

***NA P – 100AC***  
***(CATALYTIC TYPE GAS SENSOR)***  
***Handling manual***

Nemoto Sensor Engineering Co., Ltd.  
4-10-9, Takaido-higashi, Suginami-ku, Tokyo  
TEL. 03-3333-2760  
FAX. 03-3333-7344  
E-mail : [sensor2@nemoto.co.jp](mailto:sensor2@nemoto.co.jp)  
URL : <http://www.nemoto.co.jp>

NAP-100AC is a catalytic type gas sensor employed for mainly commercial or semi-industrial applications. Since this sensor does not have an explosion proof structure, it is recommended to install into an intrinsic explosion proof enclosure for actual application.

## 1. Features and application of NAP-100AC

### 1) Features

- Good stability
- Excellent repeatability and detection accuracy
- Good linearity against gas concentration
- Quick response
- Down sizing for design flexibility of gas alarm or detector

### 2) Applications

- Gas alarm or detector for general combustible gases
- Gas densitometer
- Driving module for gas leakage detector

## 2. Maximum ratings

- Supply voltage to sensor
 

AC	3.3V (50 — 60Hz)
DC	3.3V
- Ambient temperature and humidity in operation
 

Temperature	—40 ~ +80°C
Humidity	less than 99%RH (without dew condensation)
- Ambient temperature and humidity in storage
 

Temperature	—40 ~ +80°C
Humidity	less than 99%RH (without dew condensation)

## 3. Ratings

- Supply voltage to sensor
 

AC	$2.6 \pm 0.13\text{V}$ (50—60Hz)
DC	$2.6 \pm 0.13\text{V}$
- Current(when 2.5V is supplied)
 

AC	160 ~ 180mA(50—60Hz)
DC	160 ~ 180mA
- Ambient temperature and humidity in operation
 

Temperature	—20 ~ +60°C
Humidity	less than 95%RH (without dew condensation)
- Ambient temperature and humidity in storage
 

Temperature	—30 ~ +70°C
Humidity	less than 99%RH (without dew condensation)

#### 4. Detection range

It can measure/detect overall combustible gases less than 100%LEL within +/-10% accuracy, however the measurement accuracy is little lower if in over 50%LEL.

#### 5. Response and recovery time

From clean air to 10%LEL

T90 : less than 20sec.

From gas to clean air

T90 : less than 30sec.

(This time is dependent on ambient conditions.)

#### 6. Specifications

• Detected gases	General combustible gases
• Measuring range	2 - 100%LEL
• Gas sensitivity	More than 35mV/% of methane
• Repeatability in the same day	Less than 2%
• Methane sensitivity stability	Less than 1%/month
• Zero offset stability	Less than 1mV/month
• Resolution	300ppm of methane
• Zero offset value	-35 - +35mV in clean air

#### 7. Relative sensitivity

Gases		Chemical formula	LEL (%)	Relative sensitivity
1	Methane	CH <sub>4</sub>	5.0	100
2	Propane	C <sub>3</sub> H <sub>8</sub>	2.2	70
3	Iso-Butane	C <sub>4</sub> H <sub>10</sub>	1.8	65
4	n-Pentane	C <sub>5</sub> H <sub>12</sub>	1.4	65
5	n-Hexane	C <sub>6</sub> H <sub>14</sub>	1.2	65
6	n-Heptane	C <sub>7</sub> H <sub>16</sub>	1.05	55
7	Iso-Octane	C <sub>8</sub> H <sub>18</sub>	0.95	50
8	Methanol	CH <sub>3</sub> OH	6.7	110
9	Ethanol	C <sub>2</sub> H <sub>5</sub> OH	3.3	80
10	Iso-Propanol	C <sub>3</sub> H <sub>7</sub> OH	2.2	70
11	Acetone	(CH <sub>3</sub> ) <sub>2</sub> CO	2.6	75
12	Toluene	C <sub>6</sub> H <sub>5</sub> CH <sub>3</sub>	1.2	55
13	Ethyl acetate	CH <sub>3</sub> COOC <sub>2</sub> H <sub>5</sub>	2.2	65
14	Hydrogen	H <sub>2</sub>	4.0	95
15	Ammonia	NH <sub>3</sub>	15.0	160
16	Cyclohexane	C <sub>6</sub> H <sub>12</sub>	1.3	65
17	Ethylene	C <sub>2</sub> H <sub>4</sub>	2.7	75

Note ) This sensor is not applicable for the detection of acetylene.

