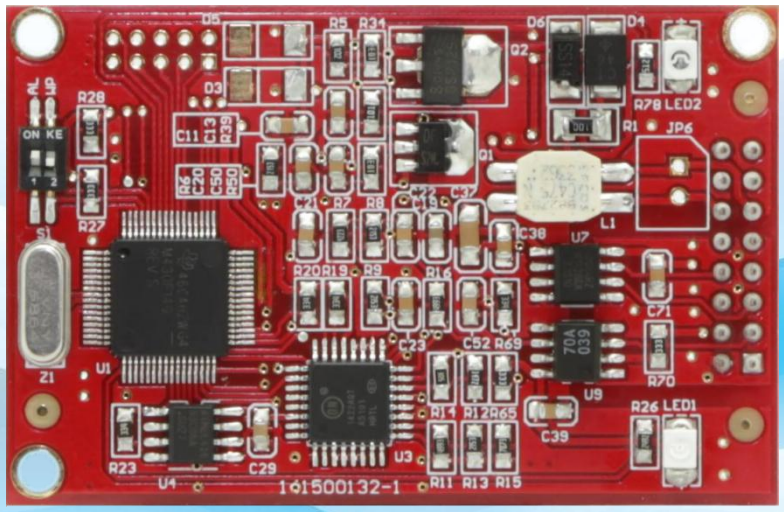
MICROCYBER

M0310 MODBUS to HART Module User Manual



Microcyber Corporation

Caution

1. Please don"t take off/install components at random.
2. Please check if the power meets the power request in the User Manual.

Version

V2.0

Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

The technical data may change at any time.

Table of Contents

Figure Directory

Table Directory

1. Overview

Microcyber Corporation (hereinafter referred to as “Microcyber”) has customized many built-in protocol converting modules for the majority of field device manufacturers, supporting to connect MODBUS RTU protocol (hereinafter referred to as “MODBUS” protocol) slave device into a variety of fieldbus system. The function of M0310 built-in MODBUS to HART module (hereinafter referred to as "HART module") is to convert MODBUS slave device into HART slave device.

1.1 Conversion Logic

HART module can convert MODBUS flow / level instrument to HART flow / level instrument.

HART Module (M0310) is a built-in converting module, converting MODBUS input device into HART current output device. HART module is built into MODBUS input device (measure instruments, like flow, level etc.), and then MODBUS application layer protocol is run by TTL level signal. HART module as MODBUS master and HART slave, converts data registers (such as input register, holding register) of MODBUS device into all the dynamic variables of HART commands. For example, holding register of one flow meter with address 30000 (range 1-65536) contains instantaneous flow value. Then we may configure the holding register to device variable 0 (range 0-5) of HART module. And nominate device 0 as Primary variable (or Secondary, Teritary, Quatenary variable). Converting logic is shown in the figure below.

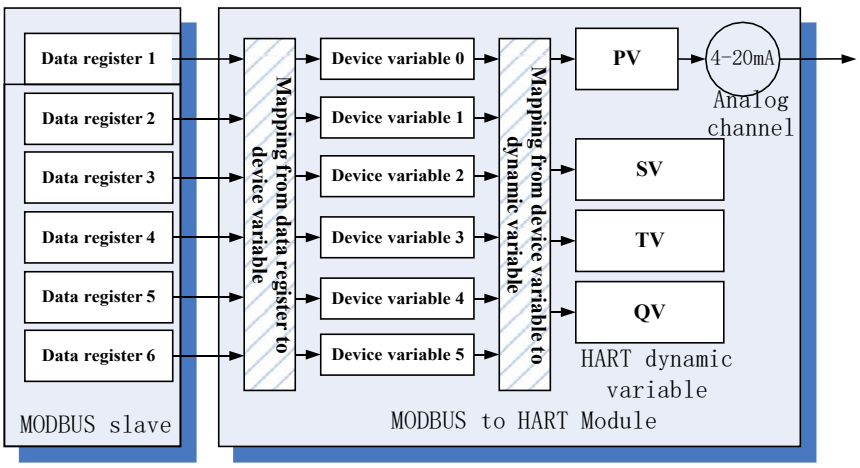


Figure 1.1 Data Mapping Logic Diagram

HART Module as a universal product will face with different interface features of various MODBUS devices (slave address, baud rate, parity, etc.), data storage mode (data register address, data type, sequence of bytes, etc.) and end users‟ requirements to HART dynamic variable allocation (data register mapping to device variable, device variable mapping to dynamic variable). All above may be configured again by device manufacturer.

Microcyber can provide PC configuration software for above configuration. Also provide HART module DD files, which is for HART master station (PC, communicator) which owns DD file analytical ability. HART module is configured through HART communication from HART master station, to confirm interface features between HART module and MODBUS device, data storage mode and mapping from device variable to HART dynamic variable.

After above configuration, HART master devie can access dynamic variable of HART module with HART commands, and realize the data‟s digital transmission from MODBUS data register (such as instaneous flow values of memory flowmeter) to HART master.

1.2 Analog Current Output

In HART module, the measuring value of Primary variable (PV) is transmitted by 4-20mA analog current output value. For example, flowmeter‟s instaneous flow is named as HART primary variable. When instanenous flow value achieves half of measuring range. HART module outputs 12.000mA.
Running HART module continuously compares primary variable value with upper and lower limit of its range. If primary variable value reaches to its upper limit, HART module outputs analog current 20.000 mA. If primary variable value down to zero, HART module outputs analog current 4.000 mA.

If primary variable value exceeds its upper and lower limit, HART module outputs a fixed current, indicating primary variable exceeds range, and the current value is called saturated output current. If primary variable value is more than upper limit, HART module outputs fixed 20.800mA; if less than

lower limit, HART module outputs fixed 3.800mA.

HART module has another group of fixed current used for fault alarm, which can be selectd by a DIP switch on HART module for high or low current alarm. If selecting high current alarm, when fault found, HART module outputs 21.750 mA. If selecting low current alarm, when fault found, HART module outputs 3.750 mA.

Table 1.1 Two Groups Fixed Output Current of HART Module

Transfinite Direction of Primary Variable (not optional)	Saturated Output Current Value
Exceed lower limit	3.800mA
Exceed upper limit	20.800mA
Fault alarm mode (Alternative)	Alarm output current value
Low current alarm	3.750mA
High current alarm	21.750mA

When HART module polling address isn"t set as „0", no matter how much is primary variable value, HART module analog channel outputs fixed 4.000mA. Only polling address is set as „0", HART module outputs 4-20mA analog current corresponding to primary variable.

1.3 Configure Interface

HART module is between HART bus and MODBUS device. It connects the main control board (hereinafter referred to as the "user board") of the field device through the socket on the back. It connects HART bus outside, and connects field device inside, see Figure 1.2 below.

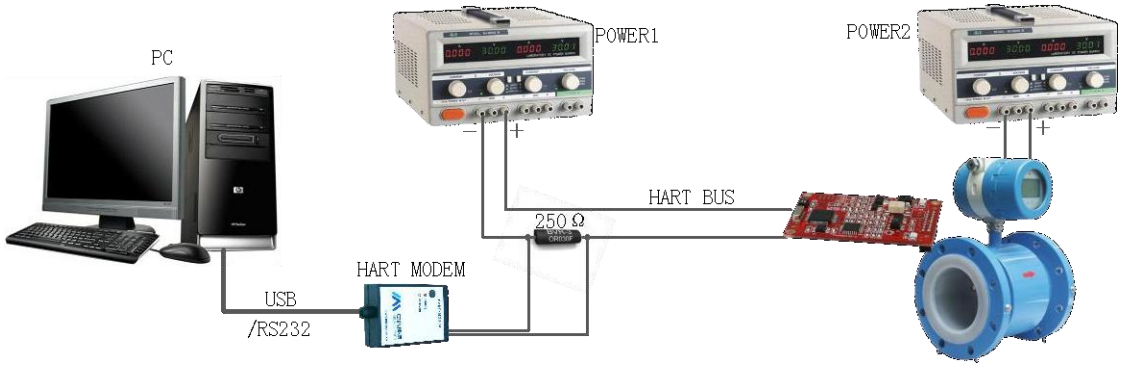


Figure 1.2 Wiring Diagram to Configure HART Module

For example, taking PC as master device, connect field device (four wire system) via HART bus. HART bus, which is composed of DC power supply (POWER1: 9-36VDC) and series-resistance (250Ω), is connected into HART Module; And field device is powered by another two wires. PC connects HART modem via USB (or RS-232) interface, and the other side of HART modem (Microcyber‟s) is nonpolar crocodile clips clipped on both sides of matched resistance. Use Microcyber‟s configuration software to configure HART Module. After configuration, HART module and field device become a whole, and can be connected into other HART network as HART device.

When configuration is required to complete by the communicator having DD analysis capability, just substitute PC and HART modem in Figure 1.2 above with the communicator.

