



NCS-PT105II

Intelligent pressure transmitter

User manual

Warning

1. Place the transmitter horizontally before calibration.
2. After the transmitter is installed in the field, the transmitter should be zero adjusted.
3. Install and secure the process connection before the transmitter is pressurized.
4. The transmitter should be installed in a dry environment and should not be washed by rain. In harsh environments, a transmitter protective case should be used.
5. It is forbidden for users to disassemble and install the transmitter by themselves.
6. Do not remove the transmitter cover in an explosive/flammable atmosphere while power is on.
7. Please check whether the power supply voltage of the transmitter meets the power supply voltage requirements in the user manual.
8. The external grounding screw of the transmitter should be reliably connected to the ground.
9. The installation of the transmitter in an explosive atmosphere must comply with relevant international, national and local standards, codes and guidelines. Please refer to the Explosion Proof section of the manual for restrictions related to safe installation.
10. The installation and use of the external safety barrier of the intrinsically safe transmitter must be carried out according to its instruction manual.
11. When using HART communication for transmitter calibration and temperature compensation, the communication device and software provided by our company must be used.

Version: V3.4

Disclaimer

The contents of this manual have been checked to confirm the consistency of the described hardware and software. Since errors cannot be completely excluded, absolute consistency cannot be guaranteed. However, we will periodically review the data in this manual and make necessary corrections in subsequent editions. Any suggestions for improvement are welcome.

Microcyber Corporation 2016

Technical data are subject to change.

Company Introduction

Microcyber Corporation is a high-tech enterprise founded by Shenyang Institute of Automation, Chinese Academy of Sciences, mainly engaged in networked control system, industrial communication and instrumentation, development, production and application. Microcyber has undertaken many national science and technology major projects, national high-tech research and development plan (863 plan), intelligent manufacturing equipment development project and other national science and technology plan projects, and is the support unit for the construction of the national networked control system engineering research center.

Microcyber has successfully developed the first domestically certified fieldbus protocol master stack, the first nationally certified fieldbus instrument, and the first domestically certified safety instrument certified by German TÜV. The first industrial Ethernet protocol standard EPA, the first industrial wireless communication protocol standard WIA-PA, and become the IEC international standard.

Microcyber's products and technologies have won two second prizes of National Science and Technology Progress Award, one National Science and Technology Invention Award, one first prize of Chinese Academy of Sciences Science and Technology Progress Award, and one first prize of Liaoning Province Science and Technology Progress Award. The products are exported to developed countries such as Europe and the United States. Top companies in the industry such as Emerson in the United States, Rotork in the United Kingdom, and Bifold in the United Kingdom have adopted Microcyber's key technologies or key components in their products, and have successfully completed more than 200 large-scale automation engineering projects.

Microcyber is a member of the FCG organization and Profibus National Organization (PNO).

Microcyber has successfully passed the ISO9001:2008 quality management system certification and the ISO/TS16949 quality system certification for the automotive industry. Excellent R&D team, rich experience in automation engineering design and implementation, industry-leading products, huge market network, and excellent corporate culture have all laid a solid foundation for the company's entrepreneurship and sustainable development.

Carry the ideals of employees, create customer value, and promote enterprise development.

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Chapter 1 Overview

NCS-PT105II series intelligent pressure transmitter adopts advanced, mature and reliable pressure sensor, and is carefully designed by combining advanced microprocessor technology and digital measurement technology. The powerful functions and high-speed computing capabilities of the internal microprocessor enable it to have excellent qualities such as intelligence, high precision, high reliability and zero point stability; the liquid crystal display module can display various physical quantities such as pressure, temperature, and current; the key operation can achieve zero point. Various functions such as migration and range setting are easy to debug on site.

NCS-PT105II series intelligent pressure transmitter supports HART, FF, PA, DP protocol, can measure various industrial parameters such as pressure, differential pressure, liquid level, flow, etc., and can be widely used in petroleum, chemical, electric power, metallurgy and other industries.

NCS-PT105II series intelligent pressure transmitters can be divided into:

Model	Mounting Type
NCS-PT105II	Capacitive pressure sensor, H-Type structure, double flange mounting
NCS-PT105IIS	Diffusion silicon pressure sensor, vertical mount
NCS-PT105IIM	Monocrystalline silicon pressure sensor, H-type structure, double flange
NCS-PT105IIMS	Monocrystalline silicon pressure sensor, vertical mount

NCS-PT105II series intelligent pressure transmitters are divided into three types according to the pressure types that can be measured:

Model	Pressure Type
NCS-PT105IISG	Gauge pressure transmitter
NCS-PT105IISA	Absolute pressure transmitter
NCS-PT105IISD	Differential pressure transmitter

NCS-PT105II series intelligent pressure transmitters are divided into four types according to the type of bus protocol:

Model	Protocol Type
NCS-PT105II H	HART
NCS-PT105II F	FF H1
NCS-PT105II P	PROFIBUS PA
NCS-PT105II D	PROFIBUS DP

As a transitional protocol in the field bus, the HART protocol realizes digital transmission on the existing analog signal transmission line and is compatible with the existing analog signal control system; FF H1 and PROFIBUS PA are used in the control field and connect field devices. The new generation of digital communication protocol, the physical layer specification adopts the international standard of IEC61158-2. FF H1, PROFIBUS PA and PROFIBUS DP are real fieldbuses.

Intelligent transmitter based on HART protocol, hereinafter referred to as **HART intelligent transmitter**; intelligent transmitter based on FF H1 protocol, hereinafter referred to as **FF intelligent transmitter**; intelligent transmitter based on PROFIBUS PA protocol, hereinafter referred to as **PA intelligent transmitter**; intelligent transmitter based on PROFIBUS DP protocol, hereinafter referred to as **DP intelligent transmitter**; transmitters of the four bus types are collectively referred to as intelligent pressure transmitter, hereinafter referred to as **intelligent transmitter**.

- Dimensions of NCS-PT105II and NCS-PT105IIM intelligent transmitters

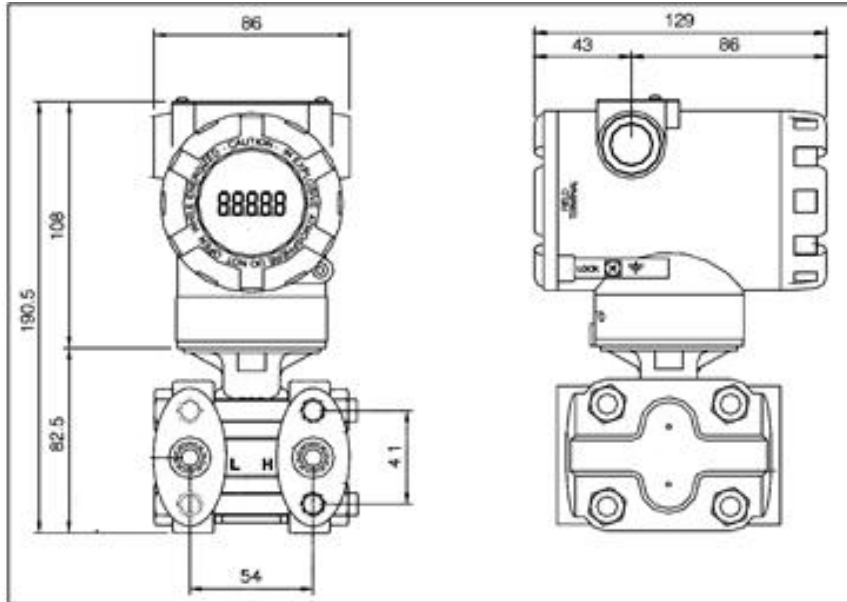


Figure 1.1 Dimensions of intelligent transmitter (unit: mm)

- NCS-PT105IIS and NCS-PT105IISM Intelligent Transmitter Dimensions

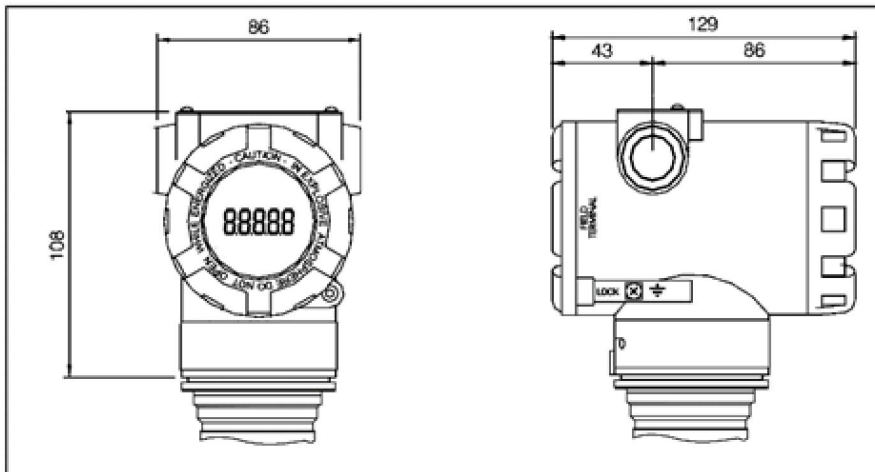


Figure 1.2 Dimensions of intelligent transmitter (unit: mm)

Chapter 2 Installation

The guarantee of the measurement accuracy of the intelligent transmitter depends largely on the correct installation of the intelligent transmitter and the impulse pipe. In particular, the measurement of flow has a lot to do with the correct installation of the primary measuring element.

2.1 NCS-PT105II and NCS-PT105IIM transmitter installation

For the installation of the intelligent transmitter, there are three types of mounting brackets available: pipe-mounted flat brackets, pipe-mounted curved brackets, and disk-mounted curved brackets. Correspondingly, there are three installation methods, namely flat bracket tube installation, curved bracket tube installation, and curved bracket plate installation.

Flat bracket tube installation is shown in Figure 2.1 .Use the 4 bolts provided to fix the transmitter on the panel mount bracket, and then use M10 bolts (user-supplied) to fix the panel mount bracket to the dial.

Curved bracket tube installation is shown in Figure 2.2. Use the 4 bolts provided to fix the transmitter on the pipe bend bracket, and then fix the pipe bend bracket to the horizontal pipe of about $\Phi 50$ mm through U-bolts.

Curved bracket plate installation is shown in Figure 2.3. Use the 4 bolts provided to fix the transmitter on the tube-mounted flat bracket, and then fix the tube-mounted flat bracket to the vertical tube of about $\Phi 50$ mm through U-bolts.

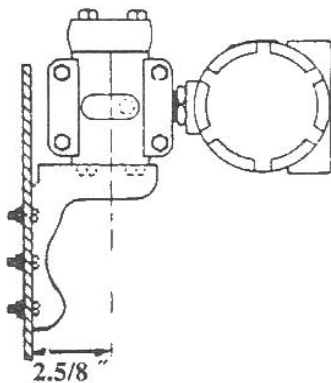


Figure2.1 Flat bracket tube installation

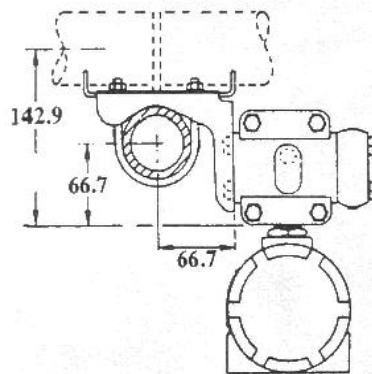


Figure2.2 Curved bracket tube installation

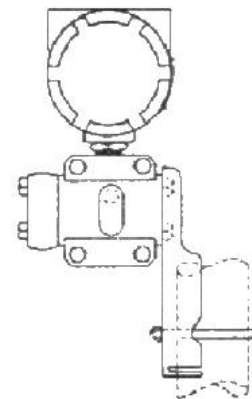


Figure2.3 Curved bracket plate installation

2.2 Installation of impulse pipe

The correct installation of the intelligent transmitter relative to the process pipeline depends on the measured medium. Intelligent transmitters measure liquids, vapors or other gases. For different measured media, the relative positions of the pressure tap, intelligent transmitter and process pipeline are different.

When measuring the pressure of liquid medium, the pressure tap must be selected on the side of the process pipeline to avoid slag deposition. The intelligent transmitter should be installed below the side pressure port so that the gas can be discharged into the process pipeline, as shown in Figure 2.4.

When measuring steam pressure, the impulse pipe should be installed on the side of the process pipeline. The intelligent transmitter is installed below the pressure port. The impulse pipe should be filled with water to prevent the intelligent transmitter from coming into direct contact with steam. When measuring steam or other high temperature media, the working temperature of the intelligent transmitter should not exceed the limit, as shown in Figure 2.5.

When measuring the pressure of gas medium, the pressure port should be installed on the top or side of the process pipeline, and the intelligent transmitter should be installed above the side pressure port so that the liquid can be discharged into the process channel, as shown in Figure 2.6.

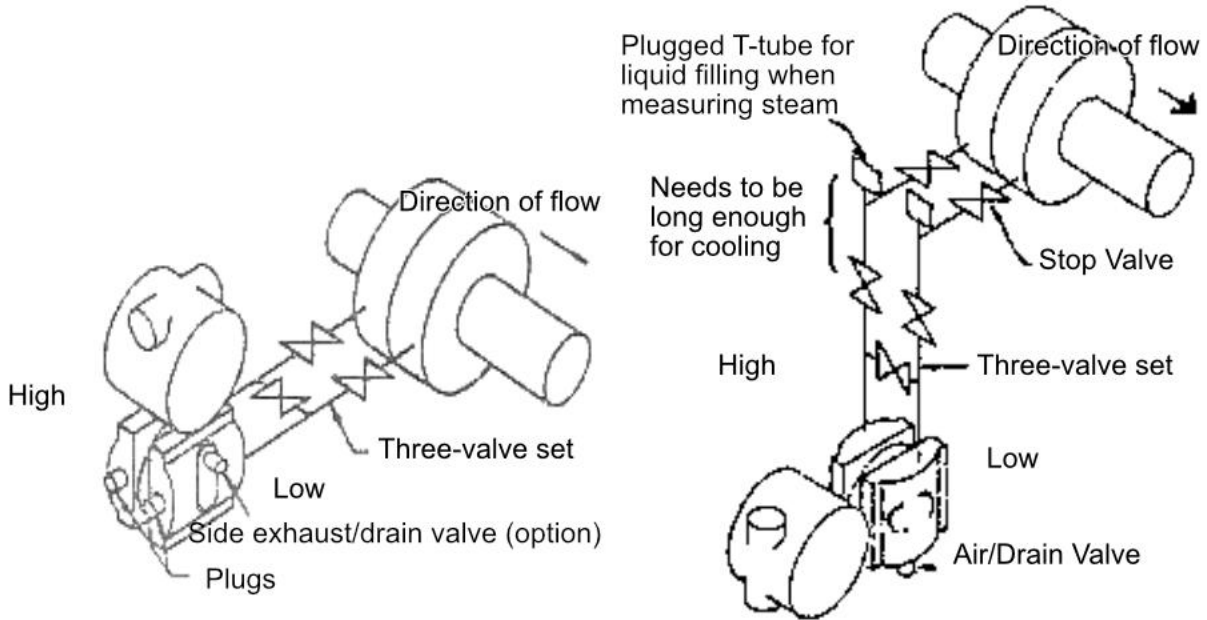


Figure 2.4 Schematic diagram of liquid medium connection. Figure 2.5 Schematic diagram of steam medium connection

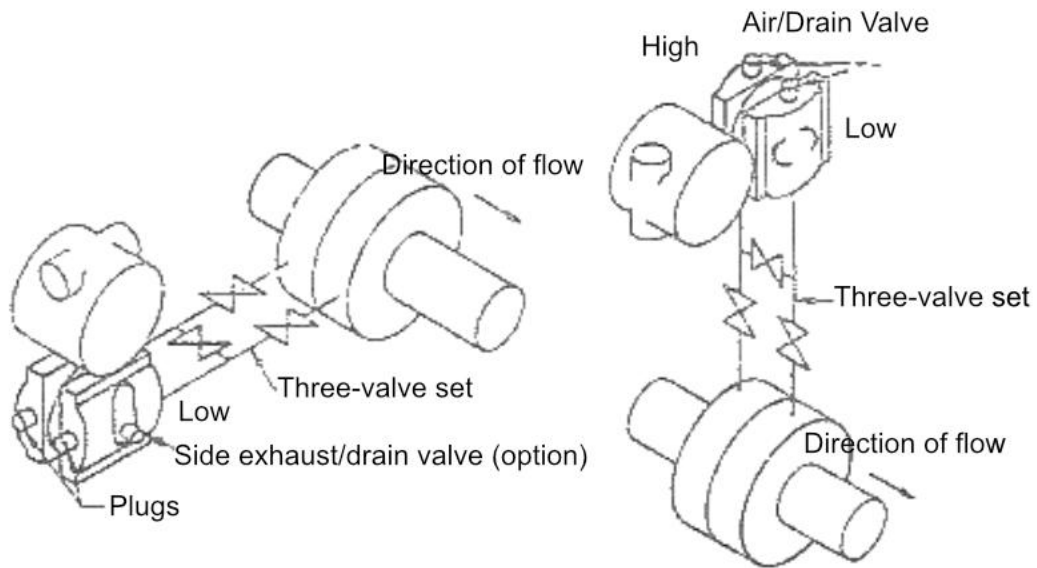


Figure 2.6 Gas medium connection diagram

Precautions for installation of impulse pipe and intelligent transmitter:

- 1) The impulse pipe should be as short as possible if it meets the requirements.
- 2) Corrosive or overheated media should not come into direct contact with the transmitter.
- 3) The impulse pipe should be installed in a place with small temperature gradient and fluctuation.
- 4) When measuring high temperature medium, refer to the operating temperature limit of the intelligent transmitter.

- 5) The two impulse pipes should keep the same temperature, and the hydraulic height should be balanced (differential pressure type).
- 6) In order to avoid the influence of friction, the pressure pipe should have a large enough diameter.
- 7) When using isolating gas, the liquid level of the two impulse pipes should be the same (differential pressure type).
- 8) When using a blowing system, the blowing system should be as close as possible to the pressure-taking port of the process pipeline, and the purified fluid should pass through the pipeline of the same size and length to the transmitter. Avoid the blowing fluid passing through the transmitter (differential pressure type).

2.3 NCS-PT105IIS and NCS-PT105IISM transmitter installation

Intelligent transmitters can be mounted directly on 2-inch pipe or directly on a wall or dashboard.

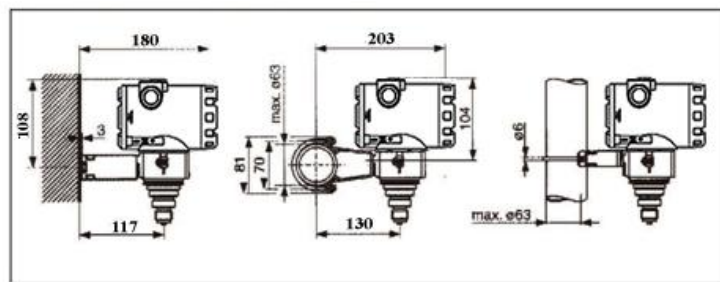


Figure 2.7 Pressure transmitter installation method

2.4 Installation of impulse pipe

The correct installation of the intelligent transmitter relative to the process pipeline depends on the measured medium. Intelligent transmitters measure liquids, vapors or other gases. For different measured media, the relative positions of the pressure tap, intelligent transmitter and process pipeline are different.

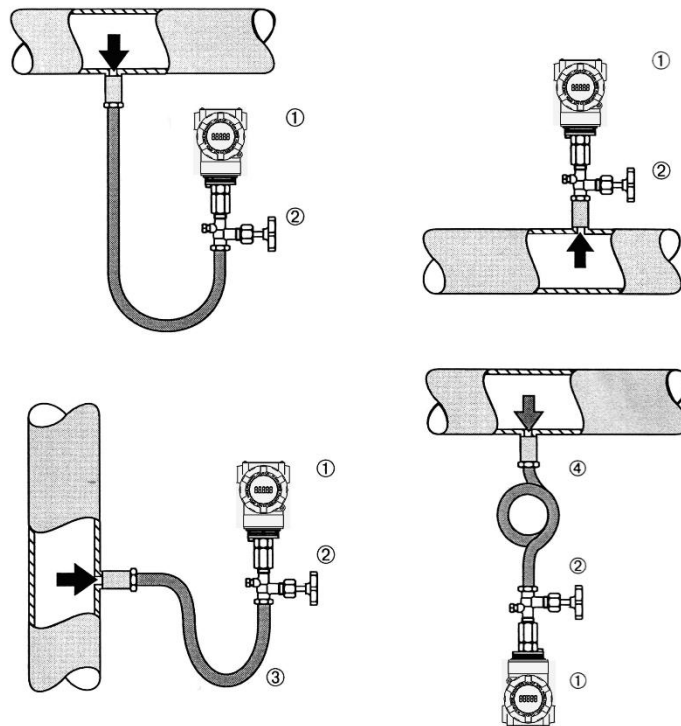


Figure 2.8 Schematic diagram of pressure pipe connection

1	Transmitter	2	Impulse valve	3	Impulse pipe	4	Pipe
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2.5 Wiring

2.5.1 Wiring of FF、PA、HART intelligent transmitter

The power and signal of the intelligent transmitter share a pair of cables, which are called bus cables. HART type intelligent transmitter can choose ordinary cable, FF type and PA type intelligent transmitter are recommended to use the field bus special cable recommended by IEC61158-2. The wiring terminals of the intelligent transmitter are located on the back cover side (marked with FIELD TERMINAL), and the wiring terminal board can be seen by unscrewing the back cover.

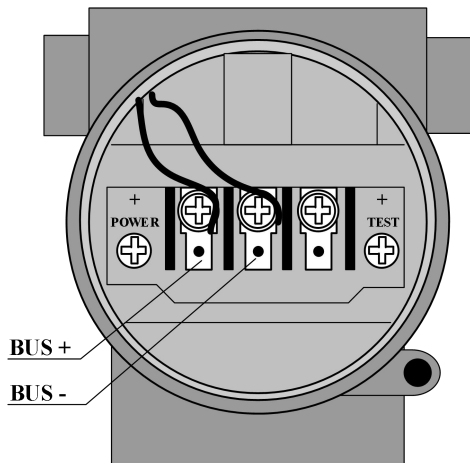


Figure 2.9 FF、PA intelligent transmitter wiring diagram

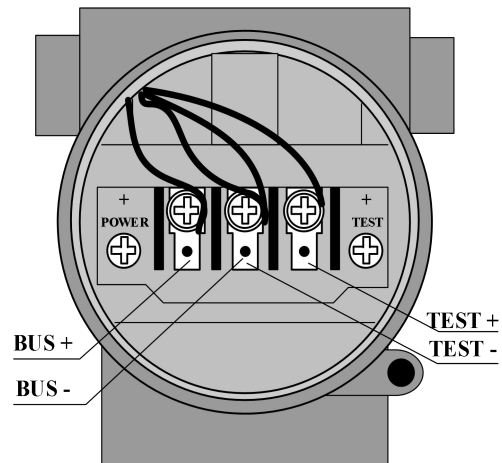


Figure 2.10 HART intelligent transmitter wiring diagram

The left terminal of the terminal board is the signal positive terminal, the right terminal is the test positive terminal, and the middle terminal is the signal negative terminal and the test negative terminal. The power is supplied to the intelligent transmitter through the signal line, and the test terminal is only available in the HART type intelligent transmitter, which is used to connect the test instrument.

The signal wire is perforated to the terminal board through the lead wire, the positive signal is connected to the terminal on the left side of the terminal board (see Figure 2.9), and the negative signal is connected to the middle terminal of the terminal board. The shielding layer of the signal line can be floating or grounded at any point in the signal loop. When connecting the test instrument for testing the analog signal of the HART type intelligent transmitter, the threading method is the same as the signal line. The difference is that the positive input line of the test instrument is connected to the wiring terminal on the right side of the HART type intelligent transmitter terminal board (see Figure 2.10). The connection of the negative input line of the test instrument is the same as that of the signal negative.

