thermo scientific

SOLA iQ
Installation Guide

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ThermoFisher
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Note: SOLA iQ was previously referred to as SOLA III

Contents

Chapter 1
Safety Information & Guidelines

This chapter contains information that must be read and understood by all personnel installing, using, or maintaining this equipment.

Safety Considerations

Failure to follow appropriate safety procedures or inappropriate use of the equipment described in this guide can lead to equipment damage or injury to personnel.

Any person working with or on the equipment described in this guide is required to evaluate all functions and operations for potential safety hazards before commencing work. Appropriate precautions must be taken as necessary to prevent potential damage to equipment or injury to personnel.

The information in this guide is designed to aid personnel to correctly and safely install, operate, and maintain the system described; however, personnel are still responsible for considering all actions and procedures for potential hazards or conditions that may not have been anticipated in the written procedures. If a procedure cannot be performed safely, it must not be performed until appropriate actions can be taken to ensure the safety of the equipment and personnel. The procedures in this guide are not designed to replace or supersede required or common sense safety practices. All safety warnings listed in any documentation applicable to equipment and parts used in or with the system described in this guide must be read and understood prior to working on or with any part of the system.

Failure to perform the instructions and procedures in this guide or other documents pertaining to this system correctly can result in equipment malfunction, equipment damage, and/or injury to personnel.

Safety Summary

The following admonitions are used throughout this guide to alert users to potential hazards or important information. Failure to heed the warnings and cautions in this guide can lead to injury or equipment damage.

Warning Warnings notify users of procedures, practices, conditions, etc., which may result in injury or death if not carefully observed or followed. The triangular icons with warnings vary depending on the hazard. ▲

Caution Cautions notify users of operating procedures, practices, conditions, etc., which may result in equipment damage if not carefully observed or followed. ▲

Caution Static sensitive component. Appropriate handling precautions required to prevent damage. ▲

Note Notes emphasize important or essential information or a statement of company policy regarding an operating procedure, practice, condition, etc. ▲

Safety Operating Information

This section contains general safety and operating information applicable to analytical systems, which must be understood by all persons installing, using, or maintaining the analyzer system. This information is designed to aid personnel in the safe installation, operation, and service of the analyzer and sample systems. It is not designed to replace or limit appropriate safety measures applicable to work performed by personnel. Any additional safety and operating measures that are required must be determined by and followed by personnel performing work on the system.

Warning Work on the SOLA iQ shall not be performed by unskilled and/or untrained personnel. ▲

Caution Failure to heed the following information may lead to equipment damage or injury to personnel. ▲

Protective eyewear (glasses with side shields or goggles as appropriate) must be worn when servicing any part of the analyzer or sample system. When servicing the sample system, chemical resistant gloves appropriate for the materials in the system must be worn. When servicing the hot analyzer oven, internal components (e.g., detectors), or hot sample system components, appropriate gloves must be worn. Heated components should be allowed to cool before servicing if possible. Other appropriate equipment or clothing must be used as required by the type of work performed.

Caution Ovens, internal components, and sample systems may be hot even when power is not applied to the unit. Take appropriate precautions to prevent injury resulting from contact with hot items. ▲

Caution Opening the Oven door while the purge air is operational can expose personnel to elevated noise levels. Take appropriate precautions to prevent injury resulting from exposure to elevated noise levels. ▲

All applicable regulations and procedures must be followed for the work performed. Before beginning any work on the system, carefully consider all the potential hazards and ensure that appropriate measures are taken to prevent injury to personnel and damage to equipment.

Electrical Power

The system uses AC power from 120/240 VAC 50-60 Hz at a maximum of 2000 watts. The AC power is converted internally to DC at several voltage levels. Appropriate precautions must be taken to prevent sparks present in the analyzer environment that may ignite combustible materials. Precautions must also be taken to prevent electrical shock if the analyzer or sample system enclosures are opened.

The AC power to the system must be free from noise, surges, sags, and spikes for proper system operation. AC power circuit breakers and wiring must be sized properly for the required current. All wiring installations must meet applicable electrical codes.

Warning All wiring must be performed by qualified individuals in accordance with all applicable codes and specifications such as the National Electric Code (NEC), ANSI/NFPA70 specifications and/or the Canadian Electric Code (CEC) Part 1. ▲

Warning Remove power prior to performing any work internal to the instrument. An override is available for use in non-hazardous areas; however, removal of components while the instrument is energized is not permitted. ▲

Warning For SOLA iQ units supplied without a Pressure Control Unit (PCU), a loss of purge only creates an alarm condition. In the event of a Purge Alarm, the user must disconnect the electrical power and I/O signals manually to de-power the unit. Not disconnecting the electrical power and I/O signals can result in an electrically active, non-purged device operating in a hazardous area environment. This can be an unsafe operating condition.▲

Warning For units without a Purge Control Unit: when a purge alarm occurs, the operator shall check the purge air and the backup purge air supplies. Power down the unit if either the purge air supply or backup air supply is not adequate Do not power up until the purge air and backup air supply problems are resolved.▲

Purge Air Supply

The Purge Air Supply shall be fitted with two regulators in series so that failure of one of the regulators does not cause an excessive over-pressure inside the electronics and/or oven enclosures. The SOLA iQ is supplied with one regulator each for the purge air supply going to the Electronics enclosure and the oven enclosure. The inlet to the SOLA iQ electronics purge air regulator and the SOLA iQ oven purge air regulator is a common header located in the pneumatics section. The header is fed by a single air inlet via a bulkhead connection.

The user is responsible for the installation of a second air supply regulator which will be exterior to the SOLA iQ. Table 2-4 specifies the SOLA iQ inlet purge air pressure range. The maximum inlet pressure for the user supplied purge air regulator is 100 psig.

Waste Disposal

Dispose of any waste, such as batteries, electronic components, and hazardous materials, in accordance with all applicable federal, state, and local environmental regulations.

Chapter 2
Product Overview

The Thermo Scientific SOLA iQ™ is an on-line total sulfur analyzer. Typical measurement applications include the total sulfur content of liquid and gaseous samples related to the processing and transport of hydrocarbon materials. The SOLA iQ combines proven detection technology, easy-to-use, menu-driven software, and advanced diagnostics to offer unsurpassed flexibility and reliability. The instrument offers field programmable ranges, high sensitivity, total sulfur measurement, fast response time, linearity through all ranges, and low consumables.

Function

Major components of the SOLA iQ include a sample injection valve, carrier gas flow control system, mixing chamber, Pyrolyzer, optional dryer, and a pulsed ultraviolet fluorescence (PUVF) detector.

The sample injection valve periodically transfers a small amount of sample (approximately 1.0 µL) into an air or nitrogen carrier gas. The air/sample mixture passes through the mixing chamber to ensure complete mixing and then flows to the Pyrolyzer. The Pyrolyzer combusts all sample components to SO_2, CO_2, and H_2O at approximately 1100°C (2012°F). The optional dryer (application dependent) removes water from the sample that is produced during combustion. The PUVF detector accurately measures the amount of SO_2 produced during combustion of the sample.

An appropriate sample conditioning system is mandatory for proper functioning. The sample conditioning system should:

- Regulate sample pressure and temperature.
- Provide filtration to at least a 0.5-micron particle size. Staged filtration is recommended (e.g., going from 10 micron to 5 micron to 0.5 micron). The final filter should contain a hydrophobic element to remove undissolved water.
- Ensure that a representative sample is transported to the analyzer in the desired time.
- Maintain the sample in a single phase.

Note Liquid samples with high vapor pressures such as naphthas and gasolines will require sample backpressure regulation 25–35 psig. ▲

- Remove undissolved water.

The sample should be delivered to the sample conditioning system using a sample probe. The sample probe should be designed and fabricated so the sample is extracted from near the center of the process pipe, preventing the unnecessary introduction of pipe scale and other particulates that tend to accumulate along the process pipe walls.

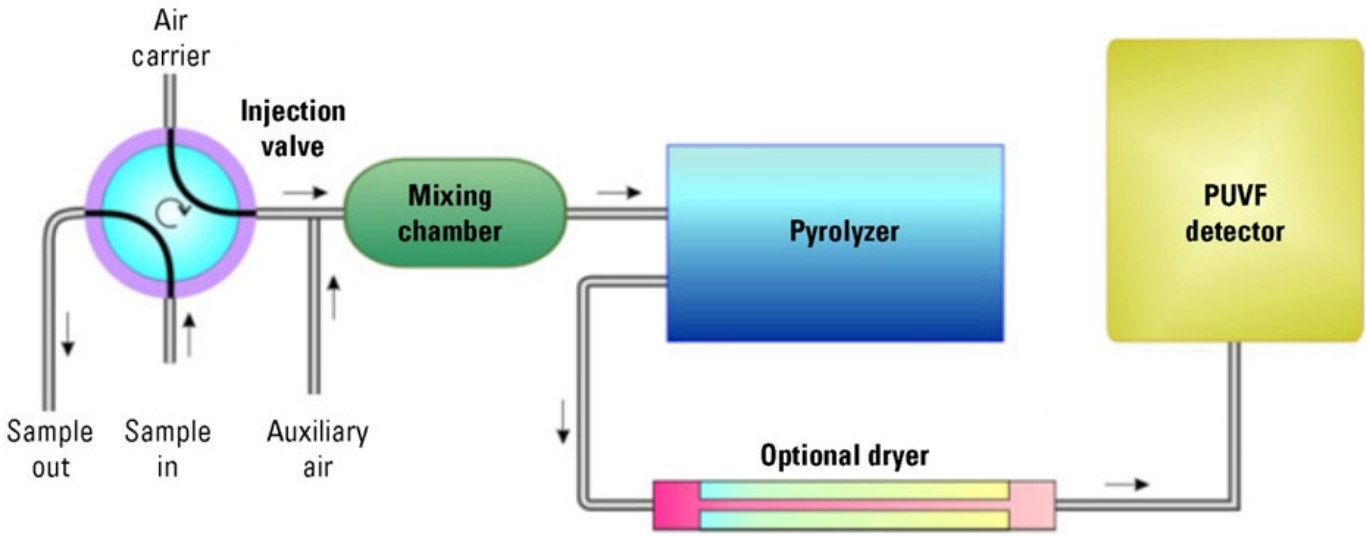


Figure 2–1. Functional Block Diagram

Total Sulfur Measurement

Total sulfur measurement is based upon the precise measurement of the SO_2 concentration produced via combustion from a wide variety of compounds containing sulfur, such as H_2S, COS, methyl mercaptan, benzothiophenes, dibenzothiophenes, sulfides, disulfides, and thiols. For liquid phase samples, the analyzer periodically injects a very small quantity of sample (1.0 µL) into a hot oven (110°C to 190°C / 230°F to 374°F) where it is vaporized and mixed with air. Analysis of gas phase samples requires typical sample sizes of 0.1 to 1.0 cm3. After thoroughly mixing with air, the sample enters the Pyrolyzer, where all components of the sample are combusted at 1100°C (2012°F) to CO_2, H_2O, or SO_2. The quantity of SO_2 formed during the combustion process is directly proportional to the total sulfur content of the sample.

The analyzer is equipped with a PUVF detector that accurately measures the quantity of SO_2 formed during the combustion process. The SO_2 molecules enter the cell of the PUVF detector where they are exposed to ultraviolet (UV) light. Absorption of UV light by SO_2 molecules results in an excited state of the SO_2 molecules. The excited state SO_2 molecules exist at a higher energy state (due to absorption of energy in the form of UV light) that rapidly relaxes to their original energy level or ground state through the emission of light. This process is called fluorescence. The intensity of the light emitted by SO_2 fluorescence is directly proportional to the SO_2 concentration. Pulsing the UV light allows more energy (UV light) to be delivered to the sample, increasing the fluorescence intensity for a given SO_2 concentration. This results in increased overall sensitivity of the instrument.

At the PUVF detector, it is important to ensure that the measured light is representative of only the SO_2 concentration and not some other species. SO_2 molecules emit light through fluorescence at a specific wavelength, and the PUVF detector utilizes band pass filters to ensure that only light from SO_2 is measured. Once the proper wavelength of light is selected, its intensity is measured by a photomultiplier tube (PMT). The PMT converts light energy to electrical energy through manipulation of the photoelectric effect. The electrical signal generated by the PMT is finally processed by the analyzer electronics and software to determine and report the concentration of total sulfur in the liquid or gas sample.

The analyzer can be configured to report total sulfur in percentage (%), parts per million (ppm), parts per billion (ppb), or milligrams per liter (mg/L).

Units of concentration calculated on a weight/weight basis are sensitive to sample density. If the density of the calibration standard is significantly different from the density of the sample, a density correction needs to be applied.

- If the sample density varies significantly, a density correction is necessary.
- If the analyzer is calibrated using mg/L, ppm (w/v), ppm (v/v), ppb (w/v), or ppb (v/v) as the units of measure, a density correction is not required.

The detector is based on the principle that SO_2 molecules absorb UV light and become excited at one wavelength, then decays to a lower energy state emitting UV light at a different wavelength. Specifically,

$$SO_2 + h\nu_1 \longrightarrow SO_2^* \longrightarrow SO_2 + h\nu_2$$

* = Excited state
$h\nu_1$ = Exposure light at excitation wavelength
$h\nu_2$ = Emitted light at emission wavelength

Principle of Operation

The sample inlet bulkhead draws the sample into the analyzer. The sample is mixed with air and passes through a Pyrolyzer furnace that oxidizes the sulfur molecules in the sample to produce SO_2. The sample then flows into the fluorescence chamber where pulsating UV light excites the SO_2 molecules. The condensing lens focuses the pulsating UV light onto a mirror assembly. The mirror assembly contains four selective mirrors that reflect only the wavelengths that excite SO_2 molecules.

As the excited SO_2 molecules decay to lower energy states, they emit UV light that is proportional to the total sulfur concentration in the sample. The bandpass filter allows only the wavelengths emitted by the excited SO_2 molecules to reach the PMT, which detects the UV light emission. The photo detector, located at the back of the fluorescence chamber, continuously monitors the pulsating UV light source to provide compensation for fluctuations in the UV light source. The measured SO_2 concentration (representing total sulfur in the sample) is processed, displayed on the front panel display, and sent to the analog outputs.

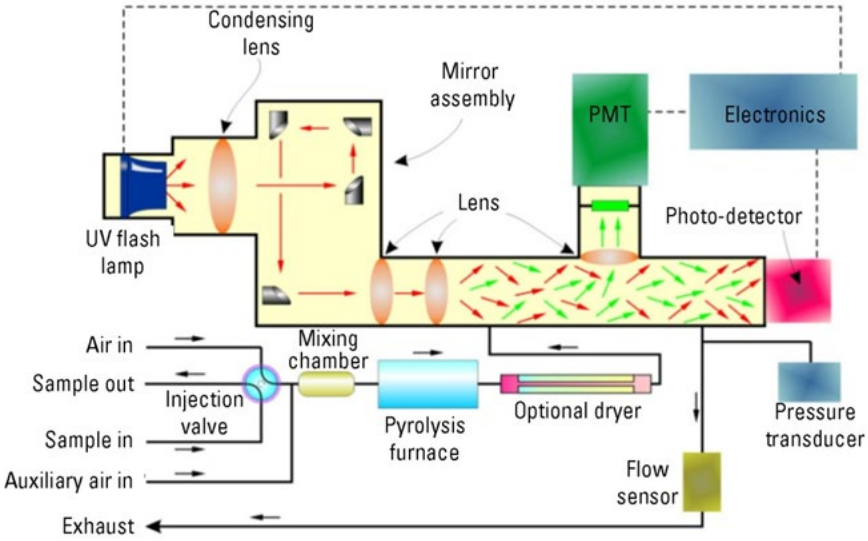


Figure 2–2. Typical functional flow diagram

PUVF Detector

The PUVF detector includes and controls the following

- UV pulsed light and associated systems
- Reaction chamber temperature control
- Digitizing of PMT signal
- Smoothing of measurement signal using moving average

Pyrolyzer

Measuring total sulfur with the PUVF detection method requires the conversion of all sulfur compounds in the sample to SO_2. This is typically accomplished with the Pyrolyzer, an electrically heated furnace designed by Thermo Fisher Scientific. The Pyrolyzer typically operates at a temperature of 1100°C (2012°F) to oxidize sulfur without need for a catalyst.

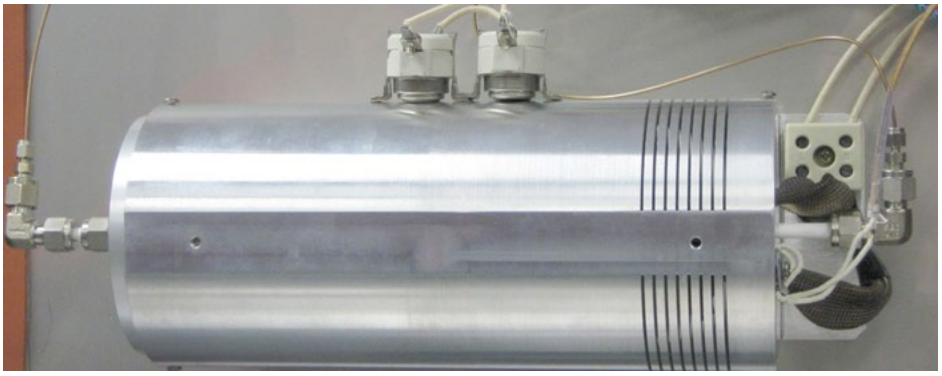


Figure 2–3. Pyrolyzer

Dryer

The optional Perma Pure dryer removes moisture from the sample prior to its entry into the PUVF detector. Dryer tubing consists of multiple small tubes encased in a large outer tube. Air circulates through the outer tube with sample passing through the inner tube. Moisture passes from the sample through the tubing where it is carried to the condensate drain by the airflow in the outer tube.

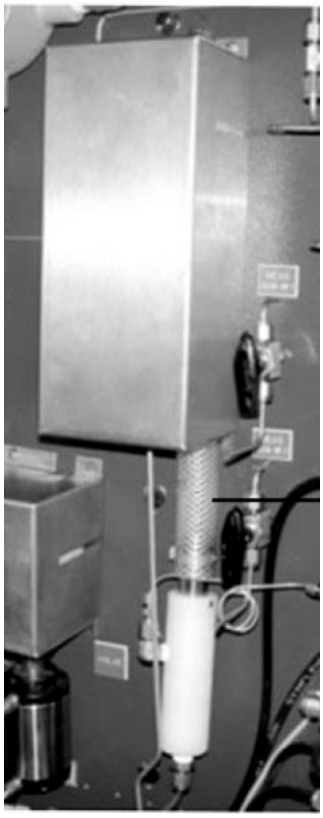


Figure 2–4. Optional dryer

Mixing Chamber

The mixing chamber mixes the gases and permits the sample to vaporize to a gaseous state before entering the Pyrolyzer.

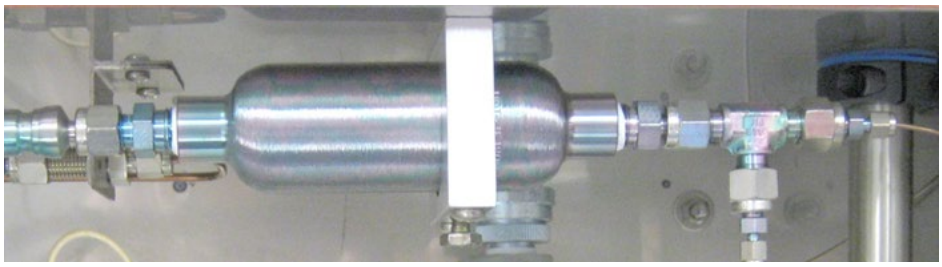


Figure 2–5. Typical mixing chamber

Injection Valve

The injection valve periodically injects precisely measured quantities of the sample stream into a controlled carrier airflow. An auxiliary airflow is added to this sample and air mixture. The sample/carrier flow then passes to the mixing chamber where it is thoroughly mixed with the air. See the SOLA iQ Users Guide for rotary injection valve service information.

Figure 2–6. Uncovered Injection Valve – Liquid Applications

Warning Samples that are analyzed for Total Sulfur using the SOLA iQ can contain a wide mixture of inert gases and hydrocarbon components as well as a wide range of sulfur containing compounds. Individual sample composition components pose the potential for hazards in the event of an exposure. Hazards include, but are not necessarily limited to, asphyxiation, toxicity, flammability, and explosion. Consult with site Health and Safety personnel, applicable Safety Data Sheets, Safety Manuals and local, state and/or federal regulations for specific details of individual sample constituents and sulfur compound types.

The quantity of sample, and the resulting specific sample component, flowing into the SOLA iQ analyzer is site and application dependent.

Under normal operating conditions, all utility and wet sample lines are checked to ensure that there are no leaks before being placed into service. Additionally, the vent line from the PUVF spectrometer is tubed to a safe location. See Chapter 3 Sample Line Installation for additional details.

Though there is a great variety in the sample composition to the Pyrolyzer, the post Pyrolyzer exit gases are composed of combustion products and excess air, CO_2, H_2O, N_2, O_2, and SO_2. If Heliox is used as a carrier gas the post Pyrolyzer exit gases will contain He instead of N_2. The flow rate of post Pyrolyzer exit gases is typically in the range of 150-300 cm3/min.

