



# Infrared Refrigerant Sensor Module (**Model: GRT510**)

User's Manual Version 1.2  
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Taiyuan Tengxing sensor technology Co., Ltd

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## GRT510 Refrigerant Sensor Module

### Profile

GRT510 refrigerant sensor module is a smart infrared type sensor module, using non-dispersive infrared (NDIR) principle to detect the existence of refrigerant, with good selectivity and non-oxygen dependent. It is a compact high performance sensor module made by combining mature infrared gas detection technology with micro machining and sophisticated circuit design. It is easy to use with excellent performance.



### Main Features

- \*High sensitivity, high resolution, fast response
- \*RS485 communication
- \*Temperature compensation, excellent linear output, good stability, long lifespan
- \*Self-heating function, anti-water vapor interference, anti-poisoning, direct replacement for catalytic sensors

### Main applications

- \*HVAC
- \*Industrial process and safety monitoring

### Main parameters

Table1.

|                    |   |
|--------------------|---|
| Model No.          | GRT510  |
| Detection Gas      | R454B(R32 or R290 can be customized)  |
| Working voltage    | 5±0.1 V DC, ripple<50mV   |
| Average current    | < 60mA (without opening the heating function)   |
| Peak current       | < 300mA   |
| Interface mode     | XHQ-4   |
| Communication mode | RS485(UART or PWM can be customized)  |
| Data update        | 1s  |
| Preheat time       | < 30s   |
| Response Time      | Under 25% LFL environment, the time reaching alarm point (7% LFL) is less than 10 seconds |
| Working T&H        | -40~80 °C, 0~100% RH  |
| Storage T&H        | -40~60 °C, 0~100% RH  |
| Sizes              | 75.4*57*21.5 mm (without connecting cable)  |
| Weight             | 32.5g (without connecting cable)  |
| Lifespan           | > 15 years  |
| Certification      | UL 60335-2-40 : 2022 & IEC 60335-2-40 : 2022  |

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Resolution

Table2.

| Detection Gas | Detection Range | Resolution | Accuracy   |
|---------------|-----------------|------------|--|
| R32           | 0~50% LFL       | 1% LFL     | 1.±2.5%LFL (-20-60℃, 0-95%RH)<br>2.±5.0%LFL (Others) |

