NAP－57A

(CATALYTIC TYPE GAS SENSOR)

Handling manual

NAP-57A is a newly developed catalytic type gas sensor based on conventional type NAP-56A for not only residential but also commercial or semi-industrial applications because of having highly excellent poisoning resistivity. Since its power consumption and pin positions are completely the same as NAP-55A and 56A, it is easily replaceable as it is. However, it does not possess the explosion proof by itself, then it is recommended to install it into an explosion proof chamber for actual application.

1. Features and usage of NAP-57A

1) Features

・Good stability
・Excellent repeatability and detection accuracy
・Good linearity against gas concentration at wide range
・Quite excellent poisoning resistivity
・Down sizing for design flexibility of gas alarm or detector

2) Usage

・Gas alarm or detector of general combustible gases for all applications
・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℃
Humidity less than 99%RH
(without dew condensation)
・Ambient temperature and humidity in storage
Temperature －40 ～ +80℃
Humidity less than 99%RH
(without dew condensation)

3. Ratings

・Supply voltage to sensor AC 2.5 ± 0.25V(50－60Hz)
DC 2.5 ± 0.25V
・Current(when 2.5V is supplied) AC 160 ～ 180mA(50－60Hz)
DC 160 ～ 180mA
・Ambient temperature and humidity in operation
Temperature －20 ～ +60℃
Humidity less than 95%RH
(without dew condensation)
・Ambient temperature and humidity in storage
Temperature －30 ～ +70℃

Humidity	less than 99%RH (without dew condensation)

4. Detection range

It can measure/detect whole combustible gases less than 100%LEL, however the excellent accuracy of linearity within +/-10% can be obtained less than 50%LEL.

5. Response and recovery time

From clean air to 10%LEL T90 : less than 10sec.

From gas to clean air T90 : less than 20sec.

(Above response time is dependent on ambient conditions and test method.)

