Operating Instruction
SS2100a TDLAS Gas Analyzer

ATEX: Zone 2

Endress+Hauser
People for Process Automation

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1 - INTRODUCTION

Endress+Hauser SS2100a 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. In order to ensure that the gas 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 SS2100a gas analyzer hardware installation and maintenance through step-by-step instructions for:

- Inspecting the analyzer and sample conditioning system (SCS)
- Mounting and connecting the analyzer and SCS
- Maintaining and troubleshooting the system

For instruction on operating the gas analyzer through firmware programming, please consult the associated firmware manual for this gas analyzer. Refer to **"Determining firmware version"** on page 1-5.

Who Should Read This Manual

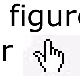
This manual should be read and referenced by anyone installing, operating or having direct contact with the SS2100a gas analyzer.

How to Use This Manual

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

This manual addresses most common options and accessories available for the SS2100a gas analyzer. Images, tables and charts are included to provide a visual understanding of the gas 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.

Conventions used in this manual

This manual includes "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.

General Cautions and Symbols

Instructional icons are provided in this manual and on the SS2100a analyzer 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.).*

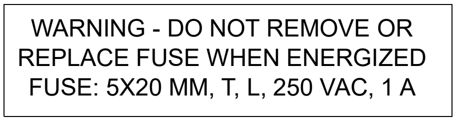
***Toxins**. Endress+Hauser analyzers measure a variety of gases, including high-level H_2S. Follow all safety protocols governing toxic gases and potential leaks.*

***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, 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

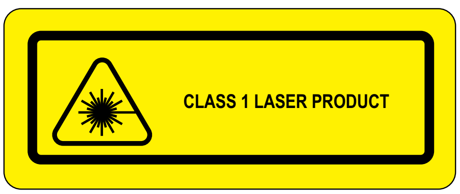
The following special safety symbols and labeling are used on the equipment to alert the user to potential hazards and important information associated with the gas analyzer. Every symbol and label has significant meaning that should be heeded.



ENERGIZED FUSE WARNING *- Do not remove or replace fuse when energized.*

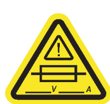
INVISIBLE LASER RADIATION *- Avoid exposure to beam. Class 3b Radiation Product. Refer servicing to the manufacturer or qualified personnel.*

CLASS 3B LASER PRODUCT*- Invisible laser radiation. Avoid direct exposure to beam. Class 3b laser product.*



CLASS 1 LASER PRODUCT *- Invisible laser radiation when open. Avoid direct exposure to the beam.*

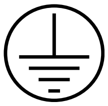
DO NOT REMOVE *- Removing label from measurement cell optical head will void analyzer warranty.*



FUSE RATING *- Maximum voltage and current specifications for the fuse closest to label.*

HAZARDOUS VOLTAGE *- Contact may cause electric shock or burn. Turn off and lock out system power before servicing.*

GENERAL WARNING *- Failure to follow all directions may result in damage or malfunction of the analyzer.*



***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.*

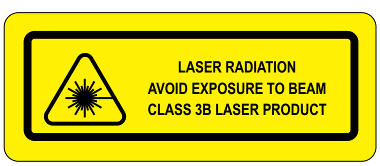
Instructional symbols

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

Failure to follow all directions or substitution of components may result in explosion.

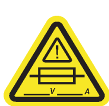
*Warning statement for **hazardous voltage**. Contact may cause electric shock or burn. Turn off and lock out system before servicing.*

Failure to follow all directions may result in 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 gas analyzer.



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

About the Gas Analyzers

Endress+Hauser gas analyzers 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 presences 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.

Sample conditioning system

A sample conditioning system (SCS) is included with this gas analyzer. The SCS has been specifically designed to deliver an optimum sample stream that is representative of the process systems stream at the time of sampling. Most SS2100a analyzer systems are configured for use at extractive natural gas sampling stations.

Determining firmware version

When the analyzer is powered on for the first time, the firmware version will display on the system LCD for approximately seven seconds. Refer to "**Powering Up the Analyzer**" in the Device Parameters for this analyzer for operational instructions. The firmware version for each analyzer is also listed on the analyzer calibration certificate.

How the Gas Analyzers Work

The SS2100a gas analyzers employ tunable diode laser absorption spectroscopy (TDLAS) to measure the concentration of single compounds in gas mixtures. In its simplest form, a tunable 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 SS2100a gas analyzers, sample gas flows continuously through the sample cell ensuring that the sample is always representative of the flow in the main pipe.

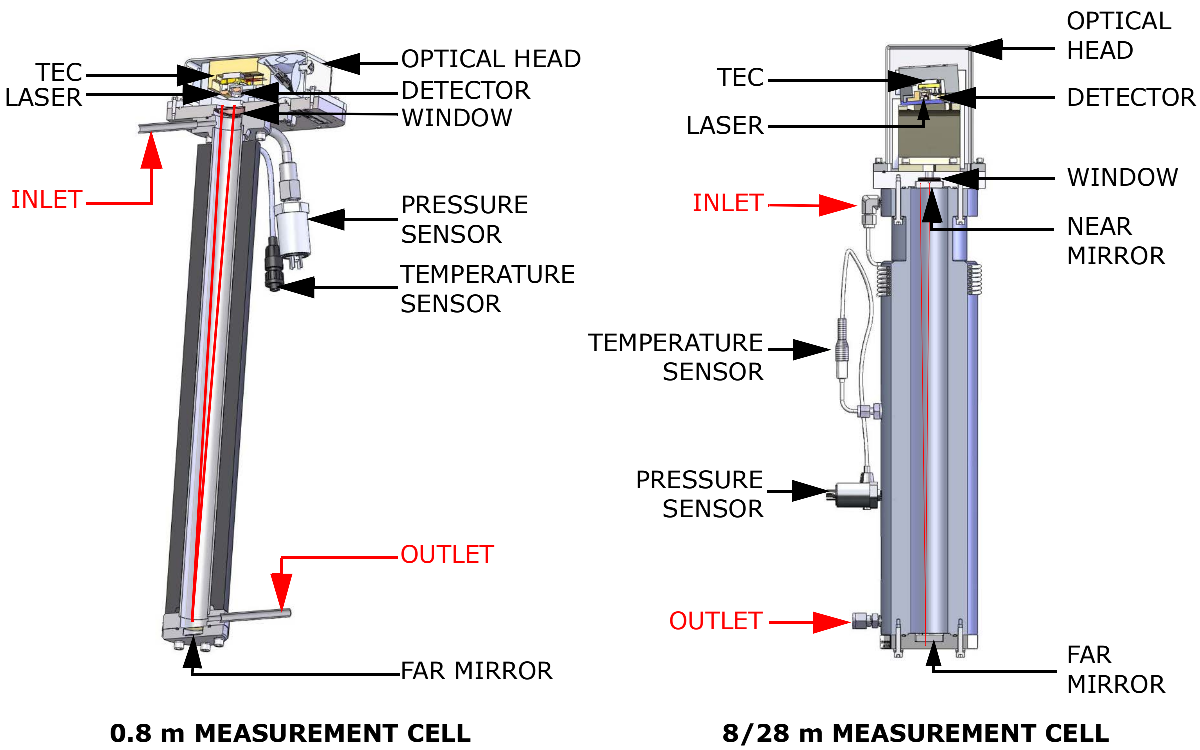


Figure 1–1 *Schematic of a typical laser diode absorption spectrometer*

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 l (cell length x number of passes), is given by

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

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

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

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 intensity to mirror contamination).

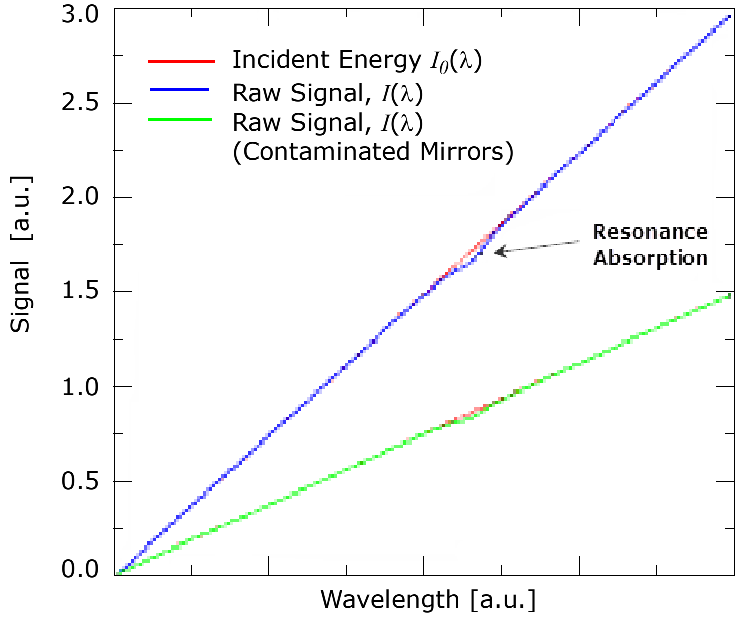


Figure 1–2 *Typical raw signal from a laser diode absorption spectrometer with and without mirror contamination*

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.

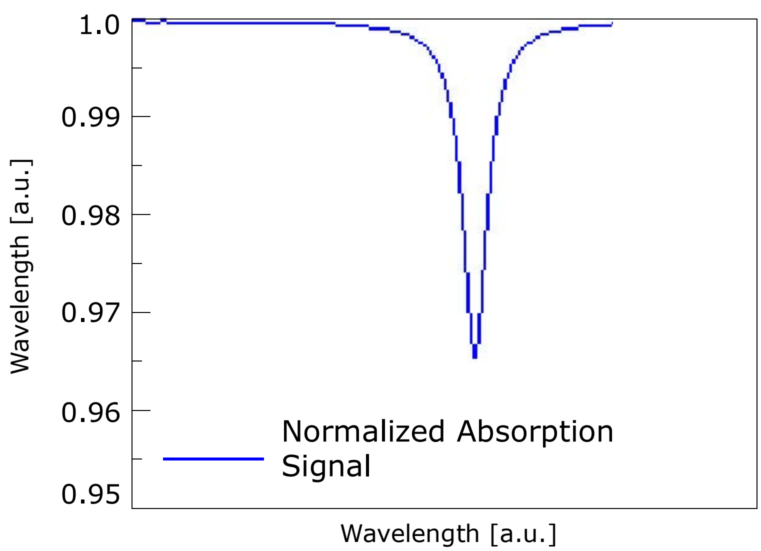


Figure 1–3 *Typical normalized absorption signal from a laser diode absorption spectrometer*

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.

Differential TDLAS

Similar to TDLAS, this Endress+Hauser technology involves subtracting two spectrums from one another. A “dry” spectrum, a response from the sample when the analyte of interest has been completely removed, is subtracted from the “wet” spectrum, a response from the sample when the analyte is present. The remainder is a spectrum of the pure analyte. This technology is used for very low or trace measurements and is also useful when the background matrix changes over time.

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 ($2f$). Refer to 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.

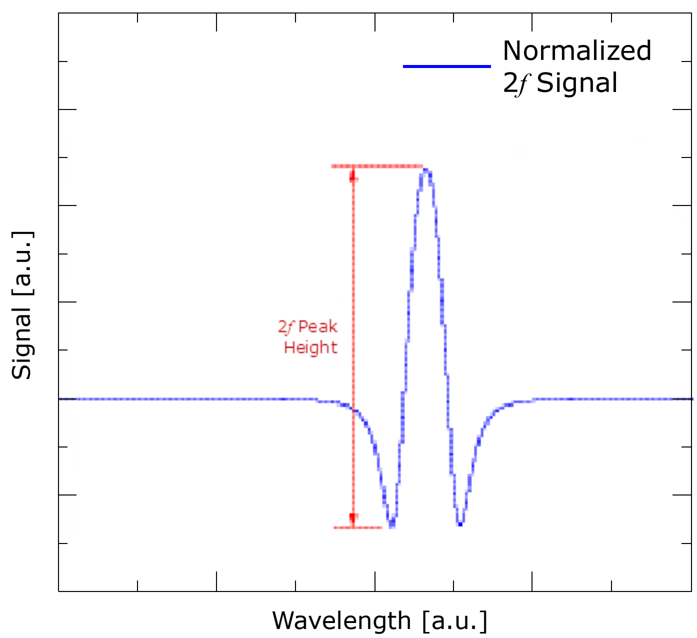


Figure 1–4 *Typical normalized $2f$ signal; species concentration is proportional to the peak height*

With the resulting low-noise signal and use of fast post-processing algorithms, reliable parts per million (ppm) or parts per billion (ppb) 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 similar design and hardware platforms. Measuring different trace gases in various mixed hydrocarbon background streams is accomplished by selecting a different optimum diode laser wavelength between 700 to 3000nm, which provides the least amount of sensitivity to background stream variations.

Getting Familiar with the Gas Analyzer

The analyzer consists of three modules; the gas analyzer electronics enclosure, the sample cell and the sample conditioning system (SCS). Figure 1–5 shows the front, rear and bottom exterior of the gas analyzer electronics. On the front cover, the keypad and LCD display serve as the user interface to the gas analyzer. The power, solenoid valve and sample cell wiring gland connections are made via access ports on the bottom module of the analyzer. Refer to Figure 1–6. Four sturdy feet on the back of the enclosure serve as attachment points for mounting the gas analyzer.

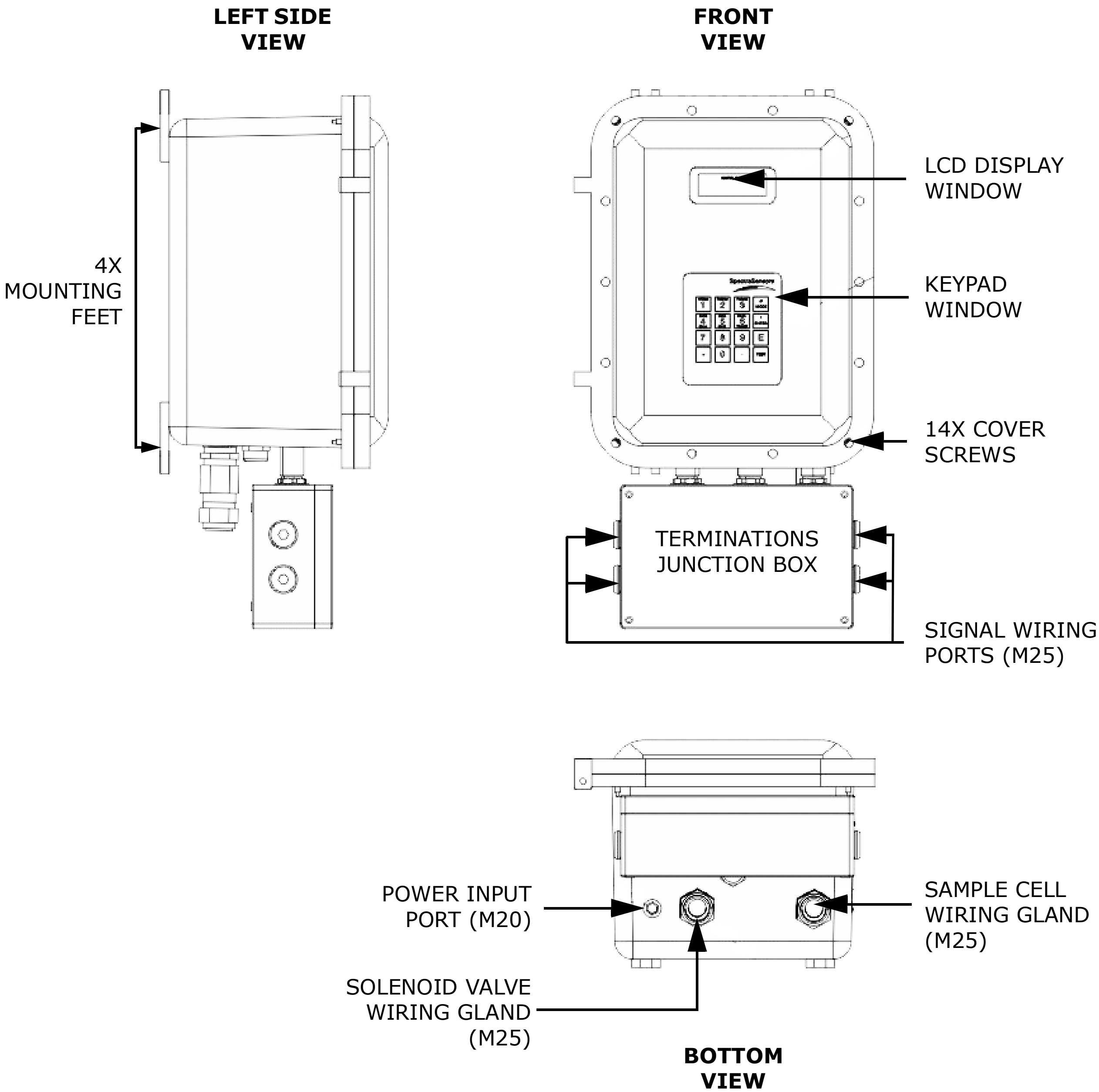


Figure 1–5 *External features of the analyzer*

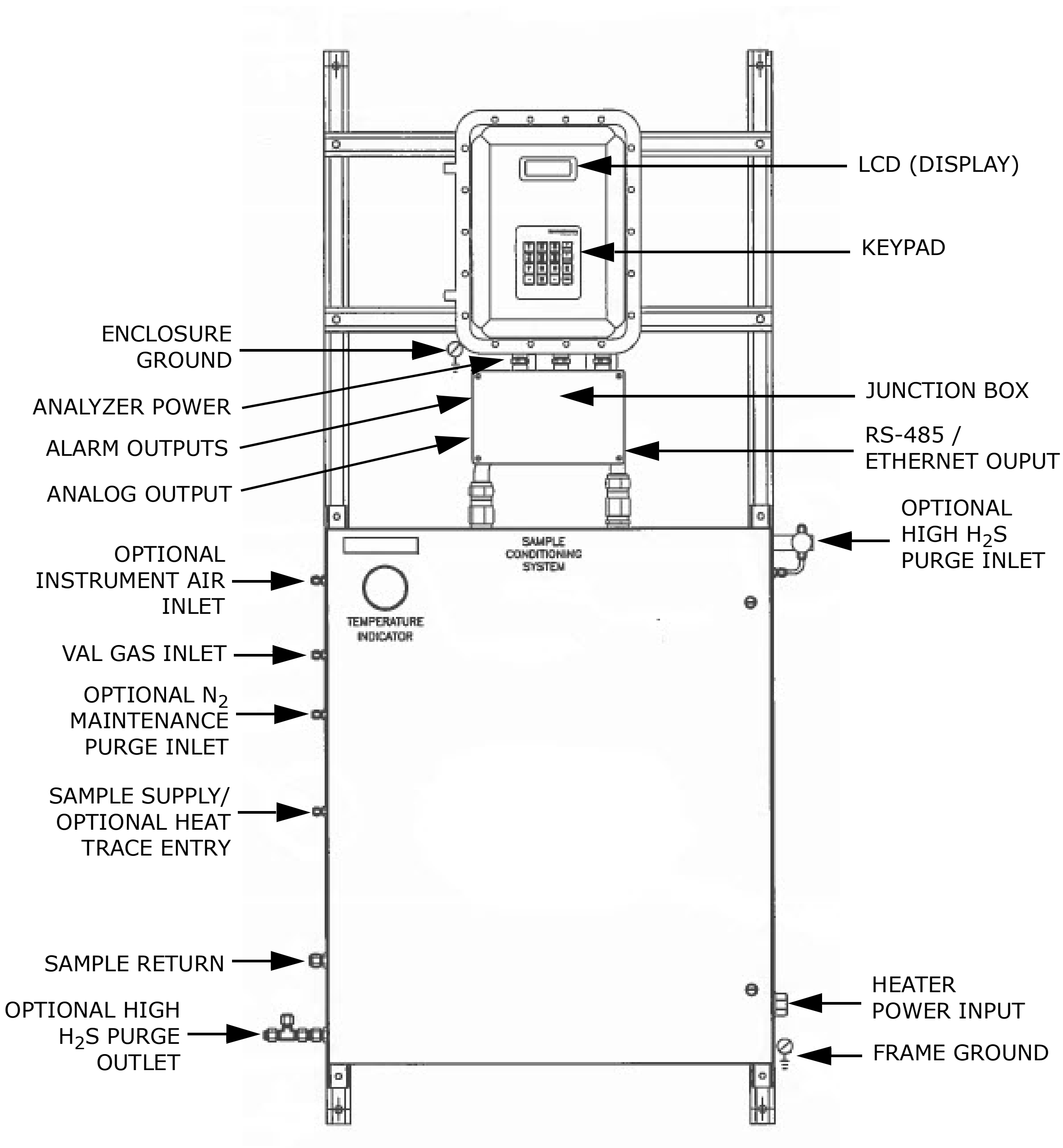


Figure 1–6 *Typical SS2100a configuration*

NOTE: Refer to system drawings in Appendix A.

The electronics panel assembly is shown in Figure 1–7. The sample cell is housed in the SCS enclosure.

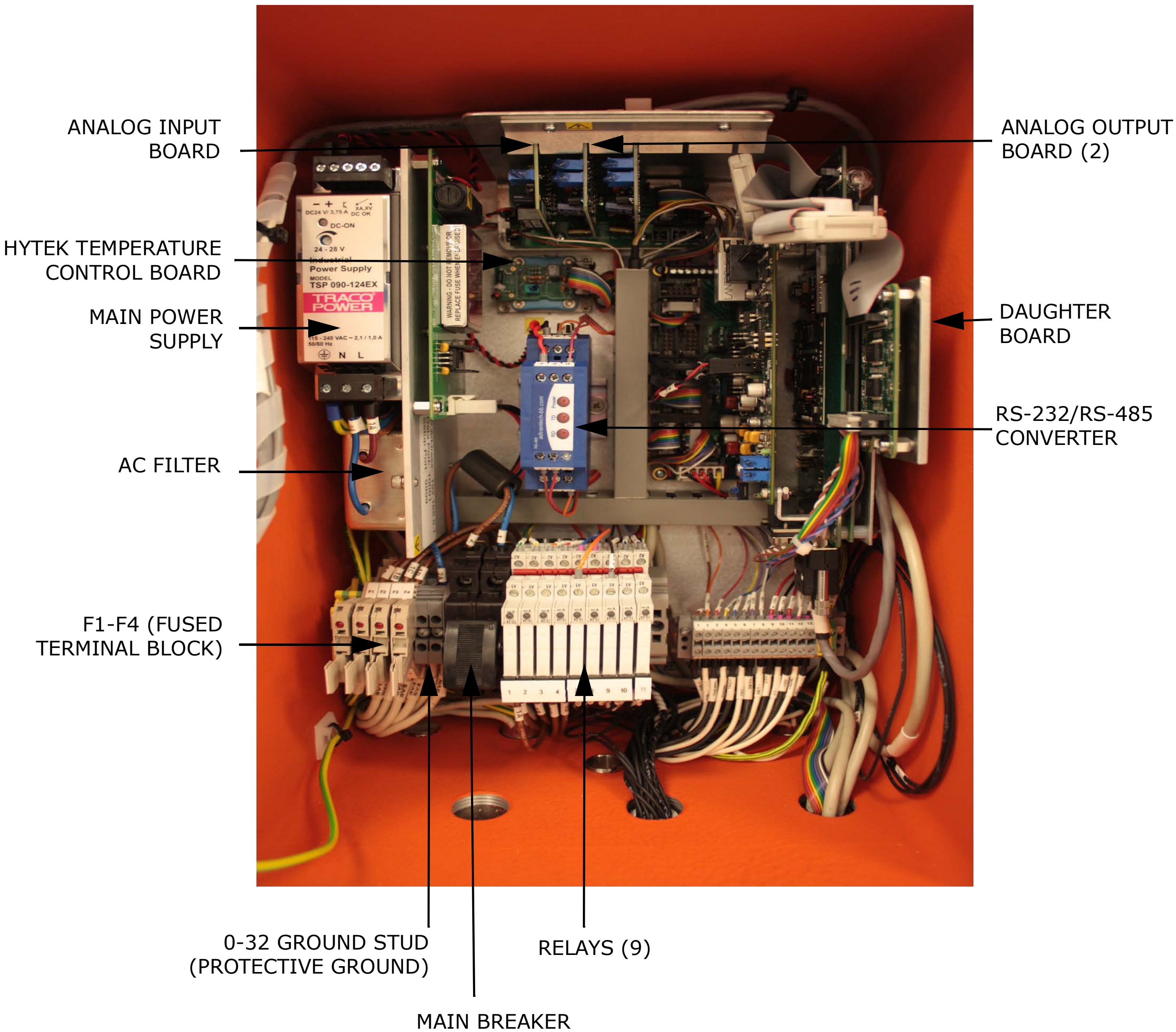


Figure 1–7 *Components on electronics panel assembly*

The SCS enclosure is the bottom module. Figure 1–8 shows all optional components available in a standard SS2100a SCS. Refer to “Sample Conditioning System” on page 4-1 for more information and the system drawings, if provided, for your specific gas analyzer configuration.