The quantity of a particular component in the post Pyrolyzer exit gases is application specific. Component concentration estimates can be made by performing material balance calculations around the Pyrolyzer.

A SOLA iQ analyzer with properly installed utility lines, sweep lines and vent lines that is free of leaks in normal operation does not emit dangerous amounts of poisonous or injurious gases or substances. Consult the system flow diagram for details of a specific SOLA iQ application. Note that others typically supply sample conditioning systems and their associated system drawings. ▲

AutoPilot Pro Board

The AutoPilot Pro board is used to control the operation of the SOLA iQ. It is located on the door of the electronics enclosure (see Figure 2-7).

A Lithium backup battery (Panasonic BR2330) is installed on the AutoPilot Pro board in the SOLA iQ to maintain the configuration, memory, and real-time clock when power is removed from the SOLA iQ. The Lithium battery in-circuit connection is set by installing a jumper at J39 pins 11-12 on the AutoPilot Pro board.

The Lithium battery lifetime depends on how long the SOLA iQ is without power. In storage, with no power applied to the SOLA iQ, the expected Lithium battery lifetime is about 5 years. During normal operation, the Lithium battery lifetime is expected to be from 5 to 10 years.

Note Loss of configuration or historical data with the backup battery jumper installed may indicate that the Lithium battery needs to be replaced. ▲

Note The Lithium battery is a field replaceable item. Refer to “Replacing the Backup Battery” in the Appendix for replacement instructions. ▲

Warning The Lithium battery may explode if mistreated. Do not attempt to recharge, disassemble, or burn it. ▲

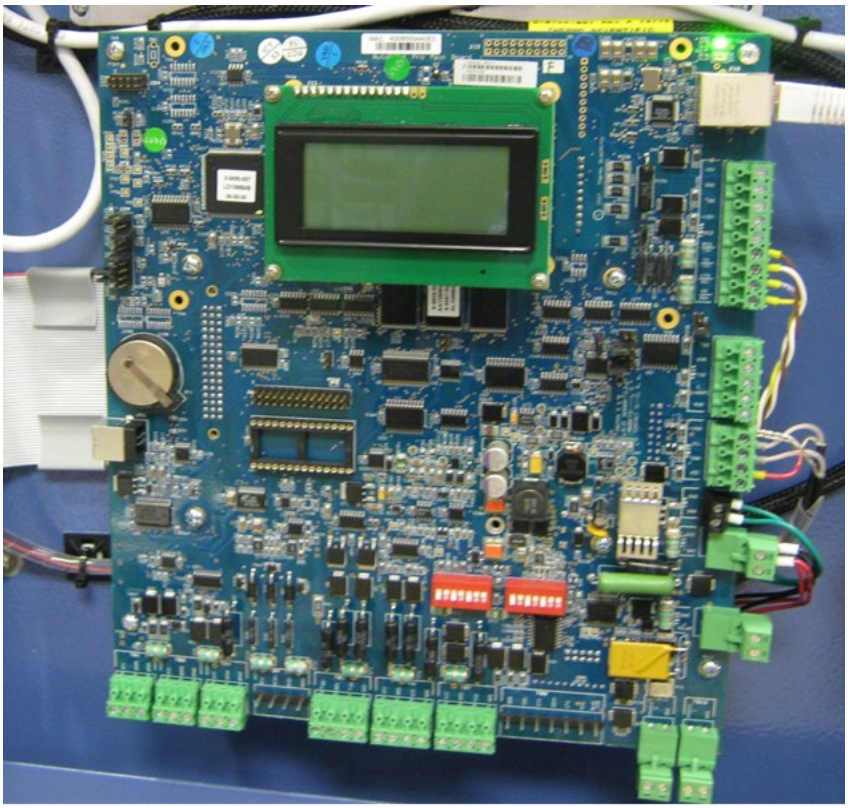


Figure 2–7. AutoPilot PRO Board

Backup Purge

All SOLA iQ models are equipped with a backup purge. The air source for the backup purge must be independent of the purge air source used to operate the SOLA iQ on a daily basis. If the backup air purge source is the same as the day to day purge air source, a loss of purge air renders the backup purge non-operational.

In the event of a loss of purge air, the backup purge cools down hot surfaces in the SOLA iQ oven. After a purge loss, the secondary independent purge source holds the pressure inside the SOLA iQ oven above 0.5 mbar. The amount of backup purge is dependent on the T rating of the SOLA iQ. In general, the amount of backup purge is greatest for a T4 System. Details on the time periods required for T2, T3, and T4 Systems can be found on the certification label attached to the SOLA iQ.

The backup purge assembly is mounted in the Pneumatics Section of the SOLA iQ unit (see Figure 2-8). Details related to the tubing and operational pressures can be found on the flow diagram supplied with the analyzer. To ensure that there is an adequate back-up purge air flow rate, the minimum pressure at the inlet of the Back-up Purge connection on the SOLA iQ is 20 psig.

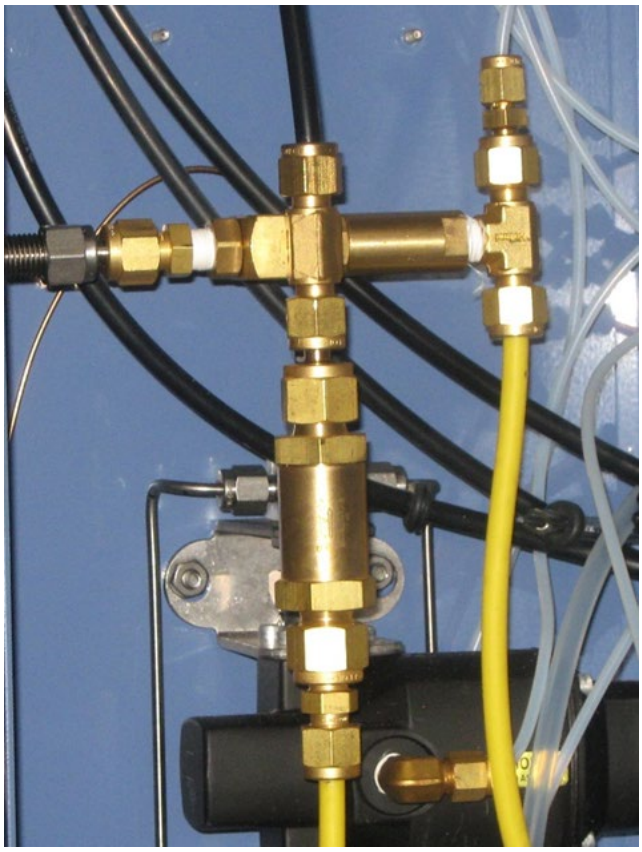


Figure 2–8. Backup Purge

Specifications

Results may vary under different operating conditions.

Table 2–1. Mechanical Specifications

Mechanical Specifications	
Dimensions, H x W x D x	44.5 x 24.0 x 18.1 inch (113 x 61 x 46 cm) (w/o PCU) 63.2 x 24.0 x 18.1 inch (167 x 61 x 46 cm) (w/ PCU)
Weight	Approximately 250 lb. (113 kg, typical; with options the estimated maximum weight is 350 lb. (159 kg))
Mounting	Wall or rack mount (see Chapter 3 Installation)
Enclosure IP Rating	IP40
Maximum Altitude	2000 meters (6561 feet)
Ambient temperature	12ºC to 40ºC (54ºF to 104ºF)
Incoming purge air temperature	12ºC to 40ºC **(**54ºF to 104ºF)
Area classification	**CSA:** Class 1, Div. 1, Groups B, C, D, T2, T3, or T4* (optional, X-Purge system) Class 1, Div. 2, Groups B, C, D, T2, T3, or T4* T2 or T3 for SOLA IQ Liquid T2, T3, or T4 for SOLA IQ Vapor, Flare, or CV **ATEX:** Zone 1, II 2 G Ex pxb IIC T2/T3/T4* Gb (optional, X-Purge system) Zone 2, II 3 G Ex pz IIC T2/T3/T4* Gc T2 or T3 for SOLA IQ Liquid T2, T3, or T4 for SOLA IQ Vapor, Flare, or CV **UKCA:** CSAE 22UKEX1264X UKCA 0539 II 2G Ex db pxb IIC T* Gb CSAE 22UKEX1265X UKCA 0539 II 3G Ex pzc IIC T* Gc *Continues Flow at minimum supply pressure of 20 psi after loss of power: T2: 50 Minutes T3: 80 minutes

Mechanical Specifications	
	T4: 130 minutes (Only for VAPOR, VAPOR TRACE, FLARE, AND CONDENSABLE VAPOR (CV) UNITS) **IECEx:** Zone 1, II 2 G Ex pxb IIC T2/T3/T4* Gb (optional, X-Purge system) Zone 2, II 3 G Ex pz IIC T2/T3/T4* Gc T2 or T3 for SOLA IQ Liquid T2, T3, or T4 for SOLA IQ Vapor, Flare, or CV
Input & Output Connections – Tubing & Electrical	Input and Output connections can be located on the system flow and electrical drawings.

Table 2–2. Analytical Specifications

Analytical Specifications	
Detector	Pulsed UV fluorescence with Pyrolyzer for total sulfur measurement
Full scale range	SOLA IQ: Full scale ranges from 0-5 ppm S to 0-100%; application dependent consult Thermo Fisher Scientific SOLA IQ Trace: Full scale ranges from 0-2 ppm S to 0-5 ppm S (higher full scale calibrations available on SOLA iQ Trace; consult Thermo Fisher Scientific) Unique ranges may be assigned to Streams 1, 2, 3 and 4. -
Repeatability	Calculated at 1 standard deviation SOLA IQ: ±1% of full scale, two sample injections per minute ±2% of full scale, one sample injection per minute SOLA Trace: Consult Thermo Fisher
Linearity	±2% of full scale, one sample injection per minute
Response time	Analyzer is semi-continuous; initial response occurs at each injection
Calibration	Remote or Manual
Calibration method	External standard(s), 2-point calibration

Table 2–3. Controller Specifications

Controller Specifications	
Display & User Interface	Full analyzer control and configuration via Front mounted 7" touch screen HMI, hazardous area classification remains intact while operating local display. Laptop connection (TCP/IP)
Remote & Local PC Interface and connectivity	Local to the SOLA IQ is a TCP/IP connection for hook up of a laptop for setup and maintenance. Remotely there is the same provision, also via TCP/IP (same SW) for complete remote control and diagnostic functions; Ability to access 30 days of backed up data from the SOLA IQ (analysis results and hardware data)
Streams	Up to four streams optional with auto stream select or DCS control of stream selection
Alarms	Low sample flow alarm (optional); Low detector flow alarm; Oven/Pyrolyzer temperature fault; Injection valve fault; Purge failure; Calibration fault; Detector temperature fault: Detector lamp voltage fault One Out of Service dry contact triggered by: Analyzer in calibration; Suspension of analyzer.
Alarm relays/indicators	SPST, 2 A at 240 Vac or 10 A at 24 Vdc; 8 total
Analog signal output	Isolated, 4–20 mA; 4 total, loop or external powered See Table 3-4 for additional information
Analog signal load	≤ 700 ohms using 24 Vdc loop power supply
Inputs	Dry contact; remote suspend, remote calibration, remote range select, remote stream select
I/O ports **Modbus Remote Interface**	Standard: RS485 Modbus RTU; RS485/RS232 Modbus RTU Provides complete remote control; Automatic logging of analysis results and analyzer parameters; Communication to SOLA analyzer via serial or TCP/IP encapsulated Modbus enables remote diagnostics See Table 3-6 for additional information

Table 2–4. Other Specifications

Other specifications	
AC power	Standard: 120/240 VAC 50-60 Hz, max 2000 watts
Fuses	Power Control Board fuses F1 & F2 – 10 A 220 Vac SloBlo 5x20 mm I/O Board fuses F1, F2, F3, & F4 – T-LAG 0.050 A 250 V TR5
Purge Air (Oven and Electronics)	Instrument air: 55–100 psig, water and oil free; -40ºC (-40ºF) dew point, particles ≤ 5 m, ISA grade hydrocarbon free, Refer to Tag for Minimum Purge Flow Rates, estimated maximum 450 SLPM (16 SCFM)
Back-up Purge Air	Minimum 20 psig supply pressure at the Back-up Purge inlet on the SOLA iQ; Back-up purge air supply shall be independent of the Oven and Electronics purge air supply
Optional Dryer Air	Instrument air: 55–100 psig, water and oil free; -40ºC (-40ºF) dew point, particles ≤ 5 m, ISA grade hydrocarbon free, 6 SLPM (0.2 SCFM) (maximum)
Carrier and auxiliary gases (Actual flow rates are application specific. Refer to analyzer calibration data sheet for actual flow rates)	Zero grade air: 80 psig, 300 sccm (maximum) Zero grade nitrogen: 80 psig, 300 sccm (maximum) application specific option Heliox (79% helium, 21% oxygen): 80 psig, 200 sccm (typical), application specific option
Sample tubing	Sulfinerted 316 stainless steel, cleaned and free from oils, moisture, and debris
Sample wetted components	Sulfinerted 316 stainless steel, Teflon®, and graphite/Vespel blend; others application dependent (Kalrez, Viton)
Vent gases	All gases entering the SOLA iQ exit as vents at nominally atmospheric pressure. Refer to Chapter 3 Installation - Sample Line Installation for details related to vent line installation.
IEC 60079-2:2014 Clause 18.4(d)	The flammable substance oxygen concentration shall not exceed 2%
IEC 60079-2:2014 Clause 18.4(d)	The flammable substance oxygen shall not have a UFL higher than 80

Warning Not all fuses are operator replaceable. For reliable operation, and to maintain safety approval validity, only replace fuses with approved fuses. ▲

Storage

If storing the instrument, the storage environment should be protected and free from extremes of temperatures and high humidity.

Chapter 3
Installation

Requirements

- Material and power: Consult the specifications for information required for installation.
- AC power, circuit breakers, and wiring must be sized properly for the required current. All wiring installations must meet applicable electrical codes.
- Operating environment: For optimum reliability and equipment life, we recommend that the analyzer be installed in a location protected from extremes in temperature and weather. The analyzer operates best in a controlled environment. Ambient temperature and purge air must not exceed the limits listed in the specifications.
- Mounting requirements: The mounting site must be as close as possible to the sampling point. The analyzer must be sheltered from extreme weather conditions. Avoid mounting the analyzer in high vibration areas. Mount the analyzer in an accessible location. Do not mount analyzer so that it is difficult to operate the installed disconnecting devices.
- Customer supplied cable glands used to supply electrical power must be IP40 rated metallic cable glands.
- Blanking elements or plugs used shall be in accordance with national standards.
- The vent line from the PUVF spectrometer that contains post-combustion gases from the Pyrolyzer shall be vented to a safe location.

Caution This product is extremely heavy. Care must be taken at all times to avoid injury. Never attempt to move this product alone or without the use of lift gear, such as a forklift. When handling the analyzer, ensure that all four corners are supported. ▲

Warning Installation of this product requires an external, lockable electrical power isolation switch supplied by the customer. The power isolation switch must be located in close proximity to the analyzer and it must be marked as the disconnecting device for the analyzer. ▲

Analyzer Mounting Support

The mounting structure the analyzer shall support four times the weight of the analyzer. Refer to Specifications in Chapter 2 for the typical and estimated maximum unit weights. A successful wall-mounting test, conducted in accordance with IEC 61010-1:2010, determined that a 385 lb. (175 kg) SOLA iQ analyzer could be mounted using grade 5 steel ½" 13TPI bolts with hardened ½" SAE washers. Attachment bars to the SOLA iQ analyzer, made from 2024-T351 aluminum stock 1" x 2" by 36" long, were used for the mounting test. The attachment bars contained a machined ½" clearance 8" long slot starting at a distance of 1" from each end of the bar along the 2" face of the attachment bar. Equivalent materials, with respect to mechanical properties, can be used to mount the SOLA iQ analyzer.

Note that the SOLA iQ analyzer can be mounted directly to a mounting structure using the mounting ears on the backside of the analyzer. Refer to drawing number 92-4129-0 for details on the location of the mounting ears as well as required clearances.

In order to prevent degradation of the support structure due to such factors as corrosion, the environmental specifics of a particular installation may dictate the use of materials of construction that differ from what was used to conduct the mounting test. Individual users are responsible for what, if any, environmental factors may affect the integrity of the mounting structure and for the selection of appropriate mounting structure materials of construction. If the exact weight of the SOLA iQ analyzer is not known, the mounting structure design, at a minimum, should be based on the estimated maximum weight of the SOLA iQ analyzer, as indicated in the Specifications, Chapter 2. Individual users are responsible for determining the structural suitability of their specific installations as well as consulting an appropriate structural expert should they have any questions regarding their particular installations.

Sample Line Installation

Note Pressure buildup or liquid accumulation in the analyzer vents degrades performance. Vent lines must be as short as possible and routed in a manner that prevents accumulation of liquids. ▲

There must be no back pressure on the vent or drain lines. All vents must be referenced to atmospheric pressure. If the analyzer is installed in a pressurized analyzer shelter, route all vents from the purge controllers and the PUVF detector to the exterior of the shelter. All sample lines must be as short as possible. Sample lines must use new 316 stainless steel that has been prepared as described in the following section "Sample Line Tubing Preparation." For lower level measurement applications, sulfinerted sampled tubing can reduce seasoning effects.

The analyzer will produce erratic readings if backpressure is created or varied by an obstructed or improperly routed vent.

See the following Sample System Compatibility Specification for SOLA iQ (Maximum Flow Rate for all SOLA iQ models is 300 cc/min):

SOLA iQ Model	Inlet Sample Pressure Max (PSIG)	Inlet Sample Temperature Max/(Recommended)	Inlet Sample Phase**
Liquid (Diesel, Kerosene)	150	148°C/(35-65°C)*	Liquid
Liquid (Naphtha)	150	60°C/(20-60°C)*	Liquid
Vapor	20	175°C/(20-60°C)	Vapor
Flare	20	175°C/(20-60°C)	Vapor
Condensable Vapor	20	175°C/(20-60°C)	Vapor

*Within these limits, the temperature may need to be reduced to avoid vaporization of light components as the sample pressure must not exceed the injection valve rating of 150psig.

Minimum inlet temperature is very sample dependent – it is necessary to avoid freezing of any components and to maintain a manageable sample viscosity e.g. ≤ 5 centistokes.

**Vapor must be non-condensed.

For hydrocarbon liquid samples the maximum water content needs to be below the dissolvable amount and entrained gas must be below the bubble point.

For vapor samples the maximum water content has to be such that it does not condense to form two phases.

Sample particulate size is limited to 0.5 micron.

PUVF Vent

The Pulsed UV Fluorescence (PUVF) vent bulkhead connection is used to vent gases from the SO_2 spectrometer (bench). Typically, this vent line is tubed to the outside of an analyzer shelter. Because the PUVF Vent line is connected directly to the SO_2 spectrometer, it cannot be tubed with other vent lines. Other vent lines can impose a backpressure on the SO_2 spectrometer that can interfere with the stability of the total sulfur measurement.

The gases exiting the SO_2 spectrometer are the same gases that exit the Pyrolyzer. Hydrocarbon combustion occurs in the Pyrolyzer producing CO_2 (carbon dioxide) and H_2O (water) as reaction products.

Warning Water in the PUVF Vent line that is exposed to ambient temperatures can freeze if the temperature is cold enough. Such freezing can plug the PUVF vent line. A frozen PUVF Vent line adversely affects the Total Sulfur analytical results. The installation of the PUVF line from the SOLA iQ needs to be done to ensure that the line will not freeze. ▲

ATM Vent

On loss of carrier gas flow and/or valve fault and/or analyzer suspension, the Atmospheric Vent (ATM Vent) can contain carrier gas and approximately 2-10 cc of potentially hazardous sample.

Warning The ATM Vent line must be routed by the user to allow for the safe removal of the exiting sample.

Sample Line Tubing Preparation

Review the following Cautions prior to performing this procedure.

Caution Isopropyl alcohol is extremely flammable, hazardous if breathed, and dries skin on contact. When using isopropyl alcohol, avoid breathing the vapors and contact with the skin. Appropriate measures must be taken to prevent ignition of the isopropyl alcohol vapors. Use isopropyl alcohol only where there is adequate ventilation and no ignition sources are present. Refer to a Material Safety Data Sheet (MSDS) for isopropyl alcohol for additional important information. ▲

Caution Acetone is extremely flammable, and hazardous if breathed, and dries skin on contact. When using acetone, avoid breathing the vapors and contact with the skin. Appropriate measures must be taken to prevent the acetone vapors from igniting. Use acetone only where there is adequate ventilation and no ignition sources are present. Refer to a MSDS for acetone for additional important information. ▲

Caution Acetone dissolves many plastics. Use caution to prevent the acetone from contacting materials that may be marred or damaged. ▲

Caution Take necessary precautions to prevent exposure to hazardous materials when conditioning the sample tubing with sample. ▲

Proper preparation of sample tubing prior to installation is very important. Prepare the sample tubing as follows.

1. Thoroughly rinse the tubing inside with isopropyl alcohol (isopropanol) or acetone to remove any oils that may be present.

