INSTALLATION AND COMMISSIONING GUIDE

Sensi+

GLA533-NG Gas Analyzer

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CHAPTER 1

Safety

This chapter provides an overview of the safety precautions that must be observed when installing and commissioning the instrument. For personnel and system safety, and to obtain optimum performance, read this guide **carefully and thoroughly** before installing, using, or maintaining the instrument.

If you do not fully understand the information contained in this guide, or if the instrument shows any signs of damage, contact ABB. See the back cover of this guide for contact information.

Symbol Definitions

This document uses the following symbols to bring attention to key technical and safety-related information.

DANGER—SERIOUS DAMAGE TO HEALTH/RISK TO LIFE

Indicates a hazardous situation that, if not avoided **will** result in death or serious injury.

When this symbol is encountered on the hardware, refer to the documentation for important safety information.

WARNING—DAMAGE TO HEALTH/RISK TO LIFE

Indicates a hazardous situation that, if not avoided **could** result in death or serious injury.

When this symbol is encountered on the hardware, refer to the documentation for important safety information.

CAUTION—DAMAGE TO HEALTH

Indicates a hazardous situation that, if not avoided, could result in **minor or moderate injury.**

NOTICE

Indicates information considered important, but not hazard related, that could impact things **other than personal injury,** like property damage.

WARNING—LASER RADIATION

Indicates the presence of a laser related hazard. It also indicates the type of laser in use, its wavelength and its safety class.

ELECTROSTATIC DISCHARGES

Indicates a device or part of a device that is susceptible to electrostatic discharges.

Identifies the terminal intended for connection to an external conductor for protection against electrical shock in case of a fault which shall be bonded to a protective earth electrode (ground).

Identifies earth conductor terminals.

Indicates the presence of direct current (DC).

Personnel Safety

WARNING

Failing to comply with any of the instructions, precautions or warnings contained in this guide is in direct violation of the standards of design, manufacture, and intended use of the instrument.

ABB assumes no liability for the user's failure to comply with any of these safety requirements, which may result in personal injuries and/or instrument damages.

- Do not, under any circumstances, remove warning and caution labels. Information must be available at all times for the security of the user.
- If the instrument is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.
- The instrument is intended for field installation by qualified service personnel according to the manufacturer's installation instructions and local/national wiring requirements.
- Operators must strictly observe all applicable national regulations with regard to installation, function tests, repairs, and maintenance of electrical devices.

Handling the Instrument

The instrument weighs 50 kg (110 lb). It is not designed to be installed by one person. At least two people should be installing the instrument.

To avoid personal injuries, make sure to follow the proper lifting and carrying precautions when handling the instrument.

General Lifting and Carrying Precautions

The use of proper methods for lifting and handling objects protects against injury and makes work easier. Over time, safe lifting technique should become a habit.

The following steps are essential to safe lifting and handling:

- Estimate the load and check overall conditions. Do not attempt to lift by yourself loads that appear to be too heavy or unwieldy.
- Make sure that there is enough room for movement, and that the footing is secure.
- Be careful with your balance. Feet should be shoulder width apart, with one foot behind the object that is to be lifted and the other just beside it.
- Bend your knees (do not stoop). Keep your back straight (not necessarily vertical) and tuck your chin (it helps straightening your back).
- Grip the load with the palm of your hands and your fingers.
- Push UP with your legs.
- Keep arms and elbows close to your body while lifting.
- Carry the load close to your body. Do not twist your body while carrying the load. To change direction, shift your foot position and turn your whole body.
- To lower the object, again, bend your knees (do not stoop).
- To deposit the load on a bench or shelf, place it on the edge and push it into position. Make sure that your hands and feet are clear when placing the load.

Electrical Safety

WARNING

The instrument is intended for field installation by qualified service personnel according to manufacturer's installation instructions and local/national wiring requirements. The electrical connection information in this guide must be observed. Otherwise, the application protection type may be affected. Ground the instrument according to requirements.

- The Sensi+ gas analyzer is a category I instrument.
- The Sensi+ gas analyzer uses voltages up to 10.5–30 VDC. There are no hazardous voltages present in the device.
- The Sensi+ is designed as a **PERMANENTLY CONNECTED INSTRUMENT.** The installation shall therefore plan for a means of disconnecting power to the instrument. This means of disconnecting the power:
  - must be included in the electrical installation;
  - must be suitably located and easily reachable;
  - must be marked as the disconnecting device for the equipment.
- Before opening any part of the analyzer, cut power at the instrument or the power source supplying it.
- In accordance with international safety standards, the monitoring system uses a protective earth (PE) that provides grounding for the monitor chassis.
  - Protective earthing connections (grounding) must always be active.
  - Ensure that the equipment, and any device connected to the analyzer, are properly grounded.
  - Make sure that the analyzer earth is at the same potential as the support's earth.
- To prevent contamination of the electronics by outside elements, the analyzer shall be opened only under controlled environmental conditions defined in the technical specifications in Appendix C on page C73

Improper Use

It is prohibited to use the instrument for any of the following including, but not limited to:

- A climbing aid, e.g., for mounting purposes.
- A support for external loads, e.g., as a support for pipes.
- By adding material, e.g., by painting over the name plate, or welding/soldering on parts.
- By removing material from the instrument, e.g., by drilling the housing.

Repairs, alterations, and enhancements, or the installation of replacement parts, are only permissible as far as these are described in this guide or allowed by standards, directives, and/or any applicable codes. Approval by ABB must be requested in writing for any activities beyond this scope. Repairs performed by ABB-authorized centers are excluded from this article.

Cybersecurity

This instrument is designed to be connected to, and communicate information and data via a network interface. It is the user's sole responsibility to provide, and continuously ensure, a secure connection between the product and the user's network or any other network (as the case may be).

Users shall establish and maintain any and all appropriate measures (such as, but not limited to, the installation of firewalls, the application of authentication measures, the encryption of data, the installation of anti-virus programs, etc.) to protect the product, the network, its system and the interface against any kind of security breaches, unauthorized accesses, interferences, intrusions, leakages and/or theft of data or information.

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http://new.abb.com/about/technology/cyber-security

Information about your product is also available on the product page:

https://bit.ly/3CHoNkE

Technical Limit Values

The instrument is designed for use exclusively within the values stated on the name plates and within the technical limit values specified on the data sheets.

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CHAPTER 2

Preparing for Installation

Installing a Sensi+ gas analyzer requires some planning. You need to plan the:

- physical location of the analyzer,
- power supply to the analyzer (connection location, etc.),
- gas connections (including gas sampling system, if required),
- necessary cables (see “Planning Your Cabling” on page 13),
- required tools.

Care should be taken to select a mounting location:

- where the gas analyzer will have sufficient clearance,
- where there is enough space to install an optional sampling system,
- that will allow for the gas analyzer screen to be positioned at eye level.

NOTICE

All information related to the actual configuration and troubleshooting of the Sensi+ gas analyzer can be found in the Sensi+ User Guide.

Also, operators of this gas analyzer should familiarize themselves with the content of the Sensi+ Product Safety Guide.

Siting the Gas Analyzer

This section indicates elements to take into consideration with regard to the location of the gas analyzer.

NOTICE

Sensi+ gas analyzers are designed to be wall-mounted.

Sensi+ gas analyzers are designed to be fitted on strut channels (a.k.a U channels). These strut channels are available from many manufacturers and should be chosen for their capacity to support the weight and weight distribution of a Sensi+ gas analyzer.

If installing a Sensi+ gas analyzer outside, make sure that the installation is not performed under the following meteorological conditions:

- In rain,
- In snow,
- In highly windy/dusty conditions,

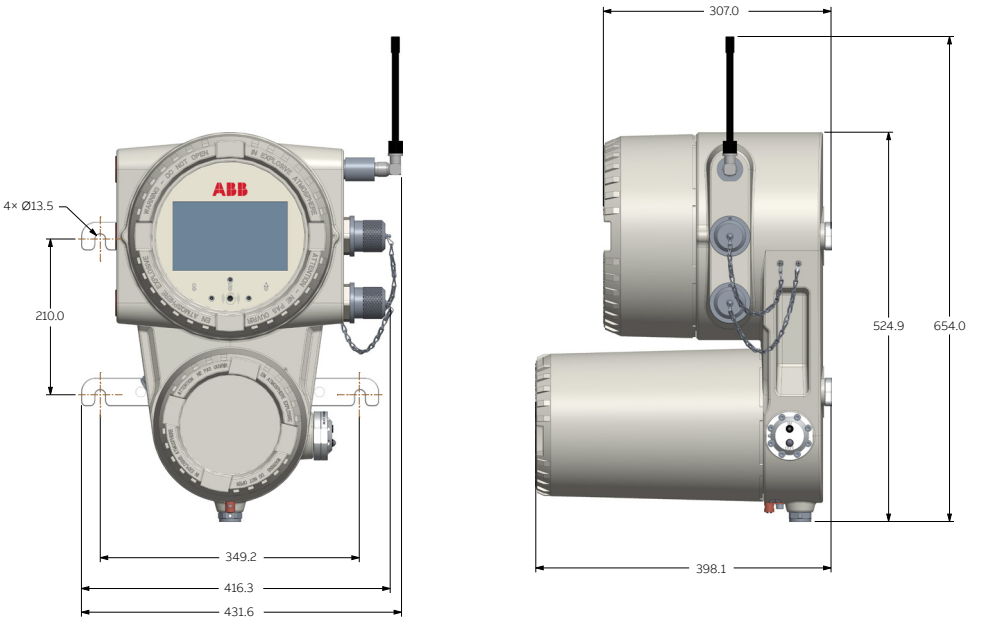
- At temperatures below 5 °C (41 °F) or above 40 °C (104 °F),
- If the relative humidity level is above 80% (at temperatures up to 31 °C [88 °F], and decreasing linearly to 50% at 40 °C [104 °F]).

Also, the gas analyzer must be fitted with a sun shield to protect it against solar radiation. The analyzer operating temperature range does not take into consideration additional impacts from solar radiation.

Clearance Requirements

Before installation, you need to make sure that you have enough room to install the gas analyzer. Below are the clearance requirements for the analyzer.

Figure 1 Sensi+ Gas Analyzer Dimensions (in millimeters)



NOTICE

There should be clearance to the left and right of the analyzer to facilitate connection to the various ports.

Moreover, if you are, or plan on, using a gas sampling system, ABB **strongly** recommends installing this system to the right of the analyzer and leaving additional clearance for this purpose.

For specific sampling system clearance requirements, refer to the sampling system documentation.

Planning Your Cabling

NOTICE

Always comply with national codes and electrical standards.

The Sensi+ gas analyzer is designed as a **PERMANENTLY CONNECTED INSTRUMENT.** The installation shall therefore plan for a means of disconnecting power to the instrument.

This means of disconnecting the power:

- must be included in the electrical installation;
- must be suitably located and easily reachable;
- must be marked as the disconnecting device for the equipment.

Select cabling according to your communication needs. Refer to the table below for recommended cable gauge or type (for more detailed information, see “Connector Definitions” on page A69).

Table 1 Recommended Cable Gauge and Type

Cable	Gauge/Type	Maximum length
Power	AWG #24 to AWG #14	N/A
Ground (earthing lug on enclosure)	AWG #10 or #6	N/A
Series (2×)	FOR FUTURE USE	
4–20 mA (4×)	AWG #24 to #14	N/A
Digital inputs (DI)(2×)	AWG #24 to #16	N/A
Digital outputs[1] (DO)(10×)	AWG #24 to #14	N/A
Ethernet (all internal and external connections)	Category 5 cable	100 m (328 ft)
USB (service port)	USB key only	N/A

1 Digital outputs are solid-state relays. Their default state is open. To ensure proper and failsafe operation, you must take this into consideration in the logic and wiring for the cabling of the external devices that they control. For more information, see “Digital Output Logic and Wiring” on page B71.

Planning Your Communications

The Sensi+ gas analyzer supports the Modbus TCP digital protocol.

MODBUS PROTOCOL DISCLAIMER

The Modbus® protocol is an unsecured protocol and, as such, the intended application of this system should be assessed to ensure that these protocols are suitable before implementation. To prevent any unauthorized accesses, always ensure that physical access to the analyzer and network are properly secured. For cyber-security reasons, ABB decided not to password protect the Modbus communication protocol in Sensi+ series analyzers.

The GLA533 requires access to the following TCP ports on the intranet:

- Modbus 502
- HTTPS Web Service 443

Table 2 below shows the various ports and their default settings. Most of these values can be modified from the Web remote interface at address **https://10.0.0.1**.

Table 2 Summary of Communication Parameters

Port	Default communication setup	Setting options from web page	Open ports
COM1 **COM2** **Only provisioned for future use**			
Ethernet 1 (CLIENT)[1] (DCS/SCADA)	• DHCP Client • Receives IP address from network DHCP server	• DHCP Client • Static IP address (set from WRI/ configuration)	• **Web https port** 443/tcp • **Modbus TCP port** 502/tcp
Ethernet 2 (SERVICE)[1] (Service / auxiliary port)	**Default static IP address:** https://10.0.0.1 (mask 255.255.255.0)	Cannot be modified	• **Web https port** 443/tcp
Wi-Fi (WPA2 only) (Service port) (optional)	• DHCP server (provides an IP address to the connected device) • **SSID:** GLA533_CPU#SerialNumber • No password by default • https://10.0.1.1 (mask 255.255.255.0)	• Can be modified from the WRI, (e.g., country frequency and power) • Customer-defined password	• **Web https port** 443/tcp
USB (software update and data download)	USB (A) 3.0 (supports USB 2.0)	N.A.	N.A.

1 ABB **strongly** suggests that Ethernet connections have a bandwidth of 800 kb/s to ensure adequate operating performance.

Gathering Installation Tools

Once you have finished planning your installation, you need to assemble a set of all the equipment necessary to perform the installation.

Recommended Tools and Equipment (Not Provided)

- 3 × 1 in NPT- (or M32-) compliant plugs (with associated tools)
- 2.5 mm hexagonal wrench
- Adjustable wrench
- Regular and extra-small (~2.5 mm) flat head screwdrivers
- Voltmeter
- Wire stripper and wire cutter
- Laptop with a web browser (for commissioning purposes) (the latest version of Chrome, Firefox, Microsoft Edge and Safari is recommended)
- Straight RJ45 Ethernet cable (for commissioning purposes)

Personal Protection Equipment

- Hard hat
- Safety shoes
- Gloves
- Protective glasses

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CHAPTER 3

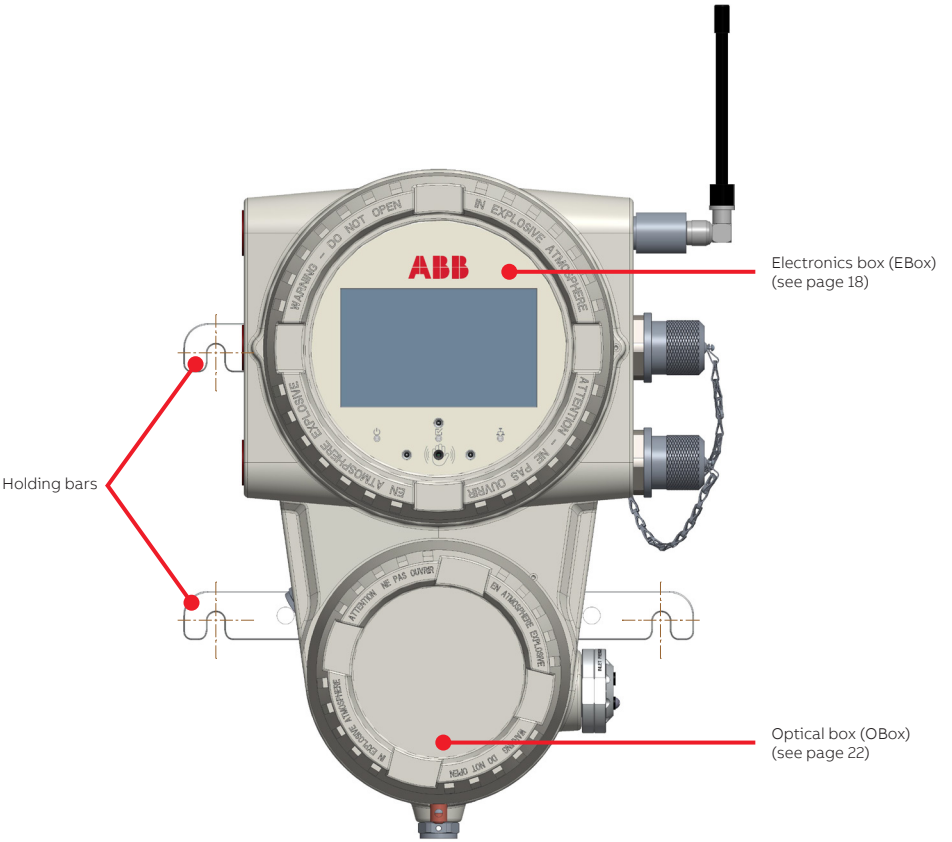
Introducing Sensi+ Series Gas Analyzers

Sensi+ Series gas analyzers continuously monitor levels of contaminants in natural gas streams, report values and store data.

