



Yantai Auto Instrument Making Co.,Ltd.

# Differential Pressure Transmitter

## User Manual



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## ➤ First.Summary

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Smart pressure transmitter is a new-type smart instrument researched and developed by our company along with some Internal companies under international advanced technology.

The meter has temperature and non-linearity compensation under micro processing technology,improved meter measurement accuracy and temperature feature,expanded range ration,added the function of intelligent configuration,further meet the reliable and stable requirement for industrial field.Key component and parts are imported and strict test is done before delivery.

The meter has advanced design principle,reliable product quality,variety, simple installation and usage etc features.

## ➤ Second.Feature

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### 2.1 product feature

■real-time to revise meter configuration in meter process:

Ex.adjust range (span) ,monitor variable etc.

■intelligent linear process pressure signal,insure reliability and accuracy of the measuring data

■on the circuit board there is reverse protect circuit,current foldback circuit,avoid circuit accidental damage.

■parameter store in E<sup>2</sup>PROM after configuration,remain unchanged

■high accuracy and reliability

■solid-state element,plug type electronic circuit board,anti-vibration

■anti-explosion structure,all-weather use

### 2.2 Function and specification

■range:see parameter selection table

■zero and span:

Adjust via span and zero button or Hart handheld smart terminal remote adjustment.

Zero plus or minus migration:

Zero minus migration,LRV must greater or equal-URL;zero plus migration,URV must less or equal than +URL.Test range must be greater or equal minimum range.



■output:

4-20mA, linear or SQRT

Digital process variate super position on 4-20mA signal for Hart protocol.

■damping timing constant

Timing constant adjustment is possible, 0.1 second increase, from minimum to 16 second.

■environment temperature limitation:

General: -40~85°C

LCD header: -20~70°C

■process temperature limitation: -40~104°C

■storage temperature limitation: -51~85°C

■environment humidity: 0-100% relative humidity

■dimension variation: less than 0.01 in<sup>3</sup> (0.16 m<sup>3</sup>)

■static pressure: 13.79 Mpa

■over pressure limit: no damage for 0~13.79 Mpa pressure on any side of transmitter

### 2.3 performance

(zero-based calibration range, silicone oil, 316L stainless steel isolation diaphragm)

■Max ref accuracy: ±0.075% calibration range

■stability: 6 months, ±0.1% URL

■environment temp influence: -29~85°C

Zero error: ±0.2% URL/56°C

Overall error: (±0.2% URL + 0.18% calibration range)/56°C

■static pressure influence:

Zero: range 4~8, under 13790 kpa, ±0.25% URL; range 3, ±0.5% URL. it is possible to revise zero

Error online via re-adjustment.

■vibration impact: at any axis upwards, under 200 Hz, 0.05% URL/g

■power impact: less 0.005% output range/volt

■load impact: no load impact unless supply voltage changed

■electromagnetism/RF interference (EMI/RFI impact):

From 20 to 1000 MHz, field intensity up to 30 V/M, output drift less than 0.1% of the range

■installation impact:

Max zero drift is 1 in H<sub>2</sub>O (0.25 kPa). It is possible to revise all zero drift. no impact on range.

### 2.4 transmitter structure material



- isolation diaphragm: 316L stainless steel, HC, Monel, tantalum
- vent: 316 stainless steel, HC, Monel
- flange and adaptor: 316 stainless steel, HC, Monel
- wetted "o" rings: fluororubber
- fill fluid: silicone oil
- bolt: 316 stainless steel
- electric housing: low copper alloy aluminum

### ➤ Third. Work Principle

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Smart circuit board used advanced integrated circuit and SMT technology, making switching and processing circuits concentrate on one circuit board.

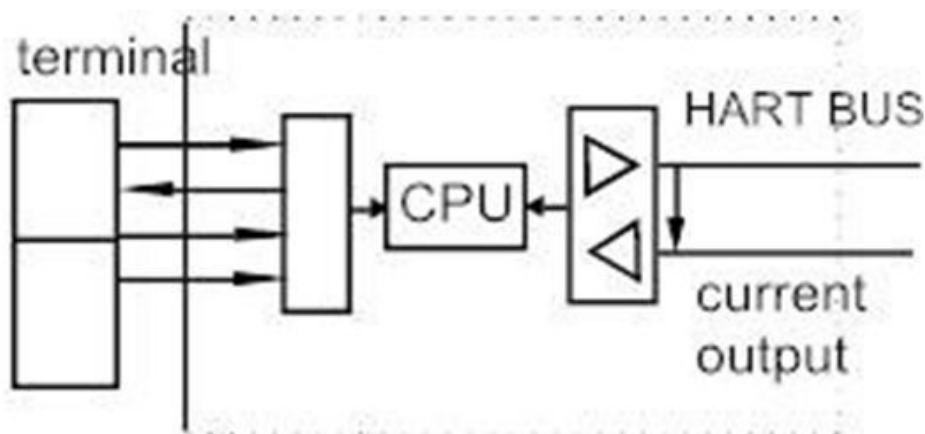
Microprocessor of transmitter controls the work for A/D and D/A conversion modules, has digital communication and self-diagnose function.

Microprocessor controlling A/D conversion module takes sample and transfer for the analog signal from sensitive element, transfer into digital signal.

Microprocessor processes the digital signal including signal linear, temperature compensation, engineering unit conversion etc.

It also has the function of characterization, range, damping time etc.

E<sup>2</sup>PROM stores all the configuration and tuning parameters, stored parameters will not miss even meet outage because of its non-volatile storage feature.



