User Manual

Monocrystalline Silicon Pressure Transmitter

U-0003P/1502/TL1502/PD1502-EN1

Preface

- Thank you for purchasing our product.
- This manual is about the various functions of the product, wiring methods, setting methods, operating methods, troubleshooting methods, etc.
- Please read this manual carefully before operation. Use this product correctly to avoid unnecessary losses due to incorrect operation.
- After you finish reading, please keep it in a place where it can be easily accessed at any time for reference during operation.

Note

- Modification of this manual's contents will not be notified as a result of some factors, such as function upgrading.
- We try our best to guarantee that the manual content is accurate. If you find something wrong or incorrect, please contact us.
- The content of this manual is strictly prohibited from being reprinted or copied.
- Please use this product in accordance with its explosion-proof characteristics and in compliance with national and regional laws and regulations.
- The final interpretation of this manual rests with our company.

Version

U-0003P/1502/TL1502/PD1502-EN1

Confirm package contents

After opening the box, please confirm the scope of delivery before starting the operation. If you find that the model and quantity are incorrect or there is physical damage to the product's appearance, please contact us.

Packing list

No.	Item	Qty	Note
1	Monocrystalline silicon pressure transmitter / Monocrystalline silicon differential pressure transmitter Monocrystalline silicon single-flanged level transmitter/ Monocrystalline silicon double-flanged level transmitter	1	
2	User manual	1	
3	Screwdriver	1	
4	Test certificate	1	

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1 Introduction

1.1 Overview

The intelligent pressure/differential pressure transmitter is a new type of intelligent high-precision transmitter that adopts high-precision silicon sensor technology and communicates with field equipment based on electronic components through a microprocessor.

Pressure/differential pressure transmitters include various types such as gauge pressure, differential pressure, absolute pressure, and high static pressure /differential pressure ones. They are widely used in industries such as petroleum, chemical, power, metallurgy, water treatment, and brewing.

Over the years, we has won consistent praise from users for our excellent product quality and high-quality after-sales service.

1.2 Working Principle

The pressure transmitter consists of two functional units: a main unit and an auxiliary unit . As shown in Figure 1:

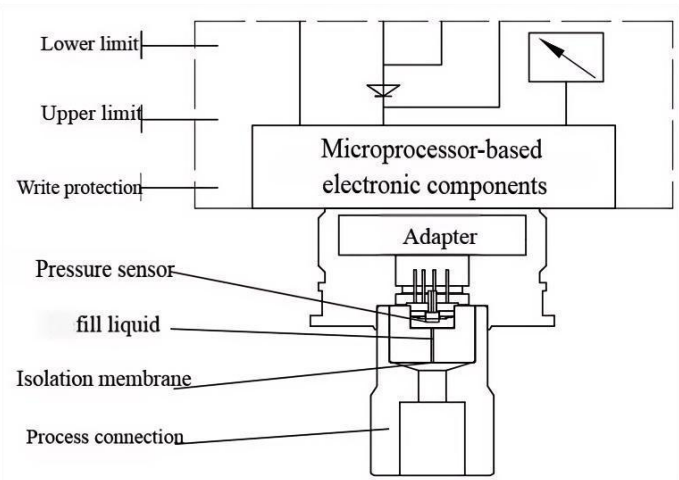


Fig.1 Pressure (Absolute Pressure) Transmitter

The main unit includes sensors and process connections, and its working principle is as follows:

The process medium applies pressure to the measuring diaphragm through a

flexible, corrosion-resistant diaphragm and its filling fluid. One surface of the measuring diaphragm is connected to atmospheric pressure (for gauge pressure measurement) or a vacuum (for absolute pressure measurement). When the measured pressure passes through the measuring diaphragm and the filling fluid, it is transmitted to the sensor silicon chip, bringing a change in the resistance of the sensor silicon chip, which in turn leads to a change in the output voltage of the detection system. This output voltage is proportional to the pressure change and is then converted into a standardized signal output by an adapter unit and amplifier. The differential pressure transmitter consists of two functional units: a main unit and an auxiliary unit (See Figure 2.)

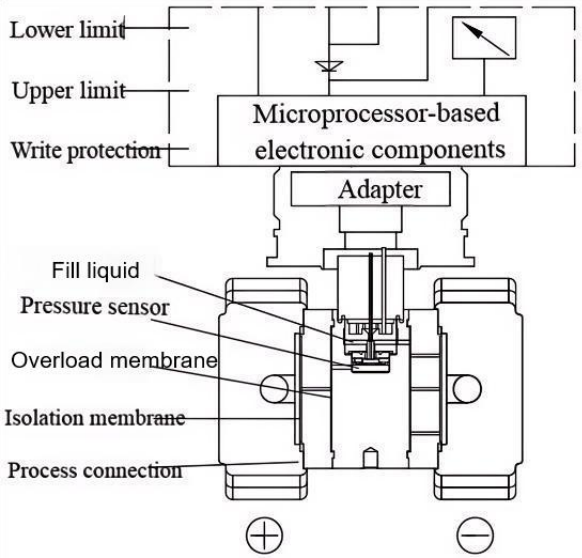


Fig.2 Differential pressure transmitter

The main unit includes sensors and process connections, and its working principle is as follows:

The sensor module employs a fully welded design and internally includes an integrated overload diaphragm, an absolute pressure sensor, and a differential pressure sensor. The absolute pressure sensor is mounted only on the high-pressure side of the sensor diaphragm housing, serving as a reference value for static pressure compensation. The negative-pressure side of the differential

pressure sensor is connected to the low-pressure chamber of the sensor diaphragm housing. When the measured differential pressure passes through the isolation diaphragm and filling fluid, it is transmitted to the sensor's silicon chip, causing a change in the chip's resistance, which in turn leads to a change in the detection system's output voltage. This output voltage is proportional to the pressure change and is then converted into a standardized signal output by an adapter unit and amplifier.

1.3 Features

- The central sensing unit adopts high-precision silicon technology.
- Patented dual overload protection diaphragm design, capable of withstanding unidirectional overvoltage up to 40MPa.
- The range can be adjusted freely within its upper and lower limits, offering wider adaptability. Selecting a range code with the lowest possible range ratio optimizes performance characteristics.
- Multi-parameter output applications are optional
- EMC complies with the latest national standards.

2 Technical Specifications

2.1 Basic Parameters

Table 1

	Differential pressure	Single pressure
Measuring range	-100kPa…0 ～ 0.1kPa…3MPa	0 ～ 0.6kPa…60MPa (gauge pressure) 0 ～ 10 kPa…3MPa (absolute pressure)
Type of stress	Differential pressure	Gauge pressure, absolute pressure
Power output	(4～20) mA two-wire system (12V～42V, generally 24V) (4～20) mA+HART protocol (15V～42V, typically 24V)	
Communication	RS485 interface	
Accuracy	±0.075%FS; ±0.1%FS	
Ambient temperature	(-40～85)℃ (with LCD display, fluororubber sealing ring -20-65℃)	
Medium temperature	(-40～80)℃	
Storage temperature	(-50～85)℃; (-40～85)℃ with LCD display	
Protection level	IP67	
Long-term stability	±0.1%FS/3 years	
Load resistor	R=(U - 12) / 21mA; U is the supply voltage.	

2.2 Differential Pressure Range and Performance Parameters

Table 1

Nominal range	Lower limit	Upper limit	Ambient temperature effect	Rated working pressure
0-100Pa～1kPa	-1kPa	1kPa	±(0.45×TD+0.25) % FS	0.2MPa(default) 7MPa (on request)
0-200Pa～6kPa	-6kPa	6kPa	±(0.30×TD+0.20) % FS	16MPa/25MPa/40 MPa
0-400Pa～40kPa	-40kPa	40kPa	±(0.20×TD+0.10) % FS	
0-2.5kPa～250kPa	-250kPa	250kPa		

Nominal range	Lower limit	Upper limit	Ambient temperature effect	Rated working pressure
0-30kPa～3MPa	-500 kPa	3MPa		
Note 1: TD = Maximum range / Adjustment range. If TD > 10, the accuracy is ± (0.0075 × TD)%.				

2.3 Single Pressure Range and Performance Parameters

Table 2

Nominal range	Lower limit	Upper limit	Ambient temperature effect	Rated working pressure
Gauge pressure				
0-0.6kPa～6kPa	-6kPa	6kPa	±(0.30×TD+0.20)%FS	7MPa
0-2kPa～40kPa	-40kPa	40kPa	±(0.20×TD+0.10)%FS	7MPa
0-2.5kPa～250kPa	-100kPa	250kPa		4MPa
0-30kPa～3MPa	-100kPa	3MPa		15MPa
0-0.1MPa～10MPa	-100kPa	10MPa		20MPa
0-0.21MPa～21MPa	-100kPa	21MPa		60MPa
0-0.4MPa～40MPa	-100kPa	40MPa		60MPa
0-0.6MPa～60MPa	-100kPa	60MPa		70MPa
Absolute pressure				
0-2 kPa～40 kPa	0kPa	40kPa	±(0.30×TD+0.20)%FS	1MPa
0-10kPa～250kPa	0kPa	250kPa	±(0.20×TD+0.10)%FS	4MPa
0-30kPa～3MPa	0kPa	3MPa		16MPa

3 Usage and Installation

3.1 Pressure Transmitter Installation

The transmitter housing can rotate approximately 360 degrees relative to the sensor without affecting performance or internal wiring. Do not rotate the sensor section with force; loosen or tighten the set screws with a 2mm hex wrench, which minimize the impact on electronic circuitry and the output display.

