GP-NOVA-M

Instruction and Maintenance Manual



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Pending ITS-I 23ATEXQ36745 DBI reg. no 233.301 DIC444QMS

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1 Safety



PAY ATTENTION
Please read, understand, and follow the instructions below.

SPECIFIC INFORMATION FOR EXPLOSION PROTECTION

- Do not open the gas detector enclosure when an explosive gas is present
- Blanking elements delivered with the enclosure are included as part of the certificate for the complete equipment. Only use ATEX/IECEx certified blanking elements, in case of replacement.
- For information about the dimensions of the flameproof joints, the manufacturer must be contacted.

GENERAL

- Only qualified personnel in accordance with EN/IEC 60079-14 can assemble, install, and conduct maintenance of the system, include but not limited to training in ATEX/IECEx and functional safety.
- Before any interaction with the system, please read and understand all warnings, instructions, and descriptions presented in this manual.
- Use only genuine Geopal replacement parts and accessories when performing any maintenance procedure. Failure to comply will invalidate the certifications and warranty.
- Do not install, mount, disassemble the system within a hazardous working environment.
- Do not subject the system to silicone lubricants and/or vapors. Silicone can inhibit and/or permanently damage catalytic/pellistor type sensors.
- Do not paint near the system.
- Do not place the detector under direct sunlight.
- To reduce the risk of unauthorized access, enable and frequently change system passwords.
- For optimum utilization of the detector's visual features, avoid placing and/or subject the detector to direct light.
- Calibration must be conducted in a gas-free environment. If in doubt, conduct zero-calibration using clean canned atmospheric air.
- Overrange gas concentration reading and/or failure high of the system may indicate the presence of high explosive and/or toxic gas concentration.
- Any flameproof parts, joints, and plugs shall not be repaired.
- Conduct regularly visual inspection and bump tests to ensure that the gas can reach the sensor and the system is reacting to the gas concentration as intended
- Beware of electrostatic charge. When cleaning, use only a damp black/dark cloth.
- Use of alcohol near the system may result in a gas reading and thereby trigger an alarm.
- Always refer to system certifications and this user manual.

FAILURE TO COMPLY WITH THE ABOVE CAN RESULT IN SERIOUS PERSONAL INJURY AND/OR DEATH!

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2 Declaration of Conformity

The producer **Geopal System A/S**
Bygmarken 19
DK-3520 Farum

declares that the specified product:

Type: Detector for explosive areas
Name: GP-EX-NOVA (GP-NOVA-M)

conforms to the following directives and standards:

Low Voltage Directive 2014/35/EU
EMC Directive 2014/30/EU
Radio Equipment Directive 2014/53/EU

EN 61000-6-2:2005+AC:2005 + EN 61000-6-2:2019
EN 61000-6-4:2007+A1:2011 + EN 61000-6-4:2019
EN 301 489-1 V2.2.3
EN 301 489-17 V3.2.4
EN 300 328 V2.2.2, sec. 4.3.2.9
EN 50270:2015+AC:2016

ATEX Directive 2014/34/EU
EN IEC 60079-0:2018
EN 60079-1:2014

EU-Type certificate no. TPS 20 ATEX 108952 0001 X
TÜV 16 ATEX 176482 X

IECEx compliance with IEC standards
IEC 60079-0, Ed. 7 (2017)
IEC 60079-1, Ed. 7 (2014-06)

IECEx-certificate no. TPS 20.0031X
TUN 11.0006X

Notified body No. 0123, 0044

Performance EN60079-29-1:2016

This declaration is given in compliance with article 7, subsection 1 of the EMC directive. For specification of the acceptable EMC level, refer to the electrical data of the product.

Farum, 28 January 2026

Christian Møller (*Producer's signature)*

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3 General Description

3.1 System Overview



Figure 1 Overview of system

The GP-NOVA-M is a stand-alone gas detector produced by Geopal, hereafter called the system, intended for detecting explosive and toxic gases. The system consists of a controller (GP-EX transmitter with build-in electronics assembly) and a sensor element inside a flameproof enclosure (GJ-EX/GJ-OX). The system is always assembled, calibrated, and tested before shipping.

3.1.1 *Visual indication*

The OLED display offers a clear and bright visual indication independent of the viewing angle. Information such as gas concentration, target gas, and alarm setpoints are clearly shown on the display. The system is also equipped with status LED bars, which can be seen from a distance of < 20 m. The status LED bars are driven in such a way that the status of the system is understandable to people with decreased ability to see colors.

The OLED display has a configurable sleep timer; however, the status LED bars will remain illuminated to signal the system state. The OLED display will wake up by tapping either of the two optical buttons and/or once Bluetooth connection is established.

3.1.2 *Analog, Relays, and Digital Outputs*

The system provides multiple options to monitor the status from a control room. Configurable galvanically isolated 4-20 mA current loop, RS-485 Modbus RTU, alarm, and fault relays are available as system outputs.

3.1.3 *Optical Buttons*

The system is equipped with optical touch buttons, which eliminates the need for any additional tools. The buttons are used to navigate through the system menu.

NOTE
To get an optimal navigation experience, avoid using black/dark gloves.

3.1.4 *Bluetooth Communication*

The system is equipped with Bluetooth wireless technology and with use of Geopal app on a smartphone or tablet, user can monitor, calibrate, configure, and send system data which reduces maintenance time, effort, and cost.

3.1.5 *Log function*

The system has an inbuilt log system; gas measurements, events, and system info which can be sent to an email via Geopal app for further analysis and is stored in a micro-SD card.

3.2 System Variants

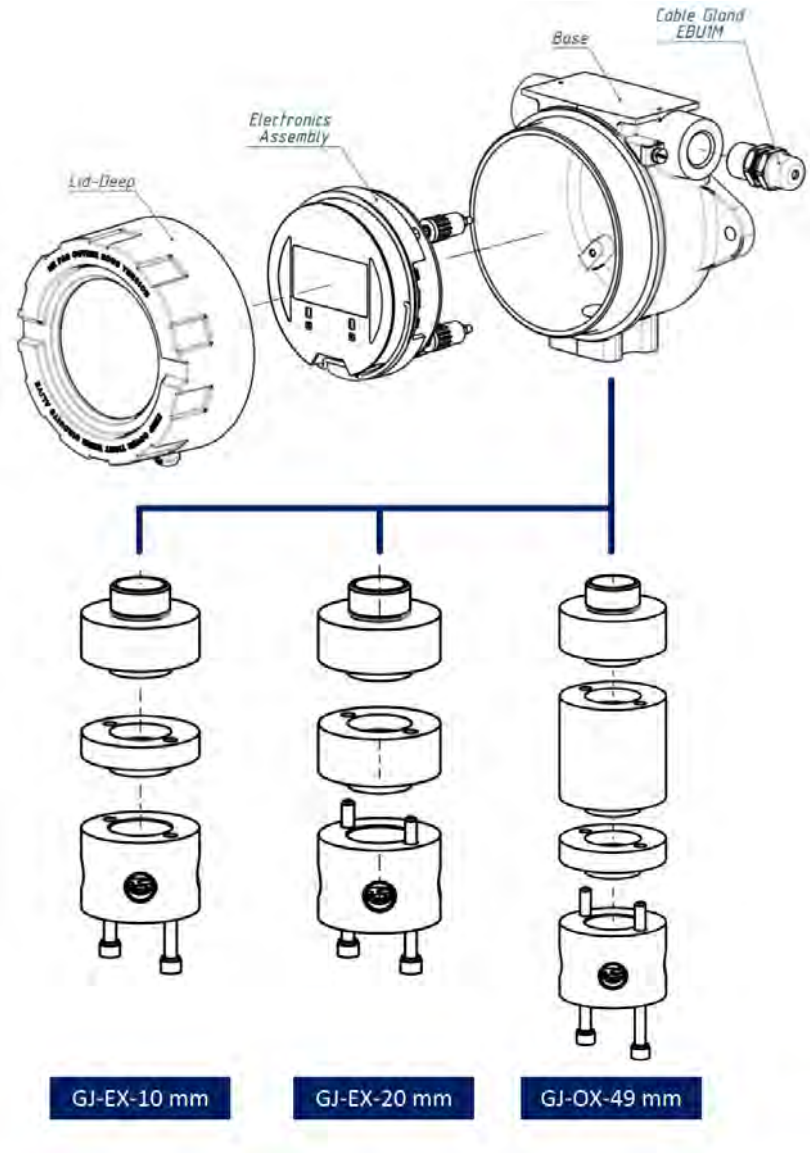


Figure 2 Main mechanical variants

The system is available in three different variants, depending on the sensor technology. Overview of system variants and main components can be seen in the figure above.

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3.3 Label Overview

The system ATEX/IECEx approvals consist of:

- GP-EX: Transmitter flameproof enclosure
- GJ-EX, -OX: Sensor flameproof enclosure

Marking and label placement can be seen below.

Table 1 Labels of GP-EX, GJ-EX, and GJ-OX

Part	Description	Label
GP-EX	Transmitter flameproof enclosure	GP-EX S/N: xxxxxx - YYYY TPS 20 ATEX 108952 0001 X CE 2575 Ex II 2 G Ex db IIC T6 Gb IECEx TPS 20.0031X Ex db IIC T6 Gb Ta: -40 °C to +60 °C Unom: 24 V Inom: 250 mA geopal® Bygmarken 19 DK-3520 Farum Denmark E-mail: info@geopal.dk "WARNING – DO NOT OPEN WHEN AN EXPLOSIVE GAS ATMOSPHERE IS PRESENT"
GJ-EX	Sensor flameproof enclosure	GJ-EX Batch: EXyyyyyy-xxxx TÜV 16 ATEX 176482 X Ex II 2 G Ex db IIC T5 Gb Ta: -20 °C to +80 °C CE 2575 IECEx TUN 11.0006X Ex db IIC T5 Gb Um: 7 Volt Im: 300 mA geopal® Bygmarken 19 DK-3520 Farum Phone: +45 4567 0600
GJ-OX	Sensor flameproof enclosure	GJ-OX Batch: EXyyyyyy-xxxx TÜV 16 ATEX 176482 X Ex II 2 G Ex db IIC T6 Gb Ta : -20 °C to +65 °C CE 2575 IECEx TUN 11.0006X Ex db IIC T6 Gb Um : 200 mV Im : 3 µA geopal® Bygmarken 19 DK-3520 Farum Phone: +45 4567 0600

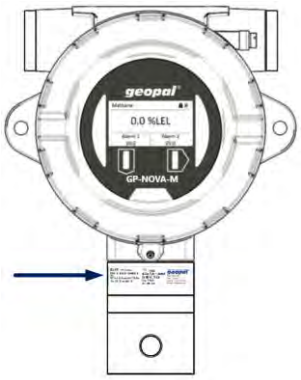


Figure 3 Label placement of sensor flameproof enclosure

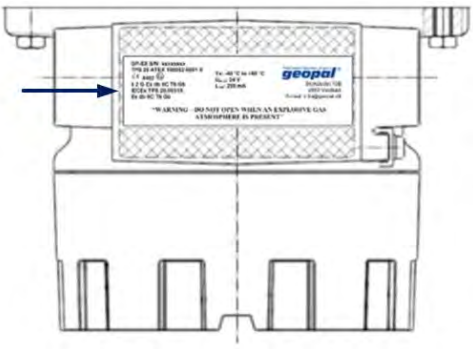


Figure 4 Label placement on top of transmitter enclosure

4 Installation

PAY ATTENTION
After reading and understanding Section 1. Safety, ensure the following:

- Product, documents, and mounting parts identification
- Placement and mounting of gas detector
- Power ratings available for the system
- System start-up, calibration, functional verification, and documentation on-site

FAILURE TO COMPLY WITH THE ABOVE CAN RESULT IN SERIOUS PERSONAL INJURY AND/OR DEATH!

NOTE
Geopal Installation and Commissioning report templates are available upon request.

