Environmental testing for water, air, and soil



cytiva

Quality matters

Cytiva's business is committed to quality. Our Whatman™ brand products are manufactured from high-purity raw materials, and our factories all operate to ISO 9001:2008 standards. Our filter selection recommendations are built on the combination of expertise in modern methods and almost 300 years of history in the paper and membrane filtration business.

Accurate and reliable analytical results are important when monitoring air, water, and soil, and Cytiva knows that you depend on us to make sure your filtration step is efficient, reproducible, and preserves the integrity of your sample. Whether you are using one of our glass papers, syringe filters, or other Whatman products, you can count on Cytiva to understand that quality matters.

This brochure highlights Cytiva's filtration solutions offered for the applications shown on page 3. We also offer interactive filter selection tools so you can quickly and easily find a filtration product that will work well for you.



An online version is available at
www.cytiva.com/LabFilterSelector



iPad™ and Android™ versions can be found in the Apple™ and Google™ app stores, respectively. Please search for "Whatman filters".

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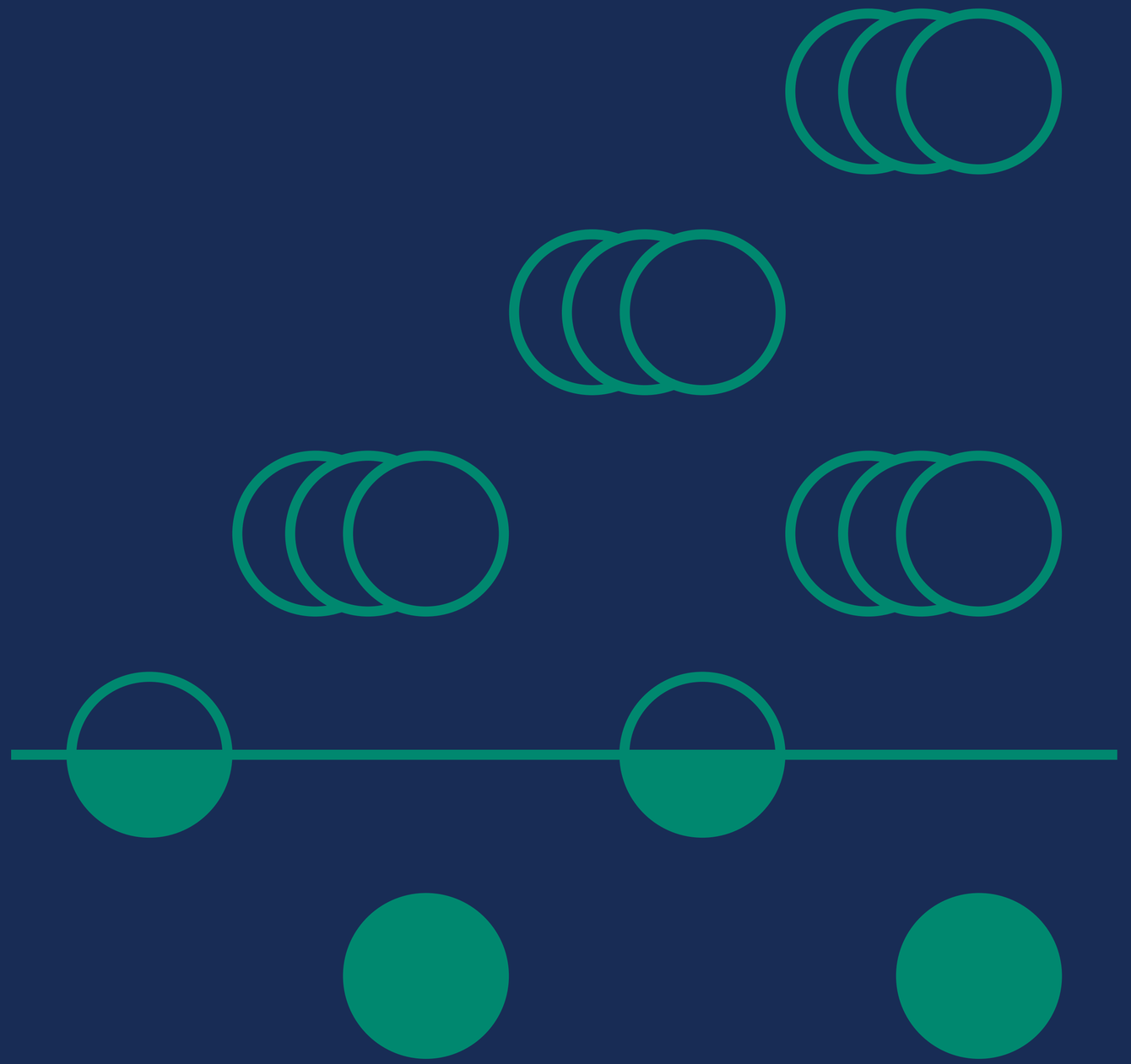
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01
Water



Physical analysis

Solids analysis

The level of suspended solids in a water sample is determined by pouring a carefully measured volume of water through a preweighed filter with a specified pore size, drying the filter to remove the water, and then weighing the filter again. The weight gain of the filter is a dry weight measure of the particulates present in the water sample expressed in units derived or calculated from the volume of water filtered (typically milligrams per liter).

Suspended solids measurements are typically performed using glass fiber filter circles that need additional preparation prior to use. However, Cytiva has developed ready-to-use 934-AH™ RTU glass fiber filters, which are supplied in a prewashed and preweighed format and enable considerable time savings in the laboratory. 934-AH RTU filters also provide reproducible results and low background contamination.



Fig 1. Total solids analysis workflow using filtration-based methods.

What are you testing for?	Product	Characteristics and benefits
Solids, including: • total suspended • total dissolved • total volatile	**GF/C™** **934-AH glass fiber filters** Ordering information p. 7	• Conform to requirements of standard methodologies: GF/C for EN 872 (Fig 2); 934-AH for Standard Method 2540D • High loading capacity enabling filtration of very turbid samples • Retention of very fine particles
	934-AH RTU Ordering information p. 7	• Share same benefits as traditional 934-AH glass fiber filters • Ready-to-use format • Prewashed, preweighed according to 2540D • Each pretreated filter comes in an aluminium pan, with the filter weight clearly noted • Each pan has its own unique barcode



Fig 2. GF/C glass fiber filters meet the requirements of EN 872.

Ordering information

Glass fiber filters for solids analysis, 100/pack

Grades	GF/C	934-AH	934-AH RTU preweighed, prewashed*
Typical particle retention (µm)**	1.2 µm	1.5 µm	1.5 µm
Diameter (mm)	Product code	Product code	Product code
42.5	1822-042	1827-042	9907-042
47	1822-047	1827-047	9907-047
55	1822-055	1827-055	9907-055
70	1822-070	1827-070	–
90	1822-090	1827-090	9907-090

* Each filter is supplied in an individual aluminum pan

** Particle retention rating at 98% efficiency



Chemical analysis

Dissolved heavy metals

Chemical analyses are commonly performed using analytic instrumentation. Filtration of water samples prior to analysis is good practice in order to remove unwanted particles from the analysis and to protect delicate instrumentation from potentially damaging compounds.

Accurate analysis of heavy metals such as lead or mercury depends on not introducing any interference into the sample from consumables used in the analytical preparation process. Water samples are often high in particulate matter, which can present filtration challenges because the particulates can readily block membrane filters. Traditionally, a glass fiber pre-filter has been used to alleviate this problem. However, filters containing some types of glass fiber can introduce trace metals into the sample. To avoid potential sample contamination, Cytiva offers a syringe filter that incorporates an effective pre-filter composed of polypropylene rather than glass fiber.

GD/XP syringe filters

GD/XP syringe filters can be used with samples that require inorganic ion analysis (e.g., trace metal analysis using inductively coupled plasma-mass spectrometry [ICP-MS]).

