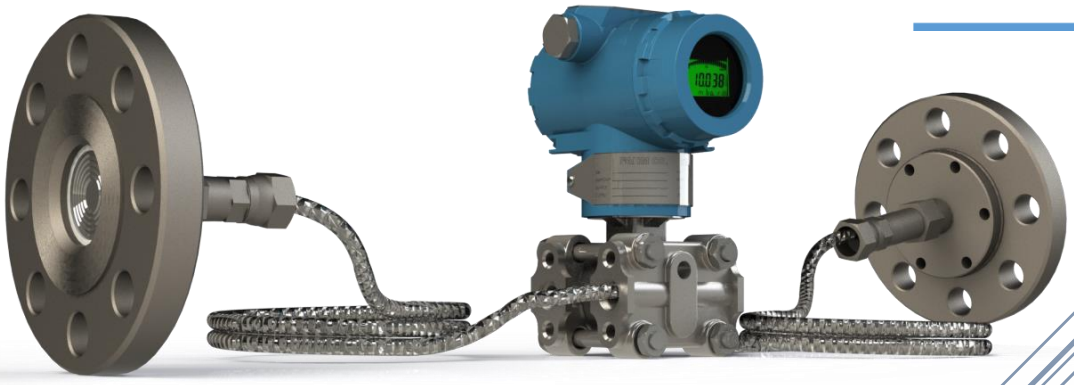
DIAPHRAGM / REMOTE SEAL

For Pressure Transmitter

LASER / TIG
Full Welded Construction



We proudly represent Diaphragm Seal products with hi-precision machining & welding.
Manufacturing Diaphragm with various materials.
Test report & calibration certificate

MADE IN IRAN
Manufactured by
FAHM Co.

INTRODUCTION

Modern chemical processing and process manufacturing procedures demand ever greater accuracy and reliability from their pressure, level and flow measuring instruments. This is important to minimize costs, and to keep production downtime and shut downs to an absolute minimum. In various situations it is necessary to isolate and therewith protect the pressure measuring instrument from the process medium in order to maintain the required accuracy and reliability objectives. This isolation or separation of the instrument and the process is typically done by means of Diaphragm Seals, to protect the vulnerable measuring instrument. This protection enhances the lifetime of the measuring instrument significantly.

This isolation is achieved by using a pressure-sensitive diaphragm made from a material resistant to the process medium enclosed in a system fitted to the base of the instrument.

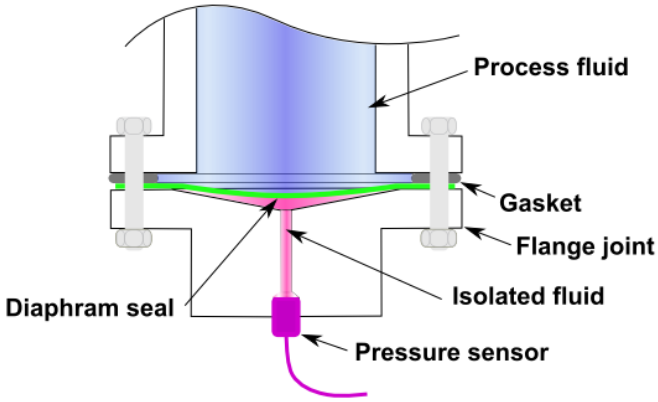
The space between the diaphragm and the measuring element in the instrument has to be evacuated under a vacuum and filled with a suitable fill fluid and sealed. The process pressure exerts a force on the outside face of the diaphragm. As the diaphragm flexes under this force it pushes inwards and attempts to compress the fill fluid within the instrument.

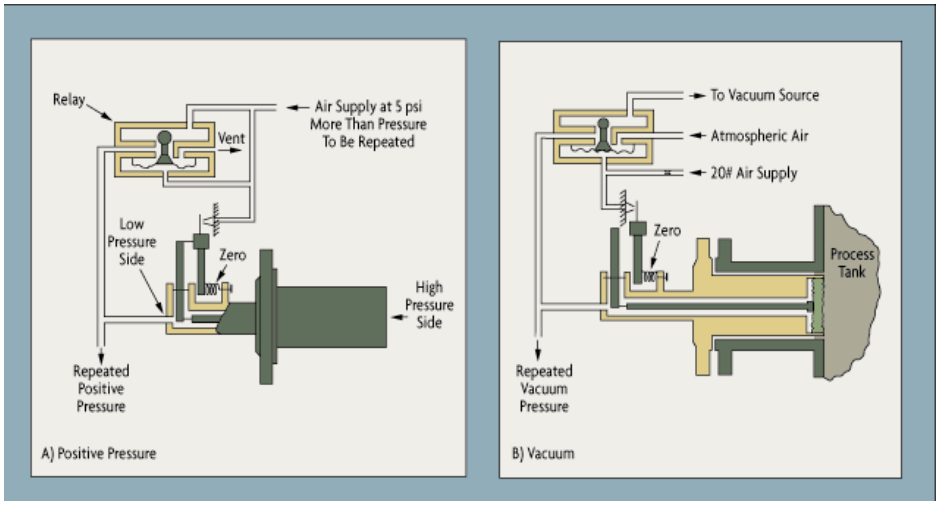
This fill fluid is designed to withstand compression so that the movement is channeled directly into the measuring element producing a resultant reading on the indicator.

For this process to work the displacement force of the diaphragm must exceed the force required to move the measuring element in the instrument itself. In practice this means that the smaller the force required to move the measuring element the easier it is to construct an accurate seal system.

OPERATING PRINCIPLE

A Diaphragm Seal System consists of a measuring instrument, typically a pressure transmitter or pressure gauge, with one or two Diaphragm Seals and either a direct mount construction or with capillary lines, filled with a fill fluid. A correctly prepared and filled Diaphragm Seal System will accurately transfer process pressure on the diaphragm to the sensing element of the measuring instrument. This is based on Pascal's principle which states that a pressure exerted on a fluid is transmitted undiminished through that fluid in every direction. The figures presents a schematic overview of this operating principle:





WHEN TO USE DIAPHRAGM SEALS

Diaphragm Seals are typically used to protect the measuring instrument. There are many different situations in which a Diaphragm Seal should be typically considered:

Corrosive medium: When the process medium is corrosive it would chemically attack the wetted parts of a standard pressure measuring instrument.

Viscous medium: When the process medium is highly viscous or contains solid particles, either of which could result in the instrument's pressure inlet getting blocked.

Solidification: When the process medium is prone to solidification, crystallization and/or polymerization over time. The medium may freeze when the temperature drops, it may set as it dries, or it may be subject to polymerization. In these situations the pressure inlet can get blocked.

High/low temperatures: When the process medium temperature is very high or very low and exceeds the temperature limits of the pressure measuring instrument resulting in damaged measurement instruments.

Sanitary requirements: When the process is easily affected by the formation of bacteria on or in the process connection. The presence of bacteria in the process medium can lead to rejection of production batches. These applications where hygiene is of paramount importance are often found in the pharmaceutical, food and beverage industry.

Specific process connections: When the location of the pressure measurement is not suitable for a direct mounting of a pressure measuring instrument. A diaphragm with remote mounting, by means of capillary, ensures easy visual check of the instrument.

Replacing 'wet legs': As a substitution for so-called 'wet legs' for liquid level measurements in pressure retaining tanks.

Hydrogen permeation: Also Diaphragm Seals are used when in the process there is a chance of presence of hydrogen ions (H+) that can permeate the diaphragm. In those cases, a diaphragm seal with gold plating offers the required protection.

PERFORMANCE CONSIDERATIONS

Mounting a Diaphragm Seal to a pressure instrument changes the performance of the instrument. The Diaphragm Seal System will have additional temperature effects and response time depending on the system configuration. The performance of the entire Diaphragm Seal System needs to be evaluated when specifying a new application to ensure satisfactory performance when mounted in process.

System volume: The fill volume in the Diaphragm Seal System needs to be minimized as much as possible. The more volume in the system, the higher the (potential) effect of temperature. For better performance always keep the system volume as small as possible, for instance by keeping capillaries as short as possible. Also it is advised not to use different capillary lengths at HP and LP of a DP measurement.

Mounting effect: The mounting effect on a Diaphragm Seal System is the variation in the pressure represented by the vertical fill fluid column between the Diaphragm Seal and the instrument, due to the variation of the gravity of the fill fluid as a result of ambient temperature deviation.

Zero shift: The most common application of Diaphragm Seals is a level measurement. Proper ranging of a transmitter for level service requires considering the specific gravity of both the fill fluid and the process fluid, and the transmitter range.

Temperature effect: Changes in volume of the Diaphragm Seal System are referred to as temperature effects. They are caused by changes in volume and density of the fluid in the system and occur when the fill fluid expands or contracts caused by fluctuations of the process and/or ambient temperatures. This change in fill volume drives a change in the internal pressure of the Diaphragm Seal System.

Diaphragm characteristics: The characteristics of the diaphragm itself are important for the performance. In general, a larger diaphragm diameter allows for more flexibility and is more sensible to changes in the volume due to temperature influences. Other diaphragm characteristics as the material, the thickness of the diaphragm as well as the convolution pattern, are an important factor as they all have an effect on the performance of the Diaphragm Seal System.

