DELIOS

SUN NEVER SETS

INSTRUCTION MANUAL

- OPERATION
- INSTALLATION
- MAINTENANCE

CAREFULLY READ THIS INSTRUCTIONS BEFORE USE.

DLS 450/600 EVO
DLS 300C/450C/600C EVO

GB

TRANSLATED FROM THE ORIGINAL IN ITALIAN LANGUAGE

Code: 240.010.0051
Date: 30/06/2022
Rev.: 00

IMPORTANT SAFETY INSTRUCTIONS

This manual contains important safety information, which must be followed during the installation and maintenance operations of the equipment.
It is compulsory for the operators to read this manual and to strictly follow the instructions contained herein, as DELIOS s.r.l. shall not be accountable for injuries caused to people and/or damages to things or to the equipment if the following instructions conditions are not followed.

Fig. 00_A

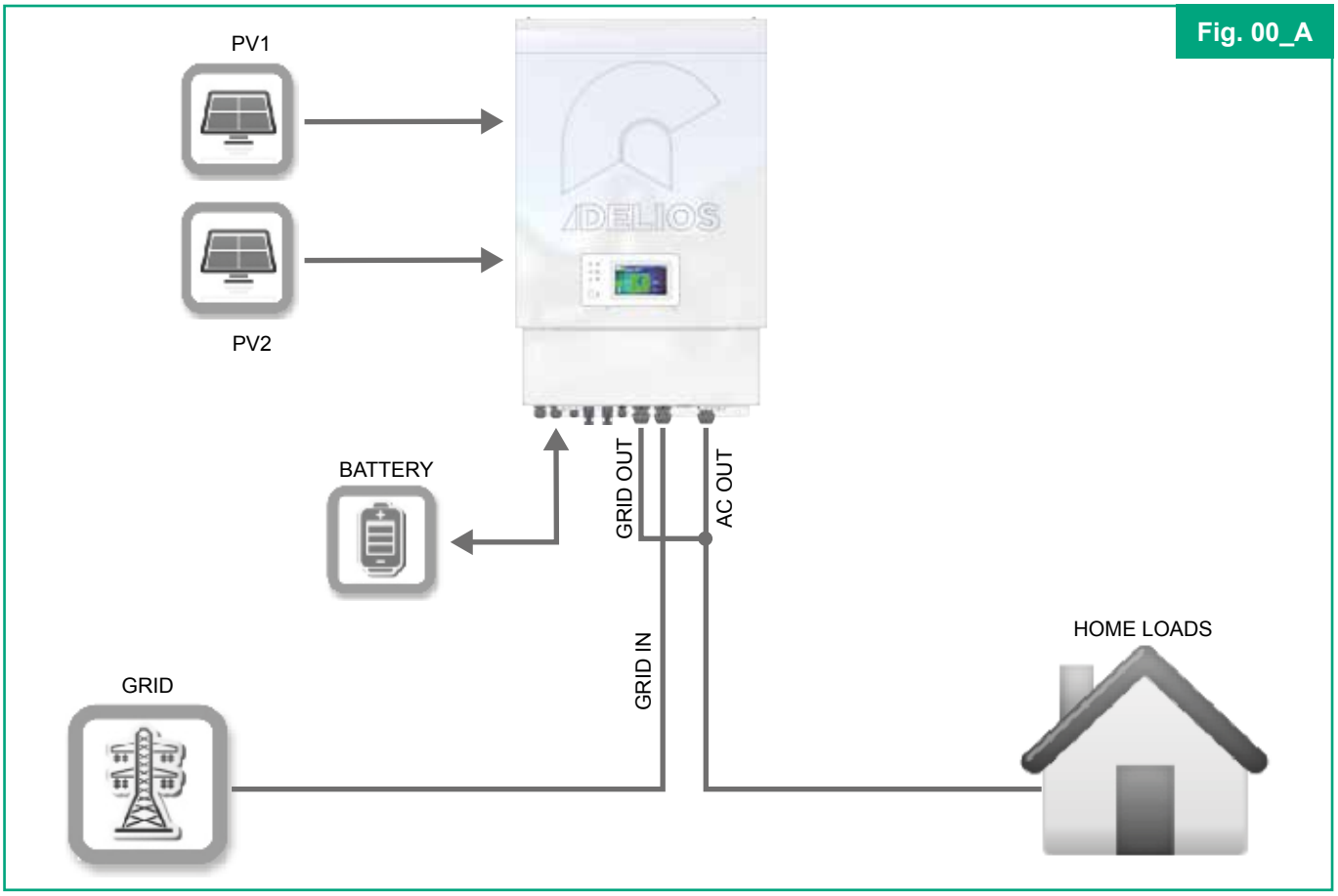
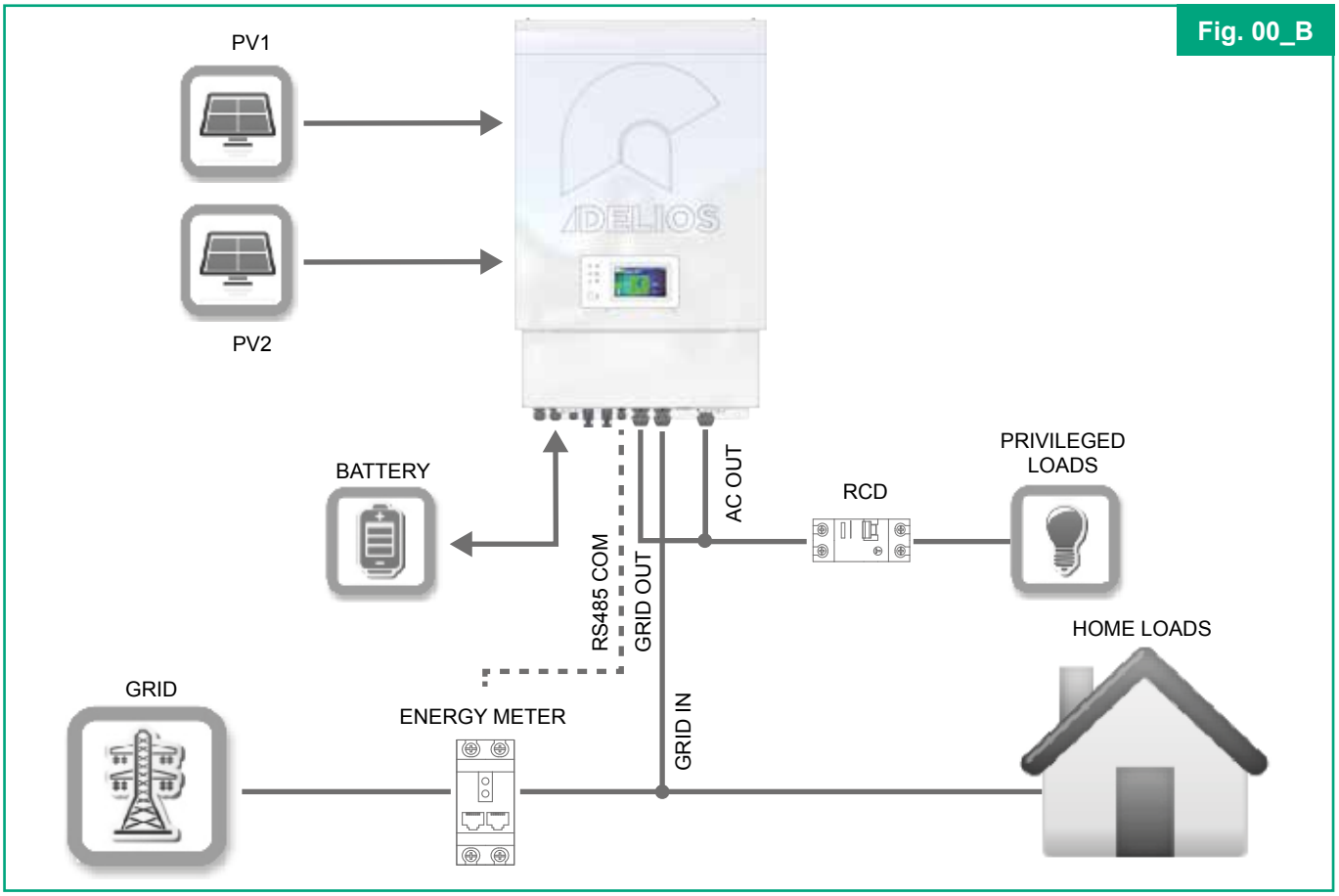


Fig. 00_B



Cod.: 240.010.0051

Fig. 00_C

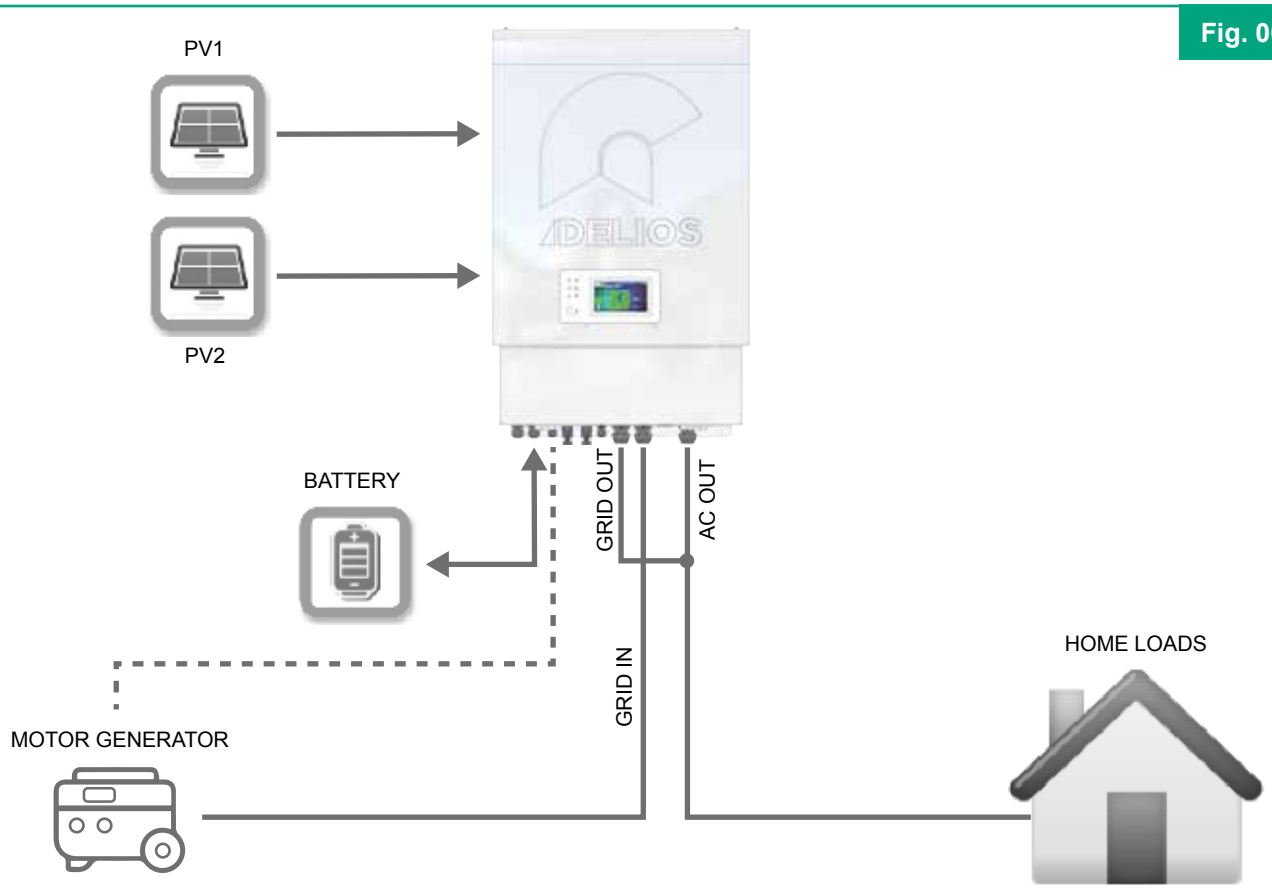


Fig. 00_D

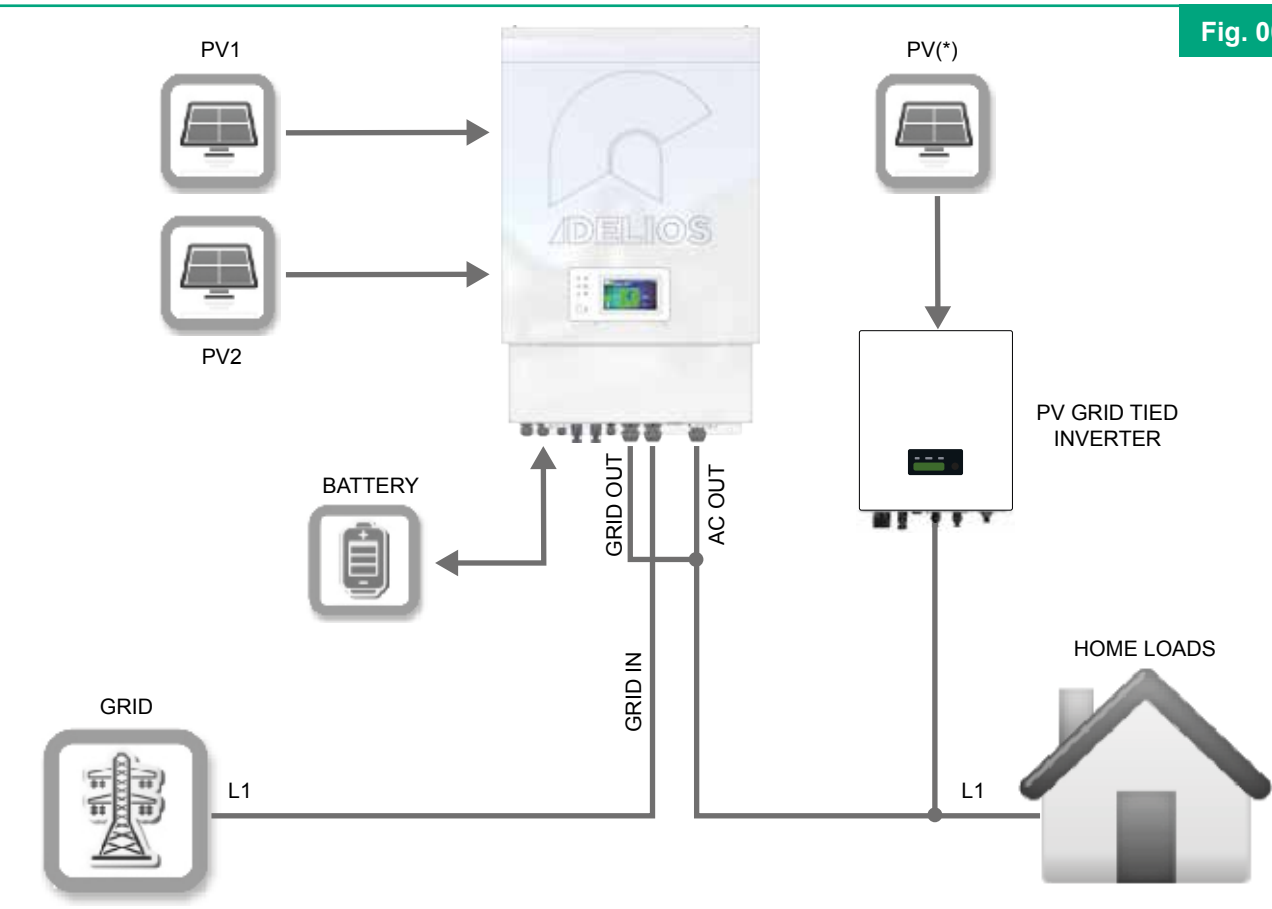


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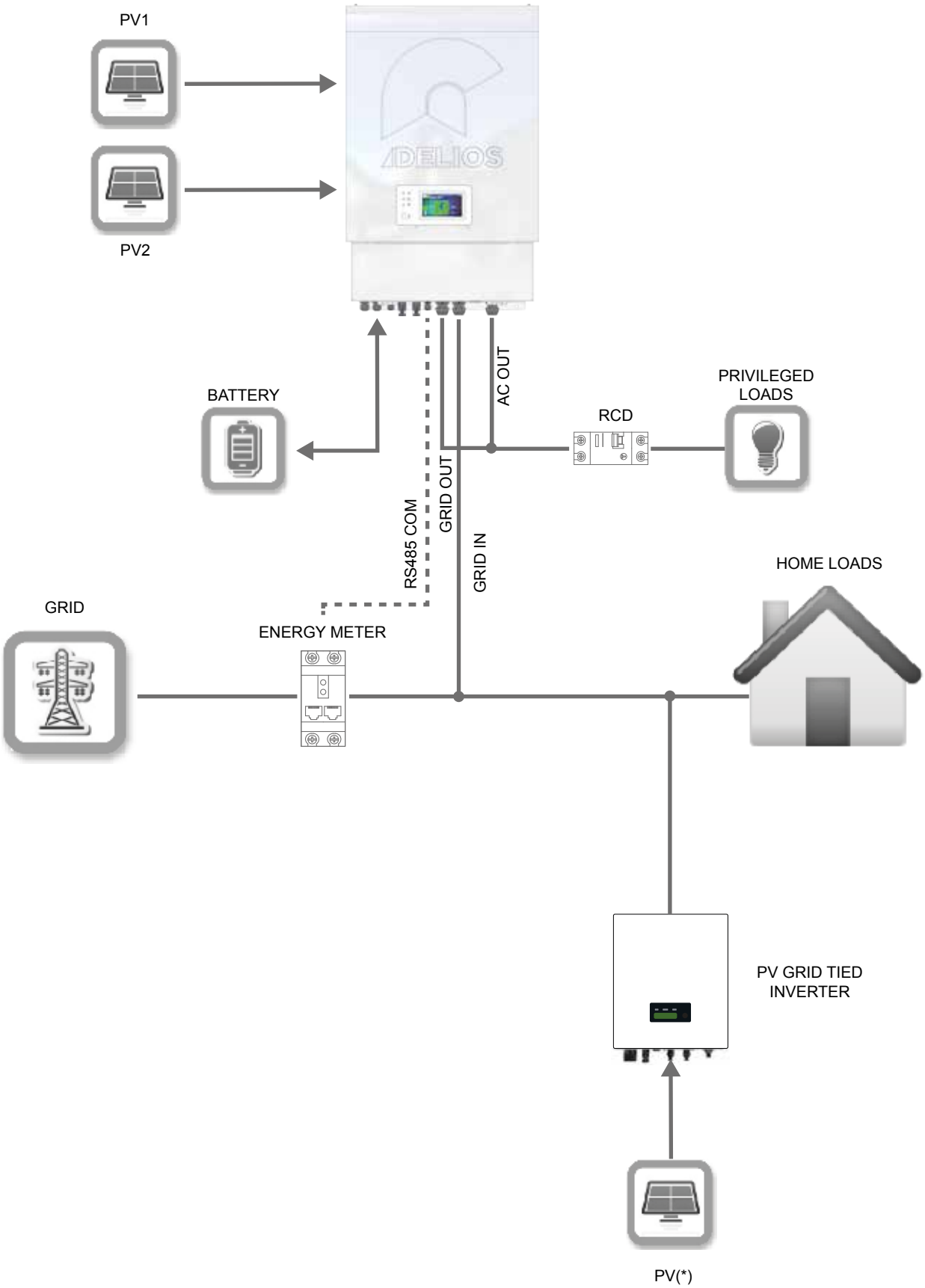
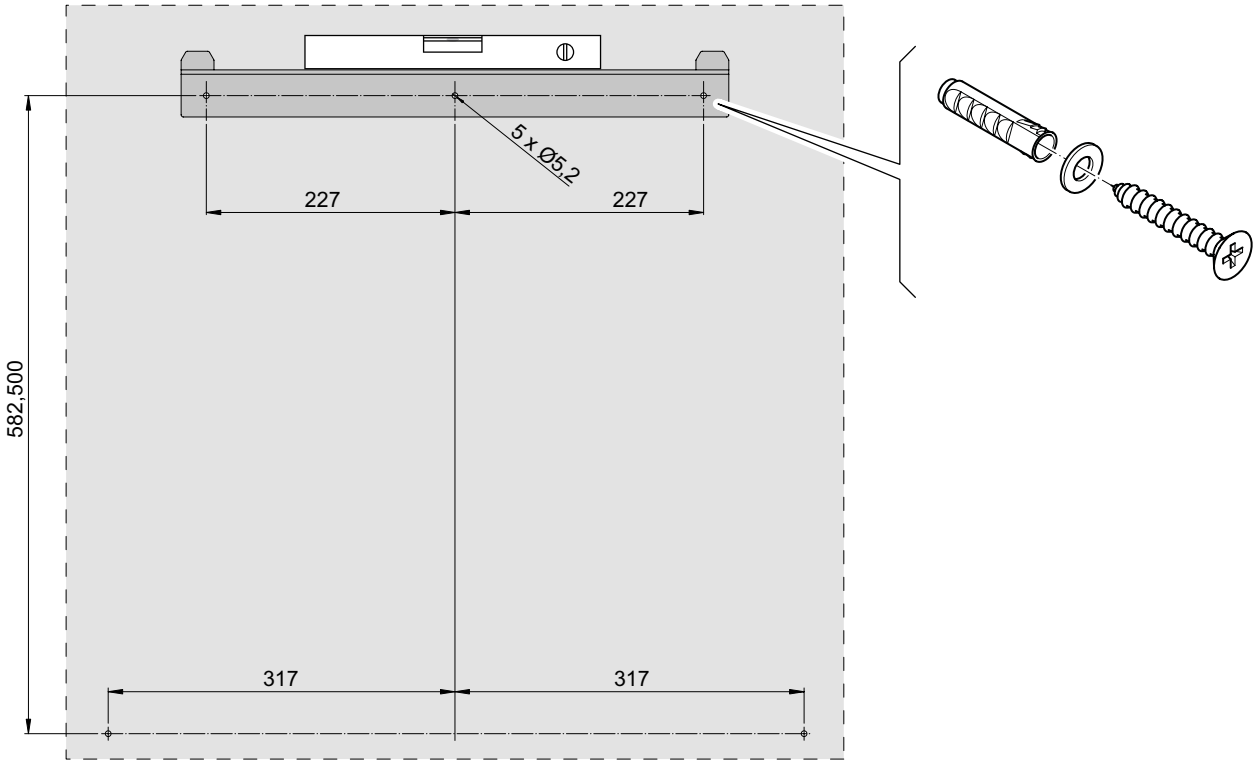
Fig. 00_E


PV1
PV2
BATTERY
AC OUT
RCD
PRIVILEGED LOADS
RS485 COM
GRID OUT
GRID IN
HOME LOADS
GRID
ENERGY METER
PV GRID TIED INVERTER
PV(*)



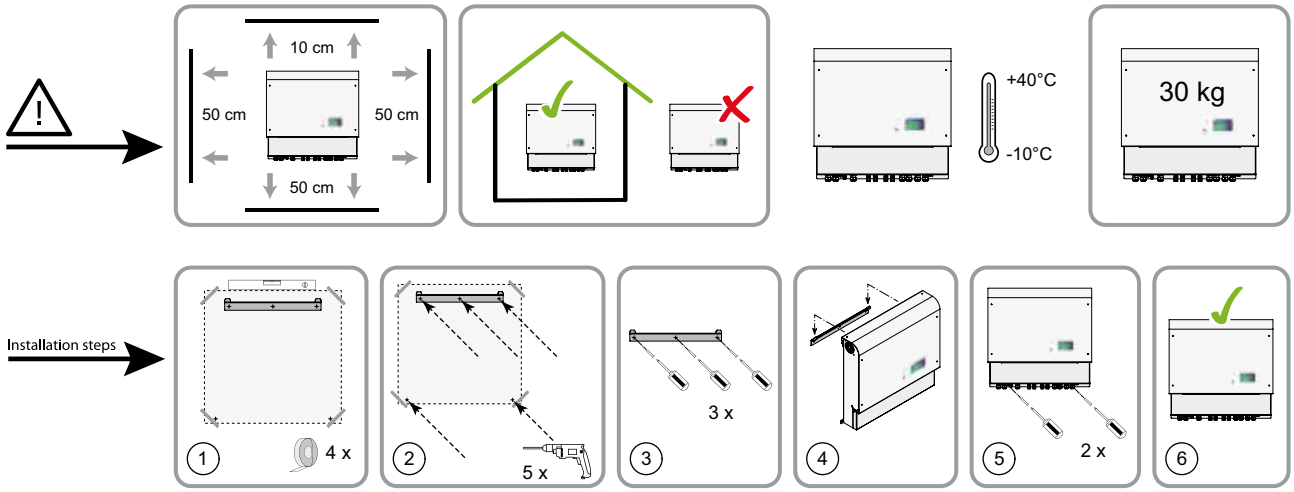


Fig. 01_A

Cod.: 240.010.0051

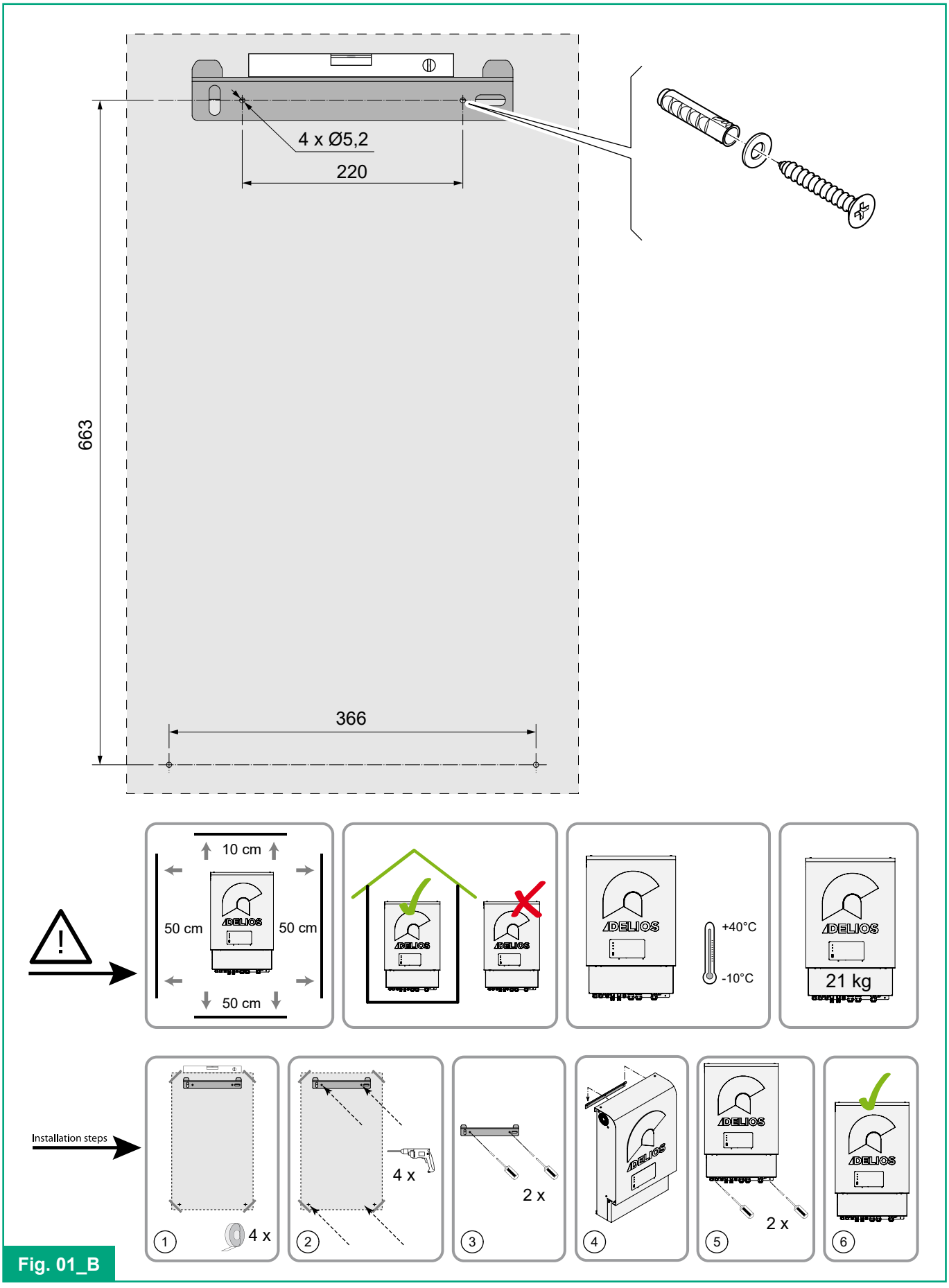
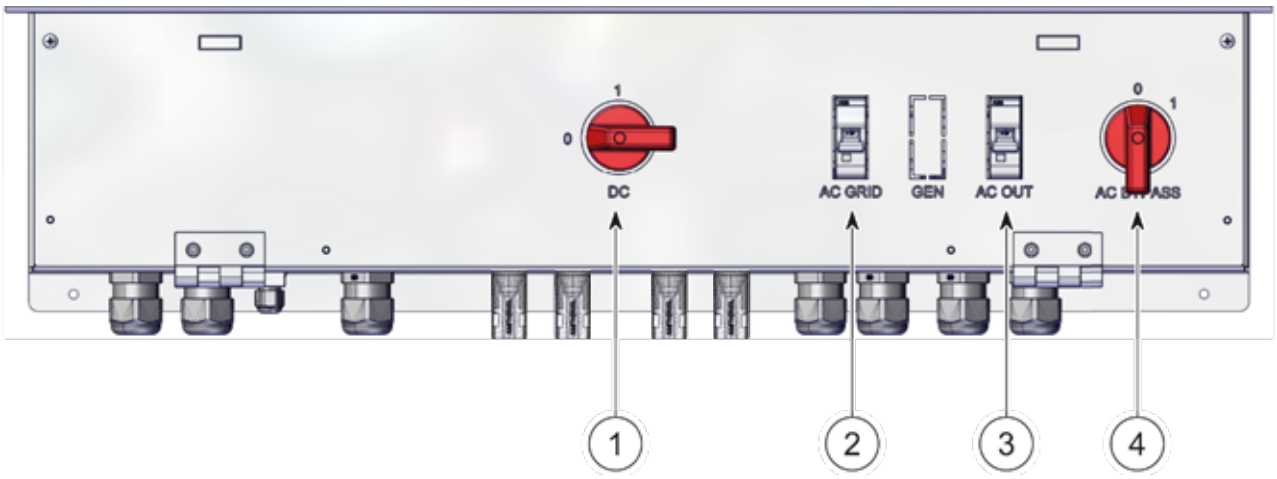


