Hydrogen Gas Sensor

(Model: MPv-820)

Manual

Version： 1.0

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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

MPv-802 Hydrogen Gas Sensor

Profile

The MPv-820 Hydrogen Sensor utilizes a multilayer thick film manufacturing process to produce a heating electrode and a metal oxide semiconductor gas sensitive layer on a ceramic substrate, encapsulated in a metal housing.

The conductivity of the sensor changes when the gas to be detected is present in the ambient air. The higher the concentration of the gas, the higher the conductivity of the sensor. This change in conductivity is converted by a circuit into an output signal corresponding to the gas concentration.

Features

High sensitivity, good selectivity, fast response, long life, simple application circuitry

Main Application

For hydrogen leakage detection in energy storage stations, fuel cell hydrogen leakage.

Basic Test Circuit

The diagram below shows the basic test circuit for the MPv-820 sensor. The sensor requires the application of two voltages: a heating voltage (VH) and a test voltage (VC).

V_H is the voltage applied across the heating electrodes to provide the sensor with a specific operating temperature, using a DC power supply.

V_C is the loop voltage used in the measurement circuit.

And V_{RL} is the voltage across the load resistor (R_L) connected in series with the sensor, the output voltage - V_{out}.

Subject to the sensor's electrical characteristics, the VH and VC can be used in a common power supply circuit.

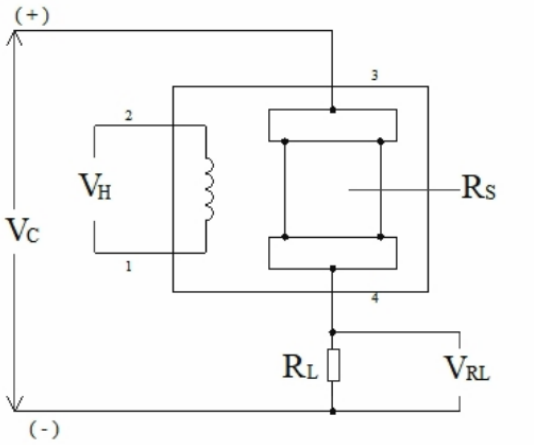


Figure 1: Basic test circuit diagram

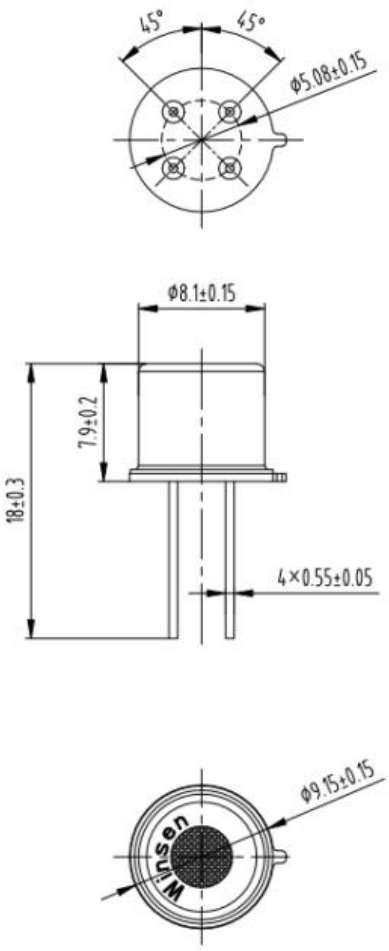
Technical Parameters

Table 1

Model			MPv-820
Sensor Type			Flat Semiconductor Gas Sensors
Standard Encapsulation			TO-5
Detection Gas			Hydrogen
Detection range			10～3000ppm
Standard circuit	Loop voltage	V_C	5.0±0.1V DC
	Heating voltage	V_H	5.0±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 200ppm H2)
	Sensitivity (Rate of change of R_s)		0.2~0.6（H2） Rs300ppm/Rs50ppm
Standard condition of test	Temperature, humidity		20℃±2℃； 65%±5%RH
	Standard test circuit		V_C:5.0±0.1V V_H:5.0V±0.1V
	Warm-up time		7 days

Figure 2: Structure and Dimensions

(Dimensions in mm)



