

# Differential pressure transmitter

## Model: SMT2001

Spec. sheet no. SD02-01

### Service intended

The high performance pressure transmitter SMT2001 is suitable to measure liquid, gas, or steam flow as well as liquid level, density and pressure.

The key features include quick response, remote set-up using communications, self-diagnostics and optional status output for pressure high/low alarm.



### Standard features

#### Accuracy

±0.05 % of calibrated span.  
±0.075 % of calibrated span.  
±0.1 % of calibrated span.

#### Range limits

0 ~ 100 Pa to 0~3 MPa

#### Turn down

Adjustable up to 100:1 range ability

#### Temperature compensation

High sensitivity temperature sensor packaged in the sensor

#### Isolating diaphragm

Stainless steel 316L / Hastelloy C / Tantalum  
Stainless steel 316L with gold plated  
Stainless steel 316L with FEP plated

#### Measurement medium

Gas, steam and liquid

#### Stability

10 years stability  
0.15 % of URL

#### Output

4 ~ 20 mA with HART protocol

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| SMT2001\_01

## Principle of operation

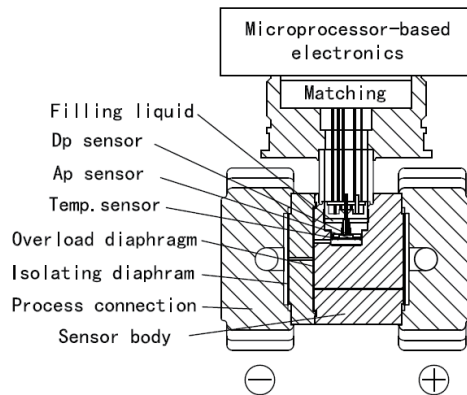
The differential pressure transmitter includes two functional units: Main unit / auxiliary unit

The main unit includes a sensor and process connection.

The completely welded sensor module is a twin-chamber system with an integral overload diaphragm, an absolute pressure sensor, a temperature sensor and the silicon differential pressure sensor.

The absolute pressure sensor, which is only exposed to the pressure at the high pressure side, acts as a reference value to compensate for the static pressure.

The temperature sensor as a temperature compensated reference value to compensate for the temperature drift.



## Main specification

- The differential pressure transmitter utilize the world's leading high stability silicon sensor, the highest Reference Accuracy is  $\pm 0.05\%$
- Micro-differential pressure transmitter utilize the world's leading dual overload diaphragm patented technology, the highest Reference Accuracy is  $\pm 0.05\%$
- The differential pressure transmitter working pressure are 16 MPa, 25 MPa and 40 MPa, the one-way limited pressure up to 16 MPa, 25 MPa and 40 MPa
- Micro-pressure / absolute pressure transmitter utilize the no pressure transmission loss overload diaphragm patented technology, the one-way overload pressure up to 7 MPa
- The absolute pressure sensor packaged in the differential pressure transmitter, can be used for static pressure measurement, display and the static pressure compensation. The minimum of the static error is  $\leq \pm 0.05\% / 10\text{ MPa}$
- High sensitivity temperature sensor packaged in the sensor. The minimum of the temperature error is  $\leq \pm 0.04\% / 10\text{K}$
- Stainless steel 316L and silicone oil filling welded seal structure
- Long stability is  $\leq \pm 0.1\% / 3\text{years}$ , 10 years of maintenance-free
- Adjustable up to 100:1 range ability
- The remote seal transmitter utilize ultra-high temperature ( $400\text{ }^\circ\text{C}$ ) patented technology.

## Standard Specifications

### Performance Specifications

Reference Accuracy of Calibrated Span (includes terminal-based linearity, hysteresis, and repeatability)  
 $\pm 0.075\%$  If  $TD > 10$  ( $TD = URL / SPAN$ ),  $\pm(0.075 \times TD)\%$

The square root accuracy is 1.5 times of reference accuracy of calibrated span.