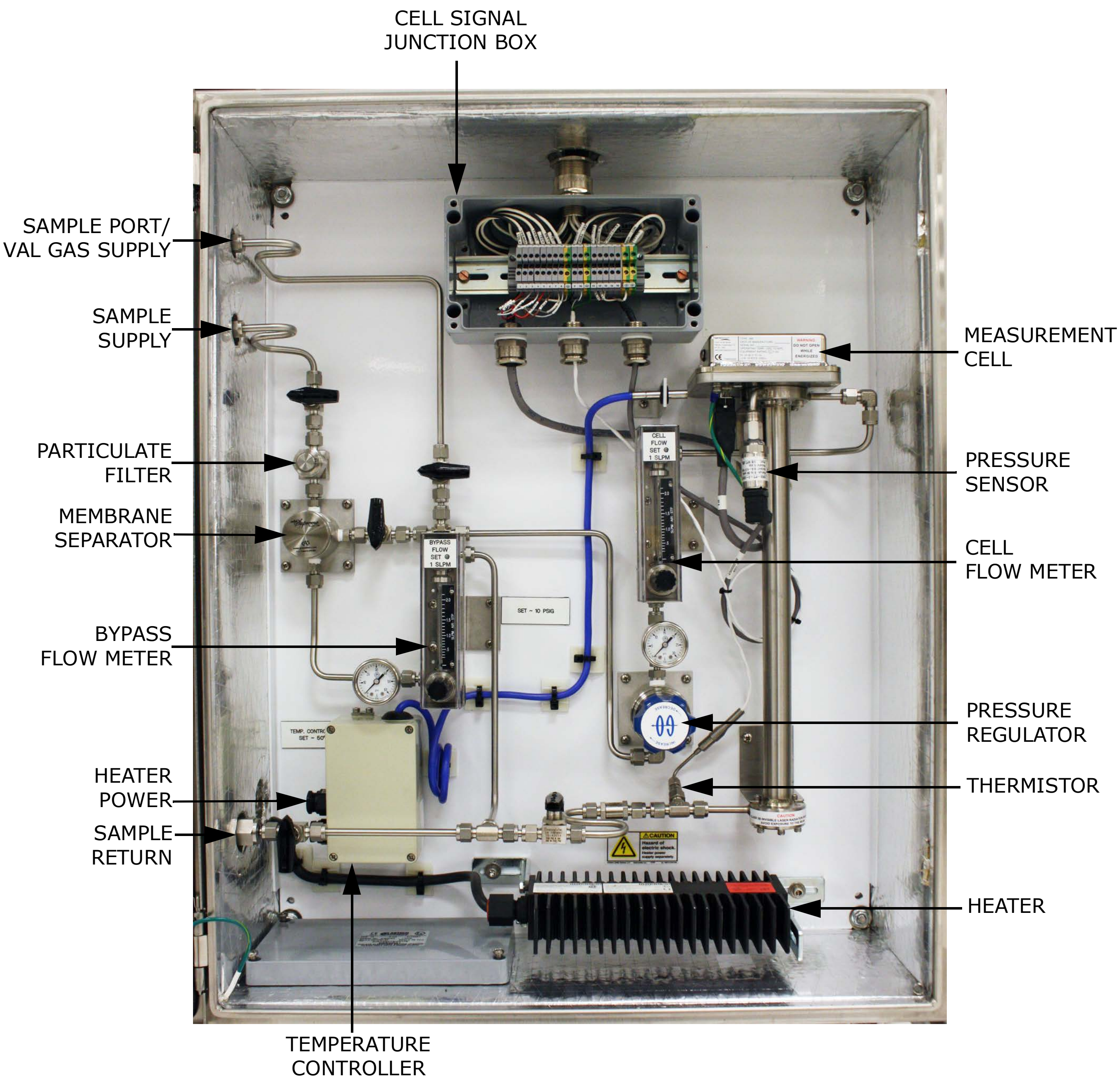


Figure 1–8 *Components available in sample conditioning system (SCS)*

NOTE: Refer to system drawings in Appendix A.

In the top module, the gas analyzer power supply provides power to the gas analyzer control electronics and relays controlling valves. The gas analyzer control electronics drive the laser, collect the signal and analyze the spectra. Powered relays control valves while unpowered relays serve as alarm contacts. An AC line filter is used to condition the input power.

The relay control board serves as the interface between the gas analyzer control electronics and the relays, whereas the temperature control board controls the thermo-electric (TEC) cooler that maintains the laser temperature inside the sample cell optical head. An optically-isolated RS-232 to RS-422/-485 converter takes the inherent RS-232 serial output of the laser control electronics and converts it to RS-485.

A DIN rail at the base of the module holds fused terminal blocks, the main breaker neutral and ground terminal blocks for all external connections.

In the SCS module, the measurement cell is the actual TDLAS spectrometer through which the gas sample flows. The measurement cell is equipped with a pressure transducer and thermistor to monitor the thermodynamic conditions of the sample. A heater maintains the inside of the SCS enclosure at a constant temperature to prevent sample condensation and to maintain/support repeatable measurements.

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 SS2100a gas analyzer. Once the gas analyzer arrives, take a few minutes to examine the contents before installing the unit.

What Should be Included in the Shipping Box

The contents of the crates should include:

- The Endress+Hauser SS2100a gas analyzer
- Safety Instruction, which includes this manual and a firmware operation manual, at a minimum
- Tooling Kit (1100002156)
- Additional accessories or options as ordered

If any of these contents are missing, contact your sales representative.

Manuals Locations

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

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:
https://endress.com/contact
or
https://addresses.endress.com/
- For standard orders:
    - Refer to the Endress+Hauser website to download the published operating instructions: www.endress.com

Inspecting the Analyzer

Remove top and sides of crate and carefully inspect all enclosures for dents, dings or general damage. Refer to **"Lifting/carrying the gas analyzer"** on page 3-2. Inspect the supply and return 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, which may disturb the optical alignment.

Lifting/carrying the gas analyzer

Before removing from the crate, move the analyzer as close as possible to the final installation location. Due to the gas analyzer's size and weight (configurations weigh approximately 130 kg [286 lbs]), Endress+Hauser recommends the use of a forklift, pallet jack, etc. to lift and/or move the gas analyzer. If the gas analyzer is to be lifted by hand, designate multiple individuals and distribute the weight among personnel to avoid injury.

Never lift the gas analyzer by the electronics enclosure. Always carry the load using one of the following points/methods. Refer to Figure 3–1.

- Cross members on Unistrut frame
- Support beneath instrument (best used when employing a forklift)

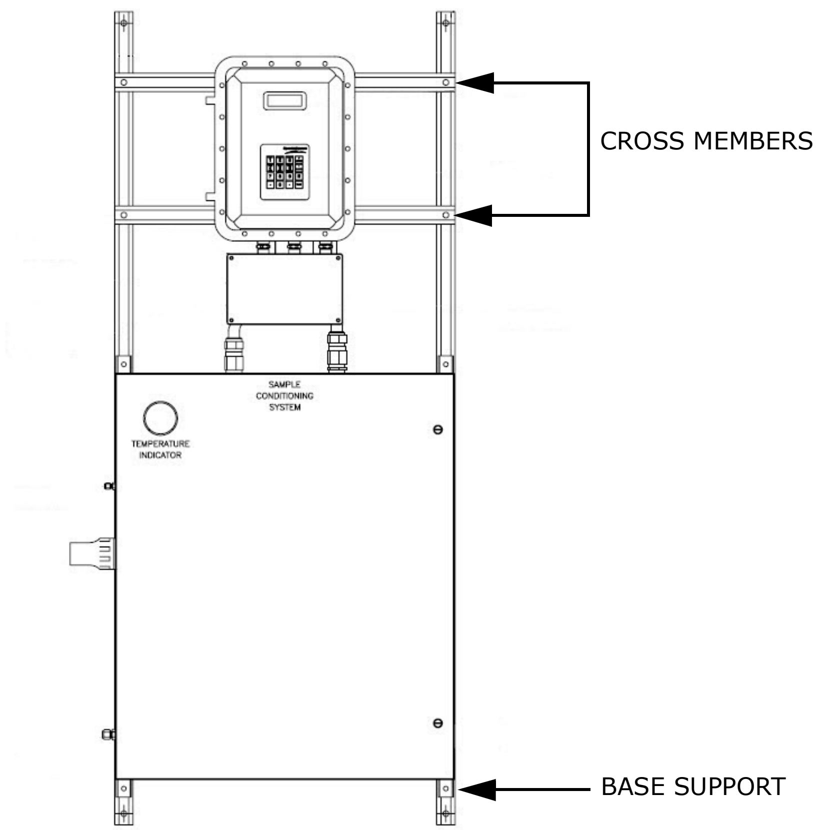


Figure 3–1 *Lifting points for the SS2100a gas analyzer*

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

Installing the Analyzer

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

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

Hardware and tools for installation

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

Hardware

- Mounting hardware

Bolts or screws used for wall-mounting the SS2100a analyzer must be able to support four times the weight of the instrument (approximately 130 kg [286 lbs]).

- Stainless steel tubing (Using 1/4 in.O.D. x 0.035 in. wall thickness, seamless stainless steel tubing is recommended)
- RS-485 - USB converter (P/N 3100002220)

Tools

- Hand drill and bits
- Tape measure
- Level
- Pencil
- 8 mm hex key
- 8 mm ball point hex L-key
- 10 mm ball point hex L-key

- 5/16 in. wrench
- 9/16 in. angle double open-end wrench - 15 and 75 degree
- 11/16 in. extra-long thin-head double open-end wrench
- 7/64 in. stainless steel ball point hex L-key
- 5/32 in. high torque ball point hex L-key

Mounting the analyzer

The SS2100a gas analyzer is manufactured for wall or Unistrut® (or equivalent) metal framing installations. Typically, the SS2100a will come mounted on a Unistrut frame that can be installed on a wall. Refer to Appendix A for detailed mounting dimensions.

When mounting the analyzer, be sure to position the instrument so that it is not 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 gas 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.

To mount the analyzer

1. Select a suitable location to mount the gas analyzer. Choose a shaded area or use an optional gas analyzer hood (or equivalent) to minimize sun exposure. Refer to **"Lifting/carrying the gas analyzer"** on page 3-2.

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

2. Locate the mounting holes on your unit. Refer to the system drawings in Appendix A.
3. Mark the centers of the top mounting holes on the wall.
4. Drill the appropriate size holes for the bolts or concrete studs you are using.
5. Hold the gas analyzer in place and fasten with the top bolts.
6. Repeat for the bottom mounting holes.

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

Opening and Closing the Gas Analyzer Enclosure Cover

*Care must be taken to avoid damaging the enclosure cover and body mating surfaces that form a machined flame path (gap ≤0.05mm, roughness ≤6µm). If the surfaces are damaged to the extent they no longer meet the above specifications, contact **"Service"** on page B-33.*

To open the gas analyzer enclosure cover

1. Using an 5/16 in. wrench or driver, remove each cover screw completely.
2. Place cover screws in a safe place to protect against damage or loss.
3. Gently open cover by pulling on the edge opposite the hinges.

To close the gas analyzer enclosure cover

1. Gently close the enclosure cover, replace the cover screws and tighten each to 40 N-m.

All cover screws must always be tightened completely and may be replaced only with screws of the same type (ISO 4762/DIN 912) and material (Stainless Steel Grade A2-70). Ultimate Racing UR 0905 Copper Anti-Seize Lubricant or equivalent on cover screw threads to prevent galling unless glands are used.

Connecting the Signals and Alarms

The 4–20 mA AI, 4–20 mA AO, serial and Ethernet outputs are connected to terminal block (located in J1-T1). Refer to Figure 3–2. In addition, seven digital inputs/outputs connected to SPDT relays on terminal 1 through 14 in JB1 are provided for customer interface.

*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 3-14.*

The relays for the alarms are configured to be fail-safe (or normally energized) so the dry contacts will open in the event of power loss. Thus, the alarms are wired to be normally closed (NC) when the gas analyzer is running.

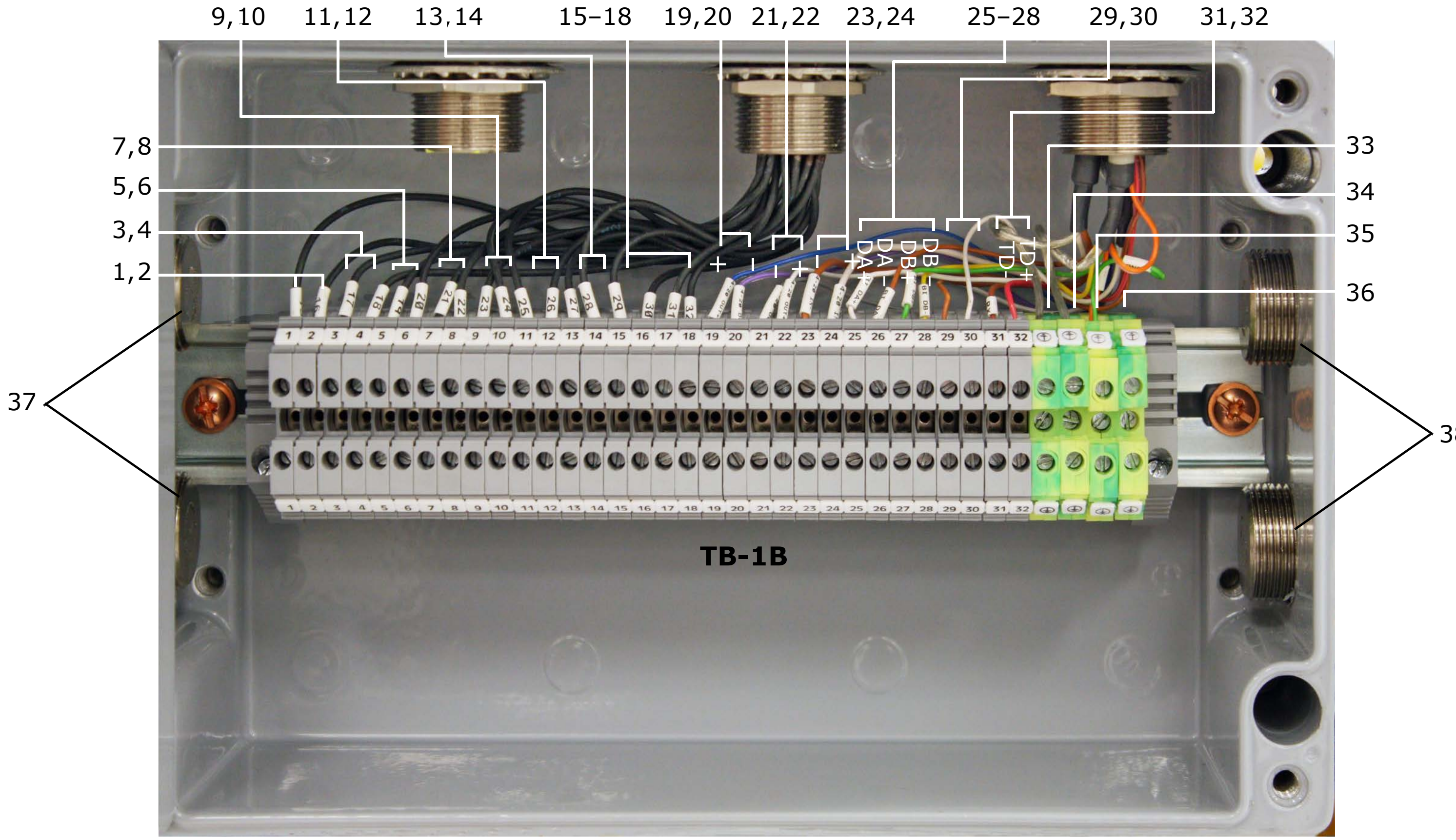


Figure 3–2 *Wiring assignments for terminal block (TB-TB1) in terminations junction box. Refer to Figure A–8 for more information.*

1, 2. Hi Conc Alarm
3, 4. General Alarm
5, 6. Val Fail
7, 8. Val 2 Active
9, 10. Val 1 Active
11, 12. Flow Switch Input
13, 14. Val Req.
15–18. Spare
19, 20. CH A 4–20 mA Output
21, 22. CH B 4–20 mA Output
23, 24. 4–20 mA Input
25–28. Ethernet Output
29, 30. Spare
31, 32. RS-485 Output
33. G1, 4–20 mA CHA/B Shield
34. G2, 4–20 mA Input Shield
35. G3, Ethernet Shield
36. G4, RS-232/485 Ground
37. 2 x M25
38. 2 x M25

Refer to Figure A–8 on page A–10 to consult the wiring diagrams in the system drawings. All work should be performed by personnel qualified in electrical installation.

Cables used shall comply with electrical code, standards, be suitable for the glands and meet the 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.*

To connect the signal and alarm cables

1. Open the junction box cover (refer to Figure 1–6 on page 1–11 for location) to gain access to the field interface terminal block.
2. Install appropriate glands into the four M25 access ports on the side of the junction box (two located on each side).
3. Pull the cables for the alarm outputs and validation request input through the first (from left) gland, the cables for the 4–20 mA AI and 4–20 mA AO through the second gland and the cable for serial or Ethernet communication through the third gland and into the junction box.
4. Strip back the jacket and insulation of the 4–20 mA AI, 4–20 mA AO and serial or Ethernet cables just enough to connect to the terminals of block.
5. Connect the 4–20 mA AI, 4–20 mA AO and serial or Ethernet wires to the appropriate terminals (TB1), as indicated in Table 3–1.
6. Strip back the jacket and insulation of the alarm output and validation request input cables just enough to connect to the terminals of block.
7. Connect the alarm output and validation request input wires to the appropriate terminals, as indicated in Table 3–2.
8. Verify that each connection is secure.
9. Close the junction box cover.
10. To complete the connections, connect the other end of the current loop wires to a current loop receiver, the serial or Ethernet to a serial or Ethernet port on a computer, the alarm cables to appropriate alarm monitors and the validation request input to a switch.

Configuring the RS-232/RS-485 Converter

The Optically Isolated RS-232 to RS-485 Converter is configured for two-wire half-duplex RS-485. DIP switches on the side of the converter, shown in Figure 3–3, can be used to set time-out and termination as indicated in Table 3–3. With the default setting of 9600 baud, the converter will generally work for baud rates of 9600 and higher.

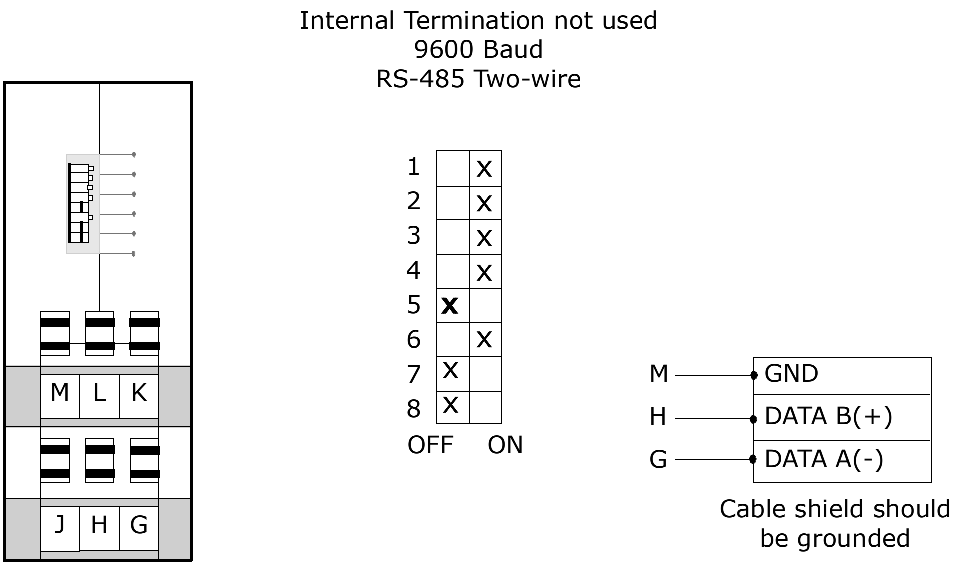


Figure 3–3 *Optically isolated RS-232-to-RS-485 converter DIP switches*

Table 3–1 *Terminal block (TB1) input/output signal connections (4–20 mA, serial, Ethernet)*

Terminal	Description	Service USB Converter Wire Color	
G	RS-232/RS-485 GND		
G	4–20 mA CH A/B Shield GND		
G	4–20 mA Input Shield GND		
G	Ethernet Shield		
32	RS-485 or TD B(+)		Orange
31	RS-485 or TD A(–)		Yellow
30	Spare		Black
29	Spare		
28	Ethernet Rx– (BI_DB–)	6	Green
27	Ethernet Rx+ (BI_DB+)	3	White/Green
26	Ethernet Tx– (BI_DA–)	2	Orange
25	Ethernet Tx+ (BI_DA+)	1	White/Orange
24	4–20 mA AI (+)	**RJ45 Pin #**	**Wire Color (T568B) Cat5(e)**
23	4–20 mA AI (–)		
22	4–20 mA AO CH B (+)		
21	4–20 mA AO CH B (–)		
20	4–20 mA AO CH A (–)		
19	4–20 mA AO CH A (+)		

Table 3–2 *Terminal block (TB1) input/output signal connections (alarm output, validation request)*

Terminal		Description
18	17	Spare
16	15	
14	13	Validation Request Input
12	11	Flow SW Input
10	9	Validation 2 Active
8	7	Validation 1 Active
6	5	Validation Fail Alarm
4	3	General Fault Alarm
2	1	High Concentration Alarm

Table 3–3 *Output signal connections (two-wire RS-485 configuration)*

	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	Time-out[1] (ms)	R11 (KΩ)
RS-485 2-Wire Half Duplex	ON	ON	ON	ON						
120Ω Built-in Termination					ON					
External or no Termination					OFF					
1200 Baud						OFF	OFF	OFF	8.330[2]	820
2400 Baud						OFF	OFF	ON	4.160	
4800 Baud						OFF	ON	OFF	2.080	
9600 Baud						ON	OFF	OFF	1.040	
19.2K Baud						ON	ON	ON	0.580	
38.4K Baud						OFF	OFF	OFF	0.260[2]	27
57.6K Baud						OFF	OFF	OFF	0.176[2]	16
115.2K Baud						OFF	OFF	OFF	0.087[2]	8.2

1. Time-out selections are equal to one character time at the indicated baud rate.
2. To achieve this time-out, an appropriate through-hole resistor must be placed in the R11 location on the converter PCB.

Table 3–4 *Output signal connections (two-wire RS-485 configuration)*

	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	Time-out[1] (ms)	R11 (KΩ)
RS-485 2-Wire Half Duplex	ON	ON	ON	ON						
120Ω Built-in Termination					ON					
External or no Termination					OFF					
1200 Baud						OFF	OFF	OFF	8.330[2]	820
2400 Baud						OFF	OFF	ON	4.160	
4800 Baud						OFF	ON	OFF	2.080	
9600 Baud						ON	OFF	OFF	1.040	
19.2K Baud						ON	ON	ON	0.580	
38.4K Baud						OFF	OFF	OFF	0.260[2]	27
57.6K Baud						OFF	OFF	OFF	0.176[2]	16
115.2K Baud						OFF	OFF	OFF	0.087[2]	8.2

1. Time-out selections are equal to one character time at the indicated baud rate.
2. To achieve this time-out, an appropriate through-hole resistor must be placed in the R11 location on the converter PCB.

Connecting Electrical Power to the Analyzer

The analyzer will be configured for 120 or 230 VAC at 50/60 Hz single-phase input. Check the manufacturing data label or the terminal block labels to determine the power input requirements. All work should be performed by personnel qualified in electrical installation.

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

Refer to the system drawings in Appendix A.

Refer to Table C–1 on page C–1 for fuse part numbers.

Fuse specifications

If you need to replace a fuse, use only the same type and rating of fuse as the original as listed in Table 3–5 on page 3–12, Table 3–6 on page 3–12. Part numbers are referenced in Appendix C.

***Table 3–5** Fuse specifications for 230 VAC systems*

DWG Ref.	Description	Rating
F1[1]	Miniature Fuse, 5 x 20 mm, Time Delay	250VAC/0.1A
F2[1]	Miniature Fuse, 5 x 20 mm, Time Delay	250VAC/0.1A
F3[1]	Miniature Fuse, 5 x 20 mm, Time Delay	250VAC/0.1A
F4[1]	Miniature Fuse, 5 x 20 mm, Time Delay	250VAC/0.1A

1. Housed in fused terminal blocks. Illuminated LED indicates blown fuse.

***Table 3–6** Fuse specifications for 120 VAC systems*

DWG Ref.	Description	Rating
F1[1]	Miniature Fuse, 5 x 20 mm, Time Delay	250VAC/0.16A
F2[1]	Miniature Fuse, 5 x 20 mm, Time Delay	250VAC/0.16A
F3[1]	Miniature Fuse, 5 x 20 mm, Time Delay	250VAC/0.16A
F4	Miniature Fuse, 5 x 20 mm, Time Delay	250VAC/0.16A

1. Housed in fused terminal blocks. Illuminated LED indicates blown fuse.

To connect electrical power to the analyzer

1. Open the analyzer enclosure cover according to the procedure under **"To open the gas analyzer enclosure cover"** on page 3-5 to gain access to the field interface terminal block.
2. Install an appropriate gland into the M20 access port on the bottom left of the enclosure.
3. Run cable from the power distribution panel to the gland.

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

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 or switch should be located in close proximity to the equipment and within easy reach of the operator.

