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Operating Instructions

SS2100a TDLAS gas analyzer

Endress+Hauser
People for Process Automation

Table of Contents

1 About this document

1.1 Document function

This manual contains information required to install and operating the SS2100a gas analyzer and electronics. For instruction on operating the gas analyzer through firmware programming, please consult the associated firmware manual for this gas analyzer. It is important to closely review the sections of this manual to ensure the analyzer performs as specified.

1.1.1 How to Use This Manual

There are a number of options and accessories available for the SS2100a. This manual has been written to address the most common options and accessories. Images, tables, and charts have been included to provide a visual understanding of the analyzer and its functions. Special symbols are also used to provide the user with key information regarding the system configuration and operation. Pay close attention to this information.

1.2 Symbols

1.2.1 Warnings

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

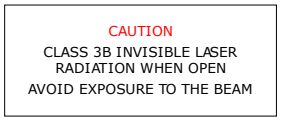
1.2.2 Safety symbols

Symbol	Description
	Hazardous voltage and risk of electric shock.
	INVISIBLE LASER RADIATION - Avoid exposure to the beam. Class 3R Radiation Product. Refer servicing to manufacturer-qualified personnel.
	The CSA certification mark indicates that the product was tested against and met the applicable North American standards requirements.
	The ETL Listed Mark provides proof of product compliance with North American safety standards. Authorities Having Jurisdiction (AHJ) and code officials across the US accept the ETL Listed Mark as proof of product compliance to published industry standards.
	The WEEE symbol indicates that the product can not be discarded as unsorted waste but must be sent to separate collection facilities for recovery and recycling.
	The CE Marking indicates conformity with health, safety, and environmental protection standards for products sold within the European Economic Area (EEA).

1.2.3 Informational symbols

Symbol	Meaning
	Permitted: Procedures, processes or actions that are permitted.
	Forbidden: Procedures, processes or actions that are forbidden.
	Tip: Indicates additional information.
	Reference to documentation
	Reference to page
	Reference to graphic
▶	Notice or individual step to be observed
1., 2., 3. ...	Series of steps
	Result of a step

1.2.4 Symbols on this device

Symbol	Description
	The warning label will be affixed to the front side of all analyzer enclosures that contain sample gas. Hazards may vary by stream composition. One or more of the following conditions may apply: **Flammable**. Gases used in the processing of this analyzer may be extremely flammable. Any work in a hazardous area must be carefully controlled to avoid creating any possible ignition sources (e.g., heat, arcing, sparking). **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/tagout procedures, toxic gas monitoring protocols, personal protective equipment (PPE) requirements, hot work permits and other precautions that address safety concerns related to performing service or operation on process equipment located in hazardous areas.
	The High Voltage symbol alerts people to the presence of electric potential large enough to cause injury or damage. In certain industries, high voltage refers to voltage above a certain threshold. Equipment and conductors that carry high voltage warrant special safety requirements and procedures. Turn off and lock out system before servicing.
	Maximum voltage and current specifications for the fuse closest to label.
	PROTECTIVE EARTH GROUND — Symbol indicates the connection point of the ground wire from the main power source.
	FUNCTIONAL EARTH GROUND — Symbol indicates grounding points intended primarily for troubleshooting.
	INVISIBLE LASER RADIATION — Avoid exposure to beam. Class 3B Radiation Product. Refer servicing to the manufacturer or qualified personnel.

Symbol	Description
	Removing label from measurement cell optical head will void analyzer warranty.

1.3 Documentation

All documentation is available:

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

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

Part Number	Document Type	Description
TI01668C	SS2100a Technical Information	Planning aid for your device. This document contains information for the analyzer including system design with sample conditioning components and inlet/outlet
XA02782C	SS2100a Safety Instructions	Requirements for installing or operating the SS2100a TDLAS Gas Analyzer related to personnel or equipment safety.
GP01177C	Description of Device Parameters (FS 5.16)	Provides the user with an overview of the FS 5.16 firmware functionality.
GP01180C	Description of Device Parameters (NS 5.14)	Provides the user with an overview of the NS 5.14 firmware functionality.
GP01181C	Description of Device Parameters (HC12)	Provides the user with an overview of the PP2f (HC12) firmware functionality.

1.4 U.S. export compliance

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

1.5 Manufacturer address

Endress+Hauser

11027 Arrow Route
Rancho Cucamonga, CA 91730
United States

www.endress.com

1.6 List of abbreviations

Term	Description
AC	alternating current
ALT	alternate
ANSI	American National Standards Institute
ATX	advanced technology extended
ATEX	atmosphere explosible
AWG	American wire gauge
°C	Celsius
CAL	calibration
CDRH	Center for Devices and Radiological Health
CFR	Code of Federal Regulations
cm	centimeter
COLL	collection
CSM	calibration switching module
CSV	comma separated value
DC	direct current
EMC	electromagnetic compatibility
EO	electro-optical
EPL	equipment protection level
EU	European Union
EXC	excitation
FAT	factory acceptance test
FC	fiber channel
G	gas
GLP	good laboratory practice
GMP	good manufacturing practice
HCA	Raman calibration accessory
HPLC	high performance liquid chromatography
Hz	hertz
I/O	input/output
IEC	International Electrotechnical Commission
INTLK	interlock
IP	internet protocol
IPA	isopropyl alcohol
IS	intrinsically safe
LED	light emitting diode
LVS	low voltage safety
mm	millimeter

Term	Description
MPE	maximum permissible exposure
MT	mechanical transfer
mW	milliwatt
NA	numerical aperture
NAT	network address translation
nm	nanometer
NOHD	nominal ocular hazard distance
OPC	Open Platform Communications
OPC UA	OPC Unified Architecture
QbD	quality by design
PAT	process analytical technology
PCM	power control module
PDF	portable document format
PLC	programmable logic controllers
RTU	remote terminal unit
SAT	site acceptance test
SOP	standard operating procedure
SPC	spectrum
TCP	transmission control protocol
UDP	user datagram protocol
UPS	uninterruptible power supply
USB	universal serial bus
USP	SIMCA project file
V	volt
W	watt
WEEE	waste electrical and electronic equipment

2 Basic safety instructions

Each analyzer shipped from the factory includes safety instructions and documentation to the responsible party or operator of the equipment for the purpose of installation and maintenance. This manual can be read and referenced by anyone installing, operating, or having direct contact with the analyzer.

⚠ WARNING

Technicians are expected to be trained and follow all safety protocols that have been established by the customer in accordance with the area hazard classification to service or operate the analyzer.

- ▶ This may include, but is not limited to, toxic and flammable gas monitoring protocols, lockout/tagout procedures, the use of personal protective equipment (PPE) requirements, hot work permits and other precautions that address safety concerns related to the use and operation of process equipment located in hazardous areas.

2.1 Requirements for personnel

Personnel must meet the following conditions for mounting, electrical installation, commissioning, and maintenance of the device. This includes, but is not limited to:

- Be suitably qualified for their role and the tasks they perform:
  - Installation, commissioning, operation, and maintenance of the measuring system may be carried out only by specially trained technical personnel.
  - Technical personnel must be authorized by the plant operator to carry out the specified activities. Technical personnel must have read and understood these Operating Instructions and must follow the instructions contained herein.
  - Electrical connections may be performed only by an electrical technician.
- Be trained in explosion protection.
- Be familiar with national and local regulations and guidelines (e.g., CEC, NEC ATEX/IECEx or UKEX).
- Be familiar with lockout/tagout procedures, toxic gas monitoring protocols and PPE (personal protection equipment) requirements.
- Faults at the measuring point may only be rectified by authorized and specially trained personnel.

⚠ WARNING

Substitution of components is not permitted.

- ▶ Substitution of components may impair intrinsic safety.
- ▶ Repairs not described in the Operating Instructions provided must be carried out only directly at the manufacturer's site or by the service organization.

2.2 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.

2.2.1 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.

2.2.2 Exposure to toxic gas (H_2S)

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

1. Purge the SCS enclosure to remove any potentially toxic gas.

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

⚠ CAUTION

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

2.2.3 Electrocution hazard

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

   ⚠ WARNING

   - Complete this action before performing any service that requires working near the main input power or disconnecting any wiring or other electrical components.
   - If service must be performed with power engaged (gain adjustment), note any live electrical components and avoid all contact with them.

2. Only use tools with a safety rating for protection against accidental contact with voltage up to 1000 V (IEC 900, ASTF-F1505-04, VDE 0682/201).

2.2.4 Explosion hazard

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

2.3 Intended use

Endress+Hauser's 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.

Use of the device for any purpose other than that described poses a threat to the safety of people and of the entire measuring system and is therefore not permitted. The manufacturer is not liable for damage caused by improper or non-designated use.

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

2.4 Workplace safety

As the user, you are responsible for complying with the following safety conditions:

- Installation guidelines
- Local standards and regulations
- Regulations for explosion protection

It is not possible to list all potential hazards within this document. The user is responsible for identifying and mitigating any potential hazards present when servicing the analyzer.

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

2.5 Operational safety

Before commissioning the entire measuring point:

1. Verify that all connections are correct.
2. Ensure that electrical cables and hose connections are undamaged.
3. Do not operate damaged products, and protect them against unintentional operation.
4. Label damaged products as defective.

During operation:

1. If faults cannot be rectified, products must be taken out of service and protected against unintentional operation.
2. Keep the door closed when not carrying out service and maintenance work.

2.6 Product safety

The SS2100 TDLAS Gas Analyzer is designed in accordance with good engineering practice to meet state-of-the-art safety requirements, has been tested, and left the factory in a condition in which it is safe to operate.

It meets general safety standards and legal requirements. It also complies with the EU directives listed in the specific EU Declaration of Conformity. Endress+Hauser confirms this by affixing the CE mark to the analyzer system.

2.6.1 General

- Adhere to all warning labels to prevent damage to the unit.
- Do not operate the device outside the specified electrical, thermal and mechanical parameters.
- Only use the device in media to which the wetted materials have sufficient durability.
- Modifications to the device can affect the explosion protection and must be carried out by staff authorized to perform such work by Endress+Hauser.
- Install the controller circuit wiring according to the Canadian Electrical Code (CEC) respective National Electrical Code (NEC) using threaded conduit or other wiring methods in accordance with NEC articles 501 to 505, or IEC 60079-14.
- Install the device according to the manufacturer's instructions and regulations.
- The flameproof joints of this equipment are outside the minimums specified in IEC/EN 60079-1 and must not be repaired by the user.

Only open the controller cover if the following conditions are met:

- An explosive atmosphere is not present
- All device technical data is observed (see nameplate)
- An electrostatic charge (e.g., caused by friction, cleaning or maintenance) is avoided on the attached stainless steel nameplate, if present, and on painted metallic housings that are not integrated into the local potential equalization (ground) system

In potentially explosive atmospheres:

- Do not disconnect any electrical connections while the equipment is energized.
- Do not open the connection compartment cover when energized or the area is known to be hazardous.

2.6.2 General pressure

The system is designed and tested with appropriate margins to ensure that is it safe under normal operating conditions, which include temperature, pressure, and gas content. The operator is responsible for ensuring that the system is shut off when these conditions are no longer valid.

2.6.3 Electrostatic discharge

The coating and the adhesive label is non-conducting and may generate an ignition capable level of electrostatic discharge under certain extreme conditions. The user can ensure that the equipment is not installed in a location where it may be subjected to external conditions, such as high pressure steam, which may cause a build-up of electrostatic charges on non-conducting surfaces. To clean the equipment, use only a damp cloth.

2.6.4 Chemical compatibility

Never use vinyl acetate or acetone or other organic solvents to clean the analyzer housing or labels.

2.6.5 Lifting/carrying the gas analyzer

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 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.

Before removing from the crate, move the analyzer as close as possible to the final installation location. Never lift the gas analyzer by the electronics enclosure. Always carry the load using one of the following points/methods. Refer to the figure below.

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

⚠ CAUTION

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

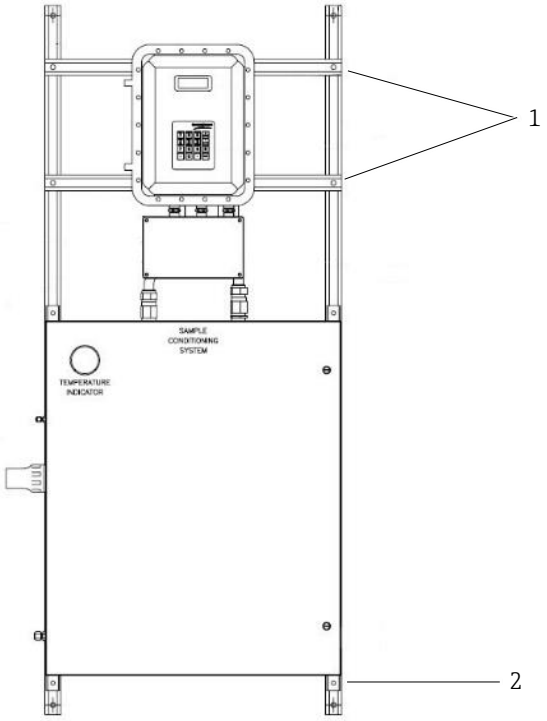


Figure 1: Lifting points for the SS2100a gas analyzer

#	Description
1	Cross members
2	Base support

2.7 IT security

Our warranty is valid only if the device is installed and used as described in the Operating Instructions. The device is equipped with security mechanisms to protect it against any inadvertent changes to the settings.

IT security measures, which provide additional protection for the device and associated data transfer, must be implemented by the operators themselves in line with their security standards.

3 Product description

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.

3.1 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.

3.2 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.

3.3 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 the figure below. 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.

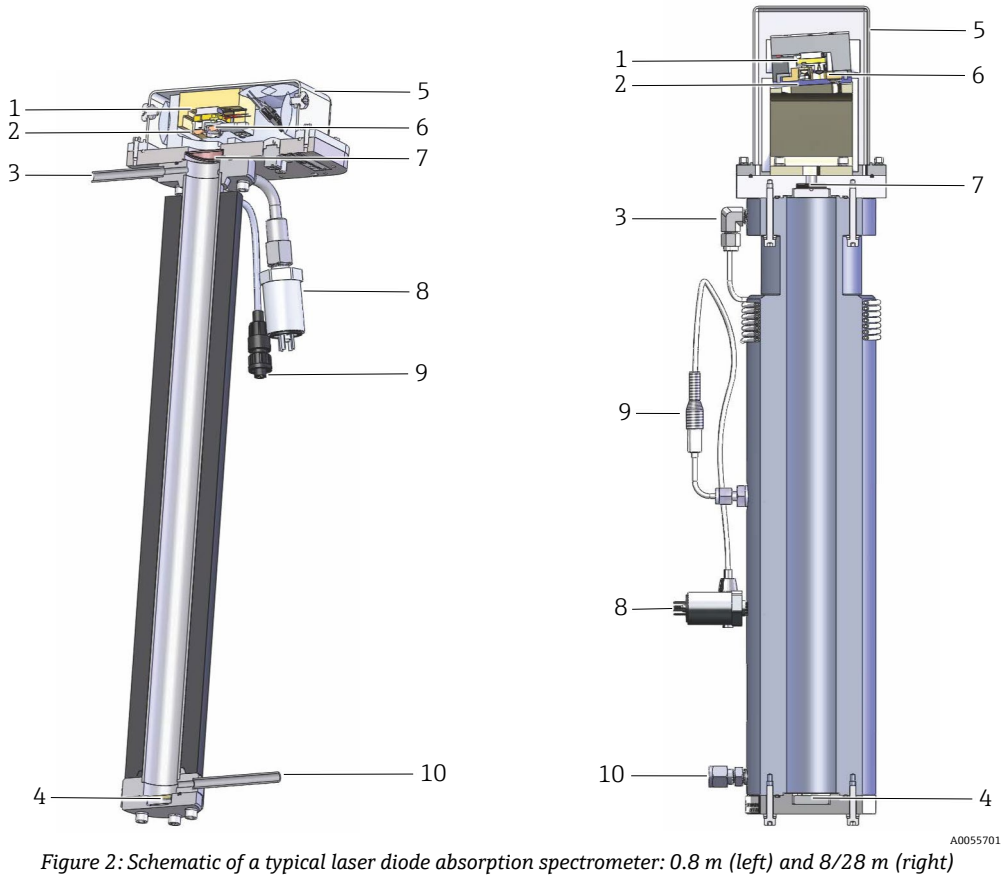


Figure 2: Schematic of a typical laser diode absorption spectrometer: 0.8 m (left) and 8/28 m (right)

#	Description
1	TEC
2	Laser
3	Inlet
4	Far mirror
5	Optical head
6	Detector
7	Window
8	Pressure sensor
9	Temperature sensor
10	Outlet

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, $\boldsymbol{I_0}(\lambda)$, passes through the sample, attenuation occurs via absorption by the trace gas with absorption cross section s(λ). According to the Beer-Lambert absorption law, the intensity remaining, $\boldsymbol{I}(\lambda)$, as measured by the detector at the end of the beam path of length $\boldsymbol{l}$ (cell length x number of passes), is given by

$$I(\lambda) = I_0(\lambda)\exp\left[-\sigma(\lambda)lN\right]$$

where $\boldsymbol{N}$ 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

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

The below figure shows the typical raw data (in arbitrary units [a.u.]) from a laser absorption spectrometer scan including the incident laser intensity, $\boldsymbol{I_0}(\lambda)$, and the transmitted intensity, $\boldsymbol{I}(\lambda)$, for a clean system and one with contaminated mirrors (shown to illustrate the system's relative intensity to mirror contamination).

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.

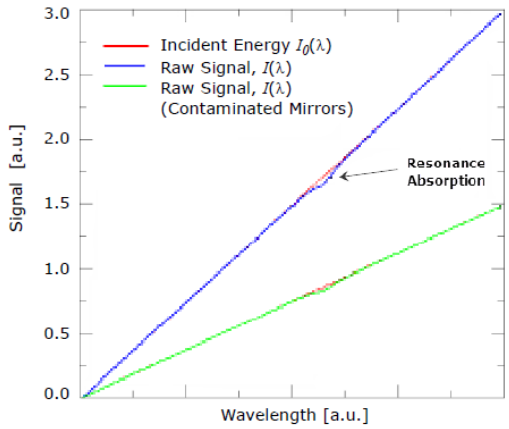


Figure 3: Typical raw signal from a laser diode absorption spectrometer with and without mirror contamination

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, as shown in the figure.

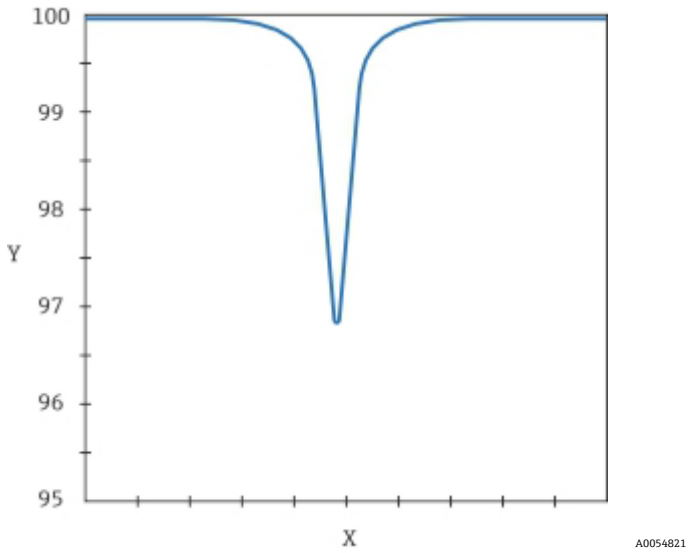


Figure 4: Typical normalized absorption signal from a laser diode absorption spectrometer

3.3.1 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.

3.3.2 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 the figure below. 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.

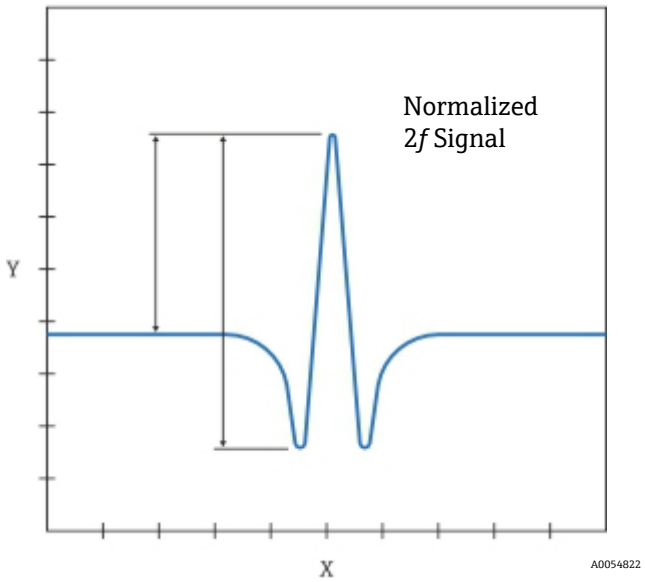


Figure 5: Typical normalized 2f signal; species concentration is proportional to the peak height

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.

