enelion

ENERGY GUARD 3.0

INSTRUCTION FOR INSTALLATION AND OPERATION

Dear user

Congratulations on purchasing an ENELION product, and thank you for your trust.

The current version of the installation and operation instructions is available at: **https://enelion.com/en/support-energy-guard**

Before undertaking any activities related to installation or startup, it is necessary to familiarize yourself with the content of this instruction.

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Important information

General provisions:

- Installation and servicing of the device must be performed by qualified and authorized persons, and repairs may only be carried out by the manufacturer or entities authorized by the manufacturer.
- Tampering with the mechanical, electrical and electronic components and the device software is forbidden and shall result in the nullification of the warranty. The exceptions include operations described herein and those agreed in writing with the manufacturer.
- The manufacturer is not responsible for damage to property resulting from the forbidden interference in the product.
- The electrical installation to be used by the device during its operation must meet the conditions described in the installation manual. The manufacturer is not responsible for incorrect assembly and/or protection of the electrical installation to which the device is connected.
- The manufacturer is not responsible for the malfunction of the electrical installation to which the device is connected.
- The electrical installation to be used by the device during its operation must comply with the legal standards in force in the place of assembly and the operation of the device.
- The manufacturer is not liable for any damage caused by an electrical installation that does not meet legal standards.
- The device does not have a built-in switch.
- The device activates when the supply voltage is applied. The power supply cut off function must be provided by the appropriate electrical installation devices described in the assembly manual. Except in emergencies, the device must not be turned off during the charging process.
- It is forbidden to supply the power to the device when the device casing remains open.
- The manufacturer is not responsible for loss of health or life by any persons resulting from failure to comply with the above-mentioned recommendations.
- The AC charger station to which the Energy Guard will be connected, must be updated to the latest software version and DLB function activation it is required, which is described in this manual.

Safety instructions

- All operations described in this manual should be performed only after making sure that there is no voltage in the power cord.
- Outdoor installation should not be carried out during precipitation or strong wind, if there is a risk of water or dirt getting into the device.

General informations

ENELION ENERGY GUARD 3.0 (EEG 3.0) is an intelligent energy meter that connects to the ENELION LUMINA charger to optimize the utilization of available electrical power in a home. ENELION ENERGY GUARD measures real-time power consumption at the electrical connection point and sends measurement results to the ENELION LUMINA charger, allowing the charger to limit its charging power to avoid exceeding the maximum power supplied by the connection. Current measurement is performed using current transformers, significantly simplifying the installation.

Fig. 1: Example of installing ENELION ENERGY GUARD 3.0 in the network

Example of installing ENELION ENERGY GUARD 3.0 in the network: ENELION ENERGY GUARD 3.0 communicates wirelessly with ENELION LUMINA chargers using Wi-Fi Mesh. The connection configuration is described in the '**Connecting ENELION ENERGY GUARD to the ENELION charger network**' chapter on page 18.

Normally, ENELION ENERGY GUARD comes with a set of current transformers selected at the time of ordering. One current transformer is allocated for each phase. Using current transformers with different parameters will result in incorrect measurements.

Current transformers are available in various measuring ranges, from 50 A to even 3000 A. Current transformers with a maximum input current of 100 A and 300 A have a hole diameter of 26 mm, while those with 500 A or 1000 A have a diameter of 36 mm.

Fig. 2: Sample current transformer

It is possible to order only the EEG 3.0 from Enelion and purchase the appropriate current transformers separately. When purchasing current transformers individually, the following requirements must be met:

- **Secondary current: 5 A,**
- **Accuracy class no worse than 1.**

Design guidelines for installation

01 Electrical Connection Recommendation

ENELION ENERGY GUARD 3.0 is designed for supplying power in both five or three-wire configurations (excluding the protective PE wire) and is compatible with TN-S, TN-C, TN-C-S, and TT network types.

The ENELION ENERGY GUARD device can operate in either a 3-phase or 1-phase setup. This manual is based on the three-phase version. All connections should be made considering the number of phases.

02 Location Selection Criteria

The device is designed for installation inside a distribution board, near the power cables where measurement transformers should be applied.

Installation of the device in easily accessible locations is prohibited

There is the option to choose the installation location for the measurement transformers. They can be installed on the power cables supplying the building's load along with the charging stations [Figure 3] or on the power cables supplying only the building's load [Figure 4].