4. Pull ground, neutral and hot wires (1.5 mm2, #14 AWG minimum) into the analyzer enclosure.
5. Strip back the jacket and/or insulation of the wires just enough to connect to the circuit breaker.
6. Attach the neutral and hot wires to the two-pole circuit breaker by connecting the neutral wire to the terminal on the left side of the circuit breaker, and the hot wire to the terminal on the right side of the circuit breaker.
7. Connect the ground wire to the ground bus bar marked ⏚.

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

8. Verify that each connection is secure.
9. Close the analyzer enclosure cover according to the procedure under **"To close the gas analyzer enclosure cover"** on page 3-5.

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-33.*

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 should 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 analyzer enclosure cover according to the procedure under **"Opening and Closing the Gas Analyzer Enclosure Cover"** on page 3-5 to gain access to the electronics panel.
3. Locate the 4–20 mA current loop board in the upper middle of the electronics panel, as shown in Figure 1–7.
4. Unscrew the screws holding the retaining bracket and remove the retaining bracket.
5. Gently pull the 4–20 mA current loop board off the backplane into which it is plugged.
6. Move the jumper (JMP1) connecting the center pin to pin A, shown in Figure 3–4, to connect the center pin with pin P.
7. Re-install the 4–20 mA current loop board and retaining bracket.
8. Reconnect power to the analyzer. Confirm the 4 mA (min.) and 20 mA (max.) points (see **"Scaling and Calibrating the Current Loop Signal"** in the Device Parameters).
9. Close the analyzer enclosure cover according to the procedure under **"To close the gas analyzer enclosure cover"** on page 3-5.

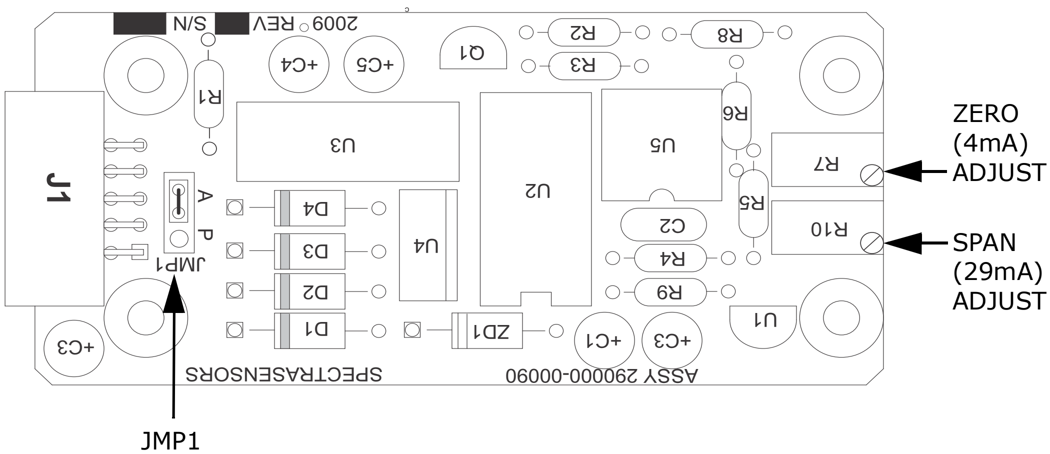


Figure 3–4 *4-20 mA board*

Connecting the Gas Lines

Once you have verified that the analyzer is properly wired, you are ready to connect the sample supply and sample return lines. All work should be performed by technicians qualified in pneumatic tubing.

If the gas analyzer comes with a factory installed sample system, consult the system drawings for tubing sizes and attachment points. Using 1/4 in. O.D. x 0.035 in. wall thickness, seamless stainless steel tubing is recommended.

Refer to "Sample Conditioning System" on page 4-1 and/or system drawings in Appendix A.

To connect the sample supply and return lines

1. Connect the supply and return tubes to the analyzer using the stainless steel compression-type fittings provided.
2. 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.
3. Check all connections for gas leaks. Using a liquid leak detector is recommended.

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

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4 - SAMPLE CONDITIONING SYSTEM

Personnel should have a thorough understanding of the operation of the analyzer and the procedures presented here before operating the sample conditioning system.

The process sample at the sample tap may be at a high pressure. A pressure reducing regulator is located at the sample tap to reduce the sample pressure and allow operation of the sample conditioning system at a low pressure. Use extreme caution when operating the sample probe isolation valve and field pressure reducing regulator.

The Sample Conditioning System (SCS) is designed to deliver a sample stream to the analyzer representative of the process at time of sampling. To ensure the integrity of the sample stream and its analysis, care must be taken to install and operate the SCS properly. Any personnel intending to operate or service the analyzer and SCS should have a thorough understanding of the process application and design of the analyzer and SCS.

Most problems experienced with sample systems result from operating the system differently than intended. In some cases, the actual process conditions may be different than originally specified (e.g., flow rates, presence of contaminants, particulates, or condensables that may only exist under upset conditions). By establishing understanding of the application and design of the system, most issues can be avoided or easily diagnosed and corrected, ensuring successful normal operation.

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.

About the SCS

The SCS is designed to filter incoming gas, as well as control pressure and flow to the analyzer. The SCS uses a 7 micron particulate filter and a membrane separator that removes entrained liquids or particles from the natural gas stream before they enter the analyzer. Because Endress+Hauser' analyzers are immune to vapor phase contaminants found in natural gas, using the particulate filter and membrane separator prevents contamination of the analyzer.

The membrane separator is a three-port device. When gas enters the separator inlet, gas vapors pass through the membrane to the outlet. The outlet flow passes through a flow control valve and a flow meter to the analyzer. Blocked liquids or particles can be flushed from the separator housing out the bypass port.

If the correct probe and regulator is used at the sample extraction point and the sample transport line is heated to prevent condensation, no liquids or particles should reach the SCS. Under normal conditions the membrane separator will remove very little liquid, if any. The main purpose of the separator is to protect the analyzer in the case of an upset condition.

Besides filtering the incoming gas, the SCS is also controls flow and pressure to the analyzer. An instrument grade pressure regulator is used to set final gas pressure before gas enters the analyzer. One flow meter serves the flow path to the analyzer and one flow meter serves the flow path of the bypass. The flow meters have built-in flow controllers to set flow rates to the recommended values (see Table A–1 or the system drawings in Appendix A for proper flow and pressure settings).

Typically the SCS is assembled inside of an overall stainless steel enclosure, which is insulated and heated using a temperature controller. This ensures that the sample remains in a stable vapor phase and improves the measurement performance.

In some cases other types of components are included in the SCS, such as coalescing filters, liquid knock-outs, pumps, special heaters and other special components that are application dependent. Refer to your system drawings for an overview of the system configuration.

Checking the SCS Installation

The integral SCS is factory set with the appropriate pressures, flow rates, and enclosure temperature, as indicated in the system drawings. However, before operating the system for the first time, a careful check of the installation of the entire SCS from the sample probe to the flare/vent is recommended.

To perform SCS installation checks

1. 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.
3. Confirm that the relief valve at the field pressure reducing station has been set to the specified set-point. The relief valve is located on the pressure reducing regulator at the process sample tap.

Although the relief valve has been preset, the set-point must be confirmed prior to operation of the sample system. To confirm or reset the relief valve, it must be removed from the pressure reducing regulator and connected to an adjustable pressure source (refer to the manufacturer's instructions for details on setting the relief valve). After the relief valve is re-installed, all connections must be leak checked.

4. Confirm that the relief valve vent line is properly installed from the field pressure reducing station to the low pressure flare or atmospheric connection.
5. If applicable, confirm that the sample probe and field pressure reducing station are properly traced and insulated without any exposed surfaces.
6. If applicable, confirm that the field run electric-traced sample transport tubing is installed correctly (no exposed tubing or pockets), terminated properly at each end, and that each line has been purged clean and pressure tested.
7. Confirm that all valves are closed and all switches are off.
8. Confirm that the AC power is available to the electrically traced sample tubing (if applicable), analyzer, and SCS but that the local switches are off.
9. Confirm that the field analog and alarm signal wiring is interconnected properly (see **“To connect the signal and alarm cables”** on page 3-7).
10. Confirm that the low pressure flare or atmospheric vent is properly connected, if applicable.
11. Confirm that the analyzer house atmospheric vent is properly installed, if applicable.
12. Confirm that all sample system tubing has been thoroughly leak checked.

Starting up the SCS

After the SCS installation has been thoroughly checked, you are ready to begin preparing for initial SCS startup.

To prepare for SCS startup

1. Confirm that all AC power switches for the analyzer and SCS are off.
2. If applicable, apply AC power to the electric-traced sample transport tubing at the tracer control system.

If used, personnel should have a thorough understanding of the operation of the tracer power supply and control system before operating the SCS.

3. If applicable, confirm that the sample supply line electric tracer temperature controller at the tracer control system is set to the temperature specified, and that the sample supply line tracer is heating to the appropriate temperature.

4. Confirm that the sample probe isolation valve is closed.
5. Confirm that the pressure regulator at the field pressure reducing station is closed (adjustment knob turned fully counterclockwise).
6. Confirm that all sample system shut-off valves are closed.
7. Confirm that the sample bypass and analyzer flow meter metering valves are closed (adjustment knob turned clockwise).

Do not overtighten the metering valves or damage could occur.

To start up the sample system heater

1. Turn on AC power to the sample system heater.
2. Monitor the SCS enclosure thermometer during the warm-up period for **5 to 8 hours** to confirm that the stabilized sample system enclosure temperature does not exceed 60 °C.

   At start-up, the system may display a temperature slightly higher than 60 °C, but should stabilize below 60 °C. Refer to the settings shown in the system drawings found in Appendix A.

If the SCS enclosure exceeds 60° C, damage to the system could occur. If this occurs, shut down the system immediately.

The entire analyzer system is calibrated for operation at the enclosure temperature specified. Measurements should be considered valid only when the enclosure is at the specified temperature.

To start up the field pressure reducing station

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 pressure reducing regulator.

1. Open the low pressure flare or atmospheric vent header shut-off valve for the relief valve vent from the field pressure reducing station.

The low pressure flare or atmospheric vent header shut-off valve must be "car-sealed" open and tagged as a relief valve vent so that this valve will not be closed unless the SCS is not in operation.

2. Slowly open the sample probe process shut-off valve at the sample supply tap.
3. Slowly open the pressure regulator at the field pressure reducing station (adjustment knob turned clockwise) and set the pressure regulator to the specified pressure. Refer to the system drawings in Appendix A for settings.

To start up the sample bypass stream on process sample

1. Ensure the low pressure flare or atmospheric vent header shut-off valve is opened for the bypass flow effluent from the SCS.
2. Open the sample supply port shut-off valve.
3. Open the bypass flow meter valve to establish sample flow from the sample probe and set the metering valve to the specified value.

Do not open the cell flow meter at this point.

4. Confirm that the sample supply pressure under flowing conditions is set to the approximate specified pressure.

Make sure that no liquid, solids, etc. are flowing through the bypass valve by viewing the flow meter. If substances are present, shut down the system and purge the lines.

Although the exact supply pressure set-point is not critical, the pressure at the sample system should be within 5 PSIG of the specified supply pressure set-point. There may be a difference between the pressure readings at the sample tap and inside the SCS due to the pressure drop in the sample transport line under flowing conditions. If the pressure at the SCS under flowing conditions is not sufficiently close to the specified set-point, it will be necessary to readjust the pressure regulator set-point at the field pressure reducing station to provide the required supply pressure with the specified sample bypass flow.

To start up the analyzer on process sample

This procedure can be completed during the system warm-up process.

1. Ensure the low pressure flare or atmospheric vent header shut-off valve is opened for the sample flow effluent from the SCS.
2. Open the sample flow meter valves to the approximate specified flow.

3. If required, adjust each sample pressure regulator to the specified set-point for the measurement cell.
4. Adjust the sample flow meter metering valves to the specified flows for the measurement cell.

The adjustment set-points of the analyzer flow meters and pressure regulators will be interactive and may require readjustment multiple times until the final set-points are obtained.

*The analyzer system has been designed for the sample flow rate specified. A lower than specified sample flow rate may adversely affect analyzer performance. If you are unable to attain the specified sample flow rate, refer to **"Service"** on page B-33.*

5. Confirm the sample flow and pressure set-points and readjust the metering valves and pressure regulator at the field pressure reducing station to the specified set-points, if necessary.
6. Confirm the sample bypass flow and readjust the bypass metering valve to the specified set-point, if necessary. The SCS is now operating with the process sample.
7. Power up the analyzers according to the procedure given in the chapter for the system's configured firmware operation.

*Allow the system a minimum of 5-8 hours (preferably overnight) to ensure stabilization. During this time, the system will emit a variety of alarms - this is normal. If the alarms do not resolve themselves by the end of the warm-up period, refer to **"Service"** on page B-33.*

8. After sufficient warm-up time, confirm that the sample system enclosure is heated to the specified temperature (see Table A–1 on page A–1) by observing the temperature reading on the door mounted thermometer.

Shutting Down the SCS

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.

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

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

To isolate the analyzer 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.

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.

1. Close the sample flow meter 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 cell.

***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 the 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 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.

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 set-point 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 gas analyzer from the bypass following the procedure under **"To isolate the analyzer for short-term shutdown"** on page 4-7.
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 gas 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.

To isolate the process sample tap for long-term shutdown

If the SCS is to be out of service for an extended period, the SCS must be isolated at the process sample tap.

The process sample at the sample tap may be at a high pressure. A pressure reducing regulator is located at the sample tap to reduce the sample pressure and allow operation of the SCS at a low pressure. Use extreme caution when operating the sample probe isolation valve and field pressure reducing regulator.

The sample transport line must be vented to the low pressure flare or atmospheric vent header through the bypass flow meter to avoid pressure surges. The procedure given in the following steps can be followed regardless of whether or not the SCS has been isolated from the process tap as described in the previous section.

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

1. Isolate the analyzer from the bypass following the procedure below.

- **a.** Close the sample flow meter valve (adjustment knob turned clockwise) for the measurement channel. Do not over-tighten the metering valves or damage could occur.
- **b.** Allow any residual gas to flow out of the measurement cell.

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

- **c.** 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.

4. Confirm flow in the sample bypass flow meter (the actual flow is not critical).

5. Close the sample probe process shut-off valve at the sample supply process tap.

6. Allow pressure in the field pressure reducing regulator to dissipate until only a low residual pressure is indicated on the pressure gauge at the field station.
7. Close the field pressure reducing regulator (adjustment knob turned fully counterclockwise).
8. Close the low pressure flare or atmospheric vent header shut-off valve for the relief valve vent from the field pressure regulator.
9. Close the sample supply shut-off valve to the SCS.
10. Leave the sample bypass flow meter metering valve open.
11. Close the low pressure flare or atmospheric vent header shut-off valve for the effluent from the sample bypass.
12. Turn off power to the analyzer.
13. Turn off the AC power to the SCS heater and the sample tracer, if applicable, at the power distribution panel.

Although power could be shut off to the sample supply electric tracer, it is advisable to allow this line to remain heated unless the SCS is to be out of service for an extended period or maintenance is required on the line.

To purge the analyzer for shipment or relocation

1. Refer to the procedure to **"To isolate the process sample tap for long-term shutdown"** on page 4-9.
2. Turn off the power to the analyzer and sample system.
3. Disconnect the sample tubing at the inlet to the analyzer.
4. Connect clean, dry nitrogen to the sample inlet and set to 30 PSIG.
5. Open the low pressure flare or atmospheric vent header shut-off valve for the effluent from the sample bypass.
6. Allow the analyzer to purge for 20 minutes.

*For differential systems, make sure to purge the scrubber for several dry cycles. If necessary, dry cycles can be initiated by pressing the **#** key followed by the **2** key to enter **Mode 2,** and then pressing the **#** key followed by the **1** key to return to **Mode 1**.*

7. Shut off the nitrogen purge and disconnect.
8. Close the low pressure flare or atmospheric vent header shut-off valve for the effluent from the sample bypass.

9. Cap off all connections.

*Refer to **"To prepare the analyzer for shipment or storage"** on page B-34 for additional instructions on shipping or storing the analyzer.*

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Appendix A: Specifications

Table A–1 *SS2100a analyzer specifications*

Performance	
Concentration	Refer to Calibration Certificate
Repeatability	Refer to Calibration Certificate
Response Time	Display updates vary from 4 to 16 seconds
Application Data	
Environmental Temperature Range	−20 °C to 50 °C (−4 °F to 122° F) - *Standard* −10 °C to 60 °C - *Optional*
Heated SCS Enclosure Temperature	50 ± 5 °C - *Standard* 60 ± 5 °C - *Optional*
Analyzer Shipment and Storage Temperature	Trace H_2O Analyzers: >0 °C (32 °F) All other analyzers: ≥ -20 °C (-4 °F)
Environmental Relative Humidity	5% to 95%, Non-condensing
Altitude	Up to 2000 m (6,550 ft.)
Pressure to Cell [1]	70 kPaG (10 PSIG) - max to spectrometer cell
Sample Cell Pressure Range [1]	800 to 1200 mbar - *Standard* 950 to 1700 mbar - *Optional*
Sample Flow Rate [1]	0.5 to 4 SPLM (0.02 to 0.1 SCFM)
Electrical & Communications	
Input Power (Electronics) [2]	120 or 240 VAC ± 10%, 50/60 Hz; 60W max. (with 2 solenoids)
Input Power (Sample Cabinet) [1]	120 or 240 VAC, 50/60 Hz - *Standard* 100W or 200W max for heated systems
Analog Communication	Isolated Analog channels, 1200 ohms at 24 VDC max *Outputs*: (2) 4–20 mA (measurement value) *Inputs*: (1) 4–20 mA (pipeline pressure) [1]
Serial Communication	Ethernet & RS-485 half-duplex
Digital Signal	*Outputs*: (5) Hi/Lo Alarm, General Fault, Validation Fail [1], Validation 1 Active [1], Validation 2 Active [1] *Inputs*: (2) Flow Alarm [1], Validation Request [1]
LCD Display	Concentration, cell pressure and temperature, diagnostics

1. Application dependent.
2. Supply voltage not to exceed ± 10% of nominal. Transient over-voltages according to Over-voltage category II.

Table A-1 *SS2100a analyzer specifications (Continued)*

Physical Specifications	
Electronics Enclosure	IP66 Copper-Free Aluminum with Weather Resistant Polyester Powder Coating, 80 to 120 micron thickness
SCS Enclosure	IP55 (min) 304 or 316L stainless steel
Sample Cell Construction	316L series polished stainless steel (standard)
Analyzer Dimensions	1829 mm H x 765 mm W x 427 mm D (72 in. H x 30 1/8 in. W x 16 13/16 in. D)
Analyzer Weight (typical) [1]	Approx. 130 kg (286 lbs)
Area Classification	
Certification	II 3 G Ex dc ec nA opis IIB+H2 T3, Gc, IP 66, EMC Directive 2014/30/EU, ATEX Directive 2014/34/EU

1. Application dependent.

For a complete listing of new or updated certificates, please visit the product page at www.endress.com.

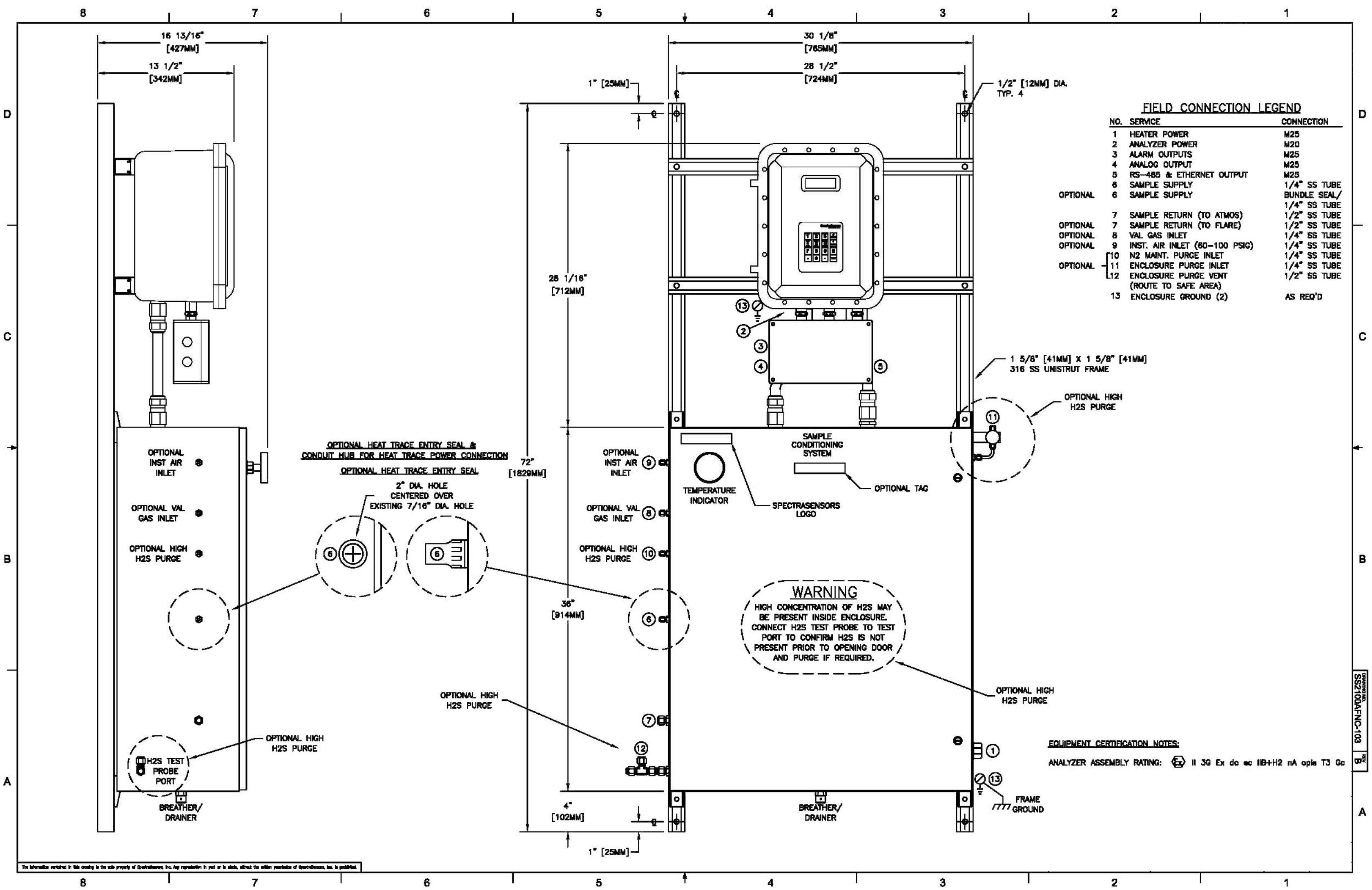


Figure A–1 *Outline dimensions and mounting for the SS2100a*

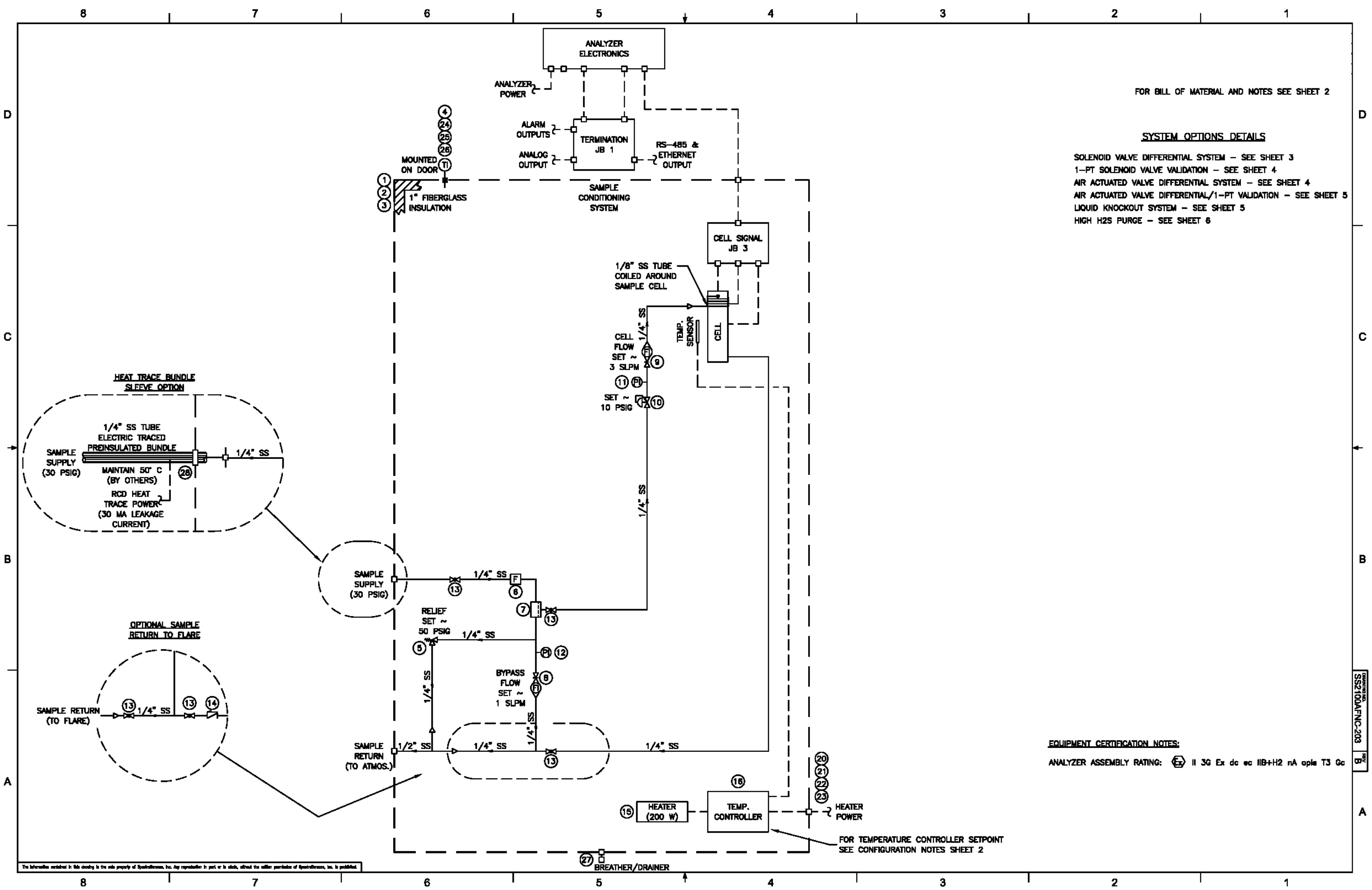


Figure A–2 *Sample system schematic for the SS2100a (fixed mount, non-validation, conventional)*

