



Refrigerant detection module  
(ZRT510 series)

# Instruction Manual

Version number: 1.3

Implementation Date: April 9, 2026

Zhengzhou Winsen Electronics Technology Co., Ltd

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Zhengzhou Winsen Electronic Technology Co., Ltd.

# ZRT510 Series Refrigerant Detection Module

## Product Description

The ZRT510 module is an intelligent infrared refrigerant detection module (hereinafter referred to as the module). It uses the non-dispersive infrared (NDIR) principle to detect refrigerants, exhibiting excellent selectivity and no oxygen dependence. This module is a compact, high-performance module that tightly integrates a mature infrared absorption gas detection sensor with micro-machining and sophisticated circuit design. It is easy to use and offers excellent performance.



## Features

- High sensitivity, high resolution, and fast response time
- RS485 communication
- Temperature compensation, excellent linear output, superior stability, and long service life.
- It is resistant to moisture interference, non-toxic, and can directly replace the catalytic combustion module.

## Main applications

- HVAC
- Industrial process and safety monitoring

## Technical indicators

Table 1

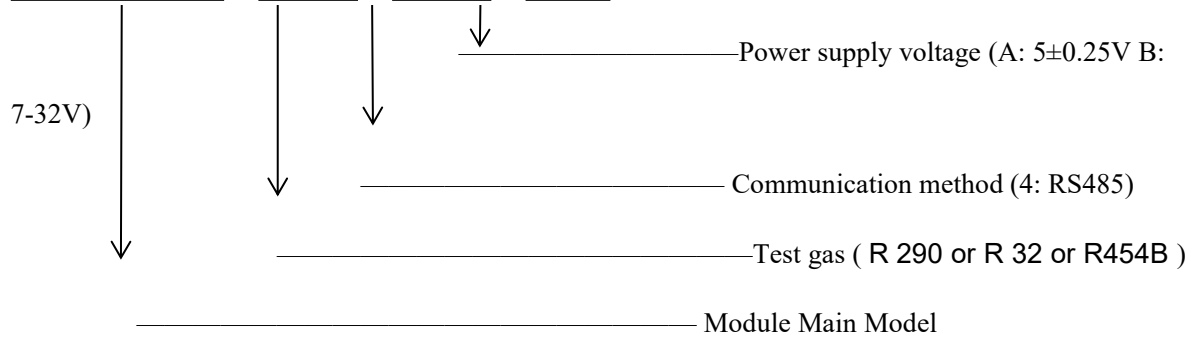
Average current	<60mA (@5V) / <30mA (@12V)
Peak current	<200mA (@5V) / <100mA (@12V)
range	0-50% LFL
resolution	0.1% LFL
accuracy	±2.5% LFL (@0%~25% LFL) ±5% LFL (@25%~ 50 % LFL)
Interface model	Sumitomo 6189-1046
Communication methods	RS485
Data update	≤1s
preheating time	< 30s
Response time <sup>①</sup>	<15s ( R290)/<10s (R32, R454B)

alarm point	10% LFL
Working conditions	-40~85°C, 0-100%RH (non-condensing)
Storage conditions	-40~70°C, 0-100%RH (non-condensing)
External dimensions	75.3*57*21.5mm
weight	Approximately 32.5g
life	>15 years
Meets standards	UL 60335-2-40 : 2022 & IEC 60335-2-40 : 2022

