SAPPHIRE

Portable Multi-Gas Detector with 8-Gas Capability and Smart Interchangeable

FEATURES

- Smart, Pre-calibrated, Interchangeable Sensor Modules
- Monitors Up to 8 Gases if CO/H_2S and CO_2/CH_4 Sensors Are Utilized
- Simultaneously Displays Data for 6 Channels of Gas
- Sensor Options: Electrochemical, Catalytic, MOS, IR & PID
- High Resolution Backlit LCD
- Encapsulated, Water-Proof Construction, with High Ingress Protection
- Modular Battery Housing Can Be Charged Separately from Instrument for Spare Battery with up to 40 Hours Operating Time
- Rapid Charging Function—Battery Module Can be Charged in 5 Hours
- Confidence Chirp During Normal Operation
- Lithium Battery Standard. Can Operate on Optional NiMH, or Alkaline Battery
- Can Be Charged Direct with Cable or Charging Base
- Powerful Networking and GPS Positioning Function
- Large Memory for Up to 3 Months of Data Storage
- Low Battery Indication
- Multi-level Filtration System extends Vacuum Sampling Pump Life
- Self-Test Function
- Two Instant Alarm Points
- STEL and TWA Alarms for Toxic Gases
- Over-range Gas Alarm
- Audio, Visual LED and Vibratory Indicators
- Available for CO, H_2S, NH_3, SO_2, H_2, O_2, etc., Combustible Gases, CO_2 and VOC's
- Designed to be Intrinsically Safe

Introduction

Highlighting the superior design features of SAPPHIRE are the exclusive, interchangeable, Pre-Calibrated, SMART SENSOR MODULES. These interchangeable modules are available for detection of VOCs, % LEL hydrocarbons, CO_2, H_2, O_2, CO, H_2S, SO_2, NO, NO_2, and other toxic gases. The choice of electrochemical, IR, PID and MOS sensors facilitates selection of the best technology for each application. Up to 27 sensors are available or in development.

Having 6 sensor positions available, SAPHIRE can monitor and display up to 8 gases when utilizing the combo CO/H_2S, and infrared CO_2/CH_4 sensors. SAPPHIRE includes audio, visual and vibratory alarm indicators. The lithium-ion battery provides long operating life and fast recharge times. SAPPHIRE is not only SMART and easy to use, it is also very robust. Intended for rugged service in harsh environments, the enclosure is constructed of thermoplastic rubber coated polycarbonate.

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SAPPHIRE SENSOR TECHNOLOGY

Infrared (IR) Sensors:
The infrared sensor is offered for CO_2 and hydrocarbons. The level of CO_2 can be from low ppm to % by volume concentrations. The range for hydrocarbons is generally 0-100% LEL. In addition to methane, propane is offered for detection of other typical hydrocarbons. The IR sensor utilizes an infrared light source of a certain wavelength that is highly absorbed by the gas to be monitored. In the process, the infrared light is passed through the gas in the sample chamber. The target gas absorbs the select wavelength proportional to the gas concentration, which is measured and displayed. Different wavelengths are used for CO_2 versus hydrocarbons so there is no cross sensitivity between these two applications. IR sensors can be used to measure hydrocarbons in an inert environment. Water vapor and corrosive gases, such as H_2S, are to be avoided.

Electrochemical (EC) Sensors:
Electrochemical sensors are used primarily for detection of inorganic gases, CO, H_2S, SO_2, etc. These sensors consist of electrodes, electrolyte and air/liquid separation barrier. Gas molecules enter the cell and, as a result of an oxidation/reduction reaction, generate an electrical current proportional to the gas concentration. Unlike MOS and PID sensors, EC sensors are quite specific, but some cross sensitivity to other similar gases generally exists.

Metal Oxide Semiconductor (MOS) Sensors:
An MOS sensor consists of a heated bead composed of mixed metal oxides that decrease in resistance in the presence of many different gases and vapors. These sensors are used for the detection of various hydrocarbons and organic solvents at ppm or percent LEL levels. They can be optimized and calibrated for a particular gas or group of gases, but they are inherently non-specific. High humidity conditions can result in higher upscale readings, while extremely dry conditions have the reverse effect.

