Safety Instructions

TDLAS gas analyzer

SS500, SS2000, and SS3000
SS500e, SS2000e, and SS3000e
SS500XP and SS2000XP

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1 Introduction

Endress+Hauser's TDLAS Gas Analyzer products are high-speed, diode laser-based extractive analyzers designed for extremely reliable monitoring of standard concentrations of specific components in various background gases.

This manual applies to the following analyzers:

- SS500, SS2000, SS3000
- SS500e, SS2000e, SS3000e
- SS500XP, SS2000XP (*discontinued*)

To operate the analyzer safely, it is important to closely review all information contained in the manuals related to system installation, operation and maintenance, as referenced in Associated Documents below. Each chapter in this manual includes product-specific safety instructions in the following topics:

- General Safety Instructions
- Equipment Installation
- Equipment Operation

Common procedures for equipment maintenance and service follow the product-specific sections.

1.1 Intended equipment use

The natural gas analyzers are intended for use as explained in the documentation provided. Endress+Hauser recommends that the qualified technician read and reference the documentation when installing, operating or having direct contact with the TDLAS Gas Analyzer. Any use of the equipment in a manner not specified by Endress+Hauser could lead to physical injury and damage to the equipment.

1.2 Who should read this manual

This manual should be read and referenced by anyone installing, operating or having direct contact with the analyzer. Endress+Hauser highly recommends that the responsible party and/or operator of the equipment be qualified to handle this equipment.

1.3 How to use this manual

Take a moment to familiarize yourself with this manual by reading the table of contents. This manual has been written to address the most common safety issues related to the installation and maintenance of the SS2100a analyzer. Additional information has been provided with the analyzer model purchased to instruct qualified users in the installation, operation and maintenance of the equipment.

Images, tables and charts are included to provide a comprehensive understanding of the analyzer and its functions. Carefully read the section on special symbols which provide key information on the system's configuration and/or operation.

1.3.1 Conventions used in this manual

In addition to the symbols and instructional information, use "hot links" to quickly navigate between different sections. These links include table, figure and section references and are identified by a pointing finger cursor when rolling over the text. Click on the link to navigate to the reference.

1.4 Associated documentation

All documentation is available:

- On the media device supplied (not included in the delivery for all device versions)
- On the Endress+Hauser mobile app: www.endress.com/supporting-tools
- In the Downloads area of the Endress+Hauser website: www.endress.com/downloads

This document is an integral part of the document package, which includes the following manuals.

Part Number	Document Type	Description
SS500		
BA02182C	Operating Instruction	A complete overview of the operations required to install, commission and maintain the device.
TI01642C	Technical Information	Provides technical data on the device with an overview of associated models available.
SS2000		
BA02182C	Operating Instruction	A complete overview of the operations required to install, commission and maintain the device.
TI01644C	Technical Information	Provides technical data on the device with an overview of associated models available.
SS3000		
BA02185C	Operating Instruction	A complete overview of the operations required to install, commission and maintain the device.
TI01653C	Technical Information	Provides technical data on the device with an overview of associated models available.
SS500XP		
BA02183C	Operating Instruction	A complete overview of the operations required to install, commission and maintain the device.
TI01642C	Technical Information	Provides technical data on the device with an overview of associated models available.
SS2000XP		
BA02183C	Operating Instruction	A complete overview of the operations required to install, commission and maintain the device.
TI01644C	Technical Information	Provides technical data on the device with an overview of associated models available.
SS500e		
BA02164C	Operating Instruction	A complete overview of the operations required to install, commission and maintain the device.
TI01657C	Technical Information	Provides technical data on the device with an overview of associated models available.
SS2000e		
BA02164C	Operating Instruction	A complete overview of the operations required to install, commission and maintain the device.
TI01658C	Technical Information	Provides technical data on the device with an overview of associated models available.
SS3000e		
BA02164C	Operating Instruction	A complete overview of the operations required to install, commission and maintain the device.
TI01659C	Technical Information	Provides technical data on the device with an overview of associated models available.
Device Parameters		
GP01181C	Description of Device Parameters HC12 v2.51	Provides the user with an overview of the HC12 v2.51 firmware functionality.

[1] *Order-specific documentation is located by analyzer serial number (SN).*

1.5 Manufacturer address

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

2 General safety

2.1 Warning labels

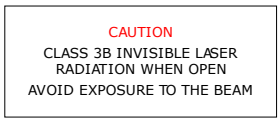
Equipment labels are adhered to the TDLAS Gas Analyzer to alert the user of potential hazards. Instructional symbols are also used in the equipment manuals to indicate potential hazards, important information and valuable tips, and are not labeled on the analyzer. Following are the equipment labels and instructional symbols with associated warning and caution types to observe when servicing the analyzer.

2.2 Warnings

Structure of Information	Meaning
⚠ WARNING Causes (/consequences) Consequences of noncompliance (if applicable) ▸ Corrective action	This symbol alerts you to a dangerous situation. Failure to avoid the dangerous situation can result in a fatal or serious injury.
⚠ CAUTION Causes (/consequences) Consequences of noncompliance (if applicable) ▸ Corrective action	This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or more serious injuries.
NOTICE Cause/situation Consequences of noncompliance (if applicable) ▸ Action/note	This symbol alerts you to situations which may result in damage to property.

2.3 Symbols

Symbol	Description
	The warning label will be affixed to the front side of all analyzer enclosures that contain sample gas. Hazards may vary by stream composition. One or more of the following conditions may apply: **Flammable**. Gases used in the processing of this analyzer may be extremely flammable. Any work in a hazardous area must be carefully controlled to avoid creating any possible ignition sources (e.g., heat, arcing, sparking, etc.). **Toxins**. Endress+Hauser analyzers measure a variety of gases, including high-level H_2S. Follow all safety protocols governing toxic gases and potential leaks. **Inhalation**. Inhaling toxic gases or fumes may cause physical damage or death.
	The Laser Radiation symbol is used to alert the user to the danger of exposure to hazardous visible laser radiation when using the system. The laser is a class 1 radiation product.
	The High Voltage symbol that alerts people to the presence of electric potential large enough to cause injury or damage. In certain industries, high voltage refers to voltage above a certain threshold. Equipment and conductors that carry high voltage warrant special safety requirements and procedures.
	Failure to follow all directions may result in damage to or the malfunction of the analyzer.
	Maximum voltage and current specifications for fuses.
	Invisible laser radiation. Avoid exposure to beam. Class 3b Radiation Product. Refer servicing to the manufacturer-qualified personnel.

	Class 1 laser product. Invisible laser radiation when open. Avoid direct exposure to the beam.
	Protective Earth (PE). A terminal which is bonded to conductive parts of equipment for safety purposes and is intended to be connected to an external protective earthing system.
	Functional earth ground (FE). Symbol indicates grounding points intended primarily for troubleshooting.
	The CSA Certification Mark indicates that the product was tested against and met the applicable North American standards requirements.
	INVISIBLE LASER RADIATION — Avoid exposure to beam. Class 3B Radiation Product. Refer servicing to the manufacturer or qualified personnel.
	Removing label from measurement cell optical head will void analyzer warranty.

2.3.1 U.S. export compliance

The policy of Endress+Hauser is strict compliance with U.S. export control laws as detailed in the website of the Bureau of Industry and Security at the U.S. Department of Commerce.

2.4 Potential risks affecting personnel

This section addresses the appropriate actions to undertake when faced with hazardous situations during or before service of the analyzer. It is not possible to list all potential hazards within this document. The user is responsible for identifying and mitigating any potential hazards present when servicing the analyzer.

NOTICE

- Technicians are expected to be trained and follow all safety protocols that have been established by the customer in accordance with the area hazard classification to service or operate the analyzer.
- This may include, but is not limited to, toxic and flammable gas monitoring protocols, lockout/tagout procedures, the use of PPE requirements, hot work permits and other precautions that address safety concerns related to the use and operation of process equipment located in hazardous areas.

2.4.1 Mitigating risks

Refer to the instructions for each situation listed below to mitigate risks.

2.4.2 Electrocution hazard

⚠ WARNING

- Complete this action before performing any service that requires working near the main input power or disconnecting any wiring or other electrical components.

1. Shut off power at the main disconnect external to the analyzer.
2. Open enclosure door.
3. If service must be performed with power engaged, do the following:
   a. Note any live electrical components and avoid all contact with them.

Only use tools with a safety rating for protection against accidental contact with voltage up to 1000V.

2.4.3 Explosion/fire hazard

Any work in a hazardous area must be carefully controlled to avoid creating any possible ignition sources (e.g., heat, arcing, sparking, etc.). All tools must be appropriate for the area and hazards present. Electrical connections must not be made or broken with power on (to avoid arcing).

3 SS500, SS2000, and SS3000 TDLAS Gas Analyzer

The information in this chapter includes technical specifications as well as safety warnings and considerations for equipment installation and equipment operation for the SS500, SS2000, and SS3000 TDLAS Gas Analyzers. For complete instructions refer to the *Operating Instructions* (BA02182C).

3.1 Analyzer technical specifications

All TDLAS Gas Analyzer models come with a set of technical specifications that outline recommended equipment settings and ratings. This information is included in the *Operating Instructions* (BA02182C).

Peripheral devices

For systems equipped with peripheral devices, e.g., probe assemblies, only devices that meet with Endress+Hauser' specifications may be used. Refer to documentation provided by the manufacturer for instruction on installation, operation, etc.

Equipment rating

The following equipment rating information is provided by model type for each TDLAS Gas Analyzer in the *Operating Instructions* (BA02182C).

