For use with version
HC12
(Device Firmware)

Operating Instruction
SS500XP/SS2000XP TDLAS Gas Analyzer

CSA Class I, Division 1 Groups B, C and D; T4

Endress+Hauser
People for Process Automation

TABLE OF CONTENTS

1 - Introduction

Endress+Hauser's SS500XP/SS2000XP products are high-speed, diode laser-based extractive analyzers designed for extremely reliable monitoring of very low to standard concentrations of specific components in various background gases. In order to ensure that the analyzer performs as specified, it is important to closely review the installation and operation sections of this manual. This manual contains a comprehensive overview of the SS500XP/SS2000XP analyzer and step-by-step instructions on:

- Inspecting the analyzer
- Installing the analyzer
- Maintaining and troubleshooting the system

Who Should Read This Manual

This manual should be read and referenced by anyone installing, operating or having direct contact with the analyzer.

How to Use This Manual

Take a moment to familiarize yourself with this manual by reading the **Table of Contents**.

There are a number of options and accessories available for the SS500XP/SS2000XP analyzers. This manual has been written to address the most common options and accessories. Images, tables and charts have been included to provide a visual understanding of the analyzer and its functions. Special symbols are also used to provide the user with key information regarding the system configuration and/or operation. Pay close attention to this information.

General Warnings and Cautions

Instructional icons are provided in this manual and on the SS500XP/SS2000XP to alert the user of potential hazards, important information and valuable tips. Following are the symbols and associated warning and caution types to observe when servicing the analyzer. Some of these symbols are provided for instructional purposes only and are not labeled on the system.

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, arching, 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.*

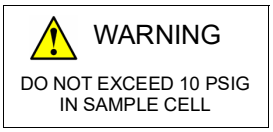
Technicians are expected to follow all safety protocols established by the customer that are necessary for servicing or operating the analyzer. This may include, but is not limited to, lockout/tag-out procedures, toxic gas monitoring protocols, personal protective equipment (PPE) requirements, hot work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

Equipment labels

The following special safety symbols and labeling are used on the equipment to alert the user to potential hazards and important information associated with the gas analyzer. Every symbol and label has significant meaning that should be heeded.

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.



Maximum sample cell operating warning. Failure to follow all directions may result in damage or malfunction of the analyzer.

Instructional symbols

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

*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 or substitution of components may result in explosion.

Failure to follow all directions may result in fire.

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

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.

Conventions used in this manual

In addition to the symbols and instructional information, this electronic manual is created with "hot links" to enable the user to quickly navigate between different sections within the manual. These links include table, figure and section references and are identified by a pointing finger cursor when rolling over the text. Simply click on the link to navigate to the associated reference.

About the Gas Analyzers

The SS500XP/SS2000XP are tunable diode laser (TDL) absorption spectrometers operating in the near- to short-wavelength infrared. Each compact sensor consists of a TDL light source, sample cell and detector specifically configured to enable high sensitivity measurement of a particular component within the presence of other gas phase constituents in the stream. The sensor is controlled by microprocessor-based electronics with embedded software that incorporates advanced operational and data processing algorithms.

A sample conditioning system may also be included with the system that has been specifically designed to deliver an optimum sample stream that is representative of the process systems stream at the time of sampling. Most SS500XP/SS2000XP analyzer systems are configured for use at extractive natural gas sampling stations.

Differences between the SS500XP and SS2000XP

The SS500XP and SS2000XP are single-channel analyzers used predominantly for measuring H_2O or CO_2 in pipeline natural gas. The SS2000XP is a higher resolution version of the SS500XP (for performance specifications, see Table A–1 on page A–1 for the SS500XP or Table A–2 on page A–2 and Table A–3 on page A–7 for the SS2000XP).

How the Analyzers Work

The SS500XP/SS2000XP analyzers employ tunable diode laser absorption spectroscopy (TDLAS) to detect the presence of trace substances in process gases. Absorption spectroscopy is a widely used technique for sensitive trace species detection. Because the measurement is made in the volume of the gas, the response is much faster, more accurate and significantly more reliable than traditional surface-based sensors that are subject to surface contamination.

In its simplest form, a diode laser absorption spectrometer typically consists of a sample cell with a mirror at one end, and a mirror or window at the opposite end, through which the laser beam can pass. Refer to Figure 1–1. The laser beam enters the cell and reflects off the mirror(s) making one or more trips through the sample gas and eventually exiting the cell where the remaining beam intensity is measured by a detector. With the SS500XP/SS2000XP

analyzers, sample gas flows continuously through the sample cell ensuring that the sample is always representative of the flow in the main pipe.

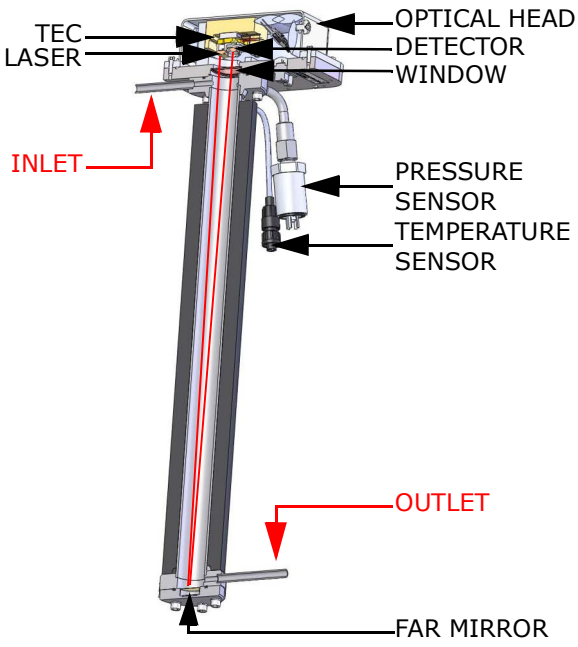


Figure 1–1 *Schematic of a typical laser diode absorption spectrometer*

Due to their inherent structure, the molecules in the sample gas each have characteristic natural frequencies (or resonances). When the output of the laser is tuned to one of those natural frequencies, the molecules with that particular resonance will absorb energy from the incident beam. That is, as the beam of incident intensity, $I_0(\lambda)$, passes through the sample, attenuation occurs via absorption by the trace gas with absorption cross section $\sigma(\lambda)$. According to the Beer-Lambert absorption law, the intensity remaining, $I(\lambda)$, as measured by the detector at the end of the beam path of length I (cell length x number of passes), is given by

$$I(\lambda) = I_0(\lambda)\exp[-\sigma(\lambda)lN] \ , \qquad (1)$$

where N represents the species concentration. Thus, the ratio of the absorption measured when the laser is tuned on-resonance versus off-resonance is directly proportional to the number of molecules of that particular species in the beam path, or

$$N = \frac{-1}{\sigma(\lambda)l}\ln\left[\frac{I(\lambda)}{I_0(\lambda)}\right] \ . \qquad (2)$$

Figure 1–2 shows the typical raw data (in arbitrary units [a.u.]) from a laser absorption spectrometer scan including the incident laser intensity, $I_0(\lambda)$, and the transmitted intensity, $I(\lambda)$, for a clean system and one with contaminated mirrors (shown to illustrate the system's relative insensitivity to mirror contamination). The positive slope of raw data results from ramping the current to tune the laser, which not only increases the wavelength with current, but also causes the corresponding output power to increase. By normalizing the signal by the incident intensity, any laser output fluctuations are canceled, and a typical, yet more pronounced, absorption profile results. Refer to Figure 1–3.

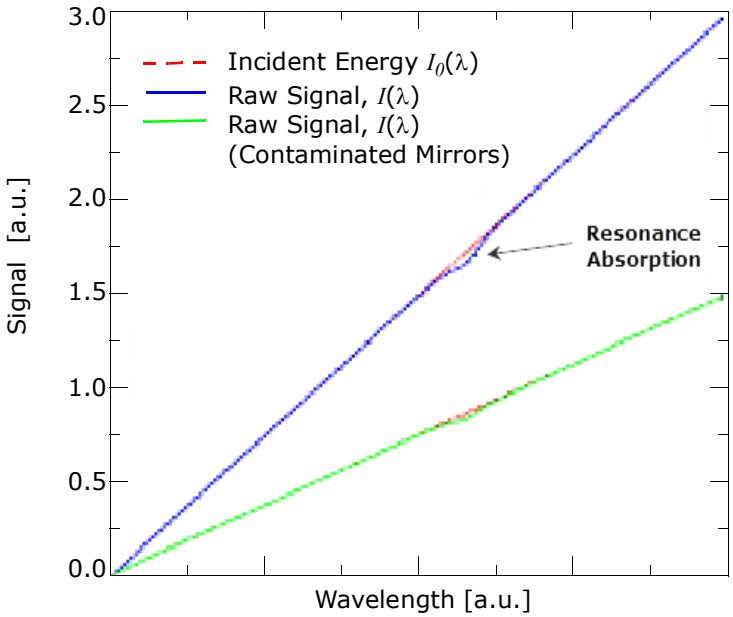


Figure 1–2 *Typical raw signal from a laser diode absorption spectrometer with and without mirror contamination*

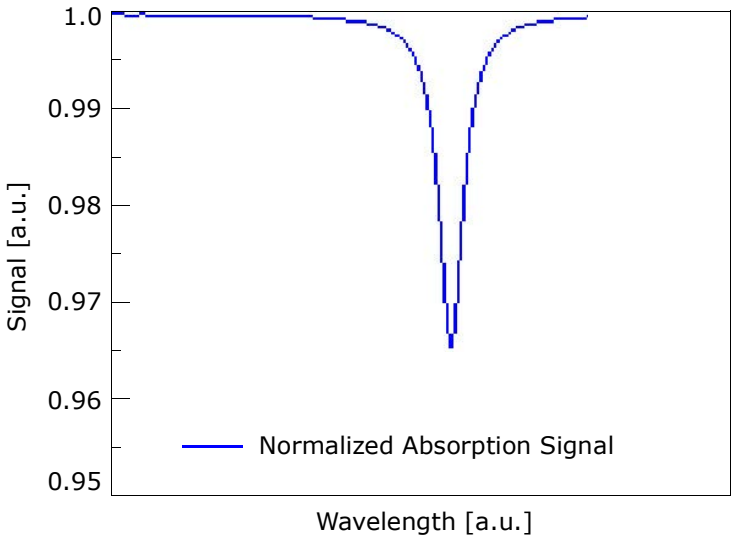


Figure 1–3 *Typical normalized absorption signal from a laser diode absorption spectrometer*

Note that contamination of the mirrors results solely in lower overall signal. However, by tuning the laser off-resonance as well as on-resonance and normalizing the data, the technique self calibrates every scan resulting in measurements that are unaffected by mirror contamination.

Wavelength Modulation Spectroscopy (WMS) signal detection

Endress+Hauser takes the fundamental absorption spectroscopy concept a step further by using a sophisticated signal detection technique called wavelength modulation spectroscopy (WMS). When employing WMS, the laser drive current is modulated with a kHz sine wave as the laser is rapidly tuned. A lock-in amplifier is then used to detect the harmonic component of the signal that is at twice the modulation frequency (2*f*), as shown in Figure 1–4. This phase-sensitive detection enables the filtering of low-frequency noise caused by turbulence in the sample gas, temperature and/or pressure fluctuations, low-frequency noise in the laser beam or thermal noise in the detector.