3.4 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. Note: Refer to system drawings in *Appendix A: Specifications* → 🖹.

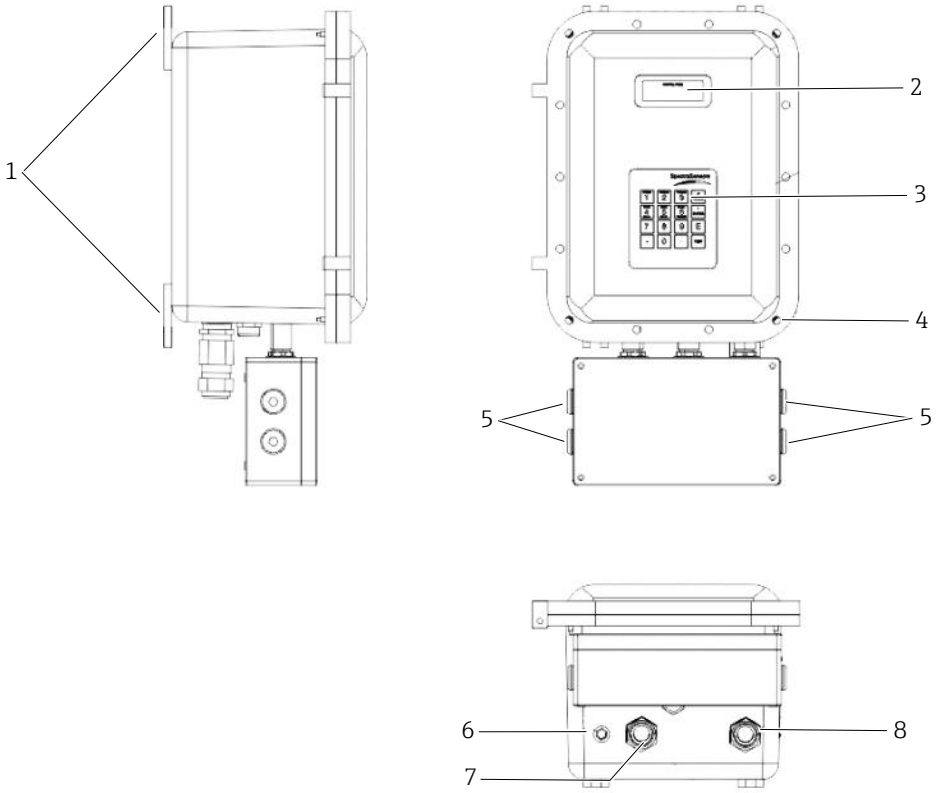


Figure 6: External features of the analyzer. Left side view (left) and front view (right)

#	Description
1	4X mounting feet
2	LCD display window
3	Keypad window
4	14X cover screws
5	Signal wiring ports (m25)
6	Power input port (M20)
7	Solenoid valve wiring gland (M25)
8	Sample cell wiring gland (M25)

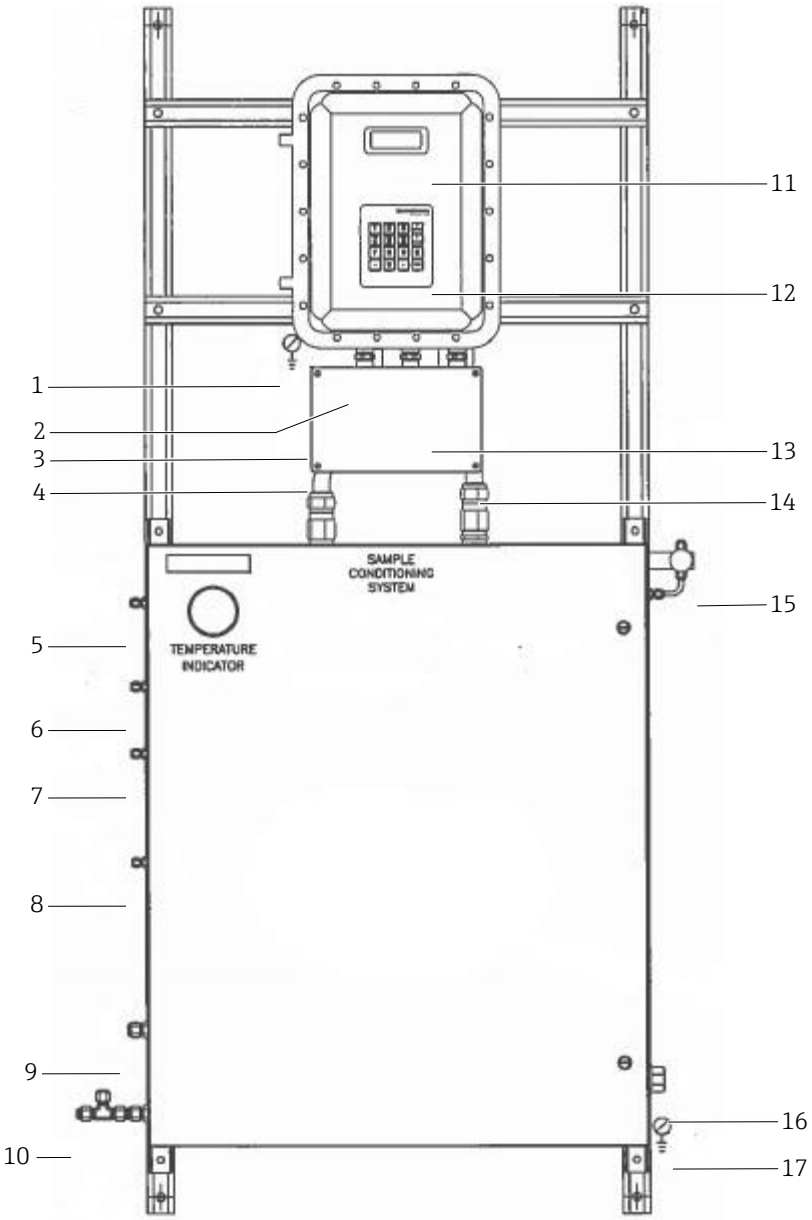


Figure 7: Typical SS2100a configuration

#	Description				
1	Enclosure ground	9	Sample return	17	Frame ground
2	Analyzer power	10	Optional high H2S purge outlet		
3	Alarm outputs	11	LCD (display)		
4	Analog output	12	Keypad		
5	Optional instrument air inlet	13	Junction box		
6	VAL gas inlet	14	RS-485 / ethernet output		
7	Optional N2 Maintenance purge inlet	15	Optional high H2S purge inlet		
8	Sample supply/optional heat trace entry	16	Heater power input		

The electronics panel assembly is shown in the figure below. The sample cell is housed in the SCS enclosure.

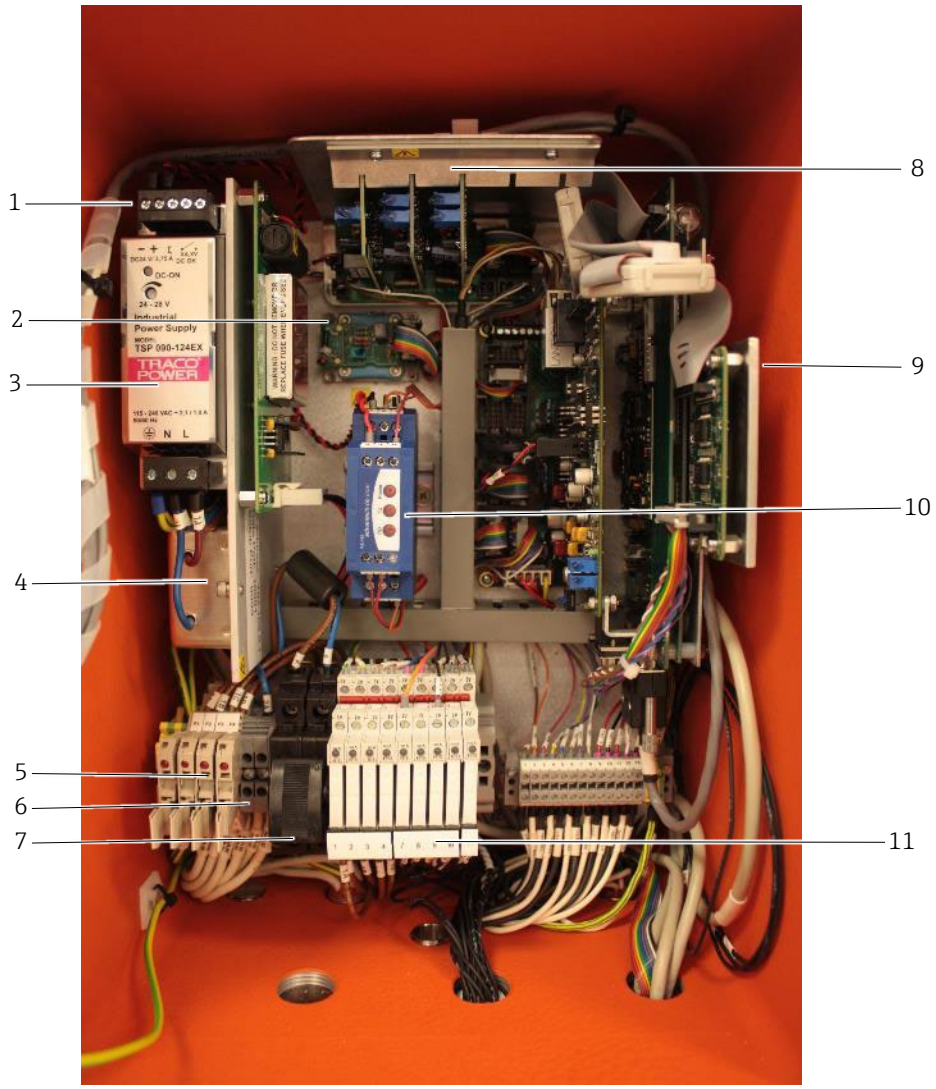


Figure 8: Components on electronics panel assembly

#	Description		
1	Analog input board	6	0-32 ground stud (protective
2	Hytek temperature control board	7	Main breaker
3	Main power supply	8	Analog output board (2)
4	AC filter	9	Daughter board
5	F1-F4 (fused terminal block)	10	RS-232/RS-485 converter
		11	Relays(9)

The SCS enclosure is the bottom module. The figure shows all optional components available in a standard SS2100a SCS. Refer to *Sample Conditioning System* → for more information and the system drawings, if provided, for your specific gas analyzer configuration. Note: Refer to system drawings in *Appendix A: Specifications* → .

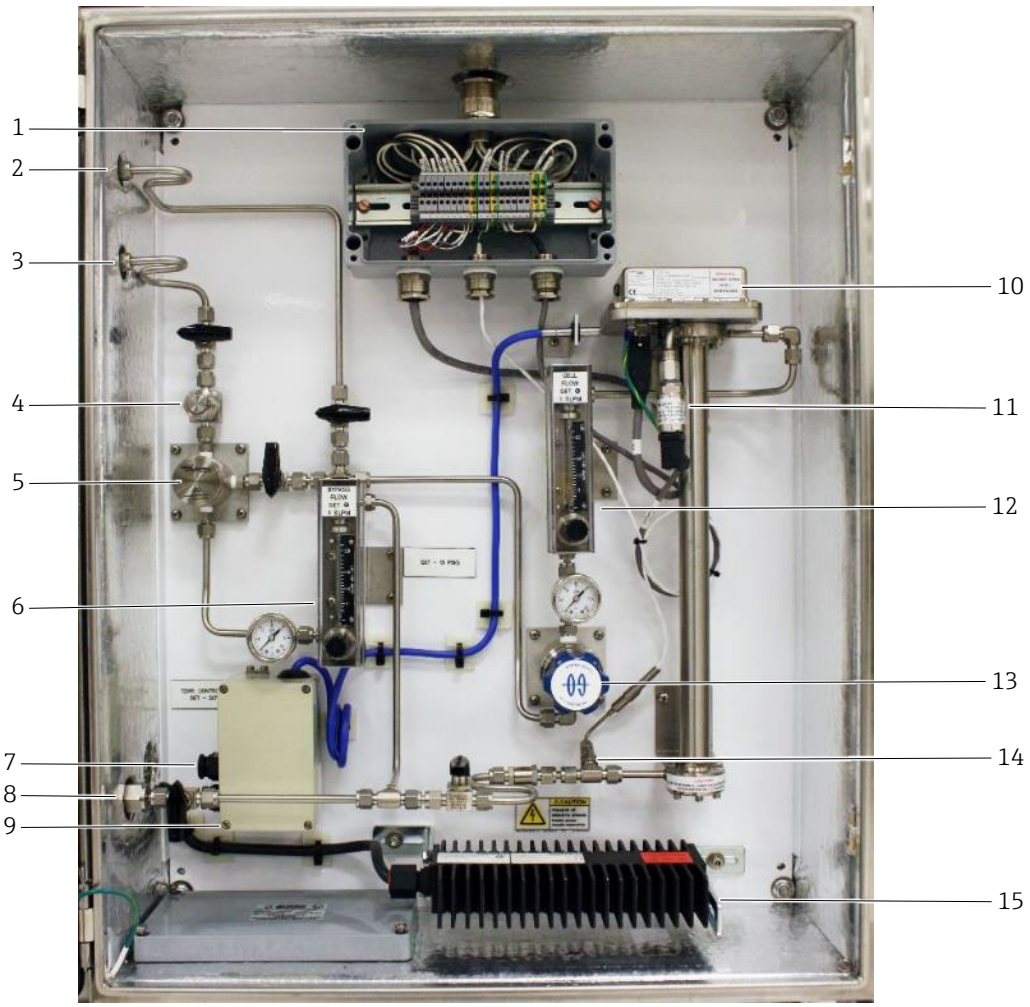


Figure 9: Components available in sample conditioning system (SCS)

#	Description		
1	Cell signal junction box	8	Sample return
2	Sample port/val gas supply	9	Temperature controller
3	Sample supply	10	Measurement cell
4	Particulate filter	11	Pressure sensor
5	Membrane separator	12	Cell flow meter
6	Bypass flow meter	13	Pressure Regulator
7	Heater power	14	Thermistor
		15	Heater

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.

4 Incoming product acceptance and identification

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.

4.1 What Can be Included in the Shipping Box

The contents of the crates can include:

- The Endress+Hauser SS2100a gas analyzer
- The SS2100a Safety Instruction
- Tooling Kit (70162344)
- Additional accessories or options as ordered

If any of these contents are missing, contact *Service* → 🖹.

4.2 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, go to the Endress+Hauser website to download the published documentation: www.endress.com.

4.3 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* →🖹 Inspect the supply and return connections for damage, such as bent tubing. Report any damage to the carrier.

⚠ CAUTION

▶ Avoid jolting the instrument by dropping it or banging it against a hard surface, which may disturb the optical alignment.

4.4 Determining firmware version

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

5 Installation

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

5.1 Site requirements and installation conditions

The SS2100a analyzer can be installed on a wall. Consider the following when choosing an appropriate location for the analyzer:

- Choose a shaded area or use an optional analyzer hood (or equivalent) to minimize sun exposure to the fully mounted analyzer.

- Position the instrument so it is not difficult to operate adjacent devices. Allow 1m (3 ft) of space in front of the analyzer.
- Ensure that supply and return lines reach the supply and return connections on the sample system enclosure. Maintain flexibility in the sample and return lines so that the lines are not under excessive stress.
- The breaker in the power distribution panel or switch will be the primary means of disconnecting the power from the analyzer. Therefore, the power distribution panel or switch can be located in close proximity to the equipment and within easy reach of the operator. A switch or circuit breaker must not interrupt a protective earth ground.
- Before removing the analyzer from the crate, move the analyzer as close as possible to the final installation location.

⚠ CAUTION

Intense sun exposure in some areas may cause the analyzer temperature to exceed the maximum.

▶ Endress+Hauser analyzers are designed for operation within the specified ambient temperature range.

5.1.1 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

  NOTICE

  ▶ 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
- $^{9}/_{16}$ 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

5.1.2 To mount the analyzer

The SS2100a gas analyzer is manufactured for wall or Unistrut® (or equivalent) metal framing installations. The analyzer is constructed with four mounting brackets, two on the top of the SCS cabinet and two on its bottom. Refer to *Appendix A: Specifications* → 🖹 for detailed mounting dimensions.

⚠ CAUTION

▶ 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.

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* → 🖹.

⚠ CAUTION

- 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: Specifications* → 🖹.
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 can be very secure and ready for the electrical connections.

5.2 Opening and Closing the Gas Analyzer Enclosure Cover

⚠ CAUTION

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

5.3 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.

5.4 To close the gas analyzer enclosure cover

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

⚠ CAUTION

- 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.

5.5 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 the figure. In addition, seven digital inputs/outputs connected to SPDT relays on terminal 1 through 14 in JB1 are provided for customer interface.

NOTICE

- 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 *Changing the 4–20 mA Current Loop Mode* → 🖹.

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.

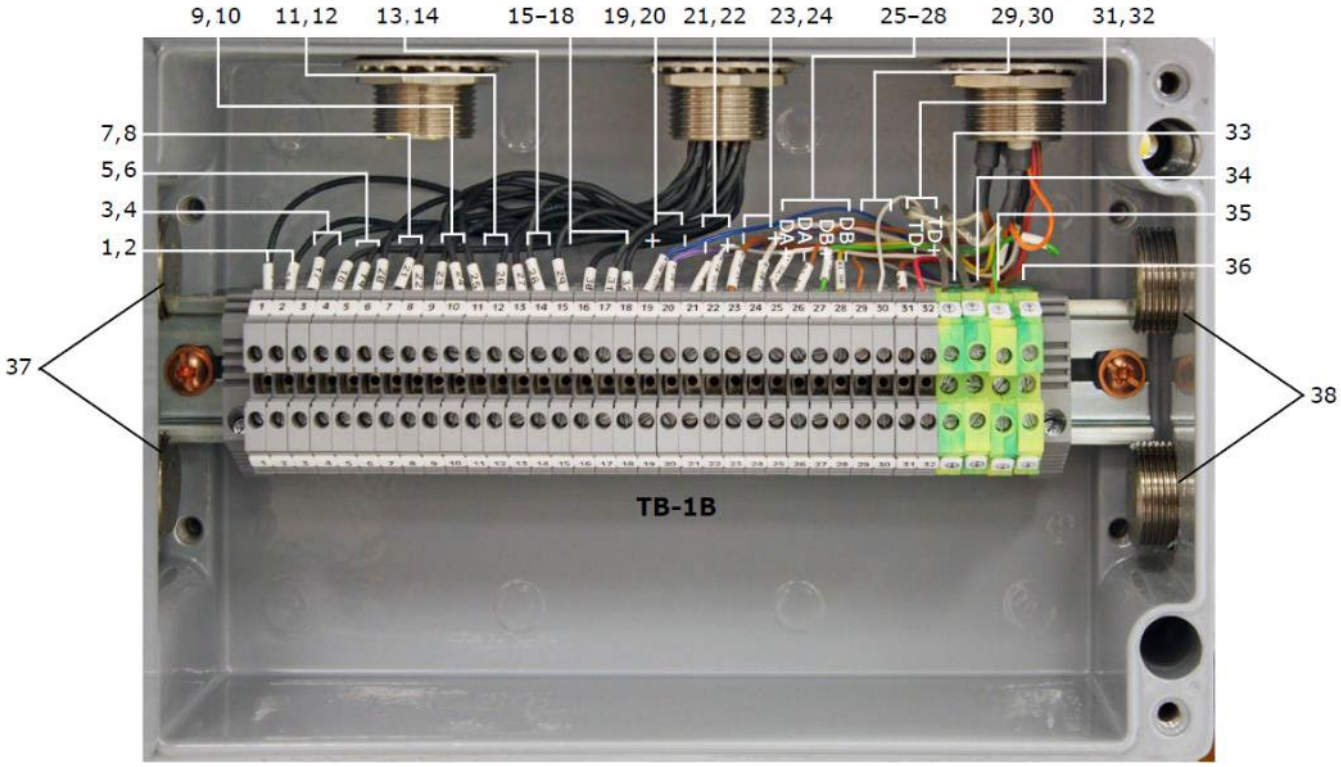


Figure 10: Wiring assignments for terminal block (TV-TB1) in terminations junction box. Refer to Figure A-8 for more information.

