MANUAL

Differential Pressure Transmitter AT5010

SIL, NACE, NEPSI, ATEX, CE, PMI, EN10204

Intelligence For Excellence

HollySys

NOTICE

This manual provides basic installation instructions for the HollySys differential pressure transmitter AT5010. Instructions for diagnosis, maintenance, overhaul, or faulty rule out are not provided. If there is any need, please feel free to consult the professional staff of the manufacturer.

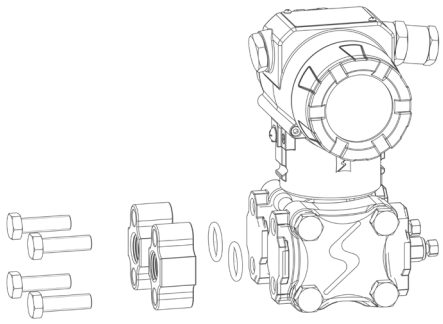
⚠ WARNING

- Differential pressure transmitter shall be installed, commissioned and maintained by professional engineers or technicians. Read the product manual carefully before installation, understand and abide by the regulations.
- The differential pressure transmitter is supplied by an external power, the power supply circuit shall comply with the energy limit circuit stipulated in the relevant standards and attention shall be paid to the high voltage that may exist in the circuit should not be more than 55VDC.
- The maximum static pressure overload has been indicated on the product label, the maximum pressure value during the process should not exceed the maximum static pressure of the differential pressure transmitter.
- The diaphragm is located at the front of the process connection, hard objects touch or squeeze the diaphragm will cause damage.
- Explosion may cause death or serious injury. When installing this transmitter in an explosive environment, be sure to comply with applicable local, national and international standards, codes and protocols. Refer to the certification of the HollySys AT5010, check for any restrictions on secure installation.
- Before connecting field communicators in explosive gas environments, please ensure that the instruments in the circuit are installed in accordance with intrinsically safe or non-flammable field wiring practices. In flameproof/fire protection installations, the transmitter cover must not be removed while the equipment is powered on.
- Process leaks can lead to casualties. Before pressurization, process connectors should be installed and tightened.
- Electric shock can cause death or serious injury, please avoid contact with the leads and terminals. High voltage that may be present on leads can cause electrical shock. .
- Conduit/cable entries in the HollySys AT5010 housing enclosure are 1/2 NPT or M20 × 1.5 type, unless otherwise indicated. In closing these entries, only plugs, joints, sealing joints or conduits with compatible threaded profiles shall be used.
- Using differential pressure transmitter in hazardous areas, the installation, use and maintenance should also comply with the relevant requirements of the operation manual and national standards.
- Attention please! Remove the transmitter only at normal atmosphere.
- The measured medium is not allowed to freeze, otherwise it will damage the sensing element, result in damage to the transmitter.

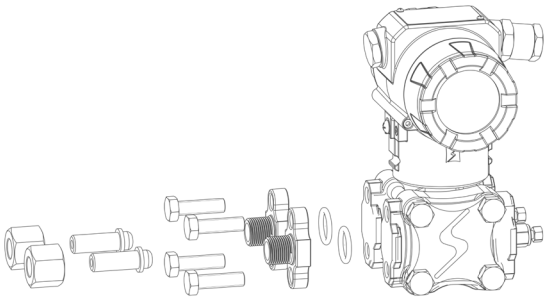
Contents

Installation

Differential Pressure Transmitter



Freedom flange type (C1), M20 × 1.5 female



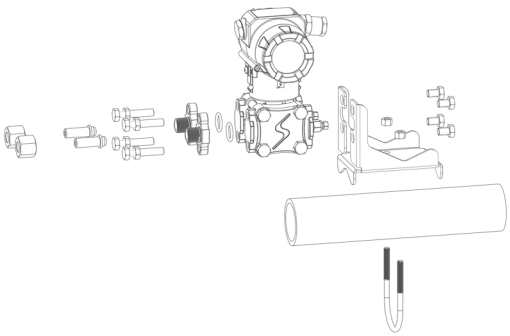
Freedom flange type (C2), M20 × 1.5 male

Procedure

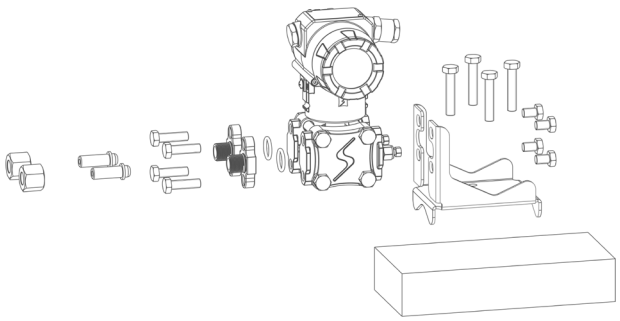
1. Install the freedom flange (welded pipe joint), please be sure to use the appropriate size O-ring to avoid accidents caused by medium leakage; Check whether the sealing ring is damaged every time when disassembled and assembled the transmitter, replace it in time if there is damage.
2. The installation of bolts does not require lubricating oil, the final installation torque of bolts is not less than 30Nm. When tightening bolts, it is necessary to ensure cross-tightening, don't tighten one side firstly and then the other side.

Note

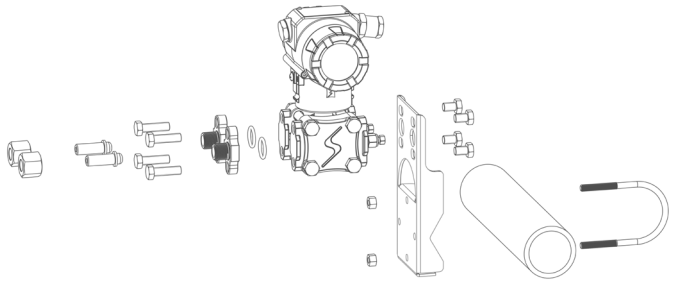
1. Transmitter should be installed where the temperature gradient and temperature fluctuation change are small, and there are no shock and vibration.
2. The measured medium is not allowed to freeze, otherwise it will damage the isolation diaphragm and cause damage to the transmitter.
3. Be sure the exhaust channels are unobstructed in the transmitter installation, in order to discharge the contaminants.



