

氟利昂气体传感器 NAP-11AF 使用手册

(Revised; August 12, 1996)

USER'S MANUAL

NEMOTO FREON GAS SENSOR NAP-11AF

1. General

NEMOTO's semiconductor type gas sensor NAP-11AF is designed to detect freon gases which create serious problems in the maintenance of the global environment. Being sensitive also to Freon 22 or 134 which do not damage the ozone layer but are still costly, this sensor is useful for detecting leakage of such substitution gases that are mainly used as refrigerants.

1) Features

- \* Excellent response characteristics
- \* Very stable to the ambient temperature & humidity
- \* Remarkable gas selectivity

2) Applications

- \* Freon gas leak monitoring devises

3) Specifications

- \* Heater voltage                   A.C. 5.0V  $\pm$  0.25V (r.m.s. 50-60Hz)  
  D.C. 5.0V  $\pm$  0.25V
- \* Heater current                   A.C. 150 ~ 170 mA (r.m.s. 50-60Hz)  
  (When 5.0V supplied)           D.C. 150 ~ 170 mA
- \* Circuit voltage                 A.C. less than 15V (r.m.s. 50-60Hz)  
  D.C. less than 15V

\* Ambient temperature & Humidity

During normal operation	Temperature	0 ~ +50°C
	Humidity	Less than 95 %RH
During storage	Temperature	-20 ~ +60°C
	Humidity	Less than 95 %RH

