



LogBox LTE

USER GUIDE V1.0x G

NOVUS
We Measure, We Control, We Record

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1. SAFETY ALERTS

The symbols below are used throughout this manual to draw the user's attention to important information regarding safety and use of the device.

		
CAUTION Read the manual fully before installing and operating the device.	CAUTION OR HAZARD Risk of electric shock.	ATTENTION Material sensitive to static charge. Check precautions before handling.

Safety recommendations must be followed to ensure user safety and to prevent damage to the device or system. If the device is used in a manner other than that specified in this manual, the safety protections may not be effective.

2. PRESENTATION

LogBox LTE is a wireless electronic data logger that has 2 analog sensors and 1 digital sensor, respectively referred to as "analog measurement channel" and "digital measurement channel". The device has 1 USB interface for local configuration and 1 mobile communication interface for direct communication with **NOVUS Cloud** (<https://iot2.novusautomation.com/>)¹ or MQTT Brokers and for sending events via SMS.

Its memory capacity is up to 140,000 logs.

The device operates with an external power supply and has internal batteries for backup. It is possible to configure its behavior during the absence of external power supply, according to the following options: **1)** Keep the device operating with full capabilities; **2)** Turn off cellular communication to preserve power and keep the device recording for a longer period.

The housing has a protective cover for the connections, a sealing ring, and a bracket that allows the device to be fixed to a wall or metal surface.

The analog inputs accept any type of temperature sensor, such as thermocouples, Pt100 or sensors for other quantities with current or voltage signals. The digital channel can either log the time of events (such as the opening of a door) or count and/or accumulate pulses from a flow sensor.

LogBox LTE also has the following internal sensors: Temperature, battery voltage, and external source voltage, whose values can be registered in memory and published in **NOVUS Cloud** or via MQTT, as well as monitored by the USB interface, by SMS or through the display.

Its display allows you to simultaneously visualize up to 3 variables and shows indications about alarms, communication status, enabled channels, voltage level of backup batteries, among other information.

LogBox LTE has 1 digital output, which can be used as an output to indicate alarms or as an electronic switch to power sensors, and can be controlled via MQTT, for example.

In operation, **LogBox LTE** logs data in memory and publishes it directly to **NOVUS Cloud** or MQTT Brokers. The interval between logs and the publishing interval are configurable. The logged data and the device configuration can be accessed through a PC via USB (using the **NXperience** software, available in the Download Area of our website) or remotely via **NOVUS Cloud**.

¹ **NOVUS Cloud** is a cloud portal that allows you to manage the registered data and perform remote configurations on your device.

3. DISPLAY AND NAVIGATION

3.1 DISPLAY INFORMATION

LogBox LTE has a 3-line 4 ½ digit numeric LCD display. It allows you to view the current value of all enabled channels as well as their minimum and maximum values. Simultaneously, it is possible to view the current value of up to 2 analog channels or the current value of the digital input. In addition to channel information, **LogBox LTE** has 14 screens and 24 symbols.

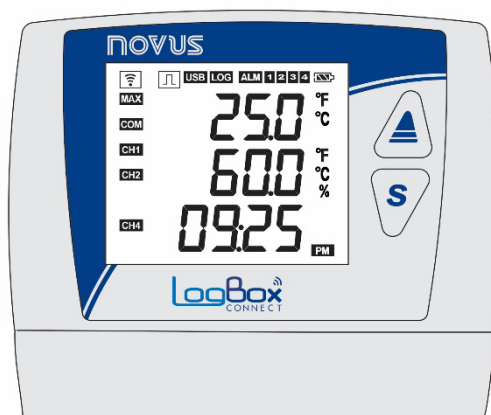


Figure 1

- : Indicates the status of the mobile network connection. When off, it indicates that the mobile interface is not operating or is not connected to the network. When lit, indicates that the device is registered. If the mobile data is enabled, it indicates that the connection was successful.
- : When the digital channel is disabled, it remains off. When set to **Pulse Count** mode, it remains on. When set to **Event Log** or **Log Control** modes, it remains lit, flashing when an event is detected at the digital input.
- **USB**: Turns on when the USB cable is connected. Turns off when the USB cable is disconnected.
- **LOG**: Remains lit from the moment the device logs the first log until the moment it stops registering. When set to **Daily** mode, which should start and end daily at a predetermined time, it will remain lit during the configured time. It will flash while registering data, turn off at the time of a log and then restart.
- **ALM**: Turns on and stays on when entering an alarm condition. Turns off when a new configuration is received or the alarm status is cleared. Indicates that, at some point, an alarm was triggered.
- **1, 2, 3, 4**: Turns on while the alarm conditions of the corresponding channels are met:
 - **1** → Any alarm configured for analog channel 1.
 - **2** → Any alarm configured for analog channel 2.
 - **3** → Any alarm configured for internal channels.
 - **4** → Any alarm configured for the digital channel.When exiting the alarm condition, the flag will be turned off.
- : Indicates the battery voltage level. The symbol will be refreshed in the HMI update interval.
 - : Battery level over 75 %.
 - : Battery level over 50 %.
 - : Battery level over 25 %.
 - : Battery level below 25 %.
- **MAX**: Turns on while information on the **Maximum** values reached in each channel is being viewed on the display.
- **COM**: Flashes to inform the reception of a valid data packet from one of the available communication interfaces.
- **CH1, CH2, CH4**: Indicates which channels are enabled.
- **MIN**: Turns on while information on the **Minimum** values reached in each channel is being viewed on the display.
- **°F, °C**: If the channel unit is set to °F or °C, one of the symbols will turn on when the channel is displayed. Otherwise, no unit symbol will be displayed.
- **PM**: If the clock is set to 12-hour format, the PM symbol will turn on when the clock is displayed and the time is greater than 1 pm.

3.2 OPERATION KEYS

To navigate between screens, LogBox LTE has 2 keys:  . Depending on the current navigation screen, each key has 2 or more functions:

- **Quick touch (less than 2 seconds):**
 - Proceeds to the next screen if the current screen mnemonic is being displayed.
 - Displays the mnemonic of the current screen again if the screen information is being displayed.
- **Long touch (longer than 2 seconds or held down):**
 - Takes an action within the current screen.
- **Both keys pressed (longer than 2 seconds or held down):**
 - Takes a second action within the current screen.

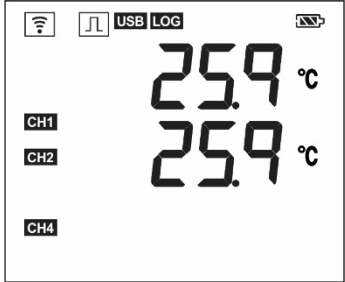
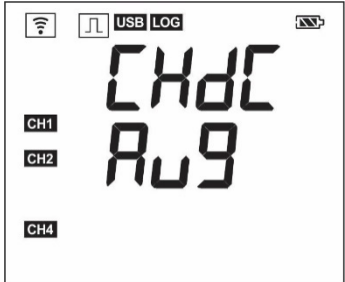
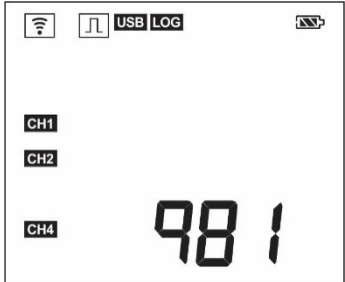
3.3 NAVIGATION SCREENS

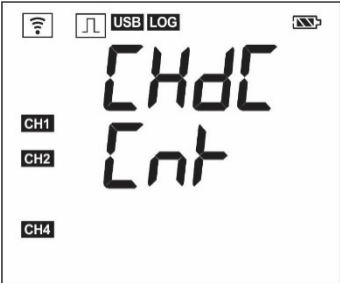
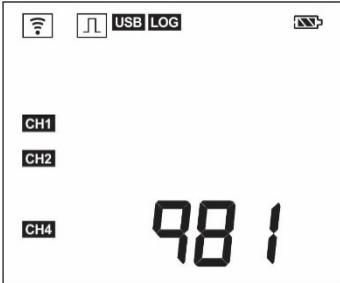
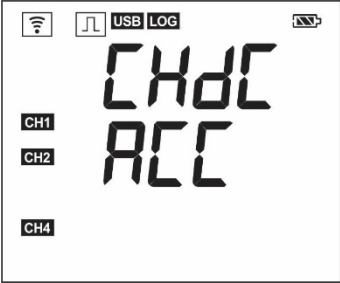
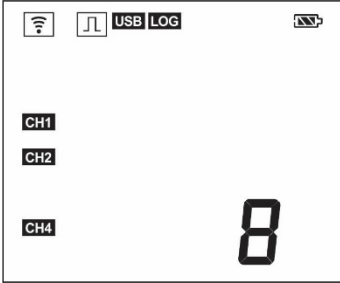
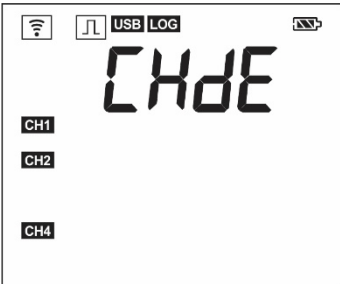
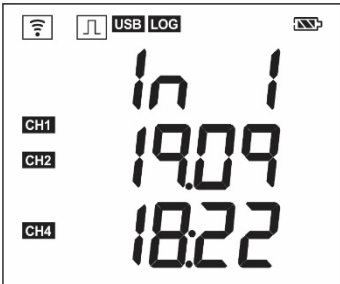
To facilitate identification of information on each screen, a mnemonic will be displayed whenever a when a key is pressed. It will remain visible for 2 seconds.

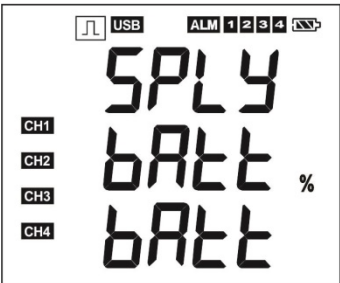
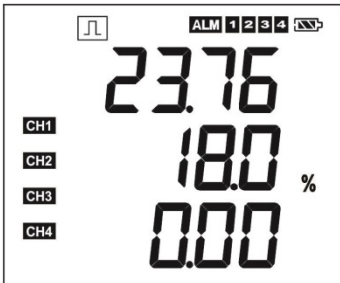
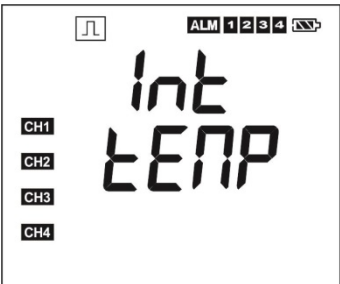
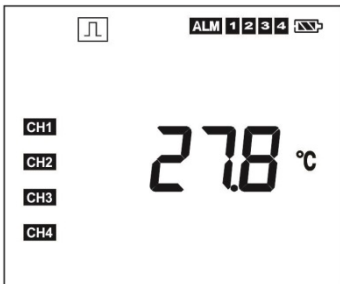
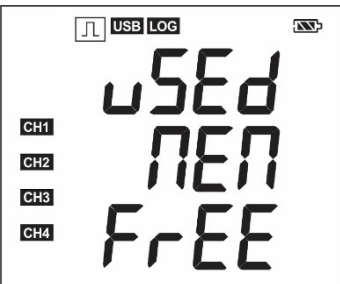
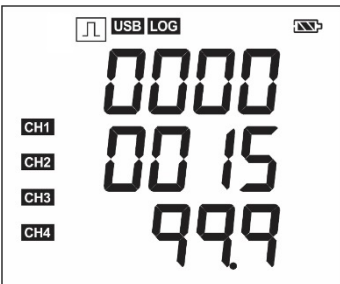
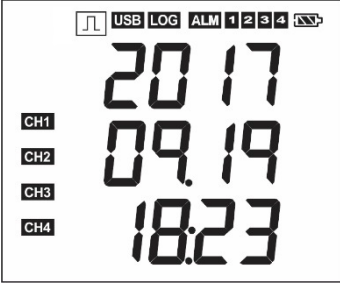
If you don't press any key during this period, the information on the current screen will be displayed. If you press the  or  keys while a mnemonic is being displayed, the device will advance to the next screen or return to the previous one, which will be duly specified by their respective mnemonics.

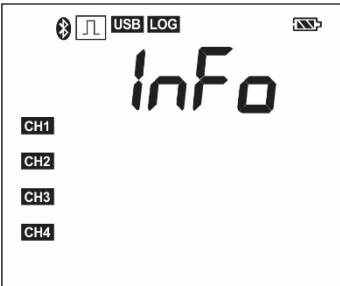
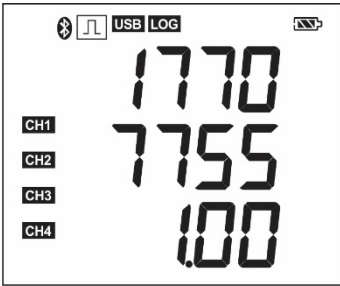
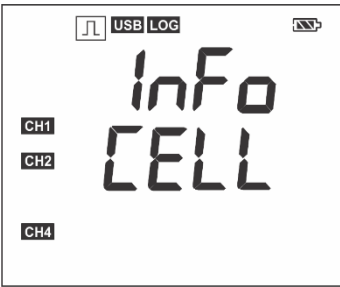
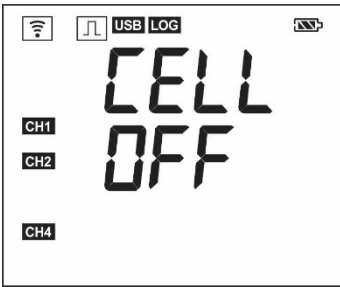
When the device is displaying the information on a screen, just give a short press on either of the 2 keys and the mnemonic will be displayed again. To access the desired screen, simply wait 2 seconds.

The table below shows the screens, the mnemonics, the information related to them, the description of each piece of information and the function of the keys on each of the screens.

SCREEN	MNEMONIC	INFORMATION	DESCRIPTION	KEYS FUNCTION
1) Analog inputs			Displays the value of the analog channels and allows you to view the maximums and minimums reached by each channel. Line 1: Value of analog channel 1. Line 2: Value of analog channel 2.	 Key held down or long touch: Informs the maximum value reached in each analog channel.  Key held down or long touch: Informs the minimum value reached in each analog channel.   Both keys held down: Clears the minimum and maximum values reached by each analog channel. Displays the CLR message when the operation is completed.
2) Internal channels			Displays the value of the internal channels and allows you to view the maximums and minimums reached by each channel. Line 1: Value of internal channel 1. Line 2: Value of internal channel 2.	 Key held down or long touch: Informs the maximum value reached in each analog channel.  Key held down or long touch: Informs the minimum value reached in each analog channel.   Both keys held down: Clears the minimum and maximum values reached by each analog channel. Displays the CLR message when the operation is completed.
3) Digital Input a) Pulse Count: Flow Rate			When enabled and set to Pulse Count mode and then configured with the Average Flow by Acquisition Interval (Application parameter / Flow Rate function), it displays the average flow registered within the configured log interval. If it is not configured, this screen will not be displayed. Use the third line of the display to display the registered flow rate.	 Key held down or long touch: Informs the maximum flow rate.  Key held down or long touch: Informs the minimum flow rate.   Both keys held down: Clears the minimum and maximum values reached by each channel.

SCREEN	MNEMONIC	INFORMATION	DESCRIPTION	KEYS FUNCTION
4) Digital Input b) Pulse Count: Count			When enabled and set to Pulse Count mode and then configured with Acquisition Interval Counting (Application parameter / Count function), it displays the registered count within the configured log interval. If it is not configured, this screen will not be displayed. Uses the third line of the display to display the registered count.	 Key held down or long touch: Informs the maximum flow rate.  Key held down or long touch: Informs the minimum flow rate.   Both keys held down: Clears the minimum and maximum values reached by each channel.
5) Digital Input c) Pulse Count: Accumulator			When enabled and set to Pulse Count mode and then configured with Volume since Last Reset (Application parameter / Flow Rate function) or with Accumulated Count Since Last Reset (Application parameter / Count function), displays the volume or count accumulated since the last digital channel reset. If it is not configured, this screen will not be displayed. Uses the third line of the display to display the registered count.	 Key held down or long touch: No action.  Key held down or long touch: No action.   Both keys held down: No action.
6) Digital Input d) Event Log or Log Control			When enabled and set to Event Log or Log Control modes, it displays the last event detected at the digital input. Line 1: Edge detected in the event: 0 → Falling edge 1 → Rising edge Line 2: Day.Month of the event (if the 24-hour format is selected); Month.Day of the event (if the AM/PM format is selected). Line 3: Hour:Minute of the event.	 Key held down or long touch: No action.  Key held down or long touch: No action.   Both keys held down: No action.

SCREEN	MNEMONIC	INFORMATION	DESCRIPTION	KEYS FUNCTION
7) Power supply status			Displays information about the device power source. Line 1: External source voltage. Line 2: Battery level. Line 3: Value of battery voltage.	 Key held down or long touch: Informs the maximum value reached.  Key held down or long touch: Informs the minimum value reached.   Both keys held down: Clears the minimum and maximum values reached.
8) Internal temperature			Displays the internal temperature of the device.	 Key held down or long touch: Informs the maximum value reached.  Key held down or long touch: Informs the minimum value reached.   Both keys held down: Clears the minimum and maximum values reached.
9) Memory			Displays the number of logs in the memory and free memory percentage. Line 1 and 2: Number of logs registered in the memory. Line 3: Free memory percentage.	 Key held down or long touch: No action.  Key held down or long touch: No action.   Both keys held down: No action.
10) Date/Time			Displays the current date and time of the device. Line 1: Year. Line 2: Month.Day. Line 3: Hour:Minute.	 Key held down or long touch: No action.  Key held down or long touch: No action.   Both keys held down: No action.

SCREEN	MNEMONIC	INFORMATION	DESCRIPTION	KEYS FUNCTION
11) Device information			Displays information about the device. Line 1 and 2: Serial number. Line 3: Firmware version.	 Key held down or long touch: No action.  Key held down or long touch: No action.   Both keys held down: No action.
12) Mobile connection information			Displays the status of the mobile network connection, showing how far the device has been able to reach. The following messages may be displayed: First messages that may occur: CELL OFF or Pur SRUE: The cellular module is switched off. This can happen if the device is only being powered via the USB interface, if the MQTT and SMS services are disabled or if the power-saving algorithm is being applied. S IP Err: SIM card error. It may occur in case of SIM card failures (missing SIM card, burned SIM card, PIN error). REG LR It: The cellular module is connecting to the network. It may occur for a few moments when turning on the device. TRY Rtt: The module is trying to authenticate itself on the mobile network. For the operation to be completed, the module must be registered, the APN must be properly configured, and the inserted SIM card must have mobile data available. Err In It: Connection error with the network or cellular module. This may occur if the device is unable to authenticate with a cellular network or during the following situations: Weak signal, lack of network available in the region by the operator used, access denied by the operator or some internal problem. To recover from the problem, the device will restart the connection process. Messages that may occur if MQTT services are enabled: MQTT Err: Failure to obtain MQTT service. It may occur due to lack of data plan or incorrect configuration of Server Address/Port/TLS Security. MQTT Jo In: MQTT is connecting. It may occur for a few moments when connecting to the MQTT Broker. MQTT on: Connected to the MQTT Broker. The connection was successful. Messages that may occur if only SMS services are enabled: SMS OFF: Failure to start SMS service. It may occur for a few moments when starting the SMS service. SMS on: The SMS service is enabled. Only occurs if SMS services are enabled and have been successfully initialized. It is not possible to validate if the operator is accepting the sending and receiving of SMS or if there is an SMS plan enabled.	

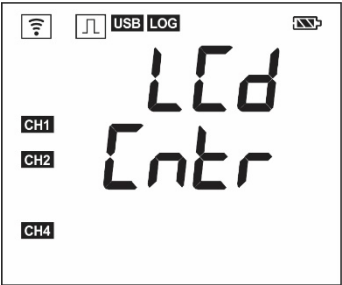
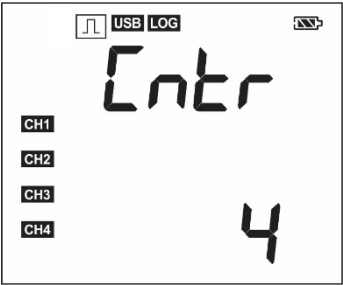
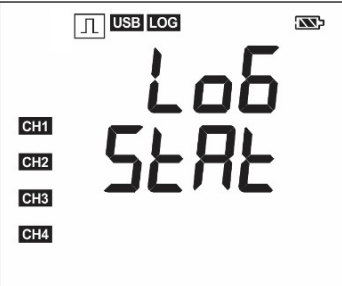
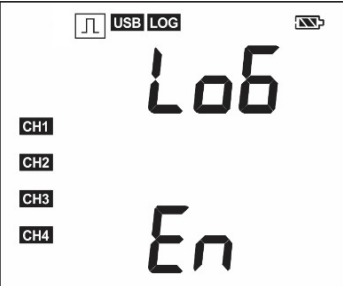
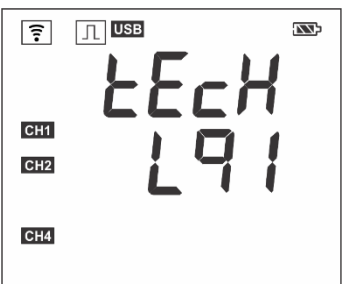
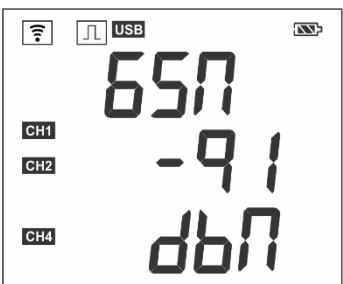
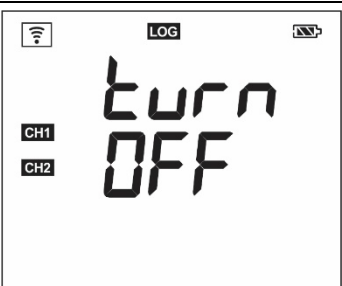
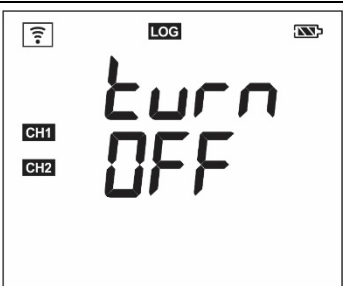
SCREEN	MNEMONIC	INFORMATION	DESCRIPTION	KEYS FUNCTION
13) Display contrast adjustment			Displays the contrast level of the display and allows you to adjust it. Line 3: Current contrast value. Can be adjusted from 0 to 7.	 Key held down or long touch: Increases contrast (Maximum: 7).  Key held down or long touch: Decreases contrast (Minimum: 0).   Both keys held down: No action.
14) Log status			Displays the status of logs and allows them to be started and/or paused if the device is configured to allow start and/or end via keyboard. En → The logs are enabled. d IS → The logs are disabled.	 Key held down or long touch: Initiates logs if By Keyboard start mode is enabled.  Key held down or long touch: Pause records if the By Keyboard end mode is enabled.   Both keys held down: No action.
15) Signal strength			Displays the signal strength received by the mobile network. The mnemonics of this screen can change, according to the technology selected: GSM, Cat.M1 or NB-IoT.	 Key held down or long touch: No action.  Key held down or long touch: No action.   Both keys held down: No action.
16) Turn off the device			It allows you to turn off the device while it is operating on the internal power backup batteries. To turn it on again, it is necessary to power it via the USB interface or an external power source.	 Key held down or long touch: No action.  Key held down or long touch: No action.   Both keys held down: Turn off the device.

Table 1

4. BACKUP BATTERIES (INTERNAL UPS)

LogBox LTE requires an external power supply to operate.

To ensure full operation during power outages, the device features internal backup batteries that operate as an uninterruptible power supply. The internal batteries are charged automatically while the external power supply is present and will automatically take over as power supply during power outages.

When **LogBox LTE** operation is exclusively via battery, the energy saving mode has 3 behaviors:

- **Off:** The device will continue to operate normally, i.e., it allows **LogBox LTE** to maintain the MQTT connection, receive MQTT publications, send SMS events, and keep other routines running.
- **Log and publish:** Device will keep registering data as per the configured log interval. It will activate the mobile interface to perform MQTT publishing of the logs based on the publishing interval. Consequently, it will not send SMS of events and it will not be possible to receive MQTT publications.
- **Only log:** **LogBox LTE** will prioritize the register of data and keep the mobile interface off until the external power is re-established. Therefore, it will not be possible to send and receive publications. No SMS of events will be sent either.

The battery lifespan depends on the interval between logs, the publishing interval in the MQTT Broker, the network the device is connected to (NB-IoT, Cat.M1, or GPRS) and the power saving mode setting. In cases where the interval between logs and the publishing interval is 10 seconds (and considering that, in this example, the batteries are 100 % charged), the typical autonomy is 8 hours with the power saving mode switched off.

For cases where the interval between logs and the publishing interval is 10 minutes, the Log & Publish saving mode considerably extends the battery lifespan estimate to 80 hours.

To configure the power saving mode, access the [MOBILE](#) tab of the [CONFIGURATION SOFTWARE](#) chapter.

The internal batteries are Li-Ion. If exposed to temperatures above or below the device operating temperatures (see [TECHNICAL SPECIFICATIONS](#) chapter), their chemistry may pose a risk of explosion. Moreover, they can only be charged in the specified temperature range (see [TECHNICAL SPECIFICATIONS](#) chapter). Thus, if the device is operating in an environment with temperature higher or lower than the range specified for the batteries, it will automatically stop charging, which can lead to uncharged batteries during power outages.

In addition, these batteries may lose the charge capacity if they are recharged when the voltage falls below 2 V. To avoid this problem, the device will automatically shut down when the battery reaches levels below 3 V. Every battery, however, has a self-discharge current. In this way, it is important to consider the storage time with the device turned off. If the battery is stored for a long period of time, especially if it is partially discharged, it can be gradually discharged and reach a point where, when it is below 2 V, it is impossible to recharge it.

It is recommended to charge the battery up to at least 50 % before disconnecting the device for a long period of time, after which the procedure for manually disconnecting the device is performed (see [NAVIGATION SCREENS](#) section).

Replacing batteries can lead to risk of explosion. Hence, the cover for access them is factory sealed and they can only be replaced by the manufacturer or by authorized technical assistance.



Risk of explosion: Internal batteries may only be replaced by the manufacturer or authorized service provider.

Risk of explosion: Be careful with the operating temperature of the device. Extremely high or low temperatures can cause ruptures and leaks in backup batteries and damage the device.

5. INPUT SIGNAL READINGS

LogBox LTE allows you to choose, in addition to the channels to be recorded and the sensor types, some configurations that make various applications more flexible. Thus, you can analyze the energy resources expended (battery lifespan) and data storage (log memory duration period).

The device can be configured with the following parameters:

- **Log Interval:** Frequency (in seconds) at which a log must be made and saved in the memory. A low periodicity will increase battery consumption and fill up the memory faster.
 - **Minimum Interval:**
 - 1 second (if no channel is set to operate by average).
 - 10 seconds (if any channel is set to operate by average).
 - **Maximum Interval:** 18 hours.
- **Display Update Interval:** Periodicity (in seconds) at which a log must be made and updated on the display. It allows to save memory by setting it to a longer interval of logs, without jeopardizing the display update interval. A low periodicity will increase battery consumption. If set to 0, it is possible to disable this interval. Thus, the display will be updated at the log interval.
 - **Minimum Interval:** 1 second.
 - **Maximum Interval:** 1 hour.

When configuring a display update interval, it should be less than the log interval. Otherwise, it will be ignored, and the display will be updated in the log interval.

The display update interval only refreshes analog channels that are not configured to operate by average. Thus, the digital channel that is configured to operate in count mode and the analog channels that are configured to operate by average will only have their information refreshed at each log interval.

If the digital channel is set to **Event Log** mode, it refreshes its respective display information at each event.

5.1 ANALOG INPUTS

LogBox LTE has 2 channels for reading analog signals. The types of signals and sensors accepted are:

- **Temperature Sensors:**
 - Pt100 thermoresistance
 - J, K, T, N, E, R, S, and B thermocouples
 - Internal temperature sensor
- **Linear Sensors:**
 - 0 to 50 mV
 - 0 to 5 V
 - 0 to 10 V
 - 0 to 20 mA
 - 4 to 20 mA
- **Internal Diagnostic Sensors:**
 - Battery voltage
 - External power supply voltage

Each type has specific operating configurations and characteristics. Its configurations are described below:

- **Temperature Sensors:**
 - They inform the measured sensor temperature within the possible measurement range for each sensor.
 - The maximum resolution for the temperature sensors is 0.1 °C.
 - They can be set to be displayed with one or no decimal places.
 - They can be set to be displayed in °C or °F.
- **Linear Sensors:**
 - Inform a magnitude in the range required by you (defined under **User Range**), as configured in the **Lower Limit**, **Upper Limit**, and **Decimal Places** parameters.
 - **Decimal Places:** You can use 0, 1, or 2 decimal places.
 - **Lower Limit:** Corresponds to the value configured to represent the minimum value of the sensor:
 - Minimum -19999 for 0 decimal places
 - Minimum -1999.9 for 1 decimal place
 - Minimum -199.99 for 2 decimal places
 - **Upper Limit:** Corresponds to the value configured to represent the maximum value of the sensor:
 - Maximum 19999 for 0 decimal places
 - Maximum 1999.9 for 1 decimal place
 - Maximum 199.99 for 2 decimal places
 - They can be configured to be displayed in °C or °F or in a custom unit of up to 8 characters, which will not be shown on the display.
 - The maximum resolution for linear sensors corresponds to a ratio between the **User Range** and the maximum resolution of the sensor.