Bend bracket mounted in 2" fixed pipe



Bend bracket mounted in backboard



Flat bracket mounted in 2” fixed pipe

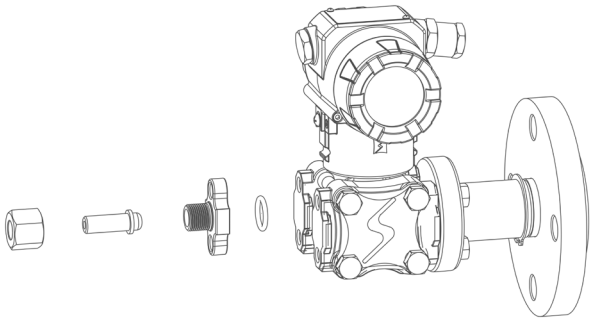
Procedure

1. The installation and precautions of freedom flange, please see the freedom flange type in page1.
2. Install the bracket to the corresponding position of transmitter and fasten the 4 bolts by cross-tightening, the final tightening torque is not less than 23Nm, and the installation is firm and reliable.
3. Install the transmitter with the bracket installed to the fixed pipe, the fastening bolt torque is not less than 23Nm, and the installation is firm and reliable.

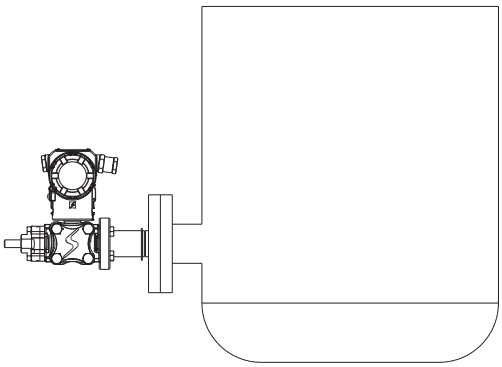
Note

1. Transmitter should be installed where the temperature gradient and temperature fluctuation change is small, and there is no shock and vibration, temperature fluctuation change should be within ±10℃.
2. The measured medium is not allowed to freeze, otherwise it will damage the sensing element isolation diaphragm and cause damage to the Transmitter.
3. Be sure the exhaust channels are unobstructed in the transmitter installation, in order to discharge the contaminants.
4. For liquids or vapors measurement, the impulse piping is to be connected upwards to the process pipe at an inclination of not less than 30°.
5. For gas measurement, the impulse pipe shall be connected downwards to the process pipe at an inclination of not less than 30°.
6. The two impulse pipes should be kept at the same temperature.
7. There should be no gas in the impulse pipe filled with liquid.
8. When using isolation liquid, the liquid on both sides of the impulse pipe should be the same;
9. For level measurement of airtight container, isolation tanks and multiple cut-off valves should be added, the drain/vent valve should be opened regularly to remove the residual gas and liquid in the impulse pipe to ensure the measurement accuracy.

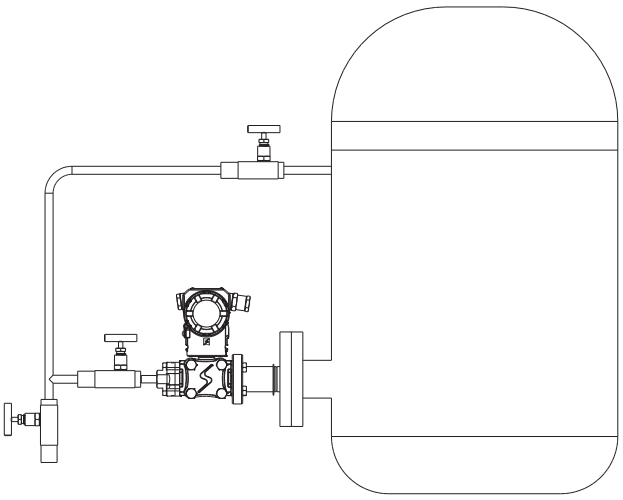
Single Flange Level Transmitter



Single flange level transmitter structure drawing



Single Flange Level Transmitter in open container

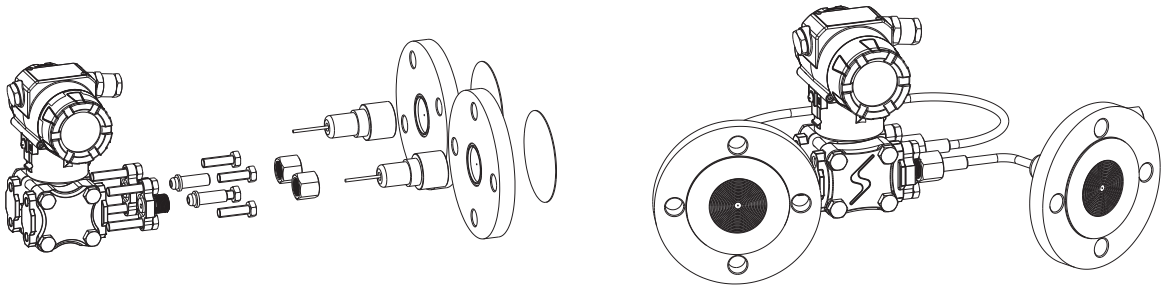


Single Flange Level Transmitter in closed container

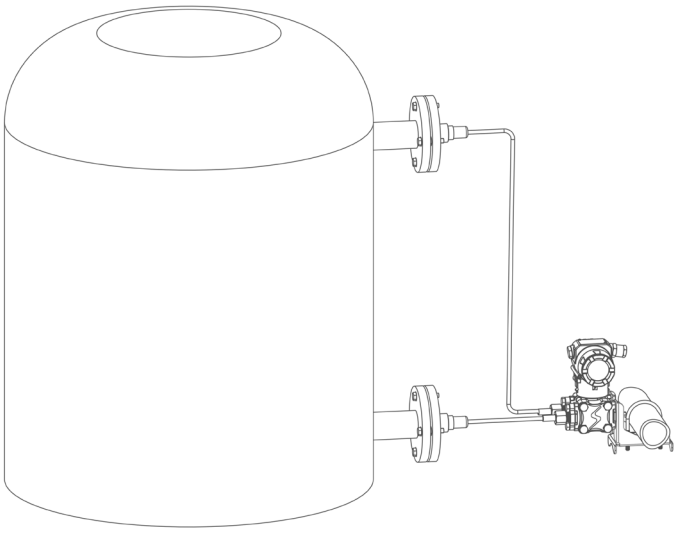
Procedure and Note

1. Single Flange installation is same with the freedom flange, see the front freedom flange procedure in differential pressure transmitter.
2. Select appropriate gaskets (gaskets according to medium characteristics and temperature range) which can meet that do not extrude the diaphragm and have good sealing performance. Please check whether the gaskets are damaged when disassembling and assembling, if there is damage, it should be replaced in time to avoid medium leakage during use.
3. Installing the flange fastening screws with cross-fastening method, it can avoid medium leakage caused by the gap in installation, the torque of the bolts should not be less than 30Nm.

