

SM100-T-B Multivariable Current Output

Operating instructions for the converter



Jiaxing Songmao Electronics Co., Ltd.

<http://www.smmeter.com>

E-mail:sales@smdznet.com

Table of contents

1. Introduction to SM100-T-B Converter	- 3 -
1.1 Product introduction	- 3 -
1.2 Product performance	- 3 -
1.3 Main parameters	- 3 -
2. SM100-T-B converter physical drawing and indicator light function	- 4 -
2.1 Physical drawings	- 4 -
2.2 Wiring diagram	- 4 -
2.2.1 Wiring diagram of two-wire instrument	- 4 -
2.2.2 Four-wire instrument wiring diagram	- 5 -
2.3 Port introduction	- 5 -
3. Function introduction and operation steps of configuration software	- 6 -
3.1 Communication connection	- 6 -
3.2 System parameters	- 7 -
3.3 Transparent way of working	- 8 -
3.4 MODBUS parameter configuration	- 9 -
3.5 Monitoring instructions	- 11 -
3.6 Mod Scan32 Communication Test	- 12 -
4. Data register address	- 13 -
5. Service and warranty	- 14 -

Disclaimer:

Copyright © 2025 SMDZNET. All Rights Reserved.

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 However, content may become outdated or invalid due to product/software upgrades.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](tel:86-573-82623038) for advice and answers.

Copyright notice:

All rights to this document are exclusively owned by our company. No individual or entity may disclose any content to third parties in any form (including transcription, photocopying, translation, email, etc.) without prior written consent.

1. Introduction to SM100-T-B Converter

1.1 Product Introduction

SM100-T-B multi-variable current output converter is a high-tech product integrating HART protocol, RS485 communication and multi-variable current output. It is composed of interface chip, hardware watchdog circuit and embedded HART modem chip. It has the characteristics of stable performance and high cost performance.

The SM100-T-B multivariable current output converter is structurally designed to fully comply with industry standards, with special design in terms of temperature range, vibration, electromagnetic compatibility and interface diversity, ensuring stable operation in harsh environments and providing high quality assurance for your equipment.

1.2 Product Performance

- Equipped with RS485 communication interface, parameters can be configured.
- The industrial general shell is adopted, which is convenient for installation and commissioning.
- With special configuration software, it can communicate with HART protocol intelligent instrument.
- With 3 current outputs, it can transmit current to HART variables.
- Support standard MODBUS protocol.
- Support single HART protocol intelligent instrument.
- Support a variety of special HART protocol intelligent instruments.
- With power-off memory function, parameters do not need to be reset after power off.

1.3 Main Parameters

- Installation dimension: L82 mm × W69 mm × H113 mm.
- Working temperature: -20 °C ~ + 80 °C.
- Storage temperature: -25 °C ~ + 80 °C.
- Power input voltage: DC 12 ~ 24V.
- HART protocol sampling resistor: 250Ω.

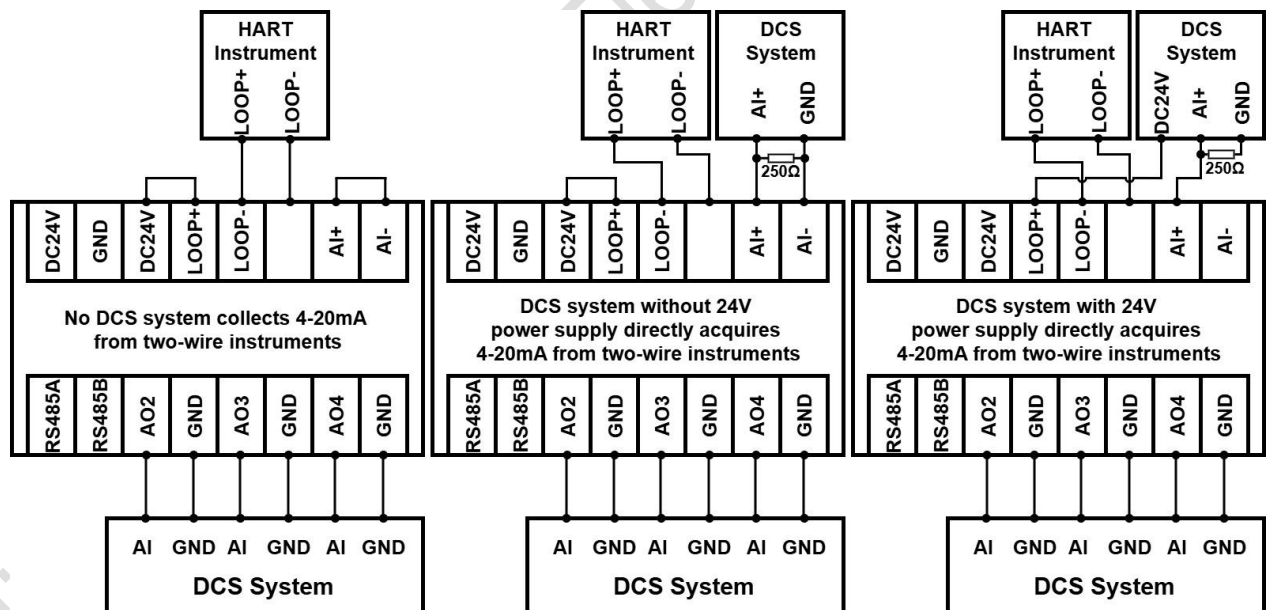
2. SM100-T-B Converter Physical Drawing and Indicator Light Function

