# TGS 813 - for the detection of Combustible Gases

Applications:

alarms

\* Portable gas detectors

\* Domestic gas leak detectors and

# Features:

- \* General purpose sensor with sensitivity to a wide range of combustible aases
- \* High sensitivity to methane, propane, and butane
- \* Long life and low cost
- \* Uses simple electrical circuit

#### The sensing element of Figaro gas sensors is a tin dioxide (SnO<sub>2</sub>) 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 813 has high sensitivity to methane, propane, and butane, making it ideal for natural gas and LPG monitoring. The sensor can detect a wide range of gases, making it an excellent, low cost sensor for a wide variety of applications. Also available with a ceramic base which is highly resistant to severe environments up to 200°C (model# TGS 816).

The figure below represents typical sensitivity characteristics, 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 1000ppm methane



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 1000ppm of methane at various temperatures/humidities Ro = Sensor resistance at 1000ppm of methane at 20°C and 65% R.H.

Temperature/Humidity Dependency:



10 Air CO Bs/Bo Methane Ethanol Propane Isobutane Hydrogen 0.1 3000 5000 500 1000 10000 Concentration (ppm)

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

### **Sensitivity Characteristics:**

#### **Structure and Dimensions:**



#### 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 (VRL) increases as the sensor's resistance (Rs) decreases, depending on gas concentration.

# (1) Sensing Element:

SnO<sub>2</sub> 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

#### **Basic Measuring Circuit:**



## Standard Circuit Conditions:

Item	Symbol	Rated Values	Remarks
Heater Voltage	Vн	5.0±0.2V	AC or DC
Circuit Voltage	Vc	Max. 24V	DC only Ps≤15mW
Load Resistance	R∟	Variable	$0.45 k\Omega$ min.

#### **Electrical Characteristics:**

Item	Symbol	Condition	Specification
Sensor Resistance	Rs	Methane at 1000ppm/air	$5 \mathrm{k} \Omega \sim 15 \mathrm{k} \Omega$
Change Ratio of Sensor Resistance	Rs/Ro	Rs (Methane at 3000ppm/air) Rs (Methane at 1000ppm/air)	0.60 ± 0.05
Heater Resistance	Rн	Room temperature	30.0 ± 3.0Ω
Heater Power Consumption	Рн	VH=5.0V	835mW (typical)

#### **Standard Test Conditions:**

TGS 813 complies with the above electrical characteristics when the sensor is tested in standard conditions as specified below:

 $\begin{array}{ll} \mbox{Test Gas Conditions:} & 20^\circ \pm 2^\circ C, \mbox{65} \pm 5\% R.H. \\ \mbox{Circuit Conditions:} & V_C = 10.0 \pm 0.1 V \mbox{ (AC or DC)}, \\ & V_H = 5.0 \pm 0.05 V \mbox{ (AC or DC)}, \\ & R_L = 4.0 k \Omega \pm 1\% \end{array}$ 

Preheating period before testing: More than 7 days

FIGARO USA, INC. 121 S. Wilke Rd. Suite 300 Arlington Heights, IL 60005 Phone: (847)-832-1701 Fax: (847)-832-1705 email: figarousa@figarosensor.com Sensor Resistance (Rs) is calculated by the following formula:

$$Rs = \left(\frac{Vc}{V_{RL}} - 1\right) x Ri$$

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

$$\mathsf{Ps} = \frac{\mathsf{Vc}^2 \times \mathsf{Rs}}{(\mathsf{Rs} + \mathsf{RL})^2}$$

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