

(Revised November 20, 1995)

USER'S MANUAL
HOT-WIRE TYPE GAS SENSOR NAP-55A & 50A
(For All Combustible Gases, Low Power Consumption)

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1. General

Nemoto's NAP-55A & 50A are miniature-sized hot-wire type gas sensors for every combustible gases. These new sensors are smaller than our NAP-2A sensor and consume much less power. (Approx. half a wattage of NAP-2A). These sensors respond 30% quicker than NAP-2A.

NAP-55A is sensitive to all combustible gases, while NAP-50A has lower sensitivity only to alcohol. NAP-55A would be suitable for general applications, and NAP-50A would be the best for residential gas detectors which should not be affected by noise gases other than fuel gases.

1) Features

- * Excellent stability.
- * Remarkable reproducibility and accuracy.
- * Linear output signal for natural (city) gas concentration.
- * Superior response characteristics.
- * Miniature size for flexibility in the design of detectors.

2) Applications

- * Gas densitometers
- * City gas leakage detectors

2. Specifications

- 1) Voltage supplied to sensor bridge ; D.C. ; 2.50 +/- 0.25 V
A.C. ; 2.50 +/- 0.25 V
(r.m.s. 50 - 60 Hz)
- 2) Current (when 2.50 V is supplied) ; D.C. ; 160 to 180 mA
A.C. ; 160 to 180 mA
(r.m.s. 50 - 60 Hz)
- 3) Ambient temperature &
humidity during operation ; Temperature ; -10°C to +50°C
Humidity ; Less than 95% RH
- 4) Ambient temperature &
humidity during storage ; Temperature ; -20°C to +60°C
Humidity ; Less than 95% RH

