

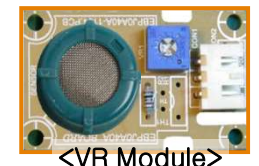
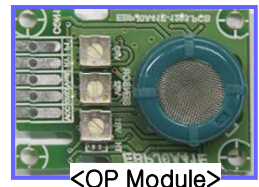
SMKs – S type Sensor

Smoke Sensor

– for the detection of Hydro Carbon, Smoke, Tobacco, Organic Solvent

Smoke 센서는 실내에서 발생하는 오염 공기(담배연기, 연료용 가스, 유기용제)를 감지하는 센서이며 일반 적으로 미국 환경보호국(EPA)은 오염물질의 실내 농도가 옥외 농도보다 2~5배 높은 것으로 보고 있고, 하루 중 80~90%정도의 시간을 실내에서 보내는 도시인들에게 공기의 오염은 심각한 건강상의 문제를 초래하고 있어 실내의 오염원 제거 및 환기에 많은 관심을 기울이고 있다.

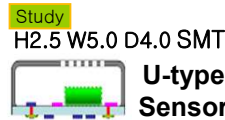
Smoke Sensor는 실내 오염공기(담배연기, LPG/NG, 유기용제 등)를 피해 한계치 이하에서 감지가 가능 하도록 개발된 센서이다.



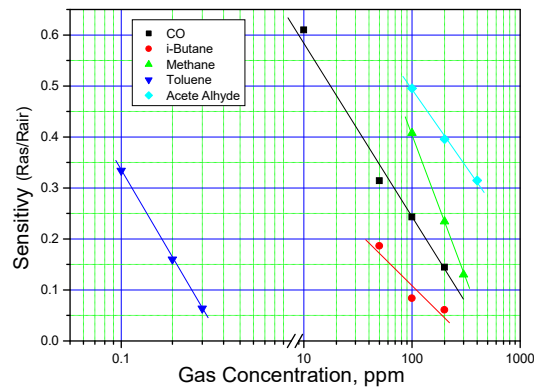
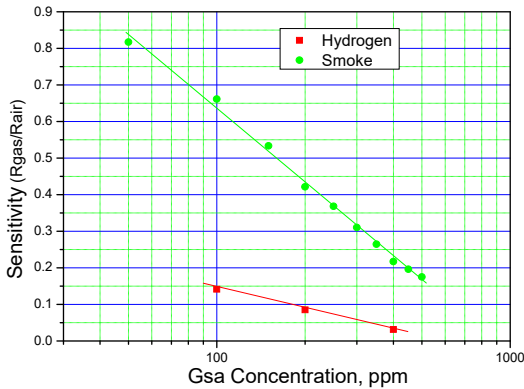
T-type Sensor



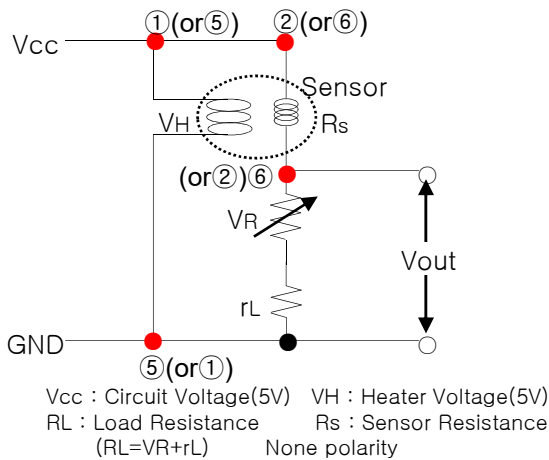
S-type Sensor



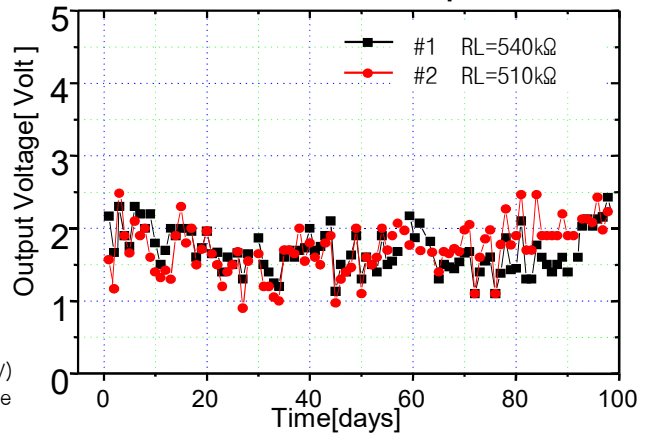
1. Sensitivity characteristic slope



2. Basic Measuring Circuit & Stability



Long Term Stability - Room condition & temperature



3. Specifications

3.1 Package (GSAT11), 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 : 19.0Ω±2.0Ω				
	PH	Power consumption : 650mW 이하, Inrush current : Less than 300mA				
Characteristics of sensitivity (β) (Rs,gas / Rs,air)	Gases	Methane	Alcohol	*TMA	Toluene	Acetaldehyde
	Concentration	100ppm	50ppm	0.1ppm	15ppm	100ppm
	Sensitivity	0.5≤	0.3≤	0.3≤	0.3≤	0.5≤
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					

