

SM100-T-B-8 Multivariable Current Output

Operating instructions for the converter



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Table of contents

1. Introduction of SM100-T-B-8 converter	- 3 -
1.1 Product introduction	- 3 -
1.2 Product performance	- 3 -
1.3 Main parameters	- 3 -
2. Physical drawing of SM100-T-B-8 converter 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 -
2.4 Description of indicator light	- 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	- 9 -
3.4 MODBUS parameter configuration	- 10 -
4. MODBUS communication test	- 12 -
4.1 Data register address table	- 12 -
4.2 Data meaning of write command	- 12 -
4.3 Examples of reading real-time data and converter parameters	- 13 -
4.3.1 Read real-time data of HART instrument	- 13 -
4.3.2 Reading Cumulative Output Value	- 13 -
4.3.3 Analog HART instrument data	- 14 -
4.3.4 Analog Cumulative Output Value	- 14 -
4.3.5 Read Cumulative Output Option	- 15 -
4.3.6 Setting Cumulative Output Options	- 15 -
4.3.7 Working mode of reading module	- 16 -
4.3.8 Set the working mode of the module	- 16 -
4.3.9 Read the upper and lower limits of the range	- 17 -
4.3.10 Set the upper and lower limits of the range	- 17 -
5. Service and warranty	- 18 -

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 However, content may become outdated or invalid due to product/software upgrades.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

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1. Introduction of SM100-T-B-8 Converter

1.1 Product Introduction

SM100-T-B-8 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-8 multivariable current output converter is structurally designed to fully comply with industrial standards. It is specially designed in terms of temperature range, vibration, electromagnetic compatibility and interface diversity to ensure stable operation in harsh environments and provide high quality assurance for your equipment.

1.2 Product Performance

- USB communication interface, parameters can be configured.
- With one RS485 interface, supporting standard MODBUS _ RTU communication protocol.
- With special configuration software, it can communicate with HART protocol intelligent instrument.
- With 8 current outputs, it can transmit and output current to HART variables.
- 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

- Mounting dimensions: 139 mm L × 104 mm W × 35 mm H.
- Working temperature: -20 °C ~ + 80 °C.
- Storage temperature: -25 °C ~ + 80 °C.
- Power input voltage: DC 12 ~ 24V.
- HART protocol sampling resistor: 250Ω.

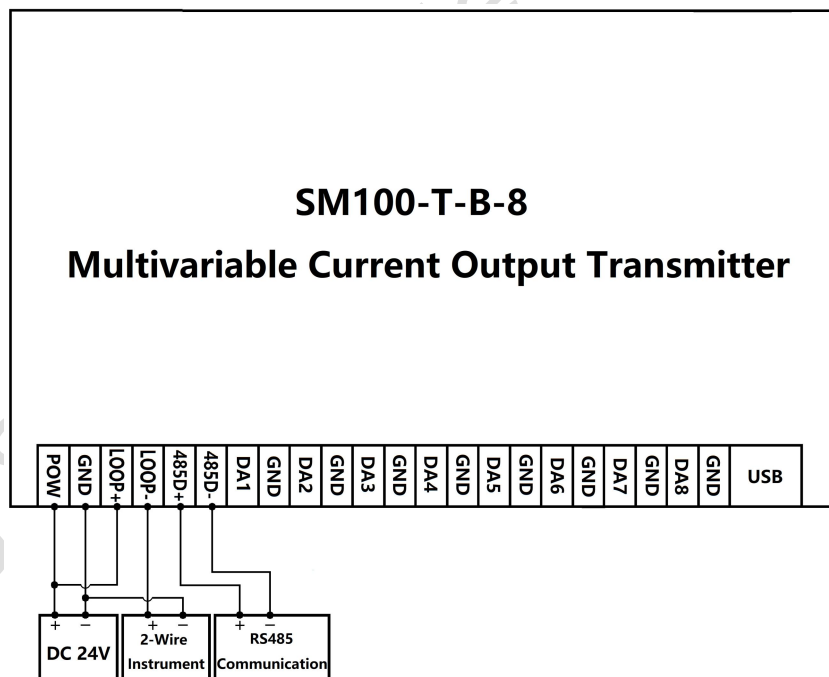
2. Physical Drawing of SM100-T-B-8 Converter and Indicator Light Function

2.1 Physical Drawings

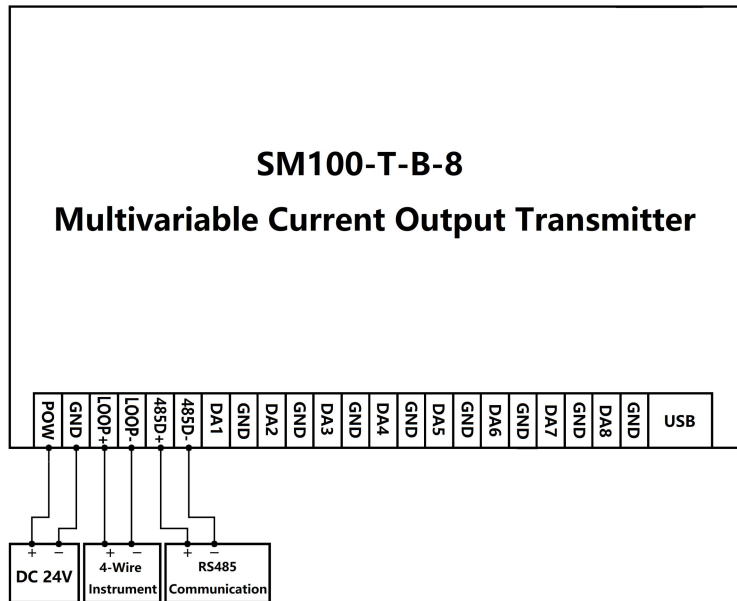


2.2 Wiring Diagram

2.2.1 Wiring Diagram of Two-Wire Instrument



2.2.2 Four-Wire Instrument Wiring Diagram



2.3 Port Introduction

Port name	POW	GND	LOOP+	LOOP-	485D+	485D-	DA1	GND	DA2	GND	DA3	GND
Function/access device	Power source		HART instrument		RS485 communication		Current 1		Current 2		Current 3	
Port name	DA4	GND	DA5	GND	DA6	GND	DA7	GND	DA8	GND	USB	
Function/access device	Current 4		Current 5		Current 6		Current 7		Current 8		USB communication	

- POW, GND: DC power supply, the positive and negative poles (+,-) of the power line are connected to the corresponding (POW, GND) terminals respectively.
- LOOP +, LOOP-: connect HART instrument and read HART instrument data.
- 485D +, 485D-: RS485 communication interface, read HART instrument real-time data, current output value, range and other parameters.
- DA1, GND ~ DA8, GND: 8-channel 4 ~ 20mA current output, with sampling resistance of 250Ω.

