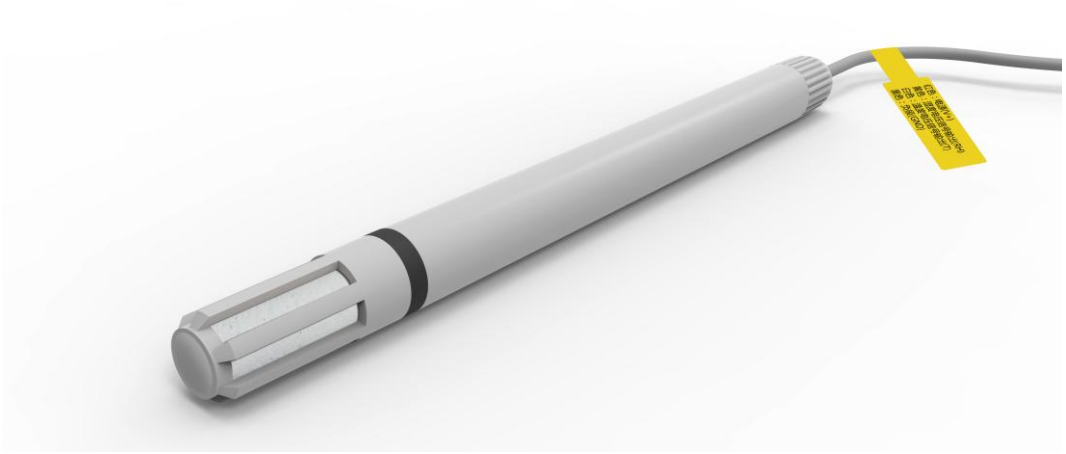
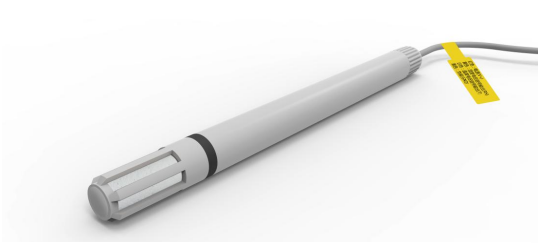
ASAIR®

Temperature & Humidity Transmitter

AF5485 User Manual



1 Product Overview



The AF5485 is a high performance industrial network-based temperature and humidity transmitter. It measures the temperature and humidity environment in the form of digital display on the local display. When the measured data exceeds the limitation, the output control signal generate a sound alarm signal, at the same time the response is sent by the host command, to upload the data to the host through the RS485 bus in the data packets.

The AW3485A has the characteristics of small volume, light weight, wide range, high precision, fast response speed and good long-term stability, etc, therefore it can be widely used in building automation, HVAC and climate signal collection, museum and hotel weather station, logistics and medical industry, room temperature monitoring and any other field that needs of the air temperature and humidity measurement and control.

2 Sensor Performance

2.1 Relative Humidity (%RH)

Parameter	Condition	Min	Typ.	Max	Units
Resolution			0.1		%RH
Measuring range		0	±3	99.9	%RH
Drift	Typical		0.1		%RH/yr
Sampling period			2.5		s

2.2 Temperature(℃)

Parameter	Condition	Min	Typ.	Max	Units
Resolution			0.1		℃
operating range(inner)		-40	±0.5	80	℃
Drift	Typical		0.1		℃/yr
Sampling period			2.5		s

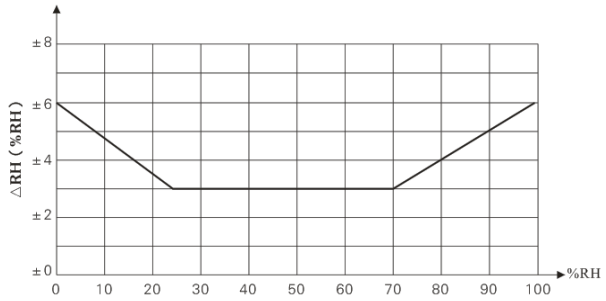


Figure 1 Relative Humidity error

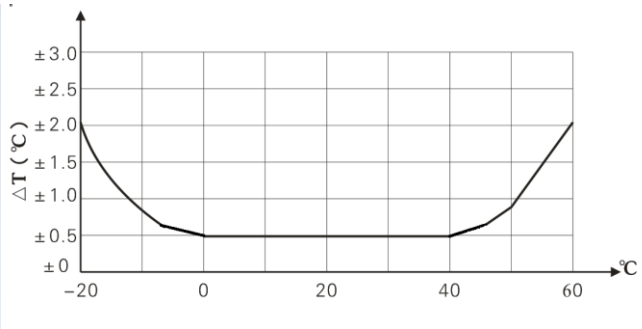


Figure 2 Relative Temperature error

The measured value of the product may be subject to the following factors:

1)．The temperature error

◎Placed in a test environment in settling time is too short.

◎Near sources of heat, cold source, or directly at the sun.

2)．The humidity error

◎Placed in a test environment in settling time is too short.

◎Prohibited for a long time in the steam, spray, curtain or condensing environments.