Fill fluid characteristics: Each fill fluid has its own characteristics, such as density, viscosity, thermal expansion, and vapor pressure. These characteristics are influenced by the systems pressure and temperature and determine the performance of the Diaphragm Seal System. The selection of the fill fluid depends on factors such as temperature, pressure, volume to be displaced (response time) and process safety. Most used fill fluids are silicone oil, glycerin, or vegetable oils. Also special inert fill fluids, such as Halocarbon® for chloride and oxygen applications and other special filling fluids for high temperatures (up to 410 °C) are used.

APPLICATION

Knowing in which situations to install a diaphragm seal rather than a standard instrument is critical to maintaining the integrity of the process. A diaphragm is usually required under the following circumstances.

- The process medium is corrosive, and would chemically attack the working parts of a standard pressure gauge or transmitter.
- The process medium is viscous or contains solid particles, either of which could result in the gauge's pressure inlet becoming blocked and preventing any pressure from reaching the measuring element.
- The process medium is prone to solidifying over time (e.g. it may freeze as the temperature drops, or it may set as it dries, or it may be subject to polymerization), in which case a standard gauge's internal moving parts could be rendered immobile.
- It is important to eliminate the formation of bacteria on or in the process connection in applications where hygiene is of paramount importance such as in the food and beverage industries.

POTENTIAL PROBLEMS WHEN SELECTING A DIAPHRAGM SEAL

Avoiding common mistakes will improve your chances of successfully selecting and installing a diaphragm seal.

- Diaphragm displacement is incompatible with the required displacement volume of the instrument's measuring element. The diaphragm is too small or too stiff to allow for natural thermal expansion of the fill fluid, leading to zero shifts and false pressure readings.
- The process or ambient temperatures exceed the acceptable service range of the fill fluid.

DIAPHRAGM SEAL PRESSURE SPECIFICATIONS

The size of the diaphragm defines the minimum pressure range that the Diaphragm Seal can handle. Apart from the diameter, the flexibility of the diaphragm is also related to the shape and number of convolutions, the material, and its thickness. FAHM Co. diaphragms have standard thickness of 100 µm. The Ø dimensions mentioned are values for the active diameters of the diaphragms i.e. the outside diameter of the outer convolution.

FAHM Co. Diaphragm Seals have a maximum static pressure effect of 0,25% of calibrated DP span on top of the standard differential pressure transmitter specifications with regard to static pressure effects. In general the total effect is < 0,5% of calibrated DP span.

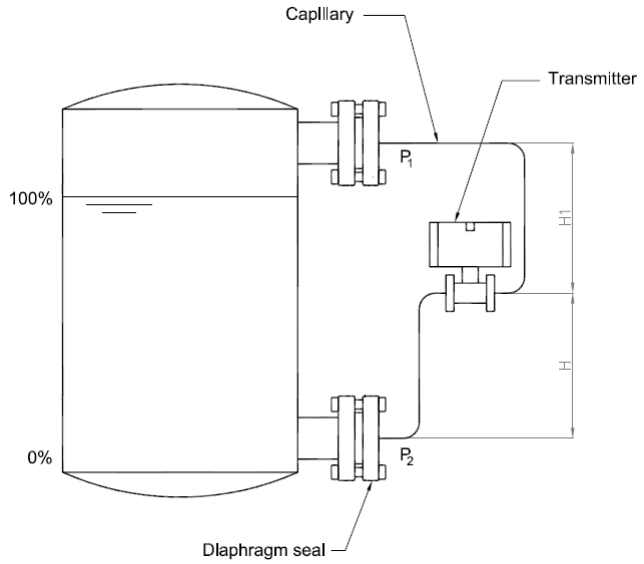
The following table presents an overview of the diaphragm size and the related pressure characteristics:

DIFFERENTIAL PRESSURE APPLICATIONS

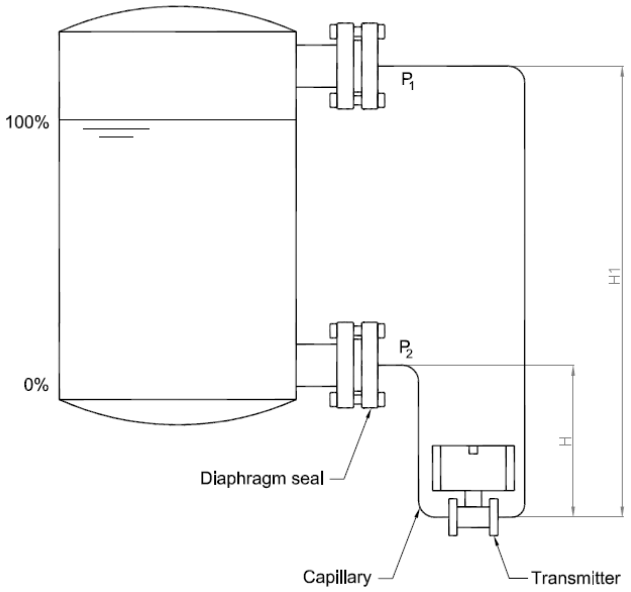
Differential pressure applications can be used for various purposes: differential pressure, level, flow, density, and interface measurements. There are three different mounting styles for level to be recognized, depending on the position of the instrument compared to the Diaphragm Seal.

- DP STYLE 1: instrument between the Diaphragm Seals
- DP STYLE 2: instrument below the Diaphragm Seals
- DP STYLE 3: instrument above the Diaphragm Seals

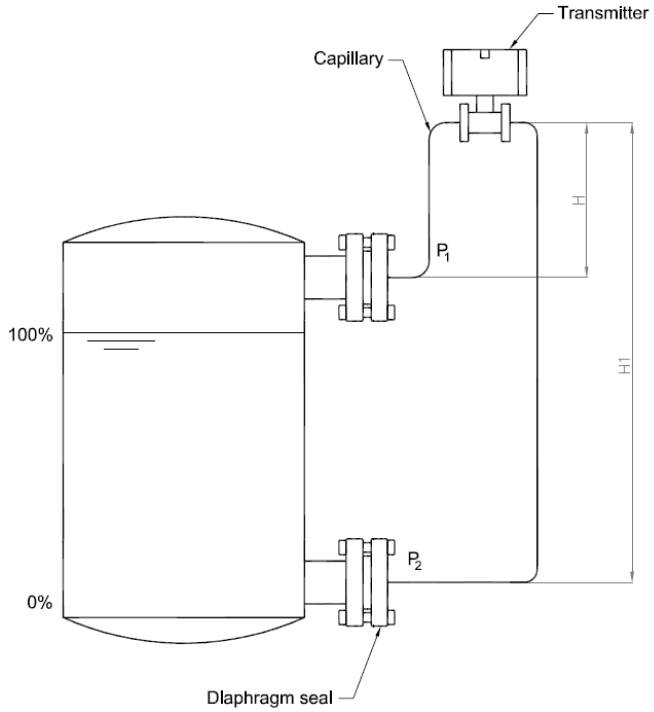
DP Style 1: instrument between the Diaphragm Seals



DP Style 2: instrument below the Diaphragm Seals



DP Style 3: instrument above the Diaphragm Seals



GAUGE PRESSURE APPLICATIONS

Gauge pressure applications can be used for pressure, level, and density measurement. Also for this application there are three different styles to be recognized depending on the position of the instrument compared to the Diaphragm Seal.

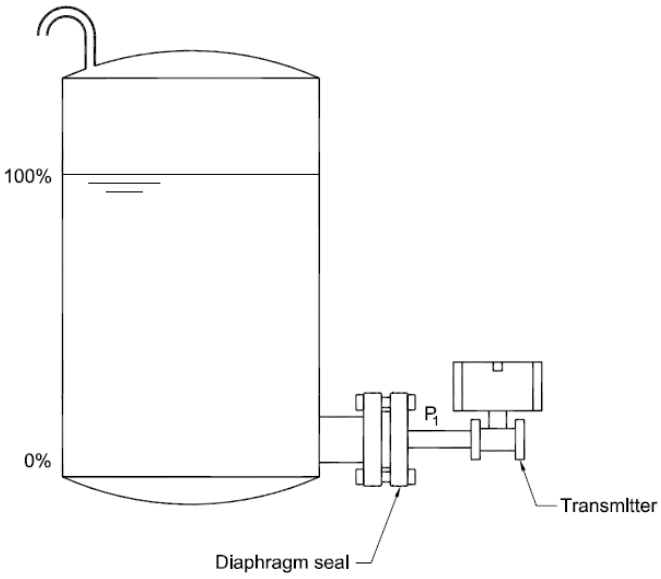
GP STYLE 1: instrument equal to the Diaphragm Seal