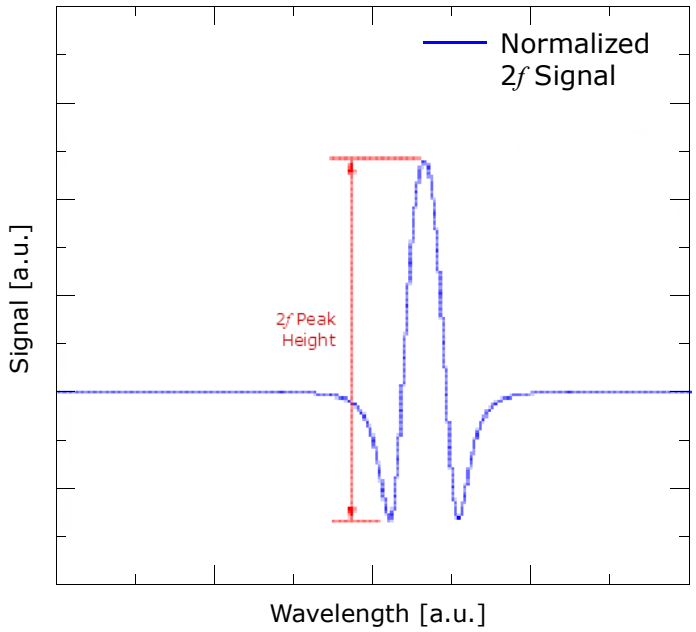


Figure 1–4 *Typical normalized 2f signal; species concentration is proportional to the peak height*

With the resulting low-noise signal and use of fast post-processing algorithms, reliable parts per million (ppm) detection levels are possible (depending on target and background species) at real-time response rates (on the order of 1 second).

All Endress+Hauser TDL gas analyzers employ the same design and hardware platform. Measuring different trace gases in various mixed hydrocarbon background streams is accomplished by selecting a different optimum diode

laser wavelength between 750 to 3000nm, which provides the least amount of sensitivity to background stream variations.

Getting Familiar with the Analyzer

Endress+Hauser's SS500XP/SS2000XP analyzers are typically comprised of a single electronics enclosure and associated measurement cell(s). Refer to Appendix A for system drawings. On the front panel of the analyzer, the keypad and LCD display, which serve as the user interface to the analyzer, are viewed through a window. Internally, the control electronics drive the laser, collect the signal, analyze the spectra and provide measurement output signals.

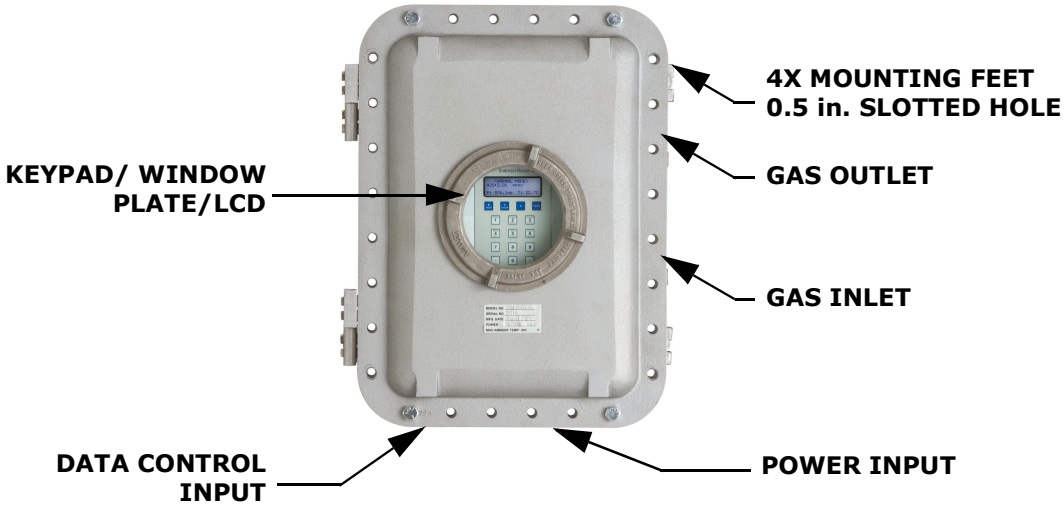


Figure 1–5 *External features of the analyzer*

Power is connected to the analyzer from an external power source through the bottom of the enclosure. Refer to Appendix A for system specifications. The measurement cell(s) along with flow devices to control flow and pressure for the measurement cell and the bypass loop are mounted on a panel alongside the enclosure.

Inside the SS500XP/SS2000XP analyzer electronics enclosure is the electronics assembly. Refer to Figure 1–6 for a view of the AC electronics assembly and Figure 1–7 for the DC electronics assembly.

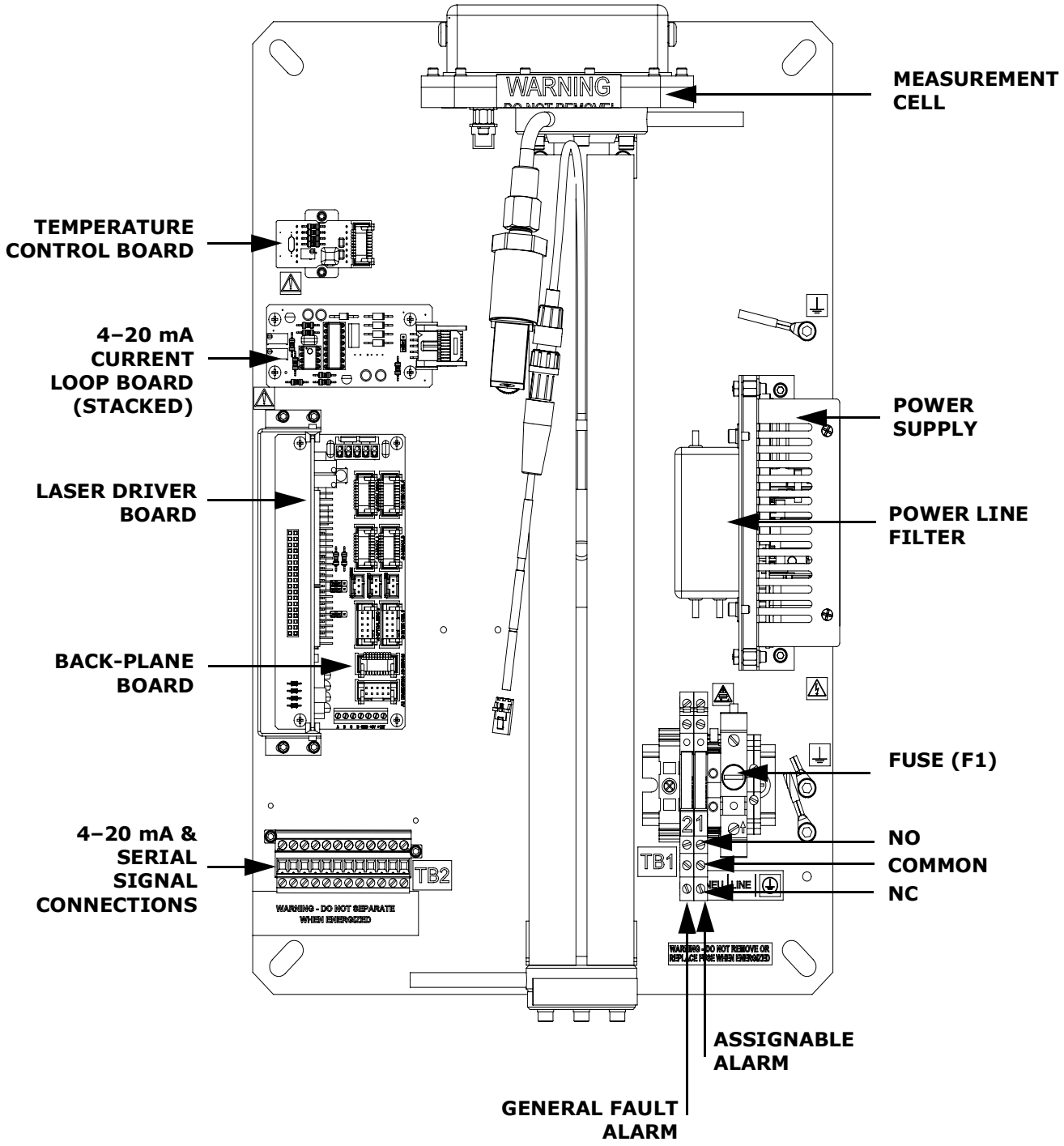


Figure 1–6 *Electronics control panel (AC) for single-channel systems (SS500XP/SS2000XP)*

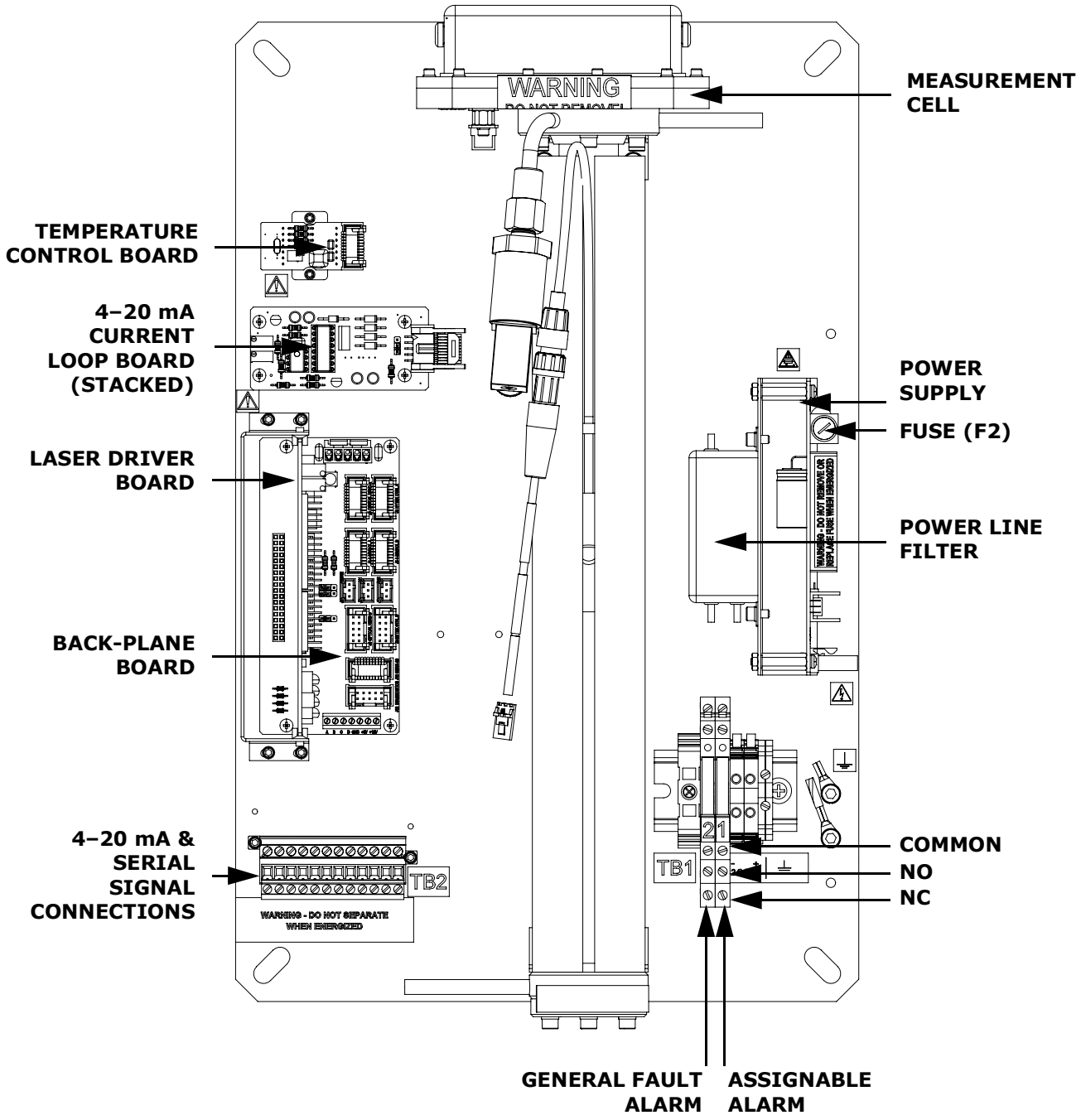


Figure 1–7 *Electronics control board (DC) for single-channel systems (SS500XP/SS2000XP)*

Fuse specifications

Fuses are located on the electronics control board, as shown in Figure 1–6 and Figure 1–7.

