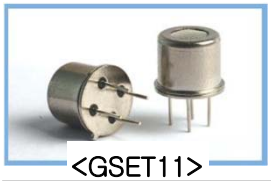
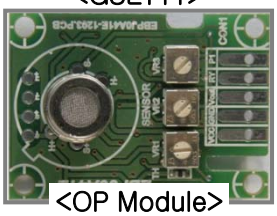
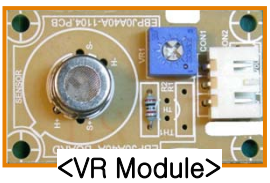
CO Sensor [일산화탄소]

- for the detection of CO gas
- Tobacco Gases


<GSET11>


<OP Module>

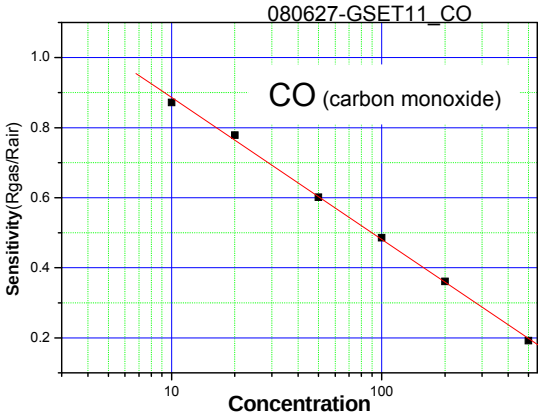

<VR Module>

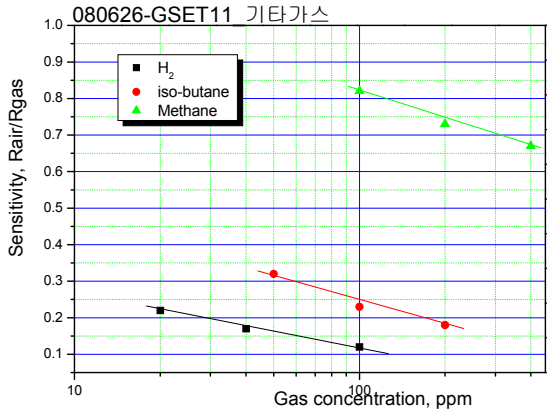
CO 센서는 우리의 생활환경에는 대단히 많은 종류의 위험한 가스가 존재하고 있으며 최근 일반가정, 업소,공사장에서의 가스사고, 석유콤비나트, 탄광, 화학플랜트 등에서의 폭발사고 및 오염 공해 등이 잇따르고 있다. 인간의 감각기관으로는 위험 가스의 농도를 정량 하거나 종류를 거의 판별할 수 없다. 이에 대응하기 위해 물질의 물리적, 화학적 성질을 이용한 가스센서가 개발되어 가스의 누설감지, 농도의 측정 기록, 경보 등에 사용되고 있다.

NDIR type 대비 저가의 반도체식 가스센서를 이용하여 보다 용이하게 사용할 수 있으며 가정과 업소 등에서의 가스난로 및 보일러 사용과 주차장 등에서의 차량배기가스에서 발생하는 CO가스의 고감도 감지토록 개발된 센서이다.

