



SMART DIFFERENTIAL PRESSURE TRANSMITTER BPT361-D/H/R (with HART® Protocol)

- HART® Protocol
- $\pm 0.065\%$ (0,04%) inaccuracy and non-linearity
- Rangeability 100:1
- 0 - 1mbar (0,1kPa) to -100 - 100 bar
- 100bar static pressure (400bar type H)
- Automatic temperature compensation
- 4 - 20mA output
- True non-interactive zero and span
- Local zero and span adjustment
- LCD indicator
- Adjustable damping
- Indication in engineering units
- AISI 316L or Hasteloy
- 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 BPT361-D/H/R Smart Differential Pressure Transmitter. 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 $\pm 0.04\%$ inaccuracy and non-linearity, 100:1 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 : 0-1mbar (0,1kPa) to -100 - 100bar (10MPa)
Output signal : Two-wire 4-20,20-4 mA & HART® Protocol
Power supply : 16 - 42 VDC (intrinsically safe 16-30VDC)
Load limitation : 0 - 600 Ω for 24VDC
Indicator : 2 line 5 digit LCD indicator
Hazardous area : IP67 weather-proof, and
 Intrinsic-safety type Exia II CT6,
 Flame-proof Exd II CT6
Certificate : ATEX
Zero and span : Non-interactive local adjustment
Ambient.temp : -40 to 85°C
Process.temp : -40 to 121°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 : $\pm 0.01\%$
Inaccuracy : $\pm 0.065\%$, (0,04%)
Temperature effect : $\pm 0.065\%$ /FS/10°C
Power supply effect : Negligible between 14,5 and 45 VDC
Mounting position effect : Any position. No span effect.

Physical Specifications

Electrical connection : $\frac{1}{2}$ "-14NPTF, M20 x 1,5
Process connection : G $\frac{1}{2}$, M20, G $\frac{1}{2}$ 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 : 3,5 kg
Mounting : Directly supported by piping or
 optionally with mounting bracket for
 2" pipes or with direct or remote seals.



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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.

BPT361 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

BPT361 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. BPT361 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 BPT361 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 BPT361 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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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

$\pm 0.065\%$ FS range (conventional)

Stability

$\leq \pm 0.15\%$ FS/5 years

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.)

$\pm 0.065\%$ range

If the range is less than X

$\pm [0.015 + 0.05 \frac{X}{\text{range}}]\%$

X value:

Diaphragm capsule	XKPa
M	4
H	50
V	100

Influence of static pressure

$\pm 0.15\%$ /10MPa range upper limit

Influence of zero point

Can correct the zero position again or conduct pressure zero position transference according to the field installation position etc.

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 BPT361D transmitter and limit value of sensor

Range	Min. range	Limit value of range and sensor	
		Upper limit of range (URL)	Lower limit of range (LRL)
M	1KPa	40KPa	-40KPa
H	2.5KPa	250KPa	-250KPa
V	10KPa	1000KPa	-1000KPa

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

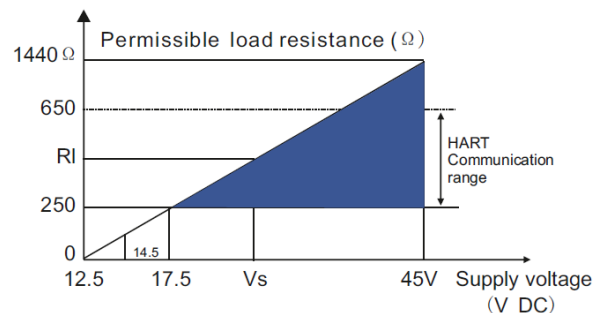
Two-wire 4-20mA, linear output or square root output is selectable for users. Digital process variable overlays on the 4-20mA signal, which can be applied to the host machines according with HART protocol.

