XA02751C/66/EN/03.26
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Safety Instructions

SS2100 2-Pack, 3-Pack TDLAS gas analyzer

Class I, Division 2, Groups B, C, D, T3/T3C, Type 4X and IP66
Class I, Zone 2 IIB+H2 T3/T3C

Endress+Hauser
People for Process Automation

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1 Introduction

Endress+Hauser's SS2100 2-Pack/3-Pack TDLAS gas analyzer products are high-speed, diode laser-based extractive analyzers designed for extremely reliable monitoring of very low (trace) to standard concentrations of specific components in various background gases.

This manual applies to all SS2100 2-Pack/3-Pack TDLAS gas analyzers. Each analyzer includes documentation on safety and instructions for properly installing and operating the equipment. Endress+Hauser highly recommends that the responsible party and/or operator of the equipment be qualified to handle this equipment. In order to operate the analyzer safely, carefully review the information in this manual. The content is divided into the following sections:

- General Safety Instructions
- Equipment Installation
- Equipment Operation
- Equipment Maintenance and Service

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 SS2100 SS2100 2-Pack or 3-Pack 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
BA02281C	Operating Instructions	A complete overview of the operations required to install, commission and maintain the device.
TI01667C	Technical Information	Provides technical data on the device with an overview of associated models available.
GP01177C	Description of Device Parameters FS 5.16	Provides the user with an overview of the FS 5.16 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

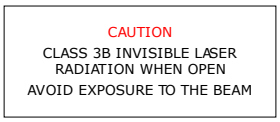
Equipment labels are adhered to the TDLAS Gas Analyzer to alert the user of potential hazards. Instructional symbols are also used in the equipment manuals to indicate potential hazards, important information and valuable tips, and are not labeled on the analyzer. Following are the equipment labels and 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 Exposure to toxic gas (H_2S)

Follow the procedure below if there has been any suspected leak from the sample system and accumulated sample conditioning system (SCS) enclosure.

1. Purge the SCS enclosure to remove any potentially toxic gas.
2. Test the H_2S levels of the SCS enclosure using the port from the safety purge kit to ensure the purge has cleared any toxic gas.
3. If no gas leak is detected, open the SCS enclosure door.

NOTICE

- Follow all safety protocols governing toxic gases and potential leaks.

2.4.3 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.

If service must be performed with power engaged, do the following:

- 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.

2.4.4 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).

2.5 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* (BA02281C).

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 SS2100 2-Pack/3-Pack gas analyzer system in the *Operating Instructions* (BA02281C).

This information includes, but is not limited to, the following:

- Supply voltage, power and current rating
- Description of all input connections
- Environmental conditions for which the equipment is designed (i.e., environmental temperature range, environmental relative humidity)
- Degree of ingress protection (IP)

2.5.1 SS2100 2-Pack and 3-Pack TDLAS gas analyzer specifications

Measurement data	
Target components	SS2100 2-Pack: H_2S+H_2O or H_2S+CO_2 in natural gas SS2100 3-Pack: H_2S+H_2O+CO_2 in natural gas
Principle of measurement	Tunable Diode Laser Absorption Spectroscopy (TDLAS)
Measurement ranges	See applicable Application Note
Repeatability	See applicable Application Note
Application Data	
Ambient temperature range	−20 °C to 50 °C (−4 °F to 122 °F) - *standard* −10 °C to 60 °C (14 °F to 140 °F) - *optional*
Environmental relative humidity	5 to 95 %, non-condensing
Maximum operating altitude	2000 m above sea level

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 Analyzer A	120 VAC or 240 VAC ± 10 %, 50 to 60 Hz, 60 W maximum or 18 VDC to 24 VDC, 1.6 A maximum
Input power, electronics enclosure Analyzer B	120 VAC or 240VAC +/-10 %, 50 to 60 Hz, 60W max or 18 to 24VDC, 1.6 A maximum
Input power, Sample Conditioning System (SCS)	SCS Input Power - 120VAC or 240VAC, 200W or 400W maximum[1].
Analog communication	Isolated Analog channels, 120 ohms at 24 VDC maximum Outputs: Qty 2 4-20 mA (measurement value)
Serial communication	Channel 1 (H_2S) - RS232C and Ethernet Channel 2 and 3 (H_2O and/or CO_2) - RS232C or Ethernet (TSP only)
Digital signals	Outputs: Qty 5 Hi/Lo alarm, general fault, validation fail[1], validation 1 active[1], validation 2 active[1] Inputs: Qty 2 flow alarm[1], validation request[1]
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
Physical specifications	
Electronics enclosure type	Type 4X 304 or 316L stainless steel
Sample system enclosure(s)	Type 4X 304 or 316L stainless steel
Analyzer dimensions	1285 mm H x 762 mm W x 394 mm D (50.6 x 30 x 15.5 inches)
Weight (approximately)	Approximately 90 to 130 kg (200 to 300 lb)
Sample cell construction	316L series polished stainless steel
Number of measurement cells	1, 2 or 3
Area Classification	
Analyzer (electronics and laser)	Class I, Division 2, Groups B, C, D, T3/T3C, Type 4X and IP66 Class I, Zone 2 IIB+H2 T3/T3C

[1] Configuration dependent

3 Equipment installation

The information in this section is related to safety considerations for equipment installation. The *Operating Instructions* (BA02281C) provides more information on installing and commissioning the equipment.