GP STYLE 2: instrument below the Diaphragm Seal

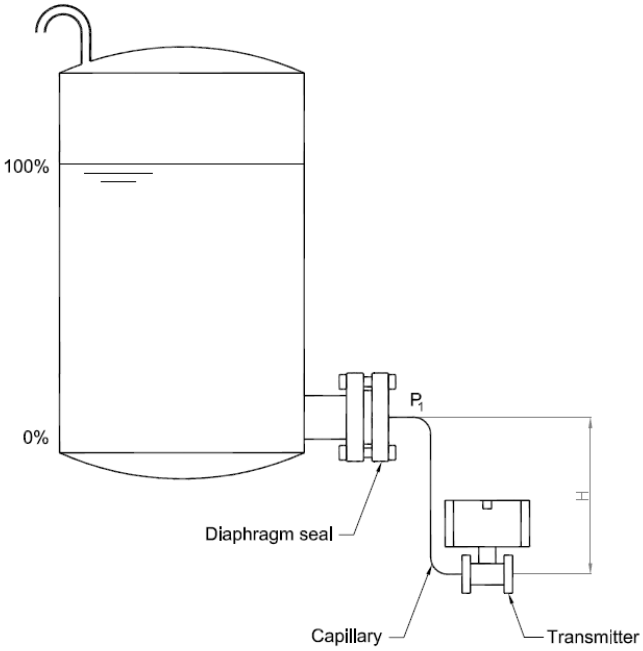
GP STYLE 3: instrument above the Diaphragm Seal

The effect of the mounting on a GP instrument is similar as described for the DP instrument. When an instrument is placed above the seal, it will sense this as a negative pressure and that pressure, in combination with the minimum operating pressure, should not exceed a value below absolute zero. The Diaphragm Seal System would be damaged in a similar way as described for DP applications.

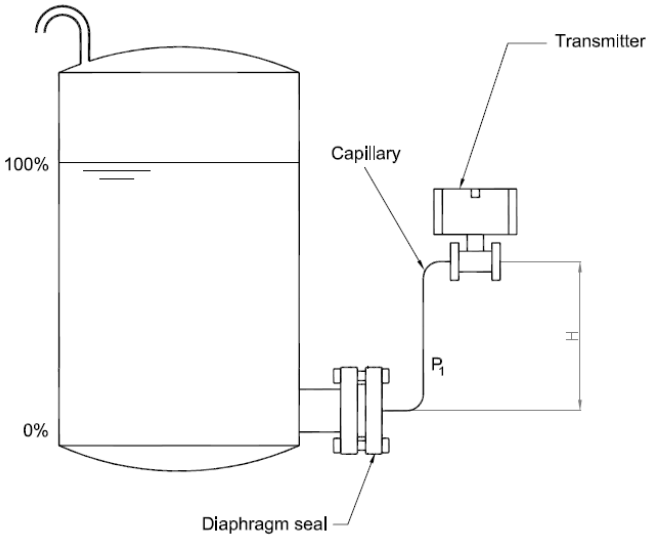
GP Style 1: instrument equal to the Diaphragm Seal



GP Style 2: instrument below the Diaphragm Seal



GP Style 3: instrument above the Diaphragm Seal



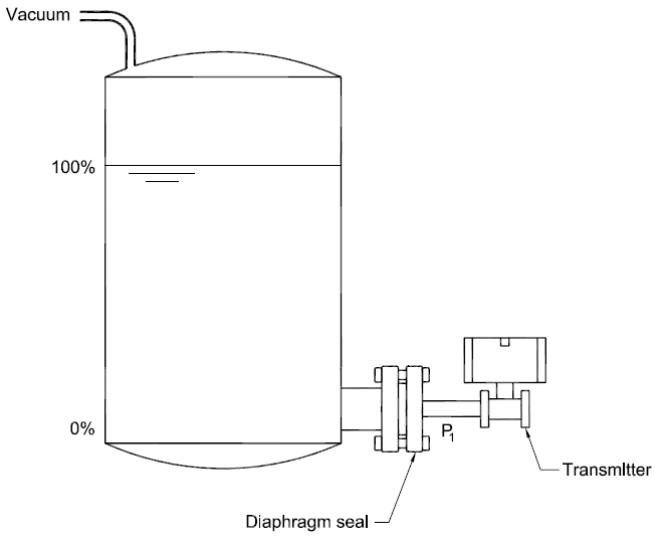
ABSOLUTE PRESSURE APPLICATIONS

Absolute pressure applications are only used to measure pressure. For this application there can be also three different styles recognized depending on the position of the instrument compared to the Diaphragm Seal.

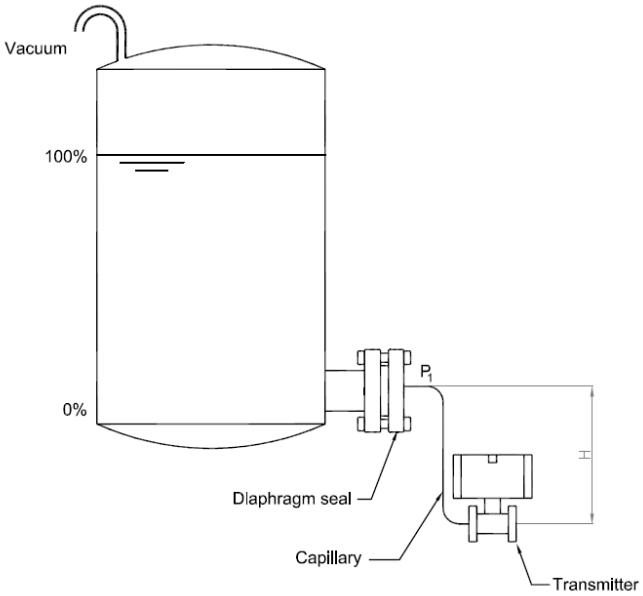
AP STYLE 1: instrument equal to the Diaphragm Seal
AP STYLE 2: instrument below the Diaphragm Seal
AP STYLE 3: instrument above the Diaphragm Seal

For absolute pressure measurement the instrument should be mounted below the diaphragm seal in order to protect the instrument at all possible conditions. This is presented in AP Style 2. If for example H=50cm the pressure on the instrument is already above 50 mbar. With this mounting style the instrument has additional protection before it reaches absolute zero. AP Style 1 is also possible, but not preferred as there is no additional protection so it is possible to reach the absolute zero and damage the application.

AP Style 1: instrument equal to the Diaphragm Seal

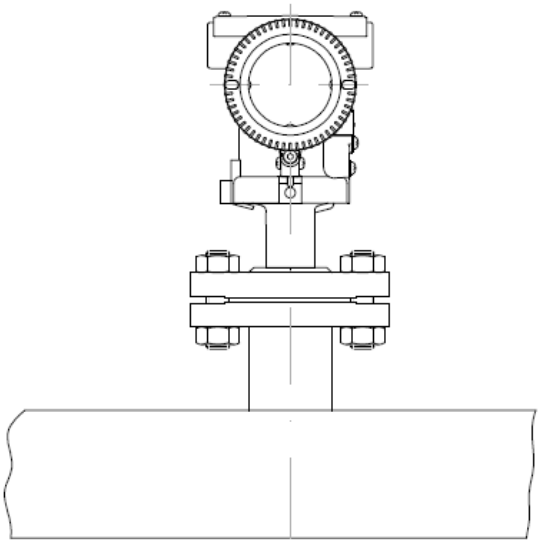


AP Style 2: instrument below to the Diaphragm Seal

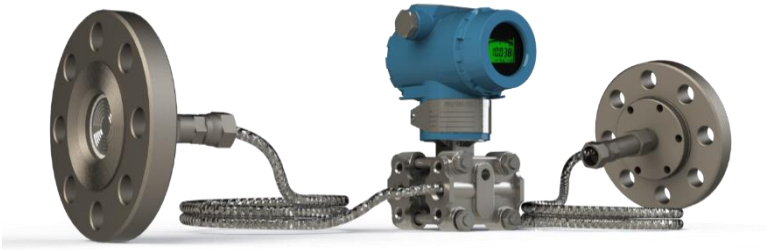


Mounting the instrument above the Diaphragm Seal (AP Style 3) will damage the Diaphragm Seal System in a similar way as described under DP applications. Care should also be taken, when an instrument is direct mounted on the Diaphragm Seal and installed as shown in AP Style 3. As a standard, FAHM Co. uses a distance tube of 80 mm. With a silicon BSO fill fluid, this will created a negative pressure of approximately 8 mbar at the pressure sensor. When the absolute pressure runs below 8 mbar, the Diaphragm Seal or instrument will be damaged.

AP Style 3: instrument above to the Diaphragm Seal



FT3351 Series

		
Gage+Direct +Heat Sink+Ext. Tube	**Gage+Direct +Extension Tube**	**Differential +Direct +Heat Sink+Extension Tube**
		
Differential +Two Capillary Hi & Low Pressure	**Gage+Capillary+Ext. Tube+Brucket Mounting**	
		
Differential +Two Capillary Hi & Low Pressure + Thermal Compensator		

POTENTIAL PROBLEMS WHEN SELECTING A DIAPHRAGM SEAL

Avoiding common mistakes will improve your chances of successfully selecting and installing a diaphragm seal.

• Diaphragm displacement is incompatible with the required displacement volume of the instrument's measuring element.

