

# STERLITECH™ HP4750 STIRRED CELL



## INSTRUCTION MANUAL

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## TABLE OF CONTENTS

<b>1.0</b>	<b><u>DESCRIPTION</u></b>	<b>2</b>
1.1	Specifications	2
1.2	General Descriptions	3
1.3	Functions	3
1.4	Features	3
<b>2.0</b>	<b><u>SYSTEMS CONFIGURATIONS</u></b>	<b>5</b>
2.1	Major Components	5
2.2	Materials of Construction	5
<b>3.0</b>	<b><u>PREPARATION AND START-UP</u></b>	<b>6</b>
3.1	Shipment Verification	6
3.2	Membrane Loading	6
3.3	Porous Support Disk Loading	7
3.4	Cell Bottom Insertion	7
3.5	Stir Bar Assembly Insertion	8
3.6	Cell Top Insertion	9
3.7	Gas Pressure Source Hook-Up	10
<b>4.0</b>	<b><u>OPERATION</u></b>	<b>10</b>
4.1	Pressure Source and Stir Plate Activation	10
4.2	Separation Completion	10
4.3	Cleaning	11
<b>5.0</b>	<b><u>ACCESSORY AND SPARE PART ORDERING INFORMATION</u></b>	<b>11</b>
<b>6.0</b>	<b><u>MEMBRANE INFORMATION</u></b>	<b>13</b>
6.1	Membrane Specifications	13
<b>7.0</b>	<b><u>RETURN MATERIAL ORDER (RMO) PROCEDURE</u></b>	<b>13</b>
<b>8.0</b>	<b><u>WARRANTY</u></b>	<b>14</b>
	<b><u>FIGURES AND TABLES</u></b>	
Fig. 1	HP4750 Stirred Cell System Configuration	5
Fig. 2	Stir Bar Assembly Diagram	8
Table 1	Media Compatibility Chart	15

**HP4750 STIRRED CELL INSTRUCTION MANUAL****1.0 DESCRIPTION****1.1 Specifications**1.1.1 Operating Parameters:

Membrane Size:	49 mm diameter (1.93 inches)
Active Membrane Area:	14.6 cm <sup>2</sup> (2.26 inches <sup>2</sup> )
Processing Volume:	300 mL
Hold-Up Volume:	1 mL
Maximum Pressure:	69 bar (1000 psig)
Maximum Temperature:	121°C (250°F) at 55 bars (800 psig)
PH Range:	Membrane Dependent

1.1.2 Connections:

Permeate Outlet:	1/8-inch diameter 316L SS tubing
Pressure Inlet:	¼-inch FNPT

1.1.3 Wetted Materials of Construction:

Cell Body:	316L Stainless Steel
O-Rings:	Buna-N, others available as options
Gaskets:	Buna-N, others available as options
Stir Bar:	Teflon-coated magnet

1.1.4 Dimensions:

Cell Diameter:	5.1 cm (2.0 inches)
Cell Height:	22.4 cm (10.0 inches)

## **1.2 General Description**

The Sterlitech HP4750 Stirred Cell is designed and manufactured to provide many years of trouble-free operation. The HP4750 Stirred Cell is just one of a number of products that Sterlitech manufactures for membrane research and small-scale production. The instruction manual describes the functions, features, configuration, start-up, and operation of the HP4750 Stirred Cell.

## **1.3 Function**

HP4750 Stirred Cell is a high-pressure chemical resistant stirred cell that performs a wide variety of membrane separations. With a maximum pressure rating of 69 bar (1000 psig), the HP4750 Stirred Cell is ideally suited for reverse osmosis (RO) filtration. The cell also performs nanofiltration (NF), ultrafiltration (UF), and microfiltration (MF) separations. Stainless steel construction and chemical resistant components make the HP4750 Stirred Cell an ideal choice to filter aqueous and non-aqueous solutions.