Note: When connecting the HART type intelligent transmitter, do not connect the signal wire to the test terminal, otherwise the built-in diode will be burned. If the diode burns out, short circuit the two test terminals as an emergency.

The bus cable of the intelligent transmitter should not share the conduit or wire duct with the power lines of other devices, and should be kept away from high-power devices.

2.5.2 Wiring of DP intelligent transmitter

The wiring terminals of the intelligent transmitter are located on the back cover side (marked with FIELD TERMINAL), and the wiring terminal board can be seen by unscrewing the back cover.

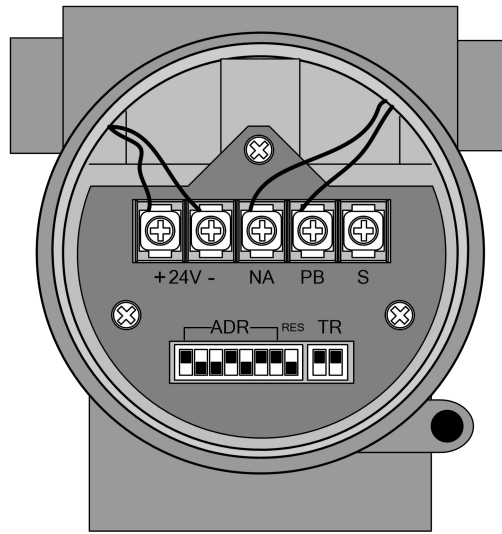
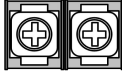
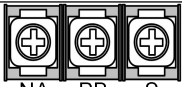


Figure 2.11 HART intelligent transmitter wiring diagram

 <p>+24V -</p>	<p>Provide a stable DC 24V power supply for the device.</p>
 <p>NA PB S - + Cable Screen</p>	<p>Provides bus signals to devices.</p>

The bus cable of the intelligent transmitter should not share the conduit or wire duct with the power lines of other devices, and should be kept away from high-power devices.

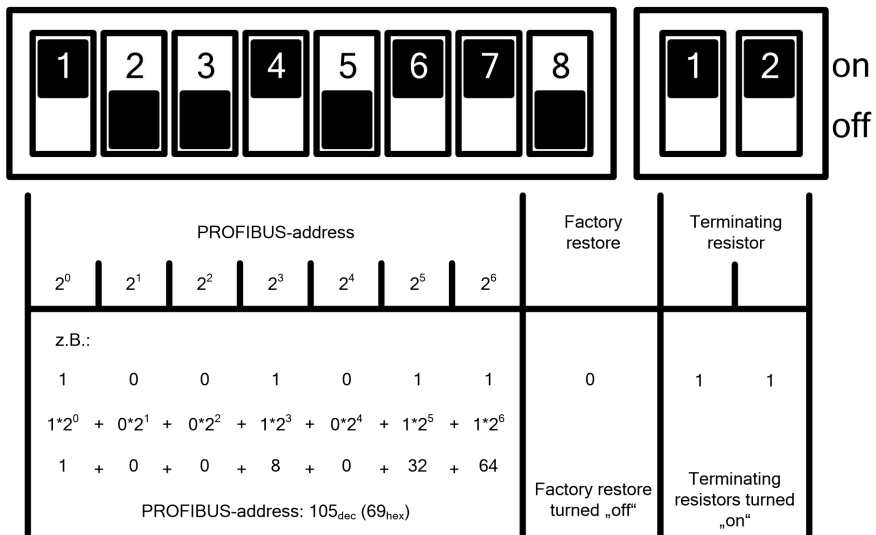


Figure 2.12 DIP switch configuration

When shipped from the factory, all DIP switches are "off".

The functions of setting the device address and restoring the factory defaults only take effect when the device is powered on again.

2.6 Re-calibration inspection

After the user gets the intelligent transmitter, it can be re-calibrated in the test room or on the installation site before it is put into use. Figure 2.13 lists the operational flow.

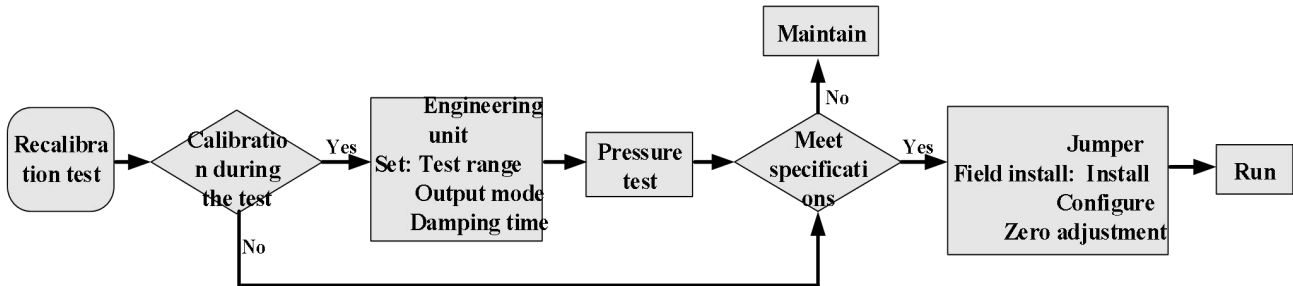


Figure 2.13 Intelligent transmitter recalibration inspection process

The content of the intelligent transmitter re-calibration check includes: function check and pressure check; for the specific check method, please refer to the following chapters.

2.7 Installation of explosion-proof transmitter

When used in hazardous locations, the on-site installation of explosion-proof transmitters must comply with the relevant regulations of GB3836.15-2000 "Electrical Equipment for Explosive Gas Environment Part 15: Electrical Installation in Hazardous Locations (except coal and mines)".

Explosion-proof transmitters must be equipped with safety barriers before they can be used in hazardous locations with explosive mixtures. The type and parameters of the safety barrier are selected according to the explosion-proof parameters in the table below. The suffix "X" of the explosion-proof certificate number means that the product must be matched with an isolated safety barrier to form an intrinsically safe explosion-proof system or that each grounding point in the intrinsically safe explosion-proof system where the product is located must ensure equipotential balance.

In order to maintain the explosion-proof performance of the installed intelligent transmitter, the following items must be paid attention to during installation:

- 1) The housing of the intelligent transmitter must be well grounded.
- 2) The circuit of the intelligent transmitter should not be disassembled or replaced by the user.
- 3) The maximum distribution parameters of the signal cable are calculated according to the selected safety barrier parameters and the explosion-proof parameters of the intelligent transmitter.
- 4) The signal cable of the intelligent transmitter must be separated from other cables, and can be shielded by steel pipes and wiring grooves.
- 5) The shielding layer of the signal line of the intelligent transmitter can be grounded or grounded at a single point.
- 6) The safety barrier should be installed on the rack at the exit of the safe place.

Chapter 3 Working Principle and Structure

The pressure measurement principle of the intelligent transmitter is the same. They are all based on monocrystalline silicon pressure sensors, adopt advanced microcontroller and sensor digital measurement technology, and apply high-accuracy algorithms to ensure high-precision measurement of pressure signals. The communication interface of the intelligent transmitter adopts advanced HART, FF H1, PROFIBUS PA bus technology and PROFIBUS DP bus technology.

HART, FF H1, and PROFIBUS PA intelligent transmitters have the same logical structure and are composed of five parts, namely sensor, instrument card, communication card, liquid crystal display card, and port card. Refer to Figure 1.2 for the overall structure of the intelligent transmitter and Figure 3.1 for the schematic diagram of the product structure. Due to the same physical layer specifications, the FF and PA intelligent transmitters are identical in hardware; the communication cards and port cards of the FF and PA intelligent transmitters are the same as those of the HART intelligent transmitter. The card is different, but other parts are exactly the same as the corresponding parts of the HART type intelligent transmitter.

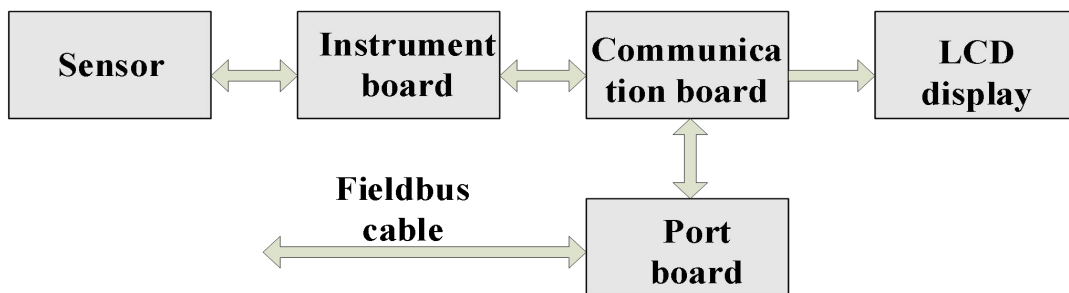


Figure 3.1 Product structure diagram

The DP pressure transmitter hardware board is composed of 5 parts, among which the liquid crystal card and the instrument card use the existing circuit board of the pressure transmitter, which will not be described in detail.

The communication card is composed of CPU, SRAM, VPC3+, EEPROM, etc. It is responsible for DP communication, data communication with the instrument card, driving liquid crystal display, and running various software algorithms.

The main functions of the isolation card include power conversion, respectively providing power to the communication card, instrument card, DP isolation driver, etc.; using an isolation chip to isolate the communication card from the instrument card and DP driver chip; transfer the DP address switch signal on the port card. For the communication card; there are also two dry tubes for the parameter setting of the magnetic rod.

Chapter 4 On-site adjustment

4.1 Operating Instructions of Magnetic Bar

The intelligent transmitter can be adjusted on-site by inserting different combinations of magnetic rods into the two jacks marked "SPAN" and "ZERO" on the top of the electronic housing (below the nameplate), as shown in Figure 4.1

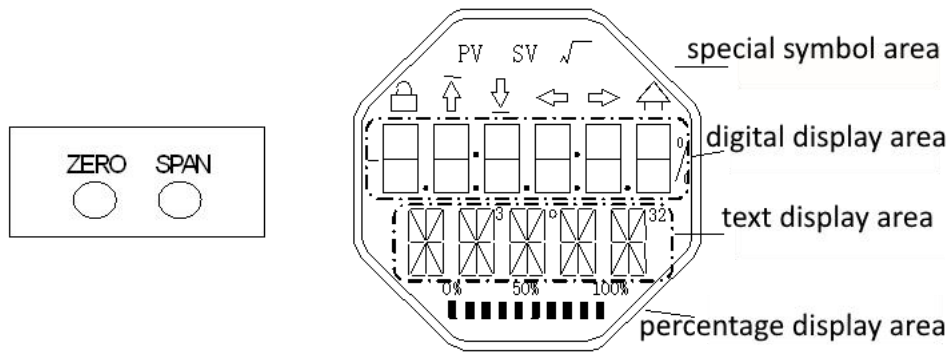


Figure 4.1 Magnet jack position and LCD full position display

The following sections will use different combinations of magnet insertion to simulate four virtual keys, which will facilitate the description of field tuning.

According to the function, the four virtual keys can be defined as the mode key ([M]), the input adjustment key ([↑], [↓]) and the confirmation key ([Enter]). The functions are as follows:

- ✧ Mode key [M]: Switch between various operable modes;
- ✧ Input adjustment key [↑]: Increment operation;
- ✧ Input adjustment key [↓]: decrement operation;
- ✧ Confirm key [Enter]: execute confirmation operation.

How to realize the operation of mode key, input adjustment key and confirmation key:

Mode key ⁽¹⁾	Enter the adjustment key ⁽¹⁾		Enter
[M]	[↓]	[↑]	[Enter]
Zero、Span Insert the magnets at the same time ⁽²⁾	Zero	Span	Zero、Span After inserting for 2 seconds at the same time, remove ⁽²⁾

Notice:

- 1) The mode key [M] and the input adjustment keys ([↓], [↑]) are only one key operation to insert and pull out the magnetic bar, or you can insert the magnetic bar for a long time to operate in the same way. When performing a key operation, it is recommended to plug it in for 1 second before pulling it out, otherwise the operation may not be detected. Always press the button to automatically perform a key operation every 1 second.
- 2) In order to avoid the conflict between the confirmation key and the mode key, when the confirmation

operation is performed, when the progress bar reaches 100%, it indicates that the magnetic bar has been inserted for more than 2 seconds, and the confirmation operation is performed when the two magnetic bars are pulled out. If the magnetic bar is not pulled out after the progress bar reaches 100% for 3 seconds, perform the mode switching operation. The progress bar does not reach 100%, pull out the two magnetic rods, no operation.

4.1.1 General adjustment method

The following is the general adjustment method, please refer to the detailed description of each function for detailed operation.

In the measured value display mode, press the mode key [M] to switch the mode.

When the mode that needs to be adjusted is displayed, take out the two magnetic rods, and the current value of the value to be adjusted in this mode will be displayed on the LCD.

Press [↓] or [↑] to adjust, and after adjustment, press [Enter] to confirm.

Press the mode key [M] to switch back to the measured value display mode.

Notice:

- 1、 Some functions do not need to be confirmed and are saved immediately after adjustment。
- 2、 If there is no key operation for 1 minute (there is no magnetic rod inserted in both holes), it will automatically return to the normal display mode.

4.2 On-site calibration of HART intelligent transmitter

This section only describes the HART intelligent transmitter. The zero point, unit, range lower limit, range upper limit and other adjustment functions of the transmitter can be realized through on-site adjustment. For specific functions and key operations, see Table 4.1

Table4.1 Specific functions and key operations

Function	Model	Key Function			Function	show, explain
	[M]	[↑]	[↓]	[Enter]	show	
Measurement value display						Display the measured value selected in mode 11
Error display						Mistake! When the transmitter fails, the text of the cause of the failure is displayed
Lower range limit	03	---	---	perform calibration	Fun03 LOWER	Set the lower limit of the main variable range with the current value
Upper range limit	04	---	---	perform calibration	Fun04 UPPER	Set the upper limit of the main variable range with the current value
Electronic damping	05	increment	Decrease		Fun05 DAMP	time constant in seconds Setting range: 0.0 to 32.0

Function	Model	Key Function			Function	show, explain
	[M]	[↑]	[↓]	[Enter]	show	
Passive lower range limit	06	preset reduce	preset increase	implement	Fun06 PVLRV	Manually set the lower limit of the primary variable range
Passive range upper limit	07	preset reduce	preset increase	implement	Fun07 PVURV	Manually set the upper limit of the main variable range
Main variable zero	08	---	---	perform calibration	Fun08 ZERO	Set the main variable zero point with the current value
Transfer Function	10	reduce	Increase	implement	Fun10 FUNCT	Set transfer function
Measured value display source	11	Choose from a variety of possibilities			Fun11 DISP	Display the desired measurement result
Unit of physical quantity	12	choose			Fun12 UNIT	Unit of physical quantity

After entering the field adjustment, long press the mode key [M] to switch between the above adjustment functions, as shown in Figure 4.2

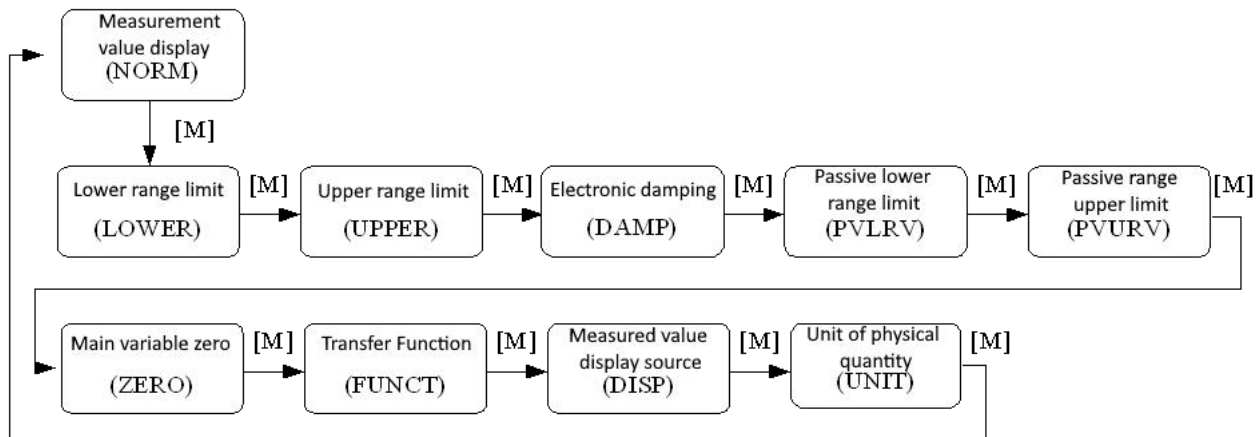


Figure4.2 Adjustment function switch diagram

In the mode switching state, the digital display area displays the function code, for example: "Fun03". The text display area displays the function description as shown in the figure above, for example: "LOWER".

Among them, modes 10, 11, and 12 do not need to be confirmed, and they are saved immediately after adjustment.

4.2.1 Measured value display

In the measured value display function, information on the configuration of the DSP display block is displayed.

4.2.2 Error display

Error messages may appear during local operation

Display	Explain
NumEr	Numerical exception
FNErr	Wrong mode number
Lock	Jumper set to configure protection

4.2.3 Operation steps for setting the lower limit of the range - Mode 03

Set the lower limit of the primary variable range with the current pressure value. Confirm that the lower limit value of the range applied to the intelligent transmitter is stable.

You can set the lower limit of the primary variable range as follows:

- Select mode 03, the LCD will display the current value and unit of the main variable, and the down arrow will be displayed in the special symbol area, indicating that the lower limit of the range is currently being set;
- Press the [Enter] key to set, if the setting is successful, it will display "OK", if it is unsuccessful, it will display "Err";
- Use [M] for mode switching

4.2.4 Operation steps for setting the upper limit of the range - Mode 04

Set the upper limit of the primary variable range with the current pressure value. Confirm that the upper range value applied to the intelligent transmitter is stable.

You can set the upper limit of the primary variable range as follows:

- Select mode 04, the LCD will display the current value and unit of the main variable, and the special symbol area will display the up arrow, indicating that the upper limit of the range is currently being set;
- Press [Enter] key to set, if the setting is successful, it will display "OK", if it is unsuccessful, it will display "Err";
- Use [M] for mode switching.

4.2.5 Steps to Set Electronic Damping - Mode 05

Sets the time constant for electronic damping in the range 0 to 32 seconds.

Set up this electronic damping as follows:

- Set mode 05;
- Use [↑] or [↓] to select damping;
- Use [M] for mode switching.

Damping only affects the output of the analog input function block.

4.2.6 Operation steps for passively setting the lower limit of the range - Mode 06

Passive range migration, set the lower limit of the main variable range.

You can set the lower limit of the primary variable range as follows:

- Adjust the lower limit value of the main variable range by using [↑] and [↓];
- Press the [Enter] key to set, if the setting is successful, it will display “OK”, if it is unsuccessful, it will display “Err”;
- Use [M] for mode switching.

4.2.7 Operation steps for passive setting of upper range limit - Mode 07

Passive range migration, set the upper limit of the main variable range.

You can set the upper limit of the primary variable range as follows:

- Adjust the lower limit value of the main variable range by using [↑] and [↓];
- Press [Enter] key to set, if the setting is successful, it will display “OK”, if it is unsuccessful, it will display “Err”;
- Use [M] for mode switching

4.2.8 Set the main variable zero operation steps - Mode 08

Set the primary variable zero point with the current pressure value. When the transmitter is installed and ready for operation, external influences such as the installation location, ambient temperature or allowable pressure associated with the installation (such as a water column in the pressure line leading to the transmitter) may cause the initial The zero point moves.

Zero calibration can be performed as follows:

- create a pressure scale;
- set mode 08;
- Press [Enter] key to set, “OK” will be displayed if successful, and “Err” will be displayed if unsuccessful;
- After the setting is successful, use [M] to switch the mode;

Switches back to the measured value display mode, the value 0 appears in the display area

4.2.9 Steps to Set Transfer Function - Mode 10

Set the current output method (transfer function).

You can set the transfer function as follows:

- Select mode 10, the LCD will display the current transfer function type;
- Select the transfer function type by using [↑] and [↓];
- Use [M] for mode switching

4.2.10 Steps for setting the measurement value display type - Mode 11

In this mode, you can select the value that will be displayed.

Select the source of the measured value as follows:

- Select mode 11, the value and description of the current display source will be displayed on the LCD;
- by using [↑] and [↓] to select the source of the measured value display;
- Use [M] for mode switching.

The supported measurement value display sources are given in the table below

Measurement value display type	LCD description
[0]main variable output	PV
[1]second variable output	SV
[2]Main variable current output	CU
[3]Primary variable percentage output	PN
[4]Main variable, current value loop output	LOOP
[5]Custom	USER

4.2.11 Steps to Set Primary Variable Units - Mode 12

In mode 12, you can change the unit of the host variable.

Set the primary variable units as follows:

- Select mode 12, the current unit identifier and description will be displayed on the LCD;
- Select a unit by using [↑] and [↓];
- Use [M] for mode switching

4.3 Field calibration of FF type intelligent transmitter

This section only describes the FF type intelligent transmitter. Through on-site adjustment, the adjustment function of the lower limit of the transmitter range, the upper limit of the range and the zero point of the main variable can be realized. For specific functions and key operations, see Table 4.2.

Table4.2 Specific functions and key operations

Function	Model	Key Function			Function	Show, explain
	[M]	[↑]	[↓]	[Enter]	show	
Measurement value display						Displays information about the DSP display block configuration
Error display						Mistake! When the transmitter fails, the text of the cause of the failure is displayed

Function	Model	Key Function			Function	Show, explain
	[M]	[↑]	[↓]	[Enter]	show	
Main variable zero	15	---	---	implement calibration	Fun15 ZERO	Empty the pressure, differential pressure, flow, liquid level transmitters, and vacuum the absolute pressure transmitters, and the unit of measurement is the pressure unit
Lower range limit	16	Default increase	Preset reduction	implement	Fun16 LOWER	Adjust the lower limit of the characteristic curve
Upper range limit	17	Default increase	Preset reduction	implement	Fun17 UPPER	Adjust the upper limit of the characteristic curve

After entering the field adjustment, long press the mode key [M] to switch between the above adjustment functions, as shown in Figure 4.3

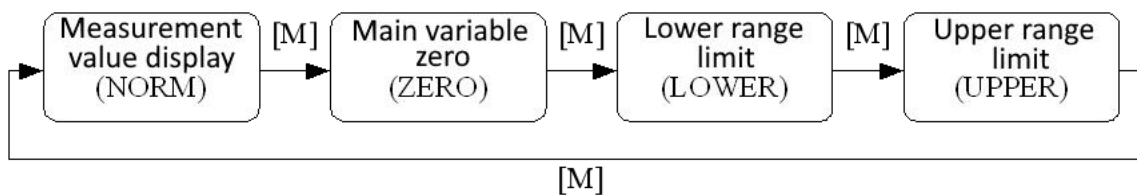


Figure 4.3 Adjustment function switch diagram

4.3.1 Measurement value display

In the measured value display function, information about the configuration of the DSP display block is displayed.

4.3.2 Error display

Error messages may appear during local operation.

Show	Explain
NumEr	Numerical exception
FNErr	Wrong mode number
Lock	Jumper set to configure protection

4.3.3 Operation steps for setting the main variable zero point - Mode 15

When the transmitter is installed and ready for operation, external influences such as the installation location, ambient temperature or allowable pressure associated with the installation (such as a water column in the pressure line leading to the transmitter) may cause the initial The zero point moves.

Zero calibration can be performed as follows:

- create a pressure scale;
- set mode 15;

- Press [Enter] key to set, "OK" will be displayed if successful, and "Err" will be displayed if unsuccessful;
- After successful calibration, return to measurement value display mode immediately.

The value 0 appears in the display area.