If you need to replace a fuse, use only the same type and rating of fuse as the original as listed in Table 1-1.

Table 1-1 *Fuse specifications*

DWG Ref.		Volt-age	Description	Rating
Figure 1–6	F1	120 VAC	Miniature Fuse, 5 x 20 mm, Time Delay	250VAC/0.8A
		240 VAC	Miniature Fuse, 5 x 20 mm, Time Delay	250VAC/0.5A
Figure 1–7	F2	24 VDC	Miniature Fuse, 5 x 20 mm, Time Delay	250VAC/1.6A

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2 - SAFETY

Potential Risks Affecting Personnel

This section addresses the appropriate actions to undertake when faced with hazardous situations during or before service of the gas 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.

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

Mitigating risks

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

Exposure to process gases

1. Shut off the process gas to the gas analyzer before any service that would require opening a part of the sample plumbing.
2. Purge the system with nitrogen.
3. Shut off the nitrogen purge before opening any part of the sample system.

Exposure to toxic gas (H_2S)

Follow the procedure below if there has been any suspected leak from the sample system and accumulated 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 gas 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 enclosure door.

If service must be performed with power engaged (gain adjustment, etc.):

1. Note any live electrical components and avoid any 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 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 - INSTALLATION

This section describes the processes used to initially install and configure your SS500XP or SS2000XP. Once the analyzer arrives, you should take a few minutes to examine the contents before installing the unit.

Endress+Hauser Class I Division 2 gas 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.

This section discusses:

- Unpacking and inspecting the analyzer
- Getting familiar with analyzer
- Installing the analyzer

What Should be Included in the Shipping Box

The contents of the crate should include:

- The Endress+Hauser SS500XP or SS2000XP analyzer
- CDs; Operator's Manual and other manuals or documents as necessary
- One external serial cable(s) to connect the analyzer to a computer
- Additional accessories or options as ordered

If any of these contents are missing, contact **"Service"** on page B-17.

Inspecting the Analyzer

Unpack and place the unit on a flat surface. Carefully inspect all enclosures for dents, dings, or general damage. Inspect the inlet and outlet connections for damage, such as bent tubing. Report any damage to the carrier.

Avoid jolting the instrument by dropping it or banging it against a hard surface. Do not attempt to pick up the instrument using the sample cell. Either action may disturb the optical alignment.

Installing the Analyzer

Installing the analyzer is relatively easy and requires only a few steps that, when carefully followed, will ensure proper mounting and connection.

This section includes:

- Hardware and tools for installation
- Mounting the analyzer
- Connecting Electrical Power to the Analyzer
- Connecting the Output Signals
- Connecting the Gas Lines

Hardware and tools for installation

Depending on the particular model, the configuration of accessories and options ordered, you may need the following hardware and tools to complete the installation process.

Hardware

- Membrane separator filter (if not included) [1]
- Pressure regulator (if not included) [1]
- Stainless steel tubing (Endress+Hauser recommends using 1/4 in. O.D. x0.035 in. wall thickness, seamless stainless steel tubing)
- 1/2 in. conduit hubs
- Conduit (rigid)
- Source of plant nitrogen gas (4 SCFH) for purge unit(s), if applicable
- 1/2 in. or 3/8 to 16 in. Unistrut (or equivalent) bolts and spring nuts
- 3/8 in. x 1-1/2 in. machine screws and nuts (for non-Unistrut installation)
- 3/4 in. or 1/2 in. EYS (or equivalent) seals
- 1/4 in. Swagelok 400-1-4 (or equivalent) connectors

Tools

- Hand drill and bits
- Tape measure
- Level
- Pencil
- Socket wrench set
- Screw driver
- Crescent wrench
- 9/16 in. open-end wrench

1 If your system comes equipped with a sample conditioning system, refer to the Sample Conditioning System (SCS) manual for more information.

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.

Refer to Appendix A for drawings and specifications of the analyzer.

Mounting the analyzer

The SS500XP/SS2000XP analyzer is manufactured for wall or Unistrut® (or equivalent) metal framing installations. Refer to the layout diagrams in Appendix A for specifications.

When mounting the analyzer, be sure not to position the instrument so that it is difficult to operate adjacent devices. Allow 1 meter (3 feet) of room in front of the analyzer and any switches.

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.

To mount the analyzer

1. Select a suitable location to mount the analyzer. Choose a shaded area or use an optional analyzer hood (or equivalent) to minimize sun exposure.

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.

2. Locate the mounting holes on your unit. Refer to Figure A–1 on page A–3.
3. For wall installations, mark the centers of the holes in the mounting brackets to the mounting surface.
4. Drill the appropriate size holes for the bolts you are using (Endress+Hauser recommends 2 in. bolts at a minimum).
5. Hold the analyzer in place and fasten with the top screws.
6. Repeat for the bottom mounting holes.

Once all four screws are tightened the analyzer should be very secure and ready for the electrical connections.

Connecting Electrical Power to the Analyzer

The analyzer will be configured for 100 to 240 VAC @ 50/60 Hz single phase input or optionally 18 to 24 VDC input. Check the manufacturing data label or the terminal block labels to determine the power input requirements. All work must be performed by personnel qualified in electrical conduit installation. Conduit seals should be used where appropriate in compliance with local regulations.

***Hazardous voltage and risk of electric shock**. Turn off and lock out system power before opening the electronics enclosure and making any connections.*

***Hazardous voltage and risk of electric shock.** Careful consideration should be taken when grounding. Properly ground the unit by connecting ground leads to the grounding studs provided throughout the system that are labeled with the ground symbol*  *.*

Depending on the analyzer configuration, the electrical wiring can typically be connected to the analyzer through a conduit hub located at the bottom right or left of the electronics enclosure.

To connect electrical power to the analyzer

1. Open the electronics enclosure door. Take care not to disturb the electrical assembly inside.

***Hazardous voltage and risk of electric shock.** Failure to properly ground the analyzer may create a high-voltage shock hazard.*

2. Run conduit from the power distribution panel to the tapped hole at the bottom of the analyzer enclosure. Refer to Figure A–2 on page A–4.

Conduit seals should be used where appropriate in compliance with local regulations.

Because the breaker in the power distribution panel or switch will be the primary means of disconnecting the power from the analyzer, the power distribution panel should be located in close proximity to the equipment and within easy reach of the operator.

An approved switch or circuit breaker rated for 15 amps should be used and clearly marked as the disconnecting device for the analyzer.

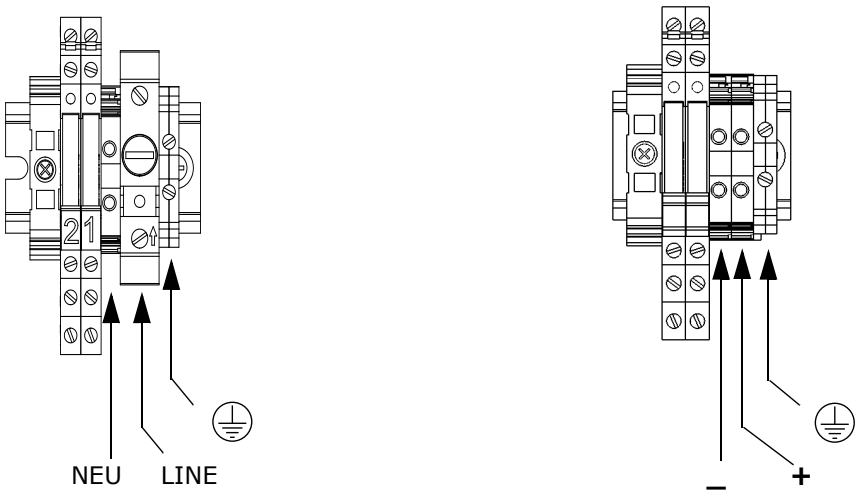
3. For AC systems, pull ground, neutral and hot wires (#14 AWG minimum) into the electronics enclosure.

   For DC systems, pull ground, plus and minus wires.

4. Strip back the jacket and/or insulation of the wires just enough to connect to the power terminal block.

5. For AC systems, attach the neutral and hot wires to the power terminal block by connecting the neutral wire to the terminal marked "NEU" and the hot wire to the terminal marked "LINE" as shown in Figure 3–1.

   For DC systems, connect the minus wire to the terminal marked "–" and the positive wire to the terminal marked "+" as shown in Figure 3–1.



AC TERMINAL BLOCK **DC TERMINAL BLOCK**

Figure 3–1 *AC and DC connection terminal blocks in electronics enclosure*

6. Connect the ground wire to the ground terminal marked ⏚.
7. Close and tighten the electronics enclosure door.

Connecting the Output Signals

The 4–20 mA current loop and serial output(s) are supplied from the mating terminal block (TB2) located inside the analyzer electronics enclosure as shown in Figure 1–6 or Figure 1–7. By default, the 4–20 mA current loop output is factory set to source current.

The 4–20 mA current loop output is factory set to source current. To change the 4–20 mA current loop output from source to sink, see ***"To change the 4–20 mA board from source to sink"*** *on page 3-8.*

Connections can be made with customer-supplied cables for the current loop(s) and for the serial connection(s). Consult the wiring diagrams in Appendix A.

Hazardous voltage and risk of electric shock*. Turn off and lock out system power before opening the electronics enclosure and making any connections.*

To connect the output signals

1. Disconnect power to the analyzer and open the electronics enclosure cover. Take care not to disturb the electrical assembly inside.
2. Run conduit from the signal/alarm receiving station to the conduit hub on the electronics enclosure labeled for signal connections.

Conduit seals should be used where appropriate in compliance with local regulations.

3. Pull the customer-supplied cable(s) for the current loop(s), digital output relays, and the external serial cable(s) through the conduit into the electronics enclosure.

The external serial cable included in the shipping container is provided for troubleshooting purposes and may not be the correct length for permanent installation.