The diaphragm is too small or too stiff to allow for natural thermal expansion of the fill fluid, leading to zero shifts and false Pressure readings.

• The process or ambient temperatures exceed the acceptable service range of the fill fluid.

• In differential pressure applications, very small differential readings may not be possible owing to the amount of force

Required to drive the diaphragm and the measuring element.

• Also in differential pressure applications, if a system has grossly imbalanced volumes on either side of the instrument this may lead to unacceptable zero shifting owing to thermal expansion or contraction.

• The fill fluid inertia (static head pressure) is greater than the force required to move the measuring element.

• The length and internal diameter of capillary in combination with the fill fluid viscosity create resistance, driving up system response time to unacceptable levels.

• The process temperature can influence the ambient temperature close to the process. If the instrument is positioned too close to the process this may lead to unacceptable reading errors.

• Care should be taken when specifying a seal system for measuring a vacuum or high vacuum pressure. While they perform normally for most standard vacuum applications, as the pressure moves closer to a perfect vacuum, acceptable accuracy levels become more difficult to achieve. This is due to the fact that most fill fluids contain microscopic amounts of air or trapped gases, which tend to expand significantly as a pressure of absolute zero is reached.

FUNCTIONAL CHARACTERISTICS

Accuracy: at 20°C ±0.1% … 1% according to the chemical seal. Those values must be added to the accuracy class of the indicating instrument. The accuracy of vacuum however cannot be guaranteed beyond -0.85 bar in the standard executions. This is due to the fact that most filling fluids contain microscopic amounts of air or trapped gases, which tend to expand significantly as a pressure of absolute zero is approached. This expansion effects the measuring element in the instrument.

Process fluid temperature: minimum -80°C, max +399°C, according to the type of filling fluid used and of the material of diaphragm and of the process connection.

Diaphragm seal with flange connection & flush diaphragm

Diaphragm seals of flange design

for gage and absolute pressure, directly fitted on transmitter

Technical specifications
Diaphragm seals (flange design) for pressure and absolute pressure,
Directly fitted on a transmitter

Nominal Diameter Nominal Pressure

• DN 50	PN 10-40, PN 100
• DN 80	PN 10-40, PN 100
• DN 100	PN 16, PN 40
• 2 inch	Class 150, class 300, class 600, class 1500
• 3 inch	Class 150, class 300, class 600, class 900
• 4 inch	Class 150, class 300, class 400
• 6 inch	Class 150

Sealing face

• For stainless steel, mat. No.	To EN 1092-1, form B1 or ASME1.4404/316LB16.5 RF 125 ... 250 AA
• For the other materials	Smooth to EN 1092-1, form B2 or ASME B16.5 RFSF

Materials

• Main body	Stainless steel 316L
• Wetted parts	Stainless steel 316L
• Without foil	
• Capillary	Stainless steel, 1.4571/316Ti

Maximum pressure	See above and the technical data of the transmitter
Tube length	• Without tube • 50 mm (1.97 inch) • 100 mm (3.94 inch) • 150 mm (5.91 inch) • 200 mm (7.87 inch)

Capillary

• Length	Max. 10 m (32.8 ft), longer lengths on request
• Internal diameter	2 mm (0.079 inch)
• Minimum bending radius	150 mm (5.9 inch)

Filling liquid	• Silicone oil DC200 • Silicone oil DC704

Permissible ambient temperature Dependent on the pressure transmitter and the filling liquid of the remote seal.
More information can be found in the technical data of the pressure transmitters and in the section "Technical data of filling liquid" in the Technical description to the remote seals.

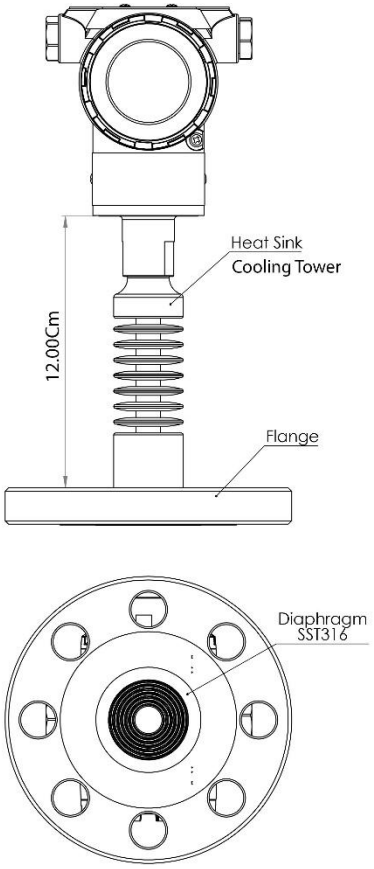
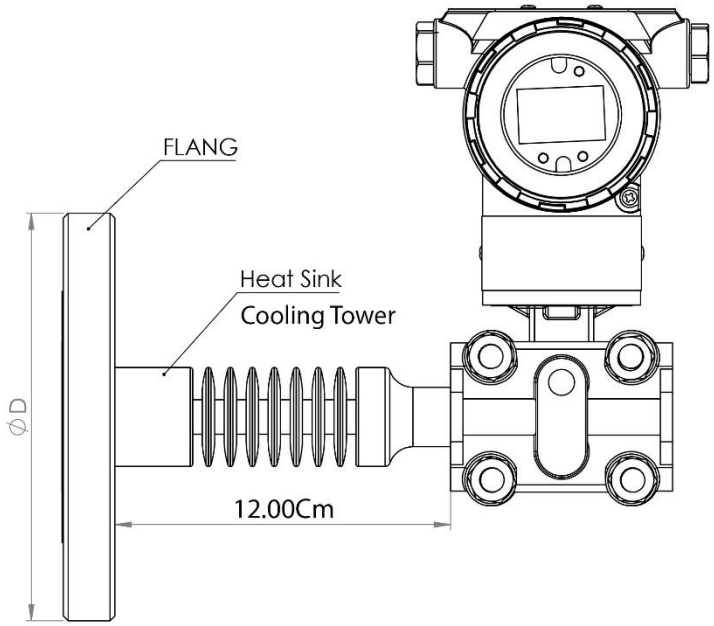
Weight Approx.	4 kg (8.82 lb)

Order Code Remote/Diaphragm Seal

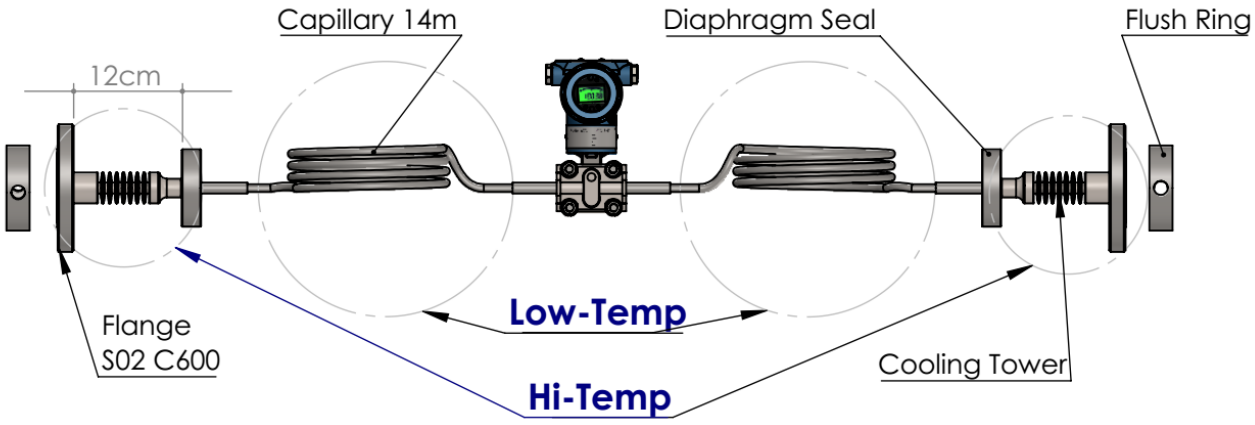
Fahm.Co Remote Seal	**FRS-**	
Flange Type		
Flat Flange Type:	F	
Extension Flange Type:	E	
Raised Flange Type	R	
Sandwich Seal Type	S	
Flange Size		
XXX: Size of Flange for DN Flanges Y: Size of Flange for ANSI Flanges	DN[xxx]	S[y]
Pressure Rating		
xxx: Pressure Rating for DN Flanges yyy: Class Rating for ANSI Flanges	PN[xxx]	C[yyy]
Facing Type		
Flat Face	FF	
Raised Face	RF	
Ring Type Joint	RTJ	
Wetted parts materials (Flanges, Connections/Fittings, Tubes)		
Stainless steel 316L	A	
Special Version	Z	
Diaphragm Material		
316L SS	2	
Titanium GR-3	3	
Alloy C-276 (Hastelloy)	4	
Tantalum (Pure)	5	
Alloy-400 (Monel)	6	
Extension Tube Length (mm)		
Without Extension tube	T0	
Extension Tube length: ...	T [xx]	
Filling liquid		
Silicone oil DC 200 (General purpose)	F1	
Silicone oil DC 704 (High temperature)	F2	
Capillary / Direct length(cm)		
Direct (Without Capillary)	D [xx]	(Standard 12cm)
Capillary Length	L [yyy]	
Option		
Heat Sink Interface	H	
Capillary with Thermal Compensator	TC	
Flushing Ring	R	

Sample Code	**FRS- F S02 C300 RF A T0 F1 L200** **FRS- E DN50 PN16 FF A T0 F2 DH**

Direct Mount Dimensional Drawings

FT3351CG + Heat Sink	FT3351CD + Heat Sink
	

FT3351CD + Thermal Compensator



FLAT FLANGE TYPE DIAPHRAGM SEALS

These types of diaphragm seals are designed for either direct mounting on the process flange or by clamping the seal between process flange and a cover flange.