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

Unidirectional overpressure and max. static pressure is 10MPa

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 to +85C

Process

Larger than or equal to the atmosphere, please see the following table

Table 2: Process temperature limit of BPT361D transmitter

Silicone oil filled sensor	-40 to 121°C
Inertia liquid filled sensor	-30 to 121°C

Temperature drift

$\leq 0.065\%FS/10^{\circ}C$

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(American-Standard) NPT1/2(F) internal thread

ISO (standard) M20×1.5 internal thread

Process interface

No process interface (NPT1/4 internal thread on the chamber flange)

With waist-shaped interface: NPT1/2 taper pipe internal thread

With T-shaped interface: M20×1.5 external thread and back welding connecting pipe (stainless steel)

With waist-shaped interface matching used with NPT1/2 pressure-leading transition head and back welding connecting pipe (stainless steel)

Process liquid-contacting piece

Process isolation diaphragm: 316 stainless steel, hastelloy C

Drain/vent valve

316 stainless steel

Process flange and interface

Carbon steel cadmium plate, 316 stainless steel

Non-liquid-contacting piece

Shell

Aluminium die casting IP65

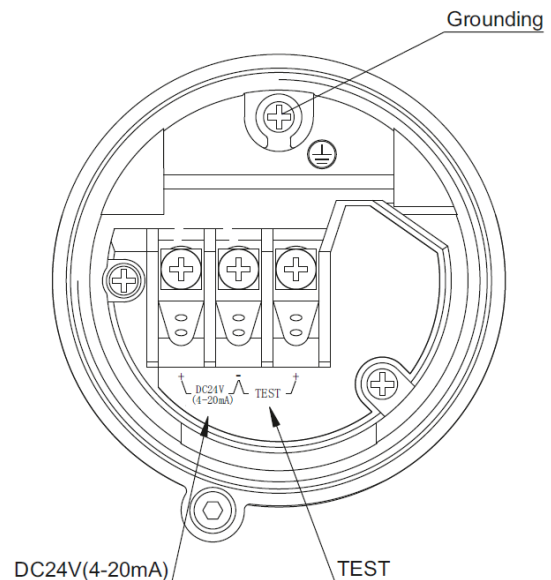
Coating

Spraying plastics

Meter cap O-ring

Nitrile rubber

Wiring diagram of terminal side



Connecting terminal	
DC24V(4~20mA) $\begin{matrix} + \\ - \end{matrix}$	Power supply and output end
TEST $\begin{matrix} + \\ - \end{matrix}$	Connect to the testing terminal of ampere meter (impedance should be less than 10Ω)
$\begin{matrix} \text{---} \\ \\ \text{---} \end{matrix}$	Ground terminal

