

Technical Information
Electrochemical H₂S Gas Sensor

NE7-H2S-S
For Industrial Application

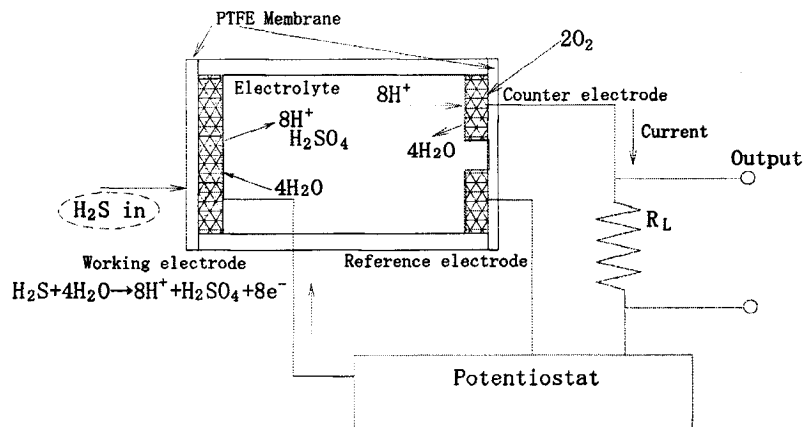
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1. General

Nemoto NE7 series sensors were newly developed for mainly fixed industrial applications, and NE7-H2S-S is a high sensitivity type electrochemical H₂S gas sensor, which is suitable for fixed applications. Shape, dimensions, pin positions and basic features are quite compatible with other 7 series, however the stability, repeatability, durability and reliability are highly superior to competitive sensors, but the price is competitive with the others. Features and applications are as follows.

2. Detection principle

Electrochemical sensor consists of working electrode on which oxidation takes place, counter electrode on which reduction takes place, and reference electrode which can monitor and keep the voltage at constant. Structure of electrochemical sensor NE7-H2S-S is shown in the following figure, H₂S gas diffuses through membrane into working electrode, and is oxidized at working electrode. Consequently generated proton at this reaction proceeds to counter electrode, and reacts with dissolved oxygen in electrolyte to water. Total reaction is in the below described. H₂S gas concentration is proportional to the current that is generated by this serial reaction.



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3. Features

- Quick response and large sensitivity
- Brilliant selectivity
- Good linearity and stability
- High reliability and long lifetime
- Excellent durability in strict circumstance

4. Detected gas

Hydrogen sulfide

5. Applications

- H₂S gas densitometer for industrial application
- H₂S gas alarm for industrial equipment
- Fixed type H₂S gas analyzer

6. Ratings

- 1) Ambient temperature and humidity in operation

Temperature : -20 - +50 degree C
Humidity : 15 - 90%RH

2) Recommended ambient temperature and humidity in storage	Temperature : 0 – 20 degree C Humidity : 15 – 90%RH
3) Operating pressure range	0.9 – 1.1 atm
4) Detection range	0 - 10ppm
5) Maximum overload	20ppm
6) Recommended load resistor	10 ohm
7. Specifications	
1) Output signal	3000 ± 700 nA/ppm.H ₂ S at 20 degree
2) Response time (T90)	Less than 35sec.
3) Repeatability in the same day	Less than +/- 1%
4) Zero offset temperature dependence (-20 ~ +50 degree C)	1ppm of H ₂ S
5) Sensitivity reduction in long term	Less than 30%/year
6) Warranty period	1 years
7) Recommended storage time	Less than 6 months
8) Noise (±2 standard deviations)	<0.02 ppm* (ppm H ₂ S equivalent)
*When used with recommended electronics	