4.3.4 Operation steps for setting the lower limit of the range - Mode 16

The slope of the characteristic curve can be changed in this mode. The characteristic curve is rotated around the high set point. This function replaces zero adjustment (mode 08).

Perform the adjustment of the lower limit of the range as follows:

- Set mode 16. Displays the last adjusted process value and its associated units;
- If you only want to view this information, you can press the [M] key to switch the mode, otherwise you will apply the reference pressure;
- Use [↑] and [↓] to enter a reference pressure value starting from this value;
- Press [Enter] key to set, "OK" will be displayed if successful, and "Err" will be displayed if unsuccessful;
- Use [M] for mode switching.

4.3.5 Operation steps for setting the upper range limit - Mode 17

The slope of the characteristic curve can be changed in this mode. The characteristic curve rotates around the low set point.

Perform the adjustment of the upper range limit as follows:

- Set mode 17. Displays the last adjusted process value and its associated units;
- If you only want to view this information, you can press the [M] key to switch the mode, otherwise you will apply the reference pressure;
- Use [↑] and [↓] to enter a reference pressure value starting from this value;
- Press the [Enter] key to set, if the adjustment is successful, it will display "OK", and if it is unsuccessful, it will display "Err".
- Use [M] for mode switching

4.4 On-site calibration of PA type intelligent transmitter

This section only describes the PA type intelligent transmitter. Through on-site adjustment, the adjustment functions of the transmitter's bus address, display variable type, decimal point position, zero point, unit, range lower limit and range upper limit can be realized. For specific functions and key operations, see Table 4.3

Table 4.3 Specific functions and key operations

Function	Model	Key Function			Function	Show, explain
	[M]	[↑]	[↓]	[Enter]	show	
Measurement						Display the measured value selected in mode 11

Function	Model	Key Function			Function	Show, explain
	[M]	[↑]	[↓]	[Enter]	show	
value display						
error display						Mistake! When the transmitter fails, the text of the cause of the failure is displayed
Electronic damping	05	increment	Decrease		Fun05 DAMP	Time constant in seconds Setting range: 0.0 to 32.0
Measured value display source	11	Choose from a variety of possibilities			Fun11 DISP	Display the desired measurement result
unit of physical quantity	12	choose			Fun12 UNIT	unit of physical quantity
Bus address	13	increase	reduce	implement	Fun13 ADDR	User address on PROFIBUS (0...126)
Decimal point	14	Revise			Fun14 DECPT	Position of decimal point in display area
Main variable zero	08	---	---	implement calibration	Fun08 ZERO	Empty the pressure, differential pressure, flow, liquid level transmitters, and vacuum the absolute pressure transmitters, and the unit of measurement is the pressure unit
Lower range limit	16	Default increase	Preset reduction	implement	Fun16 LOWER	Adjust the lower limit of the characteristic curve
Upper range limit	17	Default increase	Preset reduction	implement	Fun17 UPPER	Adjust the upper limit of the characteristic curve
Input range lower limit	18	Default increase	Preset reduction	implement	Fun18 IN 0%	Passive adjustment of the lower limit of the input range
Input range upper limit	19	Default increase	Preset reduction	implement	Fun19 IN 100%	Passive adjustment of the upper limit of the input range
Lower limit of output range	20	Default increase	Preset reduction	implement	Fun20 OUT 0%	Passive adjustment of the lower limit of the output range
Output range upper limit	21	Default increase	Preset reduction	implement	Fun20 OUT100%	Passive adjustment of the upper limit of the output range

Long press the mode key [M] to switch between the above adjustment functions, as shown in Figure 4.4

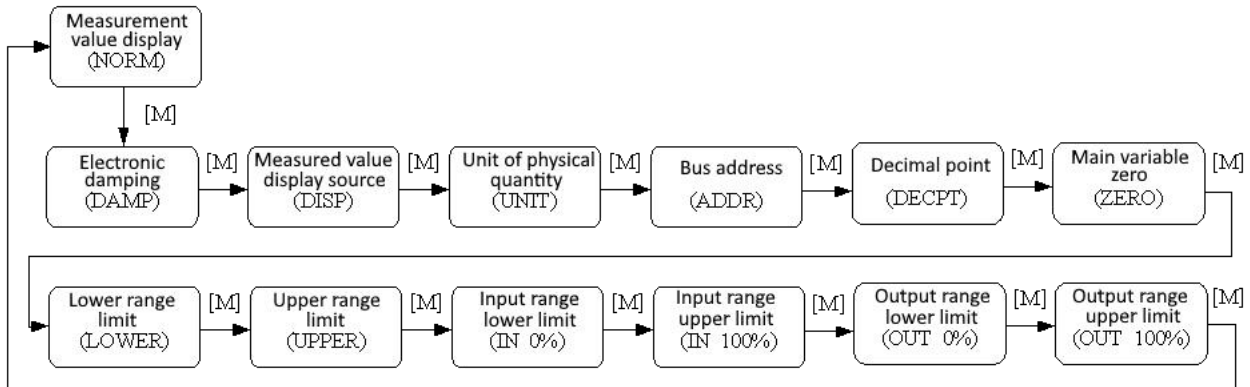


Figure 4.4 Adjustment function switch diagram

4.4.1 Measurement value display

In the measurement value display function, the measurement value selected in mode 11 is displayed. The unit of physical quantity is set in mode 12, and the position of the decimal point is set in mode 14.

4.4.2 Error display

Error messages may appear during local operation.

Show	Explain
NumEr	Numerical exception
FNErr	Wrong mode number
UNErr	Unit does not match
Lock	Jumper set to configure protection

4.4.3 Steps to Set Electronic Damping - Mode 05

Sets the time constant for electronic damping in the range 0 to 32 seconds.

Set up this electronic damping as follows:

- set mode 05;
- Use [↑] or [↓] to select damping;
- Use [M] for mode switching.

Damping only affects the output of the analog input function block.

4.4.4 Steps to set the measurement value display source - Mode 11

In this mode, you can choose the value that will be displayed.

In SIMATIC PDM, this is the "Transmitter Type" parameter.

You can choose the source of the measurement value in the following ways:

- set mode 11;
- by using [↑] and [↓] to select the source of the measured value display;
- Use [M] for mode switching.

In Mode 12, the assignable unit of physical quantity depends on the source from which the measurement value is displayed.

The supported measurement value display sources are given in the table below.

Measured value display source	LCD display auxiliary information
[0]Main variable output of pressure conversion block	PRIM
[1]Pressure Transformer Block Secondary Variable Output	SEC1
[2]AI function block output	AIOUT
[3]Pressure transducer block sensor raw value	SENS
[4]Pressure transducer block sensor temperature value	TEMP

4.4.5 Operation steps for setting physical quantity units - Mode 12

Set the physical quantity unit by selecting an option from the list. The group of units that can be selected depends on the source of the measurement display (mode 11).

You can set physical quantity units in the following ways:

- Set mode 12. The identifier of the current unit appears in the measurement value display, and the corresponding plain text appears in the unit display.
- Select a unit by using [↑] and [↓];
- Use [M] for mode switching.

The pressure unit is shown in Table 4.4:

Table 4.4 pressure unit

Unit Code	Unit	Unit Code	Unit	Unit Code	Unit
1130	Pa	1140	atm	1150	mmH ₂ O(4 °C)
1131	GPa	1141	psi	1151	mmH ₂ O(68 °C)
1132	MPa	1142	psia	1152	ftH ₂ O
1133	kPa	1143	psig	1153	ftH ₂ O(4 °C)
1134	mPa	1144	g/cm ²	1154	ftH ₂ O(68 °C)
1135	μPa	1145	kg/cm ²	1155	inHg
1136	hPa	1146	inH ₂ O	1156	inHg(0 °C)
1137	bar	1147	inH ₂ O(4 °C)	1157	mmHg
1138	mbar	1148	inH ₂ O(68 °C)	1158	mmHg(0 °C)
1139	torr	1149	mmH ₂ O		

4.4.6 Steps to Set Bus Address - Mode 13

In mode 13, you can set the user address of the device in PROFIBUS. The allowed range is 0 to 126.

Set the PROFIBUS address as follows:

- Set mode 13. The current user address will appear in the measured value display;
- Use [↑] and [↓] to modify this address within the allowed range;
- Press the [Enter] key to set, “OK” will be displayed if successful, and “Err” will be displayed if unsuccessful.
- Use [M] for mode switching

4.4.7 Steps for setting the decimal point - Mode 14

Measurements can be displayed with up to 5 decimal places of precision.

Move the decimal point position as follows:

- Set mode 14. The format of the current position of the decimal point appears in the measurement value display area;
- Use [↑] and [↓] to select the desired display format;

8.88888 88.8888 888.888 8888.88 88888.8 888888

- Use [M] for mode switching

4.4.8 Operation steps for setting the main variable zero point - Mode 15

When the transmitter is installed and ready for operation, external influences such as the installation location, ambient temperature or allowable pressure associated with the installation (such as a water column in the pressure line leading to the transmitter) may cause the initial The zero point moves.

Zero calibration can be performed as follows:

- create a pressure scale;
- set mode 15;
- Press the [Enter] key to set, “OK” will be displayed if successful, and “Err” will be displayed if unsuccessful.
- After successful calibration, return to measurement value display mode immediately.

The value 0 appears in the display area

4.4.9 Operation steps for setting the lower limit of the range - Mode 16

The slope of the characteristic curve can be changed in this mode. The characteristic curve is rotated around the high set point. This function replaces zero adjustment (mode 08).

Perform the adjustment of the lower limit of the range as follows:

- Set mode 16. Displays the last adjusted process value and its associated units;
- If you only want to view this information, you can press the [M] key to switch the mode, otherwise you will apply the reference pressure;
- Use [↑] and [↓] to enter a reference pressure value starting from this value;
- Press the [Enter] key to set, “OK” will be displayed if successful, and “Err” will be displayed if unsuccessful.

- Use [M] for mode switching

4.4.10 Operation steps for setting the upper range limit - Mode 17

The slope of the characteristic curve can be changed in this mode. The characteristic curve rotates around the low set point.

Perform the adjustment of the upper range limit as follows:

- Set mode 17. Displays the last adjusted process value and its associated units;
- If you only want to view this information, you can press the [M] key to switch the mode, otherwise you will apply the reference pressure;
- Use [↑] and [↓] to enter a reference pressure value starting from this value;
- Press the [Enter] key to set, “OK” will be displayed if successful, and “Err” will be displayed if unsuccessful.
- Use [M] for mode switching

4.4.11 Operation steps for setting the lower limit of the input range - Mode 18

In this mode, the lower limit of the input range can be passively adjusted.

Perform the adjustment of the upper range limit as follows:

- Set mode 18. Displays the last adjusted process value and its associated units;
- Use [↑] and [↓] to enter a reference value starting from this value;
- Press the [Enter] key to set, “OK” will be displayed if successful, and “Err” will be displayed if unsuccessful.
- Use [M] for mode switching

4.4.12 Operation steps for setting the upper limit of the input range - Mode 19

In this mode, the upper limit of the input range can be passively adjusted.

Perform the adjustment of the upper range limit as follows:

- Set mode 19. Displays the last adjusted process value and its associated units;
- Use [↑] and [↓] to enter a reference value starting from this value;
- Press the [Enter] key to set, “OK” will be displayed if successful, and “Err” will be displayed if unsuccessful.
- Use [M] for mode switching

4.4.13 Operation steps for setting the lower limit of the output range - Mode 20

In this mode, the lower limit of the output range can be passively adjusted.

Perform the adjustment of the upper range limit as follows:

- Set mode 20. Displays the last adjusted process value and its associated units;
- Use [↑] and [↓] to enter a reference value starting from this value;

- Press the [Enter] key to set, “OK” will be displayed if successful, and “Err” will be displayed if unsuccessful.
- Use [M] for mode switching

4.4.14 Operation steps for setting the upper limit of the output range – Mode 21

In this mode, the upper limit of the output range can be passively adjusted.

Perform the adjustment of the upper range limit as follows:

- Set mode 21. Displays the last adjusted process value and its associated units;
- Use [↑] and [↓] to enter a reference value starting from this value;
- Press the [Enter] key to set, “OK” will be displayed if successful, and “Err” will be displayed if unsuccessful.
- Use [M] for mode switching

4.5 On-site calibration of DP type intelligent transmitter

Through on-site adjustment, the adjustment functions of the transmitter's bus address, display variable type, decimal point position, zero point, unit, range lower limit and range upper limit can be realized. For specific functions and key operations, see Table 4.5

Table 4.5 Specific functions and key operations

Function	model	Key Function			Function	show, explain
	[M]	[↑]	[↓]	[Enter]	show	
Measurement value display						Display the measured value selected in mode 11
Error display						Mistake! When the transmitter fails, the text of the cause of the failure is displayed
Electronic damping	05	increment	Decrease		Fun05 DAMP	time constant in seconds Setting range: 0.0 to 32.0
Measurements show source	11	Choose from a variety of possibilities			Fun11 DISP	Display the desired measurement result
Unit of physical quantity	12	choose			Fun12 UNIT	unit of physical quantity
Decimal point	14	Revise			Fun14 DECPT	Position of decimal point in display area
Main variable zero	08	---	---	implement calibration	Fun08 ZERO	For the pressure, the differential pressure transmitter is vented, and the absolute pressure transmitter is evacuated, and the unit of measurement is the pressure unit

Function	model	Key Function			Function	show, explain
	[M]	[↑]	[↓]	[Enter]	show	
Lower range limit	16	Default increase	Preset reduction	implement	Fun16 LOWER	Adjust the lower limit of the characteristic curve
Upper range limit	17	Default increase	Preset reduction	implement	Fun17 UPPER	Adjust the upper limit of the characteristic curve
Input range lower limit	18	Default increase	Preset reduction	implement	Fun18 IN 0%	Passive adjustment of the lower limit of the input range
Input range upper limit	19	Default increase	Preset reduction	implement	Fun19 IN 100%	Passive adjustment of the upper limit of the input range
Lower limit of output range	20	Default increase	Preset reduction	implement	Fun20 OUT 0%	Passive adjustment of the lower limit of the output range
Output range upper limit	21	Default increase	Preset reduction	implement	Fun20 OUT 100%	Passive adjustment of the upper limit of the output range

After entering the field adjustment, long press the mode key [M] to switch between the above adjustment functions, as shown in Figure 4.5

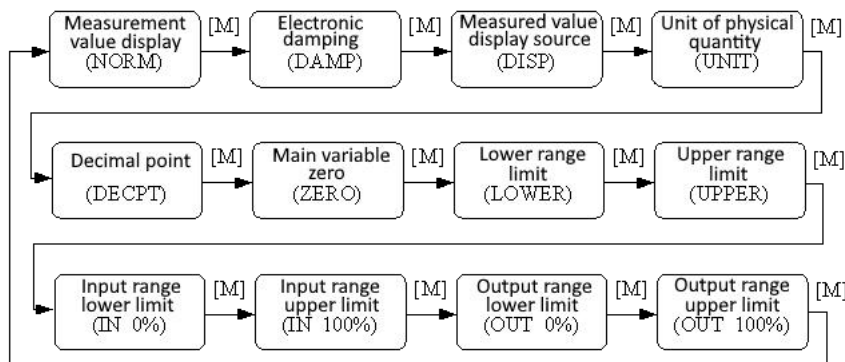


Figure 4.5 Adjustment function switch diagram

4.5.1 Measurement value display

In the measurement value display function, the measurement value selected in mode 11 is displayed. The unit of physical quantity is set in mode 12, and the position of the decimal point is set in mode 14

4.5.2 Error display

An error message occurs during local operation and is displayed for approximately 10 seconds after the error occurs.

4.5.3 Steps to Set Electronic Damping - Mode 05

Sets the time constant for electronic damping in the range 0 to 32 seconds.

Set up this electronic damping as follows:

- set mode 05;
- Use [↑] or [↓] to select damping;
- Use [M] for mode switching.

Damping only affects the output of the analog input function block.

4.5.4 Steps to set the measurement value display source - Mode 11

In this mode, you can select the value that will be displayed.

In SIMATIC PDM, this is the "Transmitter Type" parameter.

You can choose the source of the measurement value in the following ways:

- set mode 11;
- by using [↑] and [↓] to select the source of the measured value display;
- Use [M] for mode switching.

In Mode 12, the assignable unit of physical quantity depends on the source from which the measurement value is displayed.

The supported measurement value display sources are given in the table below.

Measured value display source	LCD display auxiliary information
[0]Main variable output of pressure conversion block	PRIM
[1]Pressure Transformer Block Secondary Variable Output	SEC1
[2]AI function block output	AIOUT
[3]Pressure transducer block sensor raw value	SENS
[4]Pressure transducer block sensor temperature value	TEMP

4.5.5 Operation steps for setting physical quantity units - Mode 12

Set the physical quantity unit by selecting an option from the list. The group of units that can be selected depends on the source of the measurement display (mode 11).

You can set physical quantity units in the following ways:

– Set mode 12. The identifier of the current unit appears in the measurement value display, and the corresponding plain text appears in the unit display.

– Select a unit by using [↑] and [↓];

– Use [M] for mode switching.

The pressure unit is shown in Table 4.6:

Table 4.6 Pressure unit

Unit Code	Unit	Unit Code	Unit	Unit Code	Unit
1130	Pa	1140	atm	1150	mmH2O(4°C)
1131	GPa	1141	psi	1151	mmH2O(68°C)
1132	MPa	1142	psia	1152	ftH2O
1133	KPa	1143	psig	1153	ftH2O(4°C)
1134	mPa	1144	g/cm2	1154	ftH2O(68°C)
1135	μPa	1145	kg/cm2	1155	inHg
1136	hPa	1146	inH2O	1156	inHg(0°C)
1137	bar	1147	inH2O(4°C)	1157	mmHg
1138	mbar	1148	inH2O(68°C)	1158	mmHg(0°C)
1139	torr	1149	mmH2O		

4.5.6 Steps for setting the decimal point - Mode 14

Measurements can be displayed with up to 5 decimal places of precision.

Move the decimal point position as follows:

– Set mode 14. The format of the current position of the decimal point appears in the measurement value display area;

– Use [↑] and [↓] to select the desired display format;

8.88888 88.8888 888.888 8888.88 88888.8 888888

– Use [M] for mode switching

4.5.7 Operation steps for setting the main variable zero point - Mode 15

When the transmitter is installed and ready for operation, external influences such as the installation location, ambient temperature or allowable pressure associated with the installation (such as a water column in the pressure line leading to the transmitter) may cause the initial The zero point moves.

Zero calibration can be performed as follows:

– create a pressure scale;

- set mode 15;
- Press [Enter] to set, if the adjustment is successful, it will display “OK”, if it is unsuccessful, it will display “Err”;
- After successful calibration, return to measurement value display mode immediately.

The value 0 appears in the display area.

4.5.8 Operation steps for setting the lower limit of the range - Mode 16

The slope of the characteristic curve can be changed in this mode. The characteristic curve is rotated around the high set point. This function replaces zero adjustment (mode 08).

Perform the adjustment of the lower limit of the range as follows:

- Set mode 16. Displays the last adjusted process value and its associated units;
- If you only view this information, you can press the [M] key to switch the mode, otherwise you will apply the reference pressure;
- Use [↑] and [↓] to enter a reference pressure value starting from this value;
- Press [Enter] to set, if the adjustment is successful, it will display “OK”, if it is unsuccessful, it will display “Err”;
- Use [M] for mode switching

4.5.9 Operation steps for setting the upper range limit - Mode 17

The slope of the characteristic curve can be changed in this mode. The characteristic curve rotates around the low set point.

Perform the adjustment of the upper range limit as follows:

- Set mode 17. Displays the last adjusted process value and its associated units;
- If you only view this information, you can press the [M] key to switch the mode, otherwise you will apply the reference pressure;
- Use [↑] and [↓] to enter a reference pressure value starting from this value;
- Press [Enter] to set, if the adjustment is successful, it will display “OK”, if it is unsuccessful, it will display “Err”;
- Use [M] for mode switching.

4.5.10 Operation steps for setting the lower limit of the input range - Mode 18

In this mode, the lower limit of the input range can be passively adjusted.

Perform the adjustment of the upper range limit as follows:

- Set mode 18. Displays the last adjusted process value and its associated units;
- Use [↑] and [↓] to enter a reference value starting from this value;
- Press [Enter] to set, if the adjustment is successful, it will display “OK”, if it is unsuccessful, it will display “Err”;

- Use [M] for mode switching

4.5.11 Operation steps for setting the upper limit of the input range - Mode 19

In this mode, the upper limit of the input range can be passively adjusted.

Perform the adjustment of the upper range limit as follows:

- Set mode 19. Displays the last adjusted process value and its associated units;
- Use [↑] and [↓] to enter a reference value starting from this value;
- Press [Enter] to set, if the adjustment is successful, it will display “OK”, if it is unsuccessful, it will display “Err”;
- Use [M] for mode switching

4.5.12 Operation steps for setting the lower limit of the output range - Mode 20

In this mode, the lower limit of the output range can be passively adjusted.

Perform the adjustment of the upper range limit as follows:

- Set mode 20. Displays the last adjusted process value and its associated units;
- Use [↑] and [↓] to enter a reference value starting from this value;
- Press [Enter] to set, if the adjustment is successful, it will display “OK”, if it is unsuccessful, it will display “Err”;
- Use [M] for mode switching.

4.5.13 Operation steps for setting the upper limit of the output range – Mode 21

In this mode, the upper limit of the output range can be passively adjusted.

Perform the adjustment of the upper range limit as follows:

- Set mode 21. Displays the last adjusted process value and its associated units;
- Use [↑] and [↓] to enter a reference value starting from this value;
- Press [Enter] to set, if the adjustment is successful, it will display “OK”, if it is unsuccessful, it will display “Err”;
- Use [M] for mode switching.

4.6 Restore meter data to factory defaults

Restoring the instrument data to the factory setting is a special operation, and there is no function code. After doing this, all configuration data will disappear and the factory state will be restored. Please use with caution.

You can restore the meter data to the factory value in the following ways:

- switch off the power supply of the instrument;
- Insert the two magnetic rods into the "Zero" hole and the "Span" hole at the same time;
- Power on the meter again, the LCD will display “RST?” at this moment;

- If you want to restore the data of the meter to the factory value, take out the two magnetic rods, and insert the two magnetic rods at the same time again. When the progress bar reaches 100%, take out the two magnetic rods again, and the LCD will display "R_OK", indicating that the recovery is successful;
- If you do not want to restore the meter data to the factory value, take out the two magnetic rods, wait for 5 seconds, and then it can be used normally.

Notice:

FF type, PA type intelligent transmitter, operate according to the above method. If there is an RST jumper, it will directly restore the factory value, and "RST?" will not appear.

If the DIP switch is restored to the factory default position "on", the factory value will be directly restored, and "RST?" will not appear.

When the progress bar does not reach 100%, take out the two magnetic rods, or cancel the operation of restoring the instrument data to the factory value.

Chapter 5 HART Type Intelligent Transmitter Configuration

5.1 Topologic Connection

The connection of the HART intelligent transmitter includes Point-to-Point connection and Multi-Point connection.

- **Point-to-Point Connection (Figure 5.1)**

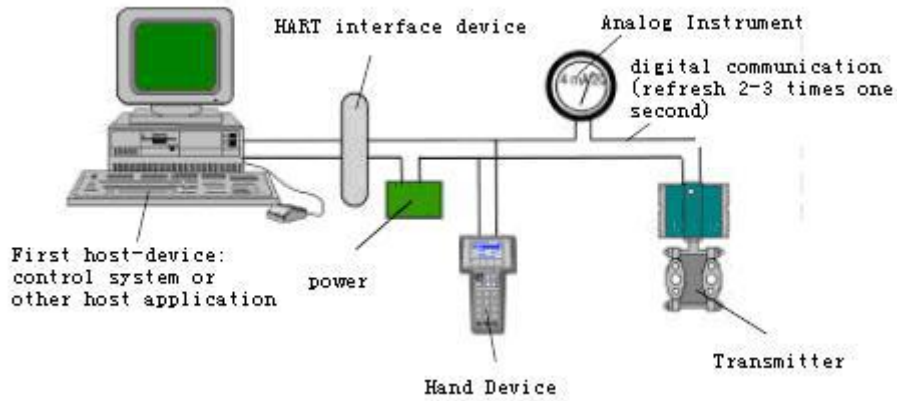


Figure 5.1 Point-to-Point Connection

Feature:

- 1) It can be connected to the upper level control system through the ordinary AI input module and HART communication device;
- 2) Mixed use of the analog and digital communication;
- 3) The device address is 0.

