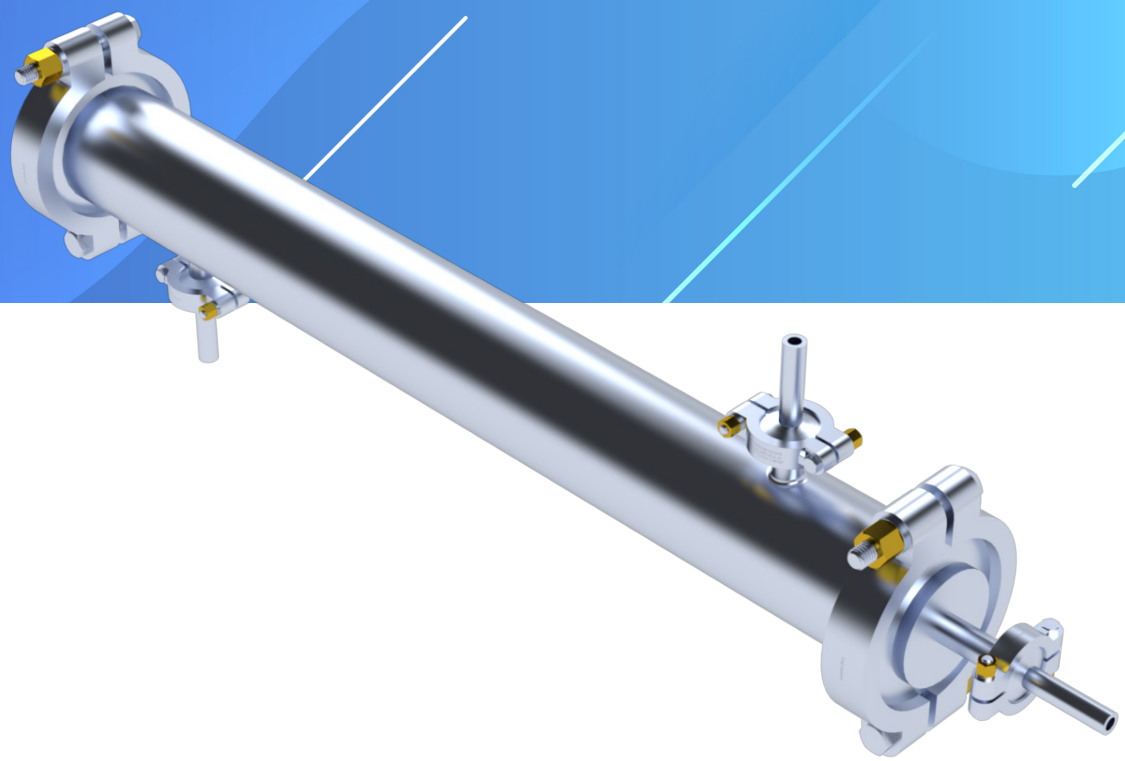
STERLITECH
Corporation

# 1812 Spiral Wound Membrane High Pressure Housing

## Assembly & Operation Manual



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## 1. Introduction

The 1812 Spiral Wound Membrane Housing is a bench-scale crossflow filtration system that is designed to evaluate 1812 spiral wound membrane elements in a variety of applications. It simulates the flow dynamics of commercially available spiral wound membrane elements. Users can vary the operating conditions and fluid dynamics over broad ranges.

**Table 1** below outlines the features and technical specifications of the 1812 Spiral Wound Membrane Housing (hereafter referred to as 1812 Housing).