4. Strip back the jacket and insulation of the current loop, digital output relays and serial cables just enough to connect to the mating terminal block (TB2), shown in Figure 3–2. The mating terminal block can be pulled up and removed from its base to make the cable connection process easier.
5. Connect the 4–20 mA current loop signal wires to the appropriate terminals, as indicated in Table 3–1.

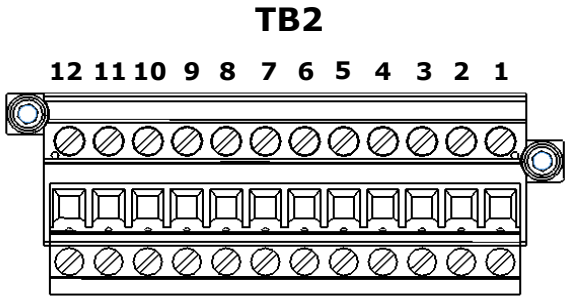


Figure 3–2 *Mating terminal block (TB2) in electronics enclosure for connecting signal cables*

Table 3–1 *Output signal connections*

Terminal	Description	D-Conn	Color
1	CH A Serial RX	Pin-3	Black
2	CH A Serial TX	Pin-2	Red
3	COM Serial Ground	Pin-5	Shield
4 [1]	N/C		
5 [1]	N/C		
6	CH A Current Loop +		
7	CH A Current Loop -		
8 [2]	CH A Current Loop +		
9 [2]	CH A Current Loop -		
10	N/C		
11	N/C		
12	N/C		

1. The description "N/C" indicates no connection.
2. Performs the same function as terminal 6/7.

6. Connect the serial cable wires to the appropriate terminals according to Table 3–1. For reference, Table 3–1 also shows the corresponding pin numbers for configuring a nine-pin Sub-D connector for connection to a computer serial port.

7. Connect the digital output relays according to the call-outs shown in Figure 1–6 and Figure 1–7.

8. Re-insert the mating terminal block into its base and verify that each connection is secure.

9. Close and tighten the electronics enclosure cover.
10. To complete the connections, connect the other end of the current loop wires to a current loop receiver and each external serial cable to a serial port on your computer.

Changing the 4–20 mA Current Loop Mode

Changing the current loop mode may negate specific hazardous area certifications. Refer to ***"Service"*** *on page B-17.*

By default, the 4–20 mA current loop output is factory set to source current. In some instances it may be necessary to change the 4–20 mA current loop output in the field from source to sink. The work must be performed by personnel qualified in electronics assembly.

Hazardous voltage and risk of electric shock*. Turn off and lock out system power before opening the electronics enclosure and servicing.*

To change the 4–20 mA board from source to sink

1. Disconnect power to the analyzer.
2. Open the electronics enclosure cover. Take care not to disturb the electrical assembly inside.
3. Locate the 4–20 mA board(s) in the center of the electronics enclosure, as shown in Figure 1–6 or Figure 1–7.
4. Remove the jumper (JMP1), shown in Figure 3–3, connecting the center pole to point "A."
5. For 4–20 mA sink, carefully replace the jumper to connect the center pole with point "P."
6. Repeat steps 2 to 4 as necessary for any remaining 4–20 mA boards.
7. Reconnect power to the analyzer. Confirm the 4 mA (min.) and 20 mA (max.) points (see **"To scale the current loop signal"** in the Device Parameters manual).
8. Close and tighten the electronics enclosure cover.

Connecting the Gas Lines

Once you have verified that the analyzer is properly wired, you are ready to connect the sample supply, sample return, and sample bypass (if applicable).

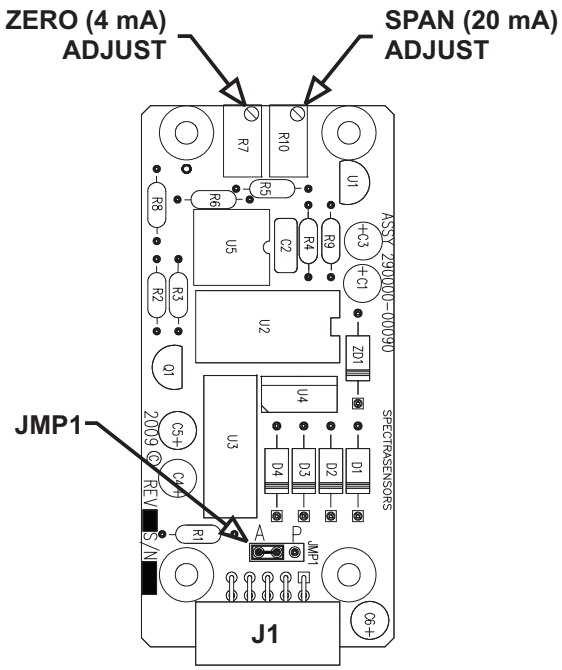


Figure 3–3 *4–20 mA output board*

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

Application of Conduit Lubricant

To ensure proper installation, Endress+Hauser recommends using STL8 screw thread lubricant or equivalent on all conduit screw thread and its tapped opening.

STL8 Screw Thread Lubricant is a lithium based, anti-galling substance with excellent adhesion that maintains rain-tightness and grounding continuity between conduit fittings. This lubricant has proven very effective between parts made of dissimilar metals, and is stable in temperatures from -20° F to +300° F.

Do not use this lubricant on exposed current-carrying parts.

1. Holding the fitting piece at one end, generously apply the lubricant on the male threaded surface (at least five threads wide) as shown below.

2. Screw the female pipe thread onto the male fitting until the lubricated threads are engaged.

***Eyes**: May cause minor irritation.*

***Skin**: May cause minor irritation.*

***Ingestion**: Relatively non-toxic. Ingestion may result in a laxative effect. Ingestion of substantial quantities may cause lithium toxicity.*

Appendix A: Specifications

Table A–1 *SS500XP H_2O analyzer specifications*

Performance	
Typical Measurement Ranges [1]	40 to 422 ppmv (2 to 20 lbs/MMscf) 40 to 1055 ppmv (2 to 50 lbs/MMscf) 40 to 2110 ppmv (2 to 100 lbs/MMscf)
Application Data	
Environmental Temperature Range	-20 to 50 °C (-4 to 122 °F)
Environmental Relative Humidity	80% for temperatures up to 31°C MAX
Altitude	Up to 2000 m (6,550 ft.)
Maximum Cell Pressure	10 PSIG (70kPaG)
Sample Cell Pressure Range	700 to 1400 mbara
Sample Flow Rate	0.5 to 1.0 LPM (1 to 2 scfh) typical
Recommended Validation	Bureau of Mines chilled mirror, portable TDL or binary gas with methane background
Electrical & Communications	
Input Voltages [2]	100 to 240 VAC, 50/60 Hz (single phase only) 18 to 24 VDC - *Optional*
Contact Rating (Inductive Load)	250V, 3A N.O. contact, 1.5A N.C. contact 24V, 1A N.O. and N.C. contact
Communication	**Analog**: (2) 4–20 mA Isolated, 1200 ohms @ 24 VDC max load **Serial**: RS-232C **Protocol**: Modbus Gould RTU, Daniel RTU or ASCII
Digital Output	(2); General Fault and Concentration/Assignable Alarm
LCD Display	Concentration, cell pressure, temperature alarms & diagnostics
Physical Specifications	
Size	565 mm H x 413 mm W x 252 mm D (17.27 in. H x 14.59 in. W x 9.94 in. D)
Weight	Approx. 46.8 Kg (103 lbs)
Sample Cell Construction	316L Series Polished Stainless Steel
Area Classification	
Certifications	CSA Class I, Division 1 Groups B, C and D; T4; -20°C ≤ Tamb ≤ +50°C, Enclosure Type 4

1. Consult factory for alternative ranges.
2. Supply voltage not to exceed ±10% of nominal. Transient over-voltages according to Overvoltage Category II.

Table A–2 *SS2000XP single-channel H_2O analyzer specifications*

Performance	
Typical Measurement Ranges [1]	0 to 422 ppmv (0.5 to 20 lbs/MMscf) 0 to 1055 ppmv (0.5 to 50 lbs/MMscf) 0 to 2110 ppmv (0.5 to 100 lbs/MMscf)
Application Data	
Environmental Temperature Range	-20 to 50°C (-4 to 122°F)
Environmental Relative Humidity	80% for temperatures up to 31°C MAX
Altitude	Up to 2000 m
Maximum Cell Pressure	70kPaG (10 PSIG)
Sample Cell Pressure Range	700 to 1400 mbara
Sample Flow Rate	0.5 to 1.0 LPM (1 to 2 schf) typical
Recommended Validation	Bureau of Mines chilled mirror, portable TDL or binary gas with methane background
Electrical & Communications	
Input Voltages [2]	100 to 240 VAC, 50/60 Hz (single phase only) 18 to 32 VDC - *Optional*
Contact Rating (Inductive Load)	250V, 3A N.O. contact, 1.5A N.C. contact 24V, 1A N.O. and N.C. contact
Communication	**Analog**: (2) 4–20mA Isolated, 1200 ohms @ 24 VDC max load **Serial**: RS-232C **Protocol**: Modbus Gould RTU, Daniel RTU or ASCII
Digital Output	(2); General Fault and Assignable alarms
LCD Display	Concentration, cell pressure, temperature alarms & diagnostics
Physical Specifications	
Dimensions	17.27 in. H x 14.59 in. W x 9.94 in. D (439 mm H x 371 mm W x 252 mm D)
Weight	Approx. 103 lbs (46.8 Kg)
Sample Cell Construction	316L Series Polished Stainless Steel
Area Classification	
Certifications	CSA Class I, Division 1 Groups B, C and D; T4; -20°C ≤ Tamb ≤ +50°C, Enclosure Type 4

1. Consult factory for alternative ranges.
2. Supply voltage not to exceed ±10% of nominal. Transient over-voltages according to Overvoltage Category II.

For more information on the SS500XP/SS2000XP analyzer specifications, refer to www.endress.com.

