

# CodeLine™ 40A Series RO Pressure Vessel

## — 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

- |   |  |
|---|--|
| <p><b>Do...</b> read, understand, and follow every guideline in this bulletin. Failure to take every precaution may void warranty and could result in catastrophic failure.</p>             | <p><b>Do not...</b> operate vessel at pressures in excess of their specific rating.</p>  |
| <p><b>Do...</b> install in an area where a vessel or piping malfunction that results in water leakage would not damage sensitive or expensive equipment, such as electronic components.</p> | <p><b>Do not...</b> service any component until you verify that pressure is fully relieved from the vessel.</p>  |
| <p><b>Do...</b> verify that head locking components are properly placed and secured.</p>  | <p><b>Do not...</b> Use corroded components. Use of such components may result in catastrophic failure.</p>  |
| <p><b>Do...</b> inspect end closures regularly. Replace deteriorated components, and correct causes of corrosion.</p>   | <p><b>Do not...</b> pressurize vessel until after visually inspecting to ensure that both retaining rings are correctly installed and seated in their grooves.</p> |
| <p><b>Do...</b> follow membrane element manufacturer's recommendations for loading elements into vessel (see <i>Replacing Elements</i>).</p>  | <p><b>Do not...</b> tolerate leaks or allow end closures to be routinely wetted in any way.</p>  |
|   | <p><b>Do not...</b> use excessive silicone lubricant.</p>  |
|   | <p><b>Do not...</b> pressurize vessel without element in place unless permeate ports are plugged internally.</p>   |
|   | <p><b>Do not...</b> overtighten fittings in ports.</p>   |

### General Information

The 40A Series Fiberglass RO/UF Pressure Vessel is designed for continuous, long-term use as a housing for reverse osmosis and ultrafiltration elements in typical industrial water treatment systems at pressures of 300, 450 & 600 psi.

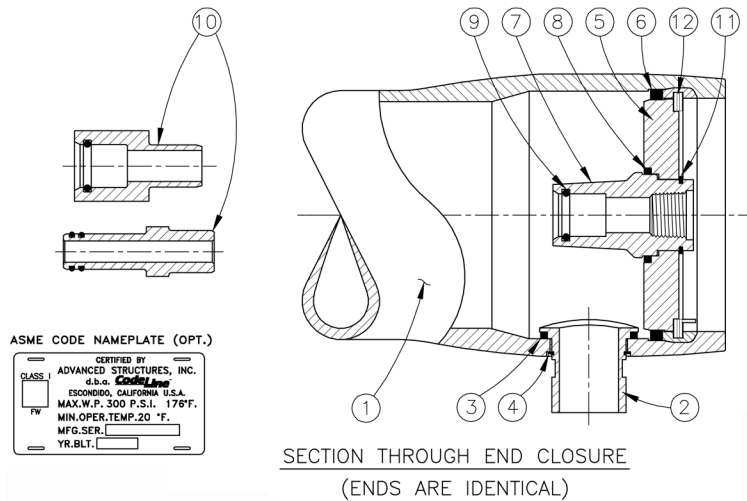
The 40A Series is designed to accommodate any make of 4-inch nominal diameter element.

The fiberglass shell can be damaged by rigid clamping, impact, scratches or abrasion. Metal parts must be maintained free of corrosion to eliminate potentially unsafe conditions due to corrosion.

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 respective engineering drawings.

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



ASME CODE NAMEPLATE (OPT.)

CERTIFIED BY	
ADVANCED STRUCTURES, INC.	
d.b.a. CodeLine	
ESCONDIDO, CALIFORNIA U.S.A.	
CLASS 1	MAX.W.P. 300 P.S.I. 178°F.
FW	MIN. OPER. TEMP. 20 °F.
MFG. SER.	
YR. BLT.	

