



Technical Cleanliness

Filters, Balances and
Accessories for Your
Particle Analysis

Simplifying Progress

SARTORIUS



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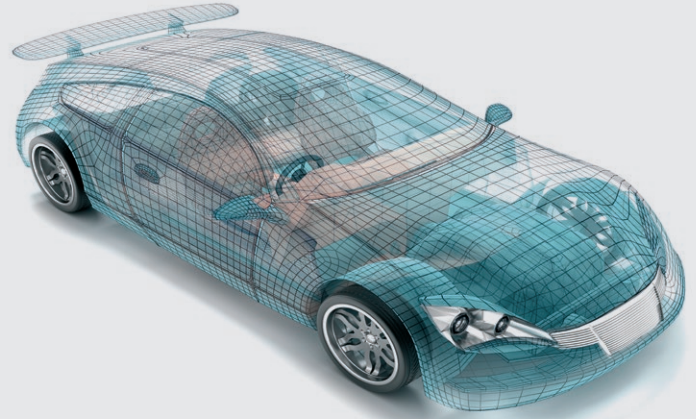


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Technical Cleanliness

In many cases, the absence of critical particles is decisive for the reliable performance and durability of a technical system. This is why analysis of the cleanliness of components is of crucial importance.

Sartorius as a leading supplier of laboratory equipment offers filtration and weighing products that meet even the most demanding requirements of cleanliness analysis.



Cleaning Processes Ensure Technical Cleanliness

Following the manufacture of subassemblies and components, particularly for sensitive fluid systems, critical particles are removed from such components. This is usually done by rinsing or immersing in an ultrasonic bath.

Such cleaning processes are performed in sectors of the following industries:

- Automotive industry
- Aerospace industry
- Precision mechanical and medical engineering

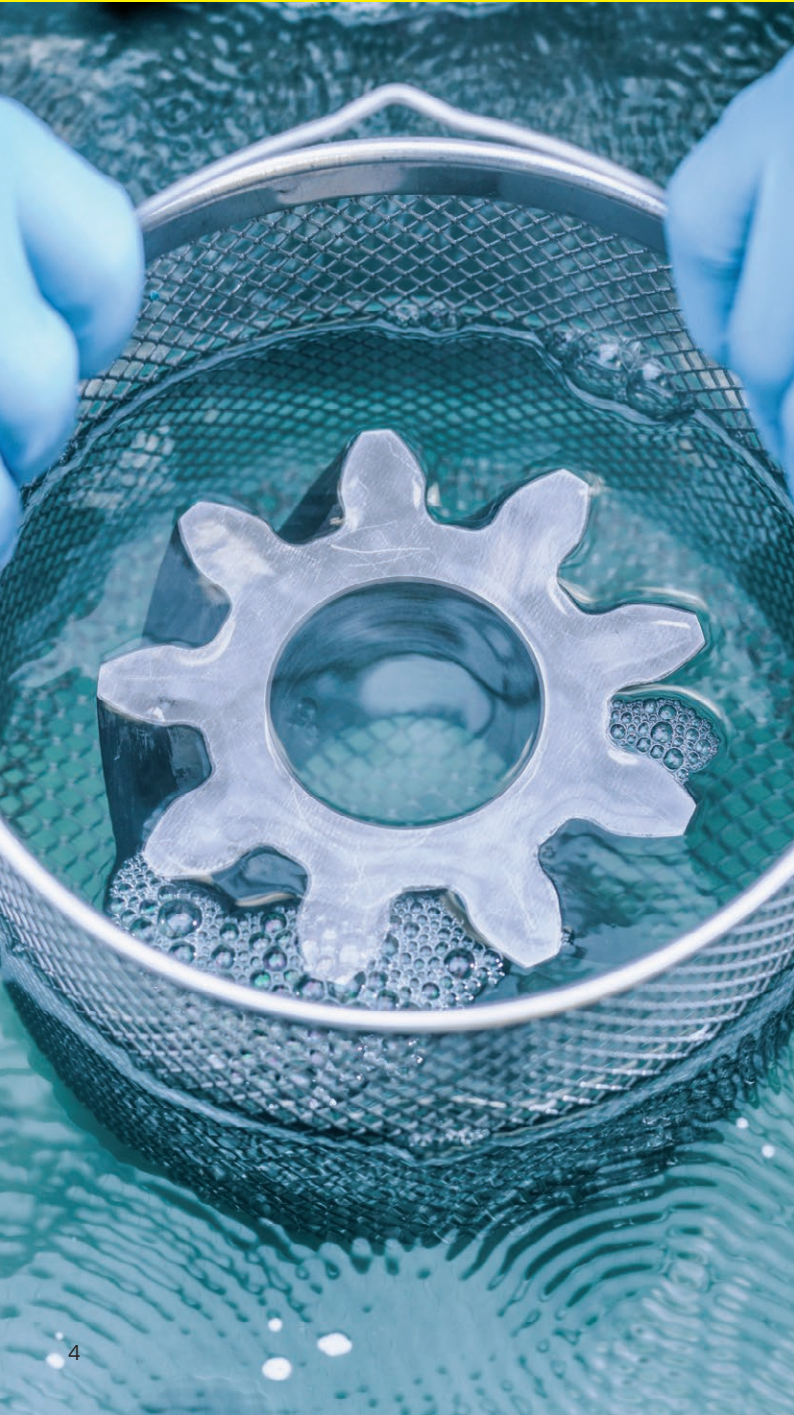
To ensure the cleanliness of subassemblies and components, particulate contamination is analyzed in various steps of the cleaning process:

- Validation of cleaning methods
- Incoming goods inspection and final QC
- In-process control and root cause analysis

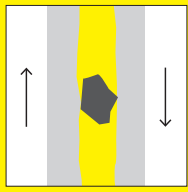
Guidelines and Standards

Component suppliers and manufacturers often test the technical cleanliness of parts using internal standard operating procedures and a number of guidelines and standards, such as the ones listed below:

- ISO 16232 Road vehicles – Cleanliness of components of fluid circuits
- VDA 19 Part 1 Inspection of Technical Cleanliness
- ISO 18413 Hydraulic fluid power – Cleanliness of components

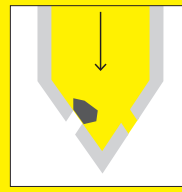


Samples of Damage and Typical Components Tested for Cleanliness



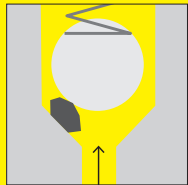
Blocked bearings or hydrodynamic surfaces

- Turbochargers
- Crankshaft bearings
- Dispensing pumps
- Cylinder linings



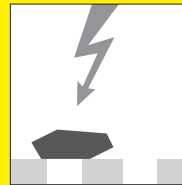
Plugged nozzles or filters

- Injectors
- Fuel feed components



Blocked valves

- Anti-lock brakes
- Power brake boosters
- Lubrication components and hydraulic parts



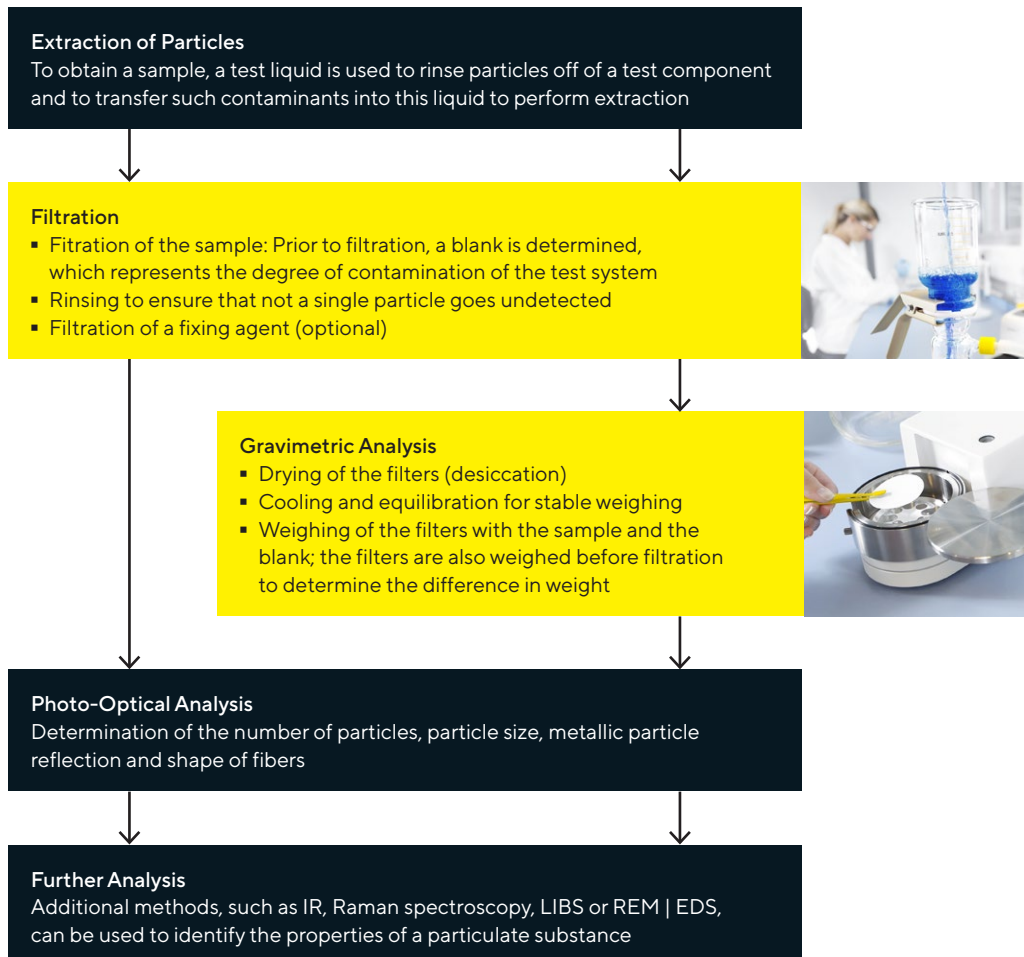
Short-circuited electrical contacts

- Control electronics

□ Component ■ Particle □ Liquid, such as fuel or oil

Schematic Workflow of Cleanliness Analysis

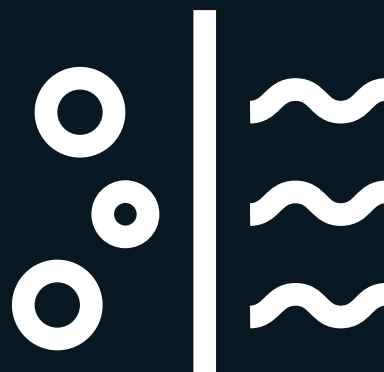
Inspection of components for cleanliness can be subdivided into the steps of extraction, filtration and analysis. In the process, all critical particles need to be detected as just a few individual particles are all it takes to cause a malfunction in a technical system.