## **1.4 Features**

In addition to its high-pressure capabilities, the HP4750 Stirred Cell has been specifically designed for ease of use. Some of the unit's features are:

### **1.4.1 Unique Design**

The top of the cell is easily removed to fill the vessel with up to 300 mL of solution. The bottom is removable for easy membrane change-out. The top and bottom are secured to the cell body with easy-to-use mechanical couplings. The design enables low hold-up volume of 1mL to prevent waste of valuable solutions.

1.4.2 High Pressure Operations

The HP4750 Stirred Cell can complete a variety of separations from microfiltration to reverse osmosis. The standard cell is designed for safe operation to 69 bar (1000 psig).

1.4.3 Inert Gas Pressure Source

Standard sources of compressed air or inert gas allow variable, safe, and consistent supply of pressure to perform separations. Volatile solutions can be processed safely because of HP4750 Stirred Cell does not require a pump to supply operating pressure. Pressure regulators and relief valves are available from Sterlitech.

1.4.4 Removable Stir Bar

Teflon-coated magnetic stir bar provides agitation to reduce concentration polarization or cake formation typical of “dead-end” or normal filtration. A stirring plate with variable speed settings is available as an option from Sterlitech.

1.4.5 Accepts Standard Membrane Disks

HP4750 Stirred Cell accommodates any 47-50 mm diameter membrane disk. For convenience, Sterlitech offers precut and packaged membranes in single type or assortment packs, from a wide selection of RO, NF, UF, and MF membranes.

1.4.6 Autoclavable

All components are fully autoclavable and sterilizable.

## 2.0 SYSTEM CONFIGURATION

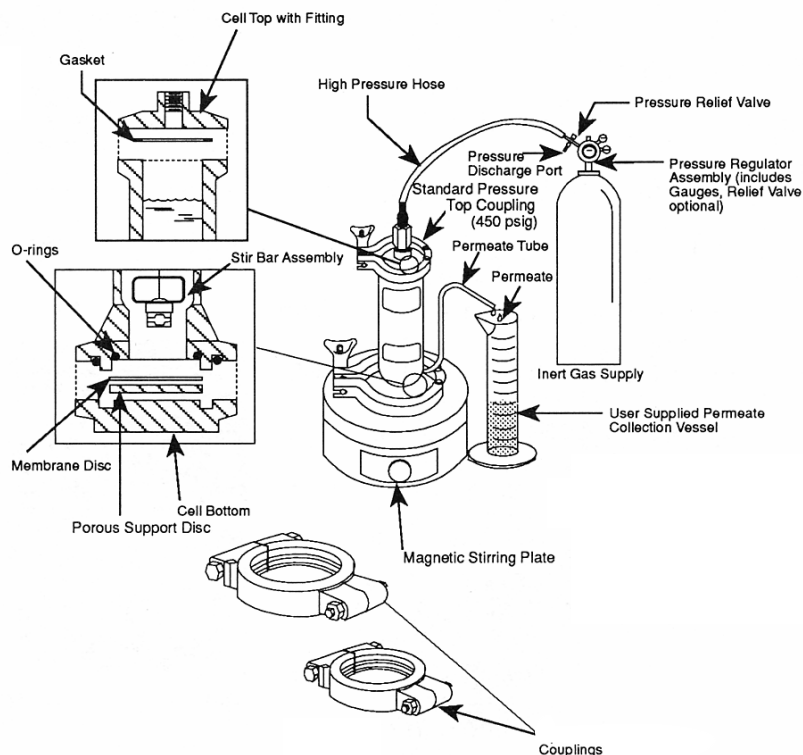
### 2.1 Major Components

FIGURE 1 illustrates the typical configuration of a standard HP4750 Stirred Cell System. The drawing shows the three major components of the system: the Cell Body with removable top and bottom, Stir Bar Assembly, and Standard Coupling. In addition, a source of gas pressure is required to pressurize the cell.

