

Rosemount 1199 Diaphragm Seal Systems

**FOR ROSEMOUNT 3051, 1151, AND 2088
TRANSMITTERS**

EXPANDED TRANSMITTER USE

- *Extreme hot and cold temperatures*
- *Corrosive applications*
- *Clogging or viscous processes*
- *Sanitary requirements*
- *Specific process connections*

APPLICATIONS

- *Level, Flow, Pressure, Interface, Density*



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Keeping You A Step Ahead

To meet your application requirements, the combination of Rosemount level transmitters and remote seals deliver an unsurpassed product offering that is easy to specify, order, and install. The Rosemount 1199 offering defined in this product data sheet highlights the wide variety of process connections, direct mount or capillary connections, and materials of construction to address almost any application. If you don't see what you need listed here, ask us. We can create a custom engineered solution to meet your needs.

Proven *Tuned-Systems*™ Deliver Best Practices for DP-Level Installations

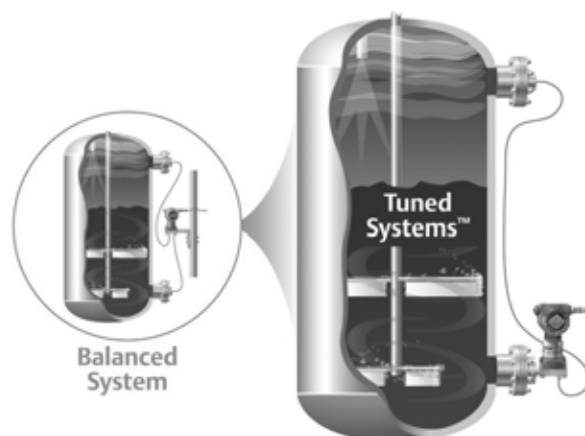
Emerson offers the only *Tuned-Systems* on the market. Direct mounting the transmitter with a Tuned-System results in:

- Transmitter installed cost reduced by 20%
- Total system performance improved by 10%
- Time response improved by over 80%.

Instrument Toolkit® Software:

- Calculates seal system temperature performance and response time
- Specifies the right seal system the first time, every time

To learn more about Instrument Toolkit software, see "Instrument Toolkit Software" on page 7. To learn more about *Tuned-Systems*, see "Balanced System vs. Tuned-Systems" on page 8.



Rosemount Pressure Solutions

Integrated level transmitters are defined in the 3051S, 3051, and 1151 product data sheets. Rosemount 1199 diaphragm seals can be attached to Rosemount, 3051, 1151, 3095, and 2088 differential, gage, and absolute pressure transmitters. For transmitter information, refer to the following product data sheets to select the transmitter and 1199 seal system.

Rosemount 3051S Series of Instrumentation

Scalable pressure, flow and level measurement solutions improve installation and maintenance practices.

Rosemount 3051 Pressure Transmitter

Provides industry leading performance, flexible *Coplanar*™ platform and guaranteed five year stability.

Rosemount 3095MV Mass Flow Transmitter

Accurately measures differential pressure, static pressure and process temperature to dynamically calculate fully compensated mass flow.

Rosemount 1151 Pressure Transmitter

Provides reliable measure of differential, gage, and absolute pressure or liquid level. Ranges from 0.5 inH2O to 0-6000 psig.

Rosemount 2088 Pressure Transmitter

Economical, compact, and rugged transmitter, ideal for gage and absolute pressure ranges from 1 to 4000 psi.

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General Information

WHAT IS A DIAPHRAGM SEAL SYSTEM?

A diaphragm seal system consists of a pressure transmitter, one or two diaphragm seals, a fill fluid, and either a direct mount or capillary style connection.

During operation, the thin, flexible diaphragm and fill fluid separate the pressure sensing element 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, through the capillary tubing, to the transmitter element. This transferred pressure displaces the sensing diaphragm of the pressure transmitter. This displacement is proportional to the process pressure and is converted electronically to an appropriate 4-20 mA, digital HART, or FOUNDATION fieldbus output signal.

WHY USE DIAPHRAGM SEALS?

Seal systems provide a reliable process pressure measurement and prevent the process medium from contacting the transmitter diaphragm.

Transmitter/diaphragm seal systems should be considered when:

- The process **temperature** is outside of the normal operating ranges of the transmitter and cannot be brought into those limits with impulse piping.
- The process is **corrosive** and would require frequent transmitter replacement or specific exotic materials of construction.
- The process contains suspended **solids** or is **viscous** and may plug the impulse piping.
- The application requires the use of **sanitary connections**.
- There is a need for easier cleaning of the process from the connections to **avoid contamination** between batches.
- There is a need to **replace wet/ dry legs** to reduce maintenance on applications where the reference leg is not stable or often needs to be refilled/drained.

- There is a need to make **density** or **interface measurements**.
- The process medium may **freeze** or **solidify** in the transmitter or impulse piping.

PERFORMANCE CONSIDERATIONS

Attaching a diaphragm seal to a pressure transmitter changes the performance of the transmitter. The seal system will have additional temperature effects and response time depending on the system configuration. The performance of the entire system needs to be evaluated when specifying a seal system for a new application to ensure satisfactory performance when installed.

Temperature Effects

Seal system temperature effects are caused by changes in volume and density of the fill fluid in the seal system. Changes in volume are described as **Seal Temperature Effects** and occur when the fill fluid expands or contracts with fluctuations in the process or ambient temperature. This change in fill volume drives a change in the internal pressure of the transmitter/seal system.

The density of the fill fluid also changes with temperature fluctuations. Changes in density are described as **Head Temperature Effect** as they represent a change in the head zero offset reference from initial installation. Both effects need to be combined to get the total temperature effects for a seal system.

Seal Temperature Effects

Three primary factors affect the seal temperature effects of a diaphragm seal system: the diaphragm stiffness, the characteristics of the fill fluid, and the system volume.

Product Data Sheet

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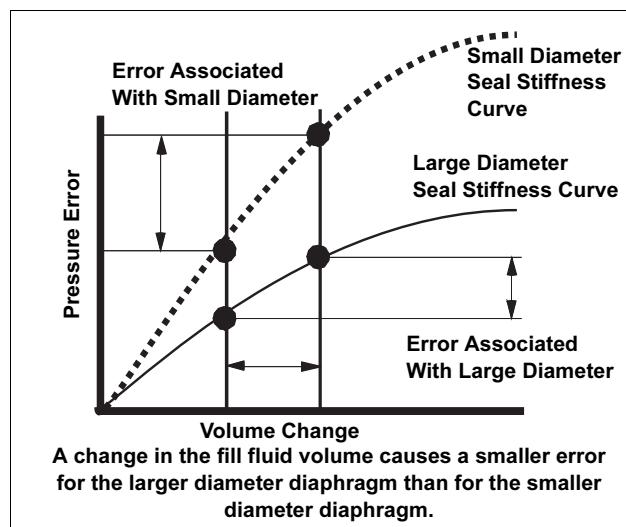
Diaphragm Stiffness

Diaphragm stiffness is a critical parameter affecting seal temperature effects. As the fill fluid expands or contracts due to temperature changes, the seal diaphragm stiffness will determine the amount of the volume change that is absorbed by the seal diaphragm and the amount exerted as back pressure on the transmitter sensor module. This back pressure acting upon the sensing diaphragm of the transmitter represents the output temperature error.

Diaphragm stiffness is affected by the diaphragm surface diameter, material of construction, thickness, and convolution pattern. Of these factors, the most significant is the diaphragm seal diameter. Each diaphragm has its own characteristic stiffness curve. Generally, smaller diameter diaphragms are stiffer than larger diameter diaphragms, and thus have a larger seal temperature effect error when the fill fluid expands or contracts with temperature changes.

Figure 1 on page 5 shows the diaphragm stiffness curves for two different sizes of diaphragms. The larger diameter diaphragm, which is less stiff can accommodate changes in fill volume and has a smaller error than the smaller diameter diaphragm.

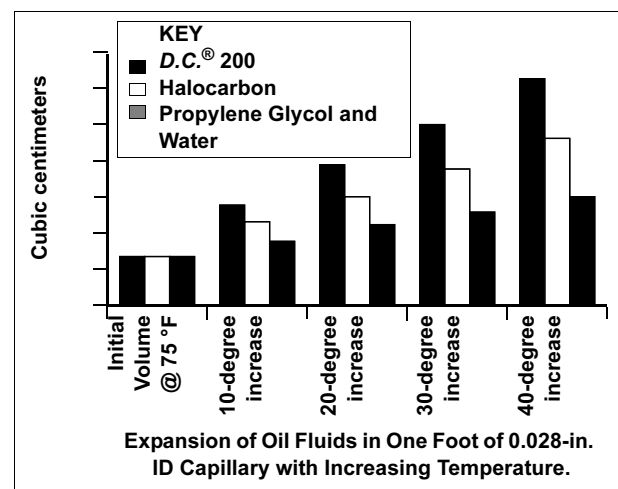
FIGURE 1. Diaphragm Stiffness Curves



Fill Fluid

The expansion characteristics and the volume of fill fluid affect seal temperature effects. All fill fluids expand and contract with changes in temperature. The coefficient of thermal expansion defines the amount of change and is represented in cubic centimeters of expansion per cubic centimeter of fluid volume per degree Fahrenheit (cc/cc/F). The amount of expansion varies between fill fluids, as shown in Figure 2. Selecting a fill fluid with a smaller coefficient of thermal expansion will help minimize seal temperature effects. Table 2 on page 15 provides the coefficients of thermal expansion for the published fill fluids.

FIGURE 2. Effect of Fill Fluid Expansion on Fill Volume



Seal System Volume

The amount of fluid in a seal system will determine the potential amount of volume expansion. Choosing the appropriate direct mount or capillary connections will determine the overall volume in the system and the resulting seal temperature effects. By selecting the right connection type for a high or low side connection, you can optimize the seal temperature effects for the system. For example, choosing a direct mount connection on the high side and a capillary connection on the low side will result in a majority of the fluid volume on the low side of the seal system. When temperature increases, the larger low side fluid expansion will cause a negative output shift on the transmitter output. When temperature decreases, the volume contracts more on the low side and the transmitter output takes a positive output shift.

Head Temperature Effects

Head temperature effects are dependent on the change in ambient temperature, fill fluid specific gravity (ratio of density of fluid to a reference density of water), and the vertical distance between the process connections. When a transmitter/seal system is installed the initial head zero offset is a function of the vertical distance between the two process connections multiplied by the specific gravity of the fill fluid on a differential pressure transmitter. This offset value is read as a negative differential pressure value, because the fluid column is pushing on the low side of the transmitter and pulling away from the high side.

Ambient temperature fluctuations cause the density of the fill fluid to change, resulting in a change in the zero offset head. When ambient temperature increases, the fill fluid density gets lighter. This reduces the head zero offset which causes a positive shift in the transmitter output. When the ambient temperature decreases, the fluid density gets heavier. This heavier fluid column increases the head zero offset which causes a negative shift in the transmitter output.

Total Temperature Effects

Seal and head temperature effects are combined to get the total temperature effects for the seal system. A balanced seal system consisting of the same seal, capillary, and fill fluid on both the high and low side will act to cancel the seal temperature effects created on either side of the transmitter. The resulting total performance will only consist of the head temperature effect, because a balanced system will not affect the head temperature effect. A preferred approach is to select a Tuned System where you specify the seal system that results in seal temperature effects that partially or completely cancel out the head temperature effects, resulting in improved system performance. More information on Tuned Systems can be found on page Pressure-8.

Time Response

Adding diaphragm seals to a transmitter increases the overall response time of a transmitter/seal system. Time response varies with temperature, pressure, capillary length, capillary inside diameter (ID), fill fluid viscosity, and transmitter type. Applications on large tanks with slow changes in level may not be hindered by a longer response time. Applications that change quickly like flow or level on small, narrow tanks require a faster response time.

Direct mount vs. capillaries: If time response is important, choose a direct mount connection when possible to minimize the connection length. For capillaries, a longer capillary provides a greater distance for the pressure signal to travel, so specify only the length required for the installation.

Capillary ID: A smaller diameter capillary (ID) creates more restrictions and slows down the pressure transport. A larger capillary ID provides a faster response time.

Fill Fluid Viscosity: Viscosity of the fill fluid is a measure of its fluidity and is temperature dependent. Choosing a less viscous fill fluid reduces time response, especially when using longer capillaries or in colder conditions.

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Instrument Toolkit Software

Emerson offers the best tool available for understanding and specifying remote seal systems. Whether a level, flow, pressure, density, or interface measurement is required, the Instrument Toolkit assists in selecting the best transmitter-diaphragm seal system for any application by:

- Eliminating transmitter and seal specification errors
- Quantifying the total system performance of the transmitter / remote seal assembly

Through the use of exclusionary logic, Instrument Toolkit eliminates transmitter and seal models that do not meet the application requirements. As a result, the best seal system for the application is specified the first time, every time. Instrument Toolkit ensures that you will:

- Use a seal that can withstand the maximum working pressure of the application
- Use the optimal transmitter sensor range for the given span
- Use a fill fluid that can withstand the pressure, temperature, and vaporization limits of the application

Additionally, Instrument Toolkit calculates the total installed performance of the entire transmitter & remote seal assembly. This eliminates the guesswork and uncertainty often associated with remote seals and allows you to know the entire system performance prior to ordering & installation. Instrument Toolkit factors in all conditions that can affect performance including:

- Transmitter location and performance
- Seal diaphragm thickness, diameter, material and stiffness
- Fill fluid volume, thermal expansion, specific gravity, and vapor pressure characteristics
- Capillary length and inside diameter
- Ambient and process temperatures
- Ambient and process pressures
- Vacuum applications

Finally, Instrument Toolkit has the ability to generate and print reports, installation drawings, and specification sheets.

FIGURE 3. Toolkit Screens

The screenshot displays the Instrument Toolkit software interface, which includes several configuration screens and a Performance Table Report.

SOAP - Application Data

Application / Flare: Level System Service: (80 character maximum)

Application type: Level (closed vessel) Differential pressure / DP flow Interface
Level (open vessel) Pressure Density

Measurement type: SOAP - Process Information

Application type: Level (closed vessel) Measurement type: Differential

Process Variables: Minimum Maximum Design Units

Process pressure: 0.00 20.00
Temperature:
Note: Design pressure and temperature is used for Flange Rating checks

SOAP - Calibration

Application type: Level (closed vessel) Measurement type: Differential

Calculate Calibration: Yes No Span Units

Distance from bottom of vessel: High side Wieg (1/1) 0.0 Low side Wieg (1/2) 0.0

Distance between seals: Level: High: Low: Specific gravity: Process fluid: High side Wieg: Low side Wieg:

SOAP - Model Selection

Transmitter: 1199MDC15A1A52
High pressure side remote seal: 1199MDC15A1A52
Low pressure side remote seal: 1199MDC15A1A52

Product: Pressure Range: Transmitter Output: Material of Construction: Isolating Diaphragm: G Ring: 1.4

1199MDC15A1A52: Isolated Ultra Differential Pressure Transmitter
1199MDC15A1A52: Isolated Ultra Differential Pressure Transmitter
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1199MDC15A1A52: Isolated Ultra Differential Pressure Transmitter

SOAP - Results

Remote Seal Effects: % of span Engineering units

Seal temperature effects: Minimum temp: 0.00 Maximum temp: 0.00
Head temperature effects: % of span
Total remote seal effects: % of span

Transmitter performance: % of span

Performance Table Report

Tag Number: Tuned System Date: 04/07
Service: Version: 3.0 (Build 2007)
Project Number: (GZ Calc Report)001-2007000-000005

Transmitter Model Number: 3051C02A22A1A52
High Side Remote Seal Model Number: 1199MDC15A1A52
Low Side Remote Seal Model Number: 1199MDC15A1A52

Calibration: 0% 100% Span Units
Minimum Working Pressure (MWP) of Remote Seal System: 0.00 17.520 115.700 115.700
Units: psig

Remote Seal Temperature Effects

	Minimum	Maximum
	% of Span	% of Span
Seal Temperature Effects	1.186	1.274
Head Temperature Effects	-3.211	-3.659
Total Remote Seal Temperature Effects	-2.025	-2.385
With Positive Tolerance	-1.280	-1.589
With Negative Tolerance	-2.885	-3.272

Remote Seal Time Response

Last Zero Adjust	Minimum	Maximum
63.2 % value (seconds)	5.641	3.262

Total System Error

	Minimum	Maximum
	% of Span	% of Span
Total Remote Seal Temperature Effects	-2.025	-2.385
Transmitter Total Probable Error (+/-)	0.125	0.144
Total System Error	2.088	2.429

This report is provided according to the terms and conditions of the Instrument Toolkit™ End-User Customer License Agreement.
Version 3.0 (Build 2007) Printed: 04/07/07

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Balanced System vs. *Tuned-Systems*

Rosemount Tuned-Systems are unique remote seal configurations that deliver improved performance and ease of use over traditional seal systems including:

- Reduced temperature-induced errors
- Faster time response
- Easier to install
- Less maintenance

Differential Pressure seal systems have traditionally been specified with balanced systems that have identical capillary lengths and seal configurations on both the high and low pressure connections. In reality, this configuration only addresses one aspect of remote seal system performance. While seal temperature effect is eliminated, other performance factors are ignored or worsened including:

- Head effect is completely ignored
- Response time of the system is slower due to excess capillary on high pressure seal.

Rosemount Tuned-Systems involve designing a better remote seal solution for the application by direct mounting to the transmitter, selecting the correct remote seal system, and validating the configuration and performance with Instrument Toolkit. The high and low side seals are carefully chosen with properties that will counteract the head effect, resulting in a system with less total error than a balanced system. Additionally, time response is drastically improved due to the less oil volume, and the overall assembly is easier to install and less maintenance intensive.

The performance improvements available with using a Rosemount Tuned-System can be easily validated with Instrument Toolkit. Additionally, all Rosemount transmitter / seal assemblies are available with an optional performance report that is calculated and supplied by Emerson (transmitter option QZ).

Balanced vs. Tuned-System Comparison		
Balanced System		Tuned-System
		
High Side Seal: 15 feet (4.5 m) of capillary Capillary I.D.: 0.028-in. (0.71 mm) 2-in. FFW seal (DN 50)		High Side Seal: Direct Mount No capillary 2-in. FFW seal (DN 50)
Low Side Seal: 15 feet (4.5 m) of capillary Capillary I.D.: 0.028-in. (0.71 mm) 2-in. FFW seal (DN 50)		Low Side Seal: 15 feet (4.5 m) of capillary Capillary I.D.: 0.04-in. (1.10 mm) 2-in. FFW seal (DN 50)
Installed Performance		
0.00%	Seal Temperature Effect ⁽¹⁾ (% of Span)	-0.73%
1.46%	Head Temperature Effect ⁽²⁾ (% of Span)	1.46%
1.46%	Total Remote Seal Temperature Effects (% of Span)	0.73%
6.04 seconds	Time Response (one time constant)	1.29 seconds

(1) Process Temperature shifted from 200 to 260 deg.F (93 to 127 deg.C)

(2) Ambient Temperature shifted from 75 to 100 deg.F (24 to 38 deg.C)

High Temperature and Vacuum Applications

There are three parameters to consider when selecting a transmitter/seal system for vacuum applications: fill fluid selection, system construction, and installation.

Fill Fluid Selection

The fill fluid must be able to withstand the highest temperature and lowest process pressure conditions under which the transmitter will be operating. Therefore, the fill fluid must have a vapor pressure that is compatible with the most extreme process conditions in order to remain in the liquid phase at all times. (Be sure to consider temperature and pressure conditions during start-up and system cleaning operations.)

Temperature limits of fill fluids are shown in Table 2 on page Pressure-15 for atmospheric pressure conditions. These limits are reduced under vacuum conditions. "Fill Fluid Vapor Pressure Curves" on page Pressure-15 provides the vapor pressure curves for *D.C. 200*, *D.C. 704*, and *Neobee M-20* fill fluids. Additional information for fill fluids can be found in technical data sheet, Rosemount 1199 Fill Fluid Specifications, document 00840-2100-4016.

The Instrument Toolkit software program makes checking fill fluid compatibility simple and easy by automatically verifying the pressure curve against the process conditions.

System Construction

The right seal system construction needs to be specified for high temperature & vacuum applications. All connections in the seal system need to be welded shut to eliminate the possibility of air being drawn into the seal system in deep vacuum conditions. The All-Welded Vacuum construction was designed for the Rosemount 3051 for use in vacuum applications. Additional information on how to order this construction is found on page Pressure-14.

Installation

For vacuum applications, to ensure positive pressure at the transmitter, mount the transmitter so that it is level with, or below the lowest tap. This ensures the minimum pressure of the transmitter (typically 0.5 psia for differential pressure sensors) is not violated.

Under the following conditions, the transmitter fill fluid may start to vaporize, at which point, the transmitter will cease to make appropriate readings:

- The transmitter is mounted above the lower tap (causing a negative head effect).
- The process pressure is less than the head pressure exerted by the fill fluid in the capillary.

This puts the transmitter fill fluid under a vacuum, thereby degrading the maximum operating temperature. If the operating temperature and vacuum pressure exceed the vapor pressure point of the transmitter fill fluid, the fill fluid is likely to vaporize.

Guide to the Selection of Diaphragm Seals

DIAPHRAGM SEAL SELECTION

Once performance needs, process conditions, and installation requirements are known, the individual seal components may be selected. The following pages help describe the seal types, system construction options, and fill fluid characteristics.

Emerson Process Management offers a complete variety of Rosemount Seals to meet many application needs. Seal categories include general application and sanitary diaphragm seals. Key features of each of the seal types follow.

Flanged Seal Types

Flush Flanged Seals

Rosemount Flush Flanged Seals are a popular seal type that can be used in many general purpose applications. The seal is mounted flush against an existing process flange. An optional flushing connection ring is also available. Line sizes are available from $\frac{3}{4}$ to 1 $\frac{1}{2}$ inches (DN 10 to DN 50) for the RFW model, and 2 to 4 inches (DN 50 to DN 100) for the FFW model. The RFW model uses a lower housing that enables larger diaphragms to be used with the smaller process connections to obtain optimal performance.

Extended Flanged Seals

The EFW extended flange seal is a special flanged seal where the diaphragm surface is flush with the tank wall. This type of configuration eliminates plugging that is common in some applications such as pulp and paper. Common line sizes include 3 and 4 inches (DN80 and DN100), and extension lengths are available in 1-inch (25 mm) increments.

Pancake Seals

The PFW pancake seal is commonly used in applications with limited or restricted space. By having the capillary connection located on the side of the seal, the pancake seal uses a smaller footprint and provides flexibility for use with flanges of various sizes and ratings.

Diaphragm Seal Selection Guide				
				
Seal Type	Pancake PFW, PCW (RTJ connection)	Flanged Flush Surface FFW, FCW (RTJ connection)	Flanged Remote Seal RFW, RCW (RTJ connection)	Extended Flanged EFW
Usual Application and Type of Service	General Applications (Small Footprint)	General Applications (Large Line Sizes)	General Applications (Small Line Sizes)	Insulated Processes
Process Connection Size	2 in. / DN 50 / 50A 3 in. / DN 80 / 80A	2 in. / DN 50 / 50A 3 in. / DN 80 / 80A 4 in. / DN 100 / 100A	$\frac{1}{2}$ in. / DN 15 $\frac{3}{4}$ in. 1 in. / DN 25 / 25A $1\frac{1}{2}$ in. / DN 40 / 40A	1 $\frac{1}{2}$ in. / DN 40 / 40A 2 in. / DN 50 / 50A 3 in. (sch. 40, 80, Headbox) / DN 80 / 80A 4 in. (sch. 40, 80, Headbox) / DN 100 / 100A
Where to Find	See page Pressure-28	See page Pressure-34	See page Pressure-48	See page Pressure-54

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Threaded Seals

Threaded Seals

The RTW seal can be used in many general purpose applications with a variety of threaded pipe connections. The seal is bolted in place between the lower housing, which is threaded onto the pipe, and a mounting connection ring. The lower housing is available with or without a flushing connection.

Other Seals

Union Connection Seals

The UCW union connection seal is designed to retrofit applications where a specially sized bushing already exists. The supplied union nut threads into this bushing, and the seal is flush with the surface.

Chemical Tee Seals

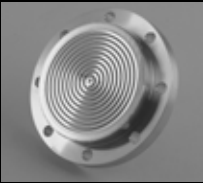
The CTW chemical tee seal is designed for use with a wedge flow primary element (or a chemical tee) that requires an eight-bolt connection pattern. The CTW seal is available in one size and can be used with wedge elements of all sizes.

Threaded Pipe Mount Seals

Rosemount offers two Threaded Pipe Mount Seals that are used primarily in pulp & paper applications. The UCP seal contains a lower housing spud that is welded to the pipe, and the seal is threaded to the spud, resulting in a flush process connection. The PMW seal is similar in design but uses a sleeve-style spud rather than a threaded spud.

Saddle and Flow-Thru Seals

Saddle and flow-thru seals are available in a variety of styles. Saddle seals are mounted directly on the process pipe. Flow-thru seals are installed in series with the process and are available in flanged, in-line, socket weld, butt weld, and threaded connection types.

Diaphragm Seal Selection Guide				
				
Seal Type	Threaded Remote RTW	Chemical Tee Seal CTW	Union Connection Seal UCW	Threaded Pipe Mount Seal UCP
Usual Application and Type of Service	High Temperature Applications	Wedge Flow Elements	Threaded Retro Fit	Pulp and Paper
Process Connection Size	1/4-18 NPT 3/8-18 NPT 1/2-14 NPT 3/4-14 NPT 1 1/4-11.5 NPT 1 1/2-11.5 NPT	Retro-fit	2 1/8-16N x 25/64 Male Thread	1 1/2 in. with Threaded Knurled Nut 1 1/2 in. with Threaded Hex Nut
Where to Find	See page Pressure-57	See page Pressure-60	See page Pressure-61	See page Pressure-62

Diaphragm Seal Selection Guide				
				
Seal Type	Paper Mill Sleeve PMW	Flow-Thru Saddle WSP	Wafer In-Line TFS	Flow-Thru Flanged WFW
Usual Application and Type of Service	Pulp and Paper	Flow Applications	Flow	Flow Applications
Process Connection Size	1 in. with Cap Screw Retainer	2 in. 3 in. 4 in. and Larger	1 in. / DN 25 1 1/2 in. / DN 40 2 in. / DN 50 3 in. / DN 80 4 in. / DN 100	1 in. 2 in. 3 in. 4 in. 6 in.
Where To Find	See page Pressure-62	See page Pressure-64	See page Pressure-65	See page Pressure-66

Diaphragm Seal Selection Guide		
		
Seal Type	Flow-Thru Socket Weld / Butt Weld WWW / WBW	WTW In Line Flow-Thru Threaded Seals
Usual Application and Type of Service	Flow Applications	Flow Applications
Process Connection Size	1/2 in. 3/4 in. 1 in. 2 in.	1/4 in. NPT 1/2 in. NPT 3/4 in. NPT 1 in. NPT
Where To Find	See page Pressure-68	See page Pressure-70

Diaphragm Seal Selection Guide		
		
Seal Type	Threaded Flush HTS	Extruder Flanged JES
Usual Application and Type of Service	High Process Pressures Chemical, Food, Paint, Pulp and Paper Industries	Plastic Extrusion High Temperature
Gasket Surface Type	Dependent on Thread Type	Extrusion Clamping Flange
Process Connection Size	G1 1-11.5 NPT G1 1/2 1 1/2-11.5 NPT G2 2-11.5 NPT	Special for Extruders
Where To Find	See page Pressure-72	See page Pressure-73

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Sanitary Seal Types

Sanitary Seals

Sanitary seals are designed for sanitary standards for food & beverage and life sciences industries. These industries require the product contact surface be free of crevices where bacteria or food may collect. Seal diaphragms need to have smooth surfaces, and for some applications specific surface finish or electro-polish requirements. They are appropriate for clean in place applications. In addition, these seals typically attach to the process using clamps instead of bolts for easy removal. The types of seals include Tri-Clamp, two types of tank spud seals, and several others compatible with specific process connections.

Tri-Clamp Seals

Tri-Clamp seals fit into Tri-Clamp ferrules that are common in sanitary applications. With this seal the seal surface is recessed from the wall of the pipe or tank.

Tank Spud Seals

There are two types of tank spud seals that are designed to have the diaphragm mounted flush with the inside of the vessel. The spud is welded into the tank and the seal is held in place with a clamp. The sanitary tank spud seal is available in 2 and 6 inch extensions. The thin-wall tank spud seal features a more compact design, allowing it to fit into a special tank spud for thin wall tanks.

Sanitary Seal Selection Guide				
				
Seal Type	Cherry-Burrell SHP	SAP Aseptic APC	Dairy Process Connections - Female Thread	Dairy Process Connections - Male Thread
Usual Application and Type of Service	Sanitary	Sanitary	Sanitary	Sanitary
Process Connection Size	2 in. 3 in.	2 in. 3 in.	DN 38 DN 40 DN 50 DN 65 DN 76 DN 80	DN 38 DN 40 DN 50 DN 65 DN 76 DN 80
Where To Find	See page Pressure-84	See page Pressure-85	See page Pressure-86	See page Pressure-88

Sanitary Seal Selection Guide			
			
Seal Type	Sanitary Tank Spud EES	Tuchenhagen Varivent Compatible Connection	Homogenizer Clamping Flange CHS
Usual Application and Type of Service	Sanitary and Food Industry	Sanitary and Food Industry	Homogenizers
Process Connection Size	Spud-Ring with Ethylene-Propylene O-ring Standard	Tuchenhagen Varivent	Special for Homogenizers
Where To Find	See page Pressure-81	See page Pressure-82	See page Pressure-83

Remote Seal System Construction

1199 remote seal systems are offered in two construction types: *repairable-welded* and *all welded (vacuum)*. The most commonly used construction is the repairable-welded. In this design all of the connection points are welded except the gasketed sensor module to transmitter flange interface, which allows for the repair of the seal system. In this case, the transmitter can be re-used with replacement remote seals attached.

The all welded vacuum construction was designed specifically for high temperature and vacuum applications. In this construction, the sensor module gaskets are removed and a disk is welded over the sensor isolators. This eliminates the possibility of air being drawn into the seal system in deep vacuum conditions. This premium design is strongly suggested for vacuum pressures below 6 psia (310 mmHg).

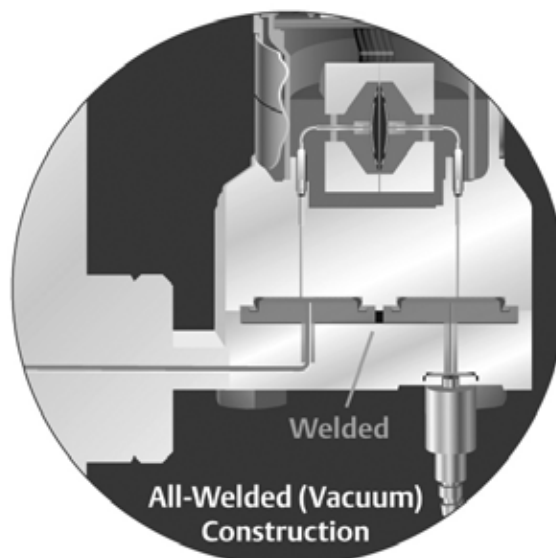
Rosemount Seal System Construction Options

Repairable-Welded Construction



All connection points welded except gasket between sensor module and transmitter flange

All Welded (Vacuum) Construction



All connection points welded including welded disk over sensor module isolators

To order the All-Vacuum construction on the Rosemount 3051C, specify S7, S8, S9, or S0 in the 3051C model number and the W seal location in the 1199 model number. To order the All Welded Vacuum system on the Rosemount 3051T, specify S1 in the 3051T model number and the P seal location code in the 1199 model number.

The inline sensor module is welded to a remote seal connection so it cannot be repaired. Use the W code in the 1199 model and either the S1 code for a 3051T/2088 or B11 code for the 3051S_T model.

See Table 1 to confirm how the transmitter assemble to code and 1199 seal location codes combine to get Repairable-Welded or All Welded Vacuum construction.

TABLE 1. Remote Seal System Construction Model Codes

Transmitter Type	Transmitter Assemble To Code	1199 Seal Location Code	Repairable -Welded	All Welded Vacuum
3051S_C	B11	R	—	●
3051S_CD	B12	S or T	—	●
3051S_T	B11 or B12	P	—	●
3051S	B12	D	●	—
	B11 or B12	W or M	●	—
3051CD	S1 or S2	W, M, or D	●	—
	S7, S8, S9, or S0	W, M, or D	—	●
3051CG / CA	S1	W	●	—
	S7 or S0	W	—	●
3051T	S1	W or P	—	●
1151	S1 or S2	W, M, or D	●	—
2088	S1	W or P	●	—

Product Data Sheet

00813-0100-4016, Rev HA

Catalog 2008 - 2009

Rosemount 1199

Fill Fluid Selection

Selecting the correct fill fluid for a new application requires a review of application conditions and calculation of expected seal system performance. Several fill fluid characteristics need to be considered to select an appropriate fluid. The first characteristic is the temperature limit of the fluid which must be able to operate over the process and ambient temperature limits for the application. For vacuum applications, a fluid's vapor-pressure curve must also be evaluated to make sure the maximum process temperature and minimum vacuum pressure condition does not violate the vapor-pressure limits. To evaluate temperature effects, the fluid's specific gravity is used to determine head temperature effects and coefficient of thermal expansion is used to determine seal temperature effects. Finally, the viscosity of the fluid will determine the response time for the seal system. Table 2 lists the fill fluid characteristics, and the graph below shows example vapor-pressure curves for D.C. 200, D.C. 704, and Neobee M-20 fluids. Additional information for fill fluids can be found in technical data sheet, Rosemount 1199 Fill Fluid Specifications, document 00840-2100-4016.