## 2. Structure

The following illustrates the structure of NAP-11AF

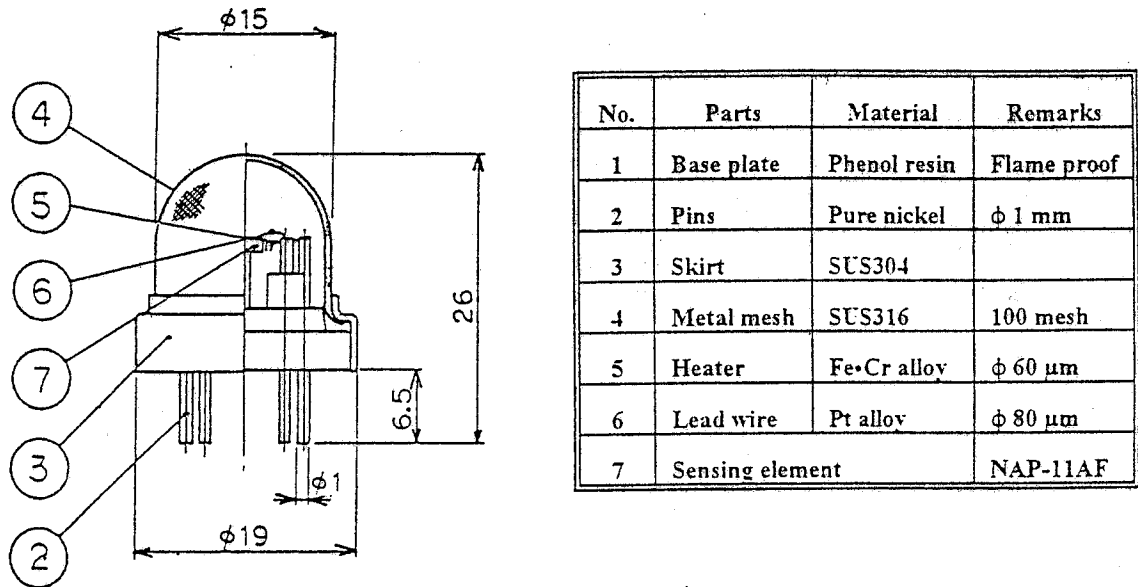


Fig. 1 Structure of NAP-11AF

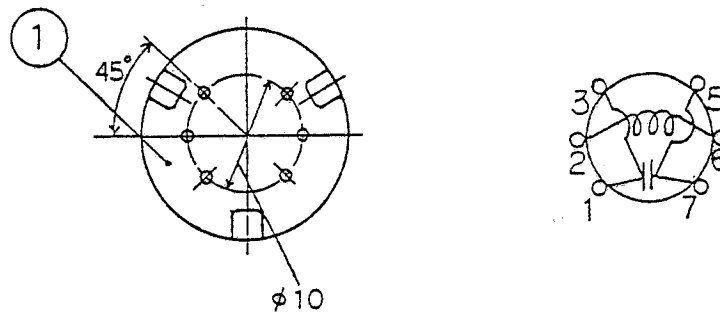


Fig. 2 Location of pins

The body of the sensor in Fig. 1 is a ceramic tube housing that contain a pair of electrodes, with a base layer consisting of semiconductor material consisting of mainly indium oxide and a second layer of a special catalyst material. The ceramic housing contains a heating coil and two pairs (a total of 4) of precious metal wires to transmit the changes in the electric resistance of the semiconductor element. The positioning of these pins is shown in Fig. 2. The sensor is protected with stainless steel explosion proof double layered wire-mesh (SUS316 - JIS, mesh size - 100). The supporting base material is made of a flame-resistant thermosetting resin, and the pins are made of pure nickel.

### 3. Freon gases

The conventional so-called freon gases have been mainly used as refrigerants and washing agents for electronic components and devices. However, it has been determined that these react with ultraviolet light and destroy the ozone layer, thus the use of freon gases is greatly restricted. Recently, substitution gases or ammonia is used since these are harmless to the ozone layer, however substitution gases are still expensive. The following list shows the kinds and applications of various gases.

Name	Chem. formula	Applications	Ozone layer
Freon 113	$CCLF_2CCL_2F$	Washing solvent	×
Freon AK225	$CF_3CF_2CCL_2H$	"	○
Freon 12	$CCL_2F_2$	Refrigerant	×
Freon 22	$CHCLF_2$	"	○
Freon 134	$CF_3CFH_2$	"	○

### 4. Basic characteristics of NAP-11AF

#### 1) Sensitivity characteristics

Fig. 3 shows the sensitivity characteristics to various freon gases.

