



SMART PRESSURE TRANSMITTER BPT363-G (with Remote Diaphragm Seal)

- HART® Protocol
- 0.2% inaccuracy and non-linearity
- Rangeability 10:1
- 0 - 100kPa) (0,1MPa to -10 - 10MPa
- Automatic temperature compensation
- 4 - 20mA output
- True non-interactive zero and span
- Local zero and span adjustment
- LCD or LED indicator
- Adjustable damping
- Indication in engineering units
- AISI 316L, Monel, Tantalum or Hastelloy
- Capable in handling most process fluids
- Small and light weight
- Weather-proof housing IP67
- Intrinsically safe
- Explosion proof
- ATEX directive 94/9/EC



GENERAL DESCRIPTIONS

BASI Model BPT363G Smart Pressure Transmitter with remote seal. Designed for process control applications, these 2-wire transmitters generate a 4-20mA signal proportional or characterized to the applied pressure. This signal can be transmitted over a pair of twisted wires through long distances (limited only by the wire resistance and load). Remarkable features of the transmitters are its 0.2% inaccuracy and non-linearity, 10:1 rangeability, compactness and light weight. The pressures are directly applied to the isolating diaphragm that provide isolation and resistance against process fluid corrosion. Being microprocessor based, the electronic circuit is extremely versatile and accurate. Combined with the sensor precision, it provides the high accuracy and rangeability. Transmitter performance is improved by continuous monitoring of the sensor temperature and corresponding corrections. A local display permits easy reading and writing of data.

TECHNICAL SPECIFICATIONS

Functional Specifications

Process fluid	: Liquid, gas or vapor
Range	: 0-100kPa to -10-10MPa
Output signal	: Two-wire 4-20,20-4 mA and HART® Protocol
Power supply	: 14,5 - 45 VDC (Exi 14,5-28VDC)
Indicator	: 2-line 5-digit LCD indicator
Hazardous area	: IP67 weather-proof, intrinsically safe Exia II CT6, Flame-proof Exd II CT6
Certificate	: ATEX
Zero and span	: Non-interactive local adjustment
Ambient.temp	: -20 to 70°C (max -40 to 85 °C)
Process.temp	: -45 to 315°C
Storage.temp	: -46 to 110°C
Turn-on time	: Performs within specifications in less than 120 milliseconds after power is applied.
Humidity limits	: 0 - 100% RH
Damping adj.	: Adjustable
Configuration	: By pushbutton on the transmitter or HHT, PC using HART® Protocol



Performance Specifications

Resolution	: ±0.01%
Inaccuracy	: ±0.2%
Temperature effect	: ± 0,065%/FS/10°C
Power supply effect	: Negligible between 14 and 45 VDC
Mounting position effect	: Any position. No span effect.



Physical Specifications

Electrical connection	: ½"-14NPTF, M20 x 1,5
Process connection	: G½, M20, G½ NPT
Wetted parts	: AISI 316L or Hasteloy
Filling fluid	: Silicone oil
Electronic housing	: Injected aluminum with polyester painting (RAL 5014) NEMA 4X, IP67
Identification plate	: 304 SST
Approximate weight	: According to type
Mounting	: with mounting bracket



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Smart Pressure Transmitter with Remote seal

BPT363-G

No. DS 27:2-E Issue: 5 18/10/18



Product Introduction

Sensor membrane head

While working, the isolation diaphragms on the high/low-pressure sides and the filling liquids will transmit the process pressure to the membrane head of sensor and then converted into the corresponding current, voltage or digital HART® (high-speed addressable remote transmitter data highway) output signal.

BPT363 series sensor can conduct temperature measurement to compensate the temperature effects.

In the characterization process of factory, all the sensors have gone through the pressure and temperature cycle test within the whole working range. The correction factors will be generated from these obtained data. Then the coefficients will be stored in the memory of intelligent board so as to ensure that the signal correction can be conducted precisely during the operational process of transmitter.

Electronic circuit board

The electronic board adopts high-performance integrated circuit and surface packaging technology. This board will correct the input signal of sensor and then conduct linear treatment. The output part of electronic board module will convert the digital signal into analog output and conduct communication with the manipulator.

The liquid crystal header can display the pressure value, current value or the percentage of range.

Data storage

The configuration data will be stored in the permanent EPROM storage of transmitter electronic board module. After the transmitter is power down, the data will be stored permanently. So after power on, the transmitter can work immediately.

Digital/analog conversion and signal transmission

The process variable is stored in the form of digital data, which can be corrected accurately and conducted the conversion of engineering units. After correcting the signal, the data will be converted into analog output signal. HART manipulator can directly access to the reading of sensor in the way of data signal so as to get higher accuracy without digital/analog conversion.

Communication format

BPT363 series transmitter adopts HART protocol to conduct communication. This protocol adopts industrial standard Bell202 frequency shift keying (FSK) technology. The telecommunication can be conducted by overlaying high-frequency signal on the analog output. By using this technology, the communication and output can be realized simultaneously without influencing the integrity of loop. BPT363 series transmitter can communicate with the host machine, which uses HART protocol.

Software function

The users of HART protocol can easily use the functions of BPT363 series, such as menu configuration, test and specific settings.

Configuration

By using HART manipulator, users can conveniently conduct current regulation, parameter configuration, HART information, two-point fine tuning and graphical monitoring on BPT363 series menu, including:

- Zero and extreme point setting
- Engineering units selection
- Linear or square root output
- Damping time
- Display mode
- Display accuracy

HART information can input the informational data into the transmitter to identify and physically describe the transmitter, including:

- Date
- Station identification: within 8 characters
- Station description: within 16 characters
- Information: within 32 characters

Test

When the system goes wrong, if the operator confirms that the loop has faults, can let the transmitter provide specific output for loop tests.

Specific settings

In the initialization phase of transmitter and while maintaining the digital electronic board, specific settings should be conducted. It allows to conduct fine tuning on the sensor and analog output to accord with the pressure standard of the factory.

Options

Liquid crystal header

- Digital header, 2-line 5-digit liquid crystal display
- Directly display the digital data, with higher accuracy
- Display the pressure, current or range percentage according to the requirements of users
- Can rotate by 360°, which is easy to install

Transient voltage resistance protection

- Integrative transient voltage resistance protection terminal
- Electromagnetic compatibility accords with the national standard:
 - IEC6100-4-2** Electrostatic discharge immunity test IIIB
 - IEC6100-4-4** Electrical fast transient pulse clusters anti-interference test IIIB
 - IEC6100-4-5** Surge (shock) immunity test IIIB



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No. DS 27:2-E Issue: 5 18/10/18

Specification

Performance index

The overall performance is the composition error based on the reference accuracy, ambient temperature effects and range static-pressure effects.

Accuracy index

$\pm 0.2\%$ FS range (conventional)

Concrete performance index

(Zero-base range, reference conditions, silicone oil filling liquid, 316 stainless steel isolation diaphragm, 4~20mA analog output, the digital fine-tuning value is equal to the set point value of range.)

Accuracy

(The reference accuracy includes hysteresis, linear, setting ability and repeatability, which are based on terminal.)

$\pm 0.2\%$ range

If the range is less than X

$\pm [0.025 + 0.05 \frac{X}{\text{range}}] \%$

X value:

Diaphragm capsule	XKPa
V	100
A	300
G	1000

Damping time constant

The total damping time constant is equal to the sum of the damping time constants of amplifier unit and diaphragm capsule. The damping time constant of amplifier unit is adjustable within the range of 0~100s.