### ➤ Fourth .Installation

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Flow or liquid measuring quality, to a large extent depends on the transmitter and the pressure pipe of the correct installation. Flow measurement accuracy, the correct installation of a measuring element is also important.

Taking into account the processes and economic factors, flow or liquid transmitters often only be installed in harsh environment. However, the transmitter should be possible to install in a temperature and accommodation gradient and temperature fluctuations in small places, to avoid vibrations and shocks.

## 1. Install

If directly installed transmitters at the measuring point, can be support by the connecting pipe. Can also be installed on the dial or on the mounting bracket which is installed on the 2" pipe.

Transmitter flanges connecting hole is 1/4-18NPT (taper pipe thread); and flange connecting is 1/2-14NPT. Unscrew the screws of the flange joint, the transmitter easily from process pipes apart. Two flanges connecting holes center distance 54mm (2 1/8"), the connecting tube can be directly installed in France. Rotate the flanges contact can change the space to a distance of 51mm, 54mm or 57mm (2", 2 1/8", 2 1/4") in three sizes: ((high span transmitter such as 6, 7 and 8 center a little wide fear. Because they fear is more than standard of 54mm center two flange, not available to connect with a standard three valve manifold.

To ensure that the flanges to be sealed shall be in accordance with the following steps to install, hands tighten the two screws, then using a wrench, tighten the first screw up.

Transmitter ontology can turn in the flange, as long as you keep the flange interface is vertical, rotate the transducer ontology cannot cause the change of zero. If the mounting flange (for example, in a vertical pipe flow) must be caused due to the different connecting pipe height hydraulic head, the influence of the need to zero.

## 2. pressure conduct pipe

Transmitter relative flow of the pipes properly installed, depending on the test medium, the following circumstances should be taken into account to determine their best installation location.

1. Corrosion or overheating media can't contacts transmitter.
2. To prevent slag in the pressure tube with sediment
3. two pressure pipe of the hydraulic head should be maintained in balance.



4. Pressure pipe as possible possible short.

5. pressure pipe should be installed in small temperature fluctuations and temperature gradients places.

Measurement of fluid flow, pressure would be installed in the process piping on the side, to avoid lag deposition. Transmitter should be installed in the side or the pressure of population below, so that the gas released into the process piping.

Measurement of gas flow, pressure would be installed in the process tube top or on the side. Transmitter should be installed in the side or the pressure of the population, so that the fluid released into the process piping.

Measuring steam flow, pressure would be installed in the flow pipe side. Transmitter should be installed in the side or the pressure of population below, so that the cooling fluid flows to pressure pipe.

Use side vent/drain valve of the transmitter, take the side of the mouth should be installed in the pipeline pressure, working medium is liquid, vent/drain valve on the top.

In order to eliminate gas, gas for working medium, the drain valve should be in the following,

In order to eliminate effusion. The flange turn 180 degrees. Can change the side vent/drain

Valve of the upper and lower position.

Note, when measuring steam or other high temperature medium, should not make the transmitter operating temperature more than the limit, is used for steam, pressure pipe shall be filled with water, in case of contact with the steam in the transmitter, due to the volume change of the transducer is small, don't need a condenser.

Transmitter connected to the measuring medium inlet pressure transmission line is the Taking pressure to the transmitter. In the transmission of pressure may cause the error for the following reasons:

1. The leakage

2, the friction loss

3, the liquid product set gas pipeline (pressure head error)

4, product set liquid gas pipeline (pressure head error)

5, the two pressure between the tube and the change of the temperature difference caused by density (pressure head error)

The method of reduce error:

1, the pressure pipe short as far as possible

2, to measure the liquid or steam, pressure piping to connect up to the process piping, the

Slope is not less than 1/12.

3. Lead to gas pressure pipe to connect down, the slope is not less than 1/12.

4. Liquid flow pipeline survey points lower, gas pipeline are higher.





- 5,the two pressure pipe should be kept the same temperature.
- 6.In order to avoid friction,pressure pipe diameter should be big enough.
- 7.Ensure that all of the gas from the fluid pressure pipe excluded.
- 8.When using the isolation liquid,two pressure pipe liquid level should be the same.
- 9.the use of injection system,injection system should be close to the process piping as far as possible to take pressure.Purification after the size off low at the same time,the length of pipe to the transmitter,to avoid injection fluid through the transducer.
- 10.To ensure that the intensity of the induced pressure pipe has enough to endure the rated working pressure.

### **3.connection wiring**

Power-the signal terminal is located in the electrical wiring within the shell side.Wiring,the plaque can be marked with"wire side"on the other side of the lid,the upper terminal is power-signal terminal,the lower terminal for testing(experiment)or indicator of terminals.The test terminal is the same as the power-signal terminal4-20ma DC current signal;It is used to connect indicating instrument or test.Power supply is a signal to the transmitter,do not need additional line.Note,don't put the power-signal received first test (experiment),otherwise,it will burn out diode.If one thousand burnout,to make the transmitter to work properly,can connect the two test terminal.

Signal line does not require shielding,but with two twisted wire works best.Do not signal line together with other power cord out through conduit or trunking,nor in the vicinity of power equipment through.

Electrical wiring hole on the housing shall be sealed or plugged(seals),to prevent the water in the electric case,if the hole is not sealed wiring,electrical casing should be installed down to the drain

Signal lines can be floated or any point in the signal circuit grounding.Transmitter shell can be grounded or not grounded.Power supply voltage requirements is not high,the power supply voltage fluctuation in time1v.the impact on the output signal can also be ignored.

