



4040 Spiral Wound Membrane Housing

Assembly & Operation Manual

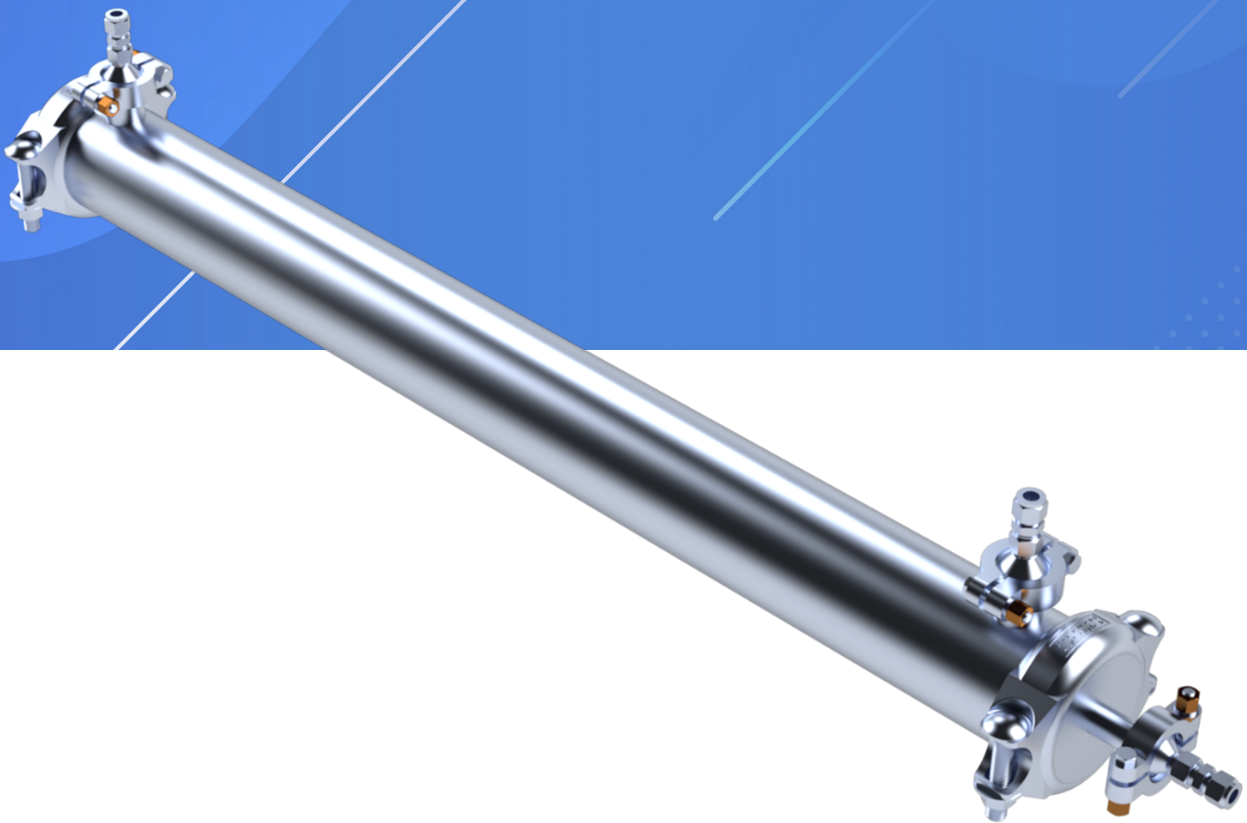


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Introduction

The 4040 Spiral Wound Membrane Housing is a bench-scale crossflow filtration system that is designed to evaluate 4040 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 below outlines the features and technical specifications of the 4040 Spiral Wound Membrane Housing (hereafter referred to as 4040 Housing).