3.1 Lifting/carrying the analyzer system

Due to the analyzer's size and weight (configurations can weigh approximately 90 kg [200 lb] for the SS2100 2-Pack and 130 kg [290 lb] for the 3-Pack), Endress+Hauser recommends the use of a forklift, pallet jack, etc. to lift or move the analyzer. If the analyzer is to be lifted by hand, designate multiple individuals and distribute the weight among personnel to avoid injury.

Before removing from the crate, move the analyzer as close as possible to the final installation location. Never lift the analyzer by the electronics enclosures. Always carry the load using one of the following points/methods (refer to the drawings included with the purchased analyzer system):

- Mounting points on sample conditioning system (SCS) in the figure below.
- Support beneath instrument (best used when employing a forklift).

⚠ 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.

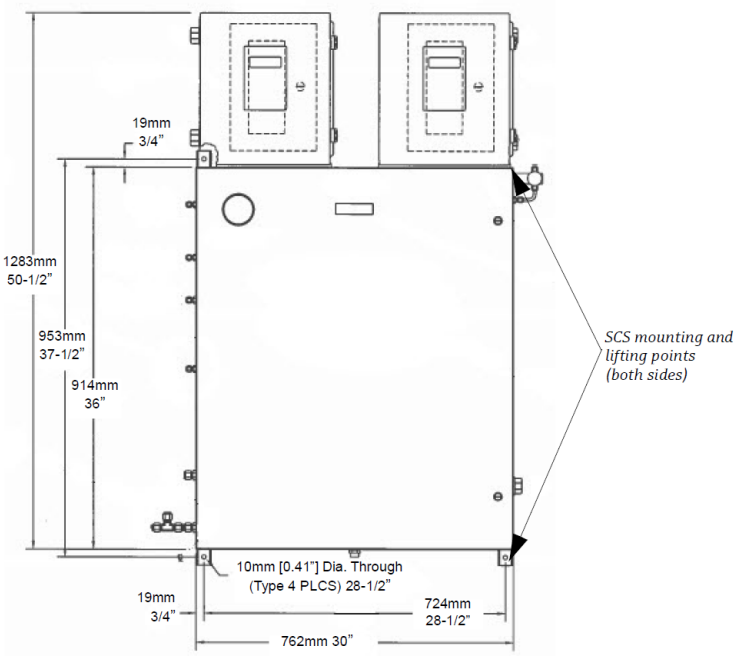


Figure 1: Lifting points and mounting dimensions for the SS2100 2-Pack and 3-Pack TDLAS gas analyzer

3.2 Mounting the analyzer

The SS2100 2-Pack and 3-Pack TDLAS gas analyzers are manufactured for wall or Unistrut® (or equivalent) metal framing installations.

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.
- ▶ Endress+Hauser analyzers are designed for operation within the specified ambient temperature range of −20 °C to 50 °C (−4 °F to 122 °F).

NOTICE

Wall-mounting hardware load requirements

- Bolts or screws used for wall-mounting the analyzer must support at least four times the weight of the instrument—90 kg (200 lb) for the SS2100 2-Pack analyzer and 130 kg (290 lb) for the 3-Pack analyzer.

⚠ 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.

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.

3.3 Electrical wiring requirements

⚠ 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.

3.3.1 Hazardous location wiring compliance

⚠ WARNING

Hazardous voltage and risk of electric shock.

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

⚠ CAUTION

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

- Interconnection between the analyzer enclosure and the sample system enclosure 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**.
- Wiring must meet requirements for **Pollution Degree 2** and **Overvoltage Category II**.
- Use certified glands and cables where required by local regulations.

NOTICE

- Use copper conductors only.

3.3.2 Field wiring requirements

⚠ 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.

3.3.3 External circuit breaker requirements

⚠ CAUTION

- An approved switch or circuit breaker rated for 15 amps should be used and clearly marked as the disconnecting device for the analyzer.
- If the breaker in the customer-provided power distribution panel or switch is the primary means of disconnecting the power from the analyzer, Endress+Hauser recommends that the power distribution panel be located in close proximity to the equipment and within easy reach of the operator.
- A switch or circuit breaker must not interrupt a protective earth conductor.

NOTICE

- 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.

3.3.4 Protective chassis and ground specifications

Before connecting any electrical signal or power, the protective and chassis grounds must be connected. Requirements for the protective and chassis grounds include the following:

- Protective and chassis grounds must be of equal or greater size than any other current-carrying conductors, including the heater located in the sample conditioning system.
- Protective and chassis grounds to remain connected until all other wiring is removed.
- Insulated protective and chassis ground wiring must use the green/yellow color.
- Protective grounding wire current carrying capacity must be, at minimum, the same as the main supply.
- Earth bonding/chassis ground shall be at least 4 mm^2 (12 AWG).