Photoionization Detector (PID):
The PID sensor utilizes a UV lamp to produce high-energy radiation which reacts with the sample gas to generate a measurable flow of charged particles, the process known as photoionization. While lamps of different energy levels are available, 10.6 eV is the most common. Various gases have different Ionization Potentials. A 10.6 eV PID can detect those gases having an IP of less than 10.6 eV. The PID is used for ppm or even ppb levels of VOC's. Like the MOS, PID sensors are very non-specific, as defined by the energy level of the UV lamp and the IP of the gases present. Water vapor will suppress readings, and corrosive gases, such as H_2S, can damage the sensor.

Catalytic (CAT) LEL Sensors:
Catalytic sensors are used to detect combustible hydrocarbons in the range of 0-100% LEL. Within this definition, these sensors are completely non-specific, however, their proper application depends upon the level of cross sensitivity response and the 100% LEL concentration for different gases. Methane is the most common calibration gas, but propane and other gases are used for other applications. The sensor consists of a pair of elements, one active and the other a reference bead, which are connected to a classic "Wheatstone Bridge". The active and reference elements create an electrical signal proportional to the gas concentration. Catalytic sensors are subject to silicone poisoning and the corrosive effects of certain gases.

SAPPHIRE Portable Multi-Gas Detectors with 8-Gas Capability

SAPPHIRE Instrument Specifications

Sampling Method: Diffusion or optional pump
Operating Temperature: +5 to +122°F (-15 to +50°C)
Storage Temperature, Short-Term: -22 to 158°F (-30 to +70°C)
Operating Humidity: 15 to 90% rH, non-condensing
Ingress Protection: Designed for IP66-IP67
Size: 6.8 x 3.7 x 1.4 inches (172 x 93 x 36 mm)
Weight: 1.3 lbs (600g)
Enclosure: Thermoplastic rubber coated polycarbonate
Display: LCD Matrix, 200 x 140
Battery Charge Time: 5 hours
Battery Operation Life: 40 hours
Battery Capacity: 6600 mAh
Battery Type: Lithium-ion, #18650, 3.7V, 2200 mAh, 3 cells

SAPPHIRE Sensor Information

Types of SMART, Pre-calibrated, Interchangeable Sensors:

Electrochemical (EC)	Infrared (IR)
Combo CO/H2S (EC)	Combo CO2/CH4 (IR)
Photoionization (PID) 10.6 eV	Metal oxide semiconductor (MOS)
Catalytic (CAT)	

Total Sensor Positions: 6
Maximum High Energy Sensors: 2
Sensor Energy Rating Based on Power Consumption:
EC: Low; EC Combo: Low; CAT: High; IR: High IR Combo: High; PID: High; MOS: High
Maximum Number (6 Total) of Installed Sensors at the Same Time, by Energy Rating:
6 low energy sensors (EC and EC combo)
2 high energy sensors (CAT, MOS, PID, IR & IR Combo)
4 low energy and 2 high energy
Maximum Gases Monitored: 8, using 2 combo sensors
Maximum Gases Displayed: 8, 4 constant, 4 alternating with 2 combo sensors