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
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 the figure to consult the wiring diagrams in the system drawings. All work can be performed by personnel qualified in electrical installation.

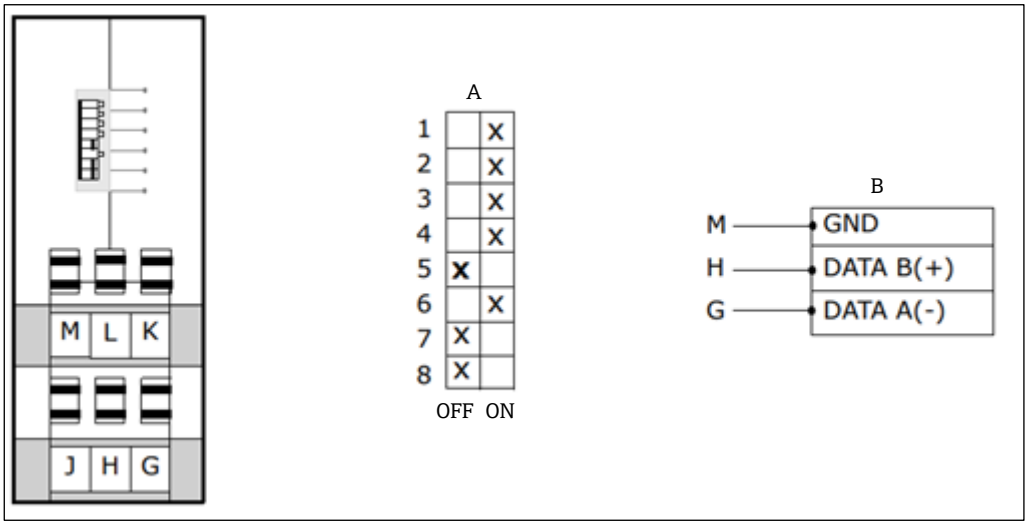


Figure 11: Optically isolated RS-232-to-RS-485 converter DIP switches

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 (+)			

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

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						
120 Ω 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.

Output signal connections (two-wire RS-485 configuration)

	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	Time-out[3] (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[4]	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

[3]Time-out selections are equal to one character time at the indicated baud rate.

[4]To achieve this time-out, an appropriate through-hole resistor must be placed in the R11 location on the converter PCB.

5.6 Connecting Electrical Power to the Analyzer

Depending on your configuration, the analyzer will be configured for AC 120 or 230 V 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 can be performed by personnel qualified in electrical installation. Refer to the system drawings in *Appendix A: Specifications*→.

⚠ WARNING

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

5.6.1 Fuse specifications

If you need to replace a fuse, use only the same type and rating of fuse as the original as listed in the tables below. Part numbers are referenced in Appendix C: Replacement Parts →.

Fuse specifications for 230 VAC systems

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

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

Fuse specifications for 120 VAC systems

DWG Ref.	Description	Rating
F1[1]	Miniature Fuse, 5 x 20 mm, Time Delay	250 VAC/0.16 A
F2[6]	Miniature Fuse, 5 x 20 mm, Time Delay	250 VAC/0.16 A
F3[1]	Miniature Fuse, 5 x 20 mm, Time Delay	250 VAC/0.16A
F4	Miniature Fuse, 5 x 20 mm, Time Delay	250 VAC/0.16 A

[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* → 🖹 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.

⚠ CAUTION

Interconnection of the analyzer enclosure and sample system enclosure shall be accomplished using wiring methods approved for the National Electric Code (NEC) Article 501, or methods described in the Standard IEC/EN 60079-0 and IEC/EN 60079-14.

- The installer is responsible for complying with all local installation codes.
- Certified glands and cables can be used where appropriate in compliance with local regulations.

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

- The maximum allowed inductance to resistance ratio (L/R ratio) for the field wiring interface must be less than 25 µH/Ω. The maximum total loop capacitance must be 0.27 microfarads.
- An approved switch or circuit breaker rated for 15 amps can be used and clearly marked as the disconnecting device for the analyzer.
- The power distribution panel or switch can be located in close proximity to the equipment and within easy reach of the operator. A switch or circuit breaker must not interrupt a protective earth ground.
- All electrical work must be performed by qualified personnel.

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 ⏚.

⚠ WARNING

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

- Careful consideration can be taken when grounding. Properly ground the unit by connecting ground leads to the grounding studs provided throughout the system that are labeled with the ground symbol ⏚.

8. Verify that each connection is secure.
9. Close the analyzer enclosure cover according to the procedure under *Opening and Closing the Gas Analyzer Enclosure Cover* → 🖹.

5.7 Changing the 4–20 mA Current Loop Mode

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 can be performed by personnel qualified in electronics assembly.

⚠ WARNING

Hazardous voltage and risk of electric shock.

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

Changing the current loop mode may negate specific hazardous area certifications.

- Contact *Service* → 🖹 for details.

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

1. Disconnect power to the analyzer and open the analyzer enclosure cover according to the procedure under *Opening and Closing the Gas Analyzer Enclosure Cover* → 🖹.

2. 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 the figure.
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), shown in the figure, connecting the center pin to pin A, to connect the center pin with pin P.

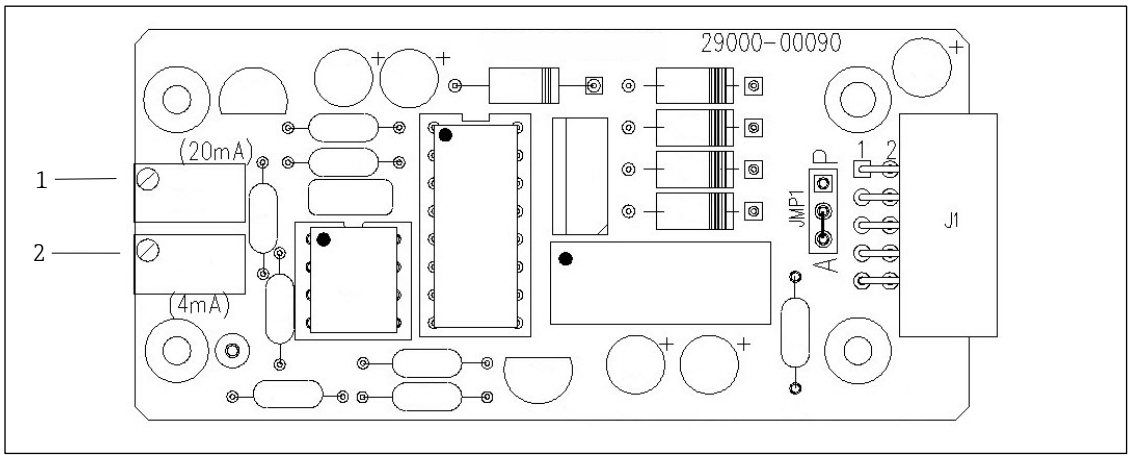


Figure 12. Analyzer 4-20 mA board

#	Description
1	Zero (4mA) adjust
2	Span (29mA) adjust
3	JMP1

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 *Opening and Closing the Gas Analyzer Enclosure Cover* → 🖹.

5.8 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 can 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* → 🖹 and/or system drawings in *Appendix A: Specifications* → 🖹.

5.8.1 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.

⚠ WARNING

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

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

6 Sample Conditioning System

⚠ WARNING

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.
- Personnel can have a thorough understanding of the operation of the analyzer and the procedures presented here before operating the sample conditioning system (SCS).

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 can 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.

⚠ CAUTION

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

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

6.1 Sample conditioning system overview

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 can 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 the table 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.

6.2 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. Purging the transport line to confirm that no dust, particulates, or liquids were trapped during installation is recommended.

To perform SCS installation checks, confirm the following:

- Confirm that the sample probe is correctly installed at the process supply tap and that the sample probe isolation valve is closed.
- Confirm that the field pressure reducing station is installed properly at the sample probe.
- 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.

  NOTICE

  Although the relief valve has been preset at the factory, the set-point must be confirmed before 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.
- Confirm that the relief valve vent line is properly installed from the field pressure reducing station to the low pressure flare or atmospheric connection.
- If applicable, confirm that the sample probe and field pressure reducing station are properly traced and insulated without any exposed surfaces.
- 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.
- Confirm that all valves are closed and all switches are off.
- 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.
- Confirm that the field analog and alarm signal wiring is interconnected properly. See *Connecting the Signals and Alarms* → 🖹.
- Confirm that the low pressure flare or atmospheric vent is properly connected, if applicable.
- Confirm that the analyzer house atmospheric vent is properly installed, if applicable.
- Confirm that all sample system tubing has been thoroughly leak checked.

6.3 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, confirm the following power and gas supplies are closed or off

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.
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).

NOTICE

- Personnel can have a thorough understanding of the operation of the tracer power supply and control system before operating the SCS.
- 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 can stabilize below 60 ˚C. Refer to the settings shown in the system drawings found in *Appendix A: Specifications* → 🖹.

   ⚠ CAUTION

   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.
   - The SCS enclosure door can remain closed during the entire start-up procedure.
   - If the SCS enclosure exceeds 60 ˚C (140 ˚F), damage to the system can occur. **Shut down the system immediately.**
   - The entire analyzer system is calibrated for operation at the enclosure temperature specified. Measurements can be considered valid only when the enclosure is at the specified temperature.

To start up the field pressure reducing station

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.

   ⚠ CAUTION
   - 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.

⚠ CAUTION

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

⚠ CAUTION

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. Although the exact supply pressure setpoint is not critical, the pressure at the sample system can be within 0.35 barg (5 psig) of the specified supply pressure setpoint.

▶ If the pressure at the SCS under flowing conditions is not sufficiently close to the specified setpoint, readjust the pressure regulator setpoint at the field pressure reducing station. This will 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.

⚠ CAUTION

▶ 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* → 🖹.

NOTICE

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.

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.

⚠ CAUTION

▶ 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* → 🖹.

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

6.4 Shutting Down the SCS

⚠ WARNING

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

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

⚠ WARNING

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

- A pressure reducing regulator is located at the sample tap to reduce the sample pressure and enable operation of the SCS at a low pressure. Use extreme caution when operating the sample probe isolation valve and field pressure reducing regulator.
- All valves, regulators, switches can be operated in accordance with site lockout/tagout 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.

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 and the sample system enclosure heater.

To isolate the measurement cell for short-term shutdown

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.

⚠ WARNING

- Never purge the analyzer with air or nitrogen while the system is powered up.
- Do not over-tighten the control valve(s) or damage could occur.

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

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.

⚠ WARNING

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

- Personnel can 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.

4. Isolate the gas analyzer from the bypass following the procedure under **“To isolate the analyzer for short-term shutdown” on page 4-7**.
5. Close the sample supply shut-off valve to the SCS.
6. 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.
7. Close the low pressure flare or atmospheric vent header shut-off valve for the effluent from the sample bypass.

8. 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.

⚠ WARNING

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

- A pressure reducing regulator is located at the sample tap to reduce the sample pressure and enable operation of the SCS at a low pressure. Use extreme caution when operating the sample probe isolation valve and field pressure reducing regulator.
- All valves, regulators, switches can be operated in accordance with site lockout/tagout procedures.

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.

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.

⚠ WARNING

- Never purge the analyzer with air or nitrogen while the system is powered up.
- Do not over-tighten the control valve(s) or damage could occur.

   c. Close the low pressure flare or atmospheric vent header shut-off valve for the effluent from each measurement cell.
2. Confirm flow in the sample bypass flow meter (the actual flow is not critical).
3. Close the sample probe process shut-off valve at the sample supply process tap.
4. 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.
5. Close the field pressure reducing regulator (adjustment knob turned fully counterclockwise).
6. Close the low pressure flare or atmospheric vent header shut-off valve for the relief valve vent from the field pressure regulator.
7. Close the sample supply shut-off valve to the SCS.
8. Leave the sample bypass flow meter metering valve open.
9. Close the low pressure flare or atmospheric vent header shut-off valve for the effluent from the sample bypass.
10. Turn off power to the analyzer.
11. 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.

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 purge the analyzer for shipment or relocation

1. Refer to the procedure to *Shutting Down the SCS* →🖹.
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.

⚠ CAUTION

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 *Packing* → 🖹 for additional instructions on shipping or storing the analyzer.

7 Appendix A: 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 [7]	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) [8]	120 or 240 VAC ± 10%, 50/60 Hz; 60W max. (with 2 solenoids)

[7] Application dependent.
[8] Supply voltage not to exceed ± 10% of nominal. Transient over-voltages according to Over-voltage category II.

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 DC 24 V 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

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	CE Ex 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.

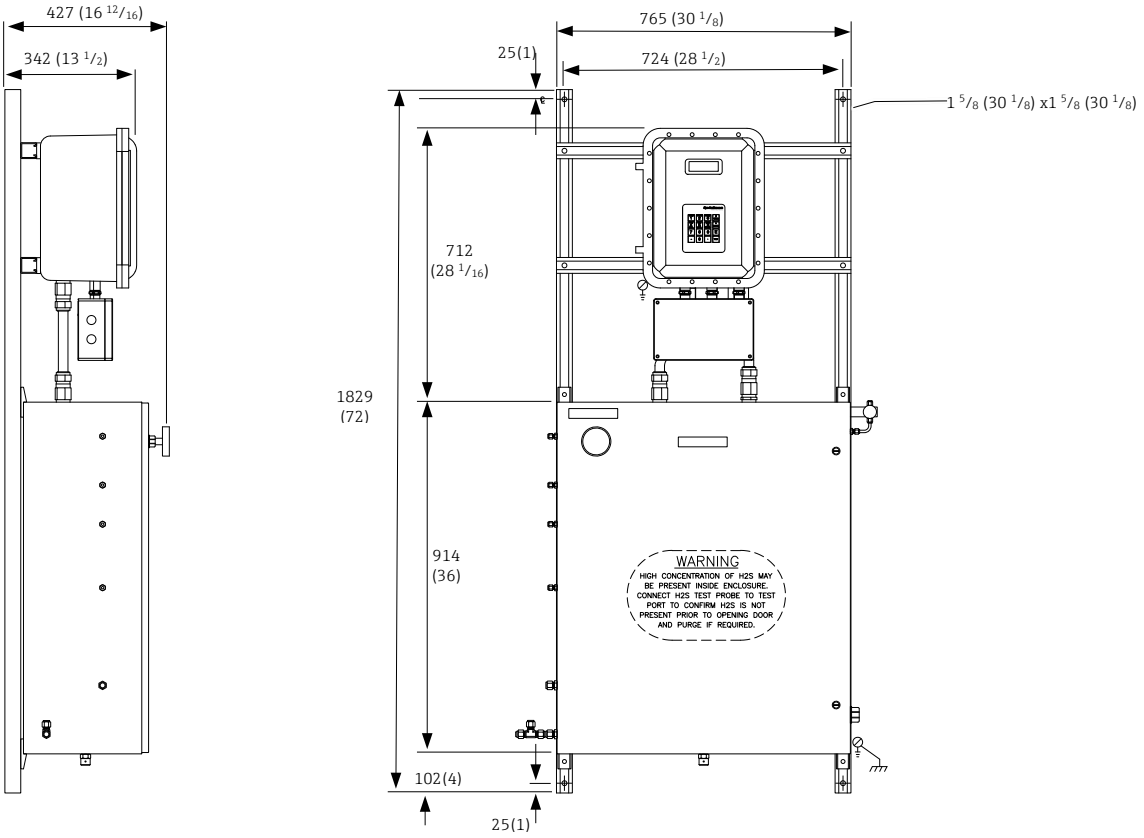


Figure 13: Outline dimensions and mounting for the SS2100a. Dimensions: mm (in)

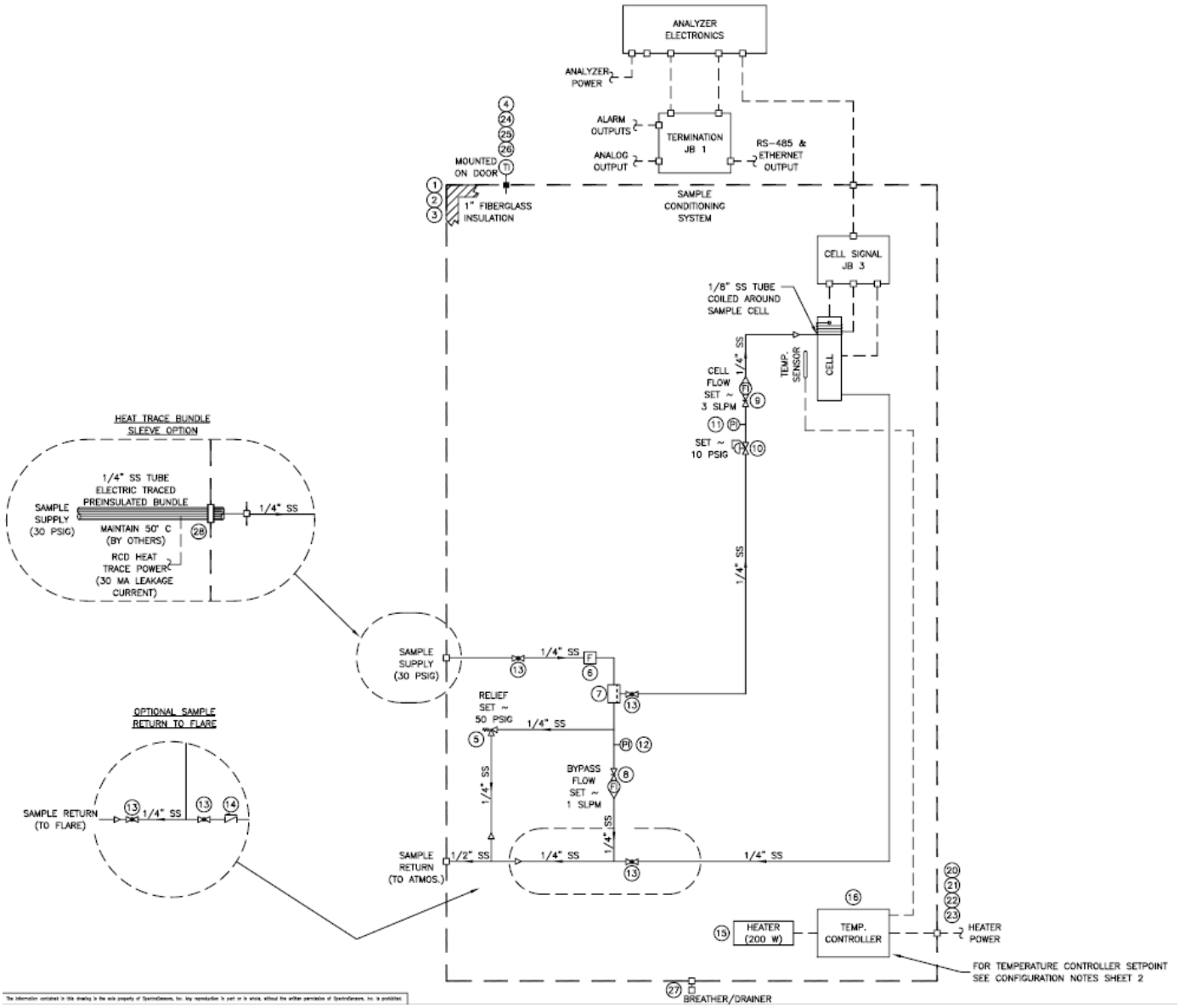
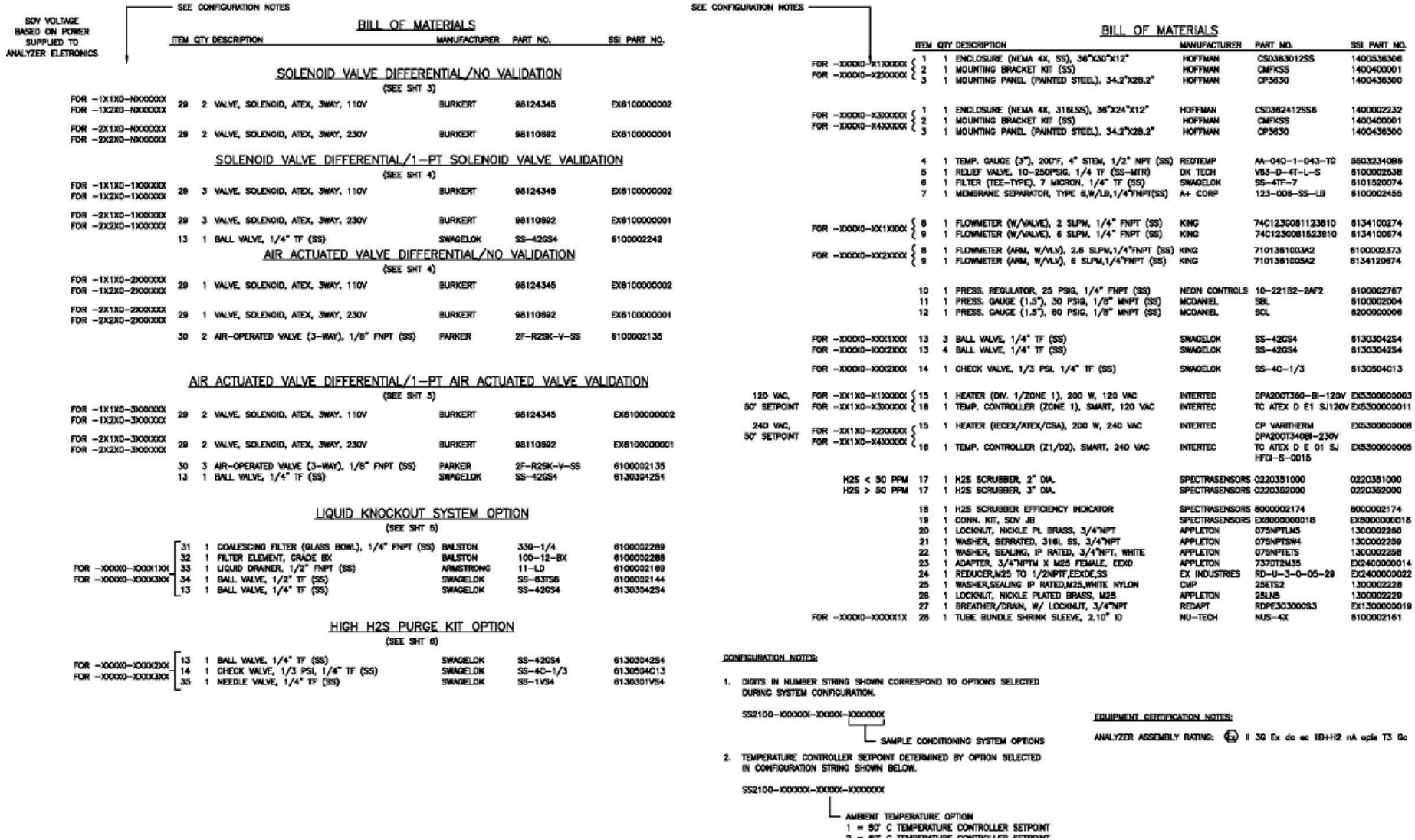


