# Technical Information

# SS2000/SS2000XP

TDLAS Gas Analyzer


Single channel TDLAS Gas Analyzer for $H_2O$ or $CO_2$ that is exceptionally reliable and tailored for the natural gas industry. Available with panel-mounted sample conditioning systems.

## Application

- $H_2O$ or $CO_2$ in Natural Gas
- $H_2O$ measurement ranges up to 2110 ppmv (100 lbs/MMSCF)
- $CO_2$ measurement ranges up to 20%

## Key Features

- Virtually maintenance free
- No interference from glycol, methanol or amine
- Accurate, real-time measurements
- Not wet-up or dry-down delays
- Reliable in harsh environments
- Short term payback; no consumables
- NIST-traceable calibration
- Analog and serial outputs for remote monitoring

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# 1 Introduction

## Product overview

The Endress+Hauser **SS2000** single channel analyzer is extremely reliable and tailored for the needs of the natural gas industry. The sensor measures gas using a patented Tunable Diode Laser (TDL) to determine the concentration of the gas without coming into physical contact with the stream.

**Rapid response time:** The SS2000 analyzer takes four measurements per second with a laser and detector and immediately averages the results. Because there is no contact with the gas, real-time measurements are not hampered by wet-up or dry-down times as with surfaced-based sensors.

**Reliable:** Trustworthy measurements are vital to natural gas pipeline and processing companies. Independent studies have proven that the SS2000 results are highly correlated with those of chilled mirrors. However, chilled mirrors require skilled experts to operate and the results are highly scattered (large standard deviation).

Uncertain measurements can be extremely costly. Additional processing of dehydration costs, upset conditions, shut-ins and inconsistent results may be caused by sensors that do not perform properly. The SS2000 is the first to offer truly reliable measurement and simple operation.

**Long life:** The TDLAS Gas Analyzer sensor does not come into contact with the sample gas stream. The result is a sensor which does not suffer from contamination or drift due to vapor impurities such as glycol, methanol or amines.

**Low cost of ownership:** Operating costs are significantly reduced by eliminating the cost of consumables, extra sensor heads, labor and overhead associated with excessive maintenance.

The SS2000 dramatically reduces intangible but real costs associated with unreliable gas measurements by eliminating added processing steps, detecting poor gas quality and reducing the possibility of costly damage to equipment that can result from sensors that produce incorrect data.

**Measuring System:** The SS2000 is offered as a stand-alone analyzer or accompanied by a sample condition system on a panel.

## Standard documentation

All documentation is available on the:

- Endress+Hauser website: www.endress.com

Each analyzer shipped from the factory is packaged with documents specific to the model that was purchased. This Technical Information document is an integral part of the complete document package, which also includes:

| Part Number | Document Type | Description |
|---|---|---|
| BA02182CEN | Operating Instruction | This manual contains a comprehensive overview of the analyzer and step-by-step installation instructions (SS2000). |
| BA02183CEN | Operating Instruction | This manual contains a comprehensive overview of the analyzer and step-by-step installation instructions (SS2000XP). |
| GP01181CEN | Description of Device Parameters, HC12 | This document provides the user with an overview of the HC12 firmware functionality. |
| BA02184CEN | Operating Instruction, Sample Conditioning System Remote Panel | To provide an overview of the Sample Conditioning System (SCS) Remote Panel along with instructions for installation and operation (SS2000XP only). |

## Registered trademarks

**Modbus®**
Registered trademark of SCHNEIDER AUTOMATION, INC.

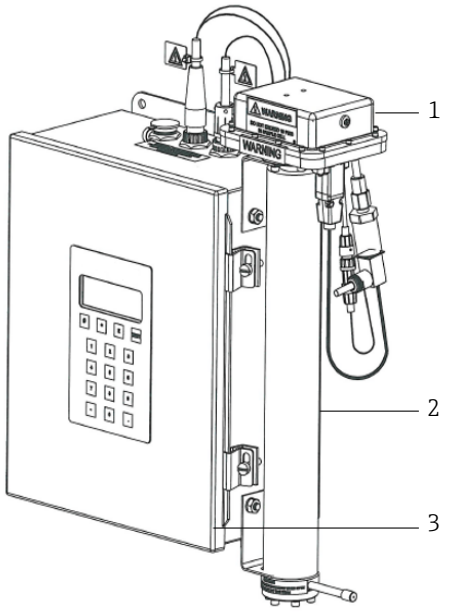
## Manufacturer address

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

# 2 System design

## Measuring system

### SS2000 TDLAS Gas Analyzer – CSA Class I, Division 2




The base analyzer consists of:

1. Optical head

   Contains the laser, laser temperature control, detector, window, pressure and temperature sensors, optical head electronics.

