CODELINE® - ECOLINE 8 INCH SERIES

UNIQUE 8 INCH SIDE ENTRY MEMBRANE HOUSING FOR RO APPLICATIONS

USER GUIDE

ARTICLE CODE: 98244

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DANGER – HIGH PRESSURE DEVICE

Incorrect Installation, Operation & maintenance of this vessel may cause loss of life, severe bodily harm, and / or property damage. Read and understand all guidelines given in this bulletin before attempting to open, service or operate this vessel.

Failure to follow these guidelines and observe every precaution may result in malfunction and could result in catastrophic failure. Misuse, incorrect assembly or use of damaged or corroded components can result in explosive release of the endclosure. We recommend that only a qualified technician experienced in servicing highpressure hydraulic systems, open, close and service this vessel.

Operation and maintenance guide

This section is a guide to proper operation and maintenance of EcoLine Series pressure vessels.

Good industrial practice must be used in applying this information to assure safe vessel use. These guidelines are not intended to relieve the user from full responsibility for correct operation and maintenance of the vessels. For technical specifications and dimensions, refer to the Engineering Drawings of each specific model. The information in all sections must be carefully followed for the vessel to provide the safe, long service life for which it is designed.

Important Safety Precautions

Do's

- Read, understand and follow every part of this section. Failure to take every precaution may void warranty and could result in explosive head failure.
- Install in an area where water leakage resulting from a vessel or piping malfunction would not damage sensitive equipment, such as electronic components.
- Install protective covering over equipment located below pressure vessels when performing maintenance.
- 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 vessel (see Replacing Elements on page no. 10).

Don'ts

- Operate vessel at pressures in excess of their specific rating.
- Service any component until you verify that pressure if 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 locking segments are correctly installed and seated in their grooves at either ends.
- Tolerate leaks or allow end closures to be wetted in any way.
- Allow petroleum or silicone based products to come in contact with membrane elements during installation or maintenance.
- Use petroleum products on Noryl components.
- Pressurize vessel without element in place, unless permeate ports are plugged properly.
- Overtighten fittings in ports.
- Stand or climb on the pressure vessels, or the feed / concentrate or permeate ports.
- Allow force in excess of 15 lbs to be applied laterally to feed/concentrate or permeate ports.
- Use vessel at negative pressure.

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Preface

The EcoLine Series
Family of Vessels

The EcoLine Series is a standardized family of fiberglass pressure vessels designed for continuous, long-term use as housings for reverse osmosis, nano-filtration, ultra-filtration and micro-filtration membranes. Any make of an eight-inch diameter spiral-wound membrane element is easily accommodated.

The EcoLine Series are unified in design and have maximum number of parts in common. Each model has the appropriate strength and materials of construction to provide years of continuous use in typical service when properly maintained. Each model is available in lengths to house from one to eight 40-inch long membrane elements. One to Five membrane elements of 60-inch length, can also be accommodated.

The EcoLine Series is designed and built in accordance with the Pentair standards and hydro tested at 1.5 times the design pressure.

Each model in the EcoLine Series has passed rigorous qualification tests which require that vessels not burst at less than four times their design pressure. Safe use is further assured in that vessels will not fail catastrophically; overpressure is relieved by weeping through the fiberglass shell. Also, every production vessel is hydro-tested to verify structural integrity.

While undertaking regular maintenance / repair / replacement of a pressure vessel it may be necessary to remove the pressure vessel from a bank. Also ensure sufficient spares are available for replacement. Care must be taken in installation / removal of the vessel to avoid damage to the shell. Damage to the shell can result in catastrophic failure and possible injury to personnel. Any corrections or recommendation for improvement for this manual should be addressed to:

CodeLine® Division
Pentair Water India Pvt. Ltd.
L/52-55, Verna Industrial Area Verna,
Goa – 403 722. INDIA
Tel: 91-832-2883300
Fax: 91-832-2883312

Installation notes

Even though your vessel may be installed by others, there are few installation checks that you should make before system start-up. Vessels must be installed correctly to ensure safe use and long service life.

- Check that vessels are mounted on horizontal support frame using compatible black urethane saddles with hold-down straps snug, not tight.
- Check that each vessel is free to expand under pressure, shell is not rigidly clamped in place, and piping to vessel is not connected using rigid connections.
- Check that vessel does not support any other component; that piping manifolds are separately mounted, and that interconnection piping is self supported

WARNING: Failure to allow expansion in diameter or length will result in vessel damage.

If you have any question about the installation of vessel in your unit, contact your supplier.
For installation guidelines, refer to page no. 23-26.

Models	80-300	80-450
Max Operating Pressure (PSI)	300	450
Operating Temp. Range (degree F)	20 - 120	20 - 120
Factory Test Pressure (PSI) (1.5X)	450	675
Prototype Min. Qualification Pressure (PSI)	1200	1800
Engineering Drawing No.	99196	99197

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Pre-pressurization checklist

Membrane elements

- ☐ Installed per manufacturer's recommendation.
- ☐ Feed flow direction correctly noted and elements correctly oriented.

Head assembly interlock

- ☐ Retaining Ring groove at each end of the shell is clean, free of corrosion and / or delamination with outboard face of groove true and is in sound condition.
- ☐ All components in as-new condition, clean and free of damage or corrosion.
- ☐ Retaining Ring is fully seated in the vessel Retaining Ring groove.

Element interface

- ☐ Adapters installed at both ends and element column.
- ☐ Thrust cone installed downstream (concentrate or brine end) of the element column.

Head

- ☐ All components in as-new condition clean and free of damage or corrosion.
- ☐ All components are properly assembled with new, freshly lubricated seals.
- ☐ Permeate port locking ring/nut installed.
- ☐ Head marked with proper pressure rating for system.

Piping connections

- ☐ Properly aligned (strain free) and secured.
- ☐ Leak free.

Assembly by: _____ Date Assembly: _____
Checked by: _____ Date of Inspection: _____
The following vessels listed by serial number below were serviced under this checklist:

_____ _____ _____ _____ _____

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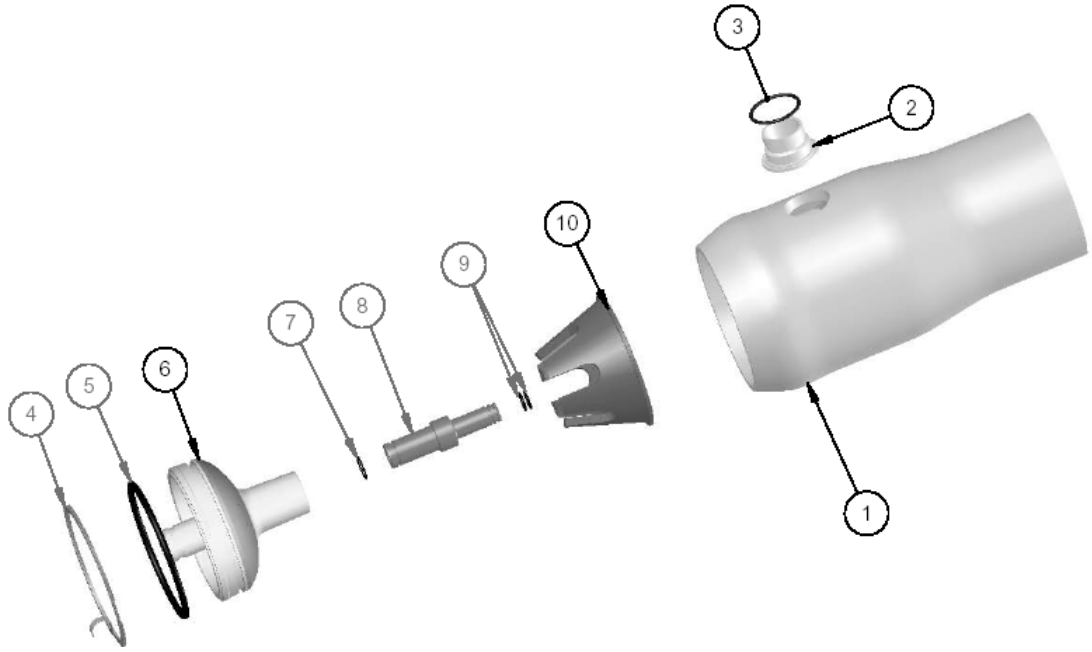
COMPONENT IDENTIFICATION
EcoLine – 80-300 & 80-450