- **Multi-Point Connection (Figure 5.2)**

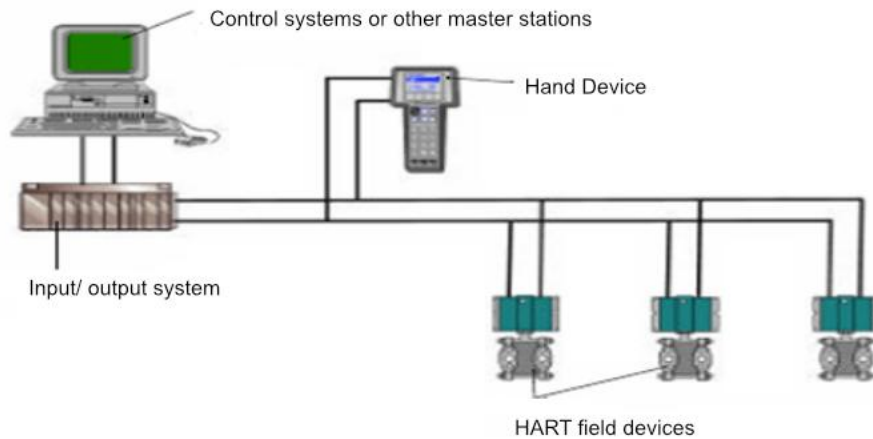


Figure 5.2 Multi-Point Connection

Feature:

- 1) Can be connected to the upper level control system through HART communication device;
- 2) Only use HART system digital function , and the fixed current on wire is 4mA;
- 3) Up to 63 device networking is supported in the short address format.

5.2 Function Configuration

The intelligent transmitter can be debugged using the HART configuration software, including the following five functions:

- 1) Basic information configuration: configure the basic information of online equipment, including label, address, date, assembly number information, etc.;
- 2) Configuration information: configuration information of online equipment, including main variable range, damping and other information;
- 3) Current calibration: can calibrate (4~20) mA current and currently using two-point calibration, namely 4 mA and 20 mA. While the user can set the fixed current output mode to test the current accuracy;
- 4) Special command: can configure the LCD display type, configuration of small signal resection, user unit, special curve configuration and other functions.
- 5) Additional information: Ability to configure sensor information for the entire pressure meter and user custom saturation / alarm current values.

5.2.1 Configuration Environment

- 1) PC machine;
- 2) HART Modem;
- 3) Match resistance (250~550) Ω ;
- 4) Standard pressure source.

5.2.2 Basic Information Configuration

Through the dialog of basic information, the basic information of the intelligent transmitter can be read or modified, including device address, message, description, label, date, assembly number, alarm, write protection, manufacturer ID, manufacturer, equipment type, equipment ID, long address, and version information, as shown in Figure 5.3.

After the information is modified, it can be downloaded to the device by pressing the "Application" button. If not sent successfully, the device information will be restored to the previously modified content. If you abandon the modification, you can choose the "Exit " button to exit the basic information operation.

- 1) The maximum length of the label is 8 specified characters;
- 2) Description can enter up to 16 specified characters;
- 3) Messages can enter up to 32 characters;
- 4) The address selection range is 0~63;

- 5) The maximum assembly number length is 6 specified characters.
- 6) The whole machine series number can not be modified;

Figure 5.3 Basic Info Tab

5.2.3 Configuration of Configuration Information

Through the configuration information dialog box, you can read or modify the configuration information of the intelligent transmitter, including the value and unit of the main variable and the second variable of the device (here refers to pressure and temperature), the current value, the percentage, the output information of the main variable (damping value, unit, upper limit of range, lower limit of range, output transfer function), sensor information (serial number, upper limit, lower limit, minimum range, unit), etc., as shown in Figure 5.4.

- 1) Primary variable unit configuration: the change of the main variable unit directly affects the variables associated with the unit, such as the upper and lower limit of the range, the upper and lower limit of the sensor, and the minimum range. When modifying units, the upper and lower limits of the main variable range cannot be modified at the same time.
- 2) Damping value configuration: the damping parameter range ranges from 0 to 32 seconds.
- 3) Set range lower limit: take the main variable value of the currently measured as the lower range range (the upper limit is adjusted); if the range upper limit exceeds the sensor upper limit, the sensor upper range upper limit is set after adjustment, and the range changes accordingly.
- 4) Set the upper limit: with the current measured main variable value as the upper limit and change the upper limit of the sensor, set the upper limit as the adjusted upper limit.
- 5) Primary variable zero: correct the offset of primary variable zero due to the influence of installation position.

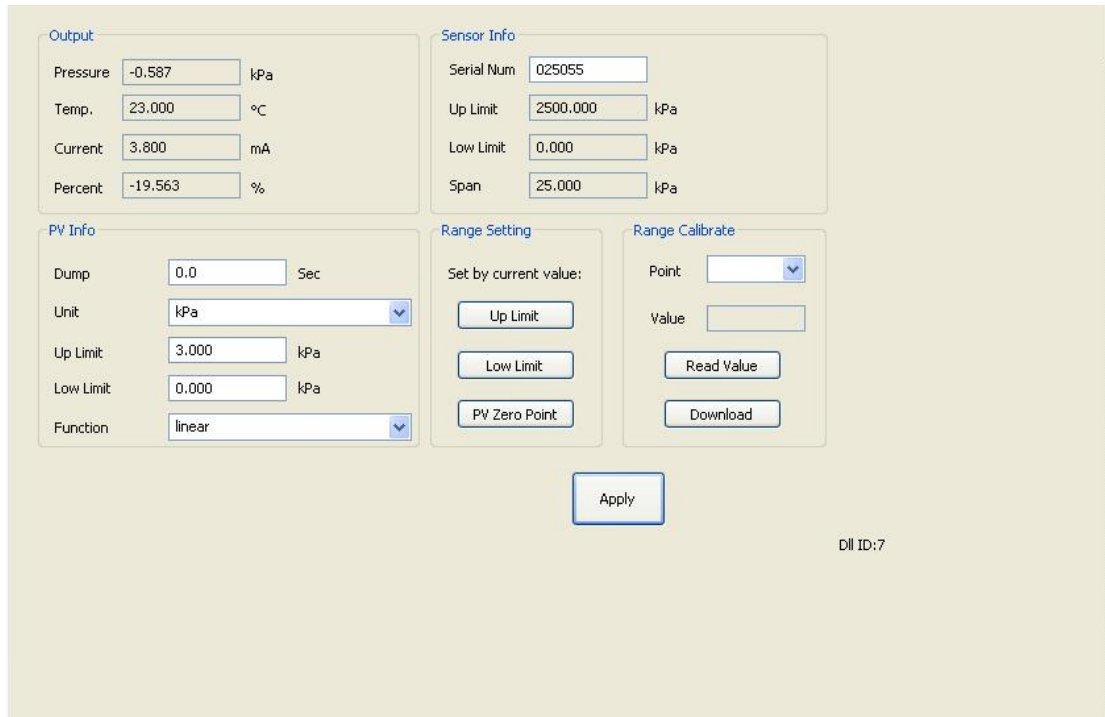


Figure 5.4 The Configuration Information Tab

6) Range calibration: after the range migration, calibration the upper and lower range limits. The calibration process is as follows:

- ① The transmitter adds the standard range lower limit pressure, select the calibration point "range lower limit", as shown in Figure 5.5, click "Get the current value", display the calibration data in the "correct value", click "download", then the actual pressure value is the lower range lower pressure value, and the current output is 4 mA.



Figure 5.5 Range Calibration-calibration Range Lower Limit

- ② The transmitter adds the standard upper limit pressure. After the pressure is stable, select the calibration point "upper limit", as shown in Figure 5.6, click "Get the current value", display the calibration data in the "correction value", click "Download", then the actual pressure output is the upper range pressure value, and the current output is 20 mA;



Figure 5.6 Scale Calibration-calibration range upper limit

5.2.4 Current Calibration and Fixed Current Output

The user can calibrate the intelligent transmitter analog output current of 4 mA, 20 mA and output fixed current. When calibrating the current and fixed current output, the polling address of the intelligent transmitter can only be 0, and other polling addresses will prompt the error message "in multipoint mode". In addition, it is necessary to string in more than five and a half precision ammeters in the intelligent transmitter output loop.

4 mA and 20 mA current calibration: In Figure 5.7, select the current value to be calibrated. After the output current value is stable, input the reading of the ammeter into the "Adjustment value" box and click "Apply" to observe whether the output current meets the requirements. If it does not meet, continue the adjustment ac

Fixed current output: In Figure 5.7, enter the current value that the intelligent transmitter will fixed output in "Fixed Current Value" and click "Enter / Exit Fixed Current Mode" to enter the fixed current output mode. The button displays "Exit Fixed Current Mode". In order to exit the fixed current mode, click the button again.

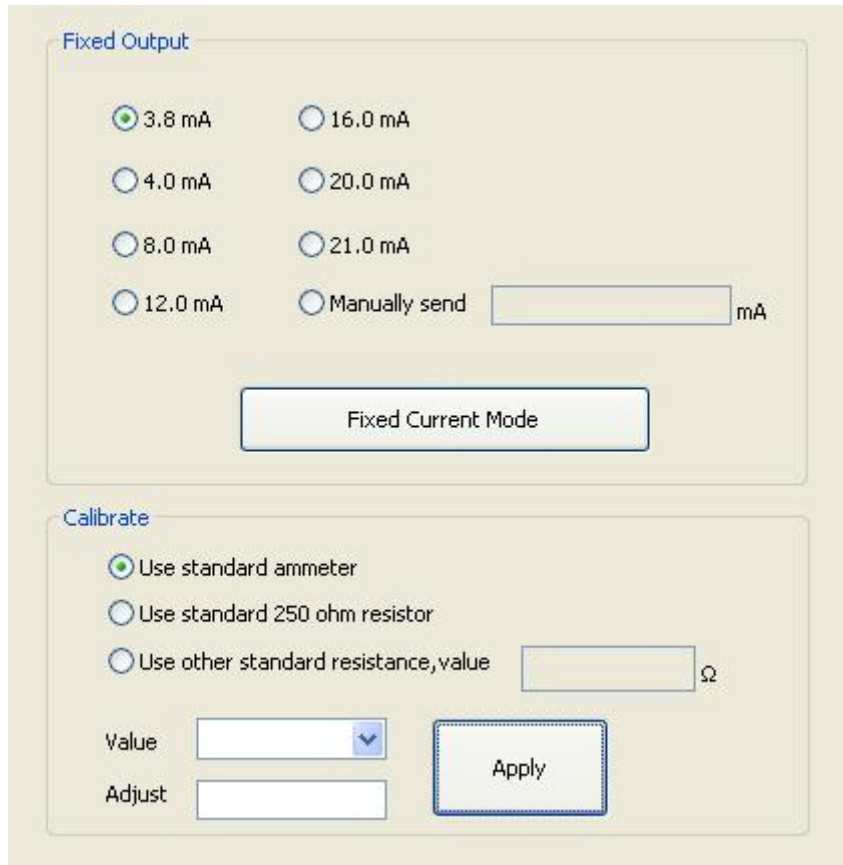


Figure 5.7 Calibrate Current Tab

5.2.5 Saturable Fixed Output (Manufacturer setting, not configurable)

When the HART intelligent transmitter runs continuously, it constantly compares the value of the main variable with the upper and lower limits. When the value of the main variable exceeds the upper and lower range, the intelligent transmitter output saturation current, indicating that the main variable exceeds the range. When the main variable is above the upper limit, the intelligent transmitter output high alarm current; when below the lower limit, the intelligent transmitter output low alarm current.

5.2.6 Special Command

The special command tab on the configuration software is shown in Figure 5.8:

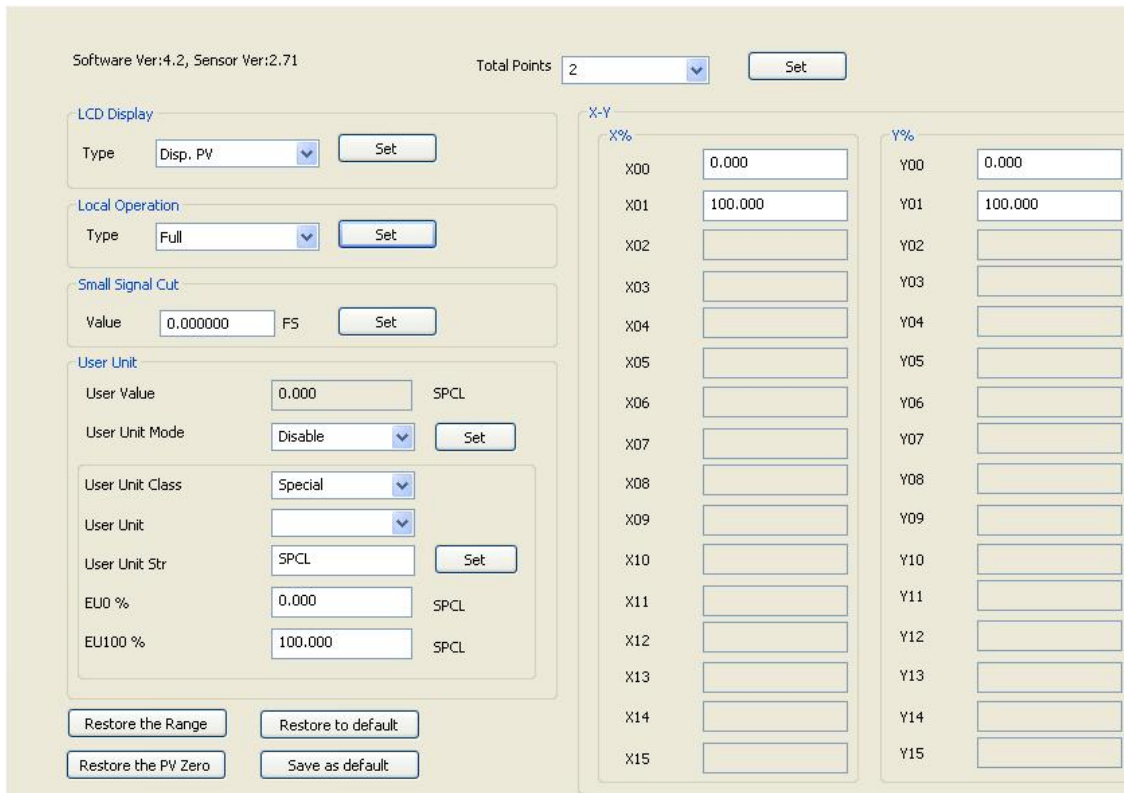


Figure 5.8 The Special Commands Tab

In this tab includes:

- LCD display type: used to set the main variable to display the transmitter LCD head. You can be set to: display the main variable value, the second variable value, the current value, the display percentage, the main variable and the current value alternately display and the user value.
- Local operation: Configure the functional permission of the local magnetic rod operation through the software. With three settings: set to Cancel, the local magnet rod operation will be invalid; set to simplified version, the geomagnetic function is limited to adjust zero and full range points; set to Full Version, the local magnet rod can perform all local tuning functions.
- Small signal excision: the percentage of removing small signals ranges from 0.0 to 0.005.
- User unit: In applications or where relative adjustment is selected, the new unit can be defined by the custom unit (user unit) function. These measurements include applications of fluid level, volume, flow rate, or mass flow rate obtained indirectly through pressure measurements. Users must change the User Unit Mode to Enable before using this feature.

For the reference, one value corresponds to 0% of the measurement and the other value corresponds to 100%.

- ✓ 0% - Required reading when pressure equals a low-end value (PV% = 0%, or output equals 4mA in transmitter mode).
- ✓ 100% - Required reading when the pressure is equal to the high-end value (PV% = 100%, or the output equals 20mA in transmitter mode).

User custom units can be selected from a drop-down list contained in the User Units. Make new

measurements to be associated with new units so that all monitoring systems equipped with the HART protocol can access the special units included in the table. The user is responsible for the consistency of this information. This pressure transmitter cannot verify that the corresponding 0% and 100% values set by the user match the selected units.

If the user needs a special unit that is not included in the "User Unit," the transmitter allows the user to enter five characters in the "User unit string" to create a new unit.

Example: The transmitter PT105II is connected to a vertical cylinder tank (6 m long, 2 m diameter) and is linearized using the capacity meter data in the linearized table. Measured by high end pressure pressure, the transmitter is 250mm under the base. The measured liquid is the water at 20°C.

Tank volume: $[(\pi*d^2)/4]*l=[(\pi*2^2)/4]\pi*6 = 18,85 \text{ m}^3$.

The pressure should be reduced from the measured pressure to obtain the tank level. Therefore, perform the following reference-free source calibration as follows:

After calibration is completed:

Range lower limit = 250mmH2O

Range upper limit = 2250 mmH2O

Pressure unit = mmH2O

In the custom units:

EU0% = 0

EU100% = 18.85

User Unit = m3

After you can customize the units, the PT105II begins to indicate the new measurements.

■ Linear table X-Y:

If the output transfer function of the pressure gauge is properly set to the Special Curve, the output follows the curve given by the table (X-Y).

If 4 to 20 mA is expected to be proportional to the volume or mass of the liquid in the tank, you must convert the pressure measurement "X" into the volume (or mass) "Y" with the table shown in the table below.

Spot	Pressure	X	Volume	Y
1	-	-10%	-	-0.6%
2	250mmH2O	0%	0m ³	0%
3	450 mmH2O	10%	0.98 m ³	5.22%
4	750 mmH2O	25%	2.90 m ³	15.38%
5	957.2 mmH2O	35.36%	4.71 m ³	25%

6	1050 mmH ₂ O	40%	7.04 m ³	37.36%
7	1150 mmH ₂ O	45%	8.23 m ³	43.65%
8	1250 mmH ₂ O	50%	9.42 m ³	50%
...
15	2250mmH ₂ O	100%	18.85 m ³	100%
16	-	110%	-	106%

As the example above, these points are freely distributed over any desired X value. To achieve better linearization, the distribution of points should be concentrated where the nonlinearity is most severely measured.

- Data for recovery: restore range calibration and zero calibration data to default values, save current configuration data as factory value, or restore previously saved configuration data.

5.2.7 Extra Message

The attachment information tab mainly includes two parts, part of the transmitter, as shown in Figure 5.9. The "Sensor Information" shows, which can be configured according to the actual situation.

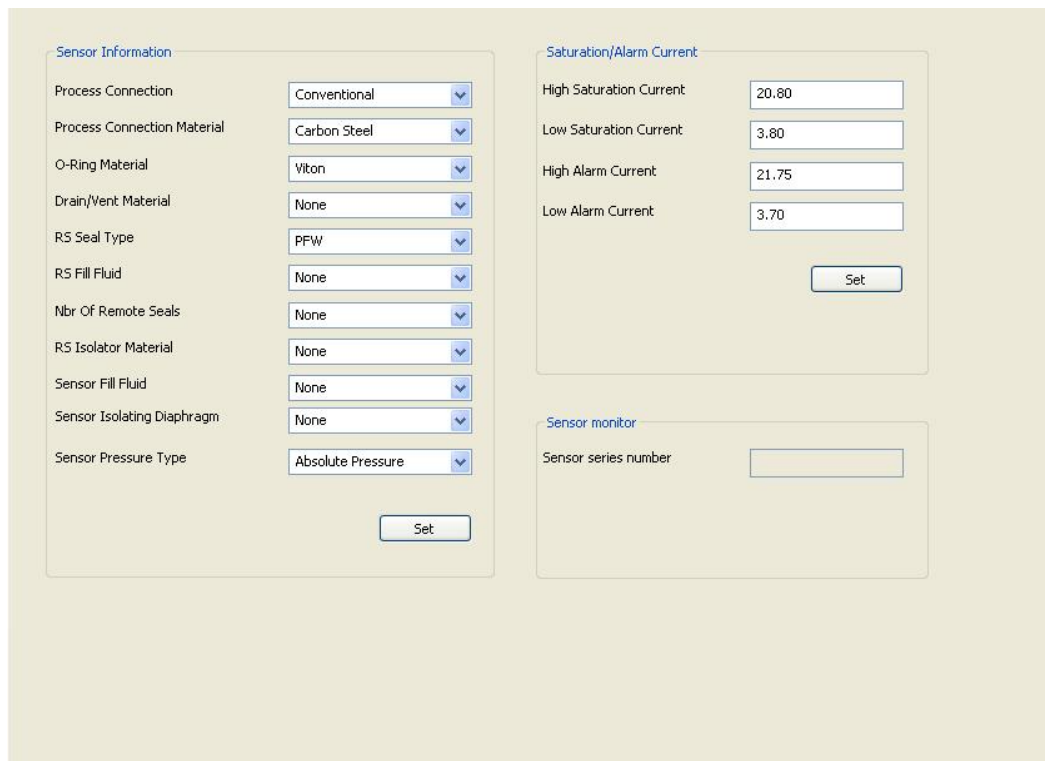


Figure 5.9 Attachment Information Tab

The saturation / alarm current setting can be used to change the current value output when the transmitter PV is in the alarm and saturation state. Range of the current settings:

limits	4~20 mA sating current	4~20 mA alarm current
Low	3.7 mA ~ 3.9 mA	3.6 mA ~ 3.8 mA

High	20.1 mA ~ 22.9 mA	20.2 mA ~ 23.0 mA
------	-------------------	-------------------

Notice:

- 1) The Low alarm current value must be less than the low saturation current value;
- 2) The High alarm current value must be higher than the high saturation current value;
- 3) Alarm current value and saturation current value are greater than 0.1mA.

5.3 Jump Line Configuration

The HART intelligent pressure transmitter has 2 sets of hardware jumpers, as shown in Figure 5.10. The lower three points for the fault alarm current, and the upper three points for the configuration protection.

5.3.1 Fault Alarm Jumper Setting

The HART intelligent transmitter has the self-diagnosis function. Once the fault is detected, the intelligent transmitter will automatically output the alarm current. The alarm current mode depends on the fault alarm current on the right side of the communication card. When the jumper is inserted in the two points marked with "Hi", it is a high alarm; When the jumper is inserted in the two points marked with "Lo", it is the low alarm;

5.3.2 Configuration Protection Jumper Settings

The HART intelligent transmitter provides the jumper setting for the device configuration protection, namely the above configuration protection setting jumper, as shown in Figure 5.10. Conis protected when the protection setting jumper is inserted on the right, marked "WRD". The HART intelligent transmitter does not allow any change in the device configuration at this time. Changes to the device configuration are allowed when the protection setting jumper is inserted at two points on the left.

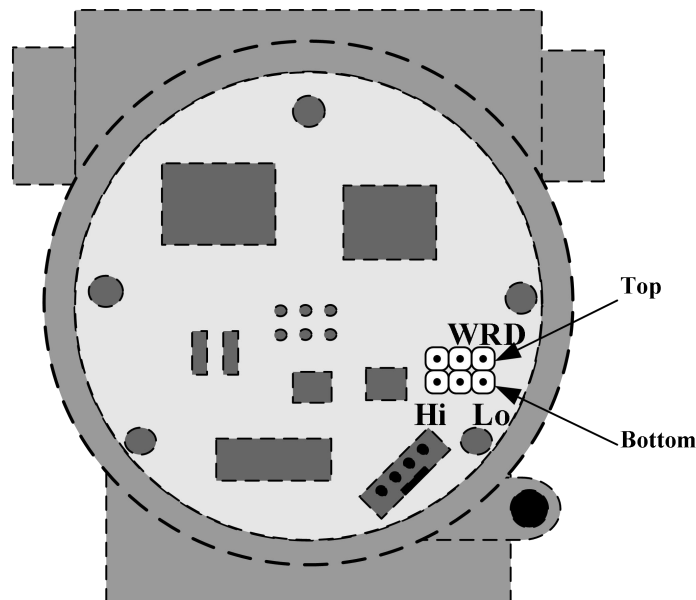


Figure 5.10 Hardware jumper of H A R T intelligent pressure transmitter

Chapter 6 FF Type Intelligent Transmitter Configuration

6.1 Topological Connection

The FF transmitter supports a variety of network topology wiring, as shown in Figure 6.1. Figure 6.2 shows the bus connection of the FF instrument, and the two ends of the bus shall match the access terminal with the resistance to ensure the signal quality. The maximum bus length is 1,900 m and can be extended to 10 km using a repeater.

