





# PRESSURE TRANSMITTER

## TP2021 Series

### Differential Type

	<h3>TP2021D</h3> <ul style="list-style-type: none"><li>• Reliable performance, easy to use.</li><li>• Short circuit protection</li><li>• Reverse polarity protection</li><li>• Anti-interference, anti-lightning design</li><li>• High precision, stability and reliability</li></ul>
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### Gauge / Absolute Type

	<h3>TP2021G/A</h3> <ul style="list-style-type: none"><li>• Compact Type</li><li>• Piezo-Resistive Sensor</li><li>• Measuring Ranges 0-1000 bar</li><li>• Non-linearity up to 0.125% of span</li><li>• Multiple Output Signal Options - 4-20mA, 0-10 V DC, 1-5 V DC</li><li>• Communication : HART, RS485</li></ul>
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## Principle of Operation

TP2021 is the ideal solution for general industrial applications with demanding pressure measuring requirements. The product features very good accuracy, a robust design and wide variations/ customizations making it suitable for the widest range of applications.

TP2021D uses piezoresistive differential pressure sensor as sensing element. Silicon oil is filled in between die and two diaphragms, when differential pressure is added on two diaphragms, the pressure could be transferred onto die through silicon oil. Sensor die connects with amplifier circuit through wires, using semi-conductor's piezoresistive effect, transforming differential pressure signal into electric signal.

The robust design turns it into a very high quality product which can work in adverse environmental conditions. The model TP2021 offers continuous measuring ranges between 0 to 0.4 and 0 to 1600 bar.

These measuring ranges can be customized in the standard industry output signals, the most common international process connections and a wide number of electrical connections making the product versatile and easy to configure and use.

## Applications

- Power Generation, Petroleum, Chemical
- Urban water supply, hydrologic exploration
- Hydraulics
- Steel, Cement, Process Industries

## Technical Specifications

Pressure Parameters		
Pressure Range	0 kPa to 3.5 MPa (Differential PT) -0.1 MPa to 100 MPa (Gauge/Absolute)	
Overload Pressure	2 times@ FS	
Electrical Parameters		
Output Type	Current Type	Voltage Type
Power Supply	9 to 30V DC	12 to 30V DC
Output Signal	4 to 20mA DC (2 wire)	0/1V to 5/10V DC (3 wire)
Load Resistance	$\leq(\text{Power supply}-9)/0.02$	$\geq 10k$
Insulation Resistance	100M Ohms , 100V DC	

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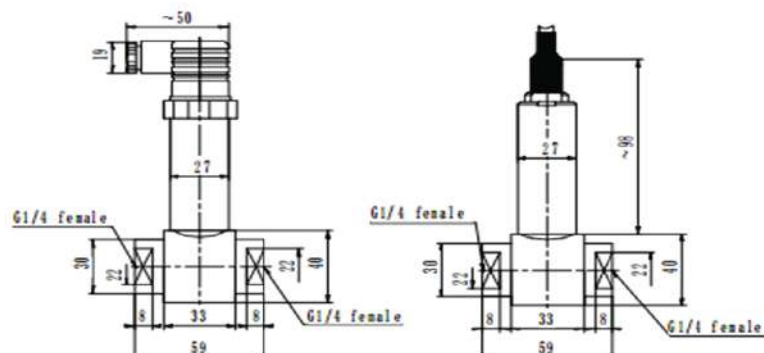




Construction Parameters		
Housing	Stainless Steel 304	
Plug Housing	Plastic	
Sensor	SS 316L	
Seal Ring	Viton	
Cable	ø7.5mm Special cable for Polyethylene	
Protection Class	IP65 (Plug)	IP68 (Cable)
Performance Parameters		
Accuracy	±0.25%FS (Typical)	±0.5% FS (Max.)
Zero Temperature Coefficient	DPT : ±1.0%FS (Typical)	DPT : ±1.5%FS (Max)
	PT : ±0.02%FS/°C (Typical)	PT : ±0.03%FS/°C (Max)
Full Temperature Coefficient	DPT : ±1.0%FS( Typical)	DPT : ±1.5%FS (Max)
	PT : ±0.02%FS/°C (Typical)	PT : ±0.03%FS/°C (Max)
Long Term Stability	DPT : ±0.2%FS/year (Max.)	
	PT : Max. : ±0.3%FS/year, Min. : ±0.1%FS/year	
Ambient Temperature Parameters		
Media Applicability	Fluid which has no corrosion to SS 316L and Viton	
Compensation Temperature	0°C to 70°C	
Medium Temperature	-40°C to 125°C	
Storage Temperature	-55°C to 150°C	

## Dimension Details

### 1. Differential Pressure Transmitter



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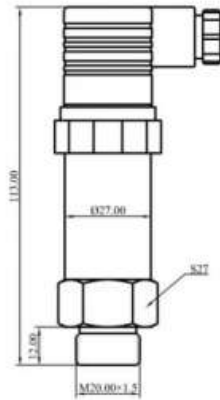
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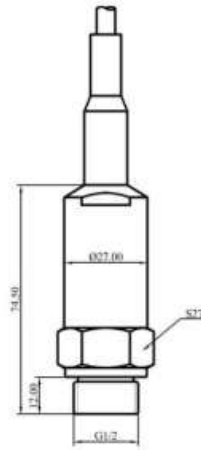


## 2. Pressure Transmitter

### 1. Pressure Transmitter with A and B output

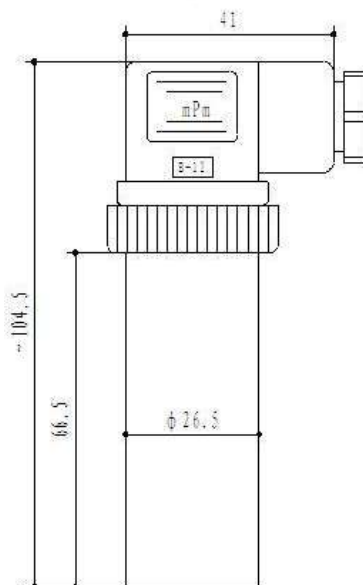


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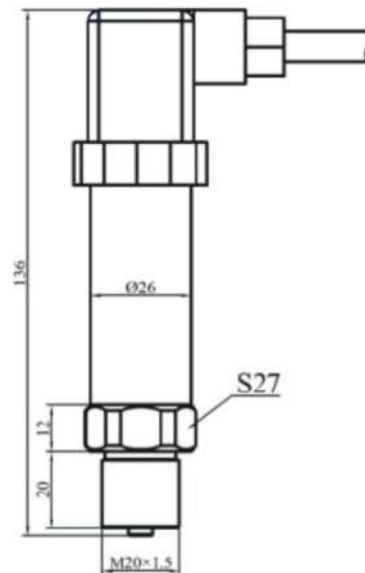


Cable

### 2. Dimensional drawing for output C



### 3. Dimensional drawing for output D





## Electrical Connection

Transmitter connects with the outer circuit through a DIN43650 plug. Terminal definition as below:

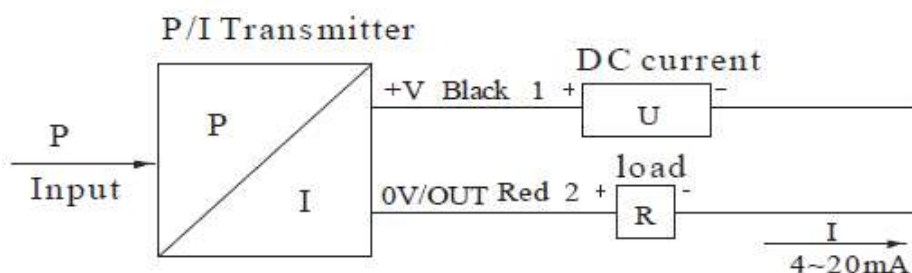
**Plug Connection**

Pin	2-Wire	3-Wire
1	+V	+V
2	Signal: +OUT	GND
3	Null	Signal: +OUT

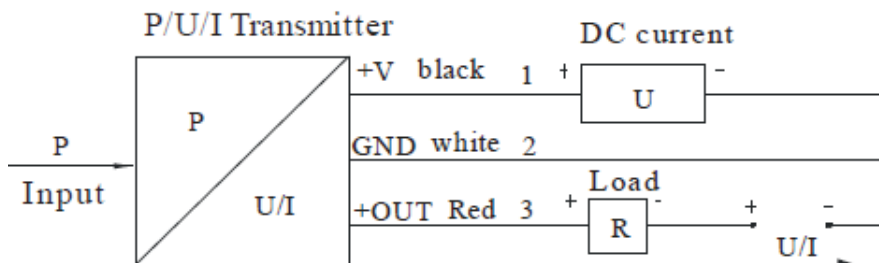
**Cable Connection**

Pin	2-Wire	3-Wire
1	+V	+V
2	0V	+OUT
3	Null	GND

**Electrical Connection for transmitter output 2-wire 4 to 20mA DC**



**Electrical Connection for transmitter 3-wire 0/1 to 5VDC**





## Selection Table

Example - TP2021DPNAAA121APX (0-10-20-30...-120)

0	Type
TP2021	Compact Pressure Transmitter
10	Measurement Type
D	Differential Pressure Transmitter
G	Gauge Pressure Transmitter
A	Absolute Pressure Transmitter
20	Sensor Type
P	Piezo-Resistive type
C	Ceramic Type
30	Display
N	None
L	LED Display
40	Pressure Range
A	0 to 10 kPa
B	0 to 20 kPa
C	0 to 35 kPa
D	0 to 70 kPa
E	0 to 100 kPa
F	0 to 200 kPa
G	0 to 350 kPa
H	0 to 700 kPa
I	0 to 1 MPa
J	0 to 2 MPa
K	0 to 3.5 MPa
L	0 to 7 MPa (Not applicable for DPT)
M	0 to 15 MPa (Not applicable for DPT)
N	0 to 20 MPa (Not applicable for DPT)
O	0 to 35 MPa (Not applicable for DPT)
P	0 to 70 MPa (Not applicable for DPT)
Q	0 to 100 MPa (Not applicable for DPT)
50	Accuracy
A	± 0.5%
B	± 0.25%
60	Output
A	4-20mA

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<b>B</b>	0/1V to 5/10V DC
<b>C</b>	4-20mA+HART (Only applicable for Without Display PT)
<b>D</b>	RS485 (Only applicable for Without Display PT)
<b>70</b>	<b>Housing</b>
<b>1</b>	SS 304
<b>2</b>	SS 316
<b>80</b>	<b>Pressure Port</b>
<b>1</b>	SS 304
<b>2</b>	SS 316L
<b>90</b>	<b>Diaphragm Material</b>
<b>1</b>	SS316L
<b>2</b>	Hastelloy C (For PT only)
<b>3</b>	Hastelloy C, Gold Plated (For DPT only)
<b>100</b>	<b>Process Connection</b>
<b>A</b>	G1/2 M
<b>B</b>	G1/4 M
<b>C</b>	M20×1.5
<b>D</b>	G1/8 M
<b>E</b>	NPT1/4 M
<b>F</b>	NPT1/2 M
<b>G</b>	Flush Diaphragm, G1/2 Male (Not available in DPT)
<b>H</b>	Flush Diaphragm, M20X1.5 Male (Not available in DPT)
<b>110</b>	<b>Electrical Connection</b>
<b>P</b>	Plug Connection
<b>C</b>	Cable Connection (standard with 1.5m cable)
<b>120</b>	<b>Special Remark</b>
<b>X</b>	Mention Customer's Required Range Example : Customer range : 0 to 10 Kg/cm <sup>2</sup>

#### Order Note:

1. Consult us by calling us on 8448441044 or emailing on [info@tipl.com](mailto:info@tipl.com) for special designs.
2. Evaluate the exact working conditions at the pressure detection point before ordering to avoid losses due to wrong product selection.
3. TIPL will not be responsible for losses due to wrong selection of specifications.
4. Customers should ensure power supply grounding, and installation of anti-lightning (surge protection) devices to minimize the chances of product failure.
5. The photos, colour, form and dimensions of the product are indicative and can change based on product selection without prior notice.

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# PRESSURE TRANSMITTER WITH REMOTE SEAL FLUSH TYPE

## TP2051F Series



TP2051F, Remote Seal intelligent flange pressure transmitter is a well-developed high performance pressure transmitter based on the international leading technology, adopting the world advanced monocrystalline silicon pressure sensor technology and the patented packaging process. This product adopts the patented double overload protection diaphragm design, with the internal circuit surge protection design, and can accurately measure the gauge pressure, absolute pressure, flow, vacuum degree, liquid level and density.

TP2051F Pressure Transmitter with Flange is a type of flush product in order to meet the flange mounting requirement of the customer. This product adopts the imported diffuse silicon pressure sensitive element, and after long-term aging and stability selection, the product performance is stable and reliable.





TP2051F Flush Pressure Transmitter with Flange takes the international standard flange plate as the connection standard, and can realize the on-site flange mounting mode for the user. Because the stress diaphragm is exposed and senses the pressure directly, convenient for cleaning, and able to meet the moisture proof, waterproof, ex-proof and other severe working condition requirements, the products of this series are widely applied for the viscous media with particles in the fields such as industrial process control, petroleum, chemical industry, metallurgy etc.

