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LUBExpert ON-GUARD

Quick start Guide

Version 1 – 2024

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1. Introduction

Welcome to the future of intelligent lubrication management with LUBExpert ON-GUARD, your premier solution for optimizing the reliability and efficiency of industrial machinery. This smart, ultrasound-assisted system is meticulously engineered to ensure your bearings are lubricated with precision, promoting prolonged asset life and operational excellence.

Featuring a versatile design, the LUBExpert ON-GUARD system is available in two configurations to suit your specific needs: a robust, coated steel enclosure for fixed installations or a rugged, portable plastic case for flexible deployment. Both options include a main Programmable Logic Controller (PLC) and are equipped with connectors or Terminal blocks for seamless integration.

The system's mobility case variant stands out with its integrated router, offering unparalleled installation ease and adaptability through wireless communications options, including Wi-Fi (2.4GHz), LTE-4G, and WAN-LAN connectivity. This ensures you can manage your lubrication tasks efficiently, regardless of your operational environment.

Each LUBExpert ON-GUARD channel supports a dedicated lubrication point, connecting one ultrasound sensor CONMONSense RSC.101 to a compatible single-point lubricator. This setup allows for up to eight simultaneous lubrication points (limited to four in the mobility case), each meticulously monitored to ensure optimal lubrication based on real-time conditions.

LUBExpert ON-GUARD is a unique solution designed to help grease bearings right. It is composed of a main PLC mounted in a coated steel enclosure or in a rugged plastic carrying case with external connectors. The mobility case includes a router for quick and flexible installation using wireless communications (Wi-Fi-2.4GHz/4G/WAN-LAN).

By choosing LUBExpert ON-GUARD, you're not just selecting a lubrication system; you're investing in a comprehensive solution designed to elevate your maintenance practices, reduce operational costs, and enhance machinery longevity.

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2. Product essentials

Dive into the essence of LUBExpert ON-GUARD, a state-of-the-art system that redefines the standards of lubrication management. This section outlines the foundational elements that make LUBExpert ON-GUARD an indispensable tool for achieving your lubrication tasks.

Once installed:

- The main unit provides easy access to the PLC from any web browser, assumed in the same subnet;
- Up to 8 simultaneous lubrication points (limited to 4 for the mobility case), composed of 8 analog channels of type 4-20 mA DC plus 8 relays/outputs;
- Monitoring of Ultrasound RMS and Temperature through 4-20 mA DC channels;
- Does not require any external software;
- The passive monitoring mode as well as the storage strategy are preconfigured, configurations and data are exclusively stored in the unit;
- Adjustable alarm levels, based on different kinds of events and conditions;
- Different lubrication strategies to best fit your existing procedures;
- Status and messages to track the lubrication process over time;
- Data available in MODBUS TCP.

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3. Kit contents

Each kit is thoughtfully assembled to ensure you have everything needed for a seamless setup and operation, right from the start.

Carefully unpack your LUBExpert ON-GUARD system. Verify that all components listed in the kit composition section are present and intact.

Here's what you'll find upon unveiling your system:

3.1.   Mobility case version

- **Robust Mobility Case**: an IP65-rated enclosure guarantees protection against dust and water, ensuring your system's durability in various industrial environments. This portable case features convenient connectors and a cable gland for straightforward setup.

- **Pre-Installed LUBExpert ON-GUARD PLC**: at the core of the mobility case is our flagship PLC, mounted on a DIN rail and ready with pluggable terminal blocks for easy wire connections.

- **Comprehensive Connectivity**: included is an AC/DC power adapter and prewired setup, comprising 2 x 4 M8-F connectors for sensors and lubricators, an Ethernet port for network connectivity, and a preconfigured RUT 240/241 router by SDT for immediate wireless communication setup.

- **Sensors and Lubricators:** the kit includes 4 SDT CONMONSense sensors (RSC.101) with mounting pads and 4 single-point lubricators (PERMA Star control), plus 8 cable assemblies (M8F<>M8M, 10 m) for connecting sensors and lubricators to their respective lubrication points.
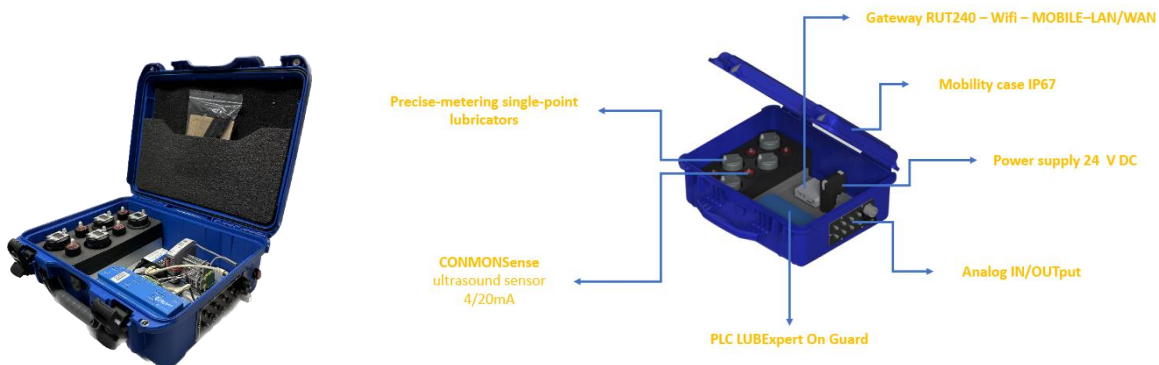
3.2.   Standard version preinstalled in an Industrial Steel enclosure

- **Durable Steel Enclosure:** a coated steel enclosure offers robust protection and includes a cable gland to maintain the IP rating while facilitating wire entries.
- **Ready-to-Use PLC Configuration:** the LUBExpert ON-GUARD PLC comes installed on a DIN rail within the enclosure, complete with pluggable terminal blocks for your wiring needs.
- **Power and Internal Wiring Provided:** an AC/DC power adapter and prewired internal configuration simplify the initial power setup.
- **Expanded Sensor and Lubricator Support:** accommodates up to 8 SDT CONMONSense sensors (RSC.101) with mounting pads, up to 8 controllable relay outputs for single-point lubricators

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(PERMA Star control), and 2 additional relay outputs for alarms, plus a variety of cable lengths (M8F<>Free end) for flexible installations.

3.3.   Internal wiring

To ensure a quick and error-free setup, a detailed schematic of the internal wiring is provided, illustrating how components interconnect within the standard configuration. This guide aids in understanding the system's architecture and facilitates a smooth installation process.

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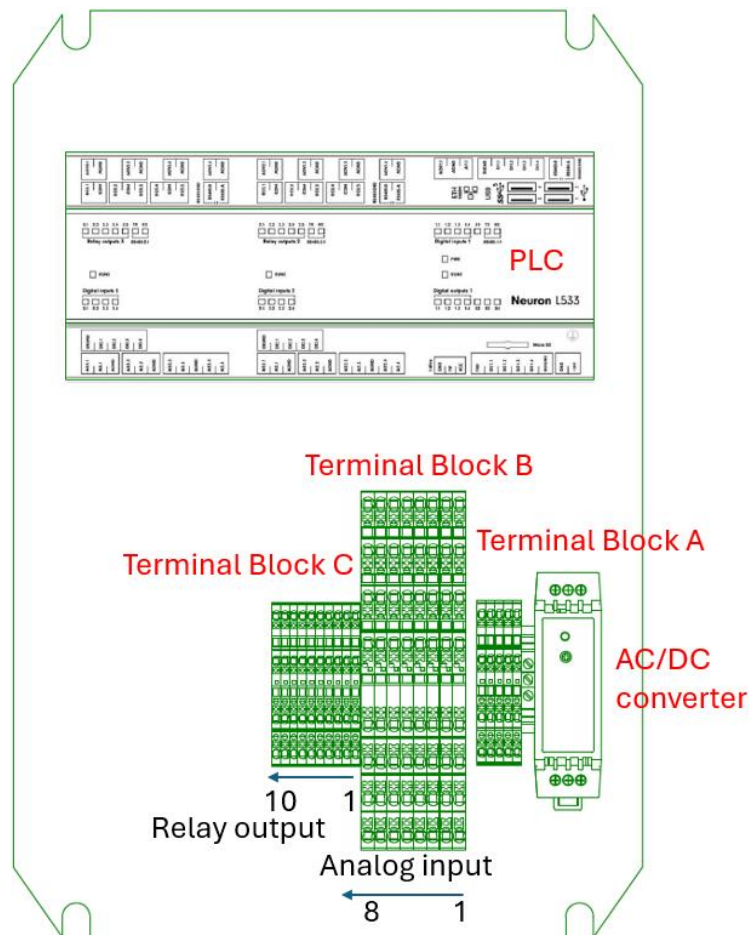
4. Powering the system

Powering up your LUBExpert ON-GUARD system marks the beginning of a new era in lubrication management. To ensure a smooth and safe start, follow this detailed guide to connect your system to its power source. As described in the specifications, *LUBExpert ON-GUARD* must be powered by a nominal 24 V DC power supply included in both configurations. The prewired configurations include a power converter to match the AC power supply to the required DC voltage. Both configurations are equipped with a cable gland (Ø 4 to 10 mm) to allow the AC cable (not provided) to pass through while maintaining the IP rating.

To power the system, follow these instructions:

- Adhere to all safety precautions and guidelines;
- Locate the AC/DC converter within the system setup Refer to the system diagram provided in the specifications for its precise location;
- If necessary, identify the AC line that will supply power to the AC/DC converter. Ensure that the power source meets the system's voltage and frequency requirements;
- Confirm the connector types on both the AC line (Neutral, Line, Earth) and the AC/DC converter (+24 V, GND). Ensure compatibility and prepare the wiring and cable management by using the cable gland;
- Use appropriate tools to connect and secure a stable and reliable connection between the AC line and the AC/DC converter. Tighten the wires (N and P) into the appropriate slots of the AC/AC converter and the chassis (PE, see Terminal block A). If the AC line connector has standard polarity markings, ensure correct alignment with the AC/DC converter.

