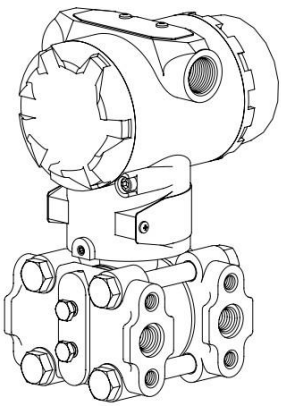
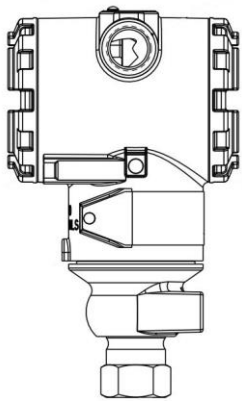
3351 SERIES

DIGITAL INTELLIGENT PRESSURE TRANSMITTER / DIFFERENTIAL PRESSURE TRANSMITTER

INSTRUCTION MANUAL





Warnings

1. Place the transmitter horizontally before adjusting.
2. Adjust the zero point of the transmitter after it is installed on site.
3. The process connection should be well installed and tightened before the transmitter is pressurized.
4. The transmitter should be installed in a dry environment preventing from getting wet by rain. In harsh environments, protection box for the transmitter should be used.
5. It is forbidden for the user to disassemble the transmitter by self.
6. Do not disassemble the transmitter cover in an explosive/flammable environment when power is on.
7. Please check if the transmitter power supply voltage meets the power supply voltage requirements in the manual.
8. The external grounding screw of the transmitter should be connected to the ground securely.
9. The installation of the transmitter in an explosive environment must comply with international, national and local standards, specifications and guidelines. Please refer to the restrictions on safe installation listed in the Explosion-proof section of the manual.
10. Installation and use of the intrinsically safe transmitter with safety barrier shall be carried out according to the specific instruction manual.
11. When doing transmitter calibration and temperature compensation using HART communication, use the communication equipment and software provided by the manufacturer.

Contents

Introduction

The intelligent transmitter produced by our company is a multi-functional digital instrument. It is designed with advanced, mature and reliable silicon sensor or capacitive sensor technology combined with advanced single-chip technology and sensor digital conversion technology.

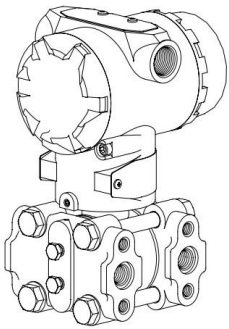
The powerful functions and high-speed computing capabilities of MCU, the core component, ensure the excellent quality of the transmitter. The entire design framework focuses on reliability, stability, high-precision and intelligence.

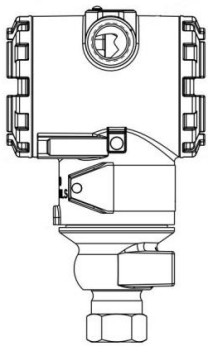
The transmitter has powerful interface operation function. The digital header can display pressure, percentage, current, and 0~100% analog indication. By key operation, zero point shift, range setting and damping setting can be easily completed without standard pressure source. The setting of basic parameters is very convenient for on-site comissioning.

Signal conversion, signal acquisition and processing, and current output control use the application-specific integrated circuit (ASICS) to make the transmitter stable, reliable, and vibration-resistant, with good interchangeability.

1.Introduction

1.1 Overall appearance





1.2 Intelligent transmitter working principle

1.2.1 Working principle

Figure 1-1 is an electrical block diagram of the basic working principle of an intelligent transmitter. The working principle and functions of the various components will be described below.

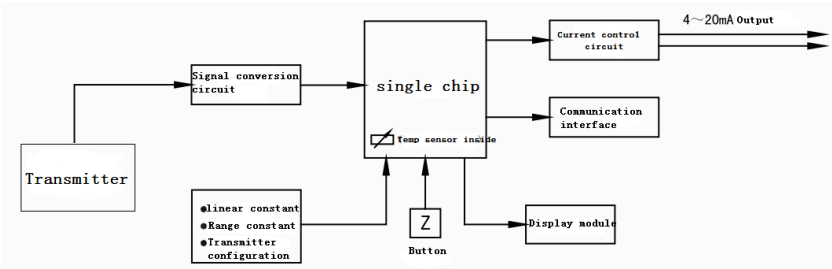


Figure 1-1 block diagram of Transmitter principle

1.2.2 Intelligent circuit board

1) A/D conversion

The A/D conversion circuit uses a dedicated low-power integrated circuit to convert the analog current output into a digital quantity by the demodulator with an accuracy of up to 18 bits, which is supplied to the microprocessor as an input signal.

2) Microprocessor

The microprocessor of the intelligent transmitter controls the A/D and D/A conversion work, and can also complete self-diagnosis and realize digital communication. During work, a digital pressure value is processed by the microprocessor and stored as a digital to ensure precise correction and engineering unit conversion. In addition, the microprocessor can also perform sensor linearization, turndown ratio, damping time, and other functional settings.

3) EEPROM memory

The EEPROM stores all configuration, characterization and digital trimming parameters. This memory is non-volatile, so even if the power is turned off, the stored data can be kept intact, so that intelligent communication can be realized at any time.

4) D/A conversion

The D/A conversion converts the corrected digital signal sent from the microprocessor into a 4-20 mA analog signal and outputs it to the loop.

