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The New Standard  
For Dissolved Gas Control

Membrane Technologies For All Your Gas Transfer Needs

# The New Standard For Dissolved Gas Control

**Membrana - Charlotte** is known world wide as the leader in membrane contactor manufacturing and development. Our products have proven themselves in the field for more than 10 years.

We offer four fiber types. Three are polypropylene and the fourth is a proprietary polyolefin. These fiber variants are then incorporated into different product designs. Each fiber and module design has unique qualities making it suited to various applications. While the fibers are nonselective and will remove all dissolved gasses, X40 is best for O<sub>2</sub> removal, X50 is recommended for CO<sub>2</sub> removal and the Polyolefin will degas low surface tension solutions.

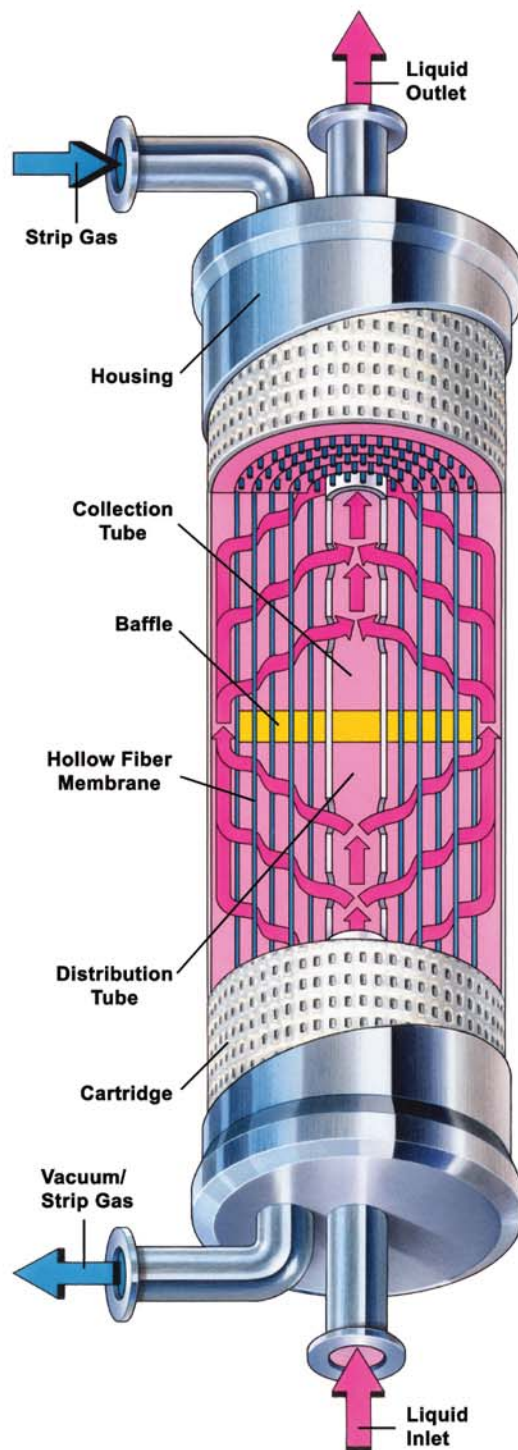
The matrix below summarizes the available module designs and fiber types.

Contactor Type	Capacity	Fiber Type			
		X40*	X50*	XIND	Polyolefin*
MiniModules®	Up to 2500 ml/min		X		
2.5 x 8 Extra-Flow	0.5-3 gpm (0.1-0.7 m <sup>3</sup> /hr)	X	X		X
4 x 13 Extra-Flow	5-15 gpm (1.1-3.4 m <sup>3</sup> /hr)	X	X		X
4 x 28 Extra-Flow	5-30 gpm (1.1-6.8 m <sup>3</sup> /hr)	X	X		X
6 x 28 Extra-Flow	5-50 gpm (1.1-11.4 m <sup>3</sup> /hr)		X		
6 x 28 NB	5-50 gpm (1.1-11.4 m <sup>3</sup> /hr)	X			
10 x 28 Extra-Flow High Purity	44-250 gpm (10-57 m <sup>3</sup> /hr)	X	X		
10 x 28 Extra-Flow INDUSTRIAL	44-210 gpm (10-48 m <sup>3</sup> /hr)			X	

\*FDA Compliant Materials

# Liqui-Cel®

## Membrane Contactors



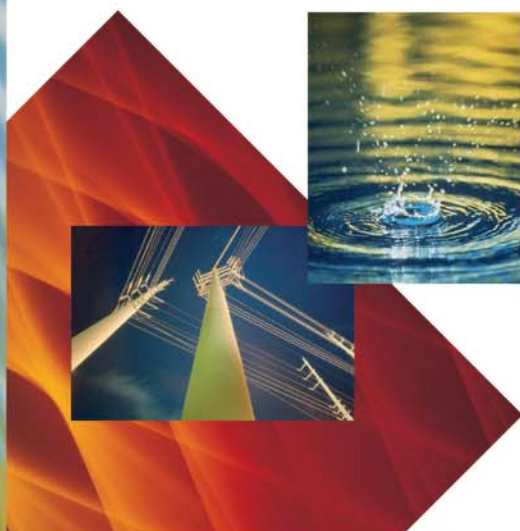
### Extra-Flow Design

The patented Liqui-Cel Extra-Flow Membrane Contactor design contains thousands of Celgard® microporous polypropylene hollow fibers knitted into an array that is wound around a distribution tube with a central baffle.

