



# SS2100 WATER MEASUREMENTS IN DRY LNG FEED GAS

Product Code 44201

## KEY FEATURES

- Fast – No wet-up or dry-down times - Responds to changes in H<sub>2</sub>O concentration in as little as 1 sec.
- Virtually maintenance free - No frequent change-out of sensor
- Avoids damage to sensor from contaminants in the process. - Tunable Diode Laser and Detector are isolated from the process Gas
- No interference from other compounds – uses high resolution TDL technology



**A new technology to control H<sub>2</sub>O concentration at desiccant dryer outlets for optimum performance and efficiency in LNG Plants.**

### DESICCANT DRYERS

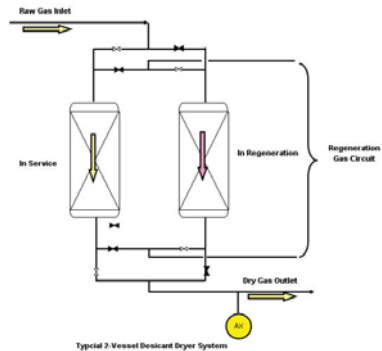
Molecular Sieves desiccants are the most common drying techniques for Liquefied Natural Gas (LNG) plants. Typically, two desiccant vessels are operated in series, using a piping system which allows either bed to be the first bed in the line, and allows either to be removed from the process for regeneration. As the first bed in the line is exhausted, it is put into the regeneration circuit where hot, dry gas drives the absorbed moisture out. The freshly regenerated bed becomes the second bed in the series.

### CRITICAL CONTROL OF MOISTURE

Normally, when the inlet gas moisture concentration is constant or can be measured, the desiccant dryers have a predictable operational period between regenerations but as the desiccant can lose capacity as it ages, or from over heating, or from contamination. Desiccant beds can also channel, allowing small concentrations of wet gas to flow through the bed without being dried. In any case, as the gas will subsequently be cooled for cryogenic liquefaction downstream, the gas must be dry.

### TRADITIONAL MEASUREMENT SOLUTIONS

Electrochemical and vibrating quartz crystal moisture analyzers have been the traditional method for monitoring the levels of H<sub>2</sub>O in Desiccant Dryer Outlets Unfortunately, trace hydrocarbons and other contaminants present in the stream contaminate the electrochemical probes, resulting in high maintenance costs due to the need to be constantly replaced. It's not uncommon for moisture probes to be replaced multiple times a year. Quartz crystal



Typical 2-Vessel Desiccant Dryer System

moisture meters have slow wet-up and dry-down times which allow water downstream and prolong regeneration times.

### SPECTRASENSORS' SOLUTION

SpectraSensors SS2100 is the ideal solution for this challenging application. Its non-contact laser and detector is impervious to damage from contaminants. Tunable Diode Laser technology means which measurement interferences from other infrared absorbing compounds are avoided. There are no wet-up or dry-down delays, resulting in fast updates even when the concentration changes dramatically. Only SpectraSensors employs Differential Spectroscopy, which incorporates a dryer using metal getter technology to subtract the spectrum of the dry gas from the wet spectrum. This allows the SS2100 to measure streams whose background gas compositions changes.

### VALIDATION

Validation of low level (<10 ppm) water measurements is essential, but also extremely difficult, as certified blends at such low levels are not readily available. Some have attempted to put permeation devices, but these require regular maintenance to prevent drying out, and there is no independent way to verify the accuracy of the permeation device. SpectraSensors employs a dilution system which dilutes a relatively high concentration certified standard of H<sub>2</sub>O in Methane using dried sample gas. Thus the validation is accurate and traceable.

# SS2100 Moisture Analyzer

## SPECIFICATIONS

### Application Data

Target Components	H <sub>2</sub> O in LNG Dry Feed Gas
Typical Measurement Ranges	0-10ppm (other ranges available upon request)*
Typical Precision	±0.05ppm or 2% of Full Scale (whichever is greater)*
Measurement Response Time	1 to ~60 seconds*
Principle of Measurement	Differential Tunable Diode Laser Absorption Spectroscopy (H <sub>2</sub> O 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	A certified blend of H <sub>2</sub> O in Methane balance is diluted with dried sample in the sample conditioning system under flow control



### Electrical Data

Power	100-240 VAC, 50-60 Hz standard
Max Current	Controller: 1A @ 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

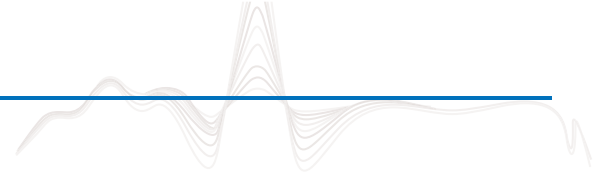
### Physical

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.



## 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.

Select the measured range desired. Other ranges are available by special order.

## TYPICAL BACKGROUND STREAM COMPOSITION

Component	Minimum (Mole %)	Normal (Mole %)	Maximum (Mole %)
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	0	<0.001 ppm
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 water, the measured component. Other stream compositions may be allowable with approval from SpectraSensors.

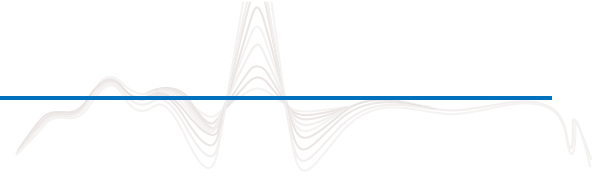
## RELAY CONTROL AND COMMUNICATIONS

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 – WATER IN LNG FEED GAS

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 SAMPLE CONDITIONING SYSTEM FOR H<sub>2</sub>O IN H<sub>2</sub> RECYCLE STREAMS

### Sample System Features

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 water concentration is essential. At the SSI factory, the calibration is done by mixing certified blends of water at a fairly high concentration with dry gas through NIST-traceable mass flow controllers. The calibration is then validated using NIST-traceable chilled-mirror devices.

In the Field, the analyzer can be validated by using a certified water blend in a background of Methane, available from a number of reliable specialty gas blenders, and diluted with dry sample gas from the outlet of the metal getter dryer.