5) Digital communication

Transmitters with the HART protocol can test and configure intelligent transmitters via a single communicator. Or complete communication through any host system host that supports HART communication protocol. The HART protocol uses the industry standard BELL202 frequency phase shift keying (FSK) technology to superimpose the digital signal of 1200Hz or 2000Hz on the 4~20mA signal to realize communication. When communicating, the frequency signal does not cause any interference to the 4~20mA process.

Intelligent transmitters can be tested and configured with dedicated adapters and software without HART protocol transmitters.

6) Display and buttons

The Intelligent transmitter with liquid crystal display can display the pressure value, current value, 0%-100% ratio display and temperature value of the sensor measured by the transmitter, and the transmitter can be configured through the buttons on the LCD panel.

Intelligent transmitters without display can also be used to clear, actively calibrate the transmitter through the S and Z buttons on the line panel.

2. Installation

2.1 On-site installation

2.1.1 Installation method

Our pressure transmitters can be mounted directly on 2" pipes

Or mount directly on the wall and on the dashboard. (as shown in Figure 2-1 and Figure 2-2)

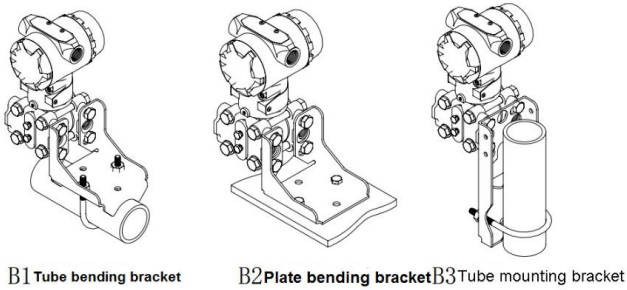


Figure 2-1 Monocrystalline silicon differential pressure transmitter installation

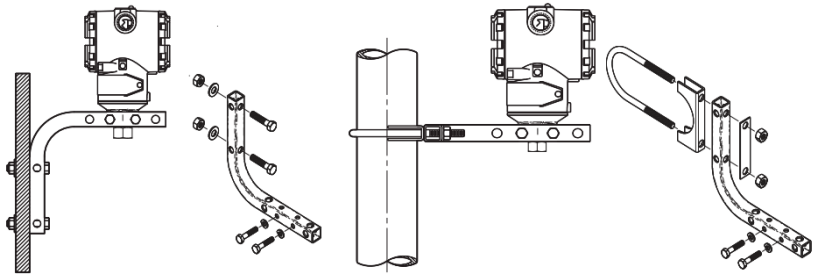


Figure 2-2 Monocrystalline silicon pressure transmitter installation

After loosening the locking screw, the electronic compartment can be rotated 90° left and right. As shown in Figure 2-3.

Warning: Do not rotate more than 90°! So as not to break the internal cable!

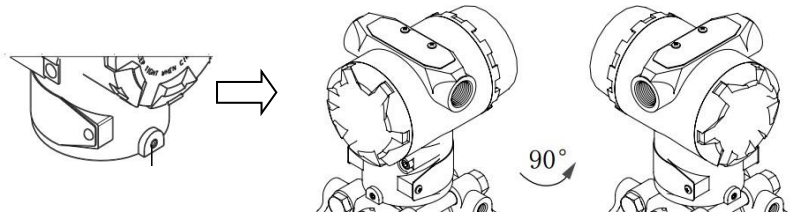
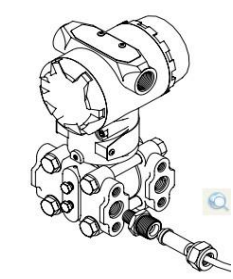


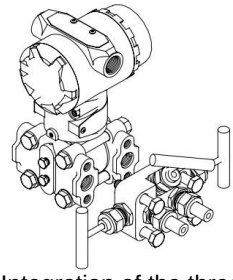
Figure 2-3 Housing rotation

2.1.2 Pressure method

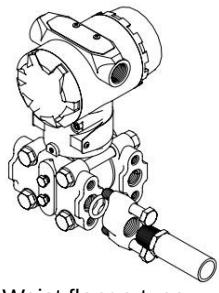
There are three types of Monocrystalline silicon differential pressure transmitter, as shown in Figure 2-4:



Welding pipe joint type



Integration of the three valve type



Waist flange type

Figure 2-4 Capacitor transmitter pressure map

The pressure-receiving type of the monocrystalline silicon differential pressure transmitter is mainly a screw connection method, and the user can provide a pressure-welded joint according to the specific thread specification.

2.1.3 The process connection hole distance adjustment of differential pressure transmitter

The process connection holes on the pressure chamber are 1/4-18 NPT. These process connection holes require a thread seal. When using a waist flange joint, the transmitter can be easily removed from the production unit by simply removing the upper and lower bolts of the joint. The center distance between the two process connection holes is 54 mm. Rotating the waist flange joint, the center distance can be changed to 50.8 mm, 54 mm, 57.2 mm as shown in the figure 2-5：

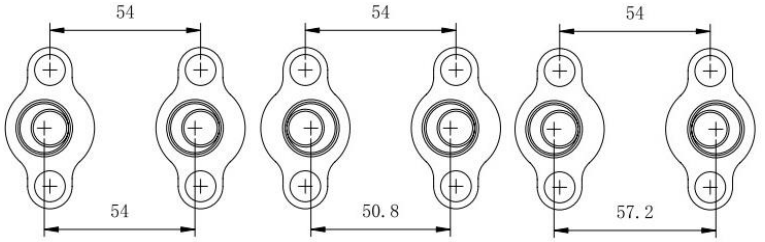


Figure 2-5 Connection hole distance of differential pressure transmitter

2.1.4 Installation Precautions

1. Prevent the transmitter from coming in contact with the measured medium with corrosivity or high temperature (≥ 90 °C).

