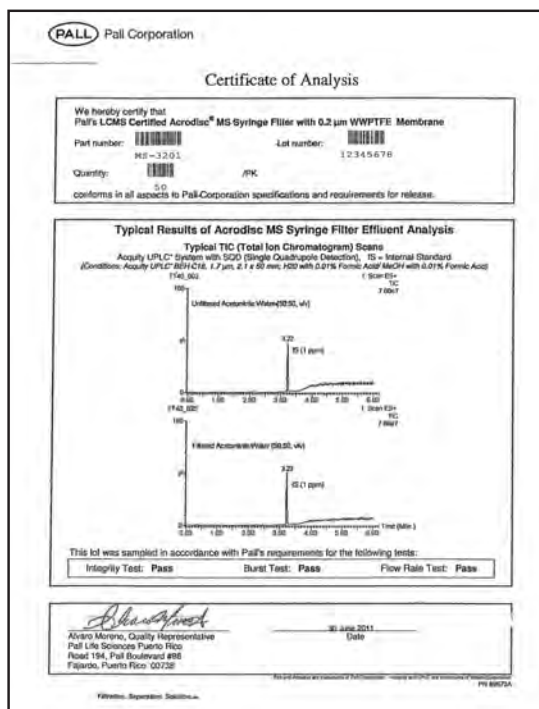
13 mm: 75 psi at 21-24 °C (70-75 °F),
30 psi at 55 °C (131 °F)
25 mm: 60 psi at 21-24 °C (70-75 °F),
30 psi at 55 °C (131 °F)

Typical Water Flow Rate

13 mm: 49 mL/min at 30 psi
25 mm: 140 mL/min at 30 psi

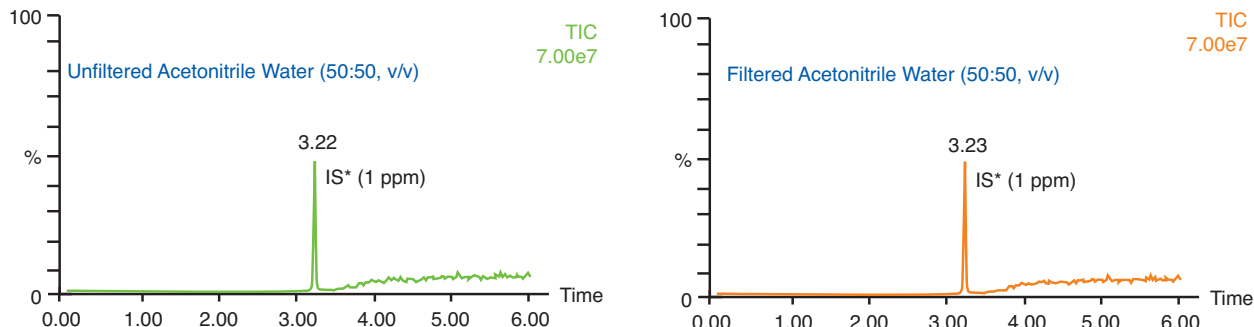
Certification

To ensure low levels of extractables, Pall certifies that all lots of WWPTFE membrane used in the Acrodisc MS syringe filters have been tested according to established LCMS techniques. Each box of product comes with a certificate containing Total Ion Current (TIC) chromatograms that show all detected peaks relative to an Internal Standard. Results for integrity, burst, and flow rate tests are also included on the certificate.



Performance

The following TIC chromatograms demonstrate full scans of unfiltered and filtered solutions of 50:50, v/v, acetonitrile:water over a six minute gradient UHPLC method.



Detection – Mass Spec: ES+ Mode; Mass Range: 100.00-1400.0
 Column: Waters Acquity UPLC BEH 1.7 μ m – 2.1 x 50 mm
 Mobile Phase A: Methanol with 0.1% Formic Acid
 Mobile Phase B: Water with 0.01% Formic Acid
 Acquisition Program: Gradient – 6.0 minutes
 *IS = Internal Standard

Ordering Information

Acrodisc MS Syringe Filter

Part Number	Description	Pkg
MS-3301	0.2 μ m, 13 mm, WWPTFE membrane	60/pkg
MS-3201	0.2 μ m, 25 mm, WWPTFE membrane	50/pkg

Related Products

Acrodisc® Syringe Filters for HPLC/UHPLC Sample Prep 187-195, 198
 HPLC Mobile Phase Filtration Membranes 177
 SolVac® Filter Holder 182

Acrodisc® Syringe Filters With GHP Membrane

The "universal" membrane filter for all your analytical filtration requirements



- ▶ Acrodisc PSF syringe filters are Zymark® and SOTAX® Automation Certified to ensure smooth operation and worry-free performance 24 hours a day in automated workstations.
- ▶ Avoid the expense and inconvenience of keeping a variety of filters on hand. Versatile filter for aqueous and aggressive organic solvent-based solutions.
- ▶ Low protein binding membrane gives high recovery of critical proteinaceous samples.
- ▶ Accurate analysis. HPLC certified for low levels of UV-absorbing extractables.
- ▶ Easy filtration of particulate-laden samples with glass fiber prefilter version.
- ▶ 13 mm Acrodisc syringe filter with minispike configuration offers low hold-up and easy filtration into autosampler vials.
- ▶ Protects columns and instrumentation from particulate buildup better than other filters.

Applications

- ▶ Highly recommended for filtering HPLC samples.
- ▶ Available in 0.2 µm for UHPLC applications.
- ▶ The Acrodisc PSF GxF syringe filter provides two to four times the throughput of standard prefilter devices for particulate-laden samples.
- ▶ 25 mm Acrodisc PSF syringe filter is available in robotic-compatible AutoPack™ packaging for SOTAX AT-70 SMART® and CTS and Zymark TPW®, APW®, and MultiDose® dissolution systems.

Specifications

Materials of Construction

Filter Media: GH Polypro membrane (GHP, hydrophilic polypropylene)
Housing: Polypropylene
GxF Prefilter: Borosilicate glass

Pore Size

GHP Membrane: 0.2 and 0.45 µm
Glass Fiber (GF): 1 µm
GxF Prefilter: 40 - 1 µm

Effective Filtration Area

13 mm: 1.0 cm²
25 mm PSF: 3.9 cm²

Sample Volume

13 mm: < 10 mL
25 mm PSF: < 150 mL

Inlet/Outlet Connections

13 mm: Female luer lock inlet, minispike outlet
25 mm PSF: Female luer lock inlet, male slip luer outlet

Typical Hold-Up Volume

(with air purge)
13 mm: < 14 µL
25 mm PSF: < 125 µL
25 mm PSF GxF: < 200 µL

Maximum Operating Temperature

25 mm PSF: 55 °C (131 °F) at 2.1 bar (210 kPa, 30 psi)

Maximum Operating Pressure

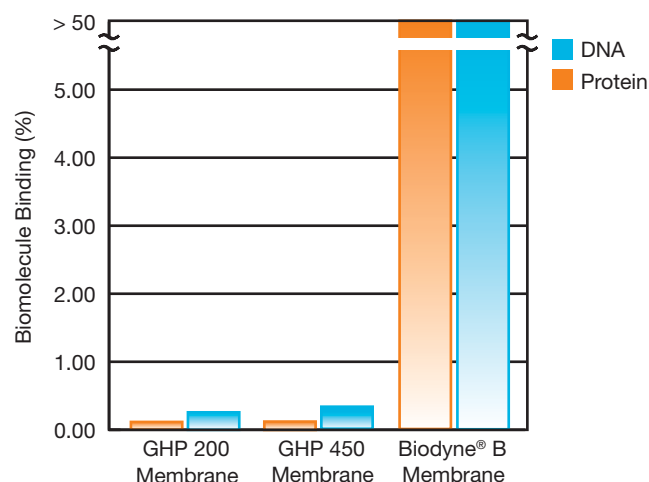
13 mm: 6.3 bar (630 kPa, 90 psi)
25 mm PSF: 4.1 bar (410 kPa, 60 psi) at 21 - 24 °C (70 - 75 °F)
2.1 bar (210 kPa, 30 psi) at 55 °C (131 °F)

Typical Water Flow Rate

mL/min at 0.7 bar (70 kPa, 10 psi)
13 mm, 0.2 µm: 17
13 mm, 0.45 µm: 28
mL/min at 2.1 bar (210 kPa, 30 psi)
25 mm PSF, 0.2 µm: 215
0.45 µm: 300
25 mm GxF/PSF, 0.2 µm: 175
0.45 µm: 195

Performance

GHP Membrane is Extremely Low in Biomolecule Binding



¹²⁵I-labeled BSA (1.6 µg) or ³²P-labeled DNA (500 ng) were diluted to 5 mL in PBS (BSA) or Tris-EDTA (DNA) and filtered through a 13 mm disc of the indicated membrane. Filtration was carried out using a 10 mL syringe at a flow rate of 1.0 mL/min.

Binding was determined by comparing the amount of radioactivity remaining in the membrane (triplicate) to the activity of the starting material by placing the disc or solution directly into scintillation cocktail and counting in a scintillation counter. Biodyne B membrane is designed for biomolecule binding and was used as a positive control.

Ordering Information

Acrodisc® Syringe Filters With GHP Membrane, 13 mm

Part Number	Description	Pkg
4554	0.2 µm, minispikes outlet	100/pkg, 300/cs
4567	0.2 µm, minispikes outlet	1000/pkg
4556	0.45 µm, minispikes outlet	100/pkg, 300/cs
4563	0.45 µm, minispikes outlet	1000/pkg

Acrodisc Syringe Filters With GHP Membrane, 25 mm

Part Number	Description	Pkg
4564	0.2 µm	50/pkg, 200/cs
4566	0.2 µm	1000/pkg
4560	0.45 µm	50/pkg, 200/cs
4562	0.45 µm	1000/pkg

Acrodisc GF Syringe Filters With GHP Membrane, 25 mm

Part Number	Description	Pkg
4559	GF/0.45 µm	50/pkg, 200/cs
4558	GF/0.45 µm	1000/pkg

Related Products

47 mm Filter Funnels, Glass	206
AcroPrep™ 24 Filtration System	201
HPLC Mobile Phase Filtration Membranes	177
SolVac® Filter Holder	182
Stainless Steel Forceps	230, 280
Vacuum/Pressure Pumps	279

Zymark® and SOTAX® Automation Certified Acrodisc PSF Syringe Filters With GHP Membrane, 25 mm

Part Number	Description	Pkg
AP-4364	0.2 µm, AutoPack™ tubes	25/pkg, 200/cs
AP-4564	0.2 µm	50/pkg, 200/cs
AP-4566	0.2 µm	1000/pkg
AP-4357	0.45 µm, AutoPack tubes	25/pkg, 200/cs
AP-4560	0.45 µm	50/pkg, 200/cs
AP-4562	0.45 µm	1000/pkg

Zymark and SOTAX Automation Certified Acrodisc PSF GxF Syringe Filters With GHP Membrane, 25 mm

Part Number	Description	Pkg
AP-4305	GxF/0.2 µm, AutoPack tubes	25/pkg, 200/cs
AP-4307	GxF/0.2 µm	50/pkg, 200/cs
AP-4306	GxF/0.2 µm	1000/pkg
AP-4557	GxF/0.45 µm, AutoPack tubes	25/pkg, 200/cs
AP-4559	GxF/0.45 µm	50/pkg, 200/cs
AP-4558	GxF/0.45 µm	1000/pkg

Acrodisc® Syringe Filters With PVDF Membrane

Hydrophilic membrane compatible with a wide variety of solvents



Specifications

Materials of Construction

Filter Media: Hydrophilic polyvinylidene fluoride (PVDF)
Housing: Polypropylene
GxF Prefilter: Borosilicate glass

Pore Size

PVDF Membrane: 0.2 and 0.45 μm
GxF Prefilter: 40 - 1 μm

Effective Filtration Area

13 mm: 1.0 cm^2
25 mm PSF: 3.9 cm^2

Sample Volume

13 mm: < 10 mL
25 mm PSF: < 150 mL

Inlet/Outlet Connections

13 and 25 mm PSF: Female luer lock inlet, male slip luer outlet
13 mm: Available with minispikes outlet

Typical Hold-Up Volume

(with air purge)
13 mm (minispikes): < 14 μL
13 mm (male luer): < 30 μL
25 mm PSF: < 100 μL
25 mm PSF GxF: < 125 μL

Maximum Operating Temperature

13 mm: 55 $^{\circ}\text{C}$ (131 $^{\circ}\text{F}$)
25 mm PSF: 82 $^{\circ}\text{C}$ (180 $^{\circ}\text{F}$) at 2.1 bar (210 kPa, 30 psi)

Maximum Operating Pressure

13 mm: 3.5 bar (350 kPa, 50 psi)
25 mm PSF: 4.1 bar (410 kPa, 60 psi) at 21 - 24 $^{\circ}\text{C}$ (70 - 75 $^{\circ}\text{F}$);
2.1 bar (210 kPa, 30 psi) at 82 $^{\circ}\text{C}$ (180 $^{\circ}\text{F}$)

Typical Water Flow Rate

mL/min at 3.1 bar (310 kPa, 45 psi)
13 mm, 0.2 μm : 5
13 mm, 0.45 μm : 15
mL/min at 2.1 bar (210 kPa, 30 psi)
25 mm, 0.45 μm PSF and GxF: 144

- ▶ Acrodisc PSF syringe filters are Zymark® and SOTAX® Automation Certified to assure smooth operation and worry-free performance 24 hours a day in automated workstations.
- ▶ Useful for a wide range of applications, including aggressive and non-aggressive solvent-based mobile phase.
- ▶ Reduces experimental variables. HPLC certified for low levels of UV-absorbing extractables.
- ▶ Protects columns and instrumentation against particulate build up.
- ▶ 13 mm device with minispikes configuration offers low hold-up and easy filtration into autosampler vials.

Applications

- ▶ Offers excellent chemical compatibility, even with aggressive acids and alcohols.
- ▶ Not recommended for acetone, DMF, DMSO, or bases > 6N.
- ▶ 25 mm Acrodisc PSF syringe filter is available in robotic-compatible AutoPack™ packaging for SOTAX AT-70 SMART® and CTS and Zymark TPW®, APW®, and MultiDose® dissolution systems.

Ordering Information

Acrodisc® Syringe Filters With PVDF Membrane, 13 mm

Part Number	Description	Pkg
4450	0.2 µm, minispikes outlet	100/pkg, 300/cs
4544	0.2 µm, minispikes outlet	1000/pkg
4452	0.45 µm, minispikes outlet	100/pkg, 300/cs
4545	0.45 µm, minispikes outlet	1000/pkg
4455	0.2 µm, male slip luer outlet	100/pkg, 300/cs
4457	0.45 µm, male slip luer outlet	100/pkg, 300/cs

Acrodisc Syringe Filters With PVDF Membrane, 25 mm

Part Number	Description	Pkg
4406	0.2 µm	50/pkg, 200/cs
4520	0.2 µm	1000/pkg
4519	0.45 µm, AutoPack™ tubes	25/pkg, 200/cs
4408	0.45 µm	50/pkg, 200/cs
4500	0.45 µm	1000/pkg

Related Products

47 mm Filter Funnels, Glass	206
AcroPrep™ 24 Filtration System	201
HPLC Mobile Phase Filtration Membranes	177
SolVac® Filter Holder	182
Stainless Steel Forceps	230, 280
Vacuum/Pressure Pumps	279



Zymark® and SOTAX® Automation Certified Acrodisc PSF Syringe Filters With PVDF Membrane, 25 mm

Part Number	Description	Pkg
AP-4795	0.2 µm, AutoPack tubes	25/pkg, 200/cs
AP-4796	0.2 µm	50/pkg, 200/cs
AP-4797	0.2 µm	1000/pkg
AP-4519	0.45 µm, AutoPack tubes	25/pkg, 200/cs
AP-4408	0.45 µm	50/pkg, 200/cs
AP-4500	0.45 µm	1000/pkg



Zymark and SOTAX Automation Certified Acrodisc PSF GxS Syringe Filters With PVDF Membrane, 25 mm

Part Number	Description	Pkg
AP-4792	GxS/0.2 µm, AutoPack tubes	25/pkg, 200/cs
AP-4793	GxS/0.2 µm	50/pkg, 200/cs
AP-4794	GxS/0.2 µm	1000/pkg
AP-4309	GxS/0.45 µm, AutoPack tubes	25/pkg, 200/cs
AP-4310	GxS/0.45 µm	50/pkg, 200/cs
AP-4308	GxS/0.45 µm	1000/pkg

Acrodisc® Syringe Filters With Nylon Membrane

Versatile filters for both aqueous and solvent-based sample filtration



syringe filters

HPLC AND CHROM SAMPLE PREP

- ▶ Acrodisc PSF syringe filters are Zymark® and SOTAX® Automation Certified to assure smooth operation and worry-free performance 24 hours a day in automated workstations.
- ▶ Excellent chemical compatibility with esters, bases, and alcohols.
- ▶ Saves time because no prewetting is required.
- ▶ Easy filtration of particulate-laden samples with the glass fiber prefilter version.
- ▶ 13 mm device with minispike configuration offers low hold-up and easy filtration into autosampler vials.
- ▶ Prevents spurious peaks on chromatograms for accurate experimental results. HPLC certified for low levels of UV-absorbing extractables.

Applications

- ▶ The Acrodisc PSF GxF syringe filter provides two to four times the throughput of standard prefilter devices.
- ▶ Not recommended for acids > 1 N or halogenated solvents.
- ▶ 25 mm Acrodisc PSF syringe filter is available in robotic-compatible AutoPack™ packaging for SOTAX AT-70 SMART® and CTS and Zymark TPW®, APW®, and MultiDose® dissolution systems.

Specifications

Materials of Construction

Filter Media: Nylon
Housing: Polypropylene
GxF Prefilter: Borosilicate glass

Pore Size

Nylon Membrane: 0.2 and 0.45 µm
GxF Prefilter: 40 - 1 µm

Effective Filtration Area

4 mm: 0.2 cm²
13 mm: 1.0 cm²
25 mm PSF: 3.9 cm²

Sample Volume

4 mm: < 2 mL
13 mm: < 10 mL
25 mm PSF: < 150 mL

Inlet/Outlet Connections

4, 13, and 25 mm PSF: Female luer lock inlet, male slip luer outlet
13 mm: Available with minispike outlet

Typical Hold-Up Volume

(with air purge)
4 mm: < 10 µL
13 mm (minispike): < 14 µL
13 mm (male luer): < 30 µL
25 mm PSF: < 125 µL
25 mm PSF GxF: < 150 µL

Maximum Operating Temperature

55 °C (131 °F) at 2.1 bar
(210 kPa, 30 psi)

Maximum Operating Pressure

4 mm: 5.2 bar (520 kPa, 75 psi)
13 mm: 6.9 bar (690 kPa, 100 psi)
25 mm PSF: 4.1 bar (410 kPa, 60 psi) at 21 - 24 °C (70 - 75 °F);
2.1 bar (210 kPa, 30 psi) at 55 °C (131 °F)

Typical Water Flow Rate

mL/min at 2.1 bar (210 kPa, 30 psi)
13 mm, 0.2 µm: 10
13 mm, 0.45 µm: 15
25 mm PSF, 0.2 µm: 115
0.45 µm: 245
25 mm PSF GxF/0.45 µm: 215

Ordering Information

Acrodisc Syringe Filters With Nylon Membrane, 13 mm

Part Number	Description	Pkg
4550	0.2 µm, minispikes outlet	100/pkg, 300/cs
4561	0.2 µm, minispikes outlet	1000/pkg
4551	0.45 µm, minispikes outlet	100/pkg, 300/cs
4546	0.45 µm, minispikes outlet	1000/pkg

Acrodisc Syringe Filters With Nylon Membrane, 13 mm

Part Number	Description	Pkg
4427	0.2 µm, male slip luer outlet	100/pkg, 300/cs
4540	0.2 µm, male slip luer outlet	1000/pkg
4426	0.45 µm, male slip luer outlet	100/pkg, 300/cs
4541	0.45 µm, male slip luer outlet	1000/pkg

Acrodisc Syringe Filters With Nylon Membrane, 25 mm

Part Number	Description	Pkg
4436	0.2 µm	50/pkg, 200/cs
4522	0.2 µm	1000/pkg
4517	0.45 µm, AutoPack™ tubes	25/pkg, 200/cs
4438	0.45 µm	50/pkg, 200/cs
4502	0.45 µm	1000/pkg

Acrodisc GF Syringe Filters With Nylon Membrane, 25 mm

Part Number	Description	Pkg
4548	GF/0.45 µm, AutoPack tubes	25/pkg, 200/cs
4549	GF/0.45 µm	50/pkg, 200/cs
4528	GF/0.45 µm	1000/pkg

Related Products

47 mm Filter Funnels, Glass	206
AcroPrep™ 24 Filtration System	201
HPLC Mobile Phase Filtration Membranes	177
SolVac® Filter Holder	182
Stainless Steel Forceps	230, 280
Vacuum/Pressure Pumps	279

Zymark® and SOTAX® Automation Certified Acrodisc PSF Syringe Filters With Nylon Membrane, 25 mm

Part Number	Description	Pkg
AP-4437	0.2 µm, AutoPack tubes	25/pkg, 200/cs
AP-4436	0.2 µm	50/pkg, 200/cs
AP-4522	0.2 µm	1000/pkg
AP-4517	0.45 µm, AutoPack tubes	25/pkg, 200/cs
AP-4438	0.45 µm	50/pkg, 200/cs
AP-4502	0.45 µm	1000/pkg

Zymark and SOTAX Automation Certified Acrodisc PSF GxF Syringe Filters With Nylon Membrane, 25 mm

Part Number	Description	Pkg
AP-4786	GxF/0.2 µm, AutoPack tubes	25/pkg, 200/cs
AP-4787	GxF/0.2 µm	50/pkg, 200/cs
AP-4788	GxF/0.2 µm	1000/pkg
AP-4548	GxF/0.45 µm, AutoPack tubes	25/pkg, 200/cs
AP-4549	GxF/0.45 µm	50/pkg, 200/cs
AP-4528	GxF/0.45 µm	1000/pkg

Acrodisc® Syringe Filters With PTFE Membrane

Exceptional chemical and temperature compatibility



- ▶ Acrodisc PSF syringe filters are Zymark® and SOTAX® Automation Certified to assure smooth operation and worry-free performance 24 hours a day in automated workstations.
- ▶ Ideal for filtration of gas and/or organic solvents.
- ▶ Prevents spurious peaks on chromatograms for accurate experimental results. HPLC certified for low levels of UV-absorbing extractables.
- ▶ Prevents "air bubble" lock when filling sample vials with 13 mm minispikes outlet.
- ▶ 4 mm device offers the lowest sample hold-up (< 10 µL) and is useful for samples up to 2 mL in volume.

Applications

- ▶ Ultimate in chemical compatibility for filtering harsh chemicals that destroy other membrane materials.
- ▶ The Acrodisc PSF GxF syringe filter provides two to four times the throughput of standard prefilter devices.
- ▶ Moisture barrier for venting applications.
- ▶ 25 mm Acrodisc PSF syringe filter is available in robotic-compatible AutoPack™ packaging for SOTAX AT-70 SMART® and CTS and Zymark TPW®, APW®, and MultiDose® dissolution systems.

Specifications

Materials of Construction

Filter Media: Hydrophobic PTFE membrane on a polypropylene support
Housing: Polypropylene
GxF Prefilter: Borosilicate glass

Pore Size

PTFE Membrane: 0.2 and 0.45 µm
GxF Prefilter: 40 - 1 µm

Effective Filtration Area

4 mm: 0.2 cm²
13 mm: 1.0 cm²
25 mm PSF: 3.9 cm²

Sample Volume

4 mm: < 2 mL
13 mm: < 10 mL
25 mm PSF: < 150 mL

Inlet/Outlet Connections

4, 13, and 25 mm PSF: Female luer lock inlet, male slip luer outlet
13 mm: Available with minispikes outlet

Typical Hold-Up Volume

(with air purge)
4 mm: < 10 µL
13 mm (minispikes): < 14 µL
13 mm (male luer): < 30 µL
25 mm PSF: < 125 µL

Typical Liquid Flow Rate (MeOH)

mL/min at 1.0 bar (100 kPa, 15 psi)
25 mm PSF, 0.2 µm: 245
25 mm PSF, 0.45 µm: 510
25 mm PSF, GxF/0.2 µm: NA
25 mm PSF, GxF/0.45 µm: 395

Maximum Operating Temperature

100 °C (212 °F) at 2.1 bar (210 kPa, 30 psi)

Maximum Operating Pressure

4 mm: 5.2 bar (520 kPa, 75 psi)
13 mm: 6.9 bar (690 kPa, 100 psi)
25 mm PSF: 4.1 bar (410 kPa, 60 psi) at 21 - 24 °C (70 - 75 °F);
2.1 bar (210 kPa, 30 psi) at 100 °C (212 °F)

Sterilization of 25 mm Filters

Provided non-sterile. If desired, autoclave at 121- 123 °C (250 - 253 °F) at 1.0 bar (100 kPa, 15 psi) for a maximum of 15 min.

Ordering Information

Acrodisc® Syringe Filter With PTFE Membrane, 4 mm

Part Number	Description	Pkg
4472	0.45 µm	250/pkg, 750/cs

Acrodisc Syringe Filters With PTFE Membrane, 13 mm

Part Number	Description	Pkg
4552	0.2 µm, minispikes outlet	100/pkg, 300/cs
4553	0.45 µm, minispikes outlet	100/pkg, 300/cs
4555	0.45 µm, minispikes outlet	1000/pkg

Acrodisc Syringe Filters With PTFE Membrane, 13 mm

Part Number	Description	Pkg
4423	0.2 µm, male slip luer outlet	100/pkg, 300/cs
4542	0.2 µm, male slip luer outlet	1000/pkg
4422	0.45 µm, male slip luer outlet	100/pkg, 300/cs
4543	0.45 µm, male slip luer outlet	1000/pkg

Acrodisc Syringe Filters With PTFE Membrane, 25 mm

Part Number	Description	Pkg
4225	0.2 µm	50/pkg, 200/cs
4521	0.2 µm	1000/pkg
4518	0.45 µm, AutoPack™ tubes	25/pkg, 200/cs
4219	0.45 µm	50/pkg, 200/cs
4501	0.45 µm	1000/pkg
4226	1 µm	50/pkg, 200/cs
4503	1 µm	1000/pkg

Related Products

47 mm Filter Funnels, Glass	206
AcroPrep™ 24 Filtration System	201
HPLC Mobile Phase Filtration Membranes	177
SolVac® Filter Holder	182
Stainless Steel Forceps	230, 280
Vacuum/Pressure Pumps	279

Zymark® and SOTAX® Automation Certified Acrodisc PSF Syringe Filters With PTFE Membrane, 25 mm

Part Number	Description	Pkg
AP-4520	0.2 µm, AutoPack tubes	25/pkg, 200/cs
AP-4225	0.2 µm	50/pkg, 200/cs
AP-4521	0.2 µm	1000/pkg
AP-4518	0.45 µm, AutoPack tubes	25/pkg, 200/cs
AP-4219	0.45 µm	50/pkg, 200/cs
AP-4501	0.45 µm	1000/pkg

Zymark and SOTAX Automation Certified Acrodisc PSF GxF Syringe Filters With PTFE Membrane, 25 mm

Part Number	Description	Pkg
AP-4789	GxF/0.2 µm, AutoPack tubes	25/pkg, 200/cs
AP-4790	GxF/0.2 µm	50/pkg, 200/cs
AP-4791	GxF/0.2 µm	1000/pkg
AP-4301	GxF/0.45 µm, AutoPack tubes	25/pkg, 200/cs
AP-4303	GxF/0.45 µm	50/pkg, 200/cs
AP-4302	GxF/0.45 µm	1000/pkg

Ion Chromatography (IC) Acrodisc® Syringe Filters

Optimized to provide the most consistent results when analyzing ionic species



syringe filters

HPLC AND CHROM SAMPLE PREP

- ▶ Acrodisc PSF syringe filters are Zymark® and SOTAX® Automation Certified to assure smooth operation and worry-free performance 24 hours a day in automated workstations.
- ▶ Accurate results for the most sensitive analysis of ionic species. Certified for low levels of extractables detected by conductivity.
- ▶ High flow rates with optimized Supor® polyethersulfone membrane.
- ▶ Conforms to quality release criteria for ion chromatography (IC) extractables.
- ▶ Convenient sizes for small sample volumes.

Applications

- ▶ Specifically designed for IC applications.
- ▶ Excellent filter selection for dissolution samples.
- ▶ Low drug and protein binding for pharmaceutical filtration.
- ▶ Supor (IC) membrane discs are recommended for aqueous samples only.
- ▶ 25 mm Acrodisc PSF syringe filter is available in robotic-compatible AutoPack™ packaging for SOTAX AT-70 SMART® and CTS and Zymark TPW®, APW®, and MultiDose® dissolution systems.

Specifications

Materials of Construction

Filter Media: Supor [hydrophilic polyethersulfone (PES)] membrane
Housing: Polypropylene

Pore Size

0.2 and 0.45 µm

Effective Filtration Area

13 mm: 1.0 cm²
25 mm PSF: 3.9 cm²

Sample Volume

13 mm: < 10 mL
25 mm PSF: < 150 mL

Inlet/Outlet Connections

Female luer lock inlet, male slip luer outlet

Typical Hold-Up Volume

(with air purge)
13 mm: < 30 µL
25 mm PSF: < 125 µL

Maximum Operating Temperature

13 mm: 55 °C (131 °F)
25 mm PSF: 100 °C (212 °F) at 2.1 bar (210 kPa, 30 psi)

Maximum Operating Pressure

13 mm: 6.9 bar (690 kPa, 100 psi)
25 mm PSF: 4.1 bar (410 kPa, 60 psi) at 21 - 24 °C (70 - 75 °F);
2.1 bar (210 kPa, 30 psi) at 100 °C (212 °F)

Typical Water Flow Rate

mL/min at 1.0 bar (100 kPa, 15 psi)
13 mm, 0.2 µm: 15
13 mm, 0.45 µm: 20
mL/min at 2.1 bar (210 kPa, 30 psi)
25 mm, 0.2 µm PSF: NA
25 mm, 0.45 µm PSF: 420

Performance

Ion Chromatography Certification

Pall Life Sciences certifies that the maximum allowable levels of extractables from the filter are 50 ppb of Cl⁻, NO₃⁻, and SO₄⁻². Data shows that the actual background levels found are typically less than 20 ppb for chloride, 6 ppb for nitrate, 1 ppb for phosphate, and 10 ppb for sulfate. This is based on 2 mL of H₂O filtrate being concentrated on-line and injected into an ion chromatograph with conductivity detection.

Ordering Information

IC Acrodisc® Syringe Filters with Supor Membrane, 13 mm

Part Number	Description	Pkg
4483	0.2 µm	100/pkg, 300/cs
4683	0.2 µm	1000/pkg
4485	0.45 µm	100/pkg, 300/cs
4685	0.45 µm	1000/pkg

IC (PES) Acrodisc Syringe Filters with Supor Membrane, 25 mm

Part Number	Description	Pkg
4583	0.2 µm	50/pkg, 200/cs
4783	0.2 µm	1000/pkg
4585	0.45 µm	50/pkg, 200/cs
4785	0.45 µm	1000/pkg

Related Products

47 mm Filter Funnels, Glass	206
SolVac® Filter Holder	182
Stainless Steel Forceps	230, 280
Vacuum/Pressure Pumps	279



Zymark® and SOTAX® Automation Certified

IC Acrodisc PSF Syringe Filters with Supor Membrane, 25 mm

Part Number	Description	Pkg
AP-4801	0.2 µm AutoPack™ tubes	25/pkg, 200/cs
AP-4802	0.2 µm	50/pkg, 200/cs
AP-4803	0.2 µm	1000/pkg
AP-4587	0.45 µm AutoPack tubes	25/pkg, 200/cs
AP-4585	0.45 µm	50/pkg, 200/cs
AP-4785	0.45 µm	1000/pkg

Acrodisc® Syringe Filters With Versapor® Membrane

Meets all prefiltration and clarification requirements



- ▶ Acrodisc PSF syringe filters are Zymark® and SOTAX® Automation Certified to assure smooth operation and worry-free performance 24 hours a day in automated workstations.
- ▶ Meets aqueous sample filtration needs.

Applications

- ▶ 25 mm Acrodisc PSF syringe filter is available in robotic-compatible AutoPack™ packaging for SOTAX AT-70 SMART® and CTS and Zymark TPW®, APW®, and MultiDose® dissolution systems.
- ▶ Useful for prefiltration of particulate-laden samples, serum filtration, and dissolution testing.
- ▶ Protects instrumentation against particulate build up.

Specifications

Materials of Construction

Filter Media: Versapor membrane (acrylic copolymer on a non-woven support)
Housing: Polypropylene

Pore Size

0.45, 0.8, and 10 µm

Effective Filtration Area

4 mm: 0.2 cm²
13 mm: 1.0 cm²
25 mm PSF: 3.9 cm²

Inlet/Outlet Connections

Female luer lock inlet, male slip luer outlet

Typical Hold-Up Volume

(with air purge)
4 mm: < 7.5 µL
13 mm: < 28 µL
25 mm PSF: < 125 µL

Maximum Operating Temperature

0.8 µm: 55 °C (131 °F) at 2.1 bar (210 kPa, 30 psi)
10 µm: 82 °C (180 °F) at 2.1 bar (210 kPa, 30 psi)

Maximum Operating Pressure

4 and 13 mm: 5.2 bar (520 kPa, 75 psi)
25 mm PSF: 4.1 bar (410 kPa, 60 psi) at 21 - 24 °C (70 - 75 °F)

Typical Water Flow Rate

mL/min at 3.1 bar (310 kPa, 45 psi)
4 mm, 0.45 µm: 3
13 mm, 0.8 µm: 180
25 mm PSF, 0.8 µm: 905

mL/min at 1.0 bar (100 kPa, 15 psi)
25 mm PSF, 10 µm: 1182

Ordering Information

Acrodisc Syringe Filters With Versapor Membrane, 4 and 13 mm

Part Number	Description	Pkg
4473	0.45 µm, 4 mm	250/pkg, 750/cs
4459	0.8 µm, 13 mm	100/pkg, 300/cs

Zymark and SOTAX Automation Certified Acrodisc PSF Syringe Filters With Versapor Membrane, 25 mm

Part Number	Description	Pkg
AP-4190	0.8 µm, AutoPack tubes	25/pkg, 200/cs
AP-4189	0.8 µm	50/pkg, 200/cs
AP-4568	0.8 µm	1000/pkg
AP-4000	10 µm, AutoPack tubes	25/pkg, 200/cs
AP-4001	10 µm	50/pkg, 200/cs
AP-4002	10 µm	1000/pkg

Related Products

47 mm Filter Funnels, Glass	206
SolVac® Filter Holder	182
Stainless Steel Forceps	230, 280
Vacuum/Pressure Pumps	279
Versapor Acrylic Copolymer Membrane Disc Filters	113

Acrodisc® Syringe Filters With HT Tuffryn® Membrane

Proven performance



- ▶ Acrodisc PSF syringe filters are Zymark® and SOTAX® Automation Certified to assure smooth operation and worry-free performance 24 hours a day in automated workstations.
- ▶ Reliable filter for dilute biological fluids.
- ▶ Available non-sterile for analytical preparation of biologicals.
- ▶ Low protein binding.

Applications

- ▶ 25 mm Acrodisc PSF syringe filter is available in robotic-compatible AutoPack™ packaging for SOTAX AT-70 SMART® and CTS and Zymark TPW®, APW®, and MultiDose® dissolution systems.
- ▶ Useful for preparation of biological samples for HPLC or FPLC.
- ▶ For general aqueous samples.