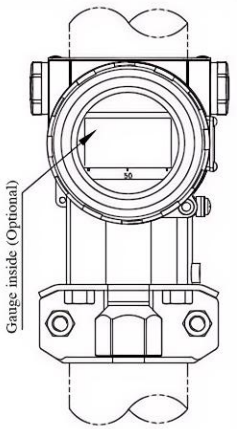


Fig.3 Horizontal piping connection method (front view)

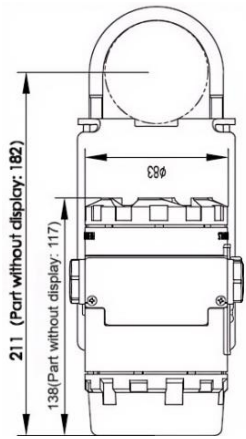


Fig.4 Horizontal piping connection method (side view)

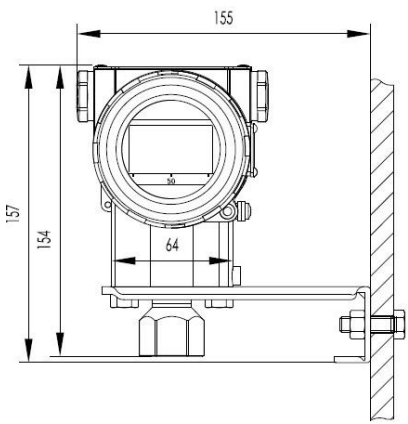


Fig.5 Wall-mounted connection method

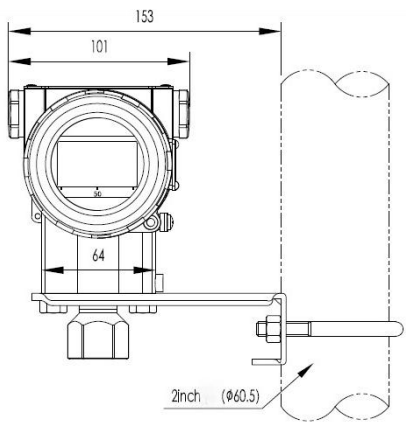


Fig.6 Vertical piping connection method

3.2 Differential Pressure Transmitter Installation

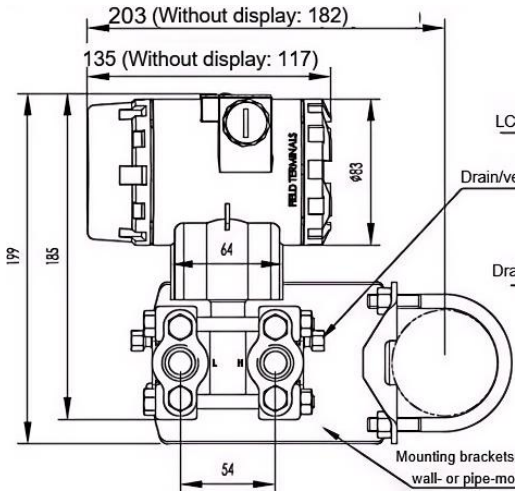


Fig.7 Horizontal piping connection method (side view)

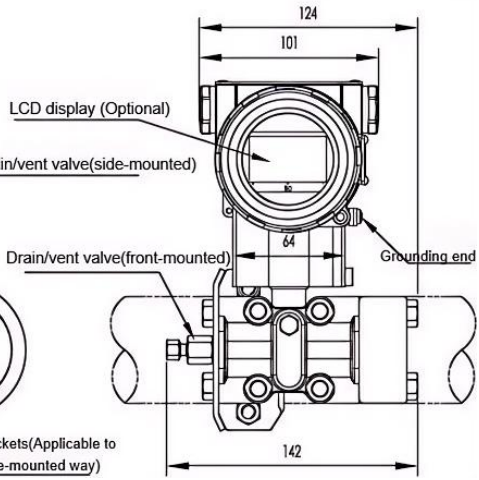


Fig.8 Horizontal piping connection method (front view)

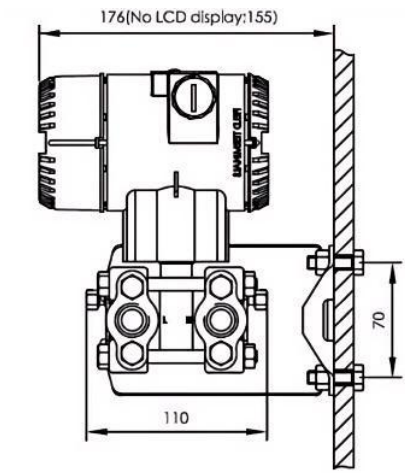


Fig.9 Wall-mounted connection method

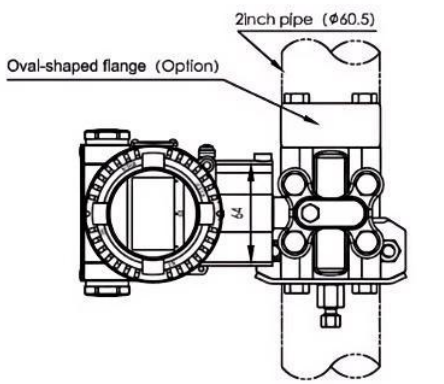


Fig.10 Vertical piping connection method

3.3 Impulse Line Connection

For proper installation, the following points must be followed:

（1）The impulse line should be as short as possible and avoid sharp bends.

（2）The installation slope of the impulse line should not be less than 1:12 to avoid sedimentation.

（3）Before connecting the impulse line to the transmitter, it must be purged with compressed air, and preferably flushed with the medium being measured.

（4）If the medium is liquid, the impulse line should be completely vented.

（5）The layout of the impulse line should allow air bubbles in the measured liquid or sediments in the measured gas to flow back into the process piping.

（6）There must be no leaks during impulse line connection.

3.4 Installation of Flange Level Transmitter

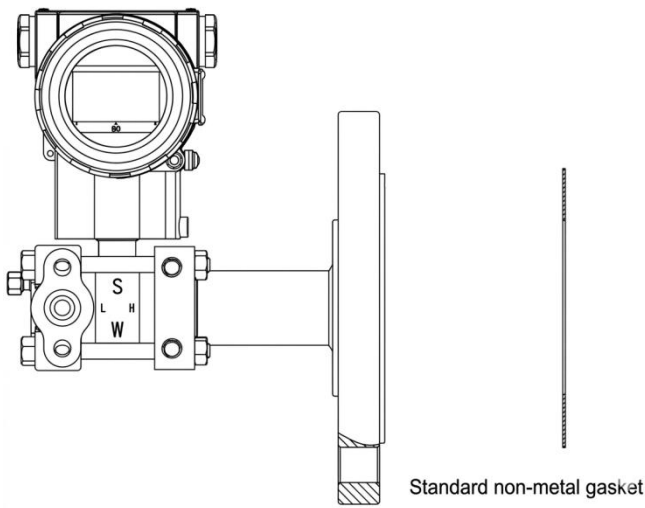


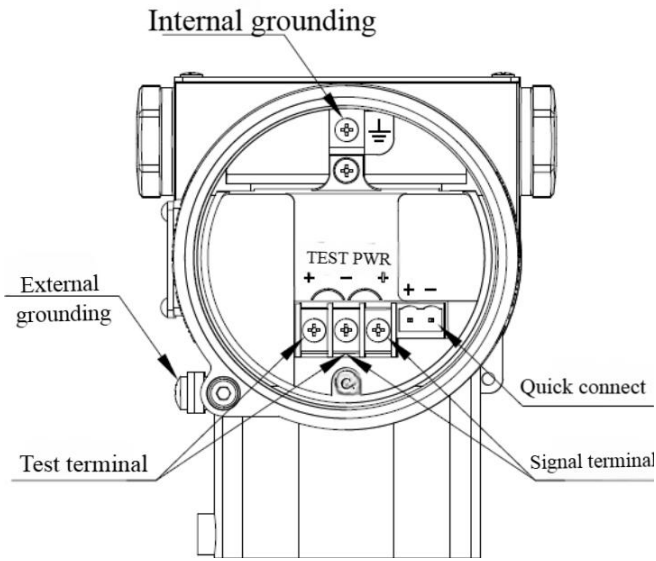
Fig.11 Diagram of flanged level transmitter installation

4 Electrical Connections

Since the transmitter is not equipped with a power switch, the system must be provided with an overcurrent protection device or a power disconnecting device. he operating voltage should be checked consistent with the specifications on the nameplate. Besides, the power supply box output signals share the same pair of phase lines. Electrical connections can be made via NPT1/2 or M20x1.5 cable inlets to the terminal blocks. The terminals can accommodate conductors with a cross-sectional area of up to 2.5 mm².

Note: for intrinsically safe(IS) products, the maximum input voltage is 12 VDC. Intrinsically safe products must be used in conjunction with explosion-proof barriers.

Standard version:



RS485 output version:

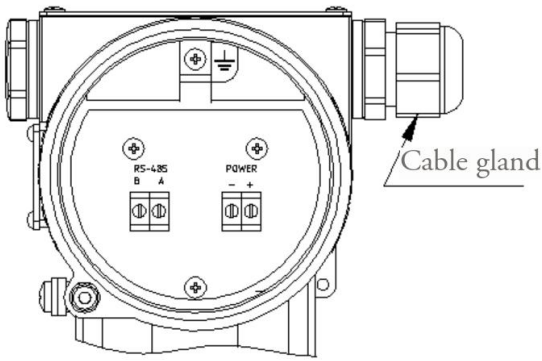


Fig.12 Electrical connection diagram

The transmitter can be operated via a PC or laptop computer with a handheld controller. The controller can be connected in parallel at any point in the signal loop. Communication between the transmitter and the communicator is achieved through an AC signal superimposed on the 4-20mA output signal. Since this modulation does not alter the average value, it therefore does not affect the measurement signal. The resistance between the controller and the power supply must be no less than 250 ohms. If this value cannot be achieved according to standard installation, an additional resistor is required.