2. Prevent the dross from depositing in the pressure tube.

3. Get the pressure tube shortened as possible as it can.

4. Keep balance between the liquid heads in the pressure tubes on both sides of the differential pressure transmitter.

5. Install the pressure tube in a place with small temperature gradient and temperature fluctuation.

6. Prevent from the crystallization or low-temperature freeze in the pressure tube.

2.2 Relevant Issues of measurement methods

Liquid measurement:

When measuring the flow rate of the liquid, the pressure tap should be opened on the side of the process piping to avoid sedimentation of the dross. At the same time, the transmitter should be installed beside or below the pressure tap to allow air bubbles to be discharged into the process piping.

Gas measurement:

When measuring the gas flow, the pressure tap should be opened on the top or side of the process piping. And the transmitter should be mounted beside or above the process piping so that the accumulated liquid can easily

flow into the process piping.

Steam measurement:

When measuring the steam flow, the pressure tap should be opened on the side of the process piping and the transmitter is installed below the pressure tap so that the pressure tube can be filled with the collected cold liquid. It should be noted that when measuring steam or other high temperature media, the temperature should not be higher than the limiting operating temperature of the transmitter. When the measured medium is steam, the pressure tube should be filled with water to prevent the steam from directly contacting the transmitter so that the volume change of the transmitter is negligible when the transmitter is working, and there is no need to install a condensing tank.

Level measurement:

The differential pressure transmitter used to measure the liquid level is actually the static head that measures the liquid column. This pressure is determined by the level and the specific gravity of the liquid, and it's equal to the liquid level above the pressure tap multiply by the specific gravity of the liquid, regardless of the volume or shape of the container.

● Liquid level measurement of open containers

When measuring the liquid level of the open container, the transmitter is mounted close to the bottom of the container to measure the pressure corresponding to the liquid level above the transmitter. The pressure of liquid level in the container acts on the high-pressure side of the transmitter while the low-pressure side is connected with the atmosphere. If the lowest level of the measured level changes is above the place where the transmitter is mounted, the transmitter must make the positive transfer.

● Level measurement of closed containers

In the closed container, the pressure P0 of the container above the liquid affects the measured pressure at the bottom of the container. Therefore, the

pressure at the bottom of the vessel is equal to the liquid level multiply by the specific gravity of the liquid plus the pressure P0 of the closed container. In order to measure the actual level, the pressure P0 of container should be subtracted from the measured pressure at the bottom of container. For this reason, open a pressure tap on the top of the container and get it connected to the low-pressure side of the transmitter. Thus, the pressure in the container acts on both the high and the low pressure sides of the transmitter at the same time. As a result, the differential pressure obtained is proportional to the product of the liquid level and the specific gravity of the liquid.

● Pressure connections

1) Dry pressure connection

If the gas above the liquid does not condense, the connecting tube on the low-pressure side of the transmitter will remain dry. This condition is called the dry pressure connection. The method of determining the measurement range of the transmitter is the same as the method of determining the measuring liquid level of opening container.

2) Wet pressure connection

If the gas above the liquid condenses, the liquid will gradually accumulate in the pressure tube on the low-pressure side of the transmitter so that the measurement error is caused. In order to eliminate this error, a certain liquid is previously filled in the pressure tube on the low-pressure side of the transmitter, which is called the wet pressure connection.

In the above case, there is a pressure head on the low-pressure side of the transmitter, so the negative transfer must be performed.

Reduce the error

The pressure tube connects the transmitter to the process piping, and transfers the pressure at the pressure tap on the process line to the transmitter. The causes of errors in the pressure transfer process are as follows:

1) Leakage;

2) Wear loss (especially when the detergent is used)

3) There is the gas in the liquid pipeline (causing the pressure head error).

4) Accumulated liquid in gas pipeline (causing the pressure head error)

5) Density difference between the pressure tubes on both sides due to the temperature difference (causing pressure head error)

The methods of reducing the errors are as follows:

1) The pressure tube should be as short as possible.

2) The pressure tube should be connected upward to the process pipeline and its slope should be less than 1/12 When measuring liquid or steam.

3) For the gas measurement, the pressure pipe should be connected downward to the process pipeline, and its slope should be not less than 1/12.

4) The layout of the liquid pressure pipeline should avoid the occurrence of high points in the middle, and the layout of the gas pressure tube should avoid the occurrence of low points in the middle.

5) The two pressure should maintain the same temperature.

6) In order to avoid the influence of friction, the diameter of the pressure tube should be large enough.

7) There should be no gas in the pressure tube filled with liquid.

8) When using the spacer liquid, the liquid in the pressure tubes on both sides should be the same.

9) When using the cleaning agent, the connection of the cleaning agent should be close to the pressure tapping of the process pipeline. The length and diameter of the pipes through which the cleaning agent passes should be the same. The cleaning agent should be prevented from passing through the transmitter.

