日本費加羅公司發明的TGS822半導體式氣敏元件（SnO2燒結体)。此種氣敏元件由於其靈敏度高，響應快，穩定性好，重複性好，壽命長等優點，已被廣泛採用。起原理基於半導體氣敏材料顆粒表面在大約400°C的溫度下，吸附還原性氣體時，發生還原性氣體吸附與氧化反應，離子界面存在的勢壘降低，導致電導率升高，其阻值與氣体濃度呈對數變化關係。

一、 結構

圖一顯示 TGS 822 內部結構在塑膠外殼內有兩個薄紗不銹鋼的防火裝置一個在上面，一個在下面，瓦斯感應器則掛在有兩條導線的四個接腳上，感應器是一個二氧化錫的陶器製品，上面印有兩個金色電極在鋁陶製的真空管上，這個元件在管子內部被熱線圈繞過後連接到第二和第五號接腳，另一電極接到第一和第三接腳由導線接到另一端的第四和第六接腳上。

二、 基本測量電路

圖二顯示 TGS 822 基本測量電路，當改變 RL 上的電壓時可測得感應器阻抗的改變值，交流電或直流電可接到 Vc 和 V_H 上量出 V_{RL} 輸出電壓值後即可借由下列公式 $R_S = \frac{V_C \times R_L - R_L}{V_{RC}}$ 算出 Rs 值。

Vc = 電路電壓

V_H = 熱絲電壓

R_L = 負載阻抗

V_{RLL} = 輸出訊號

Rs = 感應阻抗

三、 規格

TGS 822 的規格表格電極靈敏度特性

項　　目	情　　形	額 定 值
感 測 電 阻	Rs in 300 ppm et hanol/air	1 KΩ ~ 10 KΩ
阻抗改變率	$\frac{\text{Rs in 300 ppm et hanol/air}}{\text{Rs in 50 ppm ethanol/air}}$	0.4 ±0.1
燈 絲 電 阻	在室溫時	38Ω ±3 Ω
燈絲電力耗損	V_H = 5 V	660 mW ±55mW

FIGARO

PRODUCT INFORMATION

TGS 822 - for the detection of Organic Solvent Vapors

Features:

* High sensitivity to organic solvent vapors such as ethanol
* High stability and reliability over a long period
* Long life and low cost
* Uses simple electrical circuit

Applications:

* Breath alcohol detectors
* Gas leak detectors/alarms
* Solvent detectors for factories, dry cleaners, and semiconductor industries

The sensing element of Figaro gas sensors is a tin dioxide (SnO_2) semiconductor which has low conductivity in clean air. In the presence of a detectable gas, the sensor's conductivity increases depending on the gas concentration in the air. A simple electrical circuit can convert the change in conductivity to an output signal which corresponds to the gas concentration.

The **TGS 822** has high sensitivity to the vapors of organic solvents as well as other volatile vapors. It also has sensitivity to a variety of combustible gases such as carbon monoxide, making it a good general purpose sensor. Also available with a ceramic base which is highly resistant to severe environments as high as 200°C (model# TGS 823).

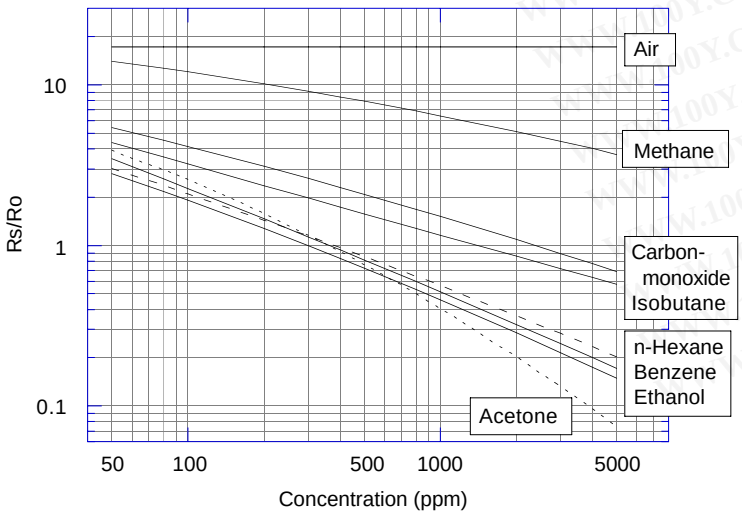
The figure below represents typical sensitivity char-acteristics, all data having been gathered at standard test conditions (see reverse side of this sheet). The Y-axis is indicated as *sensor resistance ratio* (Rs/Ro) which is defined as follows:

Rs = Sensor resistance of displayed gases at various concentrations
Ro = Sensor resistance in 300ppm ethanol

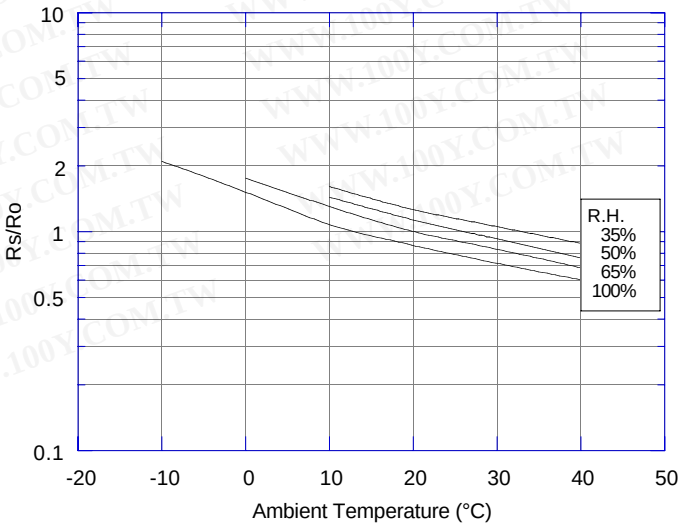
The figure below represents typical temperature and humidity dependency characteristics. Again, the Y-axis is indicated as *sensor resistance ratio* (Rs/Ro), defined as follows:

Rs = Sensor resistance at 300ppm of ethanol at various temperatures/humidities
Ro = Sensor resistance at 300ppm of ethanol at 20°C and 65% R.H.

Sensitivity Characteristics:

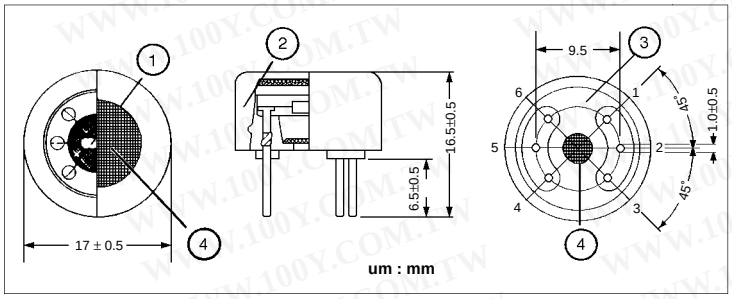


Temperature/Humidity Dependency:



IMPORTANT NOTE: OPERATING CONDITIONS IN WHICH FIGARO SENSORS ARE USED WILL VARY WITH EACH CUSTOMER'S SPECIFIC APPLICATIONS. FIGARO STRONGLY RECOMMENDS CONSULTING OUR TECHNICAL STAFF BEFORE DEPLOYING FIGARO SENSORS IN YOUR APPLICATION AND, IN PARTICULAR, WHEN CUSTOMER'S TARGET GASES ARE NOT LISTED HEREIN. FIGARO CANNOT ASSUME ANY RESPONSIBILITY FOR ANY USE OF ITS SENSORS IN A PRODUCT OR APPLICATION FOR WHICH SENSOR HAS NOT BEEN SPECIFICALLY TESTED BY FIGARO.

Structure and Dimensions:

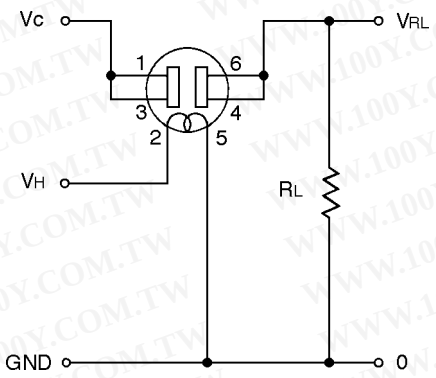


1. Sensing Element:
   SnO_2 is sintered to form a thick film on the surface of an alumina ceramic tube which contains an internal heater.
2. Cap:
   Nylon 66
3. Sensor Base:
   Nylon 66
4. Flame Arrestor:
   100 mesh SUS 316 double gauze

Pin Connection and Basic Measuring Circuit:

The numbers shown around the sensor symbol in the circuit diagram at the right correspond with the pin numbers shown in the sensor's structure drawing (*above*). When the sensor is connected as shown in the basic circuit, output across the Load Resistor (V_{RL}) increases as the sensor's resistance (Rs) decreases, depending on gas concentration.

Basic Measuring Circuit:



Standard Circuit Conditions:

Item	Symbol	Rated Values	Remarks
Heater Voltage	V_H	5.0±0.2V	AC or DC
Circuit Voltage	V_C	Max. 24V	DC only Ps≤15mW
Load Resistance	R_L	Variable	0.45kΩ min.

Electrical Characteristics:

Item	Symbol	Condition	Specification
Sensor Resistance	Rs	Ethanol at 300ppm/air	1kΩ ~ 10kΩ
Change Ratio of Sensor Resistance	Rs/Ro	$\frac{Rs(\text{Ethanol at 300ppm/air})}{Rs(\text{Ethanol at 50ppm/air})}$	0.40 ± 0.10
Heater Resistance	R_H	Room temperature	38.0 ± 3.0Ω
Heater Power Consumption	P_H	V_H=5.0V	660mW (typical)

Standard Test Conditions:

TGS 822 complies with the above electrical characteristics when the sensor is tested in standard conditions as specified below:

Test Gas Conditions: 20°±2°C, 65±5%R.H.
Circuit Conditions: V_C = 10.0±0.1V (AC or DC),
V_H = 5.0±0.05V (AC or DC),
R_L = 10.0kΩ±1%
Preheating period before testing: More than 7 days

Sensor Resistance (Rs) is calculated by the following formula:

$$Rs = \left(\frac{V_C}{V_{RL}} - 1\right) \times R_L$$

Power dissipation across sensor electrodes (Ps) is calculated by the following formula:

$$Ps = \frac{V_C^2 \times Rs}{(Rs + R_L)^2}$$

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For information on warranty, please refer to Standard Terms and Conditions of Sale of Figaro USA Inc.

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