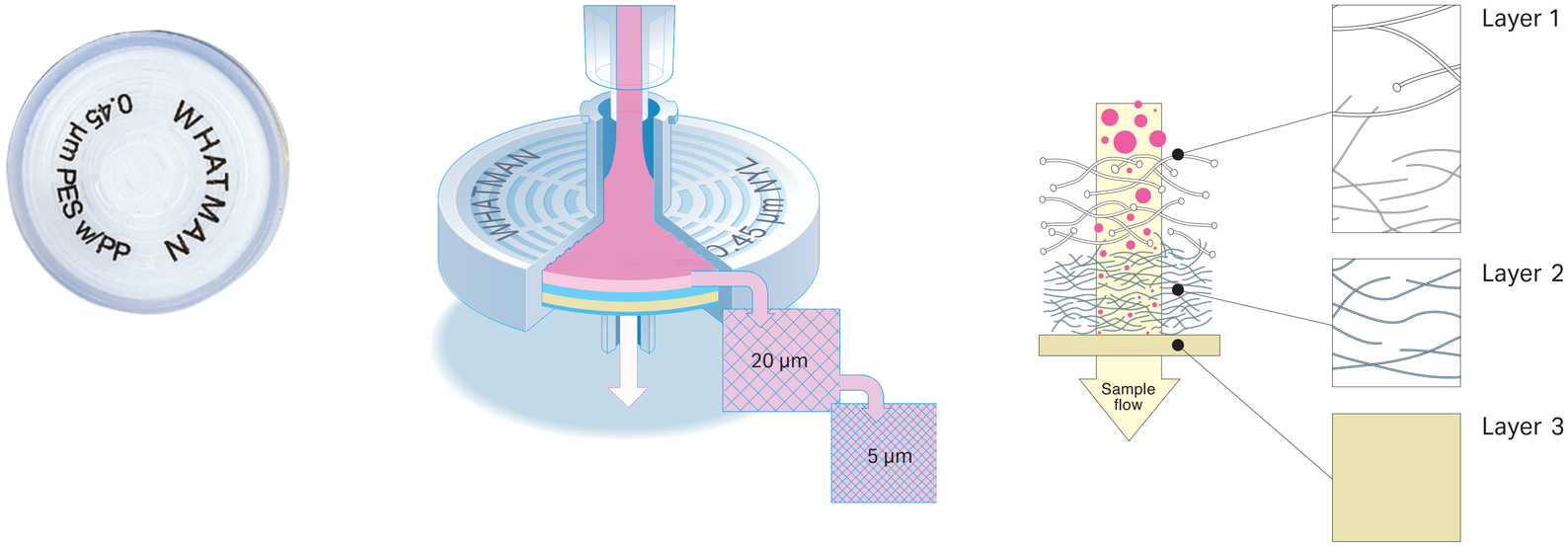


Fig 3. GD/XP syringe filters contain multiple filtration layers, which subsequently reduce blockage and increase volume throughput.

What are you testing for?	Product	Characteristics and benefits
Dissolved heavy metals	**GD/XP syringe filters, 25 mm** (filtration in the lab); Fig 3 Ordering information p. 10	• Pre-filter made of polypropylene for minimization of ion extractables • Integrated prefiltration with a dual-layer prefilter stack and one final 0.45 µm membrane • Easy filtration of hard-to-filter samples • Filtration of larger sample volumes compared to filters without pre-filters
	Polydisc GW and Polycap GW in-line filters (filtration in the field); Fig 4 Ordering information p. 10	• Integrated prefilter • Easy filtration of hard-to-filter samples • Filtration of larger sample volumes compared to filters without pre-filters



Fig 4. Polycap GW (left) and Polydisc GW (right) are designed for sample preparation of ground water samples for the analysis of dissolved heavy metals.

Ordering information

GD/XP syringe filters

Membrane type	Nylon	PVDF	PP	PES	
Pore size (µm)	Product code	Product code	Product code	Product code	Quantity
0.45	6970-2504	6972-2504	6992-2504	6994-2504	150/pack
0.45	6971-2504	6973-2504	6993-2504	6995-2504	1500/pack

In-line filters

Quantity	1/pack	100/pack	20/pack	50/pack
Product	Product code	Product code	Product code	Product code
Polydisc GW Filter 50 mm, nylon with quartz fiber prefilter, 0.45 µm	–	–	10463400	10463401
Polycap GW 75, 0.45 µm, PES membrane	6714-6004	6724-6004	–	–



Dissolved ions

Filters for sample preparation prior to ion chromatography testing should feature very low levels of anion leaching.

What are you testing for?	Product	Characteristics and benefits
Dissolved ions	Anotop™ IC syringe filters	• Contain a proprietary alumina-based Anopore™ membrane that exhibits very low levels of anion leaching (e.g., fluoride, sulfide, nitrate, nitrite) during ion chromatography (IC) testing • Pigment-free PP housing to eliminate sample contamination • Flexibility – available in either 10 mm or 25 mm diameter • Certified and guaranteed low levels of anion leaching



Ordering information

Anotop IC syringe filters

Membrane/pore size	Diameter	Quantity	Product code
Aluminum oxide – 0.2 µm	10 mm	100/pack	6909-9233
Aluminum oxide – 0.2 µm	10 mm	200/pack	6809-9234
Aluminum oxide – 0.2 µm	25 mm	200/pack	6809-9244

Dissolved organic carbons

Organic matter content is usually measured as dissolved organic carbon (DOC), which is an important component of the carbon cycle. DOC is defined as the organic matter that is able to pass through a filter, typically one with a 0.45 µm pore size.

Puradisc Aqua syringe filters are specifically designed for filtration of environmental samples prior to DOC analysis.

What are you testing for?	Product	Characteristics and benefits
Dissolved organic carbons	Puradisc Aqua 30 syringe filters	• Contain prewashed membranes (prior to assembly) to reduce organic carbon level and ensure low background • Designed for aqueous samples • Hydrophilic cellulose acetate membrane, 30 mm diameter



Ordering information

Puradisc Aqua syringe filters

Membrane/pore size	Diameter	Quantity	Product code
Cellulose acetate – 0.45 µm	30 mm	50/pack	10462656
Cellulose acetate – 0.45 µm	30 mm	100/pack	10462655
Cellulose acetate – 0.45 µm	30 mm	500/pack	10462650

HPLC, UHPLC, and other analytical techniques

What are you testing for?	Low solids content		Hard-to-filter samples		HPLC/GC autosamplers	
Product	**Puradisc** Ordering information p. 14 	**SPARTAN™** Ordering information p. 14 	**Whatman GD/X™** Ordering information p. 15 	**GD/XP** Ordering information p. 15 	**Mini-UniPrep™** Ordering information p. 16 	**Mini-UniPrep G2** Ordering information p. 17 
Characteristics and benefits	• Wide range of membranes, pore sizes and diameters • Pre-filter: no • Diameter: 4, 13, 25, or 30 mm • Available pore sizes: 0.1, 0.2, 0.45, 0.8, 1.0, 1.2, 5 µm • Membrane materials available: Cellulose acetate, nylon, PES, PVDF, PP, PTFE , GF	• HPLC certified • Pre-filter: no • Diameter: 13 or 30 mm • Available pore sizes: 0.2 or 0.45 µm • Membrane materials available: Regenerated cellulose	• For hard-to-filter samples • Pre-filter: multilayer glass filter • Diameter: 13 or 25 mm • Available pore sizes: 0.2, 0.45, 0.7, 1.0, 1.2, 1.5, 2.7, 5.0 µm • Membrane materials available: Cellulose acetate, nylon, PES, PVDF, PP, PTFE, RC	• For hard-to-filter samples where analytes of interest are inorganic ions • Pre-filter: Multilayer polypropylene • Diameter: 25 mm • Available pore sizes: 0.45 µm • Membrane materials available: Nylon, PES, PVDF, PP, PTFE	• All-in-one filter and PLASTIC autosampler vial • Pre-filter: no • Dimensions: Once compressed equivalent to 12 mm × 32 mm vial • Available pore sizes: 0.2 or 0.45 µm • Membrane materials available: PTFE, RC, Nylon, PVDF, PES, PP, GMF	• All-in-one filter and GLASS autosampler vial • Pre-filter: no • Dimensions: Once compressed equivalent to 12 mm × 32 mm vial • Available pore sizes: 0.2 or 0.45 µm • Membrane materials available: PTFE, Nylon, PVDF, PP, GMF, RC

RC = regenerated cellulose, PVDF = polyvinylidene difluoride, PTFE = polytetrafluoroethylene, PP = polypropylene, PES = polyethersulfone, GMF = glass microfiber filter, GF = glass fiber, CA = cellulose acetate

Regenerated cellulose membranes

Suitable for filtration of both aqueous and organic samples.

We offer a range of filters for sample preparation for commonly used analytical techniques in water monitoring such as:

• HPLC or UHPLC • Continuous flow analysis • Gas chromatography (GC)

Ordering information – chemical analysis of water

Puradisc syringe filters

Membrane type/ diameter	Nylon 25 mm	PVDF 25 mm	PTFE 25 mm	PP 25 mm	PES 25 mm		CA 30 mm	
Pore size	Product code	Product code	Product code	Product code	Product code	Quantity	Product code	Quantity
0.2 µm	6751-2502	6747-2502	6785-2502	6788-2502	6781-2502	200/pack	10462710	100/pack
0.2 µm	6753-2502	–	6798-2502	6790-2502	6794-2502	1000/pack	10462700	500/pack
0.45 µm	6751-2504	6747-2504	6785-2504	6788-2504	6781-2504	200/pack	10462610	100/pack
0.45 µm	6753-2504	6749-2504	6798-2504	6790-2504	6794-2504	1000/pack	10462600	500/pack

SPARTAN syringe filters

Diameter		13 mm	13 mm with mini-tip	30 mm	
Membrane	Pore size	Product code	Product code	Product code	Quantity
Regenerated cellulose	0.2 µm	10463100	10463040	10463060	100/pack
Regenerated cellulose	0.2 µm	10463102	10463042	10463062	500/pack
Regenerated cellulose	0.45 µm	10463110	10463030	10463050	100/pack
Regenerated cellulose	0.45 µm	10463112	10463032	10463052	500/pack