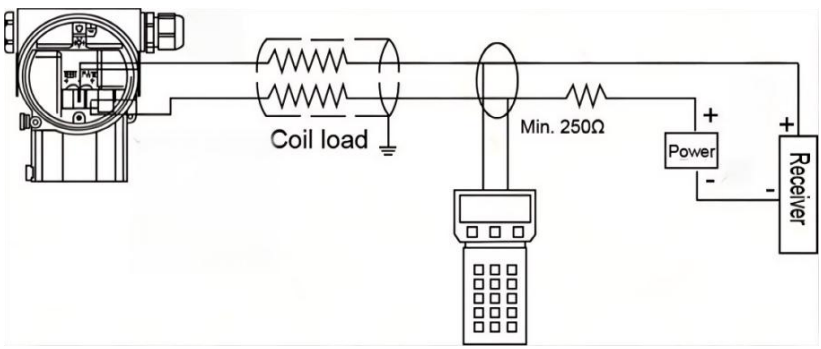


Fig.13 HART communication connection diagram

After installing the transmitter, simply connect the power supply to put it into operation.

- The following items must be checked before powering on:

  （1）Process connection

  （2）Electrical connection

  （3）The transmitter's impulse lines and measuring chamber are filled with the medium.

- To put the transmitter into operation, follow these steps:

  （1）If there is a shut-off valve, open it to bring in the pressure;

  （2）Open the balancing valve on the three-valve manifold (this option only applies to differential pressure transmitters; pressure transmitters do not have this option).

  （3）Open the positive cavity shut-off valve

  （4）Close the balancing valve (this option only applies to differential pressure transmitters; pressure transmitters do not have this option).

  （5）Open the negative chamber shut-off valve (this option only applies to differential pressure transmitters; pressure transmitters do not have this option).

- To exit the operation of the transmitter, follow the reverse steps:

Transmitter with (4~20) mA output signal: If the measured pressure is within the range indicated on the nameplate, the output current signal will be 4~20mA. If the pressure is lower than the calibrated measurement range, the output signal will be between (3.9~4) mA. If the pressure is higher than the calibrated measurement range, the output signal will be between (20~20.5) mA. Output signal limits: Imin=3.9mA, Imax= 20.5mA.

The alarm current mode can be set:

Low alarm mode (minimum) is 3.7 mA;

High alarm mode (maximum) is 21 mA;

No alarm mode (hold) holds the effective current value before the fault.

The standard setting is high alarm mode.

- Zero-point correction:

When installing a transmitter, zero-point offset may occur due to installation (such

as tilted installation position, inconsistent horizontal position of differential pressure transmitter, and influence of ambient temperature). In this case, the zero-point offset must be corrected.

When performing zero-point calibration on a transmitter with a push-button controlling unit, the transmitter must be within its operating temperature (approximately 5 minutes after power-on). For details, please refer to the next chapter about Menu Operation.

The transmitter's external control buttons are located behind the nameplate.

If needed, loosen the nameplate screws and rotate 90 degrees; after completing the calibration procedure, install and secure it in the reverse order. The local button is shown in the diagram below:

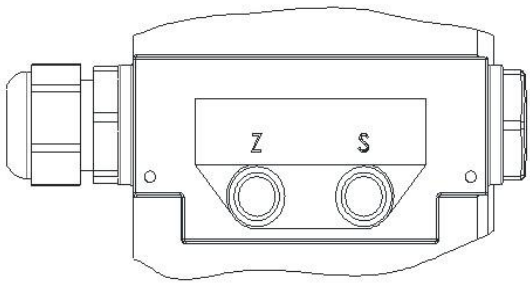


Fig.14 Local button

- Zero point and range calibration :

The following methods can be used to calibrate intelligent transmitters:

（1）Local buttons in the transmitter auxiliary unit .

（2）The handheld controller.

（3）PC configuration software.

（4）The 485 remote communication commands; see Appendix 1 for detailed commands.

"Menu Operation" section of this manual details the first method; other methods are also described in the relevant configuration instructions.

5 Menu Operations

5.1 Menu Function

When equipped with an LCD display, the transmitter can be configured as follows with the (Z) and (S) buttons on the meter head. (**Note:** the name and items in the table respectively are displayed on the first or second row on the LCD meter head). The LCD display (Fig. 15 LCD display head) and menu function list are shown in the figure below.

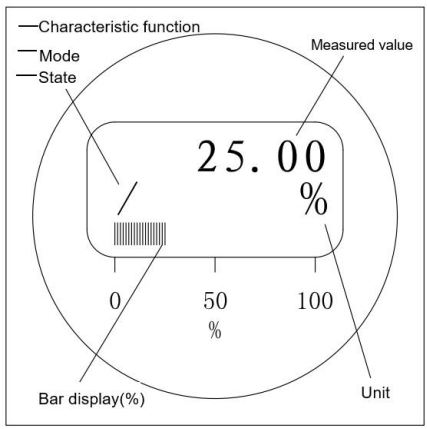


Fig.15 LCD display head

Table 4

No.	Menu items	Name	Operation [Z][S]	Remark
Main Menu	Submenu (Enter the main menu, press both keys to enter the submenu, i.e. the operation column)			
1	Preview	VIEW	Check (1.Primary pressure, 2. Percentage value, 3. Output current, 4. Analog output, 5. Temperature value, 6. Static pressure value, 7. Reserved, 8. Range lower value, 9. full-scale(upper range) value	

No.	Menu items	Name	Operation [Z][S]	Remark
2	Adjust lower range	GET 0%	Press both buttons to set the current pressure to the lower range value (LRV).	Only (4~20) mA output
3	Adjust upper range	GET 100%	Press both buttons to set the current pressure to the upper range value (URV).	
4	Set lower range	SET 0%	Press both buttons to adjust the value to the desired one. Press both keys to save the current value as the lower raneg value.	
5	Set upper range	SET 100%	Press both buttons to adjust the value to the desired one. Press both keys to save the current value as the upper range value.	
6	Set address	ADDRESS	To set the slave address, use the [Z] and [S] keys to adjust to the desired slave address value. Press both keys to confirm and save (address range: 1-255).	RS485 output only
7	Set baud rate	BAUD	Baud rate selection Available in 2400, 4800, 9600, 19200, and 38400.	
8	Parity bit	PARITY BIT	Parity bit selection 1. No parity; 2. Odd parity; 3. Even parity	
9	Communication preview	COMM VIEW	Display order 1. Address; 2. Baud rate; 3. Data bits; 4. Parity bits; 5. Stop bits	
10	Zero-point adjust	SHIFT ZERO	Press both buttons to set the current pressure to sensor range 0.	
11	Range offset	OFFSET ZERO	Use the [Z] and [S] keys to adjust to the appropriate percentage value. Press both keys to shift the entire measurement range by the set percentage value.	

No.	Menu items	Name	Operation [Z][S]	Remark
12	Damping value	DAMPING	Use the [Z] and [S] keys to adjust to the desired damping value. Press both keys to save the current damping value (damping value range: 0.1s to 60.0s).	
13	Display mode	DISPLAY	Use the [Z] and [S] keys to select the desired display type. Pressing both keys saves the selected display type (basic pressure, percentage, current, analog output).	
14	Display resolution	DISPLAY ACCUR	Use the [Z] and [S] keys to select the desired screen display accuracy. Pressing both keys saves the selected number of decimal places (Class0–Class4: 0–4 decimal places).	
15	Pressure unit	UNIT	Use the [Z] and [S] keys to select the desired pressure unit. Press both keys to save the selected pressure unit.	
16	Linear function	FUNCTION	Use the [Z] and [S] keys to select the desired linear function for measurement. Pressing both keys saves the currently selected linear function (linear, square root).	
17	Alarm type	ALARM TYPE	Use the [Z] and [S] keys to select the desired alarm type. Pressing both keys saves the selected alarm mode (high explosion, low explosion, alarm output current).	
18	Analog lower value	OUT 0%	Use the [Z] and [S] keys to adjust to the desired value. Press both keys to save the current value as the starting	

No.	Menu items	Name	Operation [Z][S]	Remark
			value of the analog output range.	
19	Analog upper value	OUT 100%	Use the [Z] and [S] keys to adjust to the desired value. Press both keys to save the current value as the full-scale value of the analog output.	
20	Analog unit	OUT UNIT	Use the [Z] and [S] keys to select the desired analog output units. Pressing both keys saves the currently selected analog output units (including flow rate, volume, length, and density units).	
21	Fixed current	SIM CUR	Use the [Z] and [S] keys to select a fixed current value, which will automatically enter the fixed current mode. Press both keys to exit the fixed current mode (selectable 4.00mA, 8.00mA, 20.00mA).	
22	Small signal cutoff	SIGNAL CUT	Use the [Z] and [S] keys to adjust to the desired percentage value. Press both keys to save the current value as the percentage of small signal removal (recommended range: 0.01%~10%).	
23	Button lock	LOCK unPo/Po	Use the [Z] and [S] keys to toggle between the Unlocked and Locked states. Press both keys to select and save the current state as the present key state.	
24	Software version	SOFT VER	Displays the current software version number (R12).	

