



PRESSURE VESSELS

8" SIDE PORT

TECHNICAL MANUAL





INTRODUCTION

BEL, founded in 1966, specializes in the design and manufacture of a variety of products made from advanced composite materials. With over 50 years of experience, the company has developed and mastered the innovative technologies necessary to manufacture the highest quality composite products. Combining innovation, technology, responsibility and dedication, our goal is to become the leader in providing commercial and industrial composite vessels for our client's needs.

BEL pressure vessels are manufactured from filament wound fiber reinforced plastic (FRP), wound over precision mandrels, using a superior epoxy resin, which results in the ultimate combination of physical strength and an ultrasmooth inside surface. Vessels are tested according to the requirements of ASME code section X, the internationally recognized standard for pressure vessel construction.

BEL holds ISO 9001 quality systems certification, and its quality assurance is also approved for in-house final inspection by many of its customers.

The BEL family of pressure vessels is designed to be used as housings for all 4" ,8" ,9" and 16" spiral-wound Reverse Osmosis (RO), Nanofiltration (NF) and Ultra filtration (UF) membrane elements.

The pressure vessels are manufactured in different configurations, according to the required operating pressures, filtration type, and piping layout. In order to enhance interchangeability and facilitate the use and maintenance of the vessels, the utilization of identical parts and sub-assemblies has been maximized throughout the design of the vessel. For better performance and longer service life, each model is manufactured from the highest quality and highest performing materials of construction.



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1. SAFETY PRECAUTIONS.

1.1. BEL pressure vessels are designed for high pressure operations. Improper installation, operation service or maintenance may cause severe damage to property, physical injury or death.

1.2. BEL pressure vessels are designed for water treatment only.

1.3. Operation of a vessel outside the design limits will make void the warranty and may result in vessel fatigue with possible eventual explosive head failure.

1.4. Although each vessel is tested at 110% of the design pressure **OPERATION ABOVE DESIGN PRESSURE MUST BE PREVENTED.**

1.5. Permeate port pressure **MUST NOT EXCEED 125 psi** (gauge pressure). Other options are available, please, consult BEL

1.6. Vessels should **NOT BE CONTINUOUSLY OPERATED AT TEMPERATURES ABOVE 150°F.** (65°C).

1.7. The pressure vessel should **NOT** be use as a support. Piping manifolds and other fittings should be properly designed system framework. **OPERATING PERSONNEL SHOULD BE DISCOURAGED FROM APPLYING UNDUE FORCE TO ANY FITTINGS CONNECTED DIRECTLY TO A PRESSURE VESSEL.**

1.8. Only **QUALIFIED MECHANICS**, experienced in working with high pressure hydraulic systems, should be allowed to disassemble or assemble the vessel.

1.9. Regularly inspect the system to ensure that components have not deteriorated or been damaged. Replace any faulty component, make sure the reason for the fault has been found and fixed as well.

1.10. Make sure that vessels and associated pipe systems are fully depressurized before attempting any service or maintenance operation.

1.11. Be careful not to scratch the inside wall of the shell, especially at the inner sealing area near the groove.

1.12. Corroded parts may cause difficulties in removing the head or other components. Do not try to force remove components before all visible signs of corrosion have been eliminated.

1.13. Never attempt to repair or disassemble the feed/concentrate port in a side port vessel without consulting BEL.



1.14. Inspect end closures regularly; replace components that have deteriorated and correct causes of corrosion.

1.15. **DO NOT TOLERATE LEAKS**, or allow end closures to be routinely wetted in any way.

2. INSTALLATION NOTES.

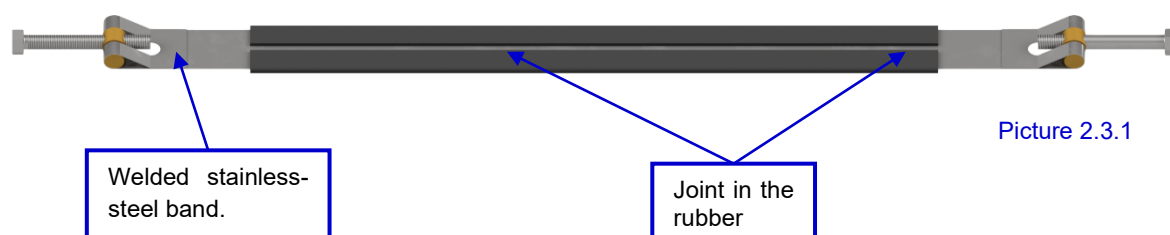
2.1. Provide adequate room for serving at both ends of vessel. Elements are installed from the upstream end, pushed through towards the downstream end and eventually removed from the downstream end.

2.2. Make sure that the vessel is horizontally installed on support saddles. Saddles may be shimmed to ensure accuracy in the leveling and also in the right position of the ports relative to the frame. For other installation ways, please consult BEL.

2.3. The vessels **MUST NOT BE RIGIDLY CLAMPED IN PLACE**, mounting design must allow for both radial and axial expansion (typically up to 0.5 mm radial and up to 2-3 mm axial). Restriction can result in damage to the vessel and other system components. The straps are intended to hold the pressure vessels on the saddles.

The straps have two different sides. On one side, you can see the joint in the rubber that covers the strap and the welded stainless-steel band. From now on, we'll refer to this side of the strap as the "joint side."

Joint Side



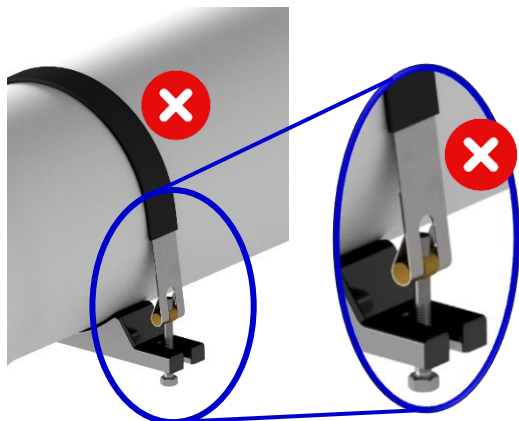
We will refer to the other side of the strap as the non-joint side.

Non-joint side

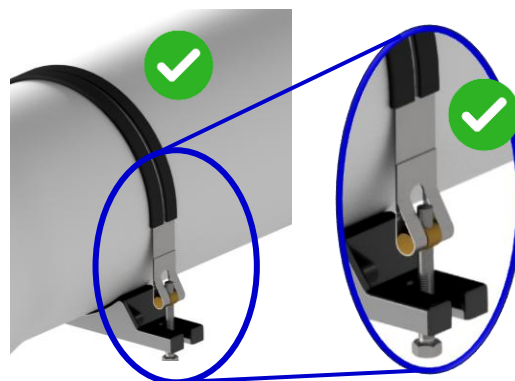


2.4. A flexible connection must be provided between the pressure vessels and the permeate pipes to prevent the transfer of unwanted loads from the collectors to the permeate connection and to allow the pressure vessel's caps to be removed. The recommended permeate pipe connection is a U-shaped connection, with flexible fittings at each end.

The straps must be mounted so that the side in contact with the pressure vessel is the "non-joint side" and the visible side is the "joint side. Failure to do so could cause the screws securing the clamps to the frame to interfere with the clamp's stainless-steel band.



Picture 2.4.1



Picture 2.4.2

2.5. The piping system must be connected to the ports using flexible connectors in order to allow relative movement of the vessels and the piping system. (Victaulic or equivalent connections are recommended).

2.6. Space must be allowed between the port faces of the pressure vessels (multiport version) or between the port face and the connecting pipe (side port version) to avoid stresses in the area of the pressure pipe supply/reject ports during installation commissioning. The distance between the faces must be according to the following table.

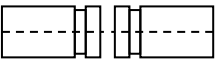
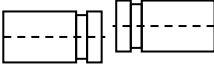
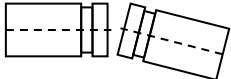
Side Port Ø	 Spacing [mm]- X	 Max Offset* [mm]	 Max Angle [Deg]
1.5"	2 + 0.5	3	2.5
2"	2 + 0.5	3	2
2.5"	3 - 0.5	3	2
3"	3 - 0.5	3	1.5
4"	3 ± 0.5	3	1.5

Table 2.6.1

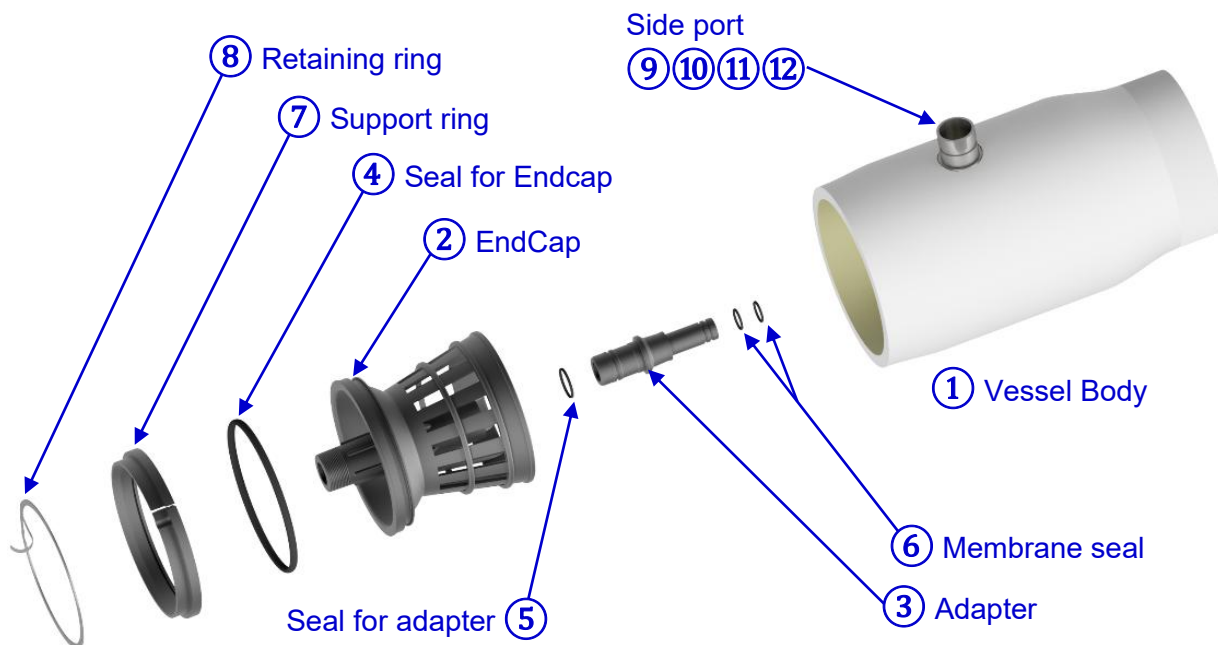
***Notes:**

1. The values shown in Table 2.6.1 correspond to the maximum offset between ports in a port-to-port connection and in a multi-port configuration.

2. The maximum offset between connecting piping alignment to feed, concentrate and permeate ports should not exceed 0.030 inches (0.75 mm).

3. COMPONENT LIST.

3.1. Pressure Vessels Side Port / Multiport model BEL8-S 300 psi (NON CODE).



Item	Part Number	Qty	DESCRIPTION	Material
1	8 / 1-5 / 300 / 1-8	1	Body of Pressure Vessel	Glass/Epoxy
2	285779010 / g / i / ig / iv / v	2	EndCap	Engineering plastic
3	See Table 3.1.3	2	Adapter	Engineering plastic
4	007-080-0092	2	Seal for Endcap	EPDM
5	285773918	2	Seal for Adapter	EPDM
6	See Table 3.1.3	2-4	Membrane seal	EPDM
7	285034015	2	Support ring	Engineering plastic
8	011-801-1202	2	Retaining ring (finger hook)	Stainless steel
9	See Table 3.1.2	1-4	Side port 1.5"/2"/2.5"/3"/4"	Stainless steel
10	See Table 3.1.2	4-8	Retaining ring for side port	Stainless steel
11	See Table 3.1.2	1-4	Seal for side port	EPDM
12	See Table 3.1.2	1-4	Disk for side port	Stainless steel
*13	55410351	2-3	Saddle	Engineering plastic
*14	55410310	2	Strap Assy.	Stainless steel
*15	285779231	0-3	Disk spacer - 1mm	Engineering plastic
*16	285779233	0-7	Disk spacer - 3mm	Engineering plastic

Table 3.1.1

(*) These parts are shown in the pressure tube assembly drawing.

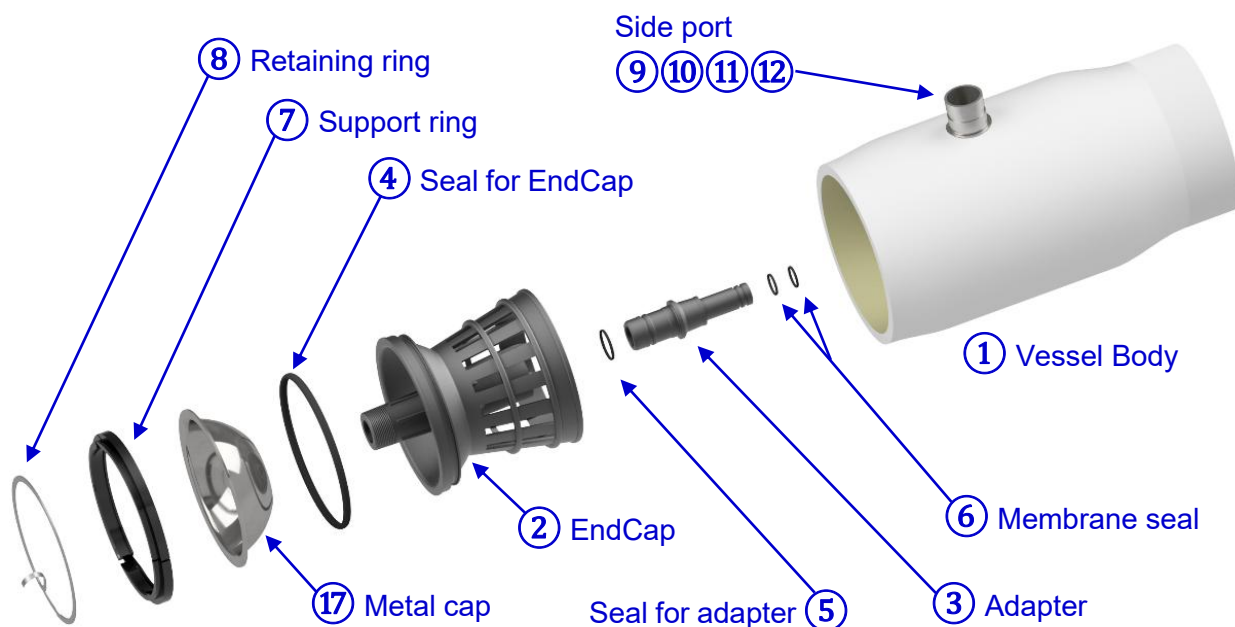
Diameter	Side port	Disk for side port	Seal	Retaining ring
1.5"	040-156-0458	006-156-0452	014-150-0506	011-150-1202
2"	041-206-0458	006-206-0452	014-200-0605	55412392
2.5"	042-256-0458	006-256-0452	014-250-0805	011-250-1212
3"	043-306-0450	006-306-0302	014-300-0807	011-300-1202
4"	044-406-0450	006-406-0302	014-400-0709	285772409

Table 3.1.2

Part description	Adapter Part number	Membrane seal Part number
Adapter 1.125"	001-112-0452	55413912
Adapter 1.125" Blind	001-112-1228	55413912
Adapter 1.5"	285349324	55412357
Adapter 1.5" Blind	001-150-0458	55412357

Table 3.1.3

3.2. Pressure Vessels Side Port / Multiport model BEL8-S 300 psi (CODE).



Item	Part Number	Qty	DESCRIPTION	Material
1	8 / 1-5 / 300A /1-8	1	Body of Pressure Vessel	Glass/Epoxy
2	285779010 / g / i / ig / iv / v	2	EndCap	Engineering plastic
3	See Table 3.2.3	2	Adapter	Engineering plastic
4	007-080-0092	2	Seal for EndCap	EPDM
5	285773918	2	Seal for Adapter	EPDM
6	See Table 3.2.3	2-4	Membrane seal	EPDM
7	55410299	2	Support ring	Aluminum
8	011-801-1202	2	Retaining ring (finger hook)	Stainless steel
9	See Table 3.2.2	1-4	Side port 1.5"/2"/2.5"/3"/4"	Stainless steel
10	See Table 3.2.2	4-8	Retaining ring for side port	Stainless steel
11	See Table 3.2.2	1-4	Seal for side port	EPDM
12	See Table 3.2.2	1-4	Disk for side port	Stainless steel
*13	55410351	2-3	Saddle	Engineering plastic
*14	55410310	2	Strap Assy.	Stainless steel
*15	285779231	0-3	Disk spacer - 1mm	Engineering plastic
*16	285779233	0-7	Disk spacer - 3mm	Engineering plastic
17	285453003	2	Metal cap 3mm	Stainless Steel

Table 3.2.1

(*) These parts are shown in the pressure tube assembly drawing.



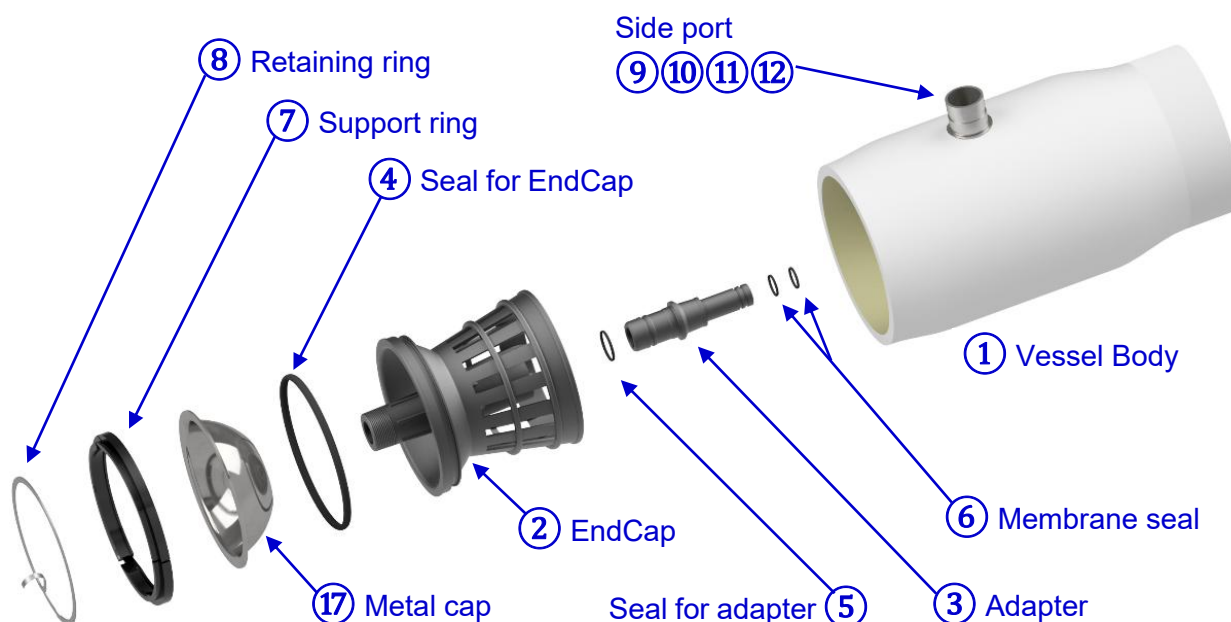
Diameter	Side port	Disk for side port	Seal	Retaining ring
1.5"	040-156-0458	006-156-0452	014-150-0506	011-150-1202
2"	041-206-0458	006-206-0452	014-200-0605	55412392
2.5"	042-256-0458	006-256-0452	014-250-0805	011-250-1212
3"	043-306-0450	006-306-0302	014-300-0807	011-300-1202
4"	044-406-0450	006-406-0302	014-400-0709	285772409

Table 3.2.2

Part description	Adapter Part number	Membrane seal Part number
Adapter 1.125"	001-112-0452	55413912
Adapter 1.125" Blind	001-112-1228	55413912
Adapter 1.5"	285349324	55412357
Adapter 1.5" Blind	001-150-0458	55412357

Table 3.2.3

3.3. Pressure Vessels Side Port / Multiport model BEL8-S 450 psi.



Item	Part Number	Qty	DESCRIPTION	Material
1	8 / 1-5 / 450 / 1-8	1	Body of Pressure Vessel	Glass/Epoxy
2	285779010 / g / i / ig / iv / v	2	EndCap	Engineering plastic
3	See Table 3.3.3	2	Adapter	Engineering plastic
4	007-080-0092	2	Seal for EndCap	EPDM
5	285773918	2	Seal for Adapter	EPDM
6	See Table 3.3.3	2-4	Membrane seal	EPDM
7	55410299	2	Support ring	Aluminum
8	011-801-1202	2	Retaining ring (finger hook)	Stainless steel
9	See Table 3.3.2	1-4	Side port 1.5"/2"/2.5"/3"/4"	Stainless steel
10	See Table 3.3.2	4-8	Retaining ring for side port	Stainless steel
11	See Table 3.3.2	1-4	Seal for side port	EPDM
12	See Table 3.3.2	1-4	Disk for side port	Stainless steel
*13	55410351	2-3	Saddle	Engineering plastic
*14	55410310	2	Strap Assy.	Stainless steel
*15	285779231	0-3	Disk spacer - 1mm	Engineering plastic
*16	285779233	0-7	Disk spacer - 3mm	Engineering plastic
17	285453003	2	Metal cap 3mm	Stainless Steel

Table 3.3.1

(*) These parts are shown in the pressure tube assembly drawing.



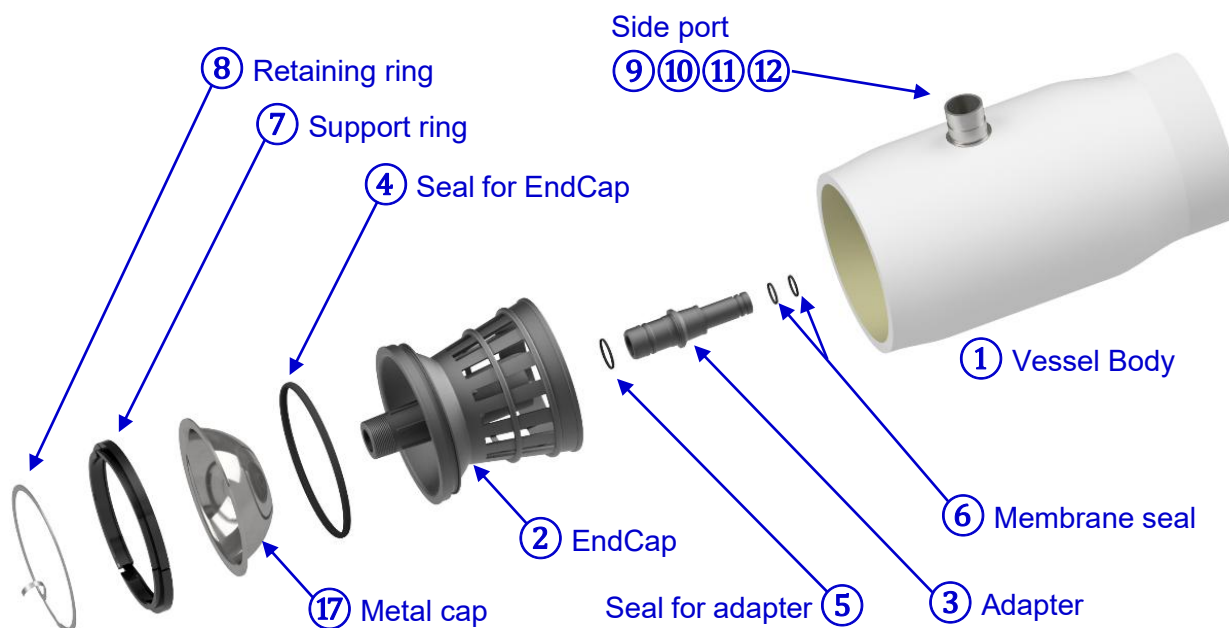
Diameter	Side port	Disk for side port	Seal	Retaining ring
1.5"	040-156-0458	006-156-0452	014-150-0506	011-150-1202
2"	041-206-0458	006-206-0452	014-200-0605	55412392
2.5"	042-256-0458	006-256-0452	014-250-0805	011-250-1212
3"	043-306-0450	006-306-1203	014-300-0807	011-300-1202
4"	044-406-0450	006-406-1203	014-400-0709	285772409

Table 3.3.2

Part description	Adapter Part number	Membrane seal Part number
Adapter 1.125"	001-112-0452	55413912
Adapter 1.125" Blind	001-112-1228	55413912
Adapter 1.5"	285349324	55412357
Adapter 1.5" Blind	001-150-0458	55412357

Table 3.3.3

3.4. Pressure Vessels Side Port / Multiport model BEL8-S 600 psi.



Item	Part Number	Qty	DESCRIPTION	Material
1	8 / 1-5 / 600 / 1-8	1	Body of Pressure Vessel	Glass/Epoxy
2	285779010 / g / i / ig / iv / v	2	EndCap	Engineering plastic
3	See Table 3.4.3	2	Adapter	Engineering plastic
4	007-080-0092	2	Seal for EndCap	EPDM
5	285773918	2	Seal for Adapter	EPDM
6	See Table 3.4.3	2-4	Membrane seal	EPDM
7	55410299	2	Support ring	Aluminum
8	011-801-1202	2	Retaining ring (finger hook)	Stainless steel
9	See Table 3.4.2	1-4	Side port 1.5"/2"/2.5"/3"/4"	Stainless steel
10	See Table 3.4.2	4-8	Retaining ring for side port	Stainless steel
11	See Table 3.4.2	1-4	Seal for side port	EPDM
12	See Table 3.4.2	1-4	Disk for side port	Stainless steel
*13	55410351	2-3	Saddle	Engineering plastic
*14	55410310	2	Strap Assy.	Stainless steel
*15	285779231	0-3	Disk spacer - 1mm	Engineering plastic
*16	285779233	0-7	Disk spacer - 3mm	Engineering plastic
17	285453003	2	Metal cap 3mm	Stainless Steel

Table 3.4.1

(*) These parts are shown in the pressure tube assembly drawing.



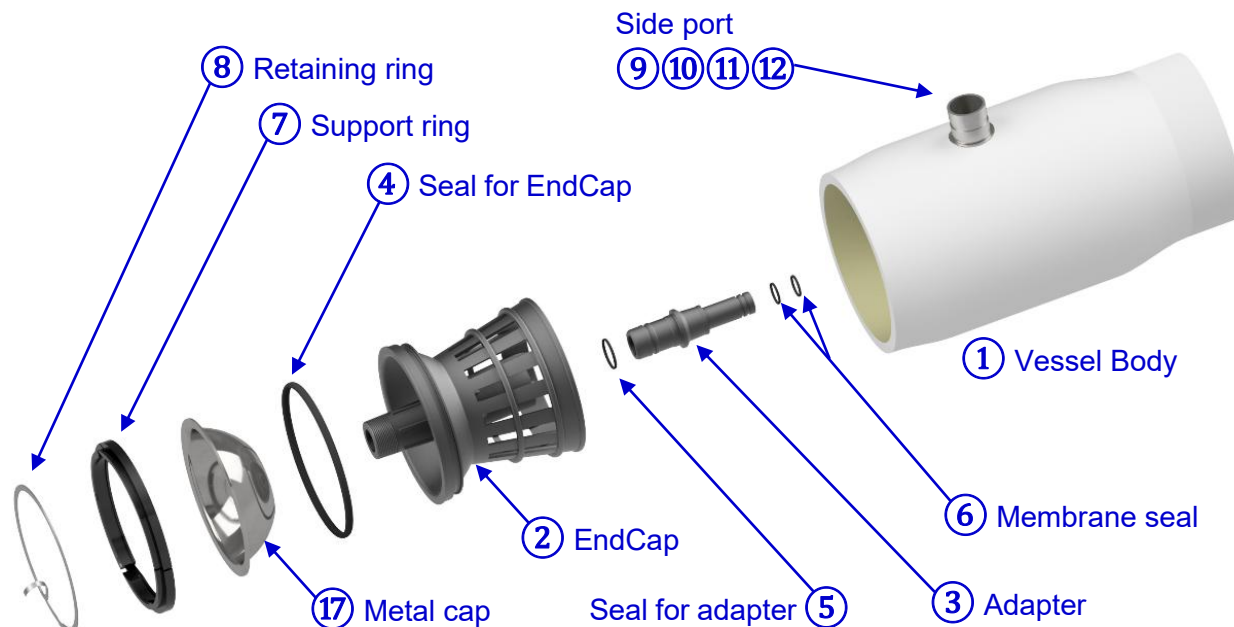
Diameter	Side port	Disk for side port	Seal	Retaining ring
1.5"	040-156-0600	006-156-1203	014-150-0506	011-150-1202
2"	041-206-0600	006-206-1203	014-200-0605	55412392
2.5"	042-256-0600	006-256-1203	014-250-0805	011-250-1212
3"	043-306-0600	006-306-1203	014-300-0807	011-300-1202
4"	044-406-0608	006-406-1203	014-400-0709	285772409

Table 3.4.2

Part description	Adapter Part number	Membrane seal Part number
Adapter 1.125"	001-112-1220	55413912
Adapter 1.125" Blind	001-112-1228	55413912
Adapter 1.5"	285349324	55412357
Adapter 1.5" Blind	001-150-0458	55412357

Table 3.4.3

3.5. Pressure Vessels Side Port / Multiport model BEL8-S 1000/1200 psi.



Item	Part Number	Qty	DESCRIPTION	Material
1	8 / 1-5 / 1000/1200 /1-8	1	Body of Pressure Vessel	Glass/Epoxy
2	285779010 / g / i / ig / iv / v	2	EndCap	Engineering plastic
3	See Table 3.5.3	2	Adapter	Engineering plastic
4	007-080-0092	2	Seal for EndCap	EPDM
5	285773918	2	Seal for Adapter	EPDM
6	See Table 3.5.3	2-4	Membrane seal	EPDM
7	005-861-1200	2	Support ring	Aluminum
8	011-801-1202	2	Retaining ring (finger hook)	Stainless steel
9	See Table 3.5.2	1-4	Side port 1.5"/2"/2.5"/3"/4"	Stainless steel
10	See Table 3.5.2	4-8	Retaining ring for side port	Stainless steel
11	See Table 3.5.2	1-4	Seal for side port	EPDM
12	See Table 3.5.2	1-4	Disk for side port	Stainless steel
*13	55410351	2-3	Saddle	Engineering plastic
*14	55410310	2	Strap Assy.	Stainless steel
*15	285779231	0-3	Disk spacer - 1mm	Engineering plastic
*16	285779233	0-7	Disk spacer - 3mm	Engineering plastic
17	285453006	2	Metal cap 6mm	Stainless Steel

Table 3.5.1

(*) These parts are shown in the pressure tube assembly drawing.



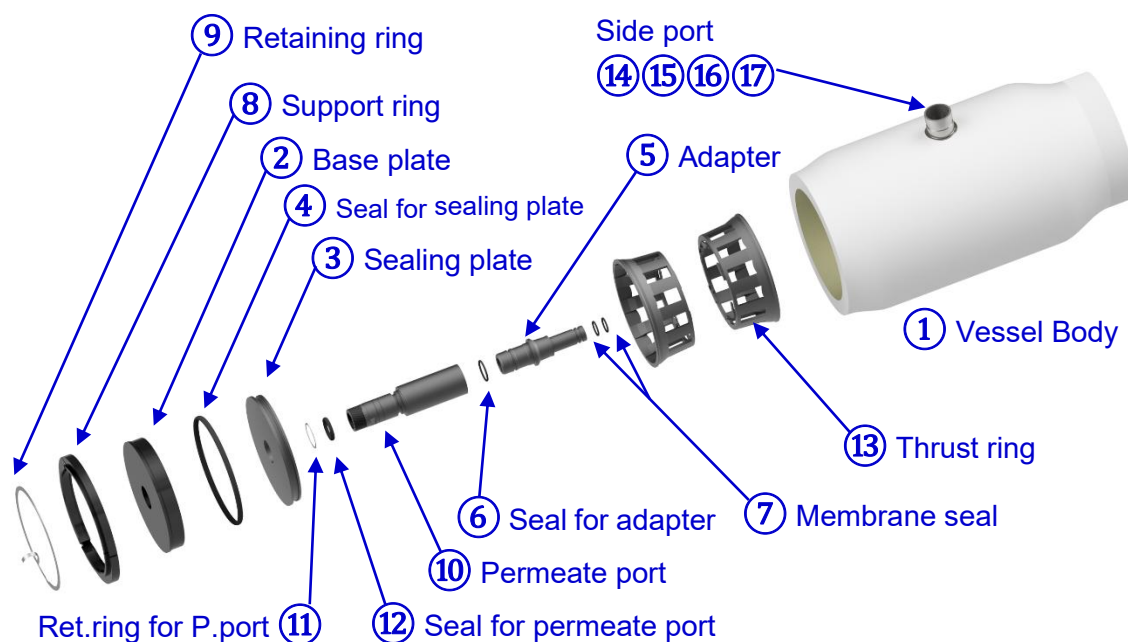
Diameter	Side port	Disk for side port	Seal	Retaining ring
1.5"	040-155-1200	006-156-1203	014-150-0506	011-150-1202
2"	041-205-1208	006-206-1203	014-200-0605	55412392
2.5"	042-255-1200	006-256-1203	014-250-0805	011-250-1212
3"	043-305-1200	006-306-1203	014-300-0807	011-300-1202
4"	044-405-1208	006-406-1203	014-400-0709	285772409

Table 3.5.2

Part description	Adapter Part number	Membrane seal Part number
Adapter 1.125"	001-112-1220	55413912
Adapter 1.125" Blind	001-112-1228	55413912
Adapter 1.5"	285349324	55412357
Adapter 1.5" Blind	001-150-0458	55412357

Table 3.5.3

3.6. Pressure Vessels Side Port / Multiport model BEL8-S 1500 psi.



Item	Part Number	Qty	DESCRIPTION	Material
1	8 / 1-5 / 1500 / 1-8	1	Body of Pressure Vessel	Glass/Epoxy
2	003-861-1205	2	Base plate	Aluminum
3	013-800-1205	2	Sealing plate	Engineering plastic
4	007-080-0092	3	Seal for Sealing plate	EPDM
5	See Table 3.6.3	2	Adapter	Engineering plastic
6	285773918	2	Seal for Adapter	EPDM
7	See Table 3.6.3	2-4	Membrane seal	EPDM
8	285154226	2	Support ring	Stainless steel
9	011-801-1202	2	Retaining ring (finger hook)	Stainless steel
10	008-811-0125	2	Permeate port 1.25 BSP-M	Engineering plastic
11	283772336	2	Retaining ring for perm. port	Stainless steel
12	283776342	2	Seal for perm. port	EPDM
13	004-830-0150	1	Thrust ring	Engineering plastic
14	See Table 3.6.2	1-4	Side port 1.5"/2"/2.5"/3"/4"	Stainless steel
15	See Table 3.6.2	4-8	Retaining ring for side port	Stainless steel
16	See Table 3.6.2	1-4	Seal for side port	EPDM
17	See Table 3.6.2	1-4	Disk for side port	Stainless steel
*18	55410351	2-3	Saddle	Engineering plastic
*19	55410310	2	Strap Assy.	Stainless steel
*20	285779231	0-3	Disk spacer - 1mm	Engineering plastic
*21	285779233	0-7	Disk spacer - 3mm	Engineering plastic

Table 3.6.1

(*) These parts are shown in the pressure tube assembly drawing.



