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Safety Instruction
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

Revision History

Revision	Engineering Order	Date
B	ECR18609	May 2021
01.21	ECR19093	April 2022

Table of Contents

1 Introduction

Endress+Hauser's 2-Pack/3-Pack 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 2-Pack/3-Pack 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 (Chapter 2)
- Equipment Installation (Chapter 3)
- Equipment Operation (Chapter 4)
- Equipment Maintenance and Service (Chapter 5)

Who Should Read This Manual

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

Using This Manual

Read the **Table of Contents** for an overview of the most common 2-Pack/3-Pack safety issues regarding installation and operation. Additional information on the installation, operation and maintenance is in the Operating Instruction. Please note that only qualified users should perform these tasks.

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.

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.

Associated Documentation

Enclosed in your analyzer system order is the product Safety Instruction for your reference. Please review all necessary safety instructions before installing or operating your analyzer.

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

Part Number	Document Type	Description
BA02193C	Operating Instruction	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.
GP01181C	Description of Device Parameters HC12 v2.51	Provides the user with an overview of the HC12 v2.51 firmware functionality.

For additional instruction manuals, please refer to the following:

- For custom orders:
  - Refer to the Endress+Hauser website for the list of local sales channels who can provide the requested order-specific documentation[1]: https://www.endress.com/contact
- For standard orders:
  - Refer to the Endress+Hauser website to download the published operating instructions: www.endress.com

Manufacturer Address

Endress+Hauser
11027 Arrow Route
Rancho Cucamonga, CA 91730
United States

www.endress.com

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

2 General Safety Information

This chapter reviews the general safety instructions for the 2-Pack/3-Pack gas analyzers.

Facing the 2-Pack/3-Pack gas analyzer, Analyzer A is on the left side and Analyzer B is on the right side.

Intended Equipment Use

The 2-Pack/3-Pack 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 2-Pack/3-Pack 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.

The safety of the analyzer is the responsibility of the installer and the organization s/he represents.

Warning Labels

Equipment labels are adhered to the 2-Pack/3-Pack gas analyzers 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 may not be labeled on the analyzer. The following symbols and their associated descriptions are used within this manual and must be observed when operating the analyzer.

Safety warning label

The warning label shown below 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.*

Technicians are expected to follow all safety protocols established by the customer that are necessary for servicing or operating the analyzer. This may include, but is not limited to, lockout/tag-out procedures, toxic gas monitoring protocols, personal protective equipment (PPE) requirements, hot work permits and other precautions that address safety concerns related to performing service or operation on process equipment located in hazardous areas.

Equipment labels

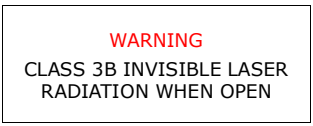
*Warning statement for **hazardous voltage**. Contact may cause electric shock or burn. Turn off and lock out system before servicing.*

Failure to follow all directions may result in damage or malfunction of the analyzer.

Maximum voltage and current specifications for the fuse closest to label.

***PROTECTIVE EARTH GROUND** - Symbol indicates the connection point of the ground wire from the main power source.*

***FUNCTIONAL EARTH GROUND** - Symbol indicates grounding points intended primarily for troubleshooting.*



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.

Instructional symbols

General notes and important information concerning the installation and operation of the analyzer.

Failure to follow all directions may result in fire.

INVISIBLE LASER RADIATION *- Avoid exposure to beam. Class 3b Radiation Product. Refer servicing to manufacturer-qualified personnel.*

Failure to follow all directions may result in damage or malfunction of the analyzer.

Maximum voltage and current specifications for fuses.

Analyzer Technical Specifications

Peripheral devices

For systems equipped with peripheral devices (e.g., probe assemblies), 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 2-Pack/3-Pack gas analyzer system in the Operating Instruction.

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)

Table 2–1 2-Pack and 3-Pack TDLAS gas analyzer specifications

Measurement data	
Target components	2-Pack: H_2S+H_2O or H_2S+CO_2 in Natural Gas 3-Pack: H_2S+H_2O+CO_2 in Natural Gas
Principle of measurement	Tunable Diode Laser Absorption Spectroscopy (TDLAS)
Measurement ranges	See applicable Application Note
Repeatability	See applicable Application Note
Application Data	
Ambient temperature range	–20 °C to 50 °C (–4 °F to 122 °F) - *standard* –10 °C to 60 °C (14 °F to 140 °F) - *optional*
Sample cell pressure range	800 to 1200 mbara - *standard* 950 to 1700 mbara - *optional*
Maximum cell pressure	70 kPag (10 psig)
Pressure to sample cabinet	140 to 350 kPag (20 to 50 psig)[1]
Sample flow rate	0.5 to 4.0 slpm (1 to 8.5 scfh)[1]
Bypass flow rate	0.5 to 1 slpm (1.1 to 2.2 scfh)
Electrical and communication	
Input power, electronics enclosure 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

1. Application dependent

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 [2], validation 1 active [2], validation 2 active [2] Inputs: Qty 2 flow alarm[2], validation request [2]
Protocol	Modbus Gould RTU or Daniel RTU or ASCII
Diagnostic value examples	Detector power (mirror health), spectrum reference comparison and peak tracking (spectrum quality), cell pressure and temperature (overall system health)
LCD display	Concentration, cell pressure and temperature, diagnostics
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)

1. Application dependent
2. Configuration dependent

Analyzer weight	Approximately 90 to 130 kg (200 to 300 lbs)
Sample cell construction	316L series polished stainless steel
Number of sample cells	1, 2 or 3
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

Potential Risks Affecting Personnel

This section addresses the appropriate actions to undertake before or during service of the analyzer when faced with hazardous situations such as exposure to process gases, electrocution, explosion or fire. 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.