6. Electrical properties

6-1. Gas sensitivity characteristics

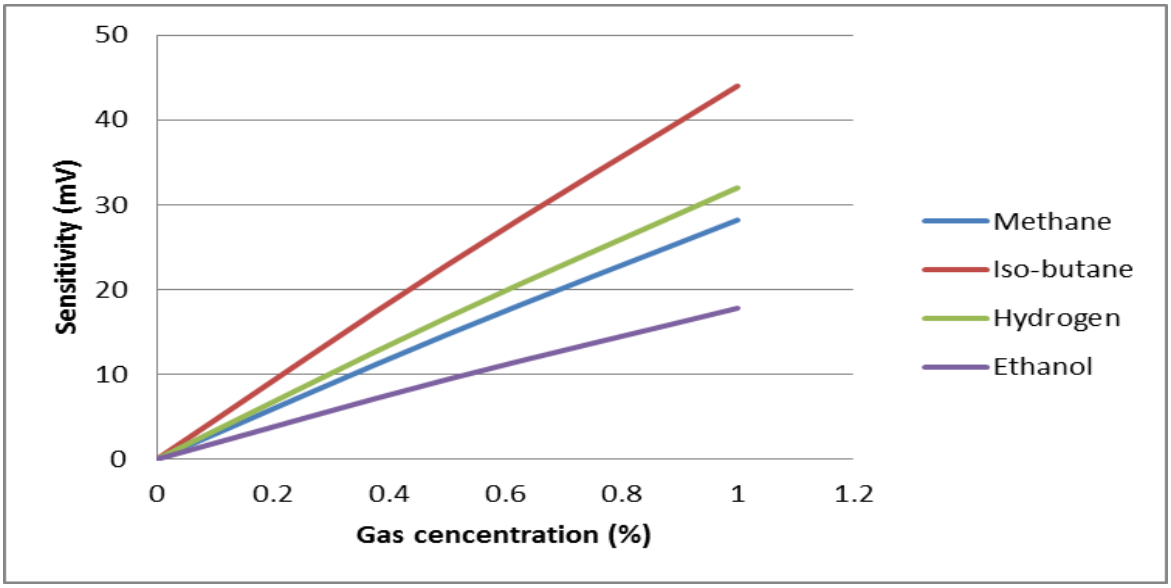


Fig. 1 Gas sensitivity characteristics

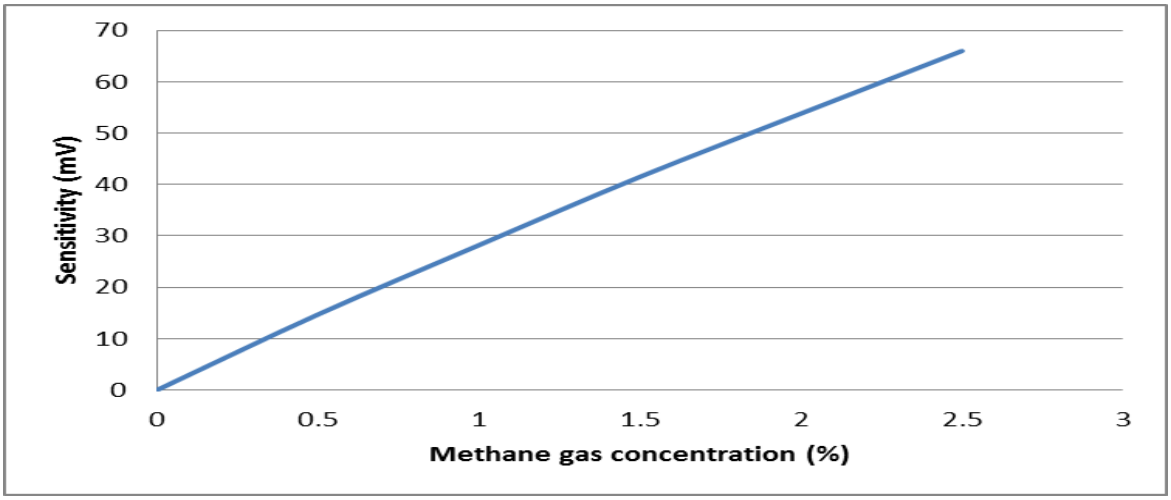


Fig. 2 Linearity to methane gas till 50%LEL

6-2. Temperature dependence

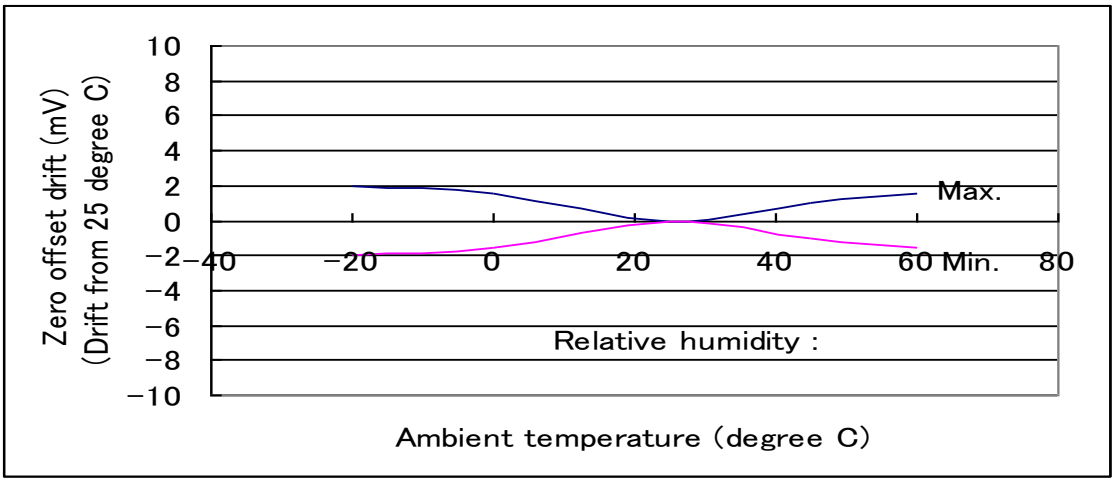


Fig.3 Temperature dependence of zero offset

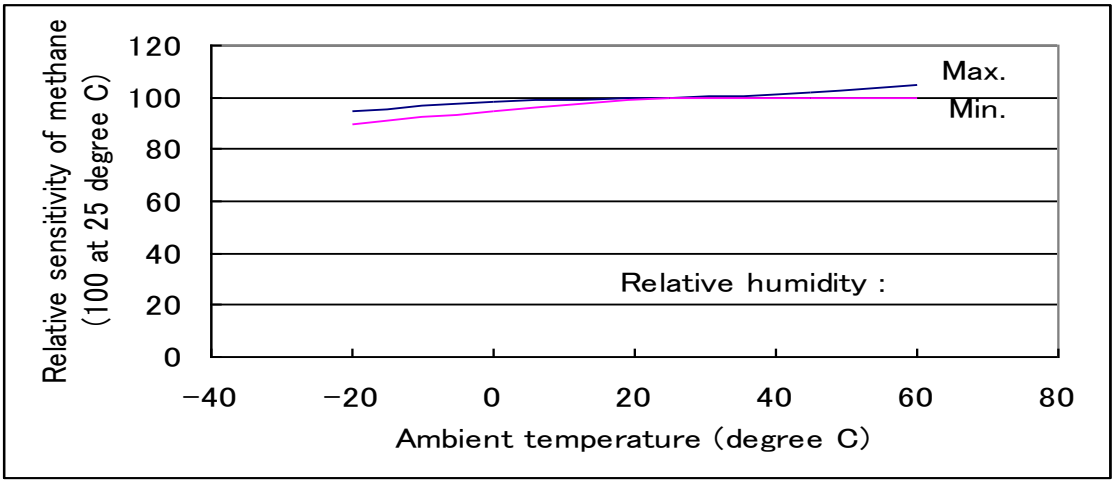