They are available in all kinds of international flange standards, ASME B16.5, EN1092-1

The BF construction has a seal body that is made of a blind flange. The weld of the diaphragm to the seal body is a wetted part and therefore diaphragm materials are mostly chosen the same as the flange material. The BF is typically used in combination with (differential) pressure transmitters for applications such as level, flow and (absolute) pressure measurement.

STANDARD EXECUTION

DIAPHRAGM	BODY	MOUNTING CONNECTION
AISI 316(L)	**AISI 316(L)**	**top (axial)**

FLANGED PROCESS CONNECTIONS

Diaphragm Dia. Ø
For Process Connections

Ømm	Flange	Flange
65	DN50	2
89	DN80	3
89	DN100	4

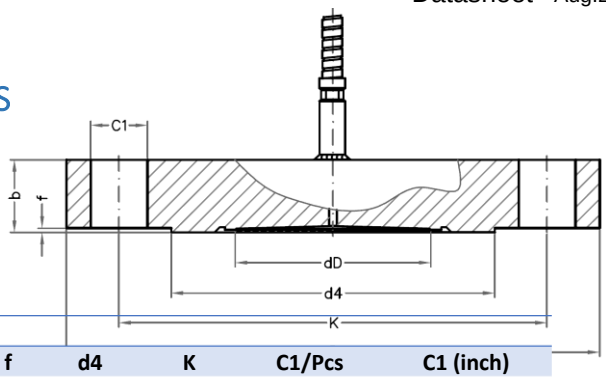
EN 1092-1

Size	Rating Class	Diaphragm Ømm
DN25	PN10-PN100	46
DN40	PN10-PN100	46
DN50	PN10-PN100	65
DN80	PN10-PN100	89
DN100	PN10-PN100	89

ASME B16.5

Size	Rating Class	Diaphragm Ømm
1"	150-2500	46
1.5"	150-2500	46
2"	150-2500	65
3"	150-2500	89
4" – 6"	150-2500	89

DRAWING AND DIMENSIONS STANDARD EXECUTIONS



ASME B16.5 - RF FACING

Size	Rating	Facing	dD	b	D	f	d4	K	C1/Pcs	C1 (inch)
1"	cl. 150	RF	32	15	110	2	51	80	16/4x	5/8”
1"	cl. 300	RF	32	18	125	2	51	89	19/4x	3/4"
1"	cl. 400-600	RF	32	25	125	7	51	89	19/4x	3/4"
1"	cl. 900-1500	RF	32	36	150	7	51	102	25/4x	1"
1"	cl. 2500	RF	32	42	160	7	51	108	25/4x	1"
1,5"	cl. 150	RF	44	18	125	2	73	99	16/4x	5/8"
1,5"	cl. 300	RF	44	21	155	2	73	114	22/4x	7/8"
1,5"	cl. 400-600	RF	44	29	155	7	73	114	22/4x	7/8"
2"	cl. 150	RF	65	19	152	2	92	121	19/4x	3/4"
2"	cl. 300	RF	65	22.5	165	2	92	127	19/8x	3/4"
2"	cl. 400-600	RF	65	25.4	165	7	92	127	19/8x	3/4"
2"	cl. 900-1500	RF	65	45	215	7	92	165	25/8x	1"
2"	cl. 2500	RF	65	58	235	7	92	171	29/8x	1 1/8"
3"	cl. 150	RF	89	24	190	2	127	152	19/4x	3/4"
3"	cl. 300	RF	89	29	210	2	127	168	22/8x	7/8"
3"	cl. 400-600	RF	89	39	210	7	127	168	22/8x	7/8"
3"	cl. 900	RF	89	45	240	7	127	191	25/8x	1"
3"	cl. 1500	RF	89	55	265	7	127	203	32/8x	1 1/4"
3"	cl. 2500	RF	89	74	305	7	127	229	35/8x	1 3/8"
4"	cl. 150	RF	89	24	230	2	157	191	19/8x	3/4"
4"	cl. 300	RF	89	32	255	2	157	200	22/8x	7/8"
4"	cl. 400	RF	89	42	255	7	157	200	25/8x	1"
4"	cl. 600	RF	89	45	275	7	157	216	25/8x	1"
4"	cl. 900	RF	89	52	290	7	157	235	32/8x	1 1/4"
4"	cl. 1500	RF	89	61	310	7	157	241	35/8x	1 3/8"
4"	cl. 2500	RF	89	81	355	7	157	273	42/8x	1 5/8"

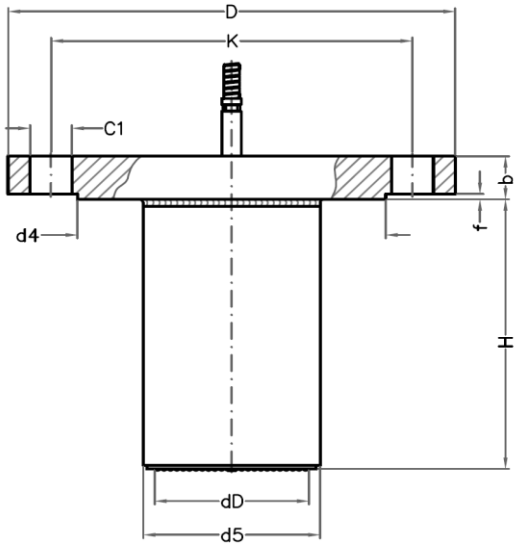
All dimensions in mm

EN 1092-1 Type B1

Size	Rating	Type	dD	b	D	f	d4	K	C1/Pcs	C1 (inch)
DN25	PN10-40	B1	32	15	110	2	51	80	16/4x	5/8”
DN25	PN63	B1	32	18	125	2	51	89	19/4x	3/4"
DN25	PN100	B1	32	25	125	7	51	89	19/4x	3/4"
DN40	PN10-40	B1	44	36	150	7	51	102	25/4x	1"
DN40	PN63	B1	44	42	160	7	51	108	25/4x	1"
DN40	PN100	B1	44	18	125	2	73	99	16/4x	5/8"
DN50	PN10-40	B1	65	21	155	2	73	114	22/4x	7/8"
DN50	PN63	B1	65	29	155	7	73	114	22/4x	7/8"
DN50	PN100	B1	65	39	180	7	73	124	29/4x	1 1/8"
DN80	PN10-40	B1	89	52	205	7	73	146	32/4x	1 1/4"
DN80	PN63	B1	89	20	150	2	92	121	19/4x	3/4"
DN80	PN100	B1	89	23	165	2	92	127	19/8x	3/4"
DN100	PN10-16	B1	89	32	165	7	92	127	19/8x	3/4"
DN100	PN25-40	B1	89	45	215	7	92	165	25/8x	1"
DN100	PN63	B1	89	58	235	7	92	171	29/8x	1 1/8"
DN100	PN100	B1	89	24	190	2	127	152	19/4x	3/4"

All dimensions in mm

EXTENDED FLANGE TYPE



ASME B16.5 - RF FACING

Size	Rating	Facing	dD	D5	b	D	f	d4	H	K	C1/Pcs	C1 (inch)
2"	cl. 150	RF	65	76	20	152	2	92	50, 100 or 150	121	19/4x	3/4"
2"	cl. 300	RF	65	76	23	165	2	92	50, 100 or 150	127	19/8x	3/4"
2"	cl. 600	RF	65	76	26	165	7	92	50, 100 or 150	127	19/8x	
3"	cl. 150	RF	89	100	24	190	2	127	50, 100 or 150	152	19/4x	3/4"
3"	cl. 300	RF	89	100	29	210	2	127	50, 100 or 150	168	22/8x	7/8"
3"	cl. 600	RF	89	100	74	210	7	127	50, 100 or 150	168	35/8x	1 3/8"
4"	cl. 150	RF	89	100	24	230	2	157	50, 100 or 150	191	19/8x	3/4"
4"	cl. 300	RF	89	100	32	255	2	157	50, 100 or 150	200	22/8x	7/8"