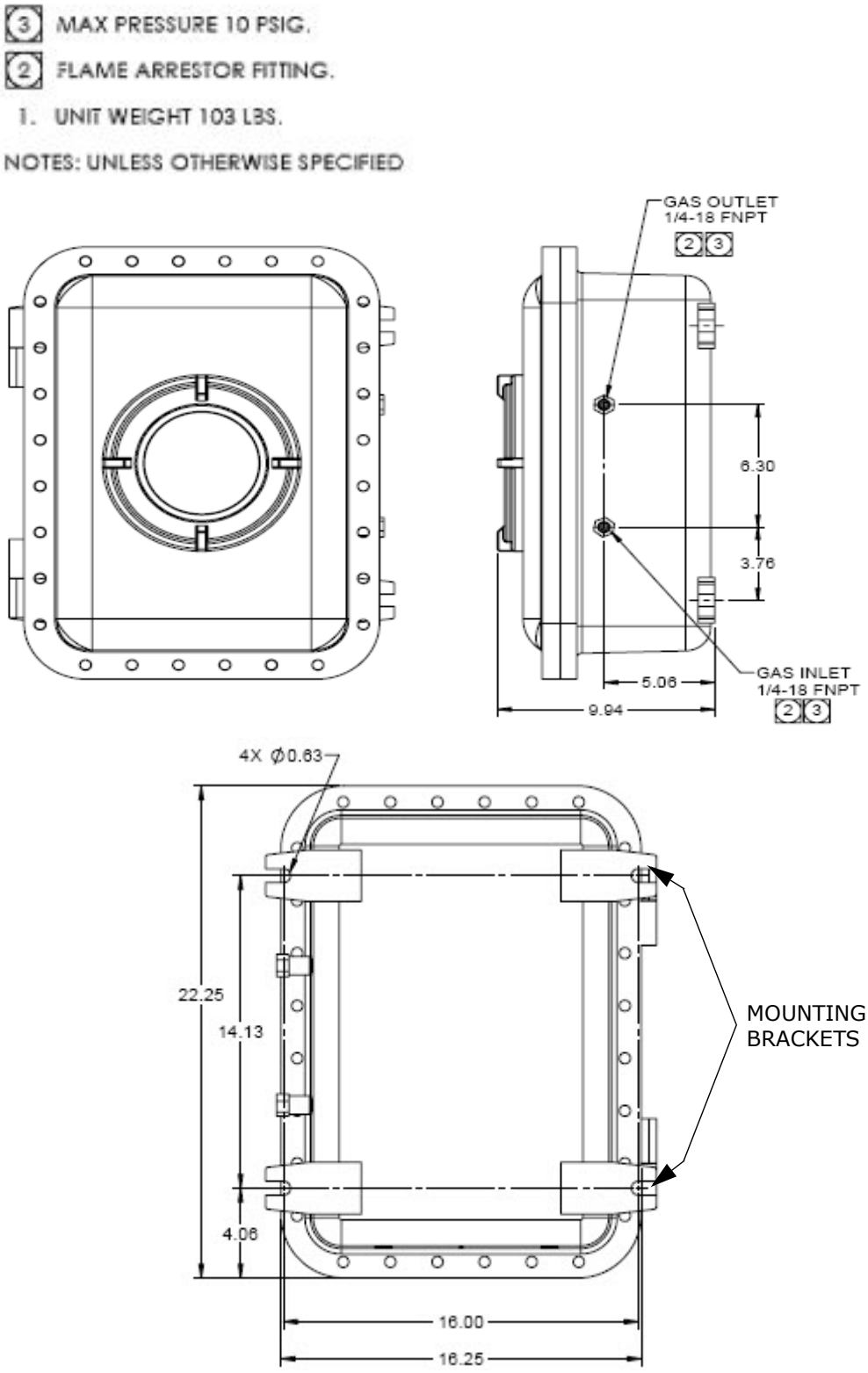


Figure A–1 *SS500XP/SS2000XP outline and mounting dimensions*

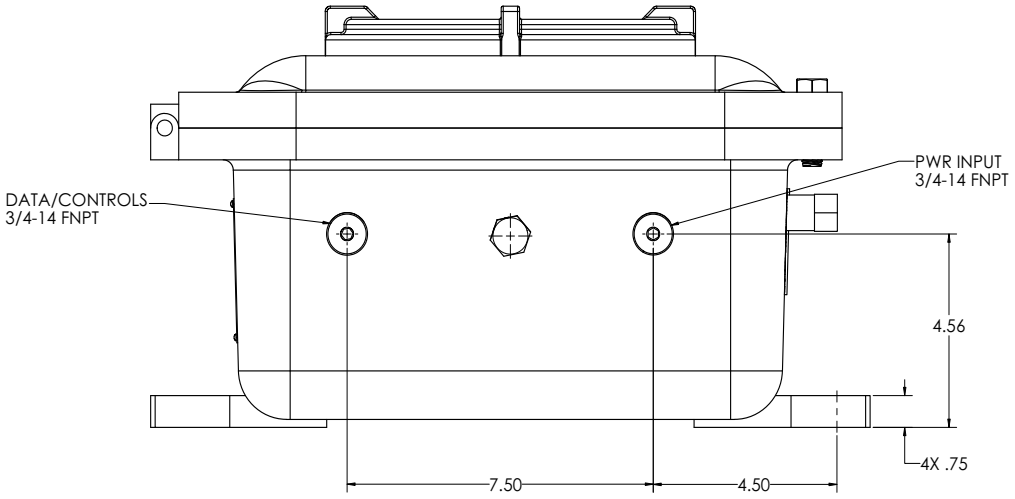


Figure A–2 *SS500XP/SS2000XP bottom view - power and data controls input*

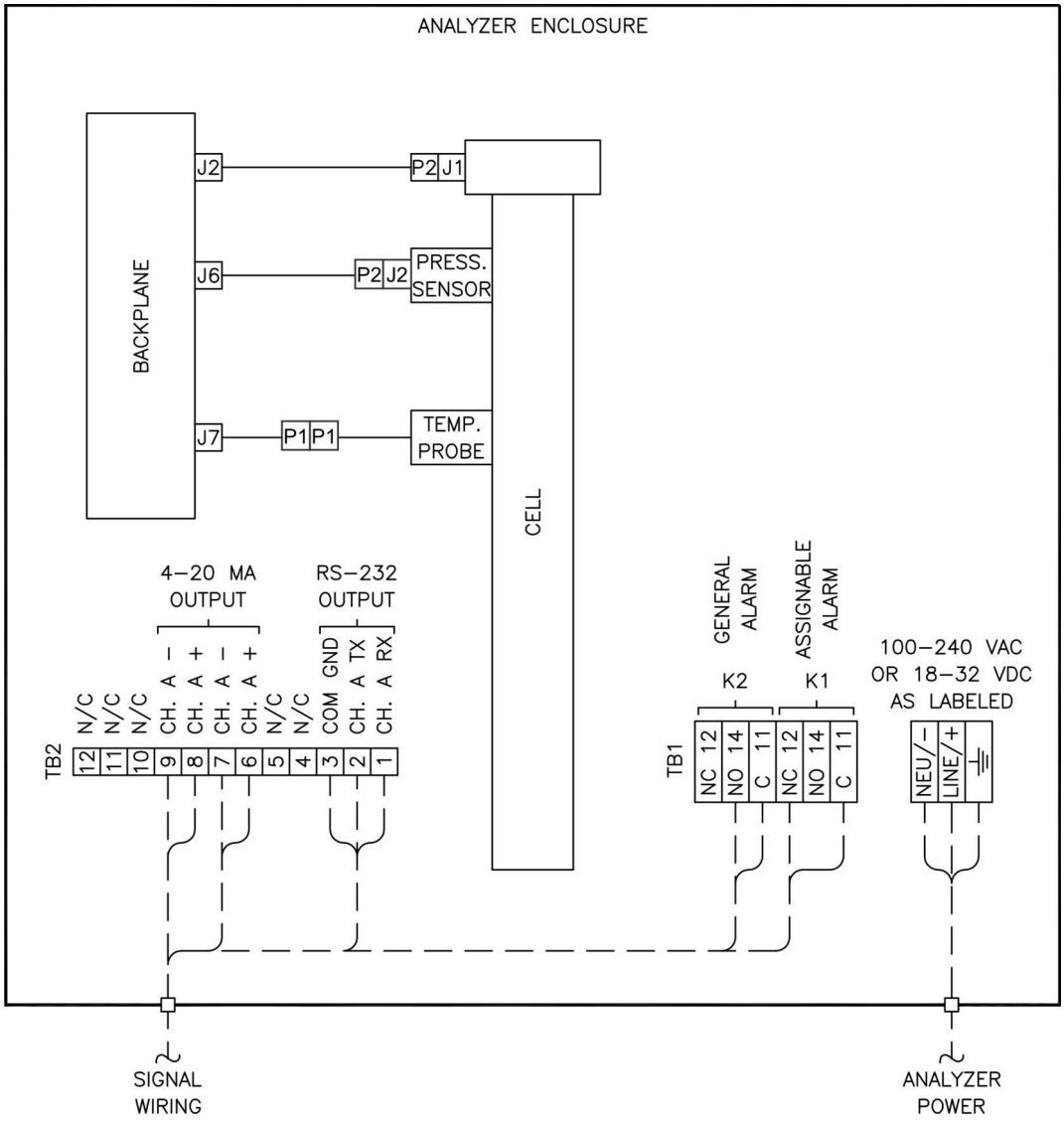


Figure A–3 *Electrical schematic for SS500XP/SS2000XP (customer connections)*

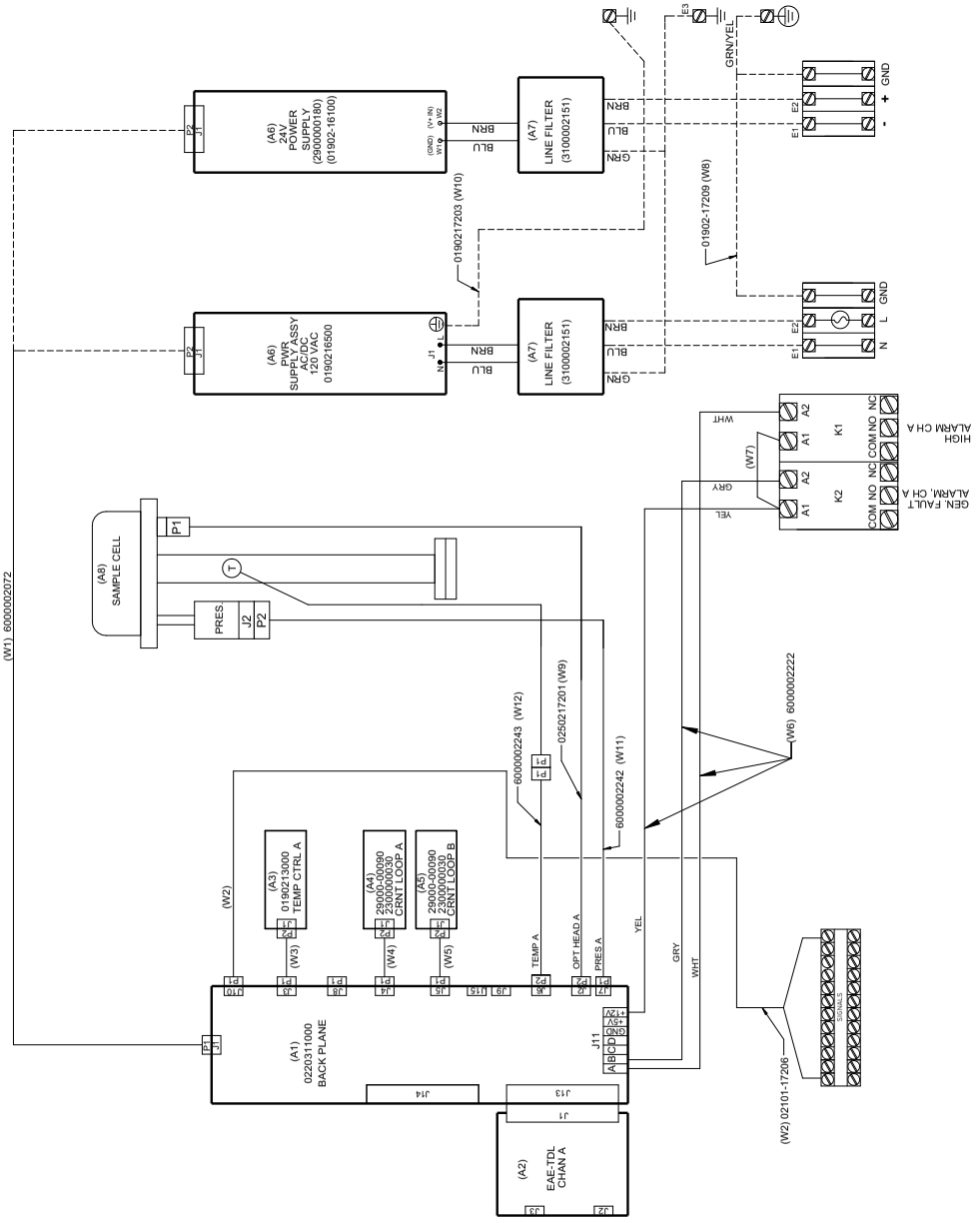


***Figure A–4** Interconnect diagram for single-channel system (SS500XP/SS2000XP)*

Spare Parts

Below is a list of spare parts for the *SS500XP/SS2000XP* analyzers with recommended quantities for 2 years of operation. Due to a policy of continuous improvement, parts and part numbers may change without notice. Not all parts listed are included on every analyzer. When ordering, please specify the system serial number to ensure that the correct parts are identified.