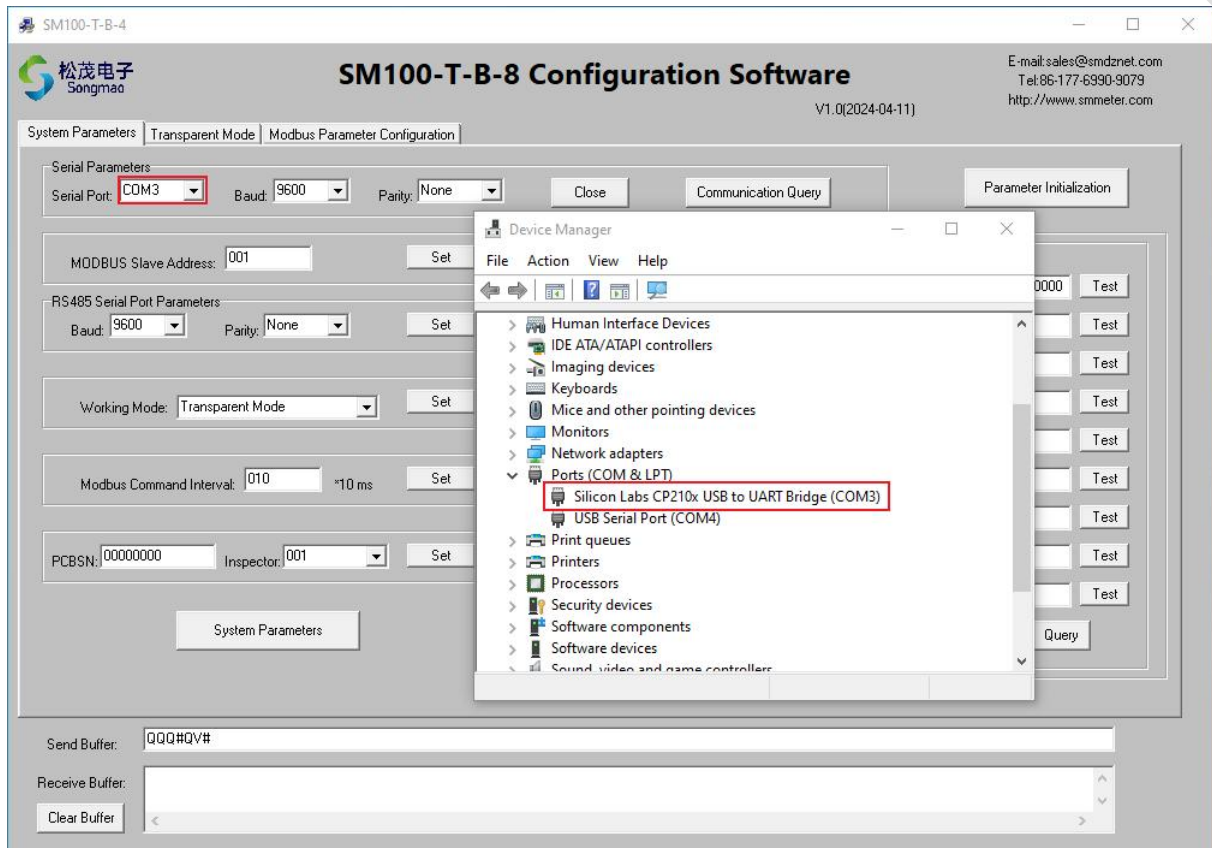
2.4 Description of Indicator Light

- POW: Power indicator. The power indicator is always on when the converter works normally.
- HART: HART interface indicator. This indicator flashes when the converter is communicating with the HART instrument.
- RS485: RS485 communication interface indicator, which flashes when RS485 interface receives and sends data.
- USB: USB port communication indicator, the indicator flashes when reading and configuring the converter parameters.

3. Function Introduction and Operation Steps of Configuration Software

3.1 Communication Connection

- 1) Connect the power supply and USB serial port cable according to the description of the port in the previous section.
- 2) Open the configuration debugging software, select the correct port number and open the serial port.
- 3) Click "Communication Query" to query the version number of this converter in the "Receiving Buffer" below. At this time, the connection is successful.



