



# G0310

## Modbus to HART gateway

### User Manual



## Warning

1. Please don't take off/install gateway at random.
2. Please check if the power of temperature board set meets the power request in the User Manual.

## Company Introduction

**Microcyber Inc.** established as a high-tech enterprise by the Shenyang Institute of Automation Chinese Academy of Sciences, mainly engages in advanced industrial control systems, equipments, instruments and chips for industrial process automation control solutions in the research, development, production and application. Microcyber undertakes a number of national scientific and technical key task and “863” project, and has Liaoning Province networked control systems engineering research center. The company successfully developed the FF H1 fieldbus protocol stack which is number one to be approved internationally in China, and the Industrial Ethernet Protocol(HSE) which is number one to be approved in China, and the domestic first fieldbus instrument which has a function of national-level intrinsically safe explosion--proof and safety barrier. Also Microcyber participated in the drafting of the domestic first Ethernet-based industrial automation protocol standards (Ethernet for Plant Automation, EPA). As a result, serial products are composed of configuration, control software, embedded software, control system, instrument chip to the OEM board, and make Microcyber be an industrial automation products provider in full range, and also further Microcyber’s leading position in the field of fieldbus technology.

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

Microcyber passes the Authentication of ISO 9001 Quality System, and has an outstanding innovative R&D team, plentiful practical experiences of design of the Automatic engineering, a leading product series, a huge market network, a strict quality management system and an excellent enterprise culture. All these further a solid foundation of entrepreneurship and sustainable development for Microcyber.

Microcyber Inc. is looking forward to the long-term smooth and close cooperation with you.

## Contents

|                                                   |    |
|---------------------------------------------------|----|
| Chapter 1 Overview .....                          | 1  |
| 1.1 Dimension .....                               | 1  |
| 1.2 Structure .....                               | 1  |
| Chapter 2 Installation.....                       | 2  |
| 2.1 Wiring .....                                  | 2  |
| 2.2 Jumper configuration .....                    | 2  |
| 2.3 Internal load resistance .....                | 3  |
| 2.4 Recalibration .....                           | 3  |
| Chapter 3 Working Principle .....                 | 5  |
| Chapter 4 Menu Tree .....                         | 6  |
| Chapter 5 Transmitter Configuration .....         | 7  |
| 5.1 Topological Connection.....                   | 7  |
| 5.2 Configuration tool.....                       | 8  |
| 5.2.1 Installation and activation .....           | 8  |
| 5.2.2 Introduction of main page features.....     | 10 |
| 5.3 Basic operations.....                         | 12 |
| 5.4 Device operation.....                         | 15 |
| 5.5 Gateway Parameter Setting .....               | 20 |
| 5.5.1 Mode selection .....                        | 20 |
| 5.5.2 Coil calibration .....                      | 21 |
| 5.5.3 Register Calibration .....                  | 22 |
| 5.5.4 Factory reset setting .....                 | 22 |
| 5.5.4.1 Reset to Factory Default.....             | 22 |
| 5.5.4.2 Save to factory settings .....            | 23 |
| 5.5.4.3 Reset to factory settings.....            | 24 |
| 5.5.4.4 Device variable assignment.....           | 25 |
| 5.5.5 Modbus variable configuration.....          | 26 |
| 5.5.5.1 Address .....                             | 26 |
| 5.5.5.2 baud rate.....                            | 26 |
| 5.5.5.3 Data bits .....                           | 27 |
| 5.5.5.4 Calibration.....                          | 27 |
| 5.5.5.5 Stop Bits .....                           | 27 |
| 5.5.5.6 CRC byte order .....                      | 27 |
| 5.5.5.7 Time frame interval.....                  | 28 |
| 5.5.6 Device Status Configuration .....           | 28 |
| 5.5.6.1 Register address.....                     | 28 |
| 5.5.6.2 Bit mode.....                             | 28 |
| 5.5.7 PV Range Setting.....                       | 28 |
| 5.5.7.1 PV Range Source .....                     | 28 |
| 5.5.7.2 PV range operation mode .....             | 29 |
| 5.5.7.3 Register data type .....                  | 29 |
| 5.5.8 Device Variable .....                       | 29 |
| 5.5.8.1 Type.....                                 | 29 |
| 5.5.8.2 Unit .....                                | 30 |
| 5.5.8.3 Upper limit of sensor range .....         | 30 |
| 5.5.8.4 Lower limit of sensor range.....          | 30 |
| 5.5.8.5 Minimum span .....                        | 30 |
| 5.5.8.6 Range limit .....                         | 31 |
| 5.5.8.7 Lower range limit .....                   | 31 |
| 5.5.8.8 Default units.....                        | 31 |
| 5.5.8.9 Modbus functional code .....              | 32 |
| 5.5.8.10 Register address .....                   | 32 |
| 5.5.8.11 Register data type .....                 | 32 |
| 5.5.8.12 Scaling factor .....                     | 32 |
| 5.5.8.13 Range Upper Limit Register Address.....  | 33 |
| 5.5.8.14 Range Lower limit register address ..... | 33 |
| Chapter 6 Quick configuration .....               | 34 |
| Chapter 7 Maintenance .....                       | 35 |

Chapter 8 Technical Specification ..... 36

Chapter 9 Appendix1 G0310 MODBUS to HART Gateway Model Selection ..... 37

# Chapter 1 Overview

G0310 Modbus to HART Gateway, designed by Microcyber Corporation is a gateway device for Modbus-RTU protocol and HART protocol. As Modbus master, G0310 Modbus to HART Gateway communicates with devices that have Modbus-RTU communication function via RS485 interface. It can convert device data to HART device variables output, and it also supports 4~20mA current output. As shown in 错误!未找到引用源。:



Figure 1.1 Modbus to HART gateway

## 1.1 Dimension

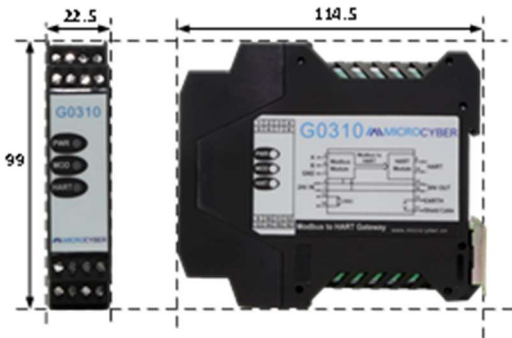


Figure1.1 Dimension (Unit:mm)

## 1.2 Structure



Figure1.2 structure

|   |                |   |                |   |               |   |          |
|---|----------------|---|----------------|---|---------------|---|----------|
| 1 | Upside Housing | 2 | Bottom Housing | 3 | Communication | 4 | Terminal |
|---|----------------|---|----------------|---|---------------|---|----------|

## Chapter 2 Installation

The dimension of G0310 Modbus to HART gateway is 99\*22.5\*114.5mm. It supports with standard DIN Rail installation.

### 2.1 Wiring

G0310 Modbus to HART gateway terminal distribution and meaning are shown as in Figure 2.1

|                                                                                                      |    |    |    |
|------------------------------------------------------------------------------------------------------|----|----|----|
| 1                                                                                                    | 2  | 3  | 4  |
| 5                                                                                                    | 6  | 7  | 8  |
| G0310                                                                                                |    |    |    |
| PWR                                                                                                  |    |    |    |
| HART                                                                                                 |    |    |    |
| FF                                                                                                   |    |    |    |
|  中科博微<br>MICROCYBER |    |    |    |
| 9                                                                                                    | 10 | 11 | 12 |
| 13                                                                                                   | 14 | 15 | 16 |

|    |        |    |       |
|----|--------|----|-------|
| 1  | 24V-   | 2  | 24V+  |
| 3  | NC     | 4  | NC    |
| 5  | A+     | 6  | B-    |
| 7  | GND    | 8  | GND   |
| 9  | HART+  | 10 | HART- |
| 11 | Shield | 12 | EARTH |
| 13 | R      | 14 | R     |
| 15 | 24V+   | 16 | 24V-  |

Figure 2.1

The power supply of G0310 MODBUS to HART gateway is HART bus, and 485 communication need external 24V power supply. The recommended is TP cable, and it shall improve device's anti-electromagnetic interference ability. G0310 MODBUS to HART gateway connection diagram is shown as in Figure 2.2:

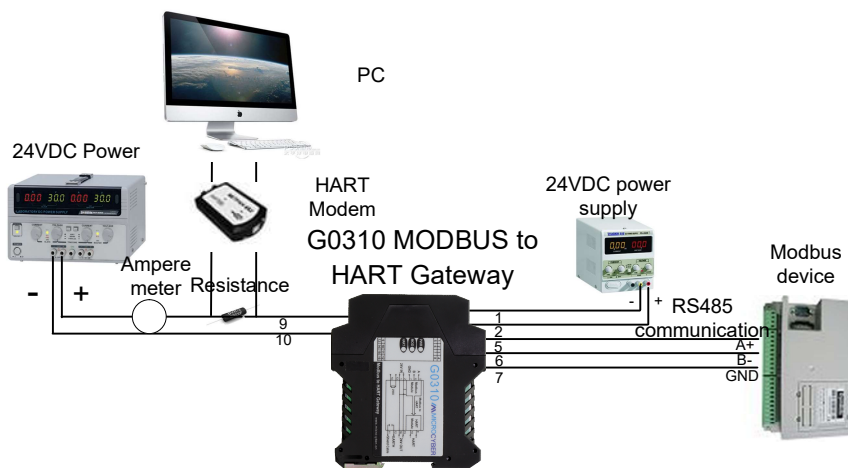


Figure 2.2 G0310 MODBUS to HART gateway connection diagram

### 2.2 Jumper configuration

G0310 MODBUS to HART Gateway has 2 jumpers, as shown on Figure 2.3. the left one is failure warning current setting and the right one is configuration protection setting jumper.

#### ● Failure Warning Jumper Setting

G0310 MODBUS to HART Gateway has self-diagnostic function. Once failure is detected, intelligent instrument

will output warning current automatically. Warning current mode is decided by JP1 Low (in green color) on the left of the board as shown in the figure 2.3. When there's no insertion or insertion of two points underside, it's high-level warning (warning current  $\geq 21.75\text{mA}$ ); When it's the insertion of two points upside, it's low-level warning (warning current  $\leq 3.7\text{mA}$ ).

### ● Configuration Protection Jumper Setting

G0310 MODBUS to HART Gateway provides jumper setting of device configuration protection by JP1 WrD (in red color) as shown in the Figure 2.3. When it's the insertion of two points upside, it's configuration protection. At this moment no change of device configuration is allowed. It is allowed when there's no insertion or insertion of two points underside.

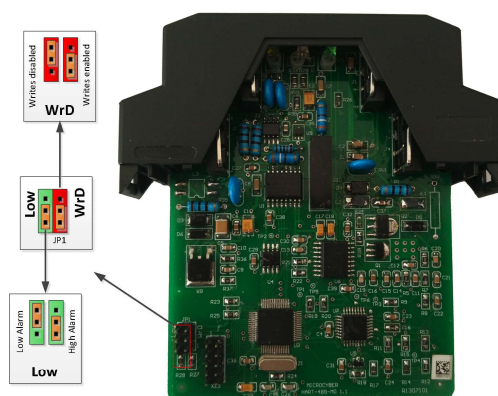


Figure 2.3 G0310 MODBUS to HART gateway jumper

### ● Saturation fixed output (manufacturer setting, no configuration)

When HART intelligent instrument is running, it will compare PV and range upper and lower limiting value constantly. When PV exceeds the limit, instrument will output fixed current. When PV is higher than upper limit, it output 20.8mA; When PV is lower than upper limit, it output 3.8mA.