SOV VOLTAGE BASED ON POWER SUPPLIED TO ANALYZER ELETRONICS

SEE CONFIGURATION NOTES

BILL OF MATERIALS

SOLENOID VALVE DIFFERENTIAL/NO VALIDATION
(SEE SHT 3)

CONFIGURATION	ITEM	QTY	DESCRIPTION	MANUFACTURER	PART NO.	SSI PART NO.
FOR –1X1X0–NXXXXXX FOR –1X2X0–NXXXXXX	29	2	VALVE, SOLENOID, ATEX, 3WAY, 110V	BURKERT	98124345	EX6100000002
FOR –2X1X0–NXXXXXX FOR –2X2X0–NXXXXXX	29	2	VALVE, SOLENOID, ATEX, 3WAY, 230V	BURKERT	98110692	EX6100000001

SOLENOID VALVE DIFFERENTIAL/1–PT SOLENOID VALVE VALIDATION
(SEE SHT 4)

CONFIGURATION	ITEM	QTY	DESCRIPTION	MANUFACTURER	PART NO.	SSI PART NO.
FOR –1X1X0–1XXXXXX FOR –1X2X0–1XXXXXX	29	3	VALVE, SOLENOID, ATEX, 3WAY, 110V	BURKERT	98124345	EX6100000002
FOR –2X1X0–1XXXXXX FOR –2X2X0–1XXXXXX	29	3	VALVE, SOLENOID, ATEX, 3WAY, 230V	BURKERT	98110692	EX6100000001
	13	1	BALL VALVE, 1/4" TF (SS)	SWAGELOK	SS–42GS4	6100002242

AIR ACTUATED VALVE DIFFERENTIAL/NO VALIDATION
(SEE SHT 4)

CONFIGURATION	ITEM	QTY	DESCRIPTION	MANUFACTURER	PART NO.	SSI PART NO.
FOR –1X1X0–2XXXXXX FOR –1X2X0–2XXXXXX	29	1	VALVE, SOLENOID, ATEX, 3WAY, 110V	BURKERT	98124345	EX6100000002
FOR –2X1X0–2XXXXXX FOR –2X2X0–2XXXXXX	29	1	VALVE, SOLENOID, ATEX, 3WAY, 230V	BURKERT	98110692	EX6100000001
	30	2	AIR–OPERATED VALVE (3–WAY), 1/8" FNPT (SS)	PARKER	2F–R2SK–V–SS	6100002135

AIR ACTUATED VALVE DIFFERENTIAL/1–PT AIR ACTUATED VALVE VALIDATION
(SEE SHT 5)

CONFIGURATION	ITEM	QTY	DESCRIPTION	MANUFACTURER	PART NO.	SSI PART NO.
FOR –1X1X0–3XXXXXX FOR –1X2X0–3XXXXXX	29	2	VALVE, SOLENOID, ATEX, 3WAY, 110V	BURKERT	98124345	EX6100000002
FOR –2X1X0–3XXXXXX FOR –2X2X0–3XXXXXX	29	2	VALVE, SOLENOID, ATEX, 3WAY, 230V	BURKERT	98110692	EX6100000001
	30	3	AIR–OPERATED VALVE (3–WAY), 1/8" FNPT (SS)	PARKER	2F–R2SK–V–SS	6100002135
	13	1	BALL VALVE, 1/4" TF (SS)	SWAGELOK	SS–42GS4	61303042S4

LIQUID KNOCKOUT SYSTEM OPTION
(SEE SHT 5)

CONFIGURATION	ITEM	QTY	DESCRIPTION	MANUFACTURER	PART NO.	SSI PART NO.
FOR –XXXX0–XXXX1XX FOR –XXXX0–XXXX3XX	31	1	COALESCING FILTER (GLASS BOWL), 1/4" FNPT (SS)	BALSTON	33G–1/4	6100002289
	32	1	FILTER ELEMENT, GRADE BX	BALSTON	100–12–BX	6100002288
	33	1	LIQUID DRAINER, 1/2" FNPT (SS)	ARMSTRONG	11–LD	6100002169
	34	1	BALL VALVE, 1/2" TF (SS)	SWAGELOK	SS–63TS8	6100002144
	13	1	BALL VALVE, 1/4" TF (SS)	SWAGELOK	SS–42GS4	61303042S4

HIGH H2S PURGE KIT OPTION
(SEE SHT 6)

CONFIGURATION	ITEM	QTY	DESCRIPTION	MANUFACTURER	PART NO.	SSI PART NO.
FOR –XXXX0–XXXX2XX FOR –XXXX0–XXXX3XX	13	1	BALL VALVE, 1/4" TF (SS)	SWAGELOK	SS–42GS4	61303042S4
	14	1	CHECK VALVE, 1/3 PSI, 1/4" TF (SS)	SWAGELOK	SS–4C–1/3	6130504C13
	35	1	NEEDLE VALVE, 1/4" TF (SS)	SWAGELOK	SS–1VS4	6130301VS4

SEE CONFIGURATION NOTES

BILL OF MATERIALS

OPTION	CONFIGURATION	ITEM	QTY	DESCRIPTION	MANUFACTURER	PART NO.	SSI PART NO.
	FOR –XXXX0–X1XXXXX FOR –XXXX0–X2XXXXX	1	1	ENCLOSURE (NEMA 4X, SS), 36"X30"X12"	HOFFMAN	CSD363012SS	1400536306
		2	1	MOUNTING BRACKET KIT (SS)	HOFFMAN	CMFKSS	1400400001
		3	1	MOUNTING PANEL (PAINTED STEEL), 34.2"X28.2"	HOFFMAN	CP3630	1400436300
	FOR –XXXX0–X3XXXXX FOR –XXXX0–X4XXXXX	1	1	ENCLOSURE (NEMA 4X, 316LSS), 36"X24"X12"	HOFFMAN	CSD362412SS6	1400002232
		2	1	MOUNTING BRACKET KIT (SS)	HOFFMAN	CMFKSS	1400400001
		3	1	MOUNTING PANEL (PAINTED STEEL), 34.2"X28.2"	HOFFMAN	CP3630	1400436300
		4	1	TEMP. GAUGE (3"), 200°F, 4" STEM, 1/2" NPT (SS)	REOTEMP	AA–040–1–D43–TG	55032340B6
		5	1	RELIEF VALVE, 10–250PSIG, 1/4 TF (SS–MTR)	DK TECH	V63–D–4T–L–S	6100002638
		6	1	FILTER (TEE–TYPE), 7 MICRON, 1/4" TF (SS)	SWAGELOK	SS–4TF–7	6101520074
		7	1	MEMBRANE SEPARATOR, TYPE 6,W/LB,1/4"FNPT(SS)	A+ CORP	123–006–SS–LB	6100002455
	FOR –XXXX0–XX1XXXX	8	1	FLOWMETER (W/VALVE), 2 SLPM, 1/4" FNPT (SS)	KING	74C123G081123810	6134100274
		9	1	FLOWMETER (W/VALVE), 6 SLPM, 1/4" FNPT (SS)	KING	74C123G081523810	6134100674
	FOR –XXXX0–XX2XXXX	8	1	FLOWMETER (ARM, W/VLV), 2.6 SLPM,1/4"FNPT (SS)	KING	7101361003A2	6100002373
		9	1	FLOWMETER (ARM, W/VLV), 6 SLPM,1/4"FNPT (SS)	KING	7101361005A2	6134120674
		10	1	PRESS. REGULATOR, 25 PSIG, 1/4" FNPT (SS)	NEON CONTROLS	10–221B2–2AF2	6100002767
		11	1	PRESS. GAUGE (1.5"), 30 PSIG, 1/8" MNPT (SS)	MCDANIEL	SBL	6100002004
		12	1	PRESS. GAUGE (1.5"), 60 PSIG, 1/8" MNPT (SS)	MCDANIEL	SCL	6200000006
	FOR –XXXX0–XXX1XXX	13	3	BALL VALVE, 1/4" TF (SS)	SWAGELOK	SS–42GS4	61303042S4
	FOR –XXXX0–XXX2XXX	13	4	BALL VALVE, 1/4" TF (SS)	SWAGELOK	SS–42GS4	61303042S4
	FOR –XXXX0–XXX2XXX	14	1	CHECK VALVE, 1/3 PSI, 1/4" TF (SS)	SWAGELOK	SS–4C–1/3	6130504C13
120 VAC, 50° SETPOINT	FOR –XX1X0–X1XXXXX FOR –XX1X0–X3XXXXX	15	1	HEATER (DIV. 1/ZONE 1), 200 W, 120 VAC	INTERTEC	DPA200T360–BI–120V	EX5300000003
		16	1	TEMP. CONTROLLER (ZONE 1), SMART, 120 VAC	INTERTEC	TC ATEX D E1 SJ120V	EX5300000011
240 VAC, 50° SETPOINT	FOR –XX1X0–X2XXXXX FOR –XX1X0–X4XXXXX	15	1	HEATER (IECEX/ATEX/CSA), 200 W, 240 VAC	INTERTEC	CP VARITHERM DPA200T340BI–230V	EX5300000006
		16	1	TEMP. CONTROLLER (Z1/D2), SMART, 240 VAC	INTERTEC	TC ATEX D E 01 SJ HFCI–S–0015	EX5300000005
H2S < 50 PPM		17	1	H2S SCRUBBER, 2" DIA.	SPECTRASENSORS	0220351000	0220351000
H2S > 50 PPM		17	1	H2S SCRUBBER, 3" DIA.	SPECTRASENSORS	0220352000	0220352000
		18	1	H2S SCRUBBER EFFICIENCY INDICATOR	SPECTRASENSORS	8000002174	8000002174
		19	1	CONN. KIT, SOV JB	SPECTRASENSORS	EX8000000018	EX8000000018
		20	1	LOCKNUT, NICKLE PL BRASS, 3/4"NPT	APPLETON	075NPTLN5	1300002260
		21	1	WASHER, SERRATED, 316L SS, 3/4"NPT	APPLETON	075NPTSW4	1300002259
		22	1	WASHER, SEALING, IP RATED, 3/4"NPT, WHITE	APPLETON	075NPTETS	1300002258
		23	1	ADAPTER, 3/4"NPTM X M25 FEMALE, EEXD	APPLETON	737DT2M35	EX2400000014
		24	1	REDUCER,M25 TO 1/2NPTF,EEXDE,SS	EX INDUSTRIES	RD–U–3–0–05–29	EX2400000022
		25	1	WASHER,SEALING IP RATED,M25,WHITE NYLON	CMP	25ETS2	1300002228
		26	1	LOCKNUT, NICKLE PLATED BRASS, M25	APPLETON	25LN5	1300002229
		27	1	BREATHER/DRAIN, W/ LOCKNUT, 3/4"NPT	REDAPT	RDPE303000S3	EX1300000019
	FOR –XXXX0–XXXXX1X	28	1	TUBE BUNDLE SHRINK SLEEVE, 2.10" ID	NU–TECH	NUS–4X	6100002161

CONFIGURATION NOTES:

1. DIGITS IN NUMBER STRING SHOWN CORRESPOND TO OPTIONS SELECTED DURING SYSTEM CONFIGURATION.

   SS2100–XXXXXX–XXXXX–XXXXXXX
   └ SAMPLE CONDITIONING SYSTEM OPTIONS

2. TEMPERATURE CONTROLLER SETPOINT DETERMINED BY OPTION SELECTED IN CONFIGURATION STRING SHOWN BELOW.

   SS2100–XXXXXX–XXXXX–XXXXXXX
   └ AMBIENT TEMPERATURE OPTION
   1 = 50° C TEMPERATURE CONTROLLER SETPOINT
   2 = 60° C TEMPERATURE CONTROLLER SETPOINT

EQUIPMENT CERTIFICATION NOTES:

ANALYZER ASSEMBLY RATING: Ex II 3G Ex dc ec IIB+H2 nA opis T3 Gc

DRAWING NO. SS2100AFNC-203 REV B

Figure A–3 *Sample system schematic bill of materials for the SS2100a (fixed mount, non-validation, conventional)*

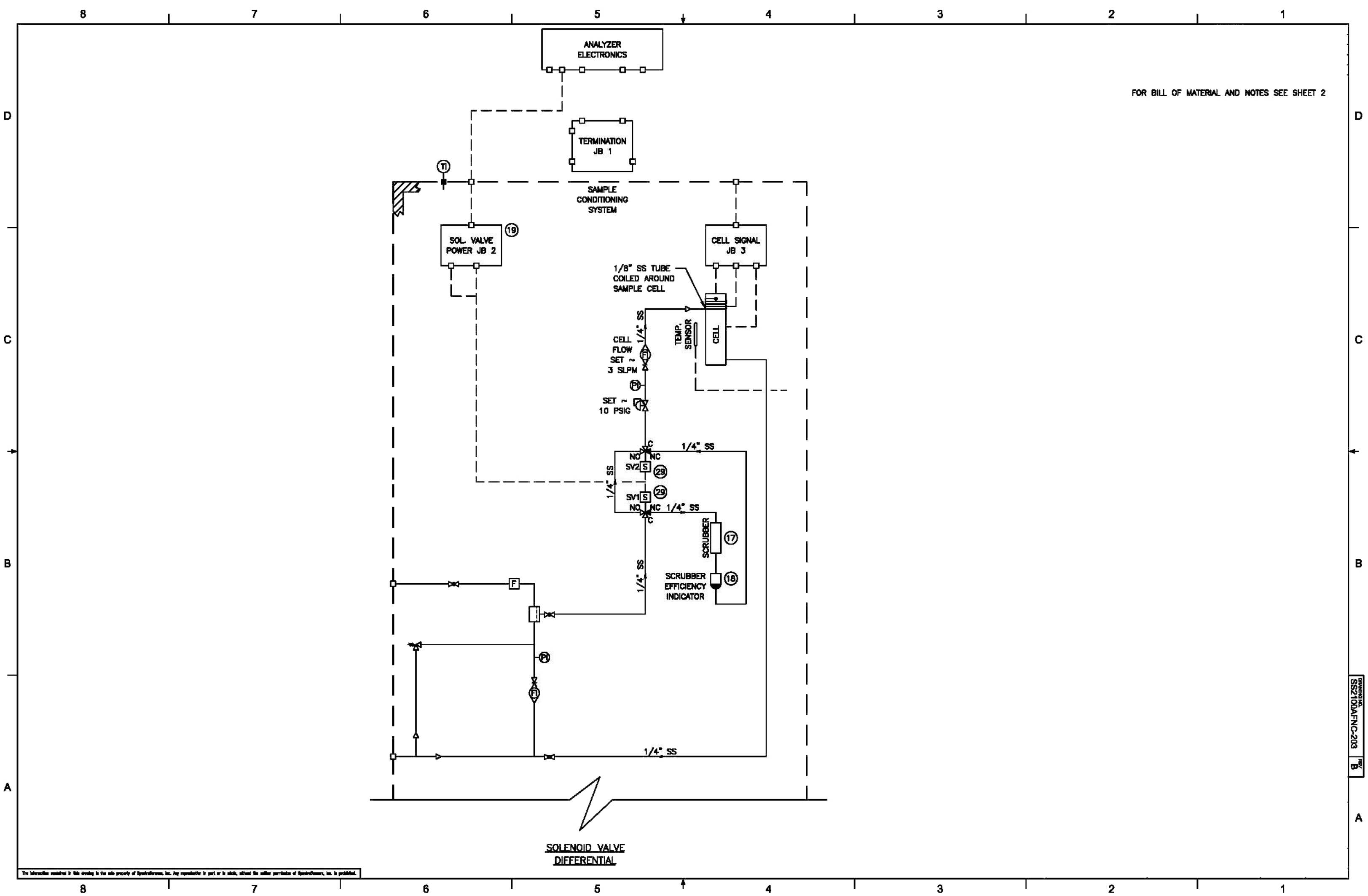


__Figure A–4__ Sample system schematic (solenoid valve differential) for the SS2100a (fixed mount, non-validation, conventional)

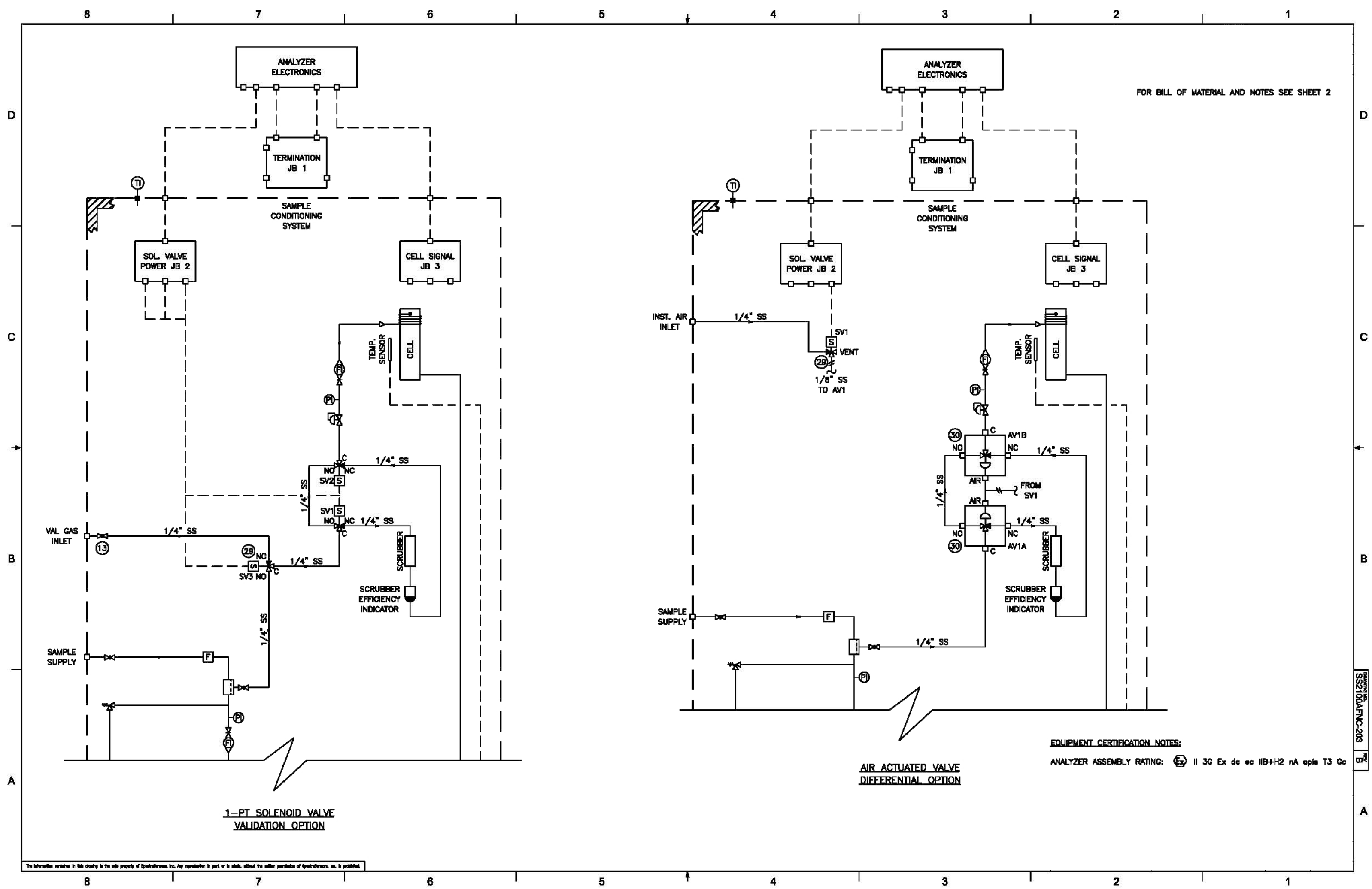


Figure A–5 Sample system schematic (1-pt solenoid valve validation option/ air-actuated valve differential option) for the SS2100a (fixed mount, non-validation, conventional)

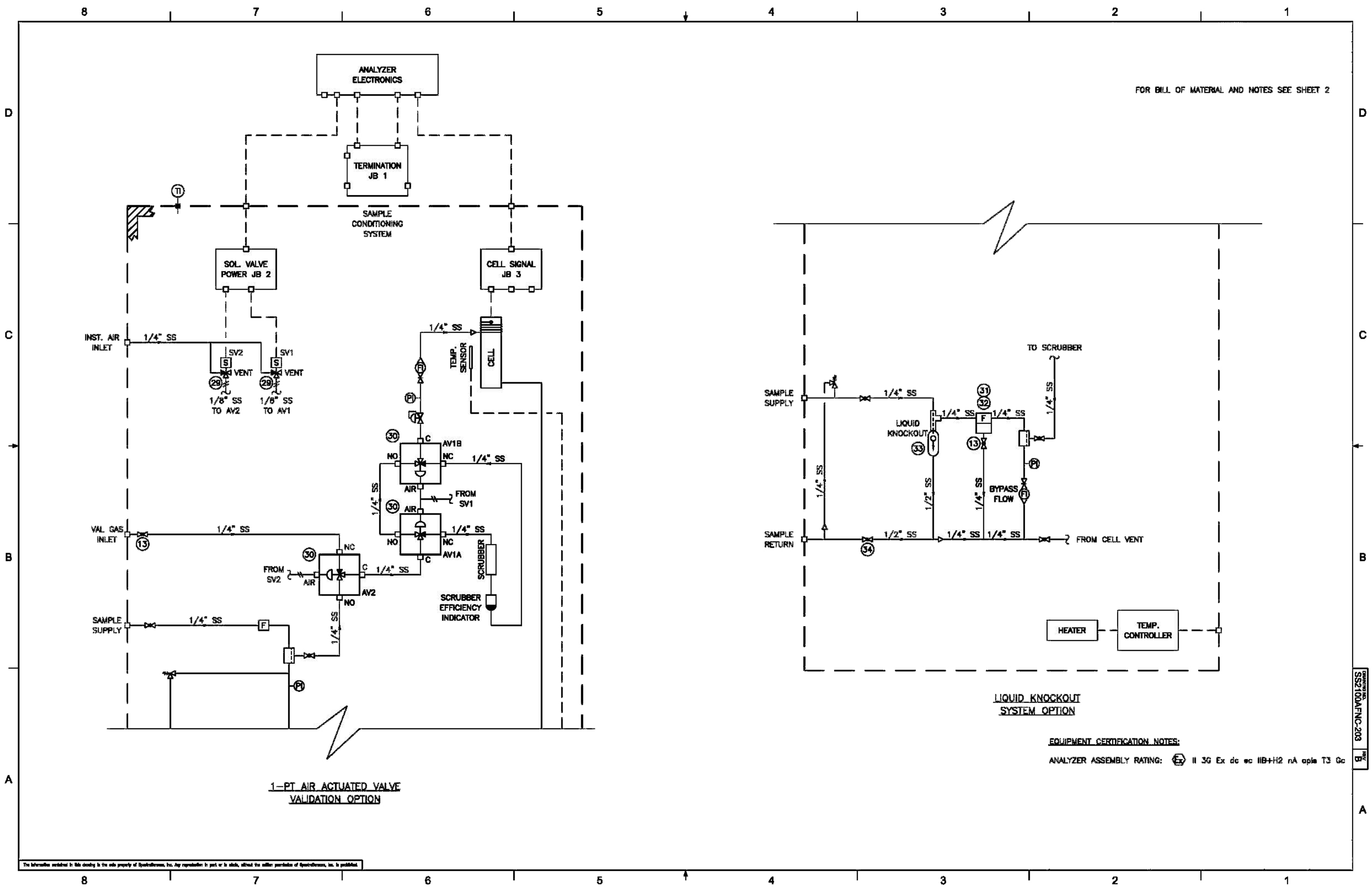


Figure A–6 *Sample system schematic (1-pt air-actuated valve validation option/ liquid knock-out option) for the SS2100a (fixed mount, non-validation, conventional)*

