

FIS GAS SENSOR SB-AD3 for gasoline exhaust detection

The SB-AD3 is a tin dioxide semiconductor gas sensor which has a high sensitivity to hydrocarbons and CO with quick response speed. This model is suitable for gasoline exhaust detection in air quality modules of automobiles.

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. The mesh is an anti-explosion feature (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.

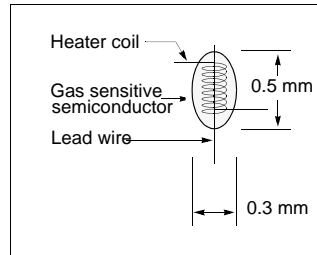


Fig 1a. Sensing element

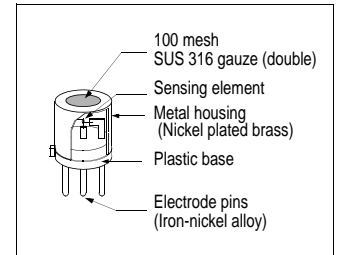


Fig 1b. Configuration

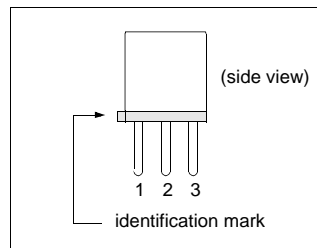


Fig 1c. Pin Layout

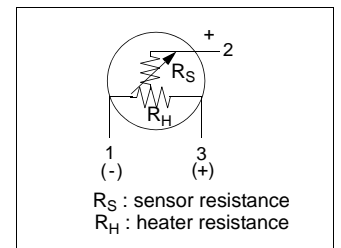


Fig 1d. Equivalent circuit

Sensitivity characteristics

Fig 3 shows the sensitivity characteristics curves of the SB-AD3 (typical data). Sensitivity characteristics of the FIS gas sensors are expressed by the relationship between the sensor resistance and gas concentration. The sensor resistance increases with an increase of gas concentration based on a logarithmic function.

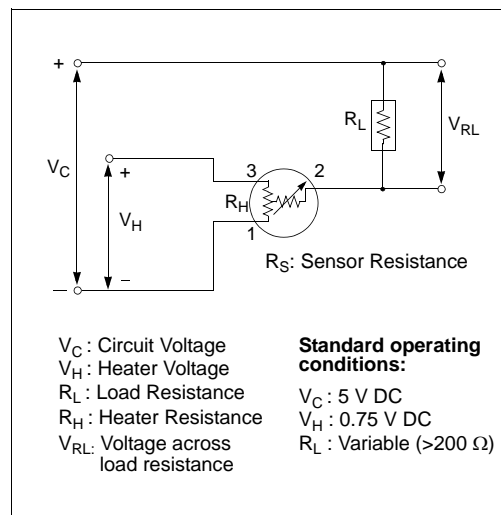


Fig 2. Standard circuit

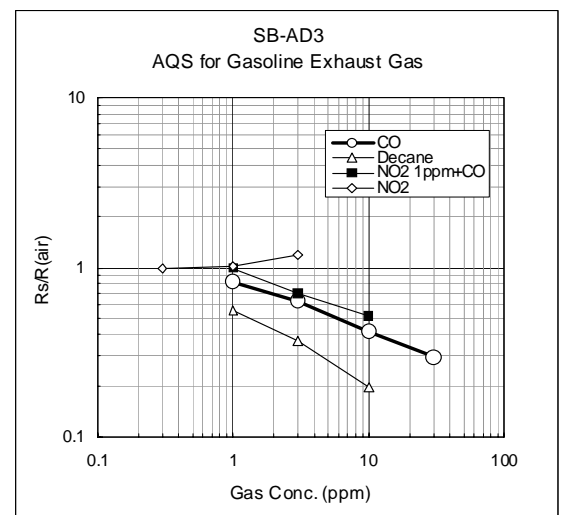


Fig 3. Sensitivity characteristics

Specifications

A. Standard Operating conditions

Symbol	Parameter	Specification	Conditions etc.
V_H	Heater voltage	$0.75\text{ V} \pm 0.0375\text{ V}$	Heat Cleaning 0.9v(120mW) 10sec.
V_C	Circuit voltage	Less than 5 V	DC: Pin3 (+) - Pin 1 (-)
R_L	Load resistance	Variable (> 200 Ω)	$P_S < 10\text{ mW}$
R_H	Heater resistance	$2.8\ \Omega \pm 0.2\ \Omega$	at room temperature
I_H	Heater current	20 mA (4.9v)	$I_H = V_H / R_H$ (typical value)
P_H	Heater power consumption	92 mW	$P_H = V_H^2 / R_H$ (typical value)
P_S	Power dissipation of sensing element	Less than 10 mW	$P_S = \frac{(V_C - V_{RL})^2}{R_S}$