## 2.3 Internal load resistance

Terminal 13 and 14 connects  $250\ \Omega$  Internal load resistance, which has no connection with internal circuit. User can use Internal load resistance to replace resistance in Figure 2.2. Then HART Modem can connect on terminal 13 and 14.

## 2.4 Recalibration

Users can make a recalibration on G0310 Modbus to HART gateway at test room or installation site before it was put into application. The operation process is shown as in the Figure 2.4.

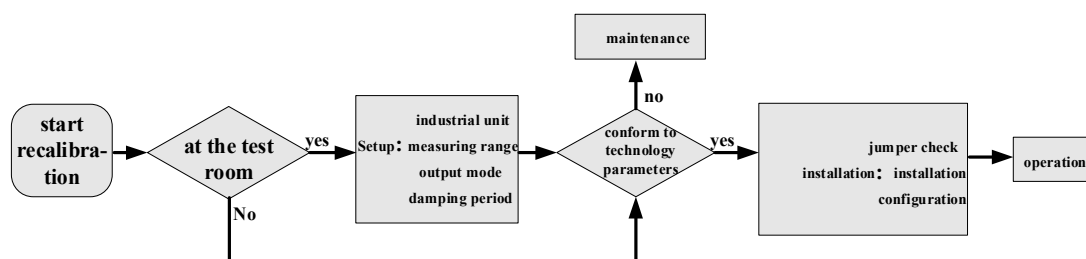


Figure 2.4 recalibration process map

G0310 Modbus to Hart gateway is mainly about functional verification. Please refer to the relevant chapters



below for specific verification.

## Chapter 3 Working Principle

G0310 MODBUS to HART Gateway supports 4 dynamic variables, 6 device variables. Via MODBUS register, the data selected by MODBUS device is configured to device variables of G0310 MODBUS to HART Gateway, and then, it enters the mapping from device variable to dynamic variable, as the device output, supporting 4~20mA analog signal output. G0310 MODBUS to HART Gateway functional block diagram is shown as Figure 3.1:

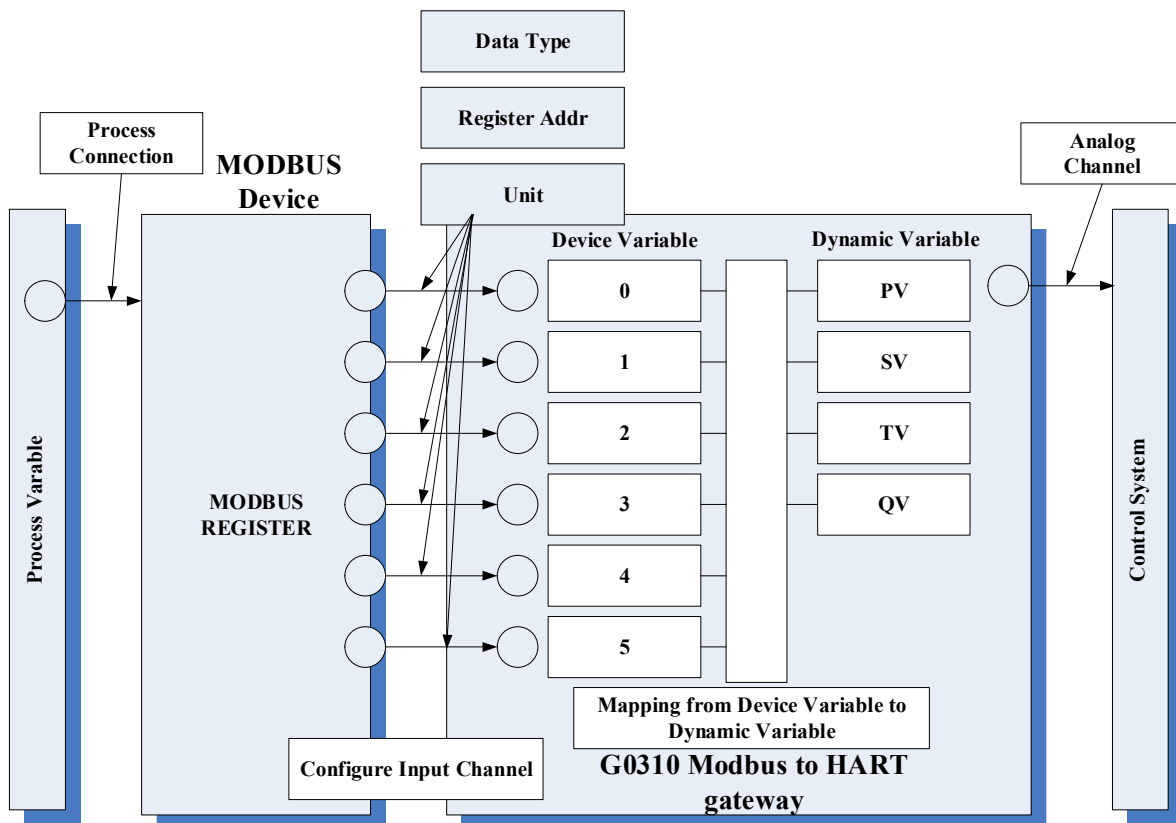


Figure 3.1 G0310 MODBUS to HART Gateway functional block diagram

# Chapter 4 Menu Tree

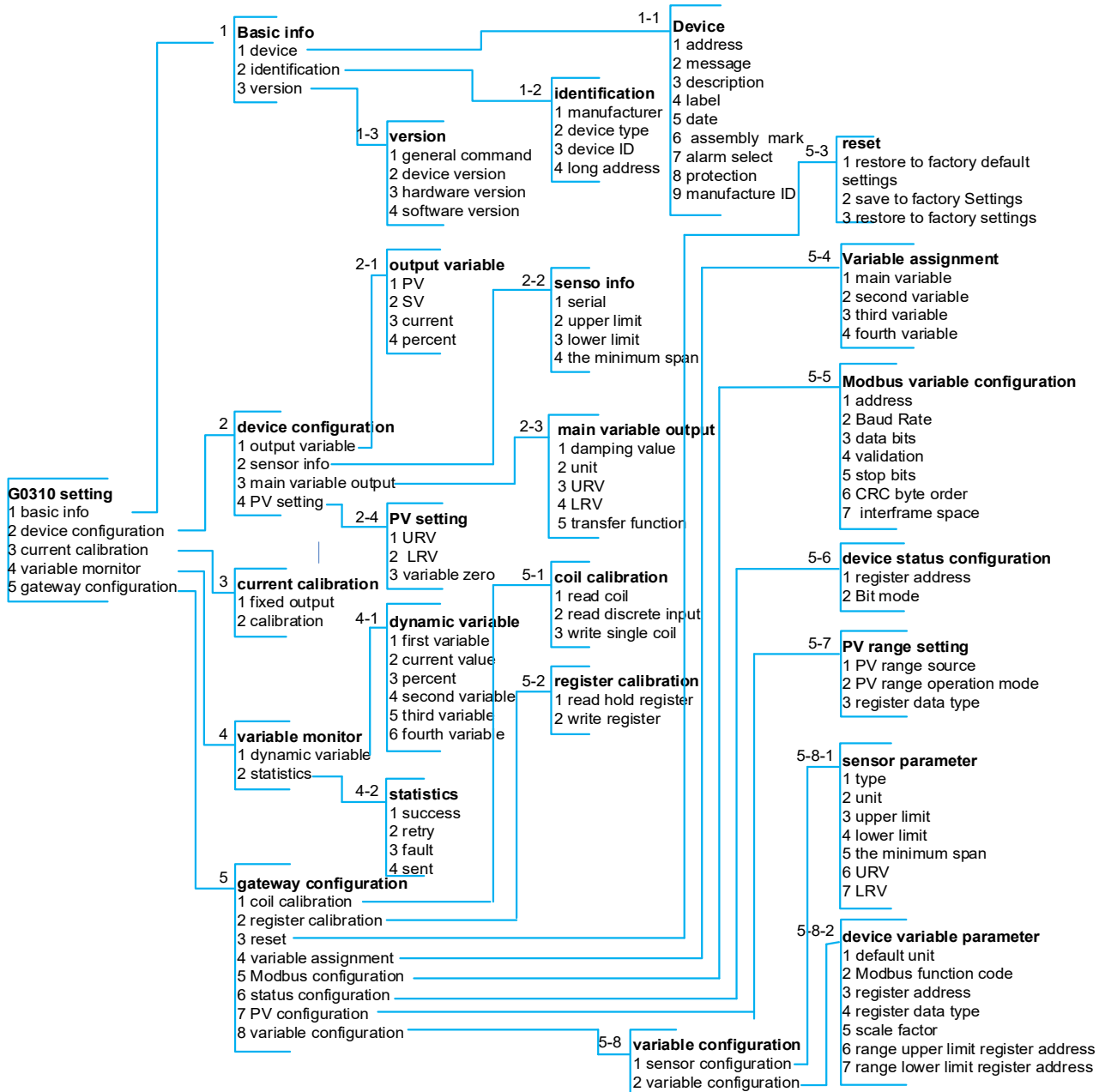


Figure 4.1 menu tree

## Chapter 5 Transmitter Configuration

### 5.1 Topological Connection

The connection mode of HART transmitters can be divided into point-to-point connection and multi-point connection.

- **point to point connection**

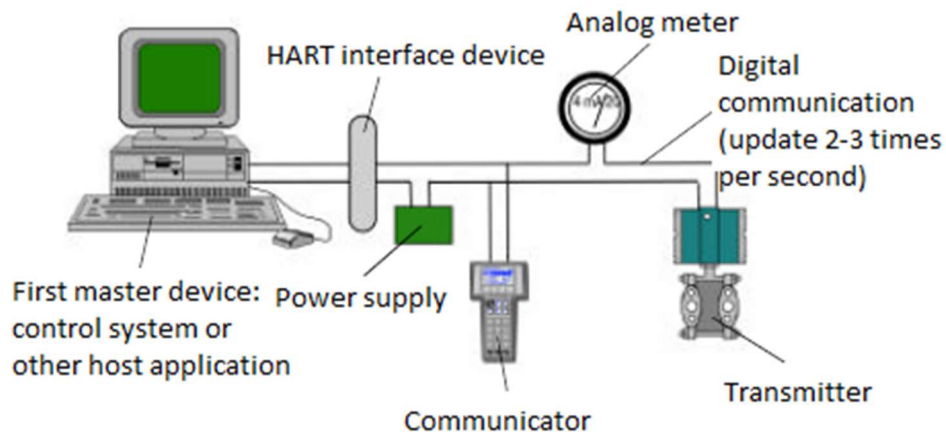


Figure 5.1 HART Point-to-point connection

Features:

- 1) It can be connected to the upper control system through the AI input module or HART communication device;
- 2) Mixing of analog and digital communications;
- 3) Device address is 0.