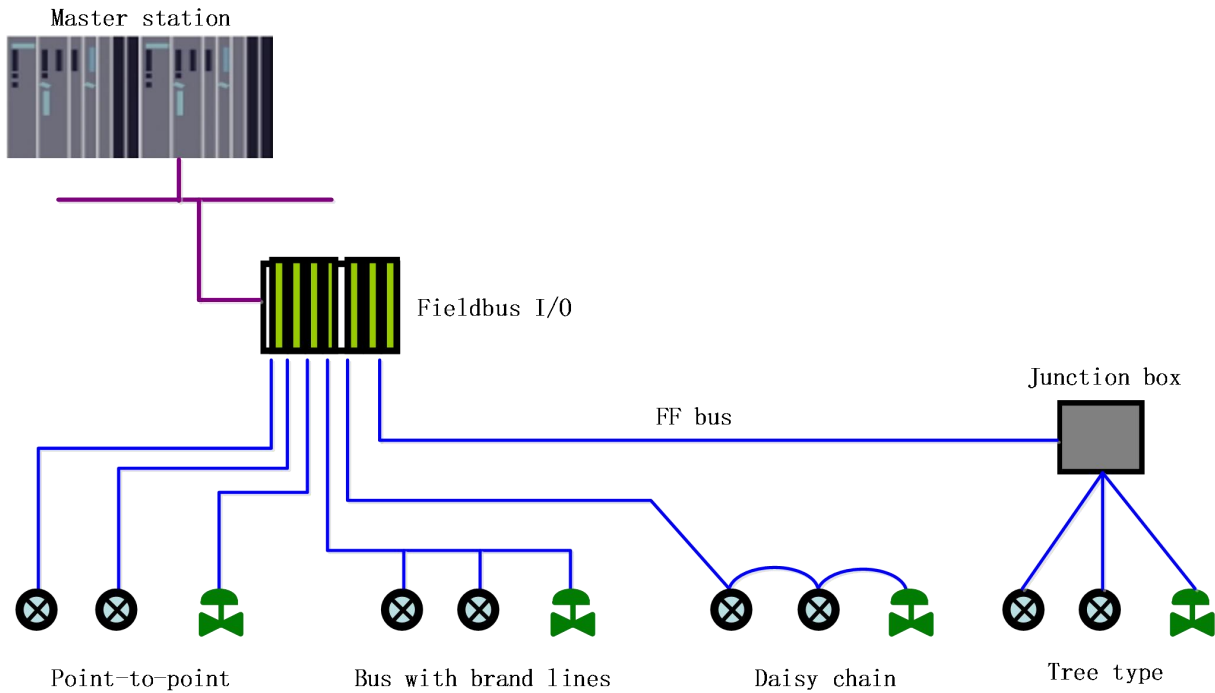


Figure 6.1 The FF network topology

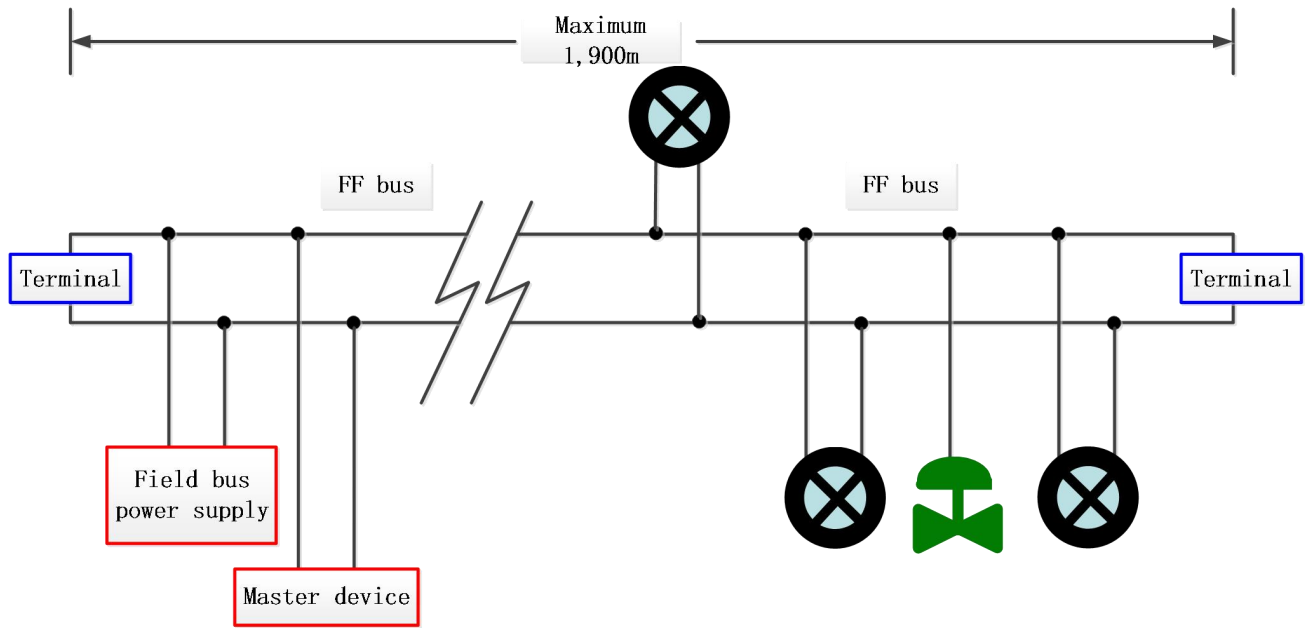


Figure 6.2 F F bus connection

6.2 Functional Block

The FF intelligent pressure transmitter implements the FF standard function block, as shown in Table 6.1. Please query the documrelated of the FF protocol.

Table 6.1 Description of functional block functions

Function block name	Description
RES	Resource block used to describe characteristics of field equipment such as equipment name, manufacturer, serial number.The resource block has no input or output parameters.A device typically has only one block of resources
TRD	Transform blocks, read sensor hardware data, or write field data to the corresponding hardware.The transformation block contains information including range, sensor type, linearization, I / O data, etc
DSP	Display block for configuring the display information on the LCD screen
PID	PID function block, which performs PID control function, but also has set point adjustment, process parameter (PV) filtering, alarm, output tracking and other functions
AI	Analog input function block, used to obtain the input data of the conversion block, and can be transmitted to other function blocks, with functions such as range conversion, square root and mantissa removal
LLAG	Advance lag function block, used for feedforward control
RA	Scale function block-Implement proportional control of two input quantities
IS	Input the selection function block to select the output according to the selection items, such as the maximum, minimum, intermediate value, etc
BG	Devdeviation gain function block so that the input and output satisfy a certain linear function
SC	Signal feature function block, the same curve can describe two signal characteristics.The first output is from X to Y according on the feature curve of the block itself.The second input selection from X to Y, easy to

	implement the reverse function for the feature description of read variables
IT	Integrator function block, to realize the integral operation function
AR	Mathematical arithmetic blocks, allowing the selection of the most commonly used measurement mathematical function

6.3 Functional Configuration

The intelligent transmitter supports the FF configuration software, NCS4000 configuration software, NI company NI-FBUS Configurator, Rosemont company DeltaV and other general FF configuration software for configuration debugging. The following-FBUS Configurator software mainly takes NI as an example to introduce the configuration method of intelligent transmitter.

6.3.1 Configuration Environment

- 1) PC machine, the operating system is Windows 2000 or Windows XP;
- 2) NI-BUS8486, H1 bus power supply, H1 terminal matcher;
- 3) NI-FBUS Configurator;
- 4) Standard pressure source.

6.3.2 Primary Variable Zero Configuration

The transmitter adds the actual working zero point pressure value, read the PRIMARY_VALUE value of the transformation block, write the read PRIMARY_VALUE value to the COMPENSATION_VALUE variable, and click "Write". The sensor zero calibration is completed when the PRIMARY_VALUE value of the transformation block is read to zero. As shown in Figure 6.3.

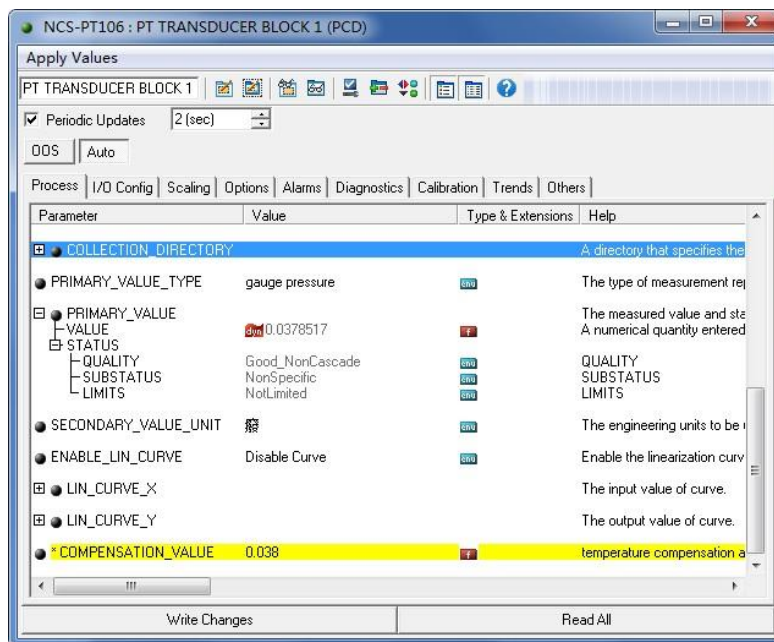


Figure 6.3 The ENABLE_LIN_CURVE configuration

6.3.3 Lower Range Limit Configuration

The transmitter adds the actual working range lower limit pressure value, read the PRIMARY_VALUE value of the transformation block, write this value to the EU_0 parameter of the AI function block XD_SCALE parameter, and

set the current sensor output lower limit of the range value of the main variable.

6.3.4 Upper Rang Limit Configuration

The transmitter adds the actual working range upper limit pressure value, read the PRIMARY_VALUE value of the transformation block, write this value to the EU_100 parameter of the AI function block XD_SCALE parameter, and set the current sensor output value to the range upper limit of the main variable.

6.3.5 Secondary-linearized Calibration

By transforming the calibration parameters LIN_CURVE_X of the block and LIN_CURVE_Y, the user can complete the secondary linearized calibration of the instrument by himself. The correction steps are as follows:

- 1) The intelligent transmitter provides six correction point inputs, namely the parameter LIN_CURVE_Y array of the transformation block, and the user can successively write the calibrated pressure value to the array and select good units. For example, when performing a three-point interpolation calibration, the user selects 10 kPa, 20 kPa, and 30 kPa as the calibration points and writes the three values in the LIN_CURVE_Y array, as shown in Figure 6.4.

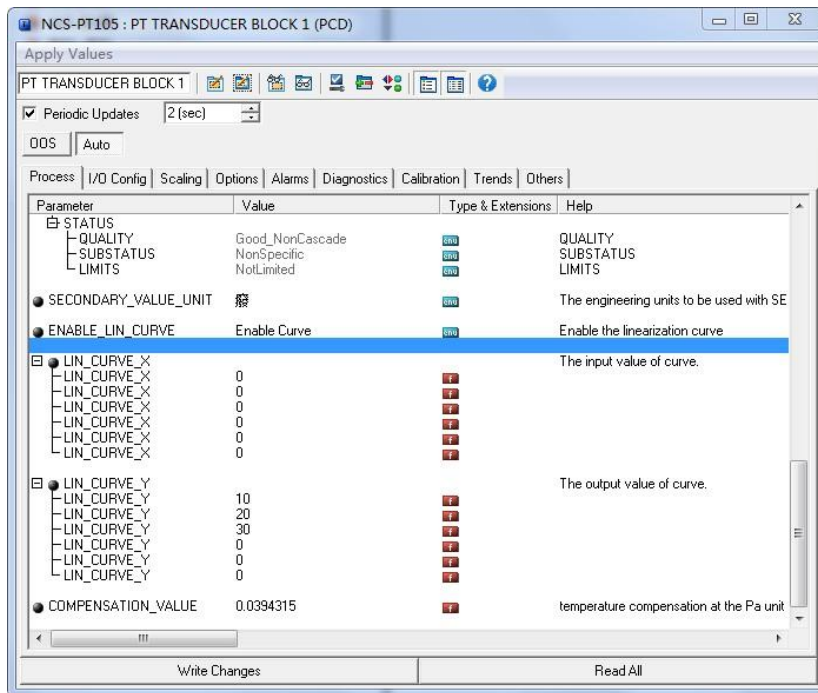


Figure 6.4 IN_CURVE_Y Configuration

- 2) Enter the standard pressure through the resor and open the corresponding transformation block on the configuration software, read the value of parameter PRIMARY_VALUE and write the value to the LIN_CURVE_X array. For example, write the 10.2,20.5,30.4 read in the LIN_CURVE_X array, as shown in Figure 6.5. Finish this calibration work.

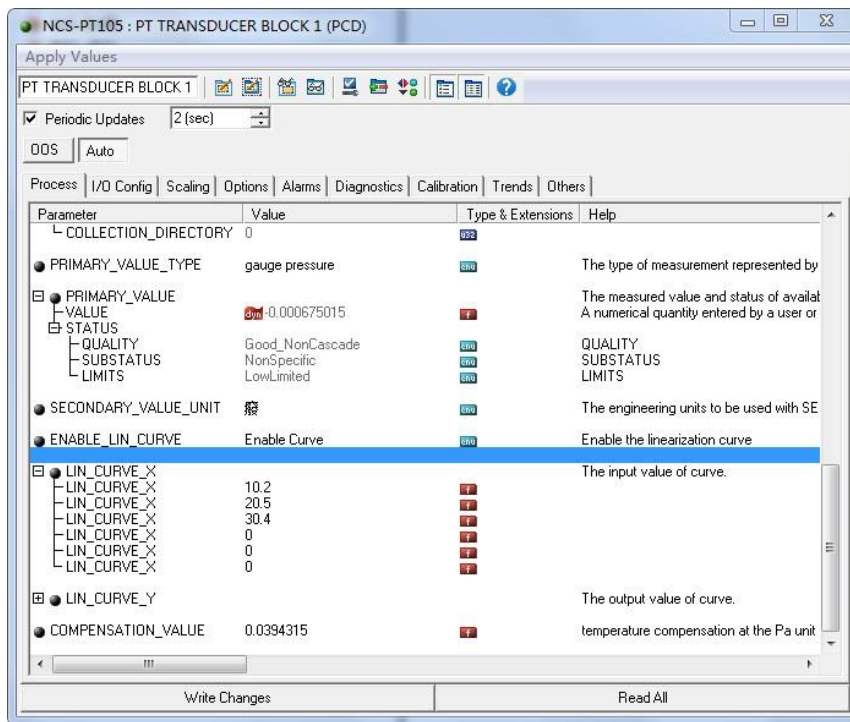


Figure 6.5 Configuration of the parameter LIN_CURVE_X

- 3) The user sets the parameter ENABLE_LIN_CURVE of the transformation block to "Enable Curve" to make the intelligent transmitter work normally after calibration.

6.3.6 LCD Display Configuration

By default, the intelligent transmitter display displays the PRIMARY_VALUE parameter values for the first channel transform block, as shown in Figure 6.6. If the user needs to display additional function block parameter information, then configure it as follows (X represents 1,2,3,4, with a total of four parameters, each of which can be configured differently. Intelligent transmitter can display four different sets of different parameter information). If the parameter configuration is incorrect, the intelligent transmitter display will only display the CONFIG_ERR. Write the mode of the display block as OOS before being properly configured, and then as AUTO after the parameters are configured. This allows the configuration to take effect.

- 1) BLOCK_TAG_X: This parameter defines the required function block name to display. For example, if a user wants to display a parameter of PT-AI1, first configure BLOCK_TAG_X and define the parameter value as PT-AI1. Note that the BLOCK_TAG_X parameter requires that the character must be 32 bytes, less than 32 bytes, which should be supplemented with space, otherwise it cannot be displayed correctly. For example, for the PT-AI1 to enter above, write the PT-AI1 in the configuration software.
- 2) RELATIVE_INDEX_X: This parameter defines the parameter index that displays the function block. For example, display the output value of PT-AI1, defining this parameter as 8 (the PT-AI1 function block OUT parameter index is 8). For the function block parameter index, the user can refer to the protocol section of the FF Fieldbus function block.
- 3) SUB_INDEX_X: This parameter defines the parameter subindex (if any) that displays the function block. For example, you need to display the VALUE value of the OUT parameter in the PT-AI1 function block, you need to define RELATIVE_INDEX_X as 8 and SUB_INDEX_X as 2 (the subindex of the OUT parameter VALUE item is 2).
- 4) MNEMONIC_X: This parameter is the display parameter name, can be entered by the user at will, the number of characters does not exceed 16.

- 5) DECI_PNT_NUMB_X: This parameter defines the display numerical accuracy. For example, you need to display 3 decimal places, defined as 3.
- 6) ACTIVE_X : The value of this parameter is FALSE or TRUE. After other parameters are configured, write it as TRUE. Only then can the parameters of the group be activated and the corresponding parameter information of this group can be displayed on the intelligent transmitter display.

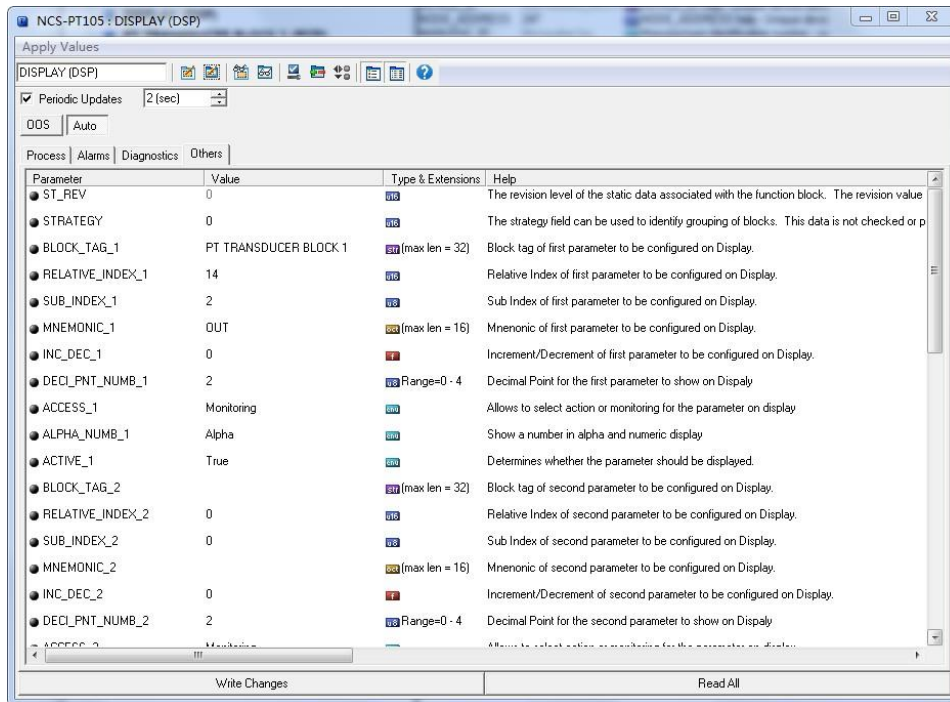


Figure 6.6 shows the parameter configuration of the block

6.4 Jump Line Configuration

The FF intelligent pressure transmitter has three hardware jumpers, as shown in Figure 6.7.

SIM jumper: simulation jumper, can achieve simulation function.

WP jumper: Write protection jumper, any write to FF intelligent pressure transmitter will be rejected, which prevents instrument data from being changed.

RST jumper: reset the jumper and restore the transmitter data to the factory state. First, the transmitter is powered off, the jumper is inserted into the RST position, the transmitter is powered on, and the transmitter is restored to the factory state.

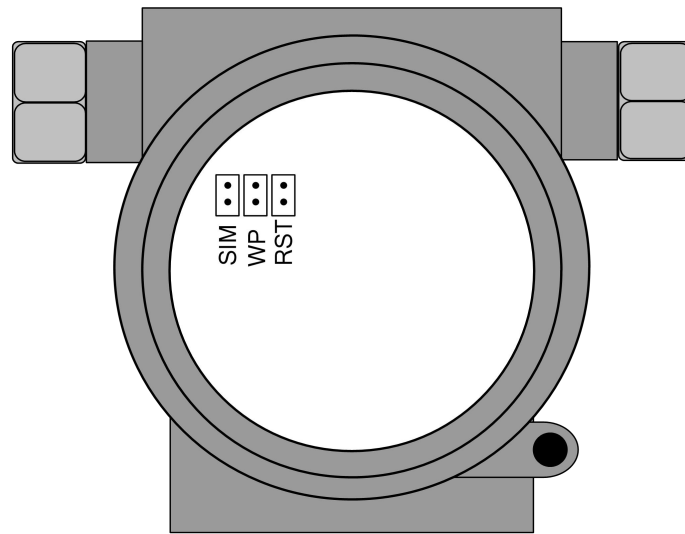


Figure 6.7 FF intelligent pressure transmitter hardware jumper

Chapter 7 PA Type Intelligent Transmitter Configuration

7.1 Topological Connection

- Transmitter Topology Wiring

A PROFIBUS PA network topology can have a variety of different structures, as shown in Figure 7.1. Figure 7.2 shows the bus connection of the PA instrument. The terminal resistance of the bus is connected to ensure the quality of the bus signal. The maximum length of the bus is 1900 m and can be extended to 10 km using a repeater.