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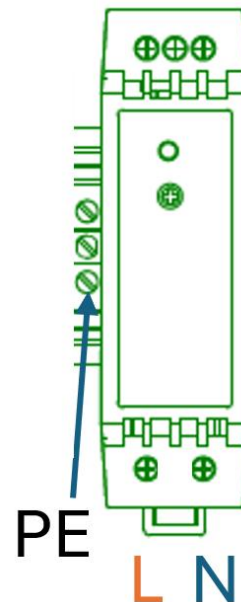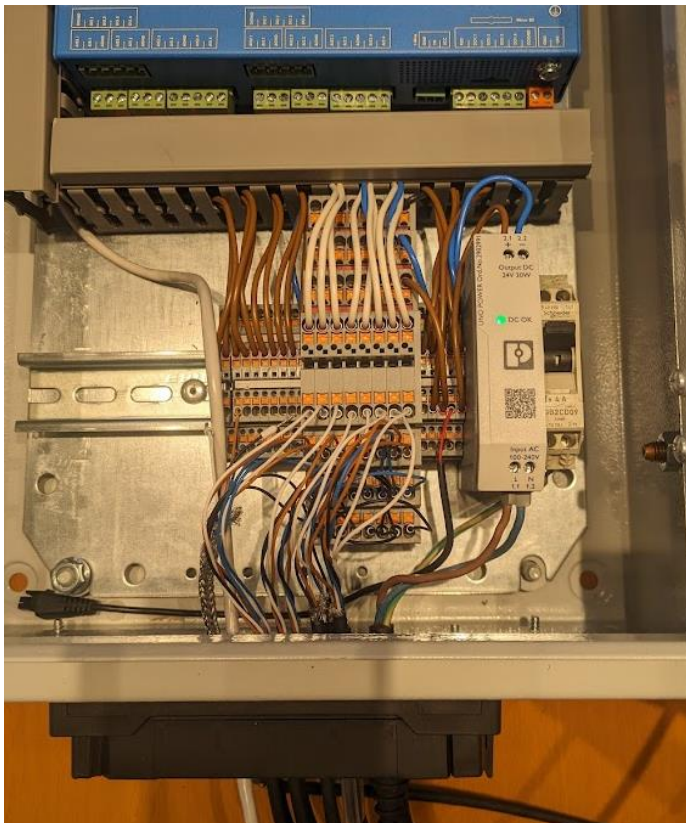
Function	IEC color code
Neutral (N)	
Protective earth or ground (PE)	
Single phase line (L)	

- Before applying power, inspect the AC line, connectors, and the AC/DC converter for any signs of damage. Replace damaged components to avoid potential hazards;
- Once connections are secure and verified, switch the activation button (and other circuit breaker, if any) to the "on" position;
- Congratulations! The system is now powered on. The PWR LED on the PLC light is red and the LED status "DC OK" on the AC/DC converter is green.

To safeguard against accidental electrical shocks or system damage during installation, ensure that the power line remains deactivated until all installation tasks are completed. Only energize the system once you've confirmed that all connections are secure and correctly made, following the outlined steps meticulously.

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5. Connecting the inputs and outputs

Establishing connections between the LUBExpert ON-GUARD and its peripheral components is a critical step toward unlocking the system's full potential. This section provides a meticulous guide to connecting ultrasound sensors and compatible lubricators, ensuring an efficient setup for optimal performance.

Connect the ultrasound sensors RSC.101 and the compatible lubricators according to the terminal block configurations.

Electrical connection	Sensors (CONMONSENSE RSC.101)	Lubricators (PERMA STAR CONTROL)
1	Power supply (24 V DC)	Power supply (24 V DC), relay NO
2	Signal output	Not used
3	Ground	Ground
4	Communication (switch T°/Ut)	Not used

M8 4pins

> To ensure accurate data transmission and minimize interference, it's recommended to use shielded cables for connecting ultrasound sensors. For connecting the lubricators, standard cables are sufficient, providing a reliable connection without the need for additional shielding.

> Only connect accessories and components approved by SDT to the LUBExpert ON-GUARD system to maintain system integrity and prevent damage.

5.1. Analog Inputs

The input range for the 8 static channels in the main unit is 4-20 mA DC, compatible with CONMONSense RSC.101 exclusively. These analog channels are preconfigured to constantly monitor ultrasound RMS, expressed in dB[µV] and Temperature (in the sensor) expressed in [°C].

To connect a SDT CONMONSense RSC.101 to LUBExpert ON-GUARD, proceed as follows:

- Prepare the sensor and corresponding shielded cable for connection;
- Refer to the internal wiring schematic to locate the terminal block B designated for analog inputs;
- Select the channel (e.g., channel 1) and route the cable through the system's cable gland;
- Securely connect the cable's wires to the appropriate terminals, ensuring a stable and accurate connection for reliable monitoring.

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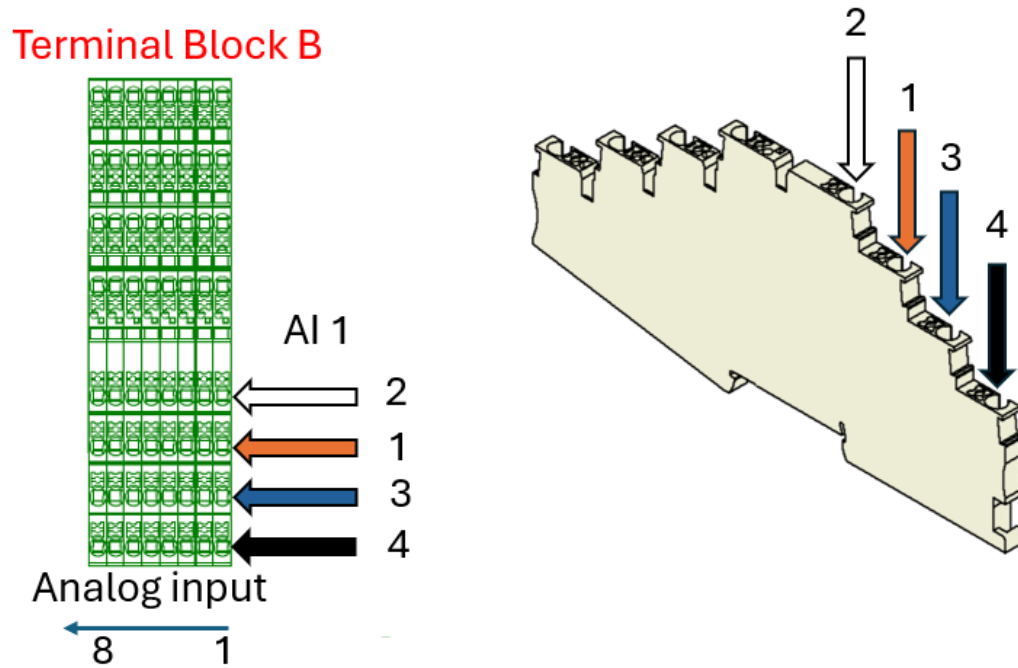
5.2. Relay Outputs for mono-point lubrication drives

These outputs control the lubrication process, activating the lubricators based on the system's commands. They are designed for specific compatibility with SDT-approved single-point lubricators.

Compatible mono-point lubricators are actionable through the relays (Normally open, +24 V).

- Prepare the lubricator and its connecting cable. If using a PERMA star control lubricator, set it to impulse mode as per the manufacturer's instructions;
- Identify the relay outputs on the terminal block C intended for lubricator control;
- Route the cable through the cable gland and connect it to the selected relay output, adhering to the wiring schematic for correct installation (2 wires required).

The connection is described below:

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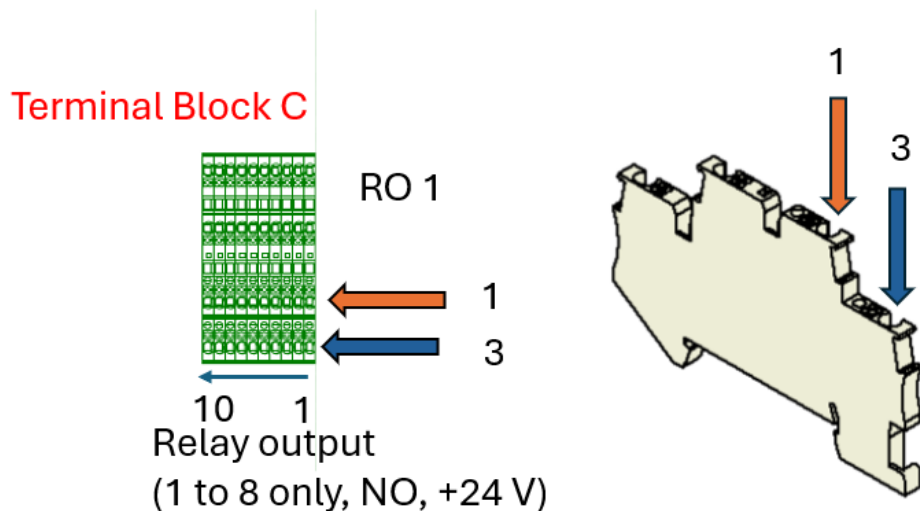
The Relay Outputs (RO 1 to RO 8) are dedicated to pilot the compatible electromechanical lubricators of the corresponding analog channels (AI 1 to AI 8). These outputs are Normally Open (NO) and connected to the 24 V DC.

The basic functioning is summarized below:

Relay	Default status (NO)	Closed
RO 1 to 8	Lubricators off	Lubricator on (1 impulse at 24 V DC)

(!) The voltage pulse duration as well as the corresponding amount of lubricant are configurable in the web server and depend on the lubricators. For simplicity and flexibility, SDT recommends using PERMA STAR Control, configured in impulse mode.

(!) To prevent power supply overload, synchronous relay activation is not possible. Multiple activations are placed on a waiting list.

5.3. Alarm relays outputs (Optional)

LUBExpert ON-GUARD system, when installed in the coated steel enclosure, is equipped with additional relay outputs that are specifically designed for alarm purposes. These outputs enable the system to communicate critical status changes or alarm conditions to external monitoring systems or control panels, enhancing safety and preventive maintenance tasks.

