

# Rosemount™ DP Level Transmitters and Diaphragm Seal Systems



## NOTICE

This guide provides basic guidelines for the Rosemount DP Level Transmitters and Diaphragm Seal Systems [Reference Manual](#). It does not provide instructions for configuration, diagnostics, maintenance, service, or troubleshooting. Refer to the appropriate reference manual for more instruction. This guide are also available electronically on [Emerson.com/Rosemount](https://emerson.com/rosemount).

## **⚠ WARNING**

The products described in this document are NOT designed for nuclear-qualified applications. Using non-nuclear qualified products in applications that require nuclear-qualified hardware or products may cause inaccurate readings.

For information on Rosemount nuclear-qualified products, contact your local Emerson Sales Representative.

### **Physical access**

Unauthorized personnel may potentially cause significant damage to and/or misconfiguration of end users' equipment. This could be intentional or unintentional and needs to be protected against.

Physical security is an important part of any security program and fundamental to protecting your system. Restrict physical access by unauthorized personnel to protect end users' assets. This is true for all systems used within the facility.

---

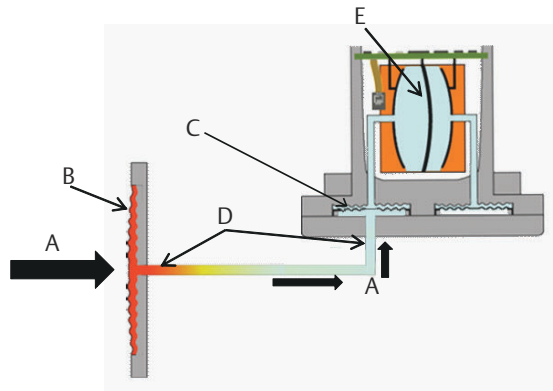
## Contents

Introduction.....	3
Preface.....	4
General handling overview.....	5
Mechanical installation .....	6
Ranging the transmitter.....	14
Rosemount 1199 seal types.....	15
Rosemount 1299 Seal Types.....	16

# 1 Introduction

A remote seal system consists of a pressure transmitter, a remote seal, and either a direct mount or capillary style connection filled with a secondary fill fluid. During operation, the thin, flexible diaphragm and fill fluid separate the pressure sensor of the transmitter from the process medium. The capillary tubing or direct mount flange connects the diaphragm to the transmitter. When process pressure is applied, the diaphragm is displaced, transferring the measured pressure through the filled system, by way of the capillary tubing, to the transmitter. This transferred pressure displaces the sensing diaphragm in the pressure sensor of the transmitter. This displacement is proportional to the process pressure and is converted electronically to an appropriate output current and/or digital protocol.

**Figure 1-1: Path of Pressure in a Standard DP Level Seal System**



- A. Pressure
- B. Process isolating diaphragm
- C. Transmitter diaphragm
- D. Fill fluid
- E. Transmitter pressure sensor

## 2 Preface

This guide is designed to assist with general handling and installation instructions for the Rosemount DP Level Transmitters and both 1199 and 1299 Diaphragm Seal Systems. The Rosemount DP Level Transmitters and Diaphragm Seal Systems [Reference Manual](#) contains supplemental information about the seal system assemblies that are not covered in the corresponding transmitter manuals.

### 3 General handling overview

Check if equipment received conforms to the order. If any issues, contact your local Emerson sales representative immediately.

When unpacking or handling seal system assemblies, do not lift the seal or transmitter by gripping the capillaries, doing so could result in disconnecting the seal and/or capillary from the transmitter, which will void the warranty.

The material of a remote seal is designed to withstand pressure and wear from process material, but outside of process connection conditions, remote seals are delicate and should be handled with care.

The protective cover should remain on the seal until the moment before installation. Try to avoid touching the diaphragm with fingers or objects and refrain from setting the diaphragm side of the seal down on a hard surface. Even minor dents or scratches in the diaphragm material may impair the performance of the seal system assembly.

Avoid sharply bending or crimping the capillary tubing. The minimum bending radius of the capillary tubing is 3-in. (8 cm).