Diaphragm capsule (silicone oil)

Time constant (s) (The time constant can be set according to the actual situation of field and is recommended 1S)

Influence of installation position

The changing of installation position, which is parallel to the surface of diaphragm, will not cause the effect of null shift. If the change between the installation position and the surface of diaphragm do not exceed 90° , the null shift within 0.4KPa can be corrected by zero setting without influencing the range.

Influence of power supply

Less than $\pm 0.005\%$ range/v

Functional parameter

The limit value of range and sensor

Table 1: Range of BPT363G transmitter and limit value of sensor

Range	Min. range	Limit value of range and sensor	
	BPT363G type	Upper limit of range (URL)	Lower limit of range (LRL)
V	100KPa	1MPa	-1MPa
A	300KPa	3MPa	-3MPa
G	1MPa	10MPa	-10MPa

Zero point and range adjustment requirements

- The zero point and range can be adjusted arbitrarily within the range limit value indicated in Table 1.

- The range should be larger than or equal to the min. range indicated in Table 1.

Applications

Measurement of liquid, gas and steam

Output

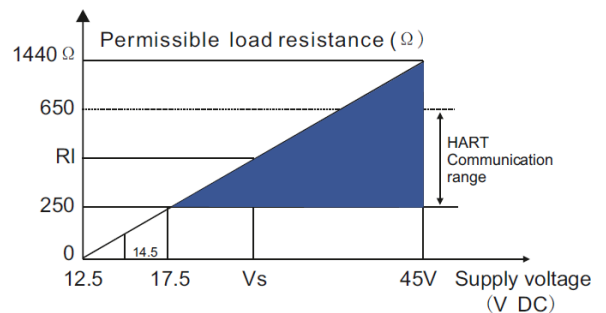
Two-wire 4-20mA, linear output or square root output is selectable for users. Digital process variable overlays on the 4-20mA signal, which can be applied to the host machines according with HART protocol.

Power supply

Need external power supply. While standard transmitter (4-20mA) has no load, work at 14.5-45V DC.

Loop load limit

The max. loop resistance is decided by the voltage of external power supply, the relations are as follows:



Supply voltage - load characteristic relation scheme

Note: The supply voltage range of transmitter with backlight display is 14.5~45V

The supply voltage range of intrinsic-safety series transmitter is 14.5~28V.

The working voltage while HART communication should be larger than 17.5V.



Limit of static pressure and max. overpressure

For BPT363G type, the limit value is from 0psia to flange rated value or the smaller one in the rated pressure values of sensor.

Table 2. Pressure rated value of BPT363G type flange

Standard	Type	Rated value of carbon steel	Rated value of stainless steel
ANSI/ASME	Class150	285psig	275psig
ANSI/ASME	Class300	740psig	720psig
ANSI/ASME	Class600	1480psig	1440psig
<i>For the measured value under 38°C, the rated value will decrease with the increasing of temperature.</i>			
DIN	PN 10-40	40bar	40bar
DIN	PN 10/16	16bar	16bar
DIN	PN 25/40	40bar	40bar
<i>Under 120°C, the rated value will decrease with the increasing of temperature.</i>			

Fault mode

Output code

While discovering the faults of sensor or microprocessor by self diagnosis, the transmitter will output one high or low alarm signal to prompt the users. The alarm output value is subject to the factory configuration mode of transmitter:

- Linear output: $3.8 < I < 20.8$
- C4: I=20.8mA high fault
- CN: I=3.8mA low fault

Temperature limit

Environment

- 20 to +70C (Ordinary)
- 40 to +85C (The highest)

Storage

- 46 to +110C
- With header: -40°C~85°C

Process

Less than or equal to atmosphere, see the following table:

Table 3. Limit of BPT363G process temperature

DC silicone oil 200	-45 to 205°C
DC silicone oil 704	-10 to 315°C
Fluorocarbon oil	-18 to 204°C

Humidity limit

0-100% relative humidity

Starting time

Reach to the performance index within 2s after the transmitter is power up.

Mechanical performance index

Electrical interface

- ANSI ...NPT1/2(F) internal thread
- ISO.... M20×1.5 internal thread

Process interface

High-pressure side: flange size (execute national and chemical industry standard)

- NP series: DN25 DN40 DN50 DN80 DN100
- PN2.5 PN6 PN10 PN16 PN25 PN40

- Class series: 1 inch, 1½ inches, 2inches, 3inches, 4 inches. 150lb, 300lb

- Low-pressure side: 1/4-18NPT taper pipe internal thread
- T-shaped interface: M20×1.5 external thread and back welding connecting pipe
- Waist-shaped interface: 1/2-14NPT taper pipe internal thread, 1/2-14NPT pressure-leading transition head and back welding connecting pipe

Process liquid-contacting piece

Process isolation diaphragm: 316L stainless steel, hastelloy C (Plug-in cartridge doesn't have this option.), Ta (Plug-in cartridge doesn't have this option.).

Drain/vent valve

316 stainless steel

Process flange and interface

316 stainless steel

BPT363G type process liquid-contacting piece

Flange type process interface (the high-pressure side of transmitter)

Process diaphragm, including process gasket contacting surface
316L stainless steel, hastelloy C or Ta

Extension part

316 stainless steel

Mounting flange

Carbon steel galvanization or stainless steel
Process connection on the low-pressure side (the low-pressure side of transmitter)

