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WinSMART™
LY14 & LY34
Smart Pressure and
Smart Differential Pressure
Transmitter

Operation Manual

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1. Outline

1.1 Introduction

The smart pressure transmitter is a multi-functional digital instrument. It is uniquely designed from advanced single-chip technology and smart digital technology on the basis of mature and reliable sensor technology.

Its core component is 16-bit single chip whose strong function and high-speed calculation will guarantee the transmitter's quality. The whole design focuses on reliability, stability, high-precision and intelligence. It also meets field industrial application requirements. The software adopts digital signal processing technology, enhancing transmitter anti-interference ability, zero point stability, Zero Sensitive Capability (ZSC) and Temperature Sensitive Capability (TSC).

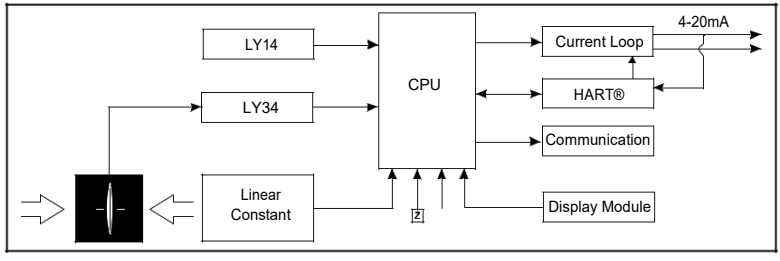
1.2 Characteristics

The smart pressure transmitter has excellent anti-interference ability, zero point stability, Zero Sensitive Capability (ZSC) and Temperature Sensitive Capability (TSC). It also has HART® communication capability with optional HART® modules.

2. Principle and Wiring Diagram

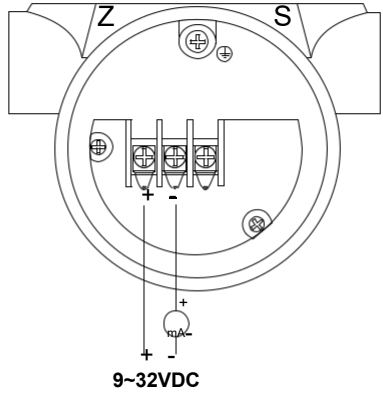
2.1 Principle

When pressure or differential pressure is externally applied, the sensor's resistance will change and be converted into frequency signals by a digital signal, and then sent to the microprocessor. The microprocessor will output a current control signal to a current output control circuit after its calculation, turning into 4-20mA analog current output and display.



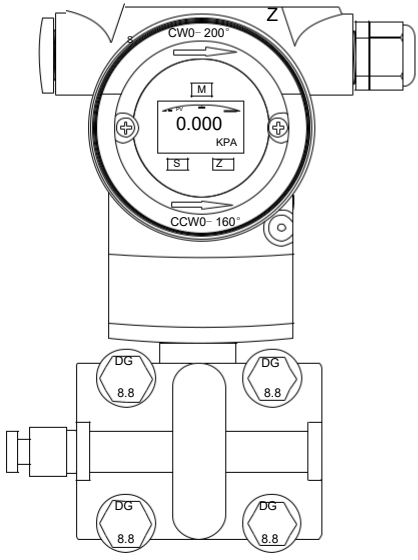
2.2 Wiring Diagram

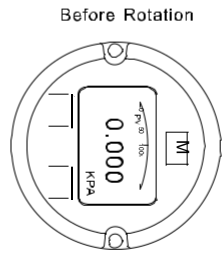
2-wire 4-20mA output.

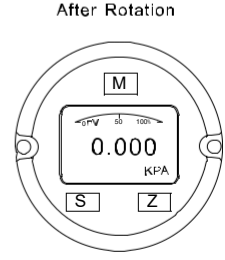


3. Transmitter Rotation

Available clockwise rotation angle: 0—200°; available counterclockwise rotation angle: 0—160°. See figure below:

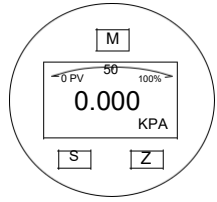






4. Interface Display

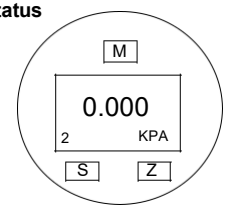
4.1 Normal Display



This transmitter can be rotated clockwise/counterclockwise 180° for your convenience.

