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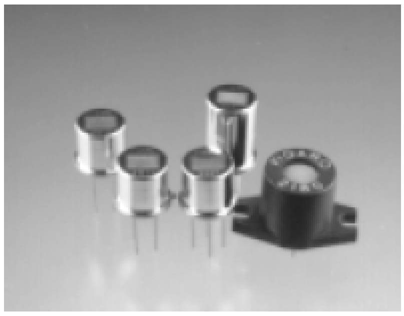
ISO9001 企业

使用 TGS 传感器进行有毒及爆炸性气体泄漏检测的技术资料。

费加罗 TGS 传感器是厚膜金属氧化物半导体型的。它成本低、寿命长，利用简单电路即可对待检测气体具有良好的敏感特性。尤其适合应用在有毒和爆炸性气体的泄漏检测器上。



1. 工作原理

TGS 气体传感器的敏感材料是金属氧化物,最具代表性的是 SnO_2。金属氧化物晶体如 SnO_2 在空气中被加热到一定高的温度时，氧被吸附在的带一个负电荷的晶体表面。然后，晶体表面的供与电子被转移到吸附的氧上，结果在一个空间电荷层留下正电荷。这样，表面势能形成一个势垒，从而阻碍电子流动（见图 1)。

在传感器的内部,电流流过 SnO_2 微晶的结合部位（晶粒边界)。在晶粒边界，吸附的氧形成一个势垒阻止载流子自由移动，传感器的电阻即缘于这种势垒。还原性气体出现时，带有负电荷的氧的表面浓度降低，导致晶粒边界的势垒降低（图 2 和图 3)。降低了的势垒使传感器的阻值减小了。

传感器阻值和还原性气体浓度之间的关系可由下面的一定范围气体浓度方程表示：

$$Rs=A[C]^{-\alpha}$$

这里：Rs=传感器电阻

A=常数

[C]=气体浓度

α=Rs 曲线的斜率

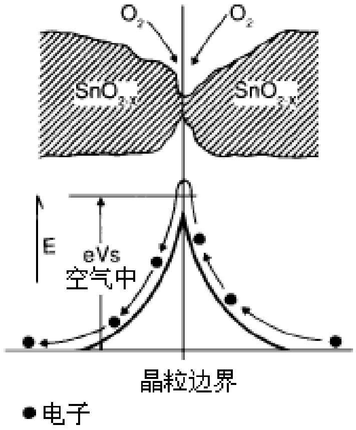


图 1-晶粒间势垒模型
(没有气体时)

$$1/2O_2 + (SnO_{2-x})^* \rightarrow O^-ad(SnO_{2-x})$$
$$CO + O^-ad(SnO_{2-x}) \rightarrow CO_2 + (SnO_{2-x})^*$$

图 2-CO 和 SnO_2 上上吸附氧之间的反应图解

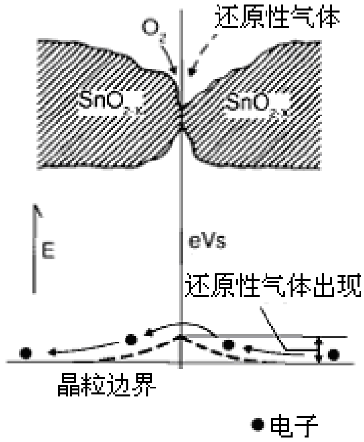


图 3-晶粒间势垒模型
(气体出现时)

2. 传感器特性

2-1 氧气分压的影响

图 4 所示为大气中氧压（PO_2）和典型 TGS 传感器在清洁空气中阻值之间的关系。可以看到减小氧压会降低传感器阻值。

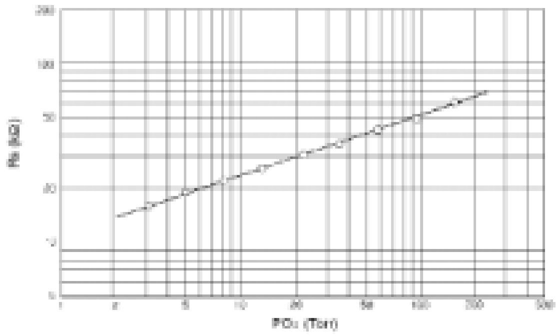


图 4-氧气分压的典型影响

2-2 气敏特性

根据第一部分的公式，气体浓度在其应用范围内（从几 ppm—几千 ppm），传感器电阻同气体浓度呈对数线性关系。图 5 表示出了传感器电阻及气体浓度之间的典型关系。传感器对多种还原气体具有敏感性，对某些气体的相对灵敏度的最佳化，取决于敏感材料的配方及其工作温度。由于实际的传感器电阻值每个都不同，典型的敏感特性由传感器在不同气体浓度下的阻值(Rs)与待检测气体的一定浓度下的阻值(R_0)的比来表达的。

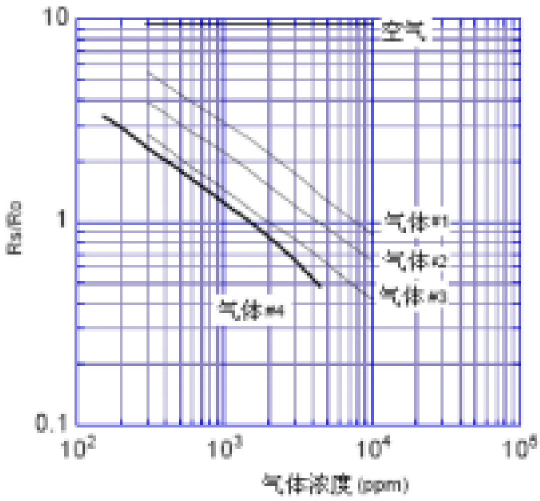


图 5-典型的敏感特性

2-3 传感器响应

传感器先被放入还原性气体中，然后再从还原性气体中移走，这个过程中传感器典型的动作如图 6 所示。传感器放入还原性气体中后，电阻值急剧下降，从还原性气体移出后，传感器的电阻经过很短的时间即恢复到它的初始值。响应速度和可逆性随传感器型号及所含气体的不同而异。

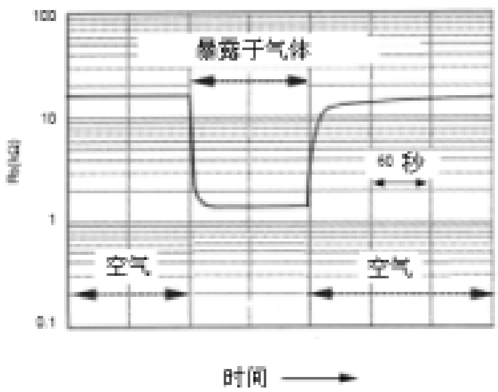


图 6-典型的传感器响应

2-4 初始动作

如图 7 所示，当传感器不通电存放后，再在空气中通电，所有的传感器都有一种短暂的行为，称之为“ 初始动作 ”。无论气体是否出现，传感器通电后，阻值（Rs）在最初的几秒钟急剧下降，然后依照周围气氛的状况达到一个平稳的水平。初始动作时间的长短取决于传感器储存期间的气氛条件、储存时间长短，并因传感器型号而异。因为通电后传感器的初始动作会在通电的最初引起报警（参照 4-6 节），所以在设计电路的时候要考虑这种初始动作。

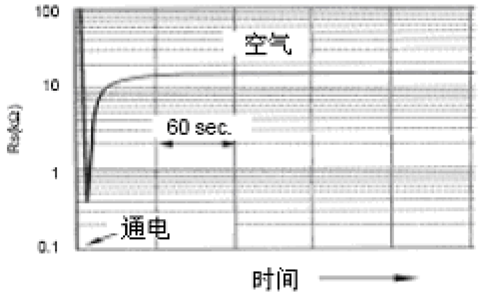


图 7-典型的初始动作

2-5 温湿度影响

TGS 传感器的检测原理是基于气体在传感器表面的化学吸附与脱附。因此环境温度会改变化学反应速度，从而影响传感器的敏感特性。此外，因为水蒸气会吸附在传感器表面，所以湿度将会引起 Rs 的降低。这些影响的典型示例如图 8 所示。使用 TGS 传感器时应考虑温度影响的补偿回路（参照 4-3 节）。

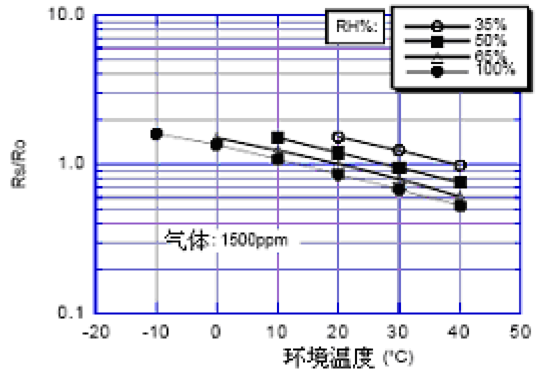


图 8-典型的温湿度影响

2-6 长期稳定性

TGS 系列传感器的长期稳定性典型数据如图 9 所示。通常，TGS 传感器所表现的稳定的经时特性，使之适用于免维护应用的场合。

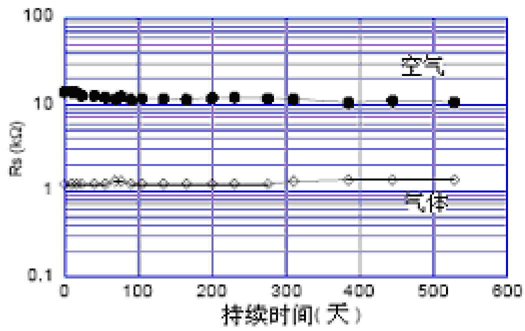


图 9-典型的长期稳定性

2-7 加热器电压的影响

传感器被设计成在某一个恒定加热电压下，传感器表现出最佳的敏感特性。气体敏感度如何随加热电压变化的典型事例如图 10 所示。由于加热电压对传感器的影响，所以一定要根据传感器规格调整恒定加热电压值。

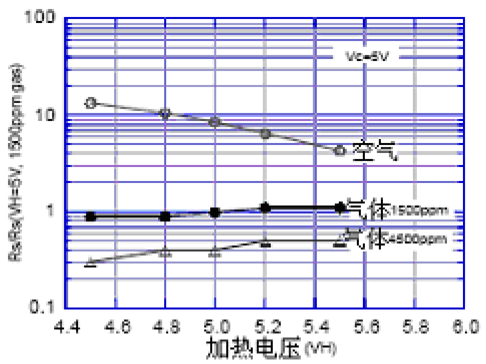


图 10-典型的加热电压影响

3 费加罗气体传感器使用注意事项

3-1 必须避免的情况

1） 暴露于有机硅蒸气中

如果传感器的表面吸附了有机硅蒸气，传感器的敏感材料会被包裹住，抑制传感器的敏感性，并且不可恢复。硅粘接剂、发胶、硅橡胶和腻子可能存在的地方，传感器要避免暴露其中。

2） 高腐蚀性的环境

在高浓度的腐蚀性气体（如 H_2S，SO_X，Cl_2，HCl 等）中暴露后的一段时间内会引起加热材料及传感器引线的腐蚀或破坏。

3） 碱金属的污染

传感器被碱金属尤其是盐水喷雾污染后，性能会发生下降。暴露在无机元素中也会发生这种下降。

4） 接触到水

溅到水或浸到水中会造成敏感特性下降。

5） 结冰

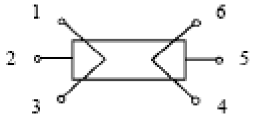
如果水在敏感元件表面结冰，敏感材料会破裂，从而改变传感器特性。

6） 施加电压过高

如果给敏感元件或加热器施加的电压高于规定值，即使传感器没有受到物理损坏或破坏，也会造成引线和/或加热器损坏，或使传感器特性下降。

7） 电压加在引线上（仅限于 8 型系列）

6 脚型的传感器，如果电压加在 1、3/或 2、4 管脚上，会导致引线断线。



3-2 应尽可能避免的情况

1） 凝结水
在室内使用条件下，轻微凝结水不会对传感器性能产生问题。但是，如果水凝结在敏感元件表面并保持一段时间，传感器特性会下降。

2） 使用在高浓度气体中
无论传感器是否通电，在高浓度气体中长时间放置，会影响传感器特性。

3） 长期贮存
不通电长时间贮存，会使传感器电阻产生可逆的漂移，这种漂移随贮存环境变化。传感器应贮存在有清洁空气的密封袋中，不要使用硅胶。注意：当不通电贮存时间很长时，传感器在使用前也需要长时间预通电以使其达到稳定。

4） 长期暴露在不利环境中
无论是否通电，如果传感器长时间暴露在极端条件下，如高湿、高温、或高污染等级条件，传感器性能将受到不利的影响。

5） 振动
过度的振动会导致敏感元件或引线产生共振和断裂。在组装线上使用气动改锥/超声波焊接机会产生这种振动，所以请检查这个因素。

6） 冲击
如果传感器受到强烈冲击会导致其引线断线。

7） 锡焊
手工焊接传感器是最理想的。但在符合下列条件时可使用波峰焊：
- a) 推荐助焊剂：含氯最少的松香助焊剂
- b) 速度：1-2 米/分钟
- c) 预热温度：100±20℃
- d) 焊接温度：250±10℃
- e) 最多允许两次通过波峰焊机

如果生产时超出了以上的规定，那么就不能保证波峰焊的结果，因为一些助焊剂蒸汽会产生与硅蒸汽类似的影响，使传感器特性下降（参照 6-2.3/4 节）。

4. 电路设计

4-1 负载电阻（R_L）

通过负载电阻可获得输出信号，此外，通过调整传感器的功率在传感器的额定电压以下，负载电阻还充当传感器的保护器。为每个传感器选择一个合适的负载电阻可使传感器特性均一，便于在传感器的最佳特性下使用。

典型的传感器特性如图 11 所示。传感器配用不同的负载电阻 R_L（5KΩ，2.5KΩ，1KΩ）在电路（如图 14）中使用时，气体浓度与输出电压（V_{RL}）的关系如图 12 所示。

R_S/R_L 和 V_{RL}/V_C 的关系如图 13 所示。R_S/R_L 为 1.0 时，V_{RL}/V_C 的斜率最大。在这一点上，可获得报警浓度下的最佳信号分辨率。因此，推荐使用使检测浓度下的 R_S/R_L 值为 1.0 的 R_L。建议使用可变电阻器（R_L）以获得最佳结果。

4-2 信号处理

传统的信号输出处理方法是使用比较器（图 14）。当 V_{RL} 超出设定值（Vref）时，比较器信号激励外部装置，比如蜂鸣器或 LED 灯。

使用微处理器进行信号处理正变得越来越流行。微处理器被广泛使用，且价格便宜。除了执行比较器的功能外，还具有其他一些有用的功能，例如温度影响的补偿，自动校准等。

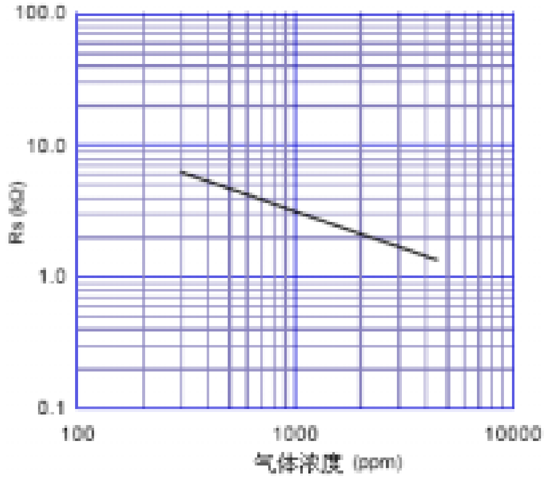


图 11-敏感特性（Rs）

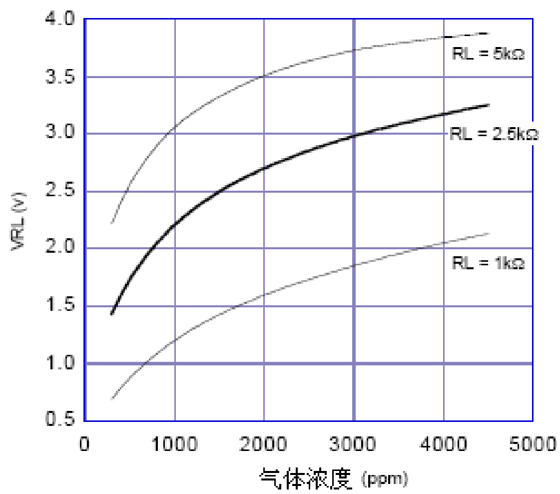


图 12-敏感特性（V_{RL}）

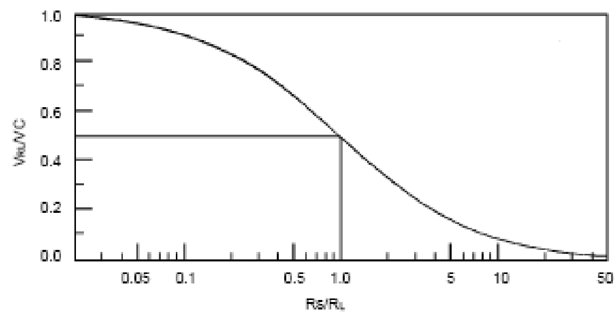


图 13-R_S/R_L 和 V_{RL}/V_C 的关系

4-3 温度补偿电路

几种环境条件下，典型的检测气体曲线如图 15 所示。没有补偿电路时，在 20℃/65%RH、1500ppm 检测气体设定的报警点在 600ppm 至 3400ppm 间变化。

假设 65%RH 恒定，使用热敏电阻可在一定程度上补偿温度影响，从而改变图 14 中的 Vref。例如 40℃/65%RH 下，Vref 可从 2.5V 变化到 3.1V，-10℃/65%RH 下，Vref 可从 2.5V 变化到 1.9V。使用补偿电路的结果见图 16 及表 1。

测量条件		气体浓度(ppm)	
温度 (°C)	湿度 (%RH)	有补偿电路	无补偿电路
-10	65	1400	3400
0	65	1450	3100
10	65	1475	2500
20	65	1500	1500
30	65	1505	1000
40	65	1520	600

表 1 - 补偿电路的效果

热敏电阻及附加电阻的选择方法推荐如下：

1）确定应用的预期环境温湿度范围。要考虑平均值为 20°C、65%RH 的通常条件以及-10°C和 40°C/40%—65%RH 的极限条件。

2）得出在上述环境条件下的待测气体的敏感特性曲线。

3）决定热敏电阻和附加电阻去拟合平均曲线。

图 14 中补偿电路的推荐值如下：

Th : Rs(25°C) = 8kΩ	B = 4200
R1 = 1kΩ	R2 = 10kΩ
R3 = 0.8kΩ	R4 = 5.8kΩ

注意：使用这种方法不能实现常温下的湿度补偿。

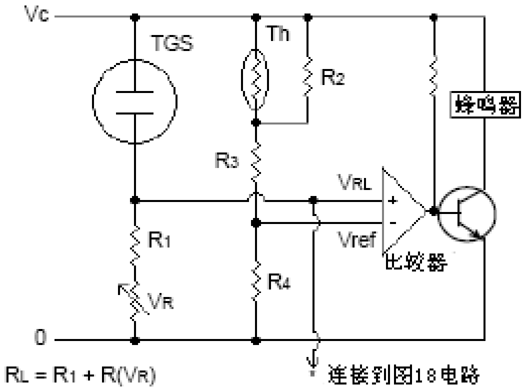


图 14-常用的温度补偿电路

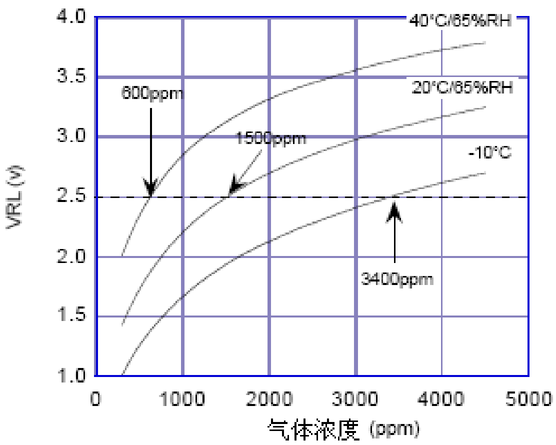


图 15-几种环境条件下的报警点

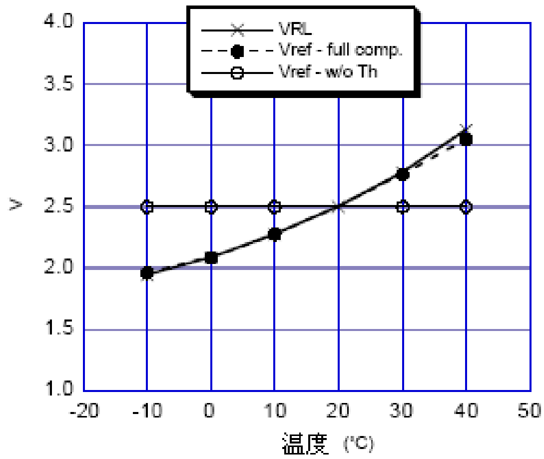


图 16-补偿电路的效果

4-4 TGS2000 系列加热器突入电流

传感器的加热器材料有它自身的温度影响。TGS2000 系列传感器在不同环境温度下突入电流及加热器稳态电流如图 17 所示。此图说明突入电流大约比稳态电流高 50%。因为加热器电阻在低温时电阻值也低，这会导致在室温下电流比预期高。因此使用了传感器的装置第一次通电时，通电的最初一段时间会产生极高的电流。因此在电路设计时要同时考虑突入电流时的保护。

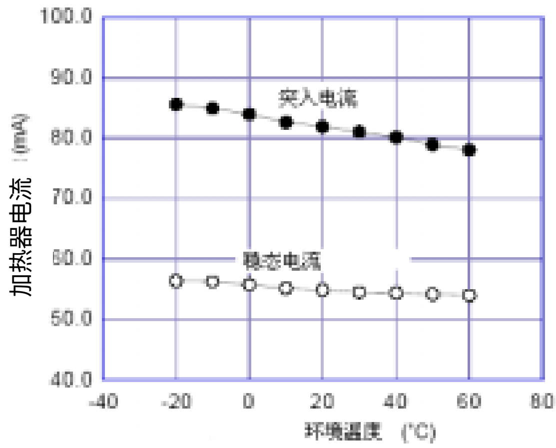


图 17-环境温度对 TGS2000 系列传感器加热体电流的影响

4-5 传感器加热器断路检测回路

传感器加热器的断路可通过与其串联的电阻检测出来。加在此串联电阻器上的电压可用于此目的。

4-6 防止初始动作误报警

正如 2-4 部分所描述的那样，无论是否有对象气体出现，通电后最初的几秒内 Rs 急剧下降，引起 V_{RL} 超过 Vref，然后依照周围气氛趋向稳态（初始动作）。由于通电的最初一段时间的暖机过程的动作很可能引起报警，为了防止初始动作误报警请使用图 18 所示的回路。此回路应与传感器回路图 14 中的 V_{RL} 连接。

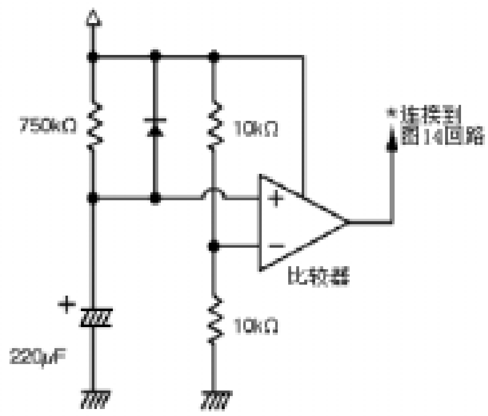


图 18-防止初始动作引发报警

4-7 蜂鸣器延迟回路

为了防止瞬间的气体干扰引发的误报警，如烹调时蒸气中的乙醇气，使用类似于图 18 所示的延迟回路。

5．检测器设计

（见图 19 示例流程图）

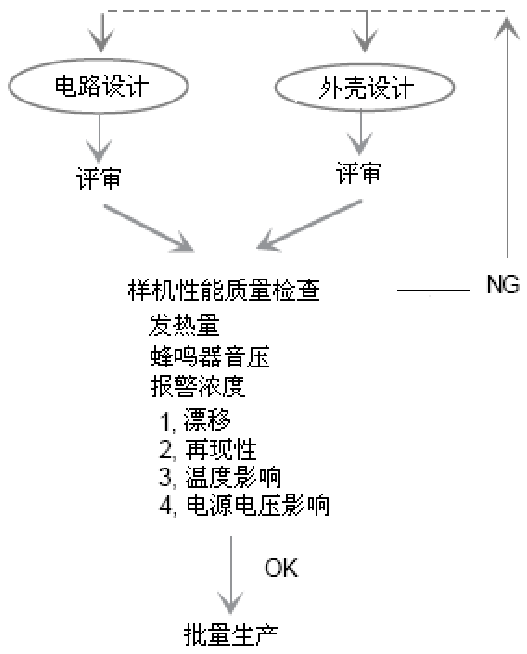


图 19-检测器设计流程图

5-1 电路

1）使用热敏电阻补偿温度影响时，注意到热敏电阻将补偿传感器周围发生的温度变化。因此传感器和热敏电阻要放在不受电路产生热量影响的地方。

2) 要确保符合规定的传感器加热器工作条件如电压，电流，加热周期和检测时间。

3) 在设计电路结构（如线条宽度，跨距和布局）时，要考虑流过传感器的大电流。

4) 负载电阻值应设定为接近报警点时的传感器电阻值。如果使用可调电阻，应考虑它的可调范围。

5) 电路功能应包括引线或加热器的断路或传感器元件的失效的故障/安全保护模式。

5-2 检测器外壳

1）外壳在传感器周围应有一个小隔断（参考图 19-1)。这个隔断间通过对流促进传感器快速响应，并且使检测器中其它元件产生的热量对传感器的影响最小化。检测器外壳至少在两面做切口，并且要保证切口足够的数量和宽度，以便于气体在传感器周围流动（参考图 19-2)。

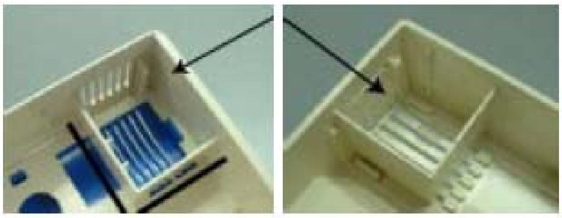


图19-1-检测器外壳中传感器隔断间示例

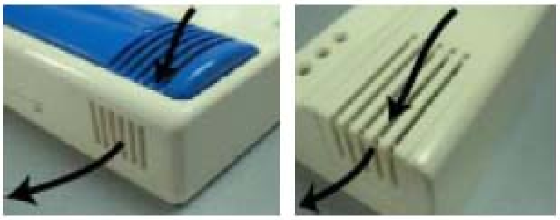


图19-2-检测器外壳切口位置应便于气流通过传感器隔断间示例

2）外壳的设计要便于从外壳最大限度地散热。

5-3 样机评审测验

做评审测验以判定是否可开始批量生产。

6．检测器生产

6-1 生产设备

1）传感器和检测器的预通电设备
不管施加电压的波动，要持续施加额定周期下的额定电压。在预通电过程中,传感器/检测器要垂直固定，如同它们在墙上的安装位置。

2）气体测试箱
避免使用熟化后可能放出气体的绝缘或密封材料，如硅树脂密封剂和溶剂型的粘合剂。提供的空气和检测气体的混合气应在可测量、可控的温湿度下进行。测试箱的容量应足够大—每个传感器 1 升或更多的空间。应给检测器提供静止的混合气，这样会避免气体直接流向传感器，防止传感器错误地高灵敏。在气体处理过程中检测器要垂直固定，如同它们在墙上的安装位置。

3）工厂环境
环境应清洁并不含有机蒸气，如酒精。特别要注意传感器/检测器预通电设备周围的环境—保持这些区域远离有影响的气体，特别是含硅蒸气。如果使用三氯乙烯，氟里昂或地板密封剂等挥发性清洗剂，所有的产品要从该区域移走并妥善安置，直到该区域彻底通风后才可以返回。

6-2 制造工艺

（制造工艺流程图示例如图-20）

1）传感器的贮存和处置
传感器要在包含通常的清洁空气的密封袋中贮存。

2）传感器预通电

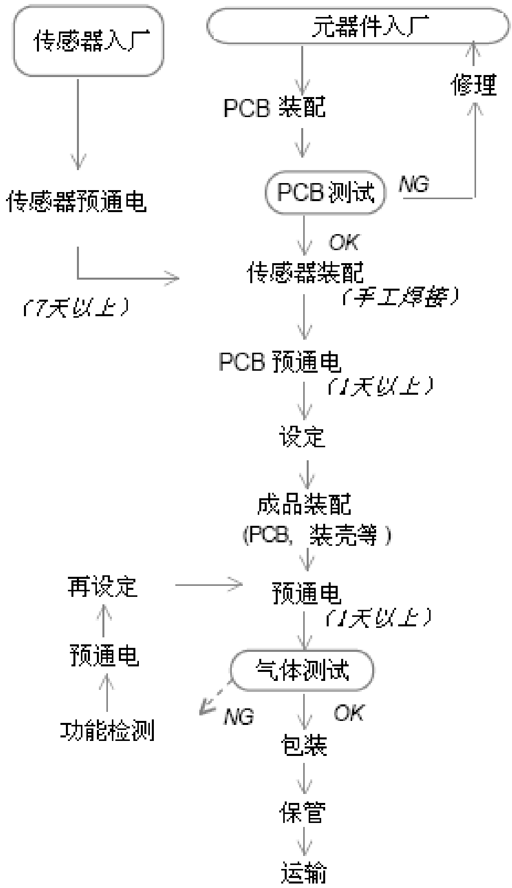


图-20 检测器制造工艺流程图

传感器预通电的时间最短为 2 天，但强烈建议通电 7 天或更长时间以获得最佳效果。确认通电时遵循标准电路条件并保持清洁的气氛条件。

3）PCB 装配
传感器装配到 PCB 上之前，助焊剂应充分烘干。

4）传感器装配
强烈建议手工焊接。推荐使用组成为 Sn63：Pb37 或 Sn60：Pb40、不含氯的树脂助焊剂（MIL：RMA 级；如 Almit KR-19）。

5）PCB 预通电
PCB 预通电的时间最短为 2 小时，但强烈推荐通电 1 天或更长时间以获得最佳效果。确认通电时遵循标准电路条件并保持清洁的气氛条件。

6）设定（参考图 14 电路）
确保使用适当的检测气体浓度来设定所有的产品。保持设定仓内气氛的温湿度条件稳定。从测试仓中清除任何痕量的烟，粘接剂，杂质气体，溶剂。

例 1）使用可变负载电阻器设定检测器时，将检测器放入气体测试箱。测试箱内准备报警浓度的气体。调整检测气中的 V_{RL} 至与 Vref 相当。

例 2）使用虚设负载电阻器（R_L*）设定检测器时，将检测器放入气体测试箱。测试箱内准备报警浓度的气体。测量 R_L*两端的电压以获得报警浓度下的 Rs。用相当于上述测量出的 Rs 阻值的 R_L 来替换检测器中的 R_L*。

注意：确认报警浓度的气体被加湿到周围环境的水平。如果不是这样，设定结果会与正常使用时大不相同。要在用户规定的测试条件下设定，即取决于其适用的性能标准以及检测器的预定使用条件。

