SM100 -A(B)
HART Smart Converter
User Manual

Jiaxing Songmao Electronics Co., Ltd

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Before using the product, please read the manual intensively.First, please confirm which type of Instruments is used with the HART protocol, and then find out the appropriate using method in the manual. Before switching on the power, please confirm all interfaces are correctly connected. The company will not be held liable for any damage caused by improper use that violates the methods specified herein unless following the instructions.

This document serves as the official product description. However, content may become outdated or invalid due to product/software upgrades. We do not guarantee consequences arising from such changes. Please monitor version updates and ensure prompt updates.

For the latest information, please refer to our website: www.smmeter.com.If you have any questions about this document or the performance description of this product, please contact your supplier or contact us directly.E-mail :sales@smdznet.com or contact tel:86-573-82623038 for advice and answers.

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1. SM100-A(B) Introduction of HART SMART Converter

1.1 Product Introduction

SM100-A(B) HART SMART converter is a product developed by using ARM microprocessor, HART protocol modulation and demodulation dedicated chip and combining a lot of practical experience. It is designed according to the requirements of industrial products and has high reliability and stability. The HART SMART Converter is equipped with standard RS232 and RS485 interfaces. It enables transparent data transmission with HART-enabled instruments or converts data to MODBUS_RTU protocol for reading, ensuring real-time data transfer.

The HART protocol utilizes Bell 202 Frequency Shift Keying (FSK) standard, superimposing modulated digital signals on the 4-20mA analog current. This allows HART-compatible instruments to enable data communication without interfering with the 4-20mA analog signal. The SM100-A(B) SMART Converter functions as an intelligent modem that modulates and demodulates digital and analog signals.

1.2 Product Features

- Equipped with standard RS232 and RS485 communication interfaces, it can configure parameters, change communication baud rate and parity bit. It unrelated to the 1200 baud rate of the HART bus, thereby enhancing the operational speed of the entire system.
- Using industry-standard modular housing for easy installation and commissioning.
- Equipped with dedicated configuration software for parameter setup of the SM100-A(B) SMART Converter. Via the converter, data communication with HART-enabled instruments is achieved.
- Support standard MODBUS_RTU protocol.
- Support simultaneous connection to multiple HART protocol instruments.
- Compatible with specialized HART instruments and enables custom command configuration for accessing device-specific data.

1.3 Main parameters

- Power input voltage: DC 12~24V, the power ripple must not be greater than 200mV , and the current must provide 100mA.
- Modular housing dimensions: length 134 mm × width 71 mm × height 43 mm.
- Working environment temperature: -20℃ ～ +80℃.
- Relative humidity: 10% ~ 80%.

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2. SM100-A(B) HART SMART converter Physical picture and indicator light function

2.1 Physical Picture

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2.2 Product Selection

model	Communication interface	Applicable occasions
SM100-A	RS232	RS232 interface is suitable for short-distance communication between the Data Acquisition Unit (or PLC) and SM100-A SMART Converter. Bus architecture is not required in this configuration. The connection scheme is: Data Acquisition Unit (or PLC) + SM100-A SMART Converter + One or multiple HART-enabled instruments.
SM100-B	AR485	RS485 interface is suitable for long-distance communication between the Data Acquisition Unit and SM100-B converter, and can be networked in bus mode. The connection scheme：Data Acquisition Unit (or PLC) + Multiple SM100-B smart converters + One or multiple HART-enabled instruments.
SM100-A+B	RS232+BR485	RS232 interface and RS485 interface are independent communication channels. The same HART converter can communicate with different Data Acquisition Unit. The connection scheme ： Two different system Data Acquisition Unit (or PLC) + SM100-A + B Smart Converter +One or multiple HART-enabled instruments.
SM100-B+B	AR485+BR485	The two RS485 interfaces are independent communication channels. The same HART converter can communicate with different Data Acquisition Unit The connection scheme： Two different system Data Acquisition Unit (or PLCs) + SM100- B+ B Smart Converter + One or multiple HART-enabled instruments.
+D Built-in power supply		Mainly used for power supply less than DC 24V and connected to DC 24V two-wire HART instrument

2.3 Wiring Diagram

(1) Wiring diagram for two-wire HART instrument (Note: When connecting one or more HART instruments, only one 250Ω resistor is required)

(2) Wiring diagram for four-wire HART instrument (Note: When connecting one or more HART instruments, only one 250Ω resistor is required)

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(3) Wiring diagram for two-wire and four-wire HART instruments at the same time (Note: When connecting one or more HART instruments, only one 250Ω resistor is required)