Figure 14: Sample system schematic for the SS2100a (fixed mount, non-validation, conventional)



SEE CONFIGURATION NOTES

SOV VOLTAGE BASED ON POWER SUPPLIED TO ANALYZER ELETRONICS

BILL OF MATERIALS

ITEM	QTY	DESCRIPTION	MANUFACTURER	PART NO.	SSI PART NO.
SOLENOID VALVE DIFFERENTIAL/NO VALIDATION (SEE SHT 3)					
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	98110592	EX6100000001
SOLENOID VALVE DIFFERENTIAL/1−PT SOLENOID VALVE VALIDATION (SEE SHT 4)					
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	98110592	EX6100000001
	13	1 BALL VALVE, 1/4" TF (SS)	SWAGELOK	SS−42GS4	6100002242
AIR ACTUATED VALVE DIFFERENTIAL/NO VALIDATION (SEE SHT 4)					
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	98110592	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)					
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	98110592	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	6130304254
LIQUID KNOCKOUT SYSTEM OPTION (SEE SHT 5)					
FOR −XXXX0−1XXX1XX	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
FOR −XXXX0−1XXX3XX	34	1 BALL VALVE, 1/2" TF (SS)	SWAGELOK	SS−63TS8	6100002144
	13	1 BALL VALVE, 1/4" TF (SS)	SWAGELOK	SS−42GS4	6130304254
HIGH H2S PURGE KIT OPTION (SEE SHT 6)					
FOR −XXXX0−1XXX2XX	13	1 BALL VALVE, 1/4" TF (SS)	SWAGELOK	SS−42GS4	6130304254
FOR −XXXX0−1XXX3XX	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

	ITEM	QTY	DESCRIPTION	MANUFACTURER	PART NO.	SSI PART NO.
FOR −XXXX0−X1XXXXX	1	1	ENCLOSURE (NEMA 4X, SS), 36"X30"X12"	HOFFMAN	CSD363012SS	1400536306
FOR −XXXX0−X2XXXXX	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	1	1	ENCLOSURE (NEMA 4X, 316LSS), 36"X24"X12"	HOFFMAN	CSD362412SS6	1400002232
FOR −XXXX0−X4XXXXX	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−040−1−043−TC	55032340B5
	5	1	RELIEF VALVE, 10−250PSIG, 1/4 TF (SS−MTR)	DK TECH	V83−D−4T−L−S	6100002538
	6	1	FILTER (TEE−TYPE), 7 MICRON, 1/4" TF (SS)	SWAGELOK	SS−4TF−7	6101520074
	7	1	MEMBRANE SEPARATOR, TYPE B,W/LB,1/4"FNPT(SS)	A+ CORP	123−008−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	7101381003A2	6100002373
	9	1	FLOWMETER (ARM, W/VLV), 6 SLPM,1/4"FNPT (SS)	KING	7101381005A2	6134120674
	10	1	PRESS. REGULATOR, 25 PSIG, 1/4" FNPT (SS)	NEON CONTROLS	10−22182−2AF2	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	6130304254
FOR −XXXX0−XXX2XXX	13	4	BALL VALVE, 1/4" TF (SS)	SWAGELOK	SS−42GS4	6130304254
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	15	1	HEATER (DIV. 1/ZONE 1), 200 W, 120 VAC	INTERTEC	DPA200T360−BI−120V	EX5300000003
120 VAC, 50° SETPOINT FOR −XX1X0−X3XXXXX	16	1	TEMP. CONTROLLER (ZONE 1), SMART, 120 VAC	INTERTEC	TC ATEX D E1 SJ120V	EX5300000011
240 VAC, 50° SETPOINT FOR −XX1X0−X2XXXXX	15	1	HEATER (IECEX/ATEX/CSA), 200 W, 240 VAC	INTERTEC	CP VARITHERM DPA200T340BI−230V	EX5300000008
240 VAC, 50° SETPOINT FOR −XX1X0−X4XXXXX	16	1	TEMP. CONTROLLER (Z1/D2), SMART, 240 VAC	INTERTEC	TC ATEX D E 01 SJ HFGI−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	1300002280
	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	7370T2M35	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

EQUIPMENT CERTIFICATION NOTES:

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

Figure 15: Sample system schematic bill of materials for the SS2100a (fixed mount, non-validation, conventional)

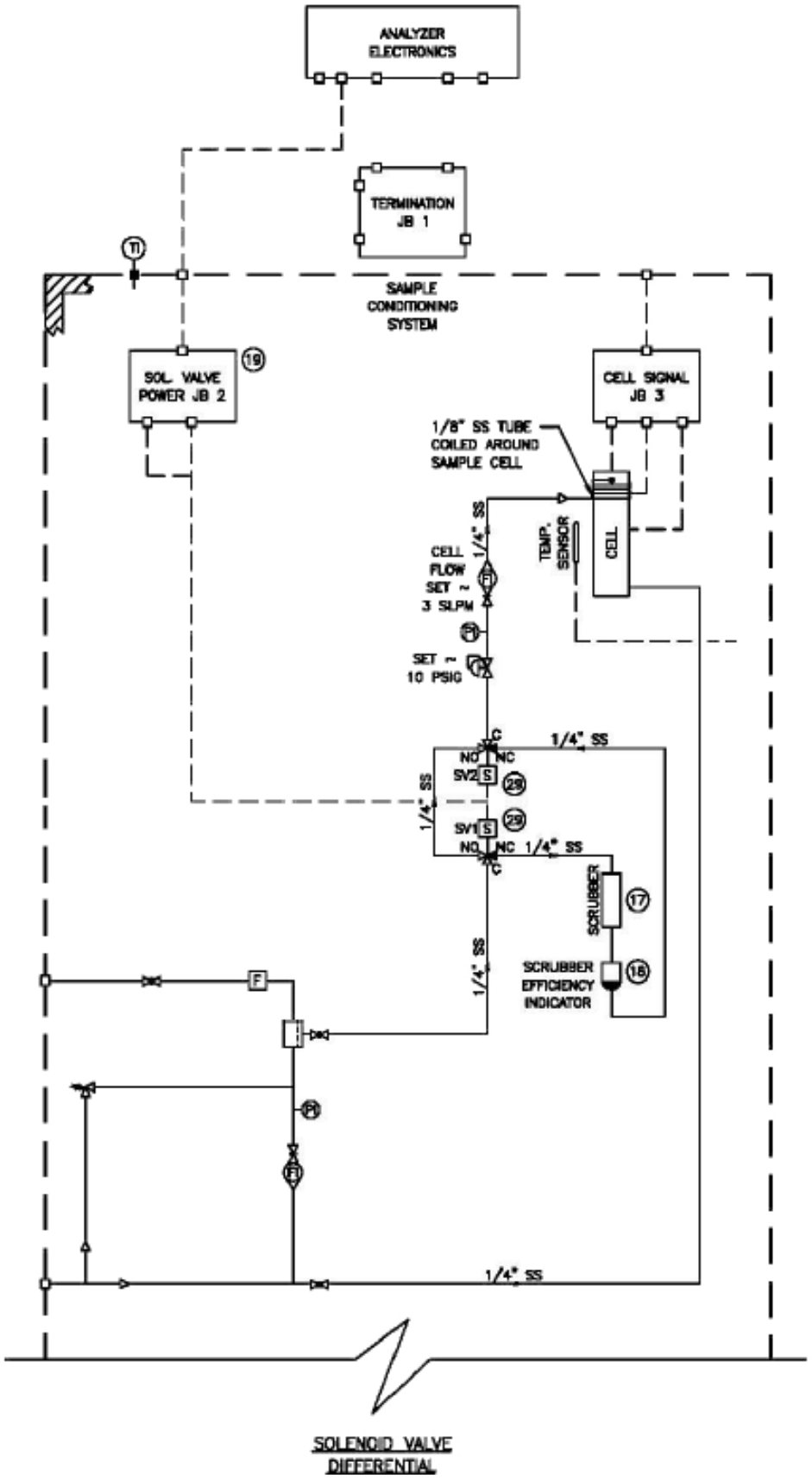


Figure 16: Sample system schematic (solenoid valve differential) for the SS2100a (fixed mount, non-validation, conventional)

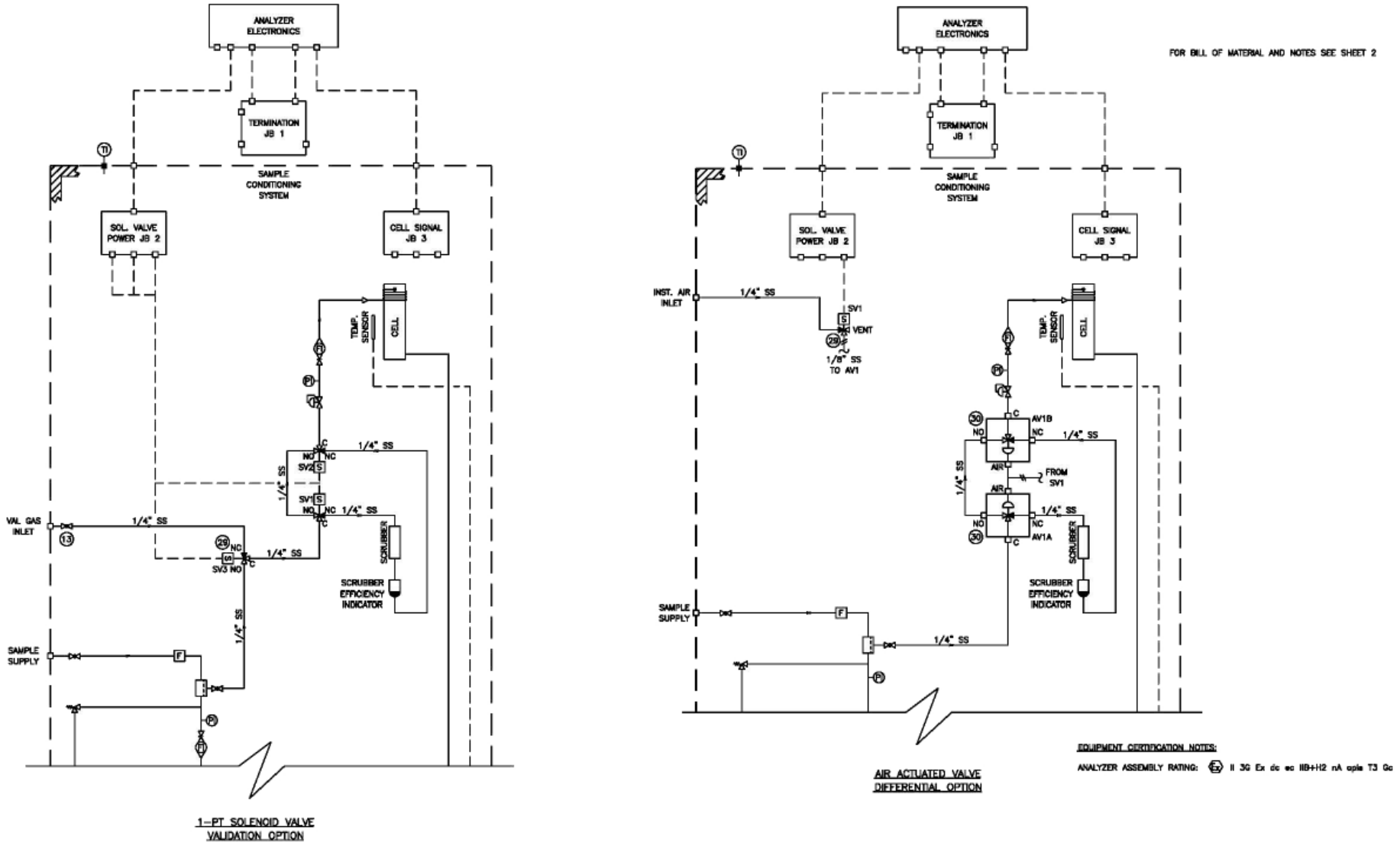


Figure 17: Sample system schematic (1-pt solenoid valve validation option/air-actuated valve differential option) for the SS2100a (fixed mount, non-validation, conventional)

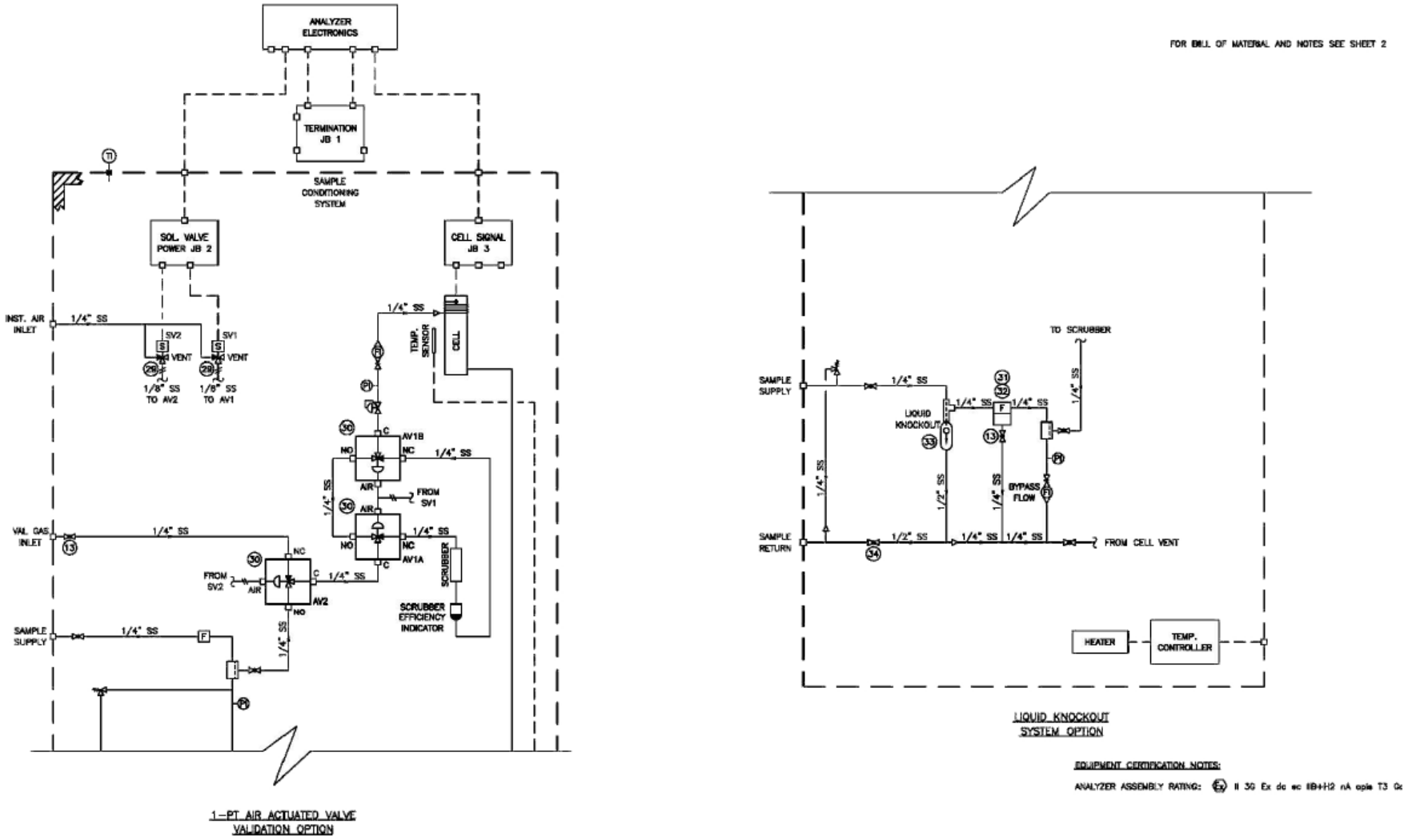


Figure 18: Sample system schematic (1-pt air-actuated valve validation option/liquid knock-out option) for the SS2100a (fixed mount, non-validation, conventional)