The Relay Outputs (RO 9 and RO 10) are dedicated to alarms. These outputs are Normally Open (NO) and not connected to the 24 V supply by default, to not overload the power supply.
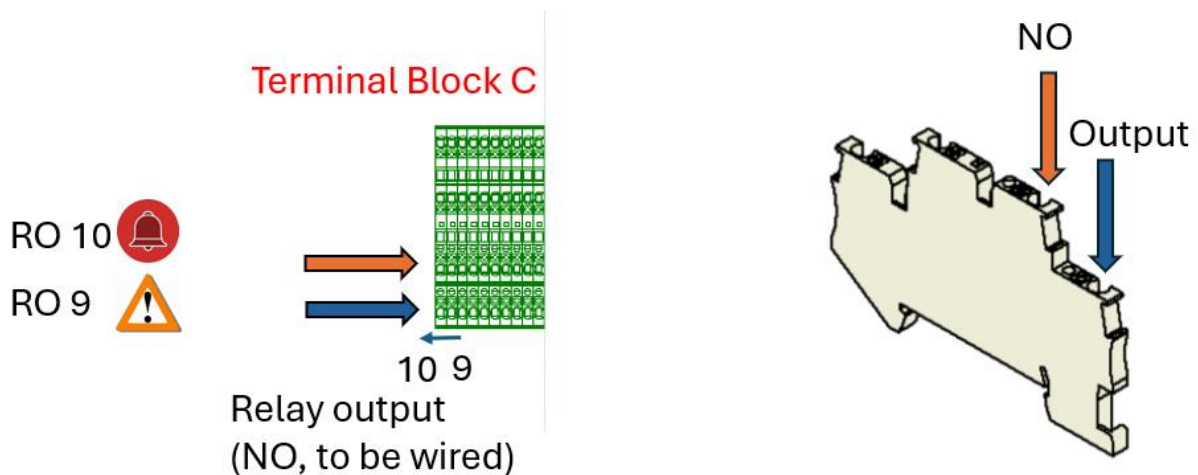
The relay status interpretation is briefly described below:

| Relay	Default status (NO)	Alarms > warning status (Closed)
RO 9	no warning or system not configured	At least, one warning detected
RO 10	no warning or system not configured	At least, one alarm detected

Warning and alarm status among other data are also available via MODBUS TCP.

Integrating the LUBExpert ON-GUARD's alarm relay outputs or data in MODBUS with your existing monitoring or control systems provides an additional layer of operational safety and efficiency. By

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doing so, you can automate responses to potential issues, such as activating backup systems, shutting down processes, or notifying maintenance personnel.

5.4. Mobility case

The mobility case version of LUBExpert ON-GUARD simplifies connectivity with external M8 connectors, clearly marked for sensors and lubricators. This feature ensures straightforward and error-free connections.
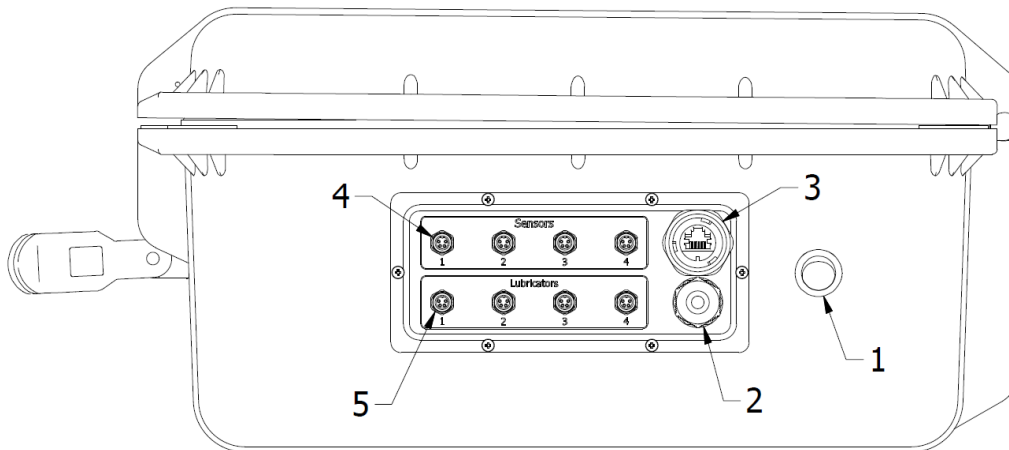
1- On/off switch
2- Cable gland for the electric cable
3- Ethernet port (WAN interface, DHCP)
4- M8-4 Pin F connector dedicated to SDT sensors.
5- M8-4Pin F connector dedicated to compatible lubricators.

Proceed as follows:

- Utilize shielded cables for connecting the sensors to their dedicated inputs, ensuring secure and tight connections at both ends;
- Connect lubricators using standard cables to the specified outputs, following the preconfigured instructions for impulse mode;
- Preconfigure PERMA STAR Control, in impulse mode with a predefined amount of lubricant per impulse set at 1 cm^3/ impulse (please refer to the PERMA technical documentation for further details).

Long press on button SET enable to configure the PERMA Star Control. The predefined amount of lubricant is user configurable. 1 cm^3 [CC]/ impulse is recommended as a simple reference. Delivering a larger amount of lubricant from this reference will imply successive pulses to be configured in the LUBExpert webserver.

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6. Network configuration

Setting up your LUBExpert ON-GUARD system's network connectivity is pivotal for leveraging its full capabilities. This section guides you through configuring your system to communicate effectively within your existing network infrastructure, ensuring seamless access to its features and data.

The LUBExpert ON-GUARD system initializes within seconds, readying itself for operation. A brief warm-up leads to the "RUN" LED indicator flashing green, signifying the system is operational and network ready. If the indicator shows a red/orange flash, it may indicate a setup issue that needs your attention.

LUBExpert ON-GUARD's built-in web server is your gateway to access and manage the system. Compatibility with any web browser facilitates easy access, provided your device shares the same network subnet, ensuring straightforward connectivity.

In SDT factory settings, adjust your client device's network settings to match the system's configuration, ensuring both devices can communicate. The default static IP address of **10.8.2.150** is your point of access for the system's web server interface.

6.1.   Standard version (LAN only)

For the standard version, configure your client PC with a compatible static IP address.
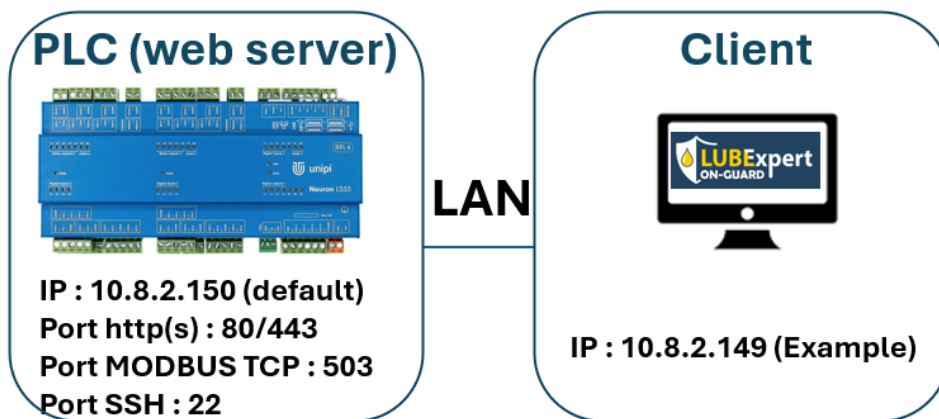
Proceed as follows for joining the LAN network:

- Pass the ethernet cable through the cable gland;
- Connect the PC "client" to the PLC "On-Guard" with the cable;
- Configure the network, on the client's side (Windows assumed with administrator privileges).

On Windows, press ⊞ + **R** to open the run box, type **ncpa.cpl** + ⏎ to open the network connection tool. Identify the corresponding network interface (Ethernet 2 in this example). Users can also access the tool at Control Panel/Network and Internet/Network Connections.

Right click on it, select **Properties** then double click on **Internet Protocol Version 4 (TCP/IPv4).**

Assign the network settings, as shown in the image below:

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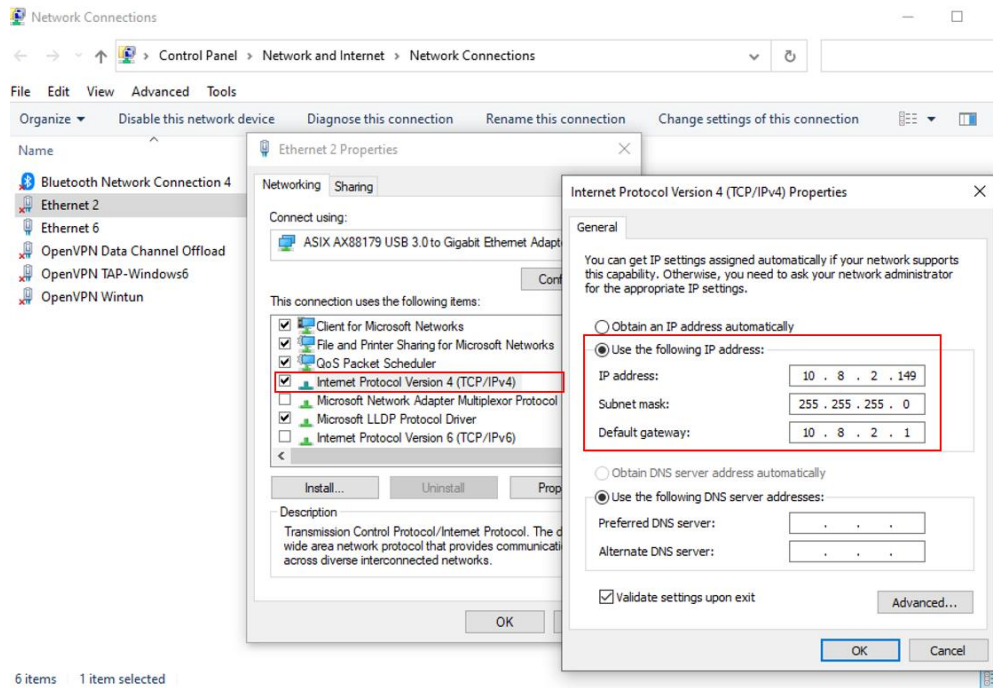
In this example, the PC client is assigned to the IP address 10.8.2.149