2.3 Electrical Installation

Wiring diagram of system:

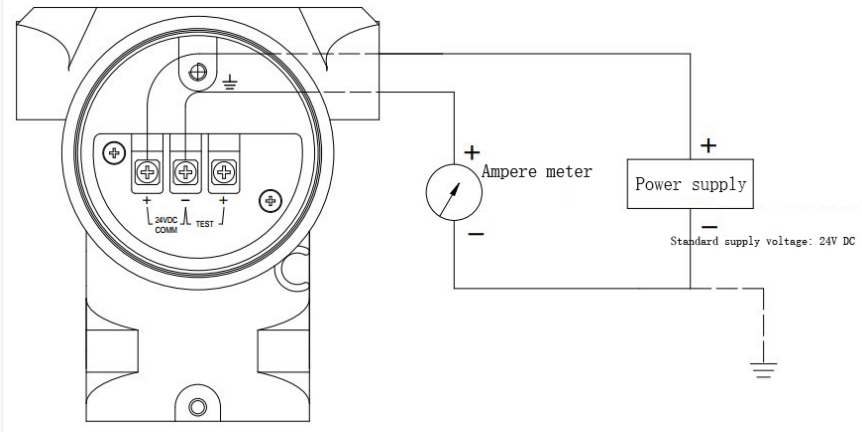


Figure 2-6

(Note 1: Please refer to the usage methods of distributor and safety barrier if the users require the distributor or safety barrier according to the site and design requirements.)

It is recommended to wire the explosion-proof cable to the terminal, the

! Pay special attention:
Do not connect the signal line with power to the test terminal, otherwise the diode inside the test terminal will be destroyed.

the wire connection. The upper terminal is the signal terminal and the lower terminal is for the test meter. Figure 2-11 shows the terminal position. The test terminal is used to connect with the optional indicator or for testing. The power is sent to the transmitter through the signal line, no additional wires are required.

If the diode is damaged unfortunately, the direct connected (not through the shield plate) test terminal can make the transmitter keep working, but it will not be able to connect to the local indicator.

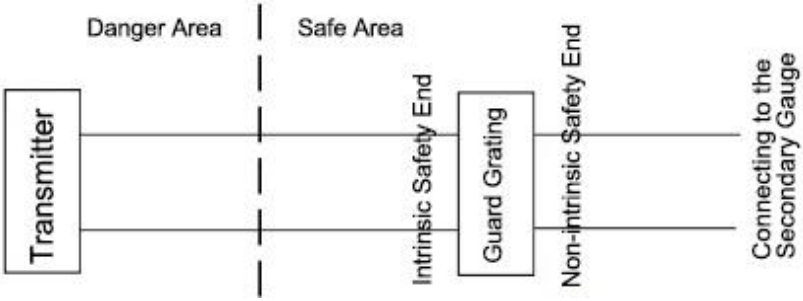
The signal line does not need to be shielded, but the effect will be better if the stranded wire is used. The signal line should not be arranged together with other power lines, or near the heavy current installation.

The threading hole of the transmitter housing should be sealed or inserted with a plug coated with the sealant, so as to prevent the moisture accumulation in the housing. If there is no sealing for the wiring, during the transmitter installation, the threading hole should face downward to discharge water.

The signal line can be un-grounded (floating) or the ground connection can be on the arbitrary point of the signal loop line. The transmitter housing can be grounded or un-grounded; there is no voltage stabilization requirement for the power supply, and even if the peak-peak value of the power ripple reaches 1V, the transmitter output ripple can still be ignored. Because the ground connection of the transmitter is through capacity coupling, please don't use the high voltage tramegger to check the insulation resistance. The voltage to be used to check the lines should not be more than 100V.

The transmitter circuit design is the intrinsic safety circuit, and the output current is limited below 24mA DC (24mA DC under the condition of high temperature or high supply voltage).

2.4 Intrinsic Safety Explosion-proof Type Transmitter System Wiring Diagram



Ui:28v DC	Um ≥ 250V AC/DC
Ii:30mA	Uo ≤ 28V DC
Pi:0.84W	Io ≤ 30mA

Notes: ① Please refer to GB3836, 4-2000 standards for the definitions of Vm, Vo, Io, Po, Vi, Ii and Pi.

② The maximum allowable distributed capacitance CP for the wire or cable connection between the guard grating and the transmitter is not greater than 0.02uF, and the maximum allowable distributed inductance LP is not greater than 2.0mH.

2.5 Isolation Explosion-proof Type Transmitter Instruction

■ During the installation for the isolation explosion-proof type transmitter, attention should be paid to the protection for the explosion-proof joint face and the explosion-proof measures; the end cover must be screwed tightly and the locking device must be locked tightly; the housing should be grounded; during the loading and unloading for the parts of the plane gap, please prevent the gap from becoming bigger caused by plane collision and scratch; please prevent the housing from falling, crash or damage, so as not to reduce the strength; after the completion of the instrument maintenance inspection, all the bolts, housings and wires must be fastened, and cannot be damaged, or else the explosion-proof performance will be lost.

■ For the isolation explosion-proof type transmitter, it is forbidden to open or loosen the end cover or housing under the energized condition on site.

■ The isolation explosion-proof type transmitter has two outlet ports, and one of them is adopted for leading in cable connection, and its cable connector should adopt the dedicated compression nut type explosion-proof leading-in device. The tightly screwed hollow bolt, gasket, sealing rubber ring are set along the external diameter of the cable, put into the port and screwed tightly; the sealing ring must be ensured to be tightly packed along the external diameter of the cable, and the hollow bolt must be screwed in for over 6 screw threads. The other outlet port must be equipped with the sealing rubber ring, gasket, solid bolt as well, and the solid must be screwed tightly; it must be screwed in for over 6 screw threads, too. In order to meet the explosion-proof requirements, the cable with the model KVVR with the diameter of 1.5*4 and the outside core diameter of 10mm(10.5mmMAX) should be selected.

