



# Smoke Gas Sensor

(Model: MP-2)

# Manual

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## MP-2 Smoke Gas Sensor

MP-2 model with advanced planar construction is comprised of heater and metal oxide semiconductor material of subminiature  $Al_2O_3$  ceramic plate, fetch out electrode down-lead, encapsulation in metal base and cap. When the target gas exists, the sensor's conductivity is more higher along with the gas concentration rising. Please use simple electrocircuit, convert change of conductivity to correspond output signal of gas concentration.

### Features:

- \* Good sensitivity to LPG, smoke in wide range
- \* Small size
- \* Long lifespan
- \* Low cost
- \* Simple circuit



### Application

Domestic smoke leakage alarm, industrial smoke gas alarm and portable smoke detector.

### Technical Parameters

Model		MP-2	
Sensor Type		Flat Surfaced Semiconductor	
Standard Encapsulation		Metal Cap	
Target Gas		$C_3H_8$ , smoke	
Detection range		200~10000ppm $C_3H_8$	
Standard Circuit Conditions	Loop Voltage	$V_c$	$\leq 10V$ DC
	Heater Voltage	$V_H$	$5V \pm 0.1V$ AC or DC
	Load Resistance	$R_L$	Adjustable
Sensor character under standard test conditions	Heater Resistance	$R_H$	$105\Omega \pm 10\Omega$ (room tem.)
	Heater consumption	$P_H$	$\leq 240mW$
	Sensitivity	$S$	$R_o(\text{in air})/R_s(\text{in } 2000\text{ppm } C_3H_8) \geq 3$
	Output voltage	$V_s$	$2.5V \sim 4.0V$ (in 2000ppm $C_3H_8$ )
	Concentration Slope	$\alpha$	$\leq 0.6(R_{3000\text{ppm}}/R_{500\text{ppm}} C_3H_8)$
Environment Conditions	Operation Temp.	$T_{ao}$	$-10^\circ C \sim 50^\circ C$
	Storage Temp.	$T_{as}$	$-20^\circ C \sim 70^\circ C$
	Relative Humidity	RH	Less than 95%RH
	O <sub>2</sub> concentration	$O_2$	$21\% \pm 1\%$ (can't less than 18%) O <sub>2</sub> concentration effects sensor's performance.
	Preheat time	Not less than 48 hours	

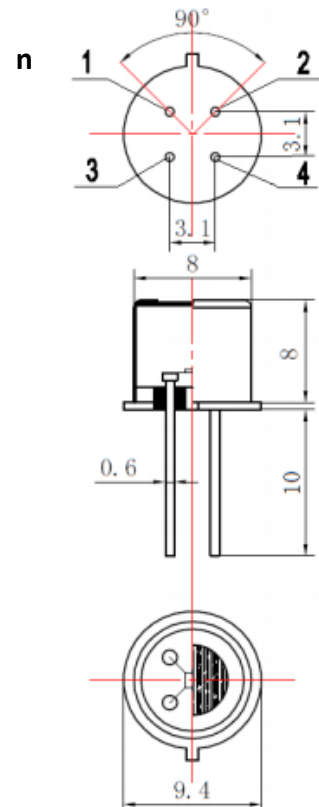


Fig1.MP-2 Configuration

### Basic circuit

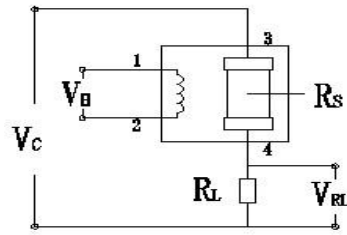


Fig2. Test circuit

This circuit shows the basic measuring circuit of sensor. Two voltage should be applied to this sensor, heating voltage ( $V_H$ ) and test voltage ( $V_c$ ).  $V_H$  is used for supplying a certain temperature which can be DC or AC.  $V_{RL}$  the voltage on the load resistance ( $R_L$ ) which connects to the sensor in series.  $V_c$  is supply the test voltage for  $R_L$  and it must be DC.

### Characterization

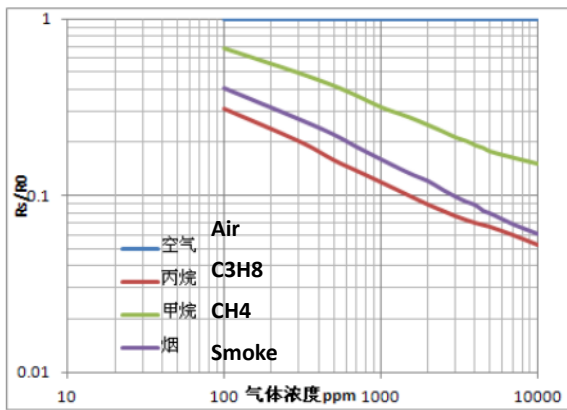


Fig3. Typical Sensitivity Curve

The ordinate is resistance ratio of the sensor ( $R_s/R_0$ ), the abscissa is concentration of gases.  $R_s$  means resistance in target gas,  $R_0$  means resistance of sensor in clean air. All tests are finished under standard test conditions.