Specifications

Materials of Construction

Filter Media: HT Tuffryn membrane (polysulfone)

Housing: Polypropylene

Effective Filtration Area

3.9 cm²

Inlet/Outlet Connections

Female luer lock inlet, male slip luer outlet

Typical Hold-Up Volume

(with air purge)

< 125 µL

Maximum Operating Temperature

25 mm: 55 °C (131 °F) at 2.1 bar (210 kPa, 30 psi)

Maximum Operating Pressure

4.1 bar (410 kPa, 60 psi) at 21 - 24 °C (70 - 75 °F)

Typical Water Flow Rate

mL/min at 3.1 bar (310 kPa, 45 psi): 390

Ordering Information

Zymark and SOTAX Automation Certified Acrodisc PSF Syringe Filters With HT Tuffryn Membrane, 25 mm

Part Number	Description	Pkg
AP-4498	0.45 µm, AutoPack tubes	25/pkg, 200/cs
AP-4497	0.45 µm	50/pkg, 200/cs
AP-4784	0.45 µm	1000/pkg

Related Products

47 mm Filter Funnels, Glass	206
HT Tuffryn Polysulfone Membrane Disc Filters	112
SolVac® Filter Holder	182
Stainless Steel Forceps	230, 280
Vacuum/Pressure Pumps	279

syringe filters

HPLC AND CHROM SAMPLE PREP

Acrodisc® Syringe Filters With Supor® Membrane

Universal life science membrane for general aqueous samples



- ▶ Acrodisc PSF syringe filters are Zymark® and SOTAX® Automation Certified to assure smooth operation and worry-free performance 24 hours a day in automated workstations.
- ▶ Superior flow rates and higher throughputs than competitive devices.
- ▶ Low protein binding to minimize sample loss.
- ▶ Acrodisc PSF syringe filters feature unique built-in prefilter for increased throughput of difficult-to-filter liquids.

Applications

- ▶ 25 mm Acrodisc PSF syringe filter is available in robotic-compatible AutoPack™ packaging for SOTAX AT-70 SMART® and CTS and Zymark TPW®, APW®, and MultiDose® dissolution systems.
- ▶ Widely used in dissolution testing.
- ▶ Larger pore size filters are used for prefiltration and particulate removal.
- ▶ > 0.8 µm pore sizes are excellent for difficult-to-filter dissolution samples.

Related Products

Supor PES Membrane Disc Filters	111
47 mm Filter Funnels, Glass	206
SolVac® Filter Holder	182
Stainless Steel Forceps	230, 280
Vacuum/Pressure Pumps.....	279

Specifications

Materials of Construction

Filter Media: Supor membrane (hydrophilic polyethersulfone)
 GxF Prefilter: Borosilicate glass
 Housing:
 25 mm PSF: Polypropylene
 32 mm: Modified acrylic

Pore Size

Supor Membrane: 0.2, 0.45, 1.2, and 5 µm
 GxF Prefilter: 40 - 1 µm

Effective Filtration Area

25 mm PSF: 3.9 cm²
 32 mm: 5.8 cm²

Inlet/Outlet Connections

Female luer lock inlet, male slip luer outlet

Typical Hold-Up Volume

(with air purge)
 25 mm PSF GxF: ≤ 200 µL
 32 mm: ≤ 100 µL

Maximum Operating Temperature

25 mm PSF GxF: 100 °C (212 °F) at 2.1 bar (210 kPa, 30 psi)
 32 mm: 55 °C (131 °F)

Maximum Operating Pressure

25 mm PSF GxF: 4.1 bar (410 kPa, 60 psi) at 21 - 24 °C (70 - 75 °F);
 2.1 bar (210 kPa, 30 psi) at 100 °C (212 °F)
 32 mm: 5.2 bar (520 kPa, 75 psi)

Typical Water Flow Rate

mL/min at 2.1 bar (210 kPa, 30 psi)
 25 mm PSF, GxF/0.2 µm: NA
 25 mm PSF, GxF/0.45 µm: 360
 mL/min at 3.1 bar (310 kPa, 45 psi)
 32 mm, 0.2 µm: 490
 32 mm, 0.45 µm: 560
 32 mm, 0.8/0.2 µm: 440
 32 mm, 1.2 µm: 1700
 32 mm, 5 µm: 1750

Ordering Information

Zymark and SOTAX Automation Certified
 Acrodisc PSF GxF Syringe Filters With Supor Membrane, 25 mm

Part Number	Description	Pkg
AP-4798	GxF/0.2 µm AutoPack Tubes	25/pkg, 200/cs
AP-4799	GxF/0.2 µm	50/pkg, 200/cs
AP-4800	GxF/0.2 µm	1000/pkg
AP-4424	GxF/0.45 µm AutoPack Tubes	25/pkg, 200/cs
AP-4425	GxF/0.45 µm	50/pkg, 200/cs
AP-4426	GxF/0.45 µm	1000/pkg

Acrodisc Syringe Filters With Supor Membrane, 32 mm (Bulk Packaging)

Part Number	Description	Pkg
4655	0.2 µm, modified acrylic housing	1000/pkg
4653	0.45 µm, modified acrylic housing	1000/pkg
4659	0.8/0.2 µm, modified acrylic housing	1000/pkg
4661	1.2/0.45 µm, modified acrylic housing	1000/pkg
4660	1.2 µm, modified acrylic housing	1000/pkg
4662	5 µm, modified acrylic housing	1000/pkg

Acrodisc® Syringe Filters With Glass Fiber

Maximize throughput for hard-to-filter samples



- ▶ Acrodisc PSF syringe filters are Zymark® and SOTAX® Automation Certified to assure smooth operation and worry-free performance 24 hours a day in automated workstations.
- ▶ Available with GxF multi-layered glass fiber prefilter, providing two to four times the throughput of standard glass fiber prefilter devices, and allowing quick and easy filtration of your most difficult-to-filter samples.
- ▶ Reduces clogging. Use alone or in series with final membrane filter to increase flow rate and throughput.
- ▶ Ensures broad chemical compatibility with polypropylene housing.

Applications

- ▶ For high throughput prefiltration of particulate-laden samples.
- ▶ Can be used alone or in series with another Acrodisc syringe filter.
- ▶ 25 mm Acrodisc PSF syringe filter is available in robotic-compatible AutoPack™ packaging for SOTAX AT-70 SMART® and CTS and Zymark TPW®, APW®, and MultiDose® dissolution systems.
- ▶ Removes particulate that interferes with UV/VIS spectrophotometric analysis.

Specifications

Materials of Construction

Filter Media: Borosilicate glass fiber
Housing: Polypropylene

Pore Size

40 - 1 µm

Effective Filtration Area

3.9 cm²

Sample Volume

< 150 mL

Inlet/Outlet Connections

Female luer lock inlet, male slip luer outlet

Typical Hold-Up Volume

(with air purge)
< 125 µL

Maximum Operating Temperature

82 °C (180 °F) at 2.1 bar (210 kPa, 30 psi)

Maximum Operating Pressure

4.1 bar (410 kPa, 60 psi) at 21 - 24 °C (70 - 75 °F);
2.1 bar (210 kPa, 30 psi) at 82 °C (180 °F)

Typical Water Flow Rate

795 mL/min at 1.0 bar (100 kPa, 15 psi)

Ordering Information

Acrodisc Syringe Filters With Glass Fiber, 25 mm

Part Number	Description	Pkg
4527	1 µm (nominal), AutoPack tubes	25/pkg, 200/cs
4523	1 µm (nominal)	50/pkg, 200/cs
4529	1 µm (nominal)	1000/pkg

Zymark and SOTAX Automation Certified Acrodisc PSF GxF Syringe Filters With Glass Fiber, 25 mm

Part Number	Description	Pkg
AP-4527	GxF/Glass, AutoPack tubes	25/pkg, 200/cs
AP-4523	GxF/Glass	50/pkg, 200/cs
AP-4529	GxF/Glass	1000/pkg

Related Products

47 mm Filter Funnels, Glass	206
HPLC Mobile Phase Filtration Membranes	177
SolVac® Filter Holder	182
Stainless Steel Forceps	230, 280
Vacuum/Pressure Pumps	279

AcroPrep™ 24 Filtration System

Eliminates the time-consuming, one-at-a-time syringe filter process by simultaneously filtering up to 24 samples in seconds



- ▶ Reduces labor time by 20 minutes per carousel over the conventional syringe filter technique.
- ▶ No need to use cumbersome, individually wrapped, disposable syringes. Use disposable pipette tips which are less costly, easier to use, and require less bench space.
- ▶ Designed for use with Waters Alliance* HPLC systems.
- ▶ Pall's HPLC certification ensures that analytical results will not be compromised by extractable filter material.
- ▶ No cross-contamination. Each 1.9 mL well is individually sealed, ensuring your sample will accurately dispense into the Waters Alliance sample carousel* with no cross-contamination or splashing.
- ▶ Materials of construction are identical to Pall's Acrodisc® syringe filters; if you are currently using Acrodisc syringe filters, this will reduce the requirements for validation of the AcroPrep 24 filter plates.
- ▶ Can be used with any conventional 12 x 32 mm vials; simply transfer your filtered samples from the Waters Alliance sample carousel to any HPLC sample carousel that houses 12 x 32 mm vials and save both time and labor.
- ▶ Can be used to process fewer than 24 samples. Simply label used wells or isolate unused wells with parafilm for application at a later time.

Applications

- ▶ Ideal for use with HPLC sample preparation.

Specifications

Materials of Construction

Filter Media: GH Polypro (GHP, hydrophilic polypropylene), nylon, PTFE, and PVDF membranes
Housing: Polypropylene

Pore Size

0.2 and 0.45 µm

Effective Filtration Area/Well

0.94 cm²

Filter Plate Diameter

15.24 cm (6.0 in.) plate containing 24 wells

Outlet Connections

Minispike outlet

Maximum Well Volume

1.9 mL

Recommended Sample Volume

1.7 mL

Typical Hold-Up Volume/Well

< 50 µL

Operating Temperature Range

18 - 27 °C (64 - 80 °F); ambient

Maximum Vacuum

56.0 cm Hg (22 in. Hg)

Chemical Compatibility

For detailed information about chemical compatibility by membrane type, see the Chemical Compatibility Chart on pages 286 - 287.

Performance

The AcroPrep 24 Filtration System Saves Time and Materials

Syringe Filter Technique

24 disposable syringes
+ 24 syringe filters

25 minutes

AcroPrep 24 Filtration System

24 disposable pipette tips
+ 1 AcroPrep 24 filter plate

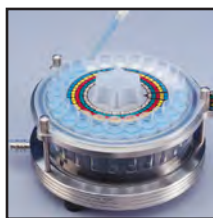
5 minutes

*The Waters Alliance 2690 Sample Carousel kit (PN WAT270328) can be ordered directly from your local Waters sales office or contact Waters Corporation at 800-252-4752 (in the USA) or 508-478-2000.

Instructions for Use

The AcroPrep™ 24 Filtration System operates by vacuum. Conventional lab pumps such as Pall Life Sciences' 115 V (PN 13157) or 230 V (PN 13158) Vacuum/Pressure pumps are

ideal for use. For maximum convenience, we recommend the use of snap-cap vials to eliminate the need to remove vials for screw capping after filtration.



1. Attach vacuum hose to the connector on the base.
2. Place the Alliance* sample carousel with empty 2 mL vials into the manifold.
3. Place the filter plate onto the manifold. The filter plate has a numerically-sequenced label that matches the carousel's sample numbers.
4. Pipette 1.7 mL (1,700 µL) of sample into each of the filter wells.
5. Apply vacuum.
6. Allow vacuum to run until all wells are evacuated.
7. Shut off vacuum source. Dispose of filter plate.
8. Cap sample vials and place the sample carousel into the Waters Alliance HPLC system or simply transfer the vials to any HPLC sample carousel that houses 12 x 32 mm vials.

The cleanliness of the AcroPrep filter plate results in very low levels of extractables, therefore eliminating the need

to pre-rinse the filter.

Ordering Information

AcroPrep 24 Filtration System Manifold

Part Number	Description	Pkg
289000159	Filtration manifold	1/pkg

AcroPrep 24 Filter Plates

Part Number	Description	Pkg
186000158	0.2 µm, GHP membrane	10/pkg
600000158	0.45 µm, GHP membrane	2/pkg
186000154	0.45 µm, GHP membrane	10/pkg
186000154P	0.45 µm, GxG/GHP membrane	10/pkg
186000159	0.2 µm, nylon membrane	10/pkg
186000155	0.45 µm, nylon membrane	10/pkg
186000157	0.45 µm, PVDF membrane	10/pkg

Related Products

47 mm Filter Funnels, Glass	206
SolVac® Filter Holder	182
Stainless Steel Forceps	230, 280
Vacuum/Pressure Pumps	279

Accessories and Replacement Parts

Part Number	Description	Pkg
13157	Vacuum/Pressure pump, 115 V	1/pkg
13158	Vacuum/Pressure pump, 230 V	1/pkg
700000231	Glass housing for filtration manifold	1/pkg
700000232	O-ring kit	3/pkg
700000233	Rubber feet	3/pkg
700000234	Manifold alignment post	3/pkg

Vacuum General Information

- ▶ Do not exceed a vacuum level of 56.0 cm (22 in.) Hg.
- ▶ Allow vacuum to run until all filter wells are evacuated. Continue running vacuum for 10 to 20 seconds to eliminate potential dripping of samples from tips when plate is removed.

How to Choose a Centrifugal Device for HPLC

Nanosep® MF, Microsep™ Advance, and Macrosep® Advance centrifugal devices are ideal for particulate removal prior to sample analysis. Designed to rapidly process small- to medium-volume samples, these spin filters are simple to use and can save on sample preparation time.

Pall's Nanosep MF centrifugal devices are certified to be low in UV extractables and feature low hold-up volumes (< 5 µL). Their high g-force ratings allow them to be spun at up to 14,000 x g, resulting in rapid sample processing. Designed with a unique sealing technology, Pall's centrifugal devices assure leak-free operation without the use of O-rings or adhesives that can add extractables. For HPLC/UHPLC applications, GHP membrane (Nanosep MF) and Supor® membrane (Microsep Advance and Macrosep Advance) deliver low protein binding and decreased processing time for high recovery rates.

An added benefit of Pall's centrifugal devices is their ease of use. Each filter is color-coded by retention level and laser etched for easy identification. The sample to be processed is pipetted into the upper reservoir of the device. The device is then placed into the appropriate centrifuge (taking care that the rotor is balanced) and spun at the desired rate. Filtrate can be recovered by removing the lower reservoir of the device and using a pipette or pipette tip to remove the liquid.

Match Device Size to Sample Volume

After choosing membrane and pore size rating, the next consideration in selecting the correct centrifugal device is the volume of starting material. Pall's centrifugal devices are available in a range of sizes to accommodate your specific sample volumes.

Device	Retention	Sample Volume
Nanosep MF	0.45 µm, clear	< 0.5 mL
Microsep Advance	0.2 µm, aqua	0.5 - 5 mL
Microsep Advance	0.45 µm, wildberry	0.5 - 5 mL
Macrosep Advance	0.2 µm, aqua	5 - 20 mL
Macrosep Advance	0.45 µm, wildberry	5 - 20 mL



Nanosep® MF Centrifugal Devices With GHP Membrane

Ideal for particulate removal, especially when sample recovery is a concern



- ▶ Rapid processing of samples. Centrifugal devices are simple to use and save on sample preparation time. Spin multiple samples at once!
- ▶ Universal membrane filter. The GHP hydrophilic polypropylene membrane is ideal for aqueous solutions and offers maximum chemical compatibility for aggressive solvents.
- ▶ GHP membrane is a low protein binding membrane. It removes unwanted particulate from samples with high recovery of critical proteins.
- ▶ Low extractables. Our HPLC-grade centrifugal devices are certified to be low in UV extractables.
- ▶ Low hold-up volume (< 5 µL) makes these devices ideal for expensive samples.
- ▶ High g-force ratings. Can be spun at 14,000 x g for confident rapid sample processing.
- ▶ Leak-free operation. Unique sealing technology assures leak-free operation without the use of O-rings or adhesives that can add extractables.
- ▶ Constructed of low binding polypropylene.
- ▶ Fits standard centrifuge rotors that accept 1.5 mL tubes.

Applications

- ▶ Sample preparation (particulate removal prior to sample analysis - HPLC, IC, GC).
- ▶ Removal of precipitates (metals, polymers, or crystals).
- ▶ Applications requiring maximum filtrate recovery from limited sample volumes.
- ▶ Removal of cells from media prior to analysis.

Specifications

Materials of Construction

Filter Media: GH Polypro (GHP, hydrophilic polypropylene) membrane
Upper Housing, Filtrate Receiver: Polypropylene

Pore Size

0.45 µm

Effective Filtration Area

0.3 cm²

Dimensions

Overall Length (Fully Assembled With Cap): 4.5 cm (1.8 in.)

Capacities

Maximum Sample Volume: 500 µL
Final Concentrate Volume: 15 µL
Filtrate Receiver Volume: 500 µL
Hold-Up Volume (Membrane/Support): < 5 µL

Operating Temperature Range

0 - 40 °C (32 - 104 °F)

pH Range

3 - 14

Maximum Centrifugal Force

14,000 x g

Centrifuge

A rotor is required that accepts 1.5 mL tubes.

Sterilization

Provided non-sterile; may be sanitized by filtering 70% ethanol through the device prior to use.

Ordering Information

Nanosep MF Centrifugal Devices With GHP membrane*

Part Number	Description	Pkg
ODGHPC34	0.45 µm, clear	100/pkg
ODGHPC35	0.45 µm, clear	500/pkg

*For more information on Nanosep centrifugal devices with Bio-Inert® or Omega™ membrane, please see page 21.

Microsep™ Advance Centrifugal Devices With Supor® Membrane

Precise, quick recovery of microliter volumes



- ▶ Particulate removal for longer HPLC and UHPLC column life.
- ▶ High spin speed and larger EFA reduces spin times.
- ▶ Color-coded and laser etched for easy identification.
- ▶ For samples from 0.5 - 5 mL.

Applications

- ▶ Remove particulate from samples for HPLC analyses.
- ▶ Clarify samples with gross particulate.

Specifications

Materials of Construction

Filter Media: Supor (polyethersulfone) membranes

Sample Reservoir, Filtrate Receiver, and Cap: Polypropylene

Paddle: Polyethylene

Effective Filtration Area

3.3 cm²

Dimensions

Diameter: 17 mm (0.7 in.)

Length: 12.0 cm (4.9 in.)

Operating Temperature Range

0 - 40 °C (32 - 104 °F)

Capacities

Maximum Sample Volume: 5.0 mL

Final Concentrate Volume:

65 µL (swinging bucket)

80 µL (45° angle rotor)

100 µL (34° angle rotor)

Filtrate Receiver Volume: 6.5 mL

Hold-Up Volume: 40 µL (membrane and paddle)

pH Range

1 - 14

Maximum Centrifugal Force

14,000 x g (microfiltration)

Centrifuge

A fixed angle rotor that accepts standard 17 x 100 mm tubes and is capable of 3,000 to 14,000 x g.

Sanitization

Provided non-sterile. May be sanitized by filtering 70% ethanol through the device prior to use.

Ordering Information

Microsep Advance Centrifugal Devices With Supor Membrane*

Part Number	Description	Pkg
MCPM02C67	0.2 µm, aqua	24/pkg
MCPM02C68	0.2 µm, aqua	100/pkg
MCPM45C67	0.45 µm, wildberry	24/pkg
MCPM45C68	0.45 µm, wildberry	100/pkg

*For more information on Microsep Advance centrifugal devices with Omega™ 3K - 100K MWCO membrane, please see page 23.

Macrosep® Advance Centrifugal Devices With Supor® Membrane

Quickly concentrates up to 20 mL of biological sample



- ▶ Particulate removal for longer HPLC and UHPLC column life.
- ▶ High spin speed and larger EFA reduces spin times.
- ▶ Color-coded and laser etched for easy identification.
- ▶ For samples from 3 - 20 mL.

Applications

- ▶ Remove particulate from samples for HPLC analyses.

Specifications

Materials of Construction

Filter Media: Supor (polyethersulfone) membranes

Sample Reservoir, Filtrate Receiver, and Cap: Polypropylene

Paddle: Polyethylene

Effective Filtration Area

7.2 cm²

Dimensions

Diameter: 29 mm (1.2 in.)

Length: 12.0 cm (4.7 in.)

Operating Temperature Range

0 - 40 °C (32 - 104 °F)

Capacities

Maximum Sample Volume: 20 mL

Final Concentrate Volume: As low as 450 µL, depending on rotor used

Filtrate Receiver Volume: 22 mL

Hold-Up Volume: 80 µL (membrane and paddle)

pH Range

1 - 14

Maximum Centrifugal Force

14,000 x g (microfiltration)

Centrifuge

Fits centrifuges that accept standard 50 mL conical end tubes.

Sanitization

Provided non-sterile. May be sanitized by filtering 70% ethanol through the device prior to use.

Performance

Rotor Selection Determines Final Concentrate Volume

Rotor Angle	Deadstop Volume
Swinging Bucket	450 µL
45° Fixed Angle	1.2 - 1.5 mL
34° Fixed Angle	1.5 mL

Ordering Information

Macrosep Advance Centrifugal Devices With Supor Membrane*

Part Number	Description	Pkg
MAPM02C67	0.2 µm, aqua	24/pkg
MAPM02C68	0.2 µm, aqua	100/pkg
MAPM45C67	0.45 µm, wildberry	24/pkg
MAPM45C68	0.45 µm, wildberry	100/pkg

*For more information on Macrosep Advance centrifugal devices with Omega™ 3K - 100K MWCO membrane, please see pages 24 - 25.

47 mm Filter Funnels, Glass

Ideal for vacuum filtration of liquids and degassing of HPLC solvents and mobile phases



- ▶ Made of 100% borosilicate glass, assures resistance to even the most aggressive solvents.
- ▶ One-liter 47 mm glass funnel/support assembly permits filtration of an entire liter at once.
- ▶ Support assembly's unique base design with integral vacuum connection prevents contamination of the vacuum line with filtrate.
- ▶ One-liter glass funnel is graduated from 300 to 1,000 mL in 50 mL increments.
- ▶ 300 mL glass funnel is graduated from 100 to 250 mL in 25 mL increments. Stepped stem fits into standard one-hole stoppers (9 mm).

Applications

- ▶ Ideal for filtration and degassing of HPLC solvents and aqueous mobile phase solutions and buffers.
- ▶ Ideal for mobile phase particulate removal.

Specifications

47 mm Glass Filter Funnel With Stopper Support Assembly

Materials of Construction

All parts are borosilicate glass except:
 Stopper: Silicone No. 8
 Clamp: Aluminum

Effective Filtration Area

9.6 cm²

Dimensions

Overall Height:
 Base: 11.7 cm (4.6 in.)
 Funnel: 11.1 cm (4.4 in.)

Diameter:

Base: 5.8 cm (2.3 in.)
 Funnel: 7.9 cm (3.1 in.)

Filter Size

Accepts 47 mm filter

Funnel Capacity

300 mL

47 mm Glass Filter Funnel With Sidearm Support Assembly and Flask

Materials of Construction

All parts are borosilicate glass except:
 Clamp: Aluminum
 Support Base/Flask Connection:
 Standard taper 40/35 ground joint

Effective Filtration Area

9.6 cm²

Dimensions

Overall Height:
 PN 4012 and 4013 Base:
 11.7 cm (4.6 in.)
 PN 4012 Funnel: 16.7 cm (6.6 in.)
 PN 4013 Funnel: 11.1 cm (4.4 in.)

Diameter:

PN 4012 and 4013 Base:
 5.8 cm (2.3 in.)
 PN 4012 Funnel: 12.0 cm (4.7 in.)
 PN 4013 Funnel: 7.9 cm (3.1 in.)

Filter Size

Accepts 47 mm filter

Funnel Capacity

300 mL or 1 L

Flask Capacity

1 or 4 L

Ordering Information

47 mm Filter Funnels, Glass

Part Number	Description	Pkg
4011	Glass filter funnel with No. 8 stopper support base (300 mL funnel, no flask)	1/pkg
4012	Glass filter funnel with sidearm support assembly and flask (1 L funnel with 4 L flask)	1/pkg
4013	Glass filter funnel with sidearm support assembly and flask (300 mL funnel with 1 L flask)	1/pkg

Accessories and Replacement Parts

Part Number	Description	Pkg
4014	Glass funnel, 300 mL	1/pkg
4015	Glass funnel, 1 L	1/pkg
4018	Glass flask, 1 L	1/pkg
4016	Glass flask, 4 L	1/pkg
4017	Fritted glass support base with sidearm	1/pkg
4019	Fritted glass support base/No. 8 silicone stopper	1/pkg
81595	Aluminum clamp, anodized	1/pkg

Microbiology Quality Control



When left undetected, microorganisms can halt the production of pharmaceuticals, spoil food, ruin the taste of beverages, negatively impact the performance of computer chips, and cause serious illness. That's why Pall is dedicated to finding new and better ways to help you accurately and reliably identify these microorganisms to protect both public safety and the integrity of industrial assets.

Pall has been setting performance standards in Microbiology Quality Control laboratories for more than 50 years, and our products are referenced and recommended by regulatory agencies worldwide. We invite you to explore the many ways Pall's sample prep solutions can enhance your pharmaceutical and beverage quality control applications.

Content

- 208** Pharmaceutical Quality Control Application Selector
- 209** Beverage Quality Control Application Selector
- 210** Microbiology Quality Control Overview
- 212** Microbiology Quality Control – Online Reference Library
- 213** Microbiology Quality Control
 - 213** Products – Membranes
 - 216** Products – Media
 - 218** Products – Filter Funnels
 - 228** Products – Hardware
 - 230** Products – Accessories

Pharmaceutical Quality Control Application Selector

	Page Number	<i>Pseudomonas</i> sp. Detection	Total Bacteria Detection	Total Coliforms Detection	Fecal Coliforms Detection	Yeast and Mold Detection
Membranes						
GN-6 Metrical® MCE membrane disc filters, S-pack	213	•	•	•	•	•
Metrical Black PES membrane disc filters, S-pack	214		•			•
Sentino™ Filter Dispenser	213a	•	•	•	•	•
Supor® 200 PES membrane disc filters, S-pack	215	•	•			
Ampoule Media*						
HPC with TTC indicator broth	216		•			
M-FC broth	216				•	
MF-Endo broth	216			•		
M-Green YM broth	216					•
M-TGE broth	216		•			
<i>Pseudomonas</i> broth	216	•				
Trypticase Soy broth - USP	216		•			
Filter Funnels						
47 mm magnetic filter funnels	226	•	•	•	•	•
MicroFunnel™ filter funnels, 100 and 300 mL	218	•	•	•	•	•
MicroFunnel Plus filter funnels, 100 and 300 mL	220	•	•	•	•	•
MicroFunnel ST filter funnels, 100 and 300 mL	222	•	•	•	•	•
Sentino Magnetic filter funnels	225a	•	•	•	•	•
Vents						
Vacushield™ vent device	165	•	•	•	•	•
Hardware and Accessories						
Absorbent pad kits	231	•	•	•	•	•
Filter funnel manifolds	229	•	•	•	•	•
Filter funnel manifolds for MicroFunnel filter funnels	228	•	•	•	•	•
Petri dishes	230, 280	•	•	•	•	•
Sentino Microbiology Pump	224	•	•	•	•	•
Stainless steel forceps	230, 280	•	•	•	•	•
Vacuum/pressure pumps	279	•	•	•	•	•

* Culture media listed may or may not meet the requirements of a regulated test method. It is the responsibility of the user to determine applicability in each situation.

Beverage Quality Control Application Selector

	Page Number	Lactobacillus sp. Detection	Total Bacteria Detection	Total Coliforms Detection	Fecal Coliforms Detection	Yeast and Mold Detection
Membranes						
GN-6 Metrice [®] MCE membrane disc filters, S-pack	213	•	•	•	•	•
Metrice Black PES membrane disc filters, S-pack	214	•	•	•	•	•
Sentino [™] Filter Dispenser	213a	•	•	•	•	•
Supor [®] 200 PES membrane disc filters, S-pack	215	•	•	•	•	•
Ampoule Media*						
HPC with TTC indicator broth	216		•			
M-FC broth	216				•	
MF-Endo broth	216			•		
M-Green YM broth	216					•
M-TGE broth	216		•			
Orange Serum broth	216	•				
Trypticase Soy broth - USP	216		•			
Filter Funnels						
47 mm magnetic filter funnels	226	•	•	•	•	•
Microcheck [®] II beverage monitors	227	•	•	•	•	•
Sentino Magnetic filter funnels	225a	•	•	•	•	•
Vents						
Vacushield [™] vent device	165	•	•	•	•	•
Hardware and Accessories						
Filter funnel manifolds	229	•	•	•	•	•
Filter funnel manifolds for MicroFunnel [™] filter funnels	228	•	•	•	•	•
Petri dishes	230, 280	•	•	•	•	•
Sentino Microbiology Pump	224	•	•	•	•	•
Stainless steel forceps	230, 280	•	•	•	•	•
Vacuum/pressure pumps	279	•	•	•	•	•

* Culture media listed may or may not meet the requirements of a regulated test method. It is the responsibility of the user to determine applicability in each situation.

Microbiology Quality Control

Rapid, Reliable Results

The accurate, reliable detection and identification of microorganisms is critical to public safety and industrial economics. As we become more aware of the presence and variety of the organisms that share the world we live in, we realize the importance of knowing how to detect and control them.

Pall is a leader in the development and manufacture of products to detect and control these microorganisms. Our products comply with international testing methods, are supported by technical literature, and carry certifications of quality. You can be confident that our affordable, easy-to-use products will meet the high quality standards you require.

Membranes

Culturing sensitive organisms can be difficult, and identification is critical for process control and public safety. Analysis membranes must be manufactured to the highest standards for accurate microbial growth and recovery. Pall's mixed cellulose ester GN Metrice[®] membrane has set the standard worldwide for meeting stringent microbial regulations. Supor[®] and Metrice[®] Black membranes provide additional benefits that range from low drug and protein binding characteristics to background contrast for ease in counting colonies. These membranes provide uniform and consistent growth of organisms.

MicroFunnel™ Disposable Filter Funnels

Pall offers the widest selection of disposable filter funnels for microbiological analysis, offering unique design features that give these products a reputation for quality and ease of use.

- ▶ MicroFunnel filter funnels make analysis easy. Design permits a simple squeeze separation of funnel from base to access membrane.
- ▶ Funnels attach directly to standard laboratory manifolds, and volume graduations are clearly marked to make it easy to measure your sample volume.
- ▶ Each unit is individually bagged, gamma-irradiated, and labeled for added assurance of lot traceability.



Rely on Pall Life Sciences to simplify your microbiological analysis with our popular line of disposable MicroFunnel filter funnels, quality hardware, and convenient accessories.

Thoughtfully Designed Hardware and Accessories

Pall offers a full line of microbiological ampoule media, laboratory hardware, and accessories like our Sentino[™] Microbiology Pump, Sentino Filter Dispenser, Petri dishes, and stainless steel forceps to simplify your microbial analysis procedures.

Industrial Microbiology Products

Ensuring the effectiveness of cleaning procedures, quality of raw materials, and reliable processing capabilities are essential to preparing a safe, high quality end product. Pall's 37 mm Quality Monitor is used to monitor microelectronics water quality to detect microorganism contamination that can block a sub-micron circuit path on a computer chip. The food and beverage industry chooses the easy-to-use Microcheck[™] II beverage monitors to improve speed, productivity, and accuracy in the lab.

Responding to Contamination Control With Disposable Funnels

The pharmaceutical microbiology market requires reliable and accurate results as a basis for quality control of raw materials, processes, and finished product. Critical decisions are made daily and confidence in results, as well as methods to control contamination during sampling and analysis, is a driving force in this market. A false positive on a test result can trigger a series of events that lead to unnecessary retesting, product release delays, and extensive paperwork to document a course of action. This all leads to increased operating costs.

One way Pall Life Sciences has responded to contamination control is by broadening our range of disposable filter funnels with designs to help improve the sampling process. Whether the need is bioburden analysis, sterility testing, or water system monitoring, we have a MicroFunnel™ filter funnel to suit the application. Certified MicroFunnel disposable filter funnels are individually bagged, labeled, and ready to use. Each lot is evaluated for recovery performance. The standard selection of MicroFunnel filter funnels is ideal for any bioburden analysis.



MicroFunnel Plus filter funnels streamline QC testing.

Simple, Versatile Contamination Control

MicroFunnel Plus filter funnels are the only disposable filter funnels on the market that can serve as a sample cup and filter funnel in one product. This unique design further streamlines sample collection and analysis of purified water systems while providing more protection to the integrity of the sample. This is a critical consideration for any contamination control program. Another important distinction of the MicroFunnel Plus filter funnel is its ability to sample water from systems maintained up to 90 °C.

The MicroFunnel ST filter funnel is packaged for ease of use when performing sterility testing within an isolator. Designed to be an acceptable sterility testing alternative and to reduce testing costs, the MicroFunnel ST filter funnel meets critical conditions of sterility testing and all requirements found in the U.S. Pharmacopeia, current edition.

MicroFunnel Filter Funnels Demonstrate High Recovery of Test Organisms

PN 4800 (GN-6 Metricel® membrane, 0.45 µm, white, gridded)	Test organism: <i>Escherichia coli</i> ATCC 11229	
	% recovery incubated in base using TSB broth, 5 test units	% recovery incubated by removing to MF-Endo broth, 5 test units
Lot 1048L	98%	96%
Lot 1382L	98%	94%
Lot 1878L	94%	98%

PN 4803 (Supor® membrane, 0.2 µm, white, gridded)	Test organism: <i>Pseudomonas aeruginosa</i> ATCC 14207	
	% recovery incubated in base using TSB broth, 5 test units	% recovery incubated by removing to <i>Pseudomonas</i> broth, 5 test units
Lot 1305L	97%	91%
Lot 1443L	97%	97%
Lot 1179M	96%	101%

PN 4805 (Metricel Black membrane, 0.45 µm, gridded)	Test organism: <i>Saccharomyces cerevisiae</i> ATCC 4117	
	% recovery incubated in base using M-Green YM broth, 5 test units	% recovery incubated by removing to M-Green YM broth, 5 test units
Lot 1197M	96%	101%
Lot 1626M	100%	97%
Lot 1933M	100%	103%

Microbiology Quality Control – Online Reference Library

Pall's website offers an extensive collection of product, technical, and application information. This valuable online reference library features hundreds of technical articles, posters, podcasts, application notes, and more that can help you get the most out of your process. To view the following titles online – and many others – click the Literature Library link in the left sidebar when you visit www.pall.com/lab.

- ▶ Membrane Filter Technique
- ▶ Microbiologist Discusses the Benefits of Using Disposable Filter Funnels for Contamination Control
- ▶ MicroFunnel™ Filter Funnels Performance Guide
- ▶ MicroFunnel ST Filter Funnel Validation of Suitability for Sterility Testing Applications
- ▶ Monitoring for Bacteriological Contamination with MicroFunnel Plus Filter Funnels
- ▶ Sentino™ Filter Dispenser Video
- ▶ Sentino Microbiology Pump Video
- ▶ Using MicroFunnel Plus Filter Funnels to Reduce Sample Contamination



Enhancing capabilities in
rapid micro

Rapid, reliable test results are critical to effective product quality monitoring. Accuracy in test results assures protection of the public while providing optimal control of a process. Pall's line of products for rapid microbiology and sample prep provide solutions that speed the time it takes to collect a sample, analyze it, and produce test results. Designed to reduce the potential for sample contamination, our products are also convenient, easy-to-use, and economical.

At Pall, we're responding to industry demands for rapid microbiological testing with revolutionary products that provide accurate, reproducible process control and bioburden analysis. Contact us today to learn more.

www.pall.com/biopharm

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Sentino™ Filter Dispenser

Simple design, reliable dispense



membranes

MICROBIOLOGY QUALITY CONTROL

- ▶ Simple loading and unloading of refill pack at any point during use.
- ▶ Guide plates assist loading and keep refill web in alignment during use to avoid jamming of the instrument.
- ▶ Soft touch keypad aseptically dispenses a disc of membrane at the touch of a button.
- ▶ Designed to hold 200 membrane discs to eliminate interruptions to reload dispenser.
- ▶ Small footprint frees valuable bench top space and provides flexibility in arranging workspace.
- ▶ Miniaturized refill pack sized to minimize storage space resulting in less packaging material waste.
- ▶ Use plugged into main power source or charge battery for use anywhere.
- ▶ Sanitize with standard laboratory disinfectants.

Applications

Use for the Membrane Filter (MF) Technique in:

- ▶ Drinking and waste water analysis
- ▶ Environmental and recreational water monitoring
- ▶ Personal care product manufacturing
- ▶ Beverage monitoring
- ▶ Pharmaceutical and industrial water system monitoring
- ▶ Pharmaceutical raw materials, intermediates, and final product.

Specifications

Materials of Construction

Housing Material: Polycarbonate ABS-blended polymer
Keypad and Label: Polyester
Bottom Plate: Aluminum
Upright: Anodized aluminum
Spools: Anodized aluminum
Guide Plates: Anodized aluminum
Retainer Clips: Stainless steel with anodized aluminum knobs
Box Retainer: Stainless steel
Foot Pads: Rubber

Dimensions

Length: 22.0 cm (8.7 in.)
Width: 12.0 cm (4.7 in.)
Height: 20.0 cm (7.9 in.)
Weight: 0.9 kg (2.0 lbs.)

