



# Refrigerant detection Gas Sensor

(Model:MP510C)

# Manual

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## MP510C Refrigerant Gas Sensor

### Profile

The MP510C 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 Al<sub>2</sub>O<sub>3</sub> 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

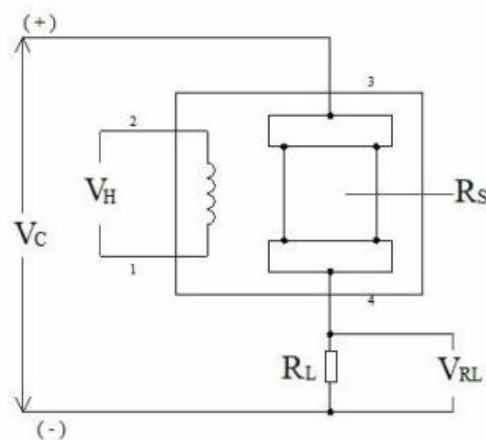
High selectivity, fast response, good anti-interference, long lifespan, good stability  
Can detect kinds of refrigerant gases R32, R134a, R410a, R290.

### Main Application

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

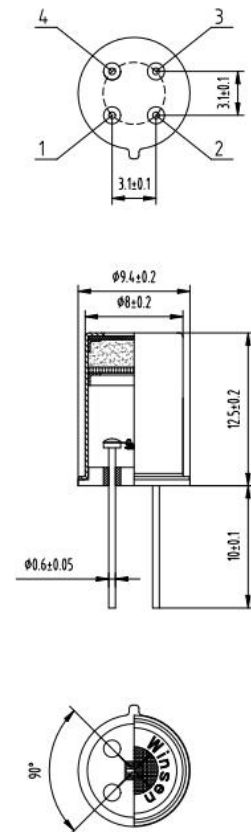
### Basic test circuit

The figure below shows the basic test circuit of the MP510C sensor. The sensor needs to apply two voltages: heating voltage ( $V_H$ ) and test voltage ( $V_C$ ). Among them,  $V_H$  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.  $V_C$  is used to measure the loop voltage of the circuit.  $V_{RL}$  is the voltage on the load resistance ( $R_L$ ) connected in series with the sensor, that is, the output voltage  $V_{out}$ . Under the premise of meeting the electrical characteristics of the sensor,  $V_H$  and  $V_C$  can share a power supply circuit.



**Technical Parameters Table1.**

Model		MP510C	
Sensor Type		Semiconductor flat surfaced sensor	
Standard Encapsulation		Metal Cap	
Detection Gas		Refrigerant gas	
Detection range		100~10000ppm	
Standard circuit	Loop voltage	V <sub>C</sub>	5.0V±0.1V DC
	Heating voltage	V <sub>H</sub>	5.0V±0.1V DC
	Load resistance	R <sub>L</sub>	Adjustable
sensor features in standard test condition	Heating consumption	P <sub>H</sub>	≤300mW
	Surface resistance	R <sub>S</sub>	0.5~10KΩ(in 5000ppm R32)
	Sensitivity	S	0.3~0.7 (R32) Rs(in 9000ppm)/Rs(in 3000ppm)
Standard condition of test	Temperature, humidity	20°C±2°C; 65%±5%RH	
	Standard test circuit	V <sub>C</sub> :5.0V±0.1V; V <sub>H</sub> :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:

$$R_S = \left( \frac{V_C}{V_{RL}} - 1 \right) \times R_L$$

**Pin definition**

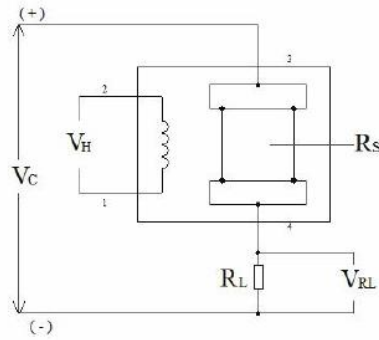
Pin1.Heater

Pin2 Heater

Pin3 Power +

Pin4 Power -

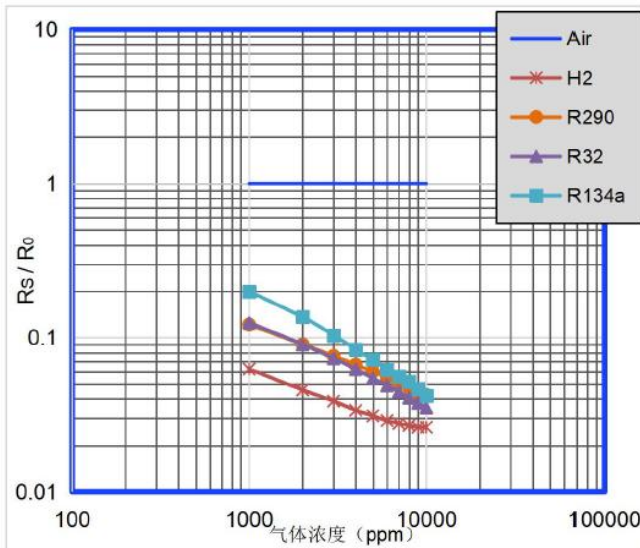
**Basic Circuit**



**Fig2. MP510C Test Circuit**

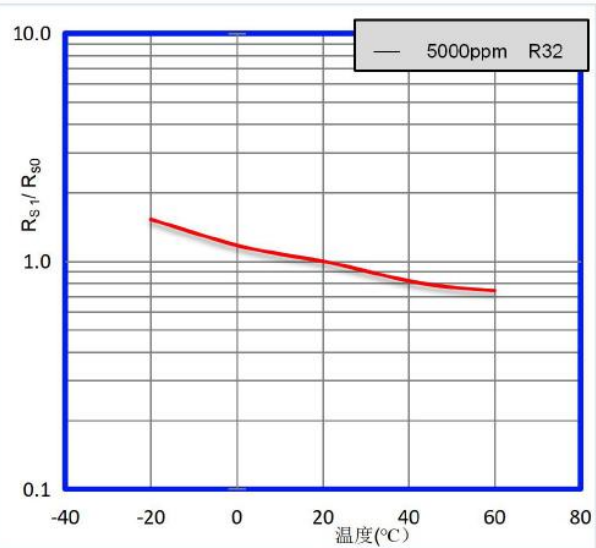
**Instructions:** The above fig is the basic test circuit. The sensor requires two voltage inputs: heater voltage ( $V_H$ ) and circuit voltage ( $V_C$ ).  $V_H$  is used to supply standard working temperature to the sensor and it can adopt DC or AC power, while  $V_{RL}$  is the voltage of load resistance  $R_L$  which is in series with sensor.  $V_C$  supplies the detect voltage to load resistance  $R_L$  and it should adopt DC power.

**Description of Sensor Characters**



**Typical Sensitivity Curve**

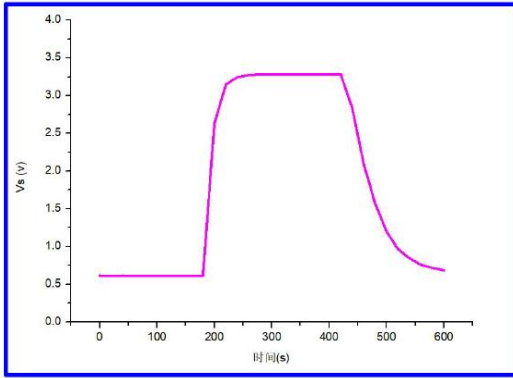
$R_s$  means resistance in target gas with different concentration,  $R_0$  means resistance of sensor in clean air. All tests are finished under standard test conditions.



**Typical temperature/humidity characteristics**

$R_{s1}$  means resistance of sensor in 5000ppm R32 under different tem. and humidity.  $R_{s0}$  means resistance of the sensor in clean air under 22°C/50%RH.

Response and Resume curve in 5000ppm R32



## 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, fixture, 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 splattered or dipped in water.

#### 1.5 Freezing

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

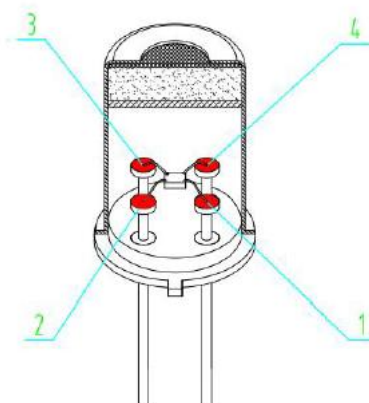
#### 1.6 Applied higher voltage

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.

**Fig8.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.**

<b>Storage Time</b>	<b>Suggested aging time</b>
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**

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

- Soldering flux: Rosin soldering flux contains least chlorine
- homothermal soldering iron
- Temperature:  $\leq 350^{\circ}\text{C}$
- Time: less than 3 seconds

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