

ENGINEERING DRAWING PACKET

MODEL PRO-4-300-EP

DESIGN PRESSURE at 120 °F	300 PSI	OPERATING pH RANGE	3-11
MINIMUM OPERATING TEMP.*	20°F	CLEANING pH RANGE (less than 30 minutes)	2-12
MAXIMUM OPERATING TEMP.	120°F	APPLICATION	TYP. BRACKISH WATER
FACTORY TEST PRESSURE	330 PSI	FEEDWATER TDS	<= 10,000 ppm Max.

INTENDED USE

The **PROTEC Model PRO-4-300-EP Pressure Vessel** is designed for continuous use as housing for membrane filtration elements to purify typical brackish waters at any positive pressure up to 300 PSI. The **PRO-4-300-EP** will accommodate any make of four-inch nominal diameter x 40" long spiral-wound element with a .75" OD product water tube and a 38" long outer shell design.

The Model **PRO-4-300-EP** must be installed, operated and maintained using good industrial practice and following the precautions listed in order to help assure safe operation and a long service life. Misuse, improper installation or operation may result in severe bodily harm or property damage and will void the vessel warranty. Therefore, review and follow the safeguards listed below **before** placing the vessels into service.

The filament-wound reinforced plastic shell of this vessel must be allowed to expand under pressure. Any undue restraint at the

support points or piping connections can cause non-repairable leaks to develop in the shell. This vessel must not be subjected to excessive stress caused by bending moments acting at the side ports in the fiberglass shell.

The end closure retaining rings must be kept dry and free of corrosion at all times. Failure to do so may result in deterioration that can lead to catastrophic failure of the vessel heads.

When requested, Bekaert Progressive Composites will assist the purchaser in determining the suitability of this standard vessel design for their operating environment. However, the final determination including the evaluation of the materials of construction for use in the specific corrosive environment shall be the responsibility of the purchaser.

Before using this engineering packet for system design or vessel installation, please verify that it is the latest revision by consulting the factory. Specifications are subject to change without notice.

PRECAUTIONS

Follow all instructions.

Failure to take every precaution listed will void the vessel warranty and may result in vessel failure.

Mount shell using furnished hardware.

Following the recommended span(s), mount the vessel on saddles provided. Tighten straps to one ft-lb maximum.

Maximize the connection flexibility.

Position the vessel and the piping so that the vessel can grow in length and diameter under pressure without any undue restraint. Δ DIA = 0.003 in. (0.1mm) and Δ L = 0.04 in. (1mm) for a length code -3 vessel.

Provide overpressure protection.

Set the safety device at not more than 105% design pressure.

Inspect end closures regularly.

Replace damaged or deteriorated components and correct the cause of any corrosion.

Relieve system pressure before working on the vessel.

Working on vessels that are under pressure may result in bodily harm and/or property damage.

Never support other components with the vessel.

Hanging piping manifolds or supporting other components with the vessel may result in vessel damage.

Do not over tighten the Permeate Port connection.

Tightening the connection more than one turn past hand tight will damage the port.

Double check end closure installation

Ensure that retaining ring is in place and fully seated.

Never operate the vessel in excess of its ratings.

This practice will void the vessel warranty, shorten vessel life and could lead to bodily harm or property damage.

Do not operate the vessel permeate port over 125 psi.

Permeate pressure in excess of 125 psi must be approved by the factory prior to operation.

Operate the vessel in only positive pressure applications.

This vessel is not designed for vacuum conditions.

Flush the vessel before system shut down.

Some feed waters may cause corrosion under static conditions. Flushing with non-corrosive permeate is recommended.

Operate the vessel within the recommended pH range.

The vessel is designed for continuous use at a pH of 3-11 and for intermittent cleaning (less than 30 min. at a pH of 2-12).

END PLUG LOADING PROCEDURE

Step 1 Inspect The Shell

Before installing the end plug, check the inside surface of the shell for any imperfections or foreign matter. Remove all foreign matter using a mild soap solution and rinse with clean water. To remove imperfections, lightly sand the surface of the vessel with 600-grit sandpaper and soapy water and then rinse with water.

Step 2 End plug Seal And Shell Lubrication

Check with your membrane supplier before using these lubricants as they can foul membranes. Ensure that the end plug seal is covered with a thin layer of glycerin and is free from any dirt or dust contamination. Then lubricate the inside of the shell into the vessel bore about $\frac{3}{4}$ " past the retaining ring groove. Only a thin layer is required. Silicone lubricants can also be used; however, care should be taken to use as little as possible.