TABLE 2. Fill Fluid Specifications

Fill Fluid	Temperature Limits ⁽¹⁾		Specific Gravity	Coeff. of Therm. Exp. (cc/cc/°C)	Viscosity at 25 °C centistokes
	Pabs < 1 bara	Pabs > 1 bara			
D.C.® 200 Silicone	–45 to 100 °C (–49 to 212 °F)	–45 to 205 °C (–49 to 401 °F)	0.93	0.00108	9.5
D.C. 704 Silicone ⁽²⁾	0 to 200 °C (32 to 392 °F)	0 to 315 °C (32 to 599 °F)	1.07	0.00095	44
Inert (Halocarbon)	–45 to 80 °C (–49 to 176 °F)	–45 to 160 °C (–49 to 320 °F)	1.85	0.000864	6.5
Syltherm® XLT Silicone	NA	–75 to 145 °C (–102 to 293 °F)	0.85	0.001199	1.6
Glycerin and Water ⁽³⁾	NA	–15 to 95 °C (5 to 203 °F)	1.13	0.00034	12.5
Propylene Glycol and Water ⁽³⁾	NA	–15 to 95 °C (5 to 203 °F)	1.02	0.00034	2.8
Neobee M-20 ⁽⁴⁾	–15 to 120 °C (5 to 248 °F)	–15 to 225 °C (5 to 437 °F)	0.92	0.001008	9.8

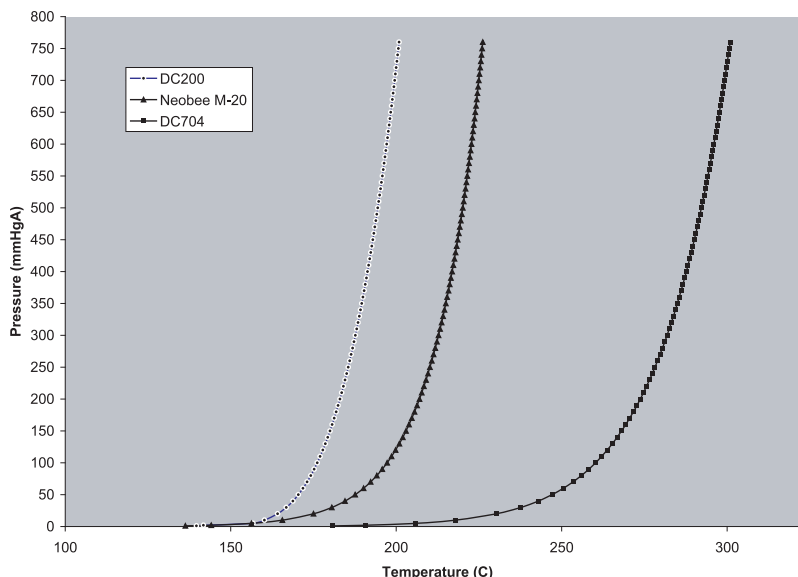
(1) Temperature limits are reduced in vacuum service and may be limited by seal selection. Contact an Emerson Process Management representative for assistance.

(2) Upper temperature limit is for capillary seal systems mounted away from the transmitter. Contact an Emerson Process Management representative for temperature limits above 315 °C.

(3) Glycerin and Water and Propylene Glycol are not suitable for vacuum service.

(4) Not compatible with Buna-N or Ethylene-Propylene O-ring material.

Fill Fluid Vapor Pressure Curves



Seal Connection Types

Capillary Style

Capillary style seal connections are available in three ID sizes:

- 0.03–inches (0.7 mm)
- 0.04–inches (1.1 mm)
- 0.07–inches (1.75 mm)

and are available in standard lengths up to 50 ft (15 m). Select the ID size and length that is appropriate for the process and installation demands and maximizes system performance.

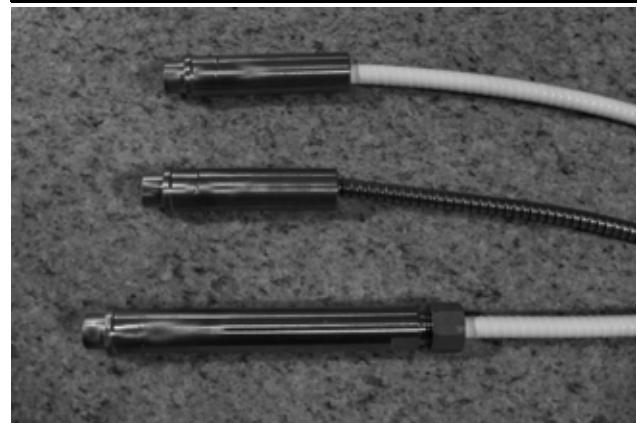
Capillary style seal connections are available in four choices:

- 316 SST armored sleeving
- PVC coating on 316 SST armored sleeving
- 316 armored sleeving, support tube without compression fitting
- PVC coating on 316 armored sleeving, support tube with compression fitting

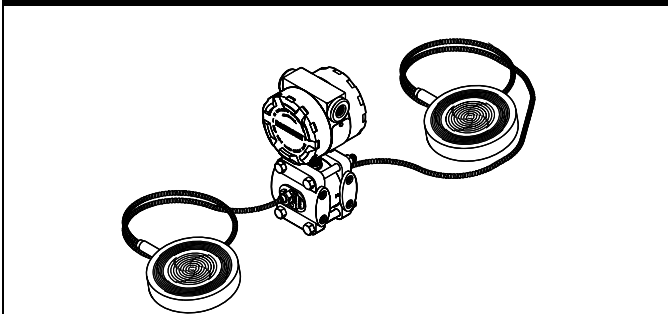
316 SST armored sleeving is the standard material choice. The optional PVC coating is useful for shielding the armored sleeving from exposure to the sun and for providing a protective coating in sanitary applications.

All capillary connections have a 2-in. (50 mm) support tube. The optional 4-in. (100 mm) support tube provides extra protection for the capillary-to-seal connection. This is a useful option for installation, especially for the Pancake type seal because the capillary connection is located on the side of the seal.

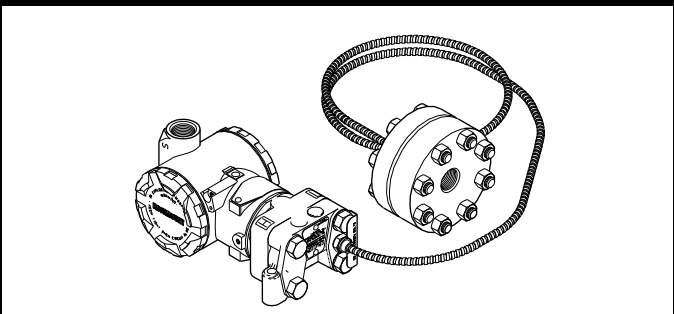
PVC Coated Armored Sleeving, Armored sleeving, and Support Tube Capillaries.



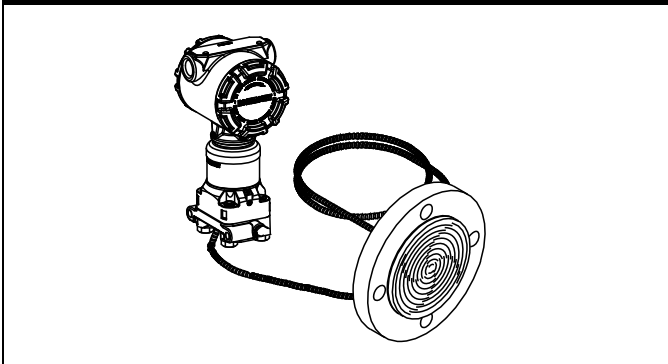
Rosemount 1151 Differential with Rosemount 1199 Pancake Diaphragm Seal Two Seal System



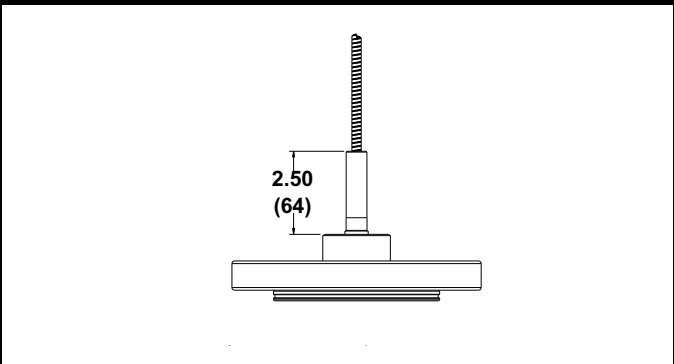
Rosemount 3051C Differential with Rosemount 1199 Threaded Remote Seal One-Seal System



Rosemount 3051S Gage with Rosemount 1199 Flush Flanged Diaphragm Seal One-Seal System



Rosemount 1199 Flanged Seal Showing Capillary Fitting Clearance



Product Data Sheet

00813-0100-4016, Rev HA

Catalog 2008 - 2009

Rosemount 1199

Direct Mount Style

The Rosemount 3051, 1151, and 2088 transmitters with the Rosemount 1199 direct mount style seals are mounted directly to the vessel. They provide a simplified installation for a wide variety of tank configurations. The direct mount style connection is available with both General Assembly Seals or Sanitary Seal Assemblies. The direct mount connection is welded at the seal. Table 7: "Direct Mount/Fill Fluid Ordering Information" on page 26 illustrates the various direct mount seal assembly configurations and weld locations.

Direct Mount Option Code Index

General Assembly Seal Systems

Rosemount 3051 (Repairable-Welded System)

Direct Mount Connection (no extension)

One Seal Connection = Option Code 93

Two Seal Connection = Option Code 94

2-inch (50 mm) Direct Mount Connection

One Seal Connection = Option Code B3

Two Seal Connection = Option Code B4

4-inch (100 mm) Direct Mount Connection

One Seal Connection = Option Code D3

Two Seal Connection = Option Code D4

Rosemount 3051 (All Welded System)

Direct Mount Connection

One Seal Connection = Option Code 97

Two Seal Connection = Option Code 96

2-inch (50 mm) Direct Mount Connection

One Seal Connection = Option Code B7

Two Seal Connection = Option Code B6

4-inch (100 mm) Direct Mount Connection

One Seal Connection = Option Code D7

Two Seal Connection = Option Code D6

Rosemount 1151

Direct Mount Connection

One or Two Seal Connection = Option Code 92

Sanitary Direct Mount Connection

One or Two Seal Connection = Option Code 99

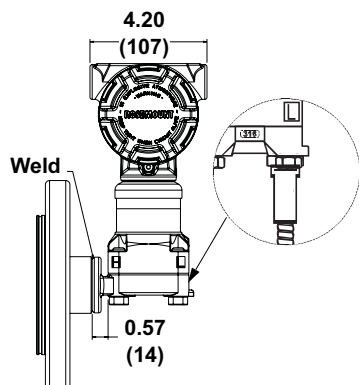
Rosemount 3051S_T, 3051T and 2088

Direct Mount Connection

One Seal Connection = Option Code 95

Thermal Optimizer Connection = Option Code D5

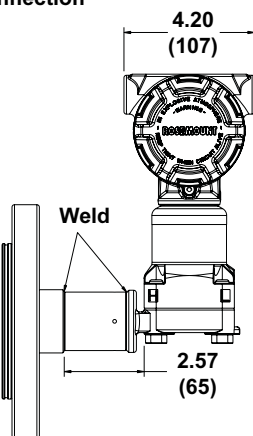
Rosemount 1199 Direct Mount Connection Types for General Purpose Seal Systems



Rosemount 3051
One-Seal System
1199 ___ 93
1199 ___ 97

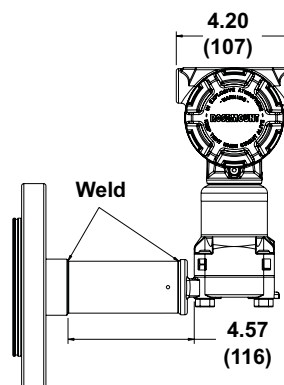
Rosemount 3051
Two-Seal System
1199 ___ 94
1199 ___ 96
(Add Low Side Capillary)

Low Side Capillary
Connection



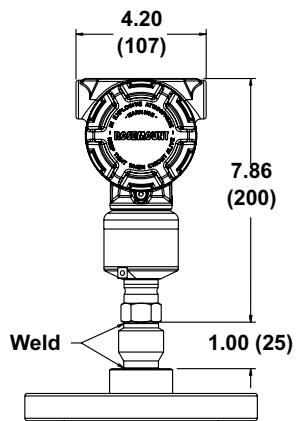
Rosemount 3051
One-Seal System
1199 ___ B3 (2-in. Connection)
1199 ___ B7 (2-in. Connection)

Rosemount 3051
Two-Seal System
1199 ___ B4 (2-in. Conn.)
1199 ___ B6 (2-in. Conn.)
(Add Low Side Capillary)

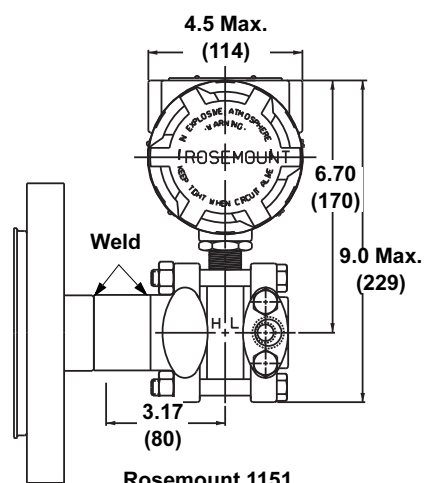


Rosemount 3051
One-Seal System
1199 ___ D3 (4-in. Connection)
1199 ___ D7 (4-in. Connection)

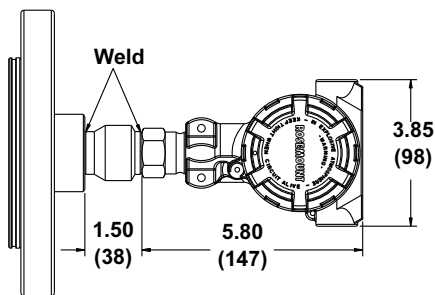
Rosemount 3051
Two-Seal System
1199 ___ D4 (4-in. Conn.)
1199 ___ D6 (4-in. Conn.)
(Add Low Side Capillary)



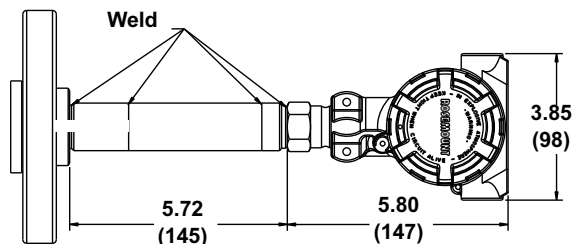
Rosemount 3051T
1199 ___ 95



Rosemount 1151



Rosemount 2088
1199 ___ 95



Rosemount 2088
1199 ___ D5

NOTES

Dimensions are in inches (millimeters).

Transmitters are shown with Flush Flanged (FFW) Seals.

TABLE 3. Availability of Direct Mount Diaphragm Seals

● Available
— Not available

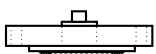
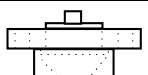
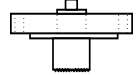
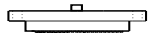
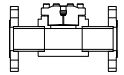
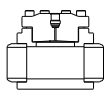
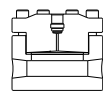
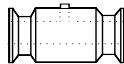
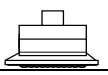
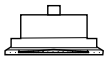
AVAILABILITY OF DIRECT MOUNT DIAPHRAGM SEALS			1151	2088/ 3051T/ 3051S_T	3051C / 3051S_C Direct Mount Extension Connection Length		
Seal Description	Model Code				0 in.	2 in.	4 in.
Pancake 	PFW/PCW (page Pressure-28)		—	—	—	—	—
Flush Flanged 	FFW/FCW (page Pressure-34)		●	●	DIN and Class 300 ANSI Two Piece Design only	●	●
Flanged Remote 	RFW/RCW (page Pressure-48)		●	●	—	●	●
Extended Flanged 	EFW (page Pressure-54)		●	●	DIN and Class 300 ANSI Flanges Only	●	●
Threaded Remote 	RTW (page Pressure-57)		●	●	—	●	●
Chemical Tee 	CTW (page Pressure-60)		●	●	—	●	●
Union Connection 	UCW (page Pressure-61)		—	—	—	—	—
Threaded Pipe Mount & Paper Mill Sleeve 	UCP PMW (page Pressure-62)		—	●	●	—	—
Saddle 	WSP (page Pressure-64)		●	●	—	●	●
Wafer Style In-Line 	TFS (page Pressure-65)		—	●	—	—	—
Flow-Thru Flanged 	WFW (page Pressure-66)		●	●	—	●	●
Flow-Thru Socket Weld 	WWW (page Pressure-68)		●	●	—	●	●
Flow-Thru Butt Weld 	WBW (page Pressure-68)		●	●	—	●	●
In Line Flow-Thru Threaded 	WTW (page Pressure-70)		●	●	—	●	●
Tri-Clamp In-Line 	VCS (page Pressure-75)		—	●	—	—	—
Tri-Clamp 	SCW (page Pressure-76)		●	●	●	●	●

TABLE 3. Availability of Direct Mount Diaphragm Seals

● Available
— Not available

AVAILABILITY OF DIRECT MOUNT DIAPHRAGM SEALS		1151	2088/ 3051T/ 3051S_T	3051C / 3051S_C Direct Mount Extension Connection Length		
Seal Description	Model Code			0 in.	2 in.	4 in.
Tank Spud 	SSW (page Pressure-78)	●	●	●	●	●
Thin-Wall Tank Spud 	STW (page Pressure-80)	●	●	—	●	●
<i>Cherry-Burrell</i> 	SHP (page Pressure-84)	—	●	—	—	—
Aseptic (APC) Style 	SAP (page Pressure-85)	—	●	—	●	●
SLS, SMS,SFS, and SRS Dairy 	SLS, SMS,SFS, SRS (page Pressure-86)	—	●	—	—	—
MLS, MMS,MFS, and MRS Dairy 	MLS, MMS,MFS, MRS (page Pressure-88)	—	●	—	—	—

Specifications

SEAL SPECIFICATIONS

Functional Specifications

Sanitary Seal Approvals

Sanitary Seals: Tri-Clamp, tank spud, thin wall tank spud, Tri-Clamp inline, APC style aseptic, and Cherry Burrell "I" line seal conform to 3-A Sanitary Standards for Sensor and Sensor Fittings and Connections used on Milk and Milk Product Equipment, Number 74-074-03.

Sanitary Fill Fluids: The sanitary fill fluids glycerin & water and Propylene Glycol & water meet United States Pharmacopeia (USP) and Food Chemical Codex (FCC) requirements and is Generally Recognized as Safe (GRAS) in accordance with the FDA Code of Federal Regulations Title 21. The sanitary fill fluid Neobee M-20 is approved under 21CFR 172.856 as a direct food additive and under 21 CFR 174.5 as an indirect food additive.

Sanitary O-Rings: The EPDM, Viton, and Buna N o-rings for the SSW Tank Spud Seal meet 3-A Sanitary Standard Number 18 Class 1 requirements. The EPDM o-ring also meets USP class VI approval requirements.

Surface Finish Certification (Q16 Option)

When ordering the Q16 option in the pressure transmitter model number, the surface finish of the seal diaphragm is certified per BPE 2002 requirements. This surface finish certification is available for Tri-Clamp, Tri-Clamp Inline, Tank Spud, and Thin Wall Tank Spud seal types.

NACE Standard (T Option)

NACE (National Association of Corrosion Engineers) standard MR0175/ISO 15156 defines metallic material requirements for resistance to sulfide stress cracking when applied on petroleum production, drilling, gathering and flow line equipment, and field processing facilities to be used in H₂S bearing hydrocarbon service. MR0103 provides material requirements exclusive to sour petroleum refining environments. Compliance guidelines are intended to include "wetted" materials as recommended by both NACE standards. The option code T in several of the general purpose seal types limits the wetted material offering. Metallurgical requirements for alloys used are virtually identical for the two standards, but application conditions enforced are different can limit material acceptance. Contact an Emerson Process Management representative to aid in selecting the proper materials to meet the NACE standard.

Material Traceability (Q8 Option)

Material traceability is provided for the diaphragm seal, upper housing, and if applicable, lower housing/flushing connection or diaphragm extension, upon selecting the option code Q8 in the pressure transmitter model number. Material traceability for the transmitter/seal system is provided per the DIN EN10204 3.1.B standard, and is only available for general purpose seal types.

Performance Specifications

The performance considerations for a remote seal system are described on page Pressure-4. Instrument Toolkit calculates the remote seal system performance and validates model number configuration, as described on page Pressure-7.

Remote Seal System Performance Calculation Report (QZ Option)

When the QZ option code is specified within the pressure transmitter model structure, Emerson will generate a remote seal system calculation report for the given application. This report quantifies all aspects of remote seal system performance including seal temperature effects, head temperature effects, seal response time, and transmitter total probable error.

Physical Specifications

Material of Construction

Remote seal materials of construction (diaphragm, upper housing, flange, lower housing/flushing connection, bolts, and gaskets/o-rings) are listed for each remote seal type. Fill fluids specifications are listed in Table 2. Mounting flange pressure ratings and dimensions are listed in Table 4 and Table 5.

Tagging

The 1199 remote seal model number is marked on the transmitter nameplate (neck or top label). The pressure transmitter will be tagged in accordance with customer requirements. The standard stainless steel tag is wired to the transmitter. Tag is 0.02 in. (0.051 cm) thick with 0.125 in. (0.318 cm) high letters. A permanently attached tag is available upon request.

Calibration

Transmitters are factory calibrated to customer's specified range. If calibration is not specified, then the transmitters are calibrated at maximum range. Calibration is performed at ambient temperature and pressure.

Custom Configurations

Rosemount 3051 (Option Code C1)

If code C1 is ordered, the customer may specify the following data in addition to the standard configuration parameters. Refer to the respective configuration data sheet within the device PDS.

Descriptor: 16 alphanumeric characters.
Message: 32 alphanumeric characters.
Date: Day, month, year.
Damping: Sec.

Rosemount 1151 (Option Code C9)

If Options Code C9 is ordered, the customer may specify the following data in addition to the standard configuration parameters. Refer to the respective configuration data sheet within the device PDS.

4 and 20 mA points must be the same unit of measure.

Available units of measure:

inH₂O mmH₂O bar kg/cm² torr
inHg mmHg mbar Pa atm
ftH₂O psi g/cm² kPa

MOUNTING FLANGE

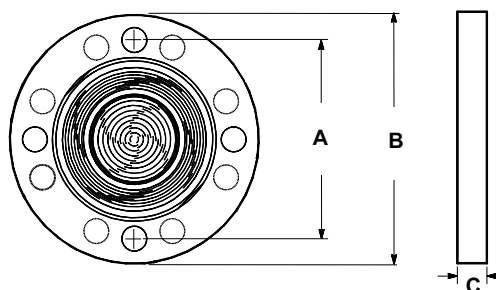


TABLE 4. Maximum Flange Pressure Rating

Standard	Class/ Rating	Carbon Steel	Stainless Steel
ANSI	150	285 psig ⁽¹⁾	275 psig ⁽¹⁾
ANSI	300	740 psig ⁽¹⁾	720 psig ⁽¹⁾
ANSI	600	1,480 psig ⁽¹⁾	1,440 psig ⁽¹⁾
ANSI	900	2200 psig ⁽¹⁾	2160 psig ⁽¹⁾
ANSI	1500	3705 psig ⁽¹⁾	3600 psig ⁽¹⁾
ANSI	2500	6170 psig ⁽¹⁾	6000 psig ⁽¹⁾
DIN	PN 40	40 bar ⁽²⁾	40 bar ⁽²⁾
DIN	PN 10/16	16 bar ⁽²⁾	16 bar ⁽²⁾
DIN	PN 25/40	40 bar ⁽²⁾	40 bar ⁽²⁾
DIN	PN 64	64 bar ⁽²⁾	64 bar ⁽²⁾
DIN	PN 100	100 bar ⁽²⁾	100 bar ⁽²⁾
JIS	10 k	200 psig ⁽²⁾	200 psig ⁽²⁾
JIS	20 k	480 psig ⁽²⁾	480 psig ⁽²⁾
JIS	40 k	960 psig ⁽²⁾	960 psig ⁽²⁾

(1) At 100 °F (38 °C), the rating decreases with increasing temp.

(2) At 248 °F (120 °C), the rating decreases with increasing temp.

TABLE 5. Mounting Flange Dimensions

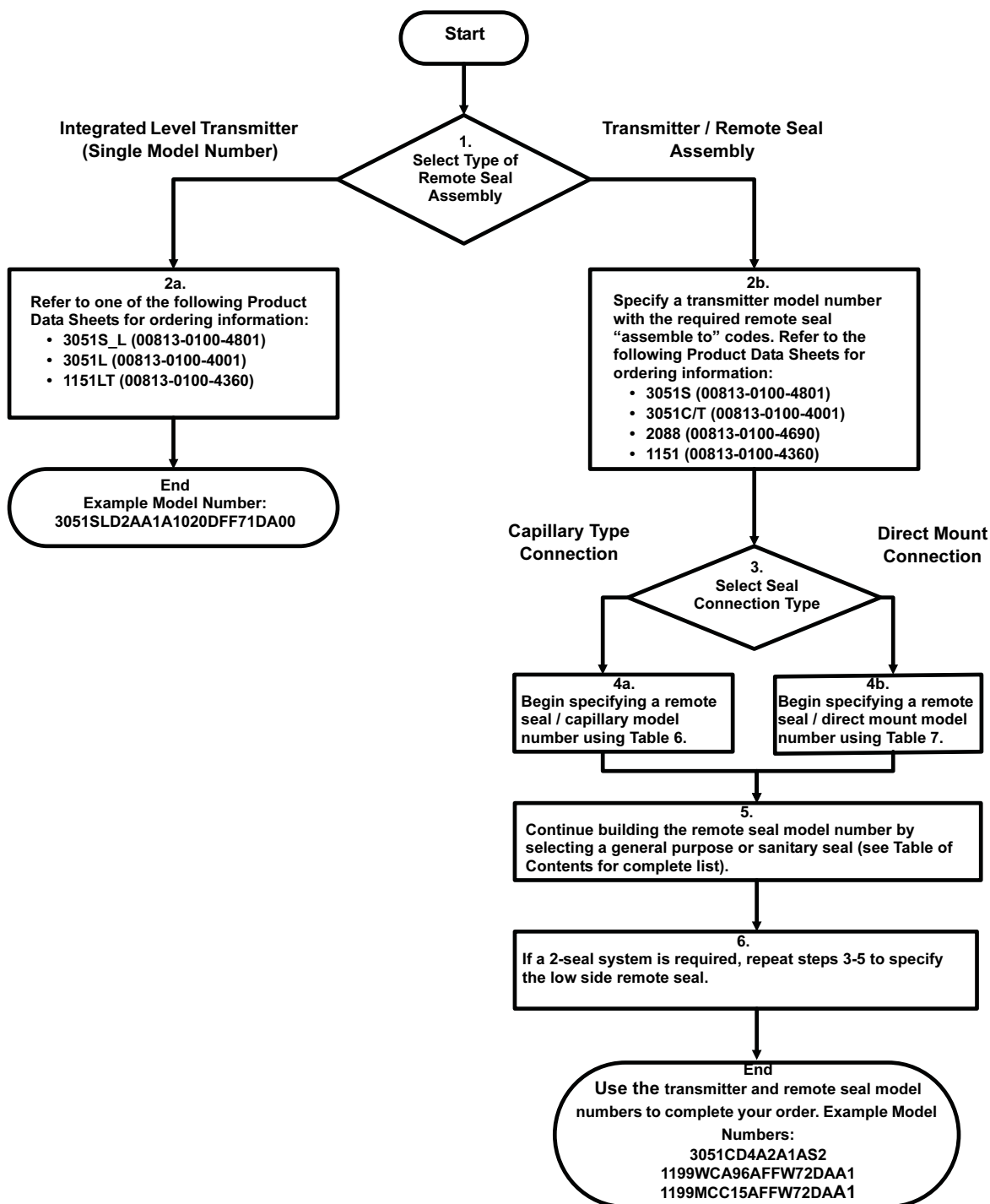
Class	Pipe Size	"A" Bolt Circle Diameter	"B" Outside Diameter	"C" Flange Thickness ⁽¹⁾	Number of Bolts	Bolt Hole Diameter
ANSI 150	1 in.	3.12 in.	4.25 in.	0.50 in.	4	0.62 in.
	1.5 in.	3.88 in.	5 in.	0.62 in.	4	0.62 in.
	2 in.	4.75 in.	6 in.	0.69 in.	4	0.75 in.
	3 in.	6 in.	7.5 in.	0.87 in.	4	0.75 in.
	4 in.	7.5 in.	9 in.	0.87 in.	8	0.75 in.
ANSI 300	1 in.	3.5 in.	4.88 in.	0.62 in.	4	0.75 in.
	1.5 in.	4.5 in.	6.12 in.	0.75 in.	4	0.88 in.
	2 in.	5 in.	6.5 in.	0.81 in.	8	0.75 in.
	3 in.	6.62 in.	8.25 in.	1.06 in.	8	0.88 in.
	4 in.	7.88 in.	10 in.	1.19 in.	8	0.88 in.
ANSI 600	1 in.	3.5 in.	4.88 in.	0.68 in.	4	0.75 in.
	1.5 in.	4.5 in.	6.12 in.	0.87 in.	4	0.88 in.
	2 in.	5 in.	6.5 in.	1.00 in.	8	0.75 in.
	3 in.	6.62 in.	8.25 in.	1.25 in.	8	0.88 in.
	4 in.	8.5 in.	10.75 in.	1.50 in.	8	1.00 in.
DIN PN 10/40	DN 25	85 mm	115 mm	18 mm	4	14 mm
	DN 40	110 mm	150 mm	18 mm	4	18 mm
	DN 50	125 mm	165 mm	20 mm	4	18 mm
	DN 80	160 mm	200 mm	24 mm	8	18 mm
DIN PN 10/16	DN 100	180 mm	220 mm	20 mm	8	18 mm
DIN PN 25/40	DN 100	190 mm	235 mm	24 mm	8	22 mm

(1) Tolerance for flange thickness is +0.125 in.

Ordering Information

There are two versions of Rosemount remote seal assemblies. Integrated Level Transmitters combine the pressure transmitter and the remote seal(s) into a single model number to facilitate easy ordering of basic seal configurations. Specifying independent transmitter and remote seal model numbers offers greater configuration flexibility including additional seal types, sizes, and materials of construction.

Consult the flowchart below for ordering instructions.



DIAPHRAGM SEAL SYSTEM CONNECTIONS

Capillary/Fill Fluid

NOTE:

Use Table 6 for Capillary Type Connections. Use Table 7 for Direct Mount Type Connections.