3)．Pollution

◎In dust or other environmental pollution, the product must be cleaned regularly.

2.3 Other specifications

1) Current consumption: ≤15mA
2) Supply voltage: 9~36VDC
3) Output signal: RS485
4) Communication protocol: Standard MODBUS RTU protocol

3 Dimensions

Figure 3 Dimension (Units: mm)

4 RS485 typical applications

The external communication specification is shown in table 1.

Table 1: Wiring interface specification

No.	Pin Mark	Wiring Color	Function Description
1	B-	white	RS485B-
2	GND	black	GND
3	V+	red	VDD
4	A+	yellow	RS485A+

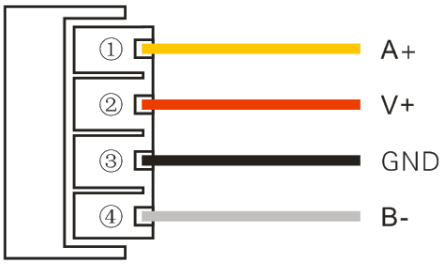


Figure 4Terminal son diagram

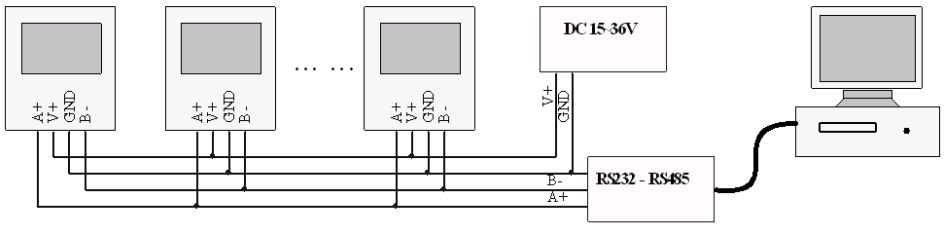


Figure 5 RS485 typical applications

5 Slave address

Based on ModBus RTU protocol -, device address is the only, according to the PCB board after eight dial the code switch (Figure 6) to set selection need to address, eight allows a maximum of 255 devices (address received from 1 ~ 255) in the system.

Figure 6

Calculation method: dial the code A - H respectively corresponding to the number 128, 64, 32, 16, 8, 4, 2, 1 (figure 6). Put A - H address code dialing to NO part code corresponding to the value add up, and is the address code values. Address code examples as shown in figure 6, 7, 8.

Figure 6 Figure 7 Figure 8

Figure 6: address = 1 H to ON, H 1, namely the address code is 1

Figure 7: address = 2 G to ON, G is 2, namely the address code of 2

Figure 8: address = 13 E, F, H and ON, the address is: 8 + 4 + 1 = 13 namely address code is 13

Note: when choosing measuring range jumper before operation, please close the transmitter power.

6 RS485 protocol

6.1、Internal register mapping address

Registers	Address	Registers	Address	Registers	Address	Registers	Address
Humidity	0x0000	Device Type	0x0008	Humidity upper limit alarm value	0x0010	Reserved	0x0018
Temperature	0x0001	Version(Low 8 Byte)	0x0009	Enabled humidity upper limit alarm	0x0011	Reserved	0x0019
Reserved	0x0002	Device ID High 16 Bit	0x000A	Humidity lower limit alarm value	0x0012	Reserved	0x001A
Reserved	0x0003	Device ID Low 16 Bit	0x000B	Enabled humidity lower limit alarm	0x0013	Reserved	0x001B
Reserved	0x0004	Temperature upper limit alarm value	0x000C	Reserved	0x0014	Reserved	0x001C
Reserved	0x0005	Enabled temperature upper limit alarm	0x000D	Reserved	0x0015	Temperature correction update	0x001D
Reserved	0x0006	Temperature lower limit alarm value	0x000E	Reserved	0x0016	Humidity correction update	0x001E
Reserved	0x0007	Enabled temperature lower limit alarm	0x000F	Reserved	0x0017	Reserved	0x001F

6.2 Supported function code

0x03 multiplexer register read

0x10 multiplexer register write

@ Read instruction:

The host frame format

transmitter address+ 0x03 + register start address(2 bytes) + register number(2 bytes) +CRC low byte +CRC high byte

Transmitter return format

transmitter address + 0x03 + returns the number of bytes(1 byte) + data 0+..+ data n + CRC low byte + CRC high byte

@Write instruction

The host frame format

transmitter address+ 0x10 + register start address(2 bytes) + register number(2 bytes) + sc-bytes(1 byte) + data 0+..+ data n + CRC low byte +CRC high byte

Transmitter return format

transmitter address + 0x10 + register start address(2 bytes) + register number(2 bytes) + CRC low byte + CRC high byte

Write function code specific instructions:

1). In the internal register address, only the address 0x000C-0x001E can be written, and others are prohibited.

2). In address 0x000C-0x001B, if the host data writing is out of the range or not in accordance with the control logic, the transmitter register will not update the values, but preserved.

3) 0x001C, 0x001d, 0x001E, the three registers, will be limited to the boundary value, if they exceed the range.