Dual Flange Level Transmitter



Dual flange level transmitter structure drawing



Dual flange level transmitter in container

Procedure and Note

1. The high-pressure flange is installed at the bottom, the low-pressure flange is installed at the top.
2. Select appropriate gaskets (gaskets according to medium characteristics and temperature range) which can meet that do not extrude the diaphragm and have good sealing performance. Please check whether the gaskets are damaged when disassembling and assembling, if there is damage, it should be replaced in time to avoid medium leakage during use.
3. Installing the flange fastening screws with cross-fastening method, it can avoid medium leakage caused by the gap in installation, the torque of the bolts should not be less than 30Nm.

Housing Rotation

To improve filed wiring access or to better view the LCD display:

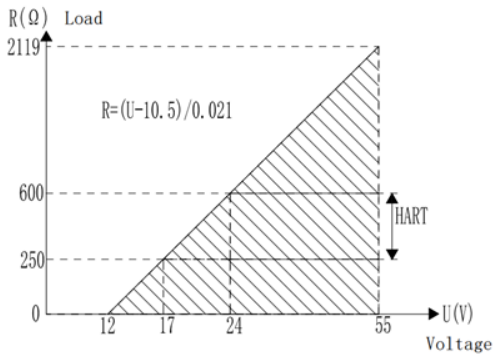
1. For explosion-proof transmitter, it must tighten the fixing screws of the front cover before disassembling, the front cover can not be disassembled directly to avoid damage. For non-explosion proof products, it can directly disassemble the front cover.
2. First rotate the housing in a clockwise direction, if it can not be rotate to the expected position, then rotate the housing in the opposite direction to the expected position. (Rotate the housing up to 270° left or right of its original).
3. Re-tighten front cover.

Wiring and Power Up

Power Supply

The power supply must be independent, should not share with other products to avoid interference or underpower. The rated voltage requirement of the product refers to the minimum on load voltage requirement. The fluctuation of DC power supply should be less than 2%. Total resistor load equals the summary load resistors of signal wiring, controller, indicator and related parts. If an intrinsically safe barrier is used, the resistance of the barrier must be taken into account.

Load Diagram



The HART communicator requires a loop resistance of at least 250-600 Ω

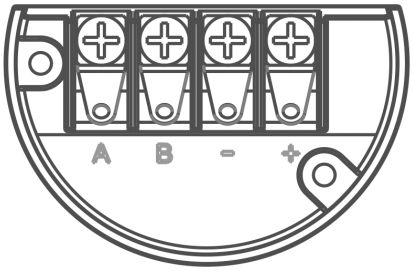
Note

1. It is recommended to use an independent DC power supply for the differential pressure transmitter. The resistive load will cause voltage drop. It is required to calculate the total resistance of the signal cable, display, and other recording and display devices to ensure that the wiring terminal voltage meets the requirements.
2. For output current with HART: 17-55VDC.
3. For intrinsically safe output current: 19-28VDC.
4. For Modbus-RTU/RS485 output: 12-32VDC.

For intrinsically safe instruments, it requires the safety barriers and instruments to make an intrinsically safe loop to be defined as intrinsically safe instruments.

Wiring Procedure

1. The transmitter back cover can be removed only after the power is cut off.
2. Connect the positive lead of the power supply to the terminal block marked "+", and the negative lead of the power supply to the terminal block marked "-". The signal wire can be twisted pair. In the case of serious electromagnetic interference, it is recommended to use shielded wires and properly grounding. The signal wires do not be threaded in the same metal conduit or put in the same cable duct with other power lines, and do not pass near strong electric equipment. Because the transmitter is grounded by capacitive coupling, the insulation resistance should not be checked with a megohmmeter higher than 100V, and the circuit should be checked with a voltage not greater than 55VDC.
3. Threading holes in the electrical housing shall be blocked with a sealing plug (gland M20 × 1.5) to avoid moisture accumulation in the electrical housing. If the threaded hole is not sealed, the transmitter should be installed with the threaded hole facing down to discharge liquid.
4. Use a drip loop when installing wiring if conditions allow. The bottom of the drip loop should below the conduit connection and transmitter housing.
5. Reinstall the back cover of the transmitter.



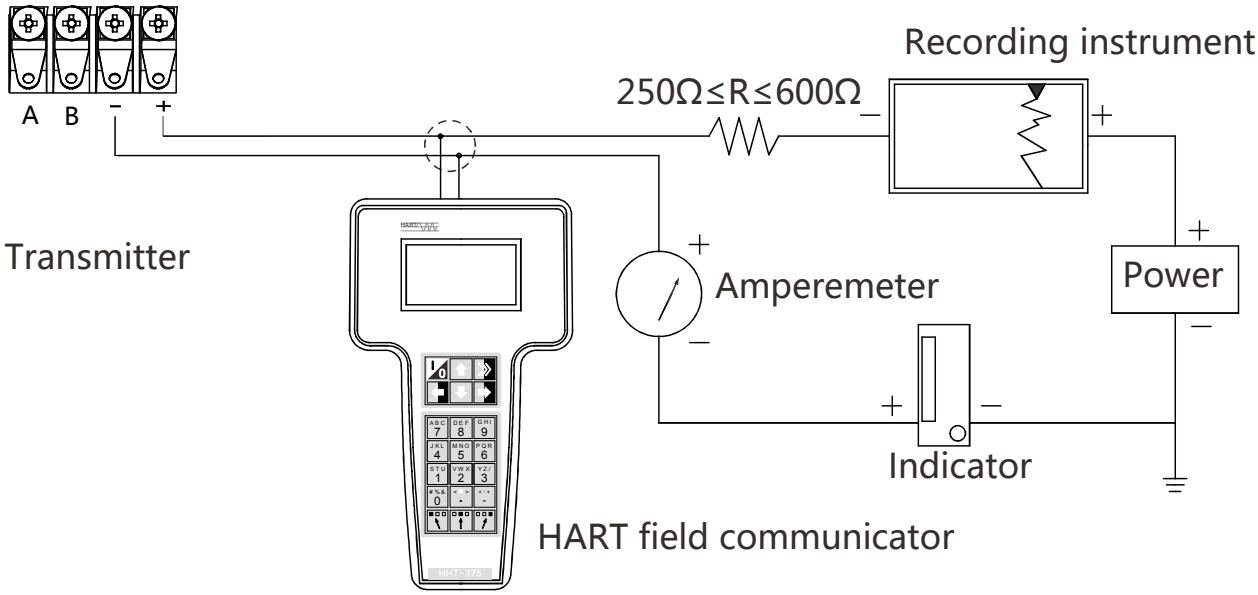
Terminal Connection	Two Wires
A	
B	
+	Signal+
-	Signal-