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

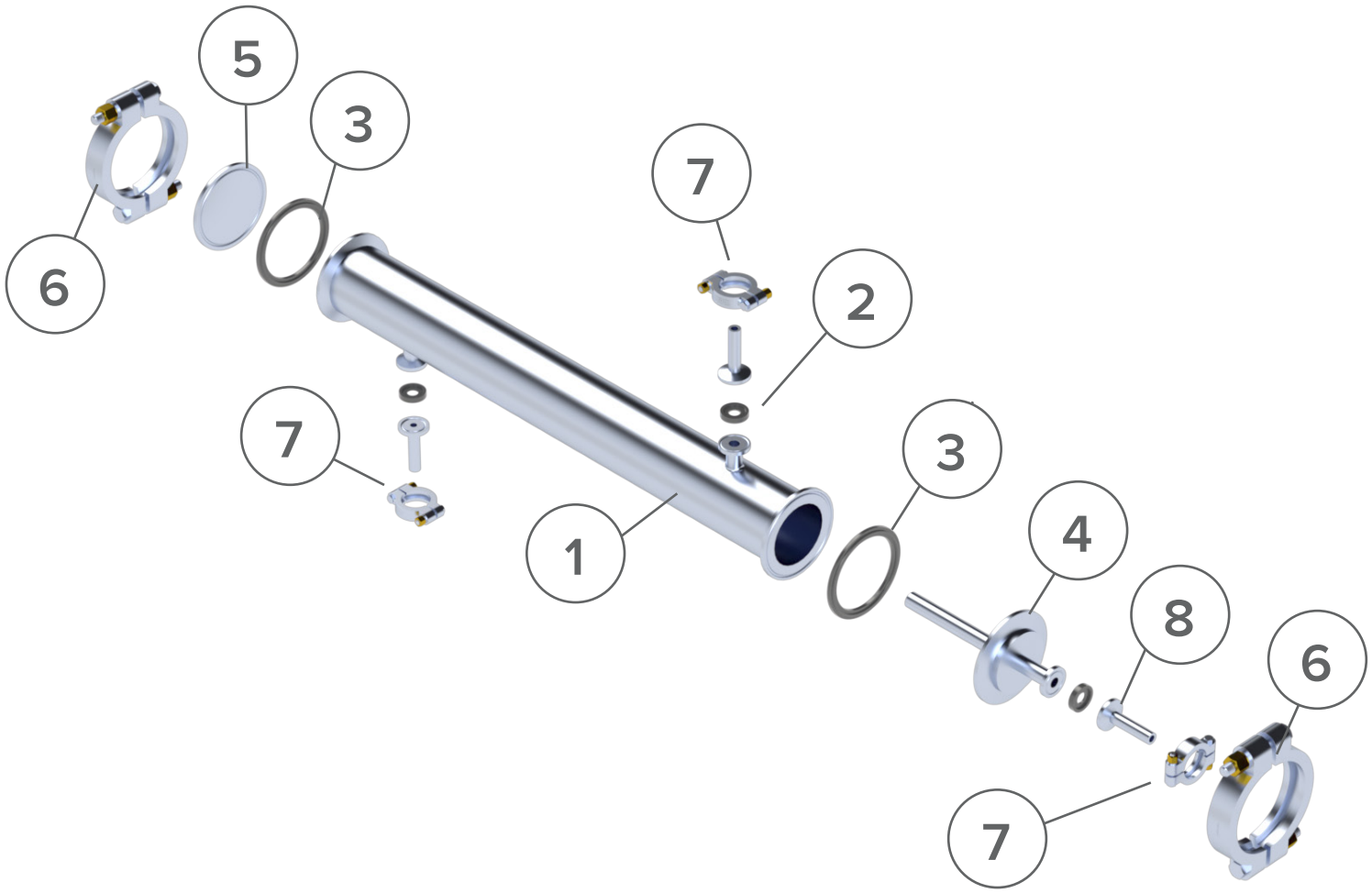
### Table 1: 1812 Housing Features and Technical Specification

| Parameter | Description |
|---|---|
| Membrane Active Area | Variable (1 to 5 $ft^2$) |
| 1812 Housing | SS316 |
| Maximum Pressure | 60 bar (870 v psig) |
| Maximum Temperature | 200°C (400 °F) |
| Gasket | Viton (Other materials available) |
| pH Range | Membrane Dependent |
| Cross Flow Velocity | Variable |
| Dimensions | |
| Tube Length | 374.6 mm (14.75 inches) |
| Tube ID | 48 mm (1.88 inches) |
| Inlet/Outlet/Permeate connection | 9.3 mm (0.365 inches) |

## 2. 1812 Housing Components

The 1812 housing consists of the following components. **Figure 1** illustrates a typical assembly of the 1812 Housing.

**Figure 1: 1812 Housing Assembly**




**Legend:**

1. Stainless Steel 316 housing
2. 3/8 inchgaskets for top and bottom end caps
3. 2.5 inch gasket for permeate tube
4. Top end cap
5. Bottom end cap
6. 2.5 inch Tri clamp fittings
7. 1/2 inch Tri clamp fitting
8. 3/8 inch ferrule, connection

## 2.1. Additional Equipment

Operation of the 1812 housing cell requires additional equipment that are sold separately as listed below. To inquire about a complete system, contact sales@sterlitech.com.

- Feed Pump
- Feed Tank
- 1812 Spiralwound Membrane Elements
- Concentrate Control Valve

## 3. 1812 Housing Assembly

After verifying that all of the necessary components were shipped and present, you can begin the assembly of the system.

To assemble the 1812 Element into the housing:

1. Close the longer end of the permeate tube of the membrane module (the end without the PTFE seal) using the compression connection **(Figure 2, #1)**. Appendix 1 shows how to install Swagelok Tube Fittings

2. Connect the hollow compression connection to the shorter end of the tube (the end with the PTFE seal) **(Figure 2, #2).**

3. Connect the hollow end cap to the hollow compression connection **(Figure 3#1)**

4. Insert the membrane module in the housing starting from the close end of the permeate tube **(Figure 4, #1,2)**

**Note:** make sure the gasket **(Figure 1, #3)** is in place before connecting the top end cap to the tube

5. Use the tri clamp fitting to secure the hollow end cap **(Figure 4, #3)**

6. Place the solid end cap on to the other side of the element and secure it using the tri clamp fitting. **(Figure 5, #1,2)**

7. Connect the feed inlet, retentate outlet and permeate outlet houses using the clamps

> NOTE: Feed inlet should be connected to the side of the housing where top end cap is connected and the retentate outlet tubing should be connected to the side where the end cap is connected

The 1812 Housing is now assembled and ready to be connected to a feed pump for operation.

WARNING: Do not exceed 870 psi (60 bar) in the 1812 Housing.

