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GE Healthcare

# Filtration for Air Monitoring



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# Particulate monitoring

## Manual air sampling

Two of the most significant fractions of suspended particulate matter are the respirable fraction ( $< 2.5 \mu\text{m}$ ) and the inhalable fraction ( $< 10 \mu\text{m}$ ). 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 GE Healthcare Life Sciences 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 thimbles or QM-A, 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	<ul style="list-style-type: none"> <li>• <b>Glass fiber filters such as GF/A and EPM 2000</b></li> <li>• <b>PTFE TE type</b></li> <li>• <b>Glass fiber thimbles</b></li> <li>• <b>PM 2.5 membranes</b></li> </ul> Ordering information for all products p. 5 	<p><b>GF/A</b></p> <ul style="list-style-type: none"> <li>• Binder free</li> <li>• Glass fiber</li> <li>• Fine particle retention</li> <li>• High flow rate</li> <li>• Good loading capacity</li> </ul> <p><b>EPM 2000</b></p> <ul style="list-style-type: none"> <li>• Binder free</li> <li>• Glass fiber</li> <li>• Used in high-volume PM-10 air sampling equipment</li> <li>• Detailed chemical analysis of trace pollutants</li> </ul> <p><b>Glass fiber thimbles</b></p> <ul style="list-style-type: none"> <li>• Binder and binder free</li> <li>• Glass fiber</li> <li>• Used at temperatures up to 500°C</li> </ul> <p><b>GF 10</b></p> <ul style="list-style-type: none"> <li>• Binder</li> <li>• Glass fiber</li> <li>• Extreme mechanical stability</li> <li>• Used up to 180°C</li> </ul>	<p><b>TE type PTFE membranes</b></p> <ul style="list-style-type: none"> <li>• Suitable for filtration of gases and liquids</li> <li>• Resistant to most acids, alkalis, and solvents such as sodium hydroxide and hexane</li> <li>• Laminated onto a nonwoven polypropylene support material</li> <li>• Increased durability for aggressive testing environments</li> <li>• Hydrophobic characteristics prevent passage of aqueous aerosols (e.g., during venting applications)</li> </ul> <p><b>PM 2.5 membranes</b></p> <ul style="list-style-type: none"> <li>• Used for PM 2.5 ambient air monitoring</li> <li>• Conform to EPA PM 2.5 reference method under the requirements of 40 CFR Part 50 Appendix L</li> <li>• Do not contain glues or adhesives</li> <li>• Sequentially numbered for easy traceability of the filter</li> <li>• Chemically resistant polypropylene support ring, which eliminates curling and makes the filter robot-friendly</li> <li>• Retain a minimum of 99.7% of 0.3 µm size particulates</li> </ul>
Particulate manual sampling: aggressive environment (high temperature and acidic)	<ul style="list-style-type: none"> <li>• <b>Quartz fiber filter such as QM-A and QM-H</b></li> <li>• <b>Quartz fiber thimbles</b></li> </ul> Ordering information for all products p. 8 	<p><b>QM-A quartz fiber filters</b></p> <ul style="list-style-type: none"> <li>• High-purity quartz microfiber</li> <li>• Used for air sampling, particularly at high temperatures up to 500°C</li> </ul> <p><b>QM-H quartz fiber filters</b></p> <ul style="list-style-type: none"> <li>• 100% pure quartz</li> <li>• Can be used up to 900°C</li> <li>• Low heavy metal content</li> </ul>	<p><b>Quartz fiber thimbles</b></p> <ul style="list-style-type: none"> <li>• Made from high-purity quartz microfiber</li> <li>• Able to withstand high temperatures up to 800°C</li> <li>• Suitable for both solvent extraction and air sampling applications</li> </ul>
Particulate automated sampling	<ul style="list-style-type: none"> <li>• <b>Glass microfiber reels</b></li> </ul> Ordering information p. 5	<ul style="list-style-type: none"> <li>• Binder</li> <li>• Glass fiber</li> </ul>	<ul style="list-style-type: none"> <li>• Extreme mechanical stability</li> <li>• Used up to 180°C</li> </ul>
Radioactivity	<ul style="list-style-type: none"> <li>• <b>Grade 72</b></li> <li>• <b>SAS cards for static air sampling*</b></li> <li>• <b>PAS cards for personal air sampling*</b></li> <li>• <b>Glass fiber filters such as GF/A</b></li> </ul> Ordering information p. 5	<p><b>Grade 72</b></p> <ul style="list-style-type: none"> <li>• Glass fiber/cellulose</li> <li>• Used to absorb radioactive iodine in air pollution monitoring and in nuclear installations</li> </ul>	
Metal chemical analysis	<ul style="list-style-type: none"> <li>• <b>Mixed cellulose ester membranes</b></li> </ul> Ordering information p. 5	<ul style="list-style-type: none"> <li>• Typically used in applications for the determination of metals in airborne particulates</li> </ul>	