■ The structure and parts of the isolation explosion-proof type transmitter has passed the strict inspections and tests according to the isolation explosion-proof type standard, conforming to the regulation of the national standard GB3836.2—2000 Explosion-proof Electrical Equipment and Isolation Explosion-proof Type Electrical Equipment “d” Applied in the Explosive Environment, and its symbol is Exd II BT6 Gb.

3.Debugging and Operation

3.1Overview of LCD display functions

The user can set the variables and decimal number of LCD displayed by configuration software. See "instrument configuration" → "output characteristics" in configuration software Settings section.

LCD supports bivariate display. Display variables that can be set include current, percentage of pivot variables and pivot variables.Each variable can be set independently to display the decimal position: 0, 1, 2, 3, 4.

If two display variables are the same, the LCD displays only one variable.Otherwise, the LCD will alternately display the set display variables at 3-second intervals.

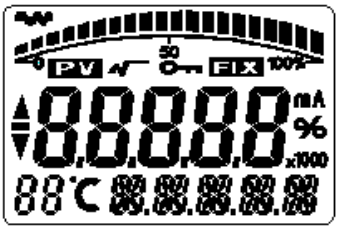


Figure 1-1 LCD Full light display image

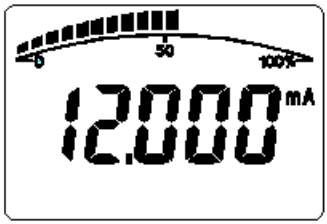
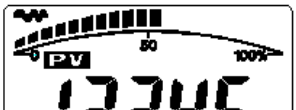


Figure1-2 Current display image



Other display instructions:

If it is in the communication state, the symbol  will flash in the upper left corner of LCD.

If the output is square root, the LCD will display  .

If the output current is fixed, LCD will display  .

If write protection is activated, LCD will display  .

If the temperature display is activated, the normal display in real time is that the “88” character in the lower left corner of the LCD displays the temperature, and the temperature is displayed as the symbol  when it’s below -19 ° C or above 99 ° C.

3.2 Key functions

The main variable can be adjusted to zero, zero shift [zero adjustment], range shift [full adjustment] by pressing the keys. It can set the unit, range, damping, and display variables by pressing the keys.

3.2.1 Quick reference table for key function codes

When key configuration is used on site, the "88" character in the lower left corner of the LCD is used to indicate the type of the currently set variable, that is, the setting function performed by the current key. The corresponding relationship is:

Display of "88" Character in lower left corner:	Variables setting
0 or empty	Normal display
1	Enter the operation code (you can directly enter the number corresponding to the function below to directly set the corresponding function)
2	Set the unit
3	Set the lower range limit
4	Set the upper range limit
5	Setting the damping
6	Zero adjustment of main variables
7	Zero shift and span shift [Zero and full adjustment]
8	Output characteristics [Set linear output or square root output]

Note: By entering the operation code corresponding to each function, you can quickly enter the corresponding function. For example, enter “5” to directly enter the damping function.

3.2.2 Key Mode Description

This product supports two operation modes: "two-button" and "three-button".

"Three-button" operation mode: faster operation, suitable for products with 3 buttons on the LCD. At this time, the key Z is used to enter the prompt data setting interface and shift. The key S is used to enter the data setting interface, add numbers and save data. The key M is used to save data.

"Two-button" operation mode: This operation mode is usually used when there are only two non-contact keys on the outside. At this time, the key Z is used to enter the prompt data setting interface and shift. The key S is used to

enter the data setting interface, add numbers and save data.

3.2.3 Data setting method

When the character "88" in the lower left corner show 1 ~ 7, it means that the transmitter is in the field configuration mode. At this time, you can enter the password, modify the parameters, or make the migration through the keys.

During data setting, the key "S" is used to adjust numbers and decimal points, the key "Z" is used to shift, and the key "M" is used to save.

The setup process is as follows:

1. Press the key S to enter the data setting interface. At the same time, the sign bit starts to flash, which indicates that the sign bit can be modified.

2. If you press the key S again, you can switch the plus and minus of the data (the positive sign is indicated by the up arrow).

3. Press the key Z, the first digit starts to flash, which indicates that it can be modified. At this time, press and hold the S key for a long time or multiple times, and the setting number is cycling between 0-9.

4. Press the key Z again to set the numbers for the second to fifth digits in sequence. The setting method is exactly the same as the first digit.

5. After setting the number for the fifth digit, press the key Z to start setting the decimal point. The four decimal points start flashing at the same time, which indicates that the decimal point can be set. At this time, press the key S, and the positions of the decimal point will cycle.

6. After the decimal point setting is completed, press the key Z, the lower left arrow starts blinking, which indicates that the setting can be saved.

7. Press the key S to save the setting; press the key Z, the sign bit starts to flash, and the data can be reset.

Note: In the "three-button" operation mode, you can press the key M at any time during the data setting process to quickly save the settings, and you do not have to wait until the down arrow flashes before you can save the settings.

3.3 Key operation instructions

3.3.1 Main variable zero adjustment (clearing) function

In the real-time normal display state, press the "M" and "Z" key at the same time, and hold it for 5 seconds to directly enter the zero adjustment function of main variables.