- **multi-point connection**

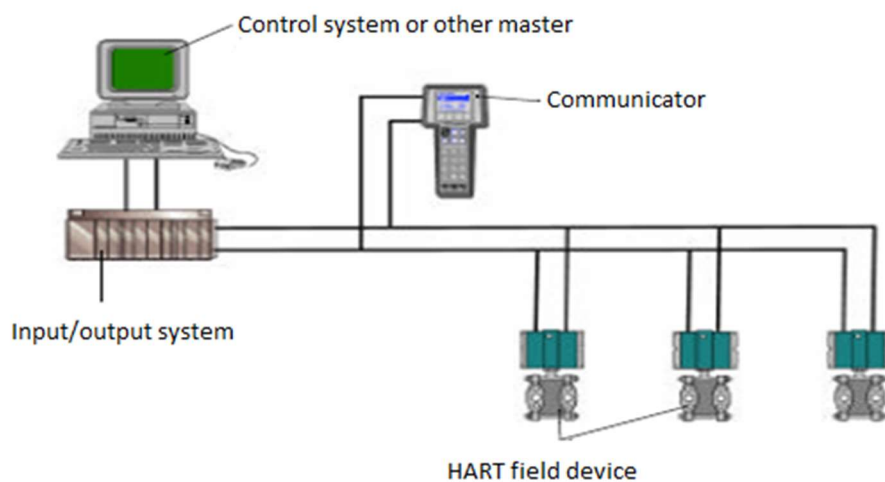


Figure 5.2 HART Multi-to-point connection

Features:

- 1) Connected to the upper control system through HART communication device;

- 2) Use HART system's digital capabilities only, the current is fixed at 4mA;
- 3) Support up to 15 devices in short address format.

## 5.2 Configuration tool

### 5.2.1 Installation and activation

The PC software of G0310 is design and development by Microcybe, the installation method is shown as follow:

1. First double-click to install the setup as shown in the Figure 5.3:



Figure 5.3 setup

2. Click “next” to the installation page as shown in the Figure 5.4:



Figure 5.4 installation

3. Select installation path and click “Install” as shown in the Figure 5.5:

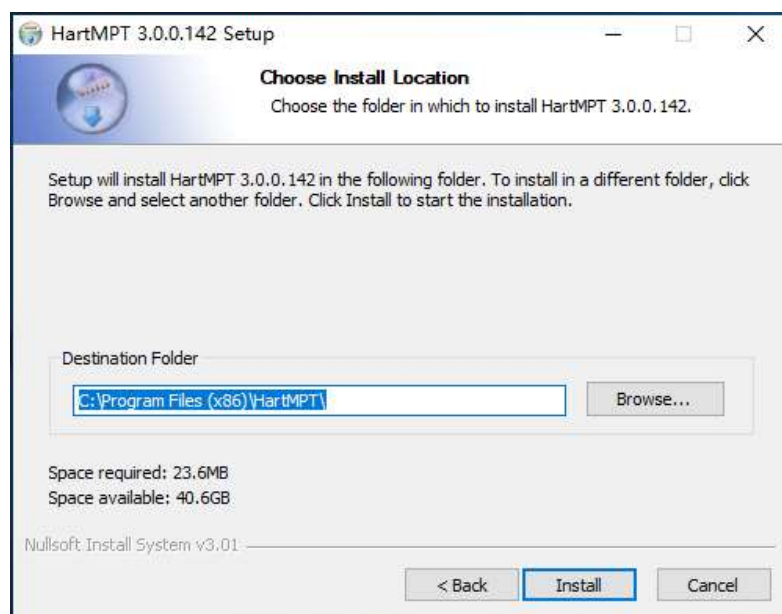


Figure 5.5 installation

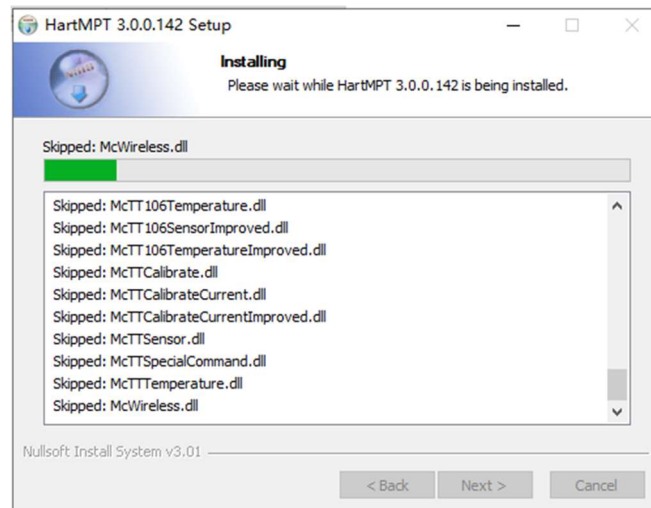


Figure 5.6 installation

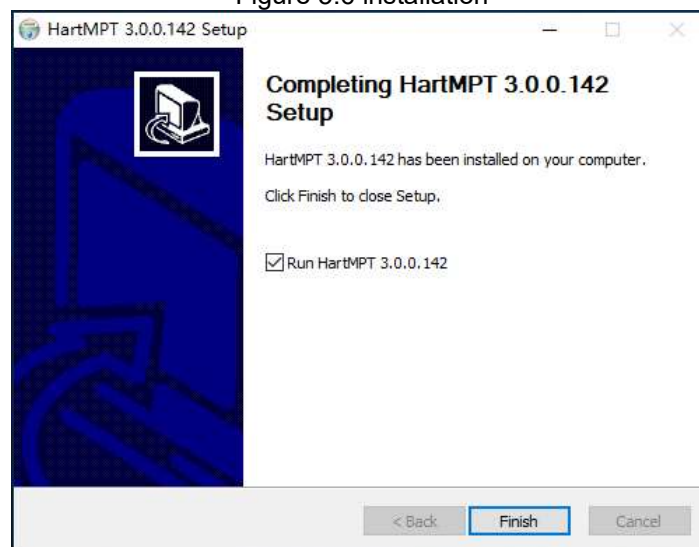


Figure 5.7 installed

The HARTMPT icon will appear on the desktop after the installation is complete as shown in the Figure5.8:



Figure 5.8 PC software

After the installation is complete, it goes directly to the system as shown in the Figure 5.9:

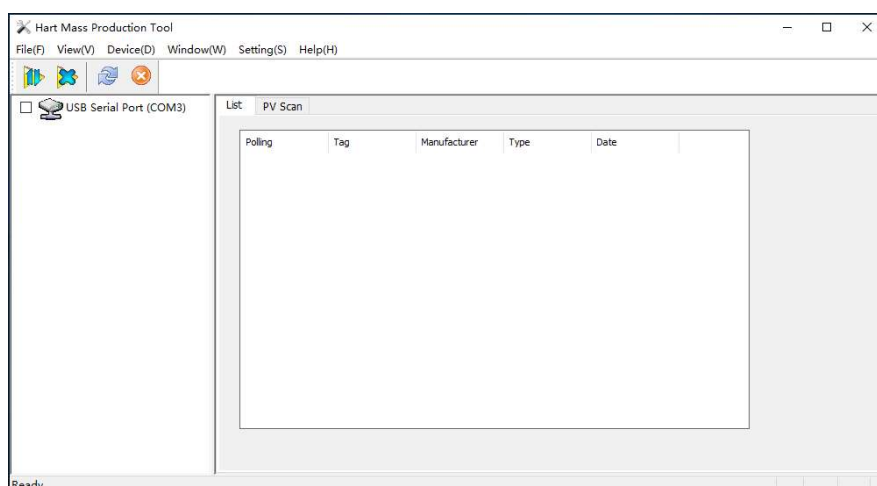


Figure 5.9 system interface

### 5.2.2 Introduction of main page features

The configuration tool can be started by executing the shortcut of this software on the desktop or in the start menu. After the configuration tool is started, the interface and the main windows are shown in Figure 5.10. 错误!未找到引用源。

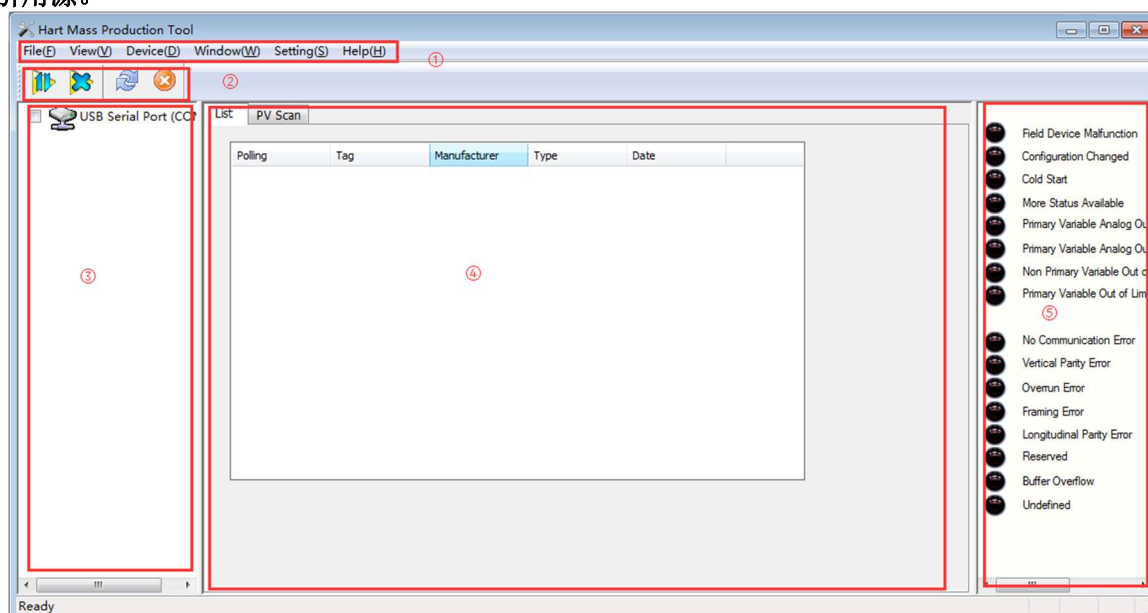


Figure 5.10 Main interface

|   |              |   |              |
|---|--------------|---|--------------|
| 1 | Menu Bar     | 2 | Toolbar      |
| 3 | Network view | 4 | Tabular View |
| 5 | Alarm window | 6 | Status bar   |

The following outlines the functions of each part.

#### i. Menu Bar

##### ● File (F)

The user executes the menu "File" → "exit" or clicks the close button in the upper right corner of the window to exit the configuration tool.

Execute the menu "File" → "exit" or click the close button in the upper right corner of the window to exit the configuration tool.

##### ● View (V)

Users can manually refresh or stop refreshing the current tab page by viewing the “refresh” and “stop” features in the menu.

View menus also feature display and hide alarm windows and send commands.

- **Device (D)**

By "on-line ", " stop on-line ", you can search any online devices in the network. To use this feature, cancel "Display Online Only ".

"Display only online" feature, can be configured in the network view, whether to display the device not online. The default is to display only online devices.

- **View (V)**

You can set whether to hide the toolbar and status bar.

- **Setting (S)**

Execution menu "Settings"→“language” configurable configuration tool language, currently support Chinese, English.

Execute menu "set"→ “serial port parameters " set the communication port. Default communication port is serial port 1(COM1).

- **Help (H)**

set the communication port. Default communication port is serial port 1(COM1).

## ii. Tool Bar

错误!未找到引用源。As shown in Figure 5.10, the toolbar contains four functions: searching online devices, stopping searching devices, refreshing, and stopping refreshing.