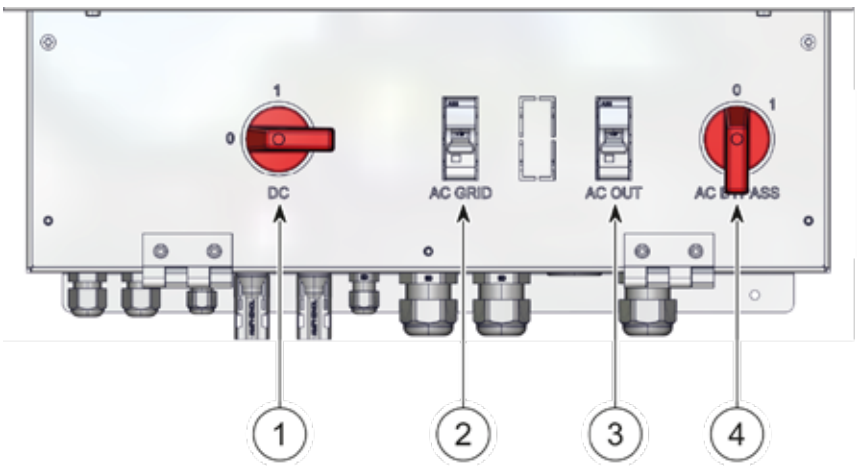
Fig. 01_B

Cod.: 240.010.0051



1 - DC switch
2 - AC GRID circuit breaker
3 - AC OUT circuit breaker
4 - AC BYPASS switch

FIG. 02_A



1 - DC switch
2 - AC GRID circuit breaker
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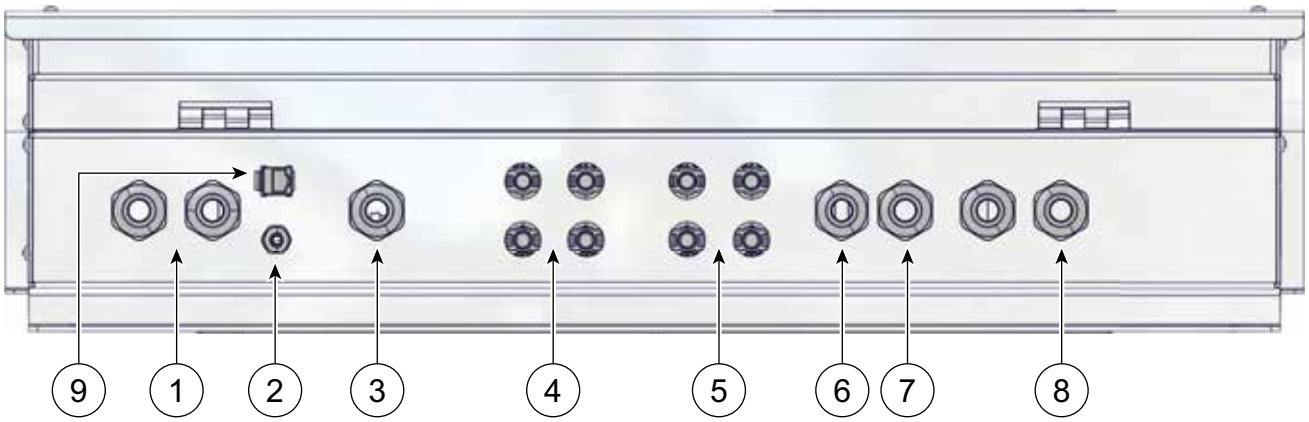
4 - AC BYPASS switch

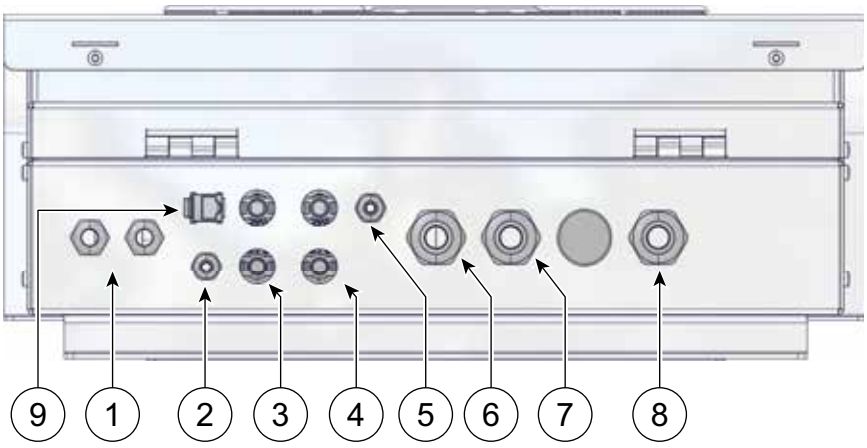
FIG. 02_B

Cod.: 240.010.0051



1 - Battery input
2 - Battery temperature sensor
3 - External wiring
4 - PV1 string input
5 - PV2 string input
6 - Public AC grid output
7 - Public AC grid input
8 - Home loads AC output
9 - LAN connector

Fig. 03_A



1 - Battery input
2 - Battery temperature sensor
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6 - Public AC grid output
7 - Public AC grid input
8 - Home loads AC output
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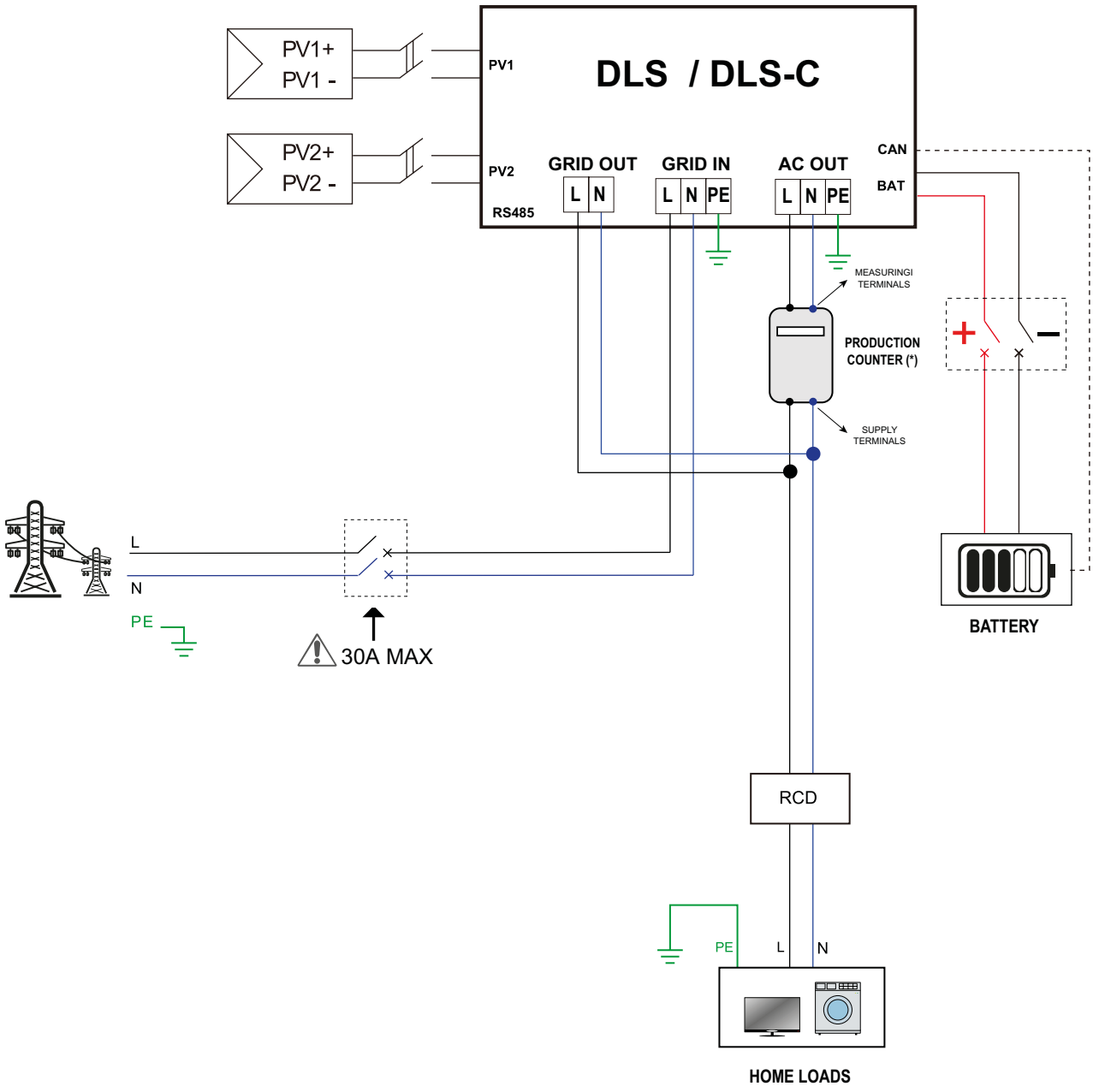
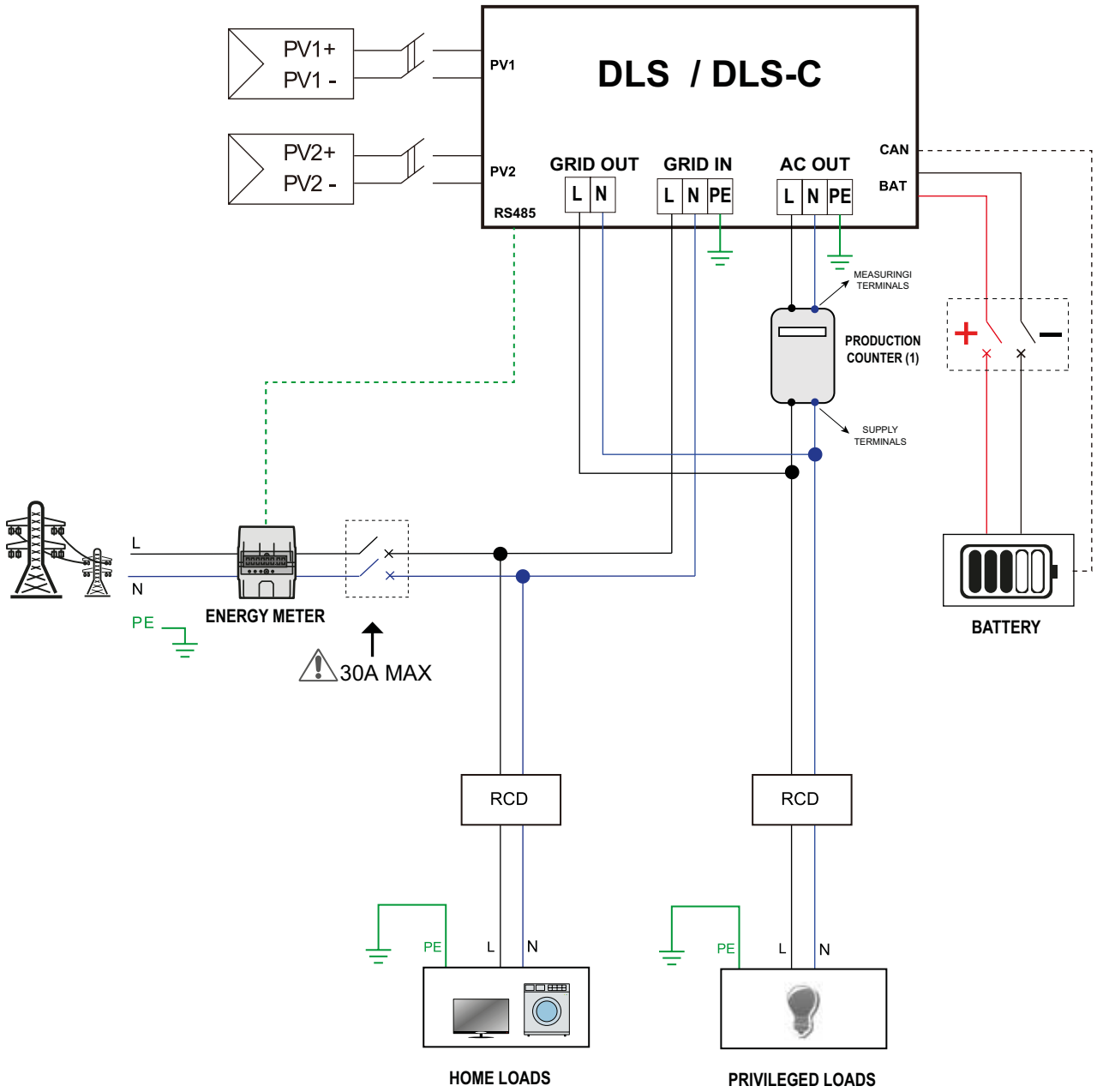
Fig. 03_B



(*) Where required by local regulations

Fig. 04

Cod.: 240.010.0051



(*) Where required by local regulations

Fig. 05

Cod.: 240.010.0051

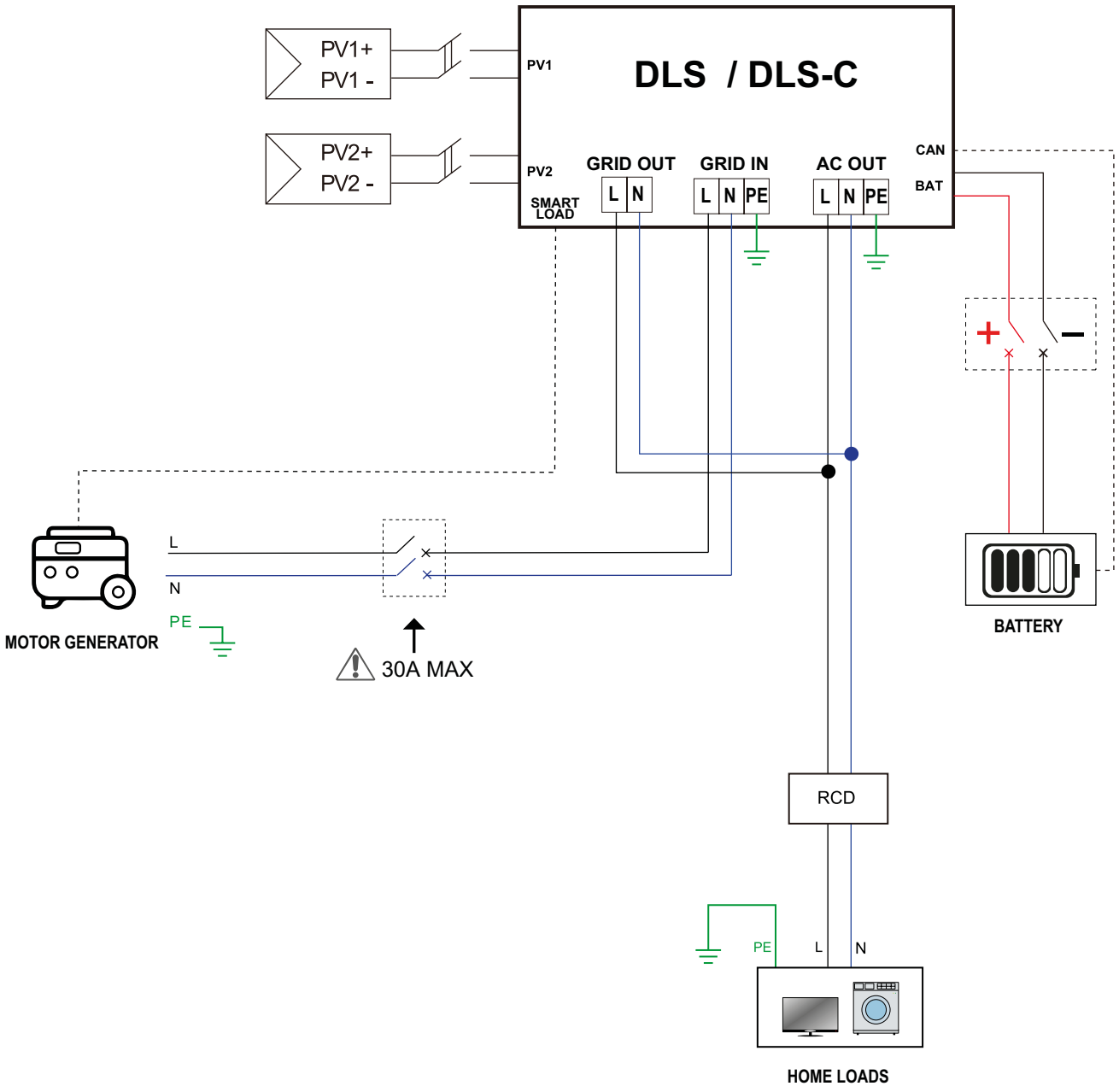


Fig. 06

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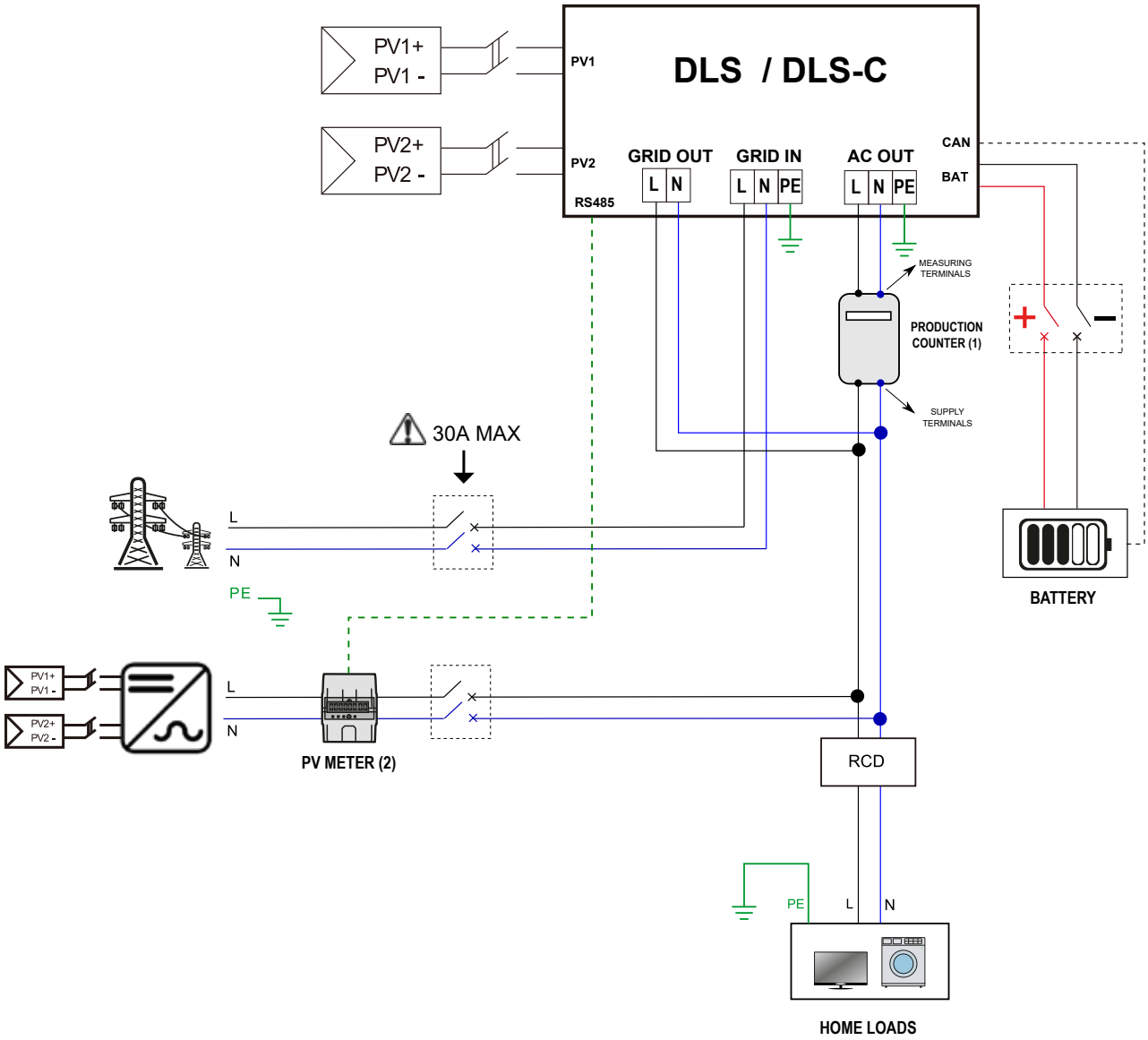
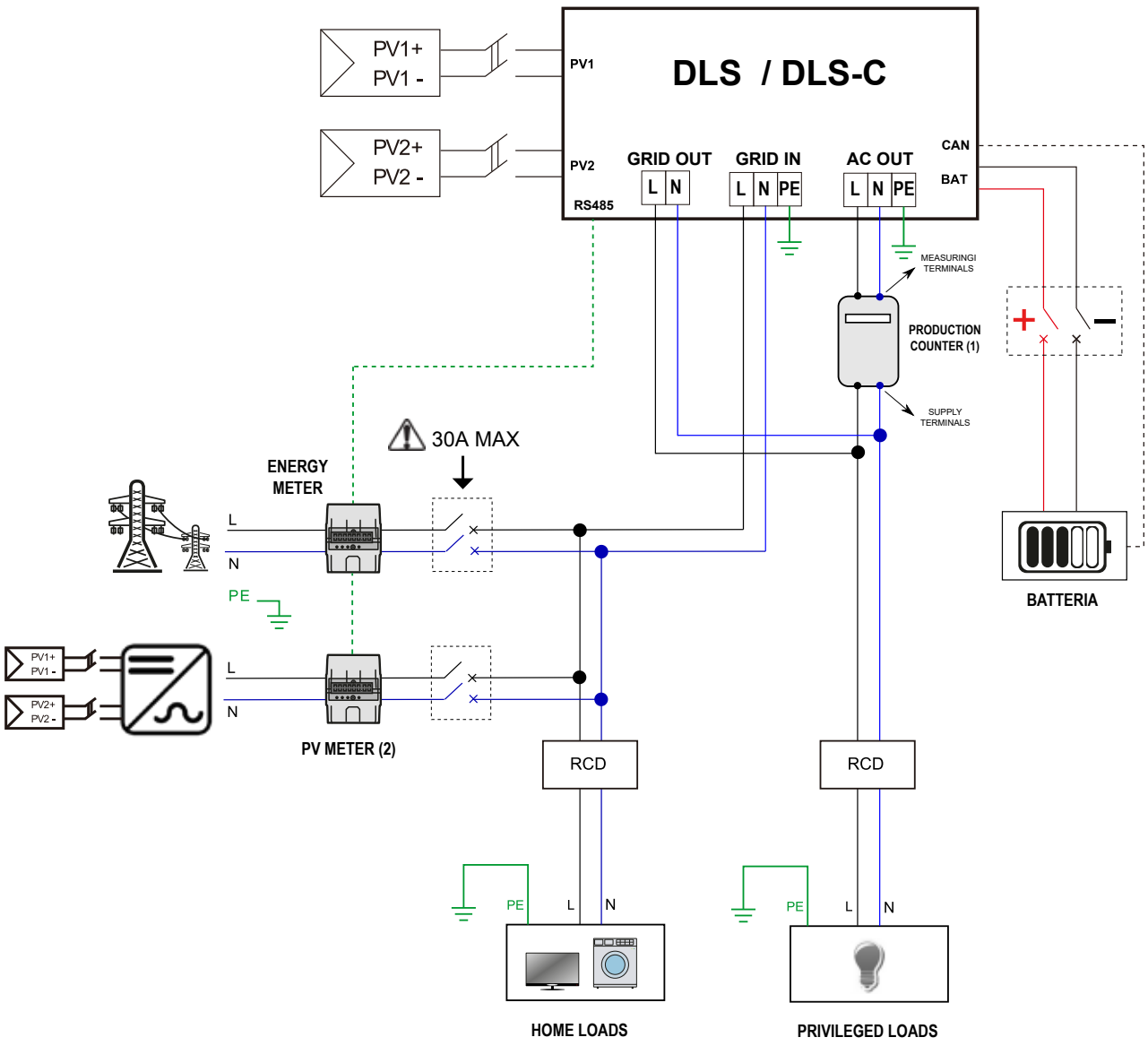


(1) Where required by local regulations
(2) Optional

Fig. 07

Cod.: 240.010.0051



(1) Where required by local regulations

(2) Optional - **WARNING**: Prior to install, contact the Technical Service to correctly program the ModBuss address