Technicians are expected to follow all safety protocols established by the customer that are necessary for servicing the analyzer. This may include, but is not limited to, lockout/tagout procedures, toxic gas monitoring protocols, personal protective equipment (PPE) requirements, hot work permits and other precautions that address safety concerns related to performing service on process equipment located in hazardous areas.

Personnel responsibility

The safety of the analyzer is the responsibility of the installer and the organization he/she represents.

Mitigating risks

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

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.

Follow all safety protocols governing toxic gases and potential leaks.

Electrocution hazard

1. Shut off power at the main disconnect external to the analyzer.

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

2. Open the enclosure door.

If service must be performed with power ON:

1. Note any live electrical components and avoid all contact with them.
2. Only use tools with a safety rating for protection against accidental contact with voltage up to 1000 V (IEC 900, ASTF-F1505-04, VDE 0682/201).

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 Equipment Installation

The information in this chapter is related to safety during the equipment installation.

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.

Analyzer Mounting

The 2-Pack and 3-Pack gas analyzers are manufactured for wall installations. For detailed mounting dimensions → 3–1 and refer to the layout diagrams provided with the purchased analyzer model.

Endress+Hauser analyzers are designed for operation within the specified ambient temperature range. Intense sun exposure in some areas may cause the analyzer temperature to exceed the maximum.

When mounting the analyzer, be sure to position the instrument so that it is not difficult to operate adjacent devices. Allow one meter (three feet) of room in front of the analyzer.

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

Lifting/Carrying the analyzer system

Due to the analyzer's size and weight (configurations can weigh approximately 90 kg [200 lbs] for the 2-Pack and 130 kg [290 lbs] 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) → 🖼 3–1
- Support beneath instrument (best used when employing a forklift)

Ensure all equipment used for lifting/moving the analyzer is rated for the weight load.

Bolts or screws used for wall-mounting the analyzer must be able to support four times the weight of the instrument (90 kg [200 lbs] for the 2-Pack analyzer and 130 Kg [290 lbs] for the 3-Pack analyzer).

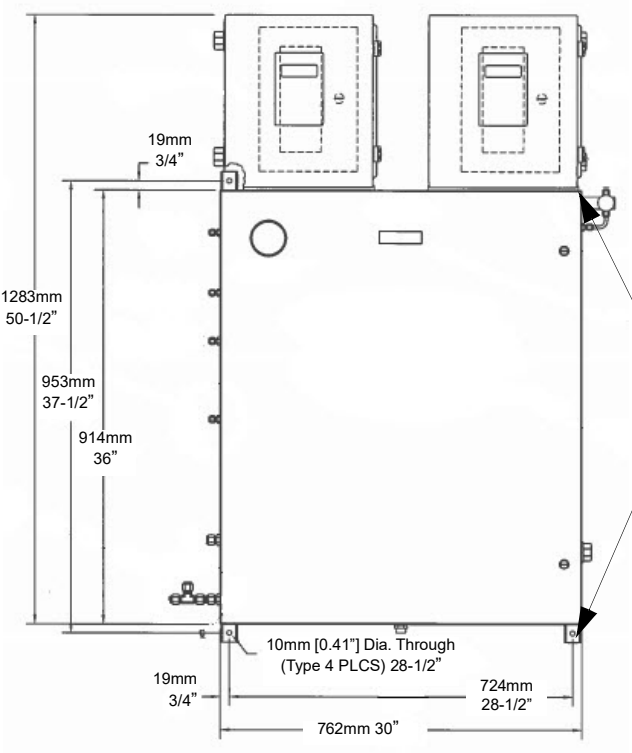


Figure 3–1 Lifting points and mounting dimensions for the 2-Pack and 3-Pack TDLAS Gas analyzer

Electrical Wiring

Interconnection of the analyzer enclosure and cell enclosure shall be performed using wiring methods approved for Class I, Division 2 or Zone 2 hazardous locations per the Canadian Electrical Code (CEC) Appendix B or J and the National Electric Code (NEC) Article 501 or 505. The installer is responsible for complying with all local installation codes.

Use copper conductors only.

External circuit breaker requirements

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.

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

Protective chassis and ground connections

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)

Color coding

Green/yellow insulation shall only be used for:

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

Connections to the 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.

Process samples may contain hazardous material in potentially flammable and/or toxic concentrations. Personnel should have a thorough knowledge and understanding of the physical properties and safety precautions for the sample contents before installing the SCS.

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.

To connect the sample supply line

Consult sample probe instructions for proper installation procedures.

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.

All valves, regulators, switches, etc. should be operated in accordance with site lock-out/tag-out procedures.

1. First confirm that the sample probe is correctly installed at the process supply tap and that the sample probe isolation valve is closed.
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 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 and set for the specified supply pressure. Refer to the system drawings for the 2-Pack/3-Pack analyzer.
6. Bend tubing using industrial grade benders, check tubing fit to ensure proper seating between the tubing and fittings.
7. Fully ream all tubing ends. Blow out the line for 10 to 15 seconds with clean, dry nitrogen or air prior to making the connection.
8. Connect the sample supply tube to the SCS using the 1/4 in. stainless steel compression-type fitting provided.
9. Tighten all new fittings 1-1/4 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.
10. Check all connections for gas leaks. Endress+Hauser recommends using a liquid leak detector.

Do not exceed 10 PSIG (0.7 barg) in sample cell. Damage to cell may result.