3. Gas sensitivity

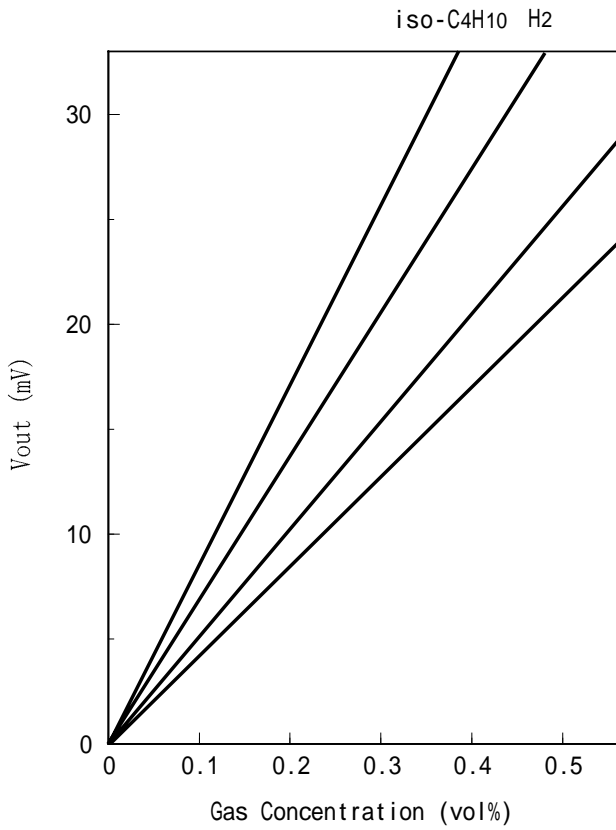


Fig. 1 Gas sensitivity of NAP-55A

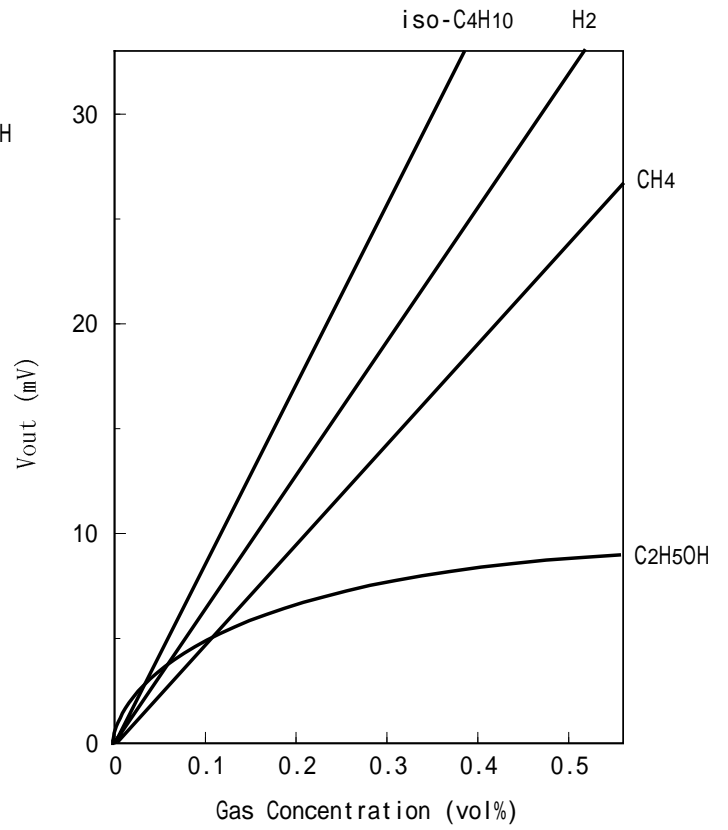


Fig. 2 Gas sensitivity of NAP-50A

4. Response characteristics

(Measurement example ; Comparison to NAP-2A)