Fig. 08

Cod.: 240.010.0051

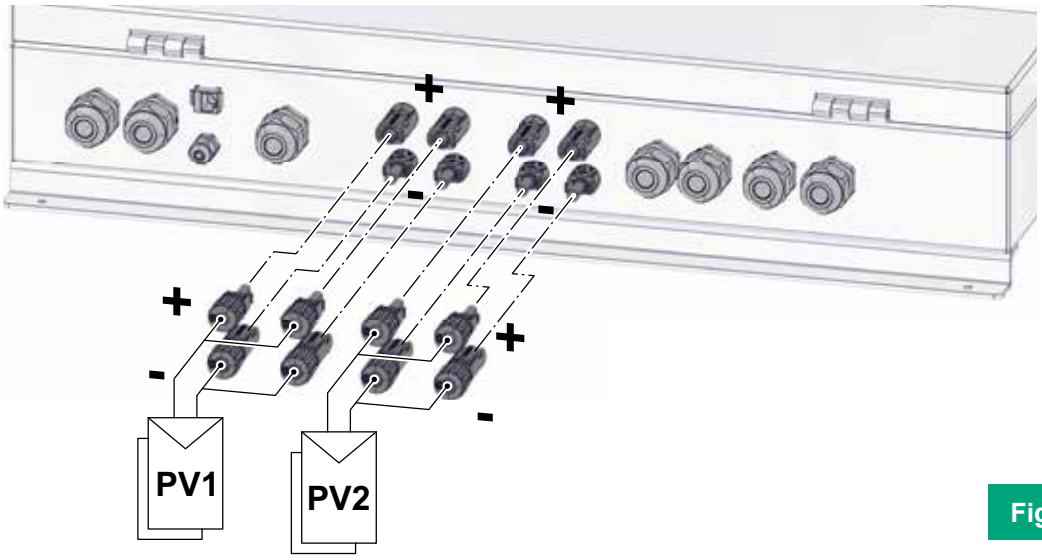


Fig. 09_A

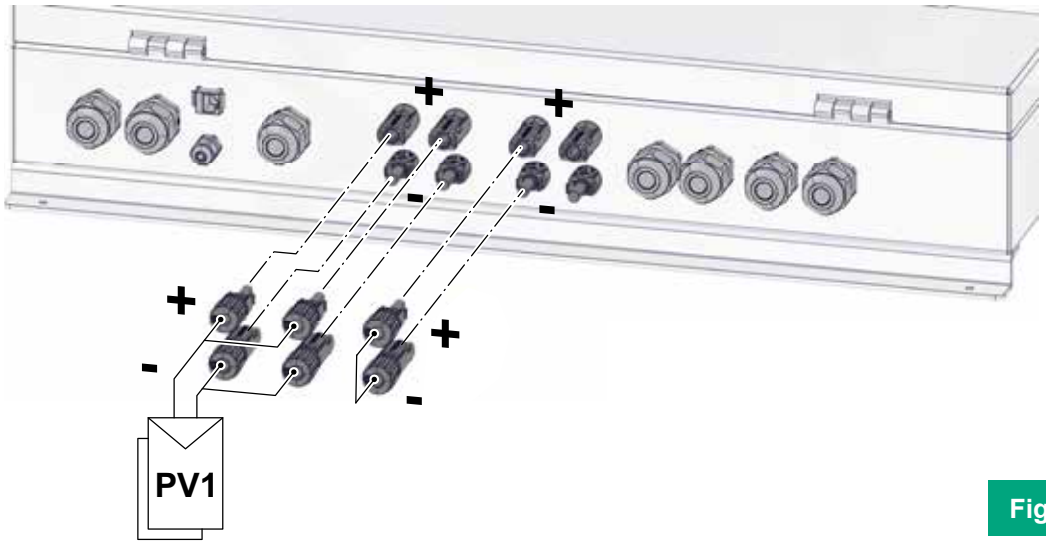


Fig. 09_B

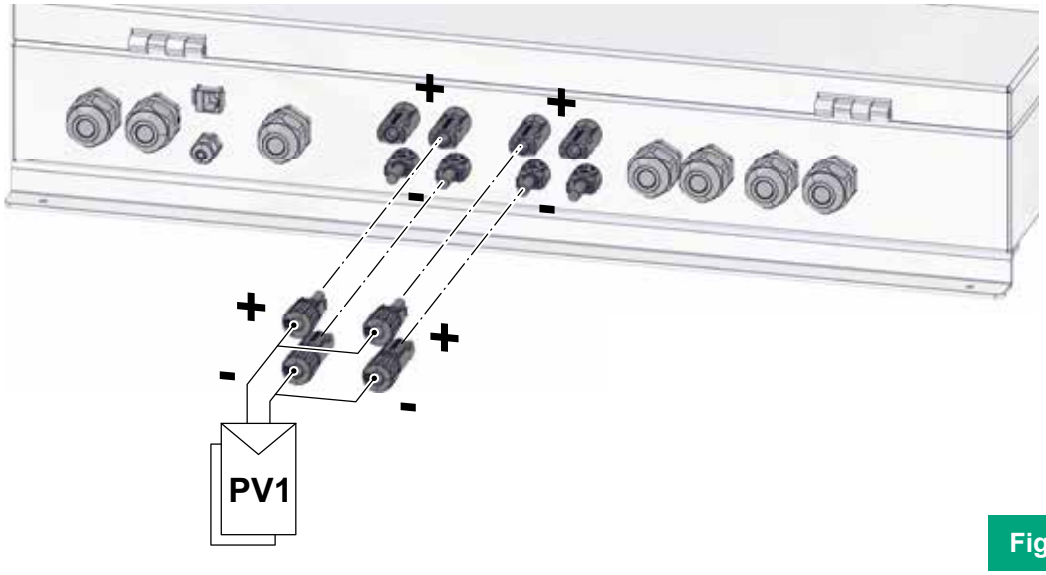


Fig. 09_C

Cod.: 240.010.0051

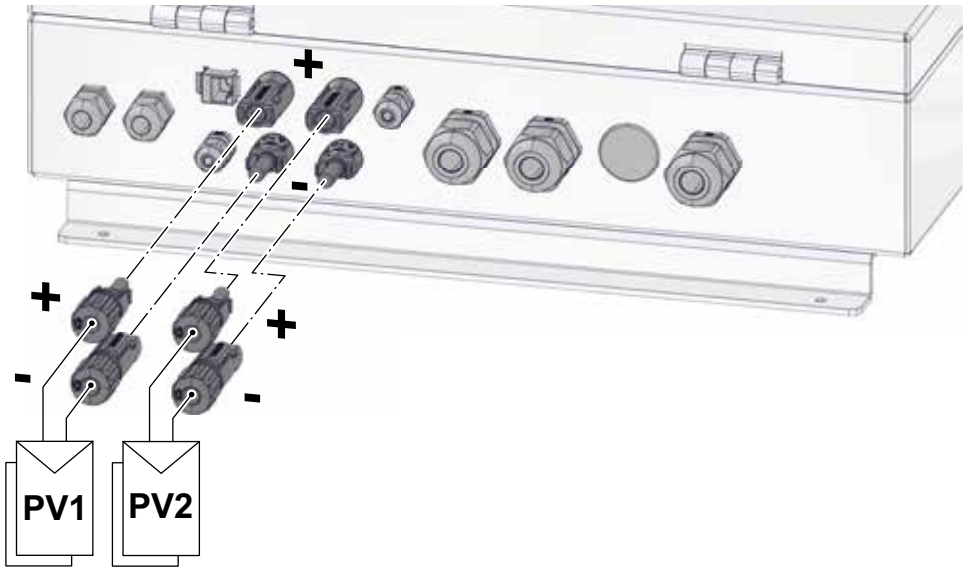


Fig. 10_A

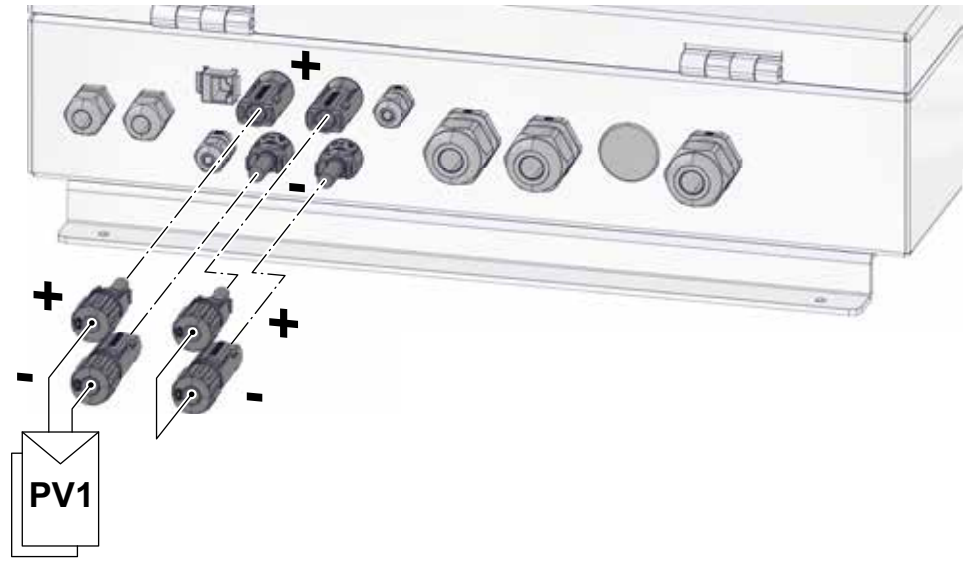


Fig. 10_B

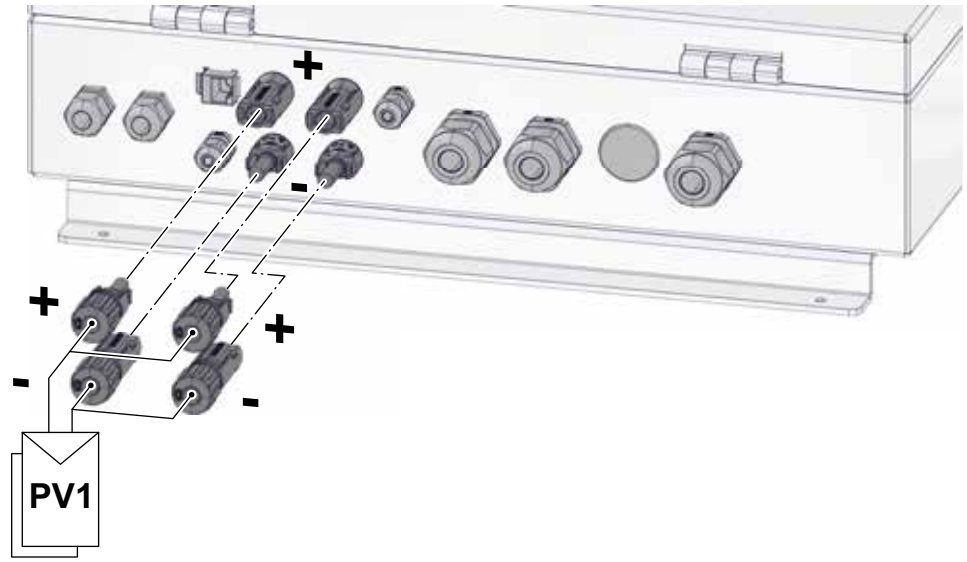


Fig. 10_C

Cod.: 240.010.0051

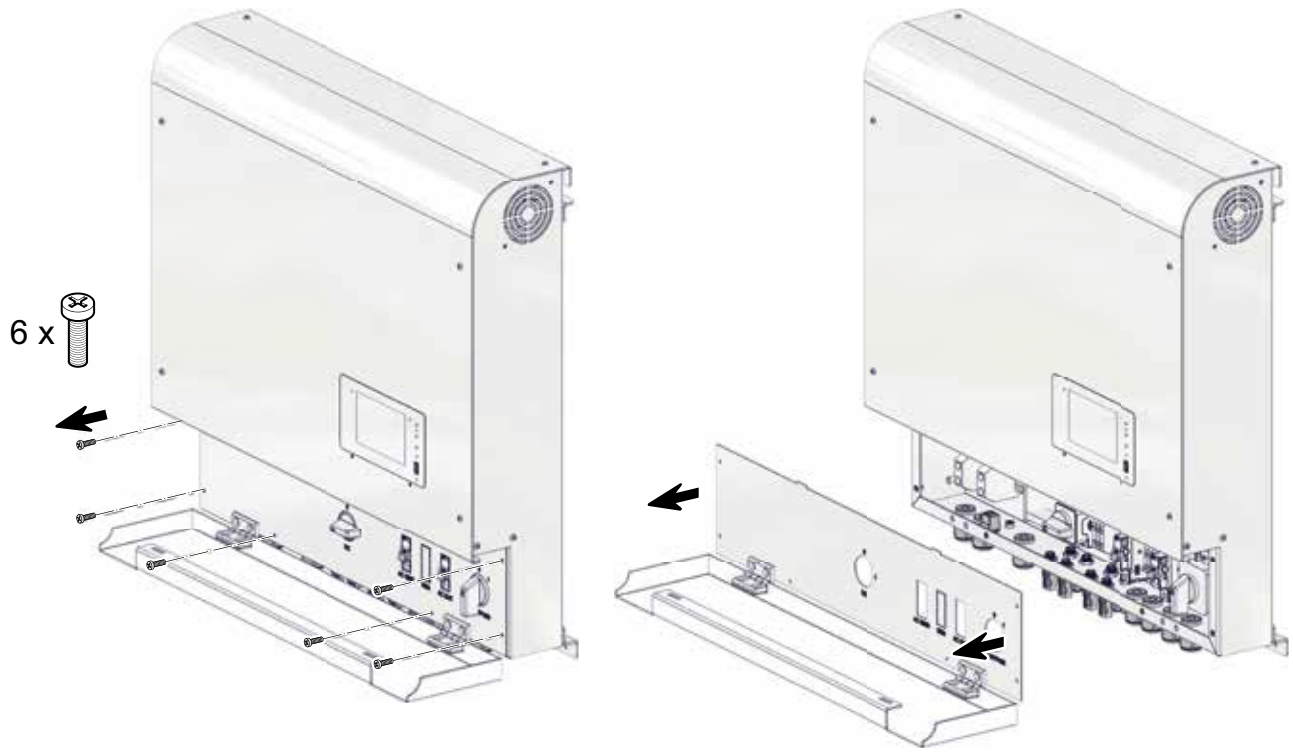


Fig. 11_A

Fig. 11_B

Cod.: 240.010.0051

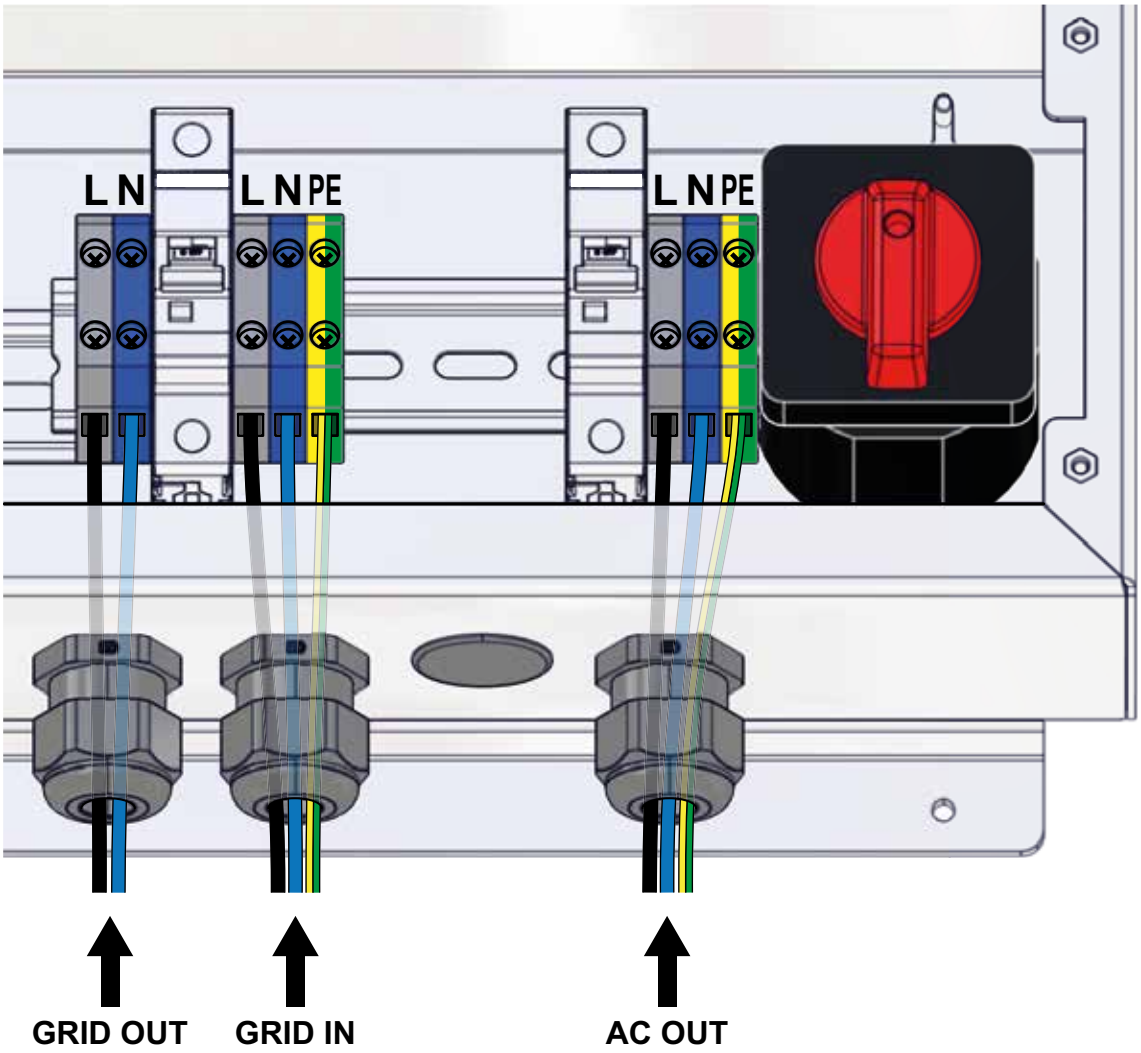


Fig. 12

Cod.: 240.010.0051

CAN BUS Connections

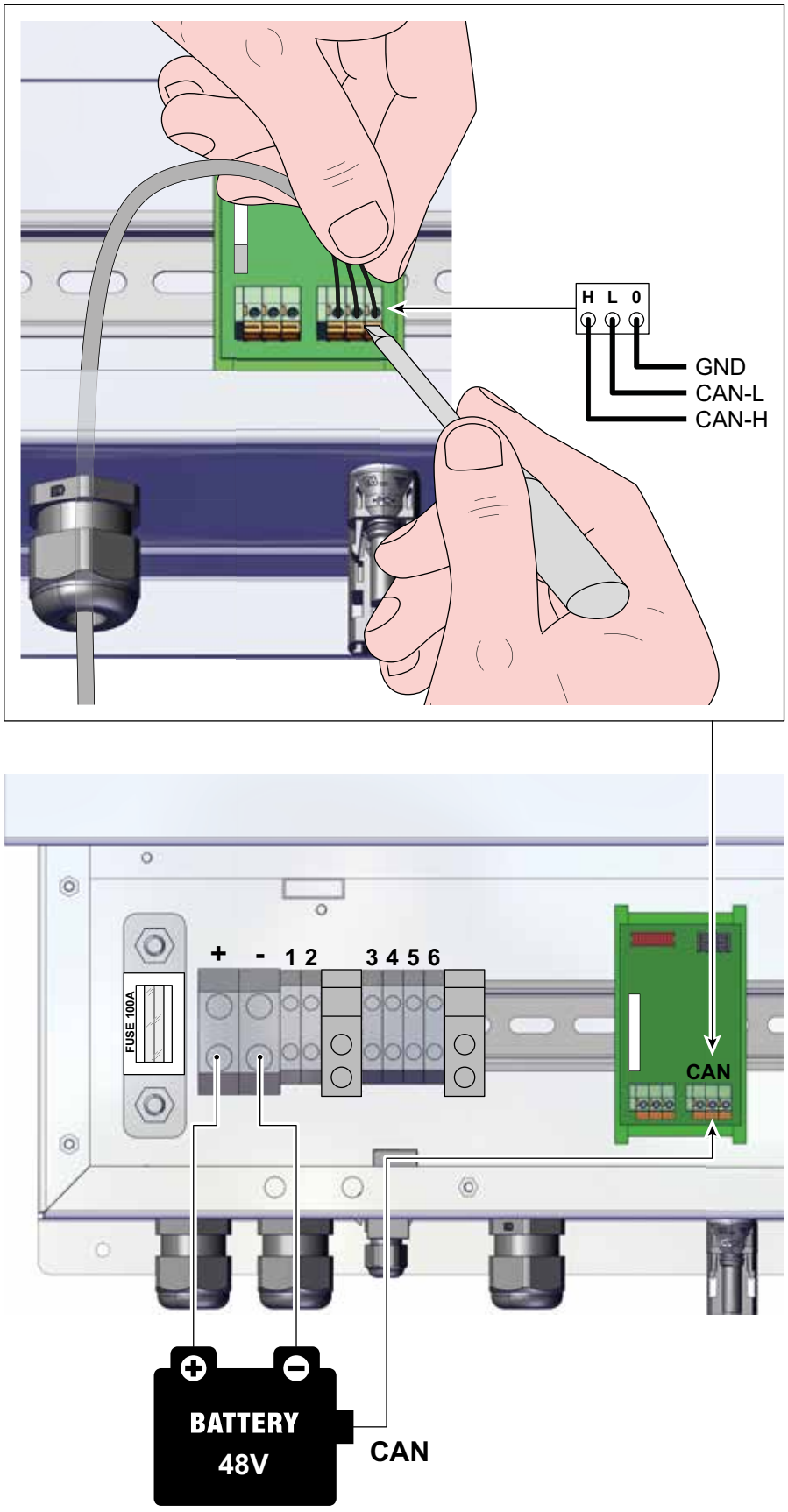
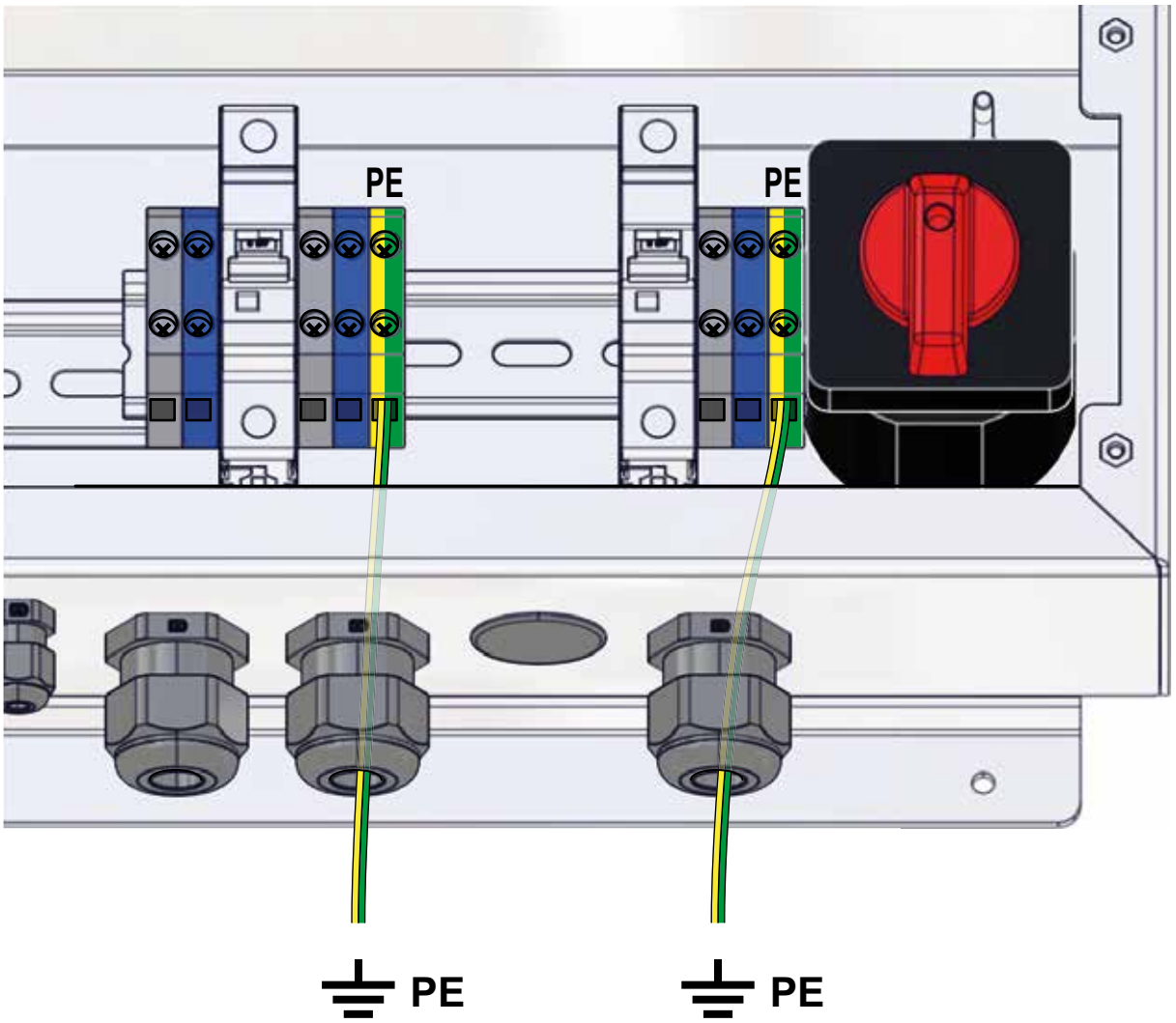


Fig. 13

Cod.: 240.010.0051

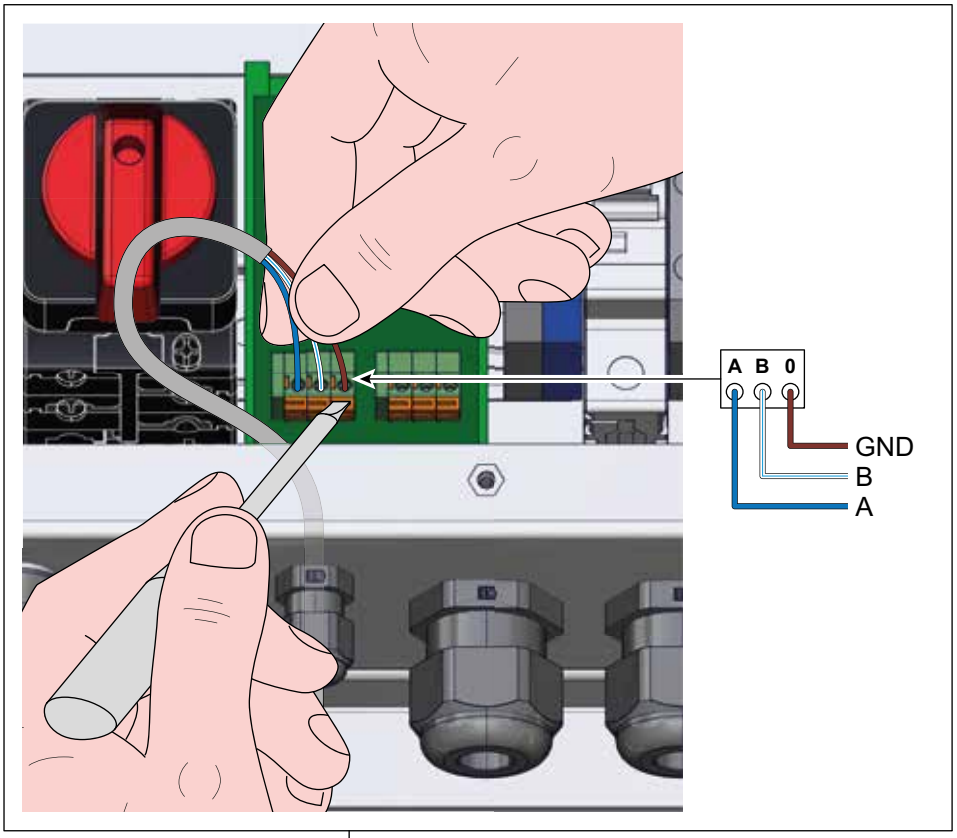


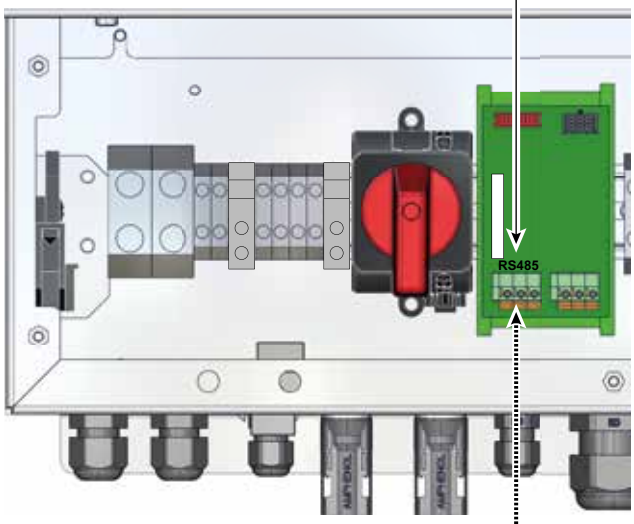
The connection of both earth terminals to the PE protective conductor is mandatory

Fig. 14

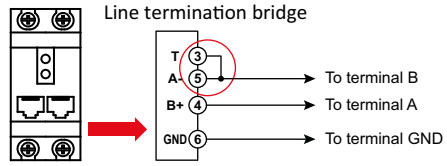
Cod.: 240.010.0051

RS485 MODBUS* Connections





ET112 RS485 MODBUS terminals connection*
(*) Refer to ET112 for further connection details



Typical RJ45 wiring

T568A			T568B		
RJ45 Pin#			RJ45 Pin#		
Green/White Tracer	1		Orange/White Tracer	1	
Green	2		Orange	2	
Orange/White Tracer	3		Green/White Tracer	3	
Blue	4	A	Blue	4	A
Blue/White Tracer	5	B	Blue/White Tracer	5	B
Orange	6		Green	6	
Brown/White Tracer	7		Brown/White Tracer	7	
Brown	8	GND	Brown	8	GND

