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Technical Information

SS2100

TDLAS Gas Analyzer

Single, dual, or triple channel TDLAS gas analyzer that is exceptionally reliable for measuring trace gas components. Available with enclosed, heated sample system. Certified for CSA Class I, Division 2 and Class I, Zone 2.

Applications

- H_2O, CO_2, H_2S, NH_3, or C_2H_2 measurements in natural gas, refinery, gas processing, LNG, petrochemical, and olefins
- Ranges from low ppmv to %

Key Features

- Laser based with rapid response
- Simple design, trouble-free operation
- No routine maintenance required
- Field calibration not needed
- No drift or interference from contaminants
- Reliable in harsh environments
- Compact analyzer for mulitple measurements
- CSA certification

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1 Introduction

Product overview

Endress+Hauser SS2100 process gas analyzers are exceptionally reliable for measuring trace gas components using SpectraSensors Tunable Diode Laser Absorption Spectroscopy (TDLAS) technology. TDLAS is a high-resolution infrared technique that enables the measurement of specific gases with precision while avoiding interferences that are common with traditional infrared analyzers. The SS2100 is certified for CSA Class I, Division 2 and Class I, Zone 2.

Simple operation: The operation of the analyzer is very straightforward. Technical personnel can learn to operate the system in a brief time. When coupled with the fact the analyzer has little maintenance requirements, the end result is a low cost of ownership.

At the same time, technical support capability is a crucial element of the product design. There are several health monitoring parameters and remote access is available using service software or directly through the touch sensitive keypad.

Simple installation: The SS2100 is easy to install; connect the power, data link, and measured gas line, and the analyzer begins working without the need for extensive calibrations or setup.

Reliable: Trustworthy measurements are vital to process analytical applications. The TDLAS analyzer is unaffected by contaminants and corrosives since the gas stream never touches the laser or detector. The SS2100 requires little regular maintenance and does not need recalibration or periodic replacement parts due to the inherent stability of TDLAS technology.

Standard documentation

Each analyzer shipped from the factory is packaged with documents specific to the model that was purchased. All documentation is available on the Endress+Hauser website at www.endress.com.

This Technical Information document is an integral part of the complete document package, which also includes:

Part number	Document type	Description
BA02281C	Operating Instruction	Provides a comprehensive overview of the analyzer and step-by-step installation instructions
XA02750C	Safety Instruction	Provides the most common safety issues related to the installation and operation of the SS2100 TDLAS Gas Analyzer
XA02751C	Safety Instruction	Provides the most common safety issues related to the installation and operation of the SS2100 2-Pack/3-Pack TDLAS Gas Analyzer
Device parameters		
GP01177C	Description of Device Parameters	Provides the user with an overview of the FS 5.16 firmware functionality
GP01180C	Description of Device Parameters	Provides the user with an overview of the NS 5.14 firmware functionality
GP01181C	Description of Device Parameters	Provides the user with an overview of the HC12 v2.51 firmware functionality
Installation instructions		
EA01398C	NH_3 Permeation Device	Provides instructions for installing the NH_3 permeation device into the Sample Conditioning System (SCS).

Registered trademarks

Modbus®
Registered trademark of SCHNEIDER AUTOMATION, INC.

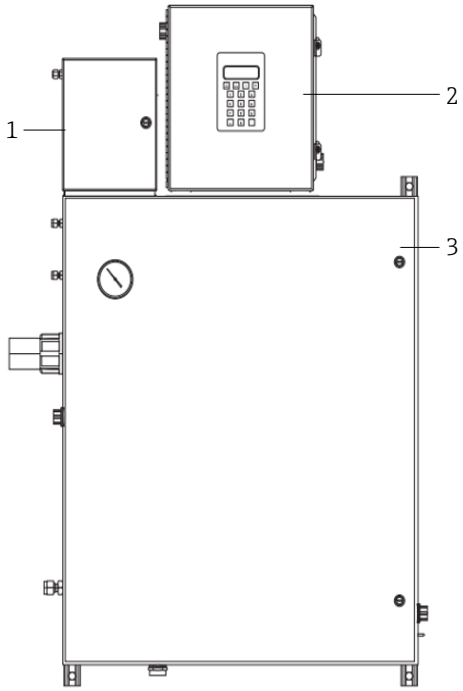
Manufacturer address

Endress+Hauser
11027 Arrow Route
Rancho Cucamonga, CA 91730
United States
www.endress.com

2 System design

Measuring system

SS2100 TDLAS Gas Analyzer



The base analyzer consists of:

1. Solenoid valve junction box

   Contains the solenoid valves for trace applications, when applicable.