(4) HART converter built-in DC24V and two-wire HART instrument wiring diagram (Note: the built-in power supply can only connect one two-wire HART instrument, and only one 250Ω resistor is required)

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2. 4 port introduction

Port Name	PROM	AR485D-	AR485D+	BR485D+	BR485D-
Function/Access Device	Program Download	RS485 Communication		RS485 Communication	
Port Name	R232TX	R232RX	GND	POW	GND
Function/Access Device	RS232 Communication			power supply	
Port Name	RESET	LOOP1+	LOOP1-	LOOP2+	LOOP2-
Function/Access Device	Parameter initialization	HART Instrument 1		HART Instrument 2	
Port Name	LOOP3+	LOOP3-	LOOP4+	LOOP4-	GND
Function/Access Device	HART Instrument 3		HART Instrument 4		

● PROM : Press and hold the program download button, then supply power, the converter will enter firmware download mode.

● AR485D-, AR485D+: RS485 communication interface A wiring terminal.

● BR485D-, BR485D+: RS485 communication interface B wiring terminal.

● R232TX , R232RX, GND: RS232 communication interface terminals.

● POW , GND : Power interface terminals, POW is connected to the positive pole of the power supply, and GND is connected to the negative pole of the power supply.

● LOOP1+, LOOP1-~LOOP4+, LOOP4-: a total of four groups of HART instrument communication interface terminals.

2.5 Indicator Light Description

● POW power indicator light: It stays on when the power is turned on.

● RS485 communication indicator light: flashes when data is being exchanged at the RS485 serial port.

● RS232 communication indicator light: flashes when data is being exchanged at the RS232 serial port.

● HART communication indicator light: flashes when the HART converter is exchanging data with the HART instrument.

2.6 Precautions for use

(1) The difference between two-wire and four-wire HART instruments

① Four-wire HART instrument: The four-wire HART instrument is powered separately, and its power line is separated from the 4 ~ 20mA input and output lines.

② Two-wire HART instrument: the power line of the two-wire HART instrument and the 4 ~ 20 mA input and output lines share two lines.

(2) Commissioning Procedure for HART SMART Converter with Multiple HART-enabled Instruments

① When connecting one HART-enabled Instruments ,set the converter module's operational mode to "MODBUS Single-Device Mode". The HART address defaults to be 0 and requires no modification.

② When connecting 4 HART-enabled Instruments , set the converter module's operational mode to " MODBUS multiple -Device Mode" , Set the HART address to be 1, 2, 3, 4. At this time, the output current of all the HART sensors is 4mA, and only one 250Ω resistor needs to be connected.

③ After using the USB/RS232 converter, when connecting to the RS232/RS485 converter, the RS232/RS485 converter needs to be connected to a DC5V power supply.

④Use Siemens PLC programming cable, USB-PPI (USB-RS485 cable) pin 3 is D+ and pin 8 is D-.

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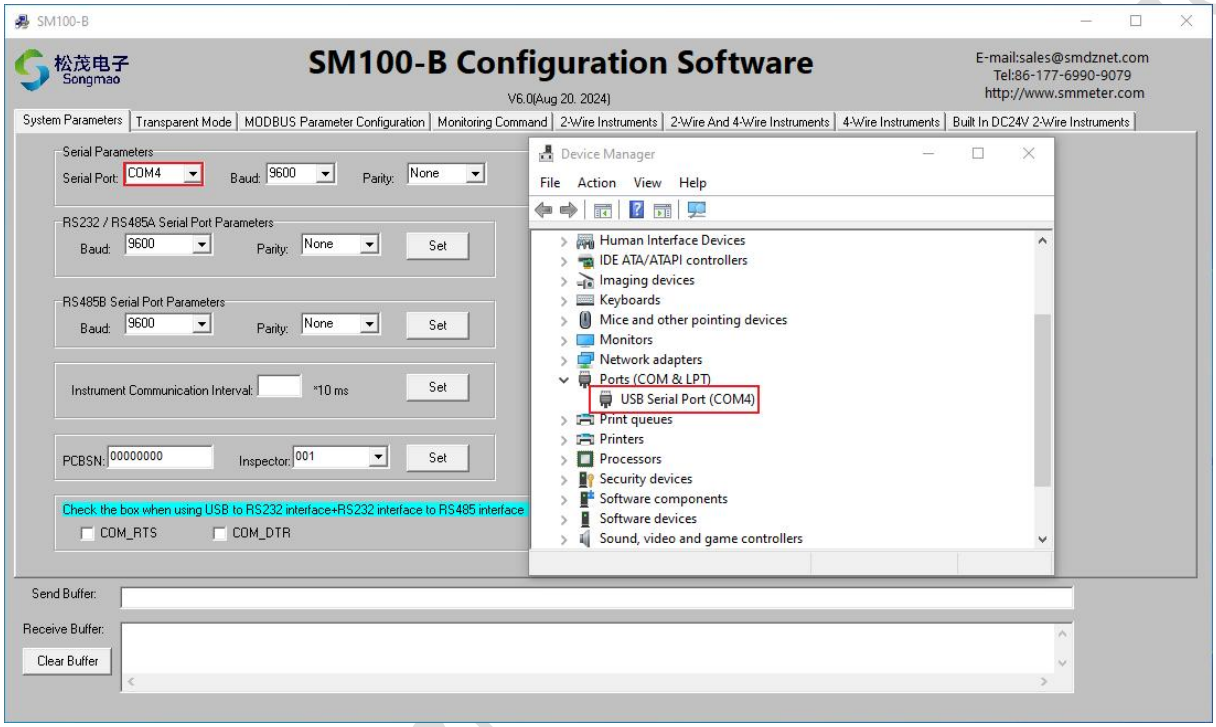
3. Configuration software function introduction and operation steps