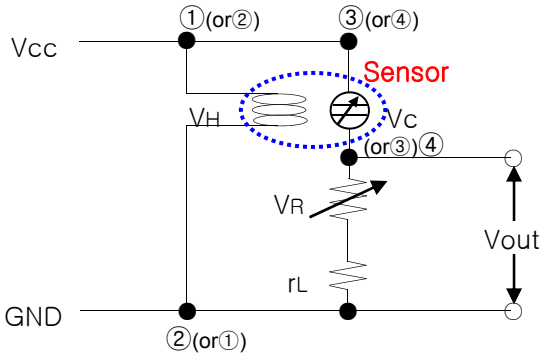
Application * Air Purifier * Damper

1. Sensitivity characteristic slope



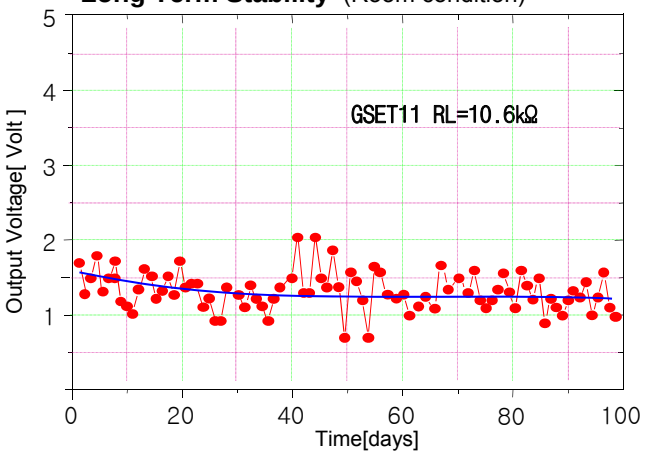


2. Basic Measuring Circuit & Stability



Vcc : Circuit Voltage(5V) VH : Heater Voltage(5V)
RL : Load Resistance Rs : Sensor Resistance
(RL=VR+rL) None polarity

- Long Term Stability (Room condition)



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3. Specifications

3.1 Package (GSET11), MOQ : 없음

a. Characteristics

Index		Spec. & Test condition
Circuit Voltage	Vc	Sensor input Voltage :1~12Volt, Sensor Resistance : refer to Rank table
	VH	Heater input voltage : 5volt±1%, Heater Resistance : 27.0Ω±2.0Ω
	PH	Power consumption : 450㎽ 이하, Inrush current : 1A 이하
Characteristics of sensitivity (β) (Rs,gas / Rs,air)		- CO(10PPM) 0.75≤ β ≤ 0.85, CO(100PPM) 0.190≤ β ≤ 0.415 - Tobacco(2,000ppm-ESSE, KOREA) β ≤ 0.6 - Ethyl alcohol vapor (50ppm) β ≤ 0.50 (Sample is gathered by using injector(10㎖) with 10mm/sec speed)
Guarantee		- 3years, - Calibration interval 1years recommended
Operating environment		- Temp. : -10 ~ 50℃, Humidity : 5 ~ 90%RH, Non-condensing - Storage → Temp. : -10 ~70℃, Humidity : 0 ~90%RH
Reaction time(T90)		- Reaction Time(T90) : Less then 10sec - Recovering Time(T90) : Less then 30sec

*Rs,gas : 가스 주입 완료 후, 출력저항, Rs,air : 청정대기 상태에서의 출력저항
*T90 : 90% of saturation point

b. 가스 농도 별 감도 : 오차 : ±15% (온도, 습도 보상 전)
기준 → Vout,air : 1.0volt (센서 인가전압 5volt)

130124-GSET11_CO

농도 (ppm)	출력 (Volt)	농도 (ppm)	출력 (Volt)	농도 (ppm)	출력 (Volt)	농도 (ppm)	출력 (Volt)
0	1.00	110	1.84	230	2.19	550	2.84
5	1.10	120	1.88	240	2.22	600	2.92
10	1.21	130	1.91	250	2.24	650	3.01
20	1.34	140	1.94	260	2.27	700	3.09
30	1.43	150	1.97	270	2.29	750	3.17
40	1.51	160	2.00	280	2.31	800	3.25
50	1.57	170	2.03	290	2.33	850	3.33
60	1.62	180	2.06	300	2.36	900	3.40
70	1.67	190	2.09	350	2.46	950	3.48
80	1.72	200	2.12	400	2.56	1000	3.55
90	1.76	210	2.14	450	2.66		
100	1.80	220	2.17	500	2.75		

CO Gas Eq.

$$Con.(ppm) = 122.89 - 271.01 \times (Vout) + 148.18(Vout)^2$$

i-Butane Gas Eq. (20190515)

$$CON. = 10^{-5.076+4.300*(Volt)-0.503*(Volt)^2}$$

Methane Gas Eq. (20190515)

$$CON. = 10^{-4.403+8.320*(Volt)-2.041*(Volt)^2}$$

농도(ppm)	Smoke (HC)	Alcohol(C2H5OH)	Hydrogen(H2)	Butane(C4H10)
Concentration	2,000ppm	50ppm	30ppm	50ppm
Sensitivity	0.6 <	0.3 <	0.3 <	0.4 <