1.4 Hardware User Interface

HART module uses 2.54mm spacing IDC16, 2x8 socket (JP3) to connect user board. Pin number definition is in Figure 1.3. Pin function explanation is in Table 1.2. If HART bus runs through user board, it may be lead in HART module via two pins in the socket.

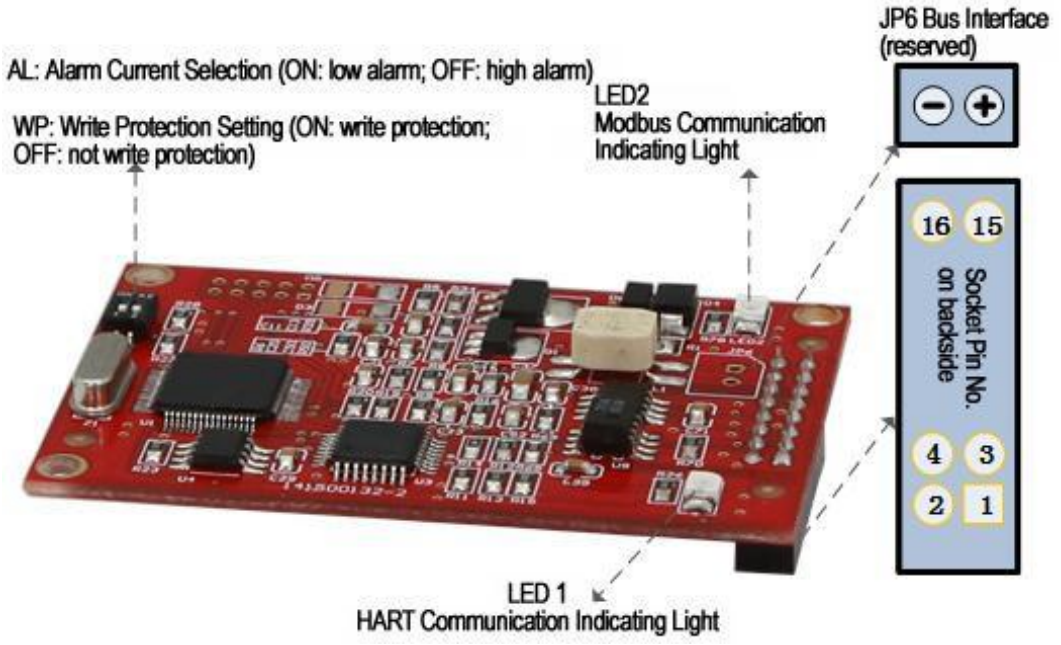


Figure 1.3 Hardware User Interface Diagram

Table 1.2 Pin Definition List of HART Module Socket

Pin		Name	Explanation	Pin		Name	Explanation
1	I	VCC	5VDC Isolated Power	2	I	GND	For VCC
3	I	/RST	Reset, low active	4	I	GND	For VCC
5	O	TxD	The send of MCU UART	6	O	-	Reserved
7	O	-	Reserved	8	I	RxD	The receive of MCU UART
9	O	-	Reserved	10	O	LED	For LED-, HART communication indicating
11	I/O	HART +	HART bus +	12	I/O	HART-	HART bus -
13	O	-	Reserved	14	I	-	Reserved
15	I	-	Reserved	16	I	-	Reserved

Shown in Figure 1.3, HART module has another reserved bus interface. It is used to connect HART bus directly when HART bus not running on user board.

HART module and user board master controller are connected by isolated TTL level. Both sides of isolation respectively are two MCU UART interfaces. To achieve user board circuit isolated with HART bus, 5 VDC isolation power supply shall be provided by user board. HART module power supply is from HART bus. Because HART module doesn"t supply power to user board, the HART module can only support 3-wire, 4-wire HART device.

As shown in Figure 1.3, HART module has two DIP switch, “AL” is fault alarm current selection DIP switch, “WP” is write protect DIP switch. When AL is turned to OFF, high current alarm selected; When AL is turned to ON, low current alarm selected.

When write protect DIP switch is turned to OFF side, write enabled state is set, means not write protect, HART master can configure HART module; When write protect DIP switch is turned to ON, write protect state is set, unable to configure HART module.

HART module is provided with two LED indicating lights, used to indicate the

current working status.

Table 1.3 HART Module Working Status Indication List

	LED1	LED2	Status Description
Initial Power-up	Light on	Light on	Module initialization, not enter working status
Continuous Work	Normally on	Normally on	After module initialization, no any HART and Modbus communication
	Twinkle	——	Indicate there"s HART communication at present
	——	Twinkle	Indicate there"s Modbus communication at present
	Light off	Light off	Indicate there"s no any communication or fault status

1.5 Software User Interface

MODBUS link and application layer standard is used between HART module and user board. HART module is master station, user board is slave station. HART fieldbus interface of HART module executes HART 7.0 protocol, and supports BURST mode operation. Common and general commands are shown in Table 1.4.

Table 1.4 Command List Supported by HART Bus Interface

Common Command No.	Command Name	General Command No.	Command Name
0	Read Unique Identifier	33	Read Device Variables
1	Read Primary Variable	34	Write Primary Variable Damping Value
2	Read Loop Current and Percent of Range	35	Write Primary Variable Range Values
3	Read Dynamic Variables and Loop Current	36	Set Primary Variable Upper Range Value
6	Write Polling Address	37	Set Primary Variable Lower Range Value
7	Read Loop Configuration	40	Enter/Exit Fixed Current Mode
8	Read Dynamic Variable Classifications	41	Perform Self Test
9	Read Device Variables with Status	42	Perform Device Reset
11	Read Unique Identifier Associated with Tag	43	Set Primary Variable Zero
12	Read Message	44	Write Primary Variable Units
13	Read Tag, Descriptor, Date	45	Trim Loop Current Zero (4.000mA)
14	Read Primary Variable Transducer Information	46	Trim Loop Current Gain (20.000mA)
15	Read Device Information	47	Write Primary Variable Transfer Function
16	Read Final Assembly Number	49	Write Primary Variable Transducer Serial Number
17	Write Message	50	Read Dynamic Variable Assignments
18	Write Tag, Descriptor, Date	51	Write Dynamic Variable Assignments
19	Write Final Assembly Number	53	Write Device Variable Units
20	Read Long Tag	59	Write Number of Response Preambles

21	Read Unique Identifier Associated with Long Tag	105	Read Burst Mode Configuration
22	Write Long Tag	107	Write Burst Device Variables
38	Reset Configuration Changed Flag	108	Write Burst Mode Command Number
48	Read Additional Device Status	109	Burst Mode Control

Factory default polling address (short address) of HART module is „0".

Serial transmission mode supported by HART module is Modbus RTU mode. Serial communication interface feature supported is shown in Table 1.5.

Table 1.5 Feature List of Modbus Communication Interface

	Default parameter	Optional range
Slave address	1	1-247
Baut rate	9600	1200,2400,4800,9600, 9200,35700,38400,57600
Data bits	8	7, 8 (this version only supports ModbusRTU, so 8-bit is valid)
Stop bits	1	1, 2
Parity	EVEN	ODD，EVEN，NONE
CRC verification	Lower-High Order	Low-High Order，High-Low Order

MODBUS communication interface of HART module supports the following MODBUS commands.

Table 1.6 Command List Supported by Modbus Communication Interface

Command No.	Command Name	No.	Command Name
1	Read coil status	4	Read input register value
2	Read discrete input status	5	Write coil
3	Read holding register value	16	Write multi register values

1.6 Dimensions

HART module PCB depth is 1.6mm, rectangular. Front (shown in Figure 1-4), the highest component is 5mm from board surface; Back, the highest is 9mm from board surface. Others all are surface mount components, lower than 4mm. Length, width, fixed hole"s location, etc. of HART module are shown in figure below.