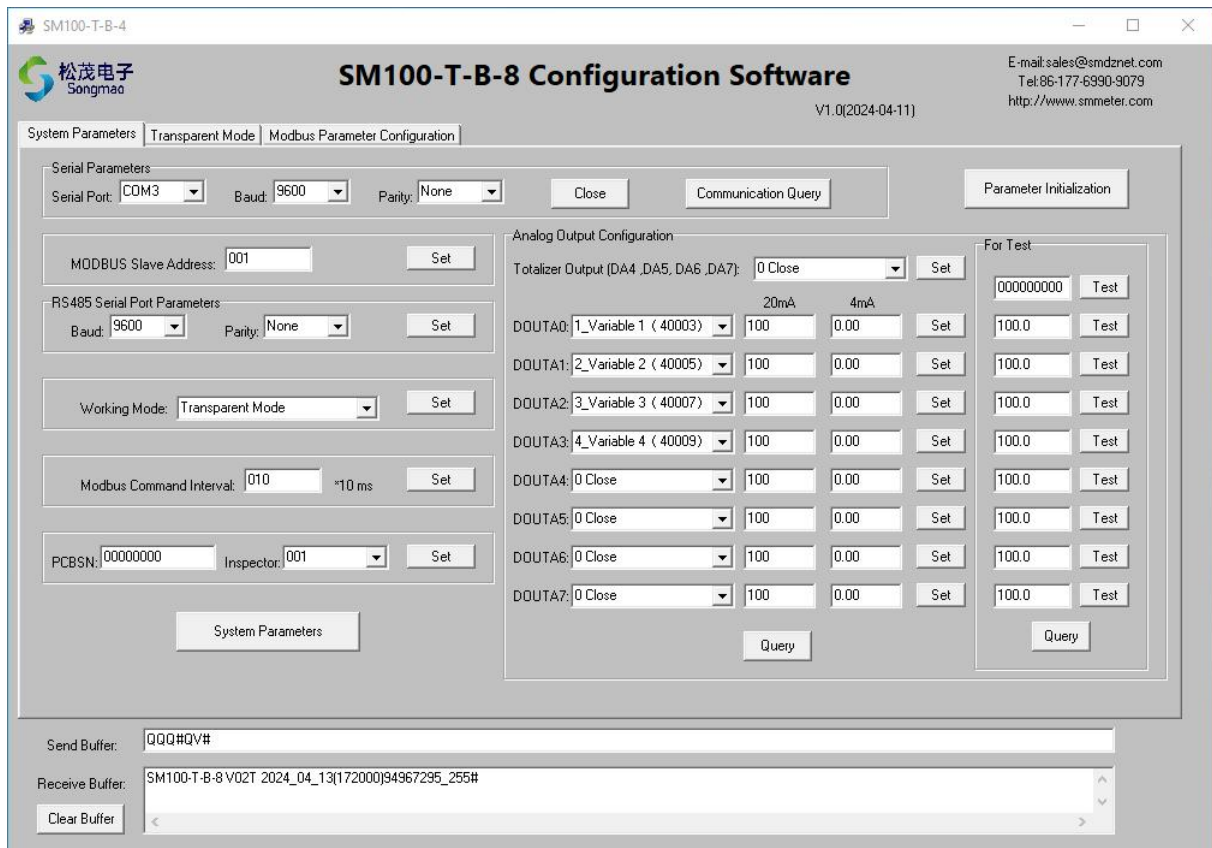
3.2 System Parameters

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

- 1) Communication query: You can query the version number of the converter.
- 2) Parameter initialization: The parameters of the converter can be restored to the initialized state.
- 3) MODBUS slave address: Enter the 3-digit slave address and click "Set".
- 4) 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 connected upper computer system, and then clicks "Set".
- 5) Working 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 Operation 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 Test current output mode: When this mode is set, the current output of each DA channel can be tested by inputting the test value.
- 6) MODBUS command 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 * 0.1S.
- 7) Analog output configuration
 - ① Cumulative output: corresponding variable can be selected as cumulative current output. When the variable is set for the cumulative quantity output, the current output by the DA5 ~ DA8 channels respectively corresponds to the conversion value of the 4 bytes of the cumulative quantity (the cumulative quantity represents FF, and each channel is equally divided by FF, i.e. 255, that is, each channel is calculated by the range 0-255).
 For example, if the current value of the cumulative amount is the 2113664, that is, 00 20 40 80 (Hex), then
 The output value of DA5 is 00 (Hex) = 0 (Dec), and the output current is 4mA;
 The output value of DA6 is 20 (Hex) = 32 (Dec), and the output current is $32/255 \times 16 + 4 = 6\text{mA}$;
 The output value of DA7 is 40 (Hex) = 64 (Dec), and the output current is $64/255 \times 16 + 4 = 8\text{mA}$;
 The output value of DA8 is 80 (Hex) = 128 (Dec), and the output current is $128/255 \times 16 + 4 = 12\text{mA}$.
 Cumulative Current (Dec): 2113664.
 ↓
 Cumulative Current (Hex): 00 20 40 80
 ↓ ↓ ↓ ↓
 (Dec) : 32 64 128 192
 ↓ ↓ ↓ ↓
 Corresponding current: 4mA 6mA 8mA 12mA
 ↓ ↓ ↓ ↓
 Corresponding channel: DA5 DA6 DA7 DA8
 - ② DOUTA1 ~ DOUTA8: The variables corresponding to 8 DA current output channels and the upper and lower limits of their ranges can be configured respectively. (Note: when the cumulative output is configured with variables, the DOUTA5 ~ DOUTA8 channels are used to represent the current output of the cumulative, so the parameters cannot be configured.) Configure the respective range according to the actual situation of each variable. The current output by the output terminal DA varies with the range of the variable setting.
- 8) For test: when the working mode of the module is set as "Test current output mode", input the current output value in the input

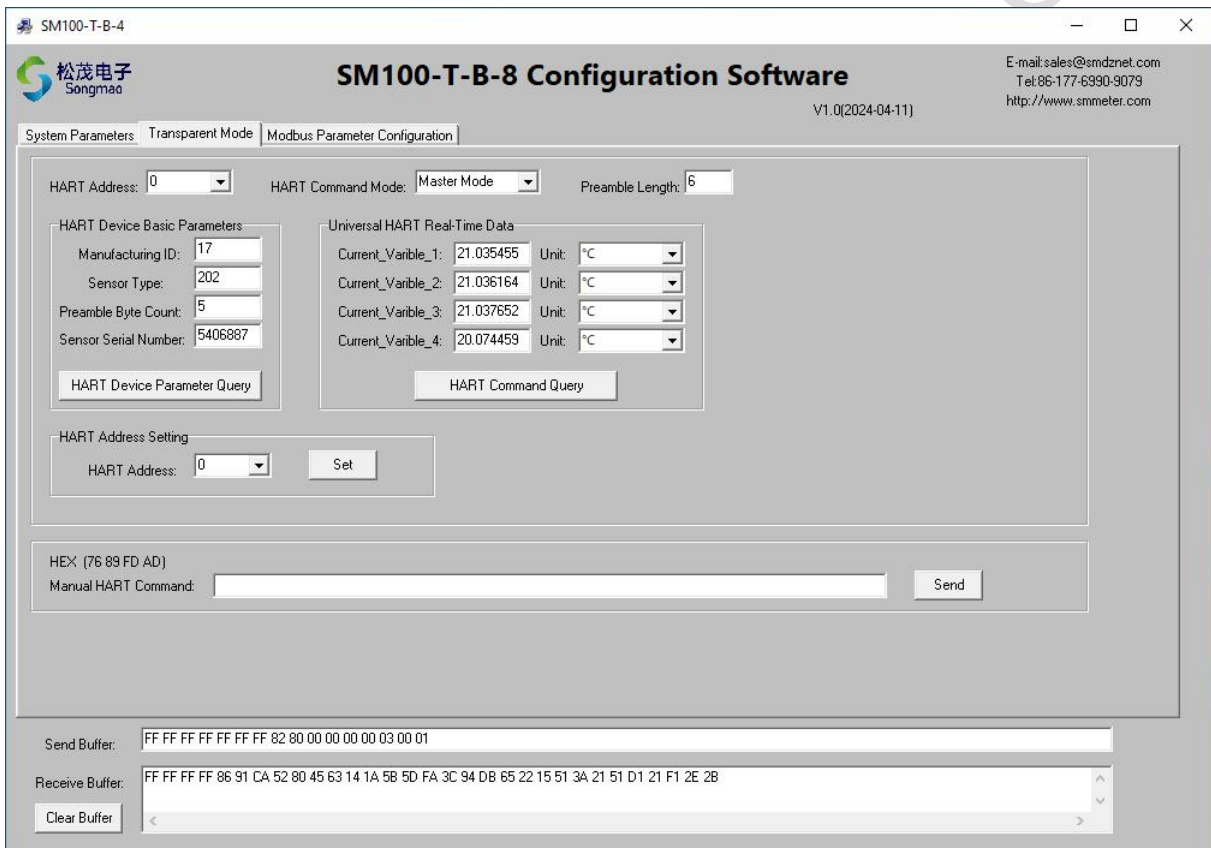
box, click "Test", and the converter will output the corresponding current signal according to the set current value.