Step 3 Install End plug

Holding the end plug square to the axis of the shell, slowly push the end plug into the shell until the end plug clears the retaining ring groove.

Step 4 Install Retaining Ring

Remove any moisture from the retaining groove before proceeding. Carefully place the end of the retaining ring into the groove on the shell. After the ring is started, slowly push the ring towards the groove. As the ring enters the groove, continue pushing as your hand slowly rotates counter-clockwise around the inside diameter of the shell. Be careful to prevent the ring from snapping against your finger as it enters the groove.

Step 5 Reconnect Piping

Reconnect the feed and permeate manifolding to the vessel.

Step 6 Pressurize System

Before starting the system, double check that each end plug has been correctly installed and that all piping connections are in place. After ensuring that all required precautions have been taken, start the system.

Step 7 Check For Leaks

After system start up, verify that all connections are leak free. Fix any leaks at this time to prevent corrosion that may lead to component deterioration and possibly unsafe operation.

END PLUG REMOVAL PROCEDURE

Step 1 Shut Down System

Shut down system and take all steps necessary to relieve system pressure from the vessel.

Step 2 Disconnect Piping

Carefully disconnect the feed and permeate piping from the vessel.

Mark the feed port location by marking the shell for easier installation. Set this piping in a secure place for re-assembly.

Step 3 Remove Retaining Ring

Pull the retaining ring out of the groove in the shell. After the ring is removed from the groove for $\frac{1}{4}$ turn, stop pulling. Finish removing the ring by running your finger behind the ring and carefully pulling the ring from groove. It is best to follow the ring in a clock-wise direction while removing to avoid stretching the ring.

Step 4 Remove End plug

It may be required to thread a $\frac{1}{2}$ " pipe nipple onto the permeate port and gently rock the end plug up and down to release the end plug from the shell.

END PLUG REBUILDING

Prior to following this procedure, remove the end plug following the removal procedure listed.

Step 1 Remove Seals

Remove the seals from the end plug and set aside.

Step 2 Clean All Components

Using a mild soap solution, clean each component, rinse with fresh water and then dry with compressed air or a lint free towel.

Step 3 Inspect Components

Examine each component for corrosion or damage that may affect the performance of the vessel. Replace any components that have corrosion or visual damage. In addition, carefully inspect each seal for damage or wear. It is recommended to replace each seal at this time. Please be aware that seal condition may affect system performance. Inspect the threads for any wear or damage. If any damage is found, replace the end plug.

