DATASHEET

KSS Diaphragm Seals

KSS Data Sheet - DC - AC - 003 - 00

Introduction

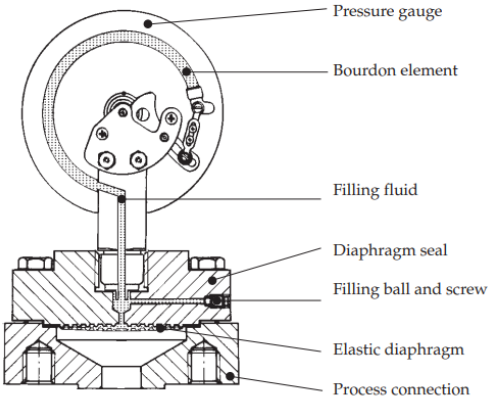
The diaphragm seal is designed to measure the process fluid pressure when the process fluid temperature is non-compatible to the instrument sensing element; when the process fluid may corrode the inner parts of the measuring instrument in contact with the fluid; when the fluid is highly viscous or it contains solid suspensions; when it solidifies at temperature changes. It is also used for long-distance pressure fluid transmission and measurement allowing to isolate dangerous fluids from the operating areas. It can be directly connected to the indicating instrument or through a capillary.

Operating Principle

The diaphragm seal operating principle is based on the fluids non-compressibility (see drawing at right). The separation from the process fluid is obtained from an elastic diaphragm sealed to the diaphragm seal body. The inner chamber between the diaphragm and the Bourdon tube is at first evacuated than filled with properly degassed fill-fluid. At this point the system is able to transmit the mechanical stress produced by the process fluid on the diaphragm to the Bourdon tube. Any air bubble in the circuit must be avoided as it could affect the right system operation.

Recommendations

The diaphragm and the body are in contact with the process fluid; therefore, they must withstand the temperature and the possible fluid chemical aggression. The filling fluid must be selected depending on the pressure fluid nature and temperature as well since any diaphragm fail may contaminate the process fluid and damage the whole process plant.



Functional Characteristic

Accuracy: at 20 C +/- 0.5...1%, depending on the diaphragm seal type. This accuracy value must be added to the pressure gauge accuracy. Process fluid temperature: minimum -45 C, maximum 340 C, depending on the filling fluid, on the diaphragm material and on the process connection.

Installation And Mounting Type

Direct Mounting

Capillary Mounting

Heat Sink Mounting

Type Of Diaphragm Seals

There are various types of Diaphragm seals, such as threaded and flanged executions, with connections for hygienic requirements. Typically diaphragm seals are made of stainless-steel Construction; however, we also specialize in exotic metal diaphragm seals. These are required for aggressive applications within the Nuclear, Oil + Gas and Chemical Industries and are the most common material that typically requires refurbishment.

Flanged Diaphragm Seal

Threaded Diaphragm Seal Welded Design

Threaded Diaphragm Seal Threaded Design

Tri-clamp Hygienic Diaphragm Seal

Threaded Diaphragm Seal Threaded Design (Low pressure)

Extended Flange Diaphragm Seal

Plug Type Diaphragm Seal

Options For Diaphragm Seal

- Other instrument connection: capillary socket or without connection (12 mm hole)
- Flange material: Duplex, Hastelloy, Monel, Titanium
- Diaphragm and wetted part material: Hastelloy,Inconel, Monel, Tantalum, Titanium, Zirconium
- Coatings: Gold, Rhodium, PFA and PTFE
- Capillary length: custom length between 1 m to 15 m
- Other flange and diaphragm materials on request
- Other flange types and sealing face
- Sealing face not covered by exotic diaphragm
- Flushing ring to suit (see Flushing Ring datasheet)

Specifications

Basic information for diaphragm seal systems	
Version	Diaphragm seal with flange connection
Other versions	■Per NACE 1) MR0175 / ISO 15156, use in H2S-containing environments in oil and gas production ■ Per NACE 1) MR0103 / ISO 17945, metals resistant to hydrogen sulphide stress cracking
Pressure range	The maximum permissible operating pressure must be determined individually for each diaphragm seal system. It is dependent on the operating temperature, the process connection, the joining method, the system fill fluid and the mounted measuring
Connection to the instrument	■ Axial connection adapter for weld seam ■ Suitable connection adapter to the instrument (e.g., G ½, G ¼, ½ NPT or ¼ NPT)
Mounting type	■ Direct mounting ■ Capillary ■ Heat sink