Table A–3 *Replacement parts for SS500XP/SS2000XP analyzers*

Part Number	Description	2 Yr. Qty.
Analyzer		
0190217106	RS-232C Serial Data Cable	1
8000002199	Temperature Control Board [1]	-
0190216400	Power Supply, 24 VDC [1]	-
8000002692	Power Supply, 100-240 VAC 50/60 Hz, CSA [1]	-
0190230011	Keypad Assembly [1]	-
0190231000	Display Assembly	-
0219900005	Kit, O-Rings Viton, 2-Pass Cell [1]	1
0219900011	Kit, Fuse, AC, DC	1
0900002146	Stainless Steel Mirror Replacement	-
Pressure Sensor		
5500002041	Pressure Sensor, 30 PSIA, 5V, 1/8 in. MNPT DIN4365 NACE	-
6000002242	Cable, Pressure Sensor, 10.5 in. [1]	-
General Items		
0219900007	Cleaning Kit, Optical Cell (Domestic U.S./Canada) [1]	1
0219900017	Cleaning Kit, Optical Cell, No Chemicals (International) [1]	1
BA02183C	SS500XP/SS2000XP Operating Instruction, additional copies	-
GP01181C	Device Parameters Manual, additional copies	-

1. Contact Service before attempting replacement. Replacing this component without technical support could cause damage to other components.

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Appendix B: Maintenance and Troubleshooting

This section presents recommendations and solutions to common problems, such as **"Gas Leaks"**, **"Contamination"**, **"Excessive Sampling Gas Temperatures and Pressures"**, and **"Electrical Noise"**. If your analyzer does not appear to be hampered by one of these related problems, direct questions to your **"Service"**.

Gas Leaks

Probably the most common cause of erroneous measurements is outside air leaking into the sample supply line. Endress+Hauser recommends periodically testing the supply lines, especially if the analyzer has been relocated, replaced or returned to the factory for service, and the sample lines have been reconnected.

Do not use plastic tubing of any kind for sample lines. Plastic tubing is permeable to moisture and other substances which can contaminate the sample stream. Using 1/4 in. O.D x 0.035 in. wall thickness, seamless stainless steel tubing is recommended.

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.

Contamination

Contamination and long exposure to high humidity are valid reasons for periodically cleaning the gas sampling lines. Contamination in the gas sampling lines can potentially find its way to the sample cell and deposit on the optics or interfere with the measurement in some other way. Although the analyzer is designed to withstand some contamination, it is recommended to always keep the sampling lines as contamination free as possible. If mirror contamination is suspected, see **"Cleaning the Mirrors"** on page B-2.

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 **Power Fail Error** 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 supply port of the analyzer.
4. Wash the sampling line with 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 supply port of the analyzer.
6. Check all connections for gas leaks. Using a liquid leak detector is recommended.

Excessive Sampling Gas Temperatures and Pressures

The embedded software is designed to produce accurate measurements only within the allowable cell operating range (see Appendix A). Pressures and temperatures outside these ranges will trigger a **P/T Fail Error** fault.

If the pressure, temperature, or any other readings on the LCD appear suspect, they should be checked against the specifications (see Appendix A).

Electrical Noise

High levels of electrical noise can interfere with laser operation and cause it to become unstable. Always connect the analyzer to a properly grounded power source.

Cleaning the Mirrors

If contamination makes its way into the cell and accumulates on the internal optics, a **Power Fail Error** will result. If mirror contamination is suspected, refer to **"Service"** on page B-17 before attempting to clean the mirrors. If advised to do so, use the following procedure.

Do not attempt to clean the cell mirror until you have consulted with **"Service"** *on page B-17 and have been advised to do so.*

The sample cell assembly contains a low-power, 10 mW MAX, CW Class 3b invisible laser with a wavelength between 700 to 3000 nm. Never open the sample cell flanges or the optical assembly unless the power is turned off.

Always handle the optical assembly by the edge of the mount. Never touch the coated surfaces of the mirror.

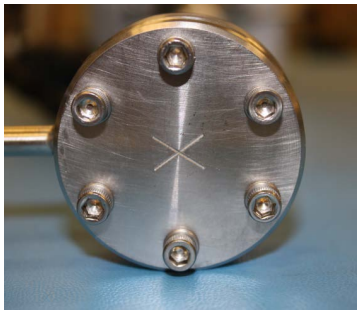
Tools and supplies

- Lens cleaning cloth (Cole Parmer® EW-33677-00 TEXWIPE® Alphawipe® Low-Particulate Clean Room Wipes or equivalent)
- Reagent-grade isopropyl (ColeParmer® EW-88361-80 or equivalent)
- Small drop dispenser bottle (Nalgene® 2414 FEP Drop Dispenser Bottle or equivalent)
- Acetone-impenetrable gloves (North NOR CE412W Nitrile Chemsoft™ CE Cleanroom Gloves or equivalent)
- Hemostat (Fisherbrand™ 13-812-24 Rochester-Pean Serrated Forceps)
- Bulb blower or dry compressed air/nitrogen
- Torque wrench
- Permanent marker
- Flashlight

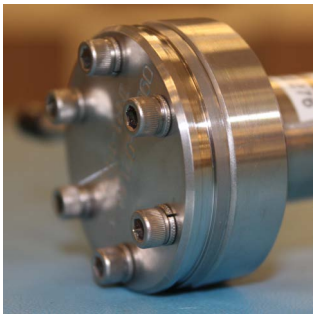
Determining the type of cell mirror

Measurement cells will come equipped with either a glass or stainless steel mirror. The stainless steel mirrors are identified with either an "X" engraved on the outside bottom of the mirror or a groove around the rim of the mirror. Glass mirrors have no external markings. To determine the type of mirror being used for the system cell:

1. Feel at the bottom of the cell for the engraved "X" marking or grooved rim. Refer to Figure B–1 below.



MIRROR MARKED WITH 'X'



MIRROR GROOVED RIM - SIDE VIEW

Figure B–1 *Stainless steel mirror marking*

a. If the surface is smooth, a glass mirror is being used.

b. If the surface is rough, or an engraving is detected, a stainless steel mirror is being used.

Do not attempt to replace a glass mirror with a stainless steel mirror or system calibration may be adversely affected.

To clean either a glass or stainless steel mirror, refer to the instructions **"To clean the mirrors"** on page B-4. To replace a stainless steel mirror, refer to the instructions for **"To replace the stainless steel mirrors"** on page B-5.

To clean the mirrors

1. Power down the analyzer following the procedure outlined in **"To power down the analyzer"** in the Firmware Operator's Manual.
2. Isolate the analyzer from the sample bypass flow by following the procedure outlined in **"Isolating the Measurement Cell for Short-term Shutdown"** in the SCS Operating Instruction.
3. If possible, purge the system with nitrogen for 10 minutes.
4. Carefully mark the orientation of the mirror assembly on the cell body.

Careful marking of the mirror orientation is critical to restoring system performance upon reassembly after cleaning.

5. Gently remove the mirror assembly from the cell by removing the six socket-head cap screws and set on a clean, stable and flat surface
6. Look inside the sample cell at the top mirror using a flashlight to ensure that there is no contamination on the top mirror.

*Cleaning of the top mirror is not recommended. Refer to **"Packing"** on page B-18.*

7. Remove dust and other large particles of debris using a bulb blower or dry compressed air/nitrogen. Pressurized gas duster products are not recommended as the propellant may deposit liquid droplets onto the optic surface.
8. Put on clean acetone-impenetrable gloves.

9. Double fold a clean sheet of lens cleaning cloth and clamp near and along the fold with the hemostats or fingers to form a "brush."
10. Place a few drops of isopropyl onto the mirror and rotate the mirror to spread the liquid evenly across the mirror surface.
11. With gentle, uniform pressure, wipe the mirror from one edge to the other with the cleaning cloth only once and only in one direction to remove the contamination. Discard the cloth.

Never rub an optical surface, especially with dry tissues, as this can mar or scratch the coated surface.

12. Repeat with a clean sheet of lens cleaning cloth to remove the streak left by the first wipe. Repeat, if necessary, until there is no visible contamination on the mirror.
13. Carefully replace the mirror assembly onto the cell in the same orientation as previously marked making sure the O-Ring is properly seated.
14. Tighten the 6 socket-head cap screws evenly with a torque wrench to **13 in-lbs**.

Replacing the stainless steel mirror

To replace the stainless steel mirrors

If your system has been configured with a stainless steel mirror and cleaning has not resolved the contamination issue, use the following instructions to replace the mirror.

If stainless steel mirrors are replacing another version of mirror in the field, such as glass, the analyzer may need to be returned to the factory for re-calibration to ensure optimal cell function. Refer to ***"Packing"*** *on page B-18.*

1. Power down the analyzer following the procedure outlined in the section called **"Powering Down the Analyzer"** in the Firmware Operator's Manual.
2. Isolate the analyzer from the sample bypass flow by shutting off the appropriate valve(s) and/or pressure regulator.

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

3. If possible, purge the measurement cell with nitrogen for 10 minutes.

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.

4. Gently remove the mirror assembly from the cell by removing the socket-head cap screws and set on a clean, stable and flat surface.

The sample cell assembly contains a low-power, 10 mW MAX, CW Class 3b invisible laser with a wavelength between 750 to 3000 nm. Never open the sample cell flanges or the optical assembly unless the power is turned off.

Always handle the optical assembly by the edge of the mount. Never touch the optical surfaces of the mirror.

5. Confirm need to replace mirror due to contamination. If yes, set mirror aside.
6. Put on clean acetone-impenetrable gloves.
7. Obtain the new stainless steel mirror. Refer to Figure B–2.

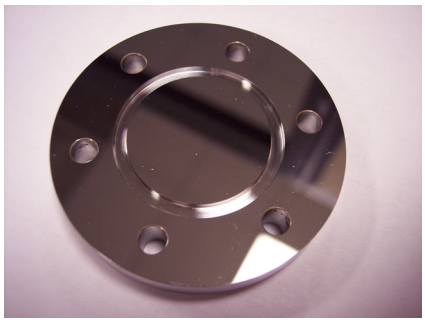


Figure B–2 *Stainless steel mirror; mirror side up*

8. Check the O-Ring.
   a. If a new O-Ring is needed, apply grease on fingertips and then to the new O-Ring.
   b. Place newly greased O-Ring into the groove around the outside of the mirror taking care not to touch the mirror surface.
9. Carefully place the new stainless steel mirror onto the cell making sure the O-Ring is properly seated.