3.1.1 SS500 TDLAS gas analyzer specifications

Measurement data	
Target components	H_2O in natural gas
Principle of measurement	Tunable Diode Laser Absorption Spectroscopy (TDLAS)
Measurement ranges	0.25 to 20, 0.25 to 50, 0.25 to 100 lbs/MMscf 5 to 422, 5 to 1055, 5 to 2110 ppmv
Repeatability	± 1 ppmv or ± 1% of reading (whichever is greater)
Accuracy	± 10 ppmv or ± 2% of reading (whichever is greater)
Application data	
Ambient temperature range	−20 °C to 50 °C (−4 °F to 122 °F)
Maximum operating altitude	2000 m above sea level
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	
Input Voltage (Electronics)	120 to 240 VAC ± 10%, 50 to 60 Hz, 20W Max 24 VDC, 1.6 A Maximum 12 VDC, 3.2 A Maximum
Max current	0.8 A maximum at 120 VAC 1.6 A at 24 VDC, 3.2 A at 12 VDC
Communication	Analog: One or two 4-20mA isolated, 1200 ohms at 24 VDC max load Serial: RS232C 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, division 2**
Electronics enclosure type	Type 3R - 304 stainless steel
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)
Weight (approximately)	11.5 kg (25 lbs)
Sample cell dimensions	438 mm H x 108 mm W (17.3 x 4.3 inches)
Number of sample cells	1
Area classification	
Certification	cCSAus Class I, Division 2, Groups A, B, C, D, T3C cCSAus Class I, Zone 2 IIC T3C

3.1.2 SS2000 TDLAS gas analyzer specifications

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 0 to 422, 0 to 1055, 0 to 2110, 0 to 5275 ppmv CO_2: 0 to 5%, 0 to 10%, 0 to 20%
Repeatability	H_2O: ± 1 ppmv or ± 1% of reading (whichever is greater) 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)
Maximum operating altitude	2000 m above sea level
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	
Input Voltage Electronics	120 to 240 VAC ± 10%, 50 to 60 Hz, 20W Max 24 VDC, 1.6 A Max 12 VDC, 3.2 A Max
Max current	0.8 A maximum at 120 VAC 1.6 A at 24 VDC, 3.2 A at 12 VDC
Communication	Analog: One or two 4-20mA isolated, 1200 ohms at 24 VDC max load Serial: RS232C 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**
Electronics enclosure type	Type 3R - 304 stainless steel*
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)
Weight approximate	11.5 kg (25 lbs)
Sample cell dimensions	438 mm H x 108 mm W (17.3 x 4.3 inches)
Number of Sample Cells	1
Area classification	
Certification	cCSAus Class I, Div 2, Groups A, B, C, D, T3C cCSAus Class I, Zone 2 IIC T3C

3.1.3 SS3000 TDLAS gas analyzer specifications

Measurement data	
Target components	H_2O and/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 0 to 422, 0 to 1055, 0 to 2110, 0 to 5275 ppmv CO_2: 0 to 5%, 0 to 10%, 0 to 20%
Repeatability	H_2O: ± 1 ppmv or ± 1% of reading (whichever is greater) 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)
Maximum operating altitude	2000 m above sea level
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	
Input Voltage Electronics	120 to 240 VAC ± 10%, 50 to 60 Hz, 20W Max 24 VDC, 1.6 A Max 12 VDC, 3.2 A Max
Max current	0.8 A maximum at 120 VAC 1.6 A at 24 VDC, 3.2A at 12 VDC
Communication	Analog: One or two 4-20mA isolated, 1200 ohms at 24 VDC max load Serial: RSlcC Protocol: Modbus Gould RTU or Daniel RTU or ASCII
Alarms	Four general fault and concentration alarms via Modbus and analog output(s)
LCD display	Concentration, cell pressure and temperature, diagnostics

Physical	Class I, division 2
Electronics enclosure type	Type 3R - 304 stainless steel*
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)
Weight (approximately)	11.5 kg (25 lbs)
Sample cell dimensions	438 mm H x 108 mm W (17.3 x 4.3 inches)
Sample cell construction	316L series polished stainless steel
Number of Sample Cells	2
Area classification	
Certification	cCSAus Class I, Division 2, Groups A, B, C, D, T3C cCSAus Class I, Zone 2 IIC T3C

3.2 Equipment installation

The information in this section is related to safety considerations for equipment installation.

⚠ CAUTION

Endress+Hauser Class I Division 2 analyzers use a non-incendive protection method, and as such all portions of the local installation codes apply.

- The maximum allowed inductance to resistance ratio (L/R ratio) for the field wiring interface must be less than 25 µH/Ω. The maximum total loop capacitance shall be 0.27 microfarads.
- Configurations requiring optional accessories, e.g., probe assemblies, with specific characteristics must meet manufacturer specifications.
- The power distribution panel or switch should be located in close proximity to the equipment and within easy reach of the operator. A switch or circuit breaker shall not interrupt a protective earth ground.
- Endress+Hauser analyzers are designed for operation within the specified ambient temperature range of −20 °C to 50 °C (−4 °F to 122 °F). Intense sun exposure in some areas may cause the analyzer temperature to exceed the maximum.

3.2.1 Lifting/carrying the analyzer

The SS500, SS2000, and SS3000 analyzers can be easily lifted from the packaging and moved to the installation location. Take care not to lift or carry the analyzer by the measurement cells or the cables connected at the top of the analyzer, or damage may occur. For analyzers configured inside enclosures and weighing more than 18 kg (approximately 40 lbs), lift the unit by the mounting brackets using at least two individuals and distribute the weight among personnel to avoid injury.

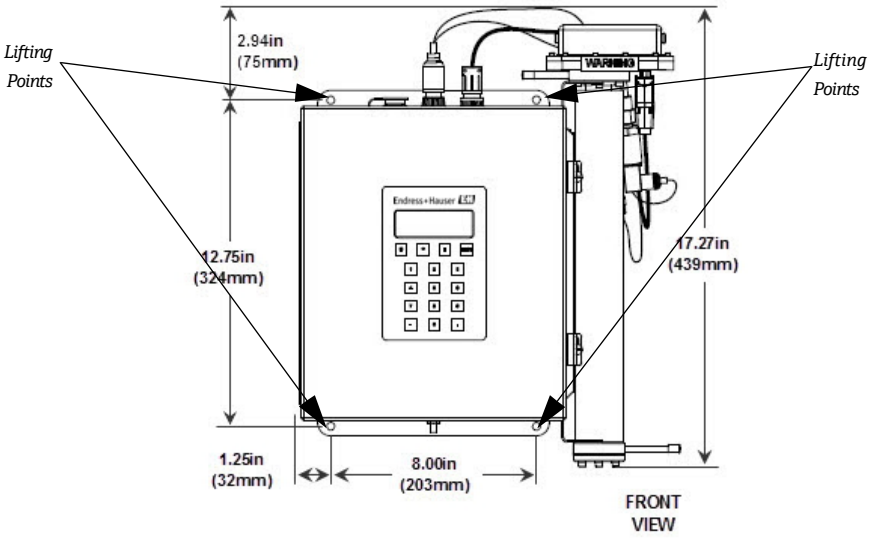


Figure 1: Lifting and carrying the SS500 and SS2000 TDLAS gas analyzers (1)

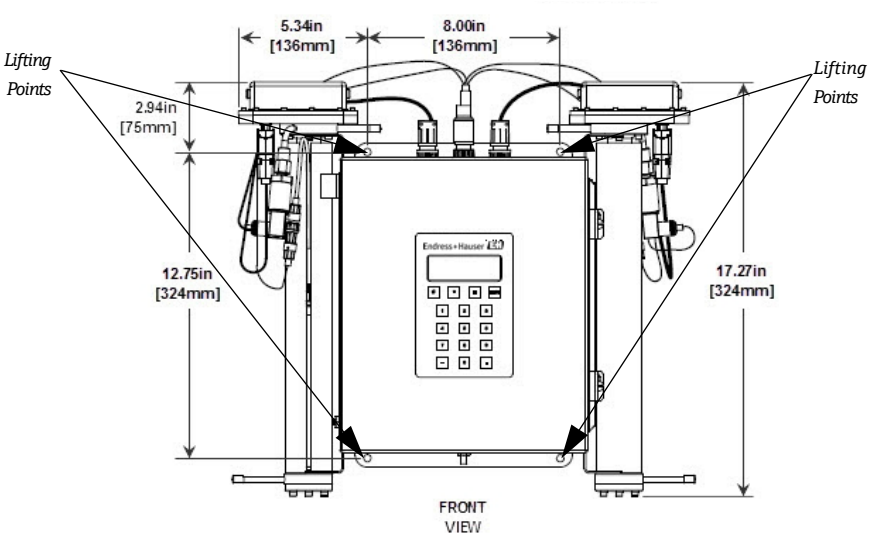


Figure 2: Lifting and carrying the SS3000 TDLAS gas analyzer (1)

⚠ CAUTION

The safety of the analyzer is the responsibility of the installer and the organization they represent. Incorrect transportation can cause injury and damage the device.

- Always use a lifting truck or a fork-lift to transport the analyzer. Two people are needed for the installation.
- Ensure all equipment used for lifting/moving the analyzer is rated for the weight load.
- Lift the device by the recessed grips.

3.2.2 Mounting the analyzer

The SS500, SS2000, and SS3000 analyzers are manufactured for wall or Unistrut® (or equivalent) metal framing installations. Depending on your application and configuration, the analyzer may come pre-mounted on a SCS panel to be mounted on a wall or Unistrut framing, or without a panel requiring mounting via the standard electronics enclosure tabs.

When mounting the analyzer, be sure to position the instrument so that it is not difficult to operate adjacent devices. Refer to the layout diagrams for mounting dimensions and additional information in the Operating Instructions.

NOTICE

The analyzer is designed to operate within its specified ambient temperature range. In regions with intense sun exposure, internal temperatures may rise beyond rated limits.

- For outdoor installations where temperature limits may be exceeded, install a sunshade or canopy over the analyzer to prevent overheating.

⚠ CAUTION

- Mount the analyzer so that inlet and outlet lines reach their respective chassis connections without excessive tension. Maintain enough slack in the sample lines to prevent stress or strain on the fittings.

3.2.3 Opening and closing the analyzer enclosure

⚠ WARNING

Hazardous voltage and risk of electric shock.

- Failure to properly ground the analyzer may create a high-voltage shock hazard.

3.2.4 Electrical wiring requirements

Hazardous location wiring compliance

⚠ CAUTION

The installer is responsible for compliance with all applicable local installation codes.

- Interconnection between the analyzer enclosure and the customer DCS room must use wiring methods approved for Class 1, Division 2 hazardous locations, in accordance with the **Canadian Electrical Code (CEC) Appendix J** and the **National Electric Code (NEC) Article 501**.
- The analyzer is rated for **Pollution Degree 2** and **Overvoltage Category II**. Wiring must meet the corresponding requirements.

Field wiring requirements

WARNING

- Thread lubricant must be applied on all conduit hub threaded connections. Endress+Hauser recommends using STL8 lubricant on all conduit screw thread and its taped openings.