Requirements for Ventilation

There are no special requirements for ventilation of the analyzer. For information related to mitigating risks associated with process gases, etc. → 🖹 8.

4 Equipment Operation

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

Firmware Version

Each Endress+Hauser analyzer operates based on its own version of firmware. The firmware version for each analyzer is listed in the system calibration report, and displays upon start-up of the analyzer. Description of Device Parameters can be found on the Endress+Hauser website (www.endress.com). For a list of documentation associated with this product → 1.

Operating Controls

The front panel mounted keypad enables the operator to modify measurement units, adjust operational parameters, and perform diagnostics. These instructions are found in the appropriate Description of Device Parameters.

During normal operation, the LCD continuously displays the measured component's concentration, sample cell temperature, and sample cell pressure.

The device keypad for the CSA certified product is shown in → 4–1. To activate any functions on the keypad, press the mode key **#** followed by a number on the keypad to specify a mode.

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

When you press the **#** key, the words <MODE MENU> display on the LCD. If the keypad watchdog is enabled, a countdown timer will begin when <MODE MENU> displays. If the countdown expires and no buttons have been pressed, the analyzer will automatically revert to **Mode 1**.

The ***** key functions as the "ENTER" key. When in **Mode 2**, always press ***** after entering a value using the keypad (unless the entry was made in error). Pressing the ***** key stores the displayed parameter value and cycles the LCD to the next parameter.

If you do make an error, press the ***** key followed by the TEST key, and then the ***** key to return to the parameter and enter the correct value.

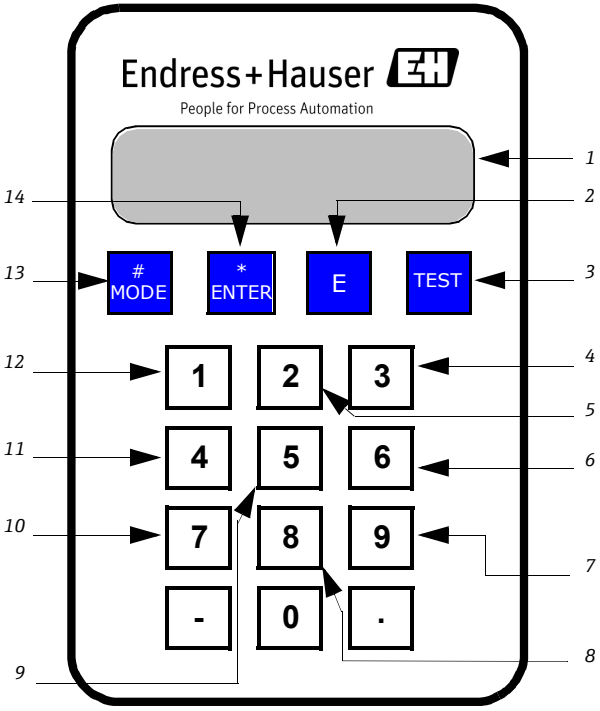


Figure 4–1 Keypad for CSA-certified analyzers

1. LCD (Display)
2. Exponent value
3. Scroll direction and analog input test
4. Scrubber life data
5. Change parameters
6. Export diagnostic data
7. Validation Results
8. Activate Validation 2
9. Analog output test
10. Activate validation 1
11. Diagnostics parameters
12. Activate process gas
13. Mode menu key
14. Enter key

Intermittent Operation

If the analyzer is to be stored or shut down for a short time period, follow the instructions for isolating the measurement cell and sample conditioning system (SCS).

Due to the high pressure of the process sample, it is advisable to allow the sample bypass flow to continue during short-term isolation of the analyzer. Continuing sample bypass flow allows the field pressure regulator to continue normal operation without possible overpressure and activation of the relief valve in the event the pressure regulator leaks when the downstream flow is discontinued.

To isolate the measurement cell for short-term shutdown

The analyzer can be isolated from the primary sample bypass section for short-term shutdown or maintenance of the analyzer while allowing the sample bypass flow to continue in a steady-state mode.

1. Close the sample flow meter metering valve (adjustment knob turned clockwise) for each measurement channel. Do not over tighten the metering valves or damage could occur.
2. Allow any residual gas to flow out of the measurement cells.

***Never** purge the analyzer with air or nitrogen while the system is powered up.*

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

If the system will not be out of service for an extended period, it is advised that power remain applied to the sample transport line electric tracer, if applicable, and the sample system enclosure heater.

To isolate the SCS for short-term shutdown

The sample conditioning system (SCS) can be isolated from the process sample tap for short-term shutdown or maintenance of the SCS without requiring the shutdown of the field pressure reducing station.

Process samples may contain hazardous material in potentially flammable and/or 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. For more information → 🖹 5.

Although the pressure reducing regulator at the process sample tap is designed for "bubble-tight" shut off, this condition may not occur after the system has been in operation for an extended period. Isolation of the SCS from the field pressure regulator will discontinue sample flow and may cause the pressure at the outlet of the field pressure regulator to slowly increase if "bubble-tight" shut off of the pressure regulator does not occur. The slow pressure increase will continue until the pressure setpoint of the relief valve is reached and the excess pressure is vented by the relief valve. Although this situation is not intended, it does not cause a significant problem if the SCS is only isolated for a short period. Only a small amount of process sample will be vented when the relief valve opens because the pressure regulator will continue to act as a flow restriction.

1. Isolate the analyzer from the bypass following the procedure → 🖹 17.
2. Close the sample supply shut-off valve to the SCS.
3. Allow the sample bypass to flow until all residual gas has dissipated from the lines as indicated by no flow on the sample bypass flow meter.
4. Close the low pressure flare or atmospheric vent header shut-off valve for the effluent from the sample bypass.
5. Turn off power to the analyzer.