Ordering information – chemical analysis of water

GD/X syringe filters (glass fiber prefilter), 25 mm diameter

Membrane type	Nylon	PVDF	PTFE	PP	PES	CA	RC	
Pore size	Product code	Product code	Product code	Product code	Product code	Product code	Product code	Quantity
0.2 µm	6870-2502	6872-2502	6874-2502	6878-2502	6876-2502	6880-2502	6887-2502	150/pack
0.2 µm	6871-2502	6873-2502	6875-2502	–	6905-2502	–	–	1500/pack
0.45 µm	6870-2504	6872-2504	6874-2504	6878-2504	6876-2504	6880-2504	6882-2504	150/pack
0.45 µm	6871-2504	6873-2504	6875-2504	6879-2504	6905-2504	6881-2504	6883-2504	1500/pack

GD/XP syringe filters (polypropylene prefilter), 25 mm diameter

Membrane type	Nylon	PVDF	PTFE	PP	PES	
Pore size	Product code	Product code	Product code	Product code	Product code	Quantity
0.45 µm	6970-2504	6972-2504	6974-2504	6978-2504	6994-2504	150/pack
0.45 µm	6971-2504	6973-2504	–	6993-2504	6995-2504	1500/pack

Ordering information – chemical analysis of water

Mini-UniPrep with polypropylene housing

Membrane type			PTFE	PVDF	Nylon	PP	RC	PES	
Pore size	**Housing**	**Cap**	**Product code**	**Product code**	**Product code**	**Product code**	**Product code**	**Product code**	**Quantity**
0.2 µm	Translucent	Standard	UN203NPEORG	UN203NPEAQU	UN203NPENYL	UN203NPEPP	UN203NPERC	UN203NPEPES	100/pack
0.45 µm	Translucent	Standard	UN203NPUORG	UN203NPUAQU	UN203NPUNYL	UN203NPUPP	UN203NPURC	UN203NPUPES	100/pack
0.2 µm	Amber	Standard	UN203APEORG	UN203APEAQU	UN203APENYL	UN203APEPP	–	UN203APEPES	100/pack
0.45 µm	Amber	Standard	UN203APUORG	UN203APUAQU	UN203APUNYL	UN203APUPP	–	UN203APUPES	100/pack
0.2 µm	Translucent	Slit septum	US203NPEORG	US203NPEAQU	US203NPENYL	US203NPEPP	–	US203NPEPES	100/pack
0.45 µm	Translucent	Slit septum	US203NPUORG	US203NPUAQU	US203NPUNYL	US203NPUPP	–	–	100/pack

Ordering information – chemical analysis of water

Mini-UniPrep G2 with inner glass storage vial (hand or multicompressor required for use)

Membrane type			PTFE	PVDF	Nylon	PP	GMF	RC	
Pore size	**Housing**	**Cap**	**Product code**	**Product code**	**Product code**	**Product code**	**Product code**	**Product code**	**Quantity**
0.2 µm	Translucent	Standard	GN203NPEORGSP	GN203NPEAQUSP	GN203NPENYLSP	GN203NPEPPSP	–	GN203NPERCSP	100 + 1 HC
0.2 µm	Translucent	Standard	GN203NPEORG	GN203NPEAQU	–	GN203NPEPP	–	GN203NPERC	100/pack
0.45 µm	Translucent	Standard	GN203NPUORGSP	GN203NPUAQUSP	–	–	GN203NPUGMFSP	GN203NPURCSP	100 + 1 HC
0.45 µm	Translucent	Standard	GN203NPUORG	GN203NPUAQU	–	–	GN203NPUGMF	GN203NPURC	100/pack
0.2 µm	Amber	Standard	GN203APEORGSP	GN203APEAQUSP	–	–	–	–	100 + 1 HC
0.2 µm	Translucent	Slit septum	GS203NPEORGSP	–	–	–	–	–	100 + 1 HC
0.45 µm	Translucent	Slit septum	GS203NPUORGSP	–	–	–	GS203NPUGMFSP	–	100 + 1 HC
0.45 µm	Translucent	Slit septum	–	–	–	–	GS203NPUGMF	–	100/pack

HC = Hand compressor

Compressors for Mini-UniPrep

Compressor suitable for	Description	Product code	Quantity
Mini-UniPrep G2 (glass vial)	Hand compressor - 1 position	MUPG2PWC1	1/pack
	Multi Compressor - 8 positions (includes 1 tray)	MUPG2MCPWC8	1/pack
Mini-UniPrep (plastic vial)	Multi Compressor - 6 positions	CR0000006	1/pack



Fig 5. Mini-UniPrep G2 Multi Compressor.

Microbiological analysis

Bacterial count and/or detection

MBS I system and membranes

The MBS I filtration system is designed for laboratories that handle high numbers of samples for microbiological quality control.

Workflow



(A)

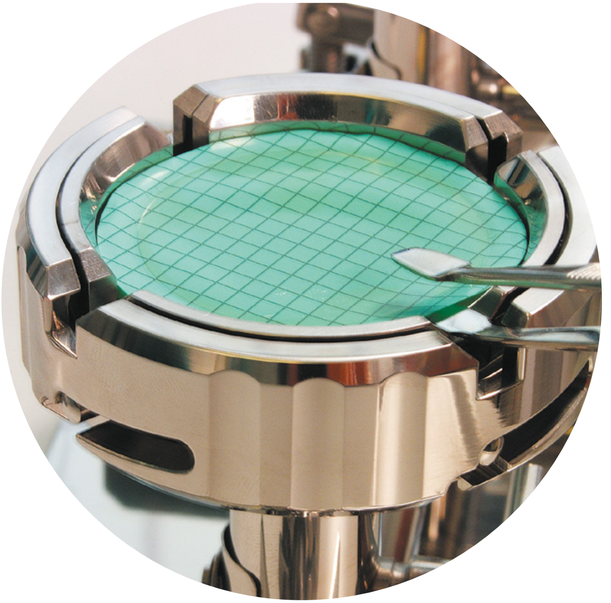
Tight sealing of funnel and membrane reducing any cross contamination to a minimum by special sealing technique.



(B)

Flexibility.

- Volume — either 100 ml or 350 ml
- Material — either ABS or PP
- PP version can be autoclaved up to 50 times



(C)

Easy removal of the membrane.

Membranes

We provide a wide and versatile range of filtration membranes that deliver high-quality performance consistently. The appropriate membrane filter choice will depend on the methodology being followed. ME and Microplus membranes are sterile and individually packed.

Membrane material	Cellulose mixed ester	High-flux cellulose nitrate	Nylon (polyamide)	Polycarbonate
Product name	ME	MicroPlus	NL	Nuclepore™
Color	White, black or green	White or black	White	White or black
Pore size	0.2 µm/0.45 µm/ 0.6 µm/0.8 µm	0.45 µm	0.2 µm/0.45 µm	0.2 µm/0.4 µm (and other pore sizes)
Application examples	*Enterococcus, E. coli, Clostridia,* Fecal coliforms, *Staphyloccus, Pseudomonas aeruginosa, etc*		*Legionella*	*Legionella*

Filtration considerations

Microorganisms in a water sample are collected using a microfiltration membrane filter. The membrane can then be transferred onto a microbiological culture medium for further identification and/or quantification of microorganisms.

Membrane filtration methods are commonly used for the detection of microorganisms such as *E. coli*, *Clostridia*, fecal coliforms, *Legionella*, *Staphylococci*, and *Pseudomonas aeruginosa*. These methods involve the use of membrane filters and filtration manifolds.

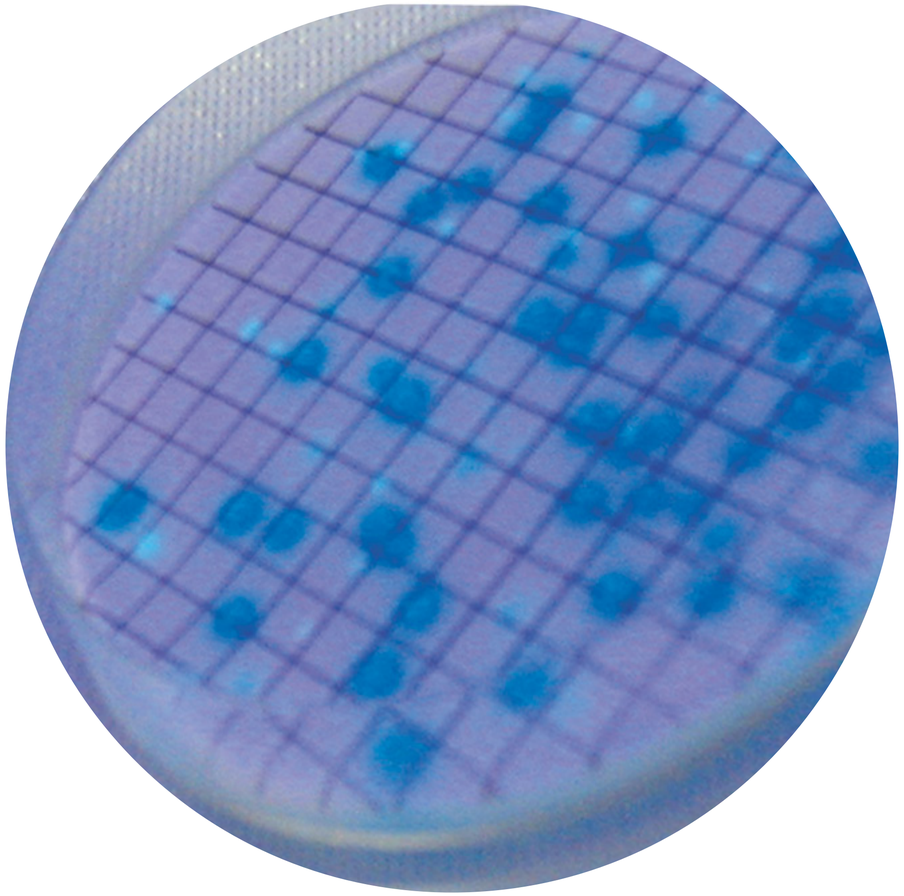


Fig 6. Gridded membrane on agar plate containing bacterial colonies.