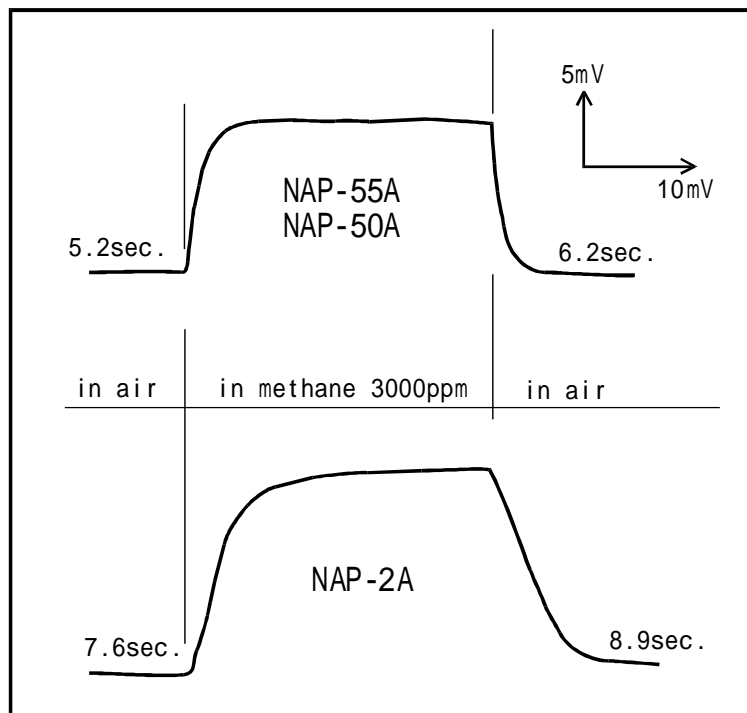


Fig. 3

The times are ones to be required for 90% response

5. Voltage dependency characteristics

Voltage dependency on NAP-55A & 50A gas sensitivity

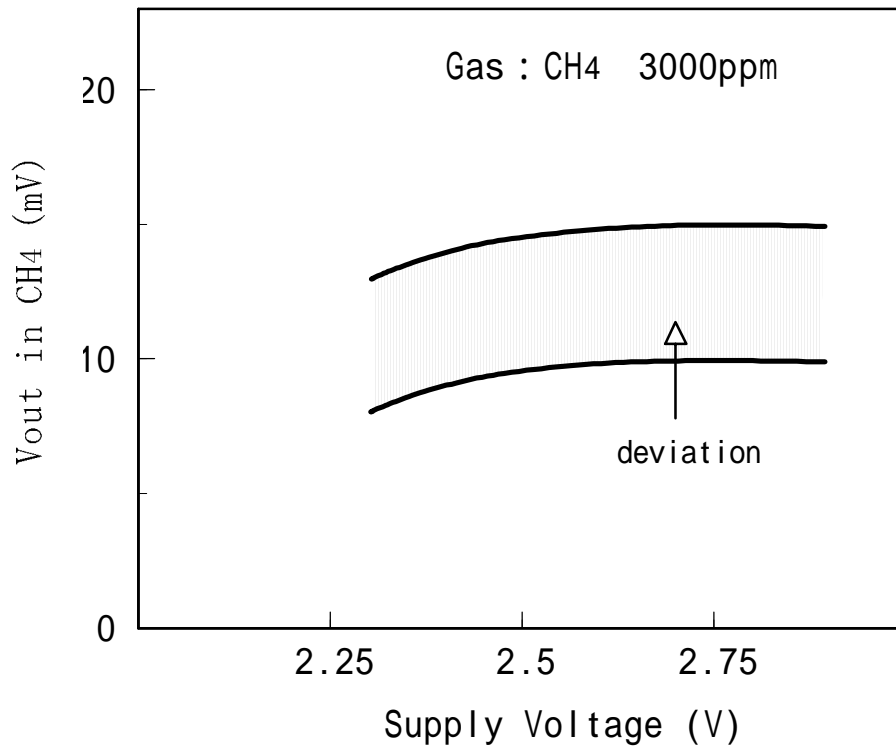