Specifications subject to change without notice

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SAPPHIRE SENSOR TABLE

SMART, PRE-CALIBRATED SENSOR MODULES

Part Number	Gas Monitored	Sensor Type	Range	Low Alarm	High Alarm	TWA Alarm	STEL Alarm	Life (3)
02622-0100	Chlorine, Cl_2 (1)	EC	10.0 ppm	0.5 ppm	1 ppm	0.5 ppm	1 ppm	24
02622-0200	Hydrogen sulfide, H_2S	EC	100 ppm	10 ppm	15 ppm	10 ppm	15 ppm	24
02622-0300	Hydrogen cyanide, HCN	EC	30.0 ppm	4.7 ppm	10 ppm	4.7 ppm	4.7 ppm	18
02622-0400	Hydrogen chloride, HCl (1)	EC	30.0 ppm	5 ppm	10 ppm	5 ppm	5 ppm	18
02622-0500	Sulfur dioxide, SO_2	EC	30.0 ppm	2 ppm	5 ppm	2 ppm	5 ppm	24
02622-0700	Hydrogen fluoride, HF (2)	EC	10.0 ppm	2 ppm	4 ppm	3 ppm	3 ppm	18
02622-0800	Ozone, O_3 (2)	EC	1.00 ppm	0.1 ppm	0.2 ppm	0.05 ppm	0.2 ppm	18
02622-1100	Oxygen, O_2	EC	30.0%V	19.5%V	23.5%V	----------	----------	12
02622-1200	Carbon monoxide, CO	EC	1000 pm	35 ppm	100 ppm	25 ppm	200 ppm	24
02622-1500	Hydrogen, H_2	EC	2000 ppm	200 ppm	2000 ppm	----------	----------	24
02622-1700	Nitrogen dioxide, NO_2	EC	30.0 ppm	2 ppm	4 ppm	3 ppm	5 ppm	24
02622-1750	Nitric oxide, NO	EC	300 ppm	25 ppm	50 ppm	25 ppm	25 ppm	24
02622-2400	Ammonia, NH_3	EC	100 ppm	25 ppm	50 ppm	25 ppm	35 ppm	18
02622-4001	Arsine, AsH_3 (2)	EC	1.00 ppm	0.05 ppm	0.1 ppm	0.05 ppm	0.1 ppm	18
02622-4002	Phosphine, PH_3 (2)	EC	1.00 ppm	0.1 ppm	0.2 ppm	0.3 ppm	1 ppm	18
02622-4003	Silane, SiH_4	EC	50 ppm	10 ppm	20 ppm	5 ppm	15 ppm	18
02622-2200	CO/H_2S Combo Sensor	EC/EC	See Carbon monoxide & Hydrogen sulfide sensor data					
02622-5101	Combustible Gas, Methane (4)	CAT	100% LEL	10% LEL	50% LEL	----------	----------	24
02622-5102	Combustible Gas, Propane (4)	CAT	100% LEL	10% LEL	50% LEL	----------	----------	24
02622-5601	Combustible Gas, Methane (4)	IR	100% LEL (5)	10% LEL	50% LEL	----------	----------	36
02622-5605	Combustible Gas, Propane (4)	IR	100% LEL (5)	10% LEL	50% LEL	----------	----------	36
02622-5326	Carbon dioxide, CO_2, ppm	IR	5000 ppm (5)	2500 ppm	4500 ppm	5000 ppm	----------	36
02622-5358	Carbon dioxide, CO2, % by V	IR	100% V (5)	Alarms per request				36
02622-5001	Broad-Range Hydrocarbon/Solvents, ppm (Based on Toluene)	MOS	500 ppm (6)	250 ppm	450 ppm	----------	----------	24
02622-5002	Broad-Range Hydrocarbon/Solvents, ppm (Based on Custom Cross Sensitivity)	MOS	50% LEL	10% LEL	20% LEL	----------	----------	24
02622-2812	Volatile Organic Compounds, VOCs, ppm (Based on Isobutylene)	PID	2000 ppm	250 ppm	500 ppm	----------	----------	12
02622-2811	Volatile Organic Compounds, VOCs, ppm (Based on Isobutylene)	PID	200 ppm (7)	75 ppm	150 ppm	----------	----------	12

(1) For best performance, it is recommended that a sample pump be used for monitoring these gases. In general, a sample pump reduces response time and improves the performance of most other sensors as well.

(2) A sample pump is required for monitoring these gases

(3) Typical sensor life in months

(4) Other gases available

(5) Other ranges available

(6) Other ranges & gases available

(7) Range of 20 ppm available

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