10. Tighten the socket-head cap screws evenly with a torque wrench to 13 in-lbs.

Pressure Sensor Replacement

A pressure sensor may need to be replaced in the field as a result of one or more of the following conditions:

- Loss of pressure reading
- Incorrect pressure reading
- Pressure sensor not responding to pressure change
- Physical damage to the pressure sensor

Use the following information to replace a pressure sensor.

Tools and materials:

- 9/16 in. wrench
- 7/8 in. wrench
- 9-64 in. Allen wrench
- Flat-head screwdriver
- Phillips-head screwdriver
- Metal pick
- Military grade stainless steel PTFE tape (or equivalent)
- Dry nitrogen
- Isopropyl alcohol

Alcohol can be hazardous. Follow all safety precautions when in use and thoroughly wash hands prior to eating.

To replace the pressure sensor

1. Close the external flow of gas to the sample conditioning system (SCS) at the sample inlet.
2. Purge the system by connecting dry nitrogen to the sample inlet. Allow the SCS to purge for 5 to 10 minutes.
3. Close the nitrogen flow.
4. Power off the system. Refer to the Device Parameters manual for this analyzer for **"Powering down the analyzer"**.

5. Open the door to the Analyzer. Refer to Figure B–3. In this view, the old model pressure sensor is pictured.

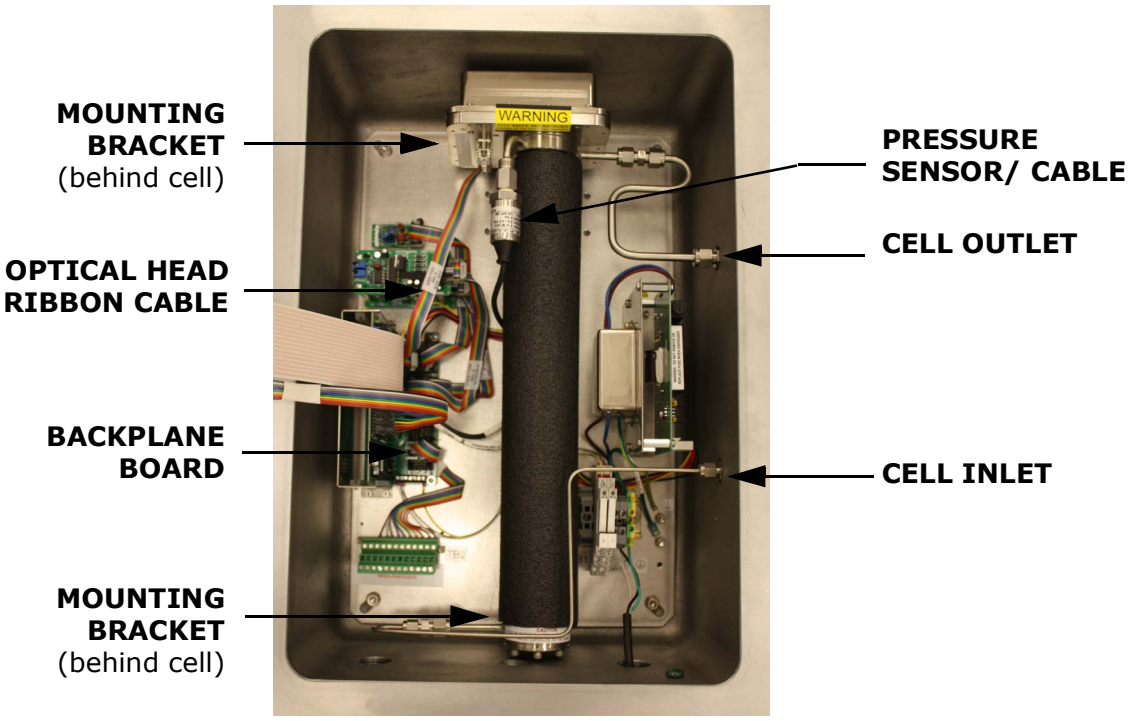


Figure B–3 *SS2000XP cabinet interior*

Depending on the manner in which the analyzer is mounted, removing the cell may not be necessary. If the cell is not removed for pressure sensor replacement, skip to step 13.

6. Remove the optical cable harness using a flat-head screwdriver.
7. Disconnect the cell inlet using a 9/16 in. wrench.
8. Disconnect the cell outlet using a 9/16 in. wrench.
9. Disconnect the thermistor cable at the circular connector.
10. Remove the pressure sensor cable from the circular connector inside the enclosure.

    For new model pressure sensors with quick-disconnects, detach the pressure sensor cable from the pressure sensor at the connector using a Phillips-head screwdriver. Do not remove the black connector from the cable inside the enclosure.

11. Dismount the cell from the bracket by removing the four securing screws (two on top, two on the bottom) using a 9/64 in. Allen wrench.

12. Place the measurement cell on a clean, flat surface with the pressure sensor facing up. Refer to Figure B–4.

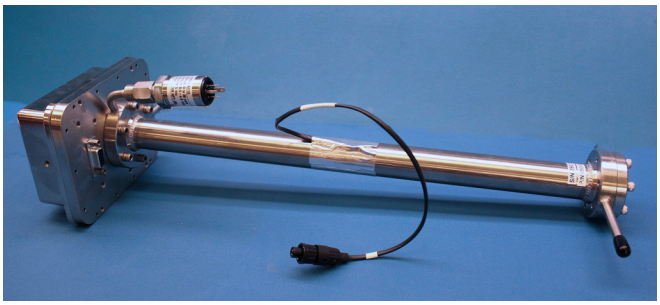


Figure B–4 *Removed measurement cell with pressure sensor face up*

Orient the measurement cell to avoid any debris from entering the cell.

13. Using a 9/16 in. wrench, secure the flange while using a 7/8 in. wrench to remove the old pressure sensor. Refer to Figure B–5.

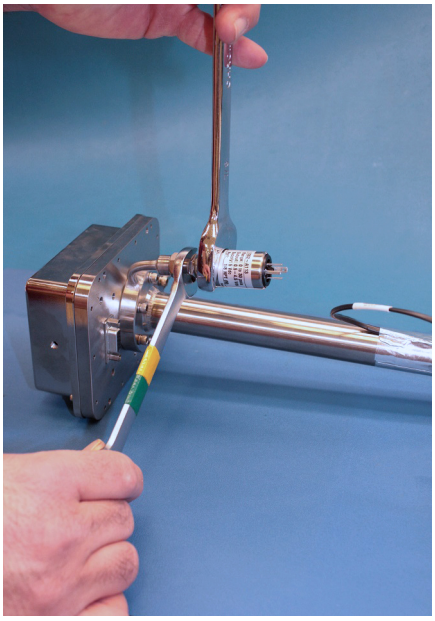


Figure B–5 *Removing the old pressure sensor*

a. Hold the wrench on the flange stable and parallel to the surface. Do not allow the 9/16 in. wrench to move.

b. Turn the 7/8 in. wrench counterclockwise to loosen the pressure sensor until it is able to be removed.

14. Remove excess seal tape from the flange opening and threads and check threads for galling. Refer to Figure B–6.

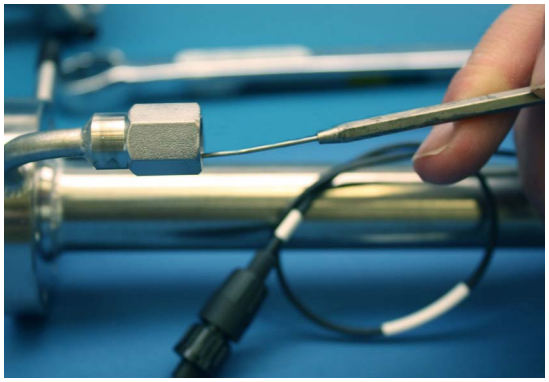


Figure B–6 *Removing excess seal tape from flange*

Threads showing signs of galling indicate a possible leak. Refer to ***"Service"*** *on page B-17 to arrange for repair.*

15. Remove the new pressure sensor from the packaging. Retain the black connector cap on the sensor — do not remove.

16. Wrap stainless steel PTFE tape around the threads at the top of the pressure sensor, beginning from the base of the threads to the top, approximately three times taking care to avoid covering the top opening. Refer to Figure B–7.

Figure B–7 *Replacing seal tape*

17. Insert the new pressure sensor into the threaded flange keeping the sensor parallel to the surface for proper fitting.

18. Hand tighten the pressure sensor turning it counterclockwise into the flange until no longer moving freely. Refer to Figure B–8.

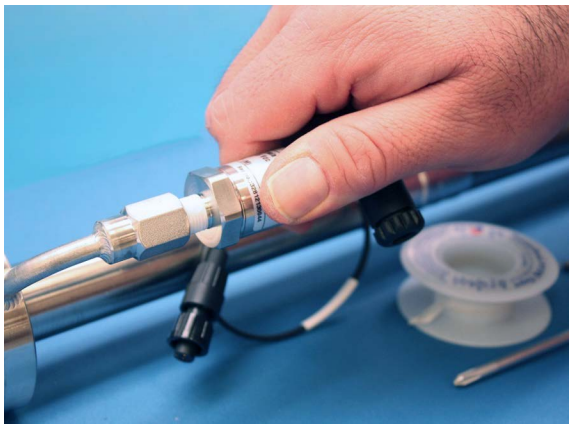


Figure B–8 *Replacing pressure sensor*

19. Using the 9/16 in. wrench to hold the flange in place, turn the sensor clockwise with a 7/8 in. wrench until tight. Two or three threads on the pressure sensor should still be visible.

Make sure the black connector at the bottom of the pressure sensor is facing up from the measurement cell, or forward towards the enclosure door. Refer to Figure B–9.

Figure B–9 *Newly installed pressure sensor positioning*

20. Remove the black connector from the pressure sensor and discard.

21. Connect the new harness/cable to the new pressure sensor.

If the new model pressure sensor cable is currently installed in the SCS, reattach the cable to the pressure sensor after the cell has been remounted. If the cell was not removed, skip steps 22 through 25.

22. Remount the cell to the mounting brackets using a 9/64 in. Allen wrench with the pressure sensor facing forward.
23. Reinstall cell inlet and cell outlet using a 9/16 in. wrench.
24. Reconnect the thermistor.
25. Reconnect the optical cable harness to the backplane board.
26. Connect the new pressure sensor cable to the backplane board.
27. Close the door.
28. Conduct a leak test to determine that the new pressure sensor is not leaking.

Do not allow cell to exceed 10 PSIG or damage could occur.

*For any questions related to leak testing the pressure sensor, refer to **"Service"** on page B-17.*

29. Turn the system power on. Refer to the Device Parameters manual for this analyzer for **"Powering up the analyzer"**.
30. Run a validation on the analyzer. Refer to the Device Parameters manual for instructions to **"Start Validation."**

    a. If the system passes, the pressure sensor replacement is successful.

    b. If the system does not pass, refer ***"Service"*** on page B-17 for instruction.