8. Dimensions and appearance

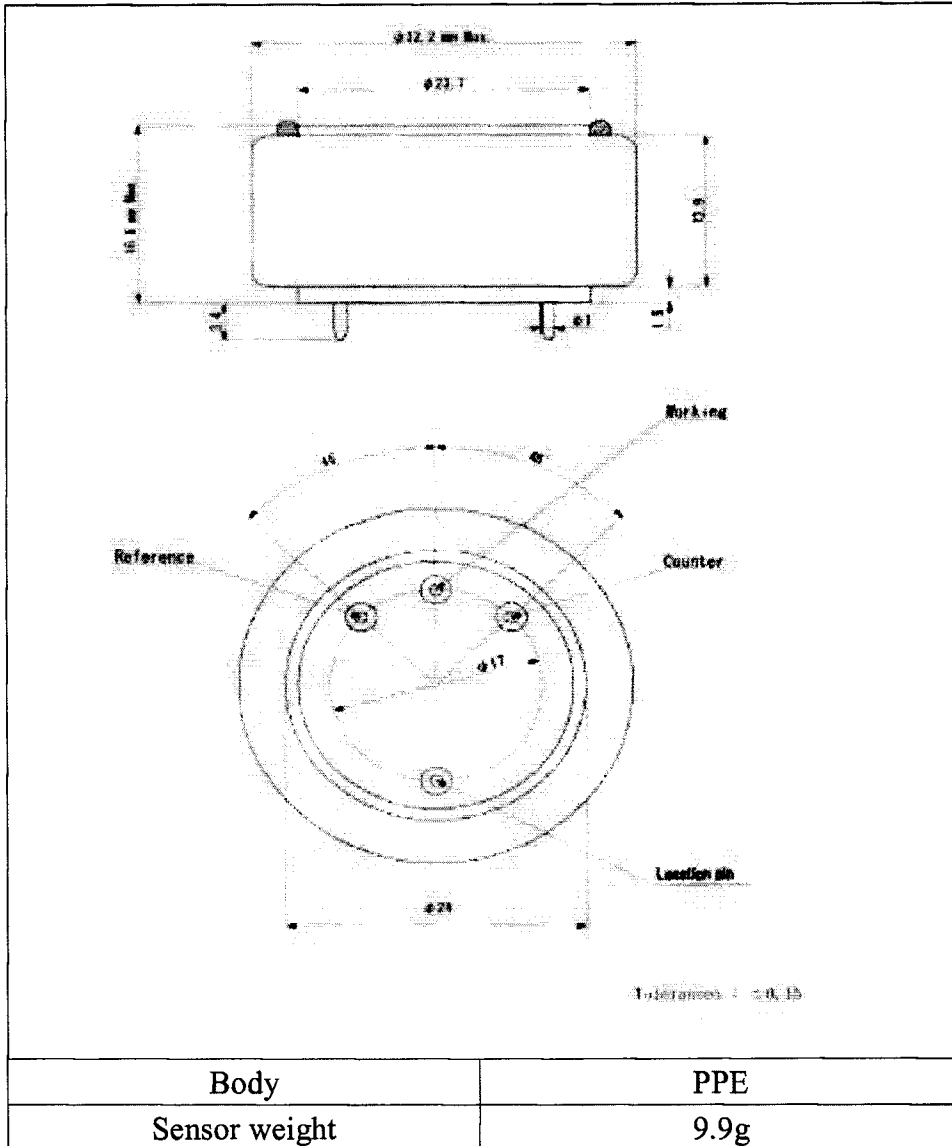


Fig.1: Appearance and dimensions of NE7-H2S-S

9. Electrical properties

9-1. Typical gas sensitivity

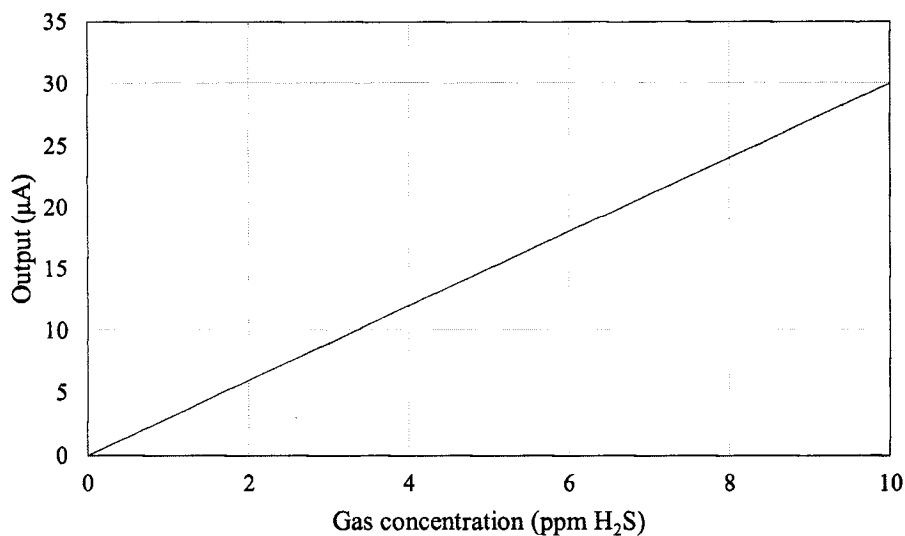


Fig.2: Gas sensitivity characteristics of NE7-H2S-S

9-2. Cross Sensitivity

Table 1: Cross Sensitivity of NE7-H2S-S

Test gas	Gas concentration (ppm)	Cross sensitivity (ppm H ₂ S equivalent)
Hydrogen sulfide	10	10
Carbon monoxide	100	<1.5
Hydrogen	1000	<5
Methane	5000	0
Isobutane	2500	0
Carbon dioxide	5000	0
Sulfur dioxide	10	<3
Nitrogen monoxide	35	<2
Nitrogen dioxide	30	<-2
Ammonia	100	0
Ethanol	1000	<50*
Acetone	1000	<0.2*
toluene	100	0*
Heptane	100	0*
2-propanol	1000	<50*
Dichloromethane	100	0

*exposure time : 30min.