2. Flush the inside of the tubing with deionized water.

3. Rinse the inside of the tubing again with isopropyl alcohol (isopropanol) or acetone.

4. Thoroughly blow-dry the tubing with clean air (free of oil and moisture).

Caution The pressure, temperature and composition of the sample flowing through the sample line during normal operation is both site and application specific. Take the necessary steps to be informed about the specific hazards related to each individual SOLA iQ installation. Consult with site Health and Safety personnel, applicable Safety Data Sheets, Safety Manuals and local, state and/or federal regulations. The preceding list is not intended to be exhaustive as each individual installation could be subject to requirements not covered by the aforementioned mentioned resources. It is the responsibility of each user to be educated about the hazards related to their specific sample as well as implementing procedures and processes to mitigate the associated risks to an acceptable level. ▲

Warning After the initial installation and after any maintenance and/or service work is performed on the sampling system (sample containment system) perform a leak check to verify that the system is properly sealed and that there are no leaks in the system. ▲

Note The following parts are required to be supplied by Thermo Fisher Scientific: 1) All printed circuit boards, 2) the SO_2 spectrometer and any associated parts and/or electronics, and 3) the Pyrolyzer and any of its component parts. ▲

Note After repair, the following actions can be used to verify that the SOLA iQ is in a safe state:

- All wires and tubing connections have been returned to their pre-repair state when the SOLA iQ was safely operated
- A leak check on the sample containment system up to and including the exit of the Pyrolyzer has been successfully performed
- Pre-Purging of the electronics and the Oven has occurred for the time interval specified on the SOLA iQ tag secured to the exterior of the analyzer
- After power has been applied, all alarm conditions have been cleared ▲

Electrical Connections

Refer to the following AC power information and wire information when planning and connecting power for the analyzer. Incoming AC power enters the SOLA iQ through a conduit hub and is wired to TS0, located on the back wall, on the left hand side of the electronics enclosure. Refer to the system wiring diagram in the documentation package supplied with the SOLA iQ Total Sulfur Analyzer for details.

Power source specification: 120/240 VAC 50-60 Hz, 2000 watts

Power wiring specification: Use 12 AWG stranded, 3-wire copper or tin-plated copper power wire rated for at least 600 Vac and 20 A at the required length.

Power line connector wiring color-coding:

Line – Black

Neutral – White

Earth Ground – Green and Yellow

Note The wiring methods shall be in accordance to the CEC and NEC requirements for Class 1, Div. 1 and Div. 2 requirement. ▲

Warning This apparatus must be earth grounded! The earth ground stud is located on the top of the SOLA iQ cabinet. Connect the AC earth ground wire to the internal earth ground stud in the SOLA iQ. ▲

The size of the earth ground conductor shall not be less than 12AWG, stranded copper or tin-plated copper wire and shall be in accordance with the latest edition of IEC 60079-0 clause 15.3, if applicable. Connections shall be effectively protected against corrosion with special precautions taken in the event there is contact between different types of metals. Connections shall also be designed so that electrical conductors cannot be readily loosened or twisted (see IEC 60079-0 clauses 15-4 and 15-5).

Warning Installation of this instrument requires an external, lockable electrical power isolation switch supplied by the customer. To meet the requirements of IEC 61010-1, the external power switch or circuit breaker must be installed to allow the power source to be disconnected from the SOLA iQ analyzer. Additionally, protective bonding (grounding) must always be provided. ▲

If the optional X-Purge unit is installed, refer to the Users Guide for important operation information. Incoming AC power is wired to TB1 located inside of the X-Purge unit. Refer to the system wiring diagram for details.

Wiring to the relay contacts should be sized according to the load imposed by the alarm systems installed by the user. Maximum current capability of the alarm contacts is 2 A at 240 Vac or 10 A at 24 Vdc. Voltage is not supplied to the relay contacts by the analyzer.

Warning Electrical installation must be done by qualified individuals in accordance with local site requirements and regulations. ▲

Warning In general, any main power required for heaters should be segregated from signal and instrument wiring. ▲

DCS & External Connections

Input and Output wiring terminals are located on the I/O Board, p/n 3-0755-003. A physical layout of the wiring terminals can be found on the SOLA iQ Wiring Diagram, 0-0755-082. Page 6 of the Wiring Diagram shows the terminals for the Fixed Range Liquid/Vapor Single or Multi Stream SOLA iQ models. Page 7 of the Wiring Diagram shows the terminals for the SOLA iQ Flare model.

Digital Outputs

The digital output (DO) function consists of two banks of relays: a group of eight mechanical relays and a group of eight solid-state relays (see Figure 3-1). The mechanical relays are rated for 250 Vac at 10 amps and 10 amps at 30 Vdc. The solid-state relays are rated for 0 to 60 Vdc at 1 amp. The solid-state relays have no contact bounce so they are preferred for applications such as pulse output where contact bounce could cause an incorrect pulse count.

The available digital outputs are provided as follows in Table 3-1:

Table 3–1. Digital Outputs/Alarm Outputs

Digital Outputs/Alarm Outputs (All Located on I/O Board)						
Output	**SOLA iQ Liquid/Vapor/CV 1 to 2 Stream (Dual AO per Stream)**	**SOLA iQ Liquid/Vapor/CV 1 to 4 Stream (Single AO per Stream)**	**SOLA iQ Liquid/Vapor/CV 1 to 4 Stream (Dual Scaling AO per Stream)**	**SOLA iQ Flare**	**Signal Connect**	**Signal Connect**
MER-DO1	Malfunction	Malfunction	Malfunction	Malfunction	J19 P1	J19 P2
MER-DO2	Offline	Offline	Offline	Offline	J19 P3	J19 P4
MER-DO3	High Alarm	High Alarm	High Alarm	High Alarm	J21 P1	J21 P2
MER-DO4	HH Alarm	HH Alarm	HH Alarm	HH Alarm	J21 P3	J21 P4
MER-DO5	Purge fail	Purge fail	Purge fail	Purge fail	J22 P1	J22 P2
MER-DO6	Stop Injection Alarm	Stop Injection Alarm	Stop Injection Alarm	Stop Injection Alarm	J22 P3	J22 P4
MER-DO7	Spare: Special application for SCS control	Spare: Special application for SCS control	Spare: Special application for SCS control	Spare: Special application for SCS control	J24 P1	J24 P2
MER-DO8	Spare: Special application for SCS control	Spare: Special application for SCS control	Spare: Special application for SCS control	Spare: Special application for SCS control	J24 P3	J24 P4
SSR-DO9	Range selected	Range selected	Range selected	Range selected	J20 P2	J20 P4
SSR-DO10	Stream1 selected	Stream1 selected	Stream1 selected	Stream1 selected	J20 P6	J20 P8
SSR-DO11	Spare	Stream2 selected	Stream2 selected	Spare	J20 P1	J20 P3
SSR-DO12	Spare	Stream3 selected	Stream3 selected	Spare	J20 P5	J20 P7
SSR-DO13	Spare	Stream4 selected	Stream4 selected	Spare	J23 P5	J23 P7
SSR-DO14	Spare	Spare	Spare	Spare	J23 P1	J23 P3
SSR-DO15	In Calibration	In Calibration	In Calibration	In Calibration	J23 P6	J23 P8
SSR-DO16	Spare	Spare	Spare	Spare	J23 P2	J23 P4

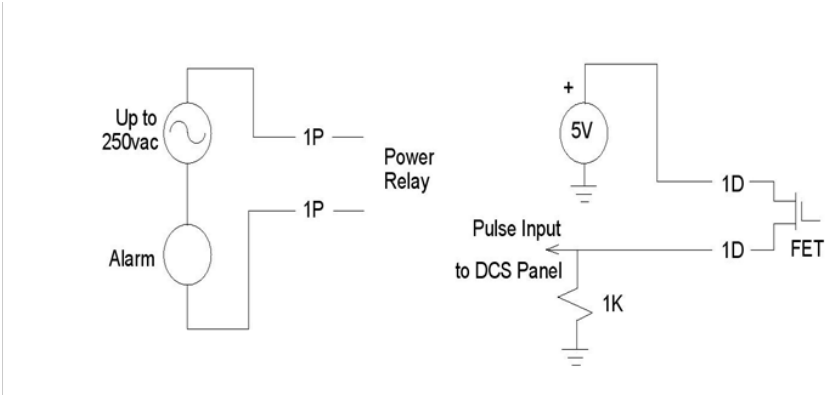
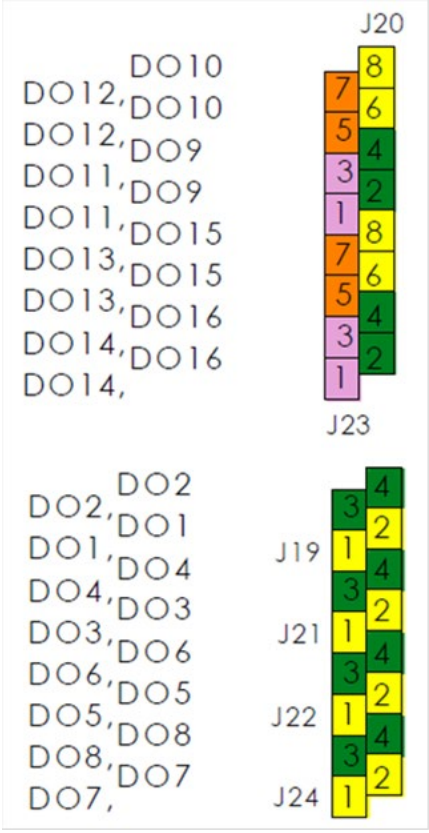


Figure 3–1. Digital Output Function

See the following SOLA iQ Digital Output Wiring Example:



Digital Inputs

The digital input function inputs are rated for 0-12 Vdc. Each point accepts an input in the form of a dry contact closure (see Figure 3-2). A 12 Vdc wetting voltage is provided onboard. Each input has a termination for wetting voltage, signal in and cable shield (or ground).

The available digital inputs are provided as follows in Table 3-2:

Table 3–2. Digital Inputs

Digital Inputs (Dry Contacts)							
Input	**SOLA iQ Liquid/Vapor/CV 1 to 2 Stream (Dual AO per Stream)**	**SOLA iQ Liquid/Vapor/CV 1 to 4 Stream (Single AO per Stream)**	**SOLA iQ Liquid/Vapor/CV 1 to 4 Stream (Dual Scaling AO per Stream)**	**SOLA iQ Flare**	**I/O Board Signal Connect**	**IO Board GND Connect**	**IO Board 12V Connect**
DI 1	Stream Control 1	Stream Control 1	Stream Control 1	Reserved	J25 P2	J25 P3	J25 P1
DI 2	Stream Control 2	Stream Control 2	Stream Control 2	Reserved	J25 P5	J25 P6	J25 P4
DI 3	Spare	Stream Control 3	Stream Control 3	Reserved	J26 P2	J26 P3	J26 P1
DI 4	Spare	Stream Control 4	Stream Control 4	Reserved	J26 P5	J26 P6	J26 P4
DI 5	AO Scaling Select	AO Scaling Select	AO Scaling Select	Spare	J29 P2	J29 P3	J29 P1
DI 6	Spare	Spare	Spare	Flare Sync	J29 P5	J29 P6	J29 P4
DI 7	Suspend	Suspend	Suspend	Suspend	J30 P2	J30 P3	J30 P1
DI 8	Remote Cal	Remote Cal	Remote Cal	Reserved	J30 P5	J30 P6	J30 P4

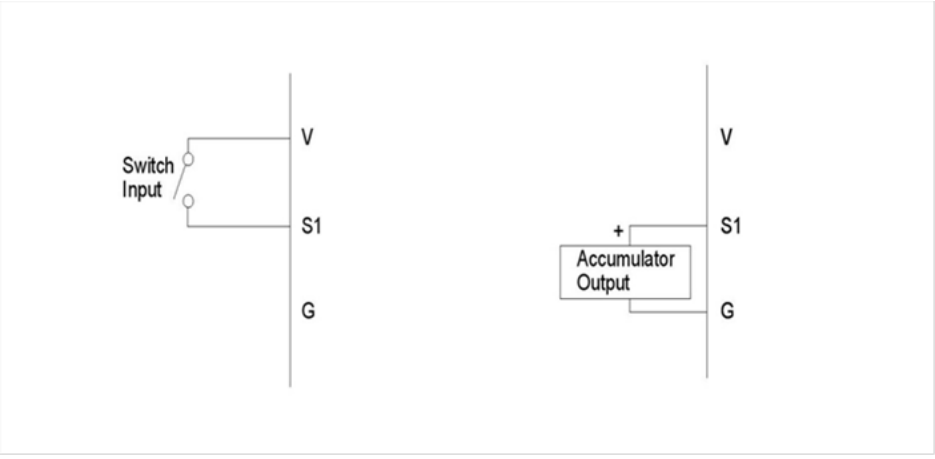
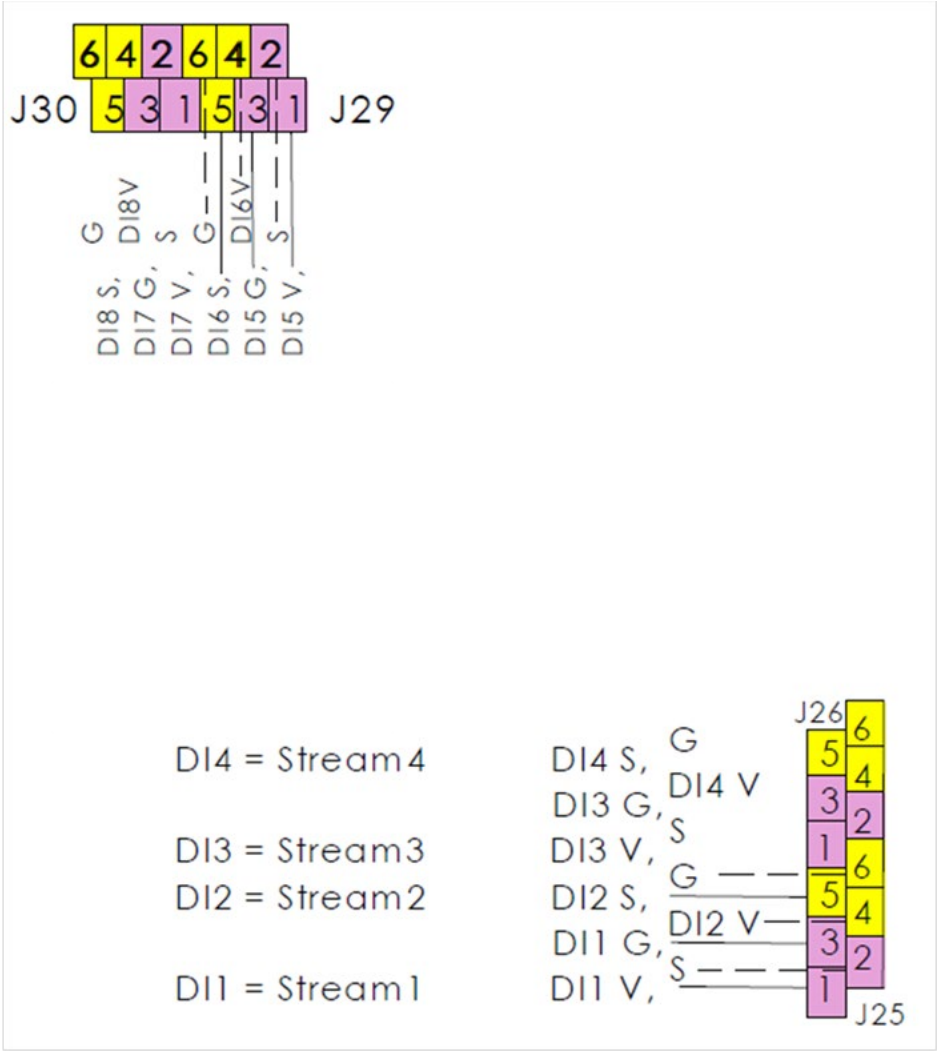


Figure 3–2. Digital Input Function

See the following SOLA iQ Digital Input Wiring Example:



Optional Analog Inputs

On the I/O board, the analog input (AI) function has 4 single–ended channels, each of which accepts a 0-5 Vdc input signal and features a high common mode rejection ratio. The AI utilizes a CMOS 14 bit analog to digital converter. An onboard DC/DC converter provides 24 Vdc loop and 12 Vdc excitation voltages.

Note 4-20mA inputs are converted to 1-5 Vdc inputs by installing a jumper to enable an on-board 250 ohm dropping resistor across the input of each channel. For example, to change Channel 1 from 0-5 Vdc to 4-20mA, move jumper JP1 from pins 2-3 to pins 1-2. See Appendix B for information related to connecting a Sarasota FD910H Density Meter to the SOLA iQ. ▲

Warning . When AI input voltage is greater than 12 VDC, damage may result to the AI1, AI2, AI3 and AI4 circuit.
- To apply 4-20mA current input to AI1 to AI4, a jumper must be installed on Pin 1 and Pin 2 of JP1 to JP4 respectively, before connecting to the signal. Otherwise, the 24V loop power voltage will damage the circuit. ▲

A fifth AI, located on the APP board, is utilized for a flow meter signal input on 4-Stream and Flare SOLA iQ models. The available analog inputs are provided as follows in Table 3-3:

Table 3–3. Analog Inputs

Analog Inputs (All Located on I/O Board Except for AI 5)							
Input	**SOLA iQ Liquid/Vapor/CV 1 to 2 Stream (Dual AO per Stream)**	**SOLA iQ Liquid/Vapor/CV 1 to 4 Stream (Single AO per Stream)**	**SOLA iQ Liquid/Vapor/CV 1 to 4 Stream (Dual Scaling AO per Stream)**	**SOLA iQ Flare**	**Signal (+)**	**Signal (-)**	**Jumper JPn**
AI 1	Stream 1 Density	Stream 1 Density	Stream 1 Density	Spare	J9 P1	J9 P2	JP1
AI 2	Stream 2 Density	Stream 2 Density	Stream 2 Density	Spare	J9 P3	J9 P4	JP2
AI 3	Spare	Stream 3 Density	Stream 3 Density	Spare	J10 P1	J10 P2	JP3
AI 4	Spare	Stream 4 Density	Stream 4 Density	Spare	J10 P3	J10 P4	JP4
AI 5*	Spare	Flow Meter	Flow Meter	Spare	TB1-1*	TB1-2*	N/A

* On AutoPILOT PRO Board

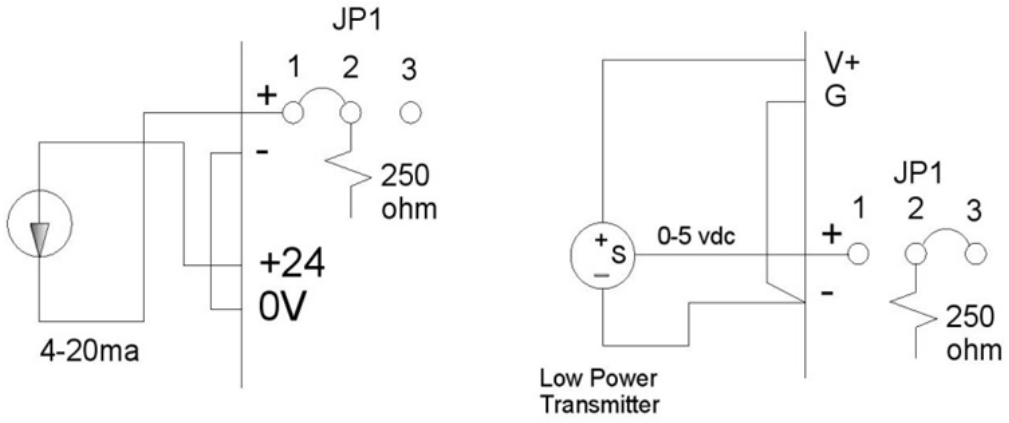
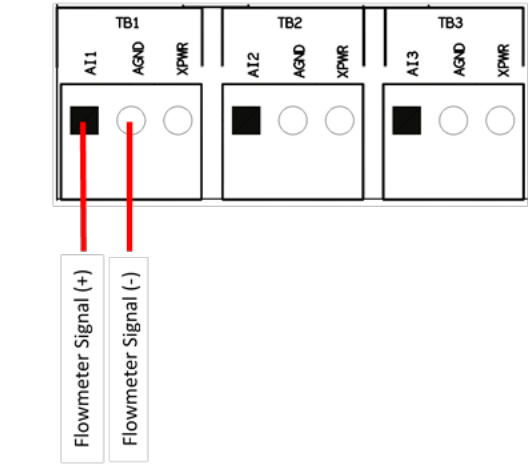


Figure 3–3.

See the following SOLA iQ Analog Input Wiring Example:



Analog inputs are available for connecting up to four sample densitometers used to correct each stream measurement based on the density of the sample. The analog input can also be used for connecting a sample flow meter. (Refer to Density Compensation in the Users Manual.)

Density Input Stream 1: This 4–20 mA DC input signal represents the density of the Stream 1 sample. The measured densities at 4 mA and at 20 mA can be programmed into the analyzer using the Density Compensation Setup menu.

Density Input Stream 2: This 4–20 mA DC input signal represents the density of the Stream 2 sample. The measured densities at 4 mA and at 20 mA can be programmed into the analyzer using the Density Compensation Setup Menu.

