

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

- H₂O, CO₂, H₂S, NH₃, or C₂H₂ 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 multiple 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 very brief time. When coupled with the fact the analyzer has very little maintenance requirements, the end result is an extremely 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
SS2100 Trace Moisture TDLAS Gas Analyzer		
BA02192C	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
SS2100 H₂S TDLAS Gas Analyzer		
BA02191C	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
SS2100 2-Pack/3-Pack TDLAS Gas Analyzer		
BA02193C	Operating Instruction	Provides a comprehensive overview of the analyzer and step-by-step installation instructions for 2-Pack TDLAS Gas Analyzer
BA02194C	Operating Instruction	Provides a comprehensive overview of the analyzer and step-by-step installation instructions for 3-Pack 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 (FS 5.16)	Provides the user with an overview of the FS 5.16 firmware functionality
GP01180C	Description of Device Parameters (NS 5.14)	Provides the user with an overview of the NS 5.14 firmware functionality
GP01181C	Description of Device Parameters (HC12)	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®**

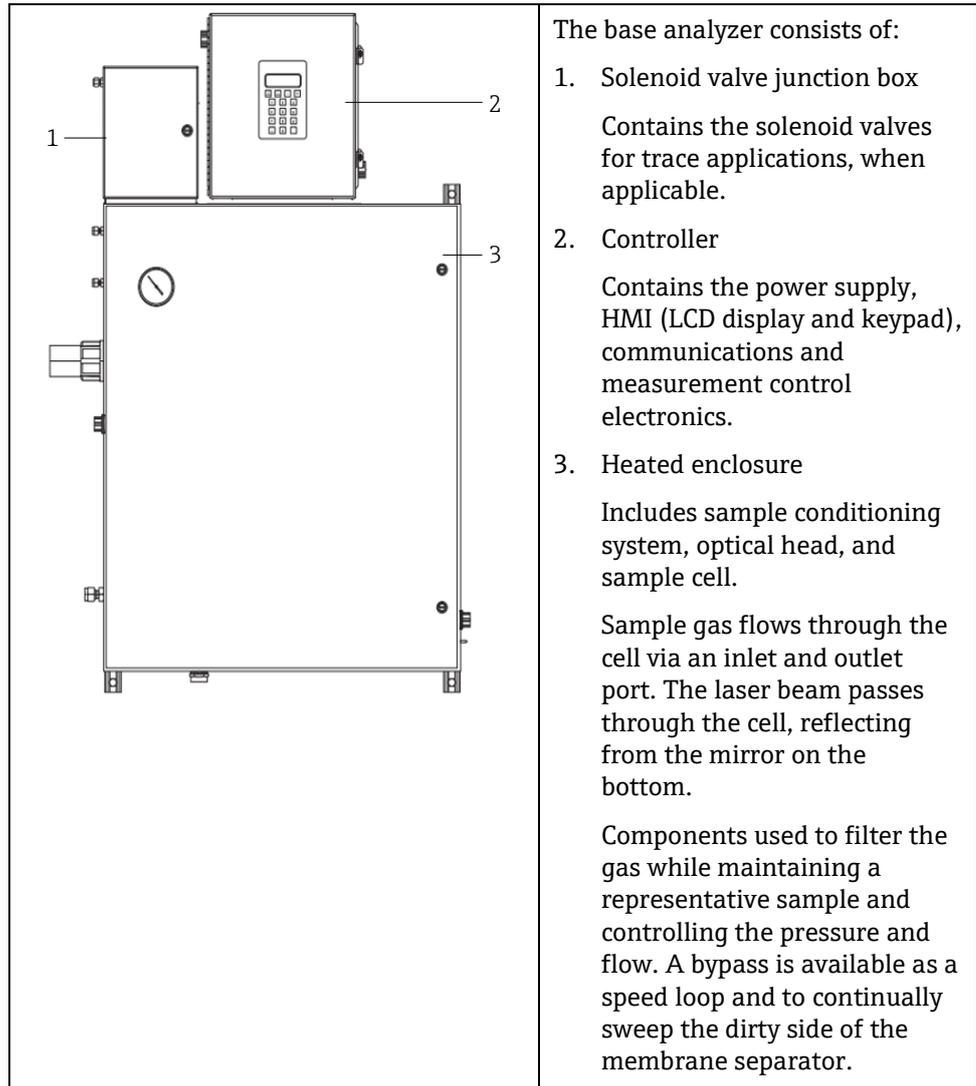
Registered trademark of SCHNEIDER AUTOMATION, INC.