4.1 Location

The gas detector should be mounted where the gas to be detected is most likely to be present. The following points should be considered when placing/installing gas detectors:

- To detect gases/fumes that are lighter than air, sensors should be mounted near the ceiling.
- To detect gases/fumes that are heavier than air, sensors should be mounted near the floor.
- Consider ease of access for bump test, service, and maintenance.
- Consider how a leakage/gas cloud formation may behave due to natural or forced air currents.
- Consider the process conditions. For example, butane is normally heavier than air, but if released from a process, which is at an elevated temperature and/or pressure, the gas may rise rather than fall.
- Location of oxygen sensors requires knowledge of the gas that may displace the oxygen. For example, carbon dioxide is denser than air and therefore is likely to displace oxygen from low levels upwards.
- Sensors on the gas detector should be mounted at head height (1.5 m nominally) to detect gases of a similar density to air, assuming that ambient conditions and the temperature of the target gas are around 20 ˚C

PAY ATTENTION
The system is delivered with a yellow protective cap over the sensor enclosure; this is to protect the sensor from potentially harmful fumes during construction. This cap **must** be removed before commissioning.

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4.2 *Mounting*

The system can be mounted directly to a surface via the mounting holes on the system enclosure. The system can also be mounted via a bracket, pipe mount adaptor, and remote detector (up to three meters from the transmitter enclosure) which can ease the installation process and access on certain applications.

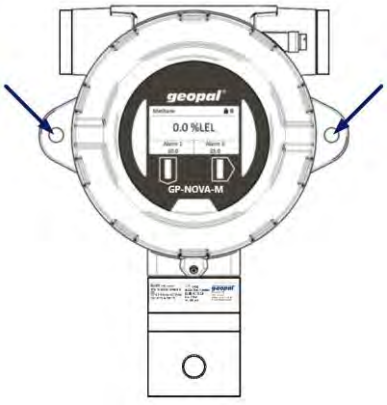


Figure 5 Available mounting holes via the system enclosure

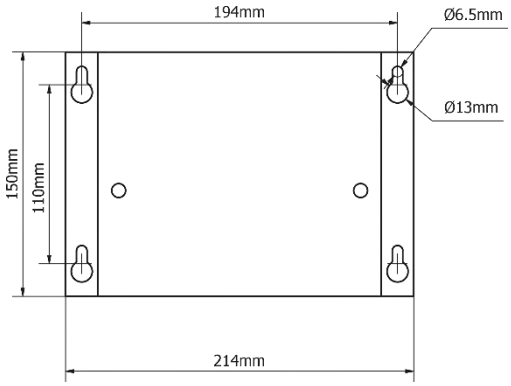


Figure 6 Available mounting holes via bracket

4.2.1 *Mounting the cover*

If the gas detectors enclosure has been opened, the cover must be installed properly. Apply a thin layer of grease or lubricant on the O-ring then tighten the cover by hand until fully seated. Then tighten the set screw with a 2 mm Allen key until it's fully seated.

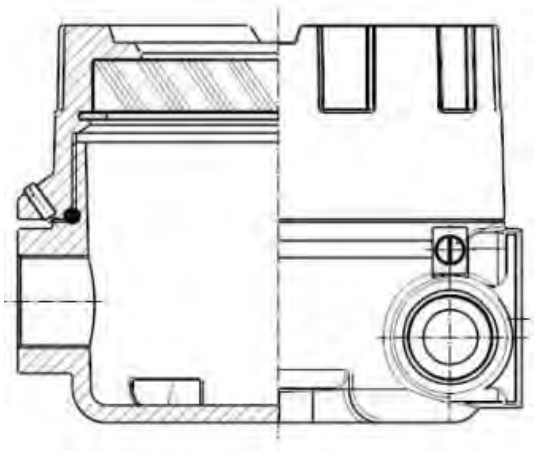


Figure 7 The systems cover with included set screw

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4.3 *Wiring*

4.3.1 *Control Cable Length*

The maximum distance between the system and the power supply depends on the wire gauge and the power supply voltage. Recommended dimensions and lengths for the control cable can be seen in the tables below. For distances longer than the stated, contact Geopal.

Table 2 Recommended maximum control cable length (AWG). *Only relay connectors can fit AWG 12, for all others max cross section is AWG 16.*

AWG	Length [m]
18	400
17	500
16	600
15	800
14	1000
13	1300
12	1700

Table 3 Recommended maximum control cable length (mm^2). *Only relay connectors can fit 2.5 mm^2, for all others max cross section is 1.5 mm^2.*

mm^2	Length [m]
0.75	350
1	500
1.5	750
2	1000
2.5	1300

4.3.2 *Cable Selection*

The system is shipped with loosely tightened cable gland and blanking element. Blanking element shipped with the enclosure is included as part of the certificate for the complete equipment. Only separately certified cable glands and blanking elements (ATEX and/or IECEx) which are suitable for the application (type of protection, gas group and operating temperature) may be installed, in case of replacement. Information regarding the included cable gland can be seen below.

MPN	Certificate No.
CG.NA.M20S.BN.C.16.K50	IMQ 14 ATEX 012 X, IECEx IMQ 14.0004X

Cables must be chosen and installed in accordance with EN/IEC 60079-14. During installation using the included cable gland the following must be observed:

- The cable gland can seal a cable with a outer diameter of ø 4-12mm.
- Non-armored cables must be used.
- Circular cables must be used.
- Cables must be effectively clamped as close to the cable gland as practically possible, to prevent pulling and twisting.
- The cable must include a screen.

See Appendix 10.3 for information regarding correct tightening of cable glands and blanking elements. Information regarding wiring and protective grounding can be found in appendix 10.2.

PAY ATTENTION
If the system integrator chooses another cable gland than the one included with the system. All of the manufacturer's instructions and special conditions **must** be followed.

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4.3.3 *System Connections*

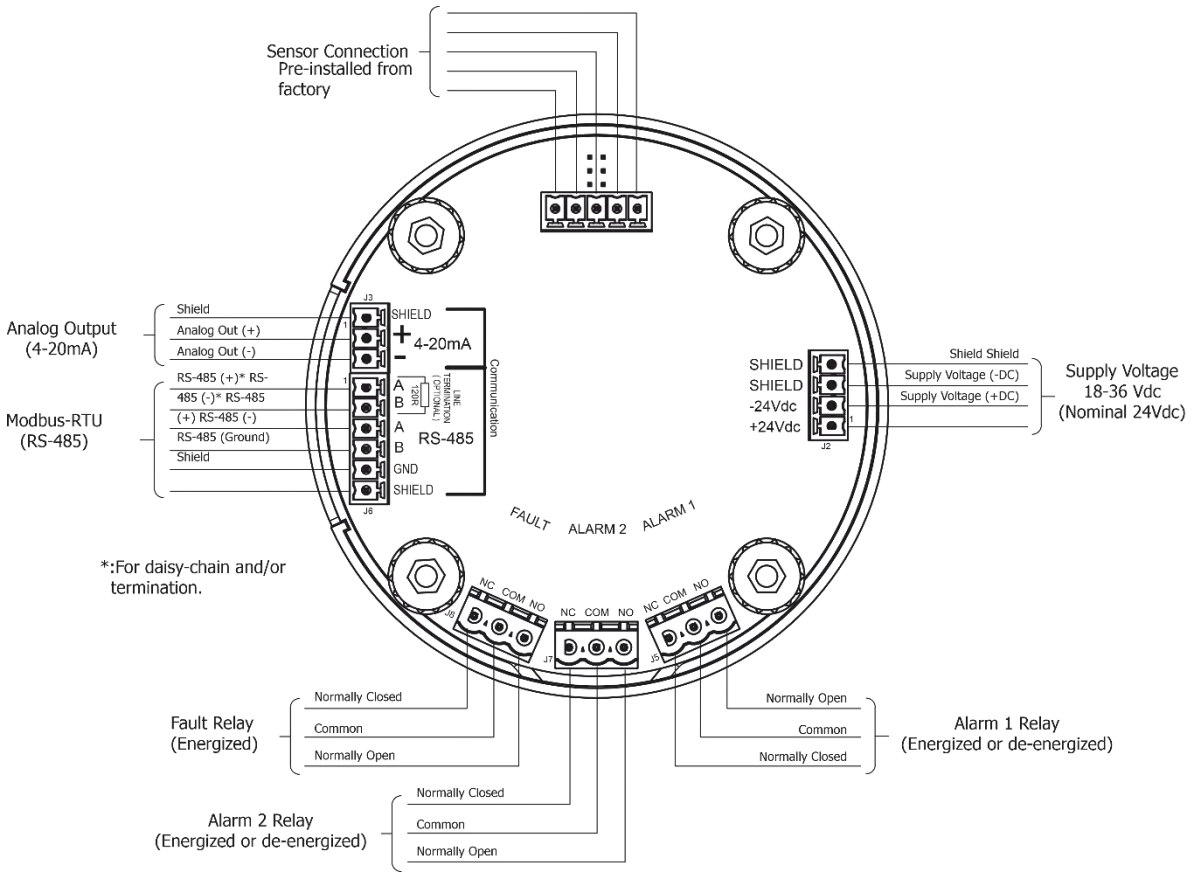


Figure 8 Input board connection terminals

Cabling diagram can be seen in Appendix 10.2.

PAY ATTENTION

Do **not** allow the shield to touch the enclosure walls nor the cable gland. Terminate cable shield to the available shield terminals on the Input Board and make sure the length is as short as possible.

5 Operation

The system is factory configured and set according to the end-user requirements. The system undergoes a series of acceptance tests, including calibration before shipment. This can reduce the effort required during installation and commissioning.

The system is designed to accommodate changes in settings, to meet individual end-user needs. The changes can be set directly via the optical buttons or using the Geopal app. Different operation states of the system will be described in the following subsections.

5.1 Warm-Up

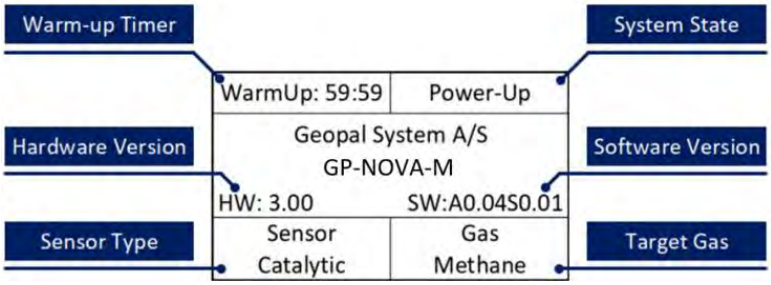


Figure 9 Example of the main window on Warm-Up state



Figure 10 Example of the system in Power-Up state

Once the system is turned on, it will enter the Warm-Up state. The purpose is to introduce a stabilization time for the system to operate with the intended accuracy. The system outputs and visual indication during the Warm-Up state, are shown in the table below.

4-20 mA loop	Fault relay state	LED bars	
		Color	Driving scheme
Fault* + 0.5 mA	De-energized	Yellow	Fade/Alternating

* The 4-20 mA Fault value is configurable. See Section 6.5. Analog Output.

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5.2 Normal Operation

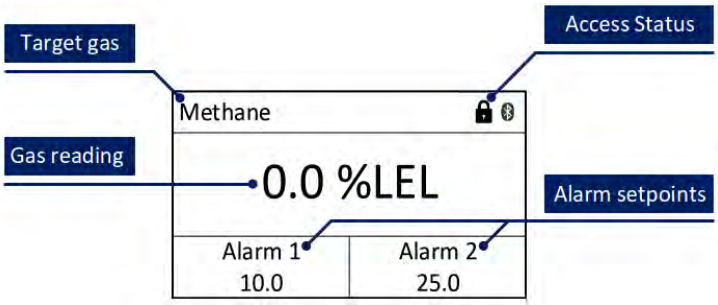


Figure 11 Example of the main window during Normal Operation



Figure 12 Example of the system in Normal Operation

The system is designed to keep the end-user visually informed of system parameters in the main window, such as target gas, gas readings, and alarm setpoints. The system outputs and visual indication during the Normal Operation State, are described in the table below.

4-20 mA loop	Fault relay state	LED bars	
		Color	Driving scheme
4*	Energized	Green	Constant/Simultaneous

* The 4-20 mA loop can have the Dead Zone feature enabled See Section 6.5. Analog Output.