If the system will not be out of service for an extended period, it is advised that power remain applied to the sample transport line electric tracer, if applicable, and the sample system enclosure heater.

5 Maintenance and Service

This chapter provides safety information related to the maintenance and service of the 2-Pack/3-Pack Gas Analyzer systems.

Facing the 2-Pack/3-Pack gas analyzer, Analyzer A is on the left side and Analyzer B is on the right side.

Potentially Hazardous Substances

The 2-Pack/3-Pack gas analyzers provided for detecting H_2S can acquire leaks that lead to unsafe amounts of potentially toxic gas. For instruction on mitigating any risks → 🖹 8.

Disposal of hazardous substances

For analyzer equipped with H_2S scrubbers, use the following instruction for safe disposal of old components.

Depleted H_2S scrubbers and scrubber indicators contain predominantly Copper (II) Sulfide [CAS# 1317-40-4] with some remaining Copper (II) Oxide [CAS# 1317-38-0] and basic cupric carbonate [CAS# 12069-69-1], each of which are odorless dark powders that require few special precautions other than avoiding contact with the internal substances, keeping the scrubber tightly sealed and protecting the contents against humidity.

Discard used scrubber and scrubber indicator in an appropriate leak-proof receptacle.

Cleaning and Decontamination

To keep the sampling lines clean

1. Make sure that a membrane separator filter (included with most systems) is installed ahead of the analyzer and operating normally. Replace the membrane if necessary. If liquid enters the cell and accumulates on the internal optics, a **Laser Power too Low** fault message at the display will result.
2. Turn off the sample valve at the tap in accordance with site lock-out, tag-out rules.
3. Disconnect the gas sampling line from the sample supply port of the analyzer.
4. Wash the sampling line with isopropyl alcohol or acetone and blow dry with mild pressure from a dry air or nitrogen source.
5. Once the sampling line is completely free of solvent, reconnect the gas sampling line to the sample supply port of the analyzer.
6. Check all connections for gas leaks. Using a liquid leak detector is recommended.

To prevent electrostatic discharge

1. Use a damp cloth to clean the displays to avoid static electricity discharge.

Replacement Parts

All parts required for operation of the 2-Pack and 3-Pack analyzers must be supplied by Endress+Hauser or an authorized agent. For contact information to determine specific parts listing for the purchased model → 30.

Fuse Ratings and Characteristics

Fuses are located on the electronics control board, shown in → 5–1, → 5–2, → 5–3, → 5–4 and → 5–5. Part numbers for the fuse spare part kits are shown in the Operating Instruction.

If you need to replace a fuse, use only the same type and rating of fuse as the original. Refer also to specifications listed in Table 5–1 and Table 5–2.

Select the replacement solenoid fuse (F2) based on the number of solenoids installed on the analyzer.

Table 5–1 Fuse specifications (Analyzer A)

Drawing	Reference	Voltage	Description	Rating
 → 5–1	8	120 VAC	1 Solenoid, Miniature Fuse, 5 x 20 mm, Time Delay	250 VAC 0.16A
			2 Solenoids, Miniature Fuse, 5 x 20 mm, Time Delay	250 VAC 0.25A
			3 Solenoids, Miniature Fuse, 5 x 20 mm, Time Delay	250 VAC 0.4A
	9		Miniature Fuse, 5 x 20 mm, Time Delay	250 VAC 0.8A
	8	240 VAC	1 Solenoid, Miniature Fuse, 5 x 20 mm, Time Delay	250 VAC 0.125A
			2 Solenoids, Miniature Fuse, 5 x 20 mm, Time Delay	250 VAC 0.16A
			3 Solenoids, Miniature Fuse, 5 x 20 mm, Time Delay	250 VAC 0.2A
	9	240 VAC	Miniature Fuse, 5 x 20 mm, Time Delay	250 VAC 0.8A

Drawing	Reference	Voltage	Description	Rating
→ 5–2	9	24 VDC	1 Solenoid, Miniature Fuse, 5 x 20 mm, Time Delay	250 VAC 0.63A
			2 Solenoid, Miniature Fuse, 5 x 20 mm, Time Delay	250 VAC 1.25A
			3 Solenoid, Miniature Fuse, 5 x 20 mm, Time Delay	250 VAC 2.0A
	4		Miniature Fuse, 5 x 20 mm, Time Delay	250 VAC 1.6A

Table 5–2 Fuse specification (Analyzer B)

Drawing	Reference	Voltage	Description	Rating
→ 5–3 → 5–4	7	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 0.8A
→ 5–5	6	24 VDC	Miniature Fuse, 5 x 20 mm, Time Delay	250 VAC 0.8A