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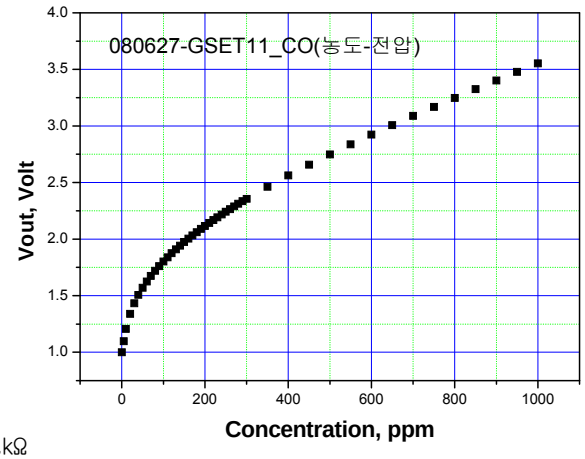
c. Sensor connection

Sensor 저항(Rs) 및 RL 을('3.1-e' 참조) 확인한 후 Basic measuring circuit('2항')을 참조하여 결선 할 것.(주의 : 센서 저항은 재고에 따라 바뀔 수 있으며, 당사와 미리 협의 요망)

- Heater(DC 5volt ± 3%)
  → ① : Vcc ② : GND, **극성 없음**
- Sensor(DC/AC 0 ~ 12volt)
  → ③ : Vcc ④ : GND, **극성 없음**

Output Curve (±15%) GSET11



d. 출고

GSET11-Q■■

Q■■ : 저항 분류 rank

ex) Q44 -> Sensor 저항(Rs,air) : 648 ~ 784㏀

Rl을 178㏀(표준 circuit 참조)을 부착할 경우 Vout=1.0volt 출력

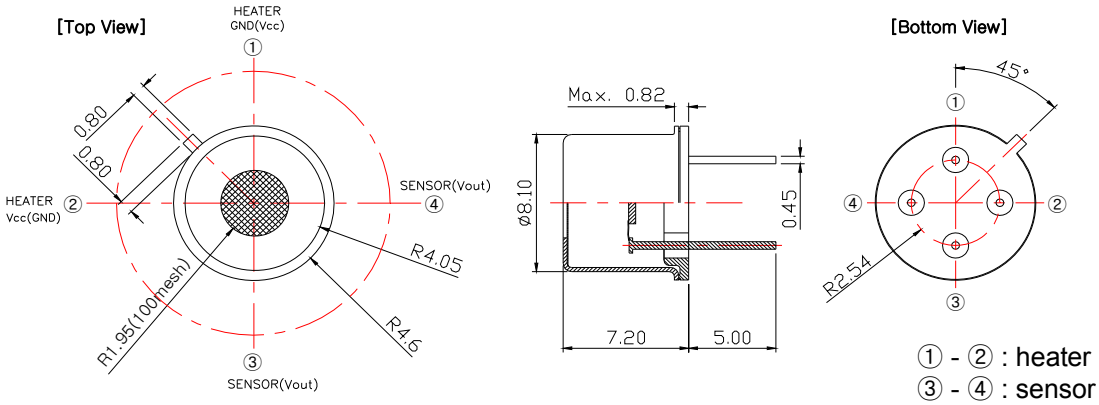
e. Sensor Resistance (Only package)

- Sensor Resistance Table(Only package) Rank Table No. : Q(1±0.25Volt)

Rank No.	Q Rank Table (㏀)		
	RL	Low limit	Hi limit
Q38	59.0	215	260
Q39	71.2	260	314
Q40	84.5	314	372
Q41	102	372	449
Q42	121	449	533
Q43	147	533	648