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5.3 Alarm

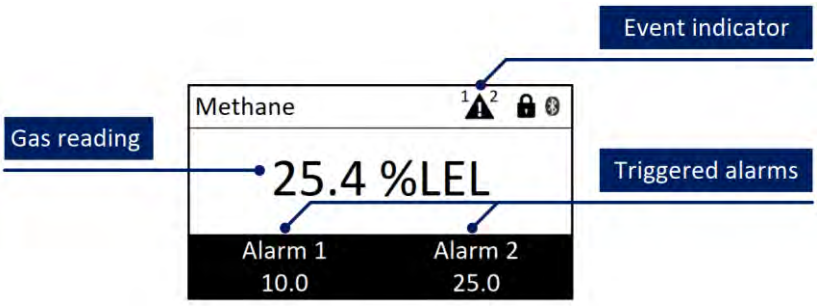


Figure 13 Example of the main window on Alarm State.



Figure 14 Example of gas detector in alarm state

In the case of a gas cloud formation, the gas concentration will be shown on the display and alarm relays will change state once the gas concentration exceeds the alarm setpoints. The system will notify the user about the alarm event via the Event indicator and will store the alarm event in the Event Log.

Two individual Alarm setpoints and delay times are set before shipping according to customer requirements. To change them, see Section 6.4. Alarm Relays. The system outputs and visual indication during the alarm state, are described in the table below.

4-20 mA loop	**Fault relay state**	**LED bars**	
		Color	**Driving scheme**
Depending on gas concentration*	Energized	Red	Flashing/Alternating

* The 4-20 mA loop can have the Dead Zone feature enabled. See Section 6.5. Analog Output.

5.4 Fault

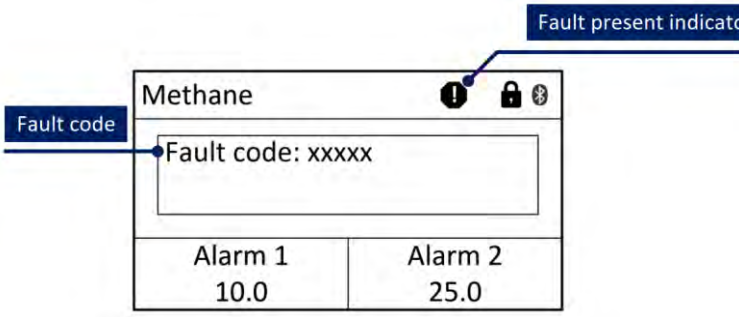


Figure 15 Example of the main window on Fault state



Figure 16 Example of system in Fault state

The system is designed to continuously run self-diagnosis. Any deviation from the correct operation will announce a fault event, store it in the Event Log, and will output a Fault Code. For more, see Section 7.4. Fault Codes and Suggested Actions. The system outputs and visual indication in case of failure detection, are described in the table below.

4-20 mA loop	Fault relay state	LED bars	
		Color	Driving scheme
Fault*	De-energized	Yellow	Flash/Simultaneous

* The 4-20 mA Fault value is configurable. See Section 6.5. Analog Output.

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5.5 Service and Configuration

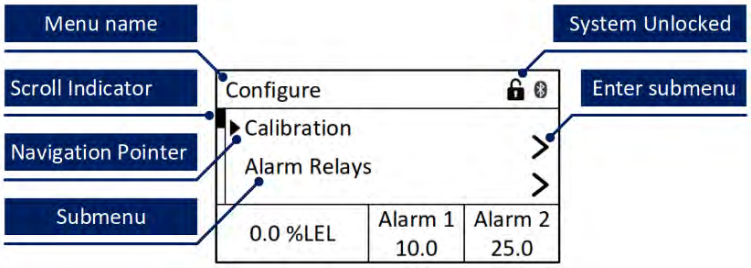


Figure 17 Example of configure menu on system display.

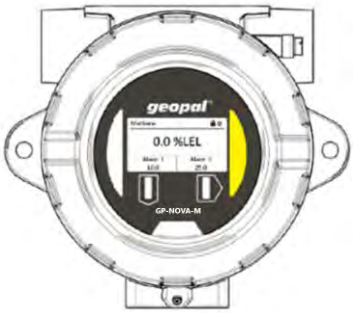


Figure 18 Example of the system in service and configuration state

In Service and Configuration state, user can conduct calibration and configure settings such as alarm setpoints, relays, analog output, and more. The system is designed to output an analog output value of Fault + 0.5 mA, to indicate that the system is subjected to service and/or configuration. If the password is enabled, the user will be prompted to enter the password here. For more, see Section 6.2. Configure. The system outputs and visual indication during the Service and Configuration state, are described in the table below.

4-20 mA loop	Fault relay state	LED bars	
		Color	Driving scheme
Fault* + 0.5 mA	De-energized	Yellow	Fade/Alternating

* The 4-20 mA Fault value is configurable. See Section 6.5. Analog Output.

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5.6 Bluetooth Communication



Figure 19 Example of Geopal app



Figure 20 Example of the system once Bluetooth communication is established

The system is equipped with a Bluetooth module to ease, maintenance, operation monitoring, and troubleshooting effort. The Geopal app will list all available devices within 10 m distance. The user will be prompted to enter a pairing password. The System will confirm a successful connection by having both LED bars flashing blue with fading effect and waking up the display. In case the system is put in Service and Configuration state, the LED bars will change color accordingly. For more, see Section 6.7.2 Bluetooth. The system outputs and visual indication once Bluetooth communication is established are described in the table below.

4-20 mA loop	Fault relay state	LED bars	
		Color	Driving scheme
Depending on gas concentration*	Energized	Blue	Fade/ Simultaneous

* The 4-20 mA loop can have the Dead Zone feature enabled. Once user enters the configuration menu, the LED bars will switch to yellow with a driving scheme of fade/alternating and the analog output will have a value of Fault + 0.5 mA. See Section 6.5. Analog Output.

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6 System menu

The main menu of GP-NOVA-M consists of four sub-menus.

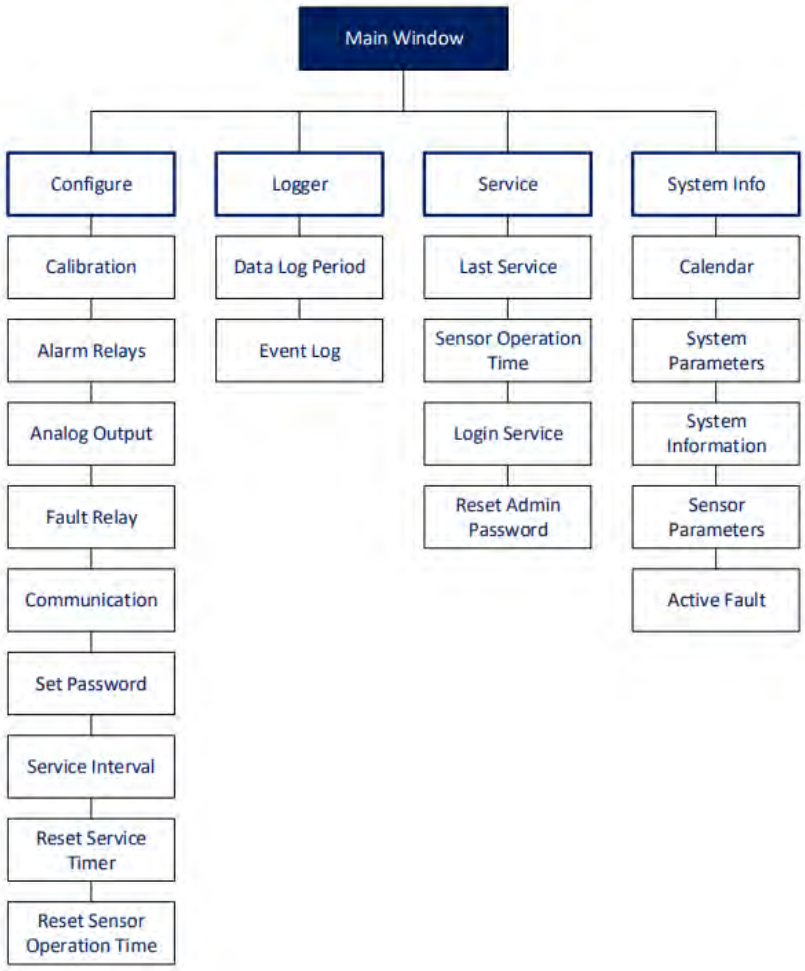


Figure 21 The GP-NOVA-M menu structure.

Entering the Configure menu will put the system into the inhibit state. In this state, the system will activate the fault relay, if connected, and the analog output will be set to Fault + 0.5 mA. In this state, the alarm relays are deactivated and will not react to gas cloud formation. However, information on the display and the LED bars will react according to the gas concentration, used as indicators when service routine and bump tests are conducted. The system will remain in Service and Configuration state until user exits the Configure menu by either tapping Back or Main Window. If no fault is detected, the system will return to Normal Operation State.

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6.1 *Control Buttons*

The system offers navigation and access to the system settings via optical buttons, which serves to navigate through the menu and to choose an alphanumeric character when needed.

To get the best response from the optical touch buttons, please:

- When tapping, flatten your finger to cover as much area as possible within the white frame around the buttons.
- Avoid wearing dark gloves.
- Keep the transmitter enclosure glass clean.



Figure 22 Finger placement for the best button response

6.1.1 *Navigation Through System Menu*

- Tap to scroll down through the menu
- Place ▶ at the desired sub-menu
- Tap to enter the sub-menu



Figure 23 Use of buttons to navigate through the menu

6.1.2 *Choose an Alphanumeric Character*

- Tap to place ▲ below a specific character slot,
- Pointing position: ✱
- Tap once to place ▲ above the star symbol to browse upwards ✱, scroll upwards now with pressing .
- Tap twice to place ▲ below the star symbol to browse downwards ✱, scroll downwards now with pressing .



Figure 24 Use of buttons to choose an alphanumeric character

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6.2 Configure

When user enters this menu, the system enters the inhibit state and will output an analog signal of FAULT + 0.5 mA. Once user exits this menu, by choosing Back or Main Window, system will return to the Normal or Alarm state, depending on gas concentration.

To find the Configure menu, navigate according to the menu-map below.

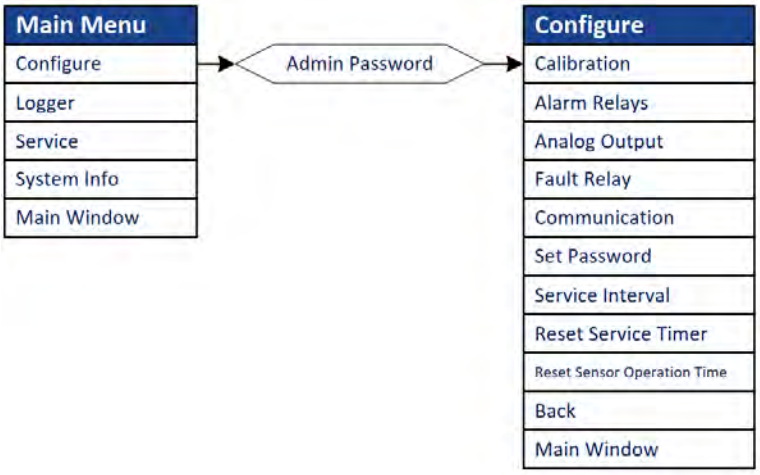


Figure 25 Configure menu-map

NOTE
To reduce the risk of unauthorized access, enable and frequently change admin password. For factory default password please see C*alibration Certificate*.

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6.3 Calibration

The system is designed to notify if calibration is needed.

If the system detects a need for calibration, the analog output will be set to 3.8 mA, based on zero-drift monitoring.

The purpose of conducting a calibration is to allow the system to construct and/or update a mathematical expression for a calibration curve, which the system will use to interpret the gas concentration.

There are two points of interest within the calibration curve:

- Zero-point (Idle Voltage V_0 at 0 % gas): Established by sensor signal when no gas present
- Span-point (Span Gas Voltage V_a at applied calibration gas concentration): Established by sensor signal when a specific gas concentration is present, which must be entered as the G_a parameter.