When using heat or steam tracing, exercise caution if PVC coating is added onto capillary. The PVC coating on the armor will break down at temperatures around 212 °F (100 °C). Best practice for heat and steam tracing is to regulate the temperature above the maximum ambient temperature for a consistent result. To avoid accuracy effects and thermal stress, the capillary should not be partially heated.

## 4 Mechanical installation

### NOTICE

Never attempt to disconnect the seals or capillaries from the transmitter or loosen bolts. Doing so will result in loss of fill fluid and will void the product warranty.

#### 4.1 Mounting the seal system in vacuum applications

Mounting the pressure transmitter at or below the bottom vessel tap is an important factor to ensure a stable measurement with vacuum applications. The static pressure limit for a differential pressure transmitter is 0.5 psia (25 mmHgA), which ensures the transmitter sensor module fill fluid remains within the liquid phase of the vapor pressure curve.

If the vessel static limit is below 0.5 psia, mounting the transmitter below the bottom tap provides a capillary fill fluid head pressure on the module. A general rule in vacuum applications is to mount the transmitter approximately 3 ft. (1 m) below the bottom tap of the vessel.

Capillaries are to be securely fastened in order to avoid false readings.

#### 4.2 Insulation considerations with a Thermal Range Expander seal system

The Thermal Range Expander System uses the heat from the process in order to keep both fluids within the system functioning properly, therefore insulation is not always required. However, it is always best practice to insulate systems to keep them functioning with optimum performance. The Thermal Range Expander should never be insulated above the line marked on the seal itself, see the figure below for reference.

**Figure 4-1: Thermal Range Expander System Insulation Considerations**



### 4.3 Flanged type seals

#### Gaskets

When installing remote seal systems which employ a gasket or a gasket and flushing connection ring, make sure the gasket is aligned properly on the gasket sealing surface. Failure to properly install the gasket may cause process leaks, which can result in death or serious injury. In addition, make sure the gasket does not press down upon the diaphragm face. Anything pressing on the diaphragm will be read by the transmitter as pressure. A misaligned gasket may cause a false reading or damage the diaphragm.

The diaphragm gasket is supplied when a lower housing or flushing connection is provided. The default gaskets are listed below, based on seal type. The process gasket must be supplied by the end user. Tantalum diaphragms are not supplied with default gasket, so a gasket option must be selected when applicable.

**Table 4-1: Gasket Materials**

Seal type	Gaskets
<b>Flanged seals assemblies</b>	
FFW	Klinger C-4401
RFW	Klinger C-4401

**Table 4-1: Gasket Materials (continued)**

Seal type	Gaskets
EFW	No gasket is supplied
PFW	Klinger C-4401
FCW	No gasket is supplied
RCW	Klinger C-4401
FUW/FVW	No gasket is supplied
<b>Threaded seal assemblies</b>	
RTW	Klinger C-4401
HTS	No gasket is supplied
<b>Hygienic seal assemblies</b>	
SCW <sup>(1)</sup>	No gasket is supplied
SSW	Ethylene propylene O-ring
STW	Ethylene propylene O-ring
EES	No gasket is supplied
VCS <sup>(1)</sup>	No gasket is supplied
SVS <sup>(1)</sup>	No gasket is supplied
SHP	No gasket is supplied
SLS <sup>(1)</sup>	No gasket is supplied
MLS <sup>(1)</sup>	No gasket is supplied
<b>Specialty seals</b>	
WSP	Klinger C-4401
UCP	Barium-Sulfate filled PTFE O-ring
CTW	No gasket is supplied
TFW	No gasket is supplied
WFW	Klinger C-4401

(1) Ensure to use EHEDG approved gasket for EHEDG conformity.

1299 does not come with a default gasket, it must be specified in the model number or ordered as a spare.

### Maximum working pressure (MWP)

Verify the MWP as marked on the transmitter neck label meets or exceeds the expected maximum process pressure the transmitter/seal assembly



could experience once installed. If a flushing ring is used, its MWP should also be verified.

### **Bolt torquing**

When connecting the process and mating flange, the bolts should be torqued to the applicable flange requirements. Required torque is a function of the gasket material and surface treatment of the bolts and nuts which are customer supplied.

## **4.4 Pancake type seal options**

### **Capillary support tube**

A common option for the pancake type seal (PFW) is the capillary support tube. Due to the side capillary-to-seal connection, the support tube provides a handle for aligning the pancake seal during installation. The support tube should not be used for supporting any weight above that of the remote seal.