Filtration

In cleanliness analysis, filtration of a sample is an essential step. Filters are used in this process to separate particles from the extraction liquid, and as sample carriers for gravimetric and photo-optical analysis.

Sartorius offers a wide variety of filter materials and pore sizes to cover many different requirements.



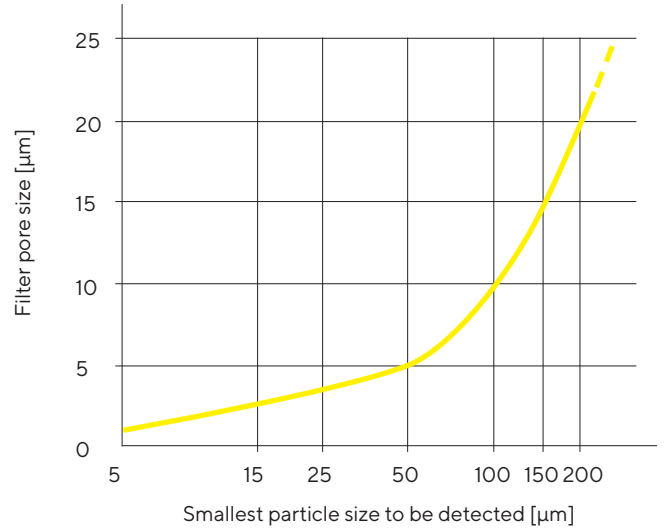
Selection of a Suitable Analytical Filter

Chemical Compatibility

Cellulose nitrate filters are the No. 1 choice for many applications. If this filter material is not compatible or has limited compatibility with the test, rinsing or fixing solution, alternative filter materials can be considered, such as cellulose acetate or PTFE having different compatibility properties.

Pore Size

The pore size of an analytical filter depends on the rated retentive capability of the particle sizes to be determined. As a rule, these pore sizes are specified in the requirements defined for the cleanliness of a specific component. For example, in VDA 19, Part 1, the pore sizes for retaining the smallest critical particles are suggested (see diagram) as a rule of thumb.



Particle size > 50 µm
Pore size (max.) = $\frac{1}{10}$ to $\frac{1}{5}$ of the particle size

Particle size < 50 µm
Pore size (max.) = $\frac{1}{5}$ of the particle size





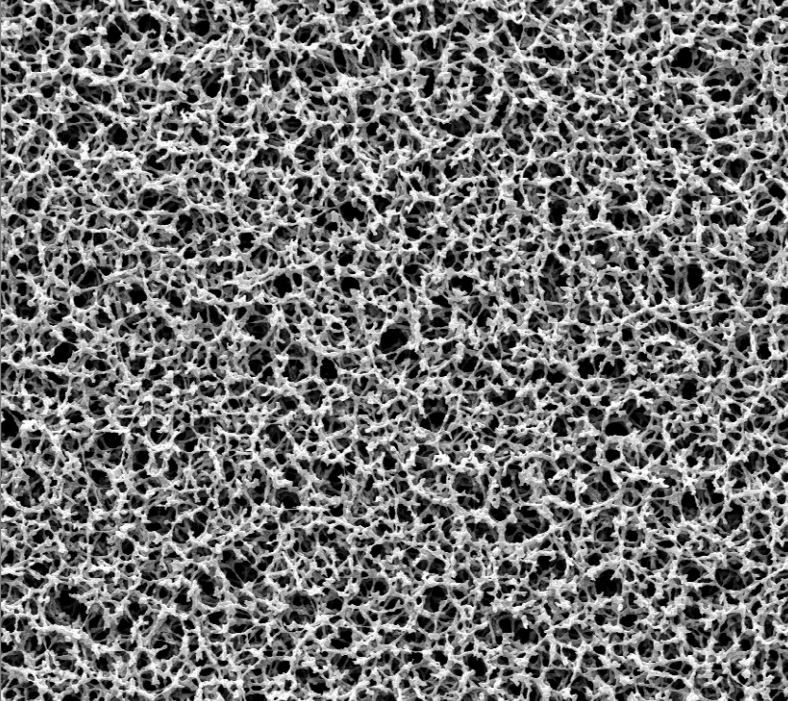
Guidance Table for Filter Selection

	Filter Material				
	Cellulose Nitrate (Mixed Cellulose Esters)	Cellulose Acetate	Polyamide	Polycarbonate Track-Etched	PTFE
Test or Rinsing Liquids					
Neutral cleaning agent, water-based	■	■	■	■	■
Isopropanol	□	■	■	■	■
Ethanol	□	■	■	■	■
Aliphatic hydrocarbons (e.g. cold cleaner)	■	■	■	■	■
Ketone (e.g., acetone)	-	-	■	■	■

■ Compatible - Not compatible □ Limited compatibility

Pore Size					
0.2 µm	■	■	■	■	■
0.45 µm 0.4 µm	■	■	■	■	■
0.65 µm	■	■	-	-	-
0.8 µm	■	■	-	■	-
1.2 µm	■	■	-	-	■
3 µm	■	-	-	-	-
5 µm	■	■	-	-	■
8 µm	■	-	-	-	-

■ Available - Not available



Cellulose Nitrate (Mixed Cellulose Esters)

Cellulose nitrate membrane filters are hydrophilic, have high flow rates thanks to their symmetrical structure and are compatible with aqueous solutions (pH 4–8), hydrocarbons and several other organic solvents. These cellulose nitrate membranes are available in different pore sizes from 0.2 μm to 8 μm .

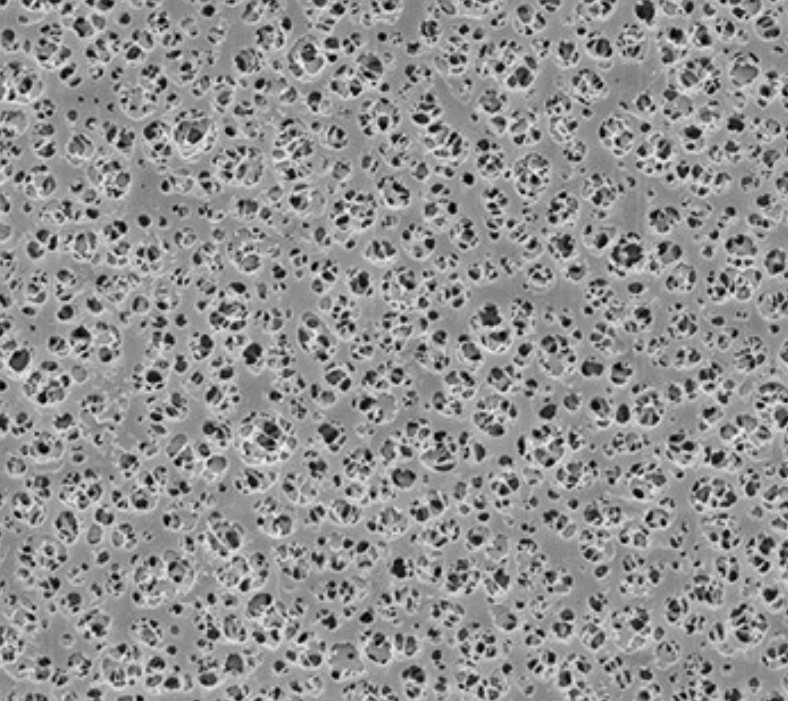
Typical Performance Characteristics

Pore Size (μm)	Type	Thickness (μm)	Water Flow Rate (mL/min/cm ² /bar)	Thermal Resistance max. ($^{\circ}\text{C}$)	Bubble Point (bar)
0.2	11327	130	25	130	4.2
0.45	11306	130	70	130	2.4
0.65	11305	130	130	130	2.0
0.8	11304	130	200	130	1.2
1.2	11303	130	200	130	1.0
3	11302	130	430	130	0.5
5	11342	130	570	130	0.5
8	11301	130	750	130	0.3

Ordering Information

Pore Size	Ø 13 mm	Ø 25 mm	Ø 47 mm	Ø 50 mm	Ø 90 mm	Ø 100 mm
0.2 μm	11327--13-----N	11327--25-----N	11327--47-----N			
0.45 μm	11306--13-----N	11306--25-----N	11306--47-----N	11306--50-----N	11306--90-----N	11306-100-----N
0.65 μm	11305--13-----N	11305--25-----N	11305--47-----N	11305--50-----N		11306-100-----N
0.8 μm	11304--13-----N	11304--25-----N	11304--47-----N	11304--50-----N	11304--90-----G	11304-100-----G
1.2 μm	11303--13-----N	11303--25-----N	11303--47-----N	11303--50-----N	11303--90-----G	11303-100-----G
3 μm	11302--13-----N	11302--25-----N	11302--47-----N	11302--50-----N	11302--90-----G	11302-100-----G
5 μm	11342--13-----N	11342--25-----N	11342--47-----N	11342--50-----N		
8 μm	11301--13-----N	11301--25-----N	11301--47-----N	11301--50-----N		11301-100-----N

G = 25 filters, N = 100 filters | Other dimensions and quantities per package are available on request



Cellulose Acetate

Cellulose acetate membranes combine thermal stability with exceptionally low adsorption characteristics. They are hydrophilic, have high flow rates thanks to their symmetrical structure and are compatible with aqueous solutions (pH 4–8), oils, alcohols and other organic solvents. These cellulose acetate membranes are available in different pore sizes from 0.2 to 5 µm.