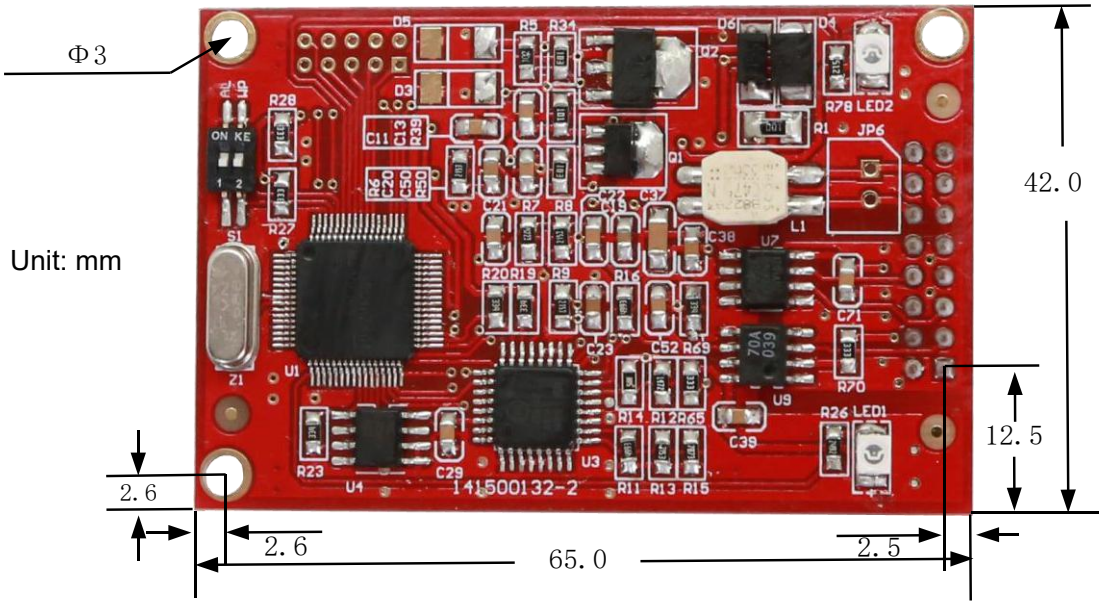


Figure 1.4 Front Dimensions of HART Module

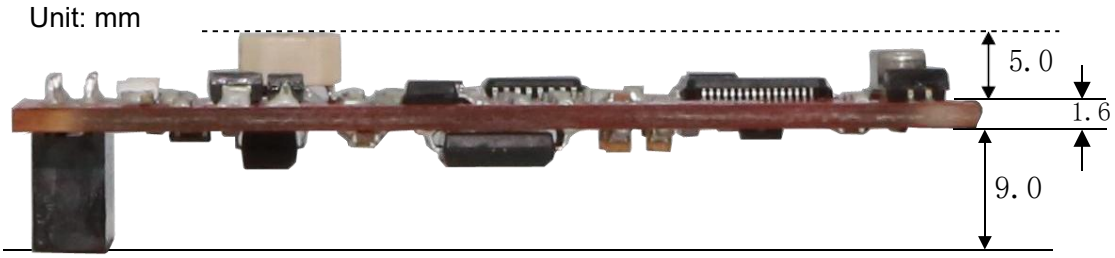


Figure 1.5 Front Back Height Dimensions of HART Module

IDC16(2x8) standard socket of 2.54mm spacing is used on backside, to plug into user board; HART module has another 3 fixed holes of Dia.3.0mm, used to fix HART module onto user board.

2. Quick Configuration

2.1 Configuration Tool Introduction

As previously mentioned, Microcyber can provide PC configuration software for HART module configuration. Or provide HART module DD files for HART master station (PC, communicator) which owns DD file analytical ability. Here take PC configuration software as an example, hardware connection is shown in Figure1-2, connection description is shown in Section 1.4.

About usage and status description of HART modem, refer to “HART Modem Datasheet” of Microcyber.

About installation and general operation of PC configuration software, refer to “HART PC Configuration Tool” of Microcyber.
Here only introduce HART module configuration and simple general operation.

After wiring according to Figure1-2, and electrifying field device with HART module, double-click shortcut icon 

on PC which has been installed HART configuration software “HartMPT.exe” (or run "C:\Program Files\Microcyber\HartMPT\HartMPT.exe"), enter initial interface of HART PC configuration software, see figure below:

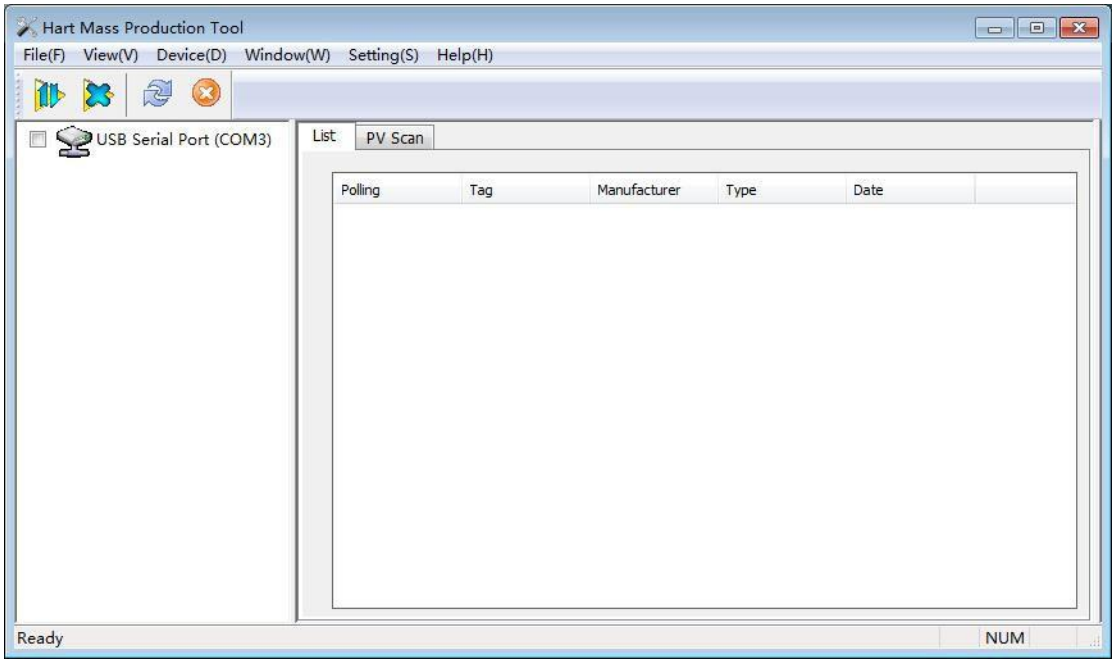


Figure 2.1 Configuration Software Icon and Intial Interface

„COM3" in Figure 2.1 is Windows system" virtual serial port used for USB interface HART modem. If driver of HART Modem (virtual serial port chip) is correctly installed, green light will be on when HART modem is inserted into PC; otherwise, check wiring and driver"s installation result. After module is electrified, check status of HART module"s LED1 and LED2, if both are normally on, that means HART module is on standby.

In webview of intial interface, right-click serial port node (COM3), select„single node" → „node 0". Configuration software sends „universal command 0" to query if HART device with short address „0" is online.

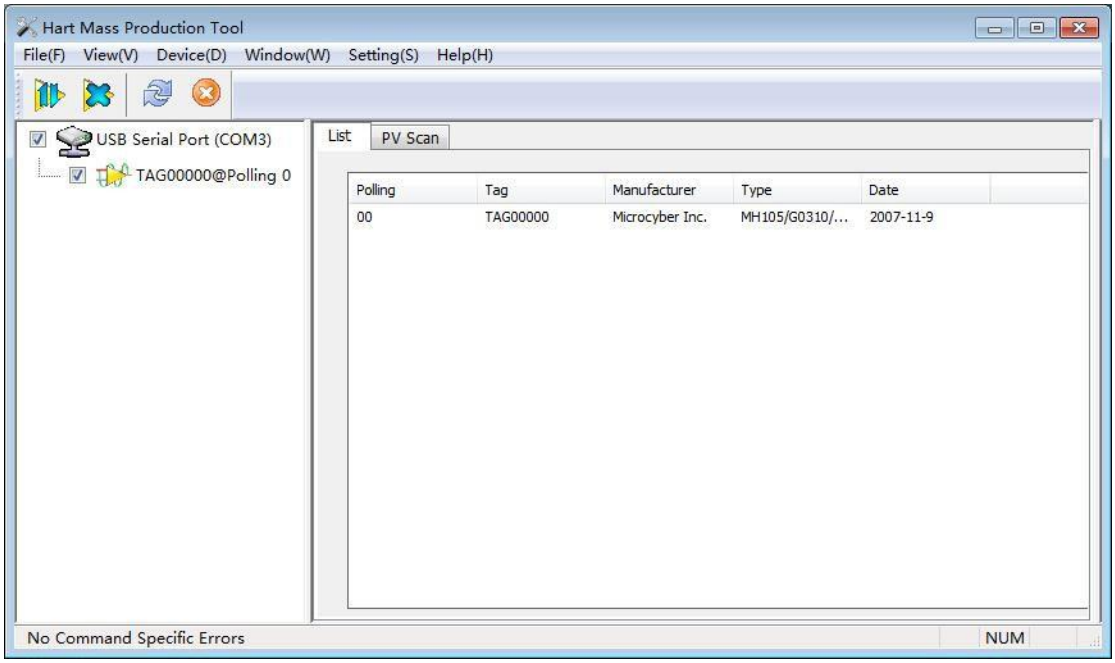


Figure 2.2 Poll Online HART Module

Factory default short address of HART module is „0", without error for wiring and power supply, HART configuration software will list query result, shown in Figure 2.2. The device with short address „0" in Figure 2.2 (Hereinafter called 0 device) is online, click 0 device, after continuous communication between configuration software and HART module, change of TAB webview is shown in the following figure.

