

Gas Sensor Guide Line

The detection of hazardous gases has always been a complex subject, making the choice of an appropriate gas sensor is a difficult task. HANWEI Electronics Co., Ltd has been providing gas sensors and gas leak alarm to customers worldwide since 1984, through the experience, we compiled this guide which provide you with some insight into various sensing methods used for gas sensor, and provide you with information about different gas sensor available.

Discussion of sensing methods will focus on the following three sensor types: semiconductor, Catalytic Bead and Electrochemical. These are the most suitable and widely used sensors for the air monitoring, and all three of these types are available from HANWEI, and HANWEI produce the semiconductor and catalytic gas sensor originally. It should be noticed that instruments utilizing these sensors will respond quickly to the presence of gas, enabling the alarms to be triggered and allowing personnel to take appropriate action. In addition, they are generally easy to use, require little maintenance, and are economically priced.

Note: to date, no gas sensors exist which are 100% selective to a single gas.

Semiconductor gas sensor

A semiconductor gas sensor consists of two electrodes embedded into a semiconductor (oxide) material. The presence of gas changes the resistance of the material, with the magnitude of change directly to the gas concentration, is measured through sensor's corresponding electronic circuitry. The sensor is kept at a specific operating temperature by applying "heater" to it. The choice of heater voltage is critical in determining the response characteristics of the sensor. By varying this voltage and by using different materials and processing techniques, they can detect both toxic and explosive gases, in concentration as low as several ppm or as high as 10000 ppm. Sensors can be made which are more sensitive to one gas or group of gases and less sensitive to others. An added advantage of semiconductor gas sensor is its long life expectancy.

Catalytic Bead Sensor

A catalytic bead sensor consists of an active element and a reference element. At the heart of each element is a heated platinum coil whose resistance varies with temperature, their resistance will be equal. In the presence of the gas, however, the active element will burn the gas on its surface, raising the temperature of the platinum coil, while reference will show no response to the gas. Hence, a differential is created in the resistances of the two elements. When both elements are placed in a wheatstone bridge circuit, this differential acts to throw the bridge out of balance, producing a signal which is proportional to the gas concentration. Because catalytic sensors operate on the combustion principle, they must be used in the environments containing oxygen. Their obvious characteristics are for their linear output signal

for gas concentration, Virtually unaffected by ambient temperature and humidity, remarkable reproducibility and accuracy.

HANWEI provides a wide ranges of gas sensors for your best selection based on your target gases and applications. Our hot-wire (catalytic) type sensors are recommended for detecting combustible gases and our semiconductor type sensors are suitable.

HOT WIRE (CATALYTIC) vs. SEMICONDUCTOR TYPE

Following is the general information of the difference between hot-wire and semiconductor type sensors for combustible gases.

1. General

The history and consensus of the combustible gas detection industry is that;

Hot-wire type—where accuracy and reliability is required—→Industrial

Semiconductor type --where pricing is most essential →Residential

And, this is still distinctive. It was pricing that hot-wire type had not been used for residential use.

For the residential use, semiconductor type has a long history, but the major or the most claim is the false alarm due to the shift of sensitivity toward "sensitive". semiconductor type requires a very long initial stabilization time ,which gives an additional dollars in assembling a detector.

Hot-wire type has a long history as an industrial gas sensor but a lot shorter for residential by another reason of short life of the sensor. Now the life or the endurance of HANWEI sensor has been vindicated in the Chinese Market, which will fully meet the world satisfaction.

2. As a leading manufacture of the gas sensor, we came to commercially handle gas sensors in 1984. since then our HOT WIRE (CATALYTIC) and SEMICONDUCTOR TYPE sensor has been supplied to the major Chinese detector makers.

3. Market trend

We have been supplying hot-wire type gas sensors also to overseas users worldwide and have earned an excellent reputation for the practicality and reliability. The calibration is easier when assembled into a detector with a good independency from the ambient temperature and humidity, wider application for detection of gases due to the linearity to the individual gas concentration is practical.

In the various areas of the world, in proportion to the strengthening of the requirements for the installation of the gas detector, it is easily estimated that more and more emphasis on hot-wire type will be placed in terms of accuracy conditions and reliability, especially under severe conditions. our sensors are used in underground shopping arcade and basement where a temperature gets over 45°C and humidity over 95%.

Recently in numbers of countries, natural gas is getting popular as an economical and convenient energy source. Thus the demand or requirements for commercially available gas detectors is called for.

4. Comparison

Item	Hot-wire	Semiconductor
Principle of detection	Variation in temperature due to contact oxidation as variation of heater resistance	Variation in electric conductivity of n-type semiconductor due to chemisorption
Sensitivity	good	Very good
reliability	Very good	Good
Gas selectivity	Good (for smoke) Bad (for combustible)	Good
Response time	Very fast(4-10sec)	Fast (5-20sec)
Stability	Very good	Good
Temp. independency	Good	bad
Humidity independency	Good	bad
simplicity	Very simple	Very simple
Cost	Very economical	Most economical
Measuring range	Up to LEL	Up to 10000ppm
Maintenance	Hardly required	Hardly required
Initial stabilization	Very short (1 min)	Long (2 hours)

All of the above, although the accuracy and reliability of semiconductor gas sensor is inferior to catalytic gas sensor, When detecting the environmental of combustible gases, CO etc at a lower concentration, the semiconductor gas sensor has a obvious superiority to the catalytic ones, and it has owned a large marketing volume with its lower cost.