



Start-up Procedures

for 3M™ Liqui-Cel™ SP 1×3, 1×6 and 2×6 Series Membrane Contactors

Prior to any start-up procedure, proper installation is required.

Please read, understand, and follow all operating and safety information contained in this guide and the product data sheet prior to using this membrane contactor. These documents are available at 3M.com/Liqui-Cel. Download and retain the instructions for future reference.

Intended Use(s): 3M™ Liqui-Cel™ Membrane Contactors are intended to remove dissolved gases and bubbles from compatible liquids or to add gases to a liquid stream. Liqui-Cel products are for use in industrial separation applications of industrial fluids only, in accordance with the applicable product instructions and specifications.

Since there are many factors that can affect a product's use, the customer and user remains responsible for determining whether the 3M product is suitable and appropriate for the user's specific application, including user conducting an appropriate risk assessment and evaluating the 3M product in user's application.

Restrictions on Use: 3M advises against the use of these 3M products in any application other than the stated intended use(s), since other applications have not been evaluated by 3M and may result in an unsafe or unintended condition. Do not use in any manner whereby the 3M product, or any extractable or leachable from the 3M product, may become part of or remains in a medical device, drug, cosmetic, or food or drink additive or supplement; or in applications involving life-sustaining medical applications or prolonged contact with internal bodily fluids or tissues. If you are considering using this 3M product for a restricted use, you must first contact 3M with information about your proposed application to request prior written authorization for supply for such use.

3M™ Liqui-Cel™ SP 1×3 Series Membrane Contactors are not for use in food contact applications. 3M™ Liqui-Cel™ SP-1×6 and 2×6 Series Membrane Contactors are constructed of FDA Title 21 CFR § 174-186 compliant materials for wetted parts only at ambient temperatures.



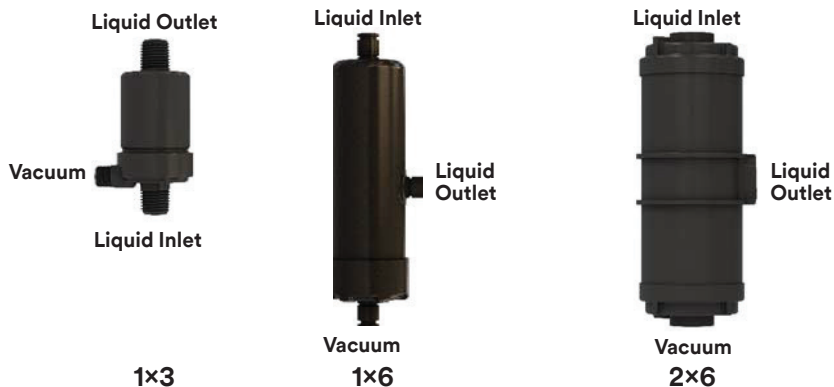
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Steps:

1. Mount the membrane contactor vertically or horizontally. Vertical orientation is recommended where possible.
2. These membrane contactors operate in vacuum only mode. The start-up procedure is the same for all products. The proper liquid and vacuum port connections must be made as illustrated below.

Correct Mounting Position and Port Identification

Vertically Mounted Module



(Other connection options may be available. Refer to product datasheets.)

Start-up Procedures

A. General start-up instructions for the liquid phase.

Note: The gas/vacuum port should not be closed off during operation

1. Connect the liquid inlet/outlet ports and the vacuum port as shown in the illustrations above. For 1×6 and 2×6, either liquid port can be used for the inlet.
2. Slowly introduce liquid into the contactor, making sure that the liquid inlet pressure and liquid flow rate through the contactor never exceed the respective maximum operating limits: The liquid must flow on the shellside of a 3M™ Liqui-Cel™ SP Series Membrane Contactor.
3. Adjust the liquid flow rate and inlet pressure to the desired levels by adjusting the appropriate valves on the system.

B. Vacuum

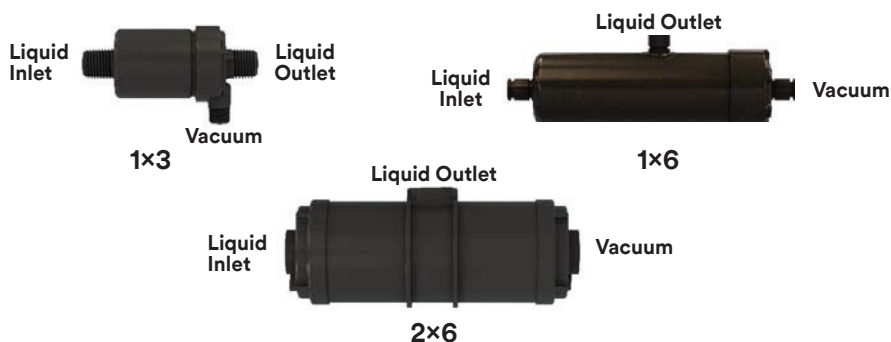
1. Start vacuum pump following the vacuum pump manufacturer's instructions.
2. Apply vacuum to the contactor by opening appropriate valve.
3. Adjust absolute gas pressure on the vacuum side to the desired level at the vacuum port on the contactor (absolute pressure depends on gauge vacuum as well as barometric pressure).