Because of the transmitter is grounding capacitive coupling,check the insulation resistance can't use high voltage megohm meter.Line inspection only apply mutatis Mutandisto no greater than 100v voltage.

4-20maDC output current in the transmitter,no more than 30maDC.

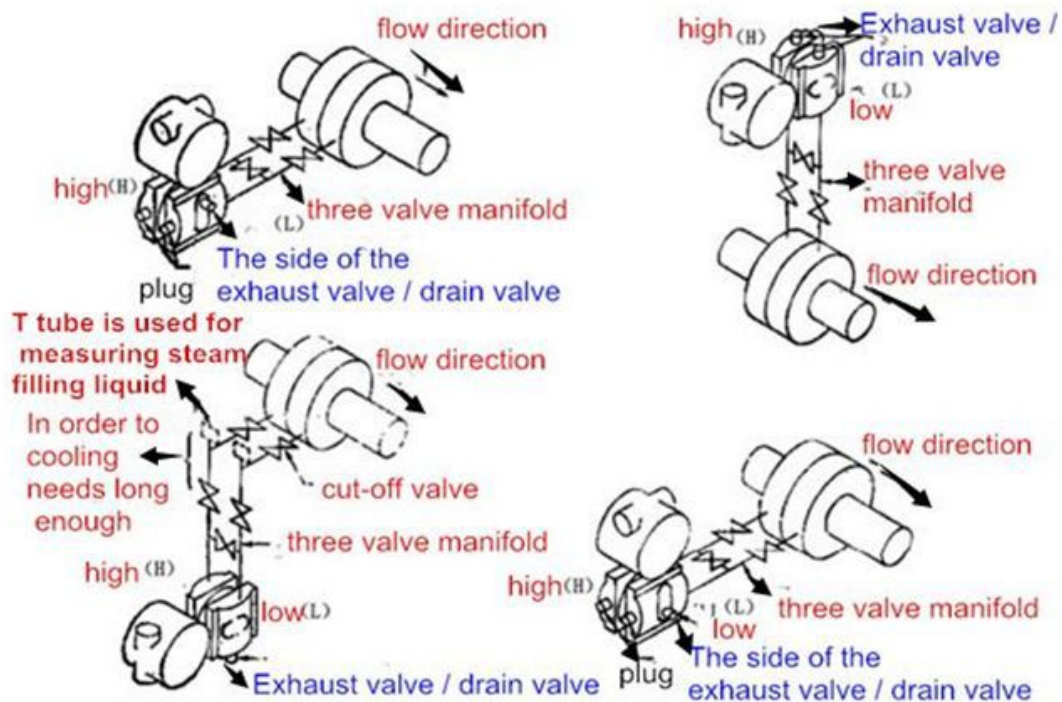
### **4.the dangerous sites to install**

To keep the installation of the transmitter explosion-proof function,must pay attention to the



subordinate.

- 1.The lid must tighten with the hand,may not damage the thread.
- 2.The sensitive parts of shell screw-in electrical shell at least six circles.
- 3.The wiring holes must use appropriate packing seal
- 4.If a connection hole on the shell need not,must use the threaded metal plug,screw in at least six times.
- 5.The shell of road side and electrical wiring between lateral sealing layer is allowed to damage,terminals must be in good condition.
- 6.Good range and zero adjustment collar.



Install (media is gas)

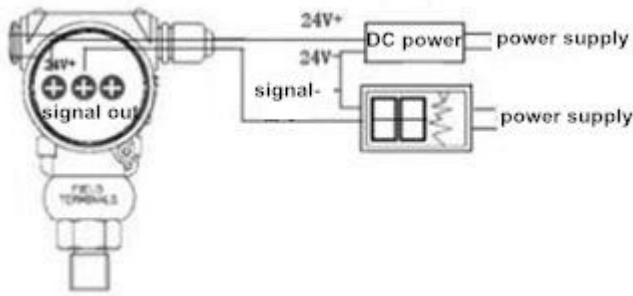
Measuring the steam,the steam cannot pass into the transmitter.When cleaning close the cut-off valve,to again filled with water before use.

## ➤ Fifth .operation instruction

### 1. Wiring diagram

Connection circuit shown in Figure IV





Figure,PUS for 24V power supply,TX for two-wire transmitter.As shown in Figure IV.LR is the load resistance,allow load resistance as 230~600Ω. In fact,the power,the transmitter and the load resistor can be connected in any order.

Loop can be in series across the resistor shunt ammeter or voltmeter  
 The handheld terminal cannot be directly connected across the two ends of the power supply, but can take on both ends of the field(A,B), can also be connected across the load resistor(B,C)(in both cases,the power supply circuit to go through powered)

## 2.Handheld devices debugging method

### (1).Starting Communications

HT388

Self Inspection

Pls wait

After the transmitter,power supply,250-ohmload is connected properly and HT388,press interface "on/off" button, to make it work.Each time you turn on,communication interfaces make self-test in order.After the self-test finished,the communication interface to start inquiries transmitters,such as found on display:

YYYtransmitter

Station No.r=XXXXXXXX

Press Key Enter continue

At this moment,press the“Start”key to enter the main menu.”YYYY”would be replaced by the product number,otherwise prompted two lines”\*\*\*\*”,both mean transmitter have been found,it can communicate now.

In order to make our production and proliferation of silicon and capacitive series OEM smart enlarged version in line with other companies,in this menu,press a”Modify”key and pop-up menu,then use“←”“↑”key to change the



first digit,use“→””↓”key to change these cond digit,this double-digit range are 0,1,2,3,4,5,6,7,8,9,A,B,C,D,E,F.