### Ambient Temperature Effects

$-20 \sim 65\text{ }^\circ\text{C} : \pm(0.2 \times TD + 0.05)\% \times \text{Span}$

Every  $10\text{ }^\circ\text{C}$  is  $\pm 0.08\% \times \text{Span}$  ( $TD=1$ )

$-40 \sim -20\text{ }^\circ\text{C}$  and  $65 \sim 85\text{ }^\circ\text{C} : \pm(0.3 \times TD + 0.1)\% \times \text{Span}$

### Static Pressure Effects

$\pm(0.05\% \text{URL} + 0.075\% \text{Span}) / 10\text{ MPa}$

### Overpressure Effects

$\pm 0.1\% \times \text{Span} / 10\text{ MPa}$

### Stability

$\pm 0.1\% \times \text{Span} / 3\text{ years}$

### Power Supply Effects

$\pm 0.001\% / 10\text{ V}$  ( $12 \sim 42\text{ V DC}$ )

### Explosion protection

Ex db IIC T4/T5/T6 Gb

Ex tb IIIC T80 °C / T90 °C / T130 °C Db

Ta =  $-40$  to  $+60\text{ }^\circ\text{C}$

### Temperature class Max. process temperature

T4 T130°C 130°C

T5 T90°C 90°C

T6 T80°C 80°C

## Functional Specifications

### Span and Range Limits

Sensor	A	B	C	D	E
Differential pressure range (bar)	10 mbar	60 mbar	400 mbar	2.5 bar	30 bar
Setting limits (offset and span in this range freely adjustable)	-10 ... 10 mbar	-60 ... 60 mbar	-400 ... 400 mbar	-2.5 ... 2.5 bar	-30 ... 30 bar
Lowest permissible span	1 mbar	2 mbar	4 mbar	25 mbar	0.3 bar
Permissible static pressure (Option)	70 bar	160 bar	160 bar		
			250 bar		
			400 bar		
Range ability turndown (with respect to the differential pressure range)	10:1	30:1	100:1		

### Accuracy

Turn-down  $\leq 10:1 : \leq \pm 0.075\% \text{ FSO}$

Turn-down  $> 10:1 : \leq \pm[0.075 \times \text{Turn-down}] \% \text{ FSO}$

with Turn-down = Nominal Pressure Range / Adjusted

### Zero Adjustment Limits

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

## Standard 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 diaphragm plane has no effect. Tilting up to 90° will cause zero shift up to 0.4 kPa which can be corrected by the zero adjustment.

### Output

2 wire 4~20 mA DC output with digital communications, linear or square root programmable. HART FSK protocol are superimposed on the 4~20 mA DC signal.  
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

The amplifier damping constant is 0.1 sec.  
The sensor damping constant is 0.1~1.6 sec, it depends on the range and range compression ratio.  
Amplifier damping time constant is adjustable from 0.1 to 60 sec by software and added to response time.

### Warm UpTime

< 15s

### Ambient Temperature Limits

-40 to 85 °C  
-20 to 65 °C with LCD display or fluorine rubber sealing

### Storage and Transportation Temperature Limits

-50 to 85 °C  
-25 to 85 °C with LCD display

### Working Pressure Limits (Silicone oil)

Maximum working pressure : 16 MPa (Option : 25 and 40 MPa)

### One-way limited pressure

The maximum one-way limited pressure is maximum working pressure.

## Standard Specifications

### HART digital communication and 4 to 20 mA output Power Supply

The transmitter operates from 12 to 42 V DC with no load and is protected against reverse polarity connection  
Minimum operating voltage increase to 12 V DC with surge protector

### Ripple

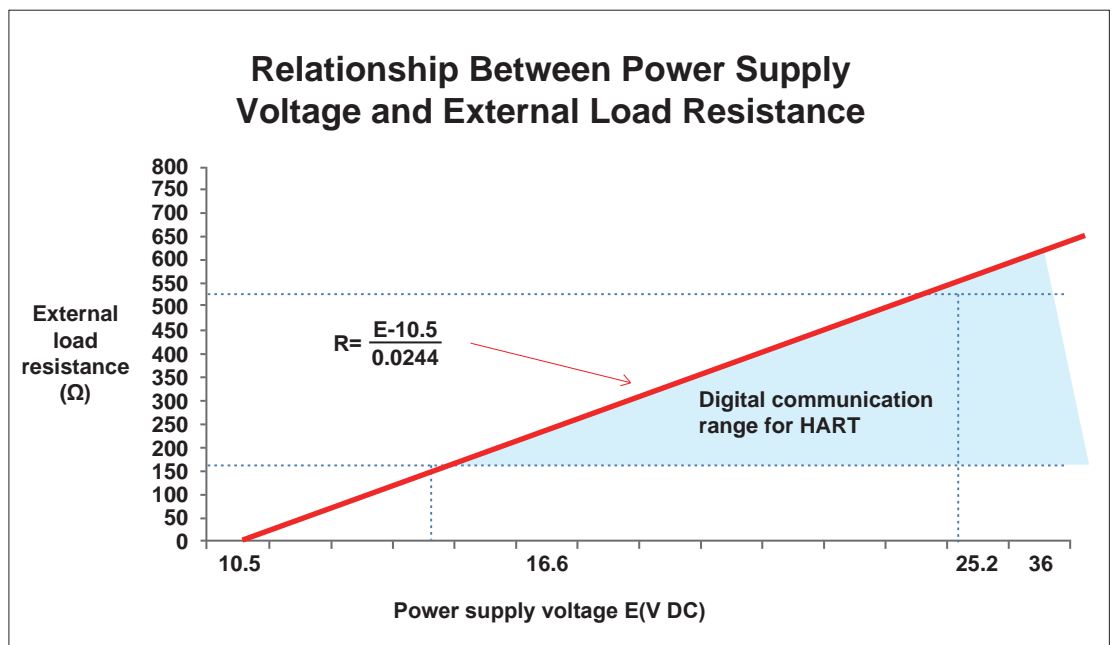
20 mV max on a 250  $\Omega$  load as per HART specifications.