- **Internal Diagnostic Sensors:**

- Inform the voltage from the possible **LogBox LTE** power supply sources.
- The maximum resolution for the internal diagnostic sensors is 0.01 V.
- They can be configured to be displayed with 0, 1, or 2 decimal places.
- The measurement unit for these sensors is Volts and no unit symbol is displayed.

To check the accuracy and connection of these signals, see [TECHNICAL SPECIFICATIONS](#) and [INSTALLATION](#) chapters.

An analog/digital (A/D) converter with high resolution and accuracy is used to read the sensors connected to the analog channel inputs. In the desired scan interval, all enabled analog channels will be read.

Each type of input signal has a valid measurement range (see [TECHNICAL SPECIFICATIONS](#) chapter). However, the device can typically measure signals that slightly exceed the limits of this range. How much it can measure beyond that, however, depends on the type of input configured and can vary between different devices.

The following table describes what to expect in the display according to the signal applied to the input for each configured input type:

5.1.1 INPUT TYPES: MEASUREMENT AND INDICATION

INPUT TYPE	INPUT SIGNAL CONDITION	INDICATION
Pt100	Within range	Read input value
	Pt100 with one or more wires disconnected	---- will be displayed -22000 will be registered in the memory
	Slightly above the upper limit	Read input value*
	Slightly below the lower limit	Read input value*
	Far above the upper limit	UUUU will be displayed 32767 will be registered in the memory
	Far below the lower limit	NNNN will be displayed -32000 will be registered in the memory
Thermocouples: J, K, T, E, N, R, S, and B	Within range	Read input value
	Open thermocouple	---- will be displayed -22000 will be registered in the memory
	Slightly above the upper limit	Read input value*
	Slightly below the lower limit	Read input value*
	Far above the upper limit	UUUU will be displayed 32767 will be registered in the memory
	Far below the upper limit	NNNN will be displayed -32000 will be registered in the memory
Voltage (mV): 0 to 50 mV	Within range	Read input value converted into User Range
	Signal disconnected	---- will be displayed -22000 will be registered in the memory
	Slightly above the upper limit	Read input value converted into User Range *
	Slightly below the lower limit	Read input value converted into User Range *
	Far above the upper limit	UUUU will be displayed 32767 will be registered in the memory

INPUT TYPE	INPUT SIGNAL CONDITION	INDICATION	
	Far below the lower limit	nnnn will be displayed -32000 will be registered in the memory	
Voltage (V): 0 to 5 V 0 to 10 V	Within range	Read input value	
	Signal disconnected	0 V converted into User Range	
	Slightly above the upper limit	Read input value converted into User Range*	
	Slightly below the lower limit	Read input value converted into User Range*	
	Far above the upper limit	uuuu will be displayed 32767 will be registered in the memory	
	Far below the lower limit	nnnn will be displayed -32000 will be registered in the memory	
Current (mA): 0 to 20 mA 4 to 20 mA	Within range	Read input value converted into User Range	
	Signal disconnected	0 to 20 mA	0 mA converted into User Range
		4 to 20 mA	---- will be displayed -22000 will be registered in the memory
	Slightly above the upper limit	Read input value converted into User Range*	
	Slightly below the lower limit	0 to 20 mA	It is not possible to decrease beyond the lower limit
		4 to 20 mA	Read input value converted into User Range*
	Far above the upper limit	uuuu will be displayed 32767 will be registered in the memory	
	Far below the lower limit	0 to 20 mA	It is not possible to decrease beyond the lower limit
		4 to 20 mA	nnnn will be displayed -32000 will be registered in the memory

(*) **Note:** The analog channel indication continues slightly beyond the limits specified for the selected input type. However, in this condition, accuracy is not guaranteed.

Table 2

LogBox LTE allows you to configure settings to be applied to analog sensor readings. These settings can be used to correct errors in the sensor or process in which the sensor is installed and are applied individually for each analog channel. Two adjustment modes are provided:

- **Offset:** Allows each analog channel to select an Offset value to be added to the channel reading indication. It is a simple and fast feature for adjusting the indication in the whole range.
- **Custom Calibration:** Allows you to enter up to 10 Setpoints for each channel to correct distortions when reading these channels at these points.

This feature is named **Custom Calibration** because it allows you to adjust the indication at the desired points, resetting the error. The adjustment is made linearly between the entered points, according to the values entered.

It warrants emphasis that both setting the Offset and entering custom calibration points are optional, only indicated for those who wish to adjust the indication to a local standard, because the **LogBox LTE** already comes pre-calibrated from the factory.



Whenever changing the input type, make sure the custom calibration points for the previous input are deleted!

For each analog channel, you must assign a unique name (tag), which will be used to reference the channel. You also need to select the type of input (sensor) that will be connected to that channel.

Additionally, the measured unit value can be assigned:

- For temperature sensors (Pt100 or thermocouples), you can select the Celsius (°C) or Fahrenheit (°F) degree unit.
- For linear sensors (current or voltage), you can type the desired unit.

For linear input types, you must set the sensor indication range, defining what the channel should indicate when the input is at its minimum value and what it should indicate when at its maximum value (minimum and maximum values considering the **LogBox LTE** working range for the chosen input type). Once the input type 4 to 20 mA is selected, for example, a 0 to 2-bar pressure transmitter will be connected. In this case, you should choose "0.0" as minimum value and "2.0" as maximum value in the input configuration. All available resolution and accuracy will be contained within the chosen range.

When a device that is connected to the mains (a thermocouple or voltage simulator, for example) is used at the analog inputs and is not isolated, it is recommended to use a reading interface other than USB. In some cases, noise and read Offsets have already been detected due to the influence of the USB cable connection, probably due to ground loops.

When operating on batteries, **LogBox LTE** keeps the analog circuitry off while no acquisition is being performed. This strategy is necessary so that the device can operate longer in the absence of external power. This feature may cause undesired effects during calibration, as some analog signal simulators (e.g., a thermocouple simulator or a Pt100) may not be able to operate properly, causing false Offsets and oscillations in the readings. If such problem is identified, it is recommended to power the **LogBox LTE** via the external power supply or USB cable while using a simulator.

It is important to set the local grid frequency (50 Hz or 60 Hz) because it helps improve the performance of analog channel reading. Usually, the power grid interferes in the signal read by the sensors. This problem can be more easily mitigated if we know the frequency.

5.2 DIGITAL INPUT

LogBox LTE has a digital input channel that can be set to the following modes: **1) Pulse Count**, **2) Event Log**, or **3) Log Control**. The digital input can be disabled.

Regardless of the function for which it will be used, you must define the type of sensor that will be connected to the input: PNP, NPN, or Dry Contact (see [INSTALLATION](#) chapter to see how the sensors should be connected). Moreover, the edge of interest for the digital signal needs to be selected to generate the count, event, or log start/end.

CORRELATION BETWEEN SENSOR TYPE, SENSOR STATUS, AND LOGIC LEVEL IN LOGBOX LTE		
SENSOR TYPE	SENSOR LEVEL	LOGICAL LEVEL
PNP	Open	0
	Closed	1
NPN	Open	1
	Closed	0
Dry Contact	Open	1
	Closed	0

Table 3

For Dry Contact sensors, you must set a Debounce time of at least 50 ms (sensor stabilization time/time during which the sensor should remain in the appropriate status for it to be considered valid).

When in **Pulse Count** mode, it is not necessary to set a Debounce time for PNP or NPN sensors. However, if the digital input is set to **Event Log** or **Log Control** modes, a minimum debounce of 50 ms is required to keep any noise from generating a false event.

In the **Event Log** and **Log Control** modes, events will be generated after the end of the Debounce time.

5.2.1 PULSE COUNT

When setting a digital input in **Pulse Count** mode, it is possible to select the application mode: **1) Flow Rate** or **2) Count**.

The **Flow Rate** mode allows:

- When selecting the **Average Flow by Acquisition Interval** option, to log the average flow rate.
- When selecting the **Volume Since Last Reset** option, to count the total volume within a previously configured period until the count is reset.

The **Count** mode allows:

- When selecting the **Acquisition Interval Counting** option, to count the number of pulses that occurred within the Log Interval.
- When selecting the **Accumulated Count Since Last Reset** option, to count the total number of pulses registered within a preset period until the count is reset.

LogBox LTE has a 32-bit register, responsible for accumulating the volume or number of pulses within a certain configurable reset interval. For example, you can set the device to reset on a monthly basis or on a specific day and time (see the [ACCUMULATOR RESETTING MODES](#) section of the [CONFIGURATION SOFTWARE](#) chapter).

LogBox LTE also has a 16-bit register, responsible for measuring the average flow rate per acquisition interval or for performing the count per acquisition interval. At each logging interval, **LogBox LTE** counts the number of pulses that have occurred and registers it in memory, resetting the register so that it can accumulate the pulses of the next interval.

If the sensor is a Dry Contact type, the **LogBox LTE** count registers (16 bits and 32 bits) will be able to count up to 10 pulses per second. For PNP and NPN sensors, 2000 pulses per second. However, for a 16-bit register, it is important to note that these pulses will accumulate within each logging interval. Thus, if the **Average Flow Through Acquisition Interval** or **Acquisition Interval Count** modes are selected, it is necessary to evaluate the maximum sensor frequency so that it does not exceed 65535 counts (16 bits) within the logging interval, causing an overflow in the register that accumulates them.

If the maximum sensor frequency is 2 kHz, **LogBox LTE** will accumulate 2000 pulses per second for up to 32 seconds. Upon exceeding this interval, the number of accumulated pulses will exceed 65535 counts, resulting in overflow in the 16-bit register. For a sensor that can reach 2000 pulses per second, the recommended log frequency should be less than 32 seconds.

When selecting the **Volume since last reset** or the **Accumulated count since last reset** options, the number of counts is, in turn, limited by the 32-bit accumulator register and enables the counting of a limit number of 4294967295 pulses. The periodicity of the reset must also be adjusted according to the frequency of the sensor pulses. By keeping the same example of sensor use at maximum frequency, i.e., 2 kHz, it is recommended that the periodicity be less than 24 days, otherwise an overflow will be generated in the register.

In typical applications, such as flow and volume measurement, simple pulse counting is not enough, and these pulses need to be converted into a flow unit. To do so, the desired flow unit and a conversion factor can be selected to transform the number of pulses generated by the connected transmitter into flow information. Pulses logged in the interval will be converted to the user-configured flow unit every time the logged data is displayed

To facilitate configuration of the digital channel in **Pulse Count** mode and conversion to the flow unit required, **LogBox LTE** provides the following measurement units:

FLOW UNITS	SENSOR UNITS
l/s, l/min, l/h, gal/s, gal/min, gal/h, m³/s, m³/min, m³/h.	pulses/l, pulses/gal, pulses/m³.

Table 4

If you want to use any of the flow and sensor units, you will need to inform the **Sensor Factor** parameter. If none of the available units are required, it is necessary to calculate the **Unit Factor** by relating the **Unit** parameter and filling it in so that the device correctly converts pulses to the required unit. In this case, **LogBox LTE** will convert the pulses to the user-defined unit as follows:

- User Value = ((Count)/(Sensor Factor))*(Unit Factor)
 - It is not necessary to consider the log interval for calculations.

Figure 2

If you want to view the production of parts in "parts per minute", for example, and the application has a PNP sensor that calculates one part produced for every 30 rising edge pulses, the following parameters must be configured at the digital input:

- **Input Type:** Pulse Count.
- **Sensor Type:** PNP.
- **Counting Edge:** Rise.
- **Application:** Flow Rate.

- **Sensor Factor:** 30 (pulses/part).

It is necessary to select the **Average Flow by Acquisition Interval** option and fill in the following parameters:

- **Unit:** Customized.
- **Unit Factor:** 60 (conversion from parts per second to parts per minute).

It is also possible to select the **Volume Since Last Reset** option and fill in the following parameters:

- **Unit:** Customized.
- **Sensor Factor:** 1 (stores the cumulative number of parts).

LogBox LTE will log the number of pulses occurring within that period at each logging interval, and every time the data is displayed, it will transform the pulses into the number of parts produced per minute (user-customized unit).

In the same example, the log interval can be assumed to be 20 seconds. As such, if the sensor gives 20 pulses per second, **LogBox LTE** will log 400 pulses per interval, displaying 40 parts per minute $((20 \text{ pulses/s}) / (30 \text{ pulses/part})) * 60 (1 \text{ min}) = 40$.

5.2.2 EVENT LOG

If the digital input is set to **Event Log** mode, each selected edge will create a log in the memory, reporting the event and the instant that it occurred. This log will not be synchronized with the periodic logs but will respect the start and end log modes.

Events will be logged after the configured Debounce time expires. Events will be logged with the Debounce time delay.

LogBox LTE can log up to 10 events in 1 second.

In **Event Log** mode, it is important to note that:

- If the **Event Edge: Rise** option is selected, only logical level changes from '0' to '1' will be considered.
- If the **Event Edge: Fall** option is selected, only logical level changes from '1' to '0' will be considered.

Thus, the event opposite to the configured edge will not be informed and the device may not correctly display the current logic level of the digital input. To obtain the correct information of the current logic level of the digital input, it is necessary to configure the device in **Event Edge: Both**.

5.2.3 LOG CONTROL

The digital input can be used to start and/or stop the logs from the other input channels. Once configured in **Log Control** mode, each selected edge will start or stop the logging in memory process. As in the **Event Log** mode, there will only be action related to detected events after the configured Debounce time expires. As such, logs will be started/paused with the Debounce time delay.

In **Log Control** mode, it is important to note that:

- If the **Event Edge: Rise** option is selected, only logical level changes from '0' to '1' will be considered.
- If the **Event Edge: Fall** option is selected, only logical level changes from '1' to '0' will be considered.

Thus, the event opposite to the configured edge will not be informed and the device may not correctly display the current logic level of the digital input. To obtain the correct information of the current logic level of the digital input, it is necessary to configure the device in **Event Edge: Both**.

6. DIGITAL OUTPUT

LogBox LTE has a PNP digital output that, when triggered, puts the voltage from the external source to the respective terminal and can be disabled or configured to operate in one of the modes described below:

- **Auxiliary Electronic Switch:** Allows you to control the power supply of external instruments during analog channel readings. 4-20 mA transmitters, for example, can be powered from the digital output terminal, with the aim that they are only switched on when they are read (which would save power from the external power supply, which can be a 12 V battery).
In the **Auxiliary Electronic Switch** mode, it will be necessary to configure how long before each acquisition the digital output must be triggered.
 - **Drive Time:** It defines (in seconds) how long before each log the digital output must be triggered. It will be deactivated when the log is ready. Such time cannot be longer than the lowest acquisition range (Instant, Average = 1/10 of the snapshot, Interval of Display Range).
If equal to 0, the **Auxiliary Electronic Switch** will be enabled at the exact moment of a log. If greater than or equal to the lowest log interval, the **Auxiliary Electronic Switch** will remain be enabled.
- **Alarm Status:** Allows you to follow the current general alarm status. If any channel is in an alarm situation, the digital output will be triggered. If no channel is set to alarm, the digital output will be disabled.
- **Control by SMS and MQTT:** Allows you to control of the digital output status through SMS (see [COMMANDS](#) section) and MQTT (see [MQTT PROTOCOL](#) chapter) commands.

7. DATA LOGGING

The data will be registered in the internal memory of the device. Its internal memory capacity is up to 140,000 logs.

The number of logs that can be stored in the internal memory depends basically on the number of input channels that are enabled, as well as factors such as registering or not registering the digital input events.

Any channel types (analog and digital in the **Pulse Count** or **Event Log** modes) can be logged in memory. In the case of analog channels logs or digital input in **Pulse Count** mode, the log will be periodic and will have its range configured through **NXperience**. At the end of each range, the current values of the enabled channels will be logged in the memory. In the case of the digital input in **Event Log** mode, the detected logs will be performed asynchronously to the periodicity of the other channels and will be performed when an event occurs.

Depending on the type of start and end selected, there may be stretches of logs in the memory and therefore periods without any recorded data. This is fully compatible with the device and is not a problem.

The device works with circular memory, which allows logs to be continuously made. Once the memory is full, the oldest data will be deleted so that the most recent data can be saved.

7.1 START MODES

First, you must set the start mode:

- **Immediate Start:** Allows logs to be started shortly after the device is reconfigured.
- **Date/Time:** Allows logs to be started at the configured date/time.
- **By Keyboard:** In a screen in the display, you can change the logs status to enabled, which start the logs (in case they had not been started yet).
- **By Digital Input:** Allows logs to be initiated from the digital input. For this option to be available, the digital input channel must have been set to **Log Control** mode. There are 4 modes to control the digital input:
 1. Start the logs at each rising edge.
 2. Start the logs at each falling edge.
 3. Log at logical level '1', which logs while at logical level '1'.
In this mode, the configured end mode should be **Logical level pause '0'**.
 4. Log at logical level '0', which logs while at logical level '0'.
In this mode, the configured end mode should be **Logical level pause '1'**.
- **By Software:** Allows logs to be started using an **NXperience** command.
- **Daily:** Allows logs to be started every day and at the configured time. The **Daily** start mode also requires a **Daily** end mode.
- **By Alarm:** Allows logs to be started from a specific alarm.

7.2 END MODES

Then, you must set the end mode:

- **Non-Stop:** Allows logs to continue indefinitely. When filling memory, the oldest data will be deleted so that the most recent data can be saved.
- **Date/Time:** Allows logs to be ended at the configured date/time.
- **By Keyboard:** In a screen in the display, you can change the logs status to disabled, which stop the logs (in case they had not been stopped yet).
- **By Digital Input:** Allows logs to be ended from the digital input. For this option to be available, the digital input channel must have been set to **Log Control** mode. There are 4 modes to control the digital input:
 1. Pause logs at each rising edge.
 2. Pause logs at each falling edge.
 3. Pause at logical level '0', which pauses while at logical level '0'.
In this mode, the configured start mode should be **Logical level pause '1'**.
 4. Pause at logical level '1', which pauses while at logical level '1'.
In this mode, the configured start mode should be **Logical level pause '0'**.
- **By Software:** Allows logs to be stopped using an **NXperience** command.
- **Daily:** Allows logs to be paused every day and at the configured time. The **Daily** end mode also requires a **Daily** start mode.
- **By Alarm:** Allows logs to be stopped from a specific alarm.

NUMBER OF CHANNELS AND LOGS MAXIMUM CAPACITY	
Number of Enabled Channels	Logs Maximum Capacity
1	143,731 logs from 1 analog channel
2	111,801 logs from 2 analog channels
3	67,076 logs from 2 analog channels and 1 digital channel
4	59,183 logs from 2 analog channels, 1 digital channel, and 1 internal channel
5	52,953 logs from 2 analog channels, 1 digital channel, and 2 internal channels

Table 5

8. ALARMS

LogBox LTE allows you to set up to 10 alarms.

Alarms will be shown on the display and can be individually configured to activate a digital output for user control, publish alarm input information via MQTT, send SMS to selected contacts or, if the start and end mode of the logs are set to **By Alarm** mode, to start or stop the logs.

When an alarm situation is satisfied, the **ALM** symbol will light up next to the **1**, **2**, **3**, **4** symbols, which correspond to the channels that satisfy the alarm situation of the status. The **1** and **2** symbols correspond respectively to alarms linked to analog channels 1 and 2. The **3** symbol corresponds to alarms linked to internal channels (internal temperature, battery voltage, or external source voltage). The **4** symbol corresponds to alarms linked to the digital channel. The **ALM** symbol indicates that an alarm has occurred since the device was turned on or since the last time the alarm status was cleared.

The alarm retentive statuses of each channel can be cleared via the display screens or **NXperience**.

When enabling 2 channels, the symbol referring to the main channel is the one that will light up.

For each enabled alarm, depending on the situation, specific values must be set for the following parameters:

- **Setpoint:** Allows you to set the value to be exceeded for the channel to satisfy the alarm situation.
- **Hysteresis:** Allows you to set the barrier to be exceeded for the channel to exit the alarm situation.
- **Range:** Allows you to set the range that will satisfy the alarm situation.

You can set a specific alarm to compare any channel with a preset Setpoint, as well as a comparison between 2 channels. In any of these situations, you must define the operation to be performed:

- **Less than (<):** The alarm will be activated whenever the value of the main channel is less than the value of the secondary channel or when the value of the main channel is less than the configured Setpoint.
- **Greater than (>):** The alarm will be activated whenever the value of the main channel is greater than the value of the secondary channel or when the value of the main channel is higher than the configured Setpoint.
- **Within Range (=):** When performing a comparison between a channel and a Setpoint, the alarm will activate when the value is within the predefined range, considering the Setpoint value configured $\pm$ the range.

When performing a comparison between 2 channels, the alarm will be activated when the values of the 2 channels are within the value of the configured range.

- **Out of Range ($\neq$):** When comparing a channel with a Setpoint, the alarm will be activated when the value is outside the predefined range, considering the Setpoint value configured $\pm$ the range.

When performing a comparison between 2 channels, the alarm will be activated when the values of the 2 channels are outside the value of the configured range.

- **Sensor error:** The sensor will go into alarm if its reading exceeds the upper or lower channel limit, or if the sensor is disconnected. Function available only for analog channels.

In comparisons using the **Within Range (=)** or **Out of Range ($\neq$)** operations, the hysteresis will automatically be calculated as 10 % of the configured range value. Thus, a configured alarm that is activated will only leave the alarm situation when, in addition to satisfying the configured range value, the 10 % hysteresis is also satisfied.

The status information of the configured alarms will be updated by any events that trigger a log, this can be readings in the log interval or the display update interval. If the main channel is one of the channels being registered, an extra log will be made to memory as soon as it goes into alarm. The same process will occur when it exits the alarm situation. The logging will only be performed if the device has the logs enabled.

If an alarm reaches a minimum or maximum value or enters an alarm situation during an acquisition other than the log interval, it may not be registered in memory. Thus, it is possible that the alarms inform that the channel has already reached one of these situations and the information is not available in a download.

In case of an error value in the analog inputs, the alarm will remain in the status it was in.

When configuring the alarm of a digital input that is set to **Event Log** or **Log Control** mode, it is possible to use only the '=' comparison with Setpoints '0' or '1', as the alarm will be used to compare with the logic level of the channel. In addition, it is important to note that, if configured for **Event Edge: Rise** or **Event Edge: Fall**, the alarm may never enter or never leave the alarm status. Therefore, for the alarm to operate correctly, it is recommended to use the **Event Edge: Both**.

In the [CONTACTS](#) screen of the **NXperience** software, it is possible to configure a phonebook and, from there, create groups that will later be authorized to receive SMS with alarm warnings whenever an alarm situation is met. Each SMS can have up to 150 characters.

For more detailed information on each SMS and on the limit of events sent by SMS, see [SMS](#) chapter.

9. DATE/TIME

The device will log data only if the date/time has been configured.

If date/time synchronization is disabled, the device will use the date/time configured and will not correct it until a new configuration is applied. Thus, if the device shuts down during a power outage, it will not log data in memory and will not publish data via MQTT until a new configuration is received.

If date/time synchronization is enabled, the device will automatically synchronize the date/time with the NTP server (see [NTP](#) section of the [CONFIGURATION SOFTWARE](#) chapter). The query to the NTP server is performed when turning on the device and daily at midnight (considering the internal clock of **LogBox LTE**).

If automatic date/time synchronization is enabled, the device will automatically resume logging and publishing data after power return. If automatic synchronization is disabled, the device will not resume logging and publishing data after power return, both being suspended until a new configuration is performed.

10. MQTT PROTOCOL

LogBox LTE is compatible with the Message Queue Telemetry Transport (MQTT) protocol, versions 3.1 and 3.1.1, which allows publishing data to the cloud. It supports the following MQTT Brokers: AWS, NOVUS Cloud, and generic MQTT Brokers.

This chapter describes the structure of the data published in the cloud and introduces the structure to send commands to the device, as well as demonstrates some examples of the messages that should be published and received, messages that will follow the JSON format.

10.1 PUBLICATION AND SUBSCRIPTION TOPICS

As described below, **LogBox LTE** uses 4 topics:

- **Topic to publish periodic data and events:** Used to publish the data produced by the device, that is, the logs. There are 3 types: **periodics**, **digin_events**, and **acc_event**.
- **Topic to publish alarms:** Used to signal the occurrence of incoming alarms that have the MQTT publishing configuration selected (see [MQTT](#) section of the [CONFIGURATION SOFTWARE](#) chapter).
- **Topic to receive commands:** Used to receive commands. The device subscribes to this topic to receive commands and signals the execution of a command by publishing in the topic to confirm commands.
- **Topic to confirm commands:** In this topic, the device publishes the result of the performed commands.

Examples of topics for a generic Broker:

TOPIC	USE
Topic to publish periodic data and events	NOVUS/device1/records
Topic to publish alarms	NOVUS/device1/alarms
Topic to receive commands	NOVUS/device1/command
Topic to confirm commands	NOVUS/device1/ack/command

Table 6

10.2 MODEL TO SEND DATA AND EVENTS

The publication of events and data generated by the device follows the standard MQTT model and uses a topic defined during configuration. The data type is indicated in the JSON of the message through 3 pieces of information: **periodics**, **digin_events**, and **acc_event**.

For all data, the timestamps used are in Unix timestamp format UTC (GMT 0).

10.2.1 PERIODIC DATA AND EVENTS

Channel data is published periodically, according to the device configuration. If events occur during the publication interval, they may be covered in the same periodic data publication, as shown in the example below.

The data is in JSON format and has the following keys/values:

```
{
  "device": "LogBox LTE",
  "periodics": {
    "quantity": 3,
    "timestamps": [1585819219, 1585819279, 1585819339],
    "cha1": [-79.5, -79.5, -79.7],
    "cha2": [-80.3, -80.1, -80.2],
    "chi1": [25.5, 25.6, 25.9]
  },
  "digin_events": {
    "quantity": 2,
    "timestamps": [1585819250, 1585819334],
    "types": ["border_up", "border_down"],
    "milliseconds": [257, 102]
  }
}
```

Notes:

- To reduce the number of publications, the data will be compiled within a single key and the amount of data will be defined by the **quantity** key. In practice, the first **timestamp** position corresponds to the first position of a **chdX**, as well as the second **timestamp** position for **chX**, and so on. The same logic applies to the digital input events, which may be present in the same publication.
- The publications value is the timestamp in Unix UTC format of the moment when the device performs a reading.
- **chX** corresponds to the channel information at the time of the timestamp. If the channel is disabled, it will not appear in JSON. If the digital channel is in **Event Log** mode, the **digin_events** key will not appear in JSON if no event occurs during the interval. If the channel is in **Pulse Count** mode, the value will correspond to the flow or count at that moment and will be present in the **periodics** key.
- When publishing in the **Topic to publish periodic data and events**, **LogBox LTE** will inform the name of the device in the **device** field. To find out how to set the name, see the [GENERAL PARAMETERS](#) section of the [CONFIGURATION SOFTWARE](#) chapter.

10.3 COMMANDS

By publishing in the topic to receive commands, you will be able to change some settings (Write) and perform some control actions (Write) or get a diagnosis of the device (Read) via MQTT. A confirmation of this publication is sent in the topic to confirm commands.

The commands available for this type of device are:

COMMAND GROUPS	READING	WRITING	COMMAND ITEM	DESCRIPTION
general	✓	✓	power_saving	Allows you to set the power saving mode when the device is powered only by the battery. You can select one of the following options: • 0 → <u>The economy mode is disabled</u>. Mobile communication continues to operate regularly. • 1 → <u>Log and publish</u>. The device continues to log data. As far as the mobile communication is concerned, the only service performed will be the publication via MQTT of the log. • 2 → <u>Only log</u>. All mobile communication is disabled so that the device continues to log data for as long as possible.
	✓	✓	log_control	Allows you to enable the logs feature of LogBox LTE: • 0 → Allows you to disable this feature. • 1 → Allows you to enable this feature.
	✓	✓	scan_interval	Allows you to set the display update interval. You can select values from 0 to 65535. The value zero indicates that the log interval will be used as a reference.
	✓	✓	record_interval	Allows you to set the range of logs. You can select values from 1 to 86400.
	✓	✓	publish_interval	Allows you to set the MQTT publication interval. You can select values from 1 to 86400. If it is lower than the log interval, the value will be disregarded and the device will use the same value as the log interval.
command	✓	✓	dig_out	If digital output control by MQTT and SMS is enabled, you can select the output status 0 or 1. See Digital Output Mode parameter on the Channels screen of the CONFIGURATION SOFTWARE.
	✓	✓	clr_acc	If the digital channel accumulator and reset via MQTT are disabled, it is possible to reset the accumulator to the value 0 by writing the value 1 in this command. See the Accumulator Resetting Modes parameter on the Channels screen of the CONFIGURATION SOFTWARE.
	✓	✓	set_download	Used to request LogBox LTE to republish the logs from the date informed in this parameter. The format of the informed date must be <u>UNIX timestamp</u>.
rtc	✓	✓	year	Setting the date and time of the internal clock of LogBox LTE, considering GMT-0 (UTC). Local time should not be entered. The time format to be written must be 24h.
	✓	✓	month	
	✓	✓	day	
	✓	✓	hour	
	✓	✓	minute	
	✓	✓	second	
ntp	✓	✓	enable	Allows you to enable the automatic clock setting feature via NTP server. Possible values: <u>0</u> or <u>1</u>.
	✓	✓	diff_to_update	If the automatic clock adjustment is enabled, it allows you to set the minimum difference between the device clock and the server clock to trigger a clock update.
	✓	✓	host	Considering that the automatic clock setting is enabled, it allows you to set the NTP server that will be used as a reference for querying.