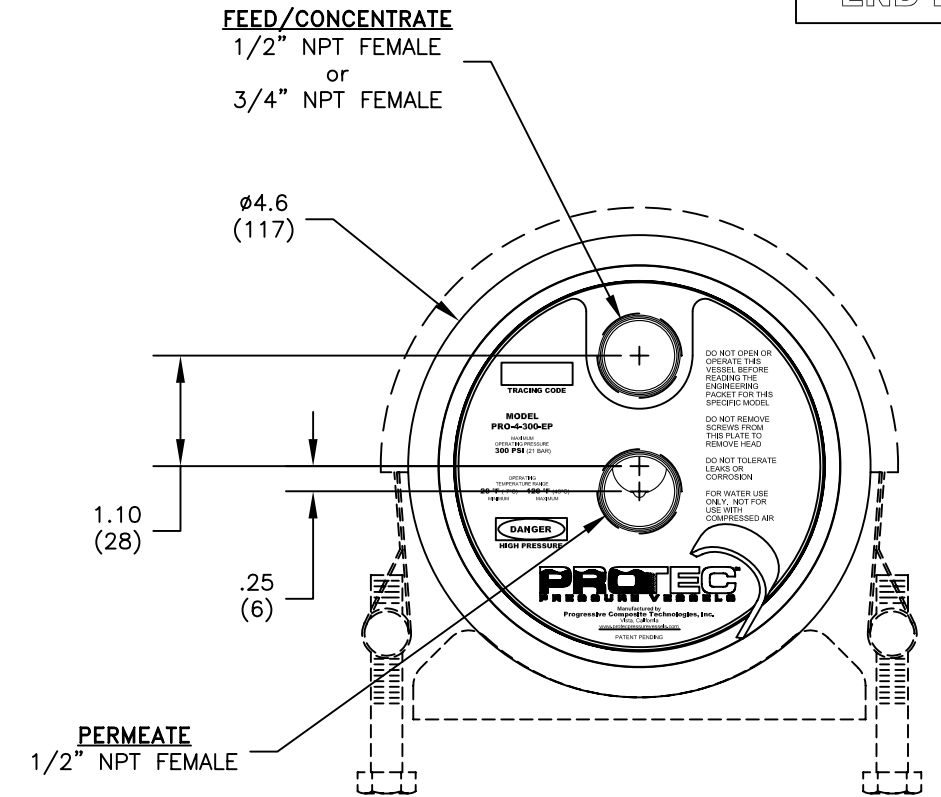
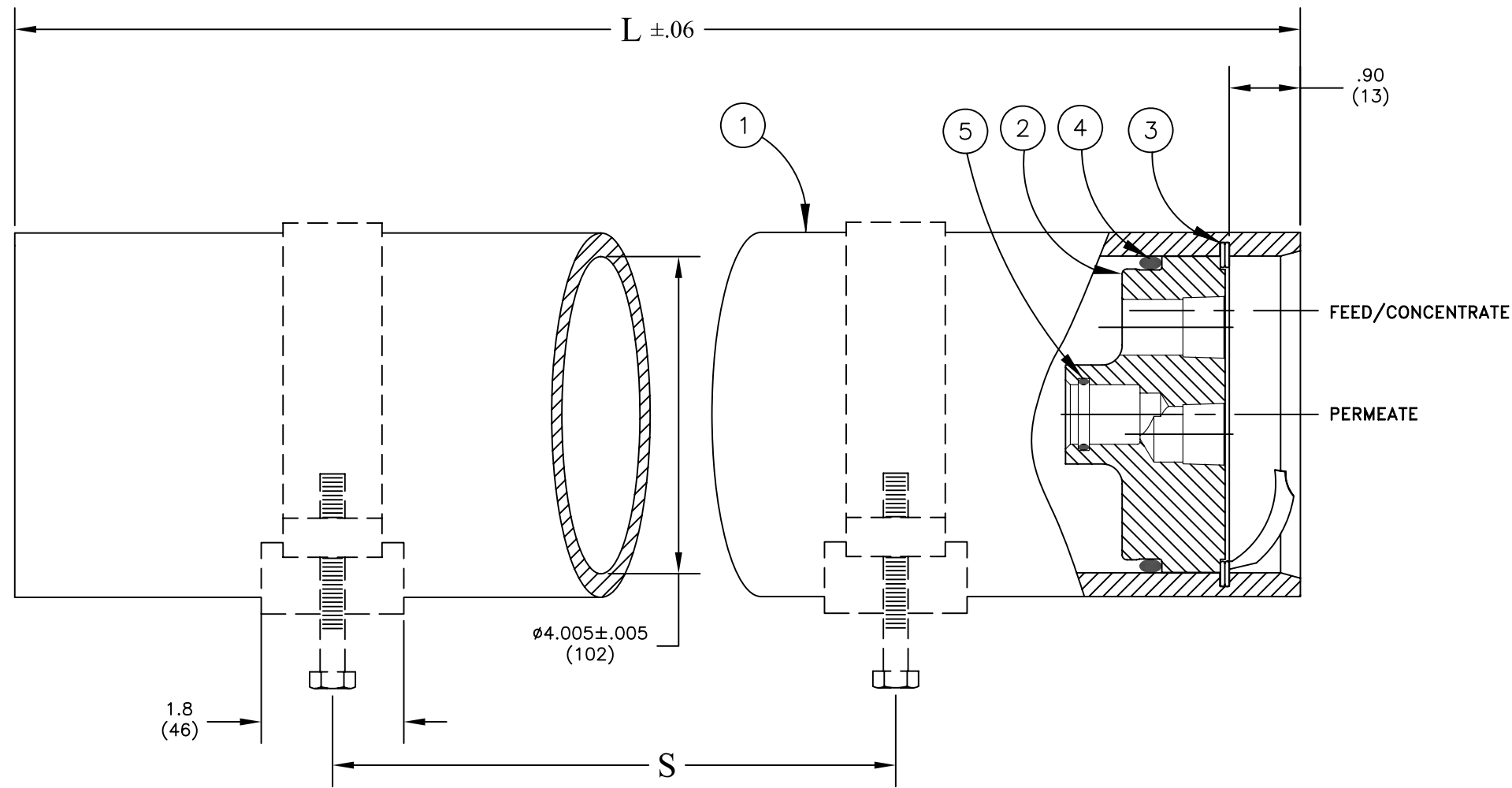
Step 4 Lubricate Seals

Check with your membrane supplier before using these lubricants as they can foul membranes. Using extreme care, coat each seal with a thin layer of glycerin. Only a thin layer is required. Silicone lubricants can also be used; however, care should be taken to use as little as possible.