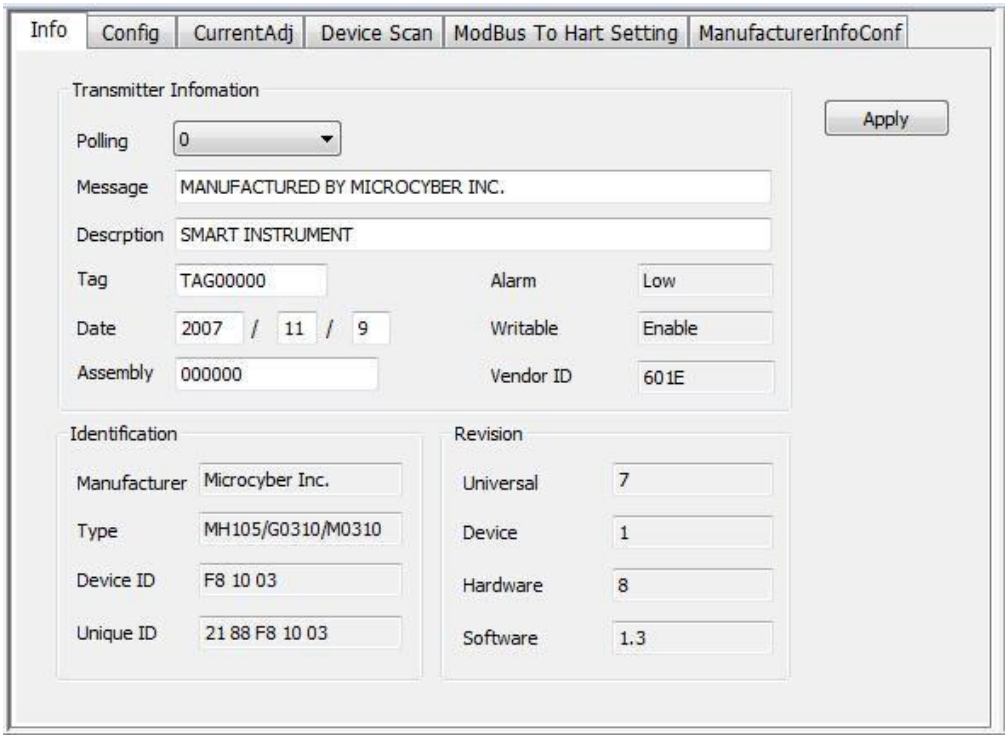


Figure 2.3 TAB of HART Module

HART module, compared with other type of HART device, its TAB 'ModBus to Hart Setting" and ManufactureInfoConf are unique, and other 4TABs shown in the figure above are shared by all HART devices. Here only emphasizes ' Modbus to HART Setting" of HART module, as shown below:

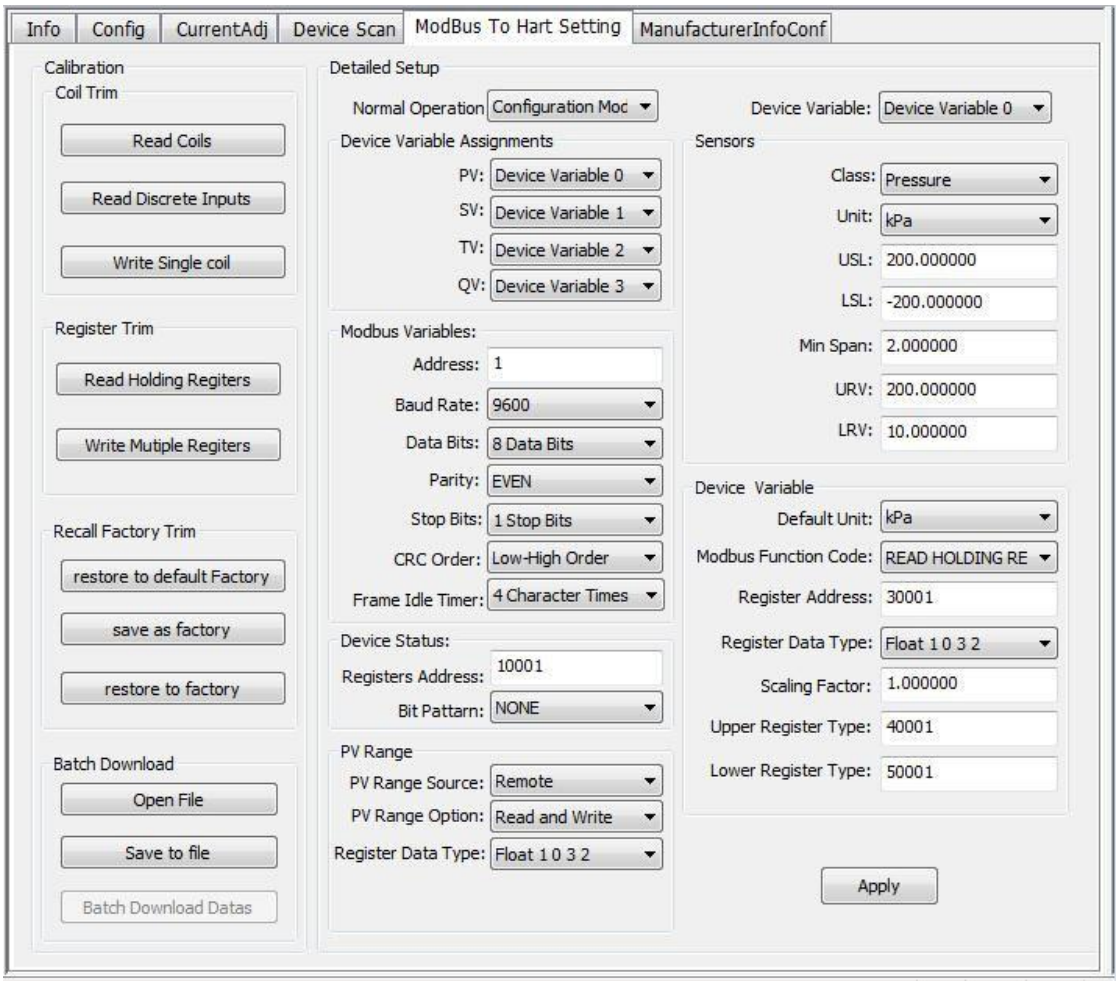


Figure 2.4 TAB of Gateway Configuration

To configure HART module, firstly modify ' ModBus to Hart Setting \ Detailed Setup \ Normal Operation" option groupt to 'Configuration Mode". Under this mode, the user can operate other functions of „Detailed Setup"; under configuration mode, HART module won"t send Modbus data to user board in initiative and cycle mode.

To configure HART module, there are three steps:

1. Configure Modbus interface; 2. Configure device variable; 3. Configure dynamic variable.

1. Configure Modbus interface, that is to use 'ModBus to Hart Setting \ Detailed

Setup \ Modbus Variables", configure Modbus interface based on different Modbus device interface features.

2. Configure device variable, that"s to use 'ModBus to Hart Setting \ Detailed Setup \ Device Variable", configure device variable based on different Modbus device data storage mode, i.e.data register is mapped to device variable.

3. Configure dynamic variable, that"s to use 'ModBus to Hart Setting \ Detailed Setup \ Device Variable Assignments", configure dynamic variable based on requirements to HART dynamic variables from different end users, i.e.device variable is mapped to dynamic variable.

As mentioned earlier, configuration function of the software can also be realized by HART master station (such as PC, communicator) with DD file analysis capability. The functions decribed by HART module DD files are basically same with HartMPT configuration software. The figure below is function menu tree of DD files, and the user can quickly find the parameters to configure in 475 communicator, etc. by the function menu tree.