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

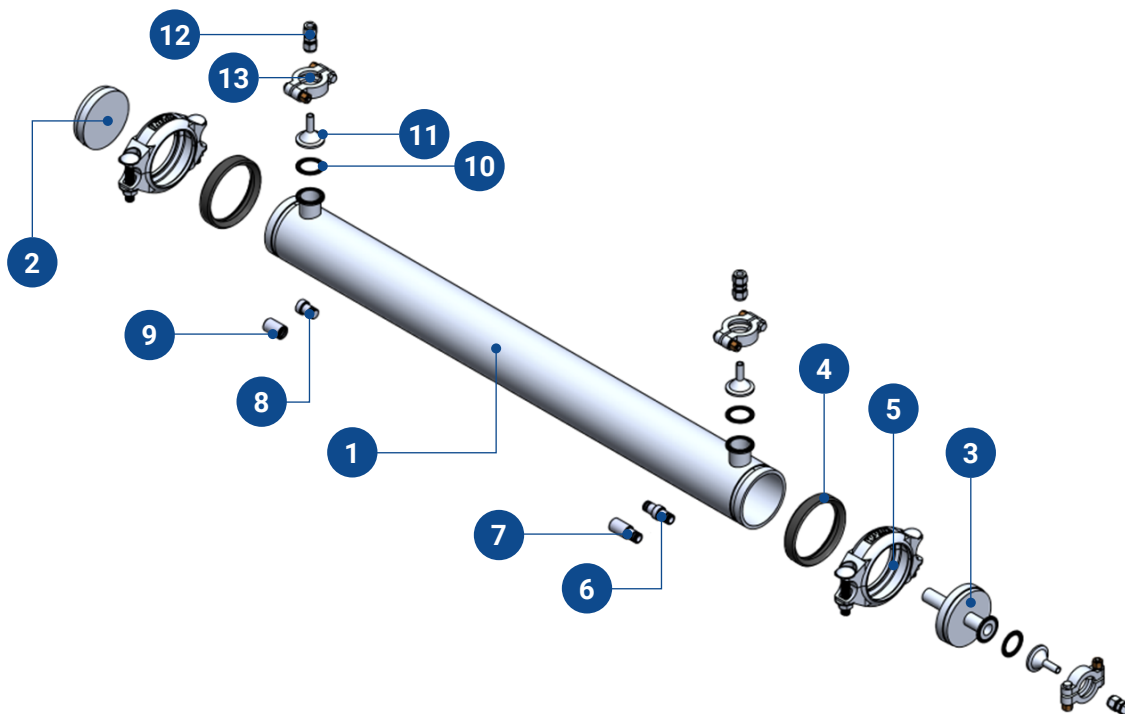
4040 Housing Features and Technical Specification

PARAMETER	DESCRIPTION
Membrane Active Area	Variable
Membrane Compatibility	Female Elements with 3/4" Permeate Tube ID Male Elements with 3/4" Permeate Tube OD
4040 Housing Material	SS316
Maximum Pressure	69 bar (1000 psig)
Maximum Temperature	177 °C (350 °F)
Gasket Materials	EPDM & Viton
pH Range	Membrane Dependent
Cross Flow Velocity	Variable
Dimensions	
Length	1193.8 mm (47 inches)
Diameter	102.108 mm (4.02 inches)
Connections	
Inlet/Outlet/Permeate	1/2" Compression

4040 Housing Components

Figure 1 illustrates a typical assembly of the 4040 housing.

Figure 1: 4040 Housing Assembly



ITEM NO.	DESCRIPTION	QTY	REF.PN
1	4040 Housing Tube	1	1180172
2	Solid End Cap for 4040 Housing (Bottom)	1	1180173
3	Hollow End Cap for 4040 Housing (Top)	1	1180174
4	EPDM End Cap Gasket	2	1180175
5	High Pressure Clamp	2	1180176
6	Permeate Line Adapter, Hollow, For Female 4040 Element	1	1180193
7	Permeate Line Adapter, Hollow, For Male 4040 Element	1	1180195
8	Permeate Line Adapter, Solid, For Female 4040 Element	1	1180194
9	Permeate Line Adapter, Solid, For Male Element	1	1180184
10	1.5" Viton Gasket	3	1200375
11	Reducing Ferrule, Connection For 4040 Housing	3	1180122
12	1/2" Compression Union	3	1200099
13	1.5" High Pressure Clamp	3	1200260

Additional Equipment

Operation of the 4040 housing requires additional equipment that are sold separately as listed below.

To inquire about a complete system contact sales@sterlitech.com.