Note: For two wires, only terminal "+" & "-" are connected for active HART signal and current 4 to 20 mA.

For four wires, terminal "+" & "-" are connected for power,terminal A&B are for active RS485/Modbus RTU.

HART Wiring Procedure

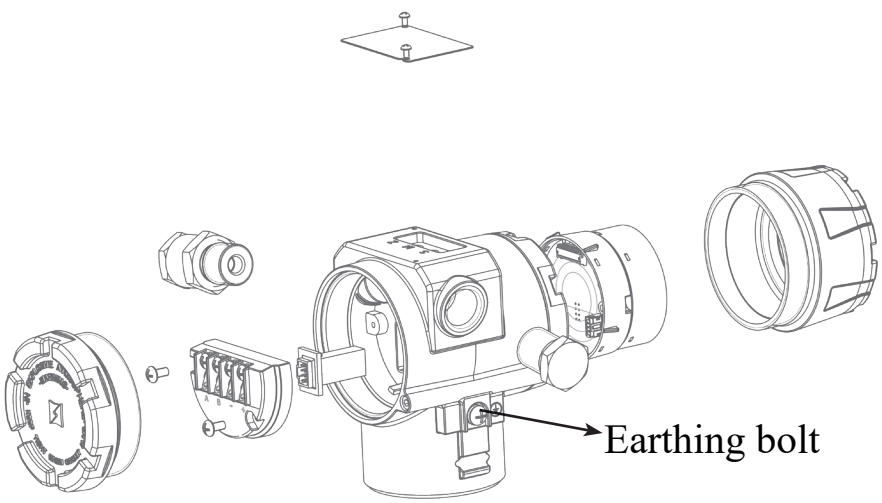
1. Open the back cover.
2. Connect the positive pole of the transmitter signal terminal to the HART communicator positive pole, the negative pole of the transmitter signal terminal to the HART communicator negative pole.
3. The communicator operation should follow the product manual.



HART field communicator wiring drawing

Grounding

1. Shielded twisted-pair signal cable is the best, in order to avoid grounding loop, the shielding layer should be single-end grounding, insulating floating ground on the side of differential pressure transmitter, and grounding on the side of control cabinet.
2. The surge protection module is only effective with good grounding, the stainless steel metal housing and internal grounding terminals are used for direct grounding locally.



Function Buttons Operation

Buttons Operation

Display module is used for field adjustment to complete all the parameters setting and site configuration before measuring. The internal and external buttons can realize its normal use in safe and hazardous areas. (For stainless steel housing, only internal buttons can be used in security zones. The operation methods of buttons are totally same as the means of standard aluminium alloy housing.)

In the back of the nameplate, there are three magnetic bar buttons, which is used in the explosion-proof area when the front cover of the instrument is not allowed to be disassembled, so as to ensure the safety adjustment of the instrument.

*If there is no LCD liquid crystal display, use the “external magnetic bar buttons” below the nameplate to operate according to the following process.

Zero Calibration

The AT5010 transmitter has been calibrated in accordance with user requirements or according to the default full scale (calibration scale equals upper limit of scale).

Zero calibration is a single point adjustment method used to compensate for the influence of installation position and pipeline pressure. During zero calibration, ensure that all balance valves are opened and the level in the pipeline is filled to the correct position.
If there is a zero deviation after installation, the buttons can be used to clear the zero operation, the field communicator can also be used to clear the zero operation.

Buttons Operation Instructions

LCD Function

Display module is used for field adjustment to complete all the parameters setting and site configuration before measuring. The internal and external buttons can realize its normal use in safe and hazardous areas. (For stainless steel housing, only internal buttons can be used in security zones. The operation methods of buttons are totally same as the means of standard aluminium alloy housing.)

Products with LCD

The display module of products with LCD is installed in the terminals, which can be viewed through the lenses.

Openings in Safe Area

Internal buttons operation in safe area, open the cover, use the internal buttons for operation.

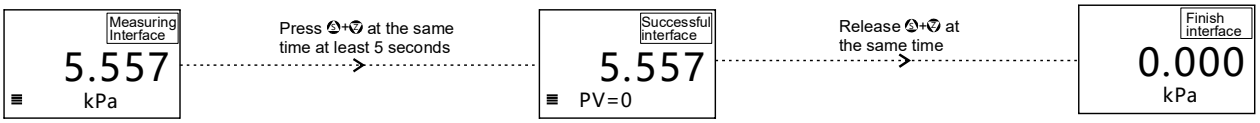
Buttons Operation in Dangerous Area

External buttons operation in dangerous area, turn over the label, use the external buttons for operation.

Buttons Operation

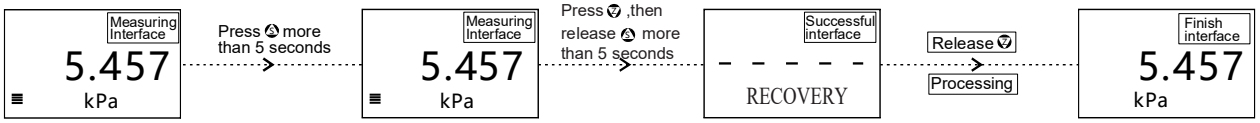
For example, factory setting parameters; pressure range -10~100kPa, display unit kPa, operate in the atmosphere.