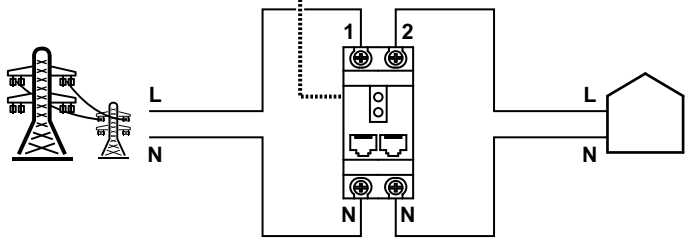


Fig. 15

Cod.: 240.010.0051

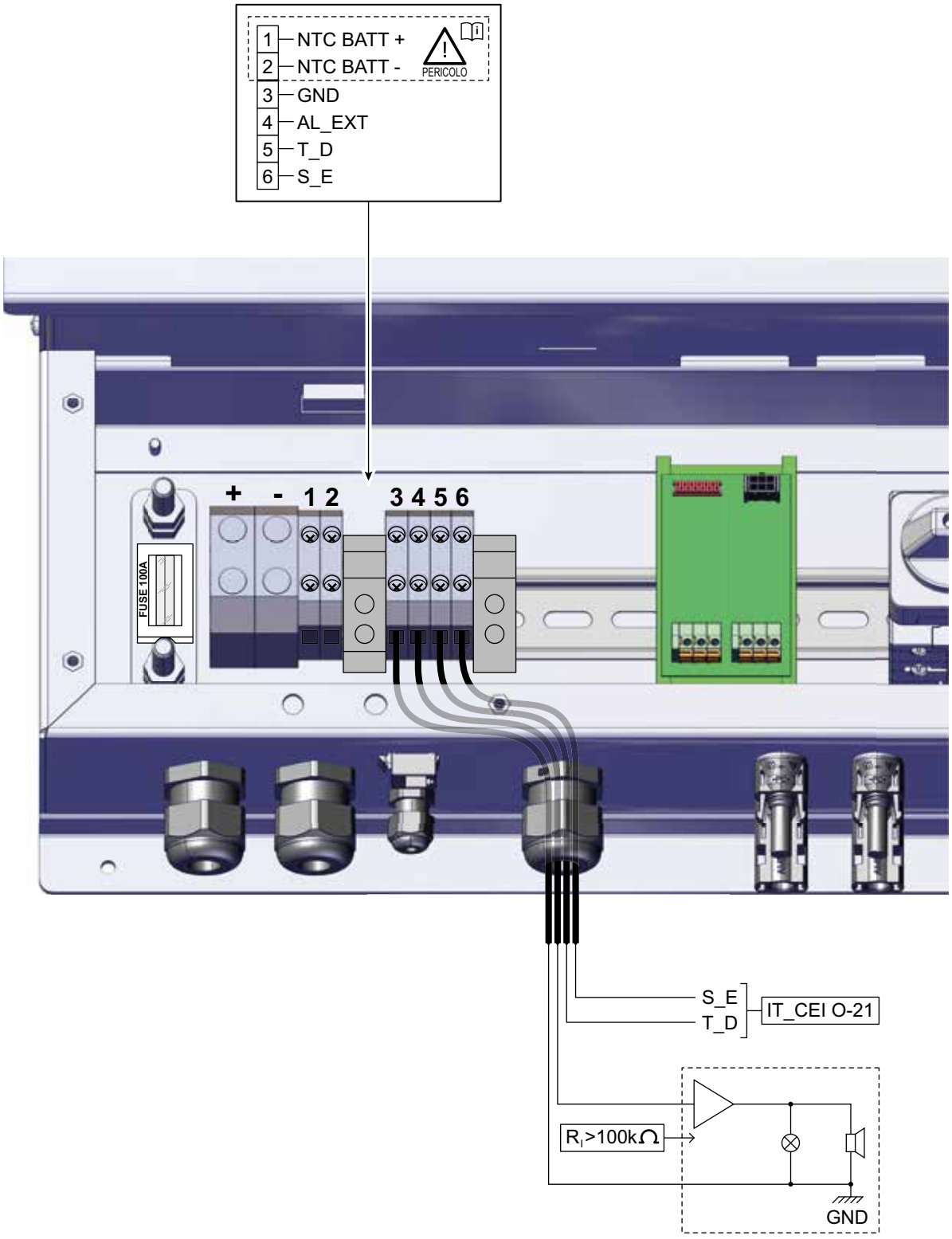


Fig. 16

Cod.: 240.010.0051

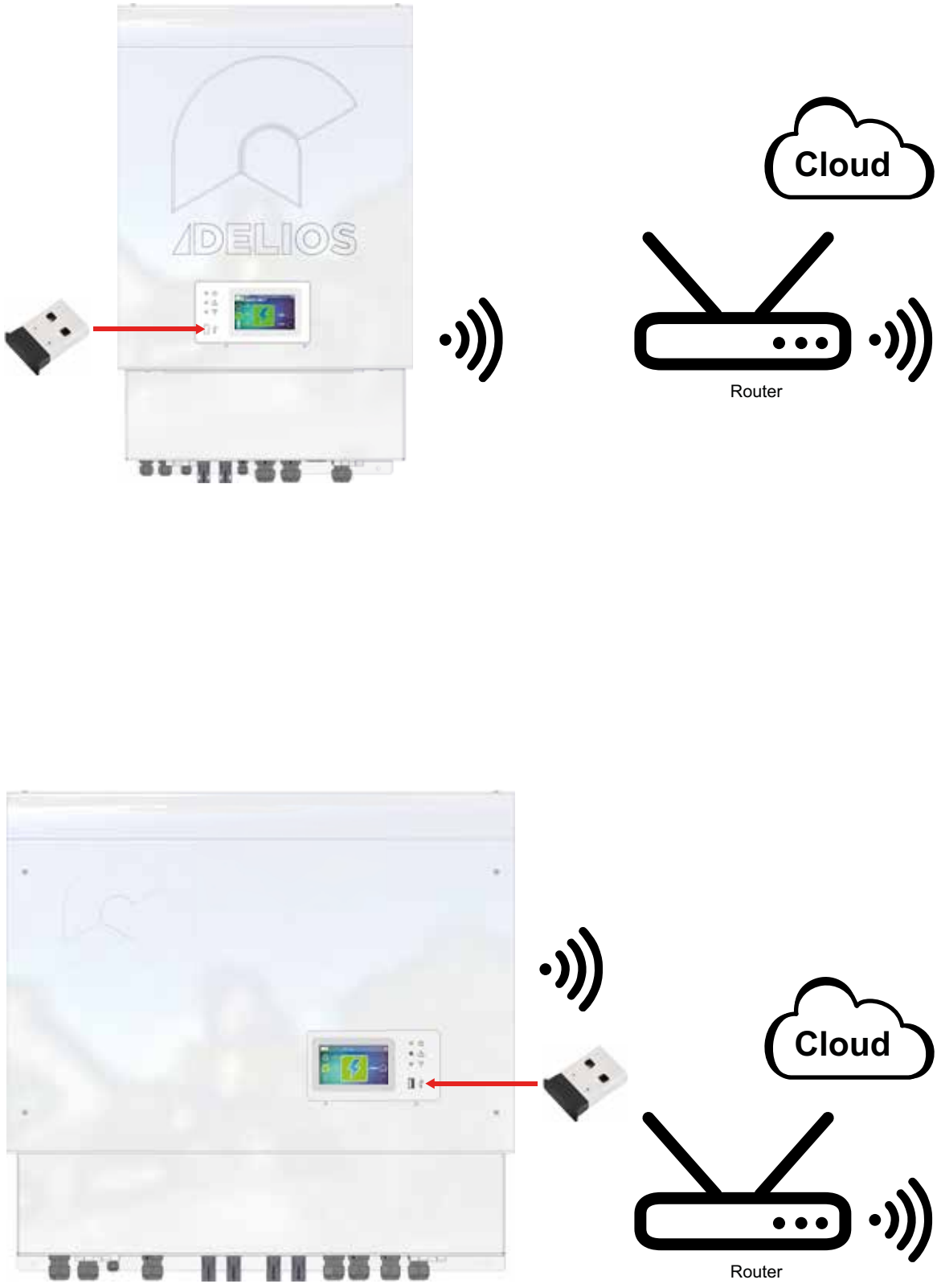
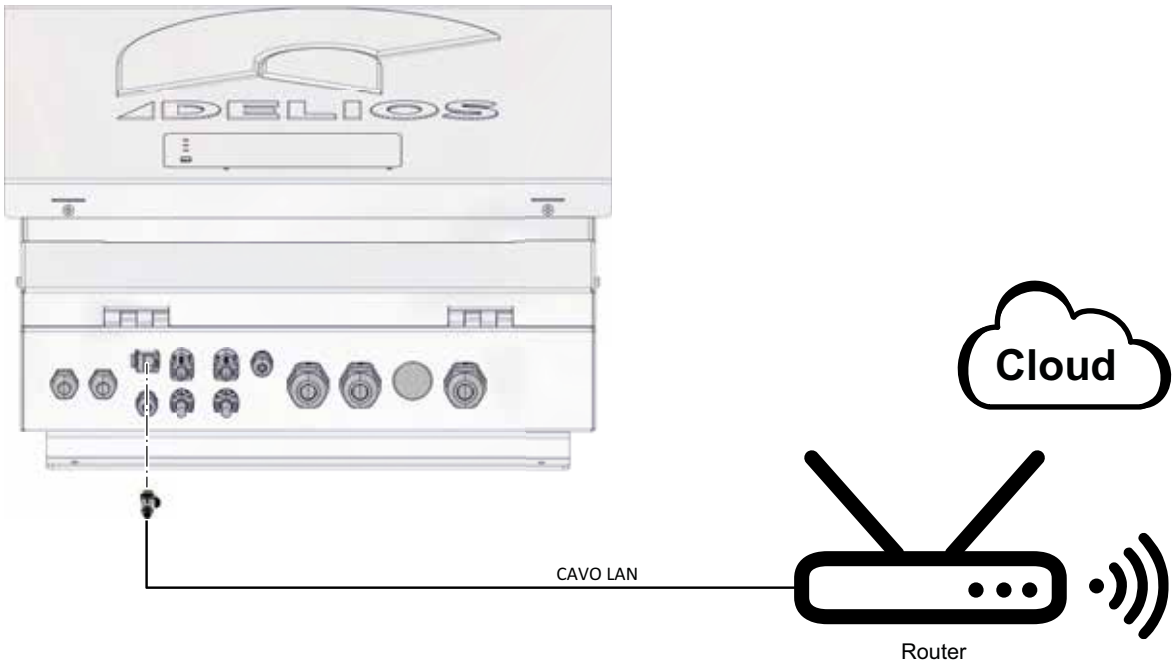


Fig. 17

Cod.: 240.010.0051



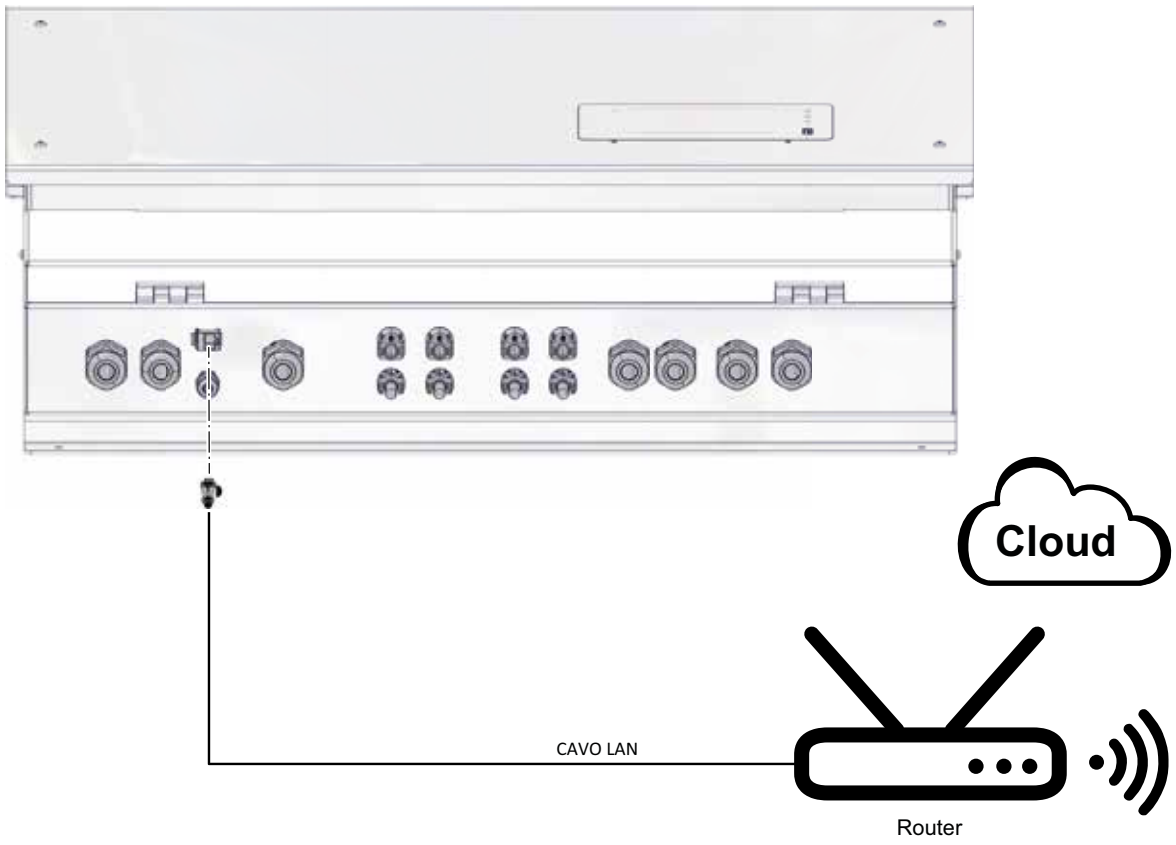


Fig. 18

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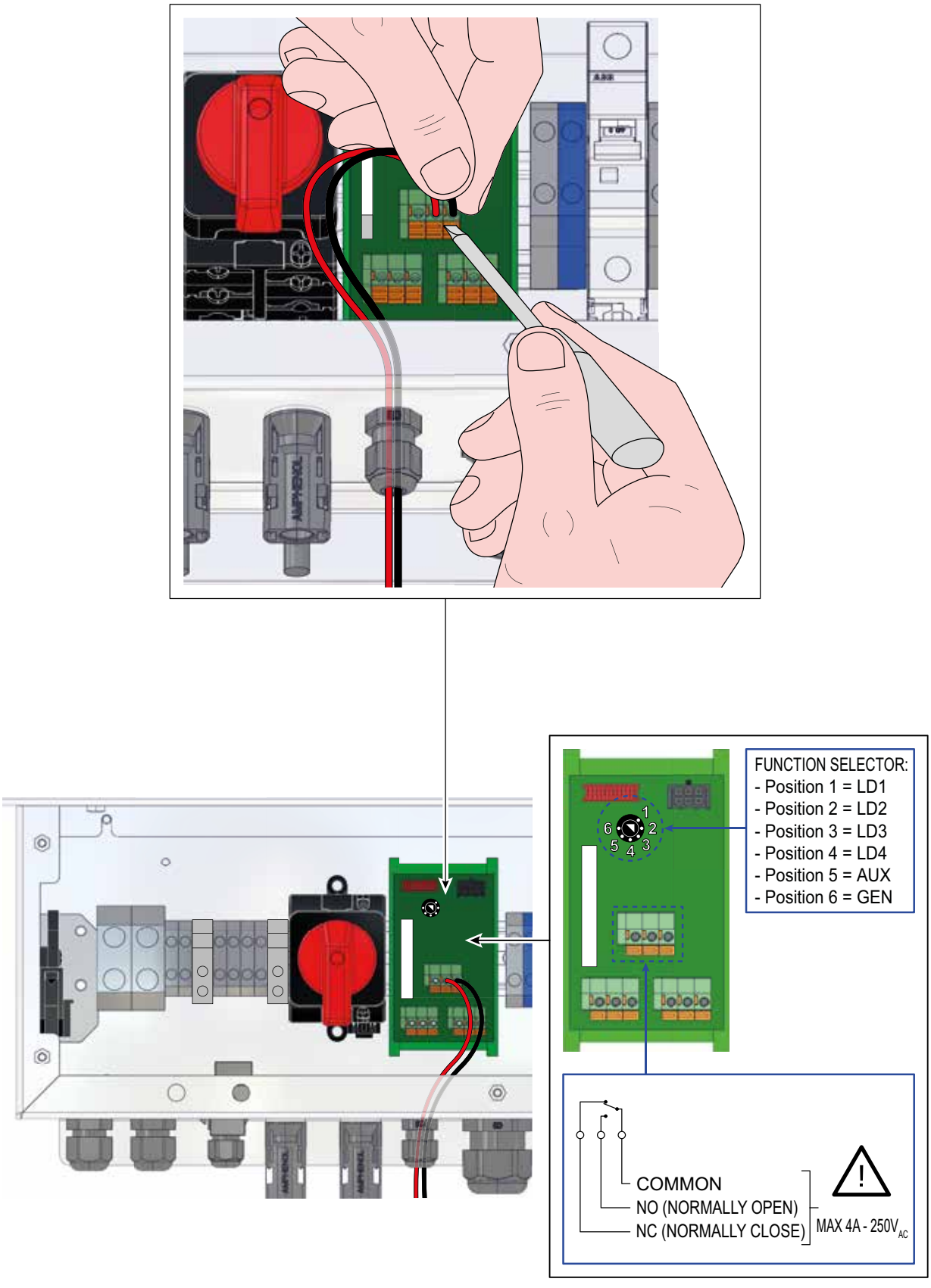


Fig. 19

Cod.: 240.010.0051

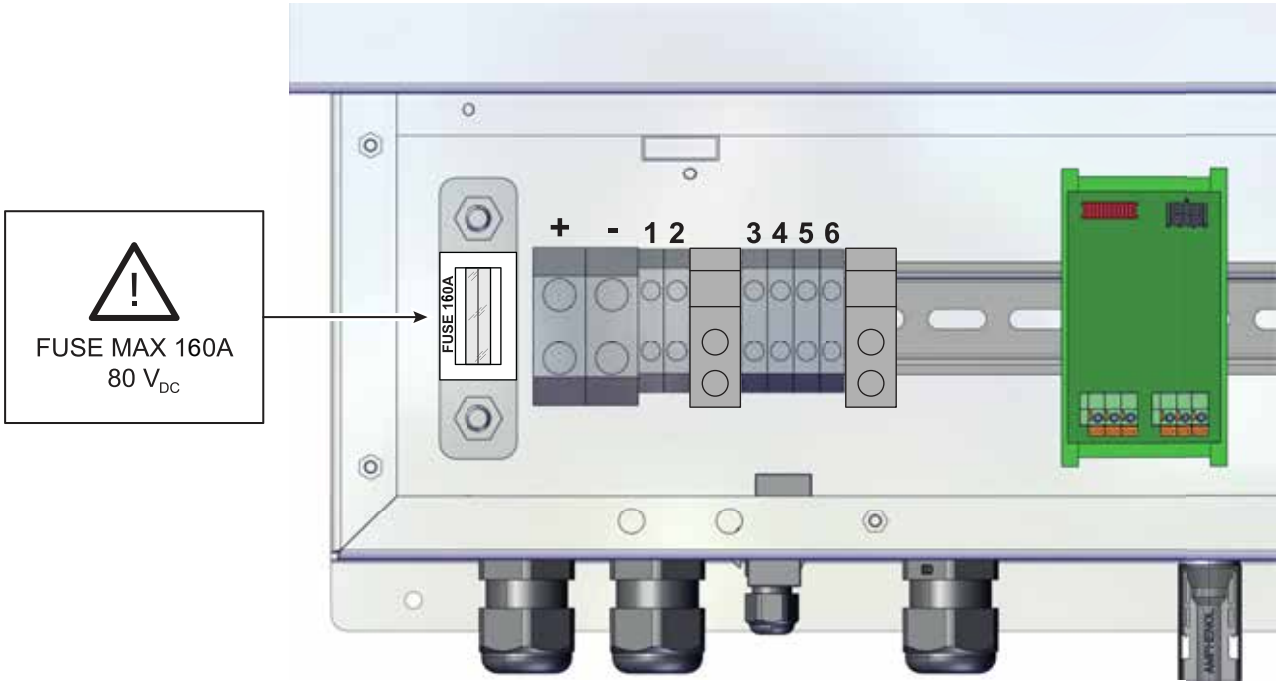


Fig. 20_A

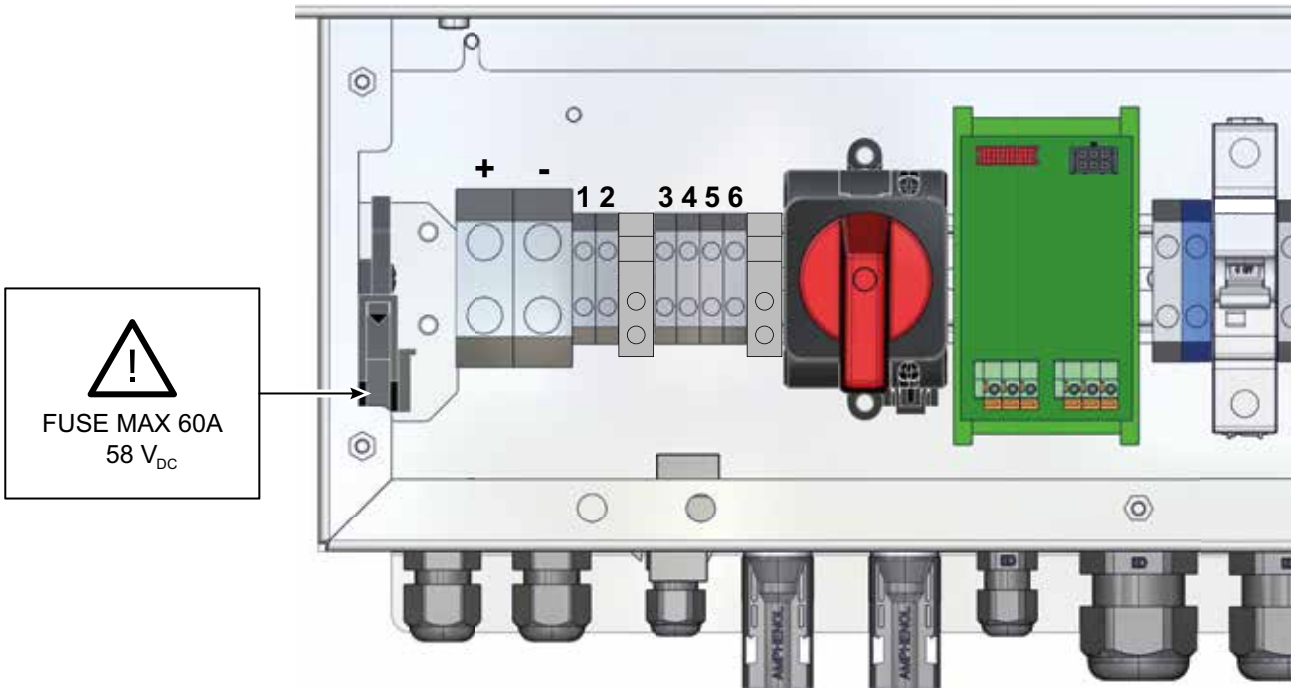


Fig. 20_B

Cod.: 240.010.0051

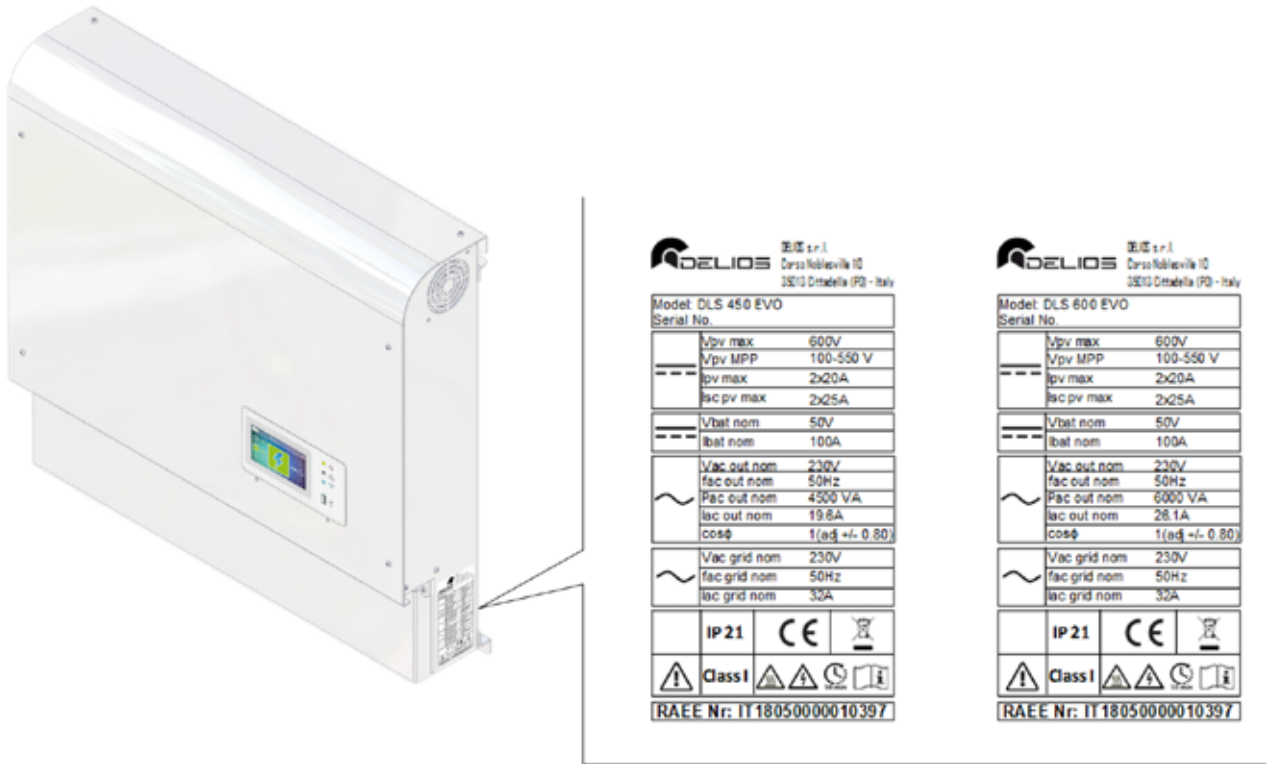


Fig. 21_A

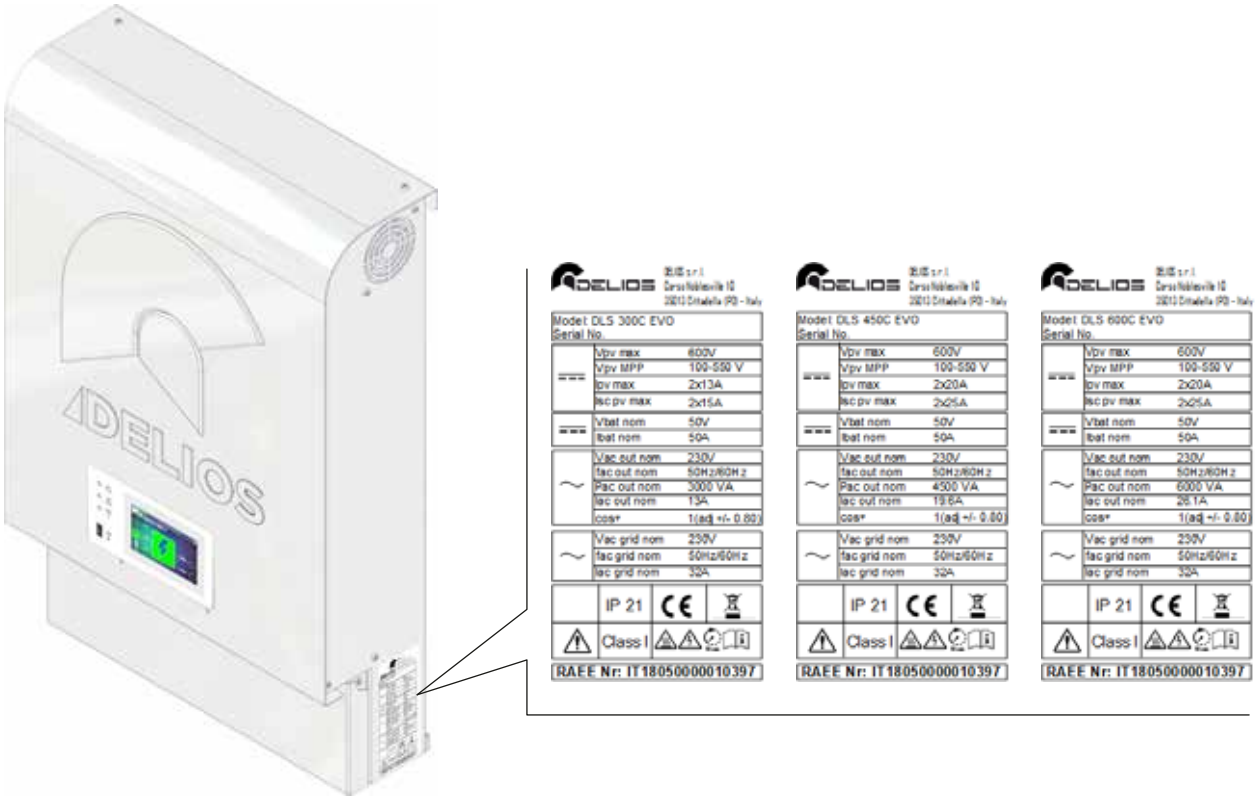


Fig. 21_B

INDICE

1 INTRODUCTION

1.1 Field of Applications

This installation manual is intended for qualified installers. It describes how to securely install and boot the following DLS systems:

- DLS 450 / 600 EVO
- DLS 300C / 450C / 600C EVO

1.2 Symbols Used in This Manual

Imminent dangers causing serious injuries. Danger of death.

Hazardous behaviors that could cause serious injuries.
Hazardous behaviors that could cause death.

Behaviors that could cause minor injuries to people or minor damages to things.

The notes preceded by this symbol relate to technical issues and ease operations.

These instructions are intended for qualified technicians.

1.3 Warranty

Our quality control program ensures that each DLS product is manufactured exactly to specifications and is subjected to exhaustive tests before leaving our factory.

The warranty conditions and the relative terms of application are available in detail on the website http://www.delios-srl.it/download-DLS/ in the CERTIFICATES section of the product.

2 CAUTIONS

These instructions are intended for qualified technicians.

Before carrying out any operations, make sure to have read and understood this manual. Do not make changes and do not carry out maintenance operations not described in this manual. The manufacturer does not accept responsibility for injuries to people and damages to things occurred because the information within this manual has not been read and followed.

The installation must only be carried out by qualified personnel.
The operations described here must be carried out only by qualified technicians.
The customer is civilly liable for the qualification and mental or physical state of the professional figures who operate this equipment. They must always use the personal protective equipment required by the laws of the country of destination and anything else provided to their employer.

The DLS system can also operate without the connection to the mains (off-grid). Under these conditions and based on the system settings, the inverter output can be automatically switched to the EPS mode which, by means of an internal interlock system, will feed the loads connected to a privileged line. According to the safety provisions in force in the country of installation, the NEUTRAL line may have to be connected to the earth potential to guarantee the operation of the protection systems against direct discharge provided for the privileged line and located downstream of the inverter and / or to ensure the correct operation of the loads connected to the AC OUT port. The DLS, in EPS mode, automatically realizes the connection of the NEUTRO line to the earth potential. **If, due to particular needs, this connection should not be made, to get the inverter output floating, it will be necessary to disable the automatic connection function of the NEUTRAL to the earth potential through the system configuration menu. Refer to the SYSTEM PROGRAMMING section.**

Emergency power in EPS mode is automatically turned on and off based on battery charge status. This means that during an emergency the power supply of the AC OUT port can be unexpectedly restored even in standby mode. For this reason, to avoid possible injuries from electric shock, before carrying out any installation or maintenance work on the home network, it is necessary to deactivate the DLS operation using the AC BYPASS switch and disconnect it both from the AC power supply, by opening the main circuit breaker, and from the photovoltaic field, by opening the DC disconnector integrated in the DLS.

PV panels, when exposed to the sun, can produce dangerous voltages. It is recommended to carry out all the procedures necessary to make the work area safe.

The DLS system operates with low voltage lithium batteries (LV). Batteries produce electricity and can cause electric shock or fire in the event of a short circuit or incorrect installation.

Only low voltage (LV) lithium batteries approved by DELIOS s.r.l. can be connected to the DLS system. The use of non-approved batteries can affect the correct functioning of the system and relieves DELIOS s.r.l. from all liabilities and invalidates the warranty.

Batteries must be installed in a suitable area that complies with local regulations. The installation area must ensure enough ventilation and the absence of open flames and sparks as potentially explosive gases may be generated during operation.

It is strictly prohibited to open the DLS system except as listed in this manual. The installation of the equipment must not be carried out by unqualified, under the influence of alcohol or drugs, have prosthetic heart valves or pacemakers.

For any doubts or problems regarding the use of the system, even if not described here, please contact qualified staff.

The DLS system must not be subjected to any type of modification. DELIOS s.r.l. declines any responsibility if the rules for correct installation are not respected and is not responsible for the system up-stream or downstream of the equipment it supplies.
The exclusion of protective devices is extremely dangerous and relieves the manufacturer of any responsibility for damage to people and things.

