

# SpectraSensors, Inc.

## Industrial Process Monitoring Gas Analyzers

### Key Features

- *Virtually Maintenance Free*
- *Does Not Become Corrupted by Contaminants or Caustic Gases*
- *Fast and Accurate Real-time Measurements*
- *No wet-up or dry-down delays*
- *Not affected by Interference Gases*
- *Reliable in Harsh Environments*
- *Short Term Payback; No Consumables*
- *NIST-Traceable Calibration*



SS500

SS2000

SS3000

SS1000

### OVERVIEW

The SS-Series sensor products are high-speed, extremely reliable extractive analyzers used to measure trace gas concentrations in a variety of applications such as natural gas, refinery fuel gases, petrochemical product purity, dryer gases, and tail gases. Typical target gases include moisture, carbon dioxide, carbon monoxide, and hydrogen sulfide.

The SS-Series laser-based gas analyzers are reliable, repeatable, less costly to operate than electrochemical sensors and are not subject to the interpretation errors of chilled mirror instruments. The wall-mount models are designed for high reliability in harsh weather and hazardous locations. Additionally, the portable unit is designed for fast hookups and battery operation.

### ACCESSORIES

Accessories are available to help customers achieve turn-key installations. SpectraSensors offers probe-regulators, sample conditioning panels, spare parts, a choice of enclosures, and a variety of options for each instrument.

### SERVICES

SpectraSensors Service programs offer an added level of service, guaranteed minimum downtime, as well as future discounts. Customers that require assurance of minimum downtimes purchase service agreements when the bottom line of their business depends on the continuous flow of gas. Please ask for more details.

*Measurements you can Trust...*

**SpectraSensors™**



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### Product Benefits

#### Low Cost of Ownership ~

The SpectraSensors analyzer pays for itself by providing concentration measurements with unprecedented reliability and speed with virtually no maintenance! You can eliminate the costs associated with false data, delays, recalibration & replacement of sensors.

Electrochemical sensors work well at the beginning of their life, but the sensor is interacting with a corrosive environment, so it clogs up and corrodes. The SpectraSensors sensor heads are immune to excess levels of moisture or contaminants.

#### Superior Performance ~

The SS-Series Analyzers experience no interference from corrosive contaminants. These gas components interfere with electrochemical sensors in various and unpredictable manners. They may condense and coat the electrochemical sensors, slowing and permanently altering the electrochemical sensors' response; if not completely destroying it. The SpectraSensors technique is inherently superior because the laser-based sensor does not make contact with the gas sample.

#### Real Time Data ~

The SS-Series Analyzers supply continuous, 24/7, real time measurement with no wet-up or dry-down delays. The speed of response can be less than one second. Figure one shows the instant response from a sudden introduction and interrupt of a moist stream of air into the SS2000 sample cell. The response is practically instantaneous.

Traditional techniques are inheritably slower because they rely on the diffusion of the sample gas into the sensor's detection cavities. The sensor must slowly dry down before it begins to provide accurate measurements – see figure 2.

#### Exceptional Reliability ~

The SpectraSensors SS-Series Analyzers are relied upon by petrochemical companies to quantify levels of water vapor, carbon dioxide and hydrogen sulfide in pipelines and process streams. These contaminants can lead to catastrophic failures - fast, dependable, and accurate measurements are absolutely vital! The SS2000 and SS3000 are available with CSA Class I, Division 1 or Class I, Division 2 certification and are designed to withstand harsh environmental conditions.

The SpectraSensors Analyzers have proven long-term reliability in the hundreds of installations around the world where the SpectraSensors analyzers are the key ingredient to the assurance of reliable, accurate, real-time measurements.

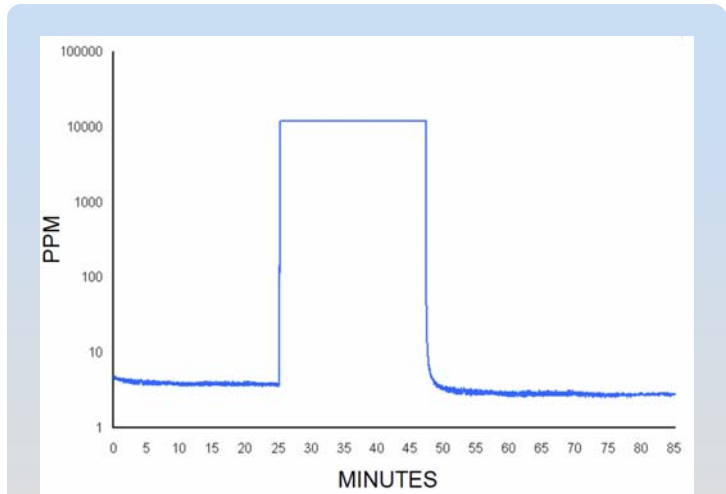


Figure 1: Instant response from a sudden introduction and interruption of a moist stream of air into the SS2000 sample cell.