TABLE 6. Capillary/Fill Fluid Ordering Information

Model	Type		
1199	Diaphragm Seals		
Code	Seal Location	Connection Type	Transmitter Type
R ⁽¹⁾⁽²⁾	Seal on High Pressure Side of Transmitter	All Welded Vacuum	3051S_C (option code B11)
S ⁽¹⁾⁽²⁾	Seal on Low Pressure Side of Transmitter (use with 1199T)	All Welded Vacuum	3051S_C (option code B12)
T ⁽¹⁾⁽²⁾	Seal on High Pressure Side of Transmitter (requires 1199S on low side)	All Welded Vacuum	3051S_C (option code B12)
D ⁽¹⁾	Same Seal on Both High and Low Pressure Sides of Transmitter	Repairable-Welded	Differential Transmitters
W ⁽¹⁾	Seal on High Pressure Side of Transmitter	Repairable-Welded	All Transmitters
M ⁽¹⁾	Seal on Low Pressure Side of Transmitter	Repairable-Welded	Differential Transmitters
Code	Fill Fluid	Temperature Limits	Specific Gravity
General Purpose Fill Fluids			
A ⁽³⁾	Syltherm XLT	−75 to 145 °C (−102 to 293 °F)	0.85
C ⁽³⁾	D.C. 704 (not available with 0.03 in. ID capillary)	0 to 315 °C (32 to 599 °F)	1.07
D	D.C. 200	−45 to 205 °C (−49 to 401 °F)	0.93
H	Inert (Halocarbon)	−45 to 160 °C (−49 to 320 °F)	1.85
Sanitary Fill Fluids			
G ⁽⁴⁾	Glycerin and Water	−15 to 95 °C (5 to 203 °F)	1.13
N ⁽⁴⁾	Neobee M-20	−15 to 225 °C (5 to 437 °F)	0.92
P ⁽⁴⁾	Propylene Glycol and Water	−15 to 95 °C (5 to 203 °F)	1.02
Code	Capillary Seal Connection Inside Diameter inches (mm)	Material	
B	0.03 (0.7)	SST Armored Sleeving	
C	0.04 (1.1)	SST Armored Sleeving	
D	0.075 (1.91)	SST Armored Sleeving	
E	0.03 (0.7)	PVC Coating on 316 SST Armored Sleeving	
F	0.04 (1.1)	PVC Coating on 316 SST Armored Sleeving	
G	0.075 (1.91)	PVC Coating on 316 SST Armored Sleeving	
H	0.03 (0.7)	SST Armored Sleeving, Support Tube without Compression Fitting	
J	0.04 (1.1)	SST Armored Sleeving, Support Tube without Compression Fitting	
K	0.075 (1.91)	SST Armored Sleeving, Support Tube without Compression Fitting	
M ⁽⁵⁾	0.03 (0.7)	PVC Coated SST Armored Sleeving, Support Tube with Compression Fitting	
N ⁽⁵⁾	0.04 (1.1)	PVC Coated SST Armored Sleeving, Support Tube with Compression Fitting	
P ⁽⁵⁾	0.075 (1.91)	PVC Coated SST Armored Sleeving, Support Tube with Compression Fitting	

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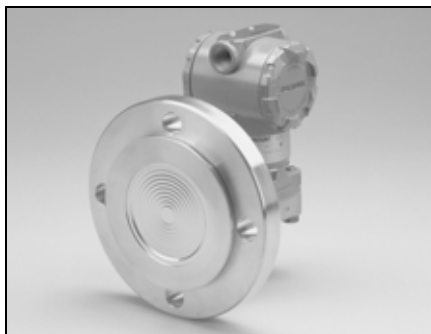
TABLE 6. Capillary/Fill Fluid Ordering Information

Code	Capillary Connection Length
01	1 ft (0.3 m)
05	5 ft (1.5 m)
10	10 ft (3.0 m)
15	15 ft (4.5 m)
20	20 ft (6.1 m)
25	25 ft (7.6 m)
30	30 ft (9.1 m)
35	35 ft (10.7 m)
40	40 ft (12.2 m)
45	45 ft (13.7 m)
50	50 ft (15.2 m)
51	0.5 m (1.6 ft)
52	1.0 m (3.3 ft)
53	1.5 m (4.9 ft)
54	2.0 m (6.6 ft)
55	2.5 m (8.2 ft)
56	3.0 m (9.8 ft)
57	3.5 m (11.5 ft)
58	4.0 m (13.1 ft)
59	5.0 m (16.4 ft)
60	6.0 m (19.7 ft)
61	7.0 m (23 ft)
62	8.0 m (26.2 ft)
63	9.0 m (29.5 ft)
64	10.0 m (32.8 ft)
65	11.0 m (36.1 ft)
66	12.0 m (39.4 ft)
67	13.0 m (42.6 ft)
68	14.0 m (45.9 ft)
69	15.0 m (49.2 ft)

- (1) See page Pressure-14 for more information on all welded vacuum and repairable-welded connection types. The difference between the all welded vacuum and repairable-welded is that all the connection points in the all welded vacuum system are welded, including welding a disk over the sensor module isolators. In the repairable-welded type, there is a gasket between the sensor module and transmitter flange. This allows the transmitter to be re-used in the event the Remote Seal System needs to be repaired.
- (2) All welded system connection types require either a 316L SST or Hastelloy C-276 isolating diaphragm in the pressure transmitter model codes.
- (3) Not available with Capillary Seal connection inside diameter codes B, E, H, or M.
- (4) This is a food grade fill fluid.
- (5) Compression fitting does not provide a hermetic seal.

Direct Mount/Fill Fluid

Rosemount 3051 Flush Flanged Seal with Direct Mount Connection



NOTE: Use Table 7 for Direct Mount Type Connections. Use Table 6 for Capillary Type Connections.

TABLE 7. Direct Mount/Fill Fluid Ordering Information

Model	Type		
1199	Diaphragm Seals		
Code	Seal Location	Connection Type	Transmitter Type
W ⁽¹⁾	Seal on High Pressure Side of Transmitter	Repairable-Welded	All Transmitters
R ⁽¹⁾⁽²⁾	Seal on High Pressure Side of Transmitter	All Welded Vacuum	3051S2_C (option code B11)
T ⁽²⁾	Seal on High Pressure Side of Transmitter	All Welded Vacuum	3051S2_C (option code B12)
Code	Fill Fluid	Temperature Limits	Specific Gravity
General Purpose Fill Fluids			
A	Syltherm XLT	–75 to 145 °C (–102 to 293 °F)	0.85
C ⁽³⁾	D. C. Silicone 704	0 to 260 °C (32 to 500 °F)	1.07
D	D. C. Silicone 200	–45 to 205 °C (–49 to 401 °F)	0.93
H	Inert (Halocarbon)	–45 to 160 °C (–49 to 320 °F)	1.85
Sanitary Fill Fluids			
G ⁽⁴⁾	Glycerin and Water	–15 to 95 °C (5 to 203 °F)	1.13
N ⁽⁴⁾	Neobee M-20	–15 to 225 °C (5 to 437 °F)	0.92
P ⁽⁴⁾	Propylene Glycol and Water	–15 to 95 °C (5 to 203 °F)	1.02
Code	Seal Connection Type		
A	Direct Mount 0.04 in. (1.1 mm)		

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TABLE 7. Direct Mount/Fill Fluid Ordering Information

Code	Direct Mount Connection Type (see page Pressure-19 for direct mount seal availability information)
REPAIRABLE-WELDED CONNECTION TYPE	
Rosemount 3051S_C with B11 Process Connection code or 3051C Transmitter code S1 (use with Seal Location code W)	
93	One-Seal System
B3	One-Seal System, 2-in. (50 mm) connection extension
D3	One-Seal System, 4-in. (100 mm) connection extension
Rosemount 3051S_C with B12 Process Connection code or 3051C Transmitter code S2 (use with Seal Location code W)	
94	Two-Seal System
B4	Two-Seal System, 2-in. (50 mm) connection extension
D4	Two-Seal System, 4-in. (100 mm) connection extension
Rosemount 3051S_T, 3051T, or 2088 In-Line Transmitter (use with Seal Location code W)	
95	One-Seal System
D5 ⁽⁵⁾	One-Seal System, 4-in. (100 mm) Thermal Optimizer connection extension
Rosemount 1151 Transmitter (use with Seal Location code W)	
92	One- or Two-Seal System
ALL WELDED VACUUM SYSTEM TYPE	
Rosemount 3051C 3051S_C with B11 process connection code (use with Seal Location code R) or 3051C Transmitter option code S0 (use with Seal Location code W)	
97	One-Seal System
B7	One-Seal System, 2-in. (50 mm) connection extension
D7	One-Seal System, 4-in. (100 mm) connection extension
Rosemount 3051S_C with B12 Process Connection code (use with Seal Location code T) or 3051C Transmitter code S9 (use with Seal Location code W)	
96	Two-Seal System
B6	Two-Seal System, 2-in. (50 mm) connection extension
D6	Two-Seal System, 4-in. (100 mm) connection extension

(1) See page Pressure-14 for more information on all welded vacuum and repairable-welded connection types.

(2) All welded system connection types require either a 316L SST or Hastelloy C-276 isolating diaphragm in the pressure transmitter model codes.

(3) Fill fluid maximum operating temperature is limited by heat transfer to the transmitter electronics. Temperature limit for 3051C 4-in. Extended Direct Mount System is 500 °F (260 °C), 3051C 2-in. Extended Direct Mount System is 464 °F (240 °C), and 401 °F (205 °C) for all other Direct Mount Connection Types at 70 °F (21 °C) ambient temperature.

(4) This is a food grade fill fluid.

(5) Thermal optimizer direct mount extension extends temperature limits for processes 400 to 650 °F (205 to 350 °C) and transmitter ambient from -40 to 185 °F (-40 to 85 °C).

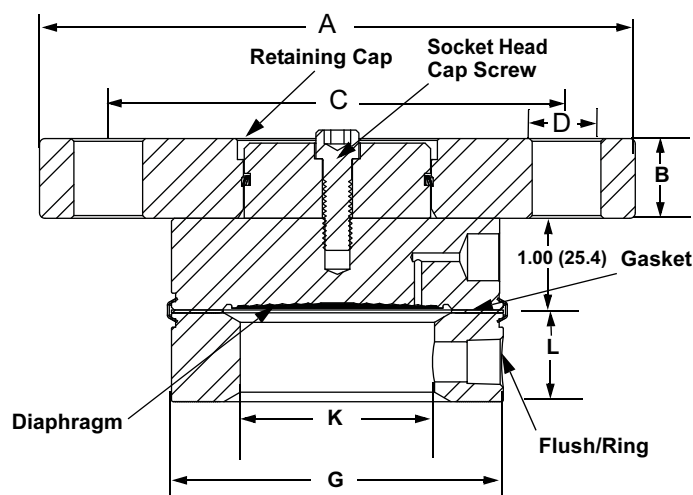
General Purpose Seal Assemblies

PANCAKE (PFW) SEAL

NOTE

Drawings represent the standard offering. Dimensional drawings may vary when ordering special shaded options. Contact an Emerson Process Management representative if dimensional drawings are required for special order configuration.

Pancake Seal with Optional Flushing Connection



Measurement in inches (millimeters)

NOMINAL PIPE SIZE	CLASS	Diaphragm "F"	FLG. OD "A"	FLG Thickness "B"	QTY. OF BOLT	BOLT HOLE SIZE "D"	BOLT CIRCLE "C"
ANSI 2"	150#	2.30[58.4]	6.00[152.4]	0.75[19.1]	4	0.750[19.05]	4.75[120.7]
	300#	2.30[58.4]	6.50[165.1]	0.87[22.1]	8	0.750[19.05]	5.00[127.0]
	600#	2.30[58.4]	6.50[165.1]	1.25[31.8]	8	0.750[19.05]	5.00[127.0]
ANSI 3"	150#	3.50[88.9]	7.50[190.5]	0.96[24.4]	4	0.750[19.05]	6.00[152.4]
	300#	3.50[88.9]	8.25[209.6]	1.12[28.4]	8	0.875[22.23]	6.62[168.1]
	600#	3.50[88.9]	8.25[209.6]	1.50[38.1]	8	0.875[22.23]	6.62[168.1]
DN 50	PN40	2.30[57]	6.50[165]	0.67[17]	4	0.71[18]	4.92[125]
	PN64	2.30[57]	7.09[180]	0.91[23]	4	0.87[22]	5.31[135]
DN 80	PN40	3.50[89]	7.87[200]	0.83[21]	8	0.71[18]	6.30[160]
	PN64	3.50[89]	8.46[215]	0.98[25]	8	0.87[22]	6.69[170]

ANSI / ASME / JIS / DIN	Lower Housing			
	Pipe Size	Outer Diameter "G"	Inner Diameter "K"	Thickness with 1/4-NPT F.C. "L"
				Thickness with 1/2-NPT F.C. "L"
	2-in.	3.62 (92)	2.12 (54)	0.97 (25)
	3-in.	5.00 (127)	3.60 (91)	0.97 (25)
	DN 50	4.00 (102)	2.40 (61)	0.97 (25)
	DN 80	5.43 (138)	3.60 (91)	0.97 (25)

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TABLE 8. Pancake Seal Ordering Information

				● = Available — = Unavailable		
Code	Industry Standard					
A	ANSI/ASME B16.5 (American National Standards Institute/American Society of Mechanical Engineers)					
D	DIN (Deutsches Institut für Normung)					
J	JIS (Japanese Industrial Standards)					
Code	Process Connection Style					
PFW ⁽¹⁾	Pancake					
Code	Process Connection Size					
	ANSI	DIN	JIS			
G	2 in.	DN 50	50A			
7	3 in.	—	80A			
J	—	DN 80	—			
Code	Maximum Working Pressure (Flange Rating)					
0	No Flange Supplied, Seal Rated to 6,250 psi					
1	Class 150 (ANSI), 10K (JIS), Flange and Retaining Cap					
2	Class 300 (ANSI), 20K (JIS), Flange and Retaining Cap					
4	Class 600 (ANSI), 40K (JIS), Flange and Retaining Cap					
G	PN 40 (DIN) Flange and Retaining Cap					
5	Class 900 (ANSI), Flange and Retaining Cap					
6	Class 1,500 (ANSI), Flange and Retaining Cap					
7	Class 2,500 (ANSI), Flange and Retaining Cap					
H	PN 64(63) (DIN), Flange and Retaining Cap					
J	PN 100 (DIN), Flange and Retaining Cap					
Code	Diaphragm and Wetted Material ⁽²⁾	Upper Housing ⁽²⁾	Mounting Flange	Available with Process Connection Code		
				G	7	J
LA ⁽³⁾	316L SST	316L SST	No Flange	●	●	●
CA ⁽³⁾	316L SST	316L SST	Carbon Steel	●	●	●
DA ⁽³⁾	316L SST	316L SST	316 SST	●	●	●
LB	Hastelloy C-276	316L SST	No Flange	●	●	●
CB	Hastelloy C-276	316L SST	Carbon Steel	●	●	●
DB	Hastelloy C-276	316L SST	316 SST	●	●	●
BB ⁽³⁾	Hastelloy C-276	Hastelloy C-276	No Flange	●	●	●
MB ⁽³⁾	Hastelloy C-276	Hastelloy C-276	Carbon Steel	●	●	●
KB ⁽³⁾	Hastelloy C-276	Hastelloy C-276	316 SST	●	●	●
LC	Tantalum-Seam Welded	316L SST	No Flange	●	●	●
CC	Tantalum-Seam Welded	316L SST	Carbon Steel	●	●	●
DC	Tantalum-Seam Welded	316L SST	316 SST	●	●	●
L3 ⁽³⁾	Tantalum-Brazed	316L SST	No Flange	●	●	●
C3 ⁽³⁾	Tantalum-Brazed	316L SST	Carbon Steel	●	●	●
D3 ⁽³⁾	Tantalum-Brazed	316L SST	316 SST	●	●	●
LF	304L SST	316L SST	No Flange	●	●	●
BF ⁽³⁾	304L SST	304 SST	No Flange	●	●	●
LV	Monel 400	316L SST	No Flange	●	●	●
BV ⁽³⁾	Monel 400	Monel 400	No Flange	●	●	●
KV ⁽³⁾	Monel 400	Monel 400	316 SST	●	●	●
MV ⁽³⁾	Monel 400	Monel 400	Carbon Steel	●	●	●
LJ	Hastelloy B	316L SST	No Flange	●	●	●
BJ ⁽³⁾	Hastelloy B	Hastelloy B	No Flange	●	●	●
KJ ⁽³⁾	Hastelloy B	Hastelloy B	316 SST	●	●	●
LP	Nickel 201	316L SST	No Flange	●	●	●
BP ⁽³⁾	Nickel 201	Nickel 201	No Flange	●	●	●
KP ⁽³⁾	Nickel 201	Nickel 201	316 SST	●	●	●
TH ⁽³⁾	Titanium Gr. 4	Titanium Gr. 4	No Flange	●	●	●
RH ⁽³⁾	Titanium Gr. 4	Titanium Gr. 4	316 SST	●	●	●
LH ⁽⁴⁾	Titanium Gr. 4	316L SST	No Flange	●	●	●
DH ⁽⁴⁾	Titanium Gr. 4	316L SST	316 SST	●	●	●

TABLE 8. Pancake Seal Ordering Information

CH ⁽⁴⁾	Titanium Gr. 4	316L SST	Carbon Steel	●	●	●
WW	316Ti	316Ti	No Flange	●	●	●
LE	Inconel 600	316L SST	No Flange	●	●	●
LM	Titanium Gr. 2	316L SST	No Flange	●	●	●
DM	Titanium Gr. 2	316L SST	316 SST			
EM	Titanium Gr. 2	Titanium Gr. 2	No Flange			
YM	Titanium Gr. 2	Titanium Gr. 2	316 SST			
L4	Hastelloy C-276	316L SST	No Flange	●	●	●
L5	Duplex 2507 SST	316L SST	No Flange	●	●	●
C5	Duplex 2507 SST	316L SST	Carbon Steel	●	●	●
D5	Duplex 2507 SST	316L SST	316 SST	●	●	●
B5 ⁽³⁾	Duplex 2507 SST	Duplex 2205 SST	No Flange	●	●	●
M5 ⁽³⁾	Duplex 2507 SST	Duplex 2205 SST	Carbon Steel	●	●	●
K5 ⁽³⁾	Duplex 2507 SST	Duplex 2205 SST	316 SST	●	●	●
Code	Flushing Connection Ring Material (Lower Housing) ⁽⁵⁾					
0	No Flushing Connection Ring					
A	316L SST					
B	Hastelloy C-276					
D	Carbon Steel					
F	304 L SST					
H	Titanium Gr. 4					
3	Titanium Gr. 2					
J	Hastelloy B					
6	Nickel 201					
V	Monel 400					
2	Duplex 2205 SST					
Code	Flushing Option					
0	No Flushing Connection Ring					
1	One 1/4-in. Flushing Connection					
3	Two 1/4-in. Flushing Connections					
7	One 1/2-in. Flushing Connection					
9	Two 1/2-in. Flushing Connections					
Code	Options					
B	Extra Fill for Cold Temperature Applications					
C	150 µm (0.006-in.) Diaphragm Thickness (316L SST and Hastelloy C-276 diaphragms only, for abrasive applications)					
D	Hastelloy Plug in Flushing Connection					
G	SST Plug in Flushing Connection					
H	SST Drain/Vent in Flushing Connection (Not NACE MR0175/ISO 15156, MR0103 compliant)					
J	PTFE Gasket (for use with flushing connection ring)					
K	Barium Sulfate-Filled PTFE Gasket (for use with flushing connection ring)					
V	PTFE Coated Diaphragm for nonstick purposes (316L SST and Hastelloy C-276 diaphragms only)					
T ⁽⁶⁾	NACE MR0175/ISO 15156, MR0103					
N	Grafoil™ Gasket (for use with flushing connection ring)					
U	25 µm (0.001 in) Gold Plated Diaphragm					

(1) Shaded areas indicate special orders. Consult an Emerson Process Management representative for configuration availability, performance effects, and lead time.

(2) When ordering special diaphragm materials, the upper housing is 316LSST unless otherwise noted.

(3) For use with customer supplied spiral wound metallic gaskets.

(4) Operating temperature limited to 150° C (302° F).

(5) Supplied standard with Aramid Fiber gasket.

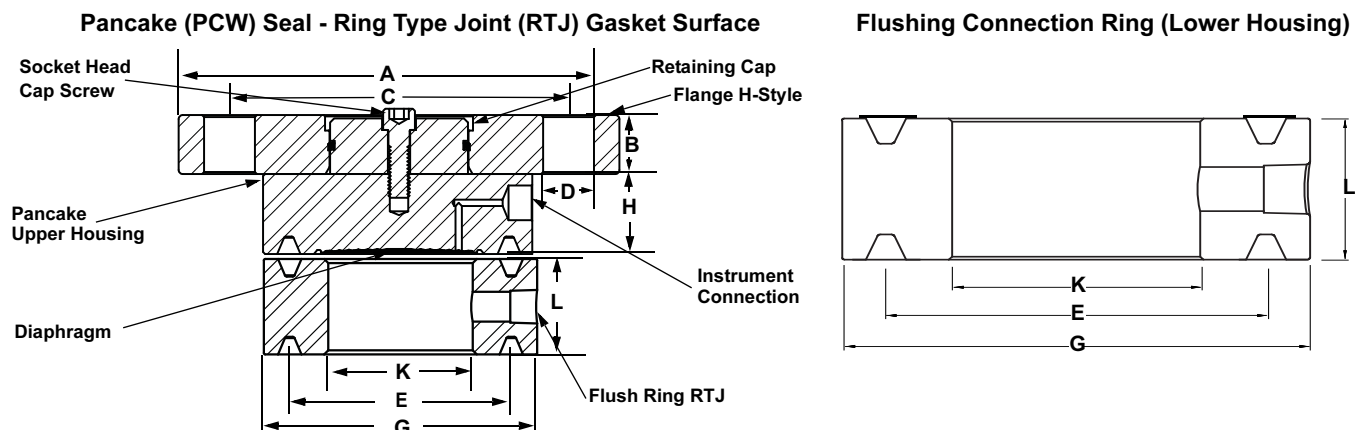
(6) Materials of Construction comply with metallurgical requirements highlighted within NACE MR0175/ISO 15156 for sour oil field production environments. Environmental limits apply to certain materials. Consult latest standard for details. Selected materials also conform to NACE MR0103 for sour refining environments.

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NOMINAL PIPE SIZE	CLASS	FLG.OD "A"	FLG Thickness "B"	QTY. OF BOLT	BOLT HOLE SIZE "D"	BOLT CIRCLE "C"
ANSI 2"	150#	6.00[152.4]	0.75[19.1]	4	0.750[19.05]	4.75[120.7]
	300#	6.50[165.1]	0.87[22.1]	8	0.750[19.05]	5.00[127.0]
	600#	6.50[165.1]	1.25[31.8]	8	0.750[19.05]	5.00[127.0]
	900/1500#	8.50[215.9]	1.50[38.1]	8	1.000[25.40]	6.50[165.1]
	2500#	9.25[235.0]	2.00[50.8]	8	1.125[28.58]	6.75[171.5]
ANSI 3"	150#	7.50[190.5]	0.96[24.4]	4	0.750[19.05]	6.00[152.4]
	300#	8.25[209.6]	1.12[28.4]	8	0.875[22.23]	6.62[168.1]
	600#	8.25[209.6]	1.50[38.1]	8	0.875[22.23]	6.62[168.1]
	900#	10.50[266.7]	1.88[47.8]	8	1.250[31.75]	8.00[203.2]
	1500#	10.50[266.7]	1.88[47.8]	8	1.250[31.75]	8.00[203.2]
	2500#	12.00[304.8]	2.62[66.5]	8	1.375[34.93]	9.00[228.6]

NOMINAL PIPE SIZE F/RTJ SIZE	DIAPHRAGM DIAMETER	SEAL THICKNESS "H"
2"	2.3 [58.4]	1.18 [30.0]
3"	3.5 [88.9]	1.18 [30.0]

Dimensional Table for Flushing Connection Ring (Lower Housing)

ANSI/ ASME /JIS	PIPE SIZE	CLASS	RTJ Diameter "E"	Outer Diameter "G"	Inner Diameter "K"	Thickness with 1/4-NPT F.C. "L"	Thickness with 1/2-NPT F.C. "L"
	2-in.	150 lb.	3.250(83)	4.00(102)	2.12(54)	1.4(36)	1.7(43)
		300 lb.	3.250(83)	4.25(108)	2.12(54)	1.4(36)	1.7(43)
		600 lb.	3.250(83)	4.25(108)	2.12(54)	1.4(36)	1.7(43)
		1500 lb.	3.750(95)	4.88(124)	2.12(54)	1.4(36)	1.7(43)
		2500 lb.	4.000(102)	5.25(133)	2.12(54)	1.4(36)	1.7(43)
	3-in.	150 lb.	4.500 (114)	5.25 (133)	3.60 (91)	1.5 (38)	1.8 (46)
		300 lb.	4.875 (124)	5.75 (146)	3.60 (91)	1.5 (38)	1.8 (46)
		600 lb.	4.875 (124)	5.75 (146)	3.60 (91)	1.5 (38)	1.8 (46)
		900 lb.	4.875 (124)	6.12 (155)	3.60 (91)	1.5 (38)	1.8 (46)
		1500 lb.	5.375 (137)	6.62 (168)	3.60 (91)	1.5 (38)	1.8 (46)
		2500 lb.	5.000 (127)	6.62 (168)	3.60 (91)	1.5 (38)	1.8 (46)

TABLE 9. Ring Type Joint Pancake Seal Ordering Information⁽¹⁾

Code	Industry Standard		
A	ANSI/ASME B16.5 (American National Standards Institute/American Society of Mechanical Engineers)		
Code	Process Connection Style		
PCW	Ring Type Joint (RTJ) Pancake		
Code	Process Connection Size		
4	1 1/2 in.		
G	2 in.		
7	3 in.		
Code	Maximum Working Pressure (Flange Rating)		
1	Class 150		
2	Class 300		
4	Class 600		
5	Class 900		
6	Class 1500		
7	Class 2500		
Code	Diaphragm Material ⁽²⁾	Upper Housing ⁽²⁾	Mounting Flange
LA	316 SST	316 SST	No Flange
CA	316 SST	316 SST	Carbon Steel
DA	316 SST	316 SST	316 SST
BB	Hastelloy C-276	Hastelloy C-276	No Flange
MB	Hastelloy C-276	Hastelloy C-276	Carbon Steel
KB	Hastelloy C-276	Hastelloy C-276	316 SST
BF	304 SST	304 SST	No Flange
BV	<i>Monel</i> 400	<i>Monel</i> 400	No Flange
KV	<i>Monel</i> 400	<i>Monel</i> 400	316 SST
BJ	Hastelloy B	Hastelloy B	No Flange
KJ	Hastelloy B	Hastelloy B	316 SST
BP	Nickel 201	Nickel 201	No Flange
KP	Nickel 201	Nickel 201	316 SST
TH	Titanium Gr. 4	Titanium Gr. 4	No Flange
RH	Titanium Gr. 4	Titanium Gr. 4	316 SST
EM	Titanium Gr. 2	Titanium Gr. 2	No Flange
YM	Titanium Gr. 2	Titanium Gr. 2	316 SST
B5	Duplex 2507 SST	Duplex 2205 SST	No Flange
M5	Duplex 2507 SST	Duplex 2205 SST	Carbon Steel
K5	Duplex 2507 SST	Duplex 2205 SST	316 SST
Code	Flushing Connection Ring Material (Lower Housing)		
0	No Flushing Connection Ring		
A	316L SST		
B	Hastelloy C-276		
D	Carbon Steel		
F	304 SST		
H	Titanium Gr. 4		
3	Titanium Gr. 2		
J	Hastelloy B		
6	Nickel 201		
V	<i>Monel</i> 400		
2	Duplex 2205 SST		

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Code	Flushing Option
0	No Flushing Connection Ring
1	One 1/4-in. Flushing Connection
3	Two 1/4-in. Flushing Connections
7	One 1/2-in. Flushing Connection
9	Two 1/2-in. Flushing Connections
Code	Options (select up to 3)
B	Extra Fill for Cold Temperature Applications
C	150 µm (0.006-in.). Diaphragm Thickness (316L SST and Hastelloy C-276 diaphragms only, for abrasive applications)
D	Hastelloy Plug in Flushing Connection
G	SST Plug in Flushing Connection
V ⁽³⁾	PTFE Coated Diaphragm for nonstick purposes (316L SST and Hastelloy C-276 diaphragms only)
T ⁽⁴⁾	NACE MR0175/ISO 15156, MR0103
U	Gold Plated Diaphragm
H	SST Drain/Vent in Flushing Connection (Not NACE MR0175/ISO 15156, MR0103 compliant)

(1) Shaded areas indicate special orders. Consult an Emerson Process Management representative for configuration availability, performance effects, and lead time.

(2) When ordering special diaphragm materials, the upper housing is 316L SST unless otherwise noted.

(3) Not available with transmitter option code Q8, for Material Traceability per DIN EN10204 3.1.B of the transmitter/diaphragm seal assembly.

(4) Materials of Construction comply with metallurgical requirements highlighted within NACE MR0175/ISO 15156 for sour oil field production environments. Environmental limits apply to certain materials. Consult latest standard for details. Selected materials also conform to NACE MR0103 for sour refining environments.

FLUSH FLANGED (FFW) SEAL

Two-Piece Design (shown with flushing ring)

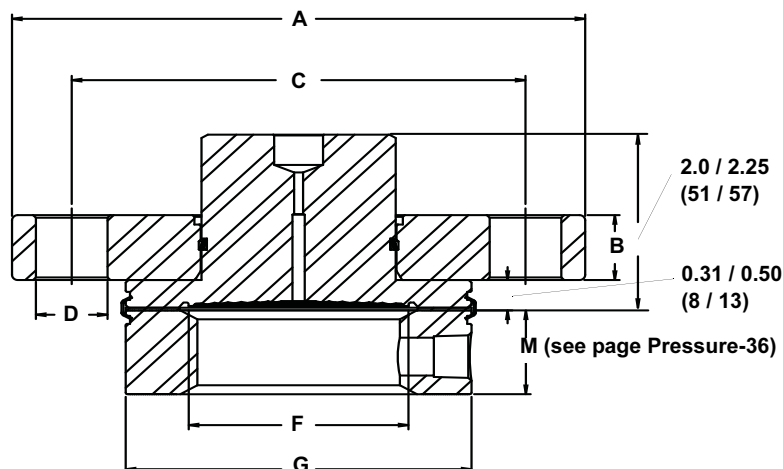


TABLE 10. Dimensional Table for Flush Flanged Raised Face Diaphragm Seals Two Piece (Upper Housing and Flange) Design
Measurement in inches (millimeters)

	Pipe Size	Class	Flange Diameter "A"	Flange Thickness "B"	Bolt Circle "C"	Bolts	Bolt Hole Diameter "D"	Standard Diaphragm Diameter "F"	Raised Face Diameter "G"
ANSI/ASME/JIS	2-in.	150 lb.	6.00 (152)	0.69 (18)	4.75 (121)	4	0.75 (19)	2.30 (58)	3.62 (92)
		300 lb.	6.50 (165)	0.82 (21)	5.00 (127)	8	0.75 (19)	2.30 (58)	3.62 (92)
		600 lb.	6.50 (165)	1.00 (25)	5.00 (127)	8	0.75 (19)	2.30 (58)	3.62 (92)
	3-in.	150 lb.	7.50 (191)	0.88 (22)	6.00 (152)	4	0.75 (19)	3.50 (89)	5.00 (127)
		300 lb.	8.25 (210)	1.07 (27)	6.62 (168)	8	0.88 (22)	3.50 (89)	5.00 (127)
		600 lb.	8.25 (210)	1.25 (32)	6.62 (168)	8	0.88 (22)	3.50 (89)	5.00 (127)
	4-in.	150 lb.	9.00 (229)	0.88 (22)	7.50 (191)	8	0.75 (19)	3.50 (89)	6.20 (157)
		300 lb.	10.0 (254)	1.19 (30)	7.88 (200)	8	0.88 (22)	3.50 (89)	6.20 (157)
		600 lb.	10.75 (273)	1.50 (38)	8.50 (216)	8	1.00 (25)	3.50 (89)	6.20 (157)
DIN	DN 50	PN 40	6.50 (165)	0.79 (20)	4.92 (125)	4	0.71 (18)	2.30 (58)	4.00 (102)
		PN 64	7.08 (180)	1.02 (26)	5.31 (135)	4	0.87 (22)	2.30 (58)	4.00 (102)
		PN 100	7.68 (195)	1.10 (28)	5.71 (145)	4	1.02 (26)	2.30 (58)	4.00 (102)
	DN 80	PN 40	7.87 (200)	0.94 (24)	6.30 (160)	8	0.71 (18)	3.50 (89)	5.43 (138)
		PN 64	8.46 (215)	1.10 (28)	6.69 (170)	8	0.88 (22)	3.50 (89)	5.43 (138)
		PN 100	9.06 (230)	1.26 (32)	7.09 (180)	8	1.02 (26)	3.50 (89)	5.43 (138)
	DN 100	PN 16	8.66 (220)	0.79 (20)	7.09 (180)	8	0.71 (18)	3.50 (89)	6.20 (157)
		PN 40	9.25 (235)	0.94 (24)	7.48 (190)	8	0.87 (22)	3.50 (89)	6.20 (157)
		PN 64	9.84 (250)	1.18 (30)	7.87 (200)	8	1.02 (26)	3.50 (89)	6.20 (157)

One-Piece Design (shown with flushing ring)

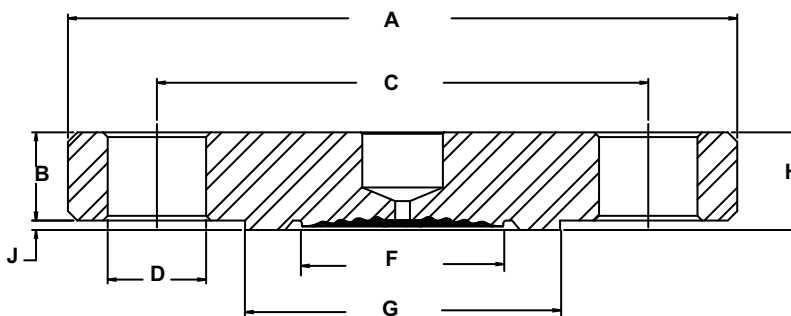


TABLE 11. Dimensional Table for Flush Flanged Diaphragm Seals One Piece (Upper Housing and Flange) Design
(Option code E)

Measurement in inches (millimeters)

