



Microporous PES Membranes

High Efficiency Membranes
for Filtration and Venting
Applications

Simplifying Progress

SARTORIUS

Sartorius

Strong Commitment to the Industry

Sartorius is a leading provider of cutting-edge membrane technologies for the industry around the world, focusing on technologies to meet the rapidly changing requirements of the industry it serves. Strongly rooted in the scientific community and closely allied with customers and technology partners, the company is dedicated to its philosophy of "Simplifying Progress."

Headquartered in Aubagne, France, Sartorius is listed on the Euronext of Euronext Paris. With its own manufacturing and R&D sites in Europe, North America and Asia and a global network of sales companies, Sartorius enjoys a

worldwide presence. Its key membrane manufacturing and R&D site is located in Germany.

Sartorius enjoys a dedicated sales structure for OEM membranes to meet customer needs. Whether located in Europe, America or Asia our sales representative can meet with you. Our experienced sales organization can help you develop OEM solutions at your request, and define product specifications to your needs.



Leading Membrane Technology

Sartorius produces a wide variety of microporous membranes that are especially designed, developed and manufactured to meet differing needs of biotechnology and medical device industries. Backed up by many decades of experience in membrane manufacturing and by utilizing the most state-of-the-art production equipment on the market, we guarantee excellent performance, consistent quality and a reliable supply of our membrane products.

All Sartorius membranes are manufactured in our premiere production facilities in Göttingen, Germany. With our advanced casting technologies and strict environmental controls in place, we ensure a stable and clean manufacturing process, as well as a strong security of supply. Consistent process performance is secured by stringent qualification of all components and assemblies, manufacturing processes, and personnel. Visits to our manufacturing facilities may be arranged on request.

Broad Range of Applications

Microporous polyethersulfone (PES) membranes are available with a multitude of different pore sizes and performance characteristics, making them ideally suited for a wide variety of applications including:

- Sterilizing grade filtration
- Mycoplasma retentive filtration—bioburden reduction
- Prefiltration
- Clarification
- Venting and gas filtration

Quality Assurance from Sartorius

All Sartorius membranes are manufactured according to an ISO 9001 certified Quality Management System. Consistent high quality of Sartorius membranes is assured by careful selection of the raw materials, and well-planned and validated production technologies, all of which result in high lot-to-lot reproducibility. The test procedures used are based both on external standard methods, such as the USP, EP and ASTM, and on in-house methods which are the result of Sartorius' experience over the past 60 years. A lot is not released until all in-process and final quality control data are available and fulfilled.

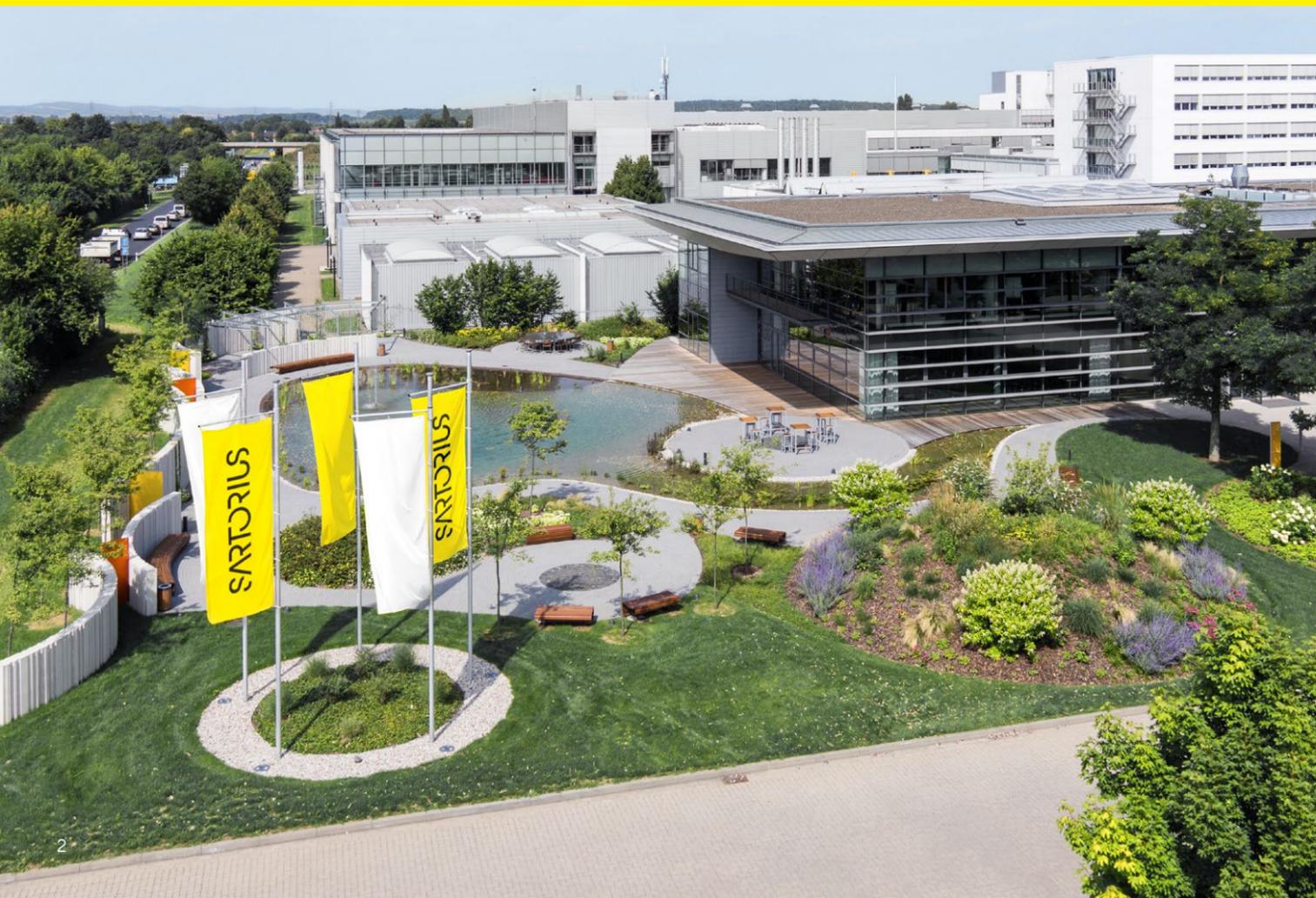
Sartorius' quality philosophy ensures that our customers receive products and services that meet the strictest quality requirements. The entire range of our membrane products is supplied with Certificates of Analysis.