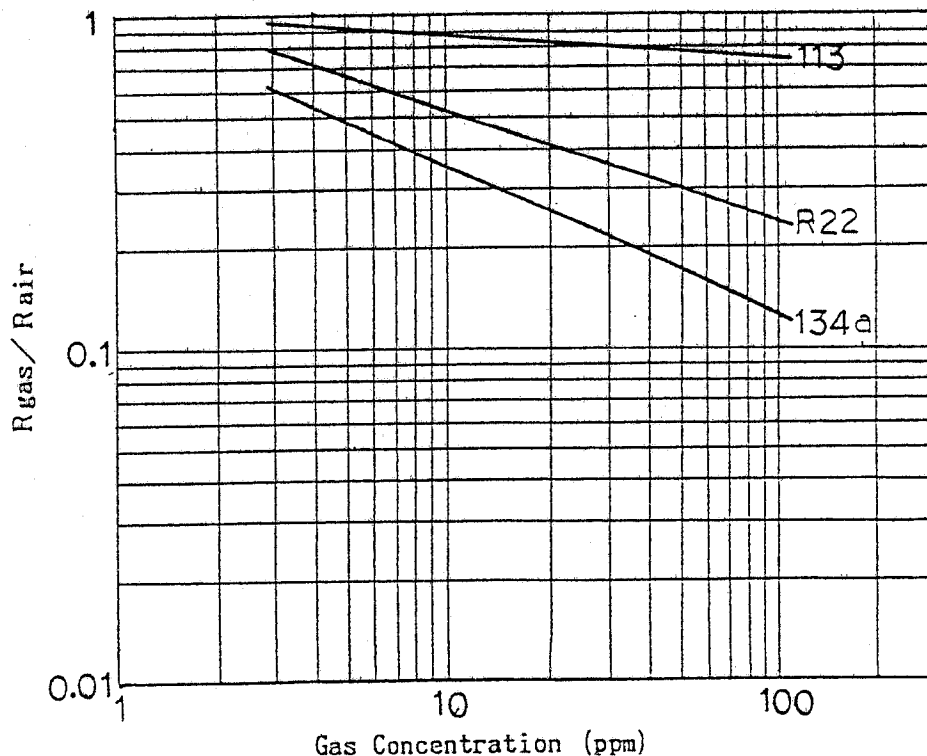


Fig. 3 Gas sensitivity of NAP-11AF

2) Temperature characteristics

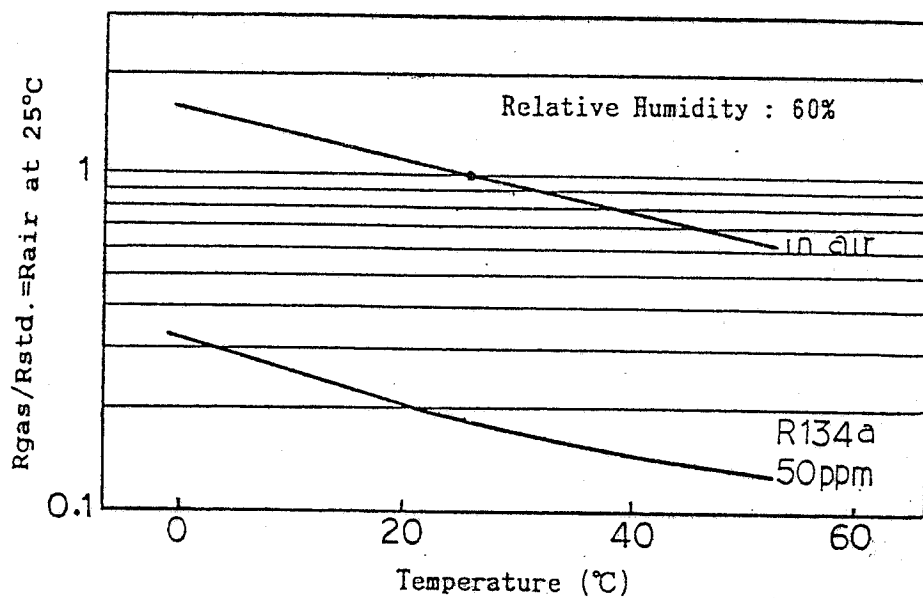


Fig. 4 Temperature characteristics of NAP-11AF

3) Humidity characteristics

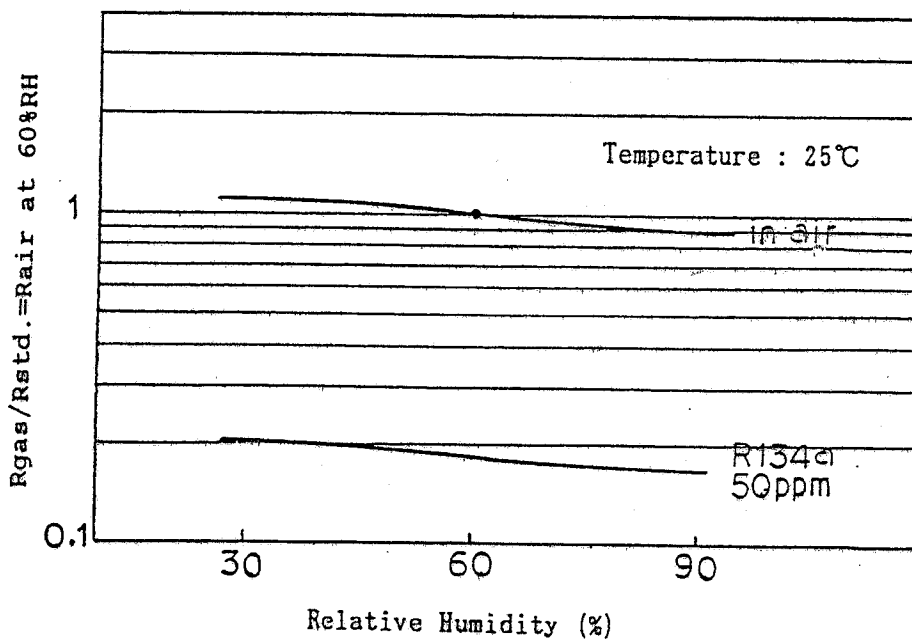


Fig. 5 Humidity characteristics of NAP-11AF

### 3) Response characteristics

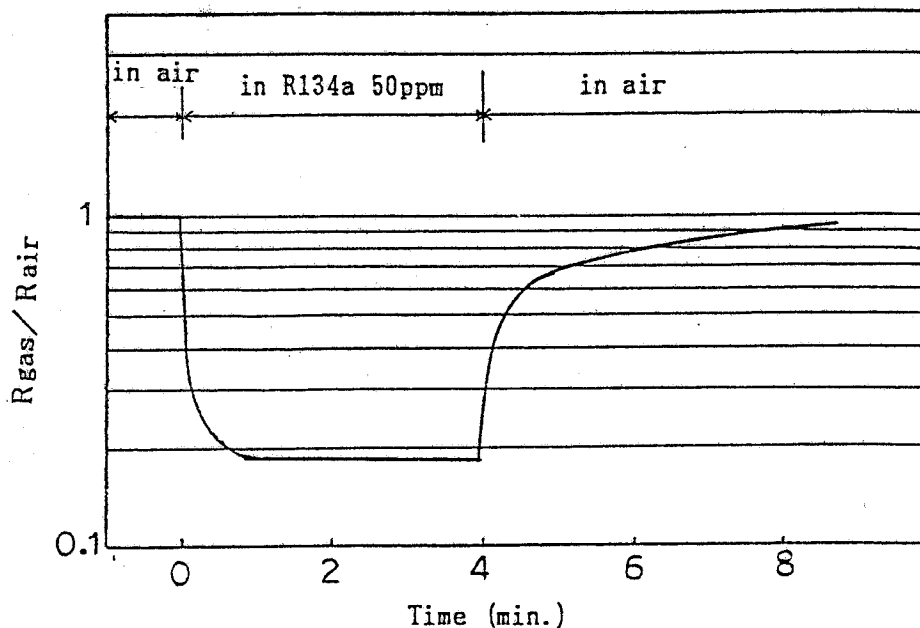