Pls select function 【 1 】

1.test2.configuration

3.format

Press Key Enter continue

After press the number keys,then press the Enter key to enter the corresponding main menu.

If the interface could not find the transmitter,then show the following warning:

warn: cannot communicate

0-15

Communicate by Station No.

Press key Enter continue

At this moment,move the cursor with”↑↓“key,then press the”Enter”key

Searching transmitter

Short For.Address 【 X 】

Press Key Enter continue

The range of“X”is:0,1,2,3,4,5,6,7,8,9,A,B,C,D,E,F.Total 16sections address (Note:When the short address format is 0 , its output 4-20mA. The rest is locked in 4mA to prepare for more than one and then the selection,the rest is locked in 4mA to prepare for multi-set use;  
When the short address format is not 0,search time will increase differently.

(2).Test

Test function includes transmitter test and loop test.

The purpose is to verify the transmitter,interfaces and circuits are working properly or not.

In the main menu,press”1“and“Enter”key to enter.

Test function

Transmitter test

Loop test

Quit continue

Move the cursor to all options,and then press”Enter”.Press the Escape key to return to main menu.



a. Transmitter Test

Under testing of transmitter

Pls wait

Transmitter test pass (Fault)

Press key Enter continue

When the transmitter is suddenly unable to communicate, the interface will prompt "communication is interrupted" (Besides Searching short address format are the same.)

b. Loop test

Warning: Pls set loop as manual

Press key Enter continue

Loop test can confirm the transmitter output, the integrity of the circuit, and access loop recorders and other equipment. This message prompts the operator, loop should be set to manual operation.

Input current value

【XX.XXX】 mA

Press key Enter continue

After the input current value with the keyboard, press "Enter" key.

If the current value is less than 3.875 mA or greater than the input 22.000 mA, the interface is transferred to the current value of the transmitter is limited in this two number.

Trimut put the same as this, it will not be repeated

Output current value

【XX.XXX】 mA

Amend quit

Modification means changing the current value at present, and therefore return to the previous screen, prompts to re-enter. If exit the loop test function, suggesting as the picture below

Warn: pls set loop as automatic

Press key Enter continue

Press "Enter" key, exit the loop test function. Return to the main menu of test



function, the output of the transmitter back to normal.

Note: When the HT388 interface was detected transmitter for two lines "\*\*\*\*", maybe this menu cannot be given by HT388.

### c. Configuration

Configuration means setting the transmitter parameters, which determines the transmitter how to work. In the main menu, press "2" and "Enter" key to enter the configuration function.

Configuration function:

● parameter related to output

Parameter not related to output

Quit continue

Move the cursor to the option, then press the "Enter" key.

Press the Escape key to return to the main menu.

Output-related parameters:

Display units, 4 and 20mA set point (Adjustment span) linear or square root output, damping

Output-not related parameters:

Station number, descriptor, date, and information etc.

1 Changes the output-related parameters

1) Select Display Units

Pls select project unit

【XXXXXX】

Press Enter key continue

Change the output value of the unit by pressing  $\uparrow\downarrow$ ,

The engineering units as following etc one hundred kinds, but for each instrument can only support limited several unit, pls choose carefully:



(1) MPa (2).InH2O (3).InHg (4).FtH2O (5).mmH2O (6).mmHg (7).psi  
 (8).bar (9).mbar (10).g/sgcm (11).kg/sgcm (12).Pa (13).kPa (14).Torr (15).Atm  
 (16) .ft3/MN (17).L/min (18).IGL/mn (19).m3/hr (20).ft/S (21).m/S (22).gal/S  
 (23).MiGL/d (24).l/S (25).MilL/d (26).ft3/S (27).ft3/d (28) .m3/S (29).m3/d  
 (30).iGal/h (31) .i Gal/d (32) .℃ (33).F (34).R (35).K (36).mV(37).Ω  
 (38).Hz (39).mA (40).gal(41).liter (42) .Imp gal (43).m3 (44).ft (45).m  
 (46).bbl (47).in (48).Cm (49).mm (50).min (51).S (52).hr (53).day (54).NO  
 (55).cpoise (56).u Simen (57).%(58).V (59).pH

Press“→”and Enter key to enter zero range adjustment.

2)Modify transmitter span range

Zero and span value

S=XXX.XXunit

Z=XXX.XXunit

Continue revise

One of the most common configuration modification is to adjust the set point transmitter's 4-20mA.

If the interface to modify span,press modifier keys(press”Enter”and“→”to enter the next step”←”return to previous.As below.)

Tips follows:

Modify zero and span value

●input by keyboard

Set by standard source

Press Key Enter continue

Using the keypad adjust the span:

Press Enter,show:

Zero(span)pressure value

【XXX.XX】 unit

Continue revise

Press the Enter key,

Display parameters unchanged.Press the Modify button,the screen prompts:with letters in paren theses input values needed

Input zero (span) pressure value



【XXX.XX】 unit

Press key Enter continue

Press←”,move the cursor to the left,for correcting the wrong numbers.

■Adjust span by using the standard value input source

Reading zero (span) pressure value

【XXX.XX】 unit

Revise quit

Press the Escape key,the zero (span)does not change.Press the modifier key,zero (span)will be modified to the new value(when the zero changes,span will shift).

When zero and span modification is completed,automatically go in the output in the form of menu.

### 3)Change the Output Type

Select output type

【Lin/Squ】

Press key Enter continue

Press“↑”“↑” , when the required output type appears,press“Enter”,enter damping menu.

Note:When the HT388 interface was detected transmitter for two lines“\*\*\*\*”,maybe this menu cannot be given by HT388.

