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**Liqui-Cel 10 x 28 316L SS Membrane Contactor**  
Assembly & Disassembly Instructions



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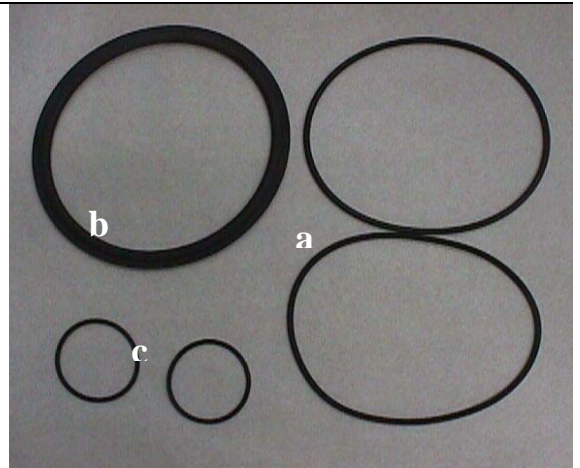
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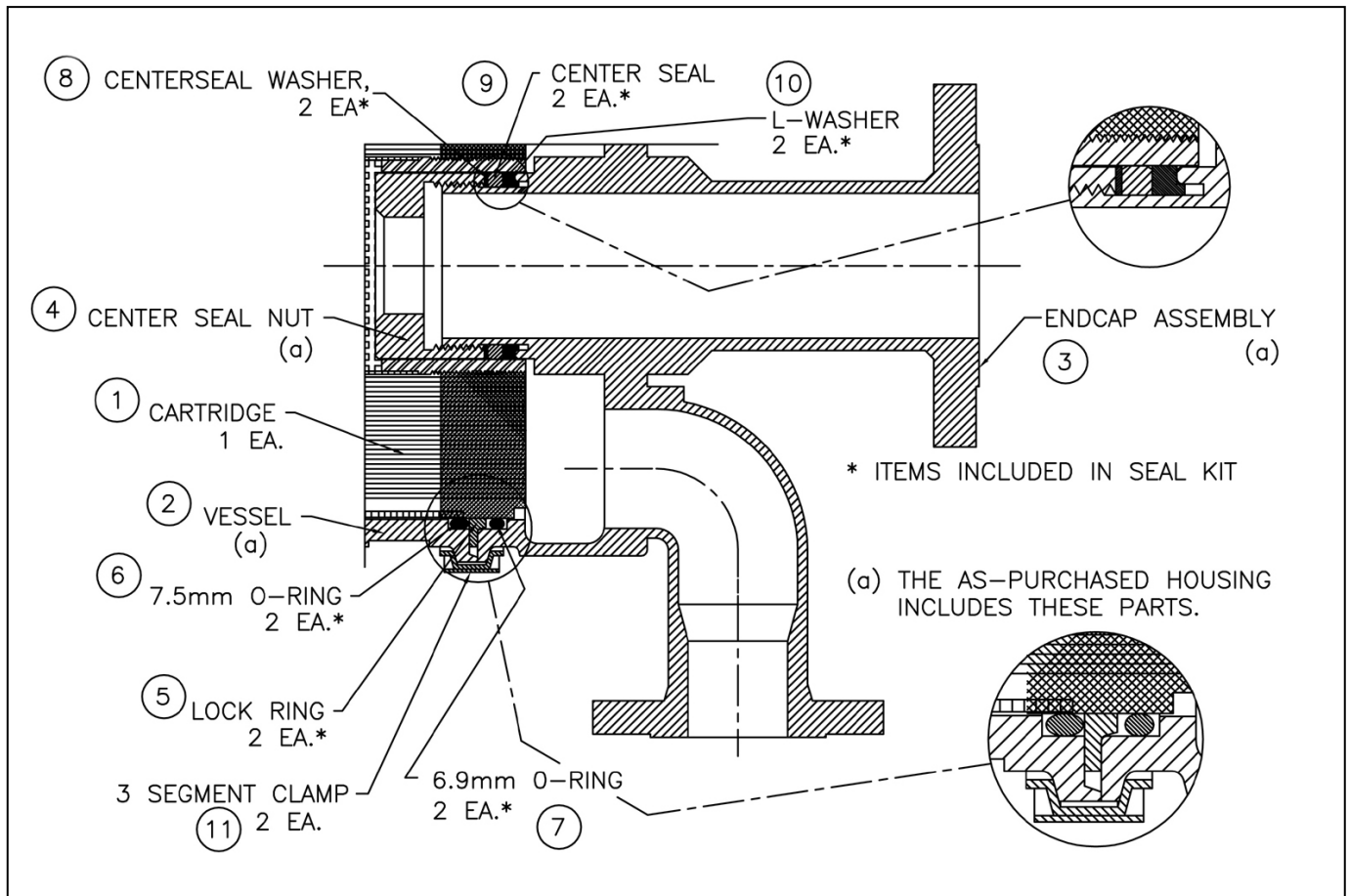
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## Assembly Parts