2.1 Physical Drawings

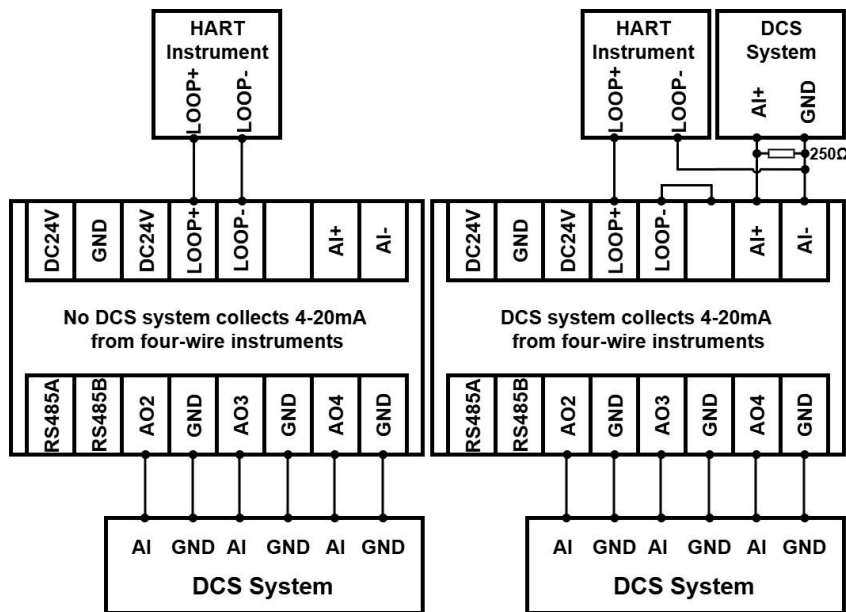


2.2 Wiring Diagram

2.2.1 Wiring Diagram of Two-Wire Instrument



2.2.2 Four-Wire Instrument Wiring Diagram



2.3 Port Introduction

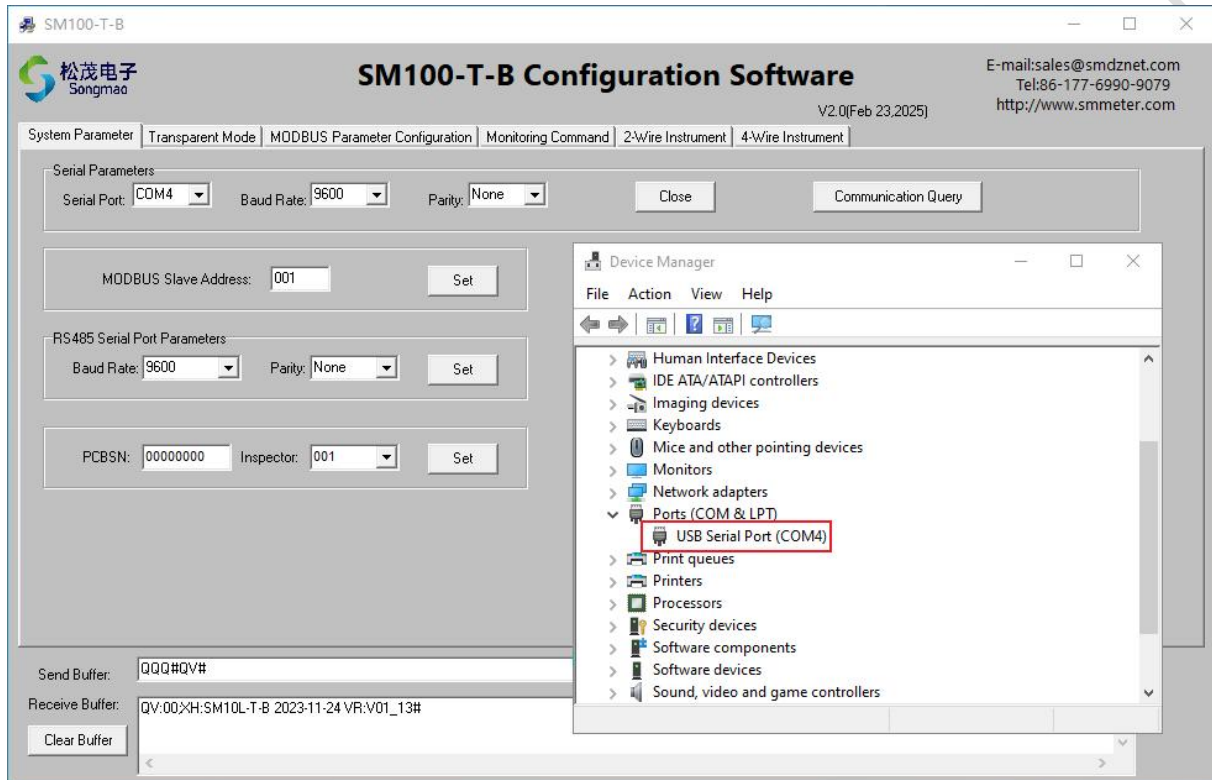
Port name	DC 24V	GND	DC 24V	LOOP+	LOOP-		IA+	IA-
Function/access device	Power source		HART instrument				DCS system	
Port name	RS485A	RS485B	AO2	GND	AO3	GND	AO4	GND
Function/access device	RS485 communication		Variable 2 output		Variable 3 output		Variable 4 output	

- DC 24V, GND: DC power supply, the positive and negative poles (+,-) of the power line are connected to the corresponding (24V, GND) terminals respectively.
- DC 24V, LOOP +, LOOP-: connect HART instrument and read HART instrument data.
- IA +, IA-: connect DCS system and collect the main variable current signal of HART instrument.
- RS485A, RS485B: RS485 communication, refer to the connection diagram to connect the instrument and equipment to realize the data transmission between the converter and the equipment.
- AO2, GND ~ AO4, GND: 3 channels of 4 ~ 20 mA current output, with sampling resistance of 250Ω.

3. Function Introduction and Operation Steps of Configuration Software

3.1 Communication Connection

- 1) Connect the power supply, RS485 communication line and HART instrument according to the introduction of the port in the above section.
- 2) Open the configuration debugging software, select the correct serial port number and open the serial port.
- 3) Click "Communication Query" to query the version number of the collector in the "Receive Buffer" below, and the connection is successful.



3.2 System Parameter

This interface is used to set and query basic parameters such as communication parameters, module working mode, MODBUS slave address, MODBUS adjacent instruction interval, etc.

- 1) Communication query: You can query the version number of the converter.
- 2) MODBUS slave address: Enter the 3-digit slave address and click "Set".