1. Feed Pump
2. Feed Tank
3. Concentrate Control Valve
4. Pressure Gauges
5. 4040 Spiral-wound Membrane Elements

4040 Housing Assembly

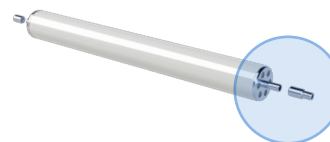
After verifying that all the necessary components were shipped and present, you can begin the assembly of the system.

Housing Assembly – Male Element

To assemble the Male 4040 Element into the housing:

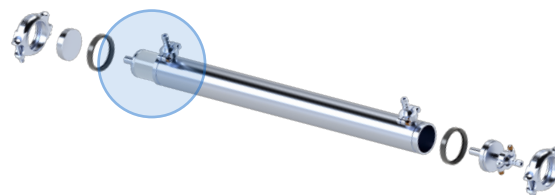
Attach Adapters to Element

1. Attach the male permeate tube adaptors to the element. Attach the solid end cap to the side of the membrane element that has an O-ring on it.



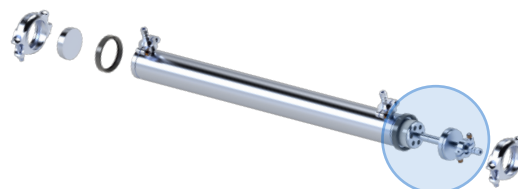
Insert Element into Housing

2. Insert element into the housing in the correct orientation, i.e. inserted from the side of the housing where the bottom end cap is.



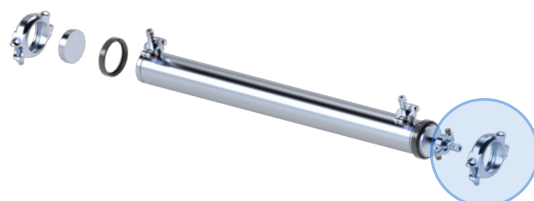
Attach End Cap to Element

3. On the other side of the housing, place the gasket around the tube, pull the element out and attach the hollow end cap to the element.



Install Clamps

4. Push the membrane element back into the housing. Install high-pressure clamps on the Top and Bottom End Cap and tighten.



Housing Assembly – Female Element

To assemble the Female 4040 Element into the housing:

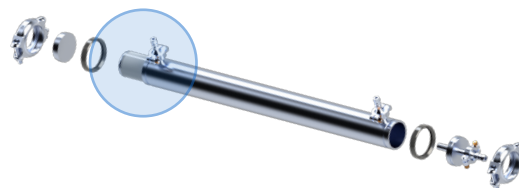
Attach Adapters to Element

1. Attach the female permeate tube adaptors to the element. Attach the solid end cap to the side of the membrane element that has an O-ring on it.



Insert Element into Housing

2. Insert element into the housing in the correct orientation, i.e. inserted from the side of the housing where the bottom end cap is.



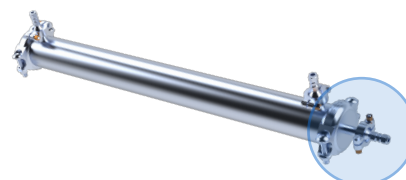
Attach Hollow End Cap

3. On the other side of the housing, place the gasket around the tube, pull the element out and attach the hollow end cap to the element.



Install Clamps

4. Push the membrane element back into the housing. Install high-pressure clamps on the Top and Bottom End Cap and tighten.



