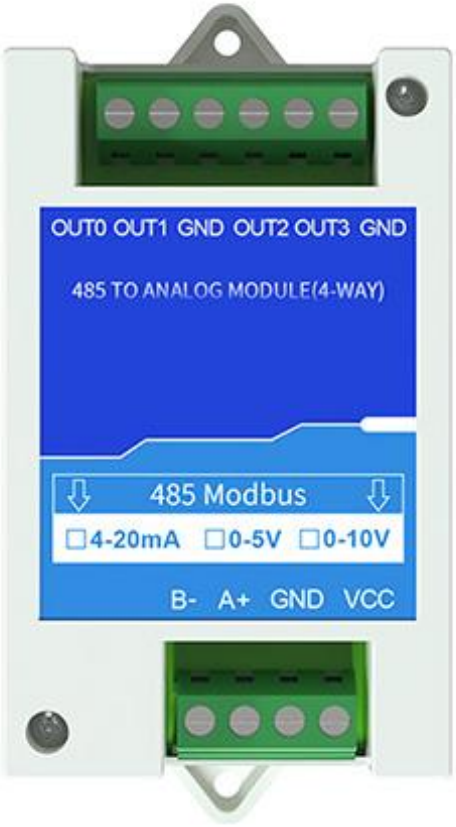
RS485 to 4-20mA/0-5V/0-10V Converter, 4 Channel

User Manual



1.1 Product Overview

This product is an industrial-grade standard analog output product, supporting 4-channel outputs with ranges of 0-20mA, 0-5V and 0-10V. The application layer adopts the standard ModBus-RTU protocol, which conforms to industrial standards and is suitable for various industrial occasions and automation systems. Convenient to communicate with the upper computer, can realize rapid networking and build monitoring system. Suitable for various industrial occasions and automation systems.

1.2 Functional Features

- Supports 4 analog outputs of current type and voltage type, each output type is selectable.
- 12-bit resolution, 0.1% accuracy ADC.
- Support standard ModBus-RTU communication protocol.
- Communication operation indicator, anti-dead watchdog.
- With lightning, electrostatic protection RS485 communication interface, op amp signal isolation.
- Address, baud rate can be set through the upper computer software.
- Anti-reverse connection, over-voltage protection, over-current protection, short circuit protection.

1.3 Main Technical Indicators

DC Power Supply (default)	5-30V	
Maximum Power Consumption	0.08W (DC12V)	
Operating Temperature	-40° C~+60° C	
AD Conversion Resolution	12 bits	
Accuracy	Typical Accuracy: ±0.1%FS	
Output Signal	4~20mA, 0~5V, 0~10V optional	
Communication Interface	ModBus-RTU	
Address Range	1-254 (default 1)	
Baud Rate	Numerical range 0-7 0: 2400bps 1:4800bps 2: 9600bps 3: 19200bps 4: 38400bps 5: 57600bps 6: 115200bps 7: 1200bps Default: 4800bps	
Output Impedance	4-20mA	≤200Ω
	0-5V/0-10V	≥10kΩ

1.4 Equipment Selection

SN-					Company Code
	3001-				Casing
		485TO-			485 communication (ModBus protocol)
			I20-		Output 4~20mA current signal
			V05-		Output 0~5V (1~5V compatible) voltage signal
			V10-		Output 0~10V voltage signal
				4	Output 4-channel analog

1.5 Analog Correspondence Table

Type	Data Acquisition (12-bit AD)	Calculation Example
4~20mA	0~4095	4mA corresponds to 819 (0mA corresponds to 0), 20mA corresponds to 4095 Example: The read data value is 3000, then the measured output current signal is (3000/4095)*20mA=14.65mA.
(Compatible with 0-20mA)	0~4095	Example: If the read data value is 300, the measured output current signal is (300/4095)*5V=0.37V.
0~5V	0~4095	Example: If the read data value is 1000, the measured output current signal is (1000/4095)*10V=2.44V.