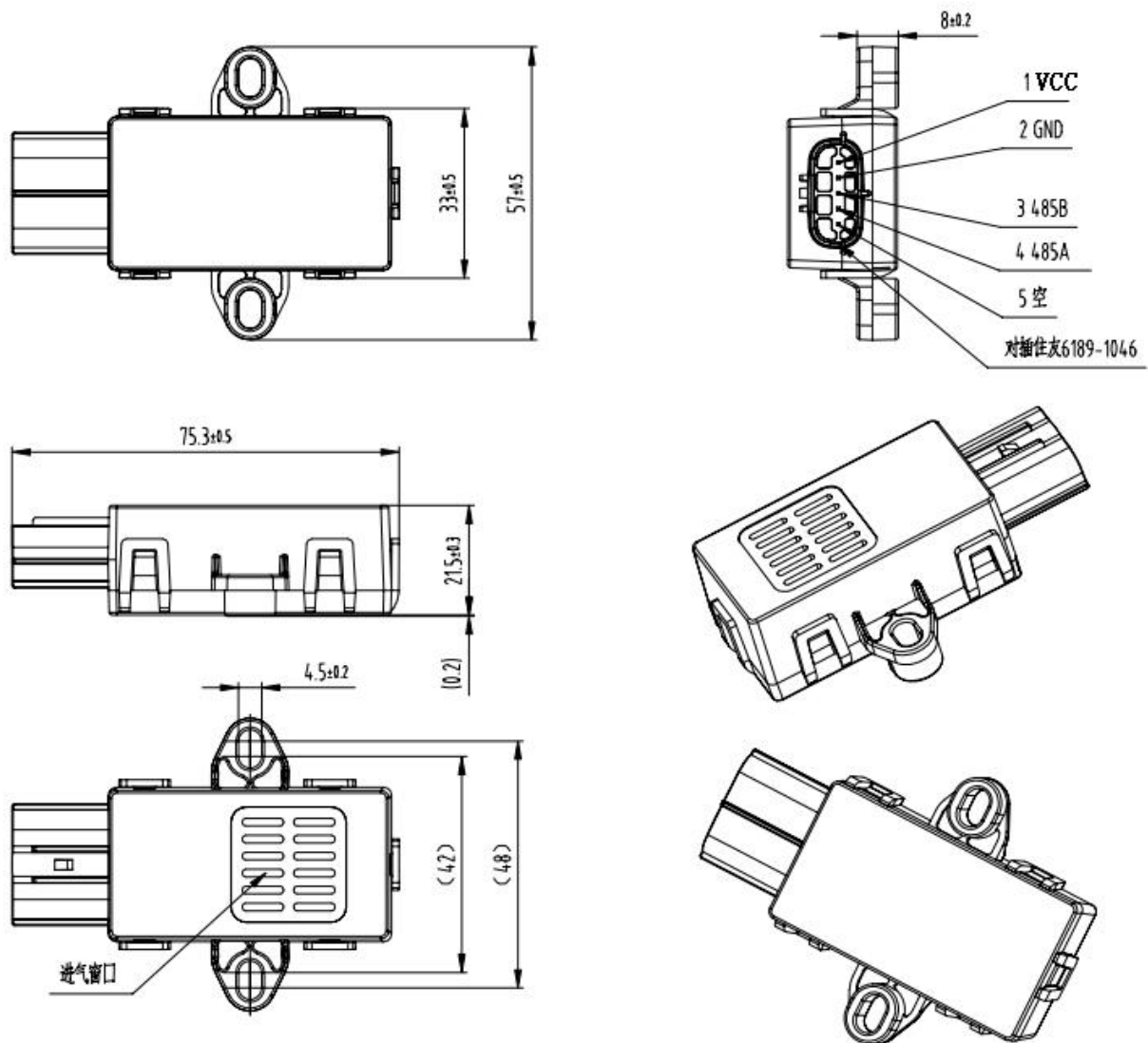
① Tested according to UL 60335-2-40:2022 & IEC 60335-2-40:2022 standards

### Model Description

ZRT510 - XX - XX - XX



**Product Dimensions**

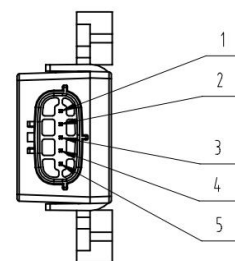


**Figure 1 Product outline dimensions**

**Pin Definitions**

**Table 2 Pin Definitions**

Pin name	Pin Description
Pin 1	VCC
Pin 2	GND
Pin 3	RS485-B
Pin 4	RS485-A
Pin 5	Reserved



**Figure 2: Pin Definitions**

**Communication Protocol**

The ZRT510 series modules use RS485 communication. The communication protocol and data format are as follows:

1、Communication settings

**surface 3. Communication Settings**

Physical layer	RS485
Software Protocol Types	Modbus RTU
Data byte order	High byte first
CRC byte order	Least byte first
Data Frame	Start bit: 1 bit Data bits: 8 bits Stop bits: 2 bits No verification
baud rate	2400bps
Modbus address	0x01 (default)
Supported function codes	0x03 (Read multiple holding registers) 0x06 (Write to a single register)
Supported exception codes	0x01 (Illegal function) 0x02 (Illegal address) 0x03 (Invalid data value) 0x04 (Server-side equipment failure)

2、Register definition

**Table 4 Register Definition Table**

Access type	name	Register address	Number of registers	Data types	describe
read	Register specification version	0x0100	1	[uint8, uint8]	The protocol specification version, where the high byte is the major version number and the low byte is the minor version number.
Write	Device reset	0x0101	1	bool	Write 1 to the register and the sensor will reset.