3.1 Communication connection

1) According to described in the port overview section: After connecting power supply, RS485/RS232 cables to the converter, proceed with parameter configuration once the PWR indicator illuminates steadily.

2) Open the configuration software, select the correct COM port, baud rate, and parity bit (default: 9600 baud, None parity), then open the communication port.

3) Click "Communication Query" and query the version number of this converter in the "Receive Buffer" below. The connection is successful.



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3.2 System parameters

This interface is used to set and query basic parameters such as communication parameters, Module working modes, MODBUS slave address, HART command interval time, etc.

1) Communication query: Retrieves converter firmware version.

2) RS232/RS485A communication parameter settings:according to actual conditions， Select baud rate and parity bit for RS232/RS485A interface (default: 9600 baud, None parity).Click "Set". After successful configuration, the software automatically closes the COM port. Reopen the port with the new settings to establish communication.

3) RS485B communication parameter setting: According to the actual situation, Select baud rate and parity bit for RS485B interface (default: 9600 baud, None parity). Click "Set". After successful configuration, the software automatically closes the COM port. Reopen the port with the new settings to establish communication.

4) HART Instrument Communication Interval: Defines the polling cycle between converter and HART instruments. Interval (seconds) = Input value × 0.1S

5) Module working mode

① Transparent working mode: When reading data in the "Transparent working mode" interface, the module working mode is set to "Transparent working mode".

②MODBUS single instrument working mode: When a single HART instrument is connected and the instrument HART address is 0, the module working mode is set to "MODBUS single instrument working mode".

③MODBUS multiple instrument working mode: When multiple HART instruments are connected and the instrument HART address is not 0, (1 ≦ addresses≦ 4). set to "MODBUS multiple instrument working mode".

④Monitoring to MODBUS RTU (custom): When other devices collect HART instrument data at the same time, the module working mode is set to "Monitoring to MODBUS RTU (custom)" Enables concurrent HART data acquisition by secondary devices.

⑤Monitoring data output: When other devices concurrently acquire data from HART instruments, set the module working mode to "Monitoring Data Output". This enables real-time monitoring of command transactions between external devices and HART instruments. Users can configure converter monitoring parameters based on the captured command sequences.

6) MODBUS slave address: Enter the 3 -digit slave address and click " Set ".

7) RS485A data return time: Set the delayed return time of RS232 or AR485 interface data according to the system connected to the back-end.

RS485B data return time: Set the delayed return time of BR485 interface data according to the system connected to the back-end.

8) RS232/RS485A data address base: The storage address range of the converter output MODBUS data is 4000~40050. If there are requirements for the storage address of the output data, the data storage address range can be modified by setting the address base.

RS485B data address base: The storage address range of the converter output MODBUS data is 4001~40050. If there are requirements for the storage address of the output data, the storage address range of the data can be modified by setting the address base.

9) COM_RTS/COM_DTR: When using the "USB-RS232 communication cable + RS232 to RS485" wiring method, check this option and then open the serial port for communication.

10) Parameter initialization : The parameters of the converter can be restored to the initialization state.

11) System parameters: You can read communication interface type, communication parameters, module working mode, MODBUS slave address, HART instrument communication interval and other parameter information.

