Refrigerant detection Gas Sensor

(Model:MP511D)

Manual

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Zhengzhou Winsen Electronics Technology Co., Ltd

Statement

Thanks for purchasing our product. In order to let customers use it better and reduce the faults caused by misuse, please read the manual carefully and operate it correctly in accordance with the instructions. If users disobey the terms or remove, disassemble, change the components inside of the sensor, we shall not be responsible for the loss.

The specific such as color, appearance, sizes & etc, please in kind prevail.

We are devoting ourselves to products development and technical innovation, so we reserve the right to improve the products without notice. Please confirm it is the valid version before using this manual. At the same time, users' comments on optimized using way are welcome.

Please keep the manual properly, in order to get help if you have questions during the usage in the future.

Zhengzhou Winsen Electronics Technology CO., LTD

MP511D Refrigerant Gas Sensor

Profile

The MP511D Freon gas sensor uses a multilayer thick film manufacturing process to fabricate heating and measuring electrodes and a metal oxide semiconductor gas-sensitive layer on a miniature ceramic substrate, and encapsulate it in a metal casing. When the detected gas exists in the ambient air, the conductivity of the sensor changes. The higher the concentration of the gas, the higher the conductivity of the sensor. This change in conductivity is converted into an output signal corresponding to the gas concentration through the circuit. The product has good anti-interference ability against common gases such as alcohol and acetic acid in usage scenarios.

Features

High selectivity, fast response, good anti-interference, long lifespan, good stability

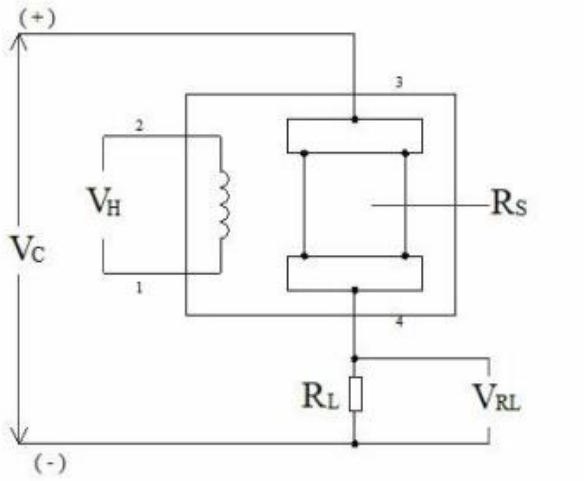
Can detect kinds of refrigerant gases R134a, R454b, R290.

Main Application

Used for leak detection of refrigerants in air conditioning and refrigeration systems

Basic test circuit

The figure below shows the basic test circuit of the MP511D sensor. The sensor needs to apply two voltages: heating voltage (VH) and test voltage (VC). Among them, VH is used to provide a specific operating temperature for the sensor, and the voltage applied to both ends of the heating electrode uses a DC power supply. VC is used to measure the loop voltage of the circuit. VRL is the voltage on the load resistance (RL) connected in series with the sensor, that is, the output voltage Vout. Under the premise of meeting the electrical characteristics of the sensor, VH and VC can share a power supply circuit.



Technical Parameters Table1.

Model			MP511D
Sensor Type			Semiconductor flat surfaced sensor
Standard Encapsulation			Metal Cap
Detection Gas			Refrigerant gas
Detection range			200～10000ppm
Standard circuit	Loop voltage	V_C	5.0V±0.1V DC
	Heating voltage	V_H	5.0V±0.1V DC
	Load resistance	R_L	Adjustable
sensor features in standard test condition	Heating consumption	P_H	≤350mW
	Surface resistance	R_S	0.5～10KΩ(in 2000ppm R290)
	Sensitivity	S	0.4~0.6 (R290) Rs(in 3000ppm)/Rs(in 1000ppm)
Standard condition of test	Temperature, humidity		25℃±2℃；55%±5%RH
	Standard test circuit		Vc:5.0V±0.1V； V_H:5.0V±0.1V
	Warm-up time		7 days