Isolation diaphragm

316L stainless steel

Flange and interface on the low-pressure side

316 stainless steel

Non-liquid-contacting piece

Shell

Aluminium die casting IP65

Coating

Spraying plastics

Meter cap O-ring

Nitrile rubber



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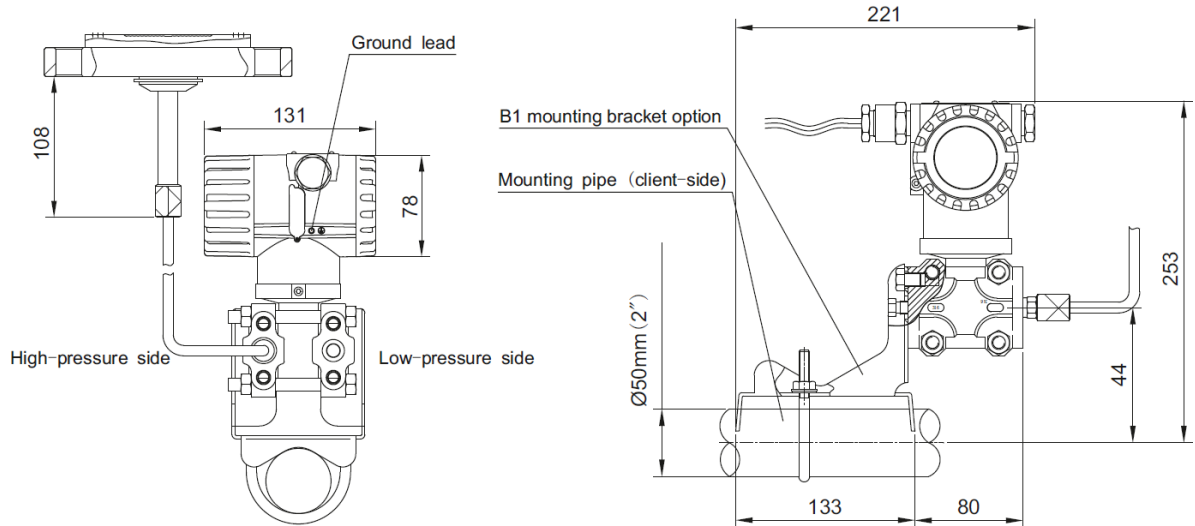
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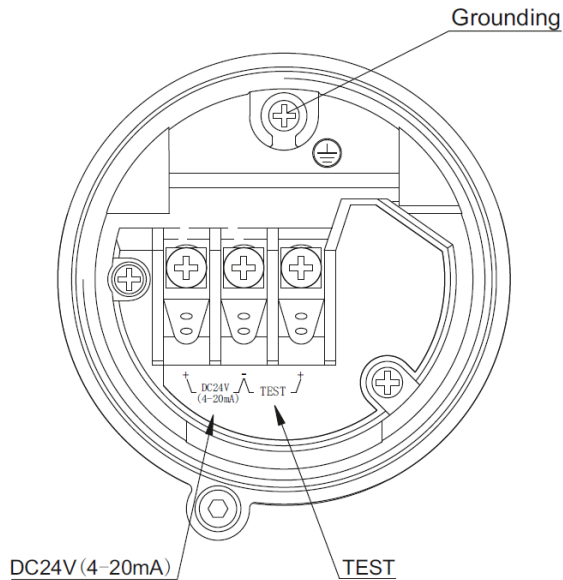
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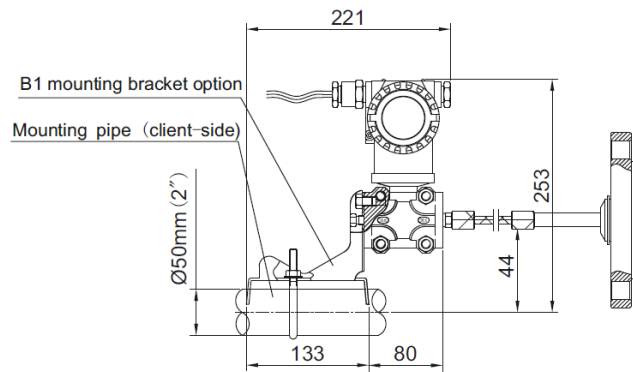


Outside drawing of single-flange installation

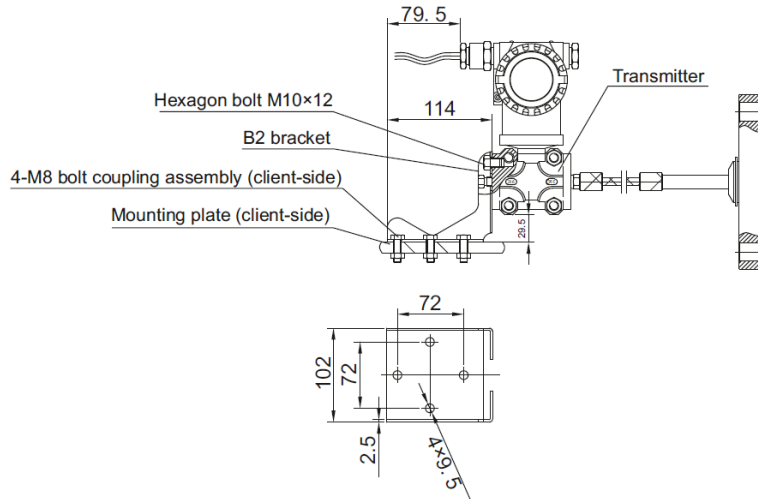


Connecting terminal	
DC24V(4~20mA) ⁺ ₋	Power supply and output end
TEST ⁺ ₋	Connect to the testing terminal of ampere meter (impedance should be less than 10 Ω)
⏏	Ground terminal