* TMA : Tri-Methylamine * Rs,gas : 가스 주입 완료 후, 출력저항, Rs,air : 청정대기 상태에서의 출력저항

b. 가스 농도 별 감도 : 오차 : ±15% (온도, 습도 보상 전) → 출력전압 (3.3-b항 참조)

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

농도	감도	농도	감도
0	1.000	300	0.071
20	0.512	320	0.061
40	0.399	340	0.051
60	0.333	360	0.041
80	0.286	380	0.033
100	0.250	400	0.024
120	0.220	420	0.016
140	0.195	440	0.009
160	0.173	460	0.001
180	0.154		
200	0.137		
220	0.122		
240	0.107		
260	0.094		
280	0.082		

$$(Sensitivity) = 1.000 - 0.375 \times \log_{10}(ppm)$$

* Tobacco (THE ONE 1.0) 1개피 연기농도
→ amount 80ppm(5평 실내)

농도	감도	농도	감도
0	1.0000	600	0.2715
40	0.7806	640	0.2593
80	0.6503	680	0.2479
120	0.5741	720	0.2372
160	0.5200	760	0.2270
200	0.4780	800	0.2174
240	0.4438	840	0.2082
280	0.4148	880	0.1995
320	0.3897	920	0.1911
360	0.3675	960	0.1831
400	0.3477	1000	0.1754
440	0.3298	1040	0.1680
480	0.3134	1080	0.1609
520	0.2984	1120	0.1541
560	0.2844	1160	0.1475

$$(Sensitivity) = 1.474 - 0.433 \times \log_{10}(ppm)$$

c. Sensor connection

Sensor 저항(R_s) 및 R_L 을('3.1-b' 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 \pm 3%) \rightarrow ① : Vcc ⑤ : GND, 극성 없음
- Sensor(DC/AC 0 ~ 12volt) \rightarrow ② : Vcc ⑥ : GND, 극성 없음

d. 출고

GSAS61-G ■ ■

G ■ ■ : 저항 분류 rank ex) G11 \rightarrow Sensor 저항($R_{s,air}$) : 146 ~ 219k Ω

- Sensor Resistance Table (Only package)

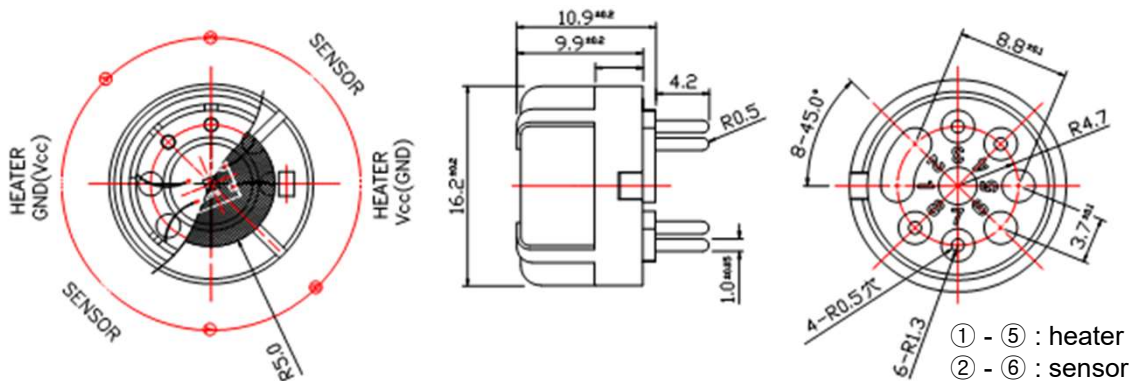
Rank Table No.:G

Rank	RL(k Ω)	Rs(k Ω)	Rank	RL(k Ω)	Rs(k Ω)	Rank	RL(k Ω)	Rs(k Ω)
G03	1.69	5.59~8.44	G07	8.66	28.5~42.9	G11	44.2	146~219
G04	2.55	8.44~12.6	G08	13.0	42.9~64.4	G12	66.5	219~329
G05	3.83	12.6~19.0	G09	19.6	64.4~97.1	G13	100	329~495
G06	5.76	19.0~28.5	G10	29.4	97.1~146	G14	150	495~743