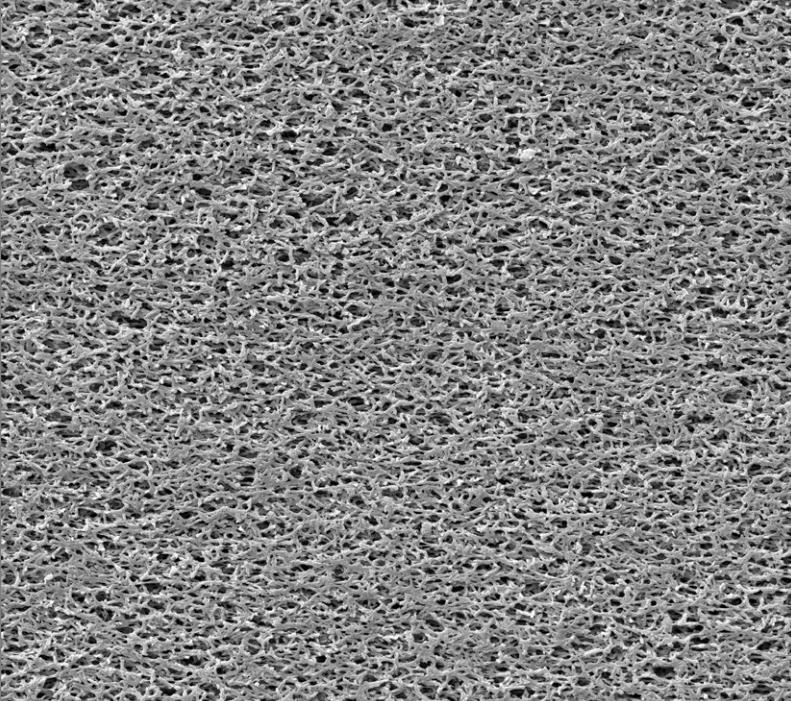
Typical Performance Characteristics

Pore Size (µm)	Type	Thickness (µm)	Water Flow Rate (mL/min/cm ² /bar)	Thermal Resistance max. (°C)	Bubble Point (bar)
0.2	11107	120	24	180	2.9
0.45	11106	120	69	180	1.9
0.65	11105	120	115	180	1.5
0.8	11104	120	200	180	1
1.2	12303	140	320	180	0.8
5	12342	140	570	180	0.4

Ordering Information

Pore Size	Ø 13 mm	Ø 25 mm	Ø 47 mm	Ø 50 mm	Ø 90 mm	Ø 100 mm
0.2 µm	11107--13-----N	11107--25-----N	11107--47-----N	11107--50-----N	11107--90-----G	11107-100-----N
0.45 µm	11106--13-----N	11106--25-----N	11106--47-----N	11106--50-----N	11106--90-----G	11106-100-----N
0.65 µm		11105--25-----N	11105--47-----N	11105--50-----N	11105--90-----G	
0.8 µm	11104--13-----N	11104--25-----N	11104--47-----N	11104--50-----N	11104--90-----N	
1.2 µm		12303--25-----N	12303--47-----N	12303--50-----N		12303-100-----G
5 µm		12342--25-----N	12342--47-----N			

G = 25 filters, N = 100 filters | Other dimensions and quantities per package are available on request



Polyamide

Polyamide membrane filters are hydrophilic and chemically resistant to alkaline solutions and organic solvents.

Typical Performance Characteristics

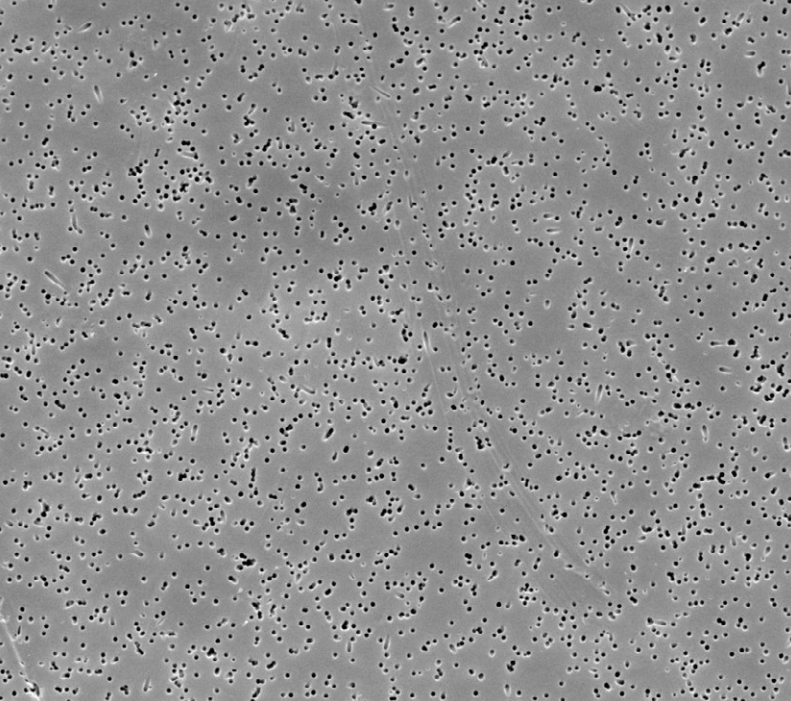
Pore Size (µm)	Type	Thickness (µm)	Water Flow Rate (mL/min/cm ² /bar)	Thermal Resistance max. (°C)	Bubble Point (bar)
0.2	25007	115	15	100	3.2
0.45	25006	115	35	100	2.3

*Max. continuous operating temperature in water

Ordering Information

Pore Size	Ø 13 mm	Ø 25 mm	Ø 47 mm	Ø 50 mm	Ø 90 mm
0.2 µm	25007--13-----N	25007--25-----N	25007--47-----N	25007--50-----N	25007--90-----G
0.45 µm	25006--13-----N	25006--25-----N	25006--47-----N	25006--50-----N	25006--90-----G

G = 25 filters, N = 100 units | Other dimensions and quantities per package are available on request



Polycarbonate Track-Etched

White and hydrophilic polycarbonate track-etched membranes are manufactured from high-grade polycarbonate film using track-etch technology. Their capillary pore structure is uniform and precise, with a narrow pore size distribution.

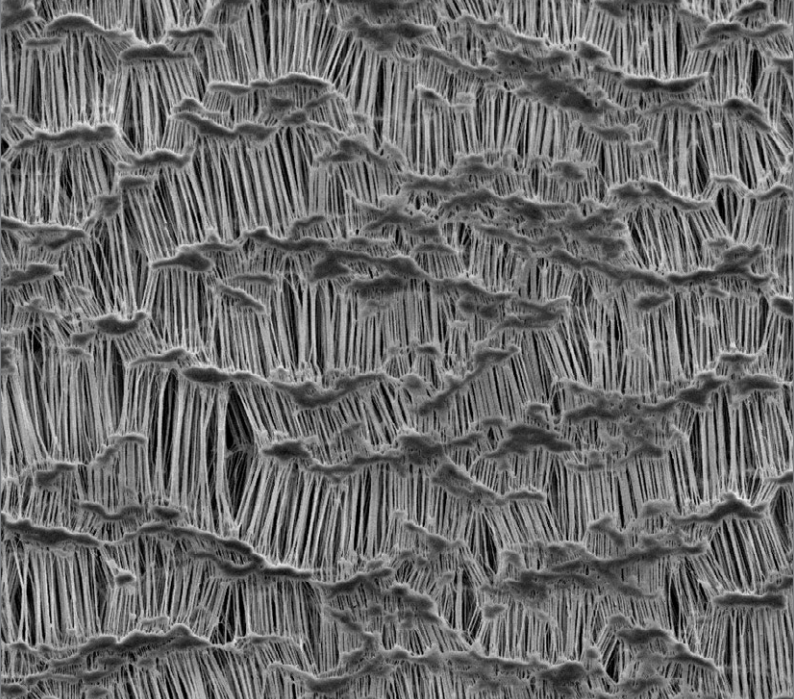
Typical Performance Characteristics

Pore Size (µm)	Type	Thickness (µm)	Water Flow Rate (mL/min/cm ² /bar)	Thermal Resistance max. (°C)	Bubble Point (bar)
0.2	23007	25	≤ 10	140	4.8
0.4	23006	25	≤ 30	140	2.5
0.8	23004	25	≤ 40	140	0.6

Ordering Information

Pore Size	Ø 25 mm	Ø 47 mm	Ø 50 mm
0.2 µm	23007--25-----N	23007--47-----N	23007--50-----N
0.4 µm	23006--25-----N	23006--47-----N	
0.8 µm	23004--25-----N		

N = 100 filters | Other dimensions and quantities per package are available on request



Hydrophobic PTFE

PTFE filters are permanently hydrophobic. These membrane filters feature excellent chemical compatibility (pH 1 to 14) so they are also used for filtration of solvents and acids that cannot be filtered using other filter types due to a lack of or limited compatibility.