MECHANICAL SPECIFICATIONS



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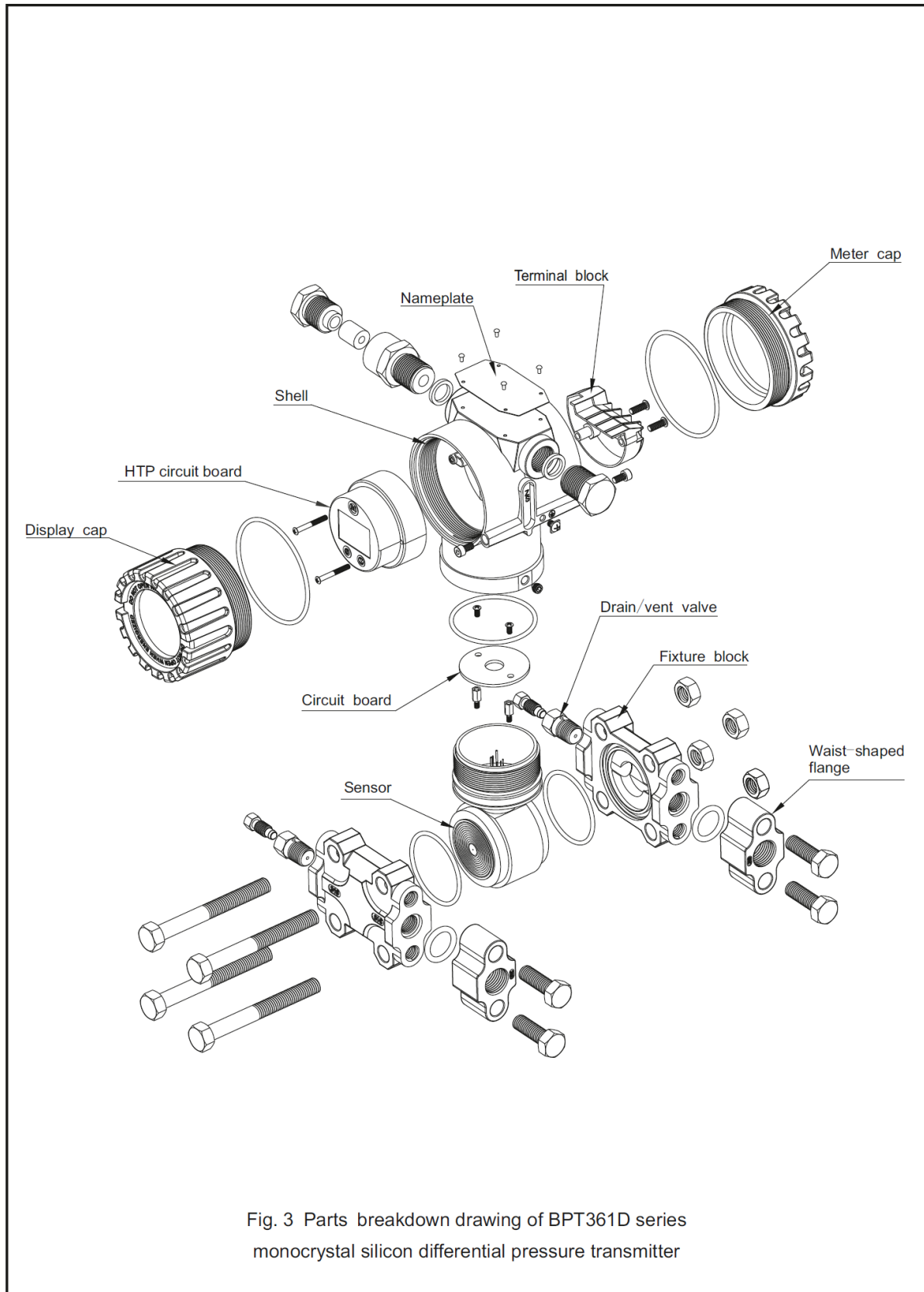
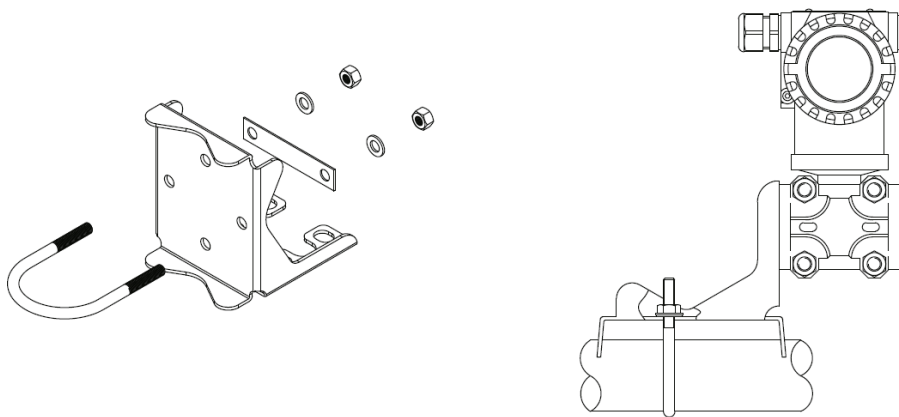
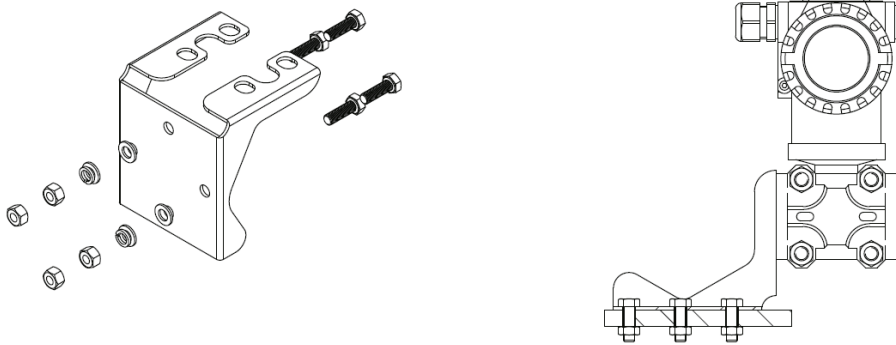