### **Process flange**

Emerson offers the option of supplying the process flange, otherwise the process flange is furnished by the customer. For certain pancake seal assemblies, the Emerson supplied process flange has a machined hole through the center of the flange. This hole corresponds to a threaded connection in the back of the pancake seal upper housing. The flange can, therefore be connected to the seal prior to installation to make handling easier.

## **4.5 Threaded type seals**

### **Lower housing installation procedure**

The lower housing of the remote seal has either a male or female thread connection for attachment to a process pipe nipple. When threading the lower housing to the process pipe, care should be taken not to overtighten. The applied torque should comply to ANSI B1.20.1 for NPT connections or applicable torque requirements for pipe connections.

### **Upper housing installation procedure**

The threaded seal is supplied with carbon steel, bolts, and nuts. 304 SST or 316 SST bolts and nuts can be ordered as options. The torque specifications for the RTW seal can be found in the table below.

### **Gasket installation**

Threaded seals with flushing connection rings come with a sealing gasket. When connecting the remote seal, gasket, and flushing connection ring make sure the gasket is properly aligned on the gasket sealing surface.

**Table 4-2: Torque Specifications**

PSIG rating	Bolt material	Torque specification
800	CS	20 ft-lbs
500	SST	15 ft-lbs
2500	CS	53 ft-lbs
2500	SST	50 ft-lbs
5000	CS	105 ft-lbs
5000	SST	120 ft-lbs
10000	CS (SST N/A)	180 ft-lbs

### Alternative system installation procedure

An alternative to threading the entire seal system assembly to the process piping is to unbolt the seal upper and lower housing and thread the lower housing to the hard piping separately. Bolt the upper and lower housings together to the required torque specification. Note that gaskets need to be replaced once they have been torqued. Thus this alternative system installation procedure requires gasket replacement.

## 4.6 Hygienic type seals

### Hygienic approvals

Supplied 3-A approved hygienic seals are marked with a 3-A symbol.

Supplied EHEDG approved hygienic seals are marked with a EHEDG symbol.

### Clamp style tank spud

For clamp style tank spud seals the procedures for welding the tank spud to the tank vessel are shipped with the tank spud. For the welding procedure refer to [Rosemount DP Level Transmitters and Diaphragm Seal Systems Reference Manual](#) for proper welding tank spud guidelines.

The clamp and gasket are furnished by the user. Maximum pressure rating of the system is dependent upon the clamp device. The clamp and O-ring are provided with the tank spud seal. Attach the clamp and hand-tighten the connection.

### Flange style tank spud

When connecting the process and mating flange, the bolts should be torqued to the specifications outlined by ANSI B16.5 or applicable flange requirements.

## 4.7 Saddle type seals

### Lower housing installation procedure

For 4-in. line size, the lower housing is welded directly into the process pipe. For 2- and 3-in. line sizes, the lower housing is welded onto the process pipe. The upper housing must be removed from the system when welding the lower housing into the process pipe. Allow the pipe connection to cool before installing the seal upper housing.

### Upper housing installation procedure

The torque specifications for the saddle seal upper housings is 180 in-lb. (20 N-m) for all bolting material. As it is necessary for the customer to torque the upper housing bolts during installation, each saddle seal includes a torque label with the specified torque.

### Gasket installation

The saddle type seal comes standard with a sealing gasket. When connecting the upper and lower housings make sure the gasket is aligned properly on the gasket sealing surface.

## 4.8 TFS wafer style in-line seal

### Connection styles

The in-line flow-through seal is attached to the process piping by flange, clamp, or male threaded connections.

### Flanged type connection

The flow-through seal comes between the two process flanges due to the flanged process connection. The bolts should be torqued to the specifications outlined by ANSI B16.5 or EN 1092-1, JIS B 2210 flange torque requirements. Required torque is a function of the gasket material and surface treatment of the bolts and nuts, which are customer supplied.