7）最终装配
避免使用气动工具可能引起的任何冲击或振动。

8）最终装配的预通电
成品预通电的时间最短为 2 小时，但强烈推荐通电 1 天或更长时间以获得最佳效果。确认通电时遵循标准电路条件并保持清洁的气氛条件。

9）气体测试
用检测气体测试所有的最终成品。保持测试箱气氛条件稳定，利用用户规定的测试条件，即取决于其适用的性能标准以及检测器预期使用条件。从测试箱中清除任何痕量的烟，粘接剂，杂质气体，溶剂。

10）气体测试不合格品的重新设定
电路功能检测如果没有问题，可以重新浓度设定。预通电时间应两倍于检测器测试后的未通电放置时间，以使检测器充分稳定。重新设定不能超过 4 次。

11）最终成品的贮存
检测器应保管在空气清洁的环境中。避免在不洁及有污染的环境中保存。6-13 部分所列出的注意事项同样适用。

7．质量控制

1) 对每个生产批次抽样一定数量的最终成品以确认报警浓度。检查这些样品是否符合运输要求，并且保持这些测试记录。

2) 周期性地对最终成品进行一定数量的抽样以确认极限条件下的报警浓度（如-10℃或 40℃/85%RH），并且保持这些测试记录。

3) 周期性地对完成品进行一定数量的抽样以确认长期稳定性。并且保持这些测试记录。

重要提示
未经设定及测试的检测器成品不保证其精确及可靠。

（许丽杰译、王连驰校 2004 年 7 月）

TGS 传感器通用资料下载				
半导体气体传感器（品牌：日本 Figaro)				
型号	测量气体	量程(ppm)	灵敏度(电阻比)	典型应用
TGS2600-B00	香烟气，氢气,酒精，甲烷，CO	1～30	0.3～0.6	空气清新机，换气空调
TGS2602-B00	甲苯，乙醇，H2S，NH3，H2 等	1～30	0.15～0.5	空气清新监测仪
TGS2100	油烟气,氢气,燃气	1～30	0.2～0.6	抽油烟机，空气清新机
TGS2104	汽油机尾气(H2,CO,HC)	10～1000	0.3～0.6	汽车尾气检测
TGS2201	汽油/柴油机尾气(NO,NO2)	10～100/0.1～10	0.35/2.5	
TGS813	易燃气体(甲、丙、丁烷)	500～10,000	0.60±0.05	家庭燃气泄漏报警器
TGS816	易燃气体(甲、丙、丁烷)	500～10,000	0.60±0.05	工业用易燃，易爆
TGS2610-BOO	易燃气体(丁烷)<圆型,酒精过滤>	500～10,000	0.53±0.05	民用/工业用易燃，易爆
TGS2610-J00	易燃气体（丁烷）<方型>	500～10,000	0.53±0.05	民用/工业用易燃，易爆
TGS2611-B00	天然气(甲烷)<圆型,酒精过滤>	500～10,000	0.60±0.06	气体探测气，报警器
TGS2611-C00	天然气(甲烷)<圆型>	500～10,001	0.60±0.06	气体探测气，报警器
TGS821	氢气	30~1000	0.6~1.20	
TGS2442	一氧化碳	30～1,000	0.23~0.49	室内气体报警器
TGS2620-A00	酒精(金属外壳)	50～5,000	0.35±0.1	酒精探测器
TGS2620-C00	酒精(不锈钢外壳)	50～5,000	0.35±0.1	酒精探测器
TGS822	酒精	50～5,000	0.40±0.1	醉酒度测试仪
TGS825	硫化氢	5～100	0.3～0.6	有毒有害气体报警器
TGS826	氨气	30～300	0.4～0.70	电冰箱气

				体探测
TGS830	R-113,R-22,R-11,R-12	100～3,000	0.30±0.10	卤素检漏仪，
TGS831	R-21,R-22	100～3,000	0.40±0.15	氟利昂检测器
TGS832	R-134a	100～3,000	0.50～0.65	
KE-25	氧气（电化学式，5 年寿命）	0～100%	±1%	氧气分析仪
KE-50	氧气（电化学式，10 年寿命）	0～100%	±2%	氧气分析仪
KE-25F3	氧气（电化学式，5 年寿命）	0～100%	±1%	氧气分析仪
TGS4160	二氧化碳（固态，10 年寿命）	350~30000ppm	±20%@1000ppm	蔬菜大棚，孵化设备
TGS4161	二氧化碳（固态，10 年寿命）	350~5000ppm	±20%@1000ppm	蔬菜大棚，孵化设备
AM-4	二氧化碳模块，用于检测 TGS4160，重新标定 TGS4160			CO2 检测
AM-4-4161	二氧化碳模块，用于检测 TGS4161，重新标定 TGS4161		(小尺寸,低功耗)	CO2 检测
COM2442	一氧化碳检测模块，设置 30、70、150ppm 三档报警			
LPM2610	TGS2610 检测模块，可以用于居民区液化石油气泄露报警	500~10000ppm		
NGM2611	TGS2611 检测模块，可以用于居民区天然气泄露报警	500~10000ppm		
AMS2600	TGS2600 检测模块，可以用于空调、空气清新机等家电	1~30ppm		
AMS2100	TGS2100 检测模块，可以用于智能抽油烟机等厨房电器			
AM-1-2600	TGS2600 检测模块，检测低浓度的空气污染物（带微处理器）			

日本 FIGARO

硫化氢传感器 TGS825（H2S 传感器 TGS825）

型号:TGS825 硫化氢传感器 TGS825（H2S 传感器 TGS825） ----深圳市 SUNSTAR 科技有限公司专业提供日本 FIGARO 硫化氢传感器,欢迎您来电咨询日本 FIGARO 硫化氢传感器价格等详细信息！ 一、硫化氢气体传感器 TGS825（H2S 传感器 TGS825）主要参数 硫化氢检测范围：5-100PPM 精度：0.3—0.6（电阻比） 输出信号：可变电阻值 环境温...

资料下载：立即下载 详细资料

氨气传感器 TGS826 （NH3 传感器 TGS826）

型号:TGS826 氨气传感器 TGS826 （NH3 传感器 TGS826）----深圳市 SUNSTAR 科技有限公司专业提供日本 FIGARO 氨气传感器,欢迎您来电咨询日本 FIGARO 氨气传感器价格等详细信息！ 一、氨气传感器 TGS826（NH3 传感器 TGS826）主要参数： 测量范围：30-300ppm 灵敏度(电阻比)：0.4-0.7 电路电压：24V(AC/DC) 加热器电压：5V±0.2V...

资料下载：立即下载 详细资料

食物蒸气传感器 TGS880

品牌:日本费加罗 FIGARO 型号:TGS880 食物蒸气传感器 TGS880----深圳 SUNSTAR 科技有限公司热销的传感器之一，欢迎来电咨询食物蒸气传感器 TGS880 原理及食物蒸气传感器 TGS880 应用解决方案等。一、食物蒸气传感器 TGS880 主要参数：加热器电压 VH：5.0+/-0.2V 传感器功耗：〈15mW 加热器电阻：30+/-3Ω 二、食物蒸气传感器 TGS880 测量范围：可测量范...

资料下载：立即下载 详细资料

可燃气体传感器 TGS2610

品牌:日本费加罗 FIGARO 型号:TGS2610 可燃气体传感器 TGS2610 深圳市 SUNSTAR 科技有限公司专业提供 FIGARO 半导体可燃气体传感器，欢迎来电咨询可燃气体传感器价格相关信息 一、可燃气体传感器 TGS2610 主要参数： 检测可燃气体范围：500-10,000ppm 灵敏度（电阻比）：0.50-0.62 加热器电压：5V±0.2V(DC/AC) 电路电压：5V±0.2V(DC/AC) 二、可燃气...

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一氧化碳传感器 TGS5042（CO 传感器 TGS5042）

品牌:日本费加罗 FIGARO 型号:TGS5042 一氧化碳（CO）传感器 TGS5042 深圳 SUNSTAR 科技有限公司专业提供日本 FIGARO 气体传感器，欢迎致电询气体传感器价格相关信息 一、一氧化碳（CO）传感器 TGS5042 主要参数： 1）一氧化碳检测范围： 0-10000ppm 2）输出电流：1.2-2.4nA/ppm 3）响应时间表：〈 60S 4）工作温度：-10℃ ~ +60℃ (持续工作...

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水蒸气传感器 TGS2180

品牌:日本费加罗 FIGARO 型号:TGS2180 水蒸气传感器 TGS2180（可间接检测油烟）深圳 SUNSTAR 科技有限公司专业供应日本 FIGARO 各种气体传感器，欢迎来电咨询气体传感器价格等信息 一、水蒸气传感器 TGS2180 主要参数：水蒸气范围：1 ~ 150g/m3 加热器电压：5.0±0.2V DC/AC 电路电压：5V±0.2V DC 二、水蒸气传感器 TGS2180 特点： 1) 对水蒸气具有...

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甲烷/一氧化碳传感器 TGS3870

品牌:日本费加罗 FIGARO 型号:TGS3870 甲烷/一氧化碳传感器 TGS3870 深圳 SUNSTAR 科技有限公司专业提供日本 FIGARO 气体传感器，欢迎致电询气体传感器价格

相关信息 一、甲烷/一氧化碳传感器 TGS3870 主要参数：甲烷检测范围：500-12500ppm 一氧化碳检测范围：50-1000ppm 甲烷灵敏度（电阻比）：0.50-0.65 一氧化碳灵敏度（电阻比）：0.1-0.6 电路电...

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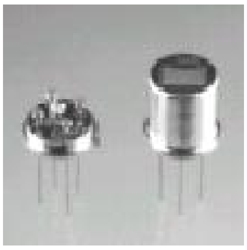
可燃气体传感器 TGS2611



品牌:日本费加罗 FIGARO 型号:TGS2611 可燃气体传感器 TGS2611 深圳市 SUNSTAR 科技有限公司专业提供 FIGARO 半导体可燃气体传感器，欢迎来电咨询可燃气体传感器价格等相关信息 一、可燃气体传感器 TGS2611 主要参数： 可燃气体检测范围：500-10,000ppm 灵敏度（电阻比）：0.54-0.66 加热器电压：5V±0.2V(DC/AC) 电路电压：5V±0.2V(DC/AC) 二、可燃...

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酒精传感器 TGS2620

品牌:日本费加罗 FIGARO 型号:TGS2620 酒精传感器 TGS2620 ——FIGARO 气体传感器 深圳市 SUNSTAR 科技有限公司专业供应 FIGARO 气体传感器，欢迎来电咨询酒精传感器价格等信息 一、酒精传感器 TGS2620 主要参数： 测量范围：50-5,000ppm 酒精传感器灵敏度（电阻比）：0.3-0.5 加热器电压：5V±0.2V (DC/AC) 电路电压：5V±0.2V (DC/AC) 二、酒精传...

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人工煤制气检测用 TGS822TF

品牌:日本费加罗 FIGARO 型号:TGS822TF 人工煤制气检测用 TGS822TF 特点：（1）对煤制气中的氢气和一氧化碳有高灵敏度（2）乙醇等有机溶剂的干扰小（3）长寿命、低成本（4）以简单电路即可使用应用：（1）家庭用、业务用煤制气报警器（2）便携式煤制气检知...

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一氧化碳传感器 TGS2442（CO 传感器 TGS2442）

品牌:日本费加罗 FIGARO 型号:TGS2442 一氧化碳 CO 传感器 TGS2442 深圳 SUNSTAR 科技有限公司专业提供日本 FIGARO 气体传感器，欢迎致电询气体传感器价格相关信息 一、一氧化碳（CO）传感器 TGS2442 主要参数： 一氧化碳 CO 检测范围：30-1,000ppm 灵敏度（电阻比）：0.13 - 0.31 加热器电压：4.8V±0.2V(DC，脉冲) 电路电压：5V±0.2V(DC，脉冲) 二、一...

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空气质量传感器 TGS2600

品牌:日本费加罗 FIGARO 型号:TGS2600 空气质量传感器 TGS2600 ——室内空气质量检测 深圳市 SUNSTAR 科技有限公司专业供应日本 FIGARO 气体传感器，欢迎来电咨询空气质量传感器价格等信息 一、室内空气检测传感器 TGS2600 主要参数： 型号：TGS2600-B00 空气质量传感器可测量范围：1-30ppm 分辨率：0.3～0.6（10ppmH2 阻值/空气中阻值） 防爆等级： ...

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可燃气体传感器 TGS2612

品牌:日本费加罗 FIGARO 型号:TGS2612 可燃气体传感器 TGS2612 深圳市 SUNSTAR 科技有限公司专业供应日本 FIGARO 可燃气体传感器，欢迎来电咨询可燃气体传感器价格等信息 一、可燃气体传感器 TGS2612 主要参数： 可燃气体检测范围：1~25%LEL 灵敏度（电阻比）：0.50 ~ 0.65 加热器电压：5.0±0.2V DC/AC 电路电压：5.0±0.2V DC/AC 二、可燃气体传感...

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可燃气体传感器 TGS816

品牌:日本费加罗 FIGARO 型号:TGS816 可燃气体传感器 TGS816 深圳市 SUNSTAR 科技有限公司专业供应日本 FIGARO 可燃气体传感器，欢迎来电咨询可燃气体传感器价格等信息 一、可燃气体传感器 TGS816 简介： 1) 测量范围：500-10,000ppm 2) 灵敏度（电阻比）：0.55-0.65 3) 加热器电压：5V±0.2V(DC/AC) 4) 电路电压：24V(AC/DC) 二、可燃气体传感器 TG...

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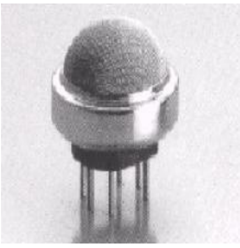
氢气传感器 TGS821



品牌:日本费加罗 FIGARO 型号:TGS821 氢气（H2）传感器 TGS821 深圳市 SUNSTAR 科技有限公司专业提供日本 FIGARO 氢气 H2 传感器,欢迎您来电咨询日本 FIGARO 氢气 H2 传感器的详细信息！ 一、氢气（H2）传感器 TGS821 主要参数： 氢气检测范围：10-10000ppm 灵敏度（电阻比）：0.60 - 1.20 加热器电压：5V±0.2V(AC/DC) 电路电压：24V(AC/DC) 二、氢气（...

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汽车尾气传感器 TGS2104

品牌:日本费加罗 FIGARO 型号:TGS2104 汽车尾气传感器 TGS2104 深圳市 SUNSTAR 科技有限公司供应日本 FIGARO 各种气体传感器，欢迎来电咨询汽车尾气传感器价格等信息 一、汽车尾气传感器 TGS2104 主要参数 可测量尾气浓度范围：10-1,000ppm 传感器灵敏度（电阻比）：0.3-0.6 加热器电压：7V±0.35V(DC) 电路电压：≤15VDC 二、汽车尾气传感器 TGS2104...

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可燃气体传感器 TGS813

品牌:日本费加罗 FIGARO 型号:TGS813 可燃气体传感器 TGS813 一、可燃气体传感器 TGS813 主要参数： 电路电压：〈24V（AC/DC） 测量范围：500-10,000ppm 灵敏度（电阻比）：0.55-0.65 加热器电压：5V±0.2V（AC/DC） 二、可燃气体传感器 TGS813 主要特点：后期电路简单；长寿命，低功耗；对甲烷、乙烷、丙烷等可燃气体的高敏感度；三、可燃气...

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二氧化氮 NO2 传感器 TGS2106

品牌:日本费加罗 FIGARO 型号:TGS2106 二氧化氮 NO2 传感器 TGS2106 深圳市 SUNSTAR 科技有限公司专业供应日本 FIGARO 气体传感器，欢迎来电咨询气体传感器价格等信息 一、二氧化氮 NO2 气体传感器 TGS2106 主要参数： 测量范围：0.1-10ppm 灵

敏度（电阻比）：2.0-7.0 加热器电压：6.2VDC±5% 电路电压:≤15VDC 二、二氧化氮 NO2 气体传感器 TGS2106 主要特点...

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一氧化碳/CO 传感器 TGS203

品牌:日本费加罗 FIGARO 型号:TGS203 一氧化碳/CO 传感器 TGS203 深圳 SUNSTAR 科技有限公司专业提供一氧化碳气体传感器，欢迎致电询问一氧化碳传感器相关信息 一、一氧化碳（CO）传感器 TGS203 主要参数： 一氧化碳 CO 检测范围：50-1,000ppm 灵敏度（电阻比）：0.19-0.45 电路电压：24V(AC/DC) 加热器电压：高 0.8V±0.08V（60s）(AC/DC); 低 0.25...

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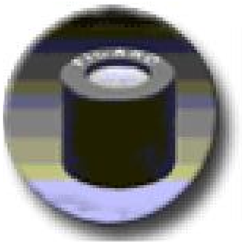
尾气传感器 TGS2201



品牌:日本费加罗 FIGARO 型号:TGS2201 尾气传感器 TGS2201 深圳市 SUNSTAR 科技有限公司专业供应日本 FIGARO 气体传感器，欢迎来电咨询气体传感器价格等信息 一、尾气气体传感器 TGS2201 主要参数： 尾气传感器电路电压：≤15VDC 加热器电压：5V±0.15VDC 灵敏度（电阻比）：4-20(CO/H2/HC) / 0.4-0.8(NO/NO2) 可测量汽车尾气量范围：10-1,000ppm (C...

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氨气传感器 TGS2444

品牌:日本费加罗 FIGARO 型号:TGS2444 氨气传感器 TGS2444 深圳 SUNSTAR 科技有限公司专业提供日本 FIGARO 气体传感器，欢迎致电询气体传感器价格相关信息 一、氨气传感器 TGS2444 主要参数： 氨气检测范围：10-100ppm 灵敏度（电阻比）：0.0.63 ~ 0.63 加热器电压：4.8V±0.2V(DC，脉冲) 电路电压：5V±0.2V(DC，脉冲) 二、氨气传感器 TGS2444 特点： ...

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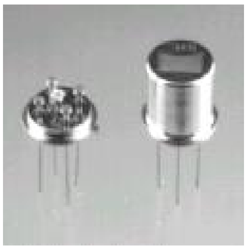
空气质量传感器 TGS2602



品牌:日本费加罗 FIGARO 型号:TGS2602 空气质量传感器 TGS2602 ——室内空气质量检测 深圳市 SUNSTAR 科技有限公司专业供应日本 FIGARO 各种气体传感器，欢迎来电咨询空气质量传感器价格等信息 一、空气质量传感器 TGS2602 主要参数 空气检测传感器测量范围：1-30ppm 电路电压：5V±0.2V DC 灵敏度（电阻比）： 0.15-0.5 传感器加热器电压：5V±0.2V...

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二氧化碳 CO2 传感器 TGS4160

品牌:日本费加罗 FIGARO 型号:TGS4160 二氧化碳 CO2 传感器 TGS4160 ——FIGARO 半导体气体传感器 深圳市 SUNSTAR 科技有限公司专业提供日本 FIGARO 固态电解质二氧化碳 CO2 传感器,欢迎您来电咨询日本 FIGARO 固态电解质二氧化碳 CO2 传感器价格等详细信息！一、二氧化碳 CO2 传感器 TGS4160 主要特点：测量范围：300-5,000ppm 加热器电压：5V±0.2VDC 对二氧...

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二氧化碳传感器 TGS4161

品牌:日本费加罗 FIGARO 型号:TGS4161 二氧化碳传感器 TGS4161 ——FIGARO 半导体气体传感器 深圳市 SUNSTAR 科技有限公司专业提供日本 FIGARO 固态电解质 CO2 传感器,欢迎您来电咨询日本 FIGARO 固态电解质 CO2 传感器价格等详细信息！ 一、二氧化碳传感器 TGS4161 主要特点 测量范围：350-3,000ppm 响应时间：1.5min 小尺寸，低成本； 长寿命，低功耗； 对...

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催化燃烧式可燃气体传感器 TGS6810

品牌:日本费加罗 FIGARO 型号:TGS6810 催化燃烧式可燃气体传感器 TGS6810 一、催化燃烧式可燃气体传感器 TGS6810 简介：该可燃气体检测传感器采用催化燃烧式原理,可以检测可燃气体甲烷,液化石油气,酒精干扰小,线形输出,精密尺寸做工,应用电路简单,满足欧盟 RoHS 要求. 二、催化燃烧式可燃气体传感器 TGS6810 主要特点： 品牌：FIGARO 测量范围：0-...

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催化燃烧式可燃气体传感器 TGS6812

品牌:日本费加罗 FIGARO 型号:TGS6812 催化燃烧式可燃气体传感器 TGS6812 一、催化燃烧式可燃气体检测传感器 TGS6812 简介： TGS6812 可燃气体传感器采用催化燃烧原理,可以检测可燃气体如氢气,甲烷,液化石油气等,酒精干扰小,线形输出,精密尺寸做工,应用电路简单,满足欧盟 RoHS 要求. 二、催化燃烧式可燃气体检测传感器 TGS6812 主要特点： 1）品牌：...

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酒精传感器 TGS822

品牌:日本费加罗 FIGARO 型号:TGS822 酒精传感器 TGS822 深圳市 SUNSTAR 科技有限公司专业提供日本 FIGARO 酒精传感器,欢迎您来电咨询日本 FIGARO 酒精传感器价格等详细信息！ 一、酒精传感器 TGS822 主要参数： 酒精测量范围：50-5,000ppm 灵敏度（电阻比）：0.40 ± 0.1 电路电压：24V(DC/AC) 加热器电压：5V±0.2V(AC/DC) 二、酒精传感器 TGS822 主要...

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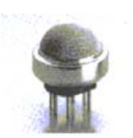

卤素气体传感器 TGS830

品牌:日本费加罗 FIGARO 型号:TGS830 卤素气体传感器 TGS830 一、卤素气体传感器 TGS830 主要参数：电路电压：24V(AC/DC) 测量范围：100-3,000ppm 灵敏度（电阻比）：0.2-0.4 加热器电压：5V±0.2V(DC/AC) 二、卤素气体传感器 TGS830 主要特点： 对 R-11,R-12,R-22,R-113 的高敏感度； 长寿命，低功耗； 后期电路简单； 陶瓷基底，抗环境能力强 三...

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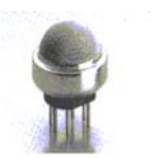

卤素传感器 TGS831

品牌:日本费加罗 FIGARO 型号:TGS831 卤素传感器 TGS831 一、R-21,R-22 气体传感器 TGS831 主要参数： 测量范围:100-3,000ppm 灵敏度（电阻比）：0.25-0.55 加热器电压：5V±0.2V(AC/DC) 电路电压：24V(AC/DC) 二、R-21,R-22 气体传感器 TGS831 主要特

点： 对 R-21,R-22 的高敏感度； 长寿命，低功耗； 后期电路简单； 陶瓷基底，抗环境能力强 三、R...

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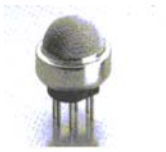

R-134a 卤素气体传感器 TGS832

品牌:日本费加罗 FIGARO 型号:TGS832 R-134a 卤素气体传感器 TGS832 一、R-134a 气体传感器 TGS832 主要参数： 测量范围：10-3,000ppm 灵敏度（电阻比）：0.5-0.65 加热器电压：5V±0.2V(AC/DC) 电路电压：24V(AC/DC) 二、R-134a 气体传感器 TGS832 主要特点： 对 R-134a 的高敏感度； 长寿命，低功耗； 后期电路简单； 陶瓷基底，抗环境能力强 三、R...

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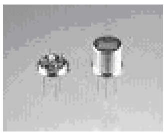
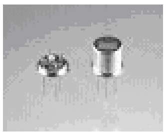
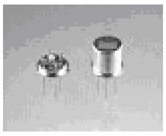
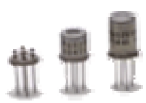
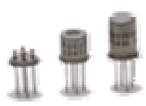
TGS 8 系列传感器 *8-Series TGS Sensor*

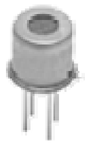
产品/型号	产品样图	用途	主要检测对象	检测范围	使用电压	消耗功率	特微	详细
TGS813		可燃气体检测	甲烷、丙烷 异丁烷	500～10,000ppm	DC5V	835mW	可燃气体泄漏 报警器应用 30 年业绩	
TGS822		有机溶剂检测	酒精有机溶剂	50～5,000ppm	DC5V	660mW	有机溶剂、 酒精检测报警器 应用 20 年业绩	
TGS822TF		煤制气检测	煤制气中氢气	200～5,000ppm	DC5V	660mW	煤制气泄漏报警器 应用 10 年业绩	
TGS203S		不完全燃烧 气体检测	一氧化碳	50～1,000ppm	H/L 驱动	295/33mW (ave.138mW)	防一氧化碳中毒 报警器应用 20 年业绩	

TGS2000 系列气体传感器 *TGS2000-Series Gas Sensor*

产品/型号	产品样图	用途	主要检测对象	检测范围	使用电压	消耗功率	特微	详细

TGS2600		空气质量控制	香烟酒精	1～10ppm	DC5V	210mW	空气清新机应用业绩 空气质量控制器	
TGS2602		空气质量控制	酒精氨气 VOC	1～10ppm	DC5V	280mW	空气清新机应用业绩 空气质量控制器	
TGS2610		可燃气体检测	丙烷异丁烷	500～10,000ppm	DC5V	280mW	石油液化气泄漏报警器应用业绩低功耗	
TGS2611		可燃气体检测	甲烷天然气	500～10,000ppm	DC5V	280mW	天然气泄漏报警器应用业绩低功耗	
TGS2620		有机溶剂检测	酒精有机溶剂	50～5,000ppm	DC5V	210mW	有机溶剂检测方面业绩低功耗	
TGS2442		毒性气体检测	一氧化碳	30～1,000ppm	DC5V 脉冲 驱动	14mW(ave.)	一氧化碳报警器应用业绩低功耗平均約 14mW	

产品型号	产品样图	用途	主要检测气体	检测浓度范围	工作电压	功率	详细
TGS203S		毒性气体检测	• 一氧化碳	50～1000ppm	H/L 驱动	295/33mW	详细
TGS813		可燃性气体	• 甲烷 • 丙烷 • 丁烷	500～10000ppm	DC5V	835mW	详细
TGS2610		可燃性气体	• 丙烷 • 丁烷	500～10000ppm	DC5V	280mW	详细
TGS2611		可燃性气体	• 甲烷	500～10000ppm	DC5V	280mW	详细

TGS2620		溶剂蒸气	• 酒精 • 有机溶剂	50～5000ppm	DC5V	280mW	详细
TGS822		溶剂蒸气	• 酒精 • 有机溶剂	50～5000ppm	DC5V	660mW	详细
TGS822TF		可燃性气体	• 人工煤制气中 • 氢气	200~5000ppm	DC5V	660mW	详细
TGS2600		空气质量控制	• 氢气 • 酒精	1~10ppm	DC5V	210mW	详细
TGS2602		空气质量控制	• 酒精 • 氨气 • 有机溶剂 • 挥发	1~10ppm	DC5V	280mW	详细
• TGS821 • TGS825 • TGS826 • TGS830 • TGS2442 • TGS3870 由【日本费加罗技研株式会社】 • TGS4160 生产 • TGS4161 • TGS6810 • TGS6812 • TGS5042			• 氢气 • 硫化氢 • 氨气 胺 • 氟利昂 有机氯气 • 一氧化碳 • 甲烷 一氧化碳(复合型) • 二氧化碳 • 二氧化碳 • 可燃气体 • 可燃气体 • 一氧化碳				详细

Select by application

>>Domestic safety

Model	**Target gas**	Typical	Ps	Description	Data

		detection range			sheet
TGS2442	**Carbon monoxide**	30 - 1,000ppm	14mW	**Compact size Low sensitivity to alcohol vapor For residential CO detectors**	
TGS2610-D00	**LP gas**	500 - 10,000ppm	280mW	**High selectivity to LP gas Good durability For residential gas alarms**	
TGS2610-C00	**LP gas**	500 - 10,000ppm	280mW	**Quick gas response For leak checkers**	
TGS2611-E00	**Methane**	500 - 10,000ppm	280mW	**High selectivity to methane gas Good durability For residential gas alarms**	
TGS2611-C00	**Methane**	500 - 10,000ppm	280mW	**Quick gas response For leak checkers**	
TGS2612	**Methane ,LP gas**	500 - 10,000ppm	280mW	**Stable relative sensitivty between CH4 & LP gas Good durability For residential gas alarms**	
TGS3870	**Methane & CO**	500 - 12,500ppm 50 - 1,000ppm	38mW	**Dual gas detection with one sensor For residential gas detectors**	
TGS5042	**Carbon monoxide**	0 - 1,000ppm	No power required	**Electrochemical type Battery operable Long life**	
TGS6810	**LP gas ,Methane**	0 - 100%LEL	525mW	**Catalytic type Wide detection range Linear output For residential gas alarms**	
LPM2610	**LP gas**	500 - 10,000ppm	280mW	**Precalibrated module with TGS2610 and temperature compensation circuit For residential gas detectors**	
NGM2611	**Methane**	500 - 10,000ppm	280mW	**Precalibrated module with TGS2611 and temperature compensation circuit For residential gas detectors**	

Select by application

Application example>>

>>Air quality control

Model	**Target gas**	Typical **detection** range	Ps	Description	Data sheet
TGS2600	**General air contaminants**	1 - 30ppm	210mW	**High sensitivity to air contaminants For indoor air quality control and**	

				automatic control in cooker hoods	
TGS2602	**General air contaminants**	1 - 30ppm	280mW	**High sensitivity to VOCs and odorous gases** **For indoor air quality control**	
TGS4160	**Carbon dioxide**	350 - 50,000ppm	1.25W	**Wide detection range** **Good durability** **For indoor ventilation control and CO2 monitoring in factories, agriculture and automobiles**	
TGS4161	**Carbon dioxide**	350 - 10,000ppm	250mW	**Low power** **Compact size** **For indoor ventilation control in residences and high occupancy buildings**	
AMS2600	**General air contaminants**	1 - 30ppm	210mW	**Precalibrated module with TGS2600 and suitable load resistor** **For indoor air quality control**	
CDM4160	**Carbon dioxide**	400-45,000ppm	1.3W	**Precalibrated module** **Maintenance free** **For indoor ventilation control**	
CDM4161	**Carbon dioxide**	400-9,000ppm	300mW	**Precalibrated module** **Maintenance free** **For indoor ventilation control**	

Select by application

Application example>>

>>Automotive

Model	**Target gas**	Typical **detection** range	Ps	Description	Data sheet
TGS2201	**Gasoline & diesel exhaust**	10 - 1,000ppm 0.1 - 10ppm	502mW	**Dual gas detection with one sensor** **For automobile ventilation control**	--
TGS2600	**General air contaminants**	1 - 30ppm	210mW	**High sensitivity to air contaminants** **For indoor air quality control and automatic control in cooker hoods**	
TGS2602	**General air contaminants**	1 - 30ppm	280mW	**High sensitivity to VOCs and odorous gases** **For indoor air quality control**	
TGS2610-D00	**LP gas**	500 - 10,000ppm	280mW	**High selectivity to LP gas** **Good durability** **For residential gas alarms**	
TGS2610-C00	**LP gas**	500 - 10,000ppm	280mW	**Quick gas response** **For leak checkers**	
AMS2600	**General air contaminants**	1 - 30ppm	210mW	**Precalibrated module with TGS2600 and suitable load resistor**	

LPM2610	**LP gas**	500 - 10,000ppm	280mW	**For indoor air quality control** **Precalibrated module with TGS2610 and temperature compensation circuit** **For residential gas detectors**	