### 4)Enter the damping value

Damping

【XX/XX】 second

Continue revise

To change the current damping value by modifying key

Input damping value

【XX/XX】 second

Press key Enter continue

After entering the new data,press the Enter key to return the configuration main menu.

Note,Parts of There are some

Smart transmitter damping is discontinuous volume

This means that the damping value of the transmitter , which HT388 gave





him, will be accepted as more recent values.

2 Change the transmitter output irrelevant information

Station No.

【XXXXXXX】

Continue revise

Press "Enter" and "→" key to enter next step. Press the Modify button, show as below:

Pls input station no.

【XXXXXXX】

Press key Enter continue

Down as follows: description, date, information, instruction sheet, flange material, o-ring materials, exhaust drain Valve material, fill fluid, diaphragm material, the number of remote devices (When you choose "no", the Following will be skipped.), Remote device form, remote device irrigation red liquid, Diaphragm material.

Which descriptors and input method information with station No., The choice of instruction sheet, flange material, o-ring materials, exhaust drain valve material, fill fluid, diaphragm material, the number of remote devices is the same as unit. The modification of date:

date

【XXXX】 year 【XX】 month 【XX】 date

Continue revise

To change the current date by modifying key

Input date

【XXXX】 year 【XX】 month 【XX】 date

Press key Enter continue

After entering the item, shown figures (1984?047) is flashing. ← minus 5 ↑ plus 1 → plus 5 ↓ minus 1 (month, day are same as) After completing input, press Enter button for 2 second and release, digits for the months starts flashing, it means you can change. After completing input, press Enter button for 2 second and release, digits for the day starts flashing, it means you can change. After completing input, press Enter button for 2 second, enter the information menu.

Note: Above mentioned information, some contain only apart of the transmitter, even some models delete part of them directly. Meanwhile all of the



above information is memory,without any relationship with the transmitter output.

### .LCD Display Function Overview

Users can set variables and decimal places displayed by LCD through the configuration software. Please refer the setting part "instrument configuration"→"output characteristic".

LCD supports double variables display. The showing variables users can set include "current", "main variable percentage", and "main variable". And each variable can be independently set to display decimal point position "0", "1", "2", "3", "4".

If two showing variables value are same, LCD only shows one variable. Otherwise, two variables will be alternately displayed by 3 seconds intervals.

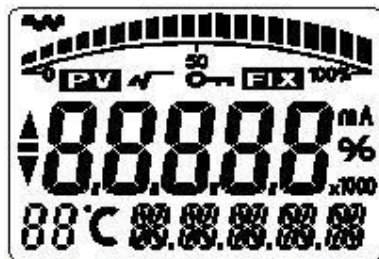


Figure1-1 All Lights Showing of LCD



Figure 1-2 Current Showing

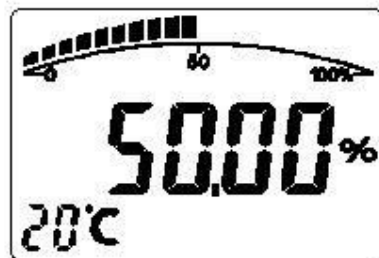


Figure 1-3 Main Variable Percentage Showing

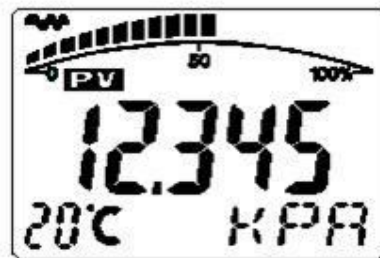


Figure 1-4 Main Variable Showing

Other display directions are as follows:



- 1). "AW" means "communication status". ↵
- 2). "√" means "square root output". ↵
- 3). "FIX" means "fixed output current". ↵
- 4). "KEY" means "start writing-protection". ↵

5). If "display temperature" is started, the character "88" on the lower left corner of LCD displays ↵  
temperature in a real-time and normal display state. "88" means that either below -19°C or  
above 99°C is not able to be shown. ↵

## 2. Button Function

Through buttons, users can execute setting zero of main variable, zero migration 【setting zero】 , and range migration 【setting full】 . Also you can set units, ranges, damping, and showing variables.

### 2.1 Button Function Codes Table

When button configuration is being used on site, the character "88" on the lower left corner of LCD is used to indicate the type of current setting variables, which is the setting function of current buttons.

The corresponding relations are as follows:

the character "88" displayed on the  
lower left corner of LCD  
setting variables  
0 or blank normal display  
1 inputting the following operating codes  
2 setting units  
3 setting the lower limit of ranges  
4 setting the upper limit of ranges  
5 setting damping  
6 main variable setting zero  
7 zero migration and range migration [zero and full]  
8 outputting characteristic [setting linear output and  
square root output]

#### Notes:

Inputting each operating code can quickly enter the corresponding function.  
For example,  
if you input "5", it will go directly to the function of setting damping.

### 2.2 Button Mode Descriptions

This product supports the "three-button" operating mode.

The "three-button" operating mode is more efficient than others, and it is



applied to products with three buttons on LCD. At this time, the button "Z" is used for going into the "prompting setting data" interface and shifting. The button "S" is used to enter the setting data interface, add digitals and save data. And the button "M" is mainly used for data storage.

### 2.3 Setting Data Methods

When the character "88" on the lower left corner of LCD shows "1" to "7", it means the product is in on-site configuration mode. Users can input passwords, modify parameters and shift by buttons.

During the process of setting data, the button "S" is used to adjust digitals and decimal points, "Z" is for shifting, and "M" is for storing data.