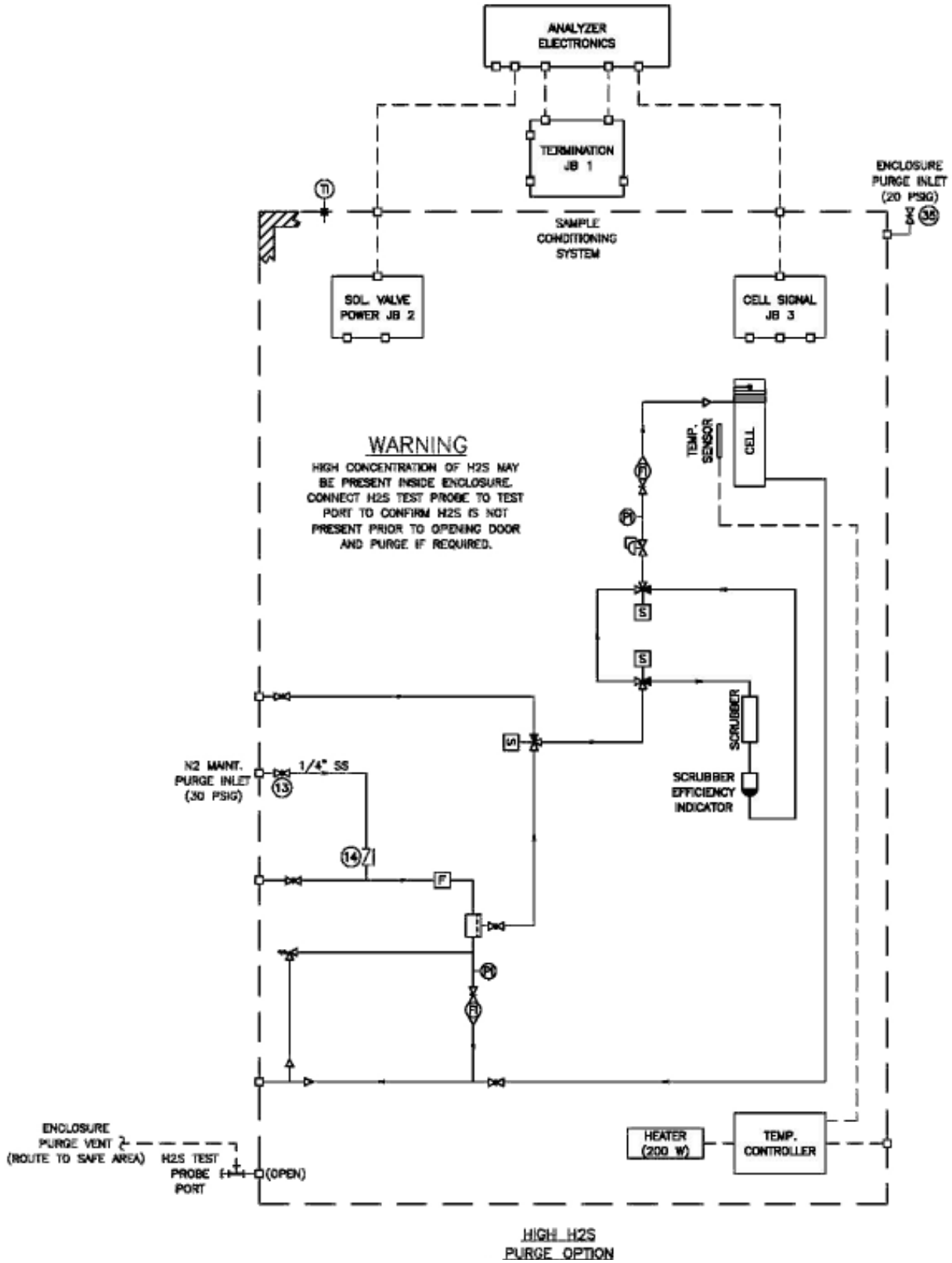


Figure 19: Sample system schematic (high H_2S purge option) for the SS2100a (fixed mount, non-validation, conventional)

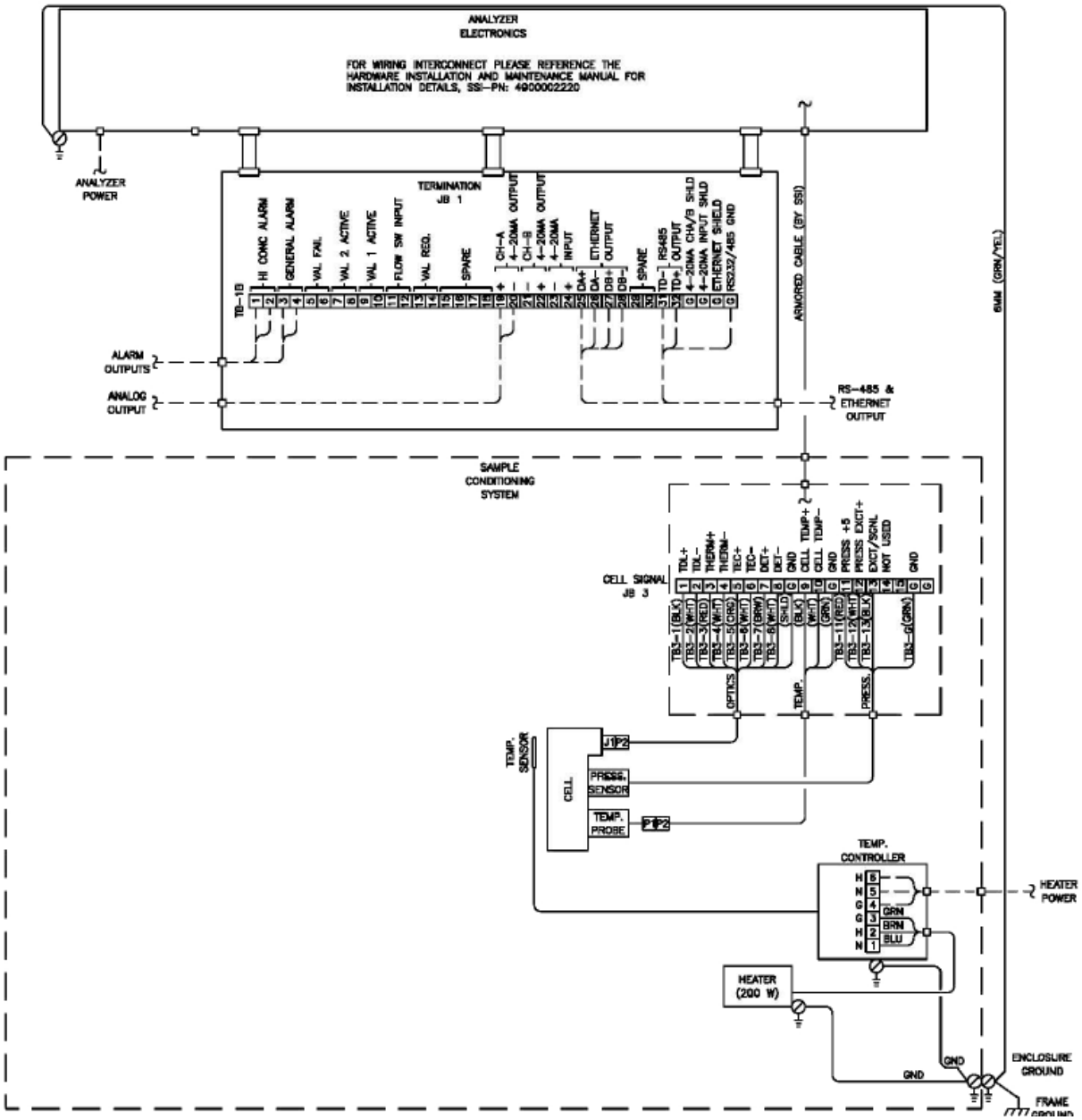


Figure 20: Power and signal wiring for the SS2100a (fixed mount, non-validation, conventional)

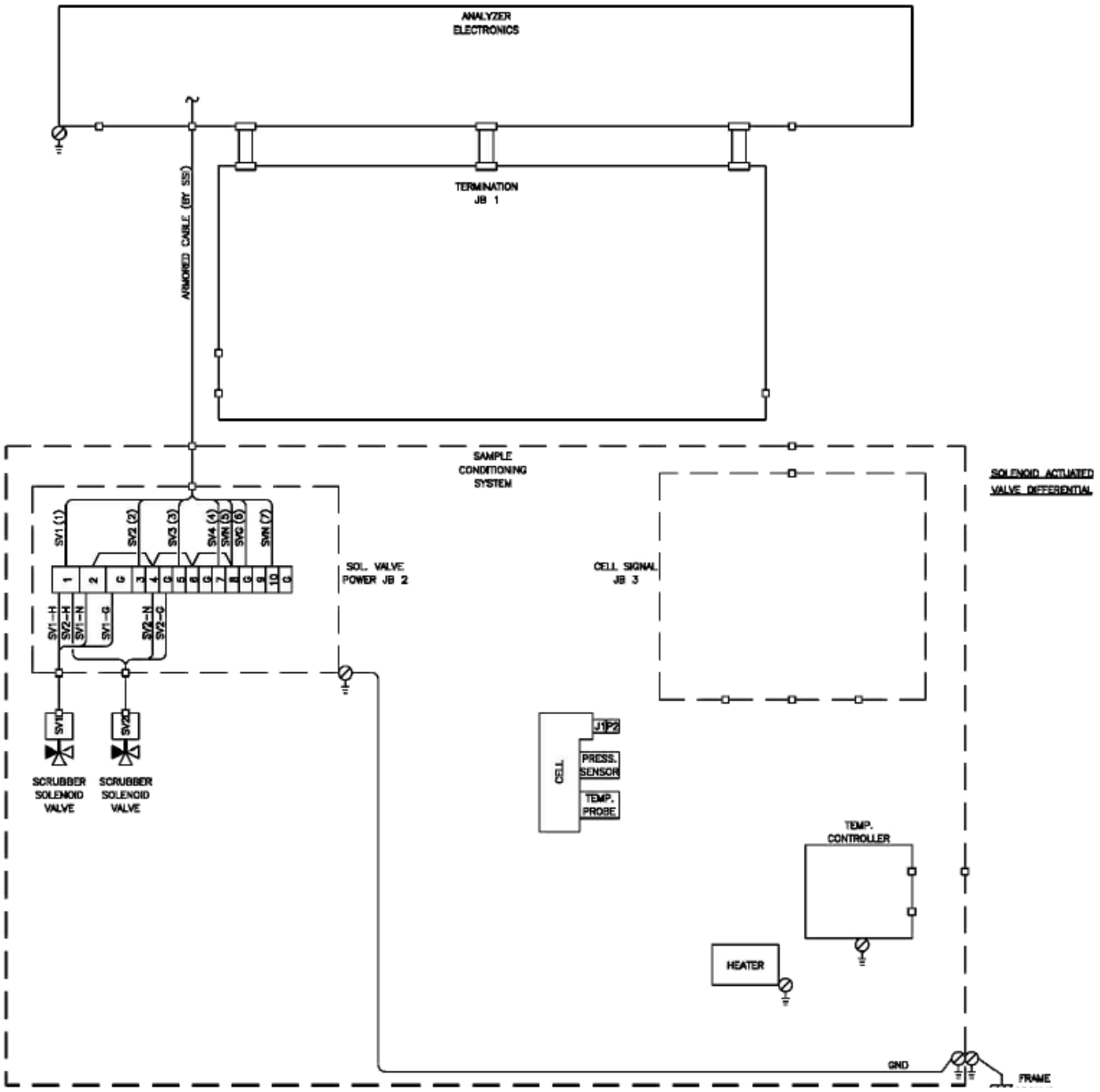


Figure 21: Power and signal wiring (solenoid-actuated valve differential) for the SS2100a (fixed mount, non-validation, conventional)

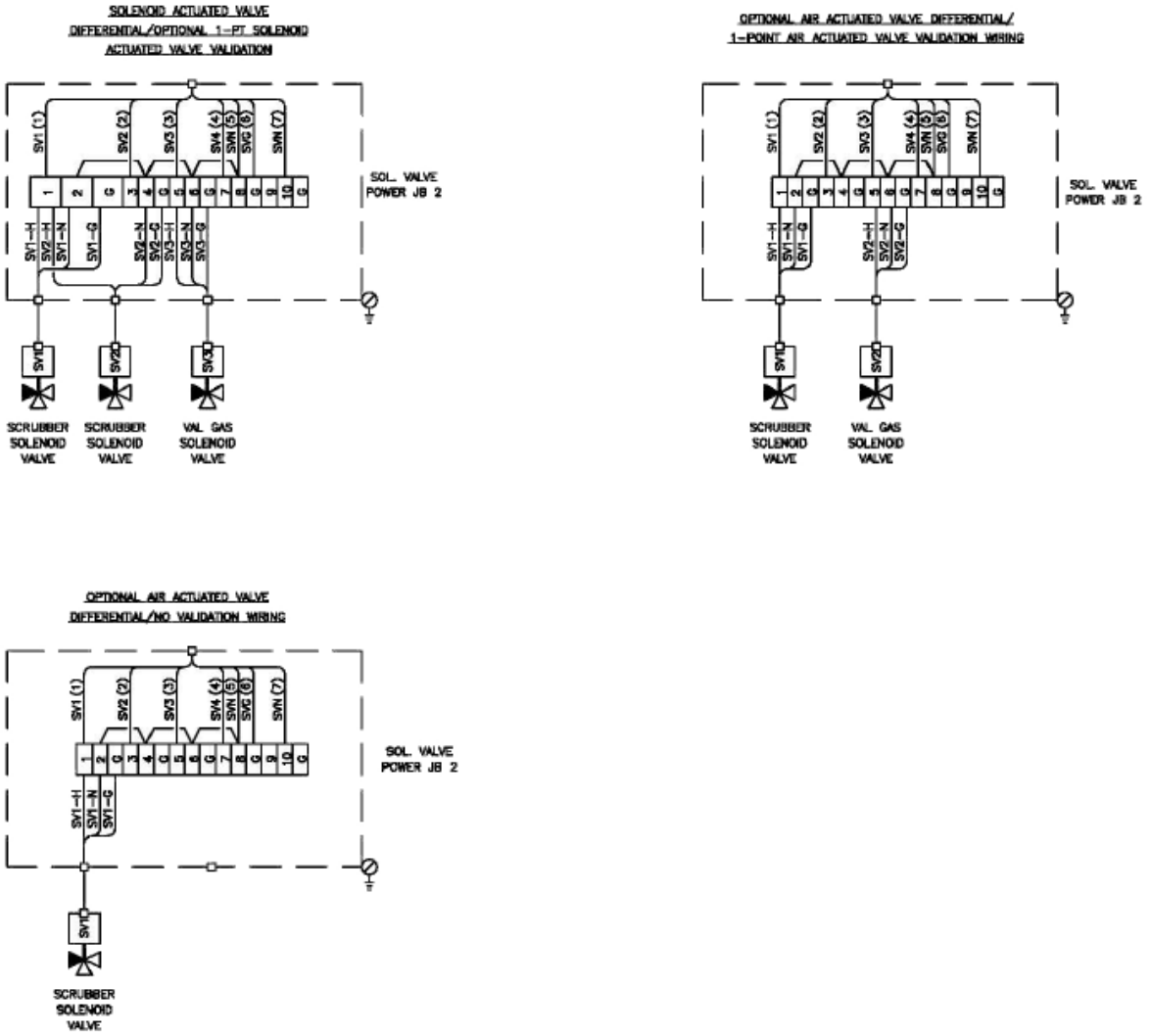
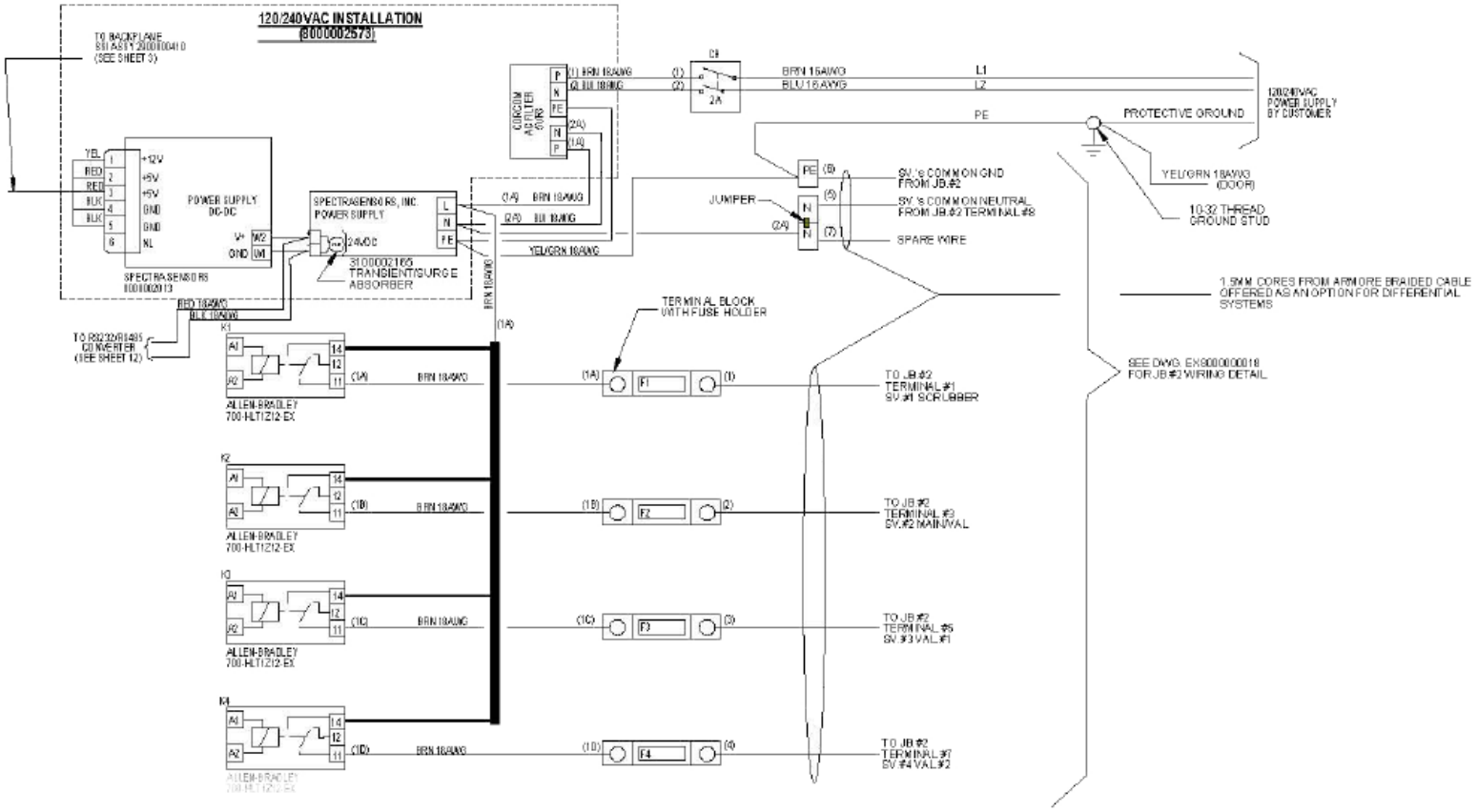


Figure 22: Power and signal wiring (solenoid, air-actuated options) for the SS2100a (fixed mount, non-validation, conventional)



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

ARM9 -120/240VAC ZONE 2

Figure 23: Electronics schematic, 120/240 VAC (to JB#2)

