HYDRANAUTICS
High Performance Membrane Products
A NITTO DENKO CORPORATION

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HydraCode 8 Inch and 8.5 Inch Side Entry RO/UF Pressure Vessel Instructions

This bulletin provides guidelines for the use of HydraCode pressure vessels.

Note:

- These vessels may cause loss of life, severe bodily harm, or property damage if not correctly installed, operated and maintained. Read and understand all instructions given in this bulletin before attempting to open, operate, or service this vessel.
- Failure to follow these instructions 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 mechanic experienced in servicing high-pressure hydraulic systems open, close, and service these vessels.

Important Safety Precautions

DO

1. Read, understand, and follow every instruction in this bulletin. Failure to take every precaution may void warranty and could result in catastrophic failure.
2. 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.
3. Verify that head locking components are properly placed and secured.

4. Inspect end closures and side ports regularly, replace deteriorated components, and correct causes of corrosion.

5. Follow membrane element manufacturer's recommendations for loading elements into vessels (see Replacing Elements - Page 5).

DO NOT

1. Do Not...Operate vessels at pressures in excess of the rated pressure or at temperatures over 120°F.

2. Do Not...Service any component until you verify that pressure is fully relieved from the vessel.

3. Do Not...Use corroded components. Use of such components may result in catastrophic failure.

4. Do Not...Pressurize the vessel until visually inspecting to ensure that all interlock components (locking segments and securing screws) are correctly installed and secured.

5. Do Not...Tolerate leaks or allow end closures to be routinely wetted in any way.

6. Do Not...Use excessive silicone lubricant.

General Information

- The 8 inch and 8.5 inch HydraCode RO/UF Pressure Vessels are used as housings for reverse osmosis membrane elements for water desalination. They are available in standard and Ultrapure versions, as shown in this bulletin. Any make of 8 inch or 8.5 inch nominal diameter spiral-wound element may be used. The vessels utilize a fiberglass reinforced plastic shell for superior corrosion resistance. However, metallic parts of the vessel may be subject to corrosion, which can result in an unsafe condition.

- The fiberglass shell can be damaged by rigid clamping, badly positioned connections, impact, severe scratches, or abrasion.

- When installed and maintained in accordance with the precautions and instructions provided in this bulletin, 8 inch and 8.5 inch side entry vessels can be expected to provide safe operation over a long service life.

Installation

Even though your vessel may have been installed by others, there are a few quick checks on installation you should make before use. Check that each vessel is:

- Mounted with compliant material (cork or rubber) between the fiberglass shell and any rigid frame.
- Mounted so that the center and side entry ports are closely aligned with the manifold heads; correct causes of misalignment in any row of vessels connected to the same heads.
- Mounted using flexible type, grooved-end couplings, Victaulic ® Style 75 or equal, at side entry ports, with .125" gap between port and piping.
- Free to expand under pressure.
- Not clamped rigidly in place, no rigid pipe connections to port fittings.
- Not used in any way to support other components such as piping manifolds hanging from ports.

NOTE!

HydraCode vessels which are five (5) elements in length or longer require three (3) support points (please refer to vessel drawings # 510001, 510002, 510003, 510004). The center support point does not need to be a load bearing support, but is necessary in order to eliminate any bowing effect which would cause alignment problems.

Opening the Vessel

WARNING!

Relieve pressure from the vessel before beginning this procedure.

Note: The side entry port is permanently bonded in place. Do not hit or otherwise mistreat it.

Contamination Removal

Metal oxidation products and mineral deposits can interfere with vessel disassembly. Remove all foreign matter from both ends of the vessel using a small wire brush or suitable abrasive (such as medium-grade Scotch-Brite™). Flush away loosened deposits with clean water.

Removing the Head

Refer to Figure 1 and proceed as follows.

The head assembly consists of the bearing plate, sealing plate, head seal, permeate port with port seal and adapter seal, and port retainer.

1. Disconnect end (permeate) ports from the piping manifold.

2. Remove four socket head screws (one per locking segment).

3. Slide segments towards the centerline of the vessel and remove. (It may be necessary to push the head assembly in a slightly to allow segments to slide out). If screws are frozen, apply penetrating oil between the screw heads and the bearing plate, allow it to penetrate, and then remove screws.

CAUTION!

Do not allow oil to penetrate the membrane element. This will cause permanent damage to the elements.

4. Grasp permeate port/plug firmly and pull head assembly out. A sharp, forceful tug may be necessary to start head assembly moving. Avoid hitting head since it may jam in the vessel.

5. If the head seal does not come out with the head, remove the seal now.

6. Remove the elements as described in Replacing Elements. Check that the side port seals are in good condition. If necessary, remove the seal by piercing it with a sharp tool (a paper clip will suffice) and lift out. Install a new, lubricated seal (square section) by first pressing it in by hand, taking care not to twist the seal. Then press in fully using a blunt object such as a tongue depressor.