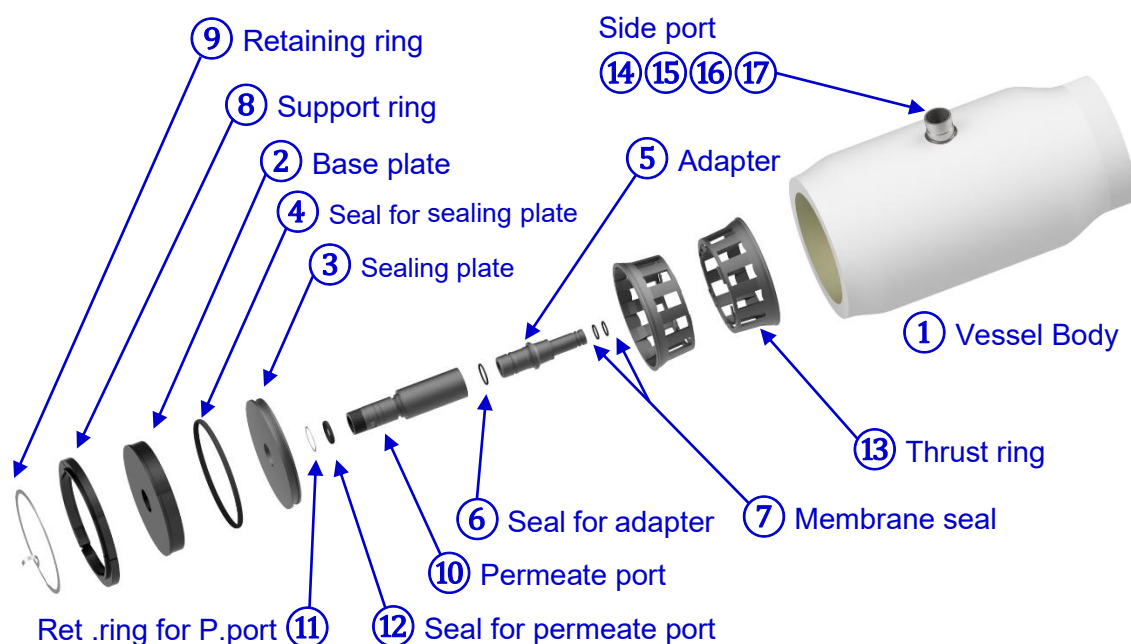
Diameter	Side port	Disk for side port	Seal	Retaining ring
1.5"	040-155-1500	006-156-1203	014-150-0506	011-150-1202
2"	041-205-1500	006-206-1203	014-200-0605	55412392
2.5"	042-255-1500	006-256-1203	014-250-0805	011-250-1212
3"	043-305-1500	006-306-1203	014-300-0807	011-300-1202
4"	044-405-1500	006-406-1205	014-400-0709	285772409

Table 3.6.2

Part description	Adapter Part number	Membrane seal Part number
Adapter 1.125"	001-112-1220	55413912
Adapter 1.125" Blind	001-112-1228	55413912
Adapter 1.5"	285349324	55412357
Adapter 1.5" Blind	001-150-0458	55412357

Table 3.6.3

3.7. Pressure Vessels Side Port / Multiport model BEL8-S 1800 psi.



Item	Part Number	Qty	DESCRIPTION	Material
1	8 / 1-2 / 1800 / 1-8	1	Body of Pressure Vessel	Glass/Epoxy
2	003-861-1205	2	Base plate	Aluminum
3	013-800-1205	2	Sealing plate	Engineering plastic
4	007-080-0092	3	Seal for Sealing plate	EPDM
5	See Table 3.7.3	2	Adapter	Engineering plastic
6	285773918	2	Seal for Adapter	EPDM
7	See Table 3.7.3	2-4	Membrane seal	EPDM
8	005-816-1800	2	Support ring	Stainless steel
9	011-801-1202	2	Retaining ring (finger hook)	Stainless steel
10	008-811-0125	2	Permeate port 1.25 BSP-M	Engineering plastic
11	283772336	2	Retaining ring for perm. port	Stainless steel
12	283776342	2	Seal for perm. port	EPDM
13	004-830-0150	1	Thrust ring	Engineering plastic
14	See Table 3.7.2	1-4	Side port 1.5"/2"/2.5"/3"/4"	Stainless steel
15	See Table 3.7.2	4-8	Retaining ring for side port	Stainless steel
16	See Table 3.7.2	1-4	Seal for side port	EPDM
17	See Table 3.7.2	1-4	Disk for side port	Stainless steel
*18	55410351	2-3	Saddle	Engineering plastic
*19	55410310	2	Strap Assy.	Stainless steel
*20	285779231	0-3	Disk spacer - 1mm	Engineering plastic
*21	285779233	0-7	Disk spacer - 3mm	Engineering plastic

Table 3.7.1

(*) These parts are shown in the pressure tube assembly drawing.



Diameter	Side port	Disk for side port	Seal	Retaining ring
1.5"	040-155-1800	006-156-1806	014-150-0506	011-150-1803
				011-150-11202
2"	041-205-1800	006-206-1806	014-200-0605	011-200-1803
				55412392

Table 3.7.2

Part description	Adapter Part number	Membrane seal Part number
Adapter 1.125"	001-112-1220	55413912
Adapter 1.125" Blind	001-112-1228	55413912
Adapter 1.5"	285349324	55412357
Adapter 1.5" Blind	001-150-0458	55412357

Table 3.7.3

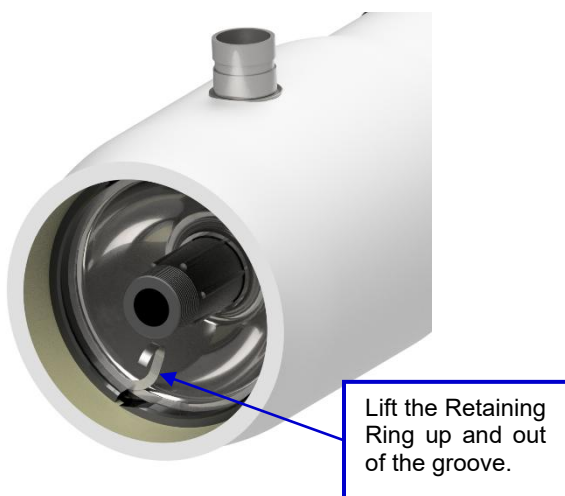
4. MAINTENANCE.

4.1. Head disassembly.

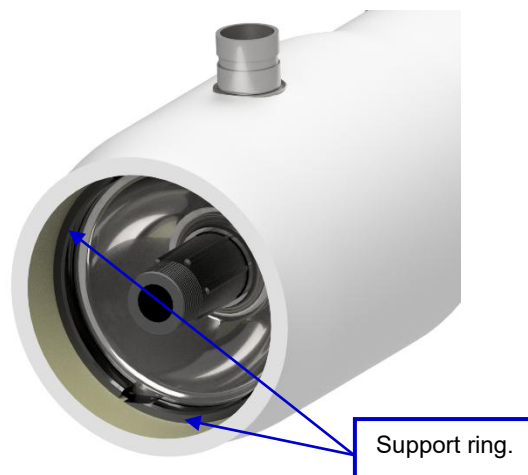
4.1.1. Stop all pumps and relieve pressure.

4.1.2. Disconnect all pipes from ports connecting the vessel's heads with the manifolds.

4.1.3. Engage your forefinger in the hook of the retaining ring, lift it up and out of the groove, by running your fingers behind the retaining ring as it continues exiting the groove.

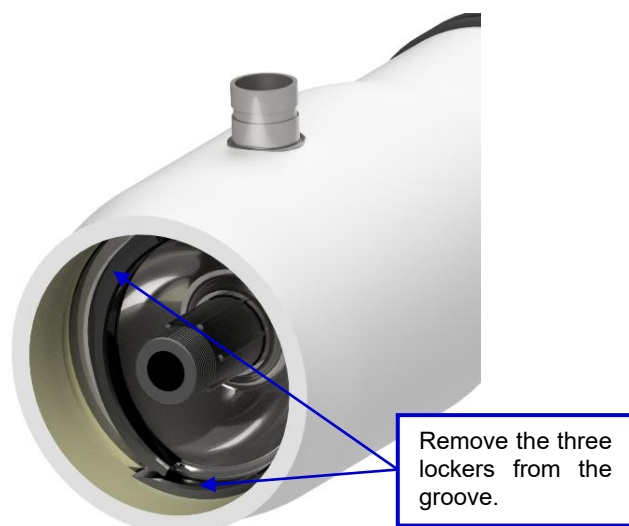


Picture 4.1.3.1



Picture 4.1.3.2

4.1.4. Move the three locker segments from the groove starting from the small segment.



Picture 4.1.4.1



Picture 4.1.4.2

How to act in case than the support rings are stuck and difficult to remove.

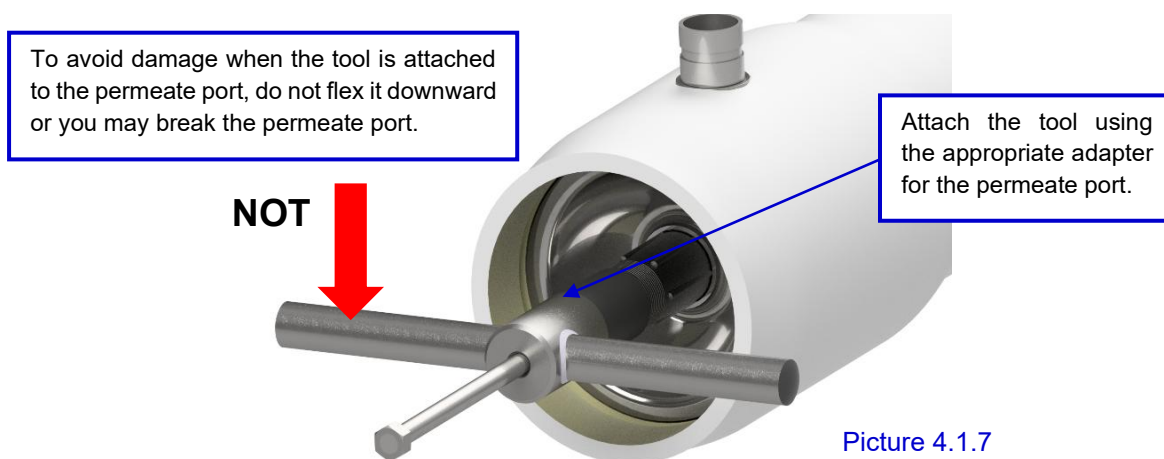
4.1.5. After long periods of operation, it may happen that after remove the retaining ring as described on point 4.1.3, the support ring is blocked and cannot be easily removed by hand.

It is very important to follow the following recommendations to avoid creating damage to the inner surface of the pressure vessel due to an incorrect way of working.

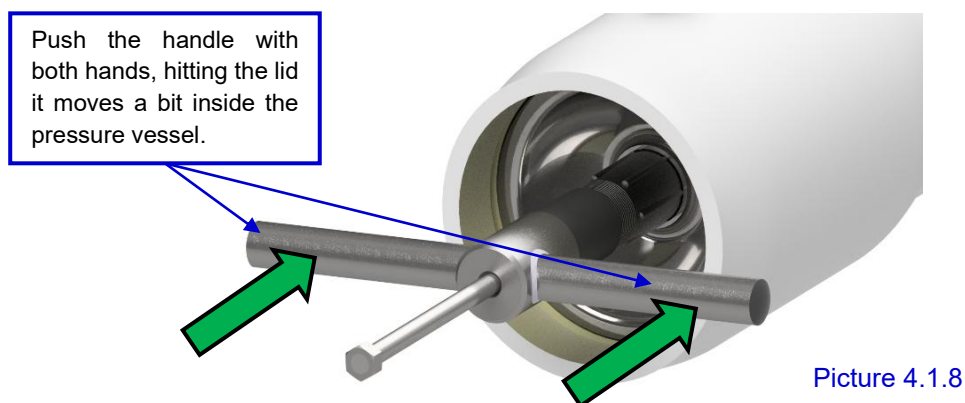
4.1.6. Sometimes, especially after prolonged periods of operation, the head pushes the support ring outward, making it difficult to remove. To avoid this issue, the head must be pushed into the pressure vessel. To push the head and separate it from the support ring will be used the BEL “Pusher” as described below.

If the BEL “Pusher” it is not available, a piece of wood resting on the head and a small mallet can be used carefully.

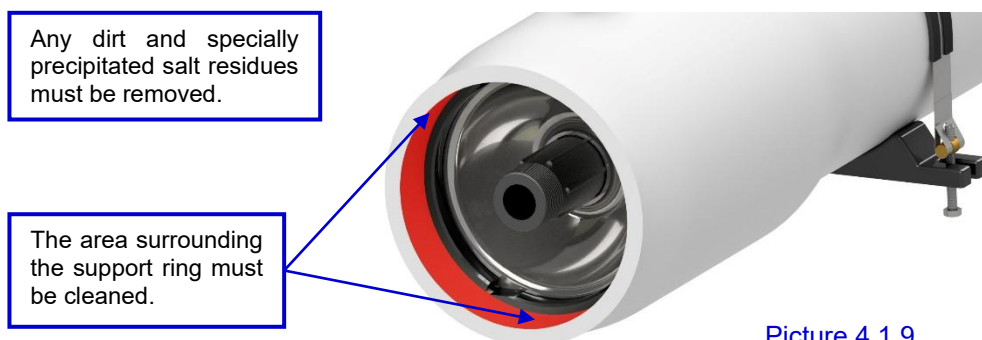
4.1.7. Attach the “Pusher” tool (see Appendix 2) on the head. To do this, carefully attach the NPT or Victaulic adapter to the permeate port.



4.1.8. Push the slide hammer quickly and repeatedly against the head until it moves a bit inside the pressure vessel and separates from the support ring. To avoid personal injury, always hold the pusher handle with both hands.

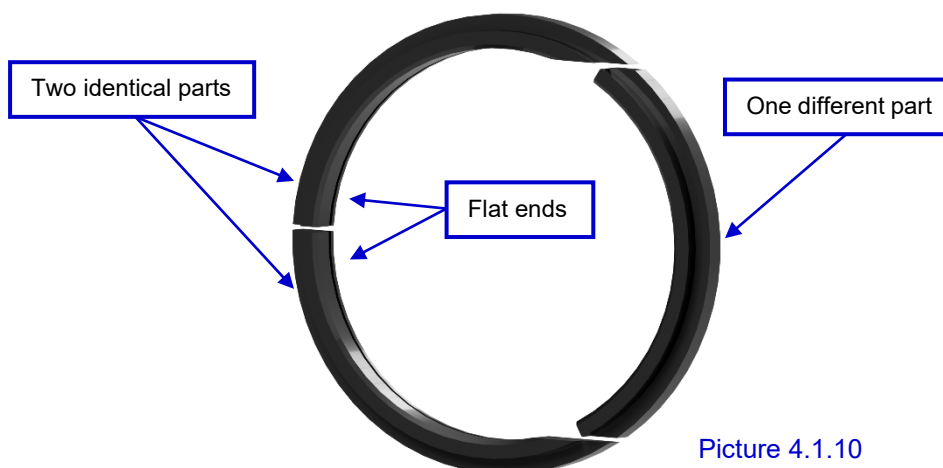


4.1.9. The area surrounding the support ring, the groove and the support ring itself, must be cleaned to remove any dirt and precipitated salt residues that could hinder the removal of the parts.



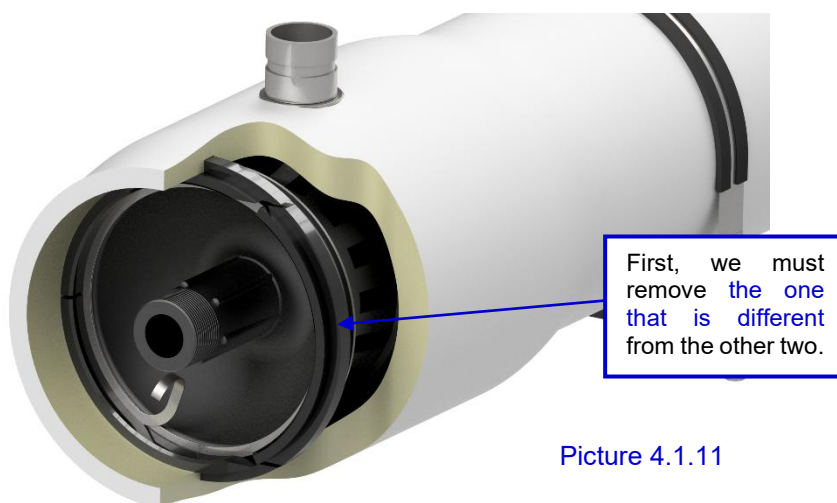
Picture 4.1.9

4.1.10. The support ring is made up of three parts, two of which are identical. This identical parts have two flat ends that touch and two slanted ends that match with the third piece.



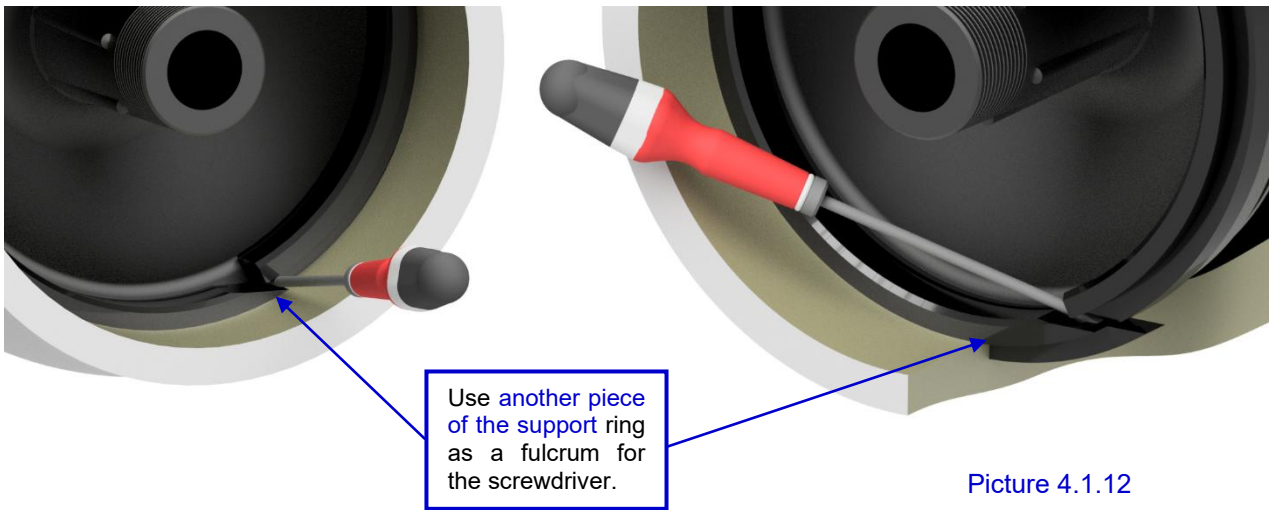
Picture 4.1.10

4.1.11. First, we must remove from the three parts that make up the support ring, the one that is different from the other two.



Picture 4.1.11

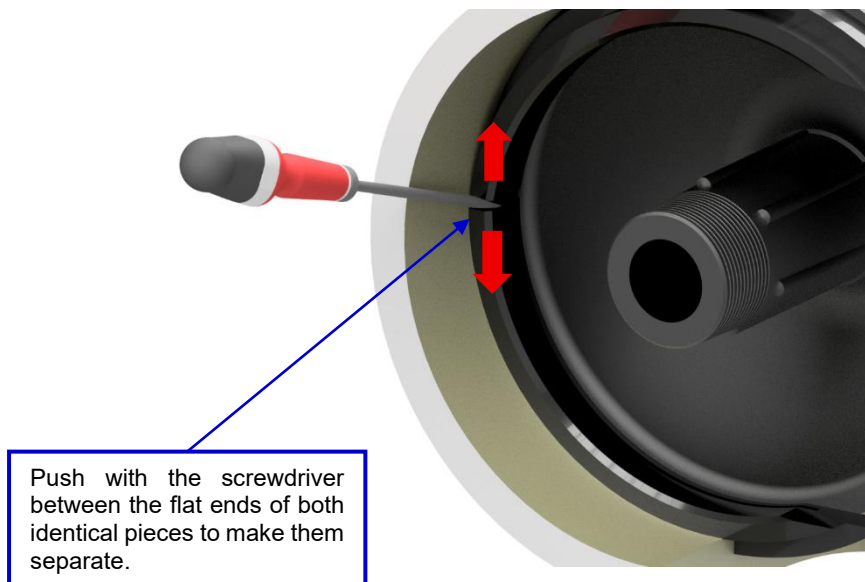
4.1.12. Use a flathead screwdriver to remove the first piece of the support ring. Use another piece of the support ring as a fulcrum for the screwdriver.



Picture 4.1.12

ALWAYS AVOID USING THE FLAT TIP OF THE SCREWDRIVER TO PRY THE SURFACE OF THE PRESSURE VESSEL AS THIS WILL SCRATCH THE PRESSURE VESSEL.

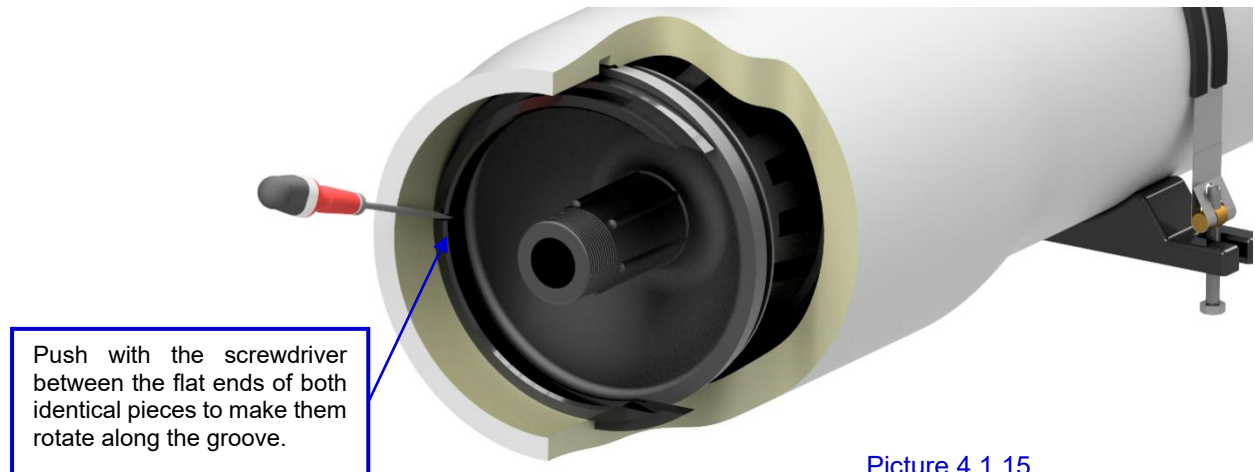
4.1.13. If it is necessary to bring the two identical pieces closer to the piece we want to remove to improve the support point, we can push with the screwdriver between the flat ends of both identical pieces to make them separate from each other and at the same time join them to the other third part of the support ring.



Picture 4.1.13

4.1.14. Clean the space in the groove left vacant after removing the first piece of the support ring. **This step is very important for removing the remaining two pieces.**

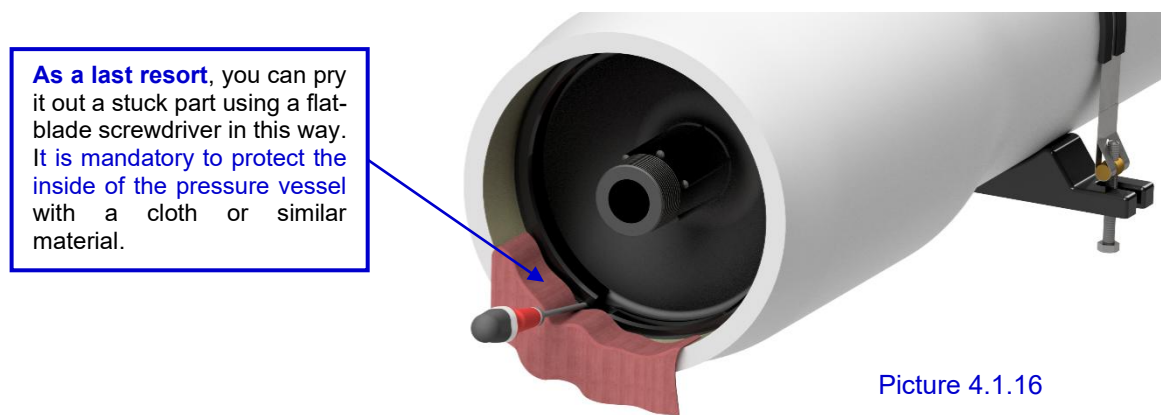
4.1.15. Once we've removed the first of the three pieces of the support ring, insert the flat-head screwdriver into the gap between the flat ends of the two remaining pieces. Push the twin pieces making them slide along the groove to the area that we cleaned previously. Once the pieces have been moved along the groove from the position in which they were stuck, to the clean side of the groove they should come out easily.



Picture 4.1.15

ALWAYS AVOID USING THE FLAT TIP OF THE SCREWDRIVER TO PRY THE SURFACE OF THE PRESSURE VESSEL AS THIS WILL SCRATCH THE PRESSURE VESSEL.

4.1.16. If, after carefully following all the steps above, any of the three parts remain stuck, **as a last resort**, you can pry it out using a flat-blade screwdriver as shown in the following image. To do this, **it is mandatory to protect the inside of the pressure vessel** with a cloth or similar material in the area where the screwdriver will be placed to avoid scratching the inside of the vessel.



Picture 4.1.16

4.2. Head Extraction (All models).

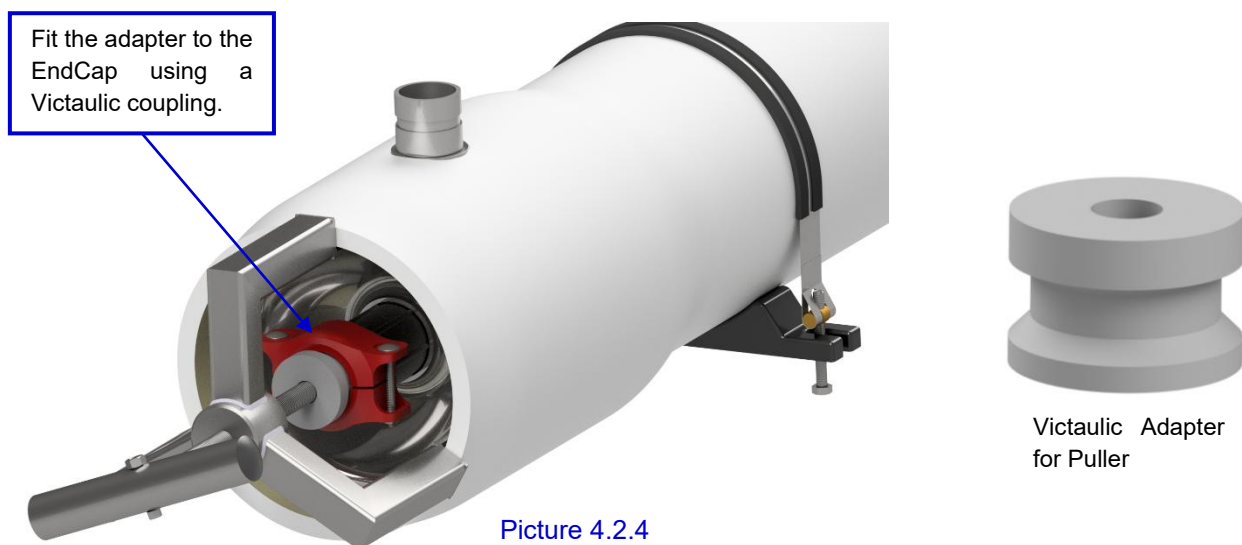
4.2.1. Tight the puller legs (see annex 1) to the vessel front wall as shown in the picture 4.2.3.

4.2.2. Apply a thin layer of lubricant (soap or glycerin) to improve the sliding of the head.

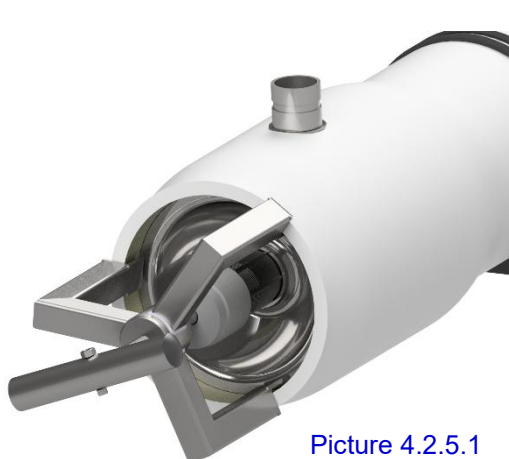
4.2.3. If the Head connection is threaded, screw the adapter supplied on the “Puller” completely to the NPT permeate outlet of the Head.



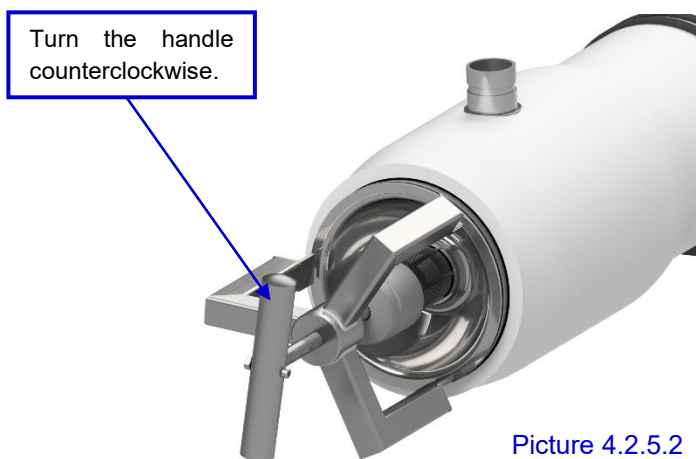
4.2.4. If the connection is Victaulic, remove the NPT adapter of Puller and replace it for the Victaulic adapter. Then fit the adapter into the permeate outlet of the Head using a Victaulic coupling. After that, apply a thin layer of lubricant (soap or glycerin) to improve the sliding of the head.



4.2.5. Once coupled, turn the “Puller” handle (counterclockwise) until the pressure vessel Head is extracted.



Picture 4.2.5.1



Picture 4.2.5.2

4.2.6. Once the Head seal have been unblocked, disassemble the “Puller” tool form the Head, remove the “Metal cap” (if it exists) and finally pull the EndCap out by hand.



Picture 4.2.6.1



Picture 4.2.6.2

4.3. Visual inspection.

Once the head have been disassembled, perform a visual inspection of the vessel head and fittings, to locate any signs of corrosion or salt concentrations.

If corrosion or salt concentrations are found, follow the following steps:

Component inspection

1. Use a small wire brush to loosen any large deposits.
2. Place components in a shallow container of soapy water and scrub their surfaces with medium-grade Scotch-Brite until all corrosion is removed.
3. Rinse components with clear water.
4. Blow components dry with compressed air.
5. Examine components for damage that may affect structural strength or sealing properties.

Vessel inspection

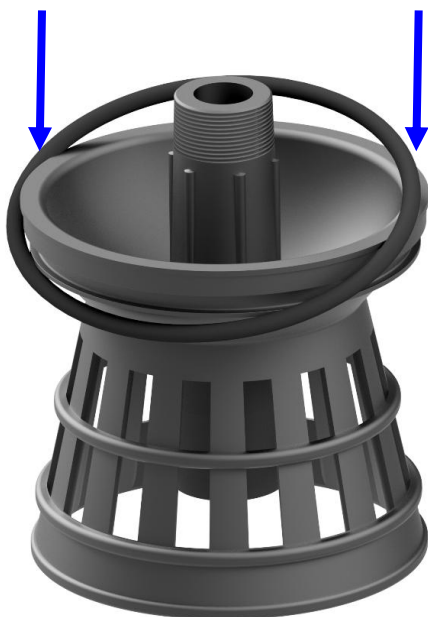
1. If any case of deposit of foreign material has been discovered scrub surface with a fine Scotch-Brite and a mild detergent solution, clean both ends of the vessel, up to 20 cm into the vessel.
2. If during inspection scratches are found on the inner surface of the vessel up to 20 cm depth, grind the area carefully with sand paper until it is smooth

4.4. Head reassembly for vessels up to 1200 psi.

4.4.1. Check that the O-ring seal is in good condition; that it has no cracks and that the material is not degraded.

4.4.2. Check that the groove where the gasket is housed is smooth, clean and free of foreign particles.

4.4.3. Insert the O-ring seal into the groove of the EndCap in the direction of the arrows as shown in picture 4.4.3.1 until it fits into the groove.



Picture 4.4.3.1



Picture 4.4.3.2

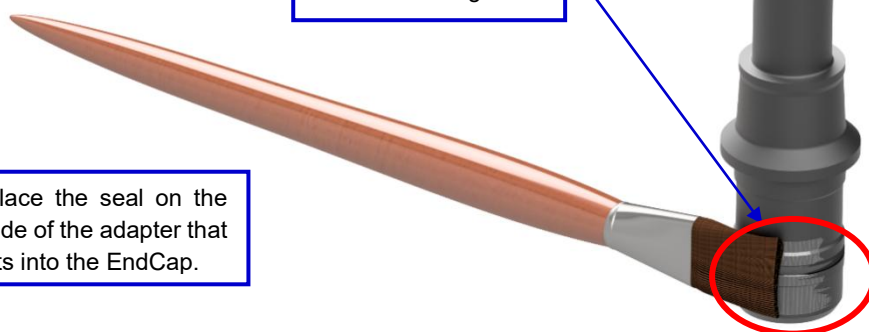
4.4.4. Take the adapter. Place the seal on the side of the adapter that fits into the EndCap (Seal for adapter). Apply a thin layer of glycerin lubricant to the surrounding area.