	Pipe Size	Class	Flange Diameter "A"	Flange Thickness "B"	Bolt Circle "C"	Bolts	Bolt Hole Diameter "D"	Standard Diaphragm Diameter "E"	Raised Face Diameter "F"	Overall Height "G"	Raised Face Height "H"
ANSI / ASME / JIS	2-in.	150 lb.	6.00 (152)	0.69 (18)	4.75 (121)	4	0.75 (19)	2.30 (58)	3.62 (92)	0.75 (19)	0.06 (1.5)
		300 lb.	6.50 (165)	0.82 (21)	5.00 (127)	8	0.75 (19)	2.30 (58)	3.62 (92)	0.88 (22)	0.06 (1.5)
		600 lb.	6.50 (165)	1.00 (25)	5.00 (127)	8	0.75 (19)	2.30 (58)	3.62 (92)	1.25 (32)	0.25 (6.3)
	3-in.	150 lb.	7.50 (191)	0.88 (22)	6.00 (125)	4	0.75 (19)	3.50 (89)	5.00 (127)	0.94 (24)	0.06 (1.5)
		300 lb.	8.25 (210)	1.06 (27)	6.62 (168)	8	0.88 (22)	3.50 (89)	5.00 (127)	1.12 (28)	0.06 (1.5)
		600 lb.	8.25 (210)	1.25 (32)	6.62 (168)	8	0.88 (22)	3.50 (89)	5.00 (127)	1.50 (38)	0.25 (6.3)
	4-in.	150 lb.	9.00 (229)	0.88 (22)	7.50 (191)	8	0.75 (19)	3.50 (89)	6.20 (157)	0.94 (24)	0.06 (1.5)
		300 lb.	10.00 (254)	1.19 (30)	7.88 (200)	8	0.88 (22)	3.50 (89)	6.20 (157)	1.25 (32)	0.06 (1.5)
		600 lb.	10.75 (273)	1.50 (38)	8.50 (216)	8	1.00 (25)	3.50 (89)	6.20 (157)	1.75 (44)	0.25 (6.3)
DIN	DN 50	PN 40	6.50 (165)	0.79 (20)	4.92 (125)	4	0.71 (18)	2.30 (58)	4.00 (102)	0.91 (23)	0.12 (3)
		PN 64	7.08 (180)	1.02 (26)	5.31 (135)	4	0.87 (22)	2.30 (58)	4.00 (102)	1.14 (29)	0.12 (3)
		PN 100	7.68 (195)	1.10 (28)	5.71 (145)	4	1.02 (26)	2.30 (58)	4.00 (102)	1.22 (31)	0.12 (3)
	DN 80	PN 40	7.87 (200)	0.94 (24)	6.30 (160)	8	0.71 (18)	3.50 (89)	5.43 (138)	1.06 (27)	0.12 (3)
		PN 64	8.46 (215)	1.10 (28)	6.69 (170)	8	0.88 (22)	3.50 (89)	5.43 (138)	1.22 (31)	0.12 (3)
		PN 100	9.06 (230)	1.26 (32)	7.09 (180)	8	1.02 (26)	3.50 (89)	5.43 (138)	1.38 (35)	0.12 (3)
	DN 100	PN 16	8.66 (220)	0.79 (20)	7.09 (180)	8	0.71 (18)	3.50 (89)	6.20 (157)	0.91 (23)	0.12 (3)
		PN 40	9.25 (235)	0.94 (24)	7.48 (190)	8	0.87 (22)	3.50 (89)	6.20 (157)	1.06 (27)	0.12 (3)
		PN 64	9.84 (250)	1.18 (30)	7.87 (200)	8	1.02 (26)	3.50 (89)	6.20 (157)	1.30 (33)	0.12 (3)

Flushing Connection Ring (Lower Housing)

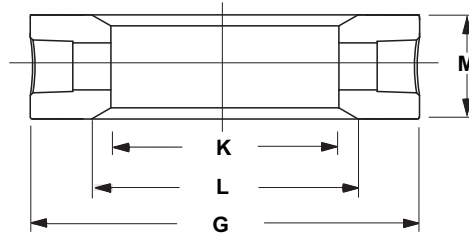


TABLE 12. Dimensional Table for Flushing Connection Ring (Lower Housing)

Measurement in inches (millimeters)

	Pipe Size	Outer Diameter "G"	Inner Diameter "K"	Beveled Edge "L"	Thickness with $\frac{1}{4}$ -NPT F.C. "M"	Thickness with $\frac{1}{2}$ -NPT F.C. "M"
ANSI/ASME/JIS	2-in.	3.62 (92)	2.12 (54)	2.48 (63)	0.97 (25)	1.31 (33)
	3-in.	5.00 (127)	3.60 (91)	—	0.97 (25)	1.31 (33)
	4-in.	6.20 (158)	3.60 (91)	—	0.97 (25)	1.31 (33)
DIN	DN 50	4.00 (102)	2.40 (61)	—	0.97 (25)	1.31 (33)
	DN 80	5.43 (138)	3.60 (91)	—	0.97 (25)	1.31 (33)

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TABLE 13. Flush Flanged (FFW) Seal – Ordering Information⁽¹⁾

Code Industry Standards	
A	ANSI / ASME B16.5 (American Standards Institute / American Society of Mechanical Engineering)
D	DIN 2401 and 2501 (Deutsches Institut für Normung)
J	JIS B2238 (Japanese Industrial Standards)
Code Process Connection Style	
FFW	Flanged, flush surface
Code Process Connection Size	
	<i>ANSI</i>
G	2-in.
7	3-in.
J	—
9	4-in.
	<i>DIN</i>
	DN 50
	—
	DN 80
	DN 100
	<i>JIS</i>
	50 A
	80 A
	—
	100 A
Code Maximum Working Pressure (Flange Rating)	
	<i>ANSI</i>
1	Class 150
2	Class 300
4	Class 600
G	—
5	Class 900
6	Class 1500
7	Class 2500
E	—
H	—
J	—
	<i>DIN</i>
	—
	—
	—
	PN 40
	—
	—
	—
	PN 10/16
	PN 64
	PN 100
	<i>JIS</i>
	10K
	20K
	40K
	—
	—
	—
	—
	—
	—
Code Diaphragm and Wetted Parts Material ⁽²⁾	
Upper Housing Material ⁽²⁾	
Mounting Flange ⁽³⁾	
CA ⁽⁴⁾⁽⁵⁾	316L SST
DA ⁽⁵⁾	316L SST
CB ⁽⁴⁾⁽⁶⁾	Hastelloy C-276, seam welded
DB ⁽⁶⁾	Hastelloy C-276, seam welded
MB ⁽⁴⁾⁽⁵⁾	Hastelloy C-276, solid faceplate
KB ⁽⁴⁾⁽⁵⁾	Hastelloy C-276, solid faceplate
CC ⁽⁴⁾	Tantalum, seam welded
DC	Tantalum, seam welded
C3 ⁽⁴⁾⁽⁵⁾⁽⁶⁾⁽⁷⁾	Tantalum, brazed
D3 ⁽⁴⁾⁽⁵⁾⁽⁶⁾⁽⁷⁾	Tantalum, brazed
DJ	Hastelloy B
CJ ⁽⁴⁾	Hastelloy B
DF	304L SST
CF ⁽⁴⁾	304L SST
DP	Nickel 201
CP ⁽⁴⁾	Nickel 201
DV	Monel 400
CV ⁽⁴⁾	Monel 400
RH ⁽⁵⁾	Titanium GR-4
DH ⁽⁸⁾	Titanium GR.4
CH ⁽⁸⁾	Titanium GR.4
DM ⁽⁸⁾	Titanium GR.2
WW ⁽⁵⁾⁽⁹⁾	316Ti SST (WNR 1.4571)
D4	Hastelloy C-22
C5 ⁽⁴⁾	Duplex 2507 SST
D5	Duplex 2507 SST
DE	Inconel 600
DZ ⁽⁸⁾	Zirconium

TABLE 13. Flush Flanged (FFW) Seal – Ordering Information⁽¹⁾

Code	Flushing Connection Ring Material (Lower Housing)
0	No flushing ring required
A	316L SST
B	Hastelloy C-276
D	Plated Carbon Steel
2	Duplex 2205 SST
E	Inconel 600
H	Titanium Gr. 4
3	Titanium Gr. 2
J	Hastelloy B
6	Nickel 201
V	Monel 400
W	316Ti SST (WNR 1.4571)
Code	Flushing Options
0	No flushing ring required
1	One 1/4-18 NPT flushing connection
3	Two 1/4-18 NPT flushing connection
7	One 1/2-14 NPT flushing connection
9	Two 1/2-14 NPT flushing connection
Code	Options (Multiple Selections)
E	One piece design
B	Extra fill for cold temperature applications
C	150 µm (0.006-in.) diaphragm thickness (available with 316L SST, Hastelloy C-276, Nickel 201, and 2507 Duplex SST diaphragms only, abrasive applications)
D	Hastelloy plug(s) for flushing connection(s)
G	SST plug(s) for flushing connection(s)
H	SST vent/drain for flushing connections
J	PTFE gasket (for use with flushing connection ring)
7 ⁽¹⁰⁾	50 µm (0.002-in.) diaphragm thickness
V ⁽¹⁰⁾	PTFE coated diaphragm for nonstick purposes only
N	Grafoil gasket (for use with flushing connection ring)
K	Barium sulfate-filled PTFE gasket in lower housing
U	25 µm (0.001 in) Gold plated diaphragm
T ⁽¹¹⁾	NACE MR0175/ISO 15156, MR0103
2 ⁽⁹⁾	Radial Capillary Connection
4 ⁽⁹⁾	Flat Face, Flush Flange

(1) Shaded areas indicate special orders. Consult a local Emerson Process Management, Rosemount division sales representative for availability, performance effects, and lead time.

(2) When ordering special diaphragm materials, the upper housing material is 316L SST unless otherwise noted.

(3) The mounting flange and upper housing are a single item for the one-piece design, option code E.

(4) Only available with two piece design.

(5) For use with spiral wound metallic gaskets.

(6) Not available with option code C.

(7) Only available in Process Connection Size code G and 7.

(8) Operating temperature limited to 150 °C (302 °F).

(9) Only available with one-piece design, option code E.

(10) Available with 316L SST and Hastelloy C-276 diaphragms only.

(11) Materials of Construction comply with metallurgical requirements highlighted within NACE MR0175/ISO 15156 for sour oil field production environments. Environmental limits apply to certain materials. Consult latest standard for details. Selected materials also conform to NACE MR0103 for sour refining environments.

FLUSH FLANGED (FCW) SEAL – RING TYPE JOINT (RTJ) GASKET SURFACE

Two-Piece Design (shown with flushing ring)

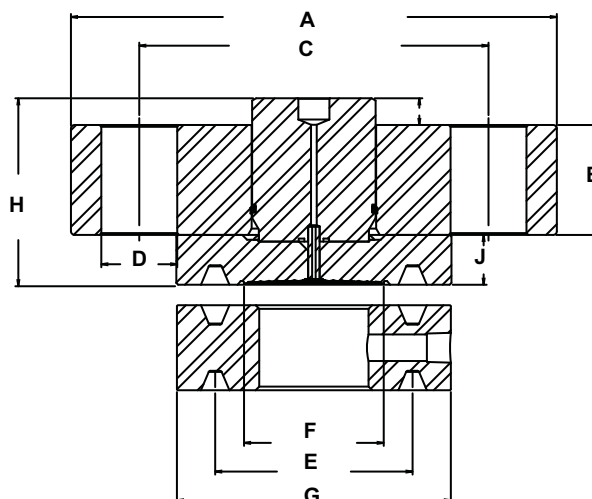


TABLE 14. Dimensional Table for FCW 2-Piece Flange Type Flush Diaphragm Seal

Measurement in inches (millimeters)

Pipe Size	Class	Flange Diameter "A"	Flange Thickness "B"	Bolt Circle Diameter "C"	Bolt Hole Diameter "D"	RTJ Diameter "E"	Standard Diaphragm Diameter "F"	Raised Face Diameter "G"	Overall Height "H"	Raised Face Height "J"
1½-in.	150 lb.	5.00 (127)	0.63 (16)	3.88 (99)	0.62 (16)	2.562 (65)	1.90 (48.3)	3.25 (83)	2.47 (62.7)	0.68 (17.3)
	300 lb.	6.12 (156)	0.75 (19)	4.50 (114)	0.88 (22)	2.688 (68)	2.30 (58.4)	3.56 (90)	2.47 (62.7)	0.68 (17.3)
	600 lb.	6.12 (156)	0.88 (22)	4.50 (114)	0.88 (22)	2.688 (68)	2.30 (58.4)	3.56 (90)	2.47 (62.7)	0.68 (17.3)
	1500 lb.	7.00 (178)	1.25 (32)	4.88 (124)	1.12 (28)	2.688 (68)	2.30 (58.4)	3.62 (92)	2.61 (66.3)	0.82 (20.8)
	2500 lb.	8.00 (203)	1.75 (44)	5.75 (146)	1.25 (32)	3.250 (83)	2.30 (58.4)	4.50 (114)	3.14 (79.8)	0.82 (20.8)
2-in.	150 lb.	6.00 (152)	0.69 (18)	4.75 (121)	0.75 (19)	3.250 (83)	2.30 (58.4)	4.00 (102)	2.47 (62.7)	0.68 (17.3)
	300 lb.	6.50 (165)	0.82 (21)	5.00 (127)	0.75 (19)	3.250 (83)	2.30 (58.4)	4.25 (108)	2.47 (62.7)	0.68 (17.3)
	600 lb.	6.50 (165)	1.00 (25)	5.00 (127)	0.75 (19)	3.250 (83)	2.30 (58.4)	4.25 (108)	2.47 (62.7)	0.68 (17.3)
	1500 lb.	8.50 (216)	1.50 (38)	6.50 (165)	1.00 (25)	3.750 (95)	2.30 (58.4)	4.88 (124)	2.61 (66.3)	0.82 (20.8)
	2500 lb.	9.25 (235)	2.00 (51)	6.75 (171)	1.12 (28)	4.000 (102)	3.50 (88.9)	5.25 (133)	3.94 (100.1)	0.82 (20.8)
3-in.	150 lb.	7.50 (191)	0.88 (22)	6.00 (168)	0.75 (19)	4.500 (114)	3.50 (88.9)	5.25 (133)	2.47 (62.7)	0.68 (17.3)
	300 lb.	8.25 (210)	1.07 (27)	6.62 (168)	0.88 (22)	4.875 (124)	3.50 (88.9)	5.75 (146)	2.47 (62.7)	0.68 (17.3)
	600 lb.	8.25 (210)	1.25 (32)	6.62 (168)	0.88 (22)	4.875 (124)	3.50 (88.9)	5.75 (146)	2.47 (62.7)	0.68 (17.3)
	900 lb.	9.50 (241)	1.50 (38)	7.50 (191)	1.00 (25)	4.875 (124)	3.50 (88.9)	6.12 (155)	2.61 (66.3)	0.82 (20.8)
	1500 lb.	10.50 (267)	1.88 (48)	8.00 (203)	1.25 (32)	5.375 (137)	3.50 (88.9)	6.62 (168)	3.81 (96.8)	0.82 (20.8)
4-in.	2500 lb.	12.00 (305)	2.62 (67)	9.00 (229)	1.38 (35)	5.000 (127)	3.50 (88.9)	6.62 (168)	3.94 (100.1)	0.82 (20.8)
	150 lb.	9.00 (229)	0.88 (22)	7.50 (191)	0.75 (19)	5.875 (149)	3.50 (88.9)	6.75 (171)	2.47 (62.7)	0.68 (17.3)
	300 lb.	10.00 (254)	1.19 (30)	7.88 (200)	0.88 (22)	5.875 (149)	3.50 (88.9)	6.88 (175)	2.47 (62.7)	0.68 (17.3)
	600 lb.	10.75 (273)	1.50 (38)	8.50 (216)	1.00 (25)	5.875 (149)	3.50 (88.9)	6.88 (175)	2.47 (62.7)	0.68 (17.3)

One-Piece Design

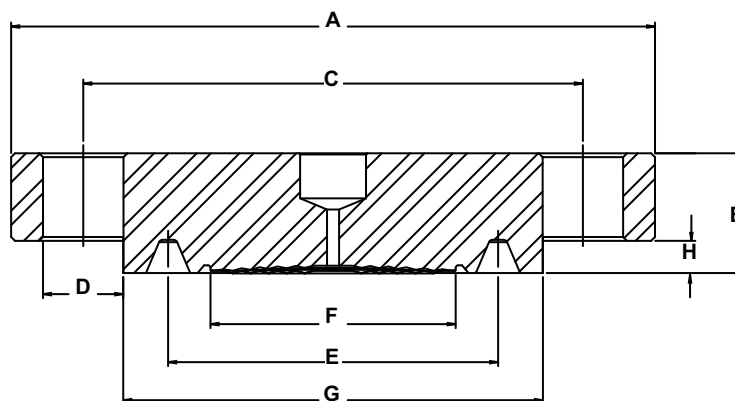


TABLE 15. Dimensional Table for FCW 1-Piece Flange Type Flush Diaphragm Seal

Measurement in inches (millimeters)

Pipe Size	Class	Flange Diameter "A"	Overall Height "B"	Bolt Circle Diameter "C"	Bolt Hole Diameter "D"	RTJ Diameter "E"	Standard Diaphragm Diameter "F"	Raised Face Diameter "G"	Raised Face Height "H"
1 1/2-in.	300 lb.	6.12 (156)	0.88 (22.4)	4.50 (114)	0.88 (22)	2.688 (68)	2.30 (58.4)	3.56 (90)	0.25 (6.4)
	600 lb.	6.12 (156)	0.88 (22.4)	4.50 (114)	0.88 (22)	2.688 (68)	2.30 (58.4)	3.56 (90)	0.25 (6.4)
	1500 lb.	7.00 (178)	1.25 (31.8)	4.88 (124)	1.12 (28)	2.688 (68)	2.30 (58.4)	3.62 (92)	0.25 (6.4)
	2500 lb.	8.00 (203)	1.75 (44.5)	5.75 (146)	1.25 (32)	3.250 (83)	2.30 (58.4)	4.50 (114)	0.312 (7.92)
2-in.	150 lb.	6.00 (152)	0.94 (23.9)	4.75 (121)	0.75 (19)	3.250 (83)	2.30 (58.4)	4.00 (102)	0.25 (6.4)
	300 lb.	6.50 (165)	1.13 (28.7)	5.00 (127)	0.75 (19)	3.250 (83)	2.30 (58.4)	4.25 (108)	0.312 (7.92)
	600 lb.	6.50 (165)	1.31 (33.3)	5.00 (127)	0.75 (19)	3.250 (83)	2.30 (58.4)	4.25 (108)	0.312 (7.92)
	1500 lb.	8.50 (216)	1.81 (46.0)	6.50 (165)	1.00 (25)	3.750 (95)	2.30 (58.4)	4.88 (124)	0.312 (7.92)
3-in.	2500 lb.	9.25 (235)	2.31 (58.7)	6.75 (171)	1.12 (28)	4.000 (102)	3.50 (88.9)	5.25 (133)	0.312 (7.92)
	150 lb.	7.50 (191)	1.13 (28.7)	6.00 (168)	0.75 (19)	4.500 (114)	3.50 (88.9)	5.25 (133)	0.25 (6.4)
	300 lb.	8.25 (210)	1.37 (34.8)	6.62 (168)	0.88 (22)	4.875 (124)	3.50 (88.9)	5.75 (146)	0.312 (7.92)
	600 lb.	8.25 (210)	1.56 (39.6)	6.62 (168)	0.88 (22)	4.875 (124)	3.50 (88.9)	5.75 (146)	0.312 (7.92)
	900 lb.	9.50 (241)	1.81 (46.0)	7.50 (191)	1.00 (25)	4.875 (124)	3.50 (88.9)	6.12 (155)	0.312 (7.92)
	1500 lb.	10.50 (267)	2.19 (55.6)	8.00 (203)	1.25 (32)	5.375 (137)	3.50 (88.9)	6.62 (168)	0.312 (7.92)
4-in.	2500 lb.	12.00 (305)	3.00 (76.2)	9.00 (229)	1.38 (35)	5.000 (127)	3.50 (88.9)	6.62 (168)	0.375 (9.52)
	150 lb.	9.00 (229)	1.13 (28.7)	7.50 (191)	0.75 (19)	5.875 (149)	3.50 (88.9)	6.75 (171)	0.25 (6.4)
	300 lb.	10.00 (254)	1.50 (38.1)	7.88 (200)	0.88 (22)	5.875 (149)	3.50 (88.9)	6.88 (175)	0.312 (7.92)
	600 lb.	10.75 (273)	1.81 (46.0)	8.50 (216)	1.00 (25)	5.875 (149)	3.50 (88.9)	6.88 (175)	0.312 (7.92)

RTJ Flushing Connection Ring (Lower Housing)

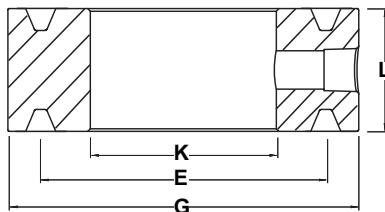


TABLE 16. Dimensional Table for Flushing Connection Ring (Lower Housing)

Measurement in inches (millimeters)

	Pipe Size	Class	"E"	Outer Diameter "G"	Inner Diameter "K"	Thickness with 1/4-NPT F.C. "L"	Thickness with 1/2-NPT F.C. "L"
ANSI / ASME / JIS	1 1/2-in.	150 lb.	2.562 (65)	3.25 (83)	1.80 (46)	1.2 (30)	1.5 (38)
		300 lb.	2.688 (68)	3.56 (90)	1.80 (46)	1.2 (30)	1.5 (38)
		600 lb.	2.688 (68)	3.56 (90)	1.80 (46)	1.2 (30)	1.5 (38)
		1500 lb.	2.688 (68)	3.62 (92)	1.80 (46)	1.2 (30)	1.5 (38)
		2500 lb.	3.250 (83)	4.50 (114)	1.80 (46)	1.2 (30)	1.5 (38)
	2-in.	150 lb.	3.250 (83)	4.00 (102)	2.12 (54)	1.4 (36)	1.7 (43)
		300 lb.	3.250 (83)	4.25 (108)	2.12 (54)	1.4 (36)	1.7 (43)
		600 lb.	3.250 (83)	4.25 (108)	2.12 (54)	1.4 (36)	1.7 (43)
		1500 lb.	3.750 (95)	4.88 (124)	2.12 (54)	1.4 (36)	1.7 (43)
		2500 lb.	4.000 (102)	5.25 (133)	2.12 (54)	1.4 (36)	1.7 (43)
	3-in.	150 lb.	4.500 (114)	5.25 (133)	3.60 (91)	1.5 (38)	1.8 (46)
		300 lb.	4.875 (124)	5.75 (146)	3.60 (91)	1.5 (38)	1.8 (46)
		600 lb.	4.875 (124)	5.75 (146)	3.60 (91)	1.5 (38)	1.8 (46)
		900 lb.	4.875 (124)	6.12 (155)	3.60 (91)	1.5 (38)	1.8 (46)
		1500 lb.	5.375 (137)	6.62 (168)	3.60 (91)	1.5 (38)	1.8 (46)
		2500 lb.	5.000 (127)	6.62 (168)	3.60 (91)	1.5 (38)	1.8 (46)

TABLE 17. Flush Flanged (FCW) Seal – Ring Type Joint (RTJ) Gasket Surface Ordering Information ⁽¹⁾

● Available
— Not available

Code	Industry Standards				
A	ANSI / ASME B16.5 (American National Standards Institute / American Society of Mechanical Engineers)				
Code	Process Connection Style				
FCW	Ring Type Joint Flanged, Flush Surface				
Code	Process Connection Size				
4	1 ¹ / ₂ -in.				
G	2-in.				
7	3-in.				
9	4-in.				
Code	Maximum Working Pressure (Flange Rating)	1 ¹ / ₂ -in.	2-in.	3-in.	4-in.
1	Class 150	●	●	●	●
2	Class 300	●	●	●	●
4	Class 600	●	●	●	●
5	Class 900	●	●	●	—
6	Class 1500	●	●	●	—
7	Class 2500	●	●	●	—
Code	Diaphragm and Wetted Parts Material ⁽²⁾	Upper Housing Materials ⁽²⁾		Mounting Flange ⁽³⁾	
CA ⁽⁴⁾	316L SST	316L SST		Carbon Steel	
DA	316L SST	316 SST		316 SST	
MB ⁽⁴⁾	Hastelloy C-276	Hastelloy C-276 / 316L SST		Carbon Steel	
KB ⁽⁴⁾	Hastelloy C-276	Hastelloy C-276 / 316L SST		316 SST	
KJ ⁽⁴⁾	Hastelloy B	Hastelloy B / 316L SST		316 SST	
MJ ⁽⁴⁾	Hastelloy B	Hastelloy B / 316L SST		Carbon Steel	
KF ⁽⁴⁾	304L SST	304L SST / 316L SST		316 SST	
MF ⁽⁴⁾	304L SST	304L SST / 316L SST		Carbon Steel	
KP ⁽⁴⁾	Nickel 201	Nickel 201 / 316L SST		316 SST	
MP ⁽⁴⁾	Nickel 201	Nickel 201 / 316L SST		Carbon Steel	
KV ⁽⁴⁾	<i>Monel</i> 400	<i>Monel</i> 400 / 316L SST		316 SST	
MV ⁽⁴⁾	<i>Monel</i> 400	<i>Monel</i> 400 / 316L SST		Carbon Steel	
RH ⁽⁴⁾	Titanium Gr. 4	Titanium Gr. 4		316 SST	
YM	Titanium Gr. 2	Titanium Gr. 2		316 SST	
WW ⁽³⁾	316Ti SST (WNR 1.4571)	316 Ti SST (WNR 1.4571)		316 Ti SST (WNR 1.4571)	
M5 ⁽⁴⁾	Duplex 2507 SST	Duplex 2205 SST		Carbon Steel	
K5	Duplex 2507 SST	Duplex 2205 SST		316 SST	
V1 ⁽³⁾	Hastelloy C-276 / Duplex 2205 SST	Duplex 2205 SST		Duplex 2205 SST	
VB ⁽⁴⁾	Hastelloy C-276	Hastelloy C-276 / Duplex 2205 SST		Duplex 2205 SST	
Code	Flushing Connection Ring Material (Lower Housing)				
0	No flushing ring required				
A	316L SST				
B	Hastelloy C-276				
D ⁽⁴⁾	Carbon Steel				
H	Titanium Gr. 4				
J	Hastelloy B				
6	Nickel 201				
V	<i>Monel</i> 400				
W ⁽³⁾	316Ti SST (WNR 1.4571)				
2	Duplex 2205 SST				

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TABLE 17. Flush Flanged (FCW) Seal – Ring Type Joint (RTJ) Gasket Surface Ordering Information ⁽¹⁾

● Available
— Not available

Code	Flushing Options
0	No flushing ring required
1	One 1/4-18 NPT flushing connection
3	Two 1/4-18 NPT flushing connection
7	One 1/2-14 NPT flushing connection
9	Two 1/2-14 NPT flushing connection
Code	Options (Multiple Selections)
E ⁽⁵⁾	One piece design
B	Extra fill for cold temperature applications
C	150 µm (0.006-in.) diaphragm thickness (available with 316L SST and Hastelloy C-276 diaphragms only, abrasive applications)
D	Hastelloy plug(s) for flushing connection(s)
G	SST plug(s) for flushing connection(s)
H	SST vent/drain for flushing connections
V ⁽⁶⁾	PTFE coated diaphragm for nonstick purposes only
7 ⁽⁶⁾	50 µm (0.002-in.) diaphragm thickness
U	25 µm (0.001 in) Gold plated diaphragm
T ⁽⁷⁾	NACE MR0175/ISO 15156, MR0103
2 ⁽³⁾	Radial Capillary Connection

(1) Shaded areas indicate special orders. Consult a local Emerson Process Management, Rosemount division sales representative for availability, performance, and lead time.

(2) When ordering special diaphragm materials, the upper housing material is 316L SST unless otherwise noted.

(3) Only available with one-piece design, option code E.

(4) Only available with two-piece design.

(5) The mounting flange and upper housing are a single item for the one-piece design, option code E.

(6) Available with 316L SST and Hastelloy C-276 diaphragms only.

(7) Materials of Construction comply with metallurgical requirements highlighted within NACE MR0175/ISO 15156 for sour oil field production environments. Environmental limits apply to certain materials. Consult latest standard for details. Selected materials also conform to NACE MR0103 for sour refining environments.

FLUSH FLANGED TYPE (FUW AND FVW) SEALS

FUW DIN 2512 Form N

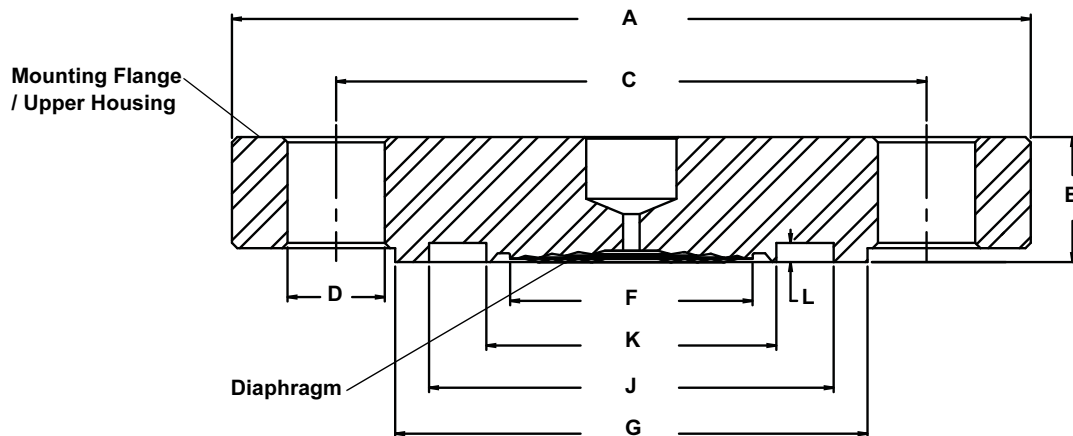


TABLE 18. FUW Flange Type Dimensions⁽¹⁾

Pipe Size	Class	Flange Diameter "A"	Flange Thickness "B"	Bolt Circle "C"	Bolt Diameter "D"	Bolts	Standard Diaphragm "F"	Raised Face Diameter "G"	Groove O.D. "J"	Groove I.D. "K"	Groove Depth "L"
DN 50	PN 40	6.50 (165)	0.79 (20)	4.92 (125)	0.71 (18)	4	2.30 (58)	4.00 (102)	3.46 (88)	2.83 (72)	0.10 (2.5)
	PN 64	7.09 (180)	1.02 (26)	5.31 (135)	0.87 (22)	4	2.30 (58)	4.00 (102)	3.46 (88)	2.83 (72)	0.10 (2.5)
	PN 100	7.68 (195)	1.10 (28)	5.71 (145)	1.02 (26)	4	2.30 (58)	4.00 (102)	3.46 (88)	2.83 (72)	0.10 (2.5)
	PN 160	7.68 (195)	1.18 (30)	5.71 (145)	1.02 (26)	4	2.30 (58)	4.00 (102)	3.46 (88)	2.83 (72)	0.10 (2.5)
DN 80	PN 40	7.87 (200)	0.94 (24)	6.30 (160)	0.71 (18)	8	3.50 (89)	5.43 (138)	4.76 (121)	4.13 (105)	0.10 (2.5)
	PN 64	8.46 (215)	1.10 (28)	6.69 (170)	0.87 (22)	8	3.50 (89)	5.43 (138)	4.76 (121)	4.13 (105)	0.10 (2.5)
	PN 100	9.06 (230)	1.26 (32)	7.09 (180)	1.02 (26)	8	3.50 (89)	5.43 (138)	4.76 (121)	4.13 (105)	0.10 (2.5)
	PN 160	9.06 (230)	1.42 (36)	7.09 (180)	1.02 (26)	8	3.50 (89)	5.43 (138)	4.76 (121)	4.13 (105)	0.10 (2.5)
DN 100	PN 16	8.66 (220)	0.79 (20)	7.08 (180)	0.71 (18)	8	3.50 (89)	6.22 (158)	5.91 (150)	5.04 (128)	0.12 (3.0)
	PN 40	9.25 (235)	0.94 (24)	7.48 (190)	0.87 (22)	8	3.50 (89)	6.37 (162)	5.91 (150)	5.04 (128)	0.12 (3.0)
	PN 64	9.84 (250)	1.18 (30)	7.87 (200)	1.02 (26)	8	3.50 (89)	6.37 (162)	5.91 (150)	5.04 (128)	0.12 (3.0)
	PN 100	10.43 (265)	1.42 (36)	8.27 (210)	1.18 (30)	8	3.50 (89)	6.37 (162)	5.91 (150)	5.04 (128)	0.12 (3.0)

(1) Measurement in inches (millimeters).