B. Environmental conditions

Symbol	Parameter	Specification	Conditions etc.
T_{ao}	Operating temperature	-40 °C to 85 °C	Recommended range
T_{as}	Storage temp	-20 °C to 70 °C	
RH	Relative humidity	10 to 95% RH	
(O_2)	Oxygen concentration	21% \pm 1% (Standard condition)	Absolute minimum level: more than 18%
		The sensitivity characteristics are influenced by the variation in oxygen concentration. Please consult FIS for details.	

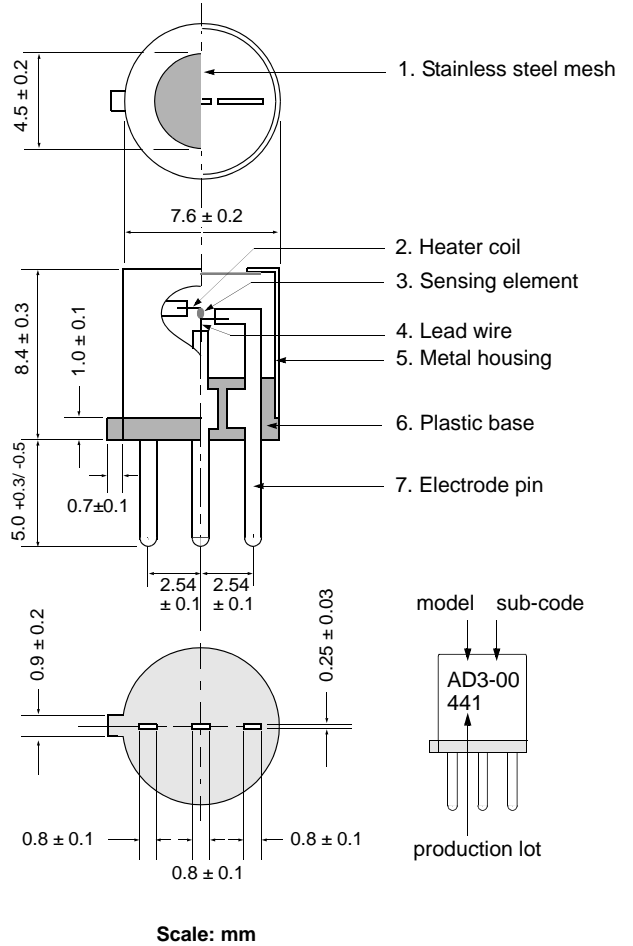
C. Sensitivity characteristics

Model	SB-AD3-00		
Symbol	Parameter	Specification	Conditions etc.
$R_{s(air)}$	Sensor resistance in air	5 k Ω to 70k Ω	in clean air
	Sensitivity to CO	less than 0.8	$\frac{R_{s(10ppm\ CO)}}{R_{s(air)}}$
	CO response	less than 0.85	$\frac{R_{s(at\ 30sec\ after\ 10ppm\ CO\ injection)}}{R_{s(air)}}$
	NO ₂ selectivity	less than 0.85	$\frac{R_{s(10ppm\ CO + 1ppm\ NO_2)}}{R_{s(air)}}$
Standard Test Conditions:		Temp: 20 °C \pm 2 °C Humidity: 65% \pm 5% (in clean air)	V_C : 5.0 V \pm 1% V_H : 0.75 V \pm 1% R_L : 750 Ω \pm 5%
Pre-heating time: more than 48 hours			

D. Mechanical characteristics

Items	Conditions	Specifications
Vibration	Frequency: 5 - 500 Hz	Should satisfy the specifications shown in the sensitivity characteristics after test.
	Acceleration: 1.3G	
	Sweep Time: 40min.	
Drop	Height: 60cm	
	Number of impacts: 3 times	

Dimensions



E. Parts and Materials

No.	Parts	Materials
1	Stainless steel mesh	SUS 316 (100 mesh, double)
2	Heater coil	Platinum
3	Sensing element	Tin dioxide (SnO ₂)
4	Lead wire	Platinum
5	Metal housing	Nickel plated brass
6	Plastic base	PBT (Poly butylene terephthalate)
7	Electrode pins	Iron-nickel alloy

Please contact

June, 2004

FIS Inc.
3-36-3 Kitazono,
Itami, Hyogo.
664-0891 Japan
Tel: +81-72-780-1800
Fax: +81-72-785-0073
<http://www.fisinc.co.jp>