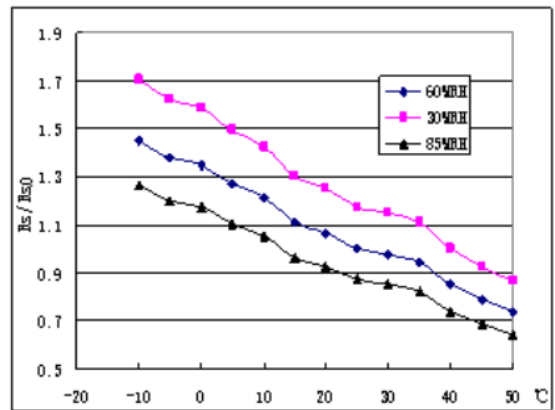


Fig4. Typical temperature/humidity characteristics

The ordinate is resistance ratio of the sensor ( $R_s/R_{s0}$ ).  $R_s$  means resistance of sensor in 2000ppm  $C_3H_8$  gas under different tem. and humidity.  $R_{s0}$  means resistance of the sensor in 2000ppm  $C_3H_8$  gas under 20°C/65%RH.

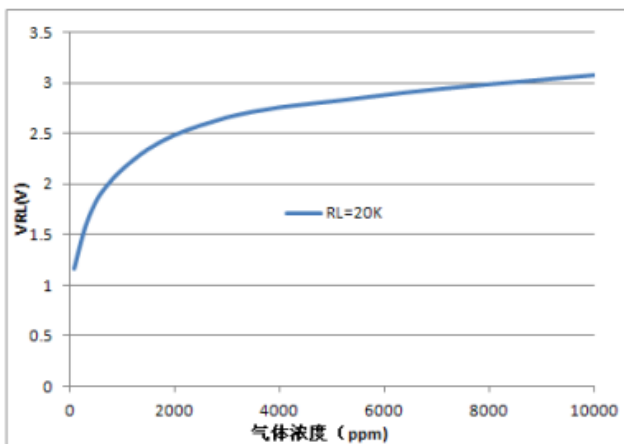


Fig5. Sensing Curve

It shows  $V_{RL}$  value when the sensor in  $C_3H_8$  gas with different concentration.  $R_L=20k\ \Omega$ , All tests are finished under standard test conditions.

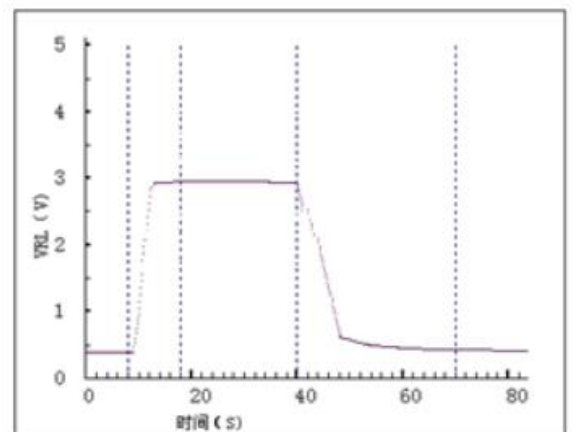


Fig6. Response and Recovery

It shows the  $V_{RL}$  changes when the sensor is put in target gas (2000ppm  $C_3H_8$ ) and then is take from it to clean air.

## 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 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.

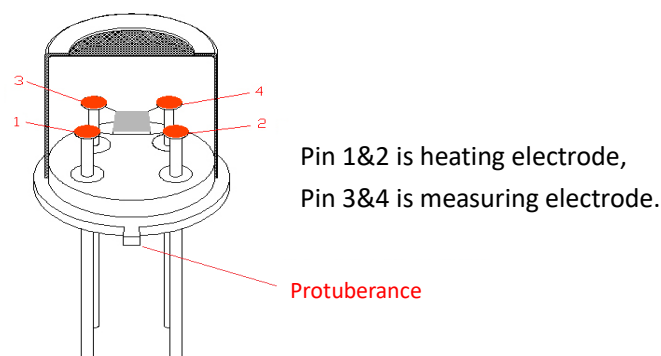


Fig6.Pin Schematic Diagram

### 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	Not less than 48 hours
1 ~ 6 months	Not less than 72 hours
More than six months	Not 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: 250°C
- Time: less than 3 seconds

2.7.2If users choose wave-soldering, the following conditions should be obey:

- Soldering flux: Rosin soldering flux contains least chlorine
- Speed: 1-2 Meter/ Minute
- Warm-up temperature: 100±20°C
- Welding temperature: 250±10°C
- One time pass wave crest welding machine

If disobey the above using terms, sensors sensitivity will be reduced.

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