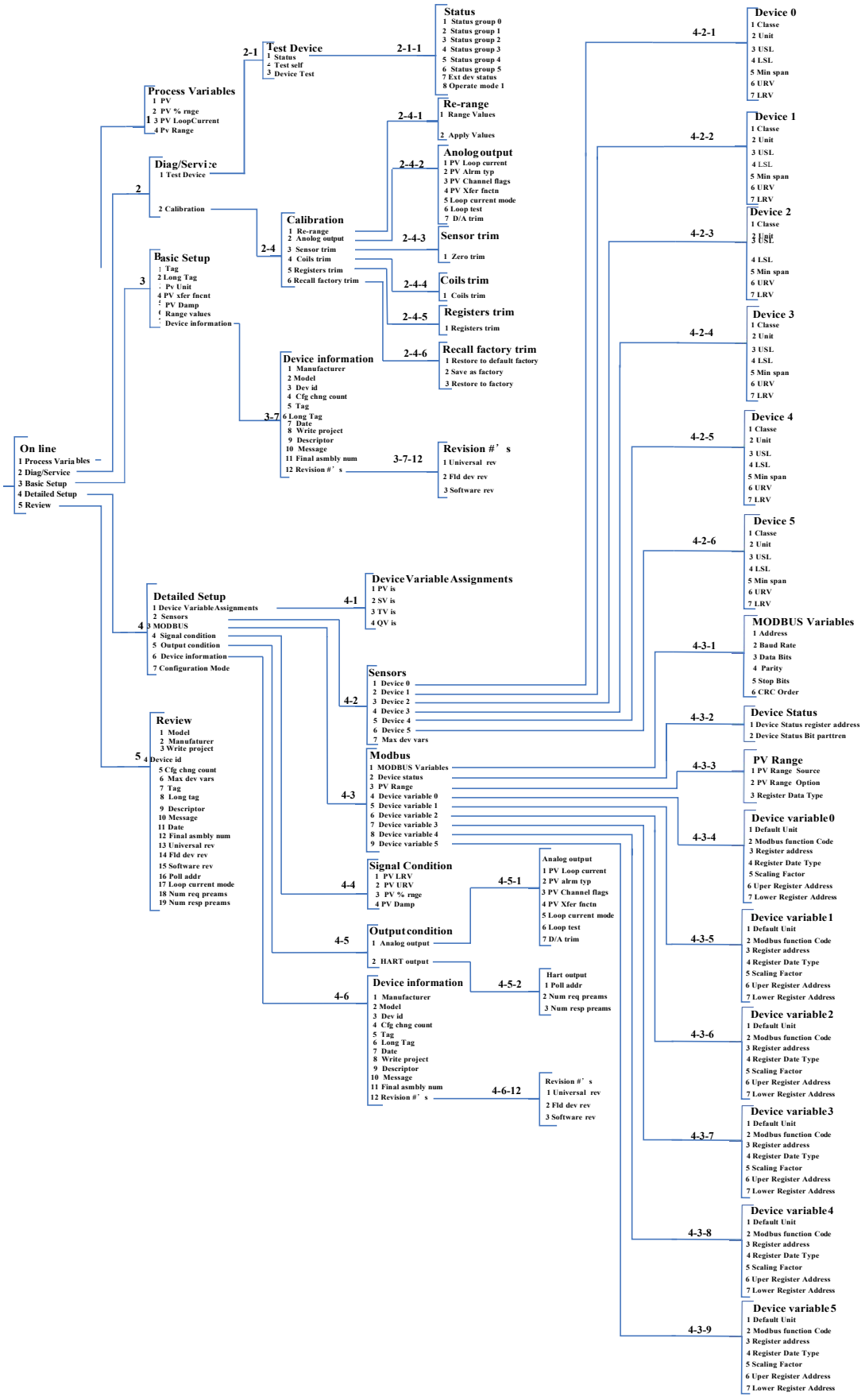


Figure 2.5 Function Menu Tree

2.2 To Configure Modbus Inteface

To unify communication parameter is the keypoint that HART module is able to correctly communicate with user board, the communication between them is Modbus-RTU protocol. To use 'ModBus to Hart Setting \ Detailed Setup \ Modbus Variables" of configuration software, the user can configure Modbus interface according to interface features of Modbus device (user board), as shown in Figure 2.6:

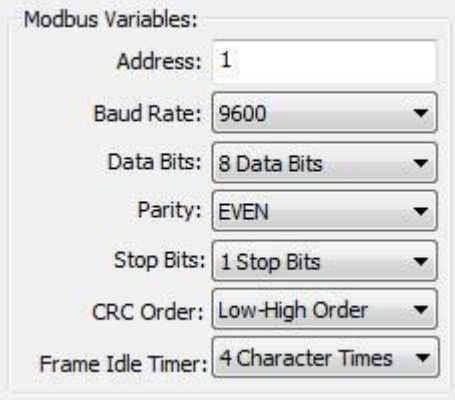


Figure 2.6 Modbus Communication Parameters

Parameter Meaning:

Table 2.1 Modbus Communication Parameters

Function Name	Usage	Fault Parameters
Address	Modbus slave device address	1
Baud Rate	The baud rate used when HART module communicate with user board	9600bps
Data Bits	Length of data bits when HART module communicate with user board	8
Parity	Bytes use parity mode: odd parity, even parity, no parity	EVEN
Stop Bits	Number of stop bits	1
CRC Order	The last two-byte CRC sending order of Modbus protocol data packet	Low-High Order

Only when all communication parameters in Table 2.1 are fully tallied with Modbus device interface features, normal communication can be ensured. After setting parameters, click „Apply" button to save configuration data into HART module. To communicate with the communication parameters described in Table 2.1 when HART module exchanges data with user board.

2.3 To Configure Device Variables

To configure device variable, that means to configure Modbus device data (such as instantaneous flow, cumulative flow, velocity, medium indensity, medium temperature, etc. of flow meter) information into the device variable of HART module. HART module can support 6 device variables" configuration. Using „ModBus to Hart Setting \ Detailed Setup \ Device Variable" to configure, detailed configured information is shown in Figure 2.7:

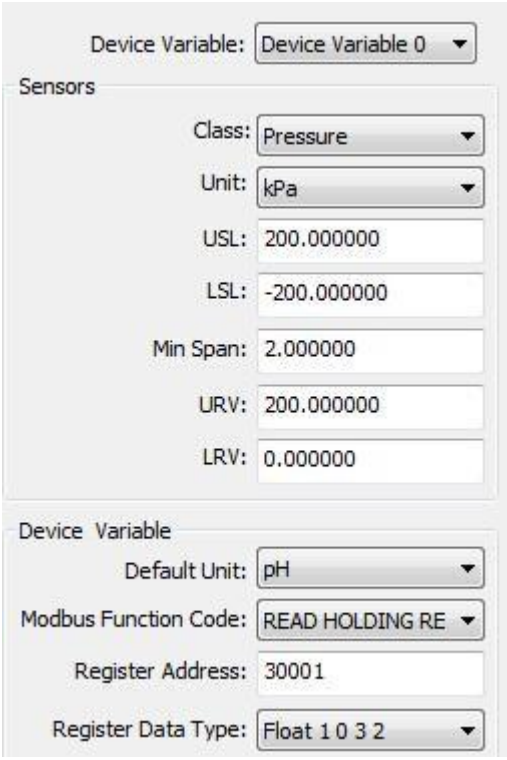


Figure 2.7 Device Variable Configuration

Under quick configuration, meaning of each item is shown in Table 2.2.

Table 2.2 Device Variable Configuration

Device Variable n (n=0~5)	
Function Name	Usage
Class	Data type of user Modbus device, according to the different type, select the corresponding item (such as volume flow rate, temperature, pressure, density, etc.) in the 'Type' drop-down list.
Unit	Device data current used and displayed unit (unit of PV)
USL	Maximum limit of device variable n acquired by user"s Modbus device
LSL	Minimum limit of device variable n acquired by user"s

	Modbus device
Min Span	Range span, usually set as sensor range upper limit divied by 100
URV	Between upper and lower limit of sensor range
LRV	Between upper and lower limit of sensor range
Default Unit	Variable value unit read from Modbus device
Modbus Function Code	Function code sent out when reading device variable n
Register Address	Data register address in Modbus device of device variable n
Register Data Type	Byte order in Modbus data register of device variable n

Among them, range upper and lower limit can be modified only when current device variable mapping is primary variable; Here, range upper/lower limit of device variable are the same parameters with that of HART device.

According the number and important degree, device data of Modbus device is assigned to 6 device variables respectively. After configuration, click on 'Apply' button to save the data into HART module;

Note: In this configuration software, data register address=data register address in user device +1. For example, user device variable 0 (flow rate) is in register address 30000, then 30001 shall be filled in the configuration software.

Relevance between the unit in Table 2.2 and default unit is as follows:
HART device primary variable value (PV) = HART device variable n (value converted from default unit to current unit)

2.4 To Configure Dynamic Variables

This function is to select 4 device variables at most from the 6 device variables above configured, and to map onto 4 dynamic variables, which is configured by 'ModBus to Hart Setting \ Detail Setup \ Device Variable Assignments' in configuration software, as shown in Figure 2.8.