## Technical Specifications

Pressure Parameters	
Range	0 - 6kPa to 3MPa
Pressure reference	Gauge pressure
Electric Parameters	
Output Type	4mA to 20mA DC (2wire), HART
Power Supply	12~32V, recommend 24V
Temperature Drift	0.25 %FS (-20°C ~ 70 °C , standard range)
Structural Parameters	
Housing	Die Cast Aluminum
Diaphragm	SS 316L
Nuts and Bolts	SS304
Process Connector	SS304/ SS316/ Hastelloy C
Fill Fluid	Silicon Oil
Sealed Ring	Perbunan/Viton
Protection Class	IP 67 (Housing)
Ambient Parameters	
Media Applicability	Fluid which has no corrosion to SS316L and Viton
Ambient Temperature	-30°C ~ 80°C
Medium Temperature	-40°C ~ 125°C
Storage Temperature	-20°C ~ 70°C

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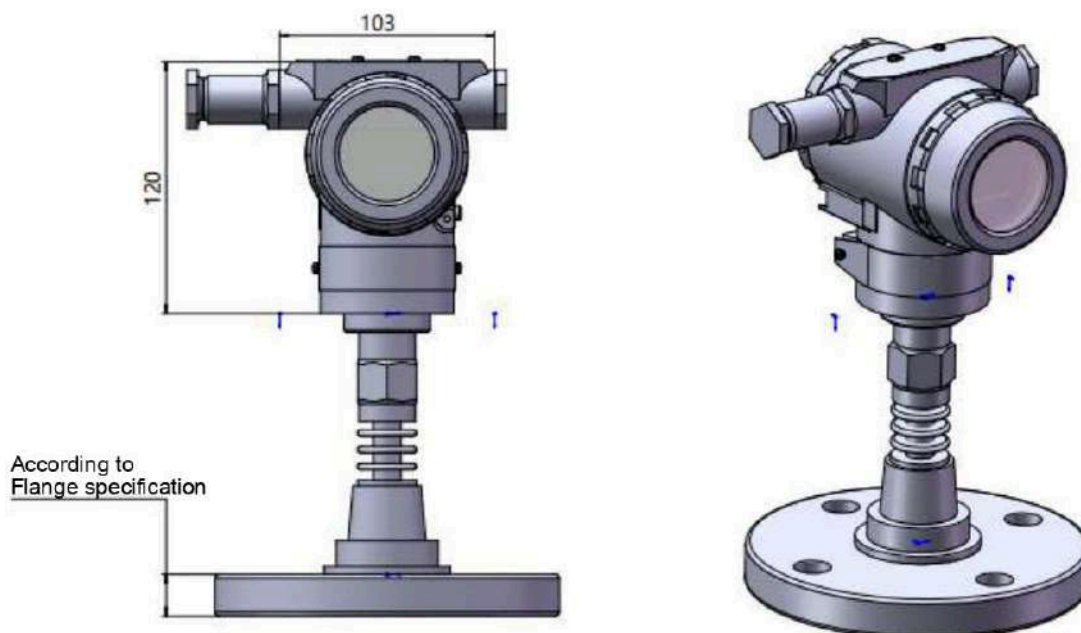
Performance Parameters	
Accuracy	±0.1%FS
Long Term Stability	±0.2%FS/2 year
Full temperature Coefficient	±0.05%FS/°C
Insulation Resistance	≥200MΩ
Mechanical Vibration	20g (20 to 5000Hz)
Shock	100g (11ms)
Protection grade	IP67
Material	Housing : Cast Aluminum Alloy Diaphragm : SS316L, Hastelloy C
Response time	0.1 Sec

Remote Seal Structural performance	
Diaphragm material	316L (316L sprayed with PTFE, Hastelloy C, tantalum)
Drain valve	Stainless steel
Filling liquid	Silicon Oil
Flange and clamp block	SS304 & SS316 Flange, ss304 stainless steel clamp
Soft capillary	SS304
Housing material	Die-cast aluminum alloy, painted epoxy coating
Pressure connection	DN25 PN40, DN40 PN40, DN50 PN40, DN80 PN16 options Implementation standard GB/T 9119-2010, other standards can be customized



## Dimension Detail

Flush mounted diaphragm type gauge Pressure Transmitter



## Selection Table

0	Type
TP2051F	Pressure Transmitter- Flush Type,Remote Seal, Smart with LCD display
10	Measurement Type
G	Gauge
A	Absolute
20	Sensor Type
P	Monocrystalline Piezo-Resistive Type
30	Special Function
N	None
40	Pressure Range
B	6kPa, 0.06 Bar, 600 mmH2O
C	40kPa, 0.4 Bar, 4000 mmH2O
J	100 Kpa, 1 Bar, 10mH2O
D	250kPa, 2.5 Bar, 25mH2O
E	1MPa, 10 Bar, 100mH2O



F	3MPa, 30 Bar, 300mH2O
<b>50</b>	<b>Accuracy</b>
C	± 0.1% FS
<b>60</b>	<b>Output</b>
A	4-20mA+HART
<b>70</b>	<b>Static Pressure</b>
0	Not Applicable for PT
<b>80</b>	<b>Pressure Port</b>
1	SS 304
2	SS 316L
<b>90</b>	<b>Diaphragm Material</b>
1	316L Stainless Steel
2	Hastelloy C
3	Tantalum
X	Custom Requirement
<b>100</b>	<b>Electrical Connection</b>
M	M20×1.5 female
<b>110</b>	<b>Flange sealing device</b>
N	Without Capillary
C	With Capillary
<b>120</b>	<b>Process Connection</b>
1	SS304 DN25 PN40 RF
2	SS304 DN40 PN40 RF
3	SS304 DN50 PN40 RF
4	SS304 DN80 PN16 RF
5	SS316 DN25 PN40 RF
6	SS316 DN40 PN40 RF
7	SS316 DN50 PN40 RF
8	SS316 DN80 PN16 RF
X	Custom Requirement
<b>130</b>	<b>Sealing Connection</b>

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F	Flat Sealing
X	Custom Requirement
<b>140</b>	<b>Fill Fluid</b>
S	Silicone Oil (-40~125°C)
H	High Temp. Silicone Oil (-10~300°C)
<b>150</b>	<b>Capillary Length</b>
N00	None
S01	1m
S02	2m
S03	3m
S04	4m
S05	5m
S06	6m
S08	8m
S10	10m\
SXX	Special Length
<b>160</b>	<b>Diaphragm protection</b>
N	NONE
<b>170</b>	<b>Capillary component</b>
N	NONE
A	SS304
B	SS316



#### Order Note :

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- Please ensure the compatibility between the measured medium and the contact point of the product when placing an order.
- If there are special requirements for the product appearance or performance parameter, our company can provide customization. Wotian reserves the right to make any change in this publication without notice. The information provided is believed to be accurate and reliable as of this product sheet
- Customers should ensure power supply grounding, and installation of anti-lightning (surge protection) devices to minimize the chances of product failure.
- The photos, colour, form and dimensions of the product are indicative and can change based on product selection without prior not.

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# PRESSURE TRANSMITTER With REMOTE SEAL

## TP2052R Series



TP2052R, Remote Seal intelligent differential pressure transmitter is a well-developed high performance pressure transmitter based on the international leading technology, adopting the world advanced monocrystalline silicon pressure sensor technology and the patented packaging process. This product adopts the patented double overload protection diaphragm design, with the internal circuit surge protection design, and can accurately measure the gauge pressure, absolute pressure, flow, vacuum degree, liquid level and density.

TP2052R Differential Pressure Transmitter with Flange/s is a type of flush product in order to meet the flange mounting requirement of the customer. This product adopts the imported diffuse silicon pressure sensitive element, and after long-term aging and stability selection, the product performance is stable and reliable.

TP2052R Pressure Transmitter with Flange takes the international standard flange plate as the connection standard, and can realize the on-site flange mounting mode for the user. Because the stress diaphragm is exposed and senses the pressure directly, convenient for cleaning, and able to meet the moisture proof, waterproof, ex-proof and other severe working condition requirements, the products of this series are widely applied for the viscous media with particles in the fields such as industrial process control, petroleum, chemical industry, metallurgy etc.



## Technical Specifications

Pressure Parameters	
Range	0-40 kPa...1 MPa
Pressure reference	Differential Pressure
Electric Parameters	
Output Type	4~20mA, 4~20mA+HART® protocol, PROFIBUS-PA, FF
Power Supply	12~32V, recommend 24V
Influence of Ambient Temperature	±0.0625%URL/10°C
Structural Parameters	
Housing	Die Cast Aluminum
Diaphragm	SS 316L
Nuts and Bolts	SS304
Process Connector	SS304/ SS316/ Hastelloy C
Fill Fluid	Silicon Oil
Sealed Ring	PTFE
Protection Class	IP 67 (Housing)
Ambient Parameters	
Media Applicability	Fluid which has no corrosion to SS316L and Viton
Ambient Temperature	-40°C~80°C
Medium Temperature	-40°C~120°C
Storage Temperature	-30°C ~ 70°C
Performance Parameters	
Accuracy	± 0.1%FS (Special) ± 0.5%FS (Standard)
Long Term Stability	±0.25%URL, 1 year
Insulation Resistance	≥200MΩ
Mechanical Vibration	20g (20 to 5000 Hz)
Shock	100g (11ms)

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Protection grade	IP67
Material	Housing : Cast Aluminum Alloy Diaphragm : SS316L, Hastelloy C
Response time	20-30 times per second
Static pressure effect	Zero point influence it is 0.35%/68.9bar Full scale influence it is 0.55%/68.9bar

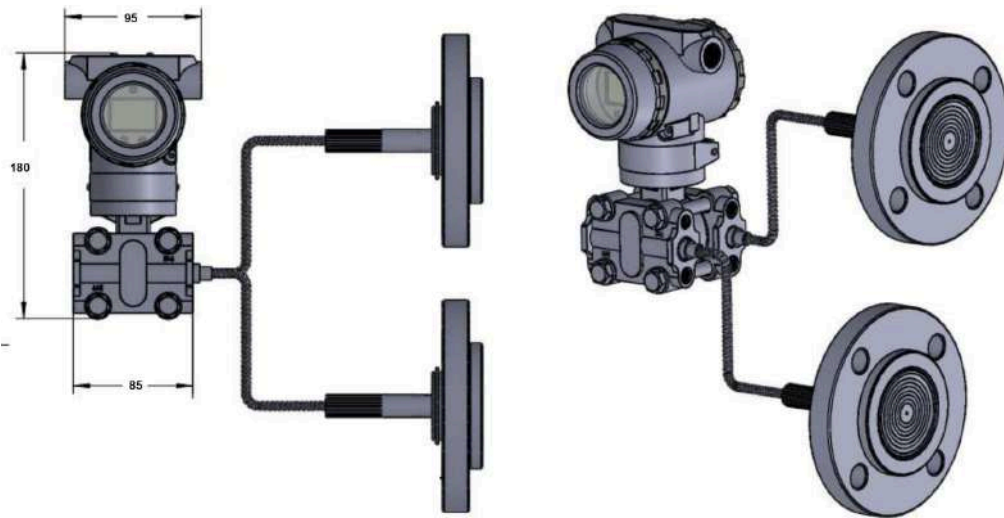
### Remote Seal Structural performance

Diaphragm material	316L (316L sprayed with PTFE, Hastelloy C, tantalum, Monel)
Drain valve	Stainless steel
Filling liquid	Silicon Oil
Flange and clamp block	SS316 Flange, ss304 stainless steel clamp
Soft capillary	SS304
Pressure connection	LT/RD high pressure side : DN25 , DN50 DN80 RD low pressure side: DN25 DN50 DN80 LT low pressure side: M20×1.5 with welded pipe



## Dimension Details

### 1. Double sided flange type Remote Seal Differential Pressure Transmitter

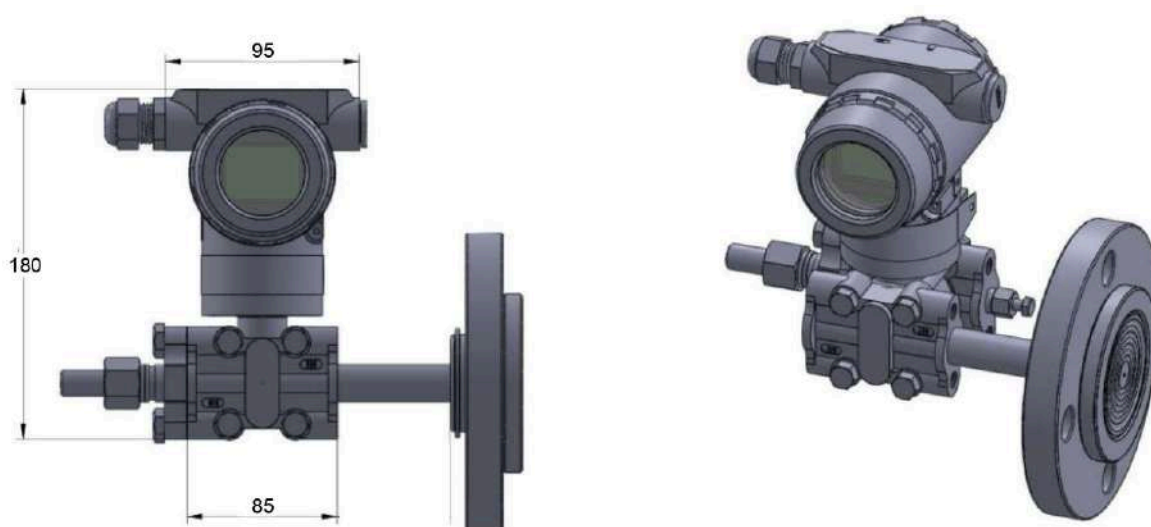


### 2. Single sided flange type remote seal differential Pressure Transmitter





### 3. Direct mount diaphragm seal pressure transmitter



## Selection Table

0	Type
TP2052R	Pressure Transmitter-Remote Seal, Smart with LCD display
10	Measurement Type
D1	Differential type with single flange
D2	Differential type with double flange
20	Sensor Type
P	Monocrystalline Piezo-Resistive Type
30	Special Function
N	None
F	Square Root Function
40	Pressure Range
A	40 kPa, 0.4 Bar, 1000 mmH <sub>2</sub> O
B	250 kPa, 2.5 Bar, 25000 mmH <sub>2</sub> O
D	1 MPa, 10 Bar, 100mH <sub>2</sub> O
50	Accuracy
D	± 0.2% FS
60	Output
A	4-20mA+HART
B	4-20mA

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P	PROFIBUS-PA
F	FF
<b>70</b>	<b>Static Pressure</b>
1	6MPa
<b>80</b>	<b>Pressure Port</b>
1	SS 304
2	SS 316L
<b>90</b>	<b>Diaphragm Material</b>
1	316L Stainless Steel
2	Alloy C-276
3	Monel
4	Tantalum diaphragm
5	316L with PTFE coating
x	Other special requirements
<b>100</b>	<b>Electrical Connection</b>
M	M20×1.5 Female
<b>110</b>	<b>Explosion-proof option</b>
N	None
<b>120</b>	<b>Flange sealing device</b>
RN	Without Capillary
RH	High Side Capillary
RL	Low Side Capillary
RB	Both Side Capillary
<b>130</b>	<b>Process Connection, Flange Material</b>
1A	DN25 PN10 Flange : SS304
1B	DN25 PN40 Flange : SS304
1C	DN25 PN64 Flange : SS304
1D	DN25 PN160 Flange : SS304
1E	DN25 PN250 Flange : SS304
1F	DN25 PN400 Flange : SS304
2A	DN50 PN25 Flange : SS304
2B	DN50 PN40 Flange : SS304
2C	DN50 PN100 Flange : SS304
2D	DN50 PN160 Flange : SS304
2E	DN50 PN250 Flange : SS304
2F	DN50 PN400 Flange : SS304