Note: 1. Only the circuit boards with software version 1.4 or later can support the fast entry function through "M" and "Z";

2. For earlier versions, you need to enter the operation code "2" to enter the setting function, or enter the operation code "6" to enter directly.

After entering the function of "zero adjustment of main variable", the function code in the lower left corner displays "6", the current main variable value is displayed in the middle, and the lower area displays "YES" or "NO".

- When “YES” is displayed, press the key “M” or “Z” to execute the operation of “main variable zero adjustment”. After performing this function, the output pressure is "0".
- When “NO” is displayed, press the key “M” or “Z” to end the operation of “main variable zero adjustment”.
- Press the key "S" to switch between "YES" and "NO".

3.3.2 Configuration function

(1) Features Overview

In the normal real-time display state, press the key Z to enter the configuration data setting state.

After entering this state, "01" is displayed in the lower left corner of the LCD, prompting for the operation code. Enter the different operation codes to enter different function setting interfaces. After the corresponding function is set, the cycle setting is performed automatically.

The operation code input, the settings of range upper and lower limits and damping can be completed as described in the point 2.2. about the Data Setting Method.

Description:

- In the two-key setting mode, when the down arrow flashes, press the key S to implement the saving function of key M.
- If the setting data exceeds the limit, the LCD displays "OVER". At this time, press key S or Z to reset.
- After the configuration data is set and returned to the normal display

Display of "88" Character in lower left corner:	Variables setting
2	Set the unit
3	Set the lower range limit
5	Set the damping
6	Zero adjustment of main variable
8	Output characteristics [Set linear output or square root output]

state, if the user presses the key Z again within 10 seconds, the configuration setting process is restarted, and the verification step of the input code is skipped.

- After entering the configuration data setting, if no button is pressed within 2 minutes, it will return to the normal display.
- If you enter the operation code in "Function 1", perform the following functions:
- Enter “×××× 2” (that is, the first 4 digits can be any number) to enter the unit setting.

- Enter “×××× 3” (that is, the first 4 digits can be any number), then enter the lower limit setting of the range.
- Enter “×××× 5” (that is, the first 4 digits can be any number) to enter the damping setting.
- Input “×××× 6” (that is, the first 4 digits can be any number), then enter the zero adjustment of main variable.
- Enter “×××× 8” (that is, the first 4 digits can be any number), then enter the output characteristic adjustment.
- If you enter other data, it returns to the normal display. This can avoid artificial misoperation.

⑵ Set the unit

During the process of setting the unit, the currently selected unit is blinking dispalyed in the lower right corner of the LCD. The unit setting process is as follows:

（1）Press the key "S" and select the main variable unit in turn; (kPa, Torr, atm, MPa, inHO, inHG, ftHO, mmHO, mmHG, psi, bar, mbar, gcm, kgcm, Pa, etc.)

（2）Press the key "Z" or key "M" to confirm the currently selected of unit main variable, and directly enter the function interface of "range lower limit setting".

Description:

- The display unit "I4H2O" means: 4 degrees Celsius inch water column;
- The display unit "m4H2O" means: 4 degrees Celsius millimeter of water column;

⑶ Set the range

When setting the range, you must first enter the “Lower Range Limit” and then the “Upper Range Limit”.

During the range setting process, the operation code in the lower left

corner displays "03" or "04", inputing "lower limit" and "upper limit" respectively. After inputting the lower limit of the range, it will automatically enter the setting of the “upper limit of the range”.

For data input method, refer to "2.2 Data Setting Method".

⑷ Setting damping

You can directly enter the setting damping page by entering the operation code "5", or directly enter the setting damping after setting the upper limit of the range.

When the operation code in the lower left corner shows "05", it means the damping value setting. The input range of the damping value is 0 to 32 seconds.

For data input method, refer to "2.2 Data Setting Method".

Special note: If the input damping value is "05678", the operation of "restore factory settings" will be performed automatically. ["data backup" operation needs to be performed before leaving the factory]

⑸ Setting output characteristics

For the output characteristics setting, the lower right corner of the LCD blinking display the currently selected output characteristic (linear LIN output or SQRT output). The setting process is as follows:

1）Press the key "S" to select the current output mode in sequence; (LIN, SQRT)

2) Press the key "Z" or "M" to confirm the currently selected output characteristics, and end the current round of settings to return to the "End Setting" function interface [function code "0" is displayed at the bottom left of the LCD]. If there is no key operation within 10 seconds, it will return to the normal display, otherwise it will continue to set from the range unit [no need to enter the operation code again].

Note: LIN means linear current output; SQRT means square root output.

3.3.3 Zero shift and range shift [Zero and Full adjustment]

In the real-time normal display state, press the keys "Z" and "S" simultaneously and hold for 5 seconds to enter the zero shift and range shift states. At this time, the operation code in the lower left corner displays "07", which indicates that zero and full adjustment can be performed.

"Zero shift", that is, "zero adjustment" operation: the current pressure is set to the lower limit of the range, and the output of transmitter is adjusted to 4mA.

"Range shift", that is, "full adjustment" operation: the current pressure is set to the upper limit of the range, and the output of transmitter is adjusted to 20mA.

During the setting process, if no key is pressed within 2 minutes, it will return to the normal display state.

3.3.4 Display variable settings

The LCD can display one of the three variables including "current", "percent" and "main variable" or alternately display two of them (interval time 4 seconds). In the real-time normal display state, you can use the key S to change two display variables. When the two display variables are set to the same parameter, one variable is fixed on the screen; When the two display variables are set to different parameters, The two variables are displayed alternately on the screen.