Dwg Ref	Qty.	Description	Material	80-300 Part number	80-450 Part number
1	1	SHELL	Filament Wound Epoxy/Glass composites – Head Locking grooves integrally wound in place.	ORDER SECTION	ORDER SECTION
2	2	F/C Port	316L Stainless Steel / Equivalent	98024	98024
3	2	F/C Port Seal	Ethylene Propylene	96077	96077
4	2	Spiral Ring	316 SST	47336	47336
5	2	Head Seal	Ethylene Propylene – O – Ring	96000	96000
6	2	Elliptical Head Assy.	Engineering Thermoplastic.	96668	96669
7	2	Adapter Seal	Ethylene Propylene –O – Ring	52245	52245
8	2	Adapter	Engineering Thermoplastic.	A/R	A/R
9	4	PWT Seal	Ethylene Propylene – O – Ring	A/R	A/R
10	1	Thrust Cone	Engineering Thermoplastic.	97014	97014
11*	3**	Strap Assy.	304 Stainless Steel – PVC Cushion	45042	45042
12*	3**	Universal Saddle	Engineering Thermoplastic.	52169	52169
13*	4	Strap Screw	5/ 16-18 UNC, 18-8 Stainless Steel	46265	46265
* Not shown in above cross section view					
** 2 each furnished with length code 1, 2 & 3. 4 nos. Strap Screws furnished for length codes 1, 2 & 3					

Opening the vessel
STEP-BY-STEP GUIDE

Step 1. Relieve Pressure

1. Shut off all sources of pressure and relieve pressure from the vessel, following the system manufacturer's recommendations.

Step 2. Disconnect Permeate Port

1. Disconnect permeate piping as required at nearest convenient joint, being careful not to place undue stress on the permeate port(s). Caution: DO NOT tap on fittings as this could damage the ports.

Step 3. Examine End Enclosure

1. Examine enclosure of vessel for deposition. Impurities and deposits can interfere with vessel disassembly. If any is evident, proceed as follows:

a) Loosen any deposits with a small wire brush and / or a medium grade piece of ScotchBrite™ .
b) Flush away loosened deposits with clean brush.

Loosening deposits

Step 4. Removing Head Retaining Ring

1. No special tools are required for this operation. Engage your fore finger in the end tab of the retaining ring, lift it up and out of the stainless steel groove in the shell.

Lifting end of retaining ring out of groove

2. Remove the retaining ring from the groove in the shell. This is accomplished by running your fingers behind the retaining ring as it continues to exit the groove.

Removing the retaining ring from the groove

Step 5. Removing Head Assembly

A. Removing head assembly

1. Using a mallet tap the Head Assembly lightly. Do not use a metal component to tap the Head Assembly.
2. Hold the permeate port and rock the Head Assembly back and forth
3. Carefully rock the head assembly back and forth to release the seal. (Care should be taken to avoid placing too much stress on the permeate port)
4. Once the head seal is broken, pull straight outward to remove the head assembly from the vessel.

Removing Head Assembly

NOTE It may be necessary to rock the head slightly and / or tap the head inboard to break head seal bond.

Repeat previous procedure for the opposite end of the vessel.

WARNING Read all guidelines in this section before attempting to open the vessel. Do not attempt to service any component without first verifying that vessel PRESSURE is fully relieved from the vessel. Attempting to remove any component before pressure is relieved may result in EXPLOSIVE release of the head.

Replacing elements

IMPORTANT Read all parts of this section before replacing elements. These procedures are provided for general information only. Elements should be installed in accordance with the element manufacturer's recommendations. Always remove and install elements in the direction of feed flow. The feed end (upstream end) is the end plumbed most directly to the pump. A record of element serial numbers and locations should be made and checked during loading. Do not scratch or damage vessel bore when removing or installing elements.

Preliminary Steps

Do not proceed with step by step instructions until…

1. All pressure has been relieved from the vessel, following system manufacturer's recommendations.

2. Both heads have been removed from vessel following step by step instructions in the Opening Vessel section.

Step 1. Remove Element Interface Hardware.

1. Remove thrust cone from downstream (concentrate) end.

2. Remove adapters from elements at each end.

Step 2. Element Removal

1. Remove elements from the vessel following element manufacturer's instructions. Clean off any excess lubricant from vessel inside diameter before removing elements.

Examining for scratches

Step 3. Element Loading

1. Examine the inside diameter of the vessel for scratches or imperfections that may affect sealing capability of head or element seals. Corrosion deposits or other foreign matter, including any excess lubricant, should be removed as described in Section – Closing the Vessel.

2. Flush out the vessel with clean water to remove any dust and debris.

3. Examine membrane element surfaces for any imperfection which could scratch the vessel bore. Pay particular attention to edges of anti-telescope device (ATD/brine seal carrier).

4. Using an approximate 50% mixture of glycerin in water, lubricate the inside of the vessel. This may best be accomplished using a suitably sized swab soaked in the mixture. This procedure will ease membrane element loading and reduce chance of scratching the vessel bore.

NOTE If the brine seal is not installed on the element and the element supplier does not specify otherwise, a brine seal should be placed on the upstream end of the elements. Open side of a seal must face upstream.

5. Load the first element into the upstream end of the vessel. Leave a few inches of the element projecting from the vessel to facilitate interconnection to the next element.

6. Apply a light film of a non-petroleum based lubricant, such as Parker Super O-Lube™, to the interconnector O-ring. (The amount of O-Lube should be just enough to give a luster to the O-ring. Excess O-lube must be removed to prevent possibility of element contamination).

7. Assemble the interconnector to the loaded element.

8. Line up the next element to be loaded and assemble it to the interconnector already assembled on the first element.

9. Push both elements into the vessel until a few inches are projecting from the vessel. Repeat loading process until all elements are installed.

10. When the final element is installed, push the element stack forward until the face of the first (downstream) element is just short of counter bore ramp.

CAUTION Maintain element alignment carefully during assembly procedure. Do not allow element weight to be supported by interconnector.

Mis-alignment can result in damage to interconnectors or permeate tubes or to element outer surface.

Take care to avoid pushing elements too far as it can be difficult to push the stack in a reverse direction.

Step 4. Install Element Interface Hardware

1. Assemble adapter to element permeate tube at each end of vessel. (Connect the central (permeate) tube of the membrane element stack, with an adapter on each end, to the permeate port in the head at both ends of vessel. Pressurizing vessel without both adapters installed could result in explosive head failure)

2. Install Head Seals.

3. Install the thrust cone over the permeate port on the head assembly at the downstream (Concentrate) end of the vessel.

   (Serious damage may result if the thrust cone is not installed in the correct location).

Installing Thrust Cone

Closing the vessel

WARNING Read all guidelines in this section before attempting to close the vessel.