The device should not be placed in areas of direct sunlight that could cause overheating of the device.
Do not install the device near heat sources or in locations exposed to high humidity.
Installation of the device in explosion hazard zones is prohibited. Before installation, ensure that the mounting space inside the distribution board for the device is sufficient.

The manufacturer is not responsible for damages resulting from non-compliance with the above recommendations.

Selection of the measuring point – the location of current transformers installation. Current transformers can be installed in the distribution board in two ways.

The first method is to install them on the main incoming power cables to the distribution board. As a result, EEG will measure the current for the entire connection [Figure 3].

The second option is to install them on the power cables supplying other loads (excluding the ENELION LUMINA charging station) [Figure 4].

This information is crucial when configuring DLB in the charging station. More information about DLB configuration can be found in the ‚**Configuring DLB in the Charging Station' chapter** on page 17.

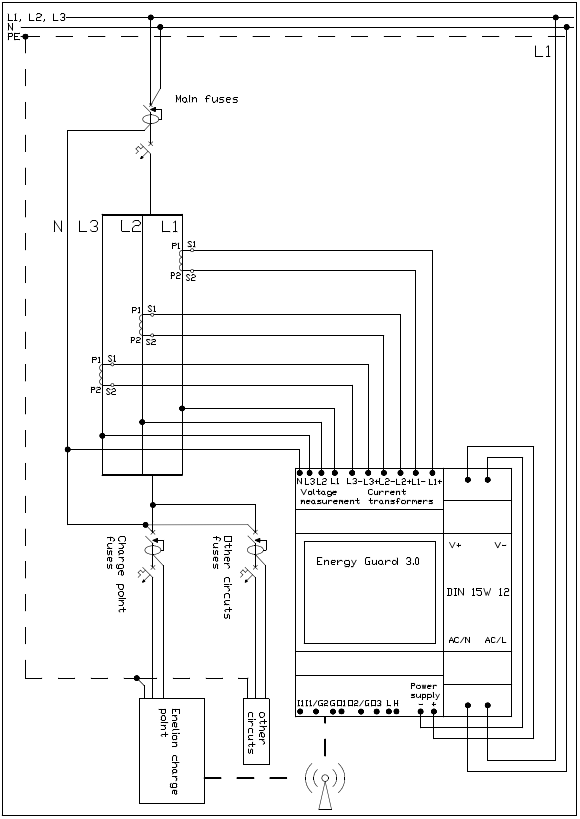

Fig. 3: Connection diagram of EEG for measuring the entire connection along with charging terminals.

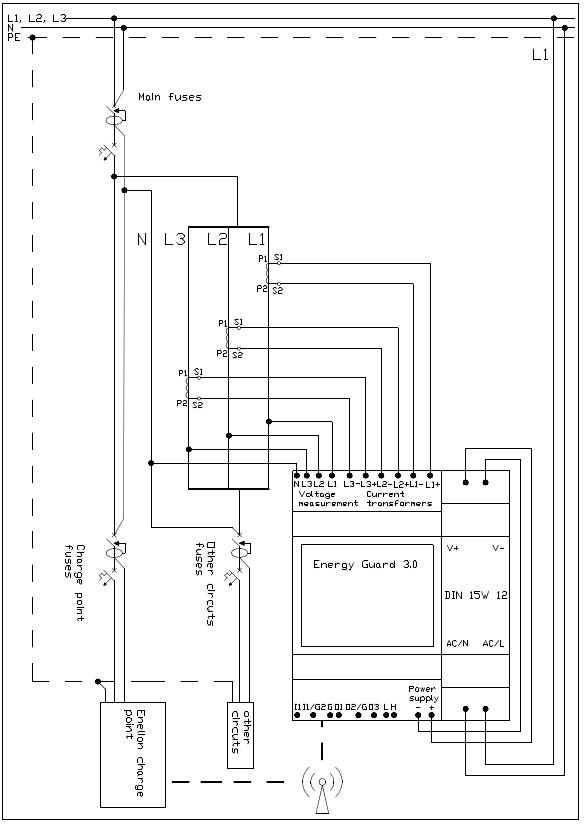

Fig. 4: Connection diagram of EEG for measuring the load excluding the charging terminals.

Installation

Before starting the installation, you must disconnect the power in the supply cables.

