MICROCYBER

NCS-IF105

Current to Fieldbus Converter

Contents

Brief Introduction

As intelligent transition device, NCS-IF105 converter receives 0~20mA or 4~20mA analog signal (4 channels) and converts into fieldbus signal. NCS-IF105 converter uses digital communication technology, and makes the interface between field device and controller easier, and reduces the expense of installation and maintenance.

NCS-IF105F converter fulfills the need of FF fieldbus intelligent instrument and can connect with several FF fieldbus devices.

NCS-IF105P converter fulfills the need of Profibus PA fieldbus intelligent instrument and can connect with several Profibus PA fieldbus devices.

NCS-IF105 converter has abundant function blocks and realizes not only normal measurement function also complex control strategy. In order to realize different function, user can choose different function blocks according to requirements and specific application environment.

Installation

Installation

For installation of NCS-IF105 converter, three types of bracket (pipe mounting flat bracket, plate mounting angle bracket and pipe mounting angle bracket) are provided. Accordingly there are three installation methods as the following.

The installation of pipe mounting flat bracket: the typical installation as Figure 2.1 shows. Fix NCS-IF105 converter in flat bracket using four bolts provided, and then fix the flat bracket on the vertical pipe in Φ50mm around through the U-shape bolt provided.

The installation of plate mounting angle bracket: the typical installation as Figure 2.2 shows. Fix NCS-IF105 converter in angle bracket using four bolts provided, and then fix the angle bracket on the plate through the M10 bolt not provided.

The installation of pipe mounting angle bracket: the typical installation as Figure 2.3, 2.4 shows. Fix NCS-IF105 converter in angle bracket using four bolts provided, and then fix the angle bracket on the horizontal pipe in Φ50mm around through the U-shape bolt provided.

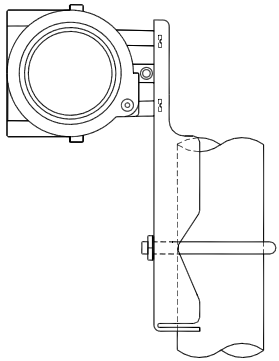


Figure 2.1 The installation of pipe mounting flat bracket

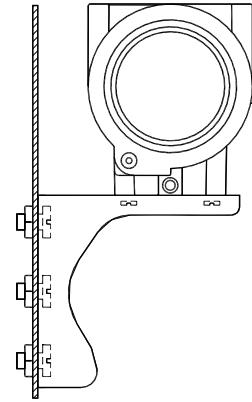


Figure 2.2 The installation of plate mounting angle bracket

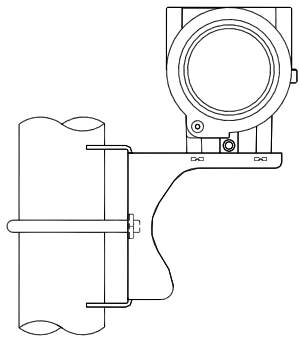


Figure 2.3 The installation of pipe mounting angle bracket-1

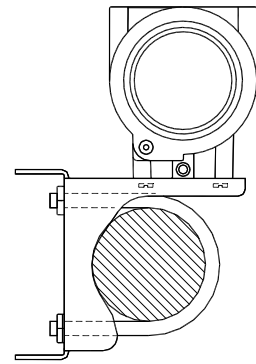


Figure 2-4 The installation of pipe mounting angle bracket-2

Wiring

The power and signal of NCS-IF105 converter Transmitter are sharing one pair of cables (Bus Cable). NCS-IF105 converter is suggested to use specific Fieldbus cables recommended by the IEC61158-2. The wiring terminal is at the rear cover side, the wiring terminal board could be seen when the rear cover is screwed.

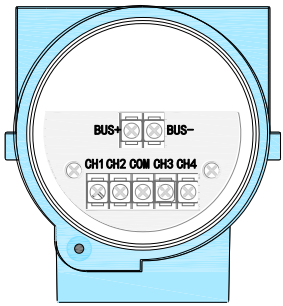


Figure 2.5 The wiring terminal board of NCS-IF105 Converter

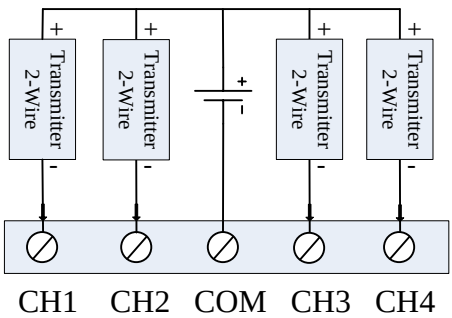


Figure 2.6 Wiring of NCS-IF105 Converter (2- Wire)

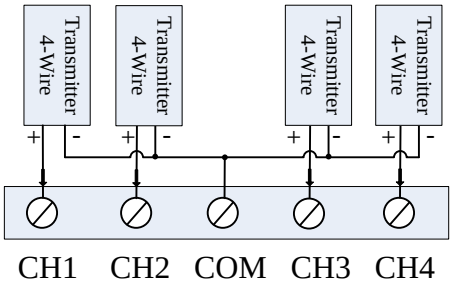


Figure 2.7 Wiring of NCS-IF105 Converter (4- Wire)

Signal wires should be passed the wire hole. Sensor signal wires are single-point grounding. The Shield of the bus cable should be floating in converter side, and be grounding in bus power side.

The signal and bus cable should not share the line pipe or trunkings with other equipment, and should stay away from high-power equipment.

Principle and Structure

NCS-IF105 converter convert input current signal that generate by most conventional transmitters to fieldbus signal.

NCS-IF105 converter is consisted of five components, as shown in Figure 3.1.