Dimensions

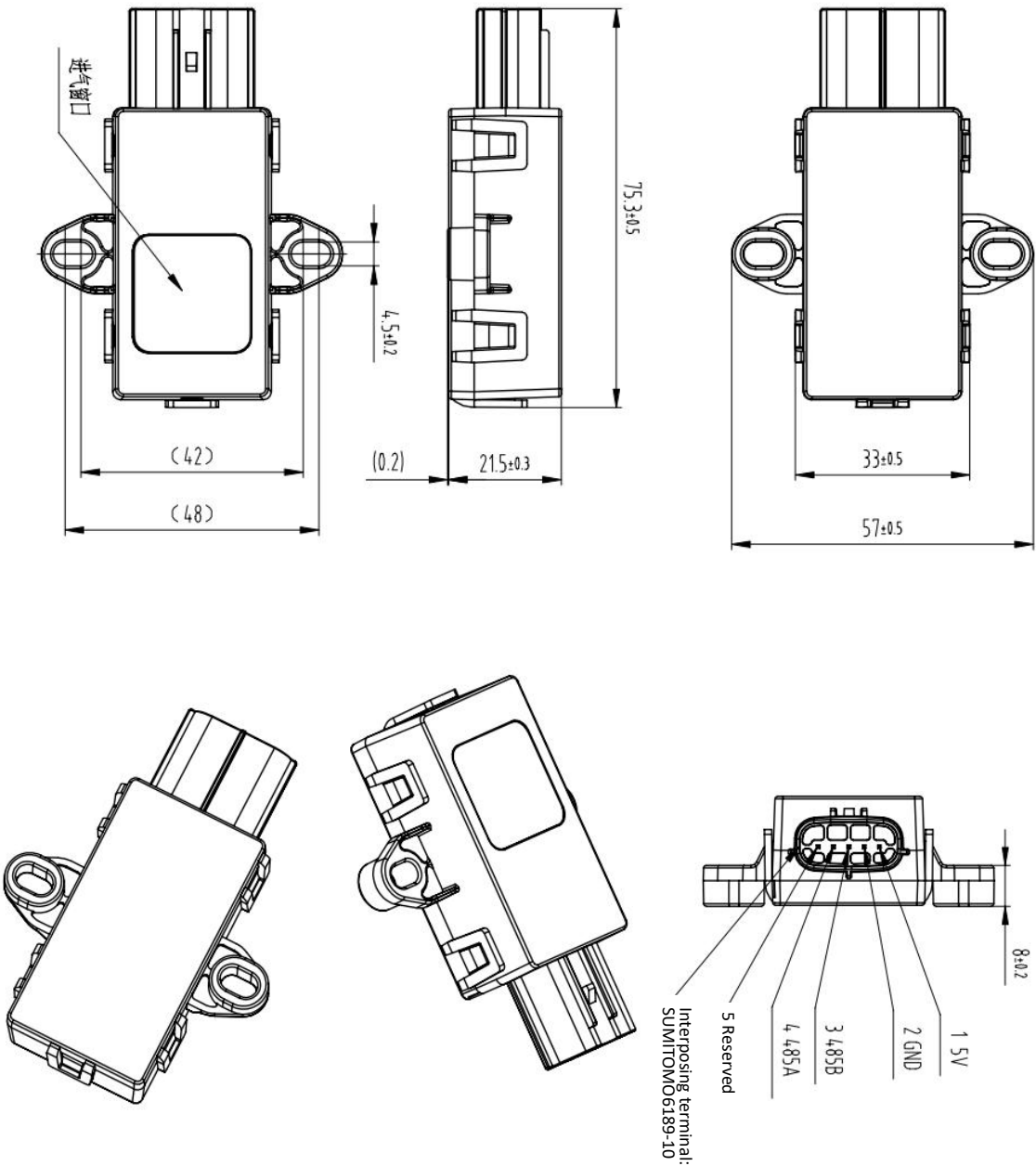


Fig1.sensor module size

## Pin Definition:

Table3.

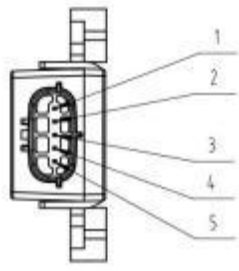
| Pin   | Pin Definition |  |
|-------|----------------|---|
| Pin 1 | VCC            |   |
| Pin 2 | GND            |   |
| Pin 3 | RS485-B        |   |
| Pin 4 | RS485-A        |   |
| Pin 5 | Reserved       |   |

Fig2. Sensor Module Pins

## Communication protocol:

GRT510 module is RS485 communication, communication protocol and data format are as follows

:1、Communication settings:

Table4. Communication settings

|                           |   |
|---------------------------|---|
| Physical Layer            | RS485   |
| Software Protocol Type    | Modbus RTU  |
| Data Byte Order           | High byte first   |
| CRC byte order            | Low byte first  |
| Data frame                | Start bit: 1 bit<br>Data bit: 8 bits<br>Stop bit: 2 bits<br>No parity   |
| Baud rate                 | 2400bps   |
| Modbus address            | 0x01 (default)  |
| Supported Function Codes  | 0x03 (Read multiple holding registers)<br>0x06 (write single register)  |
| Supported Exception Codes | 0x01 (Illegal function)<br>0x02 (illegal address)<br>0x03 (Illegal data value)<br>0x04 (server-side device fault) |

2、Register definition:

Table5. Register Definition Table

| Access Type | Name                           | Register Address | No. of Registers | Data Type      | Description   |
|-------------|--------------------------------|------------------|------------------|----------------|---|
| Read        | Register Specification Version | 0x0100           | 1                | [uint8, uint8] | Protocol specification version, the high byte is the major version number and the low byte is the minor version |

|              |                               |        |   |        |  |
|--------------|-------------------------------|--------|---|--------|--|
|              |                               |        |   |        | number.  |
| Write        | Device Reset                  | 0x0101 | 1 | bool   | The sensor will be reset by writing 1 to the register.   |
| Data Search  |                               |        |   |        |  |
| Read         | Operation mode                | 0x0110 | 1 | enum   | Operation mode of the device, no measurement values are available during startup.<br>0: start-up; 1: measurement in progress.  |
| Read         | Leak signal                   | 0x0111 | 1 | bool   | Flag that turns on when the concentration exceeds the alarm threshold. By default, the leak signal remains on for 5 minutes after the concentration falls below the leak signal threshold again.<br>0: No leak detected;<br>1: Leak is actively detected or for the duration after the leak detection. |
| Read         | Error Code                    | 0x0112 | 1 | uint16 | Refer to <6> Fault Definition Table  |
| Read         | Gas concentration LFL         | 0x0113 | 1 | int16  | The last measured gas concentration in %LFL multiplied by 10 (e.g. 250 means 25%LFL).<br>Resolution: 1% LFL;<br>Range: 0-100% LFL.   |
| Read         | Sensor Module Temperature     | 0x0114 | 1 | int16  | Last measured temperature in °C multiplied by 10 (e.g. 210 means 21.0 °C).<br>Resolution: 0.1 °C;<br>Range: -40 to 85°C.   |
| Read         | Sensor Module Humidity        | 0x0115 | 1 | int16  | Last measured humidity in %RH multiplied by 10 (e.g. 305 means 30.5%RH).<br>Resolution: 0.1%RH;<br>Range: 0-100%RH.  |
| Setting      |                               |        |   |        |  |
| Read / Write | Device Address                | 0x0120 | 1 | uint8  | Slave address of the Modbus interface<br>Range: 1 - 247;<br>Default value: 1<br>A soft reset or power reapplication is required to apply a change to this value.   |
| Read         | Leak signal trigger threshold | 0x0124 | 1 | uint16 | The gas concentration level that triggers the leak signal.<br>Resolution: 0.1% LFL (e.g. 251 means 25.1% LFL)  |
| Read         | Lifetime warning              | 0x0126 | 1 | uint16 | The life count value of the trigger life   |