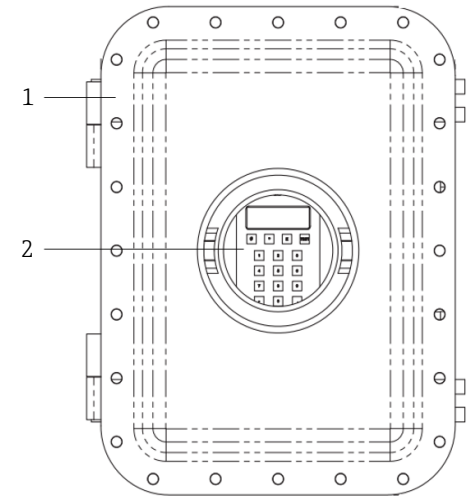
2. Sample cell and mirror

   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.

3. Controller

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

### SS2000XP TDLAS Gas Analyzer – CSA Class I, Division 1




The explosion proof analyzer consists of the base analyzer inside a cast aluminum enclosure:

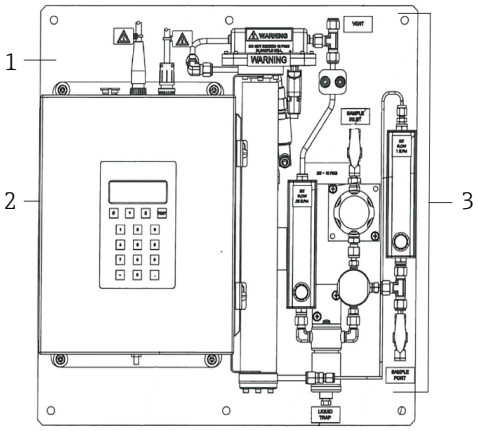
1. Electronics enclosure

   Explosion proof enclosure rated to CSA Class I, Div 1 certification.

2. SS2000 TDLAS Gas Analyzer controller

   See Controller description above

### SS2000 TDLAS Gas Analyzer with SCS on a panel




The analyzer system on a panel consists of the following and is designed for exterior mounting near the sample extraction point or inside a shelter:

1. Anodized aluminum panel

   (Other materials can be special ordered.)

   Allows easy mounting to a wall, Unistrut frame, or post and provides a mounting surface of the sample conditioning components.

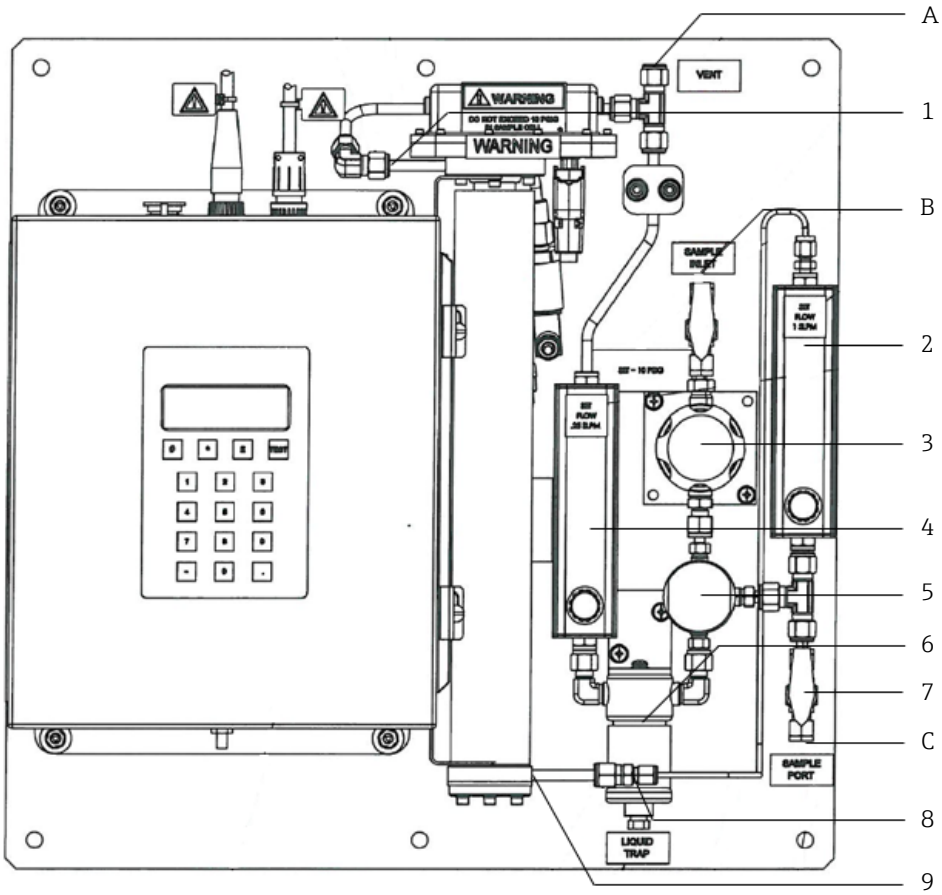
2. SS2000 TDLAS Gas Analyzer

   See description above.