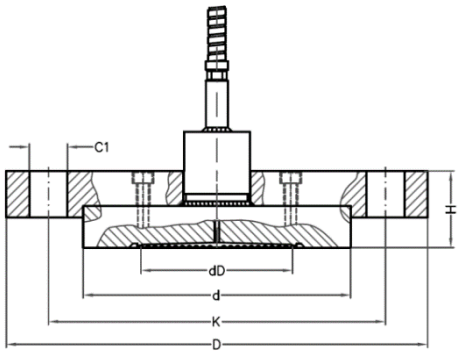
All dimensions in mm

EN 1092-1 Type B1

Size	Rating	Type	dD	D5	b	D	f	d4	H	K	C1/Pcs
DN 50	PN16	B1	65	76	15	165	3	102	50, 100 or 150	125	18/4x
DN 50	PN40	B1	65	76	18	165	3	102	50, 100 or 150	125	18/4x
DN 50	PN63	B1	65	76	23	180	3	102	50, 100 or 150	135	22/4x
DN 50	PN100	B1	65	100	27	195	3	102	50, 100 or 150	145	26/4x
DN 80	PN16	B1	89	100	17	200	3	138	50, 100 or 150	160	18/8x
DN 80	PN40	B1	89	100	21	200	3	138	50, 100 or 150	160	18/8x
DN80	PN63	B1	89	100	25	215	3	138	50, 100 or 150	170	22/8x
DN80	PN100	B1	89	100	33	230	3	138	50, 100 or 150	180	26/8x
DN 100	PN16	B1	89	100	17	220	3	158	50, 100 or 150	180	18/8x
DN 100	PN40	B1	89	100	24	235	3	162	50, 100 or 150	190	22/8x

All dimensions in mm

RAISED FLANGE TYPE



ASME B16.5 - RF FACING

Size	Rating	Facing	dD	H	D	d	K	C1/Pcs	C1 (inch)
1"	cl. 150	RF	32	27	110	51	80	16/4x	5/8”
1"	cl. 300	RF	32	30	125	51	89	19/4x	3/4"
1"	cl. 400-600	RF	32	32	125	51	89	19/4x	3/4"
1"	cl. 900-1500	RF	32	43	150	51	102	25/4x	1"
1"	cl. 2500	RF	32	49	160	51	108	25/4x	1"
1,5"	cl. 150	RF	44	30	125	73	99	16/4x	5/8"
1,5"	cl. 300	RF	44	33	155	73	114	22/4x	7/8"
1,5"	cl. 400-600	RF	44	36	155	73	114	22/4x	7/8"
1,5"	cl. 900-1500	RF	44	46	180	73	124	29/4x	1 1/8"
1,5"	cl. 2500	RF	44	59	205	73	146	32/4x	1 1/4"
2"	cl. 150	RF	65	32	150	92	121	19/4x	3/4"
2"	cl. 300	RF	65	35	165	92	127	19/8x	3/4"
2"	cl. 400-600	RF	65	44	165	92	127	19/8x	3/4"
2"	cl. 900-1500	RF	65	57	215	92	165	25/8x	1"
2"	cl. 2500	RF	65	70	235	92	171	29/8x	1 1/8"
3"	cl. 150	RF	89	36	190	127	152	19/4x	3/4"
3"	cl. 300	RF	89	41	210	127	168	22/8x	7/8"
3"	cl. 400-600	RF	89	46	210	127	168	22/8x	7/8"
3"	cl. 900	RF	89	52	240	127	191	25/8x	1"
3"	cl. 1500	RF	89	67	265	127	203	32/8x	1 1/4"
3"	cl. 2500	RF	89	86	305	127	229	35/8x	1 3/8"
4"	cl. 150	RF	89	36	230	157	191	19/8x	3/4"
4"	cl. 300	RF	89	44	255	157	200	22/8x	7/8"
4"	cl. 400	RF	89	49	255	157	200	25/8x	1"
4"	cl. 600	RF	89	52	275	157	216	25/8x	1"
4"	cl. 900	RF	89	59	290	157	235	32/8x	1 1/4"
4"	cl. 1500	RF	89	68	310	157	241	35/8x	1 3/8"
4"	cl. 2500	RF	89	90	355	157	273	42/8x	1 5/8"

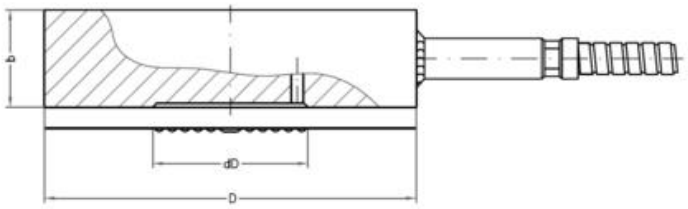
All dimensions in mm

EN 1092-1 Type B1

Size	Rating	Type	dD	H	D	d	K	C1/Pcs	C1 (inch)
DN25	PN10-40	B1	32	30	115	68	85	16/4x	5/8”
DN25	PN63	B1	32	36	140	68	100	19/4x	3/4"
DN25	PN100	B1	32	36	140	68	100	19/4x	3/4"
DN40	PN10-40	B1	44	30	150	88	110	25/4x	1"
DN40	PN63	B1	44	36	170	88	125	25/4x	1"
DN40	PN100	B1	44	36	170	88	125	16/4x	5/8"
DN50	PN10-40	B1	65	32	165	102	125	22/4x	7/8"
DN50	PN63	B1	65	38	180	102	135	22/4x	7/8"
DN50	PN100	B1	65	40	195	102	145	29/4x	1 1/8"
DN80	PN10-40	B1	89	36	200	138	160	32/4x	1 1/4"
DN80	PN63	B1	89	40	215	138	170	19/4x	3/4"
DN80	PN100	B1	89	44	230	138	180	19/8x	3/4"
DN100	PN10-16	B1	89	44	220	158	180	19/8x	3/4"
DN100	PN25-40	B1	89	36	235	162	190	25/8x	1"
DN100	PN63	B1	89	42	250	162	200	29/8x	1 1/8"

All dimensions in mm

SANDWICH SEAL TYPE



ASME B16.5 - RF FACING					
size	**rating**	**facing**	**dD**	**b**	**D**
1”	cl.150 - 2500	RF	32	24	51
1.5”	cl.150 - 2500	RF	44	24	72
2"	cl.150 - 2500	RF	65	24	92
3"	cl.150 - 2500	RF	89	24	127
4"	cl.150 - 2500	RF	89	24	157
All dimensions in mm					

EN 1092-1 - TYPE B1

size	rating	type	dD	b	D
DN25	PN10-400	B1	32	24	68
DN40	PN10-400	B1	44	24	88
DN50	PN10-400	B1	65	24	102
DN80	PN10-400	B1	89	24	138
DN100	PN10-16	B1	89	24	158
DN100	PN25-400	B1	89	24	162
All dimensions in mm					

Fill Fluid Specifications

Silicone 200 – fill fluid specifications

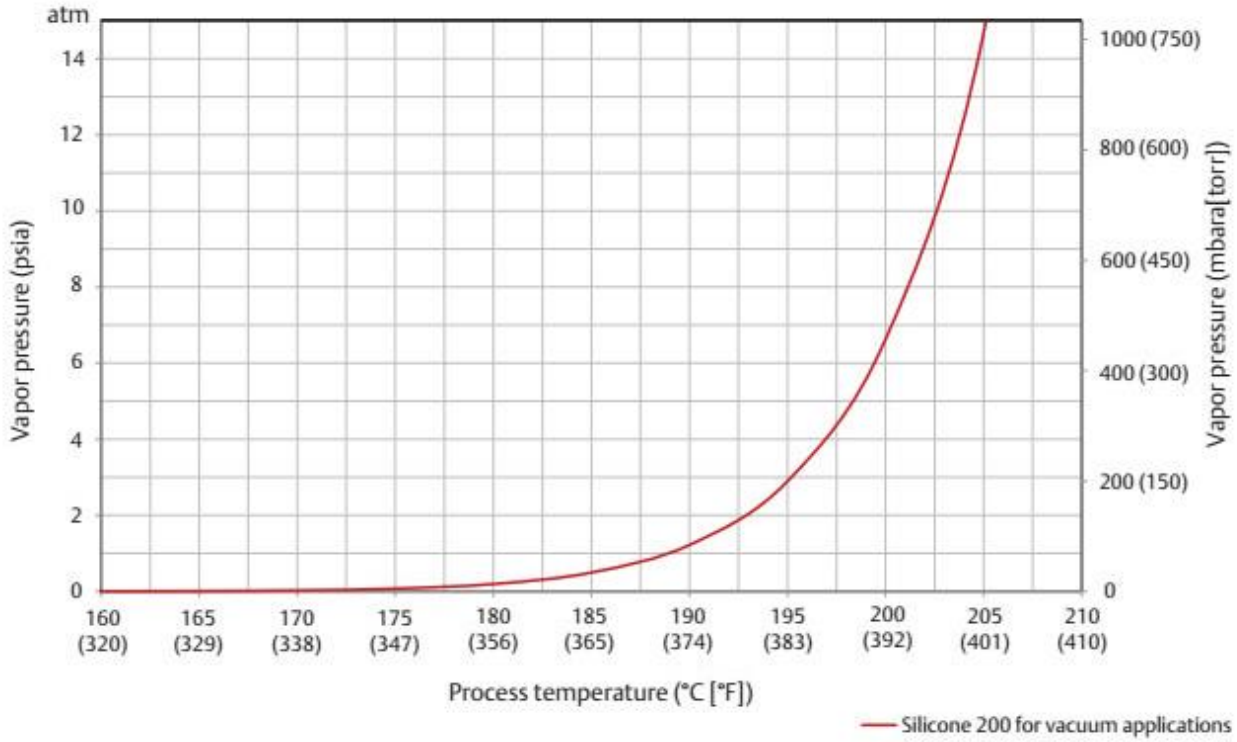
Temperature limits: At or above atm pressure:	**–45 to 205 °C (–49 to 400 °F)**
Viscosity at 25 °C (77 °F):	9.5 cST
Specific gravity at 25 °C (77 °F):	0.934
Coefficient of thermal expansion:	0.00108 cc/cc/°C (0.00060 cc/cc/°F)
Chemical name:	Polydimethylsiloxane polymer
Chemical composition:	(CH3)3SiO(SiO[CH3]2)nSi(CH3)3