- a) **O-rings (4)**
  - Inner O-ring:** To seal the cartridge into the housing, this 7.5mm O-ring is the shellside or liquid side O-ring.
  - Outer O-Ring:** To seal the cartridge into the end cap, this 6.9mm O-ring is the lumenside or gas side O-ring.
- b) **Lock ring (2)** An elastomeric ring used to position the inner shellside O-ring.
- c) **Center Seal (2)** To seal the center tube of cartridge and center nozzle of the end cap.
- d) **Center Seal Washer:** To protect the center seal during tightening (not shown)
- e) **L Washer** To compress the center seal during tightening. (not shown)



## Part Orientation



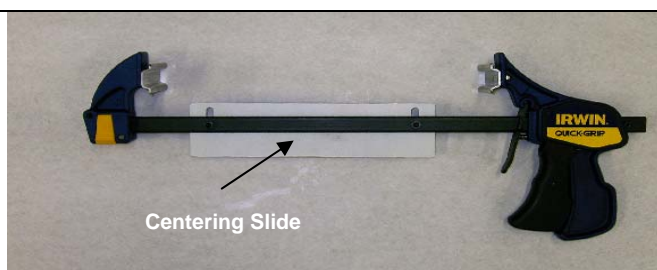
## Assembly Tools

### 10 x 28 Change-Out Tools

<b>Rubber Mallet</b>	Used to tap T-handle during inner O-ring insertion
<b>T-Handle</b>	Used to insert inner (shellside) O-ring during assembly
<b>O-Ring Pick</b>	Used to remove the inner (shellside) O-ring during disassembly
<b>Center Seal Tool</b>	Used to loosen / tighten <i>Center Seal Nut</i>
<b>Torque Wrench</b>	Used to set a specific torque on the <i>Center Seal nut</i>



<b>Cartridge Alignment Tool</b>	Used to align cartridge with housing
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### 10X28 V-Band Assembly Tools

A complete assembly tool kit will include four (4) sets of the following:

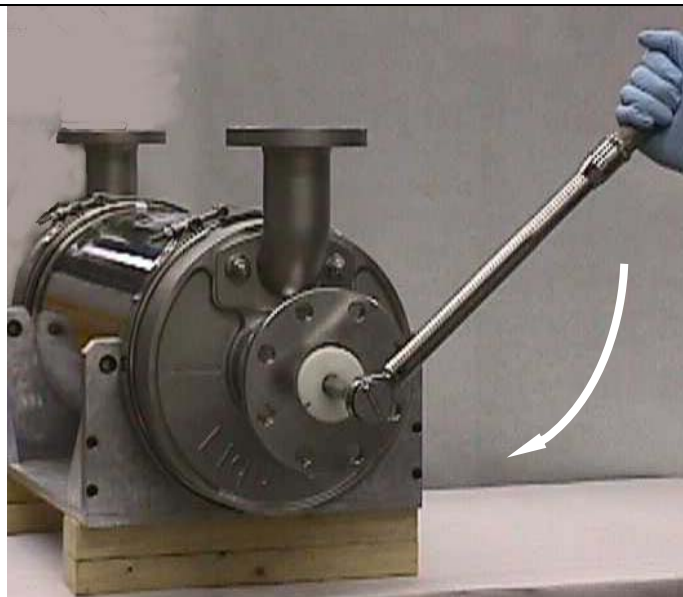
<b>Assembly Rods</b>	Threaded rod that will be screwed together to make a complete assembly tool.
<b>Assembly Clips</b>	Dark machined parts that slide over the Assembly Rods.