Rank No.	Q Rank Table (㏀)		
	RL	Low limit	Hi limit
Q44	178	648	784
Q45	215	784	947
Q46	261	947	1,150
Q47	316	1,150	1,392
Q48	383	1,392	1,687
Q49	464	1,687	2,044

f. Structure and Dimensions



3.2 OP Module (GSET11-P1xx), MOQ : 없음

a. Characteristics

Index		Spec. & Test condition
Circuit Voltage	Vc	Module input Voltage : 5±0.1Volt
	PH	Power consumption : 480㎽ 이하, Inrush current : Less than 1.2A
Guarantee		- 3years over - Calibration interval 1years recommended
Worm up Time (T90)		- Less then 300sec
Reaction time(T90)		- Reaction Time(T90) : Less then 5sec - Recovering Time(T90) : Less then 30sec

b. 가스 농도 별 data sheet (130124)

- Output data : 0.5 ~ 5Volt
- Relay Output : 4.0Volt 이상
- 오차 : ±7% (온도보상, 습도 보상 전)

- Max. Range : 200ppm (GSET11-P11X)

농도 (ppm)	출력 (Volt)	농도 (ppm)	출력 (Volt)
0	0.72	130	3.30
10	1.31	140	3.40
20	1.69	150	3.49
30	1.95	160	3.57
40	2.16	170	3.66
50	2.34	180	3.74
60	2.50	190	3.81
70	2.64	200	3.89
80	2.77	210	3.97
90	2.89	220	4.04
100	**3.00**	230	4.11
110	3.11	240	4.18
120	3.21	250	4.25

$$(ppm) = 19.51 - 38.02 * (Vout) + 21.95 * (Vout)^2$$

- Max. Range : 500ppm (GSET11-P12X)

농도 (ppm)	출력 (Volt)	농도 (ppm)	출력 (Volt)
0	0.73	300	3.21
20	1.35	325	3.31
40	1.66	350	3.40
60	1.87	375	3.50
80	2.05	400	3.59
100	2.20	425	3.67
125	2.36	450	3.76
150	2.51	475	3.84
175	2.64	500	3.93
200	2.77	525	4.01
225	2.89	550	4.09
250	**3.00**	575	4.17
275	3.11	600	4.25

$$(ppm) = 27.13 - 74.62 * (Vout) + 49.60 * (Vout)^2$$

- Max. Range : 1,000ppm (GSET11-P13X)

농도 (ppm)	출력 (Volt)	농도 (ppm)	출력 (Volt)
0	0.73	300	2.49
20	1.17	350	2.63
40	1.39	400	2.76
60	1.54	450	2.88
80	1.66	**500**	**3.00**
100	1.77	575	3.17
125	1.89	650	3.33
150	1.99	725	3.49
175	2.09	800	3.65
200	2.18	875	3.80
225	2.26	950	3.95
250	2.34	1025	4.09
275	2.42	1100	4.24

$$(ppm) = 10.83 - 83.18 * (Vout) + 82.30 * (Vout)^2$$

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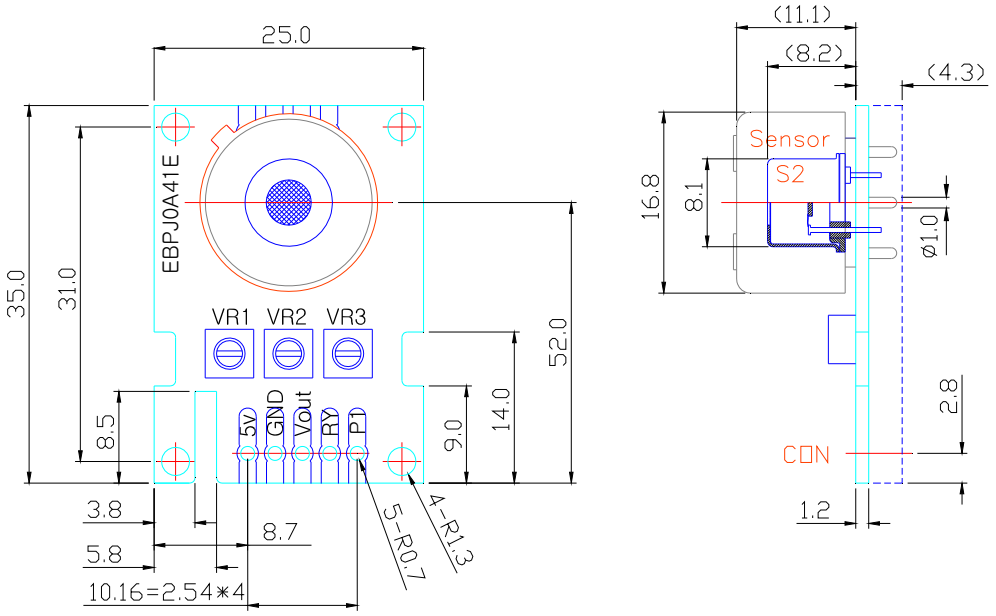
c. Structure and Dimensions