Process Connection

Process Connection				
Standard	▪ DIN EN 1092-1 ▪ ASME B16.5-2017 ▪ GOST 33259 ▪ API 6A ▪ JIS B2220			
Size				
DIN EN 1092-1	▪ DN 25 ▪ DN 80	▪ DN 40 ▪ DN 100	▪ DN 50 ▪ DN 125	▪ DN 65
ASME B16.5-2017	▪ 1" ▪ 3"	▪ 1 ½" ▪ 4"	▪ 2" ▪ 5"	▪ 2 ½"
GOST 33259	▪ DN 25 ▪ DN 80	▪ DN 40 ▪ DN 100	▪ DN 50 ▪ DN 125	▪ DN 65
API 6A	▪ 1 1/8"	▪ 1 1/16"	▪ 1 13/16"	▪ 2 1/16"
JIS B2220	▪ DN 25A ▪ DN 100A	▪ DN 40A	▪ DN 50A	▪ DN 80A

Process Connection		
Sealing face		
DIN EN 1092-1	▪ Form B1 ▪ Form A ▪ Form B2 ▪ Form C (tongue)	▪ Form D (groove) ▪ Form E (spigot) ▪ Form F (recess)
ASME B16.5-2017	▪ RF 125 ... 250 AA ▪ RFSF ▪ Flat face ▪ Small tongue ▪ Small male face ▪ Small groove	▪ Small female face ▪ Large tongue ▪ Large male face ▪ Large groove ▪ Large female face ▪ RJF groove
GOST 33259	▪ Type B ▪ Type A (flat face) ▪ Type C (tongue)	▪ Type D (groove) ▪ Type E (spigot, male face) ▪ Type F (recess, female face)
API 6A	Ring-joint groove	
JIS B2220	RF	
Wetted parts	Diaphragm and raised face → See tables below for material selection	
Origin of wetted parts	▪ International ▪ Exclusively from EU, CH, GB, US, CA	
Level of cleanliness of wetted parts	▪ Oil- and grease-free per specification (< 1,000 mg/m^2) ▪ Oil- and grease-free per ASTM G93-03 level D (< 220 mg/m^2) ▪ Oil- and grease-free per ASTM G93-03 level C (< 66 mg/m^2)	

Material Combinations

Material Combination	Maximum Permissible Temperature In °C [°F]
Stainless steel 1.4404 / 1.4435 (316L)	400 [752]
Hastelloy C22 (2.4602)	260 [500]
Hastelloy C276 (2.4819)	400 [752]
Inconel 600 (2.4816)	400 [752]
Inconel 625 (2.4856)	400 [752]
Inconel 825 (2.4858)	400 [752]
Monel 400 (2.4360)	400 [752]
Nickel 200 (2.4066)	260 [500]
Nickel 201 (2.4068)	260 [500]
Titanium grade 2 (3.7035)	150 [302]
Titanium grade 11 (3.7225)	150 [302]
Tantalum	300 [572]
Titanium grade 7 (3.7235) / Titanium grade 11 (3.7225)	250 [482]

Material Upper body of diaphragm seal and wetted parts	Maximum Permissible Temperature In °C [°F]
Stainless steel 1.4435 (316L)	400 [752]
Stainless steel 1.4539 (304L)	400 [752]
Stainless steel 1.4541 (321)	400 [752]
Stainless steel 1.4571 (316Ti)	400 [752]
Duplex 2205 (1.4462)	250 [482]
Super Duplex 2507 (1.4410)	250 [482]
Hastelloy C22 (2.4602)	400 [752]
Hastelloy C276 (2.4819)	400 [752]
Inconel 600 (2.4816)	400 [752]
Inconel 625 (2.4856)	400 [752]
Inconel 825 (2.4858)	400 [752]
Monel 400 (2.4360)	400 [752]
Nickel 200 (2.4066)	300 [572]
Nickel 201 (2.4068)	400 [752]
Titanium grade 2 (3.7035)	300 [572]

Material Of Coating Wetted parts	Maximum Permissible Temperature In °C [°F]
ECTFE	150 [302]
PFA (perfluoro alkoxy), FDA	260 [500]
PFA (perfluoro alkoxy), anti-static	260 [500]
Gold	400 [752]