\* Please contact your GE Healthcare 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	–	–	–	–	–	50/pack
TE type PTFE membrane	0.2 µm	–	–	–	–	–	50/pack
	0.45 µm	–	–	–	–	–	50/pack
	1 µm	–	–	–	–	–	50/pack
	5 µm	–	–	–	–	–	50/pack
Mixed cellulose ester membrane	0.2 µm	–	–	–	–	–	100/pack
	0.45 µm	–	–	–	–	–	100/pack
	0.8 µm	–	–	–	–	–	100/pack
	3 µm	–	–	–	–	–	100/pack

### 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	–	–	–	–	–	–	100/pack
EPM 2000	–	–	–	–	–	–	100/pack
GF 10	–	–	–	–	–	–	100/pack
GF 10	–	–	–	–	–	–	200/pack
Grade 72	–	–	–	–	–	–	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	–	–	–	–	–	25/pack

\*internal diameter × external length

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

## Automated air sampling

GE'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	–	–	–	–	1/pack

Other reel dimensions are available. Please contact your GE Healthcare representative.



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<sub>2</sub>) microfiber filters are favored for these reasons and their applicability for heavy metals analysis.

### Quartz fiber filters and thimbles

GE 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<sub>2</sub> and NO<sub>2</sub>, respectively).

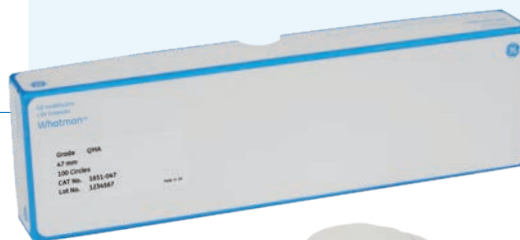
QM-H is a pure quartz fiber filter with low heavy metal content. Quartz thimbles are also available.

### Mixed cellulose ester membranes

Mixed cellulose membranes from GE are often used in heavy metals tests and typically in applications for the determination of metals in airborne particulates.

What are you testing for?	Product	Characteristics and benefits
Heavy metals	<ul style="list-style-type: none"> <li><b>Quartz fiber filters such as QM-A and QM-H</b> Ordering information p. 8</li> <li><b>EPM 2000 glass fiber filters</b> Ordering information p. 5</li> </ul>	<p><b>QM-A</b></p> <ul style="list-style-type: none"> <li>High-purity quartz microfiber</li> <li>Used for air sampling, particularly at high temperatures up to 500°C</li> </ul> <p><b>QM-H</b></p> <ul style="list-style-type: none"> <li>100% pure quartz</li> <li>Can be used up to 900°C</li> <li>Low heavy metal content</li> </ul>
Other organic or inorganic chemicals (such as ozone, volatile organic carbons, SO <sub>2</sub> , NO <sub>2</sub> , CO, Benzoate)	<ul style="list-style-type: none"> <li><b>Glass fiber filters such as GF/A</b> Ordering information p. 5</li> <li><b>Quartz fiber filters such as QM-A and QM-H</b> Ordering information p. 8</li> <li><b>Cellulose filters*</b></li> <li><b>PTFE membranes</b> Ordering information p. 5</li> </ul>	<p><b>Quartz fiber thimbles</b></p> <ul style="list-style-type: none"> <li>Made from high-purity quartz microfiber</li> <li>Able to withstand high temperatures up to 800°C</li> <li>Suitable for both solvent extraction and air sampling applications</li> </ul>

\* Please contact your GE Healthcare representative for information on cellulose filters



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.

## Optical analysis for asbestos sampling

GE provides Whatman membranes for the main asbestos sampling methods.