Picture 4.4.4.1

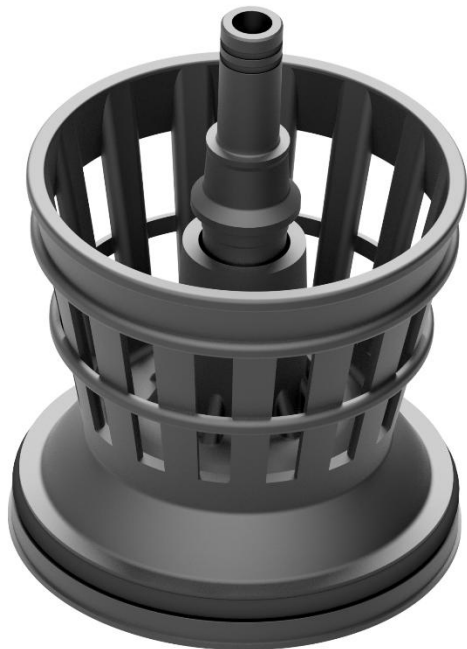
Place the seal on the side of the adapter that fits into the EndCap.

Apply a thin layer of glycerin lubricant to the surrounding area.



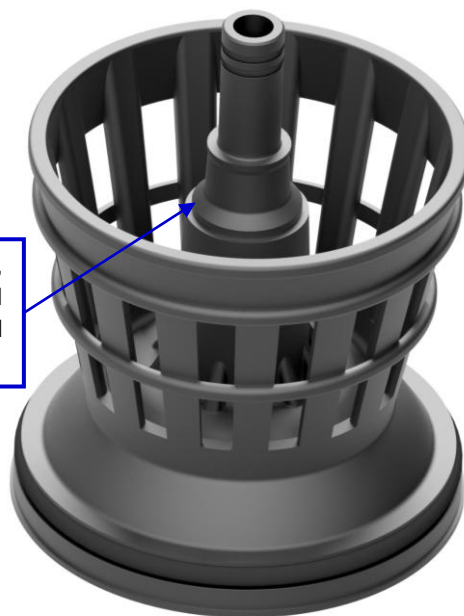
Picture 4.4.4.1

4.4.5. Insert the adapter into the EndCap. To do this, slide the adapter into position and then tap it firmly so the gasket snaps into place.



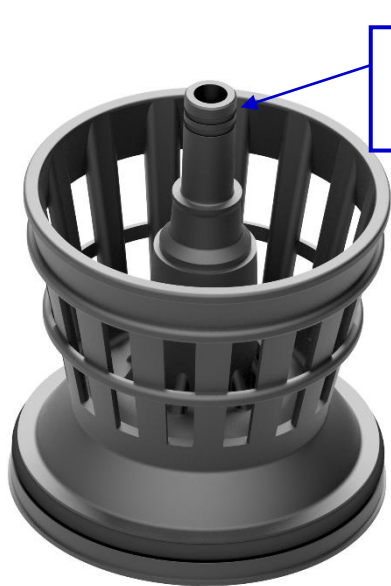
Picture 4.4.5.1

In its final position, the adapter should be totally inserted into the EndCap.



Picture 4.4.5.2

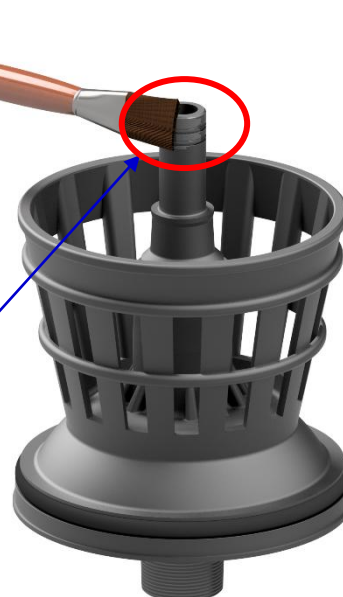
4.4.6. Place the seals on the side of the adapter that fits into the membrane (membrane seals). Apply a thin layer of glycerin to the gaskets and its surrounding area.



Picture 4.4.6.1

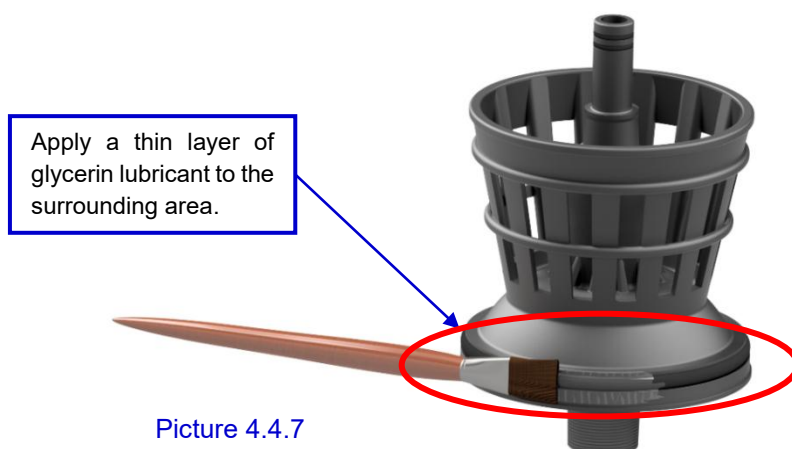
Place the seals on the side of the adapter that fits into the membrane.

Apply a thin layer of glycerin lubricant to the surrounding area.

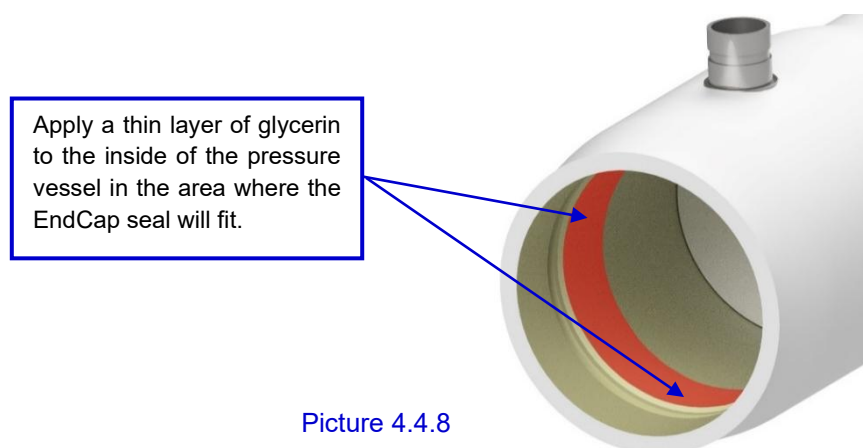


Picture 4.4.6.2

4.4.7. Apply a layer of lubricant on the O-ring (the amount of Glycerin should be just enough to give a luster to the O-ring) and on the EndCap internal groove.



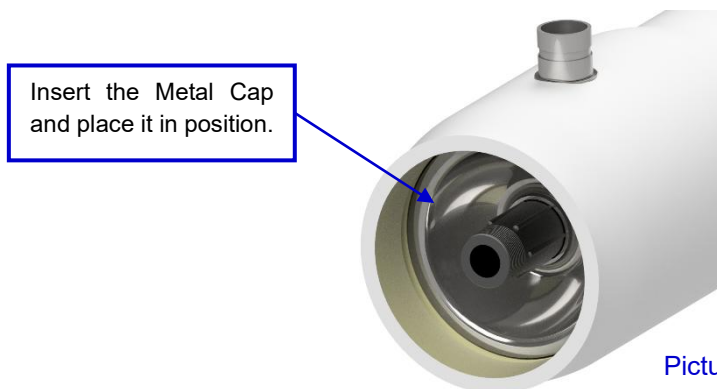
4.4.8. Also apply a thin layer of glycerin to the inside of the pressure vessel in the area where the EndCap seal will fit to improve its sliding.



4.4.9. Insert the EndCap into the pressure vessel by hand until you feel the EndCap seal hit the stop.

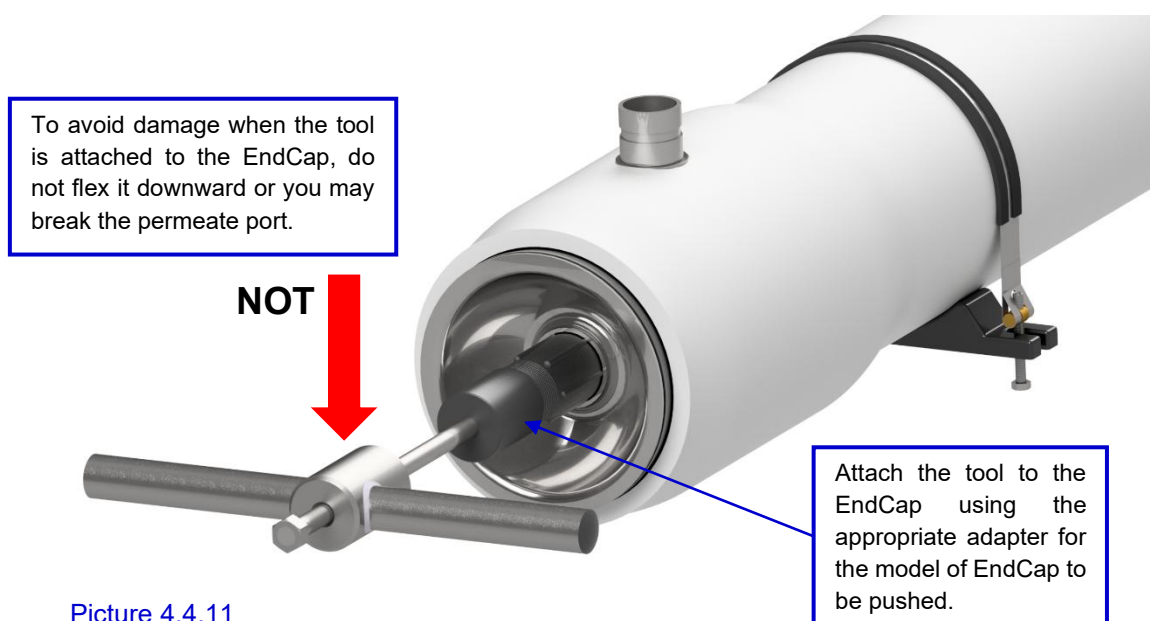


4.4.10. If the pressure vessel model you are assembling includes a “Metal Cap” insert it by hand and place it in position before moving on to the next step.



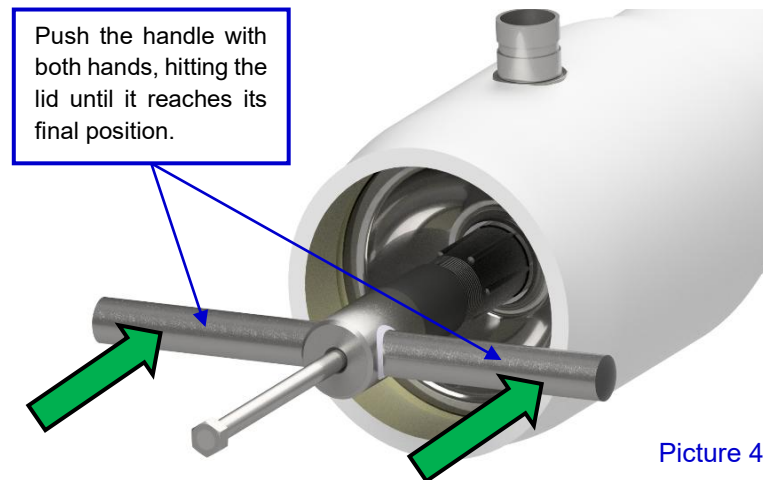
Picture 4.4.10

4.4.11. Next, attach the “Pusher” tool (see Appendix 2) on the EndCap. To do this, carefully attach the NPT or Victaulic adapter to the EndCap’s permeate port.



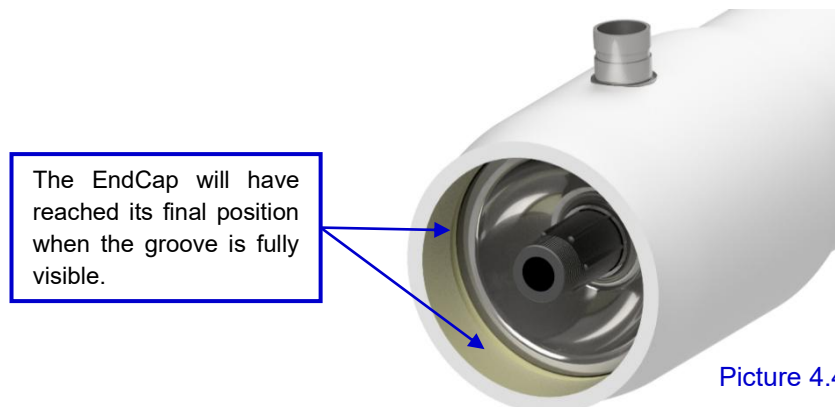
Picture 4.4.11

4.4.12. Push the slide hammer quickly and repeatedly against the EndCap until it clicks into place. To avoid personal injury, always hold the pusher handle with both hands.



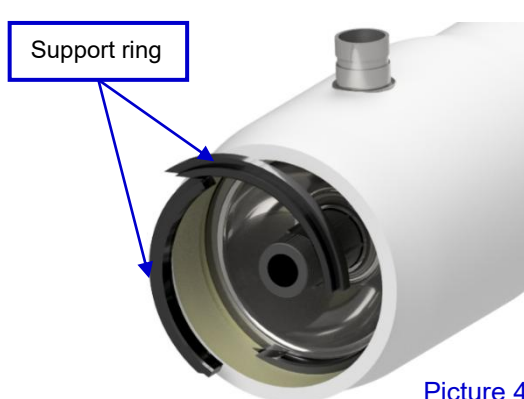
Picture 4.4.12

4.4.13. The EndCap will have reached its final position when the groove for the "Support Ring" is fully visible. Next, remove the "Pusher" from the EndCap.

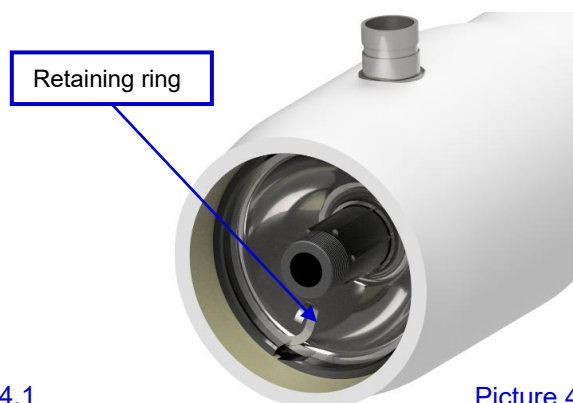


Picture 4.4.13

4.4.14. With the Head Assembly already in its place inside of the pressure vessel, slide the three segments of the "Support ring" into the groove and finally insert the Retaining Ring.



Picture 4.4.14.1



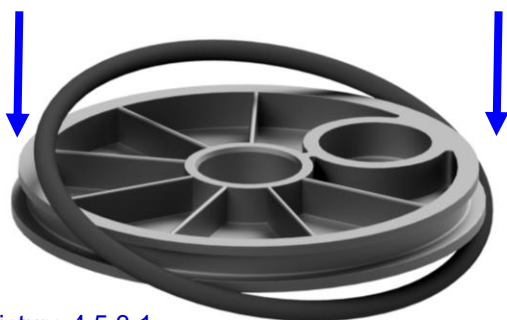
Picture 4.4.14.2

4.5. Head reassembly for vessels 1500 and 1800 psi.

4.5.1. Check that the O-ring seal is in good condition; that it has no cracks and that the material is not degraded.

4.5.2. Check that the groove where the gasket is housed is smooth, clean and free of foreign particles.

4.5.3. Insert the O-ring seal into the groove of the Sealing Plate in the direction of the arrows as shown in picture 4.5.3.1 until it fits into the groove.

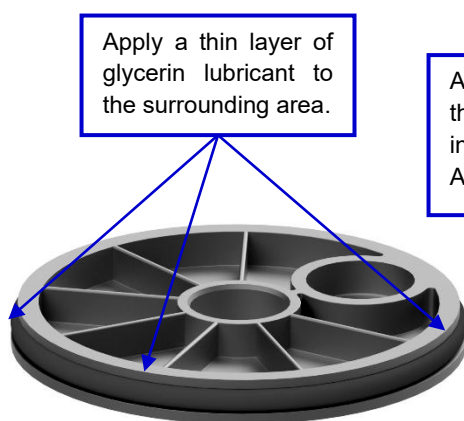


Picture 4.5.3.1



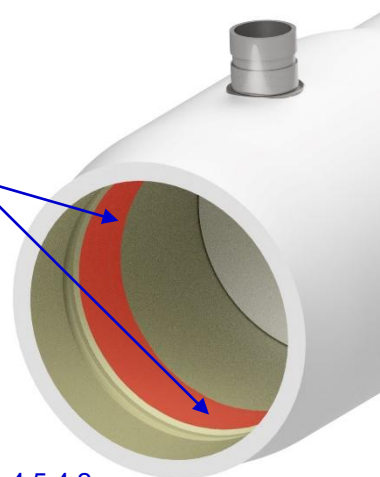
Picture 4.5.3.2

4.5.4. Apply a thin layer of glycerin to the O-ring already mounted on the Base Plate and also to the inside of the pressure vessel in the area where the seal will slide into its final position.



Picture 4.5.4.1

Apply a thin layer of glycerin to the inside of the pressure vessel in the area where the Head Assembly seal will fit.



Picture 4.5.4.2

4.5.5. Take the permeate port and place the seal.

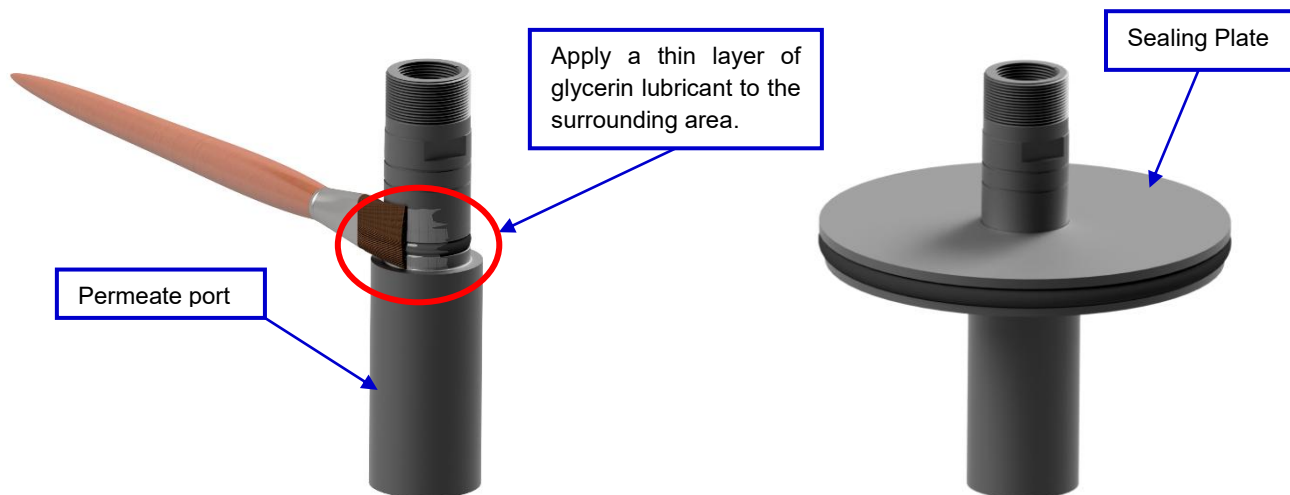


Picture 4.5.5.1



Picture 4.5.5.2

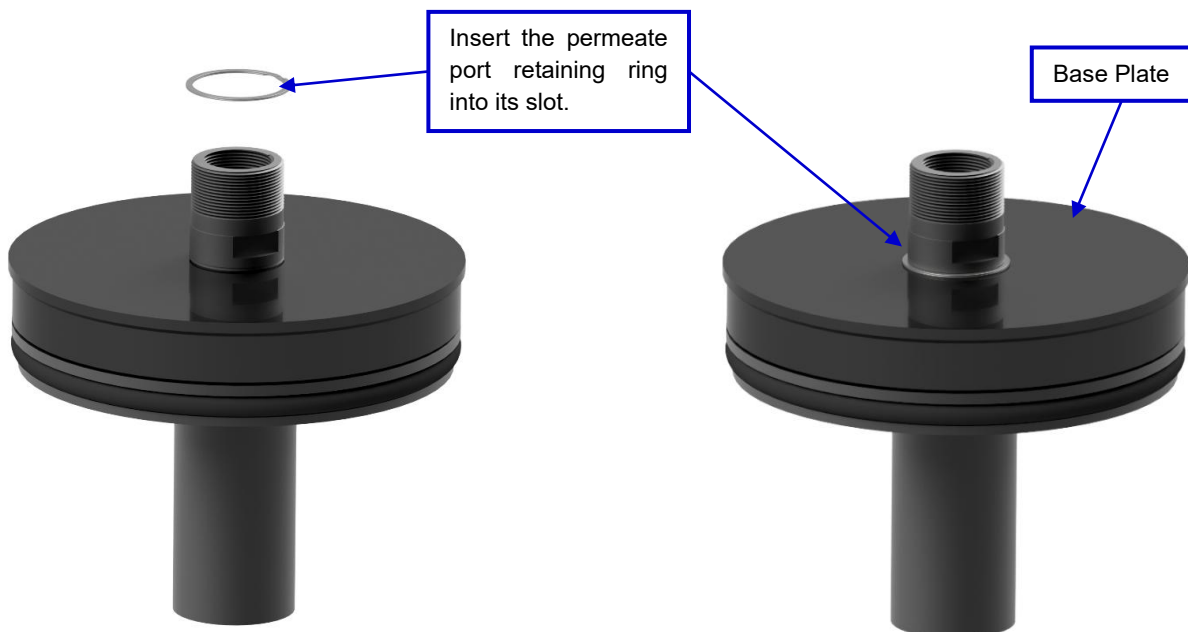
4.5.6. Apply a thin layer of glycerin lubricant to the area surrounding the seal and fit the Permeate Port into the Sealing Plate.



Picture 4.5.6.1

Picture 4.5.6.2

4.5.7. Place the Base Plate together with the Sealing Plate. Insert the permeate port retaining ring into its slot to secure all the parts.



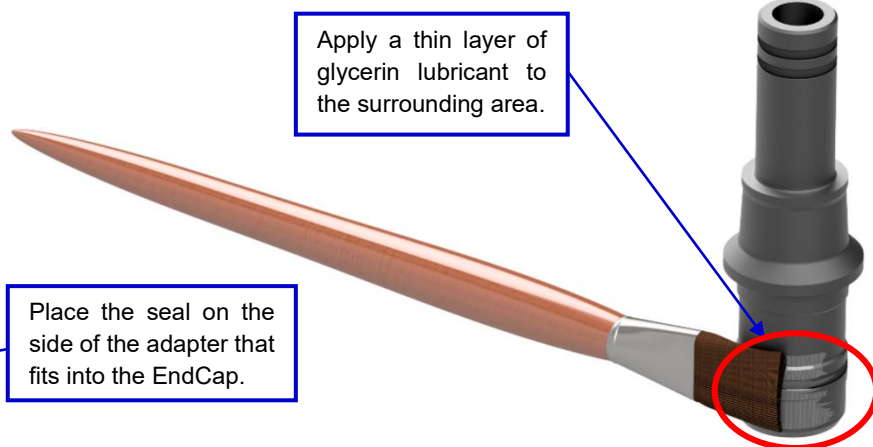
Picture 4.5.7.1

Picture 4.5.7.2

4.5.8. Take the adapter. Place the seal on the side of the adapter that fits into the EndCap (Seal for adapter). Apply a thin layer of glycerin lubricant to the surrounding area.

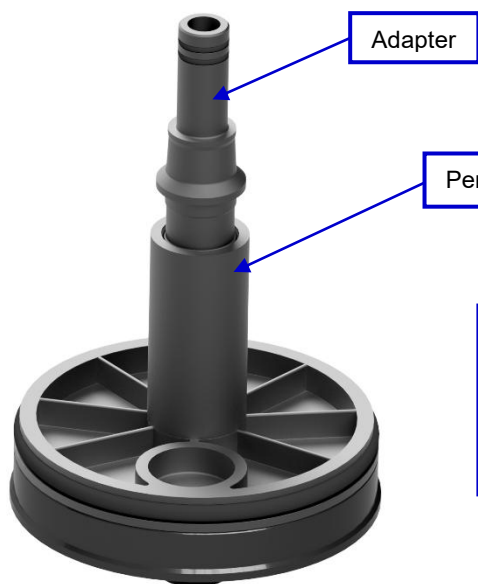


Picture 4.5.8.1



Picture 4.5.8.2

4.5.9. Insert the adapter into the Permeate Port. To do this, slide the adapter into position and then tap it firmly so the gasket snaps into its final place.



Picture 4.5.9.1

Permeate Port

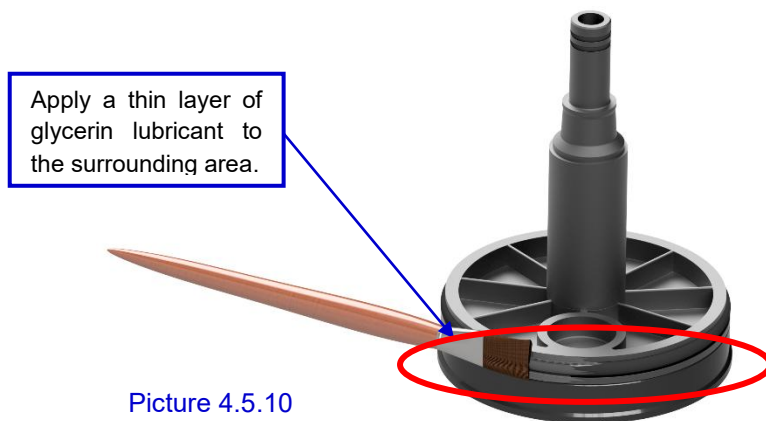
Adapter

In its final position, the adapter should be inserted into the Permeate Port as far as it will go.



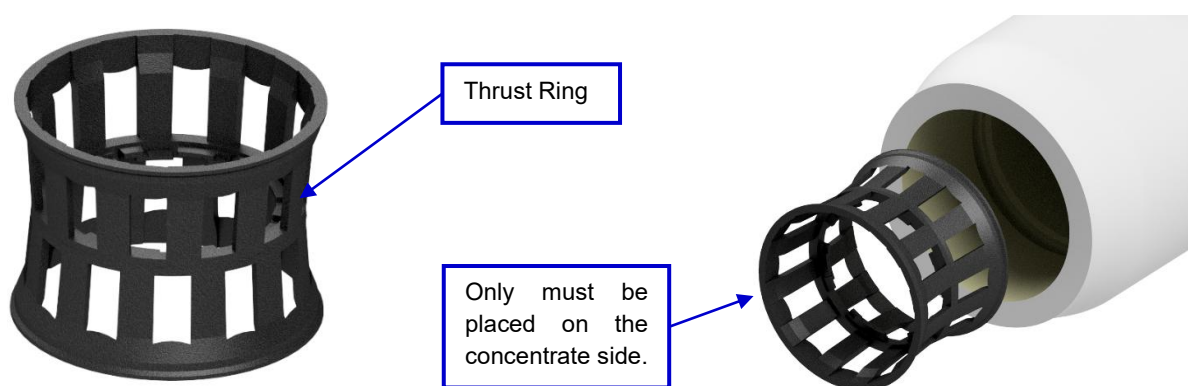
Picture 4.5.9.2

4.5.10. Apply a thin layer of glycerin to the Sealing Plate seal and its surrounding area to lubricate them.



Picture 4.5.10

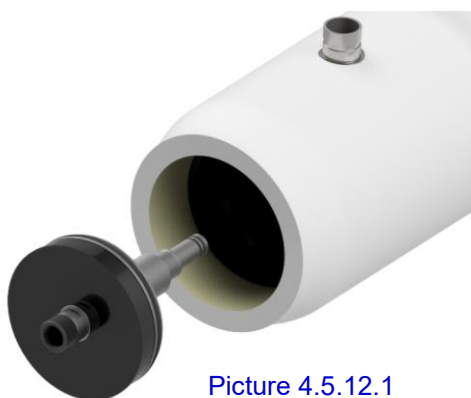
4.5.11. Take the “Thrust Ring” and insert it into the pressure vessel. **THIS ELEMENT MUST BE PLACED ONLY ON THE CONCENTRATE SIDE.**



Picture 4.5.11.1

Picture 4.5.11.2

4.5.12. Insert the assembly consisting of the Base plate, the sealing plate, the permeate port and the adapter into the pressure vessel by hand until you notice that the sealing plate joint stops.

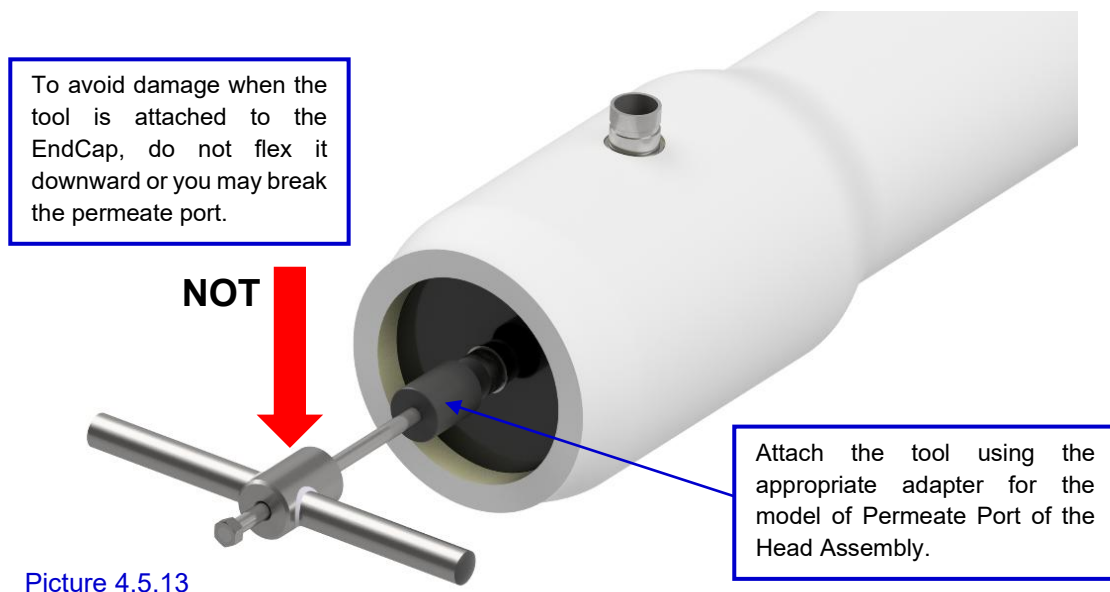


Picture 4.5.12.1

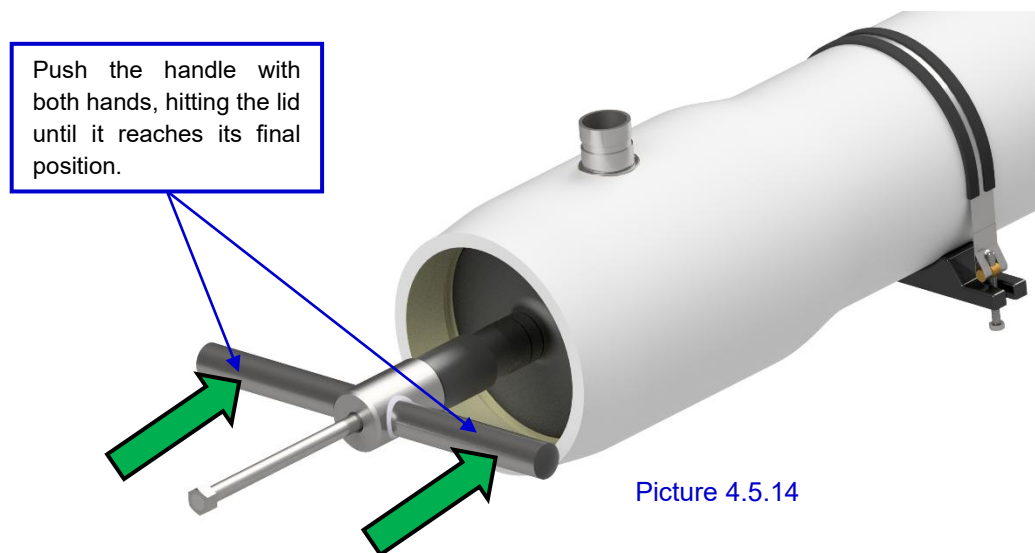


Picture 4.5.12.2

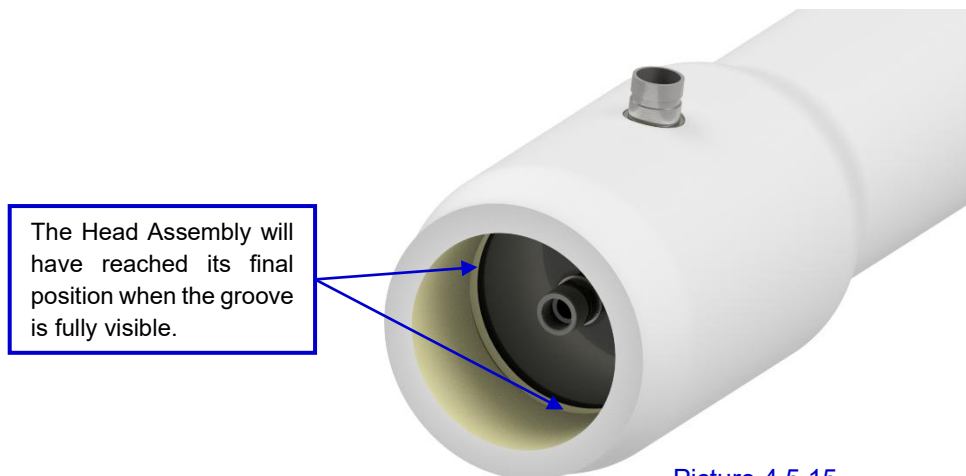
4.5.13. Next, fix the “Pusher” (see Appendix 2) to the Head Assembly. To do this, carefully secure the NPT or Victaulic adapter to the Head Assembly.



4.5.14. Push the slide hammer quickly and repeatedly against the Head Assembly until it clicks into place. To avoid personal injury, always hold the pusher handle with both hands.