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3A	DN80 PN25 Flange : SS304
3B	DN80 PN40 Flange : SS304
3C	DN80 PN100 Flange : SS304
4A	DN100 PN100 Flange : SS304
5A	1"300 lbs RF Flange : SS304
5B	1"400 lbs RF Flange : SS304
5C	1" 600 lbs RF Flange : SS304
5D	1"900 lbs RF Flange : SS304
5E	1" 1500 lbs RF Flange : SS304
5F	1"2500 lbs RF Flange : SS304
6A	2"300 lbs RF Flange : SS304
6B	2"400 lbs RF Flange : SS304
6C	2" 600 lbs RF Flange : SS304
6D	2"900 lbs RF Flange : SS304
6E	2" 1500 lbs RF Flange : SS304
6F	2"2500 lbs RF Flange : SS304
7A	3"300 lbs RF Flange : SS304
8A	4"300 lbs RF Flange : SS304
9A	DN25 PN10 Flange : SS316
9B	DN25 PN40 Flange : SS316
9C	DN25 PN64 Flange : SS316
9D	DN25 PN160 Flange : SS316
9E	DN25 PN250 Flange : SS316
9F	DN25 PN400 Flange : SS316
10A	DN50 PN25 Flange : SS316
10B	DN50 PN40 Flange : SS316
10C	DN50 PN100 Flange : SS316
10D	DN50 PN160 Flange : SS316
10E	DN50 PN250 Flange : SS316
10F	DN50 PN400 Flange : SS316
11A	DN80 PN25 Flange : SS316
11B	DN80 PN40 Flange : SS316
11C	DN80 PN100 Flange : SS316
12A	DN100 PN100 Flange : SS316
13A	1"300 lbs RF Flange : SS316
13B	1"400 lbs RF Flange : SS316
13C	1" 600 lbs RF Flange : SS316
13D	1"900 lbs RF Flange : SS316

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13E	1" 1500 lbs RF Flange : SS316
13F	1"2500 lbs RF Flange : SS316
14A	2"300 lbs RF Flange : SS316
14B	2"400 lbs RF Flange : SS316
14C	2" 600 lbs RF Flange : SS316
14D	2"900 lbs RF Flange : SS316
14E	2" 1500 lbs RF Flange : SS316
14F	2"2500 lbs RF Flange : SS316
15A	3"300 lbs RF Flange : SS316
16A	4"300 lbs RF Flange : SS316
Y	Special Requirement
<b>140</b>	<b>Sealing Connection</b>
F	Flat Sealing
X	Custom Requirement
<b>150</b>	<b>Fill Fluid</b>
S	Silicone Oil
H	High Temp. Silicone Oil (-10 Deg to +300 DegC)
V	Vegetable oil
I	Inert Oil
<b>160</b>	<b>Capillary Length</b>
N00	None
S01	1m (For Single side only)
B01	1m (For Both side only)
S02	2m (For Single side only)
B02	2m (For Both side only)
S03	3m (For Single side only)
B03	3m (For Both side only)
S04	4m (For Single side only)
B04	4m (For Both side only)
S05	5m (For Single side only)
B05	5m (For Both side only)
S06	6m (For Single side only)
B06	6m (For Both side only)
S08	8m (For Single side only)
B08	8m (For Both side only)
S10	10m (For Single side only)
B10	10m (For Both side only)

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XXX	Special Length
<b>170</b>	<b>Capillary Component</b>
N	NONE
A	SS304
B	SS316

**Order Note :**

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- Please ensure the compatibility between the measured medium and the contact point of the product when placing an order.
- If there are special requirements for the product appearance or performance parameter, our company can provide customization. Wotian reserves the right to make any change in this publication without notice. The information provided is believed to be accurate and reliable as of this product sheet.
- Customers should ensure power supply grounding, and installation of anti-lightning (surge protection) devices to minimize the chances of product failure.
- The photos, color, form and dimensions of the product are indicative and can change based on product selection without prior notice.



# PRESSURE TRANSMITTER

## TP2002 Series



## Feature

- Range: -0.1MPa...0MPa~0.01MPa...100MPa.
- LCD liquid crystal display, with HART protocol/RS485 Modbus protocol.
- Convenient to debug zero and full scale.
- Reverse polarity protection and current limiting protection.
- Anti-lightning, impact.
- High precision, high stability, high reliability.

## Application

- Industrial process control.
- Hydraulic measurement
- Pressure measurement in a variety of harsh environments.





## Introduction

TP 2002 pressure transmitter, including the gauge pressure, absolute pressure two types, can be used for industrial production process pressure, absolute pressure, liquid level measurement, with 4mA ~ 20mA output signal and optional HART or RS485 protocol. The digital signal contains a variety of configurations, signal status. The header can be used for on-site display process pressure, signal status and other information. The local button to complete the adjustment of zero and other configuration functions.

## Technical Specifications

Performance Parameters	Type
Measurement Range	50kPa~100MPa
Overload	150 to 300%FS
Accuracy	0.1% / 0.25% / 0.5%
Power Supply	18~36VDC
Display Method	4 digit OLED Display
Output Signal	4~20mA/RS485/HART
Ambient Temperature	-20~+70 °C (-40~+65 °C)
Process connector gasket Temperature	-20~+80 °C (-40~+65 °C)
Relative Humidity	0%~100%
AC external Magnetic Field	≤400A/m
Overload Capacity	200%FS
Stability	±0.2%/ year
Temperature Effects	±0.2%/10 °C
Mounting Position Effects	≤100Pa
Power Supply Effects	≤±0.02%/V
Process Connection	M20x1.5(M)/NPT 1/2(F,M)
Process Connection Material	Stainless Steel
Process Connector Gasket Material	Viton (FKM) / Custom Made

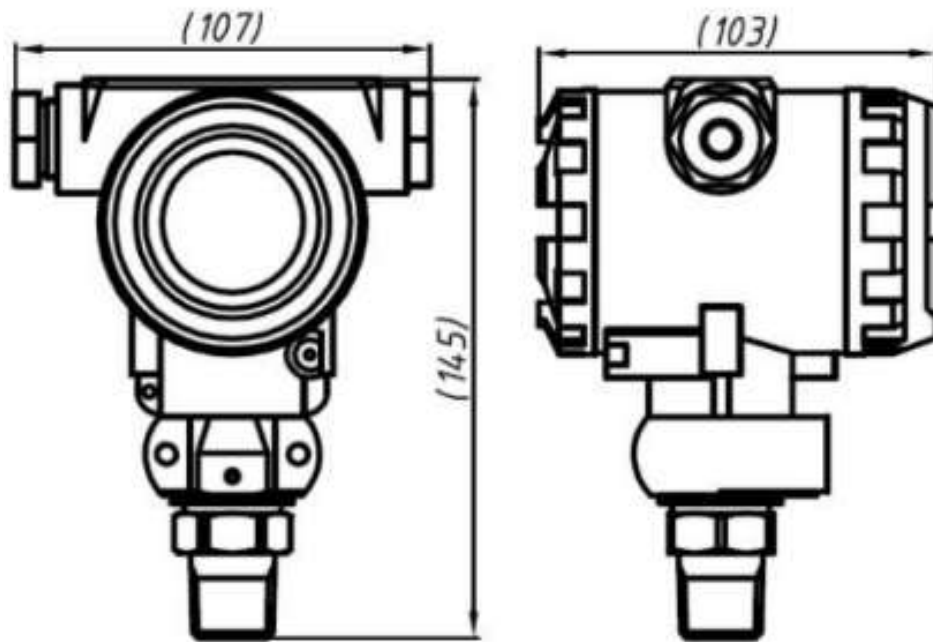
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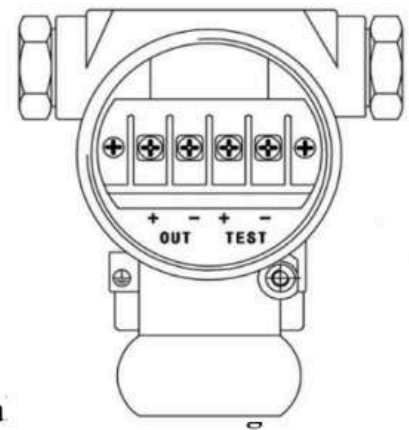


## Dimension Details



## Electrical Connection

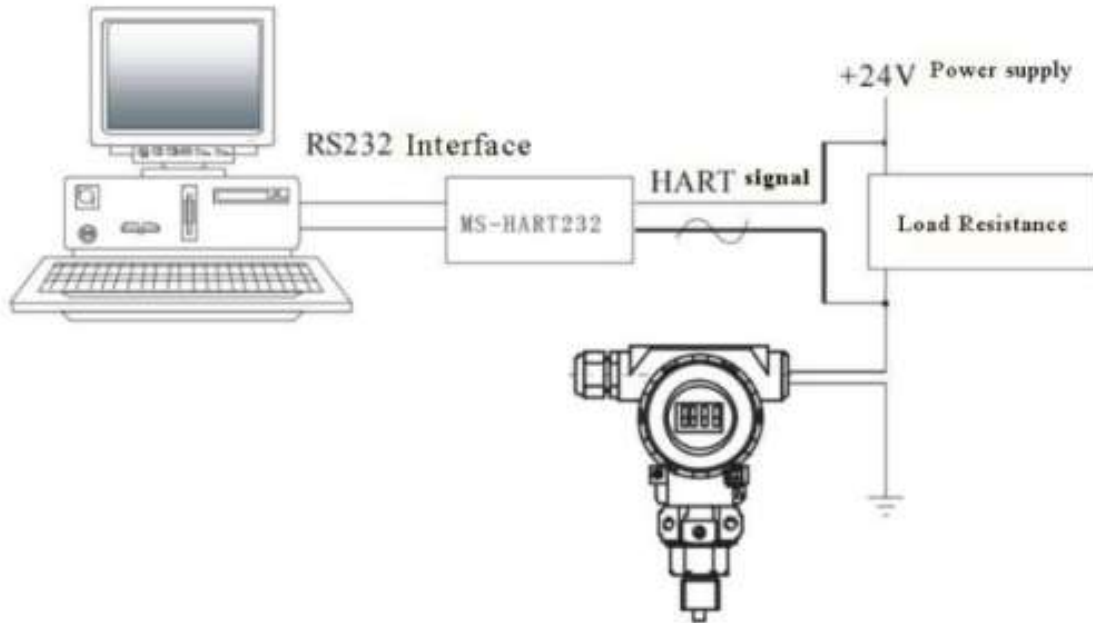
Terminal	HART	RS485
OUT+	+V	+V
OUT-	+OUT	-V
TEST+	/	RS485A
TEST-	/	RS485B



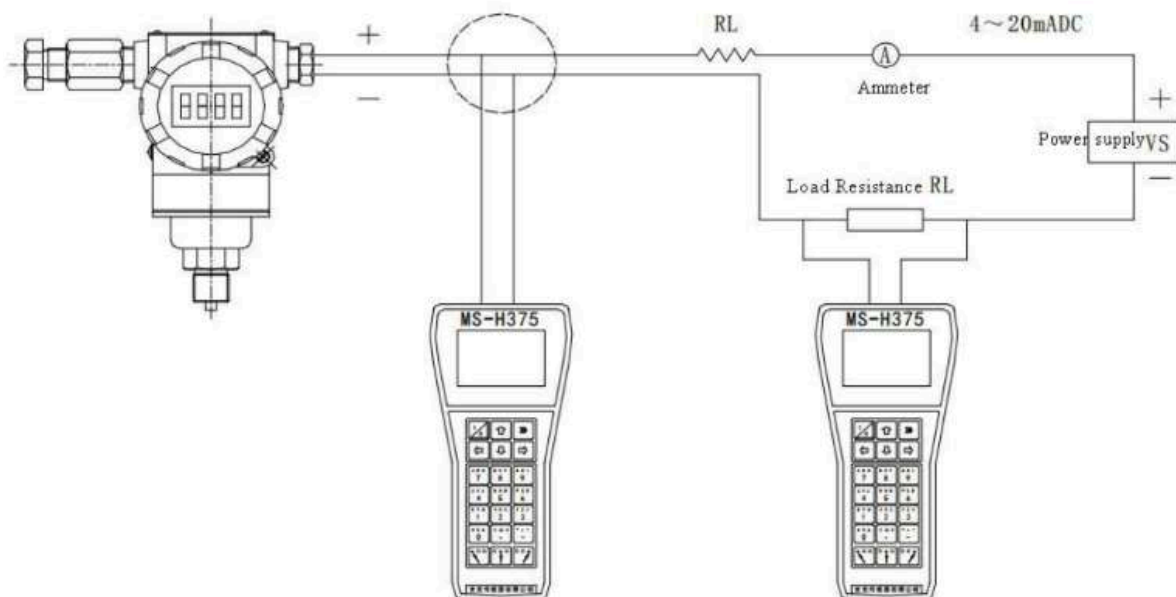
**HART Output signa**



## Diagram for Transmitter and Computer Connection



## Diagram for Transmitter and Terminal Connection



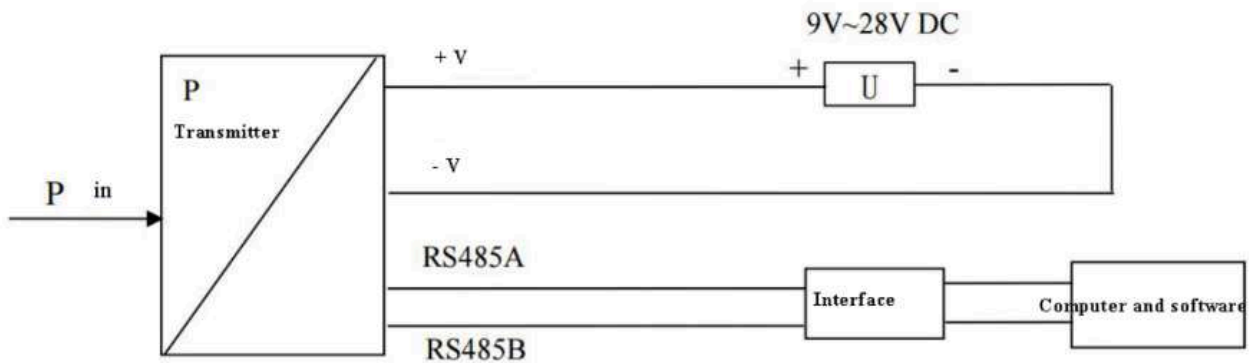
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## Signal Connection Diagram :



## Selection Table

0	Type
TP2002	Smart Pressure Transmitter Output-Compact
10	Pressure Type
AP	Absolute
GP	Gauge
SG	Sealed gauge
20	Output
S	Smart 4~20mADC/HART
R	Smart 4~20mADC/RS485
E	Analog 4~20mADC
30	Span
1	0-50~250kPa
2	0-0.25~2.5MPa
3	0-2.5~7.0MPa
4	0-5.0~35MPa
5	0- 20 ~ 100MPa
40	Accuracy
A	0.1%
B	0.25%
C	0.5%
50	Process connector accessory
1	M20x1.5 male thread

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2	NPT 1/2 male thread
3	NPT 1/2 female thread
<b>60</b>	<b>Integral indicator</b>
M3	Digital(-20~+65 °C)
N	None

#### Order Note :

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# PRESSURE TRANSMITTER

## TP2051 Series



## Features

- Advanced monocrystalline silicon pressure sensor adopted.
- Wide pressure range covering 0 ~40 MPa.
- 2-wire mode, 4~20mA analog output, HART® protocol digital communication.
- Intelligent LCD gauge with backlight.
- With both remote transmission and local zero and pressure range adjustment.
- Complete varieties, high accuracy, good stability.
- High static pressure, high overpressure protection.