### 2.2 Materials of Construction

With 316L stainless steel construction and carefully chosen components, the HP4750 Stirred Cell is extremely resistant to chemical degradation. Buna-N O-rings and gaskets are standard; other materials are available as options. The magnetic Stir Bar is Teflon coated. Table 1 in the appendix outlines O-ring and gasket material compatibility.

Figure 1



### 3.0 PREPARATIONS AND START-UP

#### 3.1 Shipment Verification

Verify that the shipment is complete, intact and undamaged. A complete system should include:

- A stainless steel Cell Body
- Stir Bar Assembly
- Bottom Coupling
- Two O-rings
- Cell Bottom
- Top Coupling
- Porous Stainless Steel Membrane Disk
- Top Gasket

#### 3.2 Membrane Loading

Insert the O-rings in the bottom of the Cell Body. (Photo 1) Check to be certain that the O-rings fit properly in the grooves. Wet the O-rings with a small amount of water or the fluid to be processed. Place a piece of precut membrane over the center o-ring. (Photo 2)

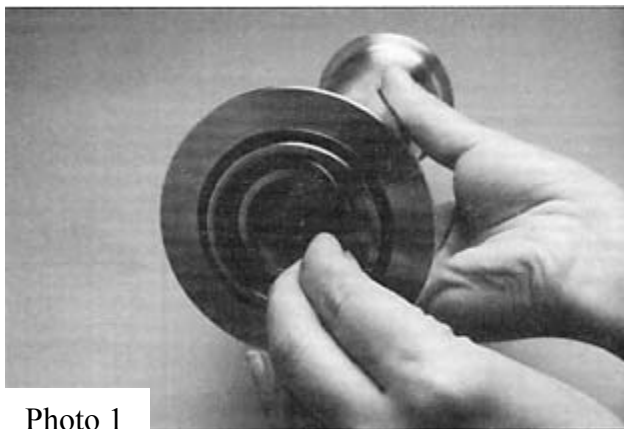


Photo 1

In general, membranes coated on substrate have a shiny, active side and a dull, substrate side. The membrane should be installed with the active side toward the Cell reservoir. If you cut your own membrane, the stainless steel porous disk can be used as a template. Use of a smooth, flat piece of



Photo 2

polyethylene as a cutting surface and a single-edged razor blade will allow manual cutting of most membranes.

NOTE: Once most membranes are wetted with water or solvent, they should not be allowed to dry in order to prevent performance loss.

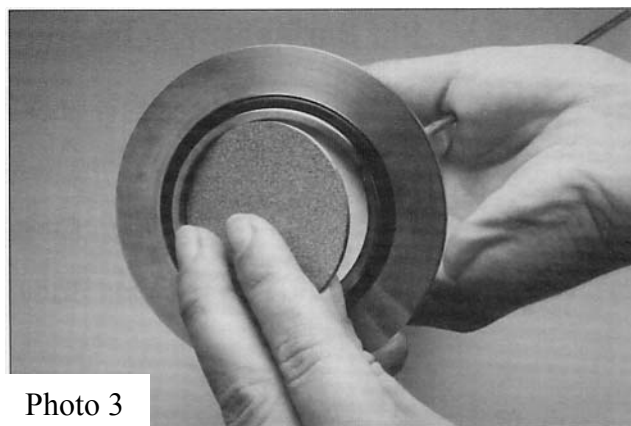


Photo 3

### **3.3 Porous Support Disk Loading**

Place the stainless steel Porous Membrane Support Disk on top of the membrane to hold the membrane in place. (Photo 3)

