

# DELTA O-RING CARTRIDGE SEAL ASSEMBLY AND INSTALLATION INSTRUCTIONS



## INTRODUCTION:

These instructions are provided to familiarize the user with the seal and its use. The instructions must be read carefully and applied whenever work is done on the seal. Please keep available for future reference.

**IMPORTANT:** **These instructions are for the installation and operation of a seal as used in rotating equipment and will help to avoid danger and improve reliability. The information required may change with other types of equipment or installations. These instructions must be read in conjunction with the instruction manuals for both the pump and any auxiliary equipment.**

If the seal is to be used for an application other than that originally intended or outside the recommended performance limits, Delta must be contacted before its installation and use.

Any warranty may be affected by improper handling, installation, or use of this seal. Contact the company for information as to product warranty and limitations of liability.

If questions or problems arise, contact your local Delta Sales/Service Engineer or the original equipment manufacturer, as needed.

**IMPORTANT:** **Delta Mechanical Seals are precision products and must be handled appropriately. Take particular care to avoid damage to lapped sealing faces.**

## SAFETY NOTES:

1. The following designations are used in the installation instructions to highlight areas of particular importance:

**NOTE:** Refers to special information on how to install or operate the seal.

**IMPORTANT:** **Refers to special information towards the prevention of damage to the seal or its surroundings.**

**WARNING:** **Refers to mandatory instructions designed to prevent personal injury or extensive damage.**

2. Installation, removal and maintenance of the seal must be carried out only by qualified personnel who have read and understood all instructions.
3. The seal is designated exclusively for sealing rotating equipment; manufacturer cannot be held liable for use of the seal for purposes other than noted.
4. The seal must only be used in perfect conditions and must be operated within the recommended performance limits in accordance with its designated use set out in these instructions for installation of Delta Mechanical Seals.
5. If the fluid pumped is hazardous or toxic, special care and appropriate precautions must be taken to ensure that any seal leakage is adequately contained. Further information on sealing hazardous or toxic fluids is available from Delta and should be read carefully prior to seal installation.
6. Fluorocarbon components should never be burned or incinerated as the fumes and residues are toxic. If fluorocarbons are accidentally heated above 700 degrees F they decompose, therefore, protective gloves should be worn as acid may be present.
7. PTFE should never be burned or incinerated as the fumes are toxic and dangerous.

## PRIOR TO STARTING EQUIPMENT:

1. Check the pump at the coupling for proper alignment of the motor.
2. Ensure that the gland nuts/bolts are securely tightened and that all screws are securely fastened.
3. Complete the assembly of the pump and turn the shaft to ensure free rotation prior to startup.
4. Consult all equipment operating instructions to check for proper piping and connections, particularly regarding: seal recirculation/flush, heating or cooling requirements, and external services.

**IMPORTANT:** **This mechanical seal is designed to operate in a liquid so the heat created must be removed. The following check should be carried out after seal installation and after any period of equipment inactivity.**

5. Check that all seal chamber lines are open and free from obstruction and ensure that the seal chamber is properly vented and filled with liquid; refer to "Delta Start-up Procedures" and pump instruction manual.

**IMPORTANT:** **Dry-running, often indicated by a squealing noise from the seal area, causes overheating and damage to the sealing surfaces, resulting in excessive leakage and shortened seal life.**

**WARNING:** **Before start-up, make sure all personnel and tools have been moved to a safe distance so there is no contact with rotating components on the pump, coupling, seal and motor.**

**WARNING:** **Seal installation should be handled only by qualified, trained personnel. If questions arise, contact the local Delta Engineer. Improper use or installation of this product could result in injury and/or harmful emissions to the environment, and may affect any warranty on the product. Please contact Delta for information as to exclusive product warranty and liability limitations.**

## AFTER EQUIPMENT HAS RUN:

1. Make sure that the pump is electrically isolated.

**WARNING:** **If the seal has been used on toxic or hazardous fluids, ensure that the seal is correctly decontaminated and safe prior to commencing work.**

**NOTE:** Fluid is often trapped during draining and may exist outside the seal. The pump instruction manual should be consulted for any special precautions.

2. Ensure that the pump is isolated by the appropriate valves. Check that the fluid is drained and pressure is fully released.
3. Make sure work area is safe, secure, and well ventilated.

## SEAL MAINTENANCE:

No maintenance of a seal is possible while installed; therefore, it is recommended that a spare seal (to prevent unnecessary downtime) be held in stock to allow immediate replacement of a removed seal.