COMMAND GROUPS	READING	WRITING	COMMAND ITEM	DESCRIPTION
diag_channels	✓	✗	mode	Inform the operating mode of the digital channel (unconfigured, metering, event, or log control). This item will not be displayed for analog and internal channels.
	✓	✗	status	Inform the status of the analog and internal channel (not configured, ok, underflow, overflow, Cold Junction error, or open sensor). This item will not be displayed for digital channels.
	✓	✗	value	Inform the current value of the analog, internal, and digital channel.
diag_device	✓	✗	fw_version	Inform the firmware version of LogBox LTE in x.yy format.
	✓	✗	power_supply	Inform the main power supply of LogBox LTE. It can report: External source, USB, or backup battery.
	✓	✗	radio_tech	Inform which technology the LogBox LTE is connected to. It can report: GSM, Cat.M1, or NB-IoT.
	✓	✗	mod_version	Inform the version number of the mobile interface of the device in xx.yyy.zzz.cc format.
	✓	✗	imei	Inform the unique mobile interface identification number of the device.
	✓	✗	iccid	Inform the unique identification number of the SIM card present in LogBox LTE. If there is no SIM card, the value 0 is returned.
	✓	✗	operator	Inform the operator to which the device is connected.

Table 7

10.3.1 MODEL TO SEND COMMANDS

The basic model of operation of the commands and settings was developed to allow you to trigger actions remotely, make adjustments while the device is in operation or just analyze **LogBox LTE**. Regardless of the command, it must always be published in the **Topic to receive commands**. The return of the execution of the commands will be through the **Topic do confirm commands**.

In practice, commands can be used to read or write. During a read operation, it is necessary to inform only the **Command Group** from which information is desired, as shown in the example of publication in the **Topic to receive commands**:

```
{
  "general": {
  }
}
```

During a write operation, you must inform the items of the command. However, it is not necessary to fill in the fields that should not be changed, as shown in the example below:

```
{
  "general": {
    "scan_interval":30,
    "record_interval":300,
    "publish_interval":600
  }
}
```

Regardless of the operation (be it writing or reading), the response to the command in the **Confirmation Topic** will always include all the items of the command, as shown in the example below:

```
{
  "device": "LogBox LTE",
  "general": {
    "power_saving":0,
    "log_control":1,
    "scan_interval":30,
    "record_interval":300,
    "publish_interval":600
  }
}
```

Notes:

- When responding to the command send to the **Confirmation Topic**, **LogBox LTE** will inform the name of the device in the **device** field. To find out how to set the name, see the [GENERAL PARAMETERS](#) section of the [CONFIGURATION SOFTWARE](#) chapter.

10.4 ALARMS

In case of an alarm linked to the MQTT publication (it is possible to link alarms through the parameter **Alarm Actions** of the [CONFIGURATION SOFTWARE](#)), **LogBox LTE** will publish in the **Topic do publish alarms**. This publication will inform the occurrence data, provided that the device is connected to the MQTT Broker at the time of the alarm entry.

The JSON content of the alarm message will be as follows:

```
{
  "device": "LogBox LTE",
  "alarm": {
    "timestamp":1675450678,
    "tag":"alarm-01",
    "source_value":30.9,
    "operator":"bigger",
    "comparated_value":28.3,
    "offset":0,
    "histeresys":0
  }
}
```

Notes:

- In the **Topic to publish alarms**, the name of the device will always appear in the device field. To find out how to set the name, see the [GENERAL PARAMETERS](#) section of the [CONFIGURATION SOFTWARE](#) chapter.
- The **offset**, **range**, and **hysteresis** fields will be displayed according to the device configuration. For the **offset** field to be displayed, the comparison with a Setpoint must not be performed. For the **range** field, there are 2 conditions: **Out of Band** or **Within Band**. For other operators, the **hysteresis** field will be displayed.

To check how to properly configure the alarms, see the [ALARMS CONFIGURATION](#) section of the [CONFIGURATION SOFTWARE](#) chapter.

11. SMS

LogBox LTE has the SMS feature, which allows you to be informed about different device situations. Event SMS messages are automatic warnings about channels in alarm condition; Command SMS messages, in turn, have several functions, which range from setting device configurations to checking specific information.

For SMS features to function properly, it is required a SIM Card with an SMS plan.

11.1 EVENTS

Events correspond to alarm situation replies via SMS to contacts or groups previously registered on the [CONTACTS](#) screen and selected on the [ALARMS](#) screen of **NXperience** (see [CONFIGURATION SOFTWARE](#) chapter).

The text below shows a sample SMS sent by the device:

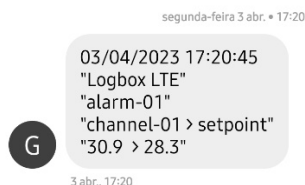


Figure 3

The table below shows the parameters that compose an Alarm Event SMS, disregarding the spaces between them (which are considered command separators):

	PARAMETER	EXAMPLE
Parameter 1	Date on which the event was processed.	03/04/2023
Parameter 2	Hour:min:second at which the event was processed.	17:20:45
Parameter 3	Device tag.	"LogBox LTE"
Parameter 4	Alarm tag.	"alarm-01"
Parameter 5	Source channel tag + operation + comparison channel tag.	"channel-01 > setpoint"
Parameter 6	Source channel value + operation + Comparison channel value.	"30.9 > 28.3"

Table 8

11.1.1 LIMIT OF EVENTS SENT BY SMS

LogBox LTE can accumulate up to 10 alarm events. These events will be accumulated in a circular queue. Once more than 10 events appear, the oldest ones will be discarded to make room for the newest ones.

Except for the SMS feature, the device ensures that all events are handled.

As it is a slow process, since on average each SMS takes 5 seconds to be sent, sending the SMS can take a long time. If there is a situation where, for example, more than 10 events happen in less than 8 minutes and where all events are set to send SMS to 10 contacts (5 seconds * 10 contacts * 10 events = 8.3 minutes), it is possible that some of these events will not be sent by SMS.

11.2 COMMANDS

Commands correspond to actions that **LogBox LTE** can take via SMS messages. With these commands, it is possible to request some device status (Read), edit some operating parameters (Write), and ask the device to take some actions (Write).

To restrict access to SMS commands, only commands from contacts already registered in the phonebook will be accepted. See the [PHONEBOOK](#) section for more information on how to register a new contact in the phonebook. In addition, to increase security when accessing the device, you can also set a password for SMS commands (this password does not accept special characters).

To use SMS functions and commands, it is required a SIM Card with a SMS plan.

Each message is divided into different operators with different functions, necessary for the device to properly understand the action that you requested. Moreover, multiple commands can be sent in a single message, abiding by the maximum length of 150 characters.

Following is a description of all symbols and commands used in the available SMS commands.

11.2.1 SYMBOLS

DESCRIPTION	SYMBOL
Start of message	<
End of message	>
Command separator	Blank space
Password validation operator	#
Write operator	=
Read operator	?

Table 9

As shown in **Table 10**, operators are used for sending specific commands to the device or receiving specific information from the device. Write operators send commands to define and change values, for example. Read operators return information about pre-configured parameters.

The password validation operator is used to authenticate the registered password. If there is no password previously registered in the device, the password validation operator should be entered with the password blank (pass#). If there is a password registered, it should be entered right after the (pass#1234), with no spaces.

11.2.2 COMMAND LIST

The SMS function has different commands, shown in the following table:

COMMAND	PARAMETER	FUNCTION
apnaddr	APN – Address	Allows you to edit or read the GPRS APN parameter of the mobile network operator (see MOBILE INTERFACE section).
apnlogin	APN – Login	Allows you to edit or read the GPRS Login parameter of the mobile network operator (see MOBILE INTERFACE section).
apnpass	APN – Password	Allows you to edit or read the GPRS Pass parameter of the mobile network operator (see MOBILE INTERFACE section).
smsspass	Password	Allows you to change the password for SMS commands. This password does not accept special characters.
digout	Digital Output	Allows you to change or obtain information about the status of the digital output.
alm1sp	Alarm 01 - "Setpoint"	Change or read Setpoint for alarm 1.
alm2sp	Alarm 02 - "Setpoint"	Change or read Setpoint for alarm 2.
alm3sp	Alarm 03 - "Setpoint"	Change or read Setpoint for alarm 3.
alm4sp	Alarm 04 - "Setpoint"	Change or read Setpoint for alarm 4.
alm5sp	Alarm 05 - "Setpoint"	Change or read Setpoint for alarm 5.
alm6sp	Alarm 06 - "Setpoint"	Change or read Setpoint for alarm 6.
alm7sp	Alarm 07 - "Setpoint"	Change or read Setpoint for alarm 7.
alm8sp	Alarm 08 - "Setpoint"	Change or read Setpoint for alarm 8.
alm9sp	Alarm 09 - "Setpoint"	Change or read Setpoint for alarm 9.
alm10sp	Alarm 10 - "Setpoint"	Change or read Setpoint for alarm 10.
logctrl	Log control	Enable or get information about the log feature.
stsdev	Device status	Obtain information about the status of the device.
stsconn	Mobile connection status	Obtain information about the status of the mobile connection.
stscha	Analog channel status	Obtain information about the status of the analog channels.
stschl	Internal channels status	Obtain information about the status of the internal channels.
stschd	Digital channel status	Obtain information about the status of the digital channel.
stsacc	Accumulator – Digital Channel status	Obtain information about the status of the digital channel accumulator.
clsacc	Reset Accumulator	Resets the digital channel accumulator count to zero.
stsalms	Alarm status	Obtain information about the status of the alarms.

Table 10

The commands should be used with the message start and end symbols and the respective operators (for password validation, execution, and reading), as shown in the examples below.

If a device is configured to run commands via SMS, has its password set as "1234", its "gprspass" as "vivo" and you want to change the "gprlogin" to "vivo" and check the value of the "gprspass" parameter, the following message must be sent to the number of the SIM Card registered in the device:

<pass#1234 apnlogin=vivo apnpass?>

In this case, as shown in the table below, an SMS was sent with 3 commands: **1) Authentication**, **2) Write**, and **3) Read**.

SYMBOL	MEANING	FUNCTION
<	Message initializer	Mark the beginning of a message.
pass#1234	1st Command: Password Validation Command	Conduct a password test and, if approved, connect to the device.
apnlogin=vivo	2nd Command: Write Command	Request that the device change the "apnlogin" to "vivo".
apnpass?	3rd Command: Read Command	Request a reply regarding the gprspass configured for the device.
>	Message finalizer	Mark the end of a message.

* Blank spaces between commands are considered command separators.

Table 11

As a result, its reply, as shown in the following SMS, will provide relevant information about the device:

<20:35:14 29/01/17 "LogBox LTE" apnlogin=vivo apnpass?vivo>

SYMBOL	MEANING	FUNCTION
<	Message initializer	Mark the beginning of a message.
20:35:14	Time at which the message was processed	Inform the time at which the message was processed.
29/01/17	Date at which the message was processed	Inform the date at which the message was processed.
"LogBox LTE"	Device tag	Enter the tag defined for the device.
apnlogin=vivo	2nd Command: Response to Write Command	Confirm the success of the requested change.
apnpass?vivo	3rd Command: Response to Read Command	Answer the question in the previous SMS.
>	Message finalizer	Mark the end of a message.

* Blank spaces between commands are considered command separators.

Table 12

	When the device has a password configured, you must inform the <i>pass</i> command (accompanied by the password) in any SMS sent to the device. If the device does not have a password, there is no need to send the <i>pass</i> command.
---	---

11.3 ERROR AND SUCCESS MESSAGES

With success, the SMS sent by the device will confirm the parameters sent, as shown in the table below:

Successful message	
Command	<pass#1234 apnlogin=vivo apnpass=vivo apnaddr=zap.vivo.com.br>
Response	<12:04:21 02/04/2023 "LogBox LTE" apnlogin=vivo apnpass=vivo apnaddr=zap.vivo.com.br>

Table 13

If the previously entered password does not match the registered password, the SMS sent by the device will include a password error warning:

Wrong password message	
Command	<pass#123 apnlogin=vivo apnpass=vivo apnaddr=zap.vivo.com.br>
Response	<12:04:21 02/04/2023 "LogBox LTE" "wrong password!">

Table 14

If the command entered is not recognized by the device, the SMS sent by the device will report a "command not found" error at the end of the message. The commands that were found will be answered in the message:

Command not found message	
Command	<pass#1234 apnloginnn=vivo apnpass=vivo apnaddr=zap.vivo.com.br>
Response	<12:04:21 02/04/2023 "LogBox LTE" apnpass=vivo apnaddr=zap.vivo.com.br "cmd not found!">

Table 15

If the SMS sent by the user contains an operator not recognized by the device, the SMS sent by the device will inform an operation error:

Successful message (without password)	
Command	<apnlogin=vivo apnpass=vivo apnaddr=zap.vivo.com.br>
Response	<12:04:21 02/04/2023 "LogBox LTE" apnlogin=vivo apnpass=vivo apnaddr=zap.vivo.com.br>

Table 16

11.4 OTHER EXAMPLES

Following are some examples of commands and their replies in different situations. Some commands have multiple functions. Others, however, have only one.

APN – Address		
Command used to obtain and change the APN – Address parameter.		
	Example 1 (Read)	Example 2 (Write)
Command	<pass#1234 apnaddr?>	<pass#1234 apnaddr=zap.vivo.com.br>
Response	<12:04:21 02/04/2023 "LogBox LTE" apnaddr=zap.vivo.com.br>	<12:04:21 02/04/2023 "LogBox LTE" apnaddr=zap.vivo.com.br>

Table 17

APN – Login		
Command used to obtain and change the APN – Login parameter.		
	Example 1 (Read)	Example 2 (Write)
Command	<pass#1234 apnlogin?>	<pass#1234 apnlogin=vivo>
Response	<12:04:21 02/04/2023 "LogBox LTE" apnlogin=vivo>	<12:04:21 02/04/2023 "LogBox LTE" apnlogin=vivo>

Table 18

APN – Password		
Command used to obtain and change the APN – Password parameter.		
	Example 1 (Read)	Example 2 (Write)
Command	<pass#1234 apnpass?>	<pass#1234 apnpass=vivo>
Response	<12:04:21 02/04/2023 "LogBox LTE" apnpass=vivo>	<12:04:21 02/04/2023 "LogBox LTE" apnpass=vivo>

Table 19

Device Password		
Command used to limit access to SMS commands.		
	Example 1 (Read)	Example 2 (Write)
Command	<pass#1234 smspass?>	<pass#1234 smspass=4321>
Response	<12:04:21 02/04/2023 "LogBox LTE" smspass?1234>	<12:04:21 02/04/2023 "LogBox LTE" smspass=4321>

Table 20

Digital Output		
Command used to obtain and change status of the digital output.		
	Example 1 (Read)	Example 2 (Write)
Command	<pass#1234 digout?>	<pass#1234 digout=1>
Response	<12:04:21 02/04/2023 "LogBox LTE" digout?0>	<12:04:21 02/04/2023 "LogBox LTE" digout=1>

Table 21

Alarms – Setpoint		
Command used to obtain and change the alarm Setpoints.		
	Example 1 (Read)	Example 2 (Write)
Command	<pass#1234 alm1sp?>	<pass#1234 alm1sp=230>
Response	<12:04:21 02/04/2023 "LogBox LTE" alm1sp?-10.3>	<12:04:21 02/04/2023 "LogBox LTE" alm1sp=25.9>

Table 22

Register Log		
Command used to obtain and change the record log status.		
	Example 1 (Read)	Example 3 (Write)
Command	<pass#1234 logctrl?>	<pass#1234 logctrl=1>
Response	<12:04:21 02/04/2023 "LogBox LTE" logctrl?0>	<12:04:21 02/04/2023 "LogBox LTE" logctrl=1>

Table 23

Device Status		
Command used to obtain the status of the device. Returns information about power supply, external power supply voltage, battery percentage, Cold Junction temperature, and reset counter.		
	Example 1 (Read)	Example 2 (Write)
Command	<pass#1234 stsdev?>	Ø
Response	<12:04:21 02/04/2023 "LogBox LTE" stsdev?Ext,14.13V,100.00%,28.4oC,41>	Ø

Table 24

Connection Status		
Command used to obtain the MQTT connection status of the device.		
	Example 1 (Read)	Example 2 (Write)
Command	<pass#1234 stsconn?>	Ø
Response	<12:04:21 02/04/2023 "LogBox LTE" stsconn?"mqtt on">	Ø

Table 25

Analog Channel Status		
Command used to obtain the status of the device analog channels. Returns information about the Channel 1 value and the Channel 2 value.		
	Example 1 (Read)	Example 2 (Write)
Command	<pass#1234 stscha?>	Ø
Response	<12:04:21 02/04/2023 "LogBox LTE" stsachs?CH1=20.4,CH2=-12.4>	Ø

Table 26

Digital Channel Status		
Command used to obtain the status of the digital channel.		
If set to Event Log or Log Control , it returns the status that generated the last event and its date and time.		
If set to Counter mode, it returns the counter value.		
	Example 1 (Read)	Example 2 (Write)
Command	<pass#1234 stsched?>	Ø
Response	"Registro de eventos":<12:04:21 02/04/2023 "LogBox LTE" stsched?value=0&ts=04:12:21_02/04/2023> "Contador": <12:04:21 02/04/2023 "LogBox LTE" stsched?counter=5874.6>	Ø

Table 27

Alarm Status		
Command used to obtain the status of the alarms. It informs whether the alarm is enabled or disabled and, if enabled, its status.		
	Example 1 (Read)	Example 2 (Write)
Command	<pass#1234 stsalms?>	Ø
Response	<12:04:21 02/04/2023 "LogBox LTE" stsalms?alm1=on,alm2=off,alm3=dis,alm4=dis,alm5=dis, alm6=dis,alm7=dis,alm8=dis,alm9=dis,alm10=dis>	Ø

Table 28

Resetting the Accumulator		
Command used to reset the accumulator.		
	Example 1 (Read)	Example 2 (Write)
Command	Ø	<pass#1234 clsacc=1>
Response	Ø	<12:04:21 02/04/2023 "LogBox-LTE" clsacc=1"

Table 29

12. CONFIGURATOR SOFTWARE AND APP

12.1 NXPERIENCE SOFTWARE

NXperience software is the main tool to configure, download, and analyze data from **LogBox LTE**. It allows you to explore all the features of the device, communicating locally through the USB interface or remotely through **NOVUS Cloud**.

This manual describes the features related to **LogBox LTE**. For instructions on other features, check the **NXperience** operations manual. The software and its respective manual can be downloaded for free in the Downloads Area of our website www.novusautomation.com.

12.2 NXPERIENCE NEXT APP

Available for Android and iOS smartphones, the **NXperience Next** app is the ideal tool to use **LogBox LTE** on a daily basis. It allows you to configure, monitor or download data from the device via OTG cable (see [CONNECTION VIA OTG CABLE](#) section), via MQTT connection (see [CONNECTION VIA MQTT](#) section) or **NOVUS Cloud** (see [CONNECTION VIA NOVUS CLOUD](#) section).

NXperience Next can be downloaded for free from the Google Play Store or App Store.



When using an iOS smartphone, it is not possible to configure, download, or perform diagnostics via USB connection, as the iOS is not compatible with OTG technology.

To perform these procedures, you must establish a connection via NOVUS Cloud.

The **NXperience Next** app and the **NXperience** software have the same screens and the parameters of the respective screens are always the same.

12.2.1 CONNECTION VIA OTG CABLE

Android smartphones with On the Go (OTG) technology can be directly connected to the device via the USB port. By connecting the OTG cable to the smartphone, **LogBox LTE** can be recognized and configured by running the **NXperience Next** app.

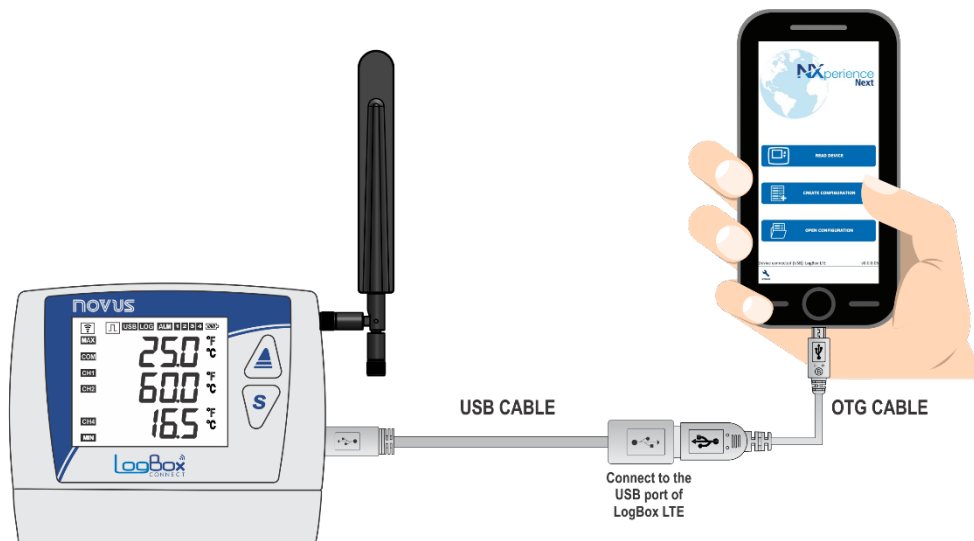


Figure 4

To use the USB communication of the device, follow the steps below:

- Download the **NXperience Next** app from the Google Play Store.
- Install the application on the smartphone to be used.
- Connect the OTG cable between the device and the smartphone.
- Run the application.



1. **Incorrectly positioning the end of the cable can cause the device not to be recognized by the application.**
2. **iOS smartphones are not compatible with the OTG cable.**

Once the above process has been carried out, the device will be automatically recognized by **NXperience Next**, as shown in the pictures below:

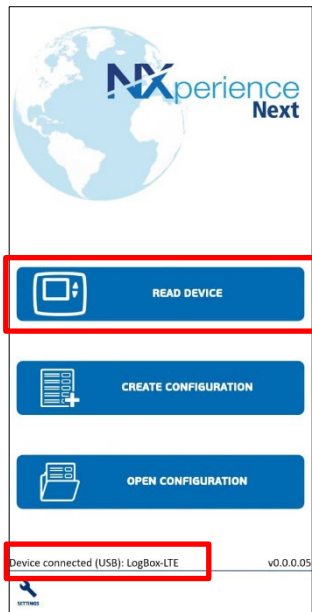


Figure 5



Figure 6

Then, by clicking on the **Read Device** button, you will be able to access the following sections:

1. **Configuration** (see [CONFIGURING LOGBOX LTE](#) section)
2. **Download** (see [DOWNLOAD](#) section).
3. **Diagnostics** (see [DIAGNOSTICS](#) section).

12.2.2 CONNECTION VIA MQTT

You can use the MQTT connection to access the configuration or diagnostics section of **LogBox LTE**. To do this, you must first enable the MQTT protocol parameter on the device via the **NXperience** software (see [MQTT](#) section) or via an OTG connection with an Android smartphone (see [CONNECTION VIA OTG CABLE](#) section).

You can then access **LogBox LTE** via the MQTT connection. To do this, follow the steps below:

- Open the **NXperience Next** app.
- Click on **Read Device**.
- Choose the **MQTT** option.
- Click on **New connection**.
- Fill in the parameters needed to make the connection and click **Ok**:

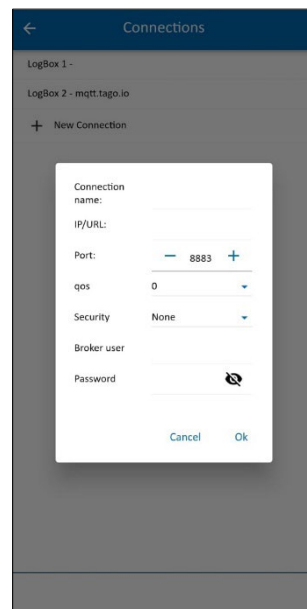


Figure 7

To establish a connection, enter the serial number of the device. Once the connection has been established, you can configure and perform diagnostics on **LogBox LTE**. Data cannot be downloaded via MQTT.

The connections created remain saved and can be re-established at any time. To delete or edit them, simply press the name of the desired connection, drag it to the side and select the **Delete** or **Edit** options, as shown in the figure below:

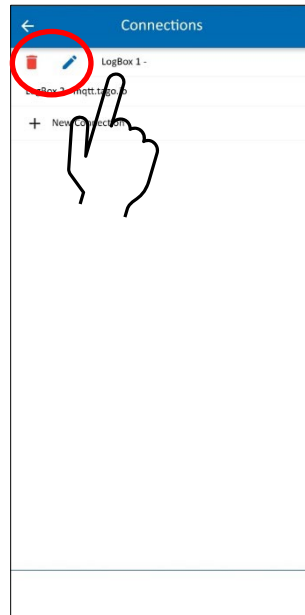


Figure 8

12.2.3 CONNECTION VIA NOVUS CLOUD

It is possible to configure, download data, or perform diagnostics on the **LogBox LTE** via **NOVUS Cloud**. To establish a connection, however, you must follow the steps below:

- The device must have been manually added to **NOVUS Cloud**. For instructions on how to add devices to **NOVUS Cloud**, see the **NOVUS Cloud** manual, available on the product page.
- **LogBox LTE** must have a valid SIM card.
- In the **NXperience** software, you need to enable the **Enable mobile data** parameter (see [MOBILE](#) section).
- In the **NXperience** software, you need to enable the **Enable MQTT** parameter (see [MQTT](#) section).
- Also, in the **MQTT** tab of the software, select the **NOVUS Cloud** option in the **Cloud** parameter. In the **Broker Password** parameter, enter the token generated by the device when it is added to the **NOVUS Cloud**. This number is fixed and can be obtained from the **NOVUS Cloud** platform (for more information on the token, see the **NOVUS Cloud** manual).

Once these steps have been carried out and the **LogBox LTE** has been registered on **NOVUS Cloud**, you can use the **NXperience Next** app to configure, download data, or analyze the device. To do this, follow the steps below:

- Open the **NXperience Next** app.
- Click on **Read Device**.
- Choose the **NOVUS Cloud** option.
- Enter the e-mail address and password of the user registered on **NOVUS Cloud**.
- Select the registered device:

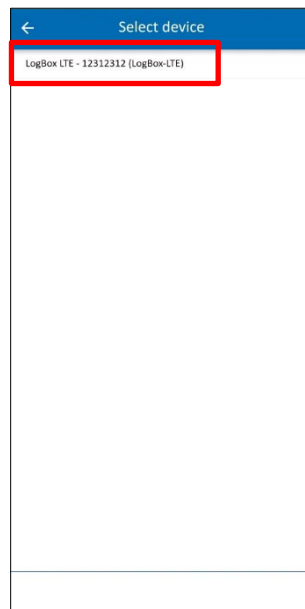


Figure 9

12.2.4 USING THE DIAGSIM FUNCTION

The **NXperience Next** application has a function called **DiagSIM**, which allows you to carry out tests and detect any problems with the SIM card used in the device.

To start the diagnosis, you need to insert the SIM card from **LogBox LTE** into the smartphone you are using and click on the **DiagSIM** button, as shown below:

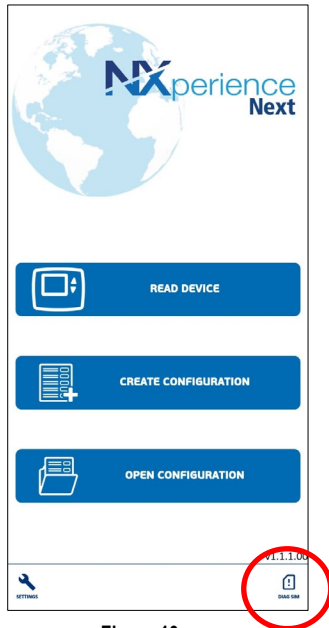


Figure 10

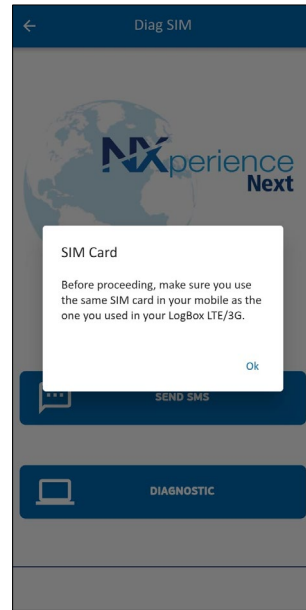


Figure 11

In addition, the smartphone must have Wi-Fi disabled and mobile data enabled. After enabling mobile data, the app will display the following screen:

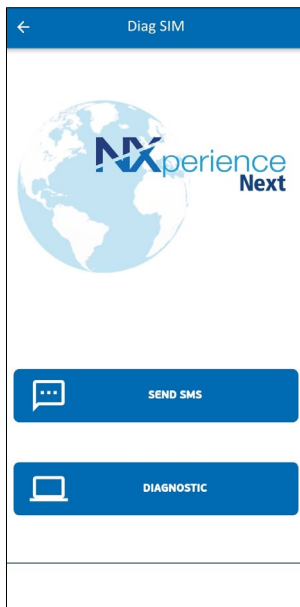


Figure 12

The **DiagSIM** function has 2 buttons:

- 1) **Send SMS**, which allows you to send a verification code via SMS to the registered number, and
- 2) **Diagnostics**, which allows you to check the SIM card being used for any problems.