CAUTION

- All field wiring to and from the analyzer must be protected using **galvanized rigid conduit** or an equivalent method approved for the installation environment.
- Accessories such as plugs, hubs, and seals must have ratings equal to or greater than those of the analyzer. Ensure all components comply with applicable local codes and hazardous location requirements.

Protective chassis and ground specifications

To protect personnel and equipment, always connect the protective and chassis grounds before connecting any electrical signal or power.

Requirements for the protective and chassis grounding are listed below:

- Protective and chassis grounds, as well as heater wire, must be at least 1.5 mm^2 (14 awg) equal to or greater size than any other current-carrying conductors in the sample conditioning system (SCS).
- Ground connections must remain intact until all other wiring is disconnected.
- If insulated, protective and chassis ground wires must use the green/yellow insulation.

External circuit breaker requirements

An approved switch or circuit breaker rated for 15 amp should be used and clearly marked as a disconnecting device for the analyzer. The switch or circuit breaker shall not interrupt a protective earth conductor.

3.2.5 Connections to the gas supply

Use the following procedure to connect the sample supply line.

To connect the sample supply line

1. Confirm that the sample probe is correctly installed at the process supply tap and that the sample probe valve is closed.

   WARNING

   The process sample at the sample tap may be at a high pressure.

   - Use extreme caution when operating the sample probe isolation valve and field sample reducing pressure regulator.
   - Consult sample probe manufacturer instructions for proper installation procedures.
   - All valves, regulators, switches, etc. should be operated in accordance with site lockout/tagout procedures.
   - Do not exceed 0.7 barg (10 psig) in the sample cell. Damage to the measurement cell may result.

2. Confirm that the field pressure reducing station is installed properly at the sample probe and that the pressure regulator at the field pressure reducing station is closed (adjustment knob turned fully counter-clockwise).
3. Determine appropriate tubing route from the field pressure reducing station to the sample conditioning system.
4. If configured with this analyzer, install the heat trace bundle in the heat trace sample inlet.
   a. Remove the white foam supplied with the SCS.
   b. Run the entire heat trace bundle into the enclosure.

   Once installed, seal the rubber tube around the heat trace by applying heat until the tube shrinks down around the heat trace bundle.

⚠ WARNING

Hazardous voltage and risk of electric shock.

- ▶ Turn off and lock out system power before opening the electronics enclosure and servicing.

5. If configured with this analyzer, install the heat trace terminal box external to the SCS enclosure; ensure that the power source for the heat trace is provided with a GFI breaker.
   a. Run the heat trace power back out of the enclosure and into the heat trace terminal box.
6. Run stainless steel tubing from the field pressure reducing station (set for the specified inlet pressure) to the sample supply port of the SCS. Bend tubing using industrial grade benders, check tubing fit to ensure proper seating between the tubing and fittings. Fully ream all tubing ends. Blow out the lines for 10 to 15 seconds with clean, dry nitrogen or air prior to making the connection.
7. Connect the inlet tube to the SCS using the ¼ " stainless steel compression-type fitting provided.
8. Tighten all new fittings 1 ¼ turns with a wrench from finger tight. For connections with previously swaged ferrules, thread the nut to the previously pulled up position, then tighten slightly with a wrench. Secure tubing to appropriate structural supports as required.
9. Check all connections for gas leaks. Using a liquid leak detector is recommended.

3.2.6 Ventilation requirements

Flammable gases or vapors shall not be vented to an area in which the existing area classification will be impacted. Flammable gases or vapors shall be vented to a safe location or to the flare header. For information related to mitigating risks associated with electrocution, refer to *Potential risks affecting personnel* →🖹.

3.3 Equipment Operation

This section provides an overview of safety operational instructions for SS500, SS2000, and SS3000 TDLAS Gas Analyzers.

3.3.1 Operating Controls

Refer to the *Operating Instructions* for the purchased analyzer to review the operating controls for the equipment. Refer to *Associated documentation* →🖹.

3.3.2 Firmware Version

Each SS500, SS2000, and SS3000 TDLAS gas analyzer operates based on its own firmware version which is listed in the system calibration report and displays when the analyzer starts up. Detailed operation instructions are provided in the Description of Device Parameters available for download by model type on the Endress+Hauser website (www.endress.com).

3.3.3 Intermittent Operation

The warnings outlined in this section apply to both the full-featured and simplified sample systems.

⚠ WARNING

Process samples may contain hazardous material in potentially flammable and toxic concentrations.

- ▶ Personnel should have a thorough knowledge and understanding of the physical properties and safety precautions for the sample contents before operating the SCS.

⚠ WARNING

The process sample at the sample tap is at a high pressure.

- ▶ A pressure reducing regulator is located at the sample tap to reduce the sample pressure and enable operation of the SCS at a low pressure. Use extreme caution when operating the sample probe isolation valve and field pressure reducing regulator.

4 SS500XP and SS2000XP TDLAS Gas Analyzer

The information in this chapter includes technical specifications as well as safety warnings and considerations for equipment installation and equipment operation for the SS500XP and SS2000XP TDLAS Gas Analyzers. For complete instructions refer to the *Operating Instructions* (BA02183C).

4.1 Analyzer Technical Specifications

All TDLAS Gas Analyzer models come with a set of technical specifications that outline recommended equipment settings and ratings. This information is included in the *Operating Instructions* (BA02183C).

Peripheral devices

For systems equipped with peripheral devices, e.g., probe assemblies, only devices that meet with Endress+Hauser specifications may be used. Refer to documentation provided by the manufacturer for instruction on installation, operation, etc.

Equipment rating

The following equipment rating information is provided by model type for each TDLAS Gas Analyzer in the *Operating Instructions* (BA02183C).

4.1.1 SS500XP TDLAS gas analyzer specifications

Measurement data	
Target components	H_2O in natural gas
Principle of measurement	Tunable Diode Laser Absorption Spectroscopy (TDLAS)
Measurement ranges	0.25 to 20, 0.25 to 50, 0.25 to 100 lbs/MMscf 5 to 422, 5 to 1055, 5 to 2110 ppmv
Repeatability	± 1 ppmv or ± 1% of reading (whichever is greater)
Accuracy	± 10 ppmv or ± 2% of reading (whichever is greater)
Application data	
Ambient temperature range	–20 °C to 50 °C (–4 °F to 122 °F)
Maximum operating altitude	2000 m above sea level
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	
Input Voltage (Electronics)	120 to 240 VAC ± 10%, 50 to 60 Hz, 20W Max 24 VDC, 1.6 A Maximum 12 VDC, 3.2 A Maximum
Max current	0.8 A maximum at 120 VAC 1.6 A at 24 VDC, 3.2 A at 12 VDC
Communication	Analog: One or two 4-20mA isolated, 1200 ohms at 24 VDC max load Serial: RS232C 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, division 1
Electronics enclosure type	Type 4, 7, 9 - cast aluminum
Electronics with sample cell dimensions	565 mm H x 413 mm W x 222 mm D (22.25 x 16.25 x 8.75 inches)
Weight (approximately)	46.8 kg (103 lbs)
Sample cell dimensions	438 mm H x 108 mm W (17.3 x 4.3 inches)
Number of sample cells	1
Area classification	
Certification	cCSAus Class I, Division 1, Groups B, C, D, T4

4.1.2 SS2000XP TDLAS gas analyzer specifications

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 0 to 422, 0 to 1055, 0 to 2110, 0 to 5275 ppmv CO_2: 0 to 5%, 0 to 10%, 0 to 20%
Repeatability	H_2O: ± 1 ppmv or ± 1% of reading (whichever is greater) 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)
Maximum operating altitude	2000 m above sea level
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	
Input Voltage (Electronics)	120 to 240 VAC ± 10%, 50 to 60 Hz, 20W Max 24 VDC, 1.6 A Maximum 12 VDC, 3.2 A Maximum
Max current	0.8 A maximum at 120 VAC 1.6 A at 24 VDC, 3.2 A at 12 VDC
Communication	Analog: One or two 4-20mA isolated, 1200 ohms at 24 VDC max load Serial: RS232C 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 1**
Electronics enclosure type	Type 4, 7, 9 - cast aluminum

Electronics with sample cell dimensions	565 mm H x 413 mm W x 222 mm D (22.25 x 16.25 x 8.75 inches)
Weight approximate	46.8 kg (103 lbs)
Sample cell dimensions	438 mm H x 108 mm W (17.3 x 4.3 inches)
Number of Sample Cells	1
Area classification	
Certification	cCSAus Class I, Div 1, Groups B, C, D, T4

4.2 Equipment installation

The information in this section is related to safety considerations for equipment installation.

⚠ CAUTION

Endress+Hauser Class I Division 1 analyzers use a non-incendive protection method, and as such all portions of the local installation codes apply.

- The maximum allowed inductance to resistance ratio (L/R ratio) for the field wiring interface must be less than 25 µH/Ω. The maximum total loop capacitance shall be 0.27 microfarads.
- Configurations requiring optional accessories, e.g., probe assemblies, with specific characteristics must meet manufacturer specifications.
- The power distribution panel or switch should be located in close proximity to the equipment and within easy reach of the operator. A switch or circuit breaker shall not interrupt a protective earth ground.
- Endress+Hauser analyzers are designed for operation within the specified ambient temperature range of −20 °C to 50 °C (−4 °F to 122 °F). Intense sun exposure in some areas may cause the analyzer temperature to exceed the maximum.

4.2.1 Lifting/carrying the analyzer

Due to the analyzer's size and weight (48.6 Kg., or 103 lbs.), Endress+Hauser recommends the use of a forklift, pallet jack, etc. to lift and/or move the analyzer. Before removing the analyzer from the crate, move the crate as close as possible to the final location.

If the analyzer is to be lifted by hand, designate multiple individuals to lift by the mounting brackets, and distribute the weight among personnel to avoid injury.