Dwg Ref	Qty Per	Item #	Description	Materials
<b>Shell</b>				
1	1		Shell	Filament Wound epoxy/glass composite. Head locking grooves internally wound in place. Shell exterior coated with white high gloss polyurethane paint.
2	2	-	Feed/Conc. Port	316 SST
3	2	-	F/C Port Seal	Ethylene propylene - Square Cut
4	2	-	F/C Port Retainer	300 Series SST
<b>Head</b>				
5	2	45140	Bearing Plate	Fiber Reinforced Epoxy Laminate
6	2	45352	Plate Seal	Ethylene propylene - Square Cut
7	2	50898	Permeate Port	Engineering Thermoplastic
8	2	45335	Permeate Port Seal	Ethylene propylene - Square Cut
9	2	45296	PWT/Adapter Seal	Ethylene propylene O-ring
10	2	As Required	Adapter	Engineering Thermoplastic
11	2	45242	Port Retainer	300 Series SST
<b>Head Interlock</b>				
12	2	45260	Retaining Ring	316L SST

## 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

## 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 ScotchBrite™).
2. Flush away loosened deposits with clean water.

### Removing the Head

*The head assembly is shown in Figure 1.*

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(s).

### CAUTION

*DO NOT tap on fittings as this could damage parts.*

2. Lift the tabbed end of the retaining ring up 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.

When using screwdriver and pliers, pry the tabbed end of the retaining ring out of the stainless steel groove with the tip of the screw driver. 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.

3. Remove the 4" retaining ring from stainless groove in the shell by rotating your finger behind the ring as it continues to exit the groove.
4. 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.
5. Install a 1/2" NPT x 6" long nipple into the product port of the head on one end of the vessel.
6. Grasp the nipple and pull the head straight out. A small amount of side-to-side movement may be necessary to start the end plug moving. Care should be taken to avoid placing too much stress on the product port threads.
7. Repeat above procedure for the opposite end of the vessel.

## 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 CodeLine™ for clarification. To replace elements, proceed as follows.

### 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.*

2. Push element out of vessel from the upstream end.

### Inserting Elements

1. Ensure that element exterior and shell bore are in clean, as-new condition before proceeding.

(See *Refurbishing Shell*, Page 6)

2. Reinstall head assembly at the downstream end as described in *Closing the Vessel*. Make sure the smaller of the two adapters supplied with the vessel is installed in the permeate port.

3. Lubricate element seal sparingly with the manufacturer's recommended lubricant or with glycerine (a commercially available lubricant that will not foul elements).

#### CAUTION

*DO NOT lubricate element seals with a silicone-based material (such as Parker Super O-Lube™, the recommended lubricant for head seals).*

4. Insert the element with the brine seal (typically a U-cup seal) 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.*

5. Install interconnectors between multiple elements as each succeeding element is inserted.
6. Push each element downstream into shell until the elements fully engage with the downstream head. If element is hard to push, make sure the brine seal is properly installed and you are pushing from the upstream end.
7. When the elements are installed, close the vessel as described in the following section.

## Closing the Vessel

Prepare and install head assemblies as described below.

1. Refurbish or replace head components as required to ensure as-new condition. (See *Refurbishing Parts*.) The PWT O-ring should be replaced each time.
2. Cover O-rings with a thin, even layer of Parker Super O-Lube™ silicone lubricant or the lubricant recommended by your element supplier.

### Note

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

3. Remove any residual lubricant from the head and work a fresh, thin film of Parker Super O-Lube™ silicone lubricant into the outer diameter of the bearing seal plates, where it contacts the plate seal in the vessel.
4. Install the smaller PWT/adapter seal into the groove inside the end of the permeate port.
5. Install the large square-cut plate seal in the seal gland in the shell. The seal should be lubricated lightly with Parker Super O-lube™ I.D. side of seal only.
6. Insert smaller adapter in one of the heads and install this head in the downstream end of the vessel. Using both thumbs, apply equal pressure on opposite sides of end plate to force head into vessel so that the head clears the retaining ring groove.

7. 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.
8. Check that the spiral retaining ring is fully seated in groove. If it is not, remove and check for foreign materials causing the spiral ring not to fully seat.