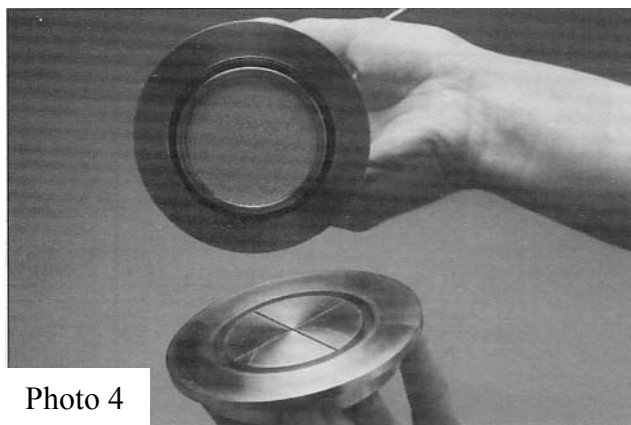


Photo 4

### **3.4 Cell Bottom Insertion**

Fit the Cell Bottom onto the Cell Body, aligning the circular grooves with the circular ridge on the bottom of the Cell Body. (Photo 4)

Use the coupling to clamp the Cell Bottom to the Cell Body.

Tighten the high pressure coupling 16 foot pounds of torque or 69 bar (1000 psig) operation. (Photo 5)

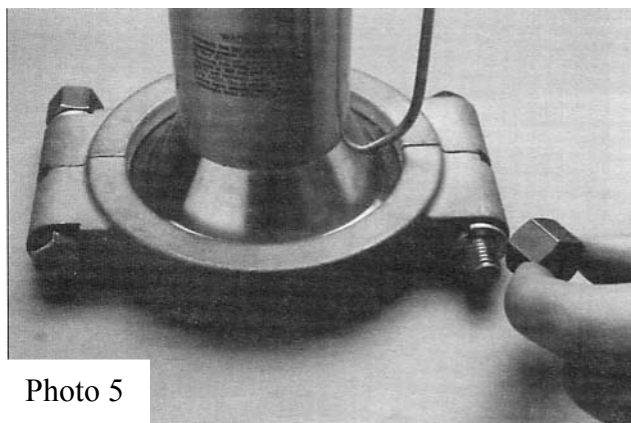


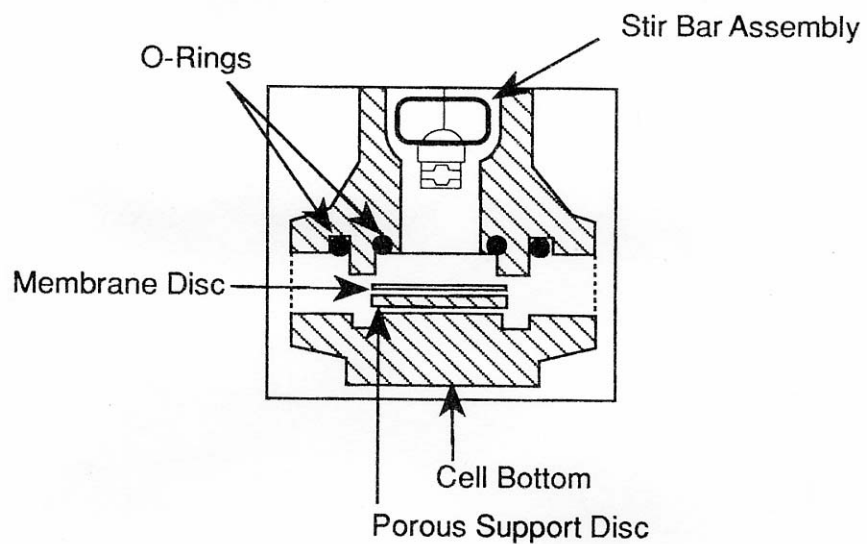
Photo 5



### 3.5 Stir Bar Assembly Insertion

Insert the Stir Bar Assembly by dropping it into the Cell Body through the 2-inch-diameter opening at the top. Figure 2 shows the correct position of the Stir Bar Assembly. After the assembly is in place, pour the solution to be filtered into the Cell Body.

Figure 2



**3.6 Cell Top Insertion**

Insert the gasket on the top of the Cell Body, making sure it fits properly in the grooves. (Photo 6) Secure the Cell Top to the Cell Body with the 2-inch clamp.