Select by application

Application example>>

>>Appliance control

Model	**Target gas**	Typical **detection** range	Ps	Description	Data sheet
TGS2180	**Water vapor**	1 - 150g/m3	830mW	**High selectivity to water vapor** **For automatic cooking control in microwave ovens**	
TGS2600	**General air contaminants**	1 - 30ppm	210mW	**High sensitivity to air contaminants** **For indoor air quality control and automatic control in cooker hoods**	
TGS2602	**General air contaminants**	1 - 30ppm	280mW	**High sensitivity to VOCs and odorous gases** **For indoor air quality control**	
AMS2600	**General air contaminants**	1 - 30ppm	210mW	**Precalibrated module with TGS2600 and suitable load resistor** **For indoor air quality control**	

Select by application

Application example>>

>>Industrial safety

Model	**Target gas**	Typical **detection** range	Ps	Description	Data sheet
TGS821	**Hydrogen**	30 - 1,000ppm	660mW	**High sensitivity and selectivity to hydrogen** **Ceramic base resistant to severe environments** **For hydrogen detectors**	
TGS825	**Hydrogen sulfide**	5 - 100ppm	660mW	**Ceramic base resistant to severe environments** **For hydrogen sulfide detectors**	
TGS826	**Ammonia**	30 - 300ppm	833mW	**Ceramic base resistant to severe environments** **For leak detection from refrigerators**	

TGS832	**Halocarbon gas**	100 - 3,000ppm	835mW	**For leak detection from refrigerators and air conditioners Ceramic base resistant to severe environments For halocarbon detectors**
TGS2442	**Carbon monoxide**	30 - 1,000ppm	14mW	**Compact size Low sensitivity to alcohol vapor For residential CO detectors**
TGS2444	**Ammonia**	10 - 100ppm	56mW	**High selectivity to ammonia Low power consumption For ventilation control in agricultural & poultry industries**
TGS2610-D00	**LP gas**	500 - 10,000ppm	280mW	**High selectivity to LP gas Good durability For residential gas alarms**
TGS2610-C00	**LP gas**	500 - 10,000ppm	280mW	**Quick gas response For leak checkers**
TGS2611-E00	**Methane**	500 - 10,000ppm	280mW	**High selectivity to methane gas Good durability For residential gas alarms**
TGS2611-C00	**Methane**	500 - 10,000ppm	280mW	**Quick gas response For leak checkers**
TGS2620	**Alcohol ,Solvent vapors**	50 - 5,000ppm	210mW	**Compact size For breath alcohol testers and solvent detectors**
TGS3870	**Methane & CO**	500 - 12,500ppm 50 - 1,000ppm	38mW	**Dual gas detection with one sensor For residential gas detectors**
TGS6812	**Hydrogen ,Methane ,LP gas**	0 - 100%LEL	525mW	**Catalytic type Wide detection range Linear output For hydrogen and combustible gas leak detectors for fuel cells**
FCM6812	**Hydrogen ,Methane ,LP gas**	0 - 35%LEL	1.0W	**Precalibrated module Maintenance free For gas leak detection in fuel cell systems**
LPM2610	**LP gas**	500 - 10,000ppm	280mW	**Precalibrated module with TGS2610 and temperature compensation circuit For residential gas detectors**
NGM2611	**Methane**	500 - 10,000ppm	280mW	**Precalibrated module with TGS2611 and temperature compensation circuit For residential gas detectors**
KE-25	**Oxygen**	0 - 100%	No power required	**Galvanic cell type No CO2 influence Long life**

KE-50	**Oxygen**	0 - 100%	No power required	**High accuracy Galvanic cell type No CO2 influence Long life**	
SK-25	**Oxygen**	0 - 30%	No power required	**Good linearity No CO2 influence Compact**	

Select by application

Application example>>

>>**Personal safety & health**

Model	**Target gas**	Typical **detection** range	Ps	Description	Data sheet
TGS2620	**Alcohol ,Solvent vapors**	50 - 5,000ppm	210mW	**Compact size For breath alcohol testers and solvent detectors**	

Related products

Model	Applied **sensor** model	Description	Data sheet
AM-1-2600	TGS2600	**Evaluation board for indoor air quality control**	
AM-1-2602	TGS2602	**Evaluation board for indoor air quality control**	
CDM4160	TGS4160	**Evaluation board for CO2 monitoring**	
CDM4161	TGS4161	**Evaluation board for CO2 monitoring**	
COM2442	TGS2442	**Evaluation board for CO detection**	
FCM6812	TGS6812	**Evaluation board for combustible gas detection**	
SRD-1	TGS8xx	**Test unit for TGS8xx series gas sensors**	
FIC 00460	TGS2442	**Microprocessor for CO detection**	
SR-4	TGS8xx	**Durable sensor socket for TGS8xx series gas sensors**	

SR-5	TGS8xx	**Standard sensor socket for TGS8xx series gas sensors**
SR-6	TGS26xx, TGS24xx	**Standard sensor socket for TGS24xx and TGS26xx series gas sensors**
SR-8	TGS3870	**Standard sensor socket for TGS38xx series gas sensors**
SR-3	TGS8xx	**Test chamber for TGS8xx series gas sensors**

TGS 813 - for the detection of Combustible Gases

Features:

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

Applications:

* Domestic gas leak detectors and alarms
* Portable gas 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 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).

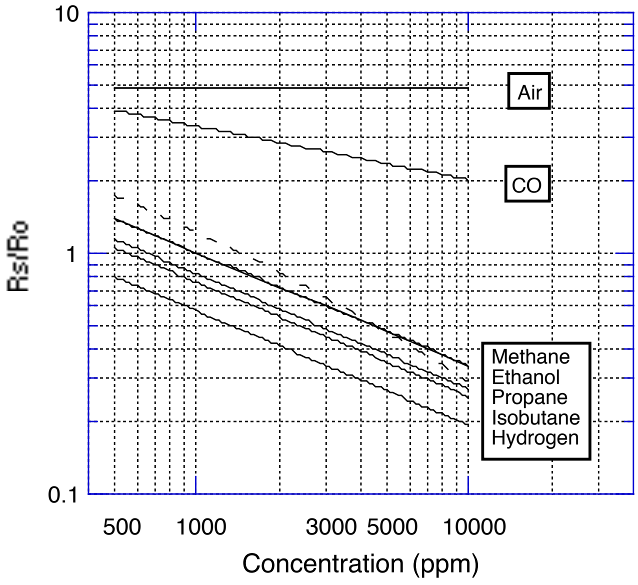
The figure below represents typical sensitivity characteristics, all data having been gathered at standard test conditions (see reverse side of this sheet). The Y-axis is indicated as sensor resistance ratio (Rs/Ro) which is defined as follows:

Rs = Sensor resistance of displayed gases at various concentrations
Ro = Sensor resistance in 1000ppm methane

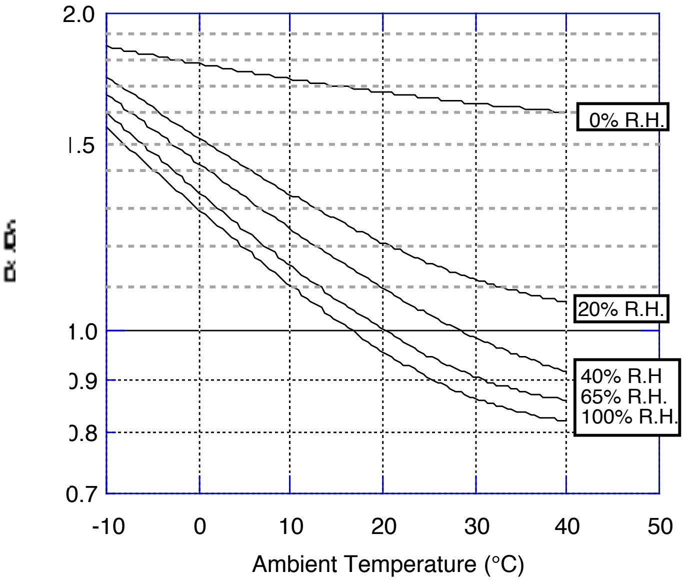
The figure below represents typical temperature and humidity dependency characteristics. Again, the Y-axis is indicated as sensor resistance ratio (Rs/Ro), defined as follows:

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.

Sensitivity Characteristics:

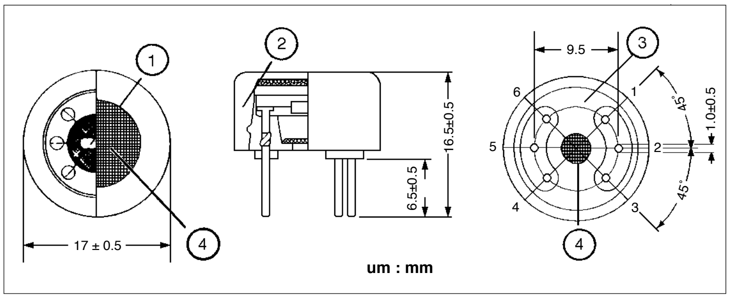


Temperature/Humidity Dependency:



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:

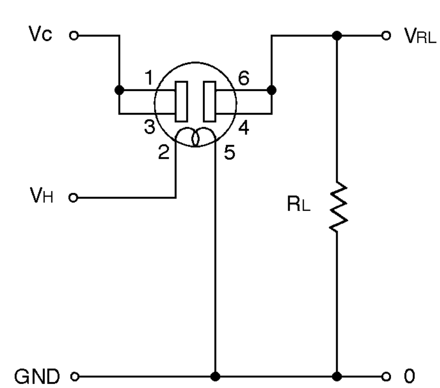


1. Sensing Element:
   SnO_2 is sintered to form a thick film on the surface of an alumina ceramic tube which contains an internal heater.
2. Cap:
   Nylon 66
3. Sensor Base:
   Nylon 66
4. Flame Arrestor:
   100 mesh SUS 316 double gauze

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	Methane at 1000ppm/air	5kΩ ~ 15kΩ
Change Ratio of Sensor Resistance	Rs/Ro	Rs (Methane at 3000ppm/air) / Rs (Methane at 1000ppm/air)	0.60 ± 0.05
Heater Resistance	R_H	Room temperature	30.0 ± 3.0Ω
Heater Power Consumption	P_H	V_H=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:

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 = 4.0kΩ±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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Phone: (847)-832-1701
Fax: (847)-832-1705
email: figarousa@figarosensor.com

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

REV: 9/02

TGS 2104 - for detection of Gasoline Engine Exhaust Gas

Features:

* High sensitivity to exhaust gases emitted by gasoline-fueled engines
* Long life and low cost
* Uses simple electrical circuit

Applications:

* Automobile ventilation control

The sensing element is comprised of a metal oxide semiconductor layer formed on an alumina substrate of a sensing chip together with an integrated heater. 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 2104** has high sensitivity and quick response to exhaust gases emitted by gasoline-fueled engines. As a result of this feature, TGS2104 is an ideal sensor for application in automatic damper control systems for automobile ventilation.

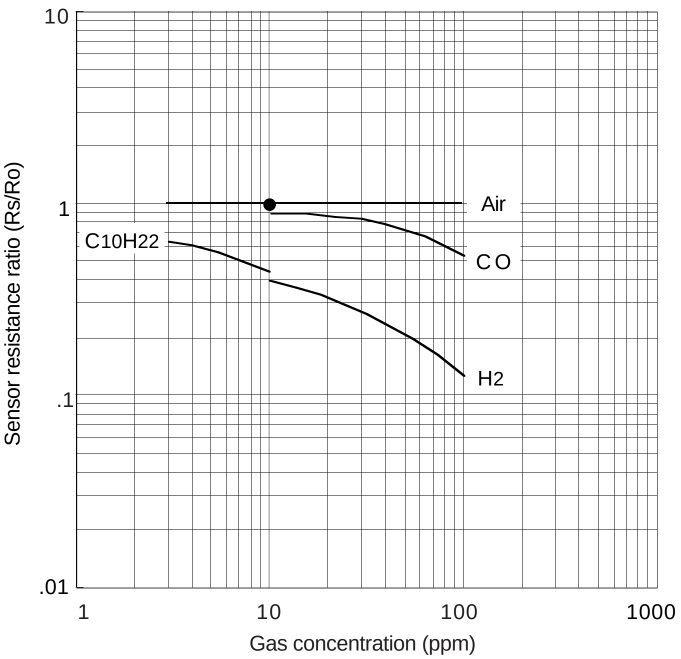
The figure below represents typical sensitivity characteristics, all data having been gathered at standard test conditions (see reverse side of this sheet). The Y-axis is indicated as *sensor resistance ratio* (Rs/Ro) which is defined as follows:

Rs = Sensor resistance in displayed gases at various concentrations

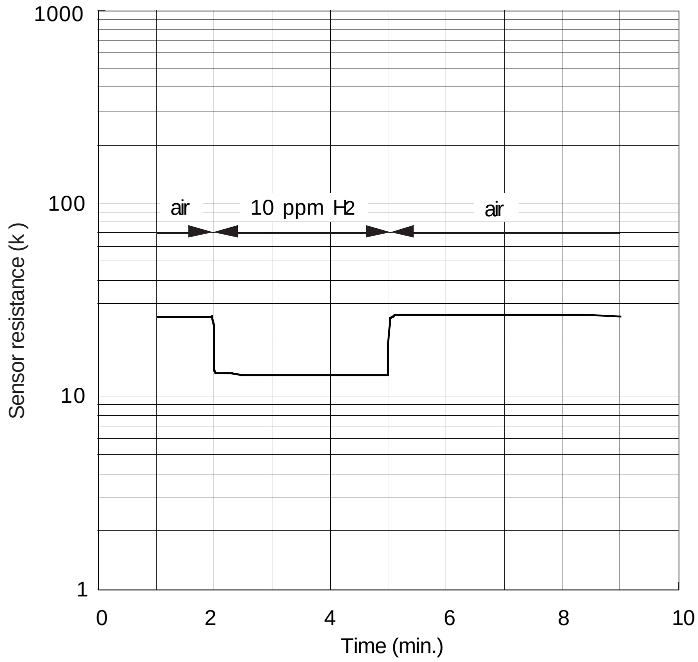
Ro = Sensor resistance in clean air

The figure below represents the typical response pattern of the TGS2104 when the atmosphere changes from clean air to the listed gas concentrations and then reverts back to clean air again.

Sensitivity Characteristics:



Sensor Response Pattern:

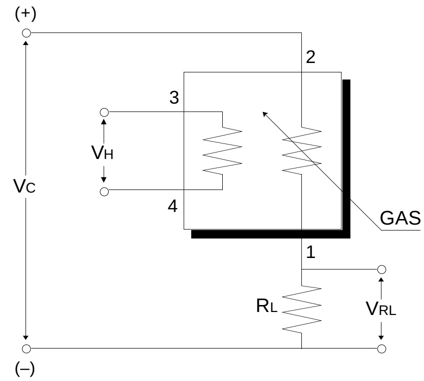


IMPORTANT NOTE: OPERATING CONDITIONS IN WHICH FIGARO SENSORS ARE USED WILL VARY WITH EACH CUSTOMER'S SPECIFIC APPLICATIONS. FIGARO STRONGLY RECOMMENDS CONSULTING OUR TECHNICAL STAFF BEFORE DEPLOYING FIGARO SENSORS IN YOUR APPLICATION AND, IN PARTICULAR, WHEN CUSTOMER'S TARGET GASES ARE NOT LISTED HEREIN. 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.

Basic Measuring Circuit:

The sensor requires two voltage inputs: heater voltage (V_H) and circuit voltage (V_C). The heater voltage (V_H) is applied to the integrated heater in order to maintain the sensing element at a specific temperature which is optimal for sensing. Circuit voltage (V_C) is applied to allow measurement of voltage (V_{RL}) across a load resistor (R_L) which is connected in series with the sensor.

A common power supply circuit can be used for both V_C and V_H to fulfill the sensor's electrical requirements. The value of the load resistor (R_L) should be chosen to optimize the alarm threshold value, keeping power dissipation (P_S) of the semiconductor below a limit of 15mW. Power dissipation (P_S) will be highest when the value of Rs is equal to R_L on exposure to gas.



Specifications:

Model number			TGS 2104	
Sensing element type			S1	
Standard package			Plastic (P3)	
Target gases			Gasoline exhaust (H_2,CO,HC)	
Typical detection range			10 ~ 1,000 ppm	
Standard circuit conditions	Heater voltage	V_H	7.0±0.35V DC	
	Circuit voltage	V_C	15.0V DC Max.	$P_S \leq$ 15mW
	Load resistance	R_L	Variable	$P_S \leq$ 15mW
Electrical characteristics under standard test conditions	Heater resistance	R_H	50 ± 5Ω at room temp.	
	Heater current	I_H	91mA	
	Heater power consumption	P_H	640mW	V_H = 7.0V DC
	Sensor resistance	Rs	10 ~ 80 kΩ in air	
	Sensitivity (change ratio of Rs)		0.3 ~ 0.6	Rs (10ppm of H_2) / Rs (air)
Standard test conditions	Test gas conditions		Air at 20±2°C, 65±5%RH	
	Circuit conditions		R_L = 10kΩ±1%, V_C = 7.0±0.2V DC, V_H = 7.0±0.2V DC	
	Conditioning period before test		7 days	

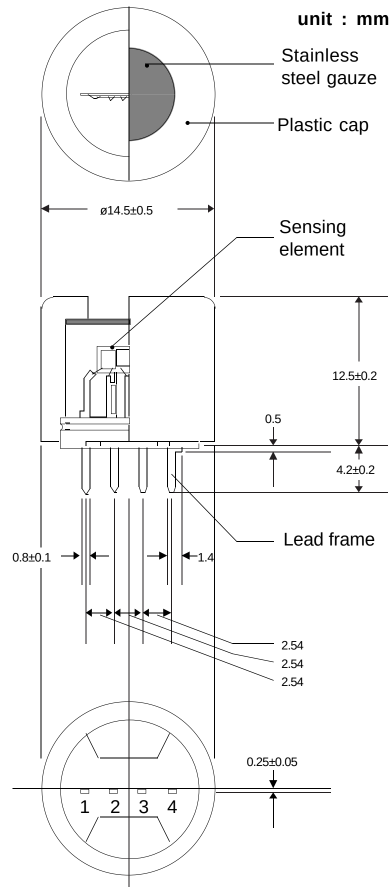
The value of power dissipation (P_S) can be calculated by utilizing the following formula:

$$P_S = \frac{(V_C - V_{RL})^2}{R_S}$$

Sensor resistance (Rs) is calculated with a measured value of V_{RL} by using the following formula:

$$R_S = \frac{V_C - V_{RL}}{V_{RL}} \times R_L$$

Structure and Dimensions:



Pin connection
1: Sensor electrode(-)
2: Sensor electrode(+)
3: Heater(+)
4: Heater(-)

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

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FIGARO

PRODUCT INFORMATION

TGS 2201 - for detection of Gasoline and Diesel Exhaust Gas

Features:

* Dual sensor element
* High sensitivity to exhaust gases emitted by both gasoline and diesel-fueled engines
* Long life and low cost
* Uses simple electrical circuit

Applications:

* Automobile ventilation control

The sensing element is comprised of a metal oxide semiconductor layer formed on an alumina substrate of a sensing chip together with an integrated heater. In the presence of a detectable gas, the sensor's conductivity changes 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 2201** contains two independent sensing elements on one substrate and produces separate output signals for responding to diesel and gasoline exhaust gases. This feature makes TGS2201 is an ideal senor for application in automatic damper control systems for automobile ventilation.

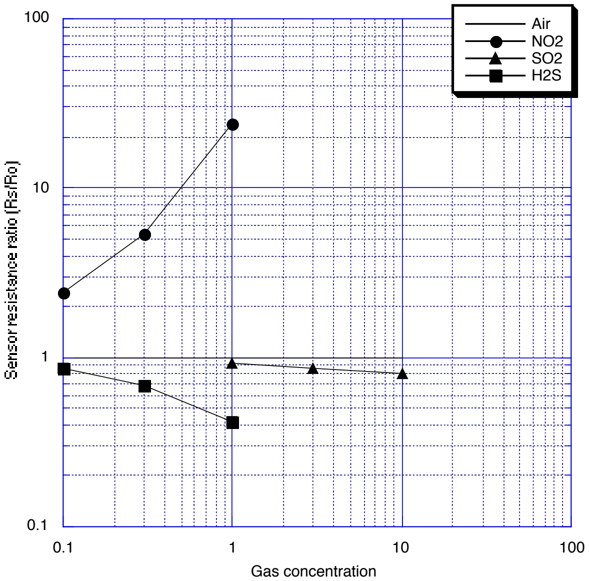
Element 1 - Diesel exhaust gas

A major component of diesel exhaust gas is NOx. The figure below represents typical sensitivity characteristics for Element 1, 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 in displayed gases at various concentrations

Ro = Sensor resistance in clean air

Sensitivity Characteristics:



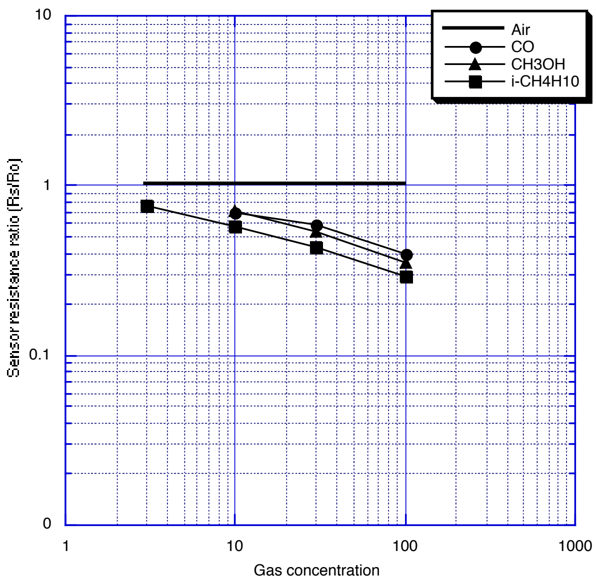
Element 2 - Gasoline exhaust gas

Gasoline exhaust gas typically contains CO, H_2, and uncombusted hydrocarbons. The figure below represents typical sensitivity characteristics for Element 2, 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 in displayed gases at various concentrations

Ro = Sensor resistance in clean air

Sensitivity Characteristics:



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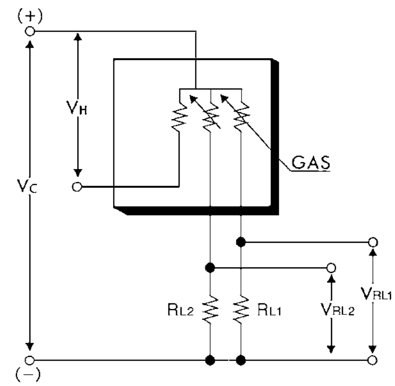
Basic Measuring Circuit:

The sensor requires two voltage inputs: heater voltage (V_H) and circuit voltage (V_C). The heater voltage (V_H) is applied to the integrated heater in order to maintain the sensing element at a specific temperature which is optimal for sensing. Vc is applied to measure output voltages V_{RL1} and V_{RL2} across R_{L1} and R_{L2} respectively. Each of these load resistors are connected in series to their corresponding sensing elements.

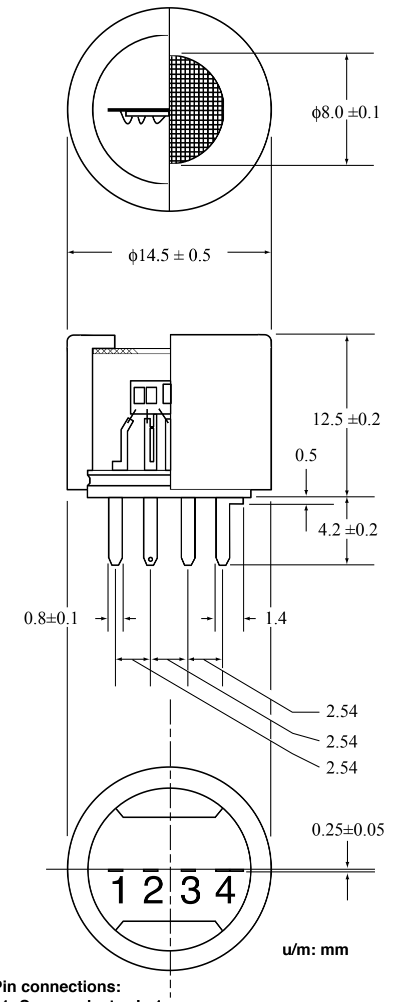
A common power supply circuit can be used for both V_C and V_H to fulfill the sensor's electrical requirements. The value of the load resistor (R_L) should be chosen to optimize the alarm threshold value, keeping power dissipation (P_S) of the semiconductor below a limit of 15mW. Power dissipation (P_S) will be highest when the value of Rs is equal to R_L on exposure to gas.



Specifications:

Model number			TGS 2201	
Sensing element type			S2	
Standard package			Plastic (P3)	
Target gases			Diesel exhaust (NO, NO_2)	Gasoline exhaust (CO,H_2,HC)
Typical detection range			0.1 ~ 10 ppm	10~1,000ppm
Standard circuit conditions	Heater voltage	V_H	5.0V DC±5%	
	Circuit voltage	V_C	15.0V DC Max., Ps ≤ 15mW	
	Load resistance	R_L	Variable, Ps ≤ 15mW	
Electrical characteristics under standard test conditions	Heater resistance	R_H	35Ω ± 10% at room temp.	
	Heater current	I_H	100mA	
	Heater power consumption	P_H	502mW	
	Sensor resistance	Rs	0.1~2MΩ in air	10~80kΩ in air
	Sensitivity (change ratio of Rs)		Rs(0.3ppm of NO2)/ Rs (air) = 12±8	Rs(10ppm of CO)/ Rs (air) = 0.65±0.15
Standard test conditions	Test gas conditions		Air at 20±2˚C, 65±5%RH	
	Circuit conditions		R_L = 200kΩ±1%	R_L = 10.0kΩ±1%
			V_C = 5.0V DC ± 3%, V_H = 5.0V DC ± 5%	
	Conditioning period before test		2~7 days	

Structure and Dimensions:



Pin connections:
1: Sensor electrode 1
2: Common (+)
3: Sensor electrode 2
4: Heater (-)

The value of power dissipation (P_S) can be calculated by utilizing the following formula:

$$P_S = \frac{(V_C - V_{RL})^2}{R_S}$$

Sensor resistance (Rs) is calculated with a measured value of V_{RL} by using the following formula:

$$R_S = \frac{V_C - V_{RL}}{V_{RL}} \times R_L$$

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FIGARO

PRODUCT INFORMATION

TGS 2442 - for the detection of Carbon Monoxide

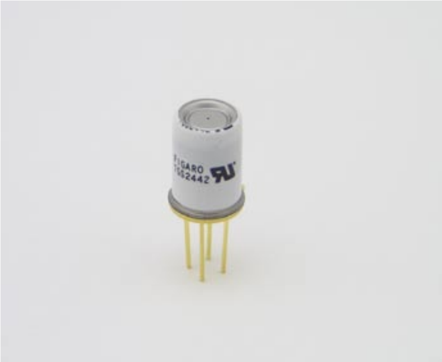
Features:

* Low power consumption
* High sensitivity/selectivity to carbon monoxide (CO)
* Miniature size
* Low sensitivity to alcohol vapor
* Long life and low cost
* Low humidity dependency

Applications:

* CO detectors
* Air quality controllers
* Indoor parking lot ventilation

TGS 2442 utilizes a multilayer sensor structure. A glass layer for thermal insulation is printed between a ruthenium oxide (RuO_2) heater and an alumina substrate. A pair of Au electrodes for the heater are formed on a thermal insulator. The gas sensing layer, which is formed of tin dioxide (SnO_2), is printed on an electrical insulation layer which covers the heater. A pair of Au electrodes for measuring sensor resistance are formed on the electrical insulator. Activated charcoal is filled between the internal cover and the outer cover for the purpose of reducing the influence of noise gases.



TGS 2442 displays good selectivity to carbon monoxide, making it ideal for CO monitors. In the presence of CO, the sensor's conductivity increases depending on the gas concentration in the air. A simple pulsed electrical circuit operating on a one second circuit voltage cycle can convert the change in conductivity to an output signal which corresponds to gas concentration.

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

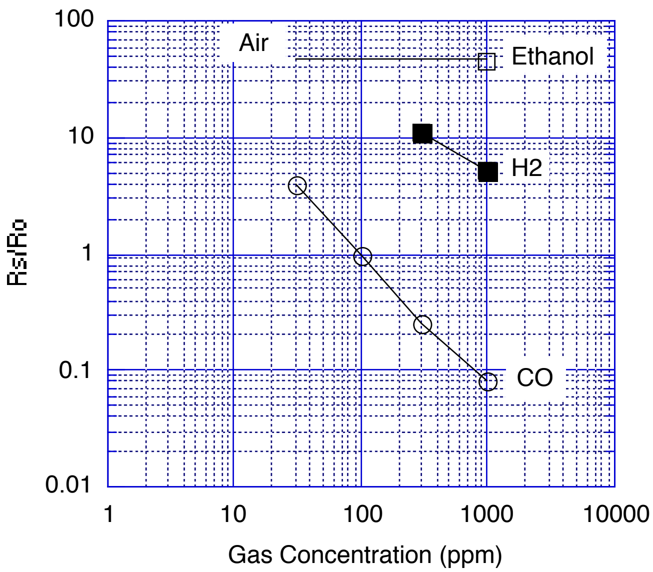
Ro = Sensor resistance in 100ppm CO

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:

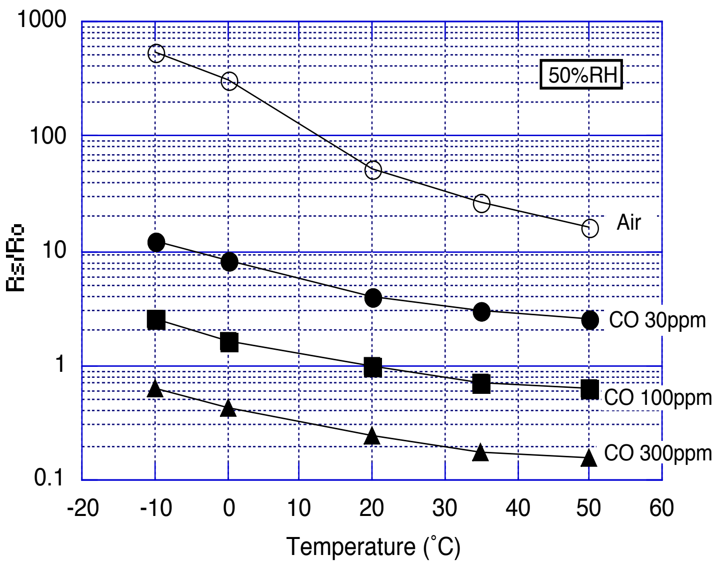
Rs = Sensor resistance at 30ppm, 100ppm and 300ppm of CO at various temperatures and 50%R.H.

Ro = Sensor resistance at 300ppm of CO at 25°C and 50% R.H.

Sensitivity Characteristics:



Temperature/Humidity Dependency:



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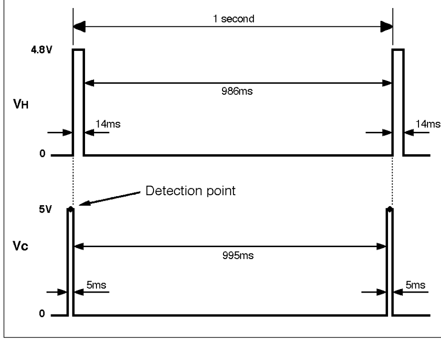
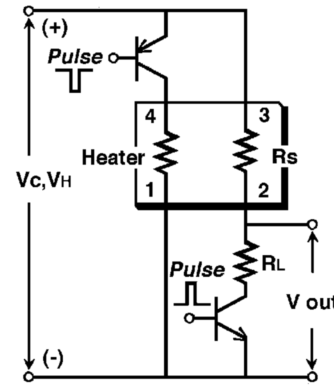
Basic Measuring Circuit:

Circuit voltage (VC) is applied across the sensing element which has a resistance (Rs) between the sensor's two electrodes (pins No. 2 and No. 3) and a load resistor (RL) connected in series. The sensing element is heated by the heater which is connected to pins No. 1 and No. 4.

