PENTAIR

CODELINE®

40E100 RO Pressure Vessels
User's Guide

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... read, understand and follow every guideline in this bulleting. Failure to take every precaution may void warranty and could result in catastrophic failure.

Do... 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.

Do... verify that head locking components are properly placed and secured.

Do... inspect end closures regularly, replace deteriorated components and correct causes of corrosion.

Do... follow membrane element manufacturer's recommendations for loading elements into the vessel (see Replacing Elements).

Do not... operate vessel at pressures and temperatures in excess of their specific rating.

Do not... service any component until you verify that pressure is fully relieved from the vessel.

Do not... use corroded components. Use of such components may result in catastrophic failure.

Do not... pressurize vessel until after visually inspecting to ensure that the spiral retaining ring is correctly installed.

Do not... tolerate leaks or allow end closures to be routinely wetted in any way.

Do not... use excessive silicone lubricant.

Do not... pressurize vessel without element in place unless permeate ports are plugged internally.

Do not... overtighten fittings in ports.

Do not... Use petroleum products on Noryl components.

Do not... Allow petroleum or silicone based products to come in contact with membrane elements during installation or maintenance.

Do not... Use the vessel at negative pressure

Do not... 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.

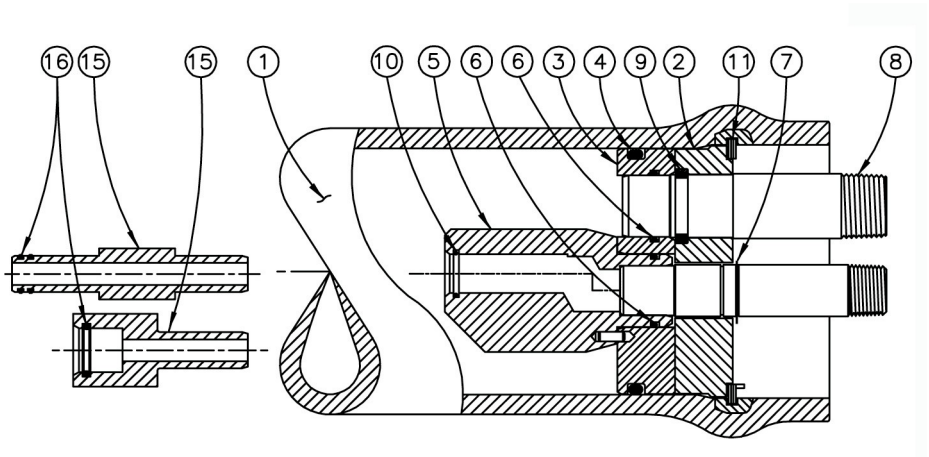
This guide should be used in conjunction with drawing number 518015.

When properly installed and maintained, 40E100 vessels can be expected to provide safe operation over a long service life.

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.



Dwg Ref	Qty Per	Item #	Description	Materials
Shell				
1	1		Shell	Filament Wound epoxy/glass composite. Head locking grooves internally wound in place. Shell exterior coated with white high gloss polyurethane paint.
Head				
2	2	47471	Bearing Plate	6061-T6 hard anodized Alum. Alloy
3	2	50481	Seal Plate	PVC Thermoplastic (gray) - 120 F Max
4	2	45317	Plug Seal	Ethylene polypropylene O-ring
5	2	47469	Permeate Port	PVC Thermoplastic (gray)
6	2	45299	Permeate Port Seal	Ethylene polypropylene O-ring
7	2	45244	Port Retainer	PH 15-7 MO SST
8	2	47472	Feed/Conc. Port	6% MO SST
9	2	50489	Port Retainer Set	CF8M Cast SST, 2 piece set
10	2	45294	Adapter Seal	Ethylene polypropylene O-ring
Head Interlock				
11	2	45260	Retaining Ring	316L SST
Element Interface				
15	2	As Required	Adapter	Engineering Thermoplastic
16	2	As Required	PWT Seal	Ethylene polypropylene O-ring

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 vessels as follows:

1. Remove contaminants using a small wire-brush or suitable abrasive (such as medium-grade ScotchBrite™)

Cleaning inside the vessel

2. Flush away loosened deposits with clean water.

Removing the Head

The head assembly is shown in figure 1, pg 2.

Remove head as follows:

Disconnect Permeate Piping

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

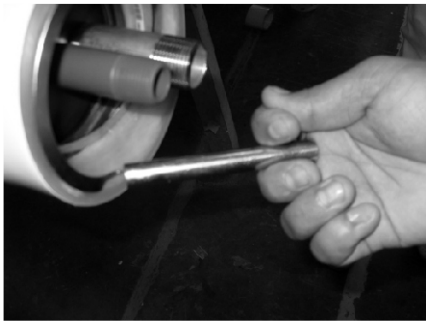
CAUTION

DO NOT tap on fittings as this could damage the ports.