Set PV=0

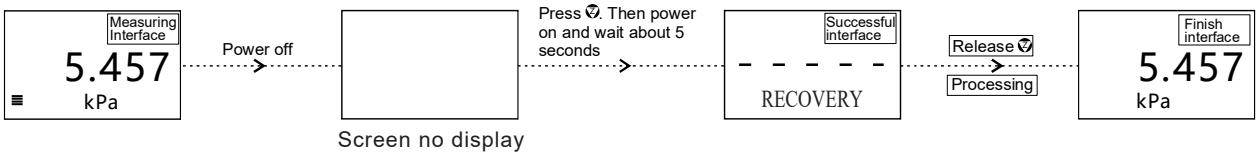


Factory Reset

Method 1:

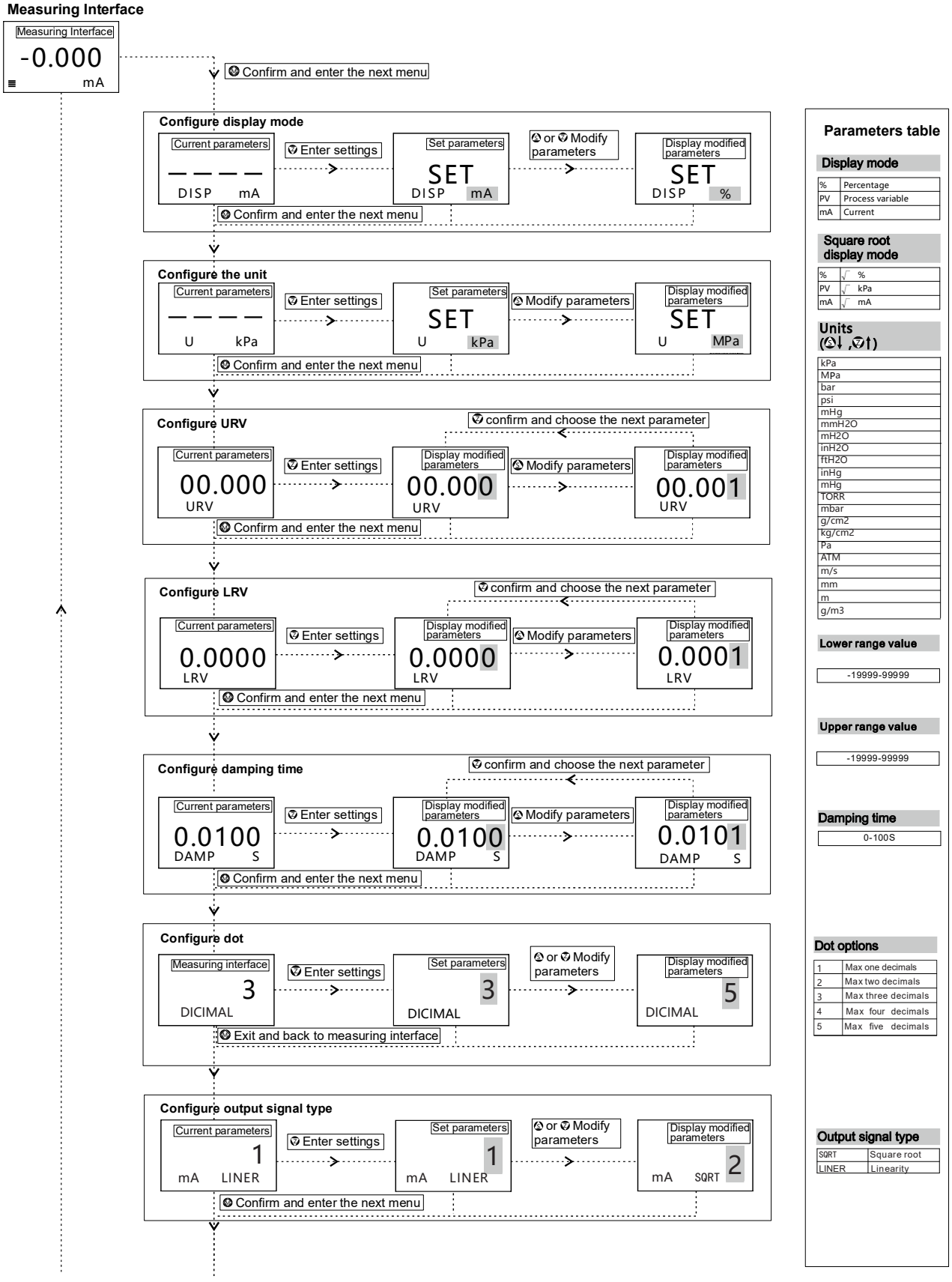


Method 2:



Detailed Operating Instructions

Measuring Interface



Parameters table

Display mode

%	Percentage
PV	Process variable
mA	Current

Square root display mode

%	√ %
PV	√ kPa
mA	√ mA

Units (↓ ,↑)

kPa
MPa
bar
psi
mHg
mmH2O
mH2O
inH2O
ftH2O
inHg
mHg
TORR
mbar
g/cm2
kg/cm2
Pa
ATM
m/s
mm
m
g/m3

Lower range value

-19999-99999

Upper range value

-19999-99999

Damping time

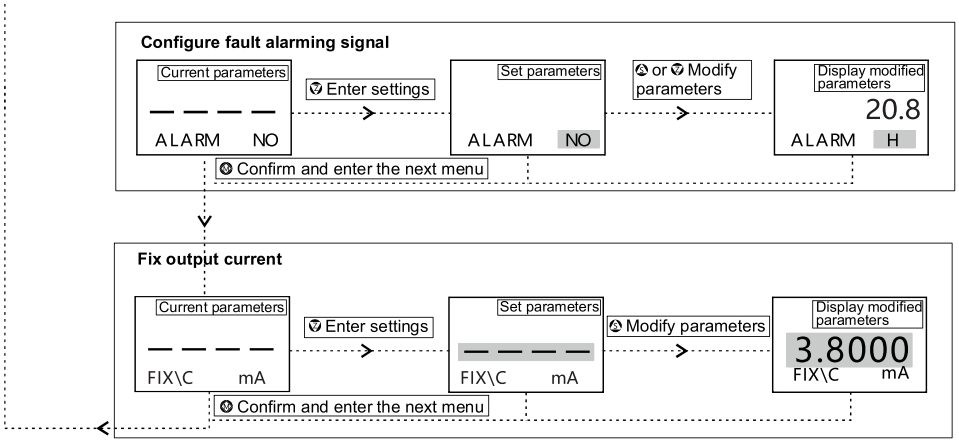
0-100S

Dot options

1	Max one decimals
2	Max two decimals
3	Max three decimals
4	Max four decimals
5	Max five decimals

Output signal type

SQRT	Square root
LINER	Linearity



Fault alarm signal

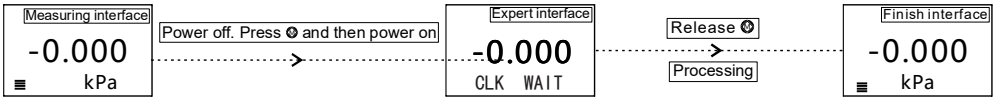
No	Saturation output to 20.8mA or 3.8mA
H	20.8mA
L	3.8mA