5.2 Pressure Units

Table 5

No.	Name	Unit
1	1 inch of water column (20°C / 68°F)	inH_2O
2	inch mercury	inHg
3	1 foot water column (20°C / 68°F)	ftH_2O
4	Millimeters of water column (20°C / 68°F)	mmH_2O
5	mmHg	mmHg
6	Psi	psi
7	bar	bar
8	mbar	mbar
9	g/cm^2	g/cm^2
10	Kg/cm^2	kg/cm^2
11	Pa	Pa
12	kPa^2	kPa
13	Torr	torr
14	ATM	atm
15	Meters of water column (4°C / 39°F)	mH_4O
16	MPa	MPa
17	1 inch of water column (4°C / 39°F)	inH_4O
18	Millimeters of water column (4°C / 39°F)	mmH_4O
19	Meters of water column (20°C / 68°F)	mH_2O

5.3 Out Functional Unit Table

Table 6

No.	Name	Display
Volumetric flow rate		
1	cubic meters per second	m^3/s
2	cubic meters per minute	m^3/m
3	cubic meters per hour	m^3/h
4	cubic meters/day	m^3/d
5	Liters per second	L/s
6	liters per minute	L/m
7	liters/hour	L/h
8	cubic feet per second	ft^3/s

No.	Name	Display
9	cubic feet per minute	ft^3 /m
10	cubic feet per hour	ft^3 /h
11	gallons/second	gal/s
12	gallons/minute	gal/m
13	gallons/hour	gal/h
Volume		
14	cubic meter	m^3
15	Lift	L
16	US gallons	gal
17	cubic feet	ft^3
18	cubic inches	in^3
Length		
19	rice	m
20	centimeter	cm
21	foot	ft
22	inch	in
Mass		
23	kilogram	Kg
24	ton	t
25	pound	lb
Mass flow		
26	kilograms per second	kg/s
27	kilograms per meter	kg/m
28	kilograms per hour	kg/h
29	tons per meter	t/m
30	tons per hour	t/h
31	tons per day	t/d
32	pounds per second	Lb/s
33	pounds per minute	Lb/m
34	pounds per hour	Lb/h
Mass per Volume		
35	kilograms per cubic meter	kg/m^3
36	kilograms per liter	kg/L
37	grams per liter	g/L

6 Operating Instructions

6.1 Button Definition

For the local buttons "Z" and "S", the following key combinations are defined:

(1) **"Confirm" key**: Press and hold buttons "Z" and "S" simultaneously for 0.2 seconds, then release them both. Each execution of operation is one Confirm key input.

(2) **"Left" key**: Press and hold the "S" button for 0.2 seconds, then release it. Each execution of operation, the "Left "key is input once.

(3) **"Right" key**: Press the "Z" button, hold for 0.2 seconds, and then release. Each execution of operation, the "Right "key is entered once.

Tip: When operating the local buttons, it is recommended to employ the non-magnetic tool; otherwise, a single button press may of no avail or single button press produces a double button effects.

6.2 Menu Access and Exit

If this menu page doesn't brought out, press "Confirm" key once will invoke this menu and the display will appear as shown in Figure 16:

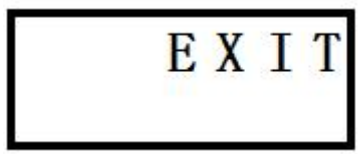


Fig.16

In the menu display in Figure 16, press the "Confirm" key once will exit the menu and return it to the disabled state.

6.3 Menu Browsing

After the menu mode is activated, the menu items can be navigated with the "Left" and "Right" keys.

(1) "Left" key can be used to cycle downward through the menu tree. In the case shown in Figure 16, pressing the "Left" key once will display the screen shown in Figure 17; pressing it one more time will display the page shown in Figure 18.

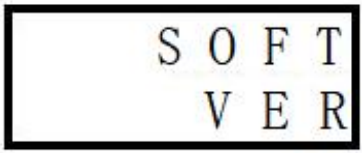


Fig.17

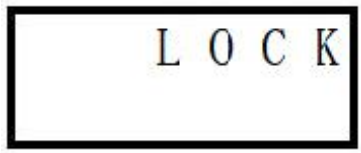


Fig.18

(2) "Right" key cycles through the menu items in the menu tree from top to bottom. In the case shown in Figure 16, one “Right” key press will display the information in Figure 19; pressing it one more time will display the page shown in Figure 20.

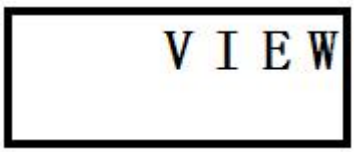


Fig.19

Fig.20

6.4 Menu Selection

When browsing the menu, pressing the “Confirm” key once will execute the function corresponding to the selected menu item.

6.5 Data Input

When setting parameter svia the menu, two methods of data transmission are available:

6.5.1. Data Selection

For example: assuming the current unit is "kPa" and the menu is not activated, to change current unit into “bar”, the following steps are to be followed:

① Enter the “Confirm” key once (activate the menu mode), and the display appear as shown in Figure 16;

② Press the "Left" key ten times or the "Right" key eleven times (menu navigation), and the screen will be shown in Figure 21;

③ Press the “Confirm” key once (Menu selection), and the program will enter the unit settings function, as shown in Figure 22 on the display screen.

Fig.21

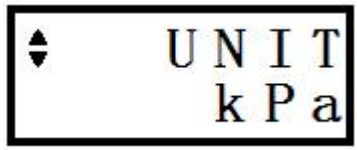


Fig.22

- Enter the "Left" key five times or the "Right" key fourteen times (data selection), and the screen will display as shown in Figure 23;
- Enter the “Confirm” key once (data input), and the program will change the unit to "bar" and display a prompt message, as shown in Figure 24 on display screen;

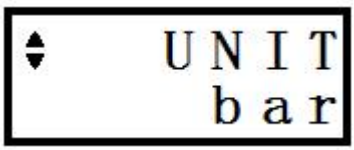


Fig.23

Fig.24

① Enter the “Confirm” key once to clear the prompt message. The program will return to the menu browsing state, and the monitor will display as shown in Figure 21 .

② Press the "Left" key eleven times or the "Right "key ten times (menu navigation) , andthe screen will display as shown in Figure 24;

③ Enter the "Confirm" key once to exit the menu function, and the menu will return to the inactive state.

④ At this point, it can be observed that the unit has changed to "bar".

6.5.2. Data Editing

For example: Suppose the current damping value is 0.1s, the menu is not activated, and you want to change the damping value to 1.0s, you can follow these steps:

① Enter the “Confirm” key once (start menu), and the display appears as shown in Figure 16;

② Enter the "Left" key thirteen times or the "Right "key eight times (menu

browsing), and the monitor will display as shown in Figure 25;

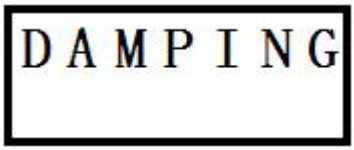


Fig.25

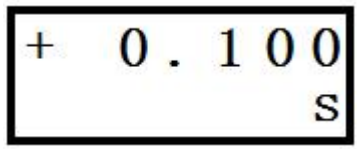


Fig.26

③ Press the "Confirm" key once (select from the menu), and the monitor will display as shown in Figure 26;

④ Press the "left "or "right "key once, the data will be editable. Then, there will appear a blinking cursor on the character "0" above the damping value unit "s".

⑤ Cursor blinking: When the cursor appears, the monitor displays as shown in Figure 27. When the cursor disappears, the original characters remain displayed.

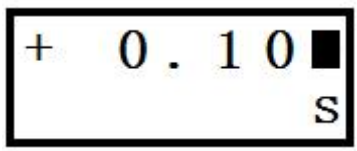


Fig.27

Cursor movement: After entering data editing mode, each press of the “left” key moves the cursor one digit to the left. The decimal point is skipped automatically. If the cursor is at the leftmost position, it wraps around to the rightmost position. **Number Reversal:** Each press of the “right” key increments the digit at the cursor position by one. For example: "0 "becomes "1", "1" becomes "2", and so on. Special changes include “9” rolls over “0”, blank space changes to “1”, “+” and “-” toggle between each other.

- Press the “left” key twice to move the cursor to the character “1”.
- Press “right” key nine times to cycle the letter”1” to “0”.
- Press “left” key once to move the cursor to the first character “0” to the left of the decimal point. (Note: when move the cursor, it will automatically skip the decimal point).
- Press the “right” key to change the character”0”to “1”. The display appears as shown in Figure 28;

- Press the “Confirm” key (data entry). The damping value is changed to 1.0s and display a prompt message, as shown in Figure 24. If the input data value exceeds the program's allowed range, the program will display an error message, as shown in Figure 29. At this point, you need to enter the "Confirm" key again to clear the error message. The program will then return to the menu browsing state, as shown in Figure 25.

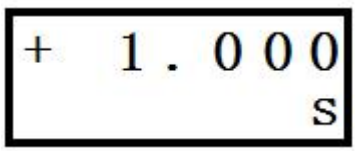


Fig.28

Fig.29

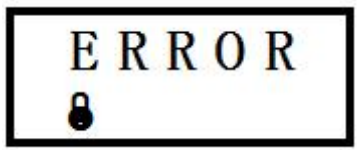


Fig.30

Enter the Confirm key once to clear the prompt message. The program will return to the menu browsing state, and the monitor will display as shown in Figure 25 .

Enter the "Left" key eight times or the "Right "key thirteen times (menu navigation), and the monitor will display as shown in Figure 16;

Enter the Confirm key once to exit the menu function, and the menu will return to the inactive state.

6.6 Operating Instructions

6.6.1. Menu Startup and Exit

If the menu is not activated, pressing the Confirm key once will activate the menu, and the display will show the following as shown in Figure 16:

In the state shown in Figure 16, pressing the Confirm key once will exit the menu and return it to the inactive state.

