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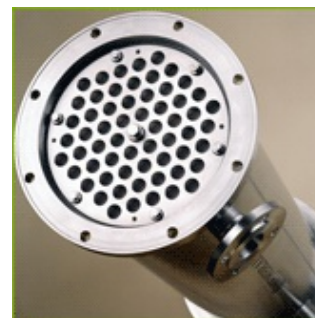
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Membralox® Ceramic Membrane Products

Description

Pall's Membralox® ceramic membrane elements are ideal for **biopharmaceutical** applications that involve extreme processes, such as high solids bulk processes, the use of high temperatures or pressures, or aggressive solvents, and where significant long-term durability is required.

Available ratings start at very low molecular weight ultrafiltration used for duties such as unwanted protein removal from antibiotic solutions, through to open (up to 5 µm) microfiltration membranes that can be used to process difficult materials such as microspheres, or clarify solvent-based plant extracts in transgenic processes.



Range of Available Sizes

Membralox membrane elements are available in 3 different channel diameters to allow optimization for solids loading. Some configurations are available with unique longitudinal permeability gradients, that facilitates the control of permeate rate along the length of the module. Membrane elements are available in sizes ranging from small laboratory devices through individual modules of over 20 square meters surface area, ensuring the ability to evaluate and scale up processes to any size.

Materials of Construction

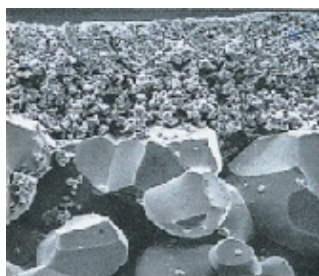
Membralox ceramic membranes comprise a highly controlled surface membrane layer that is formed on the inner (feed-side) surface of a more open support layer. Three different types of materials are available, ultrapure, alumina, zirconia and titania. All of these materials are FDA-listed for suitability in pharmaceutical processes. Ceramic membranes exhibit near zero non-specific adsorption of biological materials.

Structure and Design

- ▶ Membralox ceramic elements featuring an asymmetric membrane structure combine a unique design and manufacturing process resulting in a product ideally suited for applications involving chemicals, including solvents, extremes of pH, high temperatures and pressure processing of and fermentation broths.
- ▶ The compact multi-channel geometry and high permeability are optimized for bulk processing applications. Multiple modules each comprising a number of membrane elements can be easily assembled on manifolds to handle any scale of operation.

Features and Benefits

- ▶ Reliability
- ▶ Ease of use
- ▶ High flux
- ▶ Proven long operational life
- ▶ Wide chemical and pH (0 – 14) compatibility
- ▶ Excellent thermal stability
- ▶ Sanitizable and sterilizable
- ▶ Element burst pressure > 50 bar
- ▶ Ability to withstand high frequency backpulsing cycles
- ▶ Components are FDA-listed in 21 CFR Part 11
- ▶ 100% bubble point integrity-tested



Ceramic Membrane Structure; Electron Micrograph showing Membralox membrane layers on top of a more open support layer

Products in this datasheet may be covered by one or more patents, including EP 442,410; US 5,143,614.

Application

Biopharmaceutical Applications

- ▶ Clarification of bulk fermentation broths
- ▶ Protein removal from antibiotics
- ▶ Processing of alginates and other excipients
- ▶ Clarification of solvent extracts
- ▶ Pyrogen and bacteria removal in high purity systems

Membrane Module Versatility

Membralox membrane elements are assembled in housings containing modules with up to 60 elements per module. This versatility simplifies system designs, allowing optimal sizing of membrane area for each application.

Membralox GP Ceramic Microfiltration Membranes

The Membralox GP range of ceramic membrane elements have a calibrated longitudinal permeability gradient, that maintains a constant and uniform flux along all parts of the element. This optimizes the microfiltration of complex, transmission sensitive feed streams.