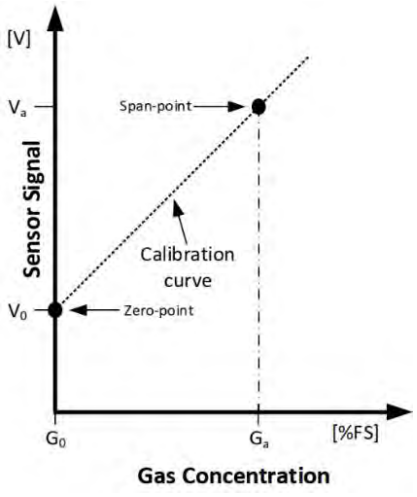


Figure 26 The zero and span points within the calibration curve

It is recommended to document V_0 and V_a from the last calibration before conducting a new calibration and compare with the new recorded values to evaluate sensor performance.

In both zero and span calibration, the system will register the values after the Stabilization Time has run out. If the values are within the allowable limits, the system will announce a successful calibration, otherwise, it will announce a failed calibration.

For troubleshooting, see Section 7.4. Fault Codes and Suggested Actions.

Calibration kit, which includes a calibration ring, regulator and feed adaptor, as well as calibration gas, can be seen in the figures to the right. Both can be purchased from Geopal.



Figure 27 Calibration kit to conduct a system calibration.

To find the Calibration menu, navigate according to the menu-map below.

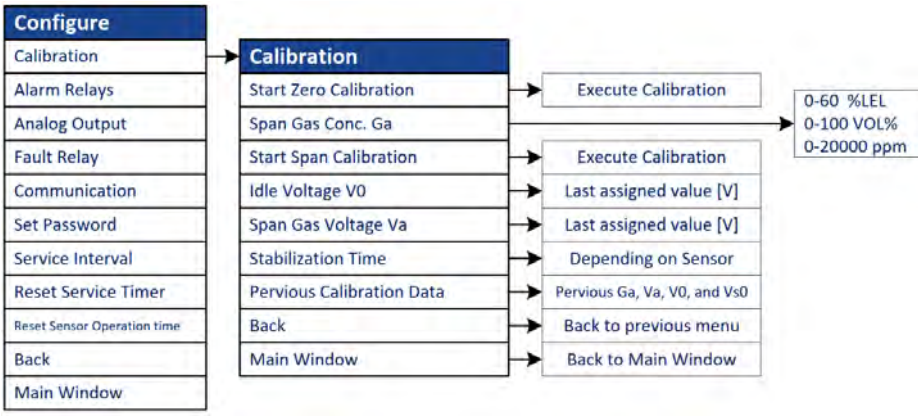


Figure 29 Calibration menu-map



Figure 28 Example of Geopal calibration gas canister

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6.3.1 *Start Zero Calibration*

To conduct a Zero Calibration, please follow the steps below:

- Make sure that no target gas is present.
- If in doubt, use canned atmospheric air as calibration gas for the Zero-point. To purchase canned atmospheric air, contact Geopal.
- If canned atmospheric air is used as calibration gas for Zero-point, apply the gas before initiating the Zero Calibration procedure.
- Navigate to Start Zero Calibration, execute calibration, and wait for the Stabilization Time to run out.
- Confirm the successful calibration by tapping either of optical touch buttons.

6.3.2 *Start Span Calibration*

To conduct a Span Calibration:

- Make sure the Ga value has the same value as the span-calibration gas concentration.
- If not, change the Ga value to match the span-calibration gas concentration.
- Attach the feed adaptor to one of the threaded holes in the sensor enclosure, cover the remaining holes with the calibration ring.
- Apply the gas before initiating the Span Calibration procedure.
- Navigate to Start Span Calibration menu, execute calibration, and wait for the count-down timer to run out.
- Confirm the successful calibration by tapping either of optical touch buttons.

The assigned V_0 and V_a can always be seen below Idle and Span Gas Voltage, respectively.

6.3.3 *Previous Calibration Data*

Pervious calibration data, including V_0, V_a, and G_a, is stored and can be extracted from Calibration History. This enables the user to evaluate sensor performance within the given operating environment. This is an advantage for planning maintenance and service routines, since the rate of performance degradation, if any, can be detected.

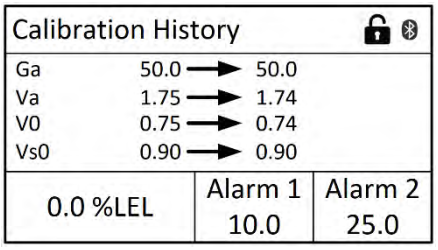


Figure 30 Example of calibration history data.

NOTE
A decrease or increase of the V_0 value may indicate a negative or positive drift respectively. A decrease in the V_a value may indicate a need for sensor replacement.

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6.4 Alarm Relays

The system has configurable relays for Alarm 1 and Alarm 2. It is possible to change the settings of both alarm relays, such as:

- On and Off Values.
- Def. State: Energized or De-energized.
- Time Delay: 0-60 seconds (valid for ON and OFF delays)

To find the Alarm Relays menu, navigate according to the menu-map below.

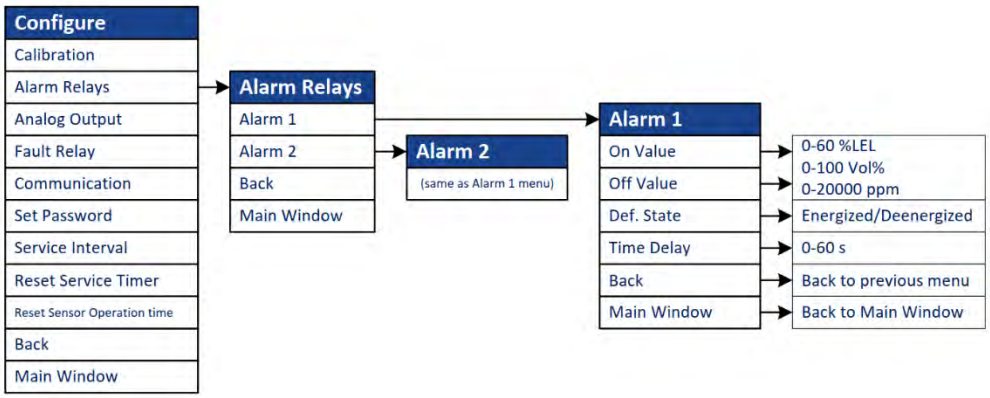


Figure 31 Alarm Relays menu-map

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6.5 *Analog Output*

The system is offering a configurable analog 4-20 mA current loop output. User can change the settings of the analog output are:

- Failure Low value: 0-3 mA
- Dead Zone: 0-5 %FS
- Enable / Disable

To find the Analog Output menu, navigate according to the menu-map below.

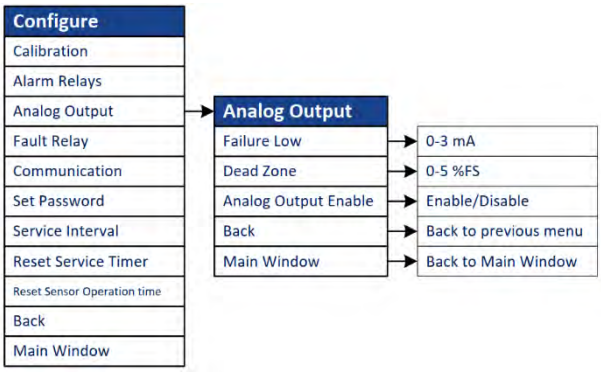


Figure 32 Analog output menu-map.

The analog output values and states are presented below.

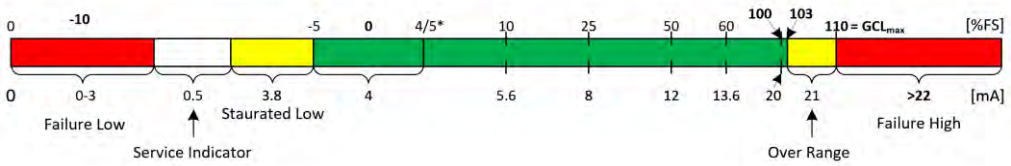


Figure 33 Analog output values and states.

Table 4 Analog output values and states

Analog Output Value [mA]	Description
0-3	Failure low
Failure Low + 0.5	Service mode
3.8	Negative drift
4-20	Measuring range
20.5	Over range mode
≥ 22	Failure high

PAY ATTENTION
Overrange value: ≈ 21 mA and Failure High value: ≈ 22 mA may indicate presence of high explosive and/or toxic gas concentration.

NOTE
The analog output load must be ≤ 500 Ω.

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6.6 Fault Relay

The system has a configurable always energized Fault Relay. User can change the settings of the fault relay, which are:

- Low Gas Concentration Limit: -20 to 20 %FS
- Time Delay: 0-5 seconds

To find the Fault Relay menu, navigate according to the menu-map below.

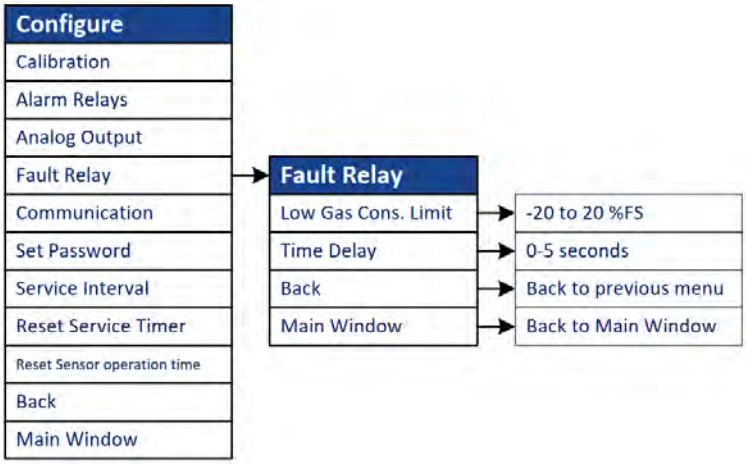


Figure 34 Fault Relay menu-map.

6.7 Communication

The system offers the following communication options:

- RS-485 Modbus RTU
- Bluetooth wireless communication

To configure navigate according to the menu-map below.

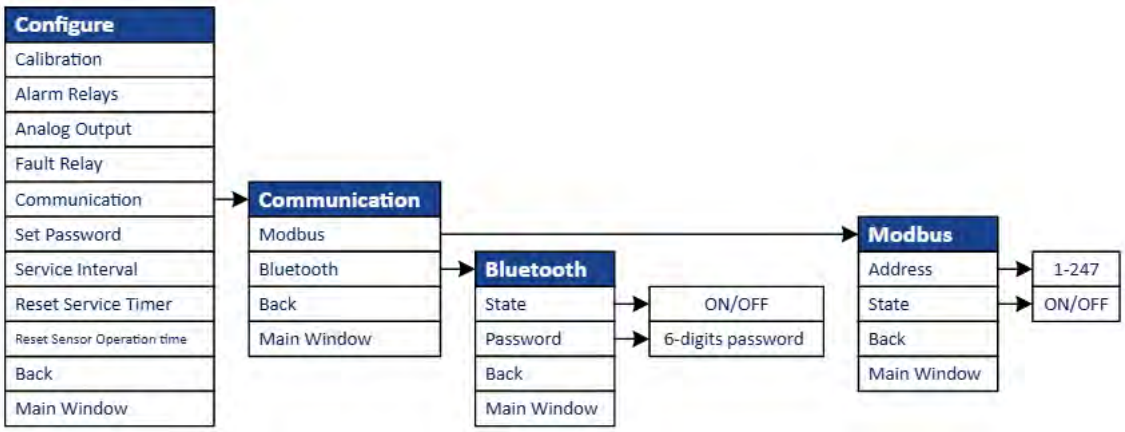


Figure 35 Communication menu-map

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6.7.1 *Modbus RTU*

The system is offering Modbus RTU via RS-485. User can change the settings of Modbus RTU communication options, which are:

- Address: 1-247
- State: ON/OFF

Baud Rate	9600
Databits	8
Stop bit	1
Parity	Even
Flow Control	None

Figure 36 The 2-wire setup of RS-485 Modbus RTU

The 2-wire setup can be seen in the figure to the right.

The holding register table can be seen below.