9-3. Temperature dependence

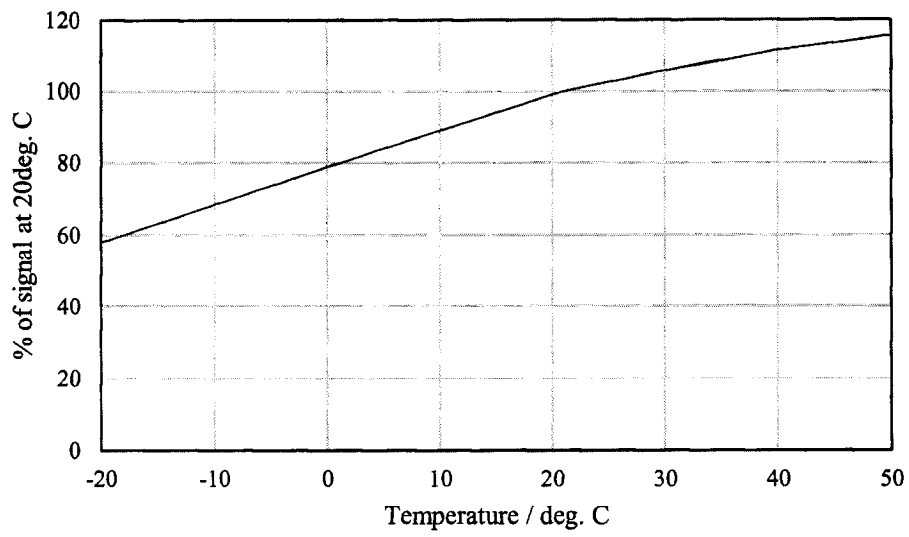


Fig.3: Typical temperature coefficient of NE7-H2S-S

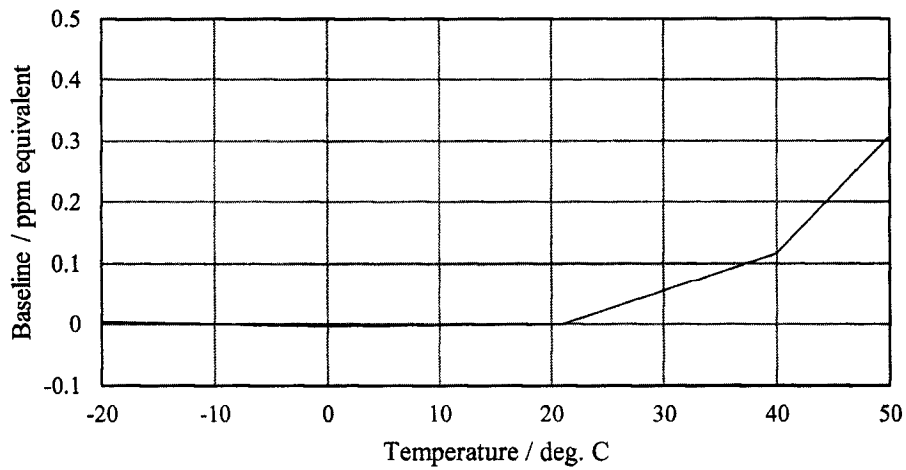


Fig.4: Baseline shift of NE7-H2S-S

9-4. Response and recovery characteristics

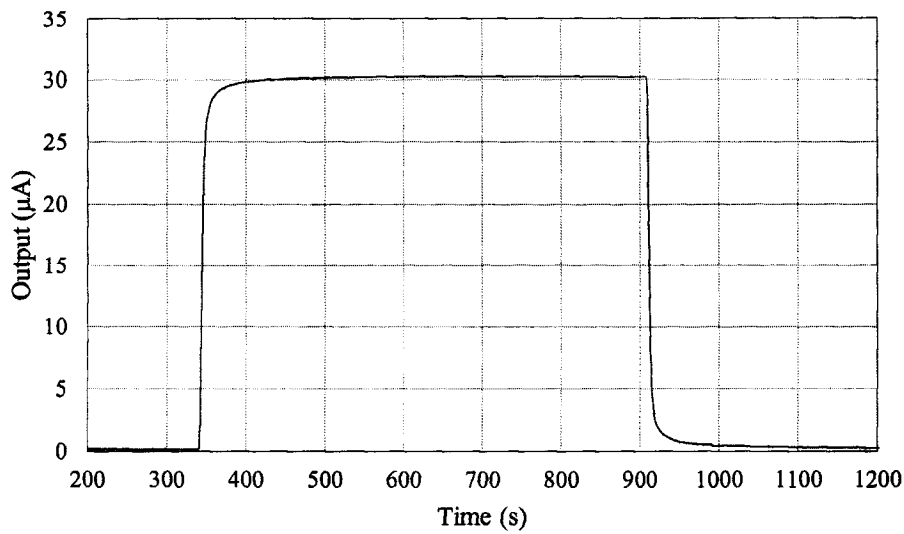


Fig.5: Response and recovery characteristics of NE7-H2S-S
(at 20 degree C, H₂S 10 ppm)