What are you testing for?	Product	Characteristics and benefits
Bacterial count and/or detection	Membranes	• Both sterile and nonsterile options • Range of pore sizes available • ME and MicroPlus membranes are sterile and individually packed. They contain a folded strip of filters for use with our membrane dispenser
	Accessories: Membrane-Butler membrane dispenser (manual version); Fig 7	With each turn a membrane filter is ejected and can be removed easily with a pair of tweezers. • Cross-contamination risks are minimized • Membrane is dispensed rapidly
	Other microbiological control accessories: funnel dispenser, funnels, tweezers, autoclaving bags	• Waste reduction, because PP funnels can be autoclaved up to 20 times • Time saving; no need to flame in between filtrations • Easy handling • Reduce cross-contamination • Reproducible results • Low background contamination





Ordering information

Membrane filters

Diameter					25 mm	47 mm	50 mm	
Membrane material/type	**Pore size**	**Color**	**Sterile**	**Membrane-Butler compatible**	**Product code**	**Product code**	**Product code**	**Quantity**
Cellulose mixed ester/ ME type	0.2 µm	white	yes	no	–	10406970	10406972	100/pack
	0.2 µm	white	yes	yes	–	10408712	10408714	400/pack
	0.45 µm	white	yes	no	–	10406870	10406872	100/pack
	0.45 µm	white	yes	yes	–	10407312	10407314	400/pack
	0.45 µm	black/white grid	yes	yes	–	10409770	–	100/pack
	0.45 µm	black/white grid	yes	yes	–	10407332	–	400/pack
Cellulose nitrate/ Microplus	0.45 µm	white	yes	no	–	10407713	10407714	100/pack
	0.45 µm	white	yes	yes	–	10407112	10407114	400/pack
	0.45 µm	black	yes	no	–	–	10407734	100/pack
	0.45 µm	black	yes	yes	–	10407132	–	400/pack
Polycarbonate/ Nuclepore	0.2 µm	white	no	no	–	111106	111206	100/pack
	0.4 µm	white	no	no	–	111107	111207	100/pack
	0.8 µm	black	no	no	110659	–	–	100/pack
Nylon (Polyamide)/NL	0.4 µm	white	no	no	–	10414112	10414114	100/pack

Accessories for microbiological control

Product	Description	Quantity/pack	Product code
AS 200	2-place vacuum manifold	1	10 445 890
Funnel dispenser	Automatic dispenser for funnels	1	10 445 870
Funnels 100 ml	PP (autoclavable)	20	10 445 861
Funnels 350 ml	PP (autoclavable)	20	10 445 866
Autoclaving bags	Autoclaving bags for MBS I funnels	20	10 445 868
Membrane-Butler	Manual dispenser for membranes	1	10 477 100



Fig 7. Membrane-Butler

02
Air



Particulate monitoring

Manual air sampling

Two of the most significant fractions of suspended particulate matter are the respirable fraction (< 2.5 µm) and the inhalable fraction (< 10 µm). Two important tests performed in air monitoring of particulate matter, PM 2.5 and PM 10, pertain to these two fractions. Whatman glass fiber filters from Cytiva are recommended for gravimetric determination of airborne particulates, such as PM 10, stack sampling, and absorption methods of air pollution monitoring.

In the analysis of collected particulate matter, care should be given to the choice of the filter medium used. The filter medium should give little or no background level for the elements and/or compounds being analyzed and should cause minimal interference in the determination.

Glass fiber filters and thimbles

Whatman glass microfiber filters (such as GF/A and EPM 2000) and quartz filters (such as QM-A) are particularly suitable for gravimetric determination of particulates due to the high retention efficiency of the media combined with rapid flow characteristics, low pressure drop, high loading capacity, and low affinity for moisture. PTFE membranes are often used for specific gravimetric analyses (e.g., PM 2.5 monitoring or vehicle emissions testing) according to the employed methodology.

Stack gases are often monitored at high temperatures for which glass microfiber or quartz filters, such as QM-A or thimbles, are appropriate.

PTFE membranes

Whatman TE type and PM 2.5 are chemically resistant and possess low chemical background interference (e.g., metals), allowing the user to carry out sensitive determinations.

Whatman TE membranes are general purpose PTFE membrane filters that have multiple applications in environmental analysis.

PM 2.5 filters are used for the measurement of fine particulate matter in the atmosphere for the EPA PM 2.5 reference method (under the requirements of 40 CFR Part 50 Appendix L).



What are you testing for?	Product	Characteristics and benefits
Particulate manual sampling: normal environment	**• Glass fiber filters such as GF/A and EPM 2000** **• PTFE TE type** **• Glass fiber thimbles** **• PM 2.5 membranes** Ordering information for all products p. 27-28 	**GF/A** • Binder free • Glass fiber • Fine particle retention • High flow rate • Good loading capacity **EPM 2000** • Binder free • Glass fiber • Used in high-volume PM-10 air sampling equipment • Detailed chemical analysis of trace pollutants **Glass fiber thimbles** • Binder and binder free • Glass fiber • Used at temperatures up to 500°C **GF 10** • Binder • Glass fiber • Extreme mechanical stability • Used up to 180°C **TE type PTFE membranes** • Suitable for filtration of gases and liquids • Resistant to most acids, alkalis, and solvents such as sodium hydroxide and hexane • Laminated onto a nonwoven polypropylene support material • Increased durability for aggressive testing environments • Hydrophobic characteristics prevent passage of aqueous aerosols (e.g., during venting applications) **PM 2.5 membranes** • Used for PM 2.5 ambient air monitoring • Conform to EPA PM 2.5 reference method under the requirements of 40 CFR Part 50 Appendix L • Do not contain glues or adhesives • Sequentially numbered for easy traceability of the filter • Chemically resistant polypropylene support ring, which eliminates curling and makes the filter robot-friendly • Retain a minimum of 99.7% of 0.3 µm size particulates

* Please contact your Cytiva representative for information on SAS and PAS cards

What are you testing for?	Product	Characteristics and benefits
Particulate manual sampling: aggressive environment (high temperature and acidic)	• **Quartz fiber filter such as QM-A and QM-H** • **Quartz fiber thimbles** Ordering information for all products p. 34 	**QM-A quartz fiber filters** • High-purity quartz microfiber • Used for air sampling, particularly at high temperatures up to 500°C **QM-H quartz fiber filters** • 100% pure quartz • Can be used up to 900°C • Low heavy metal content **Quartz fiber thimbles** • Made from high-purity quartz microfiber • Able to withstand high temperatures up to 800°C • Suitable for both solvent extraction and air sampling applications
Particulate automated sampling	• **Glass microfiber reels** Ordering information p. 29	• Binder • Glass fiber • Extreme mechanical stability • Used up to 180°C
Radioactivity	• **Grade 72** Ordering information p. 28 • **SAS cards for static air sampling*** • **PAS cards for personal air sampling*** • **Glass fiber filters such as GF/A** Ordering information p. 28	**Grade 72** • Glass fiber/cellulose • Used to absorb radioactive iodine in air pollution monitoring and in nuclear installations
Metal chemical analysis	• **Mixed cellulose ester membranes** Ordering information p. 27	• Typically used in applications for the determination of metals in airborne particulates

* Please contact your Cytiva representative for information on SAS and PAS cards

Ordering information – manual air sampling

Membrane filters

Diameter		25 mm	37 mm	46.2 mm	47 mm	50 mm	
Membrane type	**Pore size**	**Product code**	**Product code**	**Product code**	**Product code**	**Product code**	**Quantity**
PM 2.5 PTFE membrane	2 µm	–	–	7592-104	–	–	50/pack
TE type PTFE membrane	0.2 µm	10411405	–	–	10411411	10411413	50/pack
	0.45 µm	10411305	–	–	10411311	10411313	50/pack
	1 µm	10411205	–	–	10411211	10411213	50/pack
	5 µm	–	10411108	–	10411111	10411113	50/pack
Mixed cellulose ester membrane	0.2 µm	10401706	–	–	10401712	10401714	100/pack
	0.45 µm	10401606	–	–	10401612	10401614	100/pack
	0.8 µm	10400906	10400909	–	10400912	10400914	100/pack
	3 µm	10400706	–	–	10400712	10400714	100/pack

Ordering information – manual air sampling

Glass fiber filters, circles and sheets

Dimensions	25 mm	37 mm	47 mm	50 mm	90 mm	8 × 10 inches (sheet)	
Membrane type	**Product code**	**Product code**	**Product code**	**Product code**	**Product code**	**Product code**	**Quantity**
GF/A	1820-025	1820-037	1820-047	1820-050	1820-090	1820-866	100/pack
EPM 2000	–	–	1882-047	–	–	1882-866	100/pack
GF 10	–	–	–	–	10370305	–	100/pack
GF 10	–	–	10370319	10370302	–	–	200/pack
Grade 72	–	–	1872-047	–	–	–	100/pack

Glass fiber thimbles

Dimensions*	22 × 80 mm	25 × 100 mm	26 × 100 mm	33 × 94 mm	10 × 38 mm	
Binder	**Product code**	**Product code**	**Product code**	**Product code**	**Product code**	**Quantity**
Inorganic binder	10371011	10371019	10371023	10371042	10371103	25/pack

*internal diameter × external length

Other dimensions available for thimbles (with or without binder). Please contact your Cytiva representative.

