

SM8701

Non-contact infrared temperature sensor

User Manual

File Version: V21.3.24



SM8701 using the standard ,easy access to PLC , DCS and other instruments or systems for monitoring temperature state quantities.The internal use of high-precision sensing core and related devices to ensure high reliability and excellent long-term stability,can be customized RS232,RS485,CAN,4-20mA,DC0~5V\10V,ZIGBEE,Lora,WIFI,GPRS and other output methods.

Technical Parameters

| Technical parameter | Parameter value |
|----------------------------------|--|
| Brand | SONBEST |
| Temperature measurement range | 0~+300° C (Max 380°C) |
| Temperature measurement accuracy | ±1 or %1 take the maximum value (maximum ±3°C) |
| Repeat measurement accuracy | ±0.5 or %0.5 take the maximum value (maximum ±2°C) |
| Optical Resolution | 1.6:1 |
| Spectral range | 18-14um |
| Response time | 100ms |
| Emissivity | 0.96 |
| Interface | RS485/4-20mA/DC0-5V/DC0-10V |
| Power | DC12~24V 1A |
| Dimensions | Φ24mm×80mm |

Product Selection

Product Design RS485,4-20mA,DC0-5V,DC0-10V Multiple output methods, the products are divided into the following models depending on the output method.

| Product model | output method |
|---------------|---------------|
| SM8701B | RS485 总线 |
| SM8701M | 4-20mA |
| SM8701V5 | DC0-5V |
| SM8701V10 | DC0-10V |

How to wiring?

SIMPLE LAYOUT AT A GLANCE

304 stainless steel, not easy to corrode, good toughness, beautiful



RS485 wiring method

| | | |
|---------------------------------------|----|----------|
| █ | RD | PWR+ |
| █ | GN | PWR- |
| █ | YE | RS485 A+ |
| █ | BU | RS485 B- |

4-20mA wiring method

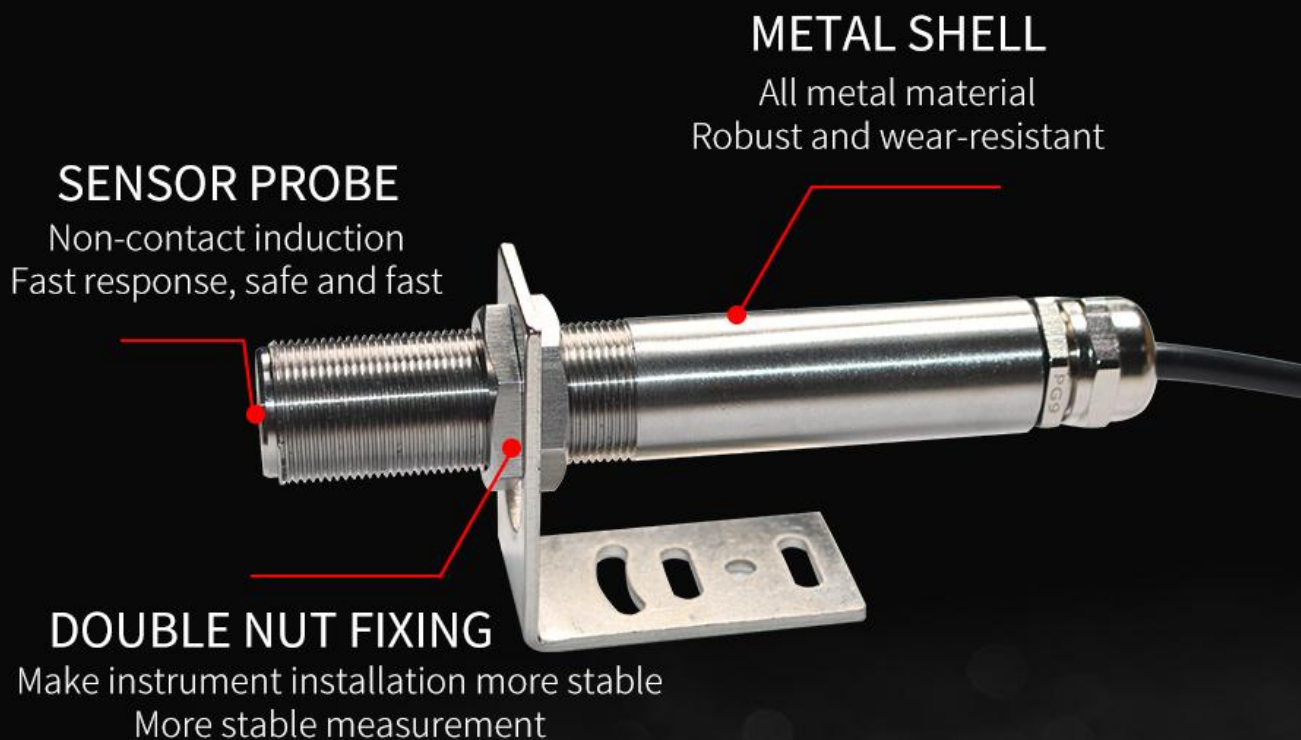
| | | |
|--------------------------------------|----|----------------|
| █ | RD | PWR+ |
| █ | BK | PWR- |
| █ | BU | Current output |