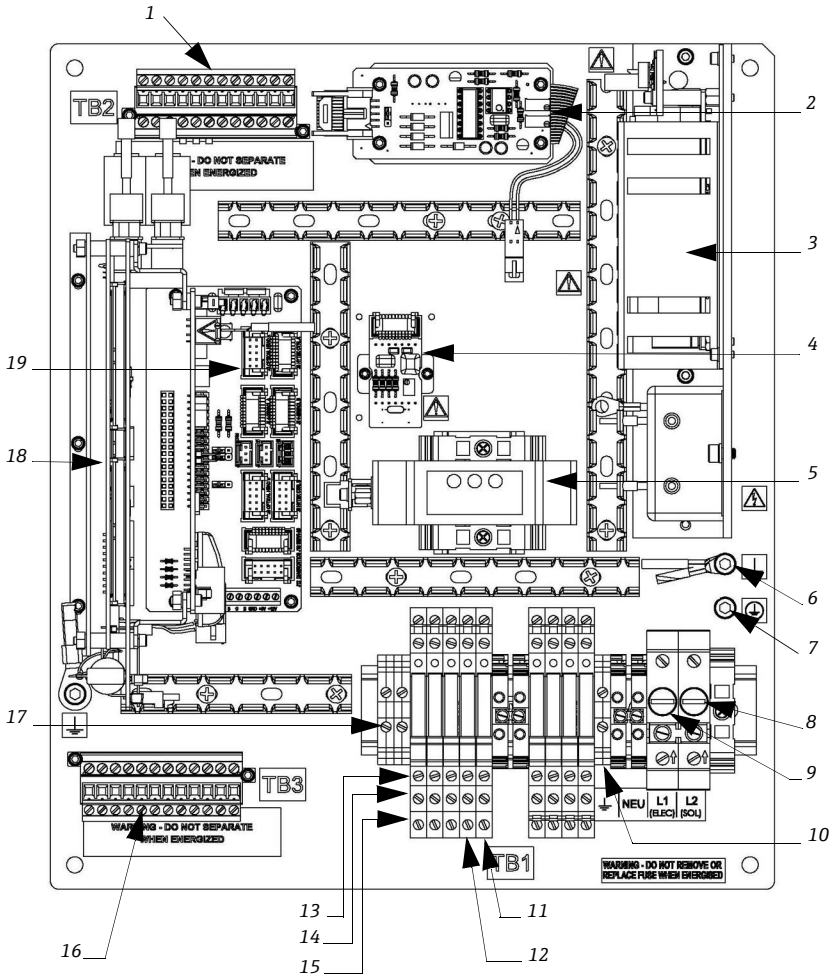


Figure 5-1 Analyzer A ARM9 electronics control board (AC) showing signal terminal block and alarm relays

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

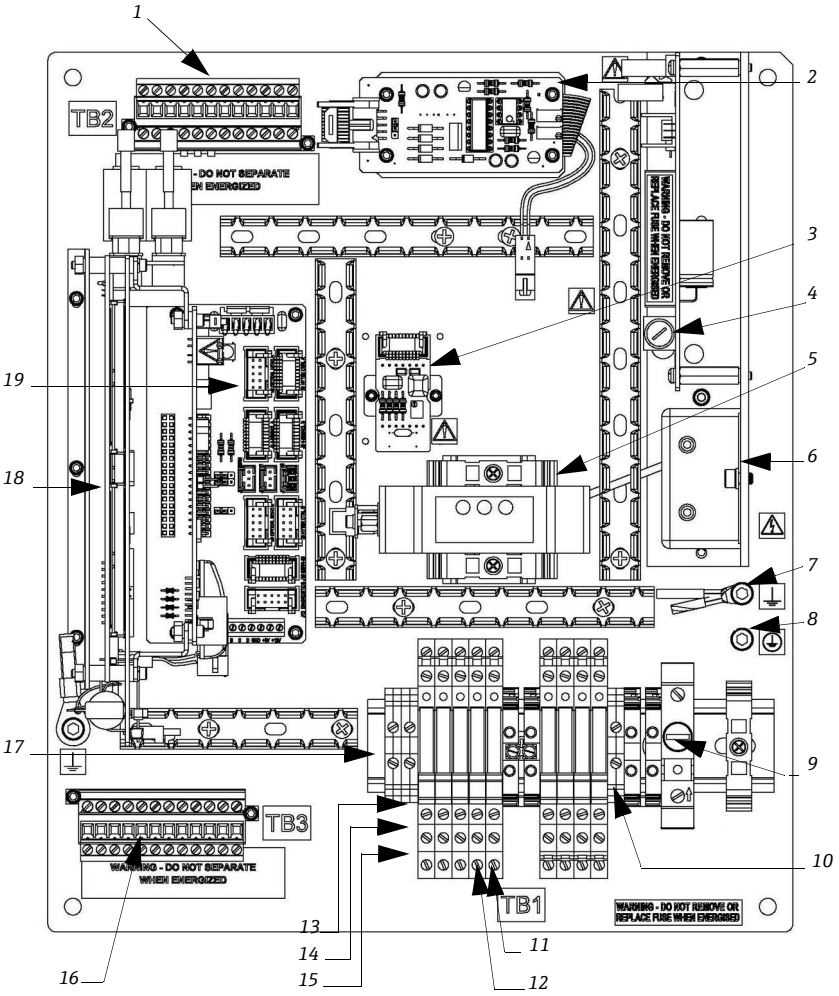


Figure 5–2 Analyzer A ARM9 electronics control board (DC) showing signal terminal block and alarm relays