Address	Register number	Description
1-247	40101	Measured Value
	40102	System State

Gas Reading	0-100 %FS

Alarm 1	1
Alarm 2	2
Fault	3
Normal Op.	4

Figure 37 Holding register table of the Modbus RTU

6.7.2 *Bluetooth*

The system is offering wireless communication via Bluetooth technology. User can change the settings of the Bluetooth communication, which are:

- State: ON/OFF
- Password: 6 digits pairing password, for factory default password please see C*alibration Certificate*.

NOTE
To reduce the risk of unauthorized access, frequently change Bluetooth pairing password.

6.8 Set Admin Password

The system offers an option to set up an admin password, to avoid unauthorized access to safety-critical settings found under Configuration Menu. User will be prompted to enter this password when entering the Configuration Menu using the optical buttons or when communicating via the Geopal app. It is possible to change the admin password in the “Set Password” menu.

To find the Set Password menu, navigate according to the menu-map below.

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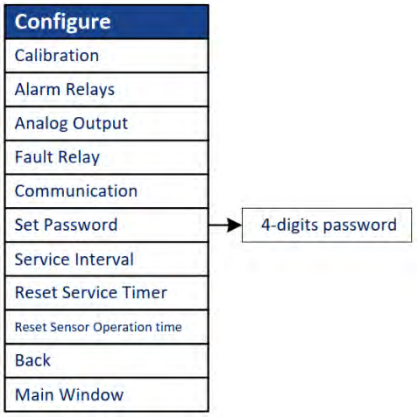


Figure 38 Set Password menu-map

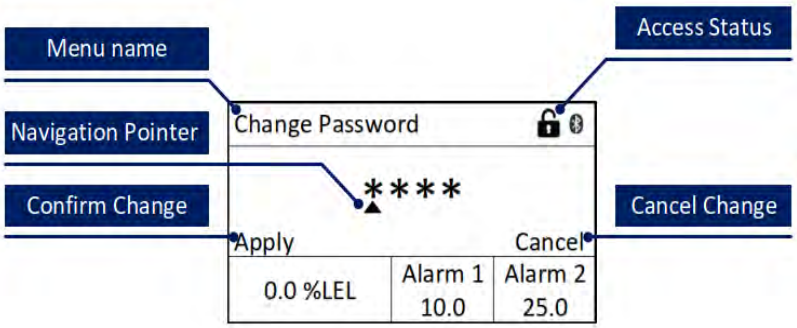


Figure 39 Example of changing password window on the system display.

NOTE
To reduce the risk of unauthorized access, enable and frequently change admin password. For factory default password see *Calibration Certificate*.

6.9 Service Interval, Reset Service Timer, and Reset Sensor Operation Time

The system has a service interval, a service timer, and sensor operating time. The purpose is to help the planning of maintenance activities, to inform user before the declared deadlines. The user can configure the above mentioned as follows:

- Service Interval: 2-12 Months (6 months recommended).
- Reset Service Timer: The span of this count-down timer is identical to the service interval.
- Reset Sensor operation time: The span of this count-down timer is set to 24 Months by default.

To find the menus above, navigate according to the menu-map below.



Figure 40 Service period, reset service timer, and reset sensor operation time menu-map.

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6.10 Log function

The system has inbuild log function where all important system parameters and events are time-stamped, saved on a microSD card, driven by a coin battery, which lifetime is estimated to be around 8 years. In case of an accident, the log files can be extracted via the microSD-card. We at Geopal call it the Black Box. There are two types of logs:

- Data Log: Logs system parameters as a function of time. The plots of this data can be seen and sent via Geopal app as a .csv file. User can choose a sampling rate from 1 to 1440 minutes. The amount of data is dependent of the size of storage capacity. The system is shipped with 2 GB microSD card.
- Event log: Logs events, such as calibration results, alarm events, fault codes, and more. The Event Log can record up to 2000 events, and the list starts with recent events

A third log can be sent by email, along with the other logs using the Geopal-app:

- System dump log: A list of all configurable system parameters and their current value.

To find the Logger menu, navigate according to the menu-map below.

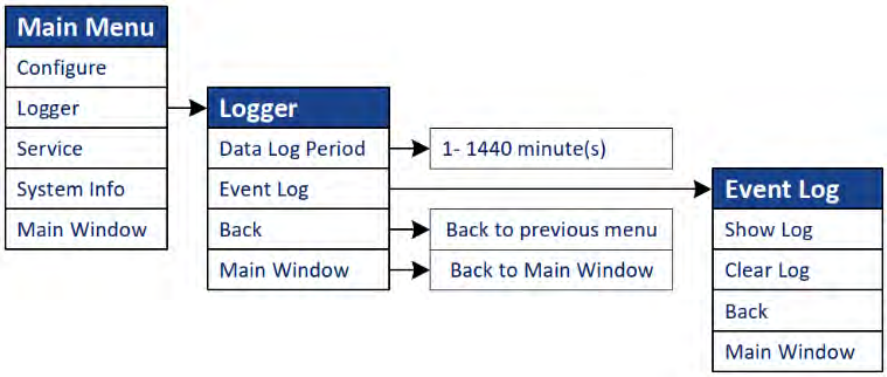


Figure 41 Logger menu-map.

See examples of displaying the log in the figures below.



Figure 42 Example of View event log window on Geopal app.

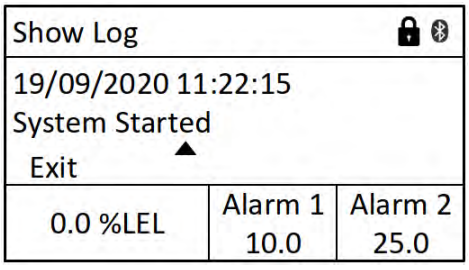


Figure 43 Example of Show Event Log window on the system display.

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6.11 Service

The system has a Service menu, where user can extract the last service date, sensor lifetime and reset the system admin password. In case the admin password is forgotten, you may contact Geopal. For more about servicing and maintenance, See Section 7. Maintenance.

The Login Service menu is restricted to trained Geopal Staff.

To find the Service menu, navigate according to the menu-map below.

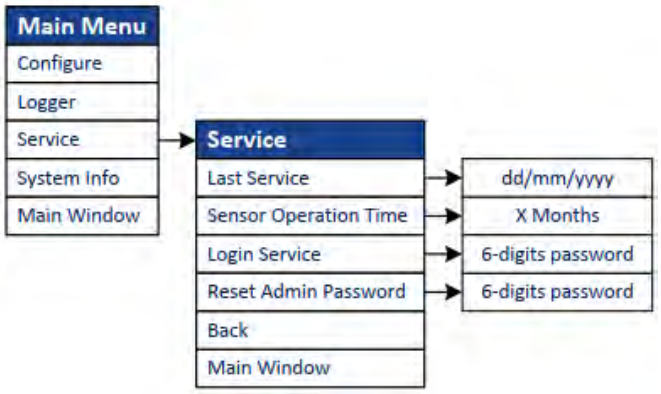


Figure 44 Service menu-map.

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6.12 System Info

The System Info menu is where the user can extract important information and real-time measurements of internal system parameters. The System Info contains the following:

- Calendar: Setup the system time and date
- System Parameters: Provides real-time measurements of internal temperature, system supply voltage, current and power consumption along with information regarding Power On time. This menu is read only menu.
- System Information: The system can be assigned a name and ownership under System Name and Owner menus, respectively. Serial Number, Production Date, HW Version, and SW Version are read only parameters.
- Sensor Parameters: Sensor Type, Sensor Supply Voltage, Sensor Supply Current, Power Consumption are some of the sensor parameters that can be monitored. The Sensing Element Voltage, Sensor Output Vtgs, and Input Stage Voltage Vsis are also monitored and available for the user along with the actual Gas Concentration, unaffected by the dead-zone dictated by the analog output.
- Active Fault: a 4 or 5-digit code that represents an internal system fault.

To find the System Info menu, navigate according to the menu-map below.

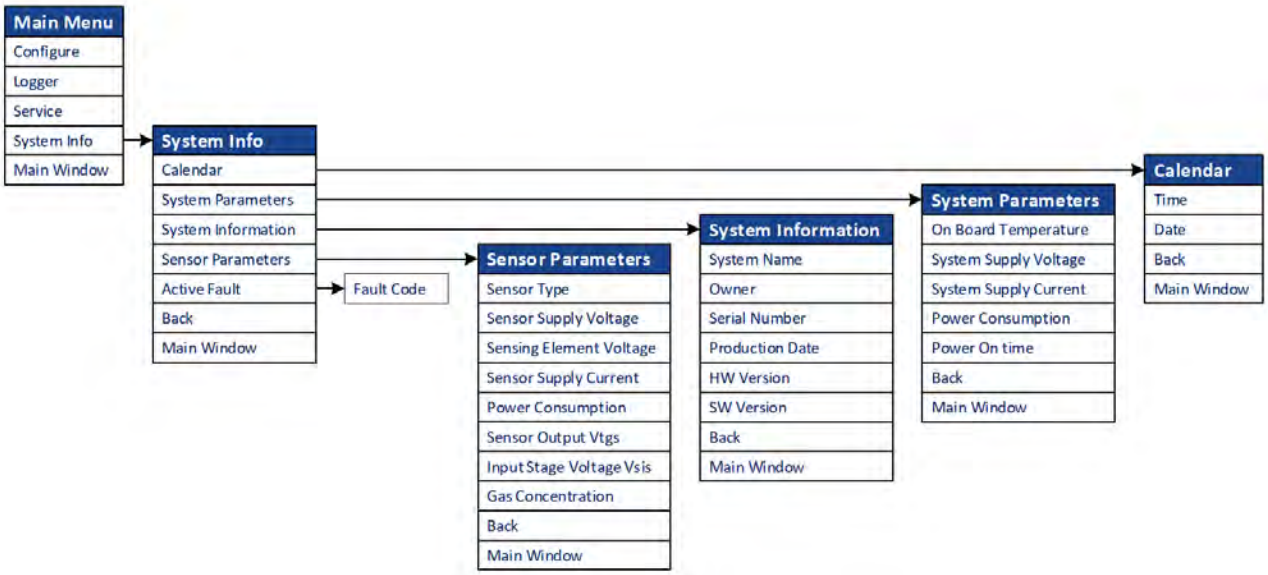


Figure 45 System Info menu-map.

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6.13 Calendar

The user can setup the system time and date using the Calendar menu. It is important to make sure the calendar is set up correctly to have accurate time-stamped log records.

To find the System Info menu, navigate according to the menu-map below.

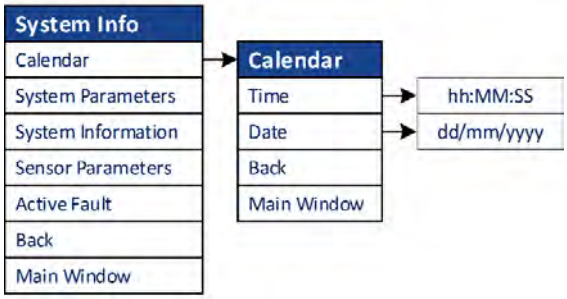


Figure 46 Calendar menu-map.

6.14 System Parameters

The user can extract important system parameters, not only to have a detailed status of system operation, but they can also be used within a troubleshooting procedure. An overview of the information that each parameter provides, is listed below.

- On Board Temperature: Real-time temperature measurement near the hottest spot, on internal PCB.
- System Supply Voltage: Real-time measurements of system supply voltage.
- System Supply Current: Real-time measurements of system supply current.
- Power Consumption: Calculated value based on the voltage and current measurements.
- Power On time: Period in minutes, which the system has been turned on since last system start-up.

To find the System Parameters menu, navigate according to the menu-map below.

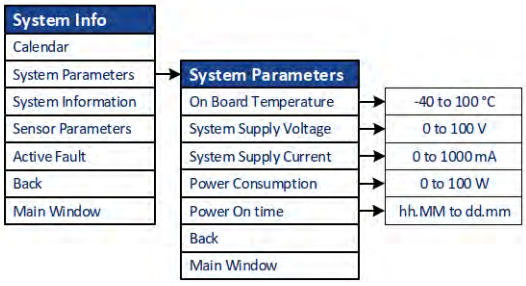


Figure 47 System Parameters menu-map.

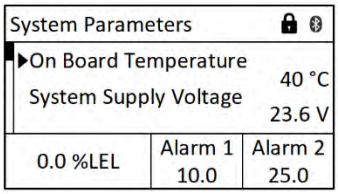


Figure 48 Example of System Parameters window on the display.