Heating cycle--The sensor requires application of a 1 second heating cycle which is used in connection with a circuit voltage cycle of 1 second. Each VH cycle is comprised by 4.8V being applied to the heater for the first 14ms, followed by 0V pulse for the remaining 986ms. The Vc cycle consists of 0V applied for 995ms, followed by 5.0V for 5ms. For achieving optimal sensing characteristics, the sensor's signal should be measured after the midpoint of the 5ms Vc pulse of 5.0V (for reference, see timing chart below).

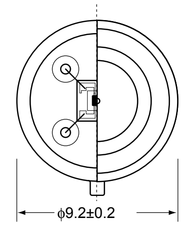


NOTE: Application of a Vc pulse condition is required to prevent possible migration of heater materials into the sensing element material. Under extreme conditions of high humidity and temperature, a constant Vc condition could result in such migration and cause long term drift of Rs to higher values. A 5ms Vc pulse results in significantly less driving force for migration than a constant Vc condition, rendering the possibility of migration negligibly small.

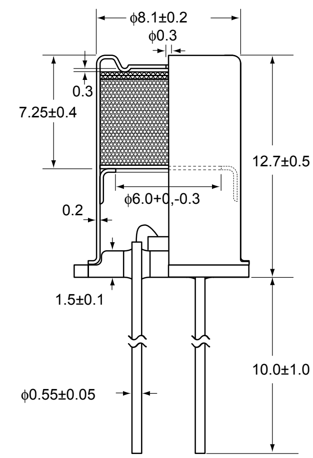


Structure and Dimensions:

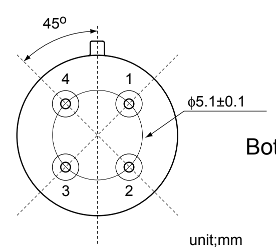
unit: mm



Top View



Side View



Bottom View

unit;mm

Specifications:

Model number			TGS 2442
Sensing element type			M1
Standard package			TO-5 metal can
Target gases			Carbon monoxide
Typical detection range			30 ~ 1000 ppm
Standard circuit conditions	Heater voltage cycle	VH	VHH=4.8V±0.2V DC, 14ms VHL=0.0, 986ms
	Circuit voltage cycle	VC	VC=0V for 995ms, VC=5.0V±0.2V DC for 5ms
	Load resistance	RL	variable (≥10kΩ)
Electrical characteristics under standard test conditions	Heater resistance	RH	17 ± 2.5Ω at room temp.
	Heater current	IH	approx. 203mA(in case of VHH)
	Heater power consumption	PH	approx. 14mW (ave.)
	Sensor resistance	Rs	13.3kΩ ~ 133kΩ in 100ppm of carbon monoxide
	Sensitivity (change ratio of Rs)	β	0.13 ~ 0.31
Standard test conditions	Test gas conditions		Carbon monoxide in air at 20±2°C, 65±5%RH
	Circuit conditions		Same as Std. Circuit Condition (above)
	Conditioning period before test		2 days or more

Sensor resistance (Rs) is calculated with a measured value of Vout as follows:

$$Rs = \frac{Vcx\ RL}{Vout} - RL$$

The value of sensitivity (β) is calculated with two measured values of Rs as follows:

$$\beta = \frac{Rs\ (CO,300ppm)}{Rs\ (CO,100ppm)}$$

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REV: 07/07

FIGARO

PRODUCT INFORMATION

TGS 2600 - for the detection of Air Contaminants

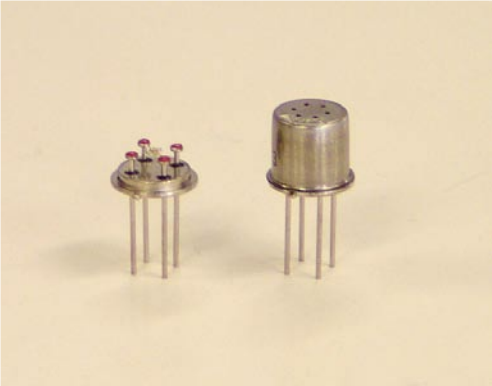
Features:

* Low power consumption
* High sensitivity to gaseous air contaminants
* Long life and low cost
* Uses simple electrical circuit
* Small size

Applications:

* Air cleaners
* Ventilation control
* Air quality monitors

The sensing element is comprised of a metal oxide semiconductor layer formed on an alumina substrate of a sensing chip together with an integrated heater. 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 2600** has high sensitivity to low concentrations of gaseous air contaminants such as hydrogen and carbon monoxide which exist in cigarette smoke. The sensor can detect hydrogen at a level of several ppm. Figaro also offers a microprocessor (FIC02667) which contains special software for handling the sensor's signal for appliance control applications.

Due to miniaturization of the sensing chip, TGS 2600 requires a heater current of only 42mA and the device is housed in a standard TO-5 package.

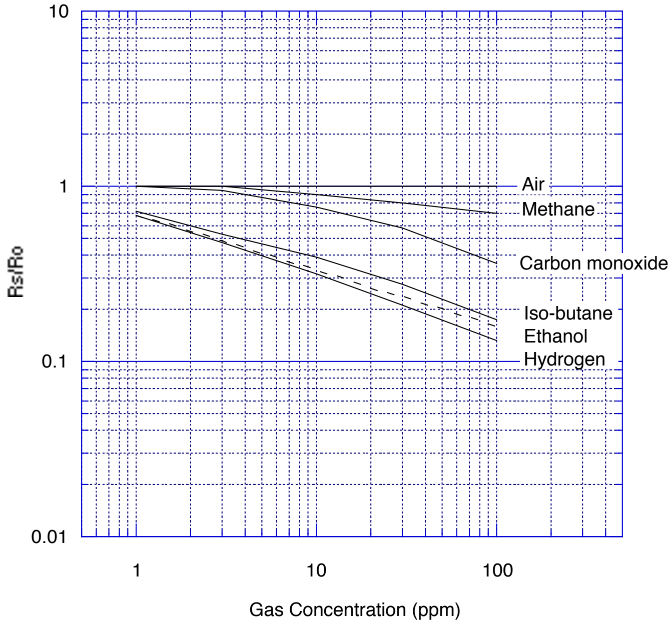
The figure below represents typical sensitivity characteristics, all data having been gathered at standard test conditions (see reverse side of this sheet). The Y-axis is indicated as sensor resistance ratio (Rs/Ro) which is defined as follows:

Rs = Sensor resistance in displayed gases at various concentrations
Ro = Sensor resistance in fresh air

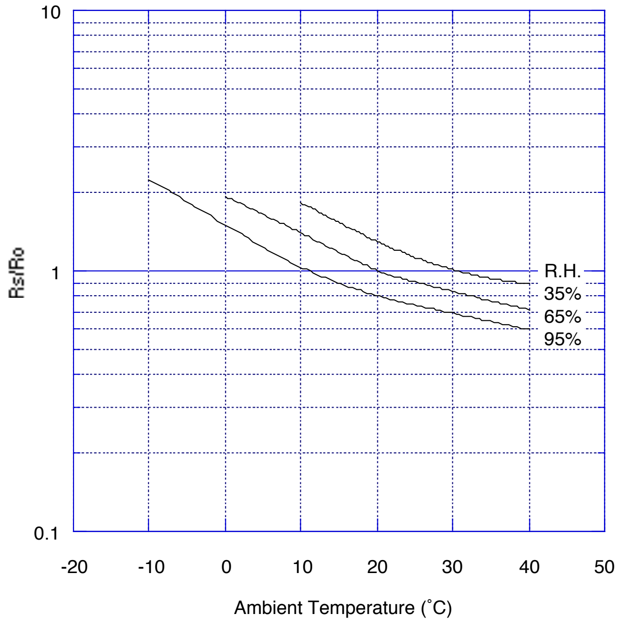
The figure below represents typical temperature and humidity dependency characteristics. Again, the Y-axis is indicated as sensor resistance ratio (Rs/Ro), defined as follows:

Rs = Sensor resistance in fresh air at various temperatures/humidities
Ro = Sensor resistance in fresh air at 20°C and 65% R.H.

Sensitivity Characteristics:



Temperature/Humidity Dependency:



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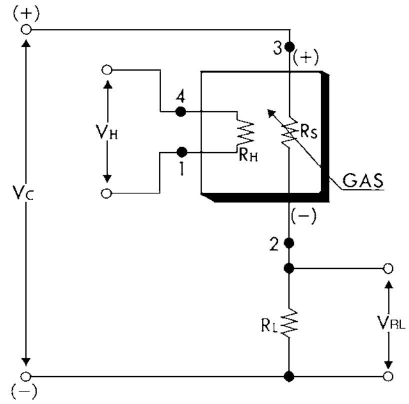
Basic Measuring Circuit:

The sensor requires two voltage inputs: heater voltage (V_H) and circuit voltage (V_C). The heater voltage (V_H) is applied to the integrated heater in order to maintain the sensing element at a specific temperature which is optimal for sensing. Circuit voltage (V_C) is applied to allow measurement of voltage (Vout) across a load resistor (R_L) which is connected in series with the sensor.

DC voltage is required for the circuit voltage since the sensor has a polarity. A common power supply circuit can be used for both V_C and V_H to fulfill the sensor's electrical requirements. The value of the load resistor (R_L) should be chosen to optimize the alarm threshold value, keeping power consumption (P_S) of the semiconductor below a limit of 15mW. Power consumption (P_S) will be highest when the value of Rs is equal to R_L on exposure to gas.



Specifications:

Model number			TGS 2600-B00	
Sensing element type			D1	
Standard package			TO-5 metal can	
Target gases			Air contaminants	
Typical detection range			1 ~ 30 ppm of H_2	
Standard circuit conditions	Heater voltage	V_H	5.0±0.2V DC/AC	
	Circuit voltage	V_C	5.0±0.2V DC	$P_S \leq$ 15mW
	Load resistance	R_L	Variable	0.45kΩ min.
Electrical characteristics under standard test conditions	Heater resistance	R_H	approx. 83Ω at room temp. (typical)	
	Heater current	I_H	42±4mA	
	Heater power consumption	P_H	210mW	V_H=5.0V DC
	Sensor resistance	Rs	10k~90kΩ in air	
	Sensitivity (change ratio of Rs)		0.3~0.6	Rs (10ppm of H_2) / Rs (air)
Standard test conditions	Test gas conditions		normal air at 20±2°C, 65±5%RH	
	Circuit conditions		V_C = 5.0±0.01V DC V_H = 5.0±0.05V DC	
	Conditioning period before test		7 days	

The value of power consumption (P_S) can be calculated by utilizing the following formula:

$$P_S = \frac{(V_C - Vout)^2}{R_S}$$

Sensor resistance (Rs) is calculated with a measured value of Vout by using the following formula:

$$R_S = \frac{V_C \times R_L}{Vout} - R_L$$

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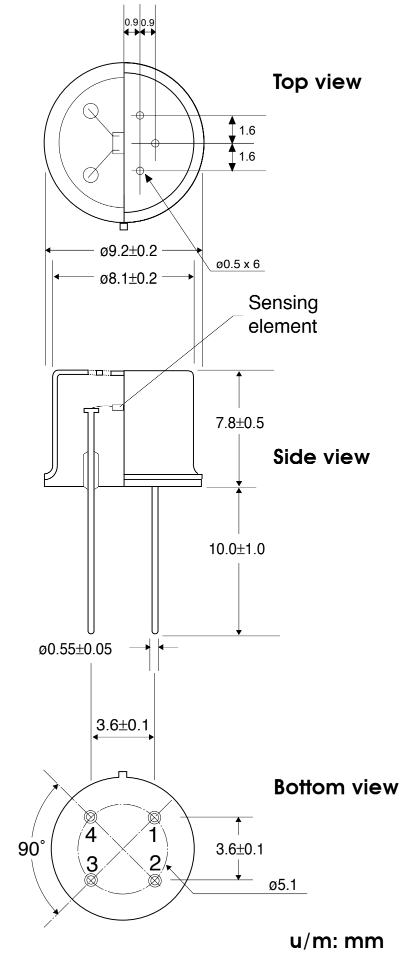
Structure and Dimensions:



Pin connection:
1: Heater
2: Sensor electrode (-)
3: Sensor electrode (+)
4: Heater

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REV: 01/05

FIGARO

PRODUCT INFORMATION

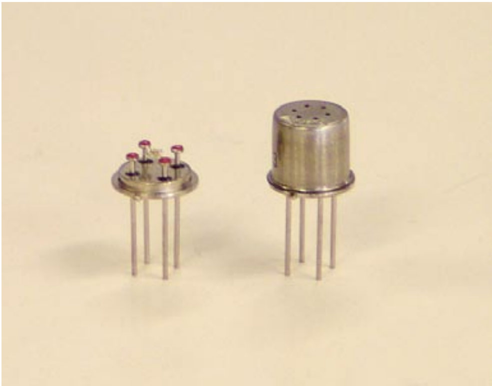
TGS 2602 - for the detection of Air Contaminants

Features:

* High sensitivity to VOCs and odorous gases
* Low power consumption
* High sensitivity to gaseous air contaminants
* Long life
* Uses simple electrical circuit
* Small size

Applications:

* Air cleaners
* Ventilation control
* Air quality monitors
* VOC monitors
* Odor monitors



The sensing element is comprised of a metal oxide semiconductor layer formed on the alumina substrate of a sensing chip together with an integrated heater. In the presence of detectable gas, sensor conductivity increases depending on 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 2602** has high sensitivity to low concentrations of odorous gases such as ammonia and H_2S generated from waste materials in office and home environments. The sensor also has high sensitivity to low concentrations of VOCs such as toluene emitted from wood finishing and construction products. Figaro also offers a microprocessor (FIC02667) which contains special software for handling the sensor's signal for appliance control applications.

Due to miniaturization of the sensing chip, TGS 2602 requires a heater current of only 42mA and the device is housed in a standard TO-5 package.

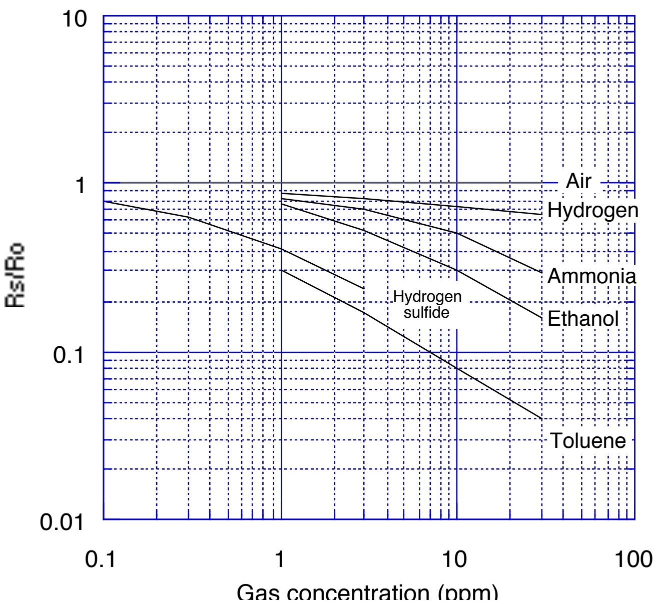
The figure below represents typical sensitivity characteristics, all data having been gathered at standard test conditions (see reverse side of this sheet). The Y-axis is indicated as sensor resistance ratio (Rs/Ro) which is defined as follows:

Rs = Sensor resistance in displayed gases at various concentrations
Ro = Sensor resistance in fresh air

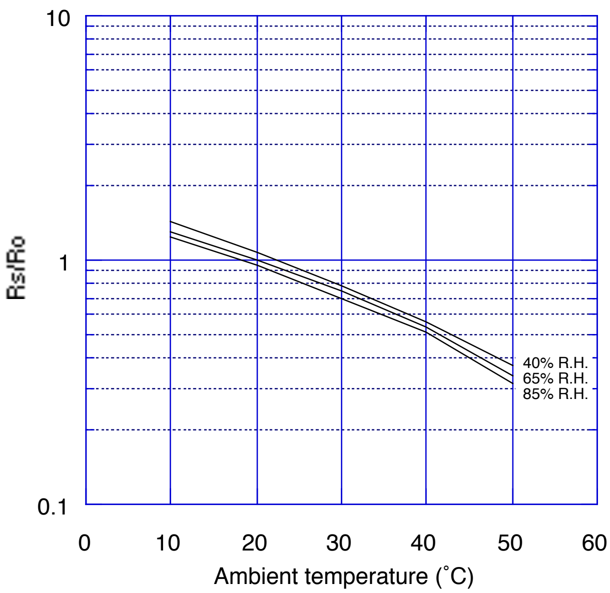
The figure below represents typical temperature and humidity dependency characteristics. Again, the Y-axis is indicated as sensor resistance ratio (Rs/Ro), defined as follows:

Rs = Sensor resistance in fresh air at various temperatures/humidities
Ro = Sensor resistance in fresh air at 20°C and 65% R.H.

Sensitivity Characteristics:



Temperature/Humidity Dependency:



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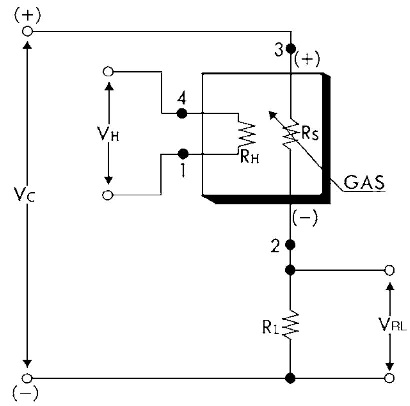
Basic Measuring Circuit:

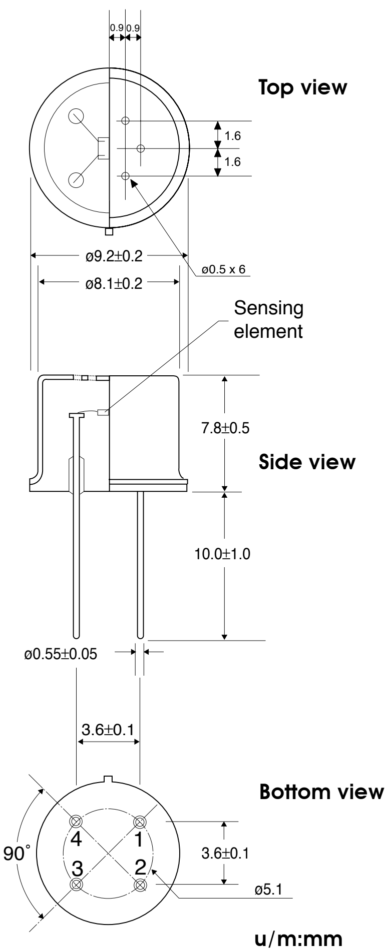
The sensor requires two voltage inputs: heater voltage (V_H) and circuit voltage (V_C). The heater voltage (V_H) is applied to the integrated heater in order to maintain the sensing element at a specific temperature which is optimal for sensing. Circuit voltage (V_C) is applied to allow measurement of voltage (Vout) across a load resistor (R_L) which is connected in series with the sensor. DC voltage is required for the circuit voltage since the sensor has a polarity. A common power supply circuit can be used for both V_C and V_H to fulfill the sensor's electrical requirements. The value of the load resistor (R_L) should be chosen to optimize the alarm threshold value, keeping power consumption (P_S) of the semiconductor below a limit of 15mW. Power consumption (P_S) will be highest when the value of Rs is equal to R_L on exposure to gas.



Specifications:

Model number			TGS 2602-B00	
Sensing element type			D1	
Standard package			TO-5 metal can	
Target gases			Air contaminants	
Typical detection range			1 ~ 30 ppm of EtOH	
Standard circuit conditions	Heater voltage	V_H	5.0±0.2V DC/AC	
	Circuit voltage	V_C	5.0±0.2V DC	Ps≤15mW
	Load resistance	R_L	Variable	0.45kΩ min.
Electrical characteristics under standard test conditions	Heater resistance	R_H	approx. 59Ω at room temp.	
	Heater current	I_H	56±5mA	
	Heater power consumption	P_H	280mW (typical)	
	Sensor resistance	Rs	10k~100kΩ in air	
	Sensitivity (change ratio of Rs)		0.15~0.5	Rs (10ppm of EtOH) / Rs (air)
Standard test conditions	Test gas conditions		normal air at 20±2°C, 65±5%RH	
	Circuit conditions		V_C = 5.0±0.01V DC V_H = 5.0±0.05V DC	
	Conditioning period before test		7 days	

Structure and Dimensions:



Pin connection:
1: Heater
2: Sensor electrode (-)
3: Sensor electrode (+)
4: Heater

The value of power consumption (P_S) can be calculated by utilizing the following formula:

$$P_S = \frac{(V_C - Vout)^2}{R_S}$$

Sensor resistance (Rs) is calculated with a measured value of Vout by using the following formula:

$$R_S = \frac{V_C \times R_L}{Vout} - R_L$$

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FIGARO

PRODUCT INFORMATION

TGS 2610 - for the detection of LP Gas

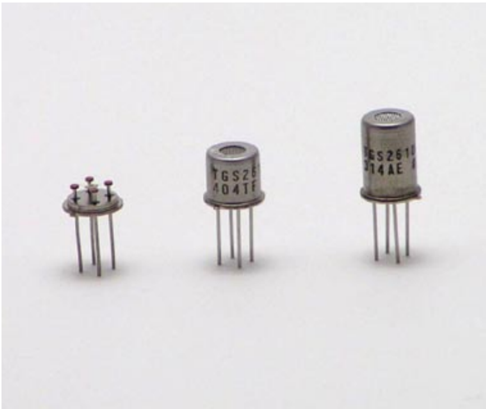
Features:

* Low power consumption
* High sensitivity to LP and its component gases (e.g. propane and butane)
* Long life and low cost
* Uses simple electrical circuit

Applications:

* Residential LP leak detectors and alarms
* Portable LP detectors
* LP gas and vapor detection

TGS2610 is a semiconductor type gas sensor which combines very high sensitivity to LP gas with low power consumption and long life. Due to miniaturization of its sensing chip, TGS2610 requires a heater current of only 56mA and the device is housed in a standard TO-5 package.



The TGS2610 is available in two different models which have different external housings but identical sensitivity to LP gas. Both models are able to satisfy the requirements of performance standards such as UL1484 and EN50194.

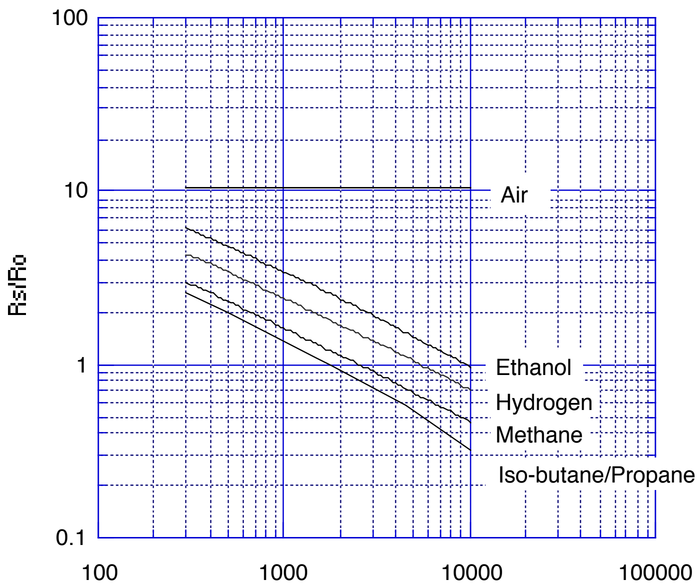
TGS2610-C00 possesses small size and quick gas response, making it suitable for gas leakage checkers.

TGS2610-D00 uses filter material in its housing which eliminates the influence of interference gases such as alcohol, resulting in highly selective response to LP gas. This feature makes the sensor ideal for residential gas leakage detectors which require durability and resistance against interference gas.

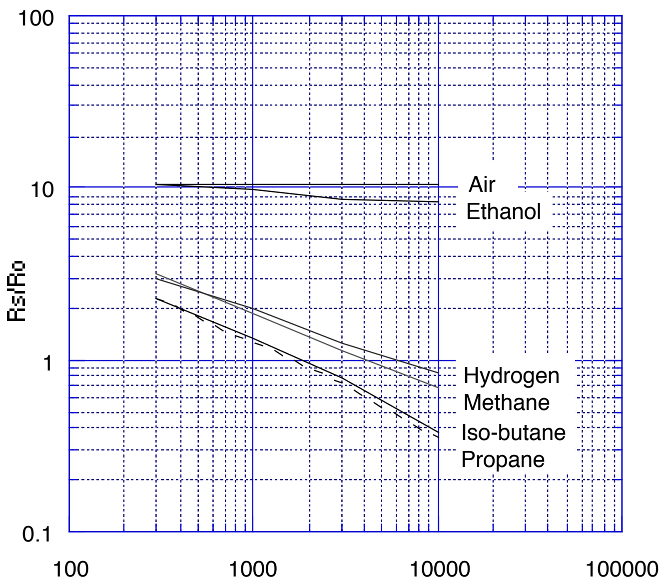
The figure below represents typical sensitivity characteristics, all data having been gathered at standard test conditions (see reverse side of this sheet). The Y-axis is indicated as sensor resistance ratio (Rs/Ro) which is defined as follows:

Rs = Sensor resistance in displayed gases at various concentrations
Ro = Sensor resistance in 1800ppm of iso-butane

TGS2610-C00 Sensitivity Characteristics:



TGS2610-D00 Sensitivity Characteristics:



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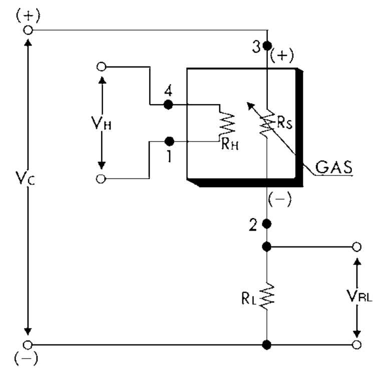
Basic Measuring Circuit:

The sensor requires two voltage inputs: heater voltage (V_H) and circuit voltage (V_C). The heater voltage (V_H) is applied to the integrated heater in order to maintain the sensing element at a specific temperature which is optimal for sensing. Circuit voltage (V_C) is applied to allow measurement of voltage (V_{RL}) across a load resistor (R_L) which is connected in series with the sensor.

A common power supply circuit can be used for both V_C and V_H to fulfill the sensor's electrical requirements. The value of the load resistor (R_L) should be chosen to optimize the alarm threshold value, keeping power dissipation (P_S) of the semiconductor below a limit of 15mW. Power dissipation (P_S) will be highest when the value of Rs is equal to R_L on exposure to gas.

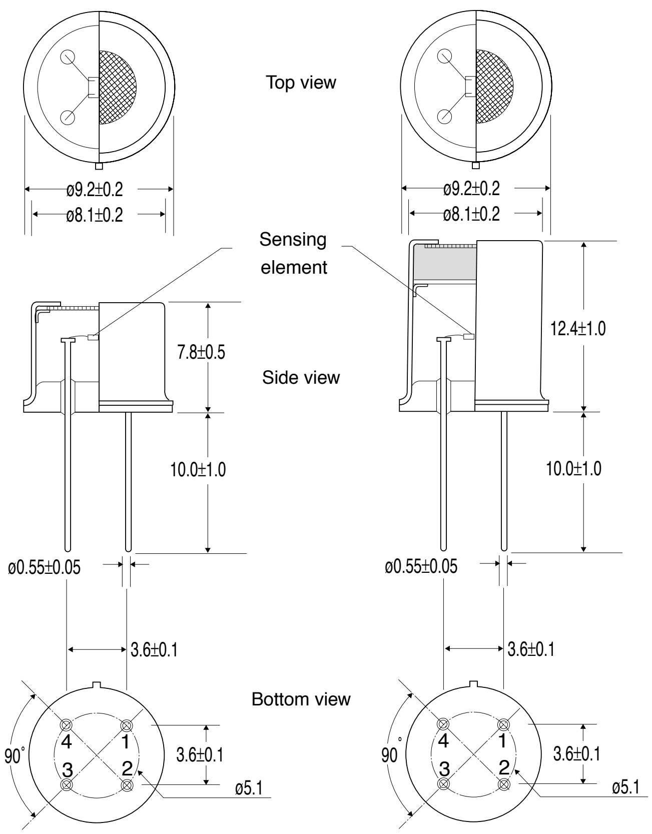


Specifications:

Model number			TGS 2610	
Sensing element type			D1	
Standard package			TO-5 metal can	
Target gases			Butane, LP gas	
Typical detection range			500 ~ 10,000 ppm	
Standard circuit conditions	Heater Voltage	V_H	5.0±0.2V DC/AC	
	Circuit voltage	V_C	5.0±0.2V DC/AC	Ps ≤ 15mW
	Load resistance	R_L	Variable	0.45kΩ min.
Electrical characteristics under standard test conditions	Heater resistance	R_H	approx. 59Ω at room temp.	
	Heater current	I_H	56 ± 5mA	
	Heater power consumption	P_H	280mW	V_H = 5.0V DC
	Sensor resistance	Rs	0.68~6.8kΩ in 1800ppm iso-butane	
	Sensitivity (change ratio of Rs)		0.56 ± 0.06	Rs (3000ppm) / Rs (1000ppm)
Standard test conditions	Test gas conditions		Iso-butane in air at 20±2°C, 65±5%RH	
	Circuit conditions		V_C = 5.0±0.01V DC V_H = 5.0±0.05V DC	
	Conditioning period before test		7 days	

Structure and Dimensions:

TGS2610-C00 **TGS2610-D00**



u/m:mm

Pin connection:
1: Heater
2: Sensor electrode (-)
3: Sensor electrode (+)
4: Heater

The value of power dissipation (P_S) can be calculated by utilizing the following formula:

$$P_S = \frac{(V_C - V_{RL})^2}{R_S}$$

Sensor resistance (Rs) is calculated with a measured value of V_{RL} by using the following formula:

$$R_S = \frac{V_C - V_{RL}}{V_{RL}} \times R_L$$

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TGS 2611 - for the detection of Methane

Features:

* Low power consumption
* High sensitivity to methane
* Long life and low cost
* Uses simple electrical circuit

Applications:

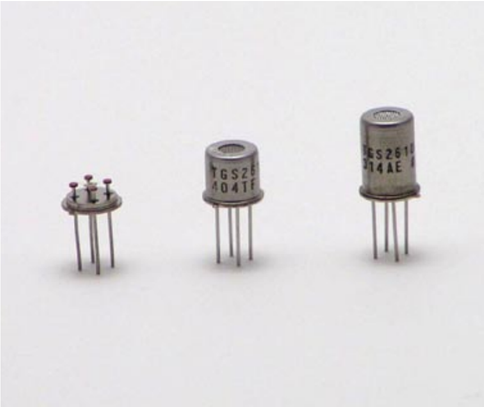
* Domestic gas alarms
* Portable gas detectors
* Gas leak detector for gas appliances

TGS2611 is a semiconductor type gas sensor which combines very high sensitivity to methane gas with low power consumption and long life. Due to miniaturization of its sensing chip, TGS2611 requires a heater current of only 56mA and the device is housed in a standard TO-5 package.

The TGS2611 is available in two different models which have different external housings but identical sensitivity to methane gas. Both models are able to satisfy the requirements of performance standards such as UL1484 and EN50194.