6.6.2. Viewing Variables

① Start Menu;

② Browse through the menu, select the "VIEW "menu, and the screen will

be diplayed as shown in Figure 18;

③ Enter the “Confirm” key once to access the variable viewing function. The first variable, "Current Pressure/Differential Pressure Value, its engineering units, and the variable number will then be displayed, as shown in Figure 31 (assuming the engineering unit is "kPa").

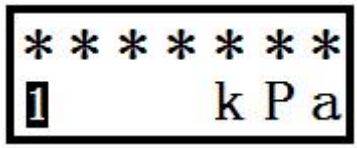


Fig.31

Note: "******* indicates the uncertain pressure/differential pressure value.

Press the "Right" key once to display the second variable "Current pressure/differential pressure value as a percentage of the range", the percentage sign "%" and the variable number, as shown in Figure 32 .

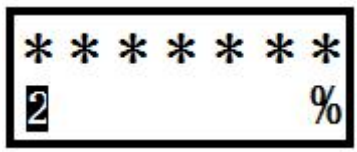


Fig.32

Note: "*******" indicates a range percentage value for an uncertain pressure/differential pressure value.

One press "right" key once to display the third variable "output current value", the unit "mA" and the variable number, as shown in Figure 33.

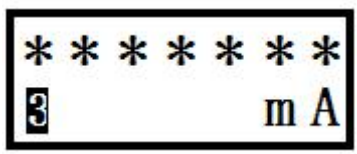


Fig.33

Note: "******* indicates an uncertain output current value.

One press “right” key will display the first variable again, as shown in Figure 31. If you press the "left" key in sequence, the first, second, and third variables will be displayed in reverse order.

One press “Confirm” key to return to the menu browsing mode. The screen will be displayed as shown in Figure 19. (Note: In the "VIEW "menu, the "Left" and "Right" keys function similarly to the menu navigation.)

6.6.3. Simulation Range Pressure Zero Shift

For example: Supposing there is a differential pressure transmitter installed onsite, its sensor range has an upper limit of 40 kPa and an analog range of 0~20 kPa. In actual operation, when the pipeline differential pressure is 0~20 kPa, the display shows 0.1 ~ 20.1 kPa and the output current is 4.08 ~ 20.08 mA .

Requirements: The display should remain unchanged, but the output current value should be changed to 4~20mA.

The operation steps are as follows:

① Set the pipeline differential pressure to 0 kPa; at this point, the display will show +0.1 kPa.

② Launch the menu, navigate through the menu, select the "GET 0%"menu, and the monitor will display as shown in Figure 19 ;

③ Press the Confirm key once; the program will change the analog range to 0.1 ~ 20.1 kPa and display a prompt message, as shown in Figure 23 .

④ Enter the Confirmation key once to clear the prompt message. The program will return to the menu browsing state, and the monitor will display as shown in Figure 19 .

⑤ In the "VIEW "menu, you can see that the first variable is 0.1 kPa and the third variable is 4 mA.

⑥ Set the pipeline differential pressure to 20 kPa;

⑦ In the "VIEW" menu, you can see that the first variable is 20.1 kPa and the third variable is 20 mA.

⑧ Exit the menu; operation complete.

6.6.4. Analog Range Full-Scale Setting

For example: assuming a differential pressure transmitter installed onsite, it has the sensor upper range limit of 40 kPa and an analog output range of (0-40)kPa. In actual operation, when the pipeline differential pressure is (0~20) kPa, the display shows (0~20) kPa, and the output current is (4~12) mA.

Requirements: The display should remain unchanged, but the output current value should be changed to (4~20) mA.

Procedure:

① Set the pipeline differential pressure to 20 kPa to the pupeline; the display indicates +20 kPa.

② Launch the menu, navigate through the menu, select the "GET100%"menu, and the display appears as shwon in Figure 34;

③ Press "Confirm" key once, and then the analog output range is rescaled to (0~20) kPa. The prompt message is displayed, as shown in Figure 24.

④ Press the “Confirm” key to clear the prompt message. The program will return to the menu browsing state, and the monitor will display as shown in Figure 33.

⑤ Using the “VIEW” menu, verify that:

- the primary variable is 20 kPa, and
- the third variable (analog output) is 20 mA.

⑥ Reduce the pipeline differential pressure to 0 kPa.

⑦ Using the “VIEW” menu, verify that: the primary variable is 0 kPa; and the third variable is 4 mA.

⑧ Exit the menu, and the operation is completed.

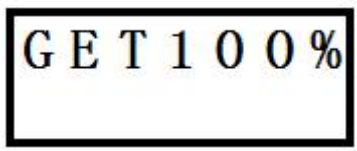


Fig.34

6.6.5. Analog Range Zero Setting

For example: Suppose there is a differential pressure transmitter installed onsite. Its sensor range has an upper limit of 40 kPa and an analog range of (0~20) kPa. In actual operation, when the pipeline differential pressure is (-4~20) kPa, the display shows (-4~20) kPa and the output current is (3.9 ~20) mA.

Requirements: The display should remain unchanged, but the output current value should be adjusted to (4~20) mA.

Procedures:

① Launch the menu, navigate through the menu, select the "SET 0% "menu, and the display appears as shown in Figure 35;

② Press the "Confirm" key once. The lower limit of the analog output range

is displayed as 0 kPa, as shown in Figure 36 ;

Fig.35

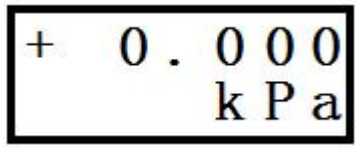


Fig.36

③ Press either the "left "or "right" key once to enter data editing mode; a flashing cursor will appear on the monitor.

④ Press “left” key three times to move the cursor to the first digit “0” to the left of the decimal point;

⑤ Press the "right" key four times to change the digit from "0 "to "4";

⑥ Press the “left” key twice to move the cursor to the sign “+”;

⑦ Press the "right "key once to toggle the sign from "+ "to "- ", as shown in Figure 37.

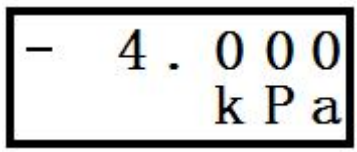


Fig.37

① Enter the "Confirm" key once, and the program will change the lower limit of the analog range to -4kPa and display the prompt message shown in Figure 24;

② Enter the "Confirm" key once to clear the prompt message. The program will return to the menu browsing state, and the display appears as shown in Figure 35.

③ Set the pipeline differential pressure to -4 kPa to the pipeline;

Using the "VIEW" menu, verify that the primary variable is -4kPa, the third variable is 4mA;

④ Set the pipeline differential pressure to 20 kPa to the pipeline;

Using the "VIEW" menu, verify that the first variable is 20 kPa and the third variable is 20 mA.

⑤ Exit the menu; operation completes.

6.6.6. Analog Range Full-Scale Setting

For example: Suppose there is a differential pressure transmitter installed onsite. Its sensor range has an upper limit of 40 kPa and an analog range of (0~40) kPa. In actual operation, when the pipeline differential pressure is (0~20) kPa, the display shows (0~20) kPa and the output current is (4~12) mA.

Requirements: The display should remain unchanged, but the output current value should be changed to (4~20) mA.

Procedures:

① Invoke the menu, navigate to the "SET100%" and select it. The display appars as shown in Figure 38;

② Press the "Confirm" key once, and the display will show the upper limit of the analog range as 40 kPa, as shown in Figure 39;

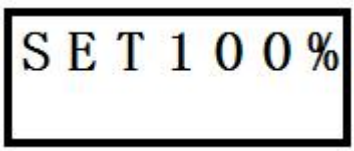


Fig.38

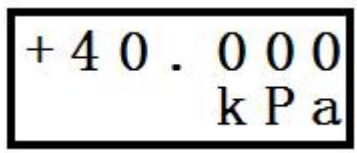


Fig.39

③ Press either the "left"or "right" key once to enter data editing mode; a flashing cursor will appear on the monitor.

④ Press the “left” key four times to move the cursor to the digit "4";

⑤ Press the "right "key eight times to change the digit from "4" to "2", as shown in Figure 40.

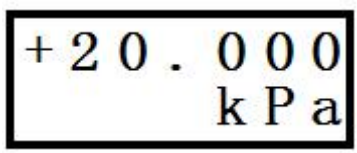


Fig.40

⑥ Press the "Confirm" key once, and the program will change the upper limit of the analog range to 20 kPa and display the prompt information shown in Figure 24;

⑦ Press the "Confirm" key once to clear the prompt message. It will return

to the menu browsing state, and the screen appears as shown in Figure 38.

⑧ Set the pipeline differential pressure to 0 kPa;

Using the "VIEW" menu, you can see that the first variable is 0 kPa and the third variable is 4 mA.

⑨ Set the pipeline differential pressure to 20 kPa;

Using the "VIEW" menu, you can see that the first variable is 20 kPa and the third variable is 20 mA.

⑩ Exit the menu; operation complete.

6.6.7. Digital Zero Adjustment

For example: Suppose there is a differential pressure transmitter installed onsite. Its sensor range has an upper limit of 40 kPa and an analog range of (0~20) kPa. In actual operation, when the pipeline differential pressure is (0~20 kPa) , the display shows (0.1 ~20.1) kPa and the output current is (4.08~20.08) mA.

Requirements: Change the display value to (0~20) kPa and the output current value to (4~20) mA.

Procedures:

① Set the pipeline differential pressure to 0 kPa; then, the display will show +0.1 kPa .

② Launch the menu, navigate through the menu, and select "SHIFT". The "ZERO" menu is displayed on the monitor as shown in Figure 40 .