2. Controller

   Contains the power supply, HMI (LCD display and keypad), communications and measurement control electronics.

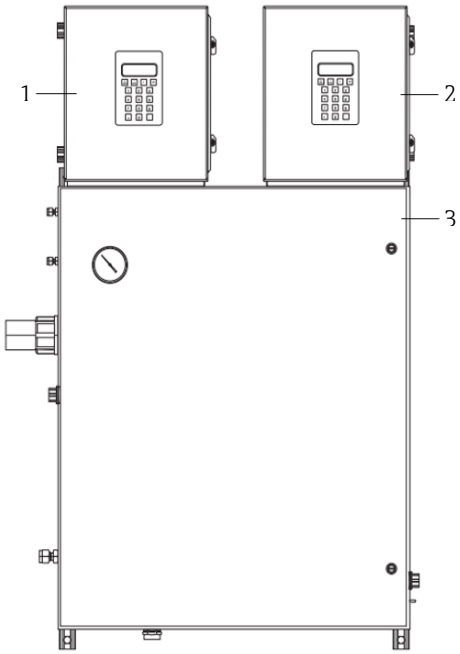
3. Heated enclosure

   Includes sample conditioning system, optical head, and sample cell.

   Sample gas flows through the cell via an inlet and outlet port. The laser beam passes through the cell, reflecting from the mirror on the bottom.

   Components filter the gas while maintaining a representative sample and controlling the pressure and flow. A bypass is available as a speed loop and to continually sweep the dirty side of the membrane separator.

SS2100 2-Pack and 3-Pack TDLAS Gas Analyzer



The base analyzer consists of:

1. H_2S controller

   Contains the power supply, HMI (LCD display and keypad), communications and measurement control electronics for H_2S.

2. H_2O and CO_2 controller

   Contains the power supply, HMI (LCD display and keypad), communications and measurement control electronics for H_2O and CO_2.

3. Heated enclosure

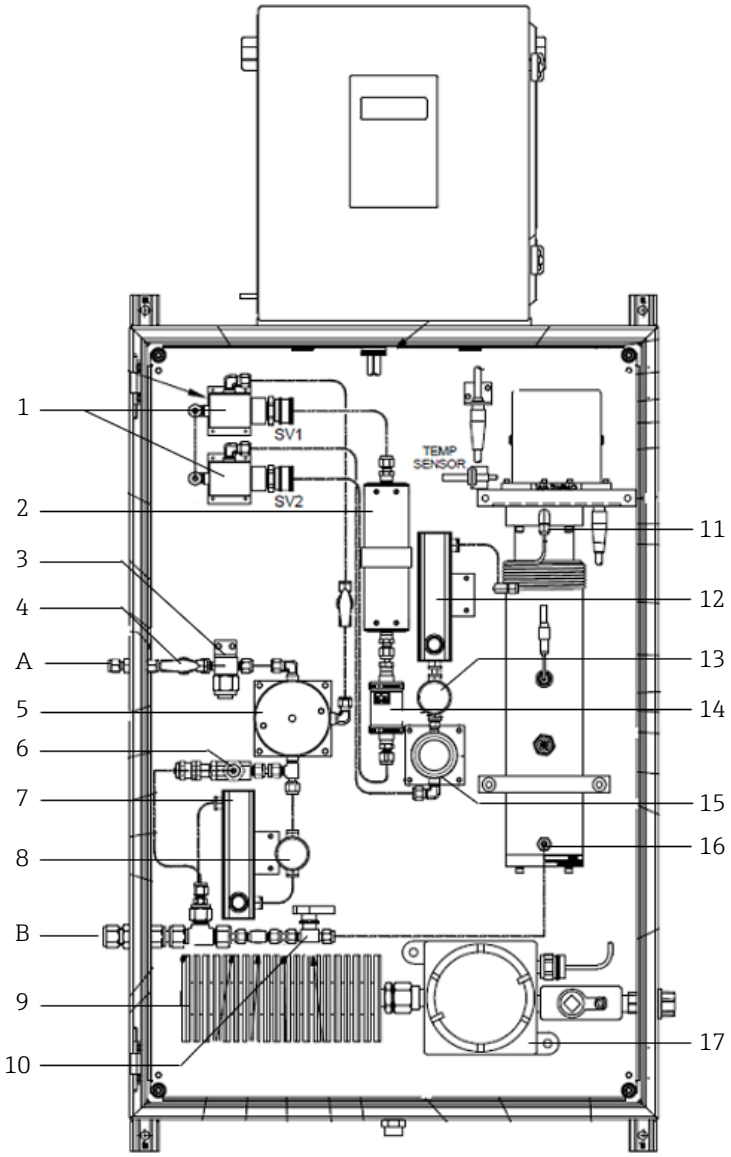
   Includes sample conditioning system, optical head, and sample cell.