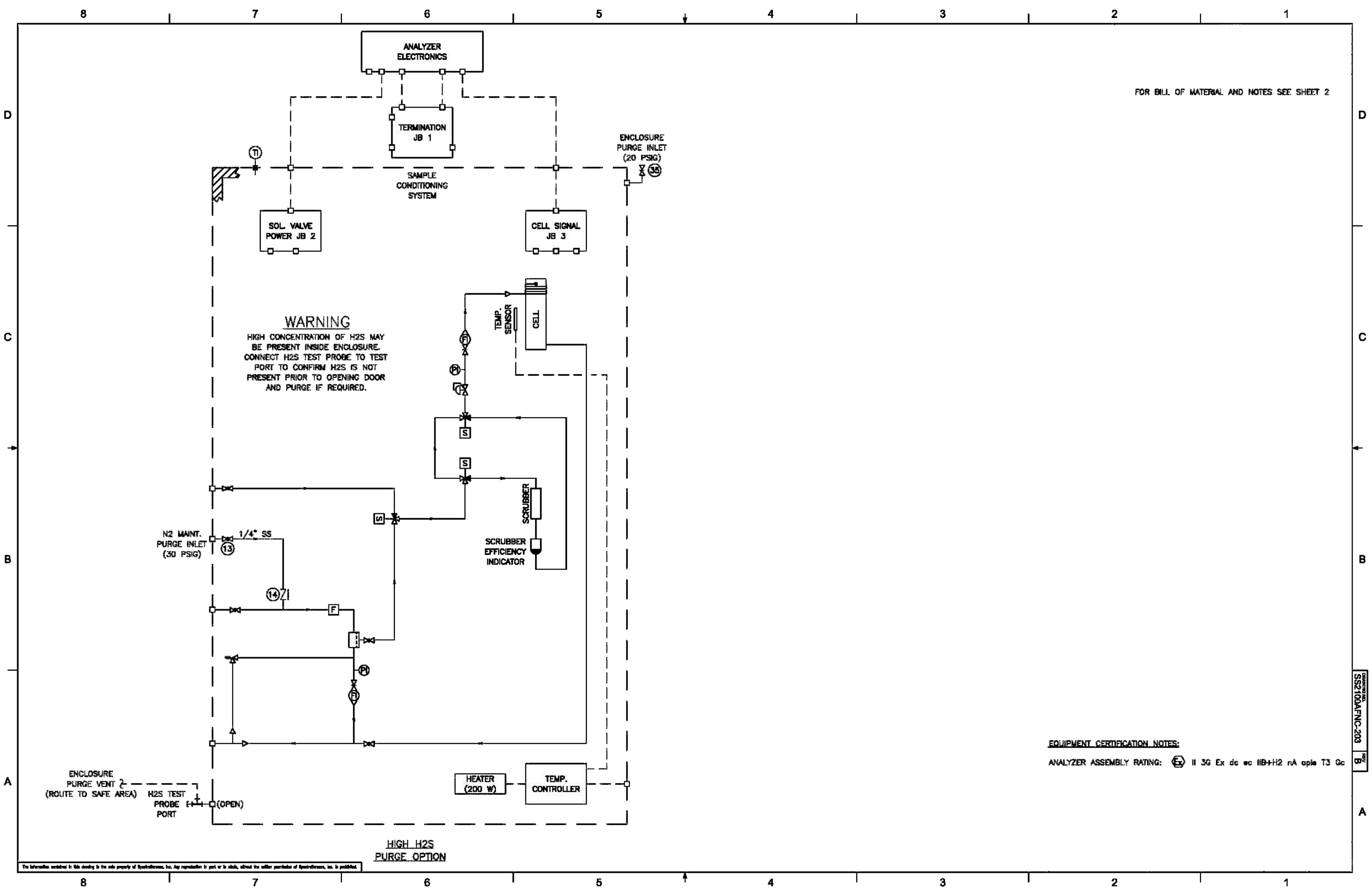


Figure A–7 *Sample system schematic (high H_2S purge option) for the SS2100a (fixed mount, non-validation, conventional)*

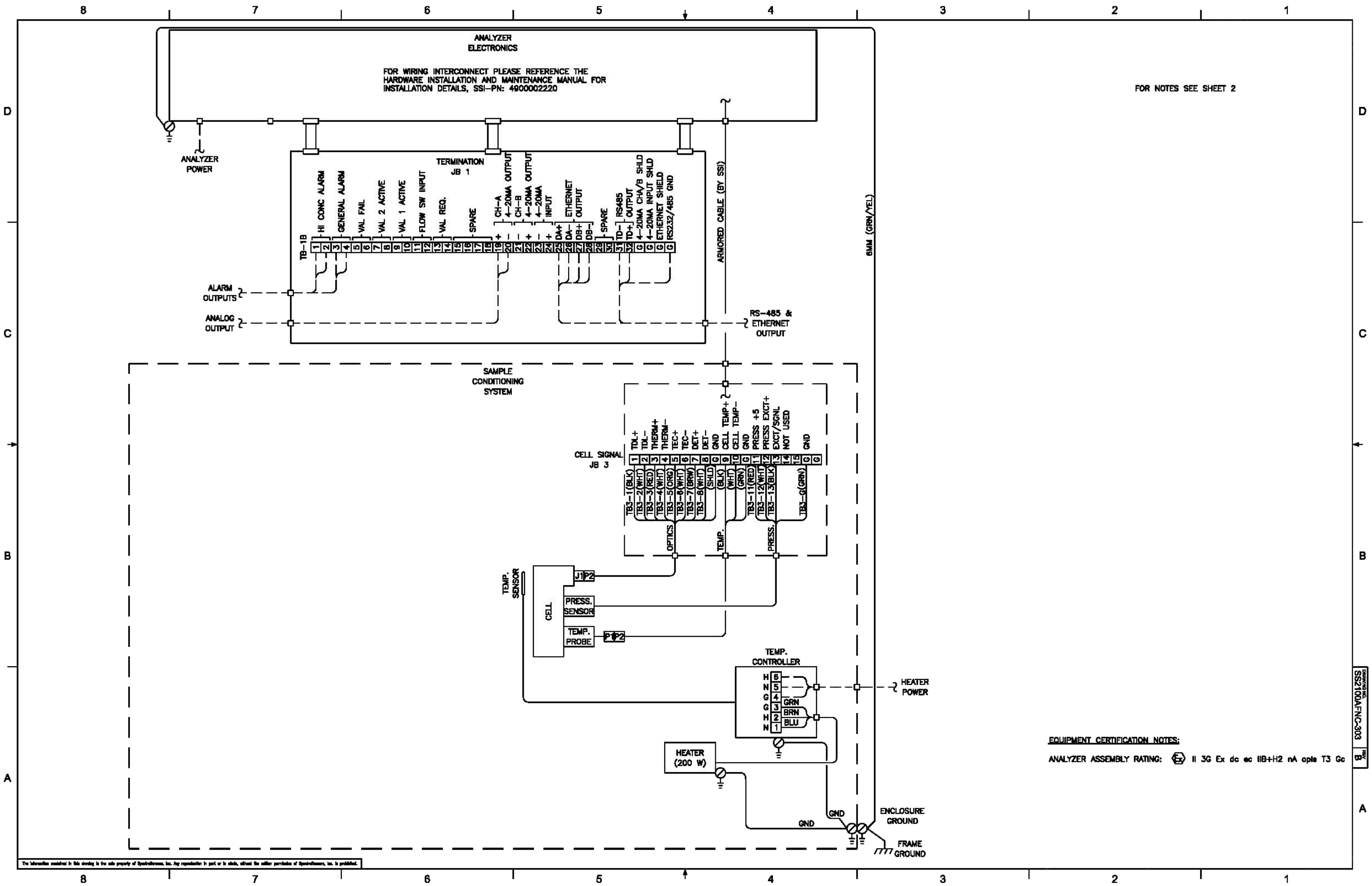


Figure A–8 *Power and signal wiring for the SS2100a (fixed mount, non-validation, conventional)*

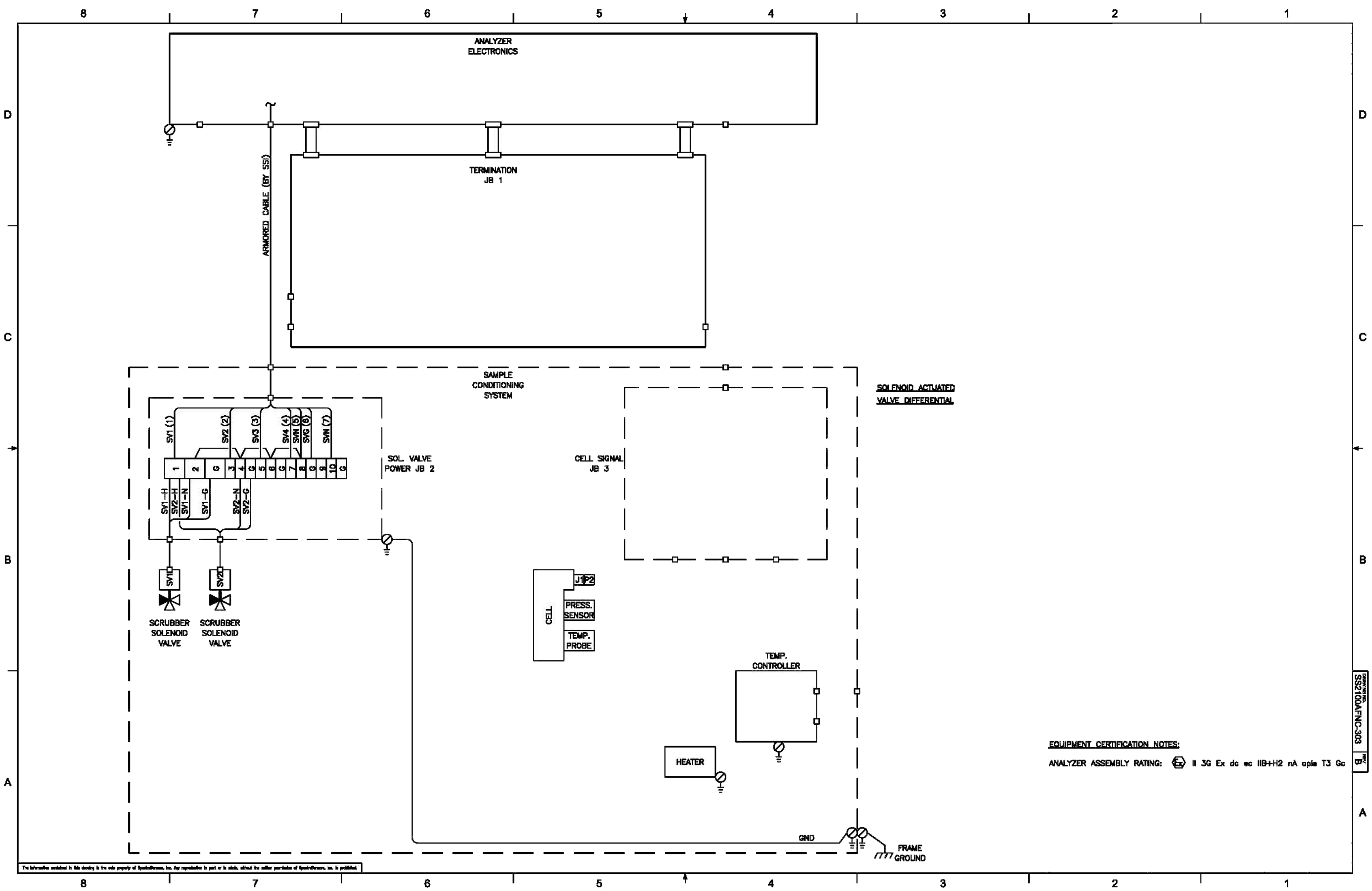


Figure A–9 *Power and signal wiring (solenoid-actuated valve differential) for the SS2100a (fixed mount, non-validation, conventional)*

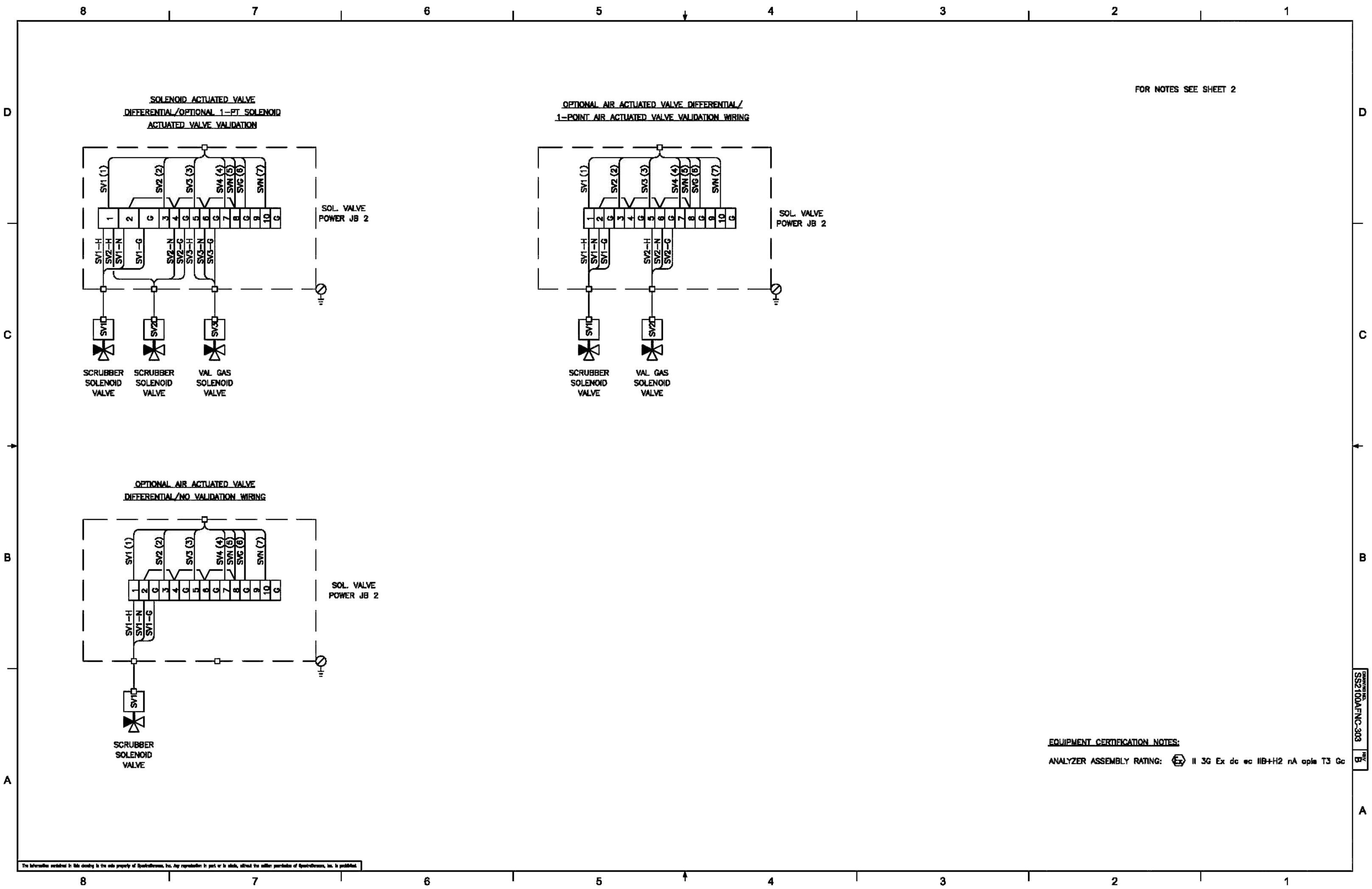
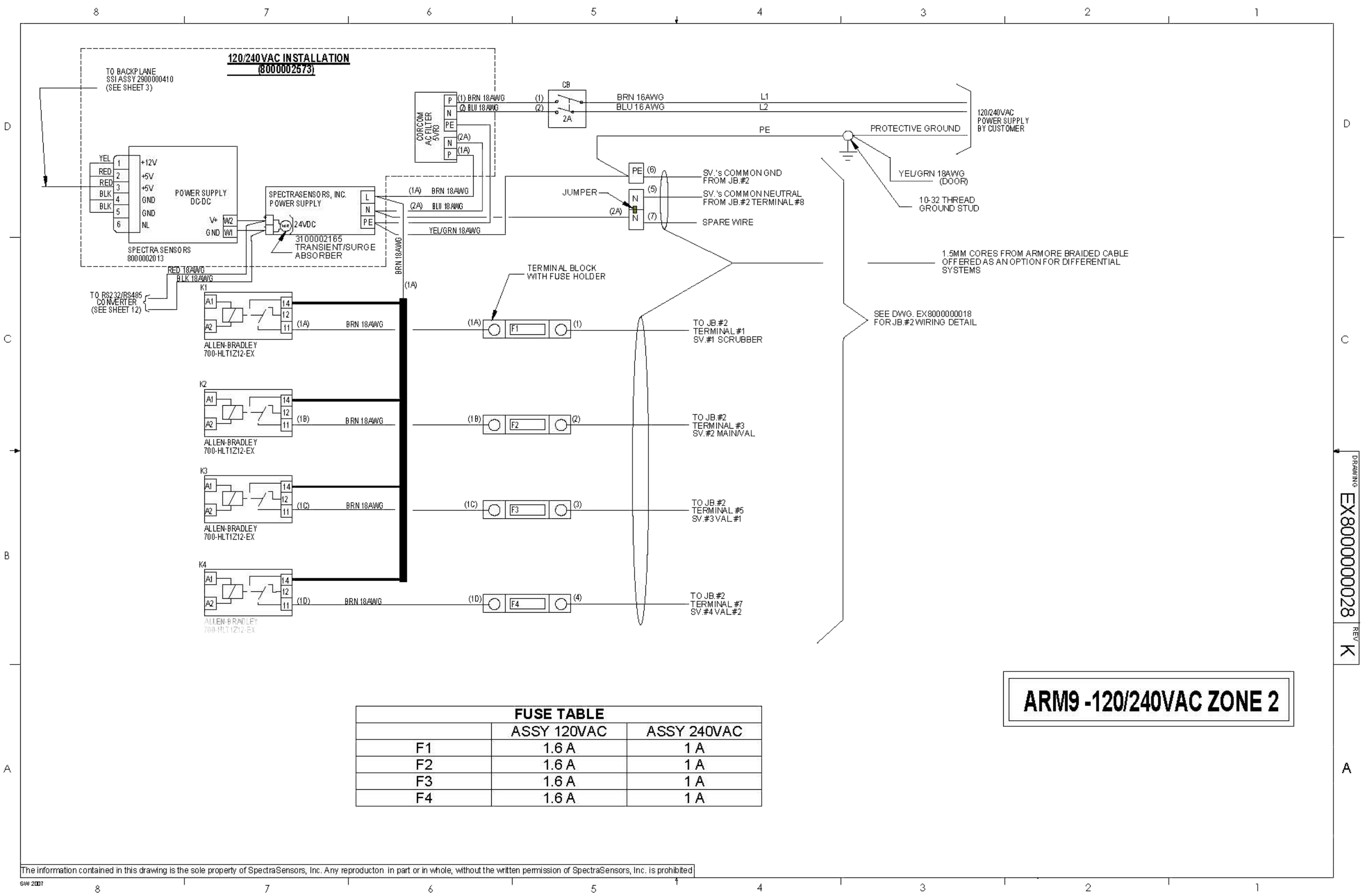


Figure A–10 *Power and signal wiring (solenoid, air-actuated options) for the SS2100a (fixed mount, non-validation, conventional)*