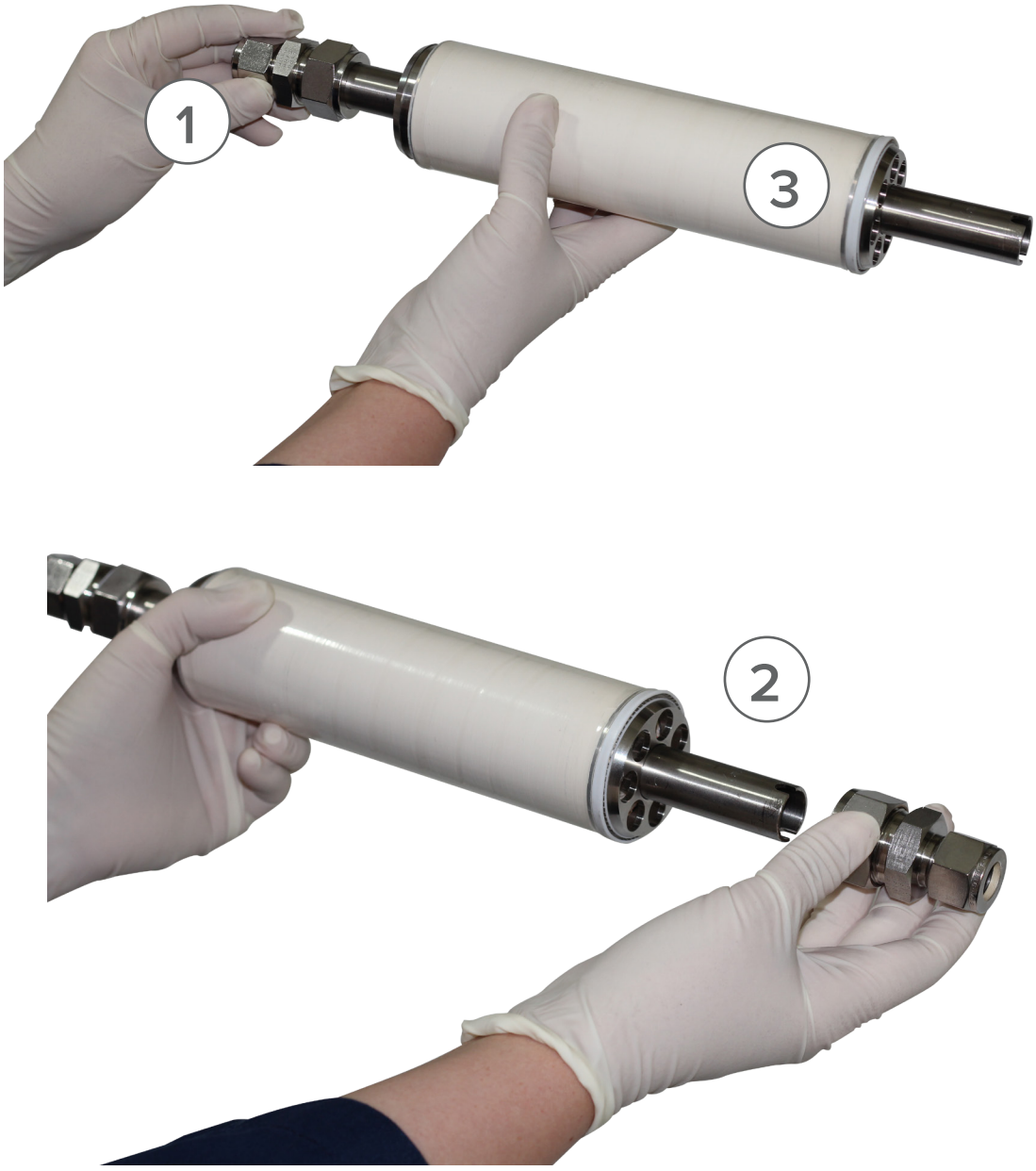
To remove the 1812 Element from the housing:

1. Remove the clamp and open up hollow end cap.

2. Remove the element by pulling the element through the hollow end cap.

3. Separate the element from the hollow end cap.

**Figure 2:** Connecting compression fittings (Swagelok tube fittings) to the module permeate tubes




**Legend:**

1. Permeate line compression fitting, solid
2. Permeate line compression fitting, solid
3. 1812 element

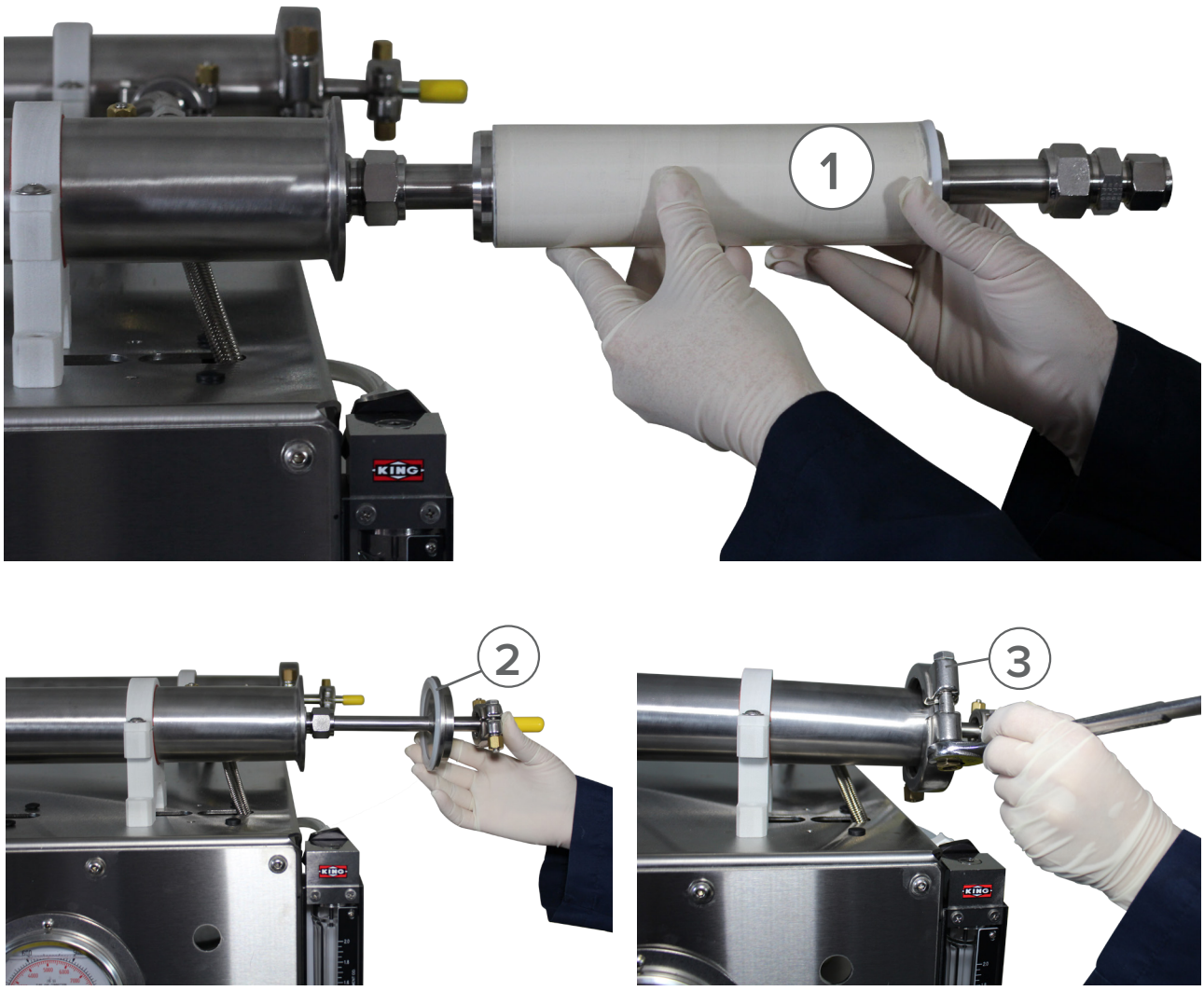
Figure 3: Connecting the top end cap




**Legend:**

1. Top End Cap
2. Compression Fitting

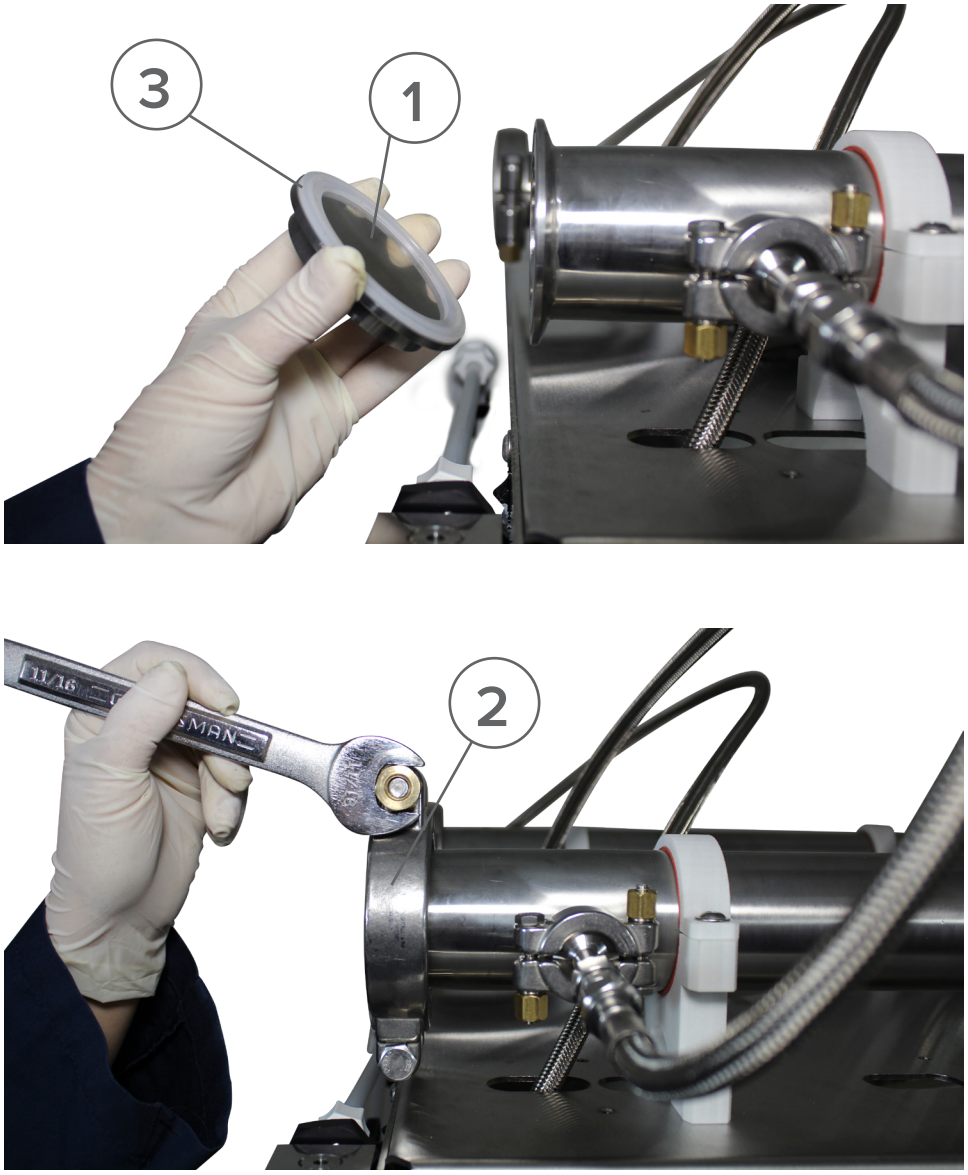
Figure 4: 1812 Element insertion into the housing