read	Operating mode	0x0110	1	enum	The device is in an operating mode where no measurements are available during startup. 0: Started; 1: Measuring.
read	Leaking signals	0x0111	1	bool	This is a flag that activates when the concentration exceeds the alarm threshold. By default, the leak signal remains active for 5 minutes after the concentration falls below the leak signal threshold again. 0: No leak detected; 1: The leak was detected proactively or within a certain period after the leak was detected.
read	Error code	0x0112	1	uint16	Refer to the fault definition table in <3>.
read	Gas concentration (LFL)	0x0113	1	int16	The final measured gas concentration is expressed as %LFL multiplied by 10 (e.g., 251 represents 25.1%LFL). Resolution: 0.1% LFL; Range: 0-100% LFL.
read	Sensor module temperature	0x0114	1	int16	The final measured temperature is in ° C multiplied by 10 (e.g., 210 means 21.0 ° C). Resolution: 0.1°C; Range: -45 - 130 °C .
read	Sensor module humidity	0x0115	1	int16	The final humidity measurement is in units of %RH multiplied by 10 (e.g., 305 means 30.5%RH). Resolution: 0.1%RH; Range: 0-100%RH.
Reading/ Writing	Device address	0x0120	1	uint8	Slave address of Modbus interface Range: 1-247; Default value: 1 A soft reset or power-on is required for the changes to this value to take effect.
read	Leakage signal trigger threshold	0x0124	1	uint16	The gas concentration level that triggers the leak signal. Resolution: 0.1% LFL (e.g., 251 means 25.1% LFL)

read	Lifespan warning signal trigger threshold	0x0126	1	uint16	The lifespan count value that triggers the lifespan warning signal, in days. Resolution: 1 day; Range: 0-65535 days.
read	Lifetime alarm signal trigger threshold	0x0127	1	uint16	The lifespan count value that triggers the lifespan alarm signal, in days. Resolution: 1 day; Range: 0-65535 days.
read	Equipment marking	0x0140	1	string[12]	Device tagging information .
read	Firmware version	0x014A	1	uint8[2]	Firmware version. Format: High byte: Major version; Low byte: Minor version.
read	Gas type	0x014C	1	enum	The type of gas configured in the sensor module. 0: Default value
read	Lifespan counter (days)	0x014E	1	uint16	The lifespan of the equipment is measured in days. Resolution: 1 day; Range: 0-65535 days. The device stores timing data every 12 hours.
read	Lifespan counter (hours)	0x014F	1	uint16	The equipment's lifespan is indicated by adding hours to the numerical value, which, together with the integer part, forms the lifespan value. The unit is hours. Resolution: 1 hour (e.g., 12 represents 12 hours; if the lifespan is 100 days, then the total lifespan is 100 days and 12 hours). Range: 0-23 hours. This value is updated every hour.

3、Fault Definition

**Table 5 Fault Definition Table**

Bits (0-15 from right to left)	Fault	describe
Bit0	Internal error	Errors that render measurement data unavailable, such as internal communication errors.
Bit1	Value exceeds limit	The sensor detects temperatures, relative humidity, or gas concentrations that exceed specified limits.
Bit2	-	-
Bit3	-	-
Bit4	-	-
Bit5	Exceeding lifespan limit alarm	It has reached the end of its service life.
Bit6	Near-life-limit warning	It has reached the service life warning threshold.

4、Data sending and receiving formats

**Table 6 Basic Format**

Device address	function code	data	CRC check code
1 byte	1 byte	N bytes	2 bytes

**Table 7 Function Code 03 - Read Holding Register Request Format**

Device address	function code	high byte of start register address	start register address low byte	Number of registers to read (high byte)	Read the low byte of the register	CRC check
1 byte	03	1 byte	1 byte	1 byte	1 byte	2 bytes

**Table 8 Function Code 03 - Read Holding Register Correct Response Format**

Device address	function code	Number of bytes returned	Register 1 data high byte	Register 1 data low byte	.....	CRC check
1 byte	03	1 byte	1 byte	1 byte	.....	2 bytes

**Table 9 Function Code 06 - Write Single Holding Register Request Format**

Device address	function code	Register address high byte	register address low byte	Write the high byte of the value	Write value low byte	CRC check

1 byte	06	1 byte	1 byte	1 byte	1 byte	2 bytes
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If the write-to-hold register is successful, the original data packet is returned.

**Table 10 Request Frame Error Response Format**

Device address	function code	Exception code value	CRC check
1 byte	Request frame function code +0x80	1 byte	2 bytes

Note: CRC checksum calculation: CRC-16/MODBUS  $x^{16}+x^{15}+x^2+x^1$

### Precautions

- When using the module, ensure the voltage is within the set range and the power supply is stable. Excessive voltage may damage the module . If the voltage is too low, the module may not function properly;
- Avoid exposing the module to high temperature and humidity, strong electromagnetic environment, excessive dust, or other similar environments for extended periods.
- Vibration and drops may reduce the measurement accuracy of the module ; excessive impact or vibration should be avoided.
- The module should always be installed in a vertical position with the air intake facing the side;
- In environments where water may accumulate, the module's air inlet and outlet ports must not be installed facing upwards;
- Do not install the module in a strong air convection environment.