CHECK THE HEAD ASSEMBLY FOR CRACKS / IMPURITIES AS DESCRIBED IN OPENING THE VESSEL SECTION. CRACKED PARTS CAN RESULT IN CATASTROPHIC FAILURE. Do not pressurize vessel until after visually inspecting to ensure that retaining ring is fully seated.

Never attempt to repair a fiberglass shell.

Preliminary Steps

Do not proceed until…

1. Elements and adapters have been installed clean each end of the vessel inner surface in the vessel following guidelines in the upto 8” from each end of the vessel. Replacing Elements section.

2. Head has been checked for correct component assembly by following step-bystep instructions in the Head Rebuilding section.

3. Vessel has been shimmed to prevent replaced. movement of the membrane elements if required. See Trouble shooting section for a description of when shimming is required.

Cleaning inside the vessel

Step 1. Inspect Inner Shell Surface

1. Inspect the vessel inner surface for any corrosion deposits or other foreign matter. If any are found, clean the surface as follows: Using a medium or finer grade of ScotchBrite™ and a mild soap solution, clean each end of the vessel inner surface upto 8” from each end of the vessel. Rinse away all loosened deposits from the shell inside surface using clean fresh water.

2. Inspect the vessel inside surface for scratches or other damage that could cause leaks. Vessels that leak must be replaced.

3. Inspect Feed/Concentrate port seals and attachments for internal and external damage or deterioration.

Step 2. Shell & Head Lubrication

1. Work O-ring lubricant into shell area behind the retaining ring groove and approximately ½” into the vessel I.D.

2. Ensure entire head seal is covered with a thin layer of O-ring lubricant, with no dirt or dust contamination.

WARNING Any remaining lubricant should be cleaned from the vessel bore before applying fresh lubricant. Glycerine is a commercially available lubricant that will not foul membranes.

** Contact Pentair Water for guidance if damage to the vessel’s internal surface or Feed/Concentrate port, seals or attachments are discovered during inspection.*

Step 3. Install Head

1. Hold the head assembly square to the axis of the shell by grasping the permeate port. Slide it straight in until a slight resistance is felt.

2. Grasp tightly and push the head in as far as it will go. (A sharp, forceful thrust or may be light tapping with a mallet may be necessary to enter the head into the vessel bore). When the head is correctly positioned, the locking groove will be exposed.

Installing Head Assembly

NOTE The permeate piping should be designed in such a way that there is no excess stress on the permeate port.
Excessive stress on the permeate port might lead to cracking and/or explosive failure of the permeate port.

Step 4. Install Head Interlock

1. Carefully wipe out any debris or moisture from the head Retaining ring groove. The groove must be clear and dry before proceeding.

2. With the head assembly installed in shell, place the tip of the head Retaining ring in the engineering thermoplastic groove. (The non pull tab end)

3. Begin pushing the retaining ring into the groove as you rotate your hand around the I.D. of the shell.

Installing Head Retaining ring

4. Continue until the entire retaining ring is installed in the groove.

5. Verify that the retaining ring is fully seated in the groove before proceeding.

CAUTION Incorrect assembly or installation can result in EXPLOSIVE HEAD failure.

CAUTION Do not create excessive stress on the permeate port connections

DO NOT PRESSURIZE THE VESSEL WITHOUT ELEMENTS INSTALLED.

Do not pressurize vessel until verifying that the Head Retaining Ring is properly installed.

Step 5. Reconnect Permeate Piping

1. Reconnect manifold piping to the vessel Permeate port. Piping connections to the permeate should be using flexible IPS grooved coupling.

Step 6. PRE_PRESSURIZATION CHECKS

It is vitally important that the following checks be carried out before any attempt is made to pressurize the vessel It is recommended that the Pre-Pressurization Checklist (Page-06) be used to systematically verify that all steps have been performed.

HEAD ASSEMBLY

Verify the following at each end of the vessel:

1. Head assembly is in good condition, with no evidence of damage. See the sections on Head Rebuilding and Maintenance.
2. Head retaining Ring is properly placed.

MEMBRANE ELEMENTS

Verify that…

1. Elements are installed in the vessel.
2. Element adapters are installed at each end of the vessel.
3. Thrust cone is installed at downstream end of the vessel.

PIPING CONNECTIONS

1. Check all piping connections to ensure that they will provide a leak-free seal.

Step 7. Pressurization

1. After following the above pre pressurization checks, pressurize vessel in accordance with element manufacturer's specifications.

2. Vessels should be filled slowly to assist trapped air in escaping.

3. Vessels should be pressurized slowly to avoid damage to membrane elements and vessel components.

Head – dis-assembling & assembling

NOTE Read all guidelines in this section before attempting to rebuild the head.

Head rebuilding should be performed in a clean work area. Dust or dirt on O-rings or other parts can scratch inner surfaces and cause subsequent leakage.

Replace any components not in "as-new" condition. Re-using corroded or damaged components can result in explosive head failure.

Single Piece Engineering Thermoplastic Head

Preliminary Steps

Do not proceed with step by step guidelines until…

1. All pressure has been relieved from the vessel, following system manufacturer's recommendations.

2. Head has been removed from the vessel following guidelines in the Opening Vessel section.

To dissemble head

Step 1. Removing Adapter

1. Remove the Membrane Adapter from the permeate port. Grasp the end of the adapter in one hand and the permeate port in the other and pull them apart.

Removing the Adapter

2. Remove the O-ring(s) from the adapter.

NOTE It may be necessary to twist the two parts in opposite directions to break a seal between them.

NOTE A small screwdriver or similar tool may be used to remove the O-rings. However, do not damage the sealing surfaces in any way or leakage may result.

It is recommended that all seals be replaced each time the head is installed.

Step 2. Removing Head Seal

1. Using a small screw driver or similar tool remove the Head Seal. Care must be taken not to damage the sealing surface in any way as it may lead to leakage.

Removing the Head Seal

Component Cleaning and examination

Step 1. Wash Components

1. Wash all components in fresh water.

2. Blow components dry with compressed air, if available. Otherwise wipe dry with a dry, lint-free cloth.

CAUTION Read all guidelines in this section before making any decisions on components structure and treatment.

This section is intended only to provide guidelines in dealing with cracking or component damage. In combination with good industrial practice, these guidelines provide a basis for safe system operation.

Any condition not covered in this section should be referred to Pentair Water.

Step 2 Initial Component Inspection

1. Examine all components for any damage that could affect structural strength or sealing properties.

2. Replace any parts considered to be structurally unacceptable.

CAUTION Feed and Concentrate ports and attachments to the shell must be carefully inspected to ensure that connections and sealing materials are sound and tight. Any questions or evidence of deterioration of these areas should be referred to Pentair Water Engineers.

Other than head seals, adapter seals & PWT seals replacement, field repair should not be attempted by user maintenance personnel without first contacting the manufacturer for guidance.

The following example indicates when replacement is required.

A. Permeate port stripped or over-strained.

B. Head Assembly cracked or distorted (possibly from being dropped or hit).

C. Retaining Ring bent or damaged.

Any other details considered to be a potential problem should be referred to Pentair Water. If any component is cracked, softened or discoloured, it may indicate a chemical resistance problem. These components must be replaced. Alternate materials may be required in these applications. Contact Pentair Water for a solution.

Step 3. Evaluating Corroded Metal Components
This procedure applies to the following parts:

A. Retaining Ring
1. Examine these components for corrosion. For any components not in "as-new" condition, proceed as follows:
A. Loosen any large deposits with small wire brush.
B. Place components in shallow container of soapy water and scrub entire surface with medium grade ScotchBrite™ until all corrosion is removed.
C. Rinse components clean with fresh water.
D. Blow components dry with compressed air, if available.
E. Re-examine components for damage that could affect structural strength or sealing properties. Any components not in "as new" condition must be replaced.
F. Inspect components for any condition that might have promoted corrosion, (e.g. external damage, inappropriate material selection, etc.)