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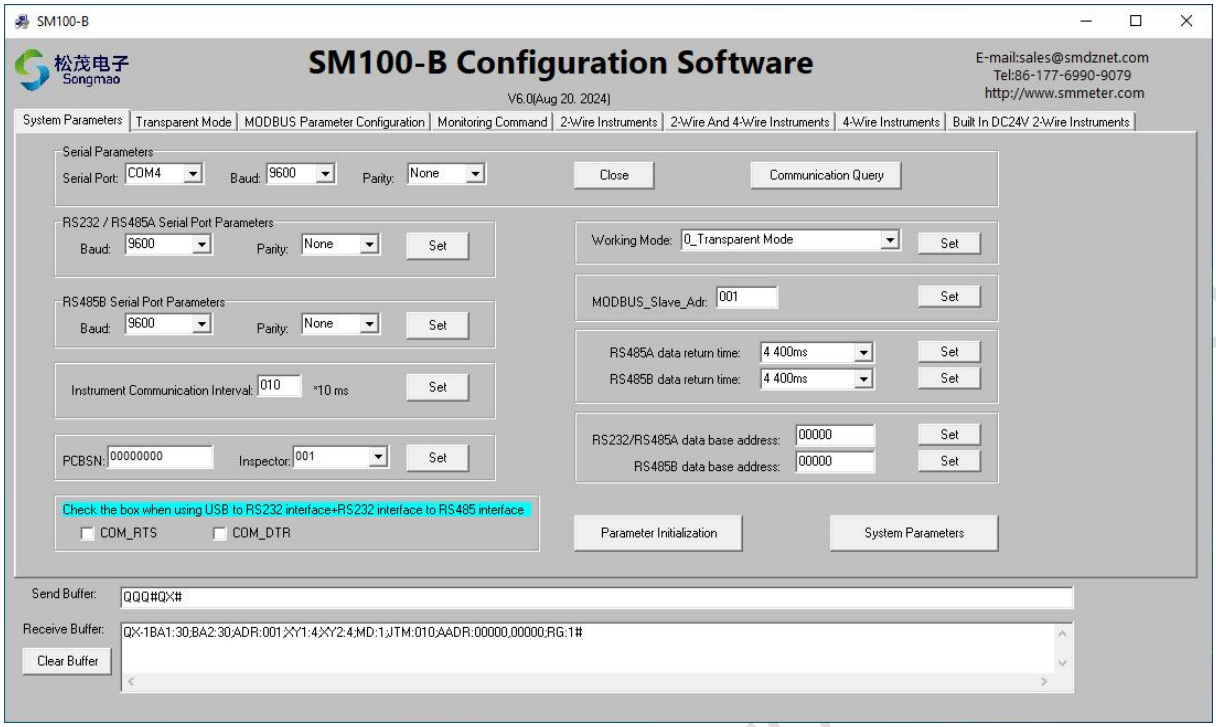

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3.3 Transparent working method

1) Before entering the "Transparent Working Mode" interface, first set the module working mode to "Transparent Working Mode".

2) Configure HART instrument parameters:

①HART address: the address of the HART instrument.

② HART command working mode : There are master mode and sub-master mode to choose from, which can be selected according to the needs of the instrument.