Fig. 4 Temperature dependence of relative sensitivity to methane

6-3. Humidity dependence

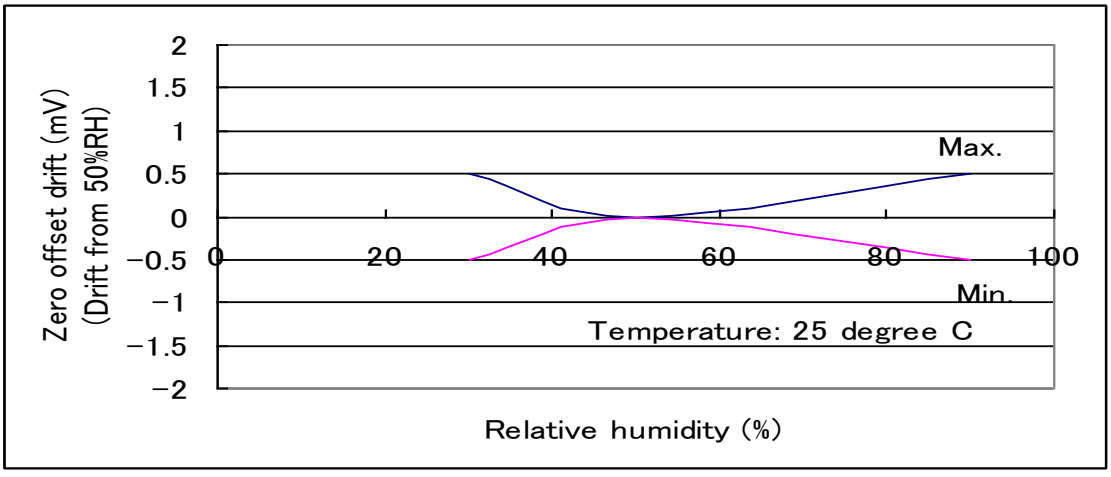


Fig.5 Humidity dependence of zero offset

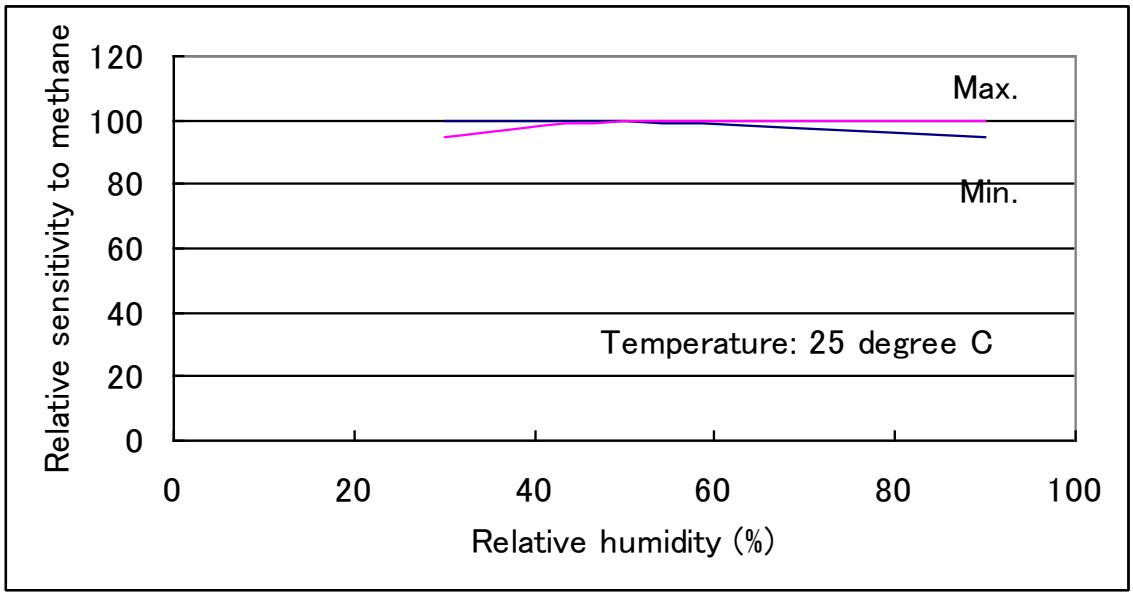


Fig.6 Humidity dependence of relative sensitivity of methane

6-4. Orientation sensitivity