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 Advanced Structures for clarification. To replace elements, proceed as follows:

Removing Elements

1. Remove heads from both ends of vessel as described in Opening the Vessel.

2. On standard models, reach inside the downstream end of the vessel, grip the thrust ring and firmly pull it out of the vessel. If the thrust ring will not move easily, it may be necessary to lift the stainless steel positioning clip using a pair of flat bladed screwdrivers while pulling the thrust ring out.

3. Push the element(s) out of the vessel from the upstream end.

4. For multi-element vessels, remove the interconnector(s) and retain them for installation.

Inserting Elements

1. Examine the inside of the vessel for any damage which could affect sealing of the head or element seals.

2. Flush out with clean water.

3. Check element surface, including ATD, for any imperfection which could scratch the vessel bore.

4. Lubricate the inside of the vessel and element seals with a 50/50 mixture of glycerine and water.

CAUTION!

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

5. With the thrust ring removed from the vessel, insert a head assembly, without a head seal but with an adapter attached, into the downstream end of the vessel.

Place one locking segment into the groove at the 6 o'clock position, then pull the head back to firmly contact the segment.

6. Load the element(s) into the upstream end of the vessel with appropriate interconnectors inserted between elements, and push the element stack downstream as far as it will go.

CAUTION!

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

7. Remove the downstream head.

8. Close the vessel as described in the next section.

Closing the Vessel

If work is being done on an Ultrapure model, please note the following points on seals before proceeding with the procedure.

- For better sealing of the relatively hard TFE O-ring surface to mating surfaces, it is advisable to boil the seal in water for approximately 3 minutes immediately before assembly. If this is not done, you may experience slight leakage during the first 24 hours after system pressurization.

- Lubricate TFE seals lightly with a 50/50 glycerine/water mix.

- Avoid excessive bending of TFE seals. If the seal is bent, the outer cover may kink. Although such kinks should not unduly affect sealing properties, they should be avoided.

- Concerning the head seal, take extra care to ensure that all vessel surfaces which the seal might touch are completely smooth.

The procedure for closure should be done as follows.

1. Inspect all components and refurbish or replace as required to achieve an “as-new” condition (see Inspecting and Refurbishing Vessel). EXCEPT on Ultrapure

models, all O-rings, including adapter O-rings, should be replaced each time the vessel is closed.

2. EXCEPT on Ultrapure models, cover O-rings with a thin, even layer of Parker Super O-Lube™ silicone lubricant or equivalent. Ultrapure (TFE) O-rings should be lightly lubricated with a glycerine/water mix (approx. 50%/50%).

Note: Glycerine is a commercially available lubricant that will not foul elements. However, silicone lubricant is recommended for non-TFE applications.

3. EXCEPT on Ultrapure models, remove any residual lubricant from the vessel bore and work a fresh film of Parker Super O-Lube™ into the shell from half way up the bevel to approximately 1/2" in from the bevel. Ultrapure models require no lubrication, but extra care should be taken to ensure that the vessel entry, including groove/bevel area, is completely smooth and free of burrs and rough edges.

CAUTION!

When lubricating the vessel chamber, wear protective gloves or finger cots to prevent cuts or penetration by glass fibers.

Note: Paragraphs 4 & 5 below are for Standard models only.

4. While holding the thrust ring with the two (2) stainless steel tabs in line with the side entry port and pressing the tabs in slightly, insert the thrust ring into the DOWNSTREAM end of vessel.

5. Push the thrust ring in until the two tabs locate into the seal groove surrounding the side entry port.

CAUTION!

Make sure the tabs are located one on each side of the stainless steel side entry port. Tips of the tabs should rest on, or just clear, the port seal.

6. Fit the adapter to the permeate port. Then, while holding the assembly square to the shell axis, fit the head seal into place on the sealing plate and insert the head into the downstream end of the vessel. A sharp, forceful thrust may be needed to insert the head seal into the vessel bore.

CAUTION!

If the head is allowed to rock from side to side during installation, the head seal may become detached.

7. Install the four locking segments into the groove WITH THE STEPPED FACE OUTWARDS. Secure the locking segments with the 3/8-16 UNC X.75" long screws supplied, and tighten firmly (approximately 5 lb/ft).

WARNING!

Interlocking components must be correctly installed. Incorrect assembly or installation can result in catastrophic failure.

8. For installation of the upstream head on standard (non-Ultrapure) models, repeat steps 6 & 7.

9. For Ultrapure models, assemble as follows:

    a. As the head is assembled on to vessel, keep hand pressure applied firmly to the permeate plug to ensure proper engagement of the head with the element.

    b. Once the head is fully engaged, repeat step 7 for the upstream end.

Inspecting and Refurbishing

Refurbishing Shell

1. Using a fine wire brush or a piece of Scotch-Brite™, remove any large deposits from the locking segment groove.

2. Using a medium or finer grade of Scotch-Brite™ and a mild soap solution, clean the inside of the vessel at least 3 inches in from the groove at each end.

3. Use clean water to rinse away all loosened deposits and soap residue.

4. Examine the 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 Components

Note: Take care not to damage the hard anodized surface of aluminum parts.

1. Remove any large deposits from the metal parts (locking segments and bearing plate) using a wire brush.

2. Scrub the entire part surface with medium grade Scotch-Brite™ until all contaminants are removed.

3. Rinse parts thoroughly with fresh water and dry.

4. Inspect all parts for serviceability. Use the points in the following paragraphs as guidelines for determining replacement.