Formula

Power consumption Ps :

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

Calculate Rs from V_{RL} :

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

Pin Definition:

1. Heater
2. Heater
3. Sensor electrode (+ pole)
4. Sensor electrode (- pole)

Sensor Characteristics

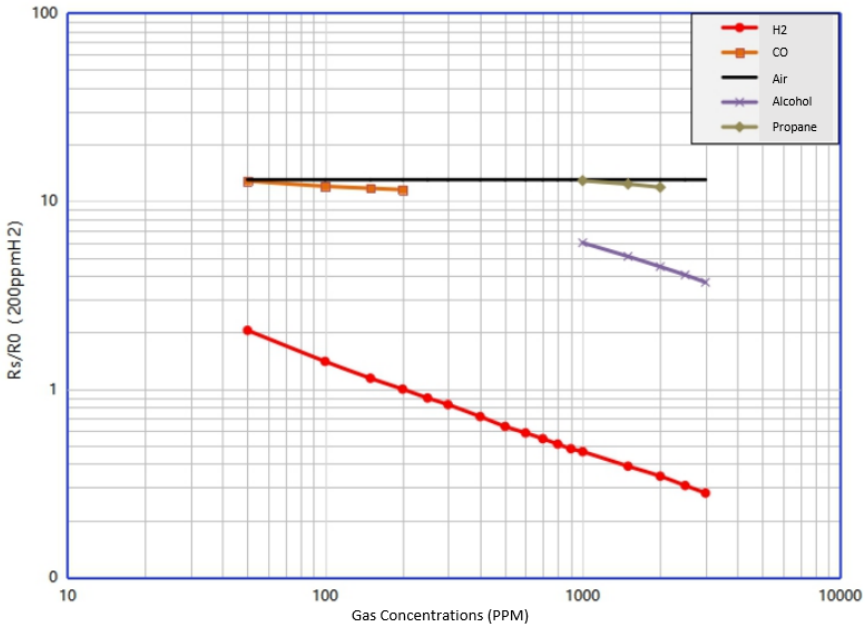
Sensitivity Characteristics:

The following figure shows the sensitivity characteristic curves for different gases measured under standard test conditions

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

Rs : sensor resistance value in each gas, each concentration of gas.

Ro : Resistance value of sensor in 200 ppm hydrogen.



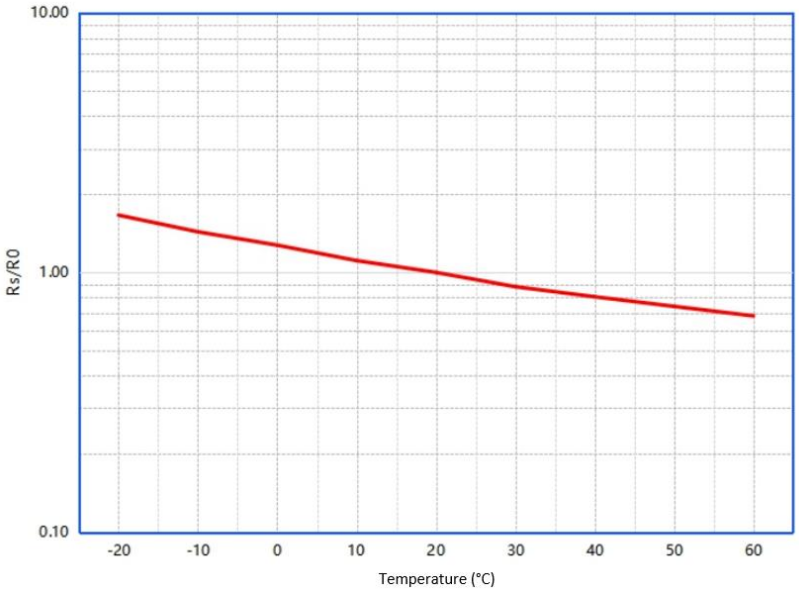
Temperature Characteristics:

The following figure shows the characteristic curve of the sensor affected by temperature and humidity.