Complete Traceability

All membrane products of Sartorius feature a comprehensive and easy-to-read out labeling which includes:

- Filter type
- Order code
- Lot number
- Pore size

The traceable lot number allows convenient retrieval of all data compiled on the materials used, production steps and QC tests.



 **Find out more**
www.sartorius.com/en/products/oem/oem-membranes-and-devices/diagnostic-membranes

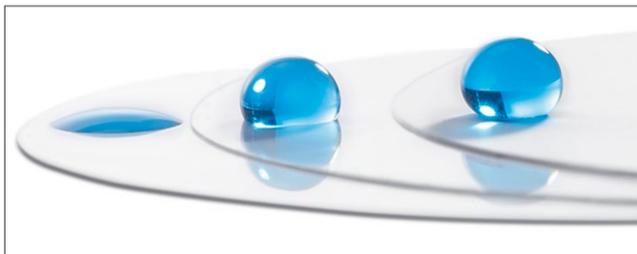
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oem-membranes@sartorius.com

PES Membrane Portfolio

Quality Made in Germany

Removal of Particles and Micro-organisms from Liquids and Gases

Membrane processes are one of the most effective separation processes, and they are steadily under development leading to new prospects of their applications. Sartorius polyethersulfone (PES) membranes are available in a wide variety of different pore sizes and structures, as well as surface properties to serve nearly unlimited selectivity of separation. Their superior intra- and inter-lot consistency guarantees reliable results. Further, outstanding features like their excellent gamma compatibility and high mechanical and thermal resistance make Sartorius PES membranes the first choice for all major liquid and gas filtration applications, including medical devices.



The picture above shows the wetting abilities of a hydrophilic, hydrophobic and oleophobic PES membrane (from left to right). The hydrophilic PES membrane wets out quickly and completely, resulting in excellent flow rates and high throughputs. The hydrophobic PES membrane reliably repels water and other high surface tension fluids. The oleophobic PES membrane even resists wet-out with low surface tension fluids like oil or organic solvents, assuring high performance in demanding venting applications.

Hydrophilic PES Membranes

Clarification | Sterile Filtration

Hydrophilic PES membranes are ideal for clarification and sterilization of aqueous liquids laden with particles (e.g., for preparation of pharmaceuticals or infusion solutions). All microorganisms and particles are reliably removed, without any effects on the ingredients due to adsorption or decomposition. For optimal results, our hydrophilic PES membranes provide high flow rates and lowest adsorption characteristics. Different structures from symmetric to highly asymmetric allow you to select the membrane with the best combination of selectivity, flux and total throughput for your individual OEM device.