A first aid kits must be provided. Do not underestimate burns or wounds.

Disclaimer
All rights related to the contents of this manual are owned by DELIOS s.r.l. By using this manual, you accept the terms of this disclaimer clause. Every effort has been made by DELIOS s.r.l. to ensure the accuracy of this manual. However, DELIOS s.r.l. cannot accept responsibility for any errors or omissions in this manual, nor for any damages caused by or associated with its use. No information published in this manual can be copied or published in any way or by any means without prior written authorization by DELIOS s.r.l. The information contained in this manual is subject to changes without notice, DELIOS s.r.l. does not have any obligation to notify anything. After its publication, DELIOS s.r.l. does not have any obligation to update or keep updating the information contained in this manual and reserves the right to improve this manual and/or the products described in this manual, at any time and without notice. We welcome your feedback or advice if incorrect, misleading or incomplete information is found within the manual.

2.1 Operating Environment and Restrictions

Each system must be used exclusively for the operations it was designed for and within the operative ranges specified in the nameplate and / or in this manual, according to the national and international safety standards.
Any use different from the intended use specified by the manufacturer is to be considered totally inappropriate and dangerous and in this case the manufacturer declines all responsibility.

This equipment is an integrated system capable of converting a direct current (DC), coming from a photovoltaic generator and a battery, into an alternating current (AC) suitable for use by local loads and / or fed into the public grid.

Check the regulations applied by the electricity provider.
Check the solar panels manufacturer's instructions.
Check the batteries manufacturer's instructions.

Operating Range Limits:

Il sistema DLS può essere utilizzato solo con moduli fotovoltaici che non richiedono la messa a terra di uno dei poli. DLS può essere utilizzato esclusivamente con moduli fotovoltaici che rispondano ai requisiti specifici della classe A conformemente a quanto indicato dalla norma IEC 61730.

Do not connect any other energy source to the inverters in addition to the modules described above. The leakage current during normal operation must not exceed the limits specified in the technical characteristics.

A low voltage lithiumion battery (LV) can be connected to the DLS system at the BAT input, which acts as a storage element for the excess energy produced by the photovoltaic generator. The stored energy is then released to the system which will make it available, at the time and in the most appropriate way, to local loads to fully or drastically reduce the drawn of energy from the distribution network.

The DLS system can be connected to the distribution network only in the countries which is certified for.

The DLS system can be used only respecting all the technical characteristics.

Improper or Unauthorized Use:

Although carefully constructed, all electrical appliances can catch fire.

The DLS system is intended for indoors installation.

Optimal operation of the DLS system is ensured at a maximum ambient temperature of 40°C (104°F).

The DLS system must be transported and stored in indoor location with temperature range of -30°C to +70°C (-22°F and 158°F).

The DLS system must be used in locations with no acids, gases or other corrosive substances.

The DLS system must be used and stored in locations with relative humidity ranging from 5% to 95% without condensation.

The DLS system must be transported in locations with relative humidity ranging from 5% to 95%.

The DLS system must be used and stored in locations with atmospheric pressure ranging from 86kPa to 106kPa.

The DLS system must be transported in locations with atmospheric pressure ranging from 70kPa to 106kPa.

The DLS system must be used at a maximum altitude above sea level of 3000m (9750 feet). For altitudes above 2000m, due to the rarefaction of the air, specific conditions may occur which must be considered when choosing the place of installation. All installations at altitudes above 2000m must be assessed case by case considering the following critical issues:

- less efficient cooling;
- decrease in the dielectric strength of the air and, in the presence of high voltages, the creation of electric arcs;
- presence of cosmic radiation that can affect the correct functioning of the electronic components.

2.2 Dismantling, decommissioning and disposal

To comply with the 2002/96 / EC European Directive relating to electrical and electronic waste and its implementation as national law, electrical equipment that has reached the end of its useful life and discharged batteries must be separated from general waste and disposed to the appropriate authorized collection and recycling centers.

Any device that is no longer needed must therefore be returned to the distributor or disposed to an authorized collection and recycling center in your area. Ignoring this European Directive can have potentially negative effects on the environment and your health!

2.3 Protecting Staff and Third Parties

The equipment was built according to the strictest safety standards and equipped with safety devices suitable for the protection of components and operators.
For obvious reasons, the manufacturer cannot envisage all potential type of installations and locations where the equipment will be installed; the Customer must therefore clearly inform the manufacturer of specific conditions of installation. DELIOS s.r.l. declines any responsibility if the DLS system is incorrectly installed and shall not be liable for other systems located upstream or downstream of the equipment supplied.

- The operators must be correctly informed. The operators must therefore read and follow the technical instructions contained in the manual and in the enclosed documentation.
- The instructions provided in this manual do not replace the safety regulations and the installation and operational technical data printed on the products, nor do they replace the current safety standards enforced in the country where the equipment is installed and the rules dictated by common sense.
- The manufacturer is available to provide the theoretical or practical training to operators, both on their site or on the customer's premises, as specified at the time of drawing up the contract.
- The equipment must not be used if any operating fault is identified.
- Temporary repairs should be avoided; repair work must be carried out only with genuine spare parts, which must be installed according to the intended use.
- The responsibilities deriving from the commercial components are delegated to the respective manufacturers.

Avoid touching the inverter enclosure during the equipment operation.
The inverter enclosure could overheat during its operation and cause burns by contact.

Guards or covers can be removed only 10 minutes after disconnecting the inverter from the power supply to allow its components to cool down and any static electricity storage devices to discharge.

As soon as it is switched off, the surface of the equipment could be hot, therefore great care must be taken.
In the event of fire, CO2 foam extinguishers must be used and selfvacuum systems must be used to put out fires in enclosed spaces.

Should the noise level exceed legal limits, the working area must be circumscribed and all the people who have access to the area must wear ear defenders or ear plugs.
The noise level produced by the inverter in normal working conditions is: < 50db.

During the installation process, special attention must be paid to fixing the equipment and its components. During this stage, circumscribing and preventing access to the installation area is recommended.

Clothing and PPE Worn by Staff
Installers are recommended to wear clothing and PPE provided by their employer. Staff must not wear clothes or accessories that could start fires or produce static electricity or, generally speaking, any item of clothing that could affect personal safety. When carrying out any operation on the equipment, clothes and instruments must be suitably insulated.
Ex: class 0, category RC insulated gloves

Maintenance operations must be strictly carried out with the equipment disconnected from the mains, from the PV generator and from the batteries.
Staff must NOT access the equipment with bare feet or wet hands.
The maintenance engineer must always ensure that nobody else is able to reset or operate the equipment during the maintenance stages and must report any fault or deterioration caused by wear or by aging, in order to restore the correct safety conditions.
The installer or maintenance engineer must always pay attention to the working environment, to ensure it is well lit and has a suitable escape route.

A first aid kits must be provided.
Do not underestimate burns or wounds.

2.4 Protection from Electric Shock

An electric shock can be fatal.
Avoid touching internal or external normally live parts whilst the system is powered on.

Cables and connections must always be secured, in good conditions, insulated and suitably sized.

The equipment contains capacitors that store static electricity, which could produce dangerous electric discharges. Make sure that the devices have discharged their energy before carrying out any work on the equipment.

2.5 Electromagnetic Fields and Interferences

Electromagnetic fields may have harmful effects (unknown to date) on the health of people who are subjected to long exposure. Avoid standing for long periods of time at less than 20cm from the inverter.

The installer must be an expert in the field and must therefore be responsible for commissioning the system according to the manufacturer's instructions and local legislation. Should electromagnetic interferences be detected, the installer must solve the problem by contacting the manufacturer's technical support service.

In any case, electromagnetic interferences must be reduced so that they no longer cause disruptions.

Connect to ground the DLS external frame or other conductive parts to ensure best protection to the system and best safe to the operators.

National standards related to grounding must be complied with.

2.6 IP Protection Class Rating

IP21

- Housing protected from access of solid objects larger than 12.5 mm.
- Housing protected against dripping with a maximum tilt of 15°.

2.7 Warning Decals and Rating Plate

The labels on the equipment must NOT be removed, damaged, soiled or hidden.
The labels must always be visible and in good conditions.
The technical data shown in this manual do not however replace those shown on the data plates on the equipment.

2.8 Residual Risks

Despite the cautions and the safety systems, some residual risks will still be present, which cannot be removed. These risks are listed in the following table, alongside a few recommendations to prevent them.

Residual Risks Table

RISK ASSESSMENT	RECOMMENDED SOLUTION
Noise pollution caused by installations in unsuitable environments or where staff works on a regular basis.	Reassess the installation environment or site.
Unsuitable ventilation in the location, causing equipment to overheat but enough to prevent the discomfort of people who are on the site.	Restore adequate ambient conditions and ventilate the site.
Protection from the elements such as water seepage, low temperatures, high humidity, etc.	Keep adequate ambient conditions for the equipment.
Overheating of temperature surfaces (transformers, batteries, coils, etc ...) can cause burns. In addition, pay attention not to obstruct openings or cooling systems on the equipment.	Use suitable PPE or wait for the equipment to cool down before accessing it.
Lack of cleanliness: this affects the cooling system and prevents the safety labels from being read.	Adequately clean the equipment, the labels and the workplace.
Storage of static energy can produce dangerous electrical discharges.	Wait until these devices have discharged their energy before carrying out any work.
Poorly trained staff.	Request an additional training course.
During the installation stage, fixing the equipment or its components with provisional means can be hazardous.	Take care and prevent access to the installation area.
Accidentally disconnecting the quick connectors whilst the equipment is operational or making incorrect connections can produce electric arcs	Take care and prevent access to the installation area.

3 GENERAL DESCRIPTION

3.1 DLS / DLS-C Hybrid Inverter

The DLS hybrid inverter (see **Figure 00_A** and **00_B**) is a DC - AC solar inverter, designed for use in indoor environments. It has been designed to be used in combination with PV panels and connected to the electricity grid and a low voltage (LV) storage battery to optimize self-consumption. In the event of a temporary or permanent power outage, the DLS automatically enables the off-grid operation on the AC OUT port supplying, with the backup energy, the part of the home system connected to it.

The DLS hybrid inverter (see **Figure 00_C**) is further able to be used to create an off-grid system in combination with an auxiliary motor generator that can be automatically enabled by the inverter control system itself (OPTIONAL).

The DLS hybrid inverter (see **Figure 00_D** and **00_E**)can also be used in combination with an existing photovoltaic system, the connection to the electricity grid and a low voltage storage battery (LV) to optimize self-consumption and expand the total power of the existing photovoltaic field.

For more information www.delios-srl.it.

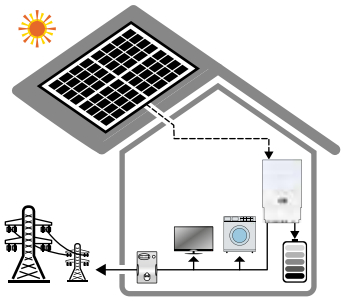
All adjustment and control operations can be performed on the LCD (touch screen) located on the front of the DLS.

3.2 Operating Modes

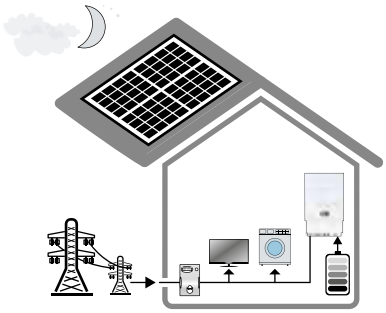
The DLS HV hybrid inverter can operate in different operating modes in order to meet the specific needs of the user.

3.2.1 "SELF-CONSUMPTION" Mode

This operating mode is mainly indicated in installations with a low tariff for the energy fed into the network and a high cost for the energy purchased from the distributor.



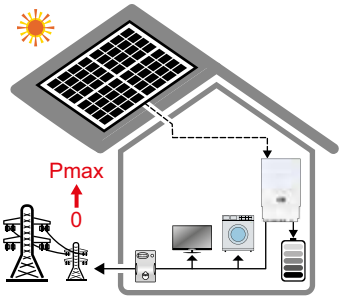
In the presence of sunshine, the energy from the photovoltaic field is used primarily to supply the domestic loads and secondly to charge the battery. Further energy in excess is transferred to the network. If the energy required by the loads is high and the available energy from photovoltaic field and battery is not enough, the missing part is drawn from the network.



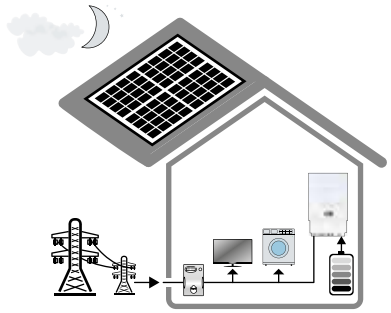
In the absence of energy from the photovoltaic field, the battery is discharged to supply domestic loads. If the energy required by the loads is high and the energy from the battery is not enough, the missing part is drawn from the network. The energy stored in the battery is never fed into the grid but is used exclusively to supply the home loads.

3.2.2 "FEED-IN CONTROL" Mode

This operating mode is mainly indicated in installations where local regulations require a limitation on the energy fed into the network.



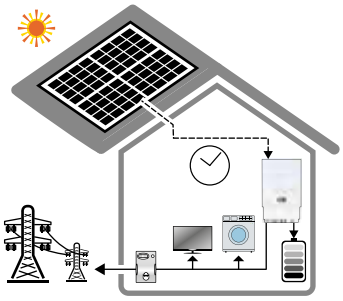
In the presence of sunshine, the energy from the photovoltaic field is used primarily to supply the domestic loads and secondly to charge the battery. Further energy in excess is transferred to the network with the possibility to set a limit on the value of the maximum power fed into the network. In this case, the inverter will limit the input power to the set value by reducing the production of the photovoltaic field until it completely inhibits it if the set limit is zero and there is no demand for energy from the loads. Therefore, by setting the input limit to 0W, the system will prevent the transfer of energy to the grid. Moreover, If the energy required by the loads is high and the available energy from photovoltaic field and battery is not enough, the missing part is drawn from the network.



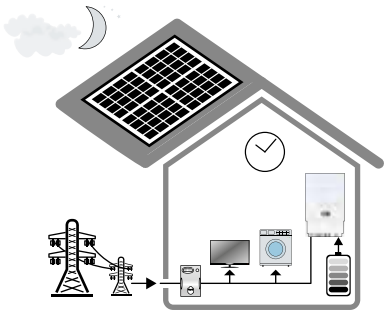
In the absence of energy from the photovoltaic field, the battery is discharged to supply domestic loads. If the energy required by the loads is high and the energy from the battery is not enough, the missing part is drawn from the network. The energy stored in the battery is never fed into the grid but is used exclusively to supply the home loads.

3.2.3 "BATTERY MANAGER" Mode

This operating mode is mainly indicated in installations where it is convenient to the enable the battery charge during the high photovoltaic production time over the day and operate a delayed discharge of the battery when the energy demand of the home is higher or the cost of energy is higher.



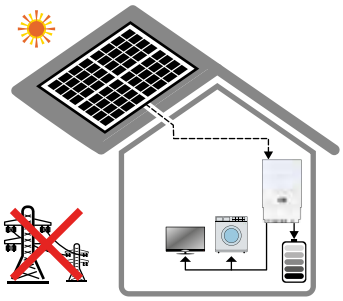
In the presence of sunshine, the energy from the photovoltaic field is used primarily to supply the domestic loads and secondly to charge the battery starting from the set charge start time. This allows you to start charging at the most convenient time of the day.



In the absence of energy from the photovoltaic field, the battery is discharged to supply the domestic loads only starting from the set time in order to keep the energy reserve ready for the moments of maximum demand and minimize any consumption from the mains in case of absorption peaks. It is also possible to set a usage time limit to disable the battery use and keep an energy reserve for the day after to support the energy demand from the loads.

3.2.4 "EMERGENCY POWER SUPPLY (EPS)" Mode

In case of a power outage, this operating mode allows an emergency output (EPS) to be activated to supply the privileged domestic loads. In order to activate this operating mode, the presence of the battery is required.



In case of a power outage, the energy from the photovoltaic field is used primarily to power domestic loads and secondly to charge the battery. If the energy required by the loads is high and the energy from the photovoltaic field is not enough, the missing part is drawn from the battery. In the absence of photovoltaic production, the energy required by the loads will be totally supplied by the battery.

WARNING: To preserve the health of the battery, the automatic enabling of the AC OUT port occurs only if the state of charge is greater than or equal to 5%. **Below this value the EPS mode is inhibited.**

WARNING: The "EPS" mode is automatically ended if, during the discharge, the battery status reaches the minimum value of 0%. It is automatically restored if the solar energy from the panels manages to bring the battery to a state of charge equal to or greater than 5%.

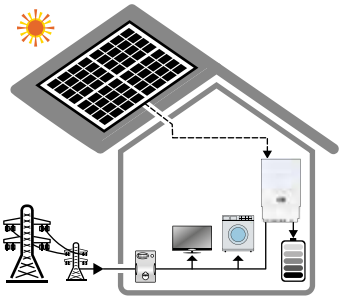
WARNING: The activation of the AC OUT port in case of a power outage can take a predetermined time which depends on the regulations in force in the country of installation. **For this reason, the DLS system cannot be used as a UPS as it does not guarantee the continuity of power supply to the loads connected to it. Do not connect devices to support vital functions.**

WARNING: The total power of the loads connected to the AC OUT output must be within the range specified in the technical data. If the total load is higher, the DLS will enter in protection mode, disabling the output power and signaling the overload event. After a few seconds it will attempt to restore the regular operation of the AC OUT port. This restart mode will continue until the total load connected to the AC OUT port is compatible with the maximum ratings specified in the technical data. It is therefore recommended to connect only essential loads to the AC OUT port.

WARNING: In EPS mode, some loads may not work properly even if their total rated power is within the limits specified in the technical data. This can happen because the inrush currents could be too high (refrigerators, air conditioners, hydraulic pumps, etc.). In these cases, the DLS hybrid inverter will enter in protection mode, disabling the output power and signaling the overload event. After a few seconds it will attempt to restore the regular operation of the AC OUT port. This restart mode will continue until the total load connected to the AC OUT port is compatible with the maximum ratings specified in the technical data. It is therefore recommended to connect only essential loads to the AC OUT port.

3.2.5 "BACKUP RESERVE" Mode

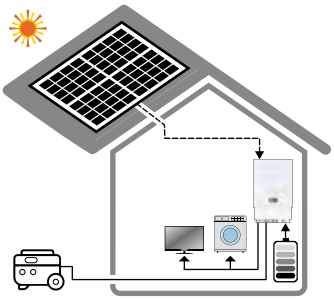
This operating mode allows you to maintain a reserve of energy stored in the battery always ready to be used in the event of a power outage and is particularly suitable for installations in areas where black-outs are frequent.



In this operating mode the battery is forced to be charged up to a preset minimum level and is never discharged below that level during normal self-consumption operation. The reserve of charge is manteined by the energy produced by the photovoltaic field or drawn from the network. in order to guarantee the pre-established safety level. The energy stored in the battery is never fed into the grid, but is used exclusively to supply the loads.

3.2.6 "SMART ISLAND" Mode

In case of no connection to the public network, this mode of operation allows to create an off-grid network (AC OUT) to power the loads. This operating mode involves the use of an auxiliary motor generator that may be automatically controlled by the control system (OPTIONAL) of the inverter itself to make up for the lack of energy. This operating mode requires the presence of the battery.



In the presence of sunshine, the energy from the photovoltaic field is used primarily to supply the domestic loads and secondly to charge the battery. If the energy required by the loads is high and the available energy from photovoltaic field and battery is not enough, the missing part is drawn from the battery. In the absence of photovoltaic production, the energy required by the loads will be totally supplied by the battery. If the energy required by the loads is such as to discharge the battery below a set threshold, the auxiliary motor generator is activated by means of a command (OPTIONAL) coming from the inverter. The energy supplied by the motor generator is used to supply the loads and to recharge the battery up to a set threshold at which the motor generator is deactivated by means of the same command coming from the inverter.

WARNING: To preserve the health of the battery, the automatic enabling of the AC OUT port occurs only if the state of charge is greater than or equal to the value set for the parameter "SOC START CH" in the "SMART ISLAND SETUP" configuration menu. **Below this value the inverter mode will enable the ignition of the external motor generator to power the loads and simultaneously recharge the battery**. The motor generator will then be deactivated upon reaching the charge state value set for the parameter "SOC STOP CH" in the "SMART ISLAND SETUP" configuration menu.

WARNING: In case of absence or malfunction of the auxiliary motor generator, the "SMART ISLAND" mode is automatically terminated if, during discharge, the battery status reaches the minimum value equal to the value set for the "SOC START CH" parameter in the "SMART ISLAND SETUP" configuration menu. It is automatically restored if the solar energy from the panels is enough to charge the battery to a state of charge greater than or equal to the value set for the parameter "SOC STOP CH" in the configuration menu "SMART ISLAND SETUP".

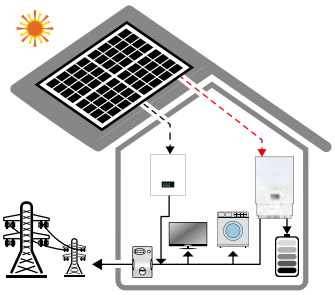
WARNING: The auxiliary motor generator must be **electronically stabilized and correctly sized** to meet the loads and battery charge power demand. The ratings of the motor generator must be compatible with the limits of use reported in the inverter and loads technical data. **The use of a not suitable motor generator can compromise the correct functioning of the system, cause damage to the loads connected to it and lead to situations of potential danger relieving DELIOS s.r.l. from any liability as well as invalidating the warranty terms.**

WARNING: The total power of the loads connected to the AC OUT output must be within the range specified in the technical data. If the total load is higher, the DLS will enter in protection mode, disabling the output power and signaling the overload event. After a few seconds it will attempt to restore the regular operation of the AC OUT port. This restart mode will continue until the total load connected to the AC OUT port is compatible with the maximum ratings specified in the technical data. It is therefore recommended to connect only essential loads to the AC OUT port.

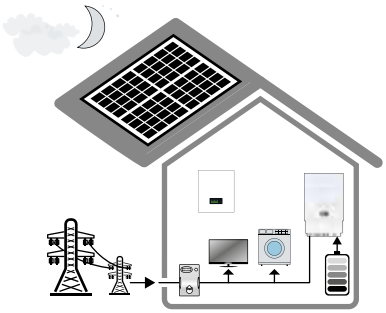
WARNING: In SMART ISLAND mode, some loads may not work properly even if their total rated power is within the limits specified in the technical data. This can happen because the inrush currents could be too high (refrigerators, air conditioners, hydraulic pumps, etc.). In these cases, the DLS hybrid inverter will enter in protection mode, disabling the output power and signaling the overload event. After a few seconds it will attempt to restore the regular operation of the AC OUT port. This restart mode will continue until the total load connected to the AC OUT port is compatible with the maximum ratings specified in the technical data. It is therefore recommended to connect only essential loads to the AC OUT port.

3.2.7 "HYBRID AC" Mode

This operating mode is mainly indicated to be used in combination with an existing PV plant where there is a low tariff for the energy fed into the network and a high cost for the energy purchased by the distributor.



In the presence of sunshine, the energy from the existing PV plant and from the additional PV field connected to the DLS is used primarily to supply the domestic loads and secondly to charge the battery. Further energy in excess is transferred to the grid. If the energy required by the loads is high and the available energy from the existing PV plant plus the additional photovoltaic field and battery is not enough, the missing part is drawn from the network.



In the absence of energy from the existing PV plant and from the additional PV field connected to the DLS, the battery is discharged to supply domestic loads. If the energy required by the loads is high and the energy from the battery is not enough, the missing part is drawn from the network. The energy stored in the battery is never fed into the grid but is used exclusively to supply the home loads.

3.3 LV Lithium Battery

The DLS hybrid inverter uses a low voltage lithium storage battery (LV) to store the energy from the PV panels and optimize self-consumption.

The DLS hybrid inverter can operate with various low voltage (LV) batteries which have been specifically tested and approved by DELIOS s.r.l. to ensure the safety and optimal operation of the system.

WARNING: Connect only the battery models approved by DELIOS s.r.l. to the DLS hybrid inverter Contact the DELIOS s.r.l. or consult the website www.delios-srl.it to identify the supported batteries.

3.3.1 Calibration Charge

Based on the state of health of the battery and to get an accurate and reliable state of charge (SOC) indication, the control module integrated in the battery (BMS) cyclically requests the DLS hybrid inverter to carry out a calibration charge up to 100%. This allows you to make the best use of the battery and maximize the useful life of the internal cells.

The calibration charge is primarily carried out by means of the energy from the solar panels which is entirely destined for the purpose. If the energy available from the solar panels is not enogh then the missing part is drawn from the network.

WARNING: During the calibration charge, normal system functionalities are disabled, and the battery cannot be used by the system. They are automatically restored at the end of the calibration process.

WARNING: During the calibration charge the EPS mode is disabled. It is automatically restored at the end of the calibration process.

WARNING: Calibration charge is required by the battery integrated control module (BMS). The DLS hybrid inverter cannot in any way disable the command from the battery.

The duration of the calibration charge depends on the energy available from the solar panels and on the health of the cells of the battery. This process can also take a long time (hours and / or days) especially during the winter when the available solar energy can be very low.

The calibration charge status is shown on the display status bar.

3.3.2 Maintenance Charge

During the winter period or after long periods of inactivity, the battery may remain at the minimum state of charge for a long time with the risk of a deep discharge phenomena with consequent risk of structural damage to the internal cells. Therefore, to avoid damages of the battery, the control module integrated in the battery (BMS) may require the DLS hybrid inverter to carry out a maintenance charge.

The maintenance charge brings the state of charge from the minimum value to a value determined by the BMS based on the state of health of the cells. The charging current is also determined by the BMS module based on the health and temperature of the battery itself.

WARNING: The maintenance charge is a safety function of the battery to avoid damages. For this reason, the DLS hybrid inverter can activate grid charging if the available solar energy is not enough.

WARNING: During the maintenance charge, normal system functionalities are disabled, and the battery cannot be used by the system. They are automatically restored at the end of the maintenance process.

WARNING: During the maintenance charge the EPS mode is disabled. It is automatically restored at the end of the maintenance process.

WARNING: Maintenance charge is required by the battery integrated control module (BMS). The DLS hybrid inverter cannot in any way disable the command from the battery.

The duration of the maintenance charge depends on the energy available from the solar panels and on the health of the cells of the battery. This process can also take a long time (hours) especially during the winter when the available solar energy can be very low.

The maintenance charge status is shown on the display status bar.

3.4 Protective Devices

To ensure maximum performance, DLS systems have been designed without transformer, i.e. without galvanic isolation between the DC inputs (PV) and the AC outputs (AC OUT). Therefore, to ensure a safe operation and to comply with current standards even without an isolation transformer, the DLS systems have been fitted with all the required safety devices, as described in the following paragraphs.

3.4.1 Anti-islanding

The DLS systems are equipped with an advanced anti-islanding protection system, i.e. with a protective automatic disconnecting system that is enabled in the event of a grid power outage or of voltage and / or frequency faults detected on the grid to avoid off-grid operation, which could be dangerous for the members of staff who work on the grid and for the loads connected to it. The safety system is fully compliant with the national relevant standards and legislation.

3.4.2 Earth Leakages of the PV panels

The DLS systems must be used with PV panels isolated from the protective conductor (earth), i.e. with the positive and negative terminals without direct connections to ground. To this purpose, a builtin protective and monitoring circuit constantly monitors the connection to ground and disables the DLS system when a fault is detected on the system by immediately displaying the associated alarm through the graphic interface.
The DLS system can only be used with PV systems compliant with Class A specific requirements, in compliance with IEC 61730 standard requirements.

3.4.3 Converter Earth Leakages

The DLS systems are fitted with a residual current monitoring unit (**RCMU**) in compliance with the requirements of IEC / EN 62109-2 safety standard. The device in question only protects the system from earth leakages occurring upstream of the AC OUT terminals (i.e. towards the DC side of the PV system and therefore towards the PV panels). Leakage currents that could occur in the AC section between the PPC (Point of Common Coupling) point and the DLS are not detected and require an external RCD.

3.4.4 Automatic Interlock Device

To allow operation in EPS mode (off-grid operation) in the case of a grid failure, DLS systems are equipped with an embedded automatic interlocking device. The system can automatically separate the part of the plant consisting of the DLS and the loads connected to it by the distribution network allowing operation according to the safety requirements and relevant standards and legislation.

WARNING: The operation of the automatic interlocking device is disabled by default factory setting. The enabling and use of the automatic interlocking system must be carried out in accordance with the regulations in force in the country of installation. (Setting are accessible only in "INSTALLER" mode with password authentication. Refer to the SYSTEM PROGRAMMING section.).

3.4.5 AC BYPASS Switch

In the event of system maintenance and/or faults, the AC BYPASS switch located on the DLS allows the safety system to be switched off and disconnected both from the national grid and the residential system it is connected to. When enabled, the AC BYPASS switch, as well as disconnecting the DLS, reconnects the residential and/or the privileged loads to the national grid, thus ensuring power supply continuity even in the event of a converter failure.

3.4.6 AC GRID Magnetothermal Circuit Breaker

The GRID IN input of the DLS system is equipped with a two poles magnetothermal switch **32A 1P + N 4.5kA** to protect and isolate of the AC line in question.

3.4.7 AC OUT Magnetothermal Circuit Breaker

The AC OUT output of the DLS system is equipped with a to poles magnetothermal switch **32A 1P + N 4.5kA** to protect and isolate of the AC line in question

3.4.8 PV Inputs DC Switch

The inputs of the PV1 and PV2 photovoltaic field of the DLS system are equipped with a dual twopoles switch to disconnect the DC lines in question.