2.1 Pre-installation Inspection of Equipment

Equipment List

- 485 to analog module (4-way) 1 unit

2.2 Wiring Instructions

	Marking	Description	Note
Power Input and Communication	VCC	Power input positive	5~30V DC
	GND	Power input ground	
	A+	485-A	485 communication
	B-	485-B	
Signal Output	OUT0	Analog 1 output	
	OUT1	Analog 2 output	
	GND	Analog output negative	
	OUT2	Analog 3 output	
	OUT3	Analog 4 output	
	GND	Negative analog output	

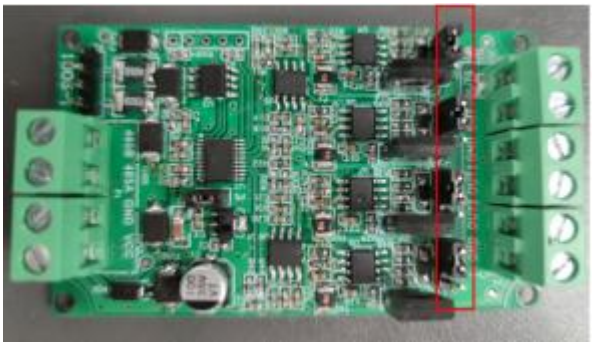
2.3 Description of Output Type Switching

Customers can switch the current type output or voltage type output according to the site conditions.

1. Open the configuration software and communicate with the upper computer, select 0-5V, 0-10V, 4-20mA for each output type.

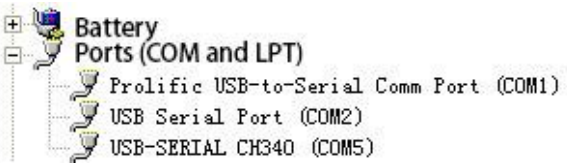
2. The circuit board needs to be changed accordingly.

If you choose current type input, short the corresponding number of shorting caps to the left and center two pins. If voltage input is selected, short the right and center pins of the corresponding shorting cap. I and V are indicated on the board.



3.1 Software Selection

When the sensor is properly connected to the computer via USB to 485 and powered, the correct COM port can be seen on the computer (“My Computer - Properties - Device Manager - Ports” for COM ports).



Open the package, select “Debugging Software”---“485 Parameter Configuration Software”, find the software and open it.

If you can't find the COM port in the device manager, it means you haven't installed the USB to 485 driver (in the package) or you haven't installed the driver correctly, please contact the technician for help.

3.2 Parameter Configuration

1. After reaching the configuration interface, first of all, according to the method in chapter 3.1, get the serial port number and select the correct serial port.
2. Click the test baud rate of the software, the software will test the baud rate and address of the current device, the default baud rate is 4800bit/s, and the default address is 0x01.

The default baud rate is 4800bit/s, and the default address is 0x01.

3. Modify the address and baud rate according to your needs, and check the current functional status of the device.

If the test is unsuccessful, please recheck the wiring of the device and the installation of the 485 driver.

4.1 Basic Parameters of Communication

Code	8-bit Binary
Data Bits	8-bit
Parity Bit	None
Stop Bit	1 bit
Error Check	CRC (redundant cyclic code)
Baud Rate	1200～115200bps can be set, factory default is 4800bps N.8.1

4.2 Data Frame Format Definition

The ModBus-RTU communication protocol is used in the following format:

Initial structure ≥ 4 bytes of time

Address code = 1 byte

Function code = 1 byte

Data area = N bytes

Error check = 16 bit CRC code End structure ≥ 4 bytes of time

Address code: address of the transmitter, unique in the communication network (factory default 0x01), range 0x01-0xFE Function code: indication of the function of the command issued by the host.

Data area: data area is specific communication data, note that 16bits data high byte in front!

CRC code: two-byte checksum code.