The Sensi+ gas analyzer is a fully functional OA-ICOS laser-based spectrometer for post–processing- and pipeline-quality natural gas. It is designed to analyze natural gas streams devoid of both hydrocarbon liquids and liquid water.

Real-time monitoring of H_2S, CO_2 and H_2O levels allows triggering of threshold alarms to redirect contaminated streams that would otherwise compromise safety and operational yield.

Figure 2 Overview of the Sensi+ Gas Analyzer



Electronics Box (EBox)

The EBox is the analyzer upper housing. It contains mainly the core electronics module (including external connection interfaces) and the graphical user interface (GUI) module.

Figure 3 Overview of the Sensi+ Gas Analyzer Electronics Box (closed)

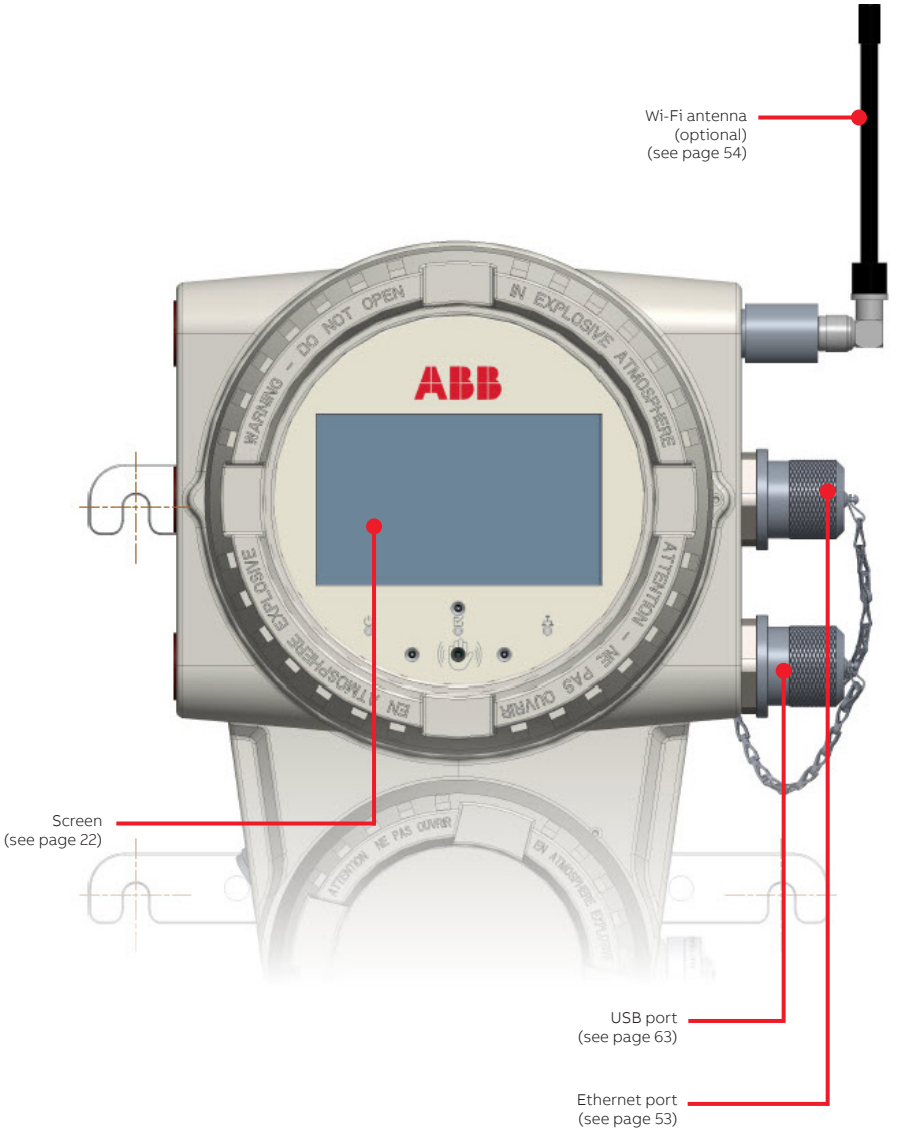
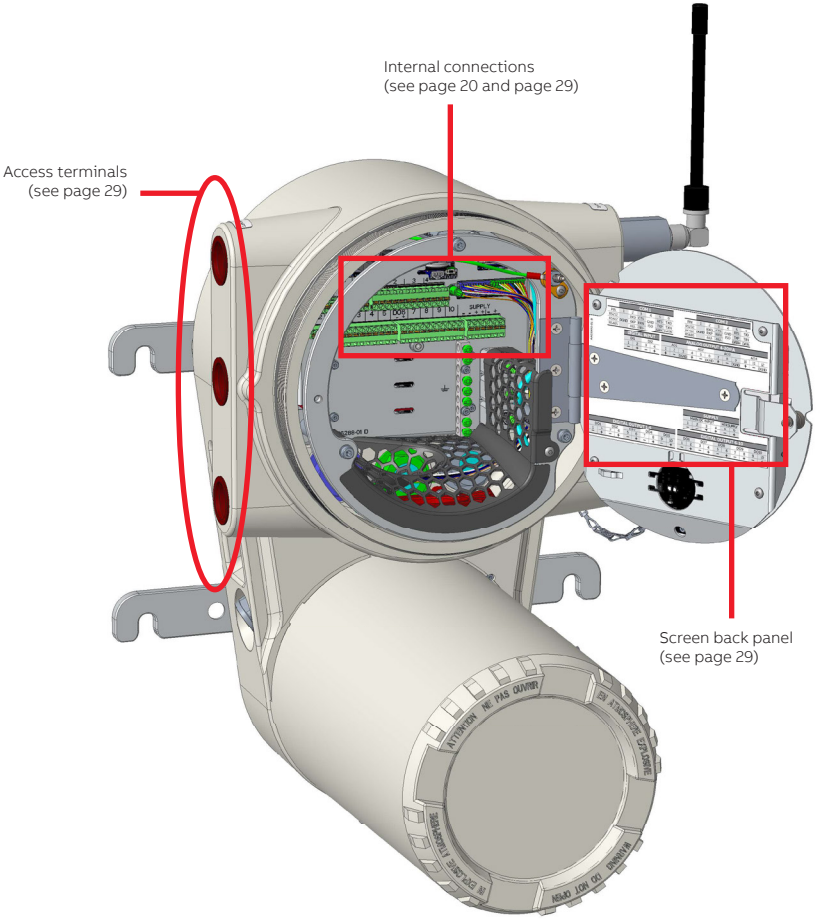


Figure 4 Overview of the Sensi+ Gas Analyzer Electronics Box (opened)



Screen

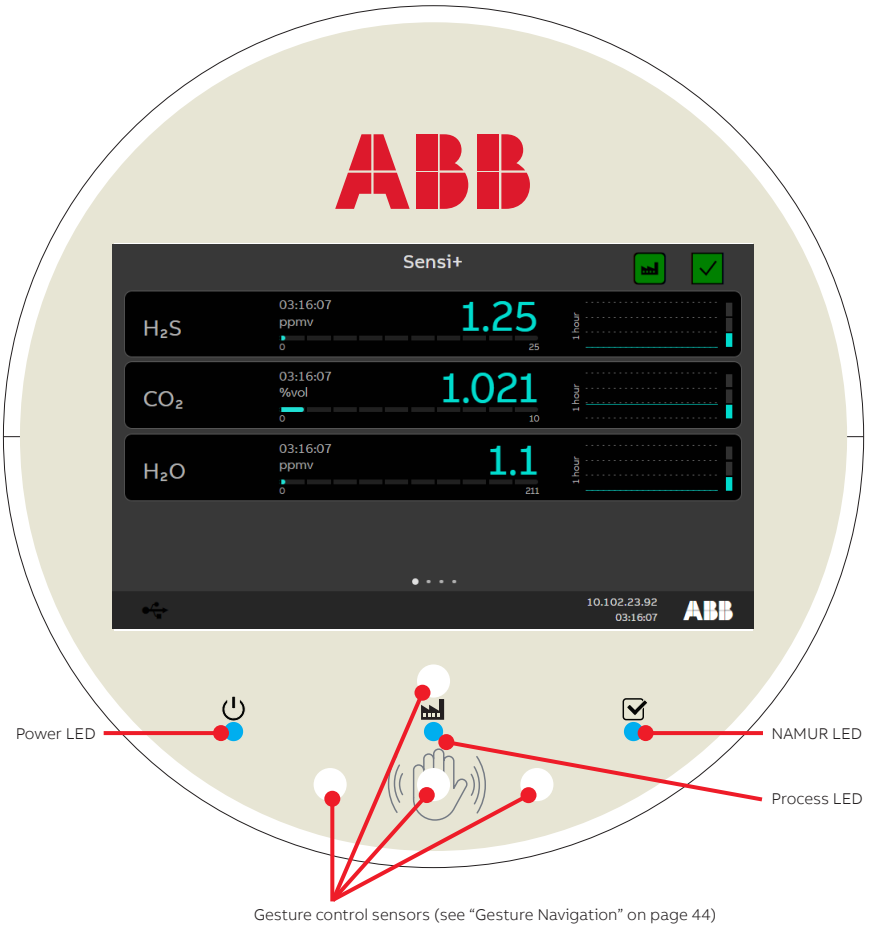
The 7-inch analyzer screen allows you to monitor values and events on site.

The graphical user interface (GUI) module is comprised of a screen and an electronics module. It also incorporates gesture control sensors that allow you to navigate through various information panels (instrument readings, configuration, statuses, etc.)

The various information panels are introduced in more details in “Introducing the Sensi+ Graphical User Interface” on page 43.

Three LEDs are also present below the screen. The behavior of these LEDs is explained in “Maintenance and Troubleshooting” on page 61.

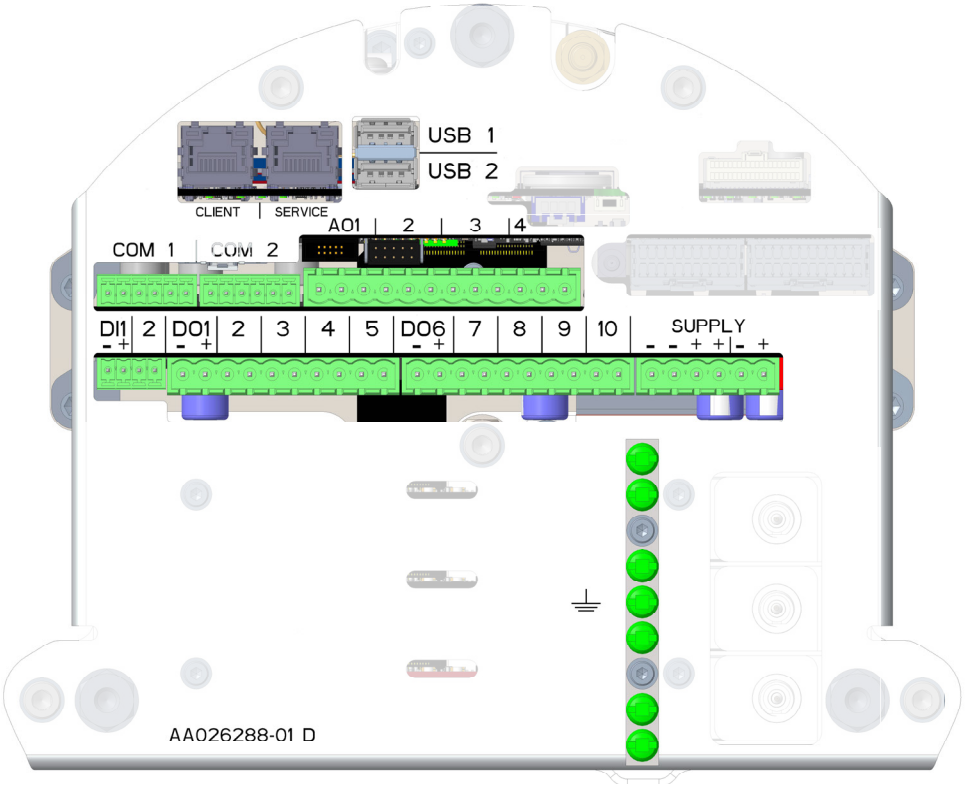
Figure 5 Sensi+ Gas Analyzer Screen (Measurements page displayed)



Internal Terminals

The purpose of each of these terminals is explained in more details in “Connecting Sensi+” on page 27.