Temperature Range

Operation: 15-30 °C (59-86 °F)
Storage: -15-45 °C (5-113 °F)

Battery

Voltage: 12.0 V
Type: NiMH (nickel metal hydride)

DC Supply

Voltage: 24.0 V

AC/DC Power Transformer

24 VDC 1.6 Amp 100-240 VAC, 47-63 Hz
Input Interface: IEC 320 3-pin socket
Output Interface (Power Entry Plug): 2.5 mm barrel jack

Power Cord

13182: IEC 320 connector and NEMA 5-15P grounded plug
13183: IEC 320 connector and European CEE 7/7 plug, IEC 320 connector and UK BS1363 plug

Ordering Information

Sentino Filter Dispenser

Part Number	Description	Pkg
13182	Unit for North America: (1) power transformer, (1) power cord with NEMA 5-15P plug, (1) User Guide CD	1/pkg
13183	Unit for Locations Outside North America: (1) power transformer, (1) European power cord with CEE 7/7 plug, (1) UK power cord with BS1363 plug, (1) User Guide CD	1/pkg

Accessories and Replacement Parts

Part Number	Description	Pkg
68123	0.2 µm, Supor® membrane	1000/pkg
68121	0.45 µm, GN-6 MetriceL® membrane	1000/pkg
68124	0.45 µm, MetriceL Black membrane	1000/pkg
68125	0.8 µm, MetriceL Black membrane	1000/pkg

Related Products

Ampoule Media for Microbiological Analysis	217
MicroFunnel™ Filter Funnels	218-223
Petri Dishes	225, 274
Sentino Magnetic Filter Funnels	225a
Sentino Microbiology Pump	224
Stainless Steel Forceps	225, 274

213a



GN-6 Metrical® MCE Membrane Disc Filters

Certified 0.45 µm membrane for microbiological analysis meets or surpasses regulatory requirements



- ▶ Mixed cellulose esters is the most accepted filter media for microbiological analysis, and provides maximum recovery of organisms.
- ▶ Unique dot grid pattern provides guidance for quantification of bacterial colonies without growth inhibition or enhancement.
- ▶ Suitable for microbiological analysis using the Membrane Filter (MF) Technique.
- ▶ Variety of packaging options meets any need. Available in gamma-irradiated, individually packaged S-packs, autoclave packs, or non-sterile packs.
- ▶ Use with Pall microbiological ampoule media for high growth levels and easy identification of contaminants.

Applications

- ▶ Certified for the microbiological analysis of potable, waste, process, and natural waters in accordance with the MF Technique referenced in *Standard Methods for the Examination of Water and Wastewater*, current edition, and the U.S. EPA's *Microbiological Methods for Monitoring the Environment*, 600/8-78-017.
- ▶ Ideal for isolation and enumeration of Total and Fecal Coliforms, *E. coli*, *Fecal Streptococcus*, fungi, and other heterotrophic organisms.

Specifications

Filter Media
Hydrophilic mixed cellulose esters

Pore Size
0.45 µm

Typical Thickness
152 µm (6 mils)

Typical Filter Weight
4 mg/cm²

Typical Water Flow Rate
> 65 mL/min/cm² at 0.7 bar (70 kPa, 10 psi)

Maximum Operating Temperature – Water
74 °C (165 °F)

Typical Moisture Pick-Up
< 1% after 24 hr at 48% relative humidity at 23 °C (73 °F)

Extractables - Boiling Water
< 2%

Minimum Bubble Point - Water
1.8 bar (180 kPa, 26 psi)

Recovery
(measured vs. control)
> 90% *E. coli*

Refractive Index
1.512

Gamma-Irradiated
Provided gamma-irradiated or non-sterile. Validated dose 15 - 30 kGy. Autoclavable if desired at 121 - 123 °C (250 - 253 °F) at 1.0 bar (100 kPa, 15 psi) for 15 - 20 min.

Ordering Information

GN-6 Metrical Membrane Disc Filters, 0.45 µm (S-Packs)

Part Number	Description	Pkg
66265	47 mm, plain, gamma-irradiated	200/pkg
66278	47 mm, grid, gamma-irradiated	200/pkg
66068	47 mm, grid, gamma-irradiated	1000/pkg
66678	47 mm, grid side down, gamma-irradiated	1000/pkg
66191	47 mm, grid, gamma-irradiated	2000/pkg
66539	50 mm, grid, gamma-irradiated	200/pkg
60016	85 mm, grid, gamma-irradiated (not individually packed)	50/pkg

GN-6 Metrical Membrane Disc Filters, 0.45 µm (Non-Sterile Packages)

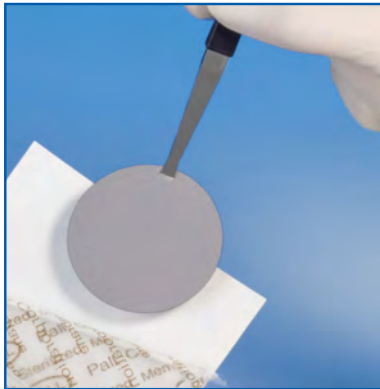
Part Number	Description	Pkg
63066	13 mm, plain	100/pkg
63068	25 mm, plain	100/pkg
64191	25 mm, grid	100/pkg
64382	37 mm, plain, with support pads	100/pkg
63069	47 mm, plain	100/pkg
63020	47 mm, grid	100/pkg
66536	142 mm, plain	25/pkg

Related Products

MicroFunnel™ Filter Funnels 219 - 223

Metrical® Black PES Membrane Disc Filters

Contrasting membrane for microbiological analysis



- ▶ Dark background provides excellent contrast for counting opaque colonies in microbiology labs.
- ▶ Exclusive dot grid pattern does not enhance or inhibit colony growth.
- ▶ Certified for use in the Membrane Filter (MF) Technique as described in Standard Methods for the Examination of Water and Wastewater, current edition.
- ▶ Sharp contrast between black membrane and white grid line provides guidance while viewing and counting.
- ▶ Available non-sterile or in individual gamma-irradiated packs (S-packs) for critical applications.

Applications

- ▶ Excellent membrane for the isolation and enumeration of yeast and mold colonies.
- ▶ Spoilage organism monitoring and identification in food and beverage quality control laboratories.

Specifications

Filter Media

Hydrophilic modified polyethersulfone, black

Pore Size

0.45 and 0.8 µm

Typical Thickness

0.45 µm: 130 µm (5.1 mils)
0.8 µm: 147 µm (5.8 mils)

Typical Water Flow Rate

mL/min/cm² at 0.7 bar
(70 kPa, 10 psi)
0.45 µm: > 34
0.8 µm: > 102

Minimum Bubble Point – Water

0.45 µm: 1.6 bar (160 kPa, 23 psi)
0.8 µm: 1.0 bar (100 kPa, 15 psi)

Gamma-Irradiated

Provided gamma-irradiated or non-sterile. Validated dose 15 - 30 kGy. Autoclavable if desired at 121 - 123 °C (250 - 253 °F) at 1.0 bar (100 kPa, 15 psi) for 15 - 20 min.

Ordering Information

Metrical Black Membrane Disc Filters

Part Number	Description	Pkg
60138	0.45 µm, 25 mm, grid	100/pkg
60065	0.8 µm, 25 mm, grid	100/pkg
66585	0.45 µm, 47 mm, grid, gamma-irradiated (S-pack)	200/pkg
66586	0.45 µm, 47 mm, grid	100/pkg
66587	0.8 µm, 47 mm, grid, gamma-irradiated (S-pack)	200/pkg
66588	0.8 µm, 47 mm, grid	100/pkg

Related Products

47 mm Magnetic Filter Funnels	226
Absorbent Pad Kits	231
Ampoule Media for Microbiological Analysis	217
Petri Dishes	230, 280
Sentino™ Magnetic Filter Funnels	225a
Stainless Steel Forceps	230, 280
Vacuum/Pressure Pumps	279

Supor® 200 PES Membrane Disc Filters

Highly retentive, certified membrane for isolation and enumeration of organisms



- ▶ Ensures accurate analysis. Exclusive dot grid pattern neither inhibits nor enhances microbial growth.
- ▶ Certified for use in the MF Technique as described in Standard Methods for the Examination of Water and Wastewater, current edition.
- ▶ Reduces filtration time. Superior flow rates and high throughputs provide fast, easy filtration.

Applications

- ▶ Ideal choice for microbiology labs requiring isolation and enumeration of organisms stunted in size from exposure to harsh conditions.
- ▶ Easily isolate and enumerate *Pseudomonas* species, especially stressed organisms, found in process water and other fluid samples (like those analyzed in the electronics and pharmaceutical industries).

Specifications

Filter Media

Hydrophilic polyethersulfone

Pore Size

0.2 µm

Diameter

47 mm

Typical Thickness

145 µm (5.7 mils)

Typical Water Flow Rate

> 19 mL/min/cm² at 0.7 bar (70 kPa, 10 psi)

Maximum Operating Temperature - Water

100 °C (212 °F)

Extractables - Soxhlet Extraction

< 4%

Minimum Bubble Point - Water

3.5 bar (350 kPa, 51 psi)

Minimum Recovery

> 90% (measured vs. controlled)

Refractive Index

1.640

Gamma-Irradiated

Provided gamma-irradiated. Validated dose 15 - 30 kGy. Autoclavable if desired at 121 - 123 °C (250 - 253 °F) at 1.0 bar (100 kPa, 15 psi) for 15 - 20 min.

Ordering Information

Supor 200 Membrane Disc Filter

Part Number	Description	Pkg
66234	0.2 µm, 47 mm, grid, gamma-irradiated (S-pack)	200/pkg

Related Products

47 mm Magnetic Filter Funnels	226
Absorbent Pad Kits	231
Ampoule Media for Microbiological Analysis	217
Petri Dishes	230, 280
Sentino™ Magnetic Filter Funnels	225a
Stainless Steel Forceps	230, 280
Vacuum/Pressure Pumps	279

Ampoule Media for Microbiological Analysis

Wide variety of sterile ampoule media pre-measured for efficiency and convenience



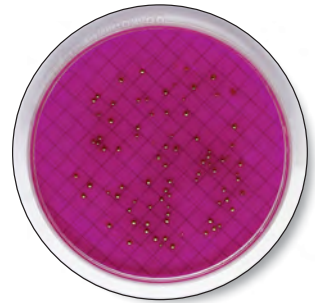
- ▶ Meets Membrane Filter (MF) Technique Standard Method requirements with 2 mL ampoules.*
- ▶ Maximizes efficiency with premixed and presterilized media.
- ▶ Choose between plastic or glass ampoules for your applications.
- ▶ Simplify pouring of the media with wide-mouth glass ampoules.
- ▶ All plastic ampoule media is economically packaged with 50 ampoules per box.

* Requirements referenced in *Standard Methods for the Examination of Water and Wastewater*, current edition.

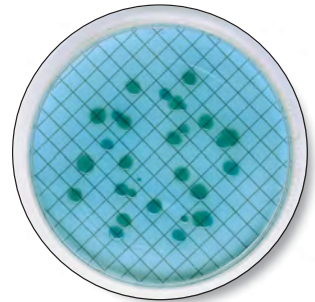
Applications

Pall Life Sciences ampoule media is available in a variety of selective, nutrient broths for use in municipal water, food and beverage, pharmaceutical, and microelectronics industries.

- ▶ **Municipal Wastewater and Drinking Water:** MF-Endo and M-FC (with and without rosolic acid) media are used when analyzing water samples for Total Coliforms, Fecal Coliforms, and *E. coli*.
- ▶ **Food and Beverage:** M-TGE, HPC, M-Green YM, and Orange Serum broths are used in the food and beverage industry to QC final products (and fluids used in the manufacture of these products) to detect potential spoilage organisms.
- ▶ **Pharmaceutical and Microelectronics:** Trypticase Soy broth, M-TGE, and HPC may be used to test final products and process waters for total bacteria in the pharmaceutical and microelectronics industries.
- ▶ **General:** Pseudomonas and KF-Streptococcal broths are highly selective media for detecting contamination in water samples.



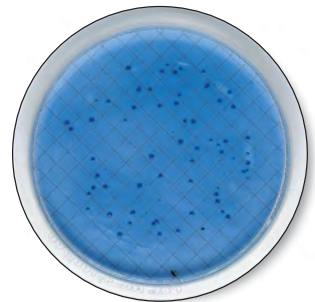
MF-Endo Broth, *E. coli*
24 hr. culture @ 35 °C (95 °F)



Pseudomonas Broth, *P. aeruginosa*
48 hr. culture @ 35 °C (95 °F)



M-TGE Broth, *S. epidermidis*
24 hr. culture @ 35 °C (95 °F)



M-FC Broth, *E. coli*
24 hr. culture @ 44.5 °C (112 °F)

Specifications

Broth	Target Organism(s)	Recovery (vs. Control)	Test Organism(s)	pH at 25 °C	Shelf Life (2 - 8 °C)	Media Color	Target Colony Color
MF-Endo	Total Coliforms	> 85%	<i>E. coli</i>	7.2 ± 0.2	1 year	pinkish red	dark red with metallic sheen
M-FC	Fecal Coliforms	> 85%	<i>E. coli</i>	7.4 ± 0.2	1 year	blue	blue
M-FC with Rosolic Acid*	Fecal Coliforms	> 85%	<i>E. coli</i>	7.4 ± 0.2	1 year	violet	blue
M-TGE	Total Bacteria	> 85%	<i>E. coli</i> ; <i>S. epidermidis</i>	7.0 ± 0.2	1 year*	pale yellow	organism dependent
M-TGE with TTC Indicator	Total Bacteria	> 85%	<i>E. coli</i>	7.0 ± 0.2	1 year	pale yellow	red
Trypticase Soy - USP	Total Bacteria	> 85%	<i>E. coli</i> ; <i>S. epidermidis</i>	7.3 ± 0.2	1 year	pale yellow	organism dependent
KF-Streptococcal	<i>Fecal Streptococcus</i>	> 85%	<i>S. faecalis</i>	7.2 ± 0.2	1 year	light purple	red
Pseudomonas	<i>Pseudomonas sp.</i>	> 85%	<i>P. aeruginosa</i>	7.1 ± 0.2	1 year	light amber	green-blue
M-Green YM	Yeasts and Molds	> 85%	<i>S. cerevisiae</i>	4.6 ± 0.2	1 year**	green	pale green
Orange Serum	<i>Lactobacillus</i> , Acid Resistant Bacteria	> 85%	<i>L. plantarum</i> ; <i>S. cerevisiae</i>	5.6 ± 0.2	1 year	dark amber	organism dependent
HPC with TTC Indicator	Total Bacteria	> 85%	<i>E. coli</i> ; <i>S. epidermidis</i>	7.1 ± 0.2	1 year	pale yellow	red

*Rosolic acid is a selective agent that helps increase the specificity of the medium for Fecal Coliforms.

**Does not require refrigeration during the one-year shelf life.

Ordering Information

Microbiological Media, 2 mL Plastic Ampoules

Part Number	Description	Pkg
68105	MF-Endo broth, Total Coliforms	50/pkg
4302	M-FC broth with rosolic acid, Fecal Coliforms	50/pkg
68106	M-TGE broth, Total Bacteria	50/pkg
68111	M-TGE with TTC indicator, Total Bacteria	50/pkg
4307	Trypticase Soy broth - USP, Total Bacteria	50/pkg
68108	KF-Streptococcal broth, <i>Fecal Streptococcus</i>	50/pkg
4306	Pseudomonas broth, <i>Pseudomonas sp.</i>	50/pkg
68107	M-Green YM broth, yeast and mold	50/pkg
68109	Orange Serum broth, <i>Lactobacillus sp.</i>	50/pkg
4352	HPC Media with TTC indicator, Total Bacteria	50/pkg

Microbiological Media, 2 mL Wide-mouth Glass Ampoules

Part Number	Description	Pkg
68100	M-FC broth, Fecal Coliforms	20/pkg
68101	M-FC broth with rosolic acid, Fecal Coliforms	20/pkg
68102	MF-Endo broth, Total Coliforms	20/pkg

Microbiological Media, 100 mL Bottle

Part Number	Description	Pkg
4313	MF-Endo broth, Total Coliforms, bottle	1/pkg

Related Products

37 mm Quality Monitors	225
Absorbent Pad Kits	231
GN-6 Metricel® MCE Membranes	213
Metricel Black PES Membranes	214
Microcheck II Beverage Monitors	227
MicroFunnel™ Filter Funnels	219 - 223
Petri Dishes	230, 280
Sentino™ Microbiology Pump	224
Stainless Steel Forceps	230, 280
Supor® 200 PES Membranes	215

MicroFunnel™ Filter Funnels

Increase laboratory efficiency with convenient, ready-to-use disposable filter funnels



- ▶ Certified. Each lot is certified for microbiological analysis to provide added assurance of reliable results.
- ▶ Easy to use. Unique squeeze separation of cylinder from base allows easy access to membrane.
- ▶ Individually bagged, disposable filter units prevent cross-contamination of samples.
- ▶ Available in 300 mL capacity to process larger samples.
- ▶ Allows easy and accurate sample measurement. The 100 mL funnels are marked in 10 mL increments. The 100 mL increment is marked completely around the funnel for higher visibility. The 300 mL funnel is marked in 50 mL increments.
- ▶ Saves time. Disposable design eliminates the cleaning and sterilization required with reusable funnels.
- ▶ Ready to use. Pre-assembled and gamma-irradiated to eliminate the potential for toxic extractables associated with EtO sterilization.
- ▶ Variety of options. Choose from GN-6 Metrical® membrane in 0.45 µm pore size, Supor® membrane with 0.2 or 0.45 µm pore size, or Metrical Black membrane with 0.45 or 0.8 µm pore size.
- ▶ Easily remove the membrane for culturing on agar or broth medium.

Applications

- ▶ Test any aqueous solution for microbial contamination using the principles of the Membrane Filter (MF) Technique.
- ▶ Ideal for quality control analysis of aqueous fluids used in pharmaceutical production. Individually labeled for lot traceability.
- ▶ Convenient for last-minute samples at the end of the day or work week. Maintain a supply of MicroFunnel filter funnels in case the autoclave breaks down and reusable hardware cannot be sterilized.
- ▶ The 300 mL funnel is ideal for processing larger samples without the "pour and wait" of smaller funnels. Processing larger samples can improve sensitivity and confidence in the results.
- ▶ Test for a variety of bacterial contaminants, such as Total Coliforms or *Pseudomonas* species, by choosing between the 0.45 and 0.2 µm pore sizes.
- ▶ MicroFunnel filter funnel with Metrical Black membrane provides a better contrast for counting yeast and other light-colored colonies.

Specifications

Materials of Construction

Filter Media: Supor (hydrophilic polyethersulfone), GN-6 Metrical (mixed cellulose esters), and Metrical Black (modified polyethersulfone) membranes
Cylinder, Base, Lid, Petri Dish Base: Polypropylene
Cover: Polystyrene
Plug: Polyethylene
Funnel Adapter: Polyethylene
Support Pad: Cellulose

Effective Filtration Area

13.46 cm²

Dimensions

100 mL Funnel

Height:

8.1 cm (3.2 in.) with Petri dish lid
7.6 cm (3.0 in.) with cover

Diameter:

6.4 cm (2.5 in.) with Petri dish lid
6.1 cm (2.4 in.) with cover

300 mL Funnel

Height:

9.1 cm (3.6 in.) with cover

Diameter:

8.8 cm (3.5 in.) with cover

Maximum Vacuum

63.5 cm Hg (25 in. Hg)
(vacuum use only)

Gamma-Irradiated

Validated dose 15 - 30 kGy

Procedures for MicroFunnel LP Filter Funnel (With Petri Dish Lid Kit)

1. Dispense the contents of an ampoule of culture medium onto the absorbent pad in the Petri dish lid kit, supplied only with MicroFunnel LP filter funnel, PN 4810.
2. With Petri dish lid kit removed, perform filtration then access membrane by gently squeezing near the top of the funnel cylinder.
3. Remove the membrane filter from the base with forceps.
4. Place the membrane filter onto the broth-soaked absorbent pad in the Petri dish lid kit.
5. Cover, invert, and incubate.



Ordering Information

MicroFunnel™ Filter Funnels, 100 mL

Part Number	Description	Pkg
4800	0.45 µm GN-6 Metrical® membrane, white, gridded, individually bagged	50/pkg
4804	0.45 µm GN-6 Metrical membrane, white, gridded, individually bagged	200/pkg
4810	LP unit with 0.45 µm GN-6 Metrical membrane, white, gridded, individually bagged, Petri dish lid kit	50/pkg
4801	0.45 µm GN-6 Metrical membrane, white, gridded, unbagged	50/pkg
4803	0.2 µm Supor® membrane, white, gridded, individually bagged	50/pkg
4806	0.2 µm Supor membrane, white, no grid, individually bagged	50/pkg
4852	0.45 µm Supor membrane, white, gridded, individually bagged	50/pkg
4805	0.45 µm Metrical Black membrane, black, gridded, individually bagged	50/pkg

MicroFunnel Filter Funnels, 300 mL

Part Number	Description	Pkg
4815	0.45 µm GN-6 Metrical membrane, white, gridded, individually bagged	20/pkg
4818	0.2 µm Supor membrane, white, gridded, individually bagged	20/pkg
4828	0.45 µm Supor membrane, white, gridded, individually bagged	20/pkg
4817	0.45 µm Metrical Black membrane, gridded, individually bagged	20/pkg
4819	0.8 µm Metrical Black membrane, gridded, individually bagged	20/pkg

Accessories and Replacement Parts

Part Number	Description	Pkg
4701	Autoclavable adapters for vacuum manifold when using rubber stopper	3/pkg
4713	Vacuum pump adapter for MicroFunnel filter funnel with Milliflex PLUS* pump	1/pkg
4895	Lid kit accessory for culturing membrane in place	20/pkg
15408	1-place aluminum manifold	1/pkg
15411	3-place aluminum manifold	1/pkg
15413	6-place aluminum manifold	1/pkg
13157	Vacuum/pressure pump, 115 V CE	1/pkg
13158	Vacuum/pressure pump, 230 V	1/pkg
4690	Forceps with multi-colored grips	3/pkg

Related Products

Ampoule Media for Microbiological Analysis.	217
Petri Dishes.	230, 280
Sentino™ Microbiology Pump	224

MicroFunnel™ Plus Filter Funnels

Combined filter funnel and sample cup revolutionizes water system monitoring to eliminate the risk of contamination



- ▶ Product performs as sample container and filter funnel all in one. No need to transfer sample from cup to disposable funnel and risk introducing contamination.
- ▶ MicroFunnel Plus AP unit allows aseptic collection of the sample through the lid sample port. No need to remove lid.
- ▶ MicroFunnel Plus products with Supor® membrane are designed to allow sampling of hot water up to 90 °C.
- ▶ Vented lid snaps to a liquid-tight seal and allows filtration without having to open the funnel and risk introducing contamination.
- ▶ Vent filter ensures no airborne contamination is drawn into the funnel during filtration.
- ▶ Attaches directly to a standard laboratory manifold or use with adapter and stopper.
- ▶ Volume graduations are clearly marked for ease in measuring your sample volume.
- ▶ Individually bagged and labeled for contamination control and lot traceability.

Related Products

Ampoule Media for Microbiological Analysis	217
Filter Funnel Manifolds	228 - 229
Petri Dishes	230, 280
Sentino™ Microbiology Pump	224
Stainless Steel Forceps	230, 280

Applications

- ▶ Improves the efficiency of monitoring your water system while reducing the introduction of contamination.
- ▶ Eliminates steps in sample collection and testing that could potentially contaminate your sample.
- ▶ Gridded 0.45 µm GN-6 Metrical® membrane is ideal for analysis of ambient water by Membrane Filter (MF) Technique.
- ▶ MicroFunnel Plus with 0.45 or 0.2 µm Supor membrane is designed for sampling hot water (such as that found in hot loop WFI systems).

Specifications

Materials of Construction

Filter Media: GN-6 Metrical (mixed cellulose esters), Supor (hydrophilic polyethersulfone), and Metrical Black (modified polyethersulfone) membranes
 Support Pad: Cellulose
 Funnel and Base: Polypropylene
 Adhesive Gasket: Urethane
 Funnel Cover: Polyethylene with hydrophobic Versapor® membrane (acrylic copolymer on a non-woven support)
 Bag: Polyethylene
 Adapter: Polyethylene
 Plug: Polyethylene (PN 4807, 4808)

Effective Filtration Area

13.46 cm²

Dimensions

100 mL Funnel

Height: 7.6 cm (3.0 in.) with cover
 Diameter: 6.1 cm (2.4 in.) with cover

300 mL Funnel

Height: 8.9 cm (3.5 in.)
 Diameter: 8.7 cm (3.4 in.)

Maximum Vacuum

63.5 cm Hg (25 in. Hg)
 (vacuum use only)

Maximum Sample Collection Temperature

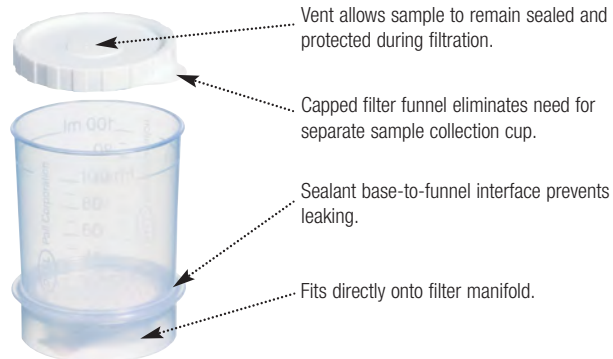
PN 4807, 4808, 4829: Ambient
 PN 4809, 4813, 4814, 4823, 4843, and 4844: 90 °C (194 °F)

Gamma-Irradiated

Validated dose 15 - 30 kGy

Performance

MicroFunnel Plus Filter Funnel Features



Save yourself time, avoid sample contamination or mix-ups, and reduce the steps in sample collection and testing.



How to Use the MicroFunnel™ Plus Filter Funnel

Sampling Ambient Water



1. Carefully remove the vented lid and collect the sample.



2. Securely snap lid in place to prevent sample loss. Transport sample to laboratory for filtration.



3. Remove membrane vent from base, place funnel directly onto manifold, and filter the sample.



4. Gently grasp funnel then remove and discard lid.



5. Release cylinder from base by squeezing the midpoint of the cylinder.



6. Remove the membrane, plate the filter, and incubate.

Note: When using this product for sampling hot water, observe safety precautions. This includes the use of insulated rubber gloves, safety glasses, and Pall Life Sciences funnel holder (PN 4824 for 100 mL funnels and PN 4825 for 300 mL funnels).

Collecting Hot Water Samples



1. Place funnel into holder with graduations visible through the viewing slot. Carefully remove the vented lid and collect the hot water sample.



2. With funnel and holder resting on a firm, level surface, securely snap lid in place to prevent sample loss. Remove funnel from holder and transport sample to laboratory for filtration. (Proceed with steps 3-6 for ambient water.)

Ordering Information

MicroFunnel Plus Filter Funnels, 100 mL

Part Number	Description	Pkg
4807*	0.45 µm GN-6 Metrical® membrane, white, gridded, individually bagged (not compatible with hot water applications)	50/pkg
4808*	0.45 µm Metrical Black membrane, gridded, individually bagged (not compatible with hot water applications)	50/pkg
4809	0.2 µm Supor® membrane, gridded, individually bagged	50/pkg
4823	0.45 µm Supor membrane, white, gridded, individually bagged	50/pkg

MicroFunnel Plus Filter Funnels, 300 mL

Part Number	Description	Pkg
4813	0.2 µm Supor membrane, white, gridded, individually bagged	20/pkg
4857	0.2 µm Supor membrane, white, gridded	20/pkg
4814	0.45 µm Supor membrane, white, gridded, individually bagged	20/pkg
4829*	0.45 µm GN-6 Metrical membrane, white, gridded, individually bagged (not compatible with hot water applications)	20/pkg

*For use with ambient temperature samples only.

MicroFunnel Plus AP Filter Funnels, 100 mL

Part Number	Description	Pkg
4843	0.2 µm Supor membrane, white, gridded, individually bagged	50/pkg
4856	0.45 µm GN-6 Metrical membrane, white, gridded, individually bagged	50/pkg
4844	0.45 µm Supor membrane, white, gridded, individually bagged	50/pkg

MicroFunnel Plus AP Filter Funnels, 300 mL

Part Number	Description	Pkg
4855	0.45 µm Supor membrane, white, gridded, individually bagged	20/pkg

Accessories and Replacement Parts

Part Number	Description	Pkg
4824	Funnel holder, 100 mL	1/pkg
4825	Funnel holder, 300 mL	1/pkg
4701	Autoclavable adapters for vacuum manifold when using rubber stopper	3/pkg
4713	Vacuum pump adapter for using MicroFunnel filter funnel with Milliflex PLUS® pump	1/pkg
4895	Lid kit accessory for culturing membrane in place	20/pkg
4845	MicroFunnel Plus AP sampling tubes, individually bagged	50/pkg

▶ www.pall.com/lab

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filter funnels

MICROBIOLOGY QUALITY CONTROL

MicroFunnel™ ST Disposable Filter Funnels

Convenient and economical choice for sterility testing within isolators



- ▶ MicroFunnel ST filter funnels offer an alternative to costly closed-system sterility testing when using an isolator or containment suite.
- ▶ 0.45 µm GN-6 Metrical® membrane or low binding Supor® membrane provides a choice for sterility testing applications in the pharmaceutical industry.
- ▶ Supor membrane is ideal for testing antibiotic solutions.
- ▶ Double bagged packaging ensures easy transfer through airlock.
- ▶ Simple squeeze separation design makes membrane retrieval easy.
- ▶ Meets requirements of U.S., Japan, and European Pharmacopeias for sterility testing.

Applications

- ▶ Test any aqueous solution for microbial contamination using MicroFunnel ST disposable filter funnels and the principles of the Membrane Filter (MF) Technique.
- ▶ Ideal for quality control analysis of aqueous fluids used in pharmaceutical production.
- ▶ Quality control testing of final product for release.

Specifications

Materials of Construction

Filter Media: Supor (hydrophilic polyethersulfone) and GN-6 Metrical (mixed cellulose esters) membranes
 Cylinder and Base: Polypropylene
 Funnel Cover: Polystyrene
 Funnel Adapter and Bag: Polyethylene
 Support Pad: Cellulose

Effective Filtration Area

13.46 cm²

Dimensions

100 mL Funnel
 Height: 7.6 cm (3.0 in.)
 Diameter: 6.1 cm (2.4 in.)

300 mL Funnel
 Height: 9.1 cm (3.6 in.)
 Diameter: 8.8 cm (3.5 in.)

Maximum Vacuum

63.5 cm Hg (25 in. Hg)
 (vacuum use only)

Gamma-Irradiated

Validated dose 15 - 30 kGy.

Packaging Note

100 mL Funnel
 40 units total per box: 10 individually bagged funnels within an overpack bag; 4 overpack bags per box.

300 mL Funnel
 20 units total per box: 5 individually bagged funnels within an overpack bag; 4 overpack bags per box.

Ordering Information

MicroFunnel ST Disposable Filter Funnels

Part Number	Description	Pkg
4750	MicroFunnel ST unit with 0.45 µm Supor membrane, plain, 100 mL	40/pkg
4751	MicroFunnel 300 ST unit with 0.45 µm Supor membrane, plain, 300 mL	20/pkg
4811	MicroFunnel ST unit with 0.45 µm GN-6 Metrical membrane, gridded, 100 mL	40/pkg
4812	MicroFunnel 300 ST unit with 0.45 µm GN-6 Metrical membrane, gridded, 300 mL	20/pkg
4851	MicroFunnel ST unit with 0.2 µm Supor membrane, gridded, 100 mL	40/pkg
4853	MicroFunnel 300 ST unit with 0.2 µm Supor membrane, gridded, 300 mL	20/pkg

Accessories and Replacement Parts

Part Number	Description	Pkg
4701	Autoclavable adapters for vacuum manifold when using rubber stopper	3/pkg
4713	Vacuum pump adapter for using MicroFunnel filter funnel with Milliflex PLUS* pump	1/pkg

Related Products

Ampoule Media for Microbiological Analysis	217
Filter Funnel Manifolds	228 - 229
Sentino™ Microbiology Pump	224
Stainless Steel Forceps	230, 280
Vacuum/Pressure Pumps	279

MicroFunnel™ Filter Funnels With Polycarbonate Membrane

Ideal for concentrating organisms in fluid samples



- ▶ Flat, smooth surface allows for easy elution of organisms or particulate.
- ▶ Collection of organisms or particulate on one planar surface is ideal prior to electron microscopy (SEM) or light microscope (LM) techniques.
- ▶ Ready-to-use, disposable design eliminates sample cross-contamination.

Applications

- ▶ Concentrate organisms in aqueous samples for further examination by PCR or eppifluorescence.
- ▶ Cell biology.
- ▶ Bioassays.
- ▶ Parasitology.
- ▶ Water microbiology.

Specifications

Materials of Construction

Filter Media: Polycarbonate with PVP (polyvinylpyrrolidone) wetting agent
Support Pad: Cellulose
Funnel and Base: Polypropylene
Funnel Cover: Polystyrene
Funnel Adapter: Polyethylene

Membrane Diameter

47 mm

Pore Size

0.4 µm

Effective Filtration Area

13.46 cm²

Dimensions

100 mL Funnel

Height: 7.6 cm (3.0 in.) with cover
7.3 cm (2.9 in.) without cover
Diameter: 6.1 cm (2.4 in.) with cover
5.7 cm (2.3 in.) without cover

300 mL Funnel

Height: 9.1 cm (3.6 in.) with cover
8.9 cm (3.5 in.) without cover
Diameter: 8.8 cm (3.5 in.) with cover
8.5 cm (3.4 in.) without cover

Maximum Vacuum

635 mm Hg (25 in. Hg)
(vacuum use only)

Gamma-Irradiated

Validated Dose: 15 - 30 kGY
(1.5 - 3.0 MRad)

Ordering Information

MicroFunnel Filter Funnels With Polycarbonate Membrane

Part Number	Description	Pkg
FMFNL1050	Polycarbonate membrane, 0.4 µm, 100 mL, individually bagged, gamma-irradiated	50/pkg
FMFNL3020	Polycarbonate membrane, 0.4 µm, 300 mL, individually bagged, gamma-irradiated	20/pkg

Related Products

Filter Funnel Manifolds	228 - 229
Sentino™ Microbiology Pump	224
Stainless Steel Forceps	230, 280
Vacuum/Pressure Pumps	279

Sentino™ Microbiology Pump

Maximize workspace and minimize contamination risk



- ▶ Compact design frees valuable benchtop space and provides flexibility for an efficient workflow.
- ▶ Minimal height of the pump allows convenient use in a hood that can limit upward range of motion during routine analysis.
- ▶ Pump's disposable fluid path is simple to load and completely disposable to eliminate potential biofilm build-up.
- ▶ Uni-directional peristaltic flow design pulls sample through the filter and fluid path eliminating the need for a vacuum source, and reducing potential for back-up and contamination of analysis.
- ▶ Fixed filtration parameters meet the Membrane Filter (MF) Technique filtration parameters described in U.S. EPA, ISO, and ASTM standards.
- ▶ Shape of unit and materials of construction are easy to wipe down with standard laboratory disinfectants.
- ▶ Soft-touch keypad has simple on/off function and pulse features to control filtration.

Applications

- ▶ MF Technique for analyzing aqueous-based fluids for microbial contamination.
- ▶ Works with MicroFunnel™ filter funnels.