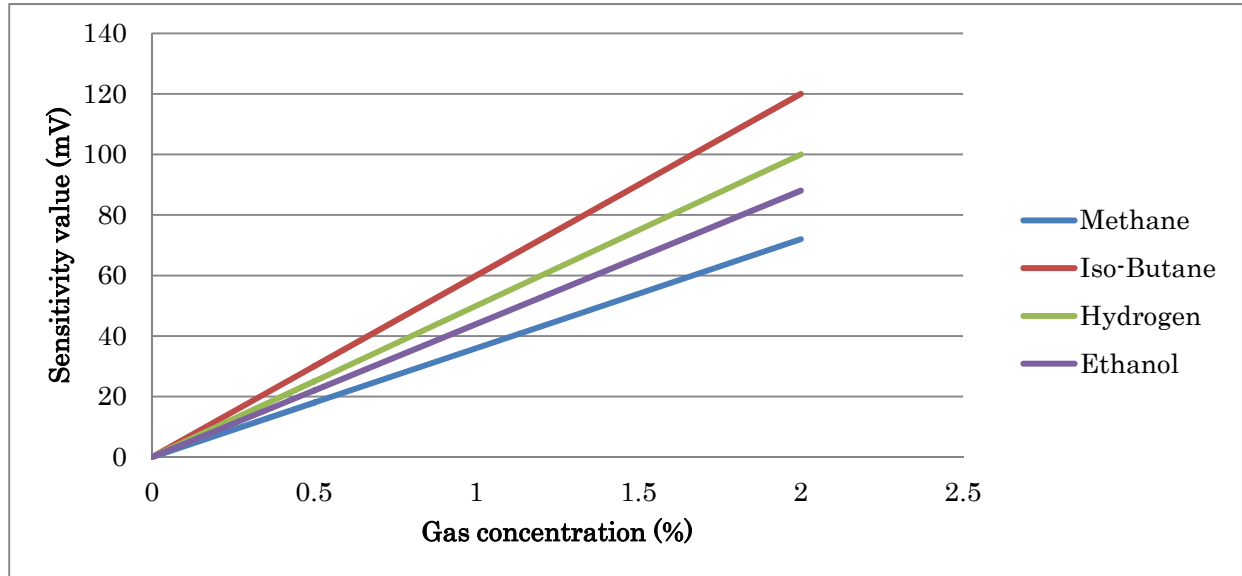
The previous table can be used for quick reference as below.

Example)

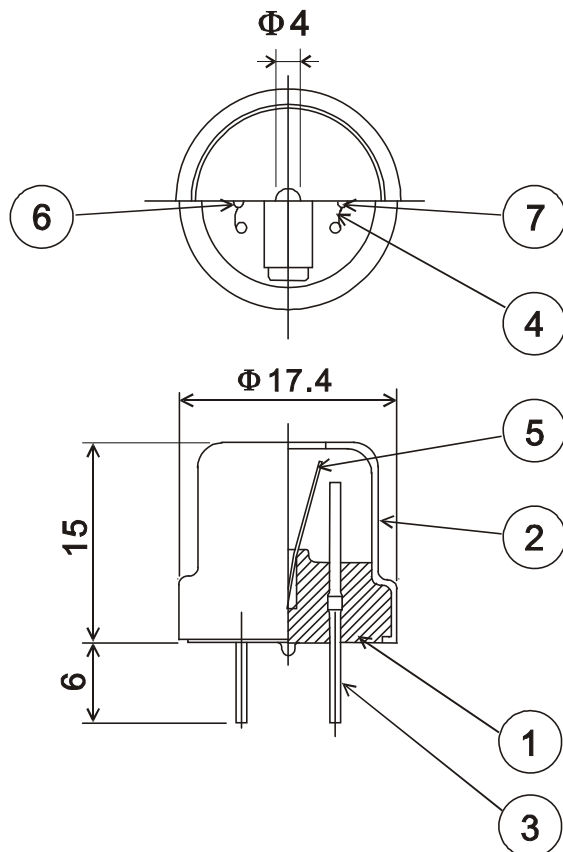
In case 50%LEL ethanol is measured by detection equipment calibrated with 0 – 100%LEL of methane, the following conversion is made from the table.