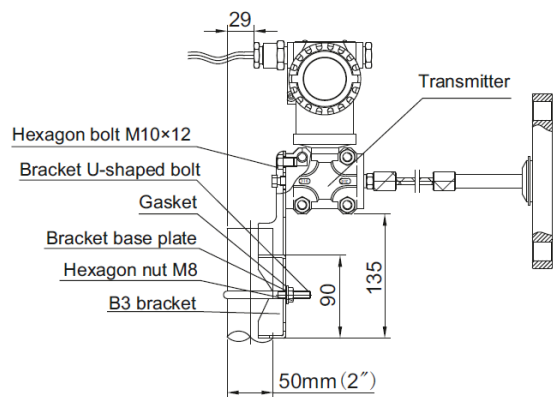
Wiring diagram of terminal side



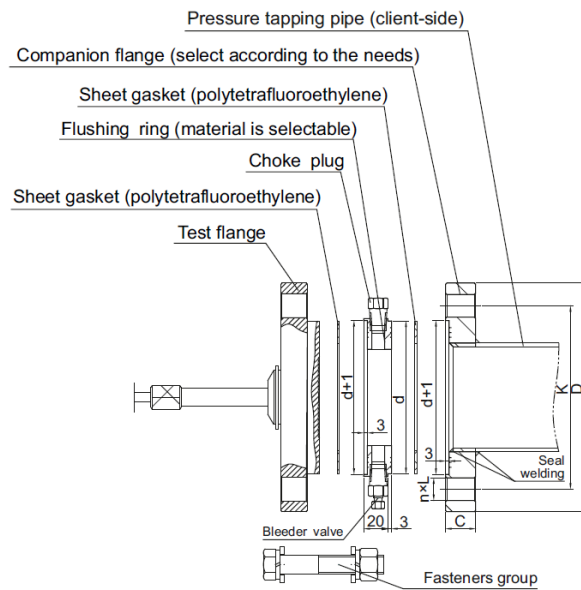
Subassembly of B1 mounting bracket



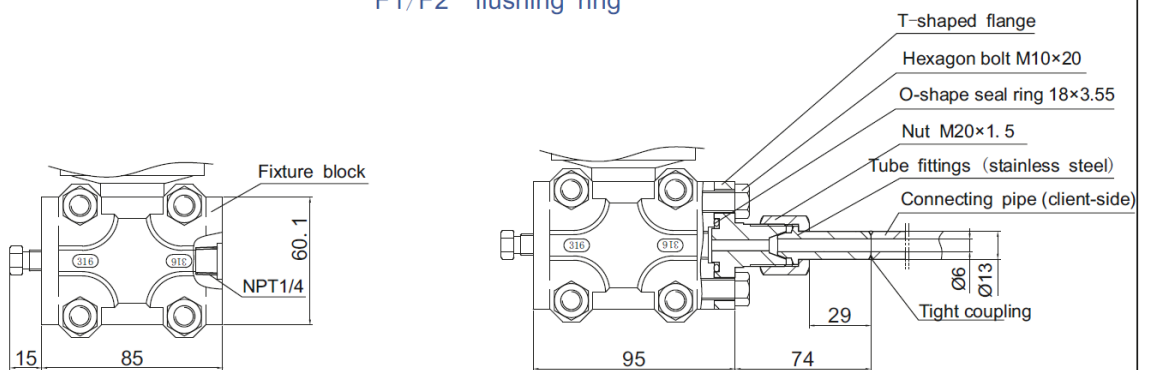
Subassembly of B2 mounting bracket



Subassembly of B3 mounting bracket

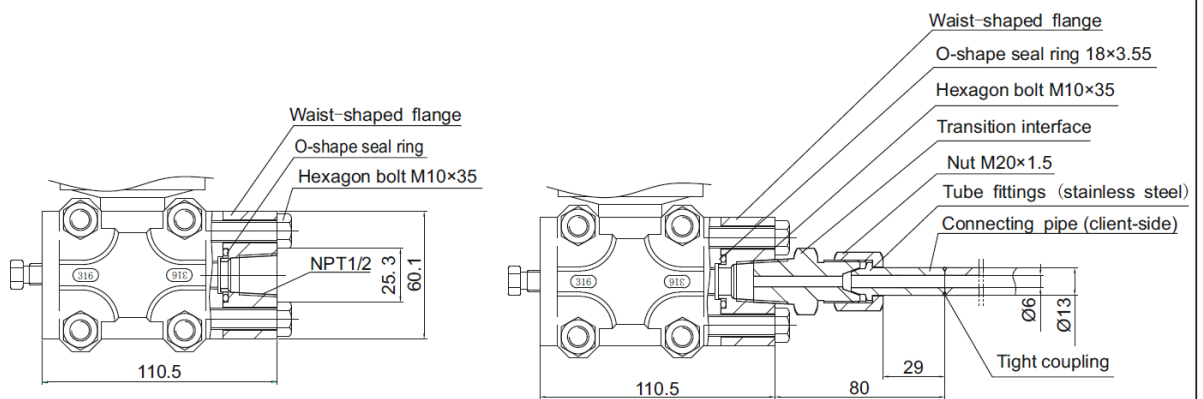


F1/F2 flushing ring



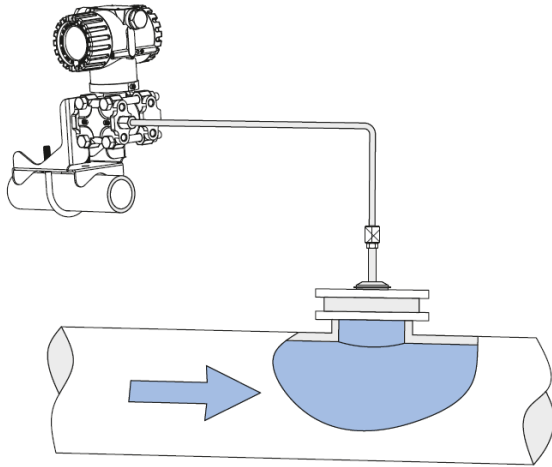
Process connecting type - leading pressure optional figure (P)
- 1/4-18NPT taper pipe female thread

Process connecting type - leading pressure optional figure (J)
- T-shaped interface, with connecting pipe interface on the back

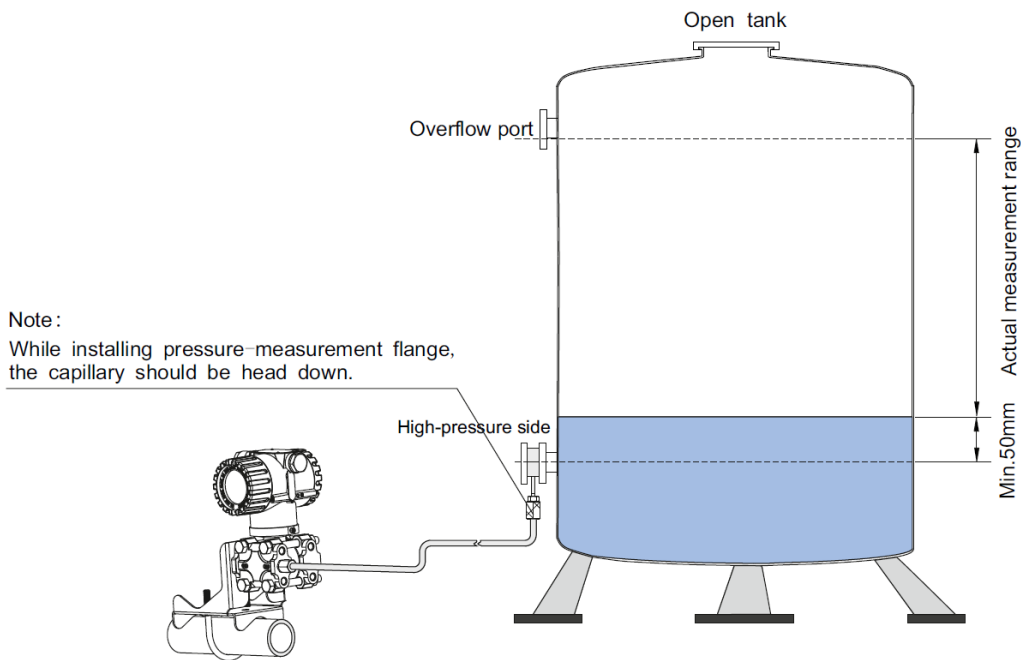


Process connecting type - leading pressure optional figure (N)
- Waist-shaped interface

Process connecting type - leading pressure optional figure
- NPT1/2-14 pressure-leading transition head,
with connecting pipe interface on the back



The flange installation mode of pipeline pressure



Flange installation mode of open tank liquid level

Field installation figure for single remote-transmission diaphragm system



Table 5.BPT363G monocrystal silicon flange remote-transmission type transmitter

Model	Transmitter type		
BPT363G-	Monocrystal silicon flange remote-transmission type transmitter		
Code	Measurement range of pressure		
V	0.1~1MPa		
A	0.3~3MPa		
G	1~10MPa		
Code	Flange standard		
P	Chemical industry standard HG/T20592-2009 (steel tube flange PN series - RF raised face flange) (adduce European system)		
C	Chemical industry standard HG/T20615-2009 (steel tube flange Class series - RF raised face flange) (adduce American system)		
Y	Other chemical industry standards		
Code	Type of sealing element		
P	Flat type		
R	Flange type		
E	Plug-in cartridge type (not offer DN25, DN40, 1 inch and 1 1/2 inches)		
T	Thread type		
Code	Nominal aperture of flange		
	PN series (Eropean system)	Class series (American system)	Thread type spec.
1	DN25	1 inch	NPT1/2
2	DN40	1½ inches	NPT1/4
3	DN50	2 inches	NPT3/8
4	DN80	3 inches	NPT1
5	DN100	4 inches	NPT 1½ (without flushing hole)
Y	Special requirements		
Code	Aperture pressure grade		
	PN series (Eropean system)	Class series (American system)	
1	PN2.5, PN6(bar)		
2	Pn10, PN16(bar)	Class150(lb)	
3	Pn25, PN40 (bar)	Class300(lb)	
Y	Special requirements		
Code	Extension length of plug-in cartridge		
0	0 (with plug-in cartridge)		
2	50mm		
4	100mm		
6	150mm		
8	200mm		
Y	Special requirements		
Code	Length of capillary on the high-ppressure H side		
<input type="checkbox"/> <input type="checkbox"/>	The length of capillary is from 1~10m, indicated by .. (for instance: 2m:02)		
Code	Diaphragm material		
-A	316L stainless steel		
-B	Hastelloy C (Plug-in cartridge type doesn't have this option.)		
-C	Ta (Plug-in cartridge type doesn't have this option.)		
-Y	Special requirements		





Table 5 (continued). BPT363G monocrystal silicon flange remote-transmission type transmitter