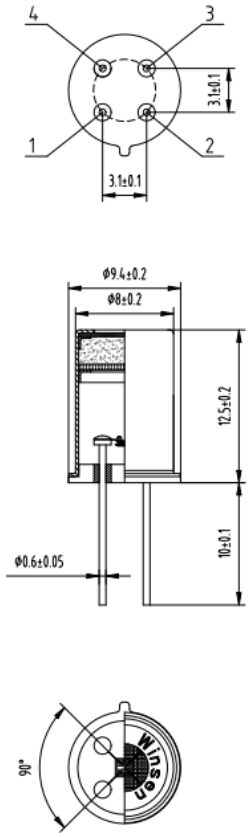


Fig1.Sensor Structure

Calculation formula

Power consumption Ps:

$$P_S = \frac{(V_C - V_{RL})^2}{R_S}$$

Rs:

$$Rs = (\frac{Vc}{V_{RL}} - 1) \times R_L$$

Pin definition

Pin1.Heater

Pin2 Heater

Pin3 Power +

Pin4 Power -

Description of Sensor Characters

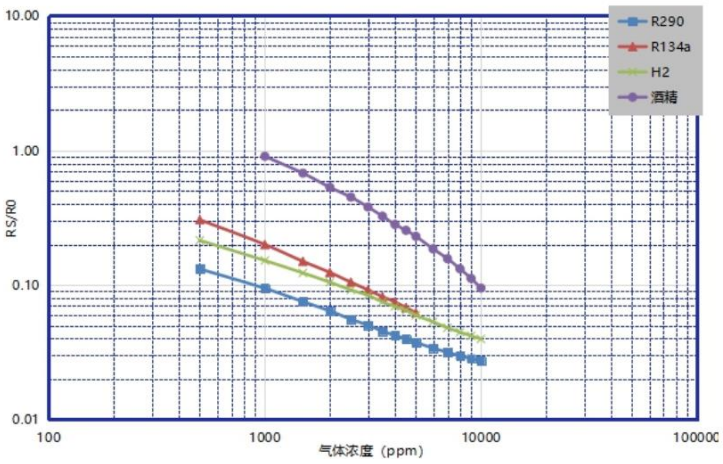


Fig 2 Typical Sensitivity Curve

Rs means resistance in target gas with different concentration, R_0 means resistance of sensor in clean air.

All tests are finished under standard test conditions.

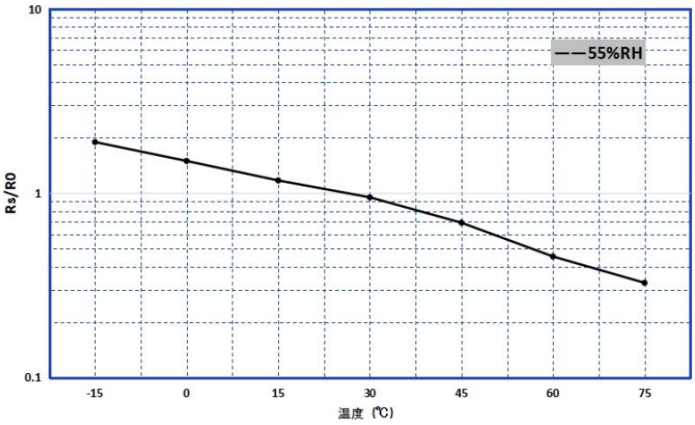


Fig 3 Typical temperature/humidity characteristics

The vertical axis represents the sensor resistance ratio Rs/R0, and Rs and R0 are defined as follows：：

Rs means resistance of sensor in 2000ppm R290 under 55%RH humidity and different tem.

R0 means resistance of the sensor in 2000ppm R290 under 55%RH humidity and 25℃ tem.

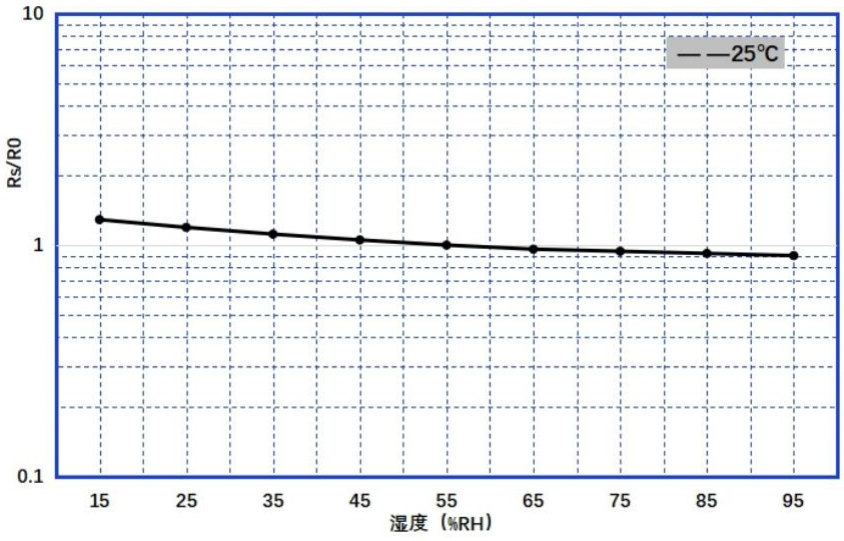


Fig 4 Typical temperature/humidity characteristics

Rs means resistance of sensor in 2000ppm R290 under 25℃ temperature and different humidity.