3. Sample conditioning components

   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




*1 Cell outlet port*
*2 Analyzer flow indicator and control*
*3 Pressure regulator*
*4 Bypass flow indicator and control (optional)*
*5 Membrane separator (optional)*
*6 Liquid trap*
*7 Reference gas on/off*
*8 Check valve (optional)*
*9 Cell inlet port*

*A Sample vent, to safe area*
*B Sample in, 140 to 310 kPa (20 to 45 psi)*
*C Reference gas in, 15 to 70 kPa (2 to 10 psi)*

# 3 Certificates and approvals

## Area classifications

| Model | Certifications |
|---|---|
| SS2000 TDLAS Gas Analyzer | cCSAus:<br>Class I, Division 2, Groups A, B, C, D, T3<br>Class I, Zone 2 IIC T3/T3C<br>Tambient: -20 ˚C to +50 ˚C |
| SS2000 TDLAS Gas Analyzer with SCS on panel | cCSAus:<br>Class I, Division 2, Groups A, B, C, D, T3<br>Class I, Zone 2 IIC T3/T3C<br>Tambient: -20 ˚C to +50 ˚C |
| SS2000XP TDLAS Gas Analyzer | cCSAus:<br>Class I, Division 1, Groups B, C, D, T4<br>Tambient: -20 ˚C to +50 ˚C |
| SS2000XP TDLAS Gas Analyzer with SCS on panel | cCSAus:<br>Class I, Division 1, Groups B, C, D, T4<br>Tambient: -20 ˚C to +50 ˚C |

# 4 Ordering information

## Order codes

Refer to the website (www.endress.com) to locate your local sales channel for more information.

| Feature number | Order code | Description |
|---|---|---|
| **Housing (choose one)** | | |
| 010 | 2 | Explosion-proof aluminum enclosure (NEMA 7, 4)[1] |
| | 3 | Class 1, Div 2, stainless steel enclosure (NEMA 3R) |
| **Measured component (choose one)** | | |
| 020 | W | $H_2O$ range 0 to 250 lbs/MMSCF (0 to 5275 ppmv)<br>Table 1 background only |
| | X | Other $H_2O$ range (min 0.5 lbs/MMSCF, max 100 lbs/MMSCF) |
| | Y | Other $CO_2$ range (min 0 to 5%, max 0 to 20%) |
| | 1 | $H_2O$ range 0 to 20 lbs/MMSCF (0 to 422 ppmv) |
| | 2 | $CO_2$ range 0 to 10% |
| | 3 | $CO_2$ range 0 to 5% |
| | 6 | $H_2O$ range 0 to 50 lbs/MMSCF (0 to 1055 ppmv) |
| | 7 | $CO_2$ range 0 to 20% |
| | 8 | $H_2O$ range 0 to 100 lbs/MMSCF (0 to 2110 ppmv) |
| **Not available** | | |
| 025 | Not available | |
| **Background gas (choose one)** | | |
| 030 | X | Other |
| | 1 | Natural gas, standard (Table 1) |
| | 2 | Natural gas, alternative (Table 2)<br>Must submit composition |
| | 3 | Natural gas with high $CO_2$ (Table 3)<br>Must submit composition[2] |
| | 4 | Air |

| Feature number | Order code | Description |
|---|---|---|
| **Power supply (choose one)** | | |
| 040 | 1 | Universal 100/250 VAC, 50/60 Hz |
| | 2 | 18 to 32 VDC[3] |
| | 3 | 9 to 16 VDC |
| **Sampling system (choose one)** | | |
| 050 | 00 | No sample conditioning system |
| | 01 | Panel remote from analyzer |
| | 11 | Analyzer mounted on Panel |
| **Liquid trap with bypass (choose one)** | | |
| 062 | 00 | Without sampling system |
| | 01 | No liquid trap or bypass flowmeter |
| | 11 | With liquid trap with valve and bypass flowmeter |
| **Not available** | | |
| 065 | Not available | |
| **Sample conditioning mounting (choose one)** | | |
| 070 | 0 | No sampling conditioning system |
| | 1 | Sample conditioning on flat aluminum panel |
| | 3 | 304 stainless steel enclosure for analyzer and SCS 24 x 24in[4] |
| | 5 | Heated 304 stainless steel enclosure for analyzer and SCS 30 x 30in |
| | 6 | Heated 304 stainless steel enclosure with heat trace connect 30 x 30in |
| **Tag option (choose one)** | | |
| 895 | T1 | Stainless steel tag (up to 2 lines of text) |

