

Smart Helmet

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Abstract

EXISTING METHOD: In the existing method the atmospheric conditions inside the coal mines are monitored inside the coal mines by using sensors but the sensed data cannot be sent to the control room every time it monitors the conditions due this method there is no safety to the people to move inside the mines since the conditions inside the coal mines will not be constant every time. **PROPOSED METHOD:** In the proposed method we are using zigbee as a wireless technology which is used to send the sensed data to the control room on web page in PC every time it measures the data so that they can also continuously monitor the conditions inside the coal mines so that if any dangerous gases gets evolved inside the they can do an immediate action for protecting the people present inside. So one of the sensor used in monitoring is the MQ4 sensor.

Keywords: Smart Helmet, MQ-4 Semiconductor Sensor, zigbee

I. INTRODUCTION

A. MQ-4 Semiconductor Sensor for Natural Gas

Sensitive material of MQ-4 gas sensor is SnO₂, which with lower conductivity in clean air. When the target combustible gas exist, the sensor's conductivity is higher along with the gas concentration rising. Please use simple electro circuit, Convert change of conductivity to correspond output signal of gas concentration.

MQ-4 gas sensor has high sensitivity to Methane, also to Propane and Butane. The sensor could be used to detect different combustible gas, especially Methane, it is with low cost and suitable for different applications.

B. Characteristics

- Good sensitivity to Combustible gas in wide range
- High sensitivity to Natural gas
- Long life and low cost
- Simple drive circuit

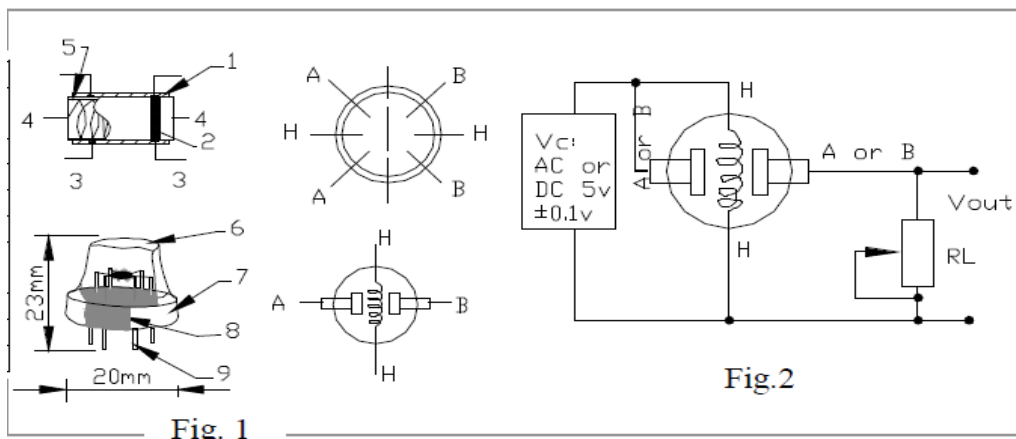
C. Application

- Domestic gas leakage detector
- Industrial Combustible gas detector
- Portable gas detector