TGS2611-C00 possesses small size and quick gas response, making it suitable for gas leakage checkers.

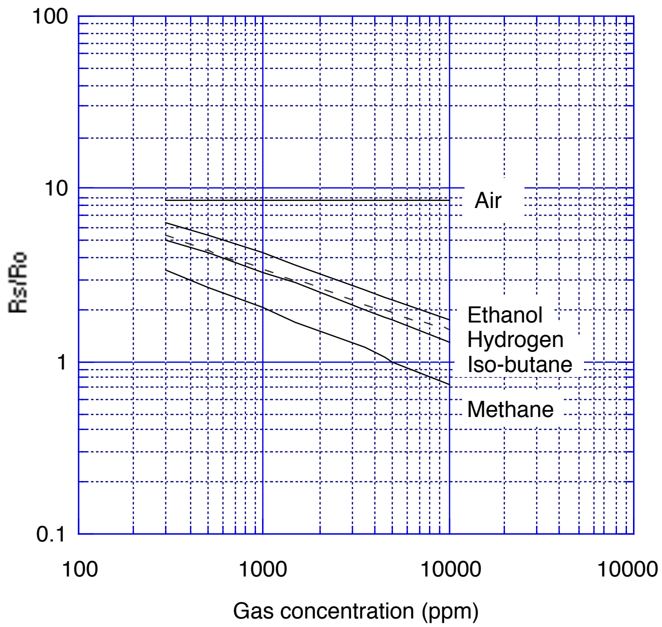
TGS2611-E00 uses filter material in its housing which eliminates the influence of interference gases such as alcohol, resulting in highly selective response to methane gas. This feature makes the sensor ideal for residential gas leakage detectors which require durability and resistance against interference gas.



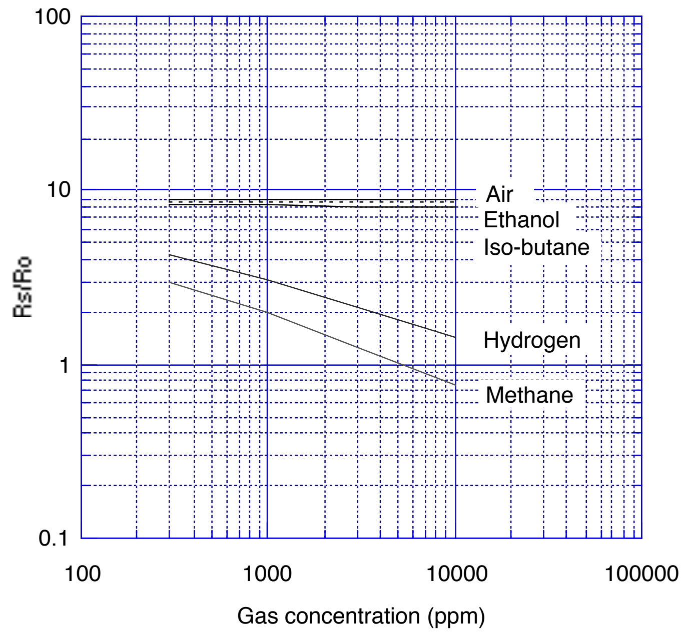
The figure below represents typical sensitivity characteristics, all data having been gathered at standard test conditions (see reverse side of this sheet). The Y-axis is indicated as sensor resistance ratio (Rs/Ro) which is defined as follows:

Rs = Sensor resistance in displayed gases at various concentrations
Ro = Sensor resistance in 5000ppm of methane

TGS2611-C00 Sensitivity Characteristics:



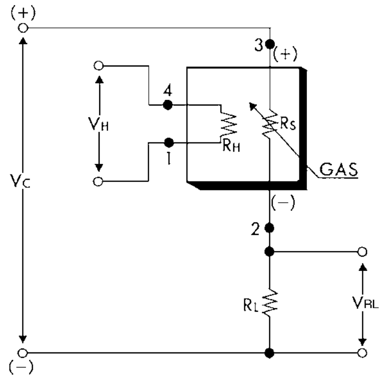
TGS2611-E00 Sensitivity Characteristics:



Basic Measuring Circuit:

The sensor requires two voltage inputs: heater voltage (V_H) and circuit voltage (V_C). The heater voltage (V_H) is applied to the integrated heater in order to maintain the sensing element at a specific temperature which is optimal for sensing. Circuit voltage (V_C) is applied to allow measurement of voltage (V_{RL}) across a load resistor (R_L) which is connected in series with the sensor.

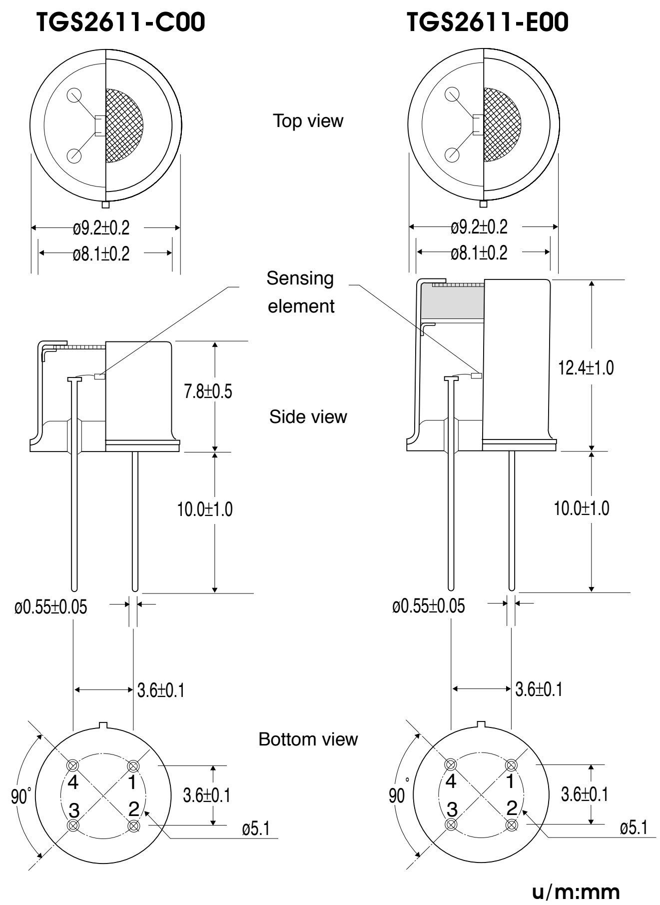
A common power supply circuit can be used for both V_C and V_H to fulfill the sensor's electrical requirements. The value of the load resistor (R_L) should be chosen to optimize the alarm threshold value, keeping power dissipation (P_S) of the semiconductor below a limit of 15mW. Power dissipation (P_S) will be highest when the value of Rs is equal to R_L on exposure to gas.



Specifications:

Model number			TGS 2611	
Sensing element type			D1	
Standard package			TO-5 metal can	
Target gases			Methane, Natural Gas	
Typical detection range			500 ~ 10,000 ppm	
Standard circuit conditions	Heater Voltage	V_H	5.0±0.2V DC/AC	
	Circuit voltage	V_C	5.0±0.2V DC	Ps ≤ 15mW
	Load resistance	R_L	Variable	0.45kΩ min.
Electrical characteristics under standard test conditions	Heater resistance	R_H	59Ω at room temp. (typical)	
	Heater current	I_H	56 ± 5mA	
	Heater power consumption	P_H	280±25mW	
	Sensor resistance	Rs	0.68~6.8 kΩ in 5000ppm methane	
	Sensitivity (change ratio of Rs)		0.60 ± 0.06	$\frac{Rs\ (9000ppm)}{Rs\ (3000ppm)}$
Standard test conditions	Test gas conditions		Methane in air at 20±2°C, 65±5%RH	
	Circuit conditions		V_C = 5.0±0.01V DC V_H = 5.0±0.05V DC	
	Conditioning period before test		7 days	

Structure and Dimensions:



Pin connection:
1: Heater
2: Sensor electrode (-)
3: Sensor electrode (+)
4: Heater

The value of power dissipation (P_S) can be calculated by utilizing the following formula:

$$P_S = \frac{(V_C - V_{RL})^2}{R_S}$$

Sensor resistance (Rs) is calculated with a measured value of V_{RL} by using the following formula:

$$R_S = \frac{V_C - V_{RL}}{V_{RL}} \times R_L$$

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FIGARO

PRODUCT INFORMATION

TGS 2620 - for the detection of Solvent Vapors

Features:

* Low power consumption
* High sensitivity to alcohol and organic solvent vapors
* Long life and low cost
* Uses simple electrical circuit

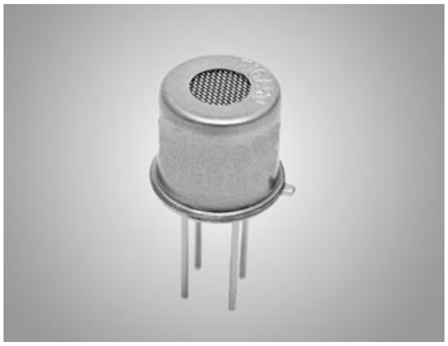
Applications:

* Alcohol testers
* Organic vapor detectors/alarms
* Solvent detectors for factories, dry cleaners, and semiconductor industries

The sensing element is comprised of a metal oxide semiconductor layer formed on an alumina substrate of a sensing chip together with an integrated heater. 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 2620** 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.

Due to miniaturization of the sensing chip, TGS 2620 requires a heater current of only 42mA and the device is housed in a standard TO-5 package.



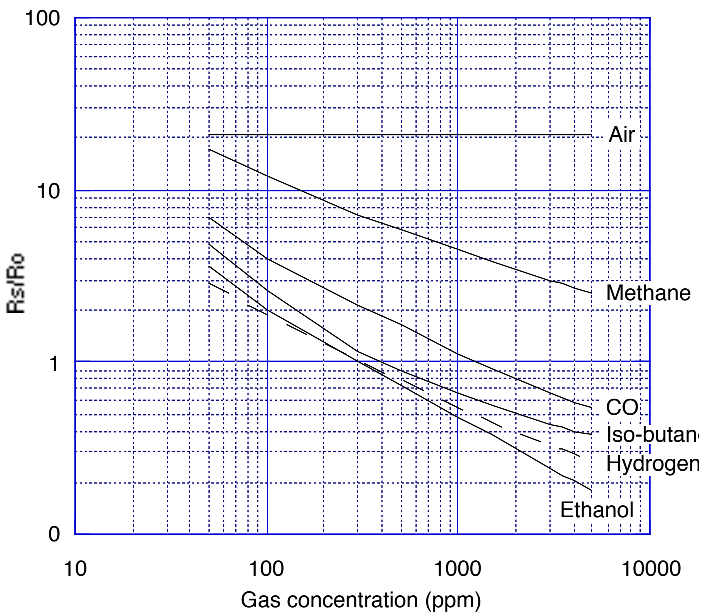
The figure below represents typical sensitivity characteristics, all data having been gathered at standard test conditions (see reverse side of this sheet). The Y-axis is indicated as sensor resistance ratio (Rs/Ro) which is defined as follows:

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

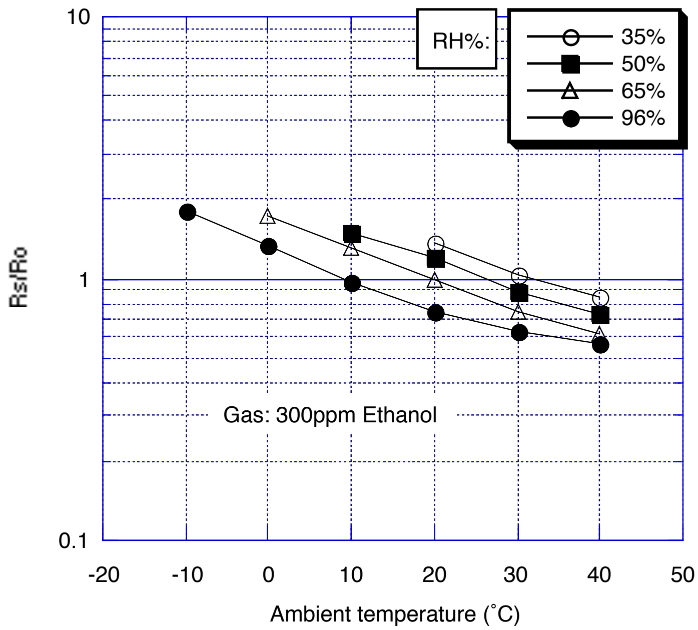
The figure below represents typical temperature and humidity dependency characteristics. Again, the Y-axis is indicated as sensor resistance ratio (Rs/Ro), defined as follows:

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

Sensitivity Characteristics:



Temperature/Humidity Dependency:



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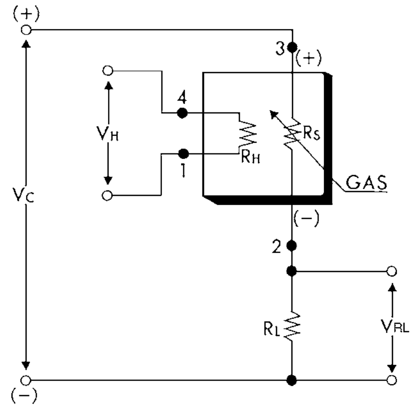
Basic Measuring Circuit:

The sensor requires two voltage inputs: heater voltage (V_H) and circuit voltage (V_C). The heater voltage (V_H) is applied to the integrated heater in order to maintain the sensing element at a specific temperature which is optimal for sensing. Circuit voltage (V_C) is applied to allow measurement of voltage (V_{RL}) across a load resistor (R_L) which is connected in series with the sensor.

A common power supply circuit can be used for both V_C and V_H to fulfill the sensor's electrical requirements. The value of the load resistor (R_L) should be chosen to optimize the alarm threshold value, keeping power consumption (P_S) of the semiconductor below a limit of 15mW. Power consumption (P_S) will be highest when the value of Rs is equal to R_L on exposure to gas.



Specifications:

Model number			TGS 2620-C00	
Sensing element type			D1	
Standard package			TO-5 metal can	
Target gases			Alcohol, Solvent vapors	
Typical detection range			50 ~ 5,000 ppm	
Standard circuit conditions	Heater Voltage	V_H	5.0±0.2V DC/AC	
	Circuit voltage	V_C	5.0±0.2V DC/AC	Ps ≤ 15mW
	Load resistance	R_L	Variable	0.45kΩ min.
Electrical characteristics under standard test conditions	Heater resistance	R_H	83Ω at room temp. (typical)	
	Heater current	I_H	42 ± 4mA	
	Heater power consumption	P_H	approx. 210mW	
	Sensor resistance	Rs	1 ~ 5 kΩ in 300ppm ethanol	
	Sensitivity (change ratio of Rs)		0.3 ~ 0.5	Rs (300ppm) / Rs (50ppm)
Standard test conditions	Test gas conditions		Ethanol vapor in air at 20±2˚C, 65±5%RH	
	Circuit conditions		V_C = 5.0±0.01V DC V_H = 5.0±0.05V DC	
	Conditioning period before test		7 days	

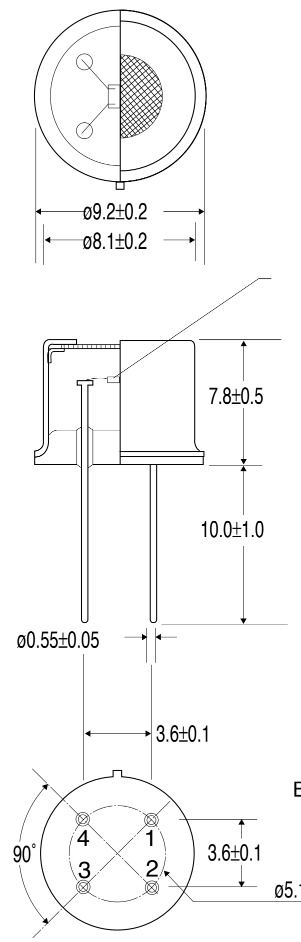
The value of power dissipation (P_S) can be calculated by utilizing the following formula:

$$P_S = \frac{(V_C - V_{RL})^2}{R_S}$$

Sensor resistance (Rs) is calculated with a measured value of V_{RL} by using the following formula:

$$R_S = \frac{V_C - V_{RL}}{V_{RL}} \times R_L$$

Structure and Dimensions:



u/m: mm

Pin connection:
1: Heater
2: Sensor electrode (-)
3: Sensor electrode (+)
4: Heater

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FIGARO

PRODUCT INFORMATION

TGS 3870 - for the detection of both Methane and Carbon Monoxide

Features:

* Miniature size and low power consumption
* High sensitivity and selectivity to both methane and carbon monoxide (CO)
* Low sensitivity to alcohol vapor
* Long life and low cost

Applications:

* Combination methane and carbon monoxide detectors

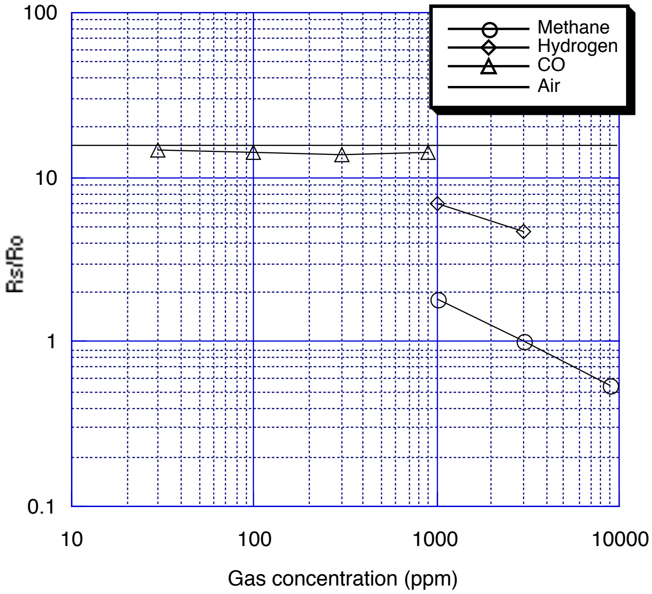
TGS 3870 is Figaro's new metal oxide semiconductor gas sensor for the detection of both methane and carbon monoxide. Using a micro-bead gas sensing structure, both methane and carbon monoxide can be detected with a single sensor element by periodic application of two different heater voltages (high and low). Miniaturization of the gas sensing bead results in a heater power consumption of only 38mW (average).

TGS 3870 has low sensitivity to alcohol vapors (a typical interference gas in the residential environment) and has high durability, making the sensor ideal for consumer market gas alarms.

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 in displayed gases at various concentrations
Ro = Sensor resistance in 3000ppm of methane

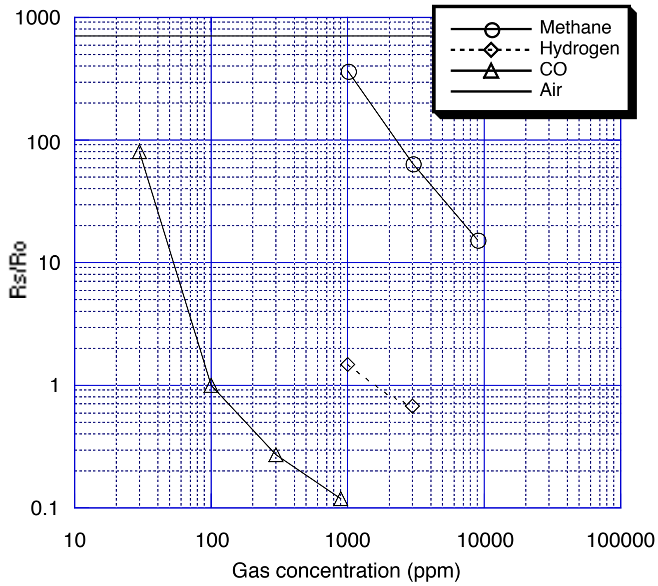
Sensitivity Characteristics (methane):



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 in displayed gases at various concentrations
Ro = Sensor resistance in 100ppm of CO

Sensitivity Characteristics (CO):



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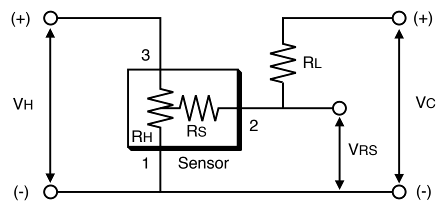
Basic Measuring Circuit:

The sensor requires two voltage inputs: heater voltage (V_H) and circuit voltage (V_C). The sensor has three pins: Pin #3--heater (+), Pin #2--sensor electrode (+), and Pin #1--common (-). To maintain the sensing element at specific temperatures which are optimal for sensing two different gases, heater voltages of 0.9V and 0.2V are alternately applied between pins #1 and #3 during a 20 second heating cycle.

Circuit voltage (V_C) is applied between both ends of the sensor (Rs) and a load resistor (R_L), which are connected in series, to allow measurement of voltage (V_{RS}).
Circuit voltage (Vc) should be applied only at the moment when the signal is taken from the sensor.
Please refer to the document "Technical Information for TGS3870" for details regarding the timing and application of Vc and V_H.



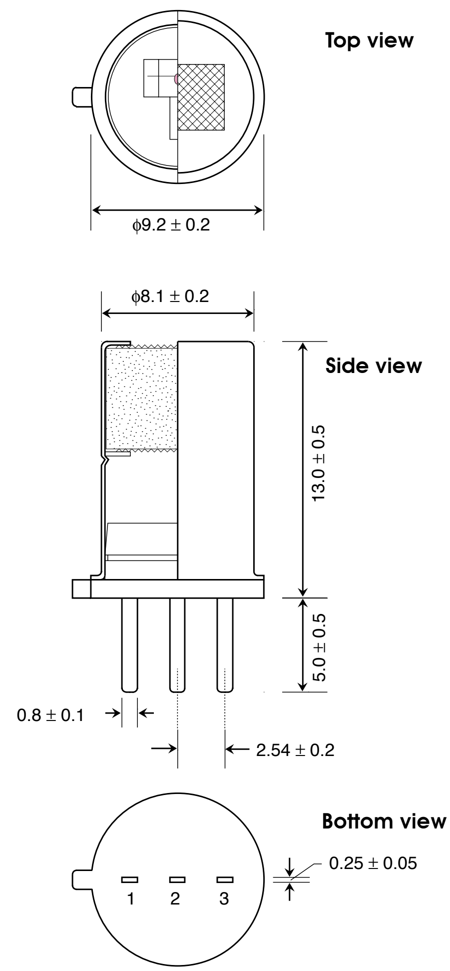
Basic measuring circuit

Caution: Do not apply a constant circuit voltage (5.0V) or the sensor would not exhibit its specified characteristics.

Specifications:

Model number			TGS 3870	
Sensing element type			Micro-bead	
Standard package			Plastic base and metal can	
Target gases			Methane and Carbon Monoxide	
Typical detection range			Methane - 500~12500 ppm Carbon monoxide - 50~1000ppm	
Standard circuit conditions	Heater Voltage	V_H	V_{HH} = 0.9V±3%, 5 sec. V_{HL} = 0.2V±3%, 15 sec.	
	Circuit voltage	V_C	5.0±0.2V DC pulse *(refer to Technical Information for TGS3870)*	
	Load resistance	R_L	Variable (>0.75kΩ)	
Electrical characteristics under standard test conditions	Heater resistance	R_H	3±0.3Ω at room temp.	
	Heater power consumption	P_H	120mW	V_{HH} = 0.9V DC
			11mW	V_{HL} = 0.2V DC
			38mW	average
	Sensor resistance	Rs	0.35~3.5kΩ in 3000ppm methane	
			1.8~24kΩ in 150ppm CO	
	Sensitivity (Change ratio of Rs)	β	0.50~0.65	Rs CH_4 3000ppm / Rs CH_4 1000ppm
			0.1~0.6	Rs CO 300ppm / Rs CO 150ppm
Standard test conditions	Test gas conditions		Target gas in air at 20±2°C, 65±5%RH	
	Circuit conditions		V_{HH} = 0.9V±2%V, 5 sec. V_{HL} = 0.2V±2%V, 15 sec. Vc = 5.0±0.02V DC pulse *(refer to Technical Information for TGS3870)*	
	Conditioning period before test		≥5 days	

Structure and Dimensions:



unit:mm

Pin connection:
1: Common(-)
2: Sensor electrode(+)
3: Heater(+)

The value of power dissipation (Ps) can be calculated by utilizing the following formula:

$$P_S = \frac{(V_{RS})^2}{R_S}$$

Sensor resistance (Rs) is calculated with a measured value of V_{RS} by using the following formula:

$$R_S = \frac{(V_{RS} - 0.5V_H)}{(V_C - V_{RS})} \times R_L$$

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REV: 12/05

FIGARO

PRODUCT INFORMATION

TGS 4160 - for the detection of Carbon Dioxide

Features:

* High selectivity to CO_2
* Low dependency on humidity
* Long life

Applications:

* Air quality control
* CO_2 control in agricultural applications
* CO_2 monitoring

The **TGS4160** is a hybrid sensor unit composed of a carbon dioxide sensitive element and a thermistor. A wide range of 350~50,000ppm of carbon dioxide can be detected by TGS4160, making it ideal for usage in a variety of applications.

The CO_2 sensitive element consists of a solid electrolyte formed between two electrodes, together with a printed heater (Pt) substrate. By monitoring the change in electromotive force (EMF) generated between the two electrodes, it is possible to measure CO_2 gas concentration.

Adsorbent (zeolite) is filled between the internal cover and the outer cover for the purpose of reducing the influence of interference gases.

TGS4160 exhibits a linear relationship between ΔEMF and CO_2 gas concentration on a logarithmic scale. The sensor displays good long term stability and shows excellent durability against the effects of high humidity.

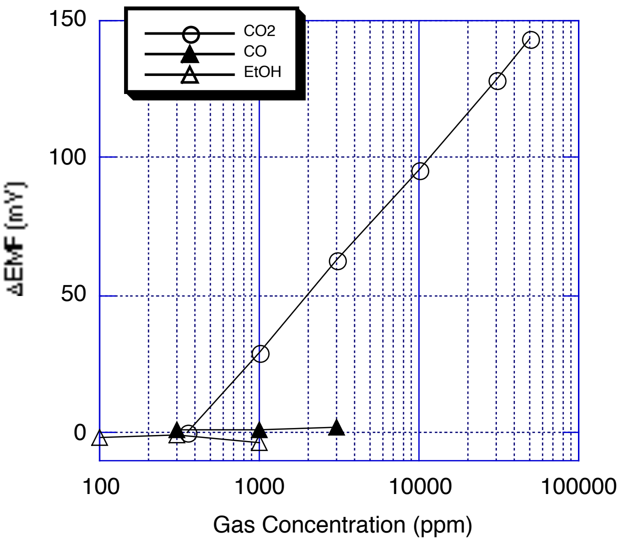
The figure below represents typical sensitivity characteristics of TGS4160. The Y-axis is indicated as ΔEMF which is defined as follows:

ΔEMF=EMF1 - EMF2
where
EMF1=EMF in 350 ppm CO_2
EMF2=EMF in listed gas concentration

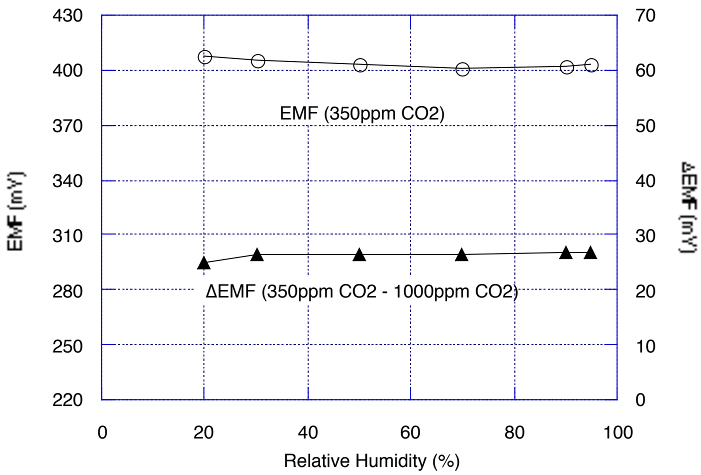
The figure below shows typical humidity dependency for an energized sensor. Again, the Y-axis is indicated as ΔEMF which is defined as follows:

ΔEMF=EMF1 - EMF2
where
EMF1=EMF in 350 ppm CO_2
EMF2=EMF in 1000ppm CO_2

Sensitivity Characteristics:



Humidity Dependency:



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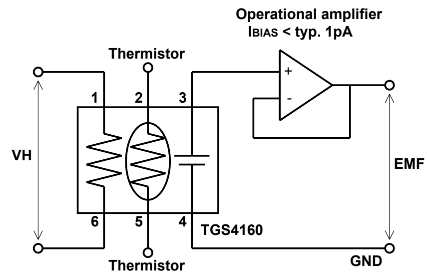
Basic Measuring Circuit:

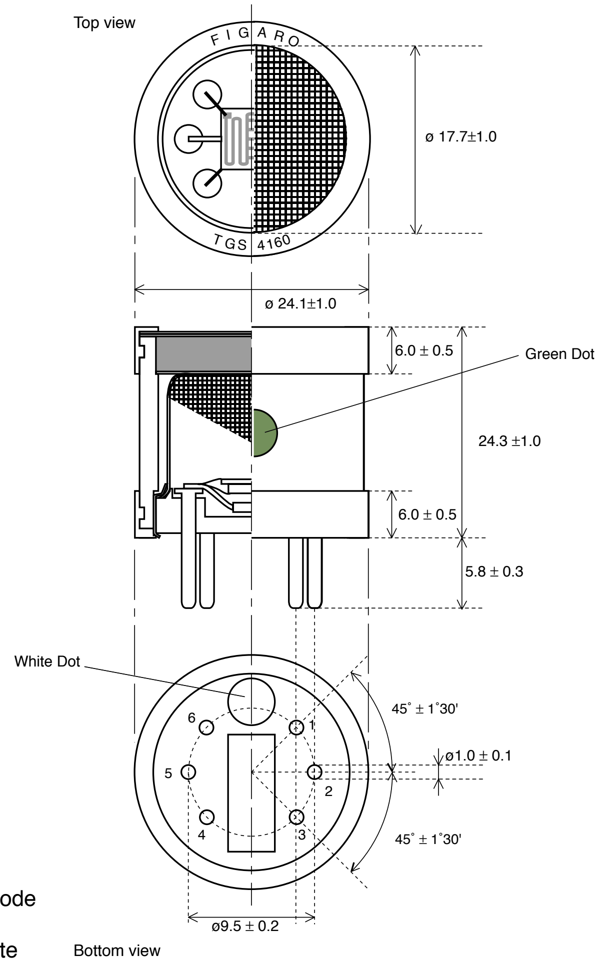
The TGS4160 sensor requires heater voltage (V_H) input. The heater voltage is applied to the integrated heater in order to maintain the sensing element at a specific temperature which is optimal for sensing. Electromotive force (EMF) of the sensor should be measured using a high impedance (> 100 GΩ) operational amplifier with bias current < 1pA (e.g. Texas Instruments' model #TLC271). Since the solid electrolyte type sensor functions as a kind of battery, the EMF value itself would drift using this basic measuring circuit. However, the change of EMF value (ΔEMF) shows a stable relationship with the change of CO_2 concentration. Therefore, in order to obtain an accurate measurement of CO_2, a special microprocessor for signal processing should be used with TGS4160. Figaro can provide a special evaluation sensor module (AM-4) for TGS4160.