The equipment illustrated above is required for the assembly or disassembly of a 10X28 Liqui-Cel Membrane Contactor that will be assembled in a 316L SS Housing.

## End Cap Removal

- Place the contactor horizontally. Insert the center seal tool into the center nozzle. Slowly loosen the center seal nut by turning in a clockwise direction 2 rotations.
- Loosen the V-Band clamp. Remove the nut from the V-band clamp and remove the clamp from the assembly.
  - Note that using ISO Ashby-Cross oil on the nut will help get the nut on and off more easily.



- Using a permanent marker place 2 small alignment marks, one on the housing and one on the end cap. This will allow the End cap to be reassembled in the same position.
- Move end cap up and down, and left and right until it becomes loose. Remove end cap and set aside. It may also be necessary to insert a prybar or screwdriver into the space between the end cap and housing to separate the two pieces.
- **EXTREME CAUTION** must be used to ensure that the epoxy surface of the contactor is not damaged. Be sure to keep the end cap with same end of the housing to allow proper realignment upon reassembly.
- Remove all seal elements between the cartridge and the housing. It will be necessary to use the o-ring pick to remove the inner (shellside) o-ring. Discard used O-rings.



**Repeat all of the above steps for each end of the contactor.**

## Cartridge Insertion

- Carefully clean the sealing surfaces of the housing and the cartridge.
- Slide the cartridge into the housing leaving the epoxy equally exposed on each end.
- NOTE: Be careful not to chip the epoxy edge of the contactor.
- Review the *Assembly Parts* and *Part Orientation* drawing to become familiar with the part location and terminology.



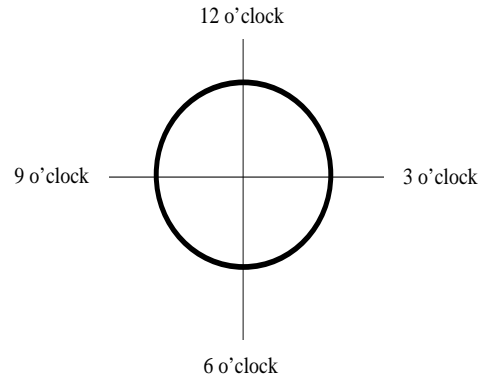
- Check to be sure that the cartridge is centered in the housing. Look at and feel both ends to ensure proper alignment.
- Measure both ends using a ruler to assure the membrane cartridge is centered in the housing.



- Loosen the wing nuts on the centering slide on the cartridge alignment tool.
- Clamp the cartridge alignment tool on one end of the housing.
- Move slide until it is flush against the face of the cartridge and tighten wing nuts.
- Check to make sure the cartridge is still centered. Use a ruler if necessary.
- If adjusting is necessary, it must be done now before O-rings are inserted completely.



- Starting at the end opposite the alignment tool, place the 7.5mm shell-side o-ring around the outside of the cartridge.
- Lift the cartridge slightly and use the T-handle insertion tool to press the o-ring into the space between the housing wall and the epoxy sealing surface of the contactor at the 6 o'clock position (*see diagram 1*).
- Recheck cartridge alignment.
- Once the alignment is acceptable, continue to set the o-rings in the 12 o'clock, 3 o'clock and 9 o'clock positions using the T-handle insertion tool.



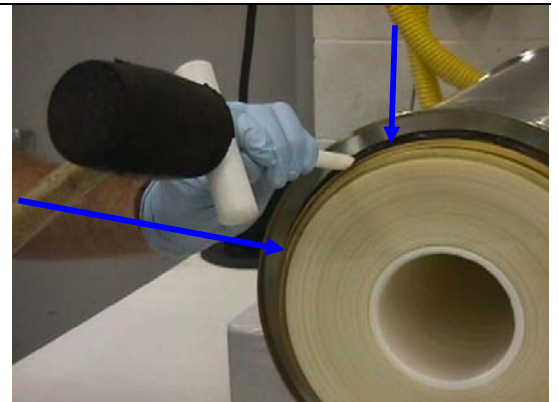
**Diagram 1**

- Use the T-Handle insertion tool to press in the remaining o-ring sections. When inserting the O-rings, it is best to always divide each section of un-inserted o-ring in half and press in the middle section. See the photograph below, for an example.
- When the 7.5 mm o-ring is completely inserted, remove the cartridge alignment tool.
- Repeat the same process on opposite end of cartridge.



