

FIS GAS SENSOR SB-12A for METHANE DETECTION

The SB-12A is a tin dioxide semiconductor gas sensor which has an excellent performance in methane detection with significant low power consumption concept (120 mW). High sensitivity, low sensitivity to noise gases, quick response speed and strong poisoning resistance features achieve reliable gas detection system applications.

Structure

Gas sensitive semiconductor material is a mini bead type and a heater coil and electrode wire are embedded in the element. The sensing element is installed in the metal housing which uses double stainless steel mesh (100 mesh) in the path of gas flow. This sensor unit is placed in an external housing which contains active charcoal filter (Fig 1).

Operating conditions

Fig 2 shows the standard operating circuit for this model. The change of the sensor resistance (R_S) is obtained as the change of the output voltage across the fixed or variable resistor (R_L). In order to obtain the best performance and specified characteristics, the values of the heater voltage (V_H) circuit voltage (V_C) and load resistance (R_L) must be within the range of values given in the standard operating conditions shown in the Specification table on the next page.

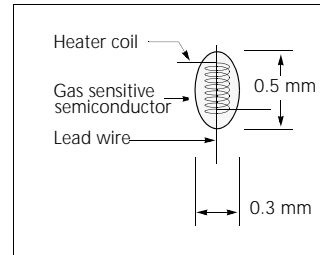


Fig 1a. Sensing element

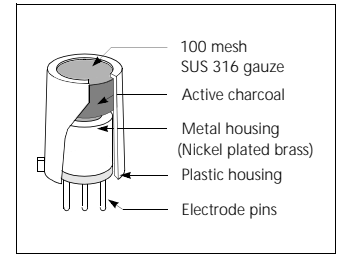


Fig 1b. Configuration

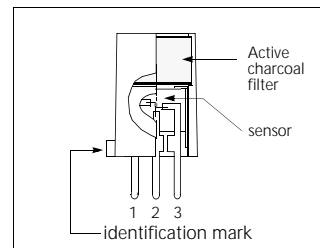


Fig 1c. Pin Layout

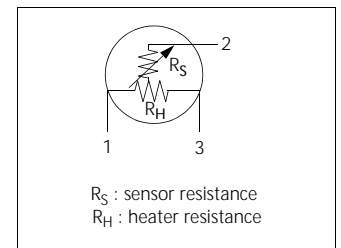


Fig 1d. Equivalent circuit

Sensitivity characteristics

Fig 3 shows the sensitivity characteristics curves of the SB-12A (typical data). Sensitivity characteristics of the FIS gas sensors are expressed by the relationship between the sensor resistance and gas concentration. The sensor resistance decreases with an increase of gas concentration based on a logarithmic function.

The sensitivity characteristics of the SB-12A is specified by the following parameters.

- Sensor resistance at methane 3000 ppm
- Sensor resistance change ratio: between methane 1000 ppm and 3000 ppm (slope)
- Sensor resistance change ratio: between methane 3000 ppm and ethanol 1000 ppm.

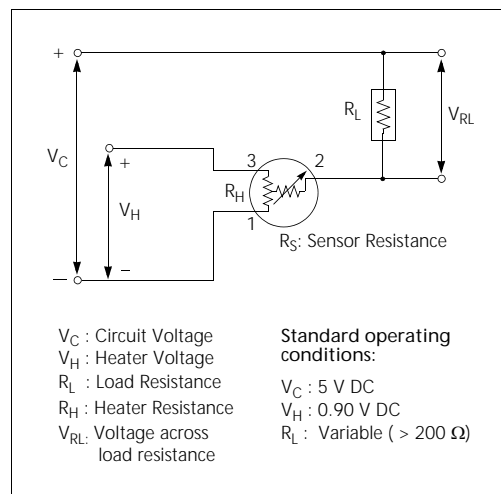


Fig 2. Standard circuit

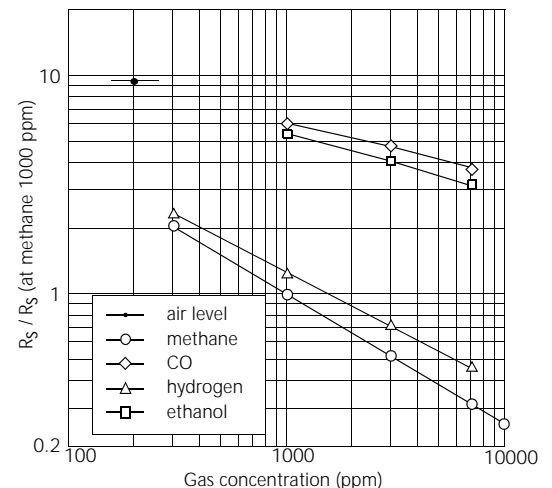


Fig 3. Sensitivity characteristics

Specifications

A. Standard Operating conditions

Symbol	Parameter	Specification	Conditions etc.
V_H	Heater voltage	$0.9\text{ V} \pm 0.05\text{ V}$	AC, DC or pulse
V_C	Circuit voltage	Less than 5 V	DC: Pin2 (+) - Pin 1 (-)
R_L	Load resistance	Variable ($> 200\ \Omega$)	$P_S < 10\text{ mW}$
R_H	Heater resistance	$2.8\ \Omega \pm 0.2\ \Omega$	at room temperature
I_H	Heater current	132 mA	$I_H = V_H / R_H$ (typical value)
P_H	Heater power consumption	120 mW	$P_H = V_H^2 / R_H$ (typical value)