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6.15 System Information

The user can assign a system and ownership name, to ease tracking of system placement and owner. The system information also offers system information such as the serial number, production date, hardware, and software (HW and SW) version number. An overview of the information that each parameter provides, is listed below.

- System Name: can be a location (e.g., Silo 1 or Basement A).
- Owner: Customer name.
- Serial Number: Assigned by Geopal.
- Production Date: Assigned by Geopal.
- HW and SW version: Assigned by Geopal.

To find the System Information menu, navigate according to the menu-map below.

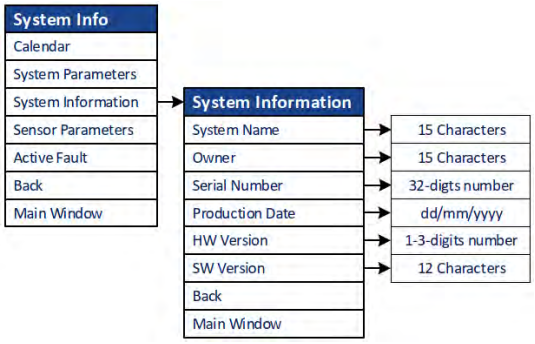


Figure 49 System Information menu-map.

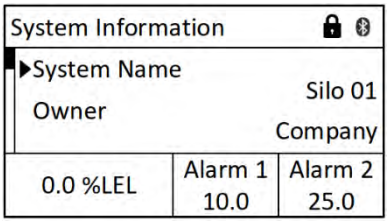


Figure 50 Example of System Information window on the display.

6.16 Sensor Parameters

User can extract important sensor parameters, not only to have a detailed status of sensor operation but to use them in a troubleshooting procedure. An overview of the information that each parameter provides, is listed below.

- Sensor Type: The type of sensor technology (e.g. Catalytic, Infrared, etc.).
- Sensor Supply Voltage: Real-time measurements of sensor supply voltage.
- Sensing Element Voltage: Real-time measurements of internal sensor voltage.
- Sensor Supply Current: Real-time measurements of sensor supply current.
- Power Consumption: Calculated value based on the sensor voltage and current values.
- Sensor output voltage Vtgs: Real-time measurements of sensor output voltage.
- Input Stage Voltage Vsis: Real-time measurements of scaled sensor output voltage.
- Gas concentration: Gas readings unaffected by the Dead Zone dictated by the analog output.

To find the Sensor Parameters menu, navigate according to the menu-map below.

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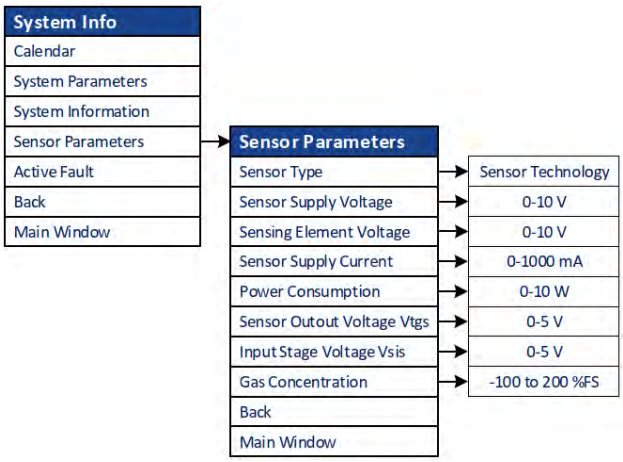


Figure 51 Sensor Parameters menu-map.

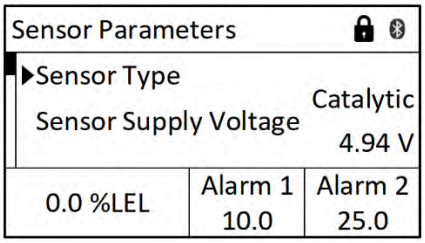


Figure 52 Example of Sensor Parameters window on system display.

6.17 Active fault

The user can extract a fault code in case of a fault being detected by the system. In Normal Operation, where no faults are present, the fault code will be assigned “None”. This means that the system is operating within specifications and as intended. If the system has detected a fault, a 4-5-digit fault code will be displayed. For more information, see Section 7.4. Fault Codes and suggested actions.

To find the Active Fault menu, navigate according to the menu-map below.

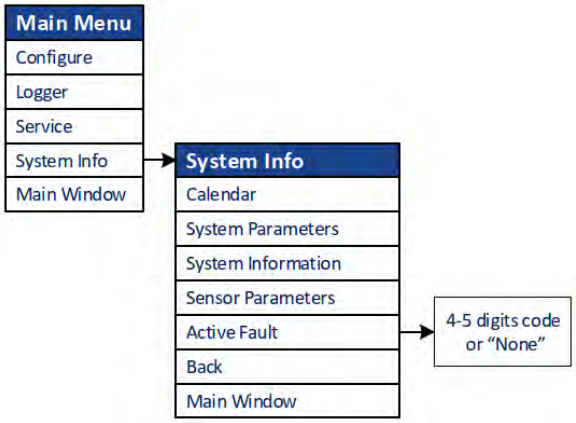


Figure 53 Active Fault menu-map.

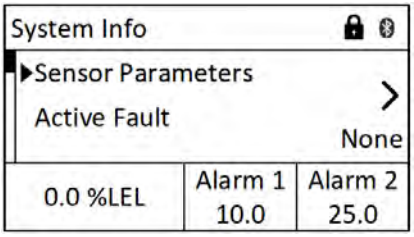


Figure 54 Example of Active Fault value window on the system display.

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7 Maintenance

Many factors dictate how and how often a maintenance procedure should be conducted. Site routines, environmental factors, and other operating conditions will have a direct effect on the frequency of routine maintenance and tests. However, Geopal recommends conducting a servicing routine every six months and a test routine every three months as a minimum.

7.1 Service Routine

A service routine must at least include the following:

- Visual inspection: Check all ATEX parts including cable glands for defect and/or damage.
- Clean the system with a damped black cloth.
- Check the system time and date. If incorrect, update them.
- Check and record the last service date.
- Check and record sensor operation time.
- Check the system logs.
- Check and record sensor signal values from the last calibration.
- Conduct system calibration.
- Conduct bump test.
- Reset service timer.
- Reset sensor operation time (if the sensor is replaced).

7.2 Bump Test

The purpose of a bump test is to check if the system is operating as intended or not. During this test, the system is subjected to a well-known gas concentration, enough to trigger alarm 2. The system will pass based on the following criteria:

- System display and visual indication, LED bars, are operating as intended during Normal operation and Alarm state.
- The analog output has a value corresponding to the applied gas.
- The alarm relays get activated at on and off setpoints.
- The Modbus RTU is sending a value corresponding to the applied gas and events.

NOTE
Geopal Maintenance Report template is available upon request.
Passing the bump test indicates that the system is working as intended.

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7.3 Sensor Replacement

If sensor replacement is needed on the EX, OX, and EX-V versions please follow the below steps. The replacement of the sensor must be conducted in an explosive gas free environment.

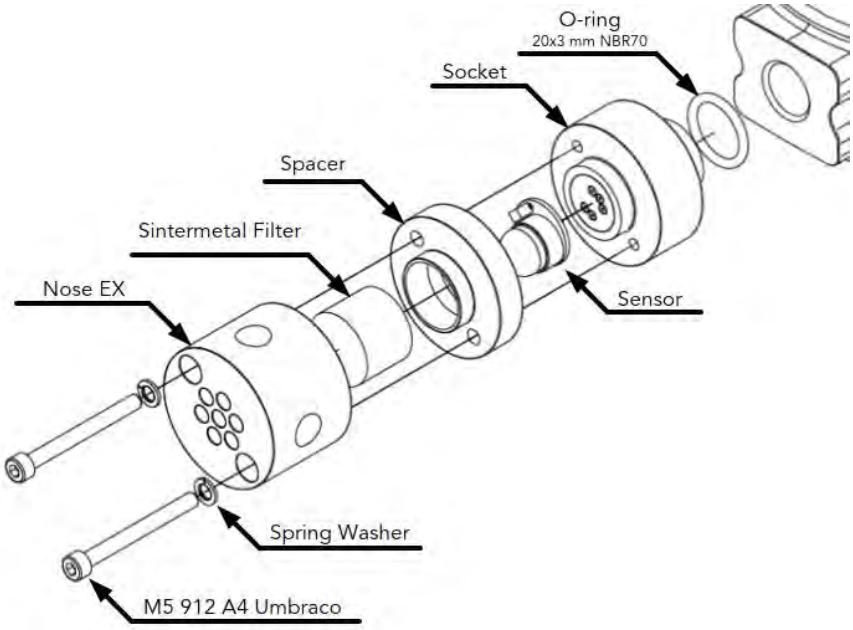


Figure 55 Simplified blow-up diagram. Detailed diagrams are available upon request.

- Make sure that the system is de-energized, by disconnecting power. Secure against unintended re-connection.
- Unscrew the sensor top part and gently grab the screws, washers, flameproof sensor protection (top Part), and spacer.
- Gently pull out the sensor from the socket.
- Align new sensor with socket holes.
- Gently push the sensor in the socket.
- Clean spacer and top part.
- Replace the sintered metal filter.
- Replace washers.
- Place spacer and top part and drive the Umbraco screws in the thread.
- Alternately tighten the screws gently with hand force. Then tighten screws with 5 N·m

PAY ATTENTION
System calibration and bump test must be conducted after sensor replacement.

7.4 Fault Codes and Suggested Actions

The table below shows different fault states with the corresponding fault code.

Fault code	Description	Action
8000-10002, 10012-12000, 12002, 16002-16005, 18000-50515	Service needed	Contact Geopal
10003	Calibration failed; span value too low	Recalibrate and ensure, 1. Correct zero calibration gas 2. Correct span gas calibration and Ga value If sensor signal is not reacting to gas, then replace the sensor, calibrate, and conduct bump test.
10005	Sensor signal/%FS too low	Check sensor signal level, 1. Above [Fault Threshold Min Value] V, conduct zero calibration 2. Below [Fault Threshold Min Value] V, check sensor connection If sensor connection is good, then replace the sensor, calibrate, and conduct bump test.
10006-10011	Faulty sensor	Replace sensor. Follow sensor replacement procedure
12001	Configuration not finished	Enter Service and Configuration state using the administrator code and review any changes recently made, then exit configuration mode. If fault code still occurs contact Geopal.
16000, 16001	Relay 1,2 setpoint is higher than 95% of full scale value	Decrease alarm setpoints below 95 % of full scale

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8 Warranty and Disposal

8.1 Warranty

Warranty coverage
Geopal System A/S provides a 1-year warranty, starting from the date of sale to the end-user. The warranty period must be documented with the original invoice or receipt. The warranty covers defects attributable to the materials and/or workmanship.

Warranty period
The warranty period begins at the date of delivery of the product to the first end-user. If the date of purchase cannot be documented, the warranty period will start at the date of production, as indicated on each product.

Warranty is void if production labels are altered, modified, or missing.

Warranty scope
The warranty does not cover labor costs for installation of replacement products or components, where Geopal System A/S chooses not to repair the product. The provision of replacement products or accessories does not extend the original warranty period.

Geopal System A/S reserves the right to offer a similar replacement product or component if the original is no longer available at the time of the complaint.

Coverage pursuant to the warranty requires that the end-user can demonstrate that defects or damages have not directly or indirectly occurred because of:

a) Faulty installation, i.e. installation contrary to the installation instructions or (in the absence of such instructions) contrary to good craftsmanship,
b) Installation outside recommended installation areas,
c) Misuse or abuse,
d) Use of incompatible spare parts or accessories,
e) Transportation, installation, or other types of handling,
f) Product modifications,
g) Other defects or damage not caused by material, production, or structural faults, if the preceding enumeration is not exhaustive.

Moreover, coverage pursuant to the warranty is conditional on the end-user demonstrating that defects or damages are not directly or indirectly attributable to failure (or that defects, damages, and defects could not be prevented by) performing maintenance as prescribed in the instructions and maintenance manual.