Hydrophobic and Oleophobic PES Membranes

Sterile Venting | Medical Use

These hydrophobic and oleophobic PES membranes have been developed to combine exceptionally high air flow rates with reliable liquid repelling properties. The membrane serves as a barrier against contamination from particles, aerosols, microorganisms, and other undesirable substances. In addition, venting membranes efficiently equalize pressure fluctuations that can occur during manufacturing processes or within a product during normal use, thus leading to increased process and product security. These high efficiency membranes are ideally suited for fast air filtration or sterile venting, while preventing any liquid passage or condensate blockage.

Applications

	Hydrophilic PES Membranes	Hydrophobic and Oleophobic PES Membranes
Medical Filtration Devices	<ul style="list-style-type: none"> IV therapy Ophthalmic Drug preparation Clinical reagents 	<ul style="list-style-type: none"> Infusion sets IV filter Transducer protectors Catheters Tubing systems Insufflation filters
Life Sciences	<ul style="list-style-type: none"> Buffer, media and sera filtration 	<ul style="list-style-type: none"> Vent caps Liquid stopper devices
Pharmaceutical Biotechnology Industry	<ul style="list-style-type: none"> Cell separation Water treatment Sterile filtration 	<ul style="list-style-type: none"> Sterile vents for containers, bioreactors, fermenters
Food and Beverage Industry	<ul style="list-style-type: none"> Clarification Concentration Sterile filtration 	<ul style="list-style-type: none"> Liquid bottling Food packaging
Electronics Industry		<ul style="list-style-type: none"> Sensors Electric motors

Custom Made Membranes and Dimensions

OEM membranes often need custom dimensions in order to suit individual customer application requirements. From the master rolls, stored immediately after production, smaller slit rolls, sheets or disks of different format can be generated. Based on technical feasibility and quantity, a customized membrane development is possible. Please contact us at oem-membranes@sartorius.com to get more information.

Do You Need Assistance to Choose the Best Suitable Membrane?

Please do not hesitate to contact us at oem-membranes@sartorius.com. Our team of experts and scientists will assist you with the right membrane choice for your OEM application.

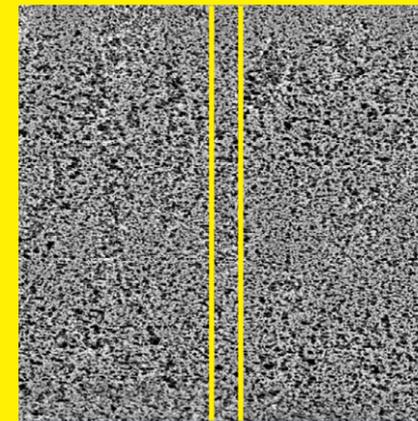


Find out more
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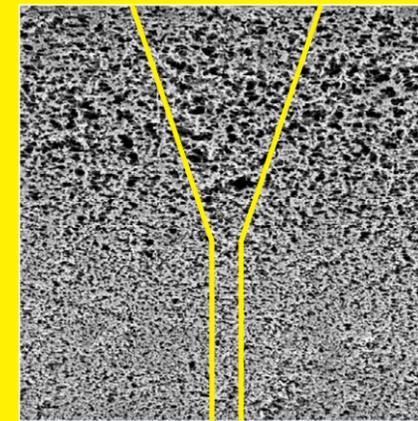
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Hydrophilic PES Membranes for Liquid Filtration

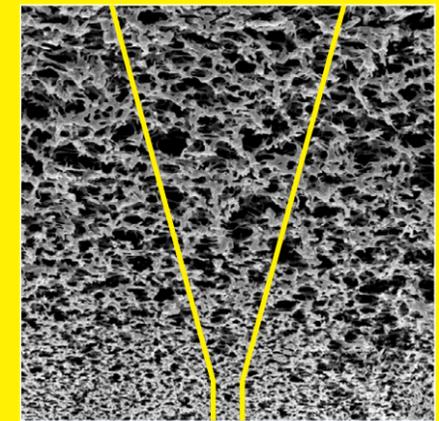
Symmetric PES membrane



Asymmetric PES membrane



Highly asymmetric PES membrane



Hydrophilic PES membranes have a high internal porosity. They perform well at high flux with an excellent throughput of aqueous solutions over the entire pH range of 1-14. Their low level of extractables makes them suitable for environmental analysis. Thanks to their low non-specific protein binding, the PES membranes are recommended for filtering biological and pharmaceutical solutions.