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Notes:

- Use of metal connectors is not recommended.
- Prefiltration is recommended. Filtration requirements depend on operating conditions and the nature of the liquid introduced to the contactor. Contact your 3M representative for guidance.
- The liquid pressure should always be higher than the gas pressure inside the contactor.
- Liquid must flow on the shellside (outside) of the fiber.
- The vacuum port should not be closed off during operation. Never connect liquid or gas under pressure to the vacuum port as it may damage the membrane contactor.

Horizontally Mounted Module



Product	Maximum Pressure*		Maximum Flow Rate
1×3	UP or UP II Fiber		60 ml/min
	25°C, 3.1 barg (77°F, 45 psig) 40°C, 1.0 barg (104°F, 15 psig)		
1×6	5-25°C, 4.1 barg (41-77°F, 60 psig) 75°C, 1.0 barg (167°F, 15 psig)		300 ml/min
2×6	UP Fiber	UP II or UP II+ Fiber	1000 ml/min
	25°C, 4.1 barg (77°F, 60 psig) 50°C, 1.0 barg (122°F, 15 psig)	25°C, 7.2 barg (77°F, 105 psig) 75°C, 1.0 barg (167°F, 15 psig)	

* using 50 torr (mm Hg) vacuum on lumenside.

Guideline for Minimum Vacuum Pressure

Maintain a vacuum level such that the absolute pressure on the vacuum side (lumenside) of the membrane is higher than the vapor pressure of the most volatile component in the liquid (water or solvent, etc.) at the operating temperature.

For example, the vapor pressure of a water-based ink operating at a temperature of 25°C would be approximately 20-22 torr (mm Hg) absolute. In this case, the absolute pressure on the vacuum side should be approximately 25-30 torr or higher. Typically, pulling a vacuum deeper than 30 torr is NOT recommended.

SAFETY INFORMATION

⚠ WARNING - To reduce the risks associated with bursting or exposure to chemicals which, if not avoided, could result in serious injury or death:

- Do not exceed maximum operating pressure or temperature limits. Cleaning should be conducted at the minimal temperature and pressure required to clean the contactor, never exceeding the maximum operating pressure and temperature limits of the contactor.
- Implement workplace safety risk controls (e.g. PPE, engineering controls) according to all applicable local and government regulations and codes.
- To prevent buildup of pressure inside contactor, do not block or valve off all gas/vacuum ports during operation. If contactor is not in use but still full of process fluids, ensure the gas/vacuum side is open to atmospheric pressure.

NOTICE - To reduce membrane contactor or system damage:

- If the membrane contactor is used with air sweep, then the temperature should not exceed 35°C (95°F). For membrane contactors used with vacuum only this statement does not apply.
- Care must be taken not to drop, hit or impact the contactor.
- 3M™ Liqui-Cel™ Membrane Contactors should be stored dry and in a sealed plastic bag or shrink wrap material to help prevent the introduction of contaminants into the contactor.
- Store 3M Liqui-Cel Membrane Contactors dry at temperatures < 50°C (122°F), but preferably at lower temperature such as < 35°C (95°F) to not risk reduced lifetime. Membrane contactors should always be stored above freezing temperatures, and if stored at low temperature, they should be allowed to equilibrate to room temperature before use.
- 3M™ Liqui-Cel™ Membrane Contactors should be stored in their original box, or other opaque box, and should not be installed where they are exposed to direct sunlight.
- Do not allow membrane contactors containing microporous hollow fiber membranes to come into contact with surfactants, oil, or organic solvents, such as pure alcohols, glycol, acetone, etc., to reduce the risk of membrane wet out. SP-series contactors containing polyolefin membrane are not subject to this restriction.
- Cumulative exposure of the membrane to oxidants, such as ozone, chlorine, hydrogen peroxide, peracetic acid, etc., should be restricted to reduce the risk of membrane oxidation.
- Filtered, de-chlorinated, and deionized water is recommended for mixing cleaning solutions. If a pH shift occurs, water containing sparingly soluble compounds of Ca, Mg, Fe, Al, etc. and silica (SiO₂) etc. could precipitate from the solution and block or damage the membrane. Ensure that your water is clean of these compounds.
- At end of life, dispose of the membrane contactor or cartridges in accordance with all applicable local and government regulations.

Product Selection and Use
Many factors beyond 3M's control and uniquely within user's knowledge and control can affect the use and performance of a 3M product in a particular application. As a result, customer is solely responsible for evaluating the product and determining whether it is appropriate and suitable for customer's application, including conducting a workplace hazard assessment and reviewing all applicable regulations and standards (e.g., OSHA, ANSI, etc.). Failure to properly evaluate, select, and use a 3M product and appropriate safety products, or to meet all applicable safety regulations, may result in injury, sickness, death, and/or harm to property.
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