3.3.5 Color coding

Green/yellow insulation shall only be used for:

- Protective earth conductors
- Protective bonding conductors
- Potential equalization conductors for safety purposes
- Functional earth

3.4 Connections to the gas supply

Use the following procedure to connect the sample supply line. Consult the layout and flow diagrams in the system drawings. All work must be performed by technicians qualified in pneumatic tubing.

⚠ WARNING

Hazardous samples

- Process samples may contain hazardous materials in potentially flammable and/or toxic concentrations. Before installing the SCS, personnel must have thorough knowledge of the physical properties and safety precautions associated with the sample contents.

Using 1/4 in. O.D x 0.035 in. wall thickness, seamless stainless steel tubing is recommended. Refer to the system layout drawings for supply and return port locations.

3.4.1 Connecting the sample supply line

⚠ 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 measurement cell. Damage to the measurement cell may result.

NOTICE

- Consult sample probe instructions for proper installation procedures.

To connect the sample supply line

1. Verify sample probe installation at the process supply tap. Ensure the sample probe isolation valve is closed.
2. Confirm proper installation of the field pressure reducing station at the sample probe. Ensure the pressure regulator is closed (adjustment knob fully counterclockwise).
3. Check relief valve vent line routing from the pressure reducing station to a low-pressure flare or atmospheric vent.
4. Plan tubing route from the pressure reducing station to the sample conditioning system (SCS).

5. Install stainless steel tubing from the pressure-reducing station to the SCS sample supply port. Set supply pressure according to system drawings for SS2100 2-Pack and 3-Pack analyzers.
6. Bend tubing using industrial-grade benders. Ensure proper fit and seating between tubing and fittings.
7. Ream all tubing ends and purge with clean, dry nitrogen or air for 10–15 seconds before making connections.
8. Connect the sample supply tube to the SCS using the provided ¼ in. stainless steel compression fitting.
9. Tighten fittings:
   - For new connections: tighten 1¼ turns from finger-tight using a wrench.
   - For previously swaged ferrules: thread the nut to the original position, then tighten slightly.
10. Secure tubing to structural supports as needed.
11. Check all connections for leaks using a liquid leak detector.

3.5 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 Equipment Operation

This chapter provides an overview of the safety operational instructions for the SS2100 2-Pack and 3-Pack TDLAS gas analyzer.

4.1 Firmware Version

Each Endress+Hauser 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).

4.2 Operating Controls

4.2.1 Keypad operation

The front panel keypad allows the operator to:

- Modify measurement units
- Adjust operational parameters
- Perform diagnostics

Refer to the *Description of Device Parameters FS 5.16* (GP01177C) for detailed instructions.

During normal operation, the LCD displays:

- Measured component concentration
- Measurement cell temperature
- Measurement cell pressure

The keypad layout for CSA-certified models is shown in the figure below.

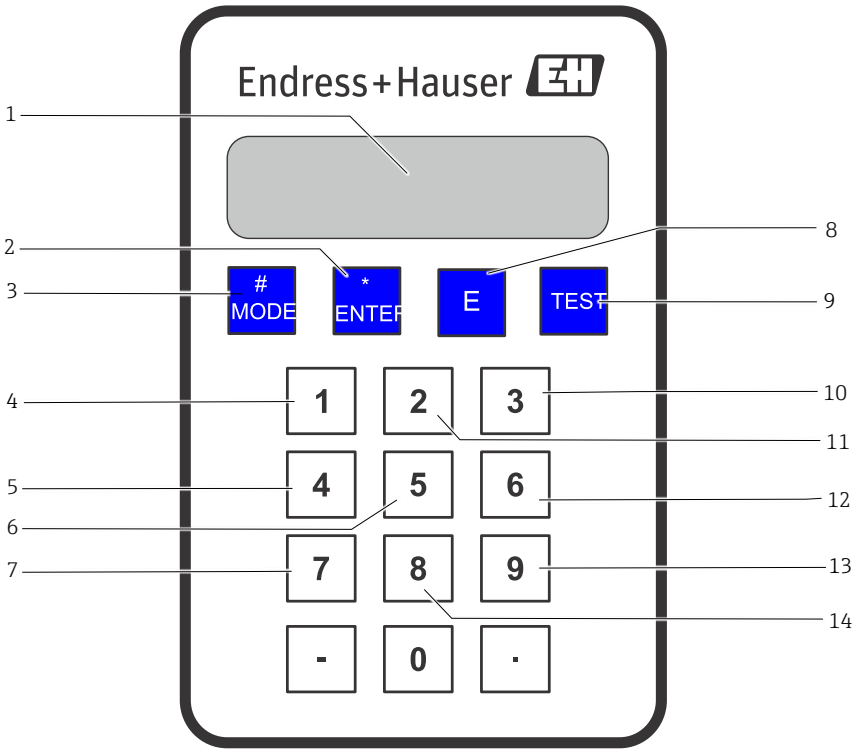


Figure 2: Keypad for CSA-certified analyzers

Item #	Description
1	LCD (Display)
2	Enter key
3	Mode menu key

Item #	Description
8	Exponent value
9	Scroll direction and analog input test
10	Scrubber life data