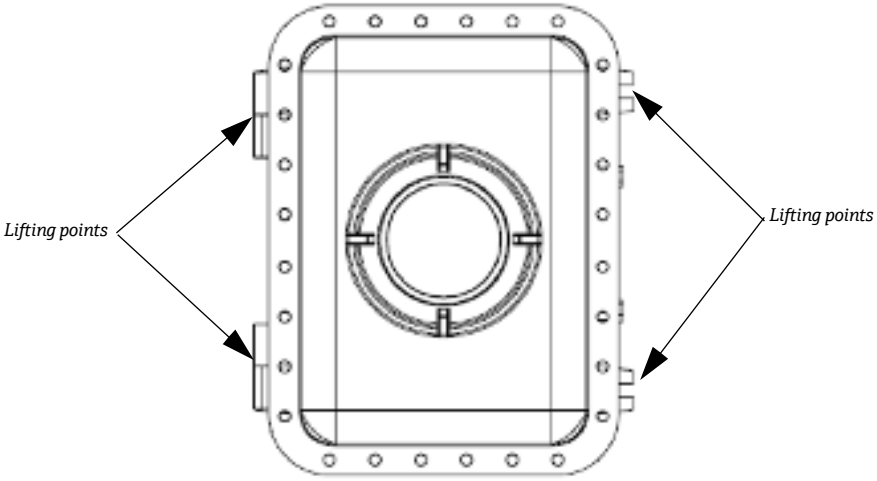


Figure 3: SS500XP and SS2000XP lifting point

4.2.2 Mounting the Analyzer

The TDLAS Gas Analyzer is manufactured for wall or Unistrut® (or equivalent) metal framing installations.

NOTICE

- When mounting the analyzer, be sure to position the instrument so that it is not difficult to operate adjacent devices.

⚠ CAUTION

- It is critical to mount the analyzer so that the inlet and outlet lines reach the inlet and outlet connections on the chassis while still maintaining flexibility so that the sample lines are not under excessive stress.

4.2.3 Opening/Closing the Analyzer Enclosure

⚠ WARNING

Hazardous voltage and risk of electric shock.

- Failure to properly ground the analyzer may create a high-voltage shock hazard.

4.2.4 Electrical Wiring Requirements

Hazardous location wiring compliance

⚠ CAUTION

The installer is responsible for compliance with all applicable local installation codes.

- Interconnection between the analyzer enclosure and the customer DCS room must use wiring methods approved for Class 1, Division 2 hazardous locations, in accordance with the **Canadian Electrical Code (CEC) Appendix J** and the **National Electric Code (NEC) Article 501**.
- The analyzer is rated for **Pollution Degree 2** and **Overvoltage Category II**. Wiring must meet the corresponding requirements.
- Certified glands and cables should be used where appropriate in compliance with local regulations.

Protective Chassis and Ground Connections

To protect personnel and equipment, connect the protective and chassis grounds first before connecting any electrical signal or power. Requirements for the protective and chassis grounds are listed below:

- The protective and chassis grounds and heater wire must be a minimum of 1.5 mm^2 (14 awg), equal or greater size than any other current-carrying conductors located in the sample conditioning system (SCS).
- The protective and chassis grounds must remain connected until all other wiring is removed.
- If the protective and chassis ground is insulated, it must use the green/yellow color.

External Circuit Breaker Requirements

An approved switch or circuit breaker rated for 15 amp should be used and clearly marked as a disconnecting device for the analyzer. The switch or circuit breaker shall not interrupt a protective earth conductor.

⚠ WARNING

- Thread lubricant must be applied on all conduit hub threaded connections. Endress+Hauser recommends using STL8 lubricant on all conduit screw thread and its taped openings.

4.2.5 Connections to the Gas Supply

Consult the Sample Conditioning System (SCS) manual for guidance. All work must be performed by technicians qualified in instrument tubing.

⚠ WARNING

Process samples may contain hazardous material in potentially flammable and toxic concentrations.

- Personnel should have a thorough knowledge and understanding of the physical properties and safety precautions for the sample contents before operating the SCS.

4.2.6 Ventilation Requirements

Flammable gases or vapors shall not be vented to an area in which the existing area classification will be impacted. Flammable gases or vapors shall be vented to a safe location or to the flare header. For information related to mitigating risks associated with electrocution, refer to *Potential risks affecting personnel* →🖹.

4.3 Equipment Operation

This section provides an overview of safety operational instructions for the SS500XP and SS2000XP TDLAS Gas Analyzers.

4.3.1 Operating Controls

Refer to the *Operating Instructions* for the purchased analyzer to review the operating controls for the equipment. Refer to *Associated documentation* →🖹.

4.3.2 Firmware Version

Each SS500XP and SS2000XP TDLAS gas analyzer operates based on its own firmware version which is listed in the system calibration report and displays when the analyzer starts up. Detailed operation instructions are provided in the Description of Device Parameters available for download by model type on the Endress+Hauser website (www.endress.com).

4.4 Preparing the analyzer for shipment or storage

If the equipment is to be shipped or stored for any length of time, it should be packed in the original packaging when shipped when shipped from the factory. If the analyzer has been installed or operated (even for purposes of a demonstration), the system should first be purged with an inert gas before powering down the analyzer.

⚠ WARNING

Process samples may contain hazardous material in potentially flammable and toxic concentrations.

- ▶ Personnel should have a thorough knowledge and understanding of the physical properties and safety precautions for the sample contents before operating the SCS.

4.4.1 Storage

The packaged analyzer should be stored in a sheltered environment that is temperature controlled between −20 °C (−4 °F) and 50 °C (122 °F), and should not be exposed to direct sun, rain, snow, condensing humidity or corrosive environments.

5 SS500e, SS2000e, and SS3000e TDLAS Gas Analyzer

The information in this chapter includes technical specifications as well as safety warnings and considerations for equipment installation and equipment operation for the SS500e, SS2000e, and SS3000e TDLAS Gas Analyzers. For complete instructions refer to the *Operating Instructions* (BA02164C).

5.1 Analyzer Technical Specifications

All SS500e, SS2000e, and SS3000e TDLAS Gas Analyzers come with a set of technical specifications that outline recommended equipment settings and ratings. This information is included in the *Operating Instructions* (BA02164C).

Peripheral devices

For systems equipped with peripheral devices, e.g., probe assemblies, only devices that meet with Endress+Hauser specifications may be used. Refer to documentation provided by the manufacturer for instruction on installation, operation, etc.

Equipment rating

The following equipment rating information is provided by model type for all TDLAS Gas Analyzers in the *Operating Instructions* (BA02164C).

5.1.1 SS500e TDLAS gas analyzer specifications

Measurement data	
Target components	H_2O in natural gas
Principle of measurement	Tunable Diode Laser Absorption Spectroscopy (TDLAS)
Measurement ranges	0.25 to 20, 0.25 to 50, 0.25 to 100 lbs/MMscf 5 to 422, 5 to 1055, 5 to 2110 ppmv
Repeatability	± 1 ppmv or ± 1% of reading (whichever is greater)
Accuracy	± 10 ppmv or ± 2% of reading (whichever is greater)
Application data	
Ambient temperature range	−20 °C to 50 °C (−4 °F to 122 °F) −10 °C to 60 °C (14 °F to 140 °F) — *optional*
Maximum operating altitude	2000 m above sea level
Sample cell pressure range	700 to 1400 mbara 700 to 1700 mbara — *optional*
Sample cell temperature range	−20 °C to 50 °C (−4 °F to 122 °F) −10 °C to 60 °C (14 °F to 140 °F) — *optional*
Maximum cell pressure	70 kPag (10 psig)
Sample flow rate	0.5 to 1.0 slpm (1 to 2 scfh)
Bypass flow rate	1 slpm (2 scfh)
Electrical and communication	
Input Voltage (Electronics)	100 to 240 VAC, 50/60 Hz, 20 W Max 18 to 24 VDC, 20 W Max
Input Voltage SCS Heater (Optional)	120 VAC or 240 VAC +/−10%, 50 to 60 Hz single phase, 100 W
Max current (Unheated)	0.8 A maximum at 120 VAC 1.6 A at 24 VDC
Max current (Heated)	2 A maximum at 120 VAC

Communication	Analog: 2 4-20mA isolated, 1200 ohms at 24 VDC max load Serial: RS232C—*standard*, RS485 and Ethernet—*optional* 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	
Enclosure type	Type 4X - 304 stainless steel
Dimensions	973 mm H x 406 mm W x 229 mm D (38.3 x 16 x 9 inches)
Weight (approximately)	34 kg (75 lbs)
Sample cell dimensions	438 mm H x 108 mm W (17.3 x 4.3 inches)
Number of sample cells	1
Area classification	
Certification	Class I Div. 2 Grp. B, C and D, T3/T3C, Type 4X Class I Zone 2 IIB+H2 T3/T3C, Type 4X

5.1.2 SS2000e TDLAS gas analyzer specifications

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 lbs/MMscf 0 to 422, 0 to 1055, 0 to 2110 ppmv CO_2: 0 to 5%, 0 to 10%, 0 to 20%
Repeatability	H_2O: ± 1 ppmv or ± 1% of reading (whichever is greater) CO_2: ± 400 ppmv or ± 2% of reading (whichever is greater)
Accuracy	H_2O: ± 2 ppmv or ± 2% of reading (whichever is greater)
Application data	
Ambient temperature range	−20 °C to 50 °C (−4 °F to 122 °F) −10 °C to 60 °C (14 °F to 140 °F)—*optional*
Maximum operating altitude	2000 m above sea level
Sample cell pressure range	700 to 1400 mbara 700 to 1700 mbara—*optional*
Sample cell temperature range	−20 °C to 50 °C (−4 °F to 122 °F) −10 °C to 60 °C (14 °F to 140 °F)—*optional*
Maximum cell pressure	70 kPag (10 psig)
Sample flow rate	0.5 to 1.0 slpm (1 to 2 scfh)
Bypass flow rate	1 slpm (2 scfh)
Electrical and communication	
Input Voltage (Electronics)	120 to 240 VAC ± 10%, 50 to 60 Hz, 20W Max 18 to 24 VDC, 20 W Max
Input Voltage SCS Heater (Optional)	120 VAC or 240 VAC +/−10%, 50 to 60 Hz single phase, 100 W
Max current (Unheated)	0.8 A maximum at 120 VAC 1.6 A at 24 VDC

Max current (Heated)	2 A maximum at 120 VAC
Communication	Analog: 2 4-20mA isolated, 1200 ohms at 24 VDC max load Serial: RS232C—*standard*, RS485 and Ethernet—*optional* 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	
Enclosure type	Type 4X - 304 stainless steel
Dimensions	973 mm H x 406 mm W x 229 mm D (38.3 x 16 x 9 inches)
Weight (approximately)	34 kg (75 lbs)
Sample cell dimensions	438 mm H x 108 mm W (17.3 x 4.3 inches)
Number of sample cells	1
Area classification	
Certification	Class I Div. 2 Grp. B, C and D, T3/T3C, Type 4X Class I Zone 2 IIB+H2 T3/T3C, Type 4X