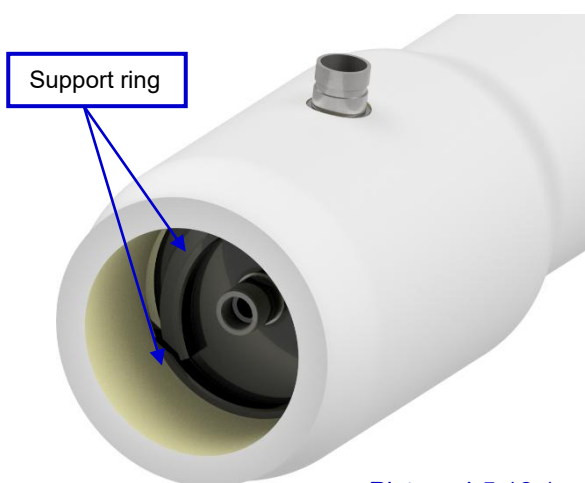


4.5.15. The Head Assembly will have reached its final position when the groove for the "Support Ring" is fully visible. Next, remove the "Pusher" from the Head Assembly.

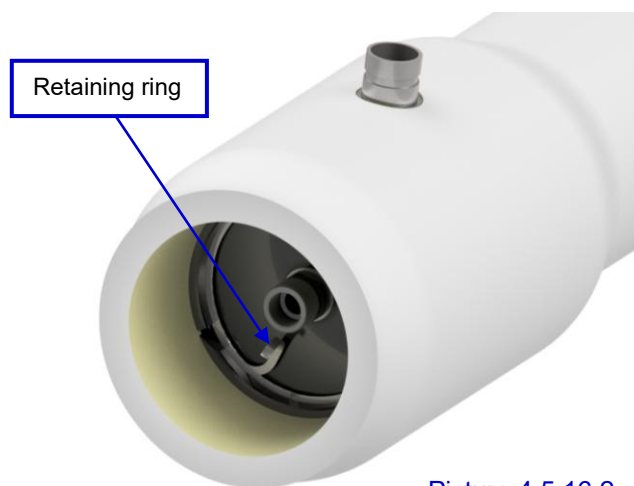


Picture 4.5.15

4.5.16. With the Head Assembly already in its place inside of the pressure vessel, slide the three segments of the "Support ring" into the groove and finally insert the Retaining Ring.



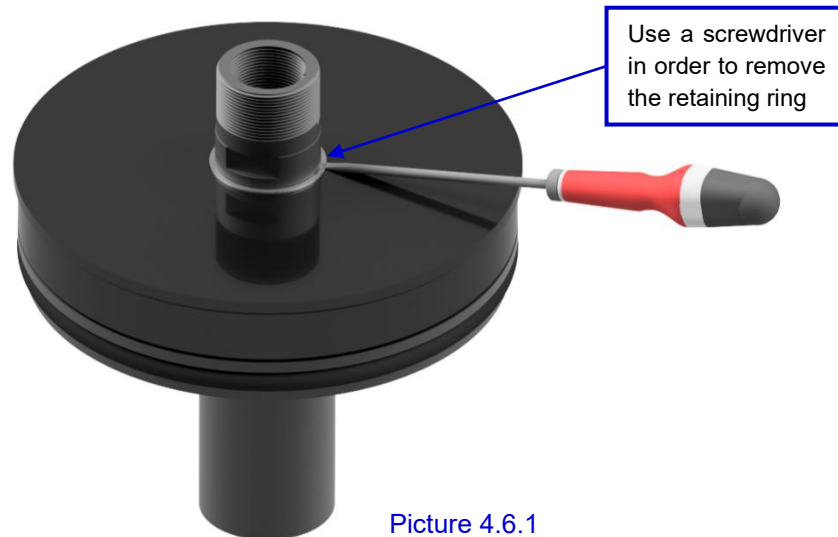
Picture 4.5.16.1



Picture 4.5.16.2

4.6. Permeate Port disassembly for pressure vessels 1500 and 1800 psi.

4.6.1. Use a screwdriver in order to remove the retaining ring which holds the Permeate Port to its place.



4.6.2. Disassemble the Retaining ring.

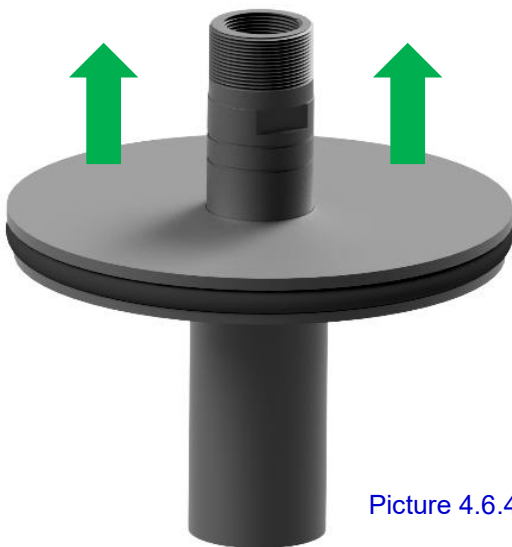


4.6.3. Disassemble the Base plate



Picture 4.6.3

4.6.4. Disassemble the Sealing Plate.



Picture 4.6.4.1

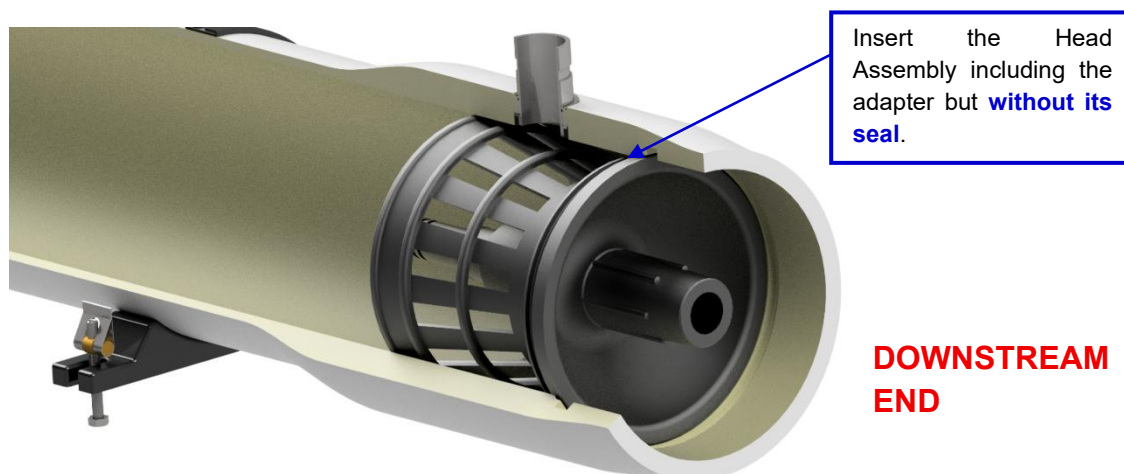


Picture 4.6.4.1

4.7. Loading the membrane elements.

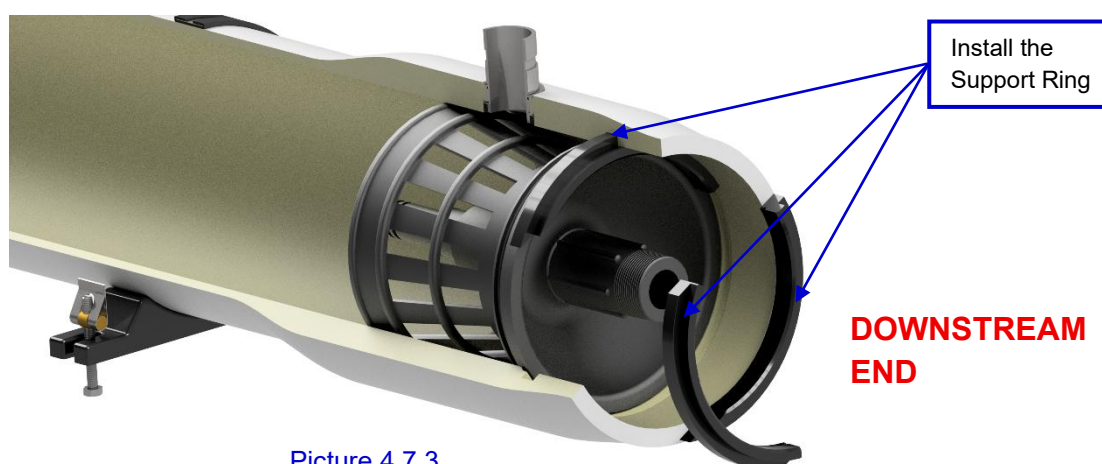
4.7.1. Flush the vessel with fresh water to remove dust and debris.

4.7.2. On the **downstream end** of the pressure vessel, Insert the Head Assembly with the adapter already mounted **but without the seal** (seal for endcap or seal for sealing plate depending on the head Assembly model).



Picture 4.7.2

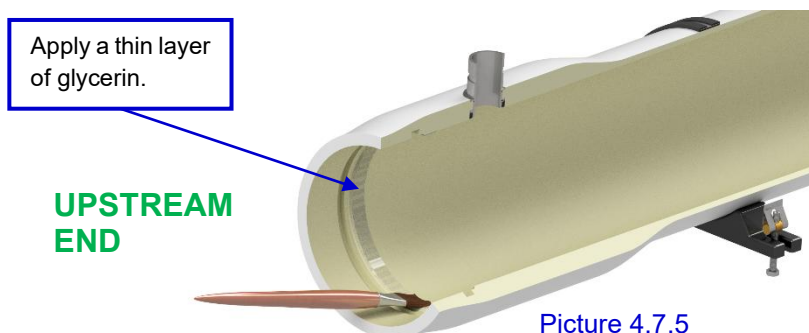
4.7.3. Install the Support Ring into the groove of the pressure vessel.



Picture 4.7.3

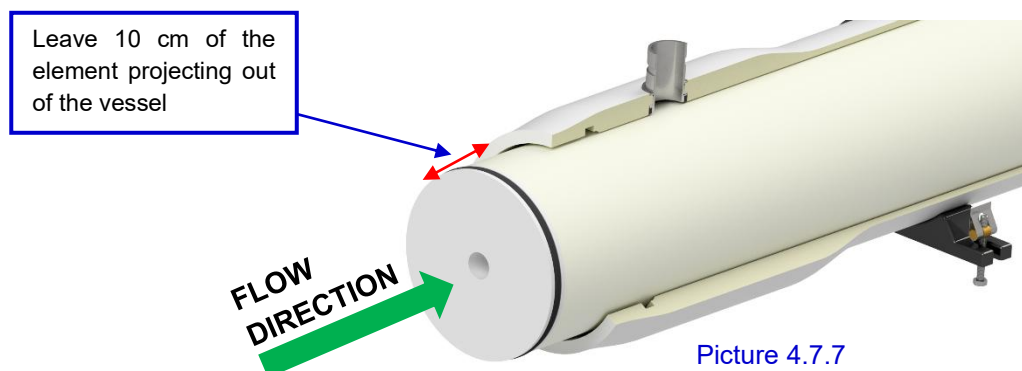
4.7.4. Inspect the surface of the membrane element for any imperfections that could damage or scratch the inner surface of the pressure vessel during the elements loading. If a defect is found that cannot be easily corrected, contact the membrane manufacturer.

4.7.5. On the **upstream end** of the pressure vessel, apply a thin layer of glycerin to lubricate the inside surface in the area closer to the groove. This will help load the membrane element and reduce the risk of inadvertently scratching its inner surface.

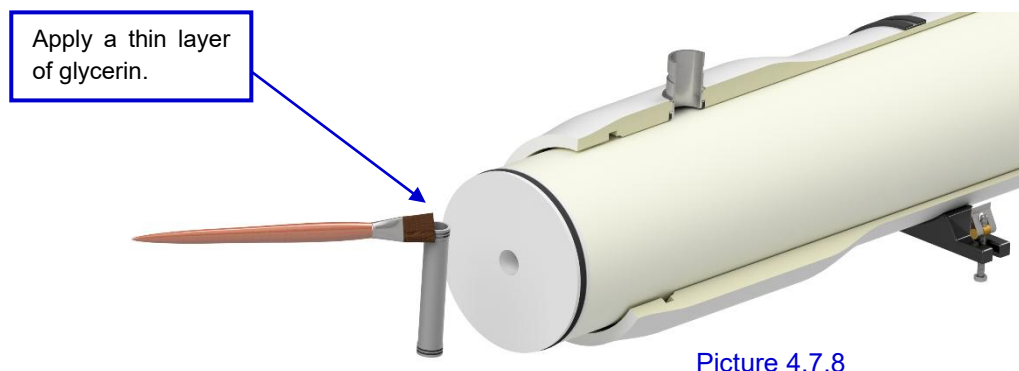


4.7.6. Load the first membrane element through the feed zone, taking into account the flow direction.

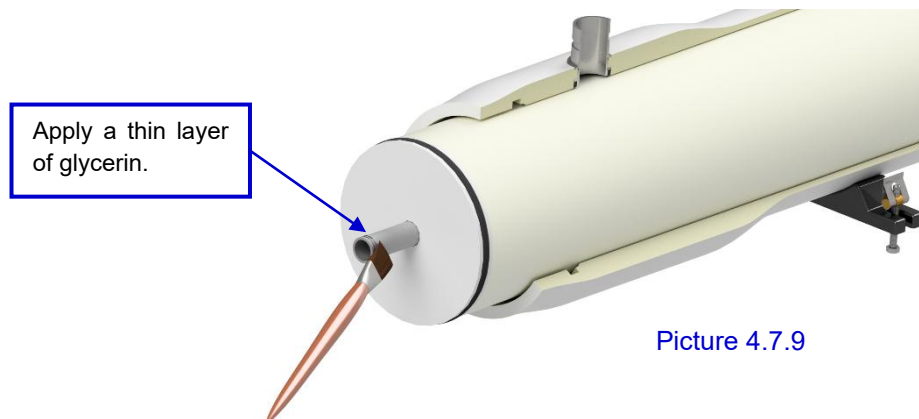
4.7.7. Leave 10 cm of the element projecting out of the vessel to facilitate connection with the next element.



4.7.8. Apply a small amount of Lubricant onto the O-ring of the interconnector.

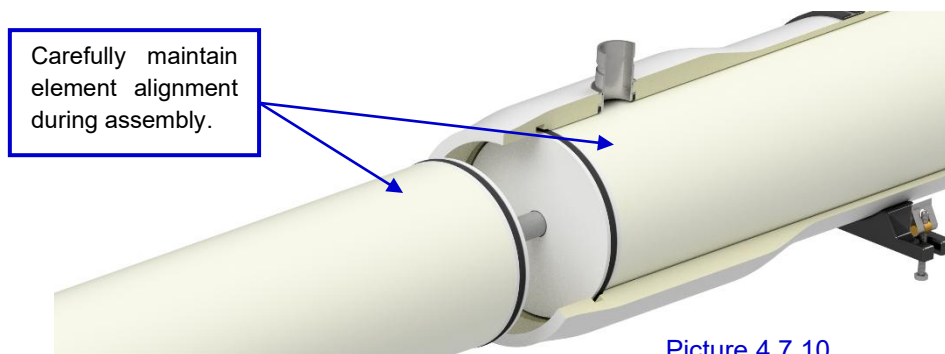


4.7.9. Connect the interconnector to the projected end of the already charged element. Once connected, apply a small amount of glycerin to the interconnector O-ring.



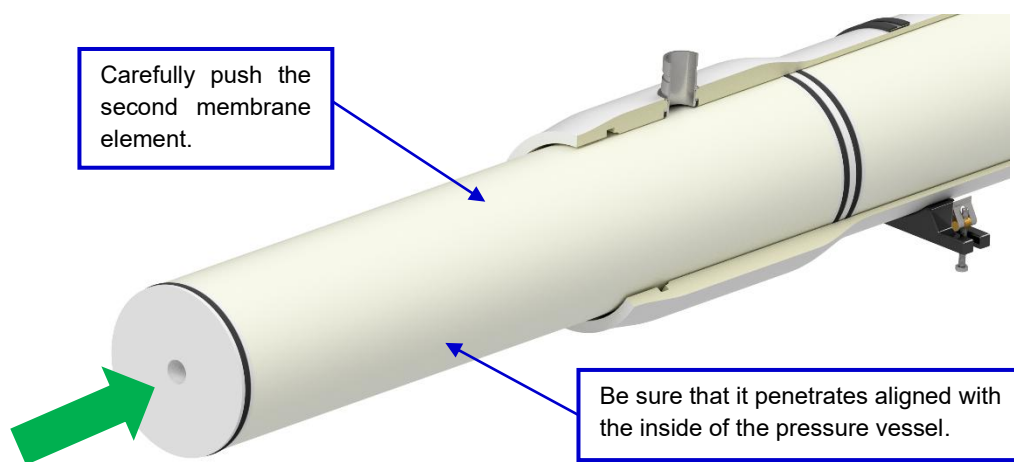
Picture 4.7.9

4.7.10. Line up the next element and assemble it to the interconnector which is already on the first element. **Carefully maintain element alignment during assembly, misalignment may result damage to the membrane and vessel parts.**



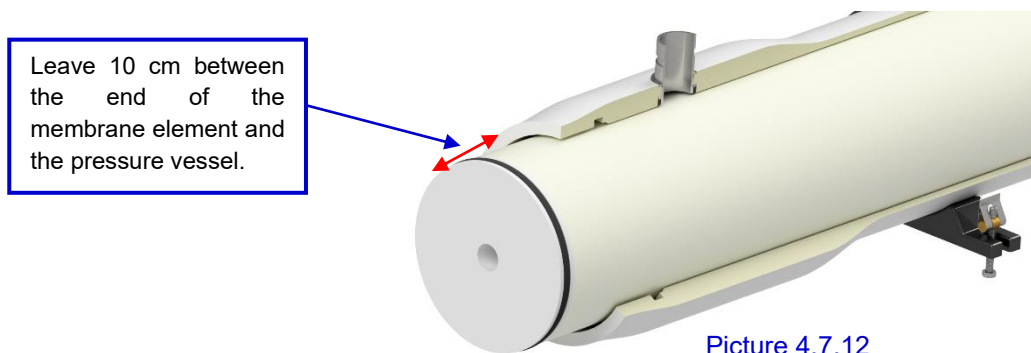
Picture 4.7.10

4.7.11. Carefully push the second membrane element so that it penetrates aligned with the inside of the pressure vessel.



Picture 4.7.11

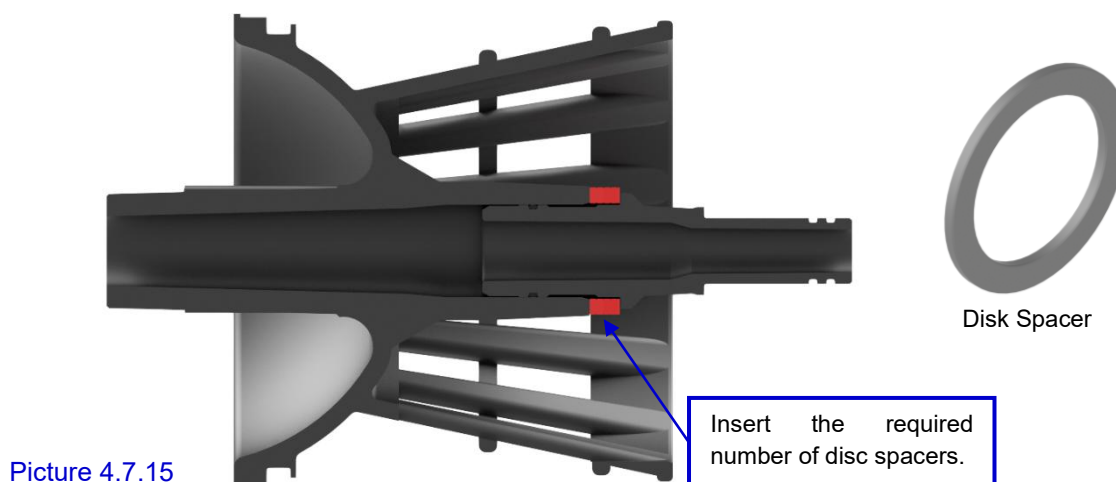
4.7.12. Keep pushing the second membrane element until its projection approximately 10 cm from the pressure vessel.



4.7.13. Repeat the above steps until all membrane elements have been assembled.

4.7.14. Calculate the correct shimming distance (see section 4.9) in order to fit the membrane elements correctly inside the pressure vessel and avoid impact damage to the membrane parts and the vessel head part during pressure drops.

4.7.15. Insert the required number of disc spacers into the feed side cap between the cap or permeate port (depending on the model) and the membrane adapter as described in Section 4.9.



4.7.16. Install the head assembly as described in the maintenance section of this document.

4.7.17. Remove the head assembly from the downstream side. Install seal (Seal for EndCap or Seal for sealing plate, depending on the pressure vessel model).

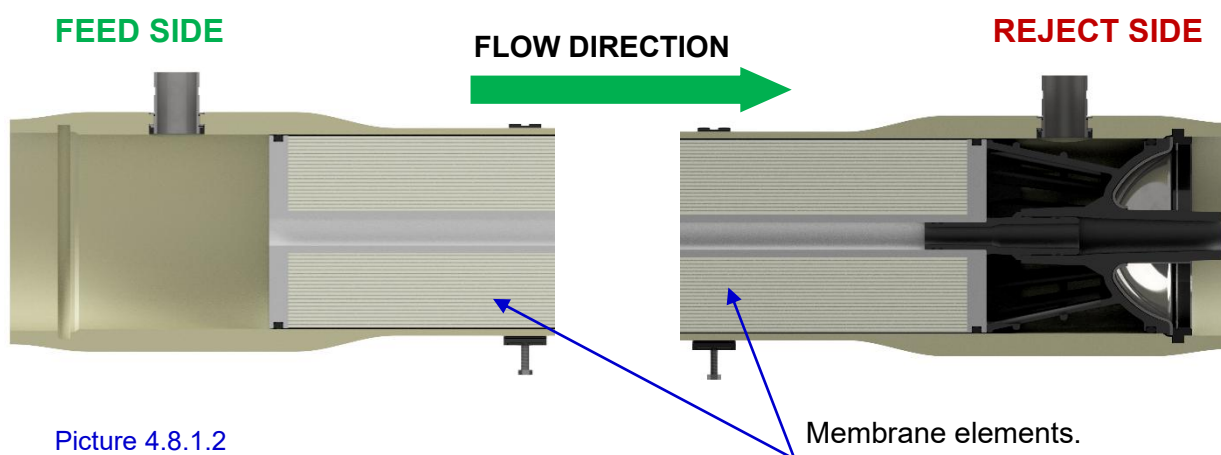
4.7.18. Finally, install the head assembly, as described in the maintenance section of this document.

4.8 Shimming procedure.

4.8.1. Side port / Multiports vessels up to 1200 psi.

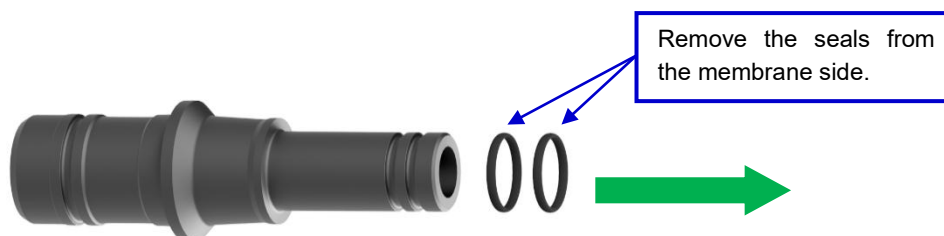
4.8.1.1. Close the vessel on the reject side.

4.8.1.2. Load the membranes from feed side to reject side.



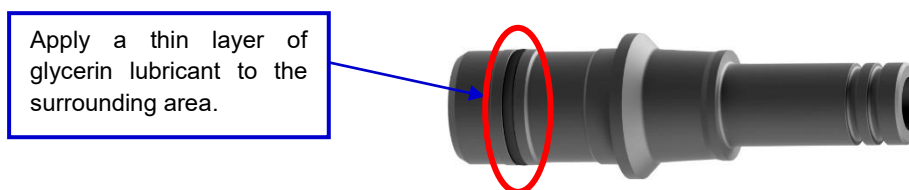
Picture 4.8.1.2

4.8.1.3. Remove the adapter from the EndCap and remove the O-rings from the membrane side (Membrane seals).



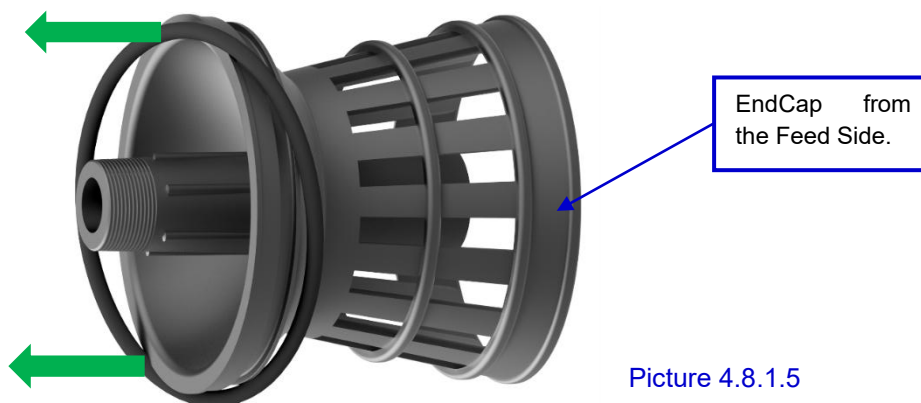
Picture 4.8.1.3

4.8.1.4. Apply a little lubricant (glycerin) on the seal of the adapter on the EndCap side (Seal for adapter), as shown in the following image.



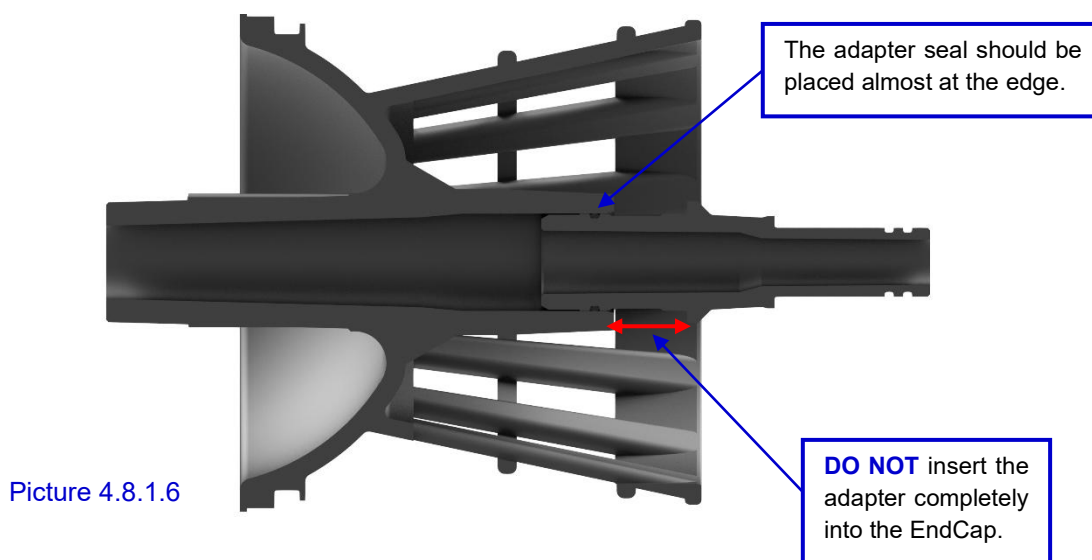
Picture 4.8.1.4

4.8.1.5. Remove the seal from the EndCap on the **FEED SIDE** of the pressure vessel.



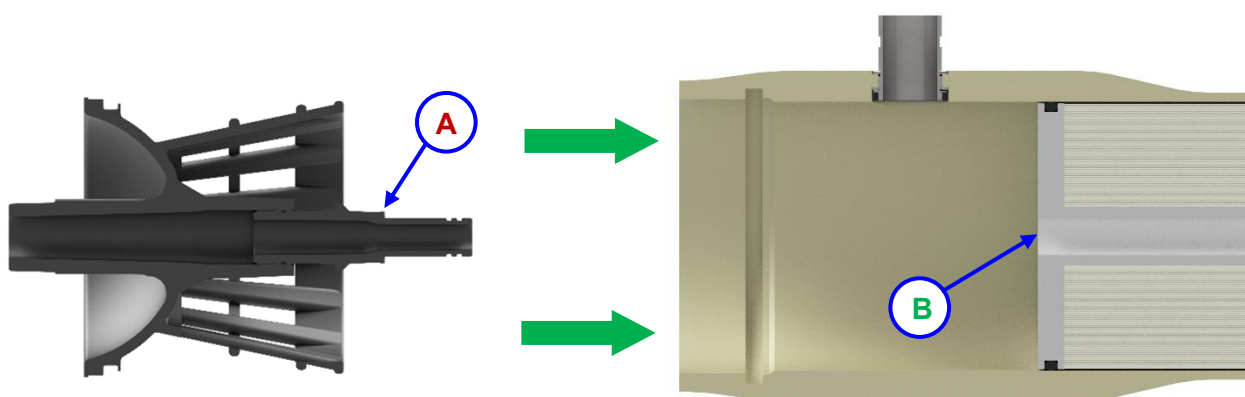
Picture 4.8.1.5

4.8.1.6. Insert the adapter into the EndCap so that the adapter seal is placed almost at the side.



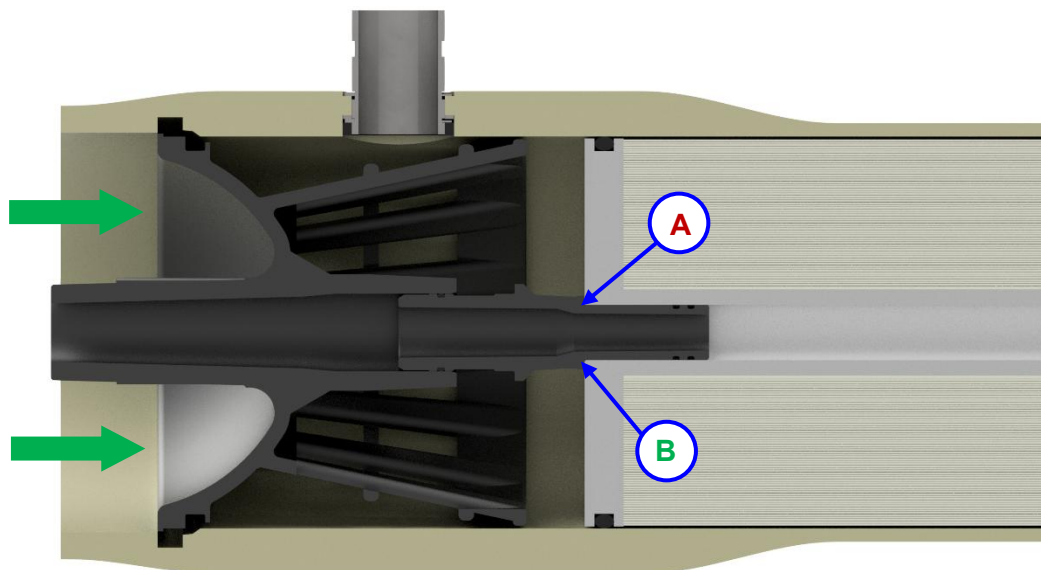
Picture 4.8.1.6

4.8.1.7. Insert the EndCap together with the adapter into the pressure vessel.



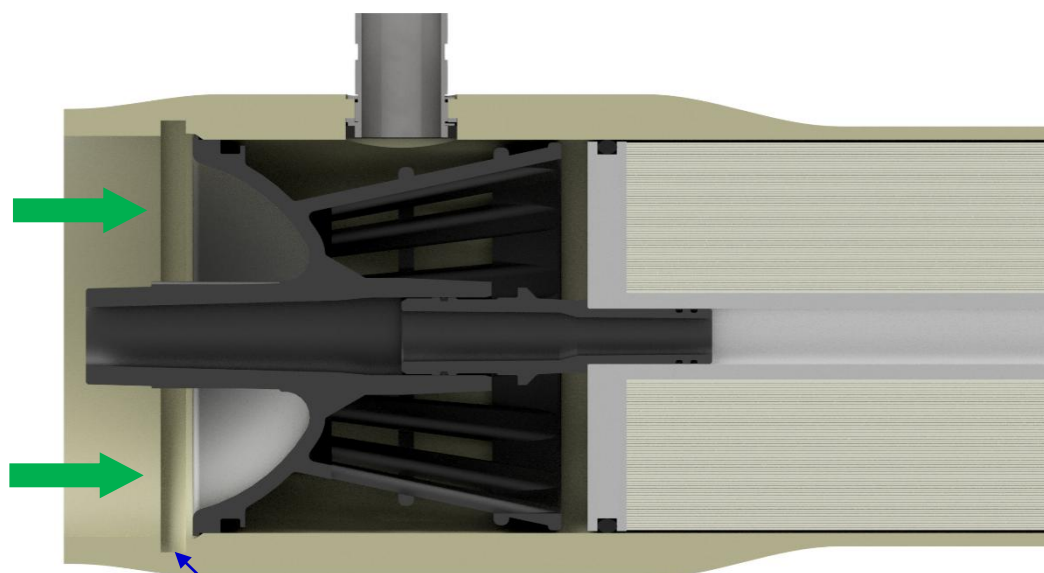
Picture 4.8.1.7

4.8.1.8. Slowly slide the EndCap into the pressure vessel so that the adapter fits into the membrane permeate tube. Since it has no seal, the adapter will slide in smoothly until point "A" makes contact with point "B," as shown in the following picture.



Picture 4.8.1.8

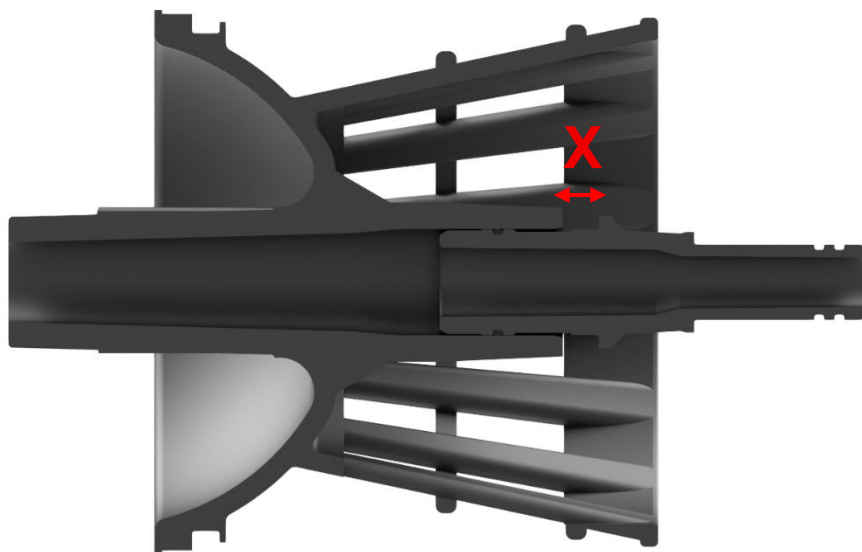
4.8.1.9. From this point on, you'll notice some resistance due to the adapter seal. Continue pressing the EndCap until it reaches its final position inside the pressure vessel.