4) The host should send the actual value magnified 10 times to change decimal into integer.

6.3 Error code display

0x81 illegal function code (not supported function code)

0x82 read illegal address

0x83 write illegal data (written to a not writable register address or transmitter)

6.4 Examples for communication read instructions

The host send message format: **01 03 00 00 00 02 C4 0B.** The description of the function code is shown as below:

Send by Host	Byte number	Message	Remarks
Slave Address	1	01	Slave that send to address 01
Function Code	1	03	Read the register
Start Address	2	0000	Start address of 0000
Register Read Number	2	0002	Read 2 registers, 4 bytes in total
CRC Code	2	C40B	The CRC calculated by the host, the low byte first(C4) and high byte behind(0B)

The message format returned by the sensor respond: **01 03 04 Humidity (16 bytes) Temperature (16 bytes) CRC check code**

The following table is an example of returning a set of temperature and humidity data: **01 03 04 01 D7 00 D6 CA 69**

Slave response	Byte number	Message	Remarks
Slave Address	1	01	Slave that send to address 01
Function Code	1	03	Read the register
Return Byte Number	1	04	Returned 4 registers, total 4 bytes
Register 0 High Byte	1	01	Contents of address 0x00 (humidity high byte)
Register 0 Low Byte	1	D7	Contents of address 0x00 (humidity low byte)
Register 1 High Byte	1	00	Contents of address 0x00 (temperature high byte)
Register 1 Low Byte	1	D6	Contents of address 0x00 (temperature low byte)
CRC Code	2	CA69	The returned CRC calculated by the slave, the low byte first(CA)

@ Temperature and humidity output format and calculation

Examples for temperature and humidity output format and calculation:

The temperature and humidity resolution are 16-bit. The temperature and humidity are printed in the actual positive or negative format, and the numerical value is 10 times the actual temperature and humidity value.

Humidity: 01D7 = 1x256+13x16+4 =471 = > Humidity = 471÷10=47.1%RH

Temperature: 00D6 = 13x16+6 = 214 = > Temperature = 214÷10 = 21.4℃

◎ **Calculation of CRC Codes**

1. Preset 1 16-bit register is hexadecimal FFFF (all 1); this register is called the CRC register;

2 . The first 8-bit binary data (the first byte of the communication information frame) is different from the lower 8 bits of the 16-bit CRC register, and the result is placed in the CRC register;

3 . Move the contents of the CRC register one bit to the right (towards the low) to fill the most significant bit with 0 and check the shifted bit;

4 . If the shift bit is 0: repeat step 3 (right shift one bit again); if the shift bit is 1: The CRC register is xor with the polynomial A001 (1010 0000 0000 0001) ;

5 . Repeat steps 3 and 4 until you move 8 times, so that the entire 8-bit data is processed;

6．Repeat step 2 to step 5 to perform the next byte processing of the communication information frame;

7．After all the bytes of the communication information frame are calculated as described above, the high and low bytes of the resulting 16-bit CRC register are exchanged;

8．The final result of the CRC register is：CRC Code.

◎ C language calculation code of CRC Code

Note : This procedure calculates the CRC code(the start address of the bytes is ptr and the length is len)

```
unsigned short crc16(unsigned char *ptr, unsigned char len)
{
    unsigned short crc=0xFFFF;
    unsigned char i;
    while(len--)
    {
        crc ^=*ptr++;
        for(i=0;i<8;i++)
            {
                if(crc & 0x01)
                    {
                    crc>>=1;
                    crc^=0xA001;
                }else
                        {
                    crc>>=1;
                }
            }
    }
    return crc;
}
```

7 License Agreement

1) Without the written permission of the company, it shall not copy or disseminate the content of this specification in any form, nor shall it be disclosed to a third party.
2) The company and the third party have the ownership of the software, and the user can only use it after signing the contract or obtaining the software license.
3) The contents of this instruction manual are subject to change without prior notice.

7 Warning and Personal Injury

Do not apply this product to safety protection devices or emergency shutdown devices, and any other applications that may cause personal injury due to the malfunction of the product, unless otherwise authorized. Please refer to the product data sheet and Application guide before installation, processing, use, or maintenance of the product. Failure to comply with the recommendations may result in death and serious bodily harm. The company will not be liable for all damages resulting in personal injury or death, and avoid the company managers and employees, agents, distributors and other subsidiary may have any claim, including all the costs and compensation costs, legal fees etc.

8 Quality Assurance

The company provides quality assurance for 12 months for the original purchaser of the products (calculated from the date of shipment), in accordance with the technical specifications of the data book of the product published by the company. If the product is proved to have its own quality problems during the warranty period, the company will provide free maintenance or replacement. The user must meet the following conditions:

1) The purchaser must notify the company of the defect in writing within 14 days of discovery.
2) The purchaser shall pay the shipping charges for product mailed back to company.
3) The product should be within the warranty period.

The company is solely responsible for products that are defective in situations where the

technical conditions of the product are met. The company applies its products to those special applications without any warranties or statements, as well as any commitment to the reliability of the products applied to products or projects.