Variation less than 100ppm of methane is expected in case that the detection bead and compensator are in the vertical relation.

6-5. Gas sensitivity distribution

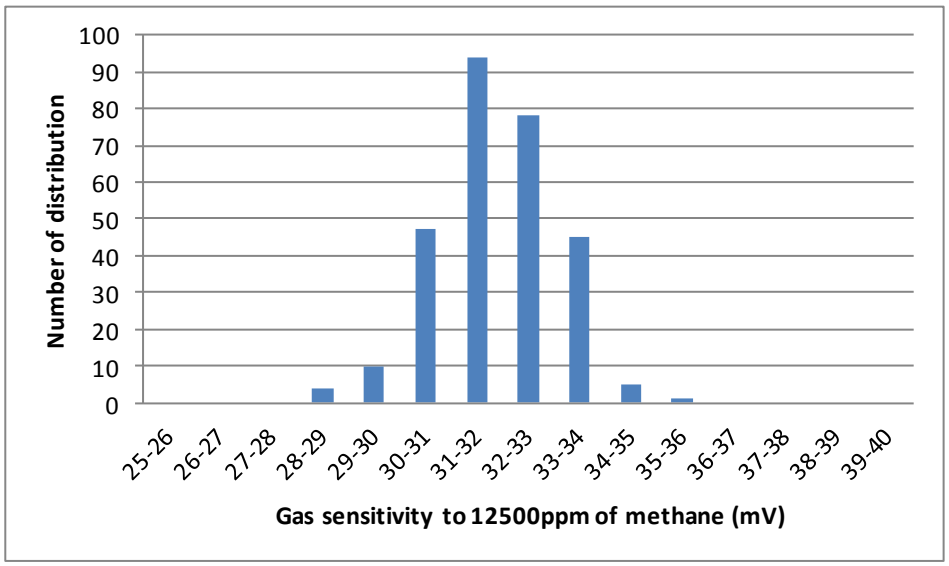


Fig.7. Gas sensitivity distribution (n=284)

7. Poisoning resistivity

Poisoning resistivity to HMDS is shown in the following figure in comparison with conventional type NAP-56A. It is quite clear to be improved.