   Sample gas flows through the cell via an inlet and outlet port. The laser beam passes through the cell, reflecting from the mirror on the bottom.

   Components filter the gas while maintaining a representative sample and controlling the pressure and flow. A bypass is available as a speed loop and to continually sweep the dirty side of the membrane separator.

Equipment architecture

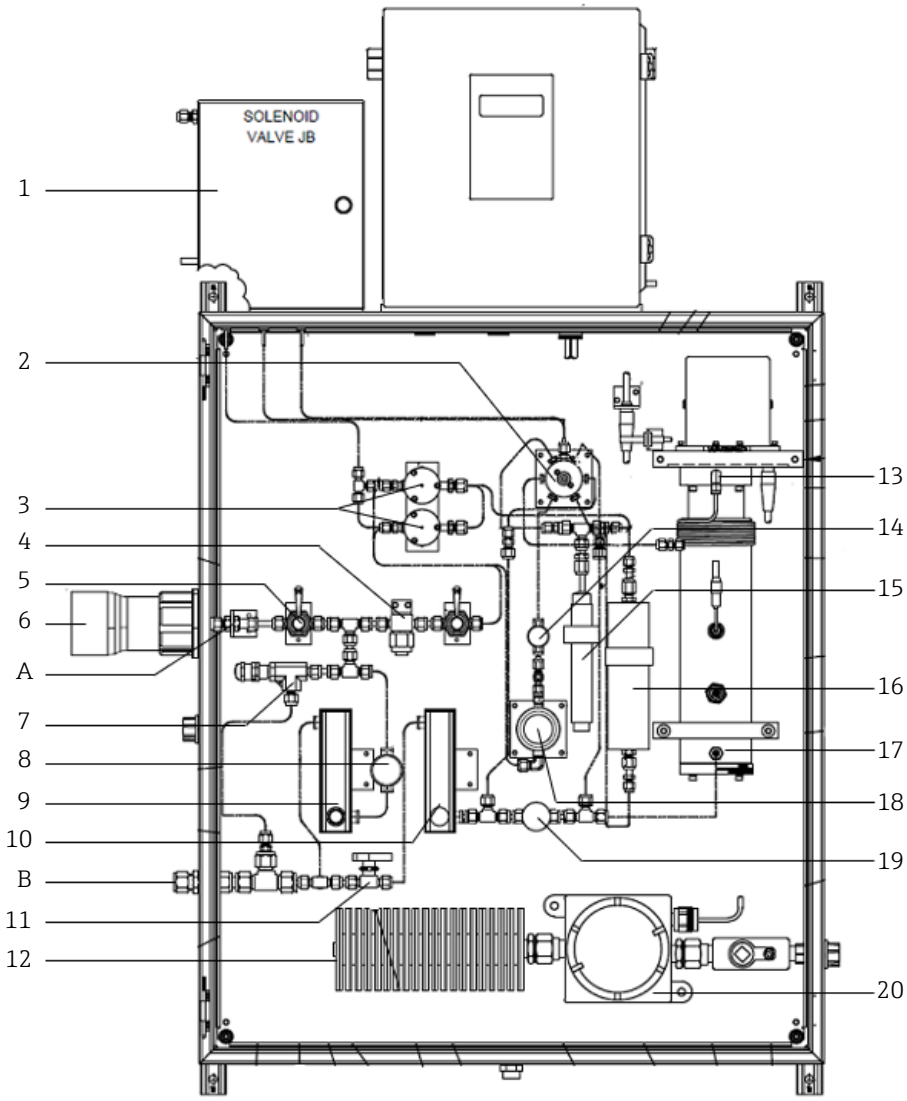
SS2100 TDLAS Gas Analyzer: H_2S measurement



