

Rosemount™ DP Level Transmitters and 1199 Diaphragm Seal Systems



NOTICE

This guide provides basic guidelines for the Rosemount DP Level Transmitters and 1199 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.

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.

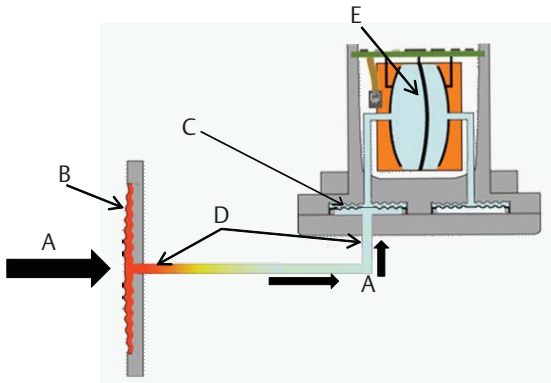
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1.0 Introduction

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. 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

2.0 Preface

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

3.0 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.

4.0 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 2. 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 1. Gasket Materials

Seal type	Gaskets
Flanged seals assemblies	
FFW	Thermo-Tork® TN-9000
RFW	Klinger C-4401
EFW	No gasket is supplied
PFW	Thermo-Tork TN-9000
FCW	No gasket is supplied
RCW	Klinger C-4401
FUW/FVW	No gasket is supplied
Threaded seal assemblies	
RTW	Klinger C-4401
HTS	No gasket is supplied
Hygienic seal assemblies	
SCW ⁽¹⁾	No gasket is supplied
SSW	Ethylene propylene O-ring
STW	Ethylene propylene O-ring
EES	No gasket is supplied
VCS ⁽¹⁾	No gasket is supplied
SVS ⁽¹⁾	No gasket is supplied
SHP	No gasket is supplied
SLS ⁽¹⁾	No gasket is supplied
MLS ⁽¹⁾	No gasket is supplied
Specialty seals	
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.

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 2. Gasket Specifications

PSIG rating	Bolt material	Torque specification
2500	CS or SST	23 ft-lbs
5000	CS	53 ft-lbs
5000	SST	50 ft-lbs
10000	CS (SST N/A)	105 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 1199 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.

5.0 Ranging the transmitter

Rosemount DP Level Transmitters and 1199 Diaphragm Seal Systems [Reference Manual](#) for proper ranging guidelines for open tank-single seal and pressurized tank-two seals.

6.0 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 “I” 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



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