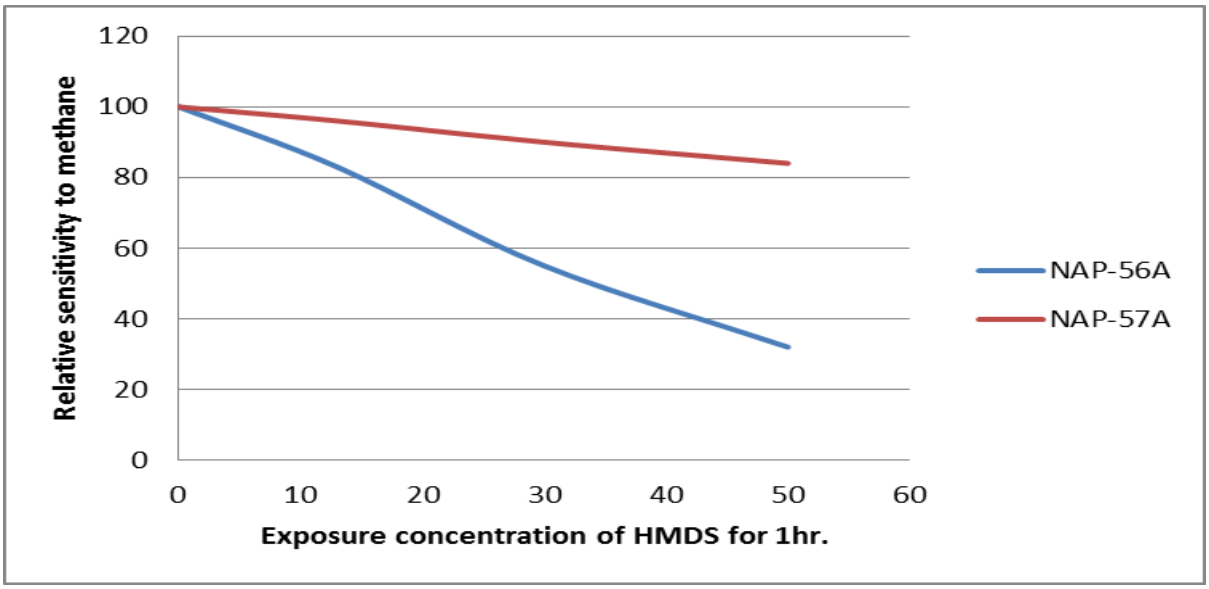


Fig.8. HMDS poisoning resistivity

8. Expected features on sensitivity and lifetime

- Zero offset in clean air : +/-35mV
- Gas sensitivity to 1.25% of methane : 25 – 40mV
- Long term span drift : less than 1% signal/month
- Long term zero drift : less than 1% LEL of methane/month
- Warranty period : 1 year from date of dispatch