Loop current output

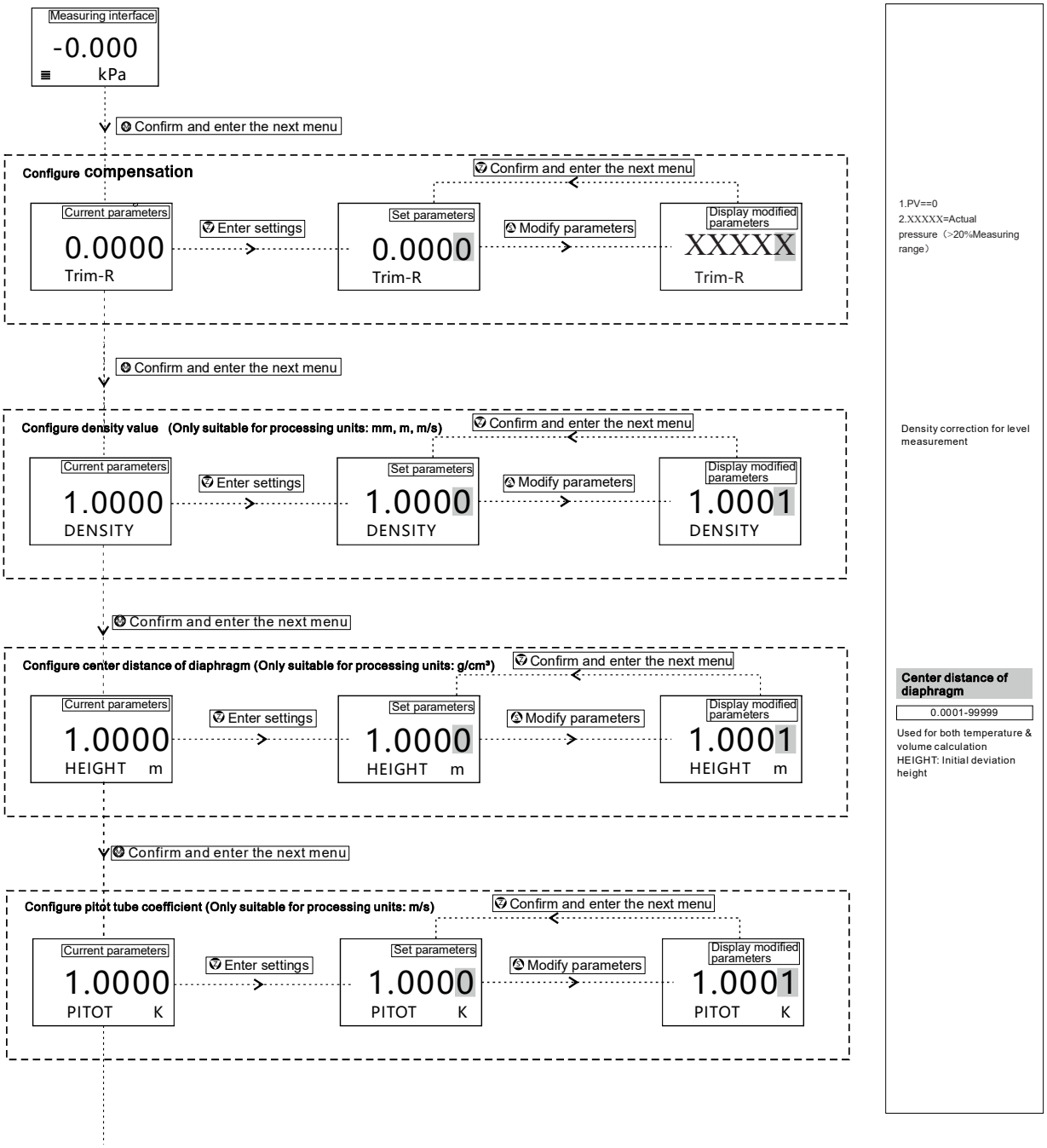
NO	Not fixed
3.8000	Fixed to 3.8mA
4.0000	Fixed to 4mA
8.0000	Fixed to 8mA
12.000	Fixed to 12mA
16.000	Fixed to 16mA
20.000	Fixed to 20mA
20.800	Fixed to 20.8mA