### Load limitations

4 to 20 mA and HART total loop resistance :

$$R \text{ (k}\Omega\text{)} = \frac{\text{Supply voltage} - \text{min. operating voltage (V DC)}}{22 \text{ mA}}$$

A minimum of 250  $\Omega$  is required for HART communication.



### Supply and Load Requirements

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

Maximum voltage limited: 42 VDC

Minimum Voltage limited: 12 VDC without LCD display

Minimum Voltage limited: 15 VDC with LCD display

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

### Electrical Protection

Short-circuit protection is permanent.

Reverse polarity protection is not damage, but also is no function.

### Electrical Connection

The electrical connection is made via cable entry M20x1.5.

The screw terminals are suitable for wire cross-sections up to 2.5 mm<sup>2</sup>.

## Standard Specifications

### Process Connection

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

### Electromagnetic field

Meets all the requirements of EN 61326 and NAMUR NE-21.

### Load

Within load/voltage specified limits the total effect is negligible.

## Install

The transmitter housing can be rotated about 360 degrees relative to the transmitter module without affecting the performance and internal wiring.

Transmitter can be operated Through the PC machine or notebook computer via HART modem.

HART modem can be connected in parallel to the signal circuit at arbitrary point.

The HART modem communicates with the transmitter through an AC signal superimposed on the 4~20 mA output signals. This modulation does not change in the mean values, so does not affect the measurement signal.

## Physical Specifications

### Sensor Body

Stainless steel 316L

### Process Connector Gasket

Viton (FKM) / Teflon (PTFE) / Graphite

### Isolating Diaphragm

Stainless steel 316L / Hastelloy C /  
Gold plated on 316L / FEP Plated on 316L /  
Tantalum

### Amplifier Housing

Aluminium with epoxy resin coat

### Nuts and Bolts

stainless steel 304 / 1.4301  
stainless steel 316 / 1.4401  
Carbon steel galvanized (Static pressure 400 bar)

### Mounting Bracket

Stainless steel 304 / 1.4301  
Stainless steel 316 / 1.4401  
Carbon steel galvanized

### Process Connection

Female thread 1/4" - 18 NPT / fixing 7/16 UNF  
Oval flange 1/2" NPT Female thread  
Others