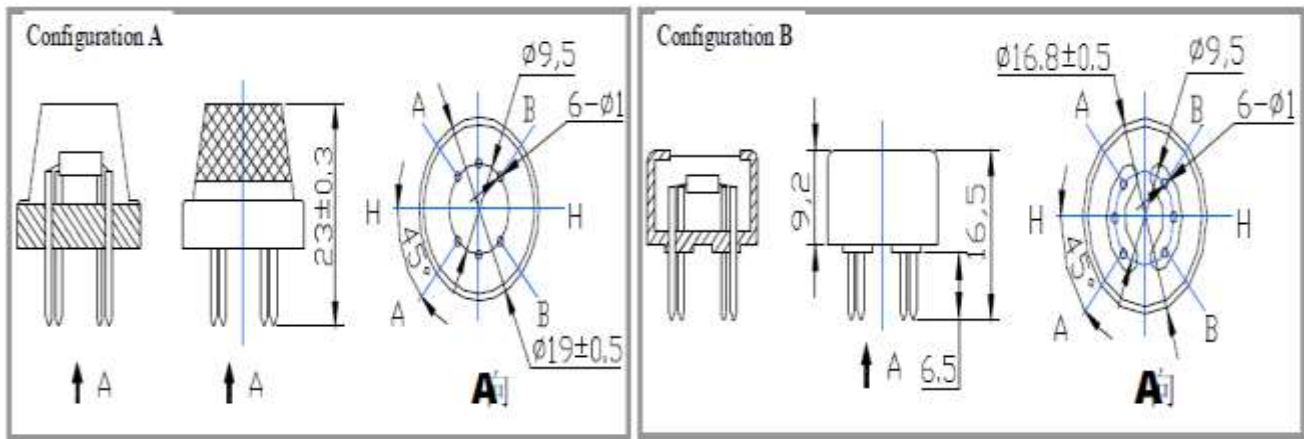
II. TECHNICAL DATA

Model No.		MQ-4	
Sensor Type		Semiconductor	
Standard Encapsulation		Bakelite (Black Bakelite)	
Detection Gas		Natural gas/ Methane	
Concentration		300-10000ppm (Natural gas / Methane)	
Circuit	Loop Voltage	V_L	$\leq 24V$ DC
	Heater Voltage	V_H	$5.0V \pm 0.2V$ AC or DC
	Load Resistance	R_L	Adjustable
Character	Heater Resistance	R_H	$31\Omega \pm 3\Omega$ (Room Tem.)
	Heater consumption	P_H	$\leq 900mW$
	Sensing Resistance	R_S	$2K\Omega - 20K\Omega$ (in 5000ppm CH_4)
	Sensitivity	S	$R_S(\text{in air})/R_S(5000\text{ppm } CH_4) \geq 5$
	Slope	α	$\leq 0.6(R_{5000\text{ppm}}/R_{3000\text{ppm } CH_4})$
Condition	Tem. Humidity	$20^\circ C \pm 2^\circ C$; $65\% \pm 5\% RH$	
	Standard test circuit	$V_L: 5.0V \pm 0.1V$; $V_H: 5.0V \pm 0.1V$	
	Preheat time	Over 48 hours	

A. Structure and Configuration, Basic Measuring Circuit



Parts	Materials
1 Gas sensing layer	SnO_2
2 Electrode	Au
3 Electrode line	Pt
4 Heater coil	Ni-Cr alloy
5 Tubular ceramic	Al_2O_3
6 Anti-explosion network	Stainless steel gauze (SUS316 100-mesh)
7 Clamp ring	Copper plating Ni
8 Resin base	Bakelite
9 Tube Pin	Copper plating Ni



B. Sensitivity Characteristics

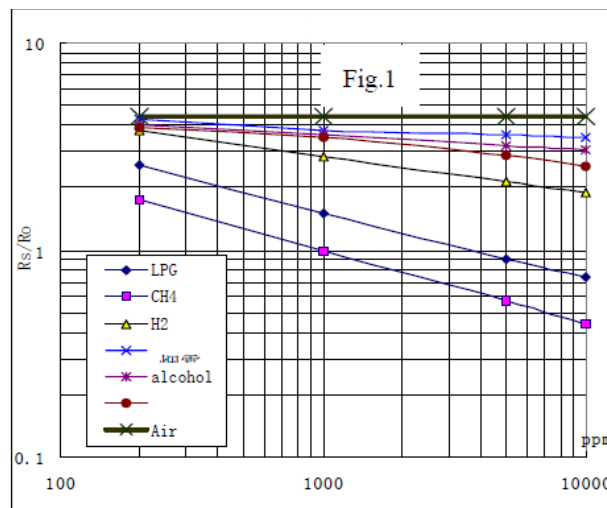


Fig. shows the typical sensitivity characteristics of the MQ4 ordinate means resistance ratio of the sensor (R_s/R_o), abscissa is concentration of gases. R_s means resistance in different gases. R_o means resistance of sensor in 1000ppm Methane. All test are under standard test conditions.

C. Influence of Temperature/Humidity

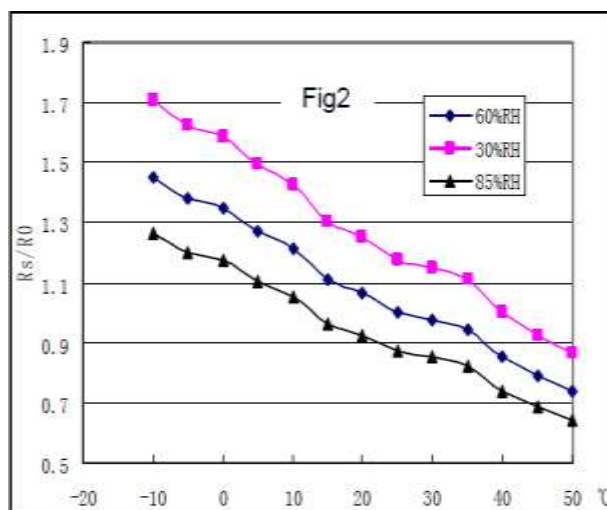


Fig shows the typical temperature and humidity characteristics. Ordinate means resistance ratio of the sensor (R_s/R_o), R_s means resistance of sensor in 1000ppm Methane under different temperature and humidity. R_o means resistance of the sensor in environment of 1000ppm Methane, 20°C/65%RH.

D. Following Conditions must be prohibited

1) Exposed to Organic Silicon Steam

Organic silicon steam cause sensors invalid, sensors must be avoid exposing to silicon bond fixture, silicon latex, putty or plastic contain silicon environment.

2) High Corrosive gas

If the sensors exposed to high concentration corrosive gas (such as H₂Sz, SOX, Cl₂, HCl etc), it will not only result in corrosion of sensors structure, also it cause sincere sensitivity attenuation.

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.

4) Touch water

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

5) Freezing

Do avoid Icing on sensors surface, otherwise sensor would lose sensitivity.

6) Applied voltage higher

Applied voltage on sensor should not be higher than stipulated value, otherwise it cause down-line or heater damaged, and bring on sensors' sensitivity characteristic changed badly.

7) Voltage on Wrong Pins

For 6 pins sensor, if apply voltage on 1, 3 pins or 4,6 pins, it will make lead broken, and without signal when apply on 2,4 pins .

III. CONCLUSION

The sensor will enhance the system of coal miner helmet and help to get the data from the environment in the work station and help to rescue the life of the people working on the sites.

The sensor not only in the coal miner helmet but also can be used in any chemical hazardous industry to keep the environment and people working in the area safe.

REFERENCE

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