|                    |                                     |        |   |            |  |
|--------------------|-------------------------------------|--------|---|------------|--|
|                    | signal trigger threshold            |        |   |            | warning signal in days.<br>Resolution: 1 day;<br>Range: 0-65535 days.  |
| Read               | Life Alarm Signal Trigger Threshold | 0x0127 | 1 | uint16     | The life count value of the trigger life alarm signal in days.<br>Resolution: 1 day;<br>Range: 0-65535 days.   |
| Device Information |                                     |        |   |            |  |
| Read               | Device Marking                      | 0x0140 | 1 | string[20] | Reads the device tag. To be set, no default value. Indicates that the string is filled with 0 and terminated without 0.  |
| Read               | Firmware Version                    | 0x014A | 1 | uint8[2]   | Firmware version.<br>Format:<br>High byte: major version;<br>Low byte: minor version.  |
| Read               | Gas Type                            | 0x014C | 1 | enum       | The type of gas for which the sensor module is configured.   |
| Read               | Life counter (days)                 | 0x014E | 1 | uint16     | The service life of the device in days.<br>Resolution: 1 day;<br>Range: 0-65535 days.<br>Device stores timing values every 12 hours.   |
| Read               | Life counter (hours)                | 0x014F | 1 | uint16     | The value of the service life of the device is supplemented by the number of hours, which together with the integer digits form the life value. The unit is hours.<br>Resolution: 1 hour (for example: 12 means 12 hours, if the number of life days is 100, the total life is: 100 days and 12 hours);<br>Range: 0-23 hours.<br>This value is updated every 1 hour. |

### 3、Fault definition

Table6. Fault Definition Table

| Bit(0-15 from right to left) | Fault               | Description   |
|------------------------------|---------------------|---|
| 0                            | Internal errors     | Errors that cause measurement data to be unavailable, such as internal communication errors.                |
| 1                            | Value exceeds limit | The sensor detects a temperature, relative humidity or gas concentration that exceeds the specified limits. |
| 2                            | -                   | -   |

|   |                                |   |
|---|--------------------------------|---|
| 3 | Self-test failed               | Internal check for errors caused by incorrect operation, invalid settings, etc. |
| 4 | Sensor module failure          | Unable to recover from an error that requires replacement of the sensor module. |
| 5 | Exceed life limit alarm        | The service life limit has been reached.  |
| 6 | Approaching life limit warning | The lifetime warning threshold has been reached.                                |

#### 4、Data sending and receiving format:

Table7. Basic Format

| Device Address | Function Code | Data   | CRC Checksum |
|----------------|---------------|--------|--------------|
| 1 byte         | 1 byte        | N byte | 2 byte       |

Table8. Function Code 03 - Read Holding Register Request Format

| Device Address | Function Code | Start register address high byte | Start register address low byte | Read the high byte of the number of registers | Read the low byte of the number of registers | CRC Checksum |
|----------------|---------------|----------------------------------|---------------------------------|---|--|--------------|
| 1 byte         | 03            | 1 byte                           | 1 byte                          | 1 byte  | 1 byte                                       | 2 byte       |

Table9. Function Code 03 - Read Holding Register Correct Answer Format

| Device Address | Function Code | Return the number of data bytes | Register 1 data high byte | Register 1 data low byte | ..... | CRC Checksum |
|----------------|---------------|---------------------------------|---------------------------|--------------------------|-------|--------------|
| 1 byte         | 03            | 1 byte                          | 1 byte                    | 1 byte                   | ..... | 2 byte       |

Table10. Function Code 06 - Write Single Holding Register Request Format

| Device Address | Function Code | Register address high byte | Register address low byte | Write value high byte | Write value low byte | CRC Checksum |
|----------------|---------------|----------------------------|---------------------------|-----------------------|----------------------|--------------|
| 1 byte         | 06            | 1 byte                     | 1 byte                    | 1 byte                | 1 byte               | 2 byte       |

Table11. Request frame error response format

| Device Address | Function Code                     | Exception code values | CRC Checksum |
|----------------|-----------------------------------|-----------------------|--------------|
| 1 byte         | Request frame function code +0x80 | 1 byte                | 2 byte       |

\* Note: CRC checksum calculation: CRC-16/MODBUS  $x_{16}+x_{15}+x_2+x_1$



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**Notes:**

- Please use the sensor module within requested and stable voltage. It may be damaged if the voltage is too high or not work properly if the voltage is too low.
  - Please do not use the product in high T&H, strong electromagnetic or dusty environment for long time.
  - Please do not impact or vibrate the module seriously.
  - Please do not install the module in the severe convection environment.
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