- 3) RS485 serial port parameters: the user selects the baud rate and check bit (default baud rate 9600, check bit None) for RS485 interface communication according to the actual situation, and then click "Set". After the setting is successful, the configuration software automatically closes the serial port. At this time, it is necessary to re-select the set baud rate and check bit, and open the serial port for normal communication.
- 4) Module operation mode:
 - ① Transparent mode: when the working mode is set, the converter has no current and MODBUS protocol data output. The converter uses HART protocol communication and can read the basic information and dynamic variable data of HART instrument in the "transparent working mode" interface.
 - ② Single Meter MODBUS Mode: when the working mode is set, the converter can perform protocol conversion on the collected HART instrument data and output standard MODBUS protocol data.
 - ③ Monitoring to MODBUS RTU (custom): When other devices collect HART instrument data at the same time, the working mode of the module is set to "Monitor to MODBUS RTU (custom)" to meet the condition that two devices collect HART instrument data at the same time.
 - ④ Monitoring data output: When other equipment collects HART instrument data at the same time, the working mode of the module is set as "monitoring data output", which can monitor the command receiving and sending of other equipment and HART instrument communication, and the customer can set the converter monitoring command parameters according to the monitored commands.
- 5) MODBUS polling interval: It is the time period for the converter to communicate with the HART instrument. Enter the interval time and click "Set". Interval time = input time * 0.01S.
- 6) RS485 response time: set the RS485 interface data delay return time according to the back-end access system.
- 7) System parameters: read communication parameters, module working mode, MODBUS slave address, MODBUS adjacent command interval and other parameter information.
- 8) Parameter initialization: The parameters of the converter can be restored to the initialized state.