1 Solenoid valves (air-operated valves optional)
2 Analyte scrubber
3 Filter
4 Sample/reference gas on/off
5 Membrane separator
6 Pressure relief valve
7 Bypass flow indicator and control
8 Bypass pressure gauge
9 Heater
10 Vent gas on/off
11 Cell inlet port
12 Analyzer flow indicator and control
13 Analyzer pressure gauge
14 Scrubber indicator
15 Pressure regulator
16 Cell outlet port
17 Temperature controller

A Sample in, 140 to 310 kPa (20 to 45 psi)
B Sample vent, to safe area

SS2100 TDLAS Gas Analyzer: Trace measurement with internal validation

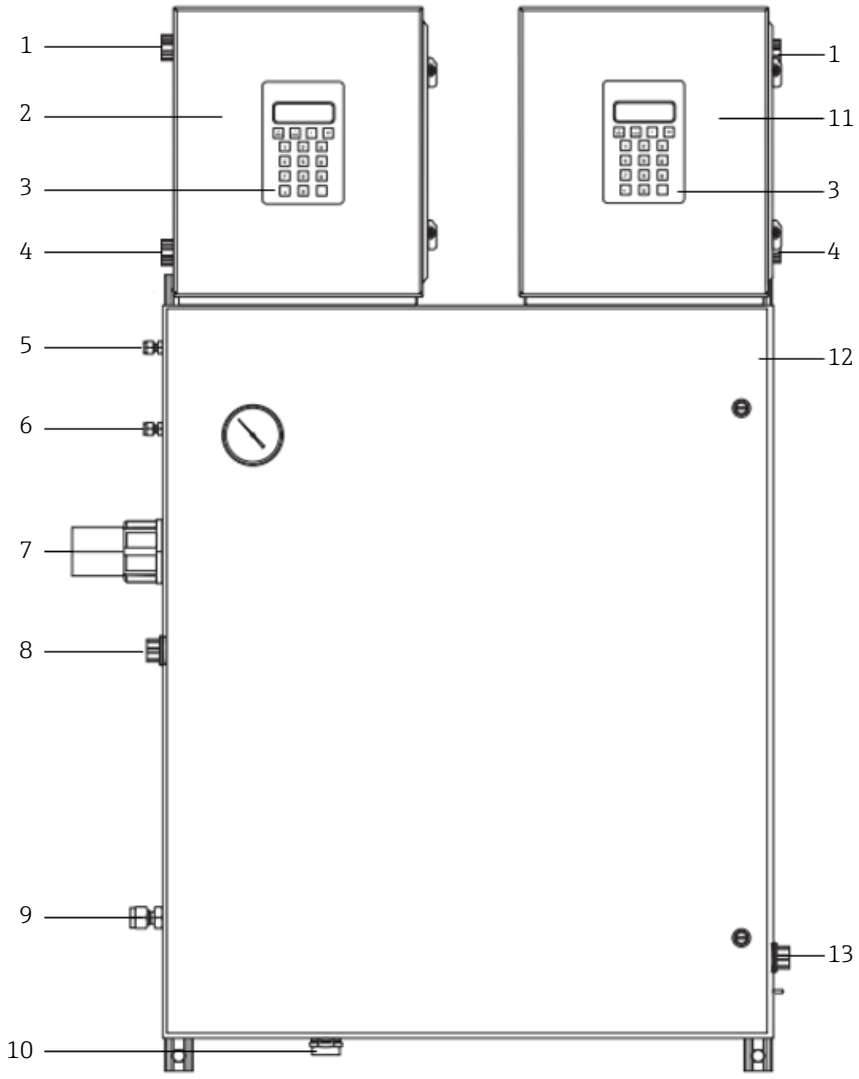


1 Solenoid valve junction box
2 6-way valve
3 Air-operated 3-way valve
4 Filter
5 Diaphragm valve
6 Heat trace boot
7 Pressure relief valve
8 Pressure gauge
9 Bypass flow indicator and control
10 Analyzer flow indicator and control