- Check **Validate settings upon exit** then press **OK;**
- Open a tab in your web browser, then type **10.8.2.150** to access the "LUBExpert ON-GUARD" web server.
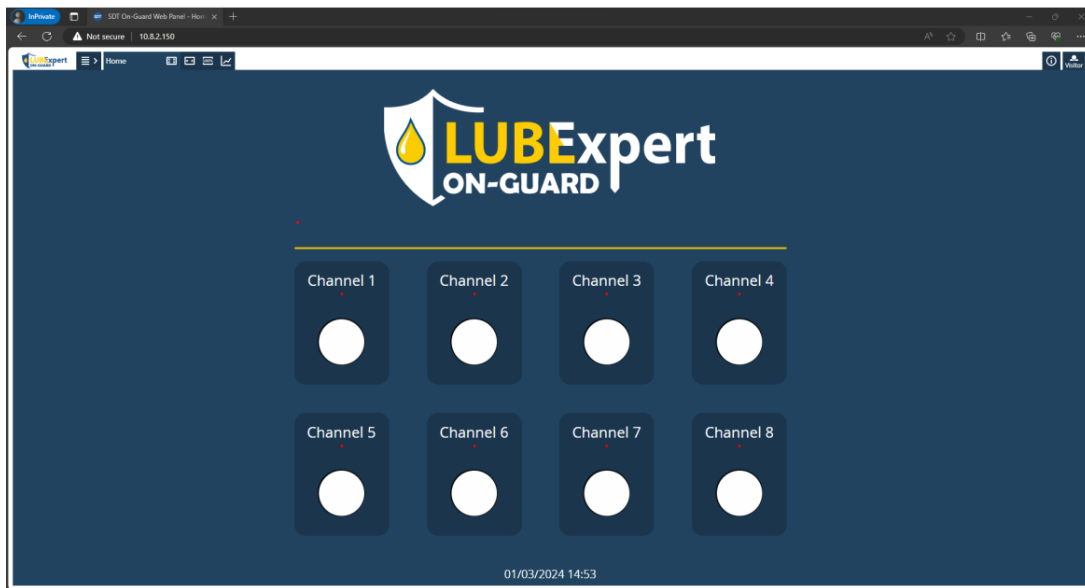
- Sign in as User: **Admin**, Password: **Password** to start configuring the system.

6.2.   Mobility case

The Mobility Case includes a router that provides various network options. The network integration diagram, pre-configured by SDT, is proposed in the following figure:

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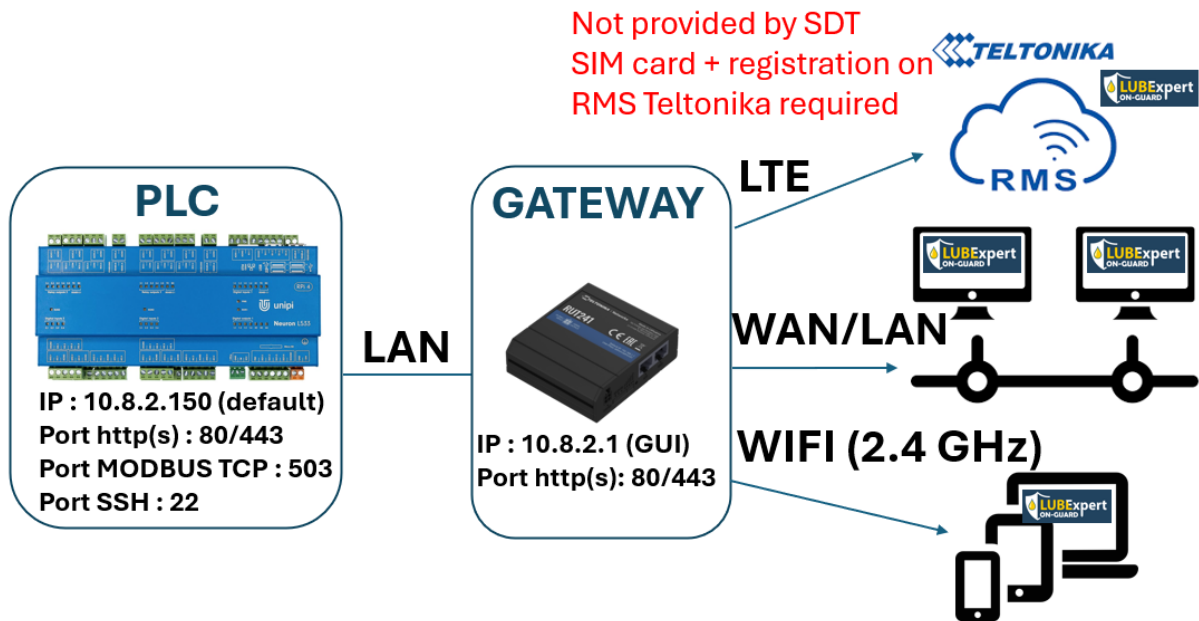
The RUT 240/241 accessory module acts as a gateway between different networks and must usually be reconfigured by your IT department, depending on your network architecture and internal policy. In certain situations, the redirection of certain ports may also be required.
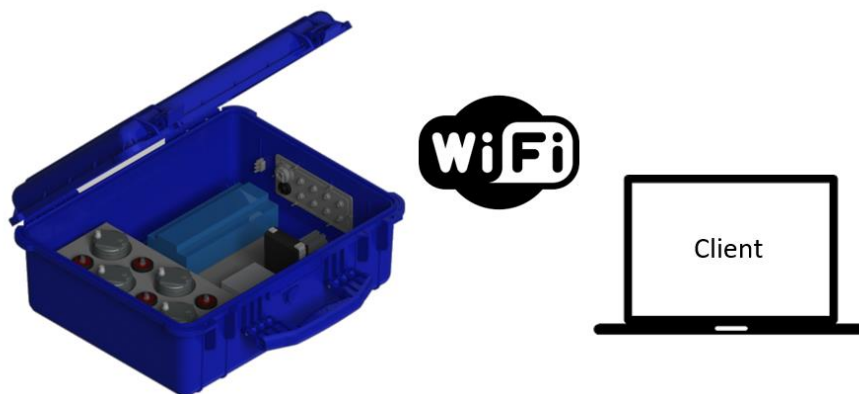
6.2.1. WIFI connection (recommended):

The router included in the Mobility Case (or available as an option), is preconfigured by SDT to generate its own WIFI network (2.4 GHz only).

Proceed as follows:

It can be accessed at:

```
SSID: LUBExpert On-Guard
Encryption: WPA2-PSK
WIFI PASS: MQUdWNOm
```


To connect to *LUBExpert ON-GUARD* using Wi-Fi, follow these steps:

- Power on the system;
- Plug the Wi-Fi antenna provided in the package into the corresponding connector of the router;
- On the Client PC, scan and connect to the following WIFI access point:
  ```
  SSID: LUBExpert On-Guard
  Encryption: WPA2-PSK
  ```

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```
WIFI PASS: MQUdWNOm
```
The PC will automatically obtain an IP address in the LAN network.

- By default, *LUBExpert ON-GUARD* in Wi-Fi comes with a preconfigured IP address. Users can also scan the network with an IP scanner freeware to better understand the network configuration;
- Type the *default* IP address **10.8.2.150**, in your web browser to access the main page of LUBExpert ON-GUARD:

```
IP address LUBExpert ON-GUARD: 10.8.2.150
User: Username
Password: Password
```
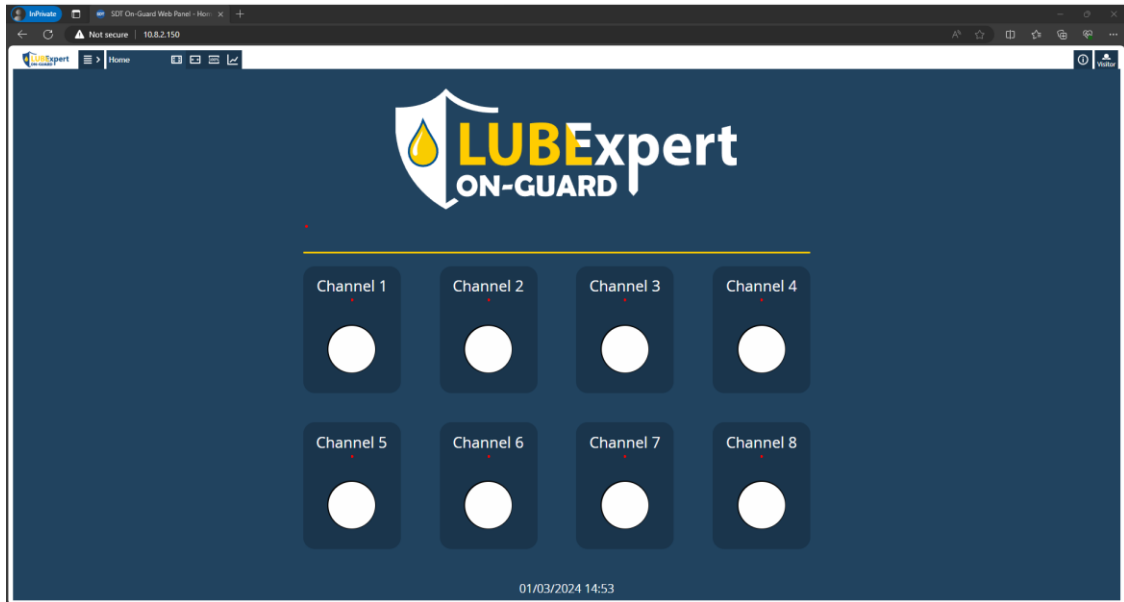

- (Advanced settings for IT) Open a new tab in your web browser to reach out the router configuration page at the following IP address.