Figure 6 EBox Internal Terminals

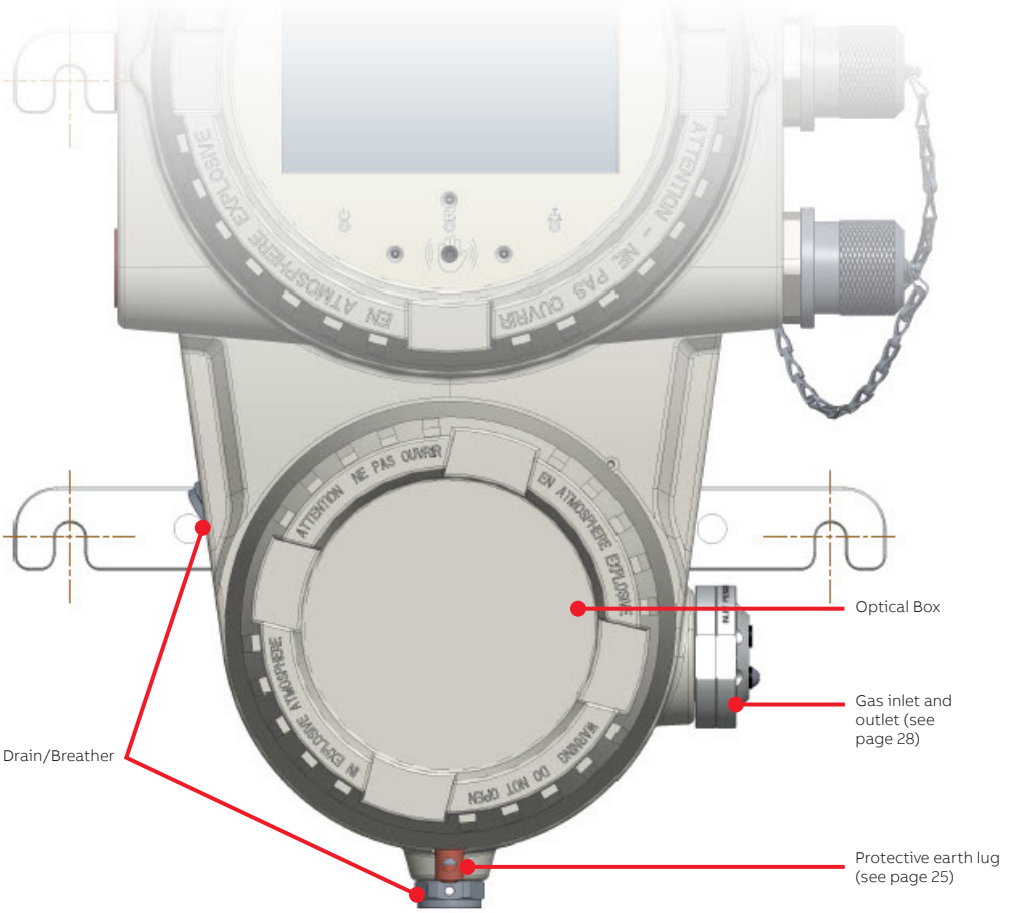


Optical Box (OptoBox)

The OptoBox is the analyzer lower housing. It contains mainly the gas inlet and outlet interface, the wetted path assembly module (WPA; module where gas samples are routed for analysis), and the optical combiner module.

The OptoBox should not normally be opened but for maintenance reasons.

Figure 7 Overview of the Sensi+ Gas Analyzer Optical Box (closed)



CHAPTER 4

Installing Sensi+

Once your installation plan is complete and you have gathered all the necessary tools, you can install the gas analyzer.

NOTICE

The following procedures are recommendations based on best practices, but final decisions as to the best method of installing the gas analyzer belong to the technical person in charge on site.

Precautions

WARNING

Installing the Sensi+ gas analyzer requires a team of at least two.

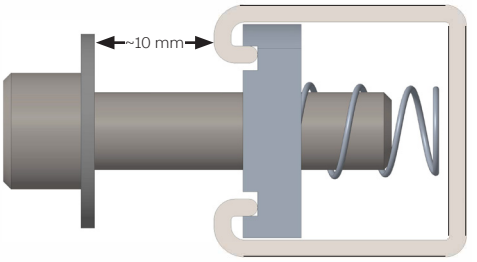
The gas analyzer weighs over 50 kg (110 lb). It could cause serious injuries or even death if it were to tip over and/or fall on someone.

Proceeding With the Installation

To install the Sensi+ gas analyzer at the installation site, where proper strut channel installation structures are in place:

1 Position the bolts destined to receive the gas analyzer 349.2 mm apart (see “Clearance Requirements” on page 12) while leaving a gap of approximately 10 mm (0.5 in) between the strut channel and the bolt head.

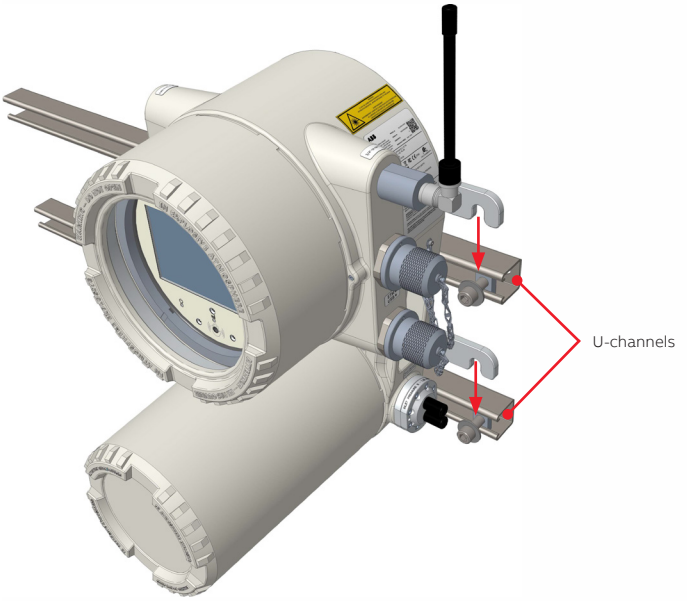
Figure 8 Gap for Holding Bars



2 Make sure that ALL covers on the gas analyzer are properly secured.

3 With the help of your colleague, lift the gas analyzer and place the gas analyzer holding bars (see Figure 1 on page 12) in the gaps between the appropriate bolts.

Figure 9 Placing the Analyzer on the U-channel



4 Tighten the bolts to secure the gas analyzer.

Earthing the Analyzer

WARNING

To ensure personnel protection, to protect against surges and to prevent explosions in potentially explosive environments, **the use of a protective grounding connection is mandatory.**

NOTICE

ONLY qualified personnel may perform the electrical installation of the gas analyzer.

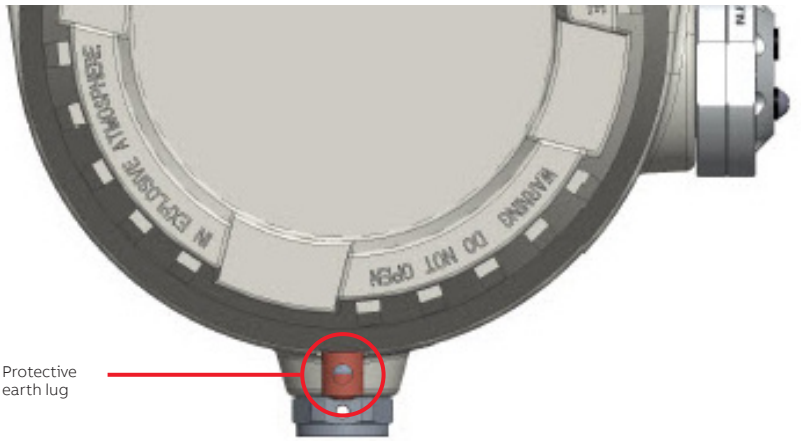
You must earth the Sensi+ gas analyzer once it has been properly secured to a strut channel structure. Before you do so, make sure that:

- the equipment, and any device connected to the gas analyzer, are properly grounded.
- protective earthing connections (grounding) are active at all times.

To earth the analyzer:

1. Attach one end of the earthing wire to an earthing rod in the ground in the vicinity of the gas analyzer (for earthing wire gauge, see Table 1 on page 13).
2. Attach the other end of the earthing wire to the gas analyzer protective earth lug located at the bottom of the analyzer (see Figure 10 on page 25).

Figure 10 Analyzer Protective Earth Lug



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CHAPTER 5

Connecting Sensi+

Once the Sensi+ gas analyzer is properly installed, you need to connect the proper gas lines, communication links, and power supply to the instrument.

The communication links (analog output, digital input and output) are configured at the factory and this detailed configuration is provided in the upcoming section and in the Sensi+ User Guide.

WARNING

Failing to comply with any of the instructions, precautions or warnings contained herein is in direct violation of the standards of design, manufacture, and intended use of the instrument.

ABB assumes no liability for user failure to comply with any of these safety requirements, which may result in personal injuries and/or instrument damages.

Safety

ONLY qualified personnel may perform the electrical installation of the Sensi+ gas analyzer.

- The Sensi+ gas analyzer is an overvoltage category I instrument.
- Operators must strictly observe all applicable national regulations with regard to installation, function tests, repairs, and maintenance of electrical devices.

WARNING

The instrument is intended for field installation by qualified service personnel according to manufacturer's installation instructions and local/national wiring requirements.
The electrical connection information in this guide must be observed. Otherwise, the application protection type may be affected. Ground the instrument according to requirements.

- Before opening any part of the analyzer, cut power at the instrument or at the power source supplying it.

WARNING

USB and Ethernet port covers should only be opened when the working area is deemed safe and non-hazardous. Port covers should remain closed if the area is not actively monitored for explosive atmosphere.

- The Sensi+ gas analyzer is designed as a **PERMANENTLY CONNECTED INSTRUMENT.** The installation shall therefore plan for a means of disconnecting power to the instrument. This means of disconnecting the power:
  - must be included in the electrical installation;
  - must be suitably located and easily reachable;
  - must be marked as the disconnecting device for the equipment.
- In accordance with international safety standards, the monitoring system uses a protective earth (PE) that provides grounding for the monitor chassis.
  - Protective earthing connections (grounding) must always be active.
  - Make sure that the equipment, and any device connected to the analyzer, are properly grounded.
  - Make sure that the analyzer earth is at the same potential as the support's earth.
- To prevent contamination of the electronics by outside elements, the analyzer shall be opened only under controlled environmental conditions defined in the technical specifications in Appendix C on page C73.

Connecting Gas Lines

NOTICE

Always ensure that the outlet line is vented to atmosphere.

The installation must allow free flow and no backpressure at the instrument outlet.

The gas inlet is designed to work at pressures between 5 and 7.25 psig.

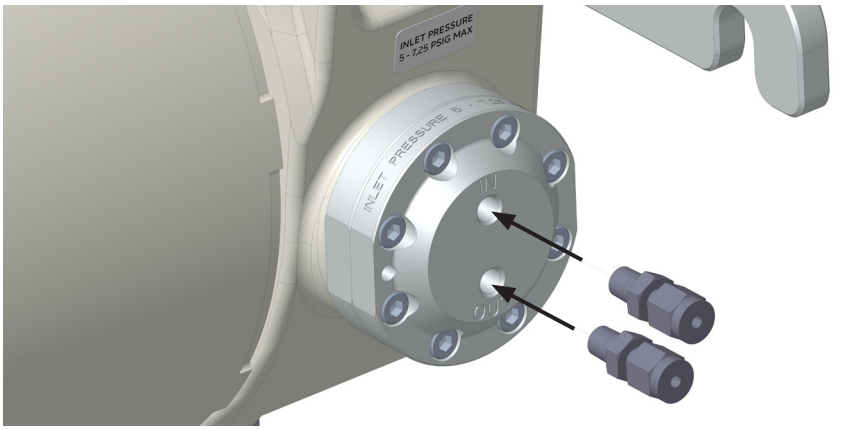
The gas inlet and outlet are permanently connected to ⅛-inch gas lines via NPT-type fittings.

To connect the gas lines with NPT fittings:

1 Remove the NPT plug located in the outlet port, making sure not to unscrew the NPT connection located behind.

2 Insert the NPT fitting and tighten it according to NPT guidelines.

Figure 11 Inserting the NPT Fittings



3 Repeat this procedure for the inlet port.

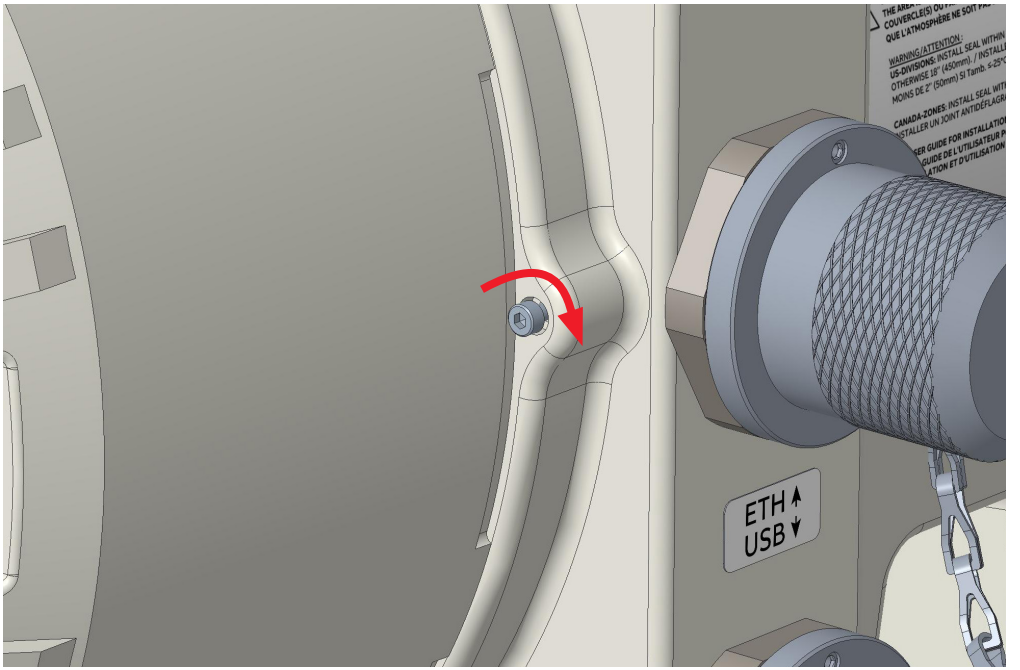
Accessing Internal Terminals

To access the Sensi+ internal terminals, you need to remove the EBox front cover and at least one of the side access port covers (see Figure 4 on page 19).

To remove the EBox front cover:

1 Locate the M3 hexagonal locking screw on the right-hand side of the EBox and turn it clockwise to screw it into the housing.

Figure 12 Screwing in the M3 Locking Screw



2 Once the locking screw is screwed in deep enough, hold the EBox cover firmly and turn it counterclockwise until it comes off (see Figure 13 on page 30).

CAUTION

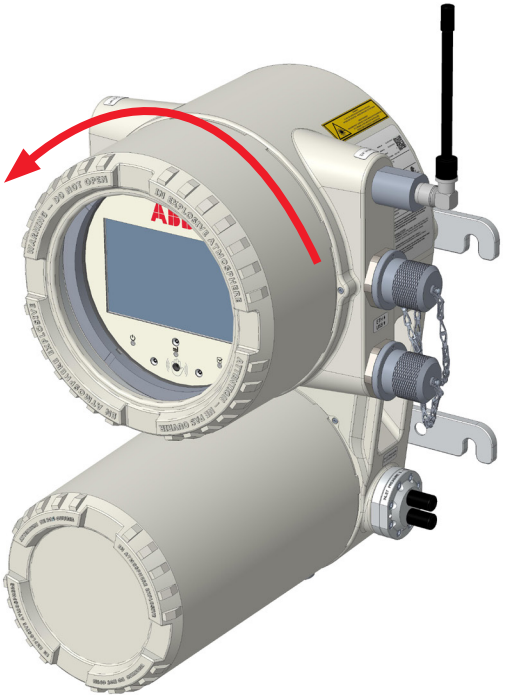
The EBox cover is heavy (±8 kg [±18 lb]). Make sure to fully support its weight until it becomes free from the threads.

3 Place the cover in a safe location where it will not fall and where the cover threads and glass window will be protected from damage and contamination.

NOTICE

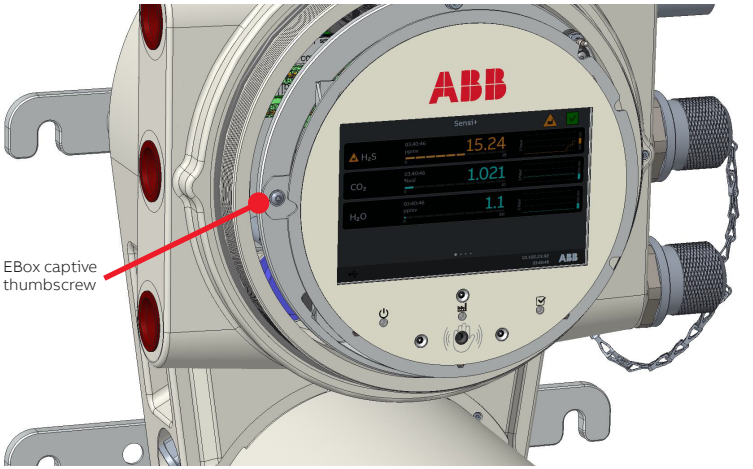
The enclosure and cover threads **MUST NOT** become damaged or contaminated **in any way.** Any defect might result in cover and enclosure completely “gripping” together, making impossible any further operation inside the enclosure.