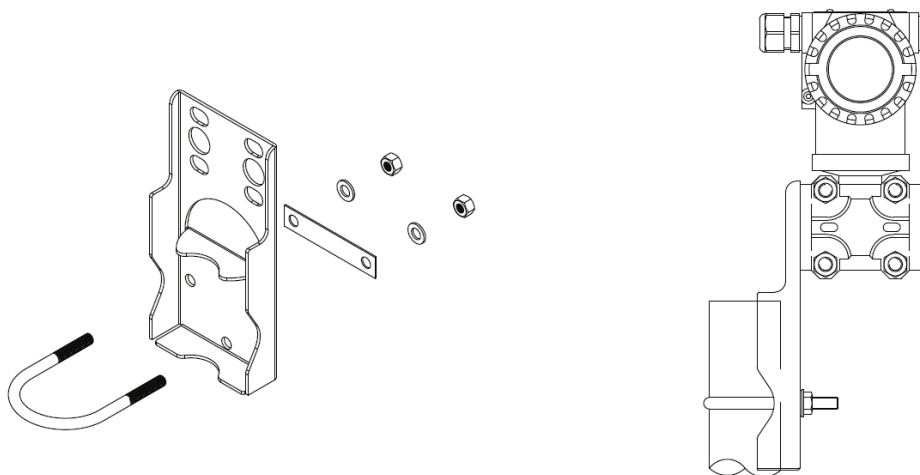
Fig. 3 Parts breakdown drawing of BPT361D series monocrystal silicon differential pressure transmitter



Pipe installation (Code of this option: B1)



Panel mounting (Code of this option: B2)



Pipe installation (Code of this option: B3)

Fig. 4: Installation structure, with optional bracket, applied to 2 inch pipe or panel installation