CAUTION This procedure for evaluating corroded components is to be used on any corroded metal parts. If this fails to bring any component to "as-new" standards, the part must be replaced.

Step 4. Removing deposits from Engineering Thermoplastic Components

CAUTION The following procedure should be used on all Engineering Thermoplastic Components contaminated by minerals or other foreign matter. If any component cannot be brought to "as-new" standards, it must be replaced.

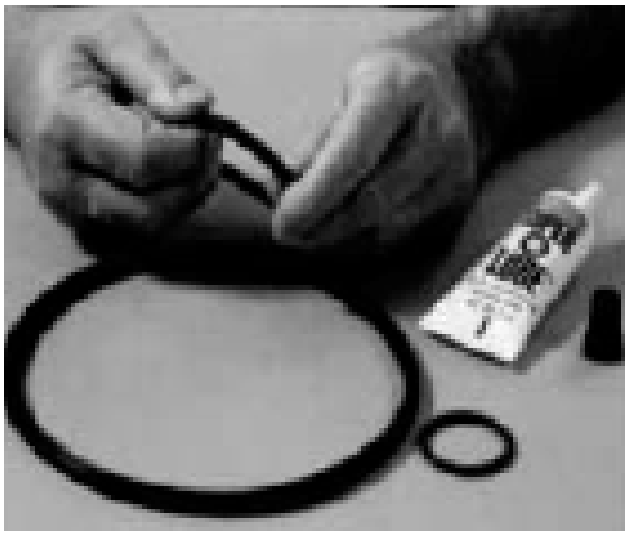
This procedure applies to the following components:
A. Single piece Head Assembly
B. Adapter
C. Thrust Cone

1. Examine all plastic components for mineral deposits or other foreign matter. If any are found, proceed as follows:
A. Place components in shallow container of soapy water and scrub entire surface with medium grade ScotchBrite™ until all foreign matter is removed.
B. Rinse components clean with fresh water.
C. Blow components dry with compressed air, if available.
D. Re-examine components for any damage that could affect structural strength or sealing properties. Any components not in "as-new" condition must be replaced.

To Re-Assemble Head

WARNING Head must be carefully assembled following these instructions. Incorrect assembly can result in CATASTROPHIC failure.

Step 1. Lubricate and Install Seals



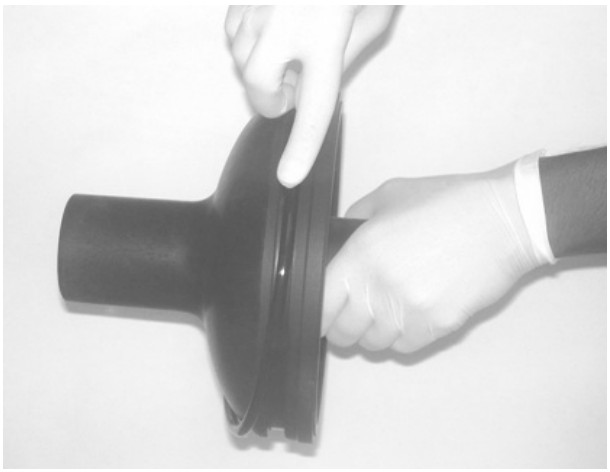
Lubricating Head Seals & O-rings

1. Lubricate and Install permeate port seal in the inner groove of the elliptical head assembly.

2. Lubricate and Install Head Seal on the outer groove of the elliptical head assembly.

3. Lubricate and install Adapter seal on the permeate port end of the Adapter.

4. Lubricate and Install PWT seal on the product water tube end of the adapter.



Installing Head Seal

CAUTION HIt is recommended that all seal be replaced each time the head is assembled. A seal replacement kit is available from Pentair Water. Lubricate seals sparingly, using non petroleum based lubricants, i.e. Parker Super O-lube®, Glycerin or suitable silicone based lubricants. (Silicone based lubricants, correctly used, will ease head assembly and disassembly). (Glycerin is a commercially available lubricant that will not foul membranes).

Preventive maintenance

Prevention of corrosion and cracks is essential for the maintenance of safe operating conditions and to ease membrane element servicing.

Attention to the points listed below will enhance long-term safe operation and will ease servicing.

For suggestions on cleaning deposits from the vessel inside surface, refer to the Closing Vessel section.

For suggestions on cleaning corrosion deposits from spiral retaining ring, refer to the Head Rebuilding section.

Preventive checklist

- ☐ End closures. Inspect for components that may have deteriorated. Replace as needed.
- ☐ Keep external head assembly components as dry as possible.
- ☐ Do not tolerate leaks.

CAUTION Any leakage indicates a potentially dangerous condition. Failure to eliminate leakage may void the warranty and could result in vessel failure.

Trouble shooting

This section is intended only to provide guidelines for dealing with problems that might arise while working with EcoLIne Series pressure vessels. These guidelines are not in any way a replacement for the good industrial practice required to ensure safe operation. We recommend that only a qualified mechanic, experienced in servicing high pressure hydraulic systems, carry out the following tasks.

Preliminary Inspection

Inspect the vessel at each end for corrosion which may interfere with head assembly removal. If corrosion is evident, proceed as follows:

1. Loosen any deposits with a small wire brush and/or a medium grade piece of ScotchBrite™.

Loosening Deposits

WARNING Do not use a wire brush on components made from Engineering Thermoplastic.

2. Flush away loosened deposits with clean water.

3. Proceed with instructions given in Opening vessels section.

Difficulty in Opening Vessel

NOTE Recommendations listed below are intended only as a guide. If the head assembly is still difficult to remove after all recommendations have been followed, call Pentair Water for technical assistance.

Head Retaining Ring

1. Will not release from the Retaining Ring Groove.

A. Apply penetrating fluid (such as WD-40 or LPS-1) to interfacing areas of retaining ring.

B. With a screwdriver handle or similar tool, tap the retaining ring to release the bond.

C. Again attempt to remove retaining ring.

Applying penetrating fluid

CAUTION When applying penetrating fluid, be careful to avoid element contamination.

Head Assembly

1. Will not release from shell when pulling.

A. Using a mallet tap the Head Assembly lightly. Do not use a metal component to tap the Head Assembly.

B. Hold the permeate port and rock the Head Assembly back and forth

C. Carefully rock the head assembly back and forth to release the seal. (Care should be taken to avoid placing too much stress on the permeate port)

D. Once the head seal is broken, pull straight outward to remove the head assembly from the vessel.

NOTE If the head assembly will not release from the shell after all recommendations have been followed, call Pentair Water for technical assistance.

Freeing Head Seal

Seal leakage

2. Head Seal Leak

D. Carefully inspect the seal gland area in the shell and clean any contaminants from the gland.

E. Clean the seal area on the head and re lubricate.

F. Install a new head seal that has been properly lubricated.

3. Feed/Concentrate Port Leak

IMPORTANT Contact Pentair Water if any Feed/Concentrate leaks are observed.

Sudden Drop in Permeate quality

If a system is started and stopped frequently and no provision is made to raise the pressure slowly, movement of the membrane column may damage O-ring seals and reduce permeate quality.

If the quality of the permeate suddenly drops off, and poor membrane performance is not suspected, remove the heads per instructions in the Users Guide (See OPENING VESSEL section on page nos. 8-9). Inspect these O-ring seals carefully for breakage or other damage. If the seals have rolled out of the groove, or are damaged, this may indicate excessive movement during start-up and shutdown. To overcome this problem, the vessel should be shimmed to minimize this movement. Follow the procedure for shimming as given below:

Shimming

Shimming is accomplished by placing spacers between the adapter and the hub on the permeate port on the upstream end of the vessel. When done properly, shimming will prevent excessive movement of the membrane elements and the adapters, thus preventing potential damage of the O-ring seals. The spacers used for shimming are shaped like a plastic washer and are 0.20 inches thick.