**WARNING:** **It is the responsibility of the user to ensure that any parts being sent to a third party have appropriate, safe-handling instructions externally attached to the mechanical seal packaging.**

## DELTA QUALITY ASSURANCE:

This seal has been assembled in accordance with Delta Quality Assurance Standards. With proper maintenance and use, it will give safe and reliable operation to the maximum recommended performance as shown in Delta publications.

**SHAFT / SLEEVE EXAMINATION:**

1. The shaft finish should be 30 micro inches RMS and feel smooth if you run your fingernail down it axially
2. Make sure the shaft or sleeve diameter is within + .001"/- .002" of nominal.
3. Use a dial indicator to measure the shaft runout in the area where the seal will be installed. (Readings should not exceed .002" TIR per inch or shaft diameter.)
4. Place the dial indicator on the end of the shaft and alternately push and pull the shaft axially to measure end play. End play should not exceed .005" TIR.
5. Protect the sleeve o-ring by lubricating the shaft with a clean silicone based lubricant.
6. A static o-ring (position 1) must seal to the shaft at the shown location. Be sure the shaft is clean and free from scratches within the o-ring area.
7. Remove all burrs and sharp corners, especially in areas where the o-ring has to slide. Cover threads and keyway slots to prevent cutting the o-ring during installation.

**STUFFING BOX/SEAL CHAMBER EXAMINATION:**

8. Check that the stuffing box/seal chamber is clean with no obstructions.
9. The stuffing box face should be a maximum of 125 micro inches RMS for proper gasket sealing.
10. Attach the dial indicator base to the shaft and rotate both the indicator and shaft while reading the runout of the stuffing box face. Misalignment of the stuffing box face relative to the shaft should not exceed .003" TIR per inch of shaft diameter.
11. Some split case pumps will have a misalignment between halves on the stuffing box face. This surface must be machined flat.

**PUMP/DRIVER ALIGNMENT:**

12. Check the driver shaft (motor) to equipment shaft (pump) alignment using a dial indicator or precision alignment procedure.

**NOTE:** If any values in the above steps are found to be out of tolerance, corrective actions must be taken to ensure extended seal life.

**INSTALLING THE SEAL:**

1. Before starting the installation, read the following instructions carefully.
2. Remove the seal from its packaging, inspect for any damage, and wipe clean.
3. Verify that the metallurgy, faces and o-rings are compatible with the fluid to be sealed.
4. The equipment should be cleaned and comply with the "Equipment Preparation" procedures as indicated above.
5. Lubricate the o-ring in the seal with the special lubricant provided.

**NOTE:** The stuffing box bore should be at least .040 larger than "D1" diameter.

6. If the seal is operating at stuffing box pressures above 250 PSI or if the shaft/sleeve is case hardened, replace the 316SS set screws with hardened steel cup point set screws.
7. Place the stationary portion of the seal into the seal gland. **NOTE:** On some stationaries, one side of the stationary seal face is lapped.
8. Place this assembly on a table with the gland gasket surface facing upward.
9. Place the gasket on the gland gasket surface.
10. Disassemble the pump according to manufacturer's instructions and clean thoroughly.
11. Determine the correct installation length for the seal using the operating length given for the 2000 rotary (See dimensional data for Delta Seal 2000 on page 4). The installation length will vary depending on the type of stationary and equipment being sealed. Check the stationary installation instructions for the particular Delta stationary being used with the 2000 rotary.
12. Scribe a mark equal to the installation dimension (determined from the operating length and distance from stationary face to face of stuffing box) away from the appropriate reference point (i.e. the stuffing box face).
13. Slide the rotary onto the shaft and bring the back of the rotary to the scribe mark. Set screw the 2000 rotary to the shaft.

**WARNING: DO NOT OVER-COMPRESS BELLOWS!**

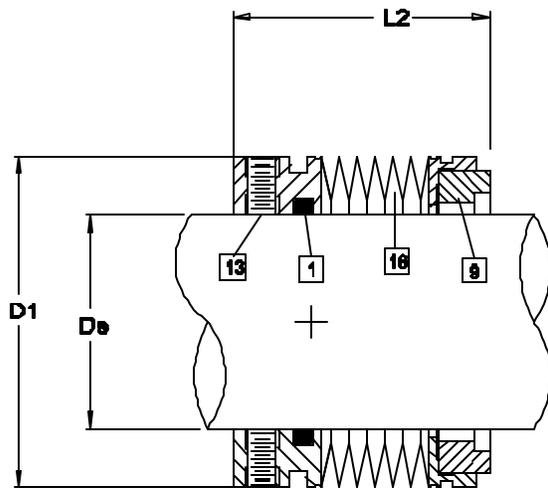
14. Reassemble the equipment (with the stationary and gland as required for the particular equipment). Proper installation of the rotary and stationary will set the 2000 at its correct operating length without over-or under-compressing the seal.
15. Orient the gland piping connections per the instructions outlined in the "API Information" of page 5. Do not connect piping until after gland bolts/nuts have been tightened!
16. Tighten gland bolts/nuts in an alternate pattern until secure (1/4 turns 180 degrees apart). Make sure flat washers are used, failure to do so may cause the gland to move off center. Use feeler gages to center stationary face to the sleeve O.D.
17. Rotate the shaft by hand. Seal should turn freely without binding or the use of excessive force. If you hear contact within the seal, the seal must be re-centered.
18. Piping connections can only be made after the gland bolts/nuts are securely tightened.
19. Make appropriate piping connections to the seal assembly and equipment. See "API Information" of page 5.

