CODELINE® - 40E100
4 INCH END ENTRY MEMBRANE HOUSING FOR RO APPLICATIONS

USER GUIDE

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DANGER – HIGH PRESSURE DEVICE
This vessel may cause loss of life, severe bodily harm, or property damage if not correctly installed, operated and maintained. Read and understand all guidelines given in this bulletin before attempting to open, operate or service this vessel. Failure to follow these guidelines and observe every precaution will result in malfunction and could result in catastrophic failure. Misuse, incorrect assembly, or use of damaged or corroded components can result in high-velocity release of the end closure. We recommend that only a qualified technician experienced in servicing high-pressure hydraulic systems open, close and service this vessel.

Important Safety Precautions
Do’s
- Read, understand and follow every guideline in this bulletin. Failure to take every precaution may void warranty and could result in catastrophic failure.
- Install in an area where a vessel or piping malfunction that result in water leakage would not damage sensitive or expensive equipment, such as electronic components.
- Verify that head locking components are properly placed and secured.
- Inspect end closures regularly, replace deteriorated components and correct causes of corrosion.
- Follow membrane element manufacturer’s recommendations for loading elements into the vessel (see Replacing Elements).

Don’ts
- Operate vessel at pressures and temperatures in excess of their specific rating.
- Service any component until you verify that pressure is fully relieved from the vessel.
- Use corroded components. Use of such components may result in catastrophic failure.
- Pressurize vessel until after visually inspecting to ensure that the spiral retaining rings is correctly installed.
- Tolerate leaks or allow end closures to be routinely wetted in any way.
- Use excessive silicone lubricant.
- Pressurize vessel without element in place unless permeate ports are plugged internally.
- Overtighten fittings in ports.
- Use petroleum products on Noryl components.
- Allow petroleum or silicone based products to come in contact with membrane elements during installation or maintenance.
- Use the vessel at negative pressure.
- Stand or climb on the pressure vessels, or the feed / concentrate or permeate ports.

General Information
The 40E100 Series of RO Pressure Vessel Housings are designed to be used in water desalination systems at operating pressures of up to 1000 psi. Each model is available in lengths to house from one to seven 40-inch long elements. Any make of 4-inch nominal diameter spiral wound element may be used. The 40E100 is designed and built in accordance with the engineering standards of the Boiler and Pressure Vessel Code of the American Society of Mechanical Engineers (ASME Code). The vessels utilize a fiberglass reinforced plastic shell for superior corrosion resistance. The information and guidelines incorporated in this User’s Guide are intended only as a supplement to good industrial practice. Full responsibility for correct operation and maintenance of vessel remains with the user. This guide should be used in conjunction with drawing number 518015. When properly installed and maintained, 40E100 vessels can be expected to provide safe operation over a long service life.
**CODELINE®**

**Installation**
Regardless of when or by whom your vessel may have been installed, there are a few quick checks you should make before use. Check that each vessel is:

- Mounted with compliant material (Polyurethane saddle) between the fiberglass shell and any rigid frame.
- Free to expand under pressure - shell not clamped rigidly in place, no rigid piping connections to port fittings.
- Not used in any way to support other components such as piping, manifolds hanging from ports.

*Section through end closure*

<table>
<thead>
<tr>
<th>Dwg Ref</th>
<th>Qty Per</th>
<th>Item #</th>
<th>Description</th>
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<tr>
<td>Shell</td>
<td></td>
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<td>Shell</td>
<td>Filament Wound epoxy/ glass composite. Head locking grooves internally wound in place. Shell exterior coated with white high gloss polyurethane paint.</td>
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<td>1</td>
<td>1</td>
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<td>Bearing Plate</td>
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<td>PVC Thermoplastic (gray)</td>
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<td>Seal Plate</td>
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<td>45244</td>
<td>Port Retainer</td>
<td>Stainless Steel</td>
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<td>47472</td>
<td>Feed/Conc. Port</td>
<td>UNS S 32750 As per ASME AS-790</td>
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<td>316L Stainless steel</td>
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<td>Adapter</td>
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<td>Strap Assembly</td>
<td>304 Stainless Steel – Thermoplastic cushion</td>
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<td>19*</td>
<td>4</td>
<td>97821</td>
<td>Strap screw</td>
<td>5/16 UNC ,18-8 Stainless steel</td>
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*Item no 17, 18, & 19 not shown in the above exploded view*
Opening the Vessel

**WARNING:** Relieve pressure from vessel before beginning this procedure.

**Contamination Removal**
Metal oxidation products and mineral deposits can interfere with vessel disassembly. Remove all foreign matter from both ends of vessel as follows:
1. Remove contaminants using a small wire brush or suitable abrasive (such as medium-grade ScotchBriteᵀᴹ).
2. Flush away loosened deposits with clean water.

**Removing the Head**
Remove head as follows:

1. Disconnect permeate piping as required at nearest convenient joint, being careful not to place undue stress on the threaded connections of the plastic permeate port.