Tighten the High Pressure Couplings require 16 foot-pounds of torque for 69 bar (1000psig) operation. (Photo 7) After both clamps are properly attached, the HP4750 Stirred Cell should be centered on top of a magnetic stirrer. (Photo 8)



Photo 6

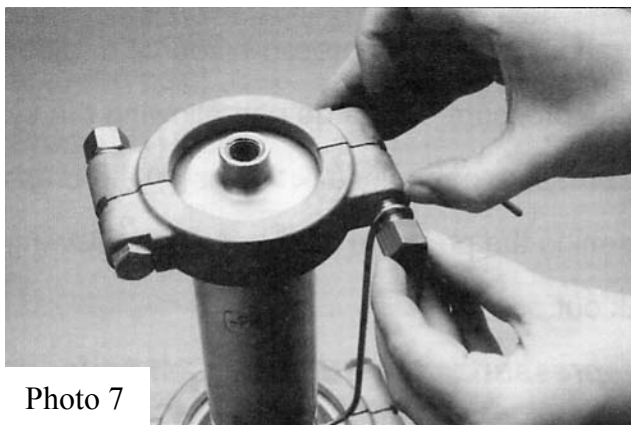


Photo 7



Photo 8

### 3.7 Gas Pressure Source Hook-Up

The HP4750 Stirred Cell is activated by compressed air or inert gas pressure source. Attach the High Pressure Hose to the fitting on the Cell Top. Connect the other end of the hose to the pressure regulator assembly on the inert gas supply or the compressed air supply. Photo 9 illustrates installation of the gas pressure source. The compressed air or inert gas source selected will determine regulator style and pressure requirements.



Photo 9

## 4.0 OPERATION

### 4.1 Pressure Source and Stir Plate Activation

Place a Permeate Collection Vessel (user-supplied) under the Permeate Tube. Turn on the magnetic stirrer to start the motion of the Stir Bar Assembly. Gradually pressurize the HP4750 Stirred Cell, checking for leaks. Foreign material on the surface of the seals and insufficient tightening of the clamps are most common causes for leakage.

### 4.2 Separation Completion

Upon completion of filtration, turn off the pressure source and depressurize the unit. Slowly open the pressure discharge port allowing the system to depressurize. For low pressure operations (<100 psig), the pressure can be bled off by slightly loosening the pressure feed hose and allowing the pressure to leak out.

**CAUTION:** *Do not depressurize the HP4750 Stirred Cell by loosening the couplings.*

### 4.3 Cleaning

The HP4750 Stirred Cell can be cleaned with a variety of cleaners, including detergents, solvents, caustic, acid, enzyme cleaners, etc. Choice of the appropriate cleaning regime should also consider the compatibility of the gasket and O-ring material. For process evaluations where membrane re-use is required, a section of membrane cleaners is presented in section 6.2.2.

## 5.0 ACCESSORY AND SPARE PART ORDERING INFORMATION

### Ordering Information

	<u>Shipping Wt. Kg(lb)</u>	<u>Order Number</u>
<b>HP4750 Stirred Cell</b>		
For operation to 69 bar (1000 psig)	3.6 (8)	HP4750
<u>Accessories</u>	<u>Shipping Wt Kg(lb)</u>	<u>Order Number</u>
<b>Pressure Regulator Assembly,</b>		
6.9-69 bar (100-1000 psig)	2.3 (5.0)	1144026
<b>Pressure Relief Valve,</b>		
69 bar (1000 psig)	0.1 (0.25)	1155893
<b>High Pressure Hose,</b>		
183 cm (72-inch)	0.7 (1.5)	1151427
<b>PTFE O-ring/gasket kit</b>	0.5 (0.1)	1144028
<b>Viton O-ring/gasket kit</b>	0.5 (0.1)	1144029
<b>Magnetic Stirring Plate</b>		
115 VAC 60 Hz	2.3 (5)	1144030
230 VAC 50 Hz	2.3 (5)	1144031

**Spare Parts**

<b>Cell Top</b>	0.1 (0.25)	1143891
<b>Cell Body</b>	1.4 (3.0)	1149782
<b>Cell Bottom</b>	1.4 (3.0)	1143073
<b>Porous Support Disk</b>	0.1 (0.25)	1114910
<b>Stir Bar Assembly</b>	0.1 (0.25)	1143109

**Membrane Packs**

See current HP4750 Stirred Cell price list for current membrane ordering information.