The vertical coordinate indicates the sensor resistance ratio Rs/R_0, and Rs and R_0 are defined as follows:

RS : Sensor resistance value in 200ppm H_2 under different temperature conditions;

R_0 : Resistance value in 200ppm H_2 under room temperature conditions.



Cautions

1. Following conditions must be prohibited

1.1 Exposure to volatile silicone compound steam.

Sensors should avoid exposure to silicone adhesives, hairspray, silicone rubber, putty, or other locations where volatile silicone compounds are present. If steam of silicone compounds are adsorbed on the surface of the sensor, the sensitive material of the sensor can become encapsulated in silica formed by the decomposition of the silicone compounds, inhibiting the sensitivity of the sensor and making it unrecoverable.

1.2 Highly corrosive environments

Exposure of sensors to high concentrations of corrosive gases (e.g. H2S, SOX, Cl2, HCl, etc.) not only results in corrosion or damage to critical materials within the sensor, but also leads to irreversible deterioration of sensitive material properties.

1.3 Pollution by alkali and alkali metal salts

Sensors contaminated with alkali metals, especially salt water sprays, can cause performance degradation.

1.4 Contact with water

Splashing or immersion in water can cause a degradation of the sensor's sensitive characteristics.

1.5 Freezing

Water freezing on the surface of the sensor's sensitive material can cause the sensitive layer to fragment and lose its sensitive properties.

1.6 Applied higher voltage

If the voltage applied to the sensor or heater is higher than the specified value, even if the sensor is not physically damaged or destroyed, it can cause damage to the lead and/or heater and cause a degradation of the sensitive characteristics of the sensor.

1.7 Voltage on wrong pins

As shown in Figure 8, sensor pins 1 and 2 are connected to the heating circuit, and pins 3 and 4 are connected to the measurement circuit; under the premise of meeting the electrical performance requirements of the sensor, the heating and measurement can share the same power supply circuit.

Note: Please pay attention to the protruding mark on the sensor, the two pins immediately adjacent to the mark are heating electrodes.

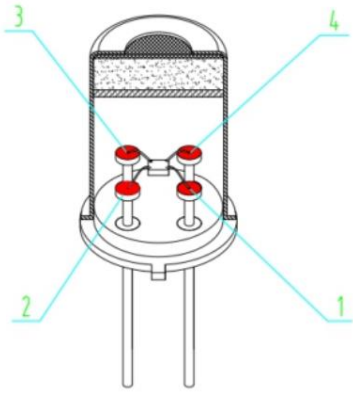


Figure 8 Pin Diagram

Pin Definition:

1. Heater
2. Heater
3. Sensor electrode (+ pole)
4. Sensor electrode (- pole)

2. Following conditions should be avoided

2.1 Water Condensation

Under indoor use conditions, slight condensation can have a minor effect on sensor performance. However, if water condenses on the surface of the sensitive layer and remains there for a period of time, the sensor

characteristics will degrade.

2.2 Using in high concentration gas

Whether the sensor is energized or not, prolonged placement in a highly concentrated gas will affect the sensor characteristics. If lighter gas is sprayed directly onto the sensor, it can cause significant damage to the sensor.

2.3 Long time storage

Sensors stored for long periods of time without power will have a reversible drift in resistance that is dependent on the storage environment. Sensors should be stored in sealed bags that do not contain volatile silicone compounds. Sensors that have been stored for a long period of time need to be energized for a longer period of time to stabilize before use. Storage times and corresponding aging times are suggested below:

Table2. Corresponding table of storage time and aging time

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

Regardless of whether the sensor is energized or not, sensor performance will be severely affected by prolonged exposure to extreme conditions such as high humidity, high temperature or high pollution.

2.5 Vibration

Frequent, excessive vibration can cause the internal leads of the sensor to resonate and break. The use of pneumatic taps/ultrasonic welders during transportation and on the assembly line can cause such vibrations.

2.6 Concussion

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

2.7 Usage Conditions

Hand soldering is the ideal method for sensors.

The recommended soldering conditions are as follows:

- Flux: Rosin flux with minimum chlorine
- Constant temperature soldering iron
- Temperature: ≤350℃
- Time: not more than 3 seconds

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

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