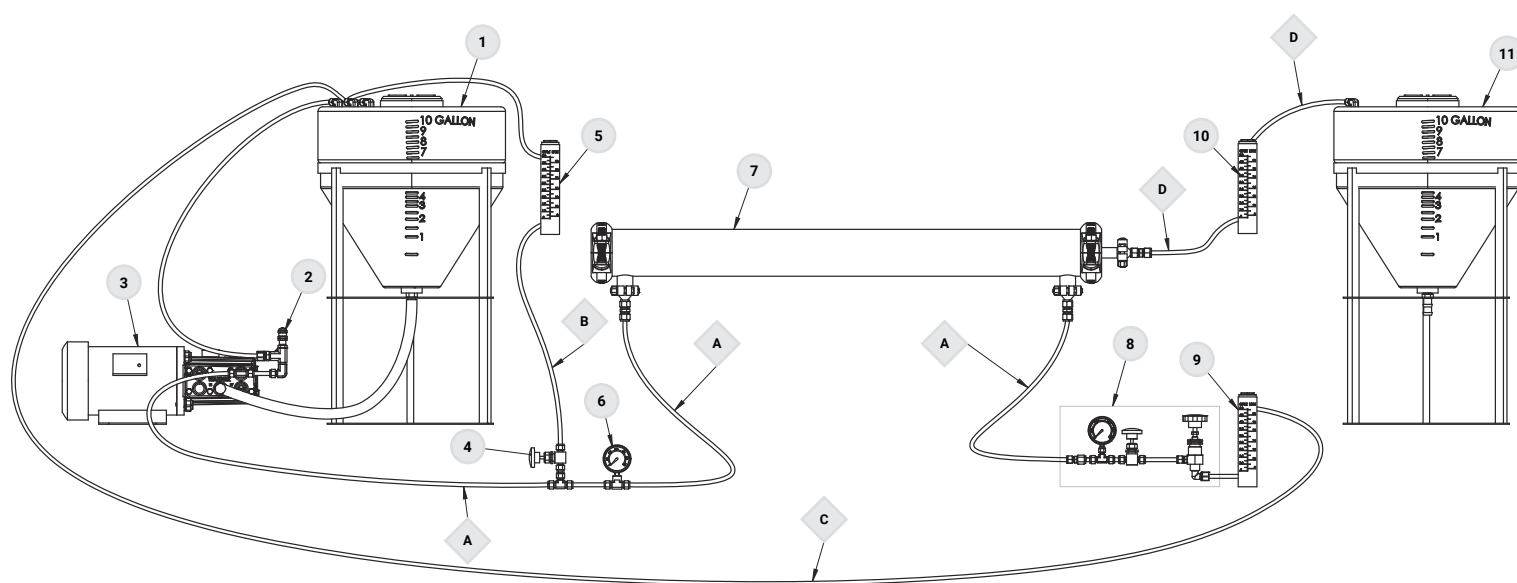
4040 Housing Assembly Connections and Parts

Figure 2 shows typical plumbing connections that need to be made for the operation of the 4040 housing, the configuration can change slightly depending on the objectives of the user. In general, the connections to be made are:

1. Feed vessel to the pump inlet
2. Pump outlet to the feed inlet of the 4040 housing (feed should be connected to the side of the housing with bottom end cap)
3. Concentrate outlet of the 4040 housing to the feed vessel (Concentrate outlet should be connected to the side of the housing with permeate collection tube)
4. Permeate collection tube to the permeate collection vessel

Figure 2 also lists the additional components that are necessary to operate the 4040 Housing. These components are sold separately and can be found in the Membrane/ Process Development section of the Sterlitech website. The final assembly of the system will vary with the feed vessels, pumps, and tubing used.

Figure 2: 4040 Housing Assembly Flow



Legend

1	Feed Tank
2	Pressure Relief Valve
3	Feed Pump
4	Feed By-Pass Valve
5	Feed By-Pass Flow Meter
6	Feed Pressure Gauge
7	4040 Housing
8	Concentrate Control Valve Assembly, (0-1000PSI)

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

Operation of the 4040 Housing Assembly

Once the 4040 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 4040 Housing Assembly:

1. Open all of the valves in the system to relieve any pressure build-up before turning on the feed pump.
2. Turn the feed pump on.
3. Set the feed pressure to be less than 1000 psig by gradually closing the concentrate control valve
4. Verify the feed pressure reading on the concentrate pressure gauge sold separately.
5. Adjust the bypass valve and concentrate control valve 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 build up.

Supplementary Operating Information

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.

Membrane Performance

Other parameters such as viscosity, pressure, and suspended solids may also affect performance/operation. Experimentation with the 4040 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, which is not supplied with the housing.

Membrane Cleaning

The 4040 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.

Temperature Limits

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

COMPONENT	MAXIMUM TEMPERATURE
4040 Housing	177 °C (350 °F)
Membrane Elements	Variable
O-rings	
Viton	200° C (400° F)
EPDM	150° C (300° F)
Buna-N	121° C (250° F)

Accessory & Spare Part Ordering Information

Accessories and spare parts for the 4040 housing can be ordered by calling Sterlitech Corporation at **1-877-544-4420** or by visiting www.sterlitech.com.