- Patented two pressure and overpressure protection diaphragm design.
- Lightning protection circuit design.
- Pressure transmitters are available in various versions for measuring :
  - Gauge pressure
  - Absolute pressure
  - Differential pressure
  - Level
  - Volume flow
  - Mass flow

## Introduction

TP2051 series pressure transmitter is the high performance pressure transmitter provided by Toshniwal Industries Pvt. Ltd., Ajmer. It transforms the physical signal of pressure , differential pressure and level etc into standard signal, by collecting cell sensor digital processing circuits. Our TP2051 series has the best precision and signal uniformity by applying advanced specified integrated circuit digital technology. Each set of transmitters is ambient temperature compensated in our factory, to ensure max precision and mini drift in a wide working temperature range.

## Principle of Operation

The transmitters utilize a high stability Piezo-resistive/ Piezo-capacitive/ Resonant sensor single crystal silicon sensor, uniquely manufactured with semiconductor technology, with state-of-the-art microprocessor based electronics to provide exceptional performance and functionality. These sensors offer high sensitivity and good linearity at constant temperature.

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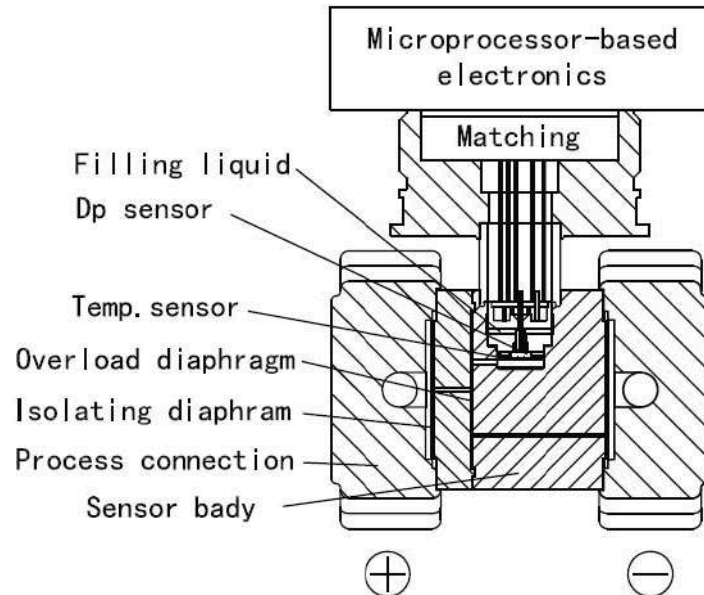




# TP2051 Differential Pressure Transmitter

The differential pressure transmitter includes two functional units :

- **Main unit**
- **Auxiliary Unit**



The main unit includes a sensor and process connection. The completely welded sensor module is a twin-chamber system with an integral overload diaphragm, a temperature sensor and the silicon differential pressure sensor. The temperature sensor acts as a temperature compensated reference value to compensate for the temperature drift

The Differential pressure transmitter is suitable to measure liquid, gas, or steam flow as well as liquid level, density and pressure. Transmitter outputs a 4 to 20 mA DC HART signal corresponding to the measured differential pressure. Other key features include quick response, remote set-up using HART communications, self-diagnostics and optional status output for pressure with high/low alarm. It has Reverse Polarity and Short-Circuit Protection.

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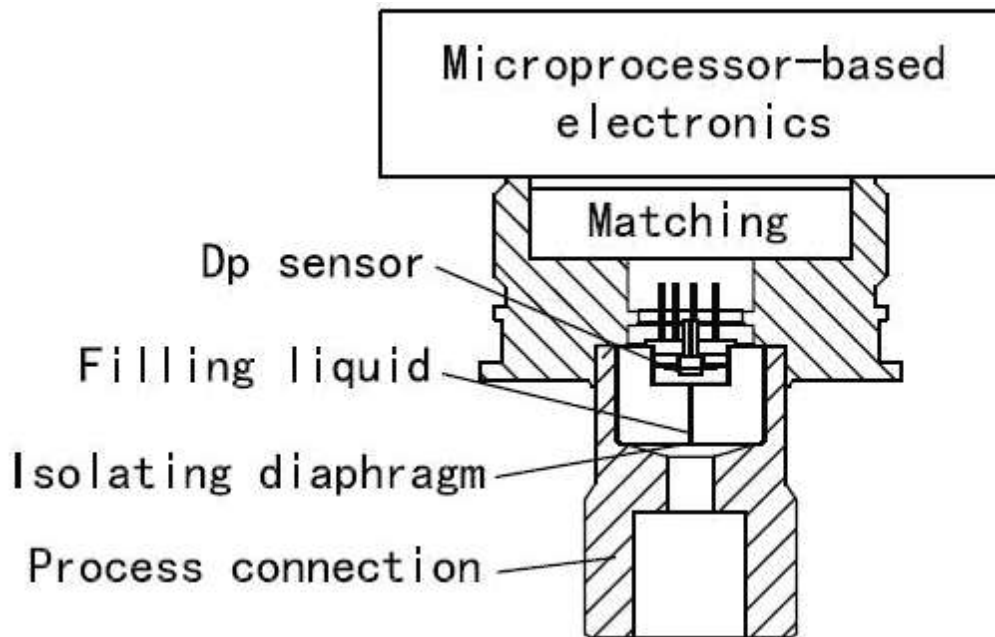




# TP2051 Gauge/Absolute Pressure Transmitter

The gauge/absolute pressure transmitter includes two functional units :

- **Main unit**
- **Auxiliary Unit**



The main unit includes gauge/absolute/temperature sensors and process connection. The low pressure span completely welded sensor module is a twin-chamber system with an integral overload diaphragm, and a silicon pressure sensor. The temperature sensor as a temperature compensated reference value to compensate for the temperature drift.

The pressure transmitter is suitable to measure liquid, gas, or steam flow as well as liquid level, density and pressure. Transmitter output 4 to 20 mA DC signal corresponding to the measured pressure. The key features include quick response, remote set-up using HART communications, self-diagnostics and optional status output for pressure with high/low alarm. It has Reverse Polarity and Short-Circuit Protection.

## Applications

Process control fields for the industries of petroleum, chemical industry, metallurgy, electricity, food, papermaking, medicine, machine manufacturing, scientific experiment and military aviation etc.

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## Technical Specifications

Pressure Parameters	
Range	0 to 40 MPa
Pressure Reference	Gauge Pressure, Absolute Pressure, Differential Pressure
Electric Parameters	
Output Type	4mA to 20mA DC (2-wire) with HART®
Power Supply (U)	12 to 32V DC
Load Impedance	(U-11V)/23mA
Temperature Drift	±1kPa: ±0.5%FS; ±6kPa: ±0.3%FS; Other pressure ranges: ±0.25%FS (In Temperature range: -20~70°C)
Structural Parameters	
Housing	Die Cast Aluminum
Diaphragm	SS316L
Nuts and Bolts	SS304
Process Connector	SS304 / SS316 / Hastelloy C
Fill Fluid	Silicon Oil
Sealed Ring	Perbunan / Viton
Protection Class	IP 67 (Housing)
Ambient Parameters	
Media Applicability	Fluid which has no corrosion to SS316L and Viton
Ambient Temperature	-30°C to 70°C
Medium Temperature	-40°C to 104°C
Storage Temperature	-30°C to 70°C
Performance Parameters	
Accuracy	±0.075%FS (Standard), ±0.065%FS (Special) ±0.04%FS (High) For ±1kPa Pressure range: ±0.1%FS
Long Term Stability	±0.05%FS/year

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Temperature Drift	$\pm 1\text{kPa} : \pm 0.5\% \text{FS};$ $\pm 6\text{kPa} : \pm 0.3\% \text{FS};$ Other ranges : $\pm 0.25\% \text{FS};$ (Standard ranges, $-20 \sim 70^\circ \text{C}$ )
Insulation Resistance	$\geq 200\text{M}\Omega / 250\text{VDC}$
Mechanical Vibration	20g (20 to 5000 Hz)
Shock	100g (11ms)
Protection grade	IP67
Material	Housing : Cast Aluminum Alloy Diaphragm : SS316L, Hastelloy C
Response Time	HART collects data from sensor: 0.1 Sec; HART Output data: 0.5Sec
Static Pressure Range (For DPT only)	16MPa for ranges : $\pm 1\text{kPa}, \pm 6\text{kPa}, \pm 40\text{kPa}$ 25MPa for ranges : $\pm 100\text{kPa}, -100$ to 250kPa 40MPa for ranges : $-0.1$ to 1MPa, $-0.1$ to 3MPa

## Influence of ambient temperature in % per 27 °C

Span Code	Temperature Effect
A & B	$(0.16 \cdot t + 0.1)\%$
C & J	$(0.05 \cdot t + 0.1)\%$
D, E, F, G, H & I	$(0.025 \cdot t + 0.125)\%$

t = max. measuring range/set measuring span

## Measuring accuracy

Up to  $\pm 0.075\%$  of range span

When range ratio is greater than 10:1

Accuracy = The accuracy of set span  $\pm [0.025 + 0.005 \cdot t]$

t = max. measuring range/set measuring span

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## Supply Voltage Effects

±0.001% /10V (12 ~ 32V DC)

## Functional Specifications

### External Zero Adjustment

External zero is continuously adjustable with 0.01% incremental resolution of span. Re-range can be done locally using the range setting switch.

### Mounting Position Effects

Rotation in the diaphragm plane has no effect. Tilting up to 90 degrees will cause zero shift up to 0.4 kPa which can be corrected by the zero adjustment.

### Failure Alarm (the mode can be selected)

Low Mode (min): 3.7 mA and High Mode (max): 21 mA

No Mode (hold): Keep the effective value before the fault.

Note: The standard setting of failure alarm is High Mode.

### Overload Pressure Limits for Pressure Transmitter :

<b>Span</b>	6kPa	40kPa	100kPa	250kPa	1MPa
<b>Range Code</b>	(B)	(C)	(J)	(D)	(E)
<b>OPL</b>	300 kPa	1MPa	2MPa	4MPa	6 MPa

<b>Span</b>	3MPa	10MPa	20MPa	40MPa
<b>Range Code</b>	(F)	(H)	(I)	(K)
<b>OPL</b>	12MPa	20MPa	40MPa	60MPa

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## Overload Pressure Limits for Differential Pressure Transmitter series :

### Supply & Load Requirements

24 V DC supply- Recommended.

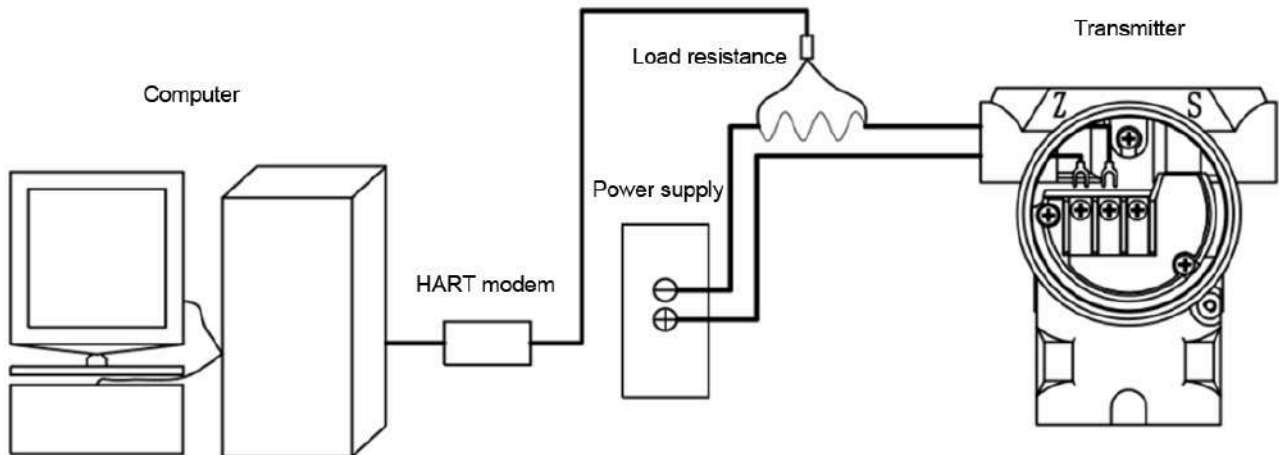
Maximum voltage limited: 32VDC, Minimum voltage limited: 12VDC.

Load: 230Ω to 600Ω for digital communication.

### Electrical Connection

The electrical connection is made via cable entry M20x1.5. The screw terminals are suitable for wire cross-sections up to 2.5mm<sup>2</sup>.