```
Router IP address: 10.8.2.1
User: admin
Password: SnE9qica
```


Note: The router can also be configured to join an existing Wi-Fi. Once connected to the router's page, go to Network/Wireless, scan for an existing Wi-Fi, type the password, then press "save and apply".

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Please refer to the manufacturers' website at https://wiki.teltonika-networks.com/view/RUT240 for further information.

6.2.2. LAN/WAN connection

By default, the external Ethernet port of the Mobility Case is connected to the WAN interface of the router, redirecting to LAN.

To access the LUBExpert On-GUARD web server as well as the router configuration page, please refer to section 6.1 and 6.2.1.

To ensure smooth integration into your network, it's advisable to consult your IT department. They can assist with adjusting network settings and ensuring secure and efficient connectivity.

Changes in the network configuration for both the PLC and the router could compromise default access. SDT advises consulting with network specialists.

6.2.3. Mobile connection (access point in WI-FI required for the initial settings)

The GSM 3G/4G mobile connection enables remote access to LUBExpert ON-GUARD in areas where other network accesses are unavailable. A SIM card with an active data plan from any Internet Service Provider (ISP) as well as an account on the Remote Management System platform (https://wiki.teltonika-networks.com/view/RMS) is required.
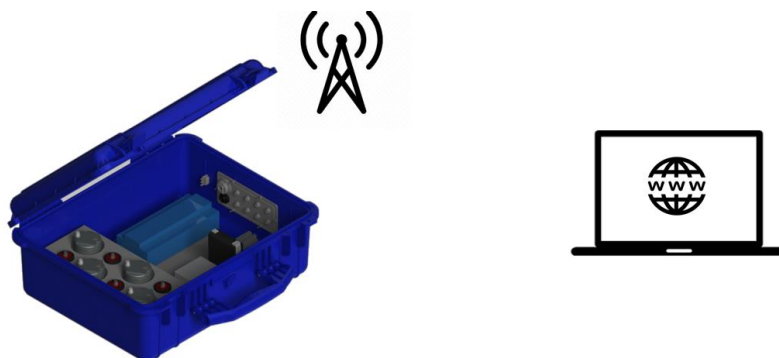
To do so, follow these steps:

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- Open the mobile case or the steel enclosure to access the RUT 240/241 Teltonika module;
- Remove the module from the Din rail then eject the SIM holder with a paper clip. Insert the SIM card according to the picture below:
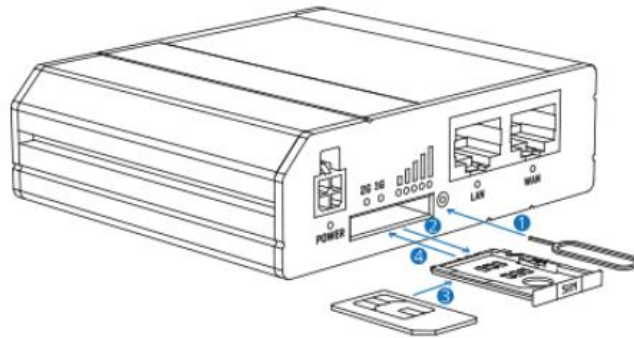
- Connect the GSM main antenna, provided in the package, to the router (in case of mounting in a steel enclosure, the antenna must be outside the box);
- Log in to the router's configuration page. As detailed in 6.3.1, you can connect to the router via WI-FI "LUBExpert ON-GUARD". To access the router's web interface, open a new tab then type **10.8.2.1**;
- To activate the mobile network, Go to Network/Mobile/General;
- Type the PIN code of the SIM card and press "SAVE & APPLY".

- Go to Status/Overview then check if the Widget "INTERNAL MODEM" reads "Connected". If not, please enable the mobile network interface in Network/interfaces/General;
- In Services/Cloud Solutions/RMS, select **Enable**, press **register**, then connect to RMS.

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https://rms.teltonika-networks.com/

The router (SN and MAC address) must be registered to the RMS service to enable the Remote Management System. On the day of installation, once the router is connected to the Internet go to Services/Cloud Solutions/RMS. The service might be deactivated (Stand-by mode) in case of prolonged inactivity. Please refer to the manufacturers' website at https://wiki.teltonika-networks.com/view/RUT240 for further information.

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7. Configuration of the main unit

LUBExpert ON-GUARD comes with an embedded web-based graphical user interface that can be accessed from any operating system, including tablets and smartphones. The following steps describe the practical way to configure LUBExpert ON-GUARD:

⚠️ Read the previous points for more information about the network settings. If you have reconfigured to network settings using different IP addresses, make sure that the main unit as well as the router (if any), are still well identified in your network.

❗ The web application has been designed for use with Google Chrome, but it should behave correctly with any other web browser.

To access the web server, open your web browser then type the IP address of the PLC.

The default IP is 10.8.2.150.

Welcome to the home page, as Visitor.

7.1. Home page
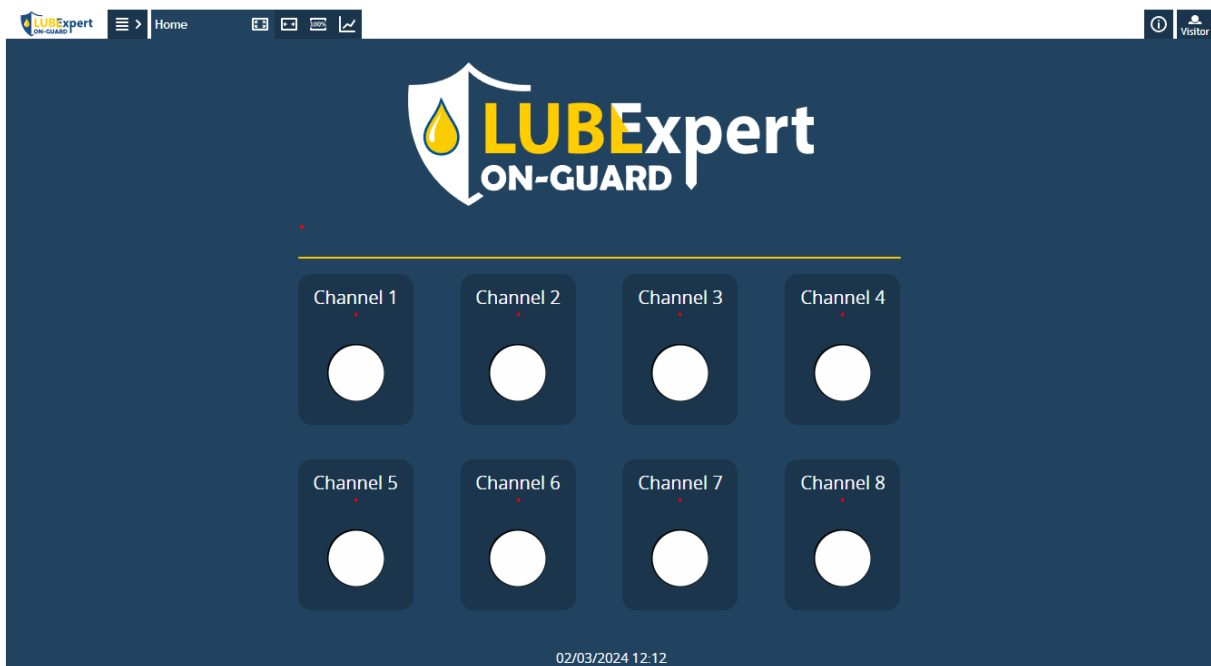
This page shows a quick overview of each channel's status. You can click on the channel button to access the individual channel pages.

Possible channel status is:

- **White**: Channel is in RESET state and lubrification is not active (see below).
- **Green**: Channel status OK. Lubrication will keep going.
- **Orange**: Warning status. Something is suspicious with the configuration or the last lubrication. Possible warning causes are:
  - Suspected bearing failure

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- o   Shorten interval
- o   Sensor not connected
- o   Cartridge nearly empty
- **Red**: Error status. Something wrong with configuration or last configuration. Lubrication will stop until manual intervention (except for safe alarm error)
   Possible error causes are:
- o   Over lubrication
- o   No change during lubrication
- o   Configuration error
- o   Measure below safe alarm

The Menu icon in the top left corner is used to access and configure the channels.
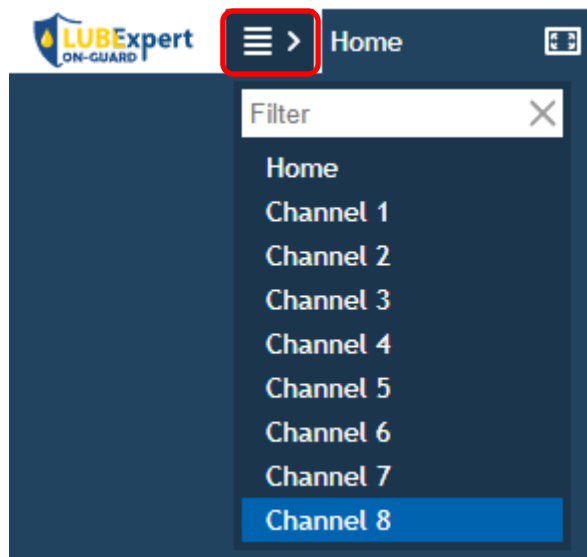
On the top right, icon provides information about the versioning. Next to it, icon enables to log in using advanced capabilities.

The default access privileges are given below:

Type/privilege	View	Edit
Visitor (default)	✅	❌
Admin	✅	✅

Click on Visitor (to log out) then log in as Admin to edit the configuration.

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User login (default, configurable with the SDT ON-GUARD tool)

User: **Username**

Password: **Password**

The Visitor account doesn't require any credential.

Users can create multiple admin accounts using the SDT ON-GUARD Tool software. Concurrent access is allowed. The system does not automatically log off users after a period of inactivity (auto-log off).

Upon successfully logging into the LUBExpert ON-GUARD web GUI as an Admin, user will notice the activation of additional icons within the web GUI. These icons represent the enhanced features and settings accessible only with Admin privileges, offering more in-depth control and customization options for the system.

Begin by assigning a name to your unit/PLC. Personalizing the name of your LUBExpert ON-GUARD unit greatly improves your ability to recognize and oversee multiple units within a larger system. To accomplish this, navigate to the home page and click directly below the main LUBExpert ON-GUARD logo. You will be prompted with a pop-up box that invites you to enter a device name.