Certificates

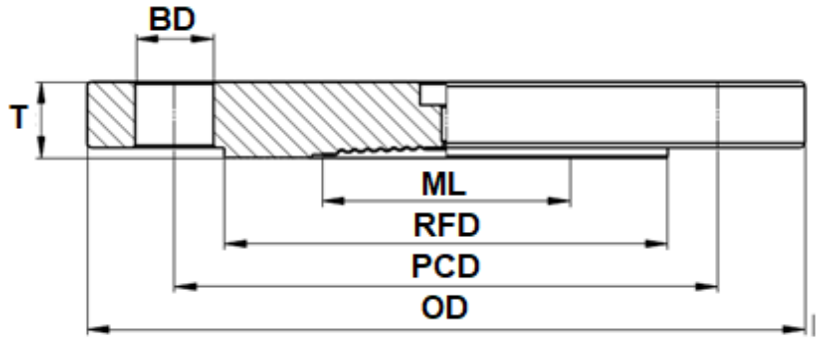
Certificates	
Certificates	• 2.2 test report per EN 10204 (e.g., state-of-the-art manufacturing, material proof, indication accuracy for diaphragm seal systems) • 3.1 inspection certificate per EN 10204 (e.g., material proof for wetted metal parts, indication accuracy for diaphragm seal systems) • Test certificate for indication accuracy. • Others on request.

Special Features

- Flush welded diaphragm (free of dead space)
- Diaphragm protected against rupture with backup convolution.
- Helium leak tested to ensure integrity of diaphragm.
- When exotic metal diaphragm or coating is required, all wetted parts including sealing face are made from samematerial.

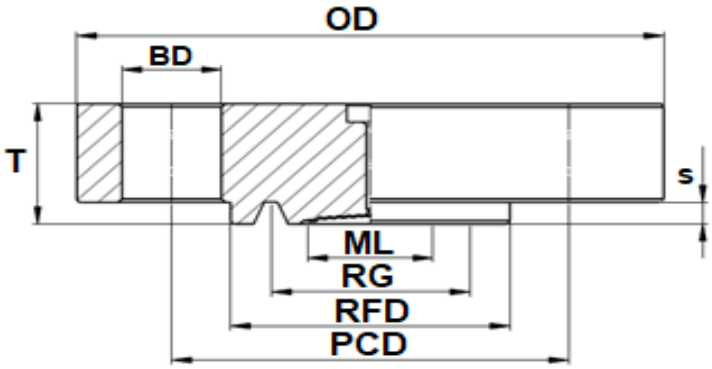
Diaphragm Seal Specifications

- Flange type: ANSI B16.5 Raised Face (RF) or Ring Type Joint (RTJ), EN 1092-1 Form B1, JIS B2220
- Flange body material: AISI 316L
- Wetted parts and diaphragm material: AISI 316L
- Instrument connection: 1/2”BSP female



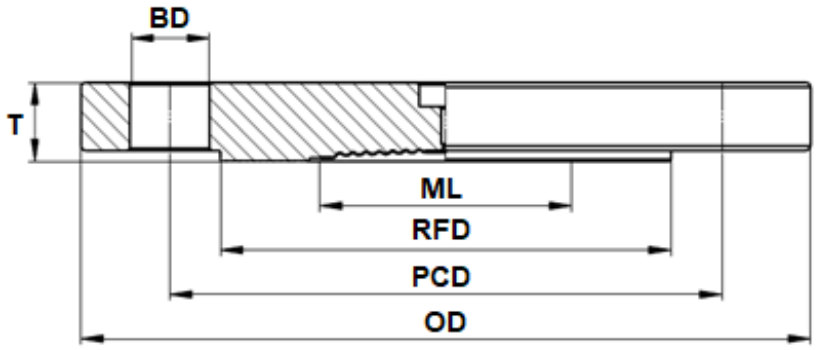
ML	Effective diameter of diaphragm
OD	Outer diameter of diaphragm seal
T	Flange thickness
BD	Bore diameter
RFD	Raised face diameter
PCD	Pitch circle diameter