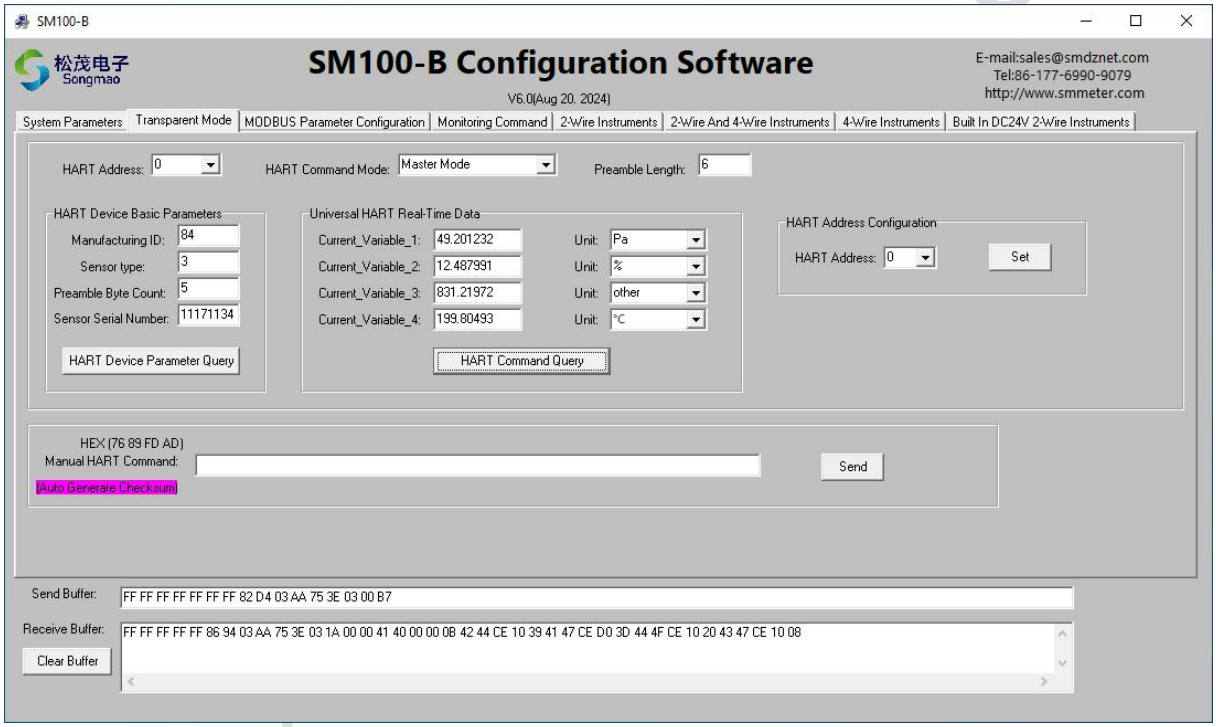
③ Preamble length: The number of HART command Preamble 'FF', usually 6 bytes.

3) HART instrument parameter query: You can query the basic parameter information of HART instrument.

4) Universal HART command data query: can read the real-time data of universal HART instruments, but cannot display the real-time data of other customized instruments.

5) HART address setting: When the address of the connected HART instrument is not address 0 , the HART address should be set to address 0 .

6) Manual HART command: You can manually input HART command to read the real-time data of HART instrument.



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3.4 MODBUS parameter configuration

1) Pre-configuration Steps， Set the module operation mode to "MODBUS Single-Device Mode" before accessing this interface. Click "MODBUS Parameter Query" to read current settings.

2) Configure HART instrument parameters

①Instrument number: Select the corresponding instrument number, which is consistent with the HART address of the connected instrument (Default: 0) .

②Instrument enable: Connect a HART instrument and turn on the enable, that is, select “Enable”.

③HART mode: There are master devices and slave devices to choose from, which can be selected according to the needs of the instrument.

④ Instrument type :According to the actual connected instrument to select

Customized instrument - The connected instrument is an uncommon HART protocol instrument, which may be an old HART protocol instrument or a special HART instruction protocol instrument. Users can define the parsing method according to the HART command , and can directly convert the MODBUS_RTU protocol without upgrading the program.

Universal instrument - suitable for the most HART-enabled instruments.

Special instrument - The connected instrument is not an instrument that reads data using the universal HART command. If the model corresponds to the special instrument model, just select that model.

⑤ Preamble length: the number of HART command Preambles 'FF'.(Default: 5)

⑥ Clear cache time: Enter a 3-digit clear cache time (in S).// Buffer Clear Time: 3-digit value in seconds (e.g., 060 = 60s)

3) Data parsing format : There are 4 types. Users need to configure the corresponding parsing format according to the format of instrument data output .

0 IEE754 (FF4 FF3 FF2 FF1)——Floating point type, highCustomize the HART data analysis format : Set the instrument instruction number, data start address, data length, and address bit to be read. The address bit (data length) is used to calculate the data check bit to determine the correctness of the data. The default value is 8, and the commonly used values are 4, 6, and 8. Users can choose according to actual conditions.

and low order in reverse (default format)

1 IEE754 (FF2 FF1 FF4 FF3)——Floating point type, high and low bit order is not reversed

2 Uint32 (FF4 FF3 FF2 FF1)——Unsigned long integer, high and low order in reverse order

3 Uint32 (FF2 FF1 FF4 FF3)——Unsigned long integer, high and low bit order is not reversed

4) Custom HART command and parsing methods : When the instrument type is "custom instrument", the user can turn on the command enable and read the HART instrument data by entering the command code.

5) Customize the HART data analysis format : Set the instrument instruction number, data start address, data length, and address bit to be read. The address bit (data length) is used to calculate the data check byte to determine the correctness of the data. The default value is 8, and the commonly used values are 4, 6, and 8. Users can choose according to actual conditions.