1) Terminal board: it is used to connect with fieldbus, current output signal, A/D board and communication board.
2) A/D board: it can convert input current signal to digital signal provided to communication board.
3) Communication card: it is core component of intelligent instrument, which implements the communication, control, diagnosis and maintenance of Foundation Fieldbus.
4) Isolation board: it is used for isolation between communication board and instrument board (power isolation and signal isolation).
5) LCD Card (optional): it is used to display function block parameters.

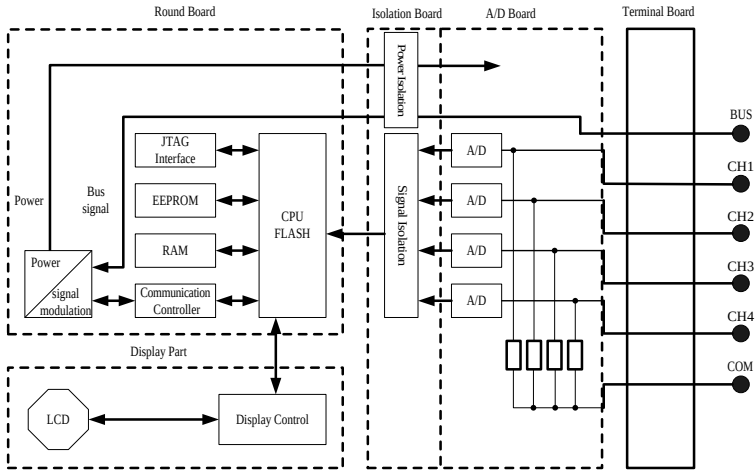


Figure 3.1 Schematic diagram of NCS-IF105 converter

● Size of NCS-IF105 Converter

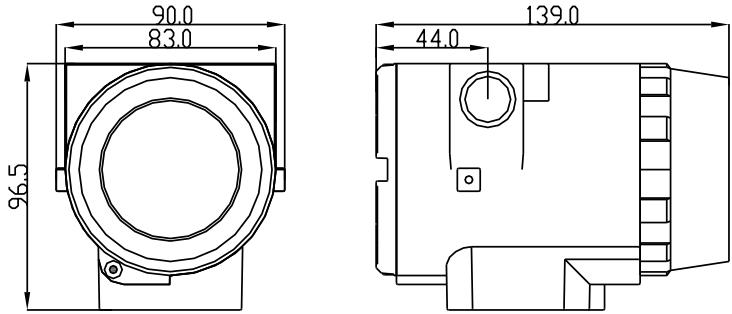


Figure 3.2 Size of NCS-IF105 Converter (unit: mm)

Structure of NCS-IF105 Converter

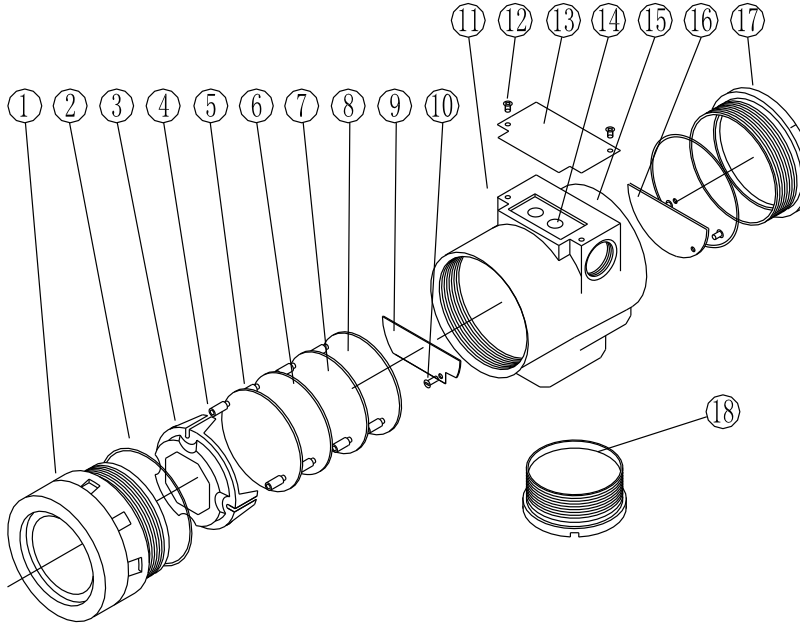


Figure 3.3 Structure of NCS-IF105 Converter

1	Front cover	2	O-ring	3	LCD cover	4	Electronics/LCD
5	Post	6	Communication board	7	Capture board	8	Isolation board
9	Terminal board	10	Screw	11	Wire hole	12	Screw
13	Name plate	14	Z/X button	15	Housing	16	Pin/block
17	Rear cover	18	Bottom cover				

As the core of NCS-IF105 converter, the Communication Card connects with terminal board, isolation board, instrument board and LCD board. The LCD board rotated in four angles is fixed on the Communication board, as Figure 3.4 shows.

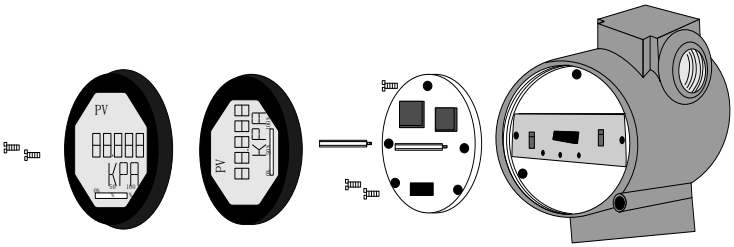


Figure3.4 Assembly structure of the meter

NCS-IF105F Configuration

Network Topology

A FF transmitter supports many kind of connection, As shown in figure 4.1. The classic connection modes for a FF device is bus connection, As shown in figure 4.2.The matching resistance on the both side of terminal ensures a good quality of signal. The maximum length of fieldbus is 1900 meters and can be prolonged to 10 kilometers using repeaters.