The density input for Streams 3 and 4 are done in a similar manner.

Analog Outputs

Each analog output from the SOLA iQ represents 0–100% of a representative output. The value of the analog output signal may be set manually, by local entry or download from the master computer, or automatically by the output of the 3 Mode Controller.

The analog output provides four 12-bit resolution channels of 4–20 mA current output. The current output accuracy is 0.1% of full scale. Each output current channel can drive up to a 700-ohm load using a 24 Vdc loop power supply. Converting the 4–20 mA output to 1–5 volts requires a 250-ohm 0.01% precision resistor with power rating of 1 W or better.

The preferred method of using the Analog Output Function is shown in Figure 3-4 A, where the power source is located next to the sense resistor. This provides maximum noise reduction.

Analog output channels can be powered from the J11 on the I/O board. It generates an isolated 24 Vdc that can be used to supply power to the four 4–20 mA current output channels. Each current output channel is equipped with a latched pluggable 2-position terminal block, providing termination for current out signal and current out signal return.

The available analog outputs are provided as follows in Table 3-4:

Table 3–4. Analog Outputs

Analog Outputs (All Located on I/O Board)						
Output	**SOLA iQ Liquid/Vapor/CV 1 to 2 Stream (Dual AO per Stream)**	**SOLA iQ Liquid/Vapor/CV 1 to 4 Stream (Single AO per Stream)**	**SOLA iQ Liquid/Vapor/CV 1 to 4 Stream (Dual Scaling AO per Stream)**	**SOLA iQ Flare**	**Signal (non-polar)**	**Signal (non-polar)**
AO 1	TS of Stream 1 (Cal A)	TS of Stream 1 (Cal A or B)	TS of Stream 1 (Cal A)	TS (Cal A)	J15 1A	J15 1A
AO 2	TS of Stream 1 (Cal B)	TS of Stream 2 (Cal A or B)	TS of Stream 2 (Cal A)	TS (Cal B)	J16 2A	J16 2A
AO 3	TS of Stream 2 (Cal A)	TS of Stream 3 (Cal A or B)	TS of Stream 3 (Cal A)	Spare	J17 3A	J17 3A
AO 4	TS of Stream 2 (Cal B)	TS of Stream 4 (Cal A or B)	TS of Stream 4 (Cal A)	Spare	J18 4A	J18 4A

Note: Terminals are not polarized. Power must be applied from external source.

Method 3-4 C (Figure 3-4) is only allowed if all four channels go to the same DCS and is located within 30 feet of the SOLA iQ.

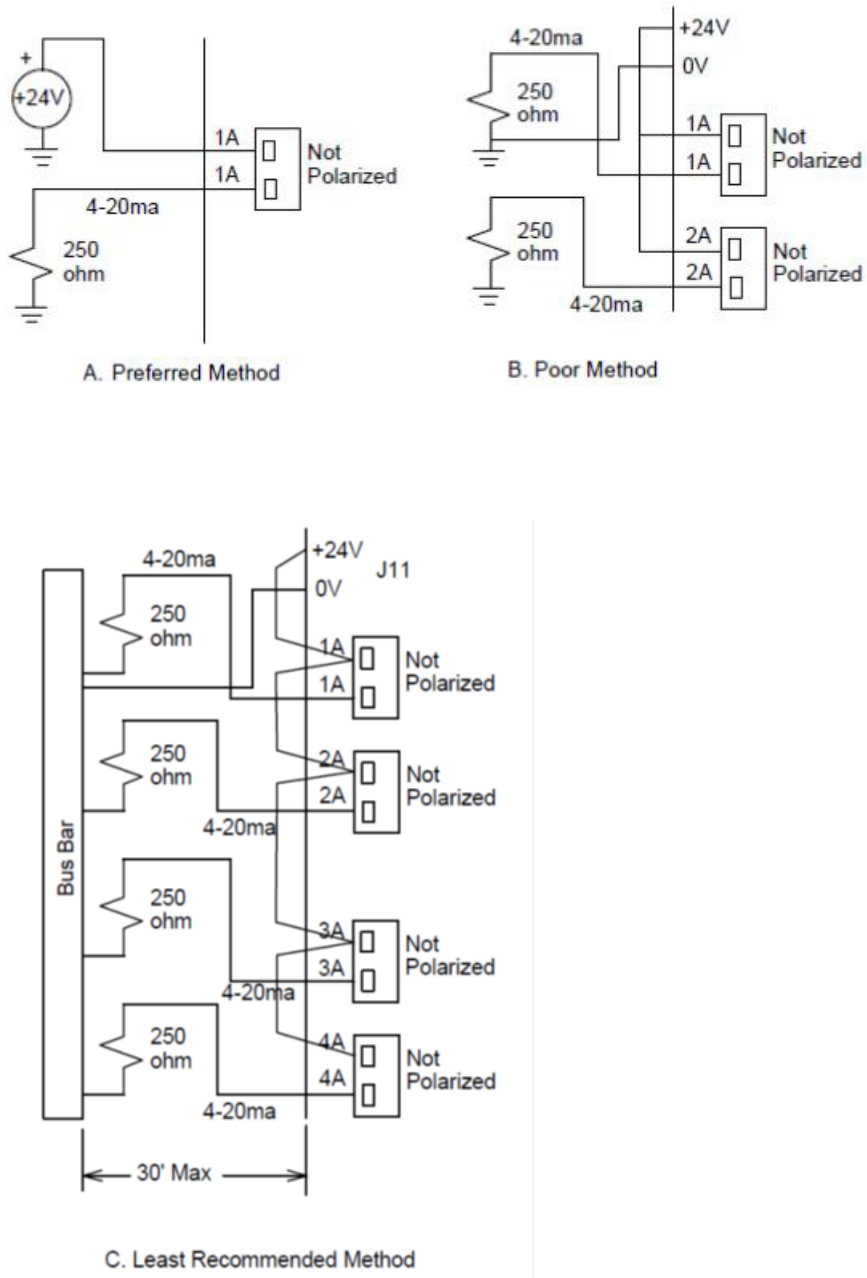
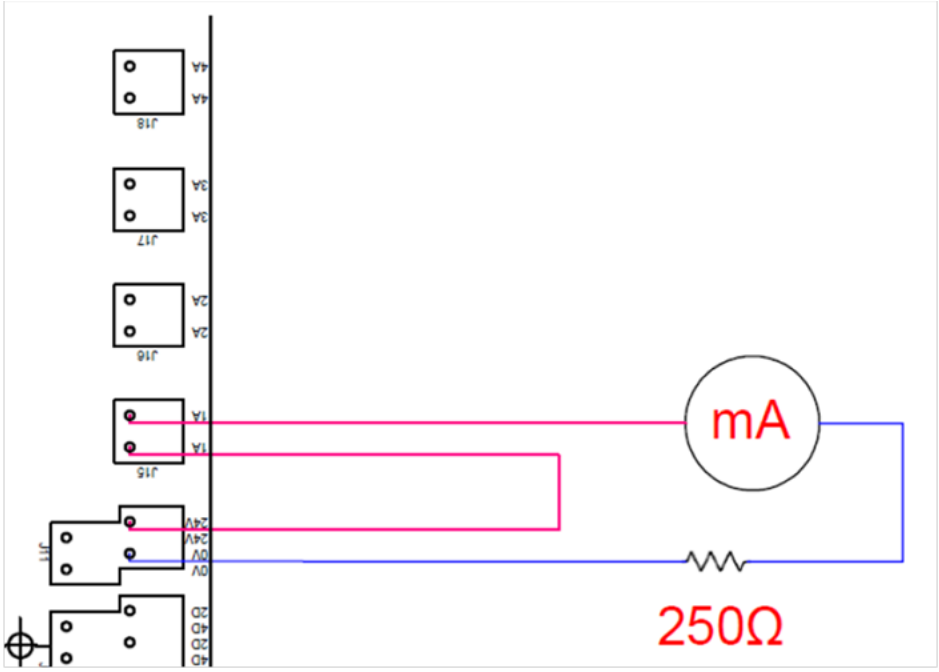


Figure 3–4. Analog Output Function

See the following SOLA iQ Analog Output Example Wiring – Using 24V power from J11:



Refer to the wiring diagrams shipped with your instrument for wiring details.

- The 4–20 mA DC signal represents the measured concentration of sample stream being analyzed. The zero value (4 mA DC) represents zero measured concentration in the sample. Full scale (20 mA DC) represents the expected maximum concentration in the sample

Pneumatic Outputs

The SOLA iQ supports up to 12 pneumatic outputs (PO). Three of the POs – PO2, PO3 &PO4 – are reserved for internal use by the SOLA iQ on all models. For multiple stream units, PO5, PO6 and PO7, are reserved for the additional streams. For flare units, PO5 through PO8 are reserved for validation/cal gas streams via the probe or introduced locally at the SOLA iQ. The available pneumatic outputs are provided as follows in Table 3-5:

Table 3–5. Pneumatic Outputs

Pneumatic Outputs			
	SOLA iQ Standard Liquid/Vapor/CV (Single stream)	**SOLA iQ Liquid/Vapor/CV Multi-Stream (Up to 4 streams)**	**SOLA iQ Flare**
PO1	Spare	Spare	Spare
PO2	Sample/Divert valve (V3)	Sample/Divert valve (V3)	N2/Range Select valve (V3, 4p)
PO3	Stream1	Stream1	Inject valve high (V2, 6p)
PO4	Inject valve 1 (V1)	Inject valve 1 (V1)	Inject valve low (V1, 10p)
PO5	Spare	Stream2	High cal gas
PO6	Spare	Stream3	Mid cal gas
PO7	Spare	Stream4	Low cal gas
PO8	Spare	Spare	Local/probe
PO9	Spare	Spare	Spare
PO10	Spare	Spare	Spare
PO11	Spare	Spare	Spare
PO12	Spare	Spare	Spare

Communications

The SOLA iQ supports RS232/RS485 serial communications. The available serial communications are provided in the following tables:

Table 3–6. Communications

Communications				
	SOLA iQ Standard Liquid/Vapor/CV (Single stream)	**SOLA iQ Liquid/Vapor/CV Multi-Stream (Up to 4 streams)**	**SOLA iQ Flare**	**Location**
Serial1	RS232/RS485 (Internal use)	RS232/RS485 (Internal use)	RS232/RS485 (Internal use)	COMM Terminal Board
Serial2	RS232/RS485 (Spare)	RS232/RS485 (Spare)	RS232/RS485 (Spare)	COMM Terminal Board
Serial3	RS232/RS485 (Internal use)	RS232/RS485 (Internal use)	RS232/RS485 (Internal use)	COMM Terminal Board
Serial4	RS232/RS485 (Spare)	RS232/RS485 (Spare)	RS232/RS485 (Spare)	COMM Terminal Board
Serial5	RS232/RS485 (Spare)	RS232/RS485 (Spare)	RS232/RS485 (Spare)	COMM Terminal Board
Serial6	RS232/RS485 (Spare)	RS232/RS485 (Spare)	RS232/RS485 (Spare)	COMM Terminal Board
Serial7	RS232/RS485 (Spare)	RS232/RS485 (Spare)	RS232/RS485 (Spare)	COMM Terminal Board
Serial8	RS232/RS485 (Spare)	RS232/RS485 (Spare)	RS232/RS485 (Spare)	COMM Terminal Board
Ethernet1	Local port/Service/diagnostics	Local port/Service/diagnostics	Local port/Service/diagnostics	Ethernet Hub

Table 3–7. SOLA iQ RS-485

RS485								
	TX -	**TX +**	**RX +**	**RX -**	**4-wire mode**	**2-wire mode**	**DC Termination**	**AC Termination**
Serial1	J2 P2	J2 P3	J2 P4	J2 P5	Jumper at J13	Jumper at J13&J14	Jumper at J10 P1-P2	Jumper at J10 P2-P3
Serial2	J3 P2	J3 P3	J3 P4	J3 P5	Jumper at J18	Jumper at J18&J19	Jumper at J15 P1-P2	Jumper at J15 P2-P3
Serial3	J4 P2	J4 P3	J4 P4	J4 P5	Jumper at J23	Jumper at J23&J24	Jumper at J20 P1-P2	Jumper at J20 P2-P3
Serial4	J5 P2	J5 P3	J5 P4	J5 P5	Jumper at J28	Jumper at J28&J29	Jumper at J25 P1-P2	Jumper at J25 P2-P3
Serial5	J6 P2	J6 P3	J6 P4	J6 P5	Jumper at J33	Jumper at J33&J34	Jumper at J30 P1-P2	Jumper at J30 P2-P3
Serial6	J7 P2	J7 P3	J7 P4	J7 P5	Jumper at J38	Jumper at J28&J39	Jumper at J35 P1-P2	Jumper at J35 P2-P3
Serial7	J8 P2	J8 P3	J8 P4	J8 P5	Jumper at J43	Jumper at J43&J44	Jumper at J40 P1-P2	Jumper at J40 P2-P3
Serial8	J9 P2	J9 P3	J9 P4	J9 P5	Jumper at J48	Jumper at J48&J49	Jumper at J45 P1-P2	Jumper at J45 P2-P3
Ethernet1	Port 1							

Table 3–8. SOLA iQ RS-232

RS232						
	TX	**RTS**	**RX**	**CTS**	**DCD**	**GND**
Serial1	J2 P2	J2 P3	J2 P4	J2 P5	J2 P6	J2 P1
Serial2	J3 P2	J3 P3	J3 P4	J3 P5	J3 P6	J3 P1
Serial3	J4 P2	J4 P3	J4 P4	J4 P5	J4 P6	J4 P1
Serial4	J5 P2	J5 P3	J5 P4	J5 P5	J5 P6	J5 P1
Serial5	J6 P2	J6 P3	J6 P4	J6 P5	J6 P6	J6 P1
Serial6	J7 P2	J7 P3	J7 P4	J7 P5	J7 P6	J7 P1
Serial7	J8 P2	J8 P3	J8 P4	J8 P5	J8 P6	J8 P1
Serial8	J9 P2	J9 P3	J9 P4	J9 P5	J9 P6	J9 P1

Purge Control Unit (PCU)

The PCU, P/N 3-0755-095, is designed to disconnect the I/O signals going to the SOLA iQ analyzer when there is a loss of purge pressure. The PCU system ensures that the SOLA iQ is safe to operate in a hazardous environment before it permits power to be applied to the SOLA iQ. If the correct purge pressure is detected then communication signals to the I/O are allowed to occur. The PCU is designed to handle ATEX and IECEx types of power cables and I/O cable entry. It is also designed to meet the hazardous area requirements for Division 1 and Zone 1 areas, including CSA for North America and Canada.

To ensure continued safe operation of the analyzer system, the Purge Control Unit must not be disabled or adjusted improperly.

When power is applied to the Purge Control Unit, it checks the purge pressure in all monitored zones and for flow exiting the exhaust ports of the enclosures. When all monitored zones register pressures at least 0.3 inches of water (0.8 mbar) above the reference pressure, adequate flow is present at the enclosure exhaust ports, and the instrument air pressure is greater than 10 psig, a time delay relay begins its timed cycle. Typically, the time delay is used to ensure that at least five volumes of air are exchanged in the enclosures before power is applied to the system. The number of exchanged volumes may be higher in some situations. After the preset time delay is accomplished, the time delay relay applies power to the analyzer system.

The Purge Control Unit is designed for monitoring two zone purge pressures and two exhaust port flows. All of the pressures in the monitored zones must be at least 0.3 inch of water (0.8 mbar) higher than the atmospheric pressure around the analyzer system. This ensures that hazardous materials are less likely to leak into the purged enclosures. Pressure differential switches compare the pressure in the monitored zones with the pressure in the explosion proof Purge Control Unit enclosure. The inside of the Purge Control Unit enclosure is referenced to ambient pressure using a ¼" breather drain with flame suppression. A flame arrestor is also installed between each pressure differential switch and the associated pressure zone that it monitors. A spark arrestor vent is used for exhaust and to maintain appropriate backpressure on the electronic enclosure and oven.

A bottled air backup source supplies air for purging the instrument in the event that instrument air pressure is lost. The backup purge system must be allowed to adequately cool the oven interior before opening the oven door. Refer to the certification label on the unit for additional information.

WARNING Failure to allow adequate cooling before opening the oven can lead to injury of personnel or equipment damage. ▲

WARNING Before attempting to install the Purge Control Unit (PCU), review the material in Chapter One in this guide, all safety information in this guide and all other applicable documents. ▲

WARNING All the flameproof joints of the Purge Control Unit (PCU) are not intended to be repaired. ▲

WARNING Applicable permits must be obtained and appropriate precautions must be taken to prevent possible injury to personnel or equipment damage when installing the system. ▲

System Mounting

The Purge Control Unit is typically shipped as part of the associated instrument (see Figure 3-5). Refer to the manuals, application notes, drawings, and applicable vendor data sheets supplied with the associated system. Review all of the material prior to installing the instrument. If you have any questions, please contact your local Thermo Scientific representative or the factory.

For field mounting of the Purge Control Unit to an existing analyzer, use a mounting panel at least 0.125" (3.5 mm) thick. The panel must be secured in place with appropriate hardware to support the weight of the Purge Control Unit explosion proof enclosure with internal components. Route tubing to the monitored zones as shown in drawings shipped with the Purge Control Unit. Power is routed into the Purge Control Unit enclosure from the top.

Figure 3–5. Purge Control Unit

Electrical Installation

AC Power

Refer to the AC power information and wire information in the following tables when planning and connecting power for the analyzer.

Power Source Specification
120/240 VAC 50-60 Hz (Wattage depends on instrument controlled by the Purge Control Unit)
Power Wiring Specification
Use stranded, 3-wire copper or tin-plated copper power wire rated for at least 600 Vac and 20 amps at the required length. 12 AWG wire is recommended.

WARNING This apparatus must be earth grounded. ▲

WARNING Installation of this instrument requires an external, lockable electrical power isolation switch supplied by the customer. ▲

WARNING Electrical power must be free of spikes, sags, surges, or electrical noise. ▲

AC power to any system using the Purge Control Unit is connected directly to the Purge Control Unit rather than the analyzer. The Purge Control Unit controls the power to the instrument to ensure safe operation in hazardous areas. Consult the following table for connecting AC power to the Purge Control Unit.

AC POWER CONNECTION	
POWER	**TERMINAL NUMBER**
Hot	TB1-1[1]
Neutral	TB1-3[2]
Ground	Ground Lug Adjacent to TB1 (Figure 3-6)

[1]Terminal 1 and 2 are jumped together

[2]Terminal 3 and 4 are jumped together

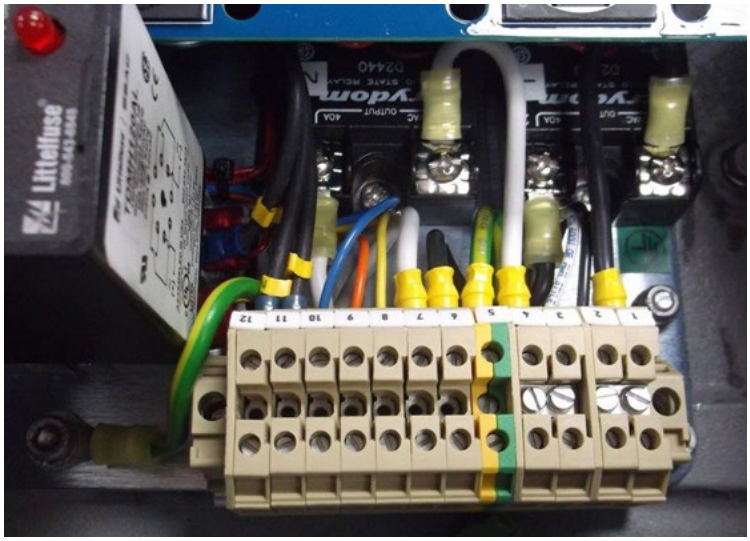


Figure 3–6. Purge Control Unit TB1 & Grounding Lug

Alarm Signal

The Purge Control Unit provides dry alarm contacts for use by the customer. To use the alarm contacts provided by the Purge Control Unit, consult the following connection table. The alarm contacts are rated for 10 amps resistive at 120/240 VAC and 28 VDC. Wiring must be sized appropriately.

ALARM CONNECTION	
ALARM TERMINAL	**TERMINAL NUMBER**
Open on Alarm (closed when power is applied to the analyzer system)	TB1 8-9
Closed on Alarm (closed when purge is lost or during fast purge of analyzer system)	TB1 8-10

Installation Checklist

The following checklist may be copied for use during system installation. Details for the installation and various specification requirements are contained in this guide, application specific drawings, and information supplied with the instrument.