Setting steps are as follows:

- 1). Press "S" to enter the "setting data" interface, and meanwhile the sign bit starts flashing, which says the sign bit can be altered.
- 2). Press "S" again, you can switch the positive sign "+" or negative sign "-" of digitals (up arrow "↑" means positive sign "+").
- 3). Pressing "Z" makes the first digital bit starts flashing, which says it can be altered. Then a longtime or continuous repeatedly pressing "S" can set digitals from "0" to "9".

4). Pressing "Z" once again can set digitals from the second bit to the fifth one orderly. The setting method is same as that of the first one.

5). After setting the fifth digital, please press "Z" to set the decimal points. Four decimal points flashing at the same time means you can set the decimal points now. Then press "S" to switch the decimal point position circularly.

6). After setting the decimal points, please press "Z", and down arrow "↓" flickering on prompts you to save settings.

7). Press "S" to save settings. You can make the sign bit flicker on and reset by pressing "Z".

Notes:

In the "three-button" operating mode, "M" can be pressed anytime to save settings quickly during the setting process. So you do not have to wait to save settings until down arrow "↓" starts flashing.

## 3. Operating Directions

### 3.1 Main Variable Setting Zero (Reset) Function

In the real-time and normal display state, pressing the combination buttons "M" and "Z" ("M" + "Z") meanwhile and keeping 5 seconds can go directly into the function of "main variable zeroing".

Notes:

- 1). Only the circuit boards above software version 1.4 can support the function of "M" + "Z" meanwhile.
- 2). For early software versions, you have to input the operating code "2" or "6"



to execute the function.

After entering the "main variable zeroing" function, the function code displayed on the lower left corner of LCD is "6", the value showed in the middle of LCD screen is the current main variable , and "YES" or "NO" is at below area.

When "YES" is displayed, please press "M" or "Z" to execute the operation "main variable zeroing". After that, the output pressure should be "0".

When "NO" is displayed, please press "M" or "Z" to end the operation "main variable zeroing".

Pressing "S" can switch between "YES" and "NO".

## 3.2 Configuration Function

### 3.2.1 Function Overview

In the real-time and normal display state, pressing "Z" can go into configuration data setting state. After that, "01" showed on the lower left corner of LCD prompts you to input operating codes. Different operating codes lead to different setting function interfaces. After setting corresponding functions, it will proceed cyclic settings automatically.

Users can finish inputting operating codes, setting the upper and lower limits of ranges and damping according to "2.3 Setting Data Methods".

Directions:

If the data setting overrun, LCD displays "OVER", then press "S" or "Z" to reset.

When the configuration data is completely set, it returns to the normal showing state. If users press "Z" again within 10 seconds, a new setting configuration process will begin and the inputting codes verification steps will also be skipped.

After entering the configuration data setting, if no button is pressed within two minutes, it will return to normal display.

In the "function 1", the following functions will be executed after inputting operating codes.

the character "88" displayed on the lower left corner of LCD  
setting variables

0 or blank normal display

1 inputting the following operating codes

2 setting units

3 setting the lower limit of ranges

4 setting the upper limit of ranges

5 setting damping

6 ("M" + "Z") main variable setting zero

7 ("S" + "Z") zero migration and range migration [zero and full]



8 outputting characteristic [setting linear output and square root output]

Input "\* \* \* \* 2" (the first four digits are arbitrary) to set units.

Input "\* \* \* \* 3" (the first four digits are arbitrary) to set the lower limit of ranges.

Input "\* \* \* \* 5" (the first four digits are arbitrary) to set damping.

Input "\* \* \* \* 6" (the first four digits are arbitrary) to set main variable zeroing.

Input "\* \* \* \* 8" (the first four digits are arbitrary) to adjust output characteristic.

If other data are input, it will return to normal display. This can avoid factitious errors.

### 3.2.2 Setting Units

During the process of setting units, the current selected unit is shown on the lower right corner of LCD.

The steps of setting units are as follows:

1). Press "S" to set main variable units in turn. The units include kPa, Torr, atm, MPa, inHO, inHG, ftHO, mmHO, mmHG, psi, bar, mbar, gcm, kgcm, Pa, etc.

2). Press "Z" or "M" to confirm the current selected unit of main variable. Then go directly into the function interface of "setting the lower limit of ranges".

Directions:

The unit "l4H2O" means 4°C inch water column.

The unit "m4H2O" means 4°C millimeter water column.

### 3.2.3 Setting Ranges

When setting ranges, you have to input "the lower limit of ranges" first, then input "the upper limit of ranges".

During the process, the operating code on the lower left corner indicating "03" or "04" prompts you to input respectively "the lower limit" and "the upper limit".

After setting the lower limit, it goes to "setting the upper limit" automatically. Please refer "2.3 Setting Data Methods".

### 3.2.4 Setting Damping

Users can go into the setting damping interface by inputting the operating code "5". Also you can go directly to set damping after setting the upper limit of ranges. Both ways are available.

The operating code "05" shown on the lower left corner of LCD means you should set damping. The inputting damping range is 0 to 32 seconds. Please refer "2.3 Setting Data Methods".

Special Notes:





If you input damping value “05678”, it will return to “restore factory settings”. So the operation “backup data” is necessary before leaving factory.

### 3.2.5 Setting Output Characteristic

During the process of setting output characteristic, the current selected output characteristic (linear output “LIN” and square root output “SQRT”) is shown on the lower right corner of LCD.