VR1 : 초기 reference 값 조정, VR2 : Gain (감도 조정), VR3 : Offset (Level shift)

- **현장 응용 출력 조정 방법**
  ① VR3을 이용하여 출력조정
  - 가변저항의 위치에 따라 조정 범위가 다를 수 있음(max. ±0.5volt)
  ② VR1을 이용하여 출력 조정 (VR3를 이용한 조정이 불가할 경우)
  → VR1(+cc) : 전체적으로 감도가 증가 됨
  → VR1(-cc) : 전체적으로 감도가 감소 됨

d. Data output

□ □ □ □
① ② ③ ④

① Vcc : 5.0volt
② GND
③ Data(Vout, analogue signal)
④ Relay

e. Relay Output

- Normal condition : Less than 0.3volt
- Hi output(4.0~4.1volt) at more than 100ppm(CO) : in case of GSET11-P11X
  at more than 200ppm(CO) : in case of GSET11-P12X
  at more than 400ppm(CO) : in case of GSET11-P13X

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3.3 RL Module(GSET11-P3xx), MOQ :1,000pcs 이상

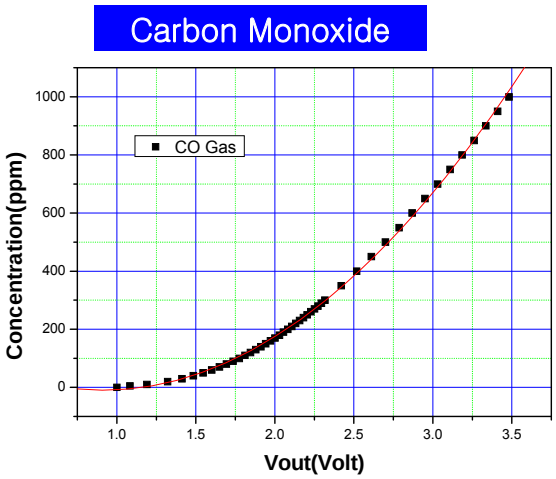
a. Characteristics

Index		Spec. & Test condition
Circuit Voltage	Vc	Module input Voltage : 5±0.1Volt
	PH	Power consumption : 460㎽ 이하, Inrush current : Less than 1.2A
Characteristics of Output data		Data 참조
Guarantee		- 2years over - Calibration interval 1years recommended
Operating environment		- Temp. : -10 ~ 50℃, Humidity : 5 ~ 90%RH, Non-condensing - Storage → Temp. : -20 ~70℃, Humidity : 0 ~90%RH
Reaction time(T90)		- Reaction Time(T90) : Less then 10sec - Recovering Time(T90) : Less then 180sec

b. 전압 출력 별 가스 농도

기준 → RL : 100㏀, Sensor resistance : 400㏀
Vout,air : 1.0volt (센서 인가전압 5volt)

- 오차 : ±15% (온도, 습도 보상 전)