### Name plate and tag

Stainless steel 304

### Body Flange

Stainless steel 316 / 1.4401  
Stainless steel 304 / 1.4301

### Weight

3.3 kg

### Fill fluid

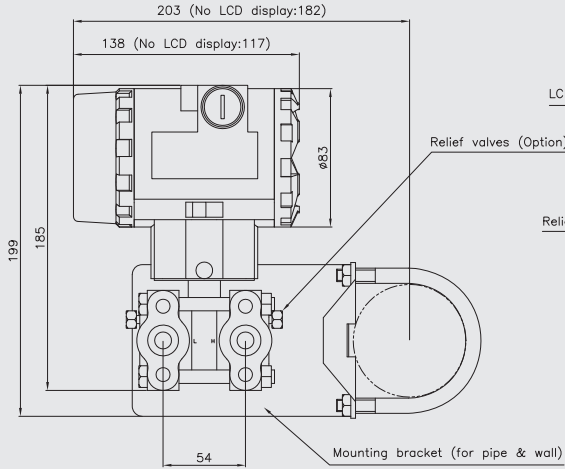
Silicone oil / Fluorinated oil

### Degrees of Protection

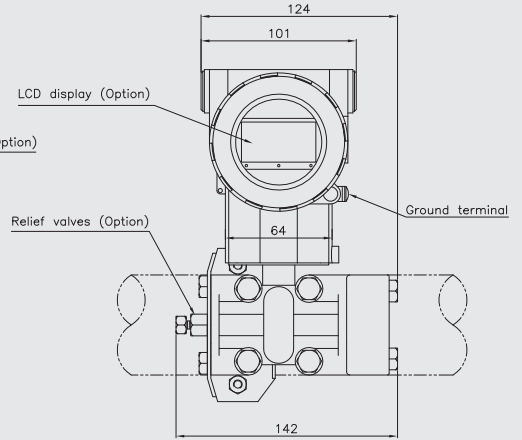
IP67

Unit : mm

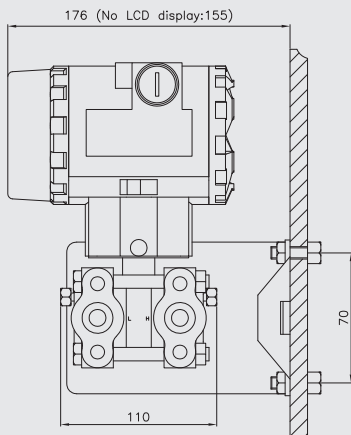
Horizontal Impulse Piping Type  
(Side face)



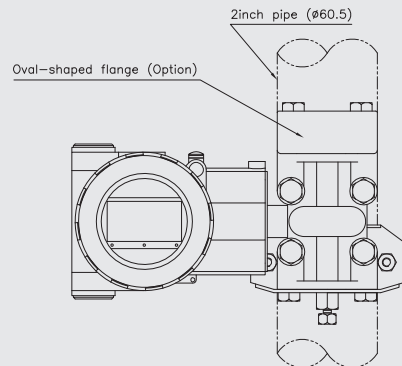
Horizontal Impulse Piping Type  
(Front side)