One of the complementary icons that become available upon logging in as an Admin is icon [icon]. This icon is instrumental in accessing and reviewing the system's network settings, providing Admins with a quick overview and control over how the LUBExpert ON-GUARD system communicates within the network infrastructure.

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Network settings	
Use DHCP	No ▾
IP address	10.8.2.150
Network Mask	255.255.255.0
Default Gateway	10.8.2.1
DNS	10.8.2.1
Proxy settings	
Enabled	No ▾
Certificate validation	No ▾
URL	https://proxy.unipi.technology
Proxy ID	PRX0000000000000
Keep alive	10
Database settings	
Enabled	No ▾
Certificate validation	No ▾
URL	https://db.unipi.technology:44
User	unipi_00000
Password	••••••••
Communication period	1
	Refresh Set

The LUBExpert ON-GUARD system's ability to seamlessly integrate into your network infrastructure is crucial for its operation. One aspect of this integration is the system's use of Static IP or DHCP for IP address assignment. Switching the DHCP mode can significantly impact how the device connects to and communicates with your network.

Modification is applied using the button "Set".

SDT suggests involving the IT department or a network administrator in the process, especially in complex network environments, to ensure that changes are implemented correctly and without disrupting other network services.

Please note that the sections "Proxy Settings" and "Database Settings" are not applicable for the ON-GUARD configuration.

If you are using a router, it's imperative to verify that these changes are still compatible with your network's router configuration. Ports redirection might be required.

Next to the network icon is icon , an important feature for administrators looking to stay informed about the LUBExpert ON-GUARD system's health and activity.

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7.2. Channel page
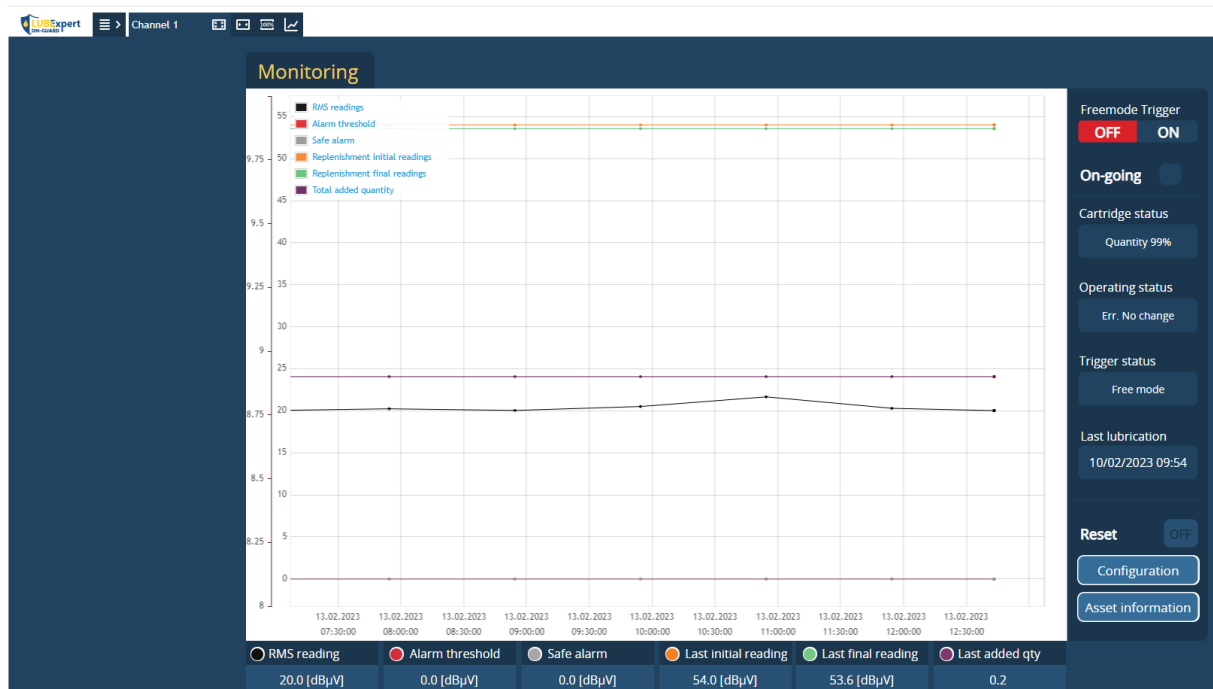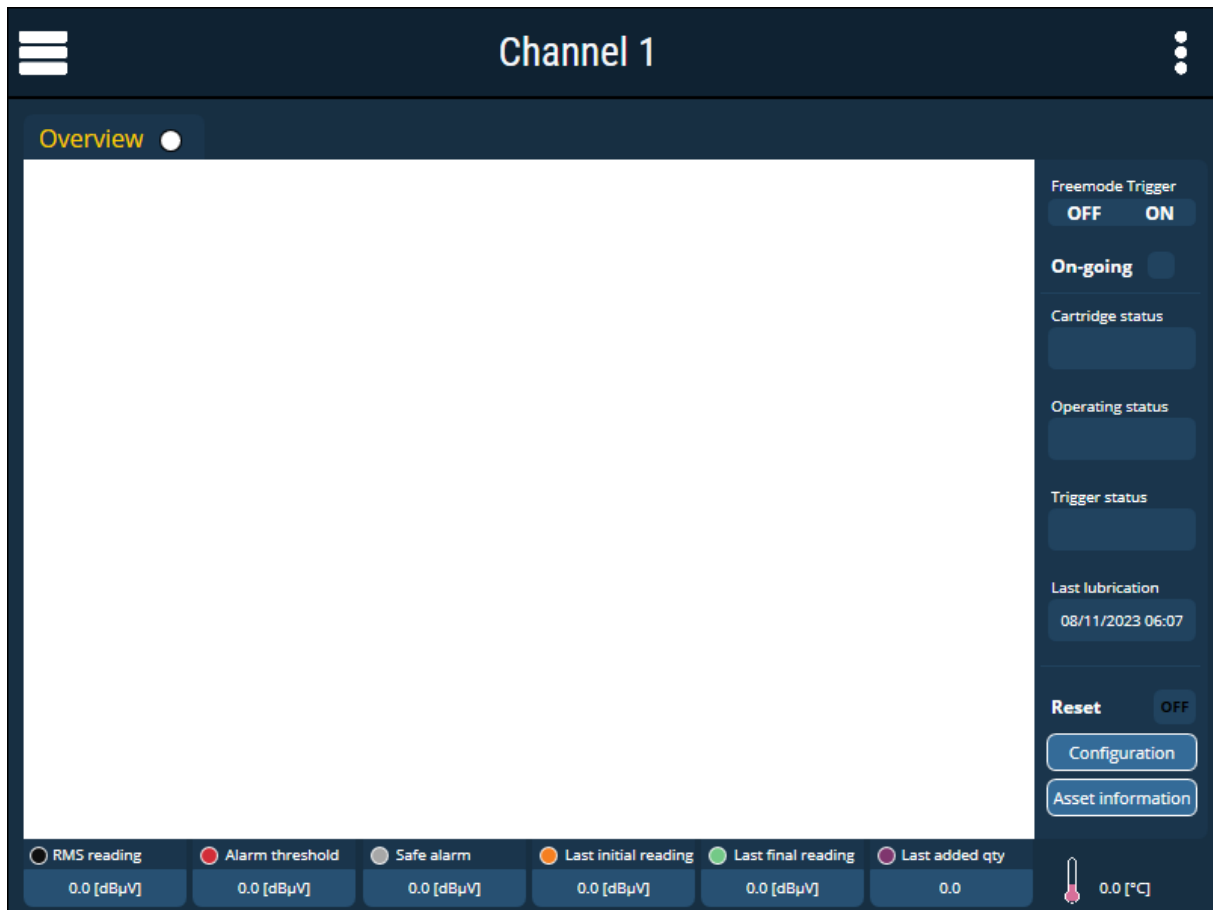
7.2.1. Monitoring graph

The monitoring graph displays the last 6 hours of data, averaged based on the acquisition time.

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When focused, if the user stays on the page, it refreshes every second displaying the current data in both graph and bottom panel. T ° is refreshed every minute.

When not focused, it will only retain the saved data (1 average value/hour in passive mode and more often in case of active lubrication mode).

Data is saved every hour in idle or every acquisition time (see configuration) during lubrication.

7.2.2. Bottom panel

◯ RMS reading	◯ Alarm threshold	◯ Safe alarm	◯ Last initial reading	◯ Last final reading	◯ Last added qty		
0.0 [dBµV]	0.0 [dBµV]	0.0 [dBµV]	0.0 [dBµV]	0.0 [dBµV]	0.0		0.4 [°C]
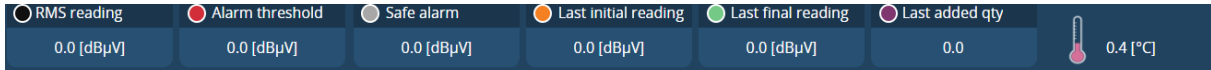
- **RMS reading**: Current sensor reading for Ultrasound;
- **Alarm threshold**: Threshold used to trigger the lubrication in alarm mode (see configuration);
- **Safe alarm**: Alarm used to calculate the operating time. A measurement higher than this value assumes that the asset is operating. Lubrication is not possible if the measurement is below this value (see configuration);
- **Last initial reading**: First measurement taken at the start of the last lubrication process;
- **Last final reading**: Last measurement taken at the end of the last lubrication process;
- **Last added qty**: Quantity added during the last lubrication (note that the monitoring graph is showing the total added quantity since last manual RESET);
- **Temperature**: Current internal temperature (inside the sensor).

It is possible to view the large historical graph of each value by using "ctrl+click" (to select/highlight the data) and then accessing the graph view at the top of the page. More than one data can be selected and displayed in the same graph.
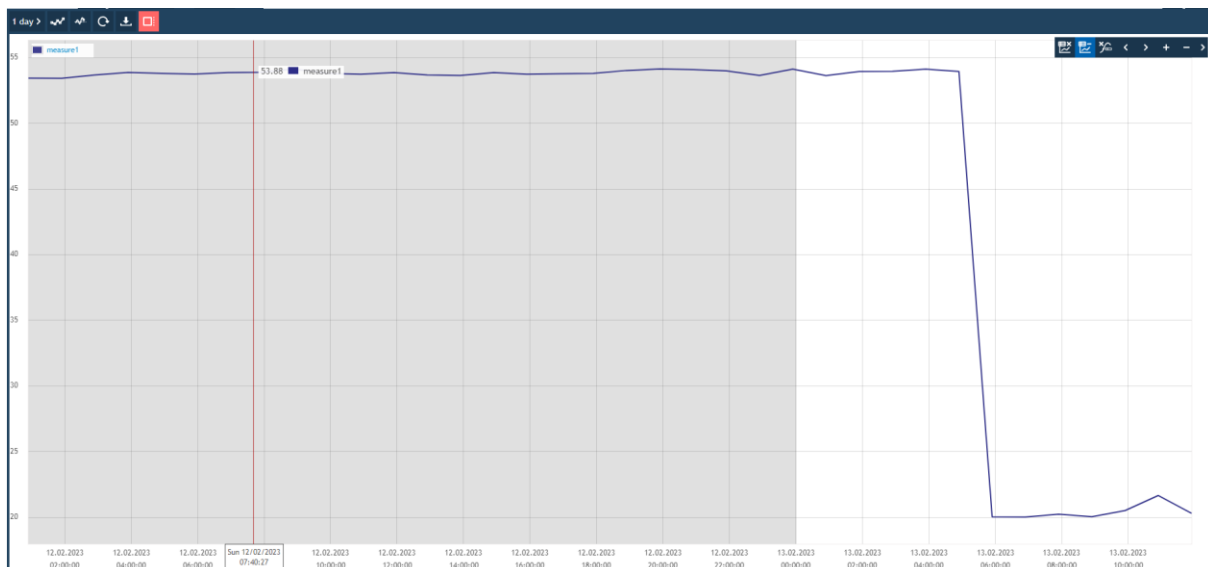
- Timeline can be selected in the top left corner;

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- Oscilloscope mode can be used to refresh the data every second (monitoring view);

7.2.3. Channel lubrication menu
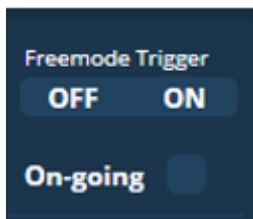
Free mode Trigger: Trigger lubrication when free mode is configurated (see configuration).

Switch to ON to command one or more voltage impulse to pilot the lubricator, depending on the configuration. Useful to prefill the grease pipe during the installation.

On-Going: Indicates the type of process currently running

Default status (0): Passive mode/monitoring

Green (1): Active mode/ in lubrication process
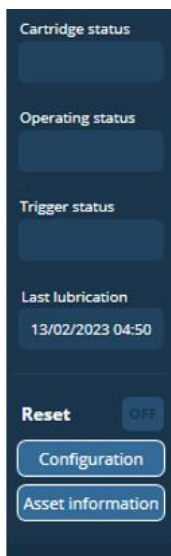
Cartridge status: Indicates the remaining lubricant volume. Click on this value to access the configuration page:

- *Empty*
    - o   remaining quantity is lower than discharge amount.
- *Invalid qty per shoot*
    - o   discharge amount not configurated.
- *Err. 0%*
    - o   cartridge empty and need to be refilled.
- *Low X%*
    - o   remaining quantity is lower than 10%.
- *Quantity X%*
    - o   indicating the remaining quantity.

Operating status: Indicates the last lubrication status. Click on this value to access configuration page:

- *RESET*
    - o   manual reset activated.
- *Stopped*
    - o   Algorithm stopped due to error (reset is needed in order to restart the algorithm).
- *Invailid conf. rst needed*
    - o   Invalid configuration
    - o   A manual reset is needed to restart the process.
- *No strategy defined*
    - o   Invalid configuration.

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- o   A manual reset is needed to restart the process.
- *Waiting*
  - o   The algorithm is ready and waits for its trigger.
- *Wait mutex*
  - o   Channel is waiting for any other on-going lubrication to finish (one lubrication at a time).
- *Process started*
  - o   Lubrication started.
- *Add Grease*
  - o   Lubricator powered.
- *Power off greaser*
  - o   Lubricator shut down.
- *Wait stabilization*
  - o   Waiting stabilization time (stabilization time is 5 times the acquisition time).
- *Completed*
  - o   End of lubrication (this message is overwritten by lubrication status).
- *Success.*
  - o   Lubrication successful.
- *LS Susp. Bearing*
  - o   Lubrication success but suspected bearing failure.
- *Success. NC*
  - o   Lubrication is successful when using LUBrain mode.
  - o   NC means no variation measured for the last values.
- *LS NC Susp. Bearing*
  - o   Lubrication successful when using LUBrain mode but suspected bearing failure.
- *Err. No change*
  - o   Lubrication failed (no change occurs during lubrication process).
  - o   A manual reset is needed to restart the process.
- *Err. NC Susp. Bearing*
  - o   Lubrication failed (no change occurs during lubrication process) and suspected bearing failure.