R0 means resistance of the sensor in 2000ppm R290 under 55%RH humidity and 25℃ temperature.

Cautions

1. Following conditions must be prohibited

1.1 Exposed to volatilizable organic silicon steam

Sensing material will lose sensitivity and never recover if the sensor absorbs organic silicon steam. Sensors must avoid exposing to silicon bond, fixature, silicon latex, putty or plastic contain silicon environment.

1.2 High Corrosive gas

If the sensors are exposed to high concentration corrosive gas (such as H_2S, SO_X, Cl_2, HCl etc.), it will not only result in corrosion of sensors structure, also it cause sincere sensitivity attenuation.

1.3 Alkali, Alkali metals salt, halogen pollution

The sensors performance will be changed badly if sensors be sprayed polluted by alkali metals salt especially brine, or be exposed to halogen such as fluorine.

1.4 Touch water

Sensitivity of the sensors will be reduced when spattered or dipped in water.

1.5 Freezing

Do avoid icing on sensor's surface, otherwise sensing material will be broken and lost sensitivity.

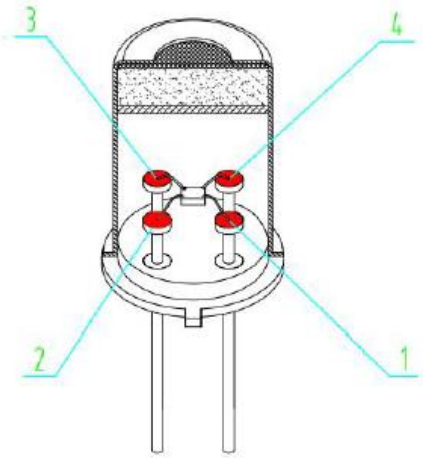
1.6 Applied higher voltage

Applied voltage on sensor should not be higher than stipulated value, even if the sensor is not physically damaged or broken, it causes down-line or heater damaged, and bring on sensors' sensitivity characteristic changed badly.

1.7 Voltage on wrong pins

As Fig8,Pin 1&2 connects to heater circuit, Pin 3&4 connects to measuring circuit; Under the requested conditions, heating and measuring can use the same power circuit.

NOTE: the two pins near the protuberance mark is heating electrode.



Pin 1&2 is heating electrode,
Pin 3&4 is measuring electrode.

Fig 5. Pin Schematic Diagram

2. Following conditions should be avoided

2.1 Water Condensation

Indoor conditions, slight water condensation will influence sensors' performance lightly. However, if water condensation on sensors surface and keep a certain period, sensors' sensitive will be decreased.

2.2 Used in high gas concentration

No matter the sensor is electrified or not, if it is placed in high gas concentration for long time, sensors characteristic will be affected. If lighter gas sprays the sensor, it will cause extremely damage.

2.3 Long time storage

The sensors resistance will drift reversibly if it's stored for long time without electrify, this drift is related with storage conditions. Sensors should be stored in airproof bag without volatile silicon compound. For the sensors with long time storage but no electrify, they need long galvanical aging time for stability before using. The suggested aging time as follow:

Stable2.

Storage Time	Suggested aging time
Less than one month	No less than 48 hours
1 ~ 6 months	No less than 72 hours
More than six months	No less than 168 hours

2.4 Long time exposed to adverse environment

No matter the sensors electrified or not, if exposed to adverse environment for long time, such as high humidity, high temperature, or high pollution etc., it will influence the sensors' performance badly.

2.5 Vibration

Continual vibration will result in sensors down-lead response then break. In transportation or assembling line, pneumatic screwdriver/ultrasonic welding machine can lead this vibration.

2.6 Concussion

If sensors meet strong concussion, it may lead its lead wire disconnected.

2.7 Usage Conditions

2.7.1 For sensor, handmade welding is optimal way. The welding conditions as follow:

- Soldering flux: Rosin soldering flux contains least chlorine
- homothermal soldering iron
- Temperature： ≤350℃
- Time： less than 3 seconds

If disobey the above using terms, sensors sensitivity will reduce.

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