5.1.3 SS3000e TDLAS gas analyzer specifications

Measurement data	
Target components	H_2O and/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 0 to 422, 0 to 1055, 0 to 2110, 0 to 5275 ppmv CO_2: 0 to 5%, 0 to 10%, 0 to 20%
Repeatability	H_2O: ± 1 ppmv or ± 1% of reading (whichever is greater) 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)—*standard* −10 °C to 60 °C (15 °F to 140 °F)—*optional*
Maximum operating altitude	2000 m above sea level
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 slpm (1 to 2 scfh)
Bypass flow rate	1 slpm (2 scfh)
Electrical and communication	
Input Voltage (Electronics)	120 to 240 VAC ± 10%, 50 to 60 Hz, 20W Max 18 to 24 VDC, 20 W Max
Input Voltage SCS Heater (Optional)	120 VAC or 240 VAC +/−10%, 50 to 60 Hz single phase, 100 W
Max current	0.8 A maximum at 120 VAC 1.6 A at 24 VDC

Communication	Analog: 1 or 2 4-20mA isolated, 1200 ohms at 24 VDC max load Serial: RS232C Protocol: Modbus Gould RTU or Daniel RTU or ASCII
Alarms	Four general fault and concentration alarms via Modbus and analog output(s)
LCD display	Concentration, cell pressure and temperature, diagnostics
Physical	**Class I, division 2**
Enclosure type	Type 4X stainless steel enclosures
Dimensions	1074 mm H x 508 mm W x 279 mm D (42.3 x 20 x 11 inches)
Weight (approximately)	45 kg (100 lbs)
Sample cell dimensions	438 mm H x 108 mm W (17.3 x 4.3 inches)
Sample cell construction	316L series polished stainless steel
Number of sample cells	2
Area classification	
Certification	Class I Div. 2 Grp. B, C and D, T3/T3C, Type 4X Class I Zone 2 IIB+H2 T3/T3C, Type 4X

5.2 Equipment installation

The information in this chapter is related to safety considerations for equipment installation.

⚠ CAUTION

Endress+Hauser Class I Division 2 analyzers use a non-incendive protection method, and as such all portions of the local installation codes apply.

- The maximum allowed inductance to resistance ratio (L/R ratio) for the field wiring interface must be less than 25 µH/Ω. The maximum total loop capacitance shall be 0.27 microfarads.
- The safety of the analyzer is the responsibility of the installer and the organization he/she represents.
- Configurations requiring optional accessories, e.g., probe assemblies, with specific characteristics must meet manufacturer specifications.

5.2.1 Lifting/carrying the gas analyzer

Before removing the crate, move the gas analyzer crate as close as possible to the final location.

Lift the gas analyzer by the mounting brackets using at least two individuals and distribute the weight among personnel to avoid injury. Never lift the gas analyzer by the electronics enclosure. Always carry the load, 34 kg (75 lbs.) to 45 Kg (100 lbs.), using one of the following points/methods. Refer to the figure.

- Mounting point brackets
- Support beneath (best used when employing a forklift)

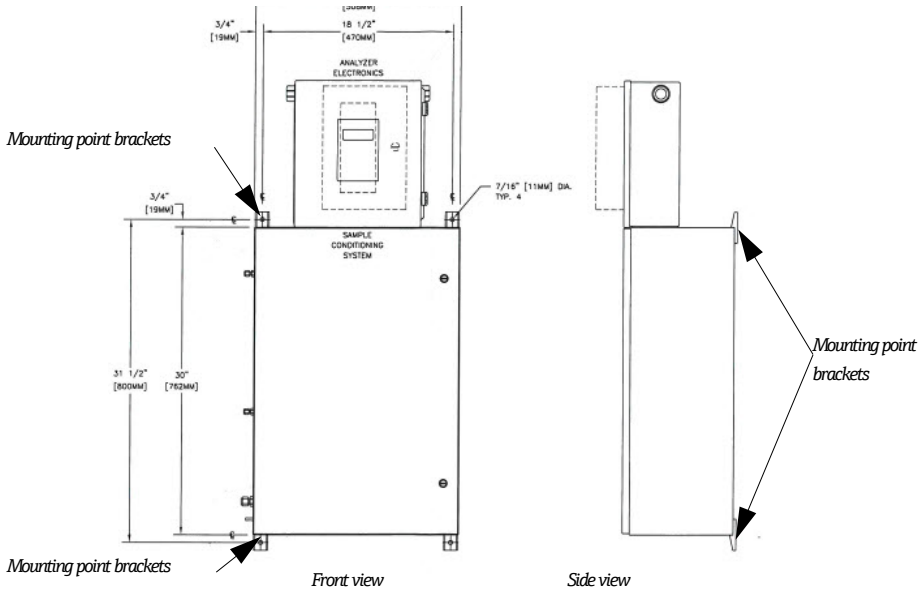


Figure 4: Gas analyzer carrying points/methods

5.2.2 Mounting the Analyzer

The SS500e, SS2000e, and SS3000e TDLAS gas analyzer is manufactured for wall or Unistrut® (or equivalent) metal framing installations. Refer to the layout diagrams in the *Operating Instructions* (BA02164C) for detailed mounting dimensions.

NOTICE

- When mounting the analyzer, be sure to position the instrument so that it is not difficult to operate adjacent devices.

⚠ CAUTION

- It is critical to mount the analyzer so that the inlet and outlet lines reach the inlet and outlet connections on the chassis while still maintaining flexibility so that the sample lines are not under excessive stress.

5.2.3 Opening/Closing the Analyzer Enclosure

⚠ WARNING

Hazardous voltage and risk of electric shock.

- Failure to properly ground the analyzer may create a high-voltage shock hazard.

5.2.4 Electrical Wiring Requirements

Hazardous location wiring compliance

⚠ CAUTION

The installer is responsible for compliance with all applicable local installation codes.

- Interconnection between the analyzer enclosure and the customer DCS room must use wiring methods approved for Class 1, Division 2 hazardous locations, in accordance with the **Canadian Electrical Code (CEC) Appendix J** and the **National Electric Code (NEC) Article 501**.
- The analyzer is rated for **Pollution Degree 2** and **Overvoltage Category II**. Wiring must meet the corresponding requirements.
- Certified glands and cables should be used where appropriate in compliance with local regulations.

Protective Chassis and Ground Connections

To protect personnel and equipment, connect the protective and chassis grounds first before connecting any electrical signal or power. Requirements for the protective and chassis grounds are listed below:

- The protective and chassis grounds and heater wire must be a minimum of 1.5 mm^2 (14 awg), equal or greater size than any other current-carrying conductors located in the sample conditioning system (SCS).

- The protective and chassis grounds must remain connected until all other wiring is removed.
- If the protective and chassis ground is insulated, it must use the green/yellow color.

External Circuit Breaker Requirements

An approved switch or circuit breaker rated for 15 amp should be used and clearly marked as a disconnecting device for the analyzer. The switch or circuit breaker shall not interrupt a protective earth conductor.

⚠ WARNING

- ▶ Thread lubricant must be applied on all conduit hub threaded connections. Endress+Hauser recommends using STL8 lubricant on all conduit screw thread and its taped openings.

5.2.5 Connections to the Gas Supply

Use the following procedure to connect the sample supply line. All work must be performed by technicians qualified in instrument tubing.

To connect the sample supply line

1. First, confirm that the sample probe is correctly installed at the process supply tap and that the sample probe isolation valve is closed.

   ⚠ WARNING

   The process sample at the sample tap may be at a high pressure.

   - ▶ Use extreme caution when operating the sample probe isolation valve and field sample reducing pressure regulator.
   - ▶ Consult sample probe manufacturer instructions for proper installation procedures.
   - ▶ All valves, regulators, switches, etc. should be operated in accordance with site lockout/tagout procedures.
   - ▶ Do not exceed 0.7 barg (10 psig) in the sample cell. Damage to cell may result.

2. Also confirm that the field pressure reducing station is installed properly at the sample probe and that the pressure regulator at the field pressure reducing station is closed (adjustment knob turned fully counterclockwise).
3. Check that the relief valve vent line is properly installed from the field pressure reducing station to the low-pressure flare or atmospheric vent connection.
4. Determine appropriate tubing route from the field pressure reducing station to the SCS.
5. Run stainless steel tubing from the field pressure reducing station to the sample supply port of the SCS. Bend tubing using industrial grade benders, check tubing fit to ensure proper seating between the tubing and fittings. Fully ream all tubing ends. Blow out the lines for 10 to 15 seconds with clean, dry nitrogen or air prior to making the connection.
6. Connect the inlet tube to the SCS using the ¼ " stainless steel compression-type fitting provided.
7. Tighten all new fittings 1¼ turns with a wrench from finger tight. For connections with previously swaged ferrules, thread the nut to the previously pulled up position, then tighten slightly with a wrench. Secure tubing to appropriate structural supports as required.
8. Check all connections for gas leaks. Using a liquid leak detector is recommended.

5.2.6 Ventilation Requirements

Flammable gases or vapors shall not be vented to an area in which the existing area classification will be impacted. Flammable gases or vapors shall be vented to a safe location or to the flare header. For information related to mitigating risks associated with electrocution refer to *Potential risks affecting personnel* →🖹.

5.3 Equipment Operation

This section provides an overview of safety operational instructions for the SS500e, SS2000e, and SS3000e TDLAS gas analyzers.

5.3.1 Operating Controls

Refer to the *Operating Instructions* for the purchased analyzer to review the operating controls for the equipment. Refer to *Associated documentation* →.

5.3.2 Firmware Version

Each SS500e, SS2000e, and SS3000e TDLAS gas analyzer operates based on its own firmware version which is listed in the system calibration report and displays when the analyzer starts up. Detailed operation instructions are provided in the Description of Device Parameters available for download by model type on the Endress+Hauser website (www.endress.com).

5.3.3 Intermittent Operation

The warnings in this section apply to the SS500e, SS2000e, and SS3000e TDLAS gas analyzers.

WARNING

Process samples may contain hazardous material in potentially flammable and toxic concentrations.