FUSE TABLE		
	ASSY 120VAC	ASSY 240VAC
F1	1.6 A	1 A
F2	1.6 A	1 A
F3	1.6 A	1 A
F4	1.6 A	1 A

Figure A–11 *Electronics schematic, 120/240 VAC (to JB#2)*

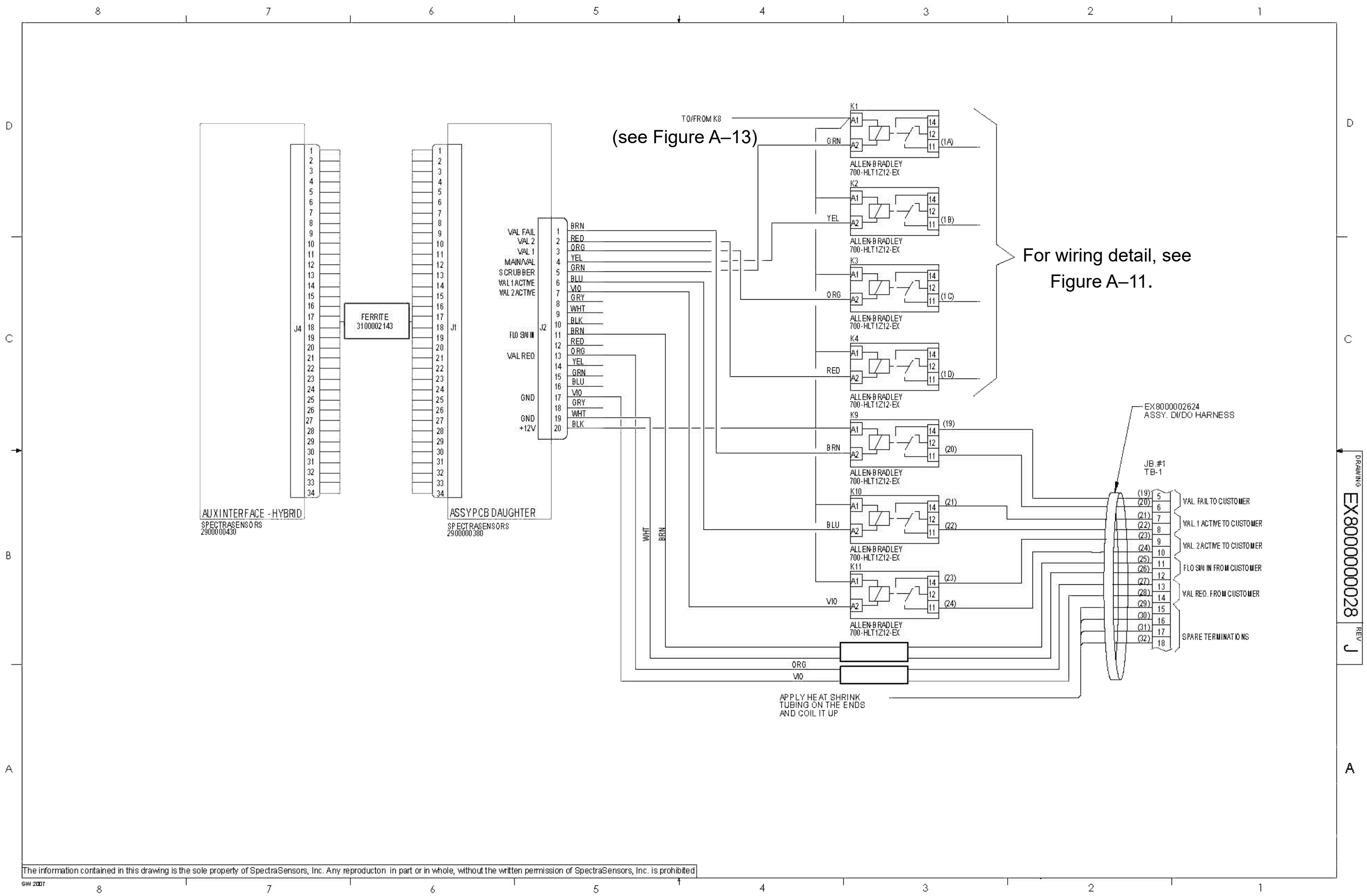


Figure A–12 *Electronics schematic, JB#1 (TB1) to PCB daughter board*

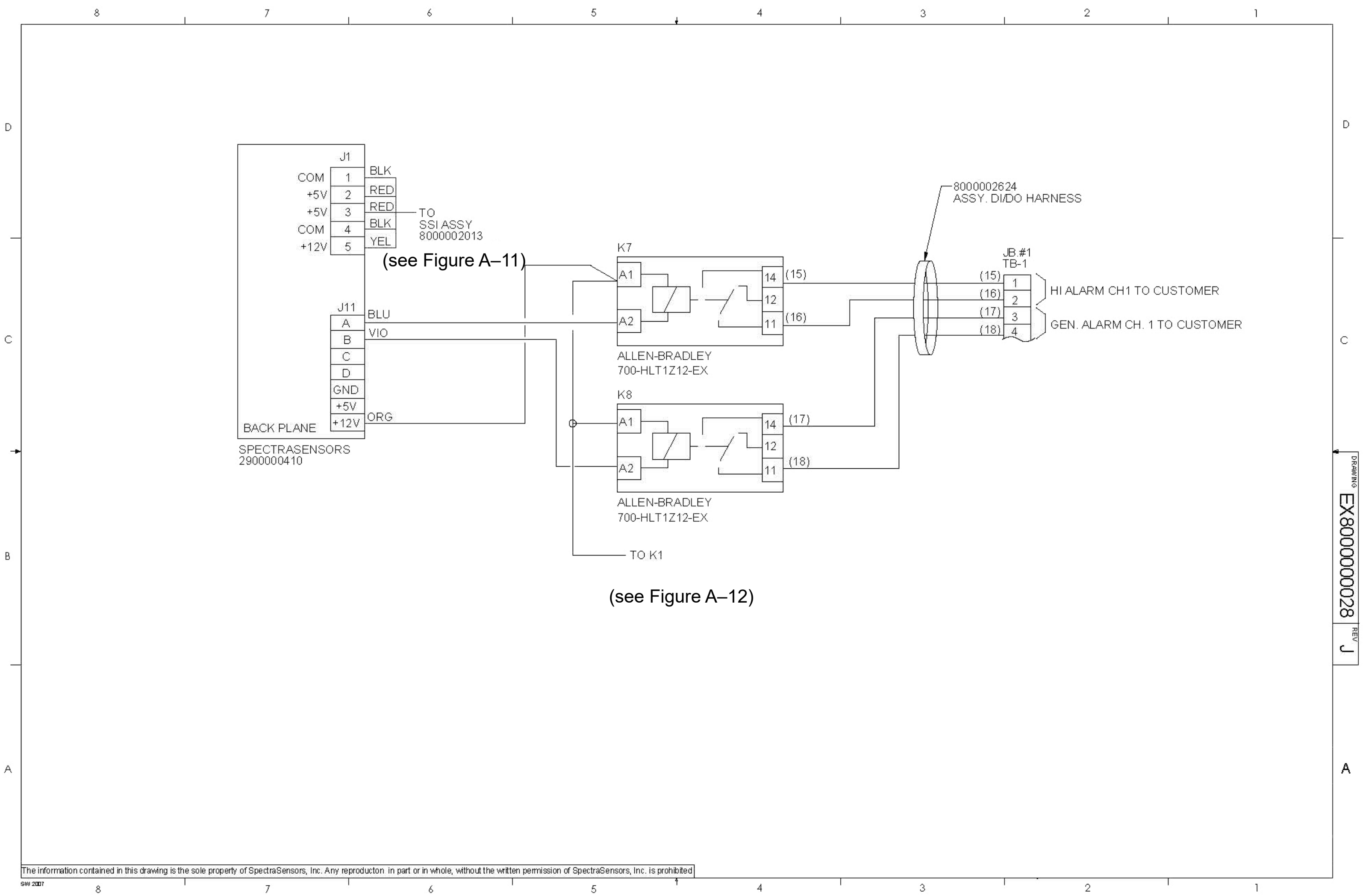
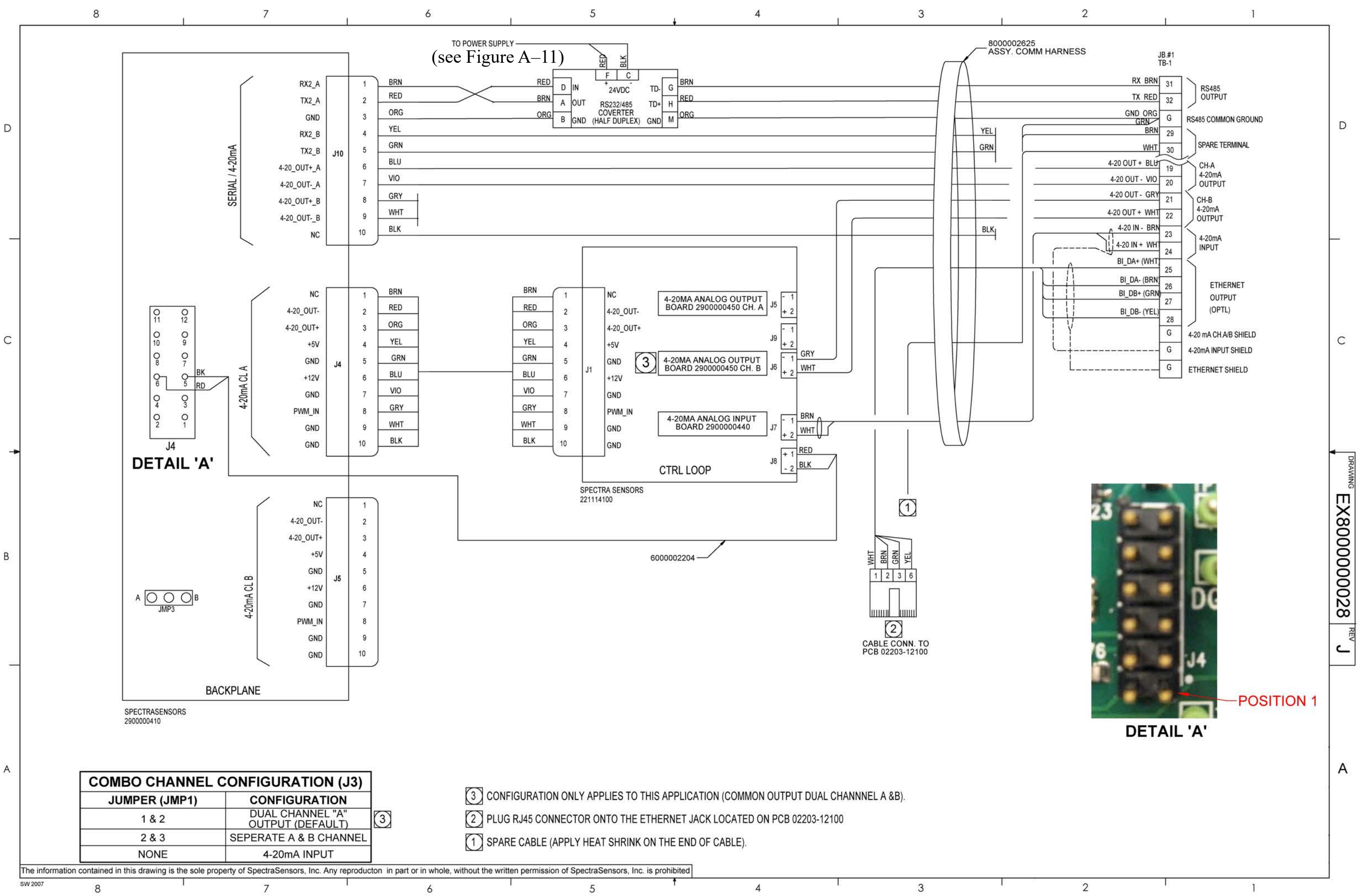


Figure A–13 *Electronics schematic, JB#1 (TB1) to J1, J11 on backplane*



COMBO CHANNEL CONFIGURATION (J3)	
JUMPER (JMP1)	CONFIGURATION
1 & 2	DUAL CHANNEL "A" OUTPUT (DEFAULT)
2 & 3	SEPERATE A & B CHANNEL
NONE	4-20mA INPUT

3 CONFIGURATION ONLY APPLIES TO THIS APPLICATION (COMMON OUTPUT DUAL CHANNNEL A &B).

2 PLUG RJ45 CONNECTOR ONTO THE ETHERNET JACK LOCATED ON PCB 02203-12100

1 SPARE CABLE (APPLY HEAT SHRINK ON THE END OF CABLE).

Figure A–14 *Electronics schematic, 4-20 mA and serial connections*

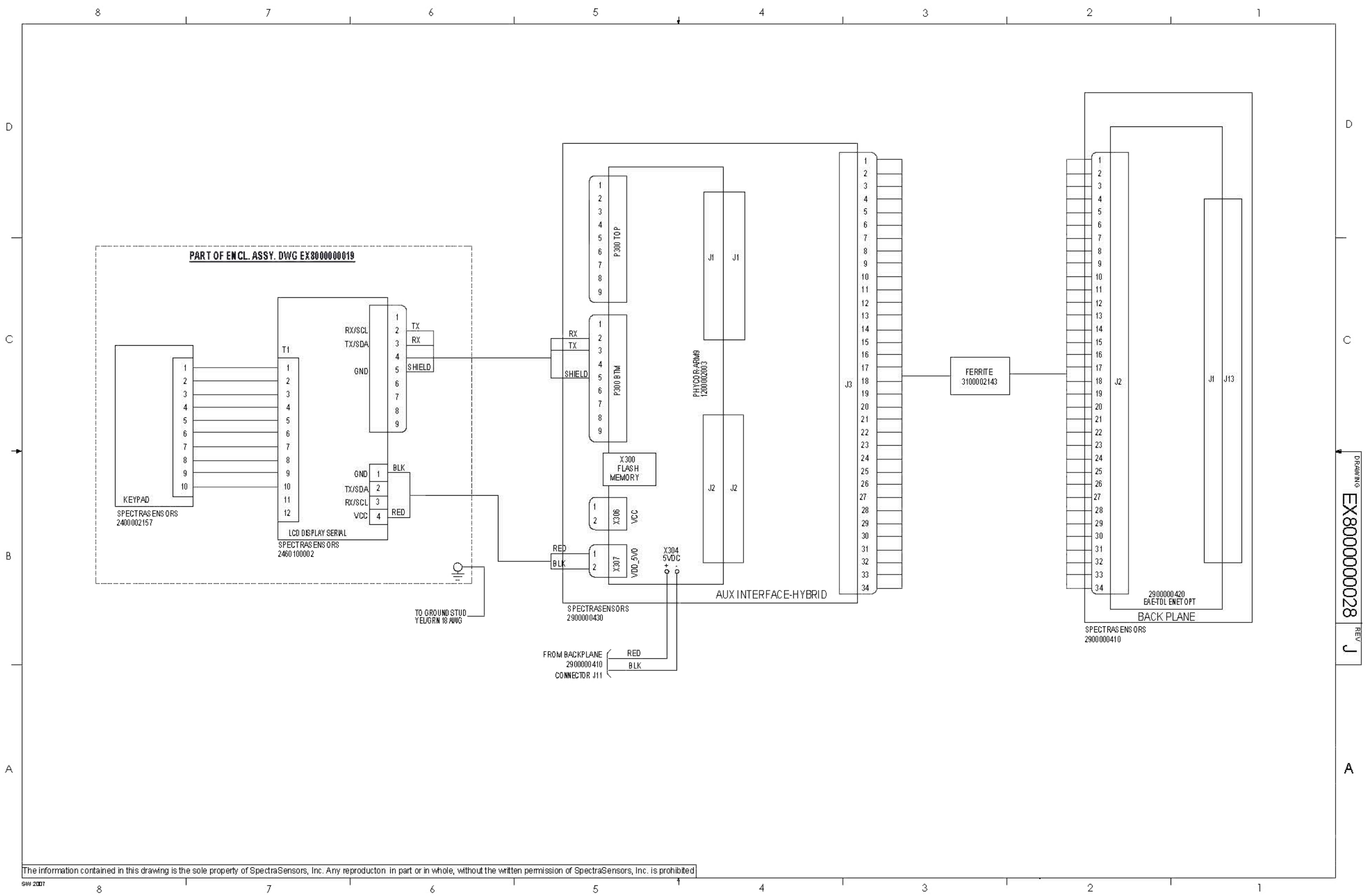


Figure A–15 *Electronics schematic, keypad, LCD connections*

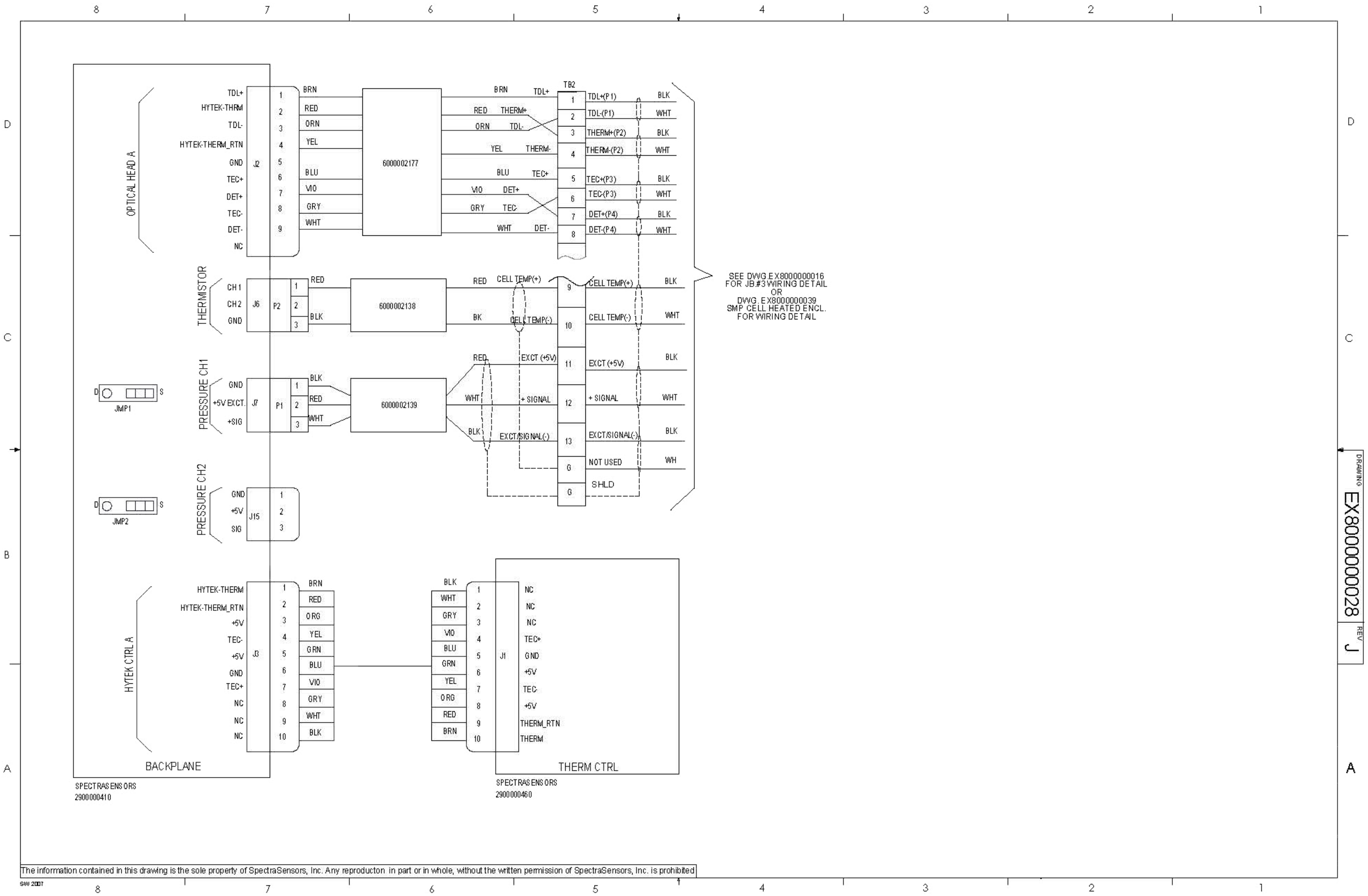


Figure A–16 Electronics schematic, temperature controller connections

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 gas analyzer is experiencing issues not related to the above mentioned problems, refer to **"Service"** on page B-33.

Class 3B invisible laser radiation when open. Avoid exposure to the beam. Never open the sample cell unless directed to do so by a service representative and the analyzer power is turned off.

The optical head has a seal and "WARNING" sticker to prevent inadvertent tampering with the device. Do not attempt to compromise the seal of the optical head assembly. Doing so will result in loss of device sensitivity and inaccurate measurement data. Repairs can then only be performed by the factory and are not covered under warranty.

Gas Leaks

Probably the most common cause of erroneous measurements is outside air leaking into the sample supply line. It is recommended the supply lines be periodically leak tested, especially if the analyzer has been relocated or has been replaced or returned to the factory for service and the supply 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-4.

To keep the sampling lines clean

1. Make sure that a membrane separator filter (included with most systems) is installed ahead of the gas analyzer and is operating normally. Replace the membrane or filter if necessary (refer to **“Replacing the Membrane Separator”** on page B-10 or **“Replacing the Filter”** on page B-11).

*If liquid enters the cell and accumulates on the internal optics, a **Laser Power too Low** fault 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 gas 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 Table A–1 on page A–1).

The cell temperature operating range for analyzers that are equipped with heated enclosures is equal to the enclosure temperature set-point ±5 °C.

Pressures and temperatures outside this range will trigger a **Pressure Low Alarm**, **Pressure High Alarm**, **Temp Low Alarm**, or **Temp High Alarm** fault. Refer to Table B–1 on page B–28 for troubleshooting information.

If the pressure, temperature, or any other readings on the LCD appear suspect, they should be checked against the specifications (see Table A–1 on page A–1).

Refer to the Device Parameters for more information on system faults and alarms.

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.

Relief Valve Setting

The relief valve is pre-set at the factory at 50 PSIG and should not require adjustment. Refer to the system drawings in Appendix A.

Improper adjustment in the field could prevent the proper operation of the relief valve and/or sample conditioning system. *Refer to **"Service"** on page B-33.*

Permeation Device Removal and Storage

If the analyzer needs to be shut down temporarily (for 48 hours or more), and a gas or purge flow cannot be maintained through the analyzer, follow the instructions below to remove and package the permeation device before storage. This procedure applies to NH_3 analyzer systems.

During a temporary shutdown, Endress+Hauser recommends removing the permeation device to prevent fouling of the measurement cell mirror.

Refer to the Operator's Instructions for procedures on shutting down the analyzer.

Removing the permeation device

1. Open the SCS door and block in the sample flow using the diaphragm valve upstream of the dryer.
2. While watching the cell flow meter, allow all flow to come to zero.
3. Block in the sample cell vent to prevent backflow into the cell and permeation device.
4. Loosen the connections on the inlet and outlet of the permeation device.

5. Remove the permeation device.

Storing the permeation device

1. Cap all inlets using the plugs retained from the permeation device installation, if possible.
2. Pack the permeation device in the original shipping packaging, if available. If the original packaging material is no longer available, the equipment should be adequately secured (to prevent excessive shock or vibration). Refer to **"Service"** on page B-33 for any questions related to packaging.
3. The packaged permeation device should be stored in a sheltered environment that is temperature controlled above 0 °C (32 °F), and should not be exposed to direct sun, rain, snow, condensing humidity or corrosive environments.

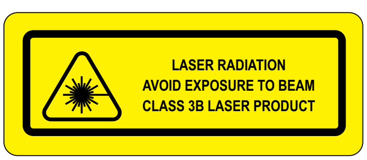
Peak Tracking Reset Procedure

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 **PeakTk Restart Alarm** is displayed, the peak tracking function should be reset. Refer to the Device Parameters for this analyzer for instruction.

Cleaning the Mirrors

If contamination makes its way into the cell and accumulates on the internal optics, a **Laser Power Low Alrm** fault will result. If mirror contamination is suspected, refer to **"Service"** on page B-33 before attempting to clean the mirrors. If advised to do so, use the following procedure.

*This procedure should be used ONLY when necessary and is not part of routine maintenance. To avoid compromising the system warranty, refer to **"Service"** on page B-33.*



***INVISIBLE LASER RADIATION** - 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.*

To clean the mirror, refer to the instructions **"To clean the mirrors"** on page B-6.

Tools and supplies

- Lens cleaning cloth (Cole Parmer® EW-33677-00 TEXWIPE® Alphawipe® Low-Particulate Clean Room Wipes or equivalent)
- Reagent-grade isopropyl alcohol (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 ink marker
- Non-outgassing grease
- Flashlight

Determining the type of cell mirror

Measurement cells will come equipped with either a glass or stainless steel mirror. Before determining whether to clean or replace the mirror, identify the type of measurement cell being used in the analyzer. There are four types of measurement cells; 0.1 m, 0.8 m, 8 m and 28 m. Refer to Figure B–4.

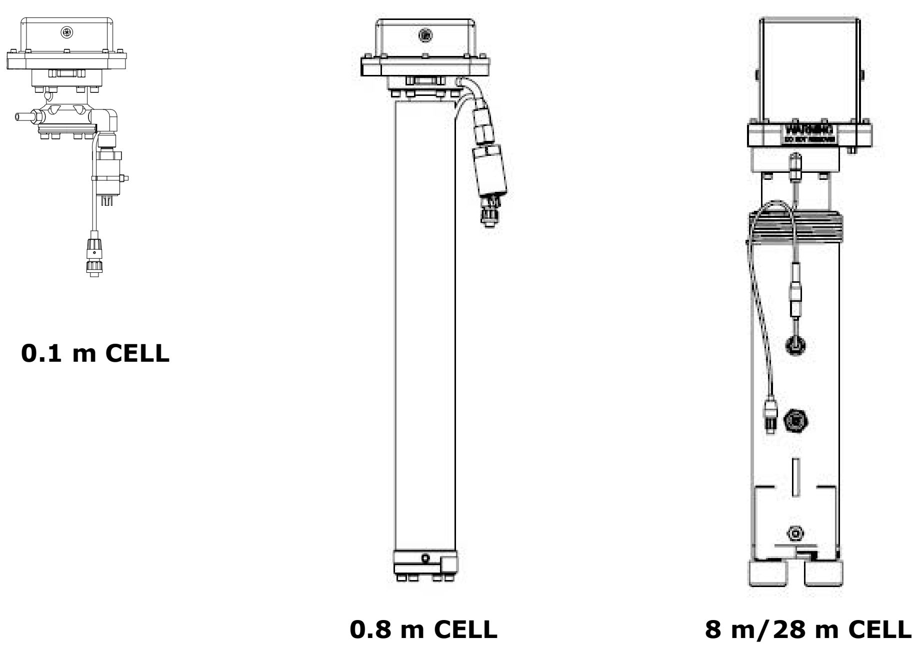
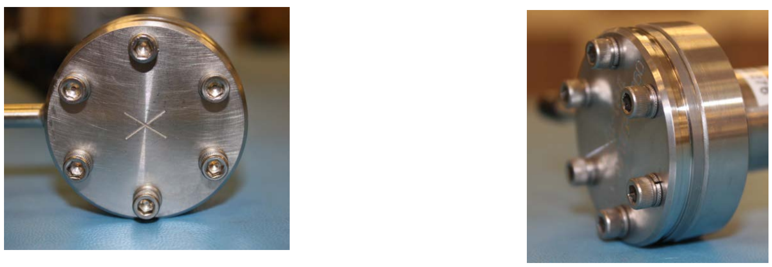


Figure B–1 *Measurement cell types*

The stainless steel mirrors are used with 0.1 m and 0.8 m measurement cells only.

The stainless steel mirrors have been identified with either an “X” engraved on the outside bottom of the mirror or a groove around the rim of the mirror. Glass mirrors can be used on any size cell. 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 the side of the mirror for a groove. Refer to Figure B–2 below.



MIRROR MARKED WITH ‘X’ **MIRROR GROOVED RIM - SIDE VIEW**

Figure B–2 *Stainless steel mirror marking*

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

   b. If the bottom surface is rough or engraved, or a groove on the side of the mirror 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 the mirror, refer to the instructions **“**To clean the mirrors**”** below. If your system has been configured with a stainless steel mirror in the 0.1 m or 0.8 m measurement cell, refer to **“To replace the stainless steel mirror”** on page B-8.

To clean the mirrors

1. Power down the analyzer following the procedure outlined in **“Powering Down the Analyzer”** in the Device Parameters for this analyzer.

The sample cell assembly contains a low-power, 20 mW MAX, CW Class 3b invisible laser with a wavelength between 800 to 3000 nm. Never open the sample cell flanges or the optical assembly unless the power is turned off.

2. Isolate the SCS from the process sample tap. Refer to **"To isolate the process sample tap for long-term shutdown"** on page 4-9.

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

3. If possible, purge the system 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. Carefully mark the orientation of the mirror assembly with a permanent ink marker 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 four (4) socket-head cap screws and set on a clean, stable and flat surface.

The sample cell assembly contains a low-power, 20 mW MAX, CW Class 3b invisible laser with a wavelength between 800 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.

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 **"Service"** on page B-33.*

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 alcohol 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.
14. Replace the O-Ring adding a very thin layer of grease. Ensure it is properly seated.
15. Tighten the socket-head cap screws evenly with a torque wrench to 30 in-lbs.

Replacing the Stainless Steel Mirror

To replace the stainless steel mirror

If your system has been configured with a stainless steel mirror in the 0.1 m or 0.8 m measurement cell, use the following instructions for replacing the mirror. The part number for the replacement mirror can be found in **"General Items for SS2100a"** on page C-8.

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 ***"Service"*** *on page B-33.*

1. Power down the analyzer following the procedure outlined in the section called **"Powering Down the Analyzer"** in the Device Parameters for this analyzer.
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 750-3000 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–3.

Figure B–3 *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.

Replacing the Membrane Separator

To replace membrane separator

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:

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

OR

If liquid or contaminants are detected on the filter:

1. Drain any liquids and clean with isopropyl alcohol.
2. Clean any liquids or contaminants from the base of the membrane separator.
3. Replace the filter and the O-Ring.
4. Place the cap onto the membrane separator and tighten.
5. Check upstream of the membrane for liquid contamination and clean and dry out before re-opening the sample supply valve.

Replacing the Dryer

1. Using a wrench, loosen the female fitting at the top and bottom of the dryer.

The VCR metal gasket face seal fitting is currently used on low moisture systems only.

2. Remove the retainer clip gasket and place in a safe location.
3. Remove the dryer.
4. Secure the retainer clip gasket to the new dryer unit.
5. Insert the new dryer into the analyzer.

*Refer to your analyzer's spare parts list or contact **"Service"** on page B-33 for ordering assistance.*

6. Connect the female nuts at the top and bottom of the dryer to finger tight.
7. Using a wrench, tighten the female nuts 1/8 turn from finger tight.