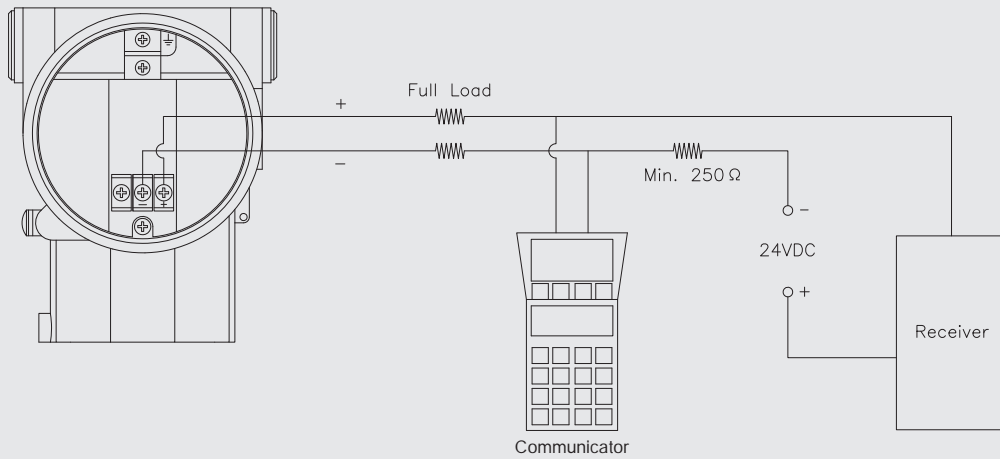
Horizontal Impulse Wall Mounting Type



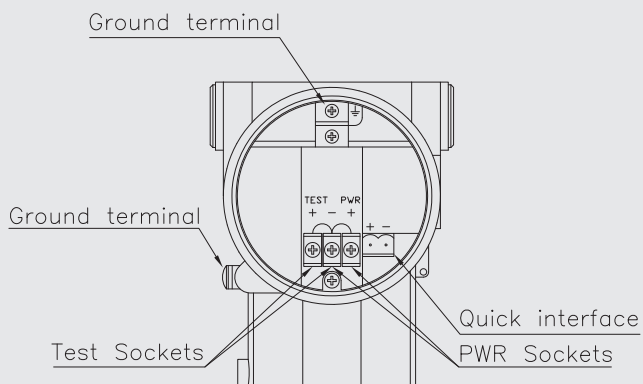
Vertical Impulse Piping Type



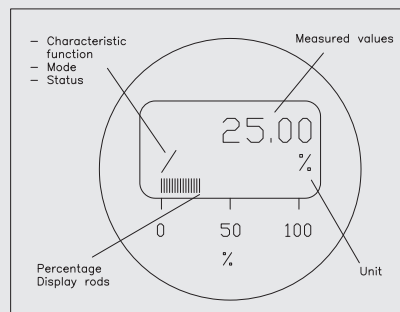
### Electrical Connection Diagram



### Terminal Configuration



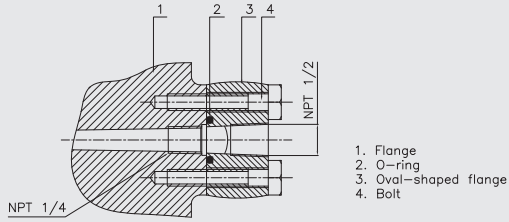
### LCD Display



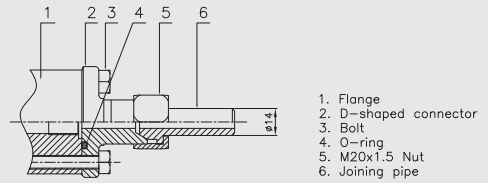


### Process Connection Description

Oval-shaped flange with 1/4-18 NPT female thread (Code 1)

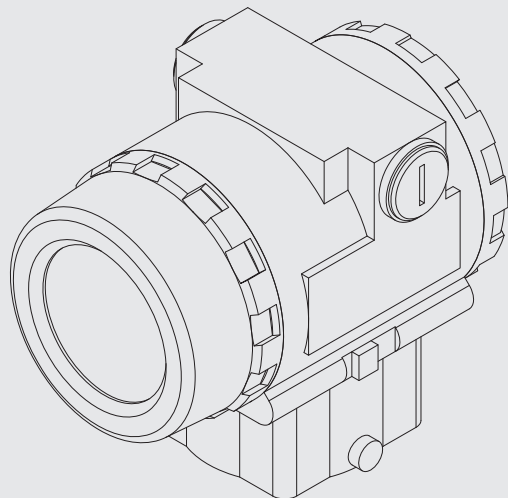
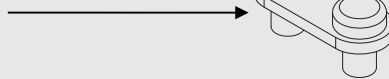


D-shaped connector with M20X1.5 male thread (Code 2)



### Push Button

Magnetic button  
Component (Two in one)



**1. Base model****SMT2001** Differential Pressure Transmitter**2. Measuring Span**

- A** 1 ~ 10 mbar (Only 0.1 %)
- B** 2 ~ 60 mbar
- C** 4 ~ 400 mbar
- D** 25 ~ 2,500 mbar
- E** 0.3 ~ 30 bar

**3. Accuracy / Output**

- 5** 0.05 % (Only C-E Sensor, 4 ~ 20 mA with HART)
- 7** 0.075 % (Only B-E Sensor, 4 ~ 20 mA with HART)

**4. Wetted parted materials (Seal diaphragm/Process connection)**

- L** 316L SS / Stainless steel
- H** Hastelloy C-276 / Stainless steel
- T** 316L SS coated by Teflon / Stainless steel
- G** 316L SS coated by Gold / Stainless steel

**5. Filled by fluid**

- S** Silicone oil
- F** Fluorinated oil

**6. Explosion protection**

- N** None
- A** Ex ia
- D** Ex d

**7. Housing material**

- A** Aluminium
- S** 304SS

**8. Conduit connection**

- M** M20 \* 1.5

**9. Mounting bracket material**

- 5** Carbon steel galvanized
- 4** 304SS
- 6** 316SS

**10. Process connection**

- Q** Female thread 1/4" - 18 NPT Fixing 7/16" UNF

**11. Accessory**

- N** None
- M** With manifold valve

**12. Static pressure**

- 7** 70 bar (1 ~ 10 mbar, Measuring span A)
- 6** 160 bar
- 2** 250 bar
- 4** 400 bar

**13. Process connector gasket**

- V** Viton (FKM)
- T** Teflon
- G** Graphite

**14. Flange / Bolt & Nut material**

- 4** 304SS / 304SS
- 6** 316SS / 316SS

1	2	3	4	5	6	7	8	9	10	11	Sample ordering code
SMT2001	A	5	L	S	N	A	M	5	Q	N	
12	13	14									
7	V	4									