Figure 13 Unscrewing the EBox Cover



4 Once the cover has been properly removed, unscrew the captive thumbscrew located on the left-hand side of the screen module.

Figure 14 Unscrewing the EBox Captive Thumbscrew



5 Gently pull on the screen module. It opens to the right, like a door.

The internal terminals are now visible, and the screen back panel indicates the mapping of all internal terminals.

Figure 15 Internal Terminals

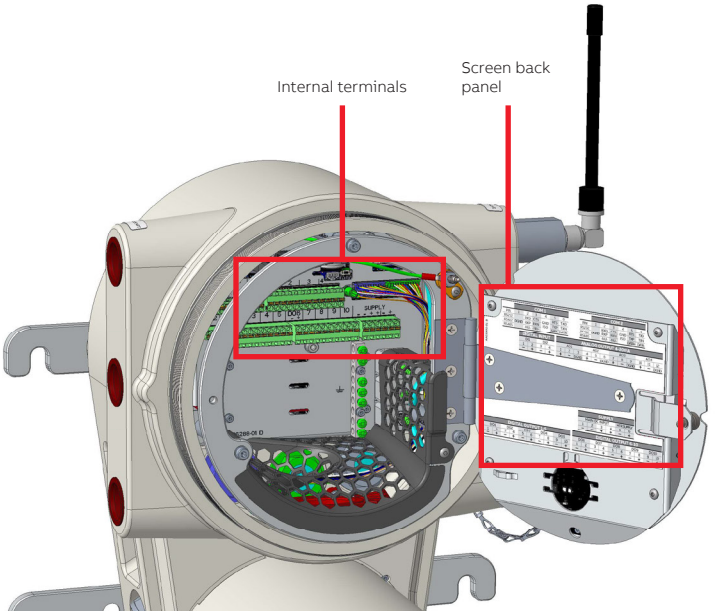
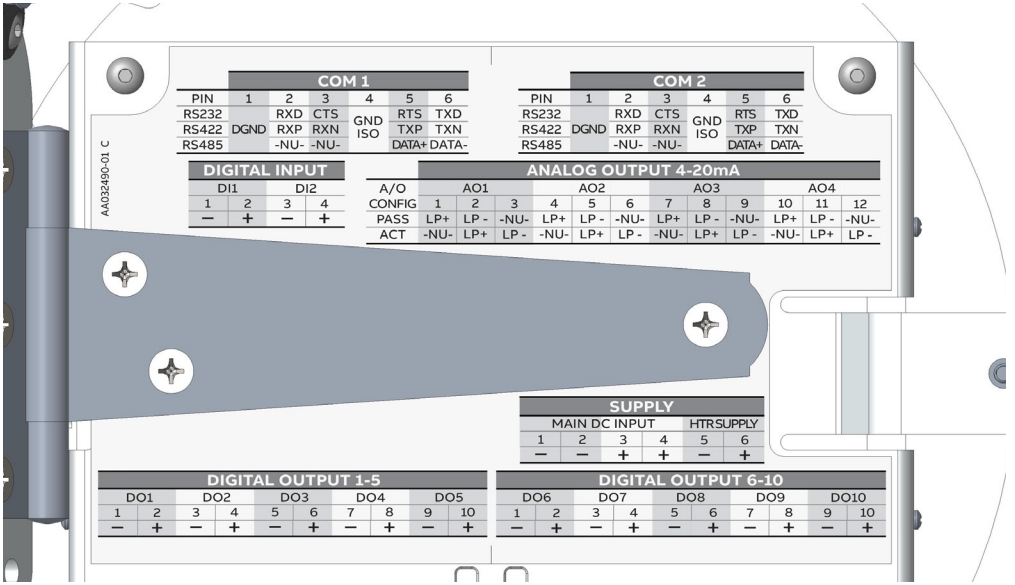
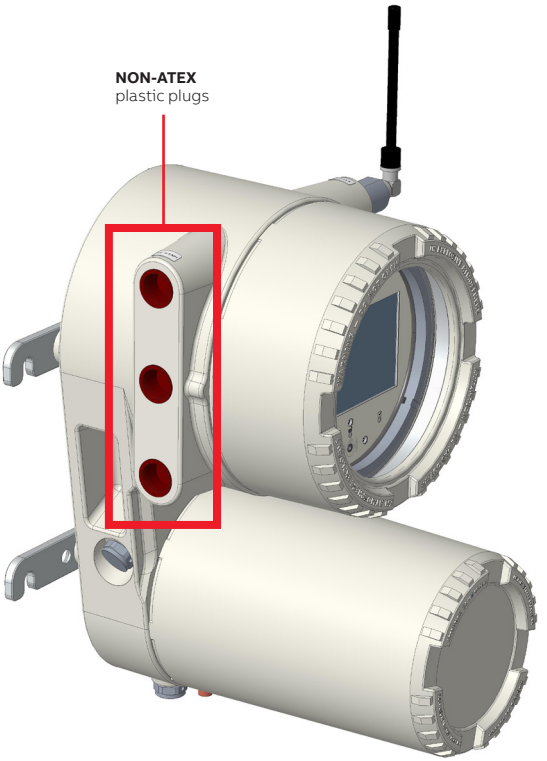


Figure 16 Screen Back Panel



6 With a flat head screwdriver, pry out the three red plastic plugs covering the access ports.

Figure 17 Removing the Red Plastic Plugs on the Left-hand Side of the EBox



NOTICE

To maintain the ATEX certification, you **must** replace **all** red plastic plugs with properly rated cable connector blanking plugs (male 1 in NPT or M32 × 1.5, based on model).

When routing the various cables through the access ports, it is **strongly** suggested to route extra lengths of cable inside the instrument to faciliate handling and connections. The analyzer is designed to accomodate such entra lengths of cable.

7 Route the required cables through your preferred ATEX-certified access solution (conduits, cable glands, etc.) and down the appropriate access ports.

You can now connect the various cables according to the instructions provided in the following sections.

Connecting to 4–20 mA Output Terminals

The 4–20 mA analog output (AO) terminals come with a default factory configuration.

The 4 mA value corresponds to the minimum displayed value in the **Measurements** panel and the 20 mA value, to the maximum displayed value (see “Measurements Panel” on page 45). The analog output is linear in between these two thresholds.

WARNING

Use only recommended shielded cables for wiring the 4–20 mA outputs interface.

By default, these AO terminals are in passive mode. They can be put in active mode if need be (for more information, refer to the Sensi+ User Guide).

Figure 18 Internal Analog Output (AO) terminals

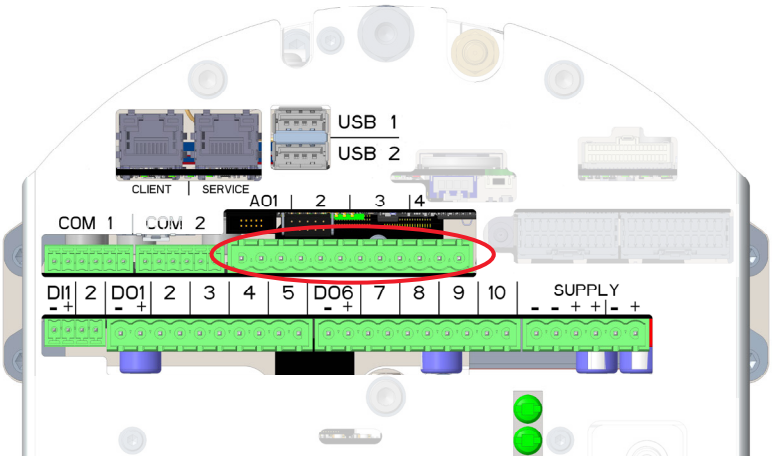


Figure 19 4–20 mA Output Terminal Electrical Configurations (for more connection details, see Table 3 on page 34)

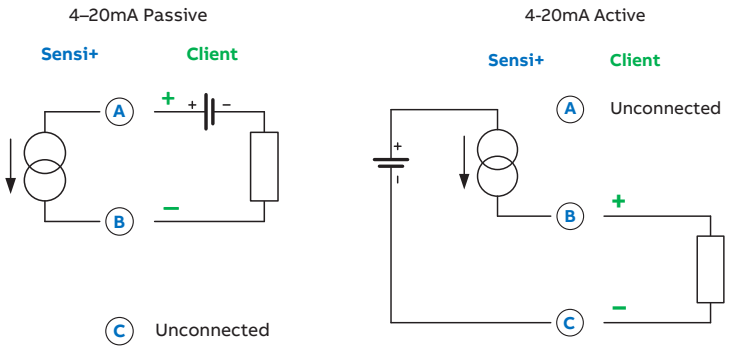


Table 3 AO terminal configuration

Terminal	AO1			AO2			AO3			AO4		
Connector	1	2	3	4	5	6	7	8	9	10	11	12
Connection	A	B	C	A	B	C	A	B	C	A	B	C
PASSIVE	+	–	-NU-	+	–	-NU-	+	–	-NU-	+	–	-NU-
ACTIVE	-NU-	+	–	-NU-	+	–	-NU-	+	–	-NU-	+	–

NOTICE

For more information on the various cables used, see Table 1 on page 13, Table 2 on page 14, and “Connector Definitions” on page A69.

Connecting to Digital Terminals

The digital input and output (DI and DO) terminals come with a default factory configuration.

NOTICE

For more information on the various cables used, see Table 1 on page 13, Table 2 on page 14, and “Connector Definitions” on page A69.

Connecting to Digital Input Terminals

Inputs are digital with pull-up resistors (10K) at 3.3 V. An external pull-up of up to 30 V can be added if needed.

Figure 20 Internal Digital Input (DI) Terminals

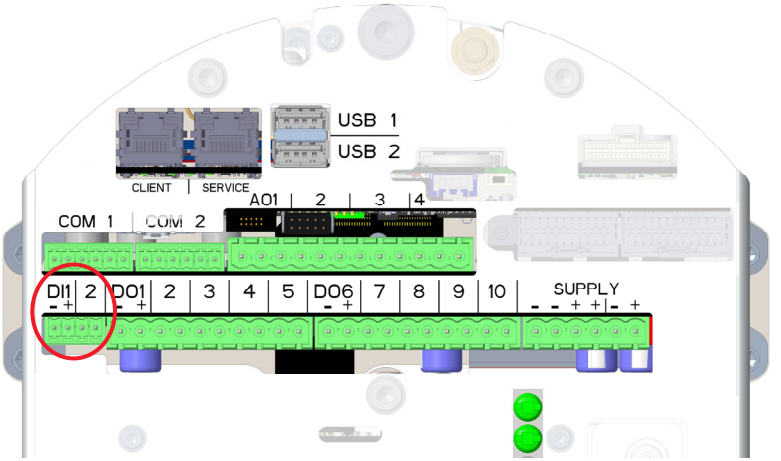
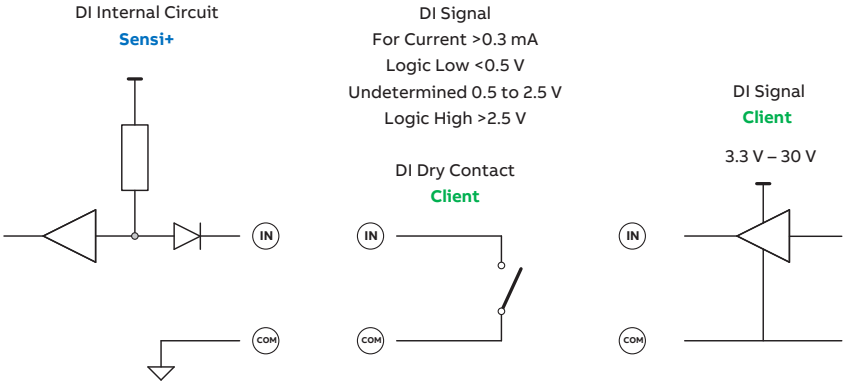


Figure 21 DIgital Input Terminals Electrical Configuration



Both digital input (DI) terminal configurations are identical.

Table 4 DI Terminal Configuration

Left pin	Right pin
COM (–)	IN (+)

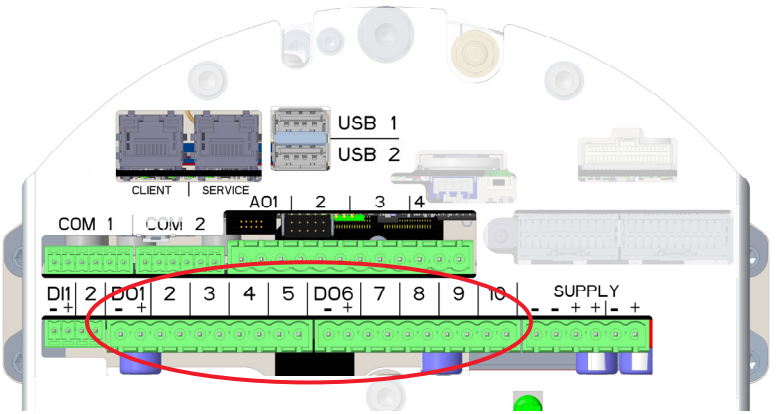
Connecting to Digital Output Terminals

Digital output (DO) terminals are divided into two banks: DO1 to DO5 and DO6 to DO10. As terminals DO1 to DO6 are already factory set, they are briefly explained in Table 6 on page 36.

All terminals support low-side and high-side.

Moreover, digital outputs are **physically** normally opened and **cannot** be configured by software. The logic and wiring implemented during installation must account for this state to ensure fail-safe operations. See Appendix B on page B71 for more information.

Figure 22 Internal Digital Output (DO) Terminals



All digital output (DO) terminal configurations are identical.

Figure 23 DIgital Output Terminals Electrical Configuration

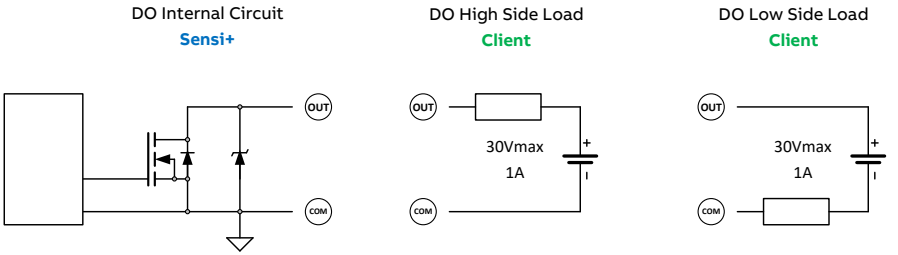


Table 5 DO Terminal Configuration

Left pin	Right pin
COM (–)	OUT (+)

Digital outputs are factory set for use as indicated in Table 6 below. Refer to the Sensi+ User Guide for more information on the configuration and definition of these outputs.

Table 6 DO Terminal Definitions

Digital Output	Definition
DO1	H_2S High High Alarm
DO2	H_2S Failed
DO3	CO_2 High High Alarm
DO4	CO_2 Failed
DO5	H_2O High High Alarm
DO6	H_2O Failed

Connecting to Communication Ports

Communication ports are provisioned for future use only.