**Legend:**

1. 1812 male element
2. Top End Cap
3. Tri clamp fitting

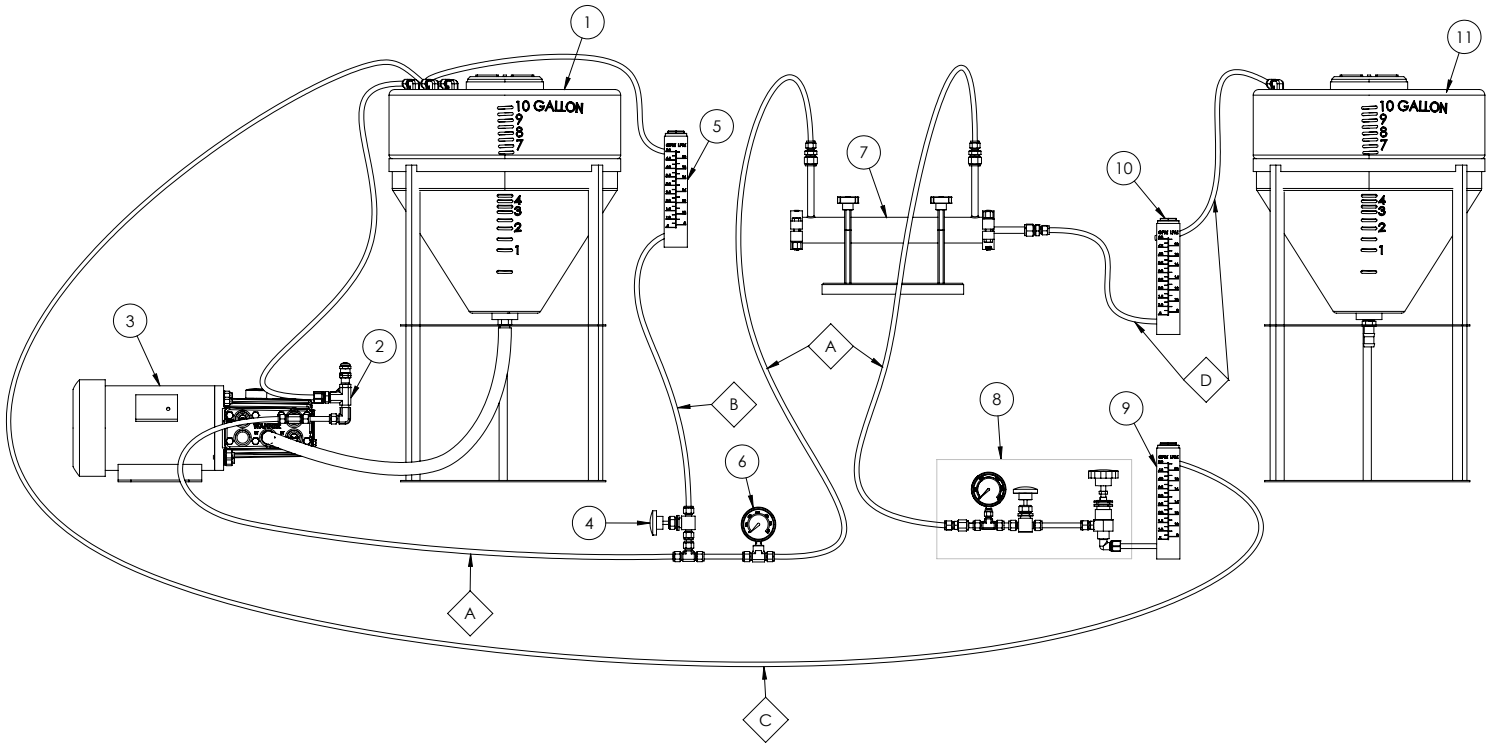
Figure 5: Bottom End Cap




**Legend:**

1. Bottom End Cap
2. Sanitary Fitting on Bottom End Cap
3. 3/8-inch gaskets for bottom end cap

## Figure 6: 1812-HP Housing Assembly Connections and Parts




1812 Flow Diagram

| Item No. | Part Description |
|---|---|
| 1 | Feed Tank |
| 2 | Pressure Relieve Valve |
| 3 | Feed Pump |
| 4 | Feed By-Pass Valve |
| 5 | Feed By-Pass Flow Meter |
| 6 | Feed Pressure Gauge |
| 7 | 1812 Housing |
| 8 | Concentrate Control Valve Assembly, (0-1000 PSI) |
| 9 | Concentrate Flow Meter |
| 10 | Permeate Flow Meter |
| 11 | Permeate Tank |
| A | 3/8” High Pressure Tubing, Feed Line |
| B | 3/8” Low Pressure Tubing, By-Pass |
| C | 3/8” Low Pressure Tubing, Return Line |
| D | 3/8” Low Pressure Tubing, Permeate Output Line |

**Figure 6** shows the typical plumbing connections that are needed for the operation of the 1812 Housing; the configuration can change slightly depending on the objectives ofthe user. In general, the connections needed are as follows:

1. Feed vessel to the pump inlet
2. Pump outlet to the feed inlet of the 1812 housing
3. Concentrate outlet of the 1812 housing to the feed vessel
4. Permeate collection tube to the permeate collectionvessel

**Figure 6** also lists the additional components that are necessary to operate the 1812 Housing. These components are sold separately and can be found in the Membrane/ Process Development section of the Sterlitech website (http://www.sterlitech.com/membrane-process-development.html). The final assembly of the system will vary with the feed vessels, pumps, and tubing used.

## 4. Operation of the 1812 Housing Assembly

Once the 1812 Housing has been assembled and connected to a feed pump, it can be used in reverse osmosis, ultrafiltration, nanofiltration, and microfiltration separation processes for applications in a variety of industries, including food and beverage, pharmaceutical, or industrial.

**To operate the 1812 Housing Assembly:**

1. Open all of the valves in the system to relieve any pressure build-up before turning on the feedpump.
2. Turn the feed pump on.
3. Set the feed pressure to be less than 600 psig by gradually closing the concentrate control valve **(Figure 6,8)** (sold separately)**.**
4. Verify the feed pressure reading on the concentrate pressure gauge (sold separately) **(Figure 6, 8).**
5. Adjust the bypass valve **(Figure 6, 4)** and concentrate control valve **(Figure 6, 8)** to obtain the desired pressure and flow. Experimentation enables you to determine the optimum settings for pressure, and flow rate 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 of the valves to relieve any pressure buildup.

## 5. Supplementary Operating Information

### 5.1. 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.

### 5.2 Membrane Performance

Other parameters such as viscosity, pressure, and suspended solids may also affect performance/operation. Experimentation with the 1812 Housing can help predict the best operating parameters. If your pump is delivering too much flow, a portion of the flow can be diverted back to the feed container before entering the feed inlet of the cell body. This requires installation of an optional bypass valve and fitting on the pump outlet **(Figure 6, 4)**, which is not supplied with the housing.

## 5.3. Temperature Limits

The membranes, feed spacer, permeate, O-rings, and cell body materials construction dictates maximum operating temperatures.

**Table 2: Upper Temperature Limits**

| Components | Maximum Temperature |
|---|---|
| 1812 Housing | 177 °C (350 °F) |
| Membrane Elements | Variable |
| O-rings | |
| Viton | 200 °C (400 °F) |
| EPDM | 150 °C (300 °F) |

## 5.4. Membrane Cleaning

The 1812 housing can be cleaned easily after the membrane is removed. However, you may wish to simulate the actual cleaning conditions of Cleaning-In-Place (CIP) in larger systems with spiral-wound or tubular membranes. CIP chemically cleans without removing the membrane to mechanically scrub the unit.

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.

## 6. Accessory and Spare Part Ordering Information

Accessories and spare parts for the 1812 housing can be ordered by calling Sterlitech Corporation at 1-877-544-4420 or by visiting www.sterlitech.com.