Typical Performance Characteristics

Pore Size (µm)	Type	Thickness (µm)	Isopropanol Flow Rate (mL/min/cm ² /bar)	Thermal Resistance max. (°C)	Bubble Point (bar)
0.2	11807	65	11	200	1.2
0.45	11806	80	20	200	0.9
1.2	11803	100	80	200	0.45
5	11842	100	250	200	0.10

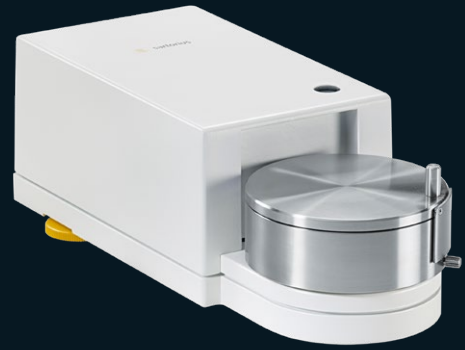
Ordering Information

Pore Size	Ø 13 mm	Ø 25 mm	Ø 47 mm	Ø 50 mm	Ø 90 mm	Ø 100 mm
0.2 µm	11807--13-----N	11807--25-----N	11807--47-----N	11807--50-----N	11807--90-----G	11807-100-----G
0.45 µm	11806--13-----N	11806--25-----N	11806--47-----N	11806--50-----N	11806--90-----G	11806-100-----G
1.2 µm	11803--13-----N	11803--25-----N	11803--47-----N	11803--50-----N	11803--90-----G	11803-100-----G
0.8 µm		11842--25-----N	11842--47-----N	11842--50-----N		11842-100-----G

G = 25 filters, N = 100 filters | Other dimensions and quantities per package are available on request

Gravimetric Analysis

The gravimetric method is used as a standard procedure for determining technical cleanliness as it provides information on the total particle burden of a component. Our Cubis® II balances meet the highest requirements on accuracy and ease of operation for particle load determination.





Cubis® II Premium Laboratory Balances

Cubis® II enables you to combine your choice of display, weighing module, draft shield, software packages and much more. You can choose from thousands of options to configure your balance to suit your individual needs and obtain the optimal solution for integration into your process.

Cubis® QApp Residual Dirt Analysis

The Cubis® II balance series brings weighing workflows as small software applications (QApps) directly on the balance, without the need for additional PC-based software. For the gravimetric determination of residual dirt according to VDA19, we offer a QApp guiding the user step by step through the workflow and automatically calculating and documenting the results. This guarantees trustworthy results and increases efficiency in the laboratory.

Cubis® QApp Filter Particulate Matter

Filter particulate matter is used for the differential weighing of filters with individual sample ID. During the process the initial and back weighing of filters is performed and the difference between the initial and back weight of each filter is determined. The acquired weights are corrected by the air buoyancy and the difference between unloaded and loaded filter in mg and % (particle load value) is calculated. Furthermore the application creates a statistics for a batch of filters by calculating the average, standard deviation, minimum and maximum particle load.

Cubis II Titanium Weighing Pans for Uncompromized Accuracy

We offer various sizes of filter holders from 50 mm - up to 150 mm diameter for ultra-micro and micro filter balances, and semi-micro balances. Made of titanium, not only the highest material quality is guaranteed, but notably the repeatability is not compromised because of the non-magnetic properties.

Selection of an Optimal Balance

Two criteria are important for selecting a balance in line with the recommendations of VDA 19 or ISO 16232:

- Maximum allowable particle load on a component
- Maximum allowable blank value (10% of the maximum allowable particle load)

The blank is determined at the beginning before extraction of particles flushed from a component and indicates the basic particulate contamination of the test setup and the liquids used.

Your Needs		Our Solutions	
Max. Allowable Particle Load	Max. Allowable Blank Value	Min. Resolution of the Balance	Recommended Type of Balance
10 mg	1 mg	0.1 mg	Analytical balance or better
1 mg	0.1 mg	0.01 mg	Semi-micro balance or better
0.1 mg	0.01 mg	0.001 mg	Micro balance or better
0.01 mg	0.001 mg	0.0001 mg	Ultra-micro balance

Specifications

Note: This table only contains selected modules. Other weighing modules are available on request.

	Ultra-Micro Balance 0.0001 mg	Micro Balance 0.001 mg	Micro Balance 0.001 mg	Semi-Micro Balance 0.01 mg	Analytical Balance 0.1 mg
Weighing module	MCA 2.7S	MCA 6.6S	MCA 10.6S	MCA 225S	MCA 224S
Draft shield	F	F	F	I	I
Scale interval (d)	0.0001	0.001	0.001	0.01	0.1
Maximum capacity (Max)	2.1	6.1	10.1	220	220
Standard weighing pan (W×D) [mm]	Ø 20	Ø 30	Ø 30	85×85	85×85
Filter weighing pan (50 mm)	incl.	incl.	incl.	-	-
Typical stabilization time [<s]	7	5	5	2	1
Typical measurement time	10	8	8	6	3
Repeatability near max. [\pm mg], standard deviation of the load values, tolerance	0.00025	0.001	0.001		0.07
Linearity deviation [\pm mg], tolerance	0.0009	0.004	0.004	0.1	0.2
Off-center load [mg]*, tolerance	0.0007	0.004	0.004	0.15	0.2

* Position according to OIML R76



Accessories

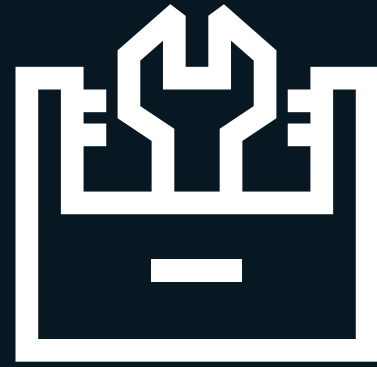
Description	Availability for Ultra-Micro Balances and Micro Balances	Availability for Semi-Micro Balances and Analytical Balances	Order Number
Cubis® II MCA QApp Package Advanced	■	■	QP2
Cubis® II MCA Residual Dirt Analysis QApp	■	■	QAPP208
Filter weighing pan made of titanium, diameter 90 mm, for ultra-micro balance or micro balance models	■	-	VF2562
Filter weighing pan made of titanium, diameter 52 mm, for ultra-micro and micro balances			YSH34
Filter weighing pan made of titanium, diameter 90 mm, for ultra-micro balance or micro balance models only together with F draft shield			YSH36
Filter weighing pan made of titanium, diameter 75 mm, for ultra-micro balance or micro balance models	■	-	YSH35
Filter Holder (150 mm) for Cubis II Semi-Microbalances and Analytical Balances	-	■	YSH30
Stat-Pen ionizing probe for neutralizing static electricity on samples or filters	■	■	YSTP01
Balance table made of cast stone; for weighing with vibration damping	■	■	YWT03
Motion sensor for triggering a maximum of 4 functions via gesture control, selection via menu	-	■	YHS02MS
Thermal transfer thermal printer for GMP GLP printouts on continuous paper and labels	■	■	YDP30
Laboratory thermal transfer printer YDP30 with USB and ethernet connection	■	■	YDP30-NET
Wireless Nano USB Adapter	■	■	YWLAN01MS
WIFI Nano Router	■	■	YWLAN02MS
SartoriusWedge software for data communication between the balance and a PC	■	■	YSW02
Tower incl. climate module YCM20MC; can be ported to all Cubis® II weighing modules with user interface MCA	■	■	YCM20MC-TOWER
Calibration of a climate module YCM20MC with DAkkS calibration certificate	■	■	YCM20DAkkS

■ Available - Not available



Accessories

Rugged and efficient filtration accessories are required to ensure reliable removal of particles in every filtration run. Sartorius facilitates your filtration procedures by offering a large selection of filter holders and vacuum systems.



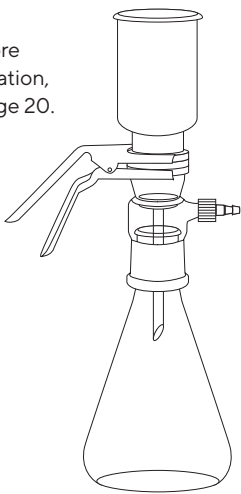
Selection of Filtration Accessories

Individual Filter Holders

All-Glass Filter Holder, 250 mL

16309

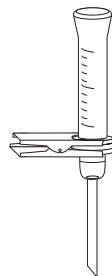
For more information, see page 20.



Glass Filter Holder, 30 mL

16306 or 16315

For more information, see page 21.



Silicone Stopper

17174

For more information, see page 26.



Glass Filter Holder, 250 mL

16307 or 16316

For more information, see page 22.



Silicone Stopper

17175

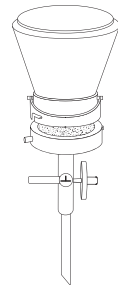
For more information, see page 26.



Stainless Steel Funnels

40 mL: 16220
100 mL: 16219
500 mL: 16201

For more information, see page 23.



Silicone Stopper

17173

For more information, see page 26.



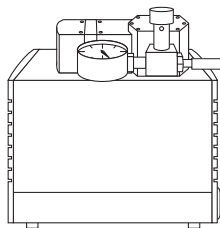
Vacuum Pumps*

Recommended: Mini.vac for 1-branch manifold; others pumps for 3- and 6-branch manifolds

Microsart® Maxi.vac
Microsart® Mini.vac

Conventional pump, 13 mbar, 26/L min
Conventional pump, 100 mbar, 20/L min

For more information, see page 28.



Vacuum Hose

Silicone: 1ZAS--0029
Rubber: 16623

For more information, see page 27.

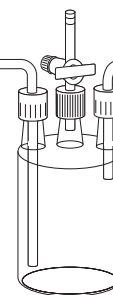
Woulff's Bottle

500 mL: 16610

or

Vacusart®
17804-----M

For more information, see pages 26 and 27.



