# TGS 830 – for the detection of Chlorofluorocarbons (CFC's)

## Features:

* * High sensitivity to R-113, R-22, R-11, and R-12
* * Low sensitivity to hydrogen and alcohol vapors
* * Uses simple electrical circuit
* * Ceramic base resistant to severe environment

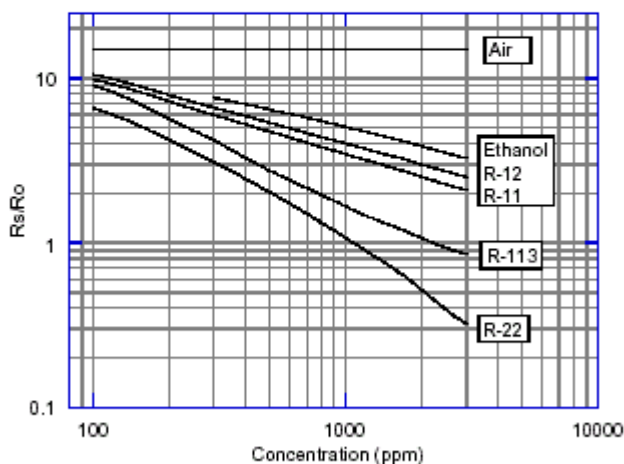## Applications:

* * Refrigerant leak detectors

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 830** has high sensitivity to R-22 as well as to R-11, R-12, and R-113. Due to its low sensitivity to hydrogen and alcohol vapors, the sensor can achieve good selectivity. Combined with its long life, this makes TGS 830 an excellent, low-cost sensor for CFC detection.

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:
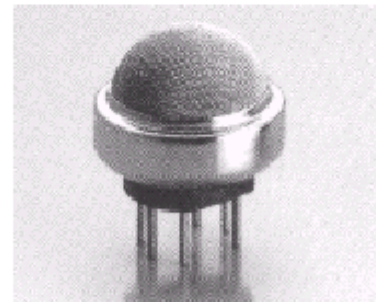
Rs = Sensor resistance of displayed gases at various concentrations

Ro = Sensor resistance at 1000ppm of R-22

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 R-22 at various temperatures/humidities

Ro = Sensor resistance at 1000ppm of R-22 at 20°C and 65% R.H.

### Sensitivity Characteristics:

### Temperature/Humidity Dependency:
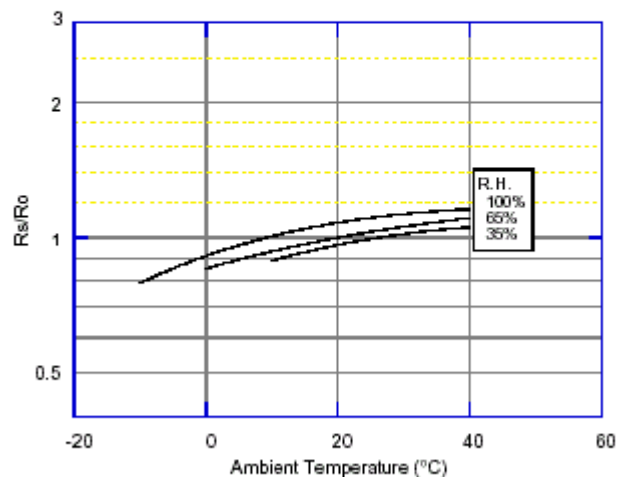
## Structure and Dimensions:



um : mm
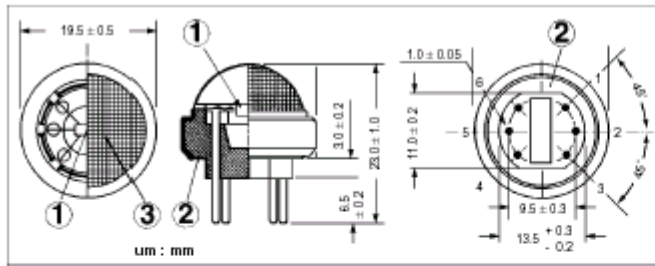
① Sensing Element:
   SnO₂ is sintered to form a thick film on the surface of an alumina ceramic tube which contains an internal heater.
② Sensor Base:
   Alumina ceramic
③ Flame Arrestor:
   100 mesh SUS 316 double gauze

## 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 ($R_s$) decreases, depending on gas concentration.

**Basic Measuring Circuit:**
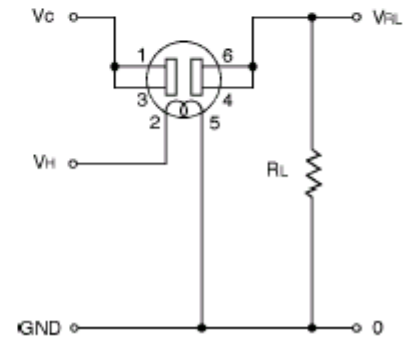


## Standard Circuit Conditions:

| Item | Symbol | Rated Values | Remarks |
|------|--------|--------------|---------|
| Heater Voltage | $V_H$ | 5.0±0.2V | AC or DC |
| Circuit Voltage | $V_C$ | Max. 24V | AC or DC *PS≤15mW |
| Load Resistance | $R_L$ | Variable | *PS≤15mW |

## Electrical Characteristics:

| Item | Symbol | Condition | Specification |
|------|--------|-----------|---------------|
| Sensor Resistance | $R_s$ | R-22 at 1000ppm/air | 1kΩ ~ 5kΩ |
| Change Ratio of Sensor Resistance | $R_s/R_o$ | $\dfrac{R_s \text{ (R-22 at 3000ppm/air)}}{R_s \text{ (R-22 at 1000ppm/air)}}$ | 0.30 ± 0.10 |
| Heater Resistance | $R_H$ | Room temperature | 30.0 ± 3.0Ω |
| Heater Power Consumption | $P_H$ | $V_H$=5.0V | 835 ± 90mW |

## Standard Test Conditions:

TGS 830 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 ($R_s$) is calculated by the following formula:

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

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

$$P_s = \frac{V_C^2 \times R_s}{(R_s + R_L)^2}$$