During operation, the liquid flows over the shellside (outside) of the hollow fibers. The patented Extra-Flow design incorporates a baffle in the middle of the contactor, which directs the liquid radially across the array. A strip gas or vacuum, either separately or in combination, is applied on the lumenside (inside) of the hollow fibers.

Because of its hydrophobic nature, the membrane acts as an inert support to allow intimate contact between a gas and liquid phase without dispersion. The gas/liquid interface is immobilized at the pore by applying a higher pressure to the liquid stream relative to the gas stream.

Liqui-Cel Extra-Flow Contactor  
Processes 0.5 - 250 gpm (0.1 - 47.7 m<sup>3</sup>/hr) in one device  
Primary Applications: Degassing or gassing of water. [O<sub>2</sub>, CO<sub>2</sub>, N<sub>2</sub>, VOC removal, and O<sub>2</sub>, CO<sub>2</sub>, N<sub>2</sub>, H absorption]

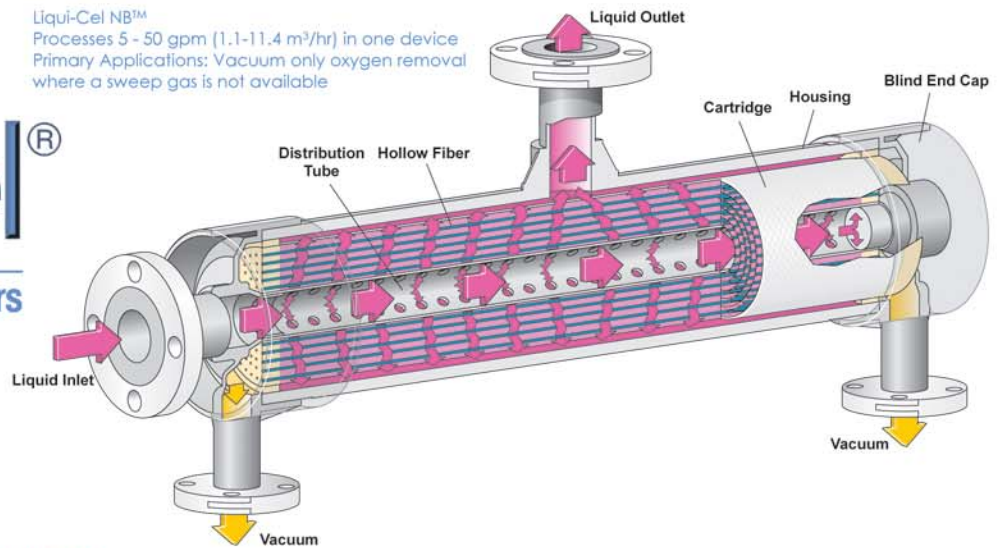


Liqui-Cel® Contactor Product Family

# Liqui-Cel<sup>®</sup>

## Membrane Contactors

Liqui-Cel NB<sup>™</sup>  
Processes 5 - 50 gpm (1.1-11.4 m<sup>3</sup>/hr) in one device  
Primary Applications: Vacuum only oxygen removal  
where a sweep gas is not available



### FEATURES AND BENEFITS

Using Liqui-Cel and SuperPhobic Membrane Contactors for your application provides many benefits:

**Modular design** offers flexibility for meeting future capacity or tighter specification requirements

**Fast equilibrium** means quick start-ups

**Maximized surface area/volume** results in high performance and space efficiency

**FDA compliant materials** of construction available for aqueous-based food contact

**Different contactor sizes and material options** allow many placement options (Ex. Makeup or polishing loops)

**Simple operation** means reduced instrumentation and maintenance requirements

**No chemical requirements** make contactors environmentally friendly and safe for employees

**High inlet pressure and low pressure drop** eliminates the need for repressurization pumps

**Non-dispersive characteristics** allow the contactor to be operated over a wide range of flow rates

**Warranties available** for 1 ppb O<sub>2</sub> outlet and 1 ppm CO<sub>2</sub> outlet

### NB<sup>™</sup> Design

The Liqui-Cel NB<sup>™</sup> design is also a radial flow device that utilizes the hollow fiber array. It does not, however, contain a central baffle. Instead, it utilizes one blind end cap that in effect acts as a flow-directing baffle. Because the outlet liquid port is located on the side of the contactor, the liquid flows radially over the fibers. The NB does a superior job in vacuum only degassing applications where sweep gas is not available.

### MiniModule<sup>®</sup> Design

The MiniModule design does not utilize the flow-directing central baffle either. The liquid in this design flows on the inside of the hollow fibers and a vacuum is pulled on the outside of the fibers. These units are designed for small flow rates where a radial flow design is not required.



### SuperPhobic<sup>®</sup> Contactors

We developed a revolutionary contactor that can degas low surface tension fluids without fiber wet out. The SuperPhobic Contactors utilize a proprietary fiber that is a semi permeable porous membrane. It is suited for degassing low surface tension fluids such as developer, plating solutions and various emulsions. The membrane introduces a barrier near the liquid phase that allows the liquid and gas phases to remain independent of each other. This membrane is incorporated in our Extra-Flow module design.

### MARKETS SERVED

- Semiconductor/Microelectronics
- Power
- Food and Beverage
- Pharmaceutical
- Medical/Analytical
- Boiler Feed Water
- Building Water
- General Industrial
- Photographic/Plating
- Inks
- Others

### APPLICATIONS

- Deoxygenation
- Decarbonation
- Carbonation
- Nitrogenation
- Hydrogenation
- Debubbling
- H<sub>2</sub>S removal
- VOC removal
- Humidification of Gasses



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Underlining Performance

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**Liqui-Cel®**  
Membrane Contactors