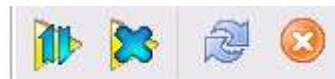


Figure 5.11 toolbar

"search online device", "stop search device" function, are like "on line", "stop on line", details are shown in i device (D). **Device (D)**

“Refresh” function is to refresh the current tab page manually.

“Stop Refresh” function is to stop the action being refreshed.

## iii. Network view

the network view contains a list of networks and devices.

错误!未找到引用源。The serial port node in the network view COM1, represent the configuration tool connected to the HART network through the COM1 serial port.

In the menu bar, click “device”→“only online devices”, to cancel “only online devices”. At this point, the network will display 16 unconnected devices, arranged in polling address order. 错误!未找到引用源。

The unlisted device icon is gray, the online device icon is yellow, and the device icon will flicker in search.



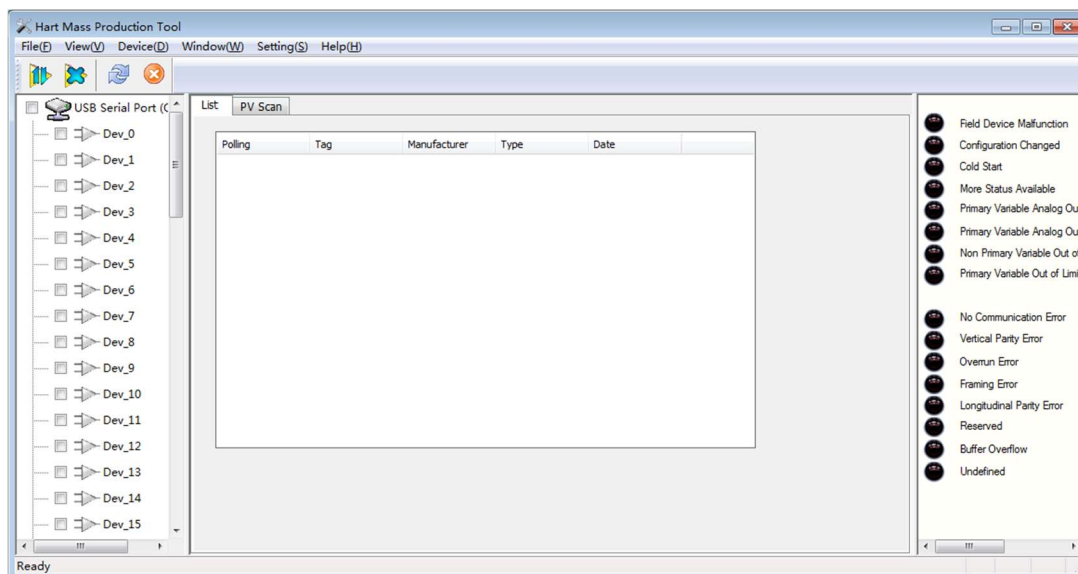


Figure 5.12 16offline devices

#### iv. Tabular View

Different tabs appear depending on the nodes selected by the network view.

When the serial port node is selected, the device list and the main variable scan tab are displayed.

When any device node is selected, the relevant tabs of the device are displayed, such as basic information, configuration information, sensor configuration, current calibration, and special commands.

#### v. Alarm window

Users can view some special states of the current device through this window. The alarm window only corresponds to the last correctly accessed device.

#### vi. Status bar

Displays the status of the current operation according to the operation.

### 5.3 Basic operations

#### i. Set up serial port

When starting, the default communication port is serial port 1. If the user's serial line is not connected to serial port 1 or serial port 1 is occupied or damaged, the serial port needs to be reset.

After startup, if the user does not operate, the configuration tool will not automatically send any commands to the serial port.

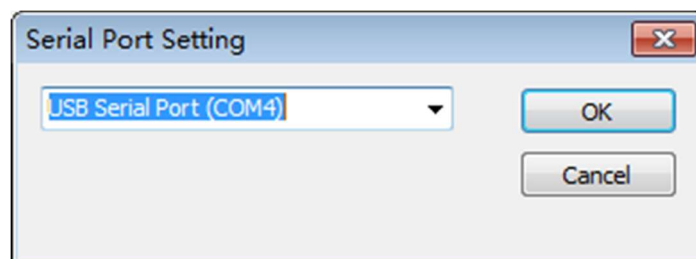


Figure 5.13 serial port setting

错误!未找到引用源。 Set the serial port dialog box as shown in Figure 5.13. The list can list the serial port available on the current computer. After the user selects the target serial port, press OK button to set up, set up success or failure have prompt information. Press the Cancel button to exit the window.

If the serial port setting fails, select again. Serial port setting failure, can not carry out communication operation.

## ii. Device Scan

Configuration tools only support user access to online devices, so you need to query which devices are currently online. Query methods can be divided into three categories:

- (1) Single node search: according to the polling address of the target device, find whether the specified device is online;
- (2) Full search: search for all devices with polling addresses 0 to 15.
- (3) Custom search: search for the specified device address.

If the device is online, the device list tab in the network view and tab view lists the brief information of the device.

### Methods of single node search:

Click on the right mouse button on the serial node of the network view and select a "single node "→a "node" (for example: node 0).



Figure 5.14 Right-click convenient search menu

### Full search:

Click the right mouse button on the serial node of the network view and select "Full Search " (e.g. COM1)

### Custom search methods:

Since in the network view, only online devices are displayed by default, the search can not be customized. To use a custom search, cancel only the online device.

In the menu bar, click "device"→ "only online device". cancel only online features.

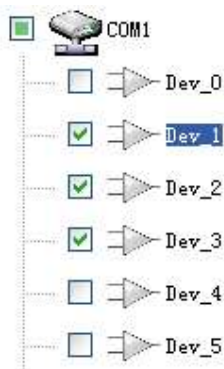


Figure 5.15 device selection

At the moment, the network view will display 16 devices with addresses (gray icons). After selecting the device



that needs to be searched, click search online device , or click menu bar "device "→"online ".



During the search process, you can click stop search device (or menu bar "device"→"stop online") to abort the current search.

The device on line is a yellow icon to distinguish the gray icon without the online address. Online device naming: the device label +@+ the device polling address.

### iii. Send command

Click “view”→“send command” on the menu bar to view send commands and call out the send command window, as shown in Figure 5.16.错误!未找到引用源。

By this function, users can send all supported HART general commands, general behavior commands, special commands.

The data to be sent must be hexadecimal.

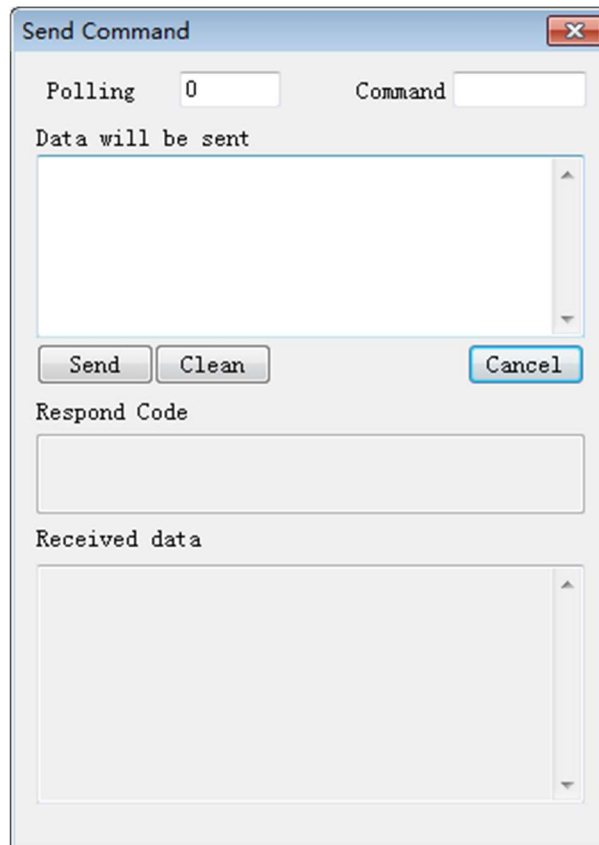


Figure 5.16 send command

Sending commands requires understanding the frame format of each command, so it is only applicable to senior users and R & D personnel.

### iv. Multilingual support

The configuration tool will select the appropriate language package according to the language settings of the current operating system at the first start, so that the user will not have a language barrier. If the user wants to use other languages, you can select the supported language in the language in Settings, as shown in Figure 5.17.

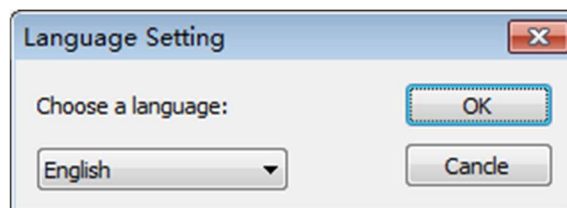


Figure 5.17 Language settings

## 5.4 Device operation

### i. list of device

The device list tab displays summary information for all searched online devices. for example: polling address, device label, vendor, device type, ex-factory date, etc.

Method 1 to enter the Device List tab:

After searching the online device, the default recovery displays the device list tab.

Method 2 to enter the Device List tab:

- (1) Click on the left mouse button in the network view serial node (for example: COM1), the right tab view shows the serial port connected to the network of all online device related tab information.
- (2) Click on the "device list" in the right tab view, and if the information is obtained successfully, the summary information of all searched online devices is displayed, as shown in Figure 5.18.错误!未找到引用源。

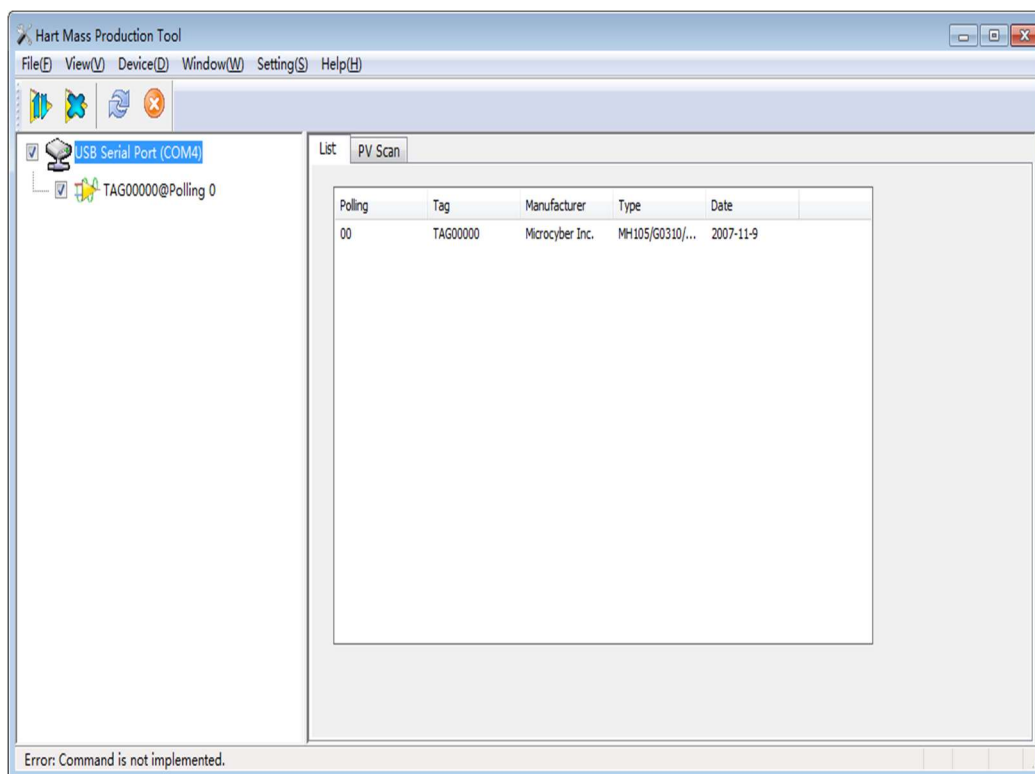


Figure 5.18 Device List tab

### ii. Main variable monitoring

It shows the trend curve for all online device main variables. Transverse time axis, longitudinal numerical axis, can be adjusted.