Item #	Description
4	Activate process gas
5	Diagnostics parameters
6	Analog output test
7	Activate validation 1

Item #	Description
11	Change parameters
12	Export diagnostic data
13	Validation Results
14	Activate Validation 2

4.2.2 Activating keypad functions

To activate any function:

- Press the **# key**, followed by a number to select a mode.
- The LCD will display <MODE MENU>.
- If the keypad watchdog is enabled, a countdown timer will begin. If no key is pressed before the timer expires, the analyzer will revert to **Mode 1**.

You must press the **# key** before any number or function key to trigger a response.

4.2.3 Entering and storing values

- The * key functions as the **ENTER** key.
- In **Mode 2**, press ***** after entering a value to store it and advance to the next parameter.
- If an incorrect value is entered:

1. Press *
2. Press **TEST**
3. Press * again to return and re-enter the correct value.

4.3 Intermittent Operation

If the analyzer will be stored or shut down temporarily, follow the procedures below to isolate the measurement cell and sample conditioning system (SCS).

⚠ 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.

⚠ CAUTION

▶ Due to high process sample pressure, maintain sample bypass flow during short-term isolation. This prevents overpressure and unintended relief valve activation if the pressure regulator leaks when downstream flow is stopped.

4.3.1 Isolating the measurement cell

If the system is not out of service for an extended period, keep power applied to the sample transport line electric tracer (if applicable) and the SCS enclosure heater.

To isolate the analyzer while maintaining bypass flow

1. Close the metering valve on the sample flow meter for each measurement channel (turn clockwise).

   ⚠ CAUTION

   ▶ Do not overtighten to avoid valve damage.

2. Allow residual gas to vent from the measurement cells.

   ⚠ WARNING

   ▶ Never purge the analyzer with air or nitrogen while powered on.

3. Close the shut-off valve on the low-pressure flare or atmospheric vent header for each measurement cell.

4.3.2 Isolating the sample conditioning system (SCS)

The SCS can be isolated from the process sample tap without shutting down the field pressure reducing station.

If the system is not out of service for an extended period, keep power applied to the sample transport line electric tracer (if applicable) and the SCS enclosure heater.

⚠ 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.

NOTICE

▶ Pressure regulators may not maintain “bubble-tight” shutoff after extended use. If the SCS is isolated and the regulator leaks, pressure may slowly rise until the relief valve vents. This is not harmful during short-term isolation, as only a small amount of sample will be released.

To isolate the SCS

1. Isolate the analyzer from the bypass.
2. Close the sample supply shut-off valve to the SCS.
3. Allow bypass flow to continue until residual gas is fully vented (confirmed by no flow on the bypass flow meter).
4. Close the shut-off valve on the low-pressure flare or atmospheric vent header for the bypass effluent.
5. Turn off power to the analyzer.

5 Maintenance and Service

This chapter provides safety information related to the maintenance and service of the SS2100 2-Pack/3-Pack Gas Analyzer systems. For complete instructions, refer to the *Operating Instructions* (BA02281C).

All parts required for operation of the SS2100 2-Pack and 3-Pack TDLAS gas analyzers must be supplied by Endress+Hauser or an authorized agent. For contact information to determine specific parts listing for the purchased model, refer to the spare parts finder tool at endress.com.

5.1 Potentially hazardous substances

The SS2100 2-Pack and 3-Pack gas analyzers used for H_2S detection may develop leaks, resulting in unsafe levels of toxic gas. For risk mitigation procedures, refer to *General safety*.

5.1.1 Disposal of hazardous substances

For analyzers equipped with H_2S scrubbers, follow these instructions for safe disposal of used components:

NOTICE

Depleted scrubbers and indicators primarily contain Copper(II) Sulfide [CAS# 1317-40-4], with residual Copper(II) Oxide [CAS# 1317-38-0] and Basic Cupric Carbonate [CAS# 12069-69-1].

- These are odorless, dark powders. While they require minimal handling precautions, avoid direct contact with internal materials. Keep scrubbers sealed and protect them from humidity.
- Dispose of used scrubbers and indicators in a leak-proof, approved waste container.

5.2 Cleaning and decontamination

5.2.1 Cleaning sampling lines

To maintain clean sampling lines

1. Ensure a membrane separator filter (included with most systems) is installed ahead of the analyzer and functioning properly. Replace the membrane if needed. Liquid entering the cell may trigger a **Laser Power Too Low** fault.
2. Shut off the sample valve at the tap, following site-specific lockout/tagout procedures.
3. Disconnect the gas sampling line from the analyzer's sample supply port.
4. Clean the sampling line with isopropyl alcohol or acetone. Dry using low-pressure dry air or nitrogen.
5. Once fully dry, reconnect the sampling line to the analyzer.
6. Inspect all connections for leaks using a liquid leak detector.