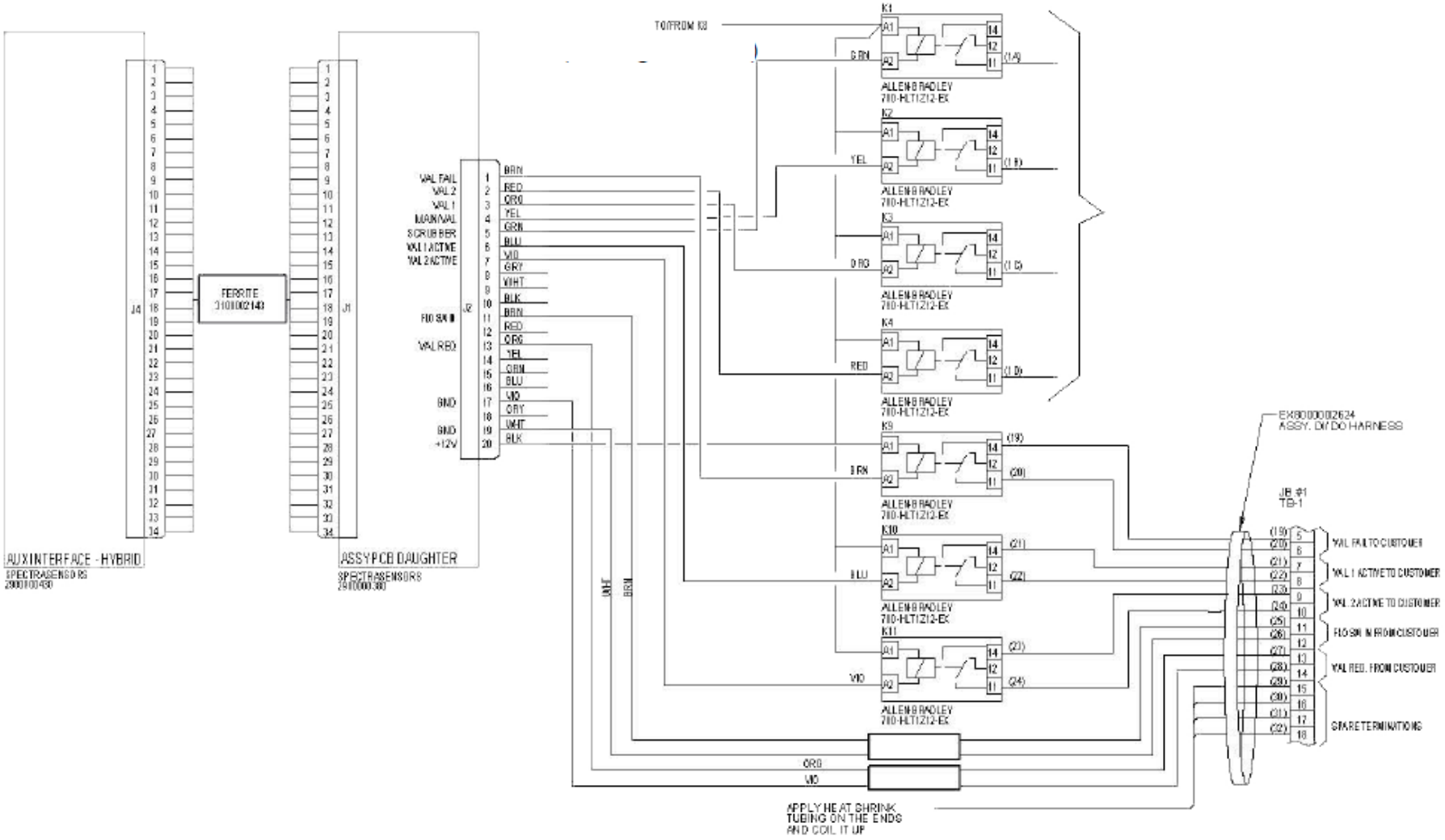


Figure 24: Electronics schematic, JB#1 (TB1) to PCB daughter board

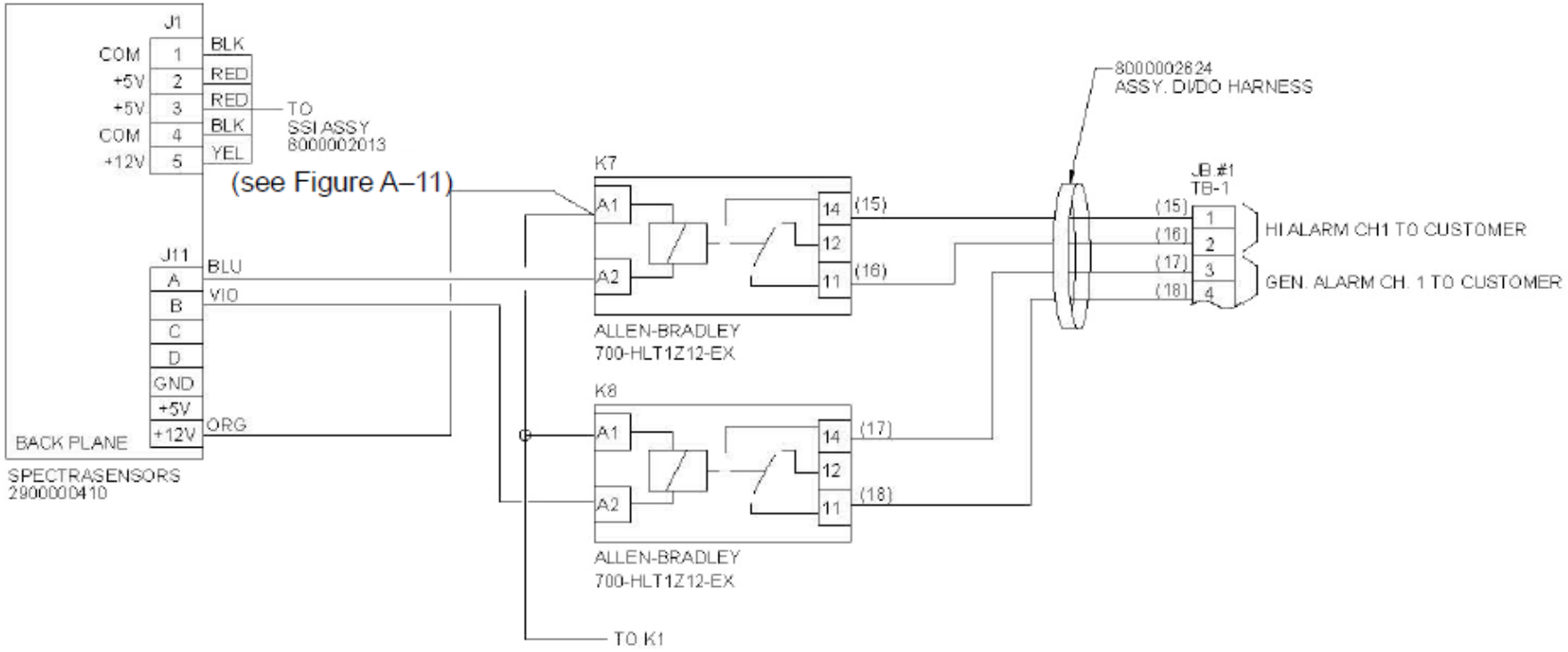
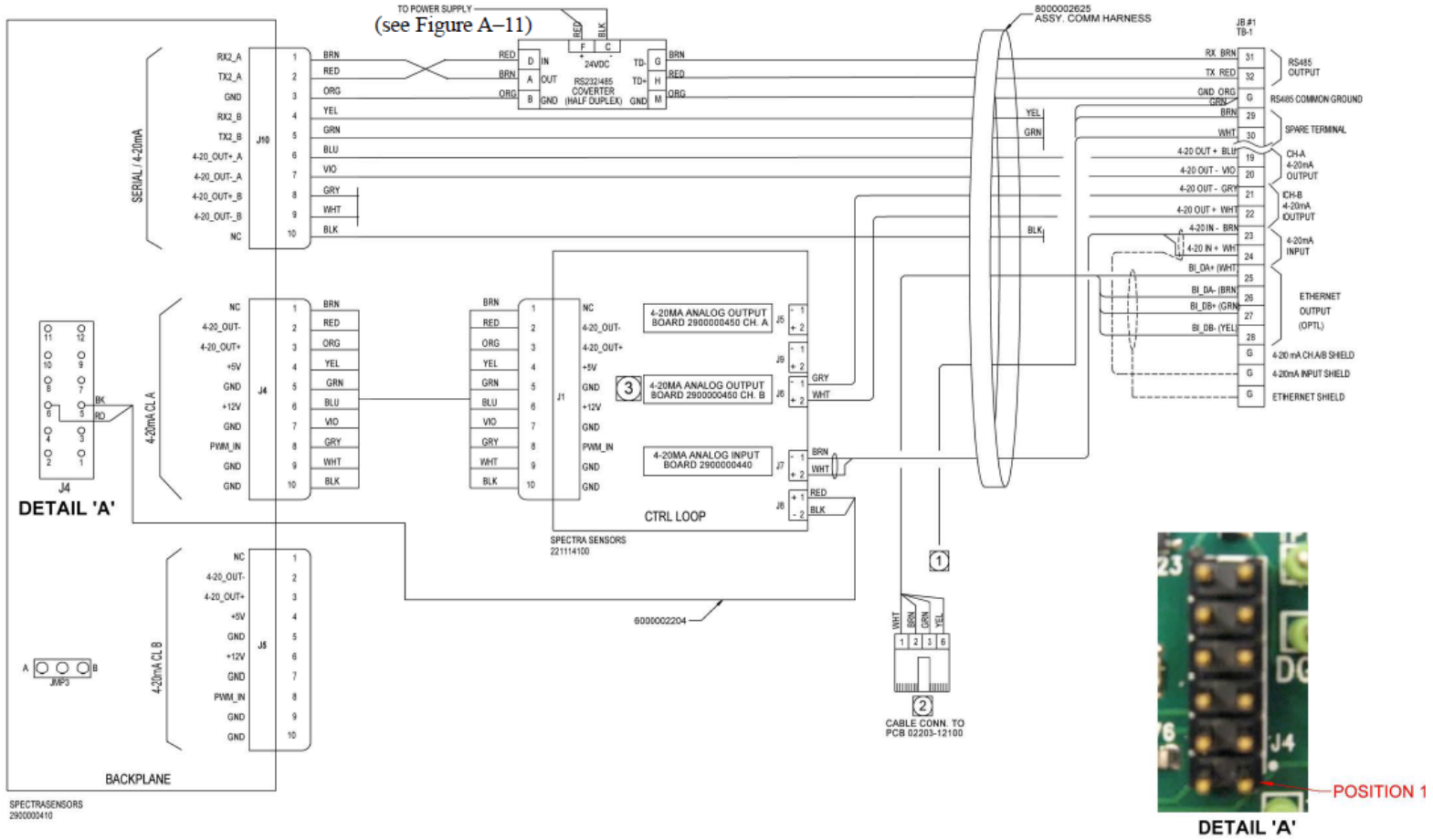


Figure 25: Electronics schematic, JB#1 (TB1) to J1, J11 on backplane



COMBO CHANNEL CONFIGURATION (J3)	
JUMPER (JMP1)	CONFIGURATION
1 & 2	DUAL CHANNEL "A" OUTPUT (DEFAULT) (3)
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 26: Electronics schematic, 4-20 mA and serial connections

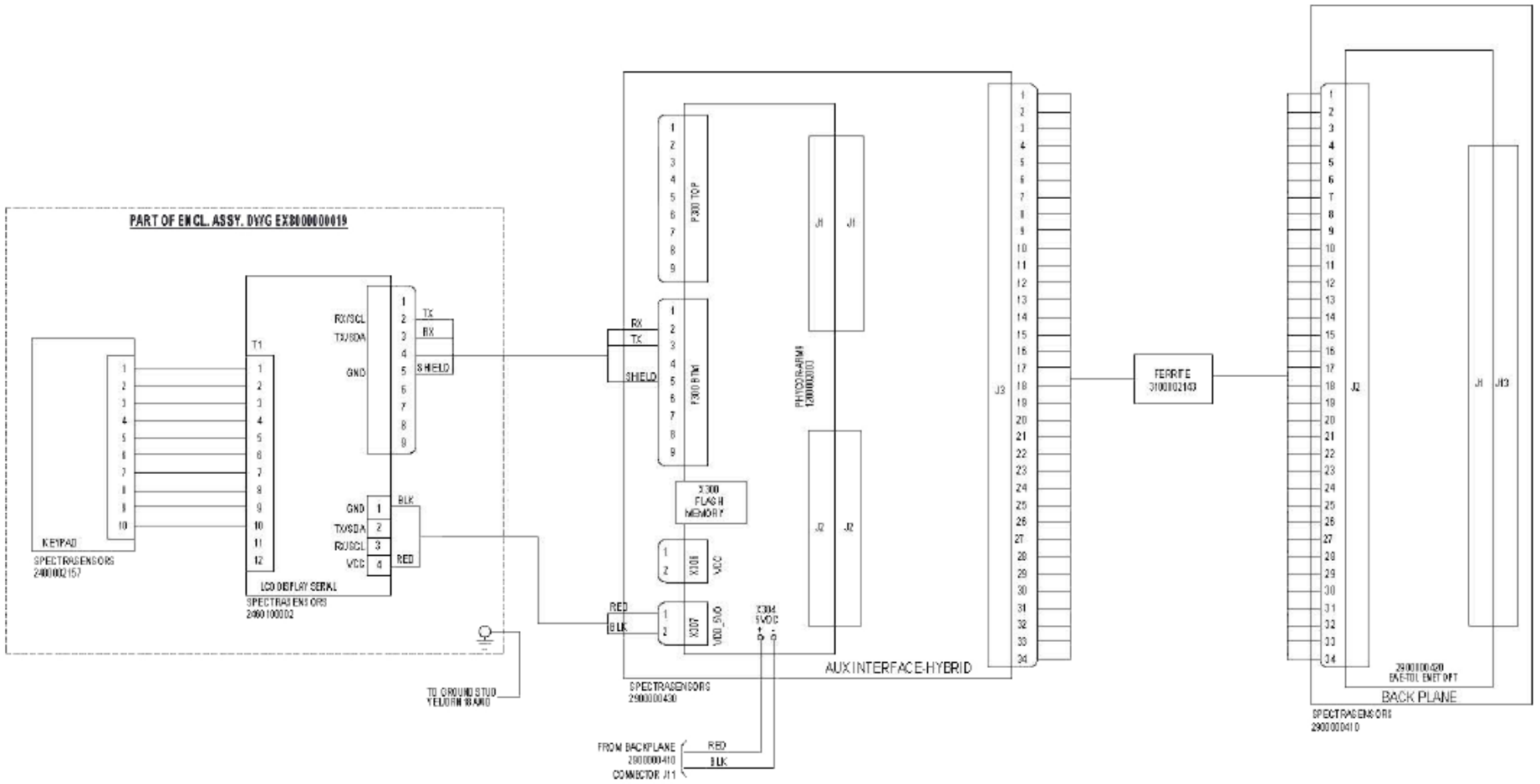


Figure 27: Electronics schematic, keypad, LCD connections

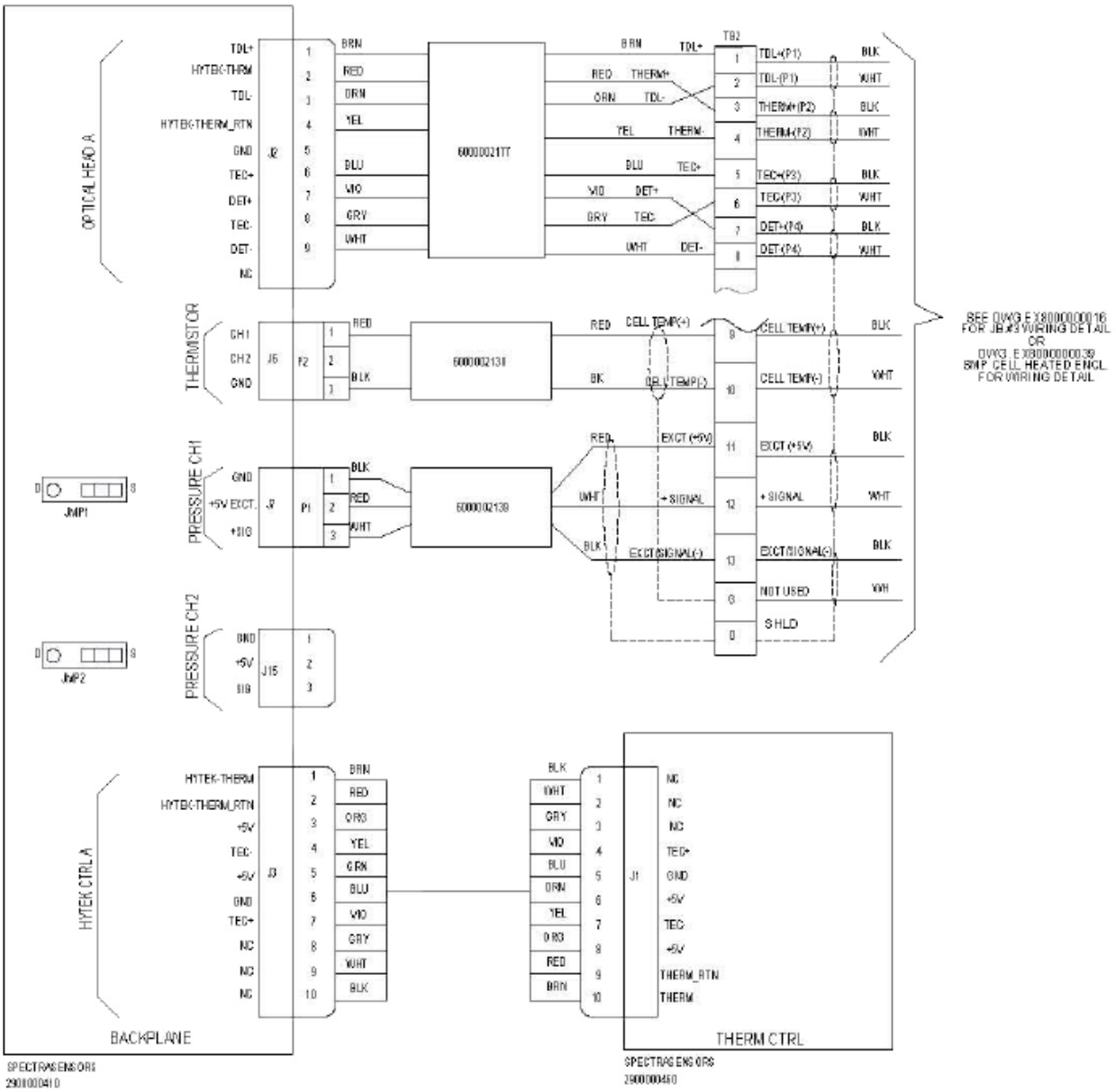


Figure 28: Electronics schematic, temperature controller connections

8 Appendix B: Diagnostics 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* →.

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.

8.1 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.

NOTICE

Plastic tubing is permeable to moisture and other substances which can contaminate the sample stream.

- Do not use plastic tubing of any kind for sample lines. Using ¼ in O.D. x 0.035 in wall thickness, seamless stainless steel tubing is recommended.

⚠ WARNING

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

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

8.2 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* → .

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* → or *Replacing the Filter* → . 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.

8.3 Excessive Sampling Gas Temperatures and Pressures

The embedded software is designed to produce accurate measurements only within the allowable cell operating range (see the table). 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 the table for troubleshooting information.

NOTICE

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

- If the pressure, temperature, or any other readings on the LCD appear suspect, they can be checked against the specifications (see the table). Refer to the Device Parameters for more information on system faults and alarms.

8.4 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.

8.5 Relief Valve Setting

The relief valve is pre-set at the factory at 50 PSIG and can not require adjustment. Refer to the system drawings in *Appendix A: Specifications* → 🖹.

NOTICE

Improper adjustment in the field could prevent the proper operation of the relief valve and/or sample conditioning system. Refer to *Service* → 🖹.

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

⚠ CAUTION

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

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 can be adequately secured (to prevent excessive shock or vibration). Refer to Service for any questions related to packaging.
3. The packaged permeation device can be stored in a sheltered environment that is temperature controlled above 0 °C (32 °F), and can not be exposed to direct sun, rain, snow, condensing humidity or corrosive environments.

8.7 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 can be reset. Refer to the Device Parameters for this analyzer for instruction.

8.8 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* → 🖹 before attempting to clean the mirrors. If advised to do so, use the following procedure.

INVISIBLE LASER RADIATION — The sample cell assembly contains a low-power, 10 mW maximum, 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.

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

- ▶ Personnel can have a thorough knowledge and understanding of the physical properties and safety precautions for the sample contents before operating the SCS.
- ▶ All valves, regulators, switches can be operated in accordance with site lockout/tagout procedures.

This procedure can be used ONLY when necessary and is not part of routine maintenance.

- ▶ To avoid compromising the system warranty, contact service before cleaning mirrors. This procedure can be used ONLY when necessary and is not part of routine maintenance. To avoid compromising the system warranty, refer to *Service* → 🖹.

To clean the mirror, refer to the instructions *Cleaning the Mirrors* → 🖹.

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

8.8.1 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.

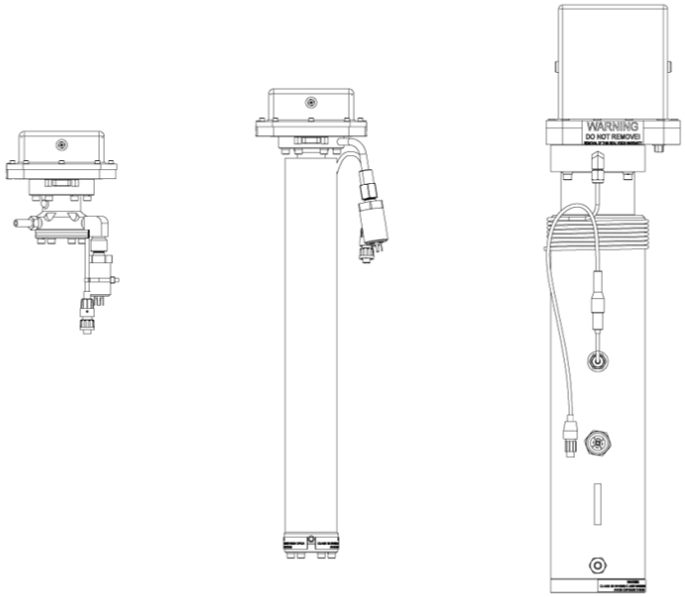


Figure 29: Measurement cell types, left to right: 0.1 m cell, 0.8 m cell, 8m or 28 m cell

The stainless steel mirrors are used with 0.1 m and 0.8 m measurement cells only. To determine the type of mirror being used for the system cell, feel at the bottom of the cell for the engraved “X” marking or the side of the mirror for a groove. Refer to the figure below.