- Personnel should have a thorough knowledge and understanding of the physical properties and safety precautions for the sample contents before operating the SCS.

WARNING

The process sample at the sample tap is at a high pressure.

- A pressure reducing regulator is located at the sample tap to reduce the sample pressure and enable operation of the SCS at a low pressure. Use extreme caution when operating the sample probe isolation valve and field pressure reducing regulator.

6 Maintenance and Service

This chapter provides safety information for the maintenance and service of the TDLAS Gas Analyzer. For complete instructions, refer to associated documentation listed in *Associated documentation* →.

6.1 Cleaning the analyzer exterior

⚠ CAUTION

Do not use vinyl acetate, acetone, or other organic solvents to clean the analyzer housing or labels.

- ▶ Clean the exterior only with a damp cloth to prevent electrostatic discharge.

6.2 Fuse ratings and locations

Fuses are located on the electronics control board inside the SS500/SS2000 analyzer enclosure. Refer to:

- Figure 5 – AC, single-channel
- Figure 6 – DC, single-channel
- Figure 7 – AC, dual-channel
- Figure 8 – DC, dual-channel

NOTICE

- ▶ Replace fuses only with the same type and rating. Refer to the table below.

Drawing	Voltage	Description	Rating
Figure 5 Figure 7 F1	120 VAC	Miniature fuse, 5 x 20 mm, time delay	250 VAC / 0.8A
	240 VAC	Miniature fuse, 5 x 20 mm, time delay	250 VAC / 0.5 A
Figure 6 Figure 10 F2	12 VDC	Miniature fuse, 5 x 20 mm, time delay	250 VAC / 3.15 A
	24 VDC	Miniature fuse, 5 x 20 mm, time delay	250 VAC / 1.6 A

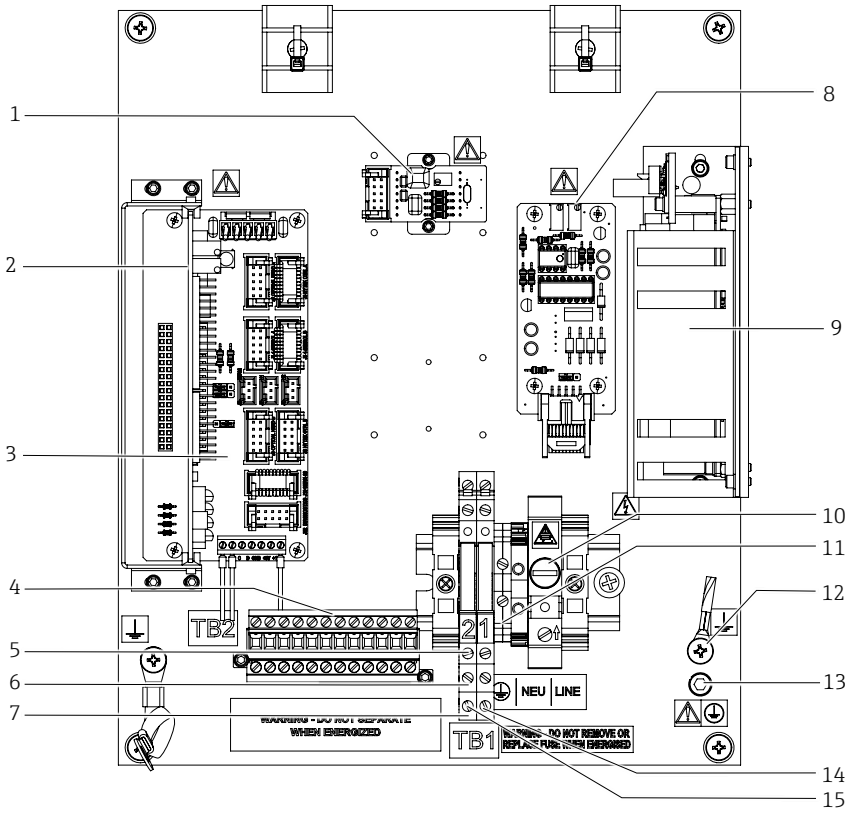


Figure 5: SS500 and SS2000 electronics control board (AC) for single-channel systems

Item #	Description	Item #	Description
1	Temperature control board	9	Power supply
2	Laser driver board	10	Fuse (F1)
3	Backplane	11	Customer ground
4	4-20 mA & serial signal connections	12	Functional/component ground
5	NO (normally open)	13	Protective ground
6	Common	14	Assignable alarm relay
7	NC (normally closed)	15	General fault alarm relay
8	4-20 mA current loop board (stacked)		

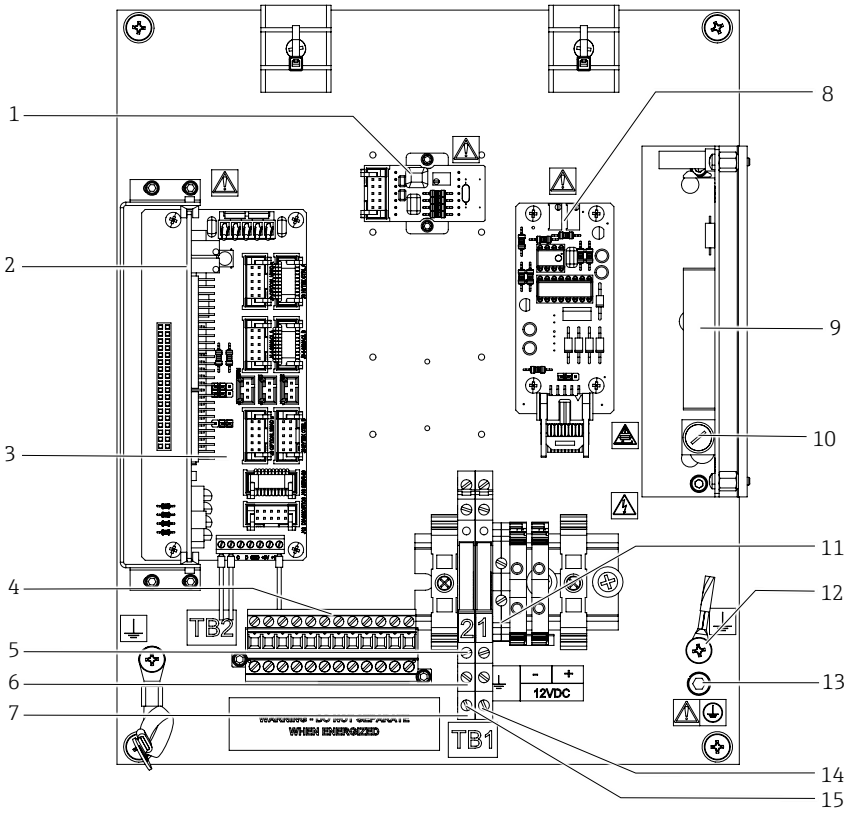


Figure 6: SS500 and SS2000 electronics control board (DC) for single-channel systems

Item #	Description	Item #	Description
1	Temperature control board	9	Power supply
2	Laser driver board	10	Fuse (F2)
3	Backplane	11	Customer ground
4	4-20 mA & serial signal connections	12	Functional/component ground
5	NO (normally open)	13	Protective ground
6	Common	14	Assignable alarm relay
7	NC (normally closed)	15	General fault alarm relay
8	4-20 mA current loop board (stacked)		

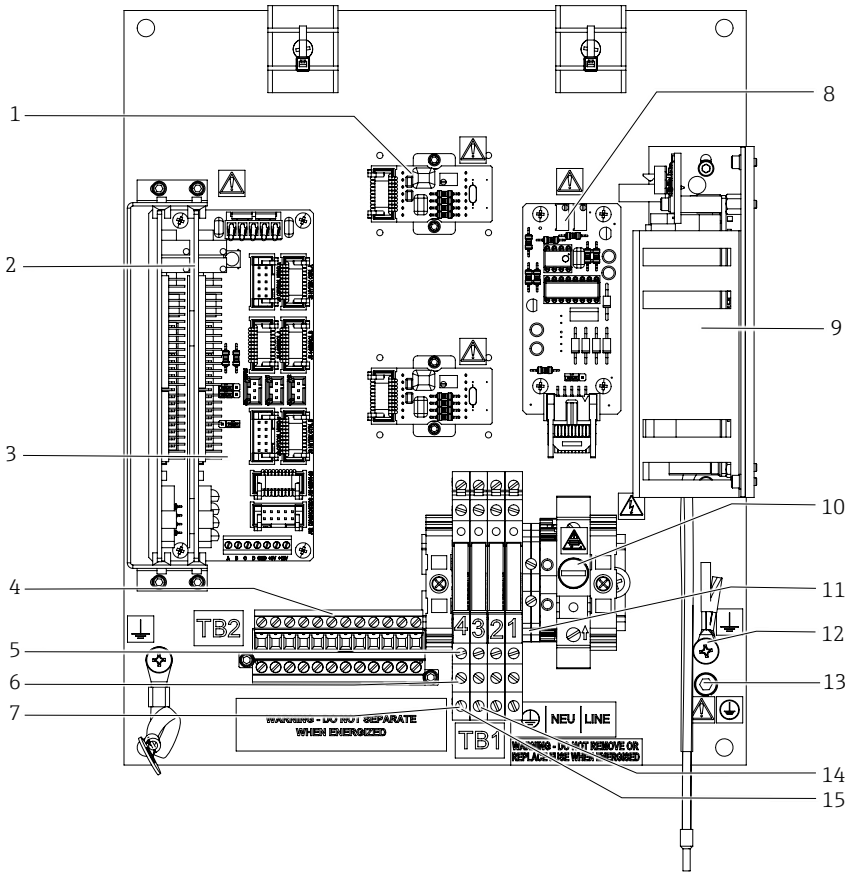


Figure 7: SS3000 electronics control board (AC) for dual-channel systems

Item #	Description	Item #	Description
1	Temperature control board	9	Power supply
2	Laser driver board	10	Fuse (F1)
3	Backplane	11	Customer ground
4	4-20 mA & serial signal connections	12	Functional/component ground
5	NO (normally open)	13	Protective ground
6	Common	14	Assignable alarm relay
7	NC (normally closed)	15	General fault alarm relay
8	4-20 mA current loop board (stacked)		