0-5V wiring method

| | | |
|--------------------------------------|----|----------------|
| █ | RD | PWR+ |
| █ | BK | PWR- |
| █ | BU | Voltage output |

HIGH SENSITIVITY INDUSTRIAL DESIGN

Every detail is manually tested and iteratively modified to provide a better life experience and carefully crafted high-quality products.



INSTRUMENT PRINCIPLE

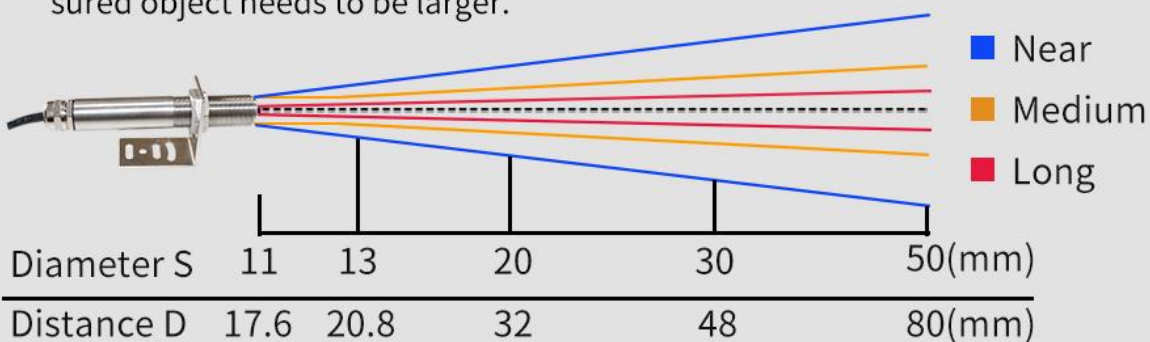
Any object will radiate infrared energy outward, and the radiation intensity will change with the change of temperature. Usually use infrared radiation energy in the range of 5.5-14mm. The infrared temperature sensor is a photoelectric sensor. It receives infrared radiation and converts it into electrical signals. It displays or outputs temperature through electronic circuit amplifiers, linearization and signal processing.



Data display to computer

LIGHT PATH DIAGRAM

Object distance ratio(D: S)The long distance object distance ratio is 16:1, the middle distance is 1.6:1, and the short distance is 1.2:1. This refers to the ratio of the measured distance to the diameter of the measured object. When the distance between the infrared temperature sensor and the measured object increases, the surface area of the measured object needs to be larger.



D: S is the optical resolution, which represents the ratio of distance to spot diameter during measurement.

For example forehead diameter is about 30mm

Recommended distance for long distance measurement is 480mm

Recommended distance for mid-range measurement is 48mm

Recommended close measurement distance is 36mm

How to use?

