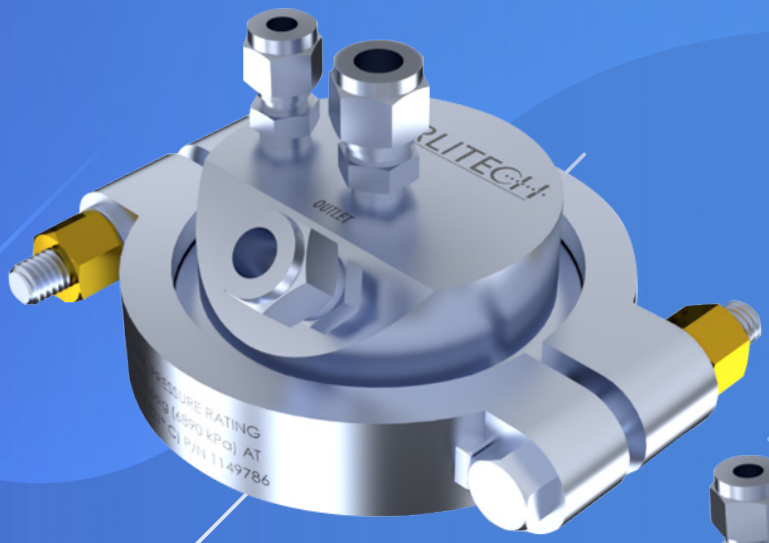
STERLITECH

Corporation

CF047 & CF090 Cell

Assembly & Operation Manual



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Introduction

The CF047/CF090 Cell is a laboratory-scale crossflow filtration unit that is designed to evaluate flat sheet membranes in a variety of applications. 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 CF047/CF090 Cell.

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

Table 1: CF047/CF090 Features and Technical Specifications

PARAMETER	DESCRIPTION
Membrane Operation	Cross Flow
Cell Material	316 Stainless Steel
Membrane Active Area	CF047: 14.6 cm² (2.26 in²) CF090: 53 cm² (8.2 in²)
Membrane Size (Diameter)	CF047: 47-49 mm CF090: 90-92mm
Maximum Pressure	69 bar (1000 PSI)
Maximum Temperature*	150 °C (302 °F)
Recommended Feed Rate	0.1-0.7 LPM (0.03-0.20 GPM)
Fittings	
Inlet/Outlet Size (Tube OD)	3/8” Compression
Permeate Size (Tube OD)	1/4” Compression
Securing Method	High Pressure Tri-Clamp (Sanitary)

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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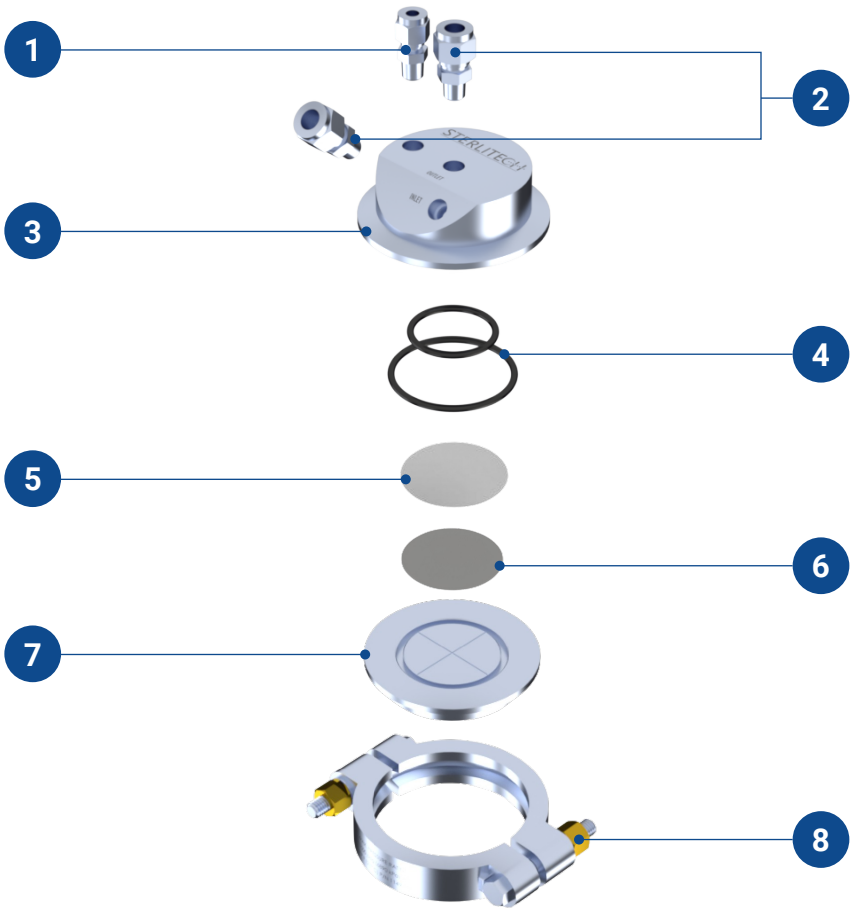
CF047/CF090 Cell Components