## Transmission electron microscopy method

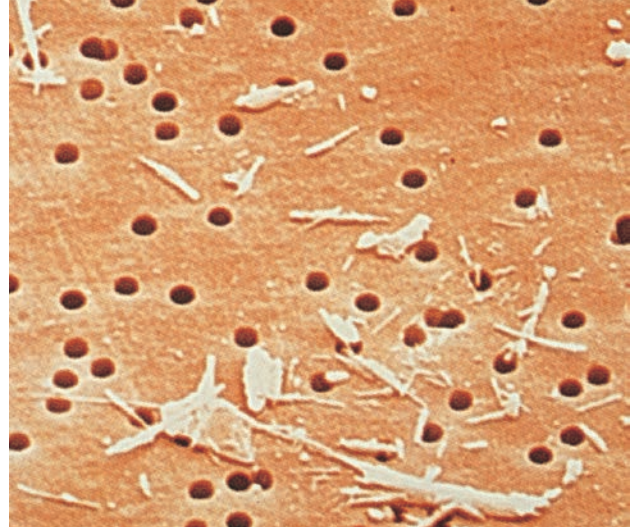
Two membrane materials are typically recommended for this method:

- Mixed ester membrane (e.g., WME membrane)
- Polycarbonate membrane (e.g., Whatman Cyclopure™ 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



Asbestos fibers on a Cyclopure membrane.

fibers from a defined volume of air. During processing the membrane is made transparent with acetone vapor. Mixed cellulose ester membrane from GE is the recommendation for this application.

## Scanning electron microscopy method

GE offers a range of polycarbonate membranes, Cyclopure and Nuclepore.

▶ What are you testing for?	▶ Product	▶ Characteristics and benefits
Asbestos	<b>WME mixed cellulose ester membrane</b> Ordering information p. 8	<ul style="list-style-type: none"> <li>• Typically used for Phase Contrast Microscopy (PCM) and Transmission Electron microscopy (TEM)</li> <li>• Cellulose mixed ester membrane</li> <li>• Gridded, 0.8 µm pore size, 25 mm surface area with high loading capacity</li> <li>• High flow rates</li> </ul>
	<b>Nuclepore and Cyclopure</b> Ordering information p. 8	<ul style="list-style-type: none"> <li>• Manufactured with proprietary Whatman technology for controlled pore size distribution</li> <li>• Smooth, flat membrane; particles are retained on surface making them easily visible during optical analysis</li> <li>• Nuclepore available in two versions: gold coated or not gold coated</li> <li>• Typically used for electron microscopy</li> </ul>
	<b>MembraClear</b>	<ul style="list-style-type: none"> <li>• Mixed cellulose ester membranes designed for use with the ‘hot block method’</li> <li>• White with black grid for high contrast during asbestos testing using microscopy</li> <li>• Becomes transparent with acetone vapor treatment, distinguishing fibers from crystalline artifacts</li> </ul>

# Ordering information

## Quartz fiber filters

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

## Glass fiber extraction thimbles , 1.5 mm thick

Dimensions*	Product code	Quantity
22 × 80 mm		25/pack
25 × 100 mm		25/pack
26 × 100 mm		25/pack
33 × 94 mm		25/pack
10 × 38 mm		25/pack

\* internal diameter × external length

## Quartz fiber extraction thimbles, 2 mm thick

Dimensions*	Product code	Quantity
25 × 90 mm		10/pack

\* internal diameter × external length

## Membrane filters for asbestos sampling and analysis

Membrane	Pore size	Diameter			Quantity
		25 mm	37 mm	47 mm	
Nuclepore polycarbonate membrane	0.2 µm		–		100/pack
	0.4 µm		–		100/pack
	0.4 µm gold coated		–	–	50/pack
	0.8 µm		–		100/pack
Cyclopore polycarbonate membrane	0.2 µm		–		100/pack
	0.4 µm		–		100/pack
	1.0 µm	–	–		100/pack
WME cellulose mixed ester membrane	0.8 µm		–	–	100/pack