Installation Checklist

- ☐ Materials used meet specifications defined in Chapter 2.
- ☐ Operating environment meets requirements defined in Chapter 3.
- ☐ Mounting meets requirements defined in Chapter 3.
- ☐ Analyzer condition inspected as follows:
  - ☐ No physical damage, broken parts, or observable defects.
  - ☐ All electronic boards are securely seated.
  - ☐ All cables and wiring connectors are in place and fully seated.
  - ☐ No loose parts (wires, nuts, screws, cables, debris, etc.).
  - ☐ All tubing is properly connected and fittings are tight.
- ☐ Installation and flow connections adhere to the following:
  - ☐ Sample system properly designed to condition (control pressure, flow, temperature, and particulate) sample as required by system.
  - ☐ Sample system fast loop panel is installed as close as possible to analyzer for fastest response time.
  - ☐ System gases meet quality and quantity (pressure and flow) specifications according to Chapter 2.
  - ☐ PUVF vent is vented to atmospheric pressure.
  - ☐ PUVF vent is **NOT** connected to headers with varying pressure or that may accumulate liquids.
  - ☐ Inject purge vent will contain instrument air plus 5–10 cm^3 of hydrocarbon liquid or gas during suspension of analyzer, loss of combustion air, or inject valve fault. Inject purge vent is routed to accommodate disposal of hydrocarbon.
  - ☐ All tubing supply lines to analyzer are sized to match or exceed connector size on the analyzer.
  - ☐ All internal and external tubing fittings are physically checked for tightness and tested for leaks.
- ☐ Installation and electrical connections adhere to the following:
  - ☐ AC power wiring meets requirements.
  - ☐ AC power wiring is properly connected to the instrument with proper earth grounding.
  - ☐ Signal wiring (DC signals, communications, etc.) meets requirements.
  - ☐ Signal wires properly connected to the instrument.
  - ☐ All electrical conduit seals poured with sealing compound such as Chico A5r or equivalent.

Site Requirements Checklist

Use this checklist as a guide for site preparation prior to a visit by a ThermoFisher Service Technician. The service group typically provides a site requirement checklist to be completed, signed and returned in anticipation of a visit by a ThermoFisher Service Technician.

No.	Requirement	Yes/No	If No, Date Available
1	All required services are available in line with the instrument site guide (i.e. power, instrument air, carrier gas, etc.)		
2	All recommended calibration standards are available via the necessary interconnecting plumbing, to the instrument.		
3	The sample streams are available and all necessary sample conditioning has been supplied and installed.		
4	All exhaust connections to the instrument are installed.		
5	Where applicable is back-up purge gas supply provided and connected to the instrument?		
6	All required connections to DCS are available and necessary personnel are available for testing.	*	
7	The prepared job site conforms with the conditions set out in the instrument site requirements.		
8	All necessary personnel from the customer job site will be available for training.	*	
9	Personnel with appropriate authority (technical and financial) for instrument acceptance will be available.	*	
10	(i) Will engineer be able to take personal laptop onsite?		
	(ii) Will engineer be able to use laptop alongside instrument?		
11	Are there any visible signs of damage to crate or instrument?		
	If yes, attach or note details below, and ensure all packing materials are retained.		
12	Please detail below any Health and Safety requirements for entry to your site. Please also indicate the time required for any special training or induction courses required on arrival.		
13	Please detail below any national holidays, or similar, that fall into the installation period. Would site access be affected?		
14	If the Host PC has **NOT** been supplied by Thermo Fisher or one of its representatives, does it comply with the minimum specification detailed in the final instrument quotation?		

***If personnel will not be available during the whole installation period, please give dates when available.**

Contact Information

The local representative is your first contact for support and is well equipped to answer questions and provide application assistance. You can also obtain support by contacting Thermo Fisher Scientific directly at the following locations.

27 Forge Parkway Franklin, MA 02038 USA +1 (800) 437-7979	Ion Path, Road Three Winsford, Cheshire CW7 3GA UNITED KINGDOM +44 (0) 1606 548700 +44 (0) 1606 548711 fax	Unit 702-715, 7/F Tower West Yonghe Plaza No. 28 Andingmen East Street, Beijing 100007 CHINA +86 (10) 8419-3588 +86 (10) 8419-3580 fax
A-101, 1CC Trade Tower Senapati Bapat Road Pune 411 016 Maharashtra, INDIA +91 (20) 6626 7000 +91 (20) 6626 7001 fax		
www.thermoscientific.com		

For returns, contact Thermo Fisher Scientific for specific instructions.

Warranty

Thermo Scientific products are warranted to be free from defects in material and workmanship at the time of shipment and for one year thereafter. Any claimed defects in Thermo Scientific products must be reported within the warranty period. Thermo Fisher shall have the right to inspect such products at Buyer's plant or to require Buyer to return such products to Thermo Fisher plant.

In the event Thermo Fisher requests return of its products, Buyer shall ship with transportation charges paid by the Buyer to Thermo Fisher plant. Shipment of repaired or replacement goods from Thermo Fisher plant shall be F.O.B. Thermo Fisher plant. A quotation of proposed work will be sent to the customer. Thermo Fisher shall be liable only to replace or repair, at its option, free of charge, products that are found by Thermo Fisher to be defective in material or workmanship, and which are reported to Thermo Fisher within the warranty period as provided above. This right to replacement shall be Buyer's exclusive remedy against Thermo Fisher.

Thermo Fisher shall not be liable for labor charges or other losses or damages of any kind or description, including but not limited to, incidental, special or consequential damages caused by defective products. This warranty shall be void if recommendations provided by Thermo Fisher or its Sales Representatives are not followed concerning methods of operation, usage and storage or exposure to harsh conditions.

Materials and/or products furnished to Thermo Fisher by other suppliers shall carry no warranty except such suppliers' warranties as to materials and workmanship. Thermo Fisher disclaims all warranties, expressed or implied, with respect to such products.

EXCEPT AS OTHERWISE AGREED TO IN WRITING BY Thermo Fisher, THE WARRANTIES GIVEN ABOVE ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, AND Thermo Fisher HEREBY DISCLAIMS ALL OTHER WARRANTIES, INCLUDING THOSE OF MERCHANTABILITY AND FITNESS FOR PURPOSE.

Items not Covered under Warranty

The following parts are considered consumable items and are not covered under the warranty:

Injection valve and associated parts

Inline filter

UV lamp

Pyrolyzer tube, ceramic

Pyrolyzer tube graphite ferrules

Appendix A
Toxic & Hazardous Substances Tables

The English and Chinese versions of the Toxic and Hazardous Substances tables are shown below.

Table A–1. English and Chinese Toxic and Hazardous Substances Table

部件名称 **Part Name**	有毒和危险品 **Toxic and Hazardous Substances or Elements**					
SOLA iQ	铅 (Pb)	水银 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴化苯 (PBB)	多溴化二苯醚 (PBDE)
印刷电路板 **(PCBs)**	X	O	O	O	O	O
机电配件 **(Electro-Mechanical Parts)**	X	O	O	O	O	O
电缆和电线 **(Cables & Wires)**	O	O	O	O	O	O
金属部件 **(Metal Parts)**	X	O	O	O	O	O
塑料零件 **(Plastic Parts)**	O	O	O	O	O	O
显示 **(Display)**	X	O	O	O	O	O
电池 **(Batteries)**	O	O	O	O	O	O
无焰燃烧器 **(Flameless Burner)**	O	O	O	O	O	O
光学单元 **(Optical Unit)**	O	O	O	O	O	O

本表格依据 SJ/T 11364 的规定编制

O = 表示该有害物质在该部件所有均质材料中的含量均在 GB/T 26572规定的限量要求以下(indicates that the content of the toxic and hazardous substance in all the Homogeneous Materials of the part is below the concentration limit requirement as described in GB/T 26572).

X = 表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T 26572规定的限量要求 (indicates that the content of the toxic and hazardous substance in at least one Homogeneous Material of the part exceeds the concentration limit requirement as described in GB/T 26572).

Appendix B
Connecting to a Sarasota FD910 Density Meter

Purpose

The SOLA iQ can be connected up to four Thermo Scientific Sarasota FD910 density meters for use with live density compensation. This appendix provides information on how to make the connections.

Connections

In Figure B-1 below, terminals 2 and 4 of the Sarasota FD910H density meter are connected to the return of the SOLA iQ supply loop. Figure B-1 shows the installation of two FD910H liquid density meters. Up to four density meters can be wired to the SOLA iQ following the pattern shown in Figure B-1. One density meter is used for each stream. Connecting a density meter measuring the sample density to the SOLA iQ allows for performing live density compensation. The incoming 4-20mA density signal needs to be set-up in the SOLA iQ so that the reported total sulfur value includes the density compensation. Information related to the density compensation set-up can be found in Chapter 5 of the SOLA iQ Users Guide.

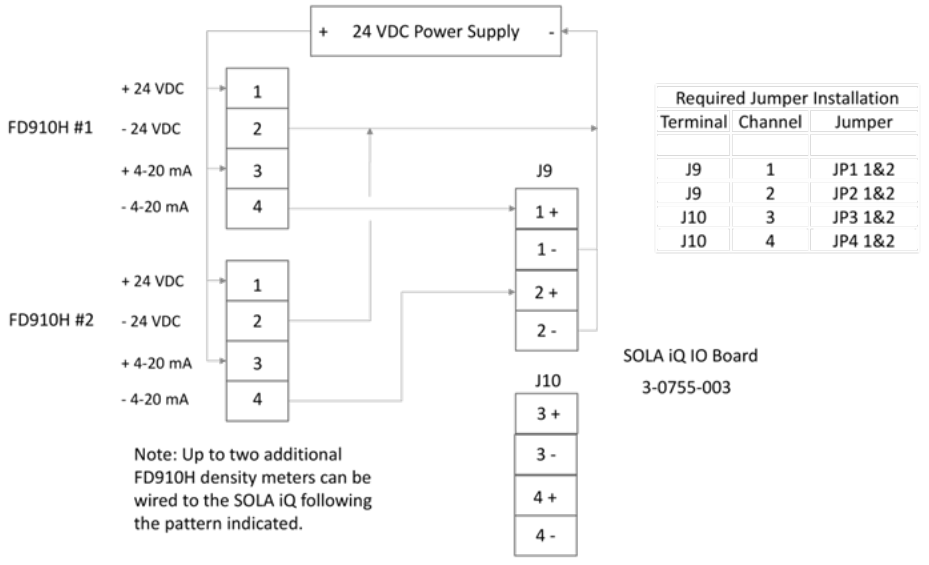


Figure B–1. Sarasota FD910H density meter to SOLA iQ connections

24 Vdc Power Supply

The I/O Board has an isolated 24 Vdc output rated for five watts (0.21 amps) available via J12. The J12 connection provides for 24 Vdc and 0 (zero) Vdc, a floating ground. Only one Sarasota meter can be operated using the 24 Vdc available on J12. For multiple meters, independent 24 Vdc power supplies are recommended.

Figure B–2 shows the density meter head mount assembly terminal connections. These terminals are the ones shown on the left in Figure B–1. Each density meter has its own set of terminals.

Figure B–2. Sarasota FD910 headmount assembly terminal connections

Figure B–3 is a picture of the SOLA IQ optional analog input board 3-0755-003.

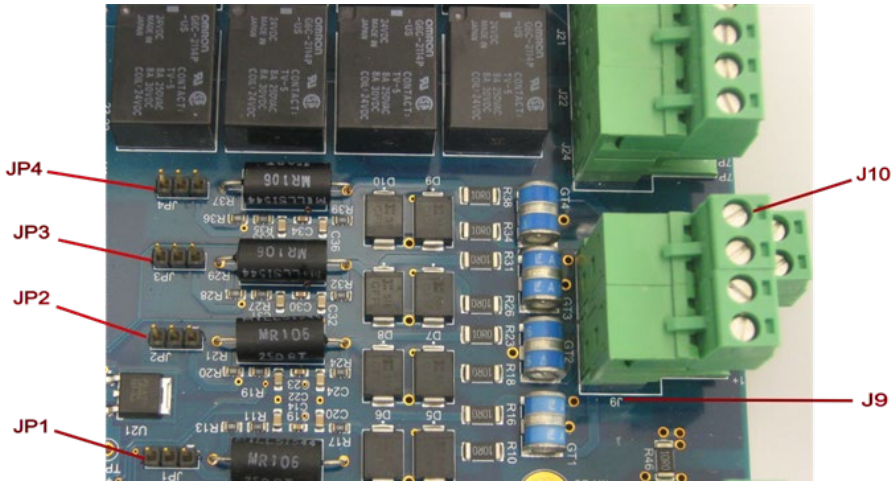


Figure B–3. Lower right corner of SOLA iQ IO Board 3-0755-003

In Figure B-3, there are four jumpers to the left of J9/J10. These jumpers are designated JP1, JP2, JP3 and JP4. If the jumper is installed per the Require Jumper Installation Table in Figure B-1, then the 4-20mA circuit is active. Jumper pins 1 and 2 are for the active position. Jumper pins 2 and 3 are for the inactive position. Figure B-4 schematically shows the relative locations of JP1, JP2, JP3 and JP4 when looking at the installed SOLA iQ board.

Warning . When AI input voltage is greater than 12 VDC, damage may result to the AI1, AI2, AI3 and AI4 circuit.
- To apply 4-20mA current input to AI1 to AI4, a jumper must be installed on Pin 1 and Pin 2 of JP1 to JP4 respectively, before connecting to the signal. Otherwise, the 24V loop power voltage will damage the circuit. ▲

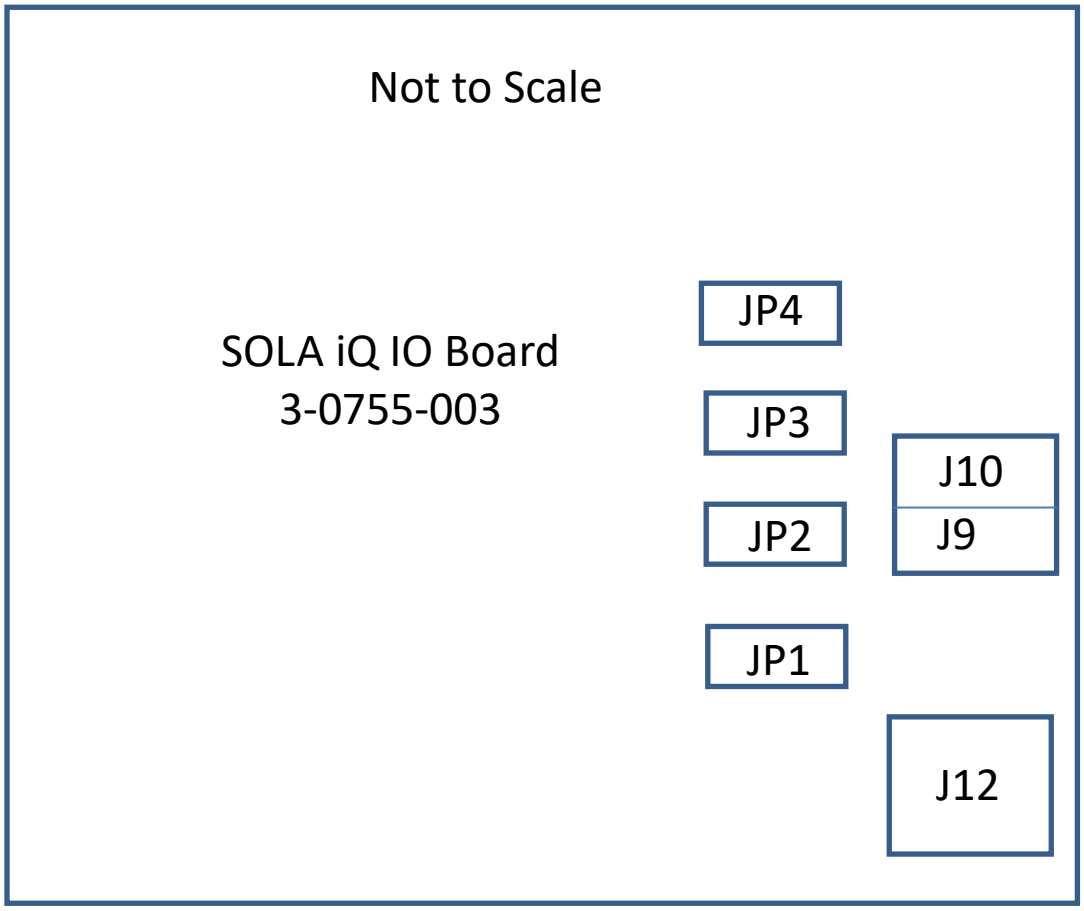


Figure B–4. Terminal block connectors on SOLA iQ IO board 3-0755-003

Appendix C
Replacing the RTC Backup Battery on the AutoPilot Pro Board and System Control Board

A lithium backup battery, BR2330, is located at BT1 on the front of the main board. Another lithium backup battery is located at XBT1 on the front of the SCB board. These are field replaceable batteries. However, the batteries can only be replaced in non-hazardous areas or non-hazardous conditions.

Warning The Lithium battery may explode if mistreated. Do not attempt to recharge, disassemble, or burn it. ▲

Warning Ensure that the Electronics enclosure purge air is off, the power is off and the area is non-hazardous before performing this procedure. ▲

1. Open the Electronics enclosure door and locate the AutoPilot Pro board or SCB.
2. Gently lift up the battery retainer and lift the battery out.
3. Install the new battery, ensuring it is secured by the retainer.
4. Shut the Electronics enclosure door.
5. Turn on the electronics purge air and apply power to the SOLA iQ.
6. Dispose the battery in accordance with local, state, and federal environmental regulations.

PCA	Part Number	Description	MFG	MFG P/N
AutoPilot Pro Board	5-3980-015	Lithium backup battery	Panasonic	BR2330
System Control Board	101440-00	Lithium backup battery	Panasonic	CR1632

Appendix D
Certification Labels

Warning Labels shown are for reference only. Refer to the label affixed to the SOLA iQ for specific unit information. ▲


Thermo Environmental Instruments LLC
27 Forge Parkway
Franklin, MA 02038
SOLA IQ LIQUID

TAG NO:
SERIAL NO:
DATE MFG:
VOLTS: 120/240VAC Hz: 50~60Hz AMPS: 18A
PURGE INLET MAX=100 PSI MIN=55 PSI
AMBIENT RANGE= 12ºC TO 40ºC
UPPER (ELECTRONIC) ENCLOSURE:
INTERNAL FREE VOLUME =120 LTRS
MINIMUM PURGE TIME = 30 MINS
PURGE FLOW RATE = 60 L/MIN
OVER PRESSURE MAX=16 mB MIN=0.5 mB
MAX LEAKAGE RATE: 185 L/MIN TYPICAL
LOWER (OVEN) ENCLOSURE:
INTERNAL FREE VOLUME =37 LTRS
MINIMUM PURGE TIME = 25 MIN
PURGE FLOW RATE = 60 L/MIN
OVER PRESSURE MAX=10 mB MIN=2.5 mB
MAX LEAKAGE RATE: 175 L/MIN TYPICAL
LIMITED RELEASE, MAXIMUM FLOW
RATE TO CONTAINMENT SYSTEM 15 CC/MIN
MAX PRESS TO CONTAINMENT SYSTEM 2 mB

COMPLIANCES:
CE 2575
UKCA 0359 CSAE 22UKEX1264X
Ex SIRA 17ATEX1305X
II 2 G Ex db pxb IIC T2/T3* Gb

WARNING: DO NOT OPEN ANY DOOR OR COVER FOR THE TEMPERATURE CODE REQUIRED PURGE TIME AFTER REMOVING POWER.

IN ORDER TO HAVE A (T) CLASS OF (T2) AFTER LOSS OF PURGE A SECONDARY PURGE SYSTEM SHALL HOLD THE PRESSURE INSIDE THE UNIT ABOVE 0.5 mbar FOR A PERIOD OF 50 MINUTES USING A MINIMUM SUPPLY PRESSURE OF 20 PSIG.

IN ORDER TO HAVE A (T) CLASS OF (T3) AFTER LOSS OF PURGE A SECONDARY PURGE SYSTEM SHALL HOLD THE PRESSURE INSIDE THE UNIT ABOVE 0.5 mbar FOR A PERIOD OF 80 MINUTES USING A MINIMUM SUPPLY PRESSURE OF 20 PSIG.

WARNING: PRESSURISED ENCLOSURE
REMOVE POWER BELOW 0.5 mbar.
ENCLOSURE SHALL NOT BE OPENED UNLESS THE AREA IS KNOWN TO BE NON-HAZARDOUS. POWER SHALL NOT BE RESTORED AFTER AN ENCLOSURE HAS BEEN OPENED. UNTIL ALL ENCLOSURE HAVE BEEN PRE-PURGED.

WARNING: BATTERIES ARE LOCATED INSIDE THE ENCLOSURE. DO NOT OPEN WHEN AN EXPLOSIVE ATMOSPHERE IS PRESENT. THE BATTERIES CAN ONLY BE REPLACED IN NON-HAZARDOUS AREA.

WARNING: BATTERIES IN THIS PRESSURIZED ENCLOSURE REQUIRE ROUTINE MAINTAINANCE. SEE INSTRUCTIONS

WARNING: THE SAFETY OF THIS EQUIPMENT RELIES ON THE PROVISION OF PROPER PURGING AND PRESSURIZING WHEN USED IN HAZARDOUS LOCATIONS. IT MUST NOT BE PUT INTO USE WITHOUT "SPECIAL PERMISSION" FROM THE INSPECTION AUTHORITY HAVING JURISDICTION.