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

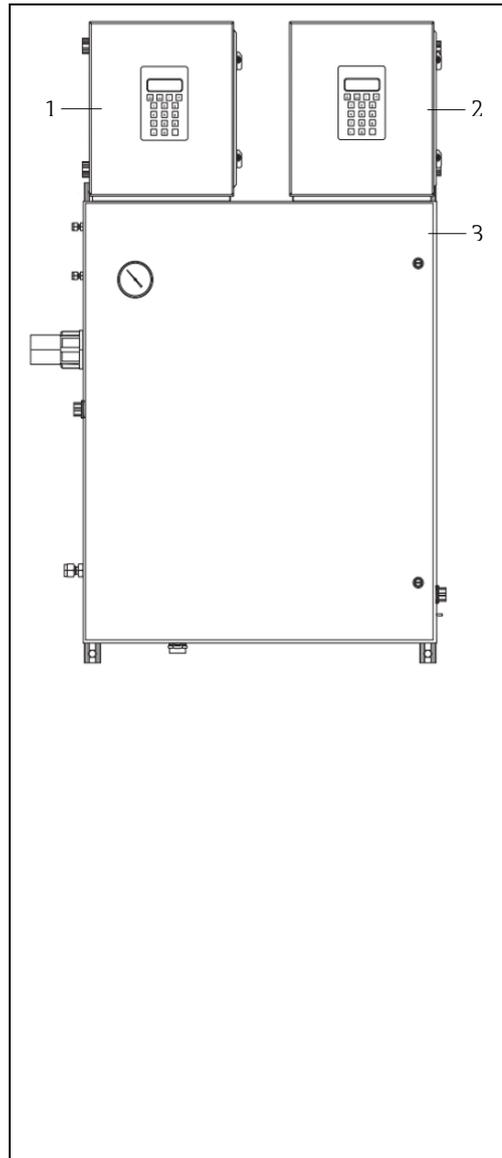
2 System design

Measuring system

SS2100 TDLAS Gas Analyzer



SS2100 2-Pack and 3-Pack TDLAS Gas Analyzer



The base analyzer consists of:

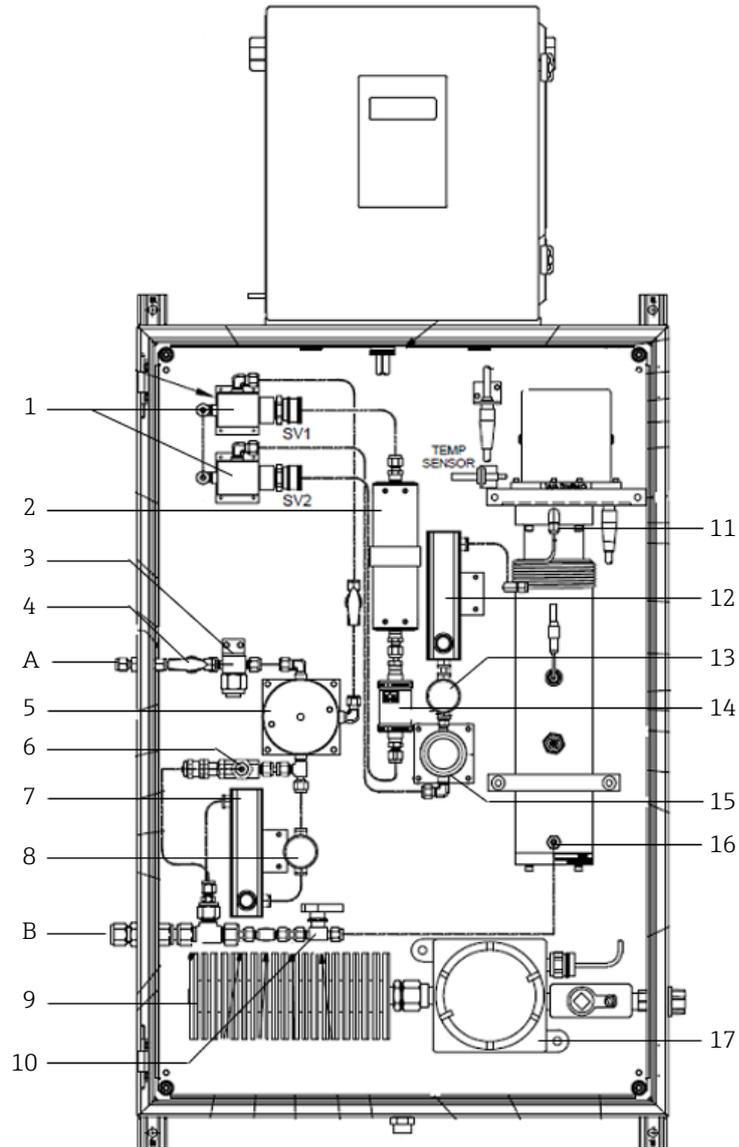
1. H₂S controller
 Contains the power supply, HMI (LCD display and keypad), communications and measurement control electronics for H₂S.
2. H₂O and/or CO₂ controller
 Contains the power supply, HMI (LCD display and keypad), communications and measurement control electronics for H₂O and/or CO₂.
3. Heated 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 used to 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.