Fig. 5: Connection diagram for the 3-phase variant of ENELION ENERGY GUARD.

In the case of the single-phase version, only one current transformer should be connected along with its corresponding voltage circuit.

01 Device Installation

ENELION ENERGY GUARD along with the power supply is intended to be mounted on a DIN rail (TS35) inside a distribution board. The devices occupy a width of 4.5 modules, which is 8.1 cm. The 230 V AC / 12 V DC power supply and EEG 3.0 should be powered according to the diagram provided in the '**Location Selection Criteria'** chapter on page 8**.**

The current transformers should be applied to the wires of all three phases in the order marked in Figure 5.

The red arrows indicate the direction of current flow. Incorrect order or improper installation of the current transformers will prevent EEG from functioning correctly.

To apply the current transformers to the wires, disconnect the supply wires of the distribution board and insert them through the transformer from the side marked with an arrow.

The transformers must be connected to EEG with appropriately short cables. The maximum allowable cable length depends on the cross-section of the power cables. Information about allowable cable connection lengths is provided in the table below.

Cross-Section of Conductor [mm^2]	Maximum Distance [m]
0,5	0,25
1	0,5
1,5	0,75
2,5	1,25

Voltage circuits (power supply) for EEG are connected following the sequence marked on the diagram [Figure 6]. The device does not require additional electrical protection. The wires on the distribution board side should be connected to the terminals of the device located before the branching of circuits in the distribution board (e.g., a meter or the main protection in the form of a circuit breaker). We suggest using stranded wires with a core cross-section of 0.5 mm^2.

Ensure a reliable and stable voltage source. Connecting the voltage circuits of EEG to a point that serves as a branch of the installation may result in a loss of power source if the branch is disconnected, for example, by triggering its protection.

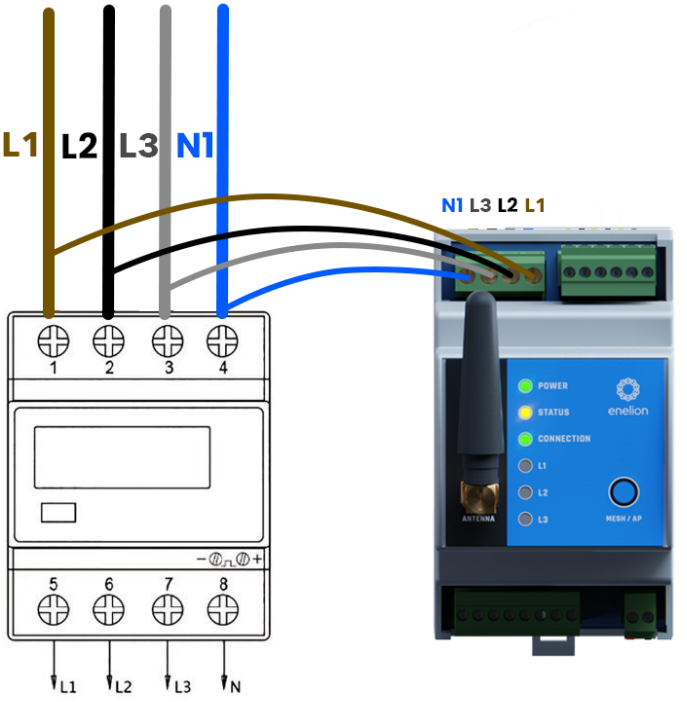

Fig. 6: Example of connecting voltage circuits to a selected device in the distribution board.

Configuration

01 Initial Setup

The device is not pre-configured to connect to any network by default, so it will start broadcasting its (unsecured) hotspot named ENELION-EG-<serial number>..

> In hotspot broadcast mode, the Connection LED will **blink** blue.
>
> You can identify a successful connection to the device's hotspot when the Connection LED **shines continuously** with a blue light.

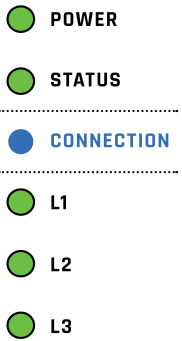

Fig. 7: EEG 3.0 LED Interface

02 Configuration Panel

To configure ENELION ENERGY GUARD, you should use the configuration panel, similar to the one available in the ENELION LUMINA charger. After connecting to the ENELION ENERGY GUARD hotspot, open a web browser and go to **192.168.8.8.**

> The ENELION ENERGY GUARD configuration panel is also designed for use on a smartphone screen.