11 Vent gas on or off
12 Heater
13 Cell inlet port
14 Filter
15 Permeation tube
16 Dryer or scrubber
17 Cell outlet port
18 Pressure regulator
19 Metering valve
20 Temperature controller

A Sample in, 140 to 310 kPa (20 to 45 psi)
B Sample vent, to safe area

SS2100 2-Pack and 3-Pack TDLAS Gas Analyzer: H_2S and H_2O and/or CO_2 measurement



1 Signal wiring
2 H_2S analyzer electronics
3 Analyzer display and keypad
4 Analyzer power
5 Instrument air inlet
6 Validation gas inlet and sampling point
7 Sample in, 140 to 310 kPa (20 to 45 psi)
8 Heat trace power connection
9 Sample vent to safe area
10 SCS enclosure drain
11 H_2O and/or CO_2 analyzer electronics
12 SCS and TDLAS cell enclosure
13 SCS enclosure heater power

3 Certificates and approvals

Area classifications

Model	Certifications
SS2100 TDLAS Gas Analyzer	cCSAus: Class I, Division 2, Groups A, B, C, D, T3 (T3C without heater), Type 4X and IP66 Class I, Zone 2 IIC T3 (T3C without heater) Tambient: -20 ˚C to +60 ˚C
SS2100 2-Pack and 3-Pack TDLAS Gas Analyzer	cCSAus: Class I, Division 2, Groups B, C, D, T3 (T3C without heater), Type 4X and IP66 Class I, Zone 2 IIB+H_2 T3 (T3C without heater) Tambient: -20 ˚C to +60 ˚C

4 Ordering Information

Product Configurator

Detailed ordering information is available for your nearest sales organization at www.addresses.endress.com or in the Product Configurator under www.endress.com. To access:

1. Click **Corporate**.
2. Select the country.
3. Click **Products**.
4. Click **Product finder**.
5. Select the product using the filters and search field.
6. Open the product page.
7. Click the **Configure** button to open the Product Configurator.

Product Configurator is a tool for individual product configuration that offers:

- Up-to-the-minute configuration data
- Automatic verification of exclusion criteria
- Automatic creation of the order code and its breakdown in PDF or Excel output format
- Ability to order directly in the Endress+Hauser Online Shop

If a certain product is not available in your region, refer to the website (www.endress.com/contact) to locate your local sales channel for more information.

Gas specifications

Component name	Abbreviation	Allowable component range[1]		
		Natural gas	Rich natural gas	Rich natural gas/pure CO_2
		Table 1	Table 2	Table 3
Methane	C1	90 to 100%	50 to 100%	0 to 50%
Ethane	C2	0 to 7%	0 to 20%	0 to 20%
Propane	C3	0 to 2%	0 to 15%	0 to 15%
Butanes	C4	0 to 1%	0 to 5%	0 to 5%
Pentanes	C5	0 to 0.2%	0 to 2%	0 to 2%
Hexanes and heavier	C6+	0 to 0.2%	0 to 2%	0 to 2%
Carbon dioxide	CO_2	0 to 3%	0 to 20%	50 to 100%
Nitrogen and other inerts	N_2	0 to 10%	0 to 20%	0 to 20%
Hydrogen sulfide	H_2S	0 to 300 ppmv	0 to 5%	0 to 5%
Water	H_2O	0 to 5000 ppmv	0 to 5000 ppmv	0 to 5000 ppmv

Component name	Abbreviation	Allowable component range[1]	
		LNG	Ethylene
		Table 21	Table 41
Methane	C1	75 to 100%	0 to 1000 ppmv
Ethane	C2	0 to 10%	0 to 1000 ppmv
Propane	C3	0 to 5%	-
Butanes	C4	0 to 2%	-
Pentanes	C5	0 to 0.5%	-
Carbon dioxide	CO_2	0 to 100 ppmv	-
Hydrogen sulfide	H_2S	0 to 10 ppmv	0 to 1 ppmv
Water	H_2O	0 to 1 ppmv	0 to 10 ppmv
Ethylene	C_2H_4	-	98.9 to 100%
Propylene	C_3H_6	-	0 to 3000 ppmv
Ammonia	NH_3	-	0 to 5 ppmv

1. Stream composition must be supplied at the time of order placement.

Application notes

The Endress+Hauser SS2100 TDLAS Gas Analyzer is capable of measuring H_2O, CO_2, C_2H_2 , NH_3, or H_2S in a variety of industries and process units.