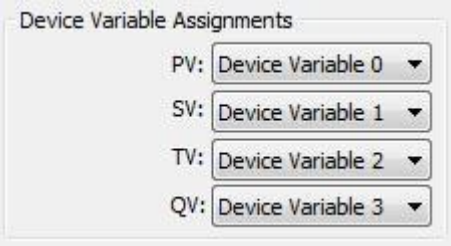


Figure 2.8 Assignments from Device Variable to Dynamic Variable

As mentioned above, HART protocols stipulates 4 dynamic variables, primary variable (PV), secondary variable (SV), teritary variable (TV), quatenary variable (QV); All 6 device variables configured in Section 2.3 can be mapped onto the 4 dynamic variables, no restriction; But PV is relative with analog current on HART bus, detail description refer to Section 1.2. According to system requiremnts, the user can map any one of 6 device variables onto PV, and this device variable value may be transferred to control system in mode of 4~20mA analog current. To be attention, analog current is valid only at single point mode. Mapping relation from device variable to dynamic variable may refer to Figure 1.1.

2.5 Running Inspection

If you have read here, that means you have completed the first three steps of HART module rapid configuration, to configure Modbus interface, to configure device variable, and to configure dynamic variable. If you are sure that the first three steps are correctly configured, please change 'ModBus to Hart Setting \ Detail Setup \ Normal Operation' to „Operation Mode", After this step is completed, HART module will send Modbus protocol data packet to user board actively and cirularly, request 6 device variables" value. Now, the user can switch to 'Device Scan" interface in the configuration software, as shown in Figure 2.9.

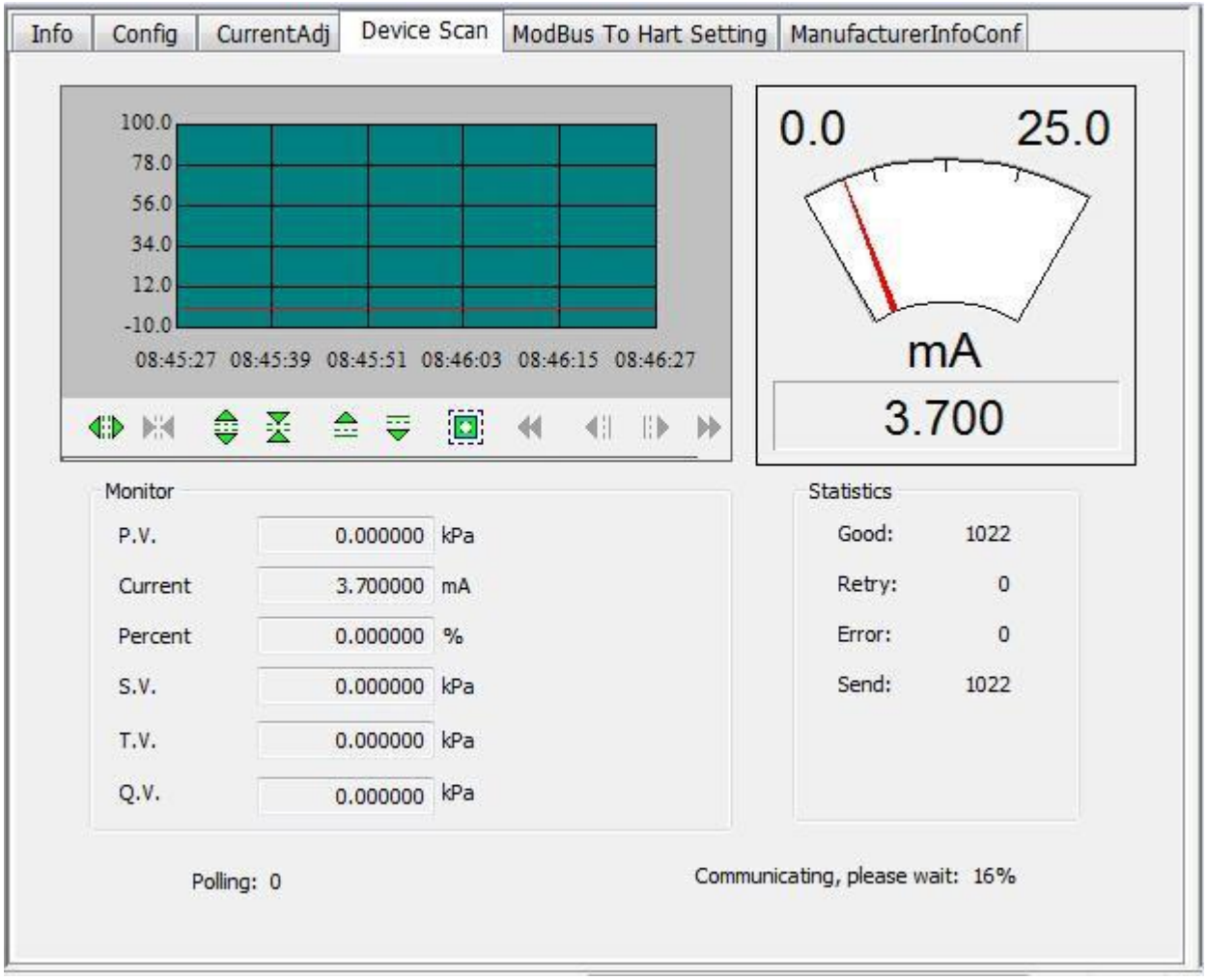


Figure 2.9 Device Scan

On this interface, the user can monitor own variables in real time.

3. Other Configuration

Last section has described quick configuration, now to configure HART module, the user can convert Modbus device variables into HART device variables, eventually transfer the values of these variables into HART control system, for the use of upper system decision.

Except providing quick configuration function, the configuration software has another seven special functions for the user"s further configuration to HART module. Details will be shown in the following.

3.1 To Configure Device Status

HART device status reflects current HART module partial status. HART device status totally includes 8 types, represented by 8 bits, into one byte and “1” means status has occurred; When HART slave devie replies master station"s request, one byte of HART device status is represented by the second byte which responses frame data domain. The user can open device status area by „View\Mini-Warnning" in configuration software, shown in upper right area of Figure 3.1.

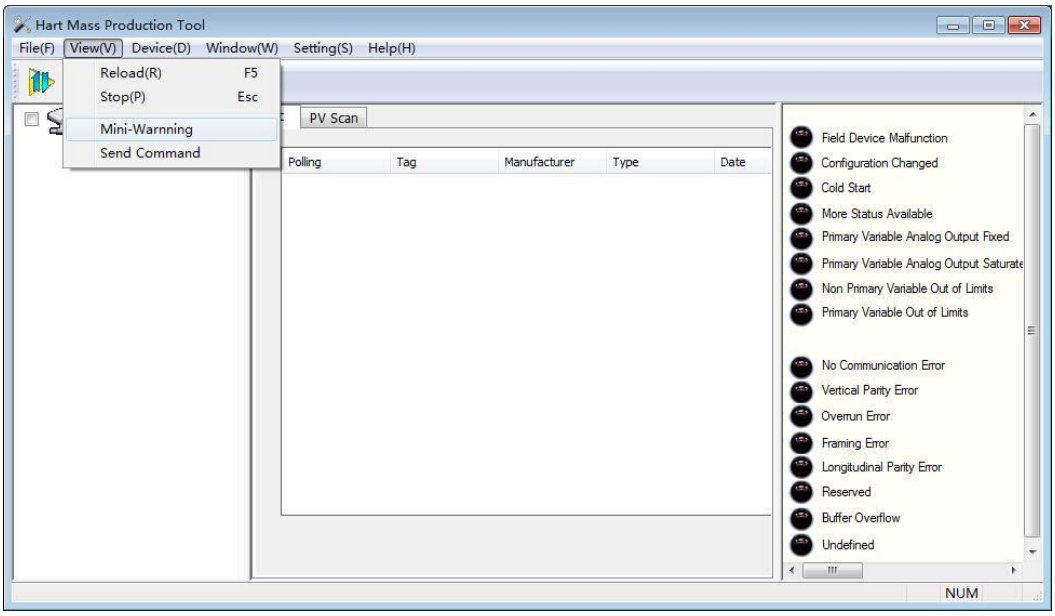


Figure 3.1 HART Device Status

HART device status only reflects 8 specific status of HART module, which is unenough to reflect some special device status of user"s Modbus device; So

the user can configure Modbus device status to HART extended device status by „ModBus to Hart Setting\Detailed Setup\Device Status" in configuration software. Device status parameters can be used to reflect some current status of Modbus device.

In HART module, the former three bytes of extended device status has been used, lower 6 bits of the first byte represent whether it is successful read of six device variable channel values (0:successfully, 1:fault or configuration is wrong); Other 2 bytes represent 16 status of user"s Modbus device.

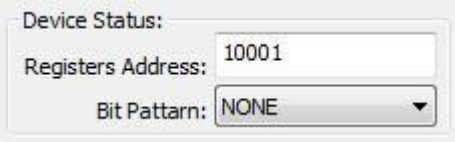


Figure 3.2 Device Status

Device status parameters are mapped from a register on behalf of user"s device status. Each bit can represent two states. „Bit Pattarn" decides which bit to be used. Bit(1~8) respectively corresponds to 8 bits of HART extended device status byte 2, Bit(9~16) respectively corresponds to 8 bits of HART extended device status byte 3, from lower to higher bit, as show in Figure 3.3.