02.1 Dashboard

The main page of the configuration panel displays basic information about the device's operation, such as voltage and current readings for each of the measured phases, uptime, and software version number.

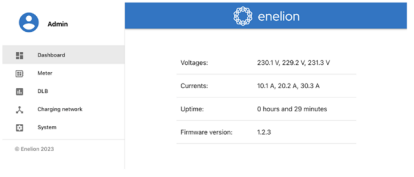

Fig. 8: View of the Dashboard section in the EEG 3.0 configuration panel

02.2 Meter Configuration

In the **Meter** section, you can view the measurement results performed by the meter, including voltage and current for each phase, and set the CT (current transformers) value. If you purchased the transformers from ENELION, set the value according to the ordered transformers. If you purchased transformers separately, you can find information about the CT value in the product's datasheet.

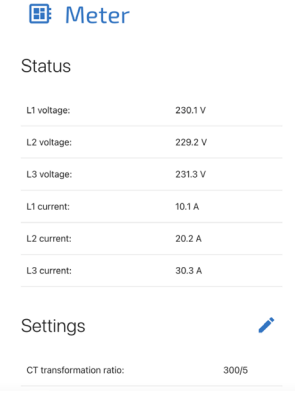

Fig. 9: View of the Meter section in the EEG 3.0 configuration panel

To set the current transformer values, click on the pencil icon on the right side of the **Settings section.**

Fig. 10: Setting the current transformer values in the configuration panel

Setting the correct value for the current transformers is necessary for ENELION ENERGY GUARD to measure current accurately.

02.3 Configuring DLB in the Charging Station

In the DLB section, you should set the current limit that household devices, along with chargers, cannot exceed You should also set the measuring point for ENELION ENERGY GUARD depending on the placement of the current transformers in the network. In the „Metering point" section, choose one of the two options:

1. "All power equipment," which measures the entire connection, including charging stations [Figure 3]..
2. „Power equipment without charging network," which measures the connection excluding the charging stations [Figure 4].

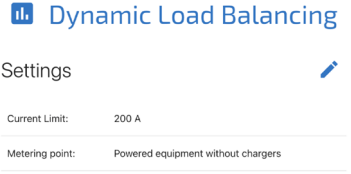

Fig. 11: View of DLB in the configuration panel..

Information about connection options along with diagrams can be found in the **'Design guidelines for installation'** chapter on page 8.

Incorrect configuration may result in improper operation of the Dynamic Load Balancing function

02.4 Connecting ENELION ENERGY GUARD to the ENELION Charging Network

ENELION ENERGY GUARD connects wirelessly to ENELION chargers.

To configure the connection between EEG and the rest of the charging network, use the Charging network section. Just like in LUMINA, you need to provide the Mesh ID and Mesh password used by the charging network you want to connect the device to. ENELION ENERGY GUARD always operates in Node mode, so there is no option to set Root/Node mode here.

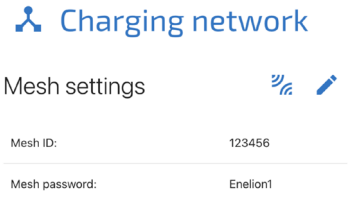

Fig. 12: Mesh connection configuration in the configuration panel

To save the Mesh network configuration, use the pencil icon and enter the correct information in the settings window. After entering the network name and password, click the connection icon next to the pencil icon to connect to the network. Since ENELION ENERGY GUARD can only operate in Hotspot or Mesh mode (it cannot operate in both modes simultaneously), attempting to connect to the Mesh network will disable the Hotspot and disconnect from the device.

Successful network connection can be verified by observing the LED indicators on the device:

- When attempting to connect, the Connection LED will **blink** green.
- When ENELION ENERGY GUARD successfully connects to the network, the LED will **shine steadily** green.
- An unsuccessful connection (e.g., incorrect connection data or no coverage) will be indicated by the Connection LED **blinking** red.

Returning to Hotspot mode and re-entering the configuration panel is possible by using the physical button on the front panel of EEG. Detailed instructions are described in the **'Daily Operation'** chapter on page 23.