10. Recommended circuit diagram

Recommended circuit diagram for evaluation of NE7-H2S-S is shown in figure 6. In this circuit diagram, OP97 as operational amplifier is employed, however the other low price one is to be applicable for actual use. Temperature compensation is necessary at actual application, please use the microcomputer with reference to the value in Table 2.

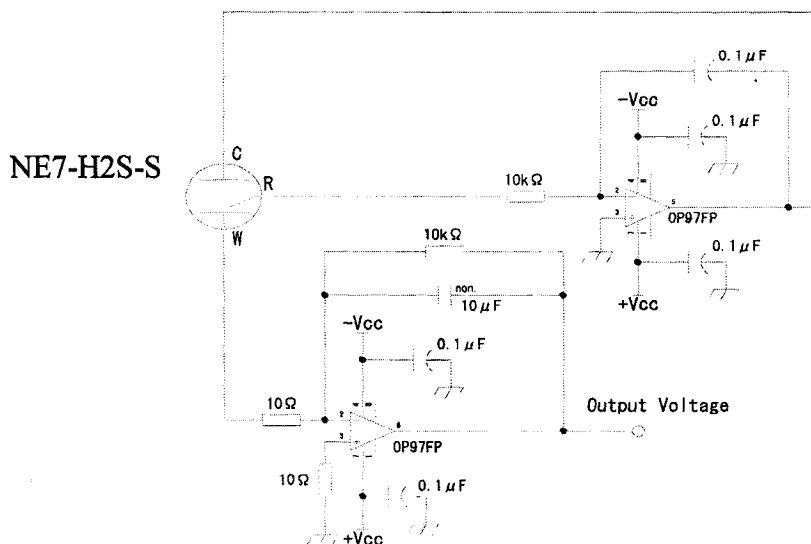


Fig. 6 Measuring circuit diagram for evaluation (100 at 20 degree C)

Table 2 Temperature coefficient of NE7-H2S-S (100 at 20 degree C)

	-20°C	-10°C	0°C	10°C	20°C	30°C	40°C	50°C
% of signal at 20 deg. C	58	70	79	90	100	106	112	116

11. Notice on handling

11-1. Seasonal variation of sensitivity

Highly hygroscopic electrolyte is normally employed for electrochemical sensor, and then the sensitivity varies according to change of temperature and humidity, i.e. sensitivity is little lower in low humidity than in high humidity. Since it is because of amount of electrolyte, this seasonal variation of sensitivity should be taken into account in case that precise measurement is necessary. However, this variation is reversible phenomenon.

11-2. Design of gas alarm or gas densitometer

- a. Calibration of gas alarm or gas densitometer is to be carried out in clean air after the output was stabilized.
- b. Gas sensitivity reduction ratio of 10% per year is to be taken into account at designing of gas alarm as recommendation. In case that precise detection is required, periodical calibration twice or three times a year is recommended.
- c. In case that water drop or oil is on the pre-filter, accurate measurement may not be available because of low diffusion of detected gas to sensor. If such accident may be conceived, design of prevention from such one is to be considered.

11-3. Storage of sensor

It is recommended that electrochemical sensor should be stored in normal temperature and humidity, possibly 0-20 degree C, of clean air.

Recommended storage time after delivery is less than 6 months. If the storage time is extended, expected life is to be shortened. It is because the lifetime of electrochemical sensor is not dependent on being electrified or not like semi-conductive type or catalytic type, and then this matter is to be correctly comprehensive in order to keep quality.

11-4. General notice

- Use only within specified conditions.
- Sensor characteristics must be measured in clean air.
- Electrode pins must be correctly connected. Wrong connection does not allow correct functions.
- Do not apply voltage directly to electrode pins.
- Do not bend pins.
- Do not put excess vibration or shocks.
- If sensor housing is damaged or scratched, do not use.
- Do not blow organic solvents, paints, chemical agents, oils, or high concentration gases directly onto sensors.
- Do not solder pins of sensor directly. Use exclusive sockets.
- Do not disassemble or change any parts.
- In case that sensor is stored by detachment from circuit board, it is recommended that working electrode pin should be short-circuited with reference electrode pin in order to shorten the initial stabilization time.

- If sensor is used under irregular atmosphere, contact us.

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