Method to enter the main variable scan tab:

- (1) Click on the left mouse button in the network view serial node (for example: COM1), the right tab view shows the serial port connected to the network of all online device related tab information.
- (2) Click "main variable Monitoring" in the right tab view, as shown in Figure 5.19.错误!未找到引用源。

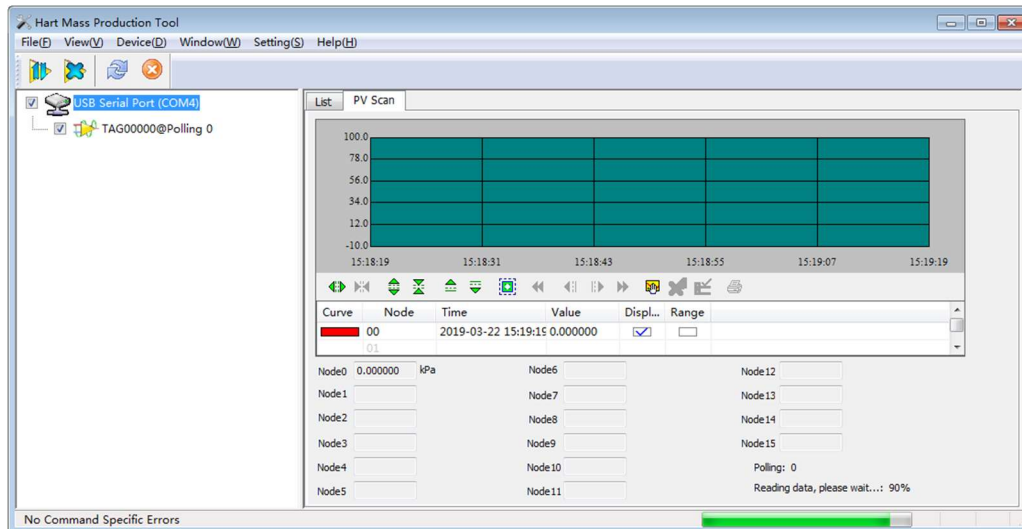


Figure 5.19 Main variable monitoring tab

### iii. Basic Info

Users can obtain and configure basic information about online devices.

Method to access the Basic Information tab:

- (1) The left mouse button clicks on an online device in the network view, and the right tab view displays the tabs associated with the device.
- (2) Click "basic information" in the right tab view, and if the information is obtained successfully, the basic information of the device is displayed, as shown in Figure 5.20.

Figure 5.20 Basic information tab

The basic information tab contains the following table:

| Functional description | Whether to modify | Remarks                                                             |
|------------------------|-------------------|---------------------------------------------------------------------|
| Address                | Yes               | polling address, selection range 0~15                               |
| Message                | Yes               | Up to 32 characters                                                 |
| Description            | Yes               | Up to 16 specified characters                                       |
| Label                  | Yes               | Maximum length of 8 specified characters                            |
| Date                   | Yes               | From 1900 to 2155                                                   |
| Assembly Number        | Yes               | Must be 6 decimal places                                            |
| Alarm selection        | No                | Display hardware alarm selection mode, " high alarm "/" low alarm " |
| Writing protection     | No                | Display hardware write protection options, NO "/" YES"              |
| ID of manufacturers    | No                | Trademark issuer code, hexadecimal                                  |

|                     |    |                                                                      |
|---------------------|----|----------------------------------------------------------------------|
| Manufacturer        | No | Display manufacturer name                                            |
| Type of equipment   | No | Display device type                                                  |
| ID of equipment     | No | Display Equipment ID Number                                          |
| Long address        | No | Display device length address                                        |
| Version information | No | Display version information such as software, hardware versions, etc |

As shown in the above table, the first six device information is modifiable information.

After the information is modified, you can click the "apply" button to download the information to the device. If the download fails, the device information will restore the content that was correctly configured last time. If you give up the modification, do not click "apply", click refresh, it will display the last correctly configured content.

If the address or label is downloaded successfully, the name of the device node in the left network view will change.

#### iv. Configuration Information

Users can obtain and configure the configuration information of online devices.

Method to access the Configuration Information tab:

- (1) The left mouse button clicks on an online device in the network view, and the right tab view displays the tabs associated with the device.
- (2) Click "configuration information" in the right tab view, and if the information is obtained successfully, the configuration information of the device is displayed, as shown in Figure 5.21.错误!未找到引用源。

Figure 5.21 Configuration Information tab

The configuration information tab contains the following table:

| Functional description | Whether to modify | Remarks                                                          |
|------------------------|-------------------|------------------------------------------------------------------|
| PV                     | No                | The first variable, the principal variable, is fixed to pressure |
| SV                     | No                | Second variable, fixed to temperature                            |
| Current value          | No                | Show PV value corresponds to the current value at 4~20 mA        |
| Percentage             | No                | Display PV value as a percentage of current range                |
| Damping value          | Yes               | Choose from 0~32 in seconds                                      |
| Unit                   | Yes               | Displays units of PV value                                       |
| Range limit            | Yes               | Maximum range display PV values                                  |
| Range                  | Yes               | Display the lower limit of range for PV values                   |
| Transfer               | Yes               | Analog current output mode supports linear                       |

|               |     |                                               |
|---------------|-----|-----------------------------------------------|
| function      |     | and square root output                        |
| Serial number | Yes | Sensor serial number, writable                |
| Upper limit   | No  | Upper limit of sensor measurement range       |
| Lower limit   | No  | Lower limit of sensor measurement range       |
| Minimum span  | No  | The sensor allows the minimum range to be set |

Configuration information mainly includes three parts: output variable, PV setting and range calibration.

**The output variables** mainly show the first variable (PV), the second variable (SV), and the current value, percentage. where the first variable can display the temperature value, the resistance value, and the millivolt signal; the second variable represents the cold end temperature. All four variables are read-only.

**PV setting** mainly displays the PV value type, damping value, unit, range upper and lower limits, as well as the passive or active setting function to the range upper and lower limits, and uses the current value to set the main variable zeropoint function. PV setting the relevant 5 configuration information (PV value type, damping value, unit, range upper and lower limits) is modified, the information can be downloaded to the device by clicking the "apply".

#### **Upper and lower limits of passive range:**

Manually modify the value of the upper or lower range limit and press the Application button to download the information to the device.

#### **Set range upper and lower limits with current values:**

"Range Upper Limit": Set the current PV value of the device to the upper limit of the main variable range.

"Range Limit": Set the current PV value of the device to the lower limit of the main variable range, which may change the upper limit at the same time.

#### **Set the main variable zero with the current value:**

"Primary variable zero": At zero temperature, the current PV value of the device is taken as the primary variable zero.

**Range calibration** is the calibration of range migration. It is necessary to measure zero and full range values and download the data to the device.

The operation is as follows:

- (1) Select the appropriate calibration point (range limit or range upper limit);
- (2) Gets the current value (zero or full range);
- (3) Click the Fix button;

#### **v. Current calibration**

Users can calibrate 4~20 mA of current and configure fixed current output through the current calibration tab.

Method to enter the current calibration tab:

- (1) Left-clicks on an online device in the network view, and the right tab view displays the tabs associated with the device.
- (2) Click on "current Calibration" in the right tab view, and if the information is obtained successfully, the current calibration function is displayed, as shown in Figure 5.22.错误!未找到引用源。

Figure 5.22 Current calibration tab

**The current calibration steps are as follows:**

- (1) Connection circuit, need to be connected to the device output circuit in series with more than five and a half precision ammeter;
- (2) Set the device's polling address to 0, refer to basic information configuration, if the polling address is 0, skip this step;
- (3) Enter the current calibration tab;
- (4) Select "current value" as 4mA, after the ammeter is stable, enter ammeter reading in "adjust value" text box, click "apply";
- (5) Select "current value" as 20mA, after the ammeter is stable, enter ammeter reading in "adjust value" text box, click "apply";
- (6) Select "current value" as blank so that the output current of the device is calculated according to the PV value.

**Configure fixed current output:**

The user can configure the fixed current output in the current calibration tab, enter the output fixed current value in the "fixed current value", and click "enter/exit fixed current mode" to enter or exit fixed current output mode. The title of the button alternately displays "enter fixed current mode" and "exit fixed current mode" to prompt the user to operate.

**Notes:**

The calibration current and fixed current output function can only be processed when the polling address of the device is 0, and the other polling addresses are in full digital communication mode, which will prompt the error message "command execution failure".

**vi. Variable monitoring**

The primary function of the variable monitoring tab is to regularly refresh all the dynamic variables of the selected device and display the trend curve of the current device main variable. the variables currently refreshed are: PV



value, current value, percentage and SV value, respectively.

Method to go to the refresh device tab:

- (1) Left-click on an online device in the network view, and the right tab view displays the tabs associated with the device.
- (2) Click “variable Monitoring” in the right tab view, as shown in Figure 5.23.错误!未找到引用源。

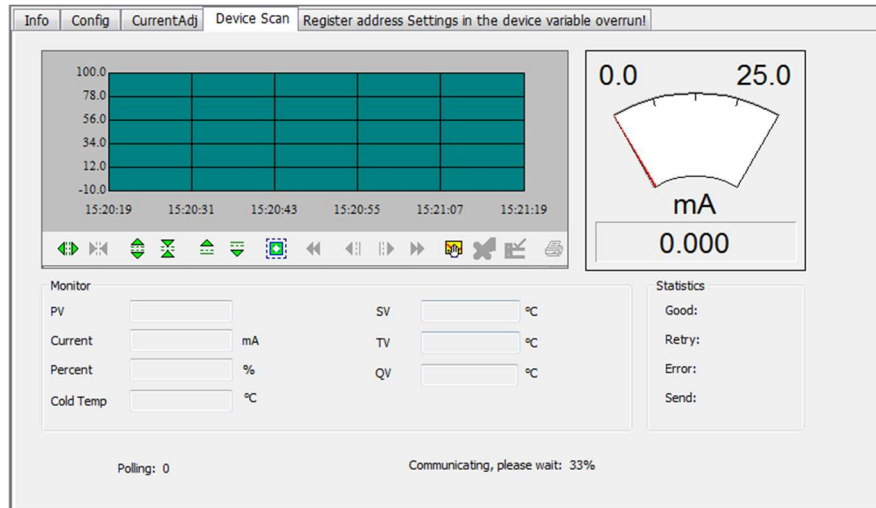


Figure 5.23 Variable Monitoring tab

## 5.5 Gateway Parameter Setting

### 5.5.1 Mode selection

- (1) Left-click on an online device in the network view, and the right tab view displays the tabs associated with the device.
- (2) Click on the "gateway configuration" in the right tab view. The first click to run this page requires reading device information. The reading time is about 1 minute. After obtaining the information successfully, the gateway configuration function is displayed, as shown in Figure 5.24.错误!未找到引用源。

Figure 5.24 Gateway Configuration

- (3) Then find the "detailed settings"->"operation mode", there are two operation modes, one is "configuration mode" and the other is "operation mode". "Configuration mode" can set all the screen option, "operation mode" can only set the "factory reset".
- (4) For example, select "configuration mode", as shown in Figure 5.25.错误!未找到引用源。

Figure 5.25 Operating Mode Settings

### 5.5.2 Coil calibration

Coil read and write, the user can choose "calibration "->" coil", and make the coil input read and write operation.