When you click on the **Send SMS** option, the app will ask you to confirm that you want to send an SMS with a verification code. To do this, you will need to enter the number used:

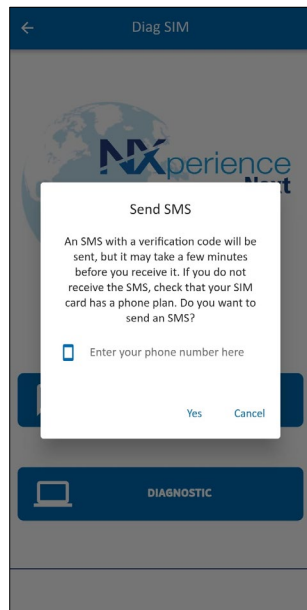


Figure 13

The SMS may take a few minutes to be received.

It is also necessary for the user to have an SMS package configured.

To run the SIM card diagnostics, simply click on the **Diagnostics** button. Before running the diagnostics, you'll need to enter the device's serial number and click **Start Diagnostics**:

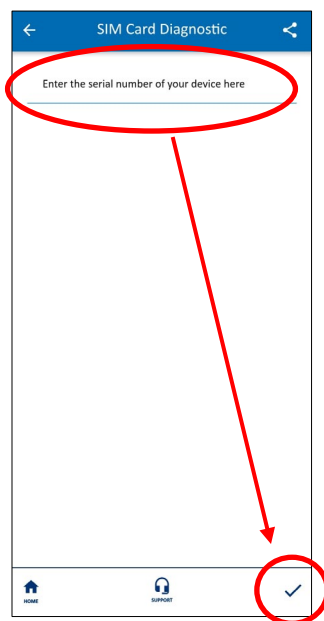


Figure 14

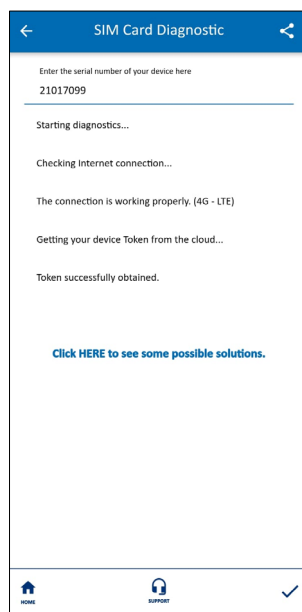


Figure 15

When starting the diagnostic process, the app will show a log of the tests currently being carried out (such as testing the Internet connection and trying to obtain the device's token from **NOVUS Cloud**, for example).

By clicking on the Support button, the user will be redirected to the **NOVUS** Technical Support page.

If the diagnosis has been successful, it is likely that the difficulties you are experiencing are not related to the SIM card. In this case, you can see some options by clicking on the option **Click HERE to see some possible solutions**, as shown in the image above.

This will cause the application to display a list of suggested items to check. From there, you can return to the previous screen, open the manual or share the diagnostic report via the file sharing options.

The diagnostic report will be generated in .txt format.

12.3 CONFIGURING LOGBOX LTE

LogBox LTE can be configured using **NXperience** software or **NXperience Next** app. The app and the software have the same screens and the parameters of the respective screens are always the same.

Below is a description of each of the possible configuration parameters, grouped by sections:

12.3.1 GENERAL PARAMETERS

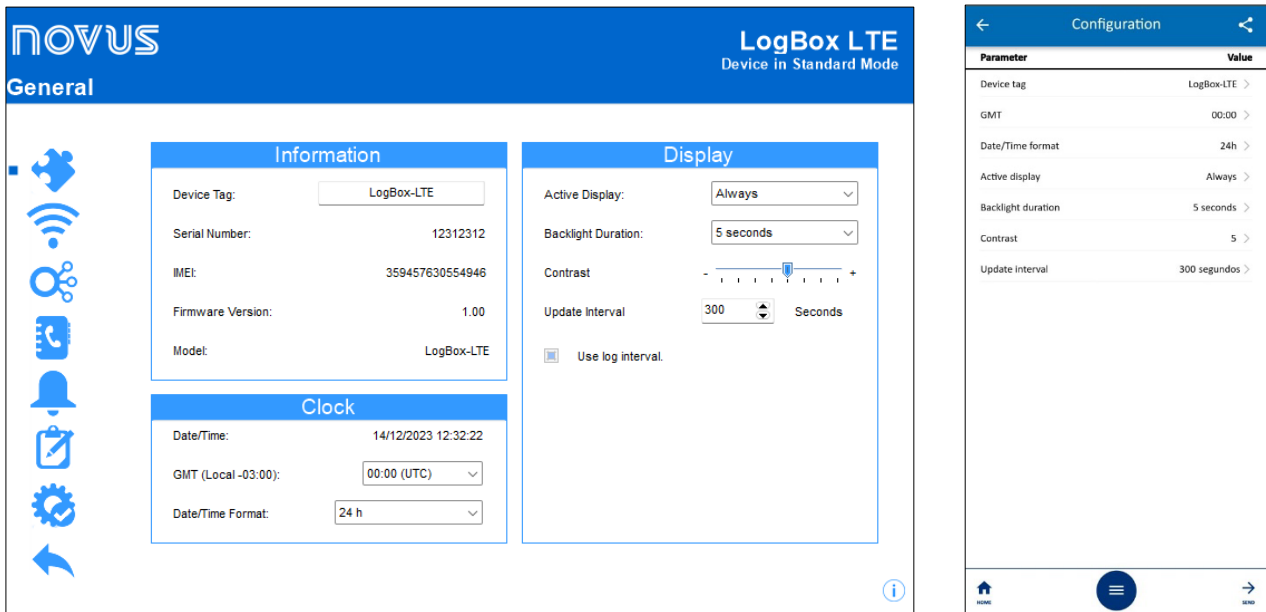


Figure 16

INFORMATION

- **Device Tag:** Allows you to set a name, which will be used as identification during a download, in MQTT publications and in SMS events. The field allows up to 20 characters.
- **Serial Number:** Displays the unique identification number of the device. The serial number is also used to register the device in **NOVUS Cloud**.
- **IMEI:** Displays the unique identification number of the mobile interface of the device. The IMEI may be required by some operators for network registration. It may be necessary to use the IMEI when registering the device in **NOVUS Cloud**.
- **Firmware Version:** Displays the firmware version of the device.
- **Model:** Displays the device model.

CLOCK

- **Date/Time:** Allows you to view the date/time that will be used to set the device clock.
- **GMT:** Allows you to set the GMT of the location where the device will be used (preferably during the first use). By default, **LogBox LTE** is configured with GMT 0.
- **Date/Time Format:** Allows you to set the clock format as 24 h or AM/PM.

DISPLAY

- **Active Display:** Allows you to set when the display should become active.
 - **Always:** If configured, it will keep the display active, obeying the configured contrast and update interval.
 - **By Keyboard:** If configured, the display will be activated when you press a key and will remain active for 1 minute (until you press a key again). This setting will follow the configured contrast.
 - **Never:** If set, it will keep the display off.
- **Backlight Duration:** Allows you to set the operation of the Backlight. You can select between always on or always off. It is also possible to set a time in seconds in which the Backlight will remain on after a key is pressed.
- **Contrast:** Allows you to set the contrast level of the display. There are 8 levels of contrast. The lowest level makes it easier to view at the top and bottom viewing angles and the highest level makes it easier to view at the front viewing angle.
- **Update Interval:** Allows you to set the frequency with which the display information will be updated.
 - **Use Log Interval:** If configured, the display information will be updated at each log interval.
 - **Interval:** Allows you to set (in seconds) a display update interval shorter than the log interval. In this way, the input channels will be read and will update the display at this periodicity. The minimum interval is 1 second; the maximum is 18 hours.

12.3.2 COMMUNICATION PARAMETERS

12.3.2.1 MOBILE

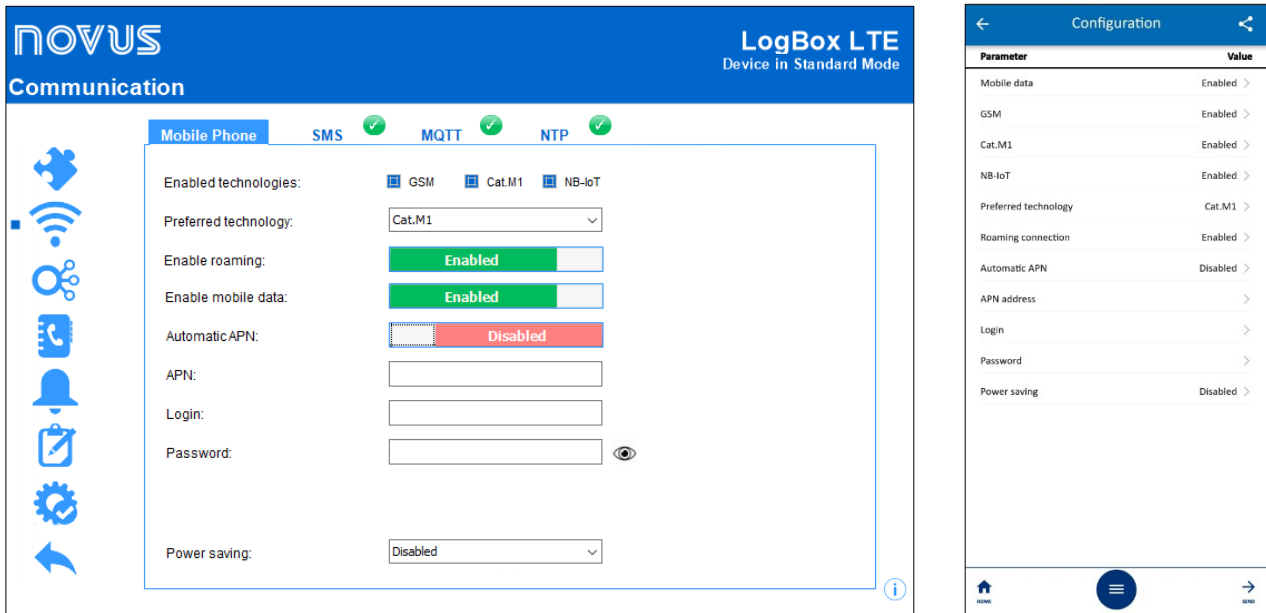


Figure 17

- **Enabled technologies:** Allows you to set the technologies for connecting to the mobile network: Cat.M1, NB-IoT, or GSM. You must select at least one.

- **Preferred technology:** Allows you to select the preferred technology among the connection technologies enabled in the previous parameter. It is recommended to select the technology with the best signal availability in the region, thus preventing **LogBox LTE** from making connection attempts to unavailable networks.

When selecting a network with a bad signal or with an unavailable technology for the SIM card, the connection time will increase significantly.

- **Enable Roaming:** If selected, allows the device to try to use the network of other operators in an area where there is no signal coverage for the operator of the inserted SIM card.

You must check with the mobile operator you have contracted if the chosen plan includes the use of the network in Roaming.

- **Enable mobile data:** Allows you to enable the communication features with the Internet via mobile data, which enables MQTT communication and automatic clock setting via NTP. To use these features, you must have a SIM card with an enabled data plan and available bandwidth.
- **Automatic APN:** If disabled, allows you to set the Access Point Name (APN) on the device. APN is the configuration of the mobile operator to allow access to the data network.

If the operator is not previously registered on the device (see [MOBILE INTERFACE](#) section), it may be necessary to set the parameter. If the operator is previously registered, you must keep this parameter **enabled**.

- **APN:** If you need to configure the APN, you must fill in the **APN** parameter with the APN of the mobile operator.
- **Login:** If you need to configure the **APN**, you must fill in the **Login** parameter with the login provided by the mobile operator. If the operator does not provide a login, leave the field blank.
- **Password:** If you need to configure the **APN**, you must fill in the **Password** parameter with the password provided by the mobile operator. If the operator does not provide a password, leave the field blank.
- **Power saving:** Allows you to set the behavior of the device when operating only by the backup battery (see [BACKUP BATTERIES \(INTERNAL UPS\)](#) chapter):
 - **Disabled:** The device will continue operating normally.
 - **Mode 1 – Logging and publishing:** The device will continue to log data according to the configured log interval and will activate the mobile interface to publish MQTT logs based on the publishing interval.
 - **Mode 2 – Only logging:** In this mode, **LogBox LTE** will prioritize the logs and keep the mobile interface off until the external power is reestablished.

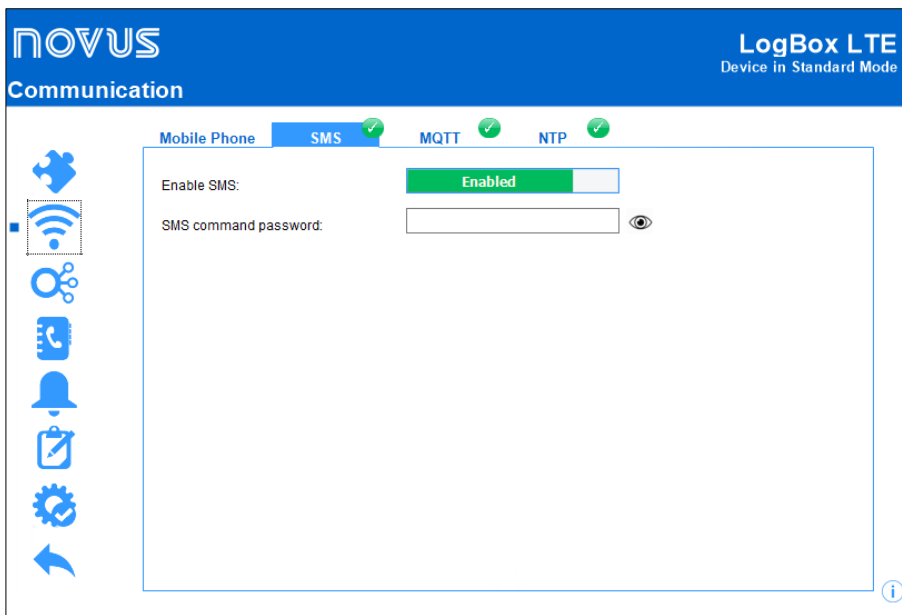


Figure 18

- **Enable SMS:** Allows you to enable the SMS services of the device. Before enabling this parameter, it is important to check if the installed SIM card has an SMS service available.
- **SMS command password:** Allows you to set a password to restrict access to SMS commands.

12.3.2.3 MQTT

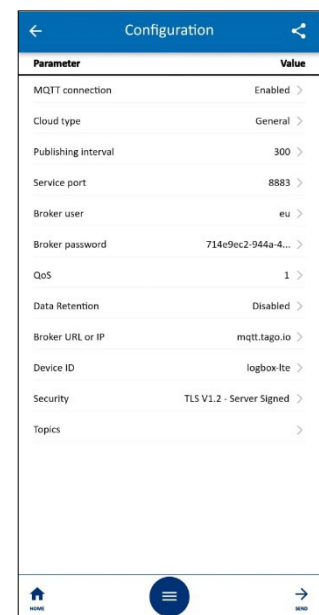
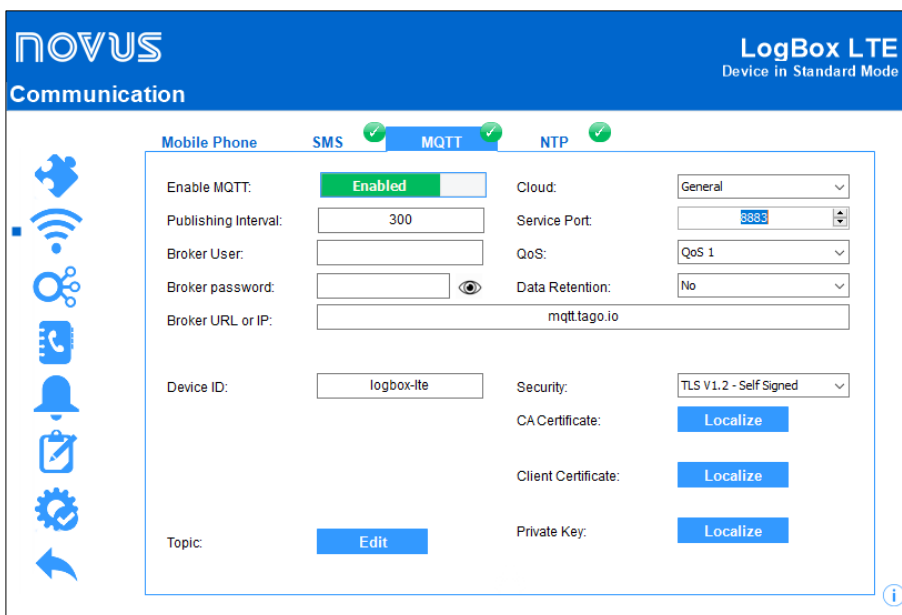


Figure 19

- **Enable MQTT:** Allows you to enable sending and receiving data through the MQTT protocol. Before enabling this parameter, it is important to check that the installed SIM card has an available data plan.
- **Cloud:** Allows you to select the platform to be used when connecting to the MQTT Broker: Generic platform, Amazon AWS, or **NOVUS Cloud**. Depending on the option chosen, the other parameters will adjust to meet the specific requirements of the platform. To customize all parameters, select the **General** option, referring to the generic platform.
- **Publishing Interval:** Allows you to set the interval used to publish data via MQTT.
- **Service Port:** Allows you to set the port number used to make the connection to the Broker.
- **Broker User:** Allows you to enter the name of the user registered with the Broker. The field allows up to 32 characters. If the field is empty, the connection will be made in anonymous mode.
- **Broker Password:** Allows you to enter the password of the user registered in the Broker. The field allows up to 42 characters. If the field is empty, the connection will be made in anonymous mode.
- **QoS:** Allows you to select the quality-of-service level used when sending MQTT messages.
- **Data Retention:** Allows you to define whether data should be retained in the cloud. Not all platforms support this feature.
- **Broker URL or IP:** Allows you to enter the address of the Broker, which can be a URL or an IP. The field allows up to 60 characters.

- **Device ID:** Allows you to enter an ID, which will allow you to identify the device during the publishing process.
- **Security:** Allows to set the protocol and data encryption for secure communication with the MQTT Broker.
 - **None:** No security measures will be used.
 - **TLS V1.2 – Server Signed:** If this option is selected, the communication with the Broker will use the Transport Layer Security (TLS) 1.2 protocol. This protocol requires the server to inform the certificate recognized by a certification authority (CA) at the beginning of the connection so that data privacy can be guaranteed after the handshake.
 - **TLS V1.2 – CA Only:** If this option is selected, communication with the Broker will use the Transport Layer Security (TLS) 1.2 protocol. This protocol requires a certificate recognized by a Certificate Authority (CA) to ensure data privacy and integrity.
 - **TLS V1.2 – Self Signed:** If this option is selected, the communication with the Broker will use the Transport Layer Security (TLS) 1.2 protocol, which, in addition to the certificate recognized by a certification authority (CA), also requires the authentication of the client certificate and its private key to ensure privacy and data integrity.



The security certificates for the MQTT connection can only be configured through the USB interface.

- **Topic:** By clicking on the **Edit** button, it allows you to enter the topics to be used for the connection:
 - **Publication Topics:** Allows you to set the name of the topic to which the device will publish data to the cloud (see [PUBLICATION AND SUBSCRIPTION TOPICS](#) section of the [MQTT PROTOCOL](#) chapter).
 - Topic to publish periodic data and events.
 - Topic to publish alarms.
 - Topic to confirm commands.
 - **Subscription Topics:** Allows you to set the name of the topic on which the device will receive data in the cloud (see [PUBLICATION AND SUBSCRIPTION TOPICS](#) section of the [MQTT PROTOCOL](#) chapter).
 - Topic to receive commands.

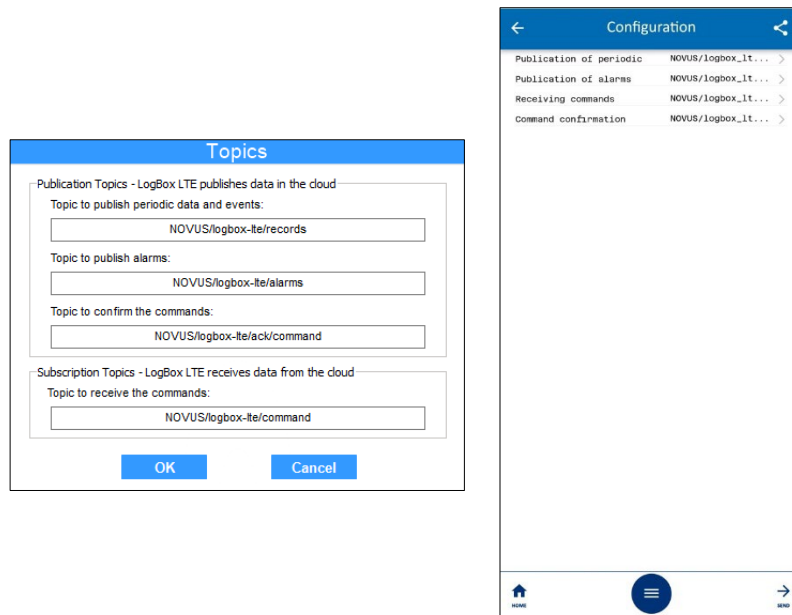


Figure 20

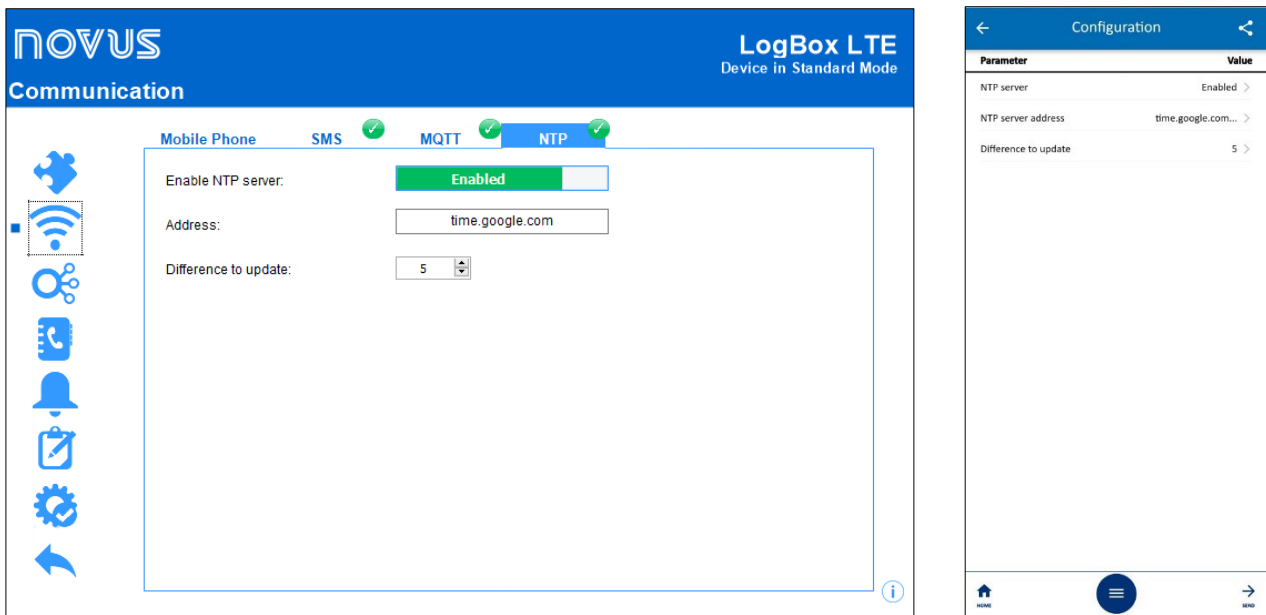


Figure 21

- **Enable NTP server:** By enabling this function, **LogBox LTE** can perform automatic clock synchronization through a NTP server. Before enabling this parameter, it is important to check that the SIM card installed has a data plan available.
- **Address:** Allows you to set the address of the NTP server that will be used as reference for the automatic clock adjustment.
- **Difference to update:** The internal clock will be updated whenever the difference between the clock of the NTP server and the device are higher than the value set in this parameter.

12.3.3 ANALOG CHANNEL PARAMETERS

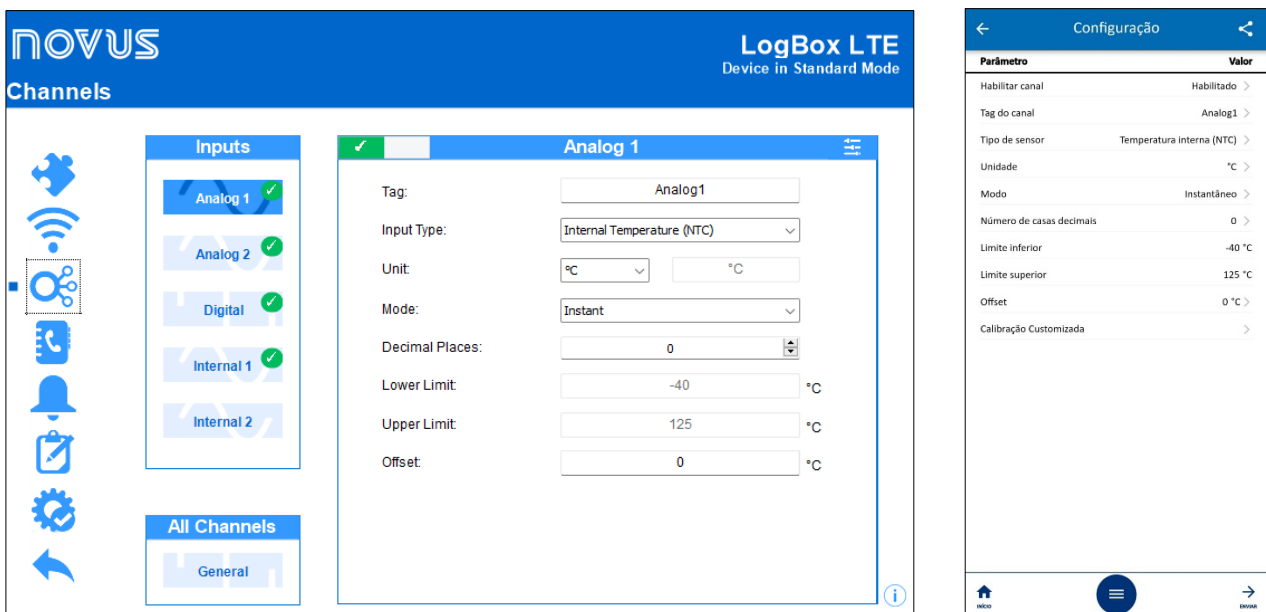


Figure 22

- **Tag:** Allows you to set a name, which will be used as channel identification during a download, for the internal channel. The field allows up to 16 characters.
- **Input Type:** Allows you to set the type of sensor to be used in each analog channel.
- **Unit:** Allows you to set the unit of each analog channel. For temperature sensors, it is possible to select °C or °F. For other sensors, it is possible to describe the unit with up to 8 characters.
- **Mode:** Allows you to set the operating mode of each analog channel. By selecting the **Instant** mode, the channel will be read and the value will be registered at each log interval. When selecting the **Average** mode, the device will take 10 readings of the channel within the logging interval and, at each logging interval, will register the average of these 10 readings.
- **Decimal Places:** Allows you to set the number of decimal places for each analog channel. Temperature sensors can be configured to display up to one decimal place. Other sensors can be configured to display up to 2 decimal places.
- **Lower Limit:** If the sensor configured for the channel is a temperature or internal diagnostic sensor, the lower limit will be filled by the software with the lower limit of the sensor. If the sensor configured for the channel is a linear sensor type (mV, V, or mA), it will be necessary to fill in the desired value to represent the minimum value of the chosen sensor.

- **Upper Limit:** If the sensor configured for the channel is a temperature or internal diagnostic sensor, the upper limit will be filled in by the software with the upper limit of the sensor. If the sensor configured for the channel is a linear sensor type (mV, V, or mA), it will be necessary to fill in the desired value to represent the maximum value of the chosen sensor.
- **Offset:** Allows you to make small adjustments to the readings of each channel. The configured Offset will be added to all readings taken on the configured channel.

12.3.3.1 CUSTOM CALIBRATION

The  icon opens the custom calibration screen, which allows you to adjust up to 10 measurement points for each channel. When a custom calibration has been configured, the minimum number of adjustment points is 2 points.

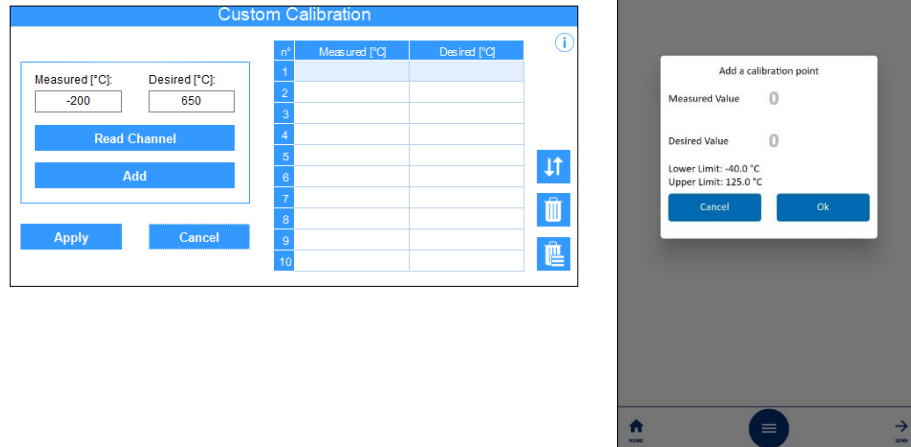


Figure 23

- **Measured:** Displays the value read from the device for which a correction is desired. It can be obtained by clicking on the **Read Channel** button or be filled in manually.
- **Desired:** Displays the value desired for the value measured by the device. It must be filled in manually.
- **Read Channel:** Allows you to obtain the values of the device during a customized calibration.
- **Add:** Allows to insert the **Measured** and **Desired** parameters in the custom calibration table.
- **Modify:** Allows you to modify the **Measured** and **Desired** parameters in the custom calibration table.
- **Organize** : Allows you to order the customized calibration table.
- **Delete** : Allows you to delete the selected row in the custom calibration table.
- **Delete All** : Allows you to clear the entire custom calibration table.
- **Apply:** Allows you to apply the custom calibration for the channel being configured.
- **Cancel:** Allows you to cancel the custom calibration operation.