Specifications

Materials of Construction

Housing Material: Polycarbonate ABS-blended polymer
 Keypad and Label: Polyester
 Pump Head: PEI with PTFE-filled PBT rollers
 Fluid Path Adaptor: Polypropylene
 Hose Material: Thermoplastic elastomer

Dimensions

Length: 13.6 cm (5.4 in.)
 Width: 9.5 cm (3.7 in.)
 Height: 10.4 cm (4.1 in.)
 Weight: 680 g (1.5 lbs.)
 Hose Dimensions: 4.8 mm (3/16 in.) ID x 7.9 mm (5/16 in.), OD [1.6 mm (1/16 in.) wall thickness]

Temperature Range

Operation: 15-30 °C (59-86 °F)
 Storage: -15-45 °C (5-113 °F)
 Fluid path should be allowed to equilibrate to operation range before use

Battery

Voltage: 12.0 V
 Type: NiMH (nickel metal hydride)

DC Supply

Voltage: 24.0 V

AC/DC Power Transformer

24 VDC 1.6 Amp 100-240 VAC, 47- 63 Hz
 Input Interface: IEC 320 3-pin socket
 Output Interface (Power Entry Plug): 2.5 mm barrel jack

Power Cord

13180: IEC 320 connector and NEMA 5-15P grounded plug
 13181: IEC 320 connector and European CEE 7/7 plug, and IEC 320 connector and UK BS1363 plug

Ordering Information

Sentino Microbiology Pump

Part Number	Description	Pkg
13180	System for North America: (1) power transformer, (1) power cord with NEMA 5-15P plug, (1) Fluid Path, and (1) User Guide CD	1/pkg
13181	System for locations outside North America: (1) power transformer, (1) European power cord with CEE 7/7 plug, (1) UK power cord with BS1363 plug, (1) Fluid Path, and (1) User Guide CD	1/pkg

Accessories and Replacement Parts

Part Number	Description	Pkg
4861	Fluid Path, disposable, for use with MicroFunnel filter funnel	10/pkg

Related Products

Ampoule Media for Microbiological Analysis	217
MicroFunnel Filter Funnels	219 - 223
Petri Dishes	230, 280
Stainless Steel Forceps	230, 280

filter funnels

MICROBIOLOGY QUALITY CONTROL

37 mm Quality Monitors

Compact and disposable filtration units for analysis of process water



- ▶ Convenient, ready-to-use, and portable for easy transport to sample site.
- ▶ Saves time. Disposable design eliminates the cleaning and sterilization required of reusable filter funnels.

Applications

- ▶ Monitor high purity water systems for microbial contamination. Simple design allows for sampling at the source or filtration in the lab.

Specifications

Materials of Construction

Filter Media: 0.45 µm GN-6 Metrical® (mixed cellulose esters), 0.2 µm Supor® (hydrophilic polyethersulfone) and 0.45 µm Metrical Black (modified polyethersulfone) membranes
Monitor Inlet, Center Ring, and Outlet: Styrene
Plugs: Polyethylene
Absorbent Pad: Cellulose

Effective Filtration Area

9.1 cm²

Dimensions

Height: 2.8 cm (1.1 in.)
Diameter: 4.2 cm (1.7 in.)

Operating Temperature

Room temperature, typically 20 - 25 °C (68 - 77 °F)

Maximum Vacuum

63.5 cm Hg (25 in. Hg)

Ethylene Oxide Exposed

Ordering Information

37 mm Quality Monitors

Part Number	Description	Pkg
4717	2 piece, GN-6 Metrical membrane, white, gridded	50/pkg
4718	2 piece, Metrical Black membrane, gridded	50/pkg
4719	2 piece, 0.2 µm Supor membrane, white, gridded	50/pkg

Related Products

Ampoule Media for Microbiological Analysis 217

Sentino™ Magnetic Filter Funnels

Designed for use with the Sentino Microbiology Pump



- ▶ Available in three sizes – 150, 300, and 500 mL. Convenient 150 mL size easily fits into small autoclaves; 500 mL size is ideal for large sample filtration.
- ▶ No-leak magnetic seal allows one-handed operation.
- ▶ Sturdy, safe polyphenylsulfone plastic construction is shatterproof and offers broad range of chemical compatibility.
- ▶ Membrane guides to help center filter on platform.
- ▶ Forceps access point allows easy filter retrieval.
- ▶ Graduated at 50 mL increments for accurate sample measurement.

Applications

Use for the Membrane Filter (MF) Technique in:

- ▶ Drinking and waste water analysis
- ▶ Environmental and recreational water monitoring
- ▶ Pharmaceutical and industrial water system monitoring
- ▶ Beverage monitoring
- ▶ Pharmaceutical raw materials, intermediates, and final product.

Specifications

Materials of Construction

Funnel Body, Stem, Lid, and Support
Screen: Polyphenylsulfone
Vent Plugs: Polypropylene

Effective Filtration Area

150 and 300 mL: 9.6 cm², 35 mm effective diameter
500 mL: 13.1 cm², 41 mm effective diameter

Dimensions

Overall Height:
150 mL: 11.8 cm (4.6 in.)
300 mL: 16.8 cm (6.6 in.)
500 mL: 16.6 cm (6.5 in.)
Maximum Diameter:
150 and 300 mL: 7.6 cm (3 in.)
500 mL: 8.9 cm (3.5 in.)

Filter Size

Accepts 47 mm filter

Funnel Capacity

150, 300, or 500 mL

Outlet Connection

Stem fits into adapter (PN 4283) for use on Sentino Microbiology Pump.

Sterilization

Provided non-sterile. Withstands multiple autoclavings* at 121 - 123 °C (250 -253 °F) at 1.0 bar (100 kPa, 15 psi) for 15 - 20 min; UV sterilizable.

*Repeated use of detergents containing polyoxyethylated alkyl phenols and alcohols, and/or anti-corrosion, anti-scaling boiler additives that may carry over in steam, may cause polyphenylsulfone to crack, thereby reducing the life of the product. Do not autoclave rubber stoppers. Do not autoclave with aluminum foil; use autoclave paper. Consult Pall Technical Service if using with thin membranes, such as track-etched material.

Ordering Information

Sentino Magnetic Filter Funnels, 47 mm

Part Number	Description	Pkg
4271	150 mL capacity	1/pkg
4273	300 mL capacity	1/pkg
4277	500 mL capacity	1/pkg

Accessories and Replacement Parts

Part Number	Description	Pkg
4279	Base with support screen for use with Sentino Pump	1/pkg
4283	Adapter for use with Sentino Pump	1/pkg
4285	Tubing, drive for Sentino Pump, 2 ft. length	10/pkg
4235	Stainless steel support screen	1/pkg
87264	Support screen, polyphenylsulfone	1/pkg
4246	Lid kit (for 300 mL funnel only)	1/pkg
4248	150 mL funnel housing	1/pkg
4243	300 mL funnel housing	1/pkg
4254	500 mL funnel housing	1/pkg

Related Products

Ampoule Media for Microbiological Analysis	217
Petri Dishes	230, 280
Sentino Microbiology Pump	224
Stainless Steel Forceps	230, 280

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47 mm Magnetic Filter Funnels

Unique magnetic seal allows easy, one-handed vacuum filtration of liquids



- ▶ No-leak magnetic seal allows one-handed operation.
- ▶ Polyphenylsulfone construction is compatible with anti-foaming agents and many other solvents.
- ▶ Convenient, 150 mL size allows for easy fit into small autoclaves, and 500 mL size is ideal for filtration of large samples.
- ▶ Sturdy and safe. Polyphenylsulfone construction provides durability and added safety at a cost less than most glass funnels.
- ▶ Forceps access point allows easy filter retrieval.
- ▶ Graduated at 50 mL increments for accurate sample measurement.

Applications

- ▶ Use for the Membrane Filter (MF) Technique.
- ▶ Municipal water treatment testing.
- ▶ Surface water analysis.
- ▶ Plant process water testing.
- ▶ Drinking water analysis.

Specifications

Materials of Construction

Funnel Body, Stem, Lid, and Support
Screen: Polyphenylsulfone
Vent Plugs: Polypropylene

Effective Filtration Area

150 and 300 mL: 9.6 cm², 35 mm effective diameter
500 mL: 13.1 cm², 41 mm effective diameter

Dimensions

Overall Height:
150 mL: 17.8 cm (7.0 in.)
300 mL: 22.9 cm (9 in.)
500 mL: 19.6 cm (7.7 in.)
Maximum Diameter:
150 and 300 mL: 7.6 cm (3 in.)
500 mL: 8.9 cm (3.5 in.)

Filter Size

Accepts 47 mm filter

Funnel Capacity

150, 300, or 500 mL

Outlet Connection

Stem fits into standard one-hole stopper.

Sterilization

Provided non-sterile. Withstands multiple autoclavings* at 121 - 123 °C (250 -253 °F) at 1.0 bar (100 kPa, 15 psi) for 15 - 20 min; UV sterilizable.

*Repeated use of detergents containing polyoxyethylated alkyl phenols and alcohols, and/or anti-corrosion, anti-scaling boiler additives that may carry over in steam, may cause polyphenylsulfone to crack, thereby reducing the life of the product. Do not autoclave rubber stoppers. Do not autoclave with aluminum foil; use autoclave paper. Consult Pall Technical Service if using with thin membranes, such as track-etched material.

Ordering Information

47 mm Magnetic Filter Funnels

Part Number	Description	Pkg
4247	150 mL capacity	1/pkg
4242	300 mL capacity	1/pkg
4241	300 mL capacity, with lid	1/pkg
4238	500 mL capacity	1/pkg

Accessories and Replacement Parts

Part Number	Description	Pkg
4235	Stainless steel support screen	1/pkg
87264	Support screen, polyphenylsulfone	1/pkg
4244	Base, without support screen	1/pkg
4246	Lid kit (for 300 mL funnel only)	1/pkg
4248	150 mL funnel housing	1/pkg
4243	300 mL funnel housing	1/pkg
4254	500 mL funnel housing	1/pkg
82728	No. 8 rubber stopper	1/pkg

Related Products

Ampoule Media for Microbiological Analysis	217
Filter Funnel Manifolds	228 - 229
Stainless Steel Forceps	230, 280
Vacuum/Pressure Pumps	279

Microcheck® II Beverage Monitors

Easy-to-use disposable filter funnel to meet microbial analysis needs for beverages



- ▶ Can convert to a Petri dish for culturing or easily remove the membrane for placing on separate agar dish.
- ▶ Ready to use; simply remove from box and place directly on a filter manifold. No need for rubber stoppers or adapters.
- ▶ Volume graduations are marked clearly for easy reading from any point of view.
- ▶ Volume graduations marked externally on the funnel to prevent potential hold-up of organisms. External marks meet guidelines listed in *Standard Methods for the Analysis of Water and Wastewater*, current edition.

Applications

- ▶ Finished product and raw material testing of beverages for microbial contamination prior to release. Available with 0.45 and 0.8 µm, white or black membranes, to easily quantify organisms.

Specifications

Materials of construction

Filter Media: GN Metricel® (mixed cellulose esters) and Metricel Black (modified polyethersulfone) membranes
Cylinder and Base: Polypropylene
Cover: Polystyrene
Plug: Polyethylene
Funnel Adapter: Polyethylene
Support Pad: Cellulose

Dimensions:

Height: 7.6 cm (3.0 in.)
Diameter: 6.1 cm (2.4 in.)

Packaging Note

Two layers of 25 funnels bulk packaged within one box-liner bag.

Gamma-Irradiated

Ordering Information

Microcheck II Beverage Monitors

Part Number	Description	Pkg
4761	0.45 µm, GN-6 Metricel membrane, white, gridded, 100 mL capacity	50/pkg
4762	0.8 µm, GN-4 Metricel membrane, white, gridded, 100 mL capacity	50/pkg
4763	0.45 µm, Metricel black membrane, black, gridded, 100 mL capacity	50/pkg
4764	0.8 µm Metricel black membrane, black, gridded, 100 mL capacity	50/pkg

Related Products

Ampoule Media for Microbiological Analysis	217
Filter Funnel Manifolds	228 - 229
Petri Dishes	230, 280
Stainless Steel Forceps	230, 280

Filter Funnel Manifolds for MicroFunnel™ Filter Funnels

Perfect fit vacuum manifolds for use with the MicroFunnel filter funnel



- ▶ No adapters or rubber stoppers required to hold the filter funnel in place.
- ▶ Works with all Pall Life Sciences MicroFunnel filter funnels, including the 100 mL and 300 mL sizes.
- ▶ Durable aluminum and stainless steel construction for easy clean-up and compatibility with many chemicals.
- ▶ Single-place manifold has a small footprint that reduces the need for large counter space.
- ▶ Single-place manifold is easily portable for moving around a lab or offsite, and easy to store out of the way.

Applications

- ▶ Designed to work with the MicroFunnel filter funnel when performing the MF Technique for microbial analysis. The filter funnel is placed directly onto the manifold, the liquid is added, and the vacuum is turned on to begin filtration.
- ▶ Process multiple samples simultaneously or use the 1-place manifold when infrequent or minimal numbers of samples are tested each day.

Specifications

1-Place Manifold

Materials of Construction

Body: Anodized aluminum
 Check Valve: 316 stainless steel with ethylene propylene O-ring
 Hose Barb Adapter: Stainless steel
 1/4 in. straight, 1/8 in. MNPT

Dimensions

Height: 5.9 cm (2.4 in.)
 Diameter (Without Hose Barb):
 7.5 cm (3.0 in.)

Sterilization

Autoclave if desired at 121 - 123 °C (250 - 253 °F) at 1.0 bar (100 kPa, 15 psi) for 15 - 20 min.

3- and 6-Place Manifolds

Materials of Construction

Body: Anodized aluminum
 Drain Plug: Stainless steel 1/4 in. MNPT
 Check Valve: 316 stainless steel with ethylene propylene o-ring
 Valves: Chrome-plated brass
 Valve O-Rings: Viton•
 Hose Barb Adapter: Nylon 6.4 mm (1/4 in.)

Dimensions

3-Place Manifold
 Height: 14.2 cm (5.6 in.)
 Width: 40.6 cm (16.0 in.)
 Depth: 15.2 cm (6.0 in.)

6-Place Manifold

Height: 14.2 cm (5.6 in.)
 Width: 82.6 cm (32.5 in.)
 Depth: 15.2 cm (6.0 in.)

Sterilization

Autoclave if desired at 121 - 123 °C (250 - 253 °F) at 1.0 bar (100 kPa, 15 psi) for 15 - 20 min.

Ordering Information

Filter Funnel Manifolds for MicroFunnel Filter Funnels

Part Number	Description	Pkg
15408	1-place aluminum	1/pkg
15411	3-place aluminum	1/pkg
15413	6-place aluminum	1/pkg

Accessories and Replacement Parts (Aluminum Manifold)

Part Number	Description	Pkg
15412	Funnel holder	1/pkg
96430	End stand	1/pkg
99130	Valve, 2-way	1/pkg
99132	Hose barb adapter, nylon, 1/4 in. MNPT to 9.5 mm (3/8 in.) ID tubing	1/pkg
99238	Stainless steel end plug	1/pkg
88160	O-ring kit for valves, includes: 3 O-rings, ARP No. -006; 6 O-rings, ARP No. -010	1/pkg
15415	Check valve for 3- or 6-place aluminum manifolds	3/pkg

Related Products

Ampoule Media for Microbiological Analysis	217
MicroFunnel Filter Funnels	219 - 223
Petri Dishes	230, 280

Filter Funnel Manifolds

The most convenient way to filter multiple samples



- ▶ Independent operation. Each funnel location has individual port control valves.
- ▶ Lightweight and durable for easy handling.
- ▶ Saves money. Less costly than stainless steel filter funnel manifolds.
- ▶ Large port opening makes sanitizing easy.
- ▶ Versatile. Accommodates both 25 and 47 mm filter funnels.
- ▶ Aluminum manifolds available with either 3 or 6 places.

Applications

- ▶ Designed for use in the vacuum filtration of liquids for analysis of microbiological or particulate contamination. Increase laboratory productivity by processing multiple samples simultaneously.
- ▶ Polyurethane manifold is ideal for small work areas. Only 27.9 cm (11.0 in.) wide, it still holds three funnels.
- ▶ Aluminum manifold is especially suited for applications where chemical compatibility is critical and easy clean-up is desired. Lightweight aluminum is easier to handle and less expensive than stainless steel, while retaining the strength of an alloy.

Specifications

Aluminum Manifolds

Materials of Construction

Body: Anodized aluminum
 Drain Plugs: Stainless steel
 1/4 in. MNPT
 Valves: Chrome-plated brass
 Valve O-Rings: Viton*
 Adapter: Nylon 6.4 mm (1/4 in.)

Dimensions

3-place
 Height: 15.7 cm (6.2 in.)
 Width: 40.6 cm (16.0 in.)
 Depth: 15.2 cm (6.0 in.)

6-place

Height: 15.7 cm (6.2 in.)
 Width: 82.6 cm (32.5 in.)
 Depth: 15.2 cm (6.0 in.)

Sterilization

Autoclavable if desired at 121 - 123 °C (250 - 253 °F) at 1.0 bar (100 kPa, 15 psi) for 15 - 20 min.

Polyurethane Manifold

Materials of Construction

Body: High impact polyurethane
 Drain Plugs: Nylon 1/4 in. MNPT
 Valves: Glass-filled polypropylene
 Valve O-Rings: Buna*-N

Dimensions

Height: 10.2 cm (4.0 in.)
 Width: 27.9 cm (11.0 in.)
 Depth: 15.2 cm (6.0 in.)

Ordering Information

Filter Funnel Manifolds

Part Number	Description	Pkg
4205	3-place polyurethane	1/pkg
15402	3-place aluminum	1/pkg
15403	6-place aluminum	1/pkg

Accessories and Replacement Parts (Aluminum Manifold)

Part Number	Description	Pkg
96429	Funnel holder	1/pkg
96430	End stand	1/pkg
99130	Valve, 2-way	1/pkg
99132	Hose barb adapter, nylon, 1/4 in. MNPT to 9.5 mm (3/8 in.) ID tubing	1/pkg
99238	Stainless steel end plug	1/pkg
82728	No. 8 rubber stopper	1/pkg
88160	O-ring kit for valves, includes: 3 O-rings, ARP No. -006; 6 O-rings, ARP No. -010	1/pkg
15415	Check valve for 3- or 6-place aluminum manifolds	3/pkg

Accessories and Replacement Parts (Polyurethane Manifold)

Part Number	Description	Pkg
81308	No. 2 stopper for manifold	1/pkg
39961	Manifold rebuild kit, includes 3 stainless steel retaining rings; 6 O-rings, ARP No. -016; 3 O-rings, ARP No. -015; 6 O-rings, ARP No. 009; 1 1/4 in. MNPT plug; 2 1/4 in. MNPT to 6.4 mm (1/4 in.) hose barb adapters; 4 foot pads; and 1 each knob and valve	1/pkg

Stainless Steel Forceps

Make filter handling easy



- ▶ Tips have a flat, smooth surface to avoid membrane filter damage.
- ▶ Polypropylene finger grips provide a comfortable and secure hold.
- ▶ Choose traditional black or multi-colored finger grips. Bright colors make forceps easy to identify, track, and see on the lab bench.

Applications

- ▶ Ideal for handling and moving membrane to and from filter holders and Petri dishes.

Specifications

Materials of Construction

Stainless steel with polypropylene finger grips

Sterilization

Provided non-sterile. "Flame" the tips prior to use, or autoclave at 121 - 123 °C (250 - 253 °F) at 1.0 bar (100 kPa, 15 psi) for 15 - 20 min. Do not autoclave in aluminum foil.

Ordering Information

Stainless Steel Forceps

Part Number	Description	Pkg
51147	Stainless steel forceps, black grips	1/pkg
4690	Stainless steel forceps, multi-colored grips (1 each of orange, blue, chartreuse)	3/pkg

Petri Dishes

Unique patented design for easy handling and storage



- ▶ Opens easily with one hand, yet closes to a tight seal.
- ▶ Uses less space on the lab bench or in the incubator with easy stacking base.
- ▶ Gamma-irradiated. No EtO residuals to impede microbial growth.
- ▶ Available with or without absorbent pads.
- ▶ Bulk packaging offers additional value.

Applications

- ▶ Ideal for microbiological analysis when performing the Membrane Filter (MF) Technique.
- ▶ Petri dishes with absorbent pads can be used with broth media, or users can pour agar into dishes without absorbent pads.

Specifications

Petri Dish

Material of Construction

Polystyrene

Dimensions

Height: 9.0 mm (0.35 in.)
Diameter: 50.0 mm (1.97 in.)

Filter Size

Accepts 47 mm membrane filter

Gamma-Irradiated

Validated dose 15 - 30 kGy

Absorbent Pads

Composition

Cellulose

Typical Thickness

0.9 mm (35 mils)

Ordering Information

Petri Dishes

Part Number	Description	Pkg
7242	Petri dishes, without absorbent pads	100/pkg
7232	Petri dishes, bulk pack, without absorbent pads	500/pkg
7245	Petri dishes, with absorbent pads	100/pkg



Absorbent Pad Kits

One-handed dispensing of cellulose absorbent pads



Specifications

Pad Composition

Cellulose

Typical Thickness

0.9 mm (35 mils)

Diameter

45.5 mm

Ordering Information

Absorbent Pad Kits

Part Number	Description	Pkg
66025	Absorbent pads, gamma-irradiated	1,000/pkg
66190	Absorbent pads, non-sterile	1,000/pkg

Related Products

47 mm Membrane Disc Filters	213 - 215
Ampoule Media for Microbiological Analysis	217
Petri Dishes.	230, 280

- ▶ Enables user to dispense a clean cellulose pad into a Petri dish whenever needed without touching the pad.
- ▶ Handy dispenser kit holds 1 tube of 100 absorbent pads (10 tubes included). Each tube drops quickly into the hand dispenser for easy use.
- ▶ Available non-sterile or gamma-irradiated. No ETO residuals to impede microbial growth.

Applications

- ▶ Absorbent pads are ideal for absorbing broth media to culture colonies in accordance with the Membrane Filter (MF) Technique.



Contamination control

simplified

New Sentino™ Microbiology Pump

Maximize workspace and minimize contamination risk

- ▶ **Compact design** – Requires less benchtop space and is easy to use in the confined space of a hood.
- ▶ **Portable** – Plug in to use or charge battery and take to point of sampling.
- ▶ **Prevent false positives** – Peristaltic flow design is uni-directional to eliminate back-up of sample.
- ▶ **Disposable fluid path** – Replace before biofilm build-up becomes a problem.

Visit www.pall.com/sentino to request a demo.



PALL Life Sciences

Providing Rapid Reliable Results

www.pall.com/sentino

2330 NW 102nd Ave Unit # 3
Doral, FL 33172

Environmental Global Solutions

305.909.7860

Environmental Water and Air



Pall is one of the world's largest suppliers of membranes and glass fiber filters designed specifically for environmental monitoring and testing. As knowledge about the impact of industrial by-products and the need for monitoring have increased, so has our commitment to developing new methods and products for air, groundwater and surface water analysis. We're proud that our water quality products set industry standards and define methods for testing groundwater, surface water, and drinking water. Pall environmental testing products are referenced by regulatory agencies worldwide for air monitoring and hazardous waste analysis of both organic and inorganic matrices. Proper product selection is critical to the integrity of your analysis. For the most accurate results possible, use the handy application selectors in this section to help you identify the best products for your environmental quality control needs.

Content

- 234** Water – Environmental/Drinking/Waste Application Selector
- 235** Air Monitoring Application Selector
- 236** Environmental Quality Control Overview
- 239** Environmental Water and Air – Online Reference Library
- 240** Environmental Water and Air
 - 240** Products – Membranes and Glass Fiber
 - 250** Products – Cassettes
 - 252** Products – Capsules

Water – Environmental/Drinking/Waste Application Selector

	Page Number	Cryptosporidium and Giardia Testing	Fecal Streptococcus Detection	Pseudomonas sp. Detection	Total Bacteria Detection	Total Coliforms/Fecal Coliforms Detection	Total Suspended Solids Detection	Groundwater Sampling
Membranes and Glass Fiber								
Glass fiber filters, type A/E	242						•	
GN-6 Metricel® MCE membrane disc filters, S-pack	213, 248		•	•	•	•		
Metricel Black PES membrane disc filters, S-pack	214		•	•	•	•		
Supor® 200 PES membrane disc filters, S-pack	215		•	•	•	•		
Capsules								
AquaPrep™ 600 groundwater sampling capsules	252							•
AquaPrep groundwater sampling device	252							•
AquaPrep-V groundwater sampling devices	252							•
Envirochek® HV sampling capsules	254	•						
Envirochek sampling capsules	254	•						
GWV high capacity groundwater sampling capsules	253							•
Ampoule Media*								
HPC with TTC indicator broth	216				•			
KF- <i>Streptococcal</i> broth	216		•					
M-FC broth	216					•		
M-TGE broth	216				•			
MF-Endo broth	216					•		
<i>Pseudomonas</i> broth	216			•				
Trypticase Soy broth - USP	216				•			
Filter Funnels								
47 mm Magnetic filter funnels	226		•	•	•	•	•	
MicroFunnel™ filter funnels, 100 and 300 mL	218		•	•	•	•	•	
Sentino™ Magnetic filter funnels	225a		•	•	•	•	•	
Hardware								
Filter funnel manifolds	229		•	•	•	•	•	
Filter funnel manifolds for MicroFunnel filter funnels	228		•	•	•	•	•	
Laboratory shaker	256	•						
Petri dishes	230, 280		•	•	•	•	•	
Stainless steel forceps	230, 280		•	•	•	•	•	
Vacuum/pressure pumps	279		•	•	•	•	•	

* Culture media listed may or may not meet the requirements of a regulated test method. It is the responsibility of the user to determine applicability in each situation.

Air Monitoring Application Selector

	Page Number	Acidic Dry Deposition	Aggressive Environments/ Aerosol Testing	Asbestos Fibers Detection	Diesel Fuel Testing	Gravimetric Testing	Lead Detection	Nuisance Dust Detection	PM 10 Testing	Polynuclear Aromatic hydrocarbon Testing	Silica Detection
Membranes and Glass Fiber											
Emfab™ filters	240		•		•	•					
Fiberfilm™ filters	240		•		•	•					
GLA-5000 PVC membrane disc filters	245					•		•			•
Glass fiber filters, type A/E	242					•			•		
GN-4 Metrical® MCE membrane disc filters	248			•		•	•				•
GN-6 Metrical MCE membrane disc filters	213, 248			•		•					
Metrical polypropylene membrane filters	249							•			
Nylasorb™ nylon membrane disc filters	246	•									
Teflo (PTFE with PMP) membrane disc filters	246				•	•			•		
TF (PTFE) membrane disc filters	246		•			•					
Tissuquartz™ filters, 2500 QAO-UP	240		•			•			•		
Tissuquartz filters, 2500 QAT-UP	240		•			•			•		
Zefluor™ (PTFE) membrane disc filters	246		•		•	•			•	•	
Zylon™ membrane disc filters	246		•			•				•	
Air Monitoring Cassettes											
25 mm air monitoring cassettes	250			•		•	•	•			
37 mm air monitoring cassettes	251			•		•	•	•		•	•
25 mm support pads	250			•		•	•	•		•	•
37 mm support pads	251			•		•	•	•			
Hardware											
13 mm Swinney filter holder, stainless steel	266		•			•					
25 and 47 mm filter holders, stainless steel	261 - 262		•			•					
37 and 47 mm open-face filter holders, aluminum	273	•				•					
47 mm in-line filter holder, aluminum	272		•		•	•					
47 mm in-line filter holder, polycarbonate	269					•					
Analyslide® Petri dish	282	•	•	•	•	•	•	•	•	•	•

Environmental Quality Control

Meeting Global Requirements for Monitoring and Testing

Cryptosporidium and Giardia Capture and Recovery

Patented Envirochek® HV sampling capsules are designed for 100% capture of *Cryptosporidium* oocysts and *Giardia* cysts from source or finished water. The protocol is faster, safer, and simpler than other methods and allows for processing of up to eight samples at once using Pall's laboratory shaker.

- ▶ Approved by regulatory agencies worldwide for *Cryptosporidium* and *Giardia* monitoring, including U.S. EPA methods 1622 and 1623, United Kingdom DWI standard operating protocols, and ISO/DIS 15553:2006.
- ▶ Field-friendly design allows for a lower pressure source than competitive products, and is easier to transport and handle. Each capsule has a unique serial number for traceability.
- ▶ Disposable design eliminates false positives from cross-contamination. 1 µm pore size membrane ensures complete capture of the organisms, eliminating false negatives.
- ▶ Designed to eliminate human contact with organisms. No filter holder assembly or cleaning is required. Self-contained capsule's filter element does not need to be handled.

Drinking Water Quality Control

Pall has been involved with water quality monitoring for coliforms since Standard Methods adopted the use of Membrane Filtration as an acceptable, and often preferable, method for monitoring drinking water quality. Our mixed cellulose ester GN Metricel® membranes set the standard worldwide for meeting stringent regulations by providing uniform and consistent growth of organisms. In addition to our membranes, Pall offers a variety of accessories to support water quality labs including Petri dishes, prepared microbiological media, and hardware. Pall's unique Magnetic Filter Funnel is used extensively throughout the water quality testing community because of its one-handed operation that simplifies testing and improves aseptic technique.



Envirochek HV sampling capsules set the standards for Cryptosporidium and Giardia testing.

Groundwater Sampling Capsules

Pall's products for groundwater analysis are cited in methods worldwide and set industry standards for performance. For dissolved metals analysis of groundwater, our disposable groundwater capsules ensure rapid sample filtration with low levels of metals extractables. Our versatile line of groundwater sampling products ensures a good fit with your sampling situation, regardless of volume or particulate level.

Air Monitoring Products

You'll find Pall environmental testing products referenced and recommended by regulatory agencies worldwide for air monitoring. Pall's time-tested filtration membranes, glass fiber media, and convenient air monitoring devices are reliable allies in the pursuit of contamination control.

Groundwater Monitoring Products Reduce Contamination

Protecting natural resources is critical to governments around the world. Groundwater quality is of particular importance because of its use as a source for drinking water. Heavy metals contamination of groundwater is a concern around landfills, industrial plants, and previously contaminated sites. Monitoring for heavy metals around landfills and industrial plants ensures that unwanted metals are not leaching into surrounding groundwater where they can be distributed farther and more quickly from the source of contamination. Monitoring these sites is maintained to ensure that remediation of the sites is progressing and effective at reducing the spread of contamination. Pall's versatile line of groundwater sampling products ensures a good fit with your sampling situation, regardless of volume or particulate level. Our capsule products are provided with a metals certification to ensure the product is not contributing metals to the sample before analysis. If you prefer reusable hardware, Pall offers a complete line of filter holders and funnels, as well as trusted membrane and glass fiber filters.



GWV High Capacity Groundwater Sampling Capsules offer five times the filtration area of conventional 142 mm filters.

Pall GWV High Capacity Groundwater Capsules Are Tested to Ensure Minimum Detectable Metals in Their Composition

Element/Ion (Periodic Symbol)	µg/L	Element/Ion (Periodic Symbol)	µg/L
Aluminum (Al)	0.2	Nickel (Ni)	0.5
Antimony (Sb)	0.02	Niobium (Nb)	0.02
Arsenic (As)	0.2	Nitrate (NO ₃ ⁻)	10
Barium (Ba)	0.01	Nitrite (NO ₂ ⁻)	10
Beryllium (Be)	0.04	Osmium (Os)	0.02
Bismuth (Bi)	0.04	Palladium (Pd)	0.06
Boron (B)	2	Phosphate (PO ₄ ³⁻)	5
Bromide (Br ⁻)	5	Platinum (Pt)	0.08
Cadmium (Cd)	0.03	Potassium (K)	25
Calcium (Ca)	25	Praseodymium (Pr)	0.01
Cerium (Ce)	0.01	Rhenium (Re)	0.06
Cesium (Cs)	0.02	Rhodium (Rh)	0.02
Chloride (Cl ⁻)	50	Rubidium (Rb)	0.1
Chromium (Cr)	0.03	Ruthenium (Ru)	0.05
Cobalt (Co)	0.02	Samarium (Sm)	0.04
Copper (Cu)	0.5	Scandium (Sc)	0.2
Dysprosium (Dy)	0.04	Selenium (Se)	7
Erbium (Er)	0.02	Silicon (Si)	0.5
Europium (Eu)	0.02	Silver (Ag)	0.03
Fluoride (F ⁻)	2	Sodium (Na)	25
Gadolinium (Gd)	0.04	Strontium (Sr)	0.01
Gallium (Ga)	0.04	Sulfate (SO ₄ ²⁻)	10
Germanium (Ge)	0.05	Tantalum (Ta)	0.02
Gold (Au)	0.05	Tellurium (Te)	0.04
Hafnium (Hf)	0.03	Terbium (Tb)	0.02
Holmium (Ho)	0.01	Thallium (Tl)	0.05
Indium (In)	0.02	Thorium (Th)	0.02
Iridium (Ir)	0.06	Thulium (Tm)	0.01
Iron (Fe)	1	Tin (Sn)	0.2
Lanthanum (La)	0.01	Titanium (Ti)	0.05
Lead (Pb)	0.05	Tungsten (W)	0.2
Lithium (Li)	0.03	Uranium (U)	0.02
Lutetium (Lu)	0.01	Vanadium (V)	0.03
Magnesium (Mg)	10	Ytterbium (Yb)	0.03
Manganese (Mn)	0.03	Yttrium (Y)	0.02
Mercury (Hg)	0.05	Zinc (Zn)	1
Molybdenum (Mo)	0.05	Zirconium (Zr)	0.05
Neodymium (Nd)	0.02		

Air Monitoring Products Comply With Global Testing Standards

Air quality is a concern worldwide due to its known impact on health issues. Globally, federal regulators set standards to control pollution in the air we breathe. Pall began research on the development and production of filters for air sampling and analysis more than 40 years ago. We are now one of the world's largest suppliers of membranes and glass fiber filters designed specifically for environmental monitoring and testing.

As knowledge about the impact of industrial by-products and the need for monitoring have increased, so has our commitment to supplying products for air analysis. You will find Pall environmental testing products referenced and recommended by regulatory agencies worldwide for air monitoring and hazardous waste analysis of both organic and inorganic matrices.

Application	Membranes	Devices and Accessories
Acid Rain	Nylasorb™ and Zefluor™ Membranes	37 and 47 mm Open-Face Aluminum Filter Holders
Aggressive Environments/ Aerosol Testing	Tissuquartz™, Emfab™, and Fiberfilm™ Membranes	47 mm In-Line Filter Holders
Asbestos/Fibers	GN-6 Metrice® and GN-4 Metrice Membranes	25 and 37 mm Air Monitoring Cassettes, 25 and 37 mm Support Pads, Analyslide® Petri Dish
Diesel Fuel	Emfab and Fiberfilm Membranes	47 mm In-Line Filter Holders
Gravimetric	A/E Glass Fiber, GLA-5000, Zefluor, Emfab, Tissuquartz, and Teflo Membranes	37 mm Air Monitoring Cassettes, 25 mm Open-Face Delrin® Holder, 37 and 47 mm Open-Face Aluminum Holders, Analyslide Petri Dish
Lead	GN-4 Metrice Membrane	37 mm Air Monitoring Cassettes, 37 mm Support Pads
Nuisance Dust	GLA-5000 Membrane	37 mm Air Monitoring Cassettes, 37 mm Support Pads
PM 10, PM 2.5	A/E Glass Fiber, Tissuquartz, Teflo, and Zefluor Membranes	Analyslide Petri Dish
Polynuclear Aromatic Hydrocarbon	Zefluor and Zylon™ Membranes	37 mm Air Monitoring Cassettes, 37 mm Support Pads
Silica	GLA-5000 and GN-4 Metrice Membranes	37 mm Air Monitoring Cassettes, 37 mm Support Pads, Analyslide Petri Dish

For more detailed information on how to select the correct filter for the specific NIOSH method you are using, visit our web site, contact your local Pall Life Sciences representative, or call our Technical Services Department.



Environmental Water and Air – Online Reference Library

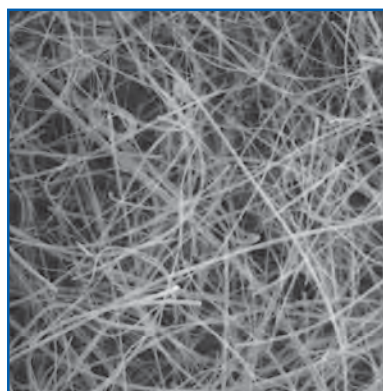
Pall's website offers an extensive collection of product, technical, and application information. This valuable online reference library features hundreds of technical articles, posters, podcasts, application notes, and more that can help you get the most out of your process. To view the following titles online – and many others – click the Literature Library link in the left sidebar when you visit www.pall.com/lab.