Figure D–1. 4-0755-108-ATEX

Figure D–2. 4-0755-109-ATEX

Figure D–3. 4-0755-110-ATEX

Figure D–4. 4-0755-111-ATEX

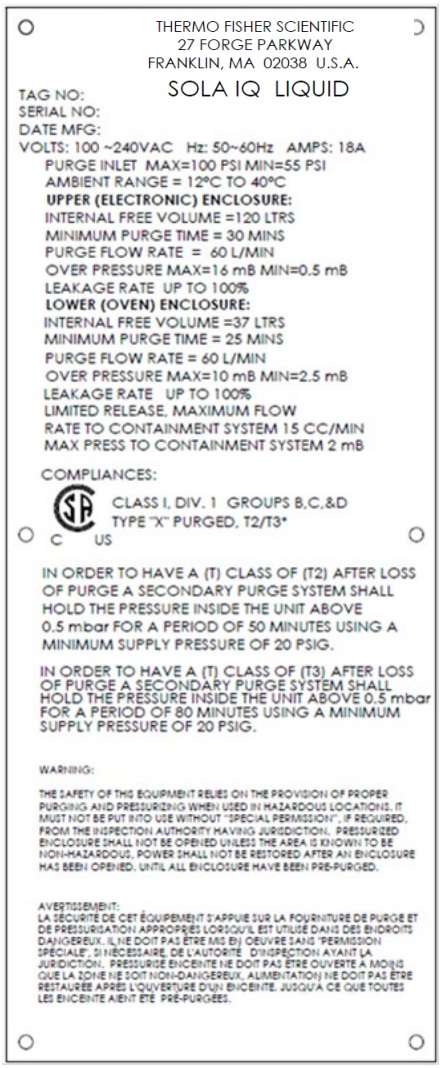


Figure D–5. 4-0755-104 CSA

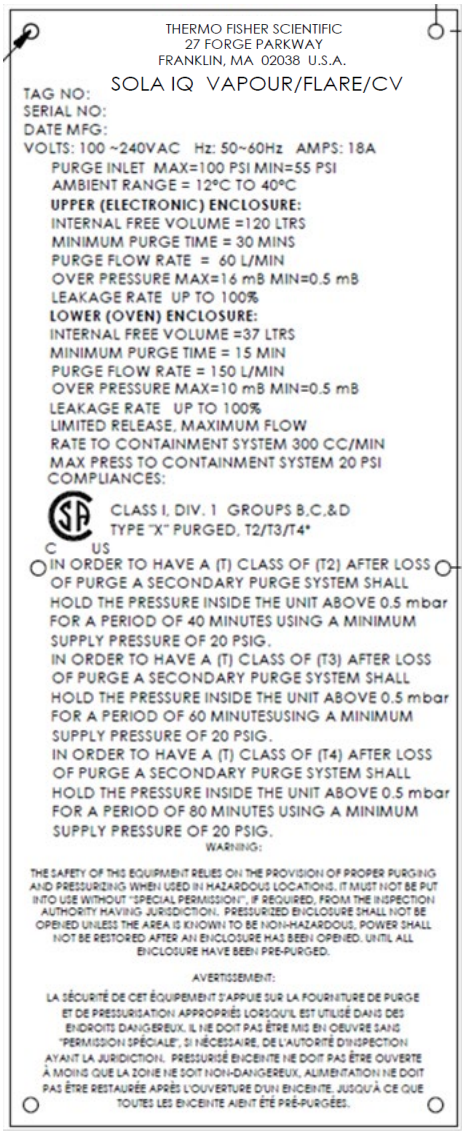


Figure D–6. 4-0755-105 CSA

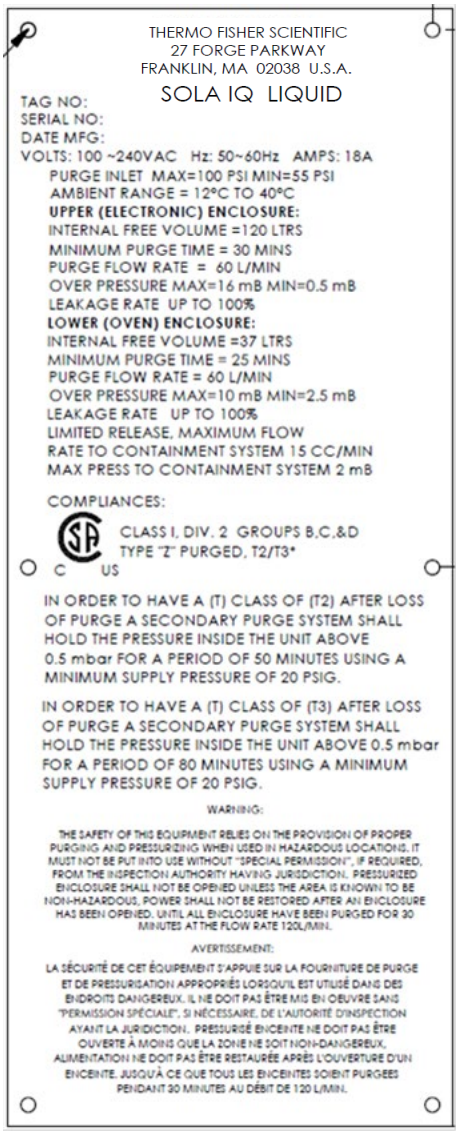


Figure D–7. 4-0755-112 CSA

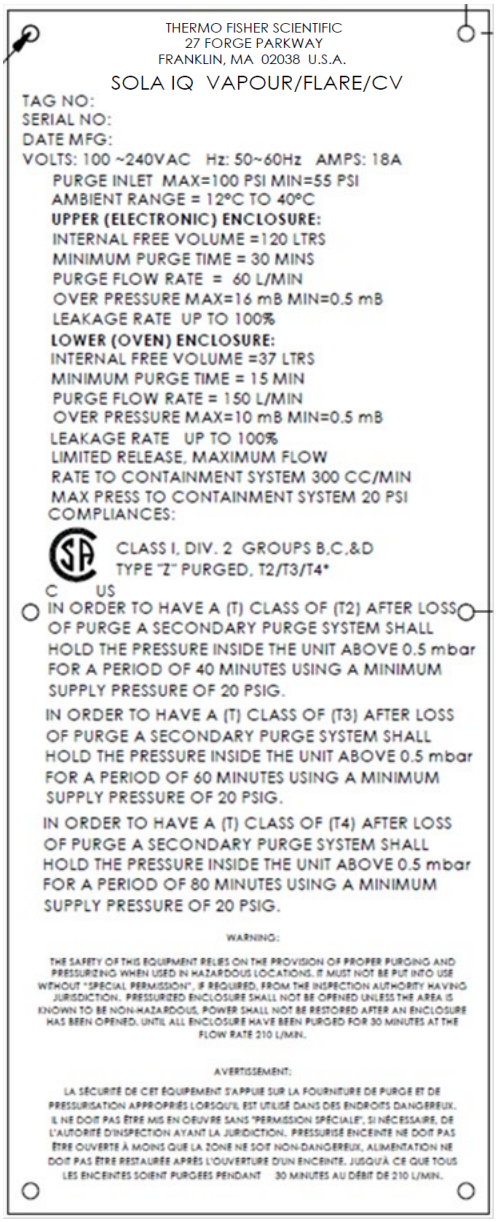


Figure D–8. 4-0755-113 CSA

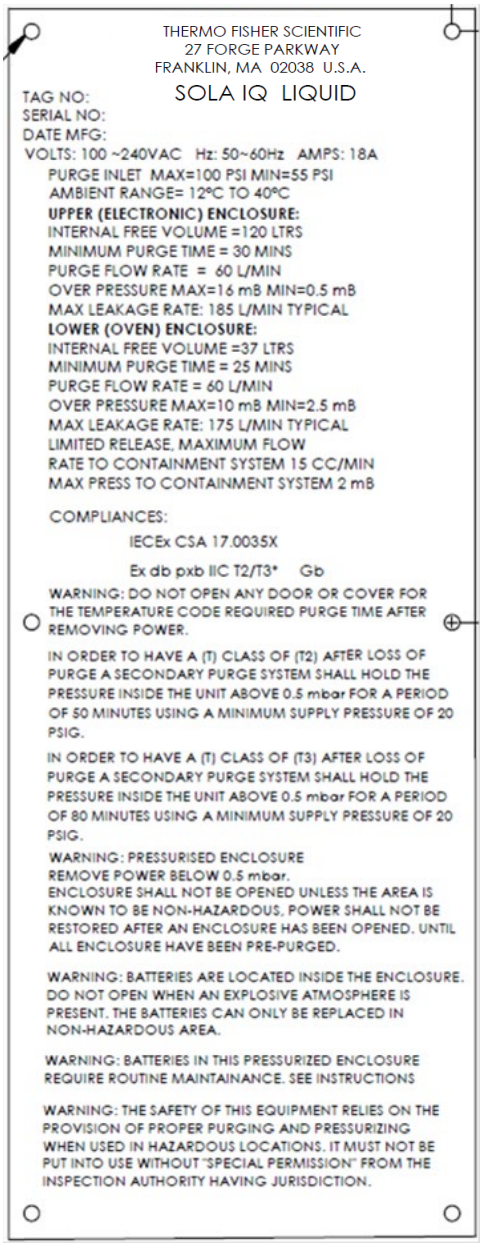


Figure D–9. 4-0755-106-IEC

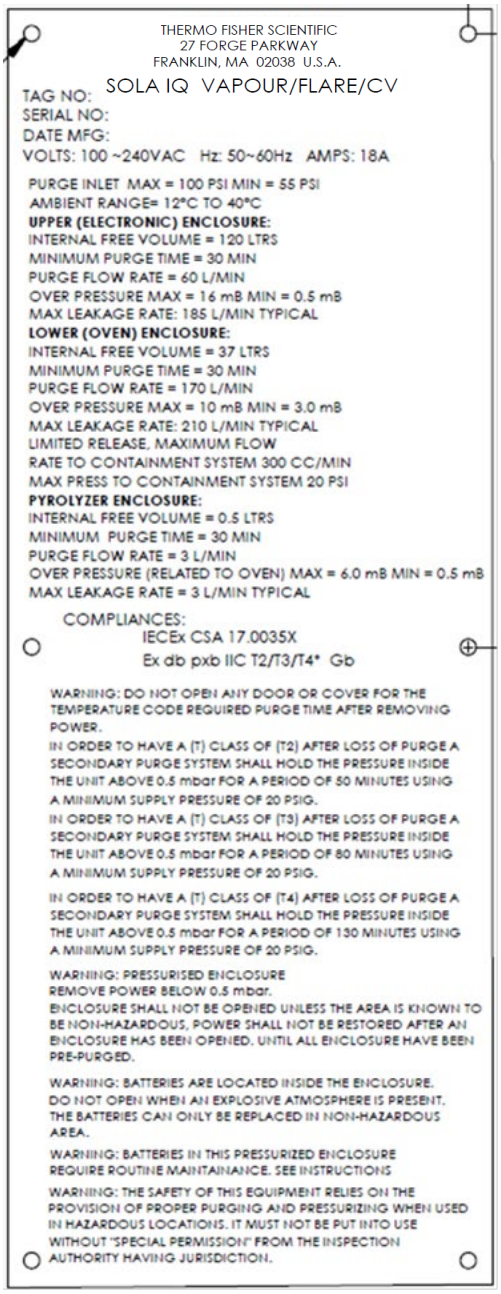


Figure D–10. 4-0755-107-IEC

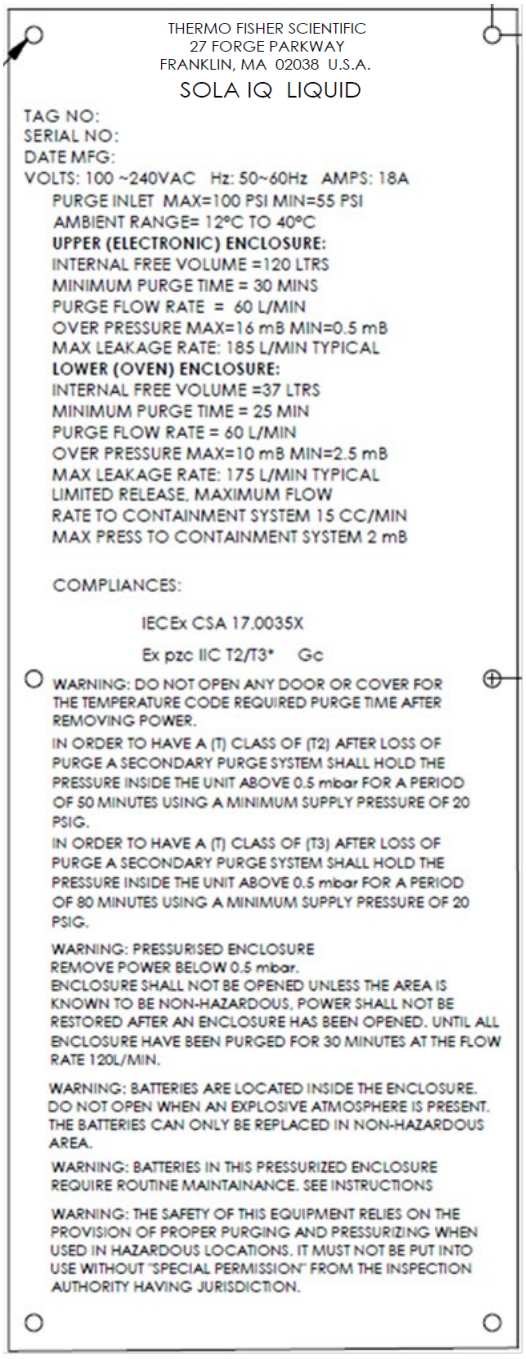


Figure D–11. 4-0755-114-IEC

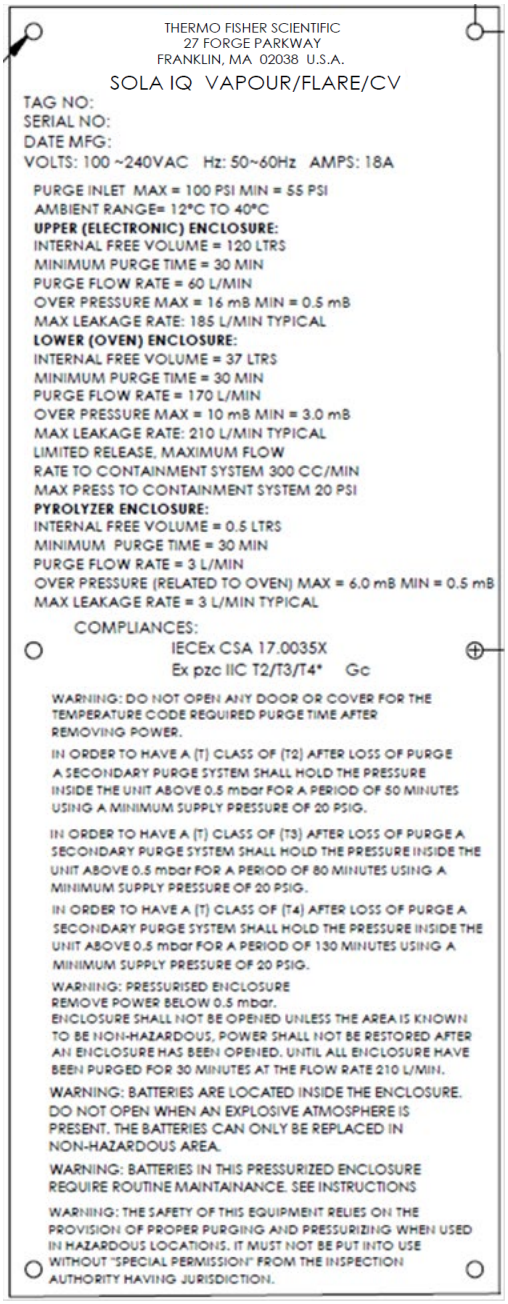


Figure D–12. 4-0755-115-IEC

For Installation Drawing details please refer to the latest version of drawings:

205-800-500-ATEX

205-800-500-CSA

205-800-500-IEC

For Installation/Dimensional Drawings please refer to the latest version of the below, configuration dependent drawings:

205-800-500-LS: SOLA iQ Liquid Single Stream Application.

205-800-500-LM: SOLA iQ Liquid Multi Stream Application.

205-800-500-VS: SOLA iQ Vapour Single Stream Application.

205-800-500-VM: SOLA iQ Vapour Multi Stream Application.

205-800-500-F: SOLA iQ Flare Application.

205-800-500-CVS: SOLA iQ Condensible Vapors Single Stream Application.

205-800-500-CVM: SOLA iQ Condensible Vapors Multi Stream Application.

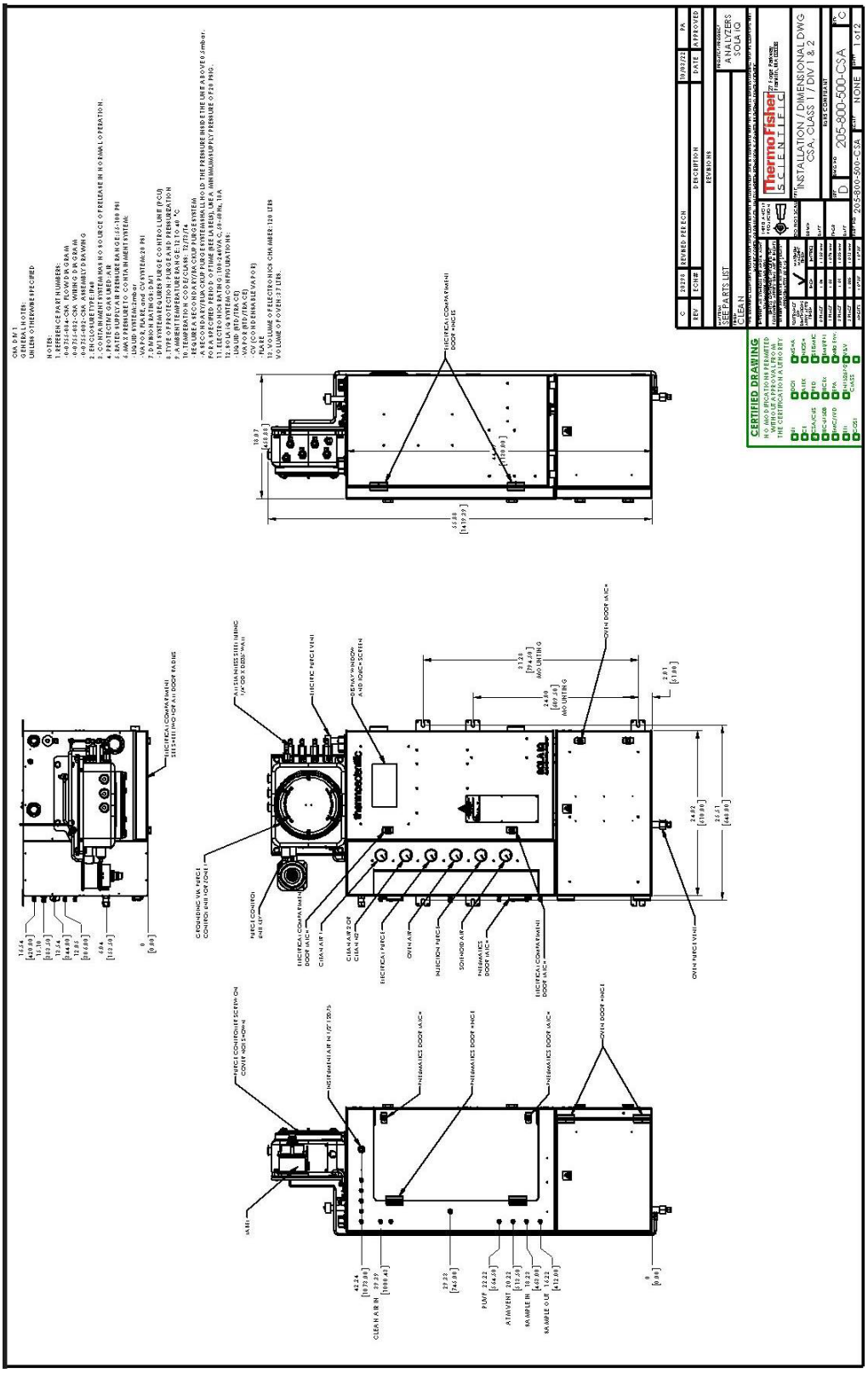


Figure D–13. Generic Installation/Dimensional Drawing

Appendix E
SOLA iQ PCU Wiring Diagram

For PCU wiring details please refer to the latest version of drawing 0-0755-083.

Appendix F
Japanese Certification – Specific Conditions of Use

- **Certificates CSAUK 19JPN020, CSAUK 19JPN021, CSAUK 19JPN045X and CSAUK 19JPN046X**

1. Maximum pressure at the sample inlet must not exceed the injection valve rating of 150 psig. The injection valve is located outside the purged enclosure and limits the pressure in the containment system to 2.0 mbar or less.

2. To minimize the risk of electrostatic charge, provisions shall be made for adequate grounding. Equipment shall be installed in such a manner so that accidental discharge shall not occur.

3. The air supply shall be fitted with two regulators in series, such that failure of one does not cause an excessive overpressure within the enclosures. Only 1 regulator is supplied. The user must install the other regulator. Refer to manual for the regulator selection instructions.