Refer to the website (www.endress.com/contact) to locate your local sales channel for more information on applications not listed.

Moisture (H_2O)measurements	
Application note	**Description**
AI01215C	H_2O in Natural Gas Production, Storage, Transportation and Distribution
AI01219C	Natural Gas Processing: H_2O in Molecular Sieve Dryer Vessel Outlet
AI01220C	Natural Gas Processing: H_2O in Natural Gas Product (Product Purity/Residue Gas)
AI01245C	Natural Gas Processing: H_2O in Y-Grade NGL Fractionation
AI01244C	Natural Gas Processing: H_2O in Ethane NGL Fractionation
AI01243C	Natural Gas Processing: H_2O in Ethane/Propane Mix NGL Fractionation
AI01242C	Natural Gas Processing: H_2O in Propane NGL Fractionation
AI01254C	LNG: H_2O in Dry LNG Feed Gas
AI01257C	LNG: H_2O in LNG Product - Terminal
AI01274C	Refining: H_2O in Hydrogen Recycle for Refinery Catalytic Reformer H_2 Recycle Steams
AI01275C	Refining: H_2O in Continuous Catalytic Reformer H_2 Recycle Streams
AI01279C	Refining: H_2O in Propane/Propylene Mix
AI01282C	Refining: H_2O in Alkylation Feedstock
AI01283C	Refining: H_2O in n-Butane feed gas to UOP Butamer Process Reactors
AI01284C	Refining: H_2O in Instrument Air
AI01258C	Petrochem: H_2O in Cracked Gas Dryer Vessel Outlets
AI01259C	Petrochem: H_2O in Pure Ethylene
AI01260C	Petrochem: H_2O in Pure Propylene (Steam Cracker)
AI01288C	Petrochem: H_2O in UNIPOL PE process ethylene feed gas
AI01361C	Energy Transition: H_2O, H_2S and O2 measurements for carbon capture, utilization, and storage (CCUS) applications

Carbon dioxide (CO_2) measurements	
Application note	**Description**
AI01216C	CO_2 in Natural Gas Production, Storage, Transportation and Distribution
AI01305C	Natural Gas Processing: CO_2 in Raw Natural Gas Feed
AI01309C	Natural Gas Processing: CO_2 in Amine Outlet (Sweet Gas)
AI01306C	Natural Gas Processing: CO_2 in Y-Grade NGL Fractionation
AI01307C	Natural Gas Processing: CO_2 in Ethane NGL Fractionation
AI01308C	Natural Gas Processing: CO_2 in Ethane/Propane Mix NGL Fractionation
AI01256C	LNG: CO_2 in LNG Amine Unit
AI01290C	Petrochem: CO_2 in Caustic Wash Tower Inlets
AI01293C	Syngas: CO_2 in GTL Syngas (Synthol Process) (Coal Liquefaction (CTL)/Benfield Outlet)

Acetylene (C_2H_2) measurements	
Application note	**Description**
AI01285C	Petrochem: C_2H_2 in Mid Bed of Back End Acetylene Converters
AI01286C	Petrochem: C_2H_2 in Outlet of Back End Acetylene Converters
AI01287C	Petrochem: C_2H_2 in Pure Ethylene

Ammonia (NH_3) measurements	
Application note	**Description**
AI01262C	Petrochem: NH_3 in Pure Ethylene
AI01261C	Petrochem: NH_3 in Pure Propylene