Written complaints
To invoke this warranty, the end-user must submit a written complaint during the warranty period to Geopal System A/S or the retailer where the product was purchased. This must occur within two months of when the end-user discovered, or ought to have discovered, the defect.

Geopal System A/S shall then determine whether the product will be repaired, replaced or whether to refund the purchase price.

Repairs under the warranty
Unless Geopal System A/S provides otherwise, the end-user is responsible for the repair. The warranty covers the free supply of spare parts/materials necessary for the end-user's repair of the defect.

Replacement
Redelivery will occur by replacement free of charge of the old product with a new product of the same kind, type, and quality. If, at the time of the complaint, the product is no longer produced or is not produced in the exact same version, Geopal System A/S shall be entitled to exchange it for a similar product.

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Transportation/shipping to and from Geopal System A/S and/or the dealer and any dismantling and reassembly of the product shall be agreed with Geopal System A/S before implementation, and if this occurs, the customer shall cover the costs.

The warranty does not cover the following

This warranty does not apply to products other than those listed under "Coverage of the warranty". For accessories, including pre-installed accessories, refer to the manufacturer's warranty, where available. Other Geopal System A/S products, regardless of whether these are pre-installed, are covered by the separate conditions stipulated in this warranty, including those relating to the warranty period referred to under "Warranty coverage".

Geopal System A/S accepts no liability for consequential damages, including consequential loss, or product liability other than what may follow from mandatory legislation.

Geopal System A/S accepts no liability for losses resulting directly or indirectly from circumstances over which Geopal System A/S has no control, including eg. strike, lockout, fire, war, blockades, import restrictions, political unrest, unusual natural occurrences, vandalism or other force majeure.

Geopal System A/S accepts no responsibility for products that are not produced by Geopal System A/S, regardless of whether they are sold or displayed together with the products listed under "Warranty coverage".

8.2 Disposal of Electrical and Electronic Products



This product is electrical and electronic equipment (EEE) and shall not be disposed of as unsorted municipal waste. At end of life, the equipment shall be collected separately and disposed of in accordance with Directive 2012/19/EU on waste electrical and electronic equipment (WEEE) and the applicable national regulations. Equipment marked with the crossed-out wheeled bin symbol is subject to separate collection requirements.

For further information on return, collection and treatment, contact the manufacturer, distributor or the relevant local waste management authority.

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9 Technical specifications

9.1 General Specifications

Supply voltage	18-36 V_{DC}, Nominal 24 V_{DC}
Power consumption	6.5 W max.
Target gas	Explosive and Toxic. For more details, contact Geopal
Measuring range	0-100 %LEL, 0-90000 ppm, 0-100 VOL%
Response time T90	Sensor dependent, please contact Geopal
Repeatability	+/- 5 %FS
Long-term stability	< 5 %FS / 12 months
Self-diagnostic	Continuous
Sensor technology	Application dependent, please contact Geopal
Signal output	Galvanically isolated, source 4-20 mA with configurable warning and fault signals RS-485 Modbus RTU
Relays	Alarm 1, 2, and Fault Configurable alarm ON/OFF setpoints Energized or de-energized alarm relays Configurable delay time 1 A @ 30 V_{DC}; 1 A @ 250 V_{AC}
Housing material	Transmitter: Aluminum Sensor: Stainless steel
IP rating	IP 65
Weight	--
Dimensions	Transmitter: 142x167x116 (HxWxD in mm) For sensor dimensions, please contact Geopal
Operating conditions	Transmitter: Temperature -40 °C to +60 °C Humidity 0 %RH to 95 %RH non-condensing Pressure 1013 mbar ±10 % For sensor operating conditions, please contact Geopal
Recommended storge temperature	0 °C to +25 °C

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9.2 Approvals

Approvals	**Low Voltage Directive** 2014/35/EU **EMC Directive** 2014/30/EU **Radio Equipment Directive** 2014/53/EU EN 61000-6-2:2005+AC:2005 + EN 61000-6-2:2019 EN 61000-6-4:2007+A1:2011 + EN 61000-6-4:2019 EN 301 489-1 V2.2.3 EN 301 489-17 V3.2.4 EN 300 328 V2.2.2, sec 4.3.2.9 EN 50270:2015+AC:2016 **ATEX Directive** 2014/34/EU EN IEC 60079-0:2018 EN 60079-1:2014
EU-Type certificate no.	TPS 20 ATEX 108952 0001 X TÜV 16 ATEX 176482 X **IECEx compliance with IEC standards** IEC 60079-0, Ed. 7 (2017) IEC 60079-1, Ed. 7 (2014-06)
IECEx-certificate no.	TPS 20.0031X TUN 11.0006X
Notified body No.	0123, 0044
Performance	EN60079-29-1:2016
Quality	ISO 9001:2015

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10 Appendices

10.1 Mechanical Drawings

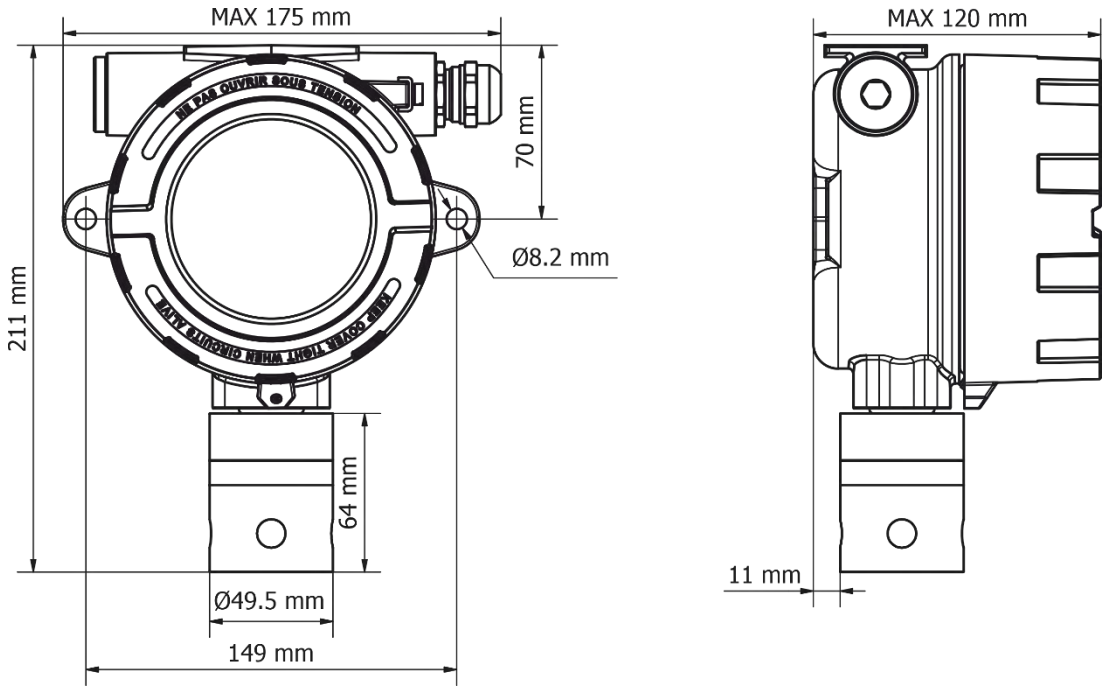


Figure 56 GP-NOVA-M-EX 10 mm

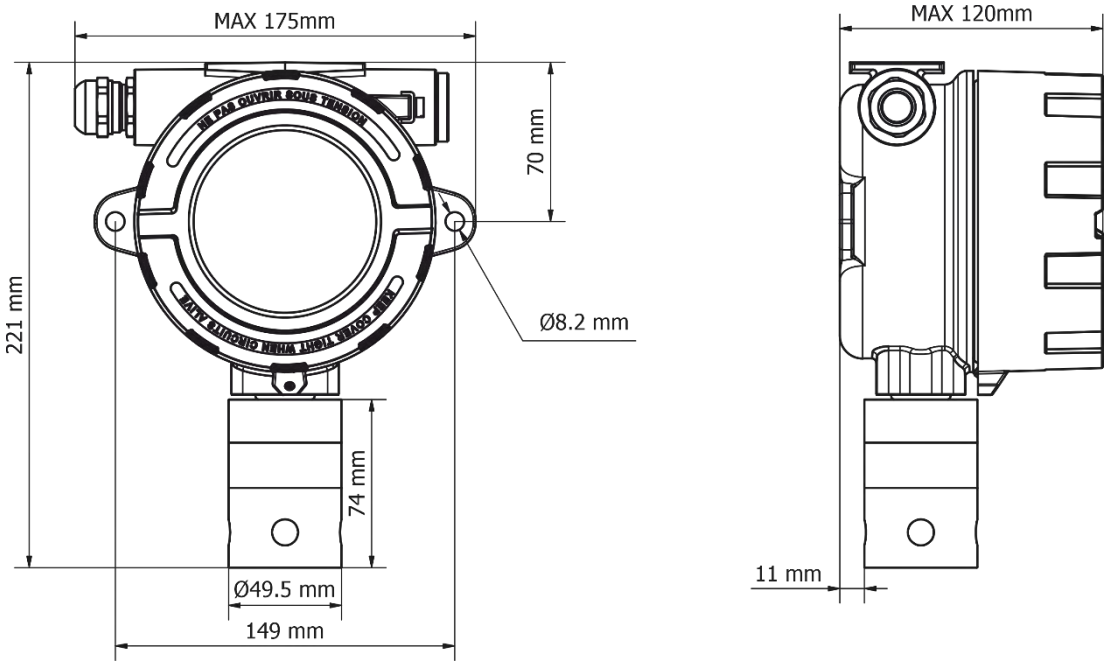


Figure 57 GP-NOVA-M-EX 20 mm

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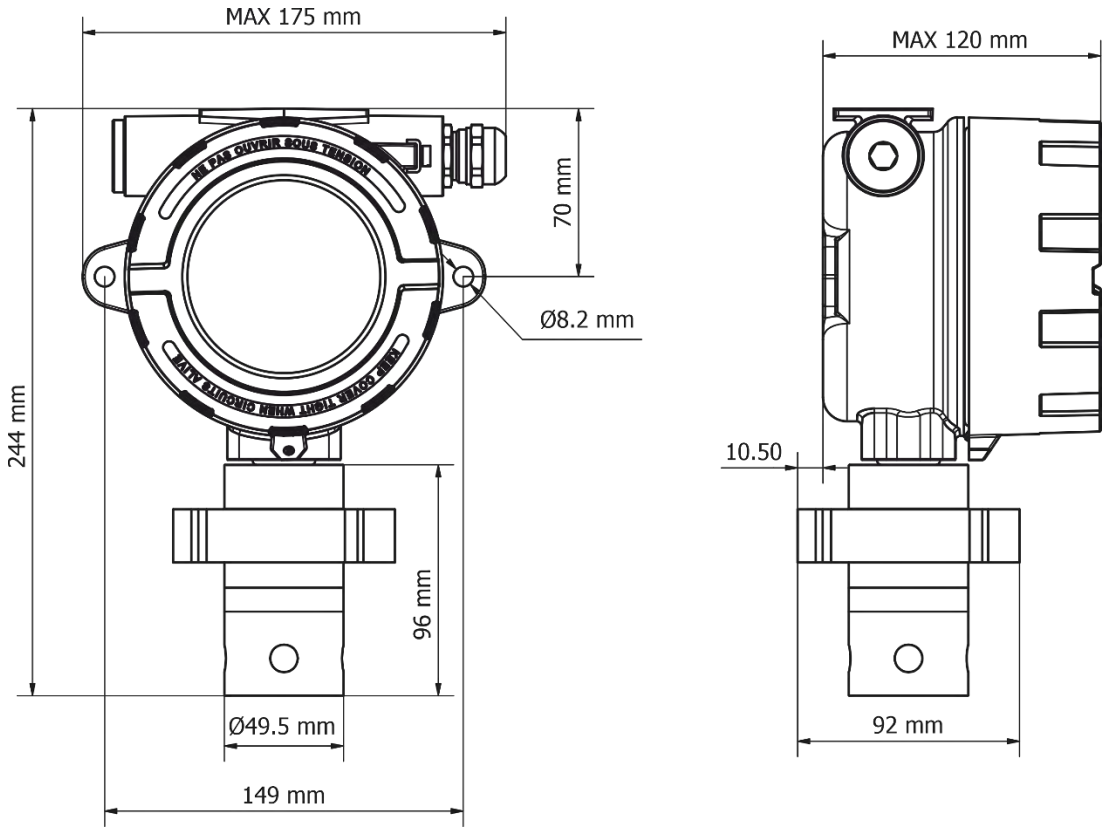