Connecting the Power Cable

Once all internal connections have been completed, you need to bring power to the analyzer from the power distribution panel.

NOTICE

Inversing polarity of the DC voltage will permanently damage the instrument. The polarity of the power supply should be verified prior to connecting and powering up the instrument.

NOTICE

The power entry is isolated to support DC power supply with ground fault circuit interruptor (GFCI).

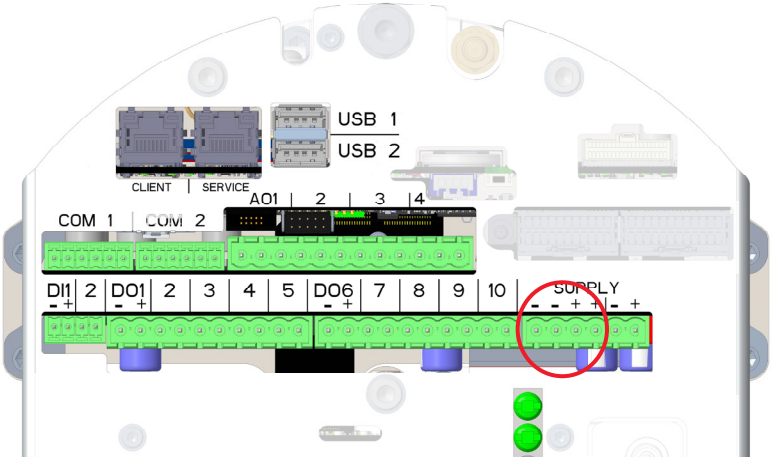
Safety

WARNING

The instrument is intended for field installation by qualified service personnel according to manufacturer's installation instructions and local/national wiring requirements. The electrical connection information in this guide must be observed. Otherwise, the application protection type may be affected. Ground the instrument according to requirements.

- The Sensi+ gas analyzer is an overvoltage category I instrument.
- Operators must strictly observe all applicable national regulations with regard to installation, function tests, repairs, and maintenance of electrical devices.
- The Sensi+ gas analyzer uses voltages up to 10.5–30 VDC. There are no hazardous voltages present in the device.
- Before opening any part of the analyzer, cut power at the instrument or the power source supplying it.
- In accordance with international safety standards, the analyzer uses a protective earth (PE) that provides grounding for the chassis.
  - Protective earthing connections (grounding) must always be active.
  - Ensure that the equipment, and any device connected to the analyzer, are properly grounded.
  - Make sure that the analyzer earth is at the same potential as the support's earth.
- To prevent contamination of the electronics by outside elements, the analyzer shall be opened only under controlled environmental conditions defined in the technical specifications in Appendix C on page C73.

Figure 24 Internal Digital Input (DI) Terminals



Connecting the Cable

As shown in Figure 24 on page 38, the instrument comes with two terminals for positive and negative connectors (should two wires be needed to account for potential voltage drops between source and instrument). When connecting the supply to the instrument, any of the two positive and negative terminals can be used (or both, if two wires are required).

NOTICE

Heater connectors (rightmost – and + connectors next to the red circle in Figure 24 on page 38) are for future use and shall not be connected at this time.

NOTE: All terminals are properly identified in the instrument itself to simplify installation.

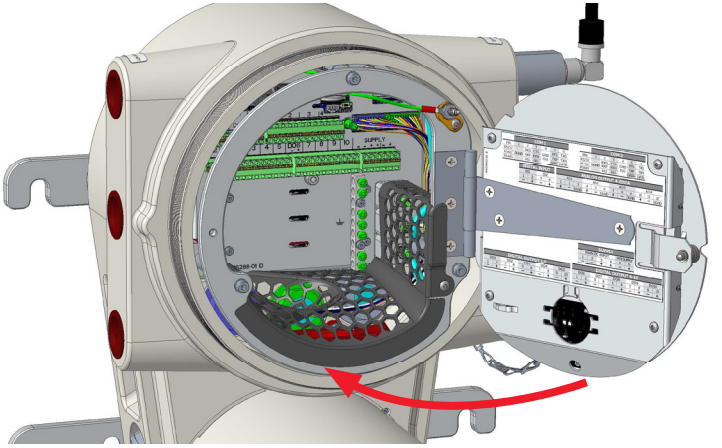
Closing the Analyzer

The Sensi+ gas analyzer complies with the IP66 and NEMA 4X standards. To ensure that the unit remains compliant once closed, precisely follow the steps indicated in the following pages.

To properly close the unit:

1 Gently push the screen module back inside the instrument.

Figure 25 Pushing the Screen Module Back In

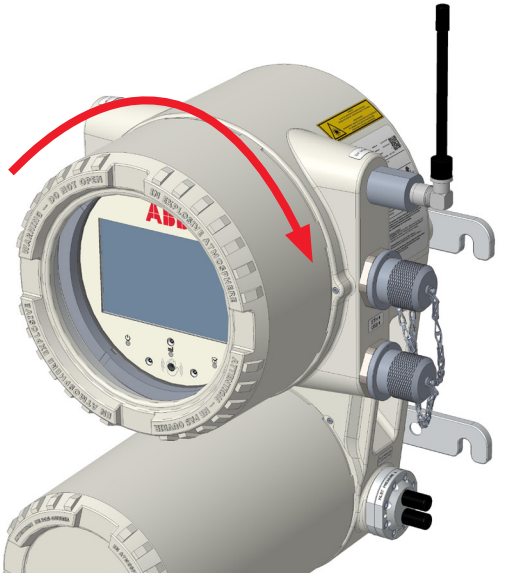


2 Screw back in the captive thumbscrew located on the left-hand side of the screen module.

Figure 26 Screwing Back in the EBox Captive Thumbscrew

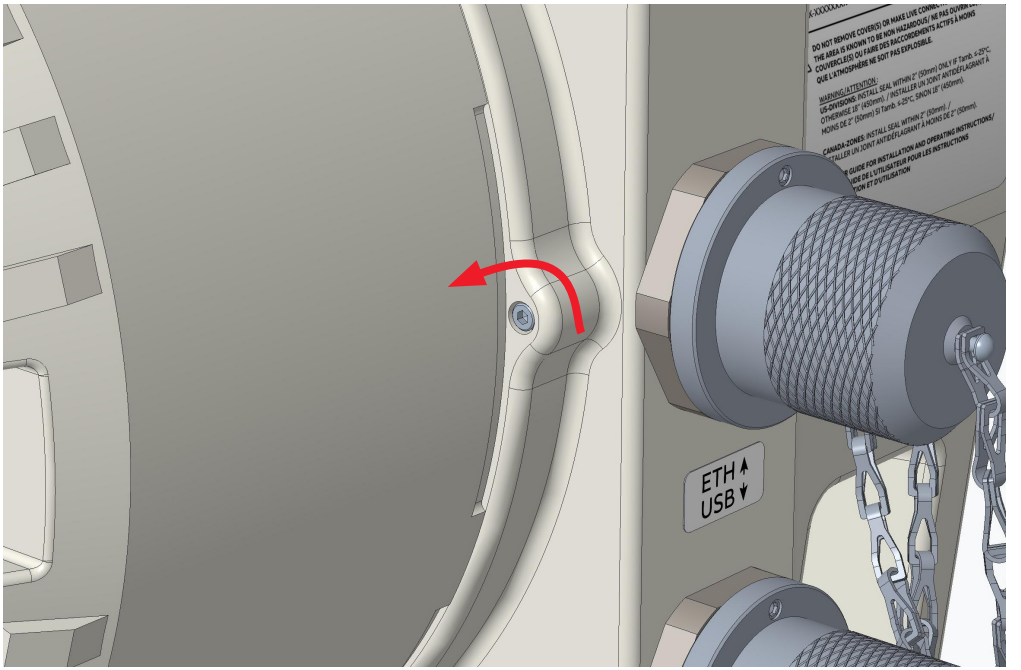
3 Put the cover back in the threads and turn it clockwise by hand until it stops turning.

Figure 27 Putting the Cover Back On



4 Locate the M3 hexagonal locking screw on the right-hand side of the EBox and turn it counterclockwise to screw it out of the housing.

Figure 28 Screwing Out the M3 Locking Screw



Powering Up the Analyzer

NOTICE

NEVER try and start the system if the ambient temperature is below freezing point.

Once all connections are properly set, you can power up the gas analyzer.

Once the analyzer is running, it is suggested to validate the wiring, as well as the readings obtained, at the interface panel connected to the Sensi+ by using overwrite functions available in the remote web interface (refer to the Sensi+ User Guide).

It is also possible to validate the readings with the proper calibration gases (see “Performing Analyzer Validation” on page 58).

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CHAPTER 6

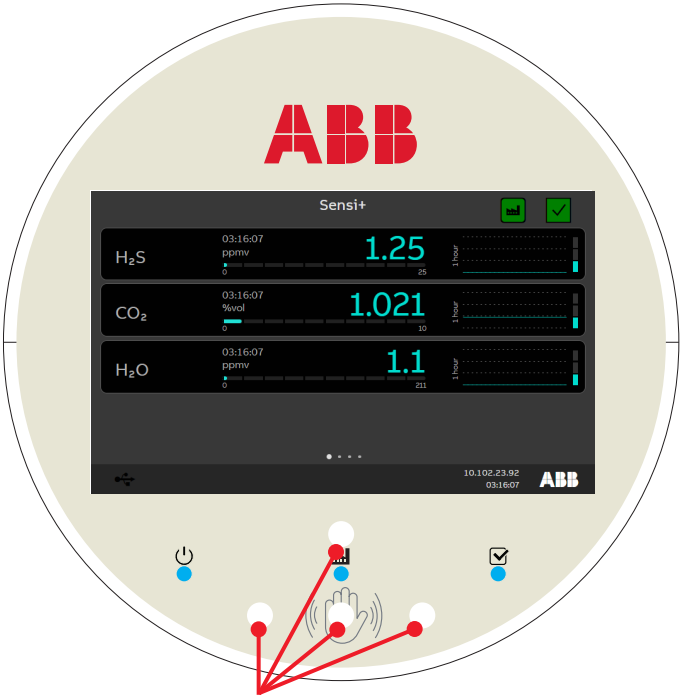
Introducing the Sensi+ Graphical User Interface

Upon powering up the Sensi+ gas analyzer, the screen will go through a start-up sequence. It will display a graphical user interface (the Measurements panel; see Figure 31 on page 45) once the start-up sequence is completed. The following pages provide a brief introduction to the information available on the various information panels that can be displayed.

Screen

The gas analyzer 7-inch screen displays one of the seven information panels available. You navigate through the information panels by swiping your hand in front of the gesture sensors located below the screen.

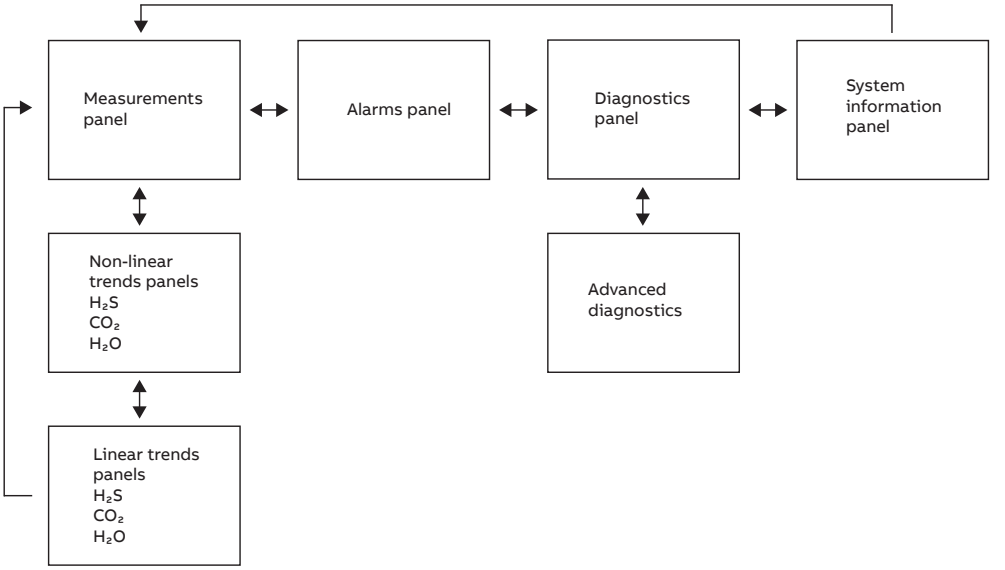
Figure 29 Sensi+ Screen (Measurements Panel displayed)



Gesture Navigation

The gesture sensors located below the analyzer screen allow you to hand swipe up, down, left and right (one inch in front of the window) through various information panels, as illustrated below.

Figure 30 Gesture navigation



Information Panels

The following sections provide a brief introduction to the various information panels accessible on the gas analyzer screen.

For more information on configuring the displayed values, alarms and alarm thresholds, as well as a more complete description of the various types of alarms, refer to the Sensi+ User Guide.

Measurements Panel

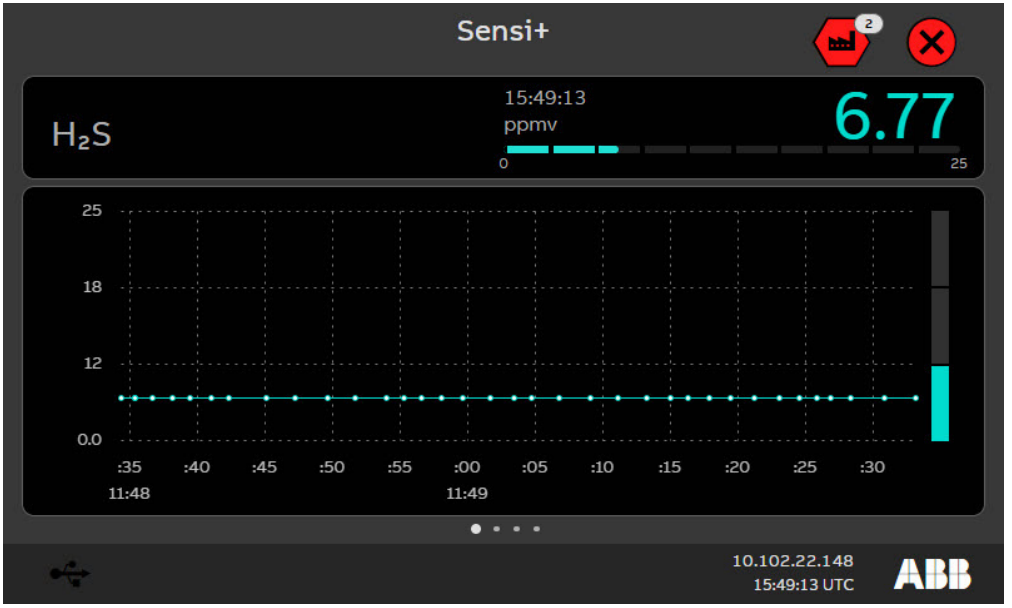
This is the main panel indicating the contaminants measured, the measurements themselves, and the general trends, as well as the presence of process and NAMUR alarms.

Figure 31 Measurements Panel

Non-Linear Trend Panels

Non-linear trend panels use warning and alarm threshold limits as the Y-axis separation. These panels are meant to highlight transitions between normal and outlier concentration values.