## **6.0 MEMBRANE INFORMATION**

### **6.1 Membrane Specifications**

See Sterlitech website [www.sterlitech.com](http://www.sterlitech.com) or call 877-544-4420 or 253-437-0844.

## **7.0 RETURN MATERIAL ORDER (RMO) PROCEDURE**

If materials are to be returned to Sterlitech for repair, evaluation, or warranty consideration, an RMO number and form must be obtained from Sterlitech prior to the return. Contact Sterlitechs' 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. HP4750 Stirred Cells have a serial number imprinted on the cell bottom.

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

## **8.0 WARRANTY**

The following is made in lieu of all other warranties expressed or implied. Sterlitech, Corp. 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.

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

**MEDIA COMPATIBILITY CHART**

The following O-ring and gasket compatibility chart is provided as an aid in selecting a specific synthetic rubber compound for a particular application situation. Operating conditions and environment must also be considered in determining the media suitability.

For recommendations regarding fluids not listed, consult Sterlitech. The recommendations represent compatibility of materials only and do not necessarily constitute a recommendation for use in a specific application.

**TABLE 1**

<u>CODE</u>	<u>COMPOUND</u>	<u>TEMP RANGE</u>
BN	Buna-N	-40 to 120°C (-40 to 250°F)
EP	Ethylene-Propylene	-50 to 150°C (-65 to 300°F)
V	Viton	-30 to 205°C (-20 to 400°F)

<u>MEDIA</u> (Liquid or Gas)	<u>CODE</u>	<u>MEDIA</u> (Liquid or Gas)	<u>CODE</u>
Acetic Acid, Glacial	EP	Fatty Acids	V
Acetone	EP	Fatty Oil	BN
Aluminum Salts	BN	Glycols	EP
Ammonium Hydroxide	EP	Grease and Oils	BN
Ammonium Salts	BN	N-Hexane	BN
Amyl Alcohol	EP	Hydrazine	EP
Aniline Dyes	EP	Hydrochloric Acid	EP
Aromatic Fuel – 50%	V	Hydrofluoric Acid	EP
Benzene	V	Hydrogen Peroxide	V
Bleach Liquor	EP	Kerosene	BN
Butanol (Buty Alcohol)	BN	Linseed Oil	BN
Butyl Cellosolve	EP	Methyl Ethyl Ketone	EP
Carbon Disulfide	V	Mineral Oils	BN
Carbon Tetrachloride	V	Naphthas	V
Cellosolve	EP	Octyl Alcohol	EP
Chlorinated Solvents	V	Peanut OilB	N
Crude Oil	V	Phenol	V
Cutting Oil	V	Pyridine Oil	EP
Decane	BN	Sewage	BN
Denatured Alcohol	BN	Sodium Acetate	EP
Detergent, Water Solution	BN	Sodium Chloride	BN
Diesel Oil	BN	Stoddard Solvent	BN
Diethylene Glycol	EP	Sulfuric Acid	V
Dry Cleaning Fluids	V	Tannic Acid	BN
Organic Ester	EP	Tertiary Butyl Alcohol	V
Ethyl Alcohol	BN	Titanium Tetrachloride	V
Ethylene Glycol	EP	Transmission Fluid	BN
Ethyl Hexanol	BN	Trioctyle Phosphate	EP
		Varnish	V
		Water (Demineralized)	BN