$$(80 \times 50)/100=40\%LEL \text{ by methane scale}$$

## 8. Typical sensitivity characteristics

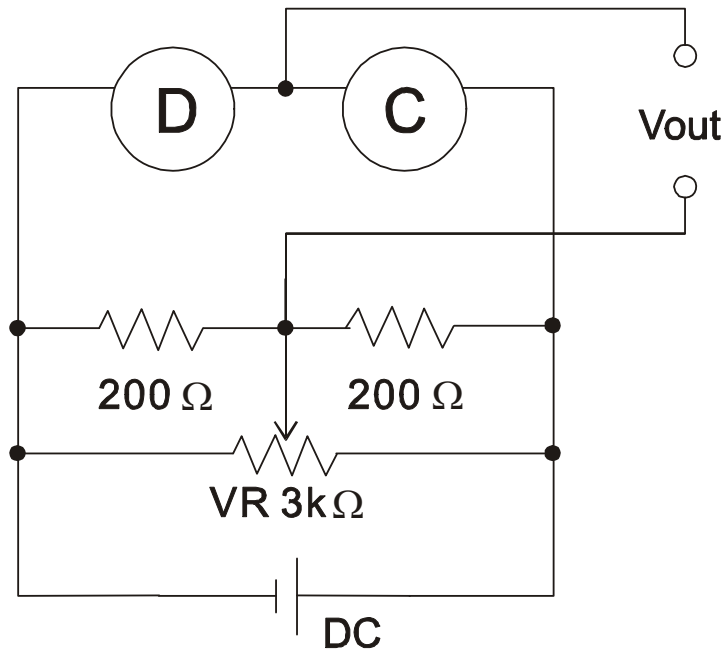


## 9. Structure and dimension



No.	Part name	Material	Remarks
1	Mount base	Phenol resin	
2	Cap	Ni coated brass	
3	Pins	Pure Ni	0.8 mm Diameter
4	Filament coil	PT	0.03 mm Diameter
5	Separator	SUS 304CSP	t = 0.1
6	Sensor		
7	Compensator		

## 10. Recommended circuit



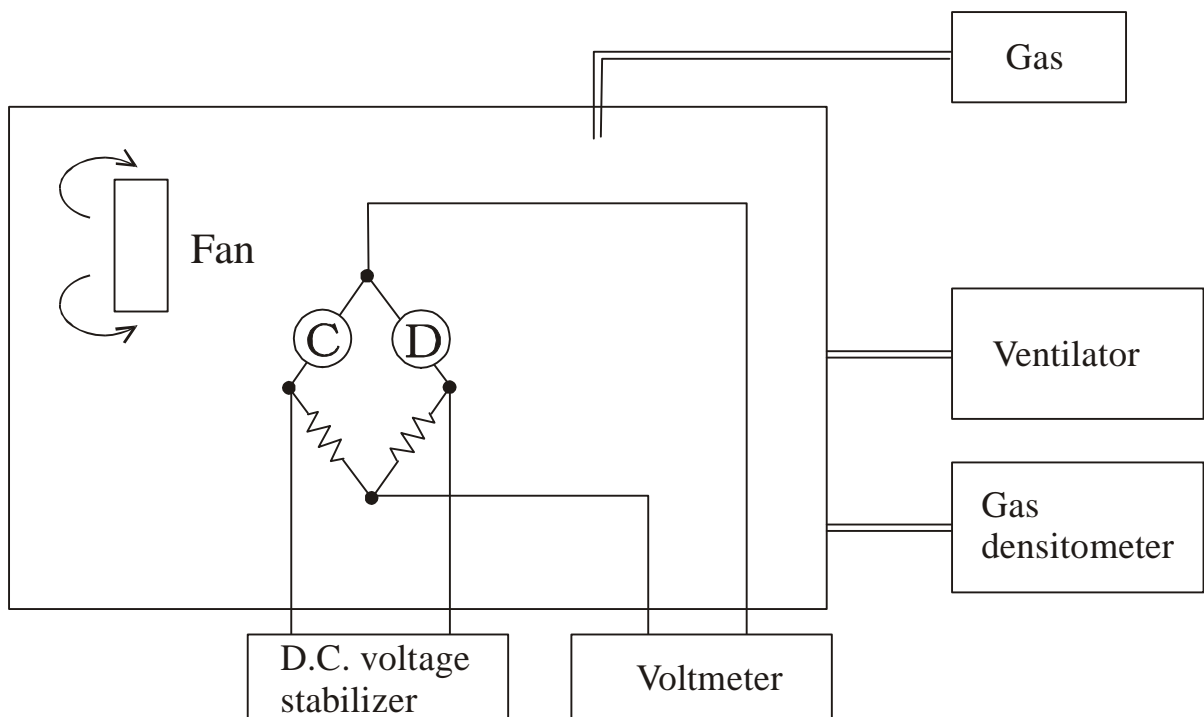
Note)