Fig.41

③ Enter the "Confirm" key once, and the program will modify the zero point value of the number and display a prompt message, as shown in Figure 23 ;

④ Enter the "Confirm" key once to clear the prompt message. It will return to the menu browsing state, and the monitor will display as shown in Figure 40.

⑤ Set the pipeline differential pressure to 0 kPa;

Using the "VIEW "menu, you can see that the first variable is 0 kPa and the third variable is 4 mA.

⑥ Set the pipeline differential pressure to 20 kPa;

Using the "VIEW "menu, you can see that the first variable is 20 kPa and the third variable is 20 mA.

⑦ Exit the menu; operation complete.

6.6.8. Parallel migration of analog range

For example: Suppose there is a differential pressure transmitter installed onsite. Its sensor range has an upper limit of 40 kPa and an analog range of (0~40) kPa. In actual operation, when the pipeline differential pressure is (-20~20) kPa, the display shows (-20~20) kPa and the output current is (3.9 ~12) mA.

Requirements: The display should remain unchanged, but the output current value should be changed to (4~20) mA.

Procedures:

① Set the pipeline differential pressure to 0 kPa, at which point the display will show 0 kPa.

② Invoke the menu, navigate through the menu, and select "OFFSET". The "SHIFT" menu is displayed on the monitor as shown in Figure 41.

③ Press the "Confirm" key once, and the display will show the current pressure/differential pressure range percentage value + 0.00 %, as shown in Figure 42;

Fig.42

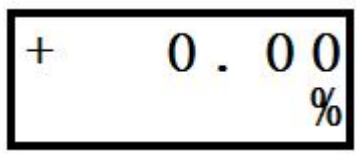


Fig.43

④ Press either the "left "or "right "key once to enter data editing mode; a flashing cursor will appear on the monitor.

⑤ Press the “left” key three times to move the cursor to the first blank character "□ " to the left of the decimal point;

⑥ Press the "right" key five times to change blank character "□" to "5", as shown in Figure 43.

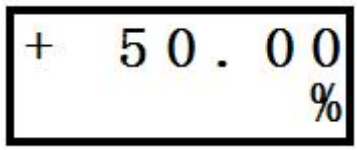


Fig.44

⑦ Press the "Confirm" key once. The program performs a parallel shift of the analog output range, meaning that the upper and lower limits are adjusted simultaneously by the same amount and in the same direction. The adjustment is performed according to the following formula:

- Span = Upper range limit – Lower limit of range = 40 – 0 = 40 kPa
- Percentage change=shifted percentage – Original percentage = 50.00 % - 0.00 % = 50.00 %
- Adjustment value = Span × Percentage change = 40 × 50.00 % = 20 kPa
- New upper range limit = Original upper limit – Adjustment value = 40 – 20 = 20 kPa
- New lower limit = original lower limit – adjustment value = 0 – 20 = -20 kPa

At the same time, the monitor displays is displayed, as shown in Figure 24;

⑧ Press the "Confirm" key once to clear the prompt message. The program will return to the menu browsing state, and the display appears as shown in Figure 42.

⑧ Set the pipeline differential pressure to 0 kPa;

Open the VIEW menu and confirm that the first variable reads 0kPa, with the third variable being 12mA;

⑨ Set the pipeline differential pressure to 20 kPa;

Open the VIEW menu and confirm that the first variable reads currently 20kPa,

with the third variable being 20mA;

⑩ Set the pipeline differential pressure to -20 kPa;

Open the VIEW menu and confirm that the first variable reads –20 kPa and the third variable reads 4 mA.

Open the SET 0% menu and confirm that the lower range limit (LRL) is –20 kPa.

Open the SET 100% menu and confirm that the upper range limit (URL) is +20 kPa.

⑨ Exit the menu; operation completes.

6.6.9. Damping Setting

Please refer to "6.5.2 Data Editing".

Note: The effective damping value range is 0.1s to 16s. If the input parameter exceeds this range, the program will not accept parameter modification and will display an error message on the screen, as shown in Figure 29.

6.6.10. Display Type Selection

When the menu is not activated, the display shows only one of the three variables described in the "VIEW" menu, which can be selected and set via the "DISPLAY" menu.

For example: Suppose the current display type is the second variable, "Percentage of pressure/differential pressure value".

Requirement: Change the display type to the first variable "Pressure/Differential Pressure Value".

Procedures:

① Invoke the menu, navigate through the menu, select the "DISPLAY" menu, and the screen appears as shown in Figure 45;

Fig.45

② Press the "Confirm" key once, and the display will show the second variable, as shown in Figure 32;

③ Press the "Left" key once or the "Right" key twice, and the monitor will display the first variable, as shown in Figure 31;

④ Enter the "Confirm" key once, and the program will change the display type to the first variable and display the prompt message shown in Figure 24;

Enter the "Confirm" key once to clear the prompt message. The program will return to the menu browsing state, and the monitor will display as shown in Figure 45.

⑤ Exit the menu, and you can see that the current display is the first variable, "Pressure/Differential Pressure Value".

6.6.11. Unit Selection

Please refer to "6.5.1 Data Selection".

6.6.12. Selection of Characteristic Functions

There are two types of characteristic functions: linear and linear square root, which can be selected and set through the "FUNC-TION "menu.

For example: Suppose the current characteristic function is linear.

Requirement: Change the characteristic function to a linear square root.

Procedures:

⑥ Invoke the menu, navigate through the menu, select the "FUNC-TION" menu, and the display appears as shown in Figure 46;

⑦ Enter the "Confirm" key once, and the display will show the current linear characteristic function, as shown in Figure 47;

⑧ Press either the "left" or “right” key once, and the display will show the linear square root characteristic function, as shown in Figure 48;

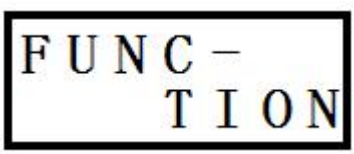


Fig.46

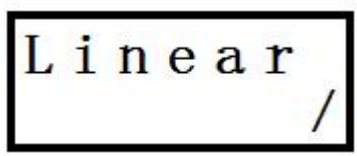


Fig.47

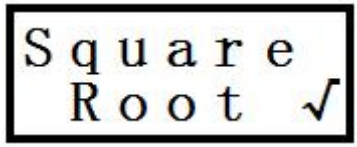


Fig.48

⑨ Press the "Confirm" key once, the program will change the characteristic function to linear square root and display the prompt message shown in Figure 24.

⑩ Enter the "Confirm" key once to clear the prompt message. The program will return to the menu browsing state, and the monitor will display as shown in Figure 24.

⑪ Exit the menu; it can be noted that the current current characteristic function has been changed to a linear square root, as shown in Figure 49; when the characteristic function is linear, the display shows as shown in Figure 50.

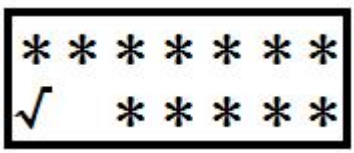


Fig.49

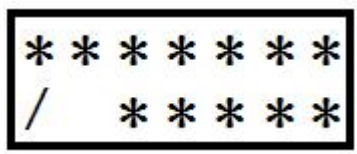


Fig.50

Note: "* "indicates an uncertain display.

7 Precautions

(1) Before calibration, please place the transmitter on a level surface. After the transmitter is installed onsite, a zero adjustment shall be performed to ensure measurement accuracy.

(2) Before pressurizing the transmitter, the process connection should be installed and tightened.

(3) The transmitter should be installed in a dry environment and should be protected from rain. In harsh environments, a transmitter protection box should be used.

(4) Do not disassemble and assemble the transmitter themselves.

(5) When powered on, the transmitter cover must not be disassembled in an explosive/flammable environment.

(6) Please verify that the power supply voltage of the transmitter meets the power supply voltage requirements in the user manual.

(7) Ensure that no slag accumulation in pressure-conducting pipe.

(8) The impluse lines should as short as possible.

(9) For differential pressure transmitters, the impulse lines inside the liquid column should be kept balanced.

(10) Pressure impulse lines should be installed in places with small temperature gradients and temperature fluctuations.

(11) Protective measures of preventing crystallization or low-temperature freezing inside the impulse lines are recommended.

8 Maintenance

Depending on the on-site working conditions, refer to the previous section for periodic inspection of instrument output signals. Even under normal circumstances, instruments may have residual deposits; therefore, the transmitter should be cleaned periodically according to the on-site application conditions. Cleaning is best performed indoors.

The operation is as follows:

1. Loosen the bolts on the process flange diagonally;
2. Carefully remove the flange, being careful not to damage the sensor's isolation diaphragm;
3. Clean the sensor diaphragm with a soft brush and a suitable solvent; the flange can also be cleaned together.
4. Replace the O-ring on the process flange;
5. When installing the process flange onto the measuring component, care should be taken not to touch the isolation diaphragm; (the cross-sections of both process flanges must be kept on the same plane and at the correct angle to the housing.)
6. Tighten the bolts and nuts diagonally with a torque wrench and check for leakage.

Product maintenance

Safety regulations must be followed throughout all operation. The transmitter should only be disassembled for cleaning, inspection, repair, or replacement of faulty parts. Sensors can only be repaired by the manufacturer. Faulty transmitters should be returned to the manufacturer for repair and report its malfunction and cause as much as possible.

9 Precaution for the Explosion-Proof Applications

The installation of explosion-proof transmitters must comply with national laws, explosion-proof regulations, and the equipment's explosion-proof test certificate. The nameplate displays the transmitter's explosion-proof marking.

9.1 Intrinsically Safe Exia Type Transmitter

Explosion-proof markings: Ex ia IIC T4...T6 Ga, Ex ia IIIC T80℃...T130℃ Db

Explosion-proof safety performance standards :

- GB/T 3836.1-2021 Explosive Atmospheres – Part 1: Equipment-General Requirements
- GB/T 3836.4 -2021 Explosive Atmospheres - Part 4: Equipment protected by intrinsically safe "i".

