



SS2100 HYDROGEN SULFIDE IN NATURAL GAS PRODUCT

Product Code 33802

KEY FEATURES

- No cylinder gases or Lead Acetate Tapes – Virtually Maintenance Free
- Tunable Diode Laser and Detector are isolated from the process Gas – No damage for process contaminants
- Fast - Responds to changes in H₂S concentration in as little as 1 sec.
- Uses high resolution TDL technology - No interference from other compounds



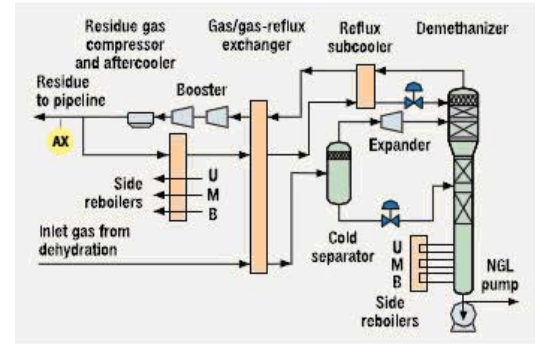
Tunable Diode Laser technology for the measurement of H₂S in Product Natural Gas from gas processing plants.

NATURAL GAS PROCESSING PLANTS

Regardless of the process downstream for Natural Gas Liquids extraction or Liquefied Natural Gas production, one of the first steps in a typical gas plant is acid gas (H₂S and CO₂) reduction and control. The Natural Gas product will typically have maximum allowable H₂S concentrations <5ppm.

CRITICAL CONTROL OF H₂S There are a variety of H₂S and CO₂ reduction systems, some using liquid scrubbers such as amines or solvents, or fixed adsorbent beds, but the optimal operation of these systems requires an on-line measurement of the acid gas in the outlets of these systems.

TRADITIONAL MEASUREMENT SOLUTIONS Lead Acetate Tape devices have been used for on-line H₂S analysis, but the on-going cost and maintenance effort of replacing the tapes is high. Moreover, many regard the Lead Acetate tape to be a hazardous material with associated handling and disposal problems. On-line gas chromatographs are another method widely used for monitoring the levels of H₂S. Unfortunately, even with the latest in chromatography techniques, the analysis can take 3-6 minutes between measurement updates. Due to rapid changes in the acid gas concentration, this delay may not be acceptable. Gas chromatographs consume carrier and flame fuel cylinder gases, as well as requiring sulfur-free air for flame photometric detectors, so the consumable costs of GC's are high. Spectroscopic methods using broadband light sources and narrow band pass filters are prone to interferences from changing background concentration



SPECTRASENSORS' SOLUTION The SpectraSensors SS2100 offers a new solution to this control measurement. There are no cylinder gases or Lead Acetate tapes to replace on a routine basis, so the analyzer is very low maintenance and has a low cost of ownership over the life of the analyzer. The high resolution that is inherent to TDL technology eliminates errors due to interferences that have hampered other spectrometric approaches. Only SpectraSensors employs **Differential Spectroscopy** to cope with the changes in background spectrum of the sample caused by changing operating conditions and feedstocks. The sample gas is passed through a copper nanoparticle scrubber to remove H₂S, and the spectrum of the H₂S-free sample is measured. The scrubber is then bypassed to measure the raw sample with H₂S, and the H₂S is measured by spectral subtraction. As the H₂S-free background spectrum can be applied repeatedly to the sample, the scrubber is only used as needed, controlled by logic in the electronic controller. The scrubber lifetime in normal service is a minimum of 18 months, so consumable costs and maintenance are low. Tunable Diode Laser technology means that analysis is fast; results can be updated every second if desired.

VALIDATION The Analyzer measurement can be validated using a certified blend of H₂S in a balance of pure Methane.

SS2100 Hydrogen Sulfide Analyzer



SPECIFICATIONS

Application Data

Target Components	H ₂ S in Natural Gas Product (Residue Gas)
Typical Measurement Ranges	0-5ppm, 0-10ppm or 0-20ppm
Typical Precision	±0.5ppm*
Measurement Response Time	1 to ~60 seconds*
Principle of Measurement	Differential Tunable Diode Laser Absorption Spectroscopy (H ₂ S scrubber included)
Environmental Temperature Range	-20° to 50° C (-4° to 122° F) -10° to 60° C (14° to 140° F) <i>optional</i>
Sample Inlet Pressure	70kPag (10 PSIG) typical 210kPag (30 PSIG) maximum
Sample Cell Temperature Range	Maintain at 50° C ±2° C
Maximum Cell Pressure	70kPag (10 PSIG)
Sample Flow Rate	3-4 L/min (6.4 to 8.5 scfh)*
Recommended Validation	Certified blend of H ₂ S in Methane balance