**WARNING:** Take all necessary precautions and follow all safety procedures before starting the equipment!

# TYPICAL STYLE 2000 SEAL ARRANGEMENT



## Seal Cutaway



## Seal Cutaway/Part Identification Key

Item	Description	Part Number
1	O-ring Pos.1	Standard
2	O-ring Pos.2	N/A
3	O-ring Pos.3	N/A
4	O-ring Pos.4	N/A
5	O-ring Pos.5	N/A
6	O-ring Pos.6	N/A
7	Gland	N/A
8	Sleeve	N/A
9	Inboard Rotary Face:	Standard
10	Outboard Rotary Face:	N/A
11	Inboard Stationary Face:	N/A
12	Outboard Stationary Face:	N/A
13	Set Screws / Lock Collar	Standard
14	Gasket	N/A
15	Snap Ring	N/A
16	Bellows Assembly	Standard
17	Centering Clips	(Not Shown)
18		
19		
20		

## Additional Products

## Gland Front View / Piping Arrangement

## Suggested Environmental Controls

Direction of view is from the driver end of pump.

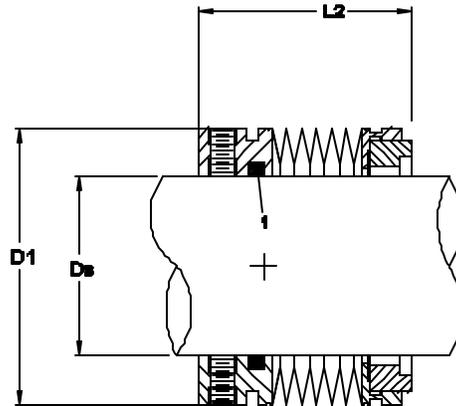
# DIMENSIONAL DATA FOR DELTA SEAL STYLE 2000



Front View

Side View

Optional Gland Feature



DS Seal Size	D1 Sleeve OD	D2 Min	D2 Max	D3 Gland OD	D4 Gland Flat	A Min. Bolt Circle by Stud Size				S Slot Width	L1 Outside Length	L2 Inside Length	L3 Gland Length	Pos. 1 Oring	Pos. 2 Oring	Pos. 3 Oring	Pos. 4 Oring	Pos. 5 Oring	Pos. 6 Oring
						3/8"	1/2"	5/8"	3/4"										
1.000	2.025													318					
1.000	1.562													120					
1.125	1.687													122					
1.250	1.812													124					
1.375	1.937													126					
1.50	2.062													128					
1.625	2.187													130					
1.750	2.312													132					
1.875	2.437													134					
2.000	2.562													136					
2.125	2.687													138					
2.250	2.812													140					
2.375	2.937													142					
2.500	3.187													144					
2.625	3.312													146					
2.750	3.437													232					
3.000	3.750													234					

**Distributor**

(Phone)  
(Fax)

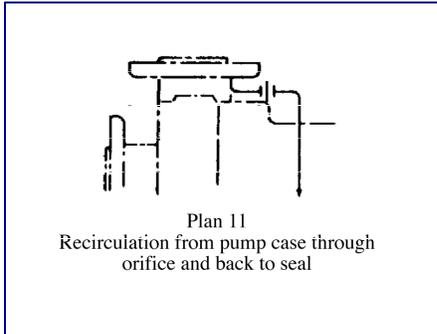


**Manufacturer**

Delta  
44 Probbler Lane  
Fall River, MA 02720  
508-324-4032 (Phone)  
508-324-4339 (Fax)

Three API Plans commonly used for glands **with** tapped flush connections.