'Register Address" is user device status register address+1. After configuration is complete, click on 'Apply' button to save configuration into HART module, and then when HART module is in normal operation mode, Modbus request packet will be sent out periodically by HART module (read coil by default) to read the status value of user's device.

In the configuration software, at present, to read device status from user Modbus device has no support of graphical interface. The user can read it by sending HART general command 48. However, the user can intuitively see each bit"s status of HART extended device status by the software which can analyze DD file, as shown in Figure 3.3.

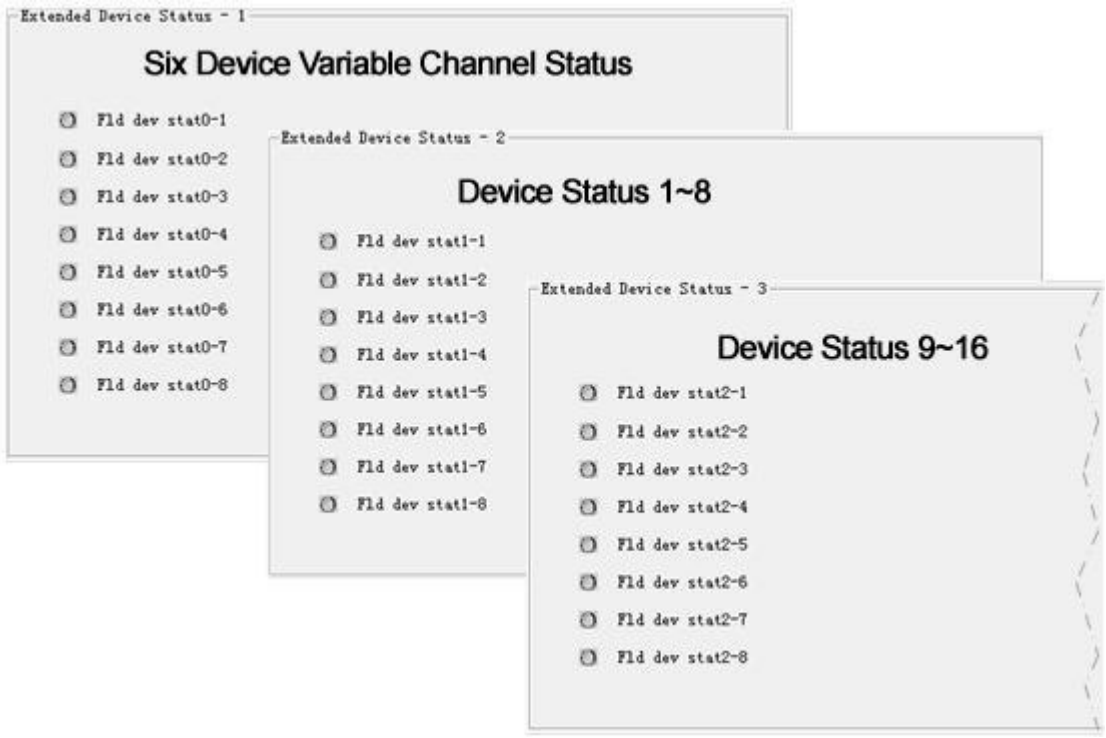


Figure 3.3 HART Extended Device Status

HART module is a general module, therefore DD file provided by Microcyber is also a general version, and each bit of HART extended device status is provided by form 'Fld dev statB-b'; If the user needs to specify a name for each status, provide the name to Microcyber, and Microcyber can customize DD files for the user.

3.2 To Configure PV Range

The user can configure source and read/write mode of primary variable range upper and lower limit by 'ModBus to Hart Setting\Detailed Setup\PV Range".

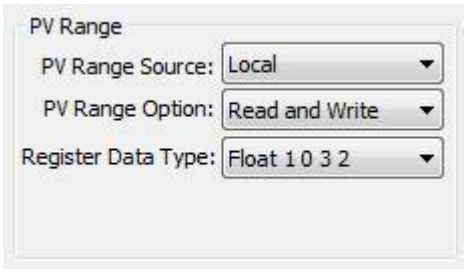


Figure 3.4 PV Range Operation

'PV Range Source" represents primary variable range upper and lower limit is configured manually by configuration software, or read remotely from the

user"s Modbus device. 'PV Range Option" means whether to read and write range upper and lower limit stored in the user"s Modbus device under remote mode. 'Register Data Type" is the storage format in the register of range upper and lower limit stored in the user"s Modbus device under remote mode.

In the following Figure 3.5, the status, that device variable 0 is mapped into primary variable (PV) under „Local" and „Remote" mode, is simply described.

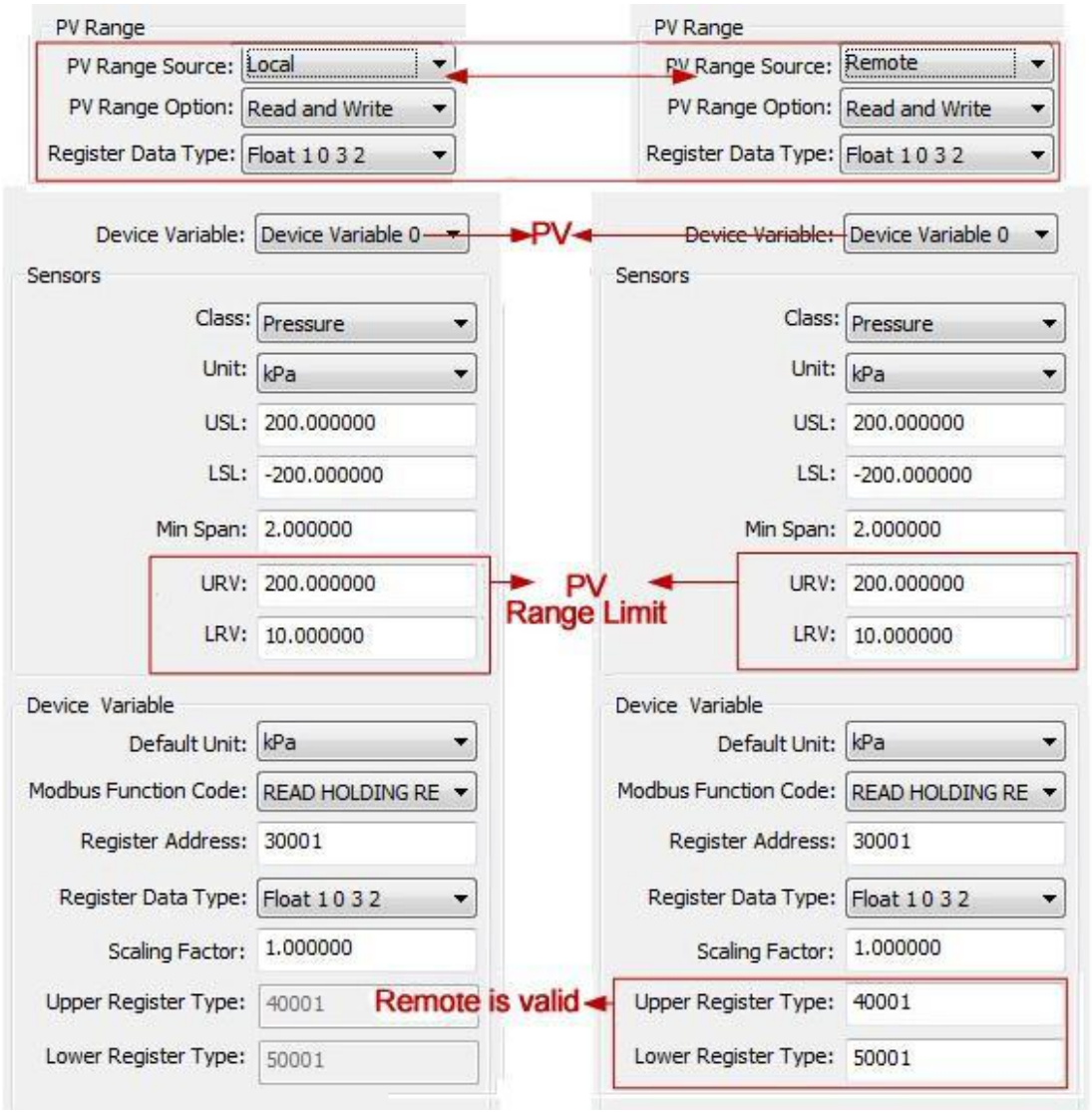


Figure 3.5 PV Range Operation Examples

In above figure, if device 0 isn"t be mapped into primary variable, then range upper and lower limit, register address, all are inoperable. When 'PV Range Source" is set to „Remote", „PV Range Option" is set to „Read and Write", after the user sets upper and lower range value and corresponding register

addresses, click on „Apply" button, HART module will send upper and lower range value with the configured data type to user"s Modbus device (default function code 16, write multiple registers); When „Read Only", HART module will periodically read upper and lower range value from upper and lowr range register specified by the user"s device (read holding register by default).