SM100-T-B


松茂电子
Songmao

SM100-T-B Configuration Software
V2.0(Feb 23,2025)

E-mail:sales@smdznet.com
Tel:86-177-6990-9079
http://www.smmeter.com

System Parameter
Transparent Mode
MODBUS Parameter Configuration
Monitoring Command
2-Wire Instrument
4-Wire Instrument

Serial Parameters
Serial Port: COM4 Baud Rate: 9600 Parity: None Close Communication Query

MODBUS Slave Address: 001 Set Module Operation Mode: 0_Transparent Mode Set

RS485 Serial Port Parameters
Baud Rate: 9600 Parity: None Set MODBUS Polling Interval: 010 *10 ms Set

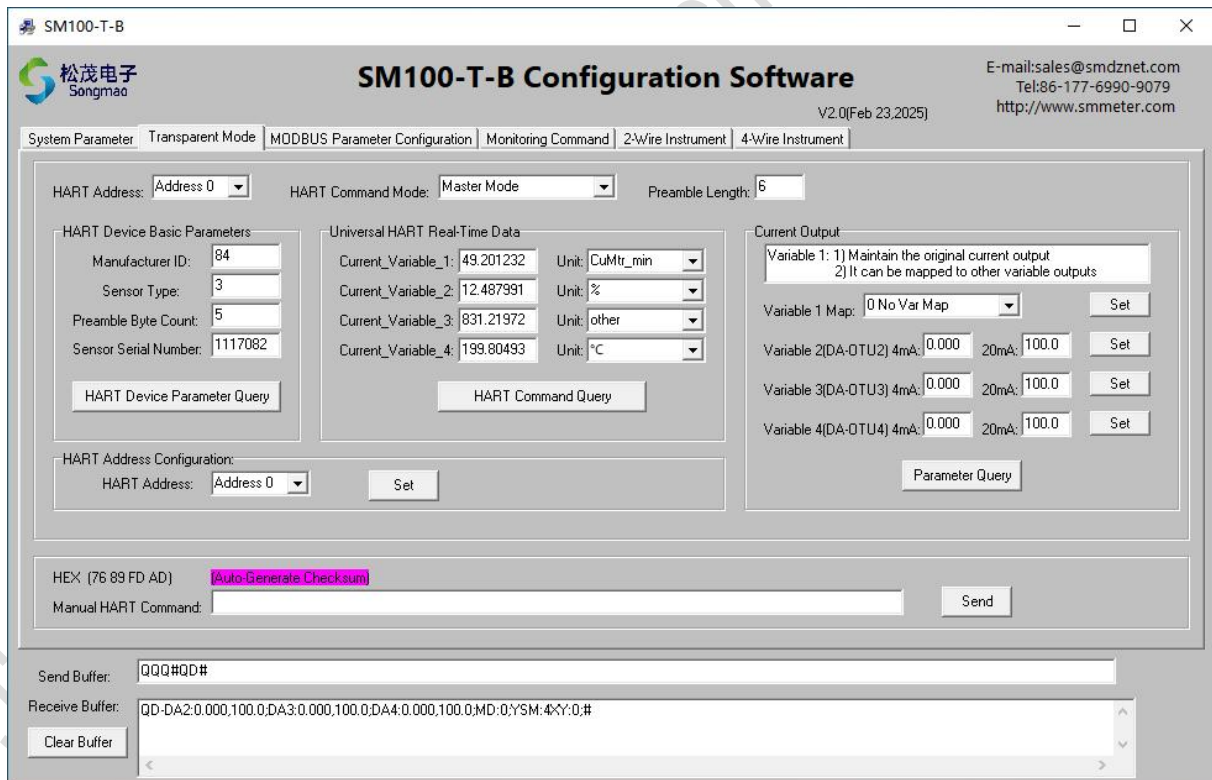
PCBSN: 00000000 Inspector: 001 Set RS485 Response Time: 3 300ms Set