Step 5 Install End Plug

Install the end plug by following the end plug loading procedure.

**300 PSI
END PORT**



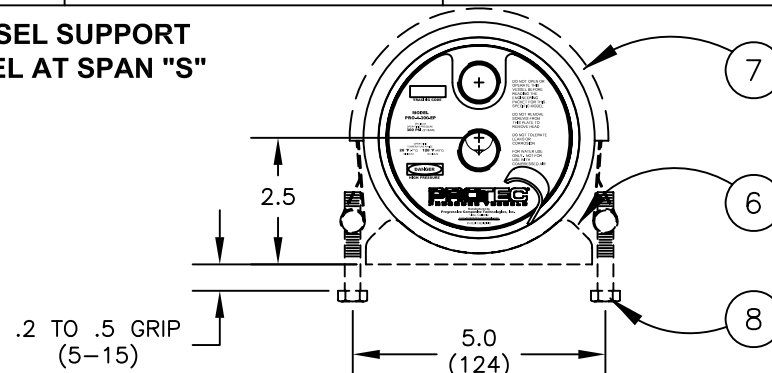
Shell Length Code	L inch (mm)	S Span in (mm)	Empty Weight lb (kg)
-1	44.3 (1125.2)	28 (711)	10 (5)
-2	84.3 (2141.2)	56 (1422)	18 (8)
-3	124.3 (3157.2)	80 (2032)	26 (12)

ITEM	QTY	P/N	DESCRIPTION	MATERIAL
1	1	4040084	Shell	Filament Wound, Epoxy FRP
2	2	4040087-1 4040088-1	End Plug, 1/2" NPT Feed (shown) End Plug, 3/4" NPT Feed	PVC Thermoplastic PVC Thermoplastic
3	2	4040079	Retaining Ring w/ Finger Pull	Stainless Steel, 300 Series
4	2	6180342	Plug Seal, O-Ring	Ethylene Propylene
5	2	6180116	PWT Seal, O-Ring	Ethylene Propylene

OPTIONAL VESSEL SUPPORT

6	2	4040037	Support Saddle	Polyurethane
7	2	4040040	Strap Assembly	Stainless Steel, 300 Series
8	4	6150001	Strap Screw	Stainless Steel, 18-8

**OPTIONAL VESSEL SUPPORT
SUPPORT VESSEL AT SPAN "S"**



NOTES:

DIMENSIONS IN INCHES (MM APPROX.)

FOR REFERENCE ONLY, NOT TO BE USED FOR CONSTRUCTION UNLESS CERTIFIED

CENTER VESSEL ON 2 SUPPORTS AT SPAN "S".

INCORRECT MANIFOLDING WILL CAUSE SEVERE LOCAL STRESS AROUND PORT AND MAY RESULT IN LEAKS AND PREMATURE FAILURE. TAKE EVERY PRECAUTION LISTED IN THIS PACKET.

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

PROTEC™
BEKAERT PROGRESSIVE COMPOSITES

Vista, California, U.S.A.

ENGR
AP
1/27/04
QLTY
WJ
1/27/04
DRAWN
DS
1/27/04

PRO 4-300-EP

DRAWING	REV
ECO 09144	J
REVISED 6/5/09	
DRAWING 104003	

ORDERING

Using the chart below, check the features you require and fax them with your purchase order to our customer service department.
Fax 760-597-4830; phone 760-599-4800.

LENGTH CODE

MODEL PRO 4-300-EP -1 -2 -3

FEED/CONCENTRATE SIZE

1/2" NPTF (1.31" offset from permeate)

3/4" NPTF (1.25" offset from permeate)

MEMBRANE INFORMATION

The **PRO-4-300-EP** will accommodate any make of four-inch nominal diameter x 40" long spiral-wound element with a .75" OD product water tube and a 38" long outer shell design.

Vessel configuration approved by _____ **Date** / /