## Connection Diagram



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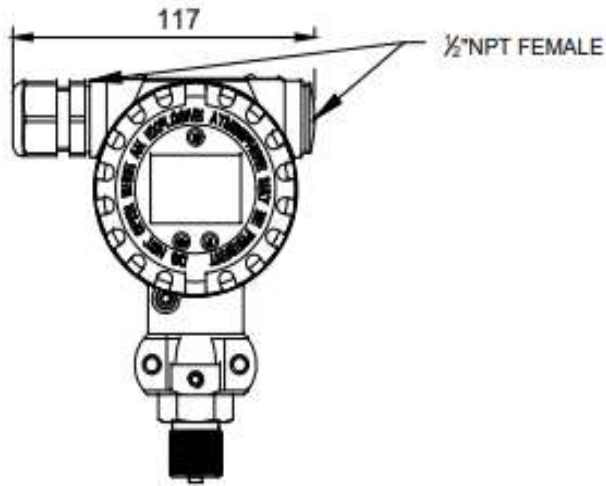
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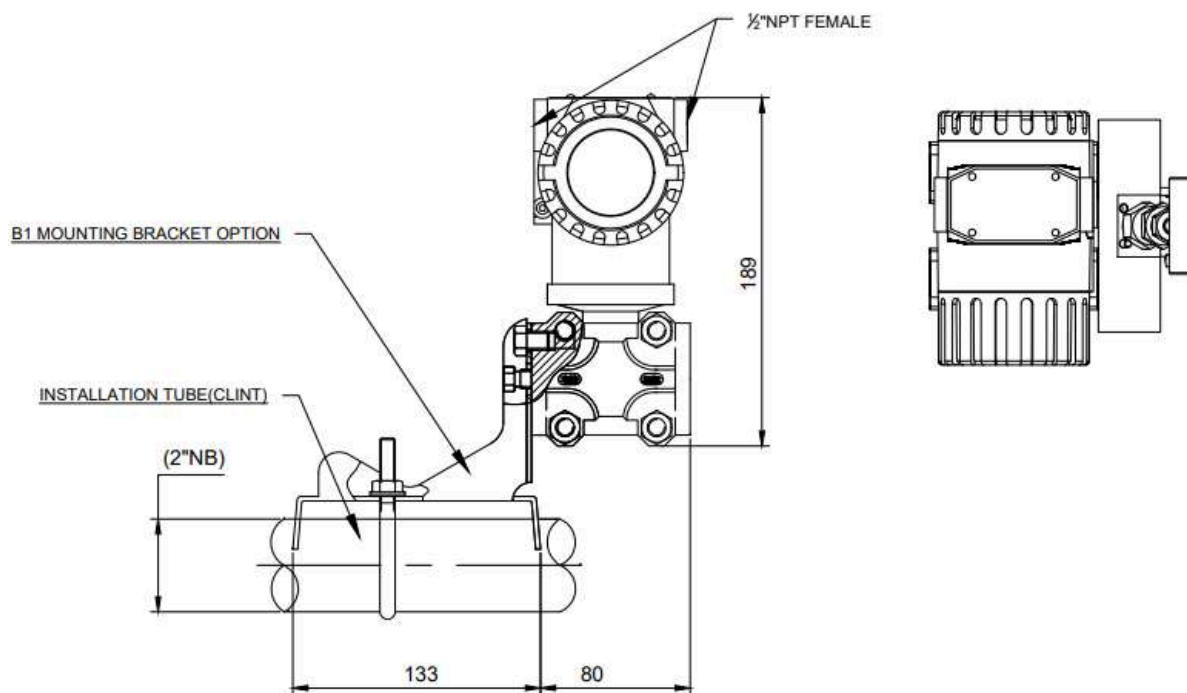
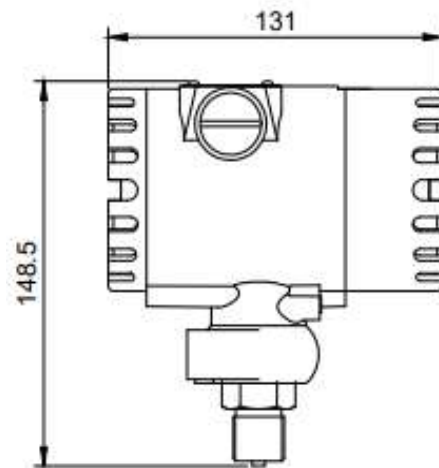


# Dimensional Details

Pressure Transmitter



Differential Pressure Transmitter



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# Model Selection Table for Gauge/Absolute Type

Model Code: TP 2051-10-20-30-40-50-60-70-80-90-100-110-120-130

Example: TP2051-DPLCAA111CMNX

0	Type
TP2051	Pressure Transmitter-Smart With LCD display
10	Measurement Type
G	Gauge
A	Absolute
20	Sensor Type
P	Monocrystalline Piezo-Resistive Type
30	Special Function
N	None
40	Pressure Range
B	6kPa, 0.06 Bar, 600 mmH <sub>2</sub> O (For Gauge Pressure Only)
C	40kPa, 0.4 Bar, 4000 mmH <sub>2</sub> O (For Gauge Pressure Only)
J	100kPa, 1 Bar, 10mH <sub>2</sub> O (For Gauge/ Absolute Pressure)
D	250kPa, 2.5 Bar, 25mH <sub>2</sub> O (For Gauge/ Absolute Pressure)
E	1 MPa, 10 Bar, 100mH <sub>2</sub> O (For Gauge Pressure Only)
F	3 Mpa, 30 Bar, 300mH <sub>2</sub> O (For Gauge Pressure Only)
H	10 MPa, 100 bar (For Gauge Pressure Only)
I	20 Mpa, 200 bar (For Gauge Pressure Only)
K	40 MPa, 400 bar (For Gauge Pressure Only)
50	Accuracy
H	± 0.04% of FS
A	± 0.065% of FS
B	± 0.075% of FS
60	Output
A	4-20mA+HART
70	Static Pressure
0	Not applicable for PT
80	Pressure Port

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1	SS304
2	SS316L
<b>90</b>	<b>Diaphragm Material &amp; Filling Fluid</b>
1	316L Stainless Steel, Silicone Oil
2	Hastelloy C, Silicone Oil
<b>100</b>	<b>Process Connection</b>
A	M20×1.5-Male
B	G ½”-Male
C	NPT ½”-Male
D	NPT ½”-Female
	<b>Electrical Connection</b>
M	M20×1.5 Female
C	4-Pin Male Connector
<b>120</b>	<b>Special Remarks</b>
X	Mention Required measuring Range Example : Range : 0 to 10 Bar

## Model Selection Table for Differential Type

Model Code.: TP 2051-10-20-30-40-50-60-70-80-90-100-110-120-130

Example: TP2051-DPLCAA111CMNX

<b>0</b>	<b>Type</b>
TP2051	Pressure Transmitter-Smart With LCD display
<b>10</b>	<b>Measurement Type</b>
D	Differential
<b>20</b>	<b>Sensor Type</b>
P	Monocrystalline Piezo-Resistive Type
<b>30</b>	<b>Special Function</b>
F	Square Root Function
<b>40</b>	<b>Pressure Range</b>
A	1 kPa, 10 mbar, 100mmH2O
B	6 kPa, 60 mbar, 600 mmH2O
C	40kPa, 400 mbar, 4000mmH2O
J	100kPa, 1 bar, 10mH2O
D	250kPa, 2.5bar, 25mH2O

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E	1MPa, 10 bar, 100mH2O
F	3MPa, 30bar, 300mH2O
<b>50</b>	<b>Accuracy</b>
B	± 0.075% of FS (Except A Range) - Standard
C	± 0.1% of FS (For A Range) - Standard
A	± 0.065% of FS (Except A Range) - Special
H	± 0.04% of FS (Except A Range) - High
S	± 2% of calibrated range for 500Pa & below (For A Range) - Standard
<b>60</b>	<b>Output</b>
A	4-20mA+HART
<b>70</b>	<b>Static Pressure</b>
1	16MPa (For A, B, C & S Range)
2	25MPa (For D & J Range)
3	40MPa (For E, F Range)
<b>80</b>	<b>Pressure Port</b>
1	SS 304
2	SS 316L
<b>90</b>	<b>Diaphragm Material &amp; Filling Fluid</b>
1	316L Stainless Steel, Silicone Oil
2	Hastelloy C, Silicone Oil
<b>100</b>	<b>Process Connection</b>
A	M20×1.5-Male
B	G ½" Male
C	NPT ½" -Male
D	NPT ½" -Female
E	NPT ¼" -Female
F	G ¼" -Male
H	Tri-valve set M20×1.5 with Welded Pipe
I	Tri-valve set NPT ¼" (Female)
<b>110</b>	<b>Electrical Connection</b>
M	M20×1.5 Female
<b>120</b>	<b>Special Remarks</b>
X	Mention Required Measuring Range Example : Range : 0 to 10 Bar



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# Differential Pressure Transmitter TP2001 Series



## Features

- Differential pressure measurement
- High accuracy up to +/-0.1%, +/-0.04% (+/-0.065% accuracy as standard)
- Two wire 4 - 20mA DC with HART (Ver. 7) / PROFIBUS-PA / FOUNDATION FIELDBUS
- Built-in square root extractor for flow measurement.
- Designed to suit a harsh industrial environment.
- Remote seal options available for corrosive and high temperature applications.
- 5 digit LCD indication with backlit
- Push button for zero and span configuration
- Fail-safe alarm modes.
- Inbuilt surge & Reverse Polarity protection as per IEC 61000-4-5:2014
- Protection class IP67 / Ex-proof (ATEX)
- Overpressure protection.



- Full compliance to SIL 2/3 requirements
- Measurement Medium: Gas, Steam & Liquid
- Measuring Range Limits: -5 ~ 30 bar
- Isolating Diaphragm : 316L / Hastelloy C / Tantalum / SS with Gold Plating

## Principle of Operation

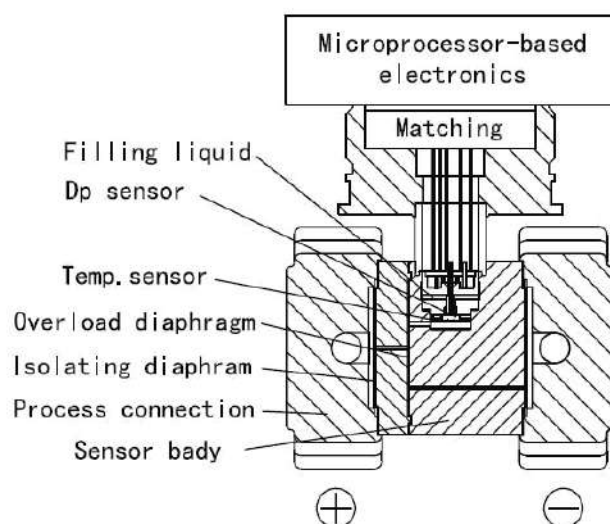
The transmitters utilize a high stability Piezo-resistive/ Piezo-capacitive/ Resonant sensor single crystal silicon sensor, uniquely manufactured with semiconductor technology, with state-of-the-art microprocessor based electronics to provide exceptional performance and functionality. These sensors offer high sensitivity and good linearity at constant temperature.

### TP2001 Differential Pressure Transmitter

The differential pressure transmitter includes two functional units: —

- **Main unit**
- **Auxiliary Unit**

The main unit includes a sensor and process connection. The completely welded sensor module is a twin-chamber system with an integral overload diaphragm, a temperature sensor and the silicon differential pressure sensor. The temperature sensor acts as a temperature compensated reference value to compensate for the temperature drift



The Differential pressure transmitter TP 2001 is suitable to measure liquid, gas, or steam flow as well as liquid level, density and pressure. TP2001- B/C outputs a 4 to 20 mA DC HART signal corresponding to the measured differential pressure. Other key features include quick response, remote set-up using HART communications, self-diagnostics and optional status output for pressure with high/low alarm. It has Reverse Polarity and Short-Circuit Protection.

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# Standard Specifications

## 1. Performance Specifications

Reference Accuracy of Calibrated Span (includes terminal-based linearity, hysteresis, and repeatability)

- Standard Accuracy:  $\pm 0.065 / 0.1 / 0.25 / 0.5$  % of span ( $\pm 0.04\%$  as an option)
- If  $TD > 10$  ( $TD = URL/SPAN$ ), Accuracy:  $\pm(0.0065 \times TD)\%$
- The square root accuracy is 1.5 times the reference accuracy of the calibrated span.
- Repeatability and non linearity  $< 0.01\%$  of span

### A. Ambient Temperature Effects

Span Code	-20°C~65°C
A	$\pm(0.45 \times TD + 0.25)\% \times \text{Span}$
B	$\pm(0.30 \times TD + 0.20)\% \times \text{Span}$
C/D/F	$\pm(0.20 \times TD + 0.10)\% \times \text{Span}$
Span Code	-40°C~20°C & 65°C~85°C
A	$\pm(0.45 \times TD + 0.25)\% \times \text{Span}$
B	$\pm(0.30 \times TD + 0.20)\% \times \text{Span}$
C/D/E/F/X	$\pm(0.20 \times TD + 0.10)\% \times \text{Span}$

### B. Static Pressure Effect

Span Code	Static Pressure Effects
A	$\pm(0.15\%URL + 0.10\%Span)/4MPa$
B	$\pm(0.10\%URL + 0.065\%Span)/16MPa$
C/D/E/F/X	$\pm(0.05\%URL + 0.05\%Span)/16MPa$

### C. Supply Voltage Effects

$\pm 0.001\% / 10V$  (10.8 ~ 42.5V DC)

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## D. Overpressure Effects

Span Code	Overpressure Effects
A	$\pm 0.2\% \times \text{Span} / 4\text{MPa}$
B	$\pm 0.2\% \times \text{Span} / 16\text{MPa}$
C/D/E/F/X	$\pm 0.1\% \times \text{Span} / 16\text{MPa}$

## 2. Functional Specifications

### Span and Range Limits

Span and Range Limits		kPa	mbar
A	Span	0.1~1	1~10
	Range Limits	-1~1	-10~10
B	Span	0.2~6	2~60
	Range Limits	-6~6	-60~60
C	Span	0.4~40	4~400
	Range Limits	-40~40	-400~400
D	Span	2.5~250	25~2500
	Range Limits	-250~250	-2500~2500
E	Span	20~2000	0.2~20 bar
	Range Limits	-500~2000	-5~20bar
F	Span	30~2000	0.3~30 bar
	Range Limits	-500~3000	-5~30bar

### Zero Adjustment Limits

Zero can be fully elevated or suppressed, within the lower and upper range limits of the capsule.

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### **External Zero Adjustment**

External zero is continuously adjustable with 0.01% incremental resolution of span. Re-range can be done locally using the range setting switch

### **Mounting Position Effects**

Rotation in the diaphragm plane has no effect. Tilting up to 90 degrees will cause zero shift up to 0.4 kPa which can be corrected by the zero adjustment.

### **Output**

Two wire 4 to 20 mA DC output with digital communications, linear or square root programmable. HART FSK protocol is an option superimposed on the 4 to 20 mA signal. Current output range: 3.9 mA to 20.5 mA.

### **Failure Alarm (the mode can be selected)**

Low Mode (min): 3.7 mA

High Mode (max): 21 mA

No Mode (hold): Keep the effective value before the fault.

Note: The standard setting of failure alarm is High Mode.

**Response Time:** <100 msec

### **Turndown Ratio**

For Span A - 10:1

For Span B - 30:1

For Span C, D, & F - 100:1

**Uptime:** <5s

**Humidity:** 0 to 100% RH

**Process Temperature :** Upto to 120°C

**Ambient Temperature Limits:** -40 to 85°C / -20 to 65°C with LCD display & fluorine rubber sealing

**Storage and Transportation Temperature Limits :** -50 to 85°C

**Working Pressure Limits (Silicone oil) :** Maximum working pressure: 0.2MPa, 7MPa, 16MPa, 25MPa, 40MPa

**Static Pressure Limits :** 3.5 kPa (Absolute) to maximum working pressure

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**One-way Overload Pressure Limit** : The maximum one-way overload pressure is maximum working pressure.