- 9) System parameters: read communication parameters, module working mode, MODBUS adjacent command interval, MODBUS slave address and other parameter information.



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 parameter query: basic parameter information of HART instrument can be queried.
- 4) HART command query: real-time data of general HART instruments can be read, but real-time data of other customized instruments cannot be displayed.
- 5) HART address setting: HART address of HART instrument can be set.
- 6) Manual HART command: read the real-time data of HART instrument by manually inputting HART command.



The screenshot shows the SM100-T-B-8 Configuration Software interface. The title bar indicates the window is titled "SM100-T-B-4". The software logo and name "SM100-T-B-8 Configuration Software" are at the top. Contact information for Songmao Electronics is provided on the right: E-mail: sales@smdznet.com, Tel: 86-177-6990-9079, and http://www.smmeter.com. The version is V1.0(2024-04-11).

The interface has three tabs: "System Parameters", "Transparent Mode" (selected), and "Modbus Parameter Configuration".

Transparent Mode Section:

- HART Address:** 0 (dropdown)
- HART Command Mode:** Master Mode (dropdown)
- Preamble Length:** 6 (input)

HART Device Basic Parameters:

- Manufacturing ID: 17 (input)
- Sensor Type: 202 (input)
- Preamble Byte Count: 5 (input)
- Sensor Serial Number: 5406887 (input)
- HART Device Parameter Query** (button)

Universal HART Real-Time Data:

- Current_Varible_1: 21.035455 Unit: °C (dropdown)
- Current_Varible_2: 21.036164 Unit: °C (dropdown)
- Current_Varible_3: 21.037652 Unit: °C (dropdown)
- Current_Varible_4: 20.074459 Unit: °C (dropdown)
- HART Command Query** (button)

HART Address Setting:

- HART Address: 0 (dropdown)
- Set** (button)

Manual HART Command:

- HEX (76 89 FD AD)
- Manual HART Command: (text input)
- Send** (button)

Send Buffer: FF FF FF FF FF FF 82 80 00 00 00 00 03 00 01

Receive Buffer: FF FF FF FF 86 91 CA 52 80 45 63 14 1A 5B 5D FA 3C 94 DB 65 22 15 51 3A 21 51 D1 21 F1 2E 2B

Clear Buffer (button)

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 Operation Mode", and then click "Parameter query" and "query" to read the parameter information in this interface.

2) Custom HART commands parsing methods

- ① Meter ID: select "Device 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.

- 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).
- ⑦ Read meter command 1/2: when the instrument type is "custom instrument", the user can turn on the command enable and read HART instrument data by inputting the command code.

3) HART data parsing format: set the start address, data length, address bit and coefficient of the data read by instruction 1 and instruction 2.

- ① MODBUS format: refers to the format of the exported MODBUS data. The user shall configure the corresponding analytic format according to the format of the 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 Address: After sending the command corresponding to the command number, the HART instrument will return the corresponding data command code. For the returned instruction code, start parsing from the instruction code of the non-leader FF and count from 0. If the data to be parsed starts from the Nth byte, the data start address is set to N.
- ③ Length: byte length of the data to be parsed.
- 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.
- ⑤ Address bit: The address bit is used to calculate the data check bit to judge the correctness of the data. The default value is 8, and the common values are 4, 6 and 8, which can be set by the user according to the actual situation.

4) 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.

5) 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.

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SM100-T-B-8 Configuration Software

V1.0(2024-04-11)

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http://www.smmeter.com

System Parameters
Transparent Mode
Modbus Parameter Configuration

Custom HART Commands Parsing Methods

Meter ID: Device 0
Read Meter Command 1: 0 Close
Read Meter Command 2: 0 Close

Enabled: 0 Close
HART Mode: Master Devi
Meter Type: 0 Custom Meter

Preamble Length: 4
Buffer Clear Time: s

Set
Parameter Query

HART Data Parsing Format

	MODBUS Format	Address	Length	Address Bit	Coefficient	
Command 1 Variable 1 (40003)	0 IEE754 (FF4 FF3 FF2 FF1)	16	4 Bit	8	1.000	Set
Command 1 Variable 2 (40005)	0 IEE754 (FF4 FF3 FF2 FF1)	21	4 Bit		1.000	Set
Command 1 Variable 3 (40007)	0 IEE754 (FF4 FF3 FF2 FF1)	26	4 Bit		1.000	Set
Command 1 Variable 4 (40009)	0 IEE754 (FF4 FF3 FF2 FF1)	31	4 Bit		1.000	Set
Command 2 Variable 5 (40011)	0 IEE754 (FF4 FF3 FF2 FF1)	16	4 Bit		1.000	Set
Command 2 Variable 6 (40013)	0 IEE754 (FF4 FF3 FF2 FF1)	21	4 Bit		1.000	Set
Command 2 Variable 7 (40015)	0 IEE754 (FF4 FF3 FF2 FF1)	26	4 Bit		1.000	Set
Command 2 Variable 8 (40017)	0 IEE754 (FF4 FF3 FF2 FF1)	31	4 Bit		1.000	Set

Query

modbus Communication Test

MODBUS Slave Addr: 001
MODBUS Start Address: 00
Read Data Length: 18

MODBUS Comm Test

Send Buffer: FF FF FF FF FF FF 82 80 00 00 00 03 00 01

Receive Buffer: FF FF FF FF 86 91 CA 52 80 45 63 14 1A 5B 5D FA 3C 94 DB 65 22 15 51 3A 21 51 D1 21 F1 2E 2B