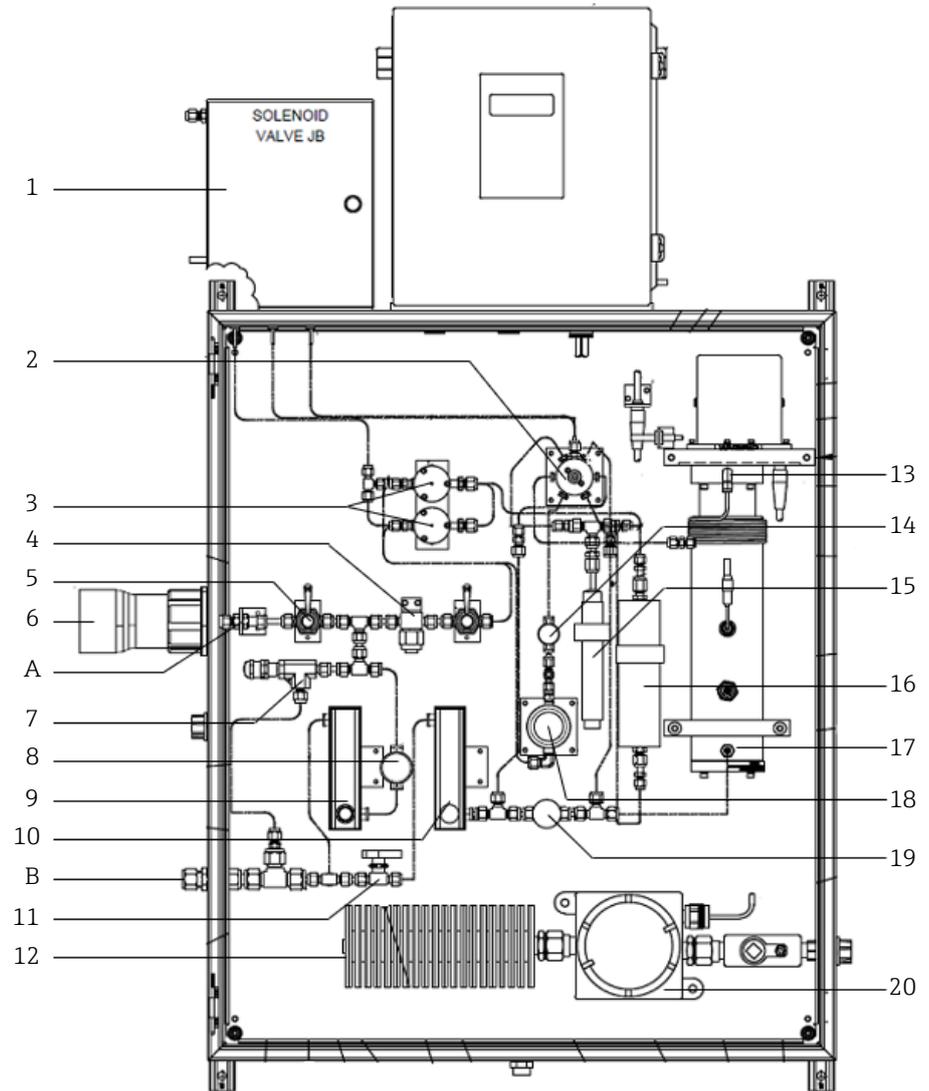
Equipment architecture

SS2100 TDLAS Gas Analyzer: H₂S measurement



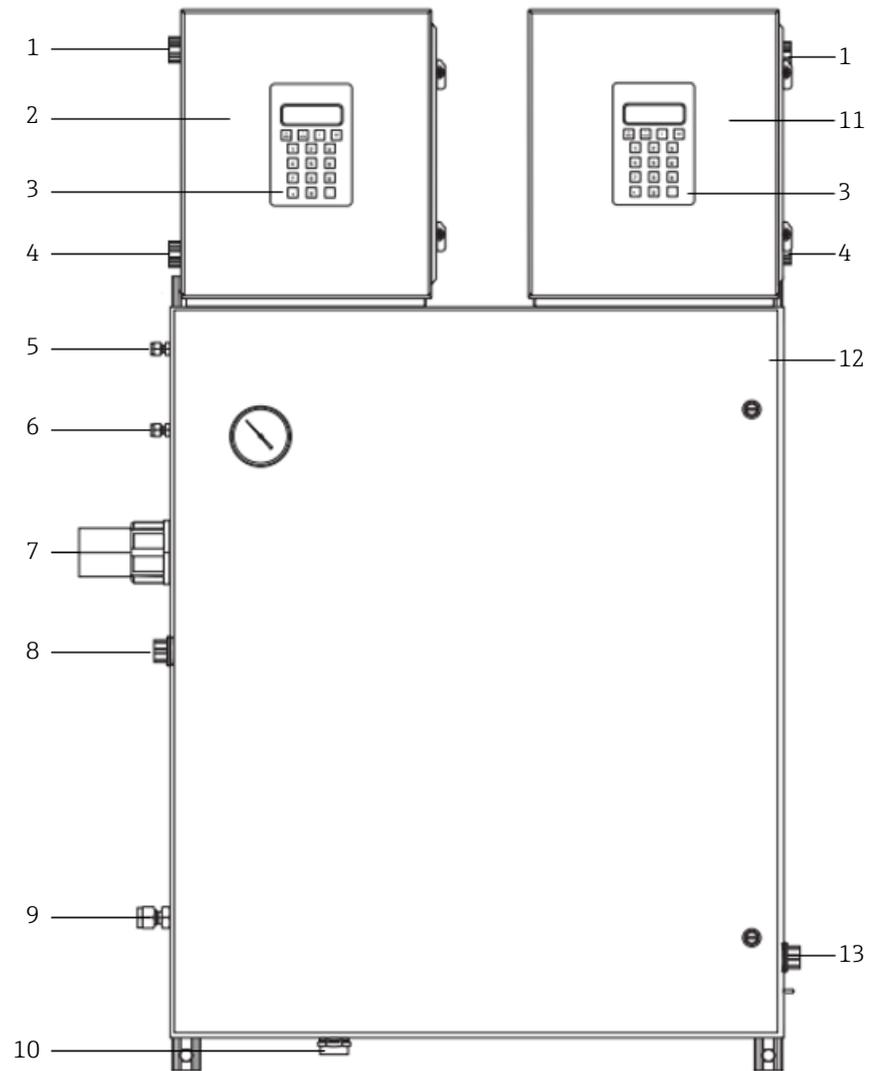
- | | | | |
|---|--|----|-------------------------------------|
| 1 | Solenoid valves (air-operated valves optional) | 9 | Heater |
| 2 | Analyte scrubber | 10 | Vent gas on/off |
| 3 | Filter | 11 | Cell inlet port |
| 4 | Sample/reference gas on/off | 12 | Analyzer flow indicator and control |
| 5 | Membrane separator | 13 | Analyzer pressure gauge |
| 6 | Pressure relief valve | 14 | Scrubber indicator |
| 7 | Bypass flow indicator and control | 15 | Pressure regulator |
| 8 | Bypass pressure gauge | 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 | 11 | Vent gas on/off |
| 2 | 6-way valve | 12 | Heater |
| 3 | Air-operated 3-way valve | 13 | Cell inlet port |
| 4 | Filter | 14 | Filter |
| 5 | Diaphragm valve | 15 | Permeation tube |
| 6 | Heat trace boot | 16 | Dryer/scrubber |
| 7 | Pressure relief valve | 17 | Cell outlet port |
| 8 | Pressure gauge | 18 | Pressure regulator |
| 9 | Bypass flow indicator and control | 19 | Metering valve |
| 10 | Analyzer flow indicator and control | 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: H₂S and H₂O and/or CO₂ measurement