4. The temperature of the instrument air shall not exceed 40°C.

5. The purge monitoring system disconnects the system power and I/O signals if the minimum purge flow rate is not met.

   In order to maintain safe operating conditions the user must

   a. ensure the minimum purge time settings are applied

   b. provide an instrument air supply in the required pressure range during normal operation

   c. provide a backup air supply which is independent of the primary purge air supply, in the required pressure range and with the required capacity

   d. make provision to isolate connections into the purged enclosure in the event of a purge alarm.

6. Backup purge requires an independent supply from primary purge air supply.

7. The non-metallic film on the label and the coating are non-conducting and may generate an ignition-capable level of electrostatic discharge under certain extreme conditions. The user should ensure that the Equipment is not installed in a location where it may be subjected to external conditions (such as high-pressure steam) which might cause a build-up of electrostatic charges on non-conducting surfaces. Additionally, cleaning of the equipment should be done only with a damp cloth.

8. All enclosure entries shall be fitted with the supplied blanking plugs, adaptors and cable glands as per the installation instructions. Cables shall be effectively clamped to prevent pulling or twisting.

9. The cable connected to the flameproof Purge Control Unit shall:
   a. be at least 3 m in length unless its other end is terminated inside another flameproof enclosure or a flameproof cable gland employing sealing compound is used at the other end of the cable,
   b. be sheathed with thermoplastic, thermosetting or elastomeric material,
   c. be circular and compact,
   d. have extruded bedding or sheath
   e. have non-hygroscopic fillers, if any.

- **Certificates CSAUK 19JPN022, CSAUK 19JPN023, CSAUK 19JPN047X and CSAUK 19JPN048X**

1. Maximum pressure at the sample inlet must not exceed the injection valve rating of 150 psig. The injection valve is located outside the purged enclosure and limits the pressure in the containment system to 2.0 mbar or less.

2. To minimize the risk of electrostatic charge, provisions shall be made for adequate grounding. Equipment shall be installed in such a manner so that accidental discharge shall not occur.

3. The air supply shall be fitted with two regulators in series, such that failure of one does not cause an excessive overpressure within the enclosures. Only 1 regulator is supplied. The user must install the other regulator. Refer to manual for the regulator selection instructions.

4. The temperature of the instrument air shall not exceed 40°C.

5. When the purge system is inoperative the purge alarm is activated and a divert valve engages to stop sample from entering the containment system within the purged oven enclosure. The divert valve shall be maintained in an operative condition at all time.

6. The purge monitoring system generates an alarm if minimum purge flow rate is not met.

   In order to maintain safe operating conditions the user must

   a. ensure the minimum purge time settings are applied

   b. provide an instrument air supply in the required pressure range during normal operation

   c. provide a backup air supply which is independent of the primary purge air supply, in the required pressure range and with the required capacity

   d. make provision to isolate connections into the purged enclosure in the event of a purge alarm.

7. Backup purge requires an independent supply from primary purge air supply.

8. The non-metallic film on the label and the coating are non-conducting and may generate an ignition-capable level of electrostatic discharge under certain extreme conditions. The user should ensure that the Equipment is not installed in a location where it may be subjected to external conditions (such as high-pressure steam) which might cause a build-up of electrostatic charges on non-conducting surfaces. Additionally, cleaning of the equipment should be done only with a damp cloth.

9. All enclosure entries shall be fitted with the supplied blanking plugs, adaptors and cable glands as per the installation instructions.

Cable entry devices permitted to be mounted on SOLA iQ Liquid and SOLA iQ Trace Liquid

Cable gland, IT/IMQ/ExTR14.0004/02 (IECEx IMQ 14.0004X issue 2)				
Manufacturer	Type	Gland material	Assessment standards	Certification code
PEPPERL+FUCHS Gmbh	CG.NA.NPT3/4.* CG.NA.NPT1.* CG.NA.NPT1-1/2.* CG.EM.NPT3/4.* CG.EM.NPT1.* CG.EM.NPT1-1/2.* CG.CO.NPT3/4.* CG.CO.NPT1.* CG.CO.NPT1-1/2.*	Silicone	IEC 60079-0:2011 Ed.6 IEC 60079-1:2014-06 Ed.7 IEC 60079-31:2013 Ed.2 IEC 60079-7:2015 Ed.5	Ex db IIC Gb Ta = -60°C to +80°C Ex eb IIC Gb Ex tb IIIC Db Ta = -60°C to +140°C

Stopping plug, IT/CES/ExTR15.0009/01 (IECEx CES 15.0006X issue 1)				
Manufacturer	Type	Gasket material	Assessment standards	Certification code
PEPPERL+FUCHS Gmbh	SP.MD.NPT3/4.* SP.MD.NPT1.* SP.MD.NPT1-1/2.* SP.MA.NPT3/4.* SP.MA.NPT1.* SP.MA.NPT1-1/2.*	Silicone	IEC 60079-0:2011 Ed.6 IEC 60079-1:2014-06 Ed.7 IEC 60079-31:2013 Ed.2 IEC 60079-7:2015 Ed.5	Ex db IIC Gb Ex eb IIC Gb Ex tb IIIC Db Ta = -60°C to +130°C

Adaptor, IT/CES/ExTR15.0009/01 (IECEx CES 15.0006X issue 1)				
Manufacturer	Types	Gasket material	Assessment standards	Certification code
PEPPERL+FUCHS Gmbh	AD.NPT3/4.NPT1* AD .NPT3/4.NPT1-1/2* AD.NPT1.NPT3/4* AD.NPT1.NPT1-1/2*, AD.NPT1-1/2.NPT3/4* AD.NPT1-1/2.NPT1*	Silicone	IEC 60079-0:2011 Ed.6 IEC 60079-1:2014-06 Ed.7 IEC 60079-31:2013 Ed.2 IEC 60079-7:2015 Ed.5	Ex db IIC Gb Ex eb IIC Gb Ex tb IIIC Db Ta = -60°C to +130°C

Cable entry devices specific installation instructions

Cable gland (CG.NA and CG.EM)

Cable Glands, Metal,

for non-armored cables CG.NA.* for shielded EMC cables CG.EM.

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Edition: 02/2018

Instructions

Personnel

The personnel must be appropriately trained and qualified to carry out mounting, installation, commissioning, operation, maintenance, and dismounting of the device. The trained and qualified personnel must have read and understood the instruction manual.

Intended Use

The metal cable glands type CG.NA.* can be used indoor and outdoor in Zone 1, Zone 2, Zone 21 and Zone 22 hazardous areas. They are intended for use with non-armored elastomer and plastic insulated cables providing a combined flameproof seal and environmental seal on the cable outer sheath.

Type CG.EM.* are intended to be used with shielded cables where the shield will be connected to the inner shielding ring of the gland in order to provide the necessary EMC protection.

Mounting and Installation

Observe the installation instructions according to IEC/EN 60079-14.

If you intend to install the device or enclosure in areas that may be exposed to aggressive substances, ensure that the stated surface materials are compatible with these substances. If required, contact Pepperl+Fuchs for further information.

Close all unused cable glands with the appropriate sealing plugs.

Disassemble the parts of the cable gland.

Choose the optimal seal insert combination (S*) according to the cable diameter. Use the outer seal insert S1 (6) for cables with large diameter. Use a combination of up to 3 seal inserts (4) ... (6) for cables with smaller diameter.

Fit the seal insert combination into the gland body basis (3).

Install the gland body basis (3) in the entry of the enclosure.

Use washer gasket (1) and O-Ring (2) when appropriate.

Push the cap nut (7) onto the cable.

Push the cable through the seal inserts (4) ... (6).

Only with GG.EM.*: Place the shield inside the EMC spring insert (8). Cut off the excess parts of shield and cable sheath.

Tighten the cap nut (7) to the gland body basis (3).

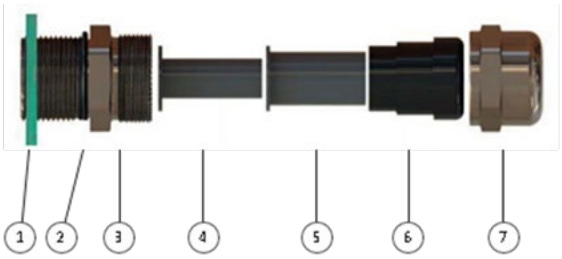
Tighten all screw threads with the appropriate torque.

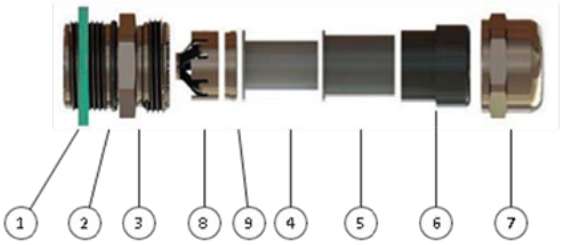
Operation, Maintenance, Repair

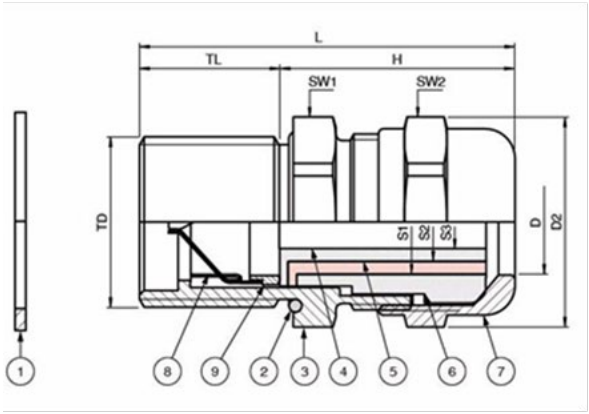
Observe IEC/EN 60079-17 for maintenance and inspection.

If there is a defect, always replace the device with an original device. Do not modify or manipulate the device.

Dimensions







Legend	
1	Washer gasket (accessory)
2	O-Ring
3	Gland body basis
4	Seal insert S3
5	Seal insert S2
6	Seal insert S1
7	Cap nut
8	EMC spring insert (CG.EM.* only)
9	Pressure ring (CG.EM.* only)
D	Clamping range, cable sheath diameter
D2	Width across corners
H	Length outside enclosure
L	Total length
S*	Clamping range, seal insert combinations
SW*	Width across flats
TD	Thread size
TL	Thread length

Technical Specifications

General	
Types	CG.NA CG.EM
Data for application in hazardous areas	
Type of protection	Ex d IIC Gb Ex e IIC Gb Ex tb IIIC Db
Zones of Installation	1, 21 (Gas), 2, 22 (Dust)
International approvals	
IECEx approval	IECEx IMQ 14.0004X
Ambient conditions	
Ambient temperature	Ex e and Ex td versions: silicone seal: -60 ... 140 °C (-76 ... 284 °F) Ex d versions: silicone seal: -60 ... 80 °C (-76 ... 176 °F)
Degree of Protection according to IEC/EN 60529	IP66 / IP68
Mechanical specifications	
Cable connection	
Cable type	non-armored cables
Clamping range	see data tables
Tightening torque	see data tables
Material	
Cable Gland	brass nickel-plated or AISI 316 (1.4401) stainless steel
Seal inserts	silicone
O-Ring	silicone
Standards	
Conformity	IEC/EN 60079-0:2012 IEC/EN 60079-1:2007 IEC/EN 60079-7:2007 IEC/EN 60079-31: 2009

Dimensions and Torques

(I)	(II)	(III)	(IV)				(V)				(VI)
	TD	D	L	TL	SW1	SW2	SW1	SW2 (S1+S2+S3)	SW2 (S1+S2)	SW2 (S1)	
CG.NA.NPT3/8.*.*.16.*	NPT 3/8"	4 ... 12	40	16	22	22	4	20	18	16	BP.NA.M16-M20S.PA
CG.NA.NPT1/2.*.*.16.*	NPT 1/2"	10 ... 16	45	16	28	28	6	25	22	18	BP.NA.M20-M25S.PA
CG.NA.NPT1/2S.*.*.16.*	NPT 1/2"	4 ... 12	40	16	22	22	5.5	20	18	16	BP.NA.M16-M20S.PA
CG.NA.NPT3/4.*.*.16.*	NPT 3/4"	14 ... 20	50	16	35	35	6	26	22	-	BP.NA.M25-M32S.PA
CG.NA.NPT3/4S.*.*.16.*	NPT 3/4"	10 ... 18	40	16	28	28	6	25	22	18	BP.NA.M20-M25S.PA
CG.NA.NPT1.*.*.20.*	NPT 1"	22 ... 26	53	20	45	45	6	45	40	-	BP.NA.M32-M40S.PA
CG.NA.NPT1S.*.*.20.*	NPT 1"	14 ... 24	43	20	35	35	6	28	23	20	BP.NA.M25-M32S.PA
CG.NA.NPT1-1/4.*.*.20.*	NPT 1-1/4"	26 ... 34	55	20	50	50	12	57	50	52	BP.NA.M40-M50S.PA
CG.NA.NPT1-1/4S.*.*.20.*	NPT 1-1/4"	22 ... 32	45	20	45	45	12	56	50	45	BP.NA.M32-M40S.PA
CG.NA.NPT1-1/2.*.*.20.*	NPT 1-1/2"	35 ... 41	63	20	64	64	18	190	155	-	BP.NA.M50-M63S.PA
CG.NA.NPT1-1/2S.*.*.20.*	NPT 1-1/2"	26 ... 35	46	20	55	50	18	57	55	52	BP.NA.M40-M50S.PA
CG.NA.NPT2S.*.*.20.*	NPT 2"	35 ... 45	53	20	68	64	25	190	155	140	BP.NA.M50-M63S.PA

(I) = Type, details see type code table

(II) = Thread, M* metric ISO pitch 1.5 mm, NPT* ANSI ASME B1.20.1
(III) = Clamping Range [mm], note various seal combinations

(IV) = Dimensions [mm], see drawings and legend

(V) = Nut torques [Nm], note various seal combinations

(VI) = Allocation sealing plugs to cable glands, BP* type code of sealing plugs For further information please see individual datasheets

(I)	(II)	(III)	(IV)				(V)				(VI)
	TD	D	L	TL	SW1	SW2	SW1	SW2 (S1+S2+S3)	SW2 (S1+S2)	SW2 (S1)	
CG.EM.NPT3/8.*.*.16.*	NPT 3/8"	4 ... 8	44.5	16	22	22	4	-	25	18	BP.NA.M16-M20S.PA
CG.EM.NPT1/2.*.*.16.*	NPT 1/2"	4 ... 12	44.5	18	22	22	5.5	20	18	16	BP.NA.M16-M20S.PA
CG.EM.NPT3/4.*.*.16.*	NPT 3/4"	10 ... 18	44.5	16	28	28	6	25	22	18	BP.NA.M20-M25S.PA
CG.EM.NPT1.*.*.20.*	NPT 1"	14 ... 24	44.5	20	35	35	6	28	23	20	BP.NA.M25-M32S.PA
CG.EM.NPT1-1/4.*.*.20.*	NPT 1-1/4"	22 ... 32	44.5	20	45	45	12	56	50	45	BP.NA.M32-M40S.PA
CG.EM.NPT1-1/2.*.*.20.*	NPT 1-1/2"	26 ... 35	44.5	20	55	50	18	57	55	52	BP.NA.M40-M50S.PA

Cable gland (CG.CO)

Cable Glands, Metal,for flexible conduits CG.CO.*

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Edition: 02/2018

Personnel

The personnel must be appropriately trained and qualified in order to carry out mounting, installation, commissioning, operation, maintenance, and dismounting of the device. The trained and qualified personnel must have read and understood the instruction manual.

Intended Use

The metal cable glands type CG.CO.* can be used indoor and outdoor in Zone 1, Zone 2, Zone 21 and Zone 22 hazardous areas. They are intended for use with non-armored cables which are protected in flexible metallic conduits.

Mounting and Installation

Observe the installation instructions according to IEC/EN 60079-14.

If you intend to install the device or enclosure in areas that may be exposed to aggressive substances, ensure that the stated surface materials are compatible with these substances. If required, contact Pepperl+Fuchs for further information.

Disassemble the parts of the cable gland.

Choose the optimal seal insert combination (S*) according to the cable diameter. Use the outer seal insert S1 (6) for cables with large diameter. Use a combination of up to 3 seal inserts (4) ... (6) for cables with smaller diameter.

Fit the seal insert combination into the gland body basis (3).

Install the gland body basis (3) in the entry of the enclosure.

Use washer gasket (1) and O-Ring (2) when appropriate.

Push the connection body (7) onto the cable. Push

the cable through the seal inserts (4) ... (6).

Tighten the connection body (7) to the gland body basis

(3). Tighten all screw threads with the appropriate torque.

Fix the flexible conduit to the conduit connection (8).

Operation, Maintenance, Repair

Observe IEC/EN 60079-17 for maintenance and inspection. If there is a defect, always replace the device with an original device. Do not modify or manipulate the device.

Dimensions

Legend	
1	Washer gasket (accessory)
2	O-Ring
3	Gland body basis
4	Seal insert S3
5	Seal insert S2
6	Seal insert S1
7	Connection body
8	Connection for flexible conduit
D	Clamping range, cable sheath diameter
D2	Width across corners
FC1	Flexible conduit, max. outer diameter
FC2	Flexible conduit, inner diameter ["]
FC3	Flexible conduit, corrugation size
H	Length outside enclosure
L	Total length
S*	Clamping range, seal insert combinations
SW*	Width across flats
TD	Thread size
TL	Thread length

Technical Specifications

General	
Types	CG.CO.
CE Number	0102
Data for application in hazardous areas	
EC-Type Examination Certificate	IMQ 14ATEX012X
Group, category	Ex d IIC Gb Ex e IIC Gb Ex tb IIIC Db
Zones of Installation	1, 21 (Gas), 2, 22 (Dust)
International approvals	
IECEx approval	IECEx IMQ 14.0004X

Ambient conditions	
Ambient temperature	Ex e and Ex td versions: silicone seal: -60 ... 140 °C (-76 ... 284 °F) Ex d versions: silicone seal: -60 ... 80 °C (-76 ... 176 °F)
Degree of Protection according to IEC/EN 60529	IP66 / IP68
Mechanical specifications	
Cable connection	
Cable type	non-armored cables in flexible metallic conduits
Clamping range	see data tables
Tightening torque	see data tables
Material	
Cable Gland	brass nickel-plated or AISI 316 (1.4401) stainless steel
Seal inserts	chloroprene / neoprene or silicone
O-Ring	silicone
Standards	
Conformity	IEC/EN 60079-0:2012 IEC/EN 60079-1:2007 IEC/EN 60079-7:2007 IEC/EN 60079-31: 2009

Dimensions and Torques

(I)	(II)	(III)	(IV)					(VI)			(V)			
	TD	D	L	TL	SW1	SW2	SW3	FC1	FC2	FC3	SW1	SW2 (S1+S2+S3)	SW2 (S1+S2)	SW2 (S1)
CG.CO.M16.*.*.16.*	M16	4 ... 12	50.9	16	22	24	24	22.2	0.5	4.5	4	20	18	16
CG.CO.M20.*.*.16.*	M20	4 ... 12	52.5	16	22	24	24	22.2	0.5	4.5	5.5	20	18	16
CG.CO.M25.*.*.16.*	M25	10 ... 18	56	16	28	29	29	27.5	0.75	4.5	6	25	22	18
CG.CO.M32.*.*.16.*	M32	14 ... 24	61	16	35	36	36	34.5	1	6	6	28	23	20
CG.CO.M40.*.*.18.*	M40	22 ... 32	70	18	45	45	45	43	1.25	6	12	56	50	45
CG.CO.M50.*.*.18.*	M50	26 ... 35	76	18	55	52	52	49.5	1.5	6	18	57	55	52
CG.CO.M63.*.*.18.*	M63	35 ... 45	74.5	18	68	65	65	62.5	2	6	25	190	155	140
CG.CO.M75.*.*.20.*	M75	46 ... 59	85.5	20	80	80	80	75	2.5	6.5	30	185	175	150

(I)	(II)	(III)	(IV)					(VI)			(V)			
	TD	D	L	TL	SW1	SW2	SW3	FC1	FC2	FC3	SW1	SW2 (S1+S2+S3)	SW2 (S1+S2)	SW2 (S1)
CG.CO.NPT3/8.*.*.16.*	NPT 3/8"	4 ... 12	56	16	22	24	24	22.2	0.5	4.5	3	20	18	16
CG.CO.NPT1/2.*.*.16.*	NPT 1/2"	4 ... 12	52.5	16	22	24	24	22.2	0.5	4.5	4	20	18	16
CG.CO.NPT3/4.*.*.16.*	NPT 3/4"	10 ... 18	56	16	28	29	29	27.5	0.75	4.5	5.5	25	22	18
CG.CO.NPT1.*.*.20.*	NPT 1"	14 ... 24	65	20	35	36	36	34.5	1	6	8	28	23	20
CG.CO.NPT1-1/4.*.*.20.*	NPT 1-1/4"	22 ... 32	72	20	45	45	45	43	1.25	6	9	56	50	45
CG.CO.NPT1-1/2.*.*.20.*	NPT 1-1/2"	26 ... 35	78	20	55	52	52	49.5	1.5	6	10	57	55	52
CG.CO.NPT2.*.*.20.*	NPT 2"	35 ... 45	76.5	20	68	65	65	62.5	2	6	16	190	155	140

(I) = Type, details see type code table
(II) = Thread, M* metric ISO pitch 1.5 mm, NPT* ANSI ASME B1.20.1
(III) = Clamping Range [mm], note various seal combinations
(IV) = Dimensions [mm], see drawings and legend
(V) = Nut torques [Nm], note various seal combinations
(VI) = Conduit connection [mm], FC2 ["], details see drawings and legend

Adapter

Adapters, Metal AD.*

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Edition: 01/2017

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Personnel

The personnel must be appropriately trained and qualified in order to carry out mounting, installation, commissioning, operation, maintenance, and dismounting of the device. The trained and qualified personnel must have read and understood the instruction manual.