Figure 58 GP-NOVA-M-V 10mm

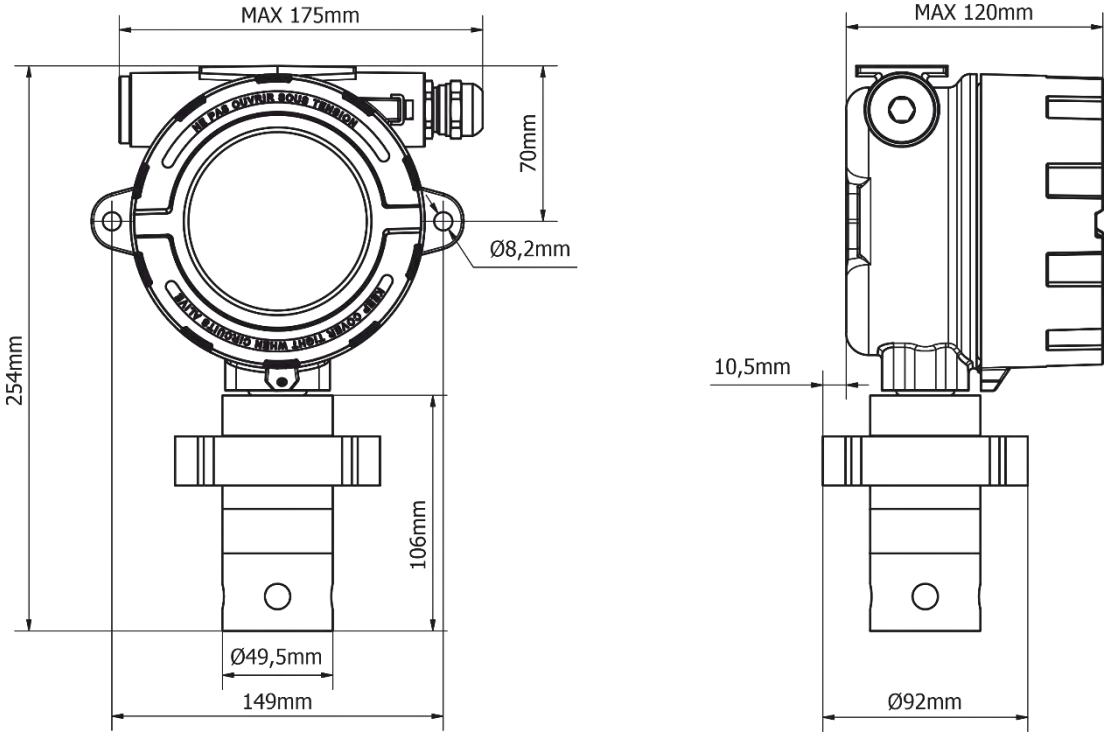


Figure 59 GP-NOVA-M-V 20mm

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10.2 Cabling Diagrams

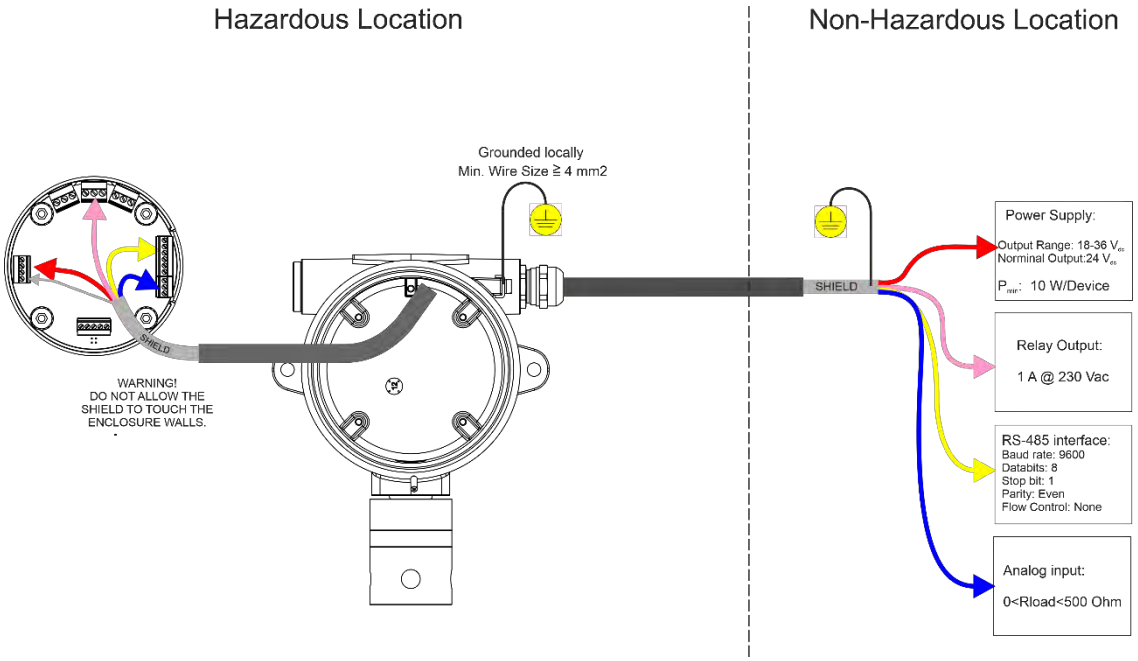


Figure 60 GP-NOVA-M cabling

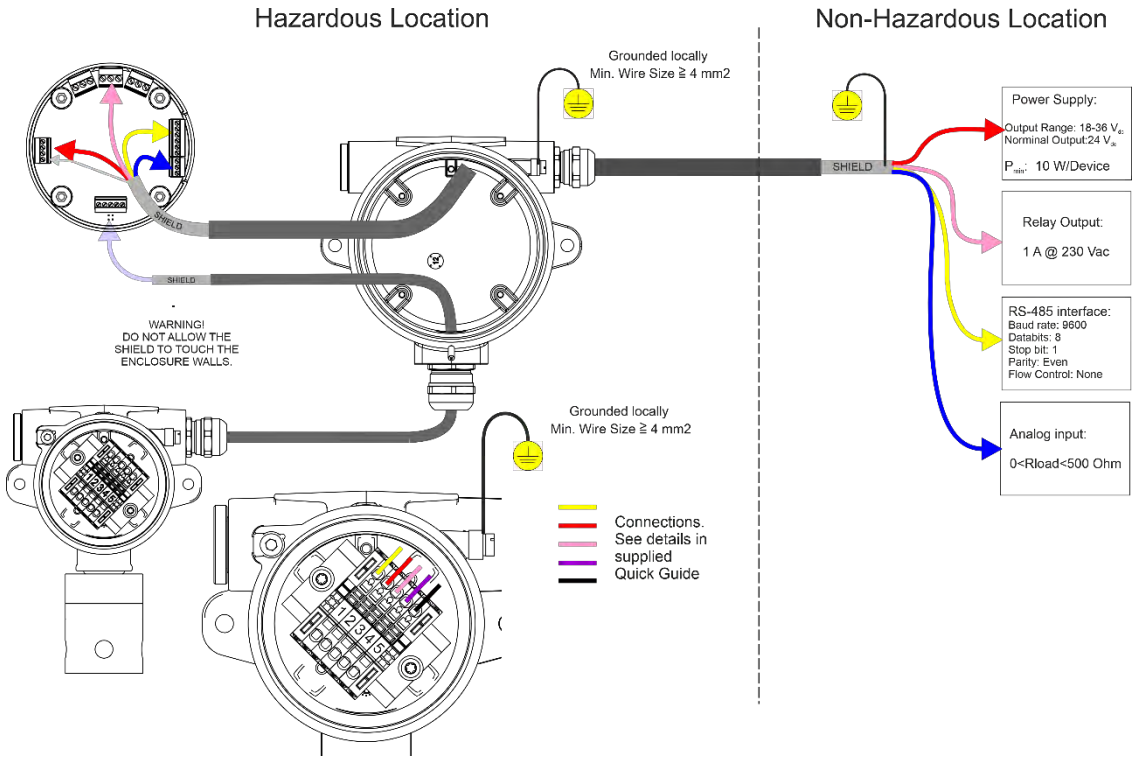


Figure 61 GP-NOVA-M and GJ-EX Cabling

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10.3 Torque instructions

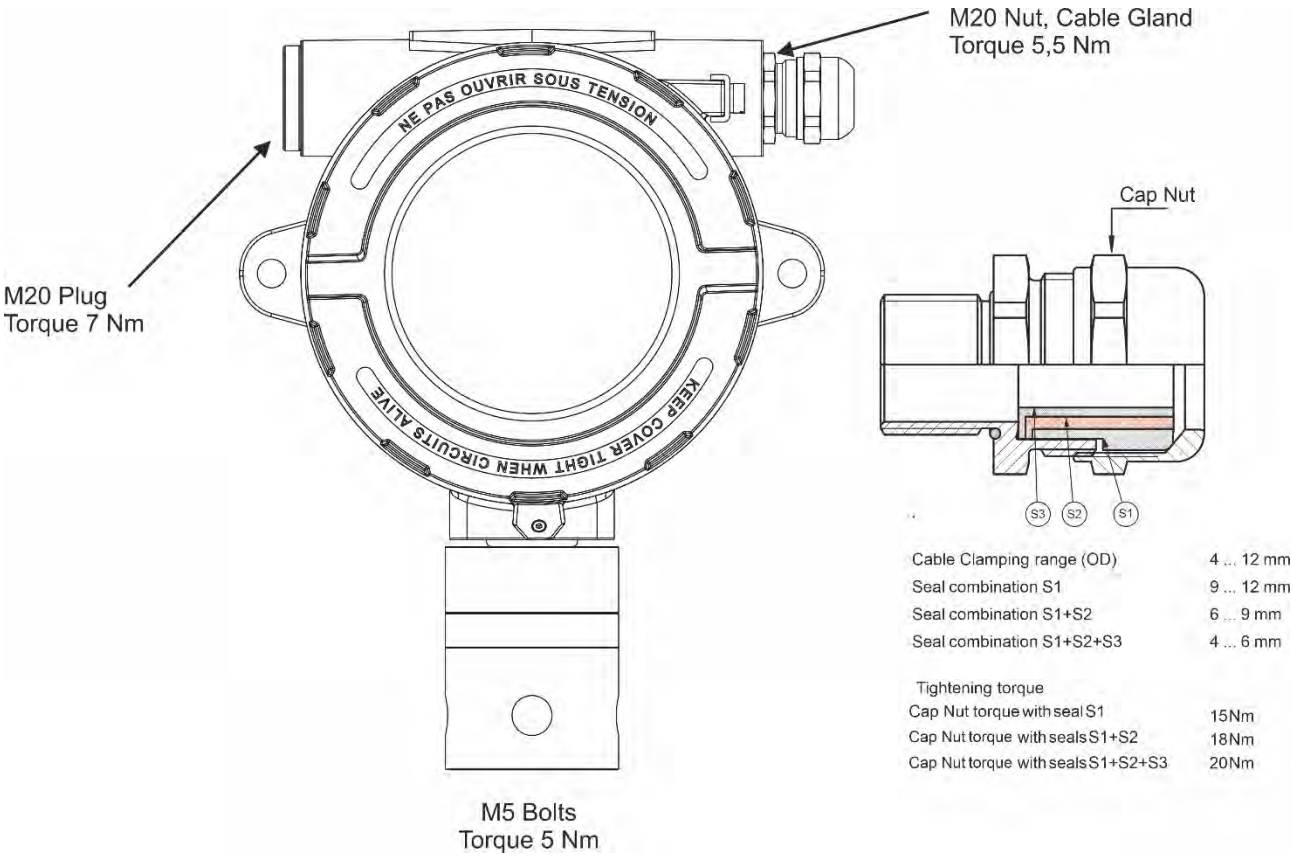


Figure 62 Instructions for proper torque during installation

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