Automated air sampling

Cytiva's microfiber filter can be customized in reel format for automated air sampling systems (Fig 9).

Glass fiber filters with binder, reels

Dimensions	70 mm × 50 m	35 mm × 30 m	40 mm × 42 m	50 mm × 100 m	
Grade	**Product code**	**Product code**	**Product code**	**Product code**	**Quantity**
GF 10	10370384	10370392	10370393	10370394	1/pack

Other reel dimensions are available. Please contact your Cytiva representative.



Fig 9. Glass fiber reel for automated samplers.

Chemical analysis

Heavy metals, organics, and inorganics

Air pollution monitoring from stacks, flues, and aerosols requires a filter that can withstand chemically harsh environments and high temperatures. High-purity quartz (SiO_2) microfiber filters are favored for these reasons and their applicability for heavy metals analysis.

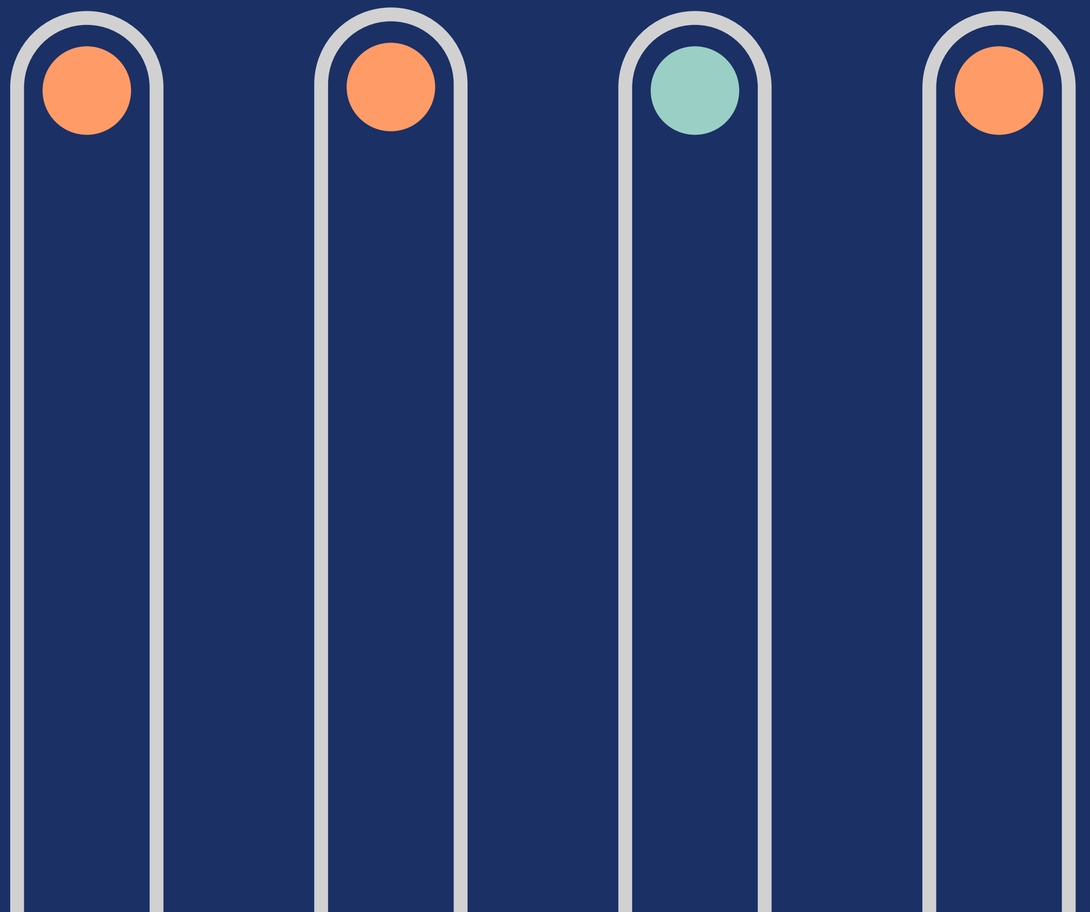
Quartz fiber filters and thimbles

Cytiva offers two types of quartz filters — QM-A and QM-H. The low level of alkaline earth metals in these filters virtually eliminates artifact products of sulfates and nitrates (from SO_2 and NO_2, respectively).

QM-H is a pure quartz fiber filter with low heavy metal content. Quartz thimbles are also available.

Mixed cellulose ester membranes

Mixed cellulose membranes from Cytiva are designed to meet your environmental air monitoring requirements. These membranes are typically used in applications for the determination of metals in airborne particulates.



What are you testing for?	Product	Characteristics and benefits
Heavy metals	• **Quartz fiber filters such as QM-A and QM-H** Ordering information p. 34 • **EPM 2000 glass fiber filters** Ordering information p. 28	**QM-A** • High-purity quartz microfiber • Used for air sampling, particularly at high temperatures up to 500°C **QM-H** • 100% pure quartz • Can be used up to 900°C • Low heavy metal content
Other organic or inorganic chemicals (such as ozone, volatile organic carbons, SO_2, NO_2, CO, Benzoate)	• **Glass fiber filters such as GF/A** Ordering information p. 28 • **Quartz fiber filters such as QM-A and QM-H** Ordering information p. 34 • **Cellulose filters*** • **PTFE membranes** Ordering information p. 27	**Quartz fiber thimbles** • Made from high-purity quartz microfiber • Able to withstand high temperatures up to 800°C • Suitable for both solvent extraction and air sampling applications

* Please contact your Cytiva representative for information on cellulose filters



Fig 10. QM-A quartz fiber filter

Asbestos testing

Asbestos analysis is commonly undertaken by a number of microscopy techniques such as Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), and Phase Contrast Microscopy (PCM).

These methods usually involve sampling and/or observation, both of which involve the use of membrane filters such as polycarbonate or mixed cellulose ester membranes.

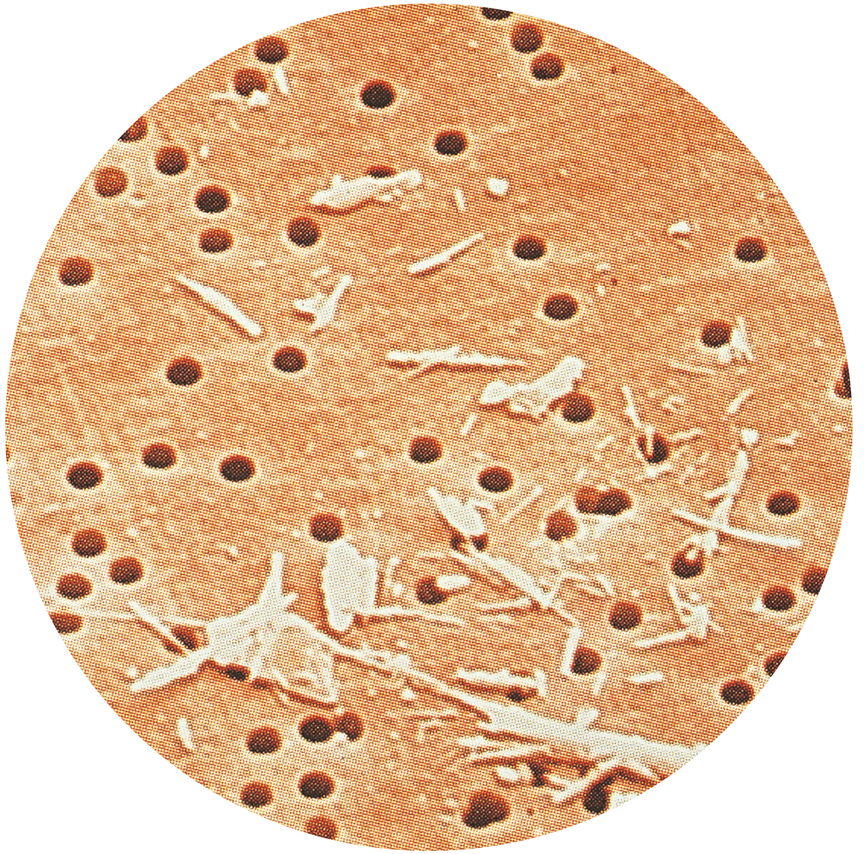


Fig 11. Asbestos fibers on a Cyclopore membrane.