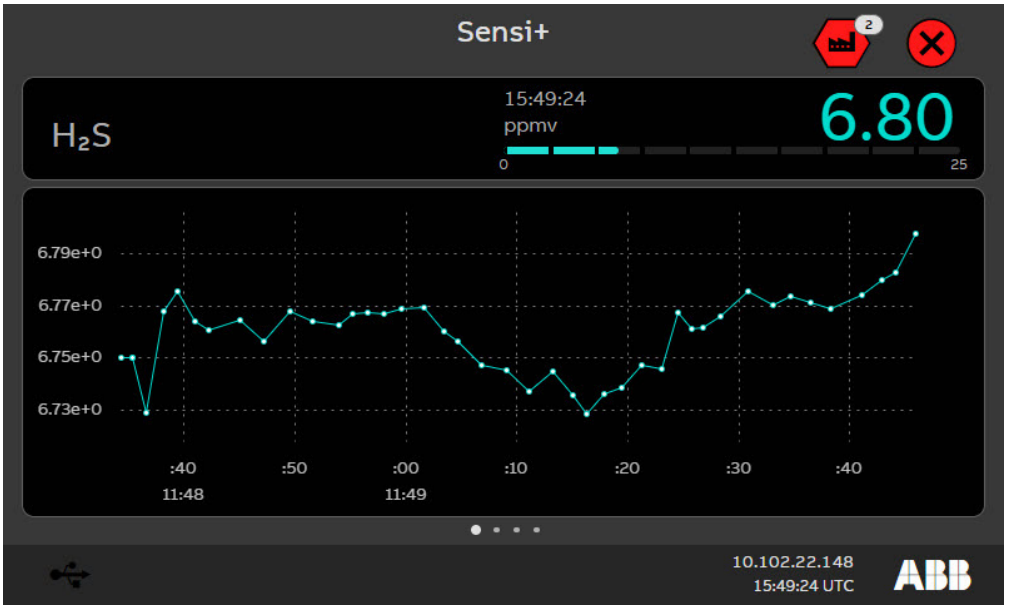
Figure 32 Non-Linear Thread Panel



Linear Trend Panels

In linear trend panels, the linear scaling gives a linear representation of the measured values but less appreciation of the alarm and warning thresholds. The main difference with non-linear trend panels is the Y-axis scaling.

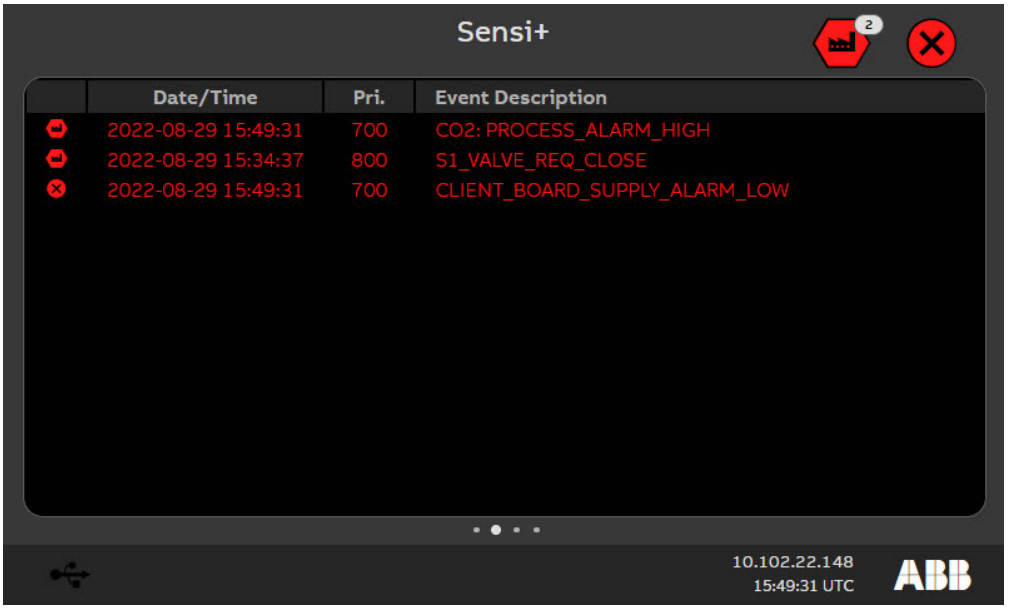
Figure 33 Linear Trend Panel



Alarms

The alarms panel displays the various ongoing alarms that the analyzer is experiencing. To manage these alarms (acknowledgment, filtering, etc.), you need to use the Web remote interface (refer to the Sensi+ User Guide).

Figure 34 Alarms Panel

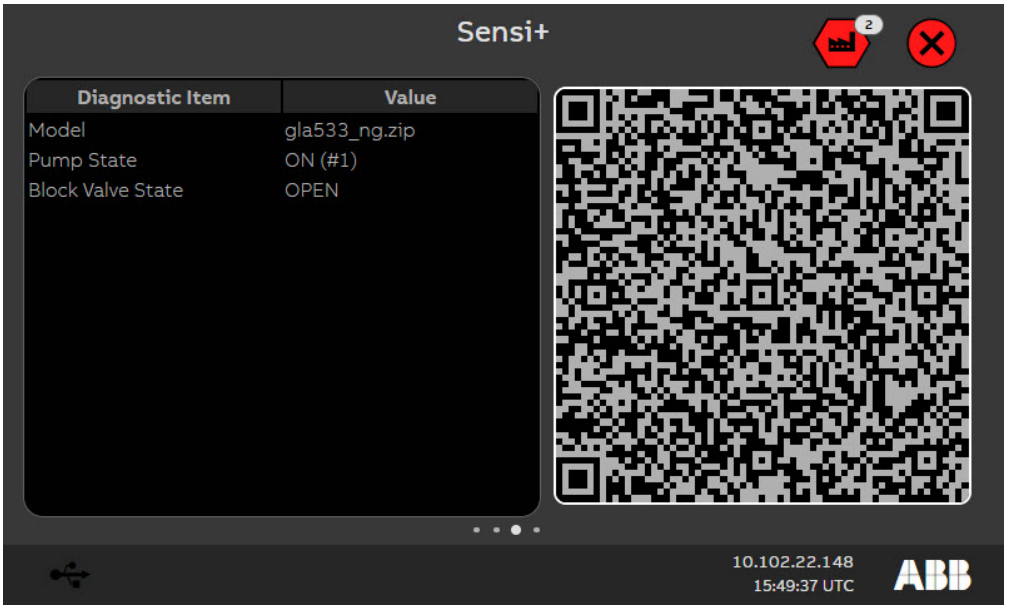


Diagnostics

The diagnostic panel provides information on the state of important analyzer mechanical components (pump and block valve).

The QR code on the right directs you to an ABB Web page.

Figure 35 Diagnostics Panel

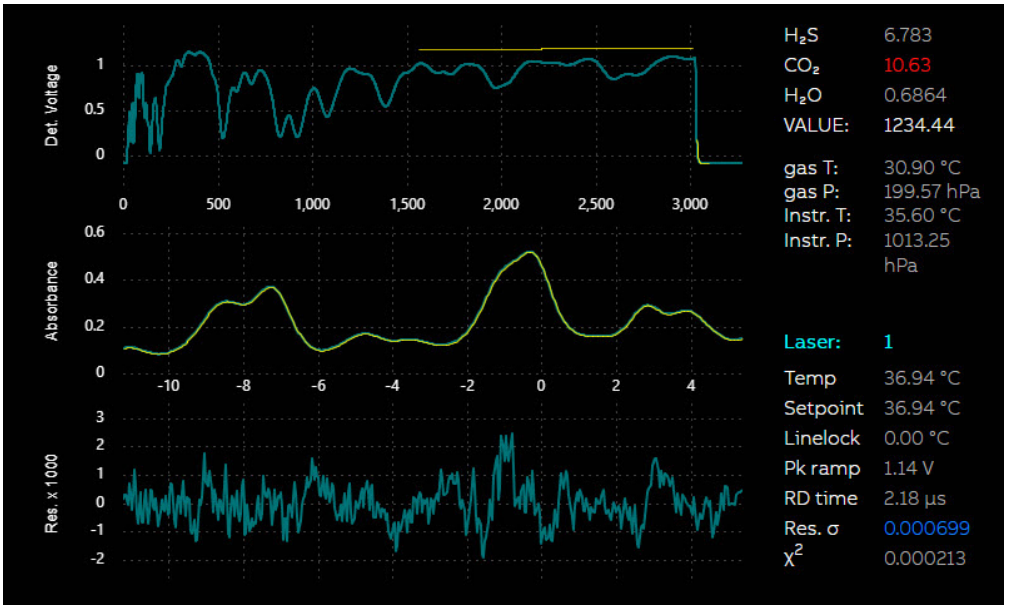


Advanced Diagnostics

The advanced diagnostic panel provides more detailed information on specific components of the analyzer (measured values, gas and instrument temperatures and pressures, laser characteristics, etc.).

Explanations on this advanced diagnostic panel are provided during formal advanced training.

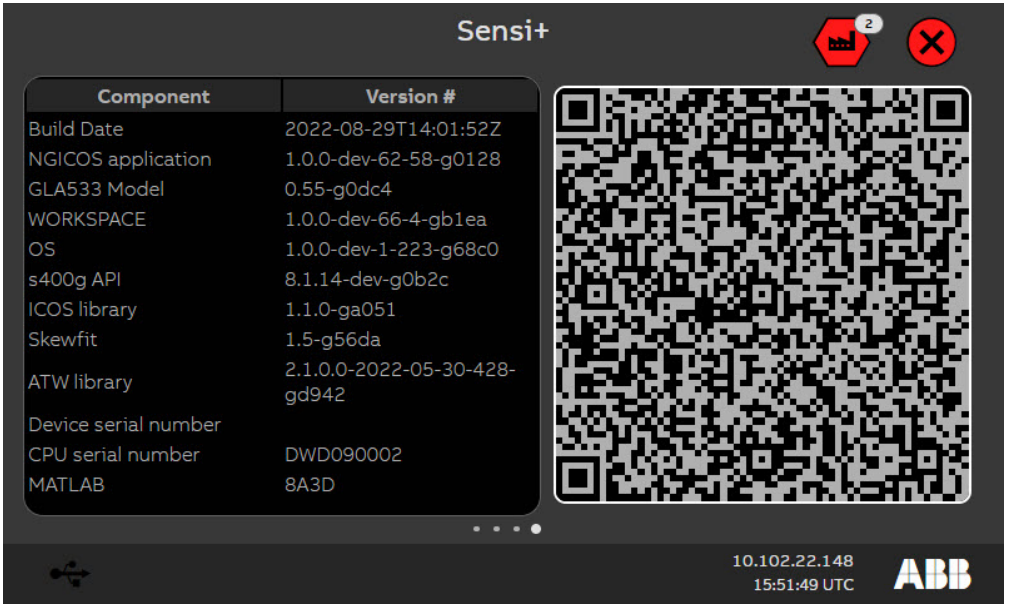
Figure 36 Advanced Diagnostics Panel



System Information

The system information panel provides technical information specific to your analyzer. The QR code on the right directs you to an ABB Web page.

Figure 37 System Information Panel



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CHAPTER 7

Establishing Communication With Sensi+

Sensi+ is designed to be operational from the moment it comes on line. However, certain tasks need to be performed to help in protecting the Sensi+ system from cyber attacks.

NOTICE—CYBERSECURITY

This product is designed to be connected to, and communicate information and data via a network interface. It is the user's sole responsibility to provide, and continuously ensure, a secure connection between the product and the user's network or any other network (as the case may be).

Users shall establish and maintain any and all appropriate measures (such as, but not limited to, the installation of firewalls, the application of authentication measures, the encryption of data, the installation of anti-virus programs, etc.) to protect the product, the network, its system and the interface against any kind of security breaches, unauthorized accesses, interferences, intrusions, leakages and/or theft of data or information.

ABB and its affiliates are not liable for damages and/or losses related to such security breaches, any unauthorized access, interference, intrusion, leakage and/or theft of data or information.

ABB strives to maintain cybersecurity for its products and services. By visiting the web page, you will find notifications about newly found software vulnerabilities and options to download the latest software. It is recommended that you visit this web page regularly:

http://new.abb.com/about/technology/cyber-security

Information about your product is also available on the product page:

http://www.abb.com/analytical

Connecting to the Analyzer

The first step is to establish a link (wired or wireless) between your computer and Sensi+. This link can be established locally or remotely.

The following sections explain each method.

Connecting Locally

There are two methods for connecting locally:

- Via the external Ethernet port (see Figure 43 on page 59)
- Via Wi-Fi (optional)

Via the External Ethernet Port

To connect to the analyzer via the external Ethernet port:

1. Configure your laptop with the following fixed IP address:
   - Fixed IP Address : `10.0.0.x` (replace the **x** with any number except 0 or 1)
   - Subnet Mask : `255.255.255.0`

DANGER

Before performing the next step, make sure that the area is properly derated.

2. Connect an Ethernet cable (Cat 5 type, minimum) between your computer and the Sensi+ external Ethernet port (to locate the port, see Figure 43 on page 59).
3. Launch your Web browser and point it to the following address: `https//10.0.0.1`

   The Sensi+ web remote interface appears.

NOTE: You may need to confirm that you trust the site that you are trying to access (REMOTE HMI) as the Security Certificate cannot be validated with your device.

Via Wi-Fi (Optional)

To connect to the analyzer via Wi-Fi (available if an antenna is present):

1. Make sure that Wi-Fi on your computer is active. By default, the analyzer Wi-Fi connection is enabled.
2. On your computer, in the list of available Wi-Fi connections, select the analyzer (e.g., **GLA533-xxxxxxxxx**).
3. When you are asked to provide the Wi-Fi security password, enter `Sens1plusWF!`

   The Sensi+ web remote interface appears.

Connecting Remotely

Technically, once your computer is connected to the network shared with your analyzer, you are connected to your analyzer and you just need to log in as explained in the next section.

Logging Into the Analyzer

Once you are connected to the analyzer, you need log into it via its Web remote interface. The remote interface is accessible through most mainstream Web browsers. Sensi+ supports the latest versions of Chrome, Firefox, Internet Explorer and Safari. **Chrome is strongly suggested.**

To log into the analyzer:

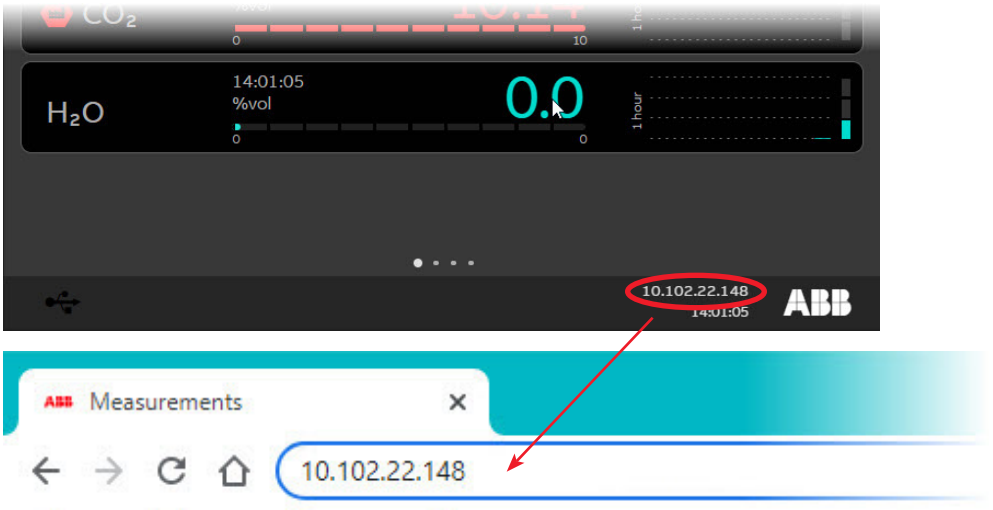
1. Point your Web browser to the correct address:
   - If you are connected locally, through the external Ethernet port, enter the IP address `https://10.0.0.1`
   - If you are connected remotely via a network, enter the fixed IP address set during commissioning of the analyzer[1], or enter the IP address assigned by the DHCP server[2] (as displayed on the Sensi+ screen [see Figure 38][3]).