**NOTE: If the O-ring is ever pinched or cut it MUST be removed and discarded.**

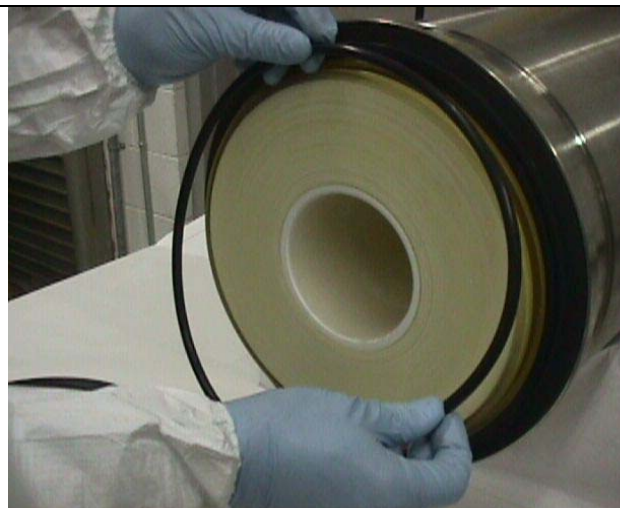
**After the O-ring has been inserted where these arrows point, use insertion tool as pictured.**



- Place the lock ring around the outside of the cartridge. (See *Assembly Parts “b”* on page 1).



- Place the outer o-ring (6.9 mm) on the lumen epoxy sealing surface. If the o-ring appears to be rolled or twisted, please adjust the position so the o-ring sits flat on the epoxy. (See *Assembly Parts “a”* on page 1).
- Repeat these steps on the opposite end of the cartridge.

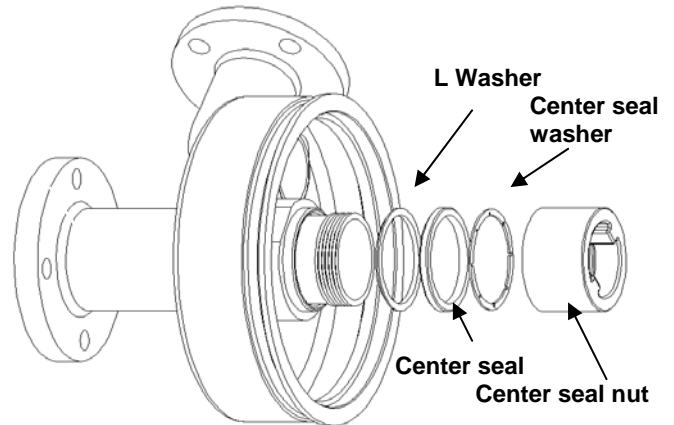


## End Cap Preparation / Installation

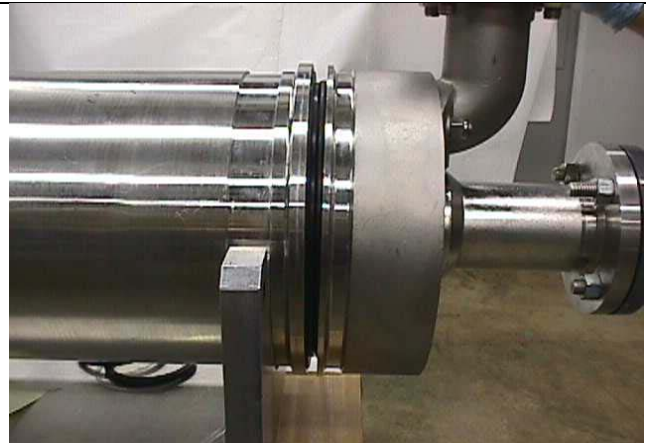
There are two options for inserting an end cap. Option 1 is Manual Insertion, Option 2 is Vacuum Insertion. Determine your method of choice and go to that section.