Optical analysis for asbestos sampling

Cytiva provides Whatman membranes for the main asbestos sampling methods.

Transmission electron microscopy method

Two membrane materials are typically recommended for this method:

- Mixed ester membrane (e.g., WME membrane)
- Polycarbonate membrane (e.g., Whatman Cyclopore™ or Nuclepore membranes)

See the following tables for more information.

Phase-contrast microscopy method

One of the techniques used to optically determine the asbestos fiber count is the "hot block" method. Crucial to this method is the membrane filter that is used to collect fibers from a defined volume of air. During processing the membrane is made transparent with acetone vapor. Mixed cellulose ester membrane from Cytiva is the recommendation for this application.

Scanning electron microscopy method

Cytiva offers a range of polycarbonate membranes, Cyclopore and Nuclepore. Nuclepore is also available in a gold-coated format.

What are you testing for?	Product	Characteristics and benefits
Asbestos	**WME mixed cellulose ester membrane** Ordering information p. 35	• Typically used for Phase contrast microscopy (PCM) and Transmission electron microscopy (TEM) • Cellulose mixed ester membrane • Gridded, 0.8 µm pore size, 25 mm surface area with high loading capacity • High flow rates
	Nuclepore and Cyclopore Ordering information p. 35	• Manufactured with proprietary Whatman technology for controlled pore size distribution • Smooth, flat membrane; particles are retained on surface so are easily visible during optical analysis • Nuclepore available in two versions: gold coated or not gold coated • Typically used for electron microscopy

Ordering information

Quartz fiber filters

Product name	Dimensions	Product code	Quantity
QM-A quartz fiber filter	25 mm diam.	1851-025	100/pack
	37 mm diam.	1851-037	100/pack
	47 mm diam.	1851-047	100/pack
	50 mm diam.	1851-050	100/pack
	90 mm diam.	1851-090	100/pack
	8 × 10 inches (sheet)	1851-8866	100/pack
QM-H (100% pure) quartz fiber filter	37 mm diam.	1853-037-50	50/pack
	47 mm diam.	1853-047-50	50/pack
	50 mm diam.	1853-050-50	50/pack
	90 mm diam.	1853-090-50	50/pack
	150 mm diam.	1853-150-50	50/pack

Glass fiber extraction thimbles, 1.5 mm thick

Dimensions*	Product code	Quantity
22 × 80 mm	10371011	25/pack
25 × 100 mm	10371019	25/pack
26 × 100 mm	10371023	25/pack
33 × 94 mm	10371042	25/pack
10 × 38 mm	10371103	25/pack

* internal diameter × external length

Quartz fiber extraction thimbles, 2 mm thick

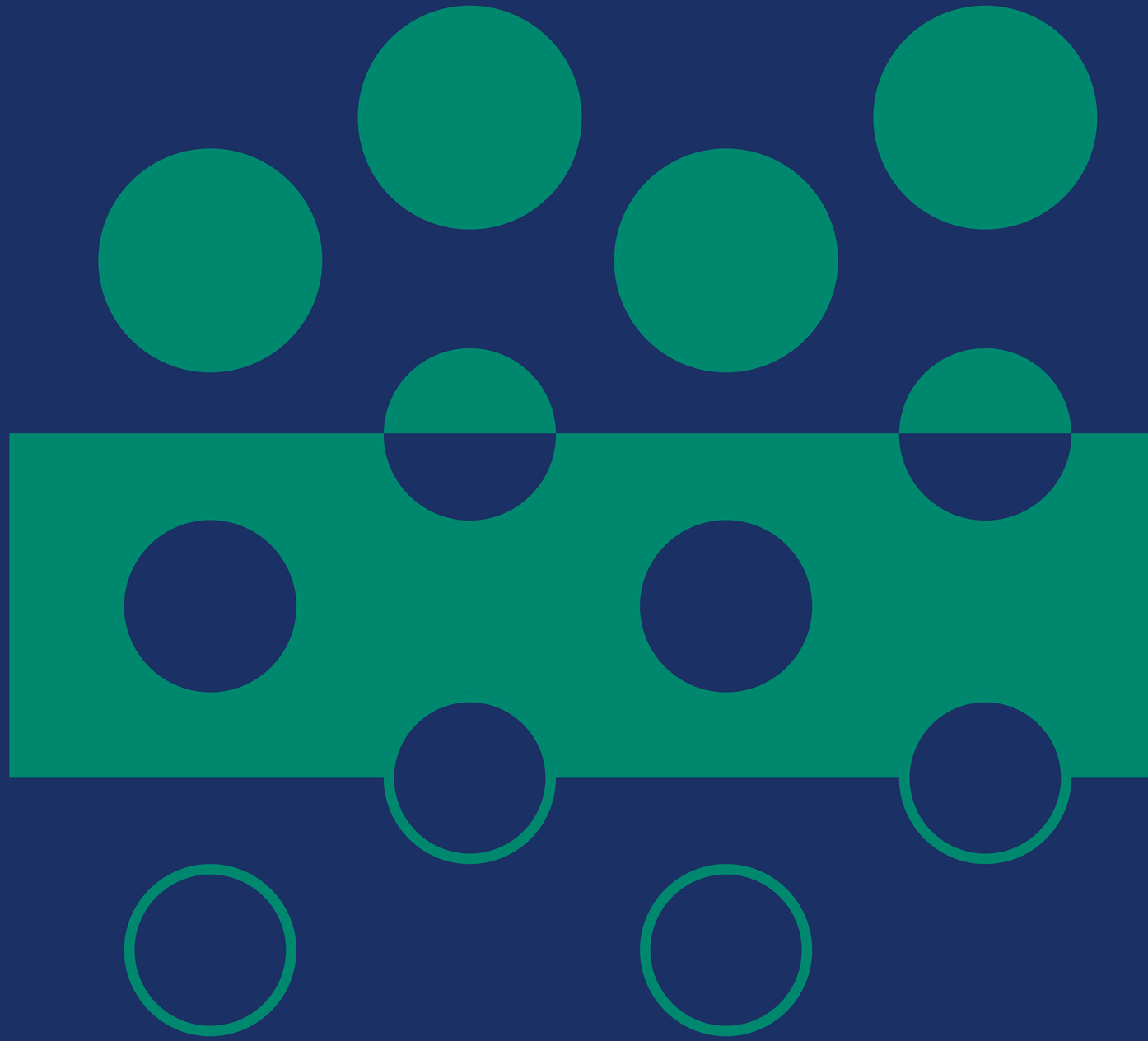
Dimensions*	Product code	Quantity
25 x 90 mm	2812-259	10/pack

* internal diameter × external length

Membrane filters for asbestos sampling and analysis

Diameter		25 mm	37 mm	47 mm	
Membrane	**Pore size**	**Product code**	**Product code**	**Product code**	**Quantity**
Nuclepore polycarbonate membrane	0.2 µm	110606	–	111106	100/pack
	0.4 µm	110607	–	111107	100/pack
	0.4 µm gold coated	170607	–	–	50/pack
	0.8 µm	110609	110809	111109	100/pack
Cyclopore polycarbonate membrane	0.2 µm	7060-2502	–	7060-4702	100/pack
	0.4 µm	7060-2504	–	7060-4704	100/pack
	1.0 µm	–	–	7060-4710	100/pack
WME cellulose mixed ester membrane	0.8 µm	7148-002	–	–	100/pack

03
Soil



Chemical analysis

Soil sample analysis requires that chemical compounds are first extracted from their matrix using pH and heat modulation and concentrated. Filters and filtration-related products play key roles throughout this process. Quality is essential to maintain the integrity of results.

What are you testing for?	What testing method?	Product
Nitrogen	Kjeldahl analysis	**Weighing boats** Ordering information p. 41
Pesticide detection	Soxhlet extraction	**Thimbles (cellulose)** Ordering information p. 41
Trace elements	Spectrophotometry and chromatography	**Syringe filters** Ordering information p. 14-15
Phosphorus	Colorimetry	**Cellulose filter papers** Ordering information p. 41
pH	pH testing	**Indicator papers** Ordering information p. 41
Retained solids and clarified solution	Gravimetric analysis. Various quantitative and qualitative analytical techniques	**Quantitative or qualitative cellulose filter papers** Ordering information p. 41

Kjeldahl nitrogen analysis

Measuring soil nitrogen content can help refine nitrogen fertilizer addition before planting.

Nitrogen content analysis is typically done with Kjeldahl techniques, which involve the sampling of an exact amount of soil before transfer to a digestion tube. Low nitrogen content weighing paper makes the sample transfer easy and quick without loss of material and with minimal interference with the end result. The sample may need to be filtered through a Whatman brand qualitative filter paper prior to analysis.