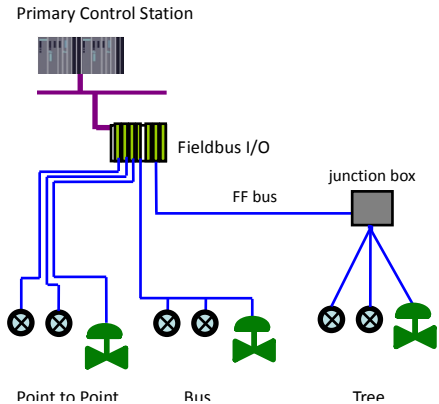


Figure 4.1 FF Network Topology

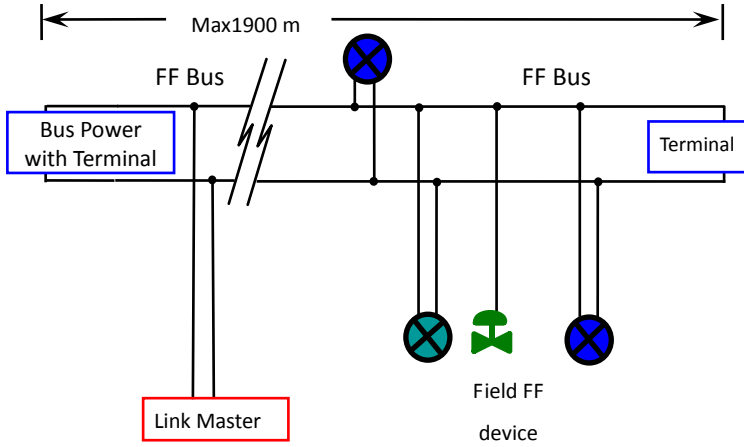


Figure 4.2 FF Bus Connections

Function Blocks

Function Block	Description
Resource	This block contains data from the hardware that is associated with the resource.
Transducer Block	This block converts input/output device variables into relevant engineering data.
Display Transducer	This block configures process variables displayed in LCD.
Analog Input	This block transmits the input data from the transducer block to other function block. It has scaling conversion, filtering, square root and low cut, etc...
PID Control	This block has a lot of features as set point treatment (value and rate limiting), filtering and

	alarm on PV, feed-forward, output tracking and others.
Ratio	This block realizes ratio control between two input data.
Input Selector	This block has four analog inputs that may be selected by an input parameter or according to a criterion as first good, maximum, minimum, middle and average.
Signal Characteristic	This block has capability for two signal characteristics based on the same curve. The second input has an option for swapping “x” to “y”, and inverse function may be used in signal characteristic of read-back variables.
Lead Lag	This block provides dynamic compensation of a variable. It is used normally in a feed-forward control.

Configuration

NCS-IF105F transmitter can be configured by the Configurator software and NCS4000 DCS software of Microcyber Inc, NI-FBUS Configurator of National Instrument, and DeltaV system of Rosemount.

- **Environments**

  1) Windows 2000 or Windows XP system;
  2) NCS-LD105 Linking Device, H1 Bus Power, H1 Terminal Matcher;
  3) FF Configurator;

- **Two point calibration**

The transmitter can be calibrated by the parameter CAL_POINT_HI and CAL_POINT_LO:

1) Input the standard current signal to the channel that will be calibrated. Such as 4 mA.
2) Read the actual current value from the parameter PRIMARY_VALUE of transducer block. For example, it is 3.9 mA.
3) Set the mode of transducer block to O/S, and then change the parameter SENSOR_CAL_METHOD to “User Trim Standard Calibration”.
4) Write the value of 4 mA to the parameter CAL_POINT_LO. If the parameter is written with no error, the low calibration would be successful. **Please note that calibration value must be in the range of sensor maximum measurement. The calibration value must not have much difference from actual value, or the calibration will be failed.**
5) Set the mode of transducer block to AUTO.
6) The upper value calibration is the same the lower value calibration. Please write the new upper value to the parameter CAL_POINT_HI while calibrating.

- **LCD Configuration**

By default, the transmitter LCD displays the parameter PRIMARY_VALUE value of the first channel of transducer block.

As is shown in the figure 4.3, if user need displays other parameter of other block, please follow the steps below. (X is equal to 1, 2, 3 or 4, the LCD display transducer block can display four kinds of parameter cicely.) The LCD will show CONFIG_ERR if it receives a wrong configuration parameter. Please set the mode to O/S and correct the configuration parameter then set the mode back to AUTO so that it display normally.

1) BLOCK_TAG_X: This parameter defines the tag name of function blocks. For example, if user wants to display a parameter of AI1 function block, he should write “AI1” to this parameter. **Please note that the length of written char should be equal to 32 bytes. If the length of char is smaller than 32, please insert blank char to make its length equal to 32.**
2) RELATIVE_INDEX_X: This parameter defines the index of the parameter of function blocks. For example, if user wants to display the OUT parameter of AI1 block, please write 8 to the RELATIVE_INDEX_X.
3) SUB_INDEX: This parameter defines the sub index of the parameter of function blocks. For example, if user wants to display the OUT.VALUE of AI1 block, please write 2 to this parameter.
4) MNEMONIC_X: This parameter defines the text which will be displayed in the LCD. The maximum length of text is 16 bytes.

5) DECI_PNT_NUMB_X: This parameter defines the position of decimal point for displayed value.

6) ACTIVE_X: This parameter wills active the display function of the group.