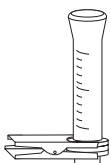


Multi-Branch Filter Holders

Glass Filter Holder, 30 mL

16306 or 16315

For more information, see page 21.



Adapter

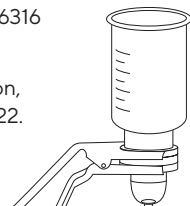
16836

For more information, see page 25.

Glass Filter Holder, 250 mL

16307 or 16316

For more information, see page 22.



Adapter

16837

For more information, see page 25.

Stainless Steel Funnels

40 mL: 6981004
100 mL: 6981065
500 mL: 6981002

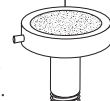
For more information, see page 23.



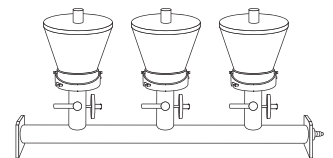
Individual Base

16840

For more information, see page 25.



Stainless Steel Manifold

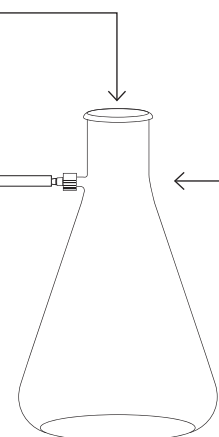


For more information, see page <?>.

Prefilter Attachment for Stainless Steel Funnels

16807

For more information, see page 27.



2 L Suction Flask
16672

5 L Suction Flask
16672-----1 (incl. stopper and glass tube)

For more information, see page 26.

Connection to Vacuum Flask

17204 tube connector
17173 silicon stopper

For more information, see page 26.

Combisart® Stainless Steel Manifolds

3-branch: 16842

All-Glass Vacuum Filter Holder

All areas where liquid and device can come into direct contact are made of glass or PTFE. Several features ensure convenient handling. A 6-mm-wide, non-ground rim above the ground glass neck of the suction flask prevents the filtrate from coming in contact with grease on the ground glass surface, thus preventing it from contamination while being poured out of the flask.

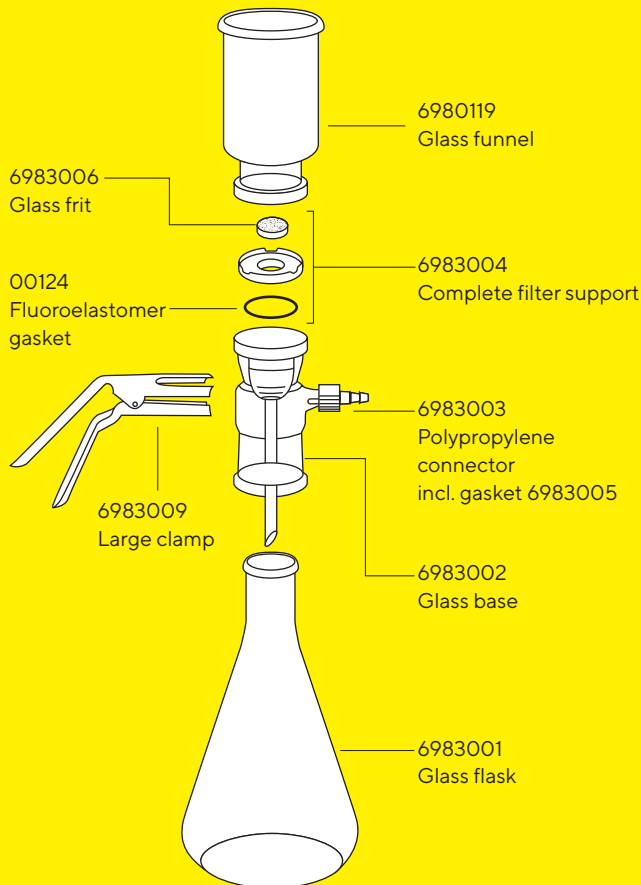
Specifications

Parts and materials	Borosilicate glass funnel, base and flask; sintered glass frit in a PTFE ring and fluoroelastomer O-ring (45 × 3 mm) underneath; anodized aluminium clamp
Chemical compatibility	As for glass and PTFE
Funnel capacity	250 mL
Capacity of the filtrate flask	1 liter
Filtration area	12.5 cm ²
Max. operating pressure	Only for vacuum
Suitable membrane filter diameter	47 mm 50 mm
Sterilization (without connector)	By autoclaving (max. 134°C) or by dry heat (max. 180°C)

Ordering Information

Description	Order No.
All-glass vacuum filter holder for 50 mm (or 47 mm) membrane filter, with vacuum-resistant flask, capacity 1 liter	16309

Replacement parts are shown in the diagram.



Specifications

Base outlet	12 mm diameter
Parts and materials	Borosilicate glass funnel and base; PTFE glass filter support (type 16306) or PTFE stainless steel filter support, coated with PTFE (type 16315) Silicone O-ring 25 × 3 mm Anodized aluminum clamp
Chemical compatibility	As for glass, PTFE and silicone. The silicone O-ring can be replaced by a fluoroelastomer O-ring (order no. 00118)
Funnel capacity	30 mL
Filtration area	3 cm ²
Max. operating pressure	Only for vacuum
Suitable membrane filter diameter	25 mm
Sterilization	By autoclaving (max. 134°C) or by dry heat (max. 180°C)

Ordering Information

Description	Order No.
Glass vacuum filtration holder for 25 mm membrane filter, with glass frit filter support	16306
Glass vacuum filtration holder for 25 mm membrane filter, with PTFE-coated screen filter support	16315

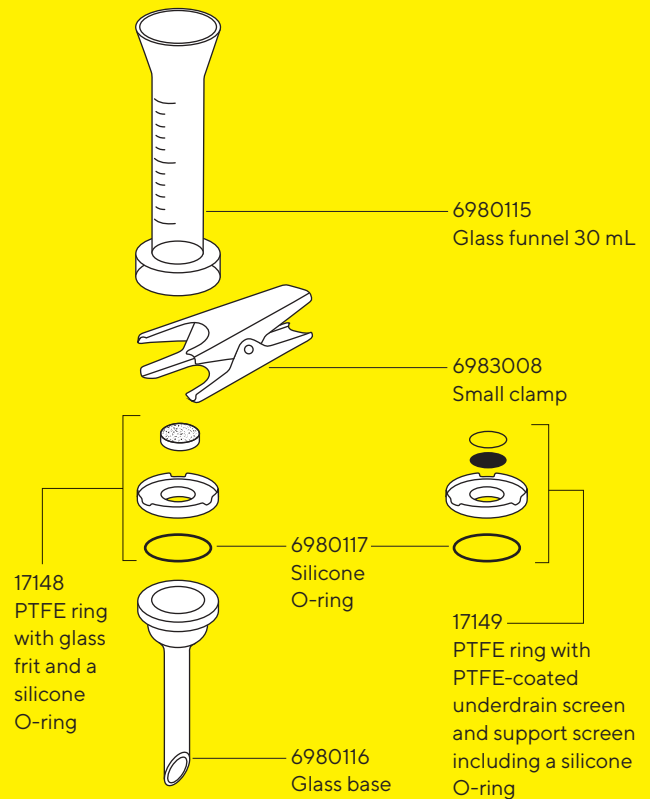
Replacement parts are shown in the diagram.



Glass Vacuum Filter Holders

25 mm Glass Vacuum Filter Holder

This filter holder is available in two versions that differ from each other only in the type of the filter support. The filter holder with a glass frit ensures uniform distribution of retained particles and is therefore recommended if the residue on the filter surface is of interest. Because it is easy to clean, the filter holder with the PTFE-coated screen support is preferable if the filtrate is required or if liquids difficult to remove from the glass frit need to be examined.



Note: PTFE rings in sets 17148 and 17149 have different dimensions and are not interchangeable.

Glass Vacuum Filter Holders

50 mm Glass Vacuum Filter Holder

This filter holder is available in two versions that differ from each other only in the type of filter support. The filter holder with a glass frit ensures uniform distribution of retained particles and is therefore recommended if the residue on the filter surface is of interest. Because it is easy to clean, the filter holder with a PTFE-coated screen support is preferable if the filtrate is required or if a liquid difficult to remove from the glass frit needs to be examined.

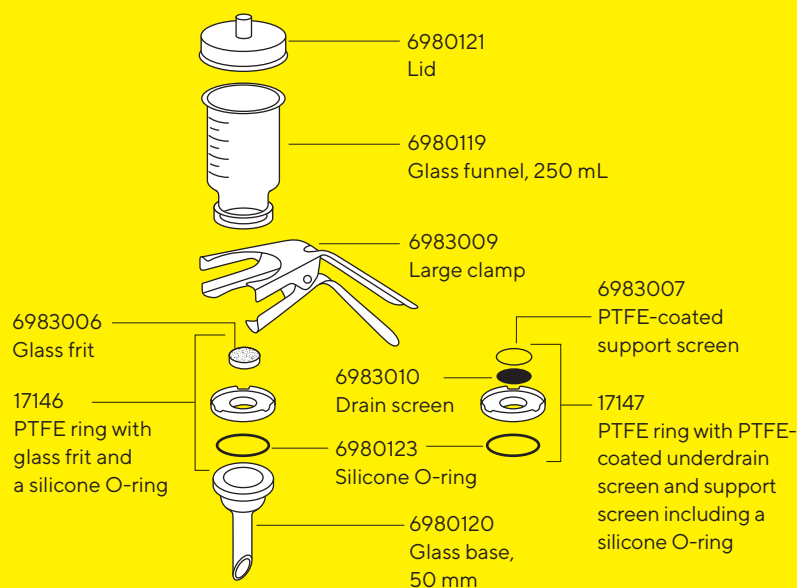
Specifications

Base outlet	15 mm diameter
Parts and materials	Borosilicate glass funnel and base Silicone rubber lid PTFE glass filter support (type 16307) or PTFE stainless steel filter support, coated with PTFE (type 16316) Silicone O-ring 45+3 mm Anodized aluminum clamp
Chemical compatibility	As for glass, PTFE and silicone The silicone O-ring can be replaced by a fluoroelastomer O-ring (order no. 00124).
Funnel capacity	250 mL
Filtration area	12.5 cm ²
Max. operating pressure	Only for vacuum
Suitable membrane filter diameter	47 mm 50 mm
Sterilization	By autoclaving (max. 134°C) or by dry heat (max. 180°C)

Ordering Information

Description	Order No.
Glass vacuum filtration holder for 50 mm (or 47 mm) membrane filter, with glass frit filter support	16307
Glass vacuum filtration holder for 50 mm (or 47 mm) membrane filter, with PTFE-coated screen filter support	16316

Replacement parts are shown in the diagram.