5.2.2 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.

5.3 Fuse ratings and locations

Fuses are located on the electronics control board, shown in the below figures. Part numbers for the fuse spare part kits are shown in the *Operating Instructions* (BA02281C).

NOTICE

- Replace fuses only with the same type and rating. Refer to the table below.
- Select the replacement solenoid fuse (F2) based on the number of solenoid valves installed in the analyzer.

Drawing	Reference	Voltage	Description	Rating
Figure 3	15	120 VAC	1 Solenoid, miniature fuse, 5 x 20 mm, time delay	250 VAC 0.16 A
			2 Solenoids, miniature fuse, 5 x 20 mm, time delay	250 VAC 0.25 A
			3 Solenoids, miniature fuse, 5 x 20 mm, time delay	250 VAC 0.4 A
	16		Input power, miniature fuse, 5 x 20 mm, time delay	250 VAC 0.8 A
	15	240 VAC	1 Solenoid, miniature fuse, 5 x 20 mm, time delay	250 VAC 0.125 A
			2 Solenoids, miniature fuse, 5 x 20 mm, time delay	250 VAC 0.16 A
			3 Solenoids, miniature fuse, 5 x 20 mm, time delay	250 VAC 0.2 A
	16		Input power, miniature fuse, 5 x 20 mm, time delay	250 VAC 0.8 A
Figure 4	16	24 VDC	1 Solenoid, miniature fuse, 5 x 20 mm, time delay	250 VAC 0.63 A
			2 Solenoid, miniature fuse, 5 x 20 mm, time delay	250 VAC 1.25 A
			3 Solenoid, miniature fuse, 5 x 20 mm, time delay	250 VAC 2.0 A
	11		Input power, miniature fuse, 5 x 20 mm, time delay	250 VAC 1.6 A

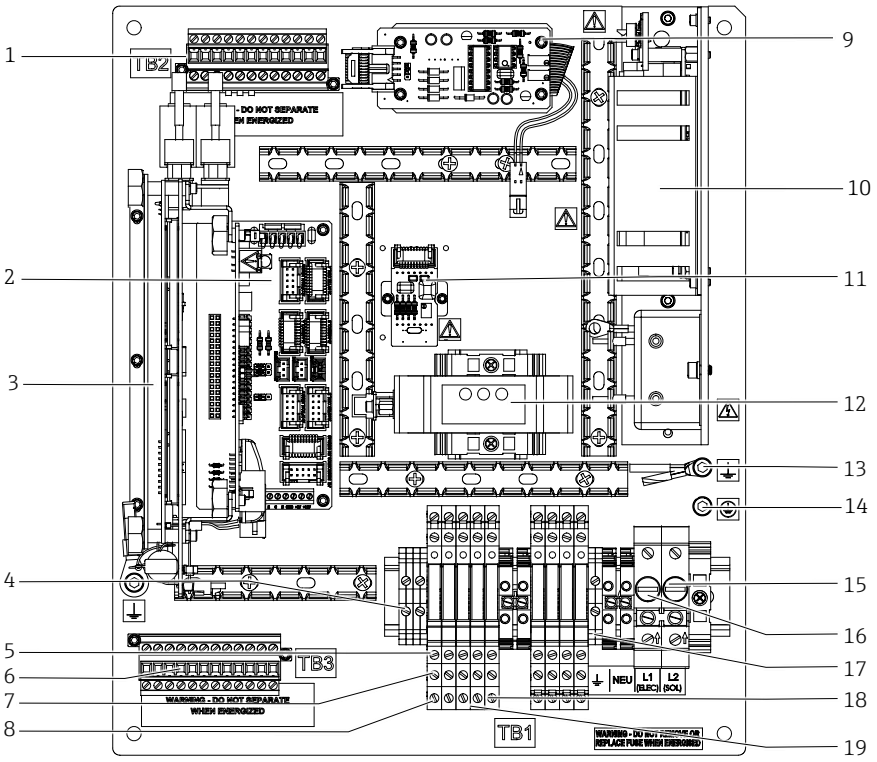


Figure 3: Analyzer A ARM9 electronics control board (AC) showing signal terminal block and alarm relays

Item #	Description	Item #	Description
1	Terminal block TB2, output signals	11	Hytek temperature controller
2	Backplane	12	Signal converter RS-232 to RS-485 (optional)
3	ARM9 control board stack	13	Component ground
4	Alarm/signal relays	14	Protective ground
5	NO (normally open)	15	Fuse (F1)
6	Terminal block (TB3), internal pressure/temperature	16	Fuse (F2)
7	Common	17	Customer ground
8	NC (normally closed)	18	Assignable alarm
9	Relay driver and 4-20 mA control board stack	19	General fault alarm
10	AC power supply		