Clear Buffer
<
>

4. MODBUS Communication Test

4.1 Data Register Address Table

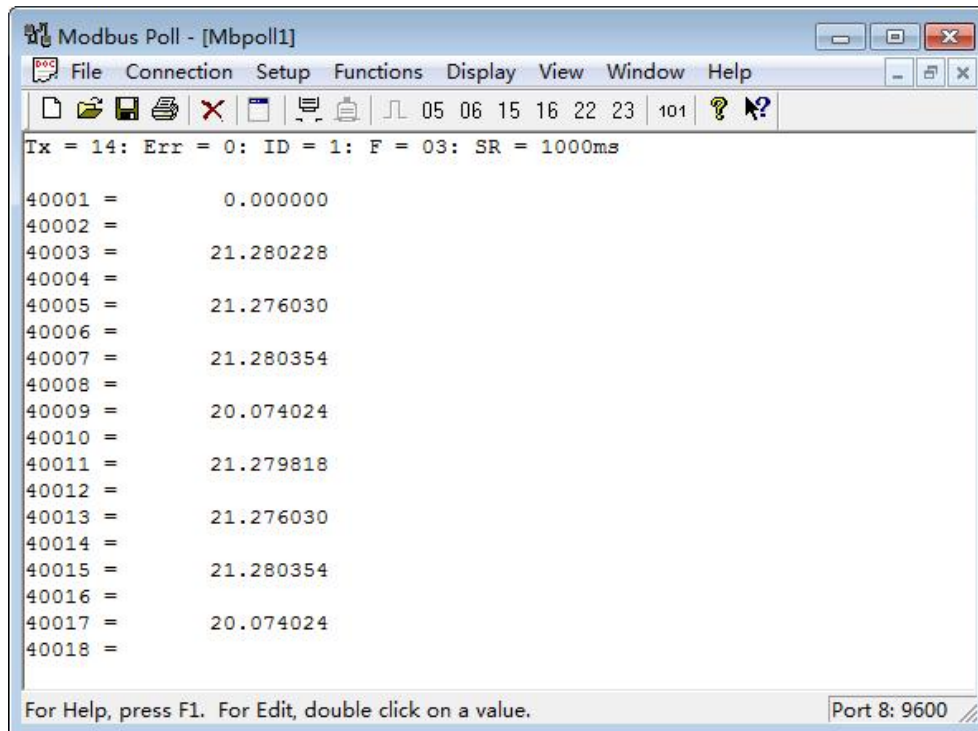
Serial number	Data name	Data address	Data type	Data format	Mode of operation	Read function code	Write the function code
1	Current value	40001 40002	IEE754	4321	Read	03	
2	Variable 1	40003 40004	IEE754	4321	Read/write	03	16
3	Variable 2	40005 40006	IEE754	4321	Read/write	03	16
4	Variable 3	40007 40008	IEE754	4321	Read/write	03	16
5	Variable 4	40009 40010	IEE754	4321	Read/write	03	16
6	Variable 5	40011 40012	IEE754	4321	Read/write	03	16
7	Variables 6	40013 40014	IEE754	4321	Read/write	03	16
8	Variable 7	40015 40016	IEE754	4321	Read/write	03	16
9	Variables 8	40017 40018	IEE754	4321	Read/write	03	16
10	Cumulative quantity	40047 40048	Uint32	4321	Read/write	03	16
11	Cumulative Output Option	40119	Uint16		Read/write	04	06
12	Module operating mode	40120	Uint16		Read/write	04	06
13	DA1 upper range limit	30121 30122	IEE754	4321	Read/write	04	16
14	DA1 lower range limit	30123 30124	IEE754	4321	Read/write	04	16
15	DA2 upper range limit	30125 30126	IEE754	4321	Read/write	04	16
16	DA2 lower range limit	30127 30128	IEE754	4321	Read/write	04	16
17	DA3 upper range limit	30129 30130	IEE754	4321	Read/write	04	16
18	DA3 Lower Range Limit	30131 30132	IEE754	4321	Read/write	04	16
19	DA4 upper range limit	30133 30134	IEE754	4321	Read/write	04	16
20	DA4 Lower Range Limit	30135 30136	IEE754	4321	Read/write	04	16
21	DA5 upper range limit	30137 30138	IEE754	4321	Read/write	04	16
22	DA5 Lower Range Limit	30139 30140	IEE754	4321	Read/write	04	16
23	DA6 upper range limit	30141 30142	IEE754	4321	Read/write	04	16
24	DA6 Lower Range Limit	30143 30144	IEE754	4321	Read/write	04	16
25	DA7 upper range limit	30145 30146	IEE754	4321	Read/write	04	16
26	DA7 lower range limit	30147 30148	IEE754	4321	Read/write	04	16
27	DA8 upper range limit	30149 30150	IEE754	4321	Read/write	04	16
28	DA8 Lower Range Limit	30151 30152	IEE754	4321	Read/write	04	16

4.2 Data Meaning of Write Command

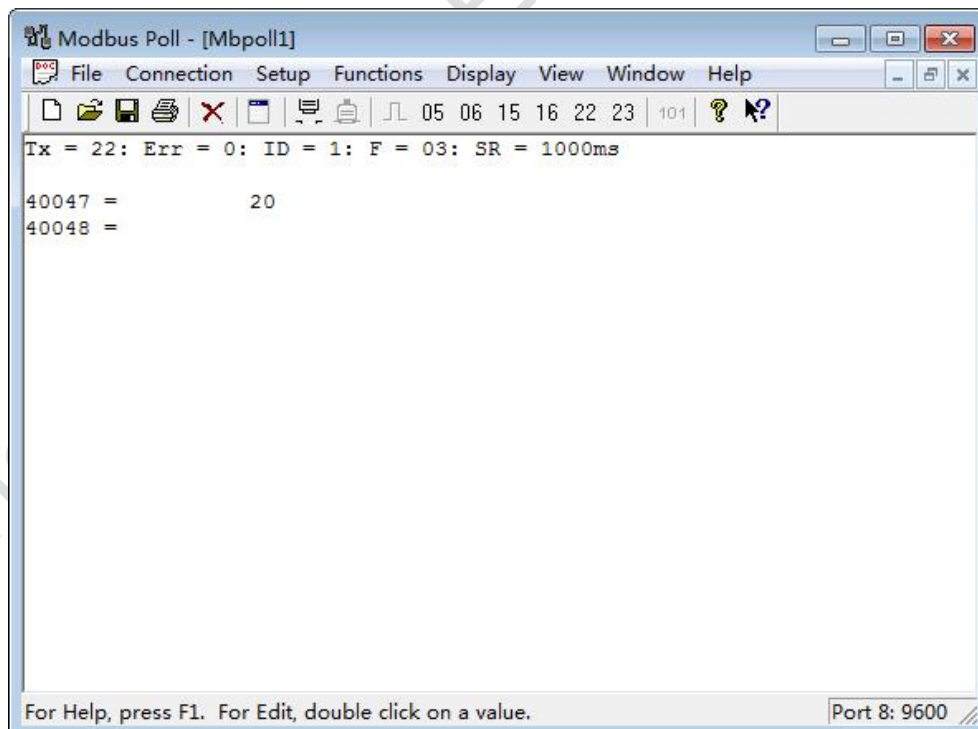
Serial number	Data name	Write the function code	Data address	Data meaning
1	Cumulative Output Option	06	40119	0-Close, 1-Variant 1, 2-Variant 2, 3-Variant 3, 4-variable4,5-variable5,6-variable6,7-variable7,8-variable8
2	Module operating mode	06	40120	0-Transparent way of working 1-MODBUS single instrument working mode 2-Test DA output mode

