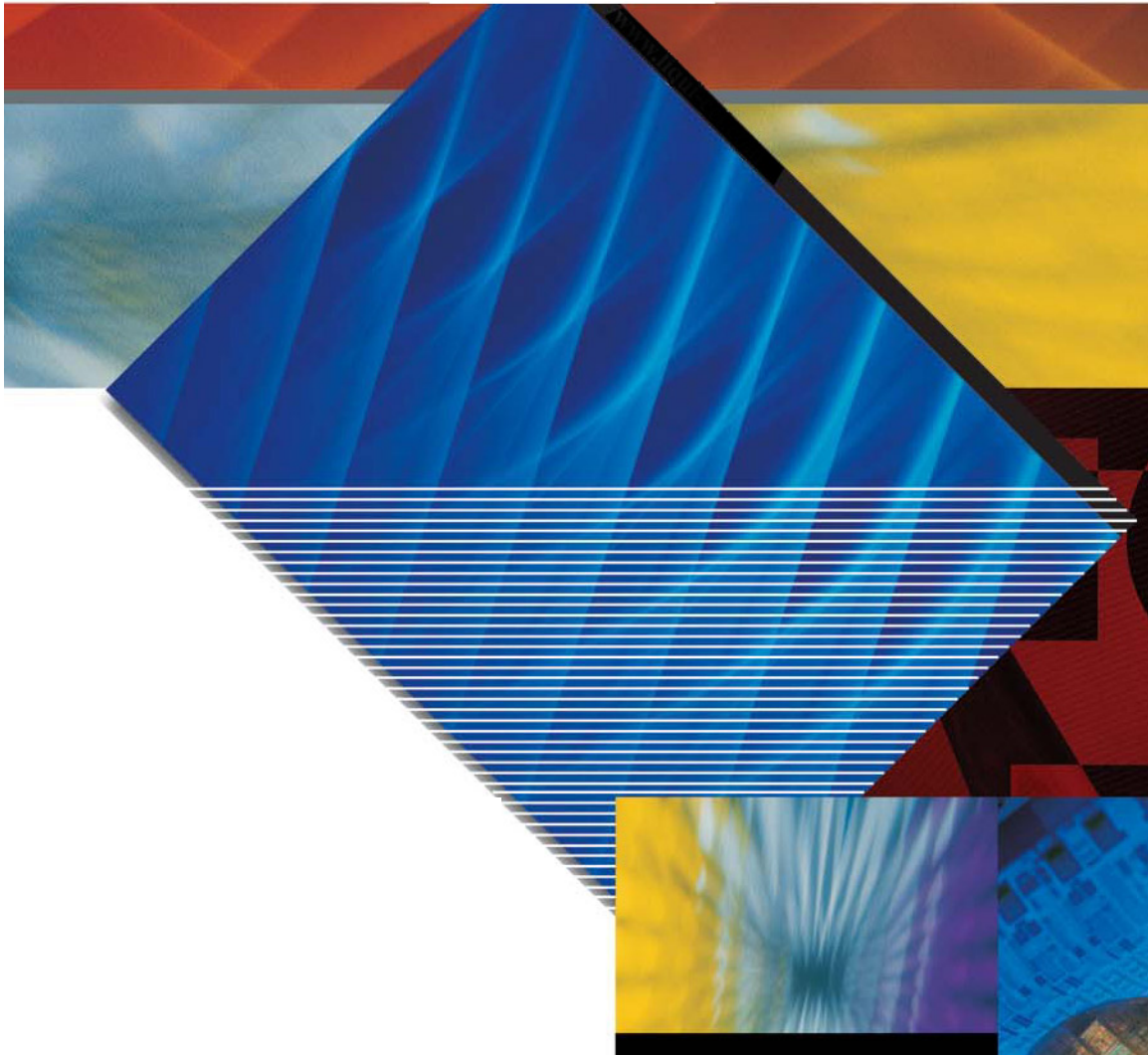




Liqui-Cel® 14 x 28 Membrane Contactor Assembly and Disassembly Instructions



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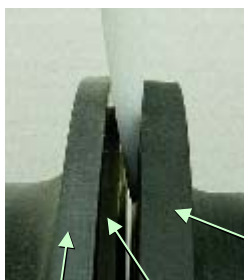
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Disassembly: Removing the 14-inch End Caps

Materials Required: 3-4 wedges and a mallet

Wear safety shoes and safety glasses.

- Remove all hardware (nuts, bolts, backing rings, lifting rings, etc.). Start by loosening all 12 bolts in a star pattern to reduce stress on the plastic parts. The end cap will remain in place because the O-rings are still seated on the center nozzle.
- Once all of the bolts and backing rings have been removed. Place a wedge between the gasket and the end cap, with the flat side toward the end cap.



NOTE: Placing the wedge between the gasket and the vessel can lead to wedge or vessel damage when the wedge hits internal parts of the contactor. Tap gently to avoid damage.

Vessel Side

Gasket

End Cap Side

- Gently tap the wedge until there is enough space for a second wedge at 90 degrees.
- Place the second wedge at 90 degrees from first one, between the gasket and the end cap. Gently tap the second wedge until there is a large enough gap for a third wedge at 90 degrees.
- Repeat this process for the third and fourth wedge. The fourth wedge may not be needed as three may sufficiently loosen the end cap.
- Once all of the wedges are in place, gently tap each one to move the end cap evenly away from the vessel.
- When the wedges bottom out and can go no further, the first O-ring will be free and it will no longer be sealing to the center tube. Gently pull the end cap evenly to get past the second O-ring.
- Move slowly so that the end cap does not suddenly come loose and fall.