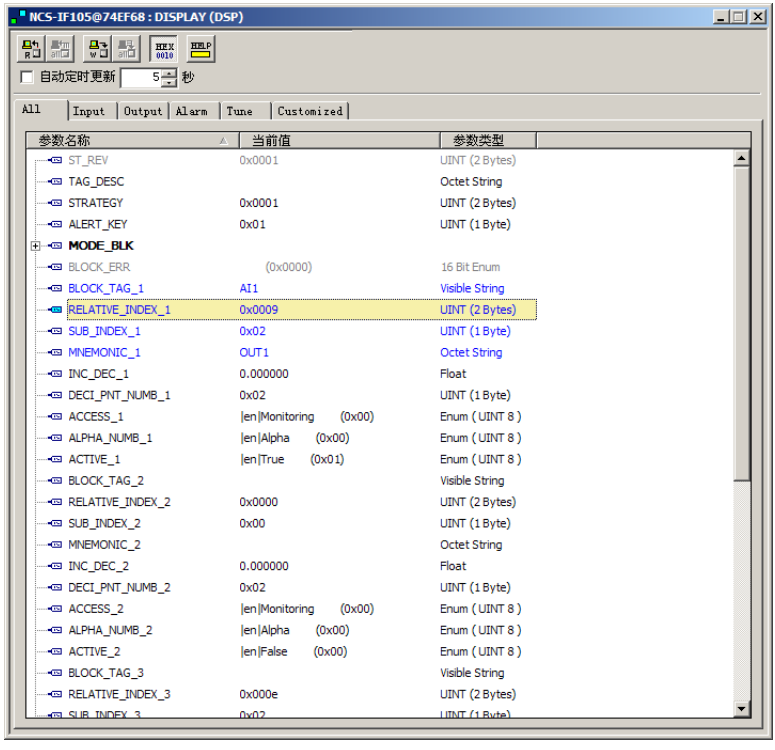


Figure 4.3 LCD Configuration

Jumper

NCS-IF105 transmitter has three hardware jumpers:

SIM Jumper: Simulate jumper. It enables the simulation of the transmitter.

WP Jumper: Hardware write lock jumper. It can prevent operator from changing the configuration of the transmitter.

RST Jumper: Factory default reset jumper. It will set the configuration of transmitter to factory default value.

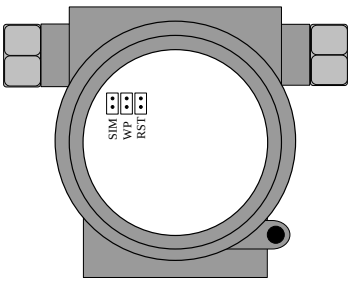


Figure 4.4 NCS-IF105 transmitter hardware jumpers

NCS-IF105P Configuration

Topology Connection

- **Transmitter topology connection**

A PROFIBUS PA transmitter supports many net topologies shown as Figure 5-1., shows the bus connection of PA instrument is shown in Figure 5-2, in order to ensure the bus signal quality, the terminal matching resistances should be connected to the 2 ends of the bus. The bus maximum length is 1900m, with a repeater, the length can be extended to 10 kilometers.

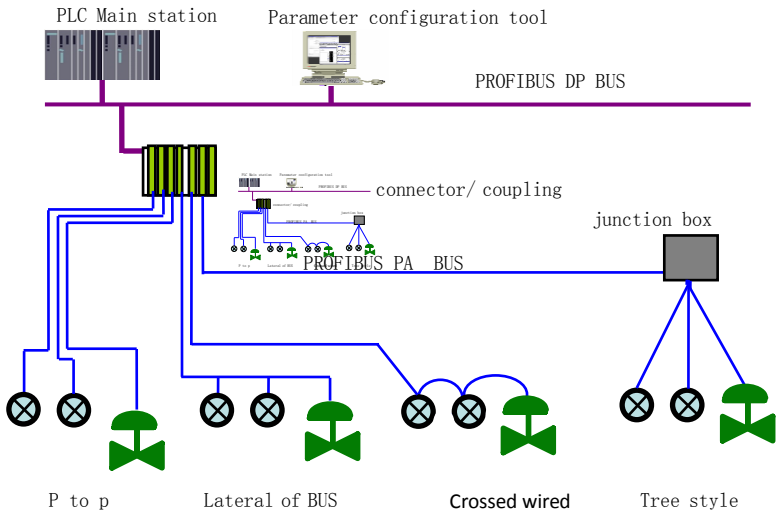


Figure 5-1 PROFIBUS PA Network Topology

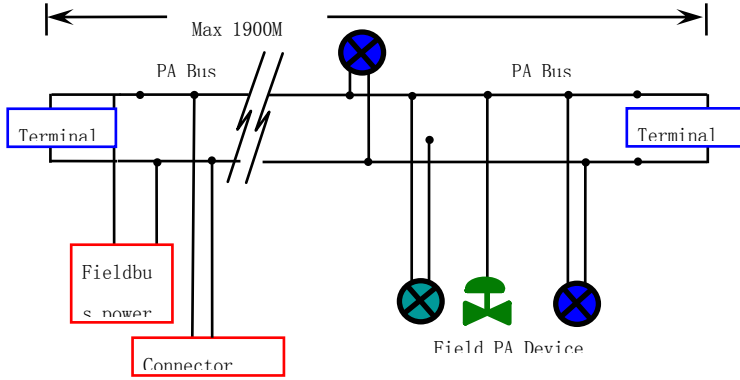


Figure 5-2 PROFIBUS PA BUS CONNECTIONS

Function Block

PA Smart Transmitter realizes the PA standard function block, as the table shown as the table below. Please refer to PROFIBUS PA specification for function block configuration methods.

Function Block Name	Description
Physical Block	Physical block（PB）describes the information of device specific hardware info, recognization info and diagnose info including device bit number, software version, hardware version, installation

	date,etc.
Transducer Block	Transducer block separates the function block from instrument input/output characteristic. It carries out the function of input/output data calibration and linearization,etc, and transfer the data to AI function block via inner channel.
Analog Input Block	Analog input block achieves analog process value via inner channel and process the value, and then provides the right measurement value to master device via bus communication.
Totalizer Block	Totalizer block achieves flow instantaneous value via inner channel and cumulates value, and then provides the cumulated value to master device via bus communication.