Parameter Initialization System Parameters

Send Buffer: QQQ#QX#
Receive Buffer: QX-BA2:30;ADR:001;MD:1;JTM:010;CT:030;RG:1#
Clear Buffer

3.3 Transparent Mode

- 1) Before entering the "Transparent mode" interface, first set the module working mode to "Transparent mode".
- 2) Configure HART instrument parameters:
 - ① HART address: refers to the address of HART instrument.
 - ② HART command mode: main mode and auxiliary main mode are available for selection, which can be selected according to the requirements of the instrument.
 - ③ Preamble length: the 'FF' quantity of the leader of the HART instruction, which is generally 6 bytes.
- 3) HART device basic parameters: basic parameter information of HART instrument can be queried.
- 4) Universal HART real-time data: real-time data of general HART instruments can be read, but real-time data of other customized instruments cannot be displayed.
- 5) HART address configuration: when the connected HART instrument address is not address 0, the HART address shall be set as address 0.
- 6) Manual HART command: read the real-time data of HART instrument by manually inputting HART command.
- 7) Parameter query: You can query the response of variable 1 and the configuration of the range of variable 2 to variable 4.
 - ① Variable 1: Variable 1 is the original current output. When the variable 1 is selected, the current will be output at the same time at the output end of the selected variable, and the output current value will be converted according to the range of the variable.
 - ② Variable 2 ~ Variable 4: configure respective range according to the actual situation of each variable. The current output from the output terminal AO will vary depending on the range of the variable setting.



3.4 MODBUS Parameter Configuration

1) When entering the "MODBUS parameter configuration" interface to read the data information, first set the module working mode in the "system parameter" interface to "Single meter MODBUS mode", and then click "MODBUS parameter query" to read the parameter information in this interface.

2) MODBUS parameter query: parameter information such as instrument enable, instrument type and user-defined command on this interface can be read.

3) Configure HART instrument parameters

① Meter ID: select "0".

② Enable: connect the HART instrument and turn on the enable, i.e. select "Open".

③ HART mode: main equipment and auxiliary main equipment are available for selection, which can be selected according to the requirements of the instrument.

④ Meter type: select according to the actually connected instrument.

Customized instrument-the instrument connected is not commonly used HART protocol instrument, which may be old HART protocol instrument or special HART command protocol instrument. The user can define the resolution mode according to the HART command, and can directly convert the MODBUS _ RTU protocol without upgrading the program.

General Purpose Instruments-Suitable for most HART protocol instruments.

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

⑤ Preamble length: the 'FF' quantity of the leader of the HART instruction.

⑥ Buffer clear time: input 3-digit clear cache time (unit: S).

4) Custom HART command parsing: When the instrument type is "Custom Instrument", the user can enable the command and read the HART instrument data by inputting the command code.

5) Custom HART data parsing format: set the read instrument command number, data start address, data length and address bit. 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 common values are 4, 6 and 8. The user can choose according to the actual situation.

6) Data analysis format: there are four types, and the user needs to configure the corresponding analysis format according to the format of instrument data output.

0 IEEE754 (FF4 FF3 FF2 FF1)-Floating-point, high-order inverted (default format)

1 IEEE754 (FF2 FF1 FF4 FF3)-Floating-point, high-order

2 Uint32 (FF4 FF3 FF2 FF1)-unsigned long, high-order inverted

3 Uint32 (FF2 FF1 FF4 FF3)-Unsigned long, high order

7) IEEE754 calculation: Input the received data instruction code and click "Calculation" to convert the hexadecimal data format into the decimal data format, which is convenient for the approval of the received data.

8) Variable 1 ~ variable 4 coefficient: when the read variable unit is inconsistent with the unit displayed on the HART instrument header, the corresponding coefficient can be set for conversion between units.

9) MODBUS communication test: input the correct MODBUS slave address, initial register address of read data and data length, and then click "MODBUS communication test" to read MODBUS data information.

10) Application example: change variable 1 to variable 2, and the range is 0 ~ 1000; Set the range of the variable 3 from 200 to 1000.