9.1.1. Special conditions applicable to product safety

(1) The temperature group and operating environment temperature range of this product are as follows, and the relationship between the maximum temperature of the connecting rod and the temperature group and operating environment range is as follows:

Temperature group	Maximum surface temperature	Operating ambient temperature range	Maximum temperature of connecting rod
T4	T130℃	(-40~85)℃	90 ℃
T5	T95℃	(-40~50)℃	50 ℃
T6	T80℃	(-40~40)℃	40 ℃

（2）When the product is installed in Zone 0, measures should be taken to avoid the risk of ignition from impact or friction.

9.1.2. Precautions for Product Use

(1) The intrinsically safe electrical parameters are as follows:

Maximum input voltage U_i (V)	Maximum input current U_i (mA)	Maximum input power P_i (W)	Maximum internal equivalent parameter	
			C_i(μ F)	L_i (mH)
28	93	0.65	≈0	≈0

(2) The connecting cable between this product and related equipment shall be a two-core shielded cable (the cable must have an insulating sheath). The shield shall be grounded in the non-hazardous area and insulated from the product enclosure. Cable routing shall be arranged to minimize the effects of electromagnetic interference.

(3) When the product is installed in a dust explosive atmosphere, the cable entry shall be fitted with cable glands or stopping plugs that are certified by a nationally authorized inspection body and comply with IP67 protection as specified in GB/T 3836.1-2021, before it can be used in hazardous locations.

(4) There should be no harmful gases that corrode aluminum alloys at the installation site.

(5) Users shall not replace parts or components of the product themselves, but shall work with the product manufacturer to resolve any faults that occur during operation to avoid the damage.

9.1.3. Standards Compliance

During installation, operation and product maintenance, users shall strictly comply with the user manual and the following standards:

- GB/T 3836.13-2021 Explosive Atmospheres - Part 13: Equipment Repair, Overhaul, Reclamation and Modification
- GB/T 3836.15-2017 Explosive Atmospheres - Part 15: Specification of Electrical Installations Design, Selection and Erection
- GB/T 3836.16-2022 Explosive Atmospheres - Part 16: Specification of Electrical Installations Inspection and Maintenance
- GB 50257-2014 Code for Construction and Acceptance of Electrical

Equipment on Fire and Explosion Hazard Electrical Equipment Installation Engineering.

- GB/T 3836.18-2024 Explosive Atmospheres Part 18: Intrinsically Safe Electrical Systems.
- GB 15577-2018 Safety Regulations for Dust Explosion and Protection.

9.2 "Explosion-proof Ex d" Type Transmitter

Explosion-proof markings: Ex db Ⅱ C T4…T6 Gb , Ex tb Ⅲ C T80 ℃ …T130℃ Db

Explosion-proof safety performance standards :

- GB/T 3836.1-2021 Explosive Atmospheres – Part 1: Equipment-General Requirements
- GB/T 3836.2-2021 Explosive Atmospheres - Part 2: Equipment Protection by Flameproof Enclosures "d".
- GB/T 3836.31-2021 Explosive Atmospheres Part 31: Equipment Dust Ignition Protection by Enclosure “t”

9.2.1. Application Precautions

(1) Product operating temperature range: -40℃~65℃.

(2) that meets the IP67 standard GB/T 3836.1-2021 and is approved by a nationally authorized testing agency before it can be used in explosive hazardous locations.

(3) There should be no harmful gases that corrode aluminum alloys at the installation site.

(4) When using and maintaining the device on site, the principle of “ it is strictly forbidden to open the cover while it is powered on ” must be strictly observed .

(5) Users shall not replace the parts of the product themselves, but shall work with the product manufacturer to resolve any faults that occur during operation in order to prevent damage from occurring.

(6) During on-site installation, the cable entry shall be fitted with cable glands or dummy plugs that have been certified by a nationally designated explosion-protection inspection body and bear CCC certification. The

selected cable entry devices shall have an explosion protection rating of Ex db Ⅱ C Gb and a thread specification of M20*1.5. Any unused cable entries shall be effectively sealed with certified dummy plugs.

9.2.2. Standards Compliance

During installation, operation and product maintenance, users shall strictly comply with the user manual and the following standards:

- GB/T 3836.13-2021 Explosive Atmospheres - Part 13: Equipment Repair, Overhaul, Reclamation and Modification
- GB/T 3836.15-2017 Explosive Atmospheres - Part 15: Specification of Electrical Installations Design, Selection and Erection
- GB/T 3836.16-2022 Explosive Atmospheres - Part 16: Specification of Electrical Installations Inspection and Maintenance
- GB 15577-2018 Safety Regulations for Dust Explosion and Protection.

10 Warranty and After-Sales Service

Our company guarantees that any product quality issues arising during the warranty period will be covered under our unconditional warranty policy, which includes free repair, replacement, or return. All non-customized products are eligible for return or exchange within 7 days (excluding products damaged due to misuse). For customized products, the warranty terms specified in the contract shall apply.

Disclaimer

The following situations are not covered under the warranty policy, even during the warranty period:

(1) Product malfunctions caused by improper use by the customer.

(2) Product malfunctions resulting from unauthorized disassembly, repair, or modification by the customer.

11 Appendix 1 Communication Protocol

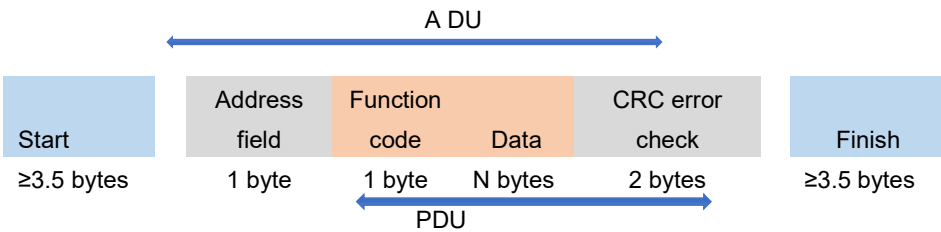
(1) Data format description

- **Communication mode**

This instrument uses the MODBUS RTU format, and the protocol is used for data communication in master-slave query mode.

- **Data format**

The protocol specifies that the instrument address ranges from 0 to 255, with address 0 used for broadcasting (broadcasting is not supported by this protocol), and the remaining addresses are reserved. The default data format is (9600, 8, E, 1), with a baud rate of 9600, 8 data bits, even parity, and 1 stop bit. A minimum of 3.5 bytes of idle time is required at the beginning and end of each information frame.



(2) Command description

This instrument uses commands 3, 4, 6, and 16 in the MODBUS protocol.

- **Data Model**

MODBUS is based on a series of data models on tables with different characteristics.

Basic Table	Object type	Access	Content
Discrete input	1 Byte	OR	The I/O system provides this type of data.
Coil	1 Byte	RW	Change this type of data through the application.
Input register	2 Bytes	OR	The I/O system provides this type of data.
Holding register	2 Bytes	RW	Change this type of data through the application.

- **Data format**

The integers involved in the command are represented as 16-bit unsigned integers. Floating-point numbers are in 4-byte 32-bit IEEE 754 format, with the 4 bytes arranged in 1032 order.

After being converted to 0123 sequence, the bits from highest to lowest are 31-0.

31	30-23	22-0
Sign bit (S)	Exponent	

Note: The sign bit indicates that the floating-point number is negative (1) or positive (0).

(3) Registers and commands used

- **Holding register**

It records device information & Configuration information

Register address	Holding register number	Description	Instruction
0001	40001	pressure unit	See the attached table of pressure unit codes.
0002	40002	static pressure unit	Synchronized with pressure units or commonly used units MPa (KPa , psi)
000 3	4000 3	Instrument type **(OR)**	0: Pressure; 1: Temperature; 2: Flow rate - orifice plate; 3: Flow rate - venturi tube, etc.
000 4	4000 4	Sensor type **(rOR)**	0: Differential pressure; 3: Gauge pressure; 6: Absolute pressure, etc.
000 5	4000 5	Sensor range code **(OR)**	0:1 KPa; 1:6 KPa; 2:40 KPa, etc.
00 06	400 06	Slave address	Address range: 1~255
00 07	400 07	baud rate	Default 9600 bps **code** **Baud rate (bps)** 1 2400 2 4800

Register address	Holding register number	Description	Instruction
			3 9600 4 19200 5 38400 Note: After modification, no restart is required; the instrument will automatically complete the communication settings modification. Adjust the baud rate value of the host computer (communicating with the instrument) to match that of the instrument before communicating with it.
00 08	400 08	Check bit	Default even parity **code** **Verification method** 0 No verification 1 Odd parity 2 Even parity Note: After modification, no restart is required; the instrument will automatically complete the communication settings modification. Adjust the verification method of the host computer (communicating with the instrument) to be consistent with the instrument before communicating with it.
00 09	400 09	Data bits	Default 8-bit

Register address	Holding register number	Description	Instruction
		(read-only)	
00 10	400 10	Stop bit **(read-only)**	Default 1
001 1	4001 1	4-byte data format	Default 1032 **code** **Data format** 0 1032 sequence 1 3210 sequence 2 0123 sequence 3 2301 sequence Note: ① This data format is for reading and writing floating-point numbers; ② Unless there are special requirements, it is generally not recommended to modify it.
001 2	4001 2	Show selection	0: Pressure; 1: Percentage; 2: Static pressure; 3: Temperature
0013- 14	4001 3 -1 4	Lowest point of instrument range	
0015- 16	40015 -1 6	High point of instrument range	
0017-18	40017 - 18	Damping time	Unit: seconds (s)
00 19-20	40019 - 20	small signal resection	Unit: percentage %
0021 -22	40021 -2 2	Sensor lower limit of measurement range	