The setting procedures are as follows:

- 1). Press “S” and select the current output mode (LIN or SQRT).
- 2). Press “Z” or “M” to confirm the current output characteristic and end this round of settings, then return to the function interface “ending setting” 【 The function code “0” is displayed on the lower left corner of LCD 】 . If no button is pressed within 10 seconds, it will return to normal display. Otherwise, a new round of settings will begin. 【 Do not need to input operating codes again 】 .It will continue to begin with setting units.

Notes:

“LIN” is linear current output and “SQRT” is square root current output.

### 3.3 Zero Migration 【Setting Zero】 and Range Migration 【Setting Full】

In the real-time and normal display state, pressing the combination buttons “Z” + “S”

meanwhile and keeping 5 seconds go directly into the migration state of “zero migration” and

“range migration”. At this time, the operating code “07” is shown on the lower left corner of LCD

to prompt you to set zero and full.

“zero migration” means setting zero. The current pressure is set to the lower limit value of

ranges, and the output current value is adjusted to 4 mA.

“range migration” means setting full. The current pressure is set to the upper limit value of

ranges and the output current value is adjusted to 20 mA.

If no button is pressed within two minutes during the process, it will return to the normal display state.



### 3.4 Display Variable Setting

LCD display screen can show one of three variables "current", "percentage", and "main variable" or alternately show two of them (4 seconds interval). In real-time and normal display state, you can modify the two variables by pressing "S". When two variables are set to be same, the screen only shows one fixed variable. If two variables are set to be different, the screen shows two values alternately.

The method is as follows:

Press the button "S", and the current showing variable (such as "current") changes, then it will circularly display "current", "percentage", and "main variable". When the showing variable you need (such as "main variable") appears on the screen, please loosen the button "S" to realize the operation of showing variable "current" changing into "main variable".

Example:

The current showing variable "current" needs to be set to show "main variable" and "percentage" alternately.

Steps:

You should press "S" to modify the first showing variable. LCD circularly displays "current", "percentage", "main variable". Loosen the button "S" after showing "main variable". At this time, "main variable" and "current" are alternately displayed.

Same way, when LCD displays "current", please press "S" to modify the second showing variable. At this time, LCD circularly displays "current", "percentage", "main variable". Then loosen the button "S" after showing "percentage". It means successful setting.

Notes:

This function can only be supported by the circuit boards above software version 2.5.



Moreover, the decimal point digits of "current" and "main variable" will be automatically switched to three after being adjusted by buttons, and that of "percentage" will also be automatically switched to one at the same time.

### 3.5 Restoring Factory Settings

If the configuration data of products have been backed up before leaving factory, users

can input the damping value "5678" by buttons to restore data on site.

The recovery methods of backup data are as follows:

1). Through "HART-CONFIG Tool" software

In the "output characteristic" page of "instrument configuration", input damping "5678"

first, then click on "writing", it will restore the backup data. 【Tip: The showing of "communication failure" is normal and does not affect the data recovery during the process of writing data.

Because "5678" is not an effective damping value】

2). Through "HART375" handheld device

Select "damping" in the option "signal status" of "detailed setting", and input damping

"5678" first, then click on "writing", it can restore the backup data. 【Tip: The showing of

"communication failure" is normal and does not affect the data recovery during the process of

writing data. Because "5678" is not an effective damping value】

3). Through buttons

Select the fifth option and input damping"05678", then save data. It will restore the backup

data. 【This operation does not affect the real damping value】

## Ninth, Transmitter Fault check and Repair

### 9.1 Fault check

#### 1. Output overload

##### Possible Cause and Correction method

An element orifice plates, etc.

Check the first element is whether the blockage.

The pressure pipe

Check the road whether leakage or blockage

Check the valve is whether full open.



Check the fluid-filled pipe any remaining gas in the gas line is whether any remaining liquid.

Check the pressure pipe fluid density whether whether there is a change

Check transmitter frank whether sediment

Electrical connection of transmitter

Ensure Connector is clean.At the same time check the sensitive parts of the connecting

Check the pins8,the reliability of next shell.

Transmitter electrical malfunction.

The backup plate to check for faulty circuit Board:replacement of faulty circuit boards.

Sensitive element

Check-sensitive element validation part of the power,check the power output

Power

Check the power supply output

2.Output is not instability

Possible Cause and Correction method

Loop

Check the transmitter voltage,

Check for intermittent short circuits,broken roads,and more.

Note:you can't use greater than 100V voltage when you check the loop

Process pressure to an artery,

Regulation Potentio meter of Damping

The pressure pipe

In fluid-filled pipe is whether remaining gas,the gas line is whether there are remaining liquid.

Electrical connection of transmitter

Check short circuit or open circuit

Ensure Connector is clean.At the same time check the sensitive parts of the connecting

Check the pins8,the reliability of next shell.

Transmitter electrical malfunction.

The backup plate to check for faulty circuit Board:replacement of faulty circuit boards.

3.Output low or no output possible

Possible Cause and Correction method

An element

Check the first element of the installation and status.

Note:tested on medium of any changes that could affect the transmitter output

Loop

Check the transmitter voltage

Check the short and acceptance of the situation,



Check the next level,

Check the circuit impedance

Note: you can't use greater than 100V voltage when you check the loop

The pressure pipe

Check the line connection correct.

Check the road whether leakage or blockage.

Check the fluid-filled pipe any remaining gas in the gasline is whether any remaining liquid.

Check transmitter tank whether sediment

Check the valve is whether full open

Check the pressure pipe fluid density whether whether there is a change

Electrical connection of transmitter

Check the alignment element is in control within the scope

The inspection of sensitive components, wiring, whether a short circuit.

Check the Connector is clean. At the same time check the sensitive parts of the connecting

Check the pins, the reliability of next shell

Test diode malfunction of diode

Replacement test diode or a short road test-end.