12.3.4 INTERNAL CHANNEL PARAMETERS



Figure 24

- **Tag:** Allows you to set a name, which will be used as channel identification during a download, for the internal channel. The field allows up to 16 characters.
- **Input Type:** Allows you to set the type of sensor to be used in each internal channel.
- **Unit:** Allows you to set the unit of each internal channel. For temperature sensors, it is possible to select °C or °F. For voltage sensors, the unit will be fixed in Volts.
- **Decimal Places:** Allows you to set the number of decimal places for each internal channel. Temperature sensors can be configured to display up to one decimal place. Other sensors can be configured to display up to 2 decimal places.
- **Lower Limit:** Allows you to enter the lower limit of the sensor.
- **Upper Limit:** Allows you to enter the upper limit of the sensor.
- **Offset:** Allows you to make small adjustments to the readings of each channel. The configured Offset will be added to all readings taken on the configured channel.

12.3.5 DIGITAL CHANNEL PARAMETERS

12.3.5.1 PULSE COUNT: FLOW RATE



Figure 25

- **Tag:** Allows you to set a name, which will be used as channel identification during a download, for the internal channel. The field allows up to 16 characters.
- **Input Mode:** Allows you to select the mode of the digital input. In this example, the selected mode is **Pulse Count**.
- **Sensor Type:** Allows you to set the type of sensor that will be connected to the digital input.
- **Counting Edge:** Allows you to set the desired counting edge. In this way, the device will increment the counts whenever the configured edge is detected at the digital input. It is possible to count on the rising edge, falling edge, or both.
- **Debounce:** If the sensor type configured is Dry Contact, it is necessary to set a debounce time for edge detection. The debounce is the sensor stabilization time (the minimum time at which the sensor must remain at the logical level of interest so that the detected edge is considered valid). The minimum configurable debounce time is 50 milliseconds and the maximum is 6 seconds.
- **Application:** Allows you to select the application type of the digital input. In this case, the **Flow Rate** mode.
- **Sensor Factor:** Allows you to set the sensor factor used at the digital input. This parameter can be found in the sensor manual as k-factor. **LogBox LTE** provides 3 units for the sensor.

The custom unit option can be selected to meet any need not previously listed by the device.

- **Average Flow by Acquisition Interval:** Allows you to configure the device to log the average flow rate per acquisition interval.
 - **User Unit:** Allows you to set the flow rate unit related to the pulses counted at the digital input. **LogBox LTE** provides 9 flow units.
The custom unit option can be selected to meet any need not previously listed by the device.
If this option is selected, the **Sensor Factor** and its respective unit need to be configured for the device to take counts and displays the flow rate in the configured unit.
 - **Custom:** Allows you to set a custom unit for the digital input. The field allows you to describe the unit with up to 8 characters. If a custom unit is configured, it is necessary to configure the **Unit Factor** parameter, correlating it with the **Sensor Factor** parameter. See [PULSE COUNT](#) section.
 - **User Factor:** If the **User Unit** or the **Sensor Factor** parameters are configured in **Custom** mode, the **User Factor** parameter will need to be configured.
The user factor should relate the required unit to the sensor unit and the sensor factor will be used as a factor to be multiplied in the counts read from the digital input. See [PULSE COUNT](#) section.
 - **Decimal Places:** Allows you to set the desired number of decimal places for displaying the calculated value, in flow, from the digital input.
- **Volume Since Last Reset:** Allows you to set the device to log the volume since the last reset.
 - **Unit:** Allows you to set the flow unit related to the pulses counted at the digital input. **LogBox LTE** provides 9 flow units.
The custom unit option can be selected to meet any need not previously listed by the device.
If this option is selected, the **Sensor Factor** and its respective unit need to be configured for the device to take counts and displays the flow rate in the configured unit.
 - **Custom:** Allows you to set a custom unit for the digital input. The field allows you to describe the unit with up to 8 characters. If a custom unit is configured, the **Sensor Factor** parameter will need to be configured. See [PULSE COUNT](#) section.
 - **Unit Factor:** If the **User Unit** or the **Sensor Factor** parameters are configured in **Custom** mode, you will need to configure the **Unit Factor** parameter.
The unit factor should relate the required unit to the sensor unit and the sensor factor will be used as a factor to be multiplied in the counts read from the digital input. See [PULSE COUNT](#) section.
 - **Decimal Places:** Allows you to set the desired number of decimal places for displaying the calculated value, in flow, from the digital input.
 - **Reset:** See [ACCUMULATOR RESETTING MODES](#) section.

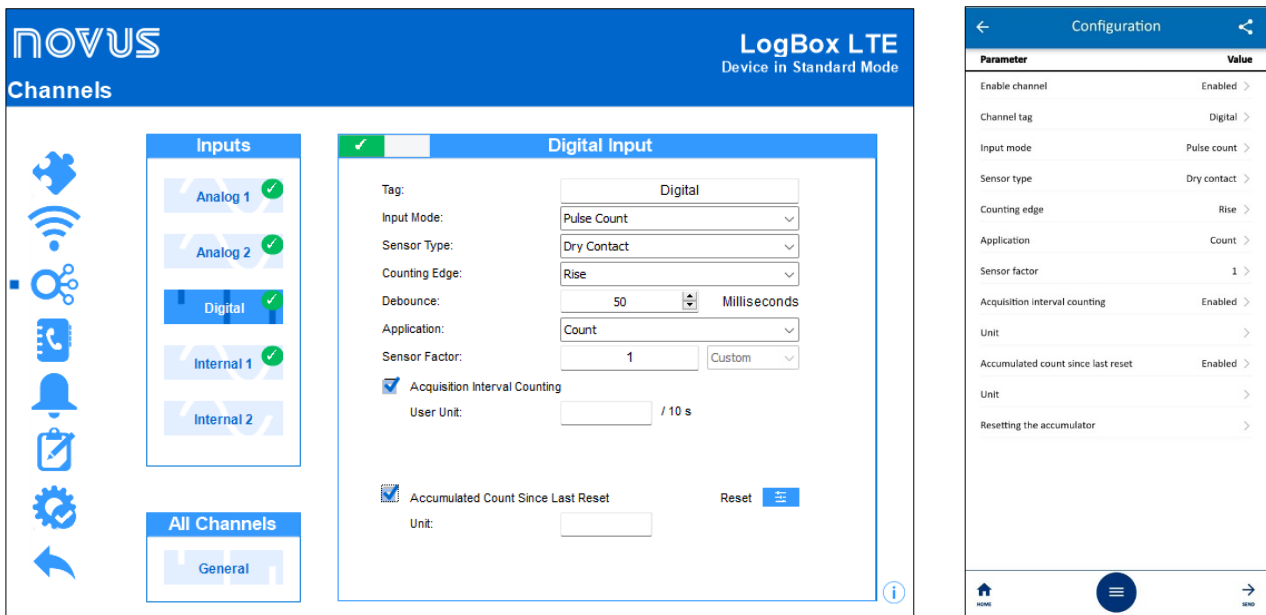


Figure 26

- **Tag:** Allows you to set a name, which will be used as channel identification during a download, for the internal channel. The field allows up to 16 characters.
- **Input Mode:** Allows you to select the mode of the digital input. The **Pulse Count** option is configured by default.
- **Sensor Type:** Allows you to set the type of sensor that will be connected to the digital input.
- **Counting Edge:** Allows you to set the desired counting edge. In this way, the device will increment the counts whenever the configured edge is detected at the digital input. It is possible to count on the rising edge, falling edge, or both.
- **Debounce:** If the sensor type configured is Dry Contact, it is necessary to set a debounce time for edge detection. The debounce is the sensor stabilization time (the minimum time at which the sensor must remain at the logical level of interest so that the detected edge is considered valid). The minimum configurable debounce time is 50 milliseconds; the maximum, 6 seconds.
- **Application:** Allows you to select the application type of the digital input. In this case, the **Flow Rate** mode.
- **Sensor Factor:** Allows you to configure the sensor factor used at the digital input. This parameter can be found in the sensor manual as k-factor. **LogBox LTE** provides 3 units for the sensor.
The custom unit option can be selected to meet any need not previously listed by the device.
- **Acquisition Interval Counting:** Allows you to configure the device to log the performed count during the acquisition intervals.
 - **User Unit:** Allows you to configure a custom unit for the count performed per acquisition interval. The field allows you to describe the unit with up to 8 characters.
- **Volume Since Last Reset:** Allows you to configure the device to log the accumulated count since the last reset.
 - **Unit:** Allows you to configure a custom unit for the count performed per acquisition interval. The field allows you to describe the unit with up to 8 characters.
 - **Reset:** See [ACCUMULATOR RESETTING MODES](#) section.

12.3.5.3 ACCUMULATOR RESETTING MODES

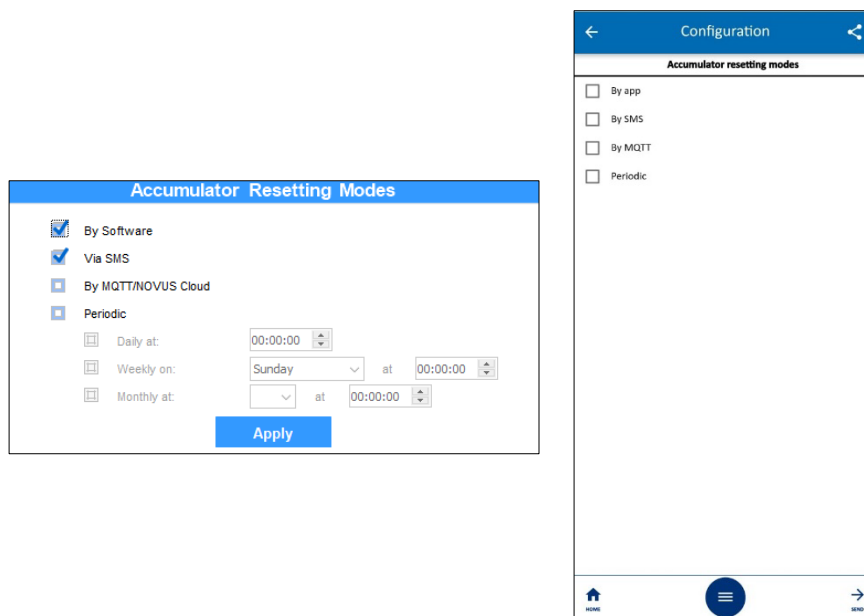


Figure 27

- **By Software:** If selected, allows you to reset the accumulator by **NXperience**. Exclusive option for the software.
- **By App:** If selected, allows you to reset the accumulator by **NXperience Next**. Exclusive option for the app.
- **By SMS:** If selected, allows you to reset the accumulator via SMS commands. For this feature to be effective, you must enable the SMS feature.
- **By MQTT/NOVUS Cloud:** If selected, allows you to reset the accumulator by the MQTT protocol. For this function to be effective, you must configure the MQTT protocol (see [MQTT PROTOCOL](#) section) or the device must be registered on **NOVUS Cloud**.
- **Periodic:** If selected, allows you to reset the accumulator daily, weekly, monthly, and you can add time, day of the week, or a date.

12.3.5.4 EVENT LOG OR LOG CONTROL

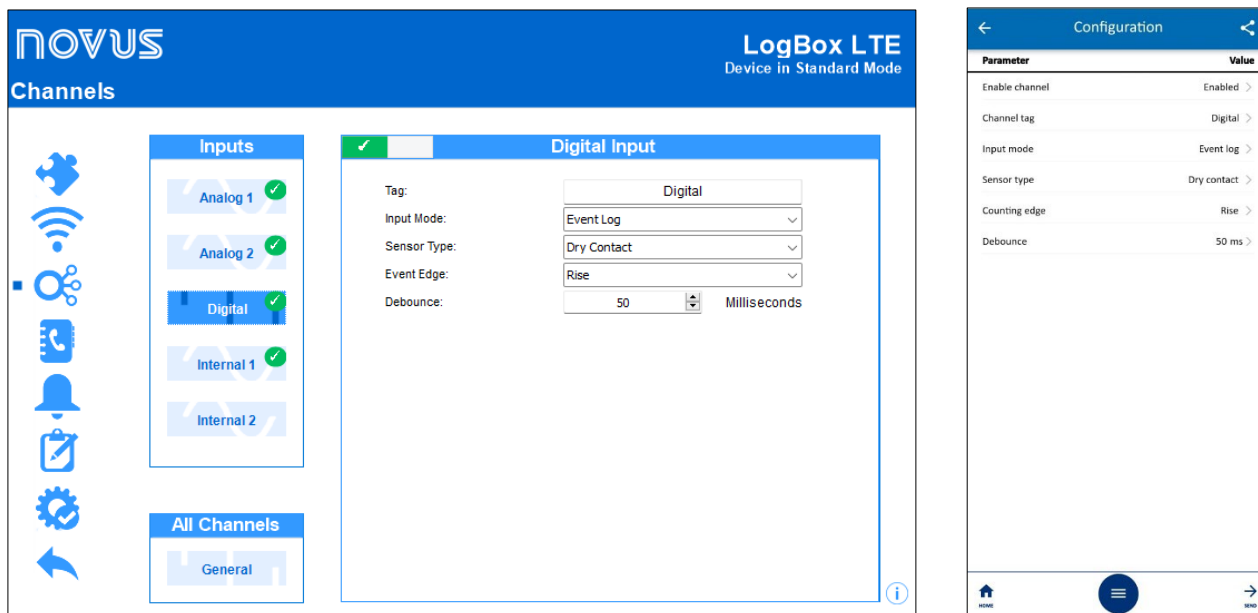


Figure 28

- **Tag:** Allows you to set a name, which will be used as channel identification during a download, for the internal channel. The field allows up to 16 characters.
- **Input Mode:** Allows you to select the mode of the digital input. In this example, the selected mode should be **Event Log** or **Log Control**. If you select the **Log Control** mode, you must select the **By Digital Input** mode in the **Start Mode** and **End Mode** parameters on the **Logs** screen. Otherwise, the setting will have no effect.
- **Sensor Type:** Allows you to set the type of sensor that will be connected to the digital input.
- **Event Edge:** Allows you to set the desired event edge. This way, the device will log events whenever the configured edge is detected at the digital input. In the **Event Log** mode, you can configure so that the logs are made during the Rising, Falling, or Both edges.

In the **Log Control** mode, you can control logs at the Rising, Falling, or Both edges, registering at logic level "1" or logical level "0".

- **Debounce:** It will be necessary to configure a Debounce time for edge detection. Debounce refers to the sensor stabilization time – the minimum time at which the sensor must remain at the logical level of interest so that the detected edge is considered valid. The minimum configurable debounce time is 50 milliseconds; the maximum, 6 seconds.

The device will only register the event after the end of the Debounce time.

12.3.6 GENERAL CHANNELS PARAMETERS

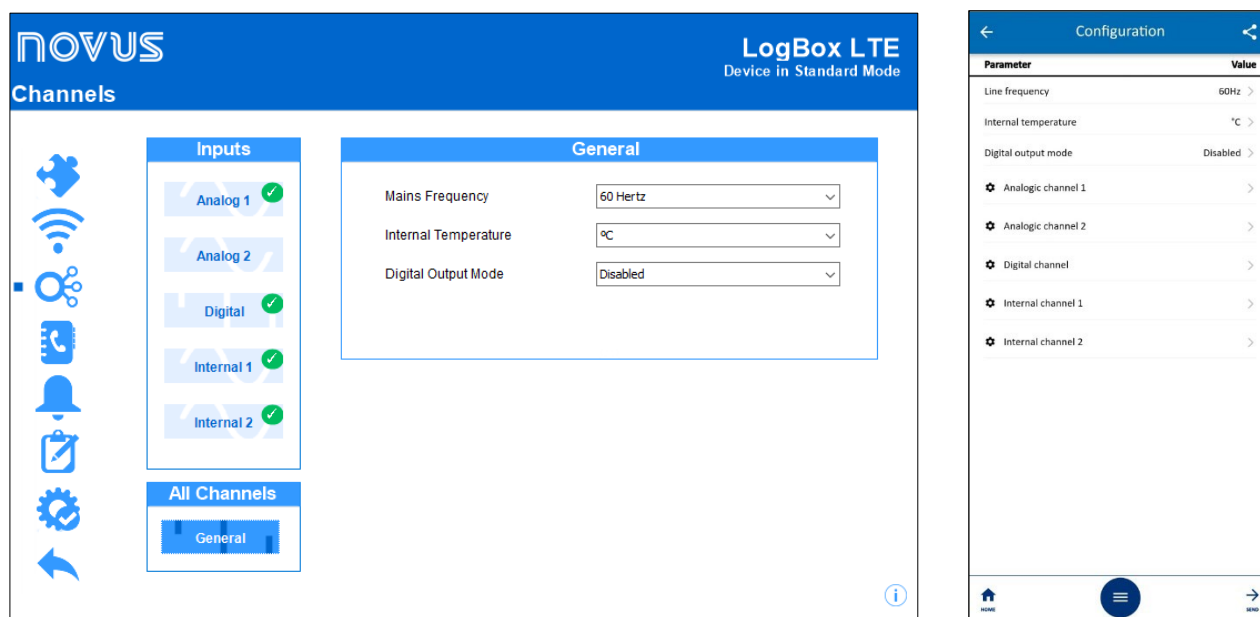


Figure 29

- **Mains Frequency:** Allows you to set the local power grid frequency (50 Hz or 60 Hz) for the device to perform better.
- **Internal Temperature:** Allows you to set the unit of measure in which the internal temperature will be displayed.
- **Digital Output Mode:** Allows you to set the digital output mode. Regardless of the configuration, **LogBox LTE** will always turn on with the digital output disabled.
 - **Disabled:** Allows you to disable the digital output.
 - **Auxiliary Electronic Switch:** Allows you to control the power supply of external instruments during analog channel readings.
 - **Drive Time:** Allows you to configure, in seconds, how long before each acquisition the digital output must be triggered. The minimum configurable time is 0 seconds; the maximum time is 15 minutes (900 seconds).
If equal to 0, the Auxiliary Electronic Switch will be enabled at the exact moment of an acquisition.
If greater than or equal to the lowest acquisition range, the Auxiliary Electronic Switch will remain continuously enabled.
 - **Alarm Status:** In this mode, the digital output will follow the current and general alarm status. If any channel is in an alarm situation, the digital output will be enabled. If no channel is set to alarm, the digital output will be disabled.
 - **Control by SMS and MQTT:** This mode allows for the status of the digital output to obey commands sent by both SMS and MQTT.

12.3.7 PHONEBOOK

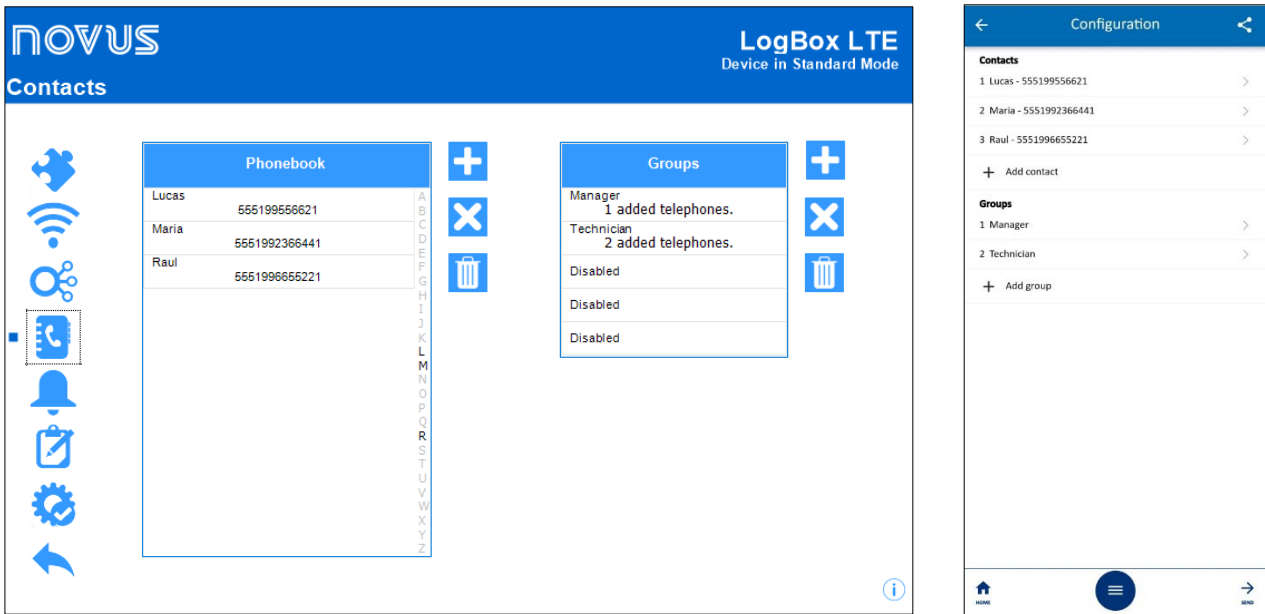


Figure 30

ADD CONTACT

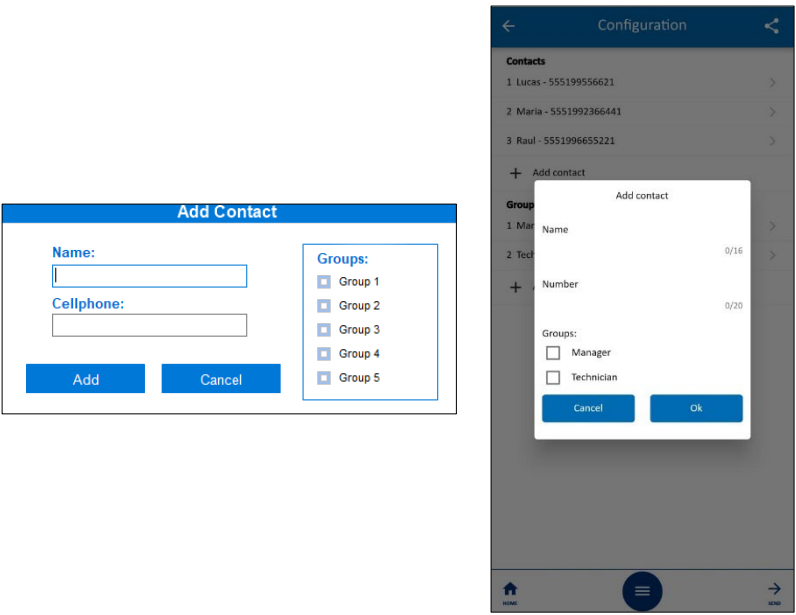


Figure 31

- **Phonebook:** Allows you to add up to 20 contacts that can later be included in groups to receive SMS messages related to the device alarm situations or send commands via SMS to perform diagnostics or configure the device.
The DDI, DDD codes and area code will need to be tested whenever a contact is entered, considering that each region and operator has its own information standard. The device is unable to identify properly. A test is recommended to ensure that the device can send SMS in case of events or command answers.
- **Add** : Allows you to add a contact to the contact list.
- **Delete** : Allows you to delete the selected contact from the contact list.
- **Delete All** : Allows you to delete the entire contact list.

GROUPS

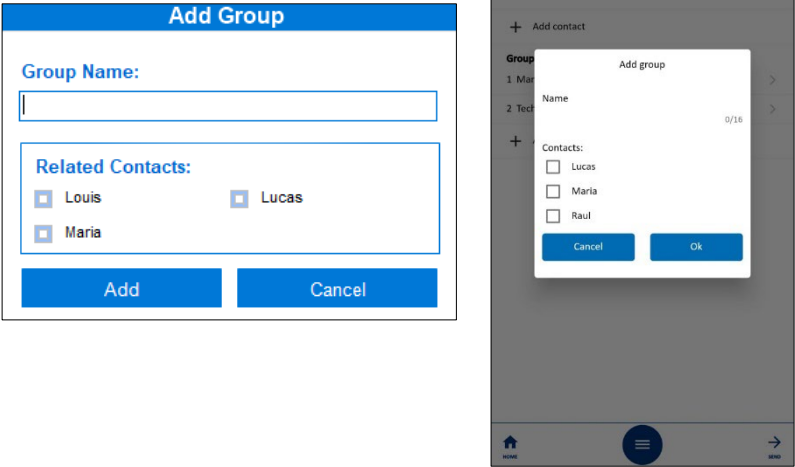


Figure 32

- **Groups:** Allows you to add up to 5 groups with 20 contacts that can later be selected receive SMS messages related to the device alarm situations.
- **Add **: Allows you to add a group to the group list.
- **Delete **: Allows you to delete a selected group from the group list.
- **Delete All **: Allows you to delete the entire group list.

12.3.8 ALARM CONFIGURATION

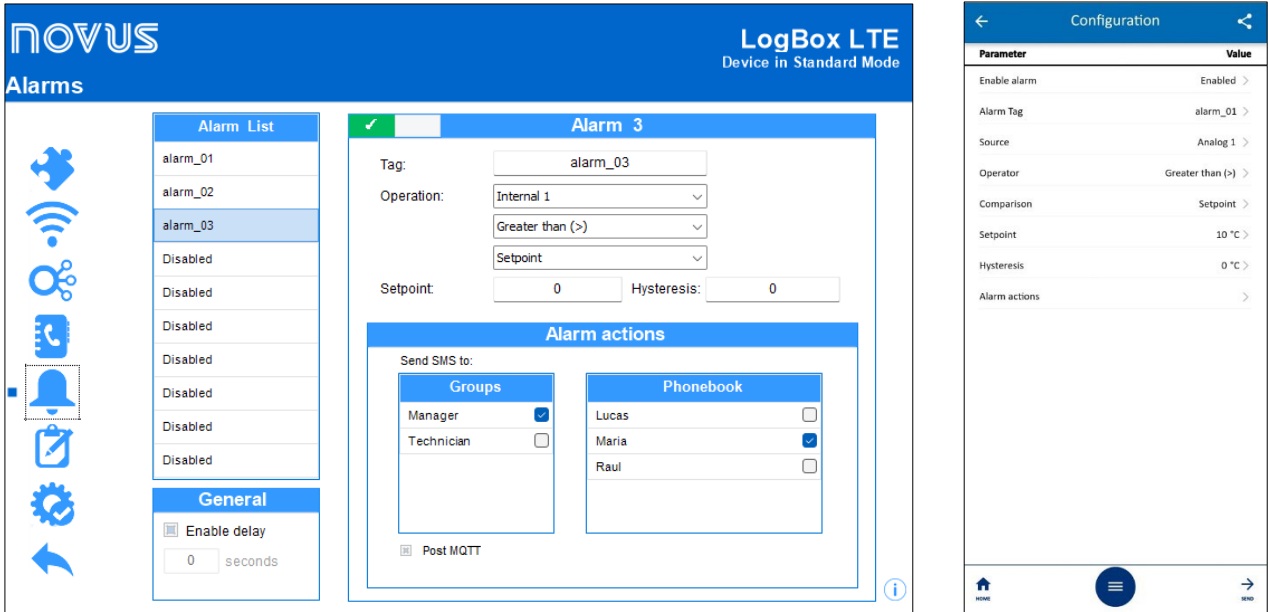


Figure 33

ALARMS

- **Tag:** Allows you to set a name, which will be used as an identification during a download, for the alarm. The field allows up to 16 characters.
- **Operation:** Allows you to select the operation to be performed by the enabled alarm. This feature has 3 parameters, which allow you to select the channels or the Setpoint to be analyzed and the operation to be performed (see [ALARMS](#) chapter).
 - **Setpoint:** Allows you to set the value to be exceeded for the channel to satisfy the alarm situation.
 - **Hysteresis:** Allows you to set the barrier to be exceeded for the channel to exit the alarm situation.
 - **Band:** Allows you to set the range of minimum and maximum limits in which the alarm will be activated or deactivated.



When configuring the alarm for a digital input that is configured for **Event Log** or **Log Control** mode, you can only use the '=' comparison with Setpoints '0' or '1', since the alarm will be used to compare with the logic level of the channel.

Also, it is important to note that, if configured for **Event Edge: Rise** or **Event Edge: Fall**, the alarm may never enter or never leave the alarm status. Thus, for the alarm to operate correctly, it is recommended to use the **Event Edge: Both** option.

GENERAL

- **General:** Allows you to enable or disable the alarm delay option.
 - **Enable delay:** Allows you to enable the delay of configured alarms. Once enabled, the device will only consider an alarm if the Setpoint is exceeded and maintained for a timer longer than the configured delay.
 - **Configure seconds:** Allows you to set the delay period to be considered. Maximum value: 3600 seconds.