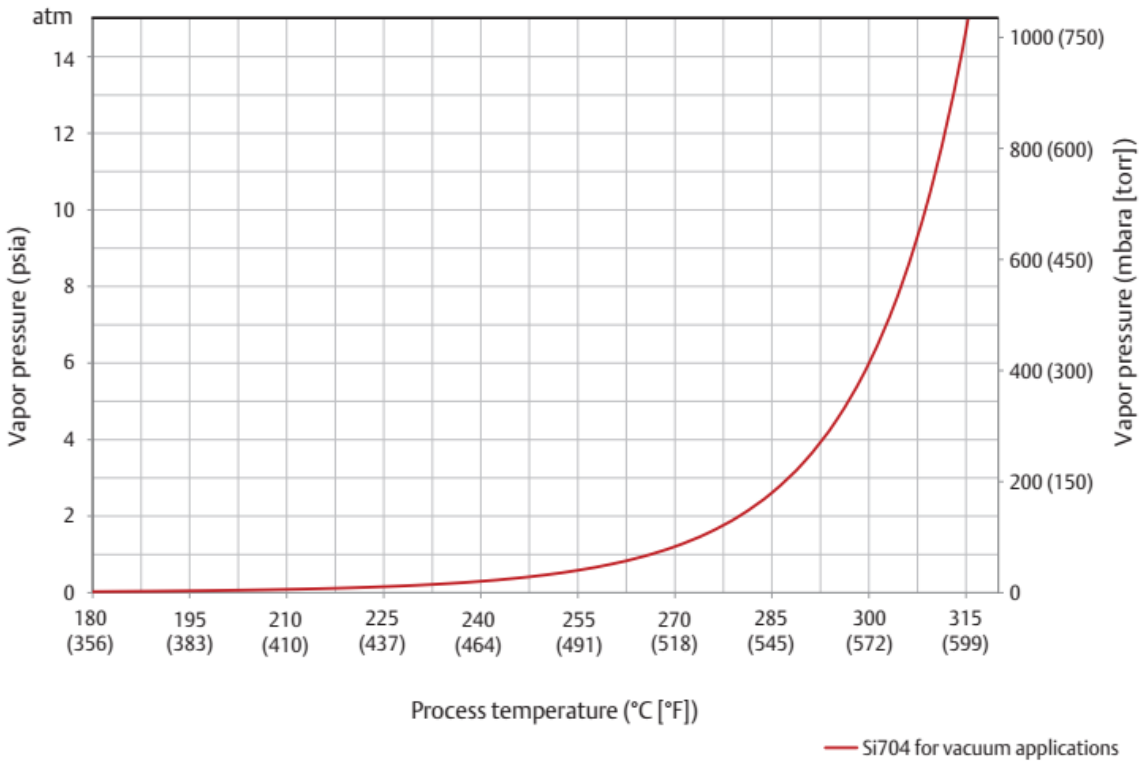
Silicone 704 – fill fluid specifications

Temperature limits: At or above atm pressure:	**–18 to 385 °C (0 to 350 °F)**
Viscosity at 25 °C (77 °F):	39 cST
Specific gravity at 25 °C (77 °F):	1.07
Coefficient of thermal expansion:	0.00095 cc/cc/°C (0.00053 cc/cc/°F)
Chemical name:	Tetramethyl tetraphenyl trisiloxane
Chemical composition:	C28H32O2Si3 (CH3)3

Description/applications

Silicone 200 is a general purpose fill fluid for industrial applications and is used in over half of all remote seal assemblies. This fluid has a broad temperature range to cover ambient and process conditions and has a low viscosity for good time response. Silicone fluids have a unique combination of properties that give superior performance in a wide variety of applications. Silicones provide excellent thermal stability and low vapor pressure.





Standard Fill Fluid

Part Number Code	Name	Description	Temperature Range (≥ 1 bara)	Viscosity cst at ~77ºF	Specific Gravity at ~77ºF	Thermal Expansion cc/cc/ºC
AS	Silicone DC200	This is the standard fill fluid for most diaphragm seal applications.	-40ºF to 400ºF -40ºC to 205ºC	20	0.94	.00104

High Temperature Silicone

Part Number Code	Name	Description	Temperature Range (≥ 1 bara)	Viscosity cst at ~77ºF	Specific Gravity at ~77ºF	Thermal Expansion cc/cc/ºC
BH	Silicone DC704	Standard for Smart Transmitters and capillary systems. Performs well in applications with high temperature and a deep vacuum.	0ºF to 650ºF -18ºC to 345ºC	39	1.07	.00077
B1	Silicone DC710	Highest temperature rating; ideal for gauge seal assemblies. Too thick for capillary assemblies. Response time can become very slow in cold conditions.	50ºF to 750ºF	500	1.11	.00043
C8	Syltherm 800	Low viscosity allows it to perform well in both low and high temperatures. Not recommended for vacuum service or at high temperatures when under low static	-40ºF to 750ºF	9.5	0.93	.00136

		pressure.				
B5	Silicone DC705	Performs very well in high temperatures when under vacuum. The high viscosity and freezing point of this fluid makes it a poor choice for cold or outdoor installations without heat tracing.	50ºF to 675ºF	175	1.09	.00096
B2	Silicone DC550	Similar high temperature performance as DC705, however it performs better at lower temperatures.	-40ºF to 575ºF	125	1.07	.00076

Food Grade

Part Number Code	Name	Description	Temperature Range (≥ 1 bara)	Viscosity cst at ~77ºF	Specific Gravity at ~77ºF	Thermal Expansion cc/cc/ºC
AG	Glycerin USP	This is the standard fill fluid for most gauge seal assemblies for food, beverage, and pharmaceutical applications. Its high viscosity will cause very slow response at times in low temperature and outdoor installations.	60ºF to 450ºF	1100	1.26	.00061
BN	NEOBEE M20	Low viscosity and a wide temperature range makes this the standard sanitary fill fluid for Smart Transmitters and capillary systems.	-10ºF to 400ºF	10	0.92	.00101
BS	Food Grade Silicone	Highest temperature limit for food grade fluids. Because of its high viscosity it does not perform well in low temperatures.	20ºF to 550ºF	350	0.97	.00096
BP	Propylene Glycol	This is the fill fluid used when Glycol is called for on the customer specification. It has a very narrow temperature range.	0ºF to 200ºF	2.85	1.03	.00073

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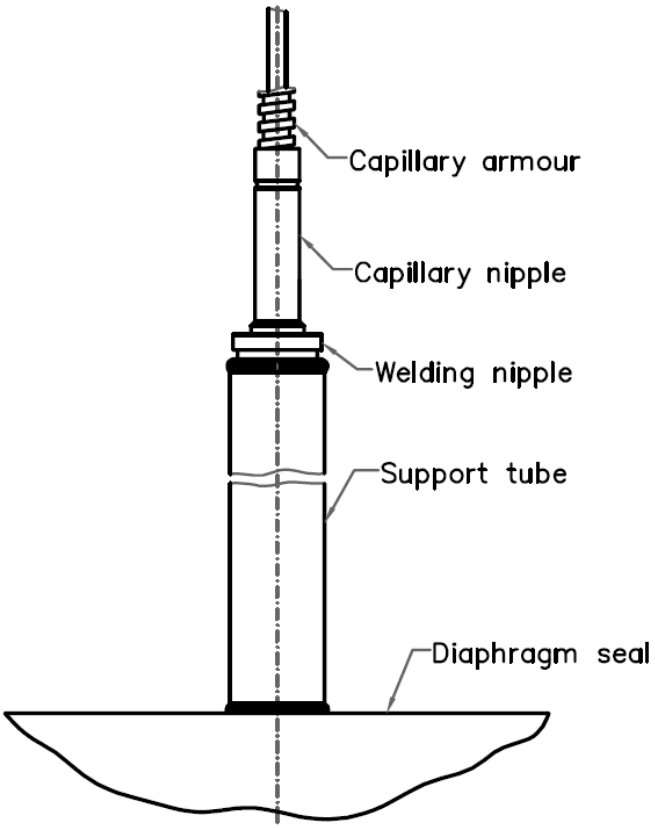
ACCESSORIES

HEAVY DUTY SUPPORT TUBE

The Heavy Duty Support Tube is robust and strong version of the standard capillary connection to the Diaphragm Seal and reduces the chance of mechanical damage on capillary connection. It also prevents chloride stress corrosion on the capillary weld (IP68 execution) and reduces the temperature on capillary in order to prevent burning of personnel.