Fig. 6 Response characteristics of NAP-11AF

### 4) Initial stabilization characteristics

Fig. 7 shows the initial stabilization test data on NAP-11AF sensors stored for a long period without electricity.

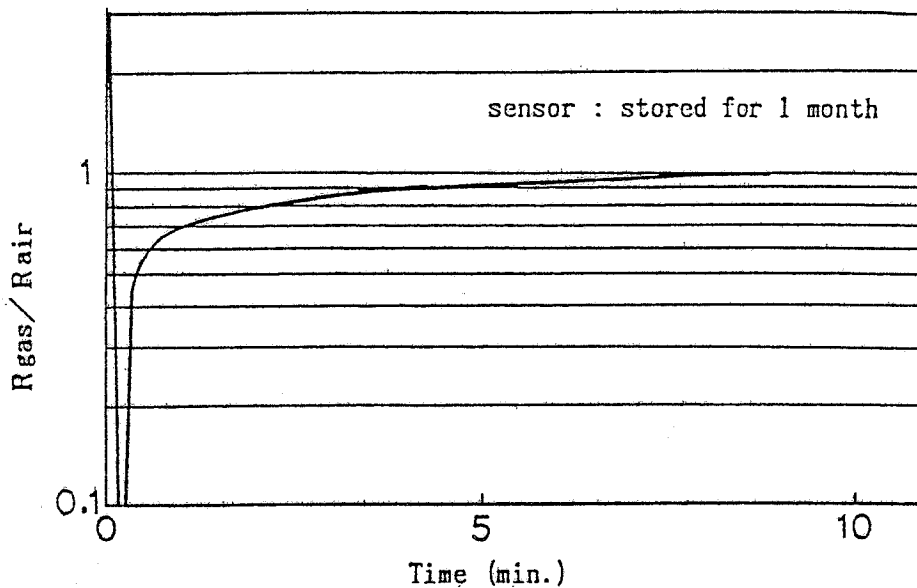


Fig. 7 Initial stabilization characteristics of NAP-11AF

6) Long-term stability characteristics

Fig. 8 shows the long term stability test data under normal ambient conditions.

