

THICK FILM GAS SENSOR AF-SERIES

Scimarec's thick film gas sensors are a new type of semiconductor gas sensor. They offer outstanding performance, quality and long-term reliability because of their unique film printing process on a flat substrate.

The gas sensing semiconductor element is fired to one side of a ceramic substrate. It is covered with a porous ceramic film for protection against dust, foreign matter or undesired gases. A micro-heater is fused to the back of the substrate. This quickly heats the gas sensing element to the desired operating temperature. The strong structure with sensor and heater both fused to the substrate offers maximum protection against vibration and shock.

DESIGN FEATURES

- High sensitivity and fast response
- Less temperature dependency
- Long life
- Superior shock and vibration resistance
- Simple drive circuitry
- Stability

GAS DETECTION MECHANISM

The gas sensing element is an oxide semiconductor heated to 350°C. When exposed to the appropriate gas, absorbed oxygen on the surface is consumed and the electrical resistance drops.

The drop in resistance follows a predictable and repeatable plot. The proper circuitry responds to this with an alarm actuation or an optical readout.

Operating Conditions

Table 1: Operating Conditions of the AF-Series

Parameter	Ratings
Operating Temperature	-10°C~55°C
Storage Temperature	-30°C~85°C
Load Resistor R_L	Variable
Rated Sensor power consumption P_s	$P_s \leq 15\text{mW}$
Rated Working Voltage of Circuit V_c	DC or AC 5V (Max 12V)
Rated Working Voltage of Heater	DC or AC 5V \pm 0.2V

$$P_s = \frac{V_c^2 \cdot R_s}{(R_s + R_L)^2} \quad R_s: \text{Sensor Resistance}$$

Basic Test Circuit

The pin allocation of the AF-Series gas sensors are shown in Fig. 1 and the basic test circuit for use with the AF-Series gas sensors are shown in Fig. 2, where pins No.1 and No.3 are connected to the heater section, and pins No.2 and No.4 to the sensor section. AF-series gas sensors are designed to operated with a stabilized 5V.

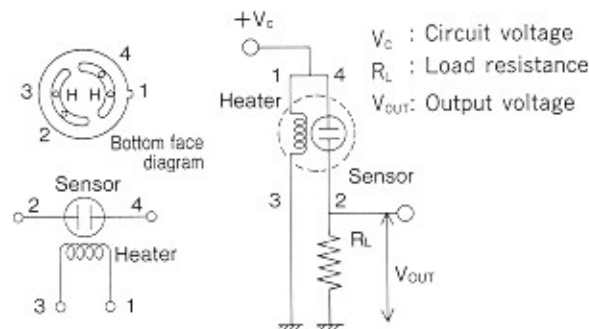


Fig.1: Pin Allocation

Fig.2: Basic Test Circuit

In this test circuit, as the sensor detects the gases, the sensor resistance is decreased. The sensor resistance (R_s) is calculated from output voltage (V_{OUT}) by the following formula.

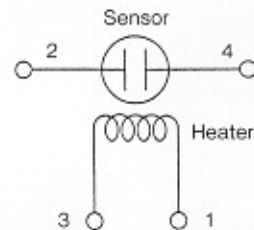
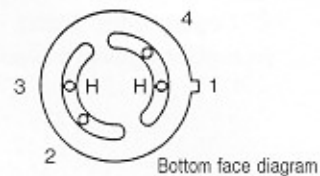
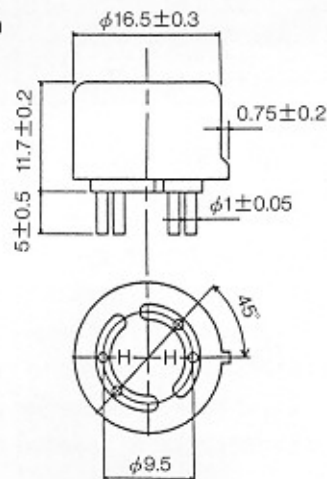
$$R_s = \frac{V_c - V_{OUT}}{V_{OUT}} \cdot R_L$$

The sensitivity denotes the ratio (R_{GAS}/R_{AIR}) of the sensor resistance obtained in the gas-containing air (R_{GAS}) to the sensor resistance obtained in the clean air without noise gases (R_{AIR}).