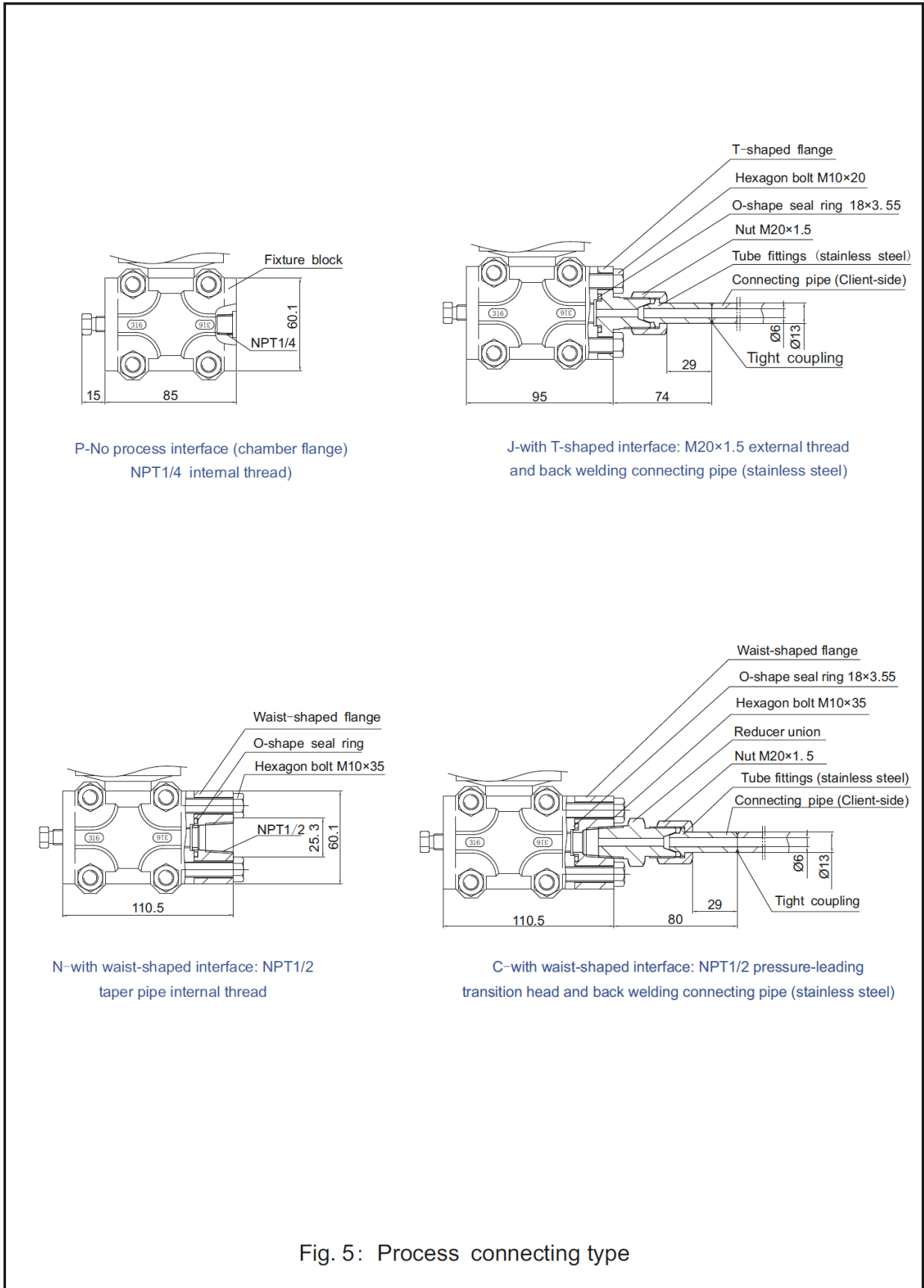
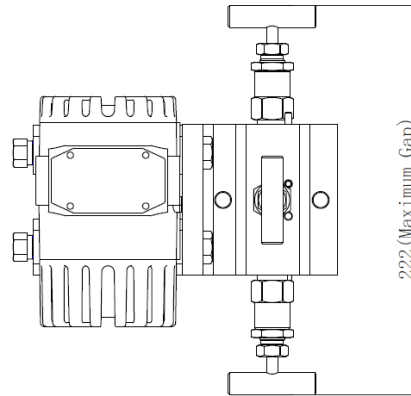
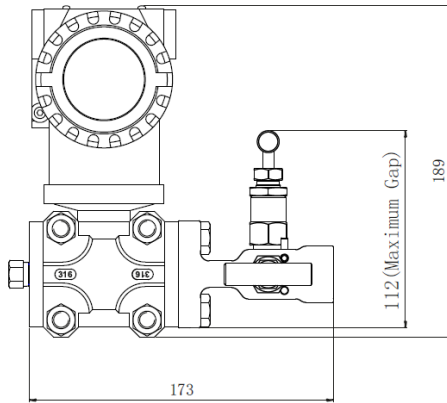
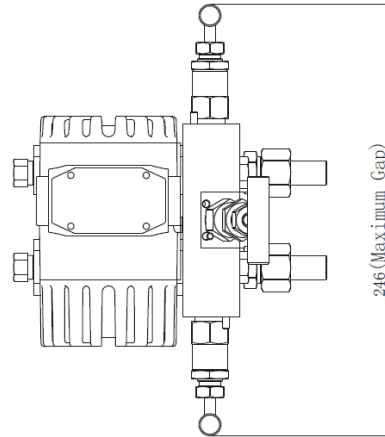
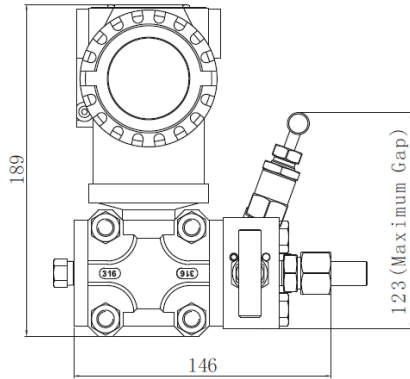
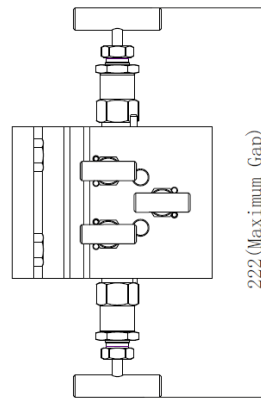
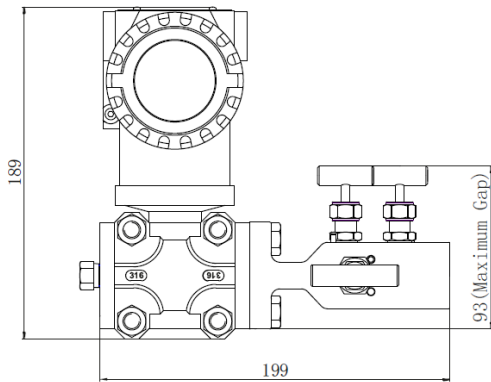