  - o   A manual reset is needed to restart the process.
- *Over lubrication*
  - o   Lubrication failed.
  - o   A manual reset is needed to restart the process.
- *Over lube Susp. Bearing*
  - o   Lubrication failed and suspected bearing failure.
  - o   A manual reset is needed to restart the process.
- *Shorten*
  - o   Shorten interval (more than calculated quantity added during the last lubrication process).
- *Susp. Bearing*
  - o   Suspected bearing failure.
- *Shorten interval (>150%)*
  - o   More than 150% of lubricant was added during the last lubrication.
- *>150% + Susp. Bearing*

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- o   Shorten interval and suspect bearing failure.

Trigger status: Indicates lubrication triggering status. Click on this value to access the configuration page:

- *RESET*
  - o   Manual reset.
- *Occurrences not defined*
  - o   Invalid configuration.
  - o   A manual reset is needed to restart the process.
- *Invalid config.*
  - o   Invalid configuration.
  - o   A manual reset is needed to restart the process.
- *Meas. < Safe alarm*
  - o   Measured RMS is below safe alarm.
  - o   Nothing will happen during this condition whatever the mode and strategy used.
- *Alarm triggered*
  - o   Trigger sent.
- *REARM*
  - o   Trigger rearmed.
- *Op. time*
  - o   Trigger set on operating time.
- *Free mode*
  - o   Trigger set on free mode.
- *Free mode triggered*
  - o   Free mode triggered.
- *Wait N occurrences*
  - o   When trigger is set on alarm and measure is above the alarm threshold, indicates that it is waiting N occurrences before triggering the process.
- *Alarm triggered*
  - o   Alarm triggered when operating in alarm mode.
- *Meas. < alarm*
  - o   Measure is below alarm threshold when configured in alarm mode.
- *Wait meas. < alarm*
  - o   The algorithm is waiting for the measure to decrease below alarm threshold to be rearmed.
  - o   No more lubrication will happen under these conditions.
- *X hours remaining*
  - o   Number of operating hours remaining before the next lubrication when configured in operating time mode.
- *X min. remaining*
  - o   Number of operating minutes remaining before the next lubrication when configured in operating time mode.

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Last lubrication: Indicates the last lubrication date (UTC format).

Reset: Stop and Reset lubrication and trigger information (also reset the total injected quantity). Needed to acknowledge a lubrication process.

Configuration: Access the channel configuration page.

Asset information: Access the channel asset information page.

7.3.   Configuration page

Configuration can only be modified when logged in as Admin.

7.3.1.   Cartridge configuration

- **Fulfilled quantity [cm³]:** Total volume of the lubricant cartridge, usually expressed in cm^3 [CC] or in fl.oz.
- **Remaining quantity [cm³]**: Remaining volume of the lubricant cartridge.

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- o This data is calculated from the *Fulfilled quantity* and the *Discharge amount* parameters (a wrong configuration will lead to a wrong remaining quantity information).
- **Discharge amount [cm³/impulse]:** Elementary quantity of lubricant injected per voltage impulse (please refer to the lubricator datasheet). SDT recommends working with the default volume unit, expressed in cm³/impulse.
- **Discharge duration [s]:** Minimum Time delay corresponding to a single discharge (refer to the lubricator datasheet). Required to avoid incomplete discharge when use recursively.
- **Refill:** Press to refill the *Remaining quantity* parameter with the *fulfilled quantity* parameter.

⚠️ To ensure optimal performance and compatibility with the LUBExpert ON-GUARD system, it is crucial to configure the PERMA star Control (or any other compatible lubricator) according to the following SDT recommendations. Please begin by consulting the PERMA star Control operating instructions for initial setup guidance

Recommended configuration with PERMA STAR Control:

PERMA STAR Control	SDT recommendation (GUI)
The PERMA STAR Control offers cartridge volumes of 60, 120, 250, and 500 cm³.	The **Fulfilled Quantity** in the LUBExpert ON-GUARD configuration should match the chosen cartridge volume to accurately reflect the available lubricant.
Ensure the impulse mode is selected for the PERMA STAR Control to synchronize with the LUBExpert ON-GUARD system effectively. Set to 1 CC/per impulse, by default.	**Discharge amount**: 1 CC **Discharge duration**: 15 seconds. Configure a discharge duration of 15 seconds for each impulse to ensure complete and accurate lubricant dispensation.

🛈 Example scenario:

To dispense 10 CC of lubricant, the LUBExpert ON-GUARD will trigger 10 successive voltage impulses. Each impulse will last for 15 seconds, accurately delivering the desired amount of lubricant to the equipment.

7.3.2. Replenishment

The LUBExpert ON-GUARD system offers two distinct replenishment modes to optimize the lubrication process according to your operational needs. Selecting the appropriate mode ensures that your equipment receives the correct amount of lubricant, either based on a predetermined quantity or through the SDT LUBrain algorithm.

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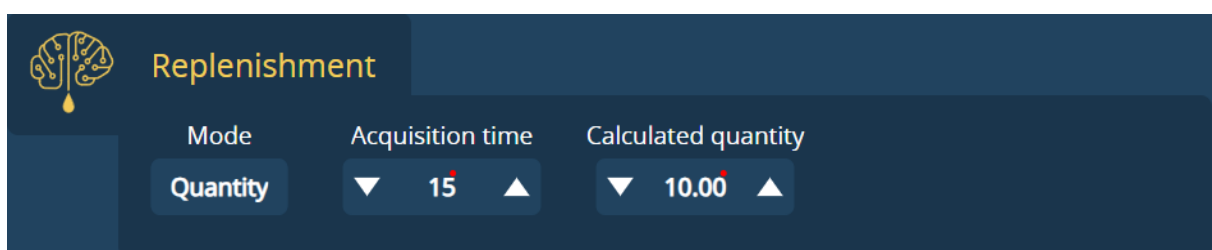
- **Mode:** Replenishment mode
  - *Quantity*: ON-GUARD will lubricate according to a specific quantity specified with the *Calculated quantity* parameter. This setting allows for precise control over the amount of lubricant applied to each piece of equipment, ensuring that lubrication is consistent with your maintenance strategy.
  - *LUBrain*: ON-GUARD will lubricate using the SDT LUBrain algorithm. While the "Calculated Quantity" parameter is still set as a reference, the actual amount of lubricant injected may vary. The LUBrain algorithm uses Ultrasound data to guide the replenishment lubrication process, potentially reducing over- or under-lubrication and extending the life of your machinery.
 - *One*-shot: use as functional test.
- **Acquisition time [s]:** This parameter determines the time frame over which ultrasound RMS (Root Mean Square) data is averaged in lubrication mode, directly influencing the system's decision-making and lubrication accuracy. The system averages the ultrasound RMS data over the specified acquisition time, smoothing out fluctuations and ensuring a more stable evaluation of initial and final readings.
  - In conjunction with the SDT LUBrain algorithm, the acquisition time helps in segmenting the lubrication process into sub-sequences (% of the calculated lubricant + stabilization time). By analyzing averaged data over set intervals, the LUBrain algorithm can make informed decisions, optimizing lubricant delivery based on the evolving condition of the equipment.