The suggested procedure for shimming is as follows:

1. With the membrane properly loaded, install the adapter in the last element and place the thrust cone on the head for the downstream end of the vessel. (See Replacing Element section on page nos. 10-11).

2. Install the head in the downstream end of the vessel following Steps 1 through 4 of the section entitled Closing Vessel on page nos. 12-14.

3. Remove the product water tube seals from the upstream adapter and the head seal.

4. Push the straight end of the adapter into the permeate hub, just far enough so that it is held by the adapter seal.

5. Line the adapter up with the product water tube on the first element and install the head fare enough into the vessel so that you can place a locking ring segment in the groove.

6. Carefully remove the head and observe the space between the hub of the adapter and the face of the permeate port. Determine the number of spacers necessary to fill this space.

7. Remove the adapter and place the product water tube seals. Insert the adapter in the product water tube of the first element.

8. Slide the number of spacers determined in Step 6, over the end of the adapter.

9. Now close the vessel according to the Vessel Closing section which begins on page no. 12.

Vessel Shimming

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INSTALLATION GUIDE

Introduction

The EcoLIne Series fiberglass membrane housing is designed for continuous long term use as housing for reverse osmosis, nano-filtration, ultra-filtration and micro-filtration elements in typical water treatment systems at operating pressure of 300 and 450 PSI.

The EcoLIne Series is designed to accommodate any make of 8-inch nominal diameter membrane element.

Improper assembly, misuse, rigid clamping, impact, scratches, abrasion or corrosion can result in mechanical failure, property damage and serious injury or death.

The information and guidelines incorporated in this User's Guide are intended only as 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 engineering drawings.

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

Should any information in this guide not agree with the system supplier's instructions, call Pentair Water for clarification.

NOTE Regardless of when and 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 connection to port fittings.
- Not used in any way to support other vessels / objects.

Handling, receiving and storage

Fiberglass reinforced plastic (FRP) Pressure vessels are extremely rugged and durable. They are designed for safe, long-term service when they are handled and installed properly. However, damage to the vessel shell or related components from improper handling or installation could result in malfunction or explosive head failure while in service. Therefore exercise the following precautions whenever handling vessel.

1. Never lift or move a vessel by placing anything inside it. The vessel is durable and ideally suited to its purpose, but careless handling can permanently damage it.

2. Be careful not to scratch the inside wall of the shell, especially in the sealing area inboard of locking segment groove near the end.

3. Do not drop vessel or allow it to hit hard on the ground or against other objects.

4. Do not apply undue stress to shell.

5. Before using a forklift to handle the vessel, pad the forks to lessen the chance of damaging the shell. Severe scratches or gouging of the vessel can result in failure of the vessel wall.

6. Do not allow undue stress to act on the Feed/ Concentrate port, which might cause impact damage to the port area, leading to leakage. Do not use the Feed/Concentrate port or the permeate port as a tool to lift the pressure vessel or as a support to manifolds. Manifolds should be self-supporting.

NOTE ON IMPACT DAMAGE
Exterior vessel damage can lead to early vessel failure. Damage received in shipment should be reported to the shipping company immediately upon receipt minor damage such as scratches that go no deeper than the paint may be acceptable. Call the Pentair Water customer service department for advice if in doubt.

Storage

Pentair Water recommends storing the vessel in the received packing or in a secure place. Vessel should not be stored in such a manner that they will roll over and get damaged.

Mounting shell & piping connection

> **NOTE** If mounting vessel for the first time, see "piping recommendations for EcoLine side-port vessel", Page no. 32

This section is concerned with the mounting of EcoLine Models 80-300 and 80-450 pressure vessels.

These guidelines must be integrated with any additional procedure required for your specific installation.

Installation Guidelines

1. Provide adequate room for servicing at both ends of vessel. Elements are installed from the upstream end (feed), pushed through towards the downstream end (concentrate) and, eventually, removed from the downstream end.
2. Follow all applicable Handling Guidelines.
3. Position each vessel on its mounting frame such that it is centered between headers.

> **NOTE** It is important that each vessel be placed to minimize any strain on piping / tubing that connects a vessel to a header. Normally each vessel should be centered in the frame with the feed and concentrate ports positioned such that piping / tubing connections can be made easily, without undue strain at each end of the vessel.

4. Mount vessels on urethane saddles (provided with the vessel) positioned in line with pre drilled frame holes for –1 through –3 vessels. Holes for the mounting straps should be drilled at approximate center span 'S'. For –4 and –8 vessels, holes for the mounting straps should be drilled at span 'S' from the middle of the vessel and a third saddle, without a strap, should be placed at mid span. These dimensions are shown on the corresponding engineering drawing.

> **WARNING** Do not mount vessel rigidly. restricted expansion can result in damage to the vessel. see elasticity and mounting requirements in the application section for further details.

5. Place mounting straps over vessel with plastic strip against vessel.
6. Position screw through the frame mounting holes into strap nuts and run up to the frame finger tight.
7. Connect vessel feed piping (See Piping Recommendations for more info)
8. Using a wrench, tighten mounting bolts one additional full turn. This should result in 25-50 lbs in of torque.

> **NOTE** To avoid damage to vessel shell, DO NOT over-tighten mounting nuts.

> **WARNING** EcoLine straps are designed to secure the vessels during operation. They are not designed to handle all loads that might occur during shipment. Appropriate vessel restraint should be employed considering such factors as the mode of shipment, distance to be traveled and design of the system. The vessels and frame should be blocked to prevent any differential movement which could be caused by the forces experienced during shipment. .

Piping connections

The following are suggested guidelines to ensure that the vessel is allowed to expand and is easily serviced:

1. Support the header and interconnecting piping in a manner that they are self-supporting.

2. Connecting piping alignment to feed, concentrate and permeate ports should not exceed 0.030 inch (0.762 mm) misalignment.

3. Piping connections to the vessel's feed / concentrate ports should be via flexible IPS grooved Coupling.

Application guide

Introduction
This Application Guide, together with the Installation Guide and the Operation and Maintenance Guide, outlines the general conditions for safe use of EcoLine Side-ported pressure vessels. Because of the considerable risk inherent in high pressure vessels, it is the purchaser's responsibility to carefully evaluate each specified application to ensure that the EcoLine Side ported vessel selected is appropriate to that application.

Pentair Water will assist the purchaser in determining the suitability of the standard vessel for their specific operating conditions. For non-standard applications, alternate materials are available on special order. The final determination, however, including evaluation of the standard materials of construction for compatibility with the specific environment, is the responsibility of the purchaser.

Suitability for intended use

EcoLine Series membrane housings are designed for continuous long-term use as housings for reverse osmosis, nano-filtration, ultra-filtration and micro-filtration membrane elements. Models are available for 300 and 450 psi. Any make of eight-inch nominal diameter spiral wound element is easily accommodated.

In a high pressure system there is considerable potential for catastrophic failure, which could result in serious injury or loss of life. All decisions as to suitability for use must include full consideration of the various safety aspects involved. These include, but are not limited to:

- Process fluid compatibility (e.g. chemical and temperature consideration).
- External environmental factors (e.g. corrosive atmosphere, remote or special environmental where certain material might be undesirable, etc.).
- Abnormal back pressure which might result in pressurizing permeate port above the rated pressure (alternate materials are available).
- Capability of the user to maintain vessel properly.
- Requirement for increased fire resistance in some circumstances.