Function Configuration

Please refer to 4.2 Adjusting for PA Smart Transmitter for detailed info about range setting, zero setting, bus address and data recovery of PA smart transmitter.

- **Environment Settings**
  1) PC with Windows 2000 or Windows XP,
  2) SIEMENS Step7 configuration software，SIEMENS PDM device management software,
  3) DP/PA coupler or connector,
  4) Class 1 master station such as PLC，Class 2 master station such as CP5611 board,

5) PA Terminal matcher,

6) Standard pressure source.

- **Transducer block parameter configuration**

The transmitter block separates the function block, sensor and special I/O device, it relys on device manufacture to access or control I/O device. Through the access to I/O device, the transducer block can achieve input data or set output data. Generally, the transducer block has the function of linearization, specialization, temperature compensation, control and exchange data,etc. The structure is shown as Figure 5-3.

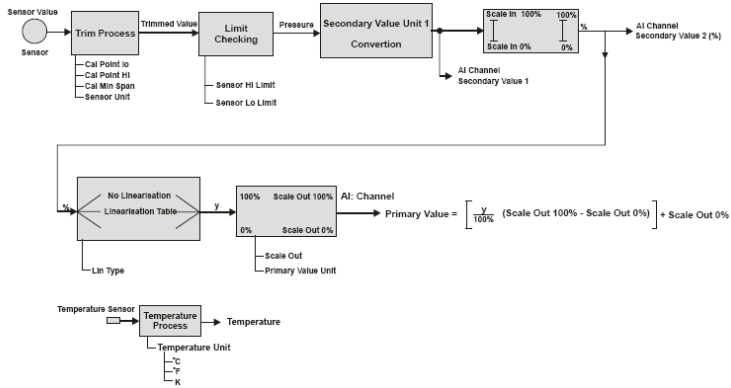


Figure 5-3 Transducer Block Structure

Parameter description as following：

Parameter	Description
CAL_MIN_SPAN	The allowable minimum calibration span is necessary to ensure that calibration is done well,

	and the two calibration points (highest and lowest) are not too close together. The unit is decided by SENSOR_UNIT.
CAL_POINT_HI	When the calibration is at the highest point, it will transfer the pressure signal at the highest point to sensor, and the sensor will write the value to parameter as the highest value at the calibration point. The unit is decided by SENSOR_UNIT.
CAL_POINT_LO	When the calibration is at the lowest point, it will transfer the pressure signal at the lowest point to sensor, and the sensor will write the value to parameter as the lowest value at the calibration point. The unit is decided by SENSOR_UNIT.
FLOW_LIN_SQRT_POINT	Flow calculation coefficient
LIN_TYPE	Linearization type
LOW_FLOW_CUT_OFF	Little signal cut value
MAX_SENSOR_VALUE	Sensor maximum pressure value, and unit is decided by SENSOR_UNIT.
MIN_SENSOR_VALUE	Sensor minimum pressure value, and unit is decided by SENSOR_UNIT.
MAX_TEMPERATURE	Sensor maximum temperature value, the unit is Celsius.
MIN_TEMPE	It holds the minimum temperature. Sensor

RATURE	minimum temperature value, the unit is Celsius.
PRIMARY_VALUE	Transmitter measurement value and status, are available to AI function block. The unit is decided by PRIMARY_VALUE_UNIT.
PRIMARY_VALUE_TYPE	Transmitter measurement value type, code as following: 0: Pressure 1: Flow 2: Level 3: Volume 4-127: Reversed > 128: Manufacturer specific By now, it only supports 0 and 1.
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 decided by SECONDARY_VALUE_1_UNIT.
SCALE_OUT	Sensor output range, the unit is decided by SECONDARY_VALUE_1_UNIT.

SECONDARY_VALUE_1	This parameter contains the Pressure value and status available to the Function Block. Measurement value and status after modification and unit exchange, are available to AI function block.
SECONDARY_VALUE_1_UNIT	SECONDARY_VALUE_1 engineering code
SECONDARY_VALUE_2	Percentage value after input range exchange is available to AI function block.
SECONDARY_VALUE_2_UNIT	SECONDARY_VALUE_2 engineering code
SENSOR_DIAPHRAGM_MATERIAL	Sensor diaphragm type code
SENSOR_FILL_FLUID	Sensor fill-liquid type code
SENSOR_HI_LIM	Sensor physical upper range
SENSOR_LO_LIM	Sensor physical lower range
SENSOR_MAX_STATIC_PRESSURE	Sensor maxmimum static pressure
SENSOR_O_	Type code for O ring between sensor diafhragm

RING_ MATERIAL	and process connection
SENSOR_SERIAL_ NUMBER	Sensor serial number
SENSOR_TYPE	Sensor type
SENSOR_UNIT	Sensor original data unit
SENSOR_VALUE	Sensor original data value
TEMPERATURE	Sensor temperature value
TEMPERATURE_UNIT	Sensor temperature value unit, now it is Celsius.
TRIMMED_VALUE	Pressure valus after calibration

- **PROFIBUS Cycle Data Communication Confuguration**

PROFIBUS DP cycle data communication means Class 1 master station and slave station exchang input and output data in the polling method. The method is unconnected. In each cycle period, Class 1 master station sends data exchange request, and slave station responses the request. Cycle data communication is mainly used for configuration between slave station and PLC master station ,due to the cycle data communication, master station PLC gets input data from slave

station real-time, or transfer the output data to the slave station. PA smart transmitter cycle data communication configurationis the same as PROFIBUS DP slave, we only need to add a coupler or a linker between PA BUS and DP BUS.

PA smart transmitter cyber data comes from AI function block parameter in the device.There are 5 bytes in total, including 4 bytes for pressure value floating-point data and 1 byte status data.