- **Calculated quantity [cm^3]:** Process lubricant quantity
  - Total quantity injected per process when the *Quantity* strategy is selected. The lubricator will inject one or more successive elementary discharge amount corresponding to the requested quantity.
  - Calculated quantity when *LUBrain* is selected (divided into sub-sequences)

> ⓘ Example: Use 60 seconds as a reference for the most common asset running a moderate and constant speed, such as Fan system [1000-3000 rpm]. The longer the acquisition time, based on history, especially for assets running at slow speed.

7.3.3. Triggering options

The LUBExpert ON-GUARD system employs a flexible approach to lubrication, allowing users to select from various strategies based on operational requirements. These strategies dictate how and when the system activates lubrication mode:
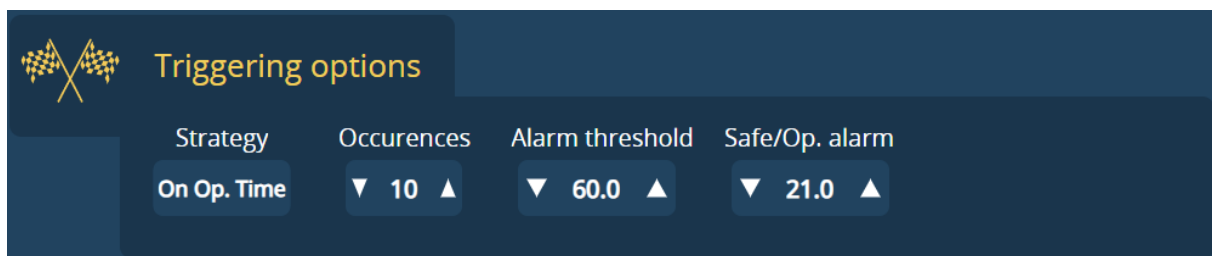
- **Strategy:** Trigger strategy defining the rules to switch in active mode (i.e. lubrication mode):
  - **Free mode:** Initiates lubrication manually and on demand, offering maximum control over the lubrication process.

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- o **On Op. Time:** Triggers lubrication after the corresponding channel reaches a specified duration of operating time, ensuring regular maintenance. (Safe alarm + Occurrences (in hour) are required).
  - o **On Alarm:** Activates lubrication in response to specific alarm conditions, tailored to the system's immediate needs (Alarm threshold + Occurrences are required)
- **Occurrences:** Defines the number of occurrences that need to happen in order to trigger the lubrication (i.e. every 200 hours of operating time):
  - o For the **Op. Time strategy**, "Occurrences" specifies the operational hours required between each lubrication event, ensuring timely maintenance.
    (ex: Occurrences = 2000 means lubricate every 2000 hours, in both Quantity or LUBrain mode).
  - o For the **On Alarm strategy**, it determines the number of consecutive alarm conditions (based on the **Acquisition time**) that must be met before initiating lubrication, enhancing response to equipment needs.
    (ex: Occurrences = 10 and acquisition time = 30 seconds, when combined, these settings define a total evaluation period of 300 seconds=5 min (10 occurrences x 30 seconds per occurrence). Lubrication will be triggered if the RMS current value exceeds the alarm Threshold continuously throughout this period.
- **Alarm Threshold:** Threshold value used to trigger the lubrication if *Strategy* is set on *On Alarm*

  To ensure optimal performance and maintenance efficiency of the LUBExpert ON-GUARD system, it's crucial to set appropriate Alarm Thresholds based on historical data and consider variations in normal operational processes.

- **Safe/Op. Alarm:** Establishes the minimum operational threshold. Lubrication is withheld if readings fall below this value, indicating non-operation or standby states.
- Minimum threshold value to define the process of non-operation. Lubrication won't occur (even on *freemode*) if the current reading is below this value. When the reading is above this value, the operating time starts counting.

Some references values based on the SDT RSC.101 specifications:

Values	Meaning
<19-20 (below 4 mA)	Setting the Safe Alarm below this range could suggest a problem with the sensor or measurement, such as a disconnection or defect.
20 to 100 (between 4 mA and 20 mA)	Represents the useful range for setting both the Safe Alarm and the Alarm Threshold. Values within this range are indicative of normal operational signals that the system can utilize for effective monitoring and maintenance actions. User must refer to the data history
>100 (above mA)	Signals a potential issue with the sensor. Values exceeding this range are typically

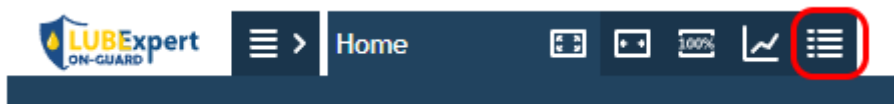|	abnormal and may require further investigation

7.4. Asset information page

Each text field can be modified by the user (logged in as admin).

7.5. Log

Log can be accessed as admin on the menu in the top left of any pages.

Time ∨	Source	Level	Message
13.02.2023 12:28:56	Unspec	2	Sending command SyncFilesystems
13.02.2023 12:28:56	Unspec	4	Saving variables to flash finished
13.02.2023 12:28:56	Unspec	3	Saving variables to flash
13.02.2023 12:20:31	TSvr12346	2	Assigned client context no. 0 for 127.0.0.1:57994
13.02.2023 12:20:31	TSvr12346	3	New connection on port 12346 (remote 127.0.0.1:57994)
13.02.2023 12:16:45	TSvr12346	2	Unassigned client context no. 0
13.02.2023 12:16:45	TSvr12346	2	Client 127.0.0.1:57992 closed connection
13.02.2023 12:05:27	TSvr12346	2	Assigned client context no. 0 for 127.0.0.1:57992
13.02.2023 12:05:27	TSvr12346	3	New connection on port 12346 (remote 127.0.0.1:57992)
13.02.2023 11:54:25	Unspec	2	Sending command SyncFilesystems
13.02.2023 11:54:25	Unspec	4	Saving variables to flash finished
13.02.2023 11:54:25	Unspec	3	Saving variables to flash
13.02.2023 11:28:56	Unspec	2	Sending command SyncFilesystems
13.02.2023 11:28:56	Unspec	4	Saving variables to flash finished
13.02.2023 11:28:56	Unspec	3	Saving variables to flash
13.02.2023 10:54:25	Unspec	2	Sending command SyncFilesystems
13.02.2023 10:54:25	Unspec	4	Saving variables to flash finished
13.02.2023 10:54:25	Unspec	3	Saving variables to flash
13.02.2023 10:47:08	SharkEval	4	Enable outputs writing
13.02.2023 10:47:08	SharkEval	4	Outputs marked as write pending
13.02.2023 10:47:07	Task	3	Found init/finish task 1122 for 997
13.02.2023 10:47:07	Task	3	Found init/finish task 1417 for 1391
13.02.2023 10:47:07	Task	3	Found init/finish task 1388 for 1375
13.02.2023 10:47:07	Task	3	Running init transformation program UID 1515
13.02.2023 10:47:07	Unspec	2	Task type=0(b09fa440) - scheduling parameters - policy = 2, priority = 71
13.02.2023 10:47:07	SharkEval	3	Channel 0 ok
13.02.2023 10:47:07	Unspec	3	TCP Server listening on 0.0.0.0:503, maximal clients 5
13.02.2023 10:47:07	Unspec	3	UDP Server listening on 0.0.0.0:8010
13.02.2023 10:47:07	Unspec	3	TCP Server listening on 0.0.0.0:12347, maximal clients 100

Filters can be used to only show the log corresponding to the "On-Guard" process or for a specific "channel".

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8. Support and contact details:

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1	CMA 2024/03/14	Original version (both products)	CGI
Ver.	Editor	Nature of modification	Verified

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