Code	Code Function
PV	Normal Display (Measuring Status)
%	Percentage
InH2O, InHg, FtH2O, mmH2O, mmHg, PSI, Bar, mBar, g/cm2, kg/cm2, Pa, kPa, Torr, ATM, MPa, InH20@4˚C, MH20@4˚C, MH2O, mHg, M, cm, mm, Special.	Display measuring unit. "Special" means customer's unit can be written by HART®.

4.2 Setting Status



Code	Code Function
2	Window code ("2": unit selection window)
KPA	Measuring unit

4.3 Keypad

Key Name	Button Sign	Setting Function
SET	M	Enter Parameter setting; save configuration; shift to next page
MOVE	Z	Move the cursor to the right
UP	S	Increase the values and decimal point position

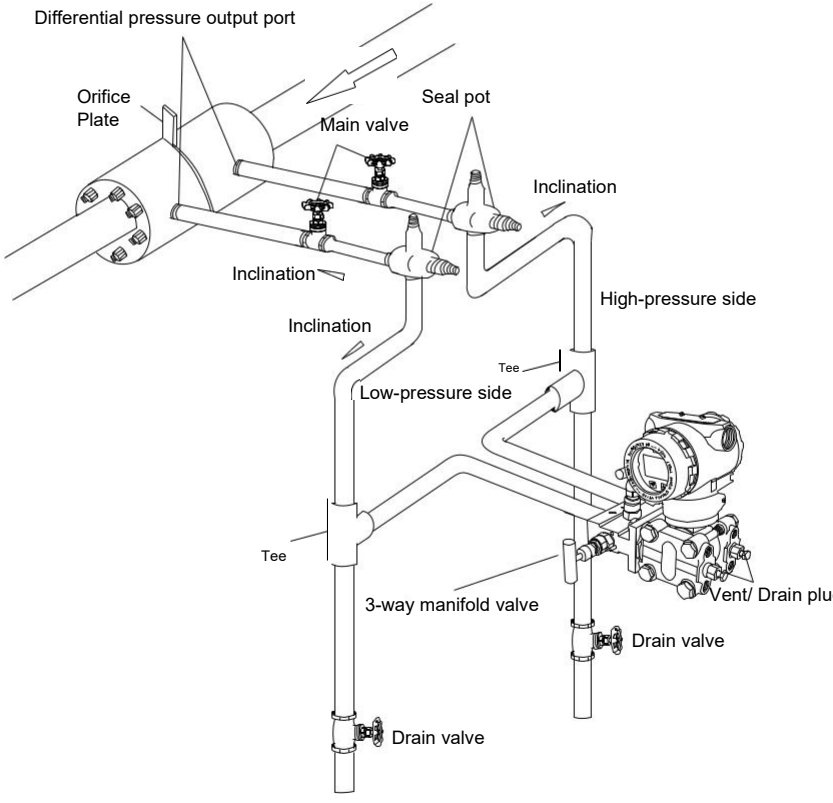
1. Hold Z button for 2 seconds then release to enter main menu settings.
   If there is no response for 10 seconds in the window 0, it will return to the normal display automatically.
   If there is no response for 2 minutes in the non-window 0, it will return to the normal display automatically.
2. Hold M + Z buttons for 5 seconds then release to enter menu setting window 6 for zero clearance. Press S button and choose "YES" to clear zero.
3. Hold S + Z buttons for 5 seconds then release and enter the menu setting window 7 for zero shift and full span shift.
   Hold Z button for 5 seconds then release to finish Zero Shift; hold S button for 5 seconds then release to finish full span shift.

5. Specific Application and Typical Installation

5.1 Typical Installation for Flow Measurement

This illustration shows a typical example for steam flow rate measurement. The differential pressure transmitter is located below the differential pressure output port of the process pipe.

After piping connections are made, make sure that the connecting pipe, 3-way manifold valve and transmitter have no pressure leaks. Pipe installation for steam flow rate measurement is as follows:



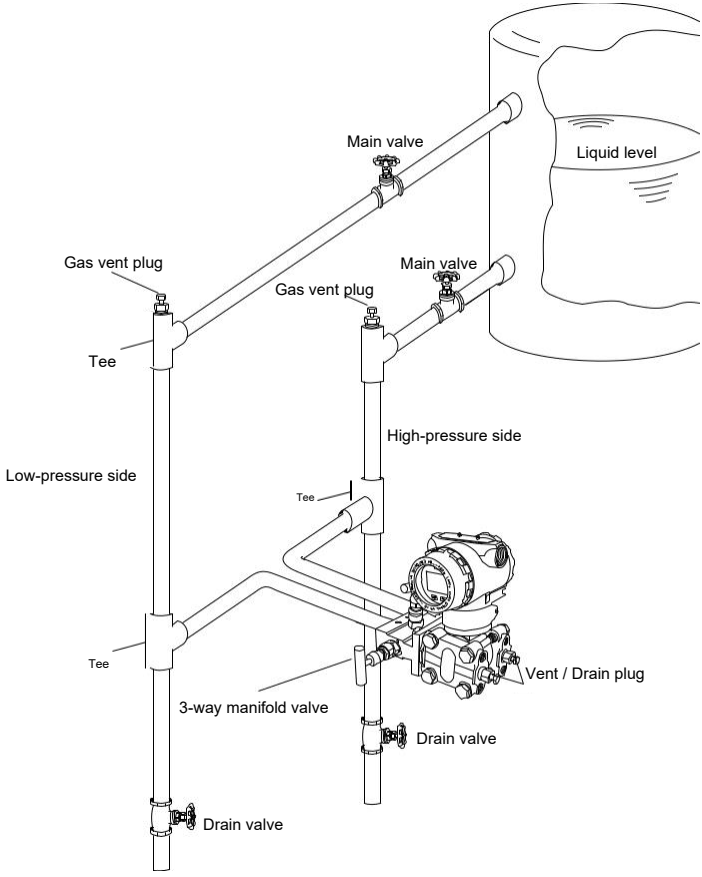
5.2 Typical Installation for Liquid Level Measurement

When using dry-leg method, connect the high-pressure side of the transmitter to the lower part of the tank. Connect the low-pressure side to the gas-sealing pipe of the tank.

After completing piping connections, check for pressure leaks around the connecting pipe, the transmitter and 3-way manifold valve. The following shows a typical installation.

Always connect the high-pressure side of this transmitter to the lower part of the tank.

Install this transmitter below the lowest liquid level to be measured.

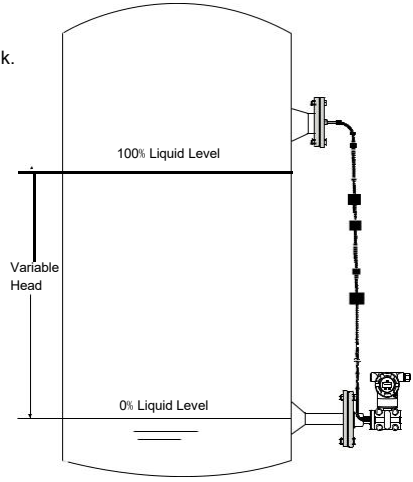


6. Applications

6.1 Closed Tank

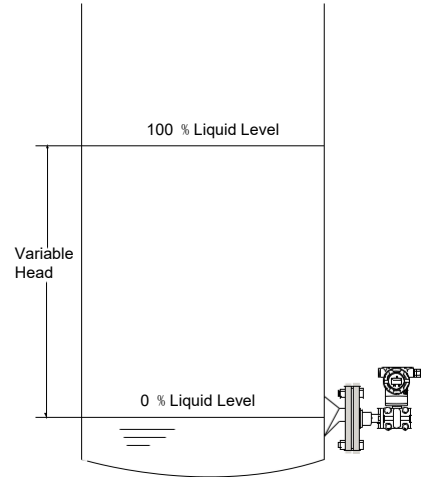
When it is a closed tank, there will be pressure inside the tank. Choose either level transmitter or remote level transmitter

When setting the zero point, make sure the diaphragm area of high-pressure side is fully wet with measured liquid for higher accuracy.The center diaphragm of high-pressure side is the right zero point. See figure:



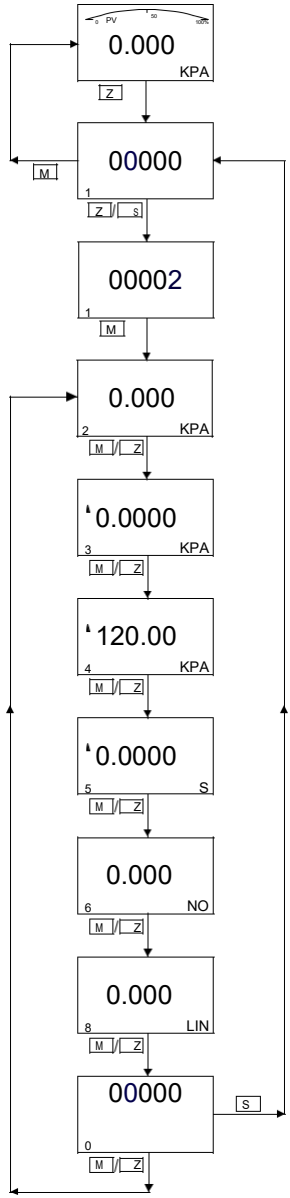
6.2 Open Tank

When it is an open tank, the liquid above will be directly in contact with atmosphere.
Choose a directly-connected pressure transmitter.
When setting the zero point, make sure the diaphragm of the high-pressure side is fully wet with measured liquid for higher accuracy. The center diaphragm of high-pressure side is the right zero point. See figure:

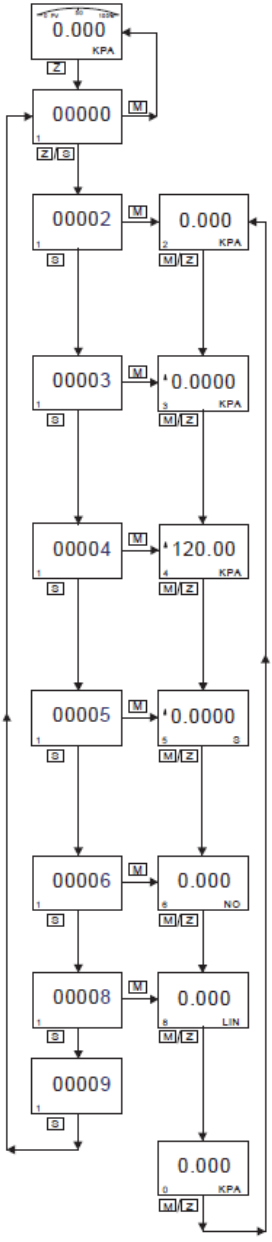


7. Operation Instructions

7.1 Operation Flow Chart



7.2 System Menu Operation



Normal Display
Hold Z for 2 seconds, then release to enter main setting menu.

Code Setting Window (Code 1)
Press Z to move cursor button and press S to change the value,
If there is no response for 10 seconds, it will return to the normal display automatically.

Unit Setting Window (Code 2)
Press M to enter unit selection, then press S to activate the cursor and press S again to select unit as follows: InH2O, InHg, FtH2O, mmH2O, mmHg, PSI, Bar, mBar, g/cm2, kg/cm2, Pa, kPa, Torr, ATM, MPa, InH20@4˚C, H20@4˚C, MH2O, mHg, M, cm, mm, Special. (”Special” means customer’s unit can be written by HART®.) Press M/Z to confirm and enter next window Code 3.

Lower Range Limit Setting Window (Code 3)
Press M to enter Lower Range Limit Setting Window, and then press S to activate cursor. Press Z again to change the symbol to "-". Or press Z directly to move cursor and then press S to change value. When cursor moves to the right, press Z and all decimal points will flash. At this time, press S to change decimal position. Press M or Z to confirm and enter next window Code 4.

Upper Range Limit Setting Window (Code 4)
Press M to enter Upper Range Limit Setting Window, and then press S to activate cursor. Press S again to change the symbol to "-". Or press Z directly to move cursor and then press S to change value. When cursor moves to right, press Z and all decimal points will flash. At this time, press S to change decimal position. Press M or Z to confirm, and enter next window Code 5.

Damping Setting Window (Code 5)
Press M to enter Damping Setting Window, and then press S to activate cursor, and press S again to change the symbol to "-". Or press Z directly to move cursor and then press S to change value. When cursor moves to right, press Z and all decimal points will flash. At this time, press S to change decimal position. Press M or Z to confirm, and enter next window Code 6.

Damping Setting Window (Code 6)
Press M to enter Zero Calibration, and then press S to activate cursor, and press S again to choose whether to calibrate zero or not.
1. YES 2. NO
Press M or Z to confirm, and enter next window Code 8.

Damping Setting Window (Code 8)
Press M to enter Output Setting, and then press S to activate cursor, and press S again to choose output type.
1. LIN 2. SQRT (Choose SQRT, normal display will show "√")
Press M or Z to confirm, and enter next window Code 0.

Exit Window (Code 0)
1. If there is no response for 10 seconds, it will return to the normal display automatically.
2. Press M or Z to confirm, and enter next window Code 2.
3. Press S to activate and press M to enter window Code 1 to set window-code input.
4. Input “00000/000007/000009” in window Code 1, and press M to return Normal Display.