Fig. 4

Voltage dependency on output in air

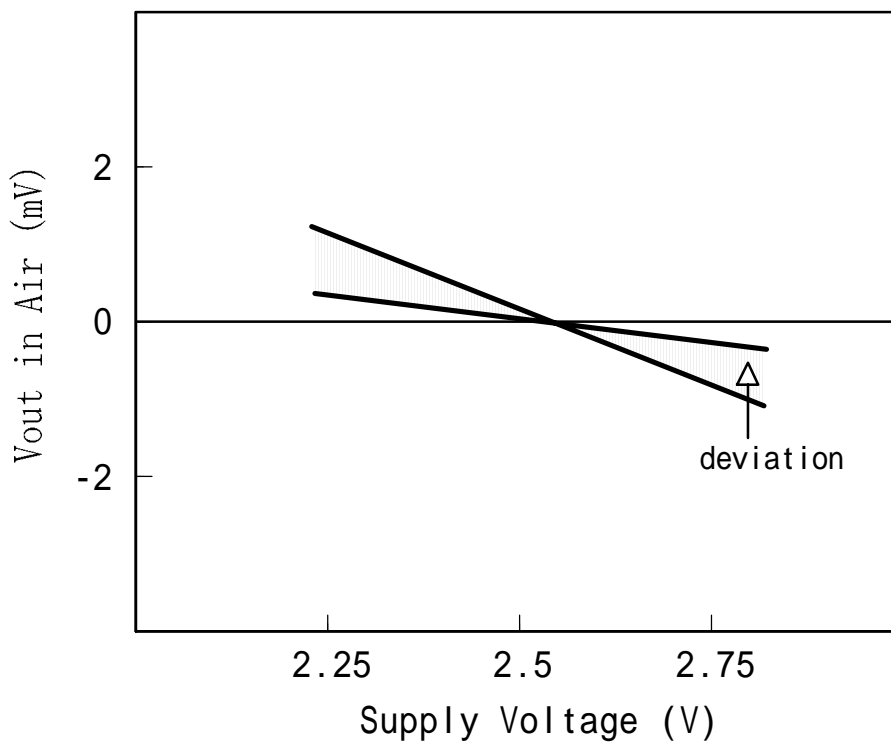


Fig. 5

Voltage dependency on theoretical alarm concentration

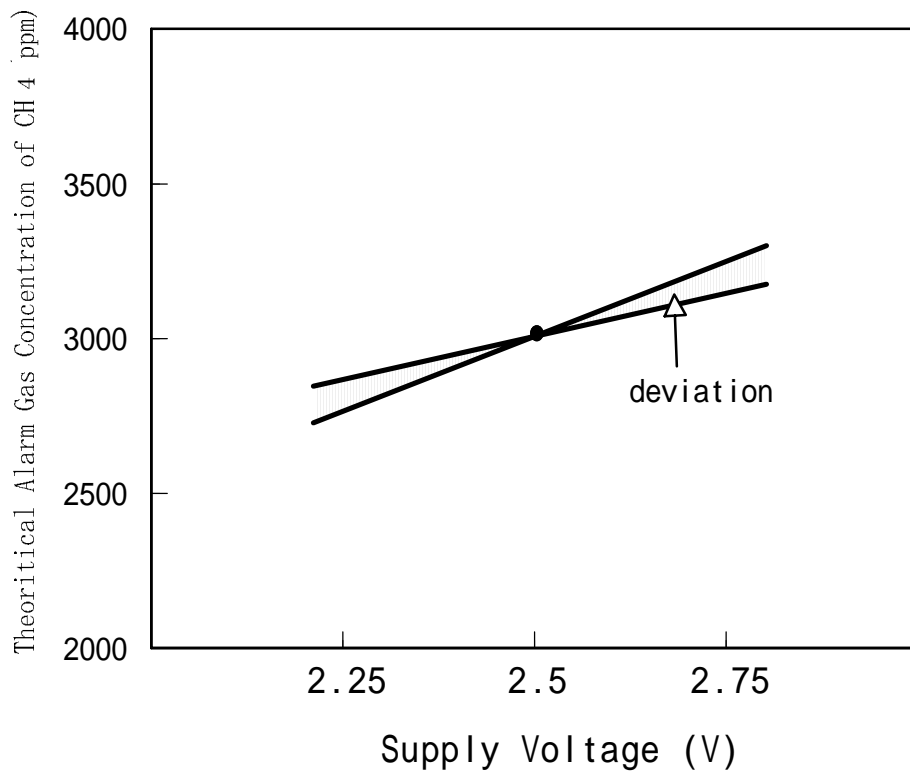


Fig. 6

6. Temperature characteristics

