Storage and Handling
3M™ Liqui-Cel™ Membrane Contactors can be damaged through improper handling and storage. The guidelines below are intended to provide a framework for the proper storage and handling of these products. If you have any questions, please review the product datasheet and operating guide at 3M.com/Liqui-Cel or contact your 3M representative.

Storage: Container/packaging: 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.

Temperature: Store 3M™ Liqui-Cel™ Membrane Contactors dry at temperatures < 49°C (120°F). Membrane contactors stored at very low temperatures < 5°C (41°F) should be allowed to equilibrate to room temperature before use.

△ Exposure to Sunlight: 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.

△ Storage and Handling: Care must be taken not to drop, hit or impact the membrane contactor. Use appropriately rated lifting equipment for lifting or moving. Review the product datasheet or operating guide for weights at 3M.com/Liqui-Cel.

Store the membrane contactors in the horizontal position. 10×28-inch membrane contactors with stainless steel housings may be packaged in cardboard boxes or wooden crates. 14×28-inch, 10×28-inch with FRP housings, 8×20-inch and 6×28-inch membrane contactors are packaged in cardboard boxes. 8×40 inch and 8×80-inch membrane contactors are individually bagged, then cradled on pallets. Membrane contactors should be stored in a safe location where they are not at risk of falling, being crushed or impacted. Always ensure the membrane contactor, and any systems using membrane contactors, are stable, level, and properly secured. Be sure the membrane contactors/system cannot tip, roll, fall, slide or make any movement that may cause injury, damage to the unit, or damage to other system components.

Technical Information: The technical information, recommendations and other statements contained in this document are based upon tests or experience that 3M believes are reliable, but the accuracy or completeness of such information is not guaranteed.

Product 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. Given the variety of factors that can affect the use and performance of a 3M product, user is solely responsible for evaluating the 3M product and determining whether it is fit for a particular purpose and suitable for user’s method of application. Not for consumer sale or use.

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Start-up Procedures for 3M™ Liqui-Cel™ EXF and SP Series Membrane Contactors

- 2.5×8
- 4×13
- 4×28
- 6×28
- 8×20
- 8×40
- 8×80
- 10×28
- 14×28
- 14×40

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

Please read, understand, and follow all safety information contained in the Operating Guide prior to using this membrane contactor. The Operating Guide is available at 3M.com/Liqui-Cel. Download and retain the instructions for future reference.
Start-up Procedures | 3M™ Liqui-Cel™ EXF and SP Series Membrane Contactors

Steps:
1. Note that for adding dissolved gases to water, the only mode of operation is sweep.
2. Mount contactor vertically or horizontally. If mounted vertically the drain port should be at the bottom end of the module. If mounted horizontally the drain port should be pointed downwards.
3. Refer to start-up procedures below for connections and mode of operation.

Notes:
- The liquid pressure should always be higher than the gas pressure inside the contactor.
- Liquids entering the membrane contactor should be prefiltered at 5 micron absolute at 99.9% removal (beta 1000).
- Gas entering the contactor should be filtered at 0.2 micron absolute at 99.9% removal (beta 1000) for high-purity applications. Filtration at 1 micron absolute at 99.9% removal (beta 1000) may be sufficient for industrial applications.
- Upon initial start-up, flush all pipes to drain prior to introducing liquid into the membrane contactors.

Mounting Position, Port Identification and Operating Modes
Note: See the Operating Guide in the Tech Support Section at 3M.com/Liqui-Cel if you need additional piping and instrumentation information.

B. Start-Up Instructions for strip gas and vacuum phase
Note: Vacuum, when used in combo, should always be pulled from the lowest gas port to facilitate draining and ensure performance.

Sweep Gas Mode
1. Regulate gas supply pressure to membrane contactor at ≤10 psig (0.7 barg) by adjusting the appropriate system valves.
2. Set the recommended total sweep flow rate by adjusting the appropriate system valves. See the sweep guidelines for typical sweep gas flow rate ranges.
3. Introduce sweep gas into each contactor.

Note: If using compressed air, make sure it is oil free and air temp <35°C.

Sweep Gas with Vacuum (Combo Mode)
1. Regulate gas supply pressure to membrane contactor at ≤1 psig (0.07 barg) by adjusting the appropriate system valves.
2. Set the recommended total sweep flow rate by adjusting the appropriate system valves. See sweep guidelines for typical sweep gas flow rate ranges in the table below.
3. Introduce sweep gas into each contactor.
4. Apply vacuum as described in the vacuum section below.

Air Sweep Guidelines for Sweeple-Only Mode
<table>
<thead>
<tr>
<th>Membrane Size</th>
<th>Minimum Flow Rate</th>
<th>Maximum Flow Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5×8</td>
<td>0.25 – 1.25 scf/m³</td>
<td>5.0 – 30.0 scf/m³</td>
</tr>
<tr>
<td>4×13</td>
<td>0.4 – 2.0 scf/m³</td>
<td>5.0 – 30.0 scf/m³</td>
</tr>
<tr>
<td>4×28</td>
<td>1.0 – 10.0 scf/m³</td>
<td>10.0 – 50.0 scf/m³</td>
</tr>
<tr>
<td>8×20 PVC</td>
<td>3.0 – 15.0 scf/m³</td>
<td>10.0 – 50.0 scf/m³</td>
</tr>
<tr>
<td>8×20 IND</td>
<td>3.0 – 15.0 scf/m³</td>
<td>10.0 – 50.0 scf/m³</td>
</tr>
<tr>
<td>8×20 SS</td>
<td>Not Recommended</td>
<td>0.5 – 1.0 scf/m³</td>
</tr>
<tr>
<td>8×40</td>
<td>5.0 – 20.0 scf/m³</td>
<td>7.9 – 117.1 scf/m³</td>
</tr>
<tr>
<td>8×80</td>
<td>Not Recommended</td>
<td>10.0 – 50.0 scf/m³</td>
</tr>
</tbody>
</table>

Blower in suction mode with atmospheric air as sweep gas for CO removal
- Refer to Air Sweep Guidelines for Sweep-Only Mode in table below for typical air flow rates.
- Start blower using suction mode operation.
- Open isolation valve (if applicable).
- Close relief valve.

* Note that the gas side/vacuum pressure limits may be less than this. See Operating Guide for other pressure restrictions in the European Communities (EU).

Max. Trans-membrane pressure (TMP)
differential at 25°C (77°F)
<table>
<thead>
<tr>
<th>Membrane Size</th>
<th>Maximum TMP</th>
</tr>
</thead>
<tbody>
<tr>
<td>X40 membrane</td>
<td>150 psi (10.3 bar)*</td>
</tr>
<tr>
<td>X100 membrane</td>
<td>120 psi (8.3 bar)</td>
</tr>
<tr>
<td>XIND membrane</td>
<td>75 psi (5.2 bar)</td>
</tr>
<tr>
<td>UP Membrane</td>
<td>75 psi (5.2 bar)</td>
</tr>
</tbody>
</table>

* Please note that the 8×40 and 8×80 modules can operate up to 300 psi TMP.