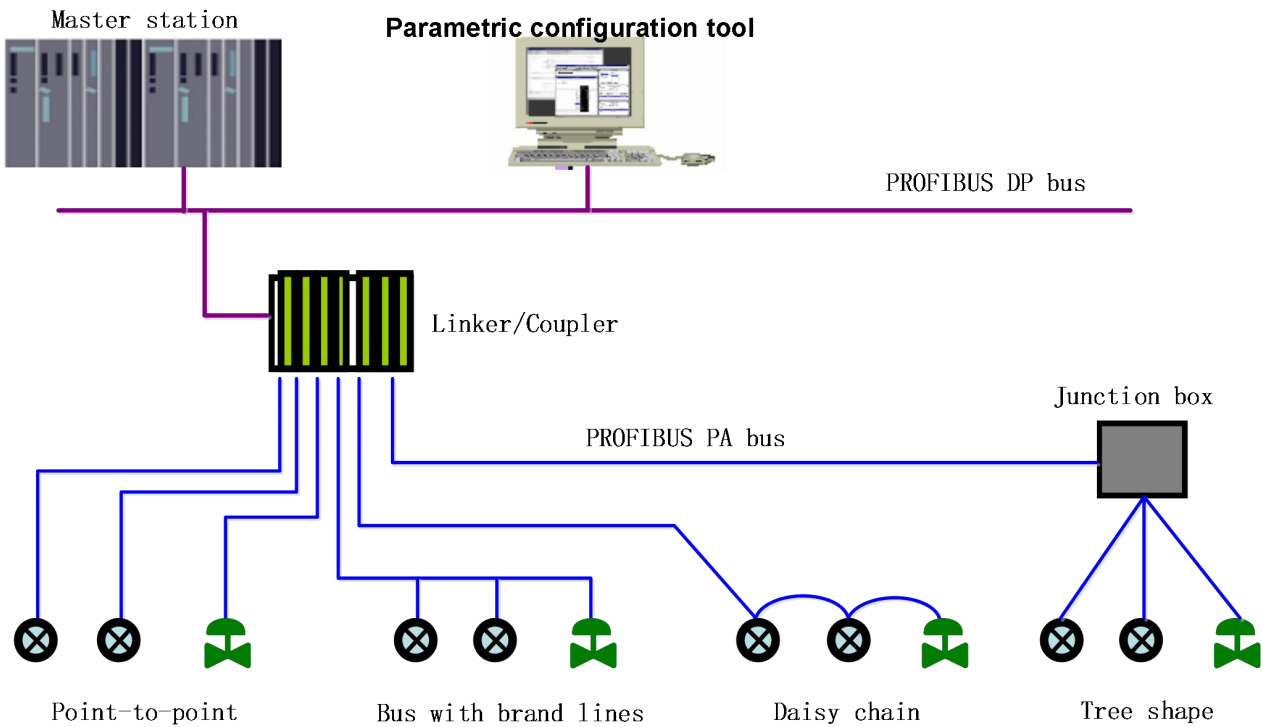


Figure 7.1 The PROFIBUS PA Network Topology

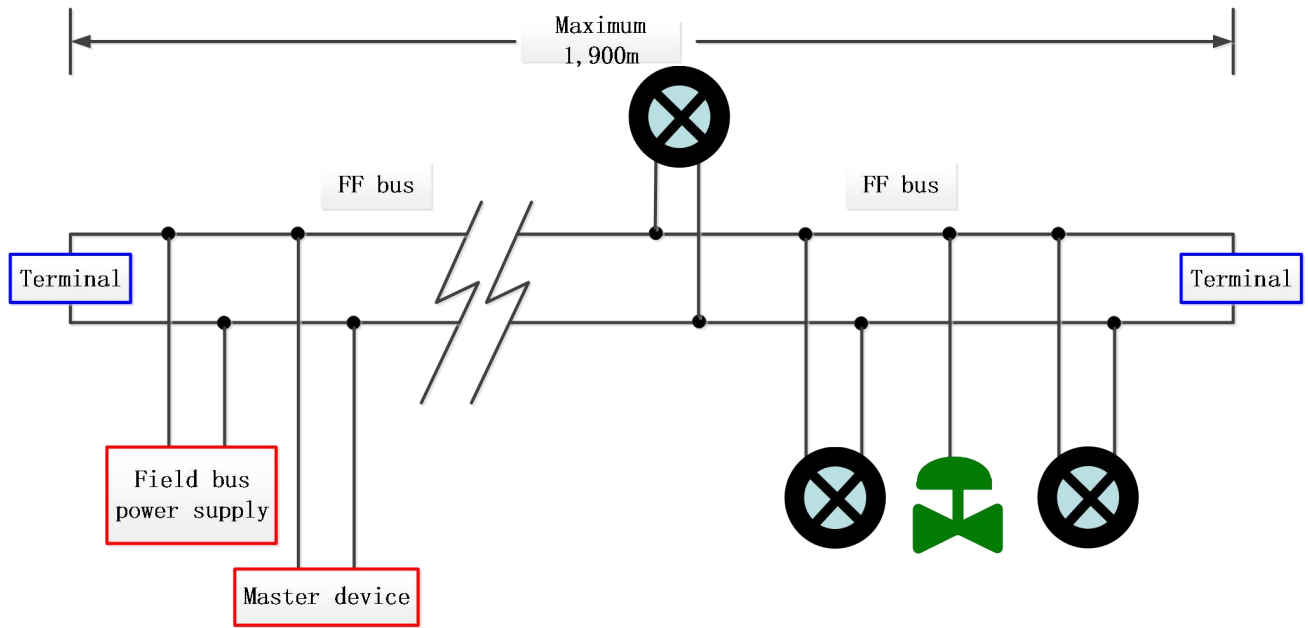


Figure 7.2 PROFIBUS PA bus connection

7.2 Function Block

The PA intelligent transmitter implements the PA standard function block, as shown in Table 7.1. Please query the PROFIBUS PA row gauge.

Table 7.1 Description of functional block functions

Function Block Name	Functional Block Description
Physical Block	The Physical Function Block (PB). Specific hardware information and identification and diagnosis information are described, including device bit number, software version, hardware version, installation date, etc
Transducer Block	Transform block (TB). Separating the functional block from the input and output characteristics of the instrument, it mainly completes the calibration and linearization of the input and output data, and provides the processed data to the AI functional block through the internal channel
Analog Input Block	Analog quantity input function block (AI). The simulated process values are obtained from the transformation block through the internal channel, processed, and the appropriate measurements are provided to the main station equipment through the bus communication

7.3 Functional Configuration

For the function configuration of range setting, zero point setting, bus address and data recovery of PA type intelligent transmitter, please refer to section 4.2 "PA type intelligent transmitter field adjustment".

The parameter configuration configuration of PA intelligent transmitter follows PROFIBUS PA line gauge version 3.02. Function block parameters of the transmitter can be read and written using Siemens device management software Simatic PDM, or configured using Siemens Step7 configuration software.

7.3.1 Configure Environment

- 1) PC machine, operating system of Windows XP or above;
- 2) Siemens Step7 Configuration Software, Siemens PDM Equipment Management Software;
- 3) DP/PA coupler or linker;
- 4) Class 1 main station such as PLC, Class 2 main station such as CP5611 card;
- 5) PA terminal Mater;
- 6) Standard pressure source.

7.3.2 Pressure Transform Block Parameter Configuration

The transformation block separates the function block from physically proprietary I / O devices such as sensors and actuators, which relies on the implementation of the device vendor to access or control the I / O device. With access to the I / O device, the transformation block can acquire the input data or set the output data. Generally, transform blocks have functions of linearization, characterization, temperature compensation, control and exchange data. The structure of the transformed block is shown in Figure 7.3.

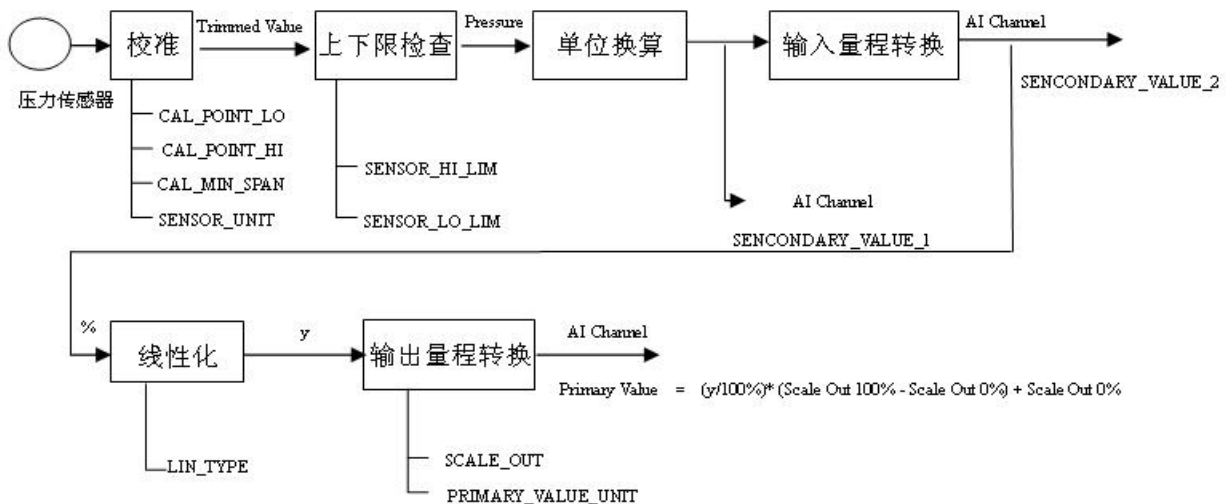


Figure 7.3 Transform block structure

The parameters of the transformation block are shown in Table 7.2:

Table 7.2 Transform block parameters

Parameter	Function Description
CAL_MIN_SPAN	Minimum step length allowed during the calibration. This minimum step size ensures a smooth calibration process, so that the highest lowest point of calibration is not too close, and the unit is specified by SENSOR_UNIT
CAL_POINT_HI	Maximum point calibration value. When calibrating the highest point, the pressure signal from the highest point is transmitted to the sensor, and then the transmitter writes the value to the parameter as the highest calibration value. The unit is specified by the SENSOR_UNIT
CAL_POINT_LO	Minpoint calibration value. When calibrating the lowest point, the pressure signal of the lowest point is transmitted to the sensor, and then the transmitter writes the value to the parameter as the lowest value for the calibration. The unit is specified by the

Parameter	Function Description
	SENSOR_UNIT
FLOW_LIN_SQRT_POINT	Flow calculation coefficient
LIN_TYPE	Linear type
LOW_FLOW_CUT_OFF	Small signal excision value
MAX_SENSOR_VALUE	Maximum sensor pressure value, as specified by SENSOR_UNIT
MIN_SENSOR_VALUE	Sensor pressure minimum, as specified by SENSOR_UNIT
MAX_TEMPERATURE	Maximum sensor temperature, measured in degrees Celsius
MIN_TEMPERATURE	Sensor temperature minimum, measured in degrees Celsius
PRIMARY_VALUE	Transmitter measurement value and status for the AI function block to use. The unit is specified by PRIMARY_VALUE_UNIT
PRIMARY_VALUE_TYPE	Transmitter measurement value type, code as following: 0: Pressure 1: Flow 2: Level 3: Volume 4-127: Reserved > 128: Manufacturer specific Currently, 0, 1 are supported, namely pressure value and flow value
PRIMARY_VALUE_UNIT	Transmitter measurement value engineering unit code
PROCESS_CONNECTION_MATERIAL	Process connection material code
PROCESS_CONNECTION_TYPE	Process Connection Material Type Code
SCALE_IN	Sensor input range, the unit is specified by SECONDARY_VALUE_1_UNIT
SCALE_OUT	Sensor output range, the unit is specified by SECONDARY_VALUE_1_UNIT
SECONDARY_VALUE_1	Pressure value and status after correction and unit conversion are used by AI function block
SECONDARY_VALUE_1_UNIT	SECONDARY_VALUE_1 engineering unit
SECONDARY_VALUE_2	The input range is converted into percent values for use by the AI function block
SECONDARY_VALUE_2_UNIT	SECONDARY_VALUE_2 engineering unit
SENSOR_DIAPHRAGM_MATERIAL	Sensor diaphragm type code

Parameter	Function Description
SENSOR_FILL_FLUID	Sensor filler fluid type code
SENSOR_HI_LIM	Sensor physical upper limits
SENSOR_LO_LIM	Sensor physical lower limits
SENSOR_MAX_STATIC_PRESSURE	Maximum static pressure value of the sensor
SENSOR_O_RING_MATERIAL	The O-ring type code between the sensor diaphragm and the process connection
SENSOR_SERIAL_NUMBER	Serial number of the sensor
SENSOR_TYPE	Type of sensor
SENSOR_UNIT	Sensor raw data unit
SENSOR_VALUE	Sensor raw data value
TEMPERATURE	Sensor temperature value
TEMPERATURE_UNIT	Sensor temperature value in unit, currently fixed at degrees Celsius
TRIMMED_VALUE	Pressure value after the correction

7.3.3 PROFIBUS Cyclic Data Communication Configuration

The cyclic data communication of PROFIBUS DP means that the class 1 master station and the slave station exchange input and output data in the mode of master-slave polling, and the communication mode is connectionless. In each cycle, the Type 1 master station actively sends a data exchange request, while the slave station passively responds to the master station's request. The cyclic data communication is mainly used in the configuration of the slave station and the PLC master station equipment. Through the cyclic data communication, the master station PLC obtains the input data of the slave station in real time or outputs the output data to the slave station.

The circular data communication configuration of PA intelligent transmitter is basically the same as that of PROFIBUS DP slave station, but it requires the use of coupler or linker between PA bus and DP bus.

The PA intelligent transmitter cycle data comes from the output parameters of the AI function block in the device, with a total of 5 bytes, including 4 bytes of pressure value floating point data and 1 byte of status data.

The transmitter contains the AI standard function blocks and also contains an empty module. If two function blocks, select an empty module. For example, if only one AI is required, it can be configured as: an AI and an empty module.

For recurrent communication, the transmitter supports multiple identifiers. Where the AI has two identifiers, namely, the short identifier and the long identifier. The identifiers are listed below:

AI	Short identifier	0x94
	Long identifier	0x42,0x84,0x08,0x05

Cycle data communication configuration for PROFIBUS PA using Siemens Step7.

Examples of configured PA transmitters using Siemens Step7 are given below.

Open SIMATIC Manager, select the PLC master station and create a new project, see Figure 7.4.

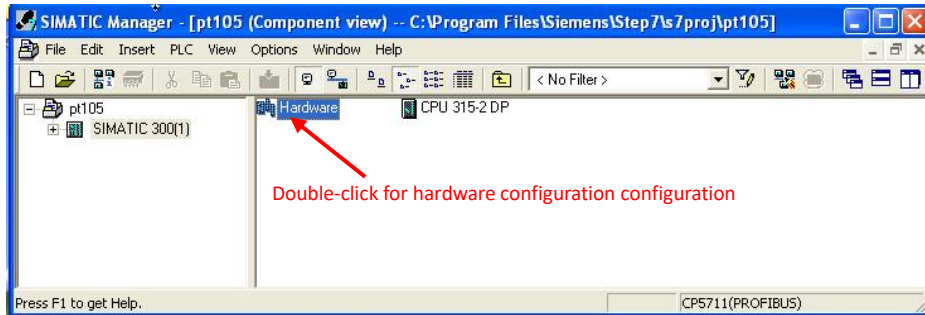


Figure 7.4 Select the PLC main station and build a new project

Double-click Hardware to punch in the HW Config software and hardware configuration. Select the GSD file for the Install GSD Install PA transmitter in the Option menu, as Figure 7.5

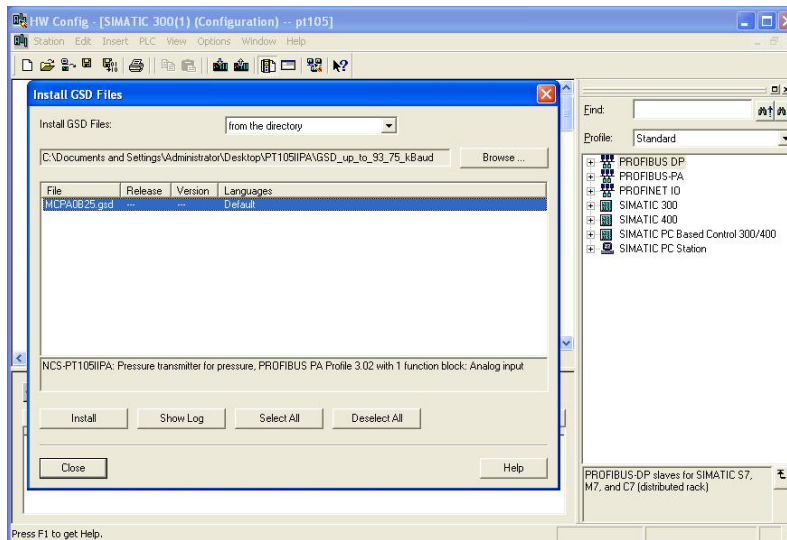


Figure 7.5 Installing the GSD file

After the GSD file is successfully installed, the newly installed PA device will be listed in the PROFIBUS-PA category in the device list on the right side of the HW Config software. Select it with the mouse and drag and drop it onto the PROFIBUS DP bus, see Figure 7.6.

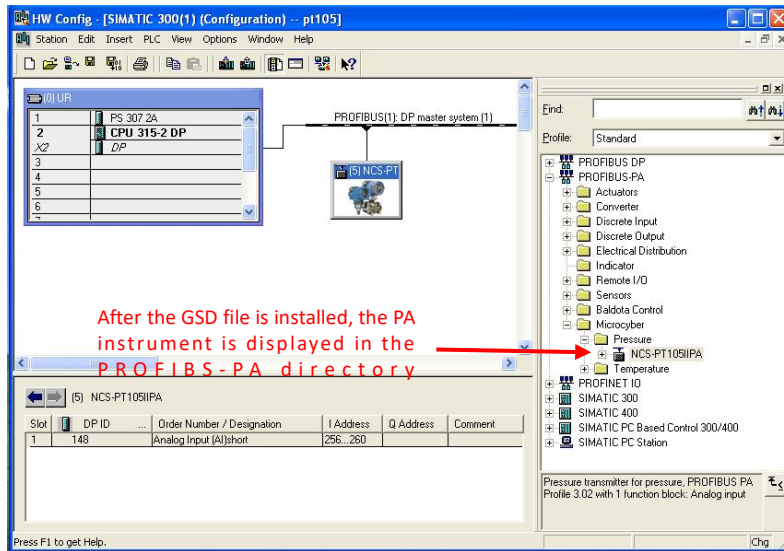


Figure 7.6 Drag the PA devices to the PROFIBUS DP bus

In the PLC menu, select Download to download the configuration information to the PLC master station. This completes the cyclic data communication configuration of PA instrument and main station, as Figure 7.7.

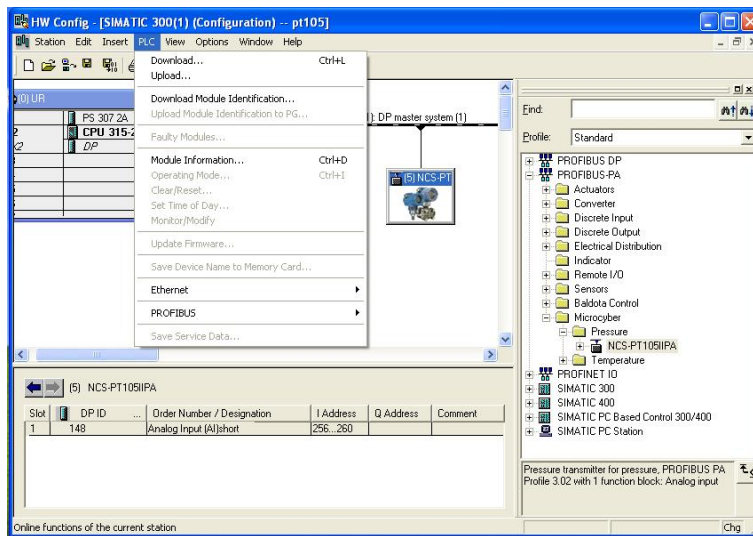


Figure 7.7 Download the configuration information to the PLC

7.3.4 The PROFIBUS Non-loop Data Communication Configuration

Uncyclic data communication of PROFIBUS DP refers to the connection-oriented data communication between class 2 master stations and slave stations. The data communication is performed in the non-cyclic period of the bus without affecting the cyclic data communication. Non-cyclic data is mainly the parameters of PA function block and the identification and diagnosis information of equipment. Non-cyclic data communication is mainly used in the management, diagnosis, identification, tuning and maintenance of PA equipment.

Uncyclic data communication configuration can be performed on PA instruments through Siemens equipment management software SIMATIC PDM.

Examples of SIMATIC PDM uncyclic communication configuration for PA intelligent transmitters are given below.

Before configuration, the vendor information should be piloted

Find the manufacturer.csv file under the... \ Siemens \ Step7 \ S7BIN path

Add “Microcyber;;http://www.microcyber.cn/;;;MICROCYBER;0x016C”

Open the Manage Device catalog software attached to SIMATIC PDM, then select the EDD file of PT105 and import it, as Figure 7.8.

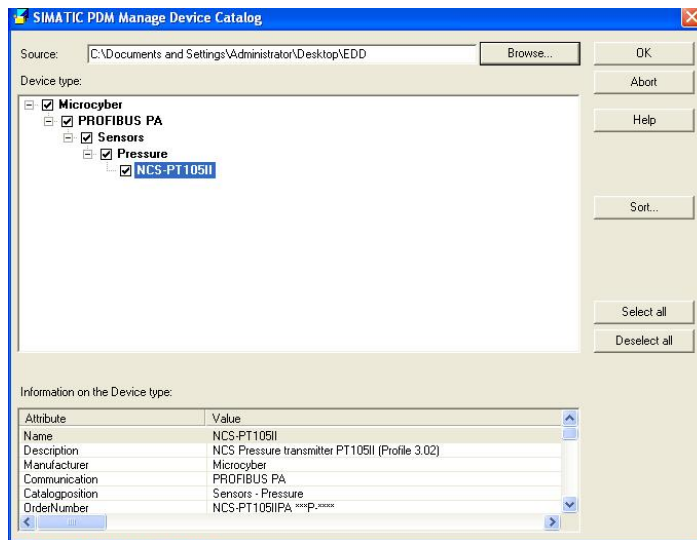


Figure 7.8 Select a Device Type

Then open the LifeList software included with SIMATIC PDM and select the Start Scan DP bus under the Scan menu, see Figure 7.9.

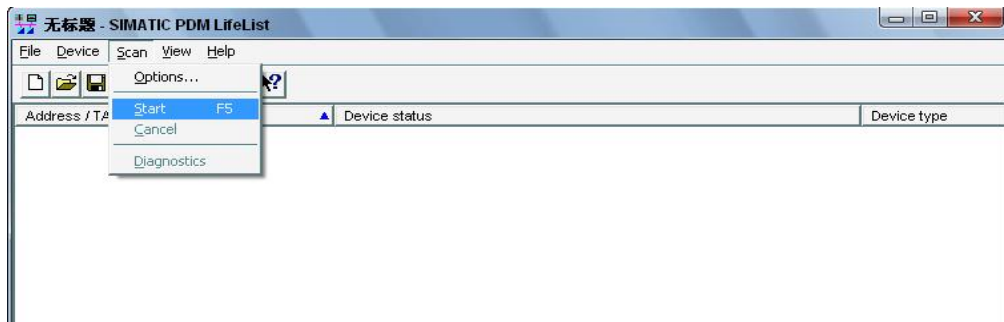


Figure 7.9 Startup of the LifeList

After scanning the bus, the slave equipment on the DP bus will be listed, showing the manufacturer ID number and some diagnostic information of the device, see Figure 7.10.

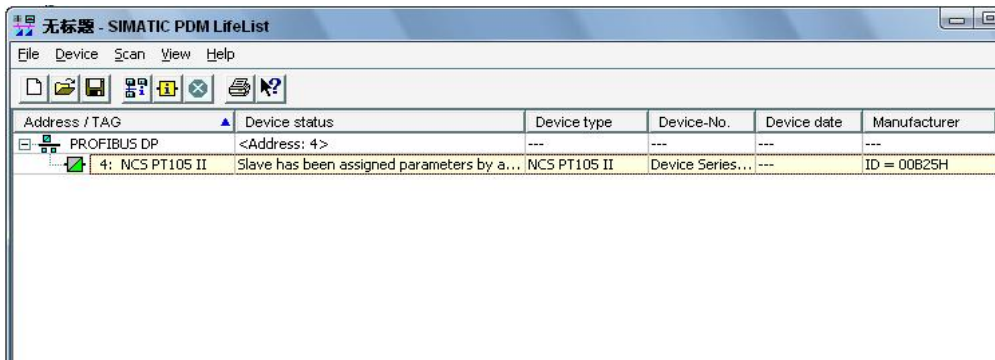


Figure 7.10 The Scan DP bus lists the PA devices

After selecting the device type, click OK, so that the non-loop data communication is configured. The parameter reading and writing of the PA instrument can be completed through the upload and download function of the PDM software, see Figure 7.11.