Use of EcoLine model pressure vessel for other than its intended application will void the warranty.

Elasticity and mounting requirements

Mounting design must allow for vessel expansion, both axially and radially. Although the expansion under pressure is slight, undue restriction can result in damage to the vessel and to other system components. Typically a eight-element vessel, to example, would expand approximately 0.20 inch (5.08 mm) in length and 0.015 inch (0.4 mm) in diameter. The following suggestions will help to ensure the vessel is allowed to expand and will ease servicing.

1. Mount the vessel on the urethane support pads furnished. Do not mount directly to any rigid structure.

2. Use the stainless steel straps furnished. Straps should be tightened sufficiently to hold the vessel on the urethane support pads, but not so tightly so as to restrict expansion. (A torque of 25-50 lbs-in. is sufficient.)

3. U-bolts should not be used for vessel mounting under any circumstances.

4. Provide flexible piping connection to permit de-coupling the header from the vessel. The recommended Permeate Port connection is a U-bend pipe with flexible connections at each end, or a flexible hose. Recommended Feed and Concentrate connections are via flexible IPS grooved coupling.

5. Do not hard plumb any piping connections to the vessel.

6. Support the header independently. Piping should be self-supporting or supported by the headers.

7. Include an expansion loop in the branch connection to allow for:
   A. Elastic growth under pressure.
   B. Thermal growth in vessel length.

8. The total weight of branch connection and fittings supported by the vessel should not exceed 8 lbs for either the Feed / Concentrate ports or the Permeate port of the Ecoline model vessels.

The above suggestions are intended to help prevent damage in typical applications. Unusual or special applications may involve other considerations to be determined by the system designer.

Corrosion

Considerations relating to corrosion are an important factor in vessel application. Corrosion can result in catastrophic failure. Correct component material selection is essential for safe long-term use. Although the process fluid is the main consideration, external environmental conditions should also be taken into account.

All reasonable precautions should be taken to protect retaining ring from external wetting, particularly in corrosive atmospheres (e.g. salt-water areas or acid atmosphere such as near lead acid battery arrays, etc.) Leaks from vessel or nearby components, which allow retaining ring to be routinely wetted, should not be tolerated.

The following typical list of EcoLine pressure vessels components indicating the standard material of construction of each part are listed in page 7. An evaluation of the possibility of corrosion damage to the metal head interlock component is of critical importance. Alternate materials are available upon requests.

Safety

CAUTION Pressure vessel may cause loss of life, severe bodily harm or property damage if not correctly installed, operated and maintained.

Safety in service of fiberglass vessel depends on proper application, installation, operation and maintenance. This section is intended to provide guidance towards safe system design. The safety information given in the installation and operation and maintenance section should also be studied and used appropriately in conjunction with the precautions listed below.

Design Considerations for Safety

Fluid Compatibly
The materials of construction selected must be compatible with the process fluid and with proposed preserving and cleaning fluids. Standard materials are listed on the engineering drawings. In case where the standard materials are unacceptable, suitable alternative may be available.

Pressure and Temperature design limits
Operation of a vessel outside its design limits will void the warranty and would result in vessel fatigue with possible eventual catastrophic failure. Although each EcoLine vessel is tested as per CE specifications, long term operation above the designed pressure must be prevented. For permeate port pressure rating and maximum operating temperature, refer respective sales drawings.

Over pressure protection
It is essential that over pressure protection be provided such that the pressure to which any vessel is subjected cannot exceed 105% of design pressure.

Mounting
The pressure vessel should not be used as a support. Piping manifolds and other fittings should be supported by properly designed system framework. Operating personnel should be discouraged from applying from undue force to any fittings connected directly to a pressure vessel.

Accessibility
Pressure vessel should be positioned within the system such that elements can be inserted at the upstream end and removed from the downstream end (i.e. elements are installed and removed in the direction of feed flow).

PENTAIR

CODELINE®

EcoLine Series ☐

MODEL
300
450

1

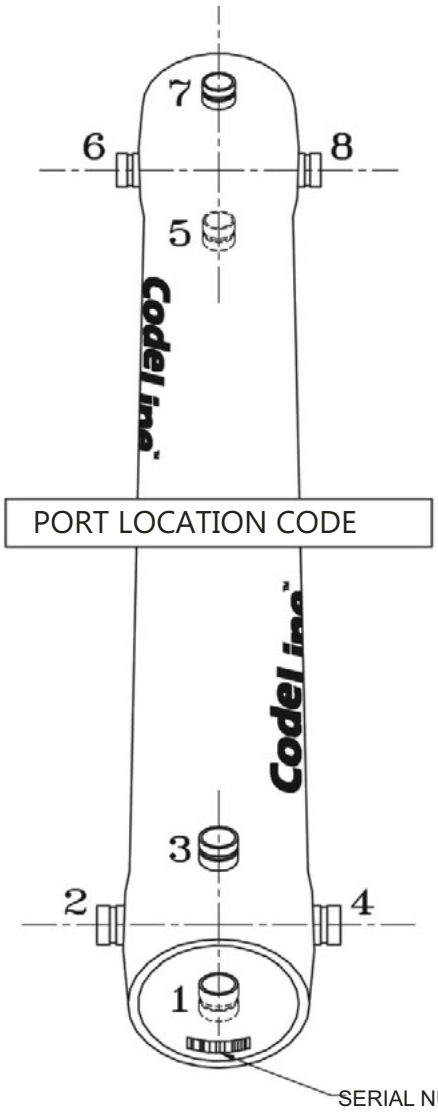
FEED PORT CONFIGURATIONS

☐ D ☐ D

LOCATION — SIZE — LOCATION — SIZE

OPTIONS AVAILABLE

1	D	5	D
2	D	6	D
3	D	7	D
4	D	8	D



PORT LOCATION CODE

PORT SIZE CODE	
D	1 ½"GROOVED END

Date	
Customer	
Project Name / Number	
P.O. Number	
Ship to Address	
Membrane	
Heads	
Others	

For Internal Use Only	
S.O. Number	

Approved by CUSTOMER: _____

PLEASE FAX THIS SHEET WITH YOUR ORDER TO: CUSTOMER SERVICE DEPT.

PENTAIR

CODELINE® ECOLINE

ORDER SPECIFICATION SHEET
ECOLINE SERIES

SIZE AND LOCATION OF PORTS

SPEC.SHEET/PM/1.5"	REV - A

Piping recommendations

Various methods of connecting side port vessel to manifolds are possible. The recommendation method is to connect each vessel side port to the manifold using two flexible IPS grooved joints and an intermediate piping section. A 90^0– elbow would be an ideal, however, a straight piping connection would also be acceptable. This two joint method is preferred over a single IPS grooved connection because it does not require as much care in vessel alignment and manifold welding accuracy. Figures 1 & 2 illustrate the preferred method.