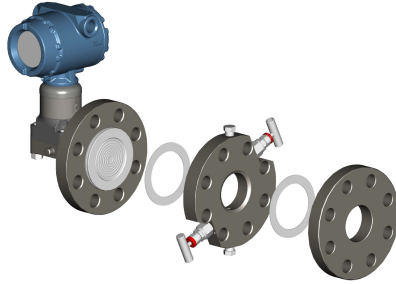
## 4.9 Flushing ring installation

The flushing ring should be mounted between the process flange and the diaphragm seal flange between two gaskets.

Flushing ports should be oriented vertically so that the flushing fluid is most effectively drained.

---

**Figure 4-2: Rosemount 319C Compact Flushing Ring Installation Orientation Example**



---

**Note**  
Figure 4-2 shown with optional plugs.

---

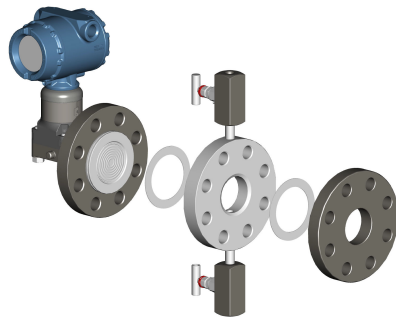
**Note**  
319C compact designs are compatible with raised-face and full-faced remote seals and process flanges.

---

---

**Rosemount 319T traditional flushing ring installation orientation example**

**Figure 4-3: Bolt-through design**



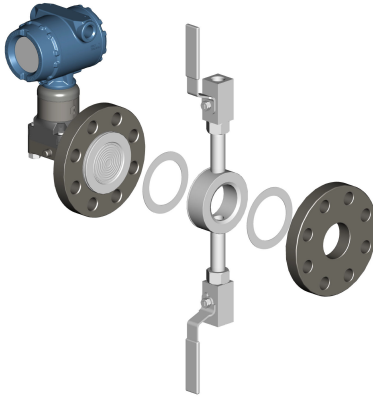
---

**Note**  
Valves should be oriented so that the valve handle faced towards the diaphragm seal. Figure 4-3 depicts an optional 90 degree valve orientation.

---

---

**Figure 4-4: Non-Bolt-through design**



---

**Note**

Figure 4-4 depicts a standard valve orientation.

---

---

## 5 Ranging the transmitter

Rosemount DP Level Transmitters and Diaphragm Seal Systems [Reference Manual](#) for proper ranging guidelines for open tank-single seal and pressurized tank-two seals.

## 6 Rosemount 1199 seal types

### 6.1 Flanged seal assemblies

FFW Flush Flanged Seal

RFW Flanged Seal

EFW Extended Flanged Seal

PFW Pancake Seal

FCW Flush Flanged Seal - Ring Type Joint (RTJ) Gasket Surface

RCW Ring Type Joint (RTJ) Flanged Seal

FUW and FVW Flush Flanged Type Seals

### 6.2 Threaded seal assemblies

RTW Threaded Seal

HTS Male Threaded Seal

### 6.3 Hygienic seal assemblies

SCW Hygienic Tri-Clover Style Tri Clamp Seal

SSW Hygienic Tank Spud Seal

STW Hygienic Thin Wall Tank Spud Seal

EES Hygienic Flanged Tank Spud Extension Seal

VCS Tri Clamp In-Line Seal

SVS VARIVENT® Compatible Hygienic Connection Seal

SHP Hygienic Cherry-Burrell "1" Line Seal

SLS Dairy Process Connection - Female Thread Seal per DIN 11851

### 6.4 Specialty seal assemblies

WSP Saddle Seal

UCP Male Threaded Pipe Mount Seals and PMW Paper Mill Sleeve Seals

CTW Chemical Tee Seal

TFS Wafer Style In-Line Seal

WFW Flow-Thru Flanged Seal

## **7 Rosemount 1299 Seal Types**

### **7.1 Flanged seal assemblies**

Offline Flanged Seal

Flush Flanged Seal

Pancake Seal

Extended Flange Seal

Flush Flanged with RTJ Surface Seal

### **7.2 Threaded Seal**

Offline Threaded Seal





For more information: [Emerson.com](https://www.emerson.com)

©2022 Emerson. All rights reserved.

Emerson Terms and Conditions of Sale are available upon request. The Emerson logo is a trademark and service mark of Emerson Electric Co. Rosemount is a mark of one of the Emerson family of companies. All other marks are the property of their respective owners.