4.3 Examples of Reading Real-Time Data and Converter Parameters

4.3.1 Read real-time data of HART instrument

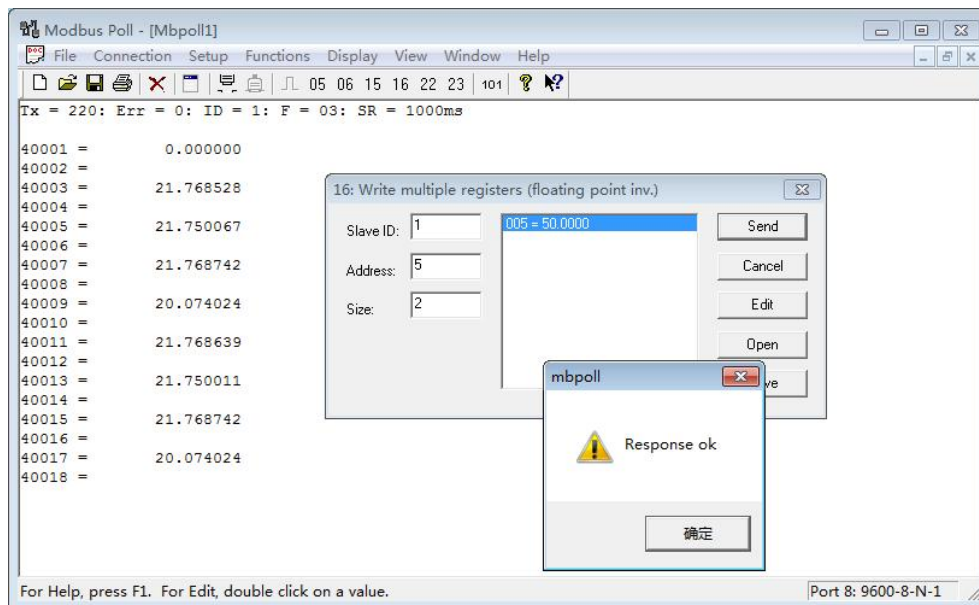


4.3.2 Reading Cumulative Output Value



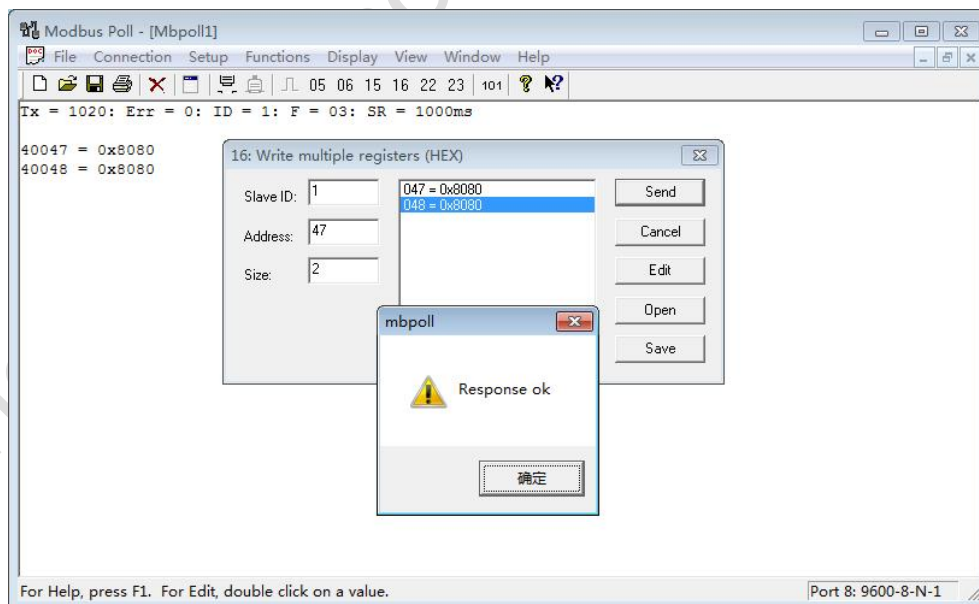
4.3.3 Analog HART instrument data

The analog HART instrument variable 2 has a value of 50. Because variable 2 is configured to the DA1 channel with a range of 0-100, the analog output has a current of 12 mA. (Note: when simulating current output, set the working mode of the module to "test DA output mode")