ALARM ACTIONS

Figure 34

- **Alarm Actions:** Allows you to select the actions to be taken whenever the configured alarm enters an alarm situation.
 - **Send SMS to:** Allows you to select the contacts that should receive this alarm notification (see [CONTACTS TO SEND SMS](#) section). It is possible to select contacts individually and/or in groups.
 - **MQTT publication:** If MQTT protocol is enabled and **LogBox LTE** is connected to the Broker, an MQTT publication will be performed in a specific topic, with data from the input in alarm condition.
 - **Start Logs:** If the **Start Mode** is set to **By Alarm**, the device will start logging every time the alarm goes into alarm.
The **Start Logs** and **Stop Logs** actions are mutually exclusive. Once an alarm has been set to start the logs whenever the device enters alarm situation, it will not be possible to use the same alarm to stop them.
 - **Stop Logs:** If **Stop Mode** is set to **By Alarm**, the device will stop logging every time the alarm goes into alarm.
The **Start Logs** and **Stop Logs** actions are mutually exclusive. Once an alarm has been set to stop the logs whenever the device enters alarm situation, it will not be possible to use the same alarm to start them.
 - **Log while Active:** If the **Start Mode** and **Stop Mode** are set to **By Alarm**, the device will register whenever the configured alarm is set to alarm. If the configured alarm is no longer in alarm, the device will automatically stop logging.
If an alarm has been set in the **Start Logs** or **Stop Logs** modes, it will not be possible to set any alarm in the **Log while Active** mode.
Unlike the previous modes, which allow only a single alarm to be configured for each action, this mode has many alarms.

12.3.8.1 COMPARISON BETWEEN CHANNELS

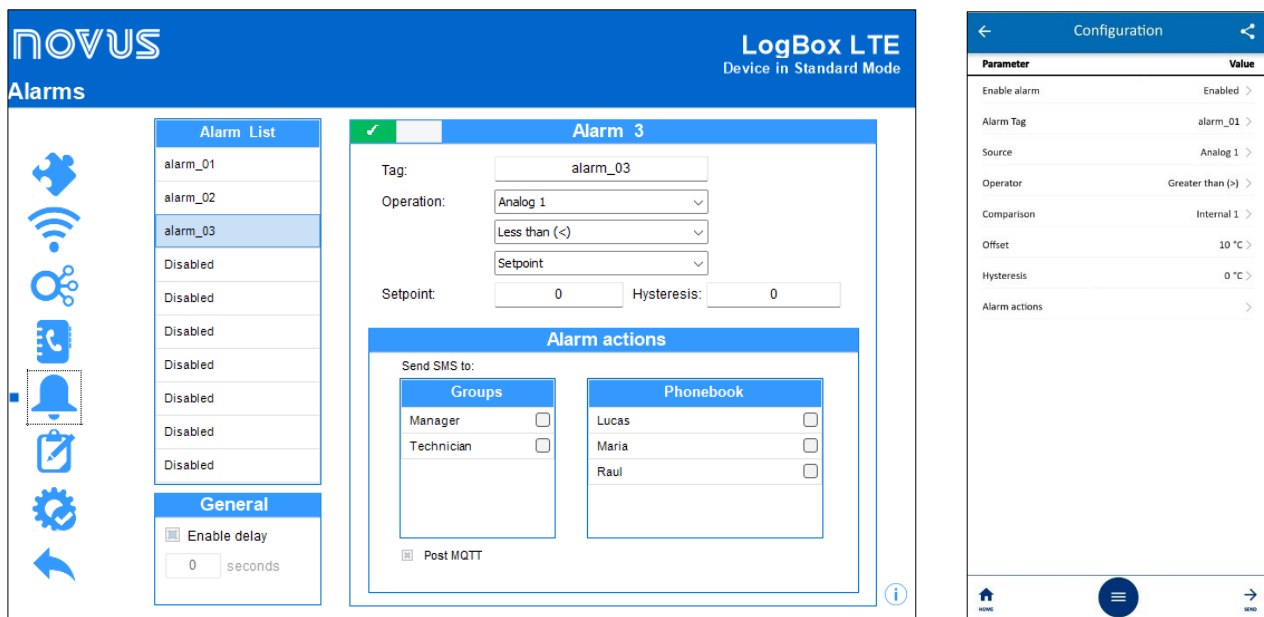


Figure 35

You can create a comparison alarm between 2 channels.

When selecting the operation and channels to be compared, you can add an Offset value (corresponding to the parameter highlighted in red) to the second selected channel. Thus, the value of the first channel will be compared to the value of the second channel and the configured Offset value.

12.3.9 DATA LOG CONFIGURATION

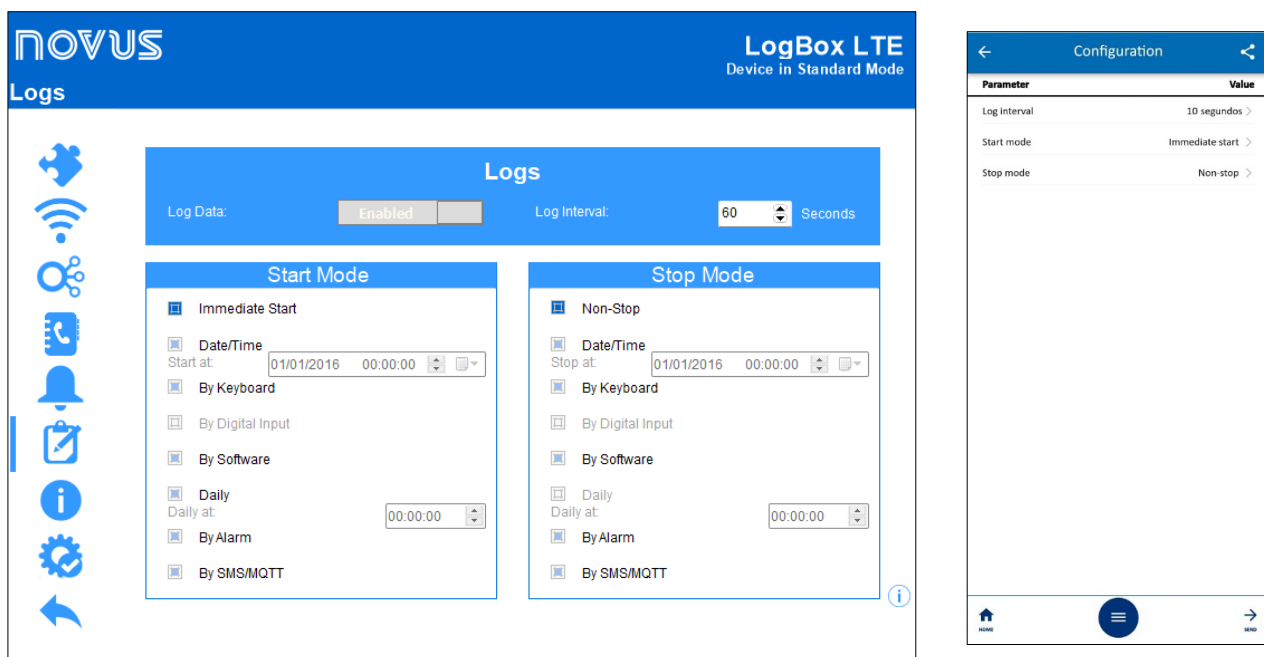


Figure 36

LOGS

- **Log Data:** LogBox LTE will start logging from the moment the first configuration is sent.
- **Log Interval:** Allows to select the periodicity, in seconds, with which an acquisition should be performed and saved in memory.
 - **Minimum Interval:**
 - 1 second (if no channel is configured to operate by average).
 - 10 seconds (if any channel is configured to operate by average).
 - **Recommended interval:** 300 seconds.
 - **Maximum interval:** 18 hours.

START MODE

- **Immediate Start:** Allows logs to be started shortly after the device is reconfigured.
- **Date/Time:** Allows you to set the date/time when logs should be started.
- **By Keyboard:** Allows you to change the log status to enabled on a screen on the display. This starts the logs.
- **By Digital Input:** Allows logs to be started by the digital input.
This parameter will be available if the digital input is enabled and configured in the **Log Control** mode. The logs will thus be started as soon as the digital input is activated. The log edge should be configured in the digital input parameters.
- **By Software:** Allows logs to be started via a **NXperience** command.
- **Daily:** Allows logs to be started every day and at the configured time. A **Daily** log start mode requires a **Daily** log end mode.
- **By Alarm:** Allows the device to be configured so that logs are started from a specific alarm.
- **By SMS / MQTT:** Allows logs to be started via SMS or the MQTT protocol.

STOP MODE

- **Non-Stop:** Allows logs to continue indefinitely. When filling the memory, older data will be erased so that newer data can be saved.
- **Date/Time:** Allows you to set the Date/Time when the logs should be concluded.
- **By Keyboard:** Allows you to change the log status to disabled on a screen on the display. This stops the logs.
- **By Digital Input:** Allows logs to be paused by the digital input.
This parameter will be available if the digital input is enabled and configured in the **Log Control** mode. The logs will thus be paused as soon as the digital input is activated. The log edge should be configured in the digital input parameters.
- **By Software:** Allows logs to be stopped via a **NXperience** command.
- **Daily:** Allows logs to be stopped every day and at the configured time. A **Daily** log end mode requires a **Daily** log start mode.
- **By Alarm:** Allows the device to be configured so that logs are stopped from a specific alarm.
- **By SMS / MQTT:** Allows logs to be stopped via SMS or the MQTT protocol

The combinations allowed for the **Start Mode** and the **End Mode** are as follows:

START MODES	END MODES
Immediate	Non-Stop Date/Time By Keyboard By Software By Alarm
Date/Time	Non-Stop Date/Time By Keyboard By Software By Alarm
Keyboard	Non-Stop By Keyboard
Digital Input	Non-Stop By Digital Input
Software	Non-Stop By Software
Daily	Daily
Alarm	Non-Stop By Alarm
SMS / MQTT	Non-Stop By SMS / MQTT

Table 30

12.3.10 DIAGRAM

12.3.10.1 DISPLAY

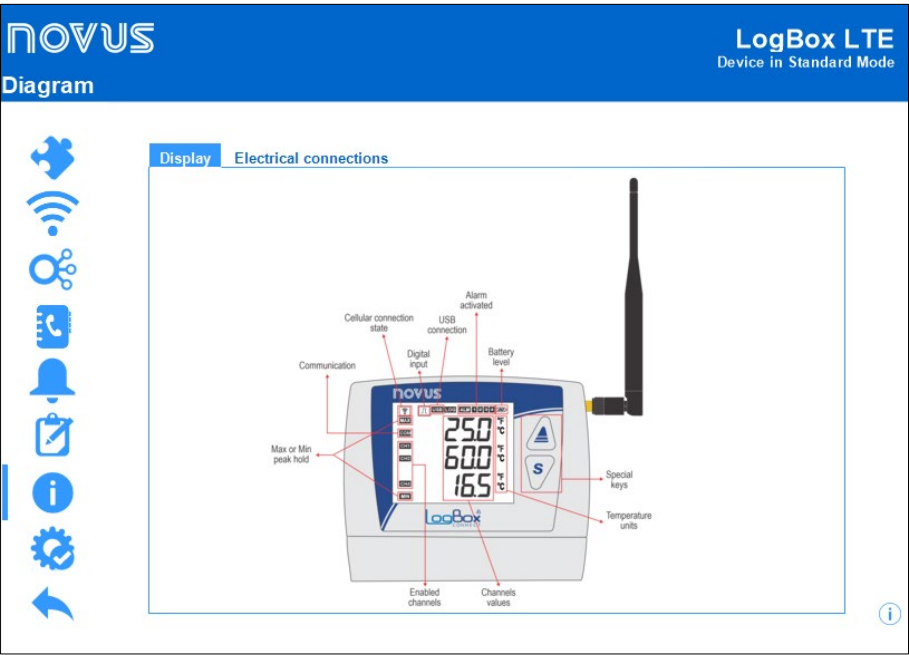


Figure 37

Displays information about the display and its components.

12.3.10.2 ELECTRICAL CONNECTIONS

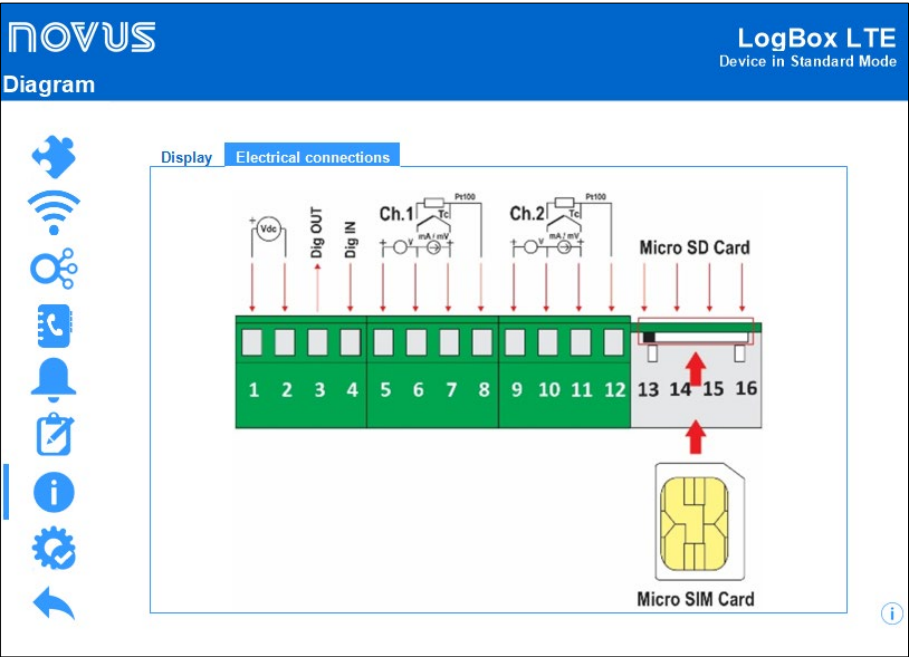


Figure 38

Displays information about the electrical connections.

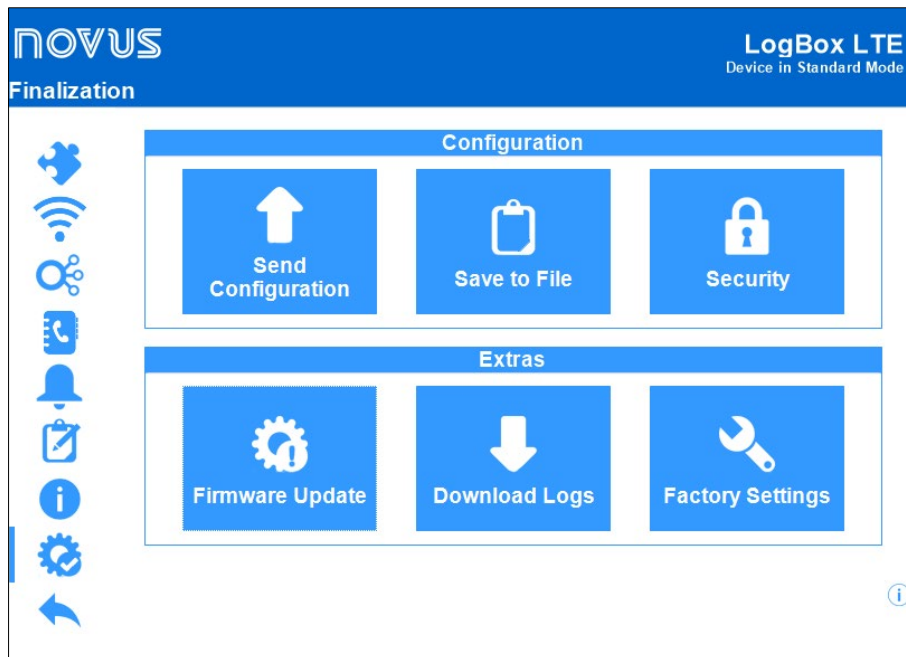


Figure 39

CONFIGURATION

- **Send Configuration:** Allows you to apply the previously configured settings to the connected device.
- **Save to File:** Allows you to save the previously configured settings to a file with .nxc extension, compatible with the NXperience software.
- **Security:** Allows you to create, change, or delete the password to block access to the device settings. This parameter allows 4 to 8 alphanumeric and special characters.
To remove a previously registered password, simply leave the **New Password Confirmation** field blank.

EXTRAS

- **Firmware Update:** Allows you to perform the device firmware update. Go to the product page on our web site and download the update file. Then just select this option and manually load the update file. The software will provide information about the updated firmware version, the update status, and the estimated time to update the firmware update.
- **Download Logs:** Allows you to download the device logs. Once downloaded, the software will display a graph with the information downloaded. To learn how to manipulate them, check the specific **NXperience** manual, available on our website.
- **Factory Settings:** Allows you to return the device to factory settings.

12.4 DOWNLOAD

Both **NXperience** and **NXperience Next** allow you to download data from the device. The **NXperience** software download is more complete, providing more information and features for the graphs (see the **NXperience** manual, available on the product page).

By using the **NXperience Next** app, you can get a quick view of the device's settings, configured channels, activated alarms and more.

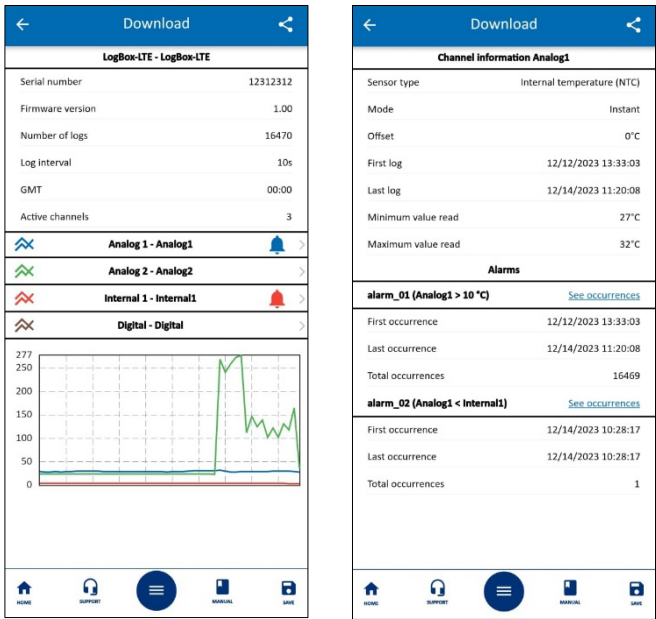


Figure 40

It is not possible to download data via MQTT connection.

12.5 DIAGNOSTICS

You can view the **LogBox LTE** diagnostics tab in the following ways:

1. In the **NXperience** software, click on the **Diagnostics** button on the **NXperience** home screen.
2. In the **NXperience Next** app, establish a connection with the device and, once the **Read Device** option has been selected, click on the **Diagnostics** button.

The update interval of the information displayed is 1 second.

12.5.1 LOGS

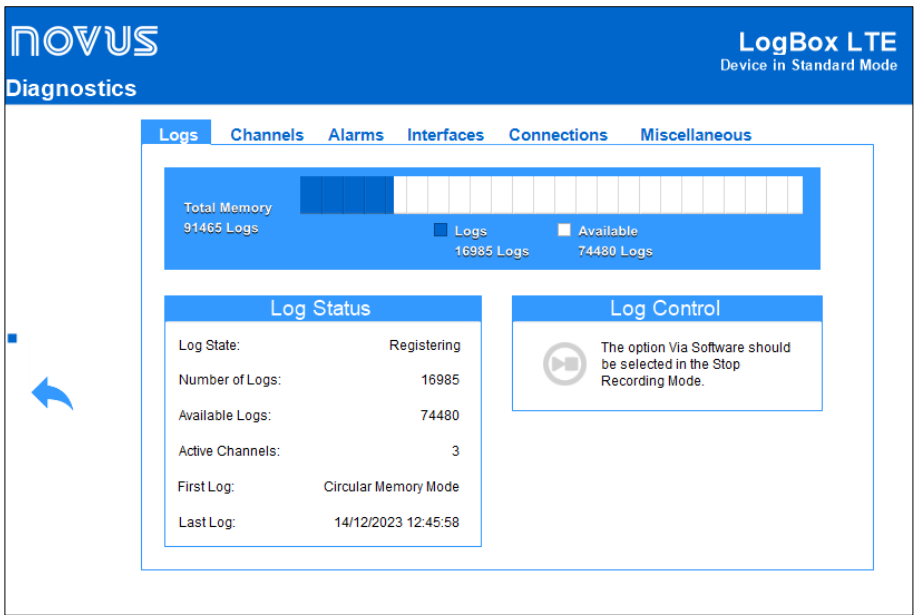
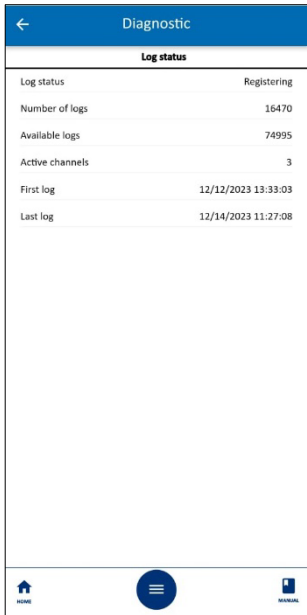


Figure 41



The **NXperience Next** graph doesn't show all the logs, but it does create a trend in the download curve.

For more complete information, use the **NXperience** software.

The application's download files can be opened in the software.

LOG STATUS

- **Registration Status:** Informs if the device is registering or not.
- **Number of Records:** Informs the number of logs made by the device.
- **Available Registrations:** Informs the number of logs that can be performed before the memory fills up.

- **Active Channels:** Informs the number of active channels.
- **First Log:** Informs the date and time of the first log made by the device.
- **Last Log:** Informs the date and time of the last log made by the device.

LOG CONTROL

- **By Software:** Informs if the device is logging or not and allows to start or pause the logs if the start and end mode **By Software** have been selected.

12.5.2 CHANNELS

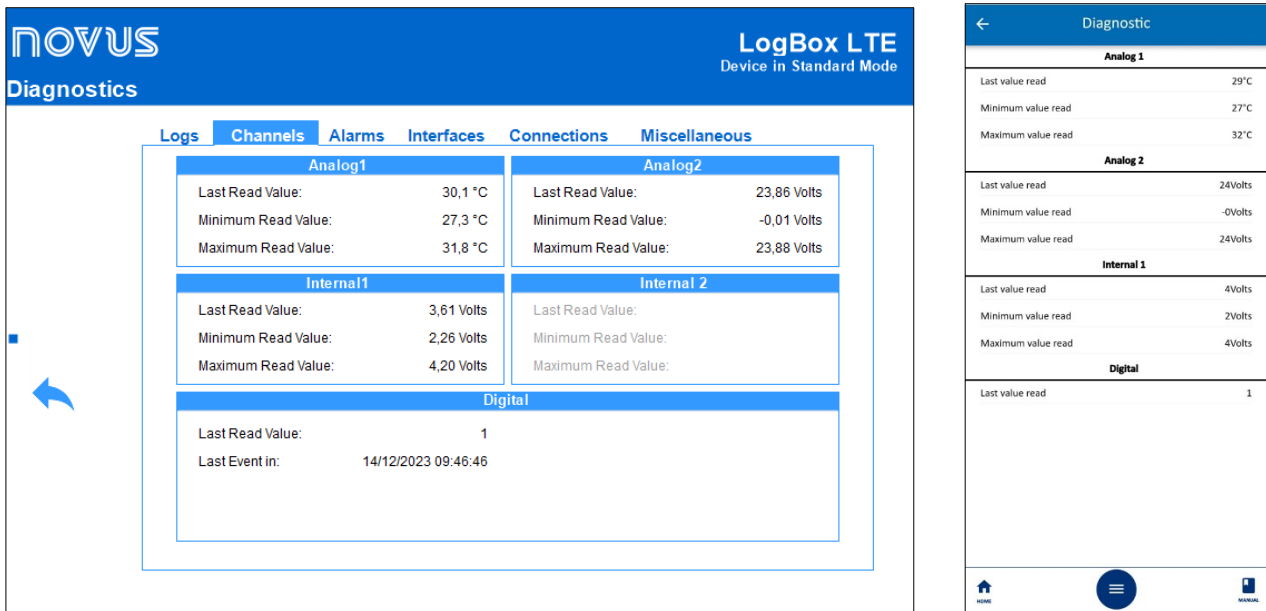


Figure 42

- **Analog Channels, Internal Channels, and Digital Channel:** Displays information about the acquisitions made by the device on the analog channel sensors and the digital channel sensor.
 - **Last Value Read:** Displays the value of the last acquisition performed by the device on the sensor of the corresponding channel. The displayed value may have been updated by a display update periodicity and not registered in memory.
 - **Minimum Value Read:** Displays the minimum value read by the device on the sensor of the corresponding channel. The displayed value may have been read in a display update periodicity and not registered in memory.
 - **Maximum Value Read:** Displays the maximum value read by the device on the corresponding channel sensor. The displayed value may have been read in a display update periodicity and not registered in memory.
 - **Last Accumulated Value:** In the case of the digital channel, displays the last value accumulated by the device in **Pulse Count** mode. Clicking on the **Reset** button allows resetting the accumulator value and restarting the count.

12.5.3 ALARMS

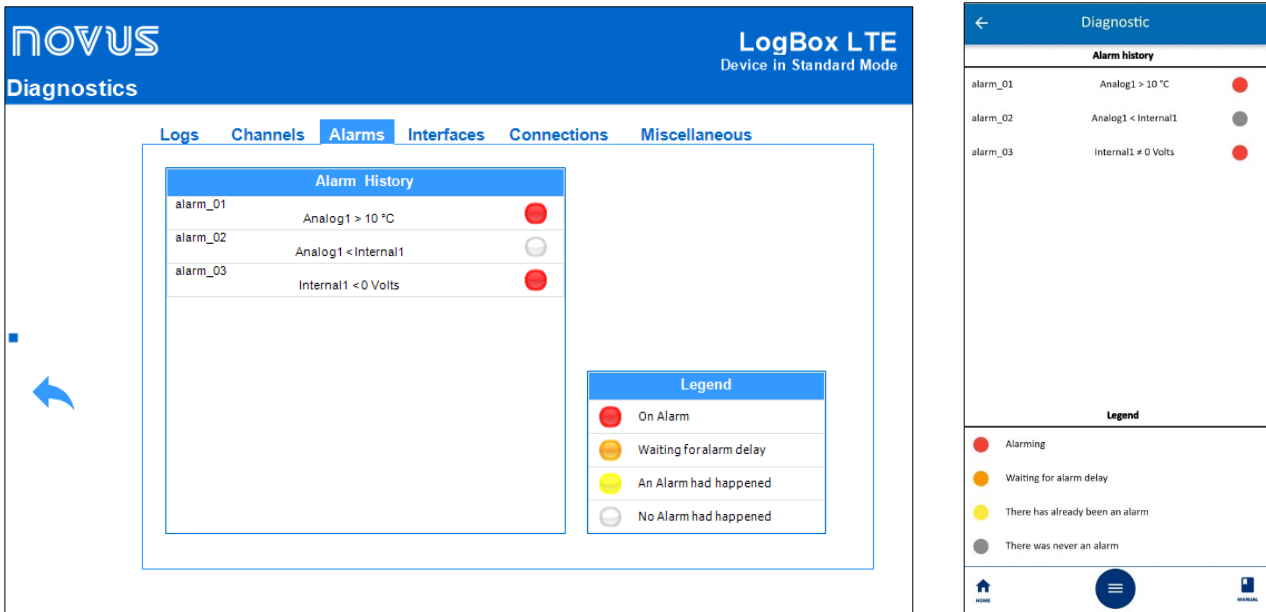


Figure 43

This tab displays information about the history of the alarms enabled and configured for **LogBox LTE** (see [ALARM CONFIGURATION](#) section), their current condition and a color legend that informs if the configured alarms are currently in alarm, if they are waiting to satisfy the delay condition to enter the alarm situation, if they have already entered the alarm situation at some point or even if they have never entered the alarm situation.