### Table 3: Accessory and Spare Part Ordering Information

| Product | Shipping Weight | Ordering Number |
|---|---|---|
| 1812 Housing, for operation to 60bar (870 psig) | 4.67 kg (10.3 lbs) | 1180150 |
| Feed Flow Pump | Contact Sterlitech | Contact Sterlitech |
| Spare Parts | | |
| 2.5” Viton Gasket | 0.05 lb (0.028 kg) | 1200373 |
| 1/2“ VitonGasket for Permeate Line | 0.5 lbs (0.22 kg) | 1200371 |
| 2.5”EPDM Gasket | 0.05 lb (0.028 kg) | 1230133 |
| 3/8“EPDMGasket for Permeate Line | 0.5lbs (0.22 kg) | 1230131 |
| Concentrate Control Valve | 2 lbs (0.9 kg) | 1149419 |
| 1812 Membrane Elements | Contact Sterlitech | Contact Sterlitech |

## 7. 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.

The form must be completed and returned with the material. Be sure to include a complete, detailed written reason for the return. Also, include serial numbers, installation and removal dates, and any other pertinent information that is available. 1812 Housings have a serial number imprinted on the cell bottom.

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.

## 8. 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.

The information contained herein is based on technical data and tests, which we believe to be reliable, and is intended for use by persons having technical skill at their discretion and risk. Since conditions of use are outside Sterlitech's control, we can assume noliability whatsoever for results obtained or damages incurred through the application of the data presented.

This information is not intended as a license to operate under, or a recommendation to infringe upon, any patent of Sterlitech or others covering any material or use.

The foregoing may not be altered except by a written agreement signed by officers of the manufacturer.

## 9. 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.

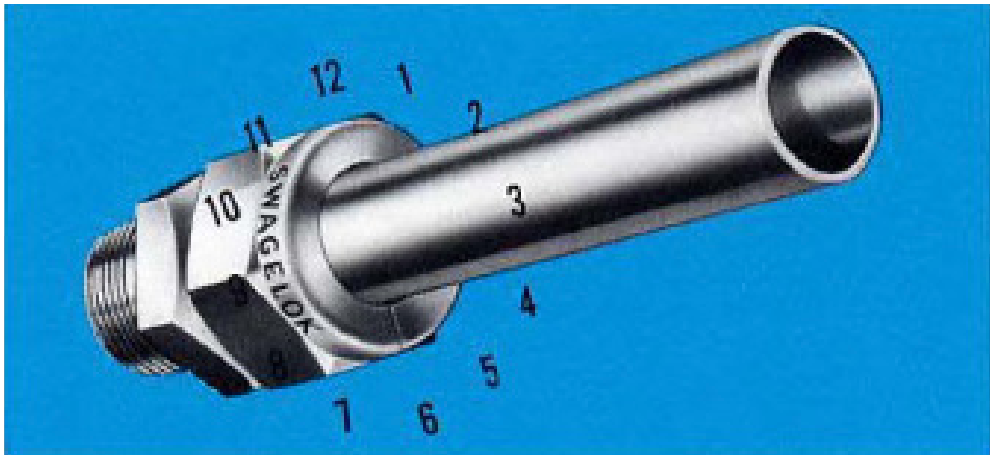
## Appendix 1: Compression Connections

To install Swagelok Tube Fittings:

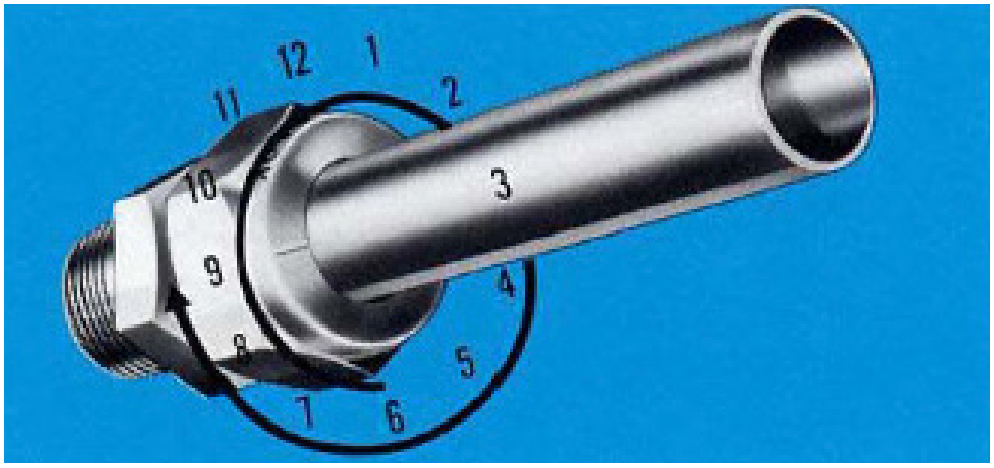
1. Insert the tubing into the Swagelok tube fitting. Make sure that the tubing rests firmly on the shoulder of the fitting and that the nut is finger-tight.




2. Scribe the nut at the 6 o'clock position. By scribing the nut at the 6 o'clock position as it appears to you, there will be no doubt as to the starting position.