6) Module working mode: Select transparent working mode when reading data in the "Transparent working mode" interface, and select MODBUS single instrument working mode when reading data in the "MODBUS parameter configuration" interface, and then click "Set". (Note: The module working mode setting box in the "System parameters" interface and the module working mode setting box here have the same function)

7) IEE754 calculation: Enter the received data command code and click "Calculate" to convert the hexadecimal data format into decimal data format, which is convenient for verifying the received data.

8) Variable 1 to Variable 4 coefficients: When the read unit of the variable is inconsistent with the unit displayed on the HART instrument head, the corresponding coefficient can be set to convert between units.o

9) MODBUS communication test: Enter the correct MODBUS slave address, the starting address for reading data and the data

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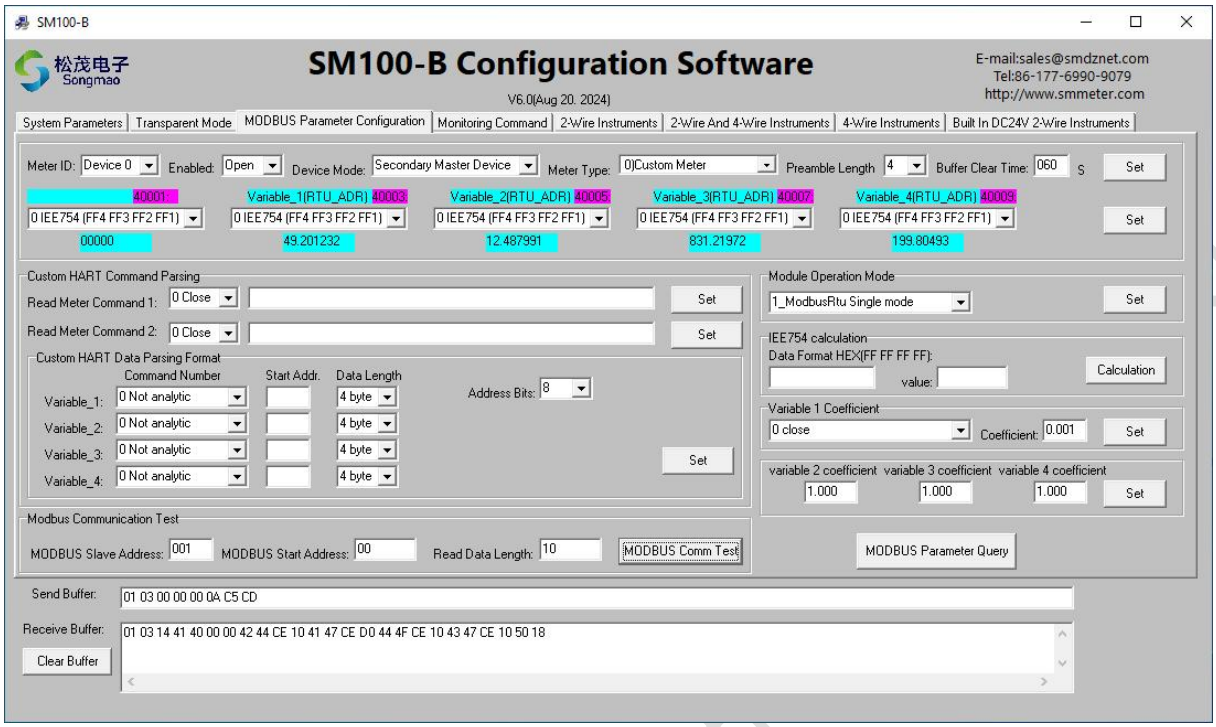
length, then click “MODBUS communication test” to read the MODBUS data information.