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FVW DIN 2512 Form F

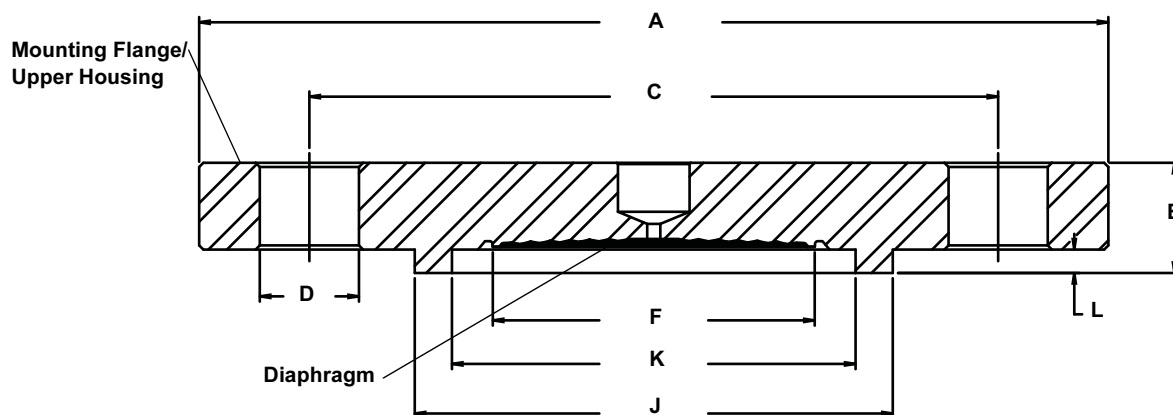


TABLE 19. FVW Flange Type Dimensions⁽¹⁾

Pipe Size	Class	Flange Diameter "A"	Flange Thickness "B"	Bolt Circle "C"	Bolt Diameter "D"	Bolts	Standard Diaphragm "F"	Raised Face Diameter "G"	Groove O.D. "J"	Groove I.D. "K"	Groove Depth "L"
DN 50	PN 40	6.50 (165)	0.79 (20)	4.92 (125)	0.71 (18)	4	2.30 (58)	4.00 (102)	3.43 (87)	2.87 (73)	0.16 (4.0)
	PN 64	7.08 (180)	1.02 (26)	5.31 (135)	0.87 (22)	4	2.30 (58)	4.00 (102)	3.43 (87)	2.87 (73)	0.16 (4.0)
	PN 100	7.68 (195)	1.10 (28)	5.71 (145)	1.02 (26)	4	2.30 (58)	4.00 (102)	3.43 (87)	2.87 (73)	0.16 (4.0)
	PN 160	7.68 (195)	1.18 (30)	5.71 (145)	1.02 (26)	4	2.30 (58)	4.00 (102)	3.43 (87)	2.87 (73)	0.16 (4.0)
DN 80	PN 40	7.87 (200)	0.94 (24)	6.30 (160)	0.71 (18)	8	3.50 (89)	5.43 (138)	4.72 (120)	4.17 (106)	0.16 (4.0)
	PN 64	8.46 (215)	1.10 (28)	6.69 (170)	0.87 (22)	8	3.50 (89)	5.43 (138)	4.72 (120)	4.17 (106)	0.16 (4.0)
	PN 100	9.06 (230)	1.26 (32)	7.09 (180)	1.02 (26)	8	3.50 (89)	5.43 (138)	4.72 (120)	4.17 (106)	0.16 (4.0)
	PN 160	9.06 (230)	1.42 (36)	7.09 (180)	1.02 (26)	8	3.50 (89)	5.43 (138)	4.72 (120)	4.17 (106)	0.16 (4.0)
DN 100	PN 16	8.66 (220)	0.79 (20)	7.08 (180)	0.71 (18)	8	3.50 (89)	6.22 (158)	5.87 (149)	5.08 (129)	0.18 (4.5)
	PN 40	9.25 (235)	0.94 (24)	7.48 (190)	0.87 (22)	8	3.50 (89)	6.37 (162)	5.87 (149)	5.08 (129)	0.18 (4.5)
	PN 64	9.84 (250)	1.18 (30)	7.87 (200)	1.02 (26)	8	3.50 (89)	6.37 (162)	5.87 (149)	5.08 (129)	0.18 (4.5)
	PN 100	10.43 (265)	1.42 (36)	8.27 (210)	1.02 (26)	8	3.50 (89)	6.37 (162)	5.87 (149)	5.08 (129)	0.18 (4.5)

(1) Measurement in inches (millimeters).

FUW and FVW Connection Ring

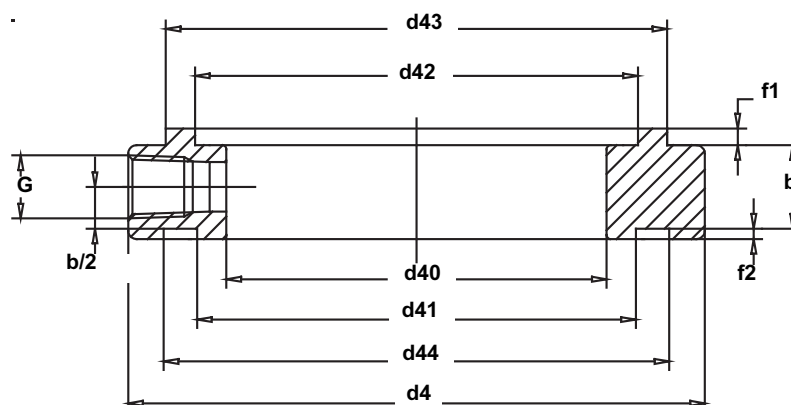


TABLE 20. Dimensional Table for FUW/FVW Connection Ring

Measurement in inches (millimeters)

DN	PN	d40	d4	d42	d43	f1	d41	d44	f2	b	g
50	10 - 100	54	102	73	87	4	72	88	2.5	20	1/4-18 NPT
80	10 - 100	82	138	106	120	4	105	121	2.5	20	1/4-18 NPT
100	10 - 100	107	162	129	149	4.5	128	150	3.0	2.4	1/4-18 NPT

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TABLE 21. FUW and FVW Seal – DIN Ordering Information ⁽¹⁾

Code	Industry Standards	
D	DIN 2401 and 2501 (Deutsches Institut für Normung)	
Code	Process Connection Style	
FUW	Flange Type: Flush Remote Seal, DIN 2512 Form N Contact Surface – up to PN 160	
FVW	Flange Type: Flush Remote Seal, DIN 2512 Form F Contact Surface – up to PN 160	
Code	Process Connection Size	Diaphragm Diameter
G	DN50	2.3-in. (57 mm)
J	DN 80	3.5-in. (89 mm)
9	DN 100	3.5-in. (89 mm)
Code	Flange Pressure Rating	
G	PN 40	
E	PN 16 (DN 100 only)	
H	PN 64 (not available for DN 25 and DN 40)	
J	PN 100	
Code	Diaphragm and Wetted Parts Material ⁽²⁾	Upper Housing Materials (includes flange)
DA ⁽³⁾	316L SST	316 SST
WW ⁽³⁾	316Ti SST (WNR 1.4571)	316Ti SST (WNR 1.4571)
KB ⁽⁴⁾	Hastelloy C-276	316 SST
DC ⁽³⁾	Tantalum	316 SST
KV ⁽⁴⁾	Monel 400	316 SST
Code	Flushing Connection Ring Material (Lower Housing)	
0	No flushing ring required	
A	316L SST	
W	316Ti SST (WNR 1.4571)	
Code	Flushing Options	
0	No flushing ring required	
1	One 1/4-18 NPT flushing connection	
3	Two 1/4-18 NPT flushing connection	
7	One 1/2-14 NPT flushing connection	
9	Two 1/2-14 NPT flushing connection	
Code	Options (Multiple Selections)	
E	One piece design	
B	Extra fill for cold temperature applications	
C	150 µm (0.006-in.) diaphragm thickness (available with 316L SST and Hastelloy C-276 diaphragms only, abrasive applications)	
D	Hastelloy plug(s) for flushing connection(s)	
G	SST plug(s) for flushing connection(s)	
H	SST vent/drain for flushing connections	
V ⁽⁵⁾	PTFE coated diaphragm for nonstick purposes only	
7 ⁽⁵⁾	50 µm (0.002-in.) diaphragm thickness	
U	25 µm (0.001 in) Gold plated diaphragm	
T ⁽⁶⁾	NACE MR0175/ISO 15156, MR0103	
2 ⁽³⁾	Radial Capillary Connection	

(1) Shaded areas indicate special orders. Consult a local Emerson Process Management, Rosemount division sales representative for availability, performance, and lead time.

(2) When ordering special diaphragm materials, the upper housing material is 316L SST unless otherwise noted.

(3) Only available with one piece design, option code E.

(4) Only available with two-piece design.

(5) Available with 316L SST and Hastelloy C-276 diaphragms only.

(6) Materials of Construction comply with metallurgical requirements highlighted within NACE MR0175/ISO 15156 for sour oil field production environments. Environmental limits apply to certain materials. Consult latest standard for details. Selected materials also conform to NACE MR0103 for sour refining environments.

FLANGED (RFW) SEAL (For smaller process connection)

Drawings represent the standard offering. Dimensional drawings may vary when ordering special shaded options. Contact an Emerson Process Management representative if dimensional drawings are required for special order configuration.

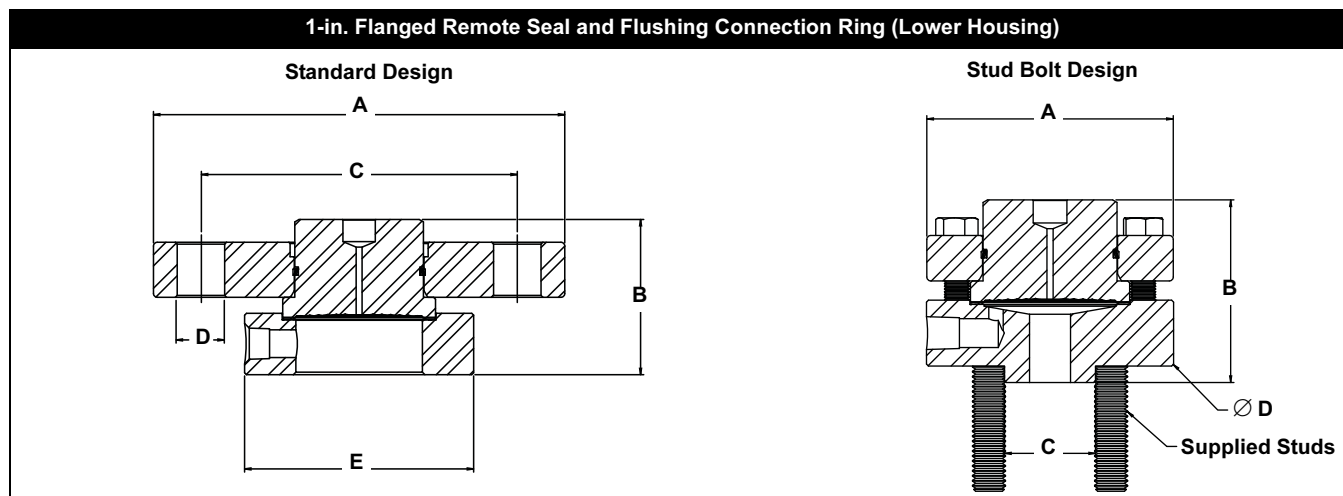


TABLE 22. RFW Dimensions⁽¹⁾

Pipe Size Class	Flange Diameter (A)	Overall Height (B)		Bolt Circle Diameter (C)	Bolt Hole Diameter (D)	Lower Housing Diameter (E)
		No or 1/4-in. NPT flush connection	1/2-in. NPT flush connection			
Standard Design⁽²⁾						
ANSI						
3/4-in. (300/600#)	4.62 (117.3)	2.45 (62.2)	2.79 (70.9)	3.25 (82.6)	0.75 (19.5)	2.62 (66.5)
1-in. (150#)	4.25 (107.9)	2.45 (62.2)	2.79 (70.9)	3.12 (79.3)	0.625 (15.9)	2.62 (66.5)
1-in. (300#)	4.88 (124.0)	2.45 (62.2)	2.79 (70.9)	3.50 (88.9)	0.75 (19.5)	2.62 (66.5)
1-in. (600#)	4.88 (124.0)	2.45 (62.2)	2.79 (70.9)	3.50 (88.9)	0.75 (19.5)	2.62 (66.5)
1 1/2-in. (150#)	5.00 (127.0)	2.45 (62.2)	2.79 (70.9)	3.88 (98.6)	0.625 (15.9)	2.62 (66.5)
1 1/2-in. (300#)	6.12 (155.4)	2.45 (62.2)	2.79 (70.9)	4.50 (114)	0.875 (22.2)	2.88 (73.2)
1 1/2-in. (600#)	6.12 (155.4)	2.45 (62.2)	2.79 (70.9)	4.50 (114)	0.875 (22.2)	2.88 (73.2)
DIN						
DN25 (40)	4.53 (115.1)	2.45 (62.2)	2.79 (70.9)	3.35 (85)	0.55 (14)	2.68 (68.1)
DN40 (40)	5.91 (150.1)	2.45 (62.2)	2.79 (70.9)	4.33 (110)	0.71 (18)	3.47 (88.1)
Pipe Size Class	Flange Diameter (A)	Overall Height (B)		Stud Circle Diameter (C) ⁽³⁾	Stud (Size, Length)	Lower Housing Diameter (D)
		No or 1/4-in. NPT flush connection	1/2-in. NPT flush connection			
Stud Bolt Design⁽⁴⁾						
ANSI						
1/2-in. (150#)	3.74 (95.0)	2.52 (64.0)	2.82 (71.6)	2.38 (60.5)	1/2-13NC, 2.5"	3.74 (95.0)
1/2-in. (300/600#)	3.74 (95.0)	2.77 (70.4)	2.87 (72.9)	2.62 (66.5)	1/2-13NC, 2.5"	3.75 (95.3)
3/4-in. (150#)	3.74 (95.0)	2.52 (64.0)	2.82 (71.6)	2.75 (69.9)	1/2-13NC, 2.5"	3.88 (98.6)
DIN						
DN 15 (PN 40)	3.74 (95.0)	2.52 (64.0)	2.82 (71.6)	2.56 (65)	M12x1.75, 60mm	3.74 (95.0)
DN 15 (PN 100/160)	3.74 (95.0)	2.52 (64.0)	2.82 (71.6)	2.95 (75)	M12x1.75, 60mm	4.13 (105)
DN 20 (PN40)	3.74 (95.0)	2.52 (64.0)	2.82 (71.6)	2.95 (75)	M12x1.75, 60mm	4.13 (105)

(1) Dimensions are in inches (millimeters).

(2) Lower housing is loose on standard design, consult factory for retained lower housing options.

(3) Lowers with 1/2 NPT flushing connections use offset stud bolt pattern.

(4) Upper and lower housing installed bolt torque with CS or SST bolts is 23 ft-lbs. (31 Nm).

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TABLE 23. Flanged (RFW) Seal Ordering Information⁽¹⁾

Code	Industry Standard		
A	ANSI / ASME B16.5 (American National Standards Institute / American Society of Mechanical Engineers)		
D	DIN (Deutsches Institut für Normung)		
J	JIS (Japanese industrial Standards)		
Code	Process Connection Style		
RFW	Flanged		
Code	Process Connection Size		
	ANSI	DIN	JIS
2	1-in.	NA	25A
4	1 1/2-in.	NA	40A
D	NA	DN 25	NA
F	NA	DN 40	NA
1	1/2-in. (bolts and studs included, CS std)	NA	NA
A	3/4-in. (bolts and studs included, CS std)	NA	NA
B	NA	DN 15 (bolts and studs included, SST std)	NA
Code	Flange Pressure Rating		
	ANSI	DIN	JIS
1	Class 150	NA	10K
2	Class 300	NA	20K
4	Class 600	NA	40K
G	NA	PN 40	
5	Class 900	NA	
6	Class 1500	NA	
7	Class 2500	NA	
H	NA	PN 64	
J	NA	PN 100	
K	NA	PN 160	
Code	Diaphragm Material	Upper Housing Material ⁽²⁾	Mounting Flange Material
CA	316L SST	316 SST	Carbon Steel
DA	316L SST	316 SST	316 SST
CB	Hastelloy C-276	316 SST	Carbon Steel
DB	Hastelloy C-276	316 SST	316 SST
CC	Tantalum	316 SST	Carbon Steel
DC	Tantalum	316 SST	316 SST
CF	304L SST	316 SST	Carbon Steel
DF	304L SST	316 SST	316 SST
CJ	Hastelloy B	316 SST	Carbon Steel
DJ	Hastelloy B	316 SST	316 SST
CE	Inconel 600	316 SST	Carbon Steel
DE	Inconel 600	316 SST	316 SST
CV	Monel 400	316 SST	Carbon Steel
DV	Monel 400	316 SST	316 SST
CP	Nickel	316 SST	Carbon Steel
DP	Nickel	316 SST	316 SST
CK	Alloy 20	316 SST	Carbon Steel
DK	Alloy 20	316 SST	316 SST
RH	Titanium Gr 4	Titanium Gr 4	316 SST
CH ⁽³⁾	Titanium Gr 4	316 SST	Carbon Steel
DH ⁽³⁾	Titanium Gr 4	316 SST	316 SST
YM	Titanium Gr 2	Titanium Gr 2	316 SST
CM ⁽³⁾	Titanium Gr 2	316 SST	Carbon Steel
DM ⁽³⁾	Titanium Gr 2	316 SST	316 SST
C4	Hastelloy C-22	316 SST	Carbon Steel
D4	Hastelloy C-22	316 SST	316 SST

TABLE 23. Flanged (RFW) Seal Ordering Information⁽¹⁾

C5	Duplex 2507 SST	316 SST	Carbon Steel
D5	Duplex 2507 SST	316 SST	316 SST
WW	316Ti SST (WNR 1.4571)	316Ti SST (WNR 1.4571)	316 SST
RZ	Zirconium 702	Zirconium 702	316 SST
CZ ⁽³⁾	Zirconium 702	316 SST	Carbon Steel
DZ ⁽³⁾	Zirconium 702	316 SST	316 SST
Code	Flushing Connection Ring Material (Lower Housing) ⁽⁴⁾		
A	316L SST		
B	Hastelloy C-276		
D	Carbon Steel		
C ⁽⁵⁾	Tantalum-lining 316 SST (no flushing connection allowed)		
2	Duplex 2205 SST		
F	304L SST		
H	Titanium Gr 4		
3	Titanium Gr 2		
J	Hastelloy B		
6	Nickel 201		
V	Monel 400		
E	Inconel 600		
1	Inconel 625		
K	Alloy 20		
W	316Ti SST (WNR 1.4571)		
Code	Flushing Options		
1	One 1/4-in. Flushing Connection		
3	Two 1/4-in. Flushing Connection		
5	No Flushing Connection		
7	One 1/2-in. Flushing Connection		
9	Two 1/2-in. Flushing Connection		
Code	Options (select up to 3)		
B	Extra Fill for Cold Temperature Applications		
C	150 µm (0.006-in.) Diaphragm Thickness (316L SST and Hastelloy C-276 diaphragms only, for abrasive applications)		
D	Hastelloy Plug In. Flushing Connection		
G	SST Plug In Flushing Connection		
H	SST Drain / Vent in Flushing Connection		
J	PTFE Gasket (for use with flushing connection ring)		
K	Barium Sulfate-filled PTFE Gasket (for use with flushing connection ring)		
N	Grafoil Gasket (for use with flushing connection ring)		
R	Ethylene Propylene Gasket for lower housing		
V ⁽⁶⁾	PTFE Coated Diaphragm for nonstick purposes (316L SST and Hastelloy C-276 diaphragms only)		
3	304 SST Bolts		
4	316 SST Bolts		
9	104 mm (4.1-in.) Diaphragm		
U	25 µm (0.001 in) Gold Plated Diaphragm		
T ⁽⁷⁾	NACE MR0175/ISO 15156, MR0103		

(1) Shaded areas indicate special orders. Consult an Emerson Process Management, Rosemount division, representative for availability, performance effects, and lead time.

(2) When ordering special diaphragm materials, the upper housing is 316 SST unless otherwise noted.

(3) Operating temperature is limited to 150 °C (302 °F).

(4) Supplied with C4401 gasket.

(5) Not applicable for Process Connection codes 1 and A with 150# Class.

(6) Not available with transmitter option code Q8, for Material Traceability per DIN EN 10204 3.1B of the transmitter / diaphragm seal assembly.

(7) Materials of Construction comply with metallurgical requirements highlighted within NACE MR0175/ISO 15156 for sour oil field production environments. Environmental limits apply to certain materials. Consult latest standard for details. Selected materials also conform to NACE MR0103 for sour refining environments.

FLANGED (RCW) SEAL RING TYPE JOINT (RTJ)

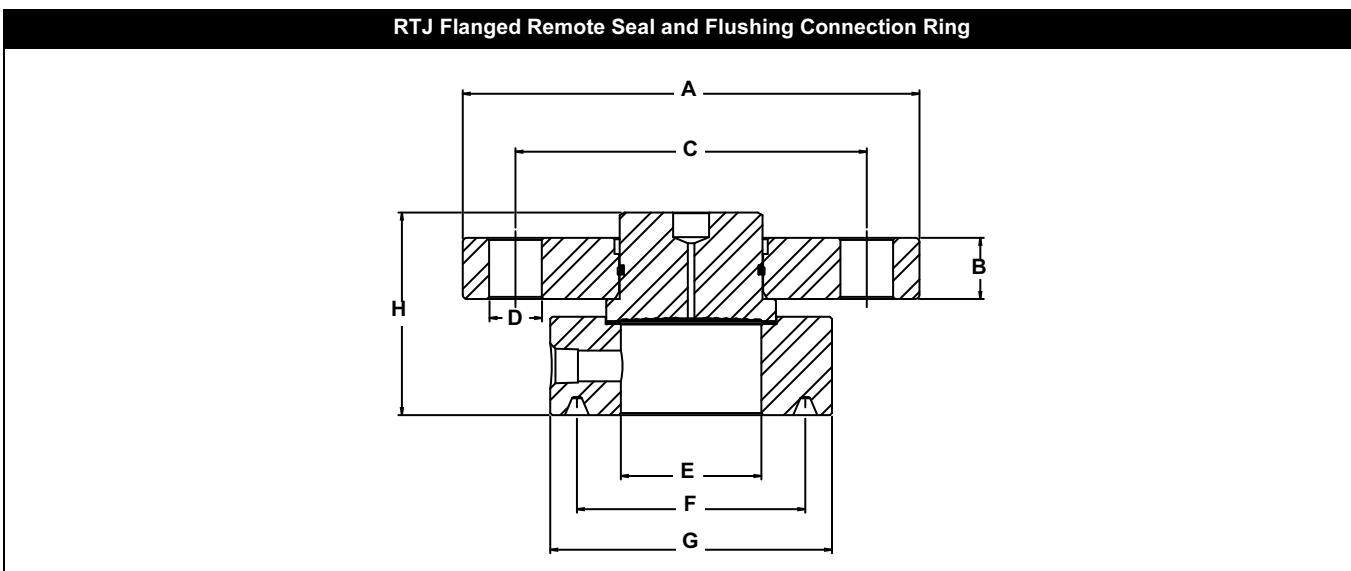


TABLE 24. RCW Dimensions⁽¹⁾

Pipe Size Class	Flange Diameter (A)	Flange Thickness (B)	Bolt Circle Diameter (C)	Bolt Hole Diameter (D)	Lower Housing Inner Diameter (E)	RTJ Groove (F)	Lower Housing Outer Diameter (G)	Overall Height (H)	No or 1/4-in. NPT flush connection	1/2-in. NPT flush connection
3/4-in. (300/600#)	4.62 (117)	0.62 (15.8)	3.25 (82.6)	0.75 (19.1)	0.82 (20.8)	1.69 (42.9)	2.64 (67.1)	2.88 (73.2)		3.18 (80.8)
3/4-in. (900/1500#)	5.12 (130)	1.00 (25.4)	3.50 (88.9)	0.88 (22.2)	0.82 (20.8)	1.75 (44.5)	2.64 (67.1)	2.88 (73.2)		3.18 (80.8)
3/4-in. (2500#)	5.50 (140)	1.25 (31.8)	3.75 (95.3)	0.88 (22.2)	0.82 (20.8)	2.00 (50.8)	2.90 (73.7)	2.88 (73.2)		3.18 (80.8)
1-in. (150#)	4.25 (108)	0.50 (12.7)	3.12 (79.3)	0.625 (15.9)	1.05 (26.7)	1.88 (47.6)	2.64 (67.1)	2.88 (73.2)		3.18 (80.8)
1-in. (300#)	4.88 (124)	0.62 (15.8)	3.50 (88.9)	0.75 (19.1)	1.05 (26.7)	2.00 (50.8)	2.77 (70.4)	2.88 (73.2)		3.18 (80.8)
1-in. (600#)	4.88 (124)	0.69 (17.5)	3.50 (88.9)	0.75 (19.1)	1.05 (26.7)	2.00 (50.8)	2.77 (70.4)	2.88 (73.2)		3.18 (80.8)
1-in. (900/1500#)	5.88 (149)	1.12 (28.5)	4.00 (102)	1.00 (25.4)	1.05 (26.7)	2.00 (50.8)	2.83 (71.9)	2.88 (73.2)		3.18 (80.8)
1-in. (2500#)	6.25 (159)	1.38 (35.1)	4.25 (108)	1.00 (25.4)	1.05 (26.7)	2.38 (60.3)	3.27 (83.1)	2.88 (73.2)		3.18 (80.8)
1 1/2-in. (150#)	5.00 (127)	0.62 (15.8)	3.88 (98.6)	0.63 (15.9)	1.61 (40.9)	2.56 (65.1)	3.27 (83.1)	2.88 (73.2)		3.18 (80.8)
1 1/2-in. (300#)	6.12 (155)	0.75 (19.1)	4.50 (114)	0.88 (22.2)	1.61 (40.9)	2.69 (68.3)	3.58 (90.9)	2.88 (73.2)		3.18 (80.8)
1 1/2-in. (600#)	6.12 (155)	0.88 (22.4)	4.50 (114)	0.88 (22.2)	1.61 (40.9)	2.69 (68.3)	3.58 (90.9)	2.88 (73.2)		3.18 (80.8)
1 1/2-in. (900/1500#)	7.00 (178)	1.25 (31.8)	4.88 (123.9)	1.13 (28.6)	1.61 (40.9)	2.69 (68.3)	3.64 (92.5)	2.88 (73.2)		3.18 (80.8)
1 1/2-in. (2500#)	8.00 (203)	1.75 (44.5)	5.75 (146)	1.25 (31.8)	1.61 (40.9)	3.25 (82.6)	4.52 (115)	2.88 (73.2)		3.18 (80.8)

(1) Dimensions are in inches (millimeters).

TABLE 25. ARCW Ring Type Joint Flanged Remote Seal Ordering Information⁽¹⁾

Code	Industry Standard		
A	ANSI / ASME B16.5 (American National Standards Institute / American Society of Mechanical Engineers)		
Code	Process Connection Style		
RCW	Ring Type Joint Flanged		
Code	Process Connection Size		
1	1½-in. (bolts and studs included for 300# to 1500# Class) (Not available for 150# Class)		
A	¾-in. (Not available for 150# Class)		
2	1-in.		
4	1½-in.		
Code	Flange Pressure Rating		
1	Class 150 (ANSI)		
2	Class 300 (ANSI)		
4	Class 600 (ANSI)		
5	Class 900 (ANSI)		
6	Class 1500 (ANSI)		
7	Class 2500 (ANSI)		
Code	Diaphragm Material	Upper Housing Material ⁽²⁾	Mounting Flange Material
CA	316L SST	316 SST	Carbon Steel
DA	316L SST	316 SST	316 SST
CB	Hastelloy C-276	316 SST	Carbon Steel
DB	Hastelloy C-276	316 SST	316 SST
CC	Tantalum	316 SST	Carbon Steel
DC	Tantalum	316 SST	316 SST
CF	304L SST	316 SST	Carbon Steel
DF	304L SST	316 SST	316 SST
CJ	Hastelloy B	316 SST	Carbon Steel
DJ	Hastelloy B	316 SST	316 SST
CE	Inconel® 600	316 SST	Carbon Steel
DE	Inconel® 600	316 SST	316 SST
CV	Monel® 400	316 SST	Carbon Steel
DV	Monel® 400	316 SST	316 SST
CP	Nickel	316 SST	Carbon Steel
DP	Nickel	316 SST	316 SST
CK	Alloy 20	316 SST	Carbon Steel
DK	Alloy 20	316 SST	316 SST
RH	Titanium Gr 4	Titanium Gr 4	316 SST
CH ⁽³⁾	Titanium Gr 4	316 SST	Carbon Steel
DH ⁽³⁾	Titanium Gr 4	316 SST	316 SST
YM	Titanium Gr 2	Titanium Gr 2	316 SST
CM ⁽³⁾	Titanium Gr 2	316 SST	Carbon Steel
DM ⁽³⁾	Titanium Gr 2	316 SST	316 SST
C4	Hastelloy C-22	316 SST	Carbon Steel
D4	Hastelloy C-22	316 SST	316 SST
C5	Duplex 2507 SST	316 SST	Carbon Steel
D5	Duplex 2507 SST	316 SST	316 SST
RZ	Zirconium 702	Zirconium 702	316 SST
CZ ⁽³⁾	Zirconium 702	316 SST	Carbon Steel
DZ ⁽³⁾	Zirconium 702	316 SST	316 SST
Code	Flushing Connection Ring Material (Lower Housing)		
A	316L SST		
B	Hastelloy C-276		
D	Carbon Steel		
F	304L SST		

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TABLE 25. ARCW Ring Type Joint Flanged Remote Seal Ordering Information⁽¹⁾

H	Titanium Gr 4
3	Titanium Gr 2
J	Hastelloy B
6	Nickel 201
V	Monel 400
E	Inconel 600
1	Inconel 625
K	Alloy 20
2	Duplex 2205 SST
Code	Flushing Options
1	One 1/4-in. Flushing Connection
3	Two 1/4-in. Flushing Connection
5	No Flushing Connection
7	One 1/2-in. Flushing Connection
9	Two 1/2-in. Flushing Connection
Code	Options (select up to 3)
B	Extra Fill for Cold Temperature Applications
C	150 µm (0.006-in.) Diaphragm Thickness (316L SST and Hastelloy C-276 diaphragms only, for abrasive applications)
D	Hastelloy Plug In. Flushing Connection
G	SST Plug In Flushing Connection
H	SST Drain / Vent in Flushing Connection
V ⁽⁴⁾	PTFE Coated Diaphragm for nonstick purposes (316L SST and Hastelloy C-276 diaphragms only)
3	300 Series SST Bolts
U	25 µm (0.001 in) Gold Plated Diaphragm
T ⁽⁵⁾	NACE MR0175/ISO 15156, MR0103

(1) Shaded areas indicate special orders. Consult an Emerson Process Management representative for availability, performance effects, and lead time.

(2) When ordering special diaphragm materials, the upper housing is 316 SST unless otherwise noted.

(3) Operating temperature is limited to 150 °C (302 °F).

(4) Not available with transmitter option code Q8, for Material Traceability per DIN EN 10204 3.1B of the transmitter / diaphragm seal assembly.

(5) Materials of Construction comply with metallurgical requirements highlighted within NACE MR0175/ISO 15156 for sour oil field production environments. Environmental limits apply to certain materials. Consult latest standard for details. Selected materials also conform to NACE MR0103 for sour refining environments.

EXTENDED FLANGED (EFW) SEAL

Drawings represent the standard offering. Dimensional drawings may vary when ordering special shaded options. Contact an Emerson Process Management representative if dimensional drawings are required for special order configuration.

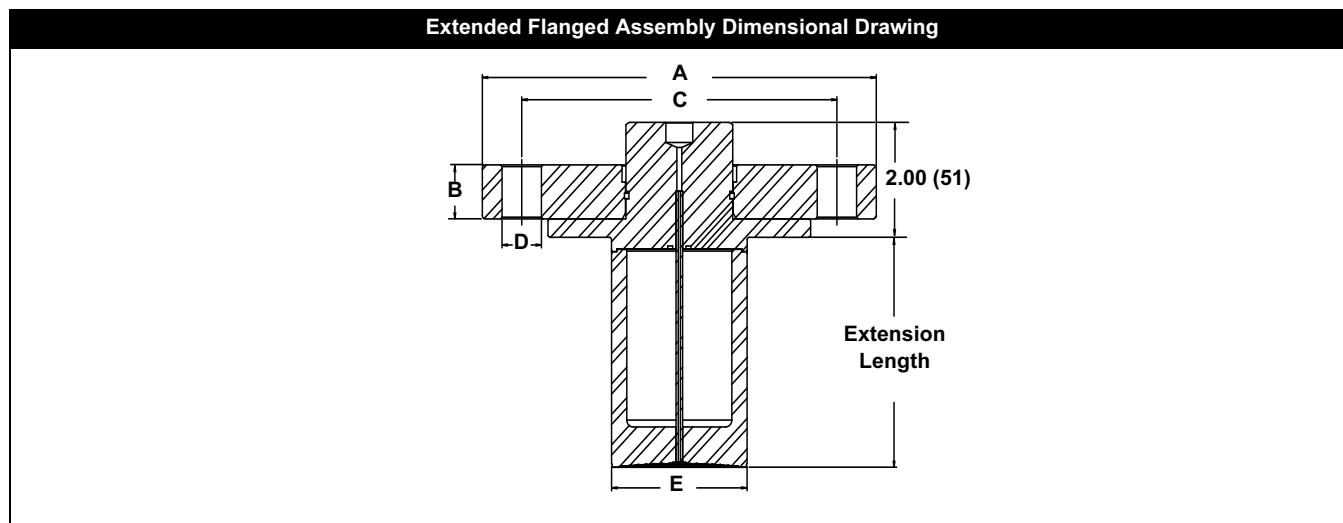


TABLE 26. EFW Dimensions⁽¹⁾

	Pipe Size	Class	Flange Diameter "A"	Flange Thickness "B"	Bolt Circle "C"	Bolts	Bolt Hole Diameter "D"
ANSI / ASME / JIS	2-in.	150 lb.	6.00 (152)	0.69 (18)	4.75 (121)	4	0.75 (19)
		300 lb.	6.50 (165)	0.82 (21)	5.00 (127)	8	0.75 (19)
		600 lb.	6.50 (165)	1.00 (25)	5.00 (127)	8	0.75 (19)
	3-in.	150 lb.	7.50 (191)	0.88 (22)	6.00 (125)	4	0.75 (19)
		300 lb.	8.25 (210)	1.06 (27)	6.62 (168)	8	0.88 (22)
		600 lb.	8.25 (210)	1.25 (32)	6.62 (168)	8	0.88 (22)
	4-in.	150 lb.	9.00 (229)	0.88 (22)	7.50 (191)	8	0.75 (19)
		300 lb.	10.00 (254)	1.19 (30)	7.88 (200)	8	0.88 (22)
		600 lb.	10.75 (273)	1.50 (38)	8.50 (216)	8	1.00 (25)
DIN	DN 50	PN 40	6.50 (165)	0.79 (20)	4.92 (125)	4	0.71 (18)
		PN 64	7.08 (180)	1.02 (26)	5.31 (135)	4	0.87 (22)
		PN 100	7.68 (195)	1.10 (28)	5.71 (145)	4	1.02 (26)
	DN 80	PN 40	7.87 (200)	0.94 (24)	6.30 (160)	8	0.71 (18)
		PN 64	8.46 (215)	1.10 (28)	6.69 (170)	8	0.88 (22)
		PN 100	9.06 (230)	1.26 (32)	7.09 (180)	8	1.02 (26)
	DN 100	PN 16	8.66 (220)	0.79 (20)	7.09 (180)	8	0.71 (18)
		PN 40	9.25 (235)	0.94 (24)	7.48 (190)	8	0.87 (22)
		PN 64	9.84 (250)	1.18 (30)	7.87 (200)	8	1.02 (26)

(1) Dimensions are in inches (millimeters).

