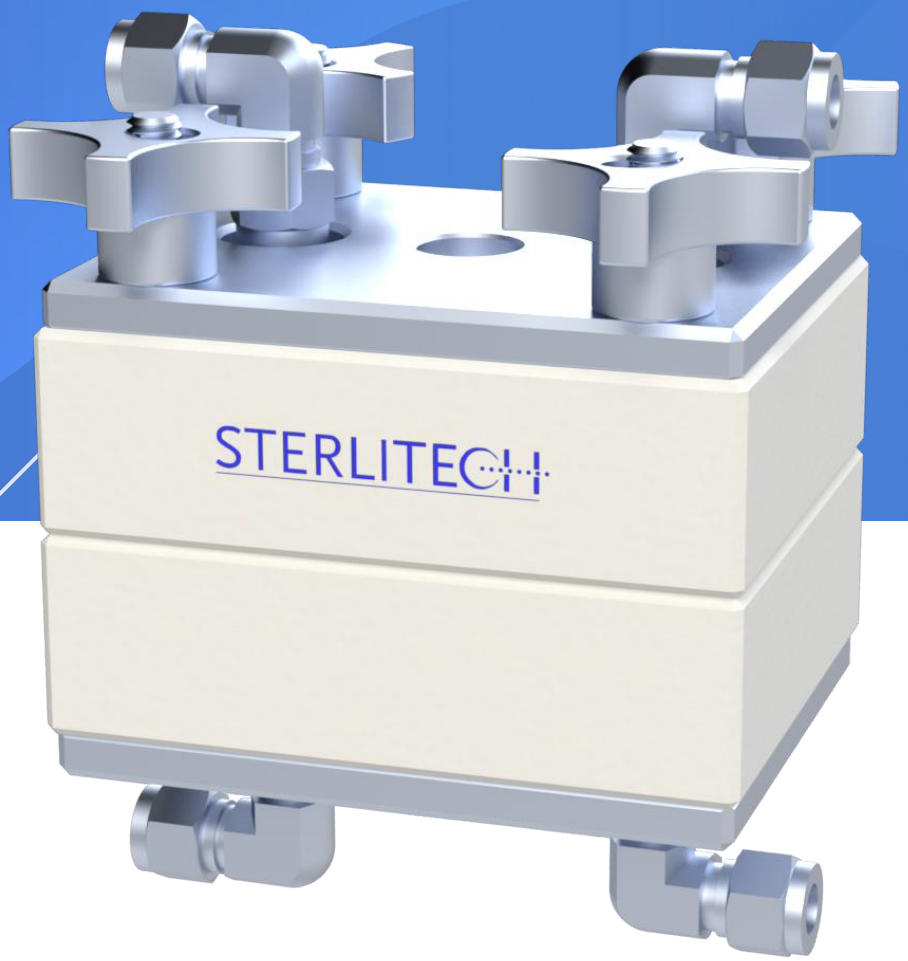
STERLITECH

Corporation

CF042D-FO Cell

Assembly & Operation Manual



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Introduction

The CF042D-FO Cell is a laboratory-scale filtration unit that is designed to evaluate a variety of engineered osmosis processes, including Forward Osmosis (FO), and Pressure Retarded Osmosis (PRO). It simulates the flow dynamics of larger, commercially available membrane elements such as industrial spiral wound membrane elements. Users can vary the operating conditions and fluid dynamics over broad ranges.

Table 1 outlines the operational parameters and technical specifications of the CF042D-FO Cell.

Prior to operating or servicing this device, this manual must be read and understood.

Table 1: CF042D-FO Features and Technical Specification

PARAMETER	DESCRIPTION
Membrane Operation	Forward Osmosis
Cell Material	Acetal Copolymer (Delrin)
Membrane Active Area	42 cm² (6.5 in²)
Maximum Pressure	69 bar (1000 PSI)
Maximum Temperature	82 °C (180 °F)
Recommended Feed Rate	0.5-2.5 LPM (0.13-.66 GPM)
Channel Dimensions	
Channel Depth	2.28 mm (0.09 inches)
Channel Width	39 mm (1.54 inches)
Fittings	
Feed Inlet/Outlet Size (Tube OD)	3/8” Compression
Draw Inlet/Outlet Size (Tube OD)	3/8” Compression
Securing Method	Quick-Release Knobs