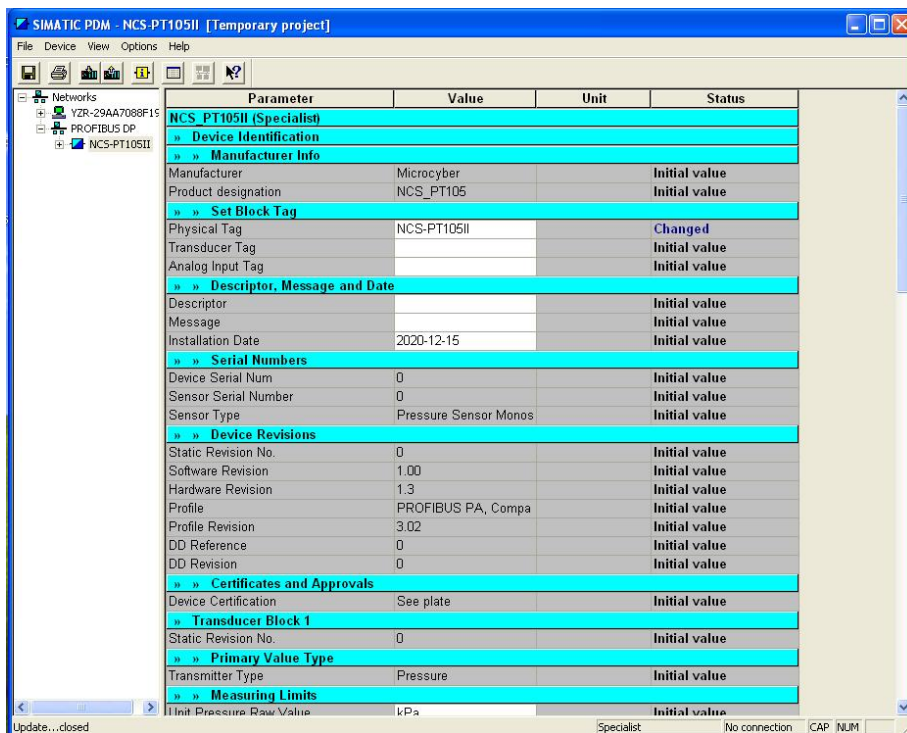


Figure 7.11 Device management with the PDM software

7.4 Jump Line Configuration

The PA intelligent pressure transmitter has three hardware jumpers, two of which can currently be used, as shown in Figure 7.12, and the SIM jumpers are not used.

RST jumper: reset jumper to restore instrument data to factory value with the same function to restore factory value data in section 5.4. The operation process is as follows: First, turn off the instrument power supply, and then insert the jumper into the RST position to repower the instrument. Then, the LCD screen is shown in Figure 7.13, indicating that the instrument data has been restored to the factory value.

Note: After using the reset jumper to restore the instrument factory value, please turn off the instrument power again, unplug the jumper at the RST, and then use the instrument normally. Otherwise, if there is a jumper at the

RST, all the data will be restored to the factory value again, and the configuration information before the outage will be lost.

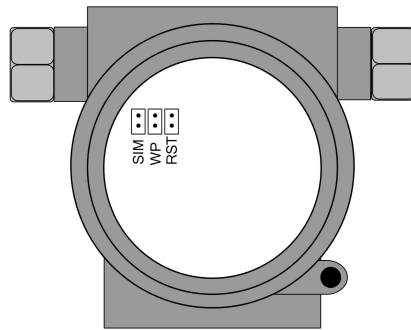


Figure 7.12 Hardware jumper of PA intelligent transmitter

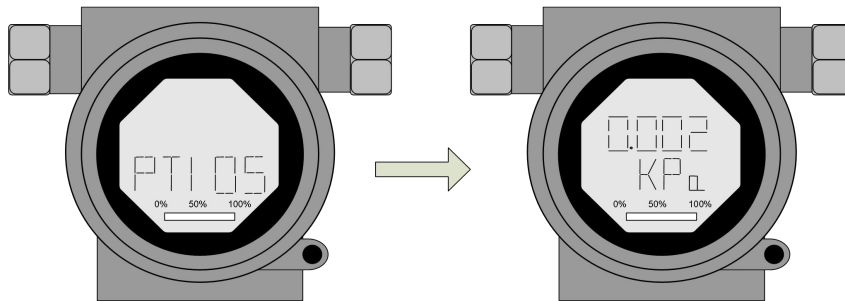


Figure 7.13 PA intelligent transmitter recovery data to the factory value

WP jumper: write protection jumper, to realize the hardware write protection function. When the jumper is inserted into the WP position, any writing to the PA intelligent transmitter is rejected, preventing the data of the instrument from being changed

Chapter 8 Configuration of DP Intelligent Transmitter

8.1 Function block

The DP pressure transmitter implements the functional blocks of the PA standard, see Table 8.1. For the configuration method of the function block, please refer to the PROFIBUS PA profile.

Table 8.1 Function block function description

Function block name	Function block description
Physical Block	Physical Block (PB). Describes device-specific hardware information, identification, and diagnostic information, including device tag number, software version, hardware version, installation date, etc.
Transducer Block	Transducer Block (TB). The function block is separated from the input and output characteristics of the instrument. It mainly completes functions such as calibration and linearization of input and output data, and provides the processed data to the AI function block through the internal channel.
Analog Input Block	Analog Input Block (AI). The analog process value is obtained from the transducer block via an internal channel, processed and the appropriate measured value is made available to the master device via bus communication

8.2 Function configuration

8.2.1 Set device address

Only using hardware DIP switches to set the device address is supported. After the address is set, the device will use the new address when it is powered on again. Setting via the SET_SLAVE_ADDRESS service is not supported.

8.2.2 Import GSD file

Each type of Profibus device from each manufacturer is different in functions and parameters. In order to support the "plug and play" design on the PROFIBUS bus, the device parameters (eg: manufacturer name, device name, software and hardware version, baud rate, number, input/output data) are defined in an electrical device data file. Done, this file is the GSD file.

GSD file is a readable text file edited by ASCII code, it contains general parameters and definitions of relevant communication standards. Each definition entry describes the feature parameters supported by the device. Information that can be read from a GSD file through keywords and editing tools includes: device information, adjustable parameters, matching data types and corresponding data upper and lower limits.

In the NCS-PT105II(S) PROFIBUS DP GSD file, the device ID is: 0x0B25, The GSD file conforms to the PROFIBUS protocol standard and provides a concise, refined format to facilitate understanding of these parameters. In this regard, these device information can also be obtained automatically using the system configuration tool.

8.2.3 Configure and use Device Type Management (DTM) software

Using suitable PC software: FDT 1.2/1.2.1 application tool framework and Class II PROFIBUS master station (equipped with corresponding communication DTM), the parameter configuration and measurement value monitoring of the NCS-PT105II(S) PROFIBUS-DP pressure transmitter can be performed through aperiodic communication.

8.2.4 Configuration by EDD file

Similar to using DTM, it is possible to configure the transmitter and monitor its measured values after importing the EDD file of the DP bus pressure transmitter using an EDD tool (eg, Siemens' device management software

SIMATIC PDM).

Import the manufacturer information before installing the device EDD file.

Find the manufacturer.csv file under the ...\Siemens\Step7\S7BIN path.

Add "Microcyber Inc.;Microcyber Inc.;;;;Microcyber Inc.;0x016C".

Chapter 9 Maintenance

- Simple maintenance

Number	Display	Reason	Methods
1	Output current value is 0	a. power failure b. wire cutting	a. modify power b. check wire
2	HART intelligent transmitter output current value exceeds limit	Failure connection between the sensor and the circuit board.	Check the connection.
3	HART intelligent transmitter current fixed on 4mA , add pressure the output has no change.	a. instrument in multi-point mode b. leakage	a. modify slaves address in single mode b. check the connection of gas pipe
4	Intelligent transmitter communication failure	a. connection failure b. multi-mode	a. check the wire loop b. check net

- Daily maintenance: Only clean.
- Failing repair: Please return it back.
- Note: Products that have passed the explosion-proof inspection are not allowed to arbitrarily replace and modify the components and structures that affect the explosion-proof performance.

Chapter 10 Technical Specifications

10.1 Basic Parameter

Measure object	liquid、 gas、 stream	
Power	FF/PA	(9~32) VDC/(9~17.5)VDC (Intrinsically Safe)
	HART	(11.9~42)VDC/(11.9~30)VDC (Intrinsically Safe)
	DP	10~30VDC
Fieldbus protocol	Two-wire, (4~20)mA+HART, FF, PA	
Load resistant	(0~1500) Ω (common) (230~1100) Ω (with HART)	
Insulating strength	Between the terminal and the housing: 500 Vrms	
Display	Optional 6 bits digital number or 5 bits characters LCD display	
Temperature scale	Work temperature: (-40~85) °C (None explosion-proof, no display) (-30~70) °C (None explosion-proof, display) (-30~60) °C (Explosion-proof grade Ex ia IIC T4 Ga) (-40~60) °C (Explosion-proof grade Ex d IIC T4/T6 Gb)	
Media temperature	(-40~110) °C (Type includes 'IC') (-40~149) °C (silicone oil) (-40~204) °C (sylthlem800) (-18~204) °C (inert liquid) (-40~104) °C (other)	
Humidity range	(5~95)%RH	
Start time*	≤8s (HART) ≤12s (PA、 DP) ≤13s (FF)	
Quiescent current (FF、 PA) **	≤14mA	
Refresh time	0.2s	

Dump adjusting	Time constant 0~32 seconds
Change of cavity	< 0.16 cm ³
Ex type	Intrinsically safe, flameproof
Protection grade	IP65/IP67
Explosion-proof performance	DA: Ex d IIC T6 Gb DC: Ex d IIC T4 Gb IC: Ex ia IIC T4 Ga
Protection class	No explosion-proof type: the enclosure protection grade reaches IP65; Explosion-proof type: the enclosure protection grade reaches IP67; Intrinsically safe: the enclosure protection level reaches IP65.
Electromagnetic compatibility	Comply with the immunity requirements of industrial places in GB/T 18268.1 Comply with the harassment requirements for Class A equipment in GB 9254

* Start time: The current is updated to the main variable pressure value (HART), and the liquid crystal displays the main variable pressure value (FF, PA, DP).

** Quiescent current accuracy is 1%.

10.2 Performance Index

10.2.1 NCS-PT105II pressure transmitter performance index

Precision	Range 3, 4, 5, 6, 7, 8, 9, 0, Accuracy is $\pm 0.075\%$ of the adjusted range. If the adjusted range is less than 1/10 of the maximum range, the accuracy is $\pm[0.025+0.005 \times (\text{maximum range/adjusted range})]\%$ of the adjusted range In range 2, the accuracy is $\pm 0.1\%$ of the adjusted range. If the adjusted range is less than 1/5 of the maximum range, the accuracy is $\pm[0.05+0.01 \times (\text{maximum range/adjusted range})]\%$ of the adjusted range	
Temperature effect	Total effects per 28°C (50°F) change: Span ≥ 0.1 URL: $\pm[0.019\% \text{ URL} + 0.125\% \text{ Span}]$ Span < 0.1 URL: $\pm[0.025\% \text{ URL} + 0.125\% \text{ Span}]$	
Long time stability	In 12 months, $\pm 0.1\%$ of maximum range	
Static effect pressure	SR	$\pm 0.5\%/6.89 \text{ MPa}$ of the maximum range
	SD	$\pm 0.25\%/13.8 \text{ MPa}$ of the maximum range
	SH	$\pm 0.25\%/31.0 \text{ MPa}$ of the maximum range
Location installed effect	The maximum of the zero point movement is 0.24kPa	

Power effect	< 0.005%/V of range calibrated
Vibration effect	Any axis (0~200) Hz, the error is ±0.05%/g of the maximum range

10.2.2 NCS-PT105IIS pressure transmitter performance index

Precision	Accuracy is ±0.075% of the adjusted range. If the adjusted range is less than 1/10 of the maximum range, the accuracy is ±[0.025+0.005×(maximum range/adjusted range)]% of the adjusted range
Temperature effect	Total effects per 28°C (50°F) change: Span≥0.1 URL: ±[0.019% URL +0.125% Span] Span<0.1 URL: ±[0.025% URL +0.125% Span]
Long time stability	In 12 months, ±0.1% of maximum range
Location installed effect	The maximum of the zero point movement is 0.24kPa
Power effect	< 0.005%/V of range calibrated
Vibration effect	Any axis (0~200) Hz, the error is ±0.05%/g of the maximum range

10.2.3 NCS-PT105IIM differential pressure transmitter performance index

● Range and range limit

Nominal accuracy	Minimum range	Lower range limit	Upper range limit	Static pressure range	One-way high-voltage end overload	One-way low-voltage end overload
1.5kPa	200Pa	-1.5Kpa	1.5kPa	25Mpa	25Mpa	16Mpa
6kPa	200Pa	-6Kpa	6kPa	25Mpa	25Mpa	16Mpa
40kPa	400Pa	-40kPa	40kPa	40Mpa	25Mpa	16Mpa
250kPa	2.5kPa	-250kPa	250kPa	40Mpa	25Mpa	16Mpa
1MPa	10kPa	-500kPa	1MPa	40Mpa	25Mpa	16Mpa
3MPa	30kPa	-500kPa	3MPa	40Mpa	25Mpa	3Mpa
10Mpa	100kPa	-500kPa	10Mpa	40Mpa	25Mpa	3Mpa
Set the high and low limit requirements: The low and high limit values are taken within the upper range.						
When $ URV \geq LRV $, $ URV \geq$ minimum range must be met; when $ URV \leq LRV $, $ LRV \geq$ minimum range must be concealed						
Overpressure limit value: Depending on the pressure value of the weakest component, which is the maximum pressure of the sensor, not the maximum pressure of the product itself.						

● Reference accuracy

According to the standard and test benchmark conditions, including linear (BFSL), hysteresis, repeatability.

Calibration temperature: 20°C ± 5°C				
Linear output accuracy	TD≤10 (note 1)	±0.075%SPAN	Range: 6kPa、40kPa、250kPa、1MPa、3Mpa、10MPa	
	10<TD≤100	±0.0075TD%SPAN		
The square root output accuracy is 1.5 times that of the above linear reference accuracy				
Note 1, TD (Turn down) is the range ratio, when URV ≥ LRV , TD=URL/ LRV				
When URV ≤ LRV , TD=URL/ LRV				

● Ambient temperature impact

Total impact for every 10°C within the-40-85°C range	± (0.1 + 0.015TD) % upper range limit
--	---------------------------------------

● Static pressure influence

Zero-point impact	±0.15TD% upper range limit/10MPa
Full-range influence	±0.2% upper range limit/10Mpa

● Power supply influence

The zero and range changes shall not exceed the ± 0.005% upper range limit / V
--

● Installation location influence

It can be installed at any position. A maximum of 400Pa can be corrected by zero clearing function
--

● Vibration influence

Test by GB/T1827.3/IEC61298-3, <0.1% upper range limit
--

● Sensor performance indicators

Overall performance includes but is not limited to the comprehensive error of reference accuracy, ambient temperature effects, static pressure effects, and other effects
Typical accuracy: ± 0.075% upper range limit
Annual stability: ± 0.2% upper range limit / 5 years

10.2.4 NCS-PT105IIM Absolute pressure transmitter performance index

● Range and range limit

Nominal accuracy	Minimum range	Lower range limit	Upper range limit	Overload
40kPa	20kPa	0kPa	40kPa	16MPa

250kPa	50kPa	0kPa	250kPa	16MPa
1MPa	200kPa	0kPa	1MPa	16MPa
10MPa	1Mpa	0kPa	10MPa	20MPa
Set the high and low limit requirements: The low and high limit values are taken within the upper range. When $URV-LRV \geq$ minimum range				
Overpressure limit value: It depends on the pressure value of the weakest part with the pressure bearing capacity. This overload pressure is the maximum pressure that the sensor can bear, not the maximum pressure that the product itself can bear.				

● **Reference accuracy**

Based on standard and test reference conditions, including linearity (BFSL), hysteresis, repeatability. Calibration temperature: $20^{\circ}\text{C} \pm 5^{\circ}\text{C}$			
Linear output accuracy	TD \leq 10 (note 1)	$\pm 0.15\% \text{SPAN}$	Nominal range 40kPa、250kPa、1MPa、10MPa
	10<TD \leq 20	$\pm 0.015\text{TD}\% \text{SPAN}$	
Square root output accuracy is 1.5 times the linear reference accuracy above			
Note 1: TD (Turn down) refers to turndown ratio, $\text{TD} = \text{URL} / \text{URV-LRV} $			
Note 2: SPAN refers to span difference: $\text{SPAN} = \text{URV-LRV} $			

● **Ambient temperature impact**

Total impact for every 10°C within the $-40-85^{\circ}\text{C}$ range	$\pm(0.1+0.015\text{TD})\% \text{SPAN}$
---	---

● **Power supply influence**

The zero and range changes shall not exceed the $\pm 0.005\%$ upper range limit / V

● **Installation location influence**

It can be installed at any position. A maximum of 400Pa can be corrected by zero clearing function
--

● **Vibration influence**

Test by GB/T1827.3/IEC61298-3, 0.1% upper range limit

● **Sensor performance indicators**

Overall performance includes but is not limited to the comprehensive error of reference accuracy, ambient temperature effects, static pressure effects, and other effects
Typical accuracy: $\pm 0.15\%$ upper range limit
Annual stability: $\pm 0.2\%$ upper range limit / 5 years

10.2.5 NCS-PT105IIM Gauge pressure transmitter performance index

● **Range and range limit**

Nominal accuracy	Minimum range	Lower range limit	Upper range limit	Overload
1.5kPa	200Pa	-1.5kPa	1.5kPa	16MPa
6kPa	200Pa	-6kPa	6kPa	16MPa
40kPa	400Pa	-40kPa	40kPa	16MPa
250kPa	2.5kPa	-100kPa	250kPa	16MPa
1MPa	10kPa	-100kPa	1MPa	16MPa
3MPa	30kPa	-100kPa	3MPa	16MPa
10MPa	100kPa	-100kPa	10MPa	20MPa
40MPa	400kPa	-100kPa	40MPa	80MPa
Set the high and low limit requirements: The low and high limit values are taken within the upper range. When URV-LRV ≥ minimum range				
This overload pressure is the maximum pressure that the sensor can bear, not the maximum pressure that the product itself can bear.				

● **Reference accuracy**

Based on standard and test reference conditions, including linearity (BFSL), hysteresis, repeatability. Calibration temperature: 20°C±5°C			
Linear output accuracy	TD≤10 (note 1)	±0.075%SPAN	Nominal range 6kPa, 40kPa, 250kPa, 1MPa, 3Mpa, 10MPa, 40MPa
	10<TD≤100	±0.0075TD%SPAN	
Square root output accuracy is 1.5 times the linear reference accuracy above			
Note 1: TD (Turn down) refers to turndown ratio, TD=URL/ URV-LRV			
Note 2: SPAN refers to span difference: SPAN= URV-LRV			

● **Ambient temperature impact**

Total impact for every 10°C within the -40-85°C range	±(0.1+0.015TD)%SPAN
---	---------------------

● **Power supply influence**

The zero and range changes shall not exceed the ± 0.005% upper range limit / V
--

● **Installation location influence**

It can be installed at any position. A maximum of 400Pa can be corrected by zero clearing function
--

● **Vibration influence**

Test by GB/T1827.3/IEC61298-3, <0.1% upper range limit
--

● **Sensor performance indicators**

Overall performance includes but is not limited to the comprehensive error of reference accuracy, ambient temperature effects, static pressure effects, and other effects
Typical accuracy: $\pm 0.075\%$ upper range limit
Annual stability: $\pm 0.2\%$ upper range limit / 5 years

10.2.6 NCS-PT105IISM Gauge pressure transmitter performance index

● **Range and range limit**

Nominal accuracy	Minimum range	Lower range limit	Upper range limit	Overload
40kPa	2kPa	-40kPa	40kPa	1MPa
250kPa	12.5kPa	-100kPa	250kPa	4MPa
1MPa	50kPa	-100kPa	1MPa	6MPa
3MPa	150kPa	-0.1Mpa	3MPa	15MPa
10MPa	500kPa	-0.1Mpa	10MPa	20MPa
40MPa	5MPa	-0.1Mpa	40MPa	80MPa

Set the high and low limit requirements: The low and high limit values are taken within the upper range. When $URV-LRV \geq$ minimum range

This overload pressure is the maximum pressure that the sensor can bear, not the maximum pressure that the product itself can bear.

● **Reference accuracy**

Based on standard and test reference conditions, including linearity (BFSL), hysteresis, repeatability. Calibration temperature: $20^{\circ}\text{C} \pm 5^{\circ}\text{C}$			
Linear output accuracy	$TD \leq 10$ (note 1)	$\pm 0.1\% \text{SPAN}$	Nominal range 6kPa, 40kPa, 250kPa, 1MPa, 3Mpa, 10MPa, 40MPa
	$10 < TD \leq 20$	$\pm 0.01 \text{TD} \% \text{SPAN}$	
Square root output accuracy is 1.5 times the linear reference accuracy above			
Note 1: TD (Turn down) refers to turndown ratio, $TD = URL / URV-LRV $			
Note 2: SPAN refers to span difference: $\text{SPAN} = URV-LRV $			

● **Ambient temperature impact**

Total impact for every 10°C within the $-40-85^{\circ}\text{C}$ range	$\pm(0.1+0.015\text{TD})\% \text{SPAN}$
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● **Power supply influence**

The zero and range changes shall not exceed the $\pm 0.005\%$ upper range limit / V

● **Installation location influence**

It can be installed at any position. A maximum of 400Pa can be corrected by zero clearing function

● **Vibration influence**

Test by GB/T1827.3/IEC61298-3, <0.1% upper range limit

● **Sensor performance indicators**

Overall performance includes but is not limited to the comprehensive error of reference accuracy, ambient temperature effects, static pressure effects, and other effects

Typical accuracy: ± 0.1% upper range limit

Annual stability: ± 0.2% upper range limit / 5 years

10.2.7 NCS-PT105IIISM Absolute pressure transmitter performance index

● **Range and range limit**

Nominal accuracy	Minimum range	Lower range limit	Upper range limit	Overload
40kPa	20kPa	0kPa	40kPa	1MPa
250kPa	50kPa	0kPa	250kPa	4MPa
1MPa	200kPa	0kPa	1MPa	6MPa
10MPa	1Mpa	0kPa	10MPa	20MPa

Set the high and low limit requirements: The low and high limit values are taken within the upper range. When URV-LRV ≥ minimum range

This overload pressure is the maximum pressure that the sensor can bear, not the maximum pressure that the product itself can bear.