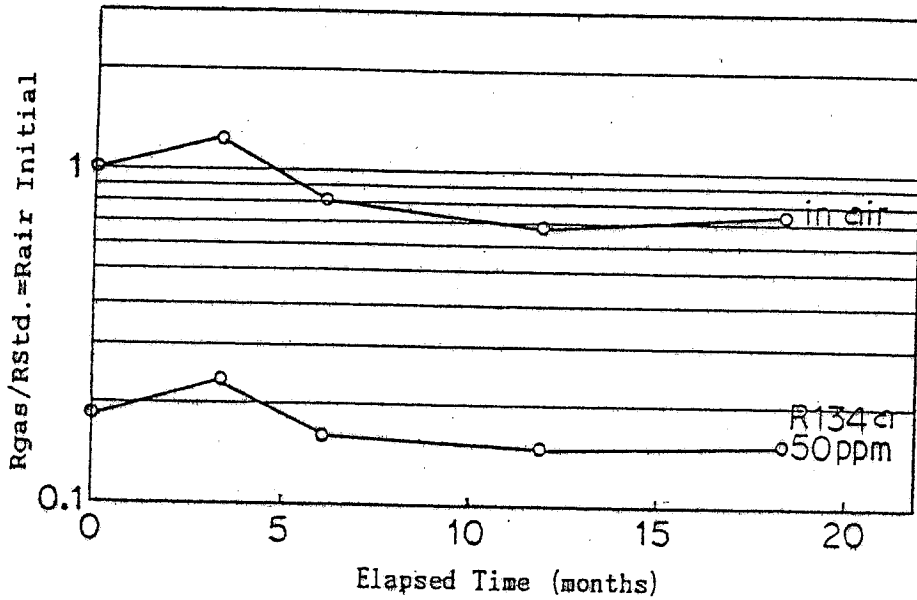
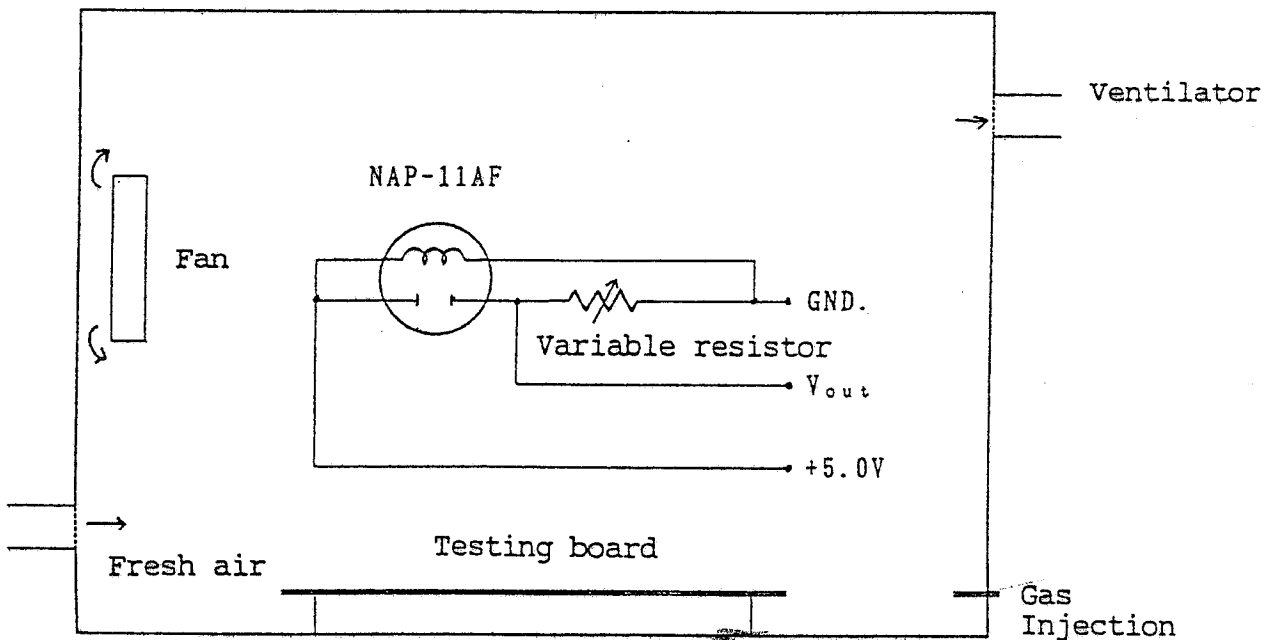


Fig. 9 Long-term stability of NAP-11AF

5. Evaluation of NAP-11AF

1) Testing equipment: The following is an outline of the test system.