Register address	Holding register number	Description	Instruction
		(read-only)	
0023-2 4	40023 -2 4	Sensor range upper limit **(read-only)**	
reserve			
0031	40031	Zero-position shift **(operation only)**	0: No action; 1: Action
0032	40032	Device restart **(operation only)**	0: No action; 1: Action
0033	40033	P T100 benchmark acquisition	
0034	40034	P T100 calibration	
reserve			
0051	40051	Serial number - Year (2 digits)	Example: 19 (2019)
0052	40052	Serial number - month (2 digits)	Example: 08 (August)
0053	40053	Serial number - Sensor type (1 digit)	Example: 2 (Pressure sensor)
0054	40054	Factory serial number - high digits of serial number (2 digits)	Example: 02 (representing the value 20000)
0055	40055	Factory serial	Example: 5885 (representing

Register address	Holding register number	Description	Instruction
		number - last two digits of the serial number	the numerical value 5885)
0056	40056	Software version (major version)	Example: 30 (R 30 , R30T01)
0057	40057	Software version (minor version)	Example: 1 (T 01, R30T01)
reserve			
0061	40061	Position 1	A 2-byte integer data type, supporting both reading and writing. Data is preserved even after power failure.
0062	40062	Position 2	A 2-byte integer data type, supporting both reading and writing. Data is preserved even after power failure.
0063	40063	Position 3	A 2-byte integer data type, supporting both reading and writing. Data is preserved even after power failure.

Note: Register addresses in the protocol start from 1. During command transmission, the actual register address used starts from 0. For example, for holding register number 4 0 002 (static pressure unit), the register address is 2, but the actual used register address is 1.

Note that the host computer uses register numbers, as register numbers are unique. 40000~49999 are the actual holding register numbers used.

11.1 Function Code 03 Read Holding Register

Function code:	03
Register addresses:	0001~0024 and 0051~0063
Data length:	no more than 24 bytes (12 holding registers in total)

Note: Read the values of holding registers. Registers 0001~0012 and registers 0051~0057 read 16-bit integers, occupying two bytes. Registers 0013 ~0024 read floating-point numbers, each occupying four bytes.

MODBUS request

Function code	1 Byte	0x 03
Starting address	2 Byte	0x0000 ~ 0x001 7 or 0x0032 ~ 0x003E
Number of reads	2 By tes	0x0001 ~ 0x000C

MODBUS Response

Function code	1 Byte	0 x03
Byte count	1 Byte	N*2
Input status	N*2 B yte	

Error Response

Function code	1 Byte	0x03 + 0x80
Error code	1 Byte	0x01 , 0x02 , 0x03 , 0x04 (see error codes below for meaning)

[Example]

Command	Addr 03 00 00 00 03 CRC0 CRC1
Response	A ddr 03 06 00 00 00 01 00 02 CRC2 CRC3

Note: Addr is the slave Modbus address, and CRCn is the CRC checksum .

11.2 Function Code 06 Write a Single Holding Register

Function code: 06

Register addresses: 0001~0012 and 0031~0034 With 0061 ~ 0063

Data length: 2 bytes

Note: Supports writing to individual registers in the holding register address ranges 0001~ 0012 , 0031~ 0034 , and 0061~0063.

MODBUS request

Function code	1 Byte	0x 06
Starting address	2 Byte	0x0000 ~0x000B or 0x001E~0x0021 or 0x003C~0x003E
Settings	2 Byte	

MODBUS Response

Function code	1 Byte	0x 06
Starting address	2 Byte	0x0000~0x000B or 0x001E~0x0021 or 0x003C~0x003E
Settings	2 Byte	

Error Response

Function code	1 Byte	0x06 + 0x80
Error code	1 Byte	0x01, 0x02, 0x03, 0x04 (see error codes below for meaning)

[Example]

Request	Addr 0 6 00 0 1 00 0 1 CRC0 CRC1
Response	A ddr 0 6 0 0 0 1 00 0 1 CRC2 CRC3

Note: Addr is the slave Modbus address, and CRCn is the CRC checksum .

11.3 Function Code 16 Writes Multiple Holding Registers

Function code:	16
Register addresses:	Supports holding register addresses 0013 ~ 0024
Data length:	4 bytes

Note: Since the # 6 command only writes to one register, the #16 command must be used for floating-point numbers that occupy two registers.

You can choose to write only one variable at a time (commonly used: write a single floating-point number) or write any number of variables at a time.

MODBUS request

Function code	1 Byte	0x 10
Starting address	2 Byte	0x00 0 C ~ 0x0017
Set length	2 Byte	0x0002
Byte count	1 Byte	0 x04
Settings	4 yte	

MODBUS Response

Function code	1 Byte	0x 10
Starting address	2 Byte	0 x00 0 C ~ 0x0017
Set length	2 Byte	0x0002

Error Response

Function code	1 Byte	0x10 + 0x80
Error code	1 Byte	0x01 , 0x02 , 0x03 , 0x04 (see error codes below for their meanings)

[Example] Set the holding registers 7-8, and the damping to 1s.

Request	Addr 10 00 0 6 00 0 2 04 00 00 3 F 80 CRC0 CRC1
Response	A ddr 10 0 0 06 00 02 CRC2 CRC3

Note: Addr is the slave Modbus address, and CRCn is the CRC checksum .

11.4 Input Register

Reading dynamic variable values

Register address	Input number	Description	Instruction
0001	30001	pressure	
0003	30003	Pressure percentage	Unit: Percentage of instrument range (%)
0005	30005	static pressure	
0007	30007	Temperature -PT100	
Reserved			
0021	30021	Lower limit alarm register	Lower limit alarm status Lowner Alert Status 0001 Operating Flow 0004 Standard Flow 0010 Pressure 0040 Temperature Note: ① Currently, the multi-parameter

Register address	Input number	Description	Instruction
			table does not have upper and lower limit setting functions, but the existing alarm function can realize sensor over-limit prompts; ② This register provides sensor over-range lower limit prompts.
0022	30022	Upper limit alarm register	Upper limit alarm status Upper Alert Status 0 001 Operating Flow 0004 Standard Flow 0010 Pressure 0004 Temperature Note: Enables sensor over-range limit warning.
0023	30023	Fault Location Register	Example: 2 (02 indicates a problem with the pressure acquisition process) (ERROR 02) 12. Pressure chip damaged or overloaded) Note: This provides error code prompts for abnormal working conditions. If an error code cannot be resolved, provide this code to the maintenance personnel.
0024	30024	Fault Type Register	Example: 12 (12, indicating that a chip appeared during the pressure acquisition process) (Problems with damage or overload) (ERROR 02) 12. Pressure chip damaged or overloaded)

Note: Register addresses in the protocol start from 1. During command

transmission, the actual register addresses used start from 0. For example, for holding register number 4 0 002 (static pressure unit), the register address is 2, but the actual used register address is 1. 30000~39999 are the actual input register numbers used.

11.5 Function Code 04 Read Input Register

Function code: 04

Register numbers: 0001~0008 With 0021~0024

Data length: no more than 24 bytes

Description: Read input data. Register numbers 0001~0008 read 32-bit floating-point numbers, and register numbers 0021~0024 read hexadecimal or integer data.

MODBUS request

Function code	1 Byte	0x 0 4
Starting address	2 Byte	0x0000 ~ 0x0007 Or 0x0014 ~ 0x0017
Input quantity	2 Byte	0x0001 ~ 0x000C

MODBUS Response

Function code	1 Byte	0 x0 4
Byte count	1 Byte	N*2
Input status	N*2 B yte	

Error Response

Function code	1 Byte	0x04 + 0x80
Error code	1 Byte	0x01 , 0x02 , 0x03 , 0x04 (see error codes below for their meanings)

[Example]

Request	Addr 0 4 00 0 0 00 0 8 CRC0 CRC1
Response	Addr 04 10 72 EF 3D FF 85 12 3E AB 00 00 00 00 FF 00 47 7F CRC2 CRC3

Note: Addr is the slave Modbus address, and CRCn is the CRC checksum .

11.6 Error code

This error code is the response code for when command requirements are not

met.

Error code	Code meaning
0x01	Function code error
0x02	For read operations: abnormal starting address or register count. For write operation (function code 6): Starting address error For write operations (function code 16): Starting address Or an anomaly in the starting address + number of registers.
0x03	For read operations: Register count anomaly For write operation (function code 6): Set value error. For write operations (function code 16): Register count or byte count = Register count ×2 exception
0x04	Data set out of range or sensor malfunction

- **Code table**

Pressure unit table

No.	Item	Code	Unit
1	1 inch of water column (20°C / 68°F)	1	inH_2O
2	inch mercury	2	inHg
3	1 foot water column (20°C / 68°F)	3	ftH_2O
4	Millimeters of water column (20°C / 68°F)	4	mmH_2O
5	mmHg	5	mmHg
6	Psi	6	psi
7	bar	7	bar
8	mbar	8	mbar
9	g/cm^2	9	g/cm^2
10	Kg/cm^2	10	kg/cm^2
11	Pa	11	Pa
12	kPa	12	kPa
13	Torr	13	torr
14	ATM	14	atm
15	Meters of water column (4°C / 39°F)	171	mH_4O
16	MPa	237	MPa
17	1 inch of water column (4°C / 39°F)	238	inH_4O
18	Millimeters of water column (4°C / 39°F)	239	mmH_4O
19	Meters of water column (20°C / 68°F)	240	mH_2O