3.4.9 PV String Fuses

If necessary, it is advisable to install PV fuse board equipped with string fuses. The fuses rating must be carefully evaluated during the installation.

3.4.10 Battery Galvanic Isolation

To ensure maximum safety, reliability and high efficiency, the DLS system is fitted with an innovative DC-DC conversion stage between battery and AC output with high frequency galvanic isolation. Thanks to the safety isolation provided by the conversion stage, the battery negative pole is directly tied to the protective earth conductor and therefore the voltage at the battery terminals can be classified as SELV (Safety Extra Low Volatge).

3.4.11 Battery Overcurrent Protection and Safety Fuse

The battery input is electronically protected from over-current. In case of an internal fault in the control system, the battery input is protected by a safety fuse. (**160A 80Vdc** for DLS EVO series and **60A 58Vdc** for DLS-C EVO series).

MODEL	FUSE RATINGS
DLS EVO	160A 80Vdc
DLS-C EVO	60A 58Vdc

3.4.12 Automatic Battery Switch

The DLS system is equipped with an automatic battery disconnecting switch which guarantees the correct connection / disconnection and operation of the batteries. When the system detects anomalous operating conditions and in cases where the ON/OFF switch is disabled for maintenance and / or malfunction of the system itself, the disconnector switch is automatically enabled, and the battery is safely disconnected from the system. In these conditions it is possible to carry out the battery maintenance.

3.4.13 Additional Protective Devices

The DLS system is fitted with additional protective devices to ensure safe operation in various operating conditions:

- Active temperature control and automatic power derating in case of abnormal operating conditions or outside the limits allowed to prevent the system from overheating.
- PV polarity reversal protections.
- Battery polarity reversal protection.
- PV, BAT, GRID IN, GRID OUT, AC OUT input/output overvoltage protection.
- AC OUT shortcircuit protection.

3.5 Touch-screen Control Panel

The control panel fitted on the DLS is a graphic touchscreen display. To input commands, simply touch the surface of the display with a finger or with objects suitable for the purpose.

Metallic or excessively sharp materials must not be used.

The display backlighting is turned off when the display is not used by the user. The LCD display remains operational even if it appears to be off. To reactivate it, simply touch the display surface.

4 INSTALLATION

The installation must be carried out only by experienced staff, authorized by the manufacturer.

During the installation, make sure that the inverter is powered off.

4.1 Lifting, Transport and Unloading Instructions

Transport and Handling
Transport of the equipment, especially on the road, must be carried out with means able to protect the system components (especially electronic components) from major impacts, humidity, vibrations, etc.
During handling, sudden or fast movements which could create dangerously sway the system must be avoided.

Lifting
DELIOS s.r.l. normally packs and protects each component by using devices able to ease its transport and handling operations but, generally speaking, these operations must be carried out by staff specialized in loading and unloading components.
The ropes and vehicles used for lifting must be suitable for withstanding the weight of the equipment.
Do not lift multiple units or parts of the equipment at the same time, unless otherwise stated.

The DLS is not equipped with specific lifting means.

Do not underestimate the weight of the DLS, check technical characteristics.
Do not move or stop the hanging load above people or things.
Do not let it drop or lay with too much force.

4.2 Unpacking and Checks

Remember that the packaging elements (cardboard, cellophane, staples, adhesive tape, straps, etc.) can cut and / or injure, if not handled with care. They must be removed with appropriate means and must not be handled by non-responsible people (i.e., children).
The packaging components must be removed of and disposed of according to the regulations in force in the country of installation.
Check the integrity of the packaging before opening.
Open the packaging and remove the DLS with care to avoid damages to the external casing or the internal electronic part.
Before starting the commissioning operations, make sure that the external casing of the DLS is in good condition and free from transport damages.

4.3 Checking the Box Contents

The DLS box must contain the following parts:

- DLS hybrid inverter.
- Top and bottom bracket for wall mounting.
- Support for wall mounting.
- Instruction manual - Operation, installation, maintenance.
- Quick connectors and related contacts for PV strings wiring and connection.
- Wi-Fi dongle for connection to a local wireless network.

4.4 Positioning the DLS

With reference to **Figure 01**, the installation position of the DLS must meet the following conditions:

- The DLS must be installed indoors in a room with relative humidity ranging from 5% to 95% without condensation.
- The DLS optimal operation is ensured if the maximum ambient temperature of 40°C is not exceeded. Should the temperature become too high, the automatic power derating will trip to prevent the system from overheating.
- Do not install the DLS in a position directly exposed to the sun.
- Install the DLS as close as possible to the meter panel.
- Install the DLS in such a way as to Ensure easy access to the controls and to the connections
- Install the DLS in such a way as to have the LCD display at eye height.
- Install the DLS and the power lines in such a way as to prevent access to pets (rodents in Particular).
- The DLS, in some specific conditions, can produce a slight buzzing noise during its operation. This noise is normal and does not affect its performance but can be annoying if the unit is mounted onto a wall of an inhabited area, onto a wall adjacent to an inhabited area or onto certain type of materials (such as thin wooden panels or metal plates).
- The position must not be accessible to children.
- The wall must be vertical, with a maximum tilt of ±5°.
- The surface where the DLS will be installed must withstand its weight (25kg).
- The DLS must be installed leaving a 500mm clearance where the bottom of the unit is located to Ensure easy cabling and connection. There are no restrictions for the top of the unit as the ventilation system does not require vertical outlets.
- In the case of multiple installation of several DLS, a side clearance of 500 mm between the units must be provided.
- The DLS system must be used at a maximum altitude above sea level of 3000m (9750 feet). For altitudes above 2000m, due to the rarefaction of the air, specific conditions may occur which must be considered when choosing the place of installation. All installations at altitudes above 2000m must be assessed case by case considering the following critical issues:
  - less efficient cooling,
  - decrease in the dielectric strength of the air and, in the presence of high voltages, the creation of electric arcs,
  - presence of cosmic radiation that can affect the correct functioning of the electronic components.

- Do not mount the DLS on or under flammable building materials.
- Do not install the DLS in areas where highly flammable substances are present.
- Do not install the DLS in areas subject to explosion hazard.

To prevent the risk of electric shock or other injury, check that there are no electrical or hydraulic lines in the walls before drilling the mounting holes of the DLS. Please note that the appropriate type of plastic plugs and screws must be selected by qualified installer, based on the following considerations:

- the installation location, as well as
- the type of the wall on which the system is to be mounted to ensure that the mounting of the hybrid inverter is done as safely as possible

Make sure there is enough free space for air circulation around the DLS. Local regulations may require larger clearances.
If you mount the DLS in a cabinet, a piece of furniture or in another relatively small and closed space, it is necessary to ensure enough air circulation to dissipate the heat generated by the unit.

4.5 Mounting the DLS

The DLS is delivered with a wall mounting bracket suitable for use on most walls.

How to mount the DLS:

1. Fix the top and bottom mounting brackets to the DLS body (Follow the instructions shown in **Figure 01**).
2. Drill the holes to fix the DLS mounting support on the wall.
3. Fix the mounting support to the wall
4. Install the DLS.
5. Fix the DLS to the wall using the bottom bracket fixing screw.

5 ELECTRICAL CONNECTIONS

5.1 Cautions

The installation must be carried out only by experienced staff.

Refer to Figure 02 to identify the switch geras of the DLS inverter.

Refer to Figure 03 to identify the connection terminals of the DLS inverter.

Refer to Figure 04 for the installation wiring diagram of DLS inverter relying on internal energy meter.

Refer to Figure 05 for the installation wiring diagram of DLS inverter relying on external energy meter.

Refer to Figure 06 for the installation diagram of DLS inverter in off-grid configuration.

Refer to Figure 07 for the installation diagram of DLS inverter in AC hybrid configuration relying on internal energy meter.

Refer to Figure 08 for the installation diagram of DLS inverter in AC hybrid configuration relying on external energy meter.

For safety reasons, an appropriately rated input load disconnector must be provided for each individual DLS. No load should be connected directly to the DLS inverter.

The DC disconnector of the PV input lines is integrated. The disconnector of the battery lines is also integrated and automatic. It is normally managed by the system control, but it can be voluntarily controlled by turning the AC BYPASS switch to the "1" position in cases of maintenance/malfunction which require disconnection of the battery from the system.

WARNING: Local regulations in force in the country of installation may require the installation of an external additional DC disconnector for the PV input lines and an external additional DC breaker switch for the positive and negative lines of the battery. Both devices must be rated according to the maximum voltage and current values specified in the technical data of the DLS.

DLS systems are equipped with a Residual Current Monitoring Unit compliant with the requirements of the IEC / EN 62109-2: 2011 safety standard (refer to paragraph 4.8.3.5 of the Standard). They are equipped with a redundancy on the earth leakage current sensitive to all components of the current, both direct and alternating. The measurement is carried out simultaneously by two different processes: it is enough that only one of the two detects a fault to disconnect the converter from the network.

It must be noted that the device integrated in the converter protects the system against the faults only occurring upstream of the inverter AC terminals (i.e. from the inverter to the photovoltaic modules). The leakage currents that can occur in the AC section between the PCC (Point of Common Coupling) and the DLS are not detected. **If, in compliance with local regulations or specific cases, the use of an external RCD is necessary, it is recommended to use a type A protection RCD with a fault current of at least 100mA.**

DELIOS s.r.l. declares that the construction of the DLS does not produce direct earth fault currents and therefore, in accordance with article 712.413.1.1.1.2 of section 712 of the Standard CEI 64-8/7 standard, a type B RCD, according to IEC 60755/A2 standard, is not required.

Connect only one DLS system for each load circuit breaker.

A threaded plug fuse cannot be used as a load circuit breaker.

Do not use measuring instruments with a maximum input voltage lower than 1000V.

The protective earth conductor must have a cross-section at least equal to or greater than the cross-section of the cables for connection to the public grid (AC) and in any case in accordance with the requirements of local regulations.

5.2 PV panels connection

See the connection instructions shown in **Figure 09** and **Figure 10**.

Before starting the connection operations, make sure that the external AC line main switch is disconnected and that the AC GRID and AC OUT circuit breakers are disconnected.

Before starting the connection operations, make sure that the DC line switch is off.

Before starting the connection operations, make sure that the AC BYPASS switch is in the "1" position.

The conductors from the solar panels are always live.

All DLS models are equipped with two input channels (double MPPT maximum power tracker). Strings of PV modules having the same type, number, orientation and inclination must be connected to the same channel.
The two independent inputs can also be connected in parallel and used as a single input respecting the above stated requirements.

All the input parameters that must be respected for correct operation of the DLS system are shown in the "technical data" table.

The voltage applied to each input channel of the DLS, determined at the minimum rated temperature for operation, must NEVER exceed 600V. Exceeding the limit can cause serious damage to the DLS.

Never disconnect the DC connectors before having switching off the circuit breaker (external or internal). Any disconnection of the connectors during operation can generate large electrical arcs.

An electric shock shock can be fatal.
An electric discharge can set fire to the inverter.
An electrical discharge can cause fires capable of spreading to the surrounding areas.

5.2.1 Connection of independent PV strings to PV1 and PV2 inputs

Refer to the connection diagram shown in **Figure 09_A** and **Figure 10_A** if the system is based on two independent PV strings.

The voltage applied to each input channel of the DLS, determined at the minimum rated temperature for operation, must NEVER exceed 600V. Exceeding the limit can cause serious damage to the DLS.

5.2.2 Connection of a single PV string to the PV1 or PV2 input

Refer to the connection diagram shown in **Figure 09_B** and **Figure 10_B** if the system is based on a single PV string connected to a single PV1 or PV2 input.

The voltage applied to each input channel of the DLS, determined at the minimum rated temperature for operation, must NEVER exceed 600V. Exceeding the limit can cause serious damage to the DLS.

WARNING: To avoid incorrect evaluation of the electrical insulation parameters of the panels, **it is necessary to short-circuit the unused input by connecting a cable between the + and – connectors.**

5.2.3 Connection of a single PV string to paralleled PV1 and PV2 inputs

Refer to the connection diagram shown in **Figure 09_C** and **Figure 10_C** if the system is based on a single PV string connected to both inputs PV1 and PV2.

The voltage applied to each input channel of the DLS, determined at the minimum rated temperature for operation, must NEVER exceed 600V. Exceeding the limit can cause serious damage to the DLS.

WARNING: The default factory setting of the DLS is set for operation with independent PV1 and PV2 inputs. To obtain the correct operation of the DLS inverter with the PV1 and PV2 inputs configured in parallel, it is necessary to access the "SETTINGS" configuration menu in INSTALLER mode, access the "SYSTEM" menu and set the MPPT parameter in "PARALLEL" mode in the "MPPT CONF" menu. Refer to the SYSTEM PROGRAMMING section.

5.3 AC grid connection

See the connection instructions shown in **Figure 12**.

Make sure to be compliant with the local regulations.
Make sure to be compliant with the grid code of the distribution network operator.

For safety reasons, an appropriately rated input load disconnector must be provided for each individual DLS. No load should be connected directly to the DLS inverter.

The connection of multiple inverters to the public grid must comply with current legislation relating to maximum power imbalance.

The power losses on the GRID IN - GRID OUT line must be less than 1% of the rated power. The indicative data of the connection are reported below.

Wire cross-section	Line maximum length		
	DLS 300C EVO	DLS 450 EVO DLS 450C EVO	DLS 600 EVO DLS 600C EVO
2.5 mm²	8 m	-	-
4.0 mm²	13 m	12 m	10 m
6.0 mm²	23 m	18 m	15 m

Before starting the connection operations, make sure that the external AC line main switch is disconnected and that the AC GRID and AC OUT circuit breakers are disconnected.

Before starting the connection operations, make sure that the DC line switch is off.

Before starting the connection operations, make sure that the AC BYPASS switch is in the "1" position.

Do not carry out other operations on the inverter for at least 10 minutes. The inverter contains capacitors that need a minimum time to discharge.

Remove the cover of the connection compartment by removing the screws as shown in **Figure 11**.

Connect the phase (L), neutral (N) and earth (PE) wires of the AC grid input to the **GRID IN** terminal block respecting the correct assignment:

- Phase (L) → L Terminal (GREY)
- Neutral (N) → N Terminal (BLUE)
- Earth (PE) → PE Terminal (YELLOW/GREEN)

Connect the phase (L), neutral (N) wires of the AC grid output to the **GRID OUT** terminal block respecting the correct assignment:

- Phase (L) → L Terminal (GREY)
- Neutral (N) → N Terminal (BLUE)

Connect the phase (L), neutral (N) and earth (PE) wires of the home loads line or the privileged loads line to the **AC OUT** terminal block respecting the correct assignment:

- Phase (L) → L Terminal (GREY)
- Neutral (N) → N Terminal (BLUE)
- Earth (PE) → PE Terminal (YELLOW/GREEN)

If the presence of an energy meter for the produced energy is not required, connect directly by a wire bridge the **AC OUT** Phase (L) and Neutral (N) terminal block and the **GRID OUT** Phase (L) and Neutral (N) terminal block respectively, making sure to comply with the correct assignment previously reported.

Where required by local regulations or by the grid operator, it may be necessary to connect an energy meter to the DLS to detect the energy produced by the plant. In this case, connect the **Phase (L)** and **Neutral (N) measuring terminals of the energy meter** to the **AC OUT** terminal block respecting the correct assignment:

- Phase (L) → L Terminal (GREY)
- Neutral (N) → N Terminal (BLUE)

Next, connect the **Phase (L) and Neutral (N) supply terminals of the energy meter** to the GRID OUT terminal block respecting the correct assignment above. Further, connect the home loads line or the privileged loads line to the **GRID OUT** terminal block respecting the correct assignment:

- Fase (L) → Morsetto L (GRIGIO)
- Neutro (N) → Morsetto N (BLU)

Be careful not to reverse the phases with the neutral. If this happens, the system may present malfunctions. In this case, the DLS detects the fault by disabling the operation and signaling the problem with a specific alarm code.

5.4 Home Loads Line and Privileged Loads Line connection

See the connection instructions shown in **Figura 04-05-06-07-08**.

WARNING: Make sure to comply with the local regulations to set up an auxiliary off-grid power supply system in case of a power outage.

WARNING: The power supply system of the loads connected to the AC OUT port **for off-grid operation relies on an internal interlocking system that automatically disconnect the part of the system composed by the DLS and the loads connected to it from the distribution network.**

WARNING: For safety reason, the operation of the internal interlock system in EPS mode is disabled as per DLS default factory setting. The enabling and use of the automatic interlocking system must take place in accordance with the regulations in force in the country of installation. To enable the operation of the AC OUT port in EPS mode, it is necessary to access the "SETTINGS" configuration menu in INSTALLER mode, access the "SYSTEM" menu and select "ON" in the "EPS" menu. Refer to the SYSTEM PROGRAMMING section.

WARNING: The NEUTRAL (N) conductor of the AC OUT port, during operation in **EPS or SMART ISLAND mode, is automatically tied to the earth potential** and this guarantees the correct functioning of the protection systems against direct discharge provided for the home loads line or for the privileged loads line and placed downstream of the inverter. For installations where the local legislation in force provides that the conductor of NEUTRAL (N) **is not connected to the ground potential, it is necessary** to disable the automatic connection of the NEUTRAL **(N) to the earth potential**. (Setting accessible only in "INSTALLER" mode with password authentication. Refer to the SYSTEM PROGRAMMING section.).

For safety reasons and according to the regulations in force in the country of installation it is necessary to provide an appropriately rated **external RCD protection device** for the home loads line and for the privileged loads line. No load should be connected directly to the DLS inverter.

The power losses on the AC OUT line must be less than 1% of the rated power. The indicative data of the connection are reported below.

Wire cross-section	Line maximum length		
	DLS 300C EVO	DLS 450 EVO DLS 450C EVO	DLS 600 EVO DLS 600C EVO
2.5 mm^2	8 m	-	-
4.0 mm^2	13 m	12 m	10 m
6.0 mm^2	23 m	18 m	15 m

WARNING: The total power of the loads connected to the AC OUT output must be within the range specified in the technical data. During EPS or SMART ISLAND operating mode, if the total load is higher, the DLS will enter in protection mode, disabling the output power and signaling the overload event. After a few seconds it will attempt to restore the regular operation of the AC OUT port. This restart mode will continue until the total load connected to the AC OUT port is compatible with the maximum rat-ings specified in the technical data. It is therefore recommended to connect only essential loads to the AC OUT port

WARNING: In EPS or SMART ISLAND mode, some loads may not work properly even if their total rated power is within the limits specified in the technical data. This can happen because the inrush currents could be too high (refrigerators, air conditioners, hydraulic pumps, etc.). In these cases, the DLS hybrid inverter will enter in protection mode, disabling the output power and signaling the overload event. After a few seconds it will attempt to restore the regular operation of the AC OUT port. This restart mode will continue until the total load connected to the AC OUT port is compatible with the maximum rat-ings specified in the technical data. It is therefore recommended to connect only essential loads to the AC OUT port.

5.5 LV Lithium Battery Connection

Before connecting the battery to the DLS system, make sure to have read and understood all the instructions provided in the operating and installation manual supplied by the battery manufacturer. Failure to follow the instructions provided in this manual may affect the correct operation of the system, lead to potentially hazardous situations, relieves DELIOS s.r.l. from any liability and invalidates the warranty conditions.

Contact the DELIOS s.r.l. or consult the website www.delios-srl.it to identify the supported batteries.

WARNING: The default factory setting of the DLS is set to operate without any battery connected to the system. To enable HV battery operation, access the "SETTINGS" configuration menu in INSTALLER mode, access the "BATTERY" menu and select the correct LV battery model from those listed in the "LITHIUM" menu. Refer to the SYSTEM PROGRAMMING section.

See the connection instructions shown in **Figure 13**.

The DLS system can operate with low voltage (LV) lithium-ion batteries. Batteries produce electricity and can cause electric shock or fire in the event of a short circuit or incorrect installation.

WARNING: Local regulations in force in the country of installation may require the installation of an external DC circuit breaker in addition to the automatic disconnector integrated in the DLS. The DC circuit breakers must be properly rated for the + and - lines to guarantee the safe disconnection of the battery from the inverter in case of maintenance.

The DLS is fitted with a safety fuse against battery short-circuits. The fuse ratings are shown in the table below. In the event of replacement, the fuse ratings must not be exceeded in any way as this could cause electric shock or fire in the event of a short circuit. Refer to **Figure 20** to locate the safety fuse.

MODEL	FUSE RATINGS
DLS EVO series	160A 80Vdc
DLS-C EVO series	60A 58Vdc

Before starting the connection operations, make sure that the battery cables are disconnected from the battery and that the poles are insulated to prevent short circuits.

Before starting the connection operations, make sure that the AC GRID and AC OUT circuit breakers are disconnected.

Before starting the connection operations, make sure that the internal DC line switch is disconnected.

Before starting the connection operations, make sure that the AC BYPASS switch is in the "1" position. In this way the automatic battery switch is controlled and the battery lines are disconnected.

Use battery cables with cross-section of 16 mm^2 for DLS-C series and 25mm^2 for DLS series with a maximum length of 3 m per cable. **Failure to comply with the following indications can lead to dangerous overheating of the connection cables as well as non-compliance with the EMC standard requirements**.

Use FTP or STP CAT5 cable with RJ45 connector for communication connections between the DLS system and the battery with a maximum length of 3 m. **Failure to comply with the following indications can lead to dangerous malfunctions of the battery as well as non-compliance with the EMC standard requirements**.

1. Make sure the battery is turned off.
2. Connect the battery cables to the DLS respecting the indicated polarity (red for the positive terminal, black for the negative terminal).
4. Connect an FTP or STP CAT5 cable between the spring terminal block (CAN) of the DLS and the BMS communication connector (RJ45) of the battery. For the appropriate settings, refer to the "SYSTEM PROGRAMMING" section, "BATTERY" paragraph.
5. Where required, connect the battery cables to the battery according to the manufacturer's instruc-tions and using any connectors provided in the battery connection kit.

Batteries must be located in specific areas reserved for them, in compliance with local regulations.

During the wiring operations, isolate the battery poles to prevent short circuits. Shorted poles can cause sparks, fire hazard or damage to batteries.

The incorrect connection of the battery cables (polarity reversal) does not damage the DLS thanks to the integrated protection, but disable the operation of the system until the correct polarity of the connection is restored. The incorrect connection message is displayed on the LCD.

5.6 Earth Connection (MANDATORY)

The DLS inverter is equipped with two earthing contacts which must be simultaneously connected to the protective conductor. The two earthing contact are provided by the GRID IN and AC OUT terminal blocks.

See the connection instructions shown in **Figure 14**.

5.7 Energy Meter Connection

The DLS inverter uses an external energy meter to monitor the energy flows between the home loads and the distribution grid to implement the available operating modes.

To ensure the correct operation of the system, it is necessary to connect the energy meter to the inverter otherwise the system will enter into protection mode disabling the operation and signaling the failure to communicate with the device.

The DLS inverter can operate only with the approved energy meter models. Contact the DELIOS s.r.l. or consult the website www.delios-srl.it to identify compatible models.

See the connection instructions shown in **Figura 15**.

5.8 External Control Signals Connection

The EXTERNAL ALARM signal provides an isolated logic control suitable for operating external indica-tors to return to the remote area the alarm conditions detected by the DLS monitoring device and indi-cated by the LCD display.

The EXTERNAL ALARM signal is available at the following terminals:

- Terminal 3 → GND (COMMON)
- Terminal 4 → AL_EXT (EXTERNAL ALARM)

The EXTERNAL ALARM signal is enabled with the following logic levels:

- AL_EXT = 0V → Alarm condition
- AL_EXT = +15V → Normal operation
  The external indicator monitoring port must have an input impedance of Ri ≥ 100kΩ.

The TELEDISTACCO and SEGNALE ESTERNO are relevant only in Italy (CEI-021).

The TELEDISTACCO and SEGNALE ESTERNO signals are available at the following terminals:

- Terminal 3 → GND (COMMON)
- Terminal 5 → T_D (TELEDISTACCO)
- Terminal 6 → S_E (SEGNALE ESTERNO)

The TELEDISTACCO e SEGNALE ESTERNO are enabled at low logic level (GND).

The NTC BATT + and NTC BATT - are only for internal use not used for the configurations described in this manual.

See the connection instructions shown in **Figure 16**.

5.9 Wi-Fi Connection

By using a Wi-Fi dongle, the DLS inverter can access a local Wi-Fi network allowing to activate the re-mote connection and system monitoring functions.

See the connection instructions shown in **Figure 17**.

Insert the Wi-Fi dongle supplied with the inverter accessories the USB port and wait for the system to recognize the device (transparent Wi-Fi icon).

WARNING: Use only the Wi-Fi dongle supplied with the inverter accessory. The correct functioning of Wi-Fi connectivity is not guaranteed with not approved similar devices.

To set the correct operation of the connection it is necessary to access the configuration menu "SETTINGS" and set the networking parameters of the "WLAN" menu according to the characteristics of the local network to be accessed. Refer to the SYSTEM PROGRAMMING - NETWORKING section.

To ensure optimal Wi-Fi connectivity, make sure that the Wi-Fi signal available near the installation of the DLS system is high enough to allow a stable connection. For this purpose, during the configuration of the network parameters, the scanning and selection of the Wi-Fi network carried out by the DLS reports the signal strength of the wireless network to which you intend to connect and the select network with signal strength S> - 60dBm. **If the detected signal is weak (S <-60dBm), the connection is not guaran-teed and therefore it is necessary to provide for the use of a Wi-Fi repeater.**

If the configuration operations are carried out correctly, the effective connection to the local Wi-Fi network is shown by the Wi-Fi icon (icon highlighted) on the status bar of the display and by the stable lighting of the blue LED on the control panel.

5.10 LAN Connection

If the Wi-Fi connection is weak and / or not very stable, alternatively the DLS inverter can access a wired local network via the LAN port allowing to activate the remote connection functions and system monitoring.

See the connection instructions shown in **Figure 18**.

Insert the network cable from the router into the LAN port and wait for the system to recognize the connection (NETWORK icon highlighted).

To set the correct operation of the connection it is necessary to access the "SETTINGS" configuration menu and set the networking parameters of the "LAN" menu based on the characteristics of the local network to be accessed. Refer to the SYSTEM PROGRAMMING - NETWORKING section.

If the configuration operations are carried out correctly, the effective connection to the local LAN is shown by the NETWORK icon (icon highlighted) on the status bar of the display and by the stable lighting of the blue LED on the control panel.

5.11 SMART LOAD Connection (OPTIONAL)

The DLS inverter provides 1 isolated change-over relay contact (4A - 250Vac max) which allows activating secondary storage systems and / or domestic loads based on the state and energy balance of the system (OPTIONAL).

See the connection instructions shown in **Figura 19**.

WARNING: The relay contact can switch loads with absolute maximum ratings up to 4A - 250Vac. If you intend to control loads with higher rated power, it is necessary to install an external switch and use the DLS contact to create the control circuit of the external switch.

WARNING: To set the contact operating mode it is necessary to access the "SETTINGS" configuration menu and set the "LD1 - SMART LOAD" parameters of the "HOME AUTOMATION" menu according to the desired energy management needs. Refer to the SYSTEM PROGRAMMING section.

5.12 System Switching On

Before starting the system, carry out the following checks:

1. Check that the inverter is correctly fixed to the wall.
2. Check that the PV string connections have been made correctly.
3. Check that the GRID IN, GRID OUT and AC OUT connections have been made correctly.
4. Check that the BATTERY connections have been made correctly.
5. Check that the EARTH connection (MANDATORY) has been made correctly.
6. Verify that the external ENERGY METER (if present) connections have been made correctly.
7. Verify that SMART LOAD connections (if present) have been made correctly.
8. Check that the connection cover is closed and secured with the fixing screws

If the checks listed above were successful, proceed as follows:

1. Turn on the DC disconnector switch (position 1).
2. Turn on the external main AC line switch.
3. Turn on the AC GRID and AC OUT circuit breakers.
4. Turn on the BATTERY circuit breaker (if present) and turn on the LV battery.
5. Wait for the display to turn on.
6. Start the inverter by turning the AC BYPASS switch in position 0.

AUTO-TEST execution (Italy - CEI 0-21) - The self-test is relevant only for Italy (CEI-021). If the DLS is configured for Italy, the self-test is available through the service menu on the display. The self-test for Italy is aimed at verifying the upper and lower limits of the voltage and frequency of the network, after exceeding which the DLS disconnects from the network. If the test fails, the DLS will not be able to connect to the electrical network. Refer to the SYSTEM PROGRAMMING section for operational details.

5.13 System Switching Off

Proceed as follows to switch off the system:

1. Enable the inverter stand-by by turning the AC BYPASS switch in the "1" position.
2. Turn off the DC switch (position 0).
3. Turn off the AC GRID and AC OUT circuit breakers.
4. Turn off the BATTERY circuit breaker (if present) and turn off the LV battery.
5. Wait for the display to turn off.
6. Do not carry out other operations on the inverter for at least 10 minutes.
   The inverter contains capacitors that need a minimum time to discharge.

6 CONTROL PANEL

6.1 General Information

1 - Power supply

- LED on: the DLS is powered and is operating regularly.
- LED blinking: the DLS is in the start-up and self-test phase.
- LED off: the DLS is not powered.

2 - General alarm

- LED on: the DLS has detected a fault. The LCD display activates the corresponding alarm icon and shows the information related to the alarm occurred on the status bar (see the "Troubleshooting" section).
- LED off: the DLS has not detected any fault.

3 - Communication

- LED on: communication with external devices is enabled.
- LED off: communication with external devices is disabled.