Parameter setting: ① In the "Transparent mode" interface, the module working mode is set as the transparent working mode.

② Click "HART Command Query" to read the value of each variable, where the value of variable 1 is 49. 201232, and the value of variable 3 is 831. 21972.

- ③ Input the range of variable 2 and variable 3 respectively, variable 2 is 0 ~ 100, variable 3 is 200 ~ 1000, and then click "Set" in turn.
- ④ Set the working mode of the module to MODBUS single instrument working mode, and then click MODBUS communication test on the "MODBUS parameter configuration" interface to read MODBUS data.
- ⑤ Connect a 250Ω resistor in parallel with the output terminals AO2 and GND of variable 2 and the output terminals AO3 and GND of variable 3 respectively, and then measure the voltage values at both ends of the resistor with a multimeter. The measured voltage value of variable 2 is 2.97 V, and the measured voltage value of variable 3 is 4.16 V.

Calculation formula: ① Define the real-time data of HART instrument as X_{ACT} , the current output has an upper range

of X_{UP} . The lower limit is X_{DOWN} , then

The output current value is

$$A_{TH} = \frac{X_{ACT} - X_{DOWN}}{X_{UP} - X_{DOWN}} \times (20 - 4) \text{mA} + 4 \text{mA}$$

Output voltage value is (load 250 Ω)

$$V_{TH} = \left[\frac{X_{ACT} - X_{DOWN}}{X_{UP} - X_{DOWN}} \times (20 - 4) \text{mA} + 4 \text{mA} \right] \times 250 \Omega$$

- ② Actual current value output by converter AO2 and GND port

$$A_{AO2} \approx A_{TH} = \frac{49.201232 - 0}{100 - 0} \times (20 - 4) \text{mA} + 4 \text{mA} = 11.87 \text{mA}$$

Actual voltage value output from converter AO2 and GND port

$$V_{AO2} \approx V_{TH} = \left[\frac{49.201232 - 0}{100 - 0} \times (20 - 4) \text{mA} + 4 \text{mA} \right] \times 250 \Omega = 2.97 \text{V}$$

- ③ Actual current value output by converter AO3 and GND port

$$A_{AO3} \approx A_{TH} = \frac{831.21972 - 200}{1000 - 200} \times (20 - 4) \text{mA} + 4 \text{mA} = 16.62 \text{mA}$$

Actual voltage value output from converter AO3 and GND port

$$V_{AO3} \approx V_{TH} = \left[\frac{831.21972 - 200}{1000 - 200} \times (20 - 4) \text{mA} + 4 \text{mA} \right] \times 250 \Omega = 4.16 \text{V}$$

SM100-T-B

 **SM100-T-B Configuration Software** V2.0(Feb 23,2025) E-mail:sales@smdznet.com
Tel:86-177-6990-9079
http://www.smmeter.com

System Parameter Transparent Mode MODBUS Parameter Configuration Monitoring Command 2-Wire Instrument 4-Wire Instrument

Meter ID: 0 Enable: Close HART Mode: Secondary Master Device Meter Type: 0 Custom Meter Preamble Length: 4 Buffer Clear Time: 060 s Set

Custom HART Command Parsing
Read Meter Command 1: 0 Close Set
Read Meter Command 2: 0 Close Set

Custom HART Data Parsing Format

Variable	Read Command Number	Start Addr	Data Length	Address Bits
Variable_1:	0 Not Analytic	00	4-Bit	8
Variable_2:	0 Not Analytic	00	4-Bit	
Variable_3:	0 Not Analytic	00	4-Bit	
Variable_4:	0 Not Analytic	00	4-Bit	

Set

IEE754 Calculation
Data Format HEX(FF FF FF FF):
Converted Value:
Calculation

Variable 1 Coefficient:
0 Close Coefficient: 1.000 Set

Variable2coefficient Variable3coefficient Variable4coefficient
1.000 1.000 1.000 Set

Current_1(RTU_ADR) 40003 Variable_2(RTU_ADR) 40005 Variable_3(RTU_ADR) 40007 Variable_4(RTU_ADR) 40009
0 IEE754 (FF4 FF3 FF2 FF1) 0 IEE754 (FF4 FF3 FF2 FF1) 0 IEE754 (FF4 FF3 FF2 FF1) 0 IEE754 (FF4 FF3 FF2 FF1) Set