**NOTES**

1. *When the NEMA 7 XP enclosure is chosen, panel type 1 is not available.*
2. *High $CO_2$ background requires heated enclosure (choose option 5 or 6 under **Sample conditioning mounting** with 40 ˚C set point. Repeatability is ±5% of reading for this system. Only order with **Measured component** options 1,6, and 8.*
3. *12 VDC not available with explosion-proof (**Housing** option 2).*
4. *An overall enclosure is highly recommended for outdoor installations. For outdoor installations and applications requiring heated sample systems, the SS2000e is the preferred product.*

## 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 | $C_1$ | 90 to 100% | 50 to 100% | 0 to 50% |
| Ethane | $C_2$ | 0 to 7% | 0 to 20% | 0 to 20% |
| Propane | $C_3$ | 0 to 2% | 0 to 15% | 0 to 15% |
| Butanes | $C_4$ | 0 to 1% | 0 to 5% | 0 to 5% |
| Pentanes | $C_5$ | 0 to 0.2% | 0 to 2% | 0 to 2% |
| Hexanes and heavier | $C_6$+ | 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% |
| Hyrdogen 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 |

1. *For Table 2 and Table 3, stream composition must be supplied at the time of order placement.*

## Technical data

| | |
|---|---|
| **Measurement data** | |
| Target components | $H_2O$ or $CO_2$ in natural gas |
| Principle of measurement | Tunable Diode Laser Absorption Spectroscopy (TDLAS) |
| Measurement ranges | $H_2O$: 0 to 20, 0 to 50, 0 to 100, 0 to 250 lbs/MMscf<br>0 to 422, 0 to 1055, 0 to 2110, 0 to 5275 ppmv<br>$CO_2$: 0 to 5%, 0 to 10%, 0 to 20% |
| Repeatability | $H_2O$: ±1 ppmv or ±1% of reading (whichever is greater)<br>$CO_2$: ±400 ppmv or ±2% of reading (whichever is greater) |
| Accuracy | $H_2O$: ±2 ppmv plus 2% of reading |
| **Application data** | |
| Ambient temperature range | -20° C to 50 °C (-4° F to 122 °F) |
| Sample cell pressure range | 700 to 1400 mbara |
| Sample cell temperature range | -20 °C to 50 °C (-4 °F to 122 °F) |
| Maximum cell pressure | 70 kPag (10 psig) |
| Sample flow rate | 0.5 to 1.0 L/min (1 to 2 scfh) |
| Bypass flow rate | 1 L/min (2 scfh) |
| **Electrical and communication** | |
| Voltage | 100 to 240 VAC, 50/60 Hz<br>9 to 16 VDC or 18 to 32 VDC - optional |
| Max current | 1 amp maximum at 120 VAC<br>1.6A at 24 VDC, 3.2A at 12 VDC |
| Communication | Analog: One or two 4-20mA isolated, 1200 ohms at 24 VDC max load<br>Serial: RS232C<br>Protocol: Modbus Gould RTU or Daniel RTU or ASCII |
| Alarms | 2, general fault and concentration alarms via Modbus and analog output(s) |
| LCD display | Concentration, cell pressure and temperature, diagnostics |

| **Physical** | **Class I, Div 2** | **Class I, Div 1** |
|---|---|---|
| Electronics enclosure type | NEMA 3R – 304 stainless steel* | NEMA 4, 7, 9 – cast aluminum |
| Electronics with sample cell dimensions | 444 mm H x 376 mm W x 135 mm D (17.5 x 14.8 x 5.8 inches) | 565 mm H x 413 mm W x 222 mm D (22.25 x 16.25 x 8.75 inches) |
| Weight approximate | 11.5 kg (25 lbs) | 46.8 kg (103 lbs) |
| Sample cell dimensions | 438 mm H x 108 mm W (17.3 x 4.3 inches) | 438 mm H x 108 mm W (17.3 x 4.3 inches) |
| Number of Sample Cells | 1 | 1 |
| **Area classification** | | |
| Certification | cCSAus Class I, Div 2, Groups A, B, C, D, T3C<br>cCSAus Class I, Zone 2 IIC T3C | cCSAus Class I, Div 1, Groups B, C, D, T4 |

* *Intended for indoor installation or within an overall enclosure. For installations requiring NEMA 4X, refer to Model SS2000e.*

TI01644C/66/EN/01.21

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