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

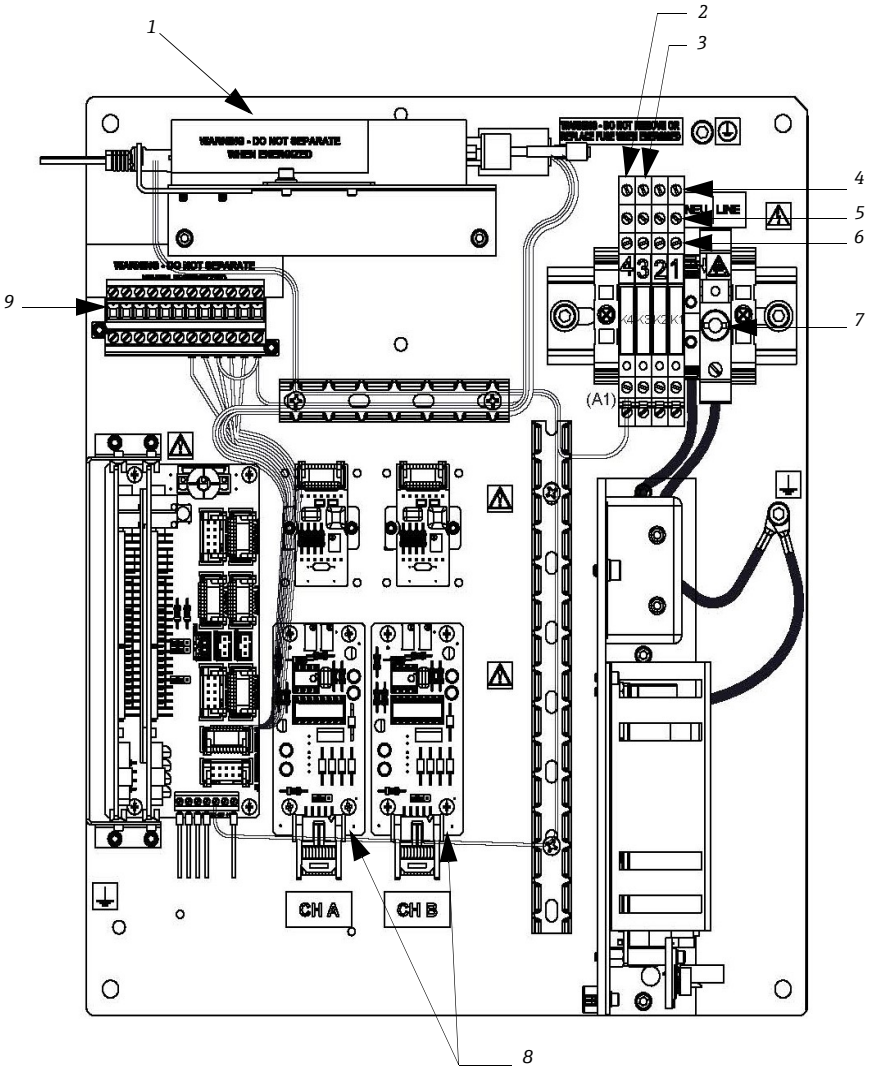


Figure 5–3 Analyzer B e-series electronics control board (AC) showing signal terminal block and alarm relays with Ethernet communication

1. *Signal converter, RS-232 to Ethernet*
2. *Assignable alarm*
3. *General fault alarm*
4. *NO (normally open)*
5. *COMMON*
6. *NC (normally closed)*
7. *Power input fuse*
8. *4-20 mA boards*
9. *Signals*

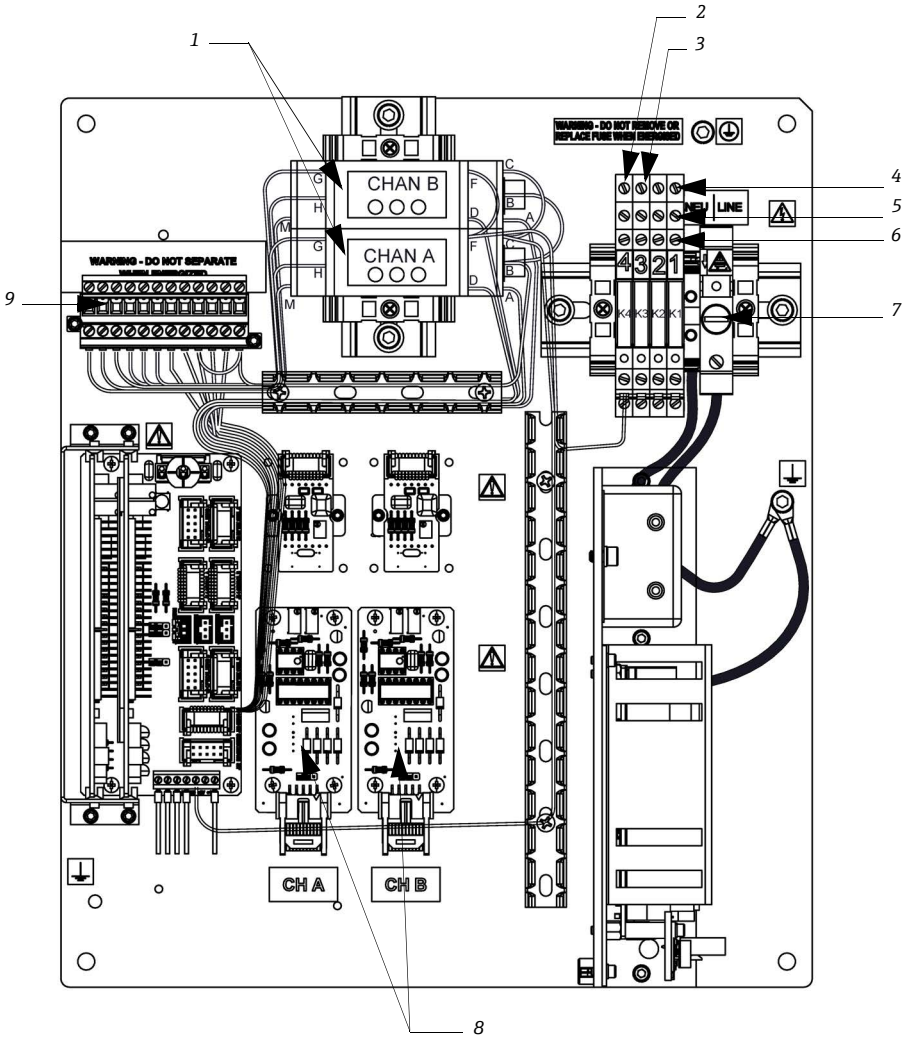


Figure 5–4 Analyzer B e-series electronics control board (AC) showing signal terminal block and alarm relays with RS-485 communication