- ▶ Air Analysis Sampling Membrane Selection Guide
- ▶ Analysis of Envirochek® Sampling Capsule versus Traditional String Wound Cartridges for Collection and Recovery of *Cryptosporidium*
- ▶ *Cryptosporidium* Occurrence in Wastewaters and Control Using UV Disinfection
- ▶ Envirochek HV Capsule: Recovering *Cryptosporidium* From High Volume Source and Finished Drinking Water Samples
- ▶ Envirochek HV Sampling Capsule Protocol
- ▶ Envirochek Sampling Capsule Protocol
- ▶ Filter Funnels Selection Guide
- ▶ Filter Holders Selection Guide
- ▶ Filtration Hardware Selection Guide
- ▶ Groundwater Sampling Devices Selection Guide
- ▶ Membranes and Devices for Air Analysis Selection Guide
- ▶ Methods for the Recovery, Isolation, and Detection of *Cryptosporidium* Oocysts in Wastewaters
- ▶ Testing Water for *Cryptosporidium* Podcast



Pallflex® Air Monitoring Filters

Versatile filters uniquely suited for a broad range of air monitoring applications



membranes and glass fiber

- ▶ Useful for high temperature and hot gas air monitoring applications.
- ▶ Ideal for stack sampling and diesel emissions testing.

Applications

Tissuquartz™ Filters

- ▶ Heat treated for reduction of trace organics and superior chemical purity.
- ▶ High temperature use for analysis of acidic gases and stack sampling aerosols.
- ▶ High flow rate and filtration efficiency.
- ▶ Ultra-pure soft water processing to reduce residual ion content. (Contact Pall Technical Service for typical values.)

Filberfilm™ Filters

- ▶ Economical filter suited for a range of air sampling applications.
- ▶ Moisture variations in air or gases during air sampling will not cause chemical reactions on the filter.
- ▶ Heat-treated version available for reduction of trace organics.

Emfab™ Filters

- ▶ Withstands folding for weighing and transport.
- ▶ Every filter flushed with DI water to remove water-soluble residue.
- ▶ Low air resistance for use in critical aerosol sampling tests, such as diesel exhaust.

Specifications

Description	Tissuquartz Filters	Emfab Filters*	Fiberfilm Filters
Filter Media	Pure quartz, no binder	Borosilicate glass microfibers reinforced with woven glass cloth and bonded with PTFE	Heat resistant borosilicate glass fiber coated with fluorocarbon (TFE)
Diameter	25 - 142 mm and 8 x 10 in.	12 - 142 mm and 8 x 10 in.	25 - 100 mm and 8 x 10 in.
Typical Thickness	432 µm (17 mils)	178 µm (7 mils)	203 µm (8 mils)
Typical Filter Weight	5.8 mg/cm ²	5.0 mg/cm ²	3.4 mg/cm ²
Typical Water Flow Rate 0.35 bar (35 kPa, 5 psi)	220 mL/min/cm ²	32 mL/min/cm ²	220 mL/min/cm ²
Typical Air Flow Rate -----	73 L/min/cm ²	68 L/min/cm ²	180 L/min/cm ²
Maximum Operating Temperature - Air	1,093 °C (2,000 °F)	260 °C (500 °F)	315.5 °C (600 °F)
Typical Aerosol Retention**	99.90%	99.95%	96.40%
pH in Boiled Water Extract	6.5 - 7.5	—	—

* The TX40HI45 and TX40HI75 are made from the same materials but were developed in conjunction with the U.S. EPA (Method 26) when a need arose to sample the exhaust gases from the stacks at incinerator facilities. These two grades are made with higher levels of the PTFE binder resin than the TX40HI20WW to withstand the corrosive atmosphere. The TX40HI75 has a higher level of binder than the TX40HI45 and both have a higher level than the TX40HI20WW.

** Following ASTM D 2986-95A 0.3 µm (DOP) at 32 L/min/100 cm² filter media.

ENVIRONMENTAL WATER AND AIR

Ordering Information

Tissuquartz™ Filters, 2500 QAT-UP

Part Number	Description	Pkg
7200	25 mm	100/pkg
7201	37 mm	25/pkg
7202	47 mm	25/pkg
7199	54 mm	25/pkg
7191	60 mm	25/pkg
7197	63.5 mm	25/pkg
7196	64 mm	25/pkg
7205	82.6 mm	25/pkg
7190	83 mm	25/pkg
7206	85 mm	25/pkg
7187	87.5 mm	25/pkg
7203	90 mm	25/pkg
7195	100 mm	25/pkg
7207	102 mm	25/pkg
7250	110 mm	25/pkg
7249	115 mm	25/pkg
7208	125 mm	25/pkg
7251	142 mm	25/pkg
7204	8 x 10 in.	25/pkg

Non-Heat-Treated Tissuquartz Filters, 2500 QA0-UP

Part Number	Description	Pkg
7198	37 mm	25/pkg
7194	47 mm	25/pkg
7240	70 mm	25/pkg
7241	90 mm	25/pkg
7193	142 mm	25/pkg

Emfab™ Filters

Part Number	Description	Pkg
7258	TX40HI20WW, 12 mm	100/pkg
7219	TX40HI20WW, 25 mm	100/pkg
7217	TX40HI20WW, 37 mm	100/pkg
7256	TX40HI20WW, 41 mm	100/pkg
7220	TX40HI20WW, 44 mm	100/pkg
7221	TX40HI20WW, 47 mm	100/pkg
7222	TX40HI20WW, 70 mm	100/pkg
7218	TX40HI20WW, 81 mm	100/pkg
7234	TX40HI20WW, 85 mm	100/pkg
7223	TX40HI20WW, 90 mm	100/pkg
7225	TX40HI20WW, 110 mm	100/pkg
7252	TX40HI20WW, 142 mm	100/pkg
7224	TX40HI20WW, 8 x 10 in.	100/pkg
7259	TX40HI45, 25 mm	100/pkg
7262	TX40HI45, 47 mm	100/pkg
7253	TX40HI45, 82.6 mm	100/pkg
7260	TX40HI45, 83 mm	100/pkg
7254	TX40HI45, 110 mm	100/pkg
7263	TX40HI75, 25 mm	100/pkg
7264	TX40HI75, 47 mm	100/pkg
7265	TX40HI75, 82.6 mm	100/pkg
7266	TX40HI75, 110 mm	100/pkg

Fiberfilm™ Filters

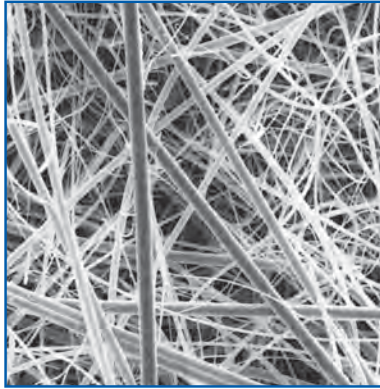
Part Number	Description	Pkg
7210	T60A20, 25 mm	100/pkg
7211	T60A20, 37 mm	50/pkg
7212	T60A20, 47 mm	50/pkg
7216	T60A20, 55 mm	50/pkg
7213	T60A20, 70 mm	50/pkg
7209	T60A20-HT, 70 mm, heat-treated	50/pkg
7214	T60A20, 90 mm	50/pkg
7257	T60A20, 100 mm	50/pkg
7215	T60A20, 8 x 10 in.	50/pkg

Related Products

In-Line Filter Holders	268 - 272
Stainless Steel Forceps	230, 280

Glass Fiber Filters

Superior grade filters for a variety of biological and environmental methods



- ▶ Type A/E meets the requirements for suspended solids testing, as described in *Standard Methods for the Examination of Water and Wastewater*, current edition.
- ▶ Reduces filtration costs and premature clogging when filtering difficult-to-filter or highly contaminated solutions.
- ▶ Extends filter life and reduces final filter changes with high capacity prefilters.
- ▶ Eliminates sample contamination. Binder-free borosilicate glass fiber has no added extractables.
- ▶ Filters a wide range of particulate loads and viscous solutions with a selection of filter thicknesses from which to choose.
- ▶ Filters with binder offer excellent wet strength for easy handling and filter integrity.

Applications

- ▶ Used in a variety of sample clean-up, prefiltration, and analytical testing applications. Choose between binder-free borosilicate glass for complete purity or glass fiber with acrylic binder for added strength.

Type A/E Glass Fiber

- ▶ For testing dissolved and suspended solids in wastewater and gravimetric analysis of air pollutants.
- ▶ High flow rates, wet strength, and dirt (solids) holding capacities.

Type A/B Glass Fiber

- ▶ High dirt-loading capacity with 2.5 times thicker glass than Type A/C.
- ▶ Manufactured of the highest quality borosilicate glass microfibers.

Type A/C Glass Fiber

- ▶ For testing dissolved and suspended solids in wastewater.
- ▶ Useful for cell harvesting applications.
- ▶ Purity eliminates risk of unwanted contaminants leaching into the filtrate.

Type A/D Glass Fiber

- ▶ Excellent prefilters for solutions with a heavy load of large-sized particulate that must be removed.
- ▶ Large nominal pore size reduces membrane clogging.

Extra Thick Glass Fiber With Binder

- ▶ Preferred for prefiltration of viscous biological solutions.
- ▶ High particulate-holding capacity makes discs efficient depth filters and allows for filtration of large volumes of solutions.

Metrigard™ Glass Fiber With Binder

- ▶ Useful for prolonging membrane filter life in liquid systems that contain substantial amounts of particulate matter.

TCLP Glass Fiber

- ▶ Designed to meet requirements for use in U.S. EPA SW-846 Method 1311: Toxic Characteristics Leaching Procedure (TCLP).

Specifications and Selection Chart

Description	Type A/E	Type A/B	Type A/C
Typical Applications	Water solids testing, air monitoring, gravimetric analysis	Diagnostic applications, sample prefiltration	Cell harvesting, prefiltration, solids testing
Filter Media	Borosilicate glass without binder	Borosilicate glass without binder	Borosilicate glass without binder
Pore Size (Nominal)	1 µm	1 µm	1 µm
Typical Thickness	330 µm (13 mils)	660 µm (26 mils)	254 µm (10 mils)
Typical Water Flow Rate mL/min/cm ² at 0.3 bar (30 kPa, 5 psi)	250	124	153
Typical Air Flow Rate L/min/cm ² at 0.7 bar (70 kPa, 10 psi)	60	24	40
Maximum Operating Temperature	Air - 550 °C (1,022 °F)	Air - 550 °C (1,022 °F)	Air - 550 °C (1,022 °F)
Sterilization	Autoclavable	Autoclavable	Autoclavable
Typical Aerosol Retention*	99.98%	–	–

Description	Type A/D	Extra Thick Discs	Metrigard™ Discs	TCLP
Typical Applications with large-sized particulate	Prefiltration of solutions contaminated samples	Prefiltration of heavily	Prefiltration in systems with high particulate matter	U.S. EPA Method 1311
Filter Media	Borosilicate glass without binder	Glass fiber with acrylic binder**	Ultrafine glass fiber with acrylic binder**	Borosilicate glass without binder***
Pore Size (Nominal)	3 µm	1 µm	0.5 µm	0.7 µm
Typical Thickness	660 µm (26 mils)	1270 µm (50 mils)	330 µm (13 mils)	432 µm (17 mils)
Typical Water Flow Rate mL/min/cm ² at 0.3 bar (30 kPa, 5 psi)	649	210	80	–
Typical Air Flow Rate L/min/cm ² at 0.7 bar (70 kPa, 10 psi)	139	26	21	–
Maximum Operating Temperature	Air - 550 °C (1,022 °F)	Water - 135 °C (275 °F)	Water - 135 °C (275 °F)	NA
Sterilization	Autoclavable	Autoclavable	Autoclavable	Autoclavable
Typical Aerosol Retention*	–	99.97%	–	–

* Following ASTM D 2986-95A 0.3 µm (DOP) at 32 L/min/100 cm² filter media.

** Binder is 5% of total material.

*** TCLP glass fiber filters are not acid washed.

Ordering Information

Type A/E Glass Fiber Discs and Sheets, 1 µm

Part Number	Description	Pkg
61628	13 mm	500/pkg
61630	25 mm	500/pkg
60097	30 mm	100/pkg
61654	35 mm	100/pkg
61652	37 mm	500/pkg
65475	42.5 mm	100/pkg
61631	47 mm	100/pkg
61632	50 mm	100/pkg
60140	55 mm	100/pkg
60012	57 mm	100/pkg
60150	63 mm	100/pkg
61665	70 mm	100/pkg
61663	76 mm	100/pkg
60010	81 mm	100/pkg

Part Number	Description	Pkg
60127	82.5 mm	100/pkg
60118	85 mm	100/pkg
61664	90 mm	100/pkg
61633	102 mm	100/pkg
60115	110 mm	100/pkg
61655	124 mm	100/pkg
65476	125 mm	100/pkg
61669	127 mm	100/pkg
66559	142 mm	25/pkg
61635	142 mm	100/pkg
61675	257 mm	100/pkg
61636	265 mm	100/pkg
66560	293 mm	25/pkg
61637	293 mm	100/pkg
61638	8 x 10 in.	100/pkg

Glass Fiber Filters (continued)

Ordering Information

Type A/B Glass Fiber Discs and Sheets, 1 µm

Part Number	Description	Pkg
66196	13 mm	100/pkg
66198	25 mm	100/pkg
66208	37 mm	100/pkg
66209	47 mm	100/pkg
66210	142 mm	25/pkg
66211	8 x 10 in.	25/pkg

Type A/C Glass Fiber Discs and Sheets, 1 µm

Part Number	Description	Pkg
66213	25 mm	100/pkg
66214	37 mm	100/pkg
66215	47 mm	100/pkg
65529	70 mm	100/pkg
66216	142 mm	25/pkg
66217	8 x 10 in.	25/pkg

Type A/D Glass Fiber Discs and Sheets, 3 µm

Part Number	Description	Pkg
66218	13 mm	100/pkg
66220	25 mm	100/pkg
66222	37 mm	100/pkg
66224	47 mm	100/pkg
66226	142 mm	25/pkg
66227	8 x 10 in.	25/pkg

Glass Fiber Discs With Binder, Extra Thick, 1 µm

Part Number	Description	Pkg
66073	13 mm	100/pkg
66075	25 mm	100/pkg
66078	47 mm	100/pkg
66084	127 mm	50/pkg
66085	142 mm	50/pkg
66086	257 mm	25/pkg
66088	293 mm	25/pkg

Metrigard™ Glass Fiber Discs With Binder, 0.5 µm

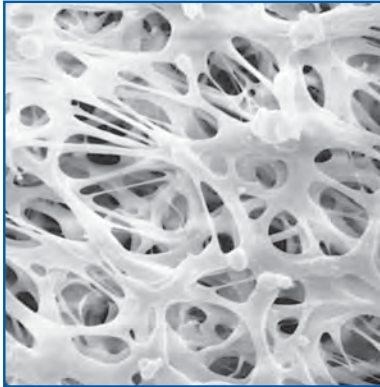
Part Number	Description	Pkg
64798	47 mm	100/pkg
64803	142 mm	100/pkg

TCLP Glass Fiber Filters

Part Number	Description	Pkg
66251	13 mm	100/pkg
66258	47 mm	50/pkg
66256	90 mm	50/pkg
66259	110 mm	50/pkg
60159	115 mm	50/pkg
66257	142 mm	50/pkg
60076	293 mm	25/pkg

GLA-5000 PVC Membrane Disc Filters

Inherently low ash membrane ideally suited for multiple NIOSH analytical methods



Specifications

Filter Media

Polyvinyl chloride (PVC)

Pore Size

5 μm

Typical Air Flow Rate

53 L/min/cm² at 0.7 bar
(70 kPa, 10 psi)

Maximum Operating Temperature – Water

52 °C (125 °F)

Gravimetric Stability

< 0.5% after 24 hrs at 48% relative
humidity at 50 °C (122 °F)

Ash Content

< 1%

Typical Aerosol Retention*

99.94% 0.3 μm (DOP) at
32 L/min/100 cm² of filter media

*Following ASTM D 2986-95A

- ▶ Assures gravimetric stability with low moisture pick-up and low tare weight.
- ▶ Low ash. Provides interference-free silica determinations.
- ▶ 5 μm pore size meets NIOSH and OSHA requirements.
- ▶ 25 and 37 mm sizes are ideal for use in Pall Air Monitoring Cassettes.

Applications

- ▶ Excellent membrane choice for sampling airborne metals, silica, and dust.

Ordering Information

GLA-5000 Membrane Disc Filters, 5 μm

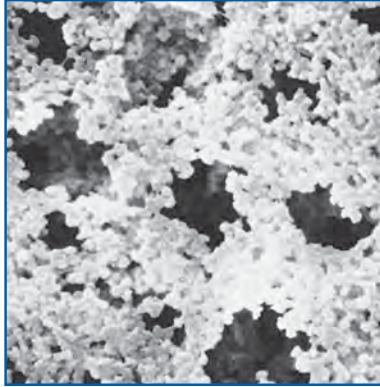
Part Number	Description	Pkg
66466	25 mm	100/pkg
66469	37 mm	100/pkg
66467	37 mm, with support pads	100/pkg
66468	47 mm	100/pkg

Related Products

Air Monitoring Cassettes	250 - 251
Analyslide® Petri Dish	282
In-line Filter Holders	268 - 272
Open-face Filter Holders	273
Stainless Steel Forceps	230, 280

Nylasorb™ Nylon Membrane Disc Filters

Pure nylon membrane specifically for the requirements of acidic dry deposition (acid rain) measurements



- ▶ Selectively adsorbs HNO₃ and SO₂.
- ▶ Accurate HNO₃ determinations. Adsorbs extremely low levels of NO, NO₂, and polynuclear aromatic hydrocarbons (PAHs).
- ▶ Assures low background levels of NO₃⁻ and SO₄²⁻. Each lot tested by ion chromatography.

Applications

- ▶ For acidic dry deposition measurements.

Specifications

Filter Media Nylon	Maximum Operating Temperature 180 °C (356 °F)
Pore Size 1 µm (nominal)	Maximum NO₃⁻ Background Level 0.025 µg/cm ²
Typical Thickness 90 µm (3 mils)	

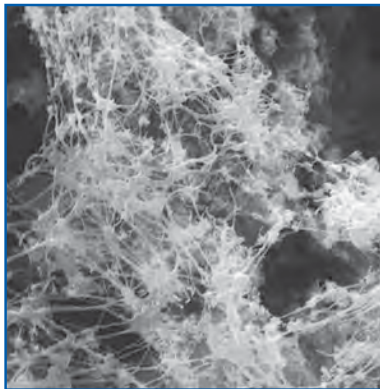
Ordering Information

Nylasorb Membrane Disc Filters, 1 µm

Part Number	Description	Pkg
66509	47 mm	100/pkg
66510	90 mm	50/pkg

PTFE Membrane Disc Filters

Strong, chemically resistant membranes for air monitoring and sampling in aggressive environments



- ▶ Low chemical background permits highly sensitive, interference-free determinations.
- ▶ Ensures accurate gravimetric determinations with low tare mass.
- ▶ Zefluor™ membrane, available in 0.5 µm pore size.
- ▶ Ideal for filtration of gas and/or organic solvents.

Applications

- ▶ For air monitoring and sampling in aggressive environments.
- ▶ Supported membranes offer increased durability for hostile testing environments or acid aerosol monitoring.
- ▶ Teflo membrane offers unique PMP support ring for PM 10 dichotomous and other air sampling techniques.
- ▶ Ultimate in chemical compatibility for filtering harsh chemicals and HPLC mobile phases that destroy other membrane materials.

Specifications

Description	Zefluor™ Membrane	Teflo Membrane	Zylon™ Membrane	TF (PTFE) Membrane
Filter Media/Support	PTFE with PTFE support	PTFE with PMP (polymethyl-pentene) support ring	Unsupported PTFE	PTFE on a polypropylene support
Typical Thickness	0.5 µm: 178 µm (7 mils) 1 µm: 165 µm (6.5 mils) 2 and 3 µm: 152 µm (6 mils)	1 µm: 76 µm (3 mils) 2 µm: 46 µm (1.8 mils) 3 µm: 30.4 µm (1.2 mils)	140 µm (5.5 mils)	0.2 µm: 139 µm (5.5 mils) 0.45 and 1 µm: 135 µm (5.3 mils)
Typical Air Flow Rate L/min/cm ² at 0.7 bar (70 kPa, 10 psi)	0.5 µm: 1 1 µm: 14.6 2 µm: 25.3 3 µm: 53	1 µm: 17 2 µm: 53 3 µm: 90	5 µm: 13	0.2 µm: 2 0.45 µm: 3 1 µm: 7
Minimum Bubble Point - IPA bar (psi)	Not applicable	Not applicable	Not applicable	0.2 µm: 1.0 (15) 0.45 µm: 0.4 (6) 1 µm: 0.1 (2)
Water Breakthrough bar (psi)	Not applicable	Not applicable	Not applicable	0.2 µm: 2.8 (40) 0.45 µm: 1.1 (16) 1 µm: 1.0 (15)
Typical Aerosol Retention*	0.5, 1, and 2 µm: 99.99% 3 µm: 99.98%	1 and 2 µm: 99.99% 3 µm: 99.79%	Not applicable	Not applicable

*Following ASTM D 2986-95A 0.3 µm (DOP) at 32 L/min/100 cm² filter media.

Ordering Information

Zefluor and Zylon Membrane Disc Filters

Part Number	Description	Pkg
P5PQ025	Zefluor, 0.5 µm, 25 mm	100/pkg
P5PQ047	Zefluor, 0.5 µm, 47 mm	50/pkg
P5PL025	Zefluor, 1 µm, 25 mm	100/pkg
P5PL037	Zefluor, 1 µm, 37 mm, with support pads	50/pkg
P5PL047	Zefluor, 1 µm, 47 mm	50/pkg
P5PL090	Zefluor, 1 µm, 90 mm	50/pkg
P5PL001	Zefluor, 1 µm, 8 x 10 in.	25/pkg
60048	Zefluor, 2 µm, 25 mm	100/pkg
P5PJ037	Zefluor, 2 µm, 37 mm, with support pads	50/pkg
P5PJ047	Zefluor, 2 µm, 47 mm	50/pkg
60224	Zefluor, 2 µm, 70 mm	25/pkg
P5PJ001	Zefluor, 2 µm, 8 x 10 in.	25/pkg
60230	Zefluor, 3 µm, 50 mm	50/pkg
60214	Zefluor, 3 µm, 63 mm	100/pkg
60537	Zefluor, 3 µm, 90 mm	25/pkg
P5PI001	Zefluor, 3 µm, 8 x 10 in.	25/pkg
P4PH037	Zylon, 5 µm, 37 mm, with support pads	50/pkg
P4PH047	Zylon, 5 µm, 47 mm	50/pkg

Teflo Membrane Disc Filters

Part Number	Description	Pkg
R2PL037	1 µm, 37 mm	50/pkg
R2PL047	1 µm, 47 mm	50/pkg
R2PJ037	2 µm, 37 mm	50/pkg

Teflo Membrane Disc Filters

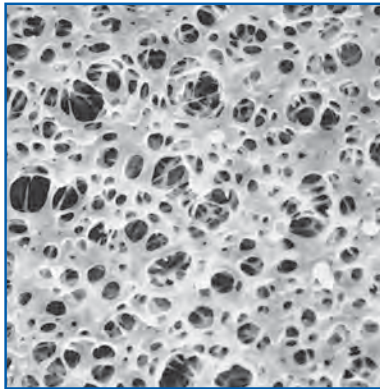
Part Number	Description	Pkg
R2PJ041	2 µm, 41 mm	50/pkg
R2PJ047	2 µm, 47 mm	50/pkg
66695	2 µm, 47 mm	50/pkg
R2PI025	3 µm, 25 mm	50/pkg
60146	3 µm, 47 mm	50/pkg

TF (PTFE) Membrane Disc Filters

Part Number	Description	Pkg
66141	TF 200, 0.2 µm, 13 mm	100/pkg
66142	TF 200, 0.2 µm, 25 mm	100/pkg
66143	TF 200, 0.2 µm, 47 mm	100/pkg
66630	TF 200, 0.2 µm, 50 mm	100/pkg
66145	TF 200, 0.2 µm, 142 mm	25/pkg
66146	TF 200, 0.2 µm, 293 mm	25/pkg
66147	TF 450, 0.45 µm, 13 mm	100/pkg
66148	TF 450, 0.45 µm, 25 mm	100/pkg
66149	TF 450, 0.45 µm, 47 mm	100/pkg
66631	TF 450, 0.45 µm, 50 mm	100/pkg
66151	TF 450, 0.45 µm, 142 mm	25/pkg
66152	TF 450, 0.45 µm, 293 mm	25/pkg
66153	TF 1000, 1 µm, 13 mm	100/pkg
66154	TF 1000, 1 µm, 25 mm	100/pkg
66159	TF 1000, 1 µm, 37 mm, with support pads	100/pkg
66155	TF 1000, 1 µm, 47 mm	100/pkg
66158	TF 1000, 1 µm, 293 mm	25/pkg

GN Metrical® MCE Membrane Disc Filters

Membrane for air monitoring applications



membranes and glass fiber

- ▶ Dissolves completely using standard digestion procedures.
- ▶ Clears completely, possesses low artifacts, and offers minimal interference in fiber counting.

Applications

- ▶ GN-4 Metrical filters meet NIOSH requirements for airborne metals and asbestos monitoring.

Specifications

Filter Media

Hydrophilic mixed cellulose esters

Pore Size

0.8 µm, 0.45 µm

Typical Thickness

152 µm (6 mills)

Typical Filter Weight

4 mg/cm²

Typical Water Flow Rate

0.8 µm: 129 mL/min/cm² at 0.7 bar
(70 kPa, 10 psi)

0.45 µm: > 65 mL/min/cm² at 0.7 bar
(70 kPa, 10 psi)

Typical Air Flow Rate

0.8 µm: 55 L/min/3.7 cm² at 0.9 bar
(90 kPa, 13.5 psi)

Maximum Operating Temperature - Water

74 °C (165 °F)

Typical Moisture Pick-Up

< 1% after 24 hr at 48% relative humidity at 23 °C (73 °F)

Extractables - Boiling Water

< 2%

Minimum Bubble Point - Water

1.0 bar (100 kPa, 15 psi)

Refractive Index

1.512

Ordering Information

GN-4 Metrical MCE Membrane Disc Filters, 0.8 µm

Part Number	Description	Pkg
64677	25 mm, plain, with support pads	100/pkg
66263	25 mm, plain	100/pkg
66276	25 mm, grid, packaged in 4 cavities	100/pkg
64678	37 mm, plain, with support pads	100/pkg
64679	47 mm, plain	100/pkg
66179	47 mm, grid	100/pkg

GN-6 Metrical MCE Membrane Disc Filters, 0.45 µm (Non-Sterile Packages)

Part Number	Description	Pkg
63066	13 mm, plain	100/pkg
63068	25 mm, plain	100/pkg
64191	25 mm, grid	100/pkg
64382	37 mm, plain, with support pads	100/pkg
63069	47 mm, plain	100/pkg
63020	47 mm, grid	100/pkg
66536	142 mm, plain	25/pkg

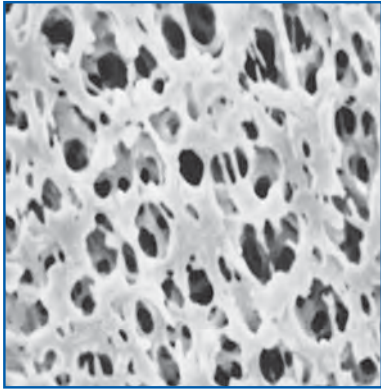
Related Products

47 mm Magnetic Filter Funnels	226
Air Monitoring Cassettes	250 - 251
Analyslide® Petri Dish	282
In-line Filter Holders	268 - 272
Open-face Filter Holders	273
Sentino™ Magnetic Filter Funnels	225a
Stainless Steel Forceps	230, 280
Vacuum/Pressure Pumps	279



Metrical® Polypropylene Membrane Disc Filters

Pure polypropylene membrane for filtration of aggressive solvents



- ▶ Pure polypropylene gives high chemical stability.
- ▶ Offers high temperature resistance and low extractable levels.

Applications

- ▶ Inherently hydrophobic.
- ▶ Economical alternative to PTFE.

Specifications

Filter Media
Hydrophobic polypropylene

Pore Size
0.1 µm

Typical Thickness
89 µm (3.5 mils)

Typical Liquid Flow Rate - Isopropyl Alcohol
1.9 mL/min/cm² at 0.7 bar (70 kPa, 10 psi)

Typical Air Flow Rate
0.8 L/min/cm² at 0.7 bar (70 kPa, 10 psi)

Maximum Operating Temperature - Water
82 °C (180 °F)

Minimum Bubble Point - Isopropyl Alcohol
1.7 bar (170 kPa, 25 psi)

Sterilization
Provided non-sterile. Autoclavable if desired.

Ordering Information

Metrical Polypropylene Membrane Disc Filters, 0.1 µm

Part Number	Description	Pkg
M5PU025	25 mm	100/pkg
M5PU047	47 mm	100/pkg

Related Products

In-Line Filter Holders	268 - 272
Stainless Steel Forceps	230, 280

25 mm Air Monitoring Cassettes

Conductive, non-static cowl prevents adherence of particles to cassette walls for more accurate analysis



- ▶ 0.8 µm GN-4 Metrical® membrane has a low fiber background count. It is widely accepted for air monitoring of fibers, asbestos fibers, and metals.
- ▶ Leak proof and tamper proof. Banded cassettes ensure air-tight seal for critical applications.
- ▶ Available unassembled for cost-effective monitoring with a variety of Pall membranes.

Applications

- ▶ GN-4 Metrical membrane meets fiber count and background requirements to comply with NIOSH Methods 7400 and 7402.
- ▶ Cassettes can be used to monitor respirable constituents, such as silica, metal, and dust.

Specifications

Materials of Construction

Filter Media: GN-4 Metrical membrane (mixed cellulose esters) with cellulose support pad
Housing: Carbon-filled polypropylene

Filter Size

25 mm

Inlet/Outlet Connections

Luer-type female inlet, female luer built-in hose adapter outlet

Effective Filtration Area

3.85 cm²

Operating Temperature

Ambient

Dimensions

Overall Length [Includes 5 cm (2 in.) Extension]: 7.9 cm (3.1 in.)
Diameter: 2.8 cm (1.1 in.)

Ordering Information

Air Monitoring Cassettes, 25 mm

Part Number	Description	Pkg
4375	Three-piece unit with GN-4 Metrical membrane and support pad	50/pkg
4382	Three-piece unit with GN-4 Metrical membrane and support pad, banded	50/pkg
4376	Three-piece unit, unassembled	50/pkg

Accessories and Replacement Parts

Part Number	Description	Pkg
66238	25 mm support pads, non-sterile	100/pkg

Related Products

Air Monitoring Membranes:

GLA-5000 Membrane	245
Glass Fiber Filters, Type A/E	243
GN Metrical Membrane	248
Pallflex® Filters	241
Teflo Membrane	247
Zefluor™ Membrane	247
Zylon™ Membrane	247
Analyslide® Petri Dish	282
Stainless Steel Forceps	230, 280

37 mm Air Monitoring Cassettes

Consistent performance for industrial hygiene sampling



- ▶ 37 mm diameter meets NIOSH and other regulatory requirements for industrial hygiene sampling using vacuum filtration.
- ▶ 0.8 µm GN-4 Metrical® membrane has a low fiber background count. It is widely accepted for air monitoring of fibers, asbestos fibers, and metals.
- ▶ Choose from two- or three-piece units.
- ▶ Disposable after a single use or may be reused.

Applications

- ▶ Designed to meet NIOSH and other regulatory requirements for industrial hygiene sampling.
- ▶ Ideally suited for particulate and air sampling analysis using vacuum filtration.
- ▶ Can be used to monitor respirable constituents, such as nuisance dust, silica, aerosols, and airborne particulates.
- ▶ For open- or closed-face monitoring methods.

Specifications

Materials of Construction

Filter Media: GHP hydrophilic polypropylene membrane, GN-4 Metrical membrane (mixed cellulose esters) with a cellulose support pad
Housing: SAN (styrene acrylonitrile)

Filter Size

37 mm

Inlet/Outlet Connections

Luer-taper (female)

Operating Temperature

Ambient

Effective Filtration Area

9.1 cm²

Dimensions

Overall Length:

Two-piece Unit: 2.8 cm (1.1 in.)

Three-piece Unit: 3.8 cm (1.5 in.)

Diameter: 4.2 cm (1.7 in.)

Ordering Information

Air Monitoring Cassettes, 37 mm

Part Number	Description	Pkg
4338	Two-piece unit, unassembled	100/pkg
4339	Three-piece unit, unassembled	100/pkg
4336	Three-piece unit with 0.8 µm GN-4 Metrical membrane and support pad	50/pkg

Accessories and Replacement Parts

Part Number	Description	Pkg
64747	37 mm support pads, non-sterile	500/pkg
88066	Plugs, blue	100/pkg
88067	Plugs, red	100/pkg

Related Products

Air Monitoring Membranes:

GLA-5000 Membrane	245
Glass Fiber Filters, Type A/E	243
GN Metrical Membrane	248
Pallflex® Filters	241
Teflo Membrane	247
Zefluor™ Membrane	247
Zylon™ Membrane	247
Analyslide® Petri Dish	282
Stainless Steel Forceps	230, 280

AquaPrep™ Groundwater Sampling Capsules and Devices

Optimized for minimal background in dissolved metals analysis of water samples



- ▶ Easiest and most efficient way to meet filtration requirements of the U.S. EPA for 0.45 µm filtration.
- ▶ Self-contained, disposable units eliminate the time and hazards associated with cleaning filter holders.
- ▶ AquaPrep 600 capsule features over four times higher EFA than 142 mm disc filters, reducing the need for multiple filter changes during the sampling process and ensuring rapid sample filtration.
- ▶ AquaPrep 600 capsules have Metals Analysis Certification on 48 metals printed on each package.

Applications

- ▶ Designed for the preparation of groundwater samples for dissolved metals analysis.
- ▶ EFA of 19.6 cm² makes AquaPrep devices perfect for samples with relatively low levels of particulate matter.
- ▶ AquaPrep 600 capsules are recommended for moderately silty and particulate-laden groundwater.

Specifications

AquaPrep and AquaPrep-V Sampling Devices

Materials of Construction

Filter Media:

AquaPrep Device

Thermopor membrane (polyester-reinforced polysulfone)

AquaPrep-V Device

Versapor® membrane (acrylic copolymer on a non-woven support)

Housing: Polypropylene

Effective Filtration Area

19.6 cm²

Dimensions

Length: 8.2 cm (3.2 in.)

Diameter: 7.3 cm (2.9 in.)

Inlet/Outlet Connections

AquaPrep Device

Stepped hose barb accepts 6.4 - 12.7 mm (1/4 - 1/2 in.) ID tubing

AquaPrep-V Device

1/8 in. MNPT

Maximum Operating Temperature

60 °C (140 °F)

Maximum Operating Pressure

5.1 bar (510 kPa, 75 psi) at ambient temperature

AquaPrep 600 Capsules

Materials of Construction

Filter Media: Supor® membrane (hydrophilic polyethersulfone)

Housing: Polypropylene

Effective Filtration Area

600 cm²

Dimensions

Length (With Fittings): 14.5 cm (5.7 in.)

Diameter: 6.9 cm (2.7 in.)

Inlet/Outlet Connections

Stepped hose barb accepts 6.4 - 12.7 mm (1/4 - 1/2 in.) ID tubing

Maximum Operating Temperature

60 °C (140 °F)

Maximum Operating Pressure

4.1 bar (410 kPa, 60 psi) at ambient temperature

Ordering Information

AquaPrep Groundwater Sampling Device

Part Number	Description	Pkg
4270	0.45 µm, Thermopor membrane	20/pkg

AquaPrep-V Groundwater Sampling Device

Part Number	Description	Pkg
4272	0.45 µm, Versapor membrane	20/pkg
4274	0.45 µm, Versapor membrane	100/pkg

AquaPrep 600 Groundwater Sampling Capsule

Part Number	Description	Pkg
12175	0.45 µm, Supor membrane	1/pkg
12176	0.45 µm, Supor membrane	10/pkg

Related Products

GWV High Capacity Groundwater Sampling Capsules	253
Versapor® Acrylic Copolymer Membrane Disc Filters	113

GWV High Capacity Groundwater Sampling Capsules

Superior flow rates and higher throughputs



- ▶ 75 Metals Analysis Certification is printed on each package.
- ▶ Meets filtration requirements of the U.S. EPA.
- ▶ Available in a variety of pore sizes to meet regional regulatory requirements.
- ▶ Saves time and money. Self-contained devices reduce the need for costly decontamination and multiple filter change steps associated with reusable filter holders.
- ▶ Ensures rapid filtration. GWV provides five times the filtration area of conventional 142 mm filters.

Applications

- ▶ Designed for the preparation of groundwater samples for dissolved metals analysis.
- ▶ Reduces the need for multiple changes when filtering particulate-laden samples.