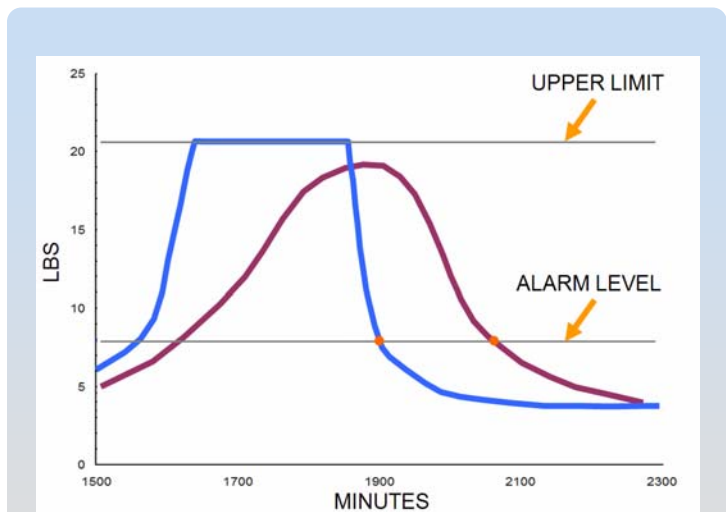


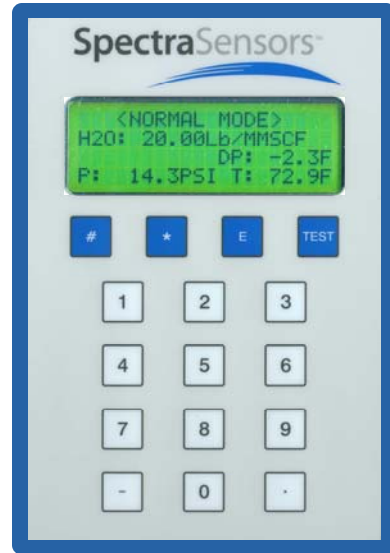
Figure 2: A readout comparison of the SS2000 (left curve) and a slower sensor demonstrates how eliminating long dry-down times can drastically improve response times.

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### Product Features



#### **Ease of use ~**

The SS-Series is a compact unit designed to provide years of accurate, dependable gas monitoring. All of the electronic controls are contained inside a NEMA 4X enclosure (other enclosure options are available). Each analyzer contains one or two gas sample cells and measurement heads (depending on number of target gases analyzed).

Installation is as simple as mounting the unit and connecting the power line. At that point, the unit is ready to operate! Additionally, RS232 and/or 4-20mA current loop wires can be connected for remote monitoring.

#### **User-Friendly Key-Pad ~**

The Keypad is made from a durable material designed for long life and weather resistance.

The digital display is easy to read and is backlit for night time visibility.

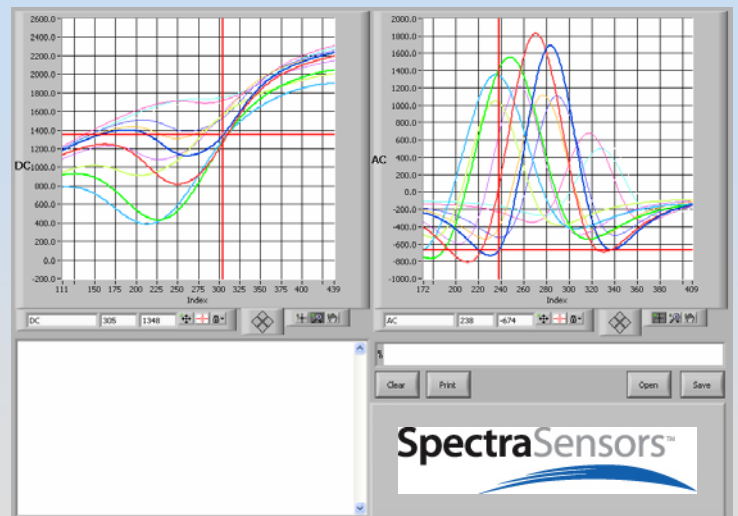
Data entry and diagnostic functions are easily accessed by pressing the appropriate menu keys.

#### **Software ~**

SpectraSensors offers software to quickly and visually inspect the data. The spectral absorption of each target species has a very distinctive shape. The user will quickly become accustomed to looking at the absorption curve to determine the level of the target species present.

The curve is produced by the physical characteristics of the gas molecules; therefore it cannot be created in error. It is a great way to verify that the unit is working properly.

The data can also be exported into other software packages for analysis.