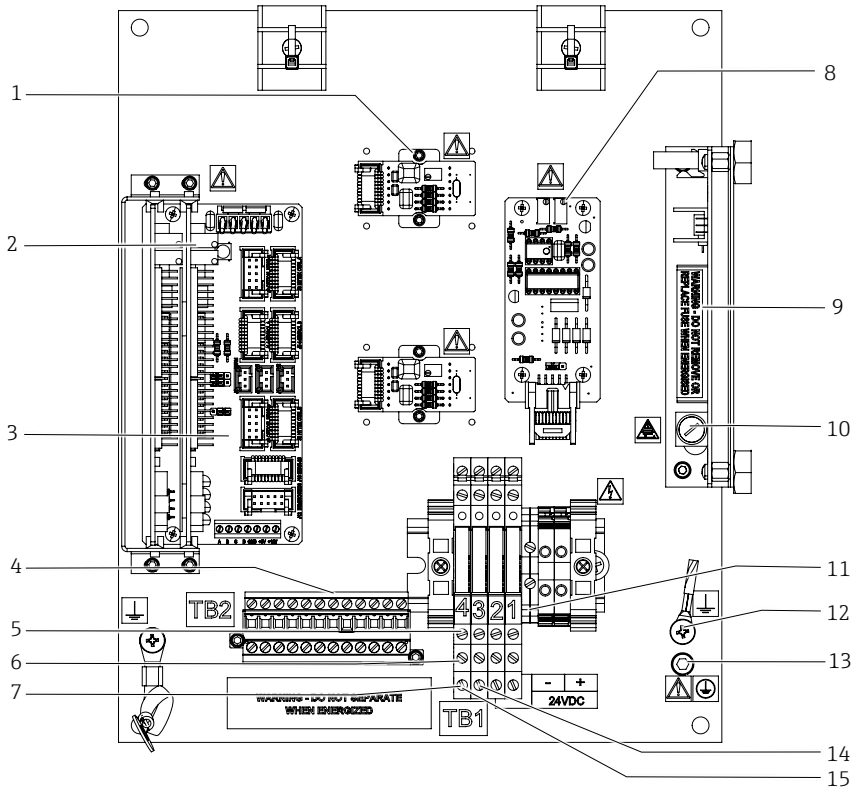


Figure 8: SS3000 electronics control board (DC) for dual-channel systems

Item #	Description	Item #	Description
1	Temperature control board	9	Power supply
2	Laser driver board	10	Fuse (F2)
3	Backplane	11	Customer ground
4	4-20 mA & serial signal connections	12	Functional/component ground
5	NO (normally open)	13	Protective ground
6	Common	14	Assignable alarm relay
7	NC (normally closed)	15	General fault alarm relay
8	4-20 mA current loop board (stacked)		

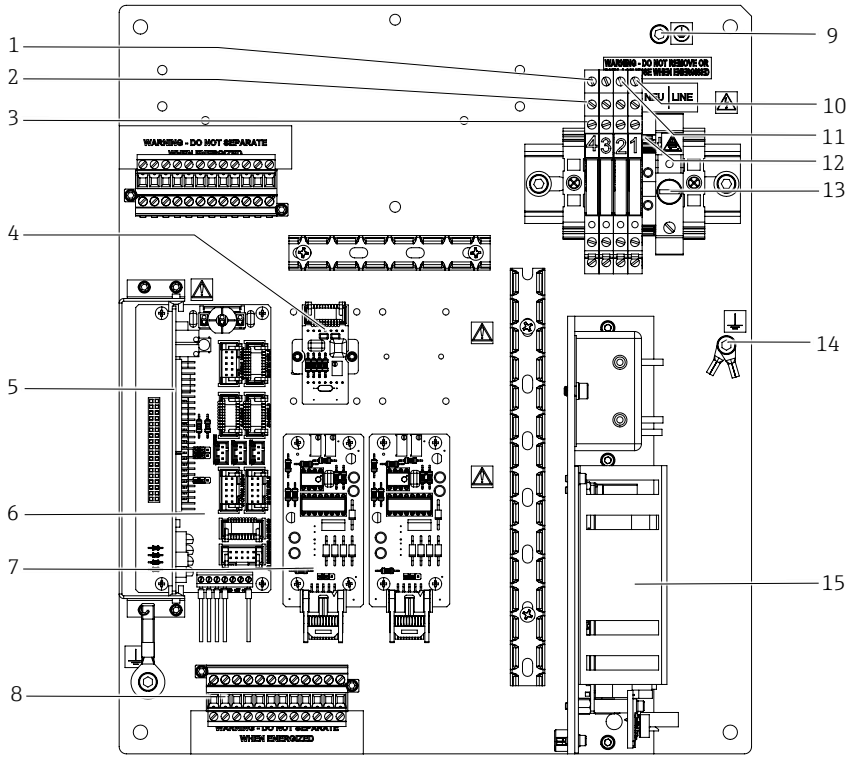


Figure 9: SS500e and SS2000e electronics control board (AC) for single-channel systems

Item #	Description	Item #	Description
1	NC (normally closed)	9	Protective ground
2	Common	10	Assignable alarm relay
3	NO (normally open)	11	General fault alarm relay
4	Temperature control board	12	Customer ground
5	Laser driver board	13	Fuse (F1)
6	Backplane	14	Functional/component ground
7	4-20 mA current loop board (stacked)	15	Power supply
8	4-20 mA & serial signal connections		

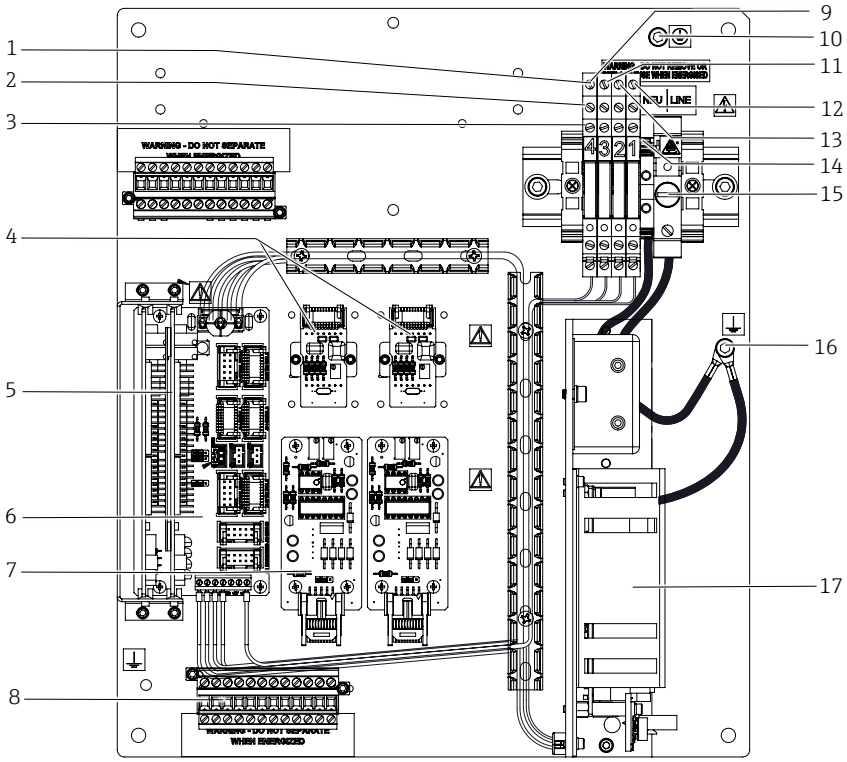


Figure 10: SS3000e electronics control board (AC) for dual-channel systems

Item #	Description	Item #	Description
1	NC (normally closed)	10	Protective ground
2	Common	11	Assignable alarm relay (CH B)
3	NO (normally open)	12	Assignable alarm relay (CH A)
4	Temperature control board	13	General fault alarm relay (CH A)
5	Laser driver board	14	Customer ground
6	Backplane	15	Fuse (F1)
7	4-20 mA current loop board (stacked)	16	Functional/component ground
8	4-20 mA & serial signal connections	17	Power supply
9	General fault alarm relay (CH B)		

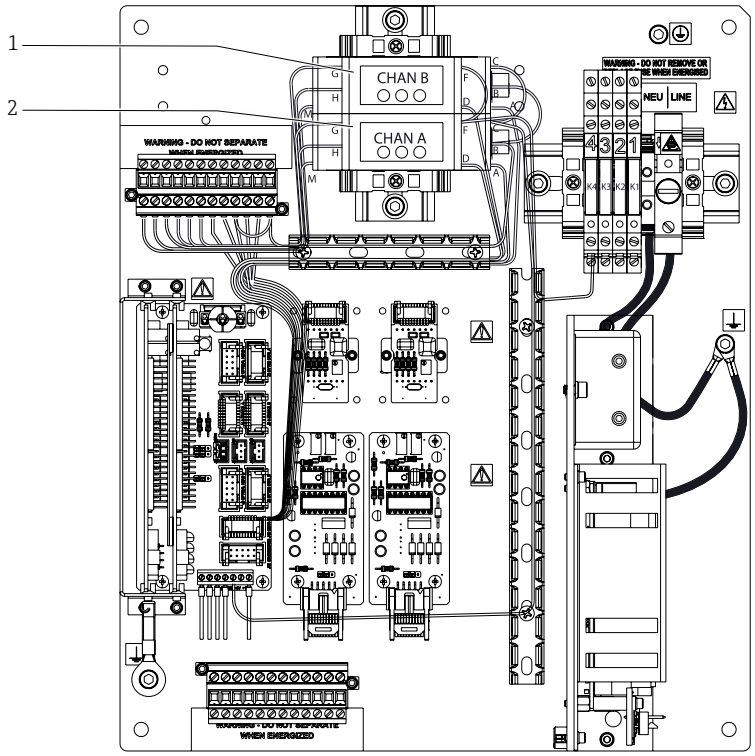


Figure 11: SS3000e electronics control board (AC) for dual-channel systems with RS485 communication. RS232 to RS485 signal converter for measurement channel A (2) and channel B (1) shown. Common AC components not repeated; see Figure 7 for details.