There are 2 standard function blocks, AI and TOT, as well as a vacant function block. If there is only one function block is necessary, you should configure the vacant function block. For example, is only AI function block is necessary, you should configure AI function block and the vacant function block.

For cyber communication, transmiitter supports many identifiers. For AI, there are long and short identifiers. For TOT, there are Total,Mode_Total and Set_ Total identifiers, shown as following:

AI	Short	0x94
	Long	0x42,0x84,0x08,0x05
TOT	Total	0x41,0x84,0x85
	Total, Mode_Total	0xC1,0x80,0x84,0x85
	Total, Mode_Total, Set_ Total	0xC1,0x81,0x84,0x85

User may use SIEMENS Step7 for PROFIBUS PA configuration

cycle data communication .Open SIMATIC Manager, select PLC master station and create a new project,shown asFigure 5-4.

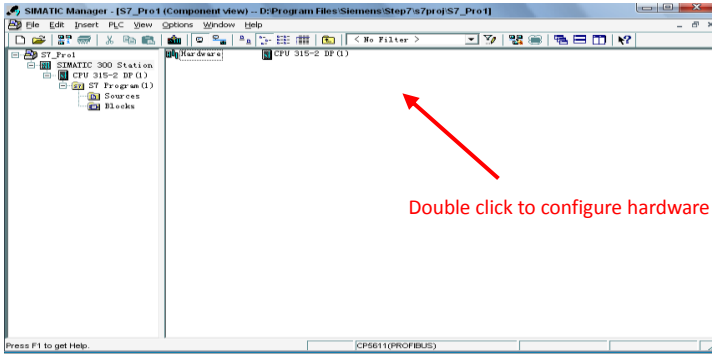


Figure 5-4 Select PLC master station，and create new project

Click hardware twice to open Hardware Configuration in HW Configuration Software. On the menu of Option, select “Install GSD” in Option list, shown as Figure 5-5.

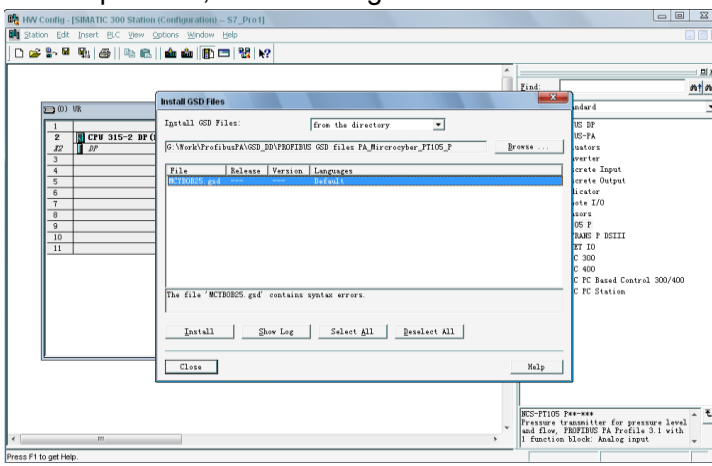


Figure 5-5 Install GSD file

When GSD files is successfully installed, at the right side of HW Configuration software you can see the device we have just installed from PROFIBUS-PA. Using your mouse to select and drag it to PROFIBS DP BUS, shown as Figure 5-6.

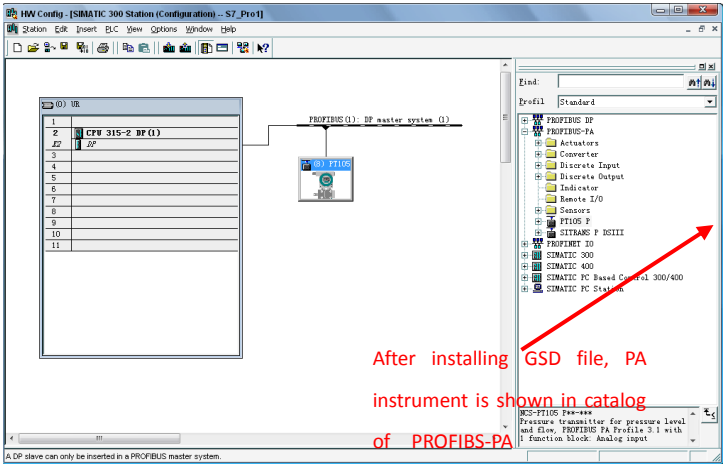


Figure 5-6 Drag PA device to the PROFIBUS DP Bus

Select Download configuration information to PLC master station in the PLC list. It is the last step for the communicarion configuration between PA instrument and master station cyber data, shown as Figure 5-7.

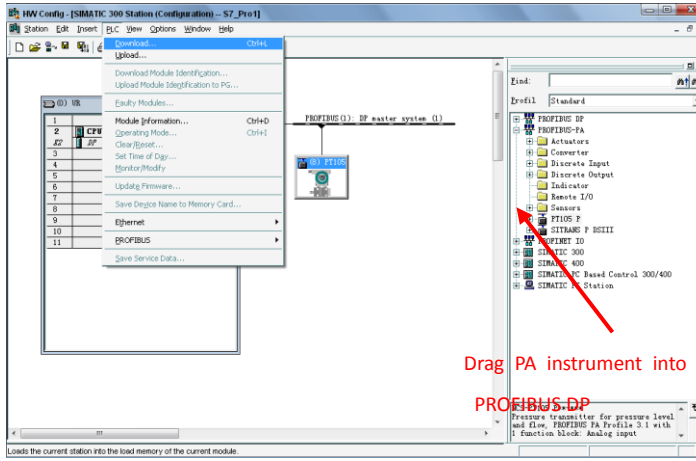


Figure 5-7 Download the configuration to PLC

- **PROFIBUS non-cycle data communication configuration**

PROFIBUS DP non-cycle data communication meansfacing linking data communication between Class 2 master station and slave station. It is under the circumstance without affection cyber data communication and in the non-cycle period. Non-cycle data is mainly PA function block parameter, recognization and diagnoseinfo,etc. Non-cycle data communication is mainly applied in PA device management, diagnose, recognization, calibration, maintenance,etc.