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 LPS™ or WD40™, being careful to avoid any contamination of a membrane element.



Retaining Ring Removal Tool

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.

Opening The Vessel (contd...)

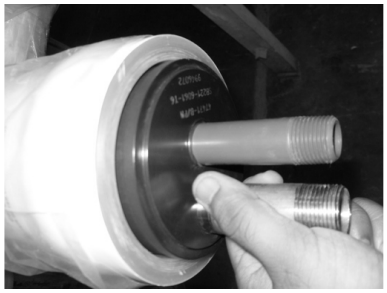
2. Remove the 4" retaining ring from the stainless steel groove in the shell by rotating your finger behind the ring as it continues to exit the groove.

Removal of Retaining Ring

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.



Removal of Head Assembly

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.

To replace elements, proceed as follows:

Removing Elements

1. Remove heads from both ends of the 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.

2. Push element(s) out of vessel from the upstream end.
3. 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, page 10).
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 in from the chamfer

CAUTION

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

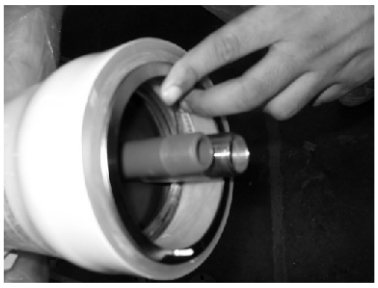
4. Install adapter if required into one end plug. At downstream end of vessel, orient end plug ports into desired position and push plug fully into vessel. A sharp, forceful thrust may be needed to enter plug seal into the vessel bore.

Installation of the End Plug Assembly into the vessel

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. 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.



Inserting Retaining Ring into the groove

Replacing Elements (contd...)

6. 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.

Retaining ring seated in the grooove

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

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

CAUTION

System malfunctions and element damage may result if elements are installed in the wrong direction.

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

NOTE

On some systems it may be easier to install the piping connections before the head is installed.
If so, please proceed with Steps 10 & 11.

10. 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 the adapter fitted if required, as described in paragraphs 4 through 6 on page 5 & 6.

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

12. 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.

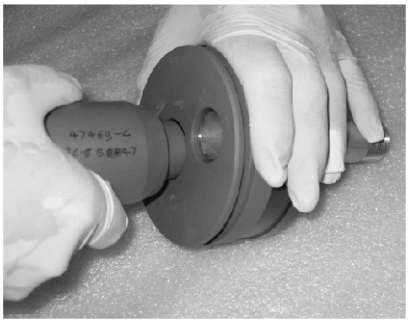
1. Using a small screwdriver or similar tool remove the Plug Seal. However do not damage the sealing surface in any way as it may lead to leakage.

Removal of the Plug Seal

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

Removal of the Circlip

3. Pull permeate port out of the Head Assembly.



Removal of the Permeate port from the End Plug Assembly

CAUTION

During the next step, one or both Port Retainer halves may fall out.