**Electromagnetic Compatibility (EMC)** : Look at the EMC Performance Table (Annexure (A)).

### 3. Installation

#### Supply & Load Requirements

24 V DC supply,  $R \leq (U_s - 12V) / I_{max}$  k $\Omega$ ,  $I_{max} = 23$  mA.

Maximum voltage limited: 42.5VDC,

Minimum voltage limited: 10.8VDC, (15VDC with LCD display)

Load: 230 $\Omega$  to 600 $\Omega$  for digital communication

#### Electrical Connection

The electrical connection is made via cable entry M20x1.5/ 1/2" NPT/ 1/2" BSP. The screw terminals are suitable for wire cross-sections up to 2.5mm<sup>2</sup> .

#### Process Connection

Flange with fixing thread 7/16"-20 UNF and 1/4"-18 NPT female thread on both sides.

### 4. Physical Specifications

#### Wetted Parts Materials

**Sensor Body** : 316L stainless steel

**Isolating Diaphragm** : SS316L/Hastelloy C/Gold plated on 316L/Tantalum

**Nuts and Bolts** : 304 stainless steel

**Process Connector** : SS304/SS316/SS316L/Hastelloy C

**Fill Fluid** : Silicone oil/Fluorinated oil

**Process Connector Gasket** : Perbunan (NBR)/ Viton (FKM)/ Teflon (PTFE)

**Amplifier Housing** : Aluminum with epoxy resin coat

**Housing Gasket** : Perbunan (NBR)

**Name Plate and Tag** : 304 stainless steel

**Weight** : 3.3kg

**Degrees of Protection** : IP67

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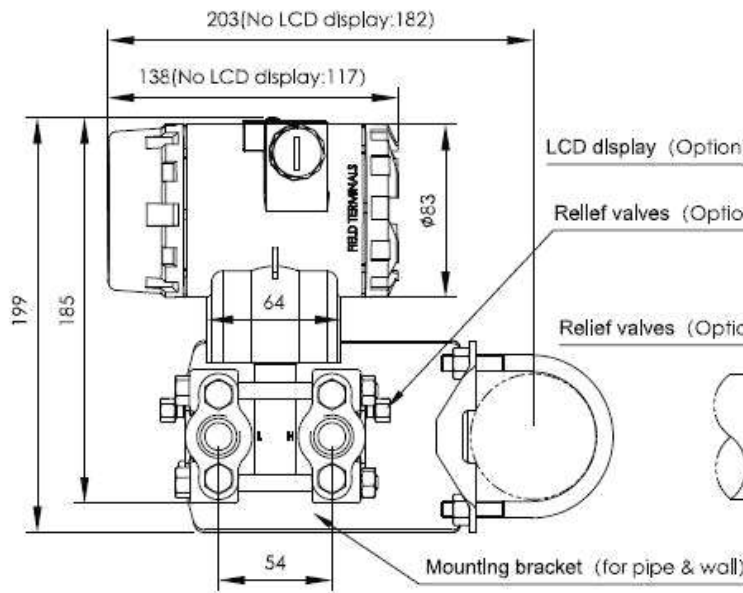




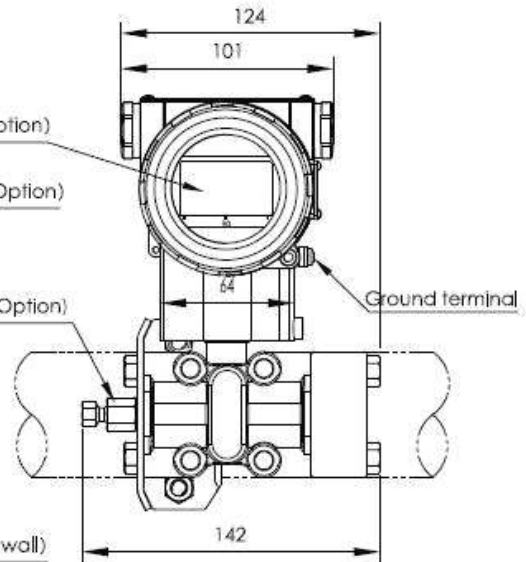


## 5. Dimensions

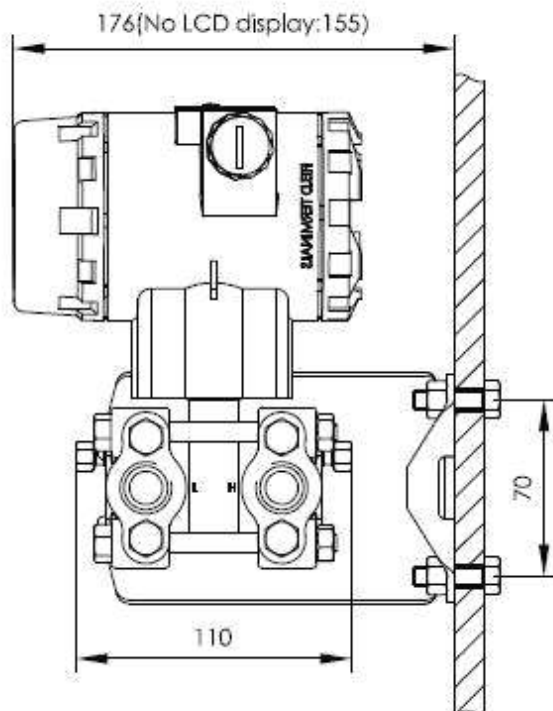
Horizontal Piping Type (side face)



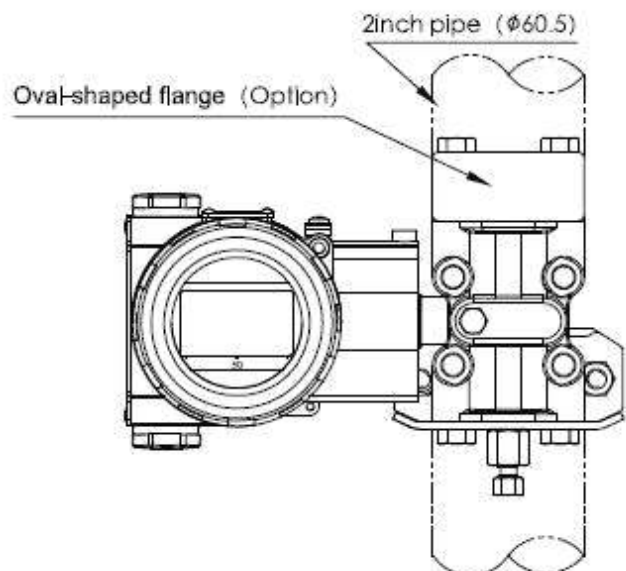
Horizontal Piping Type (front side)



Wall mounting Type

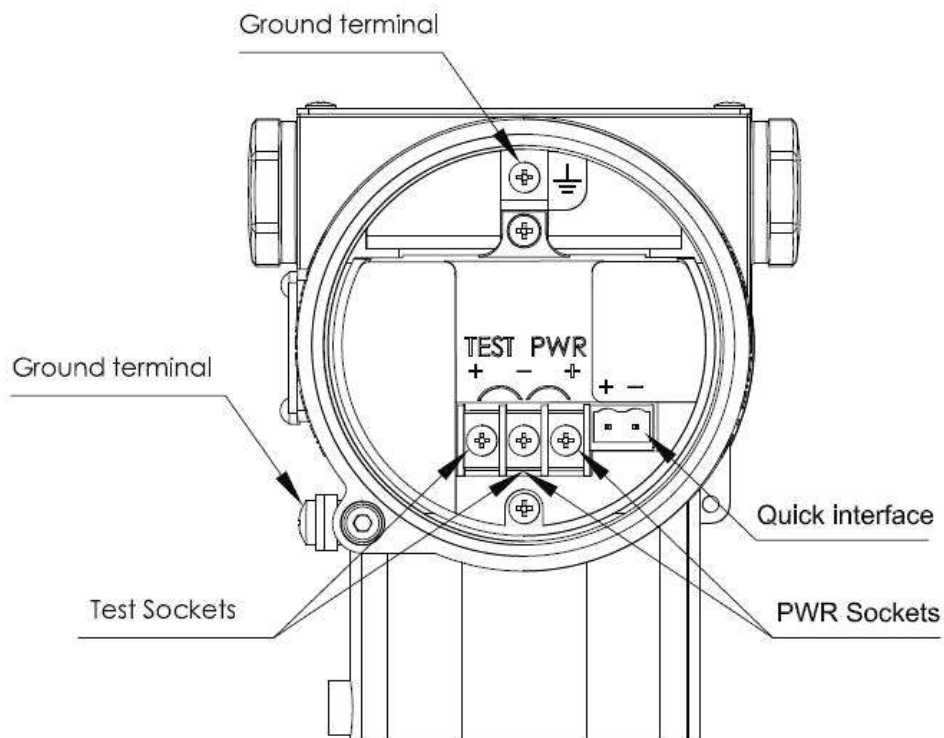


Vertical Piping Type



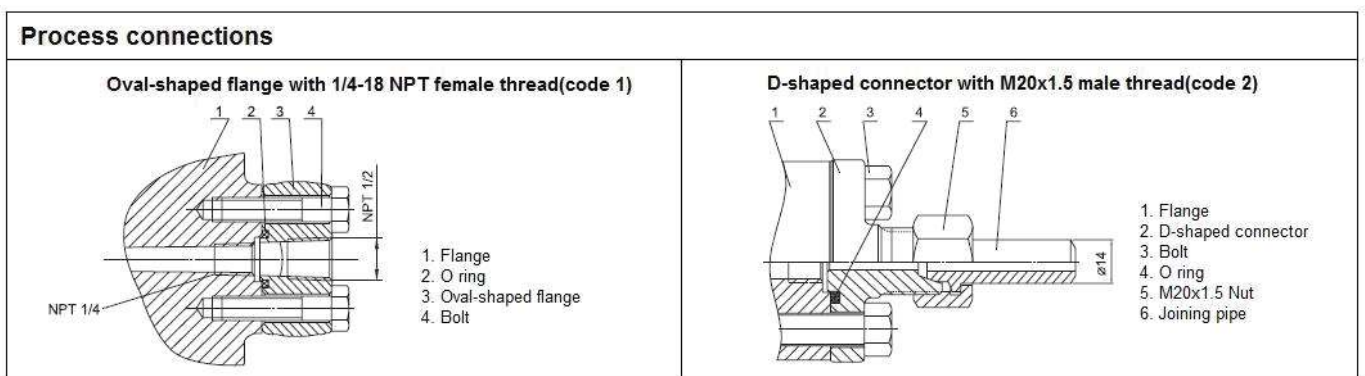


## 6. Terminal Configurations



**Note:** Quick interface functionally equivalent to the signal terminal

## 7. Process Connections Description



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## Ordering Table

Differential Pressure Transmitter TP2001-		
<b>1</b>	<b>Accuracy</b>	
	H	± 0.065% of span
	U	± 0.05% of span
	A	± 0.04% of span
	B	± 0.1% of span
<b>2</b>	<b>Sensor Type</b>	
	1	Piezo-resistive
	2	Silicon Resonant sensor
<b>3</b>	<b>Output</b>	
	B	4-20mA with HART
	C	Profibus-PA
	D	Foundation Fieldbus
<b>4</b>	<b>Span</b>	
	A	0-100Pa~1kPa (0-10~100 mmH <sub>2</sub> O)/(0-1~10mbar)
	B	0-200Pa~6kPa (0-20~600 mmH <sub>2</sub> O)/(0-2~60mbar)
	C	0-400Pa~40kPa (0-40~4000 mmH <sub>2</sub> O)/(0-20~400mbar)
	D	0-2.5kPa~250kPa (0-0.25~25 mH <sub>2</sub> O)/(0-25~2500mbar)
	E	0-20kPa~2MPa (0-2~200 mH <sub>2</sub> O)/(0-0.2~20bar)
	F	0-30kPa~3MPa (0-3~300 mH <sub>2</sub> O)/(0-0.3~30bar)
	X	Special Option
<b>5</b>	<b>Diaphragm &amp; Filling Fluid</b>	
	A	316L Stainless Steel, Silicone Oil
	B	316L Stainless Steel, Fluorine Oil
	C	Hastelloy C, Silicone Oil
	D	Hastelloy C, Fluorine Oil
	E	Gold Plated on 316L, Silicone Oil
	F	Gold Plated on 316L, Fluorine Oil
	G	FEP Plated on 316L, Silicone Oil
	T	Tantalum, Silicone Oil
<b>6</b>	<b>Working Pressure</b>	
	0	0.2MPa (only for A Span)
	7	7MPa (only for A Span)
	1	16MPa

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	2 3 4	25MPa 40MPa 70MPa
<b>7</b>	<b>Process Connection</b>	
	N B U D L R	7/16-20 UNF and 1/4-18 NPT female thread, No relief valve 7/16-20 UNF and 1/4-18 NPT female thread, Relief valves at end of flanges 7/16-20 UNF and 1/4-18 NPT female thread, Relief valves at the upper part of the flange side 7/16-20 UNF and 1/4-18 NPT female thread, Relief valve at the lower part of the flange side Level Remote Seal
<b>8</b>	<b>Process Connector Gasket</b>	
	N F P	Perbunan (NBR) Viton (FKM) Teflon (PTFE)
<b>9</b>	<b>Special Function</b>	
	N F O	None square root output Degrease cleansing treatment (Oxygen measurement must be with fluorinated oil filled capsule, Viton (FKM) gasket, <6MPa ,<60°C)
<b>10</b>	<b>Mounting Bracket</b>	
	N 1 2	None 304 Stainless Steel Carbon Steel Galvanized
<b>11</b>	<b>Process Connector Accessory</b>	
	N 1 2	None Stainless steel oval-shaped flange with 1/2 NPT female thread Stainless steel D-shaped connector with M20x1.5 male thread
<b>12</b>	<b>Integral Indicator</b>	
	N 2	None Backlit LCD Display
<b>13</b>	<b>Explosion-Proof Option</b>	
	N I D E	None Intrinsic Safety Exia Isolated Explosion / Flameproof Exd Intrinsically Safe & Explosion Proof



<b>14</b>	<b>Enclosure Material</b>	
	A	Die Cast Aluminum
	S1	SS304
	S2	SS316

**Note :** Please note that for 40 bar to 100 bar, all the DP transmitters have been designed specially so that they have different load ability as 0-10 bar. For the Negative connector, the max. Overload pressure is 60 bar and for positive connectors, the max. overload pressure is 200 bar