Code	Process filling liquid - high-pressure side	Temperature limit
D	Normal-temperature silicone oil (D.C.200)	-45 to 205
C	High-temperature silicone oil (D.C.704)	0 to 315
H	Fluorocarbon oil	-18 to 204
Code	Electrical interface	
A	ANSI NPT1/2(F) internal thread	
M	ISO M20×1.5 internal thread	
Code	Options for the hazardous occasion certification	
N	Ordinary type (anti-explosion)	
D	Flame-proof Exd II CT6	
I	Intrinsic-safety type Exia II CT6	
Code	Mounting bracket	
B3	Pipe-mounted flat bracket (2" pipe)	
B1	Pipe-mounted bent bracket (2" pipe)	
B2	Plate-mounted bent bracket	
Code	Configuration options	
F	Diaphragm sticking with polytetrafluoroethylene	
T	Diaphragm coating with teflon	
C4	High alarm	
CN	Low alarm (The default setting is low alarm)	
Q4	Verification certificate	
F1	Stainless steel flushing adapter ring (Plug-in cartridge type doesn't have this option.)	
F2	Hatelloy flushing adapter ring (Plug-in cartridge type doesn't have this option.)	
P	1/4-18NPT taper pipe internal thread (low-pressure side)	
N	With waist-shaped interface: 1/2-14NPT taper pipe internal thread (low-pressure side)	
J	With T-shaped interface: M20×1.5 external thread and back welding connecting pipe (low-pressure side)	
C	With waist-shaped interface matching used with NPT1/2-14 pressure-leading transition head and back welding connecting pipe (low-pressure side)	

Note: 1. When the length of capillary increased, the accuracy is reduced.
2. if needing higher precision, please contact the marketing representatives of the corporation.



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Smart Pressure Transmitter with Remote seal BPT363-G

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BASI series remote-transmission diaphragm system

Apply to BPT363 type monocrystal silicon transmitter

Extend the applied range of pressure transmitter

- Blistering and gelid temperature
- Corrosive measurement occasions
- Process easy to block
- Occasions needing sanitation and hygiene

Applications

- Measurement of liquid level, flow, pressure, interface and density.



Technical specification

Table 1 Specification of filling liquid

Filling liquid	Temperature limit ⁽¹⁾		Specific gravity	Coefficient of thermal expansion cc/cc/°C	Viscosity at 25°C CST
	P _{Absolute pressure} <1 bar _{Absolute pressure}	P _{Absolute pressure} >1 Bar _{Absolute pressure}			
D. C. 200 silicone oil	-45 to 100°C (-49 to 212°F)	-45 to 205°C	0.93	0.00108	9.5
D. C. 704 silicone oil ⁽²⁾	0 to 200°C (32 to 392°F)	-10 to 315°C	1.07	0.00095	44
Inert filling liquid (Halogenated hydrocarbon)	-50 to 80°C (-49 to 176°F)	-50 to 160°C	1.85	0.000864	6.5

(1) Under the occasion of vacuum measurement, the temperature limit reduces and probably be limited by the selected diaphragm sealing element. Please contact BASI Instrument AB.

(2) The upper limit value of temperature applies to the capillary sealing element system, which is far away from the transmitter installation. For the situation that the temperature limit value is higher than 315°C, please contact BASI Instrument AB.

Mounting flange

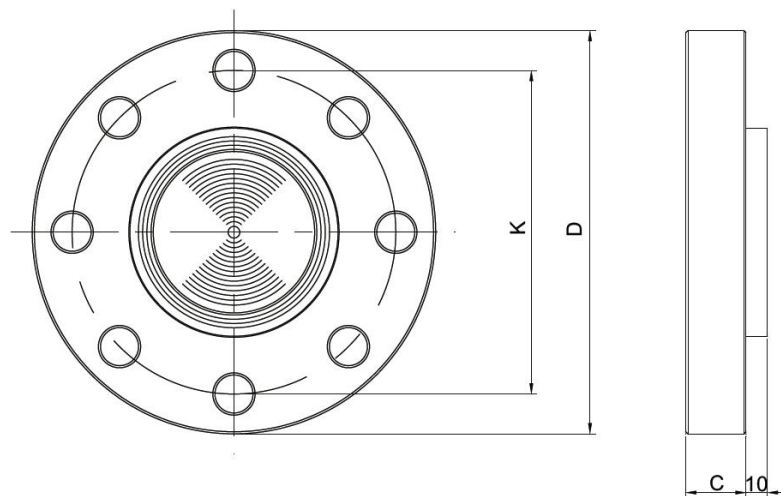






Table 2. The max. pressure rated value of flange

Standard	Grade/rated performance	Carbon steel	Stainless steel
ANSI	150	285 pounds/inch ² absolute pressure ⁽¹⁾	275 pounds/inch ² absolute pressure ⁽¹⁾
ANSI	300	740 pounds/inch ² absolute pressure ⁽¹⁾	720 pounds/inch ² absolute pressure ⁽¹⁾
ANSI	600	1480 pounds/inch ² absolute pressure ⁽¹⁾	1440 pounds/inch ² absolute pressure ⁽¹⁾
DIN	PN2.5/6	6 bar ⁽²⁾	6 bar ⁽²⁾
DIN	PN10/16	16 bar ⁽²⁾	16 bar ⁽²⁾
DIN	PN25/40	40 bar ⁽²⁾	40 bar ⁽²⁾
DIN	PN64	64 bar ⁽²⁾	64 bar ⁽²⁾
DIN	PN100	100 bar ⁽²⁾	100 bar ⁽²⁾

(1) Under 100°F (38°C), the rated value will decrease with the increasing of temperature.

(2) Under 248 (120°C), the rated value will decrease with the increasing of temperature.

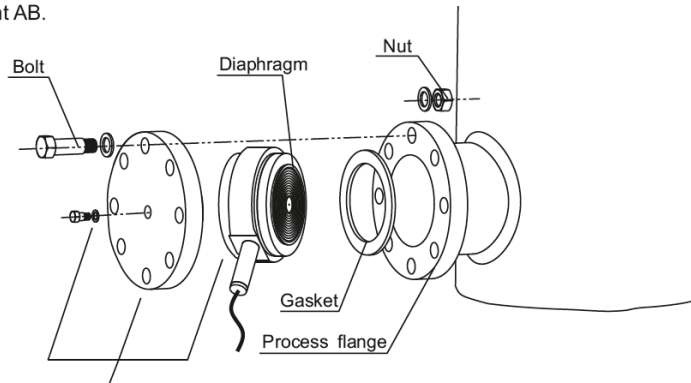
Guide for the selection of diaphragm sealing element

Guide for the selection of diaphragm sealing				
Type of sealing element	Flat type (Ring joint face connection)	Flange remote-transmission type sealing element (Ring joint face connection)	Extension-flange type sealing element	Thread type remote transmission sealing element
General application and service type	General application	General application Smaller process connection	Technical process of heat preservation	High-temperature applications Thread type connection
Process connection size	1 inch DN25 1½ inches DN40 2 inches DN50 3 inches DN80 4 inches DN100	1 inch DN25 1½ inches DN40 2 inches DN50 3 inches DN80 4 inches DN100	1 inch DN25 1½ inches DN40 2 inches DN50 3 inches DN80 4 inches DN100	NPT 1/4 NPT 3/8 NPT 1/2 NPT 1 NPT 1½ (without flushing hole)
Flange pressure rated value or max. limit working pressure	Grade 150 Grade 300 Grade 600 PN 40 PN 64(63) PN 100 No flange (max. limit working pressure 2000pounds/inch ²)	Grade 150 Grade 300 Grade 600 PN 16 PN 40 PN 64 PN 100	Grade 150 Grade 300 Grade 600 PN 10/16 PN 40 PN 64 PN 100	2500pounds/inch ²
Material of diaphragm and wet-contacting parts	316L stainless steel Hastelloy C Ta 304L stainless steel	316L stainless steel Hastelloy C Ta 304L stainless steel	316L stainless steel 304L stainless steel	316L stainless steel Hastelloy C Ta
Casing material	316L stainless steel Hastelloy C Carbon steel 304L stainless steel	316L stainless steel Hastelloy C Carbon steel 304L stainless steel	Not applicable	316L stainless steel Hastelloy C Carbon steel 304L stainless steel
Options	Diaphragm sticking with polytetrafluoroethylene Diaphragm coating with teflon	Diaphragm sticking with polytetrafluoroethylene Diaphragm coating with teflon	Diaphragm sticking with polytetrafluoroethylene Diaphragm coating with teflon	Diaphragm sticking with polytetrafluoroethylene Diaphragm coating with teflon

Sealing element subassembly of general-purpose diaphragm

Flat type diaphragm sealing element

Tips: The illustrations indicate the standard supply products. If needing the dimensional drawing of the special order configuration, please contact BASI Instrument AB.