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

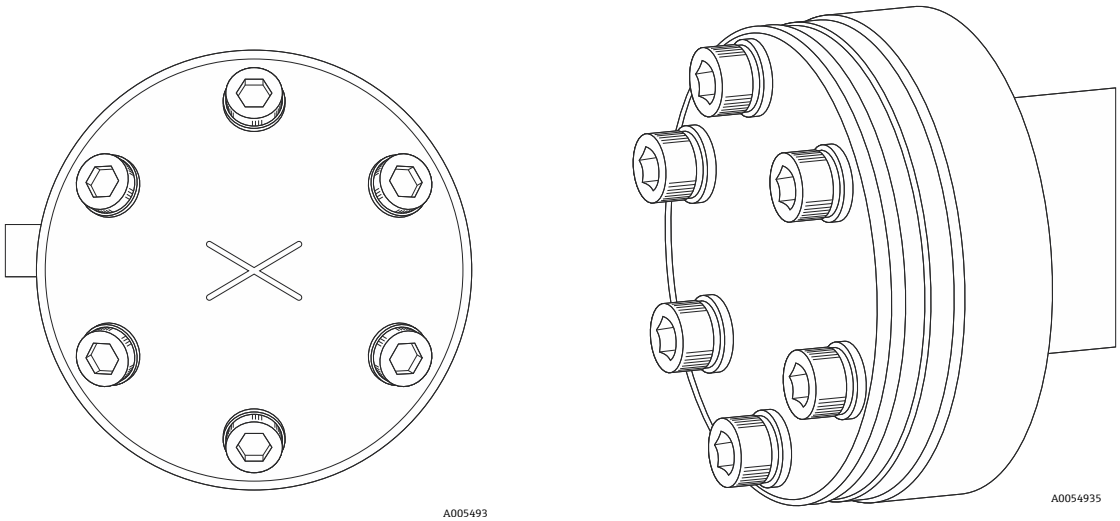


Figure 30: Stainless steel mirror marking: mirror with engraved X (left), mirror with grooved rim (right)

NOTICE

▶ 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 following instructions. If your system has been configured with a stainless steel mirror in the 0.1 m or 0.8 m measurement cell, refer to *Replacing the Stainless Steel Mirror* →.

8.8.2 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.

⚠ WARNING

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 *Shutting Down the SCS* → 🖹.
3. If possible, purge the system with nitrogen for 10 minutes.

⚠ WARNING

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

- Personnel can have a thorough knowledge and understanding of the physical properties and safety precautions for the sample contents before operating the SCS.
- All valves, regulators, switches can be operated in accordance with site lockout/tagout procedures.

4. Carefully mark the orientation of the mirror assembly with a permanent ink marker on the cell body.
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.
6. Look inside the sample cell at the top mirror using a flashlight to ensure that there is no contamination on the top mirror.

NOTICE

- Cleaning of the top mirror is not recommended. If the top mirror is visibly contaminated, refer to *Service* → 🖹.
- Never rub an optical surface, especially with dry tissues, as this can mar or scratch the coated surface.
- Always handle the optical assembly by the edge of the mount. Never touch the coated surfaces of the mirror.

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.
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.

8.9 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 *Replacement Parts* →.

NOTICE

- 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* →.
- All valves, regulators, switches can be operated in accordance with site lock-out/tag-out procedures.

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

⚠ WARNING

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

- Personnel can have a thorough knowledge and understanding of the physical properties and safety precautions for the sample contents before operating the SCS.
- All valves, regulators, switches can be operated in accordance with site lockout/tagout procedures.

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.

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.
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.
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.

8.10 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:

a. Check if there are any contaminants or discoloring of the white membrane. If yes, the filter can be replaced.

b. Remove the O-Ring and replace the membrane filter.

c. Replace the O-Ring on top of the membrane filter.

d. Place the cap back onto the membrane separator and tighten.

e. 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:

a. Drain any liquids and clean with isopropyl alcohol.

b. Clean any liquids or contaminants from the base of the membrane separator.

c. Replace the filter and the O-Ring.

d. Place the cap onto the membrane separator and tighten.

e. Check upstream of the membrane for liquid contamination and clean and dry out before re-opening the sample supply valve.

8.11 Replacing the Dryer

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

NOTICE

▶ 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.

NOTICE

▶ Refer to your analyzer's spare parts list or contact *Service* → 🖹 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.

8.12 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.

8.13 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

8.14 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

⚠ CAUTION

Isopropyl alcohol can be hazardous.

▶ Follow all safety precautions when in use and thoroughly wash hands before 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.

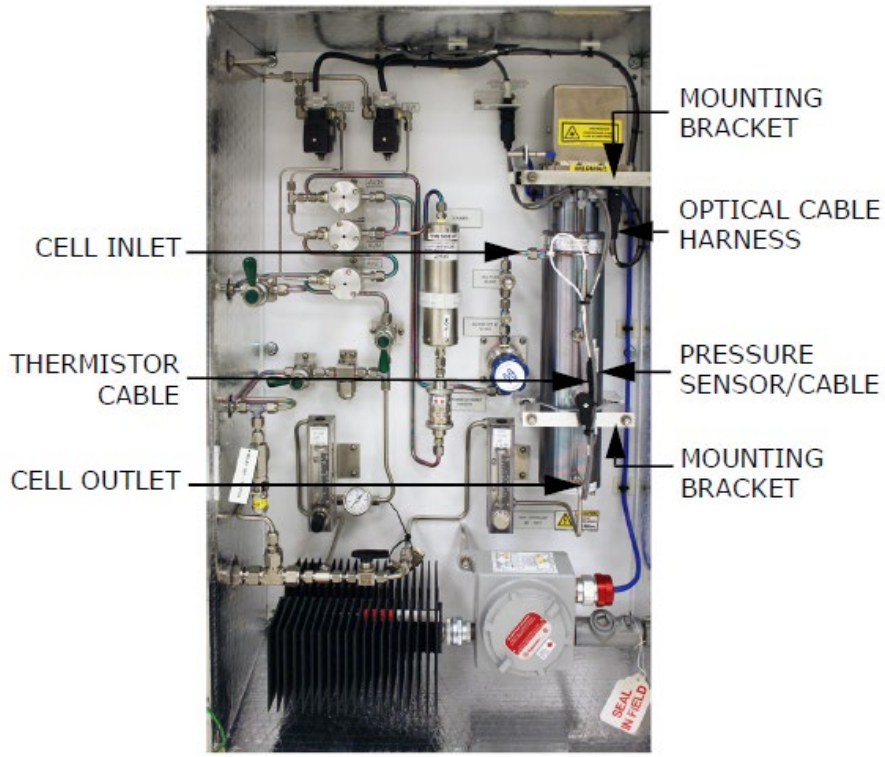


Figure 31: SCS cabinet interior

#	Description
1	**Cell inlet**
2	**Thermistor cable**
3	**Cell outlet**
4	**Mounting bracket**
5	**Optical cable harness**
6	**Pressure sensor/cable**
7	**Mounting bracket**

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.

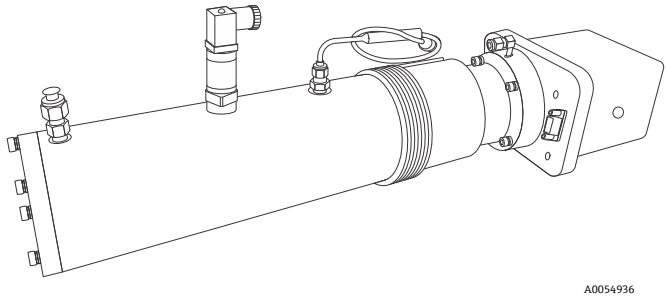


Figure 32: Removed 28m measurement cell

NOTICE

- 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.

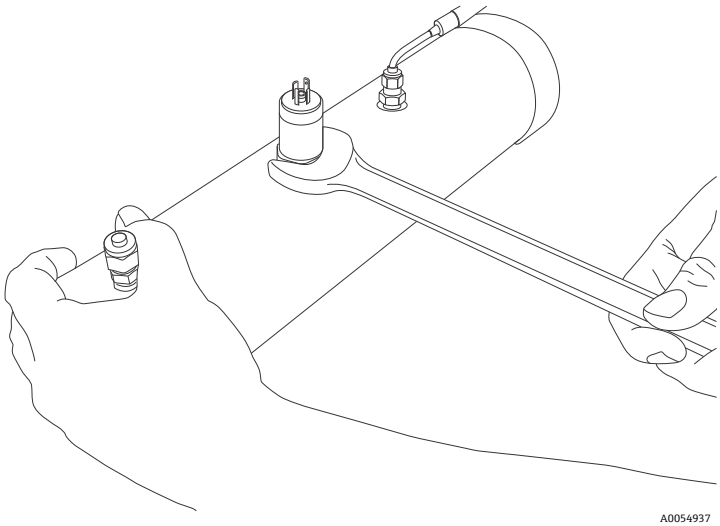


Figure 33: Removing the old pressure sensor

a. 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.

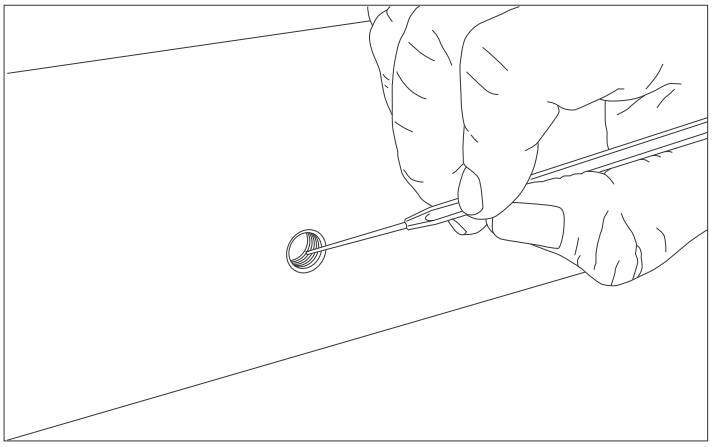


Figure 34: Removing excess seal tape from flange

⚠ CAUTION

- 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* → 🖹 to arrange for repair.

14. Check for any debris if you suspect debris has fallen into the measurement cell. Refer to *Peak Tracking Reset Procedure* → 🖹 to check for debris.
15. Check for tape fragments inside the cell and remove with a swab. Refer to Figure B–8.

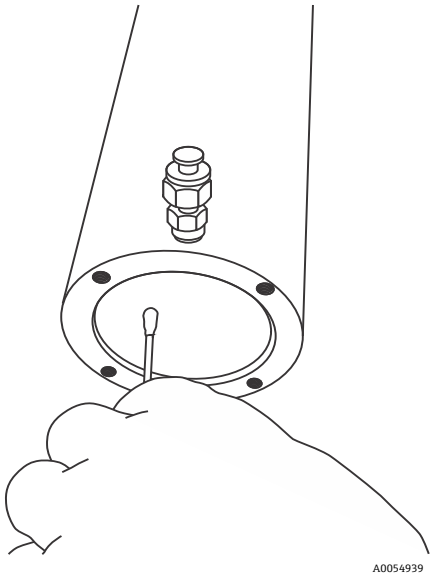


Figure 35: Removing excess seal tape from inside cell

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.

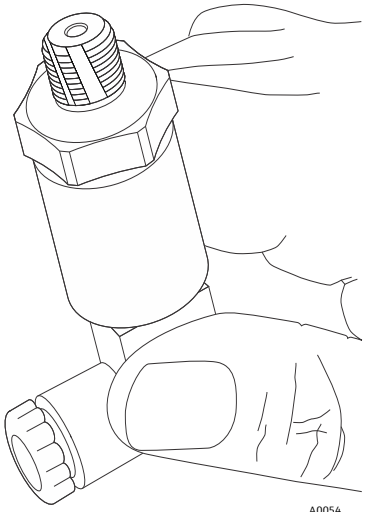


Figure 36: Replacing seal tape

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

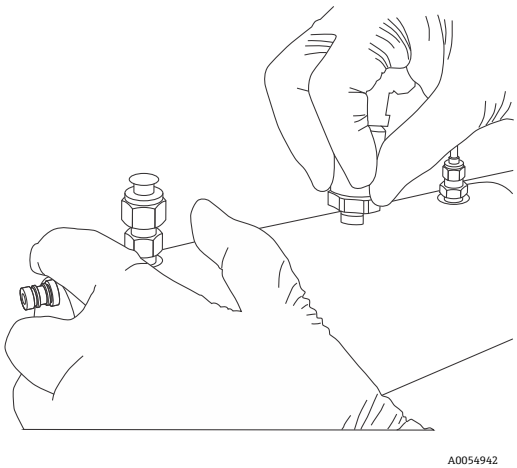


Figure 37: Replacing the pressure sensor

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 can still be visible.

NOTICE

- 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 the figure below.

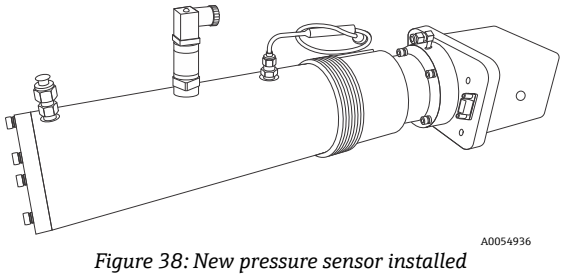


Figure 38: New pressure sensor installed

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

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

NOTICE

- 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.

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.

⚠ CAUTION

- Do not allow cell to exceed 0.7 barg (10 psig) or damage could occur.
- For any questions related to leak testing the pressure sensor, refer to *Service* → 🖹.

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* → 🖹**.** 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 *Replacing the Pressure Sensor* → 🖹 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 *Replacing the Pressure Sensor* → 🖹, then continue with the following steps:

1. 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.

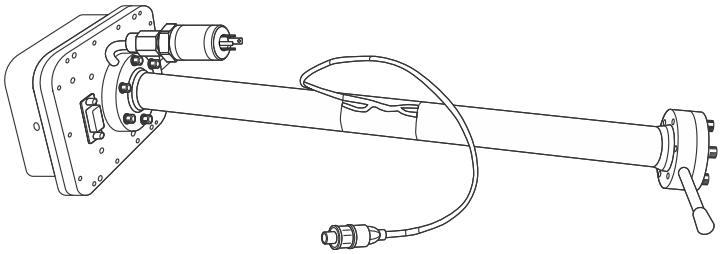


Figure 39: Removed 0.8m measurement cell with pressure sensor face up

NOTICE

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

2. 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.

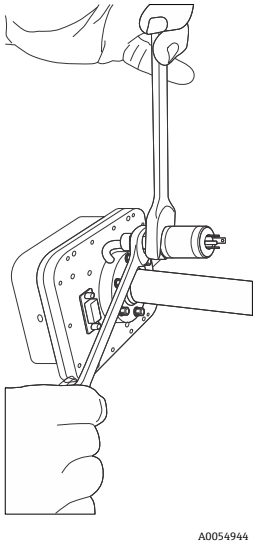


Figure 40: Removing the old pressure sensor

   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.

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

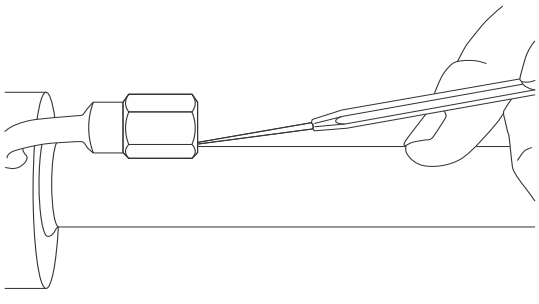


Figure 41: Removing excess seal tape from flange

⚠ CAUTION

Threads showing signs of galling indicate a possible leak.

▶ Refer to *Service* → 🖹 to arrange for a repair.

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

3. 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.

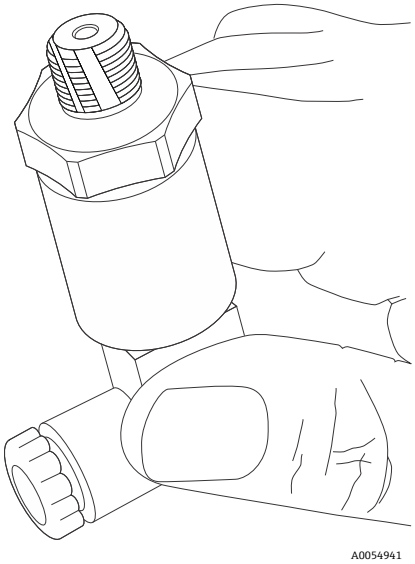


Figure 42. Replacing the seal tape.

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

5. Hand-tighten the pressure sensor turning it counter clockwise into the flange until no longer moving freely.

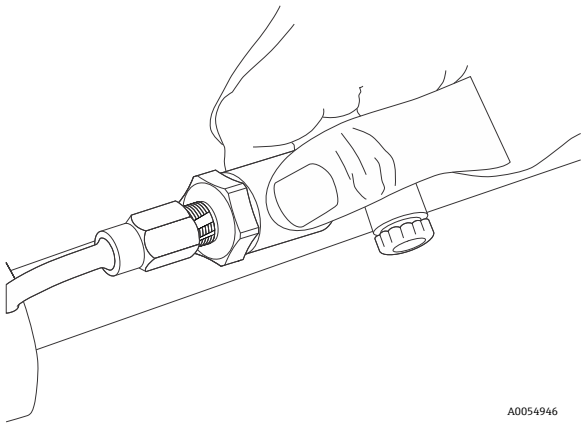


Figure 43. Replacing the pressure sensor.

5. 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 can still be visible.

NOTICE

▶ 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.

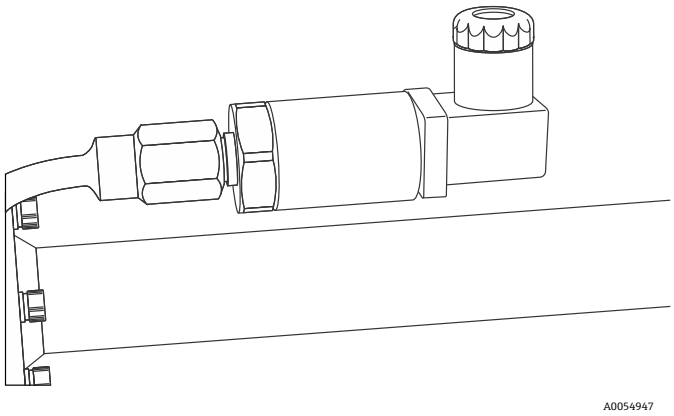


Figure 44: Newly installed pressure sensor positioning

6. Remove the black connector from the pressure sensor and discard.
7. 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.

8. Remount the cell to the mounting brackets using a 9/64 in. Allen wrench with the pressure sensor facing forward.
9. Reinstall cell inlet and cell outlet using a 9/16 in. wrench.
10. Reconnect the thermistor.
11. Connect the new pressure sensor harness and cable to the circular connector.
12. Reconnect the optical cable harness.
13. Close the door to the SCS enclosure.
14. Conduct a leak test to determine that the new pressure sensor is not leaking.

⚠ CAUTION

- Do not allow cell to exceed 0.7 barg (10 psig) or damage could occur.
- For any questions related to leak testing the pressure sensor, Refer to *Service* → 🖹.

15. Power up the system. Refer to the Device Parameters for this analyzer for “Powering Up the Analyzer”.
16. 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* → 🖹.

8.15 Periodic SCS Maintenance

⚠ CAUTION

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 can have a thorough knowledge and understanding of the chemical characteristics of the process before performing maintenance on the SCS.
- All valves, regulators, switches can be operated in accordance with site lockout/tagout procedures.

The status of the SCS can be checked regularly to confirm proper operation (pressures, flows) 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* →🖹.

All filter elements can 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 can be cleaned and the filter element replaced. See *Preventive and On-Demand SCS Maintenance* → 🖹. After observation for some time, a regular schedule can be determined for replacement of filter elements.

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

8.16 Preventive and On-Demand SCS Maintenance

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 can 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 can always be available. In general, if a problem or failure occurs, the complete part can be removed and replaced to limit system down time. Some components may be repaired (replacement of seats and seals) 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 can 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 can be purged dry with air or nitrogen before the system is placed back in operation.

NOTICE

- 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 can 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.

NOTICE

Opening the door may affect the temperature reading until the temperature is stabilized.