12.5.4 INTERFACES

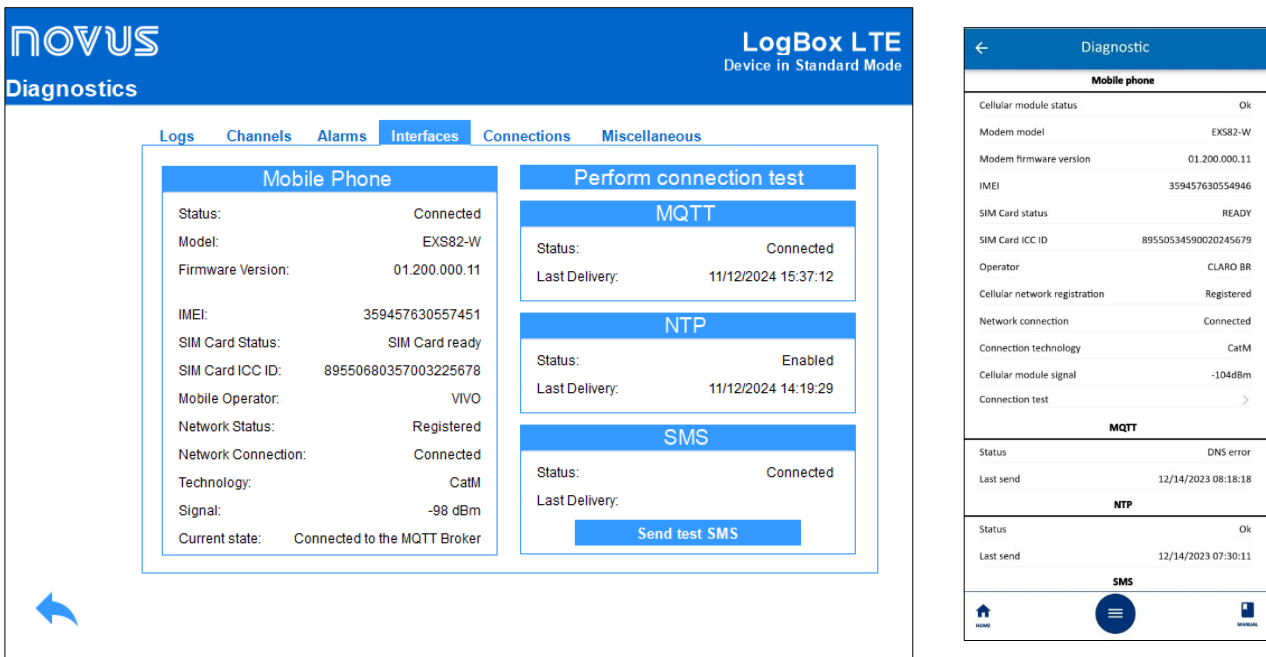


Figure 44

MOBILE

- **Status:** Informs the status of the mobile network connection.
- **Model:** Informs the model of the mobile network module.
- **Firmware Version:** Informs the firmware version of the mobile network module.
- **IMEI:** Informs the IMEI of the mobile network module.
- **SIM card status:** Informs the status of the SIM card connected to the device.
If there are problems with the connected SIM card, see the [USING THE DIAGSIM FUNCTION](#) section.
- **SIM card ICC ID:** Informs the ID of the SIM card connected to the device.
- **Operator:** Informs the operator responsible for the mobile connection.
- **Network Status:** Informs the network status of the mobile connection.
- **Technology:** Informs the technology on which the mobile connection was established.

- **Signal:** Informs the signal quality of the established mobile connection.
- **Current state:** Informs the status of the connection with the MQTT Broker.
- **Perform connection test:** Evaluates the SIM card data connection status by pinging a public IP address (8.8.8.8).

MQTT

- **Status:** Informs the connection status with the MQTT Broker.
- **Last send:** Informs the time when the last publication of logs via MQTT was made.

NTP

- **Status:** Informs the connection status with the NTP server.
- **Last send:** Informs the time when the last request to the NTP server was made.

SMS

- **Status:** Informs the connectivity status of the SMS.
- **Send test SMS:** To evaluate the operation of the service, a standard content SMS will be sent to all contacts registered in **LogBox LTE**. At the end of the process, a pop-up will be displayed with the result.

12.5.5 CONNECTION

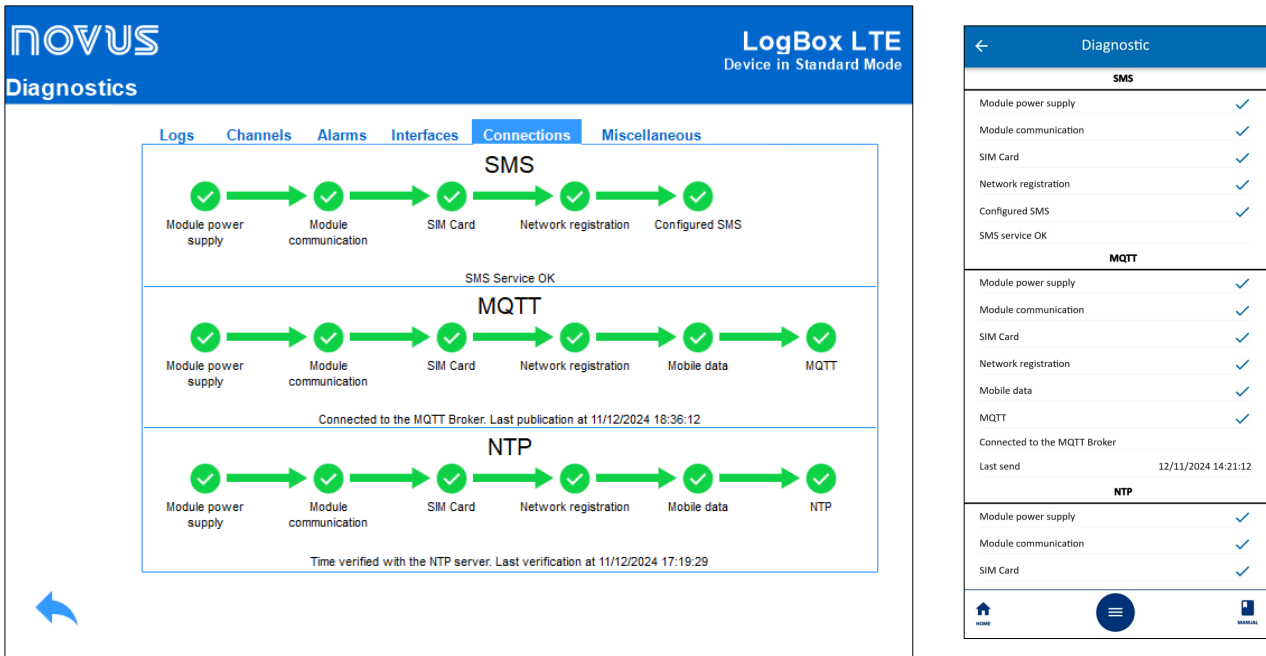


Figure 45

This tab performs a diagnosis of the connections.

12.5.6 MISCELLANEOUS

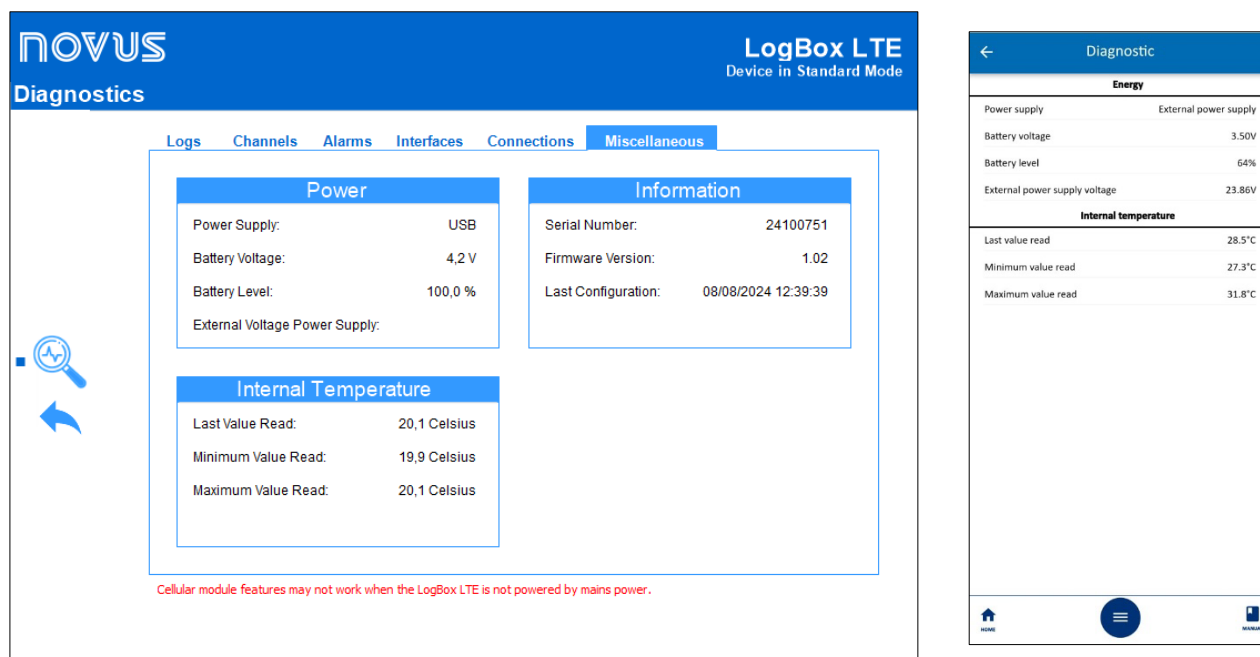


Figure 46

POWER

- **Power Source:** Reports on the current power source of the device.
- **Battery Voltage:** Reports the power battery voltage and whether the device has a battery connected.
- **Battery Level:** Informs of the percentage of the available battery to be used.
- **External Source Voltage:** Informs the value of the external power supply voltage of the device.

INTERNAL TEMPERATURE

- **Last Value Read:** Informs the value of the last internal temperature registered by the device.
- **Minimum Recorded Value:** Informs the minimum temperature registered by the device.
- **Maximum Recorded Value:** Informs the maximum temperature registered by the device.

INFORMATION

- **Serial number:** Displays the device's unique identification number. The serial number is also used to register the device with **NOVUS Cloud**.
- **Firmware version:** Displays the device's firmware version.
- **Last configuration:** Displays the time of the last configuration sent to the device. You can use this field to validate that the configuration has been applied to the device.

13. INSTALLATION

13.1 MECHANICAL INSTALLATION

LogBox LTE has high-quality housing, built in ABS+PC and with IP40 protection rating.

To make it easier to attach it, the device comes with a bracket with 3 oblong holes, arranged in the shape of a triangle, which serve to fix it with screws. Moreover, the same fixing bracket also has 4 magnets to secure the device to metal surfaces.

At the bottom of the fixing bracket there are 2 openings that can be used to pass the sensors that are connected to the device. Additionally, this bracket has a ring for placing a padlock to prevent removal of **LogBox LTE** from the installation.

With the aid of 2 screwdrivers and through 2 lateral fittings, **LogBox LTE** can be attached to or removed.

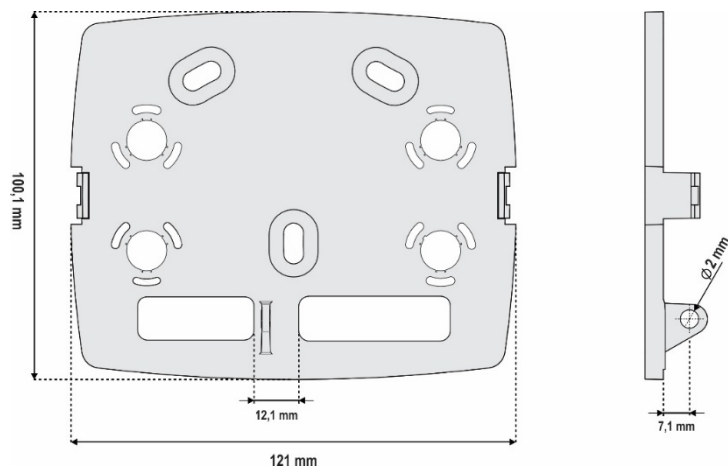


Figure 47

LogBox LTE comes with a protective cover for connections that fits into the bottom of the device and hides its sensors. This protective cover has 4 detachable cavities to facilitate sensor installation.

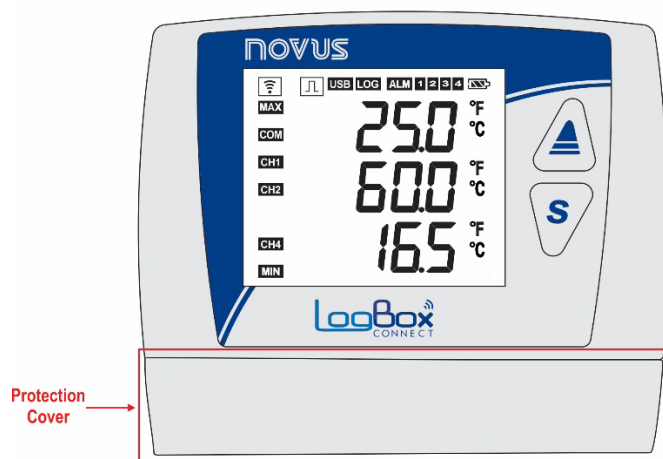


Figure 48

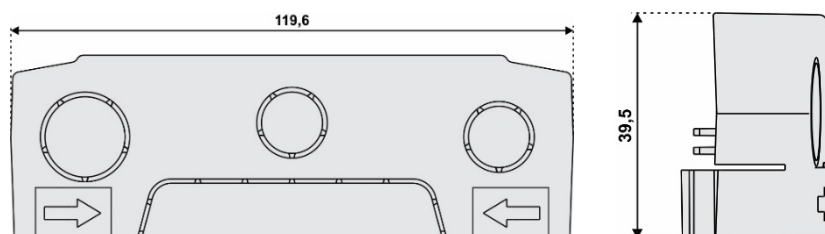


Figure 49

To detach the protective cover, press the sides, one side at a time:

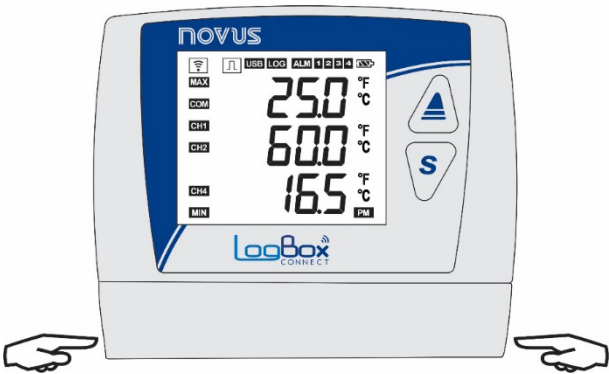


Figure 50

To attach the protective cover, the area designated by the arrows needs to be pressed from outside in, one side at a time:

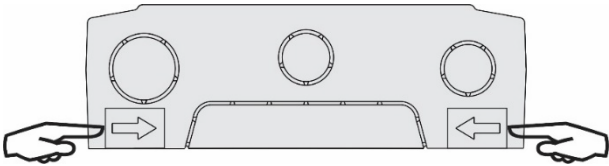


Figure 51

13.1.1 DIMENSIONS

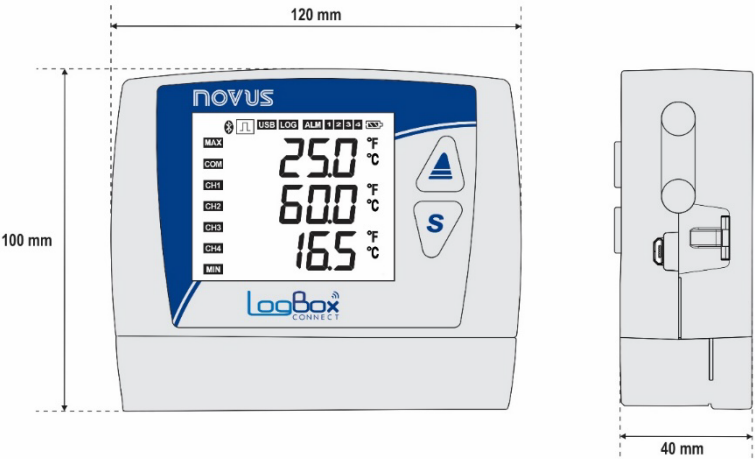


Figure 52

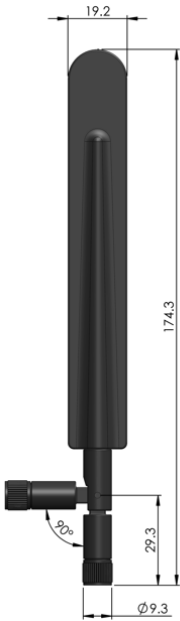


Figure 53

13.1.2 CONNECTIONS

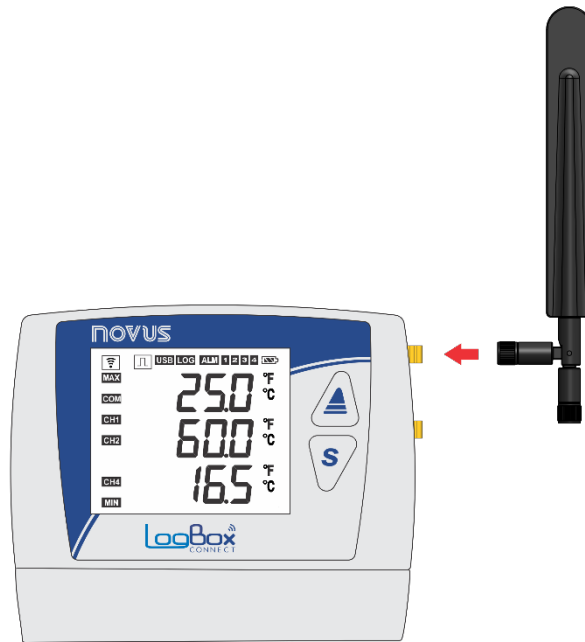


Figure 54

Make sure to fit the mobile network antenna to the right slot and position it vertically, pointed upward.

If the antenna needs to be positioned far from the device (to obtain better signal coverage), an antenna with extension cable and magnetic base can be purchased separately.

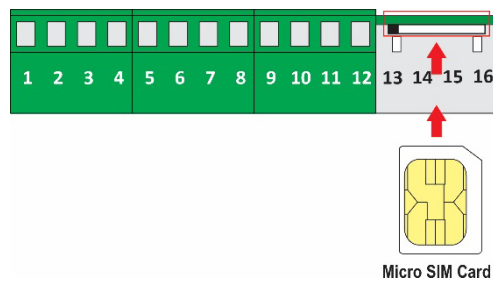


Figure 55

Make sure the device is turned off before inserting/removing the SIM Card.

13.2 ELECTRICAL INSTALLATION

13.2.1 INSTALLATION RECOMMENDATIONS

- Electronic and analog signal conduits should run through the plant separately from the output and power supply conduits. If possible, in grounded conduits.
- The power supply for electronic instruments must come from an appropriate grid for instruments.
- It is recommended to use RC FILTERS (noise suppressor) in contactor coils, solenoids, etc.
- In control applications, it is essential to consider what could happen when some part of the system fails. The device's internal devices do not ensure total protection.
- Electrical connections must be made with the terminal blocks highlighted on the device. Before connecting them, make sure that the connections have been made correctly.
- Remember to pass all wires through the desired openings, designed for their passage, before making any electrical connections.
- The power supply, digital output, digital input, and analog input terminals are not isolated from each other. As such, analog and digital signals from the same voltage source should not be used, otherwise the device will malfunction.
- If you use thermocouple sensors and want to use grounded thermocouples, you must take care that the installation does not generate ground loops that could influence the correct temperature measurement by the device. This could generate false Offsets, reading oscillation, possibly malfunction or even burn the device.

The power supply input for the analog sensors does not have galvanic isolation. Thus, grounded sensors on application equipment may create ground loops and influence the measurement. Use isolated thermocouples or, if grounded thermocouples are required, choose a power supply that provides good galvanic isolation to the device. You can also avoid ground loops by powering the device from the battery only, with no USB or external source.

13.2.2 PRECAUTIONS

Because it is an electronic module, **LogBox LTE** requires some care:

- Due to the risk of damage caused by static electricity and which may occur if the electronic circuit is exposed, the device should not be opened.
- Pay close attention to the sensor wires, the digital input, the digital output, and the external power supply connections.
- Make sure the device is turned off before inserting/removing the SIM Card.

13.2.3 ELECTRICAL CONNECTIONS

LogBox LTE has 3 detachable connection terminal blocks for connecting the external power supply, loading digital output, digital input sensor, and analog sensors for each of the 2 available analog channels. The basic electrical connections are illustrated below:

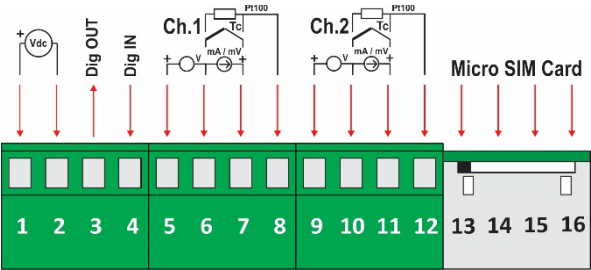


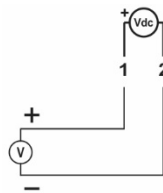
Figure 56

To connect the sensors, the connection terminal blocks should be previously detached from the device. To facilitate sensor connection, use the numbering printed on the connectors and the electrical connection image shown in the figure above and on the protective connection cover.



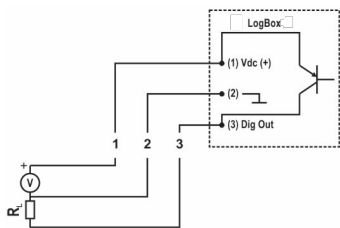
The power supply, digital output, digital input, and analog input terminals are not isolated from each other.
As such, analog and digital signals from the same voltage source should not be used, otherwise the device will malfunction.

POWER SUPPLY



The connection to the power supply is made at the terminals according to the figure.
The power supply used must be of the direct current type, with voltage between 10 and 30 V, and provide a minimum current of 15 mA when no load is connected to the digital output.
If the load is connected to the digital output, the power supply used must be able to provide current compatible with the load used.

DIGITAL OUTPUT – "ALARM STATUS" CONNECTION MODE



The connection for the digital output in "Alarm Status" mode is made at the terminals according to the figure.
To use the digital output, the device must be powered by an external supply. The source used must be capable of supplying current compatible with the load used in the digital output.

DIGITAL OUTPUT – "AUXILIARY ELECTRONIC SWITCH" CONNECTION MODE

The connection for the digital output in "Auxiliary Electronic Switch" mode, used to power current transmitters, is made at the terminals according to the figure.

To use the digital output, the device must be powered by an external supply. The source used must be capable of supplying current compatible with the number of transmitters used.

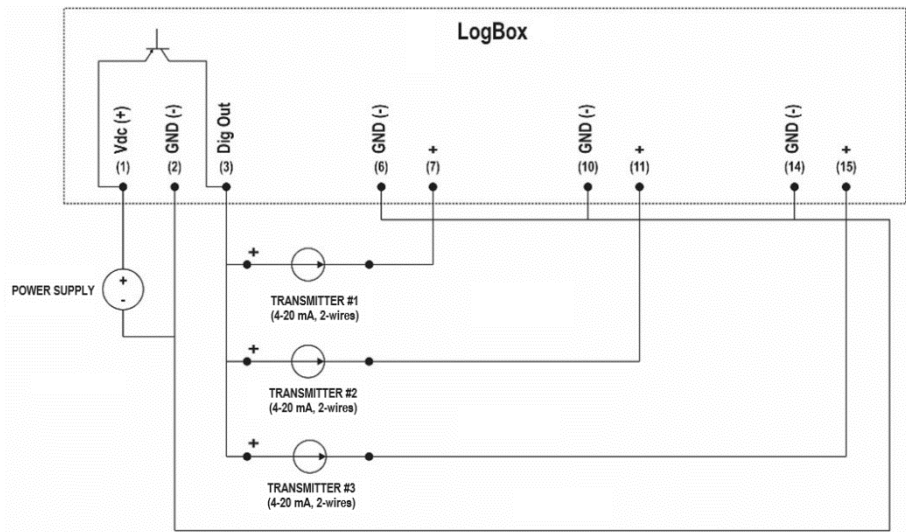
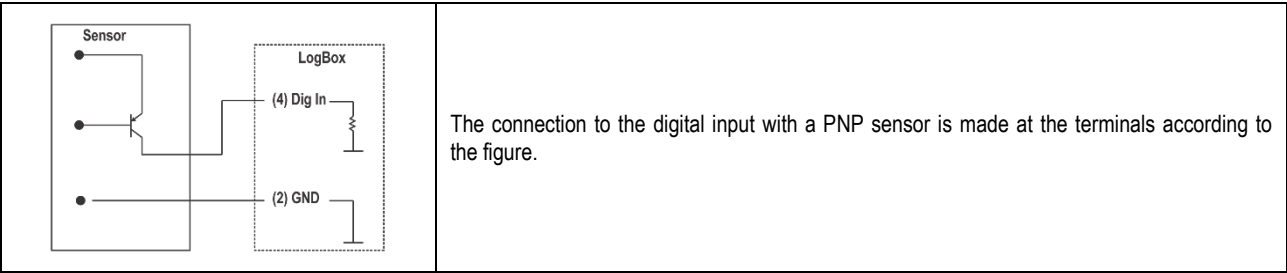
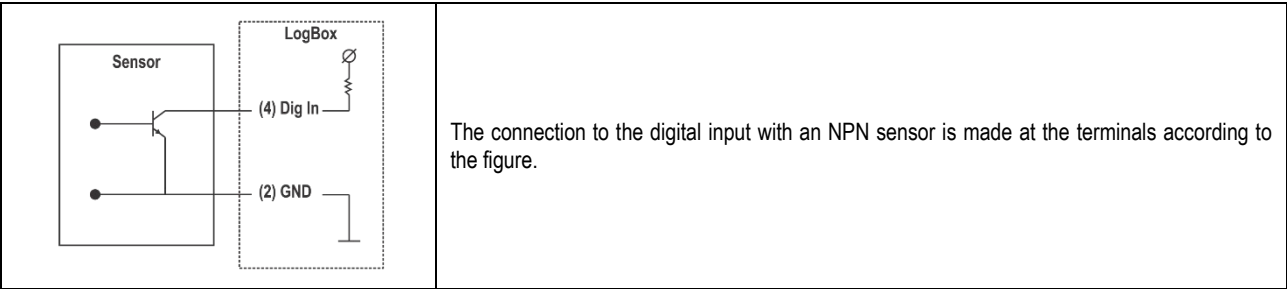


Figure 57

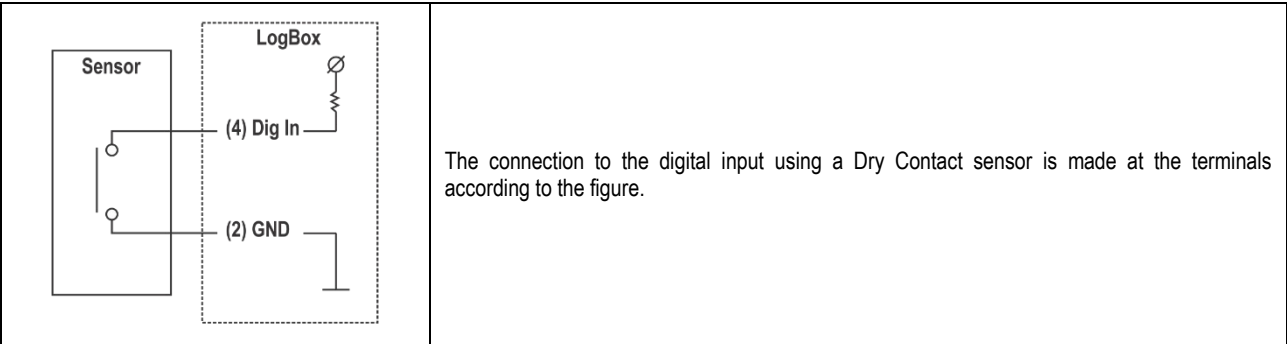
DIGITAL INPUT – PNP CONNECTION



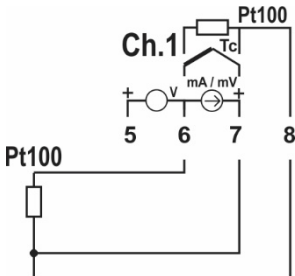
DIGITAL INPUT – NPN CONNECTION



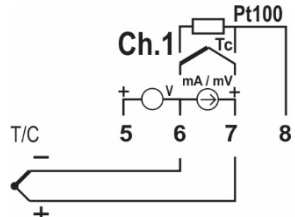
DIGITAL INPUT – DRY CONTACT CONNECTION



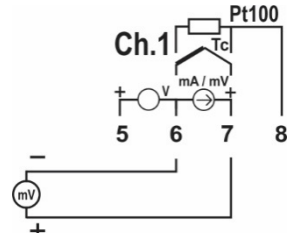
ANALOG INPUTS – Pt100 CONNECTIONS

	The connection to the channels is made at the terminals according to the figure. The 3-wire connection from the Pt100 sensor to the LogBox LTE input ensures cancellation of the error caused by wire resistance. The 3 wires should have the same gauge and length. For 2-wire Pt100, connect the RTD to terminals 7 and 8.
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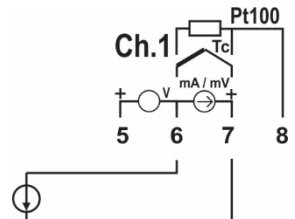
ANALOG INPUTS – THERMOCOUPLE CONNECTION

	The connection to the channels is made at the terminals according to the figure. The right connection polarity must be followed. Cables used for thermocouple connections must have the same thermoelectric characteristics as the thermocouple used (compensation cable or extension cable) and must be connected with the right polarity. Failure to use compensation cables or their use with incorrect polarity can lead to major measurement errors.
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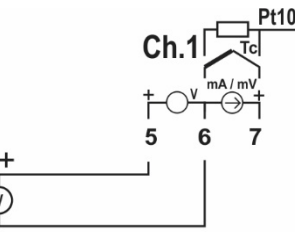
ANALOG INPUTS – VOLTAGE CONNECTION (mV)

	The connection to the channels is made at the terminals according to the figure. You must follow the right connection polarity.
--	--

ANALOG INPUTS – CURRENT CONNECTION (mA)

	The connection to the channels is made at the terminals according to the figure. You must follow the right connection polarity.
---	--

ANALOG INPUTS – VOLTAGE CONNECTION (V)

	The connection to the channels is made at the terminals according to the figure. You must follow the right connection polarity.
---	--

EXAMPLE OF CONNECTION OF 4-20 mA TRANSMITTERS POWERED BY THE CURRENT LOOP

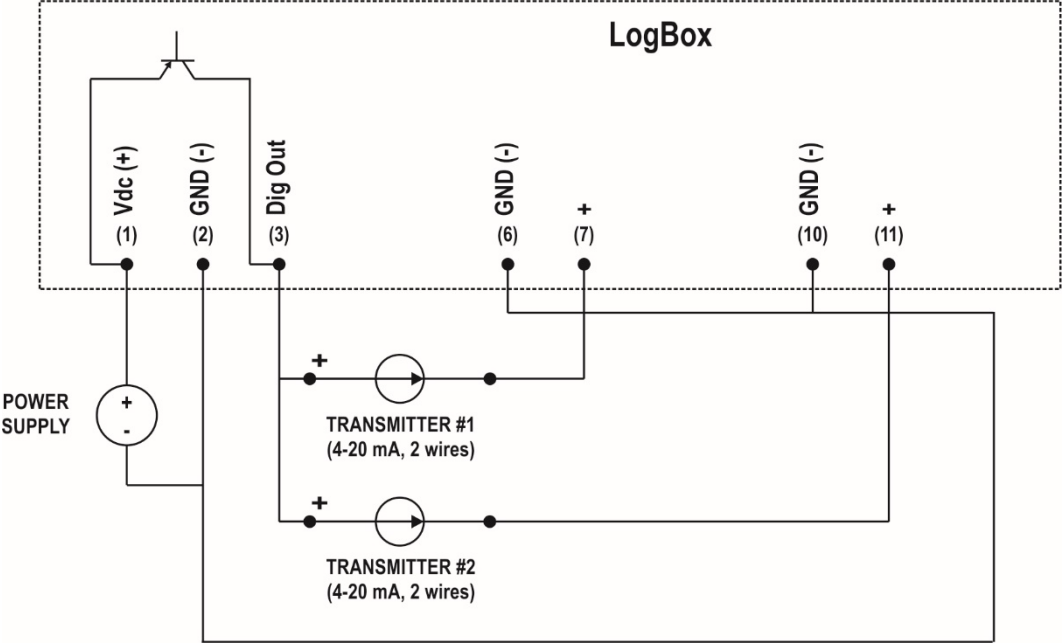


Figure 58

14. COMMUNICATION INTERFACES

14.1 USB INTERFACE

The USB interface is the preferred interface for the first configuration of the device. It is the only interface which can never be disabled. To access it, you will need to install **NXperience**, a software for Windows. The USB driver will thus be installed (see [CONFIGURATION SOFTWARE](#) chapter). A standard micro-USB cable (not supplied) must be used for desktop or notebook connection.