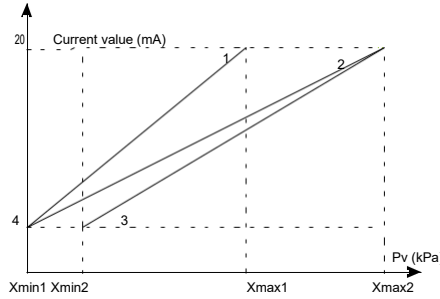
(1) Upper/Lower Range Limit Correspondence to 4-20mA

In settings, if necessary, lower/upper range Limit will be given standard current value (4mA/20mA) respectively. Preconditions: Two reference voltages should be supplied by process or pressure transmitter. After setting pressure transmitter, actual setting range might be different from the range marked in measuring plate. For different serial number and measuring range, turndown ratio can be up to 10:1.

Measuring pressure is linearly related to output current. Current value can be calculated from given formula below. I means output current, P measured pressure, ME upper limit value and MA lower limit value.

$$I = \frac{P - MA}{ME - MA} \times 16mA + 4mA$$

Actually because of change of measuring demands or conditions, transmitter's range needs to be changed too. However, changing range means changing slope of transmitter input/output, like from curve 1 to curve 2, it means upper range limit increasing adjustment; from curve 2 to curve 3, it means lower range limit increasing adjustment. See figure below:



(2) Damping Settings

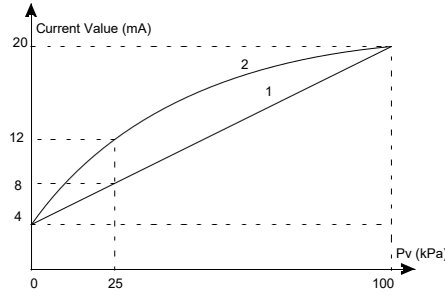
Available setting time is 0-32s. The bigger this value is, the more stable the measuring value will be (Flunctuation will be more moderate). Increasing damping time will also lead to signal delay.

(3) Zero Calibration

Because of zero drift, the measured zero point will not be 0. Zero calibration enhances better measuring accuracy.

(4) Output Settings

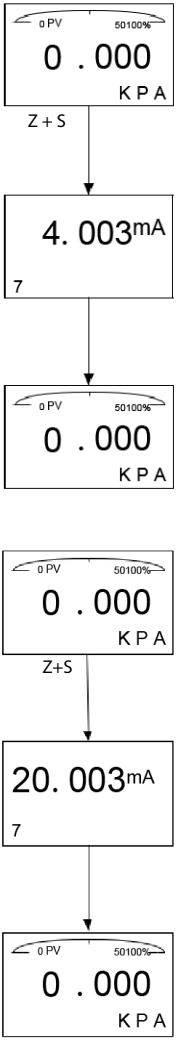
e.g. Transmitter's pressure range "0-100kPa", if output setting as "lin", current output will be curve 1. If set "sqrt", current output will be curve 2. For example, if pipe pressure as 25kPa, under "sqrt" condition current output will be 12mA.



7.3 How to Set Positive Shift and Negative Shift

7.3.1 Zero Shift and Full Span Shift Operation

This is a hidden window, so it will not display if you directly input code 7 in the code window. You have to hold S + Z for 5 seconds until it displays.



Normal Display
Hold S + Z for 5 seconds and then release to enter menu-setting window 7, setting the zero shift and full span shift.

Zero Shift
Hold Z for 5 seconds and then release to finish zero shift. If there is no key operation within 2 minutes, it will return to normal display automatically

Normal Display

Normal Display
Hold S + Z buttons for 5 seconds then release and enter window 7 for zero shift and full span shift.

Full Span Shift
Hold S for 5 seconds, and release to finish full-span shift. If there is no key operation within 2 minutes, it will return to normal display automatically.

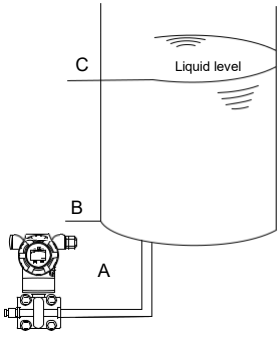
Normal Display

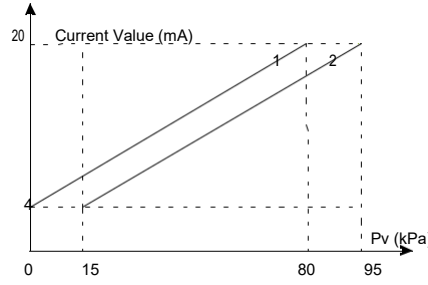
When it comes to actual measurement, the initial measuring point needs to be shifted to a certain value (positive or negative). This is called zero shift and full span shift.