Hydrogen sulfide (H_2S) measurements	
Application note	**Description**
AI01217C	H_2S in Natural Gas Production, Storage, Transportation and Distribution
AI01251C	Natural Gas Processing: H_2S in Amine Scrubber Outlet
AI01303C	Natural Gas Processing: H_2S in Natural Gas Product (Purity/Residue Gas)
AI01304C	Natural Gas Processing: H_2S in Raw Gas Feed (Produced Gas)
AI01250C	Natural Gas Processing: H_2S in Y-Grade NGL Fractionations
AI01249C	Natural Gas Processing: H_2S in Ethane NGL Fractionation
AI01248C	Natural Gas Processing: H_2S in Ethane/Propane Mix NGL Fractionation
AI01247C	Natural Gas Processing: H_2S in Propane
AI01246C	Natural Gas Processing: H_2S in Solid Scavenger Outlet
AI01276C	Refining: H_2S in Hydrogen Recycle for Catalytic Reformer
AI01277C	Refining: H_2S in Flare Gas
AI01278C	Refining: H_2S in Fuel Gas
AI01280C	Refining: H_2S in Propane/Propylene Mix
AI01281C	Refining: H_2S in Continuous catalytic reformer hydrogen recycle streams
AI01276C	Refining: H_2S in Hydrogen Recycle for Catalytic Reformer
AI01273C	Refining: H_2S in Amine Treatment Unit Outlet Hydrogen Recycle gas
AI01291C	Petrochem: H_2S in UOP C3 Oleflex process reactor effluent
AI01292C	Petrochem: H_2S in Caustic Wash Tower Inlets
AI01361C	Energy Transition: H_2O, H_2S and O_2 measurements for carbon capture, utilization, and storage (CCUS) applications

Technical data

Measurement data	
Target components	SS2100: H_2O, H_2S, CO_2, NH_3, C_2H_2 2-Pack: H_2S+H_2O or H_2S+CO_2 in Natural Gas 3-Pack: H_2S+H_2O+CO_2 in Natural Gas
Principle of measurement	Tunable Diode Laser Absorption Spectroscopy (TDLAS)
Measurement ranges	See applicable Application Note
Repeatability	See applicable Application Note
Application data	
Ambient temperature range	−20 °C to 50 °C (-4 °F to 122 °F) — standard −10 °C to 60 °C (14 °F to 140 °F) — optional
Sample cell pressure range	800 to 1200 mbara — standard 950 to 1700 mbara — optional
Maximum cell pressure	70 kPag (10 psig)
Pressure to sample cabinet	140 to 350 kPag (20 to 50 psig)[1]
Sample flow rate	0.5 to 4.0 slpm (1 to 8.5 scfh)[1]
Bypass flow rate	0.5 to 1 slpm (1.1 to 2.2 scfh)
Electrical and communication	
Input power, electronics enclosure	120 VAC or 240VAC ± 10%, 50 to 60 Hz, 60W max or 18 to 24VDC, 1.6 A maximum SCS Input Power — 120VAC or 240VAC, 200W maximum [1]
Analog communication	Isolated Analog channels, 120 ohms at 24 VDC maximum Outputs: Qty 2 4-20 mA (measurement value)
Serial communication	Channel 1 (H_2S) — RS232C and ethernet Channel 2 and 3 (H_2O and/or CO_2) — RS232C or Ethernet (TSP only)
Digital signals	Outputs: Qty 5 Hi/Lo alarm, general fault, validation fail[2], validation 1 active[2], validation 2 active[2] Inputs: Qty 2 flow alarm[2], validation request[2]
Protocol	Modbus Gould RTU or Daniel RTU or ASCII
Diagnostic value examples	Detector power (mirror health), spectrum reference comparison and peak tracking (spectrum quality), cell pressure and temperature (overall system health)
LCD display	Concentration, cell pressure and temperature, diagnostics

1 Application dependent
2 Configuration dependent

Physical	
Electronics enclosure type	Type 4X 304 or 316L stainless steel
Sample system enclosure(s)	Type 4X 304 or 316L stainless steel
Analyzer dimensions	**SS2100 Analyzer:** 1285 mm H x 610 mm W x 394 mm D (50.6 x 24 x 15.5 inches) **SS2100 Trace Analyzer:** 1285 mm H x 762 mm W x 394 mm D (50.6 x 30 x 15.5 inches) **SS2100 2-Pack and 3-Pack:** 1285 mm H x 762 mm W x 394 mm D (50.6 x 30 x 15.5 inches)
Analyzer weight	Approximately 90 to 130 kg (200 to 300 lbs)
Sample cell construction	316L series polished stainless steel
Number of sample cells	1, 2 or 3
Certification	
Analyzer (electronics and laser)	**SS2100:** Class I, Division 2, Groups A, B, C, D, T3/T3C, Type 4X and IP66 Class I, Zone 2 IIC T3/T3C **SS2100 2-Pack and 3-Pack:** Class I, Division 2, Groups B, C, D, T3/T3C, Type 4X and IP66 Class I, Zone 2 IIB+H_2 T3/T3C

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