Hydrophilic PES membranes are available in different membrane structures. The symmetric membrane structure allows for high physical stress levels in the final product manufacturing, ensuring the integrity of the membrane.

The asymmetric membrane structure features higher flow rates in combination with relatively high physical stress levels in final device manufacturing. If total throughput is most important for the application, a highly asymmetric membrane is the membrane of choice.

Regardless of the membrane structure, 0.1-0.22 µm rated PES membranes provide sterile filtration, making the membranes well-suited for biological sample preparation, or sterile filtration of culture media and buffers.



Typical Performance Characteristics

Material Type	Nominal Pore Size (µm)	Structure*	Water Flow Rate (mL/(cm ² min bar))	Bubble Point Sartocheck® (bar)	Burst Pressure (bar)	Thickness (µm)	Retention (10 ⁷ /cm ² filter area)
15442	5	AS	> 40**	0.3****	≥ 0.2	160	N/A
15402	3	AS	> 25**	0.5****	≥ 0.2	160	N/A
15413	1.2	AS	> 12**	0.8	≥ 0.3	160	N/A
15405	0.65	AS	> 80	1.5	≥ 0.4	160	N/A
15445	0.5	AS	90	2.3	≥ 0.4	160	N/A
15456	0.45	AS	> 40	2.4	≥ 0.5	160	N/A
15406	0.45	S	45	2.6	≥ 0.4	150	100% Serratia marcescens
15467	0.3	AS	> 23	> 2.9	≥ 0.4	150	N/A
15407	0.2	S	25	> 3.5	≥ 0.4	150	100% Brevundimonas diminuta
15407MI	0.2	AS	> 30	> 3.2	≥ 0.4	140	100% Brevundimonas diminuta
15427EP	0.22	HAS	> 34	> 3.55	≥ 0.4	160	100% Brevundimonas diminuta
15458	0.1	S	9	> 2.5***	≥ 0.5	150	100% Brevundimonas diminuta; LRV ≥ 7 Achleplasma laidlawii

* S = symmetric, AS = asymmetric, HAS = highly asymmetric
 ** air flow rate (L/(m² s) at 200 Pa)
 *** with isopropyl alcohol | water 60 vol% | 40 vol%
 **** visual

Structure

- Symmetric, asymmetric, highly asymmetric

Adsorption, Non-specific

- ~ 10 µg/cm² for γ-globulin
- < 8 µg/cm² for BSA

pH Stability

- Resistant to aqueous solutions pH 1-14

Thermal Resistance

- 200° C max

Biocompatibility According to USP Standard

- Passes USP Biological Tests Plastic Class VI for biocompatibility and cytotoxicity
- Tests are partially performed on final devices

Find out more

www.sartorius.com/en/products/oem/oem-membranes-and-devices/diagnostic-membranes

Email for more information

oem-membranes@sartorius.com

Hydrophobic and Oleophobic PES Membranes for Venting and Gas Filtration



These PES membranes are treated to make their hydrophobic or oleophobic surfaces perfectly liquid repelling. Even under high humidity or high moisture, outstanding air permeability is guaranteed to assure rapid venting at low differential pressure. Due to their high mechanical stability, the membranes can easily be welded and integrated into a wide variety of devices. An additional

specific feature of these membranes is their excellent gamma compatibility. In contrast to other common polymeric matrices for venting and gas filtration, such as PTFE, Sartorius PES membranes can be sterilized by gamma irradiation, making them also best suited for the most demanding applications like medical devices.

Typical Performance Characteristics

Material Type	Surface Property	Nominal Pore Size* (µm)	Thickness (µm)	Air Flow Rate (L/(m ² sec) at 200 Pa)	Water Intrusion Pressure		IPA** Wettability
					(bar)	(psi)	
15C77	hydrophobic	0.2	135	1.4	2.8	41	+
15D07MI	oleophobic	0.2	135	1.4	2.8	41	-
15D13	oleophobic	1.2	160	14	0.5	7.3	-
15D02	oleophobic	3	160	25	0.4	5.8	-
15D42	oleophobic	5	160	50	0.3	4.4	-

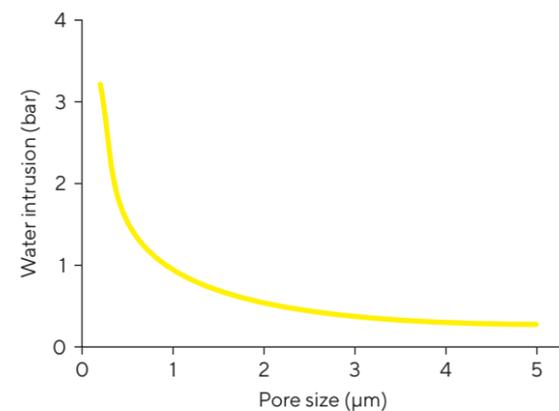
* Additional pore sizes are available, please contact us at oem-membranes@sartorius.com