Example: Read the coil

- Click the "Calibration "->" Coil "->" Read Coil" and pop up the "Read Coil" window, as shown in Figure 5.26: 错误!未找到引用源。

Figure 5.26 Read coil input

- Input register address and length value, please note that the range of register address is from 1~65536, the range of length is 1~16.

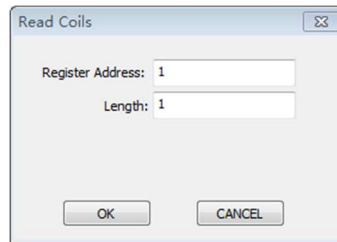


Figure 5.27 Read coil value input

- Then click the "OK" and the system prompts "read coil successfully".



Figure 5.28 read coil success prompt

### 5.5.3 Register Calibration

Register read and write, the user can select "calibration "->" register" box, read and write separate registers.

Example: Read the value of a register

- Click the "Calibration "->" Register "->" read hold register" to pop up the "register" window, as shown in Figure 5.29:错误!未找到引用源。

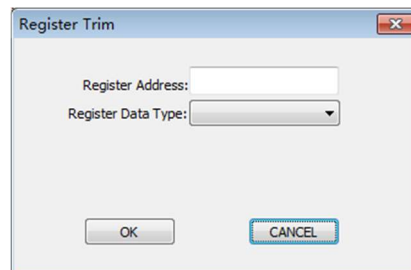


Figure 5.29 Read register input

- Enter register address and register data type, please note that the range of register address is from 1~65536.

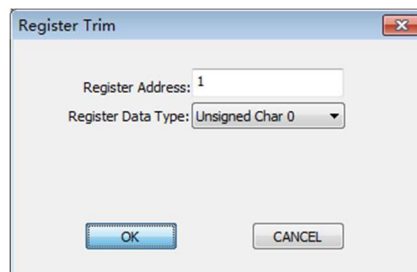


Figure 5.30 Read register value input

- Click "ok" and the system prompts "read hold register success".

### 5.5.4 Factory reset setting

#### 5.5.4.1 Reset to Factory Default

- Click the "Calibration "->" restore factory settings "->" restore to factory default settings", pop up "restore

factory settings" window, as shown in Figure 5.31:错误!未找到引用源。

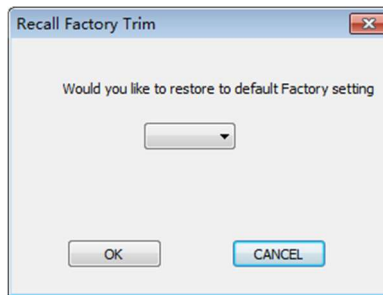


Figure 5.31 Restore to factory default settings

2. After selecting "Yes" in the drop-down box, click OK.

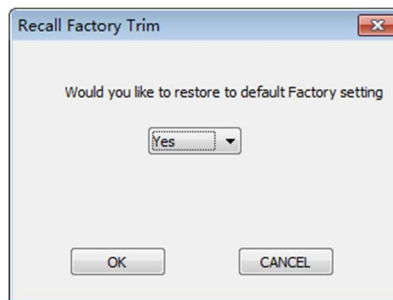


Figure 5.32 Restore to factory default settings selection

3. The system prompts "set up successfully ", then clicks OK to complete the operation.

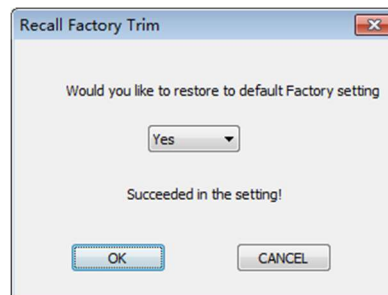


Figure 5.33 Returns to factory default settings prompt

#### 5.5.4.2 Save to factory settings

1. Click the "Calibration"->"restore factory settings"->"save to factory settings", pop up "save factory settings" window, as shown in Figure 5.34:错误!未找到引用源。

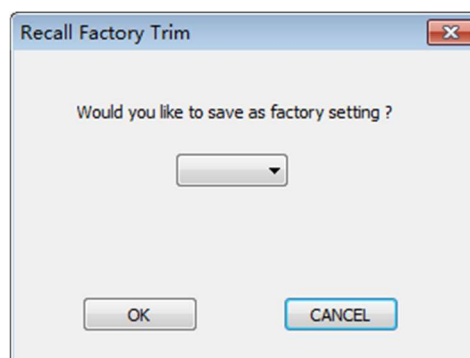


Figure 5.34 Save to factory settings

2. After selecting Yes in the drop-down box, click OK.

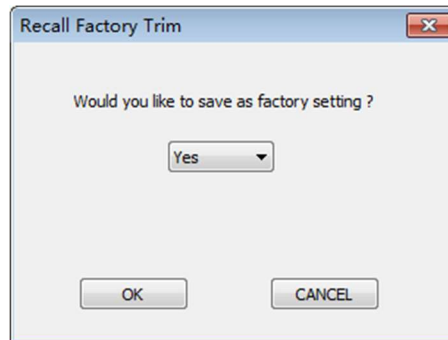


Figure 5.35 Save to factory settings selection

3. The system prompts "set up successfully", then clicks OK to complete the operation.

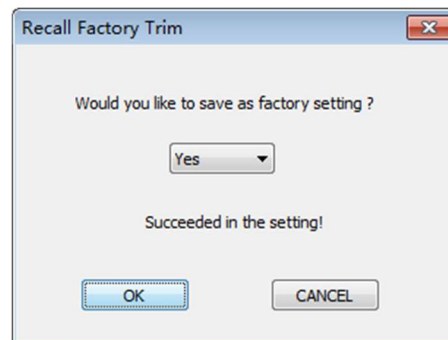


Figure 5.36 Save to factory settings prompt

#### 5.5.4.3 Reset to factory settings

1. Click the "Calibration"->"restore factory settings"->"restore to factory settings", pop up "restore to factory settings" window, as shown in Figure 5.37:错误!未找到引用源。

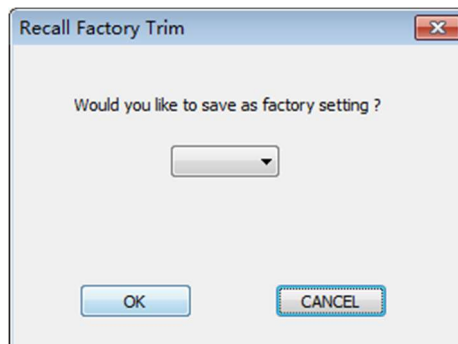


Figure 5.37 Reset to factory settings prompt

2. After selecting Yes in the drop-down box, click OK.

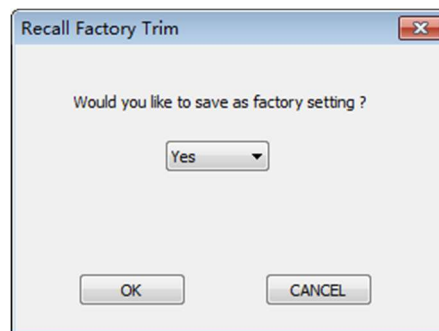


Figure 5.38 Return to factory setup selection

3. The system prompts "set up successfully", then clicks OK to complete the operation.

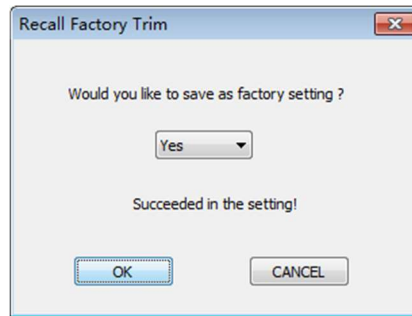


Figure 5.39 Reset to factory settings prompt

#### 5.5.4.4 Device variable assignment

Setting dynamic variable parameter assignment is to set the mapping relationship between device variable and dynamic variable. There are 6 device variables in the device, which can be mapped to 4 dynamic variables according to demand.

For example: map the main variable to device variable 4.

1. Select the "detailed design"-"device variable assignment"-"device variable assignment" corresponding to the "main variable" drop-down box, as shown in Figure 5.40:错误!未找到引用源。

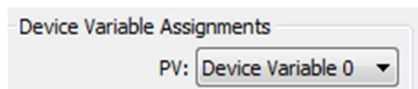


Figure 5.40 Selection of device variables

2. In the dialog box, select Device Variable 4, as shown in Figure 5.41:



Figure 5.41 Modification of device variables

3. Click the "apply" to save the settings. As shown in Figure 5.42

Figure 5.42 Save the device variable value

### 5.5.5 Modbus variable configuration

Modbus communication parameters are configured according to Modbus specific communication parameters.

#### 5.5.5.1 Address

1. locate the "detailed design"->"Modbus variable"-> the input box corresponding to"address", as shown in Figure 5.43 错误!未找到引用源。

Figure 5.43 Modbus Address settings

2. Enter a modified value with an address worth range of 1~255. Then click apply to save the modified value.

#### 5.5.5.2 baud rate

1. Select "detailed Design"->"Modbus variable"-> the drop-down box corresponding to"baud rate", select the value of baud rate, click Set, and click the Send button. baud rate support :1200,2400,4800,9600,19200,35700,38400,57600.