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

3 Certificates and approvals

Area classifications

Model	Certifications
SS2100 TDLAS Gas Analyzer	<u>cCSAus:</u> 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	<u>cCSAus:</u> 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 ₂ S	0 to 300 ppmv	0 to 5%	0 to 5%
Water	H ₂ O	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 ₂ S	0 to 10 ppmv	0 to 1 ppmv	
Water	H ₂ O	0 to 1 ppmv	0 to 10 ppmv	
Ethylene	C ₂ H ₄	-	98.9 to 100%	
Propylene	C ₃ H ₆	-	0 to 3000 ppmv	
Ammonia	NH ₃	-	0 to 5 ppmv	

1. For Tables 2, 3, 21 and 41, stream composition must be supplied at the time of order placement.

Application notes

The Endress+Hauser SS2100 TDLAS Gas Analyzer is capable of measuring H₂O, CO₂, C₂H₂, NH₃, or H₂S 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 (H₂O) measurements	
Application note	Description
AI01215C	H ₂ O in Natural Gas Production, Storage, Transportation and Distribution
AI01219C	Natural Gas Processing: H ₂ O in Molecular Sieve Dryer Vessel Outlet
AI01220C	Natural Gas Processing: H ₂ O in Natural Gas Product (Product Purity/Residue Gas)
AI01245C	Natural Gas Processing: H ₂ O in Y-Grade NGL Fractionation
AI01244C	Natural Gas Processing: H ₂ O in Ethane NGL Fractionation
AI01243C	Natural Gas Processing: H ₂ O in Ethane/Propane Mix NGL Fractionation
AI01242C	Natural Gas Processing: H ₂ O in Propane NGL Fractionation
AI01254C	LNG: H ₂ O in Dry LNG Feed Gas
AI01257C	LNG: H ₂ O in LNG Product - Terminal
AI01274C	Refining: H ₂ O in Hydrogen Recycle for Refinery Catalytic Reformer H ₂ Recycle Steams
AI01275C	Refining: H ₂ O in Continuous Catalytic Reformer H ₂ Recycle Steams
AI01279C	Refining: H ₂ O in Propane/Propylene Mix
AI01282C	Refining: H ₂ O in Alkylation Feedstock
AI01283C	Refining: H ₂ O in n-Butane feed gas to UOP Butamer Process Reactors
AI01284C	Refining: H ₂ O in Instrument Air
AI01258C	Petrochem: H ₂ O in Cracked Gas Dryer Vessel Outlets
AI01259C	Petrochem: H ₂ O in Pure Ethylene
AI01260C	Petrochem: H ₂ O in Pure Propylene (Steam Cracker)
AI01288C	Petrochem: H ₂ O in UNIPOL PE process ethylene feed gas