Note: PTFE rings in sets 17146 and 17147 have different dimensions and are not interchangeable.

Specifications

Base outlet	37,9
Parts and materials	Filter holder: High-grade stainless steel: B.S. 304S31 AISI 304 Stainless steel frit: 1.4539 (EN) 904 (ASTM) Flat gasket: silicone (PTFE available. Order No.: 6980104)
Chemical compatibility	As for stainless steel and silicone
Choice of funnel capacity	40 mL, 100 mL and 500 mL
Filtration area	12.5 cm ²
Max. operating pressure	Vacuum
Suitable membrane filter diameter	47 mm 50 mm
Sterilization	By autoclaving (max. 134°C), dry heat (max. 180°C) or by flaming

Ordering Information

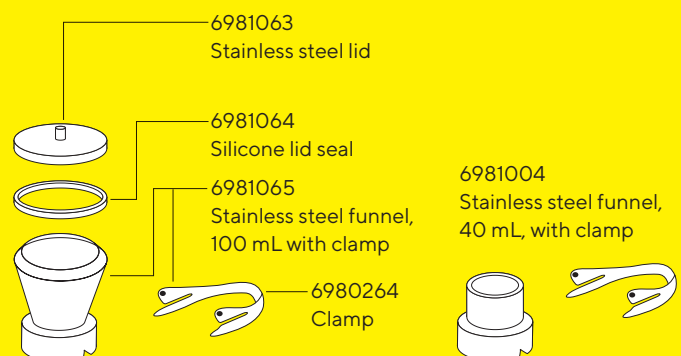
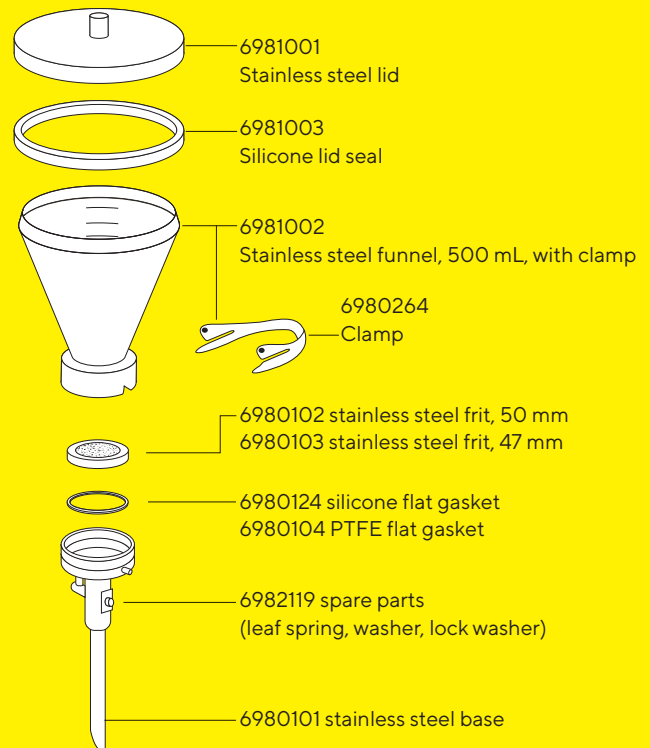
Description	Order No.
Individual stainless steel filter holder, 100 mL	16219
Individual stainless steel filter holder, 500 mL	16201
Individual stainless steel filter holder without lid, 40 mL	16220

Replacement parts are shown in the diagram.



Individual Stainless Steel Filter Holders

The three stainless steel holder types differ only in the funnel capacity (40 mL, 100 mL or 500 mL). The stainless steel frit filter support ensures uniform distribution of retained particles on the membrane surface. The filter holders feature simple handling, which is very important for performing routine tests. The convenient stainless steel tap in each base enables vacuum to be easily turned on and off independently.



Combisart® Modular Stainless Steel Manifold

The Sartorius Combisart® system features a modular design and field-proven standard accessories to make it easy for you to choose the right system. At the heart of the Combisart® system is a high-grade stainless steel manifold designed to accommodate stainless steel or glass funnels.



Specifications

Parts and materials	Lid, funnel, base, filter support, clamp and tap made of stainless steel B.S.304S31 AISI304 Flat gasket: silicone (PTFE available. Order No. 6980104) lid seal: silicone
Chemical compatibility	As for stainless steel and silicone
Filtration area	12.5 cm ²
Max. operating pressure	Vacuum only
Suitable membrane filter diameter	25 mm 47 mm 50 mm
Sterilization	By autoclaving (max. 134°C), dry heat (max. 180°C) or by flaming
Inlet	Female thread, TR 20 × 2
Outlet	Quick-connect nipple, DN 10

Ordering Information

Filter Holders and Funnels

Description	Diameter of Filter Discs	Order No.
30 mL glass filter holder with glass funnel glass frit filter support (specifications and replacement parts on page 21)	25 mm	16306
30 mL glass filter holder with PTFE-coated screen filter support (specifications and replacement parts on page 21)	25 mm	16315
250 mL glass filter holder with glass funnel glass frit filter support (specifications and replacement parts on page 22)	47 mm 50 mm	16307
250 mL glass filter holder for with PTFE-coated screen filter support (specifications and replacement parts on page 22)	47 mm 50 mm	16316
100 mL stainless steel funnel with clamp for closure	47 mm 50 mm	6981065
500 mL stainless steel funnel with clamp for closure	47 mm 50 mm	6981002
Lid, stainless steel for 100 mL funnel		6981063
Lid seal, silicone for 100 mL funnel		6981064
Lid, stainless steel for 500 mL funnel		6981001
Lid seal, silicone for 500 mL funnel		6981003

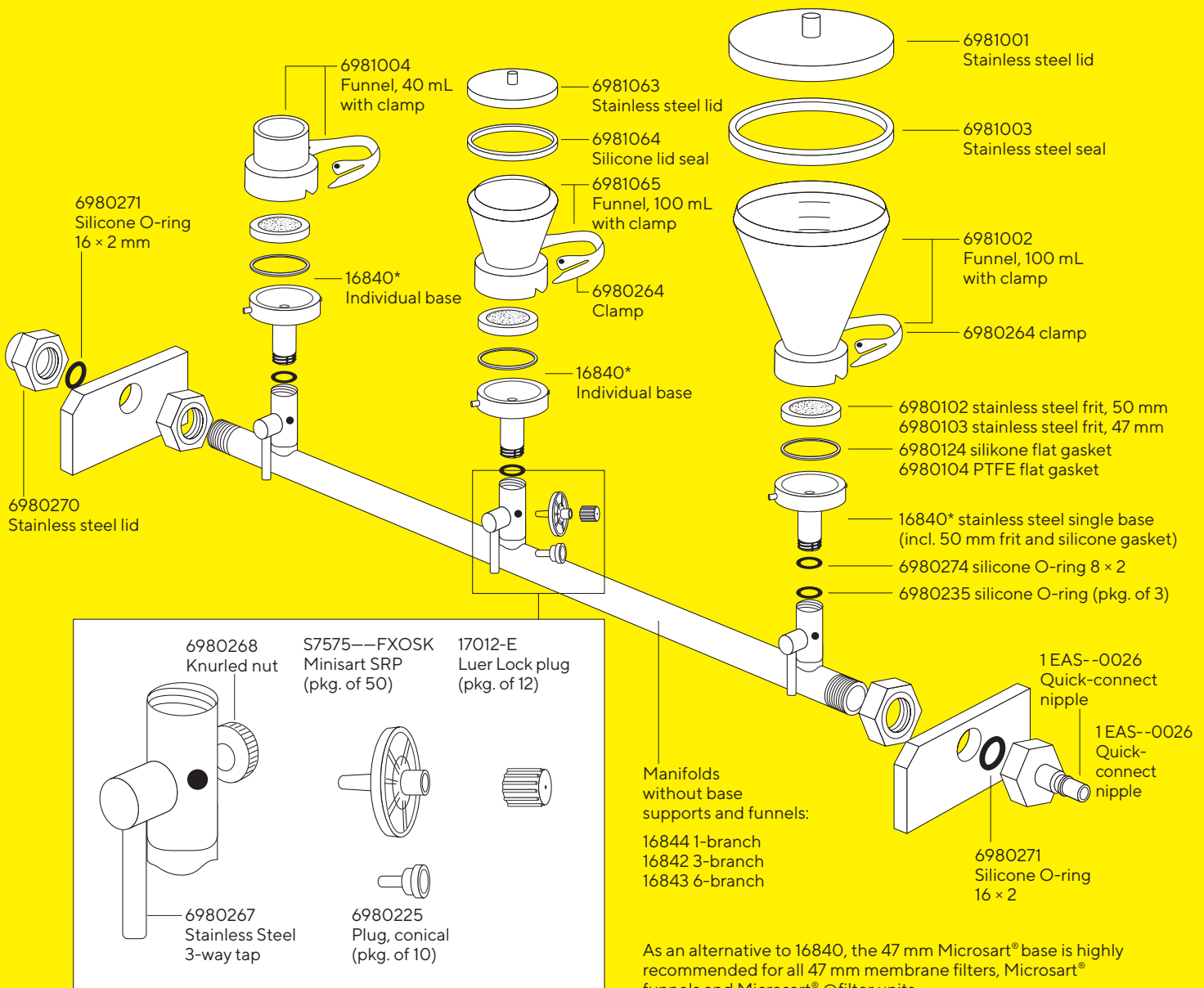
Adapters and Base Support

Description	Adaption Components for Combisart® Manifolds 16844, 16842 and 16843	Order No.
Glass funnel adapter, stainless steel with silicone stopper	16306 16315 (glass funnels, 30 mL)	16836
Glass funnel adapter, stainless steel with silicone stopper	16307 16316 (glass funnels, 250 mL)	16837
Combisart® base with frit, stainless steel	Stainless steel funnels: 40 mL (6981004) 100 mL (6981065) 500 mL (6981002)	16840

Manifolds

Description	Order No.
Combisart® 3-branch stainless steel manifold, without base and frits	16842

Replacement parts are shown in the diagram.