Process Connection Size	Diameter (E)
3 in. Sch. 80	2.580 (66)
4 in./DN 100 Sch. 80	3.500 (89)
DN 80	2.990 (76)
3 in. Headbox (Code H)	2.875 (74)
4 in. Headbox (Code K)	3.780 (97)
3 in. Sch. 40	2.850 (73)
4 in. Sch. 40	3.700 (94)
2 in.	1.900 (49)
1 ½ in.	1.450 (37)

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TABLE 27. Extended Flanged Seal (EFW) Ordering Information

● = Available — = Unavailable												
Code	Industry Standard											
A	ANSI/ASME B16.5 (American National Standards Institute/American Society of Mechanical Engineers)											
D	DIN (Deutsches Institut für Normung)											
J	JIS (Japanese Industrial Standards)											
Code	Process Connection Style											
EFW ⁽¹⁾	Extended Flanged Seal											
Code	Process Connection Size											
	ANSI		DIN		JIS	Extension Diameters						
7	3 in. (Schedule 80)		DN 80		80 A	2.580 (66)						
9	4 in. (Schedule 80)		DN 100		100 A	3.500 (89)						
J	3 in.		DN 80		80 A	2.990 (76)						
4	1½ in		DN 40		40 A	1.450 (37)						
G	2 in.		DN 50		50 A	1.900 (49)						
R	3 in. (Schedule 40)		DN 80		80 A	2.850 (73)						
H	3 in. (Headbox)		DN 80		80 A	2.875 (74)						
T	4 in. (Schedule 40)		DN 100		100 A	3.700 (94)						
K	4 in. (Headbox)		DN 100 Headbox		100 A	3.780 (97)						
Code	Maximum Working Pressure (Flange Rating)											
	ANSI		DIN		JIS							
1	Class 150		—		10K							
2	Class 300		—		20K							
4	Class 600		—		40K							
G	—		PN 40 (DIN)		—							
E	—		PN 10/16 (DN 100 only)		—							
5	Class 900		—		—							
6	Class 1500		—		—							
7	Class 2500 (Not available with 4-in. Process Connection)		—		—							
H	—		PN 64 (DIN)		—							
J	—		PN 100 (DIN)		—							
Available with Process Connection Code												
Code	Diaphragm Material	Extension/ Gasket Surface	Upper Housing	Mounting Flange	7	9	J	4	G	H	T	K
DA	316L SST	316L SST	316L SST	316 SST	●	●	●	●	●	●	●	●
CA	316L SST	316L SST	316L SST	Carbon Steel	●	●	●	●	●	●	●	●
DB	Hastelloy C-276	Hastelloy C-276	316L SST	316 SST	●	●	●	●	●	●	●	●
CB	Hastelloy C-276	Hastelloy C-276	316L SST	Carbon Steel	●	●	●	●	●	●	●	●
CD ⁽²⁾	Tantalum	316L SST	316L SST	Carbon Steel	●	●	●	—	—	—	—	—
DD ⁽²⁾	Tantalum	316L SST	316L SST	316 SST	●	●	●	—	—	—	—	—
CC	Tantalum	Tantalum-lined	316L SST	Carbon Steel	●	●	●	—	●	—	—	—
DC	Tantalum	Tantalum-lined	316L SST	316 SST	●	●	●	—	●	—	—	—
C5	Duplex 2507 SST	Duplex 2205 SST	316L SST	Carbon Steel	●	●	●	●	●	●	●	●
D5	Duplex 2507 SST	Duplex 2205 SST	316L SST	316 SST	●	●	●	●	●	●	●	●
C9	Duplex 2507 SST	316L SST	316L SST	Carbon Steel	●	●	●	●	●	●	●	●
D9	Duplex 2507 SST	316L SST	316L SST	316 SST	●	●	●	●	●	●	●	●
CP	Nickel 201	Nickel 201	316L SST	Carbon Steel	●	●	●	●	●	●	●	●
DP	Nickel 201	Nickel 201	316L SST	316 SST	●	●	●	●	●	●	●	●
CV	Monel 400	Monel 400	316L SST	Carbon Steel	●	●	●	●	●	●	●	●
DV	Monel 400	Monel 400	316L SST	316 SST	●	●	●	●	●	●	●	●
C4	Hastelloy C-22	Hastelloy C-22	316L SST	Carbon Steel	●	●	●	●	●	●	●	●
D4	Hastelloy C-22	Hastelloy C-22	316L SST	316 SST	●	●	●	●	●	●	●	●

TABLE 27. Extended Flanged Seal (EFW) Ordering Information

CE	Inconel 600	Inconel 600	316L SST	Carbon Steel	●	●	●	●	●	●	●	●
DE	Inconel 600	Inconel 600	316L SST	316 SST	●	●	●	●	●	●	●	●
RH ⁽³⁾	Titanium Gr. 4	Titanium Gr. 4	Titanium Gr. 4	316 SST	●	●	●	●	●	●	●	●
YR ⁽³⁾	Titanium Gr. 2	Titanium Gr. 2	Titanium Gr. 2	316 SST	●	●	●	●	●	●	●	●
CM	Hastelloy C-276	316L SST	316L SST	Carbon Steel	●	●	●	●	●	●	●	●
DM	Hastelloy C-276	316L SST	316L SST	316 SST	●	●	●	●	●	●	●	●
DJ	Hastelloy B	Hastelloy B	316L SST	316 SST	●	●	●	●	●	●	●	●
CJ	Hastelloy B	Hastelloy B	316L SST	Carbon Steel	●	●	●	●	●	●	●	●
Code	Extension Length											
	ANSI/ASME		DIN									
2	2 in.		(50 mm)									
4	4 in.		(100 mm)									
6	6 in.		(150 mm)									
0	0 in.		(0 mm)									
1	1 in.		(25 mm)									
3	3 in.		(75 mm)									
5	5 in.		(125 mm)									
7	7 in.		(175 mm)									
8	8 in.		(200 mm)									
9	9 in.		(225 mm)									
Code	Additional Fractional Extension Length											
	ANSI/ASME		DIN									
0	0 in.		(0 mm)									
1	1/8 in.		(2.5 mm)									
2	1/4 in.		(5 mm)									
3	3/8 in.		(7.5 mm)									
4	1/2 in.		(10 mm)									
5	5/8 in.		(12.5 mm)									
6	3/4 in.		(15 mm)									
7	7/8 in.		(17.5 mm)									
8	—		(20 mm)									
9	—		(22.5 mm)									
Code	Options											
3	4-in. Flange for 3-in. Diaphragm											
B ⁽⁴⁾	Extra Fill for Cold Temperature Applications											
C ⁽⁵⁾	150 μm (0.006-in.) Diaphragm Thickness (316L SST and Hastelloy C-276 diaphragms only, for abrasive applications)											
V ⁽⁶⁾	PTFE Coated Diaphragm for nonstick purposes (316L SST and Hastelloy C-276 diaphragms only)											
JA	Jack bolt holes in flange											
6	Add 10 in. (250 mm)											
5	0.002-in. Diaphragm Thickness (316L SST and Hastelloy C-276)											
T ⁽⁷⁾	NACE MR0175/ISO 15156, MR0103											
U	25 μm (0.001 in) Gold Plated Diaphragm											

- (1) Shaded areas indicate special orders. Consult an Emerson Process Management representative for configuration availability, performance effects, and lead time.
- (2) Available with Extension Length options 2, 4, or 6. Consult an Emerson Process Management representative for other extension lengths.
- (3) Not available with welded capillary or direct mount connections.
- (4) For seal assemblies that will be used in cold ambient temperature applications, contact an Emerson Process Management representative or reference Instrument Toolkit for assistance.
- (5) May cause adverse seal temperature effects. Consult an Emerson Process Management representative for assistance.
- (6) Not available with transmitter option code Q8, for Material Traceability per DIN EN10204 3.1.B of the transmitter/diaphragm seal assembly.
- (7) Materials of Construction comply with metallurgical requirements highlighted within NACE MR0175/ISO 15156 for sour oil field production environments. Environmental limits apply to certain materials. Consult latest standard for details. Selected materials also conform to NACE MR0103 for sour refining environments.

THREADED (RTW) SEAL

NOTES
Drawings represent the standard offering. Dimensional drawings may vary when ordering special shaded options. Contact an Emerson Process Management representative if dimensional drawings are required for special order configuration.

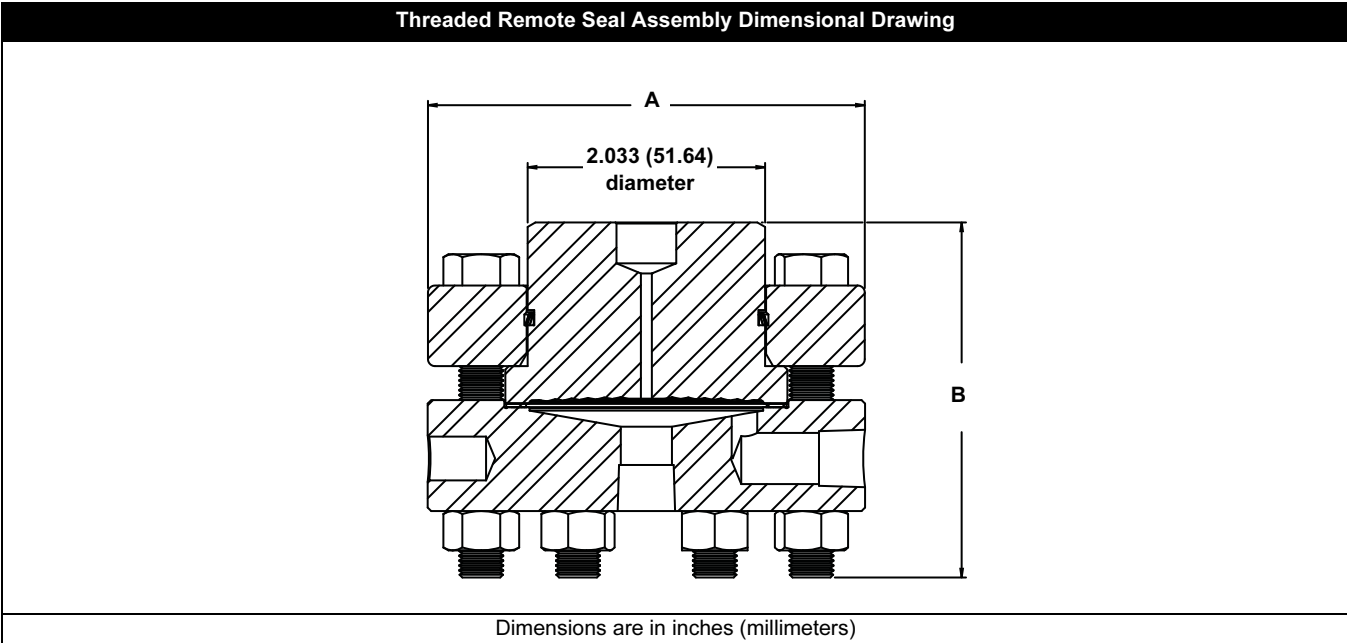


TABLE 28. RTW Dimensions⁽¹⁾

Rating	Overall Diameter (A)	Overall Height (B)	
		No or 1/4-in. NPT flush connection	1/2-in. NPT flush connection
2500 psi (172 bar)	3.75 (95.3)	3.04 (77)	3.54 (90)
5000 psi (345 bar)	3.75 (95.3)	2.50 (64)	3.00 (76)
10000 psi (690 bar)	4.00 (101.6)	2.84 (72)	—
1500 psi (103 bar)	5.47 (139)	2.50 (64)	3.00 (76)

(1) Dimensions are in inches (millimeters).

TABLE 29. Threaded (RTW) Seal Ordering Information⁽¹⁾

Code	Industry Standard		
A	ANSI / ASME B16.5 (American National Standards Institute / American Society of Mechanical Engineers)		
D	DIN (Deutsches Institut fur Normung)		
Code	Process Connection Style		
RTW	Threaded (standard thread is female, for male select Option code 9)		
Code	Process Connection Size		
	ANSI	DIN	
1	1/4-18 NPT	NA	
2	3/8-18 NPT	NA	
3	1/2-14 NPT	NA	
4	3/4-14 NPT	NA	
5	1-11.5 NPT	NA	
6 ⁽²⁾	1 1/4-11.5 NPT	NA	
7 ⁽²⁾	1 1/2-11.5 NPT	NA	
C	NA	Parallel thread: G ¹ /2A DIN 16288	
N	NA	Tapered thread: R ¹ /2 per ISO 7/1	
Code	Pressure Rating		
	ANSI	DIN	
0	2500 psi	172 bar	
2 ⁽³⁾	5000 psi	344 bar	
3 ⁽³⁾ (4)	10000 psi	NA	
8	1500 psi (4.1-in. (104 mm) diaphragm)	103 bar (4.1-in. (104 mm) diaphragm)	
Code	Diaphragm Material	Upper Housing Material ⁽⁵⁾	Mounting Ring Material
CA	316L SST	316 SST	Carbon Steel
DA	316L SST	316 SST	316 SST
CB	Hastelloy C-276	316 SST	Carbon Steel
DB	Hastelloy C-276	316 SST	316 SST
CC	Tantalum	316 SST	Carbon Steel
DC	Tantalum	316 SST	316 SST
CF	304L SST	316 SST	Carbon Steel
DF	304L SST	316 SST	316 SST
CJ	Hastelloy B	316 SST	Carbon Steel
DJ	Hastelloy B	316 SST	316 SST
CE	Inconel [®] 600	316 SST	Carbon Steel
DE	Inconel [®] 600	316 SST	316 SST
CV	Monel [®] 400	316 SST	Carbon Steel
DV	Monel [®] 400	316 SST	316 SST
CP	Nickel	316 SST	Carbon Steel
DP	Nickel	316 SST	316 SST
CK	Alloy 20	316 SST	Carbon Steel
DK	Alloy 20	316 SST	316 SST
RH ⁽⁶⁾	Titanium Gr 4	Titanium Gr 4	316 SST
CH ⁽⁷⁾	Titanium Gr 4	316 SST	Carbon Steel
DH ⁽⁶⁾	Titanium Gr 4	316 SST	316 SST
YM ⁽⁵⁾	Titanium Gr 2	Titanium Gr 2	316 SST
CM ⁽⁶⁾	Titanium Gr 2	316 SST	Carbon Steel
DM ⁽⁶⁾	Titanium Gr 2	316 SST	316 SST
C4	Hastelloy C-22	316 SST	Carbon Steel
D4	Hastelloy C-22	316 SST	316 SST
C5	Duplex 2507 SST	316 SST	Carbon Steel
D5	Duplex 2507 SST	316 SST	316 SST
WW	316Ti SST (WNR 1.4571)	316Ti SST (WNR 1.4571)	316 SST
RZ ⁽⁵⁾	Zirconium 702	Zirconium 702	316 SST

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TABLE 29. Threaded (RTW) Seal Ordering Information⁽¹⁾

CZ ⁽⁶⁾	Zirconium 702	316 SST	Carbon Steel
DZ ⁽⁶⁾	Zirconium 702	316 SST	316 SST
Code	Flushing Connection Ring Material (Lower Housing) ^{(8) (9)}		
A	316L SST		
B	Hastelloy C-276		
D	Carbon Steel		
F	304L SST		
H	Titanium Gr 4		
3	Titanium Gr 2		
V	Monel 400		
J	Hastelloy B		
W	316Ti SST (1.4571 SST)		
2	Duplex 2205 SST		
P ⁽¹⁰⁾	PVC (no flushing connections allowed)		
Code	Flushing Options		
1	One 1/4-in. Flushing Connection		
3	Two 1/4-in. Flushing Connection		
5	No Flushing Connection		
Code	Options (select up to 3)		
3 ⁽³⁾	304 SST Bolts		
4 ⁽³⁾	316 SST Bolts		
B	Extra Fill for Cold Temperature Applications		
C	150 µm (0.006-in.) Diaphragm Thickness (316L SST and Hastelloy C-276 diaphragms only, for abrasive applications)		
D	Hastelloy Plug In. Flushing Connection		
G	SST Plug In Flushing Connection		
H	SST Drain / Vent in Flushing Connection		
J ⁽³⁾⁽¹¹⁾	PTFE Gasket (for use with flushing connection ring)		
K ⁽³⁾⁽¹¹⁾	Barium Sulfate-filled PTFE Gasket (for use with flushing connection ring)		
N ⁽¹¹⁾	Grafoil Gasket (for use with flushing connection ring)		
R ⁽³⁾⁽¹¹⁾	Ethylene Propylene Gasket for lower housing		
V ⁽¹¹⁾⁽¹²⁾	PTFE Coated Diaphragm for nonstick purposes (316L SST and Hastelloy C-276 diaphragms only)		
U	25 µm (0.001 in) Gold Plated Diaphragm		
T ⁽¹³⁾	NACE MR0175/ISO 15156, MR0103		
9 ⁽¹⁴⁾	Male NPT Process Connection Threads		
5	Monel metal gasket (Pressure Rating code 3 only)		

(1) Shaded areas indicate special orders. Consult an Emerson Process Management representative for availability, performance effects, and lead time.

(2) Flushing connection not available.

(3) Consult an Emerson Process Management representative for pricing and availability on Pressure Rating codes 2 or 3.

(4) The following process connection sizes are D rated: 3/4-in (9000 psi/621 bar), 1-in. (8700 psi/600 bar), 1 1/4-in (7000 psi/483 bar), and 1 1/2-in. (6000 psi/414 bar).

(5) When ordering special diaphragm materials, the upper housing is 316 SST unless otherwise noted.

(6) Not available with welded capillary connections.

(7) Operating temperature is limited to 150 °C (302 °F).

(8) Supplied with C4401 aramid fiber gasket.

(9) Flushing Connection Ring/ Lower Housing assembly bolts provided as standard are carbon steel for ANSI and 304 SST for DIN.

(10) Maximum working pressure of 200 psi.

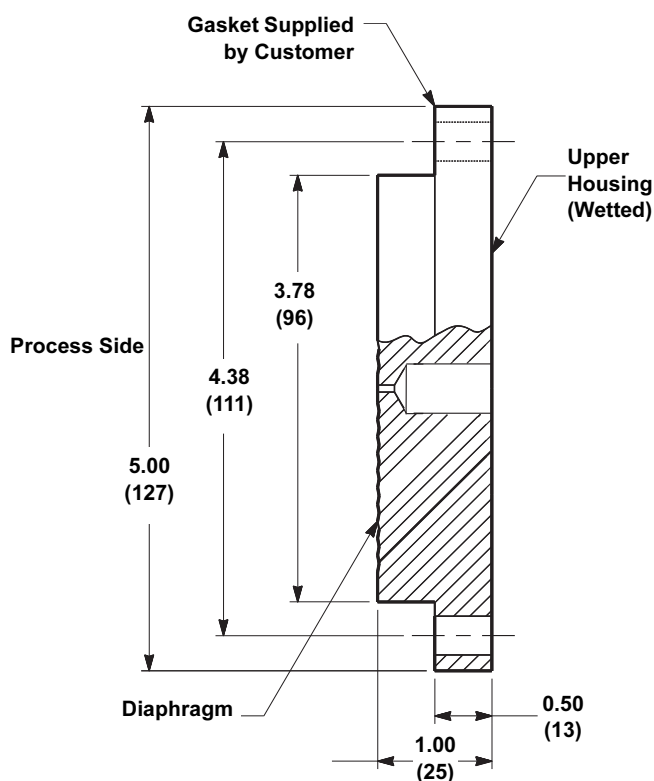
(11) Not available with Pressure Rating code 3.

(12) Not available with transmitter option code Q8, for Material Traceability per DIN EN 10204 3.1B of the transmitter / diaphragm seal assembly.

(13) Materials of Construction comply with metallurgical requirements highlighted within NACE MR0175/ISO 15156 for sour oil field production environments. Environmental limits apply to certain materials. Consult latest standard for details. Selected materials also conform to NACE MR0103 for sour refining environments.

(14) Only available with Process Connection codes 3 and 5.

CHEMICAL TEE (CTW) SEAL



Dimensions are in inches (millimeters)

TABLE 30. Chemical Tee Seal (CTW) Ordering Information

Code	Industry Standard	
N	Industry Specific	
Code	Process Connection Style	
CTW	Chemical Tee Seal (Wedge flow style seal)	
Code	Maximum Working Pressure (Flange Rating)	
20	300 psig	
Code	Diaphragm Material	Upper Housing Material (Wetted)
AA	316L SST	316L SST
BB	Hastelloy C-276	Hastelloy C-276
Code	Lower Housing/Flushing Option	
00	Not Applicable	
Code	Options	
B ⁽¹⁾	Extra Fill for Cold Temperature Applications	
C ⁽²⁾	150 μm (0.006-in.) Diaphragm thickness (316L SST and Hastelloy C-276 diaphragms only)	
T ⁽³⁾	NACE MR0175/ISO 15156, MR0103	
V ⁽⁴⁾	PTFE Coated Diaphragm for nonstick purposes (316L SST and Hastelloy C-276 diaphragms only)	

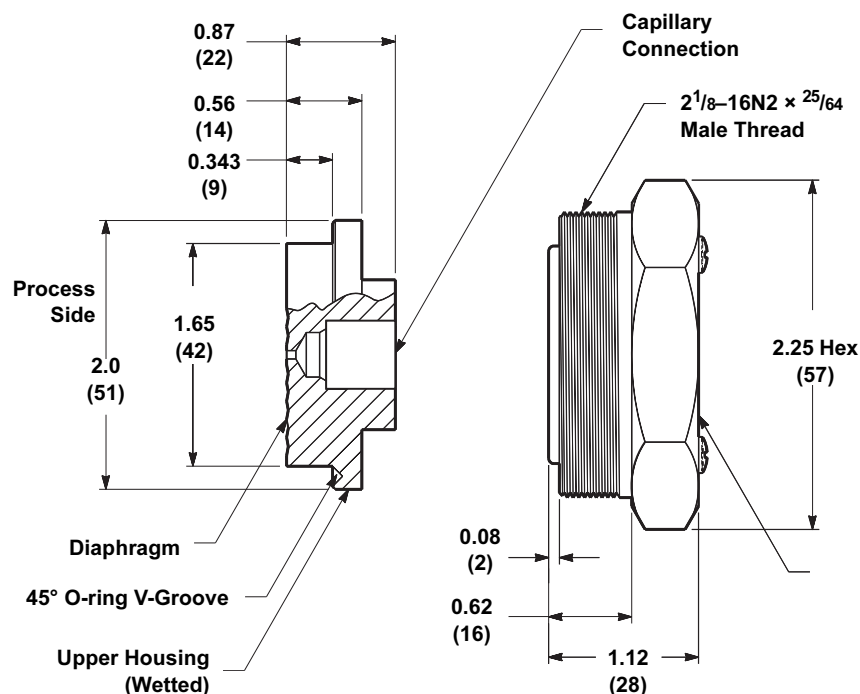
(1) For seal assemblies that will be used in cold ambient temperature applications, contact an Emerson Process Management representative or reference Instrument Toolkit for assistance.

(2) May cause adverse seal temperature effects. Contact an Emerson Process Management representative for assistance.

(3) Materials of Construction comply with metallurgical requirements highlighted within NACE MR0175/ISO 15156 for sour oil field production environments. Environmental limits apply to certain materials. Consult latest standard for details. Selected materials also conform to NACE MR0103 for sour refining environments.

(4) Not available with transmitter option code Q8, for Material Traceability per DIN EN10204 3.1.B of the transmitter/diaphragm seal assembly.

UNION CONNECTION SEAL



Dimensions are in inches (millimeters)

TABLE 31. Union Connection Seal Ordering Information

Code	Industry Standard
N	Non-Industry Standard
Code	Process Connection Style
UCW ⁽¹⁾	Union Connection Seal
Code	Maximum Working Pressure (Flange Rating)
10 ⁽²⁾	2,000 psig
Code	Upper Housing (Wetted) / Diaphragm Material
AA	316L SST/316L SST
BB	Hastelloy C-276 / Hastelloy C- 276
Code	Lower Housing/Flushing Option
00	Not Applicable
Code	Options
1	Weld Nugget for Capillary Support Tube
B ⁽³⁾	Extra Fill for Cold Temperature Applications
V ⁽⁴⁾	PTFE Coated Diaphragm for nonstick purposes (316L SST and Hastelloy C-276 diaphragms only)

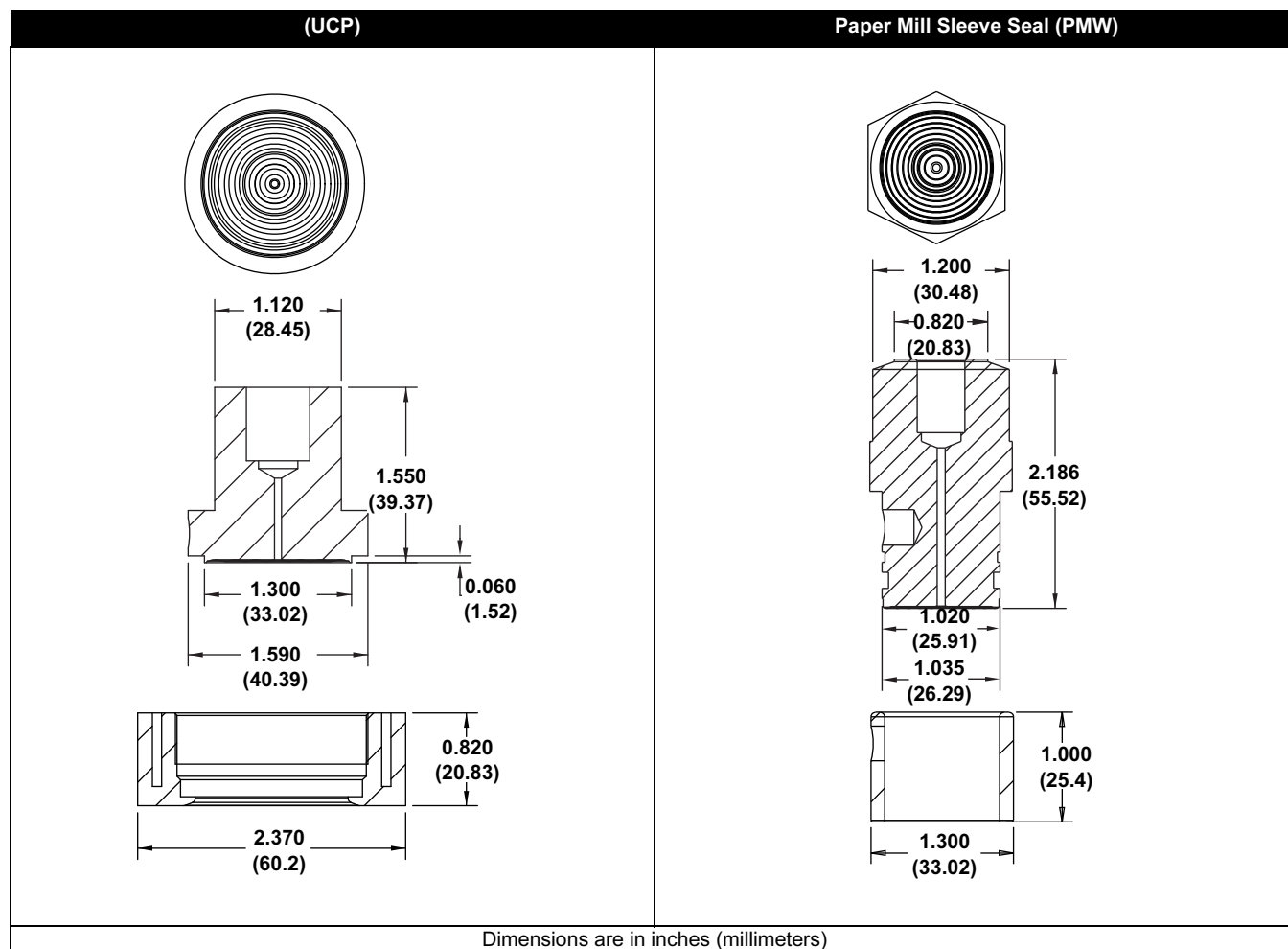
(1) Consult an Emerson Process Management representative for use with low calibrated spans.

(2) Standard O-ring is PTFE material.

(3) For seal assemblies that will be used in cold ambient temperature applications, contact an Emerson Process Management representative or reference Instrument Toolkit for assistance.

(4) Not available with transmitter option code Q8, for Material Traceability per DIN EN10204 3.1.B of the transmitter/diaphragm seal assembly.

THREADED PIPE MOUNT (UCP AND PMW) SEALS



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TABLE 32. Threaded Pipe Mount (UCP and PMW) Seal Ordering Information

Code	Industry Standard	
N	Non-Industry Standard	
Code	Process Connection Style	Maximum Working Pressure (Flange Rating)
UCP	Male Threaded (only available with process connection code 30 or 40) ⁽¹⁾	600 psig at 100 °F (4140 kPa at 38 °C)
PMW	Paper Mill Sleeve (only available with process connection code 50) ⁽¹⁾	300 psig at 100 °F (2070 kPa at 38 °C)
Code	Process Connection Size	
30	1½ in. with Threaded Knurled Nut (UCP only)	
40	1½ in. with Threaded Hex Nut (UCP only)	
50	1 in. with Cap Screw Retainer (PMW only)	
Code	Upper Housing / Diaphragm Material ⁽²⁾	
AA	316L SST/ 316L SST	
BB	Hastelloy C-276 / Hastelloy C-276	
Code	Lower Housing Material	
00	No Weld Spud	
A0	316 SST Weld Spud	
B0	Hastelloy C-276 Weld Spud	
Code	Options	
√ ⁽³⁾	PTFE Coated Diaphragm for nonstick purposes (316L SST and Hastelloy C-276 diaphragms only)	

(1) Consult factory for low-calibrated spans.

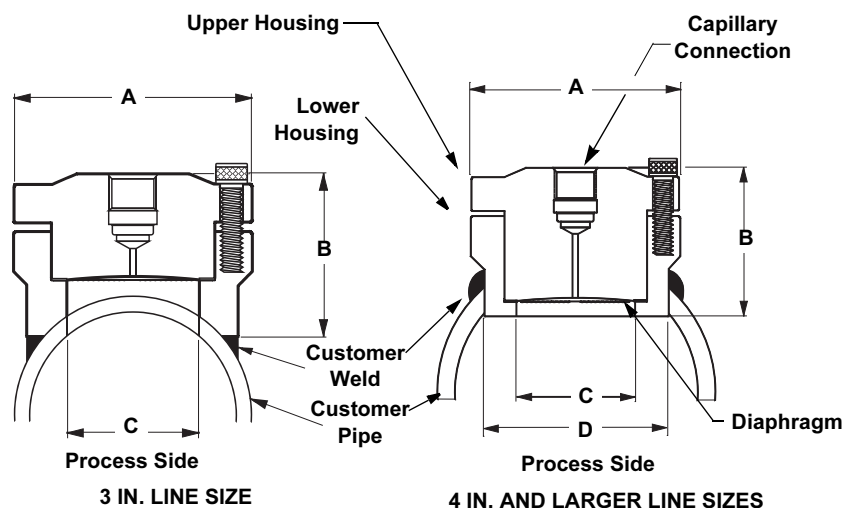
(2) UCP seal supplied standard with barium sulfate filled PTFE gasket. PMW seal supplied standard with Viton® O-ring.

(3) Not available with transmitter option code Q8, for Material Traceability per DIN EN10204 3.1.B of the transmitter/diaphragm seal assembly.

TABLE 33. Parts List

Part Description	Part Number
PTFE Gasket (package of 12 – for Process Connection Style code UCP)	02088-0078-0001
316 SST Weld Spud (for Process Connection Style code UCP)	02088-0295-0003
316 SST Plug/Heat Sink	02088-0196-0001
316 SST Weld Spud (for Process Connection Style code PMW)	02088-0285-0001
O-Ring (package of 12 – for Process Connection Style code PMW)	01199-2012-0001
Minimum Span (Consult factory for low-calibrated spans.)	
1.5" NUCP = 300 in. H2O	
1.0" NPMW = 1050 in. H2O	

SADDLE (WSP) SEAL



Size	Dimension			
	A	B	C	D
2-in.	3.50 (89)	2.6 (66)	1.5 (38)	—
3-in.	3.50 (89)	2.27 (58)	2.01 (51)	—
4-in. and larger	3.50 (89)	2.38 (60)	2.01 (51)	2.99 (76)

Dimensions are in inches (millimeters)

TABLE 34. Saddle (WSP) Seal Ordering Information

Code	Industry Standard
N	Non-Industry Standard
Process Connection Style	
WSP	Flow-Thru Saddle Seal ⁽¹⁾
Process Connection Size	
G	2 in. Pipe
7	3 in. Pipe
9	4 in. and Larger Pipe
Maximum Working Pressure (Flange Rating)	
0	1,250 psig at 100 °F (8 618 kPa at 38 °C)—Six bolt holes
1	1,500 psig at 100 °F (10 340kPa at 38 °C)—Eight bolt holes (standard design)
Upper Housing Material	
LA	316L SST (304 SST Bolts)
LB	316L SST (304 SST Bolts)
LC	316L SST (304 SST Bolts)
Diaphragm Material	
	316L SST
	Hastelloy C-276
	Tantalum
Lower Housing Material ⁽²⁾	
00	No Lower Housing
B5	Hastelloy C-276
D5	Carbon Steel
L5	316L SST
V5	Monel
Options	
J	PTFE Gasket (for Lower Housing)
N	Grafoil Gasket (for Lower Housing)
√ ⁽³⁾	PTFE Coated Diaphragm for nonstick purposes (316L SST and Hastelloy C-276 diaphragms only)
B	Extra fill for cold temperature applications

(1) Standard gasket material is Klinger Compound No. C4401.