Transmitter electrical malfunction.

The backup plate to check for faulty circuit Board: replacement of faulty circuit boards.

Sensitive element

Check-sensitive element validation part of the power, check the power output

## 9.2 Repair

Transmitter no-mechanical and movable parts, little repair work.

Testing terminal can be checked for instrument operation process with. The transmitter can be

Divided into three main parts: Sensitive components, amplifiers and adjustable plate

This section outlines the inspection method of components, assembly and disassembly steps and

Fault repair.

### 1. Test Terminal

The test terminals in parallel with the diode D14, loop signal current through the diode, when the

Header or the test instrument and the test terminal connection, and the diode in parallel, as long as the

Voltage across the terminals remains lower than initial voltage diode has no current through the diode.

In order to ensure the diode leakage, in the selection of test readings or connection header, resistance

Connections or meter for 4-20mA DC output is not more than 10 ohm internal



resistance,if up to30ohm

Test error is close to1,a socket terminal screw,with the banana plug connection

2.The sensitive parts of the examination

Sensitive components cannot be repaired in the field,remove the flange,if it is found that the

damage(for example:isolation diaphragm is damaged or oil),must be replaced.If it's not obvious

Damage can be checked using the following steps.

(1).Removal of sensitive components

(2).Remove the compensating plate,the redline,yellow line sensitive parts welding

(3).Check the sensitive component pin out.

(4).Sensitive component shell(measuring diaphragm is connected between the shell)resistance,the

resistancetomorethan10Megohm.

(5).Check lead capacitance between line and shell,the capacitance is $150\pm 30PF$

3.Circuit board inspection.

The circuit board fault is very easy to check,as long as the change in the standby board,such as

Faults and can only be replaced.

4.The disassembly steps

.sensitive components

(1).Remove the sensitive components before putting the transmitter from the flow pipe and remove the.

(2).Unscrew the 4bolts,can take down flange.Be careful not to scratchor touch isolation diaphragm

(3).With a cloth soaked inneutraldetergent scrub the isolation diaphragm(cannot use any chloride or Acid containing solution to clean,rinse)

(4).For easy installation,joint can rotate

Electrical shell

(1).Terminal is located in the name plate marked"electrical shell terminal side".Unscrew the cover

Terminal side,you can see the power signal terminal and a test terminal.

Terminal permanently fixed not

On the shell removing,otherwise the housing between the two sides of the seal is damaged,the

explosion-proof structure for casing failure.The(2).Circuitboard is positioned on the name plate

marked"circuit side"electrical circuit side shell,unscrew the cover can see the circuit board,the best





Power disconnect instruments and then take the circuit side cover.

(3).Remove the 3fastening screws,intelligent amplifiers can be removed.

(4).Modulation plate(welding in sensitive components,temperature compensation resistor board).

From the electrical housing remove sensitive component.

(1).As mentioned before,remove the intelligent amplifier.

(2).Unscrew the electrical housing.

(3).From the amplifier shell and unscrew the sensitive components.Be careful,don't damage the

Component lead.

Special attention,do not damage the diaphragm unscrew the sensitive components.

(4).Sensitive component is the whole welding parts,cannot remove.

#### 5.Assembly steps

##### Prepare work

(1).Check all,replace if necessary,ring is coated with a thin layer of silicone oil to ensure a good seal.

(2).Check the thread,thread for explosion-proofstructuretoensurethatthe6ringintact.

Connecttheelectricalhousingandthesensitiveelement

(1).The sensitive component wrapped with thread sealing,to ensure the water not to electrical shell.

(2).Sensitive component is screwed to the electrical housing,screwinthe6fasteningto.Be careful,do notdamageortwisteddsensitivecomponentsinordertolead.

(3).Facilitates installation, sensitivecomponentiscomposedofahighandlowvoltagesidelocation.

(4).On the lock nut.

##### Electrical shell

(1).Inspection of circuit boards are clean.

(2).Intelligent amplifier is fixed by screws.

##### Indicator

(1).In order to facilitate reading indicator,indicator can rotate.

(2).For some reason,indicator cover glass should be removed,must ensure that Otypering behind the glass in the original position,in order to proof,and reinstalled before the circlip must tighten,matter to the interstitial glass and metal mill(with less than11/2thickness gauge to check)

##### The transmitter body

(1).Otypering carefully into isolation cup.

(2).According to the requirements of the direction of the flange installed,hand tighten the 4bolts in.

(3).According to the following steps impaction flange.



- a. First fixed 4 bolts with hand.
- b. Tightening a bolt flange with bolts in place until
- c. Bolt spanner is fixed on the diagonal.
- d. Wrench on the diagonal back twist the first.
- e. With the wrench there remaining two.
- f. Check the sensitive element relative to the flange position, ensure not tilt the flange.
- g. Four bolt tightening torque should be in 2-2.5 M.kg.

Parts swap

No matter how the range, scale or output can be exchanged in the mechanical parts are:

Flange joint,

Electrical housing, cover and mounting bracket.

Amplifier and sensitive parts inter change shall comply with the following conditions.

(1). Indicator is the additional components, no matter how the output signals of the same range, as long as you can swap.

(2). Intelligent amplifier board and the calibration board so long as has the same output can be interchanged, regardless of range size and the transmitter model. Replace the plate, the output may change, the need to check the check.

(3). Sensitive components are interchangeable, and can be replaced by sensitive component change measuring range. After replacing the need to check the sensitive element. Compensating plate permanently installed in the sensitive components, cannot be replaced