



# SS2100 CARBON DIOXIDE IN GTL SYNGAS (SASOL PROCESS)

Product Code 65803

## KEY FEATURES

- Extremely fast analysis time – 1 second updates possible
- No consumables – Low Cost of Ownership
- No routine service needed
- High resolution laser-based measurement eliminates errors due to interferences
- Reliable Tunable Diode Laser lasts years



Tunable Diode Laser technology is perfect for fast, sensitive CO<sub>2</sub> measurements in Synthol Reactor Tail Gas Scrubber applications.

### CATALYTIC REFORMING UNIT

The Synthol process starts with synthesis gas from coal or natural gas to make hydrocarbon liquids and waxes in a Fischer-Tropsch reactor. The liquids are separated and refined to make transportation fuels and chemicals.

### CRITICAL CONTROL OF CARBON DIOXIDE

Carbon Dioxide must be removed prior to downstream cryogenic recovery and separation of the C<sub>2</sub>'s and C<sub>3</sub> hydrocarbons present. Benfield Hot Potassium Carbonate systems (Fig. 1) are used for CO<sub>2</sub> removal. Monitoring of the CO<sub>2</sub> at the outlet is essential to the operation of the plant, and high CO<sub>2</sub> concentrations present a shut-down situation for the plant.

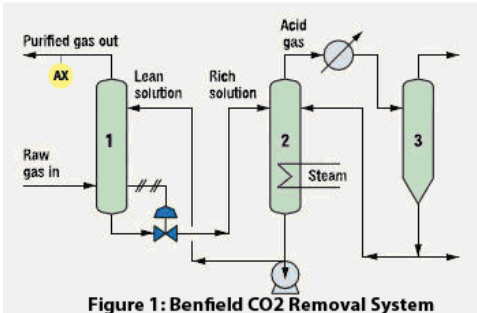
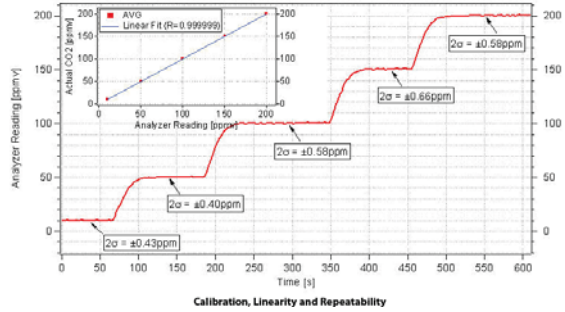


Figure 1: Benfield CO<sub>2</sub> Removal System

### TRADITIONAL MEASUREMENT SOLUTIONS

On-line gas chromatographs have been the traditional method for monitoring the levels of CO<sub>2</sub> in cracked gas streams. 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. Also, gas chromatographs consume carrier and flame fuel cylinder gases, as well as requiring



hydrocarbon-free air for flame ionization 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 concentrations. The concentrations of CO<sub>2</sub> present are too low for Raman spectroscopy.

### SPECTRASENSORS' SOLUTION

The SpectraSensors SS2100 offers a new solution to this control measurement. The use of Tunable Diode Laser technology means that analysis results can be updated every second if desired. Furthermore, the high resolution that is inherent to TDL technology eliminates errors due to interferences that have hampered other spectrometric approaches. There are no consumables required for CO<sub>2</sub> analysis at normal concentrations, so cost of ownership is low.

### VALIDATION

Validation is done with a certified blend of Carbon Dioxide in a background of Nitrogen, typically at a concentration in the middle of the measured range.

# SS2100 Carbon Dioxide Analyzer

## SPECIFICATIONS

### Application Data

Target Components	CO <sub>2</sub> in GTL/SynGas (Sasol Process)
Typical Measurement Ranges	0-100ppm* through 0-1000ppm (specify range)*
Typical Precision	±2% of Full Scale
Measurement Response Time	1 to ~60 seconds*
Principle of Measurement	Tunable Diode Laser Absorption Spectroscopy Non-differential
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 CO <sub>2</sub> in Nitrogen 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	8m cell, 559 mm H x 127 mm W (22"H x 5"W)
Sample Cell Construction	316L Series Polished Stainless Steel Standard
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