Specifications:

Model number			TGS 4160
Sensing element type			Solid electrolyte
Target gases			Carbon dioxide
Typical detection range			350 ~ 50,000 ppm
Electrical characteristics under standard test conditions	Heater resistance	R_H	11.5 ± 1.1Ω at room temp.
	Heater current	I_H	approx. 250mA
	Heater power consumption	P_H	approx. 1.25W
	Heater voltage	V_H	5.0 ± 0.2V (DC)
	Electromotive force	EMF	220~490mv in 350ppm CO_2
	Sensitivity	ΔEMF	44~72mV / EMF 350ppm CO_2- EMF 3500ppm CO_2
Sensor characteristics	Response time		approx. 2 min. (to 90% of final value)
	Measurement accuracy		approx. ±20% at 1,000ppm CO_2
Operating conditions			-10~50˚C, 5~95%RH
Strorage conditions			-20~60˚C, 5~90%RH (store in moisture proof bag with silica gel)
Standard test conditions	Test gas conditions		CO_2 in air at 20±2˚C, 65±5%RH
	Circuit conditions		V_H = 5.0±0.05V DC
	Conditioning period before test		7 days

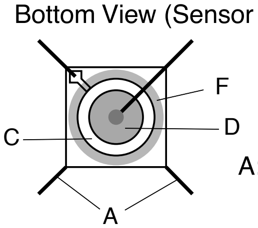
Structure and Dimensions:



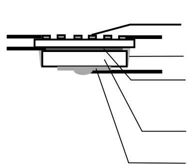
(u/m = mm)

Sensing Element Structure:

Bottom View (Sensor Element)



Side view (Sensor Element)



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TGS 4161 - for the detection of Carbon Dioxide

Features:

* High selectivity to CO_2
* Compact size
* Low dependency on humidity
* Long life and low cost
* Low power consumption

Applications:

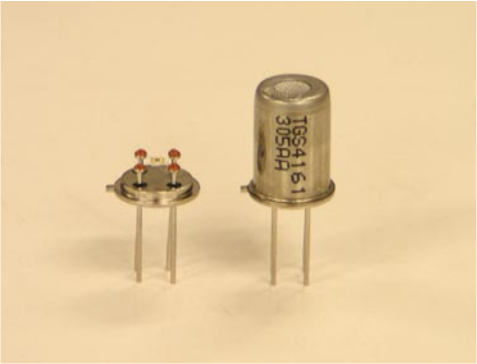
* Indoor air quality control
* CO_2 monitors

TGS4161 is a new solid electrolyte CO_2 sensor which offers miniaturization and low power consumption. A range of 350~10,000ppm of carbon dioxide can be detected by TGS4161, making it ideal for indoor air control applications.

The CO_2 sensitive element consists of a solid electrolyte formed between two electrodes, together with a printed heater (RuO_2) substrate. By monitoring the change in electromotive force (EMF) generated between the two electrodes, it is possible to measure CO_2 gas concentration.

The top of the sensor cap contains adsorbent (zeolite) for the purpose of reducing the influence of interference gases.

TGS4161 exhibits a linear relationship between ΔEMF and CO_2 gas concentration on a logarithmic scale. The sensor displays good long term stability and shows excellent durability against the effects of high humidity.



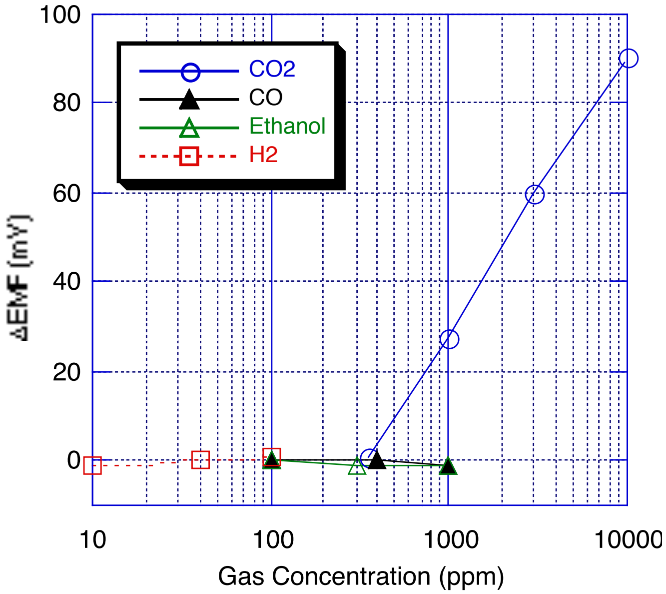
The figure below represents typical sensitivity characteristics of TGS4161. The Y-axis is indicated as ΔEMF which is defined as follows:

ΔEMF=EMF1 - EMF2
where
EMF1=EMF in 350 ppm CO_2
EMF2=EMF in listed gas concentration

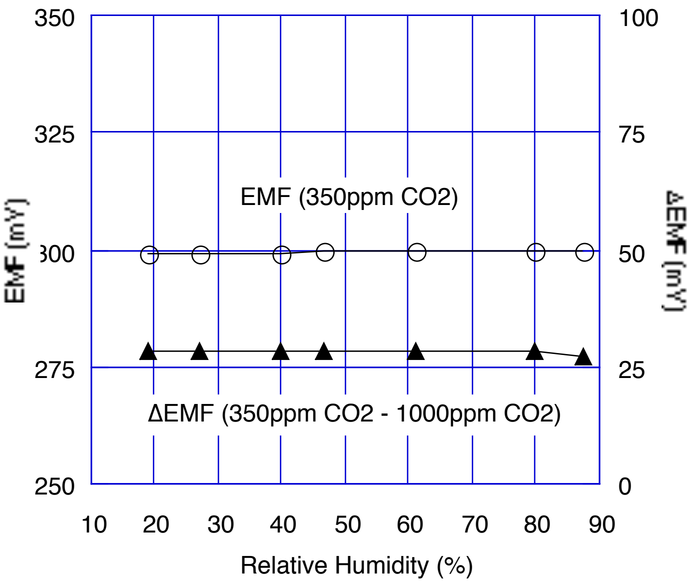
The figure below shows typical humidity dependency of TGS4161. Again, the Y-axis is indicated as ΔEMF which is defined as follows:

ΔEMF=EMF1 - EMF2
where
EMF1=EMF in 350 ppm CO_2
EMF2=EMF in 1000ppm CO_2

Sensitivity Characteristics:

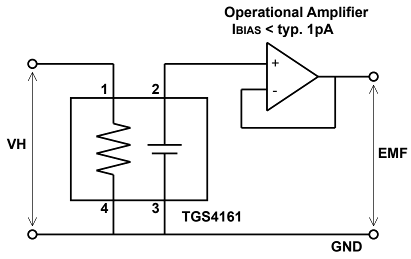


Humidity Dependency:



Basic Measuring Circuit:

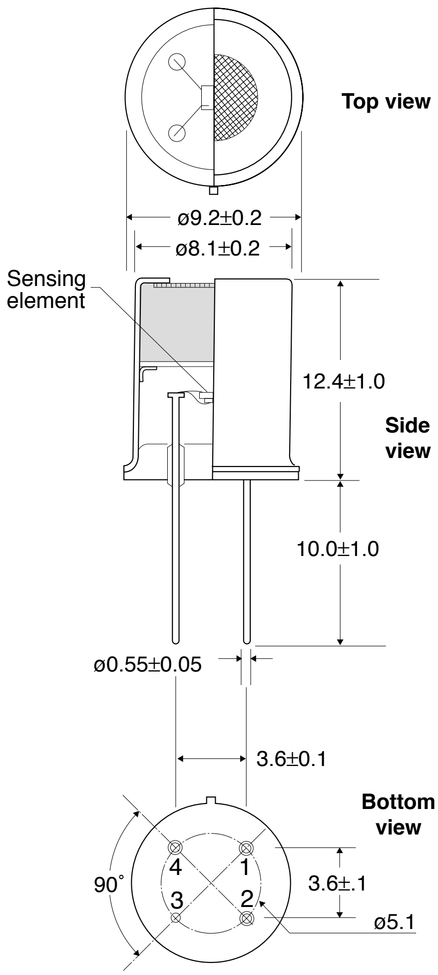
The TGS4161 sensor requires heater voltage (V_H) input. The heater voltage is applied to the integrated heater in order to maintain the sensing element at a specific temperature which is optimal for sensing. Electromotive force (EMF) of the sensor should be measured using a high impedance (>100 GΩ) operational amplifier with bias current < 1pA (e.g. Texas Instruments' model #TLC271). Since the solid electrolyte type sensor functions as a kind of battery, the EMF value itself would drift using this basic measuring circuit. However, the change of EMF value (ΔEMF) shows a stable relationship with the change of CO_2 concentration. Therefore, in order to obtain an accurate measurement of CO_2, a special microprocessor for signal processing should be used with TGS4161. Figaro can provide a special evaluation sensor module (AM-4-4161) for TGS4161.



Specifications:

Model number			TGS 4161	
Sensing element type			Solid electrolyte	
Target gases			Carbon dioxide	
Typical detection range			350 ~ 10,000 ppm	
Electrical characteristics	Heater resistance	R_H	70 ± 7Ω at room temp.	
	Heater current	I_H	approx. 50mA	
	Heater power consumption	P_H	approx. 250mW	
	Electromotive force	EMF	220~490mV in 350ppm CO_2	
	Sensitivity	ΔEMF	44~72mV	EMF(350ppm CO_2)-EMF(3500ppm CO_2)
	Heater voltage	V_H	5.0 ± 0.2V (DC)	
Sensor characteristics	Response time		approx. 1.5 min. (to 90% of final ΔEMF value)	
	Measurement accuracy		approx. ±20% at 1,000ppm CO_2	
Operating conditions			-10~50˚C, 5~95%RH	
Strorage conditions			-20~60˚C, 5~90%RH (store in moisture proof bag with silica gel)	
Standard test conditions	Test gas condition		CO_2 in air at 20±2˚C, 65±5%RH	
	Circuit condition		V_H = 5.0±0.05V DC	
	Conditioning period before test		12 hours or longer	

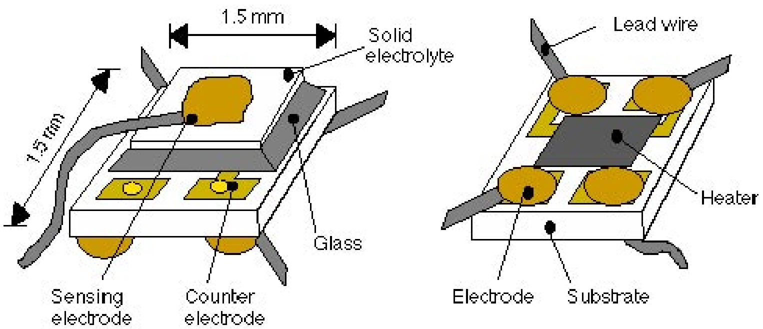
Structure and Dimensions:



u/m = mm

Pin Connection:
1. Heater (+)
2. Counter electrode (+)
3. Sensing electrode (-)
4. Heater (-)

Sensing Element Structure:



Solid electrolyte side

Heater side

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FIGARO

PRODUCT INFORMATION

TGS 5042 - for the detection of Carbon Monoxide

Features:

* Battery operable
* High repeatability/selectivity to CO
* Linear relationship between CO gas concentration and sensor output
* Simple calibration
* Long life
* UL recognized component
* Meets UL2034, EN50291, and RoHS requirements

Applications:

* Residential and commercial CO detectors
* CO monitors for industrial applications
* Ventilation control for indoor parking garages
* Recreational vehicle CO detectors
* Marine CO detectors
* Fire detection

Figaro's **TGS5042** is a battery operable electrochemical sensor which offer several advantages over traditional electrochemical sensors. Its electrolyte is environmentally friendly, it poses no risk of electrolyte leakage, can detect concentrations as high as 1% CO, operates in a range from -40˚ and +70˚C, and it has lower sensitivity to interferant gases. With a long life, good long term stability, and high accuracy, this sensor is the ideal choice for CO detectors with digital display. OEM customers will find individual sensors data printed on each sensor in bar code from, enabling users to skip the costly gas calibration process and allowing for individual sensor tracking. TGS5042 utilizes a standard AA battery-sized package.

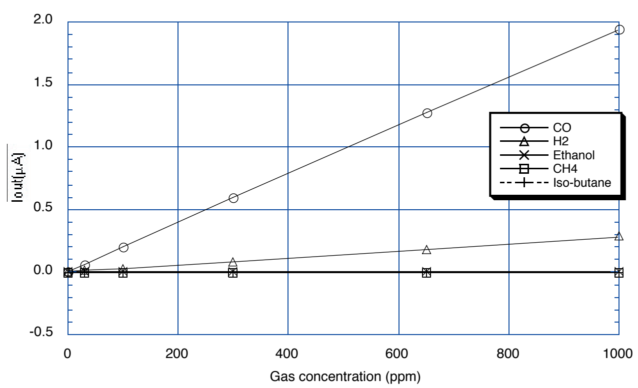
The figure below represents typical sensitivity characteristics, all data having been gathered at standard test conditions (see reverse side of this sheet). The Y-axis shows theoutput current of the sensor (Iout/μA) in each gas. Output current is linear to CO concentration, with a deviation of less than ±5% in the range of 0~500ppm.

The figure below represents typical temperature dependency characteristics. The Y-axis shows the sensor output ratio (I/Io) as defined below. The linear relationship between I/Io and CO concentration is constant regardless of the CO concentration range.

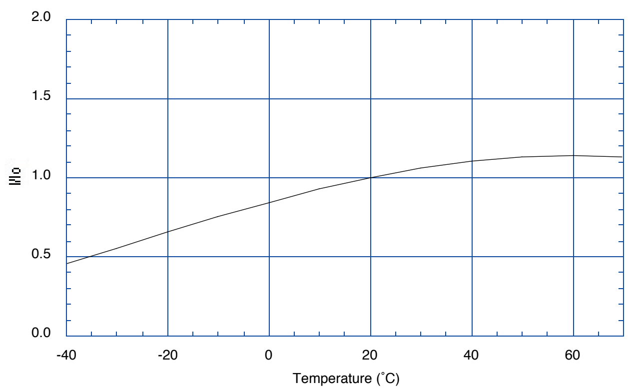
I = Sensor output current in 400ppm of CO at various temperatures

Io = Sensor output current in 400ppm at 20˚C/50%RH

Sensitivity Characteristics:



Temperature Dependency:



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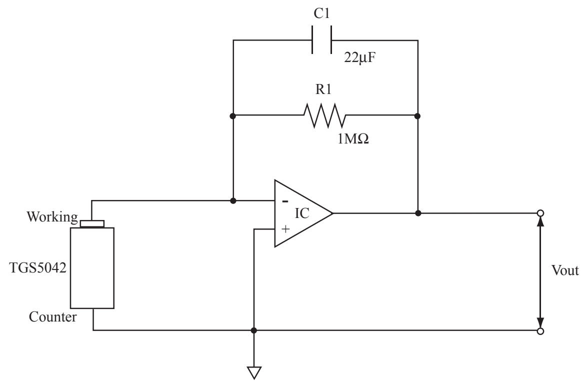
Basic Measuring Circuit:

The diagram at the right shows the basic measuring circuit of TGS5042. The sensor generates a minute electric current which is converted into sensor output voltage (Vout) by an op-amp/resistor (R1) combination.

Figaro recommends the following electrical parts:

R1 : 1MΩ
C1 : 22μF
IC : AD708

NOTE: When voltage is applied to the sensor output terminal, the sensor may be damaged. Voltage applied to the sensor should be strictly limited to less than ±10mV. An additional resistor or FET is required to prevent polarization of the sensor when Vc is off.



Basic measuring circuit of TGS5042

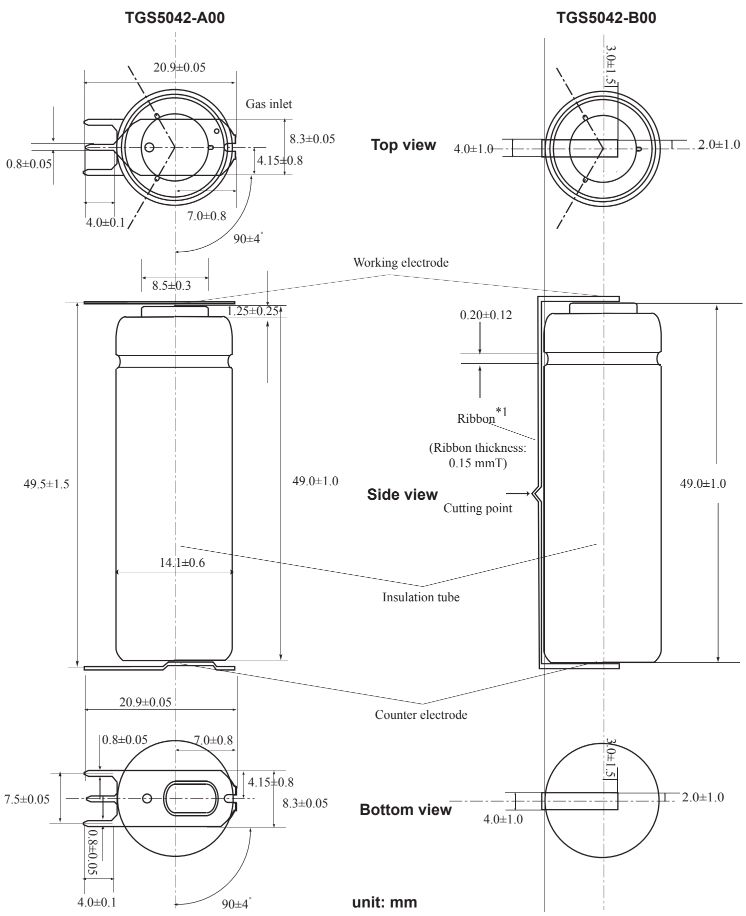
Specifications:

Item	Specification
Model number	TGS 5042-A00 (pin version) TGS5042-B00 (ribbon version)
Target gases	Carbon monoxide
Typical detection range	0 ~ 10,000 ppm
Output current in CO	1.2~2.4nA/ppm
Baseline offset (*)	<±10ppm equivalent
Operating temperature	-10˚C ~ +60˚C (continuous) -40˚C ~ +70˚C (intermittent)
Operating humidity	5 ~ 99%RH (no condensation)
Response time (T90)	within 60 seconds
Storage conditions	-10˚C ~ +60˚C (continuous) -40˚C ~ +70˚C (intermittent)
Weight	approx. 12g
Standard test conditions	20±2˚C, 40±10%RH

(*) represents sensor output in air under operating conditions

__NOTE:__ When ordering, please be sure to specify the full model number, includng the suffix.

Structure and Dimensions:



NOTE 1: When the sensor is shipped, the working electrode and counter electrode are connected (i.e. short circuited) by a spring (-A00) or a metal ribbon (-B00) in order to avoid polarization of the electrodes. To measure the sensor outout, the spring should be removed (-A00) or the ribbon should be cut (-B00) and the sensor connected to a measuring circuit (*see example above*). The cutting point as indicated can be used to cut the ribbon easily.

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REV: 06/07

FIGARO

PRODUCT INFORMATION

TGS 6810 - for the detection of Methane and LP Gas

Features:

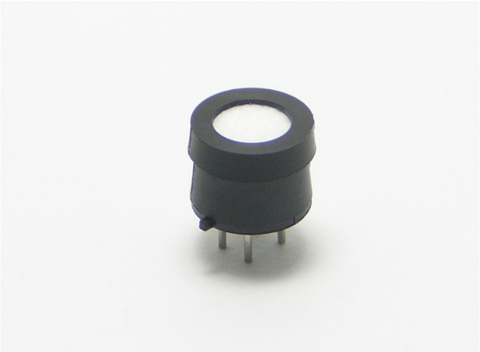
* Linear output
* Compact size
* Small sensitivity to alcohol
* Sensitive to both methane and LP gas
* Meets RoHS requirements

Applications:

* Residential LNG and LPG alarms
* Detectors for LNG and LPG

The **TGS6810** catalytic type gas sensor, which can detect both methane and LP gas, has been developed for residential gas detection. Combining Figaro's 35+ years of experience in catalyst materials technology with its advanced micro fabrication technology, Figaro can produce the most advanced compact catalytic sensors whose durability, stability, quick response, and linear output make them ideal for detecting many combustible gases.

As the sensor possesses an adsorbent inside its sensor cap, its cross sensitivity to alcohol is much smaller than traditional catalytic type sensors. In addition, TGS6810 is more durable against silicone compounds than tradit-ional catalytic type sensors.



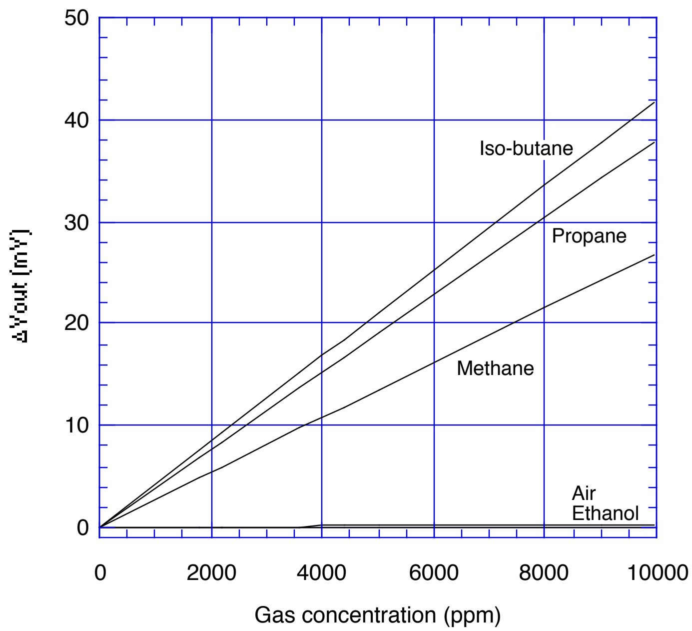
The figure below represents typical sensitivity characteristics, all data having been gathered at standard test conditions (see reverse side of this sheet). The Y-axis is indicated as sensor output sensitivity--ΔVout (mV):

ΔVout = Vout in gas - Vout in air

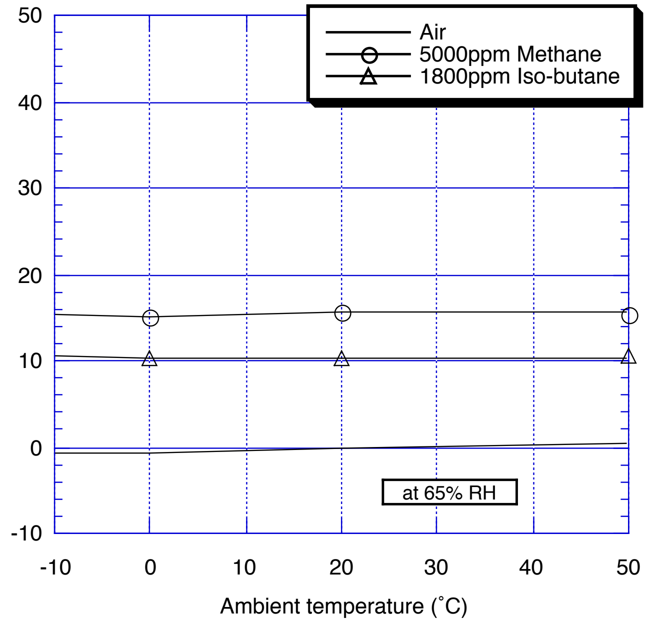
The figure below represents typical temperature dependency characteristics at 65%RH. Again, the Y-axis is indicated as sensor output sensitivity--˚Vout (mV):

ΔVout = Vout in gas - Vout in air

Sensitivity Characteristics:



Temperature Dependency:



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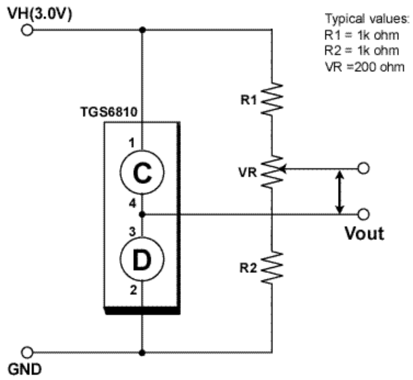
Basic Measuring Circuit:

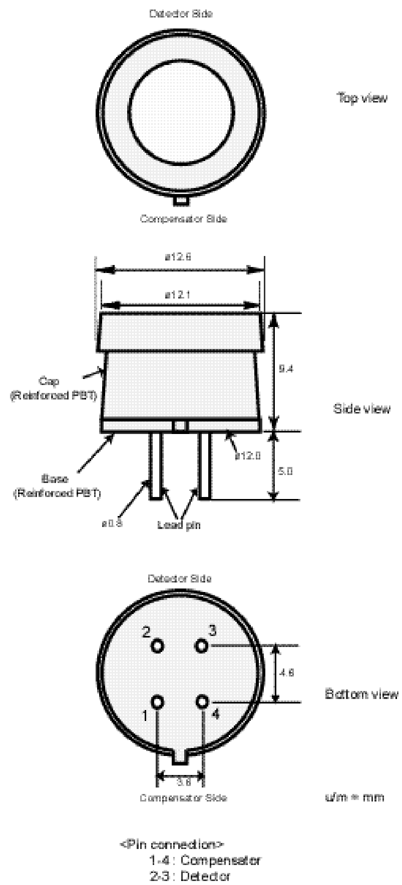
The TGS6810 is comprised of two elements: 1) element (D) which is sensitive to combustible gases and 2) a reference element (C) which is not sensitive to combustible gases. These elements are installed into a "Wheastone Bridge". A variable resistor should be adjusted so that the bridge will produce a stable baseline signal when in an environmnet free of combustible gases. When combustible gases are present, they will be combusted on the detecting element, causing its temperature to rise. Accordingly the resistance of this element will increase. This results in an "out-of-balance" signal across the bridge and a corresponding change in output voltage which can be measured.



Specifications

Model number			TGS 6810
Sensing element type			Catalytic
Target gases			Hydrogen, methane, iso-butane
Typical detection range			0~100%LEL of each gas
Standard circuit conditions	Operating Voltage		3.0±0.1V AC/DC
Electrical characteristics under standard test conditions	Heater current		175mA (typical)
	Heater power consumption		525mW (typical)
	Zero offset		±35mV
	Output sensitivity (ΔVout)	methane	12~18mV in 5000ppm
		iso-butane	7~11mV in 1800ppm
	Response time (90%)		≤15 sec.
Standard test conditions	Test gas conditions		Hydrogen/methane/iso-butane in air at 20±2°C, 65±5%RH
	Circuit conditions		3.0±0.05V AC/DC
	Conditioning period before test		≤30 sec.
Operating conditions			-10~+50°C, ≤99%RH (w/o dew condensation)
Storage conditions			-10~+60°C, ≤99%RH (w/o dew condensation)

Structure and Dimensions:



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TGS 6812 - for the detection of Hydrogen, Methane, and LP Gas

Features:

* Linear output
* Compact size
* Small sensitivity to alcohol
* Sensitive to hydrogen, methane, and LP gas
* Meets RoHS requirements

Applications:

* Hydrogen and combustible gas leak detectors for fuel cells

The **TGS6812** catalytic type gas sensor can detect levels of hydrogen up to 100%LEL. This sensor features high accuracy, good durability and stability, quick response, and linear output. This sensor can detect not only hydrogen, but also methane and LP gas, thus making it an excellent solution for monitoring gas leakage from staionary fuel cell systems which transform combustible gases into hydrogen.

As the sensor possesses an adsorbent inside its sensor cap, its cross sensitivity to alcohol is much smaller than traditional catalytic type sensors. In addition, TGS6812 is more durable against silicone compounds than tradit-ional catalytic type sensors.

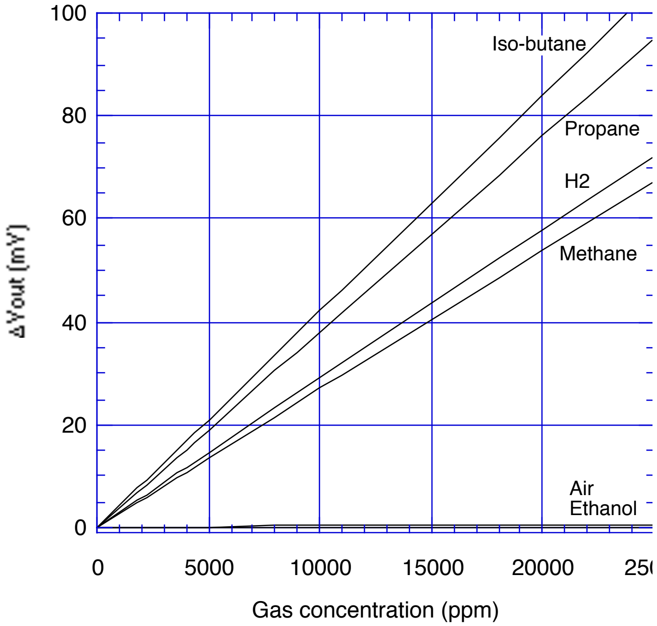
The figure below represents typical sensitivity characteristics, all data having been gathered at standard test conditions (see reverse side of this sheet). The Y-axis is indicated as sensor output sensitivity -- ΔVout (mV):

ΔVout = Vout in gas - Vout in air

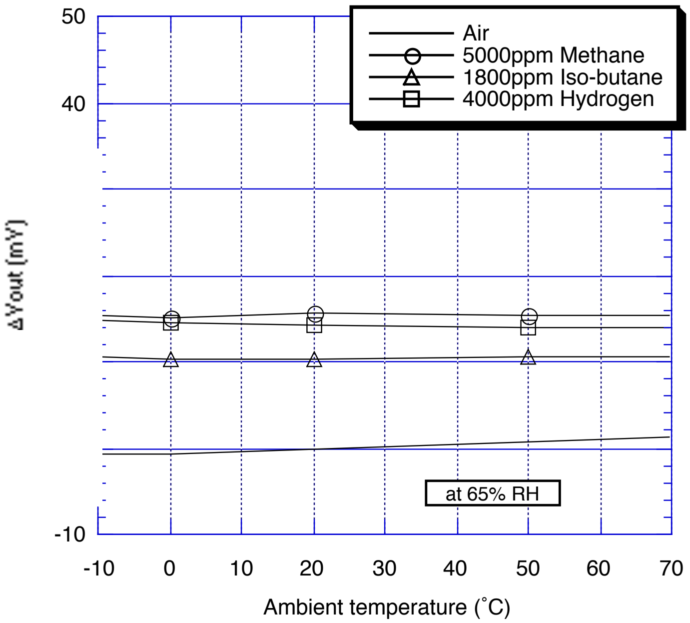
The figure below represents typical temperature dependency characteristics at 65%RH. Again, Y-axis is indicated as sensor output sensitivity -- ΔVout (mV):

ΔVout = Vout in gas - Vout in air at 20˚C

Sensitivity Characteristics:



Temperature Dependency:



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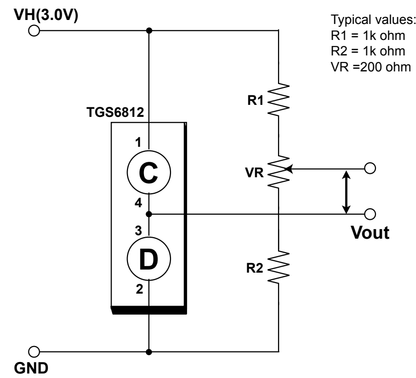
Basic Measuring Circuit:

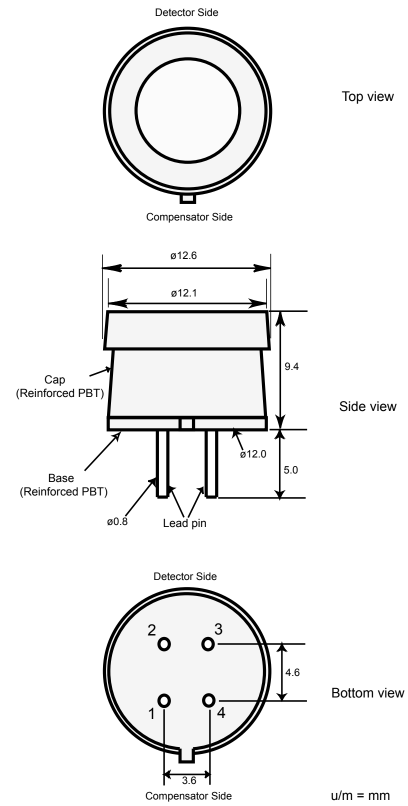
The TGS6812 is comprised of two elements: 1) element (D) which is sensitive to combustible gases and 2) a reference element (C) which is not sensitive to combustible gases. These elements are installed into a "Wheastone Bridge". A variable resistor should be adjusted so that the bridge will produce a stable baseline signal when in an environmnet free of combustible gases. When combustible gases are present, they will be combusted on the detecting element, causing its temperature to rise. Accordingly the resistance of this element will increase. This results in an "out-of-balance" signal across the bridge and a corresponding change in output voltage which can be measured.