3.3 To Configure Scaling Factor

HART module has specially assigned a scaling factor parameter for each device variable, convenient for the user to zoom in, conversion mode is:

HART Device Variable n=Modbus Device Variable n*Scaling Factor

If the user doesn't need to do a numerical zoom, or to modify zoom factor value, the factory default is 1.0.

3.4 Debug Operation of Calibration Area

Debugging calibration area is available for joint debugging of the user to configure HART module for the first time. Debug the device by „coil" and „register" of 'ModBus to Hart Setting\Calibration" in the configuration software, functional area is shown in Figure 3.6:

Figure 3.6 Debug Calibration Function

When the user uses HART module for the first time, after completing hardware connection and configuring all communication parameters in 'ModBus to Hart Setting\Detailed Setup\Modbus Variables", the user can use the function as shown in Figure 3.6 to read and write data of Modbus device. If return and

write data correctly, hardware connection and Modbus communication parameters between HART module and user device are both correct; conversely, further to check hardware connection or software configuration is required.

3.5 Data Save and Restore

Data save and restore function is realized by 'ModBus to Hart Setting\Calibration\restore to factory' in the configuration software, as shown in Figure 3.7:

Figure 3.7 Data Save and Restore

- ***Restore to default Factory:*** Restore all configured data of HART module into intial system value. The user shall carefull use it. All the configured data will lose after it.
- ***Save as factory:*** Save all configured information into factory value (The data has backup in HART module);
- ***Restore to factory:*** Restore the configured information in HART module stored when carrying out „save as factory" last time to current use status;

3.6 Batch Download

Batch download function is a quick configuration function specially provided for manufacturer, convenient to configure multiple HART modules. This is realized by „ModBus to Hart Setting\Batch Download" in configuration software, as shown in Figure 3.8:

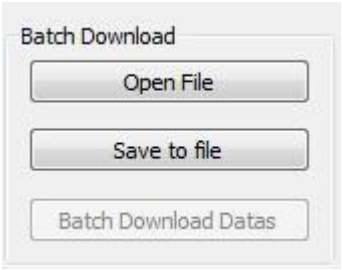


Figure 3.8 Batch Download

When the user has multiple HART modules requiring the same configuration, simply to complete one HART module configuration, and then click "Save to file" button to save the current HART module configuration information as a file; when configuring other HART modules, simply click on "Open File" button to read the configuration information stored in file, and then click "Batch Download Datas" button to download all the configuration information shown in current page into HART module, complete the configuration.

3.7 To Modify Manufacturer ID and Device Type

As a general product, HART module can help the user to realize own HART product. So, Microcyber speicially provides modification function of manufacturer ID and device type.

The user can realize that by „ManufactureInfoConf" in configuration software, as shown in Figure 3.9:

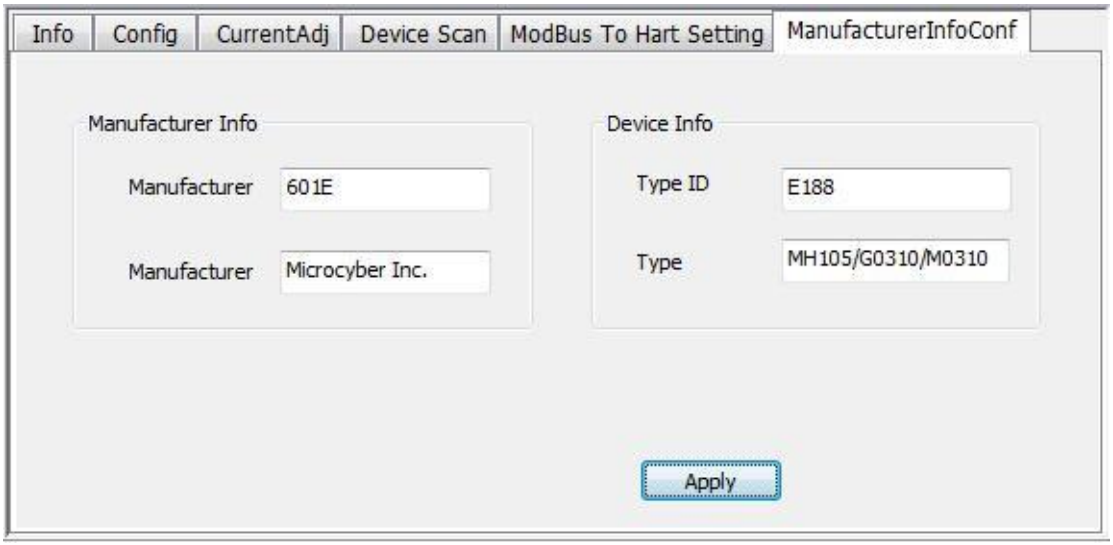


Figure 3.9 Manufacturer Information Configuration

Manufacturer information consists of manufacturer ID and manufacturer name

string. Device information consists of device type ID and character string. Manufactuer ID and device type code both are composed of 2 bytes, and filled out according to the hexadecimal form.

Manufacturer ID and device type ID cannot be modified at random, the user can apply to HCF for HART membership to achieve manufacturer ID, and then apply device type ID for free.

Disclaimer: The user casually modifies manufactuer ID and device type ID may cause accident, negligence, infringement and damage. Microcyber is not responsible for that, and also does not bear any legal liability.

4. Technical Specification

4.1 Basic Parameters

Table 4.1 Basic Parameters

Measuring Object	Modbus RTU slave device
Power Supply	(6～42)VDC
Bus Protocol	2-wire，（4～20）mA+HART
Load Resistance	(0～1500) Ω（normal） (230～1100) Ω（HART communication）
Isolating Voltage	Modbus and HART bus interface，500 VAC
Temperature Range	(-40～85) ℃
Humidity Range	(5～95) %RH
Start Time	≤5s
Refresh Time	0.2s
Damp Adjust	Time constant 0～32s
Output Current Accuracy	Max. error is ≤50 μA

4.2 Electrial Interface

Table 4.2 Electrical Interface

Pin Definition List of Module Socket							
Pin	**I/O**	**Name**	**Explanation**	**Pin**	**I/O**	**Name**	**Explanation**
1	I	VCC	5VDC Isolated Power	2	I	GND	For VCC
3	I	/RST	Reset, low active	4	I	GND	For VCC
5	O	TxD	The send of MCU UART	6	O	-	Reserved
7	O	-	Reserved	8	I	RxD	The receive of MCU UART
9	O	-	Reserved	10	O	LED	For LED-, HART communication indicating
11	I/O	HART+	HART bus +	12	I/O	HART-	HART bus -
13	O	-	Reserved	14	I	-	Reserved
15	I	-	Reserved	16	I	-	Reserved
Characteristics of Module Electrical Interface							
VCC,GND	3.7V-5.0VDC，Icc<0.8mA			/RST	3.7V-5.0VDC，Icc<0.01mA		
HART+，HART-	6-32VDC，3.75-21.75mA			TxD	3.7V-5.0VDC，Icc<0.01mA		

LED	VO<0.3V,IO<-2.0mA	RxD	3.7V-5.0VDC，Icc<0.01mA
Other	No, without connection		

5. Troubleshooting

Table 5.1 Troubleshooting

No.	Phenomena	Reason	Solution
1	Current output is 0	a. Power failure b. Wire open circuit	a. Repair the power b. Check the wire
2	Current is fixed at 21.75mA or 3.70mA	Failure between Modbus device and HART module	Check Modbus communication
3	Current is fixed at 4mA.	Device in multi-point mode	Modify sub PC address in single PC mode
4	Device cannot communicate	a. Connection failure b. Multi-point mode	a. Check loop wiring b. Check network
5	HART communication light off	a. No HART Communication b. Power failure	a. Check HART master device and HART Modem b. Check power and connection
5	Modbus Communication light off	a. No Modbus communication b. Slave device failure	a. Check Modbus device b. Check slave device and connection
7	Normal Modbus communication, but incorrect dynamic variable reading	a.Incorrect configuration of corresponding device variablet b.Incorrect configuration of Modbus communication parameters	a. Check data regiser address and data type parameter of device variable b. Check baud rate and parity bit

Annex 1 Model Selection

MOD-HART	M0310 Modbus to HART Built-in Module						
	Code	**Master/Slave**					
	M	Master Station					
		Code	**Module Form**				
		N	General				
			Code	**Hardware Interface**			
			T	TTL level			
				Code	**Software Interface**		
				M	Modbus RTU		
					Code	**Bus interface on module**	
					N	No Bus inteface	
MOD-HART-	M	N	T	M	N	——	Selection Example

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