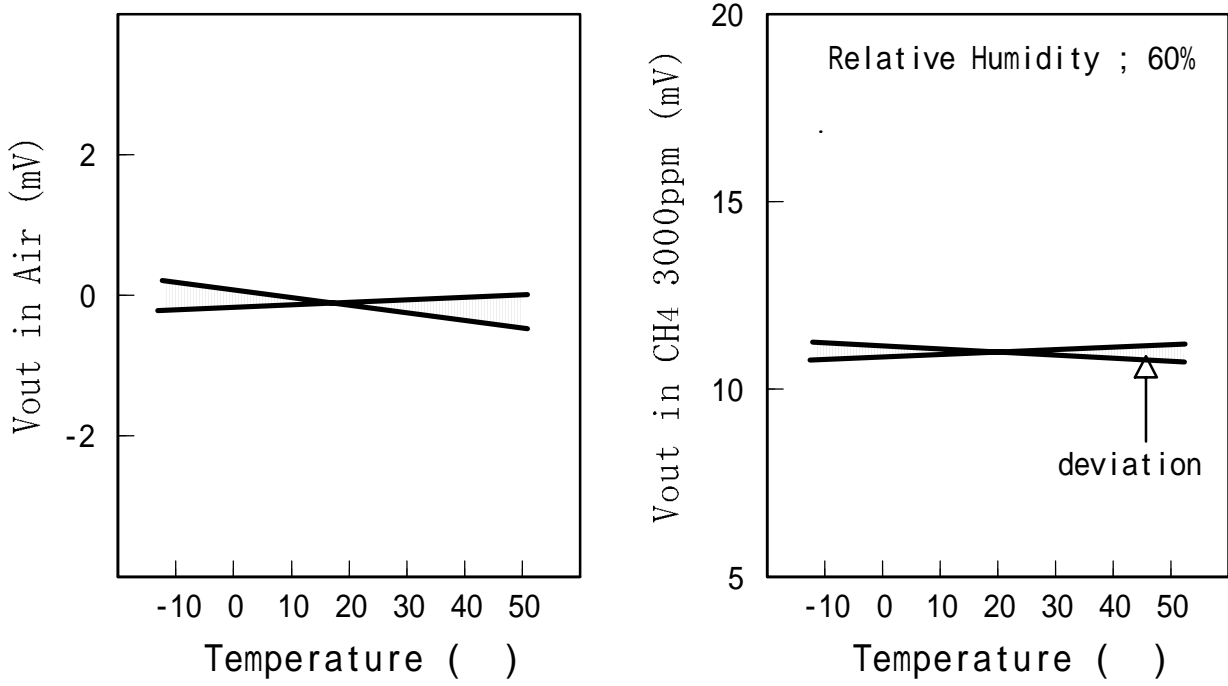


Fig. 7

7. Humidity characteristics

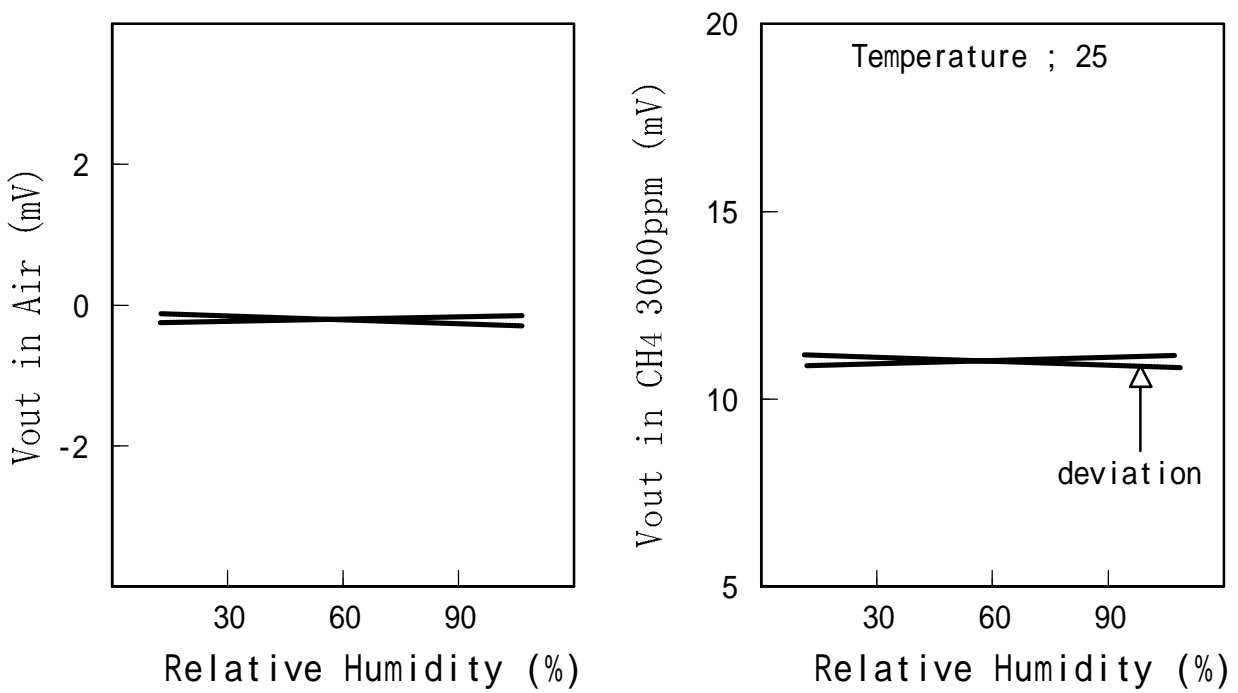


Fig. 8

8. Evaluation of sensors

(1) Testing equipment

The following is an outline of a test system.