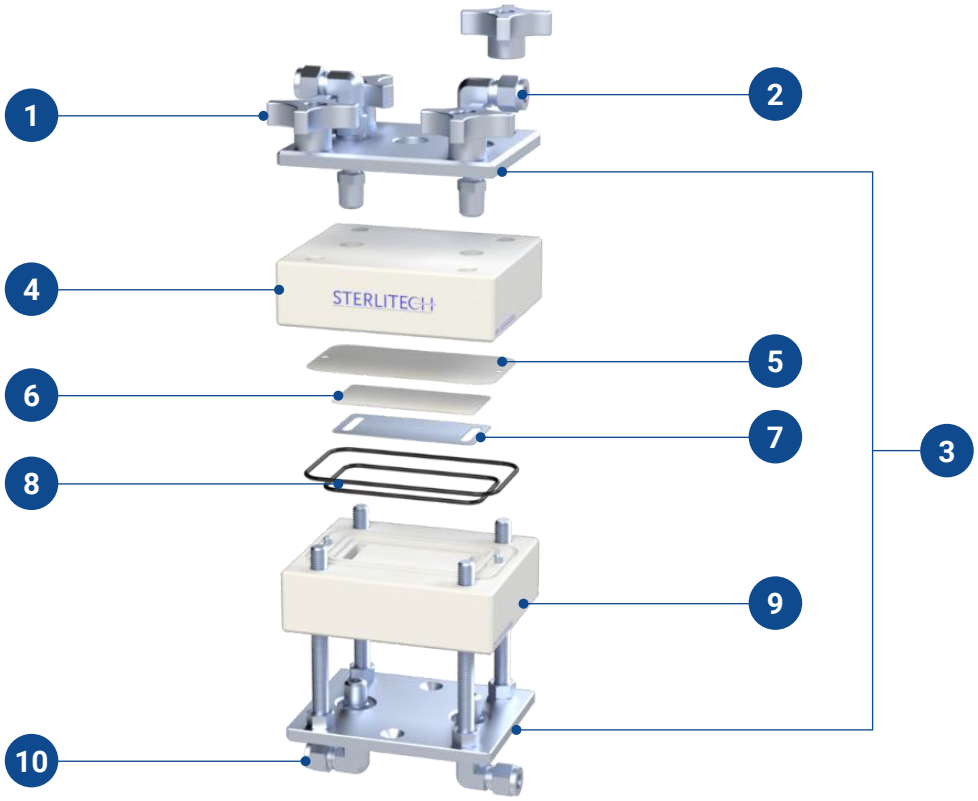
Note: *Maximum Pressure and Temperature ratings are dependent on a variety of factors. Listed values are guidelines based upon material properties and cannot be guaranteed in every application.*

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CF042D-FO Cell Components

Figure 1 illustrates a typical assembly of the CF042D-FO Cell. The cell is also packaged with a membrane cutting template.

Figure 1: CF042D Forward Osmosis Cell Body Assembly



NUMBER	DESCRIPTION	MATERIAL	WETTED?
1	Clamping Plate/Quick Release Knobs	316 Stainless Steel	No
2	Inlet/Outlet Fittings (Draw)	316 Stainless Steel	Yes
3	Clamping Assembly	304 Stainless Steel	No
4	Cell Top	Acetal Copolymer (Delrin)	Yes
5	Membrane	Various	Yes
6	Spacers**	Polypropylene	Yes
7	Shims**	316 Stainless Steel	Yes
8	O-Rings	Buna-N*	Yes
9	Cell Bottom	Acetal Copolymer (Delrin)	Yes
10	Inlet/Outlet Fittings (Feed)	316 Stainless Steel	Yes

* *Standard, Other Materials Available* ** *Not Included, Available for purchase*

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CF042D-FO Cell Assembly

To assemble the CF042D Forward Osmosis Cell: (Video)

1. Wet the O-rings with a small amount of water or the fluid to be processed and install them into the grooves on the cell bottom. (Video)

   Caution: *Make sure that the O-rings lie flat in the grooves of the cell bottom. Leaking may occur if the O-rings do not lie flat in the grooves. The O-rings will be cut or crushed when the system is operating if the O-rings are not installed correctly.*

2. Optional: Install shim(s) into your cell channel followed by the selected spacer. Spacers should be selected first, based on the desired thickness; shims should then be selected to fill the remaining channel depth. The overall channel depth is 0.09”.