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

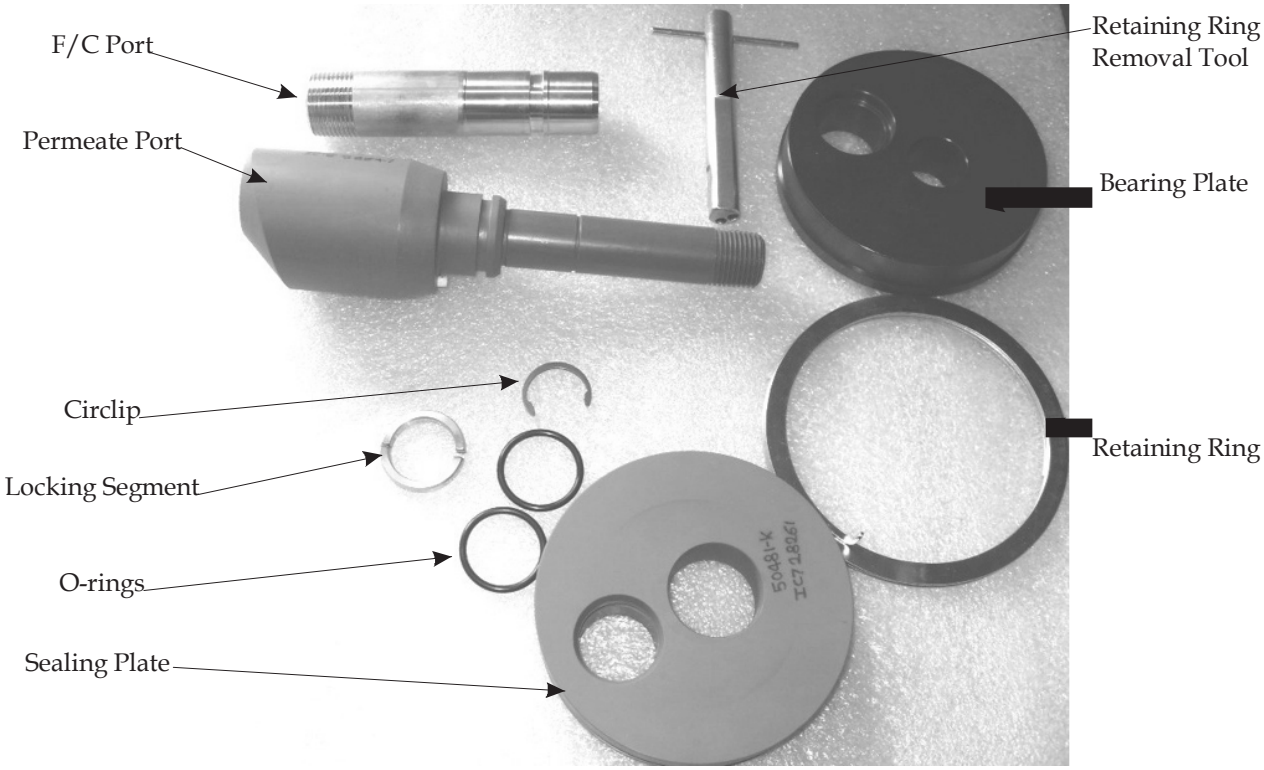
Separate the Sealing plate and the Bearing plate

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.

Removal of F/C Port from the Bearing Plate

6. Check all head components as shown in the picture Head Component Identification - 40E100 on page 8.

Head Disassembly (Contd...)



Head Component Identification (40E100) - Head Disassembled

Head Assembly

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

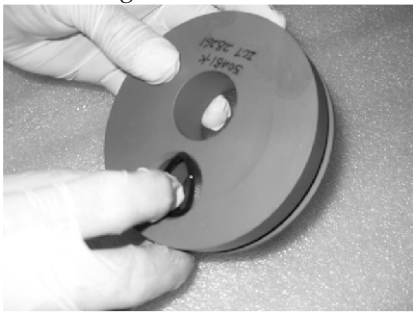
2. Cover O-rings with a this even layer of Parker Super O-Lube™ silicon lubricant or the lubricant recommended by your element supplier.

Lubricating Plug seals and O-rings

NOTE

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

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.



Inserting Permeate Port seal

Head Assembly (Contd...)

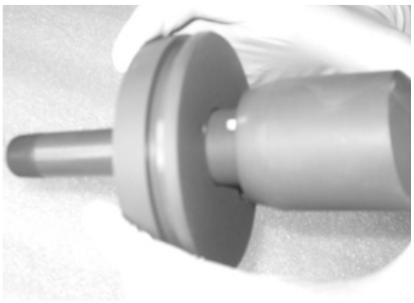
4. Hold Bearing Plate with the 3 ½" diameter stepped surface facing towards you. From this side, insert the smaller machined end of the stainless steel Feed/ Concentrate Port through the larger outer hole.
5. Holding the port in place, install the Port Retainer set into the groove in the machined end of the port. Pull port back until retaining ring set bottoms in the Bearing Plate recess.

Installing of F/C Port & Port Retainer set

NOTE

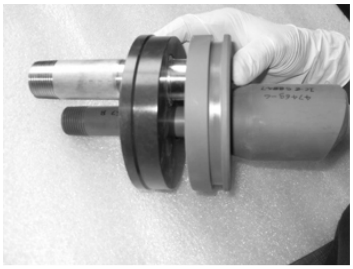
The 1/8" blind hole in one surface of the Sealing Plate must be on the side facing away from the Bearing Plate.

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.



Installing Permeate Port into the Sealing plate

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, dis-sassemble the head and start over.



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.

NOTE

Minor dings or scratches on hard anodized aluminium 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.

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
Retaining Ring - chipped, scratched, corroded or bent
Port Retainer - bent or damaged

Refurbishing Parts (Contd...)

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 Scotch-Brite™ 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 Scotch-Brite™ 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.

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 Water.