Before delivery, the product has been assembled.

Field installation figure for flat type diaphragm

3 inches flat type sealing element with optional flushing connection structure



Flat type remote-transmission transmitter

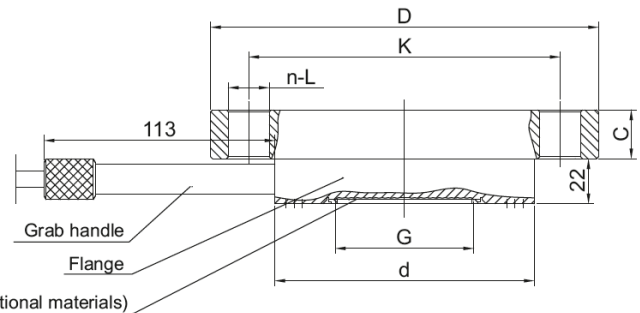


Table 5. Size of flat diaphragm sealing element

Flange specification		Extensional diameter of corrugated surface G(mm)		Connection dimension (mm)				
		Diaphragm material		Flange OD D	Diameter of sealing face d	Flange thickness C	Bolt pitch K	Bolt hole quantity-diameter n-L
Aperture	Pressure grade	316L	Ta, hastelloy C					
DN25	PN 6, 10, 16, 25, 40 Bar	56	50	Refer to the chemical industry standard HG/T20592-2009 (RF raised face flange)				
DN40		56	62					
DN50		80	78					
DN80		80	78					
DN100		80	78					
1"	Class 150, 300	56	56	Refer to the chemical industry standard HG/T20615-2009 (RF raised face flange)				
1.5"		62	62					
2"		80	76					
3"		80	78					
4"		80	78					

Note: the flanges of other specifications and standards can be determined by special contract review. Please refer to Appendix 4 for the connection dimension.

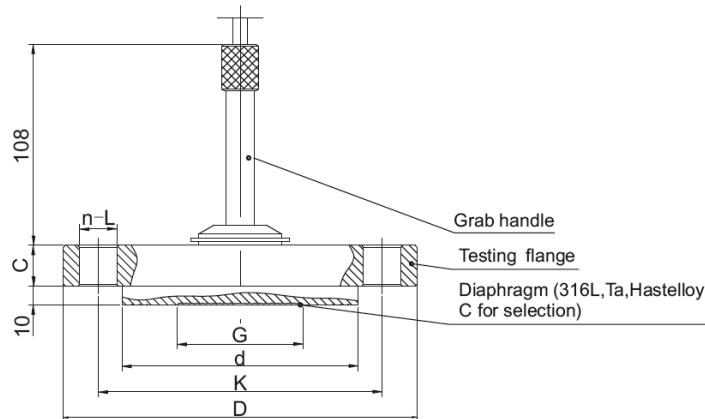
Flange remote-transmission type sealing element

(Apply to the connection of smaller process)

Tips

The illustrations indicate the standard supply products. If needing the dimensional drawing of the special order configuration, please contact BASI Instrument AB.

1 inch flange remote-transmission type sealing element and flushing connection ring (lower shell)



Flange type remote-transmission transmitter

Table 7. Size of flange remote-transmission sealing element

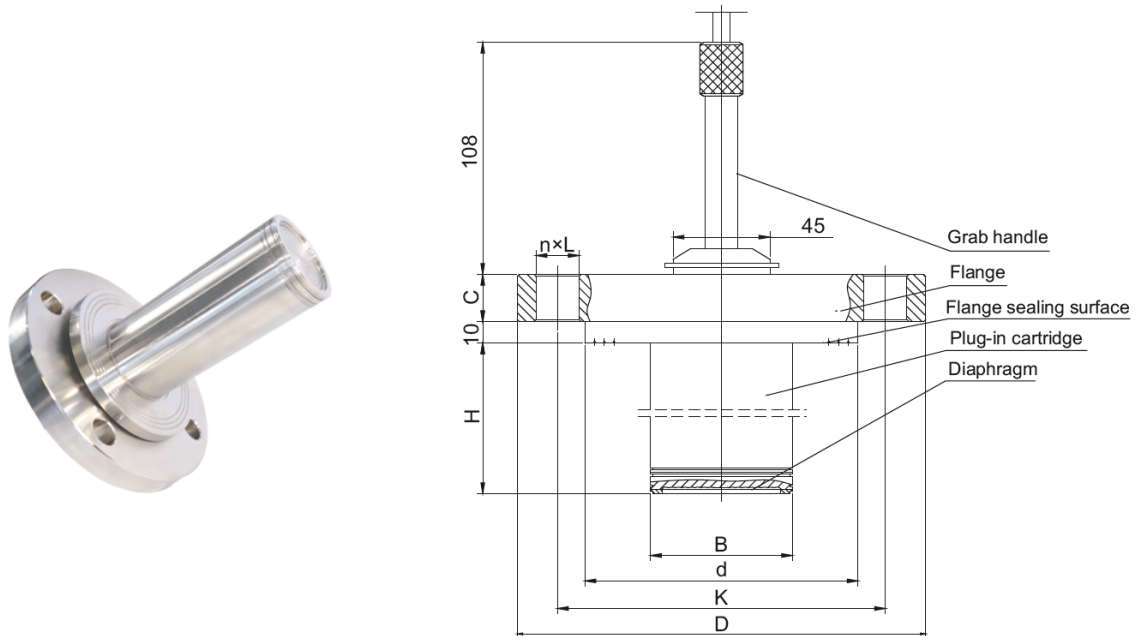
Flange specification		Extensional diameter of corrugated surface G(mm)		Connection dimension (mm)				
		Diaphragm material		Flange OD D	Diameter of sealing face d	Flange thickness C	Bolt pitch K	Bolt hole quantity-diameter n-L
Aperture	Pressure grade	316L	Ta, hastelloy C					
DN25	PN 6, 10, 16, 25, 40 Bar	56	50	Refer to the chemical industry standard HG/T20592-2009 (RF raised face flange)				
DN40		56	62					
DN50		80	78					
DN80		80	78					
DN100		80	78					
1"	Class 150, 300	56	56	Refer to the chemical industry standard HG/T20615-2009 (RF raised face flange)				
1.5"		62	62					
2"		80	76					
3"		80	78					
4"		80	78					

Note: the flanges of other specifications and standards can be determined by special contract review. Please refer to Appendix 4 for the connection dimension.

Extension flange type sealing element

Tips The illustrations indicate the standard supply products. If needing the dimensional drawing of the special order configuration, please contact BASI Instrument AB.