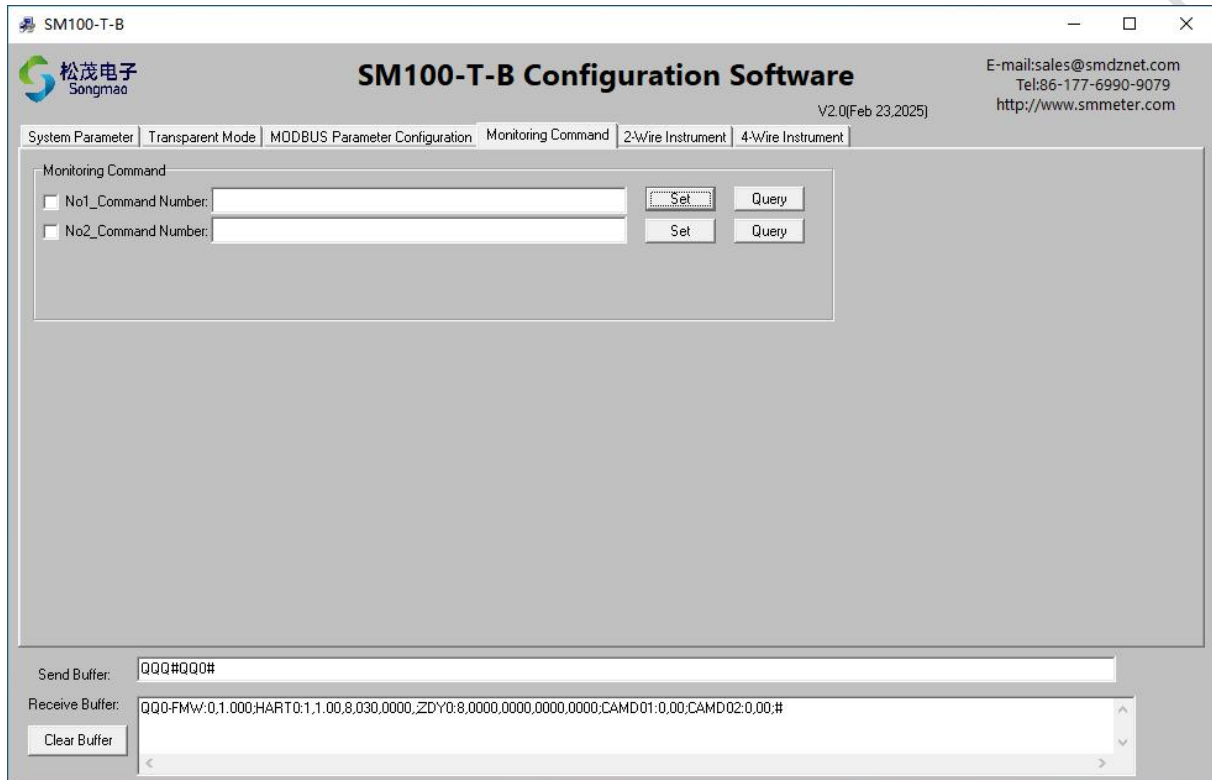
Modbus Communication Test
Modbus Slave Address: 001 Modbus Data Start Address: 00 Read Data Length: 10 MODBUS Comm Test MODBUS Parameter Query

Send Buffer: QQQ#QQQ#
Receive Buffer: QQQ-FMW:0.1.000;HART0:1.1.00.8.030.0000,ZDY0:8.0000.0000.0000.0000;CAMD01:0.00;CAMD02:0.00;#
Clear Buffer

3.5 Monitoring Command

When other devices collect HART instrument data at the same time, the working mode of the module shall be set as "Monitoring to MODBUS RTU (user-defined)" to meet the condition that two devices collect HART instrument data at the same time.

The converter can set two monitoring commands. When the set monitoring command appears during the communication between other equipment and HART instrument, the converter will convert the intercepted data into standard MODBUS protocol output.