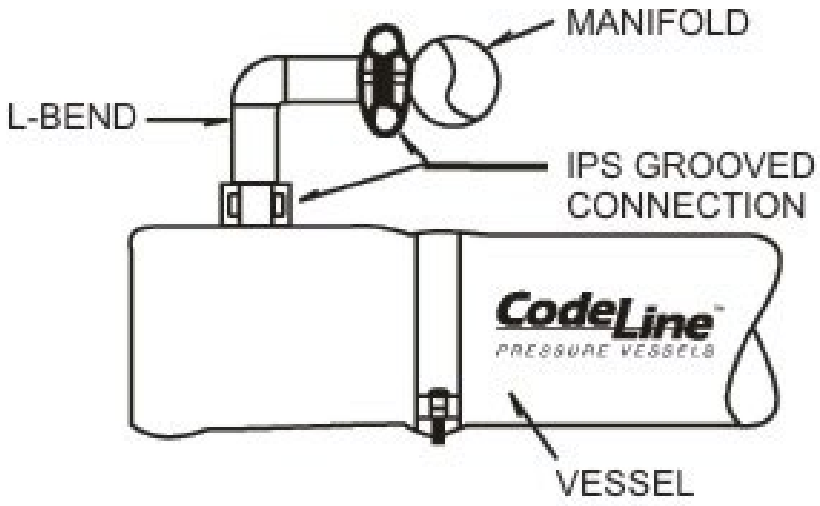


FIGURE 1

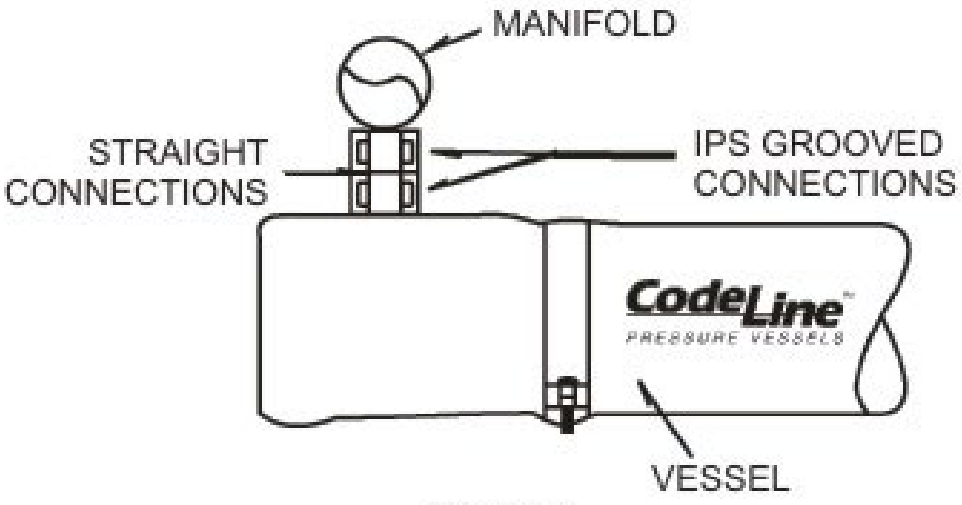


FIGURE 2

An alternate method using a single IPS grooved coupling is acceptable but requires more thoughtful execution. The manifold must be fabricated using close tolerances to help ensure correct alignment. Installation must follow a sequence of assembly steps to initially ensure correct shell to manifold alignment. First, the vessel should be set into the rack and secured loosely into position for the best alignment possible. At this time set the side port to manifold clearance at .125 inches (3.175 mm) per IPS recommendations for cut groove applications. After proper alignment is achieved, secure the shell and fix the manifolds into position. (See figure 3 & 4 for reference).

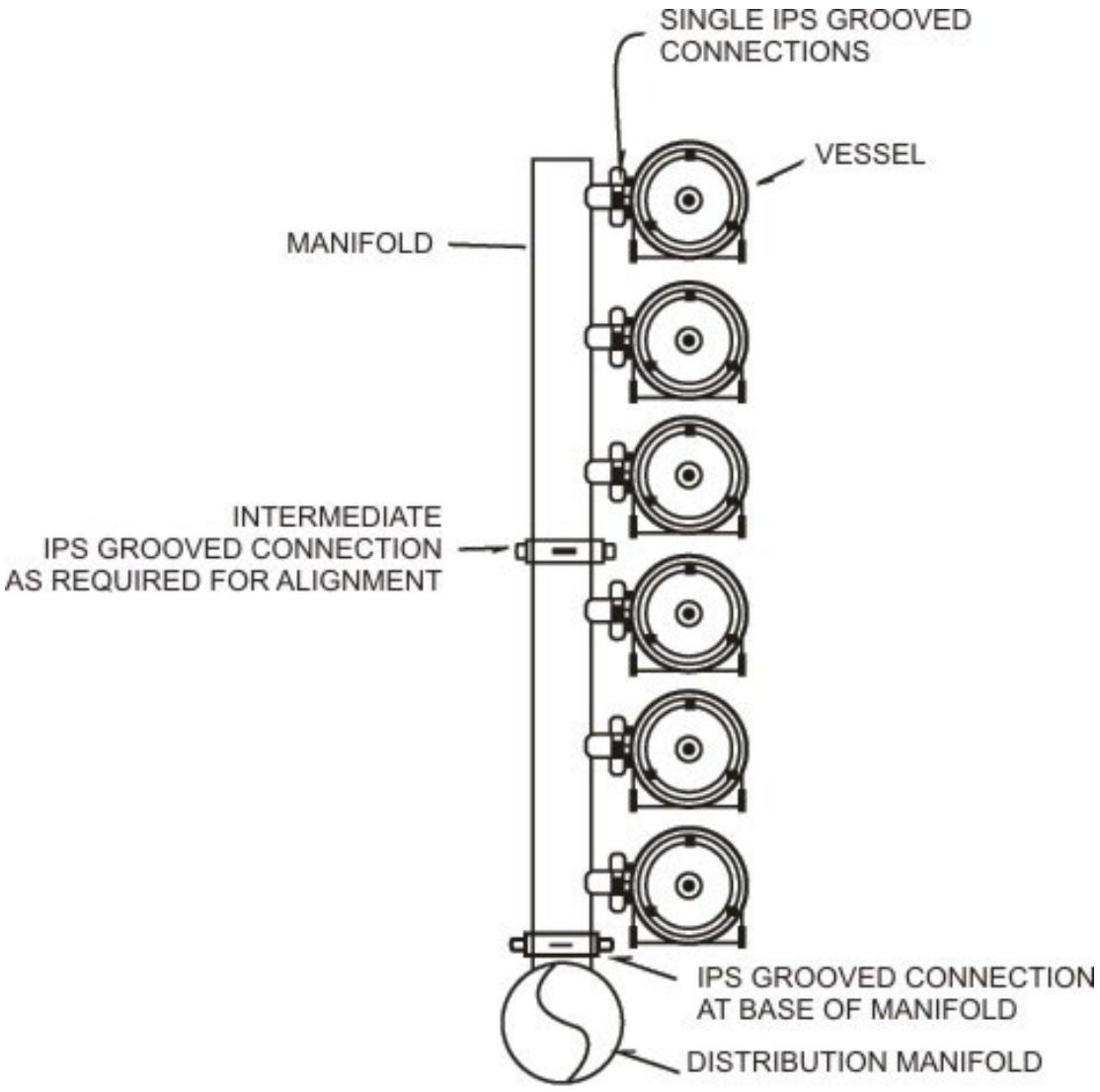


FIGURE 3

Even though a single IPS grooved coupling arrangement may be the choice for low cost and compactness, it brings with it the necessity to provide the required amount of flexibility in some other way.

A IPS grooved coupling allows angular but not lateral misalignment. Two rigidly restrained pipes not lying on a common axis can be forced to align if the fit is close enough to allow the two halves of the coupling to be pulled together by the bolts. This practice is not recommended. The resulting stresses are complex and have leveraged intensity. Any misalignment must therefore be kept to an absolute minimum.

Figure 3 illustrates how IPS grooved couplings might be incorporated in the manifolds to alleviate misalignment where a line of vessels is connected to a common manifold header and only one flexible IPS grooved joint is used between the vessel and the manifold.