B. Environmental conditions

Symbol	Parameter	Specification	Conditions etc.
T_{ao}	Operating temperature	$-10\text{ }^\circ\text{C}$ to $50\text{ }^\circ\text{C}$	Recommended range
T_{as}	Storage temp	$-30\text{ }^\circ\text{C}$ to $100\text{ }^\circ\text{C}$	
RH	Relative humidity	Less than 95% RH	
(O_2)	Oxygen concentration	$21\% \pm 1\%$ (Standard condition) The sensitivity characteristics are influenced by the variation in oxygen concentration.	Absolute minimum level: more than 18%

C. Sensitivity characteristics

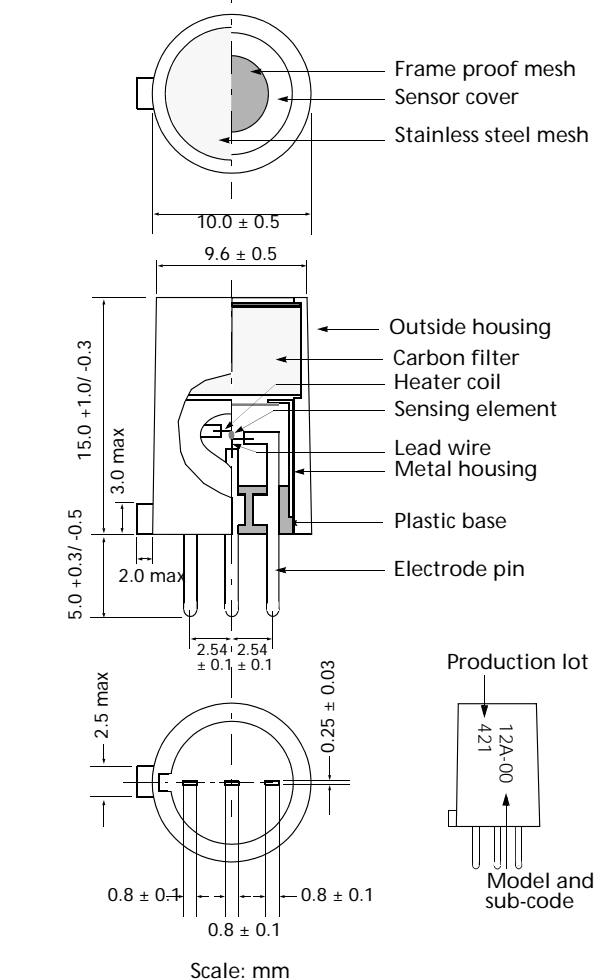
Model	SB-12A-00		
Symbol	Parameter	Specification	Conditions etc.
R_S	Sensor resistance	$0.2\text{k}\Omega$ to $1.0\text{k}\Omega$	at CH_4 3000 ppm
β	Slope	0.45 to 0.65	$\frac{R_s \text{ (at } CH_4 \text{ 3000 ppm)}}{R_s \text{ (at } CH_4 \text{ 1000 ppm)}}$
Ethanol selectivity		≥ 5.0	$\frac{R_s \text{ (at } C_2H_5OH \text{ 1000 ppm)}}{R_s \text{ (at } CH_4 \text{ 3000 ppm)}}$
Sensitivity of CH_4		≥ 9.0	$\frac{R_s \text{ (in air)}}{R_s \text{ (at } CH_4 \text{ 3000 ppm)}}$
Standard Test Conditions:	Temp: $20\text{ }^\circ\text{C} \pm 2\text{ }^\circ\text{C}$ V_C : $5.0\text{ V} \pm 5\%$ Humidity: $65\% \pm 5\%$ V_H : $0.9\text{ V} \pm 5\%$ (in clean air) R_L : $750\ \Omega \pm 1\%$ Pre-heating time: more than 4 days		
Low temperature dependency	1.2 ± 0.2	$R_s (CH_4 \text{ 3000 ppm at } -10^\circ\text{C})$ $R_s (CH_4 \text{ 3000 ppm at } 20^\circ\text{C}65\%)$	
High temperature dependency	0.85 ± 0.15	$R_s (CH_4 \text{ 3000 ppm at } 50^\circ\text{C}60\%)$ $R_s (CH_4 \text{ 3000 ppm at } 20^\circ\text{C}65\%)$	

D. Mechanical characteristics

Items	Conditions	Specifications
Vibration	Frequency:	5 - 500 Hz
	Acceleration:	1.3 G
	Sweep Time:	40 min.
Drop	Height:	60 cm
	Number of impacts:	3 times

Should satisfy the specifications shown in the sensitivity characteristics after test.

Dimensions



Weight : 1.2g

E. Parts and Materials

No.	Parts	Materials
1.	Sensing element	Tin dioxide
2.	Heater coil/ Lead wire	Platinum
3.	Stainless steel mesh	SUS 316 (100 mesh, single)
4.	Carbon filter	Activated carbon
5.	Outside housing	Nylon 6 (UL94 V-0)
6.	Flameproof mesh	SUS 316 (100 mesh, double)
7.	Metal housing	Nickel plated brass
8.	Plastic base	PBT (poly butylene telephalate)

Please contact

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