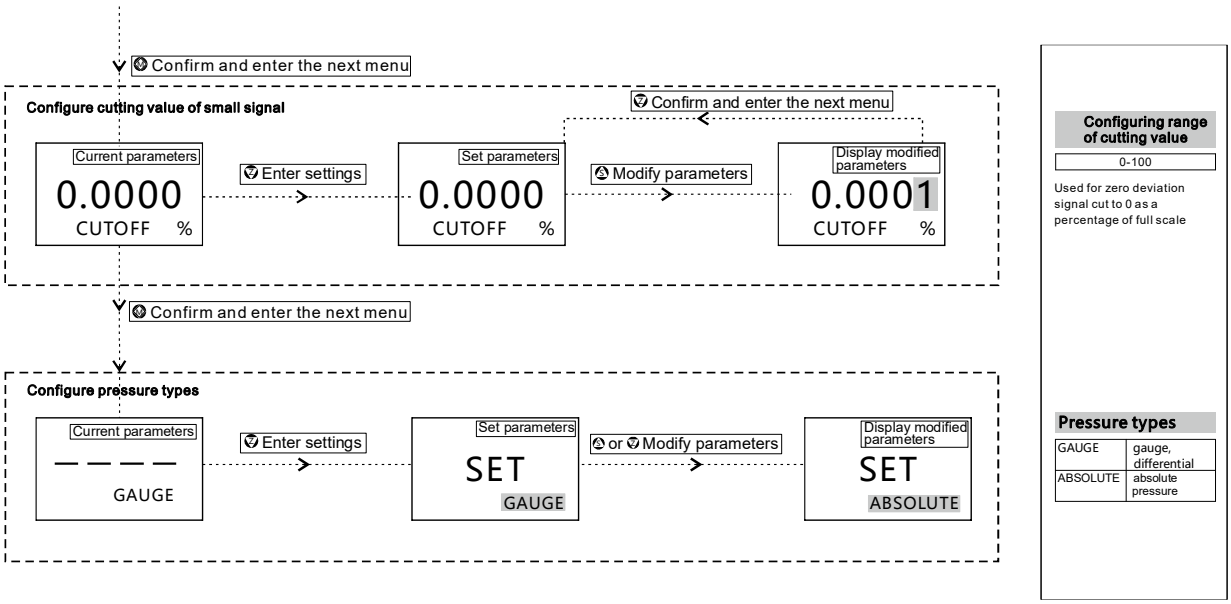
Expert Menu

Expert Menu



Detailed Operation Instructions





Closed the Housing

1. Under atmospheric pressure, there is no deviation at the zero point of the instrument, and there is no leakage pressure in the medium after feeding, which shows that it is nominal, the debugging is completed.
2. Non-explosion-proof transmitter, nominal closing enclosure.
   For explosion-proof type transmitter, be sure to tighten the explosion-proof screws on the front and rear covers.

Precautions for Explosion-proof Transmitter

Users should pay attention to the following points when ordering explosion-proof transmitter:

1. AT5010 differential pressure transmitter explosion-proof product has explosion-proof type and intrinsically safe type. Users should choose and maintain them according to the requirements of the site and the requirements of the "Safety Regulations of Electrical Appliances in Explosive Hazardous Places of the People's Republic of China" and GB50058-92 "Design Specifications of Electric Devices in Explosive and Fire Hazardous Environments". There should be no harmful gases that corrode aluminum alloys at the installation site.
2. Understand the composition and location of flammable medium in dangerous places on site, and check the explosion-proof level and group according to GB3836 standard.
3. When ordering the intrinsically safe transmitter, the corresponding safety barrier must be purchased according to the requirements of the nameplate or instruction manual. And wiring according to the requirements. (Safety barriers are generally supplied by our company, please refer to the safety barrier instruction manual).

Precautions for Flameproof Type Transmitter

The user should pay attention to the following matters when using the differential pressure transmitter:

1. The differential pressure transmitter housing has grounding terminal, it should be reliably grounded during use.
2. It must strictly abide by the warning language of "open the cover after power failure" during installation, use and maintenance on-site .
3. There should be no harmful gases that corrode aluminum alloys at the installation site.
4. The compression nut should be tightened so that the sealing ring match the cable sheath tightly. The sealing ring or cable sheath needs to be replaced in time when it is aging, the redundant introduction port must be blocked with a blind plate.
5. The maintenance must be in a safe place. The repair can be allowed after confirming that there is no flammable gas in site.
6. Users are not allowed to replace the internal electrical parts of the product at will.

Precautions for Intrinsically Safe Type Transmitter

The user should pay attention to the following matters when using the differential pressure transmitter:

1. The connecting cable between the differential pressure transmitter and the intrinsically safe end of the associated equipment is a two-core shielded cable (the cable must have an insulation sheath), the cross-sectional area of the core wire is more than 0.5 mm2, the shielding layer is grounded in a non-dangerous place, and the wiring connected with the housing should be as rule out as possible for the influence of electromagnetic interference.
2. Associated equipment must be installed in a safe place, the installation, use and maintenance must strictly abide by its instruction manual.
3. Users are not allowed to replace the internal electrical parts of the product at will.

Maintenance

The AT5010 differential pressure transmitter has no moving mechanical parts and rarely requires regular maintenance. The steps for clearing and changing the measurement range have been described in the previous sections.

When using explosion-proof products, the requirements of “Precautions for Explosion-proof Transmitter Use” must be met.

If the sensor assembly or display screen is faulty, they can not be repaired on site. If a damaged diaphragm or oil leak occurred, it must be returned to the factory for repair.

Troubleshooting

If the transmitter has faults, the following steps can help you to resolve them. If it cannot be repaired, please contact our service center.

Output Too Large

Possible reasons and solutions:

1. Check the measurement range of primary components.
2. Impulse pipe:
   Check whether the impulse pipe is leaking or plugged.
   Check whether the isolation valve is fully opened.
   Check whether there is liquid in the gas impulse pipe, and whether there is gas in the liquid impulse pipe.
   Check transmitter pressure containment for sediment.
   Check whether the liquid and specific gravity in the impulse pipe are changed.
3. Power Supply:
   Check whether the power supply voltage is within the range of 12 to 55 VDC, HART communicator power supply is 17 to 55 VDC

Output Too Small or No Output

Possible reasons and solutions:

1. Primary element
   Check the installation and working conditions of components.
   Check the changes of the medium characteristics, which may affect the output.
2. Wiring circuit
   Checking whether the power supply voltage of transmitter is normal.
   Check whether the circuit is short-circuited or multi-point grounding.
   Check the connection of the positive and negative electrodes of the circuit.

Note: the voltage should not be higher than 55VDC during checking the circuit.

3. Impulse pipe
   Check that the pipe connection is correct.
   Check whether the impulse pipe is leaking or plugged.
   Check whether there is gas in the liquid-filled impulse pipe.
   Check the pressure chamber of transmitter for sediment.
   Check whether the isolation valve is fully opened and whether the balance valve is closed tightly.
   Check whether the specific gravity of the liquid in the impulse pipe has changed.

Unstable Output

Possible reasons and solutions:

1. Wiring circuit

   Check the transmitter for intermittent short circuit, open circuit and multi-point grounding.

   Check if the supply voltage of transmitter is normal. (Please pay attention! Do not electrically check the circuit with voltages higher than 55VDC).

2. Measured liquid fluctuation

   Adjust the damping value of the circuit.

3. Impulse pipe

   Check whether there is gas in the liquid-filled impulse pipe, whether there is liquid in the gas impulse pipe.

4. Electrical connection of transmitter

   Check the transmitter circuit for intermittent short circuit or open circuit phenomenon;

Transmitter Communication Fault

Possible reasons and solutions:

1. Power supply fault

   Check whether the power supply voltage meets the requirements.

2. Load resistor

   Check that the load resistance meets the requirements (see load characteristic diagram), minimum 250 Ω.