1 This address should be in a valid network IP address range and **not** a public or reserved IP address.

2 The address assigned by a DHCP server can be found on the Sensi+ analyzer screen, or by scanning the network.

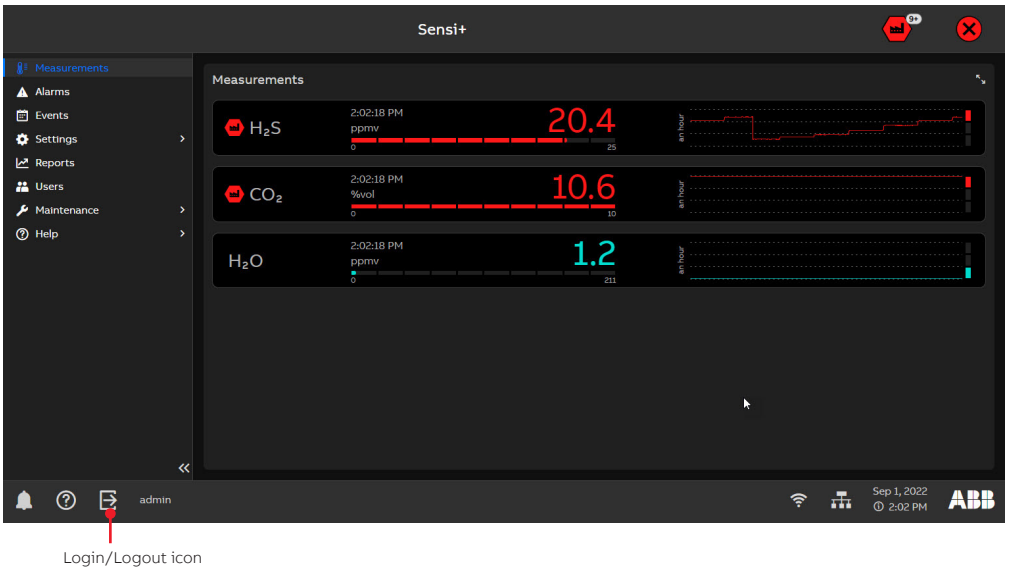
3 It is suggested to bookmark this address for future references.

Figure 38 Analyzer Address in the Web Browser



When your browser connects to the address entered, the Sensi+ application appears in the current browser tab.

Figure 39 Sensi+ Gas Analyzer Application (administrator access rights)



NOTE: The interface that you see in Figure 39 might differ slightly, depending on your access rights.

2 Click the Login/Logout icon (see Figure 39).

3 In the dialog box that appears, enter your username and password.

4 Click **Login**. The interface automatically adapts to your access rights.

NOTICE

For cybersecurity reasons, it is considered a best practice to change passwords after initial analyzer installation, and regularly thereafter. Not doing so could expose your entire network to cyber attacks. See the following section for details.

DO NOT lose the administrator passwords. If you lose them, you will have to completely wipe the analyzer to regain control. Doing this will erase all databases and their content.

Changing Default Administrator Password

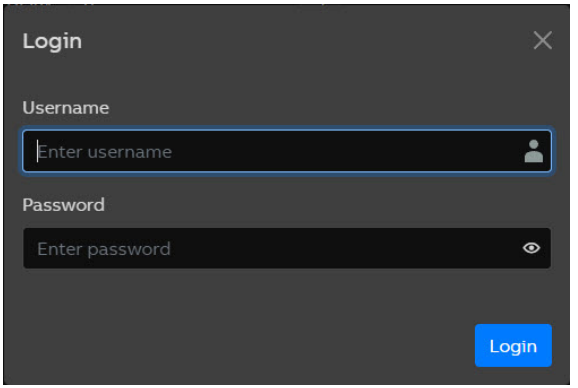
With Sensi+, parameters, functions and interface items are made available depending on the password used to access the system (not the user name).

Upon connecting with the system for the first time, you are presented with the basic Operator remote software interface.

To change the default administrator password:

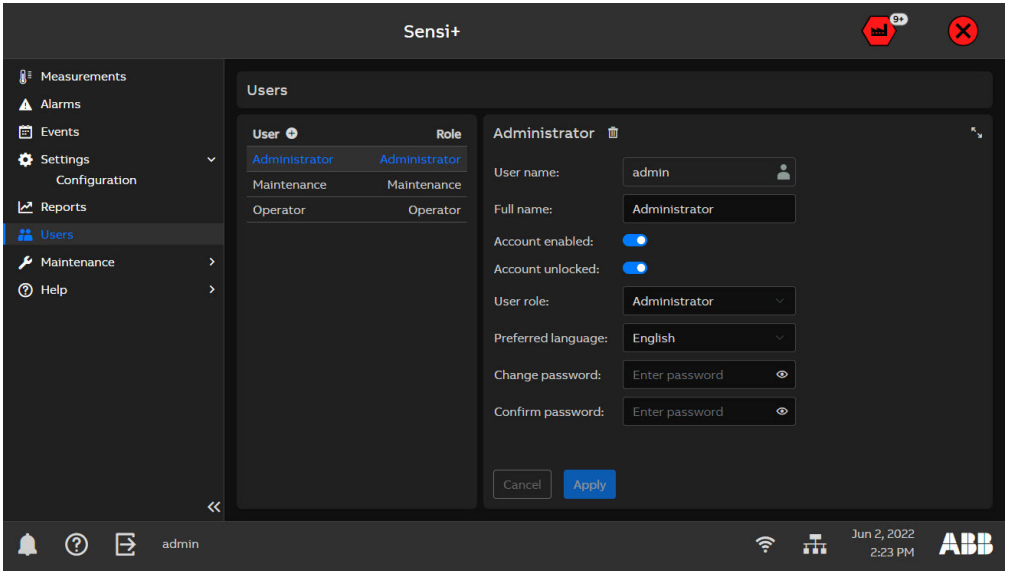
1. Click the Login/Logout icon in the bottom bar (see Figure 39 on page 55).
2. In the **Login** dialog box that appears (see Figure 40), enter the default administrator username and password and click **Login** at the bottom right of the dialog box.
   - Username `admin`
   - Password `Sens1plus!`

Figure 40 Entering the Default Username and Password



3. Once logged in as an administrator, click **Users** in the Sensi+ application sidebar (see Figure 41 on page 57). The **Users** panel appears to the right.

Figure 41 Users Panel



4 On the **Users** panel, in the **User** list below, click the user named **Administrator**.

Its information is displayed in the panel to the right.

5 If necessary, in the **Administrator** panel, change the **Full name** for something more meaningful.

NOTE: The user name used when creating the user role cannot be changed.

6 In the **Change password** text field, enter a new password (to make sure that the password is correct, you can reveal it by clicking the eye icon to the right of the text field).

7 In the **Confirm password** text field, enter the same password as the one entered in the **Change password** text field.

The **Confirm password** text field is highlighted in red until both passwords match perfectly.

8 Click **Apply** at the bottom of the User panel.

The administrator password is now changed as well as the name displayed for all users with administrator access rights.

Performing Analyzer Validation

Analyzer validation is typically performed at the end of commissioning to ensure that the system is working properly from the beginning.

NOTICE

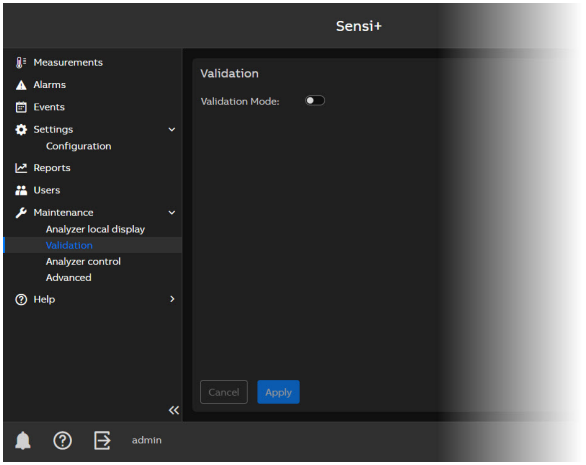
While validation mode is activated:

- All analog ouputs (4–20 mA) will broadcast and report values as read by the analyzer.
- All digital outputs associated to High High alarms will operate normally.
- All digital outputs associated to a NAMUR state will be deactivated (signaling that instrument reading should not be considered valid).

To perform a validation:

1. Connect the computer and the analyzer (for more information, refer to the Sensi+ User Guide).
2. Log in to the analyzer as administrator (for more information, refer to the Sensi+ User Guide).
3. In the Sensi+ application sidebar, select **Maintenance > Validation** (see Figure 42).

Figure 42 Validation Panel



4. From the **Validation** panel, click the **Validation Mode** toggle button, then click **Apply**.
   This raises a NAMUR orange alarm (refer to the Sensi+ User Guide for more information on NAMUR alarm conventions).
5. Prepare the system to switch from live stream to validation gas bottle.
6. Connect the validation gas bottle to the gas input port and make sure that it is ready for the switch from live stream.
7. Switch stream to the validation gas bottle and note the required information.
8. Switch back to live stream and disconnect the validation gas bottle.
9. Wait until measurements return to their normal/expected values.
10. Once the measured values have returned to normal, go back to the **Validation** panel (**Maintenance** > **Validation** [see Figure 42]), click the **Validation Mode** toggle button, then click **Apply**.

Rebooting the Analyzer

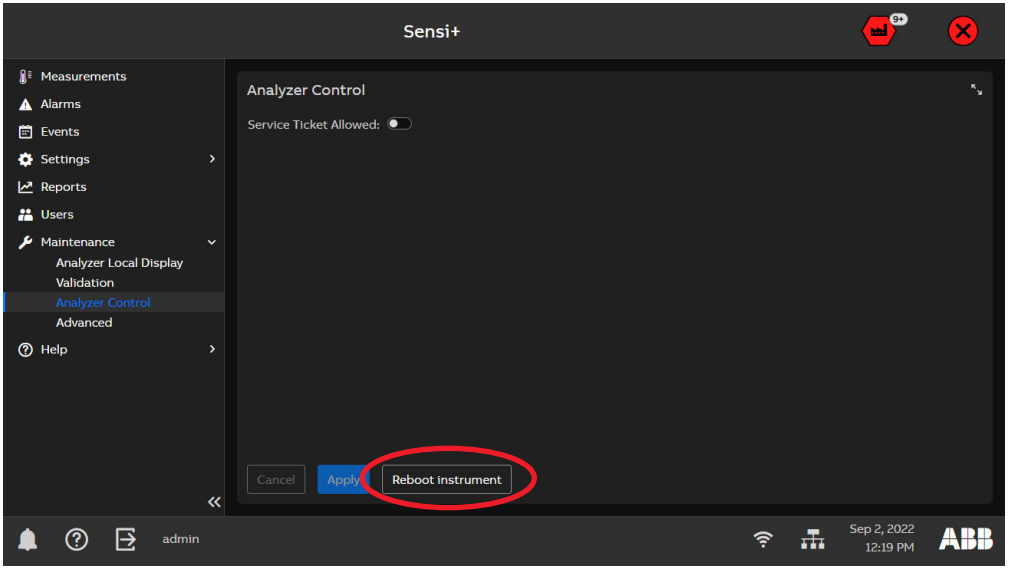
After performing the validation, it is good business practice to reboot the analyzer.

To do so:

1 In the Sensi+ application sidebar, select **Maintenance** > **Analyzer control**.

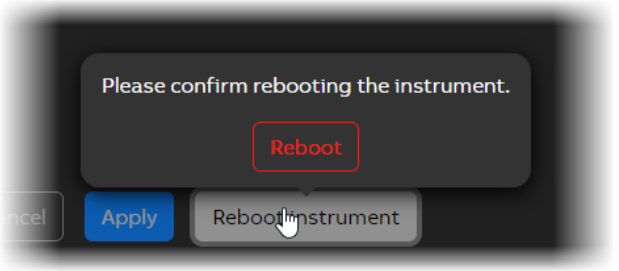
2 In the **Analyzer control** panel, click **Reboot instrument** (see Figure 43).

Figure 43 Rebooting the Analyzer



3 In the confirmation dialog box that appears, click **Reboot**.

Figure 44 Confirming the Reboot



The instrument will shut down and restart, going through all the initialization process. You can follow the reboot process by watching the LEDs behavior, as indicated in Table 7 on page 62.

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CHAPTER 8

Maintenance and Troubleshooting

The Sensi+ gas analyzer does not require regular maintenance and does not contain **any** field-serviceable parts. Instrument fuses may need replacement if they have been submitted to an unusual voltage event.

- Do not expose the analyzer innards to unstable weather events (rain, snow, hail, etc.)
- To prevent contamination of the electronics by outside elements, the analyzer shall be opened only under controlled environmental conditions as defined in the technical specifications in Appendix C on page C73.

Cleaning the System

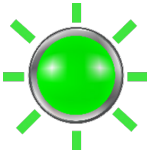
In accordance with your company's procedure:

- Perform a visual inspection of the analyzer, checking for leaks.
- The instrument shall only be cleaned with a damp cloth and soft soap.
- Make sure that the enclosure and connected cables are properly secured.

Diagnosing Problems

Most problems that could happen within the Sensi+ gas analyzer will be recorded as events in the **Events** table (refer to the Sensi+ User Guide). You will be informed of these problems either with alarms or by looking at the LEDs on the analyzer housing. The meaning of the various LEDs is explained below.

Table 7 Analyzer LED Behavior

Power		Process		NAMUR	
	Solid YELLOW (power on; during software boot process)		OFF (during boot and warmup process)		OFF (during boot process)
	Solid GREEN (when powered up; software booted)		OFF (during boot and warmup process)		Blinking GREEN (during warmup; normal initialization phase)
	Solid GREEN (when powered up; software booted)		Solid GREEN (when process values are valid; software booted, no process error)		Solid GREEN (when powered up; software booted, no NAMUR error)
					Solid YELLOW (analyzer Out Of Specification [refer to the Sensi+ User Guide])
			Solid ORANGE (Warning [refer to the Sensi+ User Guide])		Solid ORANGE (Check Function; temporarily invalid [refer to the Sensi+ User Guide])
			Solid RED (Alarm [refer to the Sensi+ User Guide])		Solid RED (Alarm [refer to the Sensi+ User Guide])
			Solid BLUE (notifications)		Solid BLUE (valid system data, but requires maintenance)

Backing Up the Analyzer System

Before performing software updates (see “Installing Software Updates” on page 65) or serious troubleshooting tasks, it is recommended to backup the complete analyzer system and not just system results and events. This is performed remotely via the Web interface, as explained below.

NOTICE

You will need the following to perform a complete analyzer backup:

- the latest software package (GLA533NG_Vx.x.x.ZIP, where x.x.x is the package software version) available here.
- a 128 GB (minimum) exFAT-formatted USB storage device (NOT labelled “ABB_USB”). An external SSD drive is recommended)

THIS PROCEDURE WILL STOP ANALYZER OPERATION. Make sure that you manage the impacts of such a stoppage on your process before proceeding.