Figure 1 illustrates a typical assembly of the CF047/CF090 Cell. The cell is also packaged with a length of permeate tubing.

Figure 1: CF047/CF090 Crossflow Cell Body Assembly



NUMBER	DESCRIPTION	MATERIAL	WETTED?
1	Permeate Fitting	316 Stainless Steel	Yes
2	Inlet/Outlet Fittings	316 Stainless Steel	Yes
3	Cell Top	316 Stainless Steel	Yes
4	O-Rings	Viton*	Yes
5	Membrane	Various	Yes
6	Sintered Metal Support	316 Stainless Steel	Yes
7	Cell Bottom	316 Stainless Steel	Yes
8	High Pressure Tri-Clamp	Stainless Steel / Brass	No
	Permeate Tubing	Polypropylene	Yes

* *Standard, Other Materials Available* ** *Not Shown*

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CF047/CF090 Cell Assembly

To assemble the CF047/CF090 Crossflow Cell:

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 top.

   Caution: *Make sure that the O-rings lie flat in the grooves of the cell top. 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. Place a pre-cut membrane inside the cell top, centered over the inner O-ring. The membrane should be installed with the shiny side (active side) down toward the cavity in the cell top.

   Note: *When cutting membranes, ensure the membrane diameter extends past the outer edge of the inner O-ring to prevent leakage.*

3. Place the sintered metal support disk on top of the membrane to hold the membrane in place.

4. Place the cell bottom on the assembled cell top.

5. Use the high pressure coupling to clamp the cell bottom to the cell top. Tighten the high pressure coupling with 27 Nm (20 ft-lb) of torque for 69 bar (1000 PSI) operation.

6. Flip the cell over and install the feed inlet/outlet and permeate fittings, if they have not been previously installed. Use PTFE tape and thread sealant when installing fittings into the cell.