4 - USB port

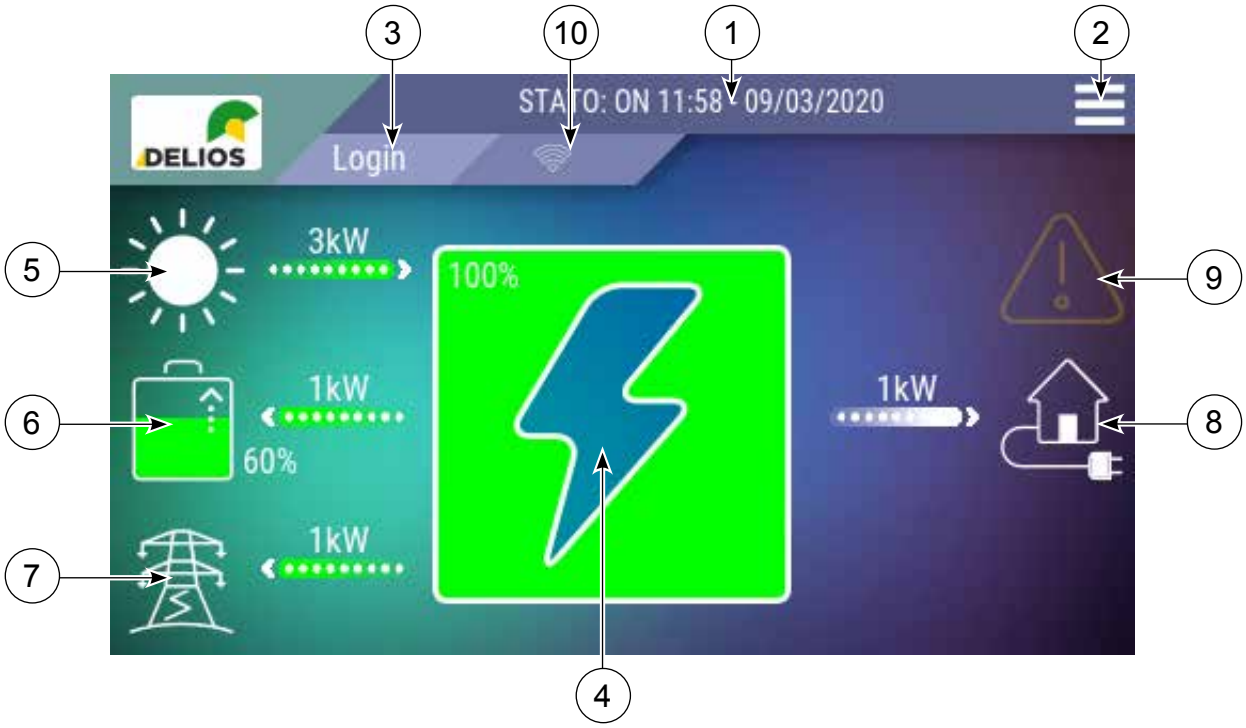
- USB port available for data download, firmware update, Wi-Fi dongle connection

Do not connect portable hard disks, MP3 players, computers and any other device other than a flash USB memory or Wi-Fi dongle to the USB port. The system is compatible with most of the flash USB memories on the market. However, the system may not recognize some types of USB memory, in this case it is recommended to try again replacing it with another model.

5 - Graphic touch-screen display

- Graphic touch screen graphic display which displays the system status and user / installer settings.

6.2 "HOME" Page



The "HOME" screen displays and analyzes in real time all parts of the DLS system. All the power sources supplied to meet the demands of the domestic needs and their operating parameters are constantly monitored and displayed in real time. Similarly, the central indicator will display in real time the system energy balance.

1. System status bar: The system indicator bar shows the DLS operating status, the current date and time. If faults are detected, the alarm codes detected by the system are displayed (see the section "Troubleshooting).

2. Access to the "MENU" page: This key allows the operator to access the built-in datalogger (graphics, data and statistical data), system configuration and programming menus.

3. Access to the "LOGIN": This key allows the operator to view the login page to access the different programming level of the system by entering the access password.

4. "ENERGY BALANCE" icon: This dynamic icon shows the system energy balance in real time: the green colour shows the percentage of energy produced by renewable sources (PV and batteries), the purple colour shows the energy drawn from the grid in order to meet the demands of the residential sys-tem connected to the DLS.

5. "SUN" icon: The "SUN icon shows if a PV solar system is connected to the system. The flow of en-ergy coming from that source is displayed on the bar located next to the icon. The numbers shown above the bar, which can be scrolled by simply pressing the bar itself, display in real time the voltage, current and power values related to the PV generator.

6. "BATTERY" icon: The "BATTERY" icon shows if a battery is connected to the system. The icon also shows the battery charge / discharge status and the percentage of energy available to the system. The flow and the direction of energy coming from that source is displayed on the bar located next to the icon. The numbers shown above the bar, which can be scrolled by simply pressing the bar itself, display in real time the voltage, current and power values related to the battery**.**

7. "GRID" icon: The "GRID" icon shows if energy is being drawn from the national grid. The flow and the direction of energy coming from that source is displayed on the bar located next to the icon. The num-bers shown above the bar, which can be scrolled by simply pressing the bar itself, display in real time the voltage, current and power parameters of to the national grid.

8. "HOME" icon: The "HOME" icon shows if there are loads which draw power from the system. The flow of energy drawn by the residential system is displayed on the bar located next to the icon. The number shown above the bar displays in real time the power drawn by the system.

9. "GENERAL ALARM" icon: If the "GENERAL ALARM" icon is on, the system has detected a fault. The code of the alarm detected by the system is displayed on the system status bar (see the "Troubleshooting" section). By touching the icon, the list of alarms recorded by the system will be displayed.

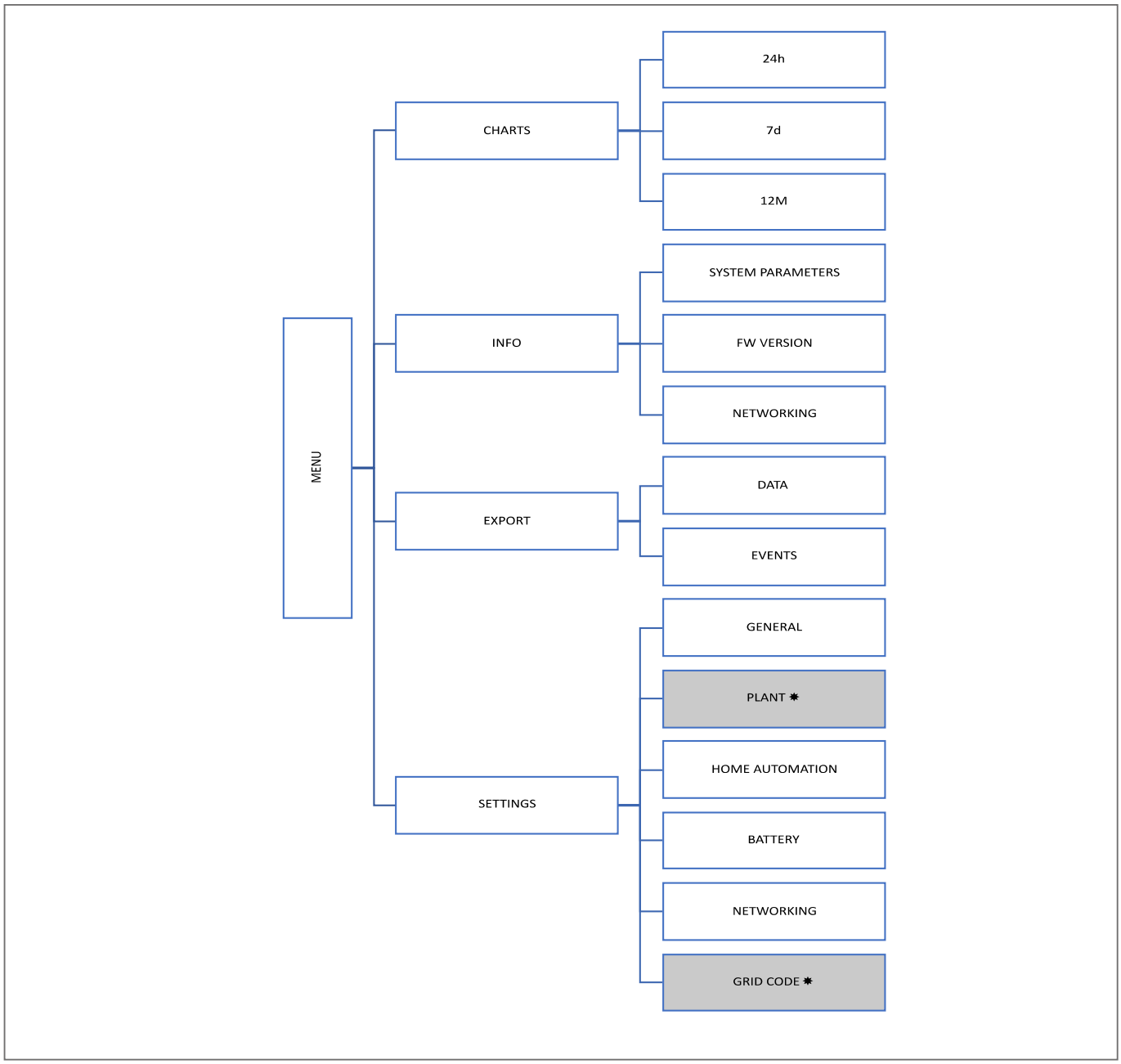
10. "USB/Wi-Fi" icon: Activation of the "USB" icon indicates that an external USB memory is connected to the port on the control panel. Similarly, the activation of the "Wi-Fi" icon indicates that a Wi-Fi dongle has been connected (transparent icon) and that a connection to a local Wi-Fi network has been estab-lished (icon highlighted)

WARNING: The display cannot be considered a measuring instrument. The measurements shown on the display are indicative and therefore are not suitable for calculating the efficiency or production yield.

7 SYSTEM PROGRAMMING

7.1 "MENU" Structure and System Navigation

The structure of the menus available from the control panel is as follows:



To access the menus marked with "✸" it is necessary to perform the "LOGIN" as INSTALLER with password which must be compulsorily re-quested from DELIOS srl.

WARNING: The parameters at INSTALLER level can be accessed only by qualified staff. Changing the parameters at the installer level by unqualified staff can affect the correct functioning of the system and relieves the manufacturer from all liabilities and invalidates the warranty.

7.2 "MAIN" Menu

1. **"HOME" key** - By pressing this key, the "HOME" screen is displayed.
2. **"BACK" key** - By pressing this key, the previous page is reloaded.
3. **"LOGIN/LOGOUT" key** - By pressing this key, the identification page can be accessed with pass-word or the installer mode can be exited.
4. **"CHARTS" key** - By pressing this key the related menu can be accessed.
5. **"INFO" key** - By pressing this key the related menu can be accessed.
6. **"SETTINGS" key** - By pressing this key the related menu can be accessed.
7. **"EXPORT" key** - By pressing this key the related menu can be accessed.
8. **"KEY" icon** - The icon shows that the INSTALLER mode is enabled.

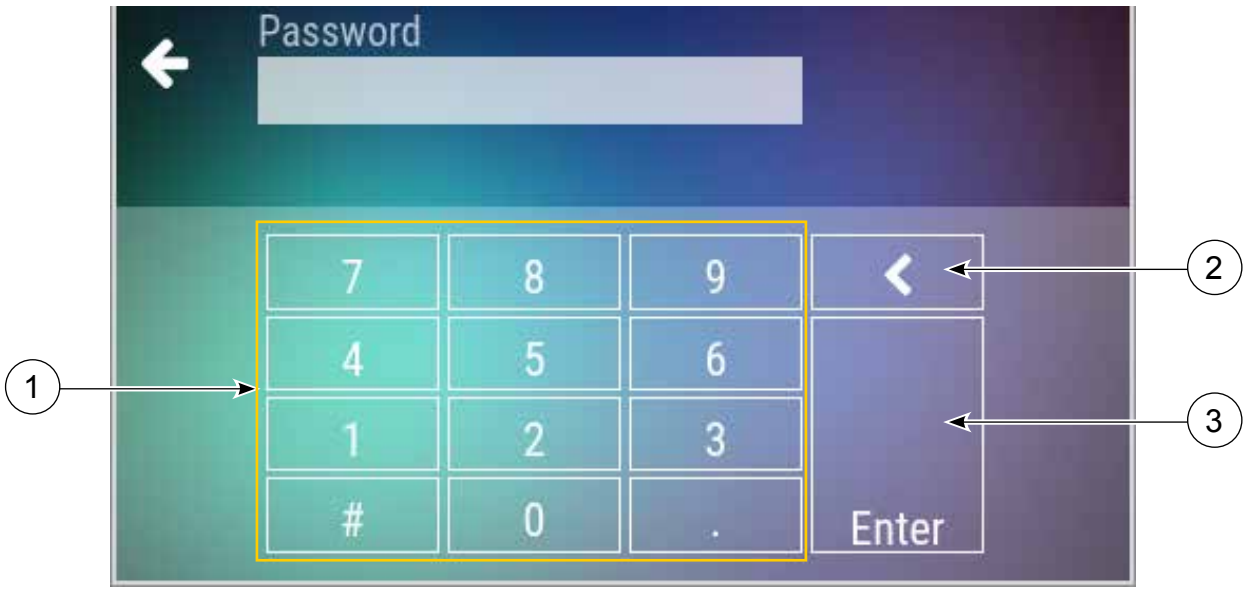
7.3 "LOGIN/LOGOUT" Menu

The "LOGIN / LOGOUT" menu allows the operator to access the system programming menu reserved to INSTALLERS.

Identification takes place by entering a PASSWORD which must be previously and compulsorily requested from DELIOS srl.

WARNING: The parameters at INSTALLER level can be accessed only by qualified staff. Changing the parameters at the installer level by unqualified staff can affect the correct functioning of the system and relieves the manufacturer from all liabilities and invalidates the warranty.

Once the settings have been made in the INSTALLER mode, make sure that you have LOGOUTED from this mode in order to prevent unqualified personnel from accessing settings that can compromise the correct functioning of the system.



1. **Numeric keypad to enter the ID password.**
2. **"BACKSPACE" Key** - Press this key to delete the last digit entered.
3. **"ENTER" Key** - Enter / Submit key.

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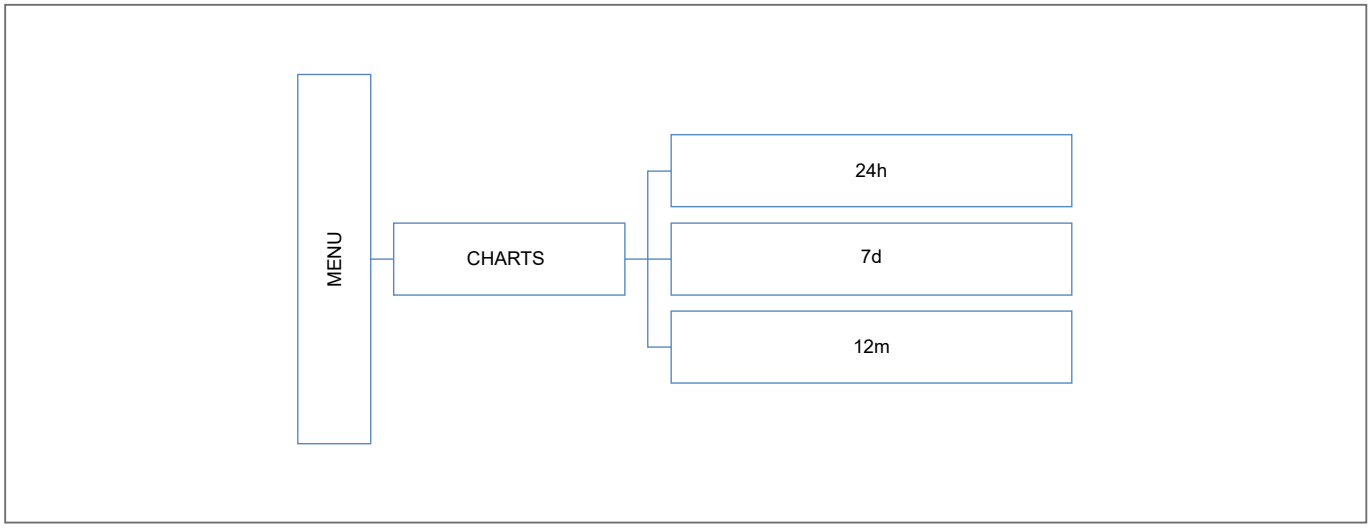
7.4 "CHARTS" Menu

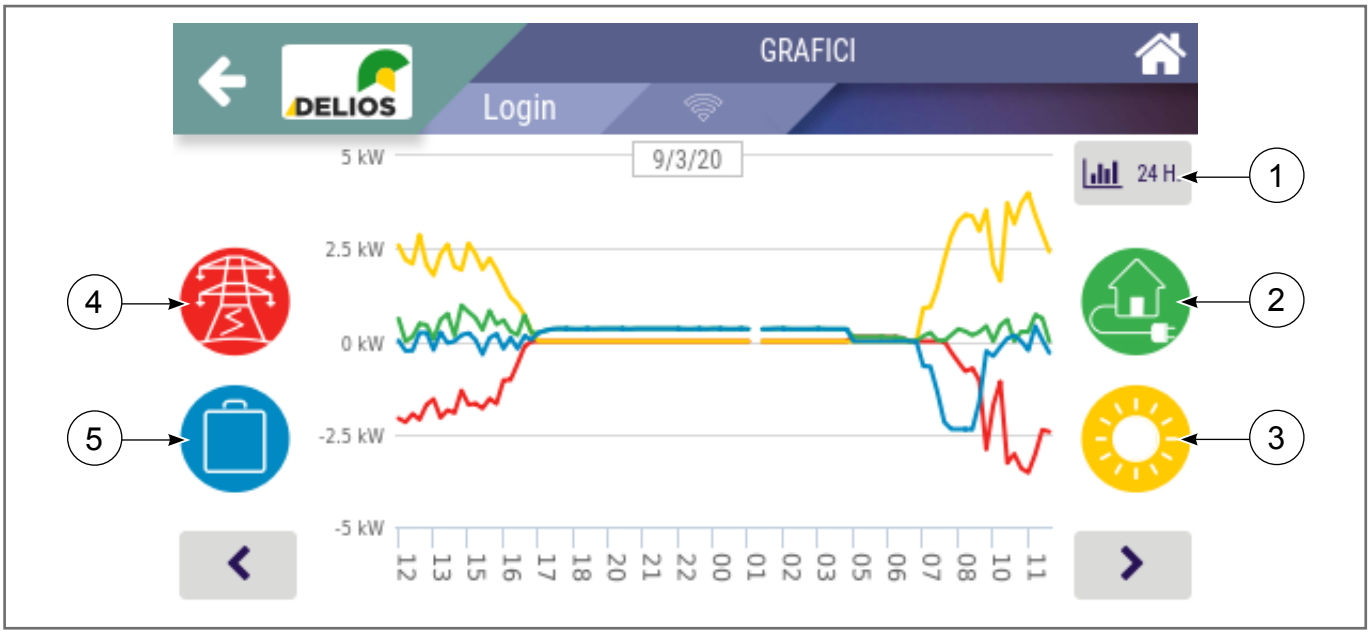
Access to the "GRAPHICS" menu allows the installer to view the following data recorded by the built-in datalogger:

- Daily time-related data of PV system, battery, grid, load powers.
- Weekly calculation, with daily partition, of energy produced by the PV generator, power sent to the grid, power drawn from the grid, load.
- Yearly calculation, with monthly partition, of energy produced by the PV generator, power sent to the grid, power drawn from the grid, load.



Access to the different graphics is made by scrolling down by using the key associated with the selection of the type of graphics.

7.4.1 "24h" Chart



1. **"CHART SELECTION" key** - Press this key to select the different chart (24 hours →7 days →12 months).

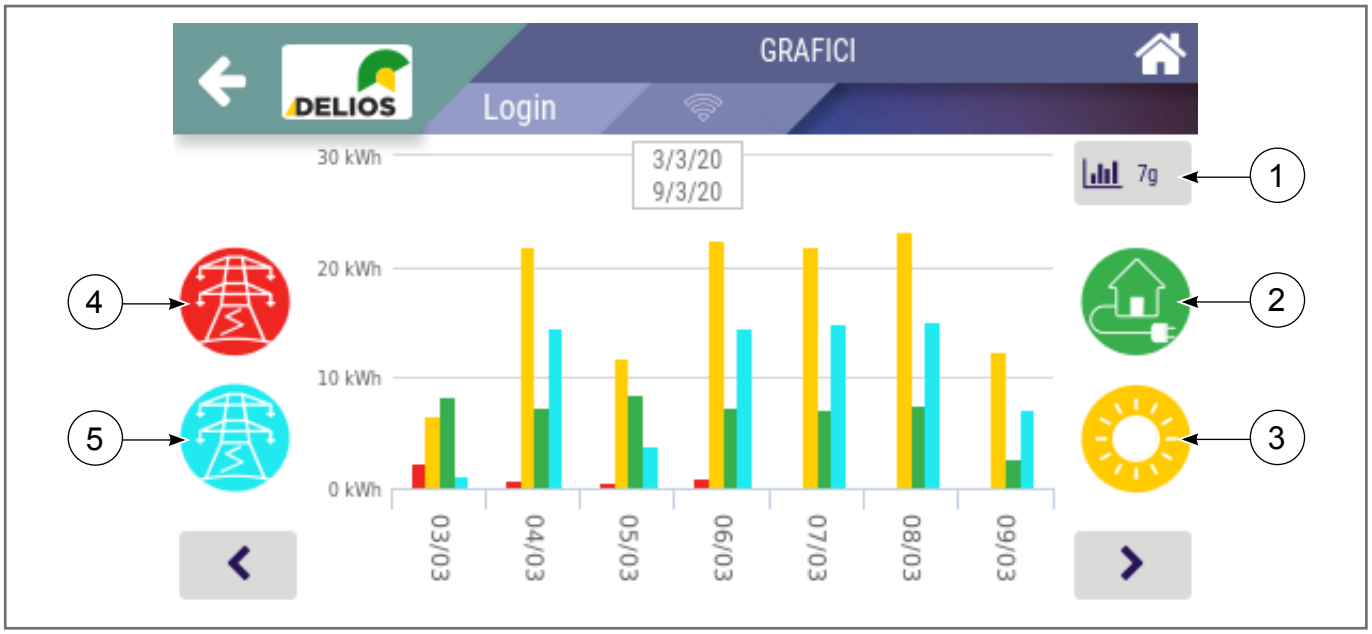
2. **"HOME" key** - Press this key to enable / disable the display of the associated value and trace on the graphics area.

3. **"SUN" key** - Press this key to enable / disable the display of the associated value and trace on the graphics area.

4. **"GRID" key** - Press this key to enable / disable the display of the associated value and trace on the graphics area.

5. **"BATTERY" key** - Press this key to enable / disable the display of the associated value and trace on the graphics area.

7.4.2 "7d" Chart



1. **"CHART SELECTION" key** - Press this key to select the different chart (24 hours →7 days →12 months).

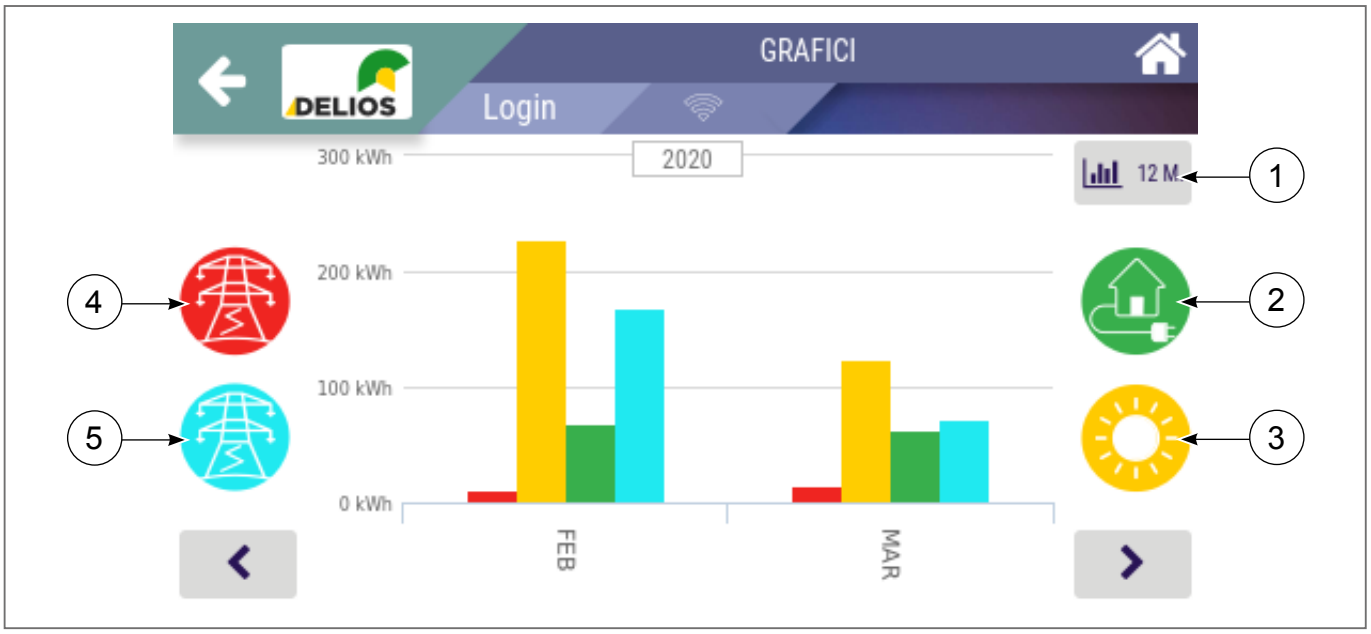
2. **"HOME" key** - Press this key to enable / disable the display of the associated value and trace on the graphics area.

3. **"SUN" key** - Press this key to enable / disable the display of the associated value and trace on the graphics area.

4. **"GRID – CONSUMPTION" key** - Press this key to enable / disable the display of the associated value and trace on the graphics area.

5. **"GRID – FEED IN" key** - Press this key to enable / disable the display of the associated value and trace on the graphics area.

7.4.3 "12m" Chart



1. **"CHART SELECTION" key** - Press this key to select the different chart (24 hours →7 days →12 months).

2. **"HOME" key** - Press this key to enable / disable the display of the associated value and trace on the graphics area.

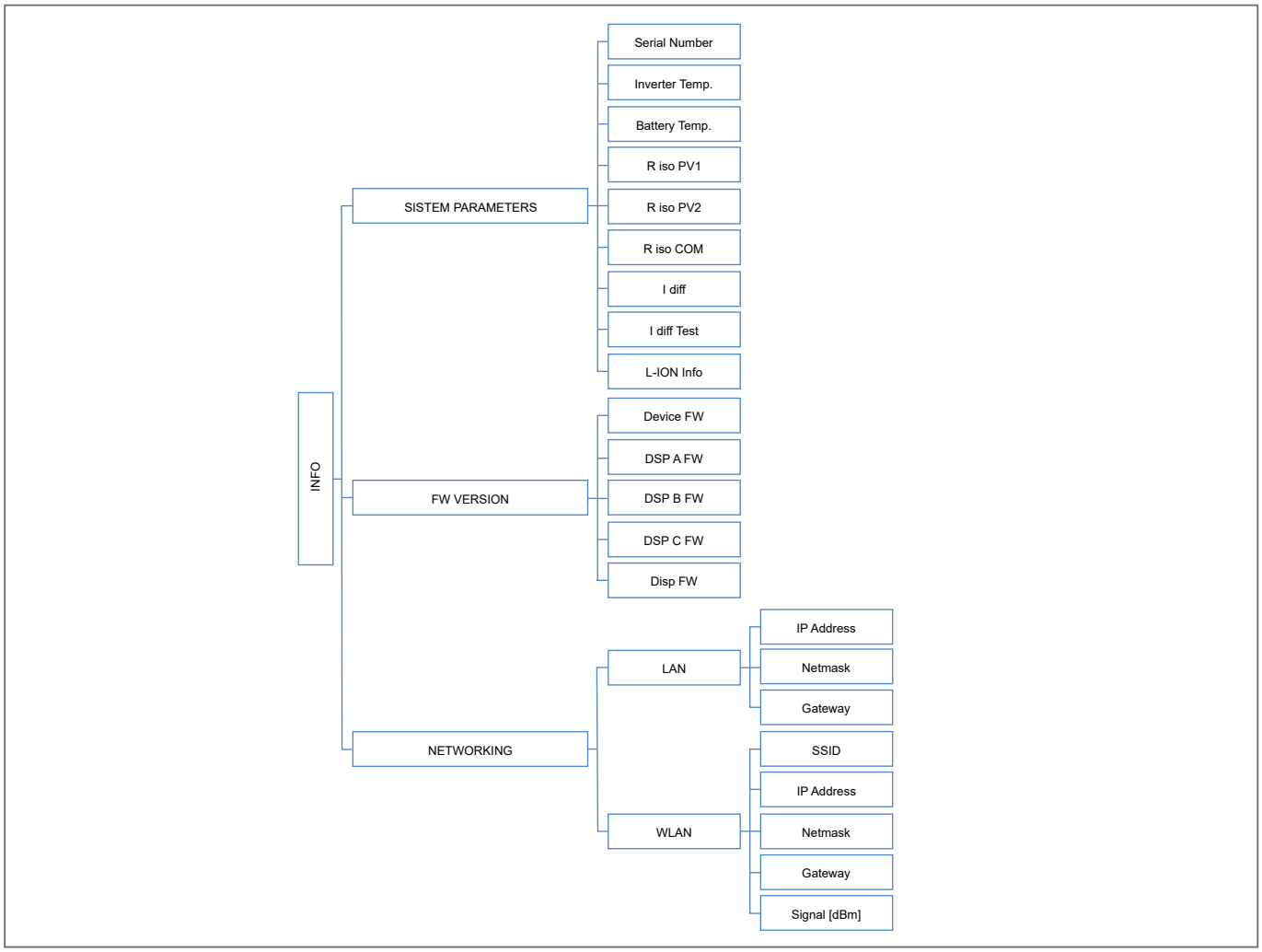
3. **"SUN" key** - Press this key to enable / disable the display of the associated value and trace on the graphics area.