To perform the analyzer backup:

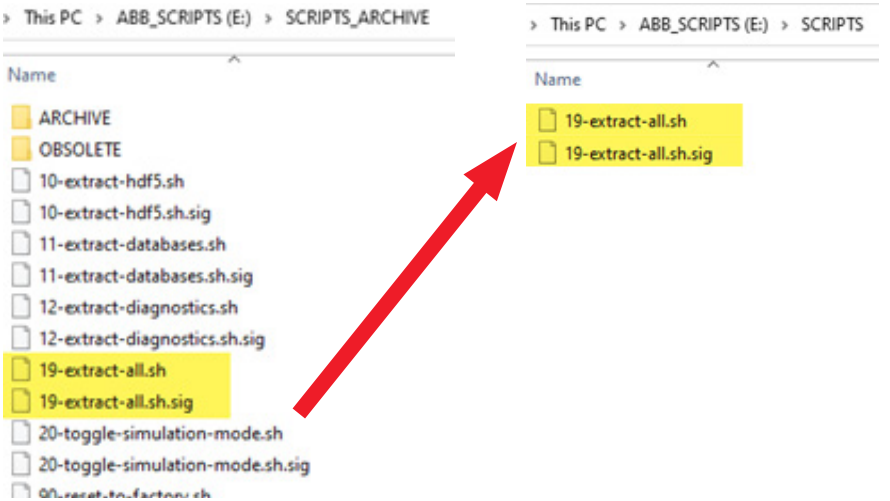
1 Connect the USB storage device to the computer where the software package is available.

2 Extract the following files on the USB storage device.

Figure 45 Extracting files to the USB storage device

3 Copy the following files (see Figure 46 on page 64) from the **SCRIPTS_ARCHIVE** folder to the **SCRIPTS** folder.

Figure 46 Copying files to the SCRIPTS folder



4 While Sensi+ is running, connect the USB storage device in the external USB service port. Upon doing so, a series of events will happen automatically:
   - The USB indicator on the Sensi+ local display (bottom left of the screen) will briefly light up when the storage device is detected:
   - The backup script closes the Sensi+ application and the desktop appears.
   - Files are backed up.
   - The Sensi+ application restarts.
5 When you see the white screen with the ABB logo, disconnect the USB storage device from Sensi+.
6 Connect the USB storage device to your computer and verify that a folder named **FROM_INSTRUMENT** has been created.
7 Verify that Sensi+ is operating properly.

NOTE: Upon completion of the analyzer backup, delete **the content** of the **SCRIPTS** folder on the USB storage device.

Installing Software Updates

At some point in the future, you might be asked by ABB service representatives to update your analyzer software. Software updates can only be performed locally via a USB key.

Before performing any software update, it is **strongly recommended** to export your system results and events (refer to the section “Managing Reports” in the Sensi+ User Guide) as well as a complete analyzer backup (see “Backing Up the Analyzer System” on page 63).

NOTICE

You will need the following to perform a complete software update:

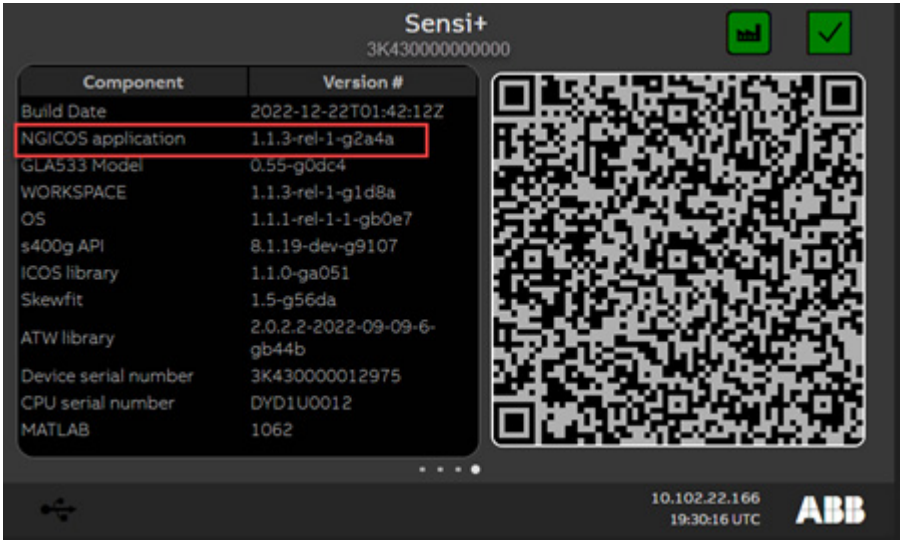
- the latest software package (GLA533NG_Vx.x.x.ZIP, where x.x.x is the package software version) available here.
- an 8 GB (minimum) exFAT-formatted USB storage device (NOT labelled “ABB_USB”).

THIS PROCEDURE WILL STOP ANALYZER OPERATION. Make sure that you manage the impacts of such a stoppage on your process before proceeding.

To perform the software update:

1 Make sure that the current version of the analyzer software is 1.1.x or later.

Figure 47 Verifying analyzer software version on the analyzer display



NOTICE

If an older version is installed (pilot versions) **CONTACT ABB** as remote assistance is required to perform the update of your device. **Do not perform the other steps of this procedure.**

2 Check the content of the software package:

Figure 48 Content of the GLA533NG_Vx.x.x.ZIP Package

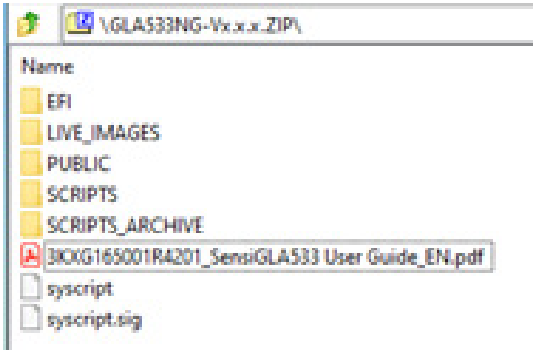
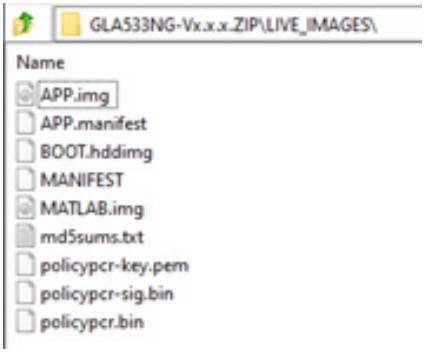
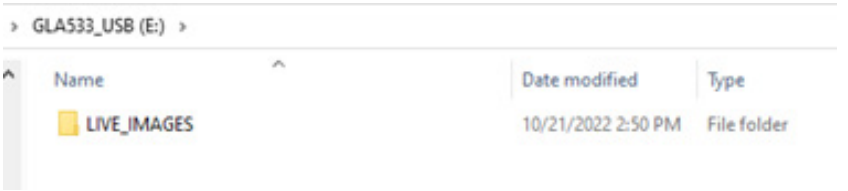


Figure 49 Content of the LIVE_IMAGE Folder



3 From the software package, unzip the folder **LIVE_IMAGES** to the root of the USB storage device. The content on the USB storage device should be as follows:

Figure 50 Content of the USB Storage Device



4 While the analyzer is running, connect the USB storage device in the external USB **SERVICE** port.

5 Power the analyzer OFF, then ON again.

6 Follow the instruction displayed on the analyzer screen.

NOTICE

DO NOT POWER OFF THE ANALYZER DURING THE UPDATE.

7 **WHEN THE REQUEST APPEARS** on screen, disconnect the USB storage device.
The instrument will restart automatically.

8 On the analyzer screen, make sure that the new software version corresponds to the one expected.

9 Power OFF the analyzer for 10 seconds, then ON again.

10 Make sure that Sensi+ operates as expected and that its configurations are still valid.

If there is no other analyzer software to update, ABB recommends deleting the content of the USB storage device.

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APPENDIX A

Connector Definitions

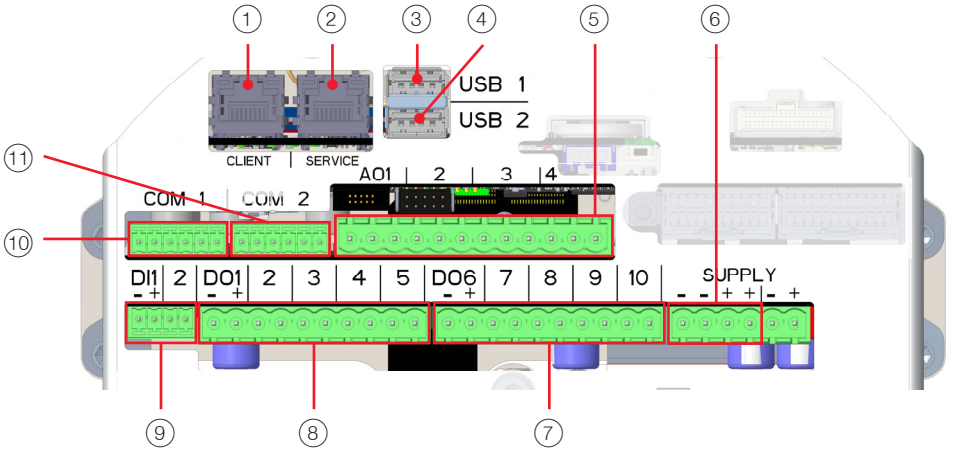
Inputs and Outputs

NOTICE

You **must** use copper wires **only.** Using other types of conductors could damage the instrument AND void the warranty.

All terminals are properly identified in the instrument itself to simplify installation.

Figure 51 Internal Terminals



	Connector	Connection	Type	Wire	Max. length	Screwdriver
1	CLIENT	Ethernet	Category 5	Straight	100 m (330 ft)	n/a
2	SERVICE	Ethernet	Category 5	Straight	3 m (10 ft)	n/a
3	USB 1	USB 3.0	A	n/a	n/a	n/a
4	USB 2	USB 3.0	A	n/a	n/a	n/a
5	AO1 - AO4	4–20 mA	Spring-loaded	AWG #24 to #14	n/a	flat
6	SUPPLY	DC voltage	Spring-loaded	AWG #24 to #14	n/a	flat
7	DO6-DO10	Digital	Spring-loaded	AWG #24 to #14	n/a	flat

	Connector	Connection	Type	Wire	Max. length	Screwdriver
(8)	DO1 - DO5	Digital	Spring-loaded	AWG #24 to #14	n/a	flat
(9)	DI1-DI2	Pull-up resistor	Spring-loaded	AWG #24 to #16	n/a	flat
(10)	COM 1	Provisioned for future use only				
(11)	COM 2					

APPENDIX B

Digital Output Logic and Wiring

Digital outputs are **physically** normally opened and **cannot** be configured by software (i.e., they always revert to their open position in situations of power failures). The logic and wiring implemented during installation must account for this state to ensure fail-safe operations. For more information, see “Connecting to Digital Output Terminals” on page 35.

Logic

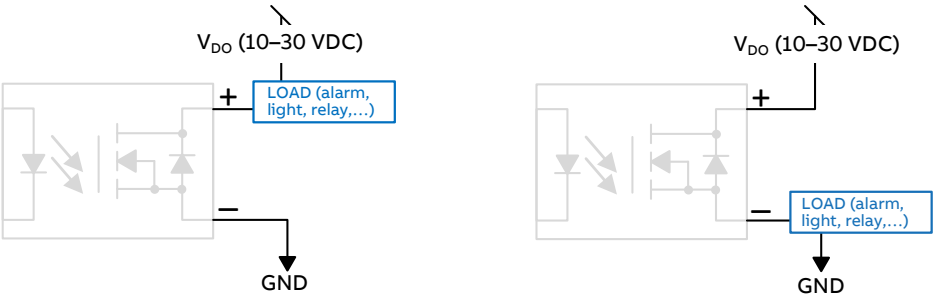
Below is an example for two critical parameters reported via digital outputs and how external equipment/wiring needs to be planned accordingly:

Instrument State	Healthy (energized)	
	Faulty (open)	
Tariff High High Limit Reached	Tariff limit exceeded (pipe shut off)	
	Normal level (pipe open)	

Wiring

Solid state relays require to be wired in a specific way to ensure proper operation. The following wirings must be matched.

Figure 52 Low-Side Switch Wiring (left) and High-Side Switch Wiring (right)



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APPENDIX C

Technical Specifications

The following pages indicate the Sensi+ gas analyzer technical specifications.

NOTICE

While the initial (cold start) accuracy of the sensor is likely to be within specifications, a settling period of approximately 12 hours is strongly recommended to allow electronic components to fully warm up and the internal temperature to stabilize.

Measurement Specifications

	H_2S	H_2O	CO_2
Linear range[1]	0–100 ppvm	0–500 ppvm	0–40%
Repeatability[1]	±0.1 ppm or ±1% of reading	±1 ppm or ±1% of reading	±100 ppm or ±1% of reading
Accuracy[1]	±0.2 ppm or ±2% of reading	±2 ppm or ±2% of reading	±300 ppm or ±2% of reading
Minimum detectable range[1]	0.2 ppm	2 ppm	150 ppm
Measurement update time	<2 s	<2 s	<2 s
Rise (fall) time (T10–90)[1]	<10 s	<35 s	<10 s
Trending range[2]	100-10,000 ppmv	0–98% RH	0–100%

Electrical Specifications

Voltage input	10.5 to 30.0 V DC
Overvoltage category	1
Electrical installation category	1
Nominal power consumption	50.0 W
Maximum power consumption (peak at startup <15 s)	100.0 W
Maximum current	10.0 A

1 As per IEC 61207 definitions

2 For safe operation, the maximum trending level shall not be exceeded. For operation at high levels, contact ABB.

Environmental Specifications

Operating temperature	–14 °C[1] to 55 °C (7 °F to 131 °F) (cold range can be extended when installation is using heated shelter/cabinet)
Shipping/storage temperature	–30 °C to 60 °C (–22 °F to 140 °F)
Operating ambient humidity	5% to 95% RH, non-condensing (applicable to internal parts only)
Installation location	Indoor/outdoor including wet area (excluding flooding)
Pollution degree	2
Operating altitude (max.)	2000 m (6562 ft)

Mechanical Specifications

Overall dimensions (L × W ×H)	525 × 385 × 364 mm (20.7 × 15.6 × 14.3 in) (L is 654 mm [25.7 in] with optional Wi-Fi antenna)
Weight	50.0 kg (110 lb)
Interface to electronics	1″ NPT or M32, female threads (as selected on order)
Process inlet pressure	35.0–48.0 kPa gauge (5.0–7.5 psig)
Sample flow rate	0.4 SLPM (0.014 scfm)
Enclosure	IP66/NEMA 4X Explosion-proof Flameproof Dual seal with annunciation

Laser

Type	DFB laser diode
Wavelength	760 nm, 1313.7 nm, 1574.5 nm
Output	50 mW max.
Class	1

Communication

Digital interfaces (internal)	• 2 × RJ45 1000Base-T Ethernet ports • 2 × USB ports
Digital interfaces (external)	• RJ45 1000Base-T Ethernet port • USB port
Protocols	Modbus TCP/IP over Ethernet
Analog interfaces	4 isolated analog 4–20 mA outputs

1 Even though the *operating* temperature is –14 °C, you must not try and start the system if the ambient temperature is below freezing point.

ABB, Inc.
Measurement & Analytics

3400, rue Pierre-Ardouin
Québec (Québec) G1P 0B2
Canada

Phone:
North America: 1 800 858 3847
Worldwide: +1 418 877 8111

Email:
icos@ca.abb.com

www.abb.com/analytical

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