Additional Accessories

Ordering Information

Suction Flasks

Description	Order No.
Suction flask, 2 liters acc. to DIN 12476, without stopper	16672
Suction flask, 5 liters acc. to DIN 12476, incl. stopper 75 D and glass tube	16672-----1



Silicone Stoppers and Connectors

Description	Flask Type	Order No.
Perforated stopper for individual stainless steel filter holders 6201 16219 16220 and for tube connector (17204)	2 liters (16672)	17173
Tube connector for connecting a rubber hose 16623 or a silicone hose (1ZAS--0029)	2 liters (16672)	17204
Perforated stopper for 30 mL glass funnels 16306 16315	2 liters (16672)	17174
Perforated stopper for 250 mL glass funnel 16307 16316	2 liters (16672)	17175
Perforated stopper 75 D for glass tube (1EAQ--0017)	5 liters (16672-----1)	1EAS--0019
Glass tube for silicone stopper 75 D (1EAS--0019)	5 liters (16672-----1)	1EAQ--0017

Replacement Parts

Hose barb, complete, polypropylene	2 liters (16672)	6983003
Glass tube for silicone stopper 75 D (1EAS--0019)	5 liters (16672-----1)	1EAQ--0017
Assembly kit for hose barb	5 liters (16672-----1)	1EA---0018

Woulff's Bottle

Used between a suction flask and a vacuum source for simple control of vacuum in glass units without a separate tap and also prevents the filtrate from overflowing from the suction flask.

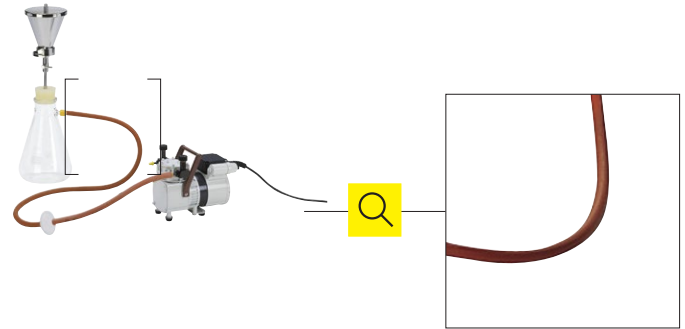
Description	Order No.
Woulff's Bottle, 500 mL	16610



Vacuum Hoses

Thick-walled hoses for connecting system components, e. g. suction flasks, vacuum pumps, etc. When ordering, please state the length you require in meters.

Description	Order No.
Rubber vacuum hose (1 meter), ID: 7mm	16623
Silicone vacuum hose (1 meter), ID: 7 mm	1ZAS--0029



Vacusart®

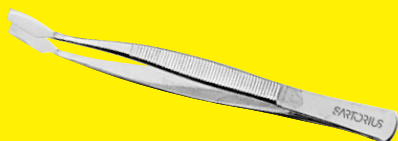
Description	Order No.
Vacusart® water trap, package of 3	17804-----M



Stainless Steel Tweezers

Membrane filters need to be handled using suitable tweezers. Sartorius tweezers have blunt-edged tips for a careful, firm hold of the membrane filter. The stainless steel tweezers can be flamed and are autoclavable.

Description	Order No.
Stainless steel tweezers	16625



Stainless Steel Prefilter Attachment

The stainless steel prefilter holder allows gradual retention ("cascade filtration") of particles by size. The device is clipped between the funnel and the base of stainless steel vacuum filter holders. It can be sterilized by autoclaving or flaming.

Description	Order No.
Stainless steel prefilter attachment	16807
Replacement part: support plate; sterilizable by autoclaving or flaming	6981139



Vacuum Pumps

Microsart® mini.vac | Microsart® maxi.vac

These Sartorius neoprene membrane pumps have a low noise level and are reliable oil- and maintenance-free sources of vacuum. The two vacuum pump series feature state-of-the-art technology for daily use. Vacuum produced by the pumps is controlled and can be easily adjusted to your specifications.



Specifications

	Microsart® maxi.vac	Microsart® mini.vac
Delivery	22 L/min	6 L/min
Final vacuum	100 mbar	100 mbar
Noise level [100 mbar]	57.5–59.0 dBA	53.5 dBA
Operating pressure	1 bar (14.5 psi)	2.5 bar (~36 psi)
Materials (contact with filtrate possible)	Aluminum, CR (neoprene), NBR (Perbunan®)	PPS, EPDM, FPM (fluoroelastomer)
Connectors for tube (mm)	ID 9	ID 4
Ambient temperature	5°C to 40°C	5°C to 40°C
Power requirements (mains)	16694-2-50-22: 230 V 50 Hz 16694-1-60-22: 115 V 60 Hz	16694-2-50-06: 230 V 50 Hz 16694-1-60-06: 115 V 60 Hz
Motor protection rating	IP 44	IP 20
Power P1	130 W	65 W
Operating current	0.9 A	0.63 A
Weight	7.1 kg	1.9 kg
Dimensions W H D (mm)	261 204 110	164 141 90
Recommended application	All multi-branch manifolds	Individual filtration run using up to 3-branch manifolds

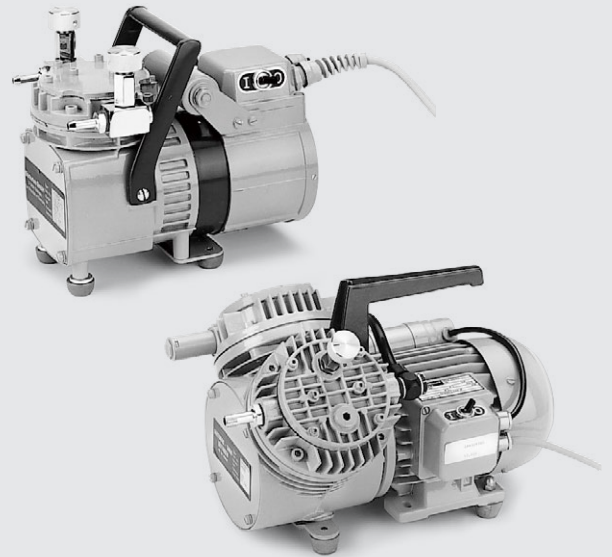
Ordering Information

Description	Order No.
Microsart® maxi.vac for multiple filtration runs, 230 V, 50 Hz	16694-2-50-22
Microsart® maxi.vac for multiple filtration runs, 115 V, 60 Hz	16694-1-60-22
Microsart® mini.vac up to 3 filter stations in parallel, 230 V, 50 Hz	16694-2-50-06
Microsart® mini.vac up to 3 filter stations in parallel, 115 V, 60 Hz	16694-1-60-06

Replacement Parts

Description	Order No.
Replacement kit for 16694-2-50-22 and -1-60-22; set of one membrane, two valve springs and two head seals	1ED---0055
Replacement kit for 16694-2-50-06 and -1-60-06; set of one membrane, two valve springs and two head seals	1ED---0054
Sound absorber for 16694-2-50-22 and -1-60-22	1EH---0002
Sound absorber for 16694-2-50-06 and -1-60-06	1EH---0001
Fine adjustment head for 16694-2-50-22 and -1-60-22	1EV---0002
Fine adjustment head for 16694-2-50-06 and -1-60-06	1EV---0001
Fine adjustment head for 16694-2-50-06 and -1-60-06, for pressure filtration	1EV---0003

Traditional Pumps



Ordering Information

Description	Order No.
Multiple filtration runs: 13 mbar final vacuum, 26 L/min max., 220 V, 50 Hz	16612
Multiple filtration runs: 13 mbar final vacuum, 26 L/min max., 110 V, 60 Hz	16615
Individual filtration run: 100 mbar final vacuum, 20 L/min max., 220 V, 50 Hz	16692
Individual filtration run: 100 mbar final vacuum, 20 L/min max., 110 V, 60 Hz	16695

Replacement Parts

Description	Order No.
Set of two neoprene membranes, four valve springs and two neoprene head seals for 16612 16615	6986017
Set of one neoprene membrane, two valve springs and one neoprene head seal for 16692 16695	6986105
Thick-walled rubber hose	16623