The method is as follows: press the key "S", the current display variable (such as: current) changes, and the "current, percentage, and main variable" are displayed cyclically. Release the key "S", which realizes that the display variable "current" is changed to "main variable".

Example:

Assuming the current display variable is "current", it needs to be set to: alternately display "main variable" and "percentage".

Step:

Modify the first display variable: press the key "S", the LCD will display

"current, percentage, and main variable" cyclically. When the "main variable" is displayed, release the key "S". At this time, the LCD displays "main variable" and "current" alternately.

Modify the second display variable:

when the LCD displays "current", press the key "S", the LCD will cycle to display "current, percentage, and main variable". When the "percent" is displayed, release the key "S" and then it's set successfully.

Note: This function is only supported by boards with software version number 2.5 or higher, and decimal point digits of the "current" and "main variable" are automatically switched to three digits, and "percent" is automatically switched to one digit after adjustment with the keys.

3.3.5 Restore factory settings

If the configuration and other data of transmitter has been backed up when it is shipped from the factory, you can restore the data on the spot by entering the damping "5678".

"Configuration data backup": Run the HART-CONFIG Tool software, in the "additional functions" option under "advanced functions", click the "data backup" button, you can carry out the backup of unit, range, damping and other information for the transmitter.

There are several ways to restore backup data:

1) Through the HART-CONFIG Tool software, enter the damping "5678" on the "Output Characteristics" page under "Instrument Configuration", and then click "Write" to restore the backup data. [Hint: When writing data, it may prompt "communication failure", which is normal and does not affect data recovery because 5678 is not a valid damping value]

2) Recovery the backup data via HART375 handheld device.

Under "Detailed Settings" → "Signal Status" → "Damping", input damping "5678" and write it to restore the backup data. [Hint: When writing data, it may

prompt "communication failure", which is normal and does not affect data recovery because 5678 is not a valid damping value]

3) By pressing the key, enter "05678" and save when inputting damping in the 5th item, and the backup data will be restored. [This operation does not affect the actual damping value]

4.The flange transmitter installation & operation instructions

4.1 Overview

Monocrystalline silicon differential pressure transmitter or monocrystalline pressure transmitter was connected by flange and the parts to be tested. It was applied to the conditions as below.

① Put the high temperature medium and transmitter in insulation.

②The measured medium is corrosive to the transmitter sensitive element.

③The measured medium is suspension liquid or with high viscosity.

④The measured medium is easy to solidify because of the changing of environment or temperature.

⑤ Use the measuring head that will be purified strictly to replace the measured medium.

⑥ Make sure the measuring head is cleaned. Capacitive flange differential pressure or pressure transmitter will be used to measure the differential pressure parameter of liquid, gas and vapor and the liquid level, interface and density of liquid. The measuring head can measure the flow rate of gas, liquid and vapor and put the measured signal changed into 4～20mA DC two-wire system signal output together with orifice set, which will be regarded as instructions, records and the input signal of regulator to constitute automatic detection, records and controlling industrial automation system together with other instruments or industrial controlling computer.

4.2 Installation site

The flanged level transmitter was made by installing the flange into the tank or tank wall. When the pressure diaphragm position being strictly vertical the maximum zero changing is 28mm H2O. When the pressure diaphragm position being strictly horizontal the minimum zero changing is 100mm H2O, when will be eliminated if it has no influence for the range. (we need to add a insertion length variation for the plug-in flange.)

4.2.1 The installation site for the fareastone flange

When installing the fareastone flanged transmitter, there are restrictions on the height difference between pressure transmitter and flange and differential pressure level transmitter and flange.

We can see the data as below.

Range No.	Permissible height difference	
	Filling silicone oil	Filling fluorocarbon oil
4	3.84	1.89
5	19.2	9.48
6、7、8	Without this limit	

When pressure transmitter and flange or differential pressure level transmitter and flange are not in a same height, the zero will be changed because of the

liquid column affecting. So it should be returned to zero after installation.

4.2.2

The changing of the measured medium temperature and environment will cause the zero drifting of transmitter. It can reduce the impact if we install as the methods below.

1.The transmitter and fareastone equipment does not shined by the sun directly.

2.Adjust zero with the changing of season.

3.Maintain the temperature constancy of fareastone capillary.

4.3 Calibration instrument

The calibration of flanged transmitter is generally same with normal transmitter. The only difference is that it needs certain equipment to make seal connection with flange. This equipment will show us the measurement standard pressure.

4.3.1 Flanged level transmitter

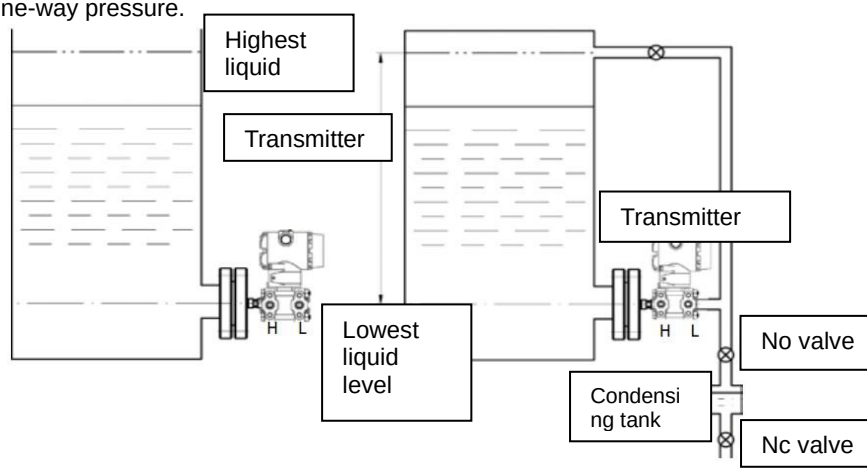
There are some notes in the using of flanged level transmitter. Flat flanged level transmitter should be used for normal sticky medium. Inserted flanged level transmitter should be used for big viscidity, easy to precipitate and suspension liquid medium. The measuring diaphragm must be penetrated into tower inwall, at least next to tower inwall. The measured medium may abrade the diaphragm if it has big flow rate and strong grinding. It can be used after adopting corresponding measures.