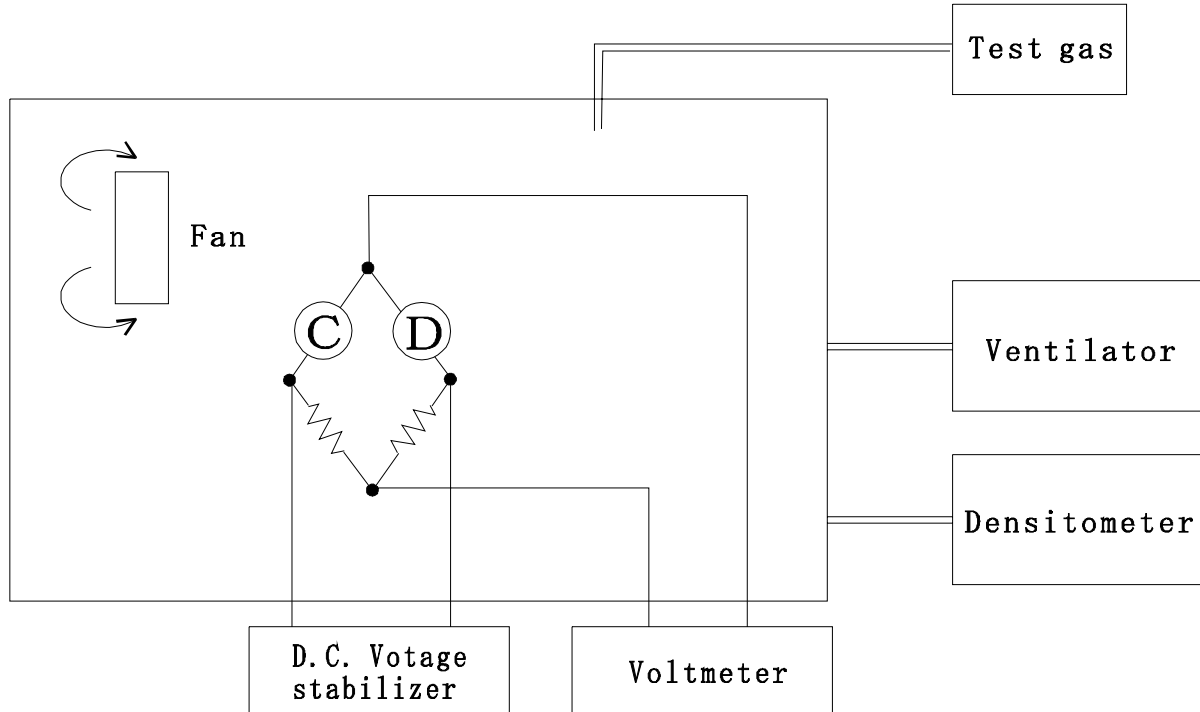


Fig. 9

Remarks:

1) Test chamber ;

* Metal or glass which does not generate or absorb gases is desirable as test chamber material.

* The volume of the chamber should be larger than 1 liter / sensor.

2) Gas densitometer ;

* An infrared gas densitometer is recommended for measuring gas concentration.

3) Air agitation ;

* The air inside the chamber should be agitated, but not so as to directly blow on the sensor. Air flow should be less than 0.5m/sec.

4) Power supply ;

* Sensors can be operated using either D.C. or A.C., but for optimal measurement accuracy, use of a D.C. voltage stabilizer is recommended.

5) Voltmeter ;

* A voltmeter with greater than 100K ohm impedance is sufficient for measuring sensor bridge output voltage.

6) Ventilation ;

* Before proceeding with a subsequent test, the air inside the test chamber should be ventilated using a ventilator which has a capacity of more than 10 times the volume of the chamber per minute.

7) Placement of sensors in a test chamber ;

* Sensors should be placed in a chamber in a same attitude. (Normally horizontal). Changing the attitude creates different thermal convection, and may cause inaccurate measurement results.

(2) Adjustment of gas concentration

Gas concentration in a test chamber is usually adjusted by a volumetric method injecting iso-butane gas using a syringe, or by monitoring with an infrared gas densitometer.

Gas concentration adjustment by a volume method can be calculated according to the following formula.

$$V (\text{ml}) = V_i \times C \times 10^{-6} \frac{273 + T_r}{273 + T_c}$$

V ; Volume of gas to be injected

V_i ; Inside volume of a chamber (ml)

C ; Gas concentration to be adjusted

T_r ; Room temperature (°C)

T_c ; Temperature inside a chamber (°C)

(3) Measurement

1) Preparatory aging;

* Before measurement, sensors should be supplied with the specified voltage at least for more than 1 hour.

2) Measurement;

* After confirming that the output voltage level has stabilized, the output value in air (V_a) is measured.

* A test gas is injected into the test chamber and wait for an even dispersion of the gas inside the chamber. (Usually 1 min. or more)

* Output voltage in gas (V_g) is measured.

* Thoroughly ventilate the test chamber with a fresh air from outside.

