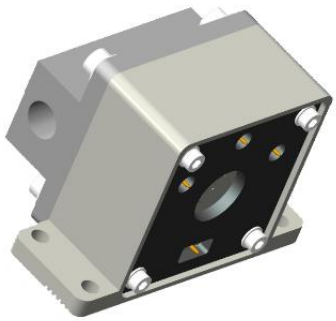
ECOSENSE SENSOR DETECTION MODULE FOR HYDROGEN H2



ECOSENSE H2 Gas Module
Part Number: 2112B6001D

TYPICAL APPLICATIONS

- Power transformers
- Energy
- Electric Power
- Power plants
- Petrochemical
- Mining
- Safety monitoring
- Industrial plants

The ECOSense Hydrogen (H2) gas sensor module has been designed for the detection of dissolved H2 in transformer oil. The module cannot be used to detect H2 in the transformer oil directly, but is commonly integrated into on-line multi-gas monitors, often based on photoacoustic spectroscopy technology (PAS). Here there is an oil / gas separation unit in PAS which will separate dissolved H2 from the oil and this specific module is for detection of the H2 after separation from oil.

When there is a fault within a transformer, H2 will be generated, where the concentration of H2 is proportional to the level of fault. H2 is a critical early indicator. It is the first gas released as temperatures rise inside a transformer, sometimes weeks or months before a failure. Real-time hydrogen sensing offers the earliest possible warnings. Hydrogen gas levels rising are a critical first line of defense, so that action can be taken before a situation becomes an emergency, from an outage to a serious fire.

Based on fuel cell patented technology, combined with years of field experience, the sensor can detect and monitor dissolved Hydrogen in transformer oil and ensures the safe operation of transformers, shunts, reactors, bushing and further applications. The sensor is integrated at the heart of on-line monitors worldwide and also has extended uses for H2 gas measurement and safety detection with harsh environments.

KEY FEATURES

- Industrial Gas Sensor with multiple patents
- Selective detection of H2
- Free from poisoning and electrolyte leakage
- Precise control of internal environment and free from environmental influences
- Designed for Hydrogen detection in harsh environments
- Free from influence of oil vapours and H2O
- High stability, fast response and wide detection range of up to 60,000ppm
- Long service life of over 10 years

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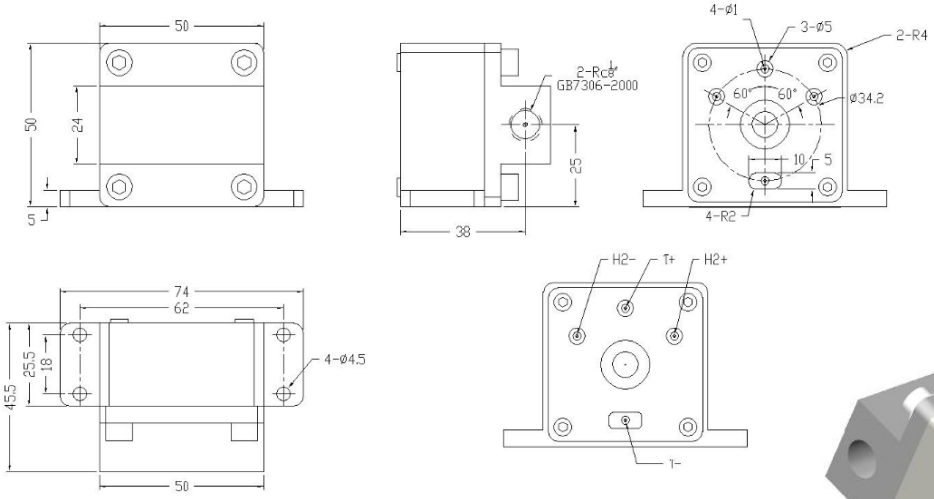
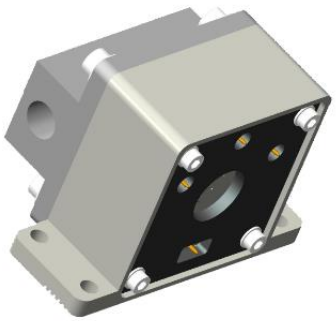
DIMENSIONS