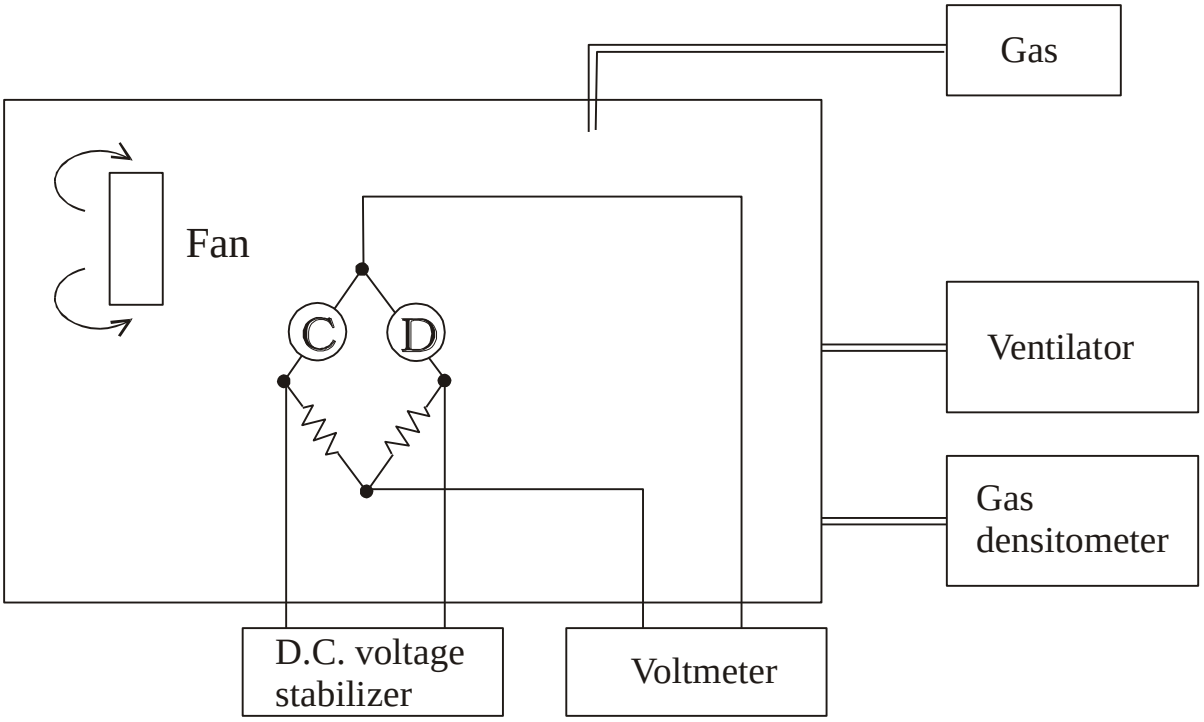
9. Relative sensitivity

Gas/Vapor		Chemical formula	LEL (%)	Relative sensitivity
Std.	**Methane**	**CH4**	**5.0**	**100**
1	Acetone	(CH3)2CO	2.6	50
2	Ethanol	C2H5OH	3.3	40
3	Ethyl acetate	C2H5COOCH3	2.2	50
4	Ethylene	C2H4	2.7	80
5	Hydrogen	H2	4.0	90
6	Iso-propanol	CH3-C2H4OH	2.2	30
7	Methanol	CH3OH	6.7	80
8	Methyl ethyl ketone	CH3-CO-C2H5	1.9	40
9	N-butane	C4H10	1.8	60
10	N-heptane	C7H16	1.05	55
11	N-hexane	C6H14	1.2	50
12	N-pentane	C5H12	1.4	45
13	Propane	C3H8	2.1	65
14	N-octane	C8H18	0.95	40
15	Toluene	C6H5CH3	1.2	30
16	Carbon monoxide	CO	12.5	160
17	Unleaded petrol	-	1.2	50

10. 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 litter 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.

$$V(m\ell) = Vi \cdot C \cdot 10^{-6} \frac{273 + Tr}{273 + Tc}$$

V ; Gas volume to be injected

Vi ; Inner volume of test chamber ($m\ell$)

C ; Target gas concentration (ppm)

Tc ; Temperature in test chamber (℃)

Tr ; Room temperature (℃)