Specifications

Materials of Construction

Filter Media: Versapor® membrane (acrylic copolymer on a non-woven support)

Housings: Polypropylene

Effective Filtration Area

700 cm²

Dimensions

Length (With Fittings): 11.4 cm (4.5 in.)

Diameter: 6.4 cm (2.5 in.)

Inlet/Outlet Connections

1/8 in. MNPT

Maximum Operating Temperature

88 °C (190 °F)

Maximum Operating Pressure

3.4 bar (340 kPa, 50 psi) at ambient temperature

Ordering Information

GWV High Capacity Groundwater Sampling Capsules

Part Number	Description	Pkg
12178	0.45 µm	1/pkg
12179	0.45 µm	10/pkg
12180	0.45 µm	50/pkg
12023	1 µm	1/pkg
12024	1 µm	10/pkg
12025	1 µm	50/pkg
12019	5 µm	1/pkg
12020	5 µm	10/pkg
12050	5 µm	50/pkg

Related Products

AquaPrep 600 Groundwater Sampling Capsules	252
AquaPrep™ Groundwater Sampling Devices	252
Versapor® Acrylic Copolymer Membrane Disc Filters	113

Envirochek® and Envirochek HV Sampling Capsules

For the concentration and recovery of *Cryptosporidium* oocysts and *Giardia* cysts from source or finished water



- ▶ Simple to use. No assembly or cleaning of filter holders or elution equipment.
- ▶ Saves time by allowing the processing of multiple samples at the same time.
- ▶ Disposable design eliminates cross-contamination and false positives.
- ▶ Typically greater than 70% recovery of target organisms.
- ▶ Eliminates false negatives with 1 µm pore size membrane for retention of *Cryptosporidium* and *Giardia*. Envirochek HV capsules are 100% integrity tested.
- ▶ Safer to use. Self-contained capsules mean that the potentially contaminated filter element does not need to be handled or cut apart.
- ▶ Capsules are serialized for traceability.

Applications

- ▶ Envirochek sampling capsules are validated and listed in U.S. EPA Methods 1622 and 1623.1, and used for sampling source water for *Cryptosporidium* and *Giardia*.
- ▶ Envirochek HV capsule is designed for sampling up to 1,000 L or more of treated water and is validated for up to 50 L of source water.
- ▶ Envirochek HV capsules, PNs 12096 and 12097, are approved for the United Kingdom DWI regulatory testing of finished water.
- ▶ Envirochek capsules are listed in ISO/DIS 15553-2006.

Specifications

Materials of Construction

Envirochek Capsule
(PN 12110 and 12107)
Filter Media: Supor® membrane (hydrophilic polyethersulfone)
Housing: Polycarbonate
Filter Support Material: Polypropylene
End Caps: Green vinyl
Adhesive: Urethane

Envirochek HV Capsule
(PN 12099, 12098, 12097, and 12096)
Filter Media: Polyester, hydrophilic membrane
Housing: Polycarbonate
Filter Support Material: Polypropylene
End Caps: Blue vinyl
Adhesive: Urethane

Effective Filtration Area
1,300 cm²

Dimensions
Length: 21.6 cm (8.5 in.)
Diameter: 6.1 cm (2.4 in.)

Inlet/Outlet Connections
12.7 mm (1/2 in.) straight hose barb

Elution Capacity
Minimum of 127 mL

Performance

Step	Approximate Time to Process Eight Samples (Minutes)	
	Envirochek Capsule	Other Major Device
Set-Up	5	50
Elution	55	240
Concentration	65	240
Cleaning Equipment	0	320
Total Time	125	850
Time/Test (minutes)	16	106

For more information on the sampling procedure and additional test data, visit our online Literature Library at www.pall.com/lab.

Performance (continued)

The Envirochek® HV capsule has been validated for testing source water up to 50 L and for high volumes of drinking water analysis up to 1,000 liters (see Table 2). High flow rates and throughput are achieved due to the high filtration area that comes from the patented pleated design. This pleated design provides 1,300 cm² of filtration area that allows for high flow rate at very low differential pressures. This means

gravity feed or smaller pumps can be used and easily carried into the field for site sampling. Site sampling eliminates the need for carrying and shipping bulky containers of water.

The patented recovery method used with the Envirochek HV capsule allows for processing up to eight filters at one time, saving valuable lab time. The method is the easiest and simplest one available.

IPR Tier 1 Validation Data for *Cryptosporidium* Recovery Using Method 1622 and the Envirochek HV Capsule for 1,000 L Finished Drinking Water Samples Using the Sodium Hexametaphosphate Elution

Sample Description	Turbidity (ntu)	Spike Dose (#)	% Recovery		
Reagent Blank	< 0.1	0			
IPR2	< 0.1	99.3	68.5		
IPR2	< 0.1	99.3	58.4		
IPR3	< 0.1	99.3	60.4	Mean % Recovery	RSD or RPD
IPR4	< 0.1	99.3	61.4	62.2	7.0
IPR Acceptable Range				13 - 143	< 67 %

IPS and MS/MSD Validation Data for *Cryptosporidium* Recovery Using Method 1622 and the Envirochek HV Capsule with 50 L of Source Water

IPR Reagent Water

N	Turbidity (ntu)	Packed Pellet Size (mL)	Spike Dose (#)	Avg. % Recovery	Avg. RSD (%)
12	< 0.1	< 0.1	95.9	57.7	15.1
IPR Acceptable Range				24 - 100	< 55%

IPR Matrix Spike

N	Turbidity (ntu)	Packed Pellet Size (mL)	Spike Dose (#)	Avg. % Recovery	Avg. RSD (%)
6	1.8 - 10.6	0.45 - 3.0	95.9	52.5	10.5
IPR Acceptable Range				13 - 111	< 51%

IPR = Initial Precision and Recovery
RSD = Relative Standard Deviation
RPD = Relative Percent Difference

Envirochek® and Envirochek HV Sampling Capsules (continued)

Ordering Information

Envirochek and Envirochek HV Sampling Capsules

Part Number	Description	Pkg
12099	Envirochek HV sampling capsule	1/pkg
12098	Envirochek HV sampling capsule, bulk pack, individually bagged	25/pkg
12110	Envirochek sampling capsule	1/pkg
12107	Envirochek sampling capsule, bulk pack, individually bagged	25/pkg

Accessories and Replacement Parts

Part Number	Description	Pkg
4820	Laureth-12 paste, 50 g bottle	1/pkg
4821	Laboratory shaker, 115 V, 50/60 Hz	1/pkg
4822	Laboratory shaker, 230 V, 50/60 Hz CE	1/pkg
89051	Clamp with collar	1/pkg

The Laboratory Shaker processes up to eight Envirochek sampling capsules at once. Shaker speed is adjustable from 0 to ~ 700 RPMs.



Hardware



Pall Life Sciences provides filter holders, filter funnels, products for pressure applications, and accessories in a range of materials to help you maximize your filtration efficiency and economy. Our durable stainless steel and aluminum filter funnels and holders are manufactured to provide years of continuous service. We also provide disposable funnels and holders in a variety of plastic materials for use with non-aggressive samples, or for convenient one-time use.

Content

258	Filter Funnel Application Selector
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260	Hardware
260	Products – Reusable Funnels
266	Products – Filter Holders
276	Products – Manifolds
279	Products – Accessories

Filter Funnel Application Selector

Pall offers a wide variety of filter funnels to meet the specific needs of your process. In laboratory applications, filter funnels are used to measure and concentrate particulate in a fluid sample onto a membrane filter or to purify the filtrate. When selecting a funnel, consider:

- **Materials of Construction**

Consider the temperature and chemical resistance of the funnel materials. For liquid clarification, particulate and microbial analysis, and situations requiring autoclaving, choose one of our plastic funnels. They are generally less expensive than stainless steel funnels and more durable than glass.

- **Sample Volume**

Match your sample volume to funnel capacity for maximum efficiency. Our filter funnels range in capacity from 50 mL to 1 liter and feature clearly marked calibrations for easy measurement.

- **Cleaning Requirements**

Pall funnels are provided non-sterile and most are autoclavable. Some microbiologists flame sanitize hardware when conducting microbial monitoring. Our stainless steel and glass funnels are ideal for these applications.

Selection Guide – Filter Funnels

Filter Size (mm)	25	25, 47	47	47	47
Part Number	4203, 4204	4240, 4221	4230	4011, 4012, 4013	4238, 4241, 4242, 4247
Description	Polysulfone	Stainless Steel	Parabola Stainless Steel ²	Glass	Polyphenylsulfone
Page Number	260	261 - 262	263	265	226
Autoclavable ¹	Yes ³	Yes	Yes	Yes	Yes ³
HPLC/IC/Mobile Phase/Degassing				•	
Microbiology, Pharmaceutical	•	•	•	•	•
Microbiology, Environmental	•	•	•	•	•
Microbiology, Beverage	•	•	•	•	•
Microbiology, Industrial Process Water	•	•	•	•	•
Solvent Filtration		•	•	•	
Water Sampling (Ground/Surface)	•		•	•	•

¹ Limited by filter type.

² Do not use funnel for filtration of high purity fuels as explosion may occur.

³ Repeated use of detergents containing polyoxyethylated alkyl phenols and alcohols, and/or anti-corrosion, anti-scaling boiler additives that may carry over in steam, may cause funnel material to crack, thereby reducing the life of the product. Do not autoclave rubber stoppers. Do not autoclave with aluminum foil; use autoclave paper.

Pressure Application Selector

Applications	Description	Part Number
Rapid batch filtration of bacteriological or cell culture media, food liquids, viscous oils, hydraulic oils, or lubricants	47 mm Pressure Filtration Funnel, Stainless Steel	4280
Rinse critical mechanical or electronic components, flush filter holders, and rinse laboratory glassware	Pressure Rinser	7074
Process batches of liquids for sterilization or clarification	Pressure Vessels, Stainless Steel	15203, 15207, 15220

Filter Holder Application Selector

Filter holders are designed for a variety of laboratory applications including sterile filtration, stack sampling, product sampling, and clarification of fluids or gases.

Filter Size (mm)	13	25	25	25, 47	47	47	47	25, 37, 47	142, 293
Part Number	4317	4320	1109	1209, 2220	1235	1119	4020	1107, 1219, 1220	11872, 11873
Description	Plastic and Stainless Steel Swinney	Easy Pressure Syringe	In-Line Delrin*	In-Line Stainless Steel	In-Line Aluminum	In-Line Polycarbonate	SolVac® Holder	Open-Face	Stainless Steel
Page Number	266	267	268	270	272	269	182	273	274
Autoclavable¹	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Ambient Air Monitoring	•		•	•	•	•		•	
Cell Harvesting	•	•		•	•				•
HPLC/IC Sample Preparation	•	•	•	•	•	•	•		
Industrial Hygiene Monitoring	•		•	•	•	•		•	
Liquid Sterilization	•	•	•	•	•	•			•
Nucleic Acid/Protein Purification/Concentration	•	•	•	•	•	•			•
Solvent Filtration	•	•	•	•	•	•	•		•
Venting/Gas Filtration	•		•	•	•	•		•	
Water Sampling (Ground/Surface)	•	•	•	•		•	•		•

¹ Autoclavability may be limited by filter type or hose barb adapters. Please contact Pall Life Sciences technical service or consult product literature for the holder being used. Do not autoclave with aluminum foil; use autoclave paper.

25 mm Filter Funnels, Polysulfone

Economical, autoclavable funnels for vacuum filtration



- ▶ Transparent funnels with graduations permit easy visual measurement.
- ▶ Less expensive than stainless steel and more durable than glass.
- ▶ Tapered stem fits standard size #2 stoppers.
- ▶ Available in 50 and 200 mL capacities.
- ▶ Changing filters is easy. Twist-lock coupling minimizes filter tearing.

Applications

- ▶ Ideal for liquid clarification, vacuum filtration, and scintillation counting studies.

Specifications

Material of Construction

Polysulfone

Effective Filtration Area

2.9 cm²

Dimensions

Overall Length:

50 mL: 15.8 cm (6.2 in.)

200 mL: 20.1 cm (7.9 in.)

Diameter: 7.1 cm (2.8 in.)

Filter Size

Accepts 25 mm filter

Funnel Capacity

50 or 200 mL

Connections

Tapered funnel stem inserts into standard size No. 2 rubber stopper

Maximum Operating Temperature

Limited by membrane or 121 °C (250 °F)

Sterilization

Provided non-sterile. Autoclavable if desired at 121 - 123 °C (250 - 253 °F) at 1.0 bar (100 kPa, 15 psi) for 15 - 20 min.

Ordering Information

25 mm Filter Funnels, Polysulfone

Part Number	Description	Pkg
4204	25 mm, 50 mL capacity	1/pkg
4203	25 mm, 200 mL capacity	1/pkg

Accessories and Replacement Parts

Part Number	Description	Pkg
79791	Support screen, Type 316 stainless steel	1/pkg
87265	Support screen, polysulfone	1/pkg

Related Products

25 mm Glass Fiber Filters	243 - 244
25 mm Membrane Disc Filters	111 - 115, 178 - 181, 213 - 214, 245, 247 - 249
Filter Funnel Manifolds	277 - 278
Vacuum/Pressure Pumps	279

25 mm Filter Funnel, Stainless Steel

High quality, corrosion-resistant funnel for vacuum filtration



- ▶ Stainless steel construction offers excellent chemical resistance.
- ▶ Threaded collar seals to base.

Applications

- ▶ Vacuum filtration of small volumes of solutions for particulate contamination analysis.

Specifications

Materials of Construction

Funnel, Base, Support Screen, Underdrain Disc, and Spiral Retaining Ring: Type 316 stainless steel
Cap: Type 303 stainless steel

Effective Filtration Area

2.8 cm²

Dimensions

Overall Length: 15.5 cm (6.1 in.)
Diameter: 4.45 cm (1.8 in.)

Funnel Capacity

50 mL

Connection

Stem inserts into standard size
No. 2 rubber stopper

Maximum Operating Temperature

Limited by filter type

Sterilization

Provided non-sterile. Autoclavable if desired at 121 - 123 °C (250 - 253 °F) at 1.0 bar (100 kPa, 15 psi) for 15 - 20 min.

Note: Not recommended for use with volatile liquids or high purity fuels as explosion may result from the static discharge.

Ordering Information

25 mm Filter Funnel, Stainless Steel

Part Number	Description	Pkg
4240	25 mm, 50 mL capacity	1/pkg

Accessories and Replacement Parts

Part Number	Description	Pkg
79791	Support screen, Type 316 stainless steel	1/pkg
79792	Underdrain disc, Type 316 stainless steel	1/pkg

Related Products

Filter Funnel Manifolds	277 - 278
Membrane Disc Filters	109 - 115, 177 - 181, 213 - 215, 245 - 249
Stainless Steel Forceps	230, 280
Vacuum/Pressure Pumps	279

47 mm Filter Funnel, Stainless Steel

Ultimate chemical resistance and easy assembly



- ▶ Quick, easy assembly. Funnel's weight seals filter to base.
- ▶ 100 mL capacity with 50 mL calibration facilitates easy measurement.
- ▶ Stainless steel construction offers excellent chemical resistance.

Applications

- ▶ For applications requiring the ultimate in chemical resistance.
- ▶ Designed for vacuum filtration to collect biological or particulate matter from liquids.
- ▶ For use with standard manifold systems or vacuum flasks.

Specifications

Material of Construction

Type 316 stainless steel

Effective Filtration Area

9.6 cm²

Dimensions

Overall Length: 16.3 cm (6.4 in.)

Diameter: 6.6 cm (2.6 in.)

Filter Size

Accepts 47 and 50 mm filters

Funnel Capacity

100 mL with 50 mL calibration

Connection

Stem fits into standard size No. 8 rubber stopper

Maximum Operating Temperature

Limited by filter type

Sterilization

Provided non-sterile. Autoclavable if desired at 121 - 123 °C (250 - 253 °F) at 1.0 bar (100 kPa, 15 psi) for 15 - 20 min.

Note: Not recommended for use with volatile liquids or high purity fuels as explosion may result from the static discharge.

Ordering Information

47 mm Filter Funnel, Stainless Steel

Part Number	Description	Pkg
4221	47 mm, 100 mL capacity	1/pkg

Accessories and Replacement Parts

Part Number	Description	Pkg
81312	Support screen, Type 316 stainless steel	1/pkg

Related Products

Filter Funnel Manifolds	277 - 278
Membrane Disc Filters	109 - 115, 177 - 181, 213 - 215, 245 - 249
Stainless Steel Forceps	230, 280
Vacuum/Pressure Pumps	279

47 mm Parabola Filter Funnel, Stainless Steel

One-liter funnel with excellent chemical compatibility



- ▶ Bayonet twist-lock seal provides reliable sealing without an O-ring.
- ▶ Stainless steel construction offers excellent chemical resistance.

Applications

- ▶ For large-volume vacuum filtration of microbiological samples, oils, and solvents.

Specifications

Materials of Construction

Funnel Housing: Type 316 stainless steel
Support Screen, Retaining Ring Assembly, and Base: Type 304 stainless steel

Effective Filtration Area

9.6 cm²

Dimensions

Overall Length: 22.2 cm (8.7 in.)
Diameter: 15.2 cm (6.0 in.)

Filter Size

Accepts 47 mm filter

Funnel Capacity

1 L

Connection

Stem inserts into standard size No. 2 rubber stopper

Maximum Operating Temperature

Limited by filter type

Sterilization

Provided non-sterile. Autoclavable if desired at 121 - 123 °C (250 - 253 °F) at 1.0 bar (100 kPa, 15 psi) for 15 - 20 min.

Note: Not recommended for use with volatile liquids or high purity fuels as explosion may result from the static discharge.

Ordering Information

47 mm Parabola Filter Funnel, Stainless Steel

Part Number	Description	Pkg
4230	47 mm Parabola	1/pkg

Accessories and Replacement Parts

Part Number	Description	Pkg
4231	Type 304 stainless steel base	1/pkg
4235	Support screen, Type 304 stainless steel	1/pkg
4301	Funnel and retaining ring assembly	1/pkg

Related Products

AcroCap™ Positive Pressure Devices	124
Acrodisc® Syringe Filters with Supor® Membrane	117 - 118, 122 - 123, 195, 198
AcroPak™ Capsules with Supor Membrane	129, 132, 137
Stainless Steel Pressure Vessels	283
Supor Membrane Disc Filters	109, 111, 215
VacuCap® Vacuum Filtration Devices	127

47 mm Pressure Filtration Funnel, Stainless Steel

High quality, corrosion-resistant funnel for rapid batch filtration



- ▶ Stainless steel construction offers excellent chemical resistance.
- ▶ Convenient hand tightening makes filter changing easy.

Applications

- ▶ Best choice for rapid batch filtration of bacteriological or cell culture media, food liquids, viscous oils, hydraulic oils, or lubricants.

Specifications

Materials of Construction

Funnel Barrel, Support Screen, and Adapter Tube: Type 304 stainless steel

Cap and Base: Type 303 stainless steel

Hose Barb: Type 316L stainless steel

Gaskets: PTFE

O-Ring: Viton*

Effective Filtration Area

9.6 cm²

Dimensions

Housing Length: 16.4 cm (6.5 in.)

Diameter: 5.8 cm (2.3 in.)

Funnel Capacity

200 mL

Connection

1/8 in. -27 FNPT pipe thread; includes hose barb adapter for 6.4 mm (1/4 in.)

ID tubing; funnel stem accepts 10 mm (3/8 in.) ID tubing or standard stopper

Maximum Operating Temperature

Limited by filter type, by Viton O-ring 204 °C (399 °F), or PTFE gasket 288 °C (550 °F)

Maximum Operating Pressure

13.8 bar (1380 kPa, 200 psi) using compressed air or nitrogen

Sterilization

Provided non-sterile. Autoclavable at 121 - 123 °C (250 - 253 °F) at 1.0 bar (100 kPa, 15 psi) for 15 - 20 min; dry heat if desired at 170 °C (338 °F) for a minimum of 1 hr.

Note: Not recommended for use with volatile liquids or high purity fuels as explosion may result from the static discharge.

Ordering Information

47 mm Pressure Filtration Funnel, Stainless Steel

Part Number	Description	Pkg
4280	47 mm, pressure filtration funnel	1/pkg

Accessories and Replacement Parts

Part Number	Description	Pkg
2110	Adapter tube, stainless steel	1/pkg
4235	Support screen, Type 304 stainless steel	1/pkg
4281	Type 303 stainless steel base	1/pkg
4282	Type 304 stainless steel center barrel	1/pkg
4284	PTFE gasket	1/pkg
4287	Spare seal kit contains 5 PTFE gaskets, 10 Viton O-rings, and 1 stainless steel hose barb adapter to 6.4 mm (1/4 in.) ID tubing	1/pkg
72833	Viton O-ring	1/pkg

Related Products

Membrane Disc Filters 109 - 115, 177 - 181, 213 - 215, 245 - 249
 Stainless Steel Forceps 230, 280

47 mm Filter Funnels, Glass

Ideal for vacuum filtration of liquids and degassing of HPLC solvents and mobile phases



- ▶ Made of 100% borosilicate glass, assures resistance to even the most aggressive solvents.
- ▶ One-liter 47 mm glass funnel/support assembly permits filtration of an entire liter at once.
- ▶ Support assembly's unique base design with integral vacuum connection prevents contamination of the vacuum line with filtrate.
- ▶ One-liter glass funnel is graduated from 300 to 1,000 mL in 50 mL increments.
- ▶ 300 mL glass funnel is graduated from 100 to 250 mL in 25 mL increments. Stepped stem fits into standard one-hole stoppers (9 mm).

Applications

- ▶ Ideal for filtration and degassing of HPLC solvents and aqueous mobile phase solutions and buffers.
- ▶ Offers excellent chemical compatibility, even with aggressive solvents.

Specifications

47 mm Glass Filter Funnel With Stopper Support Assembly

Materials of Construction

All parts are borosilicate glass except:
 Stopper: Silicone No. 8
 Clamp: Aluminum

Effective Filtration Area

9.6 cm²

Dimensions

Overall Height:

Base: 11.7 cm (4.6 in.)
 Funnel: 11.1 cm (4.4 in.)

Diameter:

Base: 5.8 cm (2.3 in.)
 Funnel: 7.9 cm (3.1 in.)

Filter Size

Accepts 47 mm filter

Funnel Capacity

300 mL

47 mm Glass Filter Funnel With Sidearm Support Assembly and Flask

Materials of Construction

All parts are borosilicate glass except:
 Clamp: Aluminum
 Support Base/Flask Connection:
 Standard taper 40/35 ground joint

Effective Filtration Area

9.6 cm²

Dimensions

Overall Height:

PN 4012 and 4013 Base:
 11.7 cm (4.6 in.)
 PN 4012 Funnel: 16.7 cm (6.6 in.)
 PN 4013 Funnel: 11.1 cm (4.4 in.)

Diameter:

PN 4012 and 4013 Base:
 5.8 cm (2.3 in.)
 PN 4012 Funnel: 12.0 cm (4.7 in.)
 PN 4013 Funnel: 7.9 cm (3.1 in.)

Filter Size

Accepts 47 mm filter

Funnel Capacity

300 mL or 1 L

Flask Capacity

1 or 4 L

Ordering Information

47 mm Filter Funnels, Glass

Part Number	Description	Pkg
4011	Glass filter funnel with No. 8 silicone stopper support base (300 mL funnel, no flask)	1/pkg
4012	Glass filter funnel with sidearm support assembly and flask (1 L funnel with 4 L flask)	1/pkg
4013	Glass filter funnel with sidearm support assembly and flask (300 mL funnel with 1 L flask)	1/pkg

Accessories and Replacement Parts

Part Number	Description	Pkg
4014	Glass funnel, 300 mL	1/pkg
4015	Glass funnel, 1 L	1/pkg
4018	Glass flask, 1 L	1/pkg
4016	Glass flask, 4 L	1/pkg
4017	Fritted glass support base with sidearm	1/pkg
4019	Fritted glass support base/No. 8 silicone stopper	1/pkg
81595	Aluminum clamp, anodized	1/pkg

13 mm Swinney Filter Holders

Available in plastic and stainless steel



- ▶ Economical for small-volume (1 to 10 mL) filtration.
- ▶ Accepts 13 mm filter discs.
- ▶ Luer inlet and outlet fittings provide easy connections.

Applications

- ▶ Clarification of small volumes using a syringe.
- ▶ Useful in filtering biologicals, ophthalmics, GC and HPLC samples, and lubricants that must be applied dust-free to critical parts such as bearings.

Specifications

13 mm Swinney, Plastic

Materials of Construction

Inlet/Outlet Housing and Support
Screen: Celcon* (acetal copolymer)
Seal Washer: PTFE

Effective Filtration Area

0.8 cm²

Dimensions

Overall Length: 3.5 cm (1.4 in.)
Diameter: 1.6 cm (0.6 in.)

Filter Size

Accepts 13 mm filter

Inlet/Outlet Connections

Female threaded luer inlet, male slip luer outlet

Maximum Operating Temperature

Limited by filter type

Maximum Operating Pressure

2.8 bar (280 kPa, 40 psi)

Sterilization

Provided non-sterile. Autoclavable at 121 - 123 °C (250 - 253 °F) at 1.0 bar (100 kPa, 15 psi) for 15 min.

13 mm Swinney, Stainless Steel

Materials of Construction

Body: Type 304 stainless steel
Gaskets: PTFE
Support Screen: Photoetched type 304 stainless steel

Effective Filtration Area

0.9 cm²

Dimensions

Overall Length: 3.9 cm (1.54 in.)
Diameter: 1.6 cm (0.6 in.)

Inlet/Outlet Connections

Standard female luer lock inlet, male slip luer outlet

Maximum Operating Temperature

Limited by filter type

Maximum Operating Pressure

6.9 bar (690 kPa, 100 psi)

Ordering Information

13 mm Swinney Filter Holder, Plastic

Part Number	Description	Pkg
4317	13 mm Swinney	5/pkg

Accessories and Replacement Parts for 13 mm Swinney Filter Holder, Plastic

Part Number	Description	Pkg
83072	PTFE seal washer	1/pkg

13 mm Swinney Filter Holder, Stainless Steel

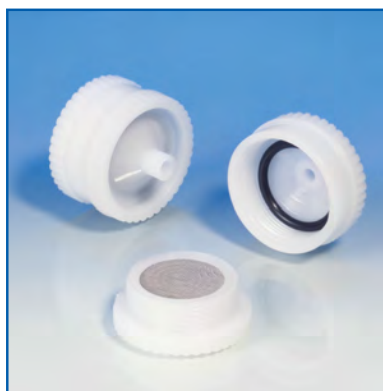
Part Number	Description	Pkg
4042	13 mm Swinney	1/pkg

Related Products

13 mm Glass Fiber Filters 243 - 244
13 mm Membrane Disc Filters 111, 178 - 181, 213, 248

25 mm Easy Pressure Syringe Filter Holder, Delrin[®] Plastic

Large filtration area for easy operation and fast liquid flow



- ▶ Economical for small-volume (10 to 100 mL) filtration.
- ▶ Accepts 25 mm filter discs.
- ▶ Luer inlet and outlet fittings provide easy connections.
- ▶ Delrin (acetal resin) construction provides broad chemical compatibility and material strength.

Applications

- ▶ Designed for particulate filtration of small volumes using a syringe.
- ▶ Can be used as a final filter for gas systems.
- ▶ Delrin caps allow for easy sample storage and transportation.

Specifications

Materials of Construction

Body/Caps: Delrin (acetal resin)
Support Screen: Type 316 stainless steel
O-Ring: Viton[®]

Effective Filtration Area

3.7 cm²

Dimensions

Overall Length: 2.7 cm (1.1 in.)
Diameter: 3.5 cm (1.4 in.)

Filter Size

Accepts 25 mm filter

Inlet/Outlet Connections

Standard female luer inlet, male slip luer outlet

Maximum Operating Temperature

In Air: 85 °C (185 °F)
In Water: 66 °C (151 °F)

Maximum Operating Pressure

2.8 bar (280 kPa, 40 psi)

Sterilization

Provided non-sterile. Autoclavable at 121 - 123 °C (250 - 253 °F) at 1.0 bar (100 kPa, 15 psi) for 15 - 20 min.

Ordering Information

25 mm Easy Pressure Syringe Filter Holder, Delrin Plastic

Part Number	Description	Pkg
4320	25 mm, easy pressure	6/pkg

Accessories and Replacement Parts

Part Number	Description	Pkg
83475	O-ring, Viton ARP No. -117	1/pkg
86362	O-ring, PTFE encapsulated	1/pkg

Related Products

25 mm Glass Fiber Filters	243 - 244
25 mm Membrane Disc Filters	111 - 115, 178 - 181, 213 - 214, 245, 247 - 249
Stainless Steel Forceps	230, 280

25 mm In-Line Filter Holder, Delrin® Plastic

Lightweight filter holder for particulate sampling



- ▶ Domed inlet provides uniform sample distribution on the filter.
- ▶ Delrin plastic offers broad chemical compatibility and material strength.
- ▶ Accepts 25 mm filter discs.
- ▶ Lightweight for venting and air monitoring applications.

Applications

- ▶ Useful for low pressure, in-line air cleaning, liquid filtering, or sampling applications.
- ▶ Can be easily incorporated into liquid- or gas-carrying tubing systems at the point of use.

Specifications

Materials of Construction

Body: Delrin (acetal resin)
Hose Barb Adapters: Nylon
O-Ring: Viton®
Support Screen: Type 316 stainless steel

Effective Filtration Area

3.7 cm²

Dimensions

Overall Length: 2 cm (0.8 in.)
Diameter: 3.5 cm (1.4 in.)

Inlet/Outlet Connections

1/8 in. FNPT; hose barb adapter accepts 6.4 mm (1/4 in.) ID tubing

Maximum Operating Temperature

In Water: 66 °C (151 °F)
In Air: 85 °C (185 °F); will perform effectively with intermittent use up to 121 °C (250 °F)

Maximum Operating Pressure

2.8 bar (280 kPa, 40 psi)

Sterilization

Provided non-sterile. Autoclavable if desired at 121 - 123 °C (250 - 253 °F) at 1.0 bar (100 kPa, 15 psi) for 15 - 20 min.

Ordering Information

25 mm In-Line Filter Holder, Delrin Plastic

Part Number	Description	Pkg
1109	25 mm, in-line	6/pkg

Accessories and Replacement Parts

Part Number	Description	Pkg
73179	Hose barb adapter, nylon, 1/8 in. MNPT to 6.4 mm (1/4 in.) tubing	1/pkg
83475	Viton O-ring, ARP No. -117	1/pkg

Related Products

25 mm Glass Fiber Filters	243 - 244
25 mm Membrane Disc Filters	111 - 115, 178 - 181, 213 - 214, 245, 247 - 249
Vacuum/Pressure Pumps	279

47 mm In-Line Filter Holder, Polycarbonate

Sturdy, lightweight unit for monitoring particulate in gases or liquids



- ▶ Lightweight plastic construction.
- ▶ Luer-Lok* vent plug facilitates removal of air bubbles in liquid filtration.

Applications

- ▶ Designed for in-line liquid or gas filtration.
- ▶ Indoor and outdoor air monitoring or sampling.
- ▶ Ideal for venting.

Specifications

Materials of Construction

Body: Polycarbonate
 Hose Barb Adapters: Nylon
 Support Screen: Polyphenylsulfone
 O-Ring: Silicone
 Vent Cap: Polypropylene

Effective Filtration Area

9.6 cm²

Dimensions

Overall Length (Includes Vent Cap, Excludes Hose Barb): 5.8 cm (2.3 in.)
 Diameter: 6.4 cm (2.5 in.)

Inlet/Outlet Connections

1/4 in. -18 FNPT; hose barb adapters accept 6.4 mm (1/4 in.) ID tubing

Maximum Operating Temperature

Limited by filter type or by hose barb
 121 °C (250 °F)

Maximum Operating Pressure

3.4 bar (340 kPa, 50 psi)

Sterilization

Provided non-sterile. Autoclavable if desired at 121 - 123 °C (250 - 253 °F) at 1.0 bar (100 kPa, 15 psi) for 15 - 20 min.

Ordering Information

47 mm In-Line Filter Holder, Polycarbonate

Part Number	Description	Pkg
1119	47 mm, in-line polycarbonate	1/pkg

Accessories and Replacement Parts

Part Number	Description	Pkg
4235	Support screen, type 304 stainless steel	1/pkg
BB-9651-1D106	Polypropylene Luer-Lock vent plug	1/pkg
81314	Hose barb adapter, nylon, 1/4 in. MNPT to 6.4 mm (1/4 in.) ID tubing	1/pkg
87264	Support screen, polyphenylsulfone	1/pkg
86366	Silicone O-ring	1/pkg

Related Products

AcroCap™ Positive Pressure Devices	124
Acrodisc® Syringe Filters with Supor® Membrane	117 - 118, 122 - 123, 195, 198
AcroPak™ Capsules with Supor Membrane	129, 132, 137
Stainless Steel Pressure Vessels	283
Supor Membrane Disc Filters	109, 111, 215
VacuCap® Vacuum Filtration Devices	127

25 and 47 mm In-Line Filter Holders, Stainless Steel

High quality, corrosion-resistant holders for stack sampling



- ▶ Stainless steel construction offers excellent chemical resistance.
- ▶ Holders open and close easily. Filter remains undisturbed for particulate analysis.
- ▶ Upstream threaded vent on 47 mm holder allows release of trapped gas during liquid filtration.
- ▶ Convenient in-line opening and closing capability.

Applications

- ▶ Designed for in-line liquid or gas filtration.
- ▶ Durable construction for stack sampling.
- ▶ Capable of continuous processing of fluids at high pressure.

Specifications

25 mm In-line Stainless Steel

Materials of Construction

Body, Underdrain Disc, and Support
Screen: Type 316 stainless steel
Hose Barb Adapters: Nylon
Center Ring Collar:
Type 303 stainless steel
O-ring: Viton*

Effective Filtration Area

3.7 cm²

Dimensions

Overall Length (Excluding Hose Barb):
4.0 cm (1.6 in.)
Diameter: 3.7 cm (1.5 in.)

Inlet/Outlet Connections

1/8 in. FNPT; hose barb adapters
accept 6.4 mm (1/4 in.)
ID tubing

Maximum Operating Temperature

Limited by filter type or by Viton O-ring
204 °C (399 °F) or by Nylon adapter
121 °C (250 °F)

Maximum Operating Pressure

14 bar (1400 kPa, 200 psi)

Sterilization

Provided non-sterile; autoclavable at
121 to 123 °C (250 to 253 °F) at
1.0 bar (100 kPa, 15 psi) for 15 to
20 minutes.

47 mm In-line Stainless Steel

Materials of Construction

Body: Type 316 stainless steel
Hose Barb Adapters: Polyethylene
Support Screen and Underdrain Disc:
Electropolished type 316
stainless steel
O-Ring: Viton
Thrust Ring: PTFE
Center Ring Collar: Type 303
stainless steel

Effective Filtration Area

9.6 cm²

Dimensions

Overall Length (Excluding Hose Barb):
5.7 cm (2.2 in.)
Diameter: 5.9 cm (2.3 in.)

Inlet/Outlet Connections

3/8 in. FNPT; hose barb adapters
accept 6.4 mm (1/4 in.) ID tubing

Maximum Operating Temperature

Limited by filter type or by hose barb
93 °C (199 °F)

Maximum Operating Pressure

14 bar (1400 kPa, 200 psi)

Sterilization

Provided non-sterile; autoclavable at
121 to 123 °C (250 to 253 °F) at
1.0 bar (100 kPa, 15 psi) for 15 to
20 minutes.