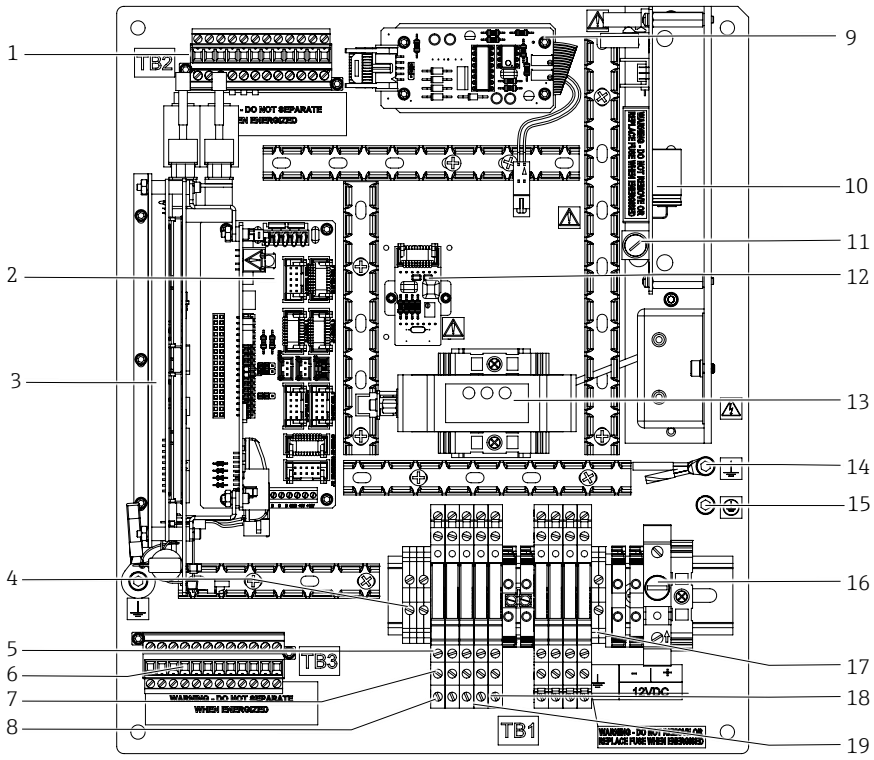


Figure 4: Analyzer A ARM9 electronics control board (DC) showing signal terminal block and alarm relays

Item #	Description	Item #	Description
1	Terminal block TB2, output signals	11	Fuse (F2)
2	Backplane	12	Hytek temperature controller
3	ARM9 control board stack	13	Signal converter RS-232 to RS-485 (optional)
4	Alarm/signal relays	14	Component ground
5	NO (normally open)	15	Protective ground
6	Terminal block (TB3), internal pressure/temperature	16	Fuse (F1)
7	Common	17	Customer ground
8	NC (normally closed)	18	Assignable alarm
9	Relay driver and 4-20 mA control board stack	19	General fault alarm
10	DC power supply		

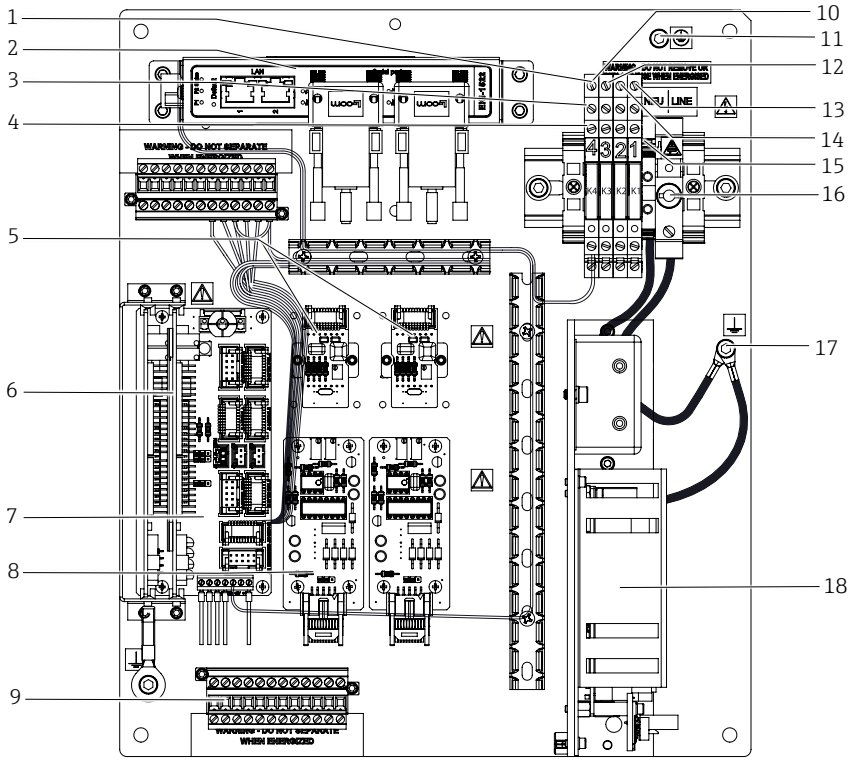


Figure 5: Analyzer B e-series electronics control board (2 channels, AC) showing signal terminal block and alarm relays with Ethernet communication