All dimensions in mm
All tolerances ± 0.15mm unless otherwise stated





CROSS SENSITIVITY

GAS	CONCENTRATION OF INTERFERENCE GAS (PPM)	READING (PPM H2)
Carbon Monoxide CO	1000	＜20
Ethylene C_2H_4	100	＜10
Acetylene C_2H_2	100	＜3
Methane CH_4	1000	0
Ethane C_2H_6	1000	0
Carbon Dioxide CO_2	10,000	0
Oxygen O_2	10,000	0
Nitrogen N_2	10,000	0

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TECHNICAL SPECIFICATIONS

	Module D **2112B6001D**
Mounting:	For H2 detection after separation from oil and suitable for general H2 detection applications
Principle:	Micro Fuel Cell
Detection Gas:	Hydrogen H2
Volume of Gas Chamber	1ml
Detection Range:	0-40,000 µL/L
Maximum Overload:	60,000 µL/L
Sensitivity	1 +/- 0.5 uV/ppm (25 +/- 3°C)
Resolution:	0.1 µL/L
Detection Limit:	1 µL/L (in oil)
Response Time (T80):	< 15 minutes
Long-term Sensitivity Drift:	2% / year
Output Signal:	Linear
Repeatability:	< 5% of signal
Operating Temperature Range:	-40 to +60 ℃
Storage Temperature Range:	-20 to +60 ℃
Operating Humidity Range:	5 – 95% (non-condensing)
Operating Pressure Range:	50 - 150 kPa
Service Life:	>10 years
Storage Life:	5 years in sealed original container

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CALCULATION OF CONCENTRATION

The sensor has a built-in resistive temperature sensor for temperature compensation. The sensor can simultaneously acquire both the voltage value (in uV) output from the gas sensor and the temperature value output from the built-in temperature sensor (in KΩ).

1. Definition:

R:	The temperature value output by the built-in temperature sensor in KΩ
t:	The output value of the temperature sensor after conversion, in °C
V:	The value of the voltage signal collected by the gas sensor in uV
V0:	The zero point voltage value of the sensor in clean air, in uV
C:	Calculated gas concentration value in PPM

2. Convert the output resistance value of the built-in temperature sensor to the temperature value in °C according to the formula below:

$$t = -0.1241 * LN(R*1000) * LN(R*1000) * LN(R*1000) + 4.7186 * LN(R*1000) * LN(R*1000) - 74.172 * LN(R*1000) + 380$$

where R is the resistance value of the output of the built-in temperature sensor, in KΩ

3. Collect and store the zero point voltage value of the sensor in clean air V0, in uV;

4. Calculate the concentration value C output of the gas sensor at a specific concentration in PPM:

$$C = (V - V0) * EXP [N2 / (273.2 + t) - N1/100]$$

N1, N2, see the parameter table for each sensor

t refers to the temperature value obtained from the conversion in 2, the unit is °C

V0 refers to the zero point voltage value of the sensor in clean air collected in 3, in uV;

V refers to the voltage value collected in real time during each test, and the unit is uV

Notes: The voltage signal output from the gas sensor ranges from -2000uV to 20000uV

The resistance value range of the built-in temperature sensor output is: 0.5 to 120KΩ

The zero value of the sensor needs to be refreshed before each test

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Notes:

- Avoid exposure to organic or corrosive solvents.
- Avoid exposure to unclean environments.
- Protect from excessive vibration and shock.
- Protect from negative pressure at the membrane of the sensor – the sensor membrane can be damaged at pressures lower than 101Kpa.
- It is recommended to install the sensor vertically, with gas in from the base and out from the top.
- It takes about 30-60 minutes for one test cycle and it is better to calculate the concentration with the maximum output.
- It is recommended that the circulating air pump should work continuously for more than 3 minutes during purging and the flow of the air pump should be less than or equal to 500ml/min.
- Only air can be used for zero voltage testing and purging.
- The sensor works best at a constant temperature between 30 to 40 ℃.

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