Ordering Information

25 mm In-Line Filter Holder, Stainless Steel

Part Number	Description	Pkg
1209	25 mm stainless steel	1/pkg

47 mm In-Line Filter Holder, Stainless Steel

Part Number	Description	Pkg
2220	47 mm stainless steel	1/pkg

Accessories and Replacement Parts, 25 mm In-Line Filter Holder

Part Number	Description	Pkg
73179	Hose barb adapter	1/pkg
73336	Viton* O-ring, ARP No. -020	1/pkg
79759	Base outlet, Type 316 stainless steel	1/pkg
79760	Collar, Type 303 stainless steel	1/pkg
79761	Cover inlet, Type 316 stainless steel	1/pkg
79791	Support screen, Type 316 stainless steel	1/pkg
79792	Underdrain disc, Type 316 stainless steel	1/pkg

Accessories and Replacement Parts, 47 mm In-Line Filter Holder

Part Number	Description	Pkg
71242	Viton O-ring	1/pkg
71243	PTFE thrust ring	1/pkg
71244	Center ring collar, Type 303 stainless steel	1/pkg
71245	Outlet, Type 316 stainless steel	1/pkg
72970	Support screen, Type 316 stainless steel	1/pkg
72971	Underdrain disc, Type 316 stainless steel	1/pkg
73184	Hose barb adapter, polyethylene, 3/8 in. MNPT to 6.4 mm (1/4 in.) ID tubing	1/pkg
76901	O-ring, EPR-008	1/pkg
81377	Hose barb adapter, Type 316 stainless steel, 3/8 in. MNPT to 6.4 mm (1/4 in.) ID tubing	1/pkg
82536	Vent screw, Type 304 stainless steel	1/pkg
82537	Inlet with vent, Type 316 stainless steel	1/pkg
82762	PTFE flat vent washer	1/pkg

Related Products

Membrane Disc Filters 109 - 115, 177 - 181, 213 - 215, 245 - 249
 Stainless Steel Forceps 230, 280

47 mm In-Line Filter Holder, Aluminum

Lightweight, anodized aluminum filter holder



- ▶ Convenient design allows opening and closing without disrupting membrane.

Applications

- ▶ Designed for in-line liquid or gas filtration.
- ▶ Durable construction for stack sampling.

Specifications

Materials of Construction

Inlet-Cover, Base, and Collar Cap:
Anodized aluminum

Hose Barb Adapters: Polyethylene

Support Screen and Underdrain Disc:

Electropolished type 316 stainless steel

O-Ring: Viton*

Thrust Ring: PTFE

Effective Filtration Area

9.6 cm²

Dimensions

Overall Length (Excluding Hose Barbs):

5.7 cm (2.2 in.)

Diameter: 5.9 cm (2.3 in.)

Inlet/Outlet Connections

3/8 in. FNPT; hose barb adapters accept 6.4 mm (1/4 in.) ID tubing

Maximum Operating Temperature

Limited by filter type, hose barb adapters 93 °C (199 °F), or O-ring 204 °C (399 °F)

Maximum Operating Pressure

14 bar (1400 kPa, 200 psi)

Sterilization

Provided non-sterile. Autoclavable if desired at 121 - 123 °C (250 - 253 °F) at 1.0 bar (100 kPa, 15 psi) for 15 - 20 min.

Ordering Information

47 mm In-Line Filter Holder, Aluminum

Part Number	Description	Pkg
1235	47 mm, in-line aluminum	1/pkg

Accessories and Replacement Parts

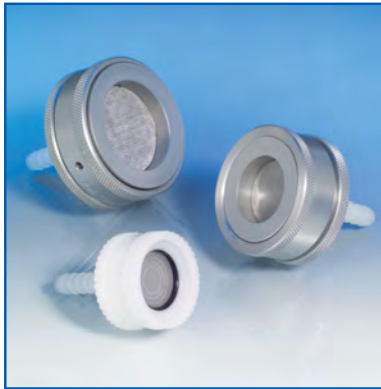
Part Number	Description	Pkg
71242	Viton O-ring	1/pkg
71243	PTFE thrust ring	1/pkg
71735	Base, aluminum	1/pkg
71736	Collar cap, aluminum	1/pkg
71737	Inlet cover, aluminum	1/pkg
72970	Support screen, Type 316 stainless steel	1/pkg
72971	Underdrain disc, Type 316 stainless steel	1/pkg
73184	Hose barb adapter, polyethylene, 3/8 in. MNPT to 6.4 mm (1/4 in.) ID tubing	1/pkg
81377	Hose barb adapter, Type 316 stainless steel, 3/8 in. MNPT to 6.4 mm (1/4 in.) ID tubing	1/pkg

Related Products

47 mm Membrane Disc Filters 109 - 115, 177 - 181, 213 - 215, 245 - 249
Stainless Steel Forceps 230, 280

Open-Face Filter Holders

Lightweight, corrosion-resistant filter holders for routine air sampling



- ▶ 25 mm holder is autoclavable. Can be used for bacterial monitoring and particulate analysis.
- ▶ 37 and 47 mm holders include a plastic cap that protects samples after filtration.

Applications

- ▶ 25 mm holder is designed for clean room sampling and collection of breathing-zone air samples.
- ▶ 37 and 47 mm holders can be used for trapping airborne particles, fluorescent tracers, and other contaminants.

Specifications

Materials of Construction

Holder

25 mm: Delrin* (acetal resin)
37 and 47 mm: Aluminum
Hose Barb Adapter: Nylon

Support Screen

25 mm: Type 316 stainless steel
37 and 47 mm: Type 304 stainless steel

O-Ring: Viton*

Cap, 37 and 47 mm: Polyethylene

Dimensions

Overall Length

25 mm: 2 cm (0.8 in.)
37 and 47 mm: 2.4 cm (0.9 in.)

Diameter

25 mm: 3.5 cm (1.4 in.)
37 mm: 4.4 cm (1.7 in.)
47 mm: 5.4 cm (2.1 in.)

Inlet/Outlet Connections

1/8 in. -27 FNPT; includes 6.4 mm (1/4 in.) ID hose barb adapter

Sterilization

Provided non-sterile. Autoclavable if desired at 121 - 123 °C (250 - 253 °F) at 1.0 bar (100 kPa, 15 psi) for 15 - 20 min. Polyethylene cap not autoclavable.

Effective Filtration Area

25 mm: 3.7 cm²
37 mm: 4.9 cm²
47 mm: 9.6 cm²

Ordering Information

25 mm Open-Face Filter Holder, Delrin Plastic

Part Number	Description	Pkg
1107	25 mm, open-face Delrin plastic	6/pkg

37 and 47 mm Open-Face Filter Holders, Aluminum

Part Number	Description	Pkg
1219	37 mm, open-face aluminum	1/pkg
1220	47 mm, open-face aluminum	1/pkg

Accessories and Replacement Parts, 25 mm Open-Face Filter Holder, Delrin Plastic

Part Number	Description	Pkg
73179	Hose barb adapter, nylon, 1/8 in. MNPT to 6.4 mm (1/4 in.) ID tubing	1/pkg
83475	O-ring, ARP No. -117, Viton	1/pkg

Accessories and Replacement Parts, 37 and 47 mm Open-Face Filter Holders, Aluminum

Part Number	Description	Pkg
1222	47 mm aluminum collar	1/pkg
245	47 mm plastic cap plug	1/pkg
4235	47 mm support screen, Type 304 stainless steel	1/pkg
4239	47 mm wave washer	1/pkg
73179	Hose barb adapter, nylon, 1/8 in. MNPT to 6.4 mm (1/4 in.) ID tubing	1/pkg
96406	37 mm aluminum collar	1/pkg
99121	37 mm support screen, Type 304 stainless steel	1/pkg
99122	37 mm wave washer	1/pkg

142 and 293 mm Disc Filter Holders, Stainless Steel

Convenient sizes and durable materials for filtration of all your laboratory samples



- ▶ Design optimizes use of filter area with 15% more EFA than most competitive units, giving higher flow rates and extending the filter's service life.
- ▶ Sanitary connections are easy to use and suitable for pharmaceutical applications.
- ▶ Corrosion-resistant type 316 stainless steel construction provides broad chemical resistance.

Applications

- ▶ Can be used with a variety of aggressive chemicals, solvents, reagents, and solutions (gases and liquids).
- ▶ Recommended for filtration of products such as laboratory solvents, cell culture media, ophthalmics, pharmaceuticals, vitamins, process water, antibiotics, and photoresists.

Specifications

Materials of Construction

Body: Electropolished type 316 stainless steel
 O-Rings: Viton*
 Legs: Type 316 stainless steel with copper threads
 Knob Assembly: Aluminum with copper threads

Effective Filtration Area

142 mm: 126 cm²
 293 mm: 587 cm²

Dimensions

Clearance between flange and benchtop: 29 cm (11.4 in.)

Prefilter Size

142 mm: 127 mm if used with a final filter, 142 mm if used alone
 293 mm: 265 mm if used with a final filter, 293 mm if used alone

Inlet/Outlet Connections

Sanitary 3.8 cm (1.5 in.) fittings

Maximum Operating Pressure

6.9 bar (690 kPa, 100 psi)

Weight

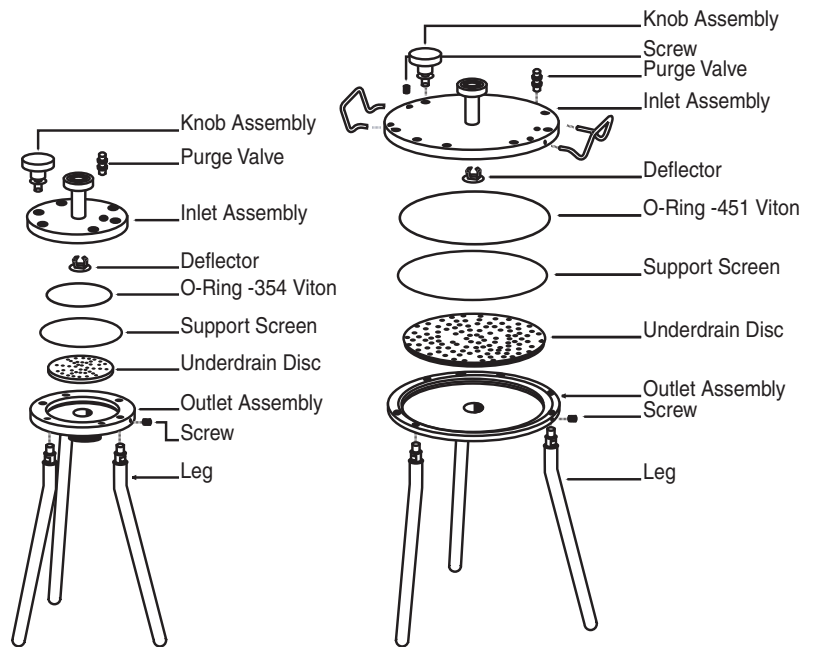
142 mm: 7 kg (15 lb.)
 293 mm: 17 kg (38 lb.)

Sterilization

Provided non-sterile. Autoclavable if desired:

142 mm: 121 - 123 °C (250 - 253 °F) at 1.0 bar (100 kPa, 15 psi) for 45 min
 293 mm: 121 - 123 °C (250 - 253 °F) at 1.0 bar (100 kPa, 15 psi) for 60 min
 (Do not autoclave with aluminum foil; use autoclave paper or other permeable wrap such as Tyvek*.)

Components



142 mm Filter Holder

293 mm Filter Holder

Ordering Information

142 and 293 mm Disc Filter Holders, Stainless Steel

Part Number	Description	Pkg
11872	142 mm, stainless steel	1/pkg
11873	293 mm, stainless steel	1/pkg

Accessories and Replacement Parts for 142 mm Disc Filter Holder

Part Number	Description	Pkg
72978	Support screen, Type 316 stainless steel	1/pkg
72989	Viton® O-ring, ARP No. -354	1/pkg
72994	Underdrain disc, Type 316 stainless steel	1/pkg
73045	O-ring, Buna® -N, PTFE coated, ARP No. -354	1/pkg
76425	O-ring, ethylene polypropylene, ARP No. -354	1/pkg

Accessories and Replacement Parts for 293 mm Disc Filter Holder

Part Number	Description	Pkg
70975	Viton O-ring, ARP No. -451	1/pkg
72161	Support screen, Type 316 stainless steel	1/pkg
72191	293 mm underdrain disc, Type 316 stainless steel	1/pkg
72220	O-ring, Buna-N, PTFE coated, ARP No. -451	1/pkg

Accessories and Replacement Parts for 142 and 293 mm Disc Filter Holder

Part Number	Description	Pkg
15206	Hose assembly kit includes clamp and PTFE gasket, Type 316 stainless steel inlet/outlet adapter, 3.8 cm (1.5 in.) sanitary to 9.5 mm (3/8 in.) hose barb	1/pkg
70638	Purge valve, 1/8 in. threaded MNPT Type 316 stainless steel	1/pkg
72197	Inlet/outlet adapter, Type 316 stainless steel, 3.8 mm (1.5 in.) sanitary to 3/4 in. -14 FNPT	1/pkg
72202	Inlet/outlet clamp, 38 mm, Type 304 stainless steel	1/pkg
72215	Anodized aluminum hand knob	1/pkg
76441	Bottom screw	1/pkg
83191	Type 316 stainless steel deflector	1/pkg
72204	Inlet/outlet gasket, PTFE	1/pkg
72205	Inlet/outlet gasket, Viton	1/pkg

Related Products

Membrane Disc Filters	109 - 115, 177 - 181, 213 - 215, 245 - 249
Stainless Steel Forceps	230, 280

Vacuum Manifold and Accessories

Designed to perfectly fit SBS-conforming filter plates



- ▶ Comes complete with the necessary O-ring and gasket. The control block includes the vacuum pressure gauge, vacuum metering valve, vacuum release valve, and 1/4 in. hose barb for vacuum line attachment.
- ▶ Includes a Delrin* spacer block designed for standard 350 μ L receiver plates. The spacer block has been optimized to reduce the space between the receiver plate and the filter plate during vacuum filtration.
- ▶ Optional spacer block available for use with 1 mL receiver plates.
- ▶ Adapter collar holds filter plates tightly to receiver plates for centrifugation.

Applications

- ▶ For vacuum filtration specifically using AcroPrep™ Advance and AcroPrep multi-well filter plates.

Specifications

Materials of Construction

Vacuum Manifold: Anodized aluminum
Gasket: EDPM (ethylene propylene)
O-Ring: Silicone
Spacer Block: Delrin plastic
Adapter Collar: Stainless steel

Dimensions

Length: 17.48 cm (6.88 in.)
Width: 12.37 cm (4.87 in.)
Height: 8.05 cm (3.17 in.)
Weight: 2.85 kg (6.27 lb.)

Maximum Operating Vacuum

71.12 cm Hg (28 in. Hg)

Note: Pall's vacuum manifold can be used with multi-well filter plates that meet the specifications set forth by the ANSI/SBS X-2004.

Methodology



1. Place plate on vacuum manifold or hold the plate so the outlets on the bottom of the plate are not touched.



2. Add sample and incubate. Apply vacuum.



3A. Release vacuum from the manifold. Remove filter plate and retained sample for further processing.



3B. Release vacuum from the manifold. Remove filter plate. Remove collection (receiver) plate and utilize collected filtrate in downstream applications.

Ordering Information

Vacuum Manifold and Accessories

Part Number	Description	Pkg
5017	Multi-well plate vacuum manifold	1/pkg
5014	1 mL receiver plate spacer block	1/pkg
5015	350 μ L receiver plate spacer block	1/pkg
5016	Replacement accessory kit (includes O-ring, gasket, and allen wrench)	1/pkg
5028	Waste drain adapter	1/pkg

Filter Funnel Manifolds for MicroFunnel™ Filter Funnels

Perfect fit vacuum manifolds for use with the MicroFunnel filter funnel



- ▶ No adapters or rubber stoppers required to hold the filter funnel in place.
- ▶ Works with all Pall Life Sciences MicroFunnel filter funnels including the 100 mL and 300 mL sizes.
- ▶ Durable aluminum and stainless steel construction for easy clean-up and compatibility with many chemicals.
- ▶ Single-place manifold has a small footprint which reduces the need for large counter space.
- ▶ Single-place manifold is easily portable for moving around a lab or offsite, and easy to store out of the way.

Applications

- ▶ Designed to work with the MicroFunnel filter funnel when performing the MF Technique for microbial analysis. The filter funnel is placed directly onto the manifold, the liquid is added, and the vacuum is turned on to begin filtration.
- ▶ Process multiple samples simultaneously or use the 1-place manifold when infrequent or minimal numbers of samples are tested each day.

Specifications

1-Place Manifold

Materials of Construction

Body: Anodized aluminum
 Check Valve: 316 stainless steel with ethylene propylene O-ring
 Hose Barb Adapter: Stainless steel
 1/4 in. straight, 1/8 in. MNPT

Dimensions

Height: 5.9 cm (2.4 in.)
 Diameter (Without Hose Barb):
 7.5 cm (3.0 in.)

Sterilization

Autoclave if desired at 121 - 123 °C (250 - 253 °F) at 1.0 bar (100 kPa, 15 psi) for 15 - 20 min.

3- and 6-Place Manifolds

Materials of Construction

Body: Anodized aluminum
 Drain Plug: Stainless steel 1/4 in. MNPT
 Check Valve: 316 stainless steel with ethylene propylene O-ring
 Valves: Chrome-plated brass
 Valve O-Rings: Viton*
 Hose Barb Adapter: Nylon 6.4 mm (1/4 in.)

Dimensions

3-Place Manifold

Height: 14.2 cm (5.6 in.)
 Width: 40.6 cm (16.0 in.)
 Depth: 15.2 cm (6.0 in.)

6-Place Manifold

Height: 14.2 cm (5.6 in.)
 Width: 82.6 cm (32.5 in.)
 Depth: 15.2 cm (6.0 in.)

Sterilization

Autoclave if desired at 121 - 123 °C (250 - 253 °F) at 1.0 bar (100 kPa, 15 psi) for 15 - 20 min.

Ordering Information

Filter Funnel Manifolds for MicroFunnel Filter Funnels

Part Number	Description	Pkg
15408	1-place aluminum	1/pkg
15411	3-place aluminum	1/pkg
15413	6-place aluminum	1/pkg

Accessories and Replacement Parts (Aluminum Manifold)

Part Number	Description	Pkg
15412	Funnel holder	1/pkg
96430	End stand	1/pkg
99130	Valve, 2-way	1/pkg
99132	Hose barb adapter, nylon, 1/4 in. MNPT to 9.5 mm (3/8 in.) ID tubing	1/pkg
99238	Stainless steel end plug	1/pkg
88160	O-ring kit for valves, includes: 3 O-rings, ARP No. -00G; 6 O-rings, ARP No. -010	1/pkg
15415	Check valve for 3- or 6-place aluminum manifolds	3/pkg

Filter Funnel Manifolds

The most convenient way to filter multiple samples



- ▶ Independent operation. Each funnel location has individual port control valves.
- ▶ Lightweight and durable for easy handling.
- ▶ Saves money. Less costly than stainless steel filter funnel manifolds.
- ▶ Large port opening makes sanitizing easy.
- ▶ Versatile. Accommodates both 25 and 47 mm filter funnels.
- ▶ Aluminum manifolds available with either 3 or 6 places.

Applications

- ▶ Designed for use in the vacuum filtration of liquids for analysis of microbiological or particulate contamination. Increase laboratory productivity by processing multiple samples simultaneously.
- ▶ Polyurethane manifold is ideal for small work areas. Only 27.9 cm (11.0 in.) wide, it still holds three funnels.
- ▶ Aluminum manifold is especially suited for applications where chemical compatibility is critical and easy clean-up is desired. Lightweight aluminum is easier to handle and less expensive than stainless steel, while retaining the strength of an alloy.

Specifications

Aluminum Manifolds

Materials of Construction

Body: Anodized aluminum
 Drain Plugs: Stainless steel
 1/4 in. MNPT
 Valves: Chrome-plated brass
 Valve O-Rings: Viton*
 Adapter: Nylon 6.4 mm (1/4 in.)

Dimensions

3-place
 Height: 15.7 cm (6.2 in.)
 Width: 40.6 cm (16.0 in.)
 Depth: 15.2 cm (6.0 in.)

6-place

Height: 15.7 cm (6.2 in.)
 Width: 82.6 cm (32.5 in.)
 Depth: 15.2 cm (6.0 in.)

Sterilization

Autoclavable if desired at 121 - 123 °C (250 - 253 °F) at 1.0 bar (100 kPa, 15 psi) for 15 - 20 min.

Polyurethane Manifold

Materials of Construction

Body: High impact polyurethane
 Drain Plugs: Nylon 1/4 in. MNPT
 Valves: Glass-filled polypropylene
 Valve O-Rings: Buna*-N

Dimensions

Height: 10.2 cm (4.0 in.)
 Width: 27.9 cm (11.0 in.)
 Depth: 15.2 cm (6.0 in.)

Ordering Information

Filter Funnel Manifolds

Part Number	Description	Pkg
4205	3-place polyurethane	1/pkg
15402	3-place aluminum	1/pkg
15403	6-place aluminum	1/pkg

Accessories and Replacement Parts (Aluminum Manifold)

Part Number	Description	Pkg
96429	Funnel holder	1/pkg
96430	End stand	1/pkg
99130	Valve, 2-way	1/pkg
99132	Hose barb adapter, nylon, 1/4 in. MNPT to 9.5 mm (3/8 in.) ID tubing	1/pkg
99238	Stainless steel end plug	1/pkg
82728	No. 8 rubber stopper	1/pkg
88160	O-ring kit for valves, includes: 3 o-rings, ARP No. -006; 6 O-rings, ARP No. -010	1/pkg
15415	Check valve for 3- or 6-place aluminum manifolds	3/pkg

Accessories and Replacement Parts (Polyurethane Manifold)

Part Number	Description	Pkg
81308	No. 2 stopper for manifold	1/pkg
39961	Manifold rebuild kit, includes 3 stainless steel retaining rings; 6 O-rings, ARP No. -016; 3 O-rings, ARP No. -015; 6 O-rings, ARP No. 009; 1 1/4 in. MNPT plug; 2 1/4 in. MNPT to 6.4 mm (1/4 in.) hose barb adapters; 4 foot pads; and 1 each knob and valve	1/pkg

Vacuum/Pressure Pumps

Cost-effective, reliable pumps now smaller and lighter weight



- ▶ Reduces the risk of sample contamination. An air seal between the pump and cylinder provides oil- and dust-free vacuum/pressure delivery.
- ▶ Compact design saves laboratory space.
- ▶ Features a diaphragm for cleaner, quieter operation.

Applications

- ▶ Ideal addition to any busy laboratory that requires a vacuum and/or pressure source for various applications.
- ▶ Oil- and dust-free delivery helps maintain a clean laboratory environment in which to produce reliable, reproducible data.

Specifications

Materials of Construction

Body: Die-cast aluminum
 Diaphragm: Neoprene*
 Seals: Stainless steel
 Filter Elements: Polyurethane foam

Dimensions

Overall Length: 20 cm (7.9 in.)
 Overall Height: 27.5 cm (10.8 in.)
 Width: 16.5 cm (6.5 in.)

Weight

6.54 kg (14.4 lb.)

Free Air Flow

115 V: 519 cm³/s (1.1 cfm) (60 Hz)
 230 V: 472 cm³/s (1.0 cfm) (50 Hz),
 613 cm³/s (1.3 cfm) (60 Hz)

Vacuum

61 cm Hg (24 in. Hg)

Pressure

4.2 kg/cm² (60 psig)

Motor

1/8 hp

Current

115 V: 4.2 A (60 Hz)
 230 V: 1.9 A (50 Hz), 2.2 A (60 Hz)

Vacuum/Pressure Connection

3/8 in. hose barb

Warranty

Unlimited one year warranty

Ordering Information

Vacuum/Pressure Pumps

Part Number	Description	Pkg
13157	115 V, 60 Hz, single phase	1/pkg
13158	230 V, 50/60 Hz, single phase (interchangeable powercords accommodate European 2 round-pin sockets and UK 3 flat-blade sockets) CE	1/pkg

Accessories and Replacement Parts

Part Number	Description	Pkg
13159	Cover gasket, filter/muffler element (2), filter element, valve screw (2), valve limiter, leaf valve (2), valve retainer, and instructions	1/pkg

Related Products

Filter Funnel Manifolds	228 - 229, 277 - 278
Magnetic Filter Funnels	226
SolVac® Filter Holder	182
Stainless Steel Pressure Vessels	283
Vacushield™ Vent Device	165
Vacuum Manifold and Accessories	276

Stainless Steel Forceps

Make filter handling easy



- ▶ Tips have a flat, smooth surface to avoid membrane filter damage.
- ▶ Polypropylene finger grips provide a comfortable and secure hold.
- ▶ Choose traditional black or multi-colored finger grips. Bright colors make forceps easy to identify, track, and see on the lab bench.

Applications

- ▶ Ideal for handling and moving membrane to and from filter holders and Petri dishes.

Specifications

Materials of Construction

Stainless steel with polypropylene finger grips

Sterilization

Provided non-sterile. "Flame" the tips prior to use, or autoclave at 121 - 123 °C (250 - 253 °F) at 1.0 bar (100 kPa, 15 psi) for 15 - 20 min. Do not autoclave in aluminum foil.

Ordering Information

Stainless Steel Forceps

Part Number	Description	Pkg
51147	Stainless steel forceps, black grips	1/pkg
4690	Stainless steel forceps, multi-colored grips (1 each of orange, blue, chartreuse)	3/pkg

Petri Dishes

Unique patented design for easy handling and storage



- ▶ Easy to use. Opens easily with one hand, yet closes to a tight seal.
- ▶ Uses less space on the lab bench or in the incubator with easy stacking base.
- ▶ Gamma-irradiated. No EtO residuals to impede microbial growth.
- ▶ Available with or without absorbent pads.
- ▶ Bulk packaging offers additional value.

Applications

- ▶ Ideal for microbiological analysis when performing the Membrane Filter (MF) Technique.
- ▶ Petri dishes with absorbent pads can be used with broth media, or users can pour agar into dishes without absorbent pads.

Specifications

Petri Dish

Material of Construction

Polystyrene

Dimensions

Height: 9.0 mm (0.35 in.)
Diameter: 50.0 mm (1.97 in.)

Filter Size

Accepts 47 mm membrane filter

Sterilization

Gamma-irradiated

Absorbent Pads

Composition

Cellulose

Typical Thickness

0.9 mm (35 mills)

Ordering Information

Petri Dishes

Part Number	Description	Pkg
7242	Petri dishes, without absorbent pads	100/pkg
7232	Petri dishes, bulk pack, without absorbent pads	500/pkg
7245	Petri dishes, with absorbent pads	100/pkg



Absorbent Pad Kits

One-handed dispensing of cellulose absorbent pads



Specifications

Pad Composition

Cellulose

Typical Thickness

0.9 mm (35 mils)

Diameter

45.5 mm

Ordering Information

Absorbent Pad Kits

Part Number	Description	Pkg
66025	Absorbent pads, gamma-irradiated	1,000/pkg
66190	Absorbent pads, non-sterile	1,000/pkg

- ▶ Enables user to dispense a clean cellulose pad into a Petri dish whenever needed without touching the pad.
- ▶ Handy dispenser kit holds 1 tube of 100 absorbent pads (10 tubes included). Each tube drops quickly into the hand dispenser for easy use.
- ▶ Available non-sterile or gamma-irradiated. No EtO residuals to impede microbial growth.

Related Products

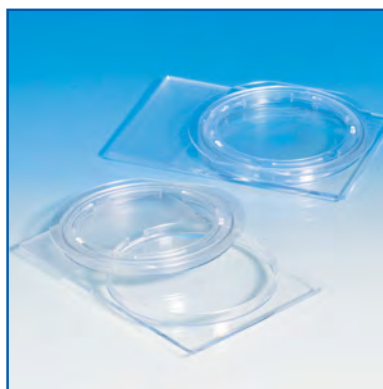
47 mm Membrane Disc Filters	109 - 115, 177 - 181, 213 - 215, 245 - 249
Ampoule Media for Microbiological Analysis	217
Petri Dishes	230, 280

Applications

- ▶ Absorbent pads are ideal for absorbing broth media to culture colonies in accordance with the Membrane Filter (MF) Technique.

Analyslide® Petri Dish

For transport, storage, and viewing membrane samples



- ▶ Rectangular base fits most microscope stages.
- ▶ Inner cover ring for secure closure.
- ▶ Clear lid does not interfere with viewing sample.
- ▶ Frosted area on base permits identification of the sample with pencil or marker.
- ▶ Convenient box simplifies collection and storage of samples.

Applications

- ▶ Protect the integrity of sample membrane during microscopic examination.
- ▶ Store and protect membrane filters for reference.

Specifications

Material of Construction
Base and Lid: Polystyrene

Filter Size
Accepts 47 mm filter

Ordering Information

Analyslide Petri Dish

Part Number	Description	Pkg
7231	Analyslide Petri dish	100/pkg

Related Products

Membrane Disc Filters 109 - 115, 177 - 181, 213 - 215, 245 - 249
Stainless Steel Forceps 230, 280

Stainless Steel Pressure Vessels

Highest quality stainless steel pressure vessels



- ▶ Long vessel life. Materials are corrosion resistant, with broad chemical compatibility.
- ▶ Wide-mouth opening makes clean-up easy.
- ▶ Multiple ports allow for temperature probes, pressure gauges, or other monitoring devices.
- ▶ Provided with pressure gauge, safety relief valve, flow shut-off valve, and hose barb connectors.
- ▶ Resists baking. Electropolished finish provides ultra-smooth walls.
- ▶ American Society of Mechanical Engineers (ASME) coded.

Applications

- ▶ Designed for processing of batches of liquids for sterilization or clarification.

Specifications

Materials of Construction

Housing: Electropolished type 316 stainless steel

O-ring: Ethylene propylene

Base: Vinyl

Dimensions

Housing Length:

PN 15220: 21.1 cm (8.3 in.)

PN 15207: 38.4 cm (15.1 in.)

PN 15203: 56.6 cm (22.3 in.)

Housing Diameter:

23.3 cm (9.2 in.)

Inlet/Outlet Connections

Accepts 9.5 mm (3/8 in.) ID tubing

Minimum Operating Temperature

-29 °C (-20 °F) at 10.7 bar

(1,070 kPa, 155 psi)*

Maximum Operating Temperature

38 °C (100 °F) at 10.7 bar

(1,070 kPa, 155 psi)*

Recommended Operating Pressure

7.0 bar (700 kPa, 100 psi)*

Sterilization

Provided non-sterile. Autoclaving is not recommended due to vinyl base and pressure gauge.

*For safety, the supplied pressure relief valve is preset at 7 bar (700 kPa, 100 psi).

Ordering Information

Stainless Steel Pressure Vessels

Part Number	Description	Pkg
15220	3.8 L (1 gallon) capacity	1/pkg
15207	11 L (3 gallon) capacity	1/pkg
15203	19 L (5 gallon) capacity	1/pkg

Accessories and Replacement Parts

Part Number	Description	Pkg
15214	Pressure vessel replacement parts kit (pressure gauge, safety relief valve, and all necessary connections)	1/pkg

Pressure Rinser

Dispenses a pressurized stream of ultra-clean liquid at the touch of a finger



Specifications

Materials of Construction

Exterior: Chrome-plated brass
 Interior: Brass
 Nozzle: Type 316 stainless steel
 Gasket: PTFE
 Washer: Nylon
 Filter Holder: Delrin* acetal resin with PTFE encapsulated O-ring

Effective Filtration Area

3.7 cm²

Filter Size

Inlet/Outlet Connections

Filler Cap Connection: Straight connection accepts standard air chuck

Maximum Operating Temperature

38 °C (100 °F)

Operating Pressure Range

1.4 - 5.2 bar (140 - 520 kPa, 20 - 75 psi)

Sterilization

- ▶ Sturdy chrome-plated brass provides long life.
- ▶ One-liter capacity allows for frequent refills.
- ▶ Can be pressurized by hand pump, gas cylinder, or air supply.
- ▶ Comes with 25 mm filter holder with a PTFE encapsulated O-ring.

This product is no longer available. Please contact Technical Service for a recommended alternative at:

- **1.800.521.1520 (USA and Canada)**
- **(+)PALL.LIFE (Outside USA and Canada)**
- **LabSupport@pall.com**

Applications

- ▶ Rinse critical mechanical or electronic components.
- ▶ Flush filter holders.
- ▶ Rinse laboratory glassware.

7105	25 mm filter holder	1/pkg
39947	Repair kit (includes valve stem, washer, flat nylon, valve spring, valve cap, valve core, filler cap, filler cap gasket, cotton pin, valve stem, valve trigger, adapter, and filter nozzle assembly)	1/pkg
72032	Nozzle assembly only*	1/pkg
86362	O-ring, PTFE encapsulated	1/pkg

*Includes 25 mm filter holder and stainless steel nozzle.

Related Products

In-Line Filter Holders, Delrin	268
Membrane Disc Filters 109 - 115, 177 - 181, 213 - 215, 245 - 249	
Stainless Steel Forceps	230, 280

Appendix



With Pall as your partner, you have access to hundreds of scientists, engineers, and technicians in laboratories around the world who are dedicated to helping you optimize Pall membranes and devices for your applications. Our mission is to help you achieve the very best possible results when you use Pall products in your process.

In the following pages, we present a brief summary of basic filtration concepts and definitions, as well as the chemical compatibilities for many of Pall's laboratory products. This handy reference guide will give you a basic understanding of the different types of filtration technologies that are available to you, and that can help you achieve the separation and purification results you need.

To access our complete library of reference materials, please visit us at www.pall.com/lab.

Content

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Principles of Filtration

Filtration is a science of growing information, distinctive terminology, and proprietary knowledge. These basic concepts have been compiled so that we at Pall Life Sciences can establish a common ground with you, our customer, on the basic language of filtration. As always, if you have questions about any of these concepts or how they apply to your specific applications, contact our Technical Service Department.

We will explain some of the fundamental aspects of filtration technology and how they relate to each other and to your application. Then, we will guide you through the logic of selecting the proper filter media and devices.

Filter media have many different properties that affect the performance of the filter in certain applications. When selecting the best filter media or device for your application, consider the important properties described on the following pages.

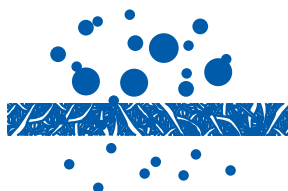
For information on the use of our products in detection procedures, see pages 78 - 85.

Depth vs. Membrane Filtration

A **Depth Media** is a filter consisting of either multiple layers or a single layer of a medium having depth, which captures contaminants within its structure as opposed to on the surface. (Example: Glass Fiber media.)

Advantages

- ▶ Lower cost
- ▶ High throughputs
- ▶ High dirt-holding capacity
- ▶ Final filter
- ▶ Removes variety of particle sizes



Potential Disadvantages

- ▶ Media migration (shedding)
- ▶ Nominal pore size
- ▶ Particulate unloading at increased differential pressure

A **Membrane Filter** typically traps contaminants larger than the pore size on the surface of the membrane. Contaminants smaller than the rated pore size may pass through the membrane or may be captured within the membrane by other mechanisms. Membrane filters are typically used for critical applications such as sterilizing and final filtration. (Examples: Supor® and GN-6 Metrice® membranes.)



Advantages

- ▶ Absolute sub-micron pore size ratings are possible
- ▶ Can be bacteria and particle retentive (pore size dependent)
- ▶ Generally lower extractables
- ▶ Generally integrity testable

Potential Disadvantages

- ▶ Lower flow rates than depth media
- ▶ More costly than depth media

A **Combination Filter** combines different membrane pore sizes, or combines depth media and a membrane filter to create self-contained serial filter units. They can offer an economical alternative to using individual prefilters and final filters. (Examples: Acrodisc® syringe filters with GxF glass fiber/0.45 µm GHP membrane, Acrodisc PF syringe filters, VacuCap® PF devices, and AcroPak™ 500 capsules.)

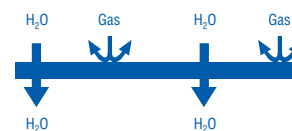
Chemical Compatibility

Chemical Compatibility is defined as the ability of a filter's materials of construction to resist chemicals so that the filter's function is not adversely affected, and the filter material does not shed particles or fibers, or add extractables to the sample being filtered. It is important to remember that compatibility is specific for a particular chemical or combination of chemicals at a particular temperature. To select the proper filter or device, you must determine the compatibility of the filter components with the fluid. Temperature, concentration, applied pressure, and length of exposure time affect compatibility. The materials used in the manufacture of filtration products are carefully chosen for their resistance to a wide range of chemical solutions. Still, understanding the compatibility between the fluid to be filtered and the filter elements under actual conditions of use is essential. (See pages 286 - 291 for the chemical compatibility of media and housing materials, centrifugal and TFF devices, and ultrafiltration membranes with common fluids.)

Hydrophilic vs. Hydrophobic

Hydrophilic filters are easily wet with water. Hydrophilic filters can be wetted with virtually any liquid and are the preferred filters for aqueous solutions, as appropriate by compatibility. (Example: Supor membrane.) Note that in the filtration industry, "hydrophilic" is used somewhat differently than in some other fields where it refers to a material to which water clings.

Once wetted, hydrophilic filters do not allow the free passage of gases until the applied pressure exceeds the bubble point and the liquid is expelled from the pores of the membrane. (See page 283.)