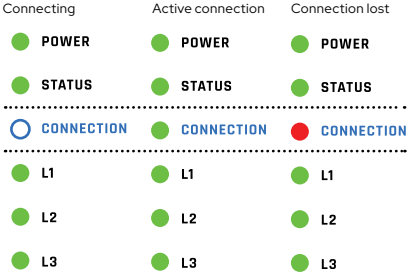

Fig. 13: Connection status indication for EEG in the Mesh network using the Connection LED

02.5 System Section

The **System** section allows you to view device information such as the serial number, model, production date, uptime, and software version number. In this section, you can also update the EEG software using the appropriate update file or perform a device restart.

Dynamic Load Balancing

01 DLB System

Dynamic Load Balancing is an intelligent load management system used during EV charging. It allows for the distribution of the total available power of the connection in a way that keeps energy consumption below a specified/safe level. It helps prevent overloads of the charging station operator's network, thus avoiding additional charges from the electricity provider. DLB also allows for the utilization of potentially available power, which is accessible even after disconnecting any car from the charging station.

02 Impact of ENELION ENERGY GUARD on DLB Operation

Connecting ENELION ENERGY GUARD to the charging station network extends DLB functionality to include other electrical devices besides charging terminals in power distribution. From this point forward, the connection limit will determine the total power allocated to the building, including charging terminals. Charging stations will adjust the charging power of vehicles in proportion to the other electrical devices, ensuring that the current limit of the connection is not exceeded.

When energy-consuming devices are active, ENELION ENERGY GUARD measures the load and transmits information about current energy consumption to the charging station. This results in a proportional reduction in available power for EV charging, preventing the risk of electrical network overload and triggering electrical protections.

ENELION ENERGY GUARD can also be used in charging terminal networks (parking, shopping center, fleet parking), allowing for the full utilization of the currently supplied energy without the need for an increase in power. During peak hours, cars can be charged with the minimum required power distributed by ENELION charging terminals. One significant advantage of using EEG is the ability to have a network of charging terminals with a total power exceeding that of the available power. With available 22 kW power for charging stations, multiple 22 kW stations can be used, always charging at maximum available power.

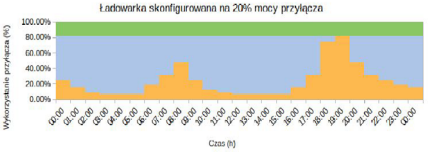

Fig. 14: DLB system missing

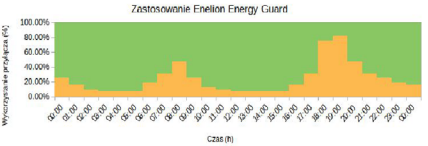

Fig. 15: Active DLB system

03 EEG operating speed

Maximum possible momentary overload*	100%
Bidirectional current measurement	Yes
Measurement point parameters	Single or three-phase system
Typical reaction time from load activation to power change	< 1.5 s
Maximum charging interruption time	3 s, according to IEC 61296

Maximum charging station reaction time to available power change	5 s, according to IEC 61296
Maximum EEG reaction time to increased current consumption	1 s
Maximum connection overload time**	9 s
Maximum connection current limit	3 kA
Maximum charging interruption time	3 s, according to IEC 61296

*The following conditions must be met:

1. The connection was fully utilized by the vehicles
2. At one point, an external load was activated, utilizing 100% of the connection.

**The following conditions must be met:

1. The connection was 100% used by cars. External load was started immediately after the last measurement by ENELION ENERGY GUARD (1-second delay).
2. The previous change in charging current occurred immediately before the load was turned on (5-second delay).
3. The connected load was large enough to require charging to be stopped.
4. The car did not respond to charging interruption from the charging station side (3-second delay).

04 Queuing

According to IEC 61296, the charging terminal cannot limit the charging current of the car below 6 A per phase. This means 1.4 kW for single-phase charging and 4.1 kW for three-phase charging. In case there is insufficient current, the charging terminal goes into a standby state. Charging will resume when the minimum charging power is available again.

Queueing aims to evenly distribute energy among all charging cars.

Daily operation

01 Connection Mode Change Button

On the front panel of the device, there is a button that switches the connection modes of ENELION ENERGY GUARD between:

- Hotspot
- Mesh

It can be used to reconnect to the configuration panel via hotspot to verify Mesh network settings when the device cannot connect to it.