For example : TP2001-HB1CA1BNF211NA

[H]: +/-0.065%

[1]: Piezo-resistive

[B]: 4-20mA with HART

[C]: Span: 0-400Pa~40kPa (-40~4000 mmH2O)

[A]: 316L Stainless Steel, Silicone Oil

[1]: Working pressure: 16MPa

[B]: 7/16-20 UNF and 1/4' -18 NPT female thread, Relief valves at end of flanges

[N]: Perbunan (NBR)

[F]: Square root output

[2]: Carbon Steel Galvanized

[1]: Stainless steel oval-shaped flange with 1/2 NPT female thread

[1]: Backlit LCD Display

[N]: None

[A]: Die cast Aluminum

### Annexure

(A) The pressure transmitter complies to the following international standards for function & performance tests

Sr. No.	Test Name	Test Standards
1	IP 67 (Category 1)	Test IS/IEC 60529:2001
2	Conducted Emission Test	CISPR:11:2009+A1:2010 EN61326-1:2013
3	Radiated Emission Test	IEC 61000-4-20:2010 EN61326-1:2013

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4	Radiated Electromagnetic Field Disturbance Test	IEC 61000-4-20:2010 EN61326-1:2013
5	Electrostatic Discharge (ESD)Test	IEC 61000-4-20:2010 EN61326-1:2013
6	Electrical Fast Transient/ Burst Test	IEC 61000-4-20:2010 EN61326-1:2013
7	Power Frequency Magnetic Field Test	IEC 61000-4-20:2010 EN61326-1:2013
8	Surge Immunity Test	IEC61000-4-5:2014
9	Ring Wave Immunity Test	IEC 61000-4-12:2006
10	Immunity to Radiated, Radio-freq- uency Electromagnetic Field Test	IEC61000-4-3:2006
11	Vibration Test	IEC 60770-1:2010 IEC61298-3:2008
12	Shock Test	IEC 60770-1:2010 IEC61298-3:2008
13	Mounting Position Effect Test	IEC 60770-1:2010 IEC61298-3:2008
14	Inaccuracy	IEC61298-2 & 3 Edition 2.0 2008-10
15	Hysteresis	IEC61298-2 & 3 Edition 2.0 2008-10
16	Non-Repeatability	IEC61298-2 & 3 Edition 2.0 2008-10
17	Terminal based Non-Linearity	IEC61298-2 & 3 Edition 2.0 2008-10
18	Independent Nonlinearity	IEC61298-2 & 3 Edition 2.0 2008-10
19	Zero based Non-Linearity	IEC61298-2 & 3 Edition 2.0 2008-10
20	Dead Band	IEC61298-2 & 3 Edition 2.0 2008-10
21	Over Pressure Test	IEC61298-2 & 3 Edition 2.0 2008-10
22	Long Term Drift Test	IEC 60770-1:1999 & IEC 61298-3:2008
23	Insulation resistance Test	IEC 60770-1:1999 & IEC 61298-3:2008
24	Dielectric strength	IEC 60770-1:1999 & IEC 61298-3:2008
25	Power Consumption	IEC 60770-1:1999 & IEC 61298-3:2008
26	Output ripple	IEC 60770-1:1999 & IEC 61298-3:2008
27	Common mode interference	IEC 60770-1:1999 & IEC 61298-3:2008
28	Supply voltage variation	IEC 60770-1:1999 & IEC 61298-3:2008
29	Reverse supply voltage Protection	IEC 60770-1:1999 & IEC 61298-3:2008
30	Earthing	IEC 60770-1:1999 & IEC 61298-3:2008



31	Short circuit of output	IEC 60770-1:1999 & IEC 61298-3:2008
32	Input resistance	IEC 60770-1:1999 & IEC 61298-3:2008
33	Electrical Output Load Effect	IEC 60770-1:1999 & IEC 61298-3:2008
34	Life Cycle Test	IEC61298-2: 2008
35	Salt mist test	ASTM b.117:1973
36	Static pressure test	IEC61298-2: 2008
37	Response time	IEC61298-2: 2008

**Note:**

(1) Performance level A description: The technical specifications within the limits of normal performance.

(2) Performance level B description: Temporary reduction or loss of functionality or performance, it can restore itself. The actual operating conditions, storage, and data will not be changed.

(B) Unit Conversion Table:

**CONVERSION TABLE FOR PRESSURE UNITS**

	kPa	bar	psi	kgf / cm <sup>2</sup>	mmH <sub>2</sub> O	inH <sub>2</sub> O	ftH <sub>2</sub> O	mmHg	inHg	torr
kPa		0,01000	0,14504	0,01020	101,972	4,01463	0,33455	7,50064	0,29530	7,50064
bar	100,000		14,5038	1,01972	10197,2	401,463	33,4552	750,064	29,5300	750,064
psi	6,89476	0,06895		0,07031	703,070	27,6799	2,30666	51,7151	2,03602	51,7151
kgf / cm <sup>2</sup>	98,0665	0,98067	14,2233		10000,0	393,701	32,8084	735,561	28,9590	735,561
mmH <sub>2</sub> O	0,00981	0,00010	0,00142	0,00010		0,03937	0,00328	0,07356	0,00290	0,07356
inH <sub>2</sub> O	0,24909	0,00249	0,03613	0,00254	25,4000		0,08333	1,86833	0,07356	1,86833
ftH <sub>2</sub> O	2,98907	0,02989	0,43353	0,03048	304,800	12,0000		22,4199	0,88267	22,4199
mmHg	0,13332	0,00133	0,01934	0,00136	13,5951	0,53524	0,04460		0,03937	1,00000
inHg	3,38639	0,03386	0,49115	0,03453	345,316	13,5951	1,13292	24,4001		25,4001
torr	0,13332	0,00133	0,01934	0,00136	13,5951	0,53524	0,04460	1,00000	0,03937	

**Prefixes**

tera	T	10 <sup>12</sup>
giga	G	10 <sup>9</sup>
mega	M	10 <sup>6</sup>
kilo	k	10 <sup>3</sup>

**Symbols**

hecto	h	10 <sup>2</sup>
deca	da	10
deci	da	10 <sup>-1</sup>
centi	c	10 <sup>-2</sup>

**Factors**

mili	m	10 <sup>-3</sup>
micro	μ	10 <sup>-6</sup>
nano	n	10 <sup>-9</sup>
pico	p	10 <sup>-12</sup>



(C) The Pressure Transmitter Series 2000 can be calibrated in various engineering units such as Pa, kPa, MPa, mbar, bar, mmH<sub>2</sub>O, mH<sub>2</sub>O, psi, kg/cm<sup>2</sup>, etc.

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# **PRESSURE TRANSMITTER**

## **With REMOTE SEAL**

### **TP2051R Series**



TP2051R, Remote Seal intelligent flange pressure and differential pressure transmitter is a well-developed high performance pressure transmitter based on the international leading technology, adopting the world advanced monocrystalline silicon pressure sensor technology and the patented packaging process. This product adopts the patented double overload protection diaphragm design, with the internal circuit surge protection design, and can accurately measure the gauge pressure, flow, vacuum degree, liquid level and density.

TP2051R-D/G/A Differential/ Gauge Pressure Transmitter with Flange/s is a type of flush product in order to meet the flange mounting requirement of the customer. This product adopts the imported diffuse silicon pressure sensitive element, and after long-term aging and stability selection, the product performance is stable and reliable.



TP2051R-D/G/A Flush Pressure Transmitter with Flange takes the international standard flange plate as the connection standard, and can realize the on-site flange mounting mode for the user. Because the stress diaphragm is exposed and senses the pressure directly, convenient for cleaning, and able to meet the moisture proof, waterproof, ex-proof and other severe working condition requirements, the products of this series are widely applied for the viscous media with particles in the fields such as industrial process control, petroleum, chemical industry, metallurgy etc.

## Technical Specifications

Pressure Parameters	
Range	0-10 kPa...3 MPa
Pressure reference	Gauge pressure, Differential Pressure
Electric Parameters	
Output Type	4~20mA, 4~20mA+HART® protocol
Power Supply	12~32V, recommend 24V
Temperature drift	$\pm(0.1+0.1\times\text{Range ratio})\%FS(@-10\sim70^{\circ}\text{C})$
Structural Parameters	
Housing	Die Cast Aluminum
Diaphragm	SS 316L
Nuts and Bolts	SS304
Process Connector	SS304/ SS316/ Hastelloy C
Fill Fluid	Silicon Oil
Sealed Ring	Perbunan/Viton
Protection Class	IP 67 (Housing)
Ambient Parameters	
Media Applicability	Fluid which has no corrosion to SS316L and Viton
Ambient Temperature	-40°C~80°C
Medium Temperature	-40°C~120°C
Storage Temperature	-30°C ~ 70°C
Performance Parameters	

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Accuracy	±0.1%FS
Long Term Stability	±0.2%FS/year
Full temperature Coefficient	±0.05%FS/°C
Insulation Resistance	≥200MΩ
Mechanical Vibration	20g (20 to 5000 Hz)
Shock	100g (11ms)
Protection grade	IP67
Material	Housing : Cast Aluminum Alloy Diaphragm : SS316L, Hastelloy C
Response time	0.1 Sec
Static pressure effect (For DPT only)	Zero point influence 0.15% FS/4MPa Full scale influence 0.25%FS/4MPa

### Remote Seal Structural performance

Diaphragm material	316L (316L sprayed with PTFE, Hastelloy C, tantalum)
Drain valve	Stainless steel
O-Ring	Viton
Filling liquid	Silicon Oil
Flange and clamp block	SS316 Flange, ss304 stainless steel clamp
Soft capillary	SS304
Housing material	Die-casting aluminum epoxy resin coating
Pressure connection	LT/RD high pressure side: DN25 PN4.0, DN50 PN4.0, DN80 PN1.6 RD low pressure side: DN25 PN4.0, DN50 PN4.0, DN80 PN1.6 LT low pressure side: M20×1.5 with welded pipe

## Dimension Details

### 1. Double sided flange type Remote Seal Differential Pressure Transmitter

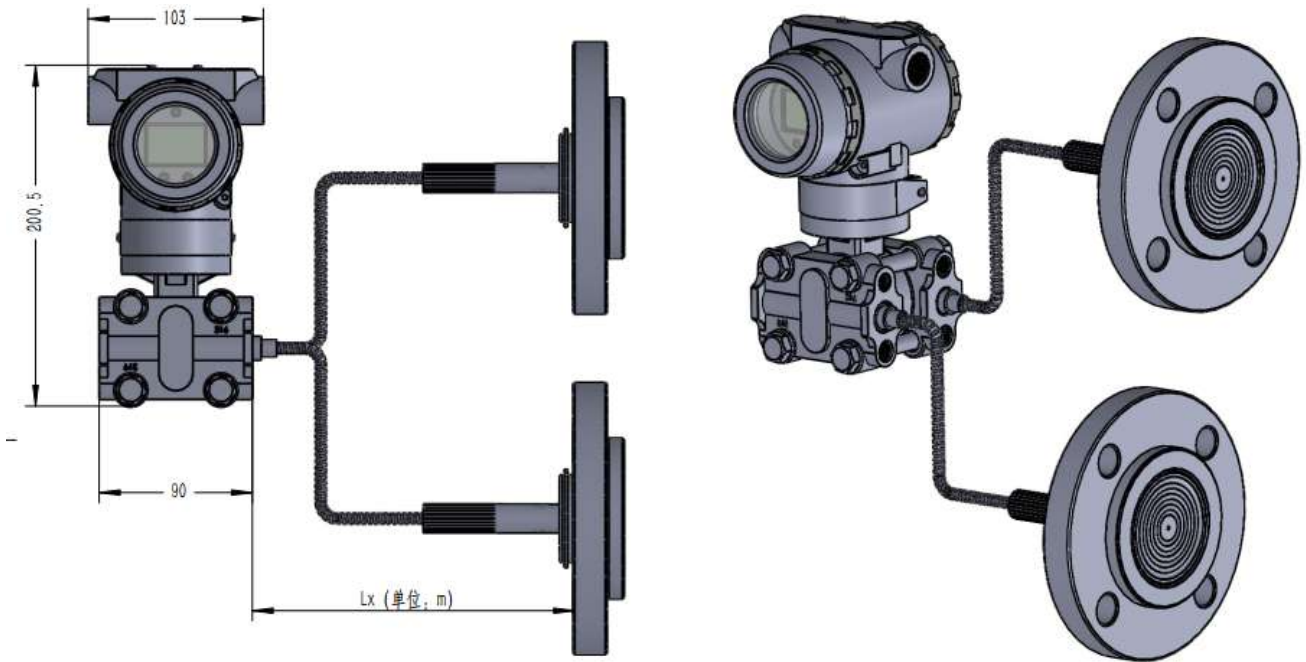
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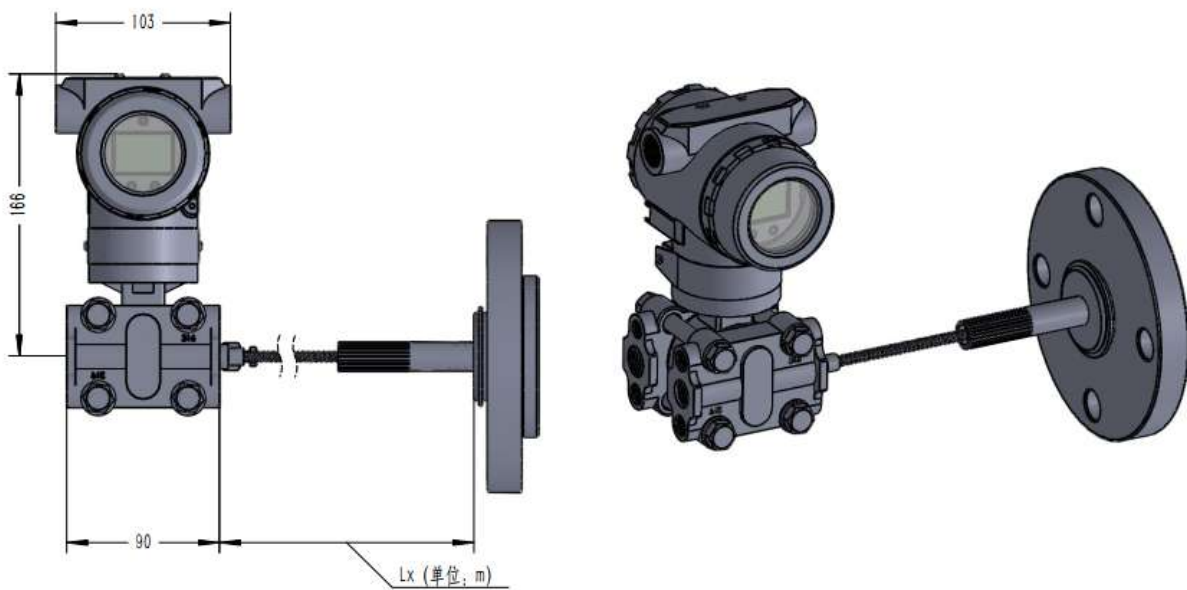
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## 2. Single sided flange type remote seal differential Pressure Transmitter