Electrical Data

Power	100-240 VAC, 50-60 Hz standard
Max Current	Controller: 1 A @ 120 VAC
Controller to Cell Cable Length	1m standard (3m, 5m & 10m available optionally)
Communication	Current Loop Output 4-20 mA Isolated, 1200 ohms @ 24 VDC max load. Serial: ASCII Text RS232C standard, Modbus RS232C
Digital Outputs	Four (4) 12 VDC for valve operations: Scrubber (if required), Process/Val, Val 1, Val 2 5 SPDT (Form C) Dry Contacts: Common Fault, Val 1 Active, Val 2 Active, Val Fail, One user assignable DO to standard alarms
LCD Display	Concentration, Cell Pressure and Temperature, Diagnostic Data

Physical

Controller Enclosure	NEMA 4X – 304 stainless steel <i>standard</i>
Controller Dimensions	343 mm H x 305 mm W x 165 mm D (13.5" H x 12" W x 6 7/16" D)*
Weight Approximately	13.1 Kg (28.6 lbs)*
Sample Cell Dimensions	28m Herriott cell, 559 mm H x 127 mm W (22"H x 5"W)
Sample Cell Construction	316L Series Polished Stainless Steel Standard SilcoNert® coated
Number of Sample Cells	1 (Single Channel SS2100) or 2 (Dual Channel SS2100)
Dimensions with Sample System	1678 mm H x 613 mm W x 427 mm D (66" H x 24-1/8" W x 16-13/16" D)
Weight with Sample System	68 Kg (150lbs)

Area Classification

Certification	CSA Certified for Class I, Div. 2, Groups ABCD T3C Ex II 2G Ex d IIB+H2 T5; Tamb : -20 ÷ +60 °C
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* Application specific; consult factory.

SPECTRASENSORS SS2100 WATER IN HYDROGEN RECYCLE ANALYZER

The Analyzer Scope consists of the Electronic controller, cell, and 1m long interconnecting cable. The customer or analytical systems integrator is responsible for providing a sample conditioning system and/or cell enclosure that maintains the sample and cell at a constant temperature (generally 50°C +/- 0.2°C) that is above the hydrocarbon and moisture dew points of the process stream. The sample flow, sample pressure, and temperature specifications listed above must be maintained at all times. Any departure from these specifications must be approved by SpectraSensors.

Cable lengths of 3m, 5m and 10m may be substituted by specifying the corresponding part number. See spare parts and accessories list.

TYPICAL BACKGROUND STREAM COMPOSITION

Component	Minimum (Mole %)	Normal (Mole %)	Maximum (Mole %)
Hydrogen Sulfide	0.5 ppm	1 – 5 ppm	10 ppm
Water	0.05 ppm	<1 ppm	10 ppm
Nitrogen	0	1 – 3	3
Oxygen	0	<1	1
Methane	75	75 - 95	100
Carbon Dioxide	0	< 100 ppm	100
Ethane	0	0 - 10	10
Propane	0	0 - 5	5
Butanes	0	0 - 2	2
C5+	0	0 – 0.5	0.5

The background stream composition must be specified for proper calibration and measurement performance. Specify the Normal composition, along with the minimum and maximum expected values for each component, especially H₂S, the measured component. Other stream compositions may be allowable with approval from SpectraSensors.

RELAY CONTROL AND COMMUNICATIONS

All SS2100 Process Analyzers are supplied with 9 relays:

- o Four (4) are 12 VDC powered and provided for driving switching valves associated with Process, Validation 1 and Validation 2 and a scrubber (for differential systems only).
- o Five (5) SPDT (Form C) dry contact digital outputs are provided for common fault, Val 1 active, Val 2 Active, Validation Fail, and one (1) user-assignable DO to any standard alarm, such as high concentration, high cell pressure, low cell temperature, high cell temperature, low sample flow, etc. depending on the application.

Data Output is via 4-20 mA Isolated Analog Output.

Serial Communication via Modbus protocol is provided. See Modbus specifications for details.

MEASUREMENT SOLUTION – HYDROGEN SULFIDE IN AMINE SCRUBBER OUTLET

For a complete analytical solution and to ensure the integrity of the sample stream and its analysis, SpectraSensors Gas Analyzers may be ordered with a Sample Conditioning System (SCS). Each SCS has been specifically designed to deliver a sample stream to the analyzer that is representative of the process stream at the time of sampling.

TYPICAL BACKGROUND STREAM COMPOSITION

The Sample Conditioning System provides the necessary features to complete the total analytical solution:

- Stable heated environment for the cell (50°C +/- 0.2°C)
- Sample supply and return shut-off valves
- Sample overpressure relief valve
- Analyzer guard particulate filter
- Validation gas inlet and automatic selection valve
- Cell pressure regulator
- Sample bypass pressure gauge
- Sample bypass flow valve and rotameter
- Cell flow valve and rotameter
- Outlet pressure gauge
- Outlet non-return valve
- Temperature gauge on cabinet
- Special Dilution System for Validation

VALIDATION

SpectraSensors analyzers require no calibration in the field and the calibration is stable for the life of the analyzer, however, validation of trace H₂S concentration is essential. At the SSI factory, the calibration is done by mixing certified blends of H₂S at fairly high concentrations with pure gases through NIST-traceable mass flow controllers.

In the Field, the analyzer can be validated by using a certified blend of H₂S in a background of Methane, available from a number of reliable specialty gas blenders.