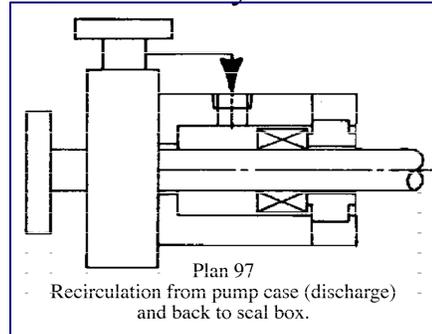
**API Plan 11**



A line is connected from the pump discharge to the seal gland. The pumped fluid used to flush the seal must be clean and at a temperature well below the product's vapor pressure at seal chamber temperature. In some cases where the product is near its initial boiling point at chamber pressure, the seal chamber pressure may be increased by installing a bushing in the throat of the chamber. This bushing will increase the seal chamber pressure and reduce damaging flashing and vaporization of the product at the seal faces.

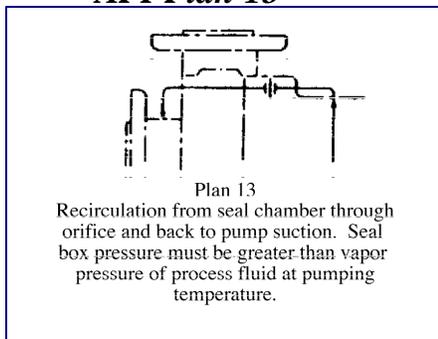
Three Delta Auxiliary Plans commonly used for glands **without** tapped flush connections.

**Delta Auxiliary Plan 97**



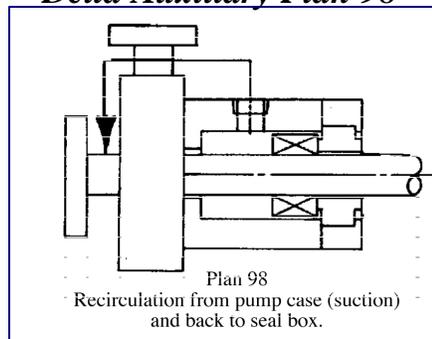
A line is connected from the pump discharge to the stuffing box / seal chamber. The pumped fluid used to flush the seal must be clean and at a temperature well below the product's vapor pressure at seal chamber temperature. In some cases where the product is near its initial boiling point at chamber pressure, the seal chamber pressure may be increased by installing a bushing in the throat of the chamber. This bushing will increase the seal chamber pressure and reduce damaging flashing and vaporization of the product at the seal faces.

**API Plan 13**



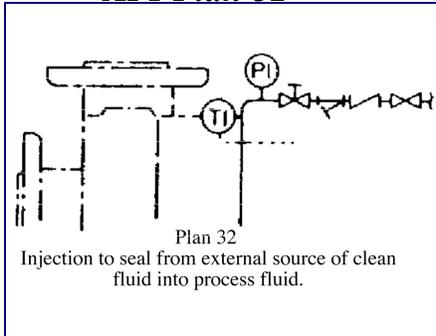
A line is connected from the pump suction to the seal gland. This is used to reduce pressure in the seal chamber enabling the seal to run cooler and to recirculate liquid and solids away from the seal faces.

**Delta Auxiliary Plan 98**



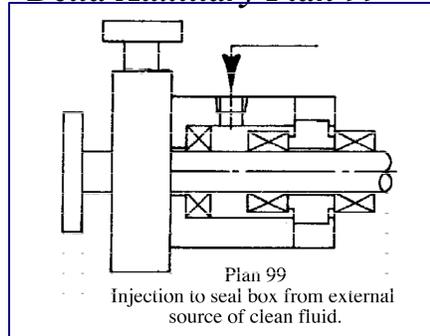
A line is connected from the pump suction to the stuffing box / seal chamber. This is used to reduce pressure in the seal chamber enabling the seal to run cooler and to recirculate liquid and solids away from the seal faces.

**API Plan 32**



The seal is flushed from a clean, cool external source at a rate and temperature to maintain a proper environment for the seal. The flush must be sufficient to prevent the pumped fluid from entering the seal chamber. A close clearance bushing installed in the bottom of the seal chamber will reduce the flush required by increasing the velocity at the throat at a given flow.

**Delta Auxiliary Plan 99**



The seal is flushed from a clean, cool external source at a rate and temperature to maintain a proper environment for the seal into the stuffing box / seal chamber. The flush must be sufficient to prevent the pumped fluid from entering the seal chamber. A close clearance bushing installed in the bottom of the seal chamber will reduce the flush required by increasing the velocity at the throat at a given flow.

**WARNING:**

**Take all necessary precautions and follow safety procedures before starting the equipment.**