Specifications

Model number			TGS 6812
Sensing element type			Catalytic
Target gases			Hydrogen, methane, iso-butane
Typical detection range			0~100%LEL of each gas
Standard circuit conditions	Operating Voltage		3.0±0.1V AC/DC
Electrical characteristics under standard test conditions	Heater current		175mA (typical)
	Heater power consumption		525mW (typical)
	Zero offset		±35mV
	Output sensitivity (ΔVout)	hydrogen	12~18mV in 4000ppm
		methane	12~18mV in 5000ppm
		iso-butane	7~11mV in 1800ppm
	Response time (90%)		≤15 sec.
Standard test conditions	Test gas conditions		Hydrogen/methane/iso-butane in air at 20±2˚C, 65±5%RH
	Circuit conditions		3.0±0.05V AC/DC
	Conditioning period before test		≤30 sec.
Operating conditions			-10~+70˚C, ≤99%RH (w/o dew condensation)
Storage conditions			-10~+80˚C, ≤99%RH (w/o dew condensation)

Structure and Dimensions:



<Pin connection>
1-4 : Compensator
2-3 : Detector

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FIGARO

PRODUCT INFORMATION

TGS 813 - for the detection of Combustible Gases

Features:

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

Applications:

* Domestic gas leak detectors and alarms
* Portable gas 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 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).

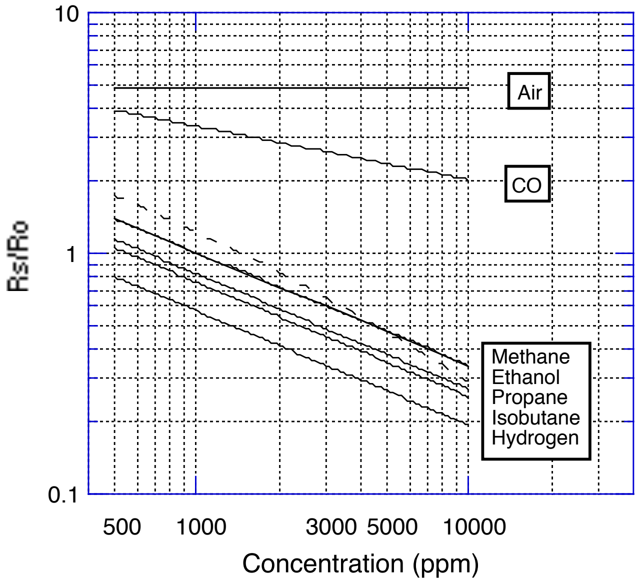
The figure below represents typical sensitivity characteristics, all data having been gathered at standard test conditions (see reverse side of this sheet). The Y-axis is indicated as sensor resistance ratio (Rs/Ro) which is defined as follows:

Rs = Sensor resistance of displayed gases at various concentrations
Ro = Sensor resistance in 1000ppm methane

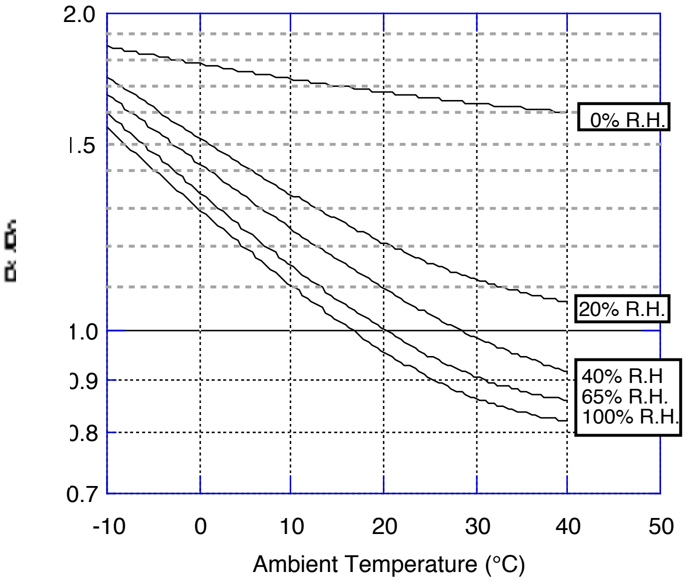
The figure below represents typical temperature and humidity dependency characteristics. Again, the Y-axis is indicated as sensor resistance ratio (Rs/Ro), defined as follows:

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.

Sensitivity Characteristics:



Temperature/Humidity Dependency:



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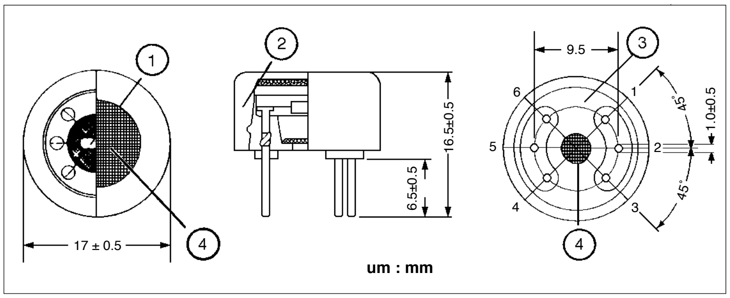
Structure and Dimensions:



(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

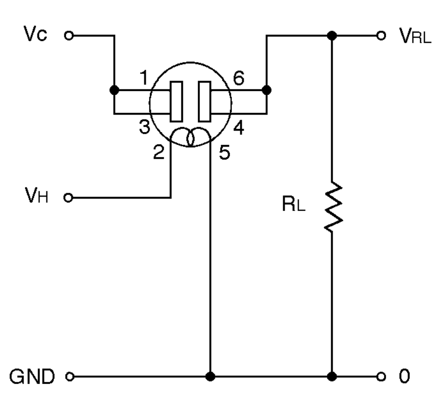
(3) Sensor Base:
Nylon 66

(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	Methane at 1000ppm/air	5kΩ ~ 15kΩ
Change Ratio of Sensor Resistance	Rs/Ro	Rs (Methane at 3000ppm/air) / Rs (Methane at 1000ppm/air)	0.60 ± 0.05
Heater Resistance	R_H	Room temperature	30.0 ± 3.0Ω
Heater Power Consumption	P_H	V_H=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:

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 = 4.0kΩ±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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FIGARO

TGS 821 - Special Sensor for Hydrogen Gas

Features:

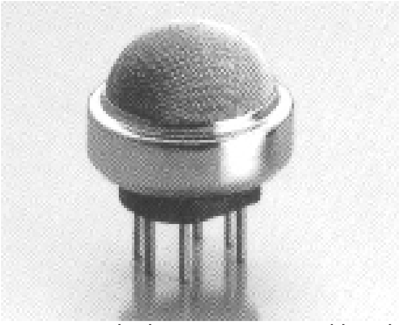
* High sensitivity and selectivity to hydrogen gas
* Good repeatability in measurement and excellent stability
* Uses simple electrical circuit
* Ceramic base resistant to severe environment

Applications:

* Hydrogen gas detection for:
  - transformer maintenance
  - batteries
  - steel industry usage
  - etc.

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 821** has high sensitivity and selectivity to hydrogen gas. The sensor can detect concentrations as low as 50ppm, making it ideal for a variety of industrial applications.



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

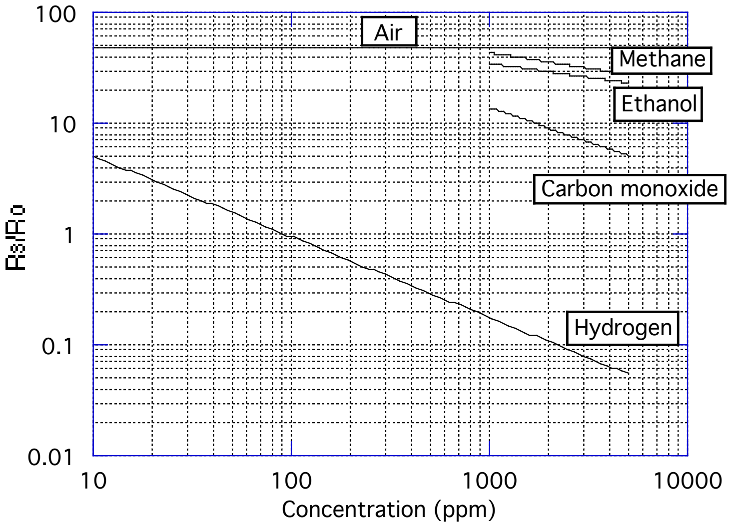
Ro = Sensor resistance at 100ppm of hydrogen

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:

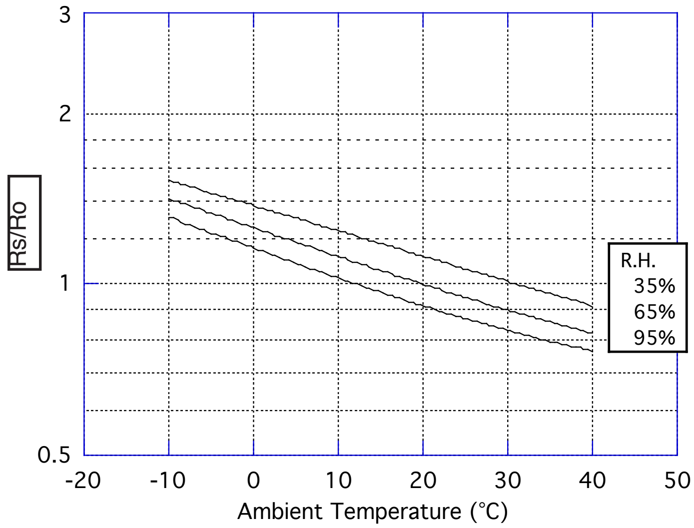
Rs = Sensor resistance at 100ppm of hydrogen at various temperatures/humidities

Ro = Sensor resistance at 100ppm of hydrogen at 20°C and 65% R.H.

Sensitivity Characteristics:



Temperature/Humidity Dependency:



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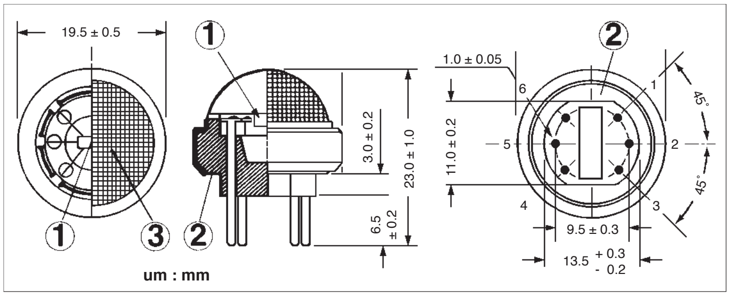
Structure and Dimensions:

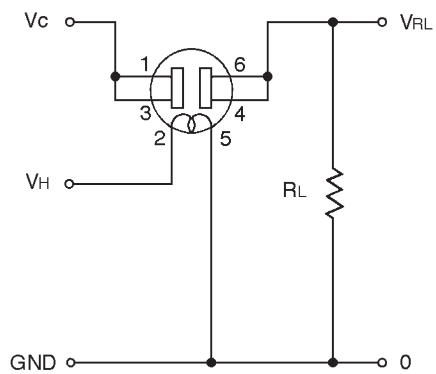


1. Sensing Element:
   SnO_2 is sintered to form a thick film on the surface of an alumina ceramic tube which contains an internal heater.
2. Sensor Base:
   Alumina ceramic
3. Flame Arrestor:
   100 mesh SUS 316 double gauze

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 (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	Hydrogen at 100ppm/air	1kΩ ~ 10kΩ
Change Ratio of Sensor Resistance	Rs/Ro	$\frac{\text{Log[Rs(H}_2\text{ 100ppm)/Rs(H}_2\text{ 1000ppm)]}}{\text{Log (1000ppm/100ppm)}}$	0.60 ~ 1.20
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 821 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 = 4.0kΩ±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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REV: 10/04

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

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).

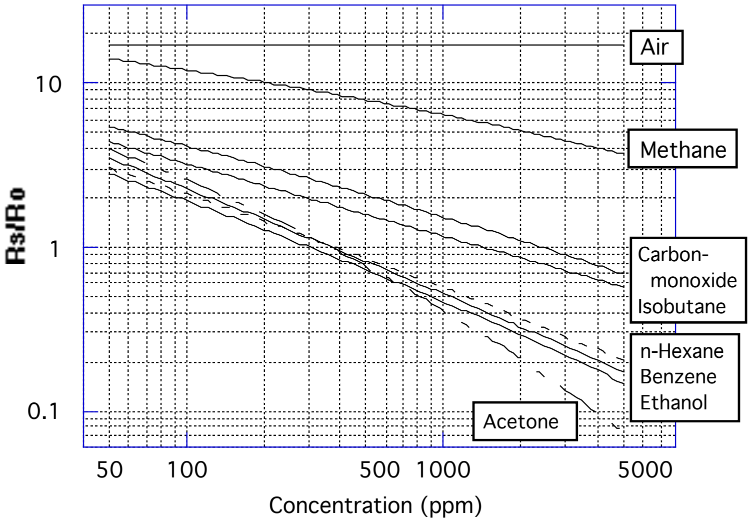
The figure below represents typical sensitivity characteristics, all data having been gathered at standard test conditions (see reverse side of this sheet). The Y-axis is indicated as sensor resistance ratio (Rs/Ro) which is defined as follows:

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

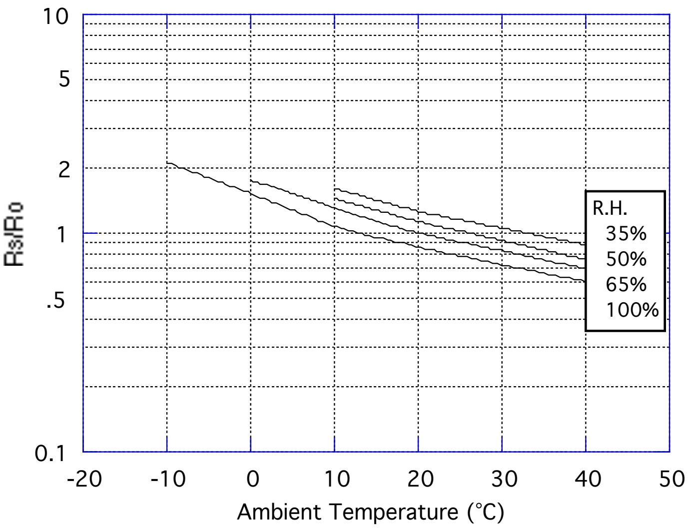
The figure below represents typical temperature and humidity dependency characteristics. Again, the Y-axis is indicated as sensor resistance ratio (Rs/Ro), defined as follows:

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:



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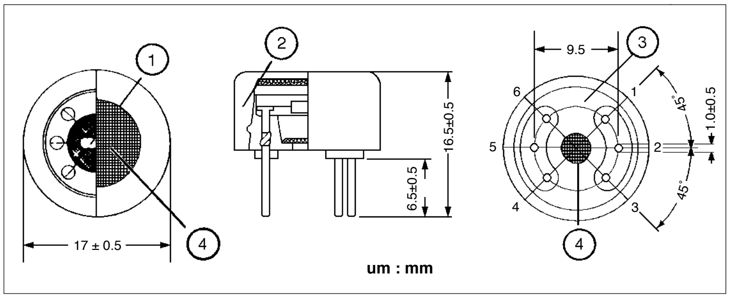
Structure and Dimensions:

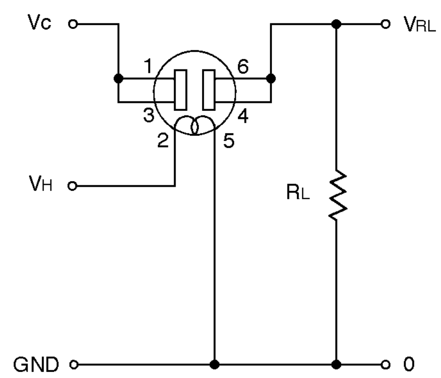


1. Sensing Element:
   SnO_2 is sintered to form a thick film on the surface of an alumina ceramic tube which contains an internal heater.
2. Cap:
   Nylon 66
3. Sensor Base:
   Nylon 66
4. Flame Arrestor:
   100 mesh SUS 316 double gauze

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	Rs(Ethanol at 300ppm/air) / Rs(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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REV: 09/02

FIGARO

PRODUCT INFORMATION

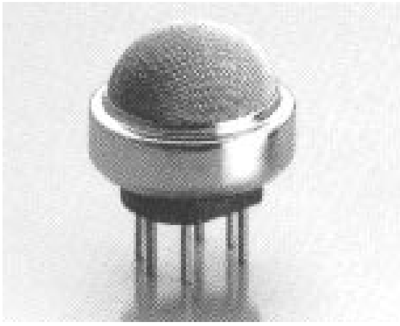
TGS 825 - Special Sensor for Hydrogen Sulfide

Features:

* High sensitivity to low concentration of hydrogen sulfide
* Good repeatability in measurement
* Uses simple electrical circuit
* Ceramic base resistant to severe environment

Applications:

* Hydrogen sulfide detectors/ alarms



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 825** has high sensitivity to hydrogen sulfide. The sensor can detect concentrations of hydrogen sulfide as low as 5ppm, making it ideal for application in gas leak 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

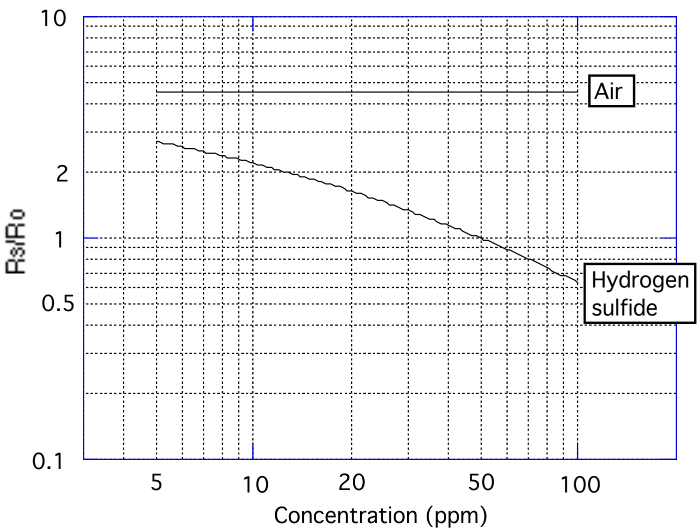
Ro = Sensor resistance at 50ppm of hydrogen sulfide at 20°C and 65% R.H.

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:

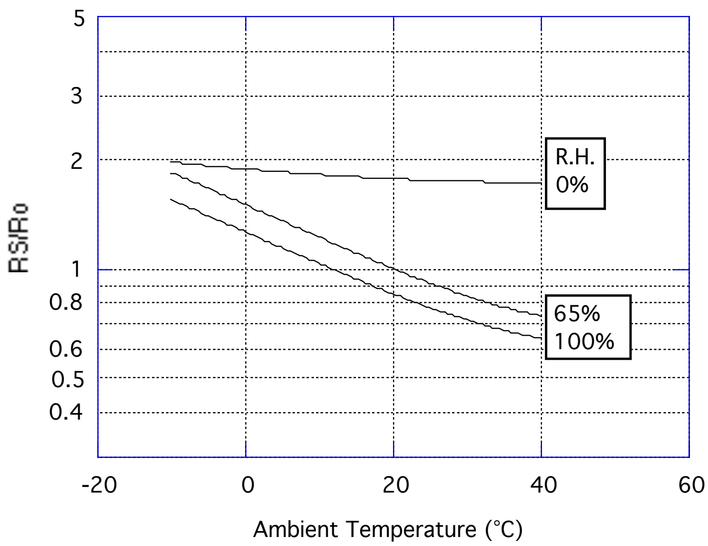
Rs = Sensor resistance at 50ppm of hydrogen sulfide at various temp./humidities

Ro = Sensor resistance at 50ppm of hydrogen sulfide at 20°C and 65% R.H.

Sensitivity Characteristics:



Temperature/Humidity Dependency:



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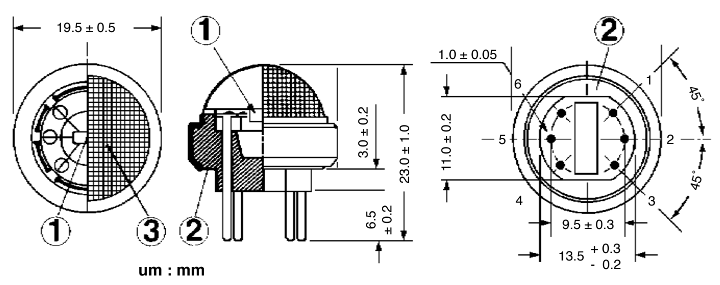
Structure and Dimensions:

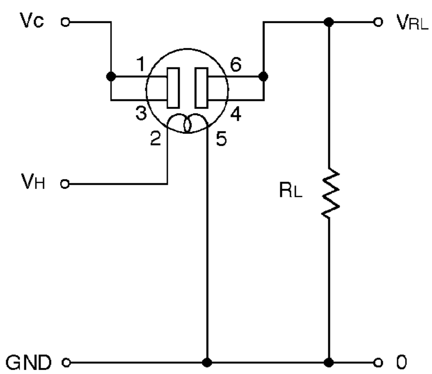


1. Sensing Element:
   SnO_2 is sintered to form a thick film on the surface of an alumina ceramic tube which contains an internal heater.
2. Sensor Base:
   Alumina ceramic
3. Flame Arrestor:
   100 mesh SUS 316 double gauze

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 (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	Hydrogen sulfide at 50ppm/air	3kΩ ~ 30kΩ
Change Ratio of Sensor Resistance	Rs/Ro	$\frac{Rs(H_2S \text{ at } 50ppm/air)}{Rs(H_2S \text{ at } 10ppm/air)}$	0.45 ± 0.15
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 825 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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REV: 11/04

TGS 826 - for the Detection of Ammonia

Features:

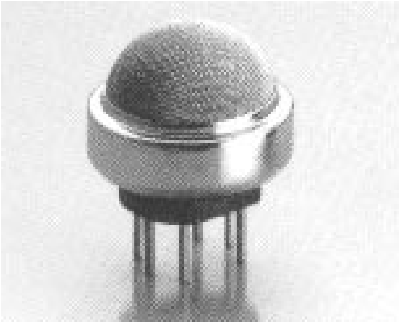
* High sensitivity to ammonia
* Quick response to low concentrations of ammonia
* Uses simple electrical circuit
* Ceramic base resistant to severe environment

Applications:

* Ammonia leak detection in refrigerators
* Ventilation control for the agricultural and poultry industries

The sensing element of TGS826 is a metal oxide 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 TGS826 has high sensitivity to ammonia gas. The sensor can detect concentrations as low as 30ppm in the air and is ideally suited to critical safety-related applications such as the detection of ammonia leaks in refrigeration systems and ammonia detection in the agricultural field.



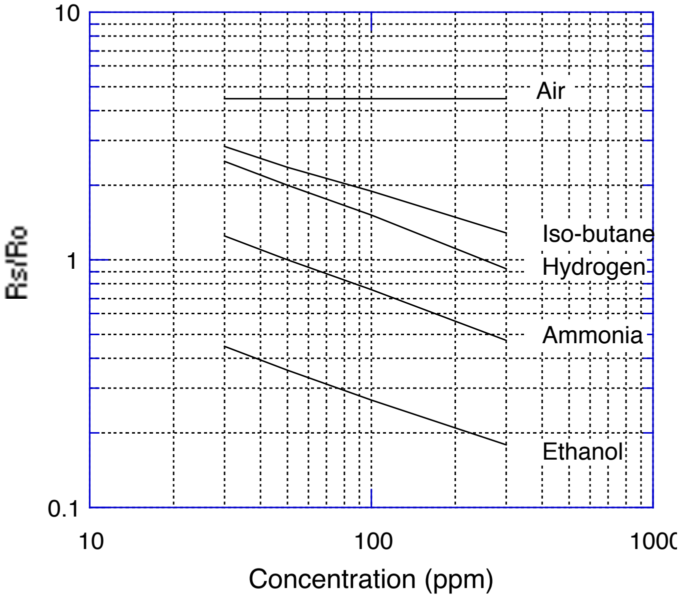
The figure below represents typical sensitivity characteristics, all data having been gathered at standard test conditions (see reverse side of this sheet). The Y-axis is indicated as sensor resistance ratio (Rs/Ro) which is defined as follows:

Rs = Sensor resistance of displayed gases at various concentrations
Ro = Sensor resistance at 50ppm of ammonia

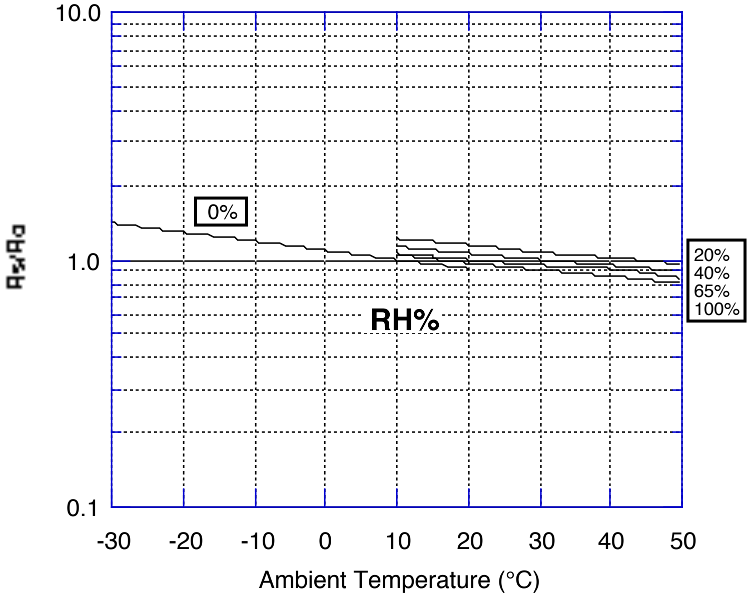
The figure below represents typical temperature and humidity dependency characteristics. Again, the Y-axis is indicated as sensor resistance ratio (Rs/Ro), defined as follows:

Rs = Sensor resistance at 50ppm of ammonia at various temperatures/humidities
Ro = Sensor resistance at 50ppm of ammonia at 20°C and 65% R.H.

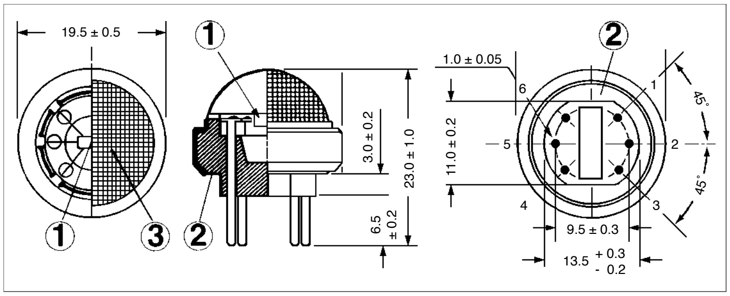
Sensitivity Characteristics:



Temperature/Humidity Dependency:



Structure and Dimensions:



1 Sensing Element:
Metal oxide is sintered to form a thick film on the surface of an alumina ceramic tube which contains an internal heater.

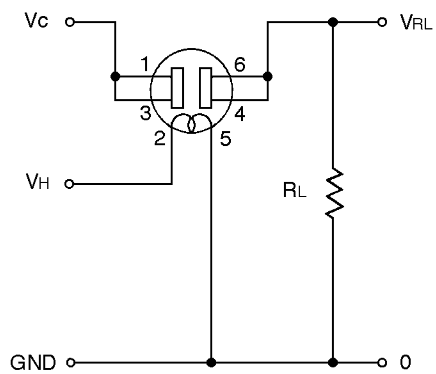
2 Sensor Base:
Alumina ceramic

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). Since the sensor has a polarity, DC voltage is always required for circuit voltage (a white dot indicates pin 2). 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:



Pin #2 is indicated by a white dot on the sensor's base.

Specifications:

Model number			TGS 826	
Target gases			Ammonia	
Typical detection range			30 ~ 300 ppm	
Standard circuit conditions	Heater Voltage	V_H	5.0±0.2V DC/AC	
	Circuit voltage	V_C	Max. 24V (DC only)	Ps ≤ 15mW
	Load resistance	R_L	Variable	Ps ≤ 15mW
Electrical characteristics under standard test conditions	Heater resistance	R_H	30±3Ω at room temp.	
	Heater current	I_H	167mA	
	Heater power consumption	P_H	833mW	V_H = 5.0V DC
	Sensor resistance	Rs	20~100kΩ in 50ppm ammonia	
	Sensitivity (change ratio of Rs)		0.55 ± 0.15	Rs (150ppm) / Rs (50ppm)
Standard test conditions	Test gas conditions		Ammonia in air at 20±2°C, 65±5%RH	
	Circuit conditions		V_C = 5.0±0.01V DC V_H = 5.0±0.05V DC R_L = 33kΩ±1%	
	Conditioning period before test		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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Special Note: A more narrowly defined range of Rs or Rs/Ro will be indicated on each production lot (see Appendix). Preselected ranges of Rs or Rs/Ro are not available.

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

REV: 05/04

FIGARO

Appendix

TGS 826 Pre-Sorted Groupings

The TGS 826 sensor has a wide specification range in terms of its rated value in 50ppm of NH_3 and sensor resistance ratio (Rs in 150ppm of NH_3 / Rs in 50ppm of NH_3). To facilitate usage of this sensor, TGS 826 is shipped in pre-sorted groupings of 20 pieces per bag, with each bag marked with one of the following group numbers which indicate a more narrow range within the specification.

Please be advised that the sensor is produced to meet the overall specification range--production of specific groupings within the spec cannot be done. As a result, if a user requests a specific group(s), the sensor can be made available at an additional charge, but no guarantee can be offered as to availability for shipment. The minimum delivery time for special group selection should be considered at 8 weeks minimum.