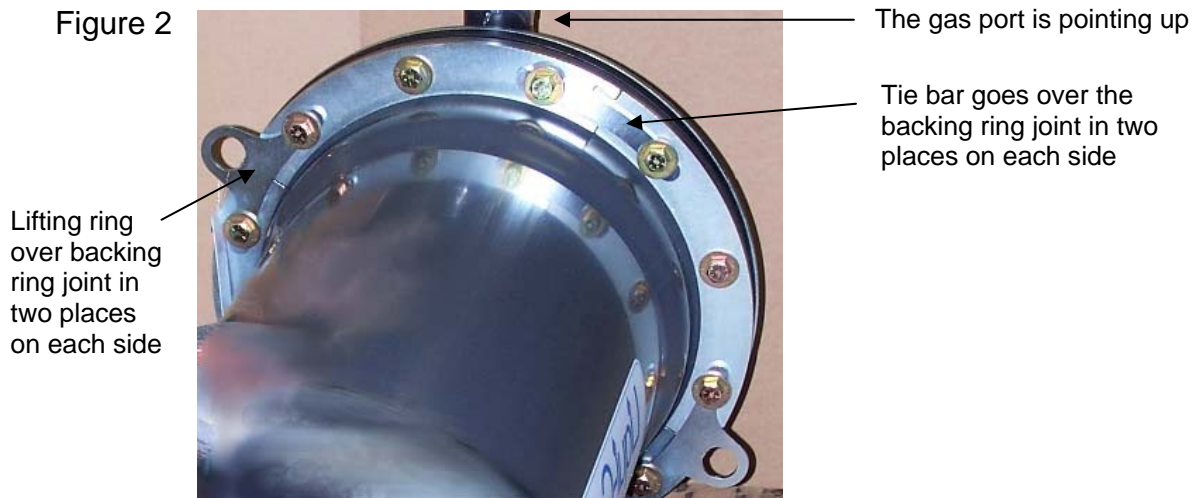


Assembly: Putting the First 14-inch End Cap Back On

Each flange requires 4 backing pieces to be assembled.

- Start by taking 2 backing ring sections and linking them together at the puzzle joint. Hold with the radius side towards you.
- Assemble these two sections of backing rings on the vessel side of the flange and then add the remaining 2 backing ring sections to complete the full backing ring assembly.
- The backing ring joints must be located as shown in Figure 1 and Figure 2. Tie bars and lifting rings are placed over the indicated puzzle joints, and bolts are placed through the bolt holes to hold the backing rings in place.

PROCESS NOTE: The position of the lifting rings, tie bars, and puzzle joints are critical to product strength. Do not deviate from the positions shown in the picture. When adding the tie bar, make sure the tie bar curves the same way as the outer edge.



Note: the backing rings are shown in steel for illustration purposes. Backing rings on the final product are black.

- Place the gasket over the bolts on the side where the vessel will mate to the end cap.
- Put 2 O-rings into grooves on the center nozzle on both end caps.
- Make sure the bolts are sticking out so they will hold the end cap, then line up holes in end cap with bolts in the vessel flange and press end cap into center tube as far as it will go.

SAFETY NOTE: USE CAUTION NOT TO DROP THE END CAP, AS THIS WILL CAUSE DAMAGE. USE SECOND PERSON IF NEEDED TO KEEP BOLTS IN PLACE DURING THIS STEP.

If the first O-ring won't go into the center tube by hand:

- Put a nut on every fourth bolt.
- Use an impact wrench set to 30 ft-lbs to slowly tighten each one. Slowly and evenly tighten each bolt in a star pattern. Watch for and be careful that the O-ring does not roll out of the groove or get pinched.
- When the second O-ring gets to the center tube, take off these four nuts.

Assemble a backing ring on the end cap side, with puzzle joints located as shown.

PROCESS NOTE: For strength, make sure the backing ring joints on each side of the flange do not line up with each other. See figure 1 and Figure 3.

Figure 3



Backing ring joint on this side

- Rotate the vessel so the gas port is up, and place one backing ring section on the end cap behind the port. Again, it is important that the joints on the end cap side do not line up with the joints of the backing ring on the vessel side of the flange - stagger them instead.
- Add a large flat washer, a lock washer, and a nut to the bolt, and tighten by hand.
- Then, rotate the vessel to add next backing ring section until all 4 sections have been added.
- Make sure that joints are connected and in place. If needed, use an impact wrench set to 30 ft-lbs to tighten all bolts enough so that the end cap is close to the gasket and vessel.
- Then use an impact wrench set to 30 ft-lbs in a star pattern to slowly and evenly pull the end cap into the center tube. Put a wrench on the backside of the nut (vessel side), and use an impact wrench to get the washer to touch the backing ring (bolts should not be tight yet). Go back over all the bolts until the impact wrench is no longer turning.
- Set calibrated torque wrench to 45 ft-lbs
- With the wrench on the bolt and the torque wrench on the nut, keep turning until the torque wrench starts clicking. Repeat this for each bolt in a star pattern to equalize the flange stresses.
- Repeat once more just to be sure that torque wrench is still clicking on every bolt.
- Repeat process for second end, using backing ring segment, tie bar, and lifting ring locations as shown in Figure 1. Torque as described above.



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