PRODUCT	SHIPPING WEIGHT	ORDERING NUMBER
4040 Housing, For operation to 69 bar (1000 psig)	4.67 kg (10.3 lbs)	1180167
Spare Parts for 4040		
EPDM O-rings	28 g (1 oz)	1180196/ 1180187
Viton gasket	28 g (1 oz)	1200375
Permeate line adapter, hollow, for female 4040 element	113 g (4 oz)	1180193
Permeate line adapter, solid, for female 4040 element	113 g (4 oz)	1180194
Permeate line adapter, hollow, for male 4040 element	113 g (4 oz)	1180195
Permeate line adapter, solid, for male 4040 element	113 g (4 oz)	1180196
4040 Membrane Elements	Contact Sterlitech	Contact Sterlitech

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.

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. 4040 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.

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 no liability whatsoever for results obtained or damages incurred through the application of the data presented.

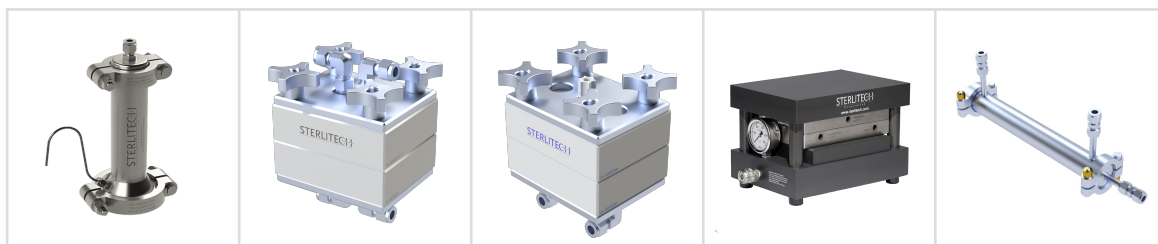
This information is not intended as a license to operate under, or a recommendation to infringe upon, any patent of Sterlitech or others covering any material or use.

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

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.

Membrane & Process Development Product Families



PARAMETER	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 (24 in ²)	0.27-0.46 m ² (3-5 ft ²)
Typical Permeate Flow Rate (per Cell)	1.5-15 mL/min	1-10 mL/min	2-20 mL/min	7-70 mL/min	350-2300 mL/min
System Capacity	0.7-7 L/day (0.2-2 GPD)	1.5-15 L/day (0.4-4 GPD)	3-30 L/day (0.5-5 GPD)	10-100 L/day (2.6-26 GPD)	194-1,940 L/day (51-510 GPD)
Min. Batch Volume (per Cell)	300 mL	3.7 L (1 gal)	3.7 L (1 gal)	3.7 L (1 gal)	15 L (4 gal)
Max. Pump Capacity	N/A	6.8 LPM (76 bar) 1.8 GPM (1100 psi)	6.8 LPM (76 bar) 1.8 GPM (1100 psi)	6.8 LPM (76 bar) 1.8 GPM (1100 psi)	6.8-38 LPM (76 bar) 1.8-10 GPM (1100 psi)
Cell Material	SS316, Hastelloy™	PTFE, Delrin, Acrylic, SS316, Hastelloy™	PTFE, Delrin, Acrylic, SS316, Hastelloy™	Acrylic, SS316, Hastelloy™	SS316
Max. Operating Pressure	HP4750: 69 bar (1,000 psi) HP4750X: 172 bar (2,500 psi)	PTFE/Acrylic: 27.6 bar (400 psi) Delrin/SS316/ Hastelloy™: 69 bar (1,000 psi)	PTFE/Acrylic: 27.6 bar (400 psi) Delrin/SS316/ Hastelloy™: 69 bar (1,000 psi)	Acrylic: 27.6 bar (400 psi) SS316/Hastelloy™: 69 bar (1,000 psi)	41.4 bar (600 psi)
Filtration Mode(s)	Dead-End Stirred Cell	Cross Flow, Forward Osmosis	Cross Flow, Forward Osmosis	Cross Flow, Forward Osmosis	Cross Flow

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 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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