Dimensional drawing for extension flange type subassembly



Extension flange type remote-transmission transmitter

Table 9. Size of extension flange type sealing element

Flange specification		Plug-in cartridge (mm)		Connection dimension (mm)				
Aperture	Pressure grade	Diameter B	Depth H	Flange OD D	Diameter of sealing face d	Flange thickness C	Bolt pitch K	Bolt hole quantity-diameter n-L
DN50	PN 6, 10, 16, 25, 40 Bar	49	50, 100, 150, 200	Refer to the chemical industry standard HG/T20592-2009 (RF raised face flange)				
DN80		66						
DN100		89						
2"	Class 150, 300	49	50, 100, 150, 200	Refer to the chemical industry standard HG/T20615-2009 (RF raised face flange)				
3"		66						
4"		89						

Note: the flanges of other specifications and standards can be determined by special contract review. Please refer to Appendix 4 for the connection dimension.

Thread remote-transmission type sealing element

Tips The illustrations indicate the standard supply products. If needing the dimensional drawing of the special order configuration, please contact BASI Instrument AB.

Dimensional drawing for thread remote-transmission type sealing element subassembly

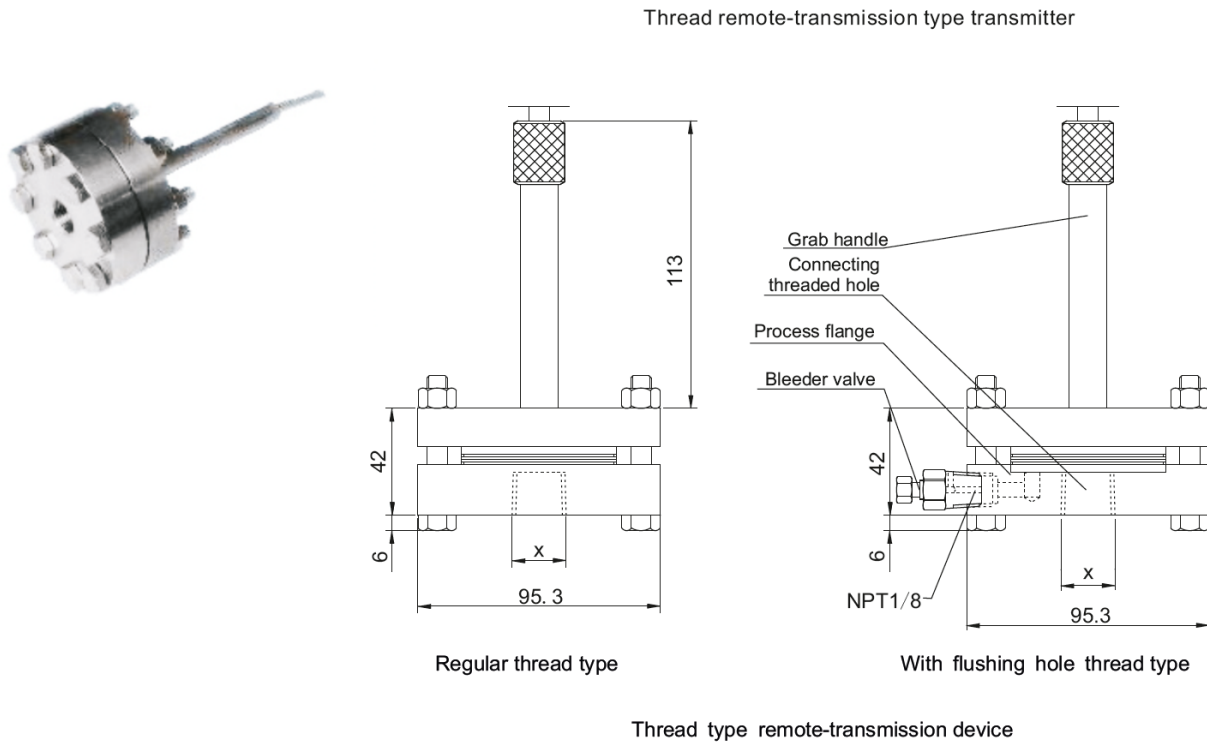


Table 11. Size of thread remote-transmission type sealing element ⁽¹⁾

Rated value	Overall diameter (A)	Overall height (B)
2500pounds/inch ² (172bar)	3.74 (95)	2.32 (59)

(1)The unit of size is inch (mm).

Thread specification X
NPT1/2 (GB/T 12716-2002)
NPT1/4 (GB/T 12716-2002)
NPT3/8 (GB/T 12716-2002)
NPT1 (GB/T 12716-2002)
NPT1½ (Without flushing hole)

The threads of other specification can be determined by special contract review.

Comprehensive technical data

Comprehensive technical data

The performance data of this product provide the information relevant to BASI transmitter/diaphragm sealing element system.

The diaphragm sealing element can be assembled onto the BASI type differential pressure, gage pressure and absolute pressure transmitters and liquid level transmitter. Please refer to the related product performance data for the specific information.

Tips:

★ The transmitters/diaphragm sealing element materials, structural configuration and filling liquids of many other special orders, which haven't been contained in this book, can also be offered. Please contact BASI Instrument ab for more information.

What is a diaphragm sealing element system?

A diaphragm sealing element system is composed of a pressure transmitter, a diaphragm sealing element, a kind of filling liquid and a directly-mounted or capillary type connecting structure.

While working, the thin and elastic diaphragm and filling liquid will isolate the pressure sensing element of transmitter from the process medium. The channel of capillary will connect the diaphragm to the transmitter.

When the process pressure works, the diaphragm will have displacement and the measured pressure will be transmitted to the element of transmitter via filling liquid system and capillary channel. This transmitted pressure will make the detecting diaphragm, which is in the pressure sensing element of transmitter, have displacement. The displacement is in direct proportion to the process pressure and converted into the appropriate current, voltage or digital HART (Bus addressable remote transmitter) output signal via electronic circuit.

Why should the diaphragm sealing element be used?

The diaphragm sealing element system of BASI Instrument ab not only can provide reliable process pressure measurement, but also can prevent the process medium from contacting the transmitter diaphragm.

Under the following conditions, should consider using transmitter/diaphragm sealing element system:

- The process temperature is beyond the normal operating range of transmitter and the pressure-leading pipeline cannot adjust the temperature under the temperature limit value.
- The process is corrosive, which needs to replace the transmitter frequently or use unusual structural materials.
- The process contains suspending solid particles or viscous liquid, which will probably block the pressure-leading pipeline.
- It is required to adopt sanitary connection structure.
- The process should be cleaned easier from the connection structure so as to avoid the pollution among the processing batches.
- Objectively, the filling liquid connecting pipe should be replaced to reduce the maintenance under some application occasions, such as the place that the filling liquid connecting pipe is not stable or the place in which the liquid should be filled.
- It needs density or interface measurement.
- The process will probably be frozen or solidified in the transmitter or connecting pipe.

The factors influencing the performance

Temperature effect

When the filling liquid is dilated or shrunk with the fluctuation of process and ambient temperature, the temperature effect will come into being. This kind of change (in the volume of filling liquid) will transform the internal pressure of transmitter/sealing element system.

There are two main factors influencing the temperature performance of a diaphragm sealing element system: the rigidity of diaphragm and the characteristics of filling liquid.

Diaphragm rigidity

The rigidity of diaphragm is a key parameter which will influence the temperature performance. When the filling liquid dilates and shrinks as a result of temperature changing, a elastic diaphragm will have less reverse pressure than a rigid diaphragm (if the changes of filling liquid volumes are equal). The reverse pressure will cause measurement error, for it is acting on the detecting diaphragm of transmitter. Therefore, the elastic diaphragm sealing element can tolerate the changing of filling liquid volume caused by temperature changing and greatly reduce the error caused by temperature changing.