   Note: *Shims and Spacers are not included with a CF042D-FO Cell purchase.*

3. Place a piece of pre-cut membrane onto the cell bottom using the two alignment pins to hold the membrane in position. The membrane should be installed with the shiny side (active side) down, toward the cavity in the cell bottom.

   Note: *If you are cutting your own membranes, the membrane’s outer edge should fit between the inner and outer O-rings in the cell body to prevent leakage.*

4. Optional: Place a spacer on top of the membrane followed by the appropriate shim(s). Align in the middle of the membrane, verifying the orientation for proper flow.

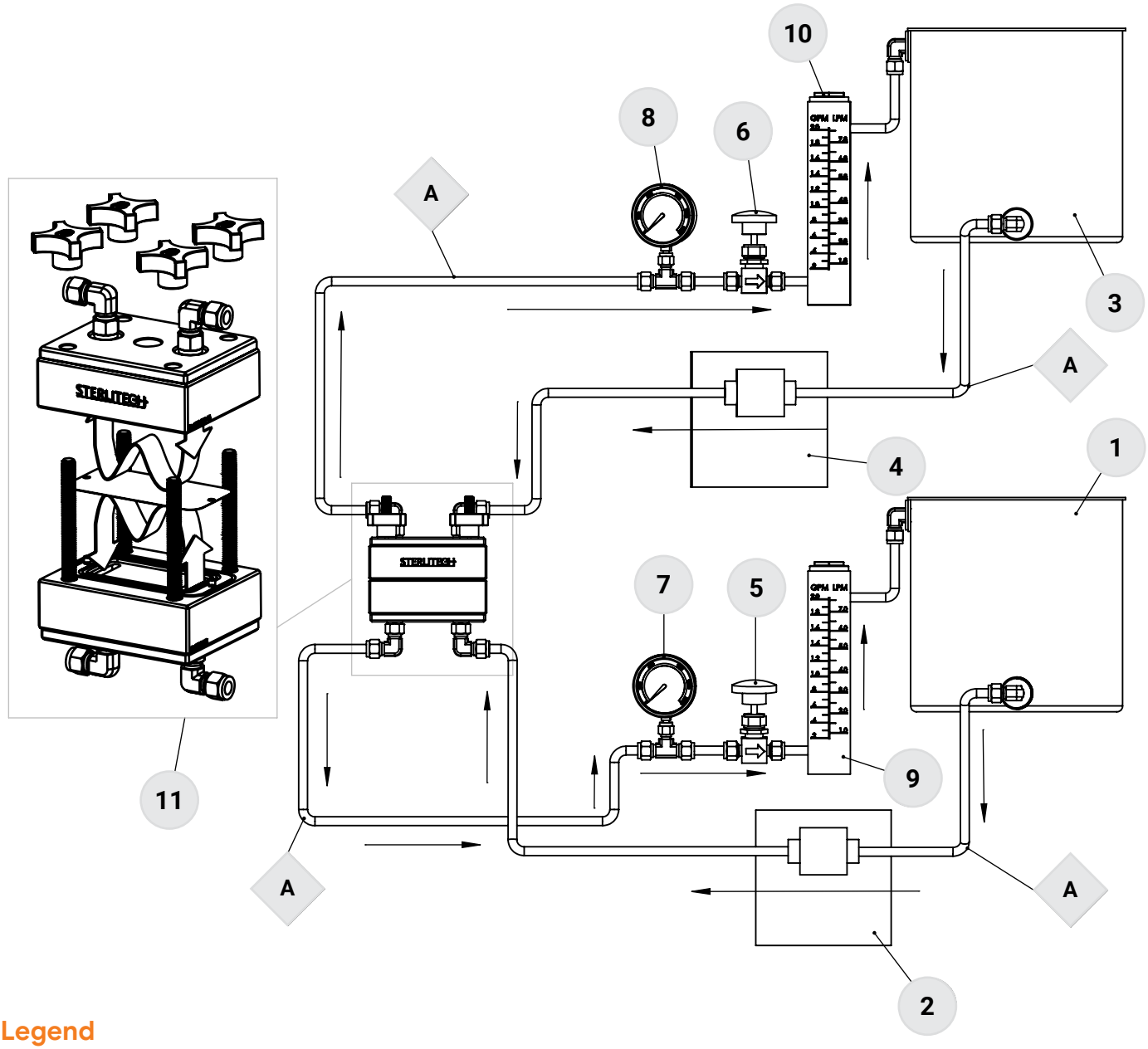
5. Place the cell top onto the cell bottom. The alignment holes in the top should fit over the alignment pins in the cell bottom.