● **Reference accuracy**

Based on standard and test reference conditions, including linearity (BFSL), hysteresis, repeatability. Calibration temperature: 20°C±5°C			
Linear output accuracy	TD≤10 (note 1)	±0.2%SPAN	Nominal range 40kPa, 250kPa, 1MPa, 10MPa
	10<TD≤20	±0.02TD%SPAN	
Square root output accuracy is 1.5 times the linear reference accuracy above			
Note 1: TD (Turn down) refers to turndown ratio, TD=URL/ URV-LRV			
Note 2: SPAN refers to span difference: SPAN= URV-LRV			

● **Ambient temperature impact**

Total impact for every 10°C within the -40-85°C range	±(0.1+0.015TD)%SPAN
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● **Power supply influence**

The zero and range changes shall not exceed the ± 0.005% upper range limit / V

● **Installation location influence**

It can be installed at any position. A maximum of 400Pa can be corrected by zero clearing function

● **Vibration influence**

Test by GB/T1827.3/IEC61298-3, <0.1% upper range limit

● **Sensor performance indicators**

Overall performance includes but is not limited to the comprehensive error of reference accuracy, ambient temperature effects, static pressure effects, and other effects

Typical accuracy: ± 0.2% upper range limit

Annual stability: ± 0.2% upper range limit / 5 years

10.3 Physical properties

10.3.1 NCS-PT105II and NCS-PT105IIM Intelligent pressure transmitter

Electrical connection	1/2-14 NPT female thread
Process connection	1/4-18 NPT female thread
Structural materials	<p>Isolated Membrane and exhaust/outlet valve: 316 stainless steel, Hastelloy C, Monel or tantalum;</p> <p>Bleed/drain valve: 304 stainless steel, 316 stainless steel;</p> <p>Flange and connector: 304 stainless steel, 316 stainless steel;</p> <p>O-ring: Nitrile rubber, fluorine rubber;</p> <p>Filled liquid: silicon oil or fluorocarbon oil;</p> <p>Bolt: zinc plating carbon steel;</p> <p>(The material above should be selected at order, if has other requirement, please report in advance)</p> <p>Housing: low copper aluminum alloy;</p> <p>Coating: Polyester epoxy resin.</p>

10.3.2 NCS-PT105IIS and NCS-PT105IISM Intelligent pressure transmitter

Electrical connection	1/2-14 NPT female thread
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Appendix 1 NCS-PT105II Intelligent pressure transmitter selection

● Supplied ○ Not supplied

Model	Name							
NCS-PT105IISR	Micro differential pressure transmitter							
NCS-PT105IISG	Gauge pressure transmitter							
NCS-PT105IISA	Absolute pressure transmitter							
NCS-PT105IISD	Differential pressure transmitter							
NCS-PT105IISH	High static differential pressure transmitter							
	Code	Range (kPa)	Lower range limit (kPa)					Upper range(kPa)
			SR	SG	SA	SD	SH	
	2	0.03~1.5	-1.5	/	/	/	/	1.5
	3	0.075~7.5	/	-7.5	/	-7.5	/	7.5
	4	0.374~37.4	/	-37.4	0	-37.4	-37.4	37.4
	5	1.86~186.8	/	-98	0	-186.8	-186.8	186.8
	6	6.9~690	/	-98	0	-690	-690	690
	7	20.68~2068	/	-98	0	-2068	-2068	2068
	8	68.9~6890	/	-98	0	-6890	/	6890
	9	206.8~20680	/	-98	/	/	/	20680
0	413.7~41370	/	-98	/	/	/	41370	
	Code	Communication protocol						
	H	HAR						
	P	PA						
	F	FF						
	Code	Structure material (Filled liquid: silicon oil)						
		Flange, drain/vent valve			Isolation diaphragm			
	22	316 stainless steel			316 stainless steel			
	23	316 stainless steel			Hastelloy C			
	24	316 stainless steel			Monel alloy			
	25	316 stainless steel			Tantalum			
	32	304 stainless steel			316 stainless steel			
	33	304 stainless steel			Hastelloy C			
	34	304 stainless steel			Monel alloy			
	35	304 stainless steel			Tantalum			
	Code	Options						
	M ₅	LCD display						
	IC	Ex ia IIC T4 Ga						
	C ₆₂	T shape connector, M20, Weld Seal, 316 Stainless						
	T ₂	Three-Valve Manifold, 316 Stainless Steel						
	B ₁	Plate bending bracket						
	D ₁	Flange side vent/drain valve on top						
NCS-PT105IISG	4	H	22	C ₆₂ M ₅ B ₁	—	—	selection sample	

Note: For options not listed, please refer to the list of options.

Appendix 2 NCS-PT105II Pressure transmitter list of options

● Supplied ○ Not supplied

Option		Transmitter type							
Code	Mounting brackets	SR	SG	SA	SD	SH	SL	Remote SG	Remote SD
B ₁	Plate bending bracket	●	●	●	●	●	○	●	●
B ₂	Pipe mounting bracket (2"pipe)	●	●	●	●	●	○	●	●
B ₃	Pipe flat mounting bracket (2"pipe)	●	●	●	●	●	○	●	●
Code	Bleed/drain valve	SR	SG	SA	SD	SH	SL	Remote SG	Remote SD
D ₁	Flange side vent/drain valve on top	●	●	●	●	●	○	○	●
D ₂	Flange side vent/drain valve on bottom	●	●	●	●	●	○	○	●
Code	Transition joint	SR	SG	SA	SD	SH	SL	Remote SG	Remote SD
D ₄₂	316 stainless steel	●	●	●	●	●	●	○	●
D ₄₄	304 stainless steel	●	●	●	●	●	●	○	●
Code	Pressure joint	SR	SG	SA	SD	SH	SL	Remote SG	Remote SD
C ₂₂	1/2—14NPT, gland seal, 316 stainless steel	●	●	●	●	○	●	○	●
C ₂₃	1/2—14NPT, gland seal, 304 stainless steel	●	●	●	●	○	●	○	●
C ₃₂	1/4—18NPT, gland seal, 316 stainless steel	●	●	●	●	○	●	○	●
C ₃₃	1/4—18NPT, gland seal, 304 stainless steel	●	●	●	●	○	●	○	●
C ₄₂	1/2—14NPT, welded seal, 316 stainless steel	●	●	●	●	●	●	○	●
C ₄₂	1/2—14NPT, welded seal, 304 stainless steel	●	●	●	●	●	●	○	●
C ₅₂	1/4—18NPT, welded seal, 316 stainless steel	●	●	●	●	●	●	○	●
C ₅₃	1/4—18NPT, welded seal, 304 stainless steel	●	●	●	●	●	●	○	●
C ₆₂	T type, M20, welded seal, 316 stainless steel	●	●	●	●	●	●	○	●
C ₆₃	T type, M20, welded seal, 304 stainless steel	●	●	●	●	●	●	○	●
Code	Display	SR	SG	SA	SD	SH	SL	Remote SG	Remote SD
M ₅	LCD display	●	●	●	●	●	●	●	●
Code	Ex grade	SR	SG	SA	SD	SH	SL	Remote	Remote

Appendix 3 NCS-PT105IIM Intelligent pressure transmitter selection

Model	Name					
NCS-PT105IIMSG	Gauge pressure transmitter					
NCS-PT105IIMSA	Absolute pressure transmitter					
NCS-PT105IIMSD	Differential pressure transmitter					
	Code	Range	Lower range limit			Upper range
			SG	SA	SD	
	2	6kPa	-6kPa	None	-6Kpa	6kPa
	3	40kPa	-40kPa	0kPa	-40kPa	40kPa
	4	250kPa	-100kPa	0kPa	-250kPa	250kPa
	5	1MPa	-100kPa	0kPa	-500kPa	1MPa
	6	3MPa	-100kPa	None	-500kPa	3MPa
	7	10MPa	-100kPa	0kPa	-500kPa	10Mpa
8	40MPa	-100kPa	None	None	40Mpa	
	Code	Communication protocol				
	H	HART				
	P	PA				
	F	FF				
	D	DP				
	Code	Structure material (Filled liquid: silicon oil)				
		Flange, drain/vent valve		Flange, drain/vent valve		
	22	316 stainless steel		316L stainless steel		
	23	316 stainless steel		Hastelloy C		
	24	316 stainless steel		Monel alloy		
	25	316 stainless steel		Tantalum		
	32	304 stainless steel		316L stainless steel		
	33	304 stainless steel		Hastelloy C		
	34	304 stainless steel		Monel alloy		
	35	304 stainless steel		Tantalum		
	42	SS2205 stainless steel		316L stainless steel		
	43	SS2205 stainless steel		Hastelloy C		
	44	SS2205 stainless steel		Monel alloy		
	45	SS2205 stainless steel		Tantalum		
		Code	Options			
M ₅		LCD display				
IC		Ex ia IIC T4 Ga				
T ₂		Three-Valve Manifold, 316 Stainless Steel				
B ₁		Plate bending bracket				
NCS-PT105IIMSG	4	H	22	C ₆₂ M ₅ B ₁	— — selection sample	

Note: For options not listed, please refer to the list of options.

Appendix 4 NCS-PT105II Pressure transmitter list of options

● Supplied ○ Not supplied

Option		Pressure transmitter					
Code		SG	SA	SD	SL	Remote SG	Remote SD
B ₁	Plate bending bracket	●	●	●	○	●	●
B ₂	Pipe mounting bracket (2"pipe)	●	●	●	○	●	●
B ₃	Pipe flat mounting bracket (2"pipe)	●	●	●	○	●	●
Code	Bleed/drain valve	SG	SA	SD	SL	Remote SG	Remote SD
D ₁	Flange side vent/drain valve on top	●	●	●	○	○	●
D ₂	Flange side vent/drain valve on bottom	●	●	●	○	○	●
D ₃	Equipped with exhaust/drain valve at the rear end of the flange	●	●	●	○	○	●
Code	Housing material	SG	SA	SD	SL	Remote SG	Remote SD
K ₁	Aluminum	●	●	●	●	●	●
K ₂	Stainless steel	●	●	●	●	●	●
Code	Transition joint	SG	SA	SD	SL	Remote SG	Remote SD
D ₄₂	316 stainless steel	●	●	●	●	○	●
D ₄₄	304 stainless steel	●	●	●	●	○	●
Code	Pressure joint	SG	SA	SD	SL	Remote SG	Remote SD
C ₁₀	1/4—18NPT, OD ferrule joint	●	●	●	●	○	●
C ₁₁	External thread transfer welding union, φ14*2/φ14*2 welded short tube (06Cr19Ni10)	●	●	●	●	○	●
C ₁₂	With external thread transfer welding union and φ14×2/φ14×2 welded short pipe (SS2205 duplex stainless steel)	●	●	●	●	○	●
C ₂₂	1/2—14NPT, gland seal, 316 stainless steel	●	●	●	●	○	●
C ₂₃	1/2—14NPT, gland seal, 304 stainless steel	●	●	●	●	○	●
C ₃₂	1/4—18NPT, gland seal, 316 stainless steel	●	●	●	●	○	●
C ₃₃	1/4—18NPT, gland seal, 304 stainless steel	●	●	●	●	○	●
C ₄₂	1/2—14NPT, welded seal, 316 stainless steel	●	●	●	●	○	●

C ₄₂	1/2—14NPT, welded seal, 304 stainless steel	●	●	●	●	○	●
C ₅₂	1/4—18NPT, welded seal, 316 stainless steel	●	●	●	●	○	●
C ₅₃	1/4—18NPT, welded seal, 304 stainless steel	●	●	●	●	○	●
C ₆₂	Type T, M20, Weld Seal, 316 Stainless Steel	●	●	●	●	○	●
C ₆₃	Type T, M20, Weld Seal, 304 Stainless Steel	●	●	●	●	○	●
Code	Display	SG	SA	SD	SL	Remote SG	Remote SD
M ₅	LCD display	●	●	●	●	●	●
Code	Ex grade	SG	SA	SD	SL	Remote SG	Remote SD
IC	Ex ia IIC T4 Ga	●	●	●	●	●	●
IA	Ex ia IIC T6 Ga	●	●	●	●	●	●
DC	Ex d IIC T4 Gb	●	●	●	●	●	●
DA	Ex d IIC T6 Gb	●	●	●	●	●	●
Code	three valves manifold	SG	SA	SD	SL	Remote SG	Remote SD
T ₂	316 stainless steel	○	○	●	○	○	○
T ₃	304 stainless steel	○	○	●	○	○	○
Code	Protection class	SG	SA	SD	SL	Remote SG	Remote SD
IP	IP67 (If IP is not selected, the default is IP65)	●	●	●	●	●	●

Note: If the factory range is not specified, it will be shipped according to the highest range.

Appendix 5 NCS-PT105IISM Intelligent pressure transmitter selection

● Supplied ○ Not supplied

Model		Transmitter	SG	SA
NCS-PT105IISM SG		Gague pressure transmitter	●	○
NCS-PT105IISM SA		Absolute pressure transmitter	○	●
Code	Range		SG	SA
1C	6kPa		●	○
1E	40kPa		●	○
1F	250kPa		●	○
1H	1MPa		●	○
1K	3MPa		●	○
1M	10MPa		●	○
1P	40MPa		●	○
2C	40kPa		○	●
2E	250kPa		○	●
2F	1MPa		○	●
2H	10MPa		○	●
Code	Communication protocol		SG	SA
H	HART		●	●
F	FF		●	●
P	PA		●	●
D	DP		●	●
Code	Process connection material		SG	SA
	Thread, built-in diaphragm material			
GA	Male thread M20*1.5, Φ3 pressure hole, GB/T193-2003, ISO261		●	●
GB	Male thread G1/2, Φ3 pressure hole, EN837		●	●
GC	Male thread G1/4, Φ3 pressure hole, EN837		●	●
GD	Male thread G1/4, Φ3 pressure hole, GB/T7307, ISO228, DIN16288, BS2779, <i>Sealing reference DIN3852-E (rear end seal)</i>		●	●
GE	Male thread 1/2-14NPT, Φ3 pressure hole, GB/T12716,ANSI/ASME B1.20.1		●	●
GF	Male thread 1/4-18NPT, Φ3 pressure hole, GB/T12716,ANSI/ASME B1.20.1		●	●
GG	Female thread 1/2-14NPT, Φ3 pressure hole, GB/T12716,ANSI/ASME B1.20.1		●	●
GH	Female 1/4-18NPT, Φ3 pressure hole, GB/T12716,ANSI/ASME B1.20.1		●	●
Code	Process connection material		SG	SA
A	SUS316 stainless steel		●	●
Code	Display		SG	SA
M	LCD display		●	●
Code	Additional Options Process Connection Mounting Accessories		SG	SA

N1	Heat exchange connector, M20*1.5 internal thread to M20*1.5 external thread, SUS304 stainless steel (condensing pipe)	•	•
N2	Heat exchange connector, M20*1.5 internal thread to M20*1.5 external thread, SUS304 stainless steel (heat sink)	•	•
Code	Additional options process connection accessories	SG	SA
Z1	Welded connector, internal thread M20*1.5, SUS304 stainless steel	•	•
Z2	Welding adapter, female thread G1/2, SUS304 stainless steel	•	•
Code	Ex type	SG	SA
DA	Ex d IIC T6 Gb	•	•
IA	Ex ia IIC T6 Ga	•	•
IB	Ex ia IIC T5	•	•
IC	Ex ia IIC T4 Ga	•	•

Appendix 6 NCS-PT105IIS pressure transmitter selection (FF, PA,HART)

● Supplied ○ Not supplied

Model		Name	SG	SA
NCS-PT105IIS SG		Gauge pressure transmitter	●	○
NCS-PT105IIS SA		Absolute pressure transmitter	○	●
Code	Range		SG	SA
1C	100 mbar (10 kPa/1 mH ₂ O)		●	○
1E	250 mbar (25 kPa/2.5mH ₂ O)		●	○
1F	400 mbar (40 kPa/4 mH ₂ O)		●	○
1H	1 bar (100 kPa/10 mH ₂ O)		●	○
1K	2 bar (200 kPa/20 mH ₂ O)		●	○
1M	4 bar (400 kPa/40 mH ₂ O)		●	○
1P	10 bar (1 MPa/100 mH ₂ O)		●	○
1S	40 bar (4 MPa/400 mH ₂ O)		●	○
1U	100 bar (10 MPa/1000 mH ₂ O)		●	○
1W	400 bar (40 MPa/4000 mH ₂ O)		●	○
1X	700 bar (70 MPa/7000 mH ₂ O)		●	○
2C	100 mbar (10 kPa/1 mH ₂ O)		○	●
2E	250 mbar (25 kPa/2.5 mH ₂ O)		○	●
2F	400 mbar (40 kPa/4 mH ₂ O)		○	●
2H	1 bar (100 kPa/10 mH ₂ O)		○	●
2K	2 bar (200 kPa/20 mH ₂ O)		○	●
2M	4 bar (400 kPa/40 mH ₂ O)		○	●
2P	10 bar (1 MPa/100 mH ₂ O)		○	●
2S	40 bar (4 MPa/400 mH ₂ O)		○	●
2U	100 bar (10 MPa/1000 mH ₂ O)		○	●
2W	400 bar (40 MPa/4000 mH ₂ O)		○	●
2X	700 bar (70 MPa/7000 mH ₂ O)		○	●
Code	Communication protocol		SG	SA
H	HART		●	●
F	FF		●	●
P	PA		●	●
Code	Process connection material		SG	SA
	Thread, built-in diaphragm material			
GA	Thread ISO 228 G1/2 A with hole 3 mm, 316L		●	●
GB	Thread ISO 228 G1/2 A with hole 3 mm, Hastelloy C		●	●
GC	Thread ISO 228 G1/2 A with hole 3 mm, Monel		●	●
GD	Thread ISO 228 G1/2 A 内孔 3 mm, PVDF(max, 15 bar, -10...+60 °C)		●	●

GE	Thread ISO 228 G1/2 A(外)G 1/4(内), 316L	•	•
GF	Thread ISO 228 G1/2 A (male) G 1/4 (female), Hastelloy C	•	•
GG	Thread ISO 228 G1/2 A (male) G1/4 (female), Monel	•	•
GH	Thread ISO 228 G1/2 A with hole 11.4 mm, 316L	•	•
GJ	Thread ISO 228 G1/2 A with hole 11.4 mm, Hastelloy C	•	•
GK	Thread ISO 228 G1/2 A with hole 11.4 mm, Monel	•	•
RA	Thread ANSI 1/2 MNPT 1/4 FNPT, 316L	•	•
RB	Thread ANSI 1/2 MNPT 1/4 FNPT, Hastelloy C	•	•
RC	Thread ANSI 1/2 MNPT 1/4 FNPT, Monel	•	•
RD	Thread ANSI 1/2 MNPT, with hole 11.4 mm, 316L	•	•
RE	Thread ANSI 1/2 MNPT, with hole 11.4 mm, Hastelloy C	•	•
RF	Thread ANSI 1/2 MNPT, with hole 11.4 mm, Monel	•	•
RG	Thread ANSI 1/2 MNPT, with hole 3 mm, PVDf(max.15 bar, -10...+60 °C)	•	•
RH	Thread ANSI 1/2 FNPT, 316L	•	•
RJ	Thread ANSI 1/2 FNPT, Hastelloy C	•	•
RK	Thread ANSI 1/2 FNPT, Monel	•	•
GL	Thread JIS B0202 PF 1/2(male), 316L	•	•
RL	Thread JIS B0203 Pt 1/2(male), 316L	•	•
GP	Thread DIN 13 M20×1.5 with hole 3 mm, 316L	•	•
GQ	Thread DIN 13 M20×1.5 with hole 3 mm, Hastelloy C	•	•
Code	Process connection material	SG	SA
	Thread, built-in diaphragm material		
1G	Thread ISO 228 G 11/2A, 316L	•	•
1H	Thread ISO 228 G 11/2A, Hastelloy C	•	•
1J	Thread ISO 228 G 11/2A, Monel	•	•
1K	Thread ISO 228 G 2 A, 316L	•	•
1L	Thread ISO 228 G 2 A, Hastelloy C	•	•
1M	Thread ISO 228 G 2 A, Monel	•	•
2D	Thread ANSI 11/2 MNPT, 316L	•	•
2E	Thread ANSI 11/2 MNPT, Hastelloy C	•	•
2F	Thread ANSI 11/2 MNPT, Monel	•	•
2G	Thread ANSI 2 MNPT, 316L	•	•
2H	Thread ANSI 2 MNPT, Hastelloy C	•	•
2J	Thread ANSI 2 MNPT, Monel	•	•
1R	Thread DIN I3 M 44×1.25, 316L	•	•
1S	Thread DIN 13 M44×1.5, Hastelloy C	•	•
Code	Process connection material	SG	SA
	EN/DIN flange, flush Mount Diaphragm		
CP	DN 32 PN 25/40 B1,316L	•	•
CQ	DN 40 PN 25/40 B1,316L	•	•

BR	DN 50 PN 10/6 A. PVDF(max.10 bar,-10...+60 °C)	•	•
B3	DN 50 PN 25/40 A,316L	•	•
C3	DN 50 PN 63 B1,316L	•	•
BS	DN 80 PN 10/1 6 A,PVDF(max.10 bar...10...+60 °C)	•	•
B4	DN 80 PN 25/40 A,316L	•	•
Code	Process connection material	SG	SA
	ANSI flange, flush mount diaphragm		
AE	1 1/2" 150 1bs RF,316/316L	•	•
AQ	1 1/2" 300 1bs RF, 316/316L	•	•
AF	2" 150 1bs RF,316/316L	•	•
JR	2" 150 1bs RF,316L with ECTFE coating	•	•
A3	2" 150 1bs RF,PVDF(max, 15 bar, -10...+60 °C)	•	•
AR	2" 300 1bs RF,316/316L	•	•
AG	3" 150 1bs RF,316/316L	•	•
JS	3" 150 1bs RF,316L with ECTFE coating	•	•
A4	3" 150 1bs RF,PVDF(max, 15 bar, -10...+60 °C)	•	•
AS	3" 300 1bs RF,316/316L	•	•
AH	4" 150 1bs RF,316/316L	•	•
JT	4" 150 1bs RF,316L with ECTFE coating	•	•
AT	4" 300 1bs RF,316/316L	•	•
Code	Process connection material	SG	SA
	JIS flange, flush mount dDiaphragm		
KF	10K-50A RF,AISI 316L	•	•
Code	Seal ring material	SG	SA
A	FKM Viton	•	•
B	EPDM	•	•
D	Kalrez	•	•
E	Chemraz	•	•
F	NBR	•	•
1	FKM Viton, degreased	•	•
2	FKM Viton, cleaning	•	•
Code	Display	SG	SA
M	LCD display	•	•
Code	Ed grade	SG	SA
DA	Ex d IIC T6 Gb	•	•
IA	Ex ia IIC T6 Ga	•	•
IB	Ex ia IIC T5	•	•
IC	Ex ia IIC T4 Ga	•	•
NCS-PT105IIS SG 1H H GP A MIC		Selection sample	

Appendix 7 NCS-PT105IIS pressure transmitter selection(DP)

Model		Name
NCS-PT105IIS SG		Gauge pressure transmitter
NCS-PT105IIS SA		Absolute pressure transmitter
Code	Range	
0	200 mbar(20 kPa)	
1	350 mbar(35 kPa)	
2	1bar(100 kPa)	
3	3.5 bar(350 kPa)	
4	7 bar(700 kPa)	
5	10 bar(1 MPa)	
6	25 bar(2.5 MPa)	
7	35 bar(3.5 MPa)	
8	60 bar(6 MPa)	
9	100 bar(10 MPa)	
A	350 bar(35 MPa)	
B	600 bar(60 MPa)	
Code	Communication protocol	
DP	Profibus DP	
Code	Process connection	
	Thread, built-in diaphragm	
GA	Thread ISO 228 G1/2 A with hole 3 mm	
GE	Thread ISO 228 G1/2 A(male), G 1/4(female)	
GH	Thread ISO 228 G1/2 A with hole 11.4mm	
RA	Thread ANSI 1/2 MNPT, 1/4 FNPT	
RD	Thread ANSI 1/2 MNPT, with hole 11.4 mm	
RH	Thread ANSI 1/2 FNPT	
GL	Thread JIS B0202 PF 1/2(male thread)	
RL	Thread JIS B0203 Pt 1/2(male thread)	
GP	Thread M20×1.5, with hole 3mm	
Code	Process connection	
	Threaded, Flush mount diaphragm	
1G	Thread ISO 228 G 1 1/2A	
1K	Thread ISO 228 G 2 A	
2D	Thread ANSI 1 1/2 MNPT	
2G	Thread ANSI 2 MNPT	
1R	Thread M44×1.25	

Code	Process connection
	EN/DIN flange,flush mount diaphragm
CP	DN 32 PN 25/40 B1
CQ	DN 40 PN 25/40 B1
B3	DN 50 PN 25/40 A
C3	DN 50 PN 63 B1
B4	DN 80 PN 25/40 A
Code	Process connection
	ANSI flange,flush mount diaphragm
AE	11/2"150 1bs RF
AQ	11/2"300 1bs RF
AF	2"150 1bs RF
AR	2"300 1bs RF
AG	3"150 1bs RF
AS	3"300 1bs RF
AH	4"150 1bs RF
Code	Process connection
	JIS flange,flush mount diaphragm
KF	10K-50A RF
Code	Seal ring material
A	Fluororubber
F	Nitrile rubber
G	Teflon
Code	Display
M	LCD display
NCS-PT105II(S) SG 1 DP - GP A M	



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