Picture 4.8.1.9

The EndCap will have reached its final position when the groove is fully visible.

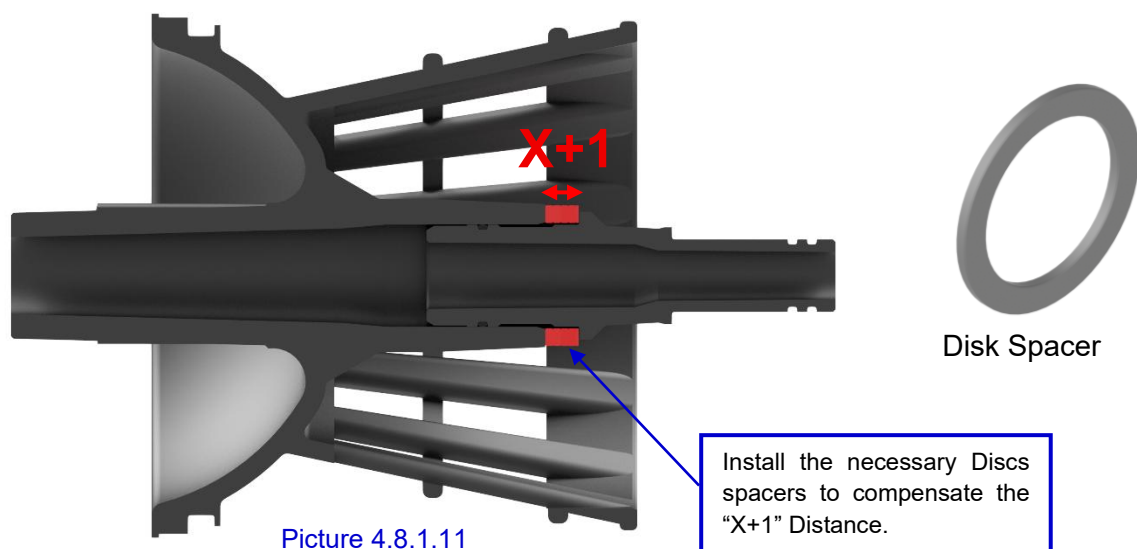
4.8.1.10. Remove the EndCap without disassembling the adapter and measure the distance "X".



Picture 4.8.1.10

4.8.1.11. To compensate for the tolerances of the membranes and other elements in the assembly of the pressure vessel, we will add a 1 mm spacer disc to the "X" measurement.

The distance "X+1 mm" is the actual clearance for this pressure vessel in question. This clearance must be compensated for by installing an appropriate amount of spacer discs between the adapter and the EndCap.



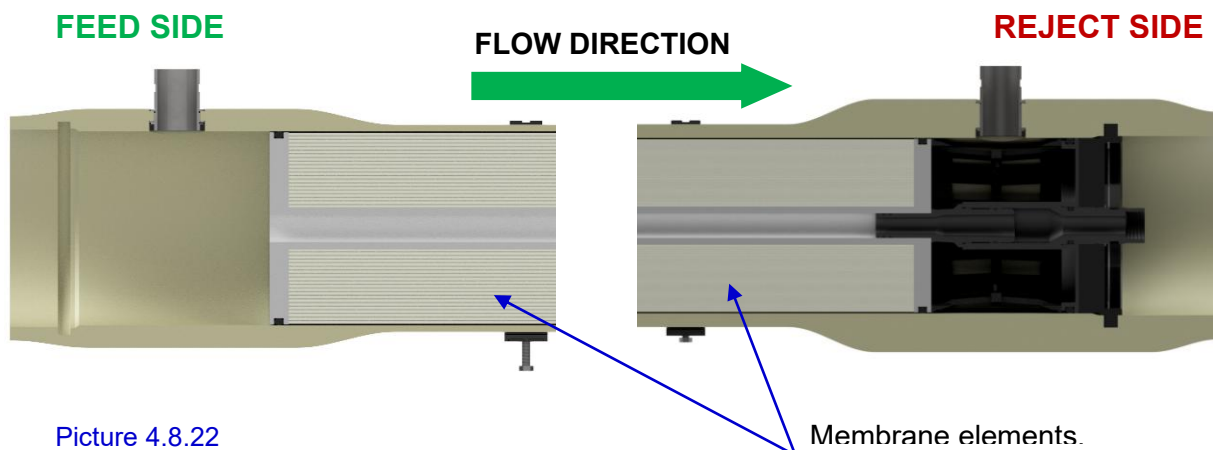
Picture 4.8.1.11

4.8.1.12. **Repeat this process for each pressure vessel** to determine the actual adjustment distance for each one.

4.8.2. Side port / Multiports vessels BEL8-S 1500 & 1800 psi.

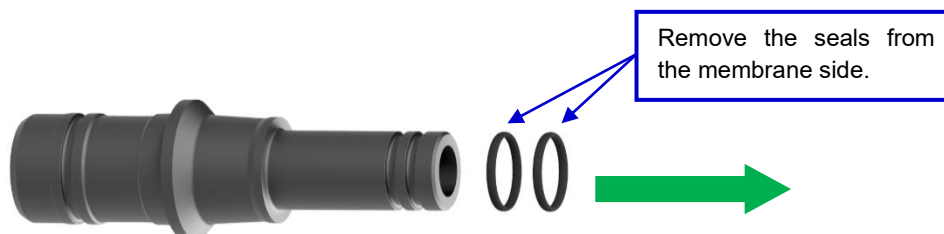
4.8.2.1. Close the vessel on the reject side.

4.8.2.2. Load the membranes from feed side to reject side.



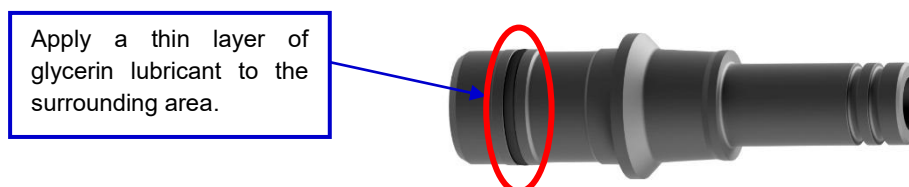
Picture 4.8.22

4.8.2.3. Remove the adapter from the EndCap and remove the O-rings from the membrane side (Membrane seals).



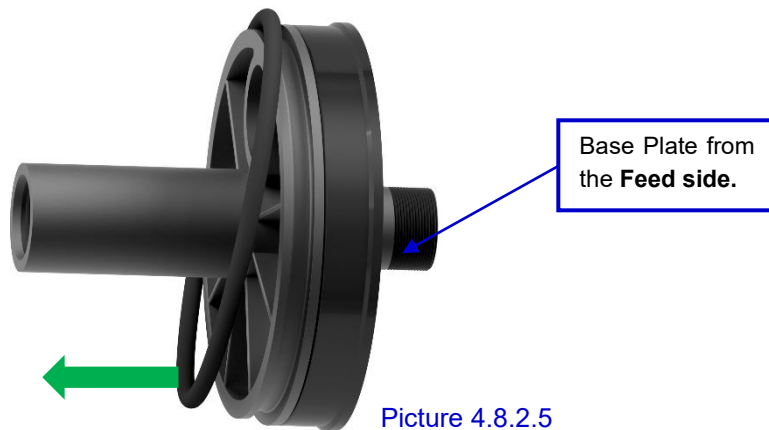
Picture 4.8.2.3

4.8.2.4. Apply a little lubricant (glycerin) on the seal of the adapter on the EndCap side (Seal for adapter), as shown in the following image.

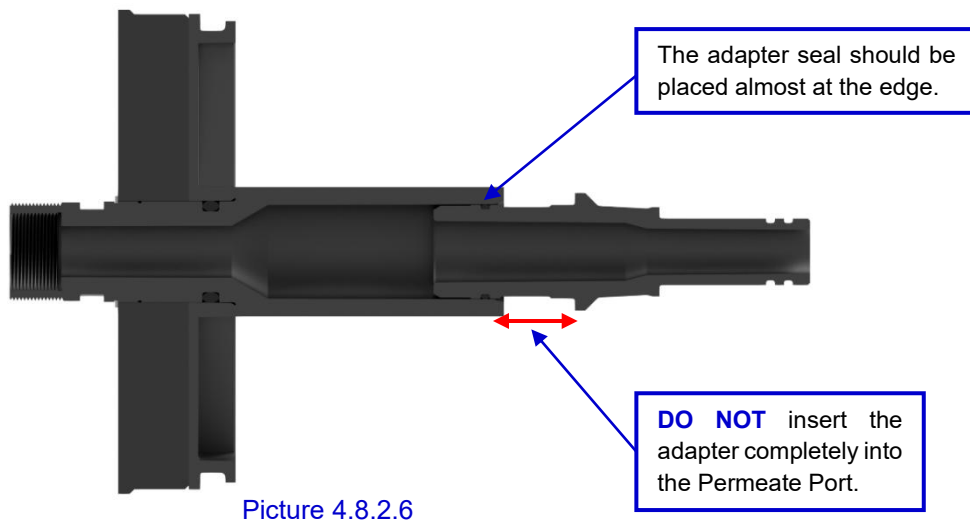


Picture 4.8.2.4

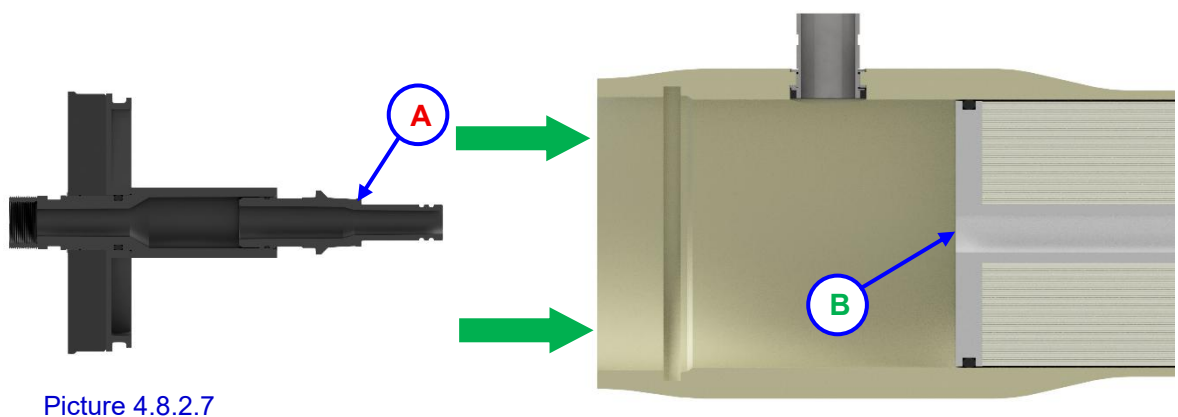
4.8.2.5. Remove the seal of the Base Plate from the **FEED SIDE** of the pressure vessel.



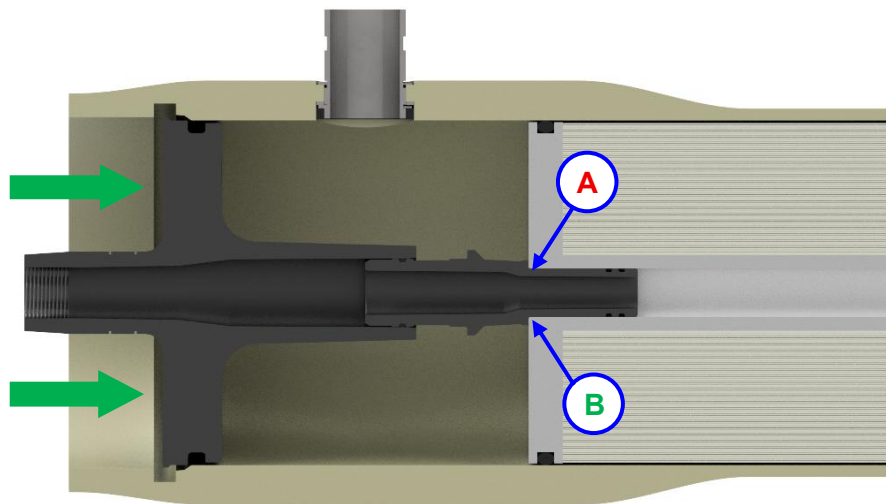
4.8.2.6. Insert the adapter into the Permeate Port so that the adapter seal is placed almost at the side.



4.8.3.7. Insert the Head Assembly together with the adapter in the pressure.

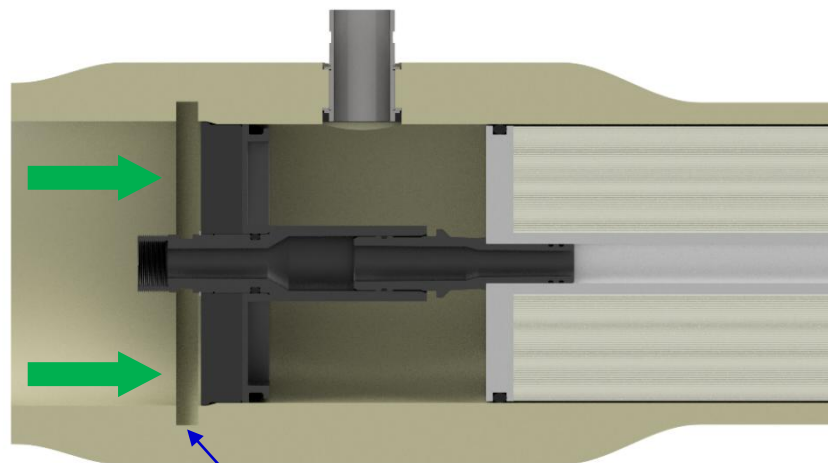


4.8.2.8. Slowly slide the Head Assembly and the adapter into the pressure vessel so that the adapter enters the membrane permeate core tube. Since it has no seal, the adapter will slide in smoothly until point "A" makes contact with point "B," as shown in the following picture.



Picture 4.8.2.8

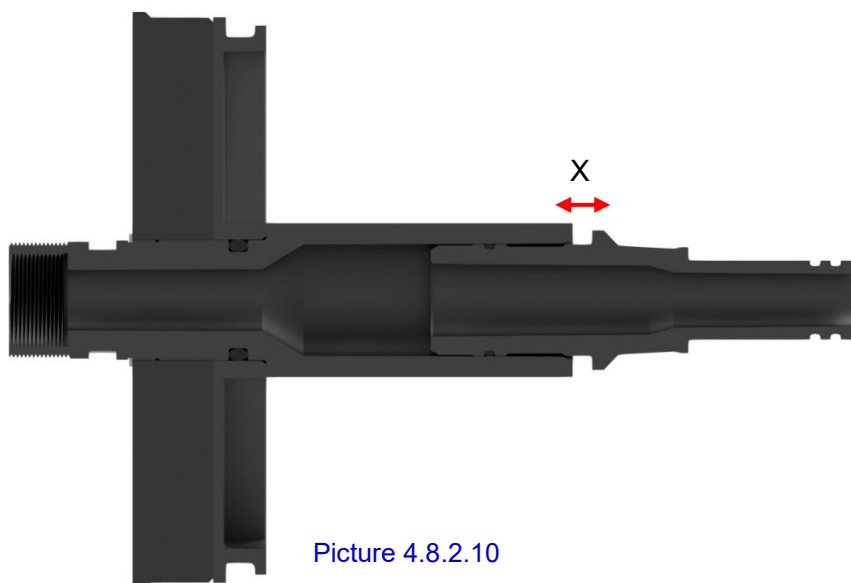
4.8.2.9. From this point on, you'll notice some resistance due to the adapter seal. Continue pressing the Head Assembly until it reaches its final position inside the pressure vessel.



Picture 4.8.2.9

The head assembly will have reached its final position when the groove is fully visible.

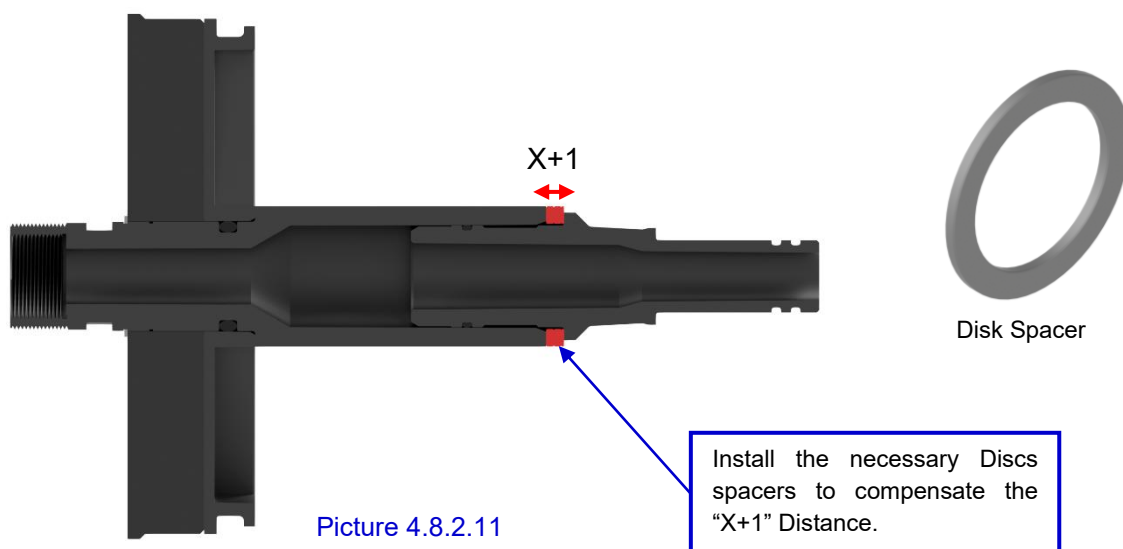
4.8.2.10. Remove the Head Assembly without disassembling the adapter and measure the distance "X".



Picture 4.8.2.10

4.8.2.11. To compensate for the tolerances of the membranes and other elements in the assembly of the pressure vessel, we will add a 1 mm spacer disc to the "X" measurement.

The distance "X+1 mm" is the actual clearance for this pressure vessel in question. This clearance must be compensated for by installing an appropriate amount of spacer discs between the adapter and the Head Assembly.



Picture 4.8.2.11

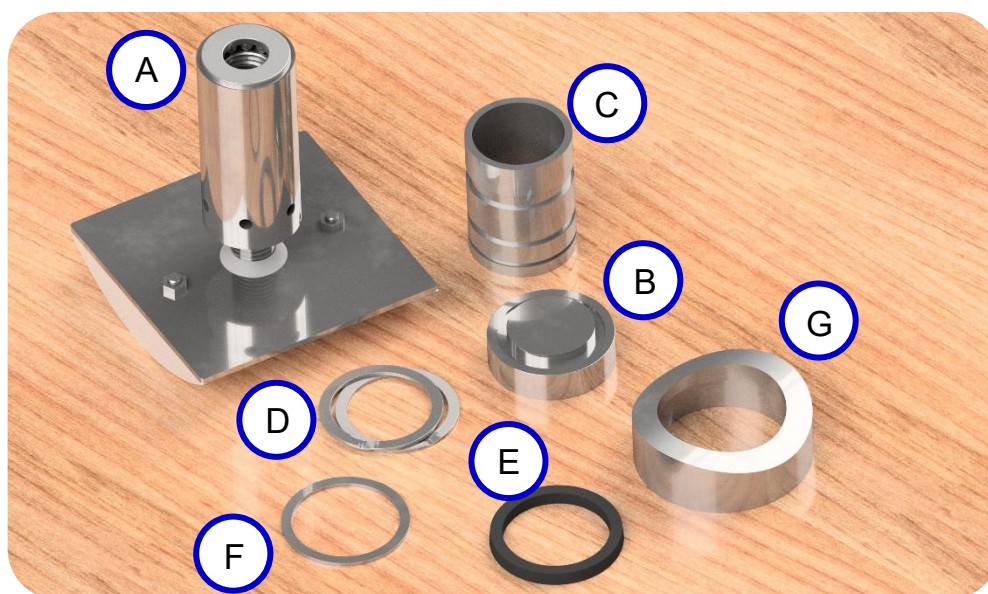
4.8.2.12. **Repeat this process for each pressure vessel** to determine the actual adjustment distance for each one.

4.9. Side ports extraction / installation.

4.9.1. Proper installation of side ports determines the quality of the final product while prevent potential leakages. Wrong installation may damage the vessel. Using too much force during installation can cause cracks in the vessel.

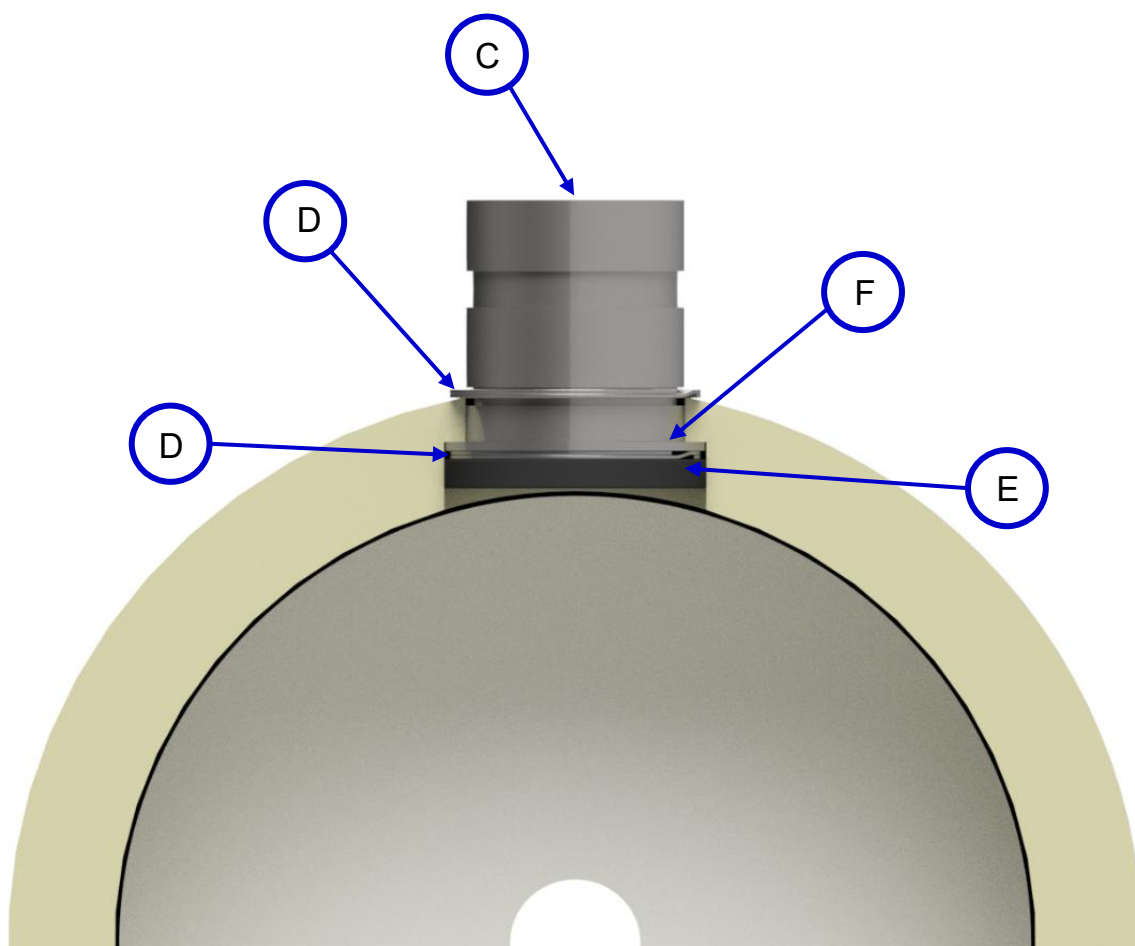
4.9.2. Tools.

- Manual pusher (part number 069-800-9000) (A)
- Adapter for manual pusher (B) & guiding tool (G).
- Glycerin or soap for lubricating.
- Flat screw driver.
- Rags.
- Rubber Hammer.
- Side port KIT for installation: Side port (C), Retaining ring (D), Seal for side port (E), Disk for side port (F).



Picture 4.9.2

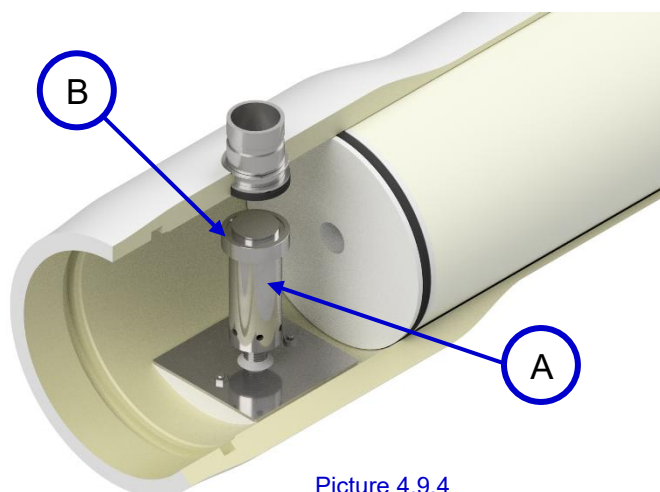
4.9.3. The following image shows the different parts that make up a side port assembly kit.



SIDE PORT ASSEMBLY KIT:

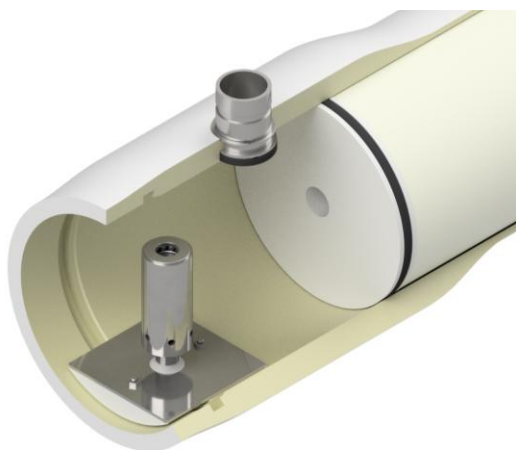
Side port (C)
Retaining ring (D)
Seal for side port (E)
Disk for side port (F).

4.9.4. Once the work area on the pressure vessel head is clean and dry, take the adaptor for the manual pusher (B) with the diameter in accordance with the model of the side port and fit it to the manual pusher (A).



Picture 4.9.4

4.9.5. Place the manual pusher inside the vessel, just below the side port. Be sure that the manual pusher is aligned with the side port axis.



Picture 4.10.5.1

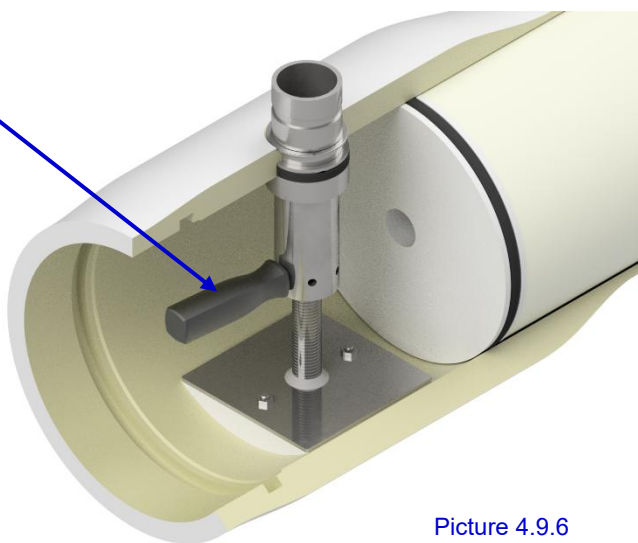


Picture 4.9.5.2 Be sure that the manual pusher is aligned with the side port axis.

4.9.6. Start to raise the manual pusher increasing the pressure over the side port little by little, allowing the adaptor to sit in its position below the side port. If the manual pusher is not in its place (totally aligned) the pressure must to be released.

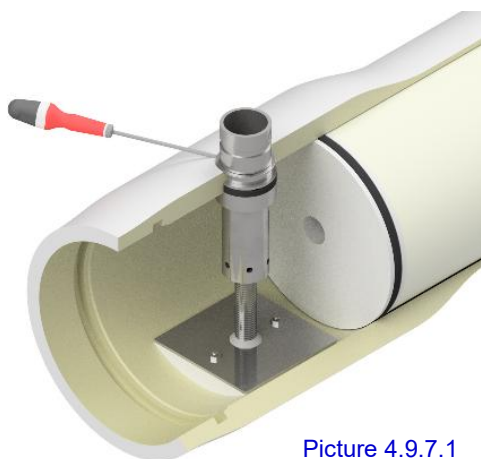
Once the pusher is in its place, the pressure must to be raised until the retaining ring of the side port can be removed easily. (You must to use always the minimum pressure that allow you to remove the retaining ring).

TIP. You can use a screwdriver to rotate the body of the manual

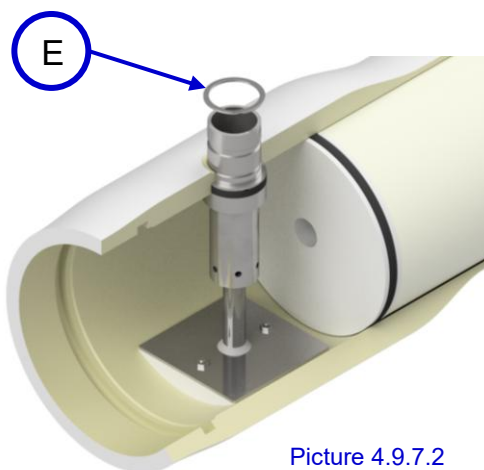


Picture 4.9.6

4.9.7. Remove the Retaining ring (E) using a flat screw driver.



Picture 4.9.7.1

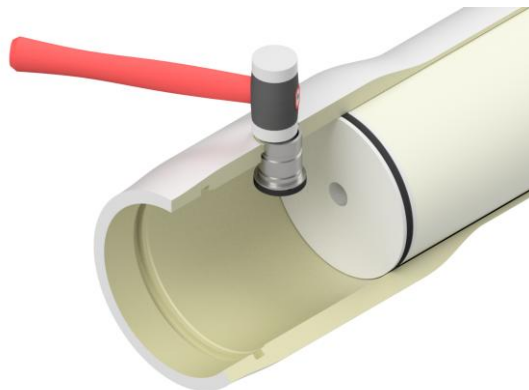


Picture 4.9.7.2

4.9.8. Release the pressure of the manual pusher. Remove the manual pusher from below the side port. Remove the side port assembly. If is necessary a Teflon hammer can be used.



Picture 4.9.8.1

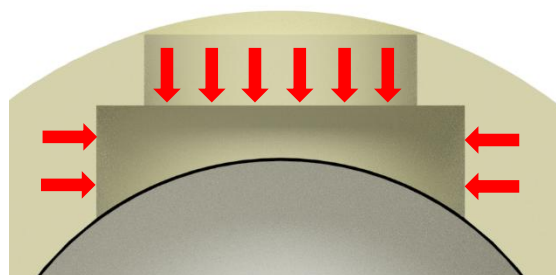


Picture 4.9.8.2 If necessary, a Teflon hammer can be used.

4.9.9. Prepare the area where the seal will be placed. Clean the area using a dry cloth. This way any track of dirt will be removed.

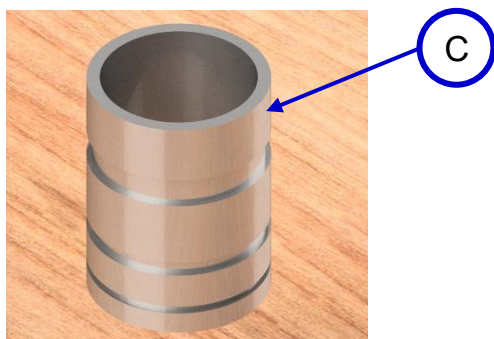


Picture 4.9.9

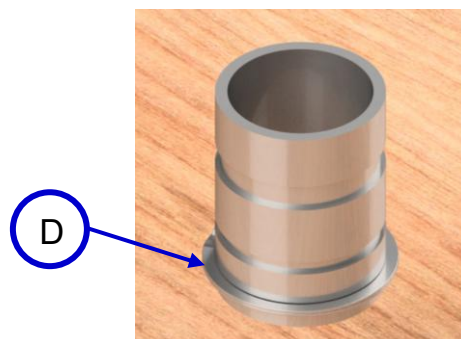


Detail A. Area that needs to be prepared.

4.9.10. Before the installation on the vessel, the side port (C) must be prepared. The retaining ring must be placed (D) on the lower groove.

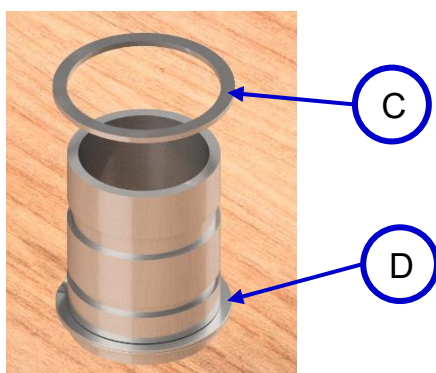


Picture 4.9.10.1

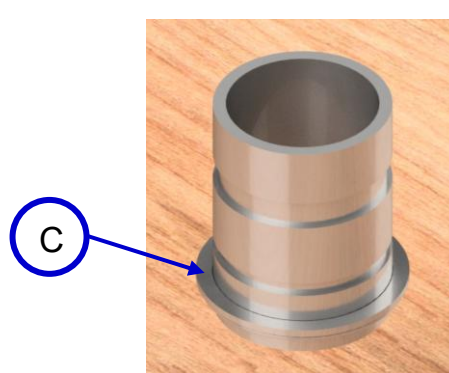


Picture 4.9.10.2

4.9.11. Next, place the disc (C) resting on the retaining (D) that we just placed before.



Picture 4.9.11.1



Picture 4.9.11.2

4.9.12. Then, fit the seal in its place (E). Note that the seal is trapezoidal in shape. **The larger diameter should be on the bottom.**



Picture 4.9.12.1



Picture 4.9.12.2

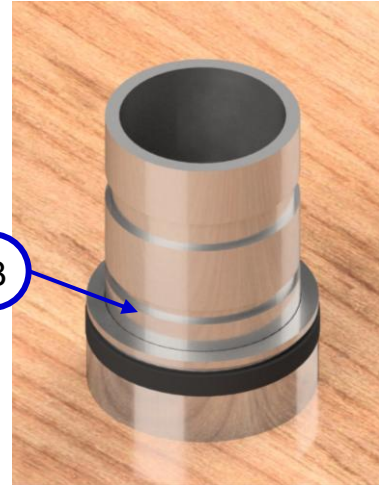


Picture 4.9.12.3 The seal is trapezoidal in shape. The larger diameter should be on the bottom.