3.6 Mod Scan32 Communication Test

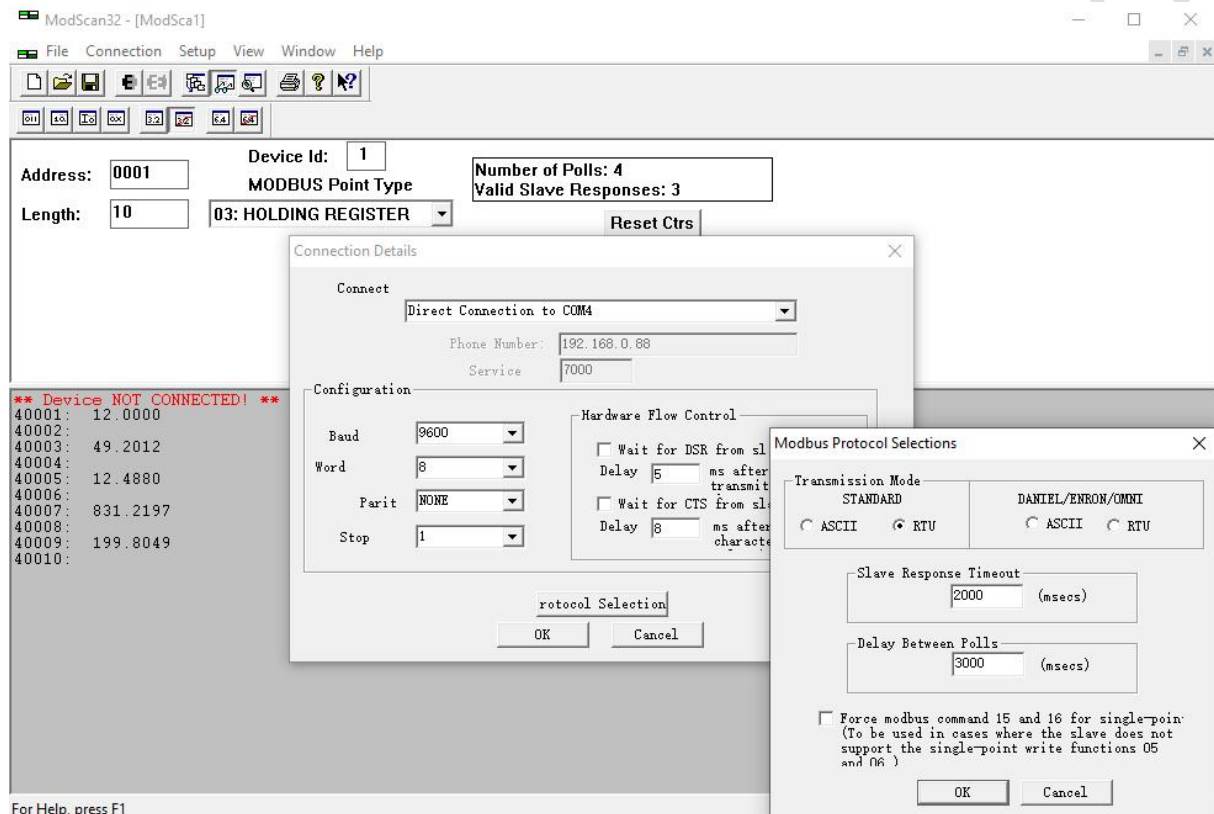
- 1) Close the serial port of the configuration software, open the Modscan32 software, click "connection", configure the appropriate parameters in the pop-up dialog box according to the arrow in the figure below, and then click OK.
- 2) Select the appropriate data format in the main window of modscan32 software, input the correct parameter information, and then click the "Connect" button to read the instrument data information.

Address-Address of MODBUS data start register

Device Id-MODBUS slave address

Length-read data length

MODBUS Point Type-Function Code



4. Data Register Address

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

Data name	Data address	Data type	Data format (default)
Current value	40001 40002	IEE754	4321
Primary variable 1	40003 40004	IEE754	4321
Variable 2	40005 40006	IEE754	4321
Variable 3	40007 40008	IEE754	4321
Variable 4	40009 40010	IEE754	4321

5. Service and Warranty

1. This product is guaranteed for three years under normal use conditions.
2. During the warranty period, our company will provide you with warranty service for any failure caused by product technology.
3. The following circumstances are not within the scope of free warranty:
 - ① Products that are disassembled and repaired without the consent of the Company;
 - ② Damage caused by external force and other natural disasters.
4. If the user thinks that the product of our company needs to be repaired, please call our company to contact us in time, and we will repair and send it back as soon as possible.
5. The warranty liability is limited to the fault maintenance of the product during the warranty period, and does not assume other responsibilities.

After-sales service hotline: 86-573-82623038

Email: service@smdznet.com