Remove the Retaining Ring from the groove.
1. Lift the tabbed end of the retaining ring up and out of the stainless steel groove in the shell and then away from the head so that it rests in the end margin of the vessel. This is best accomplished by using CodeLine Removal Tool, part number 50303, which is available from your supplier. This can also be accomplished using a screwdriver and a pair of pliers if the tool is not readily available.

With the removal tool the retaining ring can be lifted upward by simply rotating the tool counterclockwise after inserting it over the tab on the retaining ring (use the smaller hole). Hold the tool flat against the end margin and parallel to the vessel bore. It is then possible to pull the end of the retaining ring straight out. The retaining ring may snap back into the groove if this alignment is not closely adhered to. If the retaining ring is difficult to remove, try soaking with a release agent such as LPGᵀᴹ or WD4⁰ᵀᴹ, being careful to avoid any contamination of a membrane element.

When using screwdriver and pliers, pry the tabbed end of the retaining ring out of the stainless steel groove with the tip of the screwdriver. Once the end of the retaining ring is clear of the groove, grab the tab with the pliers and pull towards the end of the vessel until the end of the ring is resting in the end margin of the shell.

2. Remove the 4” retaining ring from the stainless steel groove in the shell by rotating your finger behind the ring as it continues to exit the groove.
3. Once the retaining ring has been removed, examine the area for burrs or dings which could damage the head or membrane. If necessary, use ScotchBrite™ or 600 grade sandpaper to smooth the area.

Removing Head Assembly

1. Grasp the feed/concentrate port and pull the necessary head assembly straight out. It may be required to give a sharp forceful tug or to rock the head from side to side in order to move the head. Take care to avoid damaging the permeate port. It is made of PVC or other engineering thermoplastic (occasionally stainless steel or other metal) and is not designed to withstand mistreatment.

2. Remove and discard plug seal, taking care not to scratch or otherwise damage the sealing surfaces.

3. Repeat above procedures for opposite end of the vessel.

4. As soon as possible after removal, disassemble and check all head components, as described in *Rebuilding the Head and Refurbishing Parts*.
Replacing Elements
The following procedures are provided for information only. Elements should be installed in accordance with the element manufacturer’s recommendations. Where conflicts exist, contact the element manufacturer or Pentair Water for clarification.

Removing Elements
1. Remove heads from both ends of vessels as described in Opening the Vessel.

   **NOTE:** Always remove and install element in the direction of feed flow. The feed end (upstream end) is the end plumbed most directly to the pump.

   1. Push element(s) out of vessel from the upstream end.
   2. For multi-element vessels, remove the interconnectors and retain for reinstallation.

Inserting Elements
1. Ensure that heads are available in clean, as-new condition before proceeding. (If in doubt as to head condition see section on inspecting parts at pg. 11).
2. Check that all required elements are ready for assembly, with no dings or other damage which could scratch the inside of the vessel.
3. Check that the interior of the vessel is clean and free of burrs, sharp edges or other damage. Remove any residual lubricant from the vessel bore and work a fresh, thin film of Parker-Super-O-Lube™ silicon lubricant into the lead-in chamfer and an area approximately ½ inch from the chamfer.

   **CAUTION:** When lubricating the vessel chamfer, wear protective gloves or finger cots to prevent cuts or penetration of fiberglass.

4. Carefully insert retaining ring into its groove. This is done by inserting the lead end of the spiral retaining ring (end without bent tab) into the stainless steel retaining ring groove located in the shell, and slowly pushing the remaining turns into the shell.

3. Install adapter if required into one end plug. At downstream end of vessel, orient end plug ports into desired position and push plug fully into vessel. A sharp, forceful thrust may be needed to enter plug seal into the vessel bore.

   **CAUTION:** If vessel is to be pressurized above 125 psi without elements installed, the central permeate port should be plugged from the inside. Solid adapters are available for this purpose.
5. Check that the spiral retaining ring is fully seated in the groove. If it is not, remove and check for foreign material that is causing the spiral ring not to sit into the groove.

6. Lubricate element seals sparingly with the element manufacturers recommended lubricant or with glycerine.

7. Insert each element with the brine seal (typically a U-cup seat) installed on the upstream end with its lip facing upstream.

8. Install the interconnectors between multiple elements as each succeeding element is installed.

9. Push each element downstream into the shell as it is installed until the element is fully engaged with the downstream head. If the elements are hard to push, make sure the brine seal is properly installed and you are pushing from the upstream end. When all the elements are fully inserted into the vessel, install the upstream head with adapter fitted if required.

10. Reconnect piping to vessel as described in Remaking Pipe Connection to Eng Plug.

11. Pressurize the vessel. Inspect for leaks at connections to the vessel and all around the vessel itself. If any leaks occur, release pressure from the vessel and tighten the fittings as necessary. Then pressurize vessel and check for leaks again.