Group #	Rs in 50ppm of NH_3 (kΩ)			Rs (in 150ppm of NH_3) / Rs (in 50ppm of NH_3)		
1-A	20 ~ 30			0.4 ~ 0.5		
1-B	20 ~ 30				0.5 ~ 0.6	
1-C	20 ~ 30					0.6 ~ 0.7
2-A		30 ~ 40		0.4 ~ 0.5		
2-B		30 ~ 40			0.5 ~ 0.6	
2-C		30 ~ 40				0.6 ~ 0.7
3-A			40 ~ 53	0.4 ~ 0.5		
3-B			40 ~ 53		0.5 ~ 0.6	
3-C			40 ~ 53			0.6 ~ 0.7
4-A	53 ~ 70			0.4 ~ 0.5		
4-B	53 ~ 70				0.5 ~ 0.6	
4-C	53 ~ 70					0.6 ~ 0.7
5-A		70 ~ 85		0.4 ~ 0.5		
5-B		70 ~ 85			0.5 ~ 0.6	
5-C		70 ~ 85				0.6 ~ 0.7
6-A			85 ~ 100	0.4 ~ 0.5		
6-B			85 ~ 100		0.5 ~ 0.6	
6-C			85 ~ 100			0.6 ~ 0.7

FIGARO

PRODUCT INFORMATION

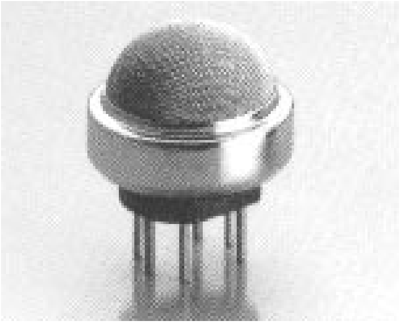
TGS 830 - for the detection of Chlorofluorocarbons (CFC's)

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.

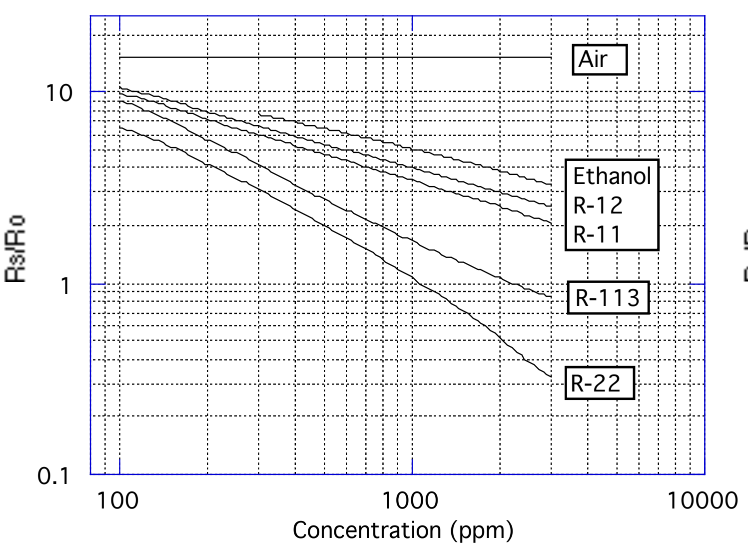
The figure below represents typical sensitivity characteristics, all data having been gathered at standard test conditions (see reverse side of this sheet). The Y-axis is indicated as sensor resistance ratio (Rs/Ro) which is defined as follows:

Rs = Sensor resistance of displayed gases at various concentrations
Ro = Sensor resistance at 1000ppm of R-22

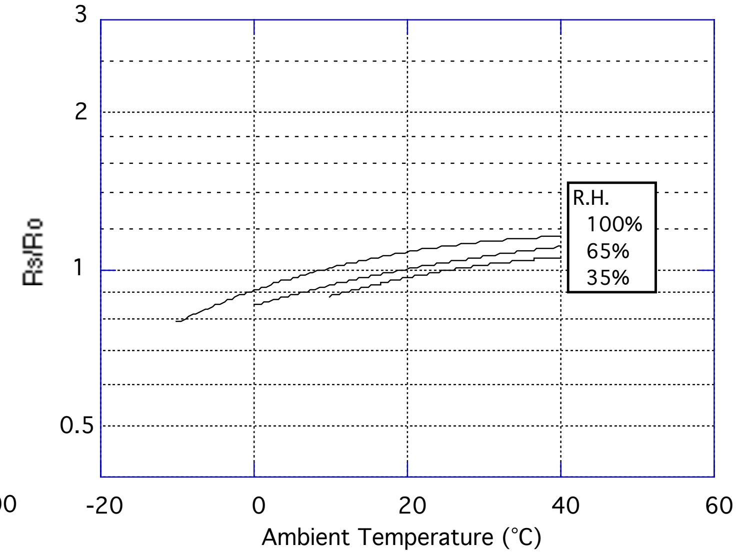
The figure below represents typical temperature and humidity dependency characteristics. Again, the Y-axis is indicated as sensor resistance ratio (Rs/Ro), defined as follows:

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.

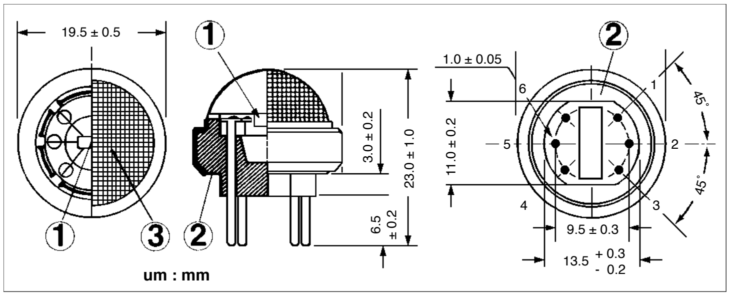
Sensitivity Characteristics:



Temperature/Humidity Dependency:



Structure and Dimensions:

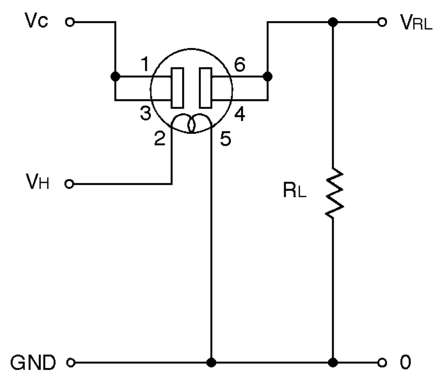


(1) Sensing Element:
SnO2 is sintered to form a thick film on the surface of an alumina ceramic tube which contains an internal heater.
(2) Sensor Base:
Alumina ceramic
(3) Flame Arrestor:
100 mesh SUS 316 double gauze

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 (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	R-22 at 1000ppm/air	1kΩ ~ 5kΩ
Change Ratio of Sensor Resistance	Rs/Ro	Rs(R-22 at 3000ppm/air) Rs(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	835mW (typical)

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 (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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FIGARO

PRODUCT INFORMATION

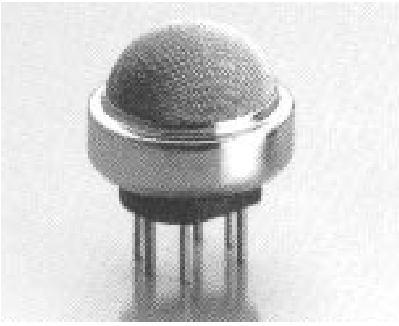
TGS 831 - for the detection of Chlorofluorocarbons (CFC's)

Features:

* High sensitivity to R-21 and R-22
* Low dependency on temperature and humidity
* Quick response
* Uses simple electrical circuit
* Ceramic base resistant to severe environment

Applications:

* Refrigerant leak detector



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 831** has high sensitivity to R-21 and R-22. Due to its low dependence on temperature and humidity, the sensor has good reproducibility in measurement and excellent stability. Combined with its long life, this makes TGS 831 an excellent, low-cost sensor for CFC detection.

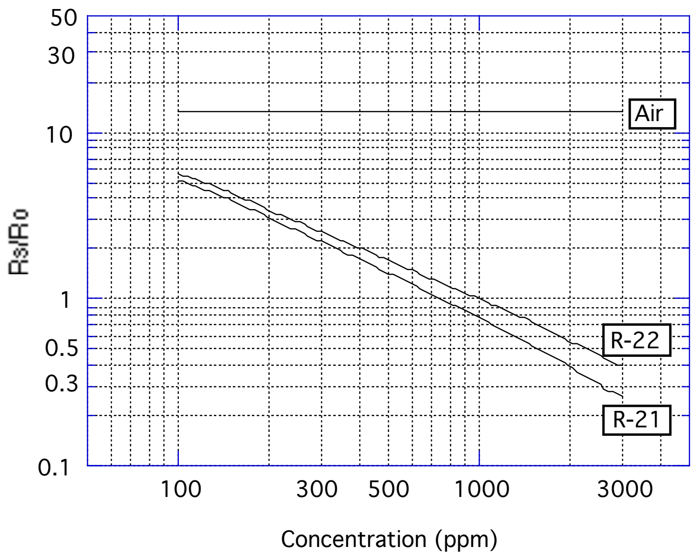
The figure below represents typical sensitivity characteristics, all data having been gathered at standard test conditions (see reverse side of this sheet). The Y-axis is indicated as sensor resistance ratio (Rs/Ro) which is defined as follows:

Rs = Sensor resistance of displayed gases at various concentrations
Ro = Sensor resistance at 1000ppm of R-22

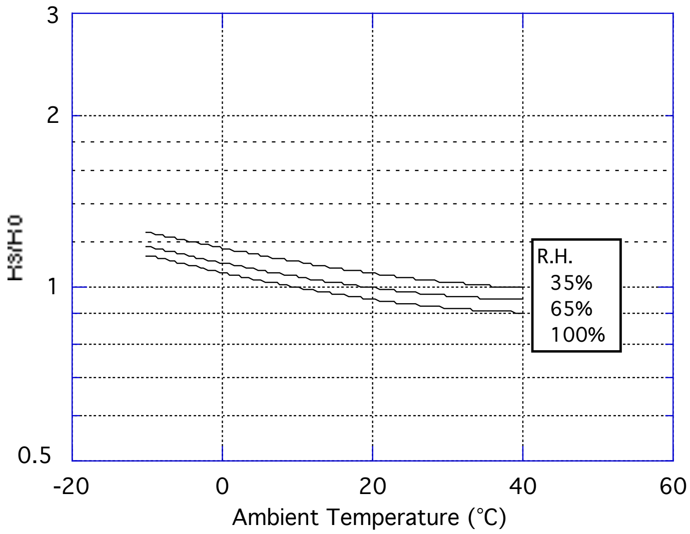
The figure below represents typical temperature and humidity dependency characteristics. Again, the Y-axis is indicated as sensor resistance ratio (Rs/Ro), defined as follows:

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:

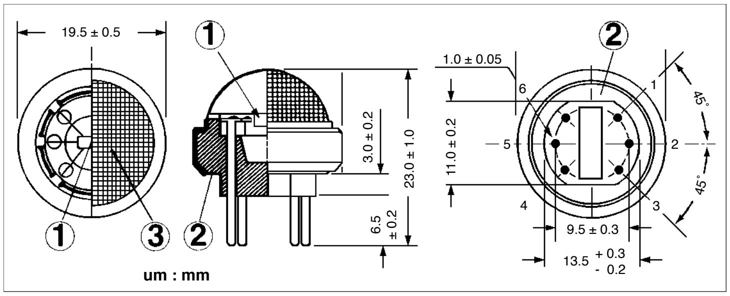


Temperature/Humidity Dependency:



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:

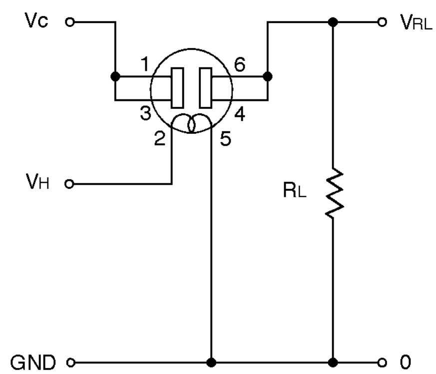


1. Sensing Element:
   SnO_2 is sintered to form a thick film on the surface of an alumina ceramic tube which contains an internal heater.
2. Sensor Base:
   Alumina ceramic
3. Flame Arrestor:
   100 mesh SUS316 double gauze

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	R-22 at 1000ppm/air	1kΩ ~ 10kΩ
Change Ratio of Sensor Resistance	Rs/Ro	Rs(R-22 at 1000ppm/air) / Rs(R-22 at 300ppm/air)	0.40 ± 0.15
Heater Resistance	R_H	Room temperature	30.0 ± 3.0Ω
Heater Power Consumption	P_H	V_H=5.0V	835mW (typical)

Standard Test Conditions:

TGS 831 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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FIGARO

PRODUCT INFORMATION

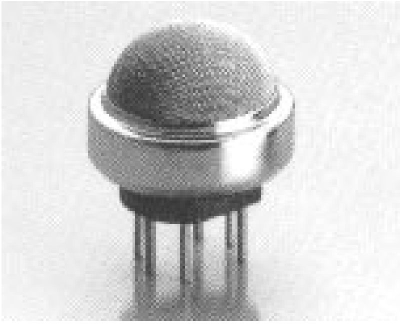
TGS 832 - for the detection of Chlorofluorocarbons (CFC's)

Features:

* High sensitivity to R-134a
* Quick response to R-134a
* Improved selectivity
* Long term stability
* Uses simple electrical circuit
* Ceramic base resistant to severe environment

Applications:

* Refrigerant leak detector



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 832** has high sensitivity to R-134a, the most promising alternative to R-12, commonly used in air conditioning systems and refrigerators. R-12 and R-22 are also detectable by TGS 832. With its good long term stability, TGS 832 is an excellent, low-cost sensor for CFC detection.

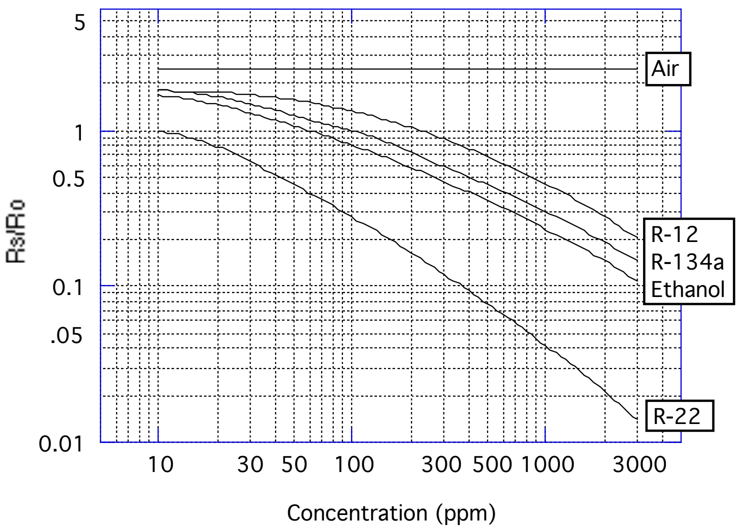
The figure below represents typical sensitivity characteristics, all data having been gathered at standard test conditions (see reverse side of this sheet). The Y-axis is indicated as sensor resistance ratio (Rs/Ro) which is defined as follows:

Rs = Sensor resistance of displayed gases at various concentrations
Ro = Sensor resistance at 100ppm of R-134a

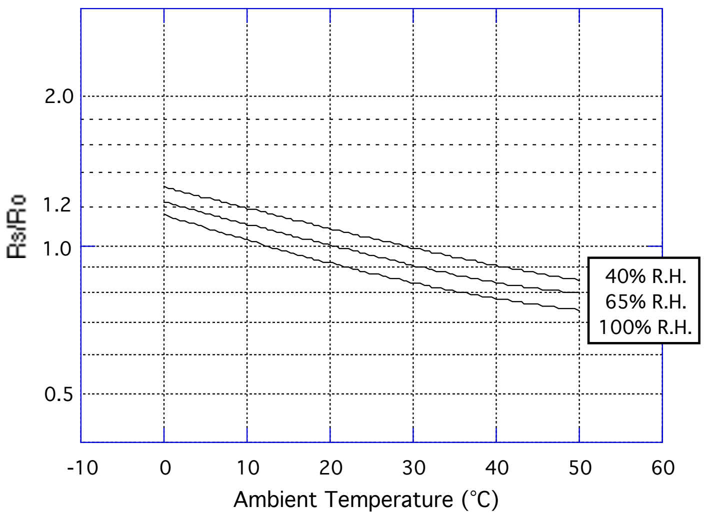
The figure below represents typical temperature and humidity dependency characteristics. Again, the Y-axis is indicated as sensor resistance ratio (Rs/Ro), defined as follows:

Rs = Sensor resistance at 100ppm of R-134a at various temperatures/humidities
Ro = Sensor resistance at 100ppm of R-134a at 20°C and 65% R.H.

Sensitivity Characteristics:



Temperature/Humidity Dependency:



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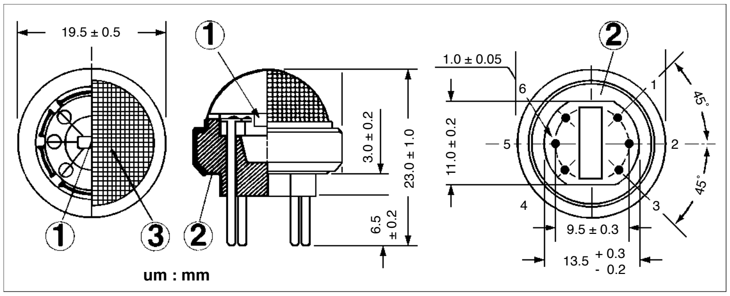
Structure and Dimensions:



(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.

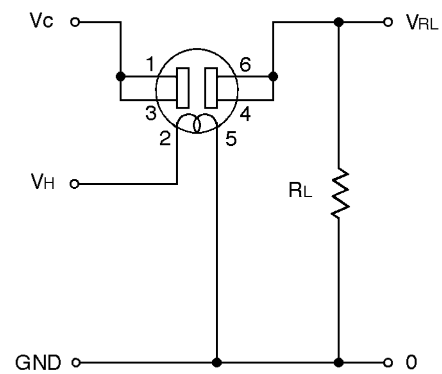
(2) Sensor Base:
Alumina ceramic

(3) Flame Arrestor:
100 mesh SUS316 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	R-134a at 100ppm/air	4kΩ ~ 40kΩ
Change Ratio of Sensor Resistance	Rs/Ro	Rs(R-134a at 300ppm/air) / Rs(R-134a at 100ppm/air)	0.50 ~ 0.65
Heater Resistance	R_H	Room temperature	30.0 ± 3.0Ω
Heater Power Consumption	P_H	V_H=5.0V	835mW (typical)

Standard Test Conditions:

TGS 832 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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TGS 842 - for the detection of Methane

Features:

* High sensitivity to Methane
* Long-term stability
* Low sensitivity to alcohol vapors
* Uses simple electrical circuit

Applications:

* Domestic gas alarms for the detection of methane
* Portable gas 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 842** has high sensitivity and selectivity to methane. Due to its low sensitivity to alcohol vapors and its low temperature/humidity dependency, the sensor can achieve good reproducibility, making it ideal for domestic gas alarms.

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

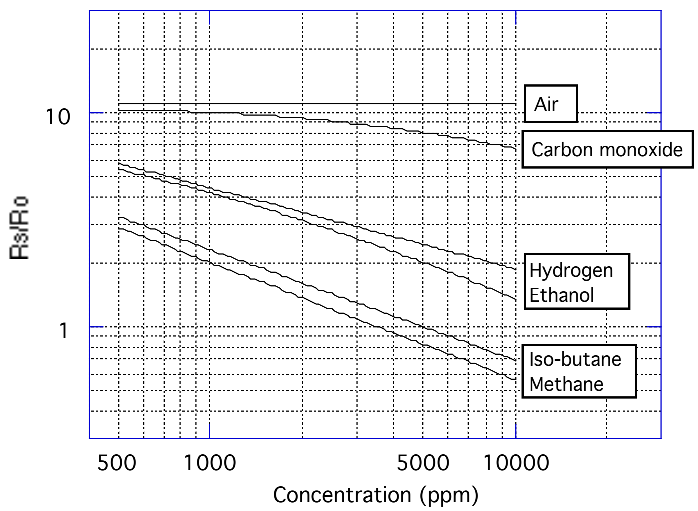
Ro = Sensor resistance in 3500ppm methane

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:

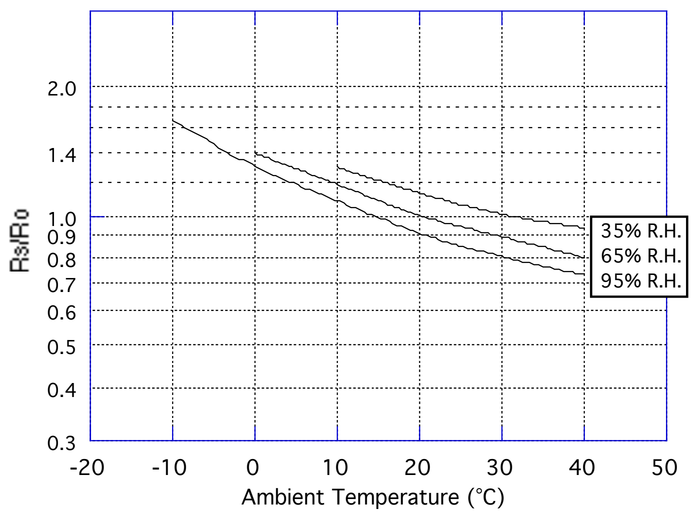
Rs = Sensor resistance at 3500ppm of methane at various temperatures/humidities

Ro = Sensor resistance at 3500ppm of methane at 20°C and 65% R.H.

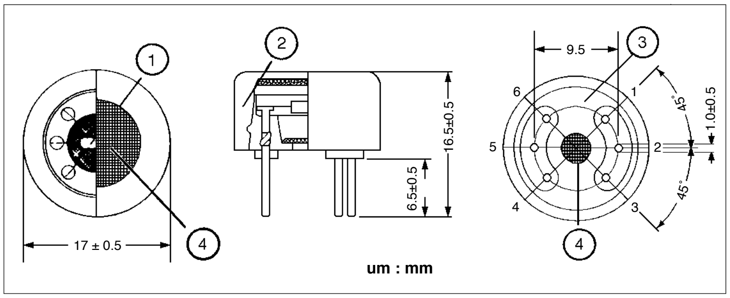
Sensitivity Characteristics:



Temperature/Humidity Dependency:



Structure and Dimensions:

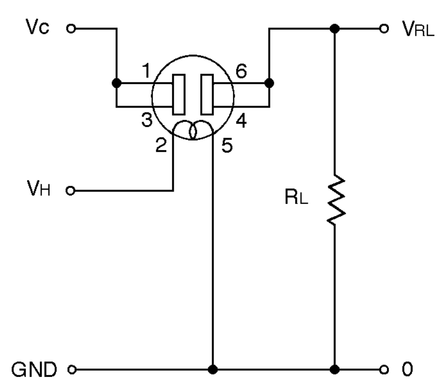


1. Sensing Element:
   SnO_2 is sintered to form a thick film on the surface of an alumina ceramic tube which contains an internal heater.
2. Cap:
   Nylon 66
3. Sensor Base:
   Nylon 66
4. Flame Arrestor:
   100 mesh SUS316 double gauze

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	Methane at 1000ppm/Air	3kΩ ~ 15kΩ
Change Ratio of Sensor Resistance	Rs/Ro	Rs (Methane at 3000ppm/air) / Rs (Methane at 1000ppm/air)	0.55 ± 0.05
Heater Resistance	R_H	Room temperature	30.0 ± 3.0Ω
Heater Power Consumption	P_H	V_H=5.0V	835mW (typical)

Standard Test Conditions:

TGS 842 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 = 4.0kΩ±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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REV: 09/02

FIGARO

PRODUCT INFORMATION

GS Oxygen Sensors

Features:

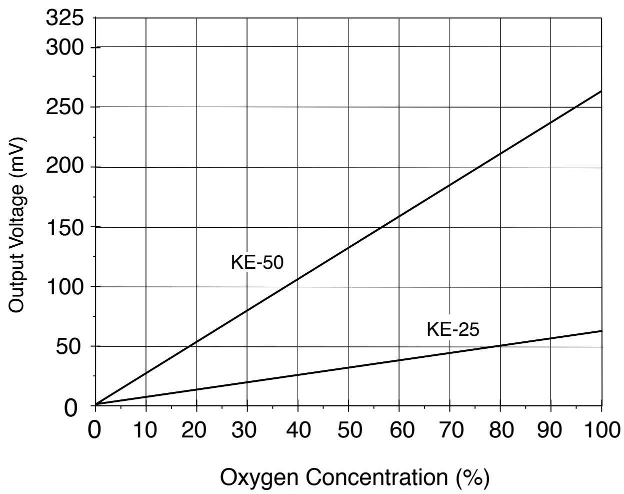
* Long life
  KE-25 - 5 years / KE-50 - 10 years in ambient air
* Virtually no influence from CO_2, CO, H_2S, NO_x, H_2
* Low cost
* Operates in normal ambient temperatures
* Stable output signal
* No external power supply required for sensor operation
* No warmup time is required

Applications:

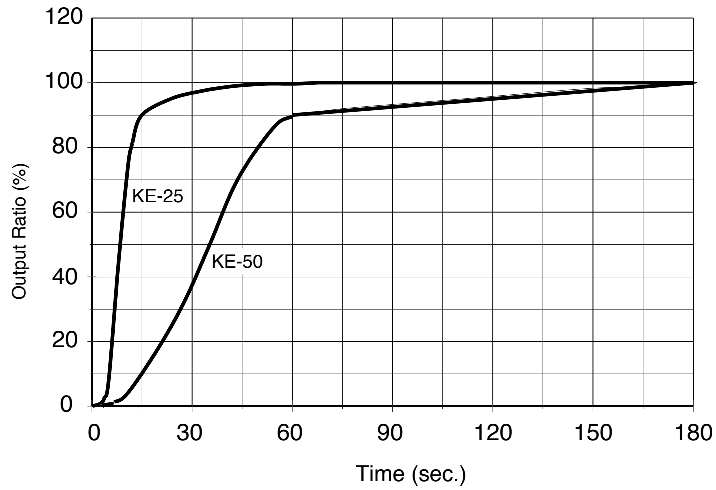
* Medical - Anesthetic instruments, respirators, oxygen-enrichers
* Biotechnology - Oxygen incubators
* Food industry - Refrigeration, greenhouses
* Safety - Air conditioners, oxygen detectors, fire detectors

The GS Oxygen Sensor KE series (KE-25 and KE-50) is a unique galvanic cell type oxygen sensor which was developed in Japan in 1985. Its most notable features are long life expectency, excellent chemical durability, and it is not influenced by CO_2. The KE series oxygen sensor is ideal to meet the ever-increasing demand for oxygen monitoring in various fields such as combustion gas monitoring, the biochemical field, medical applications, domestic combustion appliances, etc.

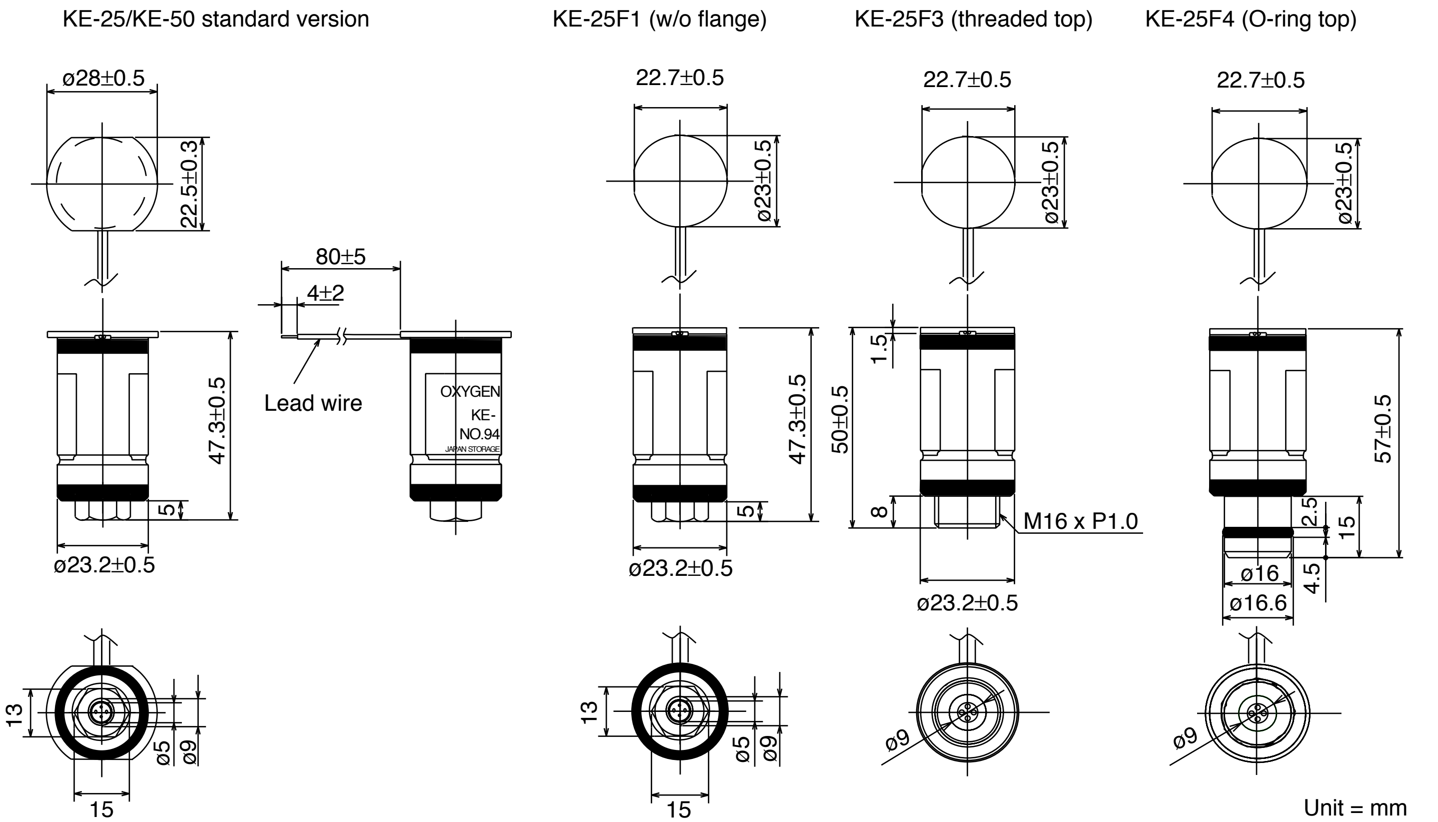
Sensitivity characteristics (typical values under std. test conditions)



Response time (typical)



Dimensions



Specifications

Item		KE-25	KE-50
Measurement range		0~100% O_2	
Accuracy (Note 1)		±1% (full scale)	±2% (full scale)
Operating conditions	Atmospheric pressure	811hPa ~1216hPa	
	Temperature	5~40˚C	
	Relative humidity	10 ~ 90%R.H. (no condensation)	
Response time (90%) (Note 4)		14±2 seconds	60±5 seconds
Initial output voltage under standard test conditions		10.0~15.5mV	47~65mV
Standard test conditions	Test gas	21% O_2	
	Atmospheric pressure	1013±5hPa	
	Temperature	25˚C±1˚C	
	Relative humidity	60±5%	
Linearity	$(V_a-V_0)/(V_{100}-V_0)$ (Note 2)	0.21±0.02	
Offset voltage	V_0	≤0.5mV	≤6.0mV
Temperature characteristics (Note 3)	V_H/V_a	0.91~1.09	
	V_L/V_a	0.91~1.09	

Notes:

1) When calibrated at both 0% and 100% of O_2, accuracy in the range from 0-100% O_2 shall be within ±1% of full scale for KE-25 and ±2% of full scale for KE-50.

2) V_a = output voltage at 21% O_2
V_0 = output voltage at 0% O_2
V_{100} = output voltage at 100% O_2

3) V_a = output voltage at 25˚C
V_H = output voltage at 40˚C
V_L = output voltage at 5˚C

4) Sensors should be used under conditions where the air exchange is greater than 200~300ml per minute in order to obtain the response speed as specified in Table 1.

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