Flange Connection According To ASME / ANSI B 16.5, RF (Raised Face)								
Size	Class Rating	Dimensions In mm						Drill Holes
		ML	OD	T	BD	PCD	RFD	
1”	150	32	110	14.7	16	79.4	51	4
	300	32	125	17.9	19	88.9	51	4
1 1/2”	150	46	125	17.9	16	98.4	73	4
	300	46	155	21.1	22	114.3	73	4
	600	46	155	29.3	22	114.3	73	4
	1,500	46	180	38.8	29	123.8	73	4
	2,500	46	205	51.5	32	146	73	4
2”	150	57	150	19.5	19	120.7	92	4
	300	57	165	22.7	19	127	92	8
	600	57	165	32.4	19	127	92	8
	1,500	57	215	45.1	26	165.1	92	8
	2,500	57	235	57.9	29	171.4	92	8
3”	150	88	190	24.3	19	153.4	127	4
	300	88	210	29	22	168.3	127	8
	600	88	210	38.8	22	168.3	127	8
	900	88	240	45.1	26	190.5	127	8
	1,500	88	265	54.7	32	203.2	127	8
	2,500	88	305	73.7	35	228.6	127	8
4”	150	88	230	24.3	19	190.5	158	8
	300	88	255	32.2	22	200	158	8
	400	88	255	42	26	200	158	8
	600	88	275	45.1	26	215.9	158	8
	900	88	290	51.5	32	235	158	8
	1,500	88	310	61	35	241.3	158	8
	2,500	88	355	83.2	42	273	158	8



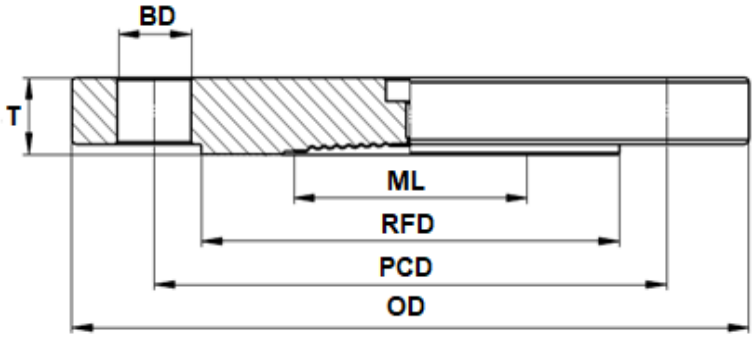
ML	Effective diameter of diaphragm
OD	Outer diameter of diaphragm seal
T	Flange thickness
RFD	Raised face diameter
S	Height of raised face
PCD	Pitch circle diameter
BD	Bore diameter
RG	Ring groove diameter

Flange Connection According To ASME / ANSI B 16.5 RTJ, (Ring Type Joint)										
Size	Class Rating	Dimensions in mm								Drill Holes
		ML	OD	T	BD (inch)	PCD	RFD	S	RG	
1”	150	32	110	19	5/8”	79	64	6	48	4
	300	32	125	22	3/4”	89	70	6	51	4
	400-600	32	125	24	3/4”	89	70	6	51	4
	900-1500	32	150	35	1”	102	72	6	51	4
	2500	32	160	41	1”	108	83	6	60	4
1 1/2”	150	44	125	22	5/8”	98	83	6	65	4
	300	44	155	26	7/8”	114	91	6	68	4
	400-600	44	155	29	7/8”	114	91	6	68	4
	900-1500	44	180	38	1 1/8”	124	92	6	69	4
	2500	44	205	53	1 1/4”	146	114	8	83	4
2”	150	57	150	24	3/4”	121	102	6	83	4
	300	57	165	29	3/4”	127	108	8	83	8
	400-600	57	165	33	3/4”	127	108	8	95	8
	900-1500	57	215	46	1”	165	124	8	102	8
	2500	57	235	59	1 1/8”	171	133	8	114	8
3”	150	81	190	29	3/4”	152	133	6	124	4
	300	81	210	33	7/8”	168	146	8	124	8
	400-600	81	210	46	7/8”	168	146	8	124	8
	900	81	240	59	1”	191	156	8	137	8
	150	81	265	29	1 1/4”	203	168	8	127	8
	2500	81	305	35	1 3/8”	229	168	10	149	8
4”	150	81	230	29	3/4”	191	171	6	149	8
	300	81	255	38	7/8”	200	175	8	149	8
	400	81	255	43	1”	200	175	8	149	8
	600	81	275	46	1”	216	175	8	149	8
	900	81	290	52	1 1/4”	235	181	8	149	8
	1500	81	310	62	1 3/8”	241	194	8	162	8
	2500	81	355	87	1 5/8”	273	203	11	157	8



ML	Effective diameter of diaphragm
OD	Outer diameter of diaphragm seal
T	Flange thickness
BD	Bore diameter
RFD	Raised face diameter
PCD	Pitch circle diameter