Replacing the Filter

To replace the filter

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.

Replacing the Pressure Sensor

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

Refer to the following information for replacing the pressure sensor.

Replacing the pressure sensor on a 8 m or 28 m cell

To replace the pressure sensor on a 8 m or 28 m cell

Use the following instruction to replace a pressure sensor on a 8 m or 28 m measurement cell.

Tools and materials

- Acetone-impenetrable gloves (North NOR CE412W Nitrile Chemsoft™ CE Cleanroom Gloves or equivalent)
- 9/16 in. wrench
- 7/8 in. wrench
- 9/64 in. hex key
- Flat-head screwdriver
- Phillips-head screwdriver
- Metal pick
- Military grade stainless steel PTFE tape (or equivalent)
- Dry nitrogen
- Isopropyl alcohol

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

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 for this analyzer for **"Powering down the analyzer"**.
5. Open the door to the SCS enclosure. Refer to Figure B–4.

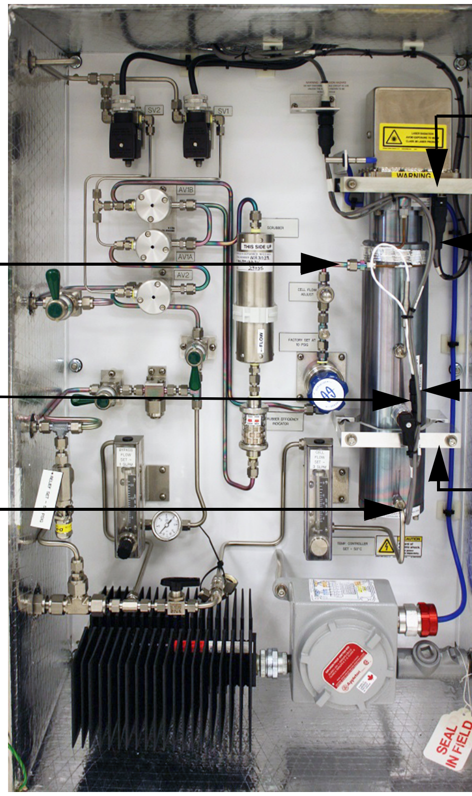


Figure B–4 *SCS cabinet interior*

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. Remove the cell from the bracket by removing the four securing screws (two on top, two on the bottom) using a 9/64 in. hex key. Place the measurement cell on a clean, flat surface with the pressure sensor facing up. Refer to Figure B–5.

Figure B–5 *Removed 28 m measurement cell*

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

12. Holding the cell firmly with one hand, use a 7/8 in. wrench to remove the old (to be replaced) pressure sensor as shown in Figure B–6 below.

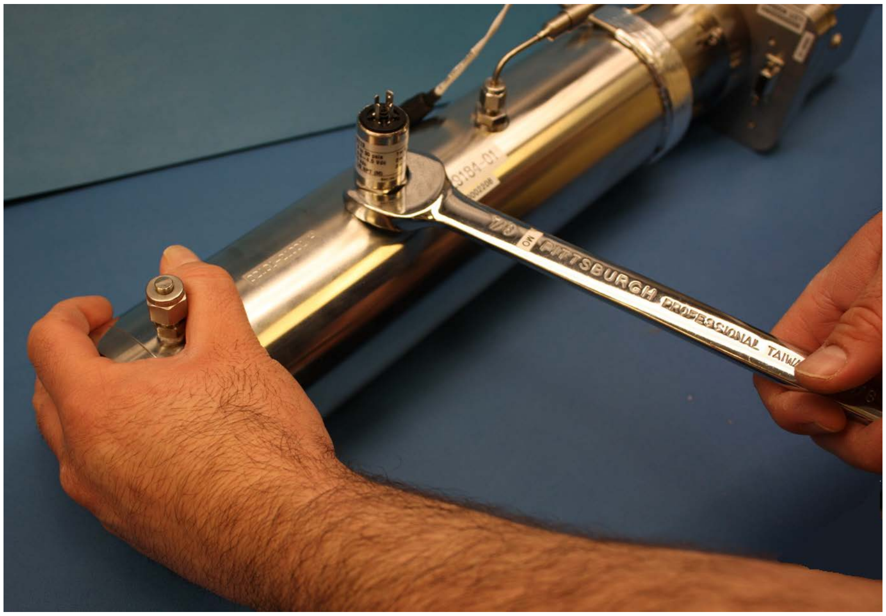


Figure B–6 *Removing the old pressure sensor*

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

13. Remove excess seal tape from the threads at the opening and check for galling. Refer to Figure B–7.

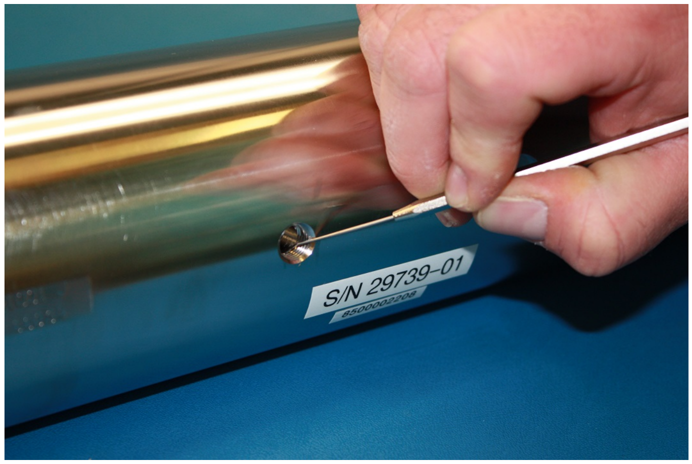


Figure B–7 *Removing excess seal tape from flange*

Tip the measurement cell forward so that any loose debris falls to the flat surface and not back inside the cell.

*Threads showing signs of galling indicate a possible leak. Refer to **"Service"** on page B-33 to arrange for repair.*

14. Check for any debris if you suspect debris has fallen into the measurement cell. Refer to **"Cleaning the Mirrors"** on page B-4 to check for debris.
15. Check for tape fragments inside the cell and remove with a swab. Refer to Figure B–8.

Figure B–8 *Removing excess seal tape from inside cell*

16. Remove the new pressure sensor from the packaging. Retain the black connector cap on the sensor - *do not remove*.
17. 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–9.

Figure B–9 *Replacing seal tape*

18. Holding the cell steady, insert the new pressure sensor into the threaded opening. Refer to Figure B–10.

Figure B–10 *Replacing pressure sensor*

19. Hand tighten the pressure sensor clockwise into the opening until no longer moving freely.

20. Holding the cell 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 end of the pressure sensor is facing towards the head or the base of the measurement cell to facilitate connection. Refer to Figure B–11.

Figure B–11 *New pressure sensor installed*

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

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

If the new model pressure sensor cable is currently installed in the SCS, a new cable may not be required. If no new cable is installed, re-attach the existing cable in place of step 26.

23. Remount the cell to the mounting brackets using a 9/64 in. hex key with the pressure sensor facing out towards the cabinet door.
24. Reconnect the cell inlet and cell outlet using a 9/16 in. wrench.
25. Reconnect the thermistor connector.
26. Connect the new pressure sensor harness and cable to the circular connector.
27. Reconnect the optical cable harness.
28. Close the door to the SCS enclosure.
29. 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-33.*

30. Turn the system power on. Refer to the Device Parameters for this analyzer for **"Powering up the analyzer"**.
31. Run a validation on the analyzer. Refer to the Device Parameters for instructions on **"Validating the Analyzer"**.

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

    b. If the system does not pass, refer **"Service"** on page B-33 for instruction.

Replacing the pressure sensor on a 0.8 m or 0.1 m cell

To replace the pressure sensor on a 0.8 m or 0.1 m cell

Use the following instruction to replace a pressure sensor on a 0.8 m or 0.1 m measurement cell.

Tools and materials

All tools and materials listed in **"To replace the pressure sensor on a 8 m or 28 m cell"** on page B-12 will be necessary to complete this instruction with the exception of the following:

- Acetone-impenetrable gloves (North NOR CE412W Nitrile Chemsoft™ CE Cleanroom Gloves or equivalent)

Follow steps 1-10 listed under the section for replacing the pressure sensor on the 8-m/28-m cell on **"To replace the pressure sensor on a 8 m or 28 m cell"** on page B-12, then continue with the following steps:

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

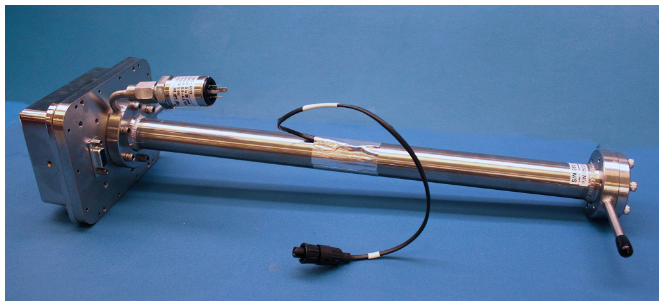


Figure B–12 *Removed 0.8 m measurement cell with pressure sensor face up*

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

12. 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–13 below.

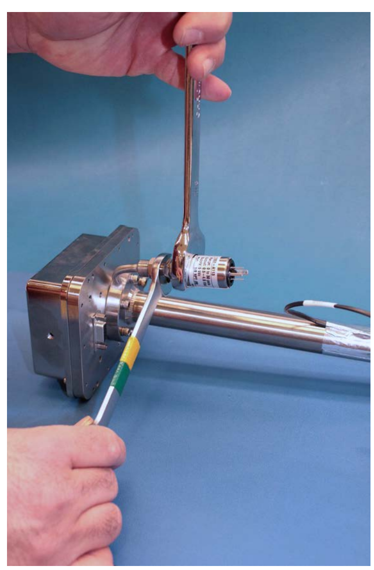


Figure B–13 *Removing the old pressure sensor*

a. Hold the 9/16 in. 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.

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

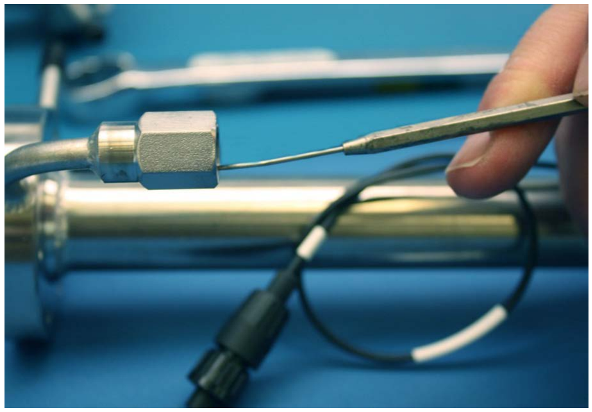


Figure B–14 *Removing excess seal tape from flange*

Contact Service to arrange for a repair if the threads show signs of galling indicating a possible leak. Refer to page B-33.

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

15. 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–15 below.

Figure B–15 *Replacing seal tape*

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

17. Hand tighten the pressure sensor turning it counterclockwise into the flange until no longer moving freely. Refer to Figure B–16 below.

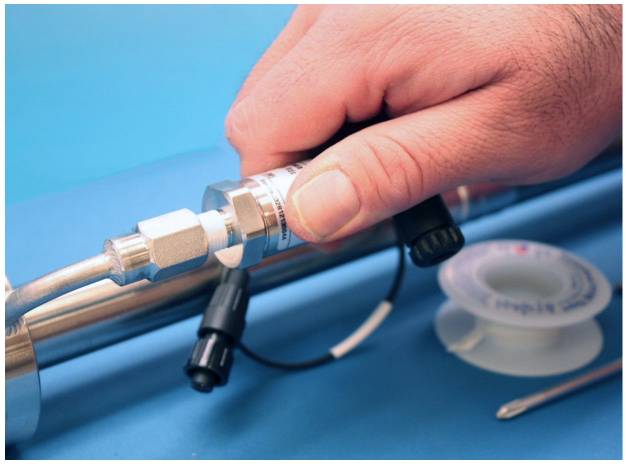


Figure B–16 *Replacing pressure sensor*

18. 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. Refer to Figure B–17 below.

Figure B–17 *Newly installed pressure sensor positioning*

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

20. 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 and disregard step 11.

21. Remount the cell to the mounting brackets using a 9/64 in. Allen wrench with the pressure sensor facing forward.

22. Reinstall cell inlet and cell outlet using a 9/16 in. wrench.

23. Reconnect the thermistor.

24. Connect the new pressure sensor harness and cable to the circular connector.

25. Reconnect the optical cable harness.

26. Close the door to the SCS enclosure.

27. 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.

*Contact Service for any questions related to leak testing the pressure sensor. Refer to **"Service"** on page B-33.*

28. Power up the system. Refer to the Device Parameters for this analyzer for **"Powering Up the Analyzer"**.

29. Run a validation on the analyzer. Refer to the Device Parameters for instructions on **"Validating the Analyzer**.**"**

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

b. If the system does not pass, the pressure sensor replacement was not successful. Contact Service if the system does not pass. Refer to **"Service"** on page B-33.

Periodic SCS Maintenance

Due to the chemical properties of the process samples, care must be taken to repair or replace components with proper materials of construction. Maintenance personnel should have a thorough knowledge and understanding of the chemical characteristics of the process before performing maintenance on the SCS.

The status of the SCS should be checked regularly to confirm proper operation (pressures, flows, etc.) and detect potential problems or failures before damage occurs. If maintenance is required, isolate the part of the system to be serviced by following the appropriate procedure under **"Shutting Down the SCS"** on page 4-6.

All filter elements should be checked periodically for loading. Obstruction of a filter element can be observed by a decreasing supply pressure or bypass flow. If loading of a filter is observed, the filter should be cleaned and the filter element replaced. See **"To check filters"** on page B-24. After observation for some time, a regular schedule can be determined for replacement of filter elements.

No other regularly scheduled maintenance should be required for the system.

Preventive and On-Demand SCS Maintenance

Due to the chemical properties of the process samples, care must be taken to repair or replace components with proper materials of construction. Maintenance personnel should have a thorough knowledge and understanding of the chemical characteristics of the process before performing maintenance on the SCS.

Preventive and on-demand maintenance will be required when components and parts deteriorate or fail as a result of continuous use. The performance of the entire SCS and individual components should be monitored regularly so that maintenance may be performed on a scheduled basis in order to prevent a failure that could take the system out of operation.

The SCS is designed for convenient removal and replacement of component parts. Complete spare components should always be available. In general, if a problem or failure occurs, the complete part should be removed and replaced to limit system down time. Some components may be repaired (replacement of seats and seals, etc.) and then reused.

Under a process upset condition, it is possible for liquid to enter the sample probe and sample transport tubing. Normally, this liquid should purge from the sample transport line and be trapped in a coalescing filter upstream of the analyzer.

If the sample supply line does not appear to completely clear during normal operation, it may be necessary to clean the sample transport line to remove any liquid that may adhere to the wall of the tubing. The sample transport line must be disconnected at both ends to allow cleaning. After cleaning, the line should be purged dry with air or nitrogen before the system is placed back in operation.

The system must be taken out of service during any cleaning of the sample transport line.

If liquid makes it into the analyzer SCS, a filter element may become obstructed leading to a decreasing supply pressure or bypass flow. If obstruction of a filter is observed, the filter should be cleaned and the filter element replaced. Follow the procedure below.

Regular SCS Status Check

1. Open the SCS door.
2. Read and record the flow meter settings while the gas is flowing.
3. Close the SCS door.

Do not leave the SCS door open any longer than absolutely necessary. Endress+Hauser recommends no more than 60 seconds.

4. Compare the current readings with the past readings to determine any variations. Reading levels should remain consistent.
5. If reading levels decrease, check the filters.

To check filters

1. Shut down the system following the procedure in **"Shutting Down the SCS"** on page 4-6.
2. Inspect, repair or replace the filter as required. Refer to **"Replacing the Filter"** on page B-11.

*For additional information, refer **"Service"** on page B-33.*

3. Restart the system following the procedure in **"Starting up the SCS"** on page 4-3.

Servicing the H_2S Scrubber

Due to the chemical properties of the process samples, care must be taken to repair or replace components with proper materials of construction. Maintenance personnel should have a thorough knowledge and understanding of the chemical characteristics of the process before performing maintenance on the SCS.

The H_2S scrubber contains material that gradually loses its scrubbing ability with use. The lifetime of the material depends on how much H_2S flows through the scrubber (gas composition) and how often (switching frequency). Thus, scrubber lifetime is very application specific.

Endress+Hauser SS2100 analyzers predict the remaining scrubber capacity by using the actual H_2S concentration measurements and dry cycle durations to calculate how much cumulative H_2S has been removed by the scrubber. Scrubber lifetimes have been simulated for typical natural gas and fuel gas applications. As shown in Figure B–18, under normal operating conditions, a 2 in. scrubber in a natural gas application with an average H_2S concentration of 4 ppmv will last for many years, whereas a 3 in. scrubber in a fuel gas application with an average H_2S concentration of 100 ppmv would be expected to last approximately 190 days.

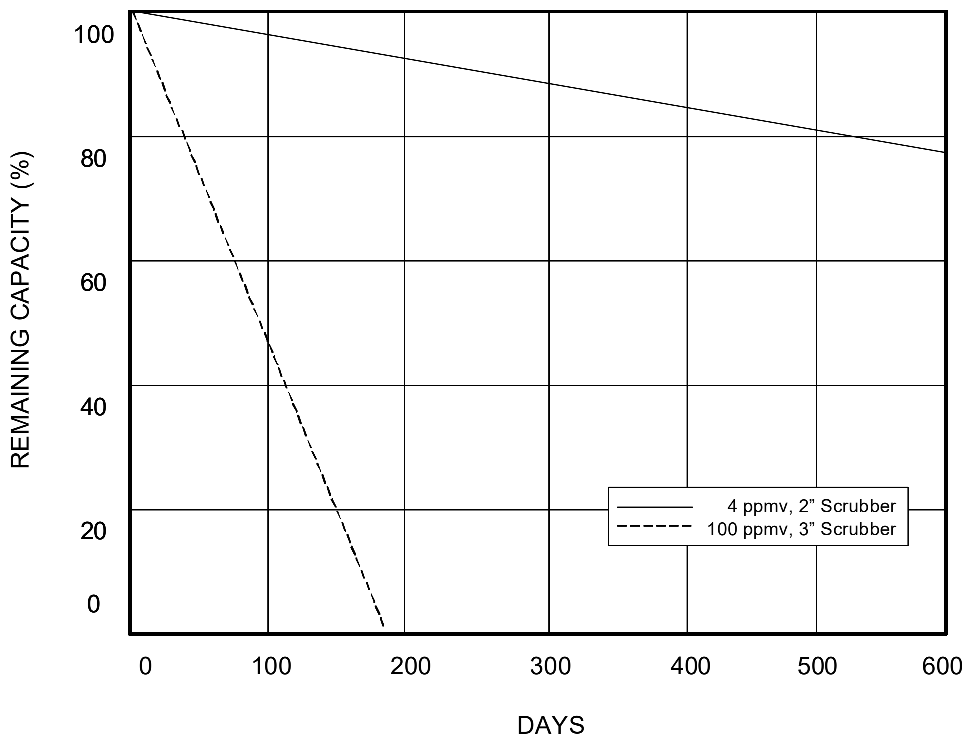


Figure B–18 *Predicted scrubber lifetime based on average H_2S load*

As an added precaution, a scrubber efficiency indicator, shown in Figure B–19, is mounted at the outlet of the scrubber. The powder material in the scrubber efficiency indicator changes color from turquoise to dark gray if there is any H_2S breakthrough, as shown in Figure B–20. Alternatively, regular validation of the system with an appropriate gas standard will indicate when the scrubber needs to be replaced.

When specifying gas standards, indicate H_2S in methane balance. For a measured range of 0 to 20 ppm, a concentration of 4 to 16 ppm is recommended.

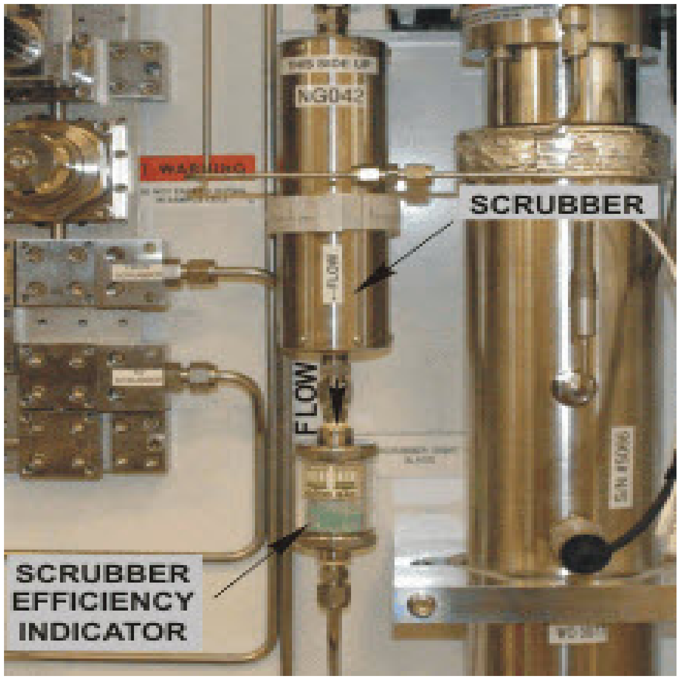


Figure B–19 *Scrubber and scrubber efficiency indicator*

The system will activate a **New Scrubber Alarm** fault, which triggers the **General Fault Alarm** to indicate when it is time to replace the scrubber and scrubber efficiency indicator. Once the scrubber and scrubber efficiency indicator have been replaced, 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 Device Parameters for your analyzer).

If scrubber replacement is necessary, follow the procedure below. Replacement scrubbers, scrubber efficiency indicators, and other replacement parts can be ordered by the part numbers listed in Table C–8 on page C–8.

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

To replace the scrubber and scrubber efficiency indicator

1. Close the sample supply shut-off valve.
2. Allow all residual gas to dissipate as indicated by no flow on the sample bypass flow meter.

Before breakthrough **After breakthrough**

Figure B–20 *H_2S scrubber efficiency indicator before and after breakthrough*

3. Unscrew the compression nuts on the inlet end of the scrubber and scrubber efficiency indicator assembly.
4. 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, according to the flow pattern shown in Figure B–19.
5. 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.
6. 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 Device Parameters for your analyzer).
7. Restart the SCS.
8. Check all connections for gas leaks. Using a liquid leak detector is recommended.
9. Re-validate the system with an appropriate gas standard following the instructions under **"Validating the Analyzer"** in the Device Parameters for your analyzer.

10. Purge the scrubber and scrubber efficiency indicator assembly with nitrogen to remove all flammable gas and cap the inlet and outlet.

H_2S scrubbers and scrubber indicators contain Copper (II) Oxide [CAS# 1317-38-0] and basic cupric carbonate [CAS# 12069-69-1], which are harmful if swallowed and toxic to aquatic organisms. Handle with care and avoid contact with the internal substances.

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.

To dispose of used scrubbers

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

Instrument Troubleshooting

If the instrument does not appear to be hampered by issued described earlier in this section, refer to Table B–1 before contacting **"Service"** on page B-33.

Table B–1 *Potential instrument problems and their 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? (120 or 240 VAC at 50-60 Hz, 24 VDC).
	Check fuse(s). If bad, replace with equivalent fuse. Refer to Table 3–6 and Table 3–5.
	Refer to **"Service"** on page B-33 for service information.
Laser Power Low Alrm fault	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.**

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

Symptom	Response
Laser Power Low Alrm fault (continued)	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. Perhaps the existing tubing needs to be replaced with stainless steel flexible tubing.
	Refer to the Device Parameters for this analyzer to capture diagnostic data and send the file to Service. Refer to page B-33 for service information.
	Possible alignment problem. Refer to ***"Service"*** on page B-33 for assistance.
	Possible mirror contamination issue. Refer to ***"Service"*** on page B-33. If advised to do so, clean the mirrors by following the instructions under ***"To clean the mirrors"*** on page B-6.
Temp Low Alarm or **Temp High Alarm** fault	Check that the actual temperature in the measurement cell is within specification (Table A–1 on page A–1). For systems with a heated enclosure, check that the temperature in the measurement cell is within ± 5 °C of the specified enclosure temperature.
	If the temperature reading is incorrect, check that the pressure/temperature cable on the bottom of the electronics enclosure 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 indicates a short circuit on the temperature sensor leads; a reading of less than –40 °C indicates an open circuit).
Pressure Low Alarm or **Pressure High Alarm** fault	Check that the actual pressure in the measurement cell is within specification (Table A–1 on page A–1).
	If the pressure reading is incorrect, check that the pressure/temperature cable on the bottom of the electronics enclosure is tight. Check the connector on the pressure sensor. Check the pressure connector on the backplane board.

Table B-1 *Potential instrument problems and their 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 fuse(s) are replaced.
	Check for 5 VDC on red wires, 12 VDC on yellow wires, and 24 VDC on orange wires from power supply.
	Check connections on display communication and power cables.
System stuck in **Fit Delta Exceeds Limit** restart for greater than 30 minutes	Refer to **"Service"** on page B-33 for assistance.
Not getting enough flow to the sample cell	Check both the micro filter and membrane separator for contamination. Replace if necessary. Refer to **"Replacing the Membrane Separator"** or **"Replacing the Filter"** on page B-11.
	Check if supply pressure is sufficient.
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. Refer to **"Changing the 4–20 mA Current Loop Mode"** on page 3-14.
	Make sure the device is connected to the correct terminals (see Table 3–1 on page 3–9).
	Check the open circuit voltage (35 to 40 VDC) across the current loops terminals (see Table 3–1 on page 3–9).
	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.
	Capture diagnostic data and send the file to Service (see **"To read diagnostic data with HyperTerminal"** in the Device Parameters for this analyzer).