In checking for correct alignment, the maximum axial misalignment from port to manifold should be .030 inches (.762 mm) in any direction (See figure 5). While exceeding .030 inches (.762 mm) misalignment should not significantly reduce vessel safety, it may decrease vessel service life. A recommended method of checking for acceptable alignment is to test for coupler rotation.

To use the rotation method, install the IPS grooved coupling between the vessel side port and the manifold. With the two coupling bolts tightened until snug, you should be able to rotate the coupling by hand. If rotation is possible, the alignment will be acceptable.

Use of IPS Grooved coupling at interval of 1.0m or 1.5m is recommended on the header manifold for ease and proper alignment of these pipes.

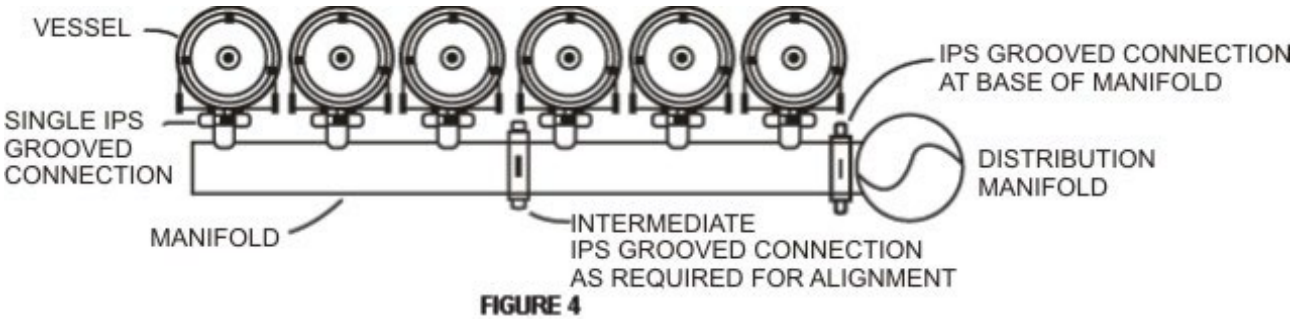


FIGURE 4

FIGURE 5

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Pentair Water – Limited Warranty

Pentair Water India Pvt. Ltd., a division of "Pentair Water" manufactures its products ("Products") and parts ("Parts") under the highest standards of workmanship using quality materials. Accordingly, Pentair Water expressly warrants these Products and Parts as follows:

Warranty coverage

a) All the "CodeLine" & "Pentair" branded membrane housing products are warranted to the original owner to be free of defects in material and/or workmanship under normal use for a period of one (1) year from date of Invoice.
b) Any replacement Product or Part provided hereunder will be warranted against defects in material and workmanship for the unexpired portion of the one year warranty period applicable to the goods.

Exclusions from this limited warranty

This warranty does not cover:

1. Defects not reported to Pentair Water within the above described warranty period.
2. Any items manufactured by other companies. Such items may carry warranties offered by the original manufacturers.
3. Problems resulting from failure to comply with installation instructions or drawings, or improper installation.
4. Damage caused by acts of nature or problems resulting from abuse, misuse, negligence or accident by any party other than Pentair Water.
5. Problems resulting in whole or in part from alteration, modification or attempted repair of these Products or Parts by any party other than Pentair Water.
6. Normal wear of replaceable components, including elastomeric Seals, Spacers etc. These parts require maintenance as part of a yearly service schedule.
7. Non compliance with applicable codes and ordinances including without limitation, plumbing codes.
8. Damage due to chemical attack.
9. Warranty applies only to original owner at the original installation location
10. Shortages in receipt of spares/components/ products not intimated to the seller within 60 days of the receipt by buyer.

Warranty obligations of pentair water

Should a defect in workmanship and/or material in Products or Parts covered by this warranty become evident during the term of the warranty, then upon compliance with the procedures, as set forth below, Pentair Water, at its option, will: In the case of Products, issue a credit in the amount of the original purchase price of the product, or repair or replace the defective Products. Pentair Water will consider, in good faith customer preferences in making a determination whether to issue a credit or repair or replace a Product. In the case of Parts, whether purchased new or exchanged on a Product by other parts, Parts may not be returned for credit or repair. Pentair Water will only be responsible for the replacement of defective parts.

Procedure for obtaining warranty performance

If the buyer discovers within this period a failure of the product to conform to specifications, or a defect in material or Workmanship, the buyer must promptly notify Pentair Water in writing. In no event may that notification be received by Pentair Water more than 30 days after the end of the warranty period. Any goods that the buyer believes to be defective are to be returned to Pentair Water factory for examination. However, upon request of the buyer, Pentair Water may, at its discretion, agree to examine the goods in the field. If, upon examination by Pentair Water, any goods sold under this agreement or purchase order do fail to conform to CodeLine / Pentair specifications, or prove to be defective in material or workmanship, Pentair Water will supply an identical or substantially similar part F.O.B., Pentair Water factory; or Pentair Water, at its option, will repair such part or give credit to the buyer for the original cost of such goods. However, if the goods were examined in the field and Pentair Water determines that they do conform to CodeLine / Pentair specifications, the buyer will be responsible to pay to Pentair Water, a $750 field service charge, plus travel expenses and a $750 per diem charge.

NO OTHER WARRANTIES. To the maximum extent permitted by applicable law, PENTAIR WATER DISCLAIMS ALL OTHER WARRANTIES, WHETHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANT ABILITY AND FITNESS FOR A PARTICULAR PURPOSE, with regard to the Product(s), Part(s) and/or any accompanying written materials. This limited warranty gives you specific legal rights. You may have others, which vary from state / jurisdiction to state/jurisdiction.

NO LIABILITY FOR CONSEQUENTIAL DAMAGES. To the maximum extent permitted by applicable law, in no event shall Pentair Water be liable for any damages whatsoever (including without limitation, loss of times, inconveniences, expenses such as telephone calls, labor or material charges incurred in connection with the removal or replacement of the Product(s) or Part(s), special, incidental, consequential, or indirect damages for personal injury, loss of business profits, business interruption, loss of business information, or any other pecuniary loss) arising out of the use of or inability to use the defective Product(s) or Part(s), even if Pentair Water has been advised of the possibility of such damages. In any case, Pentair Water entire liability under any provision of this Limited Warranty shall be limited to the amount actually paid for the Product(s) or part(s). PLEASE NOTE: Because some states/jurisdictions do not allow the exclusion or limitation of incidental or consequential damages, the above limitation or exclusion may not apply.

WARRANTIES OR REPRESENTATIONS BY OTHERS - No dealer or another person has any authority to make any warranties or representations concerning Pentair Water or its products. Accordingly, Pentair Water is not responsible for any such warranties or representatives.

OTHER RIGHTS This warranty gives specific legal rights, and other rights may apply.

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CODELINE® ECOLINE

PENTAIR WATER REGISTRATION CARD

Vessel Model:	Serial Numbers
Date of Purchase	Numbers are located at one end of the vessel. (If you have purchased more than 64 vessels, please attach the serial nos. separately).
OEM Purchased From: (Name/ Address/Tel no.)	
Treatment System wherein used: (Please circle the relevant) RO UF NF Other	
System Capacity:_________GPD No. of Vessels: __________ Date of Installation:____________	
Name/Address/Tel & email of your Company:	
Installation Site: (Address/Country)	**Mailing Address:** CodeLine Division Pentair Water India Pvt. Ltd. L/52-55, Verna Industrial Area Verna, Goa – 403 722. INDIA Tel: 91-832-2883300 Fax: 91-832-2883312 www.codeline.com

Thank you for purchasing an EcoLine vessel. To help us service you better and update you on "improvement and changes", please fill up the above registration card and mail at the address given in the same.