The measurement computing method of flat flanged level transmitter and inserted flanged level transmitter is same.

4.3.2 Using without migration (see below figure)

The instrument should be installed in the lowest liquid level as the same horizontal height. When we measure the open capacity, negative pressure diaphragm plate of instrument will be filled in atmosphere. When we measure the sealed container, the upside of vessel will be covered in negative pressure

side diaphragm plate. If the side of negative pressure can keep dry, condensing tank will not be installed. Or condensing tank will be installed. The condensate will be drained away from the tank. Turn off the NO Valve when the condensate was drained away in order to make transmitter to support one-way pressure.



4.3.3 Using with negative migration (see below figure)

If it is inconvenience for installing condensing tank, or in order to prevent corrosive medium into negative pressure side, we can use spacer fluid as figure 4. In this situation, the differential pressure of the instrument is:

$\Delta P=r_1(H+H_0)-r_2h=r_1H-(r_2h-r_1H_0)$

Volume of migration：$B=r_2h-r_1H0$

Range：P=r

Example：

Density of the measured medium: $r_1=1.4g/cm^3$，$r_2=0.89g/cm^3$

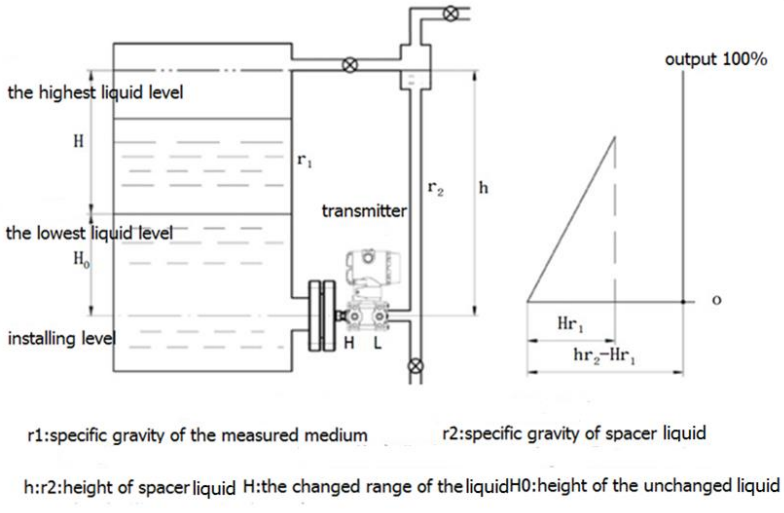
H=500mm，H0=100mm, h=1700mm

Range : $\Delta P=r1\cdot1=1.4\times500=2100(mmH_2O)$

Volume of negative migration:$B=r_2h - r_1H0$

$=0.8\times700-1.4\times100=1220(mmH_2O)$

Before installation the range shall be adjusted to -1220~880（mmH_2O）



4.3.3 Using with positive migration (see figure below)

When the instrument is installed below the lowest liquid level, the usage is shown in the following figure.

Range : ΔP=（H_0＋H）r

Volume of migration: A=H_0r

Example:

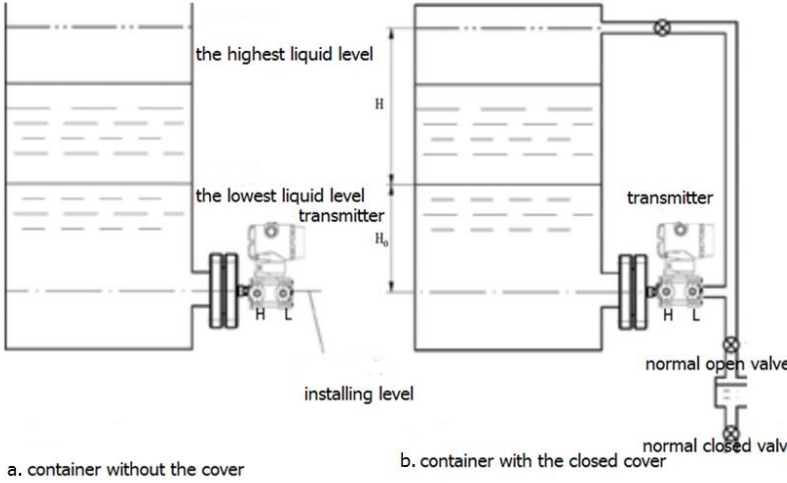
Density of the measured medium r=1．1g/cm^3

H=910mm，H_0=820mm

Range: P=H • r=910×1．1=1001≈1000mmH_2O

Volume of positive migration: $A=H_0r=820\times1.1=902\approx900mmH_2O$

Before installation the range shall be adjusted to 900~1900（mmH_2O）



a. container without the cover

b. container with the closed cover