Flange Connection According To EN 1092-1, Form B1								
DN In mm	PN In Bar	Dimensions In mm						Drill Holes
		ML	OD	T	BD	PCD	RFD	
25	10/40	32	115	18	14	85	68	4
	63/100	32	140	24	18	100	68	4
40	10/40	46	150	18	18	110	88	4
	63/100	46	170	26	22	125	88	4
	160	46	170	28	22	125	88	4
	250	46	185	34	26	135	88	4
50	10/40	57	165	20	18	125	102	4
	63	57	180	26	22	135	102	4
	100	57	195	28	26	145	102	4
	160	57	195	30	26	145	102	4
	250	57	200	38	26	150	102	8
80	10/16	88	200	20	18	160	138	8
	25/40	88	200	24	18	160	138	8
	63	88	215	28	22	170	138	8
	100	88	230	32	26	180	138	8
	160	88	230	36	26	180	138	8
	250	88	255	46	30	200	138	8
100	10/16	88	220	20	18	180	158	8
	25/40	88	235	24	22	190	162	8
	63	88	250	30	26	200	162	8
	100	88	265	36	30	210	162	8
	160	88	265	40	30	210	162	8
	250	88	300	54	33	235	162	8



ML	Effective diameter of diaphragm
OD	Outer diameter of diaphragm seal
T	Flange thickness
BD	Bore diameter
RFD	Raised face diameter
PCD	Pitch circle diameter

Flange Connection According To JIS B2220, RF (Raised Face)								
Size	Class Rating	Dimensions in mm						Drill Holes
		ML	OD	T	BD	PCD	RFD	
50A	10K	57	155	18	19	120	96	4
	16K	57	155	18	19	120	96	8
	20K	57	155	20	19	120	96	8
80A	10K	88	185	20	19	150	126	8
	16K	88	200	22	23	160	132	8
	20K	88	200	24	23	160	132	8
100A	10K	88	210	20	19	175	151	8
	16K	88	225	24	23	185	160	8
	20K	88	225	26	23	185	160	8

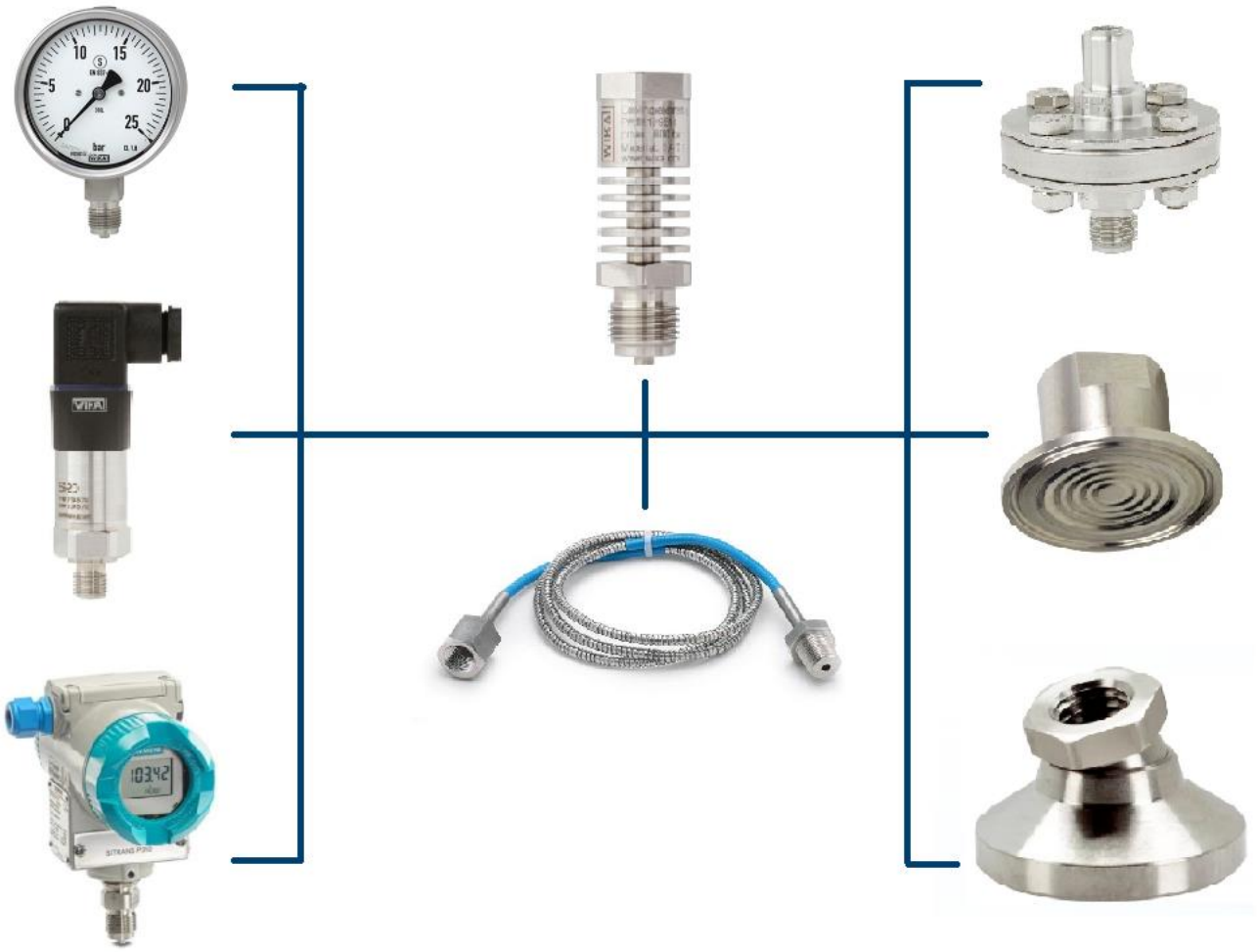
Fit And Fill Service For Diaphragm Seals