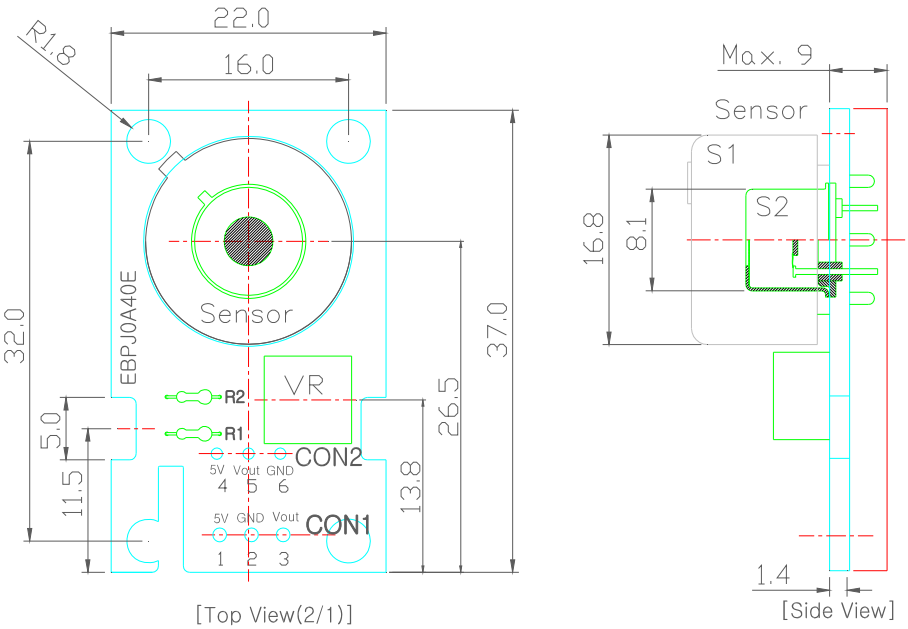
출력 (Volt)	농도 (ppm)	출력 (Volt)	농도 (ppm)	출력 (Volt)	농도 (ppm)	출력 (Volt)	농도 (ppm)
1.00	0	1.81	110	2.16	230	2.79	550
1.08	5	1.85	120	2.18	240	2.87	600
1.19	10	1.88	130	2.20	250	2.95	650
1.32	20	1.91	140	2.23	260	3.03	700
1.41	30	1.94	150	2.25	270	3.11	750
1.48	40	1.97	160	2.27	280	3.18	800
1.55	50	2.00	170	2.29	290	3.26	850
1.60	60	2.03	180	2.32	300	3.34	900
1.65	70	2.06	190	2.42	350	3.41	950
1.69	80	2.08	200	2.52	400	3.48	1000
1.74	90	2.11	210	2.61	450		
1.77	100	2.13	220	2.70	500		

$$Con.(ppm) = 120.71 - 285.63 \times (Vout) + 156.29(Vout)^2$$

c. Sensor connection

- CON1, CON의 결선에 주의할 것.

d. Structure and Dimensions



e. Data output (CON1, CON2 배선에 주의할 것)

CON1 □ □ □
① ② ③

CON2 □ □ □
④ ⑤ ⑥

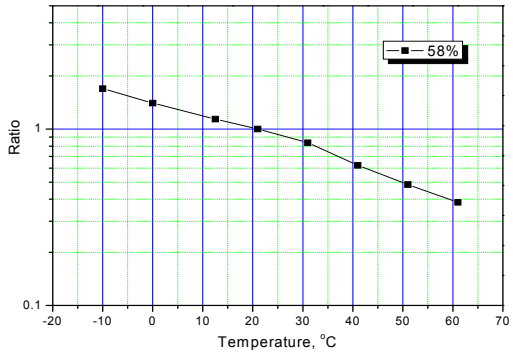
①, ④	→	Vcc : 5.0volt
②, ⑥	→	GND
③, ⑤	→	Data(Vout, analogue signal)

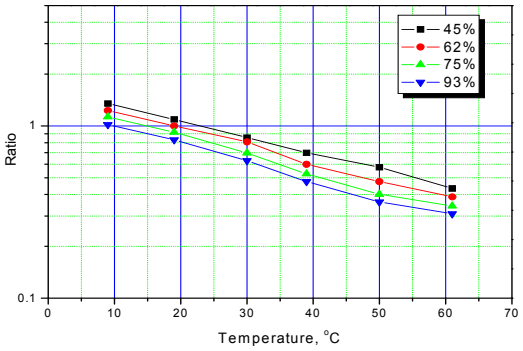
3.4 Product code & characteristics

Product code	Consumption	Circuit	Output	Worm-up time
GSET11 – P1XX	390㎽ 이하	OP-Amplifying	Data : Analogue Relay : Hi(4V), Low(0V)	Long
Study– P2XX	↑	μ-processor	Data : Digital Open collect	short
GSET11 – P3XX	↑	Basic Circuit	Data : Analogue	Long