### Manual Insertion

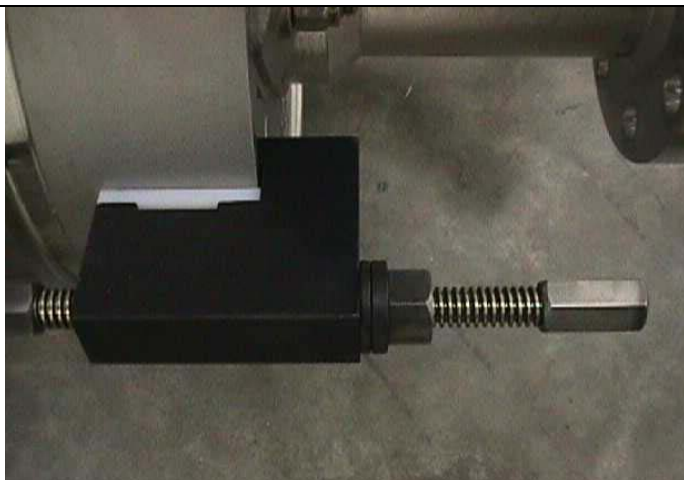
- Inspect and clean the sealing surface of both end caps.
- Place **L** washer around the center nozzle and press it down until it touches the cap nut.
- Place the center seal (see *Assembly Parts d* on page 1) on the center nozzle. Press it over the threads and down against the **L** washer. Place the center seal washer (thinner washer) over the threads and against the center seal (see *Assembly Parts e* on page 1). Screw the center seal nut onto the nozzle. Once it touches the washer, loosen one turn.



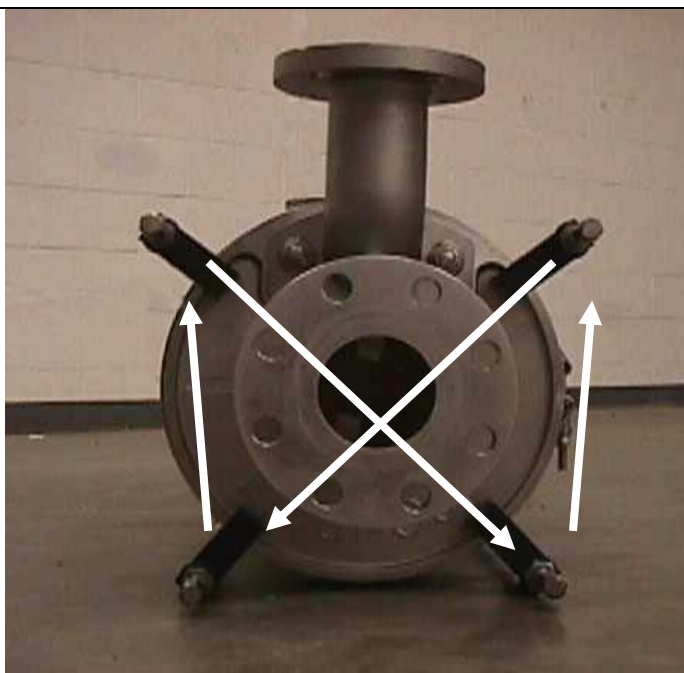
- Lift the end cap and place the center nozzle into the center tube of the cartridge. Check the identification marks to ensure the end cap matches the correct end of the housing.
- Slowly slide the end cap in until it touches the Outer O-ring (lumenside). Complete this step for both ends of the contactor.
- Rotate the end cap to align the marks placed on the end cap and the housing during disassembly.
- Place the V-Band clamp behind the clamping ridge of the housing. The clamp will need to remain there until the assembly process is complete.



- Hook the assembly clips onto the end cap at both ends and adjust the nut for a secure fit. Repeat this step for the remaining assembly fixtures.
- Tighten nuts (two rotations max at a time) to pull the end cap onto the cartridge. Tighten in an even manor that will allow the end cap to progress slowly and evenly. It will be necessary to do the tightening from both ends of the assembly arms during the installation process.
- Continue checking the alignment marks on the end caps and housing to properly align the end caps.