4.9.13. The next step is to place the port, with all the accessories that were mounted on the previous steps, over the adapter for the manual pusher (B).

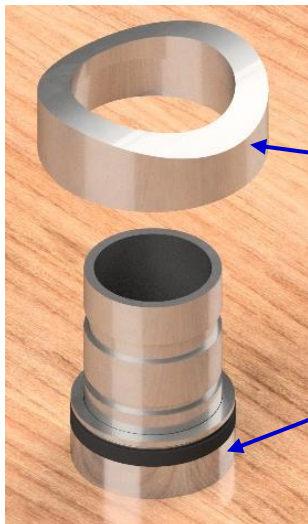


Picture 4.9.13.1

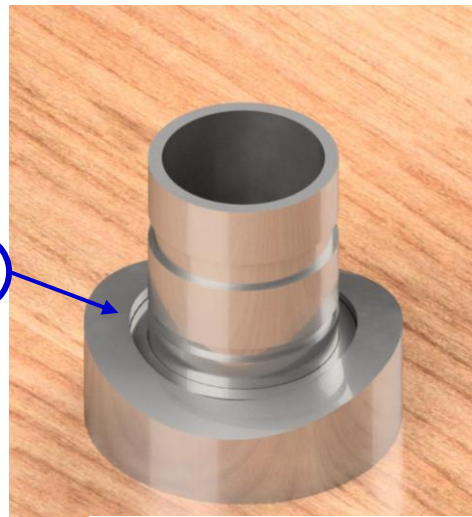


Picture 4.9.13.2

4.9.14. Finally, place the side port + the adapter for the manual pusher (B) that we prepare on the last step, inside the guiding tool (G). From now on, we will refer to this set of parts as the port mounting package.

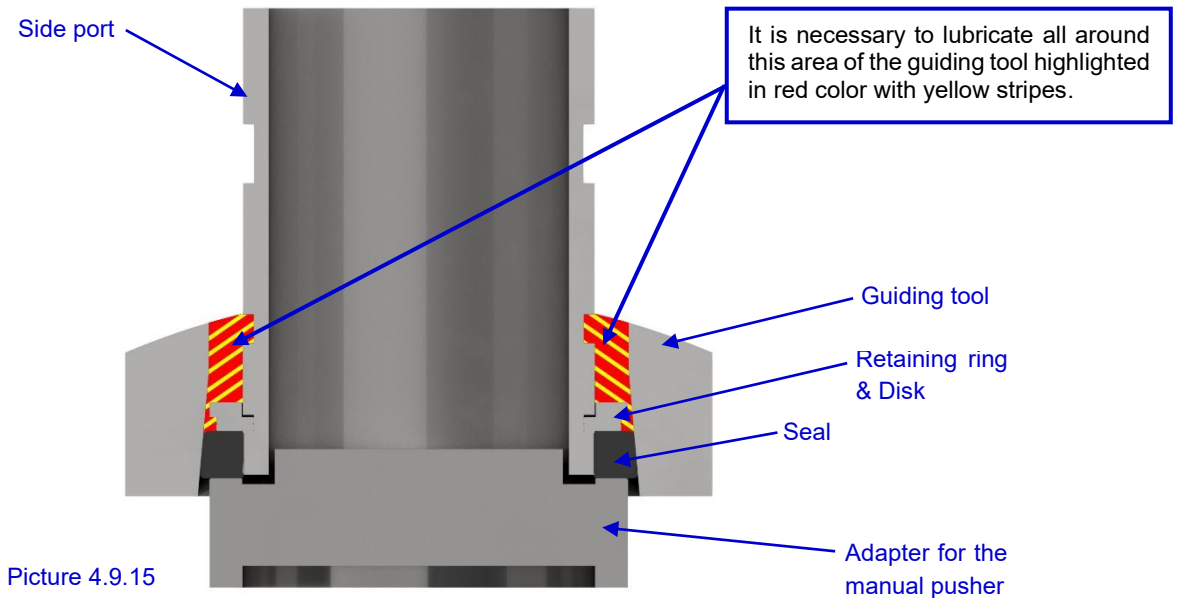


Picture 4.9.14.1

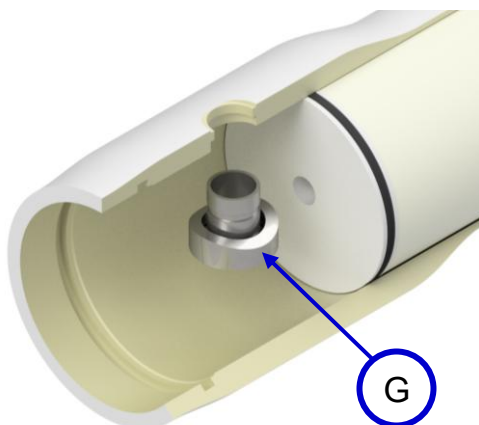


Picture 4.9.14.2 From now on,
we will refer to this set of parts
as the port mounting package.

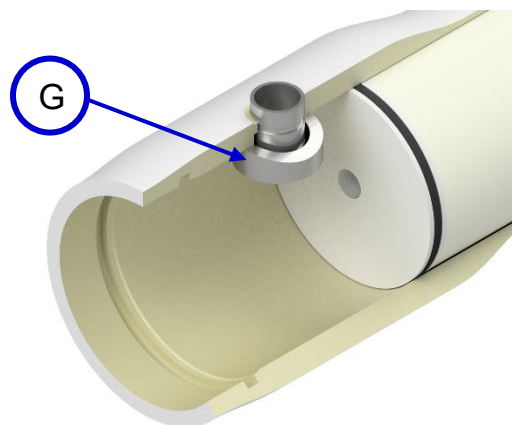
4.9.15. To smooth the sliding of the seal along the guiding tool until it reaches its final position in the pressure vessel side port hole, it is necessary to lubricate this area of the guiding tool using soap or glycerin.



4.9.16. Once the work area on the pressure vessel head is clean and dry, the next step is to place the port mounting package inside the vessel. It should be held with the hand by the bottom to prevent the guiding tool from separating. It is very important to properly align the guiding tool (G) inside the pressure vessel. Note that the shape of this tool is designed so that its surface rests completely on the inner contour of the pressure vessel.



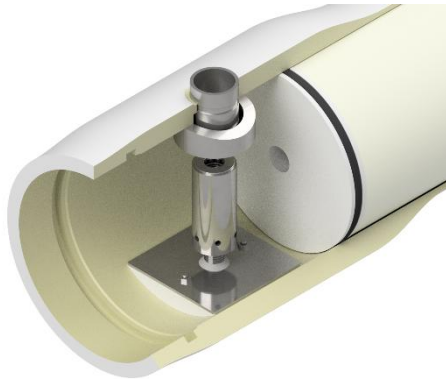
Picture 4.9.16.1. Hold the mounting package with the hand by the bottom to prevent the guiding tool from separating.



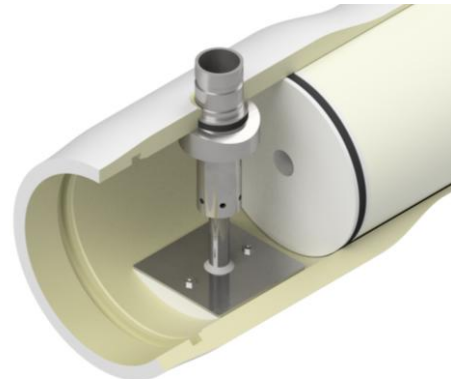
Picture 4.9.16.2 It is very important to properly align the guiding tool inside the pressure vessel.

4.9.17. Then place the manual pusher inside the vessel, just below the side mounting package. Start to raise the pressure little by little, allowing the head of the manual pusher to sit in its position.

4.9.18. If the pusher is not in its place (totally aligned) the pressure must to be released. When the manual pusher is in its place, the pressure must to be raised until the retaining ring of the side port can be installed easily. (**You must to use always the minimum pressure that allow you to install the retaining ring**).

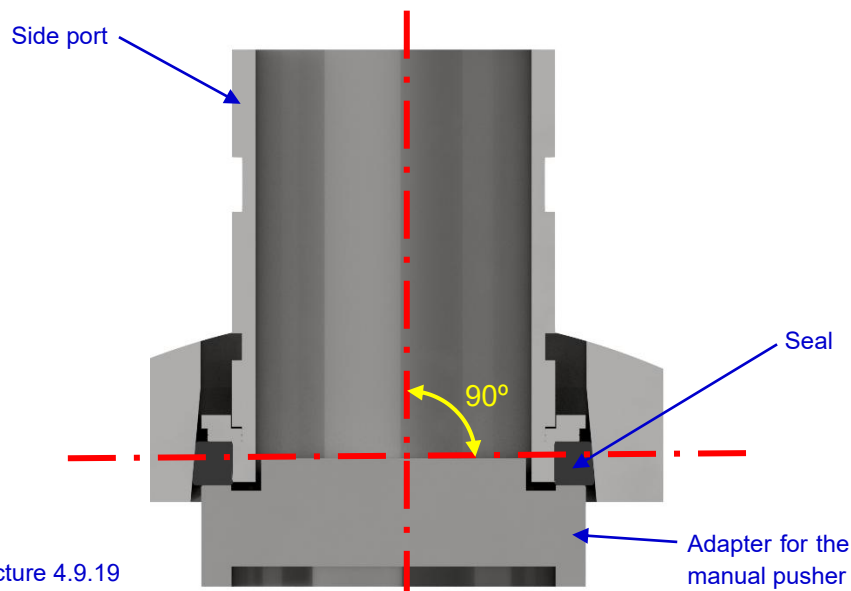


Picture 4.9.18.1



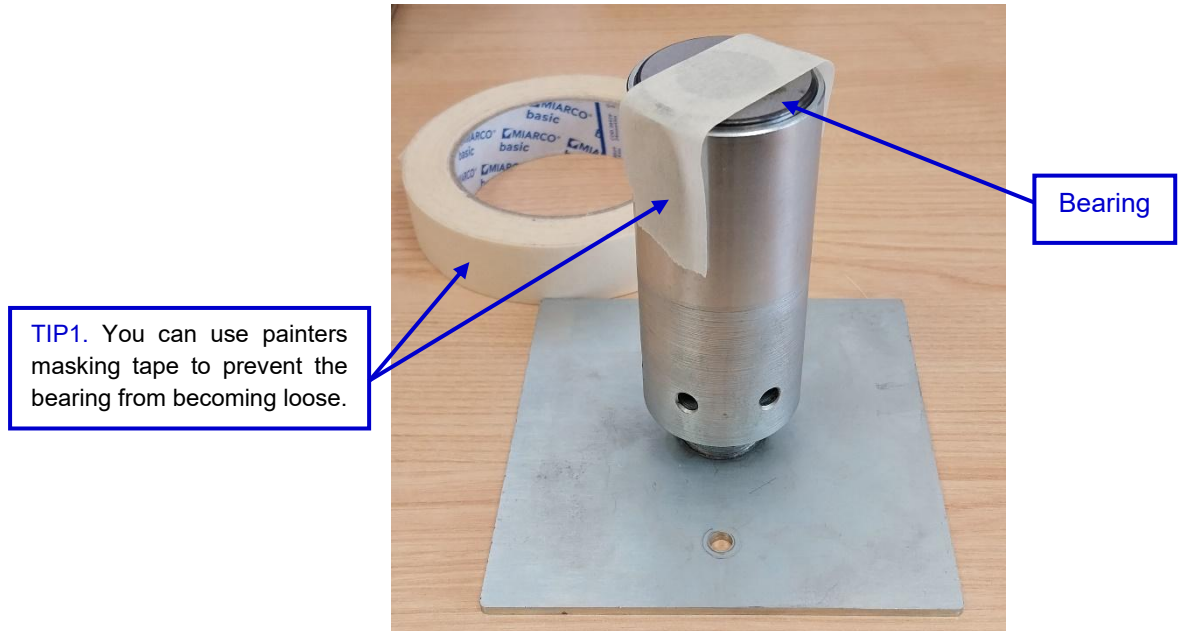
Picture 4.9.18.2 You must use always the minimum pressure that allow you to install the retaining ring.

4.9.19. It is very important that the port be aligned with the guiding tool to assure the proper insertion of the seal in the port hole.



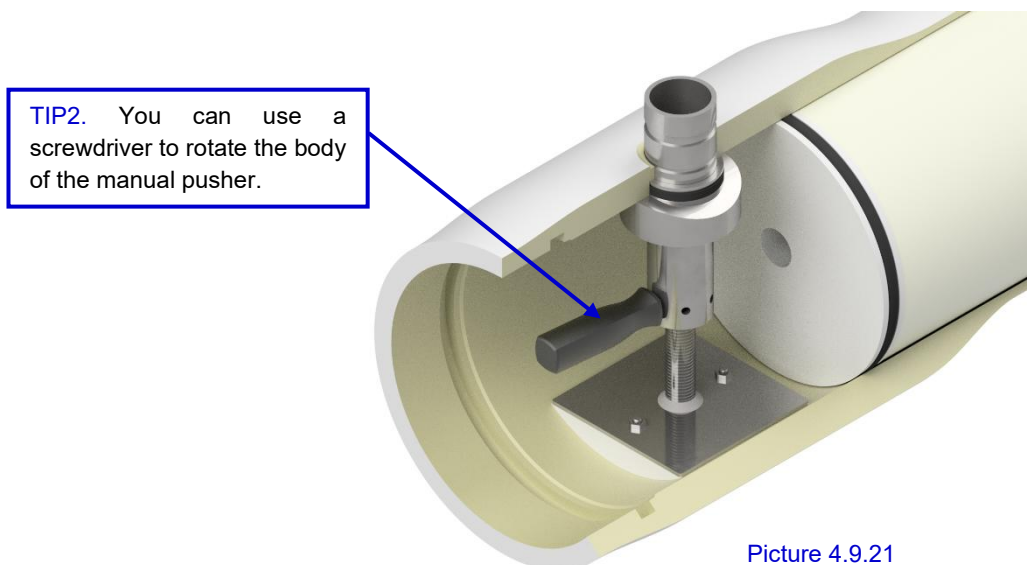
Picture 4.9.19

4.9.20. You can use painters masking tape (or similar) to prevent the bearing at the top of the manual pusher from becoming loose during the process of fitting it into place. It is not recommended to use electrical tape or similar because it is too strong.



Picture 4.9.20

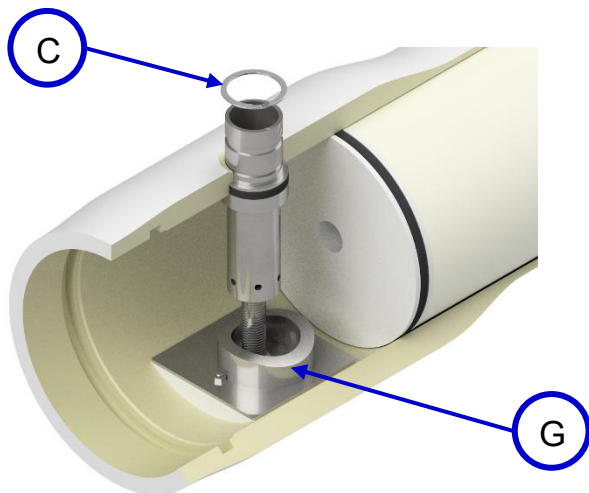
4.9.21. You can use a screwdriver to rotate the body of the manual pusher.



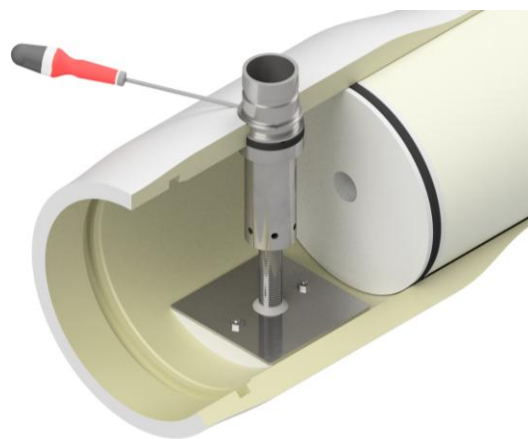
Picture 4.9.21

4.9.22. Once the mounting package has entered into the port hole far enough, the guiding tool (G) will come off. We'll leave it at the bottom as it won't be needed for the rest of the procedure.

When the groove for the retaining ring is completely visible from the outside of the pressure vessel and therefore the retaining ring of the side port can be installed easily stop raising the pressure. Install the Retaining ring (C) using a flat screw driver.



Picture 4.9.22.1



Picture 4.9.22.2

4.9.23. Release the pressure of the manual pusher. Remove the manual pusher from below the side port. At this point the side port is assembled.



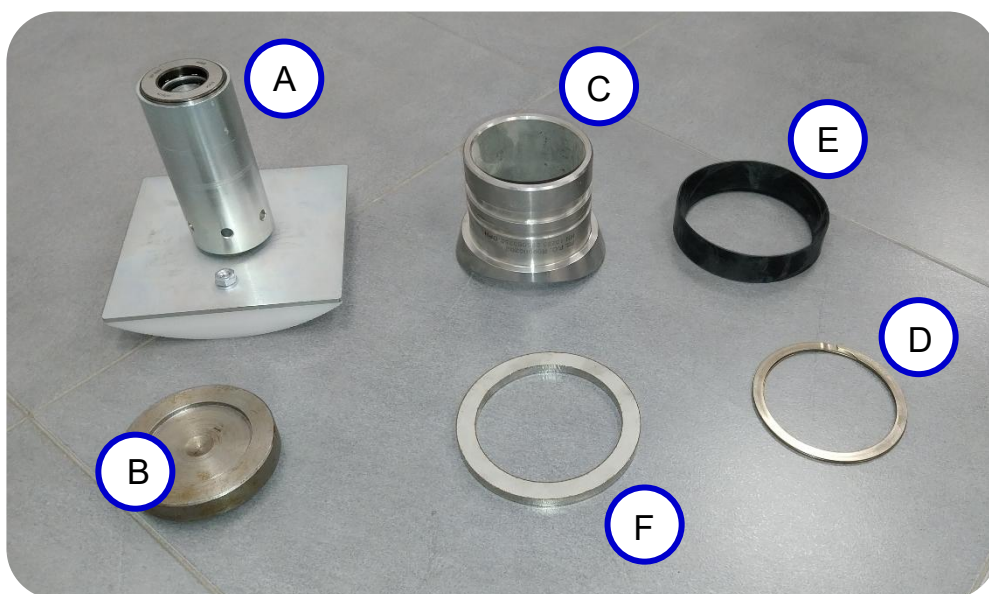
Picture 4.9.23

4.10. Side ports extraction / installation. (Old Side Ports).

4.10.1. Proper installation of side ports determines the quality of the final product while prevent potential leakages. Wrong installation may damage the vessel. Using too much force during installation can cause cracks in the vessel.

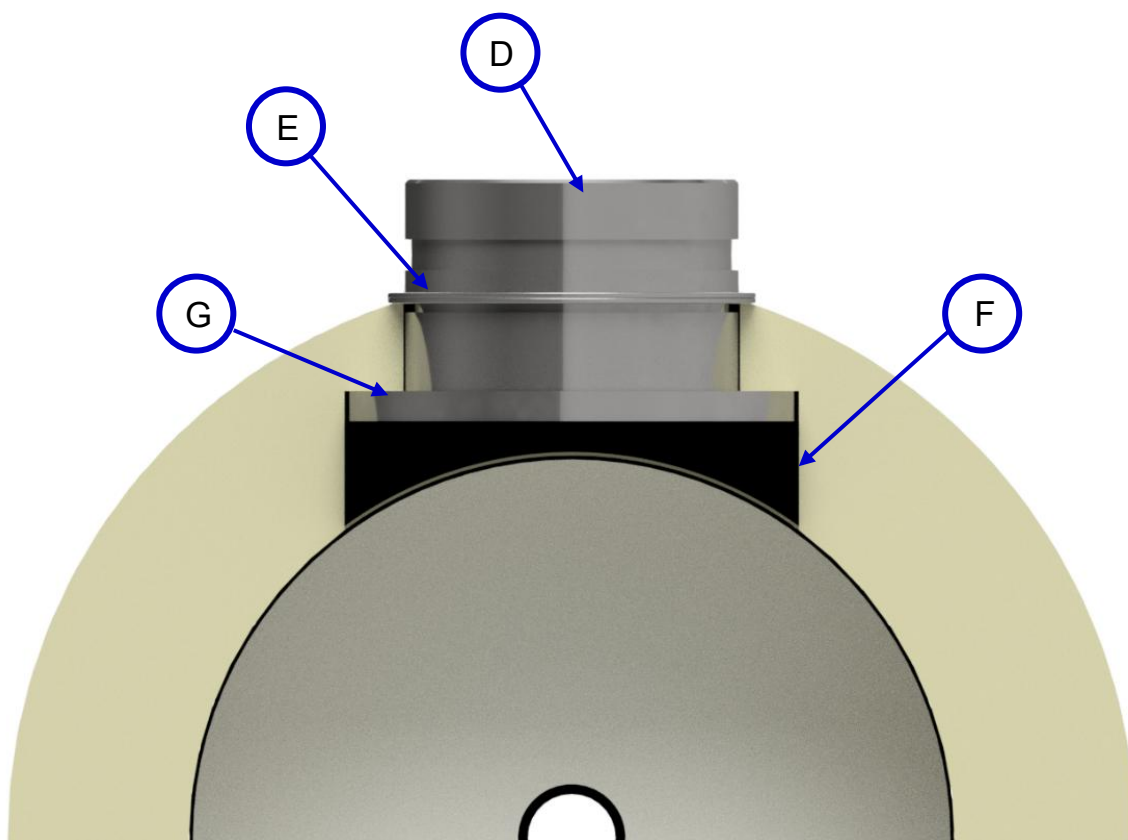
4.10.2. Tools.

- Manual pusher (part number 069-800-9000) (A)
- Adapters for manual pusher (B).
- Glycerin or soap for lubricating.
- Bi-component clear lacquer for seal surfaces.
- Flat screw driver.
- Sandpaper.
- Rubber Hammer.
- Cutter blade.
- Side port KIT for installation: Side port (C), Retaining ring (D), Seal for side port (E), Disk for side port (F).



Picture 4.11.2

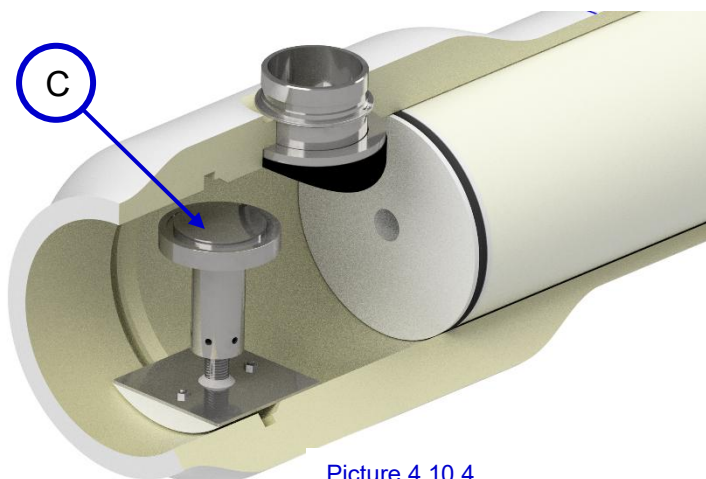
4.10.3. The following image shows the different parts that make up a side port assembly kit.



SIDE PORT ASSEMBLY KIT:

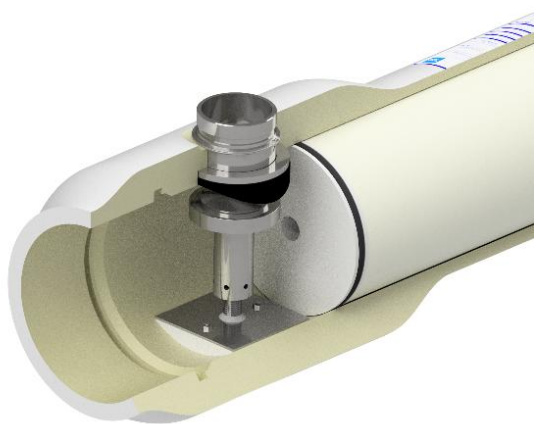
Side port (D)
 Retaining ring (E)
 Seal for side port (F)
 Disk for side port (G). *Note: some models don't use it.*

4.10.4. Take the adaptor (C) for the manual pusher with the diameter in accordance with the model of the side port and fit it to the manual pusher.

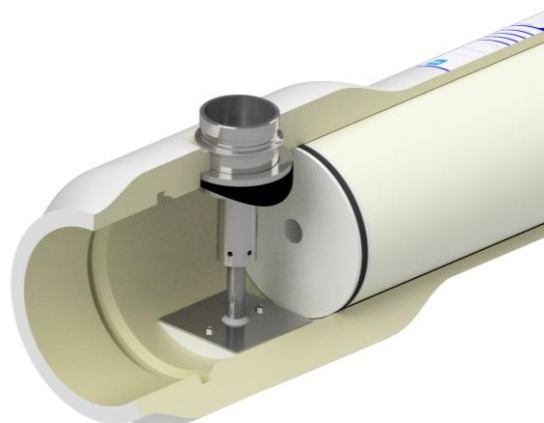


Picture 4.10.4

4.10.5. Place the manual pusher inside the vessel, just below the side port. Be sure that the manual pusher is aligned with the axis of the side port.



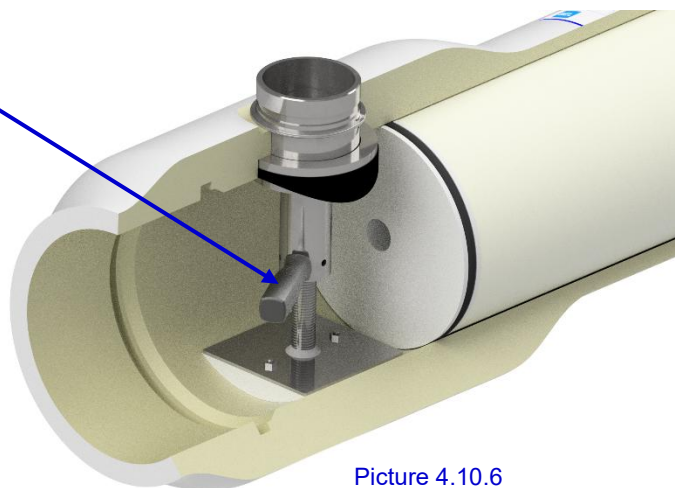
Picture 4.10.5.1



Picture 4.10.5.2 Be sure that the manual pusher is aligned with the axis of the side port

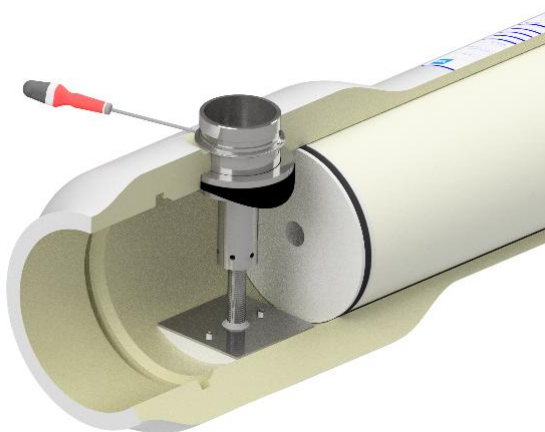
4.10.6. Start to raise the manual pusher increasing the pressure over the side port little by little, allowing the head of the manual pusher to sit in its position. If the manual pusher is not in its place (totally aligned) the pressure must be released. Once the pusher is in its place, the pressure must be raised until the retaining ring of the side port can be removed easily. (**You must to use always the minimum pressure that allow you to remove the retaining ring**).

TIP. You can use a screwdriver to rotate the body of the manual pusher.

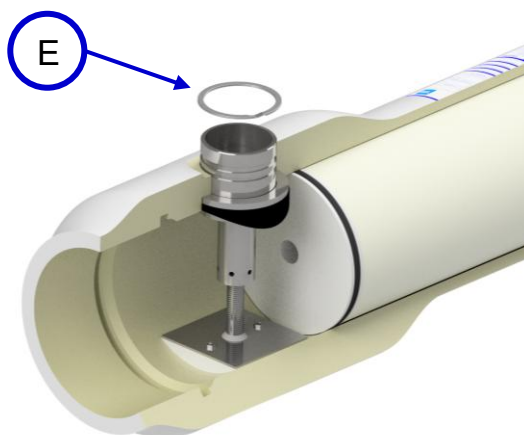


Picture 4.10.6

4.10.7. Remove the Retaining ring (E) using a flat screw driver.

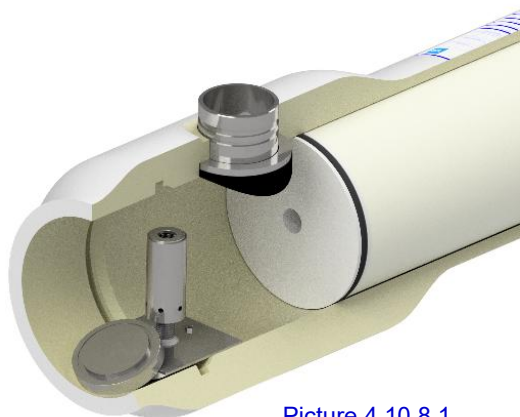


Picture 4.10.7.1

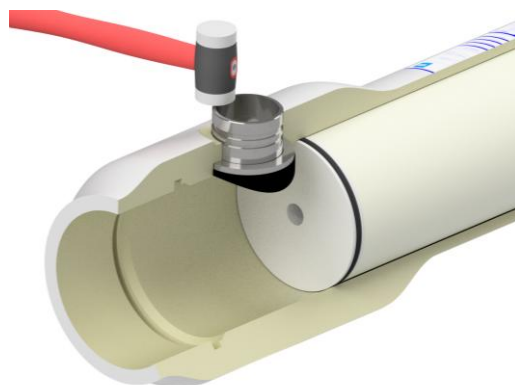


Picture 4.10.7.2

4.10.8. Release the pressure of the manual pusher. Remove the manual pusher from below the side port. Remove the side port assembly. If is necessary a Teflon hammer can be used.

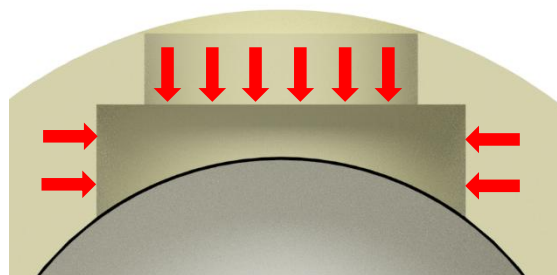


Picture 4.10.8.1



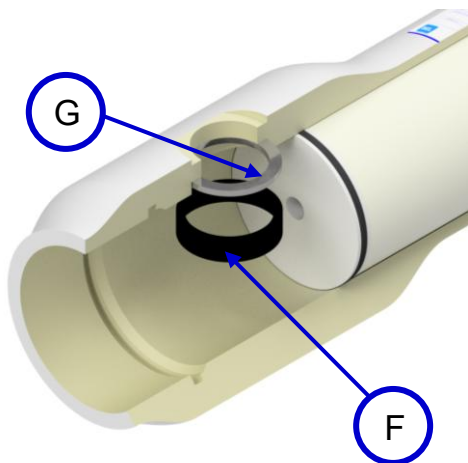
Picture 4.10.8.2 If is necessary a Teflon hammer can be used.

4.10.9. Prepare the area where the seal will be placed. Clean the area using a dry cloth. This way any track of dirt will be removed.



Detail A. Area that needs to be prepared.

4.10.10. Place the disk (G) if necessary, (some models of pressure vessels don't use disk). Apply a thin layer of glycerin on the seal for lubricating. Place Seal (F) in the inner side of the vessel.

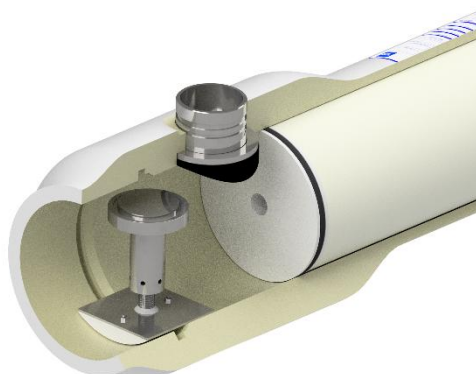


Picture 4.10.10.1

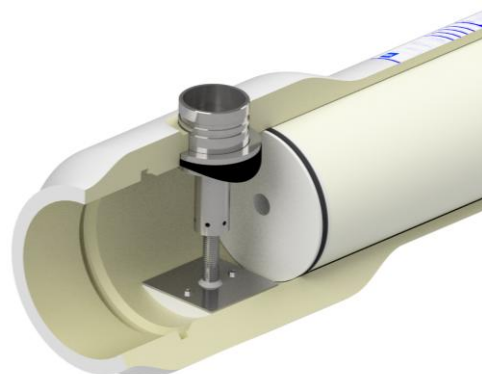


Picture 4.10.10.2

4.10.11. Place the side port inside the hole and rotate it according to vessel inner surface. Place the manual pusher inside the vessel just below the side port. Start to raise the pressure little by little, allowing the head of the manual pusher to sit in its position. If the pusher is not in its place (totally aligned) the pressure must to be released. When the manual pusher is in its place, the pressure must to be raised until the retaining ring of the side port can be installed easily. (You must to use always the minimum pressure that allow you to install the retaining ring).

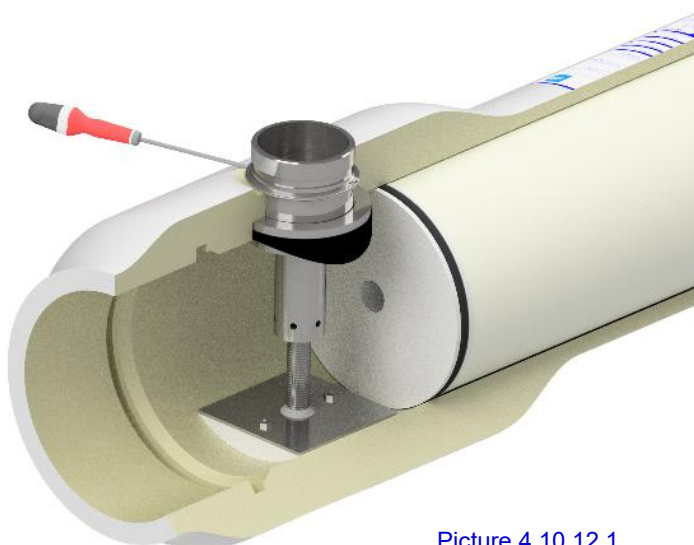


Picture 4.10.11.1 Place the side port and rotate it according to vessel inner surface.