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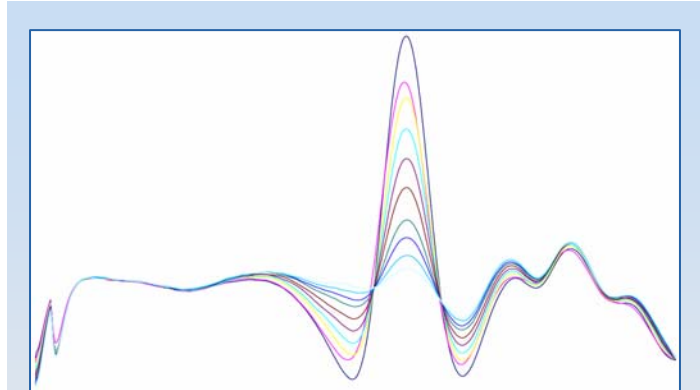
## Industrial Process Monitoring - Gas Analyzers

### How It Works

SpectraSensors' gas analyzers utilize laser absorption spectroscopy to detect the presence of one or more gases in a mixture of background gases. This technique has been applied to gas measurements since the laser was first invented over 40 years ago. Recent advancements in semiconductor lasers have made this technology economically viable for industrial monitoring applications.

The target gases are measured by monitoring their absorption of near-infrared (NIR) light at specific wavelengths. The human eye responds to light in the range from approximately  $0.4\mu\text{m}$  (deep violet) to  $0.8\mu\text{m}$  (deep red), but most molecules respond to light at longer wavelengths that are invisible to the human eye (the infrared region). By using a laser that operates precisely at a wavelength where the target gas absorbs, it is possible to determine accurately the concentration of the target gas by measuring the fraction of light that is absorbed by the molecules.

The graph at the right represents spectral scans in a gas sample with varying amounts of moisture. In this example, the characteristic shape of the  $\text{H}_2\text{O}$  (tall peak) and  $\text{CH}_4$  (triple peak to the right of the  $\text{H}_2\text{O}$  peak) makes it very easy to determine that the sensor is working properly because the shape of the curve is determined by the physical properties of the molecules. The curves cannot be produced in error.



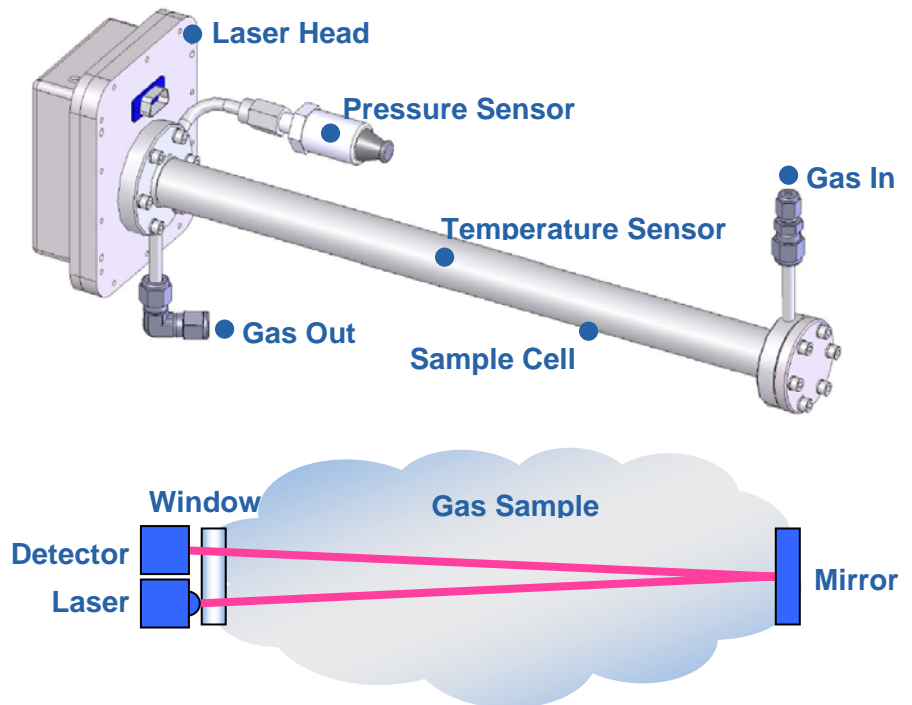
*Water absorption spectra in natural gas.* The graph shows several moisture spectra in natural gas. The higher the concentration of moisture or  $\text{CO}_2$ , the more absorption of light, and the stronger the corresponding absorption signal. Since the calculation is a direct, fundamental measurement, the amount of moisture or  $\text{CO}_2$  present can be measured quickly and accurately. There are no wet-up or dry-down delays like those associated with surface-based sensors.

Illustrative representations of the SS-Series SpectraSensors "Laser Sample Cells" on the right demonstrate the relatively simple construction which is the basis of a robust and trouble-free design.

The SS-Series analyzers use long lasting and resilient tunable diode lasers (TDL) that emit near-infrared light at wavelengths specifically absorbed by the target gas. The robustness of Laser Diodes is proven in many consumer and commercial applications such as CD players, barcode scanners and fiberoptic communications.

As the light passes through the gas sample, energy is absorbed, reducing the amount of light arriving at the detector. The length of the laser beam affects the sensor's sensitivity; hence SpectraSensors offers the dual-pass optical path in most applications (some applications require a different number of passes).

Please contact SpectraSensors for detailed explanations of this and other technologies used in our products.



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