Specifications

Type Name	AF10	AF20	AF30	AF33	AF35	AF50	AF56	AF63	AF63P
Detection Gases	Hydrogen	Carbon-monoxide	Cigarette Smoke			Methane	LP-Gas (propane, butane)	Alcohol Toluene Gasoline vapor	Ethanol Water
Detection Range	10ppm~1000ppm	50ppm~2000ppm				500ppm~10000ppm	500ppm~10000ppm	100ppm~5000ppm	
Power Consumption mW (Max)	530	780	535	680	530	690	690	680	
Sensing Element	Semiconducting Oxide								
Pin Material	Ni alloy								
Case Material	Nylon 66								PPS
Flame Arrestor	Double 100-mesh stainless steel gauze (SUS316)								

Dimensions and Pin configuration



*** Test Conditions ***

The technical data of this catalogue has been obtained by measurements carried out on the following conditions unless otherwise specified.

Atmospheric Conditions : Clean air
with $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$ and R.H. $50 \pm 5\%$
without noise gases

Circuit Voltage : $5\text{V} \pm 0.05\text{V}$
Heater Voltage : $5\text{V} \pm 0.05\text{V}$
Load Resistance : $5\text{k}\Omega \sim 10\text{k}\Omega \pm 1\%$
Preheating Time : more than 48 hours.

(NOTES)

- If the gas sensor is used after it is left for a long time under high humidity, it will takes some time until its characteristics are stabilized. In general, the longer it is left under high humidity, the longer it will take to stabilize.
- The temperature of the gas sensor case, heated by the built-in heater, will be 30°C to 40°C higher than the ambient temperature during operation.

The following must be observed

- Measure the gas sensor characteristics after operating more than 24 hours to fully stabilize the sensor.
- The gas sensor characteristics must be measured in clean air without noise gases.

AF50



□ Features

- High sensitivity
- Good selectivity

□ Applications

Gas leak detector

AF56



□ Features

- High sensitivity
- Good selectivity
- Small dependence on humidity

□ Applications

Gas leak detector

AF63, AF63P



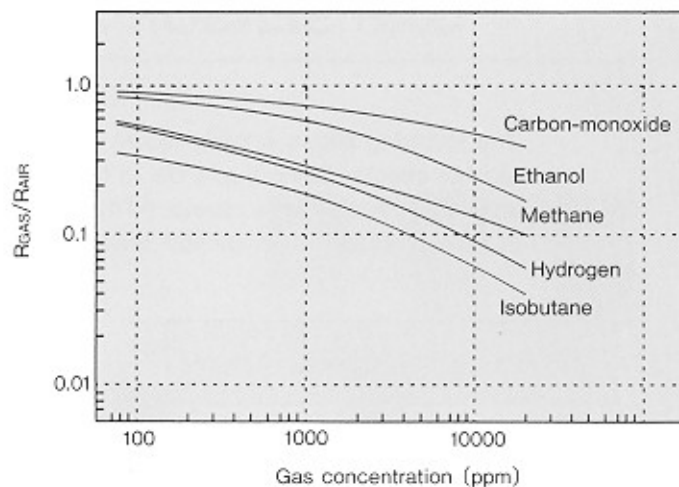
□ Features

- Low sensitivity to H₂ and cigarette smoke
- Small dependence on humidity
- Initial stabilization time is short

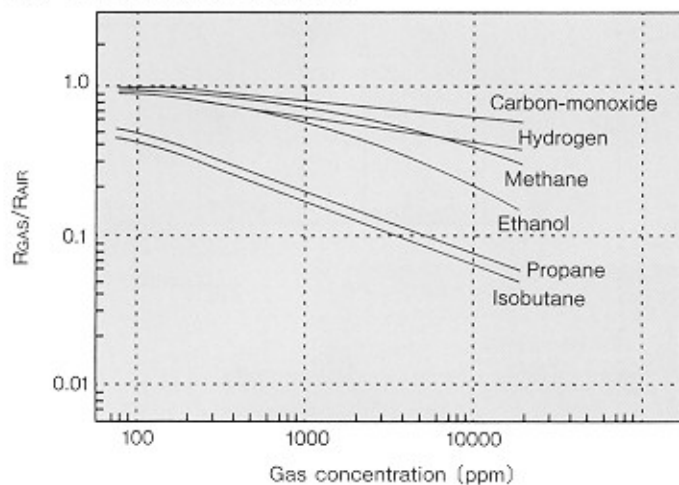
□ Applications

Gas leak detector
Alcohol checker
Microwave oven

R_{GAS} : Resistor value in gas
R_{AIR} : Resistor value in atmosphere



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