VARIOUS ENVIRONMENTS ALL NEED ME

Real-time monitoring every day, wide application range, high detection efficiency, stable and reliable, can be used in various indoor environments such as hospitals, factories, warehouses, shopping malls.



■ Boiler ———

Boiler room refers to the machine room where auxiliary equipment such as boilers and pumps are placed. Generally used for heating and production.

——— Steel mill ■

Long-term high temperature working environment
Need to monitor ambient temperature at any time
Prevent accidents



■ Power station ———

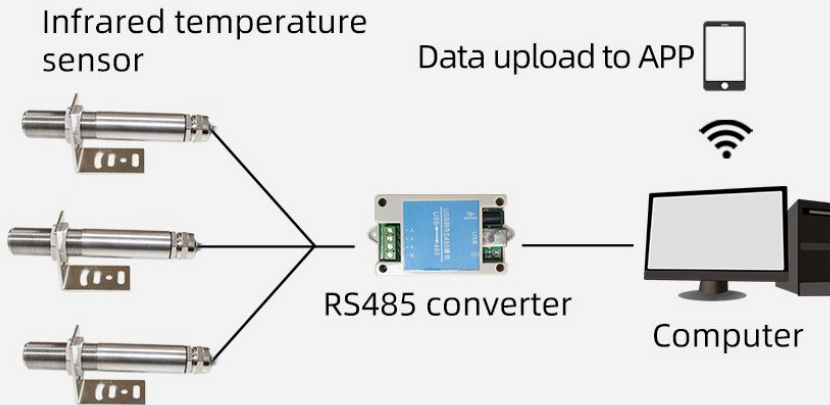
A place with a lot of heat
If you do n't pay attention, it is easy to cause accidents.
Need to configure instruments for long-term monitoring



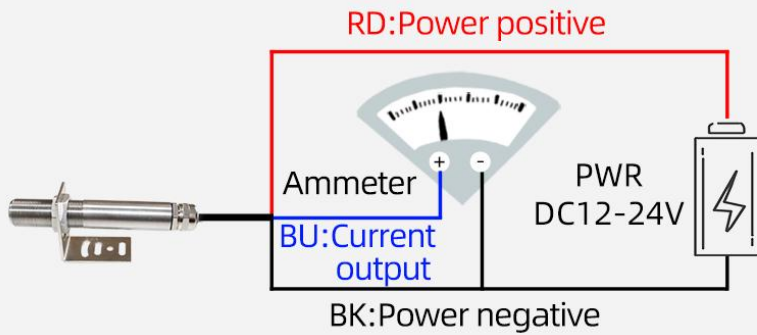
WIRING METHOD

The data line has simple wiring, fast response speed, high data transmission efficiency, long-term stability and reliability, and excellent performance.

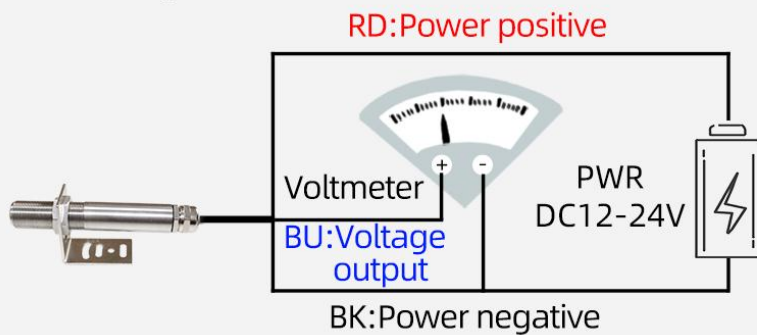
RS485 wiring method



4-20mA wiring method



0-5V wiring method



Protocol

The product uses RS485 MODBUS-RTU standard protocol format, all operation or reply commands are hexadecimal data. The default device address is 1 when the device is shipped, the default baud rate is 9600, 8, n, 1