(2) Standard pipe schedule 40/40S, for other pipe schedules consult the factory.

(3) Not available with transmitter option code Q8, for Material Traceability per EN10204 3.1.B of the transmitter/diaphragm seal assembly.

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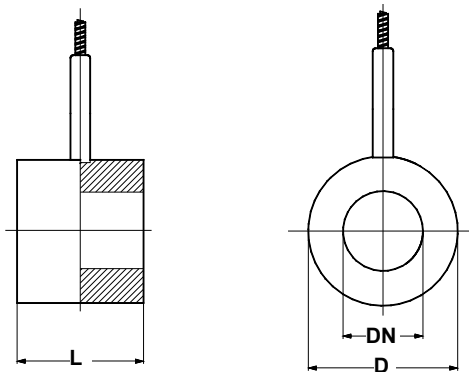
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WAFER STYLE IN-LINE (TFS) SEAL

TFS Cell Type: In-Line Diaphragm Seal Dimensional Drawings



ANSI/ASME B16.5 - 1996		Dimensions (mm)		DIN 2501		Dimensions (mm)	
DN	CL	D	L	DN	PN	D	L
1 in.	150-2500	51	90	25	16-400	68	90
1½ in.	150-2500	73	90	40	16-400	88	90
2 in.	150-2500	92	90	50	16-400	102	90
3 in.	150-2500	127	90	80	16-400	138	90
4 in.	150-2500	157	90	100	16-400	162	90

TABLE 35. Wafer Style In-Line (TFS) Seal Ordering Information

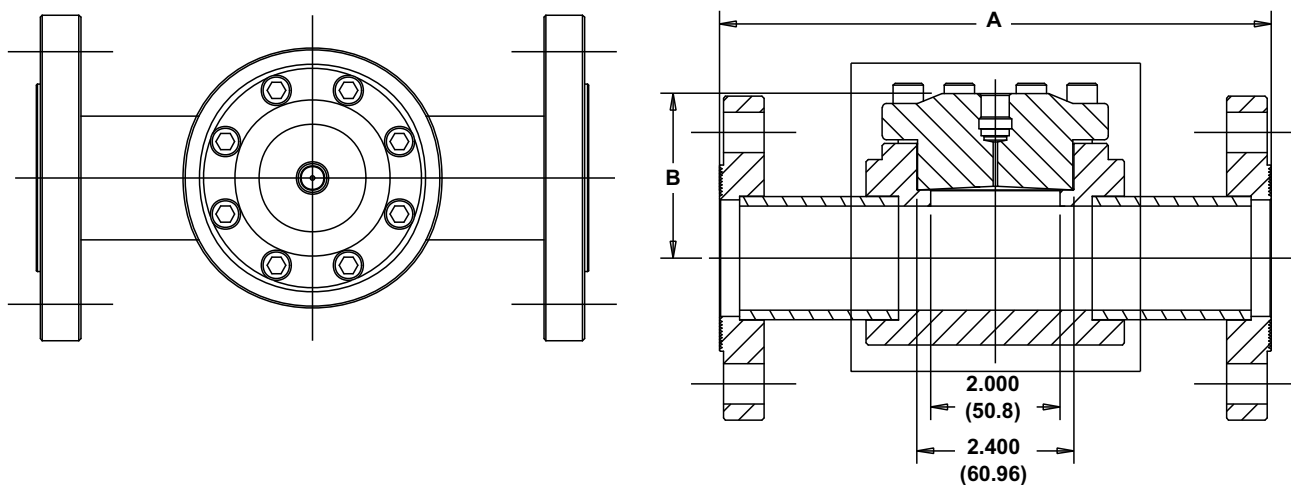
Code	Industry Standard	
A	ANSI/ASME B16.5 (American National Standards Institute/American Society of Mechanical Engineers)	
D	DIN 2501 (Deutsches Institut für Normung)	
Code	Process Connection Style	
TFS ⁽¹⁾	Wafer Style: In-Line Diaphragm Seal	
Code	Process Connection Size	
	ANSI/ASME	DIN
2 ⁽²⁾	1 in.	—
4 ⁽²⁾	1½ in.	—
G	2 in.	DN 50
7	3 in.	—
9	4 in.	—
D	—	DN 25
F	—	DN 40
J	—	DN 80
K	—	DN 100
Code	Maximum Working Pressure (Flange Rating)	
0	Flange not supplied. Seal rated to carbon steel Class 2500 or flange rating	
Code	Diaphragm and Wetted Parts Material ⁽³⁾	Housing Material
LA	316L SST	316L SST
LB	Hastelloy C-276	316L SST
Code	Housing Body Length	
00	90 mm (standard configuration)	

(1) Available with welded capillary connection only.

(2) Consult factory for low calibrated spans.

(3) When ordering special diaphragm materials, the standard housing material is 316L SST, unless noted otherwise. Optional housing, diaphragm, and wetted parts materials are available upon request. Contact an Emerson Process Management representative for additional information.

FLOW-THRU FLANGED



Dimensions are in inches (millimeters)

Class (lb.)	Nominal Pipe Size (in.)	Overall Length ± 0.05 "A"	Upper to Centerline Height "B"
150	1	7.00 (177.8)	2.28 (57.91)
	2	9.00 (228.6)	2.80 (71.12)
	3	11.00 (279.4)	3.50 (88.9)

TABLE 36. Flow-Thru Flanged (WFW) Seal Ordering Information

Code	Industry Standard
A	ANSI/ASME B16.5 (American National Standards Institute/American Society of Mechanical Engineers)
Code	Process Connection Style
WFW	Flow-Thru Flanged
Code	Process Connection Size ⁽¹⁾
1	1/2 in.
A	3/4 in.
2	1 in.
4	1 1/2 in.
G	2 in.
7	3 in.
9	4 in.
C	6 in.
Code	Maximum Working Pressure (Flange Rating) ⁽¹⁾
1	Class 150
2	Class 300
4	Class 600
5	Class 900
6	Class 1500

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TABLE 36. Flow-Thru Flanged (WFW) Seal Ordering Information

Code	Upper Housing	Diaphragm Material ⁽¹⁾
LA	316L SST	316L SST
LB	316L SST	Hastelloy C276
LC	316L SST	Tantalum
LJ	316L SST	Hastelloy B
LV	316L SST	Monel 400
FF	304L	304L
LH ⁽²⁾	316L SST	Titanium Gr. 4

Code	Lower Housing ⁽¹⁾
0	No lower housing
L	316L SST
B	Hastelloy C-276
D	Plated Carbon Steel
V	Monel 400
F	304L
J	Hastelloy B
H	Titanium Gr. 4 ⁽³⁾

Code	Pipe Schedule ⁽¹⁾	Maximum Working Pressure of Pipe (in psig)							
		1/2 in.	3/4 in.	1 in.	1 1/2 in.	2 in.	3 in.	4 in.	6 in.
K	5	1500	1500	1340	920	730	630	490	430
M	10/10s	1500	1500	1500	1500	1250	920	710	530
N	40/40s	1500	1500	1500	1500	1500	1500	1500	1120
P	80	3000	3000	3000	3000	3000	3000	2000	1720
T	160	4000	4000	4000	4000	4000	4000	3300	2860

Code	Options
3	304 SST Bolts
U	25 µm (0.001 in) Gold Plated Diaphragm
J	PTFE O-ring (between Upper and Lower Housing)
N	Grafoil Gasket (between Upper and Lower Housing)
K	Gylon Gasket (between Upper and Lower Housing)
V	PTFE coated diaphragm for nonstick purposes (available with 316L SST and Hastelloy C-276 diaphragm materials only)
1	PIC or ITT 6 bold style bolting pattern
9	.002 in. diaphragm thickness (316 sst and Hastelloy diaphragm material only)
C	.006 in. diaphragm thickness (316 sst and Hastelloy diaphragm material only)
B	Extra fill for cold temperature applications
T ⁽⁴⁾	NACE MR0175/ISO 15156, MR0103

(1) Consult factory for special process connection sizes, flange pressure ratings, diaphragm/lower housing materials, and pipe schedules.

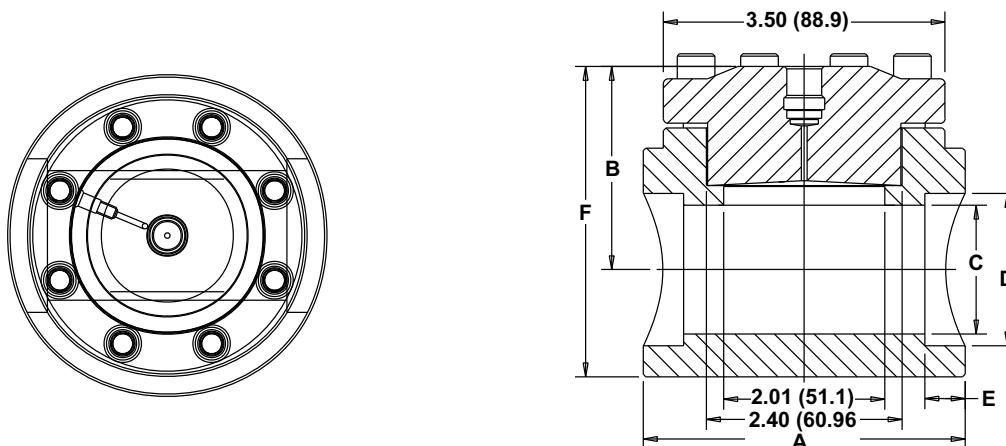
(2) Operating temperature limited to 150 °C (302 °F).

(3) Requires applications review prior to ordering.

(4) Materials of Construction comply with metallurgical requirements highlighted within NACE MR0175/ISO 15156 for sour oil field production environments. Environmental limits apply to certain materials. Consult latest standard for details. Selected materials also conform to NACE MR0103 for sour refining environments.

FLOW-THRU SOCKET AND BUTT WELD SEALS

Flow-Thru Socket Weld Dimensional Drawing

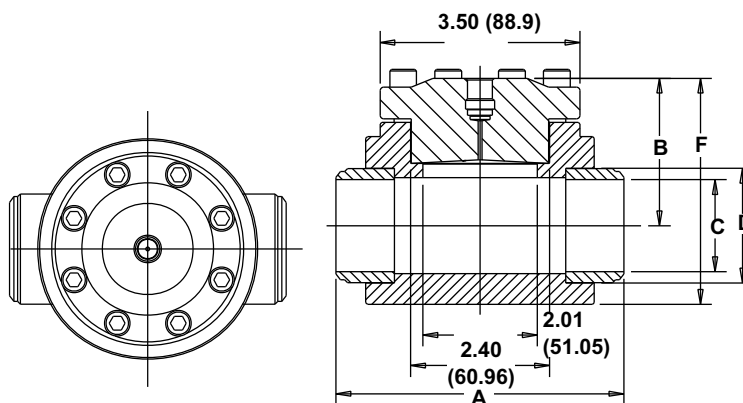


Dimensions are in inches (millimeters)

Code	Overall Length "A"	Upper to Centerline Height "B"	Bore Diameter "C"	Counter Bore Diameter "D"	Counter Bore Depth "E"	Overall Height "F"
A	3.50 (88.9)	2.18 (55.37)	0.82 (20.83)	1.06 (26.92)	0.40 (10.16)	3.09 (78.49)
2	3.50 (88.9)	2.28 (57.91)	1.05 (26.67)	1.32 (33.53)	0.40 (10.16)	3.33 (84.58)
4	4.00 (101.6)	2.56 (65.02)	1.61 (40.89)	1.91 (48.51)	0.50 (12.7)	3.90 (99.06)
G	4.00 (101.6)	2.80 (71.12)	2.07 (52.58)	2.38 (60.45)	0.50 (12.7)	4.37 (111.0)

Flow-Thru Butt Weld Dimensional Drawing

1 in. Flow-Thru Butt Weld Seal



Dimensions are in inches (millimeters)

Code	Overall Length "A"	Upper to Centerline Height "B"	Bore Diameter "C"	Counter Bore Diameter "D"	Overall Height "F"
A	4.25 (107.95)	2.17 (55.12)	0.82 (20.83)	1.05 (26.67)	3.13 (79.5)
2	4.25 (107.95)	2.29 (58.17)	1.05 (26.67)	1.32 (33.53)	3.39 (86.11)
4	5.00 (127.0)	2.57 (65.28)	1.61 (40.89)	1.90 (48.26)	3.95 (100.33)
G	5.00 (127.0)	2.77 (70.36)	2.07 (52.58)	2.38 (60.45)	4.38 (111.25)

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TABLE 37. Flow-Thru Socket and Butt Weld (WWW and WBW) Seals Ordering Information

Code	Industry Standard							
A	ANSI/ASME B16.5 (American National Standards Institute/American Society of Mechanical Engineers)							
Code	Process Connection Style							
WWW	Flow-Thru Socket Weld							
WBW	Flow-Thru Butt Weld							
Code	Process Connection Size ⁽¹⁾							
1	1/2 in.							
A	¾ in.							
2	1 in.							
4	1 ½ in.							
G	2 in.							
7	3 in. (not available for Socket Weld)							
9	4 in. (not available for Socket Weld)							
Code	Maximum Working Pressure (Flange Rating)							
0	1250 psi (6 bolt pattern) (not available for pipe schedule codes P & T)							
1	Not Applicable (See Pipe Schedule)							
Code	Upper Housing	Diaphragm Material ⁽¹⁾						
LA	316L SST	316L SST						
LB	316L SST	Hastelloy C-276						
LC	316L SST	Tantalum						
LV	316L SST	Monel 400						
LJ	316L SST	Hastelloy B						
LH ⁽²⁾	316L SST	Titanium Gr. 4						
FF	304L	304L						
Code	Lower Housing ⁽¹⁾							
0	No lower housing							
L	316L SST							
B	Hastelloy C-276							
D	Plated carbon steel (Zinc)							
V	Monel 400							
J	Hastelloy B							
H ⁽³⁾	Titanium Gr. 4							
F	304L							
Working Pressure of Pipe (in psig)								
Code	Pipe Schedule ⁽¹⁾ Maximum	1/2 in.	¾ in.	1 in.	1 ½ in.	2 in.	3 in.	4 in.
M	10/10	1500	1500	1500	1500	1250	920	710
N	40/40s	1500	1500	1500	1500	1500	1500	1500
P	80	3000	3000	3000	3000	3000	3000	2000
T	160	4000	4000	4000	4000	4000	4000	3300
Code	Options							
3	304 SST Bolts							
U	25 µm (0.001 in) Gold plated diaphragm							
J	PTFE O-ring (between Upper and Lower Housing)							
N	Grafoil Gasket (between Upper and Lower Housing)							
K	Gylon Gasket (between Upper and Lower Housing)							
V	PTFE coated diaphragm for nonstick purposes (Available with 316L SST and Hastelloy C- 276 diaphragm materials only.)							
9	.002 in. diaphragm thickness (Available with 316L SST and Hastelloy C- 276 diaphragm materials only.)							
C	.006 in. diaphragm thickness (Available with 316L SST and Hastelloy C- 276 diaphragm materials only.)							
B	Extra fill for cold temperature applications							
T ⁽⁴⁾	NACE MR0175/ISO 15156, MR0103							

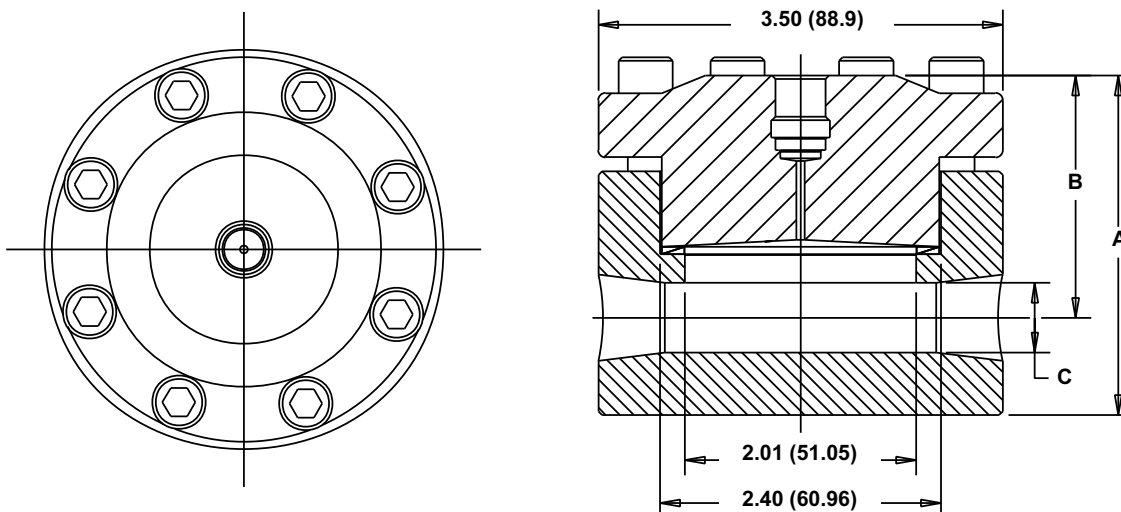
(1) Consult factory for special process connection sizes, diaphragm/lower housing materials, and pipe schedules.

(2) Operating temperature limited to 150 °C (302 °F).

(3) Requires applications review prior to ordering.

(4) Materials of Construction comply with metallurgical requirements highlighted within NACE MR0175/ISO 15156 for sour oil field production environments. Environmental limits apply to certain materials. Consult latest standard for details. Selected materials also conform to NACE MR0103 for sour refining environments.

IN-LINE FLOW-THRU THREADED SEAL



Dimensions are in inches (millimeters)

Code	Process Connection Size	Overall Length "A"	Upper to Centerline Height "B"	Bore Diameter "C"
1	¼ in. NPT	2.62 (66.55)	1.97 (50.04)	0.44 (11.18)
3	½ in. NPT	2.91 (73.91)	2.12 (53.85)	0.72 (18.29)
4	¾ in. NPT	3.13 (79.5)	2.22 (56.39)	0.92 (23.37)
5	1 in. NPT	3.38 (85.85)	2.34 (59.44)	1.15 (29.21)

TABLE 38. In-Line Flow-Thru Threaded (WTW) Seal Ordering Information

Code	Industry Standard	
A	ANSI/ASME B16.5 (American National Standards Institute/American Society of Mechanical Engineers)	
Code	Process Connection Style	
WTW	In Line Flow-Thru Threaded	
Code	Process Connection Size	
1	¼ in. NPT	
3	½ in. NPT	
4	¾ in. NPT	
5	1 in. NPT	
Code	Maximum Working Pressure (Flange Rating)	
0	1250 psi (6 bolt pattern) (Not available for pipe schedule code P)	
1	Not Applicable (See Pipe Schedule)	
Code	Upper Housing	Diaphragm Material ⁽¹⁾
LA	316L SST	316L SST
LB	316L SST	Hastelloy C-276
LC	316L SST	Tantalum
LV	316L SST	Monel 400
LJ	316L SST	Hastelloy B
LH ⁽²⁾	316L SST	Titanium Gr. 4
FF	304L	304L

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TABLE 38. In-Line Flow-Thru Threaded (WTW) Seal Ordering Information

Code	Lower Housing ⁽¹⁾	
0	No lower housing	
L	316L SST	
B	Hastelloy C-276	
D	Plated carbon steel (Zinc)	
V	Monel 400	
J	Hastelloy B	
H ⁽³⁾	Titanium Gr. 4	
F	304L	
Code	Pipe Schedule ⁽¹⁾	Maximum Working of Pressure Pipe
P	80	3000 psi
N	40/40s	1,500 psi
Code	Options	
3	304 SST Bolts	
U	25 µm (0.001 in) Gold plated diaphragm	
J	PTFE O-ring (between Upper and Lower Housing)	
N	Grafoil Gasket (between Upper and Lower Housing)	
K	Gylon Gasket (between Upper and Lower Housing)	
V	PTFE coated diaphragm for nonstick purposes (Available with 316L SST and Hastelloy C- 276 diaphragm materials only.)	
9	.002 in. diaphragm thickness (Available with 316L SST and Hastelloy C- 276 diaphragm materials only.)	
C	.006 in. diaphragm thickness (Available with 316L SST and Hastelloy C- 276 diaphragm materials only.)	
B	Extra fill for cold temperature applications	
T ⁽⁴⁾	NACE MR0175/ISO 15156, MR0103	

(1) Consult factory for special diaphragm materials, lower housing materials, and pipe schedules.

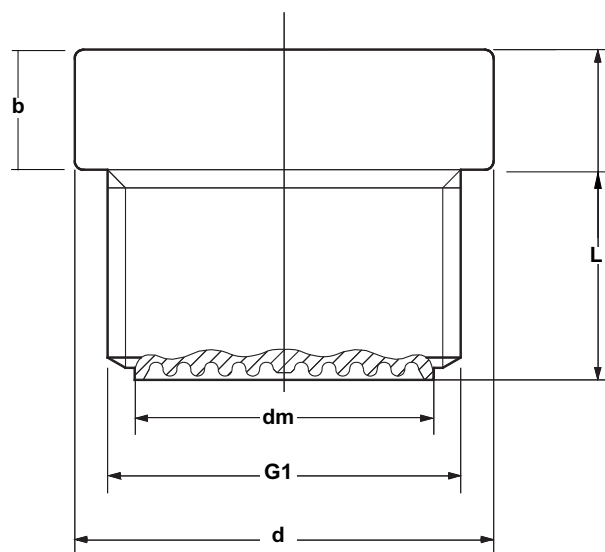
(2) Operating temperature limited to 150 °C (302 °F).

(3) Requires applications review prior to ordering.

(4) Materials of Construction comply with metallurgical requirements highlighted within NACE MR0175/ISO 15156 for sour oil field production environments. Environmental limits apply to certain materials. Consult latest standard for details. Selected materials also conform to NACE MR0103 for sour refining environments.

THREADED FLUSH TYPE (HTS) SEAL

Dimensional Drawing for HTS Threaded Type: Flush Diaphragm Seal



HTS Process Connection Dimensions

ISO 228/1 Parallel Thread						NPT: Tapered Thread					
G1	PN	Dimensions (mm)				G1	PN	Dimensions (mm)			
		dm	L	b	d			dm	L	b	d
1 in.	455	28	21	30	47	1 in.	600	28	23	30	47
1½ in.	400	35	30	30	60	1½ in.	410	35	32	30	60
2 in.	280	48	35	30	70	2 in.	280	48	37	30	70

TABLE 39. Threaded Flush Type (DHTS) Seal — DIN Ordering Information⁽¹⁾

Code	Process Connection Style	
DHTS	Parallel Thread	
Code	Process Connection Size	Diaphragm Diameter
EA	G1 – 455 bar (6600 psi)	28 mm
GA	G1 ¹ / ₂ – 400 bar (5800 psi)	35 mm
JA	G2 – 280 bar (4000 psi)	48 mm
Code	Diaphragm and Wetted Parts Material	Housing Material
LA00	316L SST	316 SST

(1) Consult an Emerson Process Management representative for use with low calibrated spans. Shaded areas indicate special orders, consult an Emerson Process Management representative for availability, performance effects, and lead time.

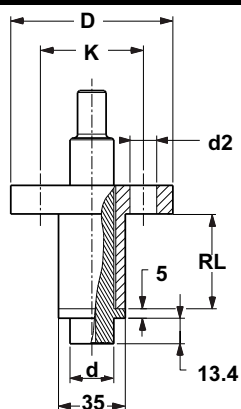
TABLE 40. Threaded Flush Type (AHTS) Seal —NPT Ordering Information⁽¹⁾

Code	Process Connection Style	
AHTS	Tapered Thread	
Code	Process Connection Size	Diaphragm Diameter
5A	1-11,5 NPT – 600 bar (8700 psi)	28 mm
7A	1½-11,5 NPT – 410 bar (6000 psi)	35 mm
9A	2-11,5 NPT – 280 bar (4000 psi)	48 mm
Code	Diaphragm and Wetted Parts Material	Housing Material
LA00	316L SST	316L SST

(1) Consult an Emerson Process Management representative for use with low calibrated spans. Shaded areas indicate special orders, consult an Emerson Process Management representative for availability, performance effects, and lead time.

EXTRUDER FLANGED TYPE (JES) SEAL

Dimensional Drawings for JES Extruder Flanged Type



JES Process Connection Dimensions (mm)						
PN	dM	D	K	d2	RL	Flange Thickness
400 bar	23	85	54	4x14	See Table 41	25 mm

TABLE 41. Extruder Flanged Type (JES) Seal Ordering Information⁽¹⁾

Code	Process Connection Style			
NJES	Plastics Extrusion Clamping Flange			
Code	Process Connection Size			
B	23 mm			
Code	Pressure Rating			
P ⁽²⁾	400 bar			
Code	Diaphragm and Wetted Parts Material		Upper Housing Material	
LA	316L SST		316 SST	
Code	Extension Length		Code	Extension Length
0	Add 0 mm		5	Add 50 mm
1	Add 10 mm		6	Add 60 mm
2	Add 20 mm		7	Add 70 mm
3	Add 30 mm		8	Add 80 mm
4	Add 40 mm		9	Add 90 mm
Code	Extension Length (Amount to Add)		Code	Extension Length (Amount to Add)
0	Add 0 mm		5	Add 5 mm
1	Add 1 mm		6	Add 6 mm
2	Add 2 mm		7	Add 7 mm
3	Add 3 mm		8	Add 8 mm
4	Add 4 mm		9	Add 9 mm
Code	Options (Multiple Selections)			
6	Add 100 mm extension length			
7	Add 200 mm extension length			
T ⁽³⁾	NACE MR0175/ISO 15156, MR0103			

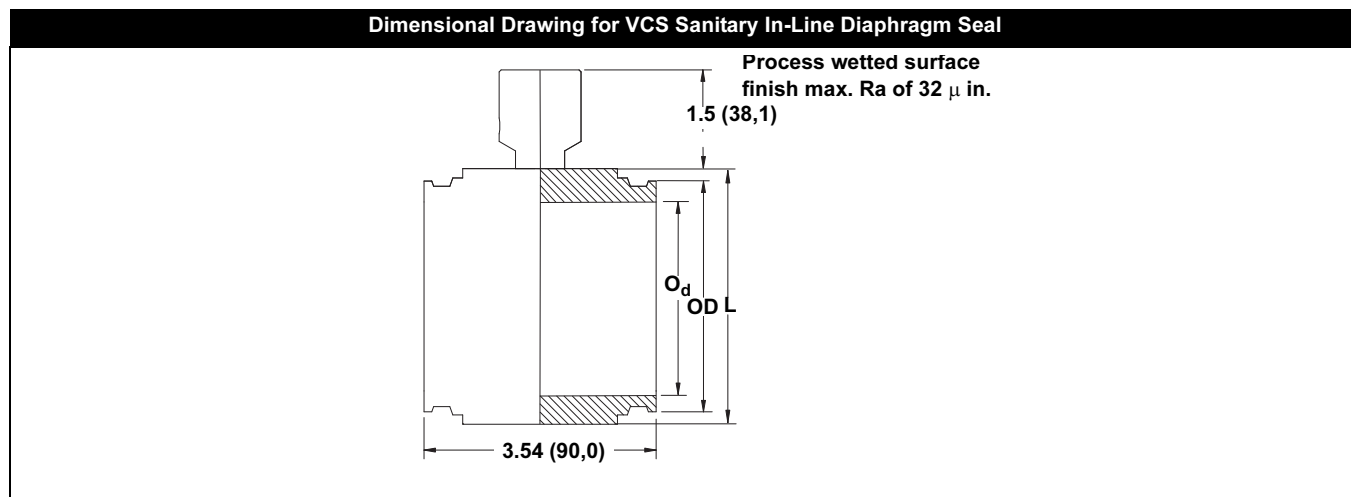
(1) Shaded areas indicate special orders. Consult an Emerson Process Management representative for availability, performance effects, and lead time.

(2) Minimum span is 60 bar.

(3) Materials of Construction comply with metallurgical requirements highlighted within NACE MR0175/ISO 15156 for sour oil field production environments. Environmental limits apply to certain materials. Consult latest standard for details. Selected materials also conform to NACE MR0103 for sour refining environments.

Sanitary Seals

TRI-CLAMP® IN-LINE (VCS) SEAL



Dimensions are in inches (millimeters)

DN	Max. Working Pressure	Dimensions (inches)		
		O _d	OD	L
1 in.	600 psi	0.87	1.99	3.54
1½ in.	600 psi	1.37	1.99	3.54
2 in.	600 psi	1.87	2.52	3.54
3 in.	600 psi	2.87	3.58	3.54
4 in.	600 psi	3.83	4.69	3.54

TABLE 42. Tri-Clamp In-Line (VCS) Seal Ordering Information

Code	Industry Standard	
S	Sanitary (Conforms to 3-A Standard 74)	
Code	Process Connection Style	
VCS ⁽¹⁾	Tri-Clamp In-Line Seal Maximum Working Pressure: 600 psi (4140 kPa)	
Code	Process Connection Size	
20 ⁽²⁾	1 in.	
30 ⁽²⁾	1½ in.	
50	2 in.	
70	3 in.	
90	4 in.	
Code	Diaphragm Material ⁽³⁾	Housing Material
LA00	316L SST	316L SST
Code	Options	
P	Non-Sanitary Fill Fluid (Does not conform to 3-A standard 74)	
H	20 μ in. (0.5 μ m) Ra diaphragm surface finish	
G ⁽⁴⁾	15 μ in. (0.375 μ m) Ra diaphragm surface finish	
6	Electropolishing	

(1) Gasket and clamp are furnished by the user. The maximum working pressure is dependent upon the clamp pressure rating.

(2) Consult factory for low calibrated spans.

(3) When ordering optional diaphragm materials, the standard housing material is 316L SST. Optional housing, diaphragm and wetted parts materials are available upon request. Contact an Emerson Process Management representative for additional information.

(4) Requires Option code 6, electropolishing.

Tri-Clamp (SCW) Seal

Sanitary Tri-Clamp Diaphragm Seal Dimensional Drawing

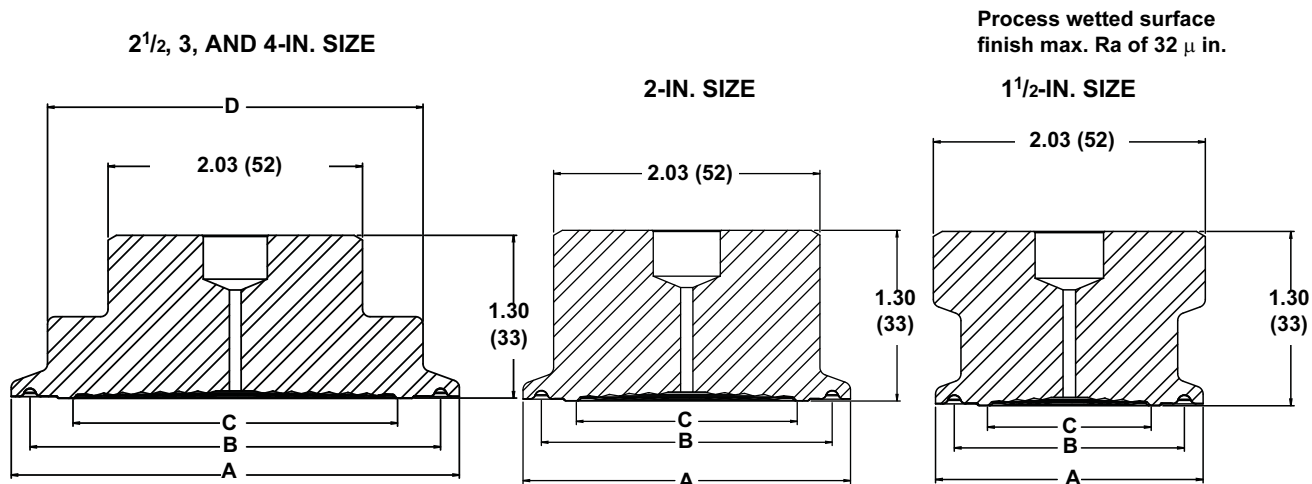


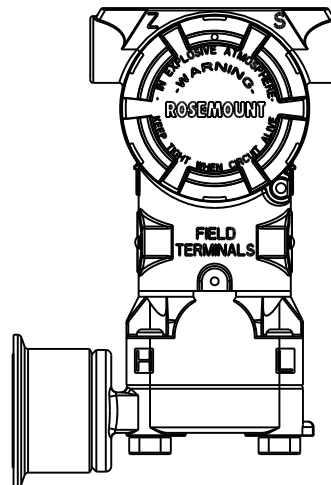
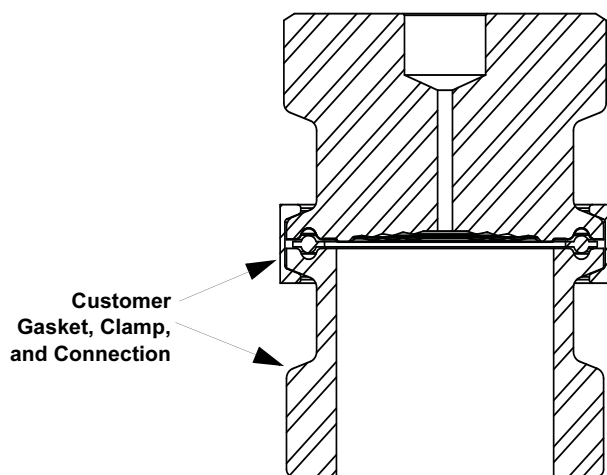
TABLE 43. Tri-Clamp SCW Dimensions⁽¹⁾

Ordering Code	Size	Outer Diameter (A)	O-Ring Groove Diameter (B)	Diaphragm Diameter (C)	Diameter (D)
30	1.5 (38)	2.00 (50.8)	1.72 (43.7)	1.21 (30.8)	—
50	2.0 (51)	2.50 (63.5)	2.22 (56.4)	1.68 (42.6)	—
60	2.5 (64)	3.04 (77.4)	2.78 (70.6)	2.07 (52.6)	2.50 (64)
70	3.0 (76)	3.58 (90.9)	3.28 (83.3)	2.58 (62.6)	3.00 (76)
90	4.0 (102)	4.68 (119)	4.35 (110)	3.66 (93.0)	4.00 (102)

(1) Dimensions are in inches (millimeters).