(1) Zero Shift (Elevated Span / Suppressed Span)

After zero shift, measuring range will change toward positive (increase) direction, namely positive shift. For example, pressure transmitter is installed at point A, the liquid head AB that is formed by medium that comes into pressure-guiding pipe will send a pressure to transmitter, turning the measuring result into AC's pressure (measured pressure BC plus liquid head's pressure). At this time, when liquid level is at point B, give positive zero shift to transmitter, the initial value of corresponding 4-20mA will move from point A to point B, making it convenient to control the application.

If transmitter's range is 0~80kPa and AB pressure of pressure guiding pipe is 15kPa, after zero shift, change will be like figure below: curve 1 to curve 2.

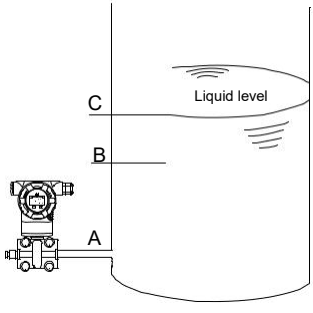


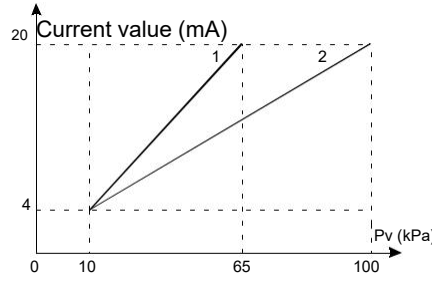


(2) Full Span Shift

After full span shift, measuring range will change toward negative (decrease) direction, namely negative shift. For example, when pressure transmitter measures liquid level's pressure and the operator just needs the pressure of level AB (lower than AC pressure), full span shift can start.

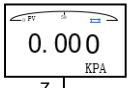
If transmitter's range is 10~100kPa and AB pressure of liquid level is 65kPa, after full span shift, change will be like figure below: curve 2 to curve 1.





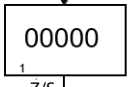
7.4 How to set Decimal Point and Minus Value

Example: Set zero as "-15kPa"



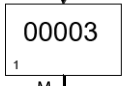
Z

Normal Display
Hold Z for 2 seconds and then release to enter main menu setting.



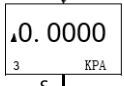
Z/S

Code Setting Window (Code 1)
Press Z to move cursor button and press S to change value. If there is no key operation within 10 seconds, it will return to normal display automatically



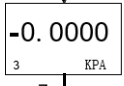
M

Code Setting Window (Code 1)
Press S to change value and set numeric value to 00003, and then press M to enter zero setting.



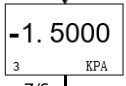
S

Zero Setting Window (Code 3)
Press M to enter zero setting.



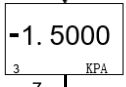
Z

Zero Setting Window (Code 3)
Press S to activate cursor.
Press S again to change symbol as "-" ("-" symbol will be added to the furthest left position).
Press Z to move cursor position, and then press S to change the numeric value.
Enter next window:



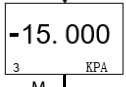
Z/S

Zero Setting Window (Code 3)
Press Z to move cursor. When the cursor moves furthest to the right, continue to press Z until all the decimal points flash. Enter next window:



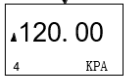
Z

Zero Setting Window (Code 3)
Press S to change decimal position after all decimal points flash. Press S twice to enter the next window:



M

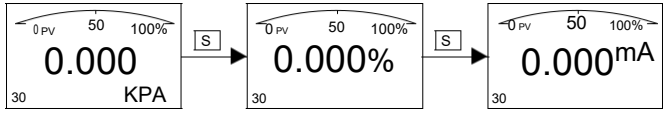
Zero Setting Window (Code 3)
Press M to confirm and enter next window Code 4.



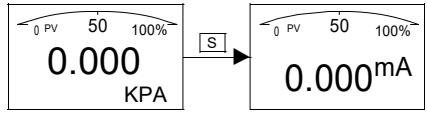
Span Setting Window (Code 4)

7.5 Displayed Variable Settings

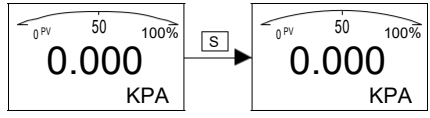
LCD can be set to display "Process Variable", "mA value", "%". These 3 can be displayed either constantly, one of them, or alternatively 2 of them.
If first displayed variable and second displayed variable are the same, this will be constant display.
If first displayed variable and second displayed variable are different, this will be alternative display (interval is 4 secs).
In normal display interface, hold [S] button to change displayed variable (In bottom left corner, function code is 30.).