6. Place the top clamping plate on the cell top. Secure the assembly by tightening the quick release knobs in an alternating pattern to ensure even pressure on the O-rings.

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CF042D-FO Cell Connections and Parts

Figure 2: Cross Flow System Diagram for CF042D-FO Cell



Legend

1	Feed Tank
2	Feed Pump
3	Draw Solution Tank
4	Draw Solution Pump
5	Concentrate Pressure Control Valve
6	Draw Solution Pressure Control Valve

7	Concentrate Pressure Gauge
8	Draw Solution Pressure Gauge
9	Concentrate Flow Meter
10	Draw Solution Flow Meter
11	CF042 Forward Osmosis Cell Assembly
A	Low Pressure Tubing

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Operation of the CF042D-FO Cell

To operate the CF042D-FO Cell:

1. Open all the valves in the system to relieve any pressure build-up before turning on the feed pump.

2. Turn the system ON and set the feed pump to desired flow rate.

   Note: *If a bypass line is present, slowly close the bypass control valve; this valve is required only at low pressures and flows. Leaving the bypass line slightly open can also help to stabilize the system.*

3. Adjust the control valves (sold separately) to obtain the desired pressure and flow for feed and concentrate solution.

   Note: *A good starting point may be to set the system at 1.7 bar (25 PSIG) pressure for ultrafiltration or 17.2 bar (250 PSIG) for reverse osmosis.*

   Note: *Experimentation is required to determine the optimum settings of pressure, flow rate, and shim/spacer combination to use on the chosen membrane and the fluid being processed.*

4. Once the experiment is complete, shut down the system by turning the feed pump OFF and opening all of the valves to relieve any pressure build up.

To replace a membrane filter:

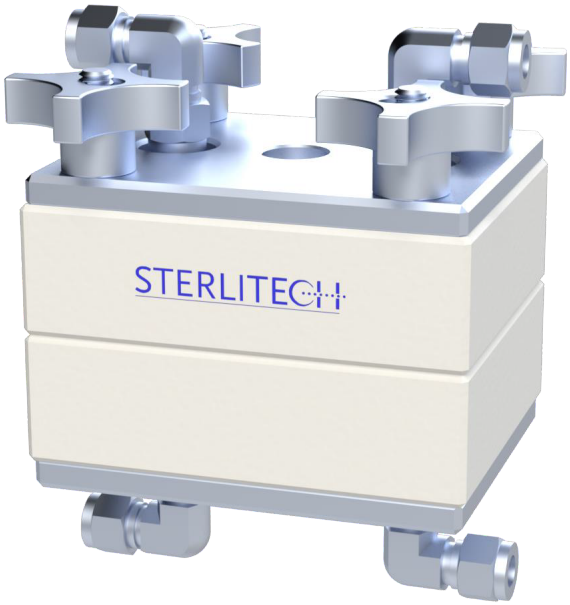
1. Turn the feed flow pump OFF.
2. Open all the valves in the system to relieve any pressure build up.
3. Unscrew and remove the quick-release knobs.
4. Lift off the top plate and the cell top from the assembly.
5. Remove the membrane.
6. Install the new membrane.
7. Reinstall the cell top and top plate.
8. Secure the cell top to the cell bottom using the quick-release knobs.