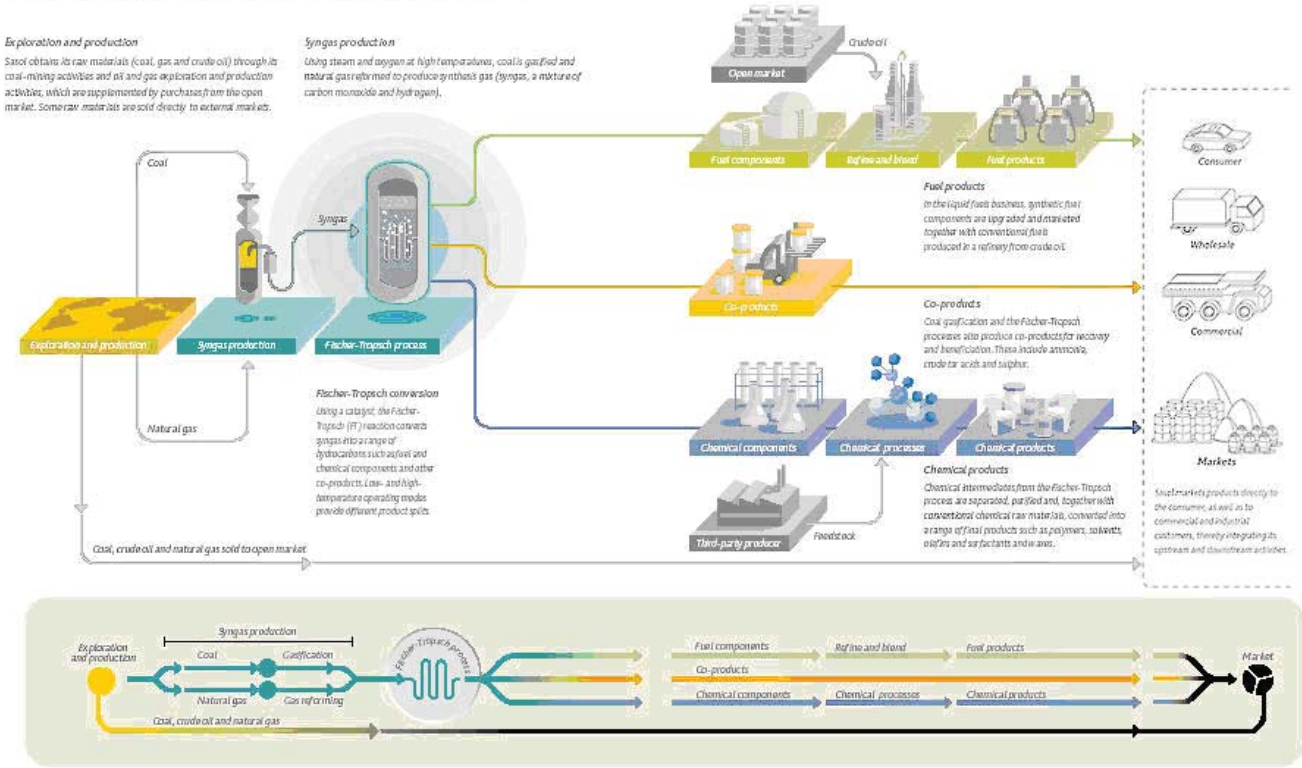
Certification	CSA Certified for Class I, Div. 2, Groups ABCD T3C  II 2G Ex d IIB+H2 T5; Tamb : -20 ÷ +60 °C
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\* Application specific; consult factory.

**SYNTHOL PROCESS FLOW**

*sasol's integrated business model*

*exploiting the benefits of fischer-tropsch technology*



**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.

**VALIDATION**

Validation is done with a certified blend of Carbon Dioxide in a background of Nitrogen, typically at a concentration in the middle of the measured range.

**TYPICAL STREAM COMPOSITION FOR SYNTHOL REACTOR TAIL GAS AFTER CO<sub>2</sub> SCRUBBER:**

Component	Unit	Typical Concentration	Min. for Application	Max. for Application
Carbon Dioxide (CO <sub>2</sub> )	ppmv	50	2	200
Hydrogen (H <sub>2</sub> )	Mole %	50	35	65
Methane (CH <sub>4</sub> )	Mole %	40	20	60
Ethane (C <sub>2</sub> H <sub>6</sub> )	Mole %	2	0	5
Ethylene (C <sub>2</sub> H <sub>4</sub> )	Mole %	2	0	5
Propylene (C <sub>2</sub> H <sub>6</sub> )	Mole %	3	0	5
Butenes	Mole %	2	0	5
Water (H <sub>2</sub> O)	Mole %	0.4	0	0.5
Total	Mole %	100		

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 CO<sub>2</sub>, 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**

Proper sample conditioning is essential to an accurate and reliable measurement. SpectraSensors provides standard and custom engineered Measurement Solutions for all applications. Standard features include:

Inlet Pressure Relief Valve	Automatic Valve for Validation Gases (optional)
Inlet and Outlet Shut-off Valves	Cell Flow Rotameter and Control Valve
Sample Filter	Outlet Pressure Gauge
Sample Bypass Pressure Gauge	Cell Outlet Non-return Valve
Bypass Flow Rotameter and Control Valve	