- Basic Circuit을 이용하여 R_L 을 적용할 경우 $V_{out} = 1.0\text{Volt} \pm 0.2\text{Volt}$

$$R_L = V_R + r_L \quad (V_R \rightarrow R_L * 2, \quad r_L \rightarrow R_L * 0.4)$$

e. Structure and Dimensions



f. 주의사항

- 센서 납땜 시 플럭스(Flux)에 노출이 안되도록 할 것.
- Gas 반응 테스트 시 20mm 이상 떨어진 곳에서 가스를 주입할 것.



3.2 OP Module (GSAS61-P1xx), MOQ : 없음

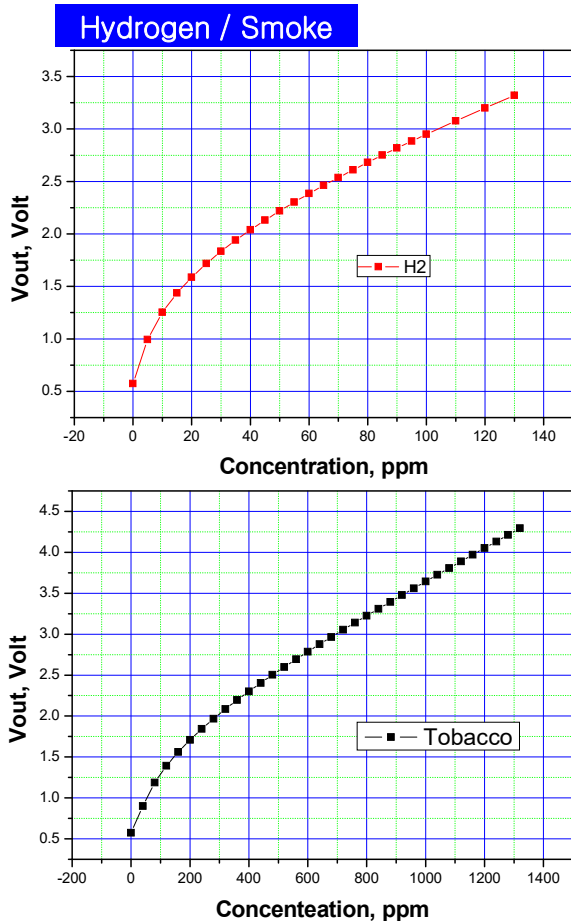
a. Characteristics

Index		Spec. & Test condition
Circuit Voltage	Vc	Module input Voltage : 5 ± 0.1 Volt
	PH	Power consumption : 680mW 이하, Inrush current : Less than 310mA
Guarantee		- 2years 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

- Output data : 0.5 ~ 5Volt
- Relay Output : 4.0Volt 이상

- 오차 : $\pm 7\%$



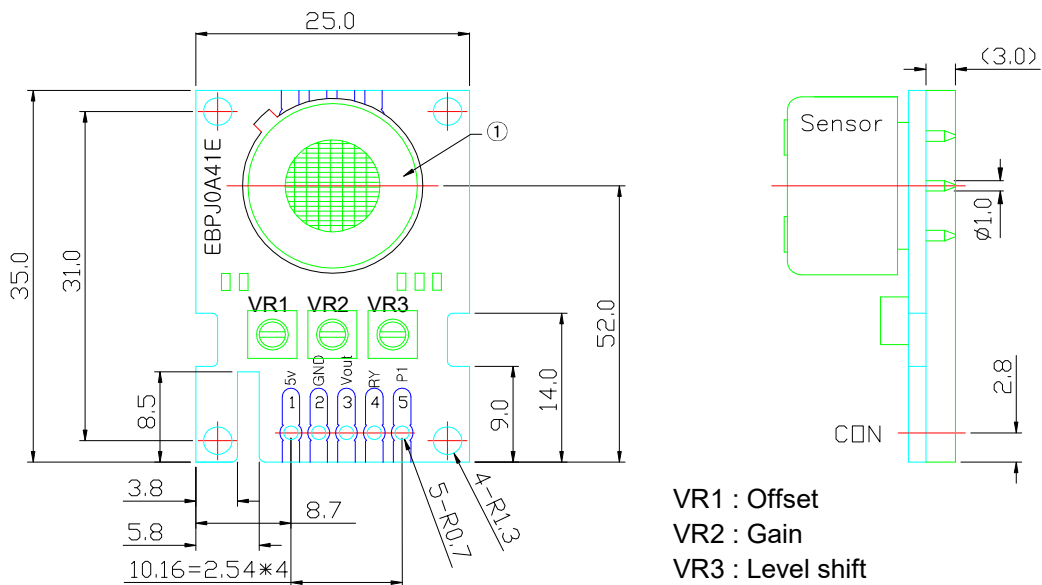
수소 (Hydrogen) 140129				Smoke (Tobacco) 140129			
농도 (ppm)	출력 (Volt)	농도 (ppm)	출력 (Volt)	농도 (ppm)	출력 (Volt)	농도 (ppm)	출력 (Volt)
0	0.57	120	3.20	0	0.57	480	2.50
10	1.25	130	3.32	40	0.91	520	2.60
20	1.59	140	3.44	80	1.19	560	2.69
30	1.83	150	3.55	120	1.39	600	2.79
40	2.04	160	3.67	160	1.56	640	2.88
50	2.22	170	3.78	200	1.71	680	2.97
60	2.38	180	3.89	240	1.84	720	3.05
70	2.54	190	4.00	280	1.97	760	3.14
80	2.68	200	4.10	320	2.08	800	3.23
90	2.82	210	4.21	360	2.20	840	3.31
100	2.95	220	4.32	400	2.30	880	3.39
110	3.08	230	4.42	440	2.40	920	3.48