Wetted membrane prior to bubble point.

Hydrophobic filters will not wet in water but will wet in low surface tension liquids, for example, organic solvents such as alcohols. Once a hydrophobic filter has been wetted with a water-miscible fluid, aqueous solutions may also pass through.

Hydrophobic filters are best suited for gas filtration, low surface tension solvents, and venting. In certain applications, hydrophobic filters are used to filter aqueous solutions because of compatibility requirements. [Example: TF (PTFE) membrane.]

Water or aqueous solutions can also pass through a hydrophobic filter once the water breakthrough pressure is reached. (See page 283.)

Ratings

Pore Size Rating is the pore size of the filter determined by the diameter of the particle that it can be expected to retain with a defined, high degree of efficiency under specific conditions. Pore size ratings are usually stated in **Micrometers** (µm). **Ratings** can be stated as either nominal or absolute.

Nominal filter ratings are an arbitrary value indicating a particulate size range at which the filter manufacturer claims the filter removes a certain percentage of particulate load. Nominal ratings vary from manufacturer to manufacturer and cannot be used to compare filters among manufacturers. Processing conditions such as operating pressure and concentration of contaminant have a significant effect on the retention efficiency of the nominally-rated filters. (Example: depth media, such as glass fiber media.)

Absolute filter ratings are a value associated with a filter that represents the size of the smallest particle completely retained. Complete retention is within the experimental uncertainty of a standard test method consistent with the intended filter usage. Among the test conditions that must be specified are test organism (or particle size), challenge pressure, concentration, and detection method used to identify the contaminant. (Example: most membrane filters, such as Supor® membrane products.)

Below are typical challenge organisms for specific membrane pore sizes:

Absolute-Rated Filter Media (Pore Size)	Challenge Organism
0.1 µm	<i>Acholeplasma laidlawii</i>
0.2 µm	<i>Brevundimonas diminuta</i>
0.45 µm	<i>Serratia marcescens</i>
0.8 µm	<i>Lactobacillus species</i>
1 µm	<i>Candida albicans</i>

Binding

Binding is the tendency of certain substances to “stick” to the filter medium (or other filter components) and be removed from the fluid. This is usually based on charge. Binding can be a desirable characteristic, as in the case of nucleic acid or protein binding on transfer membranes, which allows them to be separated and identified. Binding can also be an undesirable characteristic, as in the case of protein binding during filtration, which can lead to a loss of valuable products. [Examples: HT Tuffryn®, Supor, Omega™, Fluorodyne® II, and GH Polypro (GHP) membranes are extremely low protein binding.]

Extractables

Extractables are substances that may leach or otherwise come off the filtration system and into the fluid being filtered. These contaminants may include wetting agents in the filter media, manufacturing debris, chemical residue from sterilizing the filter, adhesives, or components of the filter materials of construction. The type and amount of extractables will vary with the type of liquid being filtered.

Extractables can be minimized by flushing the filter with either water or a process-compatible solvent before using it. Careful manufacturing procedures can eliminate the need to flush filters. (Example: filter devices sterilized with gamma irradiation do not exhibit toxic extractables associated with ethylene oxide sterilization.)

Extractables can affect filtration in almost every application:

- ▶ In HPLC analysis, they can add extraneous peaks.
- ▶ In cell culture, they can cause cytotoxicity (kill cells).
- ▶ In microbiological analysis, they can inhibit growth and affect recovery of microorganisms.
- ▶ In environmental analysis, they can appear as additional contaminants.

Thermal Stability

Thermal Stability is the ability of the filter media and device components to maintain integrity and functionality at elevated temperatures. Thermal stability is important when considering filter sterilization, such as autoclaving. Certain filters cannot be autoclaved because of insufficient thermal stability. Keep in mind that there is a relationship between chemical compatibility and thermal stability; many types of filter media may be compatible with a chemical at room temperature, but not at high temperature. Thermal stability can be characterized by determining the maximum operating temperature under specified conditions.

Principles of Filtration (continued)

Flow Rate and Throughput

Flow Rate and **Throughput** are two important related measures of filter media and device performance described in this section. This performance is affected by many different variables. The most important variables are detailed in the subsequent text.

Water Flow Rate is a measure of the amount of water that flows through a filter at a defined pressure. It is related to the degree of contamination, differential pressure, total porosity, and effective filtration area. It is commonly expressed in the membrane industry in units of milliliters/minute (mL/min).

Air Flow Rate is a measure of the amount of air that flows through a filter. It is related to the degree of contamination, differential pressure, total porosity, and filter area. It is commonly expressed in the membrane industry in liters/minute (L/min) at a given pressure.

Throughput is the amount of fluid able to pass through a filter prior to plugging. (See Filter Life, page 283.)

Differential Pressure (ΔP) is the difference between the pressure in the system before the fluid reaches the filter (upstream pressure) and the pressure after the fluid flows through the filter (downstream pressure). In a constant flow application, the differential pressure increases as the filter begins to clog.

Viscosity is a measurement of a fluid's resistance to flow. For example, a slow-flowing liquid like honey has a higher viscosity than a "thin" liquid like water. The higher the viscosity (at a constant pressure), the lower the flow rate through a filter (assuming that the fluid is Newtonian, i.e., that the viscosity does not change as the conditions change).

Porosity (also called "open area" or "void volume") is a measurement of all of the open spaces (pores) in the membrane. Generally, membranes have 50 - 90% open space. Flow rate is directly proportional to the porosity of the membrane (more pores = higher flow rate for a given pore size and thickness of filter medium).

Filter Area. Filter media and devices are available in a wide range of sizes with different Effective Filtration Areas (EFA). EFA is the filter area that is available for filtration. For a given membrane, the larger the filter area, the higher the flow rate at a given differential pressure.

Filter Media and Device Configurations are available in a wide variety of sizes and configurations from disc membranes to small syringe filters to large capsule filters.

Disposable Filtration Devices, such as syringe filters and capsule filters, are the most convenient means for filtering any sample volume. These devices usually consist of a membrane integrally sealed into a polymeric housing with fittings that attach easily to a syringe, tubing, or piping on the inlet and/or outlet of the device. These devices are typically pre-sterilized, ready for use, and intended primarily for one-time use.

Disc Filters are installed by the end-user into a reusable filter holder made of stainless steel, glass, or a polymeric housing material. From strictly a material cost standpoint, the membrane disc is less expensive. However, this method requires the end-user to install the filter integrally (i.e., without bypass) into the filter holder and often to sterilize the filtration system prior to use.

Filter Area, Flow Rate, and Throughput Examples

0.2 μm Supor[®] Membrane Devices	Filter Area (cm²)	Typical Water Flow Rate Lpm at 0.7 bar (70 kPa, 10 psi)	Throughput* (L)
25 mm Acrodisc [®] Syringe Filter	2.8	0.039	0.1
AcroCap [™] Device	15	0.20	2
AcroPak [™] 200 Capsule	200	2.35	12
AcroPak 500 Capsule	500	8.0	25
AcroPak 1000 Capsule	1000	16	50

*Estimated throughput when filtering RPMI media with 10% bovine calf serum.

More Terms and Definitions

To access a comprehensive reference of filtration and separation terms and definitions, visit www.pall.com/lab. Then, click the Literature Library sidebar link and select "Terms and Definitions" under literature type. You can easily access this document online or download and print the pdf.



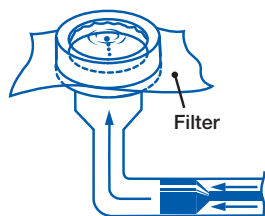
Measuring a Filter's Performance

To help determine whether a filter will be suitable for your applications, manufacturers use various tests to rate the performance of the filter under certain conditions.

Biological Safety Test is a general term used to categorize tests performed to determine whether the filter's materials of construction are capable of inducing measurable degrees of systemic toxicity, localized skin irritation, sensitization reaction, or other biological responses. Either *in vivo* or *in vitro* test methods may be employed. Tests like the "United States Pharmacopoeia (USP) Biological Reactivity Test, *In Vivo* <88>" ensure that the filters can be exposed to the test solutions without causing an adverse reaction.

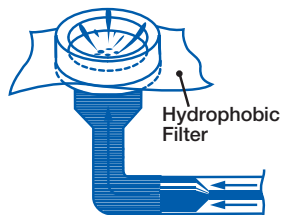
Pyrogenicity is the tendency of a substance to raise body temperature when injected into the body. Filtration materials that come in contact with injectable liquids must meet pyrogenicity standards and be classified as non-pyrogenic. Pyrogenicity can be determined by such standard tests as the Limulus Amoebocyte Lysate (LAL) test.

Bubble Point is a measure of the air pressure required to force liquid from the largest wetted pore of a membrane. It serves as an indication of pore size and rates the filter's ability to serve as a particle barrier.



The bubble point is dependent on the liquid used to wet the membrane. For a given pore size, the bubble point will be higher in a liquid with a higher surface tension (such as water) than in a liquid with a lower surface tension (such as isopropyl alcohol). The bubble point rating is determined when the largest pore yields a bubble; the larger the pore, the less pressure required to form the bubble. This measurement is expressed in units of pounds per square inch (psi) or bar for membranes (ASTM:F316-03, Standard Test Methods for Pore Size Characteristics).

Water Breakthrough is a measure of the amount of pressure required to transmit water through the largest pore of a dry hydrophobic filter. It serves as an indication of pore size for a hydrophobic membrane, and rates a filter's ability to serve as an aqueous barrier.



The larger the pore size, the less pressure is required to push water through the pore. This measurement is expressed in the filtration industry in units of pounds per square inch (psi) or bar.

DOP Test is a measure of the efficiency of a filter for the removal of particulate from air, based on the retention of 0.3 µm Dioctyl Phthalate (DOP) aerosol droplets, and usually expressed as a percentage. A High Efficiency Particulate Air (HEPA) filter must retain at least 99.97% of 0.3 µm DOP droplets (ASTM:D2986-95A). The 0.3 µm size was chosen because particles of this size are the most difficult to retain in many air filters.

Filter Efficiency measures the percentage of particles which are removed from the fluid by the filter. In filtration of liquids, filter efficiency is given on the basis of particles at or above a certain diameter in size. In gas filtration, efficiency is stated as including all particles, including those at the most penetrating particle size. See the DOP Test for a test of efficiency in air filtration. Some filter manufacturers will report efficiency in terms of the percentage removal of the particles by weight, which does not reveal the number of particles that may pass through the filter. This is a type of nominal filter rating. For high-efficiency filters, this is often replaced by a beta rating. Efficiency can be calculated from a beta value as follows:

$$\% \text{ Efficiency } (\eta) = \frac{\beta - 1}{\beta} \times 100$$

Filters rated as one micron or finer are often rated using titer reduction values or log reduction values.

Filter Life is a measure of how long a filter will last before requiring replacement or cleaning. It can be stated either in terms of time (e.g., 30 days between changes) or volume of fluid filtered (e.g., 10,000 liters processed between filter changes). A filter's actual life will depend on what particulates and conditions it is exposed to in actual usage, so filter life ratings from lab testing with standard contaminants can be used for comparison but do not necessarily predict actual service life. To predict actual life, testing with the actual application fluid under actual operating conditions is required.

Typically, the useful life of a filter can be determined by a two-to-four fold increase of differential pressure in a constant flow system or a drop in flow rate of 50 to 80% in a constant pressure system. See Throughput, page 291.

As you use this catalog, you will find more helpful hints for selecting the proper filter media, devices, and hardware for your applications. If you have additional questions, or just want to talk more about your application, please contact our Technical Service Department – we'd like to hear from you! (See the inside back cover for contact information.)

Understanding Product Terminology

The following information is provided to define terms typically used in product specifications. For our complete glossary of terms, visit www.pall.com/lab.

Adsorption

Retention of gas, liquid, solid, or a dissolved substance on a surface due to positive interaction (attraction) between the surface and the molecules of the adsorbed material. The interactive forces can be electrostatic (coulombic) or non-electrostatic (dipole-dipole and hydrophobic). Adsorption to a membrane or filter device can occur in a specific manner (affinity) or non-specifically.

Autoclave(ing)

A chamber for sterilizing filters or equipment with saturated steam by using constant high temperature and pressure (commonly 121° C, 15 psi). Many materials requiring sterilization (such as cell culture media and injectable drugs) are degraded by the heat of an autoclave and must be sterilized by other means such as filtration.

Binding Constant

Defined as the concentration of a ligand that saturates the binding of half of the available binding sites. It is a combination of the available target (receptor) and the affinity of the ligand. Also known as the dissociation constant K_d .

Coefficient of Variation (CV)

A measure of the variation that can occur between samples during a binding assay. Variation can result from liquid transfer, non-specific binding, improper washing, and anomalies with the plate. Studies indicate that the AcroWell™ plate has low CVs making it useful for binding assays.

Counts Per Second (CPS)

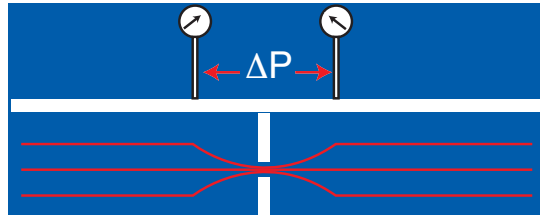
Relates to the number of photons detected that are given off by the scintillant or as a result of a fluorescence emission. CPS is measured by a scintillation counter (radioactivity) or multilabel counter (fluorescence).

Cytotoxicity Test

A test designed to determine the biological reactivity of mammalian cell cultures following contact with the plastic or membrane with specific extracts prepared from the material under test. The procedure allows for extraction of the material at physiological to non-physiological temperatures for varying intervals.

Differential Pressure

Differential Pressure (ΔP) is the difference between the pressure in the system before the fluid reaches the filter (upstream pressure) and the system pressure after the fluid flows through the filter (downstream pressure) in a constant flow situation. As the filter begins to clog, differential pressure increases.



Effective Filtration Area (EFA)

EFA is the filter area that is available for filtration. For a given membrane, the larger the filter area, the higher the flow rate at a given initial differential pressure. Filter media and devices are available in a wide range of sizes with different EFAs.

Endotoxin

A complex molecule (lipopolysaccharide) which forms an integral part of gram negative bacterial cell walls and is released when the integrity of the wall is disturbed, (i.e., cell division, growth, and death). Endotoxins may be released during biosynthesis of a recombinant DNA product, thus necessitating purification steps to ensure their removal.

Extractables

Substances present in the composition of the filter media or the filter manufacturing process that may be leached into the fluid as it is filtered, thereby affecting its purity. Extractables may include manufacturing debris, surfactants, and adhesives. The type and amount of extractables will vary with the type of liquid being filtered. Extractable components which can end up as contaminants may be minimized with sufficient preflushing.

Fluorescence

Light emitted from a fluorophore (fluorescent molecule) as a result of excitation. The excitation wavelength (color) is different than the emission wavelength. The difference between these wavelengths is known as the Stokes shift. The emitted light is detected in a specialized detector such as the Victor• multi-label counter. Most fluorophores give a simple emission that is about 1 picosecond after excitation while in time-resolved fluorescence the emission occurs after a microsecond lag.

Good Manufacturing Practices (GMPs)

Regulations promulgated by the Food and Drug Administration governing the manufacture of drugs (Ref. Code of Federal Regulation 21 CFR 210 and 211), medical devices (21 CFR 820), and Large Volume Parenterals (21 CFR 212 proposed). cGMPs are the current accepted standards of operation in a regulated industry.

Hold-Up Volume

Volume of fluid retained in a filter and/or housing after purging the assembly with air or suitable gas. Hold-up volume is usually considered to be lost volume.

Integrity Test

A test to ensure that a sterilizing-grade filter is intact and will function as intended. Recommended integrity tests are the Forward Flow test, Bubble Point test, and the Pressure Hold test. Integrity tests on sterilizing-grade filters are correlated with bacterial challenge data.

Limulus Amoebocyte Lysate (LAL) Test

An LAL gel clot test prescribed by the United States Pharmacopeia (USP) to detect and determine the level of bacterial endotoxins in a substance. The reagent is made from the circulating blood cells (amoebocytes) of limulus polyphemus, the horseshoe crab.

Luminescence

The emission and detection of light produced by chemical reactions, or bioluminescence, due directly to the enzyme light production. These enzymes can be used as labels to trace a molecule of interest. It does not require laser excitation like fluorescence because it is a result of a chemical reaction. Luminescence reactions can be carried out on membranes (blots), in a plate, or in solution. If the reaction is being done in a 96-well form, the use of a white plate enhances the recovery of photons.

Molecular Weight Cut-Off (MWCO)

Nominal rating system for ultrafiltration and nanofiltration membranes. MWCO is defined as the molecular weight of solute of which the membrane retains 90%. Often defined by the molecular weight of dextran particles retained.

Operating Limits

Minimum and maximum parameters set for validation and processing pressures and temperatures.

Permeability

The degree to which a fluid will pass through a permeable substance under specified conditions. The space or void volume between molecules allowing fluid flow.

pH

The pH value of an aqueous solution is a number describing its acidity or alkalinity. A pH is the negative logarithm (base 10) of the concentration of hydrogen ions (equivalents per liter). The pH value of a neutral solution is 7. An acidic solution has a pH less than 7 while a basic solution has a pH greater than 7 and up to 14.

Recovery

Ability of a filter to retain bacteria, DNA or other biomolecules from a solution. Percentage of a chemical or organism population that can be recovered after processing.

Retention

Ability of a filter to retain particles (total number or those of a specific size) suspended in a gas or liquid. In the case of ultrafiltration, refers to the ability to concentrate molecules in solution. Retention is expressed as percent of particles or molecules originally present.

Sanitization, Sanitize

To make clean by removing dirt and other extraneous materials with soap and general disinfectant so as to reduce possibility of growth and spread of pathogenic organisms. A common sanitization agent is 70% ethanol. Bleach is also commonly used.

Sterile, Sterility, Sterilization

To make or be free of any viable microorganisms. Demonstrated by testing to show the absence of growth of microorganisms. If a high bioburden level was present prior to sterilization, pyrogens may still be present afterward.

Thickness

Thickness is typically measured with a gauge called a micrometer and is usually expressed as microns or mils. A micron is a unit of length equal to one millionth of a meter and a mil is a unit of length equal to one thousandth of an inch or 0.0254 millimeter.

Throughput

The amount of solution that will pass through a filter prior to clogging.

Toxicity Standards

Test to indicate adverse reactions or lethality to drugs or drug components, also used to assess biosafety of filters. Tests include appropriate combinations of direct injection, extraction, and implantation. Generally known as USP biological Reactivity Test, *In Vivo* <88>.

Vacuum

Depression of pressure below atmospheric pressure. The maximum vacuum possible is about 63.5 cm (25 in.) of Hg.

Chemical Compatibility

Media Materials

Acetic acid, glacial
 Acetic acid, 90%
 Acetic acid, 30%
 Acetic acid, 10%
 Hydrochloric acid, conc. (35%)
 Hydrochloric acid, 6N (20%)
 Hydrochloric acid, 1N (3.3%)
 Nitric acid, conc. (67%)
 Nitric acid, 6N (27%)
 Sulfuric acid, conc. (98%)
 Sulfuric acid, 6N (16%)
 Amyl alcohol
 Benzyl alcohol
 Butanol
 Ethanol
 Isopropanol
 Methanol
 Ammonium hydroxide, 3N (5.7%)
 Ammonium hydroxide, 6N (11.4%)
 Potassium hydroxide, 3N (11%)
 Sodium hydroxide, 3N (11%)
 Sodium hydroxide, 6N (22%)
 Amyl acetate
 Butyl acetate

	Acids										Alcohols					Bases				Esters				
Biodyne® Membrane	N	N	N	N	N	N	N	N	N	N	N	R	R	R	R	R	L	L	N	L	N	R	R	
Bio-Inert® (Nylon) Membrane	N	N	N	N	N	N	N	N	N	N	N	R	R	R	R	R	L	L	N	L	N	R	R	
BioTrace™ NT Membrane	N	-	-	-	N	-	-	N	-	N	-	R	N	L	N	R	N	-	-	N	-	-	N	N
BioTrace PVDF Membrane	R	R	R	R	R	R	R	R	R	R	N	-	R	R	R	R	R	-	N	N	N	N	R	R
Emflon® II (PVDF) Membrane	R	R	R	R	R	R	R	R	R	R	N	-	R	R	R	R	R	-	N	N	N	N	R	R
Fluorodyne® II (PVDF) Membrane	R	R	R	R	R	R	R	R	R	N	-	R	R	R	R	R	N	N	N	N	N	N	R	R
FluoroTrans® W (PVDF) Membrane	R	R	R	R	R	R	R	R	R	N	-	R	R	R	R	R	-	N	N	N	N	N	R	R
FP Vericel™ (PVDF) Membrane	R	R	R	R	R	R	R	R	R	N	-	R	R	R	R	R	-	N	N	N	N	N	R	R
GH Polypro (GHP) (PP) Membrane	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
GLA-5000 (PVC) Membrane	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	N	N
Glass Fiber Media	R	R	R	R	R	R	R	L	-	R	R	R	N	R	R	R	R	R	N	-	-	R	R	
GN Metricel® (MCE) Membrane	N	-	-	-	N	-	-	N	-	N	-	R	N	L	N	R	N	-	-	N	-	-	N	N
HT Tuffryn® Membrane	R	R	R	R	R	R	N	-	N	-	N	N	R	R	R	R	R	R	R	R	R	R	R	R
Metricel Black Membrane	R	R	R	R	R	R	-	N	-	N	N	R	R	R	R	R	R	R	R	R	R	R	R	R
Metricel Polypro Membrane	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Mustang® E Membrane*	R	R	R	R	R	R	R	N	-	N	-	N	N	R	R	R	R	R	R	R	R	R	R	R
Mustang Q Membrane*	R	R	R	R	R	R	R	N	-	N	-	N	N	R	R	R	R	R	R	R	R	R	R	R
Mustang S Membrane*	R	R	R	R	R	R	R	N	-	N	-	N	N	R	R	R	R	R	R	R	R	R	R	R
Nyloflo™ (Nylon) Membrane	N	N	L	R	R	R	R	N	L	N	L	L	N	L	R	L	L	R	L	R	R	L	L	R
Posidyne® Nylon Membrane*	R	R	R	R	R	R	R	N	-	N	-	N	N	R	R	R	R	R	R	R	R	R	R	R
Supor®, Supor EKV (PES) Membrane	R	R	R	R	R	R	R	N	-	N	-	N	N	R	R	R	R	R	R	R	R	R	R	R
Teflo, TF (PTFE) Membrane	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Ultipor® N66 Membrane	N	N	N	N	N	N	N	N	N	N	N	N	R	R	R	R	L	L	N	L	N	R	R	
Versapor® Membrane	N	-	-	-	N	-	L	N	-	N	-	R	R	R	R	R	R	R	R	R	R	R	L	L
WWPTFE Membrane	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Zefluor™, Zylon™ Membrane	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R

Test Methods

The data presented in this chart is a compilation of testing by Pall Corporation with certain chemicals, manufacturer's data, or compatibility recommendations from the *Compass Corrosion Guide* by Kenneth M. Pruett. This data is intended to provide expected results when filtration devices are exposed to chemicals under static conditions for 48 hours at 25 °C (77 °F), unless otherwise noted. Membrane integrity for syringe filters was tested by bubble point.

This chart is intended only as a guide. Accuracy cannot be guaranteed. Users should verify chemical compatibility with a specific filter under actual use conditions. Because chemical compatibility is affected by many variables (including temperature, pressure, concentration, and purity), various chemical combinations prevent complete accuracy.

*Chemical compatibility refers to the base membrane. The effect of various chemicals on the surface chemistry has not been tested.

Chemical Compatibility (continued)

Housing Materials

Acetic acid, glacial
 Acetic acid, 90%
 Acetic acid, 30%
 Acetic acid, 10%
 Hydrochloric acid, conc. (38%)
 Hydrochloric acid, 6N (20%)
 Hydrochloric acid, 1N (3.3%)
 Nitric acid, conc. (67%)
 Nitric acid, 6N (27%)
 Sulfuric acid, conc. (98%)
 Sulfuric acid, 6N (16%)
 Amyl alcohol
 Benzyl alcohol
 Butanol
 Ethanol
 Isopropanol
 Methanol
 Ammonium hydroxide, 3N (5.7%)
 Ammonium hydroxide, 6N (11.4%)
 Potassium hydroxide, 3N (11%)
 Sodium hydroxide, 3N (11%)
 Sodium hydroxide, 6N (22%)
 Amyl acetate
 Butyl acetate

	Acids								Alcohols								Bases				Esters				
Acetal Copolymer, Celcon* and Delrin*	N	N	L	L	L	L	-	N	N	-	N	R	R	R	R	R	R	L	L	R	R	R	R	R	R
Acrylonitrile-Butadiene-Styrene (ABS)	N	N	L	L	R	R	R	L	L	-	L	R	N	R	L	-	N	L	L	R	R	R	R	N	-
Aluminum	L	L	L	L	N	N	N	N	N	N	L	L	L	L	L	R	L	L	N	N	N	N	R	R	
Borosilicate Glass	L	-	-	-	R	R	R	-	R	-	R	-	-	-	R	R	R	-	-	N	N	N	-	-	
Brass	N	N	N	N	N	N	N	N	N	-	-	R	-	R	R	-	R	N	N	N	L	N	R	R	
Buna*-N	L	L	R	R	L	L	-	N	N	N	L	R	N	L	L	R	R	N	N	R	R	R	R	N	N
Ethylene Propylene	-	L	R	R	L	L	-	N	N	L	L	R	L	R	R	R	R	R	R	R	R	R	R	L	L
High Density Polyethylene (HDPE)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Modified Acrylic	N	N	-	-	L	R	R	L	L	L	R	N	N	R	L	L	L	L	N	N	R	L	N	-	
Nylon Adapter	-	R	R	R	N	N	-	N	N	N	N	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Polycarbonate	L	L	L	R	N	N	L	L	L	N	L	L	N	R	L	R	L	N	N	N	R	L	N	N	
Polyphenylsulfone	-	-	-	R	-	R	-	-	R	-	R	-	-	-	-	R	R	-	-	R	R	-	-	-	
Polypropylene	R	R	R	R	R	R	-	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Polystyrene	N	-	-	-	R	R	R	N	N	N	R	N	-	-	R	-	R	R	R	R	R	R	-	-	
Polysulfone	R	R	R	R	R	R	-	R	R	N	R	R	N	R	R	R	R	N	R	R	R	R	R	L	L
PTFE	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
PVC (Polyvinyl Chloride)	N	N	N	N	L	R	R	L	R	N	R	N	R	N	L	R	R	R	R	R	R	R	R	N	N
Silicone Rubber	R	L	R	L	N	N	-	L	L	N	N	N	L	L	R	R	R	R	N	L	L	R	R	R	
Tygon*	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	N	N
Type 304 Stainless Steel	N	N	L	L	N	N	N	R	R	N	N	R	L	R	R	L	R	R	L	L	L	R	L	L	
Type 316 Stainless Steel	R	L	L	R	N	N	N	R	R	N	N	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Viton*	N	N	L	L	R	R	R	R	R	R	R	R	R	R	R	R	N	R	R	R	R	R	R	N	N

Test Methods

The data presented in this chart is a compilation of testing by Pall Corporation with certain chemicals, manufacturer's data, or compatibility recommendations from the *Compass Corrosion Guide* by Kenneth M. Pruett. This data is intended to provide expected results when filtration devices are exposed to chemicals under static conditions for 48 hours at 25 °C (77 °F), unless otherwise noted. Membrane integrity for syringe filters was tested by bubble point.

This chart is intended only as a guide. Accuracy cannot be guaranteed. Users should verify chemical compatibility with a specific filter under actual use conditions. Because chemical compatibility is affected by many variables (including temperature, pressure, concentration, and purity), various chemical combinations prevent complete accuracy.

Cellulosolve acetate
 Ethyl acetate
 Isopropyl acetate
 Methyl acetate
 Ethyl ether
 Tetrahydrofuran
 Tetrahydrofuran/water (50/50,v/v)
 Ethylene glycol
 Glycerol
 Propylene glycol
 Benzene
 Toluene
 Xylene
 Carbon tetrachloride
 Chloroform
 Ethylene dichloride
 Methylene chloride
 Tetrachloroethylene
 Acetone
 Cyclohexanone
 Methyl ethyl ketone (MEK)
 Methyl isobutyl ketone
 Cottonseed
 Peanut
 Acetonitrile
 Dimethyl formamide (DMF)
 Dimethyl sulfoxide (DMSO)
 Formaldehyde, 37%
 Formaldehyde, 4%
 Hexane, dry
 Kerosene
 Pyridine
 18 Megohm water

Esters			Ethers			Glycols			Aromatic Hydrocarbons			Halogenated Hydrocarbons			Ketones			Oils			Miscellaneous												
R	R	N	R	R	R	-	R	R	R	R	L	R	R	R	R	R	R	R	R	R	N	-	R	R	R	R	R	R					
-	N	-	N	N	-	-	R	-	L	N	N	N	N	N	N	-	N	N	N	N	-	-	N	N	R	N	N	-	R				
R	R	N	R	R	-	-	R	R	R	L	R	R	N	L	R	L	R	R	R	R	R	R	-	R	R	R	R	R	L	R			
-	R	-	-	-	R	-	R	-	-	R	R	R	-	R	-	R	-	R	-	-	-	R	R	R	R	R	R	-	-	R			
L	L	-	R	L	-	-	L	-	-	-	R	R	L	L	R	R	-	R	-	R	-	-	-	-	R	R	R	R	L	R			
N	N	N	N	N	N	-	R	R	R	N	N	N	N	N	N	N	N	N	N	N	N	R	R	N	N	N	R	R	R	N	R		
L	R	L	L	N	N	-	R	R	R	N	N	N	N	N	L	N	N	R	L	R	R	R	R	R	R	R	R	N	N	L	R		
R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R		
-	N	-	N	N	N	-	R	R	R	N	N	N	N	N	N	N	N	N	N	N	N	L	L	L	N	N	R	R	L	R	N	R	
R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
N	N	N	N	N	N	-	R	R	L	N	N	N	N	N	N	N	N	N	N	N	N	-	-	N	N	N	R	R	N	N	N	R	
-	-	-	-	-	-	-	-	-	-	-	N	-	-	N	-	N	-	-	-	N	-	-	-	-	-	-	-	-	-	R	-	R	
R	R	R	R	R	L	-	R	R	R	L	L	L	L	N	L	R	R	R	R	R	R	R	R	R	R	R	R	R	R	L	R	R	R
-	N	-	-	N	-	-	R	R	-	N	N	-	N	-	-	-	N	-	N	-	-	-	-	N	-	R	R	-	-	-	-	R	
N	N	L	N	R	N	-	R	R	R	N	N	N	L	N	L	N	R	N	N	N	N	R	N	N	R	R	R	R	R	N	R	N	R
R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
N	N	N	N	N	N	-	R	-	N	N	N	N	N	N	N	N	N	N	N	N	N	L	R	-	N	N	R	R	L	R	N	R	
R	L	L	-	N	N	-	R	R	R	N	N	N	N	N	N	N	N	N	N	N	N	R	R	N	N	N	L	R	N	N	N	R	
N	N	N	N	N	N	-	R	R	R	N	N	N	N	N	N	N	L	L	L	L	L	-	L	R	L	L	-	N	N	L	R	R	
L	L	N	R	L	R	R	L	-	L	L	R	L	L	R	L	R	-	R	R	R	L	R	R	-	R	R	R	R	R	R	R	R	R
R	R	R	R	R	R	-	R	R	R	R	R	R	L	R	L	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
N	N	N	N	N	N	N	R	R	R	R	R	R	R	R	R	R	L	R	N	N	N	R	R	R	L	N	R	R	R	R	R	N	R

Caution

Alcohol residues that are allowed to dry on a filter may cause stress cracks. Pall Corporation recommends that filters used in alcohol processing should remain alcohol wet or should be flushed with copious quantities of water to remove residuals prior to drying and subsequent reuse.

R = Resistant

No significant change was observed in flow rate or bubble point of the membrane. No visible indication of chemical attack was detected.

L = Limited Resistance

Moderate changes in physical properties or dimensions of the membrane were observed. The filter may be suitable for short term, non-critical use. Hardware or housing may be suitable for short-term exposure at low pressures and ambient temperatures.

N = Not Resistant

The membrane or housing is basically unstable and is not recommended for use.

- = Insufficient Data

Information is not available. Trial testing is recommended.

Chemical Compatibility (continued)

Centrifugal and TFF Devices

	Acetic acid (10%)	Citric acid (1%)	Formic acid (1N)	Hydrochloric acid (1 N) (0.1N, 50 °C)	Lactic acid (5%)	Nitric acid (1%)	Oxalic acid (1%)	Phosphoric acid (1%)	Sulfuric acid (1N) (0.1N, 25 °C)	Butanol (1N)	Butyl cellosolve (70%)	Ethanol (10%)	Isopropanol (25%)	Mercaptoethanol (10%)	Methanol (70%) (25%)	Propanol (70%)	Ammonium hydroxide (1 N)	Sodium hydroxide (1 N)	Isopropyl acetate (1 N)	Ethyl acetate (1%)	Ethyl acetate (10%)	Glycerol (100%)	Polyethylene glycol (0.1%)	Chloroform (0.8%)	Chloroform (100%)	
	Acids								Alcohols					Bases	Esters	Glycols	HH*									
Centrifugal Devices																										
Nanosep® Device	R	-	R	R	-	-	-	R	R	R	R	-	-	R	R	R	R	-	-	N	R	R	R	-		
Microsep™ Advance Device	R	-	R	R	-	-	-	R	R	R	R	-	-	R	R	R	R	-	-	N	R	R	R	-		
Macrosep® Advance Device	R	-	R	R	-	-	-	R	R	R	R	-	-	R	R	R	R	-	N	N	R	R	R	-		
Jumbosep™ Device	R	-	R	R	-	-	-	R	R	R	R	-	-	R	R	R	R	-	N	N	R	R	R	-		
TFF Devices																										
Minimate™ Device	R	R	R	R	R	R	R	R	-	-	-	R	R	R	R	-	-	R	R	R	-	-	-	R	-	
Ultrasette™ Device	R	-	R	R	-	-	-	R	R	R	R	-	-	R	R	R	R	-	N	-	R	R	R	-		
T-Series TFF Cassettes	-	R	-	R	-	-	-	R	-	-	-	R	-	-	-	-	N	-	-	-	-	-	-	-	-	
*HH = Halogenated Hydrocarbons																										
Cassettes																										
Centramate™ Cassettes	-	R	R	R	R	R	R	R	-	-	-	R	R	-	-	-	-	R	R	-	-	-	-	-	R	-

Ultrafiltration Membrane

	Acetic acid (5%)	Acetic acid (25.5%)	Citric acid (1%)	Formic acid (5%)	Hydrochloric acid (0.1N at 25 °C)	Hydrochloric acid (0.1N at 50 °C)	Lactic acid (5%)	Nitric acid (< 1%)	Oxalic acid (1%)	Phosphoric acid (1N)	Sulfuric acid (1%)	Butanol (70%)	Butyl cellosolve (10%)	Ethanol (70%)	Isopropanol (25%)	Mercaptoethanol (0.1%)	Methyl alcohol (25%)	Ammonium hydroxide (5%)	Sodium hydroxide (0.1N at 25 °C)	Sodium hydroxide (0.1N at 50 °C)	Sodium hydroxide (0.5N at 25 °C)	Sodium hydroxide (1N at 25 °C)	Aliphatic & aromatic esters	Butyl acetate (40%)	Ethyl acetate (< 30%)	Isopropyl acetate (1%)		
	Acids								Alcohols					Bases	Esters													
Omega™ Membrane	R	R	R	R	R	R	R	R	R	N	R	R	R	R	R	R	R	N	N	R	R	R	R	R	N	R	R	R

*AH = Aromatic Hydrocarbons
**HH = Halogenated Hydrocarbons

Test Methods

This data is a compilation of testing by Pall Corporation with the listed chemicals. Chemical compatibility was determined with discs. Flux rates and solute retention were determined before and after a two-hour exposure to the indicated chemical. If membrane integrity was unchanged, the chemical was deemed compatible. Membrane integrity for syringe filters was tested by bubble point.

This chart is intended only as a guide. Accuracy cannot be guaranteed. Users should verify chemical compatibility with a

specific filter under actual use conditions. Because chemical compatibility is affected by many variables (including temperature, pressure, concentration, and purity), various chemical combinations prevent complete accuracy.

Our ultrafiltration membranes have been evaluated for compatibility with many common laboratory buffers and solvents over a wide pH range.

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