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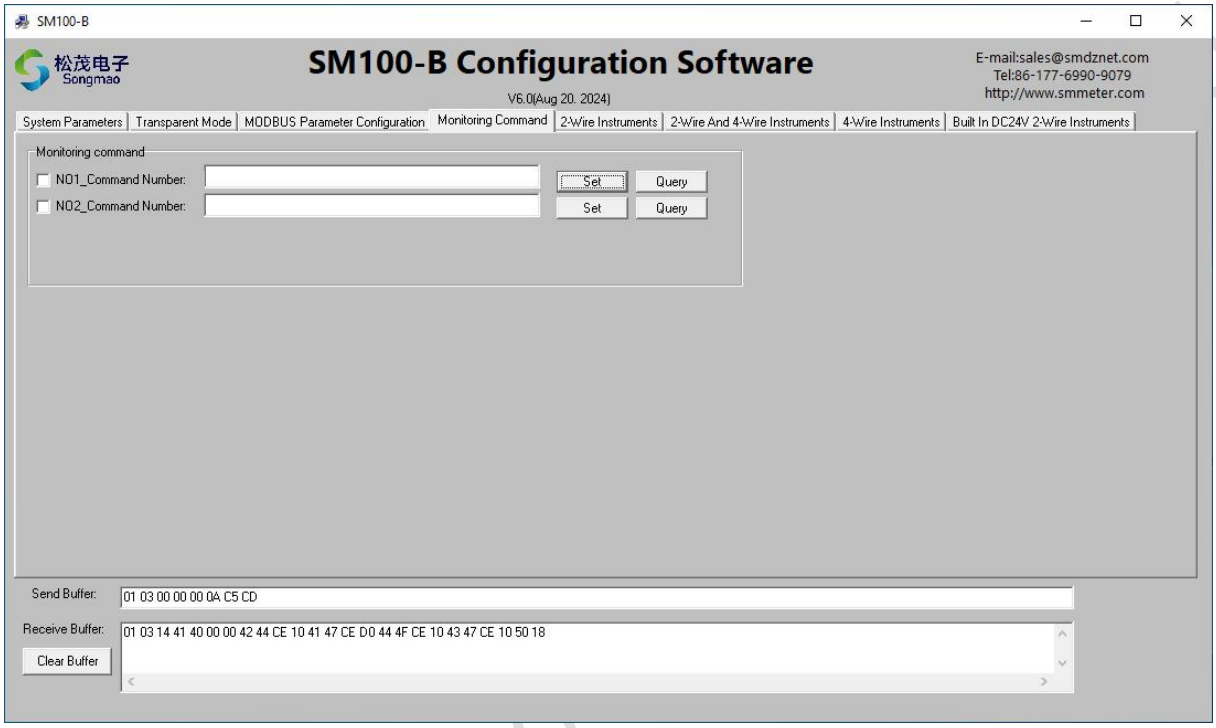
3.5 Monitoring Command

1. When other devices concurrently acquire data from HART instruments, the module working mode is set to "Monitoring to MODBUS RTU (custom)" Enables concurrent HART data acquisition by secondary devices.
2. The converter can set two monitoring command,. When displayed the set monitoring command during the communication between other devices and the HART instrument, the converter will simultaneously convert the intercepted data into standard MODBUS protocol output.



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3.6 ModScan32 communication test

1) Close the serial port of the configuration software, then open the Modscan32 software, click "connection", follow the arrow instructions in the figure below to configure the appropriate parameters in the pop-up dialog box, and then click OK.

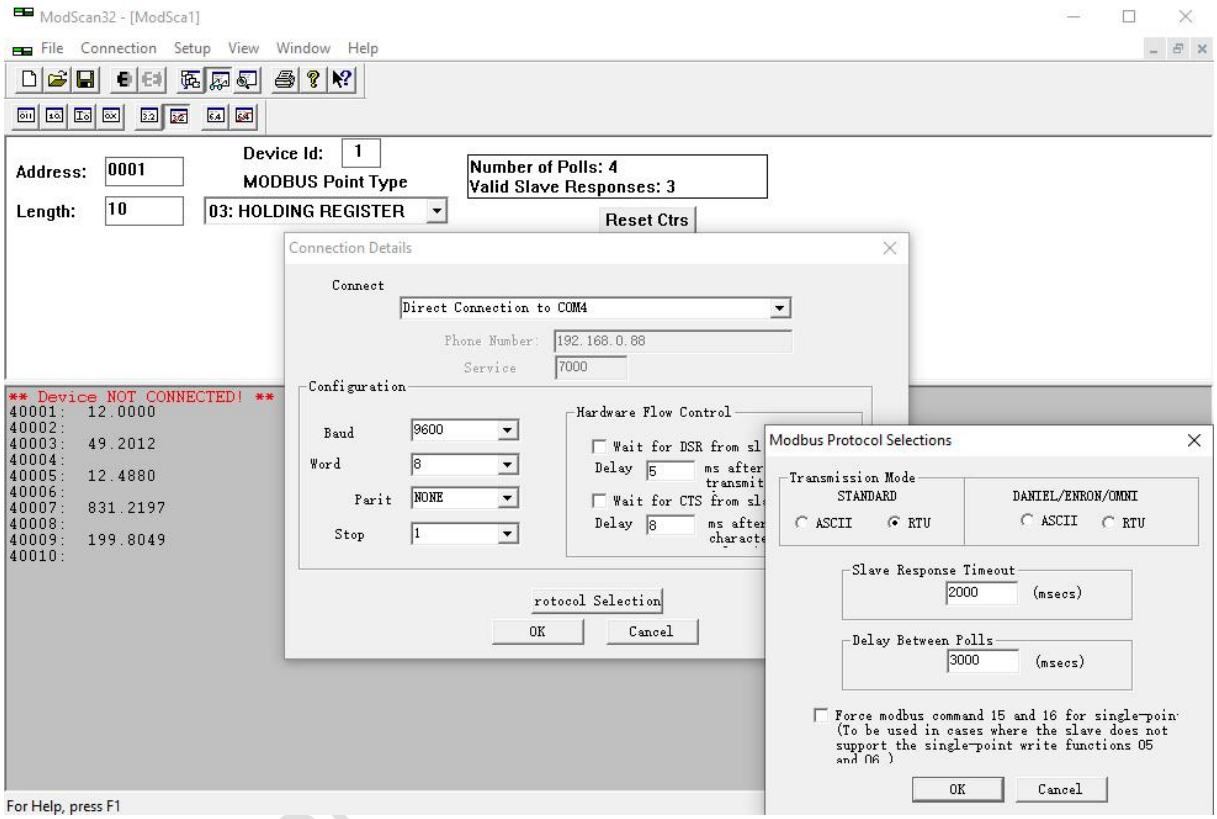
2) Select the appropriate data format in the main window of the modscan32 software, enter the correct parameter information, and then click the "Connect" button to read the instrument data information as below,