1. *Signal converter, RS-232 to RS-485*
2. *Assignable alarm*
3. *General fault alarm*
4. *NO (normally open)*
5. *COMMON*
6. *NC (normally closed)*
7. *Power input fuse*
8. *4-20 mA boards*
9. *Signals*

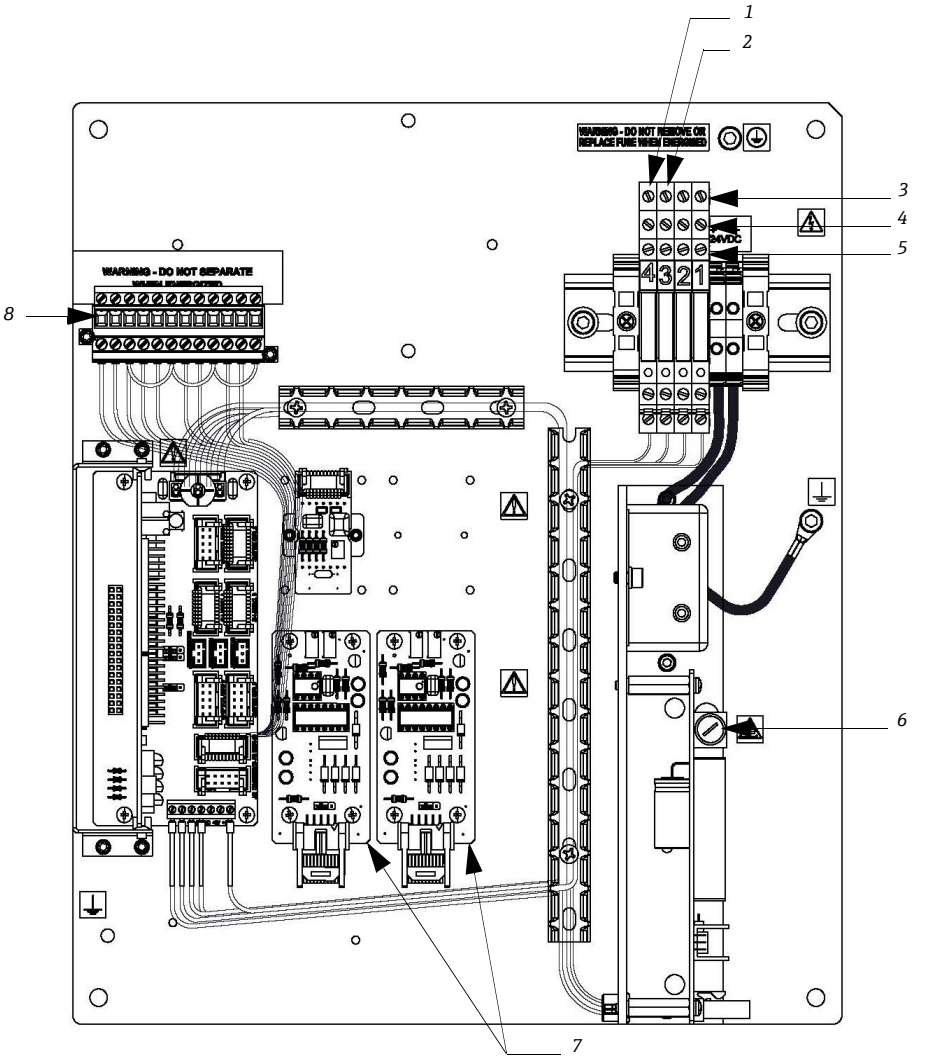


Figure 5–5 Analyzer B e-series electronics control board (DC) showing signal terminal block and alarm relays

1. *Assignable alarm*
2. *General fault alarm*
3. *NO (normally open)*
4. *COMMON*
5. *NC (normally closed)*
6. *Power supply fuse*
7. *4-20 mA boards*
8. *Signals*

Fuse Replacement

1. Power off the system and close the sample supply valve.
2. Open the electronics enclosure. For Analyzer A fuse locations → 🖼 5–1 (AC) or → 🖼 5–2 (DC). For Analyzer B fuse locations → 🖼 5–3, → 🖼 5–4 (AC) or → 🖼 5–5 (DC).
3. Using a flat-head screwdriver, remove the fuse screw turning counter-clockwise as shown in the example below.