Fig. 5: Process connecting type



Component dimension figure of three valve group



Component dimension figure of five valve group

Fig. 6: Component dimension figure of integrated valve group (unit: mm)



Table 3: BPT361D series monocrystal silicon differential pressure transmitter

Model	Transmitter type	
BPT361D-	Monocrystal silicon differential pressure transmitter	
Code	Measurement range of pressure	
M	1~40KPa	
H	2.5~250KPa	
V	10~1000KPa	
Code	Transmitter output	
S	Standard intelligent type (4~20) mA DC with HART protocol	
J	Standard intelligent type (4~20) mA DC, output is HART+ $\sqrt{\Delta P}$	
Code	Filling liquid	Diaphragm
1	Silicone oil	316L stainless steel
2	Fluorocarbon oil	316L stainless steel
3	Silicone oil	Hastelloy C
4	Fluorocarbon oil	Hastelloy C
Code	Electrical interface	
A	ANSI NPT1/2(F) internal thread	
M	ISO M20×1.5 internal thread	
Code	Header	
-M	LCD display (with setting button)	
-N	No header (lower than -20℃)	
Code	Anti-explosion grade	
N	Ordinary type (no 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	Process connecting type	
P	No process interface (NPT1/4 internal thread on the chamber flange)	
N	With waist-shaped interface: NPT1/2 taper pipe internal thread	
J	With T-shaped interface: M20×1.5 external thread and back welding connecting pipe (stainless steel)	
C	With waist-shaped interface matching used with NPT1/2 pressure-leading transition head and back welding connecting pipe (stainless steel)	
Code	Installation selection of valve group integration (can be selected) ⁽¹⁾	
V3	Three valves manifold	
V5	Five valves manifold	
Code	Other options	
Q4	Verification certificate (please contact with BASI)	
C4	High alarm	
CN	Low alarm (The default setting is low alarm.)	
Typical model	BPT361D-MS1A-MDB3N	

Note: if needing higher precision, please contact the marketing representatives of the corporation.