1. Read Data (Function id 0x03)

Inquiry frame (hexadecimal), sending example: Query 1# device 1 data, the host computer sends the command:01 03 00 00 00 01 84 0A .

| Device ID | Function id | Start Address | Data Length | CRC16 |
|-----------|-------------|---------------|-------------|-------|
| 01 | 03 | 00 00 | 00 01 | 84 0A |

For the correct query frame, the device will respond with data:01 03 02 00 79 79 A6 , the response format is parsed as follows:

| Device ID | Function id | Data Length | 数据 1 | Check Code |
|-----------|-------------|-------------|-------|------------|
| 01 | 03 | 02 | 00 79 | 79 A6 |

Data Description: The data in the command is hexadecimal. Take data 1 as an example. 00 79 is converted to a decimal value of 121. If the data magnification is 100, the actual value is 121/100=1.21. Others and so on.

2. Data Address Table

| Address | Start Address | Description | Data type | Value range |
|---------|---------------|-----------------------|------------|-------------|
| 40001 | 00 00 | 1#temperatureregister | Read only | 0~65535 |
| 40101 | 00 64 | model code | read/write | 0~65535 |
| 40102 | 00 65 | total points | read/write | 1~20 |
| 40103 | 00 66 | Device ID | read/write | 1~249 |
| 40104 | 00 67 | baud rate | read/write | 0~6 |
| 40105 | 00 68 | mode | read/write | 1~4 |
| 40106 | 00 69 | protocol | read/write | 1~10 |

3 read and modify device address

(1) Read or query device address

If you don't know the current device address and there is only one device on the bus, you can use the command FA 03 00 64 00 02 90 5F Query device address.

| Device ID | Function id | Start Address | Data Length | CRC16 |
|-----------|-------------|---------------|-------------|-------|
| FA | 03 | 00 64 | 00 02 | 90 5F |

FA is 250 for the general address. When you don't know the address, you can use 250 to get the real device address, 00 64 is the device model register.

For the correct query command, the device will respond, for example the response data is: 01 03 02 07 12 3A 79, the format of which is as shown in the following table:

| Device ID | Function id | Start Address | Model Code | CRC16 |
|-----------|-------------|---------------|-------------|-------|
| 01 | 03 | 02 | 55 3C 00 01 | 3A 79 |

Response should be in the data, the first byte 01 indicates that the real address of the current device is, 55 3C converted to decimal 20182 indicates that the current device main model is 21820, the last two bytes 00 01 Indicates that the device has a status quantity.

(2)Change device address

For example, if the current device address is 1, we want to change to 02, the command is:01 06 00 66 00 02 E8 14 .

| Device ID | Function id | Start Address | Destination | CRC16 |
|-----------|-------------|---------------|-------------|-------|
|-----------|-------------|---------------|-------------|-------|

| | | | | |
|----|----|-------|-------|-------|
| 01 | 06 | 00 66 | 00 02 | E8 14 |
|----|----|-------|-------|-------|

After the change is successful, the device will return information: 02 06 00 66 00 02 E8 27 , its format is parsed as shown in the following table:

| Device ID | Function id | Start Address | Destination | CRC16 |
|-----------|-------------|---------------|-------------|-------|
| 01 | 06 | 00 66 | 00 02 | E8 27 |

Response should be in the data, after the modification is successful, the first byte is the new device address. After the general device address is changed, it will take effect immediately. At this time, the user needs to change the query command of the software at the same time.

4 Read and Modify Baud Rate

(1) Read baud rate

The device default factory baud rate is 9600. If you need to change it, you can change it according to the following table and the corresponding communication protocol. For example, read the current device's baud rate ID, the command is: 01 03 00 67 00 01 35 D5 , its format is parsed as follows.

| Device ID | Function id | Start Address | Data Length | CRC16 |
|-----------|-------------|---------------|-------------|-------|
| 01 | 03 | 00 67 | 00 01 | 35 D5 |

Read the baud rate encoding of the current device. Baud rate encoding: 1 is 2400; 2 is 4800; 3 is 9600; 4 is 19200; 5 is 38400; 6 is 115200.