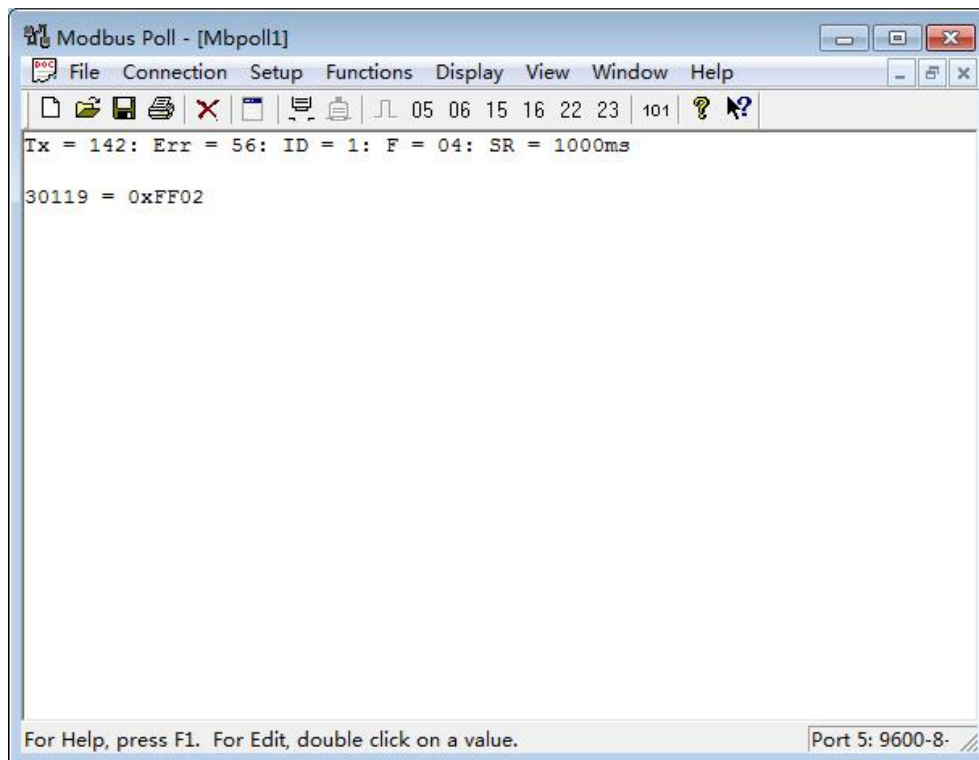


4.3.4 Analog Cumulative Output Value

The value of the analog accumulation is the 80808080 (Hex), so the current of the analog outputs of the DA4 to DA7 channels is 12 mA. (Note: when simulating current output, set the working mode of the module to "test DA output mode", and configure the output variable for cumulative output)

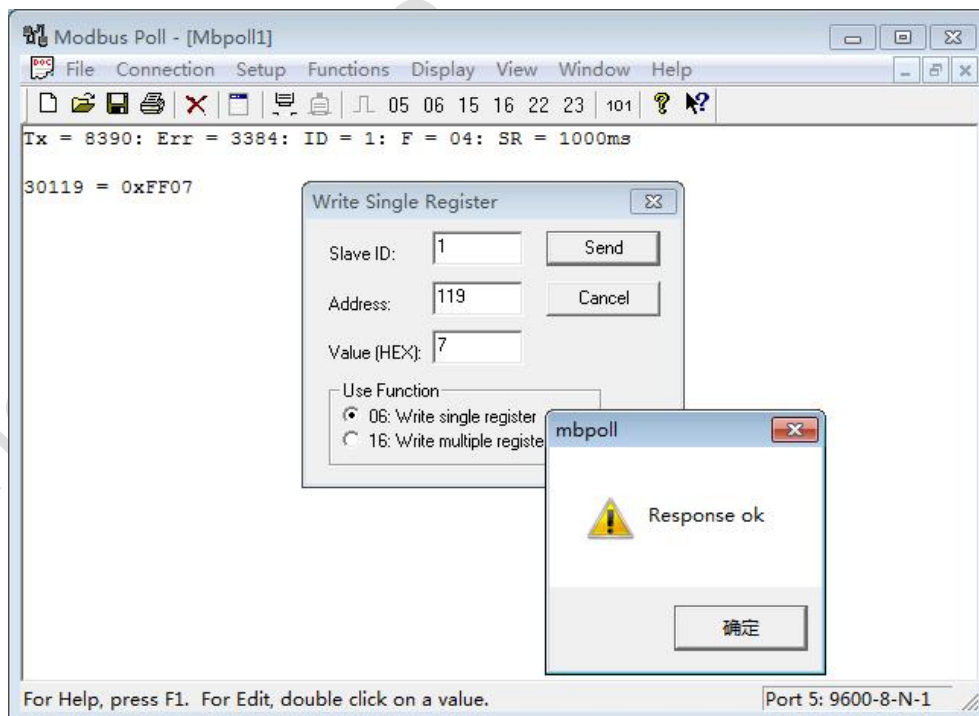


4.3.5 Read Cumulative Output Option

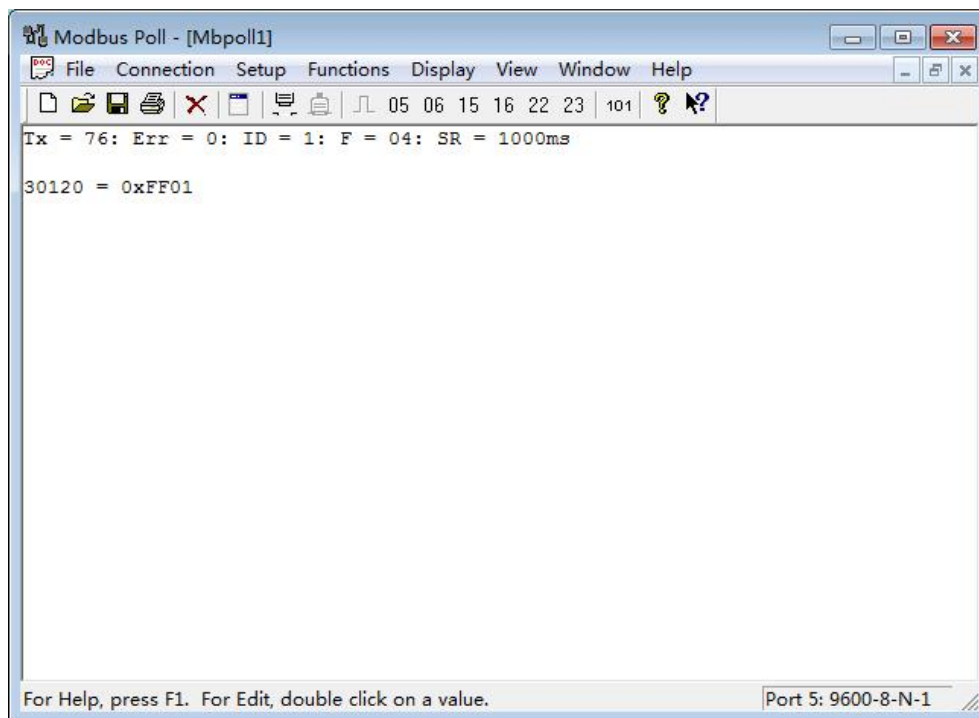


4.3.6 Setting Cumulative Output Options

Set the Cumulative Output option to Variable 7.