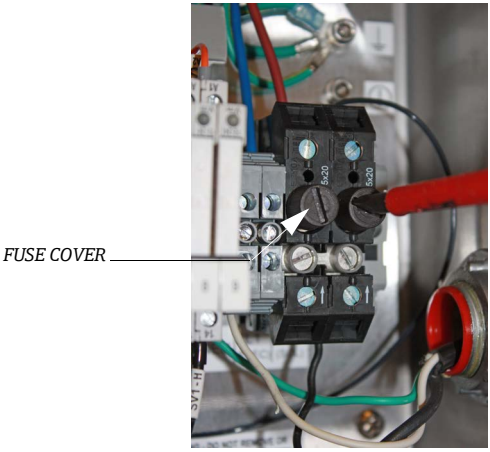


Figure 5–6 Unscrewing fuse cover

4. Remove the fuse cover and fuse.
5. Remove the fuse from the cover and replace with a new fuse as shown below → 🖹 20.

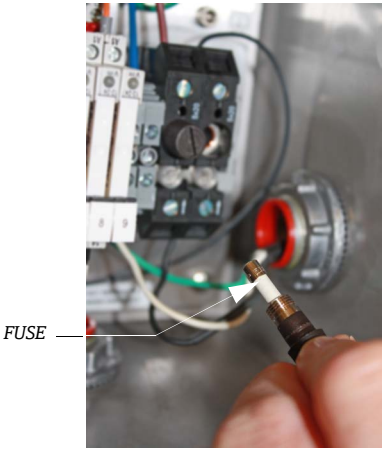


Figure 5–7 Replacing fuse

6. Insert the new fuse into the screw cover and replace into the fuse opening.
7. Use the screwdriver to turn the fuse cover clockwise until tight. Do not overtighten.

Repeat steps for each fuse to be replaced.

8. Close enclosure door and apply power to the analyzer.

Membrane Separator Replacement

Use the following steps to replace a membrane separator.

1. Close the sample supply valve.
2. Unscrew the cap from the membrane separator.

If the membrane filter is dry:

3. Check if there are any contaminants or discoloring of the white membrane. If yes, the filter should be replaced.
4. Remove the O-Ring and replace the membrane filter.
5. Replace the O-Ring on top of the membrane filter.
6. Place the cap back onto the membrane separator and tighten.
7. Check upstream of the membrane for liquid contamination and clean and dry out before re-opening the sample supply valve.

If liquid or contaminants are detected on the filter:

3. Drain any liquids and clean with isopropyl alcohol.
4. Clean any liquids or contaminants from the base of the membrane separator.
5. Replace the filter and the O-Ring.
6. Place the cap onto the membrane separator and tighten.
7. Check upstream of the membrane for liquid contamination and clean and dry out before re-opening the sample supply valve.
8. Check connections for gas leaks. Using a liquid leak detector is recommended.

Filter Replacement

If necessary, use the following steps to replace the filter:

1. Close the sample supply valve.
2. Unscrew the four screws with a 5/23 in. screwdriver from the base of the filter. Remove the filter unit from the analyzer for disassembly.
3. Unscrew and remove the filter cap.
4. Remove the top O-Ring.
5. Check if there are any contaminants or solid components blocking the metal filter.
6. Drain any contaminants found and clean with isopropyl alcohol.
7. Replace the top O-Ring.
8. Place the filter cap back into position and tighten.

9. Place the filter unit into the analyzer and tighten the base with the four screws.
10. Check upstream of membrane for liquid contamination and clean and dry out before opening the sample supply valve.
11. Check connections for gas leaks. Using a liquid leak detector is recommended.

Replacing the scrubber and scrubber efficiency indicator

All valves, regulators, switches, etc. should be operated in accordance with site lock-out/tag-out procedures.

1. Close the sample supply shut-off valve. Allow all residual gas to dissipate as indicated by no flow on the sample bypass flow meter.
2. Unscrew the compression nuts on the inlet end of the scrubber and scrubber efficiency indicator assembly.
3. To install the new scrubber and indicator, insert the inlet and outlet tubes into the compression fittings of a new scrubber and scrubber efficiency indicator assembly, ensuring each are oriented correctly, as shown below.

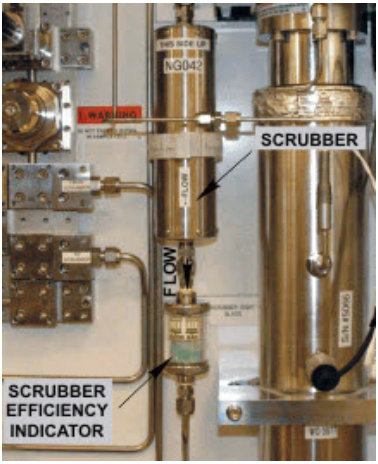


Figure 5–8 Scrubber and scrubber efficiency indicator

4. Tighten all new fittings 1-1/4 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.
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 for your analyzer).

6. Restart the SCS.
7. Check all connections for gas leaks. Using a liquid leak detector is recommended.
8. Re-validate the system with an appropriate gas standard following the instructions under **"Validating the Analyzer"** in the Description of Device Parameters for your analyzer.
9. Purge the scrubber and scrubber efficiency indicator assembly with nitrogen to remove all flammable gas and cap the inlet and outlet.

Disposal of Used Scrubbers

Depleted H_2S scrubbers and scrubber indicators contain predominantly Copper (II) Sulfide [CAS# 1317-40-4] with. some remaining Copper (II) Oxide [CAS# 1317-38-0] and basic cupric carbonate [CAS# 12069-69-1], each of which are odorless dark powders that require few special precautions other than avoiding contact with the internal substances, keeping the scrubber tightly sealed and protecting the contents against humidity.

1. Discard used scrubber and scrubber indicator in an appropriate leak-proof receptacle.

Service

For Service, refer to our website for the list of local sales channels in your area (https://www.endress.com/contact).

Service Repair Order

If returning the unit is required, obtain a **Service Repair Order (SRO) Number** from a Sales channel representative before returning the analyzer to the factory. Your representative can determine whether the analyzer can be serviced on site or should be returned to the factory. All returns should be shipped to:

Endress+Hauser
11027 Arrow Rte.
Rancho Cucamonga, CA 91730-4866
United States of America
1-909-948-4100

XA02751C/66/EN/01.21

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