Remarks:

- a) Test chamber; Metal or glass which does not generate or absorb gases is desirable as test chamber material. The volume of the chamber should be larger than 1 liter / sensor.
- b) Power supply; Sensors can be operated using either D.C. or A.C., but for optimal measurement accuracy, use of a D. C. voltage stabilizer is recommended.
- c) Voltmeter; A voltmeter with approximately 20 MOhm impedance is sufficient for measuring sensor output voltage.
- d) Ventilation; The test chamber should be ventilated directly outdoors so as to avoid contamination of the air inside the test room.

(2) Adjustment of gas concentration

Gas concentration in a test chamber is to be adjusted by a volumetric method. Use of a substitution freon gas for testing is preferable, but it may be difficult to obtain on the market.

(3) Measurement

- a) Preparatory aging; Before measurement of gas sensitivity, an ageing period of more than 1 day with the specified voltage should be given to test samples.  
The appropriate aging time depends on the length of the storage period, but longer aging periods are preferable.
- b). Measurement;
  - \* Test samples on the testing board are put into the test chamber.
  - \*  $V_a$  (output voltage in clean air) is measured.
  - \* Using a syringe freon gas is injected into the test chamber.
  - \* Wait until the test gas is dispersed in the chamber, and  $V_g$  (output in gas) is measured.
  - \* Ventilation output should be directed outdoors.
- c) Re-measurement

In case of a re-measurement of the same sensor, a 6.0 V power supply (specified voltage x 1.2) is recommended to remove contamination of the sensor surface. This removes decomposed or partly oxide substances that may form when freon gases is adsorbed in the sensor element. Same effect is obtained when the specified voltage is supplied to the sensor for 10 - 30 min., but the aging time can be shortened with 6.0 V.

欢迎索取免费详细资料、设计选型指南和光盘、样品；产品繁多未能尽录，欢迎来电查询。

[中国传感器科技信息网：HTTP://WWW.SENSOR-IC.COM/](http://WWW.SENSOR-IC.COM/)

[工控安防网：HTTP://WWW.PC-PS.NET/](http://WWW.PC-PS.NET/)

[消费电子专用电路网：HTTP://WWW.SUNSTARE.COM/](http://WWW.SUNSTARE.COM/)

E-MAIL：[xjr5@163.com](mailto:xjr5@163.com) [szss20@163.com](mailto:szss20@163.com)

MSN：[suns8888@hotmail.com](mailto:suns8888@hotmail.com)