$$H_2(ppm) = -8.154 - 0.589 * (Vout) + 12.517 * (Vout)^2$$

$$Tobacco(ppm) = -50.715 + 25.994 * (Vout) + 73.435 * (Vout)^2$$

- 조정 : 출하 시 대기 상태에서 1.0Volt \pm 0.2volt 조정
- 상황에 따라 VR3을 이용하여 출력 조정 필요.

c. Structure and Dimensions



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

d. Data output



① ② ③ ④

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

e. Relay Output

Hi(4.0~4.1volt) output at 40ppm(H₂)

Hi(4.0~4.1volt) output at 700ppm(Smoke)

3.3 RL Module(GSAS61-P3xx), MOQ :500pcs 이상

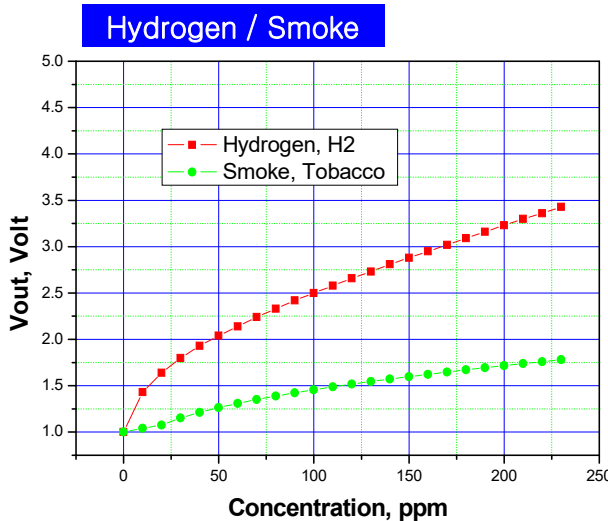
a. Characteristics



Index		Spec. & Test condition
Circuit Voltage	Vc	Module input Voltage : 5±0.1Volt
	PH	Power consumption : 660mW 이하, Inrush current : Less than 31mA
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

- 오차 : ±15% (온도, 습도 보상 전)



수소 (Hydrogen) 140129				Smoke(Tobacco) 140129			
농도 (ppm)	출력 (Volt)	농도 (ppm)	출력 (Volt)	농도 (ppm)	출력 (Volt)	농도 (ppm)	출력 (Volt)
0	1.00	120	2.66	0	1.00	480	2.22
10	1.43	130	2.73	40	1.03	520	2.28
20	1.64	140	2.81	80	1.39	560	2.34
30	1.80	150	2.88	120	1.52	600	2.40
40	1.93	160	2.95	160	1.62	640	2.45
50	2.04	170	3.02	200	1.72	680	2.51
60	2.14	180	3.09	240	1.80	720	2.57
70	2.24	190	3.16	280	1.88	760	2.62
80	2.33	200	3.23	320	1.95	800	2.67
90	2.42	210	3.30	360	2.02	840	2.73
100	2.50	220	3.36	400	2.09	880	2.78
110	2.58	230	3.43	440	2.16	920	2.83