Item #	Description	Item #	Description
1	NC (normally closed)	10	General fault alarm relay (CH B)
2	Signal converter, RS-232 to Ethernet	11	Protective ground
3	Common	12	Assignable alarm relay (CH B)
4	NO (normally open)	13	Assignable alarm relay (CH A)
5	Temperature control board	14	General fault alarm relay (CH A)
6	Laser driver board	15	Customer ground
7	Backplane	16	Fuse (F1)
8	4-20 mA current loop board (stacked)	17	Functional/component ground
9	4-20 mA & serial signal connections	18	Power supply

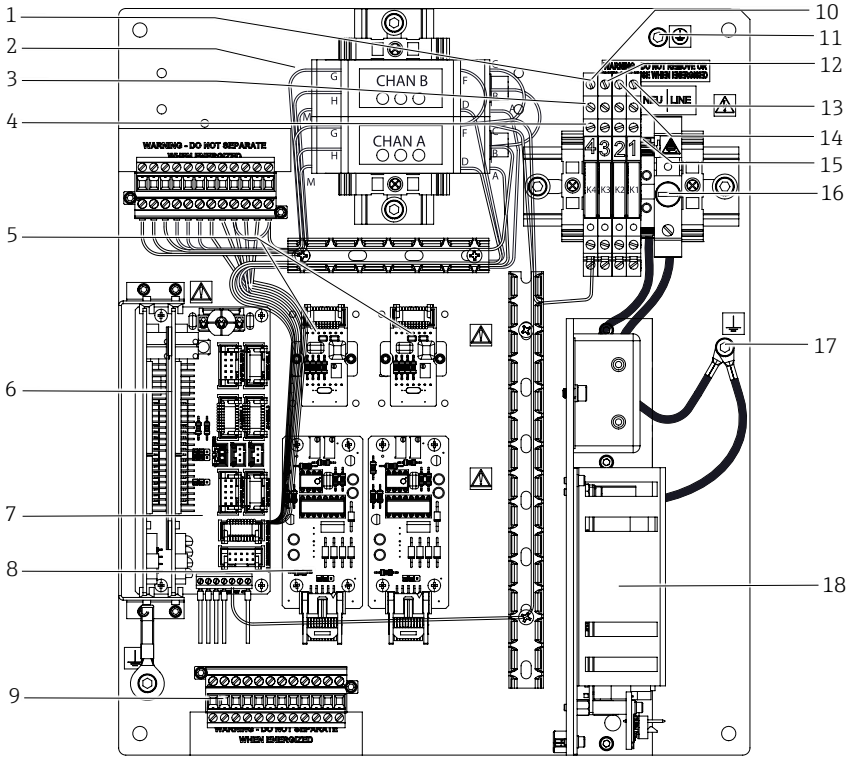


Figure 6: Analyzer B e-series electronics control board (2 channels, AC) showing signal terminal block and alarm relays with RS-485 communication

Item #	Description	Item #	Description
1	NC (normally closed)	10	General fault alarm relay (CH B)
2	Signal converter, RS-232 to RS-485	11	Protective ground
3	Common	12	Assignable alarm relay (CH B)
4	NO (normally open)	13	Assignable alarm relay (CH A)
5	Temperature control board	14	General fault alarm relay (CH A)
6	Laser driver board	15	Customer ground
7	Backplane	16	Fuse (F1)
8	4-20 mA current loop board (stacked)	17	Functional/component ground
9	4-20 mA & serial signal connections	18	Power supply