## 3. Direct mount diaphragm seal pressure transmitter

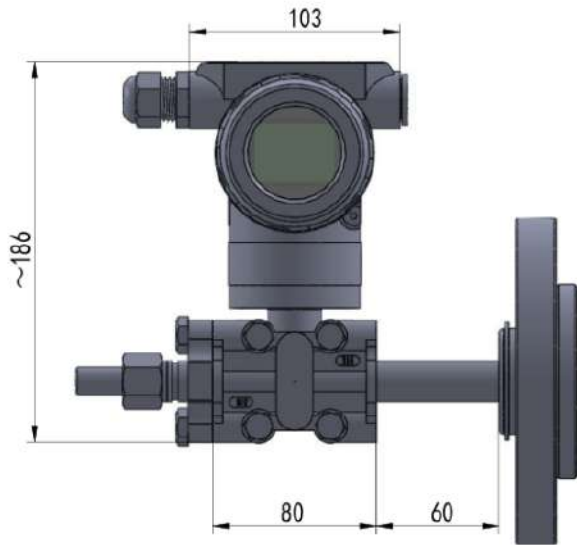
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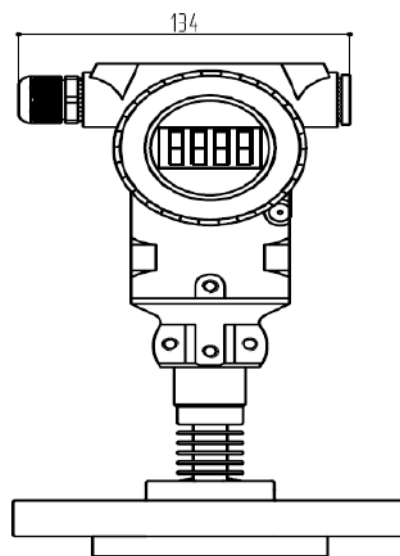
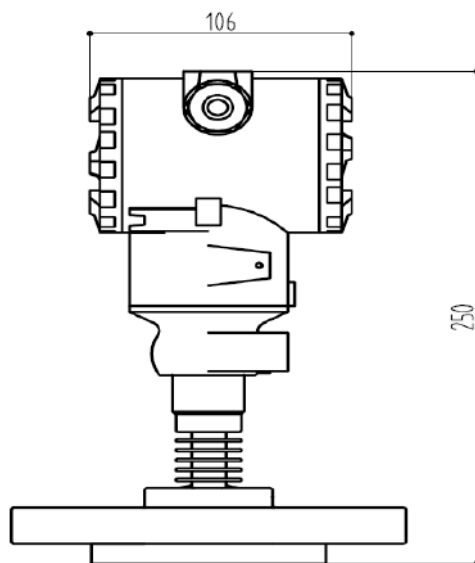
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#### 4. Flush mounted diaphragm type gauge Pressure Transmitter





## Selection Table

<b>0</b>	<b>Type</b>
<b>TP2051R</b>	<b>Pressure Transmitter-Remote Seal, Smart with LCD display</b>
<b>10</b>	<b>Measurement Type</b>
D	Differential
G	Gauge
<b>20</b>	<b>Sensor Type</b>
P	Peizo-Resistive type
<b>30</b>	<b>Special Function</b>
N	None
F	Square Root Function ( For Differential pressure type only)
<b>40</b>	<b>Pressure Range</b>
B	0~10kPa...40kPa
C	0~25kPa...100kPa
J	0~50kPa...250kPa
D	0~200kPa...1MPa
E	0~500kPa...3MPa
<b>50</b>	<b>Accuracy</b>
B	± 0.1% FS
<b>60</b>	<b>Output</b>
A	4-20mA+HART
<b>70</b>	<b>Pressure Port</b>
1	SS 304
2	SS 316L
<b>80</b>	<b>Diaphragm Material &amp; Filling Fluid</b>
1	316L Stainless Steel, Silicone Oil
2	Hastelloy C, Silicone Oil
<b>90</b>	<b>Electrical Connection</b>
M	M20×1.5 female
N	NPT1/2 female
<b>100</b>	<b>Explosion-proof option</b>
N	None
<b>110</b>	<b>Process Connection</b>

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R	Remote seal (Applicable for All type)
<b>120</b>	<b>Flange sealing device</b>
RN	Without Capillary
RC	With Capillary (For Gauge Pressure)
RH	High Side Capillary (For Differential Pressure)
RL	Low Side Capillary (For Differential Pressure)
RB	Both Side Capillary (For Differential Pressure)
<b>130</b>	<b>Process Connection, Flange and Diaphragm Material</b>
	<b>Please refer below table</b>
<b>140</b>	<b>Sealing Connection</b>
F	Flat Sealing
H	Bulge Sealing, 316L Stainless Steel, Extended Diaphragm Seal 50mm
L	Bulge Sealing, Hastelloy C, Extended Diaphragm Seal 50mm
X	Custom Requirement
<b>150</b>	<b>Fill Fluid</b>
S	Silicone Oil, -30~150°C
H	High Temp. Silicone Oil, -10~350°C
<b>160</b>	<b>Capillary Length</b>
N	None
1	1m (For Single side only)
2	1m (For Both side only)
3	2m (For Single side only)
4	2m (For Both side only)
5	3m (For Single side only)
6	3m (For Both side only)
7	4m (For Single side only)
8	4m (For Both side only)
9	5m (For Single side only)
10	5m (For Both side only)
11	6m (For Single side only)
12	6m (For Both side only)
13	8m (For Single side only)
14	8m (For Both side only)
15	10m (For Single side only)



16	10m (For Both side only)
S	Special Length
<b>170</b>	<b>Diaphragm Protection</b>
N	None
1	PFA Plated on 316L, $\leq 260^{\circ}\text{C}$
2	PTFE Coated on 316L, $\leq 200^{\circ}\text{C}$
<b>180</b>	<b>Capillary Component Characteristics</b>
N	None
A	SS304 (Standard)
B	SS316
C	SS304 (With PVC Protective Coating Capillary)

## Process Connection, Flange and Diaphragm Material

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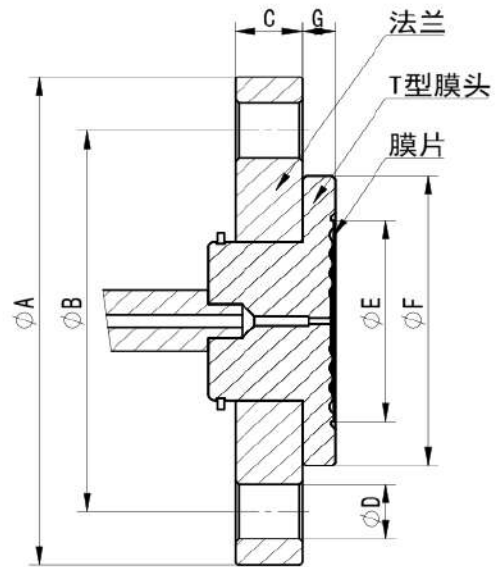
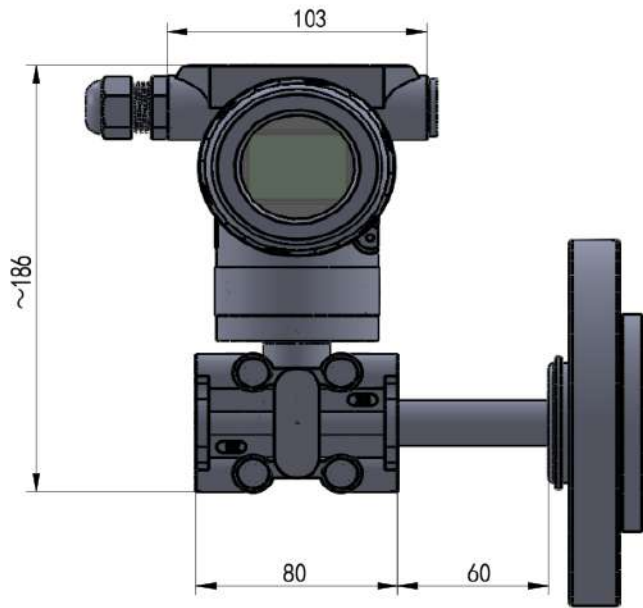
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CODE (140)	Flange	T-shaped membrane head	F	Diaphragm material	A	B	C	D	E	G
1	304 DN25 PN4.0	316L	62	316L	125	85	16	14	49	9.6
2	304 DN50 PN4.0	316L	95	316L	165	125	20	18	65.5	9
3	304 DN80 PN1.6	316L	127	316L	200	160	20	18	89	8.8
4	304 DN25 PN4.0	316L	62	316L PTFE	125	85	16	14	65	9.6
5	304 DN50 PN4.0	316L	95	316L PTFE	165	125	20	18	95	9
6	304 DN80 PN1.6	316L	127	316L PTFE	200	160	20	18	127	8.8
7	304 DN25 PN4.0	316L	65	Hastelloy C	125	85	16	14	65	9.6
8	304 DN50 PN4.0	316L	95	Hastelloy C	165	125	20	18	95	9
9	304 DN80 PN1.6	316L	127	Hastelloy C	200	160	20	18	127	8.8
10	304 DN25 PN4.0	316L	65	Tantalum	125	85	16	14	65	9.6
11	304 DN50 PN4.0	316L	95	Tantalum	165	125	20	18	95	9
12	304 DN80 PN1.6	316L	127	Tantalum	200	160	20	18	127	8.8

**Order Note:**

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# PRESSURE TRANSMITTER TP2052



## INTRODUCTION

The TP2052 pressure transmitter is used to TP2052 measure the on-site pressure of a liquid or gas and then convert it to a 4-20 mA DC output with HART communication protocol.

## STANDARD SPECIFICATION

The adjustment of range is based on the standard zero, The diaphragm is stainless steel 316L and the filling fluid is silicone oil.

### Principle of Operation

The transmitters utilize a high stability Piezo-resistive sensor single crystal silicon sensor, uniquely manufactured with semiconductor technology, with state-of-the-art microprocessor based electronics to provide exceptional performance and functionality. These sensors offer high sensitivity and good linearity at constant temperature.

### 1. Performance Specification

#### Reference Accuracy of Adjusted Range:

$\pm 0.075\% / \pm 0.1\% / \pm 0.25\%$  (Optional) (Including nonlinearity, hysteresis and repeatability)



### Ambient Temperature Effects

The total amount of influence from -25 °C to 65 °C is:  $\pm(0.15 \times TD + 0.1)\% \times \text{Span}$

The total influences at -40 °C to -25 °C and 65 °C to 85 °C are:  $\pm(0.2 \times TD + 0.1)\% \times \text{Span}$

TD = maximum range/adjustment range

### Over range Effects

$\pm 0.075\% \times \text{Span}$

### Stability

$\pm 0.1\% \times \text{Span/year}$

### Supply Voltage Effects

$\pm 0.001\% / 10V$  (14 ~ 45V DC), (it can be almost ignored)

## 2. Function Specification

### Span and Range Limits

Span Code	Span kPa	Range kPa
B	3 ~ 6	(-)6 ~ 6
C	4 ~ 40	(-)40 ~ 40
D	25 ~ 250	(-)100 ~ 250
F	0 ~ 3000	(-)0.1 ~ 3
G	0 ~ 10000	(-)0.1 ~ 10
H	0 ~ 21000	(-)0.1 ~ 21
I	0 ~ 40000	(-)0.1 ~ 40
L	10 ~ 40	0 ~ 40
M	25 ~ 250 kPa abs	0 ~ 250 kPa abs
O	0.25 ~ 3 MPa abs	0 ~ 3 MPa abs

### Zero Setting

Zero and span can be adjusted to any value within the measurement range in the table, as long as: calibrated range  $\geq$  minimum range

### Installation Location Influence

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Transmitter mounting position deviation will produce a correctable zero offset. After zero adjustment, there is no range effect.

### **Output**

2 wires type, 4 ~ 20mADC output, with HART communication protocol

Output Signal Limit: Imin=3.9mA □ □ Imax=20.5mA

### **Alert Current**

Underreport mode (Min): 3.6mA

High-report mode (Max): 21 mA

### **Turndown Ratio**

For Span B - 2:1

For Span C,D,G,H,I & M - 10:1

For Span F & N - 12:1

For Span L - 4:1

### **Responding Time**

The damping constant of the amplifier component is 0.1s and the time constant of the sensor is 0.2 to 2s, which depend on the sensor's range, turndown ratio, and fill fluid characteristics. The additional adjustable time constant is 0.1 to 60s.

### **Preheat Time**

< 15s

### **Ambient Temperature**

(-)40 ~ 85°C

(-)20 ~ 65°C (with LCD backlit display)

### **Storage temperature / Transport temperature**

(-)50 ~ 85°C

(-)25 ~ 85°C (with LCD backlit display)

### **Storage temperature / transport temperature**

-50 ~ 85°C

-25 ~ 85°C (with LCD backlit display)

### **Medium Temperature**

(-)30 ~ 125°C

### **Overload Limit**

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Span Code	B	C/L	D/M	F/O	G	H	I
Overload Limit MPa	0.2	1	4	15	20	50	50

### 3. Installation

#### Power and Load Conditions

Power supply voltage is 24V,  $R \leq (U_s - 12V) / I_{max}$  k $\Omega$

Where  $I_{max} = 23$  mA

Maximum supply voltage: 45VDC

Minimum supply voltage: 14VDC

#### Electrical Connection

1/2-NPT Female Thread/M20X1.5 cable sealing buckle, terminal block is suitable for 0.5~2.5mm<sup>2</sup> wire.

#### Process Connection

1/2 NPT Female thread or M20 x 1.5 Male thread is optional.

### 4. Physical Specifications

#### Material

Diaphragm: stainless steel 316L or Hastelloy C

Process connection: stainless steel 304

Filling liquid: silicone oil

Transmitter housing: aluminum alloy, epoxy coated on the outside.

Nameplate: Stainless steel 304

**Weight:** about 1.2kg

#### Housing Protect Level

IP67