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Supplementary Operating Information

Additional Resources

- MPD Cell Quick Reference Guide
- MPD Video Channel
  - Cell Assembly
  - Shim and Spacer Installation
  - System Operation
- CF Filtration Handbook
  - Basics of Cross Flow Filtration
  - FAQs
  - Example Studies
  - Preconditioning Membranes
  - Temperature Effect on Membranes
- How to Swage a Compression Fitting
- How to Cut Custom Membrane Filters



Recommended Blog Articles

- How to Calculate Cross Flow Velocity
- How to Select a Spacer
- How to Clean Membranes

Analyzing Membrane Performance Results

Spiral wound membranes containing mesh spacers are usually operated with a fluid velocity across the membrane surface of 0.1–0.5 m/sec (0.3–1.6 ft/sec). Higher velocities in membranes may lead to excessive pressure differential across the membrane and possible damage. Hollow fiber membranes, tubular membranes, and membranes with tubular spacers may be operated at higher velocities, but this may not contribute to a more effective operation.

Other parameters such as viscosity, pressure, and suspended solids may also affect performance/operation. Experimentation with the CF042D-FO Cell can help predict the best operating parameters.

Cell and Membrane Cleaning

The CF042D-FO Cell can be cleaned with or without the membrane installed. Leave the membrane installed to simulate the cleaning conditions of Clean-In-Place (CIP), a common practice in larger systems with spiral-wound or tubular membranes.

During CIP, cleaning solutions are re-circulated and, in some cases, allowed to sit for a period of time within the cell body. In some cases, the feed pump can be used to re-circulate the cleaning solutions.

Refer to the Membrane Cleaning Blog linked above for recommended cleaning instructions.

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Accessory & Spare Part Ordering Information

PRODUCT	LINK
System Components (Pump, Flow Meters, Pressure Gauges, etc.)	System Components
CF042-FO Shim Assortment Pack	1160030
CF042-FO Feed Spacer Assortment Pack	1142820
CF042-FO Steel Rule Die	CF042 Die
CF042 Stainless Steel Stand	1230031
Membrane Packs	Flat Sheet Membranes
Spare Parts (Alternative O-Rings, Sintered Support Plate, Knobs)	Spare Parts

Product Support

Return Material Authorization

If materials are to be returned to Sterlitech for repair, evaluation, or warranty consideration, a Return Material Authorization (RMA) number and form must be obtained from Sterlitech prior to the return. Contact Sterlitech's Customer Service Department for these forms.

Be sure to include a complete, detailed written reason for the return. Also, include serial numbers, installation and removal dates, and any other information that is available. The crossflow cells have a serial number imprinted on them.

Indicate the proposed disposition of the material, and reference the RMA number on all packages or cartons. All material must be shipped to Sterlitech with freight prepared by the customer.

Warranty

The following is made in lieu of all other warranties expressed or implied. Sterlitech Corporation guarantees equipment to be free from defects in material and workmanship when operated in accordance with written instructions for a period of one year from receipt. Parts not manufactured by Sterlitech are covered by their manufacturer's warranties, which are normally for one year.

Manufacturers and Seller's only obligation shall be to issue credit against the purchase or replacement of equipment proved to be defective in material or workmanship. Neither manufacturer nor seller shall be liable for any injury, loss or damage, direct or indirect, special or consequential, arising out of the use of, misuse, or the inability to use such product.

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Technical Assistance

Please contact us if you have any questions or technical inquiries about our products by calling Sterlitech Corporation at **1-877-544-4420** or by visiting www.sterlitech.com.

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Company Background

Founded in 2001 in Kent, WA, Sterlitech Corporation manufactures and markets filtration-focused laboratory products to a broad spectrum of scientific and industrial sectors. Its line of flat sheet membranes and tangential flow cells deliver industry-leading performance and reliable results. Configured for reverse osmosis, nanofiltration, ultrafiltration, and microfiltration applications, Sterlitech's benchtop cross flow membrane test system provides the versatility required to innovate.

Sterlitech's comprehensive line of products is supported by the expertise of its technical specialists who can assist with application-specific product selection, and provide customized solutions where necessary. Unique problem-solving approaches, flexibility, and consistent quality have made Sterlitech Corporation a renowned global provider of filtration products and equipment.

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