Fig 12. Low nitrogen content weighing boats.

Soxhlet extraction for chemical detection

Prior to analysis by, for example, gas chromatography (GC), soils may be prepared using Soxhlet extraction or microwave digestion. Extraction thimbles are widely used for Soxhlet techniques. Qualitative filter papers or glass fiber filters can help clear extracts after microwave extraction. Samples may then be refiltered with a 0.45 µm filter to remove small particles and protect your GC instrument. Mini-UniPrep syringeless filter, which is an all-in-one filter and autosampler vial, allows you to process samples faster than traditional syringe filters and eliminates multiple consumables. See pages 16-17 for Mini-UniPrep ordering information.



Fig 13. Extraction thimbles in Soxhlet extraction apparatus.

Spectroscopy and chromatography for trace element analysis

Trace element analysis in soil generally involves determination of essential nutrients for plant growth (e.g., potassium, magnesium, calcium) and detection of potential heavy metal contamination (e.g., lead, chromium, arsenic, zinc, copper, cadmium, mercury, and nickel).

Most trace element tests are based on extracting soil and measuring the concentration of trace elements in the soil-free liquid phase using for example inductively coupled plasma atomic emission spectrometry (ICP-AES). Extraction methods can vary between laboratories. The sample then generally needs to be filtered through a qualitative filter paper or glass fiber filter to make sure it will not clog nebulizers or interfere with injection into the analysis instrument. If digested with aqua regia, the sample may be filtered through an ashless filter paper. If syringe filters are used as an additional sample preparation step, please see “HPLC, UHPLC, and other analytical techniques” on page 13.



Fig 14. Whatman cellulose filter paper.

Colorimetry for phosphorus analysis

Through soil phosphorus testing, the amount of phosphorus fertilizer required to achieve maximum plant growth can be determined. Soils with low or medium phosphorus content will likely show higher yields if extra phosphorus is added. However, crops are not likely to respond with a yield increase in soils with high or very high phosphorus content.

To determine the soil phosphorus content, the soil is extracted with a chemical solution and the phosphorus content in the extract is measured by colorimetry. Filtration of the extract through a qualitative filter paper is generally needed before analysis. If an automated method is used for determining phosphorus concentration, acid-resistant filter paper may be needed.



Fig 15. Whatman Grade 40 ashless filter paper.

pH testing

The pH of soil is vital for how well it holds minerals. When the soil it too acidic, minerals will be leached out by rainwater before the plants have a chance to use them. Highly alkaline soils are often associated with mineral deficiencies due to the low solubility of minerals under alkaline conditions. Neutral or slightly alkaline soils are ideal for growing plants. However, some plants have very particular pH requirements.

There are many different ways of measuring soil pH. Litmus/pH paper is a quick and inexpensive method to test soil pH when a pH-meter is unavailable or when highly precise values are not necessary. When preparing your soil sample, use a weighing paper to weigh the soil before adding water. Filter papers can be used to remove unnecessary particles from the suspension.



Fig 16. Color bonded pH strips.



Clarification and solids retention

Various test methods require that liquid components of a solution be separated from suspended solids prior to analysis. Cytiva offers a wide choice of cellulose filter papers with different levels of flow rate, loading capacity, and chemical resistance to support these applications.

Whatman quantitative filter papers are designed for gravimetric analysis and the preparation of samples for instrumental analysis. They are available in three formats: ashless, hardened low ash, and hardened ashless. Hardened low ash grade papers are acid-treated to remove trace metals, produce high wet strength, and provide chemical resistance. The tough, smooth surface of these filters makes it easy to recover precipitates, rendering them particularly suitable for Büchner filtration. Hardened ashless grade filters combine acid-hardening with extremely low ash content, making them suitable for applications requiring the filter and retained solids to be burned.

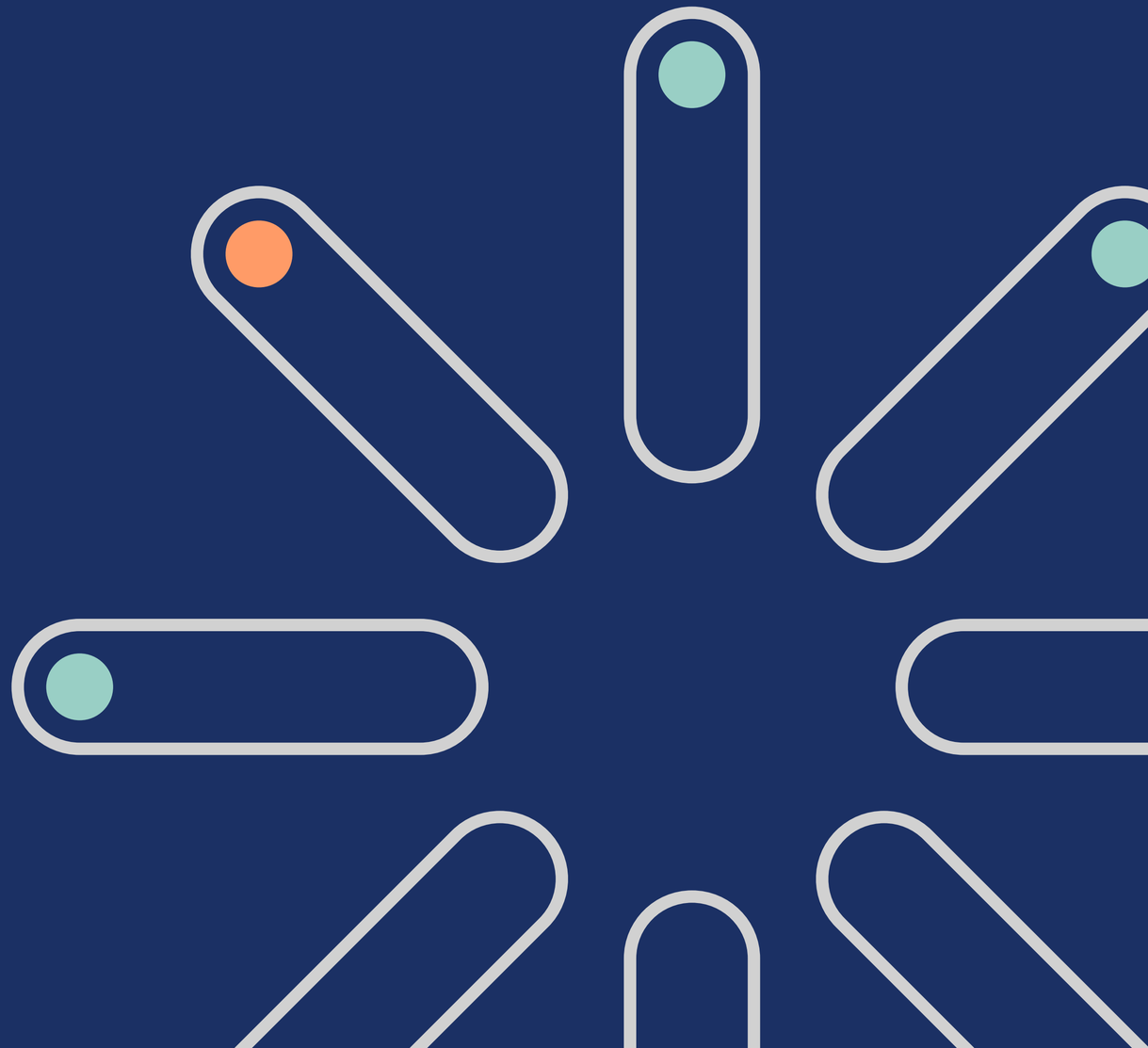
Qualitative cellulose filters are used to determine and identify the presence of materials. Two formats are available: standard filters and wet-strengthened filters. Some standard and wet-strengthened filters are available in pre-pleated forms which improves flow rate and increases loading capacity compared to equivalent flat filters. Whatman qualitative filter papers are manufactured from high-quality cotton linters, ensuring quality, reproducibility, and uniformity.

Ordering information

For what use?	Product	Quantity	Product code
Kjeldahl analysis	Grade 609 weighing boats	100/pack	10313032
Soxhlet extraction	Thimbles (cellulose)	25/pack	2800-105
Spectrophotometry and chromatography	Various syringe filters	N/A	See pages14-15
Colorimetry	Grade 5, 15 cm cellulose filter paper	100/pack	1005-150
pH testing	Indicator papers	100/pack	10362000
Sample clarification and solids retention	Quantitative cellulose paper grade 41, 15 cm*	100/pack	1441-150
	Qualitative cellulose paper grade 4, 40 cm*	100/pack	1004-400

*For a full list of cellulose paper grades please visit www.cytiva.com/whatman

04
Other lab essentials

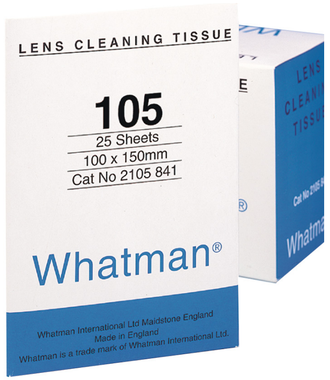


General laboratory accessories

In addition to the filtration consumable range, we provide a comprehensive range of accessories for routine work in your laboratory.