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

$$\text{수소} : (\text{ppm}) = -69.459 + 32.258 * (Vout) + 15.465 * (Vout)^2$$

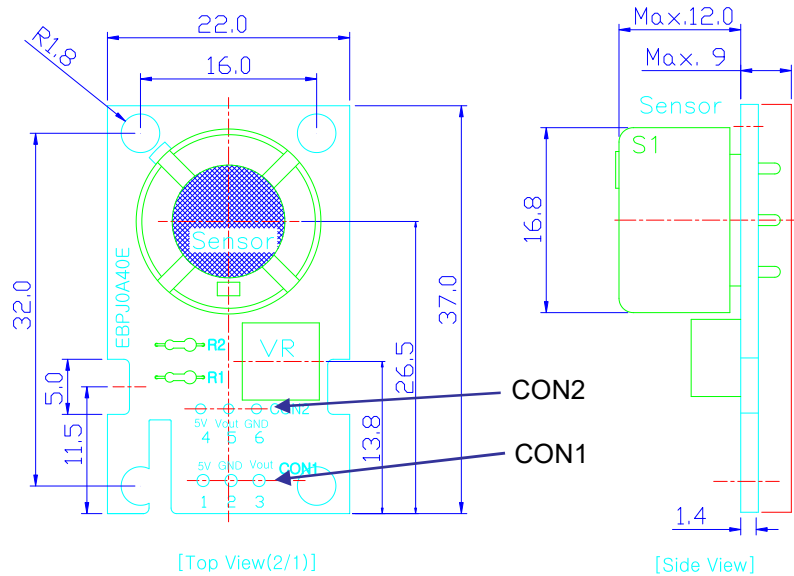
$$\text{Tobacco}(\text{ppm}) = -75.040 - 95.715 * (Vout) + 154.725 * (Vout)^2$$

* Tobacco (THE ONE 1.0) 1개피 연기농도
→ amount 80ppm(5평 실내)

c. Sensor connection

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

d. Structure and Dimensions



e. Data output (CON1, CON2 배선에 주의할 것)

CON1 Pitch : 2.54mm
 ① ② ③ R0.45 hole

CON2 Pitch : 2.54mm
 ④ ⑤ ⑥ R0.45 hole

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

3.4 Circuit characteristics

Index	GSAS61	GSAS61-P11X	GSAS61-P21X ^{study}	GSAS61-P3XX
Circuit Name	Package	OP-Module	MP-Module	RL-Module
Target Gas	HC, Smoke, Tobacco, Organic Solvent			
Accuracy	±15%	±7%	±7%	±10%
Measuring Circuit	Basic Circuit	Op-Amplifying	μ-Processor	Basic Circuit
Input Voltage	5Volt±3%	←	←	←
Output	0 ~ 4volt	0 ~ 4volt	Data : Digital Open collect	0 ~ 4volt
Worm-up time	-	Long	short	Long
MOQ	None	None	None	More than 500ea



4. 제품 비교

Product code	Power Consumption	Worm-up time	Long term stability	Housing
GSAT11 GSAT11 - PXXX	350mW 이하	Long	Very Good	Plastic Package
GSAS61 GSAS61 - PXXX	660mW 이하	Short	Good	Small Metal Package

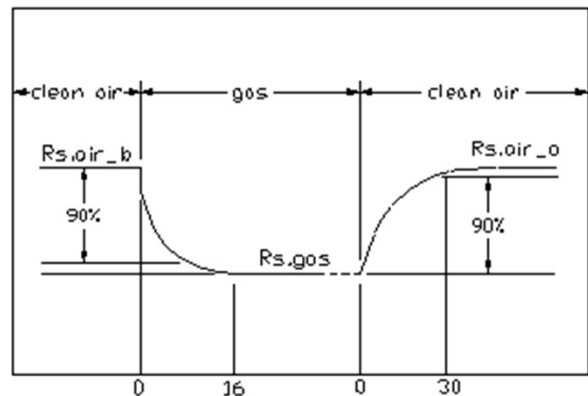
5. Reaction time(T90)

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

Sensor : **GSAS61**

(A) Division Circuit → **A** : Smoke(HC) Gas of Sensing gas

(S) Chip Size → **S** : 2.0mm * 3.0mm

(1) Shape of Package → **6** : Plastic Cover

(1) Gas Sensing Characteristics
→ **1** : Normal

Module : GSAS61 - P **1 2 3**

(1) Division Circuit → 1 : Op-amp circuit
2 : Micro processor Circuit
3 : Basic Circuit

(2) Sensing range → 0 : 센서 병렬저항
→ **1 : Standard**

(3) Connector → 0 : None
→ 1 : SMAW250-03G(연호)

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