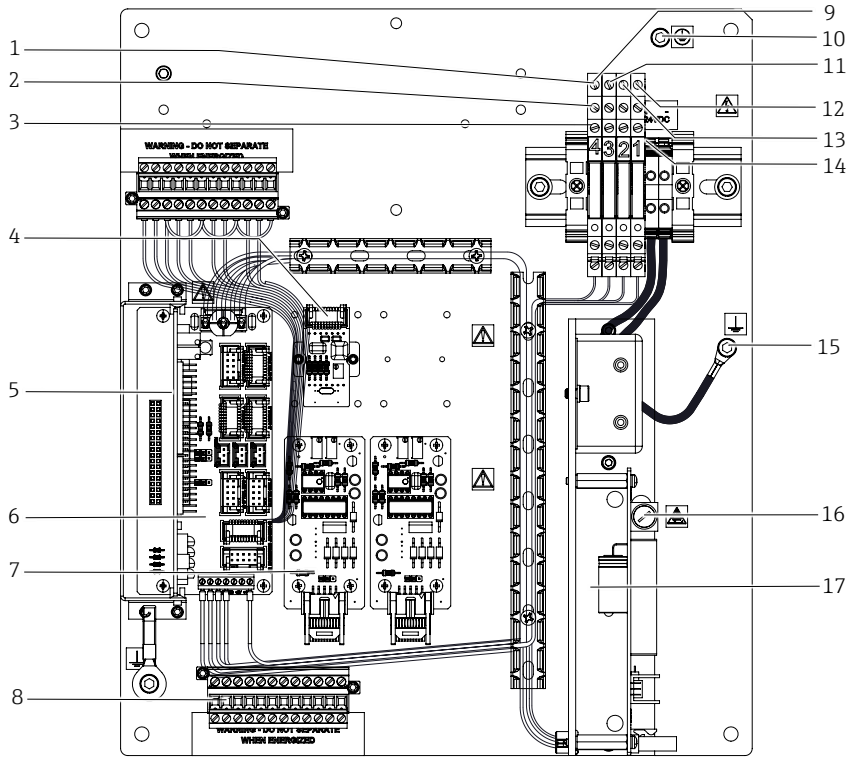


Figure 7: Analyzer B e-series electronics control board (1 channel, DC) showing signal terminal block and alarm relays

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)		

5.4 Troubleshooting and Repair

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

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

5.4.1 Replacing a fuse

1. Power off the system and close the sample supply valve.
2. Open the electronics enclosure. Refer to Figures Figure 3 to Figure 7 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.

5.4.2 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.

5.4.3 Replacing the membrane separator

Inspecting the membrane filter

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.

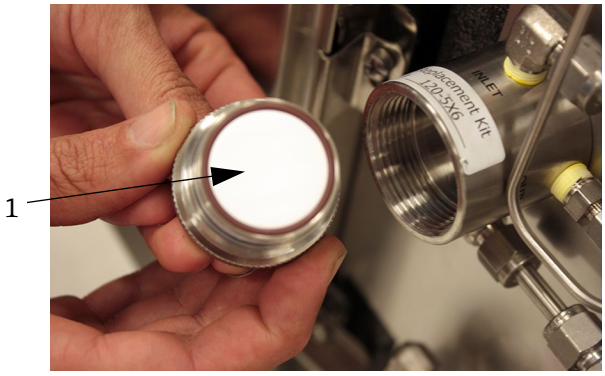


Figure 8: Inspecting the membrane separator filter (1)

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.

Replacing the membrane filter

1. Close the sample supply valve.
2. Remove the filter unit by unscrewing four base screws with a 5/32″ screwdriver.
3. Unscrew and remove the filter cap.
4. Remove the top O-Ring.
5. Inspect for contaminants or blockages.
6. Clean with isopropyl alcohol if needed.
7. Replace the top O-ring.
8. Reinstall the filter cap and tighten.
9. Reinstall the filter unit and tighten the base screws.
10. Check upstream for contamination. Clean and dry before reopening the valve.
11. Check connections for gas leaks. Use a liquid leak detector.

5.4.4 Replacing the scrubber and indicator

⚠ WARNING

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

▶ All valves, regulators, switches, etc. should be operated in accordance with site lockout/tagout procedures.

1. Close the sample supply shut-off valve. Allow residual gas to dissipate (no flow on bypass flow meter).
2. Unscrew compression nuts on the inlet end of the scrubber and indicator assembly.
3. Insert inlet and outlet tubes into the new assembly, ensuring correct orientation (see Figure 9).

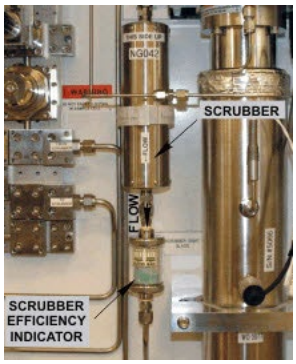


Figure 9: Scrubber and scrubber efficiency indicator

4. Tighten fittings 1¼ turns from finger-tight. For previously swaged ferrules, thread the nut to the original position, then tighten slightly.
5. Reset the scrubber lifetime monitor with the **New Scrub Installed** parameter and the general fault alarm with the **Reset** option for the **General Alarm DO** parameter (see “To change parameters in Mode 2” in the Description of Device Parameters).
6. Restart the SCS.
7. Check all connections for gas leaks. Use a liquid leak detector.
8. Re-validate the system using a certified gas standard. Refer to *Validation of TDLAS gas analyzers* (SD03286C).
9. Purge the assembly with nitrogen and cap the inlet and outlet.

5.4.5 Disposal of used scrubbers

NOTICE

Depleted scrubbers and indicators primarily contain Copper(II) Sulfide [CAS# 1317-40-4], with residual Copper(II) Oxide [CAS# 1317-38-0] and Basic Cupric Carbonate [CAS# 12069-69-1].

- These are odorless, dark powders. While they require minimal handling precautions, avoid direct contact with internal materials. Keep scrubbers sealed and protect them from humidity.
- Dispose of used scrubbers and indicators in a leak-proof, approved waste container.

5.5 Service

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

SS2100 2-Pack, 3-Pack TDLAS gas analyzer

www.addresses.endress.com

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People for Process Automation