

## Hot CIP Sanitization Procedure for Liqui-Cel® Membrane Contactors in Stainless Steel Housings

Hot CIP sanitization is the accepted cleaning strategy against microbiological growth in many industries. It has been commonly used in the pharmaceutical and the food and beverage industry for years. Performed frequently as prevention strategy, hot sanitization is a requirement for high purity water (HPW) for United States Pharmacopeia (USP) and European Pharmacopoeia (*Ph. Eur.*).

Hot CIP Membrane Contactors are subject to material stress and high temperature influences. The following TechBrief provides some advice on how to perform correct hot sanitization with Liqui-Cel Contactors.

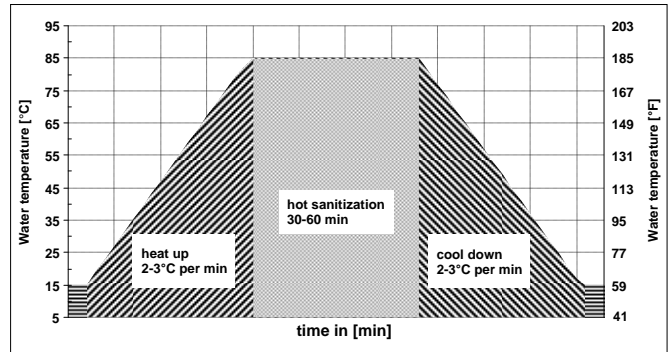
The following Contactors are available in a SS housing which is required for Hot CIP:

- 4x13 Extra-Flow Liqui-Cel Contactors
- 4x28 Extra-Flow Liqui-Cel Contactors
- 10x28 Extra-Flow Liqui-Cel Contactors

To start the CIP cleaning steps, you must stop the sweep gas supply and/or vacuum first. Then open the drain port to release and drain any water that may have condensed and collected in the lumens. The next step is to start heating the water slowly by increasing the temperature 2-3° C (35.6 – 37.4° F) per minute until 80 – 85° C (176 – 185° F) is reached. This maximum temperature should be maintained for 30 – 60 minutes. The hot water temperature should not exceed 85° C during this process.

The final ramp down of the cleaning process should be to slowly cool down the liquid using the same process of 2-3 °C (35.6 – 37.4° F) per minute. After cooling you will need to start the vacuum (if used) and then apply sweep gas. Note that the maximum water pressure at high temperatures is limited to 2 bar (29 psi).

Figure 1 illustrates the three main steps during hot sanitization.



The table below summarizes the general process limitations during CIP.

water temperature	max 80 - 85° C (176 - 185° F)
water pressure	max 2 bar (29 psi)
heating / cooling rate	2 - 3° C per min (35.6 – 37.4° F per min)
sanitization time	30 - 60 min

Since water vapor and other volatile gases will pass through the membrane, the lumenside gas will become saturated with the water vapor. Depending on the temperature, condensation will occur in the outlet gas piping. Therefore a drain should be installed.

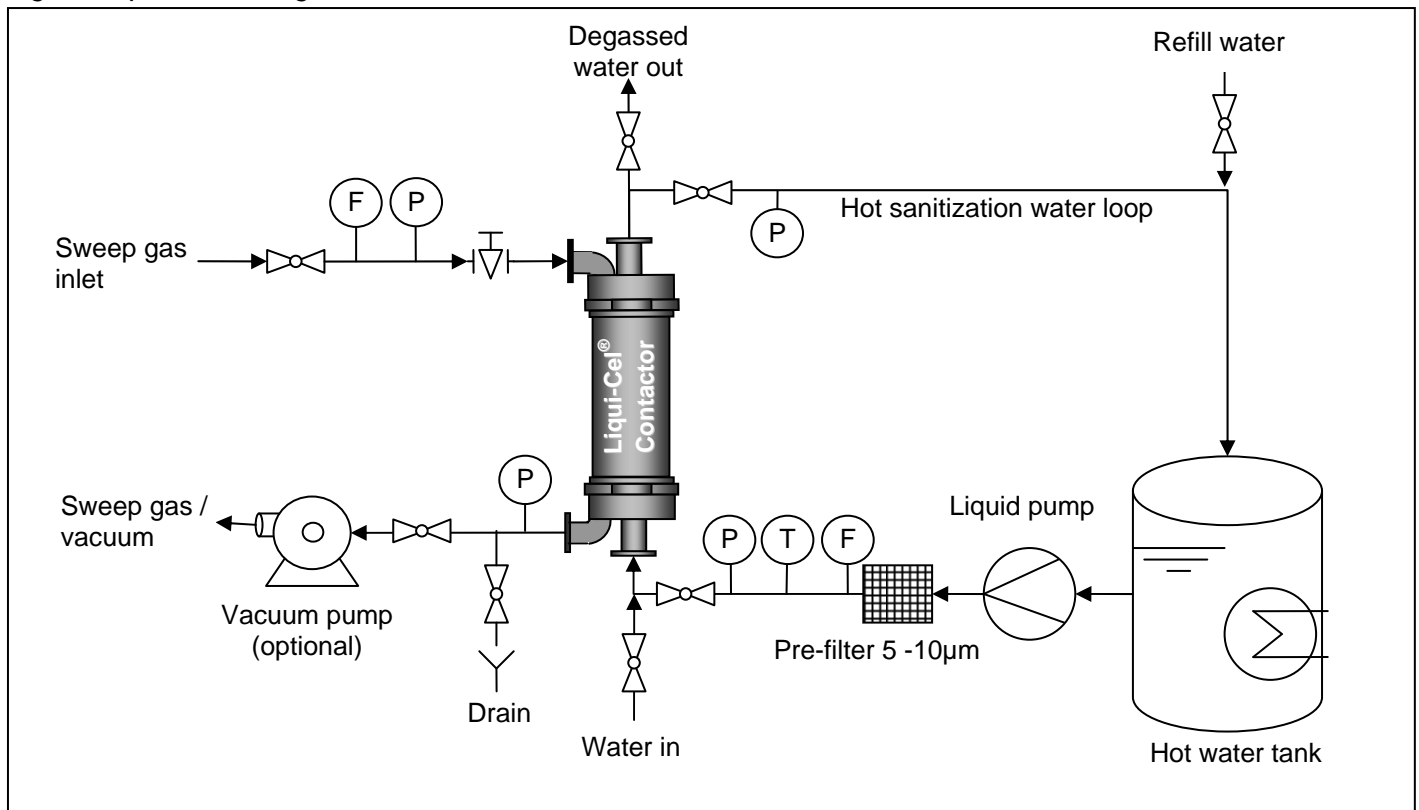
The condensation rate depends on the liquid temperature. The warmer the liquid stream, the higher the water-vapor transport rate. This condensation phenomenon is normal. After the CIP cooling cycle, purging the lumens with sweep gas for 5 minutes at 1 – 2 bar (14.5 – 29 psi) will facilitate clearing the lumens of water vapor.

Additionally we recommend vertically mounting the contactors. If a vacuum is used on the system it should be pulled from the gas port on the bottom of the contactor. This and the downward sweep gas flow used in vertically mounted contactors facilitates draining the water vapor condensation out of the bottom lumen port of the contactor.

Figure 2 shows a basic system design. The system set up will depend on the operating conditions. More information about system design can be found in the full operating guide.

Our cleaning guide also provides more information on other cleaning strategies. For any questions please contact your Membrana representative or visit us online at [www.liqui-cel.com](http://www.liqui-cel.com).

Figure 2: process design for hot sanitization



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