** isopropyl alcohol

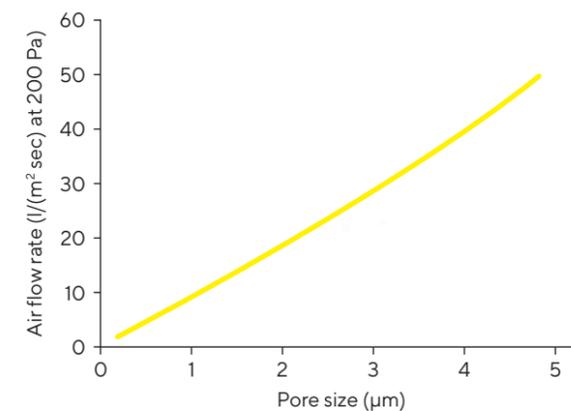
Thermal Resistance
 ■ 200° C max

Biocompatibility According to USP Standard
 ■ Passes USP Biological Tests Plastic Class VI for biocompatibility and cytotoxicity

Water Intrusion Pressure



Air Flow Rate



Technical Information



Sterilization Methods

All Sartorius PES membrane products show excellent gamma compatibility and high thermal resistance, giving you the freedom to choose the sterilization method that best meets the requirements of your device:

- Gamma irradiation (≤ 50 kGy)
- Autoclaving at 121° C or 134° C
- EtO sterilization

Membrane Sealing Methods

Due to their good tensile strength and high thermal resistance, all PES membrane products can easily be sealed onto plastic support or housing, using most common welding methods like heat, radio frequency, ultrasonic and adhesives.

Storage and Handling

By respecting the following recommendations you will ensure that your membrane products will always be at their optimum condition before use.

- The membranes are stored in their original package until use.
- Do not expose the membrane to direct sunlight or chemical vapors and keep it away from sources of heat.
- Constant temperatures between 15–25° C and a relative humidity of max 70% are best for storage and handling of the membrane. Very dry or humid storage conditions may alter the wettability and handling properties of the membrane. This change is only temporary and can be overcome by conditioning the membrane at relative humidity between 40–70% for approximately 12 hours before processing the membrane.
- After unpacking the membrane, please avoid any direct contact of the membrane to materials that have the potential to release chemicals or additives. Adsorption or absorption of such substances could affect essential membrane properties like wettability. For the same reason, any direct contact with the membrane should be avoided.

Would You Like to Use Membranes with Other Polymeric Matrices?

Microporous membranes can be composed of various polymers that differ from one another in their chemical and physical properties. Together with the characteristics of the filter pores these polymer properties govern the results in

many filtration applications. The table below provides an overview which other polymeric matrices are available at Sartorius in addition to our PES portfolio.

Polymer	Features	Typical Applications
Cellulose acetate (CA)	<ul style="list-style-type: none"> ▪ High flow rates ▪ Thermal stability ▪ Very low non-specific adsorption 	<ul style="list-style-type: none"> ▪ Protein filtration ▪ Biological and clinical analysis ▪ Sterility tests
Surfactant free cellulose acetate (SFCA)	<ul style="list-style-type: none"> ▪ Excellent wettability ▪ Very low non-specific adsorption ▪ Low content of extractables 	<ul style="list-style-type: none"> ▪ Removal of particles and microorganisms from aqueous solutions ▪ Sterile filtration
Cellulose nitrate (CN)	<ul style="list-style-type: none"> ▪ Very high protein and DNA binding 	<ul style="list-style-type: none"> ▪ Cell retention ▪ Buffer filtration ▪ Microbiological testing
Regenerated cellulose (RC)	<ul style="list-style-type: none"> ▪ Strong chemical resistance ▪ Low protein binding 	<ul style="list-style-type: none"> ▪ Particle removal from organic and aqueous media ▪ Ultracleaning of solutions for HPLC
Polyamide (PA)	<ul style="list-style-type: none"> ▪ Chemically resistant to alkaline solutions and organic solvents 	<ul style="list-style-type: none"> ▪ Particle removal in solutions for HPLC ▪ Filtration of protein-free culture media

 **Find out more**
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Email for more information
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Please contact us at
oem-membranes@sartorius.com for a complete listing of our membrane products.

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