- ▶ Stability of the filtration regime
- ▶ Standard modules accommodate these unidirectional flow directional membranes
- ▶ Uniform transmembrane pressure simplifies system designs
- ▶ A wide range of calibrated permeability gradient options are available to suit different feedstream characteristics

Specifications

Membrane Element Configurations

Element Type	P37 – 30	P19 – 40	P19 – 60
Channel Diameter	3 mm	4 mm	6 mm
Number of Channels	37	19	19
Filtration Surface Area	0.35 m ² (3.77 ft ²)	0.24 m ² (2.58 ft ²)	0.36 m ² (3.88 ft ²)
Length	1020 mm	1020 mm	1020 mm
Material	Ultrapure alumina (>99.7%)		

Membrane Pore Sizes

Application	Pore Sizes
Microfiltration	5.0, 2.0, 1.4*, 0.8*, 0.5*, 0.2*, 0.1* µm (a alumina)
Ultrafiltration	100, 50, 20 nm (zirconia) 5000, 1000 Da MWCO (titania)

* Available in Membralox GP membrane version.

Operating Limits in Aqueous Liquids

	Operating Limits
Temperature	95 °C (203 °F)
Pressure	8 – 10 barg ⁽¹⁾
Differential Back Pressure	8 bard

(1) Depending on module selected. Contact Pall for additional information.

Membralox SD Sanitary Modules

Element Type	P19 – 60	P19 – 40/P37 – 30
Number of Membranes	1 – 3 – 12 – 22	1 – 3 – 7 – 19 – 37
Filtration Surface Area	up to 7.9 m ² (85 ft ²)	up to 13.0 m ² (140 ft ²)
Permeate Connections	Sanitary clamps/3A gaskets	
Construction of	316L SS, ceramic, EPDM or FPM	
Wetted Materials		

Membralox HCB Industrial Modules

Part Number	36P2	60P1
Element Type	P19-60	P19-40/P37-30
Number of Membranes	36	60
Filtration Surface Area	13.0 m ²	14.4/21.0 m ²
Retentate Connections	Bolt flanges with O-rings	
Permeate Connections	Bolt flanges with flat gaskets	
Construction of	316L SS, ceramic, PTFE	
Wetted Materials		

Membralox T1-70 Modules⁽²⁾

Channel Diameter	7 mm
Length	250 mm
Filtration Surface Area	0.005 m ² (0.054 ft ²)
Housing Material	316L SS

(2) The T1-70 module housing holds individual ceramic tubes; please specify desired membrane pore size at time of order in accordance with membrane pore size selection chart. This module is suitable for use with Pall laboratory and pilot-scale test systems. Contact Pall for additional information.

Performance

Membralox SD Modules

The Membralox SD module features a fully sanitary design for stringent [biopharmaceutical](#) processes. All wetted components are swept by cleaning solutions ensuring compliance with requirements of cleaning validation. Module hardware and gaskets are available in materials that meet the demands of all cleaning regimes.

- ▶ All wetted parts fully accessible by cleaning chemicals
- ▶ Vertical operating position enables total drainage
- ▶ High-performance sealing assembly with gasket leak detection, eliminates by-pass possibility between retentate and permeate side
- ▶ Modules and membrane components fully traceable, materials certificate available upon request
- ▶ Long-life, stable and reliable performance

Membralox HCB Modules

The Membralox HCB module range takes advantage of the unique hexagonal shape of the Membralox ceramic membrane elements to obtain a high membrane packing density up to $240 \text{ m}^2/\text{m}^3$ ($2583 \text{ ft}^2/\text{ft}^3$), thus significantly reducing filtration system costs.

Features of the HCB module – increased surface area, reduced permeate hold-up volume, PTFE gaskets for a wider chemical compatibility – provide economical solutions in bulk fermentation broth clarification and [pharmaceutical](#) effluent treatment.

- ▶ Highly compact for cost-effective system design and small footprint
- ▶ Reduced permeate hold-up volume
- ▶ Proprietary built-in gasketing solution to ensure perfect sealing
- ▶ Wide chemical compatibility
- ▶ Long service life

Membralox T1-70 Modules

Potential applications can be conveniently evaluated using this laboratory scale module with integrated ceramic membrane element. Feasibility testing allows the appropriate membrane pore size to be selected for pilot scale studies. The module has a low permeate hold-up volume of 7 mL.

Membralox Pilot Scale Systems

Pilot-scale evaluation of Membralox technology with full scale modules can be performed on pilot plant systems. Several options are available on request.

Contact Information

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