Figure 5.44 Modbus baud rate selection

2. Select the value that needs to be modified, then click apply to save the modified value.

### 5.5.5.3 Data bits

1. Select "Detailed Design"-"Modbus variable"-"> the drop-down box corresponding to" data bit", select the supported data bit number of 7 or 8 bits, as shown in Figure 5.45

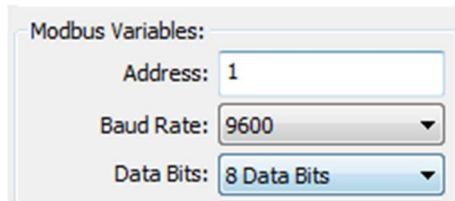


Figure 5.45 Modbus Data Bit Selection

2. Select the value that needs to be modified, then click the apply button to save the modified value.

### 5.5.5.4 Calibration

1. Select "detailed Design"-"Modbus variable"-"calibrate" corresponding to the drop-down box, support: odd check, even check, and no check, as shown in Figure 5.46

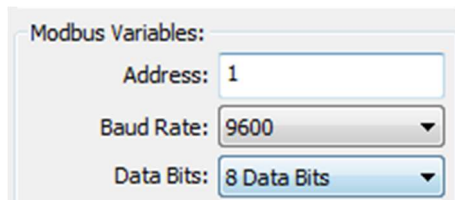


Figure 5.46 Modbus Selection of calibration values

2. Select the value that needs to be modified, then click the apply button to save the modified value.

### 5.5.5.5 Stop Bits

1. Select "Detailed Design"-"Modbus variable"-"> the drop-down box corresponding to" stop bit", the stop bit can be selected as: 1 bit stop bit and 2 bit stop bit, as shown in Figure 5.47

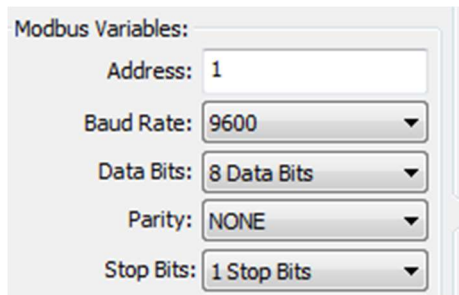


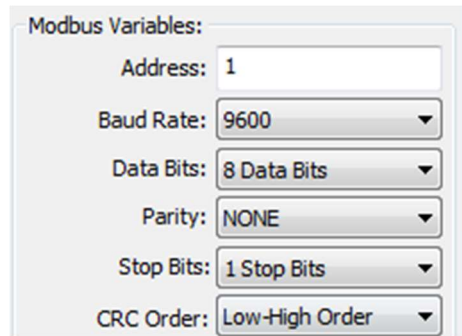
Figure 5.47 Modbus Stop Bit Selection

2. Select the value that needs to be modified, then click apply to save the modified value.

### 5.5.5.6 CRC byte order

1. Select "detailed Design"-"Modbus variable"-"> the drop-down box corresponding to"CRC byte order", the check includes: Low-high and High-low, as shown in Figure 5.48





Modbus Variables:

Address: 1

Baud Rate: 9600

Data Bits: 8 Data Bits

Parity: NONE

Stop Bits: 1 Stop Bits

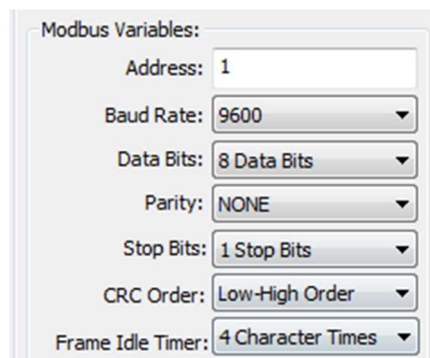
CRC Order: Low-High Order

Figure 5.48 Modbus CRC byte order selection

2. Select the value that needs to be modified, then click the apply to save the modified value.

#### 5.5.5.7 Time frame interval

1. Select "Detailed Design"-"Modbus variable"-> the drop-down box corresponding to"frame interval time", the interval time range is 4~10, as shown in Figure 5.49



Modbus Variables:

Address: 1

Baud Rate: 9600

Data Bits: 8 Data Bits

Parity: NONE

Stop Bits: 1 Stop Bits

CRC Order: Low-High Order

Frame Idle Timer: 4 Character Times

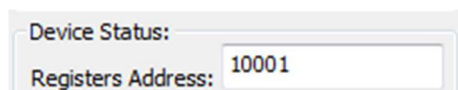
Figure 5.49 Modbus Number of frame intervals selected

2. Select the value that needs to be modified, then click apply to save the modified value.

#### 5.5.6 Device Status Configuration

##### 5.5.6.1 Register address

1. locate the "detailed design"-"device status"-> the input box corresponding to the"register address", the range of the register address is 1~65536, as shown in Figure 5.50



Device Status:

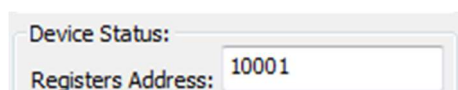
Registers Address: 10001

Figure 5.50 Register Address Selection

2. Enter the value you need to modify, then click apply to save the modified value.

##### 5.5.6.2 Bit mode

1. Select "Detailed Design"-"device status"-> the drop-down box corresponding to"Bit mode", the Bit mode range is 1~16, as shown in Figure 5.51



Device Status:

Registers Address: 10001

Figure 5.51 Bit Mode selection

2. Select the value that needs to be modified, then click apply to save the modified value.

#### 5.5.7 PV Range Setting

##### 5.5.7.1 PV Range Source

"PV Range Source" indicates if it's from local.

1. Select "detailed Design"->"PV range"-in the drop-down box corresponding to"Pv range source", which includes local and remote sources, as shown in Figure 5.52

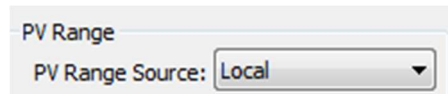


Figure 5.52 PV Range Source Selection

2. Select the value that needs to be modified, then click apply to save the modified value.

#### 5.5.7.2 PV range operation mode

If "PV Range Source" is from MODBUS device, "PV range option" indicates if range supports write operation.

1. Select "detailed Design"->"PV range" in the drop-down box corresponding to"Pv range operating mode", which includes read-only and read-write, as shown in Figure 5.53

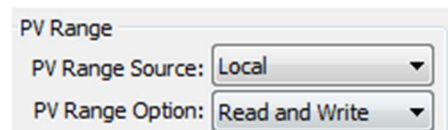


Figure 5.53 PV range mode selection

2. Select the value that needs to be modified, then click apply to save the modified value.

#### 5.5.7.3 Register data type

Select "detailed Design"->"PV range"-> the drop-down box corresponding to"register data type", the mode includes read-only and read-write, as shown below:

1. Select "Detailed Design"->"PV range"-> the drop-down box corresponding to"register data type", as shown in Figure 5.54

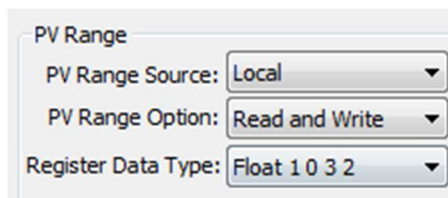


Figure 5.54 Selection of register data type

2. Select the value that needs to be modified, then click apply to save the modified value.

#### 5.5.8 Device Variable

There are 6 default device variables, which are "device variable:0", "Device variable :1", "Device variable:2", "Device variable:3", "Device variable:4", "Device variable:5". When the system is initialized, select "Device variable:0", After changing the device variable in the Detailed Design -> device variable selection box, The system automatically refreshes the corresponding parameters.



Figure 5.55 Selection of Device Variables

When the user changes the parameter value of the device variable and does not click the "apply", the system prompts the user whether to save the modified parameter value and click "Yes" to save the parameter. Click No not to save parameter modification, and finally refresh the selected device variable parameter.

##### 5.5.8.1 Type

1. Select "Detailed Design"->"Sensor"-> drop-down box corresponding to"Type", as shown in Figure 5.56

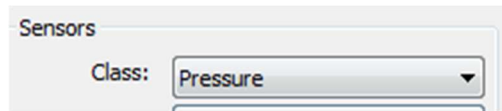


Figure 5.56 Type Selection

2. Select the value that needs to be modified, then click apply to save the modified value.

#### 5.5.8.2 Unit

1. select "Detailed Design"->"Sensor"-> drop-down box corresponding to"Unit", as shown in Figure 5.57



Figure 5.57 Unit selection

2. Select the value that needs to be modified, then click apply to save the modified value.

#### 5.5.8.3 Upper limit of sensor range

1. Select "detailed Design"->"Sensor"-> drop-down box corresponding to"Sensor range limit", as shown in Figure 5.58 错误!未找到引用源。

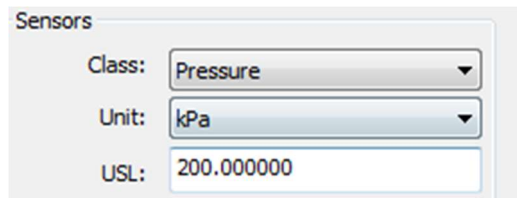


Figure 5.58 Upper Range Selection of Sensor Range

2. Enter the modified value, then click apply to save the modified value.

#### 5.5.8.4 Lower limit of sensor range

1. Select "detailed Design"->"Sensor"-> drop-down box corresponding to"sensor range limit", as shown in Figure 5.59

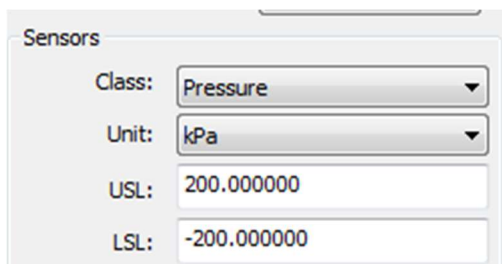
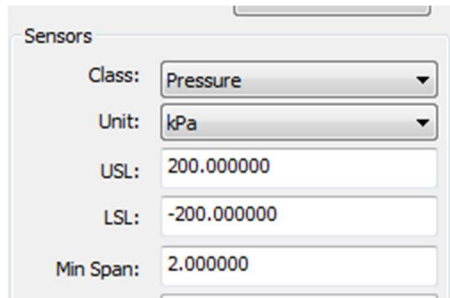


Figure 5.59 Selection of Lower Range Limit of Sensor Range

2. Enter the modified value, then click apply to save the modified value.

#### 5.5.8.5 Minimum span

1. Select "Detailed Design"->"Sensor"-> the drop-down box corresponding to"bottom span", as shown in Figure 5.60



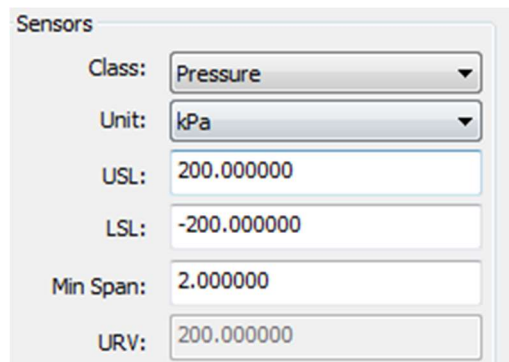
The image shows a 'Sensors' configuration window. It contains several fields: 'Class' is a dropdown menu set to 'Pressure'; 'Unit' is a dropdown menu set to 'kPa'; 'USL' is a text input field with the value '200.000000'; 'LSL' is a text input field with the value '-200.000000'; and 'Min Span' is a text input field with the value '2.000000'.

Figure 5.60 Selection of the minimum span

2. Enter the modified value, then click apply to save the modified value.

#### 5.5.8.6 Range limit

1. Select the "detailed design"-"sensor"-> the drop-down box corresponding to the "range limit", as shown in Figure 5.61



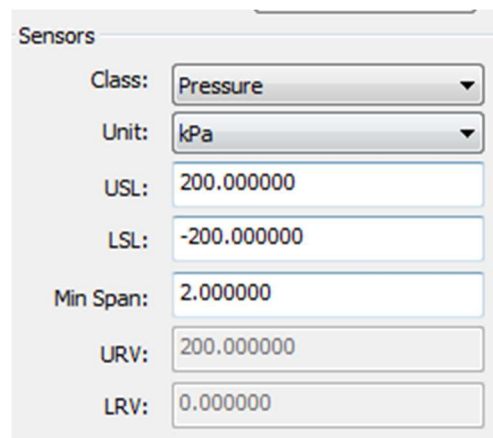
The image shows a 'Sensors' configuration window. It contains several fields: 'Class' is a dropdown menu set to 'Pressure'; 'Unit' is a dropdown menu set to 'kPa'; 'USL' is a text input field with the value '200.000000'; 'LSL' is a text input field with the value '-200.000000'; 'Min Span' is a text input field with the value '2.000000'; and 'URV' is a text input field with the value '200.000000'.