QQ：195847376

地址：深圳市福田区福华路福庆街鸿图大厦 1602 室

电话：0755-83376549 83376489 83387030 83387016

传真：0755-83376182 83338339 邮编：518033 手机：(0)13902971329

深圳展销部：深圳华强北路赛格电子市场 2583 号 TEL/FAX：  
0755-83665529 25059422

北京分公司：北京海淀区知春路 132 号中发电子大厦 3097 号

TEL：010-81159046 82615020 13501189838 FAX：010-82613476

上海分公司：上海市北京东路 668 号上海赛格电子市场 2B35 号

TEL：021-28311762 56703037 13701955389 FAX：021-56703037

西安分公司：西安高新开发区 20 所(中国电子科技集团导航技术研究所)  
西安劳动南路 88 号电子商城二楼 D23 号

TEL：029-81022619 13072977981 FAX:029-88789382

成都：TEL:(0)13717066236

技术支持：0755-83394033 13501568376

SUNSTAR商斯达实业集团是集研发、生产、工程、销售、代理经销、技术咨询、信息服务等为一体的高科技企业，是专业高科技电子产品生产厂家，是具有10多年历史的专业电子元器件供应商，是中国最早和最大的仓储式连锁规模经营大型综合电子零部件代理分销商之一，是一家专业代理和分销世界各大品牌IC芯片和电子元器件的连锁经营综合性国际公司。在香港、北京、深圳、上海、西安、成都等全国主要电子市场设有直属分公司和产品展示展销窗口门市部专卖店及代理分销商，已在全国范围内建成强大统一的供货和代理分销网络。我们专业代理经销、开发生产电子元器件、集成电路、传感器、微波光电元器件、工控机/DOC/DOM电子盘、专用电路、单片机开发、MCU/DSP/ARM/FPGA软件硬件、二极管、三极管、模块等，是您可靠的一站式现货配套供应商、方案提供商、部件功能模块开发配套商。专业以现代信息产业（计算机、通讯及传感器）三大支柱之一的传感器为主营业务，专业经营各类传感器的代理、销售生产、网络信息、科技图书资料及配套产品设计、工程开发。我们的专业网站——中国传感器科技信息网（全球传感器数据库）[www.SENSOR-IC.COM](http://www.SENSOR-IC.COM) 服务于全球高科技生产商及贸易商，为企业科技产品开发提供技术交流平台。欢迎各厂商互通有无、交换信息、交换链接、发布寻求代理信息。欢迎国外高科技传感器、变送器、执行器、自动控制产品厂商介绍产品到中国，共同开拓市场。本网站是关于各种传感器-变送器-仪器仪表及工业自动化大型专业网站，深入到工业控制、系统工程计 测量、自动化、安防报警、消费电子等众多领域，把最新的传感器-变送器-仪器仪表买卖信息，最新技术供求，最新采购商，行业动态，发展方向，最新的技术应用和市场资讯及时的传递给广大科技开发、科学研究、产品设计人员。本网站已成功为石油、化工、电力、医药、生物、航空、航天、国防、能源、冶金、电子、工业、农业、交通、汽车、矿山、煤炭、纺织、信息、通信、IT、安防、环保、印刷、科研、气象、仪器仪表等领域从事科学研究、产品设计、开发、生产制造的科技人员、管理人员、和采购人员提供满意服务。我们公司专业生产、代理、经销、销售各种传感器、变送器、敏感元器件、开关、执行器、仪器仪表、自动化控制系统：专业从事设计、生产、销售各种传感器、变送器、各种测控仪表、热工仪表、现场控制器、计算机控制系统、数据采集系统、各类环境监控系统、专用控制系统应用软件以及嵌入式系统开发及应用等工作。如热敏电阻、压敏电阻、温度传感器、温度变送器、湿度传感器、湿度变送器、气体传感器、气体变送器、压力传感器、压力变送、称重传感器、物（液）位传感器、物（液）位变送器、流量传感器、流量变送器、电流（压）传感器、溶氧传感器、霍尔传感器、图像传感器、超声波传感器、位移传感器、速度传感器、加速度传感器、扭距传感器、红外传感器、紫外传感器、火焰传感器、激光传感器、振动传感器、轴角传感器、光电传感器、接近传感器、干簧管传感器、继电器传感器、微型电泵、磁敏（阻）传感器、压力开关、接近开关、光电开关、色标传感器、光纤传感器、齿轮测速传感器、时间继电器、计数器、计米器、温控仪、固态继电器、调压模块、电磁铁、电压表、电流表等特殊传感器。同时承接传感器应用电路、产品设计和自动化工程项目。

更多产品请看本公司产品专用销售网站：

商斯达中国传感器科技信息网：<http://www.sensor-ic.com/>

商斯达工控安防网：<http://www.pc-ps.net/>

商斯达电子元器件网：<http://www.sunstare.com/>

商斯达微波光电产品网：[HTTP://www.rfoe.net/](http://www.rfoe.net/)

商斯达消费电子产品网：<http://www.icasic.com/>

商斯达军工产品网：<http://www.junpinic.com/>

商斯达实业科技产品网：<http://www.sunstars.cn/> 传感器销售热线：

地址：深圳市福田区福华路福庆街鸿图大厦1602室

电话：0755-83607652 83376489 83376549 83370250 83370251 82500323

传真：0755-83376182 (0) 13902971329 MSN: [SUNS888@hotmail.com](mailto:SUNS888@hotmail.com)

邮编：518033 E-mail: [szss20@163.com](mailto:szss20@163.com) QQ: 195847376

深圳赛格展销部：深圳华强北路赛格电子市场2583号 电话：0755-83665529 25059422

技术支持：0755-83394033 13501568376

欢迎索取免费详细资料、设计指南和光盘；产品凡多，未能尽录，欢迎来电查询。

北京分公司：北京海淀区知春路132号中发电子大厦3097号

TEL: 010-81159046 82615020 13501189838 FAX: 010-62543996

上海分公司：上海市北京东路668号上海赛格电子市场D125号

TEL: 021-28311762 56703037 13701955389 FAX: 021-56703037

西安分公司：西安高新开发区20所(中国电子科技集团导航技术研究所)

西安劳动南路88号电子商城二楼D23号

TEL: 029-81022619 13072977981 FAX:029-88789382