3. Transmitter circuit fault

   Return to the factory for maintenance.

External Cleaning

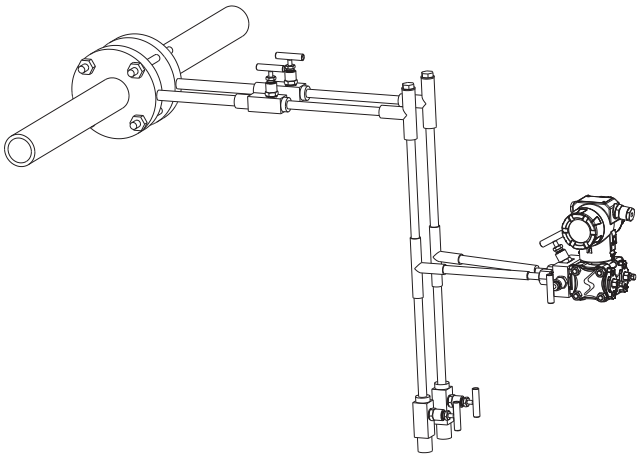
Please pay attention to the following points:

1. Use a cleaning agent that will not damage the instrument surface and sealing ring.
2. Mechanical damage to process isolation diaphragms must be avoided.
3. Metal diaphragms must not be mechanically cleaned.
4. During using a pressure washer, do not point the nozzle directly at the electrical connection or the air hole (where the atmosphere connected).
5. During using a pressure washer for internal cleaning, do not point the nozzle directly at the diaphragm.

Differential Pressure Flowmeter

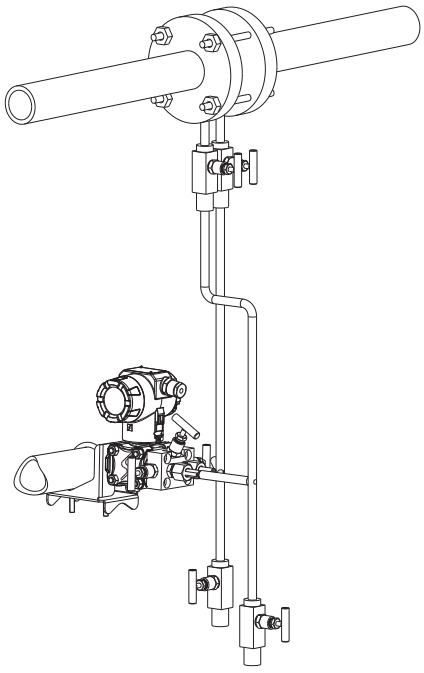
The AT5010 differential transmitter can be combined with many kinds of throttling elements for differential pressure flowmeters. The accuracy of pressure measurement is directly affected by the correct installation of the transmitter and impulse pipe. Therefore, the correct installation of the device and impulse is very important. The following is the example of orifice plate flowmeters.

Steam Flow Measurement



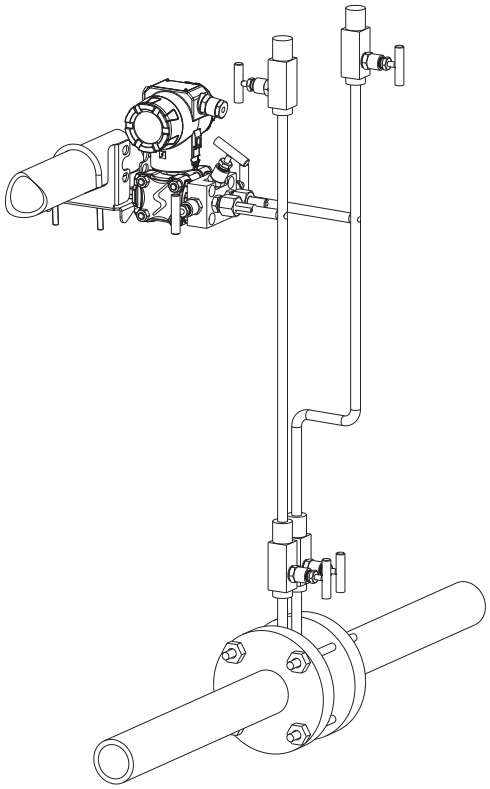
Steam flow measurement, the differential pressure transmitter is installed at a lower position than the process pipe. Isolation tanks and multiple isolation valves should be added, coolant should be injected into the impulse pipe in advance,. The drain valve should be opened regularly to drain the residual gas and liquid in the impulse pipe to ensure the measurement accuracy.

Liquid Flow Measurement



Liquid flow measurement, impulse pipe inclined down 45°. The differential pressure transmitter is installed at a lower position than the process pipe. Isolation tanks and isolation valves should be added, and the exhaust and liquid discharge valves should be opened regularly to discharge the residual gas and liquid in the impulse pipe to ensure the measurement accuracy.

Gas Flow Measurement



Gas flow measurement, impulse pipe inclined down 45°. The differential pressure Transmitter is installed at a higher position than the process pipe. Isolation tanks and isolation valves should be added, and the exhaust and liquid discharge valves should be opened regularly to remove the residual gas and liquid in the impulse pipe to ensure the measurement accuracy.

Certifications

Name	Description
NEPSI	NEPSI explosive-proof Ex db IIC T4 … T6 Gb
	Applicable standard: GB/T 3836.1-2021, GB/T 3836.2-2021, GB/T 3836.31-2021
	NEPSI dust exploration prevention ex tb IIIC t80 ℃ … T130 ℃ Db
	Applicable standard: GB/T 3836.1-2021, GB/T 3836.2-2021, GB/T 3836.31-2021
	NEPSI intrinsically safe Ex ia IIC T4 Ga
	Applicable standard: GB/T 3836.1-2021, GB/T 3836.4-2021, GB/T 3836.20-2010
NACE	NACE MR0175
SIL	The measuring instrument can be used as a pressure monitoring system, up to SIL2
HART	Measurement system can meet HART 7, equipment can be used with the certified equipment of other suppliers (interoperability)
Modbus	Modbus-RTU/RS485
Certificate of Compliance	Certificate of Compliance, EN IEC 61326-1: 2021, electromagnetic compatibility directive 2014/30/EU
ATEX	ATEX Exd, ATEX Exia
IEC Ex	IEC Exd, IEC Exia
PMI	PMI verification and certificate
EN	EN10204

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