- Do not leave the SCS door open any longer than absolutely necessary. Endress+Hauser recommends no more than 60 seconds.
- For additional information, refer *Service* → 🖹.

4. Compare the current readings with the past readings to determine any variations. Reading levels can 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* →.
2. Inspect, repair or replace the filter as required. Refer to *Replacing the Filter* → .
3. Restart the system following the procedure in *Starting up the SCS* → .

8.17 Servicing the H_2S scrubber

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.

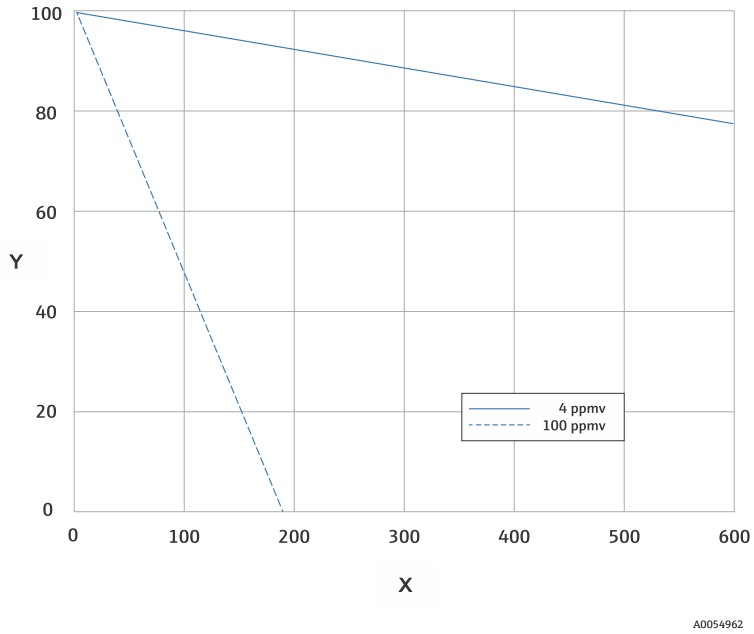


Figure 45. Predicted scrubber lifetime based on average H_2S load

Axis	Description
X	Days
Y	Remaining capacity [%]

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.

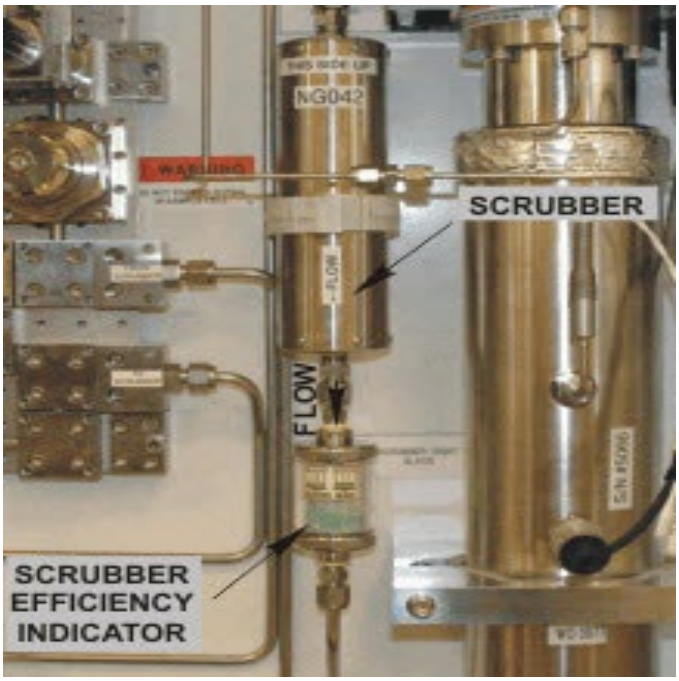


Figure 46: Scrubber and scrubber efficiency indicator

NOTICE

When specifying gas standards, indicate H2S in methane balance. For a measured range of 0 to 20 ppm, a concentration of 4 to 16 ppm is recommended.

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 the table.

⚠ CAUTION

- All valves, regulators, switches can 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.
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.

⚠ CAUTION

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.

8.18 Disposal of Used Scrubbers

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

⚠ CAUTION

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].

- These substances are odorless dark powders that require few special precautions other than avoiding contact with the internal substances, keeping the scrubber tightly sealed, and protecting the contents against humidity.
- Discard used scrubber and scrubber indicator in an appropriate leak-proof receptacle.

8.19 Instrument Troubleshooting

If the instrument does not appear to be hampered by issued described earlier in this section, refer to the table before contacting *Service* → 🖹.

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? (AC 120 V or AC 240 V at 50-60 Hz, DC 24 V).
	Check fuse(s). If bad, replace with equivalent fuse. Refer to the tables.
	Refer to *Service* → 🖹 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.**
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 *Service* → 🖹.
	Possible alignment problem. Refer to *Service* → 🖹 for assistance.
	Possible mirror contamination issue. Refer to *Service* → 🖹. If advised to do so, clean the mirrors by following the instructions under *Cleaning the Mirrors* → 🖹.

Temp Low Alarm or **Temp High Alarm** fault	Check that the actual temperature in the measurement cell is within specification (the table). 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 (the table).
	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.

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 DC 5 V on red wires, DC 12 V on yellow wires, and DC 24 V 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* → 🖹. 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* → 🖹.
	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* → 🖹.
	Make sure the device is connected to the correct terminals (see the table).
	Check the open circuit voltage (DC 35 V to DC 40 V) across the current loops terminals (see the table).
	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 can 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).
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 can be near DC 1 V. If the concentration reading is low, the voltage can be near DC 4.7 V. If not, the problem is probably on the main electronics board. Return to the factory for service. Refer to *Service* → 🖹. 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.

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"** or *Replacing the Filter* → 🖹.
	Check if supply pressure is sufficient.

8.20 Service

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

8.20.1 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 can be returned to the factory. All returns can be shipped to:

Endress+Hauser
11027 Arrow Rte.

Rancho Cucamonga, CA 91730-4866

United States of America

8.20.2 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.

8.21 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 can 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 can first be decontaminated (purged with an inert gas) before powering down the analyzer.

⚠ WARNING

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

▶ Personnel can have a thorough knowledge and understanding of the physical properties and safety precautions for the sample contents before 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 can 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.

8.22 Storage

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

8.23 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.

8.24 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 must 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 must 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 must 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 must be applicable in addition to all shipping expenses.

9 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.

Part Number	Description
4300002019	Miniature Fuse, 5x20mm Time Lag 250 VAC, 0.16 AMP (Power Supply Kit P/N 8000002574) - for 120 VAC
70162333	Miniature Fuse, 5x20mm Time Lag, 0.1 AMP (Power Supply Kit P/N 8000002573) - for DC 24 V
70156930	Miniature Fuse, 5x20mm Time Lag 250 VAC, 0.5A (Power Supply Kit P/N 8000002576) - for DC 24 V
1100002218	Fuse Kit, 120 VAC
1100002219	Fuse Kit, 240 VAC

Fig. No.	Ref. No.	Part Number	Description
C-1	1	70159315	Assembly, Power Supply, 120 VAC

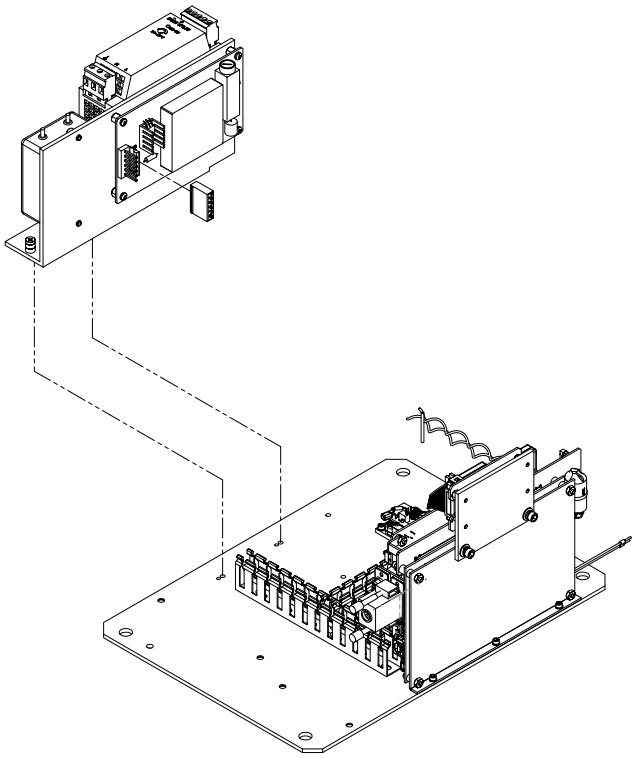


Figure 47: Electronics power supply parts

Fig. No.	Ref. No.	Part Number	Description
C-2	3	70156988	Relay, w/ Socket, C1D2, 6A, DC 12 V, SPDT
C-2	4	70156936	Varistor, “ZNR” Transient/Surge Absorber
C-2	5	70156937	Circuit Breaker Double Pole, 2 AMP 250 Rated

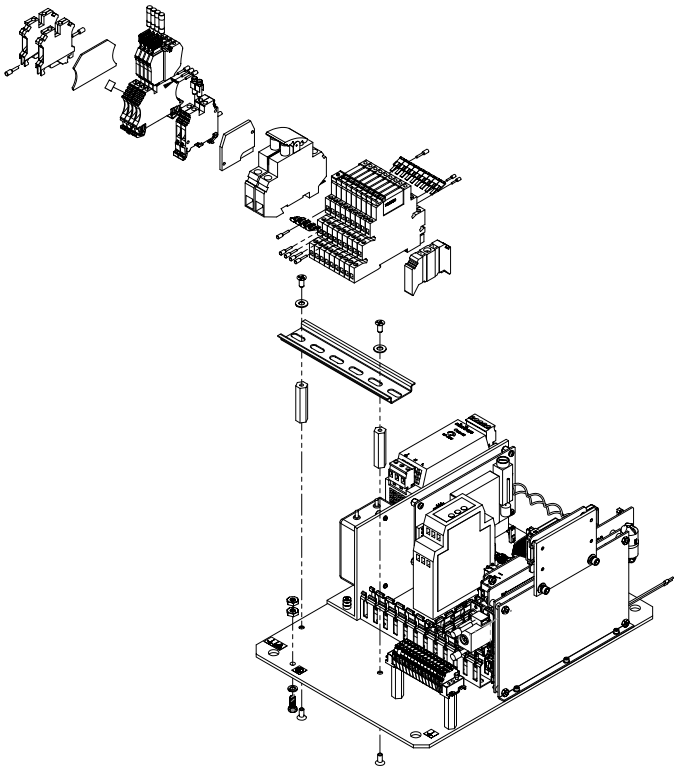


Figure 48: Electronics assembly parts

Fig. No.	Ref. No.	Part Number	Description
C-3	7	70162332	Assembly, Temperature Control, Hytek, 28 Meter

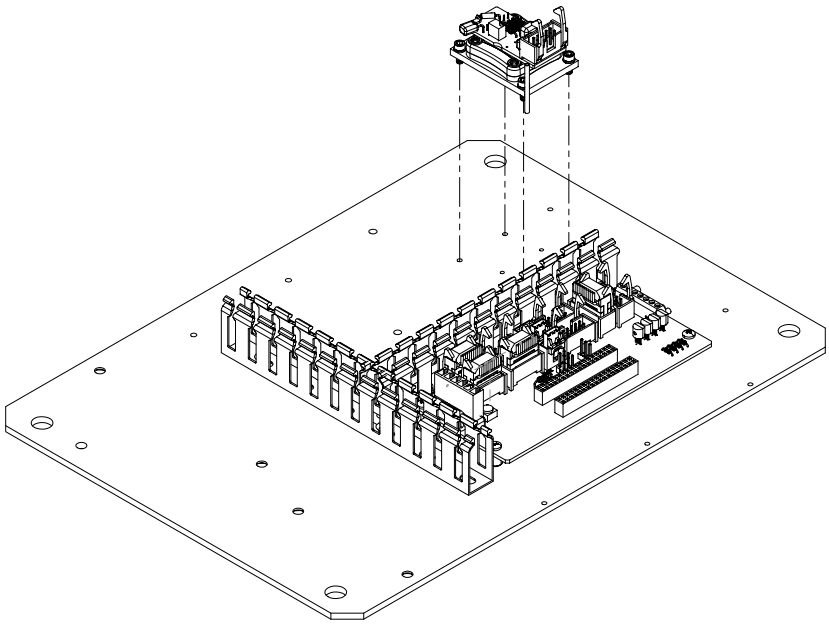


Figure 49: Electronics assembly parts

Fig. No.	Ref. No.	Part Number	Description
C-4	8	70162331	Assembly, PCBA, 4–20 mA, Dual Adj, Low Noise, RoHS
C-4	9	70162330	Assembly, PCBA, 4–20 mA Isolated Input, RoHS

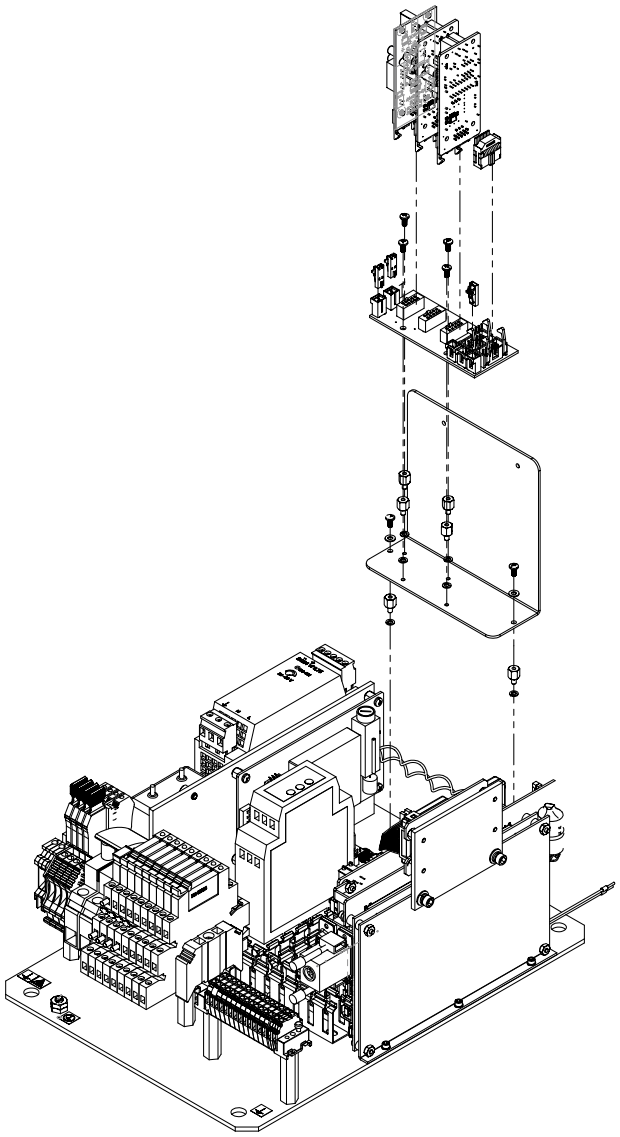


Figure 50: Electronics assembly board replacement parts

Fig. No.	Ref. No.	Part Number	Description
C-5	10	70162329	PCBA, Daughter, Interface, Hybrid, RoHS
C-5	11	2900000420	PCBA, EAE-TDL, w/ Ethernet, Hybrid, RoHS

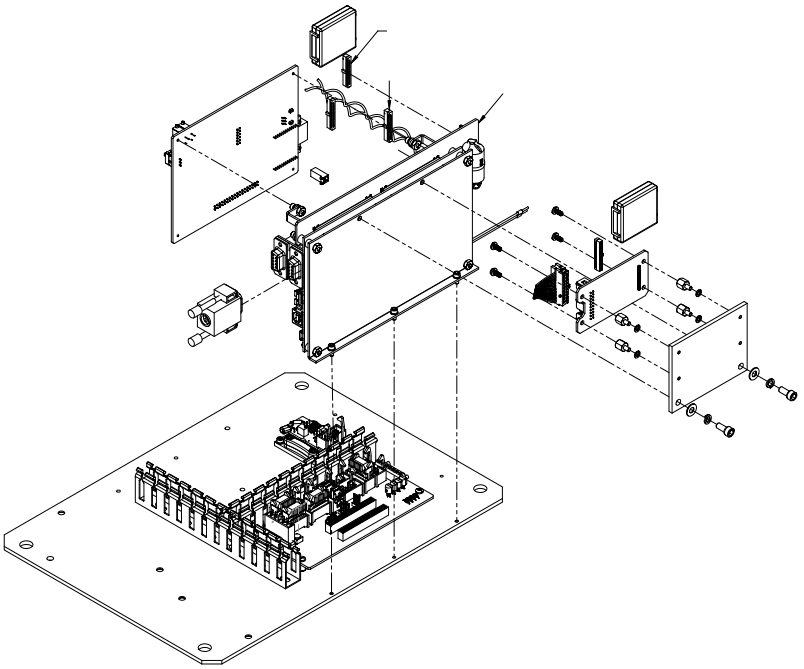


Figure 51: Electronics assembly board replacement parts (continued)

Fig. No.	Ref. No.	Part Number	Description
C-6	12	70156697	Display, LCD, 20x4, Back-lit, 5 V, Serial
C-6	13	70156940	Keypad, Touch Sensitive, 16 keys

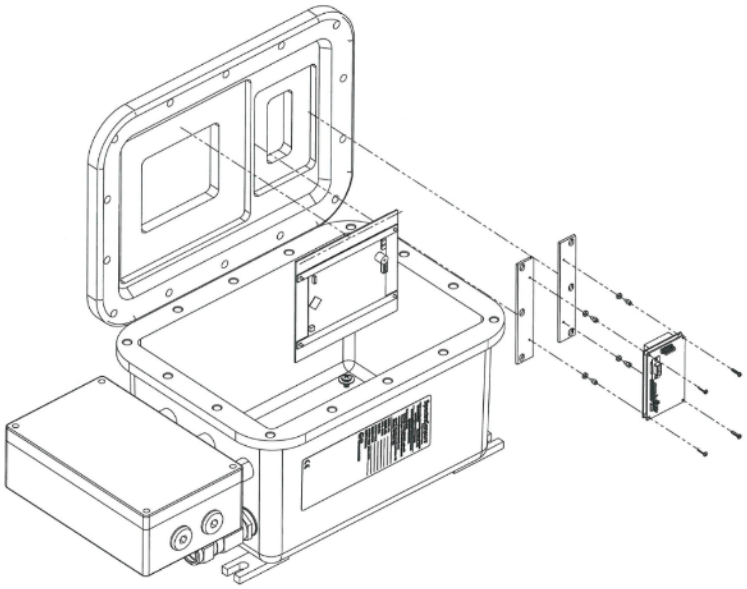


Figure 52: Keypad and display replacement parts

Part Number	Description
Pressure Sensor	
70162334	Pressure Sensor, 30 PSIA, 5 V, 1/8 in. NPT DIN4365, NACE [1]
70156902	Cable, Pressure/Temperature, EXT, 32 in.
Scrubber/Indicator	
70156759	Kit, H_2S Scrubber/Indicator, 3 in. diameter
70156758	Kit, H_2S Scrubber/Indicator, 2 in. diameter
8000002205	Kit, NH_3 Scrubber/Indicator, 3 in. diameter
70156962	Kit, NH_3 Scrubber/Indicator, 2 in. diameter
8000002205	Kit, HCl Scrubber/Indicator, 3 in. diameter
8000002224	Kit, HCl Scrubber/Indicator, 2 in. diameter

70175070	Dryer, NuPure
Hardware/Kits	
70162343	Washer, Sealing, SS, M10
70162341	Screw, Socket Head Cap, 304SS, M10x35
70162342	Screw, Socket Head Cap, 304SS, M10x30
70156810	Stainless Steel Mirror (0.1 m and 0.8 m cells only)
1170162328	Kit, SS2100i-2, M10x35 Bolts and M10 Washer
70156818	Kit, Cleaning Tools, Optical Cell (International) [9]
70162344	Tooling Kit (Installation/Maintenance)
Cables	
70156908	Assembly, Cable, Thermistor Cell, Electronics
70156958	Assembly, Cable, RS-232, M-M., Display, Data (EExd)
70156959	Assembly, Cable, Power, Display (EExd)
70156968	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

[9]Contact Endress+Hauser's Service department before attempting replacement. Replacing this component without technical support could cause damage to other components. Refer to ***Service*** → 🖹.

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