User may use SIEMENS device management software SIMATIC PDM for non-cycle data communication configuration of PROFIBUS PA transmitters.

Here is an example:

Before the configuration, please add manufacture info.

Find manufacturer.csv file in ...\Siemens\Step7\S7BIN. Add “Microcyber Inc.;Microcyber Inc.;;;;Microcyber Inc.;0x016C”

Open SIMATIC PDM Lifelist Software; select Start Scan DP bus from Scan list, shown as Figure 5-8.

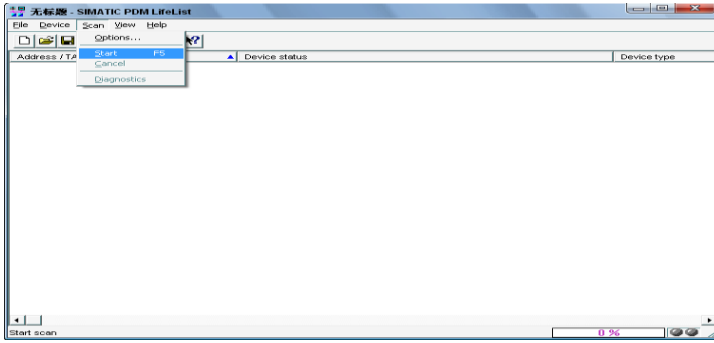


Figure 5-8 Start LifeList

After the bus is scanned, the slave devices in DP bus will be listed, at the same time the device ID and some diagnose info will be shown, shown as Figure 5-9.

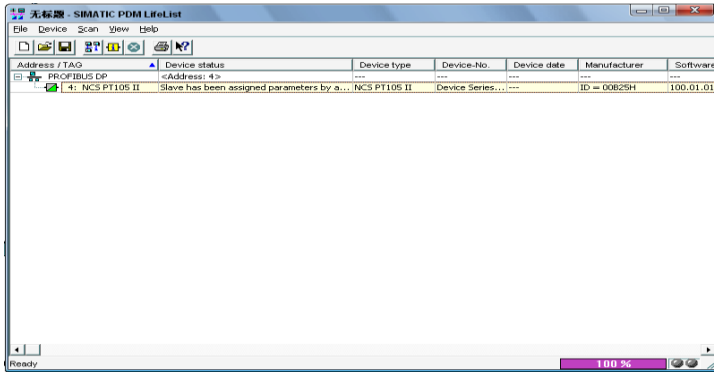


Figure 5-9 Scan DP bus list PA devices

Click PA device twice will start SIMATIC PDM software. According to this software, you can write / read parameter and diagnose PA device. At the popup box, for PA instrument type, choose Device Catalog, to aff GSD file. If it's NCS-IF105 PA transmitter, you may choose Microcyber Inc\NCS-IF105 shownas figure 5-10.

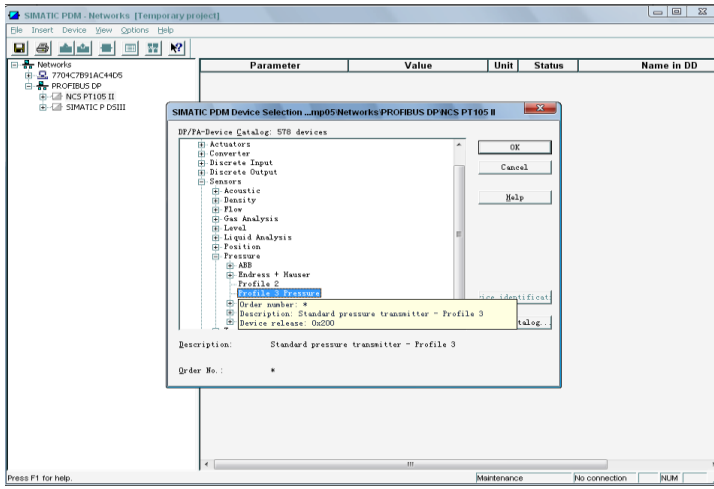
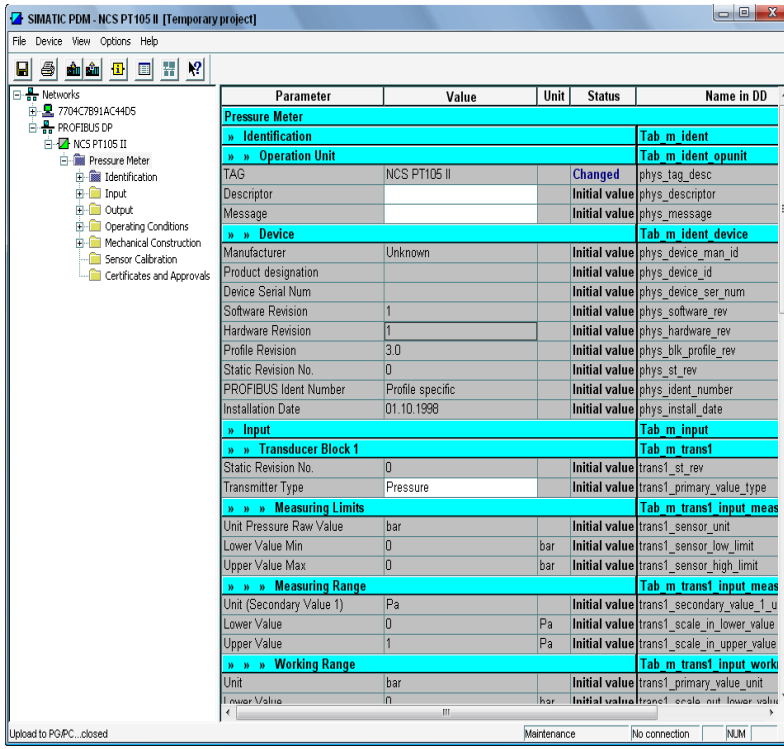


Figure 5-10 Select device type

When device type is selected, click “OK”, now you have finished the configuration. According to the functions of download and upload of PDM software, you can complete writing and reading parameters, shownas figure 5-11 .