The rigidity of diaphragm is influenced by the diaphragm diameter, structural material, thickness and volution pattern, among which, the most important one is the diameter of diaphragm sealing element. Every diaphragm has its own rigidity characteristic curve. Generally speaking, the rigidity of a diaphragm with shorter diameter is larger than that of a diaphragm with longer diameter. So its rigidity curve presents a smaller perpendicularity. The more perpendicular rigidity curve is conducive to reducing the pressure error amount, which will probably occur when the filling liquid dilates or shrinks with the changing of temperature.

The Fig. 1 on Page58 shows the diaphragm with longer diameter and less rigidity. The error caused by the changing of filling liquid volume is smaller, which is the result of more vertical rigidity curve. The diaphragm with shorter diameter has a smaller perpendicularity of rigidity curve, which will make the error bigger with the changing of temperature.

Filling liquid

The swelling properties and volume will influence the performance of sealing element.

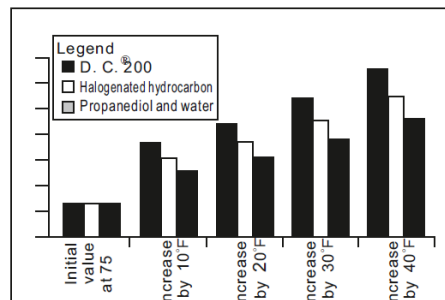
All the filling liquids will dilate and shrink with the changing of temperature. The coefficient of thermal expansion determines this variation, which is indicated by the cubic centimeter amount dilated per cubic centimeter per Fahrenheit (CC/CC/°F). Shown as in the Graph 2 in Fig.1, the swell increments of filling liquids are different. To select the filling liquid with smaller coefficient of thermal expansion will conduce to greatly reducing the temperature error. The table 1 on Page46 "Technical specification of filling liquid" offers the coefficients of thermal expansion of all the filling liquids that we can provide.

The big volume of filling liquid increases the capacity of volume expansion. The volume of filling liquid can be kept at the min. amount as far as possible by reducing the capillary length and internal diameter so as to reduce the effect of temperature.

Influence of pressure head

The influence of pressure head is the result of the density fluctuation of filling liquid in the capillary, which is caused by the fluctuation of process or ambient temperature and can be added to the error of temperature effect.

The influence of pressure head is decided by the changing of ambient temperature, internal diameter of capillary, filling liquid and the distance between the pressure-tapping nozzles of process connection (not the length of capillary).



The expansion of oil, which is in a capillary with internal diameter 0.028 inches and length 1 inch, with the increasing of temperature

Time response

Using diaphragm seal element will increase the total response time of transmitter/diaphragm sealing element system. The time response will change with the temperature, pressure, capillary length, internal diameter (ID), filling liquid, viscosity and transmitter model.

Capillary ID: If the internal diameter (ID) of capillary is smaller, it will generate stronger throttling and slow down the transmission of pressure.

If the ID is larger, it will provide faster response time.

Viscosity of filling liquid: The viscosity of filling liquid is a kind of measurement of its flowability, which is related to the temperature. While selecting a kind of filling liquid with smaller viscosity, especially under the colder condition, using longer capillary will improve the response time.

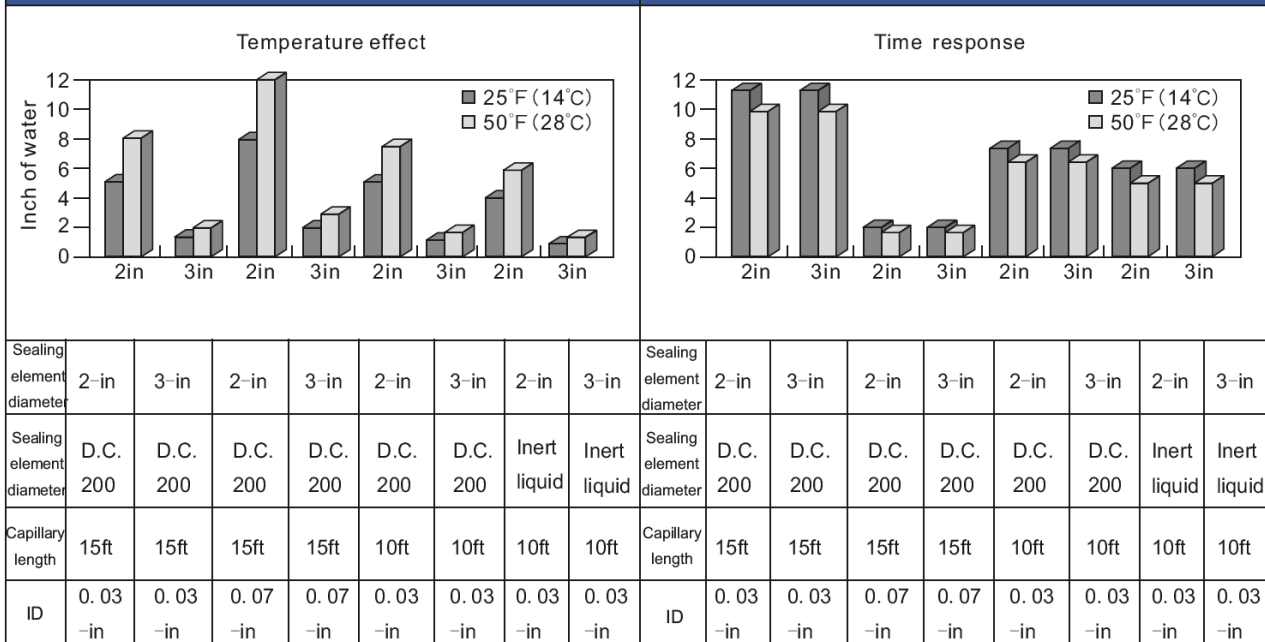
Length of capillary: If the capillary is longer, the transmission distance of pressure signal will be longer, which increase the response time.

In the occasion that the big tank and liquid level changes slowly, it will probably not be hindered by the longer response time. However, if the response time is too slow, the measurement difficulties will easily occur for a small and narrow tank. For the occasions with quick change, such as flow, quicker response time is required.

Brief summary

Adding the diaphragm sealing element on the transmitter will influence the total system performance. These effects can be reduce furthest and the performance of assembling units can be strengthened by selecting the most suitable diaphragm sealing element, capillary and filling liquid. In addition, it can meet or superior to the process requirements.

Summary of temperature effect and time response caused by the combination of sealing element, capillary and filling liquid
(The displayed is calculated by using the instrument tool set.)



While selecting a remote-transmission diaphragm system, the following points should be taken into consideration:

- Select the diaphragm with larger diameter to greatly reduce the effects of temperature.
- Select the shorter capillary to greatly reduce the effects of temperature and response time.
- Select the capillary with larger internal diameter to improve the time response or select capillary with smaller ID to improve the temperature performance.
- Select the filling liquid with the smallest viscosity and min. coefficient of thermal expansion, which can simultaneously meet the extreme process conditions.

Connection type of diaphragm sealing element

Capillary type

The capillary type sealing element connects with the diameter of 1.09mm and can provide standard length (7.5m). There are two kinds of connection structure of capillary type sealing element for selection:

- PVC sheath
- 304 stainless steel armoured casing

PVC casing, 304 stainless steel armoured casing