Inspecting Parts

- Plastic parts - Examine for cracking, softening, or discoloration. This may indicate chemical attack of the material. Defective parts must be replaced. Alternate materials may be required. Contact your supplier for assistance.
- Metal parts - Check for corrosion, scratches, dents, cracks, or other damage to anodized surfaces of the bearing plate and locking segments.
- 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 plate - bent, pitted or corroded at step; or anodized coating chipped or stripped.
    - Sealing plate - cracked, discolored, sealing areas damaged (chipped or gouged).
    - Securing screws - corroded and/or stripped thread.
    - Locking segments - bent, corroded, or damaged in any way.
    - Feed/Concentrate ports - deformed, corroded (especially at inner end).

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.

- All seals should be replaced each time the vessel is serviced. Parts are available from your supplier.

Head Disassembly/Assembly

CAUTION!

Wear safety glasses during snap ring removal and installation.

To Disassemble Head

1. Remove the permeate port/plug snap ring using appropriate snap ring pliers. Take care to avoid damage to the outer end of the permeate port/plug while removing the snap ring.

2. Remove the permeate port/plug by pressing it out from the small end.

3. Carefully remove the seals from each end of the permeate port (inner seal on one end, outer seal on the other end). New seals should be used each time the head is assembled.

4. Wash all components in fresh water and dry, using clean, dry compressed air, if available.

5. Check components for corrosion and other damage as described under "Refurbishing Parts". Replace any parts to attain an "as-new" condition throughout.

To Assemble the Head

1. Fit an O-ring, lubricated with Parker Super O-Lube™ or other suitable lubricant, to each end of permeate port or to seal plate on the upstream end of Ultrapure vessels. (Excess lubricant may foul membranes and should be removed. A thin, shiny coat is sufficient).

2. Press the male end of the permeate port/plug into the smaller diameter side of the sealing plate until the port is fully sealed.

3. Fit the bearing plate over the same end of the permeate port/plug with the smaller outside diameter of the bearing plate towards the sealing plate.

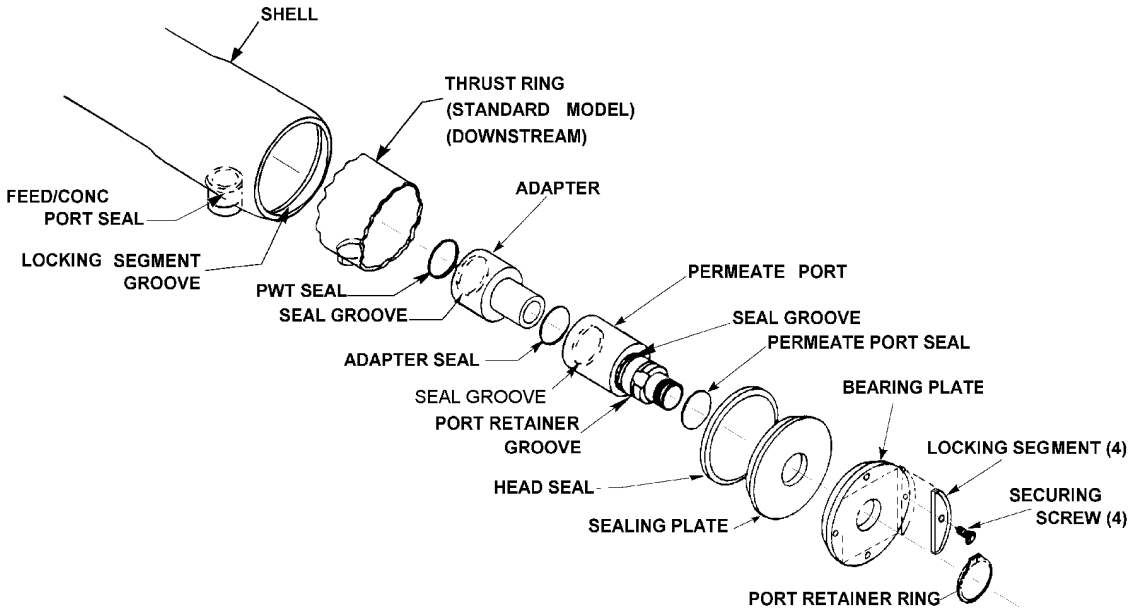
4. Fit the snap ring into the permeate port groove adjacent to the bearing plate, taking care to avoid damaging the outer end of the permeate port/plug. The head is now ready for addition of the head seal and insertion into the vessel.

NOTES:

1. Ultrapure models have an adjustable permeate plug in place of the regular permeate port at the upstream end of the vessel. The term "permeate port/plug" is used in this bulletin to indicate either arrangement as appropriate.

2. Ultrapure models use a different type of seal from those in the regular model. The Ultrapure seal consists of an O-ring encapsulated in a clear, TFE cover. Special handling for these seals, referred to as TFE seals, is indicated in this guide.

Figure 1
EXPLODED VIEW



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