STANDARD EXECUTION

IP CLASS	BODY	LENGTH	DIA.	MOUNTING
IP54/ IP68	316(L)	80 mm<200°C	1/2”- 40S	Capillary
		150 mm > 200°C		

CAPILLARY

The Capillary is used to remotely mount the pressure instrument to the Diaphragm Seal. The inside diameter of the capillary has a close relation with the temperature influence and the response time of the Diaphragm Seal System.

The use of the capillary allows the reading of the instrument from remote and limits the effects of the process temperature (above 250°C) on the accuracy of the instrument. A capillary length of 500mm is normally enough the keep the temperature of the instrument close to the ambient temperature value.

The length of the capillary must be as short as possible, and is advised not to exceed 6 meters because the temperature variation on the capillary length may influence the accuracy and response time.

Inside diameter	Outside diameter	Tube	Amour	MWP
2 mm	6 mm	AISI 316(L)	AISI 304	850 bar

Miniature Remote Seal (MRS)

Overview:

The FAHM Co. all-welded flush mini-diaphragm seal or isolation device protect pressure measuring instruments. Used to ensure process compatibility, they are also applied when process media exhibits high temperature, pulsation, and a potential for plugging or freeze-up.

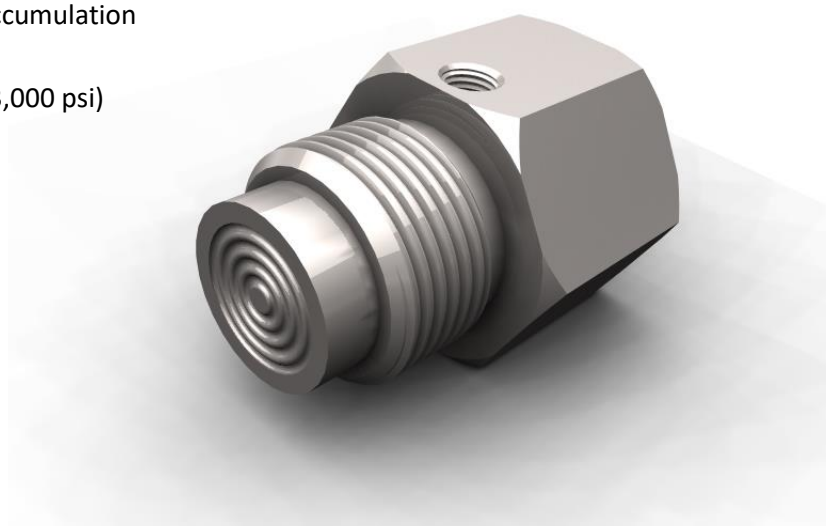
An ideal choice for limited space applications.

Key Features:

- Compact and lightweight design
- All-welded construction
- Flush diaphragm; eliminates clogging or process accumulation
- Volumetric displacement;

For use with 3 1/2" pressure gauges or smaller (60 to 3,000 psi)

- Pressure rated up to 3,000 psi



Applications:

- Process Market:
  - Pulp and Paper
  - Chemical and Petrochemical
- Medical & Life Sciences Market:
  - Pharmaceutical
  - Food and Beverage

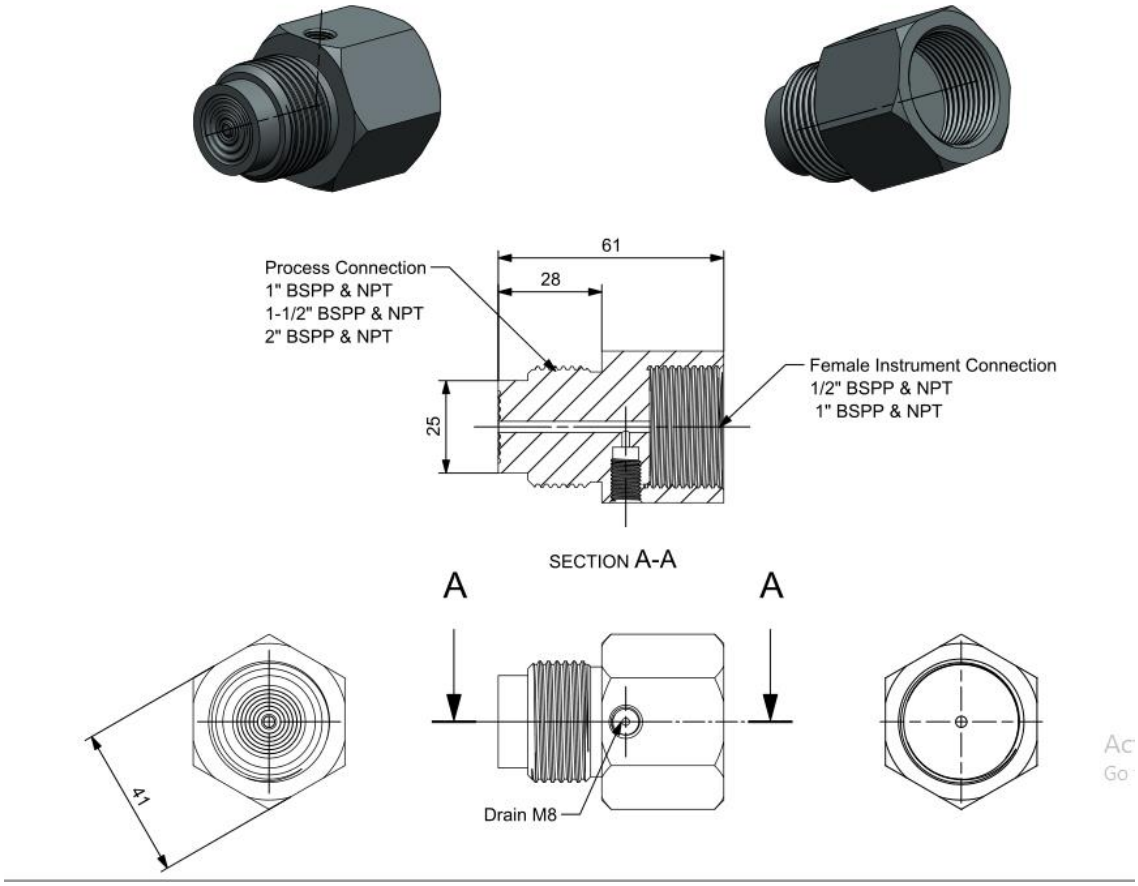
SPECIFICATIONS

- Connection style: Threaded
- Process Connection: 1 NPT
- Instrument Connection: 1/2, 3/4 , 1 NPT or BSPP Female and Male
- MAWP: 3,000 psi

Miniature Remote Seal Order Code

Miniature Remote Seal	**MRS-**
Model	
Flush Threaded Seal	T
Process Connection (Male Thread)	
1” BSPP (G1B)	G1
1-1/2” BSPP (G1-1/2B)	G1.5
2” BSPP (G2B)	G2
1” NPT	N1
1-1/2” NPT	N1.5
2” NPT	N2
Body Material	
316 Stainless Steel	SS
Diaphragm Material	
316L SS	2
Titanium GR-3	3
Alloy C-276 (Hastelloy)	4
Tantalum (Pure)	5
Alloy-400 (Monel)	6
Instrument Connection Size	
1/2 NPT Male (Standard for Direct Mount to Pressure Sensor)	C0
1/2 BSPP (G1/2”) Female	C1
1 BSPP (G1”) Female	C2
1/2 NPT Female	C3
1 NPT Female	C4
Others	Z
Filling liquid	
Silicone oil DC 200 (General purpose)	F1
Silicone oil DC 704 (High temperature)	F2
Sample Order Code: MRS-T G1 SS 2 C0 F1	

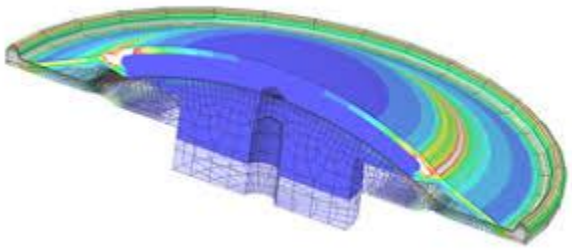
Miniature Remote Seal Dimensional Drawings



INFLUENCE OF TEMPERATURE

The complete pressure sensing system, made with the diaphragm seal (with or without capillary) and the pressure instrument, is filled with a fill fluid at a specific temperature (generally +20 ±2°C) called reference temperature.

A increase or decrease in ambient temperature or of the process fluid make a proportional variation on the fill fluid volume. Consequently this has an effect on the internal pressure of the closed sensing system and adds an error of zero on the instrument.



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