Intended Use

The metal adapters type AD.* are suitable to adjust different thread types and sizes for connections to enclosures certified according to type of protection Ex d, Ex e or Ex tb

Mounting and Installation

Observe the installation instructions according to IEC/EN 60079-14.

If you intend to install the device or enclosure in areas that may be exposed to aggressive substances, ensure that the stated surface materials are compatible with these substances. If required, contact Pepperl+Fuchs for further information.

Install the adapter (3) in the entry of the enclosure.

Use washer gasket (1) and O-Ring (2) when appropriate.

Screw the second installation component into the adapter (3).

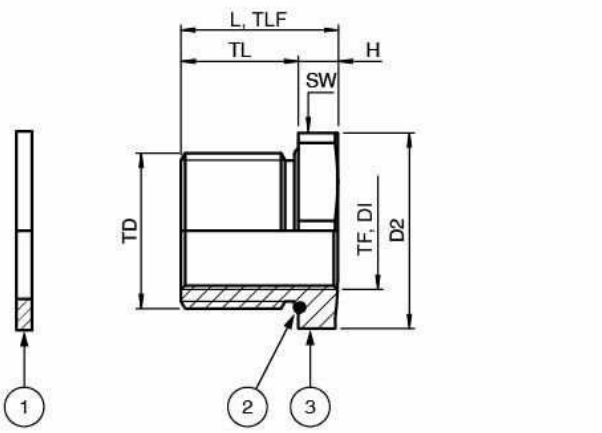
Tighten all screw threads with the appropriate torque.

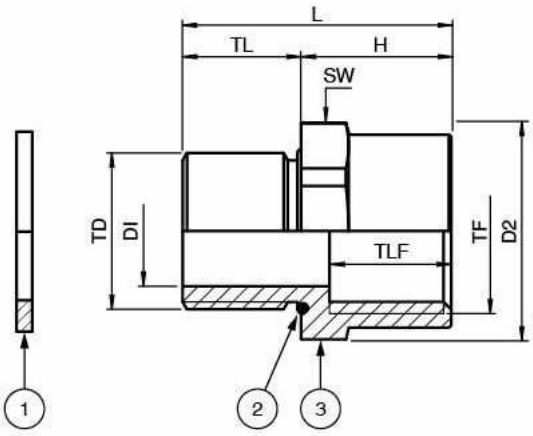
Operation, Maintenance, Repair

Observe IEC/EN 60079-17 for maintenance and inspection.

If there is a defect, always replace the device with an original device. Do not modify or manipulate the device.

Dimensions





Legend	
1	Washer gasket (accessory, metric versions only)
2	O-Ring (metric versions only)
3	Adapter
DI	Diameter thru-hole
D2	Width across corners
H	Length outside enclosure
L	Total length
SW*	Width across flats
TD	Thread size
TF	Thread size female
TL	Thread length
TLF	Thread length female

Technical Specifications

General	
Types	AD.
Data for application in hazardous areas	
Type of protection	Ex d IIC Gb Ex e IIC Gb Ex tb IIIC Db
Zones of Installation	1, 21 (Gas), 2, 22 (Dust)
International approvals	
IECEx approval	IECEx CES 15.0006X
Ambient conditions	
Ambient temperature	Ex e and Ex td versions: silicone seal: -60 ... 140 °C (-76 ... 284 °F) Ex d versions: silicone seal: -60 ... 80 °C (-76 ... 176 °F)
Degree of Protection according to IEC/EN 60529	IP66 / IP68
Mechanical specifications	
Material	
Adapter	brass nickel-plated or AISI 316 (1.4401) stainless steel
O-Ring	silicone
Standards	
Conformity	IEC/EN 60079-0:2012 IEC/EN 60079-1:2007 IEC/EN 60079-7:2007 IEC/EN 60079-31: 2009

Dimensions and Torques

(I)	(II)		(III)		(IV)			(V)
	TD	TL	TF	TLF	L	DI	SW	SW
AD.NPT1/2.M20.*.*.15.*	NPT 1/2"	15	M20	15	34	14.5	25	8
AD.NPT3/4.M20.*.*.15.*	NPT 3/4"	15	M20	19	19	(*)	30	9
AD.NPT3/4.M25.*.*.15.*	NPT 3/4"	15	M25	15	34	19	30	9
AD.NPT3/4.M32.*.*.15.*	NPT 3/4"	15	M32	15	34	19	36	9
AD.NPT1.M32.*.*.15.*	NPT 1"	15	M32	15	34	26	36	11
AD.NPT1.M40.*.*.15.*	NPT 1"	15	M40	15	37	26	45	11
AD.NPT1-1/4.M40.*.*.18.*	NPT 1-1/4"	18	M40	18	40	35	45	13
AD.NPT1-1/2.M50.*.*.18.*	NPT 1-1/2"	18	M50	18	40	40	55	15
AD.NPT2.M75.*.*.18.*	NPT 2"	18	M75	18	40.5	51	80	18

(I) = Type, details see type code table
(II) = Thread, male
M* metric ISO pitch 1.5 mm, NPT* ANSI ASME B1.20.1
(III) = Thread, female
M* metric ISO pitch 1.5 mm, NPT* ANSI ASME B1.20.1
(IV) = Dimensions [mm], see drawings and legend
(V) = Torques [Nm]

Stopping Plugs

Stopping Plugs, Metal SP.MA.* / SP.MD.*
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Personnel

The personnel must be appropriately trained and qualified in order to carry out mounting, installation, commissioning, operation, maintenance, and dismounting of the device. The trained and qualified personnel must have read and understood the instruction manual.

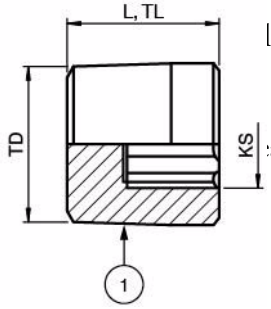
Intended Use

The metal stopping plugs type SP.M* are suitable for safely closing openings and holes for cable entries that are not used in enclosures certified according to type of protection Ex e or Ex tb as well as for Ex d.

Mounting and Installation

Observe the installation instructions according to IEC/EN 60079-14.

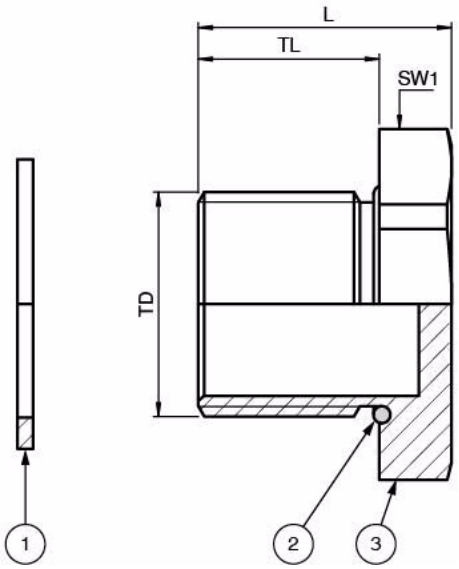
If you intend to install the device or enclosure in areas that may be exposed to aggressive substances, ensure that the stated surface materials are compatible with these substances. If required, contact Pepperl+Fuchs for further information.



lug in the entry of the enclosure. Use O-Ring (2) when appropriate.

ads with the appropriate torque.

Legend	SP.MA.*
1	Stopping plug
KS	Key size
L	Total length
TD	Thread size
TL	Thread length



Legend	SP.MD.*
1	Washer gasket (accessory, metric versions only)
2	O-Ring (metric versions only)
3	Stopping plug
L	Total length
SW*	Width across flats
TD	Thread size
TL	Thread length

Technical Specifications

General	
Types	SP.M
Data for application in hazardous areas	
Type of protection	Ex d IIC Gb Ex e IIC Gb Ex tb IIIC Db
Zones of Installation	1, 21 (Gas), 2, 22 (Dust)
International approvals	
IECEx approval	IECEx CES 15.0006X
Ambient conditions	
Ambient temperature	Ex e and Ex td versions: silicone seal: -60 ... 140 °C (-76 ... 284 °F) Ex d versions: silicone seal: -60 ... 80 °C (-76 ... 176 °F)
Degree of Protection according to IEC/EN 60529	IP66 / IP68

Mechanical specifications	
Material	
Stopping plug	brass nickel-plated or AISI 316 (1.4401) stainless steel
O-Ring	silicone
Standards	
Conformity	IEC/EN 60079-0:2012 IEC/EN 60079-1:2007 IEC/EN 60079-7:2007 IEC/EN 60079-31: 2009

Dimensions and Torques

(I)	(II)	(IV)			(V)
	TD	L	TL	KS	SW1
SP.MA.NPT3/8.*.*.15.*	NPT 3/8"	15	15	6	7
SP.MA.NPT1/2.*.*.20.*	NPT 1/2"	20	20	10	8
SP.MA.NPT3/4.*.*.20.*	NPT 3/4"	20	20	10	9
SP.MA.NPT1.*.*.25.*	NPT 1"	25	25	14	11
SP.MA.NPT1-1/4.*.*.25.*	NPT 1-1/4"	25	25	14	13
SP.MA.NPT1-1/2.*.*.25.*	NPT 1-1/2"	25	25	14	15
SP.MA.NPT2.*.*.25.*	NPT 2"	25	25	14	18

(I)	(II)	(IV)			(V)
	TD	L	TL	SW1	SW1
SP.MD.NPT3/8.*.*.16.*	NPT 3/8"	20	16	20	7
SP.MD.NPT1/2.*.*.18.*	NPT 1/2"	22	18	24	8
SP.MD.NPT3/4.*.*.18.*	NPT 3/4"	22	18	28	9
SP.MD.NPT1.*.*.21.*	NPT 1"	25	21	35	11
SP.MD.NPT1-1/4.*.*.21.*	NPT 1-1/4"	25	21	45	13
SP.MD.NPT1-1/2.*.*.21.*	NPT 1-1/2"	26	21	50	15
SP.MD.NPT2.*.*.21.*	NPT 2"	26	21	65	18

(I) = Type, details see type code table
(II) = Thread, M* metric ISO pitch 1.5 mm, NPT* ANSI ASME B1.20.1
(IV) = Dimensions [mm], see drawings and legend
(V) = Nut torques [Nm]

Appendix G
SOLA iQ I/O Board Analog Input Port Calibration

The analog input ports (AI) on the SOLA iQ I/O board need to be calibrated before first use. If the reported analog input value does not match the value from a calibrated meter, the following procedure may be used to repeat the analog input port calibration.

You will need the following:

SOLA iQ with functional I/O board.
Computer with AutoCONFIG software installed.
DC Power Supply that can be adjusted 0 through 5V or Current Loop Calibrator that can be adjusted 0 through 20 mA.
Calibrated Voltmeter or Milliamp Meter.
Connecting Wires or Clip Leads.

This procedure uses input Voltage as an example. Adjust the procedure accordingly if using input Current.

Connect the computer to the SOLA iQ AutoPILOT PRO board (connection may be direct serial or via Ethernet). Launch the AutoCONFIG program and connect to the AutoPILOT PRO.

Ensure that the SOLA iQ is offline or that reported values will be ignored during this procedure.

1. In AutoCONFIG, go to home screen -> User Configurable -> Programmable Screens -> SOLAIO_xx. The initial screen should look like the following figure (xx is shown as version 29 here but may be different in your unit):

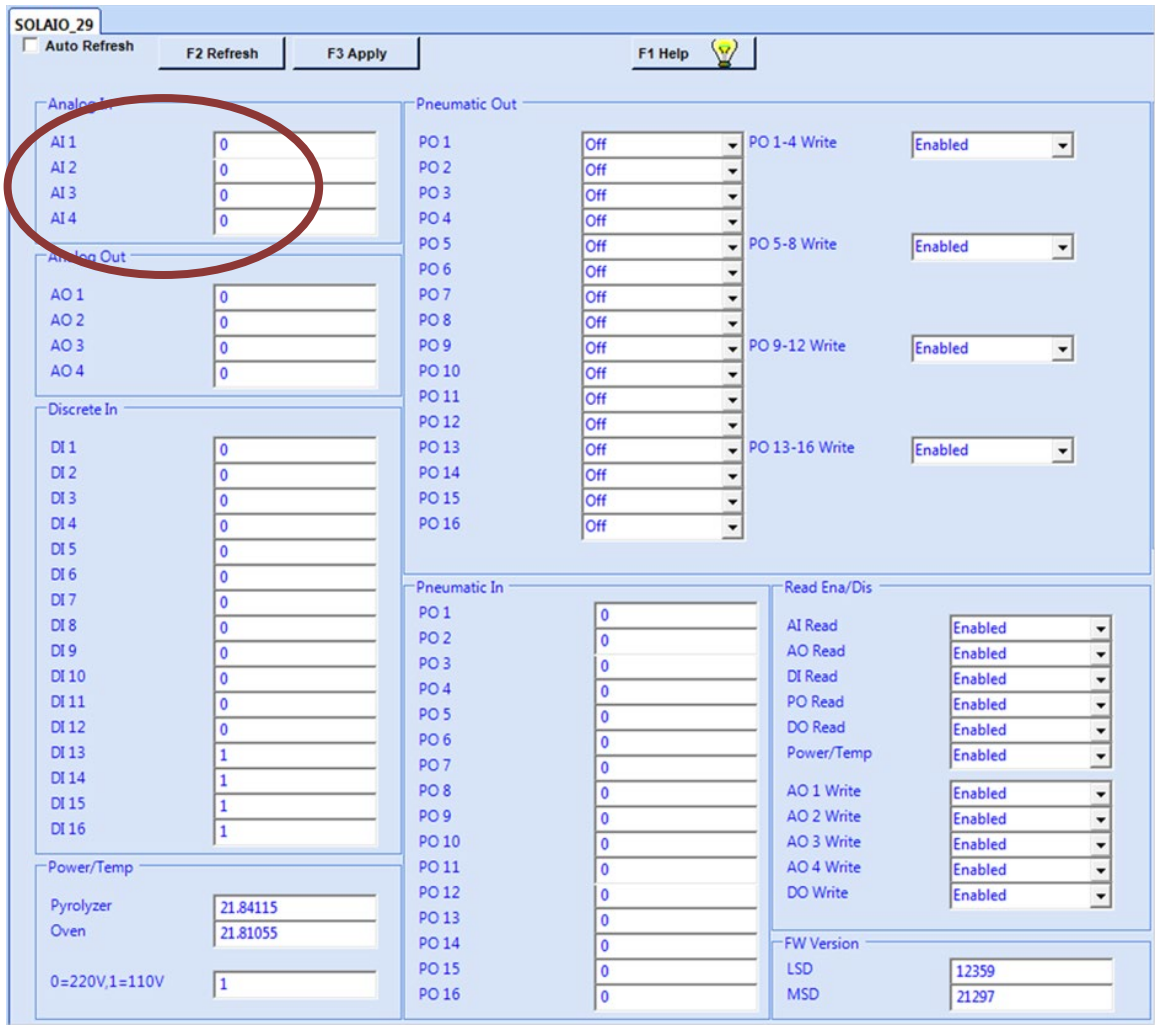


Figure G–1. I/O Input Screen in AutoCONFIG

2. Make note of the orientation and then carefully remove any wiring connected to J9 of the I/O board. Insulate or isolate the wires and secure out of the way.

3. Apply a voltage of 1V to J9 pins 1 and 2, with pin 2 as the ground. Refer to the next figure for an example of the wiring.

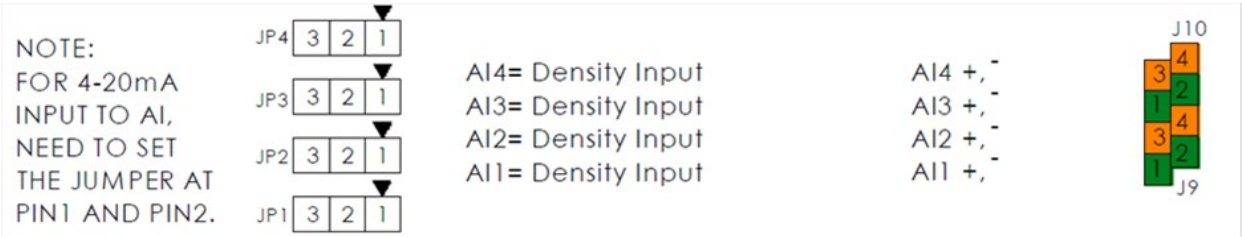


Figure G–2. A1 Test Wiring to J9

4. Observe the corresponding value in the AI 1 field of the SOLAIO_xx screen. You need to click F2 Refresh or enable Auto Refresh to see new values.

5. Copy the observed value to -> Physical Data Points -> Physical Smart XDucer Input -> AI1 Pt 17-1 Descr2 -> Calibration -> Cal. Pt #1 "Raw" Zero Value.

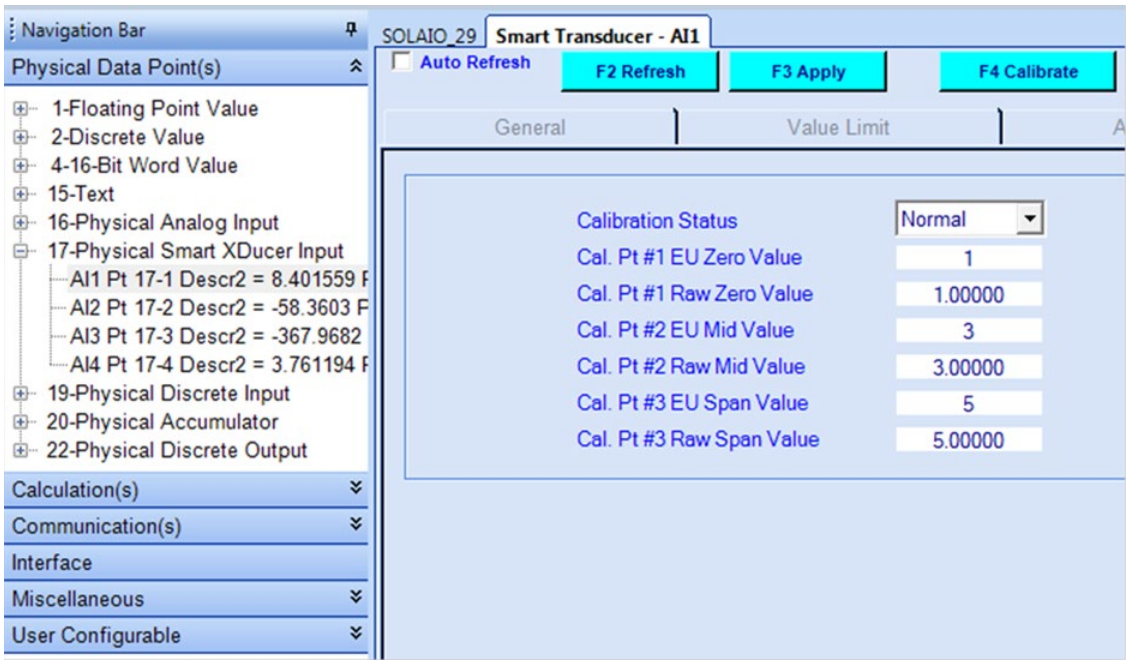


Figure G–3. Physical Smart XDucer Input Table

6. Enter the actual (calibrated value) in Cal. Pt #1 Zero Value.

7. Apply a voltage of 3V to J9 and observe the corresponding value in the AI 1 field.

8. Copy the observed value to -> Physical Data Points -> Physical Smart XDucer Input -> AI1 Pt 17-1 Descr2 -> Calibration -> Cal. Pt #2 "Raw" Mid Value.

9. Enter the actual (calibrated value) in Cal. Pt #2 Mid Value.

10. Apply a voltage of 5V to J9 and observe the corresponding value in the AI 1 field.

11. Copy the observed value to -> Physical Data Points -> Physical Smart XDucer Input -> AI1 Pt 17-1 Descr2 -> Calibration -> Cal. Pt #3 “Raw” Span Value.

12. Enter the actual (calibrated value) in Cal. Pt #3 Span Value.

13. Press F3 Apply and then F2 Refresh. The AI 1 port calibration process is completed.

14. Repeat the above steps for AI2, AI3 and AI4 at their respective terminals J9-3&4, J10-1&2 and J10-3&4 as desired.

Revision History

Revision Level	Date	Comments
A (Initial Release)	3-2018	ECO 9432
B	5-2018	ECO 9475
C	12-2018	ECO 9520
D	8-2019	ECO 9830
E	9-2020	ECO 9993
F	10-2021	ECN 10073
G	10-2022	ECN 20078
H	1-2023	ECN 20353

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