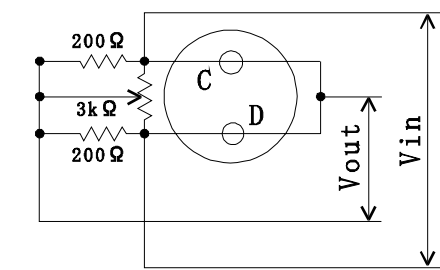
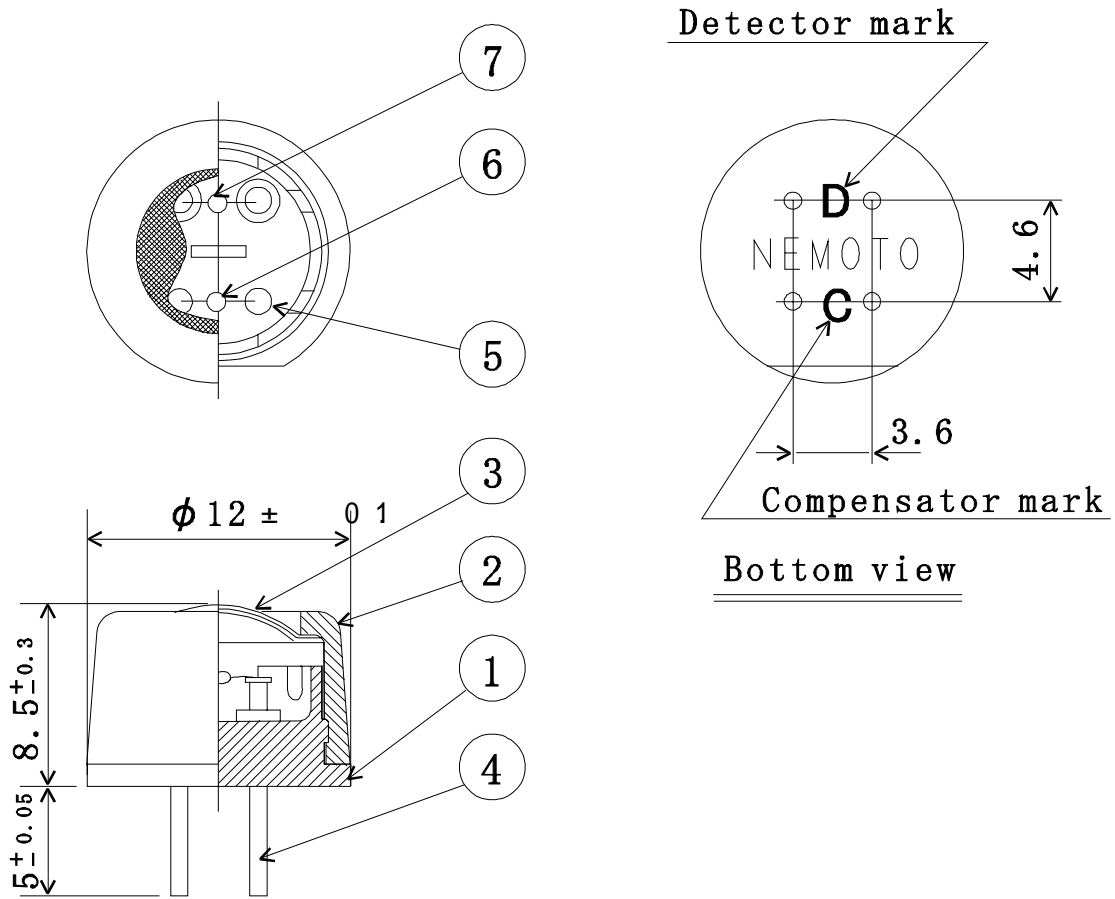
(4) Other remarks

* Sensors should not be dropped or subjected to strong shocks.

* Refrain from use in an atmosphere that may contain poisonous or corrosive gases.

* Do not soak sensors in water.

9. Drawings



Measuring circuit

7	Detector	_____	NEMOTO & CO., LTD.
6	Compensator	_____	NEMOTO & CO., LTD.
5	Coil	Pt	φ 30 μ m
4	Pin	Pure Ni	φ 0. 8
3	Strainer	SUS316#100mesh	Double layered
2	Cap	66Nylon	20% Glass
1	Base mount	66Nylon	20% Glass
No.	PARTS	MATERIALS	REMARKS

THIRD ANGLE PROJECTION 	APPROVED	CHECKED	DESIGNED	DRAWN	MATERIAL	Q.TY	SCALE
					DATE	DRG.NO.	
	TITLE NAP-55A & 50A				DEC, 25, 1993	G-01-04-143	NEOTO & CO., LTD

Fig. 10