Different variables in normal interface means alternative display, for example, “process variable” and “mA value” display alternatively (first variable: “process variable”; second variable: “mA value”).



Same variables in normal interface means constant display, for example, “process variable” displays constantly (first variable and second variable are both the same: “process variable”).



e.g. 1 **When displayed contents are “process variable” and “mA value”, which means alternative display,** to change to constant display and make displayed content as “process variable”, you need to change “mA value” to “process variable”, namely, making the first variable same as the second.

Procedure: When screen displays “mA value”, hold [S] and do not release until screen shows “process variable”. Namely changing “mA value” to “process variable”. At this time, screen will constantly display “process variable”.

e.g 2 **When displayed contents are “process variable”, which means constant display,** to change to alternative display and make displayed content as “process variable” and “mA value”, you need to change “process variable” to “mA value”, namely, making the first variable different from the second.

Procedure: When screen displays “process variable”, hold S and do not release until screen shows “mA value”. Namely changing “process variable” to “mA value”. At this time, screen will alternatively display “process variable” and “mA value”.

8. Flow Measurement Settings

Differential pressure transmitter measures flow and displays flow rate. As long as flow range and differential pressure's range is certain, flow can be measured and flow rate can be displayed.

If your purchased product has HART® communication function, you can set parameters by yourself.

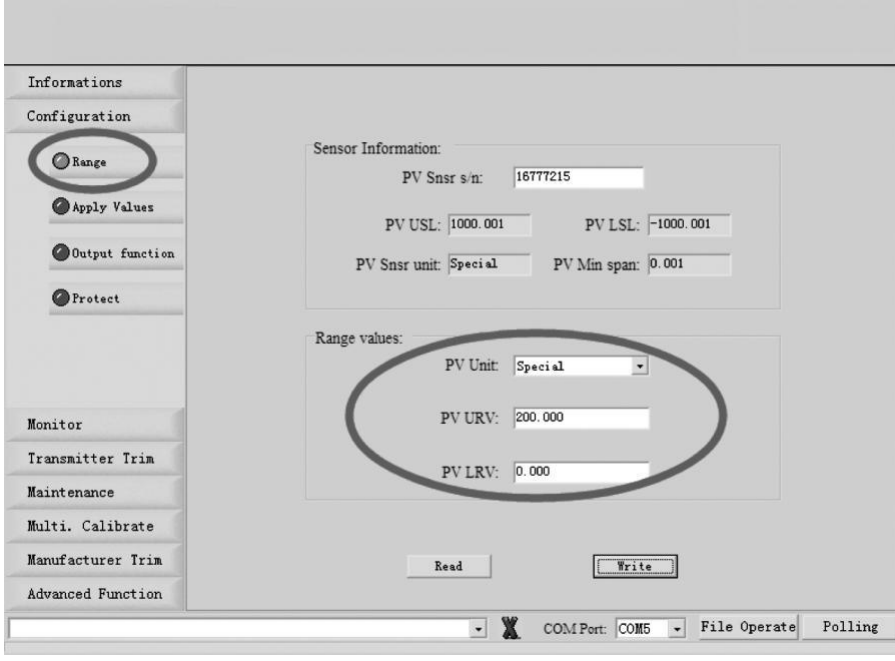
Let's take an example of HART® function settings

EX.1: Differential pressure's range is 0~500mbar and corresponding flow range is 0~200M3/H.

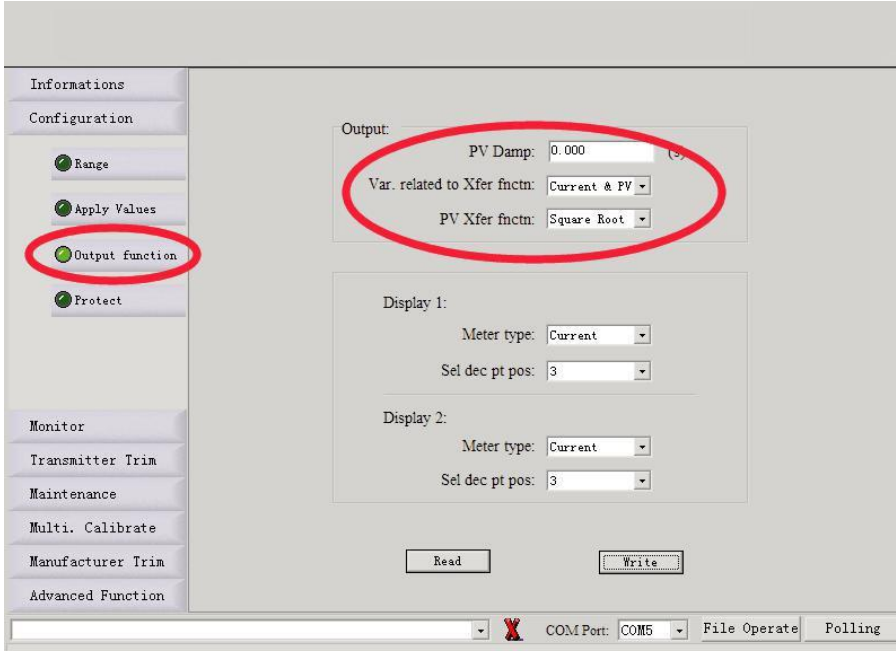
Steps: 1. Build Hart® communication, Run software.