# Whatman 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	
<b>Phase separation paper</b> <ul style="list-style-type: none"> <li>Separatory funnel replacement: Automatic cut-off</li> <li>Ease of use: No special training required</li> </ul>	1PS Phase separator paper	Diam. 125 mm	100/pack		
		Diam. 150 mm	100/pack		
<b>Optical lens cleaning tissue</b> <ul style="list-style-type: none"> <li>Soft tissue for removing surface moisture and grease from lenses and other optical surfaces</li> </ul>	Grade 105	100 × 150 mm	25 wallets of 25 sheets		
		200 × 300 mm	100/pack		
<b>Benchkote bench protection papers</b> <ul style="list-style-type: none"> <li>High-quality, smooth, absorbent Whatman paper</li> <li>Quickly absorbs liquid spills and protects the working surface</li> <li>Benchkote Plus is thicker and more absorbent</li> </ul>	Benchkote	460 × 570 mm	50/pack		
		460 mm × 50 m	1/pack		
	Benchkote Plus	500 × 600 mm	50/pack		
		600 mm × 50 m	1/pack		
<b>pH indicator paper</b> <ul style="list-style-type: none"> <li>Range of pH indicator and test papers for rapid results</li> </ul>	Color Bonded, 0.0 to 14.0 range	6 × 80 mm	100 strips, 1/pack		
		Standard Full Range, Reel, 1.0 to 14.0 range	7 mm × 5 m	1/pack	
		Standard Narrow Range, Reel, 4.0 to 7.0 range	7 mm × 5 m	1/pack	
<b>Pump protection filters</b> <ul style="list-style-type: none"> <li>Protects vacuum pump systems from aqueous aerosols. Hydrophobic PTFE membranes retain 99.99% of airborne particles &gt; 0.1 µm</li> </ul>	Vacu-Guard	50 mm	10/pack		

## The Whatman electronic butler

The Whatman eButler for microbiology supports rapid dispensing of the Whatman sterile mixed cellulose ester (MCE) microbiology membranes allowing you to work quickly and efficiently. This is the only eButler compatible with Whatman MCE microbiology membranes.

- Aluminum and stainless-steel construction for labs requiring total sterility
- Designed for easy membrane loading and device usability
- Both push-button and touch-free operation modes to suit your preference
- Supports rapid dispensing of the culture membrane
- Compatible with Whatman sterile mixed cellulose ester (MCE) microbiology membranes
- Faster, cleaner and easier microbiological testing



Membrane-Butler

Description	Product name	Dimension	Quantity	Product code
<b>Filtration flask for batch filtration</b> <ul style="list-style-type: none"> <li>• Consists of a 250 mL glass filtration funnel and 1000 mL flask, funnel base, top, and clamp</li> <li>• Good choice for use with Whatman filtration membranes</li> </ul>	Whatman GV050/2 vacuum filtration unit	–	–	
<b>Pressure filtration apparatus</b> <ul style="list-style-type: none"> <li>• Stainless steel</li> <li>• Infusion vessel 2200 mL</li> </ul>	MD142/5/3	142 mm	1	
<b>Pressure filter holder</b> <ul style="list-style-type: none"> <li>• PTFE</li> <li>• Infusion vessel 1500 mL</li> </ul>	MD142/7/3	142 mm	1	
<b>In-line filtration degasser</b> Connects directly into an HPLC line to simultaneously filter and degas the mobile phase as it is being used <ul style="list-style-type: none"> <li>• Flexibility: available with either nylon or polypropylene membranes</li> <li>• Polypropylene housing with security ring sealing</li> <li>• No need for preliminary mobile phase separation</li> </ul>	Inline Filtration Degasser (IFD)	–	–	
<b>3-piece filter funnel</b> <ul style="list-style-type: none"> <li>• For quick and easy filtration</li> <li>• Choice of 3 plates</li> </ul>	Filter funnel	47 mm	1	
	Filter funnel	90 mm	1	
	Filter funnel	70 mm	1	
<b>Membrane holder</b> <ul style="list-style-type: none"> <li>• Produced from borosilicate glass</li> <li>• Suitable for aqueous and organic solvent filtration</li> </ul>	Vacuum-type glass membrane holder	47 mm	1	
	Vacuum-type glass membrane holder	90 mm	1	
<b>Automatic dispenser for membranes</b>	Membrane eButler	–	1	



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[gelifesciences.com/WhatmanFilterSelector](http://gelifesciences.com/WhatmanFilterSelector)



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