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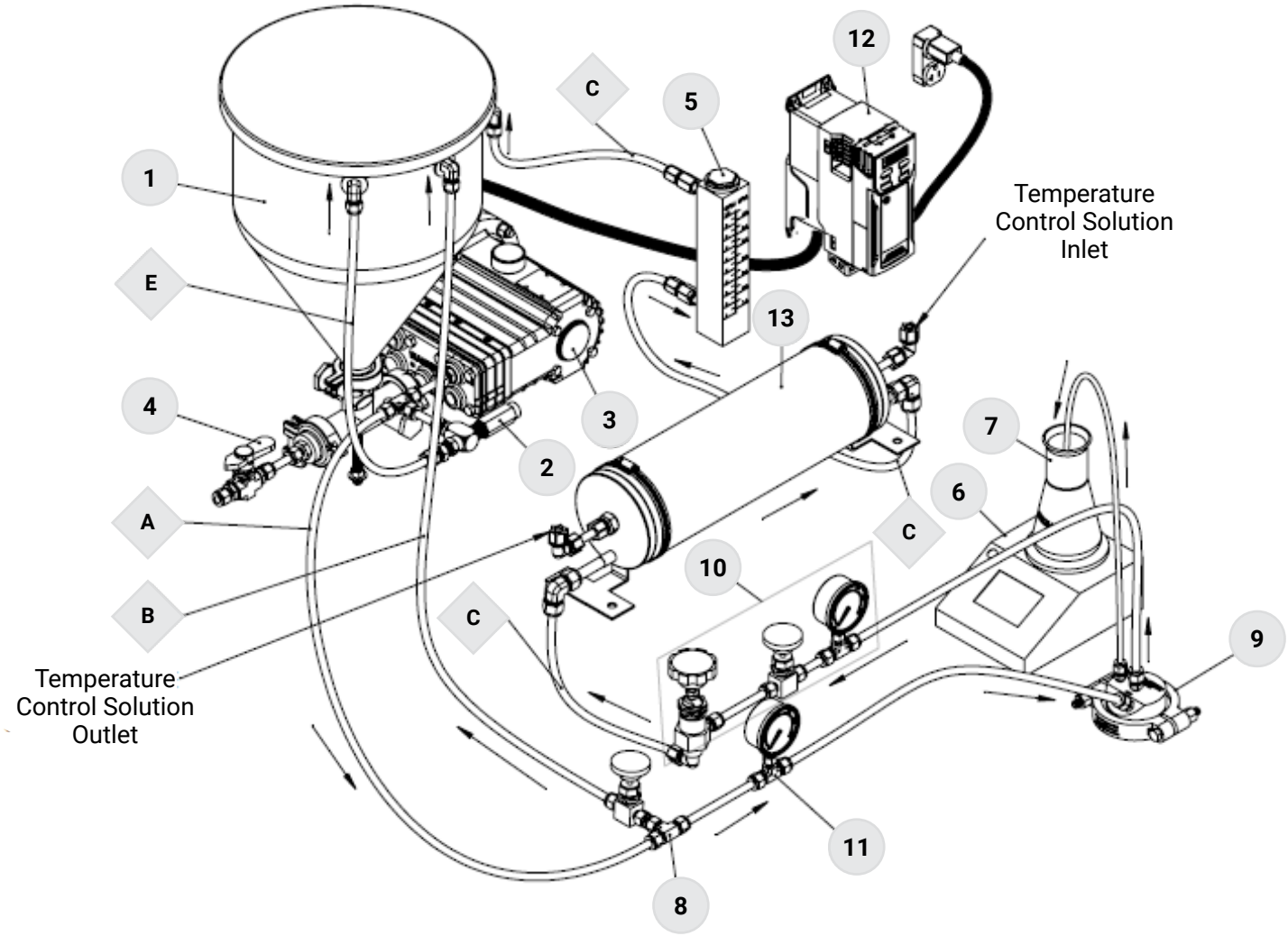
CF047/CF090 Cell Connections and Parts

Figure 2: Cross Flow System Diagram for CF047/CF090 Cell



Legend

1	5 Gal Conical Tank w/ Tee
2	Pressure Relief Valve
3	Motor & Pump Assembly
4	Drain Valve
5	Flow Meter
6	Scale for Measuring Permeate Flux
7	Permeate Collector
8	Bypass Needle Valve with Tee Fitting
9	CF047 / CF090 Cell Assembly
10	Concentrate Control Valve Assembly

11	Feed Pressure Gauge
12	Variable Frequency Drive (VFD)
13	Heat Exchanger
14	Cell Stand
A	High Pressure Flex or Rigid Tubing, Feed Line
B	Low Pressure Tubing, Bypass Line
C	Low Pressure Tubing, Return Line
D	Low Pressure Tubing, Permeate Output Line
E	Low Pressure Tubing, Relief Return Line

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Operation of the CF047/CF090 Cell

To operate the CF047/CF090 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. Set the feed pressure by gradually closing the concentrate control valve assembly. Do not exceed the maximum pressure rating of the cell, membrane or system.

   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.*

4. Verify the feed pressure reading on the concentrate pressure gauge.

5. Adjust the concentrate flow control valve to obtain the desired pressure and flow.

   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.*

6. Once the experiment is complete, shut down the system by turning the feed pump OFF and opening all 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. Loosen the high pressure clamp.
4. Flip the cell assembly over and remove the cell bottom.
5. Remove the support disk and the used membrane.
6. Install the new membrane, followed by the support disk.
7. Reinstall the cell bottom to the cell top.
8. Secure the cell top to the cell bottom using high pressure clamp.

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Supplementary Operating Information

Additional Resources

- MPD Cell Quick Reference Guide
- MPD Video Channel
  - Cell Assembly
  - 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 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 CF047/CF090 Cell can help predict the best operating parameters.

Cell and Membrane Cleaning

The CF047/CF090 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
Membrane Packs	Flat Sheet Membranes
Spare Parts (Alternative O-ring/Gasket Kits, Porous Support Disc, etc.)	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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