Carbon dioxide (CO₂) 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 (C₂H₂) measurements	
Application note	Description
AI01285C	Petrochem: C ₂ H ₂ in Mid Bed of Back End Acetylene Converters
AI01286C	Petrochem: C ₂ H ₂ in Outlet of Back End Acetylene Converters
AI01287C	Petrochem: C ₂ H ₂ in Pure Ethylene

Ammonia (NH₃) measurements	
Application note	Description
AI01262C	Petrochem: NH ₃ in Pure Ethylene
AI01261C	Petrochem: NH ₃ in Pure Propylene

Hydrogen sulfide (H₂S) measurements	
Application note	Description
AI01217C	H ₂ S in Natural Gas Production, Storage, Transportation and Distribution
AI01251C	Natural Gas Processing: H ₂ S in Amine Scrubber Outlet
AI01303C	Natural Gas Processing: H ₂ S in Natural Gas Product (Purity/Residue Gas)
AI01304C	Natural Gas Processing: H ₂ S in Raw Gas Feed (Produced Gas)
AI01250C	Natural Gas Processing: H ₂ S in Y-Grade NGL Fractionations
AI01249C	Natural Gas Processing: H ₂ S in Ethane NGL Fractionation
AI01248C	Natural Gas Processing: H ₂ S in Ethane/Propane Mix NGL Fractionation
AI01247C	Natural Gas Processing: H ₂ S in Propane
AI01246C	Natural Gas Processing: H ₂ S in Solid Scavenger Outlet
AI01276C	Refining: H ₂ S in Hydrogen Recycle for Catalytic Reformer
AI01277C	Refining: H ₂ S in Flare Gas
AI01278C	Refining: H ₂ S in Fuel Gas
AI01280C	Refining: H ₂ S in Propane/Propylene Mix
AI01281C	Refining: H ₂ S in Continuous catalytic reformer hydrogen recycle streams
AI01276C	Refining: H ₂ S in Hydrogen Recycle for Catalytic Reformer
AI01273C	Refining: H ₂ S in Amine Treatment Unit Outlet Hydrogen Recycle gas
AI01291C	Petrochem: H ₂ S in UOP C3 Oleflex process reactor effluent
AI01292C	Petrochem: H ₂ S in Caustic Wash Tower Inlets

Technical data

Measurement data	
Target components	SS2100: H ₂ O, H ₂ S, CO ₂ , NH ₃ , C ₂ H ₂ 2-Pack: H ₂ S+H ₂ O or H ₂ S+CO ₂ in Natural Gas 3-Pack: H ₂ S+H ₂ O+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 or 240 VAC ±10%, 50 to 60 Hz; 200W 18 to 24 VDC, 1.6A max - optional
Analog communication	Isolated Analog channels, 120 ohms at 24 VDC maximum Outputs: Qty 2 4-20 mA (measurement value)
Serial communication	Channel 1 (H ₂ S) - RS232C and ethernet Channel 2 and 3 (H ₂ O 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	<p>SS2100 Analyzer: 1285 mm H x 610 mm W x 394 mm D (50.6 x 24 x 15.5 inches)</p> <p>SS2100 Trace Analyzer: 1285 mm H x 762 mm W x 394 mm D (50.6 x 30 x 15.5 inches)</p> <p>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)</p>
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)	<p>SS2100: Class I, Division 2, Groups A, B, C, D, T3/T3C, Type 4X and IP66 Class I, Zone 2 IIC T3/T3C</p> <p>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+H₂ T3/T3C</p>

TI01667C/66/EN/01.21

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