**CAUTION:** DO NOT tolerate any leaks. Leaks can result in corrosion and eventual catastrophic vessel failure.
Head Disassembly

**NOTE:** Head Rebuilding should be performed in a clean work area. Dust or dirt on O-rings or other parts can scratch inner surfaces, with subsequent leakage.

1. Using a small screwdriver or similar tool remove the Plug Seal. However do not damage the sealing surface in any way as it may lead to leakage.

2. Remove circlip from its groove in the Permeate port. Take care not to scratch the hard-anodized surface of the bearing plate.

3. Pull permeate port out of the Head Assembly.

4. Rotate sealing plate relative to bearing plate and separate the two.

5. Push Feed/Concentrate Port further into the bearing plate, remove the two Port Retainer segments, then pull Feed/Concentrate Port out of the Bearing Plate.
6. Check all head components as shown in the picture Head Component Identification - 40E100.
Head Assembly

1. Use only head components in as-new condition. Use new O-rings each time the head is assembled.

2. Cover O-rings with a thin even layer of Parker Super O-Lube™ silicon lubricant or the lubricant recommended by your element supplier.

3. Assemble one Port Seal into the groove in the Sealing Plate and the other into the groove on the small end of the Permeate Port. Insert Adapter seal into the groove at the large end of the Permeate Port.

4. Hold Bearing Plate with the 3 ½” diameter stepped surface facing towards you. From this side, insert the smaller machined end of the stainless steel Feed/Concentrate Port through the larger outer hole.

5. Holding the port in place, install the Port Retainer set into the groove in the machined end of the port. Pull port back until retaining ring set bottoms in the Bearing Plate recess.

6. Holding the Bearing Plate and Feed/Concentrate Port firmly together, press the Sealing Plate on to the machined end of the Feed/Concentrate Port so that the two pairs of holes line up.

7. Assemble the Permeate Port through the center hole in the Sealing Plate, align the Permeate port pin with the Sealing Plate alignment hole and press fully into position.

8. Snap the Retaining ring into the groove in the Permeate Port, up against the face of the Bearing Plate.

9. Examine the assembly to ensure that the mating faces of the Sealing and Bearing Plate are in complete contact. If they are not, disassemble the head and start over.

NOTE: Glycerine is a commercially available lubricant that will not foul elements. However, silicon lubricant is recommended for this application.

NOTE: The 1/8” blind hole in one surface of the Sealing Plate must be on the side facing away from the Bearing Plate.
Installing the Bearing Plate and Sealing Plate

10. When head is correctly assembled, insert the Plug Seal O-ring into the groove on the outside diameter of the Seal Plate.
11. Protect heads from contamination until ready to assemble into the vessel(s).

Refurbishing Parts

Plastic parts: examine for cracking, softening or discoloring. This may indicate chemical attack of the material. Defective parts must be replaced. Alternate materials may be required. Contact your supplier or Pentair Water for assistance.

Metal parts: check for corrosion, scratches, dents, cracks or other damage to insert ring and spiral retaining ring.

Carefully inspect each component for any damage that could affect structural strength or sealing properties. The following examples show some of the situations in which parts should be replaced.

- Bearing Plate - hard-anodized surface removed at any point or corroded
- Sealing Plate - cracked, softened or distorted
- Feed/Concentrate Port - bent or distorted
- Permeate Port - cracked, softened or thread damaged

Refurbishing Shell

1. Using a fine wire brush, remove any large deposits from Retaining Ring groove in the vessel.
2. Using a medium or finer grade of ScotchBrite™ and mild soap solution, clean the inside of the vessel at least 4 inches in from each end.
3. Use clean water to rinse away all loosened deposits and soap residue.
4. Examine inside of the vessel for scratches, gouges or other imperfections that could prevent proper sealing. If such areas exist and leaks are observed when the vessel is placed back in service, the shell may need to be replaced.

Refurbishing Other Parts

1. Remove any large deposits from metal parts using a wire brush.
2. Scrub the entire surface with medium grade ScotchBrite™ until all contaminants are removed.
3. Rinse parts clean with fresh water and dry.
4. Inspect all parts for serviceability as specified above.

Remaking Pipe Connections to End Plug

1. Use a wire brush to remove all foreign matter from threads on pipe fittings.
2. Scrub the entire surface with medium grade ScotchBrite™ until all contaminants are removed.
3. Rinse parts clean with fresh water and dry.
4. Inspect all parts for serviceability as specified above.

NOTE: If the head has to be reoriented to attain suitable port positions, head will have to be removed and reinstalled as described in Head Assembly section.

NOTE: Minor dings or scratches on hard anodized aluminum surfaces may be temporarily protected with epoxy paint. However, since catastrophic failure can result if corrosion occurs, damaged parts should be replaced with new ones as soon as possible.
Part Replacement
Replace all parts that cannot be restored to as-new condition. Replace any parts showing signs of structural damage or corrosion.

**CAUTION:** Use of components that are damaged by corrosion can result in catastrophic failure.

Seals should be replaced necessarily, each time the vessels are serviced. Any parts that need to be replaced are available from your supplier or from Pentair.