2. In Configuration column, single click Range ⟶ Range values ⟶ PV Unit ⟶ Special.
3. Input upper range value and lower range value, namely "PV URV"=200.000 and "PV LRV"=0.000.
4. Click "write" to save settings.

Shown as below:



5. In Configuration, click “Output func” ⟶ “Output” ⟶ Related Var.of Xfer fnctn ⟶choose “Current and PV” ⟶ PV Xfer fnctn ⟶ choose “Square Root”.



6. In “User Unit”, set it as “M3/H”.

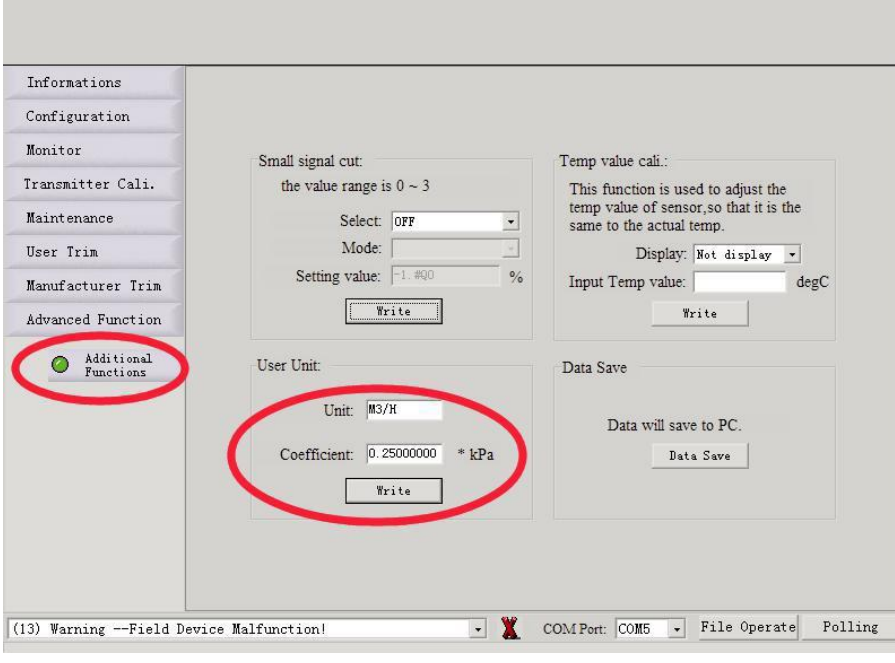
7. Input “Coefficient” value.

   The calculation formula of Coefficient value =△P(kPa)/ Max Flowrate. 500mbar=50kPa

   Now coefficient value is =50/200=0.25 and you should input 0.25 in Coefficient.

8. Click write to save settings.

Shown as below:



Note: If actual value and displayed value are different, trim coefficient value.

EX.2: Differential pressure's range is 0~6000mmH2O and corresponding flow range is 0~300NM3/H.

Steps: 1. Build Hart® communication. Run software.

2. In Configuration column, click Range ⟶ Range values ⟶ PV Unit ⟶ Special
3. Input up range value and low range value, namely "PV URV"=300.000, "PV LRV"=0.000.
4. Click "write" to save settings.
5. In Configuration column, click "Output func" ⟶ Output ⟶ Related Var.of Xfer fnctn ⟶ choose "Current and PV" ⟶ PV Xfer fnctn ⟶ choose "Square Root".
6. In "User Unit", set it as "NM3/H".
7. Input Coefficient value.

   The calculation formula of Coefficient value =△P(kPa)/ Max Flowrate. 6000mmH2O=58.84kPa

   Now coefficient value is =58.84/300=0.196 and you should input 0.196 in Coefficient.
8. Click Write to save settings.