The host asks for the frame structure:

Address Code	Function Code	Register Start Address	Register Length	Low Check Digit Byte	High Check Digit Byte
1 byte	1 byte	2 bytes	2 bytes	1 byte	1 byte

Slave answer frame structure:

Address Code	Function Code	No. of Effective Bytes	Data 1 Area	Data 2 Area	Data N Area	Low Check Digit Byte	High Check Digit Byte
1 byte	1 byte	1 byte	2 bytes	2 bytes	2 bytes	1 byte	1 byte

4.3 Holding Register Address Definition

Register Addresses	PLC or Configuration Address	Content	Function Code Support	Remarks
0000 H	40001	1-channel analog value	0x03/0x04/0x06	Range: 0-4095
0001 H	40002	2-channel analog value	0x03/0x04/0x06	Range: 0-4095
0002H	40003	3-channel analog value	0x03/0x04/0x06	Range: 0-4095
0001 H	40004	4-channel analog value	0x03/0x04/0x06	Range：0-4095
07D0 H	42001	Device address	0x03/0x04/0x06	1-254, default 1
07D1H	42002	Baud rate	0x03/0x04/0x06	Value range: 0-7; 0: 2400bps 1: 4800bps 2: 9600bps 3: 19200bps 4: 38400bps 5: 57600bps 6: 115200bps 7: 1200bps Default: 4800bps
07D2H	42003	Parity bit	0x03/0x04/0x06	Numerical range: 0-2 0: no checksum 1: odd checksum 2: even parity Default: no parity

4.4 Communication Protocol Examples and Explanations

4.4.1 Read Signal Value

Example: Read the analog signal value of channels 1 and 2 at device address 0x01.

Query Frames

Address Code	Function Code	Starting Address	Data Length	Low Check Digit Byte	High Check Digit Byte
0x01	0x03	0x00 0x00	0x00 0x02	0xC4	0x0B

Response Frame

Address Code	Function Code	No. of Effective Bytes Return	Analog 1	Analog 2	Low Check Digit Byte	High Check Digit Byte
0x01	0x03	0x04	0x01 0x2C	0x00 0xC8	0x3B	0x90

Description:

Returns the 1st channel data as 012CH, which converts to decimal 300, indicating that the current analog acquisition data code value is 300.

Return the 2nd channel data is 0x00C8, converted to decimal 200, indicating that the current analog acquisition data code value is 200.

If the module is 0-5V and the code value is 3000, the output signal is 5 * 3000/4095 = 3.66V.

If the module is 0-10V, the code value is 3000, the output signal is 10 * 3000/4095 = 7.33V.

If the module is 4-20mA and the code value is 3000, the output signal is 20 * 3000/4095 = 14.65mA.

4.4.2 Read Device Address

Example: Read device address 0x01 Address

Query Frames

Address Code	Function Code	Starting Address	Data Length	Low Check Digit Byte	High Check Digit Byte
0x01	0x03	0x07 0xD0	0x00 0x01	0x84	0x87

Response Frame

Address Code	Function Code	No. of Effective Bytes Return	Address Code	Low Check Digit Byte	High Check Digit Byte
0x01	0x03	0x02	0x00 0x01	0x79	0x84

4.4.3 Read Device Baud Rate

Example: Read the baud rate of device address 0x01.

Query Frames

Address Code	Function Code	Starting Address	Data Length	Low Check Digit Byte	High Check Digit Byte
0x01	0x03	0x07 0xD1	0x00 0x01	0xD5	0x47

Response Frame

Address Code	Function Code	No. of Effective Bytes Return	Address Code	Low Check Digit Byte	High Check Digit Byte
0x01	0x03	0x02	0x00 0x01	0x79	0x84

The baud rate in the returned data is 0x01, indicating that the baud rate is 4800bps.

5.1 The Device Cannot Connect to the Computer

1. The computer has multiple COM ports and the port selected is incorrect.

2. The device address is wrong, or there are devices with duplicate addresses (factory default is 1 for all).

3. The baud rate, parity, data bits, and stop bits are incorrect.

4. Host polling interval and wait for answer time are too short, need to be set above 200ms. 5. 485 bus is disconnected.

5. The 485 bus is disconnected, or the A and B wires are reversed. 6.

6. The number of devices is too large or the wiring is too long, the power supply should be nearby, add 485 enhancer, and increase the 120Ω termination resistor.

7. USB to 485 driver is not installed or damaged.

8. The device is damaged.