(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

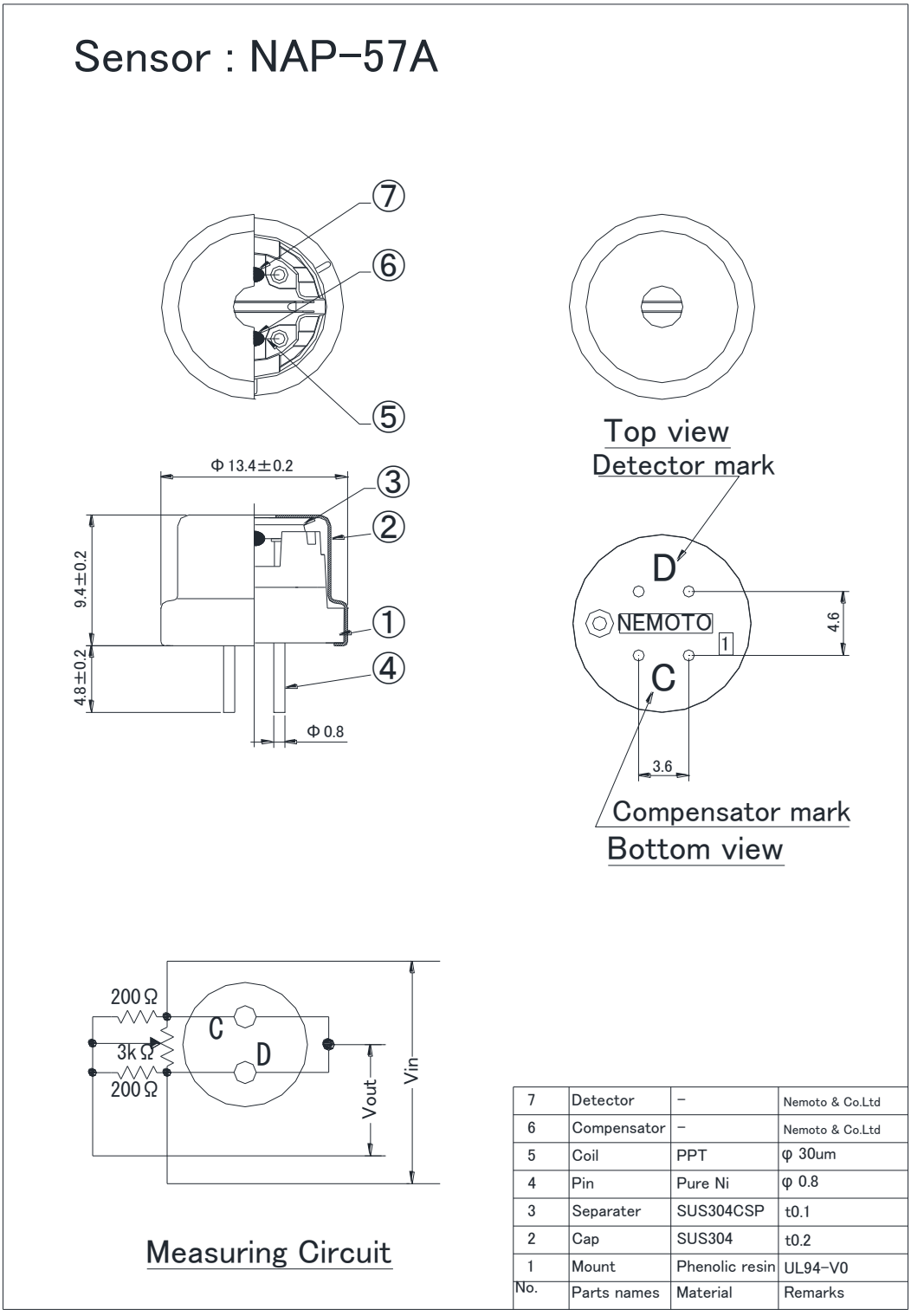
- At first, output voltage in clean air is to be measured. It should be confirmed that output voltage has to be stable, not fluctuated.
- Output voltage is to be measured after the designated volume of gas is injected into a test chamber.
- After measurement, air in test chamber is to be exhaled compulsory.

(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.

11. Figure of sensor



No.	Parts names	Material	Remarks
7	Detector	–	Nemoto & Co.Ltd
6	Compensator	–	Nemoto & Co.Ltd
5	Coil	PPT	φ 30um
4	Pin	Pure Ni	φ 0.8
3	Separater	SUS304CSP	t0.1
2	Cap	SUS304	t0.2
1	Mount	Phenolic resin	UL94-V0