Figure 5.61 Upper Range Selection

2. Enter the modified value, then click apply to save the modified value.

#### 5.5.8.7 Lower range limit

1. Select the "detailed design"-"sensor"-> drop-down box corresponding to the "lower range limit", as shown in Figure 5.62



The image shows a 'Sensors' configuration window. It contains several fields: 'Class' is a dropdown menu set to 'Pressure'; 'Unit' is a dropdown menu set to 'kPa'; 'USL' is a text input field with the value '200.000000'; 'LSL' is a text input field with the value '-200.000000'; 'Min Span' is a text input field with the value '2.000000'; 'URV' is a text input field with the value '200.000000'; and 'LRV' is a text input field with the value '0.000000'.

Figure 5.62 Selection of Lower Range Limit

2. Enter the modified value, then click apply to save the modified value.

#### 5.5.8.8 Default units

1. Select "Detailed Design"-"Sensor"-> the drop-down box corresponding to "default unit".

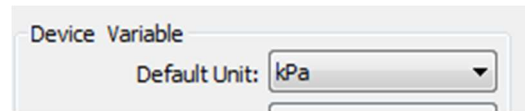


Figure 5.63 Default unit selection

2. Select the value that needs to be modified, then click apply to save the modified value.

#### 5.5.8.9 Modbus functional code

1. Select "Detailed Design"-"Sensor"-> the drop-down box corresponding to "Modbus function Code".

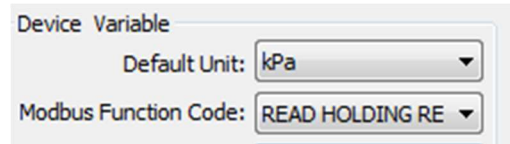


Figure 5.64 Modbus Functional code selection

2. Select the value that needs to be modified, then click the apply button to save the modified value.

#### 5.5.8.10 Register address

1. Select "Detailed Design"-"Sensor"-> drop-down box corresponding to "Register address", as shown in Figure 5.65

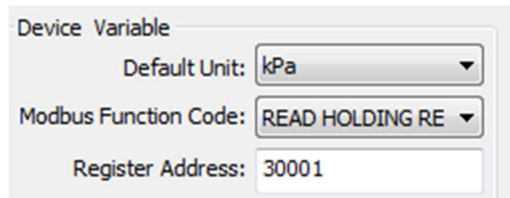


Figure 5.65 Register address selection

2. Enter the modified value, then click the apply button to save the modified value.

#### 5.5.8.11 Register data type

1. Select "Detailed Design"-"Sensor"-> drop-down box corresponding to "Register data Type", as shown in Figure 5.66

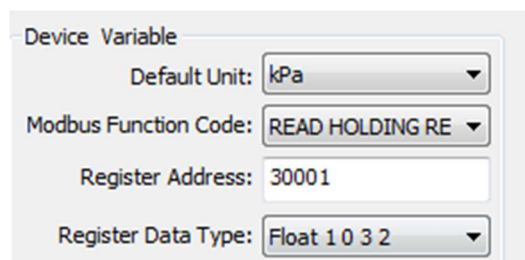


Figure 5.66 Register Data Type Selection

2. Select the value that needs to be modified, then click the apply button to save the modified value.

#### 5.5.8.12 Scaling factor

1. Select "Detailed Design"-"Sensor"-> the drop-down box corresponding to "zoom factor", as shown in Figure 5.67

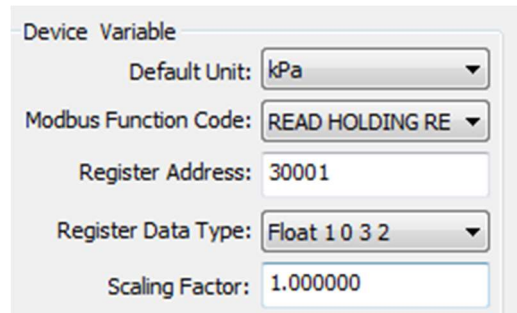


Figure 5.67 Scale Factor Selection

2. Enter the modified value, then click the apply button to save the modified value.

#### 5.5.8.13 Range Upper Limit Register Address

1. Select > drop-down box corresponding to "detailed design"-"sensor"-">"range upper limit register address", as shown in Figure 5.68

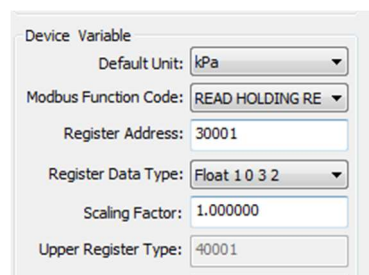


Figure 5.68 Address Selection of Range Upper Limit Register

2. Enter the modified value, then click the apply button to save the modified value.

#### 5.5.8.14 Range Lower limit register address

1. Select the "detailed Design"-"Sensor"-">"drop-down box corresponding to the"range lower limit register address", as shown in Figure 5.69

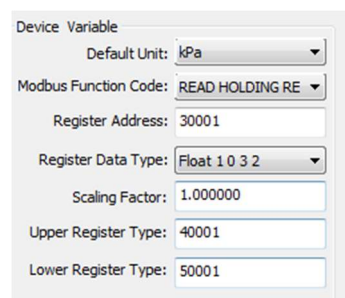


Figure 5.69 Range Lower limit register address selection

2. Enter the modified value, then click the apply button to save the modified value.

## Chapter 6 Quick configuration

- Step 1** set "Operation mode" to "Configuration mode ". See subsection 5.5.1.错误!未找到引用源。
- Step 2** set the "device variable assignment" parameter, set the mapping relationship between the device variable and the dynamic variable, the device has 6 device variables, which can be mapped to 4 dynamic variables according to the requirements. See subsection 错误!未找到引用源。 .错误!未找到引用源。
- Step 3** set the "Modbus communication" parameters: according to the specific communication parameters to configure the Modbus communication parameters. Configuration items include: address, baud rate, data bit, CRC check mode, stop bit, etc. See subsection 错误!未找到引用源。 .5.5.5
- Step 4** set the device status parameter. This step is optional, if there is a device status register in the Modbus device, you can use this step to configure, otherwise you can not configure.The Device Status parameter contains Register Address and Bit Mode, where Register Address indicates the register location of the device status, while Bit Mode indicates which status bits are used, each of which represents a device status, using set 1 and unused set 0. See subsection 5.5.6.5.5.6
- Step 5** Set the "PV range" parameter: Contains "PV range source","PV range operation mode" and "register data type ". The "PV range source" indicates whether the main variable range comes from local, and if it comes from the Modbus device, the "PV range operation mode" indicates whether the range supports write operation, and the "register data type" indicates the type of register data. See subsection 错误!未找到引用源。 .5.5.7
- Step 6** Set Modbus related device variable parameters: including default address, device variable register address, data type device variable scaling factor, range upper and lower limit register address, etc. See subsection 5.5.8.

## Chapter 7 Maintenance

### ● Simple Maintenance

| No. | Phenomena                              | Reason                                                                         | Solution                                                                                                       |
|-----|----------------------------------------|--------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| 1   | Current output is 0                    | a. Power failure<br>b. Wire open circuit                                       | a. Repair the power<br>b. Check the wire                                                                       |
| 2   | Output current beyond limit            | Failure between MODBUS device and circuit                                      | Check MODBUS communication                                                                                     |
| 3   | The current is stable at 4mA.          | Device in multi-point mode                                                     | Modify sub PC address in single PC mode                                                                        |
| 4   | No connection.                         | a. Connection failure<br>b. Multi-point mode                                   | a. Check loop wiring<br>b. Check network                                                                       |
| 5   | 485Power supply 24V<br>Power light off | a. Power failure<br>b. Wire open circuit<br>c. internal failure                | a. Repair the power<br>b. Check the wire<br>c.Contact technical support                                        |
| 6   | HART communication light off           | a. No HART Communication<br>b. Power failure<br>c. Internal failure            | a. Check HART master device and HART Modem<br>b. Check power supply connection<br>c. Contact technical support |
| 7   | 485 communication light off            | a.Slave device no connection<br>b. Slave device failure<br>c. Internal failure | a. Connect slave device correctly<br>b.Check slave device and connection<br>c.Contact technical support        |

- Daily maintenance is only for device cleansing.
- Failure maintenance: Please return to factory if there is failure.



## Chapter 8 Technical Specification

### a) Basic parameter

|                    |                                                    |
|--------------------|----------------------------------------------------|
| Measurement Object | Modbus RTU slave device                            |
| Power              | 12~42VDC                                           |
| Bus Protocol       | 2-wire, 4~20mA+HART                                |
| Load resistance    | 0~1500Ω (4~20mA)<br>230~1100Ω (HART communication) |
| Isolation Voltage  | Modbus and HART bus interface, 500VAC              |
| Temperature Range  | -40°C~85°C                                         |
| Humidity Range     | 5~95%RH                                            |
| Start Time         | ≤5s                                                |
| Refresh Time       | 0.2s                                               |
| Damping adjustment | Time constant 0~32s                                |

### b) Performance Index

|                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Protection level | Housing protection grade up to IP 20                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| EMC              | EMC Requirements for Electrical Equipment for GB/T 18268.1-2010<Measurement, Control and Laboratory> Part 1: Disturbance Resistance Requirements for Industrial Places in General Requirements<br>HART Port Test Methods Electromagnetic Compatibility Requirements for Electrical Equipment GB/T 18268.23-2010<Measurement, Control and Laboratory> Part 23: Test Configuration, Working Conditions and Performance Criteria for Special Requirements with Integrated or Remote Signal Conditioning Transmitters |

### c) Physical Performance

|                    |                                                            |
|--------------------|------------------------------------------------------------|
| Weight             | 0.2kg                                                      |
| Structure Material | Housing: Polyamide PA6.6<br>Coating: Polyester epoxy resin |

### d) Default Communication Parameter

|                       |                     |
|-----------------------|---------------------|
| Slave station address | 1                   |
| Baud rate             | 9600                |
| Data bits             | 8                   |
| Stop bits             | 1                   |
| Check out             | EVEN                |
| CRCcheck out          | Low byte in advance |

### e) Supporting Modbus Function Code

|    |                                |
|----|--------------------------------|
| 1  | read loop status               |
| 2  | read discrete input status     |
| 3  | read keeping register value    |
| 4  | read input register value      |
| 5  | write loop                     |
| 16 | write multiple register values |

## Chapter 9 Appendix1 G0310 MODBUS to HART Gateway Model Selection

| Type<br>Selection<br>List | G0310                               |  | Modbus to HART Gateway |                    |                         |                    |
|---------------------------|-------------------------------------|--|------------------------|--------------------|-------------------------|--------------------|
|                           |                                     |  | Code code              | Hardware interface |                         |                    |
|                           |                                     |  | R4( could be omitted)  | RS485              |                         |                    |
|                           |                                     |  |                        |                    | Code code               | Software interface |
|                           |                                     |  |                        |                    | MR M (could be omitted) | Modbus RTU Master  |
|                           |                                     |  |                        |                    |                         |                    |
|                           | G0310-(R4-MRM)— — Selection Example |  |                        |                    |                         |                    |



## MICROCYBER CORPORATION

Microcyber Corporation

[Http://www.microcybers.com](http://www.microcybers.com)

Add: 17-8 Wensu Street, Hunnan New District, Shenyang, China 110179

Tel: 0086-24-31217278 / 31217280

Fax: 0086-24-31217293

Email: [huang.xin@microcyber.cn](mailto:huang.xin@microcyber.cn)