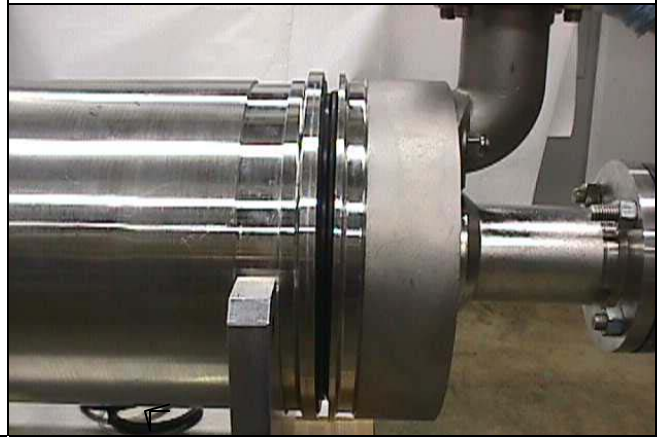
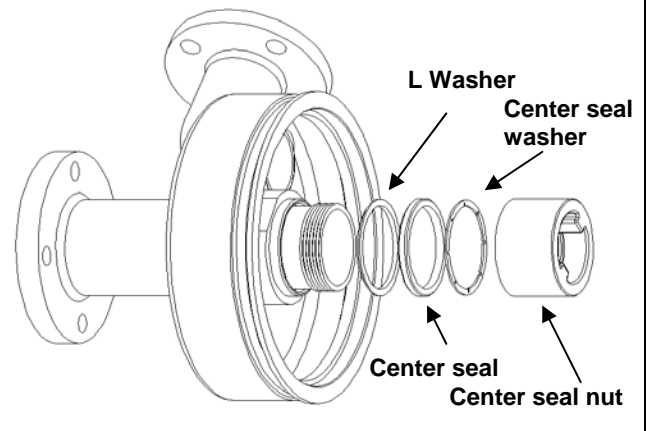


- It is necessary to tighten in a pattern similar to the one shown on this picture. This will ensure that the end cap is inserted evenly.
- While the end cap is pulled tight against the housing, place the V-Band clamps on the ridges of housing and the end caps and tighten the clamps.
- Loosen the threaded rods of the assembly tool and disconnect the tool from the housing.

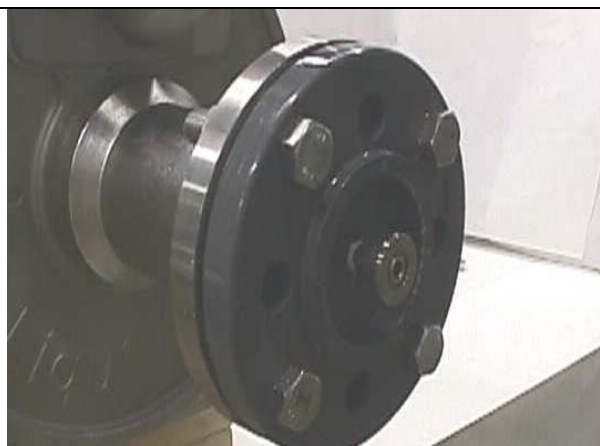


## Vacuum Insertion

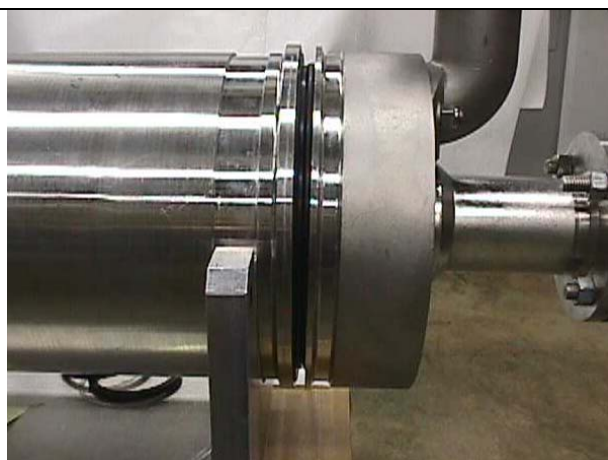
- Inspect and clean the sealing surface of both end caps.
- Place the **L** washer around the center nozzle and press down until it touches the cap nut.
- Place the center seal (see *Assembly Parts d* on page 1) on the center nozzle. Press it over the threads and down against the **L** washer. Place the center seal washer (thinner washer) over the threads and against the center seal (see *Assembly Parts e* on page 1). Screw the center seal nut onto the nozzle. Once it touches the washer, loosen it one turn.
- Bolt blind flanges on both lumen ports and one of the shell ports of the end caps.
- Lift the end cap and place center nozzle into center tube of the cartridge. Slowly slide the end cap in until it touches the Outer O-ring (lumen). Complete this step for both ends of the contactor.
- Rotate the end cap to align the marks placed on the end cap and housing during disassembly.