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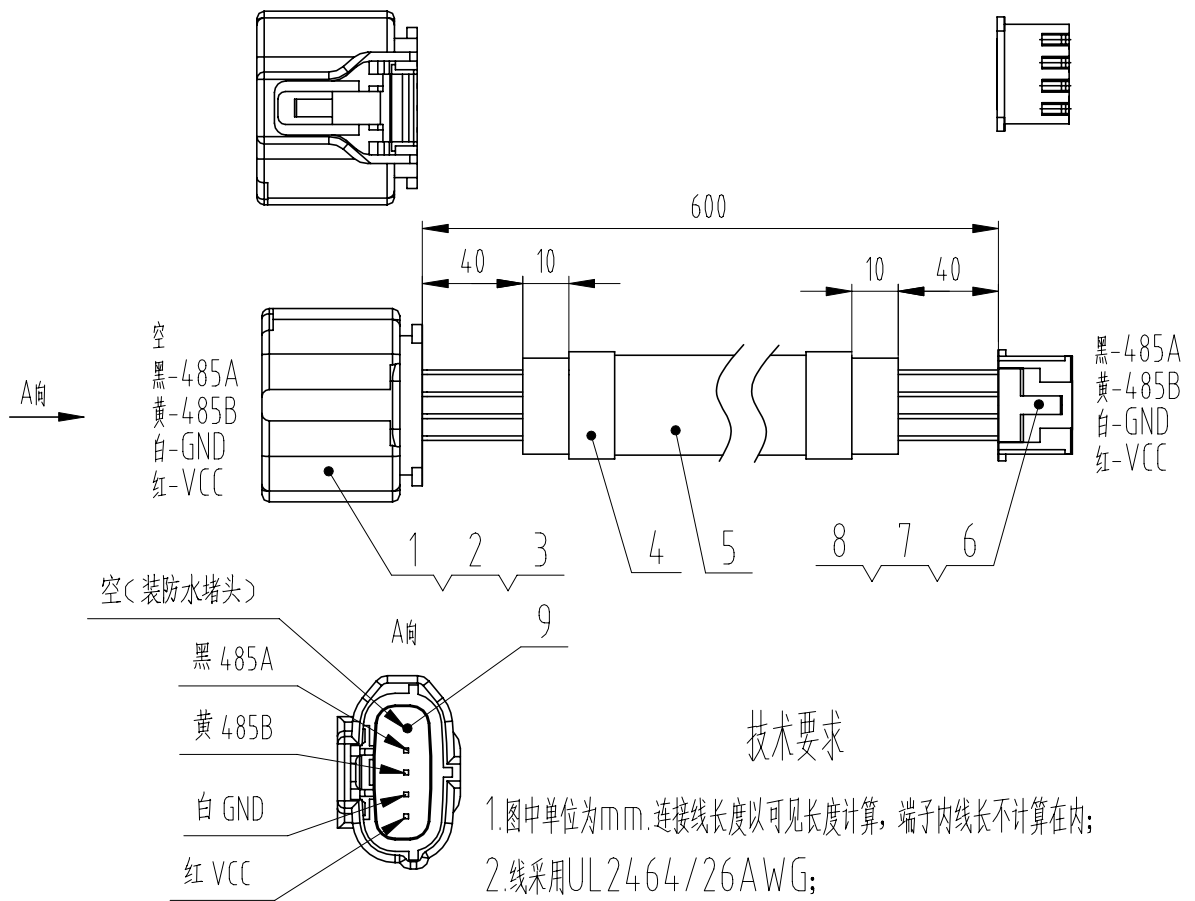
E-mail:sales@winsensor.com

Http://www.winsensor.com



住友6189-1046接头正面

XHD-4正面



## 技术要求

- 1.图中单位为mm.连接线长度以可见长度计算,端子内线长不计算在内;
- 2.线采用UL2464/26AWG;
- 3.端子连接处应能承受>30N的拉力;
- 4.连接线长偏差: 0~300mm公差±10mm,301~1500mm公差±30mm。

9	住友7165-0797	防水堵(盲堵)	1			EE系列 灰色
8	XH-T	端子	4			镀锡端子
7	XHD-04RSTB	卡子	1			红色
6	XHD-04YB	塑壳	1			白色带扣
5		多股电缆(黑色外被)	1	PVC/CU		UL2464/26AWG
4		热缩套管 $\phi 4 \times 20$	2			内部加胶
3	住友7165-1198	防水栓	4			黄色
2	住友8240-0336	母端子	4			
1	住友6189-1046	塑壳	1	PBT		
序号	结构图号	名称	数量	材质	物料编码	备注
				接线图		SJ-ZRT510-005-001
A	版本	更改人	审核	批准	年月日	ZRT510模组连接线
产品设计			结构设计			
标准化			审核			郑州炜盛电子科技有限公司
工艺			批准			
			物料编码			