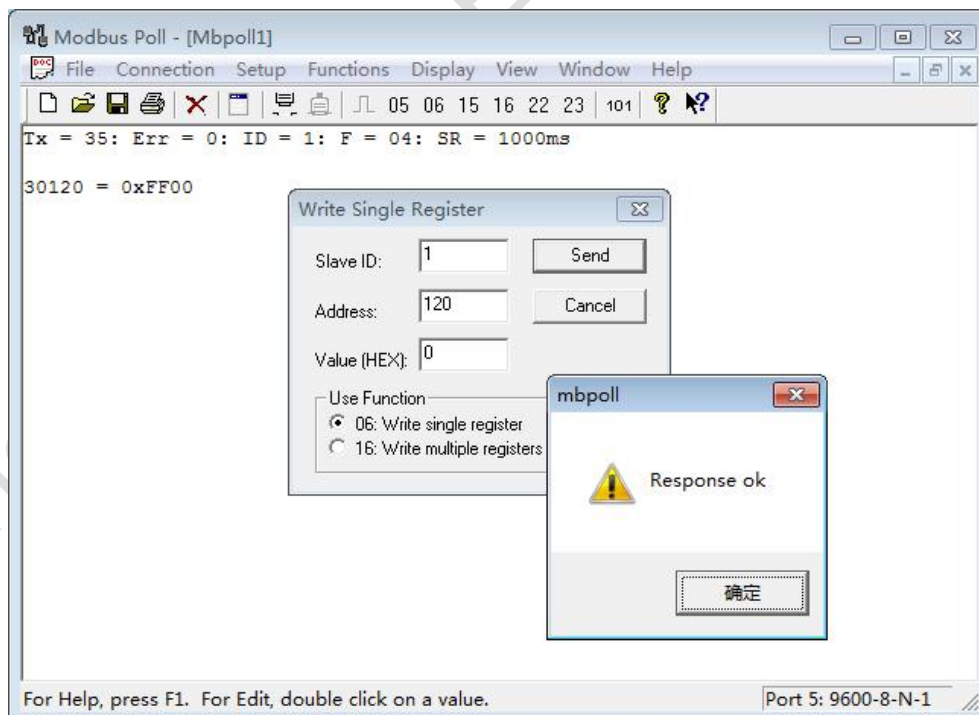


4.3.7 Working mode of reading module

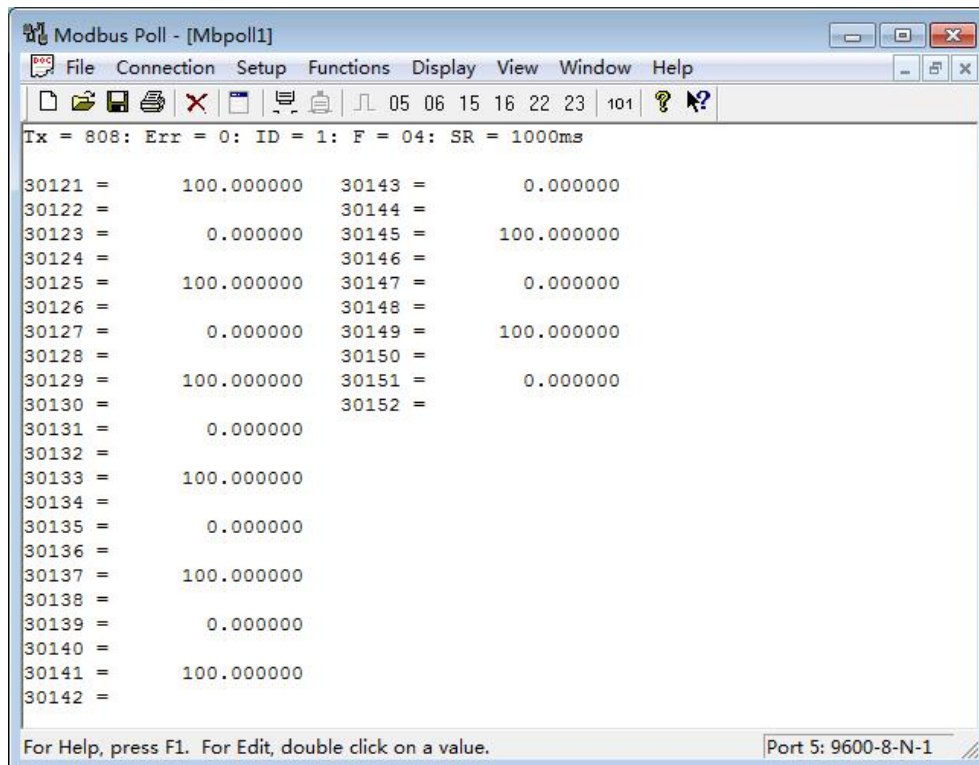


4.3.8 Set the working mode of the module

Set the working mode of the module to the transparent working mode.

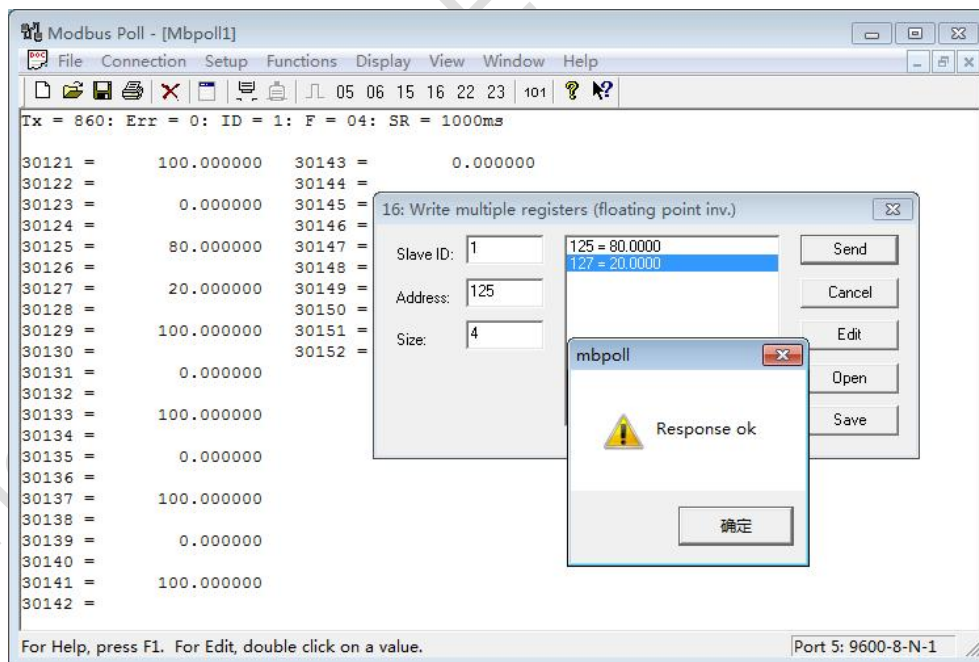


4.3.9 Read the upper and lower limits of the range



4.3.10 Set the upper and lower limits of the range

Set the upper range limit of the DA1 channel to 80 and the lower range limit to 20.



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