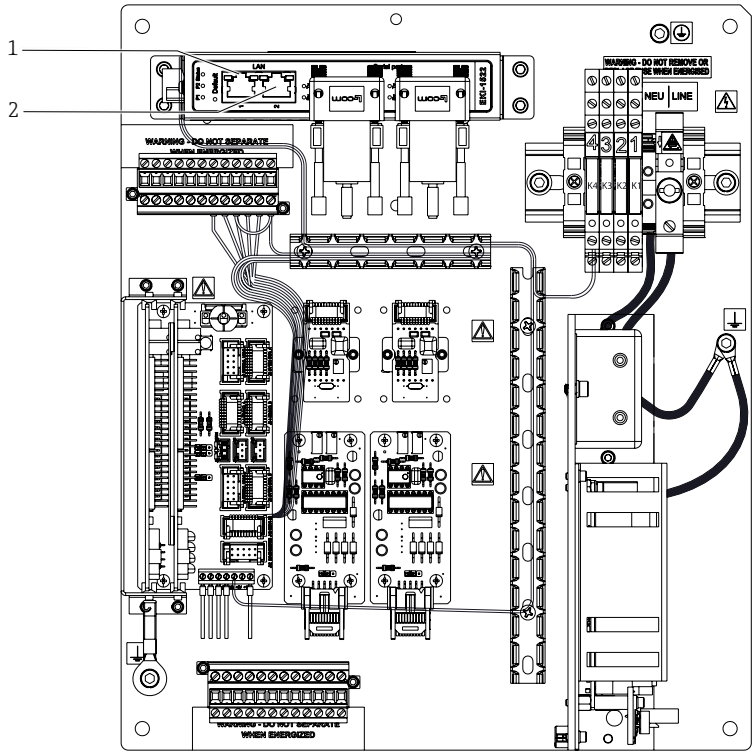


Figure 12: SS3000e electronics control board (AC) for dual-channel systems with Ethernet communication. RS232 to Ethernet signal converter for measurement channel A (1) and channel B (2) shown. Common AC components not repeated; see Figure 7 for details.

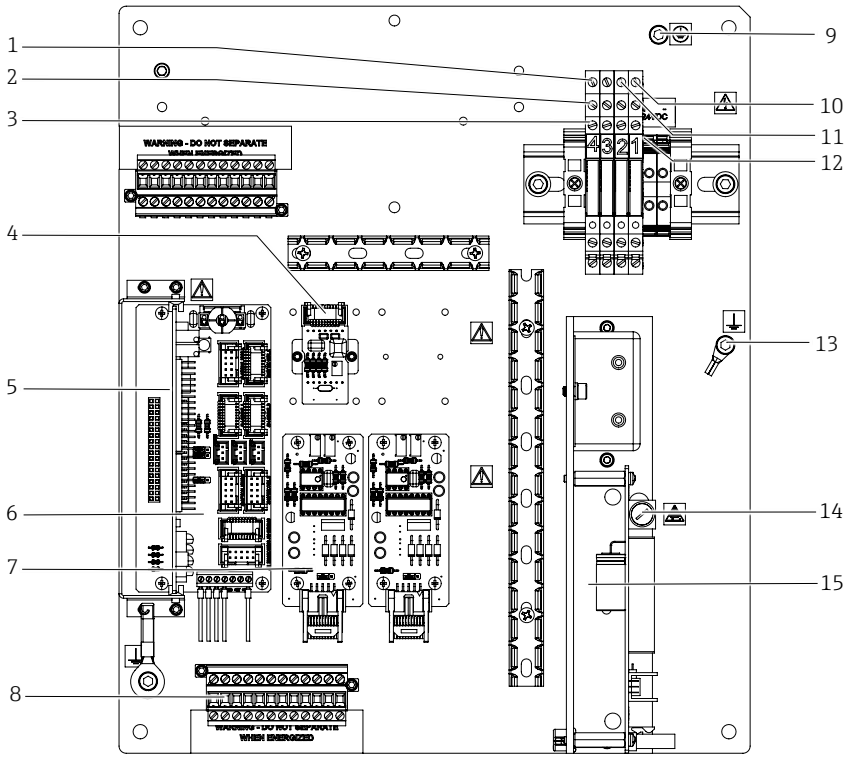


Figure 13: SS500e and SS2000e electronics control board (DC) for single-channel systems

Item #	Description	Item #	Description
1	NC (normally closed)	9	Protective ground
2	Common	10	Assignable alarm relay
3	NO (normally open)	11	General fault alarm relay
4	Temperature control board	12	Customer ground
5	Laser driver board	13	Functional/component ground
6	Backplane	14	Fuse (F2)
7	4-20 mA current loop board (stacked)	15	Power supply
8	4-20 mA & serial signal connections		

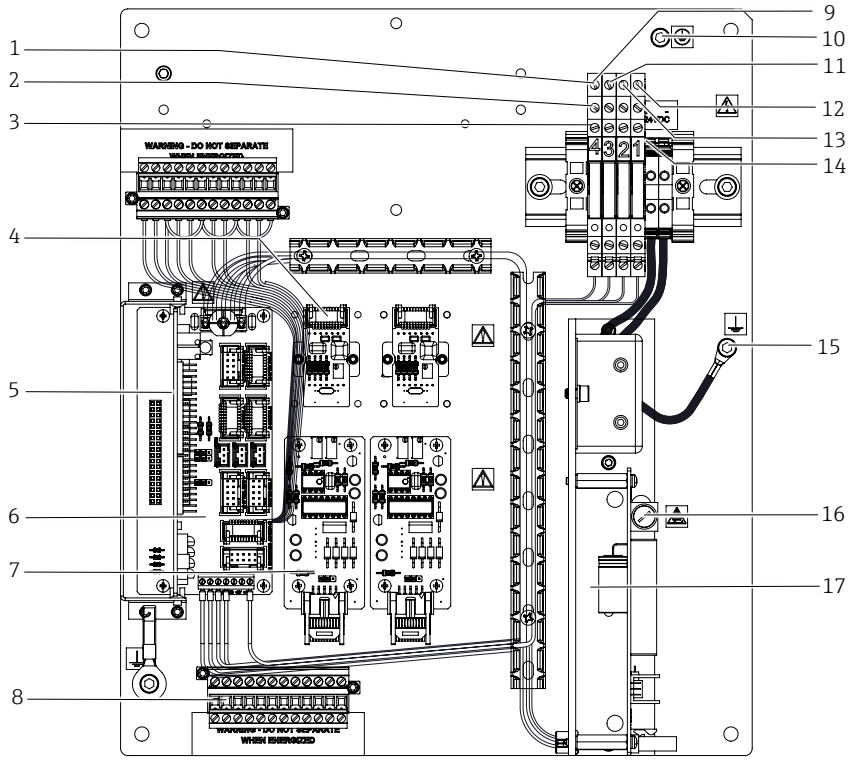


Figure 14: SS3000e electronics control board (DC) for dual-channel systems

Item #	Description	Item #	Description
1	NC (normally closed)	10	Protective ground
2	Common	11	Assignable alarm relay (CH B)
3	NO (normally open)	12	Assignable alarm relay (CH A)
4	Temperature control board	13	General fault alarm relay (CH A)
5	Laser driver board	14	Customer ground
6	Backplane	15	Functional/component ground
7	4-20 mA current loop board (stacked)	16	Fuse (F2)
8	4-20 mA & serial signal connections	17	Power supply
9	General fault alarm relay (CH B)		

6.3 Troubleshooting and Repair

All customer-performed repairs must be documented in a site dossier and made available for inspection.

6.3.1 Replacement parts

Only use parts supplied by Endress+Hauser or an authorized agent. Contact Service for part identification and ordering.

6.3.2 Replacing a fuse

1. Power off the system and close the sample supply valve.
2. Open the electronics enclosure. Refer to Figures 5–8 for fuse locations.
3. Using a flat-head screwdriver, turn the fuse screw counterclockwise to remove the cover.
4. Remove the fuse and replace it with one of the same type and rating.
5. Insert the new fuse into the cover and reinstall.
6. Tighten the fuse cover clockwise. Do not overtighten.
7. Repeat for additional fuses as needed.
8. Close the enclosure and restore power.

6.3.3 Replacing a relay

1. Power off the system and close the sample supply valve.
2. Open the electronics enclosure. Refer to Figures 5–8 for relay locations.
3. Note or photograph relay wiring for reference.
4. Using a small flat-head screwdriver, disconnect all wires from the relay.
5. Pull down the black latch behind the relay to release it. If needed, loosen the gray relay placer for more space.
6. Remove the relay and insert the replacement. Press to latch.
7. Reconnect wires using your reference.
8. Repeat for additional relays as needed.
9. Close the enclosure and restore power.

6.3.4 Replacing the membrane separator

1. Close the shut-off valve at the sample tap.
2. Unscrew the membrane separator cap using a channel-lock wrench.
   - For SS500e, SS2000e, and SS3000e: Remove four screws at the filter base with a 5/32″ screwdriver and remove the top O-ring.
3. Inspect the filter.

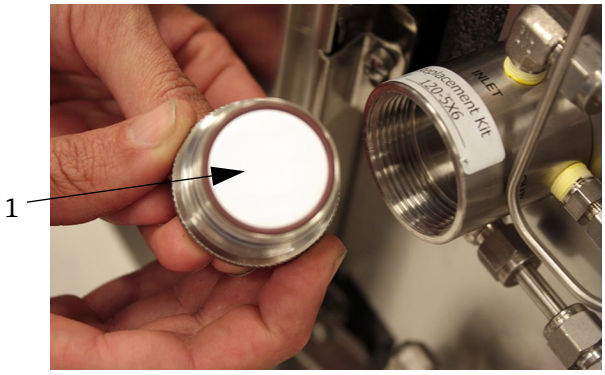


Figure 15: Inspecting the membrane separator filter (1)

If the filter is dry:

1. Check for discoloration or contamination. If contaminated:
   - Remove and replace the membrane filter and O-ring.
   - Reinstall the cap and tighten.
2. Check upstream for liquid contamination. Clean and dry before reopening the shut-off valve.

If the membrane filter is wet (liquid or contaminants are detected on the filter):

1. Drain liquid and clean with isopropyl alcohol.
2. Clean the membrane separator base.
3. Replace the filter and the O-ring.
4. Reinstall the cap and tighten with a channel-lock wrench.
   - For SS500e, SS2000e, and SS3000e: Reinstall and tighten the four screws.
5. Check upstream for liquid contamination. Clean and dry before reopening the shut-off valve.

6.4 Service

For service assistance, visit https://www.endress.com/contact to find your local sales and support channel.

www.addresses.endress.com

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