### CAUTION

*DO NOT pressurize vessel without element(s) properly installed.*

9. Insert elements if not already installed, and insert longer adapter into the remaining head. Then install this head in the upstream end of the vessel, using technique given in steps 6 and 7.
10. Reconnect piping to vessel, as described in *Refurbishing Parts* (Page 6).

### CAUTION

*Be sure to hold feed/concentrate port with a wrench when tightening fittings.*

11. **If threading fittings into the head, avoid overtightening. Hand tight plus approximately 1/4 turn should produce a satisfactory seal.** If leaks occur on pressurization, a small amount of further tightening may be required.
12. Pressurize vessel. Inspect for leaks at connections to the vessel and all around the vessel itself. If any leaks occur, release pressure from vessel and tighten 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.*

## Refurbishing Parts

### Inspecting 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 CodeLine™ for assistance.

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

**Other parts:** examine for any damage, such as gouges, chips or cracks, that could affect structural strength or sealing characteristics. The following are some examples of defects that may require replacement of the affected part.

- Bearing/Sealing Plate and Permeate Port: cracked, discolored, sealing areas damaged (chipped or gouged), port threads stripped or cross-threaded.
- Spiral Retaining rings: are the sole means of end plug retention. Parts bent, corroded, cracked or damaged in any way must not be used. Carefully check for hairline cracks.

### Refurbishing Shell

1. Using a fine wire brush, remove any large deposits from locking ring groove in the shell.
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. Take care not to damage feed/concentrate port and its respective seal.
3. Use clean water to rinse away all loosened deposits and soap residue.
4. Examine inside of 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 Permeate Port

1. Use a wire brush to remove all foreign matter from threads on pipe fittings.
2. Apply non-hardening thread sealant or Teflon™ tape to fitting and install in permeate port. Tighten fitting a maximum one quarter-turn past hand tight; the plastic port could be damaged if fittings are overtightened.
3. Fit head and spiral retaining ring as described in *Closing the Vessel* (page 5).

### Remaking Pipe Connections to Feed/Concentrate Port

1. Follow steps 1 & 2 above. Be sure to hold feed/concentrate port with a wrench when tightening fitting. Movement of the port could damage shell and/or port.

### 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 damaged by corrosion can result in catastrophic failure.*

Seals should be replaced as necessary each time the vessel is serviced. Any parts that need to be replaced are available from your supplier or from CodeLine™.

## Shimming

1. Shut down the system and remove both of the vessels fiberglass endcaps
8. Re-start system

2. Drain the vessel

3. Check the location of the membrane column on each end of the vessel

A. You want to look at the distance that the face of the membrane is from the ramp on the counter bore of the vessel. Push the membrane column from the feed end so that the brine seal has sufficient engagement to the 4.00" dia. bore of the vessel

### NOTE

*Ease the water pressure up on start up. You don't want to damage the downstream adapter by ramming the pressure into it.*

8. Run your system and check the water quality to make sure that your seals are all in their proper places.

### NOTE

*The membrane should be flush to the counter bore ramp.*

4. Re-install the end cap on the feed end and make sure that you can get the end cap in far enough to get the spiral ring in
5. Go around to the reject end/ downstream end and remove the square head seal
6. Remove the adapter

**Flush cut membrane or Type II style adapter** - Put a shim or two on the membrane side of the adapter and re-insert the adapter into the membrane.

**Membrane with male product water tube or Type I adapter** - Leave the adapter attached to the membrane and place a shim on the end of the adapter inserted into the permeate port. Insert end cap assembly, engage the adapter and see how far you can push the head assembly into the vessel

If it can go deep, check the distance between the back of the groove on the stainless steel insert ring on the vessel and the fiberglass end cap. If you have at least .150" gap, take the head out and put another shim on. Repeat the shimming until you reach the point where you can just get the end cap and spiral locking ring to engage. (Use no more than four spacers)

7. Reinstall end cap square head seal and reinstall end cap