Address——MODBUS data starting register address

Device Id——MODBUS slave address

Length——Read data length

MODBUS Point Type——Function Code



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4. Data register address

Factory default parameters: station address 001, baud rate 9600,parity bit None, data bit 8, stop bit 1, and function code 03 is used when reading data.

Module working mode	HART Instrument Number	Data name	Data address	Data Types	Data Format (default)
MODBUS single instrument working mode	0	Current value	40001 40002	IEE754	4321
		Main variable 1	40003 40004	IEE754	4321
		Variable 2	40005 40006	IEE754	4321
		Variable 3	40007 40008	IEE754	4321
		Variable 4	40009 40010	IEE754	4321
MODBUS multiple instrument working mode	1	Current value	40011 40012	IEE754	4321
		Main variable 1	40013 40014	IEE754	4321
		Variable 2	40015 40016	IEE754	4321
		Variable 3	40017 40018	IEE754	4321
		Variable 4	40019 40020	IEE754	4321
	2	Current value	40021 40022	IEE754	4321
		Main variable 1	40023 40024	IEE754	4321
		Variable 2	40025 40026	IEE754	4321
		Variable 3	40027 40028	IEE754	4321
		Variable 4	40029 40030	IEE754	4321
	3	Current value	40031 40032	IEE754	4321
		Main variable 1	40033 40034	IEE754	4321
		Variable 2	40035 40036	IEE754	4321
		Variable 3	40037 40038	IEE754	4321
		Variable 4	40039 40040	IEE754	4321
	4	Current value	40041 40042	IEE754	4321
		Main variable 1	40043 40044	IEE754	4321
		Variable 2	40045 40046	IEE754	4321
		Variable 3	40047 40048	IEE754	4321
		Variable 4	40049 40050	IEE754	4321

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5. Service and warranty

SM100-A(B) HART Smart Converter Quality Assurance

1. This product has a three-year warranty under normal use.

2. During the warranty period, our company will provide you with warranty services for any failure caused by product technical reasons.

3. The following situations are not covered by free warranty:

① Products that have been disassembled, assembled, or repaired without the consent of our company;

② Damage caused by external forces and other natural disasters.

4. If the user believes that our product needs repair, please call our company to contact us in time. We will repair it and send it back as soon as possible.

5. This warranty liability is limited to product failure repairs during the warranty period, and no other liability is assumed.

SM100-A(B) Precautions for using HART intelligent converter

1. Please read the instructions carefully before use.

2. Confirm whether the power supply meets the working requirements of the equipment.

3. Confirm whether the distance between the HART instrument and the device greater than 200m, If it exceeds this range, please use thicker wires and add shielded cables. When using shielded wires, please ground one end.

4. Confirm whether there is a large inductive load nearby, This will cause serious interference to the signal and appropriate shielding measures should be taken.

After-sales service hotline: 86-573-82623038

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