Peak Tracking Reset Procedure

The analyzer's software is equipped with a peak tracking function that keeps the laser scan centered on the absorption peak. Under some circumstances, the peak tracking function can get lost and lock onto the wrong peak. If the difference between **PkDf** and **PkD1** is more than 4, or **Track Fail Error** is displayed, the peak tracking function should be reset. Refer to Device Parameters for this analyzer for instruction.

Instrument Problems

If the instrument does not appear to be hampered by gas leaks, contamination, excessive sampling gas temperatures and pressures, or electrical noise, refer to Table B–1 before contacting **"Service"** on page B-17.

Table B–1 *Potential instrument problems and solutions*

Symptom	Response
Non-Operation (at start up)	Is the power connected to both the analyzer and power source? Is the switch on?
Non-Operation (after start up)	Is the power source good? (100 to 250 VAC @ 50 to 60 Hz, 9 to 16 VDC, 18 to 32 VDC).
	Check fuse(s). If bad, replace with equivalent amperage, slow-blow fuse.
	Contact a factory sales representative for service information.
Power Fail Error	Turn off the power to the unit and check the optical head cables for a loose connection. **Do not disconnect or reconnect any optical head cables with the power connected.**
	Check the inlet and outlet tubes to see if they are under any stress. Remove the connections to the inlet and outlet tubes and see if the power goes up. The existing tubing may need to be replaced with stainless steel flexible tubing.
	Possible mirror contamination issue. Contact a factory sales representative for service information. If advised to do so, clean the mirrors by following the instructions under **"To clean the mirrors"** on page B-4.
	Possible alignment problem. Contact a factory sales representative for service information.
	Capture diagnostic data and send the file to Endress+Hauser (refer to **"To read diagnostic data with HyperTerminal"** in the Device Parameters manual).
	Verify Power Fail error. Refer to Device Parameters for instruction.

Table B-1 *Potential instrument problems and solutions (Continued)*

Symptom	Response
Null Fail Error	Refer to the Device Parameters manual to verify a **Null Fail Error** fault.
	Move the jumper JMP1 on the HC12 main board next to the pre-pot.
	Capture diagnostic data and send the file to Endress+Hauser (refer to **"To read diagnostic data with HyperTerminal"** in the Device Parameters manual).
Spectrum Fail Error	Turn off the power to the unit and check the optical head cables for a loose connection. **Do not disconnect or reconnect any optical head cables with the power connected.**
	Turn the analyzer off for 30 seconds and then turn it on again.
	Reset the peak tracking.
	Capture diagnostic data and send the file to Endress+Hauser (refer to **"To read diagnostic data with HyperTerminal"** in the Device Parameters manual).
Track Fail Error	Refer to the Device Parameters manual for instruction on system faults.
	Reset the peak tracking.
P/T Fail Error	Check that the actual pressure in the measurement cell is within specification (see Appendix A).
	If the pressure reading is incorrect, check that the pressure/temperature cable is tight. Check the connector on the pressure sensor. Check the pressure connector on the backplane board.
	Check that the actual temperature in the measurement cell is within specification (see Appendix A).
	If the temperature reading is incorrect, check that the pressure/temperature cable is tight. Check the connector on the cell temperature sensor. Check the temperature connector on the backplane board. (**Note**: A temperature reading greater than 150 °C (302 °F) indicates a short circuit on the temperature sensor leads; a reading of less than -40 °C (-40° F) indicates an open circuit).

Table B-1 *Potential instrument problems and solutions (Continued)*

Symptom	Response
Front panel display is not lit and no characters appear	Check for correct voltage on terminal block input. Observe polarity on DC powered units.
	Check for correct voltage after fuses.
	Check for 5 VDC on red wires, 12 VDC on yellow wires, and 24 VDC on orange wires from power supply (black wires are ground).
	Check connections on display communication and power cables.
Strange characters appear on front panel display	Check connections on display communication cable.
Reading seems to always be low by a fixed amount	Refer to the Device Parameters manual for **"Adjusting Analyzer Reading to Match Specific Standard(s)"**.
	Capture diagnostic data and send the file to Endress+Hauser (refer to **"To read diagnostic data with HyperTerminal"** in the Device Parameters manual).
No reading on device connected to current loop	Make sure that connected device can accept a 4–20 mA signal. The analyzer is set to source current.
	Make sure the device is connected to the correct terminals on the green connector (see Figure 3–2 on page 3–7).
	Check the open circuit voltage (35 to 40 VDC) across the current loops terminals on the green connector (see Figure 3–2 on page 3–7).
	Replace the current loop device with a milliampere meter and look for current between 4 mA and 20 mA. A voltmeter connected across a 249-ohm resistor can be used instead of the milliampere meter; it should read between 1 and 5 volts.
Reading seems to always be low by a fixed percentage	Refer to the Device Parameters manual for **"Adjusting Analyzer Reading to Match Specific Standard(s)"**.
Reading seems to always be high by a fixed percentage	Refer to the Device Parameters manual for **"Adjusting Analyzer Reading to Match Specific Standard(s)"**.
	Capture diagnostic data and send the file to Endress+Hauser (refer to **"To read diagnostic data with HyperTerminal"** in the Device Parameters manual).

Table B-1 *Potential instrument problems and solutions (Continued)*

Symptom	Response
Reading seems to always be high by a fixed amount	Refer to the Device Parameters manual for **"Adjusting Analyzer Reading to Match Specific Standard(s)"**.
	Capture diagnostic data and send the file to Endress+Hauser (refer to **"To read diagnostic data with HyperTerminal"** in the Device Parameters manual).
Reading is erratic or seems incorrect	Check for contamination in the sample system, especially if the readings are much higher than expected.
	Capture diagnostic data and send the file to Endress+Hauser (refer to **"To read diagnostic data with HyperTerminal"** in the Device Parameters manual).
Reading goes to full scale	If **4–20 mA Alarm Action** is set to **1**, look on display for a fault message (refer to the Device Parameters manual for instruction on system faults and **"To change parameters in Mode 2"**).
	Gas concentration is greater than or equal to full scale value.
Reading goes to "0"	If **4–20 mA Alarm Action** is set to **0**, look on display for a fault message (refer to the Device Parameters manual for instruction on system faults and **"To change parameters in Mode 2"**).
	Gas concentration is equal to zero.
Serial output is providing no data	Make sure the computer COM port is set for 19200 baud, 8 data bits, 1 stop bit, no parity, and no flow control.
	Be sure no other programs are using the COM port selected.
	Make sure the connections are good. Verify the correct pin connections with an ohmmeter.
	Make sure to select the correct COM port into which the cable is plugged.

Table B-1 *Potential instrument problems and solutions (Continued)*

Symptom	Response
Serial output is displaying garbled data	Make sure the computer COM port is set for correct baud, 8 data bits, 1 stop bit, no parity, and no flow control.
	Be sure no other programs are using the COM port selected.
	Make sure the connections are good. Verify the correct pin connections with an ohmmeter.
	Make sure to select the correct COM port that the cable is plugged into.
Current loop is stuck at 4 mA or 20 mA	On the current loop board, check the voltage between the end of resistor R1 closest to the jumper and ground. If the concentration reading is high, the voltage should be near 1 VDC. If the concentration reading is low, the voltage should be near 4.7 VDC. If not, the problem is probably on the HC12 main board. Return to factory for service.
Current loop is stuck at 4 mA or 20 mA (Continued)	Check display for fault message. If alarm has been triggered, reset the alarm. Refer to the Device Parameters manual for instruction on resetting alarms.
LCD does not update. Unit is locked up.	Switch off power, wait 30 seconds, and then switch power back on.
LCD does not update. Unit is locked up.	Switch off power, wait 30 seconds, and then switch power back on.
	Gas concentration is equal to zero.
Pressing keys on front panel does not have specified effect	Check connections on keypad cable.

Service

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

Service repair order

If returning the unit is required, obtain a **Service Repair Order** (**SRO**) **Number** from Service before returning the analyzer to the factory. Your service 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

Renewity returns

Returns can also be made inside the USA through the Renewity system. From a computer, navigate to http://www.us.endress.com/return and complete the online form.

Before contacting Service

Before contacting Service, prepare the following information to send with your inquiry:

- Analyzer serial number (SN)
- Diagnostic downloads using the procedures provided in the associated Device Parameters manual or using AMS100 software from Endress+Hauser
- Contact information
- Description of the problem or questions

Access to the information above will greatly expedite our response to your technical request.

Packing

Endress+Hauser's SS500XP and SS2000XP analyzers and auxiliary equipment are shipped from the factory in appropriate packaging. Depending on the size and weight, the packaging may consist of a cardboard-skinned container or a wooden crate. All inlets and vents are capped and protected when packaged for shipment.

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 analyzer has been installed and or operated (even for purposes of a demonstration), the system should first be decontaminated (purged with an inert gas) before powering down the analyzer.

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 of the sample and prescribed safety precautions before installing, operating or maintaining the analyzer.

To prepare the analyzer for shipment or storage

1. Shut off the process gas flow.
2. Allow all residual gas to dissipate from the lines.
3. Connect a purge supply, regulated to the specified sample supply pressure, to the sample supply port.
4. Confirm that any valves controlling the sample flow effluent to the low pressure flare or atmospheric vent are open.
5. Turn on the purge supply and purge the system to clear any residual process gases.
6. Turn off the purge supply.
7. Allow all residual gas to dissipate from the lines.
8. Close any valves controlling the sample flow effluent to the low pressure flare or atmospheric vent.
9. Disconnect power to the system.
10. Disconnect all tubing and signal connections.
11. Cap all inlets and outlets to prevent foreign material such as dust or water from entering the system.
12. Pack the equipment in the original packaging in which it was shipped, if available. If the original packaging material is no longer available, the equipment should be adequately secured (to prevent excessive shock or vibration).
13. If returning the analyzer to the factory, complete the Decontamination Form provided by Endress+Hauser **"Service"** and attach to the outside of the shipping package as instructed before shipping.

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.

Disclaimers

Endress+Hauser accepts no responsibility for consequential damages arising from the use of this equipment. Liability is limited to replacement and/or repair of defective components.

Warranty

For a period of 18 months from date of shipment or 12 months in operation, whichever comes first, Endress+Hauser warrants that all products sold by it shall be free from defects in material and workmanship under normal use and service when correctly installed and maintained. Endress+Hauser's sole liability and Customer's sole and exclusive remedy for a breach of warranty is limited to Endress+Hauser's repair or replacement (at Endress+Hauser’s sole option) of the product or part thereof which is returned at Customer's expense to Endress+Hauser’s plant. This warranty shall apply only if Customer notifies Endress+Hauser in writing of the defective product promptly after the discovery of the defect and within the warranty period. Products may only be returned by Customer when accompanied by a return authorization reference number (SRO) issued by Endress+Hauser. Freight expenses for products returned by Customer will be prepaid by Customer. Endress+Hauser shall pay for shipment back to Customer for products repaired under warranty. For products returned for repair that are not covered under warranty, Endress+Hauser’s standard repair charges shall be applicable in addition to all shipping expenses.

INDEX

Numerics

A

B

C

D

E

F

G

H

I

L

M

N

O

P

R

S

T

W

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