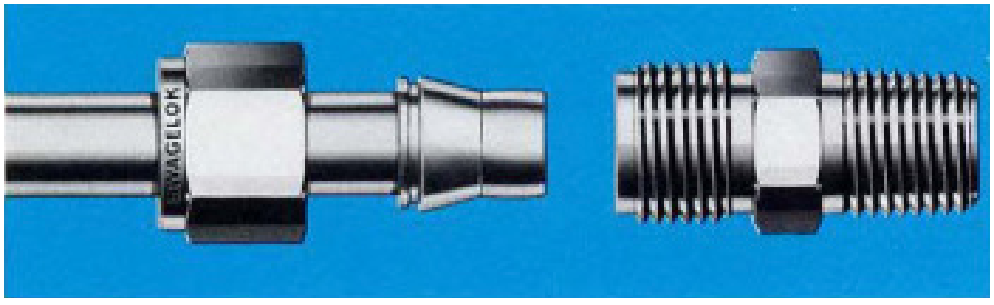


3. Hold the fitting body steady with a backup wrench and tighten the nut 1¼ turns. Watch the scribe mark, make one complete revolution and continue to the 9 o'clock position. When the nut is tightened to the 9 o'clock, you can easily see the fitting has been tightened properly.

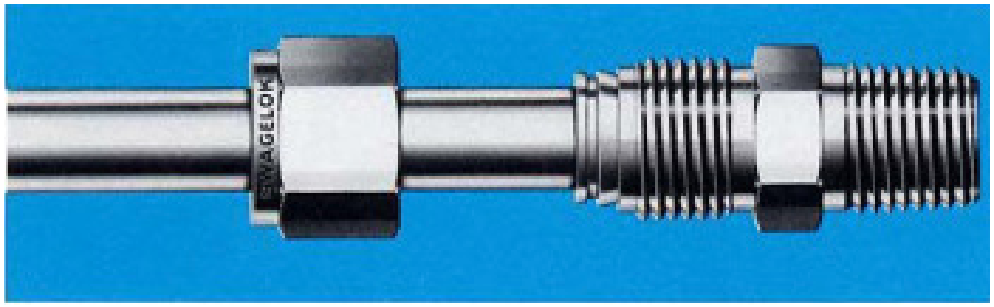



Swagelok connections can be disconnected and retightened many times.
To retighten the Swagelok connection:

1. Start with the disconnected fitting.



2. Insert tubing with pre-swaged ferrules into fitting body until front ferrule seats.




3. Tighten the nut by hand. Rotate nut to the original position with a wrench. An increase in resistance will be encountered at the original position. Then tighten slightly with the wrench.



## Appendix 2: Sterlitech Bench Scale Filtration Products

| | Discoverer | Innovator | Explorer | Developer | Investigator |
|---|---|---|---|---|---|
| |  |  |  |  |  |
| **Filter Holder** | HP4750(X) | CF016 | CF042 | Sepa | 1812 |
| **Membrane Active Area** | 14.6 $cm^2$(2.26$in^2$) | 20.6 $cm^2$(3.2$in^2$) | 42 $cm^2$(6.5$in^2$) | 140 $cm^2$(6.5$in^2$) | 0.27-0.46 m (3-5$ft^2$) |
| **Typical Permeate Flux** | 30-300 LMH (17.6-176 GFD) | 30-300 LMH (17.6-176 GFD) | 30-300 LMH (17.6-176 GFD) | 30-300 LMH (17.6-176 GFD) | 30-300 LMH (17.6-176 GFD) |
| **Typical Permeate Flow Rate (per Cell)** | 1.5-15 mL/min | 1-10mL/min | 2-20 mL/min | 7-70mL/min | 350-2,300mL/min |
| **System Capacity** | 0.7-7L/day (0.2-2 GPD) | 1.5-15L/day (0.4-4 GPD) | 3-30L/day (0.5-5GPD) | 10-100L/day (0.5-5GPD) | 194-1,940 L/gal (51-510 GPD) |
| **Min. Batch Volume (per Cell)** | 300mL | 3.7 L(1gal) | 3.7L(1gal) | 3.7L(1gal) | 15L(4gal) |
| **Max. Pump Capacity** | N/A | 6.8 LPM (76 bar) 1.8 GPM (1,100 psi) | 6.8 LPM (76 bar) 1.8 GPM (1,100 psi) | 6.8 LPM (76 bar) 1.8 GPM (1,100 psi) | 6.8-38 LPM (76bar) 1.8-10GPM(1,100psi) |
| **Cell Material** | SS316,Hastelloy™ | PTFE, Delrin,Acrylic, SS316, Hastelloy™ | PTFE, Delrin,Acrylic, SS316, Hastelloy™ | Acrylic, SS316, Hastelloy™ | SS316 |
| **Max Operating Pressure** | HP4750: 69bar (1,000 psi) HP4750X: 172bar (2,500 psi) | PTFE/Acrylic: 27.6 bar (400psi) Delrin/SS316/ HastelloyTM: 69 bar (1,000 psi) | PTFE/Acrylic: 27.6 bar (400psi) Delrin/SS316/ HastelloyTM: 69 bar (1,000 psi) | Acrylic: 15.2bar (220 psi) SS316/ HastelloyTM: 69bar (1,000 psi) | Standard:41.4 bar (600 psi) High pressure:60 bar (870 psi) |
| **Filtration Mode(s)** | Dead-End Stirred Cell | Cross Flow, Forward Osmosis | Cross Flow, Forward Osmosis | Cross Flow, Forward Osmosis | Cross Flow |

Notes:

Notes:

Founded in 2001 in Kent, WA, Sterlitech Corporation manufactures and markets filtrationfocused 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 bench scale test equipment 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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