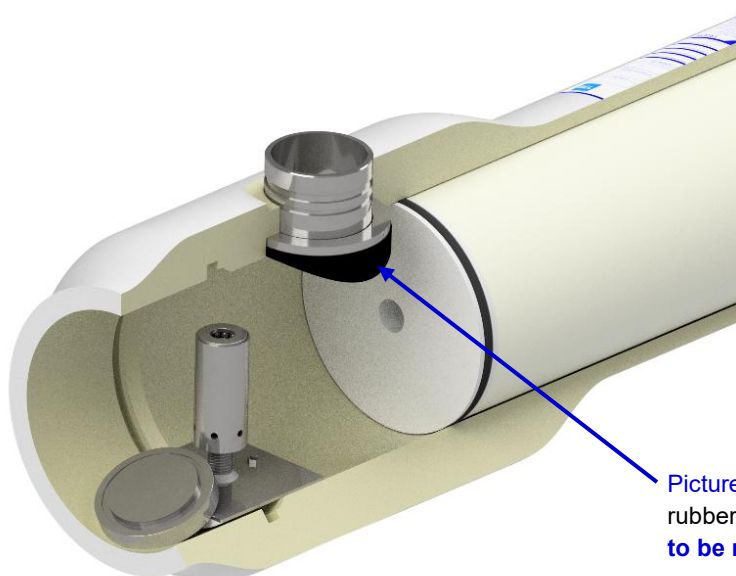
Picture 4.10.11.2 You must to use always the minimum pressure that allow you to install the retaining ring.

4.10.12. Install the Retaining ring (E) using a flat screw driver.



Picture 4.10.12.1

4.10.13. Release the pressure of the manual pusher. Remove the manual pusher from below the side port. At this point the side port is assembled, pending removal of excess rubber from the seal as described below in this document.



Picture 4.10.13. The excess of rubber from the seal **still needs to be removed.**

4.10.14. The purpose of this section is to describe the procedure for removing excess rubber remaining after installing the side port kits inside the pressure vessel.

This procedure must be carried out inside the pressure vessel with the seal and side port fully installed.

NEVER REMOVE THE EXCESS OF RUBBER FROM THE SEAL BEFORE FULLY INSTALL THE SIDEPORT INSIDE THE VESSEL.



Picture 4.10.14.1. Side port Assembly before remove the excess of rubber.



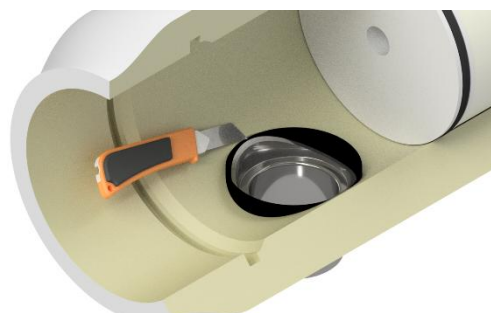
Picture 4.10.14.2. Side port Assembly after remove the excess of rubber.

4.10.15. Before start the cut, soaking the blade with some glycerin or soap can help to get an easier and cleaner cut.

4.10.16. To start the cut, use the point on the side of the side port where the height of the excess of rubber is lower. Place the cutter-blade parallel to the inside of the pressure vessel. Do not touch with the blade the inside surface of the pressure vessel; if necessary, use the metal port as a support for the blade (**NEVER THE INNER SURFACE OF THE PRESSURE VESSEL**).

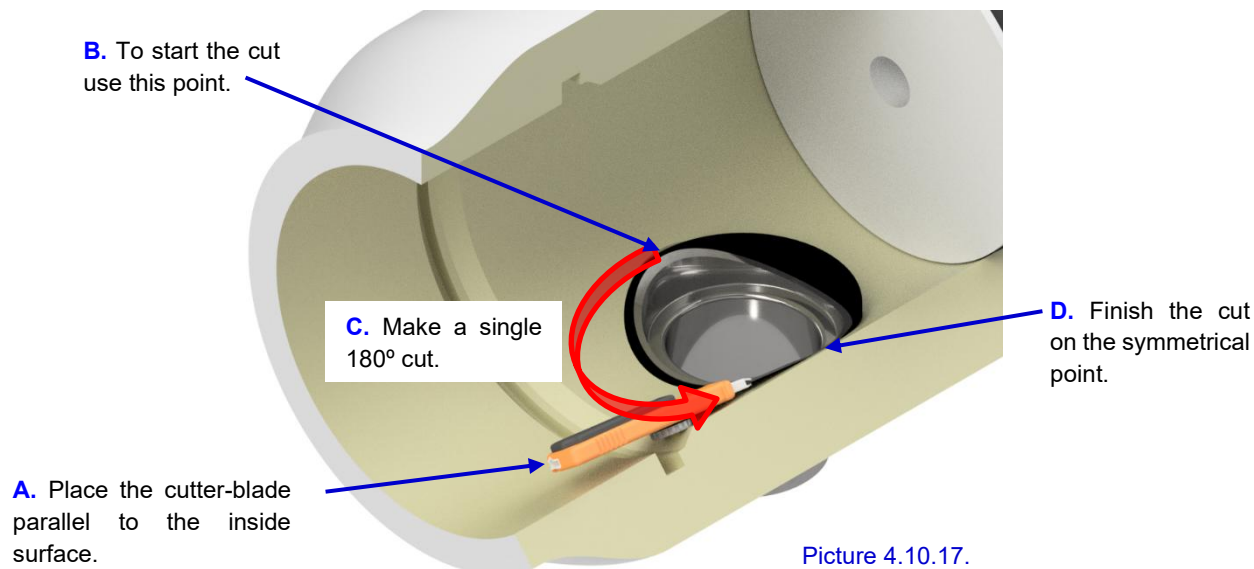


Picture 4.10.16.1. To start the cut, use this point or its symmetrical.

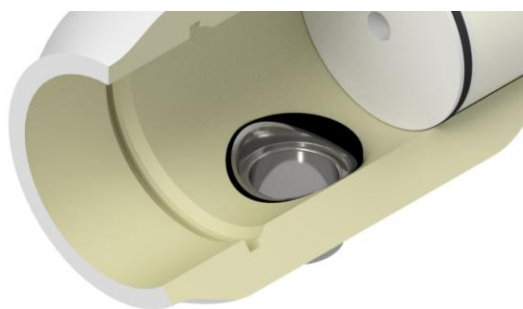


Picture 4.10.16.2. Place the cutter-blade parallel to the inside surface of the pressure vessel. If necessary, use the metal port (**NEVER THE VESSEL**) as a support for the blade.

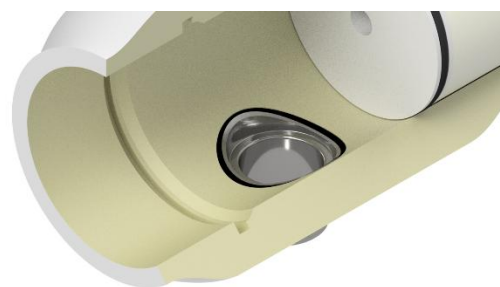
4.10.17. Perform a single 180° cut until you reach the symmetrical point with respect to where you started. Avoid removing the excess of rubber by making small cuts as if the blade were a saw to get a nice surface finish.



4.10.18. Once the first cut is done, you will have removed the half of the excess rubber closest to the edge of the pressure tube. Repeat the same steps to remove the remaining half of the excess rubber.



Picture 4.10.18.1 After the first cut you will have removed the half of the excess rubber.



Picture 4.10.18.2 Repeat the same steps to remove the remaining excess of rubber.

4.11. Seal of side port replacement without removing the side port. (Only for new models of Side Ports)

4.11.1. This procedure is designed to replace a side port seal without disassembly the side port from the vessel's body. *This procedure is only suitable for new Side Port models.*

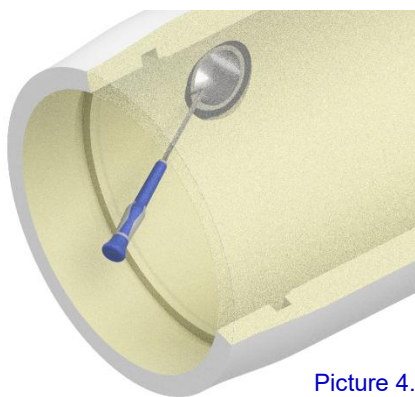
4.11.2. Tools:



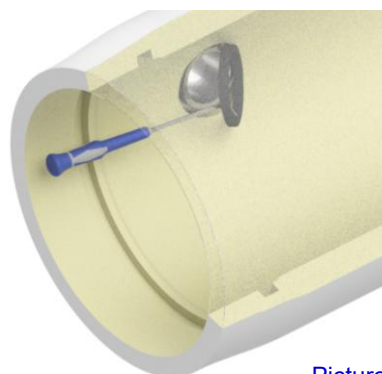
Picture 4.13.2

- Manual pusher (part number 069-800-9000) (A)
- Adapter for manual pusher (B).
- Guiding tools (C).
- Lockpick (D).
- Seal for side port (E).

4.11.3. Remove the old side port seal with the Lockpick.



Picture 4.11.3.1

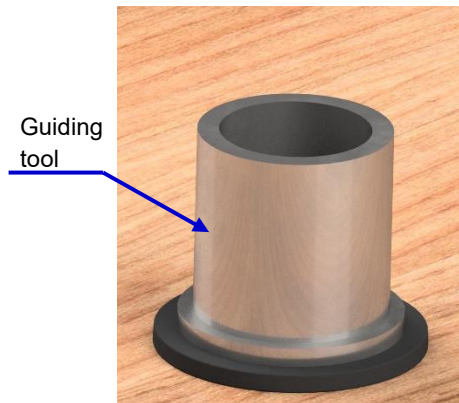


Picture 4.11.3.2

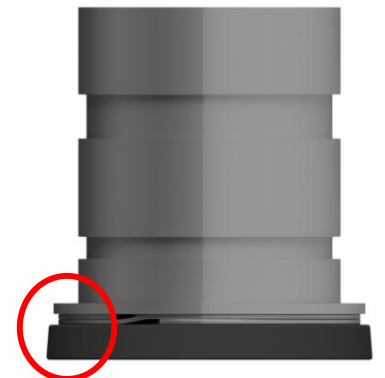
4.11.4. Assemble the new seal in the guiding tool. Note that the seal is trapezoidal in shape. **The larger diameter should be on the bottom.**



Picture 4.11.4.1



Picture 4.11.4.2



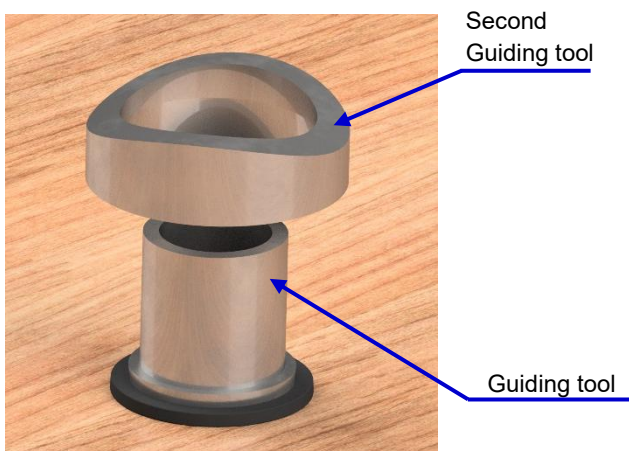
Picture 4.11.4.3 The seal is trapezoidal. **Place larger diameter at the bottom.**

4.11.5. Apply a thin layer of soap all around the O-ring.

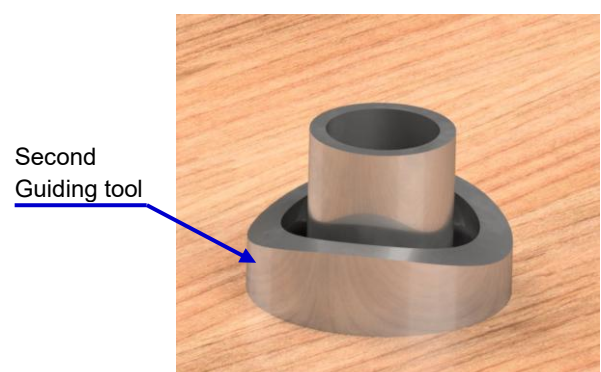


Picture 4.11.5

4.11.6. Finally, place the seal + guiding tool that we prepare on the last step, inside the second guiding tool. From now on, we will refer to this set of parts as the port mounting package.

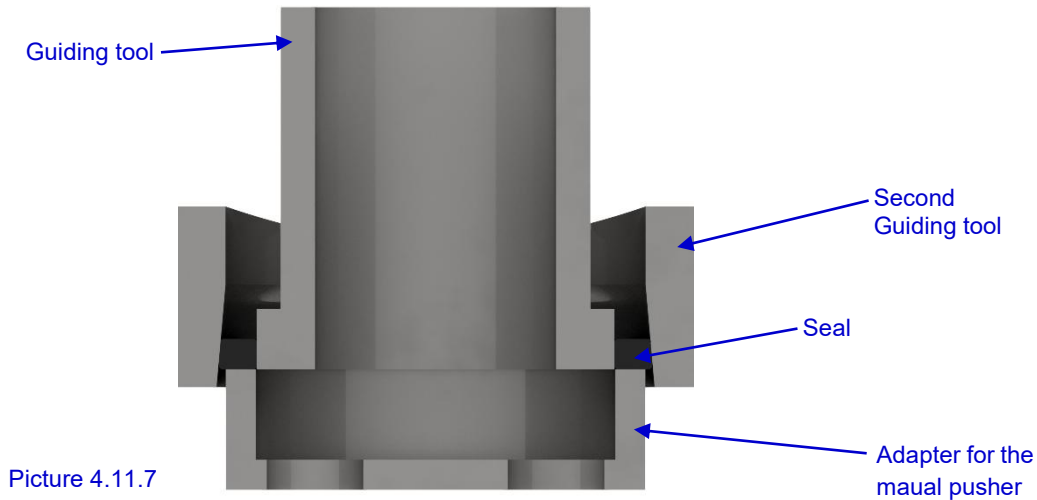


Picture 4.11.6.1

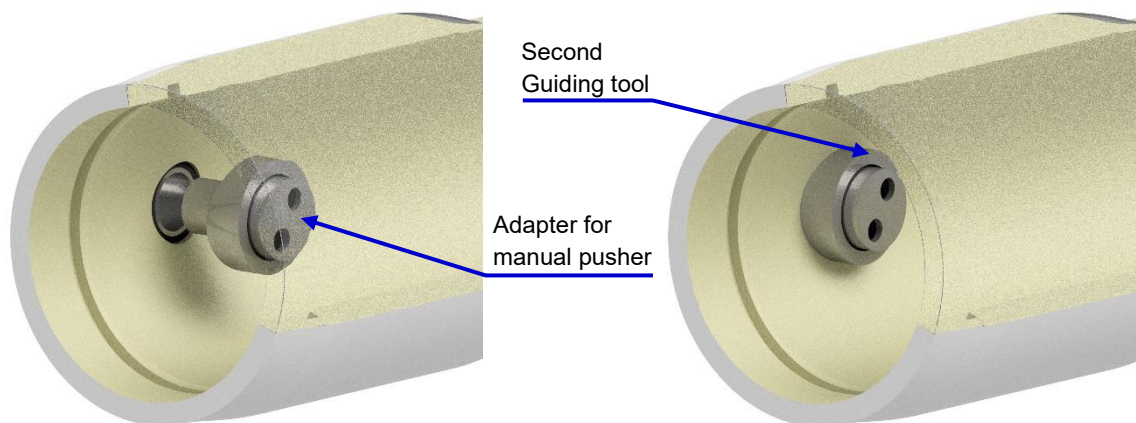


Picture 4.11.6.2 From now on, we will refer to this set of parts as the port mounting package.

4.11.7. To smooth the sliding of the seal along the guiding tool until it reaches its final position in the pressure vessel side port hole, it is necessary to lubricate this area of the guiding tool using soap or glycerin.



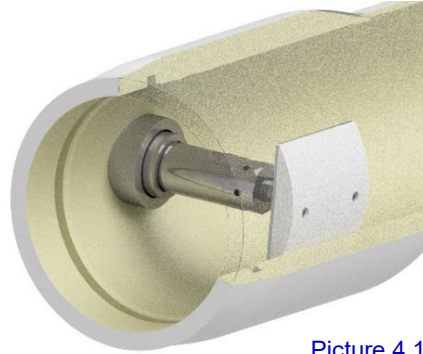
4.11.8. Once the work area on the pressure vessel side port area is clean and dry, the next step is to place the port mounting package inside the side port. It is very important to properly align the guiding tool inside the side port. Note that the shape of the second guiding tool is designed so that its surface rests completely on the inner contour of the side port.



Picture 4.11.8.1. Hold the mounting package with the hand to prevent the guiding tool from separating.

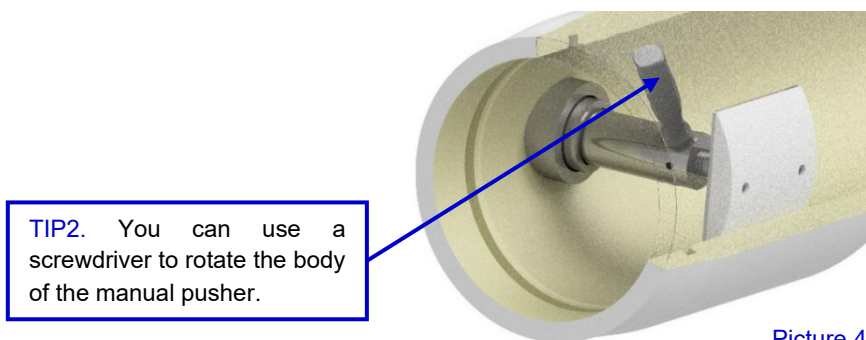
Picture 4.11.8.2 It is very important to properly align the tools inside the pressure vessel.

4.11.9. Then place the manual pusher inside the vessel aligned with the mounting package. Start to raise the pressure little by little, allowing the head of the manual pusher to sit in its position.



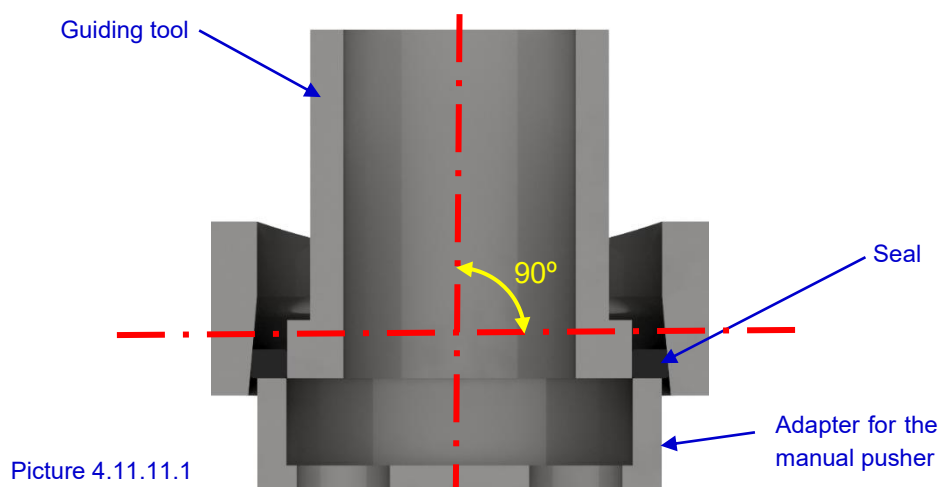
Picture 4.11.9

4.11.10. You can use a screwdriver to rotate the body of the manual pusher.



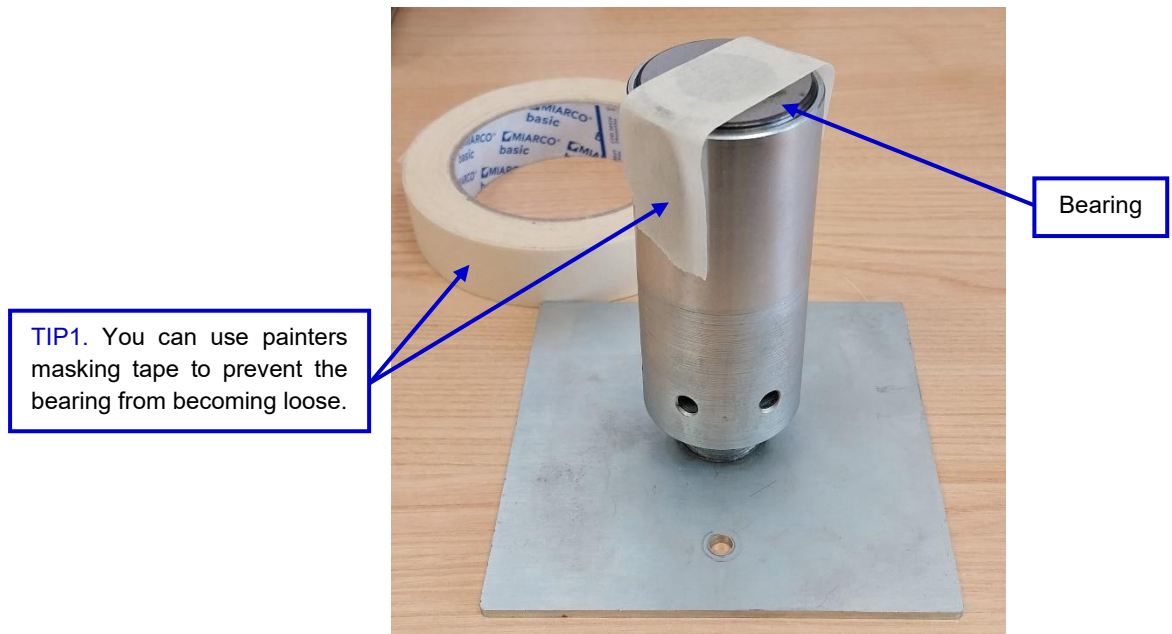
Picture 4.11.10

4.11.11. It is very important that the port be aligned with the guiding tool to assure the proper insertion of the seal in the port hole. If the pusher is not in its place (totally aligned) the pressure must to be released.



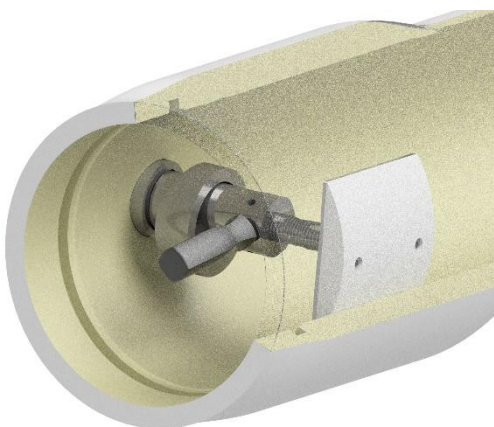
Picture 4.11.11.1

4.11.12. You can use painters masking tape (or similar) to prevent the bearing at the top of the manual pusher from becoming loose during the process of fitting it into place. It is not recommended to use electrical tape or similar because it is too strong.



Picture 4.11.12

4.11.13. When the manual pusher is in its place and aligned, the pressure must to be raised little by little until the seal is assembled.



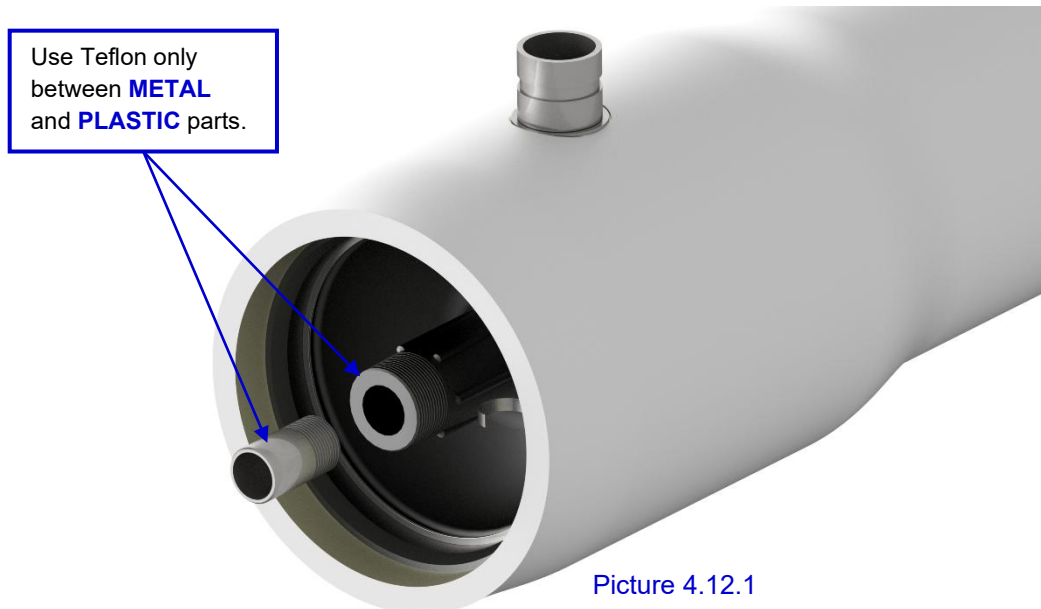
Picture 4.11.13.1. The pressure must to be raised little by little until the seal is assembled.



Picture 4.11.13.2

4.12. Application of Teflon. Sealing of threaded connections.

Use this procedure **ONLY IN TREADS BETWEEN METAL AND PLASTIC PARTS.**



Picture 4.12.1

Teflon is a synthetic material used to seal threaded joints in pipes, valves, and other hydraulic components. Teflon prevents water leaks that may occur due to lose or worn threads.

The Teflon for sealing threaded elements can be found in liquid or in tape form.

4.12.1. Using Liquid Teflon (Preferable).

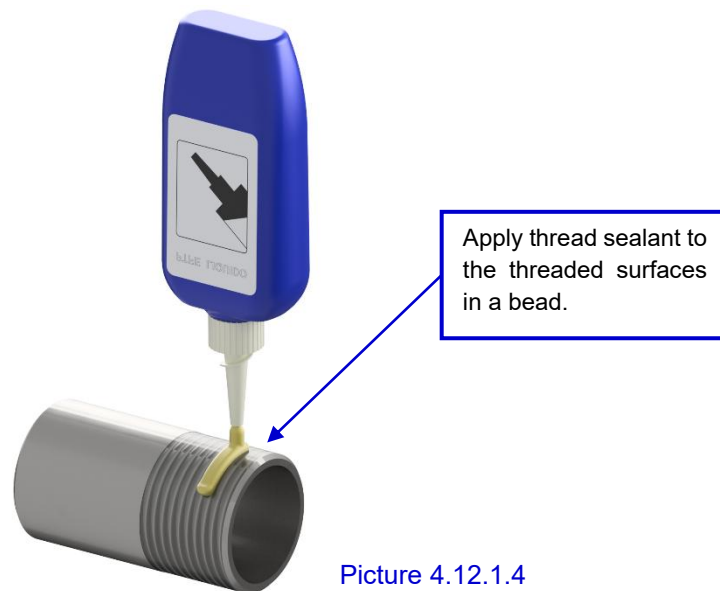
4.12.1.1. Liquid Teflon directly replaces traditional Teflon tape. It allows easy disassembly of threaded connections and performs its function more efficiently. In addition to protecting pipes from leaks caused by vibrations, friction, temperature, and high pressure, it creates a lubricating layer that prevents rust and wear on metal surfaces.

4.12.1.2. Materials:

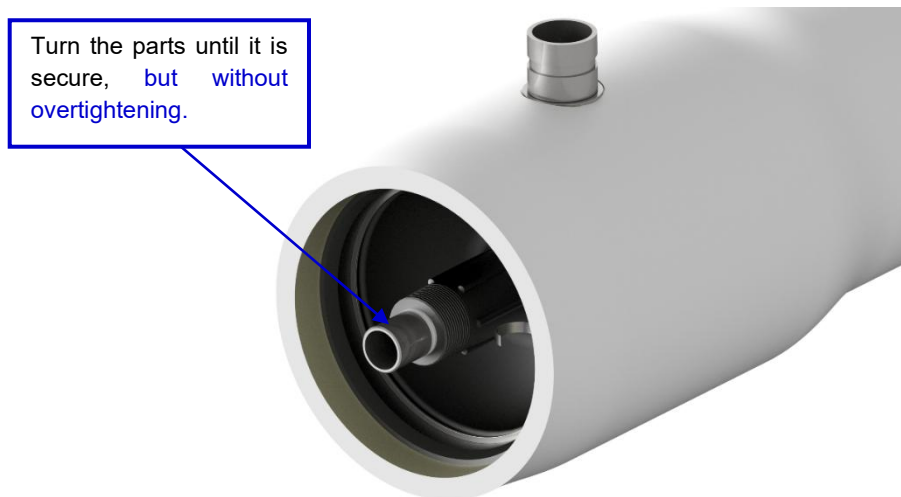
- Liquid teflon, which you can find at any hardware or DIY store.
- A wrench or adjustable wrench to tighten the threaded joint.
- Rags.

4.12.1.3. Thoroughly clean and dry the parts to be sealed, removing all dust, grease, or oil.

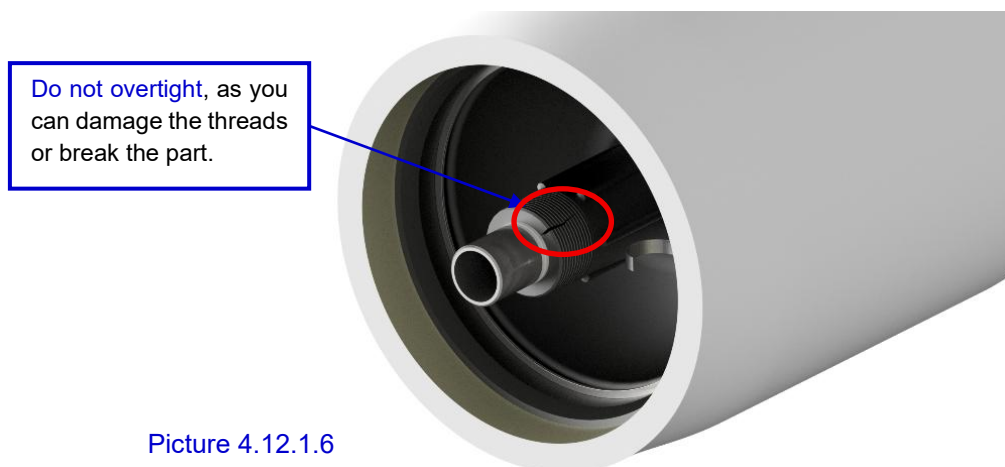
4.12.1.4. Apply thread sealant to the threaded surfaces in a bead.



4.12.1.5. Screw both parts matching the grooves. Turn the parts until it is secure, but without overtightening.



4.12.1.6. Tighten the parts with a wrench or adjustable wrench, giving it a quarter turn after it is hand-tight. **DO NOT OVERTIGHTEN, AS YOU CAN DAMAGE THE THREADS OR BREAK THE PART.**



Picture 4.12.1.6

4.12.1.7. For maximum resistance to pressure and solvents, allow at least 24 hours for the product to fully cure before applying pressure.

4.12.1.8. General Recommendations:

- Avoid any contamination of the product.
- Store the liquid Teflon in a cool, dry place at a temperature between 8°C and 28°C.
- Once the product is opened and in use, do not allow metal particles to enter the container (this causes polymerization/solidification of the product).
- Keep the product away from exposure to radiation produced by electric welding. Do not repackage the product once it has been removed from its original packaging.
- [Always consult the product data sheet before use.](#)

4.12.2. Using Teflon tape.

Teflon Tape is a common, inexpensive and effective thin white tape used to seal pipe threads being joined together for plumbing jobs. It is silky in texture and breaks in a stringy manner.

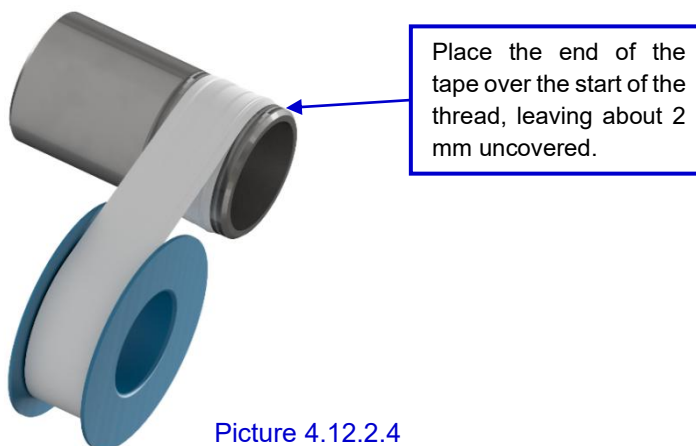
4.12.2.1. Materials:

- Teflon tape, which you can find at any hardware or DIY store.
- Scissors or a utility knife to cut the tape.
- A wrench or adjustable wrench to tighten the threaded joint.
- Rags.

4.12.2.2. Clean the thread you are going to seal with a rag or paper towel to remove any dust or dirt.

4.12.2.3. Cut a piece of Teflon tape long enough to wrap around the thread several times. The length will depend on the thread diameter, but as a guide, you can use about 30 cm for a half-inch thread.

4.12.2.4. Place the end of the tape over the start of the thread, leaving about 2 mm uncovered. This will prevent the Teflon from entering the pipe and obstructing fluid flow.

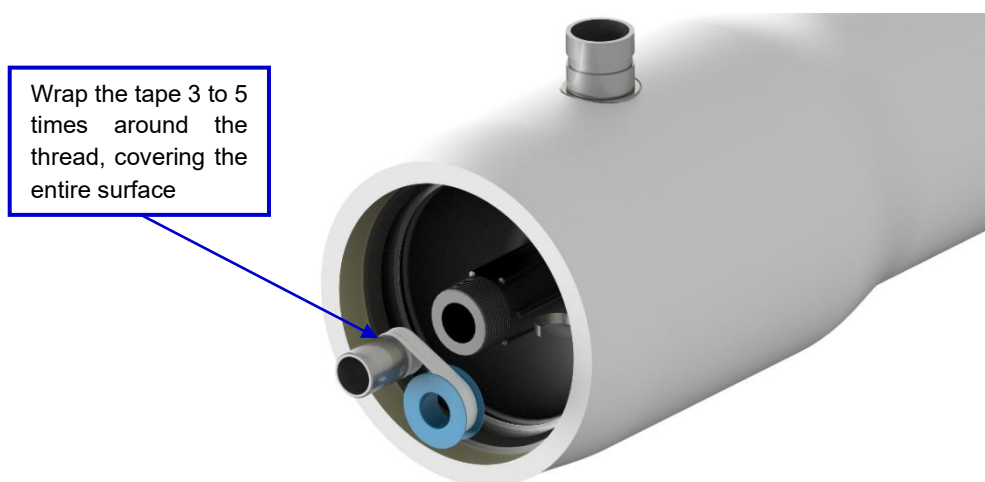


Picture 4.12.2.4

4.12.2.5. Wrap the tape around the thread in the opposite direction to which the part will be screwed on. That is, if the part is screwed on clockwise, you should wrap the tape counterclockwise. This way, the Teflon will fit better on the thread and won't come off when tightening the joint.