1PS phase separator



Grade 105 lens cleaning tissue



Benchkote™ protection paper



pH paper



Vacu-Guard Pump protection filter

Description	Product name	Dimension	Quantity	Product code
Phase separation paper • Separatory funnel replacement: Automatic cut-off • Ease of use: No special training required	1PS Phase separator paper	Diam. 125 mm	100/pack	2200-125
		Diam. 150 mm	100/pack	2200-150
Optical lens cleaning tissue • Soft tissue for removing surface moisture and grease from lenses and other optical surfaces	Grade 105	100 × 150 mm	25 wallets of 25 sheets	2105-841
		200 × 300 mm	100/pack	2105-862
Benchkote bench protection papers • High-quality, smooth, absorbent Whatman paper • Quickly absorbs liquid spills and protects the working surface • Benchkote Plus is thicker and more absorbent	Benchkote	460 × 570 mm	50/pack	2300-916
		460 mm × 50 m	1/pack	2300-731
	Benchkote Plus	500 × 600 mm	50/pack	2301-6150
		600 mm × 50 m	1/pack	2301-6160
pH Indicator Paper • Range of pH indicator and test papers for rapid results	Color Bonded, 0.0 to 14.0 range	6 × 80 mm	100 strips, 1/pack	2613-991
	Standard Full Range, Reel, 1.0 to 14.0 range	7 mm × 5 m	1/pack	2600-100A
	Standard Narrow Range, Reel, 4.0 to 7.0 range	7 mm × 5 m	1/pack	2600-102A
Pump protection filters • Protects vacuum pump systems from aqueous aerosols. Hydrophobic PTFE membranes retain 99.99% of airborne particles > 0.1 µm	Vacu-Guard	50 mm	10/pack	6722-5000

Description	Product name	Dimension	Quantity	Product code
Filtration flask for batch filtration • Consists of a 250 ml glass filtration funnel and 1000 ml flask, funnel base, top, and clamp • Good choice for use with Whatman filtration membranes	Whatman GV050/2 vacuum filtration unit			10442200
Pressure filtration apparatus • Stainless steel • Infusion vessel 2200 ml	MD142/5/3	142 mm	1	10451610
Pressure filter holder • PTFE • Infusion vessel 1500 ml	MD142/7/3	142 mm	1	10451710
In-line filtration degasser Connects directly into an HPLC line to simultaneously filter and degas the mobile phase as it is being used • Flexibility: available with either nylon or polypropylene membranes • Polypropylene housing with security ring sealing • No need for preliminary mobile phase separation	Inline Filtration Degasser (IFD)			
3-piece filter funnel • For quick and easy filtration • Choice of 3 plates	Filter funnel	47 mm	1	1950-004
	Filter funnel	90 mm	1	1950-009
	Filter funnel	70 mm	1	1950-017
Membrane holder • Produced from borosilicate glass • Suitable for aqueous and organic solvent filtration	Vacuum-type glass membrane holder	47 mm	1	1960-004
	Vacuum-type glass membrane holder	90 mm	1	1960-009

Chemical compatibility of membranes and housings*

Selecting the right filter depends on the solvent that you are using for your application. This table will help ensure that you get it right the first time.

Solvent	ANP	CA	CN	PC	PE	GMF	NYL	PP	DpPP	PES	PTFE‡	PVDF	RC
Acetic acid, 5%	R	LR	R	R		R	R	R	R	R	R	R	R
Acetic acid, glacial	R	NR	NR			R	LR	R	R	R	R	R	NR
Acetone	R	NR	NR	NR	R	R	R	R	R	NR	R	NR	R
Acetonitrile	R	NR	NR			R	R	R	R	NR	R	R	R
Ammonia, 6 N	NR		NR	NR	LR	LR	R	R	R	R	R	LR	LR
Amyl acetate	LR	NR	NR	NR	R	R	R	R	R	LR	R	LR	R
Amyl alcohol	R	LR	LR			R	R	R	R	NR	R	R	R
Benzene†	R	R	R	NR	R	R	LR	NR	NR	R	R	R	R
Benzyl alcohol†	R	LR	LR	LR	R	R	LR	R	R	NR	R	R	R
Boric acid	R	R	R	R	R	R	LR	R	R		R	R	R
Butyl alcohol	R	R	R	R	R	R	R	R	R	R	R	R	R
Butyl chloride†						R	NR	NR	NR		R	R	
Carbon tetrachloride†	R	NR	R	LR	R	R	LR	NR	NR	NR	R	R	R
Chloroform†	R	NR	R	NR	R	R	NR	LR	LR	NR	R	R	R
Chlorobenzene†	R		LR	NR		R	NR	LR		NR	R	R	R
Citric acid						R	LR	R		R	R	R	R
Cresol		NR	R			R	NR	NR	NR	NR	R	NR	R
Cyclohexane	R	NR	NR	R	R	R	NR	NR	NR	NR	R	R	R
Cyclohexanone	R	NR	NR			R	NR	R	R	NR	R	R	R
Diethylacetamide		NR	NR			R	R	R	R		R	NR	R
Dimethylformamide	LR	NR	NR			R	R	R	R	NR	R	NR	LR
Dioxane	R	NR	NR	NR	R	R	R	R	R	LR	R	LR	R
DMSO	LR	NR	NR	NR	R	R	R	R	R	NR	R	LR	LR
Ethanol	R	R	NR	R	R	R	R	R	R	R	R	R	R
Ethers	R	LR	LR	R	R	R	R	NR	NR	R	R	LR	R

Solvent	ANP	CA	CN	PC	PE	GMF	NYL	PP	DpPP	PES	PTFE‡	PVDF	RC
Ethyl acetate	R	NR	NR	NR	R	R	R	R	R	NR	R	NR	R
Ethylene glycol	R	LR	LR	R	R	R	R	R	R	R	R	R	R
Formaldehyde	LR	LR	R	R	R	R	R	LR	LR	R	R	R	LR
Freon TF	R	R	R	R	R	R	NR	NR	NR	R	R	R	
Formic acid		LR	LR			R	NR	R	R	R	R	R	LR
Hexane	R	R	R	R	R	R	R	R	R	R	R	R	R
Hydrochloric acid, conc.	NR	NR	NR	NR	NR	R	NR	LR	LR	R	R	R	NR
Hydrofluoric acid		NR	NR			NR	NR	LR	LR		R	R	NR
Isobutyl alcohol	R	LR	LR	R	R	R	R	R	R		R	R	R
Isopropyl alcohol	R	R	LR			R	R	R	R		R	R	R
Methanol	R	R	NR	R	R	R	R	R	R	R	R	R	R
Methyl ethyl ketone	R	LR	NR	NR	R	R	R	R	R	NR	R	NR	R
Methylene chloride†	R	NR	LR			R	NR	LR	LR	NR	R	R	R
Nitric acid, conc.		NR	NR	LR	NR	R	NR	NR	NR	NR	R	R	NR
Nitric acid, 6 N		LR	LR			R	NR	LR	LR	LR	R	R	LR
Nitrobenzene†	LR	NR	NR	NR	R	R	LR	R	R	NR	R	R	R
Pentane	R	R	R	R	R	R	R	NR	NR	R	R	R	R
Perchloroethylene	R	R	R			R	LR	NR	NR	NR	R	R	R
Phenol 0.5%	LR	LR	R			R	NR	R	R	NR	R	R	R
Pyridine	R	NR	NR	NR	R	R	LR	R	R	NR	R	NR	R
Sodium hydroxide, 6N	NR	NR	NR	NR	NR	NR	LR	R	R	R	R	NR	NR
Sulfuric acid, conc.	NR	NR	NR	NR	NR	R	NR	NR	NR	NR	R	NR	NR
Tetrahydrofuran	R	NR	NR			R	R	LR	LR	NR	R	R	R
Toluene†	R	LR	R	NR	R	R	LR	LR	LR	NR	R	R	R
Trichloroethane†	R	NR	LR	NR	R	R	LR	LR	LR	NR	R	R	R
Trichloroethylene†	R		R			R	NR	LR	LR	NR	R	R	R
Water	R	R	R	R	R	R	R	R	R	R	R	R	R
Xylene†	R	R	R			R	LR	LR	LR	LR	R	R	R

*ANP = Anopore; CA = Cellulose acetate; CN = Cellulose nitrate; DpPP = Polypropylene depth filter; GMF = Glass microfiber; NYL = Nylon; PC = Polycarbonate; PE = Polyester; PES = Polyethersulfone; PP = Polypropylene; PTFE = Polytetrafluoroethylene; PVDF = Polyvinylidene difluoride; RC = Regenerated cellulose R = Resistant; LR = Limited Resistance; NR = Not Recommended.
† Short Term Resistance of Housing. ‡ Membrane may need pre-wetting with isopropanol/methanol if filtering a polar liquid.
The above data is to be used as a guide only. Testing prior to application is recommended.

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cytiva.com/whatmanfilterselector

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