Parameter	Value	Unit	Status	Name in DD
Pressure Meter				
» Identification				**Tab_m_ident**
» » Operation Unit				**Tab_m_ident_opunit**
TAG	NCS PT105 II		**Changed**	phys_tag_desc
Descriptor			**Initial value**	phys_descriptor
Message			**Initial value**	phys_message
» » Device				**Tab_m_ident_device**
Manufacturer	Unknown		**Initial value**	phys_device_man_id
Product designation			**Initial value**	phys_device_id
Device Serial Num			**Initial value**	phys_device_ser_num
Software Revision	1		**Initial value**	phys_software_rev
Hardware Revision	1		**Initial value**	phys_hardware_rev
Profile Revision	3.0		**Initial value**	phys_blk_profile_rev
Static Revision No.	0		**Initial value**	phys_st_rev
PROFIBUS Ident Number	Profile specific		**Initial value**	phys_ident_number
Installation Date	01.10.1998		**Initial value**	phys_install_date
» Input				**Tab_m_input**
» » Transducer Block 1				**Tab_m_trans1**
Static Revision No.	0		**Initial value**	trans1_st_rev
Transmitter Type	Pressure		**Initial value**	trans1_primary_value_type
» » » Measuring Limits				**Tab_m_trans1_input_meas**
Unit Pressure Raw Value	bar		**Initial value**	trans1_sensor_unit
Lower Value Min	0	bar	**Initial value**	trans1_sensor_low_limit
Upper Value Max	0	bar	**Initial value**	trans1_sensor_high_limit
» » » Measuring Range				**Tab_m_trans1_input_meas**
Unit (Secondary Value 1)	Pa		**Initial value**	trans1_secondary_value_1_u
Lower Value	0	Pa	**Initial value**	trans1_scale_in_lower_value
Upper Value	1	Pa	**Initial value**	trans1_scale_in_upper_value
» » » Working Range				**Tab_m_trans1_input_work**
Unit	bar		**Initial value**	trans1_primary_value_unit
Lower Value	0	bar	**Initial value**	trans1_scale_out_lower_valu

Figure 5-11 Use PDM software to manage device

Jump-pin Configuration

PA smart transmitter has three hardware jumpers, at present you can use two of them, shown as Figure 5-12 , J3 is non-used.

RST Jumper:Reset jumper will reset the transmitter data back to factory. It is the same as the operation for data back to factory with magnetic bars shown as Chapter 5.4. Please make the transmitter powered off, insert the jumper to RST, and then power the transmitter on, the data will be back to factory data, shown as Figure 5-13.

Attention: After the operation for data back to factory with RST jumper, please turn off instrument power again, pull out the RST jumper, then use the instrument normally. Otherwise if you keep RST jumper like this, when next time you restart the instrument, all data will be back to factory. the configuration info before power off will be lost.

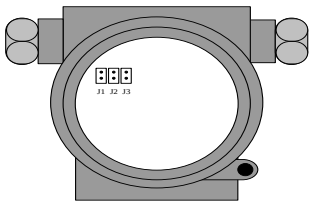


Figure 5-12 PA smart transmitter hardware jumpers

Maintenance

Phenomenon	Solution
No Communication	**Transmitter connection** Check the bus connection Check the polarity of bus power Check shield of bus cable, if it is single point earthing
	Bus power Bus power should in the range 9 ~ 32V for the transmitter. Bus noise and ripple should fulfill: 1） peak-to-peak value noise is 16mV, 7~39kHz; 2） peak-to-peak value noise is 2V, 47~63HZ, for non-EX 3） peak-to-peak value noise is 0.2V, 47~63HZ, for EX 4） peak-to-peak value noise is 1.6V, 3.9M~125MHZ.
	Network connection Check network topology structure Check terminal matcher and wire connection Check the length of main trunk and branch
	Address conflict The factory default address if a temporary address

	from 0xF8 to 0xFB. If there are more devices with temporary address, some device will not communicate online. Please insure that there are not too many devices with temporary address on the bus.
	Transmitter fault Replace the transmitter with others.
Fail to read value from transmitter	**Transmitter connection** Check if it is short circuit or open circuit. Check if it is the fault of transmitter itself.
	Noise disturb Check if the earthing is correct. Check if the terminal is wet. Check if the cable is far from the strong Electromagnetic Interference
	Software configuration Check the function block configuration
	Transmitter fault Replace the transmitter with others.

Technical Specification

Basic parameters

Input signal	4～20mA
Channels	4 Channels
Power supply	9 ～ 32 VDC ;Current Dissipation (static): ≤ 14mA
Fieldbus Signal	Communication Baudrate 31.25kbit/s, current-mode
Insulation	Between housing and terminal board: 500 Vrms (707 VDC)
Display	6 bits digital number and 5 bits characters LCD display (Optional)
Temperature range	- 40 ～ 85℃ （No display） - 30 ～ 70℃ （display）
Humidity Range	0% ～ 100% RH
Start Time	≤ 5s
Protection grade	IP 65
EMC	Designed to comply IEC 61000

Technical performance

Accuracy	< 0.05 %;
Input impedance	150 Ω
Temperature effect	< ± 50 ppm/℃

Physical performance

Electrical connection	1/2 - 14 NPT
Material of Construction	Aluminum
Weight	1.1 kg