4.12.2.6. Keep the tape taut during application to avoid gaps between layers.

4.12.2.7. Wrap the tape 3 to 5 times around the thread, covering the entire surface. You don't need to apply much pressure when winding the tape, just enough to adhere it to the thread.



Picture 4.12.2.7

4.12.2.8. Cut off the excess tape with scissors or a utility knife and press the end with your finger to secure it to the thread.

4.12.2.9. Before screwing the parts together, perform a visual check to ensure the tape is evenly distributed and there are no irregularities.

4.12.2.10. Screw both parts matching the grooves. Turn the parts until it is secure, but without overtightening.

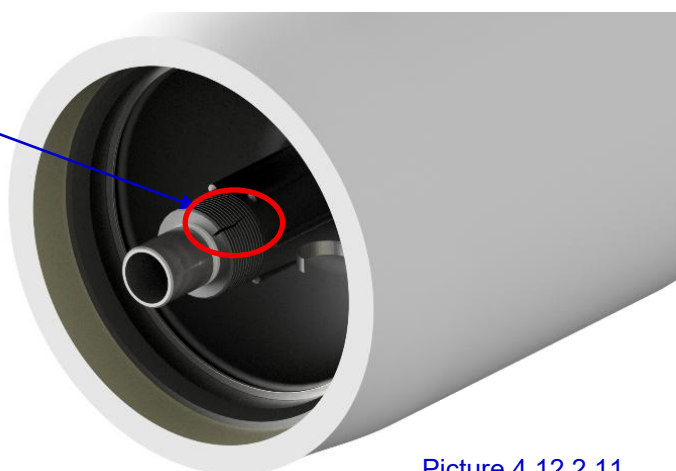
Turn the parts until it is secure, but without overtightening.



Picture 4.12.2.10

4.12.2.11. Tighten the joint with a wrench or adjustable wrench, giving it a quarter turn after it is hand-tight. **DO NOT OVERTIGHTEN, AS YOU CAN DAMAGE THE THREADS OR BREAK THE PART.**

Do not overtight, as you can damage the threads or break the part.



Picture 4.12.2.11

4.12.2.12. **DO NOT REUSE USED TEFLON TAPE, ALWAYS USE NEW TAPE ON EACH INSTALLATION.**

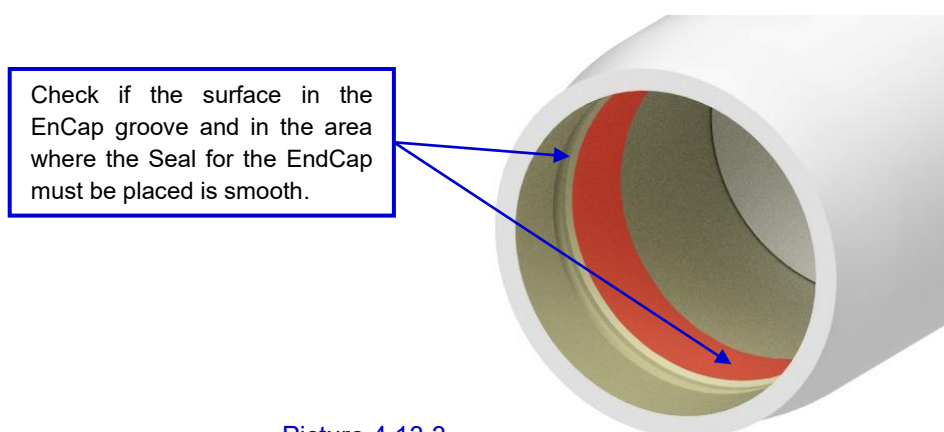
4.13. Repair procedure for leaking EndCaps.

4.13.1. Most of the times the leaks in the EndCaps are related to small imperfections in the surface where the seal is placed inside the vessel.

4.13.2. Tools:

- Replacement Endcap.
- Seal for EndCap with 9.2 mm of section.
- Sandpaper.

4.13.3. Check if the surface in the endcap groove and in the area where the Seal for the EndCap must be placed is smooth all around the vessel.



Picture 4.13.3

4.13.4. Clean the surface carefully using water and sandpaper (Use the sandpaper always wet).

4.13.5. DO NOT sand deep into the vessel, this might cause permanent damage to the vessel.

4.13.6. Make sure that the surface is clean of chips, delaminations, foreign particles etc...

4.13.7. Close the vessel, following the instructions from BEL Technical Manual.

4.14. Probing Procedure.

Probing procedure involves the insertion of a plastic tube into the full length of the permeate tube in order to measure the permeate conductivity at different locations inside the pressure vessel.

If one pressure vessel shows a significantly higher permeate concentration than the other vessels of the same stage, then this vessel should be probed. The problem may be either a poorly performing membrane element, an O-ring leak at an interconnector or end adapter, or possibly even a cracked adapter/interconnector.

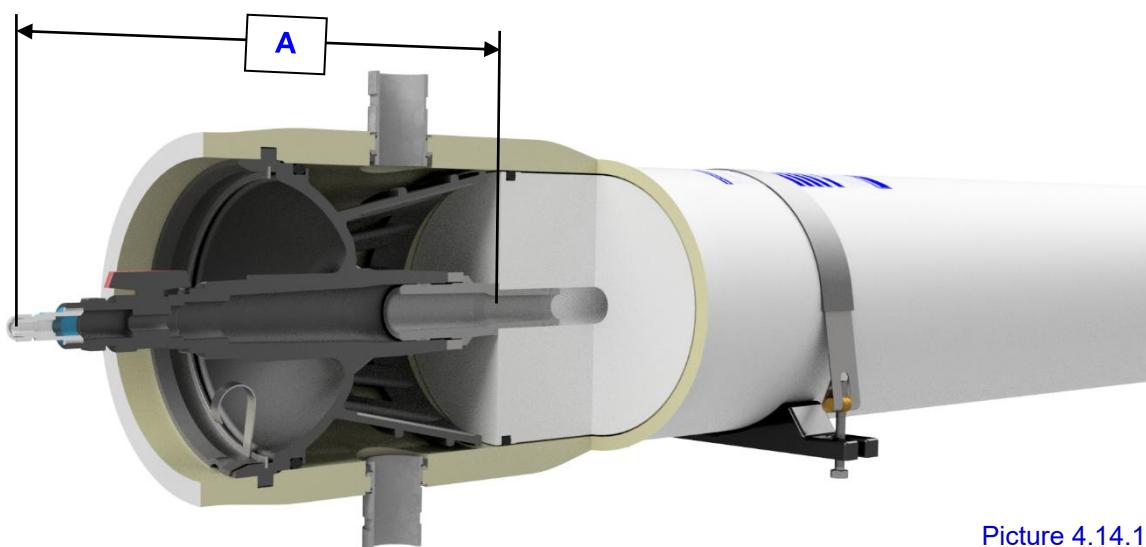
The use of the [BEL probing permeate sampling valve](#) allows to probe a pressure vessel while online without unloading the membrane elements. Also, it eliminates water leakage at the point of entry.

The [BEL probing permeate sampling valve](#) should be used at the opposite end of the pressure vessel from the product header piping, with the permeate manifold remaining in place.

4.14.1. Before start

Obtain a piece of aprox. 6mm (1/4") of outside diameter polyethylene tubing. The tubing should be several centimeters longer than the total length of the vessel.

Calculate aproximately the distance from the end of the ProValve to first membrane element. We will call it (A) distance from now.



Picture 4.14.1



As reference with standard accessories for BEL vessels you can use these values:

Model of pressure vessel	Distance "A" (mm)	
	Sideports Vessels	Endport Vessels
300 psi	322	338
450/600 psi	325	338
1000/1200 psi	328	338
1500 psi	338	338
1800 psi	338	338

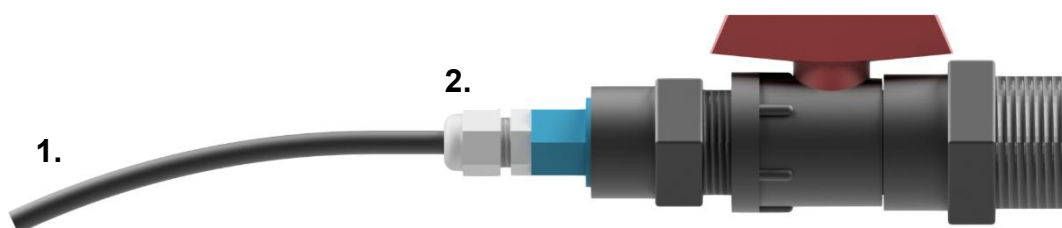
Using a permanent marker, mark in one end of the tubing the (A) distance described. Then, mark the tubing in increments of 508 mm (20") from this point. This way if we introduced the tubing on the ProValve when the piping reach to the 1st mark the end of the tubing (from where the sample will come) will be placed at the beginning of the 1st membrane element. If we push the tubing until the next mark the end of the tubing will be placed at the middle of the 1st membrane element, and so on. (See figure 4 for more details).

The last mark performed on the tubing must coincide with the end of the last membrane. From now we will call this mark the "full length mark."

4.14.2. Starting the sampling procedure.

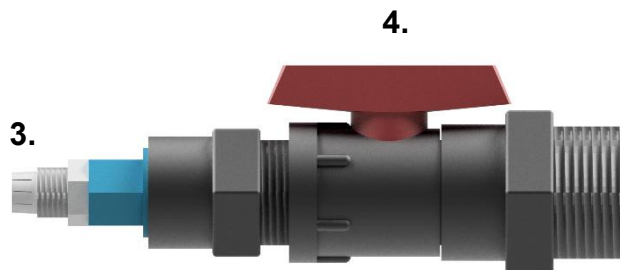
Using the [BEL probing permeate sampling valve](#) measure the conductivity of the water coming out of the vessel. Recheck several times to make sure the value is constant. Record the conductivity and note the location.

With the balve closed, remove the polyethylene pipe hose (1.) and the Quick connector (2.) of the ProValve.



Picture 4.14.2.1

The provalve should look like this:



Picture 4.14.2.2

Be sure that the system has run for at least 15 minutes before start the test.

Insert the tubing with all the marks performed as described above into the quick connector (3. as showed figure 4.14.2.2) while opening up the ball valve (4. as showed figure 4.14.2.2) on the Provalve.

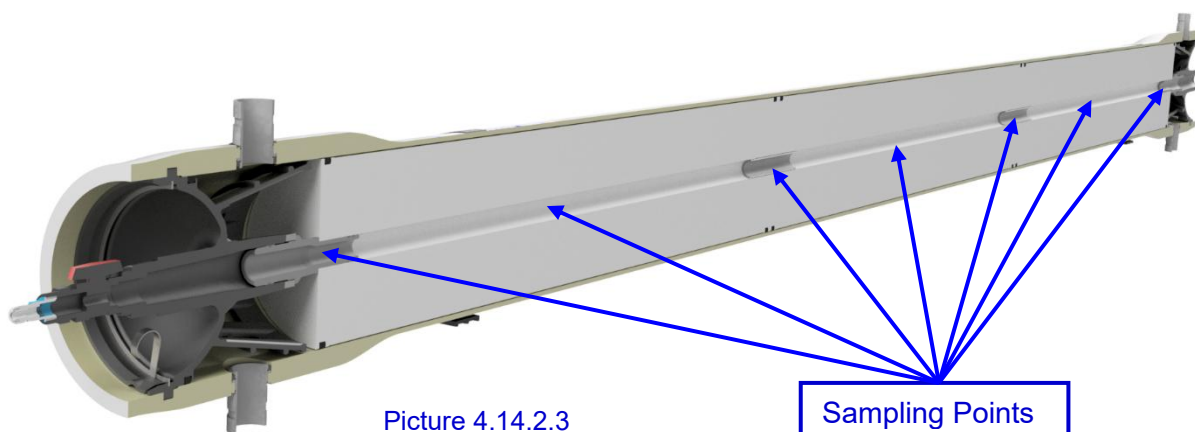
To stop any permeate from flowing around the probing tube fit the quick connector bolt (3. as showed figure 3) in the way that you can be able to push/pull the piping easily but the permeate don't flows out.

Push the tubing in until the "full length" mark is reached.

After 1 minute, measure the conductivity of the water coming out of the tubing. Recheck several times to make sure the value is constant. Record the conductivity and note the location.

Pull the tubing out 508 mm (20") using the marks as a guide, wait 1 more minute, and repeat the measurement procedure. You may slightly close the quick connector (3. as showed figure 4.14.2.2) to hold the tubing in place.

When the end of the tubing comes out of the vessel close the ball valve mount again the originals pipe hose and quick connector of the Provalve as on the figure 4.14.2.1.



Picture 4.14.2.3



Chart the values of the permeate conductivity over the length of the vessel. A steady trend should be observed as a function of position.

4.14.3 Notes:

A normal conductivity profile shows a steady increase of the permeate produced at the feed side of the pressure vessel towards the concentrate end of the vessel. An unusually large deviation from this profile locates the source of the high salt passage problem. O-ring problems are generally indicated by a step change in the conductivity profile at coupler/adaptor locations, while a marked increase outside this region points to a leakage from an element, e.g., due to a backpressure damage. Consult your membrane supplier for more detailed info.

BEL's **ProValve** is designed for all BEL 8".

Catalog number: 004-008-010.



4.15. Vessel's Re-painting procedure.

- 4.15.1. Use acetone in order to clean the vessel surface and reduce the stickiness of the vessel's surface.
- 4.15.2. Polish/remove the vessel's paint layer with sand-paper (grain size 220).
- 4.15.3. Use putty filler to fill and cover the defects on the surface.
- 4.15.4. Let the putty dry for at least 30 min, and grind again the surface until it is totally smooth
- 4.15.5. Clean the vessel with dry rugs.
- 4.15.6. Paint the vessel with the polyurethane high gloss white paint (RAL9010), hardener agent and thinner, better to use air compressed painting system.
- 4.15.7. In case the damage is located in small areas, is suitable the use of high gloss polyurethane spray paint.
- 4.15.8. One or two layers are enough to have a smooth surface.
- 4.15.9. The time between the application of painting layers should be minimum 20 min.
- 4.15.10. Wait 24h before manipulating the vessel to allow fully curing of the painting.



5. STORAGE AND PRESERVATION.

Vessels likely to be stored several weeks or more prior to installation on the skid.

In order to maximize vessel performance as well as cosmetic external appearance the following actions should be taken:

A. Vessels must be stored indoor.

B. In case that the site conditions prevent indoor storage, the below measures must be kept:

B.1. In case that the vessels are unpacked from the original packing (supplied by BEL) keep vessels supported by three equally spaced points as required in the vessels drawing. Short vessels, i.e. three membranes elements or less, may be supported by two points.

B.2. In case these unpacked vessels have to be stored in columns, one over each other, use the supports beams supplied in the original BEL packing, to avoid unwanted contact between the ports and follow same original structure of “head crossed”.

B.3. Do not lean on vessels or over its original packing any other materials. It cannot be used as a storage area.

B.4. It is strictly forbidden to walk on the vessels.

B.5. Laminate can dissolve when exposed to direct sunlight, therefore, avoid exposing the vessels to direct sunlight for a long period of time. It is recommended (if possible) to store the vessels in the same packing as delivered by BEL.

B.6. Protect vessels from extreme weather conditions, as well as the dust.

B.7. FRP vessels cannot withstand direct or indirect hit. Therefore, Delimit and highlight properly the area where the vessels will be stored to avoid crushes and or hits with machinery, which can damage the vessels.

B.8. For long-term outdoor storage, it is highly recommended to remove the plastic bags, located inside to the vessels, which contain seals, adapters, etc, and store them indoor.

B.9. The plastic packing cannot last under direct UV, in case of unshaded storage the vessels must be covered with tarpaulin or any other suitable cover.

B.10. Prevent all contact with aggressive chemicals that may affect the outer coating of the pressure vessel.

ANNEX 1 - BEL Puller for 8" pressure vessels heads extraction.

This tool is designed to extract BEL head assembly for 8" pressure vessels.

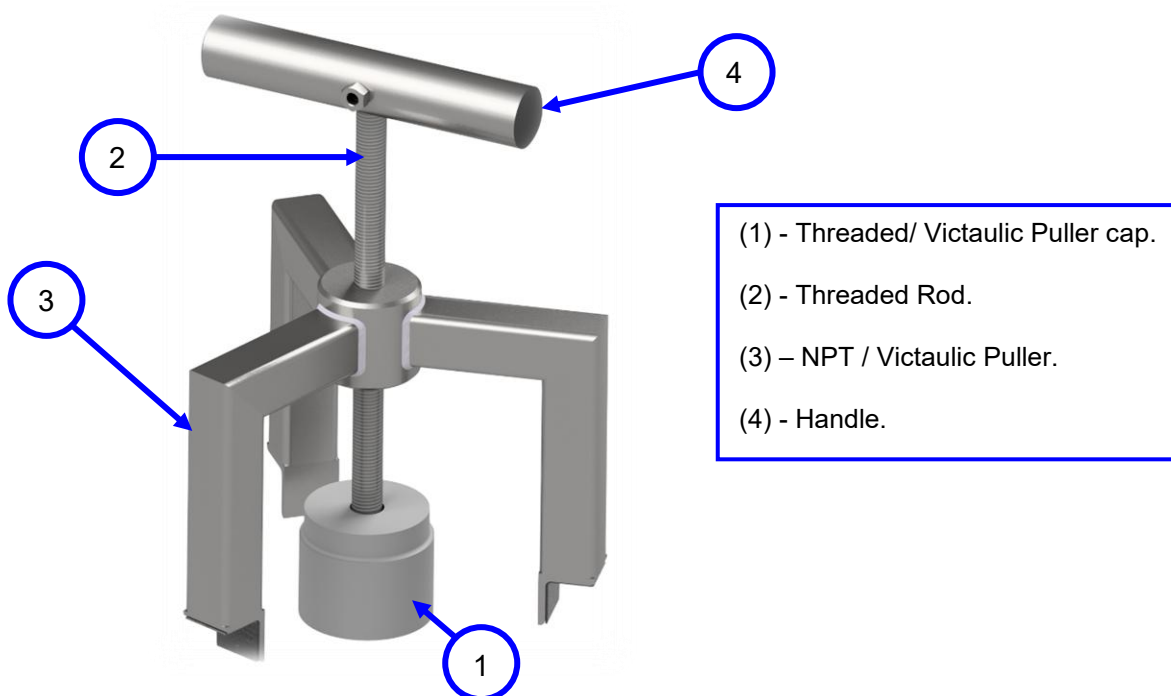
Before disassemble any of the vessel's parts ensure internal pressure has been released.
Otherwise, **DO NOT PROCEED** to disassemble any part until the elimination of any internal pressure inside the pressure vessel is verified.

NOTE:

It is highly recommended to replace all seals each time the head is reassembled.
A seal replacement kit is available from BEL's Customer Service.

Part number:	069-080-0101	+ 069-080-1000 (for 1" NPT adapter) or
		+ 069-080-1250 (for 1.25" NPT adapter) or
		+ 069-080-1500 (for 1.5" NPT adapter) or
		+ 069-080-1510 (for 1.5" Victaulic adapter).
		+ 069-080-2010 (for 2" Victaulic adapter for 9" PV)
		+ 069-080-1258 (for 1.25" BSP adapter (1500/1800 psi))

Tool must be assembled as shown on the following illustration:



ANNEX 2 - BEL Pusher for 8" pressure vessels heads installation.

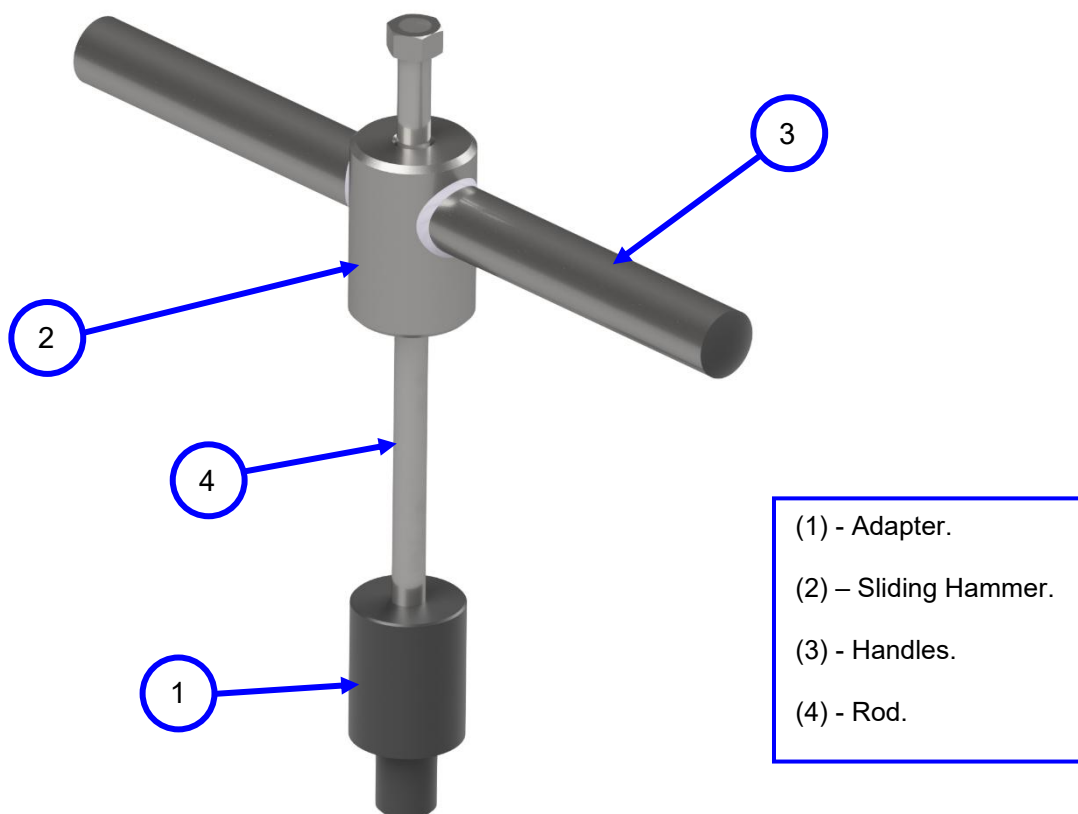
This tool designated to install BEL head assembly for 8" and pressure vessels.

NOTE:

It is highly recommended to replace all seals each time the head is reassembled.
A seal replacement kit is available from BEL's Customer Service.

Part number:	069-080-0100	Vessels up to 1200 psi
	069-080-0200	Vessels 1500 & 1800 psi

Tool must be assembled as shown on the following illustration:



NOTE: Ensure tool's handle (piece 3) is located as far away from the pusher adapter (piece 1).



ANNEX 3 – O-Rings replacement and scratches treatment procedure.

3.1. Preparations.

Please prepare the following items before procedure:

- 3.1.1- New intact O-Ring seal suitable with End-Cap type.
- 3.1.2. BEL End-Cap. Ensure O-Ring groove is clean and free of scratches.
- 3.1.3. Clean cloth.
- 3.1.4. Lubricant.
- 3.1.5. BEL Pusher-Puller (optional).

3.2. O-Ring Replacement procedure.

- 3.2.1. Clean vessel internal surface at sealing area (O-Ring area) with clean damp cloth after the dissembling of the head assembly from the vessel.
- 3.2.2. Ensure vessel sealing area is smooth and free of scratches. See next procedure for scratch treating.
- 3.2.3. Assemble End-Cap parts (e.g. End-Cap, Adapter, O-Rings and Shims) and apply full and reach layer of lubricant on seals, vessel's groove and vessel's sealing area.
- 3.2.4. Install End-Cap using BEL's pusher-puller.

3.3. Scratches treatment procedure.

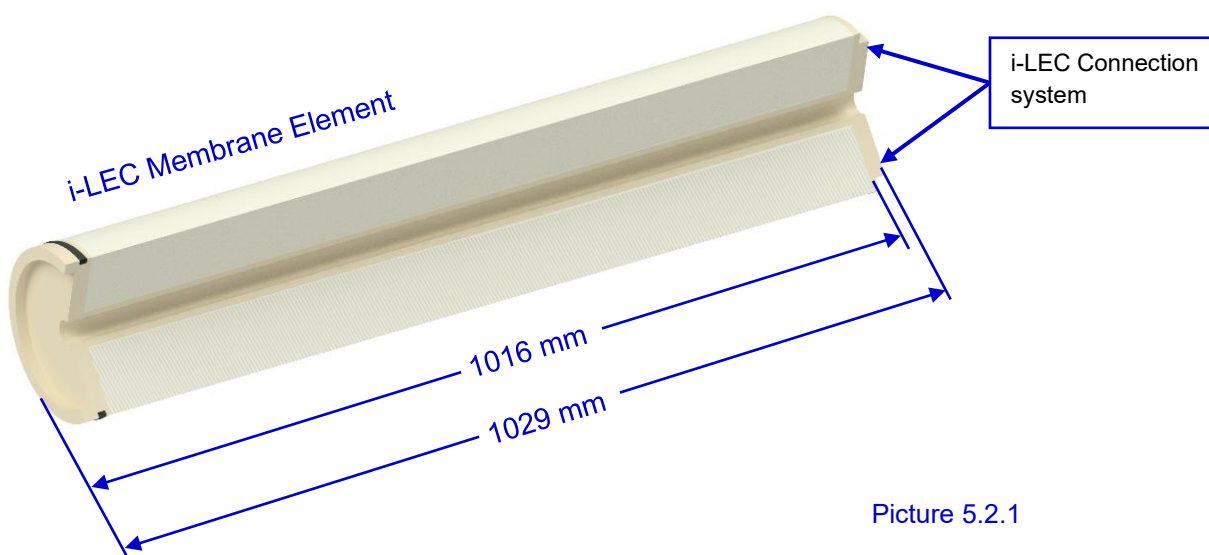
- 3.3.1. Clean vessel internal surface at sealing area (O-Ring area) with clean damp cloth.
- 3.3.2. Locate the scratch at the O-Ring sealing area. Scratches out of this area will not cause leaks, therefore will not be treated.
- 3.3.3. Grind out the scratch using Extra-Fine sand paper (P400) until scratch is flat and smooth. DO NOT grind deep into the vessel, this might cause permanent damage to the vessel.

Note: In case of deep scratches or layers delamination please consult BEL engineering department.

ANNEX 4 – EndCaps with i-LEC membranes (up to 1200 psi vessels).

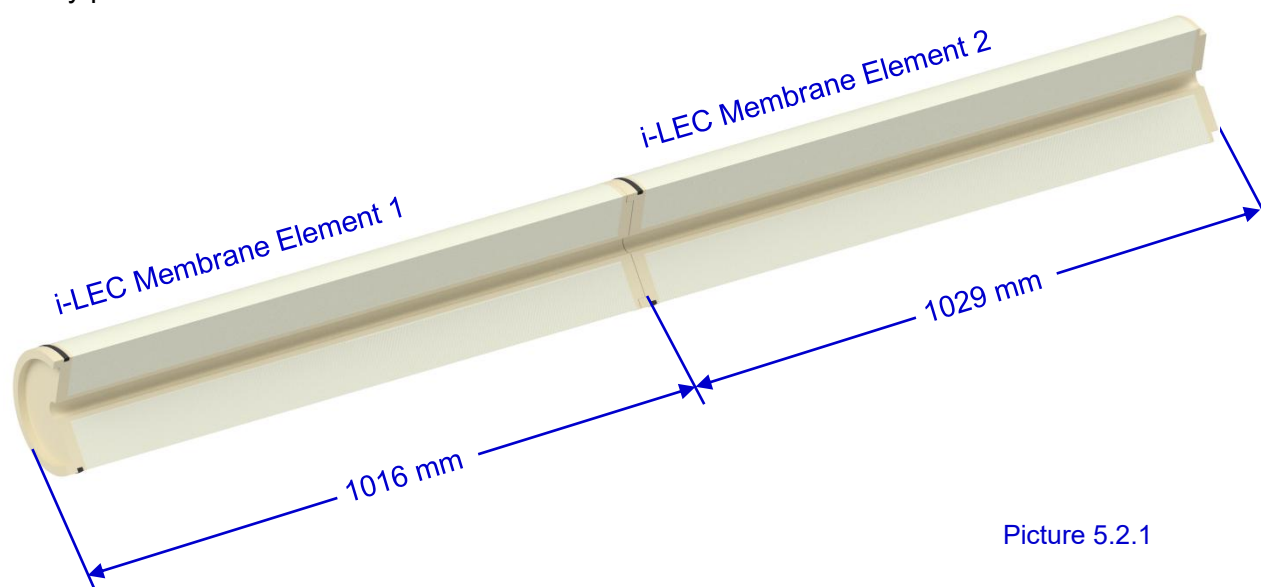
4.1. The i-LEC connection system from DOW FILMTEC Membranes in length while the other manufacturers. The standard length for standard 8040 membranes is 1016mm. However, the i-LEC membranes have a total length of 1029mm (40.5”).

This particularity of +13mm (0.5”) corresponds to the connection system of i-LEC as it can be clearly observed from the following picture.



Picture 5.2.1

4.2. If we bear in mind that once the i-LEC elements are interconnected, each membrane fits in its following one, the added measure of 0.5” only will be taken into consideration 1 time in every packet of membranes.



Picture 5.2.1

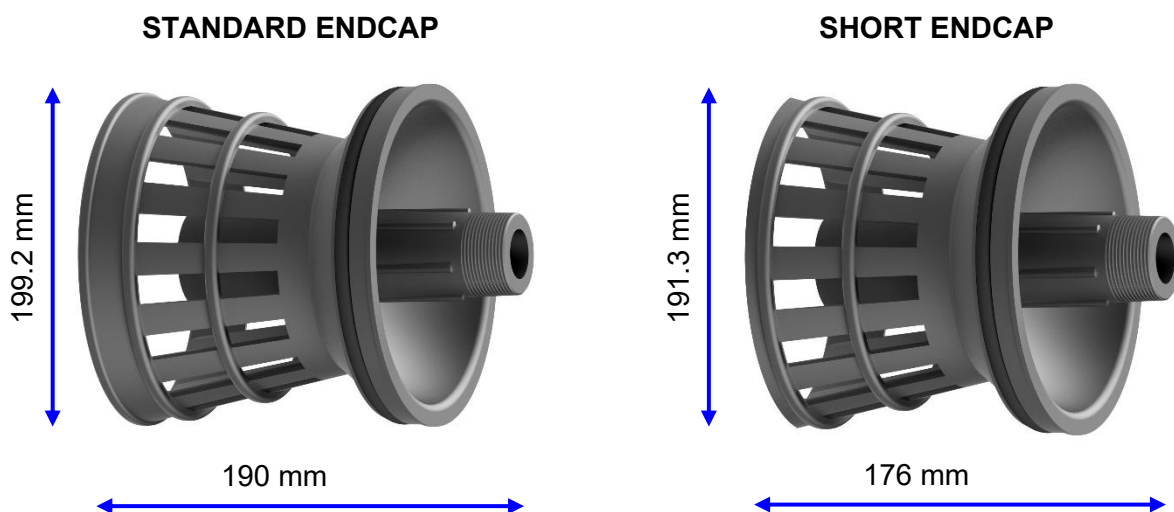


In pressure vessels which will be installed i-LEC system membranes, EndCaps supplied will be of two different kinds. 1 Standard EndCap and one “short” EndCap special for i-Lec system membranes. The special EndCaps, will show the “i” at the end of their reference number as it shown in the following table.

Description	Material	Part Number
EndCap 1,5" NPT-M	Engineering plastic	285779010
EndCap 1,5" NPT-M i-Lec	Engineering plastic	285779010i
EndCap 1" BSP-F	Engineering plastic	285779010g
EndCap 1" BSP-F i-Lec	Engineering plastic	285779010ig
EndCap 1,5" vict.	Engineering plastic	285779010v
EndCap 1,5" vict. I-Lec	Engineering plastic	285779010iv

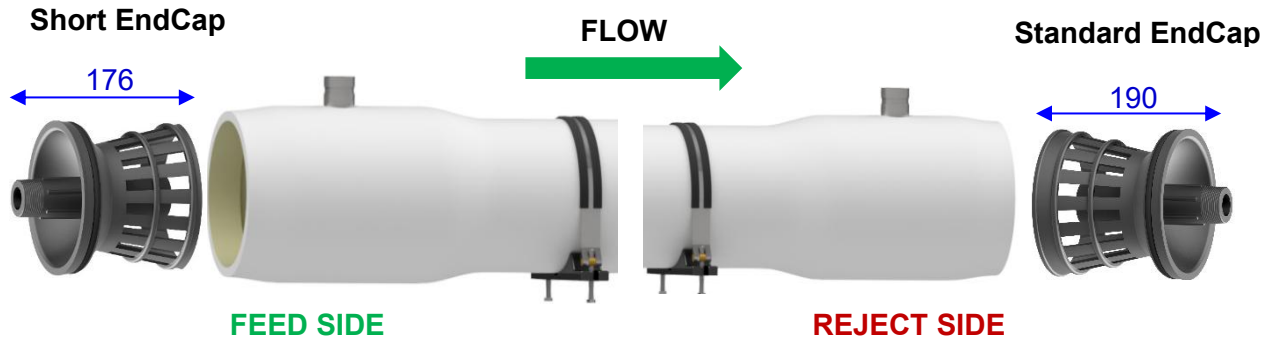
This kind of “i” end, shown the particularity to be shorter than standard EndCaps (no I-Lec) to fit with the special dimensions of these kinds of membranes.

Model of Membrane	Lenght
8040 standadrd membranes	40" - (1.016 mm)
8040 iLec Membranes	40,5" - (1.029 mm)





The proper way to install them in the pressure vessel is shown in the next figure:



The shot EndCap always must be placed in the feed side.

As an additional note in order to simplify membranes loading, given that the membranes are installed by turning, it is recommended the use of a grip wrench-a tool which will help much during the membranes loading, taking into consideration that the operators' hands will be soaked in glycerin (lubricant). For you more detailed information, please note the following figure.



Warning: The size of Grip Wrench must be enough to tighten 8" membranes.

ANNEX 5 – EndCaps options.