- Fitted to all kind of pressure measuring instrument.
- Wide selection of fill fluids to suit the application e.g.,food safe, high temperature, inert etc…
- Filled using our unique turbo molecular vacuum filling station (can pull an ultra-high vacuum to 2 X 10 x-2 mbar A) ensures measurement accuracy and reliability
- Calibrated using high accuracy calibration equipment's.

Required Information For Diaphragm Seal Systems

- Pressure measuring instrument model and range.
- Process connection on instrument.
- Process temperature.
- Ambient temperature.
- System fill fluid.

We can fit all manufacturer's instruments to a diaphragm seal



Turbo Filling Technology - State-Of-The-Art Manufacturing

A diaphragm seal can be mounted to almost all pressure instruments. Mostly they are used in combination with pressure transmitters – differential or gauge types. They can also be used in combination with pressure Gauges and pressure switches. The use of diaphragm seals is recommended when the process medium is:

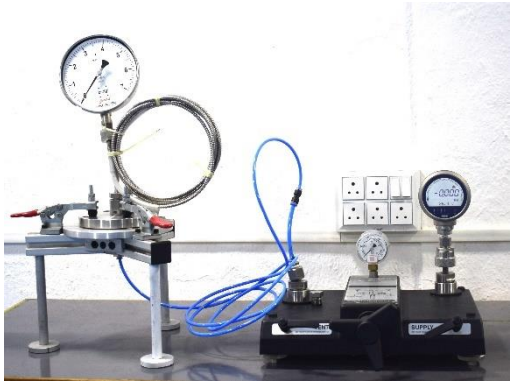
- Corrosive
- Extremely high or low temperature
- Viscous or contains solid particles
- Sterile (Important to eliminate formation of bacteria) – sanitary connections

Diaphragm seals can also be used when in the process where there are chances of H+ ions being present, that can permeate the diaphragm. In these cases, a diaphragm seal with GOLD COATING is provided to protect the transmitter from Hydrogen permeation.

KSS utilizes a highly accurate turbo-boost filling technology, which allows an optimal degassing (de-vacuuming) of the fill fluids, thus providing a negligible influence on the accuracy of the instrument.

The pressure instrument is direct mounted or through a capillary line to the diaphragm seal. The complete volume of the diaphragm seal, the capillary and the measuring system, is filled under high vacuum with the appropriate fill fluid.

The seals are filled with fluids, such as silicone based, inert and FDA approved oils (for hygienic seals). Filling fluids that we use can withstand various temperature ranges between -105 ºC up to 410 ºC.



The mounting and filling is done professionally according to stringent International standards and procedures. We have our own calibration test systems / equipment in place to attain a high accuracy and communication protocols are readily available – HART, FOUNDATION FIELDBUS, D/E, etc.

Flush Rings and Flush Flanges

Flushing rings are used with flanged chemical seal systems for flushing or venting the space immediately in front of the diaphragm. They are simply mounted between the flanged process connection and the diaphragm seal. The two flushing ports allow washing out of particles accumulated in front of the membrane and the pressure space can be vented or drained according to requirement.

Flush rings & Flush flanges

Industries Vertical

Oil & Gas

Chemical & Petrochemical

Pharma

Power Generation

Food & Beverages

For inquiries contact us at:

Khot System And Solution

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