When connecting the USB cable, the respective icon should light up on the device's display, indicating that its interface is ready for use. For the first use, you will need to wait for Windows to automatically install the driver that comes pre-installed by **NXperience**.

NXperience will configure, monitor, and download logs from the device via USB interface.



The USB interface IS NOT ISOLATED.

It is intended for temporary use during **CONFIGURATION, MONITORING, and LOG DOWNLOAD**. For the safety of people and devices, it should only be used when the device is disconnected from the external power supply.

The USB interface can be used in any other connection condition, although the decision requires careful analysis by the person in charge of installation.

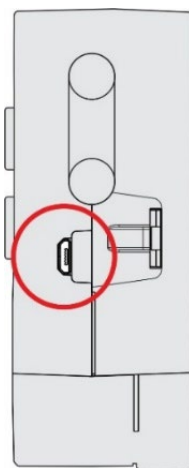


Figure 59

14.2 MOBILE INTERFACE

LogBox LTE features a mobile network interface compatible with NB-IoT, Cat.M1 and GPRS technologies, which provide data and SMS connection services.

The data connection is used to communicate with MQTT brokers, including **NOVUS Cloud**, where the device can publish the logged data or receive commands. The data connection is also used to perform automatic clock adjustment via the NTP server.

SMS services allow the device to send alarm events and respond to diagnostic commands. Both services may be enabled/disabled during configurations, which allows you to use the device only as a data logger, with or without alarms via SMS, publishing data in the cloud or not.

The identification label of the device shows the IMEI of the mobile module. It is the unique identifier of the mobile network module and may be requested by some operators.

LogBox LTE comes factory-configured with the APN information required for data connection with the main telecom operators (see table below). However, if the operator is not pre-registered in the device or the APN configurations have changed, a new APN, Login and Password can be configured via **NXperience**.

Proper APN configuration is required for the device to have access to the data network.

TELECOM OPERATORS			
Operator	APN	Login	Password
VIVO	zap.vivo.com.br	vivo	vivo
CLARO	claro.com.br	claro	claro
TIM	timbrasil.br	tim	tim
OI	gprs.oi.com.br	oi	oi
CTBC	ctbc.br	The operator does not require a value.	The operator does not require a value.
Sercontel	sercontel.com.br	The operator does not require a value.	The operator does not require a value.
Nextel	wap.nextelLTE.net.br	The operator does not require a value.	The operator does not require a value.
T-Mobile	fast.t-mobile.com	The operator does not require a value.	The operator does not require a value.

Table 31

LogBox LTE features the  symbol, which informs the mobile network status. It also has a screen that provides more detailed data on the mobile network connection (see [DISPLAY INFORMATION](#) and [NAVIGATION SCREENS](#) sections).

For the mobile network interface to operate correctly with data connection services, a SIM Card with an active data plan needs to be connected. For the mobile network interface to operate with SMS services, a SIM Card with an active SMS plan needs to be connected.

15. TROUBLESHOOTING

15.1 START/STOP MODES

Depending on the Start/Stop rule configured in the device, it may lose information if it is to continue registering data after a power outage or not. Logging start and end modes **By Keyboard**, **By Software**, or **By Digital Input** may be lost when the device is powered on.

Immediate Start, **Date/Time**, or **Daily** logging start and end modes will resume when the device is powered on again and is able to restart the clock.

15.2 CLOCK

If date/time syncing is disabled, the device will use the user-configured date/time, not correcting it until a new configuration is applied. As such, in the event of a power outage, **LogBox LTE** will not be able to reset the clock on its own. The device will thus not log anything until the clock is reconfigured.

If automatic syncing is enabled, the device will automatically resume data logging and publication after power returns.

15.3 ALARM INFORMATION

Alarm information, maximum and minimum values reached in each channel, as well as date/time of the last event are data that can be lost if the device remains powered off for more than 30 minutes. The data logged at the logging frequency or the digital input events, if configured for **Event Log**, are the only data that are will not be lost (unless a new configuration is applied, or you choose to clear the memory).

NXperience has a function to report the maximum and minimum logged values, as well as indicating the logs in alarm condition.

15.4 MOBILE INTERFACE

- If the mobile network interface signal is poor or not working, the following possibilities should be checked:
 - Make sure the mobile antenna is connected to the right place, always at the first side slot.
 - Check whether there is a data plan contracted for the SIM Card inserted in the device.
 - Check whether there is any problem with the SMS plan.
 - Check whether the device is in an area without coverage.
 - Check whether the SIM Card is presenting any loose contact problems.
 - Check to see if the SIM Card is burned.
 - Check the APN connection required by the operator.
 - Check whether the USB cable is connected and if the device is not connected to an external power supply. The mobile network interface does not operate in these conditions.
- If the wireless symbol is off or flashing, see [DISPLAY AND NAVIGATION](#) chapter.
- To perform a diagnostic on the SIM Card used in **LogBox LTE**, use the **DiagSIM** function in the app **NXperience Next** (see [USING THE DIAGSIM FUNCTION](#) section).

15.5 MQTT CONFIGURATION

When using the MQTT connection, it is possible to remotely configure the device. This feature depends on the signal quality of the network to which the **LogBox LTE** is connected. If the signal quality is poor and considering the packet traffic that this feature requires, even if the device is connected to the MQTT Broker, it is not certain that the configuration will be carried out.

Immediately after sending the configuration, the device will restart to apply all the changed parameters. It may take a few minutes for **LogBox LTE** to finish applying the parameters and reconnect to the network and the MQTT Broker.

If it is not possible to read the settings via MQTT, check that:

- The device is connected to the MQTT Broker.
- The signal quality reported by the device is acceptable. Typically, an LTE connection (Cat.M or NB-IoT) with a signal quality greater than -90 dbm is considered acceptable. You can check the signal value on the display of **LogBox LTE** or via the **NXperience** software.

As this feature is prone to instability, we recommend checking that the time of the last configuration coincides with the time of sending after sending a configuration via MQTT. To check, wait for at least 1 minute after sending, until the device reconnects to the MQTT Broker, and consult the time of the last configuration in the diagnostics area of the **Miscellaneous** section (see [MISCELLANEOUS](#) section).

15.6 BACKUP POWER BATTERY

If the device temperature is below or above the specification (see [TECHNICAL SPECIFICATIONS](#) chapter), the backup battery will not charge.

If it is noted that the battery is no longer able to retain charge, it is recommended to leave the device on and without a SIM card for at least 24 hours. Check the battery operation after this period. Having been unable to return to normal, contact the manufacturer or authorized service provider to perform the replacement.

The backup battery may present fluctuations due to the mobile data communications of the device (when the device communicates via mobile network interface, the battery voltage and percentage will naturally fall). The device will shut down automatically when it detects that the voltage has dropped to a critical level.

15.7 ANALOG INPUTS

When a device that is connected to the mains (a thermocouple or voltage simulator, for example) is used in the analog inputs and is not isolated, it is recommended to use a reading interface other than USB. In some cases, due to the influence of the USB cable connection, noise and Offsets have been detected in the reading.

Configuring the local grid frequency (50 Hz or 60 Hz) is important for improving the performance of analog channel reading, even if the device is running on battery power. Usually, the power grid causes interference, which can be more easily mitigated if its frequency is known in the signal read by the sensors.

15.8 UNREGISTERED ALARMS

The alarm status information, as well as the maximum and minimum values reached in each channel, is refreshed by any events that trigger an acquisition, which may be readings during the log interval or the display update interval. If a channel reaches a minimum or maximum value or an alarm condition during an acquisition other than the logging interval, it may not be registered in the memory. As such, statuses may indicate that the channel has already reached one of these situations and that the information is not available in a download.

The log interval must be configured according to the maximum period allowed by the process being monitored, so that no important information is lost (or stops being registered).

15.9 LIMIT OF EVENTS SENT BY SMS

Sending SMS is a relatively slow process and takes on average 5 seconds to send each SMS to each recipient. **LogBox LTE** supports a circular queue of 10 events for sending SMS. If more than 10 events occur simultaneously, the oldest events will be discarded, giving way to the newest ones.

All events will be treated, although it may be possible that, in certain circumstances, not all SMS will be sent (see [SMS](#) chapter).

15.10 FIRMWARE RECOVERY

If you need to recover the firmware after problems when updating it, follow the steps below:

- Try to perform the firmware update process again.
- If the device is not recognized by **NXperience**, use the shortcut **Ctrl + Shift + F12** on the software home screen to access the firmware update screen.
- If the previous procedure did not work, turn the device off and on again, holding down both keys – which will initialize the Bootloader mode. Use the shortcut described above to access the **NXperience** firmware update screen.

15.11 PROBLEMS WHEN COMMUNICATING WITH THE DEVICE VIA USB INTERFACE OR DURING FIRMWARE UPDATE

If you have problems communicating with the device via the USB interface or there are problems during firmware update, it is recommended to perform the following procedure to speed communication and minimize incompatibility issues:

- a. Open the Device Manager.
- b. Open the COM port setting of the device.
- c. Open advanced COM port configuration options:

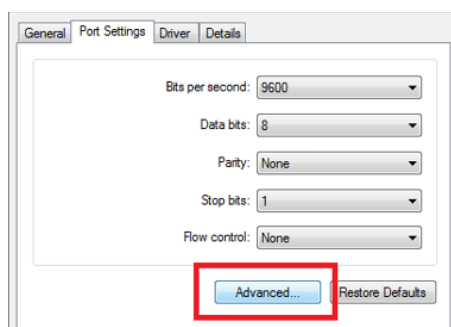


Figure 60

- d. Uncheck the **Use FIFO buffers** option:

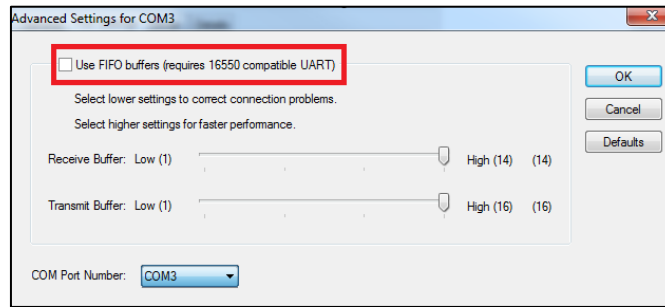


Figure 61

15.12 FIRMWARE UPDATE

If there are problems during the firmware update, it is recommended to perform the following procedure:

- Before upgrading the firmware, verify if the latest version of **NXperience** has been installed.
- If a failure occurs during firmware update, the software will display an error message.
- Click **OK** and verify if the device is still available for the update. If it is, click on **Program** again:

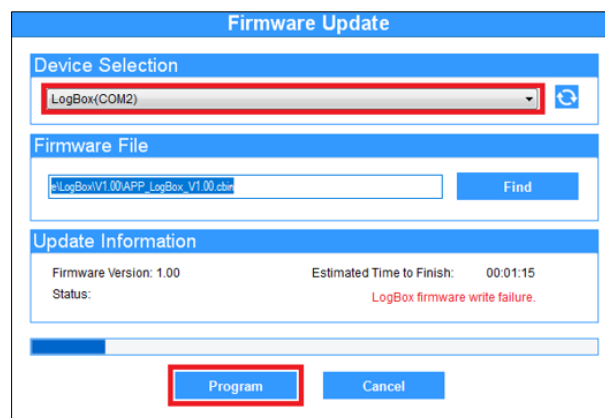


Figure 62

- If **NXperience** has been closed and/or it is no longer possible to find the device on the update screen, it is necessary to close the **NXperience**, turn off your **LogBox LTE** and reconnect the device to the USB interface for a new attempt.
- In case **NXperience** presents an error while reading the configuration, and the device display is off, you must go back to the **NXperience** home screen and press **Ctrl + Shift + F12** keys simultaneously. This will cause the firmware update screen to reappear:

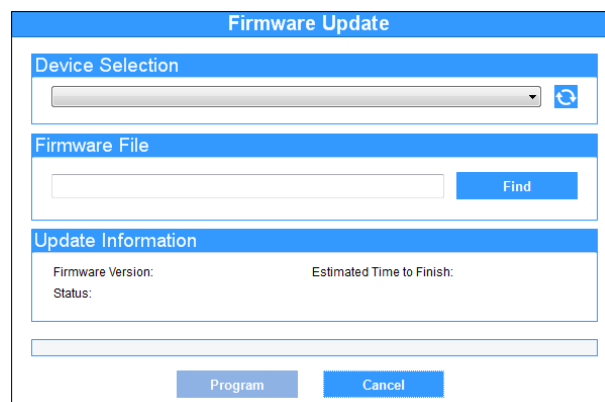


Figure 63

- Try to update the firmware again.
- If the device cannot be found in **Step E**, turn off your **LogBox LTE** and switch it back on again, keeping both keys pressed. After that, repeat **Step E**.
- In case of failure during previous procedures, contact **NOVUS** Technical Support.

16. TECHNICAL SPECIFICATIONS

FEATURES	LOGBOX LTE	
Input channels	2 Analog 1 Digital	
Compatible analog signals	J, K, T, N, E, R, S, and B Thermocouples, Pt100, 0-50 mV, 0-5 V, 0-10 V, 0-20 mA, 4-20 mA	
Internal measurements	Internal Temperature (NTC) Battery Voltage External Power Supply Voltage	
Analog channel input impedance	Thermocouples / Pt100 / mV: > 2 MΩ mA: 15 Ω + 1.5 V V: 1 MΩ	
Pt100	Maximum compensation cable resistance: 25 Ω Excitation current: 166 μA Curve used: $\alpha = 0.00385$	
Digital input	Logical levels	Logical Level "0": From 0 to 0.5 VDC Logical level "1": From 3 to 30 VDC
	Maximum voltage	30 Vdc
	Input impedance	270 kΩ
	Input current @ 30 VDC (typical)	150 μA
	Maximum frequency (square wave)	Dry Contact: 10 Hz, PNP: 2 kHz, NPN: 2 kHz
	Minimum pulse duration	Dry Contact: 50 ms, PNP: 250 μs, NPN: 250 μs
Digital output	1 NPN-type output Maximum current that can be switched at output: 700 mA	
Display	3 lines, 4½ digits	
Resolution	Analog Signals: 15 bits (32768 levels) Digital Signal: 16 bits (65536 levels)	
Memory capacity	140,000 logs (total)	
Logging interval	1 second to 12 hours (recommended: 300 seconds)	
Log type	Instant or Medium	
Log trigger	Date/time, keyboard, digital input, software command or SMS	
Alarms	10 alarms available (they may trigger the digital output, internal buzzer and send SMS)	
Communication interfaces	USB NB-IoT (NB1 and NB2, compatible with 5G and 4G), Cat.M1 (compatible with 5G and 4G), fallback to GPRS/GSM/2G and SMS	
Communication protocols	MQTT with TLS 1.2 NTP	
Brokers MQTT	AWS, Azure ² , NOVUS Cloud, and generic Broker	
Software	NXperience (for PC via USB or remotely via NOVUS Cloud)	
Power supply	Power supply	Voltage: 10 VDC to 30 VDC Maximum Consumption: 700 mA Typical Consumption: 70 mA
	Backup batteries	Internal rechargeable battery
Estimated backup battery life	Up to 80 hours in "Log and Publish" economy mode configured with a publishing interval of at least 15 minutes ^{3,4}	

² In development.

³ Risk of explosion: Internal batteries may only be replaced by the manufacturer or authorized service provider.

FEATURES	LOGBOX LTE
Operating temperature	Using Power Supply: -20 to 60 °C ⁵ Using Backup Power: 0 to 45 °C ⁶
Housing	ABS+PC
Protection Index	IP40
Dimensions	120 x 100 x 40 mm (without antenna)

Table 32

16.1 SENSOR RANGE AND ACCURACY

	SENSOR	MINIMUM SENSOR VALUE	MAXIMUM SENSOR VALUE	SENSOR RESOLUTION	ACCURACY (%)
Thermocouples	J	-100.0 °C -148.0 °F	760.0 °C 1400.0 °F	0.1 °C 0.2 °F	0.15 % (F. S. ⁷) ±1 °C ±1.8 °F
	K	-150.0 °C -238.0 °F	1370.0 °C 2498.0 °F	0.1 °C 0.2 °F	0.15 % (F. S.) ±1 °C ±1.8 °F
	T	-160.0 °C -256.0 °F	400.0 °C 752.0 °F	0.1 °C 0.2 °F	0.15 % (F. S.) ±1 °C ±1.8 °F
	N	-270.0 °C -454.0 °F	1300.0 °C 2372.0 °F	0.1 °C 0.2 °F	0.15 % (F. S.) ±1 °C ±1.8 °F
	E	-90.0 °C -130 °F	720.0 °C 1328.0 °F	0.1 °C 0.2 °F	0.15 % (F. S.) ±1 °C ±1.8 °F
	R	-50.0 °C -58.0 °F	1760.0 °C 3200.0 °F	0.3 °C 0.5 °F	0.15 % (F. S.) ±1 °C ±1.8 °F
	S	-50.0 °C -58.0 °F	1760.0 °C 3200.0 °F	0.4 °C 0.7 °F	0.15 % (F. S.) ±1 °C ±1.8 °F
	B	500.0 °C 932.0 °F	1800.0 °C 3272.0 °F	0.4 °C 0.7 °F	0.15 % (F. S.) ±1 °C ±1.8 °F
Pt100	Pt100	-200.0 °C -328.0 °F	650.0 °C 1202.0 °F	0.1 °C 0.2 °F	0.15 % (F. S.)
Linear	0 to 50 mV	0.000	50.000	0.003 mV	0.15 % (F. S.)
	0 to 5 V	0.000	5.000	0.6 mV	0.15 % (F. S.)
	0 to 10 V	0.000	10.000	0.6 mV	0.15 % (F. S.)
	0 to 20 mA	0.000	20.000	0.001 mA	0.15 % (F. S.)
	4 to 20 mA	4.000	20.000	0.001 mA	0.15 % (F. S.)

⁴ Battery autonomy depends on the strength of the mobile network signal and the technology (NB-IoT, Cat.M1, or GPRS) to which the device is connected.

⁵ Risk of explosion: Be careful with the device's operating temperature. Extremely high or low temperatures can cause ruptures and leaks in backup batteries and cause damage.

⁶ Backup batteries will be charged only while the device is operating in the temperature range from 0 to 45 °C.

⁷ F. S. = Full Span / Full Scale

	SENSOR	MINIMUM SENSOR VALUE	MAXIMUM SENSOR VALUE	SENSOR RESOLUTION	ACCURACY (%)
Digital Input	Count Mode	0	65535		0.01 % (F. S.)
Internal Sensors	Temperature (NTC)	-40 °C -40 °F	125.0 °C 257.0 °F	0.1 °C 0.1 °F	0.15 % (F. S.) ±1 °C ±1.8 °F
	Battery Voltage	3.2 V	4.2 V	0.01 V	2 % (F. S.)
	External Power Supply Voltage	4.5 V	30 V	0.01 V	2 % (F. S.)

Table 33

Accuracy: The sensor accuracy reading is measured in relation to Full Scale and is proportional to the maximum range measured at each sensor. For a Pt100 sensor, for example, in which **LogBox LTE** can read in the range from -200 °C to 650 °C, with 0.15 % precision, the accuracy in °C will be $(650\text{ °C} - 200\text{ °C}) \cdot 0.15\% = 1.28\text{ °C}$.

Thermocouples: The analog input circuit for **LogBox LTE** ensures the specified accuracy in the thermocouple sensor reading with a maximum cable impedance of 100 Ω. Thermocouple sensors with impedance above 100 Ω are read by **LogBox LTE**. Accuracy, however, is not guaranteed. For reading thermocouple sensors, **LogBox LTE** uses the internal temperature sensor for Cold Joint compensation. Just like the internal temperature sensor, thermocouples may present a greater error than specified when there are sudden variations in ambient temperature. The specified accuracy is only guaranteed when the device is installed in an environment with stable temperature for longer than one hour.

Pt100: The **LogBox LTE** analog input circuit guarantees the accuracy specified in reading PT100 type sensors with a maximum cable resistance of up to 25 Ω. The device can read sensors with cables that have resistance above 25 Ω, but in these cases, the accuracy and measurement range are not guaranteed. **LogBox LTE** performs the cable resistance compensation internally if it is equal in the three wires connecting the device to the sensor.

Linear 0 to 50 mV: The analog input circuit for **LogBox LTE** ensures the specified accuracy when reading electrical voltage magnitudes from 0 to 50 V and with a maximum cable impedance of up to 100 Ω. Voltage sources with series impedance above 100 Ω can be read by **LogBox LTE**. Accuracy, however, is not guaranteed.

Linear 0 to 5 V and 0 to 10 V: The analog input circuit for **LogBox LTE** ensures the specified accuracy when reading electrical voltage magnitudes from 0 to 5 V and 0 to 10 V with a maximum cable impedance of up to 200 Ω. Voltage sources with series impedance above 200 Ω can be read by **LogBox LTE**. Accuracy, however, is not guaranteed.

Linear 0 to 20 mA and 4 to 20 mA: All **LogBox LTE** input channels have common grounding between each other and with the power supply. Hence, for **LogBox LTE** to be able to correctly measure current transmitters, they need to be powered by isolated sources or by using all current transmitters with the grounding interconnected.

Digital Input: All **LogBox LTE** input channels have common grounding between each other and with the power supply. For **LogBox LTE** to correctly measure the digital input sensor, this characteristic must be considered. For correct detection of the logical levels of the sensor connected to the digital input, the maximum series impedance with the sensor should be less than 10 kΩ.

Internal Temperature Sensor: **LogBox LTE** has an NTC-type internal temperature sensor that can be used for monitoring ambient temperature. This sensor is used for the Cold Joint compensation of thermocouples. Because it is located inside the device's casing, it may present a greater error than specified when there are abrupt variations in ambient temperature. The specified accuracy is only guaranteed when the device is installed in an environment with stable temperature for longer than one hour. The sensor allows for readings in a range from -40 °C to 125 °C. The temperature, however, is limited to the device's operating range.

16.2 WIRELESS CONNECTIVITY

LogBox LTE has an embedded wireless connectivity module for communication with mobile phone networks. The mobile connectivity module used is the EXS82-W, from the manufacturer Telit Cinterion, which provides data and SMS connectivity via GPRS, EDGE, LTE Cat. M1, Cat. NB1, and Cat. NB2.

RF	TECNOLOGIES	UPLINK (TX) [MHz]	DOWNLINK (RX) [MHz]	MAXIMUM OUTPUT POWER
LTE 2100 Band 1	Cat. M1 and Cat. NB1/2	1920 – 1980	2110 – 2170	20 dBm (± 2 dBm) Class 5
LTE 1800 Band 2	Cat. M1 and Cat. NB1/2	1850 – 1910	1930 – 1990	20 dBm (± 2 dBm) Class 5
LTE 1900 Band 3	Cat. M1 and Cat. NB1/2	1710 – 1785	1805 – 1880	20 dBm (± 2 dBm) Class 5
LTE AWS-1 Band 4	Cat. M1 and Cat. NB1/2	1710 – 1755	2110 – 2155	20 dBm (± 2 dBm) Class 5
LTE 850 Band 5	Cat. M1 and Cat. NB1/2	824 – 849	869 – 894	20 dBm (± 2 dBm) Class 5
LTE 900 Band 8	Cat. M1 and Cat. NB1/2	880 – 915	925 – 960	20 dBm (± 2 dBm) Class 5
LTE 700 Band 12	Cat. M1 and Cat. NB1/2	699 – 716	729 – 746	20 dBm (± 2 dBm) Class 5
LTE 700 Band 13	Cat. M1 and Cat. NB1/2	777 – 787	746 – 756	20 dBm (± 2 dBm) Class 5
LTE 800 Band 18	Cat. M1 and Cat. NB1/2	815 – 830	860 – 875	20 dBm (± 2 dBm) Class 5
LTE 800 Band 19	Cat. M1 and Cat. NB1/2	830 – 845	875 – 890	20 dBm (± 2 dBm) Class 5
LTE 800 Band 20	Cat. M1 and Cat. NB1/2	832 – 862	791 – 821	20 dBm (± 2 dBm) Class 5
LTE 1900 Band 25	Cat. M1 and Cat. NB1/2	1850 – 1915	1930 – 1995	20 dBm (± 2 dBm) Class 5
LTE 800 Band 26	Cat. M1 and Cat. NB1/2	814 – 849	859 – 894	20 dBm (± 2 dBm) Class 5
LTE 800 Band 27	Cat. M1	807 – 824	852 – 869	20 dBm (± 2 dBm) Class 5
LTE 700 Band 28	Cat. M1 and Cat. NB1/2	703 – 748	758 – 803	20 dBm (± 2 dBm) Class 5
LTE AWS-3 Band 66	Cat. M1 and Cat. NB1/2	1710 – 1780	2110 – 2200	20 dBm (± 2 dBm) Class 5
LTE 600 Band 71	Cat. NB1/2	663 – 698	617 – 652	20 dBm (± 2 dBm) Class 5
LTE 700 Band 85	Cat. M1 and Cat. NB1/2	698 – 716	728 – 746	20 dBm (± 2 dBm) Class 5
GSM 850	GPRS/EDGE	824 – 849	869 – 894	33 dBm (± 2 dBm) Class 4 27 dBm (± 3 dBm) Class E2
E-GSM 900	GPRS/EDGE	880 – 915	925 – 960	33 dBm (± 2 dBm) Class 4 27 dBm (± 3 dBm) Class E2
DCS 1800	GPRS/EDGE	1710 – 1785	1805 – 1880	30 dBm (± 2 dBm) Class 1 26 dBm (± 3 dBm) Class E2
PCS 1900	GPRS/EDGE	1850 – 1910	1930 – 1990	30 dBm (± 2 dBm) Class 1 26 dBm (± 3 dBm) Class E2

Table 34

16.3 CERTIFICATES

FCC

Contains FCC ID: QIPEXS82-W

This device has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the device is operated in a commercial environment. This device generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, it may cause harmful interference to radio communications.

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this device.

RF Exposure: To satisfy FCC RF exposure requirements, a separation distance of 20 cm or more should be maintained between the antenna of this device and persons during operation. To ensure compliance, operations at closer distances than this are not recommended. This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

IC

Contains IC: 7830A-EXS82W

This device complies with Industry Canada's license exempt RSS standard(s). Operation is subject to the following two conditions: (1) This device may not cause interference, and (2) This device must accept any interference, including interference that may cause undesired operation of the device.

The installation of the transmitter must ensure that the antenna has a separation distance of at least 20 cm from all persons or compliance must be demonstrated according to the ISED SAR procedure.

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotopically radiated power (EIRP) is not more than that necessary for successful communication.

ANATEL

This device is homologated by ANATEL, according to the regulated procedures for conformity assessment of telecommunications products, and meets the technical requirements applied.

This equipment is not subject to the protection from harmful interference and may not cause interference with duly authorized systems.

For more information, see ANATEL website: www.anatel.gov.br.

VIBRATION TEST

The device is in accordance with vibration tests in sinusoidal vibration methods - item 6.1 and mechanical shock - item 6.2 of norm NP EM 12830 (2008).

CE MARK

This is a Class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures.

17. WARRANTY

Warranty conditions are available on our website www.novusautomation.com/warranty.