Fixed resistors in the above circuit have to be metal film resistor, and variable resistor has to be cermet or metal film type. If the carbon type is employed, zero offset value is not stable because the resistance values of them are varied.

## 11. Evaluation method of sensor

### (1) Test equipment

Outline of test equipment is shown as below.



Remarks)

1) Test chamber

- Material of test chamber is to be like as metal or glass which does not exhale and adsorb gases.
- Volume of test chamber is to be 1 liter per 1pc. of sensor.

2) Circumstance

- Clean air is to be available. Dirty air in a factory which contains combustible gases or organic solvent vapor is not to be supplied to test chamber.

3) Gas densitometer

- IR gas densitometer is suitable.

4) Air agitation in test chamber

- Air agitation in test chamber is to be noticed in order not to flow air to sensor directly. Air velocity is to be less than 0.5m/sec.

5) Power supply

- Sensor is available by AC power and DC power, but DC power supply is to be recommended for more accurate measurement.

6) Digital volt meter

- Since the impedance of sensor is fairly low, general digital volt meter having over 100kohm as input impedance is recommended.

7) Ventilation

- Ventilator with ventilation ability of over 10 times per minute of the volume of test chamber is to be necessary for the next measurement.

8) Installation position of sensor in test chamber

- When the sensor is installed in test chamber, it should be noticed that every sensor is to be in constant position because output signal is changed in case that position of sensor is changed. If the rough evaluation is enough, such notice is not needed.

(2) Adjustment of gas concentration

Adjustment of gas concentration is to be conducted by volume method or by using IR gas densitometer. In case of volume method, gas volume of injection to chamber is obtained from the calculation formula described as below.

$$V(m\ell) = V_i \cdot C \cdot 10^{-6} \frac{273 + T_r}{273 + T_c}$$

$V$  ; Gas volume to be injected

$V_i$  ; Inner volume of test chamber ( $ml$ )

$C$  ; Target gas concentration ( $ppm$ )

$T_c$  ; Temperature in test chamber ( $^{\circ}C$ )

$T_r$  ; Room temperature ( $^{\circ}C$ )

### (3) Evaluation method

#### 1) Preliminary aging

- Before evaluation of sensor, preliminary aging at rated voltage for over 1 hr. is to be necessary.

#### 2) Measurement

- At first, output voltage in clean air is to be measured. It should be confirmed that output voltage has to be stable, not fluctuated.
- Output voltage is to be measured after the designated volume of gas is injected into a test chamber.
- After measurement, air in test chamber is to be exhaled compulsory.

#### (4) Notice on handling

- Sensor is to be gently handled without drop or shock.
- Handling is to be avoided in a location which corrosive gases and poisoned gases exist.
- Sensor is not to be dipped in water