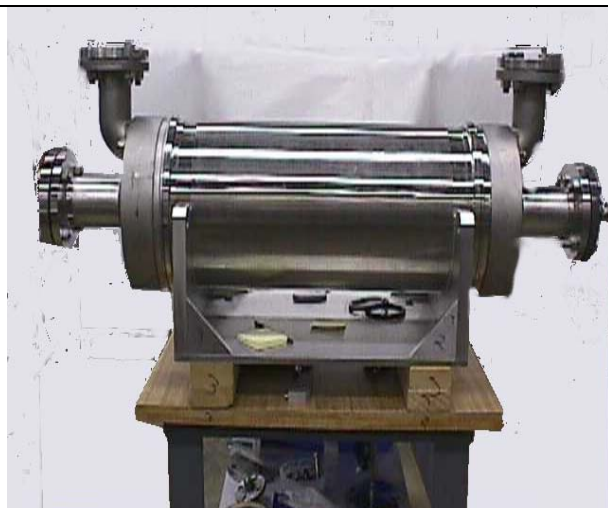
- Bolt the vacuum flange onto to remaining shell port.  
Connect the vacuum hose to the flange and the vacuum.



- Turn the vacuum pump on. Press the end caps against the O-rings.

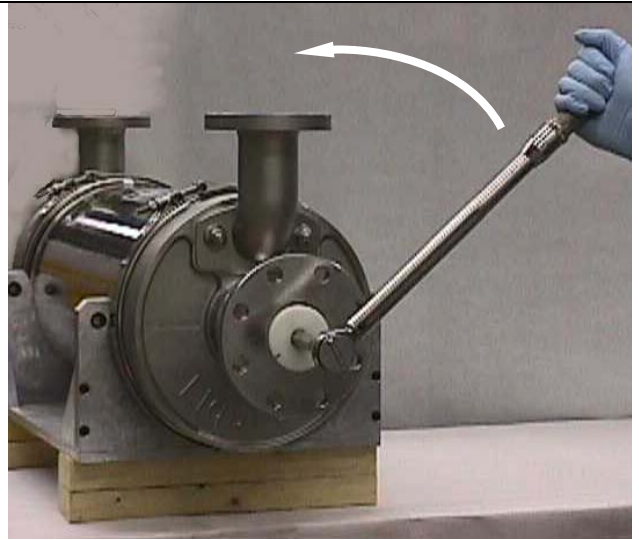


- While the end cap is pulled tight against the housing, place the V-Band clamp on the ridge of the housing and the end cap and tighten the clamp. Repeat this step for the other end.
  - Note that using ISO Ashby-Cross oil on the clamp nut will help get the nut on and off more easily.
- Turn off the vacuum. Remove the blind flanges from the shell connections and proceed to tighten the center seal.



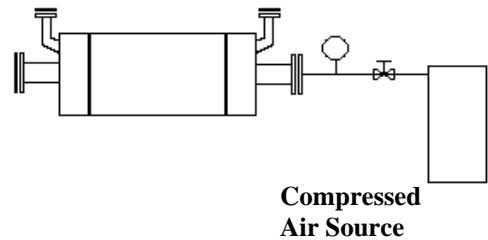
## Center Seal tightening

- Insert the center seal tool into the center nozzle. Turn the tool until you feel the notch in the tool mesh with the nubs of the center nut.
- Using a counter clockwise motion, slowly torque the center seal to 90 ft/lb. (122 Newton/meters). Repeat for other end.



## Pressure Test

- Bolt blind flanges on both lumen ports and one of the shell ports.
- Bolt a flange equipped with a 0 - 100 psi gauge and hose connection.
- Pressurize the housing to 60 psig with clean, oil free, air.
- Isolate the pressurized housing and monitor the pressure to verify a leak free seal. There should be no pressure decay over 30 minutes.







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