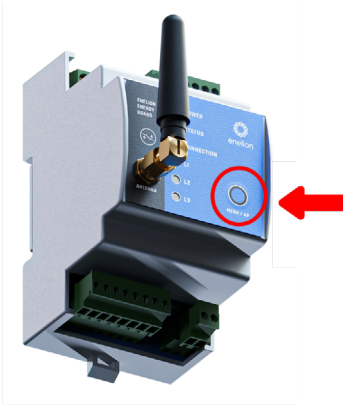

Fig. 16: Connection Mode Change Button

02 LED

In addition to the button on the front panel, there are LED indicators on the device indicating its status::

- **Power LED:** the LED always **lights up** green when the device is powered.
- **Status LED:** a **flashing** green LED indicates normal device operation. **Illumination or flashing** of this LED in red indicates a critical error. In such cases, it is recommended to contact ENELION service.

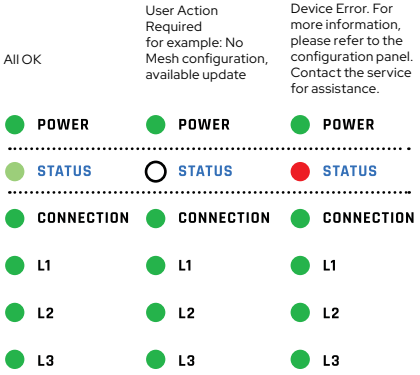

Fig. 17: Possible Status LED Indications

- **Connection LED:**
  - The LED **lights up** green when the device is connected to the Mesh network.
  - When the hotspot is turned on and ready for user connection, the LED **flashes** blue.
  - After a user connects to the hotspot, the LED will **continuously light up** in blue.
  - During an attempt to connect to the hotspot, the LED **flashes** green.
  - An unsuccessful connection is indicated by **flashing** red.

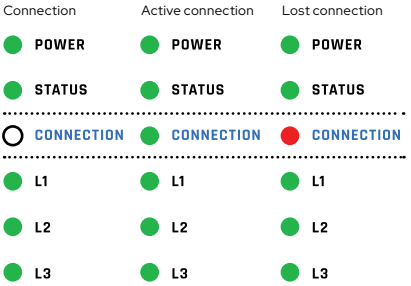

Fig. 18: Possible Connection LED Indications

- L1, L2, L3 **Phase LEDs**:
  - The LEDs **light up** green when voltage is applied to their respective phases.

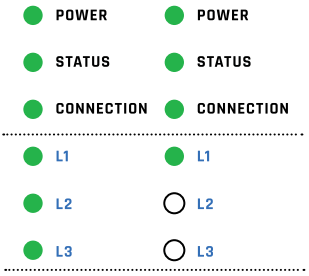

Fig. 19: Three-Phase and Single-Phase Connection Indication

03 Maintenance

The device is designed to operate in temperatures ranging from -30°C to 55°C. The manufacturer does not guarantee the correct functioning of the device if it is exposed to temperatures outside this range. Devices that have been damaged due to exposure to temperatures below -30°C or above 55°C are not covered by warranty.

The device can only be installed by a qualified and authorized person.

Technical data

Electrical data	
Nominal operating voltage EEG 3.0	12 V DC
Nominal network voltage	3 x 230 V AC (± 10%)
Nominal input voltage of the power supply	230 V AC (± 10%)
Nominal output voltage of the power supply	12 V DC
Nominal input current of the power supply	0,35 A/230 V
Nominal output current of the power supply	1,25 A
Compatible network systems	TN-C; TN-S; TN-C-S; TT
Network frequency	50 Hz
Overvoltage category	III according to EN 60664-1
Maximum measured current value	It depends on the current transformers.
Accuracy class	0,5

Mechanical data	
Enclosure	Artificial material PC/ABS, DIN rail mounting
Resistance to external factors	Mounting inside the distribution box
Maximum diameter of conductor cross-section	Depends on current transformers
External dimensions of EEG	90,5 mm x 55 mm x 62 mm
External dimensions of the power supply	98 mm x 26 mm x 53 mm

Interface	
Maximum number of charging terminals	30 units
User Interface	LED indicators on the front panel, web-based configuration panel

Environmental conditions	
Operating temperature	From -30°C to 55°C
Storage temperature	From -35°C to 55°C
Permissible relative air humidity	From 5% to 95%
Maximum installation altitude above sea level	2000 m

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