For the correct query command, the device will respond, for example the response data is: 01 03 02 00 03 F8 45, the format of which is as shown in the following table:

| Device ID | Function id | Data Length | Rate ID | CRC16 |
|-----------|-------------|-------------|---------|-------|
| 01 | 03 | 02 | 00 03 | F8 45 |

coded according to baud rate, 03 is 9600, ie the current device has a baud rate of 9600.

(2) Change the baud rate

For example, changing the baud rate from 9600 to 38400, ie changing the code from 3 to 5, the command is: 01 06 00 67 00 05 F8 16 01 03 00 66 00 01 64 15 .

| Device ID | Function id | Start Address | Target Baud Rate | CRC16 |
|-----------|-------------|---------------|------------------|-------|
| 01 | 03 | 00 66 | 00 01 | 64 15 |

Change the baud rate from 9600 to 38400, changing the code from 3 to 5. The new baud rate will take effect immediately, at which point the device will lose its response and the baud rate of the device should be queried accordingly. Modified.

5 Read Correction Value

(1) Read Correction Value

When there is an error between the data and the reference standard, we can reduce the display error by adjusting the correction value. The correction difference can be modified to be plus or minus 1000, that is, the value range is 0-1000 or 64535 -65535. For example, when the display value is too small, we can correct it by adding 100. The command is: 01 03 00 6B 00 01 F5 D6 . In the command 100 is hex 0x64 If you need to reduce, you can set a negative value, such as -100, corresponding to the hexadecimal value of FF 9C, which is calculated as 100-65535=65435, and then converted to hexadecimal to 0x FF 9C. The correction value starts from 00 6B. We take the first parameter as an example. The correction value is read and modified in the same way for multiple parameters.

| Device ID | Function id | Start Address | Data Length | CRC16 |
|-----------|-------------|---------------|-------------|-------|
| 01 | 03 | 00 6B | 00 01 | F5 D6 |

For the correct query command, the device will respond, for example the response data is: 01 03 02 00 64 B9 AF, the format of which is as shown in the following table:

| Device ID | Function id | Data Length | Data value | CRC16 |
|-----------|-------------|-------------|------------|-------|
| 01 | 03 | 02 | 00 64 | B9 AF |

In the response data, the first byte 01 indicates the real address of the current device, and 00 6B is the first state quantity correction value register. If the device has multiple parameters, other parameters operate in this way. The same, the general temperature, humidity have this parameter, the light generally does not have this item.

(2)Change correction value

For example, the current state quantity is too small, we want to add 1 to its true value, and the current value plus 100 correction operation command is:01 06 00 6B 00 64 F9 FD .

| Device ID | Function id | Start Address | Destination | CRC16 |
|-----------|-------------|---------------|-------------|-------|
| 01 | 06 | 00 6B | 00 64 | F9 FD |

After the operation is successful, the device will return information: 01 06 00 6B 00 64 F9 FD, the parameters take effect immediately after successful change.

For example, the range is 0~300℃, the analog output is 4~20mA current signal, temperature and current The calculation relationship is as shown in the formula: $C = (A2-A1) * (X-B1) / (B2-B1) + A1$, where A2 is temperature range upper limit, A1 is the lower limit of the range, B2 is current output range upper limit, B1 is the lower limit, X is the currently read temperature value, and C is the calculated current value. The list of commonly used values is as follows:

| current(mA) | temperatureValue (℃) | Calculation Process |
|-------------|----------------------|---------------------------|
| 4 | 0.0 | $(300-0)*(4-4)÷(20-4)+0$ |
| 5 | 18.8 | $(300-0)*(5-4)÷(20-4)+0$ |
| 6 | 37.5 | $(300-0)*(6-4)÷(20-4)+0$ |
| 7 | 56.3 | $(300-0)*(7-4)÷(20-4)+0$ |
| 8 | 75.0 | $(300-0)*(8-4)÷(20-4)+0$ |
| 9 | 93.8 | $(300-0)*(9-4)÷(20-4)+0$ |
| 10 | 112.5 | $(300-0)*(10-4)÷(20-4)+0$ |
| 11 | 131.3 | $(300-0)*(11-4)÷(20-4)+0$ |
| 12 | 150.0 | $(300-0)*(12-4)÷(20-4)+0$ |
| 13 | 168.8 | $(300-0)*(13-4)÷(20-4)+0$ |
| 14 | 187.5 | $(300-0)*(14-4)÷(20-4)+0$ |
| 15 | 206.3 | $(300-0)*(15-4)÷(20-4)+0$ |
| 16 | 225.0 | $(300-0)*(16-4)÷(20-4)+0$ |
| 17 | 243.8 | $(300-0)*(17-4)÷(20-4)+0$ |
| 18 | 262.5 | $(300-0)*(18-4)÷(20-4)+0$ |
| 19 | 281.3 | $(300-0)*(19-4)÷(20-4)+0$ |
| 20 | 300.0 | $(300-0)*(20-4)÷(20-4)+0$ |

As shown in the above formula, when measuring 8mA, current current is 79℃.

For example, the range is 0~300℃, the analog output is 0~5V voltage signal, temperature and voltage The calculation relationship is as shown in the formula: $C = (A2-A1) * (X-B1) / (B2-B1) + A1$, where A2 is temperature range upper limit, A1 is the lower limit of the range, B2 is voltage output range upper limit, B1 is the lower limit, X is the currently read

| voltage(V) | temperatureValue (°C) | Calculation Process |
|------------|-----------------------|----------------------------|
| 0 | 0.0 | $(300-0)*(0-0)\div(5-0)+0$ |
| 1 | 60.0 | $(300-0)*(1-0)\div(5-0)+0$ |
| 2 | 120.0 | $(300-0)*(2-0)\div(5-0)+0$ |
| 3 | 180.0 | $(300-0)*(3-0)\div(5-0)+0$ |
| 4 | 240.0 | $(300-0)*(4-0)\div(5-0)+0$ |
| 5 | 300.0 | $(300-0)*(5-0)\div(5-0)+0$ |

temperature value, and C is the calculated voltage value. The list of commonly used values is as follows:

As shown in the above formula, when measuring 2.5V, current voltage is 150 °C。

For example, the range is 0~300°C, the analog output is 0~10V voltage signal, temperature and voltage The calculation relationship is as shown in the formula: $C = (A2-A1) * (X-B1) / (B2-B1) + A1$, where A2 is temperature range upper limit, A1 is the lower limit of the range, B2 is voltage output range upper limit, B1 is the lower limit, X is the currently read temperature value, and C is the calculated voltage value. The list of commonly used values is as follows:

| voltage(V) | temperatureValue (°C) | Calculation Process |
|------------|-----------------------|------------------------------|
| 0 | 0.0 | $(300-0)*(0-0)\div(10-0)+0$ |
| 1 | 30.0 | $(300-0)*(1-0)\div(10-0)+0$ |
| 2 | 60.0 | $(300-0)*(2-0)\div(10-0)+0$ |
| 3 | 90.0 | $(300-0)*(3-0)\div(10-0)+0$ |
| 4 | 120.0 | $(300-0)*(4-0)\div(10-0)+0$ |
| 5 | 150.0 | $(300-0)*(5-0)\div(10-0)+0$ |
| 6 | 180.0 | $(300-0)*(6-0)\div(10-0)+0$ |
| 7 | 210.0 | $(300-0)*(7-0)\div(10-0)+0$ |
| 8 | 240.0 | $(300-0)*(8-0)\div(10-0)+0$ |
| 9 | 270.0 | $(300-0)*(9-0)\div(10-0)+0$ |
| 10 | 300.0 | $(300-0)*(10-0)\div(10-0)+0$ |

As shown in the above formula, when measuring 5V, current voltage is 150 °C。

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