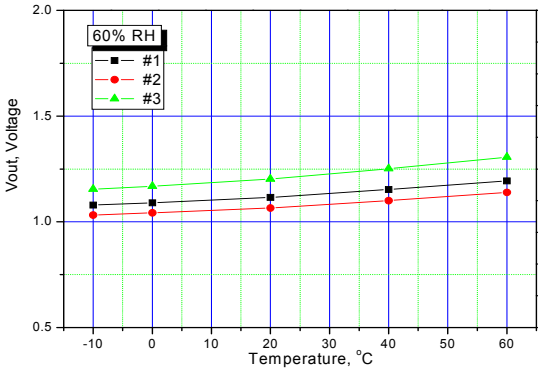
3.5 Dependency of temperature & humidity

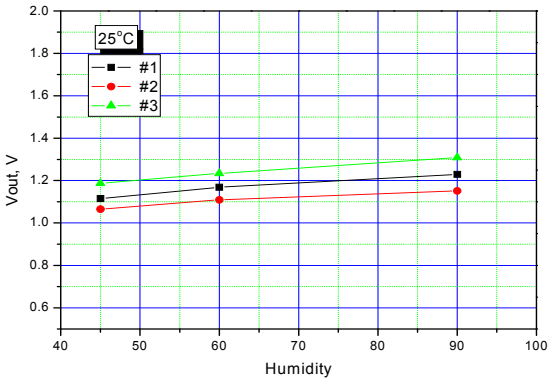
- Sensor





- Module(온.습도 의존 특성)





4. 제품 비교

Index	GSET11	GSET11-**P11X**	GSET11-**P21X**study	GSET11-**P3XX**
Circuit	Package	OP-Module	MP-Module	RL-Module
Target Gas	CO Gas			
Accuracy	±15%	±7%	±7%	±10%
Measuring Circuit	Basic Circuit	Op-Amp	Micro Processor	Basic Circuit
Input Voltage	5Volt±3%	←	←	←
Output	0 ~ 4volt	0 ~ 4volt	Open collect	0 ~ 4volt
MOQ	None	None	None	More than 3,000ea

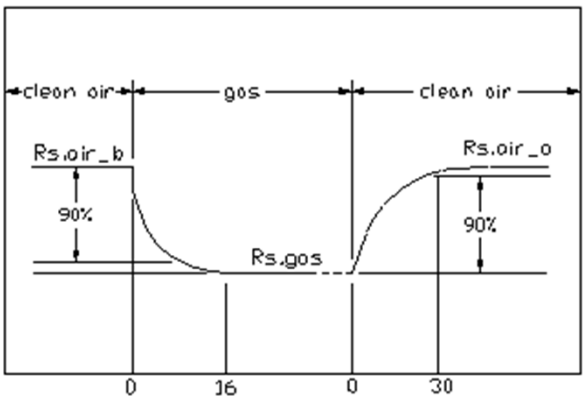
5. Reaction time(T90)

Reaction Time(T90) : Less then 10sec
[Between Rs,air_b & Rs,gas]

Recovering Time(T90) : Less then 30sec
[between Rs,gas & Rs,air_a]

Beginning stability time(T90) : Less then 10 min

Rs,air_b : Sensor Resistance without gases
Rs,gas : Sensor Resistance after blowing gases
Rs,air_a : Sensor Resistance removing gases



6. Application

* Hood, Ventilator
* Damper
* Gas Leak Alarm (Explosive gases)

7. Product code

GSET11 – P ■ ■ ■
(1) (2) (3) (4)

(1) GSET11 → CO Sensor
(2) Division Circuit → 1:Op-amp circuit 2:Micro processor Circuit 3:Basic Circuit
(3) Gas sensing range → 1:Standard
(4) Connector → 0:None 1:in

* 본 규격서는 summary 규격서로 제품 향상을 위하여 공지 없이 변경될 수 있음을 알려드립니다.

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