Typical Installation

Rosemount 3051C with Direct Mount Seal (Connection Codes 93 and 94)



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TABLE 44. Sanitary *Tri-Clamp* (SCW) Seal Ordering Information

Code	Industry Standard	
S	Sanitary (Conforms to 3-A Standard 74)	
Code	Process Connection Style	
SCW	Sanitary <i>Tri-Clover</i> Style <i>Tri-Clamp</i> ⁽¹⁾	
Code	Process Connection Size	
30 ⁽²⁾	1½ in.	
50 ⁽²⁾	2 in.	
60	2½ in.	
70	3 in.	
90	4 in.	
Code	Diaphragm Material	Upper Housing Material
LA	316L SST (WNR 1.4435)	316L SST
LB	Hastelloy C-276	316L SST
BB ⁽³⁾	Hastelloy C-276	Hastelloy C-276
Code	Lower Housing Flushing or Extension Option	
00	Not Applicable	
Code	Options	
H	20 µin. (0.5 µm) R _a diaphragm surface finish	
G	15 µin. (0.375 µm) R _a diaphragm surface finish	
D	10 µin. (0.25 µm) R _a diaphragm surface finish	
2	High Pressure Ladish Clamp and Buna N Gasket—see Table 45 below for clamp pressure rating (Conforms to 3-A Standard 74)	
3	Buna-N Gasket (Conforms to 3-A Standard 74)	
6	Electropolishing	
P	Non-Sanitary Fill Fluid (Does not conform to 3-A Standard 74)	

(1) Clamp and gasket furnished by user. The maximum working pressure is dependent upon the clamp pressure rating.

(2) Consult an Emerson Process Management representative for use with low calibrated spans.

(3) Not available with option codes H, G, D, or 6.

TABLE 45. High Pressure Ladish Clamp Maximum Working Pressure

Process Connection Size	psi at 70 °F	psi at 250 °F
1½ in.	1,500	1,200
2 in.	1,000	800
2½ in.	1,000	800
3 in.	1,000	800
4 in.	1,000	800

TANK SPUD (SSW) SEAL

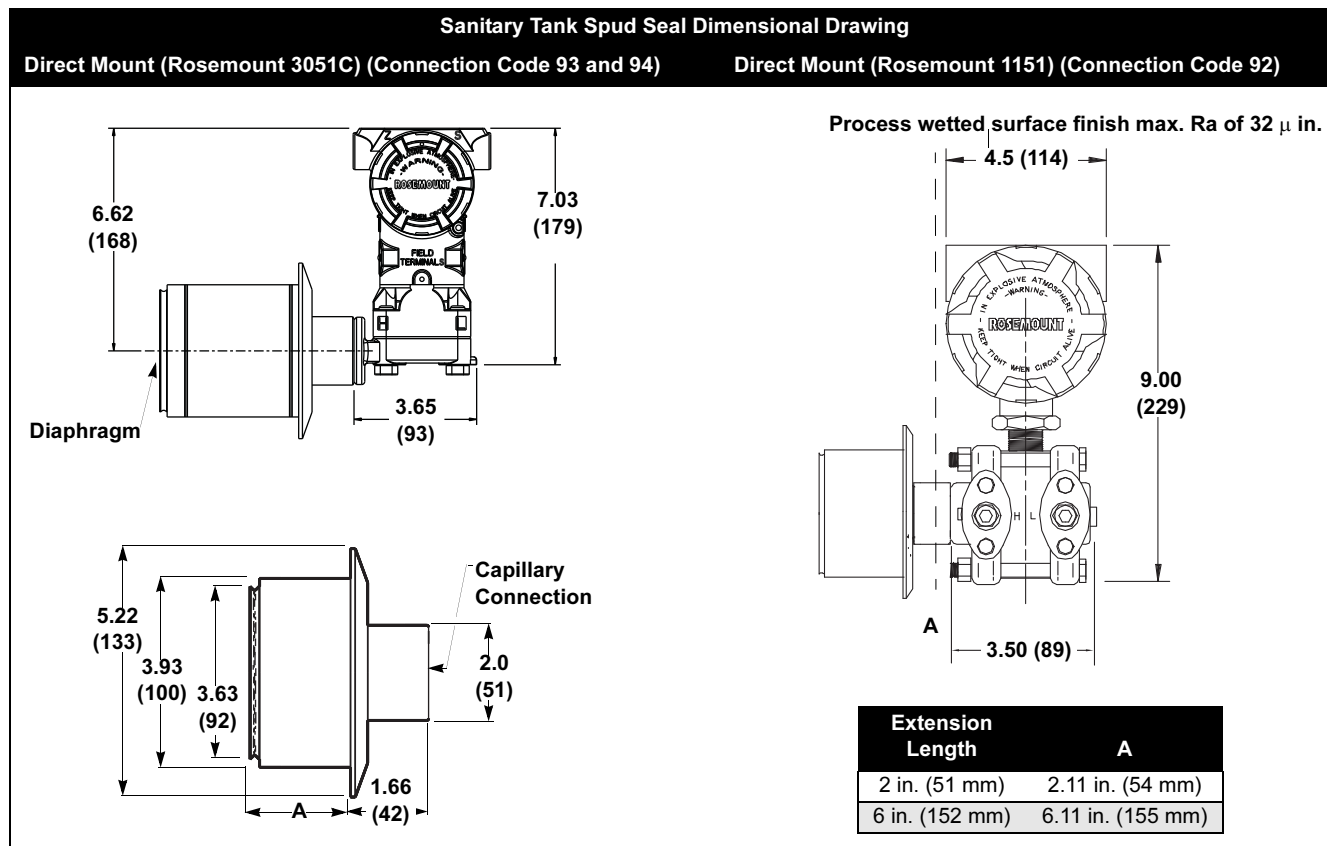


TABLE 46. Sanitary Tank Spud (SSW) Seal Ordering Information

Code	Industry Standard	
S	Sanitary (Conforms to 3-A Standard 74)	
Code	Process Connection Style	
SSW ⁽¹⁾	Sanitary Tank Spud Style	
Code	Maximum Working Pressure (Clamp Rating)	
A0	600 psig (4 136 kPa)	
Code	Upper Housing Material	
A	316 SST	
Code	Wetted Parts Material – Diaphragm	Extension
AL	316L SST (WNR 1.4435) ⁽²⁾	316L SST ⁽²⁾
BB	Hastelloy C-276	Hastelloy C-276/ 316L SST
Code	Extension Length	
2	2 in. Extension	
6	6 in. Extension	
Code	Options	
1	Tank Spud Included with Seal Shipment	
4	Viton® O-ring, instead of Standard Ethylene Propylene O-ring (Conforms to 3-A Standard 74)	
3	Buna N O-ring, instead of Standard Ethylene Propylene O-ring (Conforms to 3-A Standard 74)	
P	Non-Sanitary Fill Fluid (Does not conform to 3-A Standard 74)	
C	150 μ m (0.006-in.) Diaphragm Thickness	
H	20 μ in. (0.5 μ m) diaphragm surface finish	
G ⁽³⁾	15 μ in. (0.375 μ m) diaphragm surface finish	
6	Electropolishing	

(1) Clamp and Ethylene Propylene o-ring (conforms to 3-A standard 74 and USP class VI) supplied.

(2) Diaphragm brazed and Tig-welded to extension.

(3) Requires Option code 6, electropolishing.

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Sanitary Tank Spud Accessories

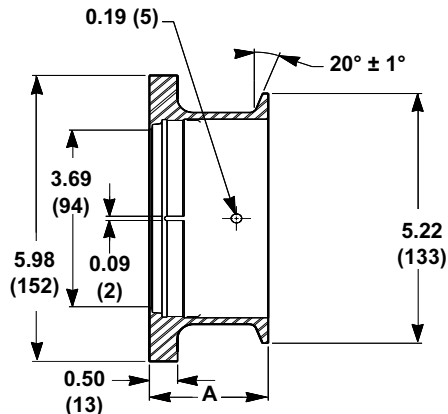
Tank Spud and Clamp



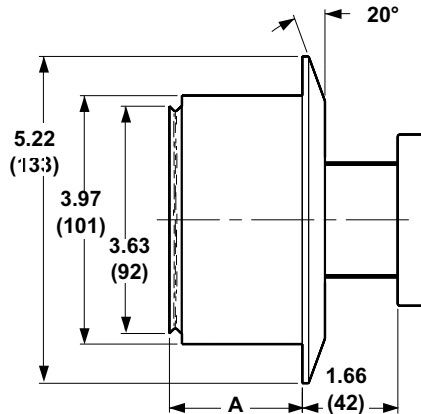
Rosemount 1151 with 1151 Direct Mount Sanitary Tank Spud with Tank Spud and Clamp



Tank Spud



Tank Spud Plug



Dimensions are in inches (millimeters)

TABLE 47. Sanitary Tank Spud Optional Accessories

Model	Description
1199-0061-	Sanitary Tank Spud ⁽¹⁾
Code	Size
0001	2 in.
0002	6 in.

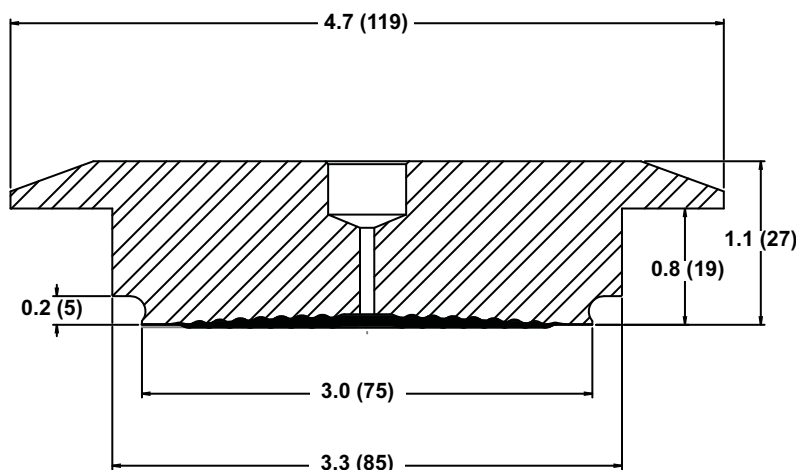
Model	Description
1199-0552-	Sanitary Tank Spud Plug
Code	Size
0001	2 in.
0002	6 in.

(1) Welding procedures and material certifications are shipped with the tank spud. Standard material is cast equivalent of 316L SST per ASTM- A351 grade CF3M.

TABLE 48. Sanitary Tank Spud Spare Parts

Part Number	Description
01199-0526-0002	Clamp
C531850070-0341	Ethylene Propylene O-ring

SANITARY THIN-WALL TANK SPUD (STW) SEAL



Dimensions are in inches (millimeters)

TABLE 49. Thin-Wall Tank Spud (STW) Seal Ordering Information

Code	Industry Standard
S	Sanitary (Conforms to 3-A Standard 74)
Code	Process Connection Style
STW ⁽¹⁾	Sanitary Thin Wall Tank Spud
Code	Maximum Working Pressure (Flange Rating)
B0	600 psig Maximum Working Pressure (41 bar) with supplied clamp and ethylene propylene O-ring
Code	Upper Housing/Diaphragm Material
LA	316 SST/316L SST
BB	Hastelloy C-276/Hastelloy C-276
Code	Other Wetted Material/Extensions
00	Not Applicable
Code	Options
P	Non-Sanitary Fill Fluid (Does not conform to 3-A Standard 74)
1	Tank Spud Included With Shipment
H	20 μ in. (0.5 μ m) R _a diaphragm surface finish
G ⁽²⁾	15 μ in. (0.375 μ m) R _a diaphragm surface finish
6	Electropolishing

(1) For tank walls up to $\frac{3}{16}$ -in. thick. Clamp and Ethylene Propylene o-ring supplied.

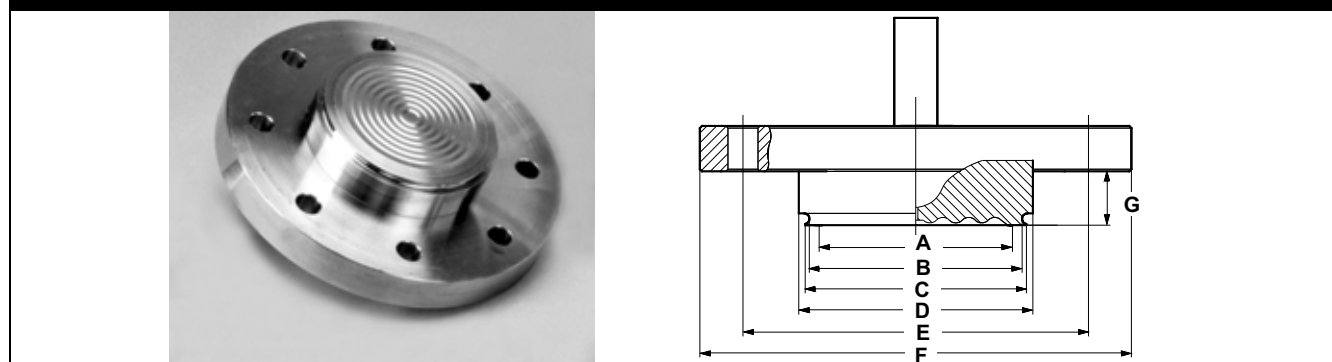
(2) Requires option code 6, electropolishing.

TABLE 50. Optional Accessories

Description	Part Number
Sanitary Thin-Wall Tank Spud	01199-0073-0001
Tri-Clamp	01199-0526-0004
Ethylene Propylene O-ring	53185-0070-0336

SANITARY FLANGED TANK SPUD EXTENDED (EES) SEAL

Dimensional Drawing for EES Sanitary Tank Spud Type: Extended Diaphragm Seal



		Dimensions (mm)						
DN	PN	A	B	C	D	E	F	G
50	40	72	73	76	82.5	125	165	25
80	40	89	98	102	108	160	200	25

Flanged Type Tank Spud

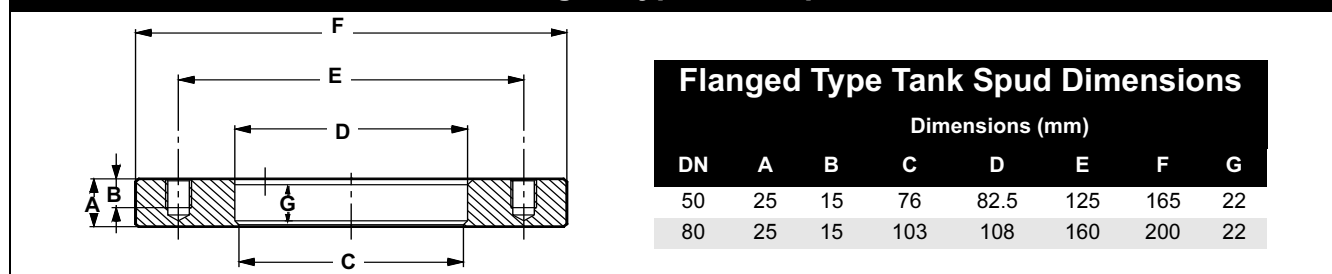


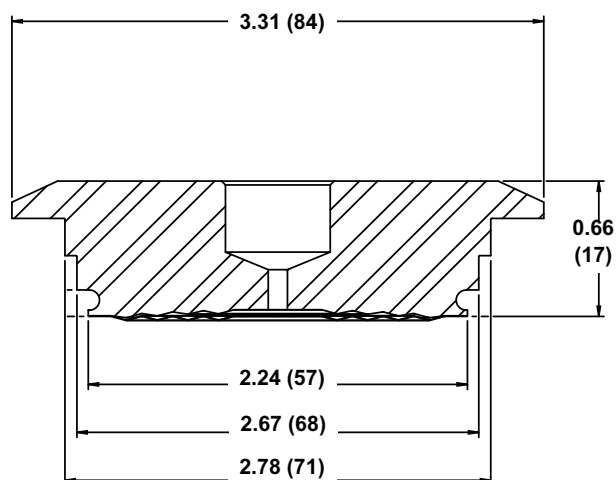
TABLE 51. Sanitary Flanged Tank Spud Type (EES) Seal Ordering Information⁽¹⁾

Code	Industry Standard	
S	Sanitary	
Code	Process Connection Style	
EES	Flanged Tank Spud Seal Type: Extended Diaphragm Seal (Supplied with ethylene propylene gasket)	
Code	Process Connection Size	Flange Pressure Rating
JG	DN 80	40 bar
GG	DN 50	40 bar
Code	Diaphragm ⁽²⁾	
LA	316L SST	
LB	Hastelloy C-276	
Code	Extension Length ⁽³⁾	
10	25 mm	
Code	Options (Multiple Selections)	
1	Viton [®] O-ring	
2	Tank spud counterpiece to be welded on tank: includes Ethylene-Propylene O-ring, stainless steel bolts, and washers	
B	Extra Fill for Cold Temperature Applications	
6	Electrolytical Polishing of Diaphragm Material	
7	Blind Plug for Tank Spud Counterpiece	

(1) Shaded areas indicate special orders. Consult an Emerson Process Management representative for availability, performance effects, and lead time.

(2) When ordering optional diaphragm materials, the standard housing material is 316L SST unless noted otherwise.

(3) Other extension lengths are available upon request.

VARIVENT COMPATIBLE CONNECTION (SVS) SEAL**Dimensional Drawing for Varivent Compatible Connection**TABLE 52. *Varivent* Compatible Sanitary (SVS) Seal Ordering Information

Code	Industry Standard
S	Sanitary
Code	Process Connection Style
SVS	Off-line <i>Varivent</i> compatible (maximum working pressure: 40 bar)
Code	Process Connection Size
V0	<i>Varivent</i> compatible standard connection only
Code	Diaphragm Material
LA00	316L SST
Code	Options (Multiple Selections)
6	Electrolytical polishing of diaphragm material
B	Extra Fill for Cold Temperature Applications

CHS HOMOGENIZER CLAMPING FLANGE TYPE (CHS) SEAL

Dimensional Drawings for CHS Homogenizer Clamping Flange Type

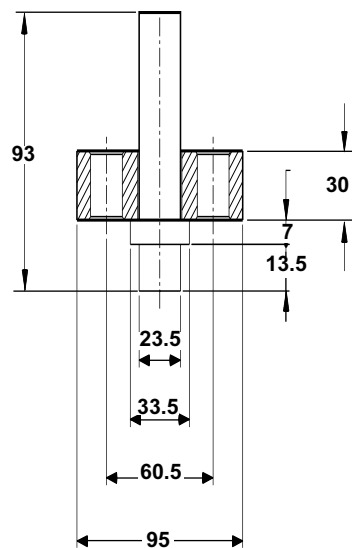


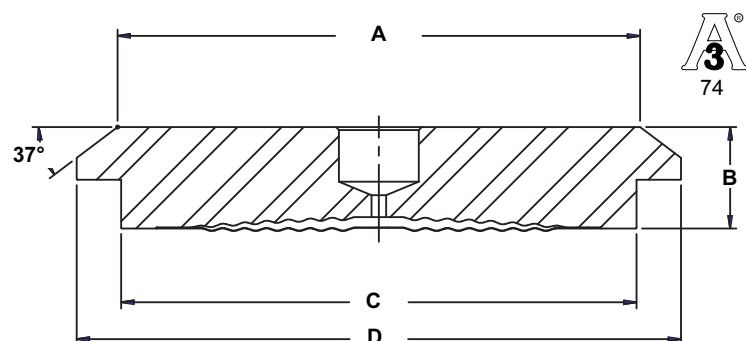
TABLE 53. Homogenizer Clamping Flange Type (CHS) Seal Ordering Information⁽¹⁾

Code	Process Connection Style
NCHS	Homogenizer Clamping Flange
Code	Process Connection Size
C	23,5 mm
Code ⁽²⁾	Pressure Rating
R	600 bar
Code	Diaphragm and Wetted Parts Material
LA00	316L SST
Code	Options (Multiple Selections)
V	PTFE Coated Diaphragm for nonstick purposes only (available with 316L SST and Hastelloy C-276 diaphragm only)
B	Extra Fill for Cold Temperature Applications

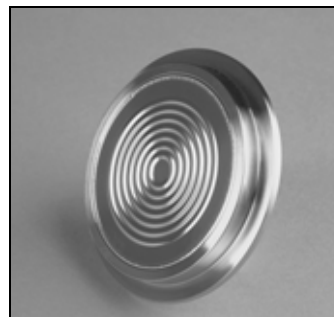
(1) Shaded areas indicate special orders. Please consult an Emerson Process Management representative for availability, performance effects, and lead time.

(2) Minimum span is 60 bar.

Cherry-Burrell "I" LINE (SHP) SEAL



Process wetted surface
finish max. Ra of 32 μ in



Diameter (Nominal)	Dimensions (in inches (millimeters))			
	"A"	"B"	"C"	"D"
2 in.	2.04 (52)	0.65 (17)	2.24 (57)	2.64 (67)
3 in.	3.35 (85)	0.65 (17)	3.30 (84)	3.87 (98)

TABLE 54. Cherry-Burrell "I" Line (SHP) Seals Ordering Information

Code	Industry Standard
S	Sanitary (Conforms to 3-A Standard 74)
Code	Process Connection Style
SHP ⁽¹⁾	Sanitary Cherry-Burrell "I" Line Style (Maximum Working Pressure 500 psig)
Code	Process Connection Size
50 ⁽²⁾	2 in.
70	3 in.
Code	Upper Housing/Diaphragm Material
AA	316 SST/316L SST
BB	Hastelloy C-276/Hastelloy C-276
Code	Lower Housing/Flushing Option
00	Not Applicable
Code	Options
P	Non-Sanitary Fill Fluid (Does not conform to 3-A Standard 74)

(1) Clamp and gasket furnished by user. Maximum working pressure is the lesser of either clamp pressure rating or 500 psi.

(2) Contact an Emerson Process Management representative for use with low calibrated spans.

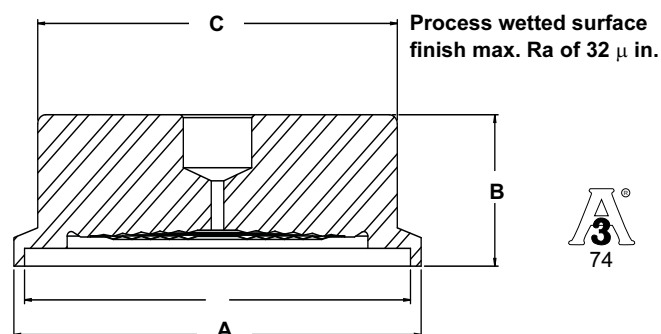
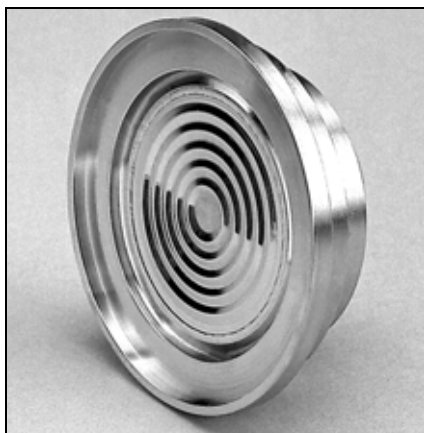
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ASEPTIC STYLE (APC) SEAL



Diameter (Nominal)	"A"	"B"	"C"	"D"
2 in.	3.05 (77)	1.0 (25)	2.69 (68)	2.89 (73)
3 in.	4.23 (107)	1.0 (25)	3.80 (97)	4.01 (102)

Dimensions are in inches (millimeters)

TABLE 55. Aseptic Style APC (SAP) Seal Ordering Information

Code	Industry Standard
S	Sanitary (Conforms to 3-A Standard 74)
Code	Process Connection Style
SAP	APC Style Seal ⁽¹⁾
Code	Process Connection Size
50 ⁽²⁾	2 in.
70	3 in.
Code	Upper Housing/Diaphragm Material
LA	316L SST / 316L SST
Code	Lower Housing/Flushing Option
00	Not Applicable
Code	Seal Options
P	Non-Sanitary Fill Fluid (Does not conform to 3-A Standard 74)

(1) Clamp and gasket furnished by user.

(2) Consult an Emerson Process Management representative for use with low calibrated spans.

DAIRY PROCESS CONNECTIONS— *FEMALE THREAD (DIN 11851 AND SMS) SEALS*

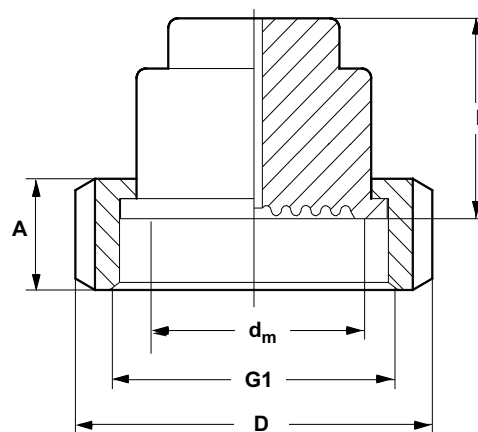


TABLE 56. Dairy Process Connection - **Female Thread** Dimensions

Standard	DN	PN	DIMENSIONS (mm)				
			A	b	d _m	G1	D
DIN 11851	40	40	21	45	40	Rd65×1/6	78
	50	40	22	46	57	Rd78×1/6	92
	65	40	25	47	59	Rd95×1/6	112
	80	40	29	47	76	Rd110×1/4	127
SMS	38	40	25	40	32	Rd60×1/6	74
	51	40	26	40	50	Rd70×1/6	84
	63.5	40	30	40	50	Rd85×1/6	100
	76	40	32	40	76	Rd98×1/6	114
IDF ⁽¹⁾							
RTJ ⁽¹⁾							

(1) Contact factory for dimensions.

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TABLE 57. Sanitary (SLS) Seals: Dairy Process Connection - **Female Thread** Ordering Information

Code	Industry Standard	
S	Sanitary	
Code	Process Connection Style	
SLS ⁽¹⁾⁽²⁾	Female Thread per DIN 11851	
Code	Process Connection Size	Maximum Working Pressure (Flange Rating)
F0	DN 40	40 bar
G0	DN 50	25 bar
J0	DN 80	25 bar
H0	DN 65	25 bar
Code	Diaphragm Material	Upper Housing Material
LA00	316L SST	316L SST (coupling nut 304L SST)
Code	Options (Multiple Selections)	
6	Electrolytical polishing of diaphragm material	
2	Counterpiece (tank/pipe spud) and Gasket	

(1) Shaded areas indicate special orders. Consult an Emerson Process Management representative for configuration availability, performance effects, and lead time.

(2) Available with welded capillary or direct mount connections only.

TABLE 58. Sanitary (SMS) Seals: Dairy Process Connection - **Female Thread** Ordering Information

Code	Industry Standard	
S	Sanitary	
Code	Process Connection Style	
SMS ⁽¹⁾⁽²⁾	Female Thread per SMS Standard	
Code	Process Connection Size	Maximum Working Pressure (Flange Rating)
30	DN 38 (1½ in.)	40 bar
50	DN 51 (2 in.)	25 bar
60 ⁽³⁾	DN 63.5	25 bar
70	DN 76	25 bar
Code	Diaphragm Material	Housing Material
LA00	316L SST	316L SST (coupling nut 304L SST)
LB00 ⁽⁴⁾	Hastelloy C-276	316L SST
Code	Options (Multiple Selections)	
6	Electrolytical polishing of diaphragm material	
2	Counterpiece (tank/pipe spud) and Gasket	

(1) Shaded areas indicate special orders. Consult an Emerson Process Management representative for configuration availability, performance effects, and lead time.

(2) Available with welded capillary or direct mount connections only.

(3) Process Connection Size Code 6 is not available with the SMS seal.

(4) Diaphragm/Housing Material code LB00 is available only with the SRS Seal.

DAIRY PROCESS CONNECTIONS—*MALE THREAD*

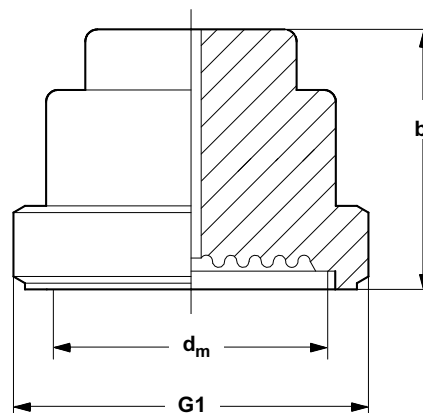
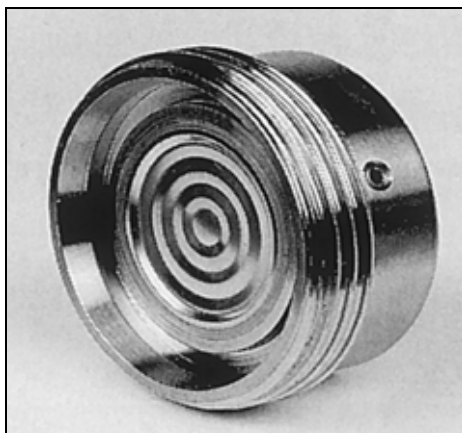


TABLE 59. Dairy Process Connections Male Thread Dimensions

Standard	DN	PN	DIMENSIONS (mm)		
			b	d _m	G1
DIN 11851	40	40	46	40	Rd65×1/6
	50	40	46	50	Rd78×1/6
	65	40	46	57	Rd95×1/6
	80	40	47	76	Rd110×1/4
SMS	38	40	47	40	Rd60×1/6
	51	40	47	50	Rd70×1/6
	63.5	40	47	57	Rd85×1/6
	76	40	47	76	Rd98×1/6
IDF ⁽¹⁾					
RTJ ⁽¹⁾					

(1) Consult the factory for dimensions.

Product Data Sheet

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TABLE 60. Sanitary (MLS) Seal: Dairy Process Connections - Male Thread Ordering Information

Code	Industry Standard	
S	Sanitary	
Code	Process Connection Style	
MLS ⁽¹⁾⁽²⁾	Male Thread per DIN 11851	
Code	Process Connection Size	Maximum Working Pressure (Flange Rating)
F0	DN 40	40 bar
G0	DN 50	25 bar
J0	DN 80	25 bar
H0	DN 65	25 bar
Code	Diaphragm Material	Upper Housing
LA00	316L SST	316L SST (coupling nut 304L SST)
Code	Options (Multiple Selections)	
6	Electrolytical polishing of diaphragm material	
2	Counterpiece (tank/pipe spud) and gasket	

(1) Shaded areas indicate special orders. Consult an Emerson Process Management representative for configuration availability, performance effects, and lead time.

(2) Available with welded capillary or direct connections only.

TABLE 61. Sanitary (MMS) Seal: Dairy Process Connections - Male Thread Ordering Information

Code	Industry Standard	
S	Sanitary	
Code	Process Connection Style	
MMS ⁽¹⁾⁽²⁾	Male Thread per SMS Standard	
Code	Process Connection Size	Maximum Working Pressure (Flange Rating)
30	DN 38 (1½ in.)	40 bar
50	DN 51 (2 in.)	25 bar
60	DN 63	25 bar
70	DN 76	25 bar
Code	Diaphragm Material and Wetted Parts	Upper Housing
LA00	316L SST	316L SST (coupling nut 304L SST)
LB00 ⁽³⁾	Hastelloy C-276	316L SST
Code	Options (Multiple Selection)	
6	Electrolytical polishing of diaphragm material	
2	Counterpiece (tank/pipe spud) and gasket	

(1) Shaded areas indicate special orders. Consult an Emerson Process Management representative for configuration availability, performance effects, and lead time.

(2) Available with welded capillary or direct mount connections only.

(3) Diaphragm/Housing Material code LB00 is available with the MRS seal only.

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Many other special order transmitter/seal configurations, materials and fill fluids are available that are not covered in this document. Contact your Rosemount representative or consult factory for additional information.

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