Note(1): Installation selection of valve group integration, this item can be choose according to your require, we offer you 316ss material as standard choice. If you have other requirement, please contact with sales representative.



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Table 3: BPT361H series monocrystal silicon high hydrostatic pressure differential pressure transmitter

Model	Transmitter type	
BPT361H-	Monocrystal silicon high hydrostatic pressure differential pressure transmitter	
Code	Measurement range of pressure	Unidirectional overpressure
M	1~40KPa	25MPa
H	2.5~250KPa	25MPa
V	0.01~1MPa	25MPa
Code	Transmitter output	
S	Standard intelligent type (4~20) mA DC with HART protocol	
J	Standard intelligent type (4~20) mA DC, output is HART+ $\sqrt{\Delta P}$	
Code	Static pressure	
1	25MPa	
2	40MPa	
Code	Filling liquid	Diaphragm
1	Silicone oil	316L stainless steel
2	Fluorocarbon oil	316L stainless steel
3	Silicone oil	Hastelloy C
4	Fluorocarbon oil	Hastelloy C
Code	Electrical interface	
A	ANSI NPT1/2(F) internal thread	
M	ISO M20×1.5 internal thread	
Code	Header	
-M	LCD display (with setting button)	
-N	No header (lower than -20℃)	
Code	Anti-explosion grade	
N	Ordinary type (no 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	Process connecting type	
P	No process interface (NPT1/4 internal thread on the chamber flange)	
N	With waist-shaped interface: NPT1/2 taper pipe internal thread	
J	With T-shaped interface: M20×1.5 external thread and back welding connecting pipe (stainless steel)	
C	With waist-shaped interface matching used with NPT1/2 pressure-leading transition head and back welding connecting pipe (stainless steel)	
Code	Installation selection of valve group integration (can be selected) ⁽¹⁾	
V3	Three valves manifold	
V5	Five valves manifold	
Code	Other options	
Q4	Verification certificate (please contact with BASI)	
C4	High alarm	
CN	Low alarm (The default setting is low alarm.)	
Typical model	BPT361H-MS11A-MDB3N	

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Table 3: BPT361R series monocrystal silicon micro differential pressure transmitter

Model	Transmitter type	
BPT361R-	Monocrystal silicon micro differential pressure transmitter	
Code	Measurement range of pressure	Unidirectional overpressure
E	0.1~40KPa	200KPa
L	0.3~6KPa	4MPa
Code	Transmitter output	
S	Standard intelligent type (4~20) mA DC with HART protocol	
J	Standard intelligent type (4~20) mA DC, output is HART+ $\sqrt{\Delta P}$	
Code	Filling liquid	Diaphragm
1	Silicone oil	316L stainless steel
2	Fluorocarbon oil	316L stainless steel
3	Silicone oil	Hastelloy C
4	Fluorocarbon oil	Hastelloy C
Code	Electrical interface	
A	ANSI NPT1/2(F) internal thread	
M	ISO M20×1.5 internal thread	
Code	Header	
-M	LCD display (with setting button)	
-N	No header (lower than -20℃)	
Code	Anti-explosion grade	
N	Ordinary type (no 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	Process connecting type	
P	No process interface (NPT1/4 internal thread on the chamber flange)	
N	With waist-shaped interface: 1/2-14NPT taper pipe internal thread	
J	With T-shaped interface: M20×1.5 external thread and back welding connecting pipe (stainless steel)	
C	With waist-shaped interface matching used with NPT1/2 pressure-leading transition head and back welding connecting pipe (stainless steel)	
Code	Installation selection of valve group integration (can be selected) ⁽¹⁾	
V3	Three valves manifold	
V5	Five valves manifold	
Code	Other options	
Q4	Verification certificate (please contact with BASI)	
C4	High alarm	
CN	Low alarm (The default setting is low alarm.)	
Typical model BPT361R-ES1A-MDB3N		

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