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

Symptom	Response
Current loop is stuck at 4 mA or 20 mA	Check display for error message. If alarm has been triggered, reset the alarm. Refer to the Device Parameters for information on alarms.
	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 main electronics board. Return to the factory for service. Refer to **"Service"** on page B-33 for service information.
Strange characters appear on front panel display	Check connections on display communication cable.
Pressing keys on front panel do not have specified effect	Check connections on keypad cable.
Reading seems to always be high by a fixed percentage	Capture diagnostic data and send the file to Endress+Hauser (see **"To read diagnostic data with HyperTerminal"** in the Device Parameters for this analyzer).
Reading displays 0.0 or seems relatively low	Capture diagnostic data and send the file to Endress+Hauser (see **"To read diagnostic data with HyperTerminal"** in the Device Parameters for this analyzer).
	Check that Peak Tracking is enabled (see **"To change parameters in Mode 2"** in the Device Parameters for this analyzer).
Reading is erratic or seems incorrect	Check for contamination in the sample system, especially if the readings are much higher than expected.
	Gas concentration is equal to zero.
Reading goes to "0"	If **4–20 mA Alarm Action** is set to **2**, look on display for an error message (see **"To change parameters in Mode 2"** in the Device Parameters for this analyzer).
	Gas concentration is equal to zero.

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

Symptom	Response
Reading goes to full scale	If **4–20 mA Alarm Action** is set to **1**, look on display for an error message (see **"To change parameters in Mode 2"** in the Device Parameters for this analyzer).
	Gas concentration is greater than or equal to full scale value.
Serial output is displaying garbled data	Make sure the computer COM port is set for 19200 baud, 8 data bits, 1 stop bit, no parity, and no flow control.
	Make sure the connections are good. Verify the correct pin connections with an ohmmeter.
Reading seems to always be high by a fixed amount	Capture diagnostic data and send the file to Endress+Hauser (see **"To read diagnostic data with HyperTerminal"** in the Device Parameters for this analyzer).
	Check connections on display communication and power cables.
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.
LCD does not update. Unit is locked up for more than 5 minutes.	Switch off power, wait 30 seconds, and then switch power back on.
Not getting enough flow to the sample cell	Check both the micro filter and membrane separator for contamination. Replace if necessary. Refer to **"Replacing the Membrane Separator"** on page B-10 or **"Replacing the Filter"** on page B-11.
	Check if supply pressure is sufficient.

Service

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

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

Before contacting Service

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

- Diagnostic downloads using the procedures provided in the associated firmware 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 analyzer systems 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 (e.g., dry nitrogen), regulated to the specified sample supply pressure (refer to drawings in Appendix A), 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. For differential systems, make sure to purge the scrubber for several dry cycles.

   If necessary, dry cycles can be initiated by pressing the **#** key followed by the **2** key to enter **Mode 2**, and then pressing the **#** key followed by the **1** key to return to **Mode 1**.
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, outlets, vents, conduit or gland openings (to prevent foreign material such as dust or water from entering the system) using the original fittings supplied as part of the packaging from the factory.
12. Pack the equipment in the original packaging in which it was shipped. If the original packaging material is no longer available, the equipment should be adequately secured (to prevent excessive shock or vibration) within a weather-proof enclosure. Contact **"Service"** for any questions related to packaging.
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' sole liability and Customer's sole and exclusive remedy for a breach of warranty is limited to Endress+Hauser' repair or replacement (at Endress+Hauser' sole option) of the product or part thereof which is returned at Customer's expense to Endress+Hauser' 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' standard repair charges shall be applicable in addition to all shipping expenses.

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Appendix C: Replacement Parts

This section provides a list of replacement parts for the SS2100a analyzer electronics. Due to a policy of continuous improvement, parts and part numbers may change without notice. Not all parts listed in this manual are included on every analyzer. Replacement parts for the sample conditioning system (SCS) will be provided separately. When ordering, please specify the system serial number to ensure that the correct parts are identified.

Table C–1 *Replacement parts for electronics panel assembly (fuses)*

Part Number	Description
4300002019	Miniature Fuse, 5x20mm Time Lag 250 VAC, 0.16 AMP (Power Supply Kit P/N 8000002574) - for 120 VAC
4500002012	Miniature Fuse, 5x20mm Time Lag, 0.1 AMP (Power Supply Kit P/N 8000002573) - for 24 VDC
4500002010	Miniature Fuse, 5x20mm Time Lag 250 VAC, 0.5A (Power Supply Kit P/N 8000002576) - for 24 VDC
1100002218	Fuse Kit, 120 VAC
1100002219	Fuse Kit, 240 VAC

Table C–2 *Replacement parts for electronics panel assembly (power supply)*

Fig. No.	Ref. No.	Part Number	Description
C-1	1	8000002573	Assembly, Power Supply, 120 VAC

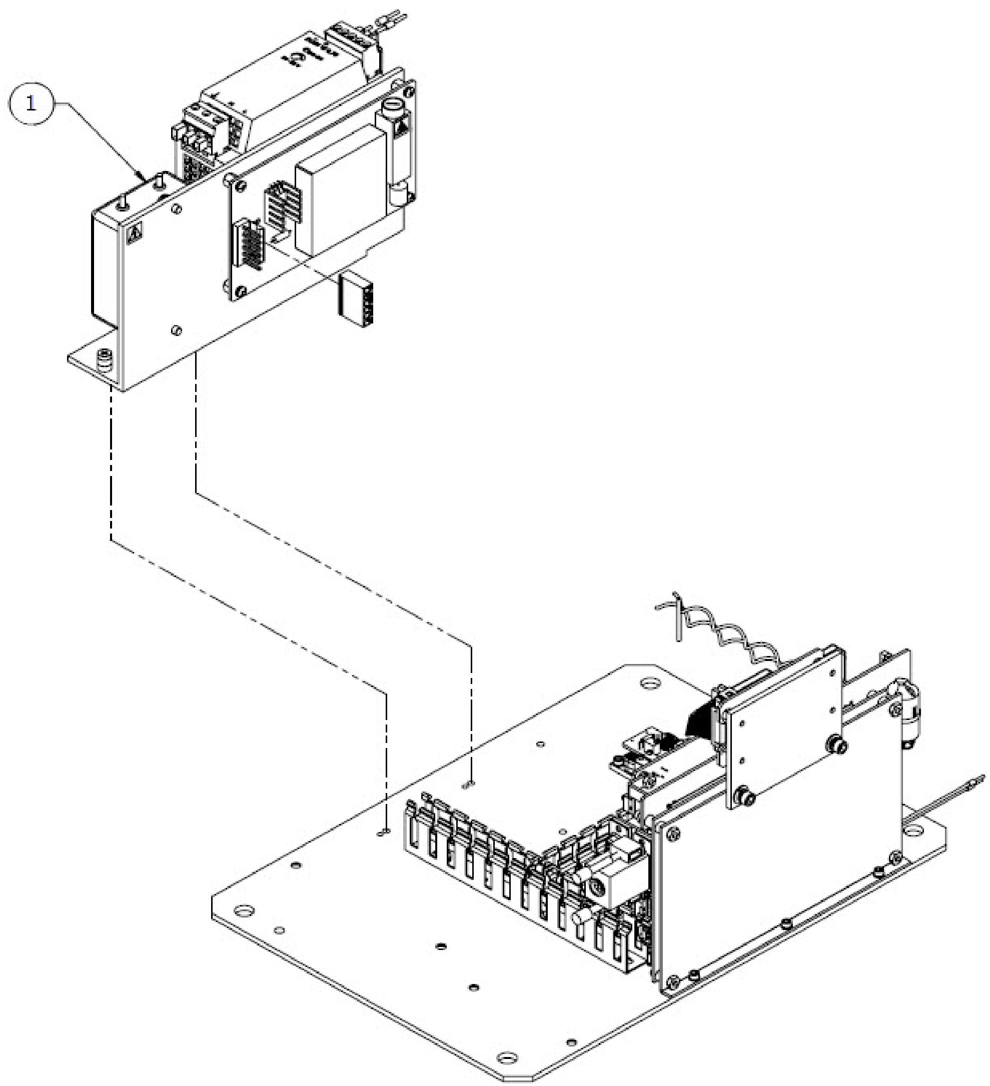

Figure C–1 *Electronics power supply parts*

Table C–3 *Replacement parts for electronics panel assembly*

Fig. No.	Ref. No.	Part Number	Description
C-2	3	4500002002	Relay, w/ Socket, C1D2, 6A, 12 VDC, SPDT
C-2	4	3100002165	Varistor, “ZNR” Transient/Surge Absorber
C-2	5	4500002018	Circuit Breaker Double Pole, 2 AMP 250 Rated

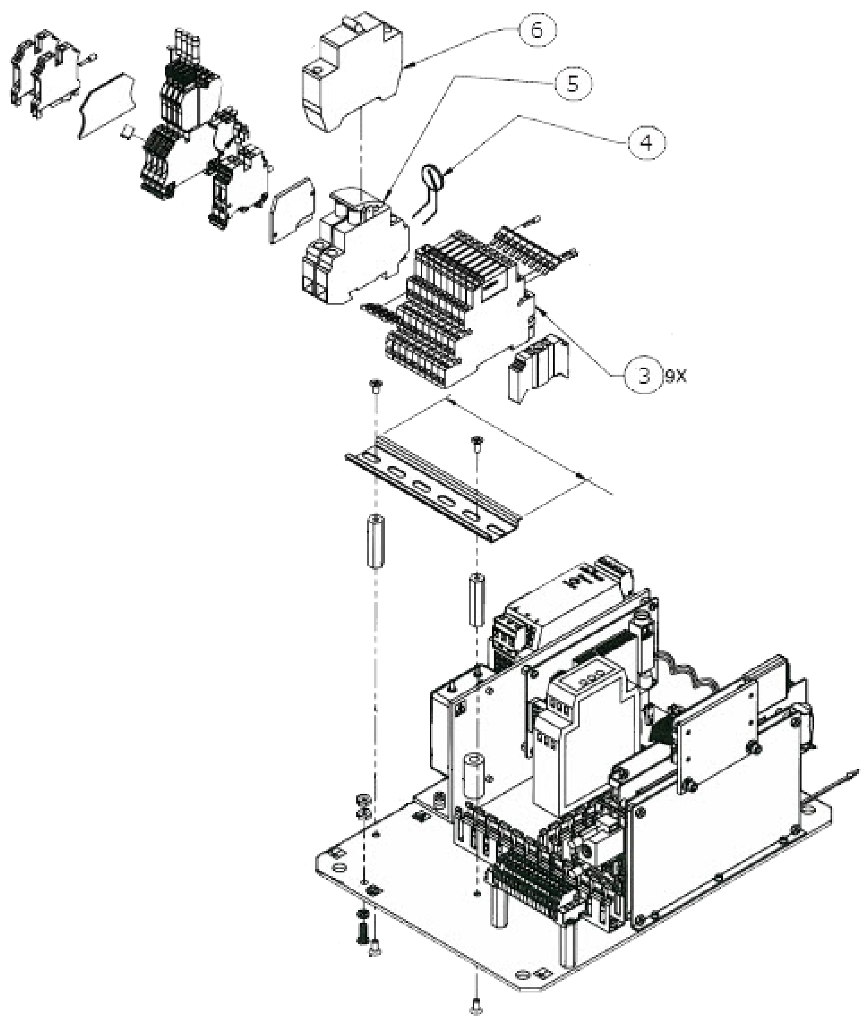

Figure C–2 *Electronics assembly parts*

Table C–4 Replacement assembly parts for electronics panel

Fig. No.	Ref. No.	Part Number	Description
C-3	7	8000002730	Assembly, Temperature Control, Hytek, 28 Meter

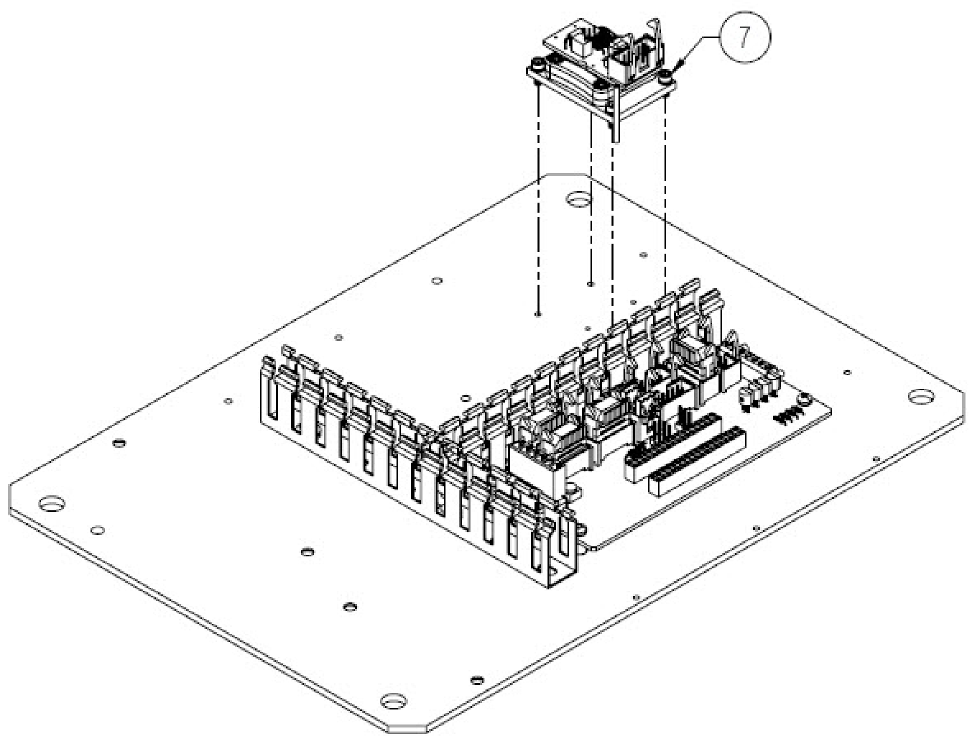

Figure C–3 Electronics assembly parts

Table C–5 *Replacement parts for electronics panel assembly (boards)*

Fig. No.	Ref. No.	Part Number	Description
C-4	8	2900000450	Assembly, PCBA, 4–20 mA, Dual Adj, Low Noise, RoHS
C-4	9	2900000440	Assembly, PCBA, 4–20 mA Isolated Input, RoHS

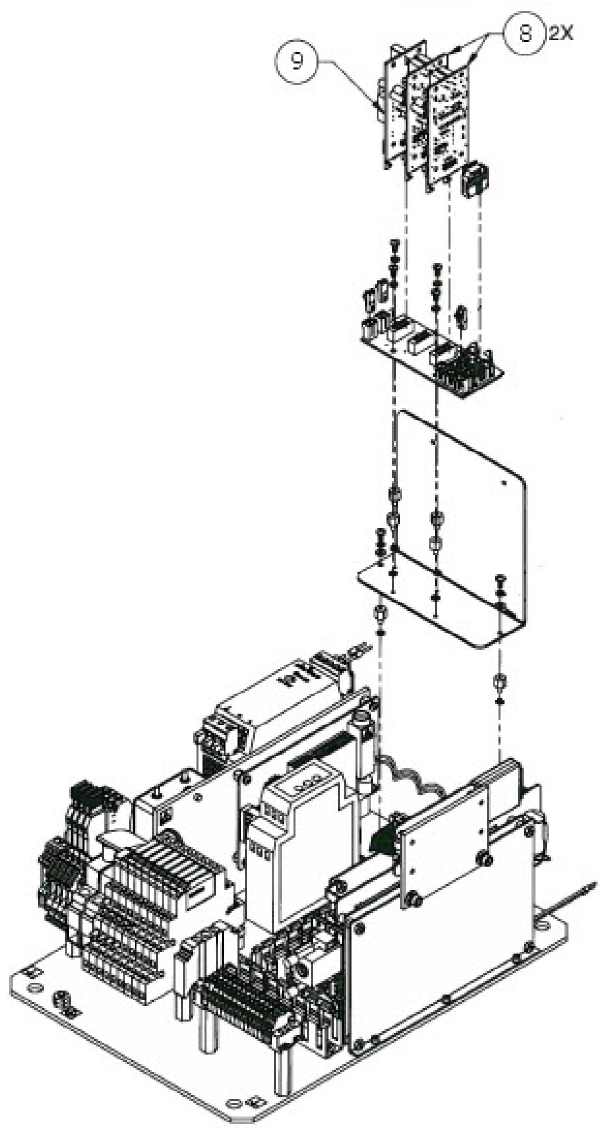

Figure C–4 *Electronics assembly board replacement parts*

Table C–6 Replacement parts for electronics panel assembly (boards) (Continued)

Fig. No.	Ref. No.	Part Number	Description
C-5	10	2900000380	PCBA, Daughter, Interface, Hybrid, RoHS
C-5	11	2900000420	PCBA, EAE-TDL, w/ Ethernet, Hybrid, RoHS

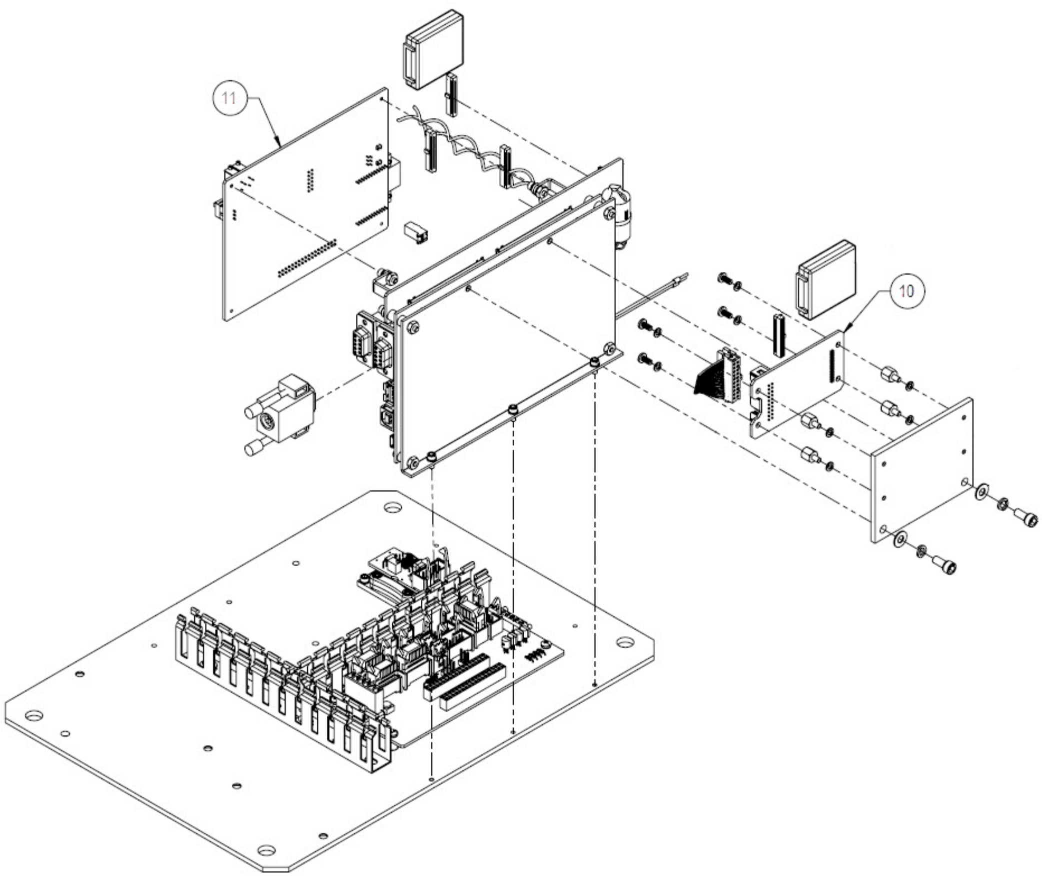

Figure C–5 *Electronics assembly board replacement parts (Continued)*

Table C–7 *Replacement parts for keypad and display*

Fig. No.	Ref. No.	Part Number	Description
C-6	12	2460100002	Display, LCD, 20x4, Back-lit, 5 V, Serial
C-6	13	2400002157	Keypad, Touch Sensitive, 16 keys

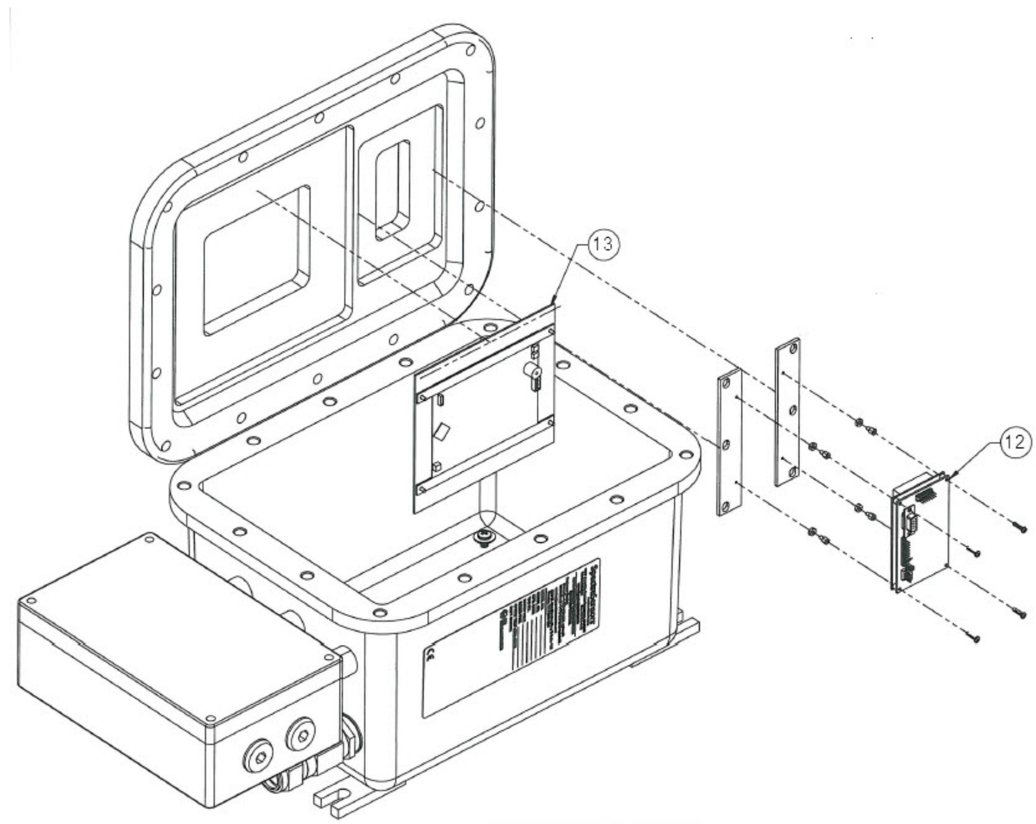

Figure C–6 *Keypad and display replacement parts*

Table C–8 *General Items for SS2100a*

Part Number	Description
Pressure Sensor	
5500002041	Pressure Sensor, 30 PSIA, 5 V, 1/8 in. NPT DIN4365, NACE [1]
6000002148	Cable, Pressure/Temperature, EXT, 32 in.
Scrubber/Indicator	
8000002209	Kit, H_2S Scrubber/Indicator, 3 in. diameter
8000002207	Kit, H_2S Scrubber/Indicator, 2 in. diameter
8000002205	Kit, NH_3 Scrubber/Indicator, 3 in. diameter
8000002224	Kit, NH_3 Scrubber/Indicator, 2 in. diameter
8000002205	Kit, HCl Scrubber/Indicator, 3 in. diameter
8000002224	Kit, HCl Scrubber/Indicator, 2 in. diameter
6101811014	Dryer, NuPure
Hardware/Kits	
1300002427	Washer, Sealing, SS, M10
1300002425	Screw, Socket Head Cap, 304SS, M10x35
1300002426	Screw, Socket Head Cap, 304SS, M10x30
0900002146	Stainless Steel Mirror (0.1 m and 0.8 m cells only)
1100002211	Kit, SS2100i-2, M10x35 Bolts and M10 Washer
0219900017	Kit, Cleaning Tools, Optical Cell (International) [1]
1100002156	Tooling Kit (Installation/Maintenance)
Cables	
6000002138	Assembly, Cable, Thermistor Cell, Electronics
6000002158	Assembly, Cable, RS-232, M-M., Display, Data (EExd)
6000002159	Assembly, Cable, Power, Display (EExd)
0190217204	Cable, Power Supply Output, 14 in.
Operational Manuals	
BA02163C	SS2100a Operating Instruction, additional copies
GP01180C	NS 5.14 Device Parameters, additional copies
GP01177C	FS 5.16 Device Parameters, additional copies

1. Contact Endress+Hauser's Service department before attempting replacement. Replacing this component without technical support could cause damage to other components. Refer to **"Service"** on page B-33.

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