Chemical Compatibility

Filter Materials

	Cellulose Acetate	Cellulose Nitrate	Reg. Cellulose	PTFE	Polyamide	Glass Fiber	Polycarbonate	Polyether-sulfone
Solvents	111	113	184	118	250	134	230	154
Acetone	-	-	■	■	-	■	□	-
Acetonitrile	?	?	■	■	-	?	?	■
Benzene	■	■	■	■	■	■	?	■
Benzyl alcohol	□	□	■	■	■	■	?	-
n-Butyl acetate	□	-	■	■	■	■	■	■
n-Butanol	■	■	■	■	■	■	■	■
Carbon tetrachloride	□	■	■	■	■	■	?	■
Cellosolve	■	-	■	■	?	■	-	■
Chloroform	-	■	■	■	■	■	-	-
Cyclohexane	□	□	■	■	?	■	■	-
Cyclohexanone	-	-	■	■	■	■	?	?
Diethylacetamide	-	-	■	■	■	■	?	?
Diethyl ether	■	-	■	■	■	■	■	?
Dimethyl formamide	-	-	□	■	□	■	-	?
Dimethylsulfoxide	-	-	■	■	■	■	-	-
Dioxane	-	-	■	■	■	■	-	■
Ethanol, 98%	■	□	■	■	■	■	■	■
Ethyl acetate	-	-	■	■	■	■	?	-
Ethylene glycol	■	□	■	■	?	■	■	■
Formamide	?	?	?	■	?	■	-	?
Gasoline	■	■	■	■	■	■	■	■
Glycerine	■	■	■	■	■	■	■	■
n-Heptane	■	■	■	■	?	■	?	?
n-Hexane	■	■	■	■	■	■	■	?
Isobutanol	□	□	■	■	■	■	■	?
Isopropanol	■	□	■	■	■	■	■	■
Isopropyl acetate	□	-	■	■	?	■	?	■
Methanol, 98%	■	-	■	■	?	■	■	■
Methyl acetate	-	-	■	■	■	■	?	-
Methylene chloride	-	■	■	■	■	■	-	-
Methyl ethyl ketone	-	-	■	■	■	■	?	-
Methyl isobutyl ketone	■	-	■	■	■	■	?	?
Monochlorobenzene	■	■	■	■	■	■	-	?
Nitrobenzene	■	□	■	■	■	■	-	?
n-Pentane	■	■	■	■	■	■	■	?
Perchloroethylene	■	■	■	■	■	■	■	?
Pyridine	-	-	■	■	■	■	-	-
Tetrahydrofuran	-	-	■	■	■	■	-	-

	Cellulose Acetate	Cellulose Nitrate	Reg. Cellulose	PTFE	Polyamide	Glass Fiber	Polycarbonate	Polyether-sulfone
Solvents	111	113	184	118	250	134	230	154
Toluene	■	■	■	■	■	■	?	■
Trichloroethane	□	■	■	■	?	■	?	?
Trichloroethylene	■	■	■	■	■	■	-	■
Xylene	■	■	■	■	■	■	■	■
Acids								
Acetic acid, 25%	■	■	■	■	□	?	□	■
Acetic acid, 96%	-	-	■	■	-	?	?	■
Hydrochloric acid, 25%	-	□	-	■	-	?	■	■
Hydrochloric acid, 37%	-	-	-	■	-	?	■	■
Hydrofluoric acid, 25%	■	□	□	■	-	?	■	?
Hydrofluoric acid, 50%	■	□	-	■	-	?	■	?
Perchloric acid, 25%	-	□	□	■	-	?	?	?
Phosphoric acid, 25%	■	□	□	■	-	?	?	?
Phosphoric acid, 85%	■	□	□	■	-	?	-	?
Nitric acid, 25%	-	□	-	■	-	?	■	■
Nitric acid, 65%	-	-	-	■	-	?	■	■
Sulfuric acid, 25%	-	□	□	■	-	■	?	■
Sulfuric acid, 98%	-	-	-	■	-	?	-	?
Trichloroacetic acid, 25%	-	□	■	■	-	?	?	?
Bases								
Ammonium, 1N	■	■	□	■	■	■	-	■
Ammonium hydroxide, 25%	-	□	-	□	■	□	-	■
Potassium hydroxide, 32%	-	-	□	■	□	□	-	■
Sodium hydroxide, 32%	-	-	□	■	□	□	-	■
Sodium hydroxide, 1N	□	-	□	■	■	■	-	■
Aqueous Solutions								
Formaline, 30%	□	■	□	■	□	■	■	■
Hydrogen peroxide, 35%	■	■	□	■	□	?	?	?
Sodium hypochlorite, 5%	■	□	■	■	□	■	?	?

Key to Symbols

■ = Compatible □ = Limited compatibility

- = Not compatible ? = Not tested

E = Compatible after replacing the silicone O-ring with an EPDM O-ring

V = Compatible after replacing the silicone O-ring with a fluoroelastomer O-ring

Contact time: 24 hours at 20°C

Chemical compatibilities can be influenced by various factors.

Therefore, we recommend that you confirm compatibility with the liquid you wish to filter by performing a trial filtration run before you begin with actual filtration.

Filter Holder | O-Ring Materials

	Glass	Poly-carbonate	Poly-propylene	PTFE	Stain-less-Steel	EPDM O-Ring	PTFE O-Ring	Silicone O-Ring	Fluoro-elastomer O-Ring
Solvents									
Acetone	■	□	■	■	■	■	■	-	-
Acetonitrile	■	?	■	■	■	□	■	-	■
Benzene	■	-	-	■	■	-	■	-	■
Benzyl alcohol	■	-	■	■	■	□	■	■	■
n-Butyl acetate	■	-	□	■	■	■	■	-	-
n-Butanol	■	■	■	■	■	■	■	■	■
Carbon tetrachloride	■	-	□	■	■	-	■	-	■
Cellosolve	■	-	-	■	■	□	■	-	-
Chloroform	■	-	-	■	■	-	■	-	■
Cyclohexane	■	□	■	■	■	-	■	-	■
Cyclohexanone	■	-	■	■	■	-	■	-	-
Diethylacetamide	■	-	?	■	■	?	■	■	-
Diethyl ether	■	-	□	■	■	-	■	-	-
Dimethyl formamide	■	-	■	■	■	■	■	□	-
Dimethylsulfoxide	■	?	?	■	■	?	■	□	-
Dioxane	■	-	□	■	■	■	■	-	-
Ethanol, 98%	■	■	■	■	■	■	■	■	■
Ethyl acetate	■	-	■	■	■	■	■	-	-
Ethylene glycol	■	■	■	■	■	■	■	■	■
Formamide	■	-	■	■	■	■	■	-	□
Gasoline	■	□	■	■	■	-	■	-	■
Glycerine	■	□	■	■	■	■	■	■	■
n-Heptane	■	■	■	■	■	-	■	■	■
n-Hexane	■	■	■	■	■	-	■	-	■
Isobutanol	■	■	■	■	■	■	■	■	■
Isopropanol	■	□	■	■	■	■	■	■	■
Isopropyl acetate	■	■	■	■	■	■	■	-	-
Methanol, 98%	■	-	■	■	■	■	■	■	■
Methyl acetate	■	?	■	■	■	■	■	-	-
Methylene chloride	■	-	-	■	■	-	■	-	□
Methyl ethyl ketone	■	-	■	■	■	■	■	-	-
Methyl isobutyl ketone	■	-	?	■	■	-	■	-	-
Monochlorobenzene	■	-	■	■	■	-	■	-	■
Nitrobenzene	■	-	□	■	■	-	■	-	-
n-Pentane	■	■	■	■	■	-	■	-	■
Perchloroethylene	■	-	□	■	■	-	■	-	■
Pyridine	■	-	□	■	■	-	■	-	-

	Glass	Poly-carbonate	Poly-propylene	PTFE	Stain-less-Steel	EPDM O-Ring	PTFE O-Ring	Silicone O-Ring	Fluoro-elastomer O-Ring
Solvents									
Tetrahydrofuran	■	-	□	■	■	-	■	-	-
Toluene	■	-	■	■	■	-	■	-	□
Trichloroethane	■	-	?	■	■	-	■	-	■
Trichloroethylene	■	-	-	■	■	-	■	-	■
Xylene	■	-	□	■	■	-	■	-	□
Acids									
Acetic acid, 25%	■	■	■	■	■	■	■	■	-
Acetic acid, 96%	■	-	■	■	■	■	■	?	-
Hydrochloric acid, 25%	■	□	■	■	-	□	■	-	■
Hydrochloric acid, 37%	■	-	■	■	-	■	■	-	■
Hydrofluoric acid, 25%	-	-	■	■	-	□	■	-	□
Hydrofluoric acid, 50%	-	-	■	■	-	□	■	-	□
Perchloric acid, 25%	■	□	■	■	-	■	■	-	■
Phosphoric acid, 25%	■	□	■	■	□	■	■	-	■
Phosphoric acid, 85%	■	□	■	■	□	■	■	-	■
Nitric acid, 25%	■	-	■	■	-	□	■	-	■
Nitric acid, 65%	■	-	-	■	-	-	■	-	■
Sulfuric acid, 25%	■	■	■	■	□	■	■	-	■
Sulfuric acid, 98%	■	-	-	■	-	-	■	-	■
Trichloroacetic acid, 25%	■	□	■	■	-	■	■	-	-
Bases									
Ammonium, 1N	■	-	■	■	■	■	■	-	-
Ammonium hydroxide, 25%	■	-	■	■	■	■	■	■	-
Potassium hydroxide, 32%	■	-	■	■	■	■	■	□	□
Sodium hydroxide, 32%	■	-	■	■	■	■	■	□	■
Sodium hydroxide, 1N	■	-	■	■	■	■	■	■	■
Aqueous Solutions									
Formaline, 30%	■	■	■	■	■	■	■	□	■
Hydrogen peroxide, 35%	■	■	■	■	■	■	■	■	■
Sodium hypochlorite, 5%	■	■	■	■	■	■	■	■	■

Key to Symbols

■ = Compatible □ = Limited compatibility
 - = Not compatible ? = Not tested

Contact time: 24 hours at 20°C


Chemical compatibilities can be influenced by various factors. Therefore, we recommend that you confirm compatibility with the liquid you wish to filter by performing a trial filtration run before you begin with actual filtration.

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