4. **"GRID - CONSUMPTION" key -** Press this key to enable / disable the display of the associated val-ue and trace on the graphics area.

5. **"GRID - FEED IN" key** - Press this key to enable / disable the display of the associated value and trace on the graphics area.

7.5 "INFO" Menu

Access to the “INFO” menu to view general system information:



1. **"SYSTEM PARAMETRS"** - The page displays the operating parameters monitored by the system such as:

Serial Number	Unit serial number
Inverter Temp	Inverter internal temperature
Battery Temp	Battery temperature
R iso PV1	Insulation resistance + PV1 to earth
R iso PV2	Insulation resistance + PV2 to earth
R iso COM	Insulation resistance – PV1 and - PV2 to earth
I diff	Measured leakage current to earth
I diff Test	Measured test leakage current to earth
L-ION info	Battery info (if transmitted by battery BMS)

2. **"FW VERSION"** - The page displays the firmware versions installed on the system:

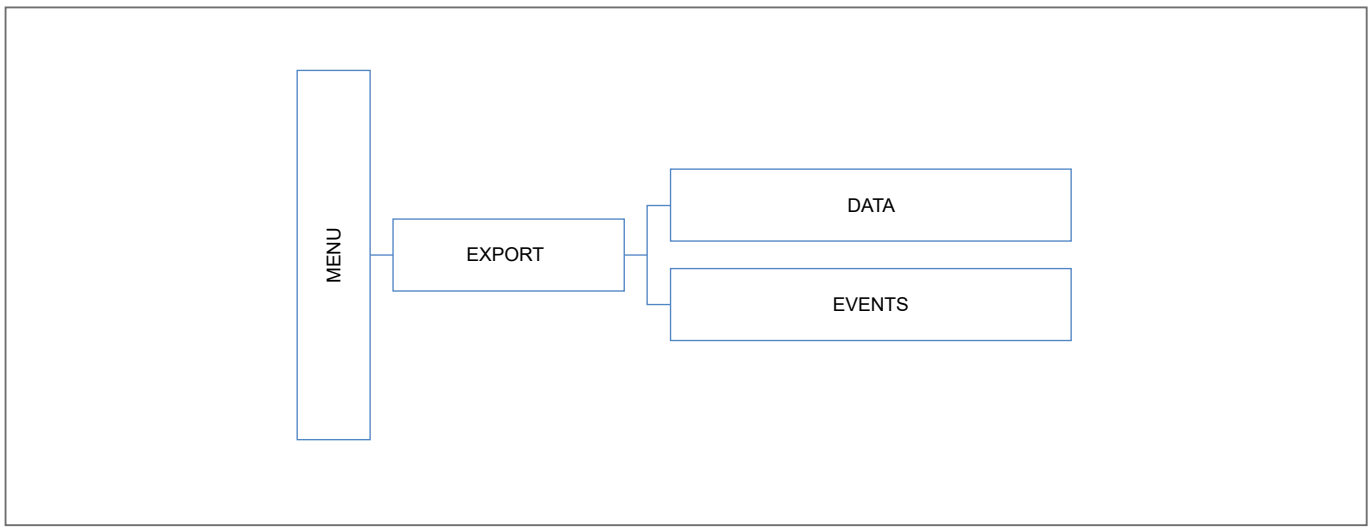
Device FW	Main inverter firmware
DSP A FW	DSP A Firmware
DSP B FW	DSP B Firmware
DSP C FW	DSP C Firmware
Disp FW	UI firmware

3. **"NETWORKING" -** The page displays the information of the local network to which the system is connected:

LAN	**IP Address**	IP address assigned to the inverter within the local network
	Netmask	Network Subnet mask
	Gateway	Network Gateway
WLAN	**SSID**	Wi-Fi network ID accessed by the inverter
	IP Address	IP address assigned to the inverter within the local network
	Netmask	Network Subnet mask
	Gateway	Network Gateway
	Signal (dBm)	Signal strength

7.6 "EXPORT" Menu

Access to the "EXPORT" menu to export the data stored in the internal data-logger to an external USB memory:



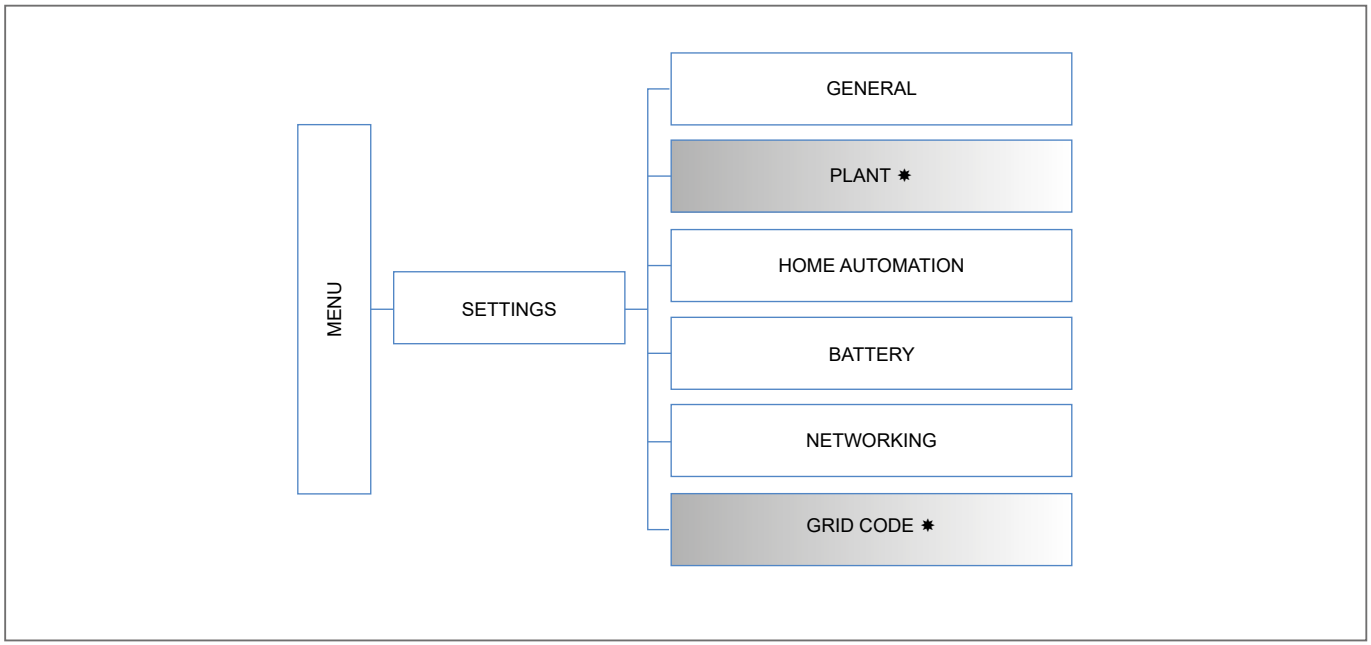
1. **"DATI"** - The page allows to access the system production data download function on an external USB memory. Enter the start and end dates to define the time period to download the data.

2. **"EVENTI"** - The page allows to access the download function of the events (alarm queue, parameter modifica-tion) recorded by the system on an external USB memory. Enter the start and end dates to define the time period to download the data.

Make sure to have connected an external USB memory before performing the export procedure. The external USB memory must be large enough and must have at least 128Mb of free space.

7.7 "SETTINGS" Menu

Access to the "SETTINGS" menu to access to the following submenus:



1. **"GENERAL"** - The page allows to access general system settings and utilities.

2. **"PLANT"** - The page allows to access the plant settings. The settings are accessible only in the INSTALLER mode which require a password to be logged in (see the "LOGIN menu" section).

3. **"HOME AUTOMATION"** - The page allows you to access the home automation functions setting.

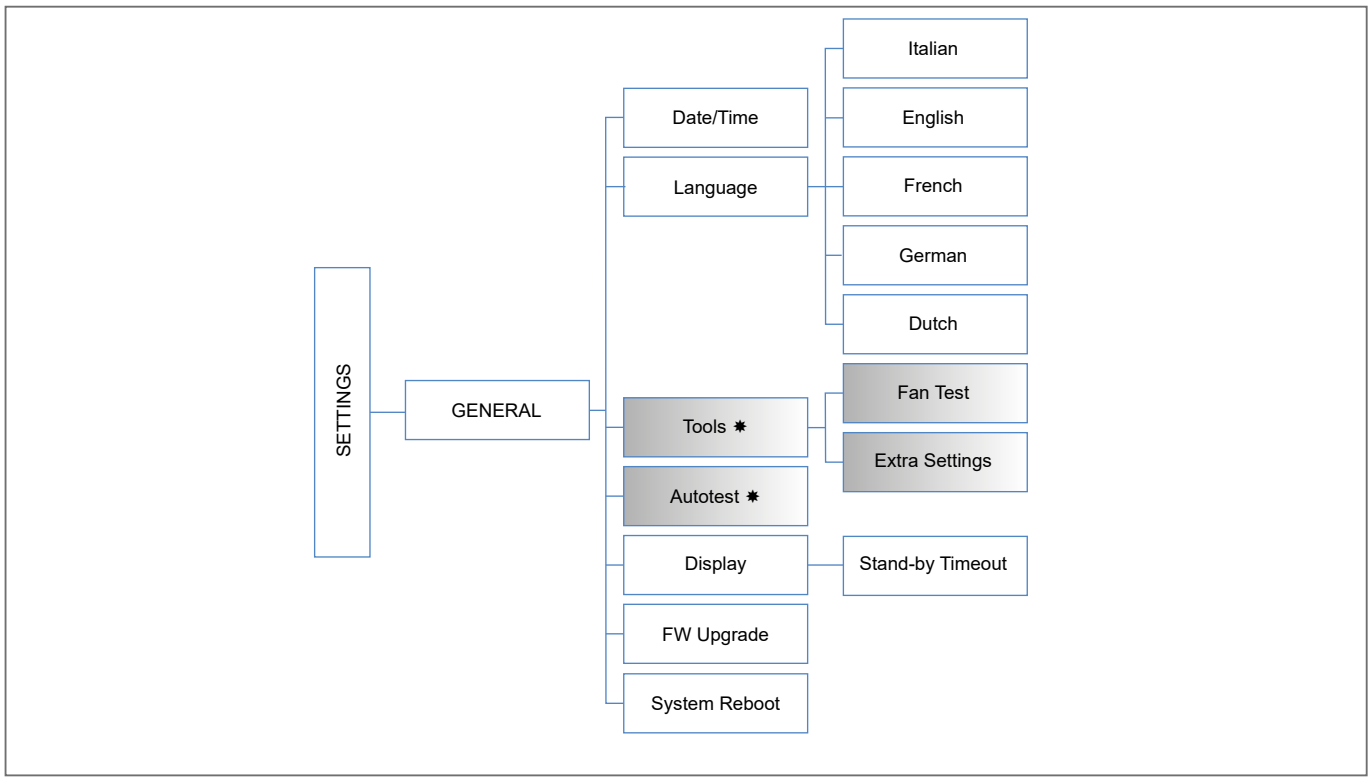
4. **"BATTERY"** - The page allows to access the battery settings. Some of the settings are accessible only in the INSTALLER mode which require a password to be logged in (see the "LOGIN menu" section).

5. **"NETWORKING"** - The page allows to access the settings to connect the system to a local data network LAN or Wi-Fi. Some settings are accessible only in the INSTALLER mode which require a password to be logged in (see the "LOGIN menu" section).

6. **"GRID CODE"** - The page allows to access the settings of the specific connection rules for the country where the system is installed. The settings are accessible only in the INSTALLER mode which re-quire a password to be logged in (see the "LOGIN menu" section).

7.7.1 "GENERAL" Menu

Access to the "GENERAL" menu to access to the following submenus:



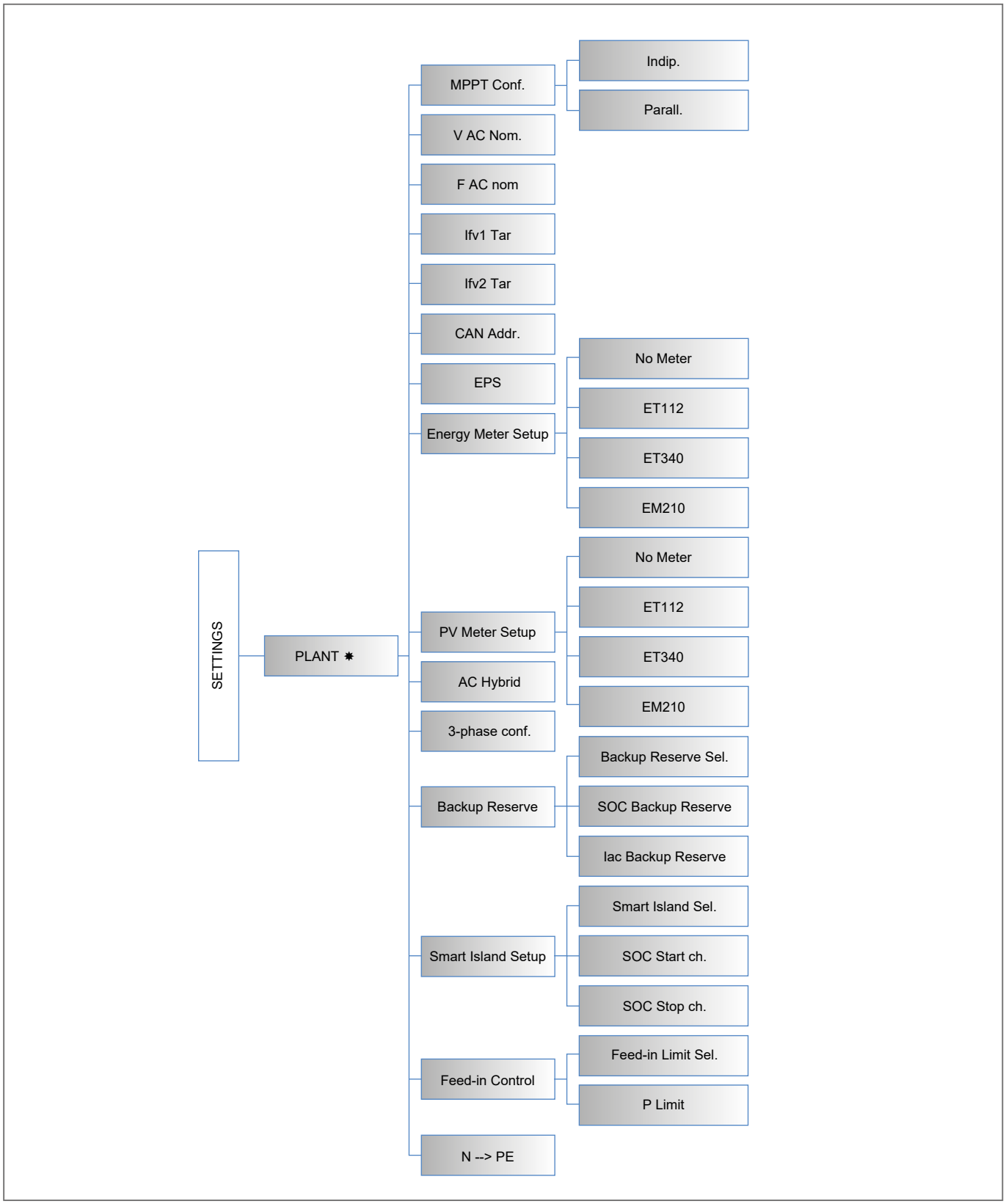
1. **"DATE / TIME"** - The page allows to set the current date and time.
2. **"LANGUAGE"** - The page allows to select the language of the current display.
3. **"TOOLS"** - The page allows to access system tools. The settings are accessible only in the INSTALLER mode which require a password to be logged in (see the "LOGIN menu" section).

PARAMETER	VALUE	
Fan Test	**ON/OFF**	Forced ventilation enabling to check the correct operation of the fans.
Extra Settings	**0 - 99999**	The EXTRA parameters must be used only by qualified staff. **The modification of parameters by unqualified staff can affect the correct functioning of the system, relieves the manufacturer from any liabilities and invalidates the warranty.**

4. **"AUTOTEST"** - The page allows to start the self-test and verify its correct execution. It is also possible to export the complete self-test report to external USB memory. The self-test procedure is only relevant for Italy (CEI 0-21). It is possible to export the complete self-test report in TXT format to external USB memory. Make sure to connect an external USB memory before carrying out the export procedure. The settings are accessible only in the INSTALLER mode which require a password to be logged in (see the "LOGIN menu" section).
5. **"DISPLAY"** - The page allows to set the time before the display enters the stand-by mode.
6. **"FW UPGRADE"** - The page allows to update the system firmware using a guided procedure. See the "SYSTEM UP-DATE" section.
7. **"SYSTEM REBOOT"-** The page allows you to restart the display operative system.

7.7.2 "PLANT" Menu

Access to the "PLANT" menu allows to set the advanced operating modes of the system. The settings are accessible only in the INSTALLER mode which require a password to be logged in (see the "LOGIN menu" section).



1. **"MPPT CONF."** - The page allows to set the INDEPENDENT or PARALLEL operating mode based on the type of system. The default factory is INDEPENDENT mode.

PARAMETER	VALUE	DESCRIPTION
MPPT Conf.	**Indip./Parall.**	PV string inputs configuration selection (Default = INDEPENDENT)

2. **"V AC NOM"** - The page allows to set the nominal grid phase voltage.

3. **"F AC NOM"** - The page allows to set the nominal grid frequency.

4. **"IFV1 TAR"** - The page allows to calibrate the current reading of the photovoltaic string connected to the PV1 input.

5. **"IFV2 TAR"** - The page allows to calibrate the current reading of the photovoltaic string connected to the PV2 input.

6. **"CAN ADDR."** - The page allows to perform MASTER / SLAVE settings in the case of systems consisting of several units in parallel according to the following table:

PARAMETER	VALUE	DESCRIPTION
CAN Addr.	**0**	Single unit (default)
	1	MASTER unit
	2 - 3	SLAVE unit

7. **"EPS"** - The page allows to enable / disable the EPS functionality.

PARAMETER	VALUE	DESCRIPTION
EPS	**ON/OFF**	AC OUT port operation enable (Default = OFF)

8. **"ENERGY METER SETUP"** - The page allows to select the type, brand and model of any external energy meter connected to the AC distribution network among those supported by the DLS system. The selection of one of the en-ergy meters indicated configures the DLS system to interact exclusively with the type, brand and model of energy meter selected. The settings are accessible only in the INSTALLER mode which re-quire a password to be logged in (see the "LOGIN menu" section). **WARNING - The type, brand and model of the approved and listed energy meters may be subject to change at any time and without notice.**

PARAMETER	VALUE	DESCRIPTION
Energy Meter Setup	**No meter**	Internal energy meter enabled (Default)
	ET112	Carlo Gavazzi ET112 external energy meter enabled
	ET340 / EM540	Carlo Gavazzi ET340 / EM540 external energy meter enabled
	EM210	Carlo Gavazzi EM210 external energy meter enabled

9. **"PV METER SETUP"** - The page allows you to configure the functionality of a possible auxiliary energy meter connected to the production line of an existing ON-GRID inverter to collect its production data to be combined with a DLS inverter coupled on AC network. The selection of one of the energy meters indicated config-ures the DLS system to interact exclusively with the type, brand and model of energy meter selected. The settings are accessible only in the INSTALLER mode which require a password to be logged in (see the "LOGIN menu" section). **WARNING - The type, brand and model of the approved and listed energy meters may be subject to change at any time and without notice.**

PARAMETER	VALUE	DESCRIPTION
PV Meter Setup	No meter	Internal energy meter enabled (Default)
	ET112	Carlo Gavazzi ET112 external energy meter enabled
	ET340	Carlo Gavazzi ET340 external energy meter enabled
	EM210	Carlo Gavazzi EM210 external energy meter enabled

10. **"AC HYBRID"** - The page allows to enable / disable the HYBRID AC operating mode.

PARAMETER	VALUE	DESCRIPTION
AC HYBRID	ON/OFF	HYBRID AC operation enable (Default = OFF)

11. **"3-PHASE CONF."** - The page allows to enable / disable the single-phase compensation operation mode over a three-phase network relying on a three-phase external energy meter.

PARAMETER	VALUE	DESCRIPTION
3-Phase Conf.	ON/OFF	1 phase compensation over 3 phase network enable (Default = OFF)

12. **"BACKUP RESERVE"** - The page allows to enable / disable the RESERVE BACKUP mode and set the SOC reserve level to be used in EPS mode.

PARAMETER	VALUE	DESCRIPTION
Backup Reserve Sel.	ON/OFF	BACKUP RESERVE operation enable (Default = OFF)
SOC Backup Reserve	0 - 100%	Reserve level SOC

13. **"SMART ISLAND SETUP"** - The page allows to enable / disable the SMART ISLAND operating mode and set the SOC levels to enable and disable the battery charge from external motor generator.

PARAMETER	VALUE	DESCRIPTION
Smart Island Sel.	ON/OFF	SMART ISLAND operation enable (Default = OFF)
SOC Start ch.	0 – 100%	SOC level to enable battery charge from external motor generator
SOC Stop ch.	0 – 100%	SOC level to disable battery charge from external motor generator

14. **"FEED-IN CONTROL"** - The page allows to enable / disable the FEED-IN CONTROL mode to limit the injection of the energy produced into the network and to set the limit value.

PARAMETER	VALUE	DESCRIPTION
Feed-in Sel.	ON/OFF	FEED-IN CONTROL operation enable (Default = OFF)
P Limit	0 – 100'000 W	Limit of the power fed into the grid (DEFAULT = 0)

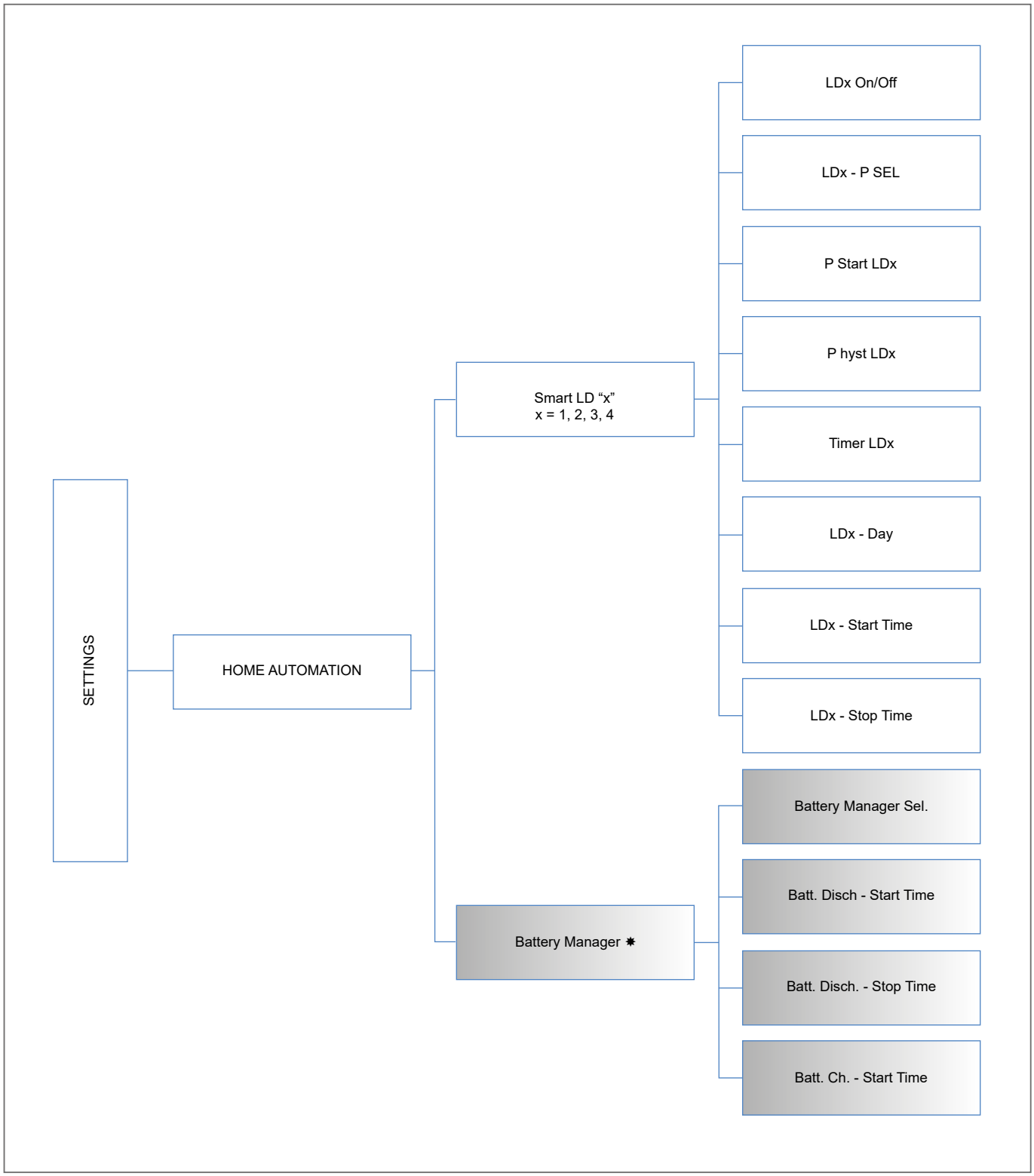
15. **"N → PE"** - The page allows to enable / disable the automatic connection of the NEUTRAL line to the EARTH potential during the inverter's off-grid operation (EPS and SMART ISLAND operating modes).

PARAMETER	VALUE	DESCRIPTION
N → PE	ON/OFF	Automatic connection of the NEUTRAL line to PE enable during EPS and SMART ISLAND operating mode (Default = ON)

7.7.3 "HOME AUTOMATION" Menu

Access to the "HOME AUTOMATION" menu allows to configure the operation of the isolated change-over contact (4A - 250Vac max) according to SMART LOAD modes.

Access to the "HOME AUTOMATION" menu also allows the activation of the BATTERY MANAGER mode, mainly indicated in installations where it is convenient to enable the battery charge during the high photovoltaic production time over the day and operate a delayed discharge of the battery when the energy demand of the home is higher or the cost of energy is higher.



Cod.: 240.010.0051

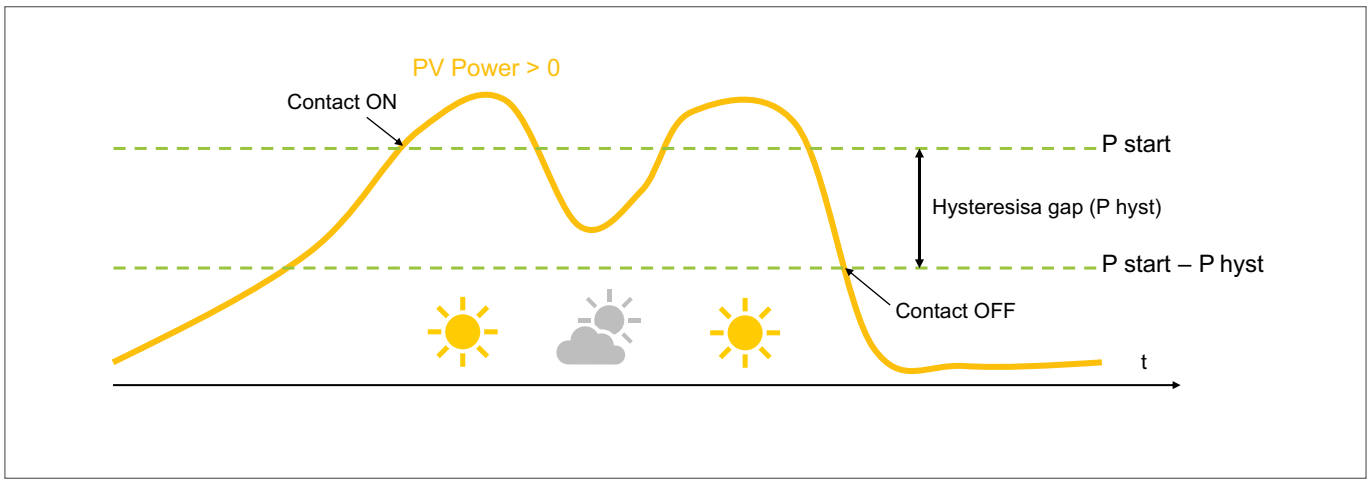
1. **"SMART LD" -** The page allows to set the SMART LOAD operating mode for the load controlled by the isolated changeover contact (4A - 250Vac max) available in the DLS. Through the contact it is possible to en-able secondary storage systems and / or domestic loads based on the status and energy balance of the system.

PARAMETER	VALUE	DESCRIPTION
LD On/Off	**ON/OFF**	LD program enable (Default = OFF)
LD – P sel	**PV / GRID**	Selection of the activating power type
P start LD	**-99999 – 99999 W**	Power-on threshold setting
P hyst LD	**0 – 99999 W**	Hysteresis power-off setting
Timer LD	**0 - 1440 min**	Power-off timer (Default = 0 min)
LD - Day	**Mon - Sun**	Day selection for enabling LD program
LD – Start time	**hh:mm**	LD program start time setting (Default = 00:00)
LD – Stop time	**hh:mm**	LD program stop time setting (Default = 00:00)

The contact activation logic, based on the settings, is summarized in the following table:

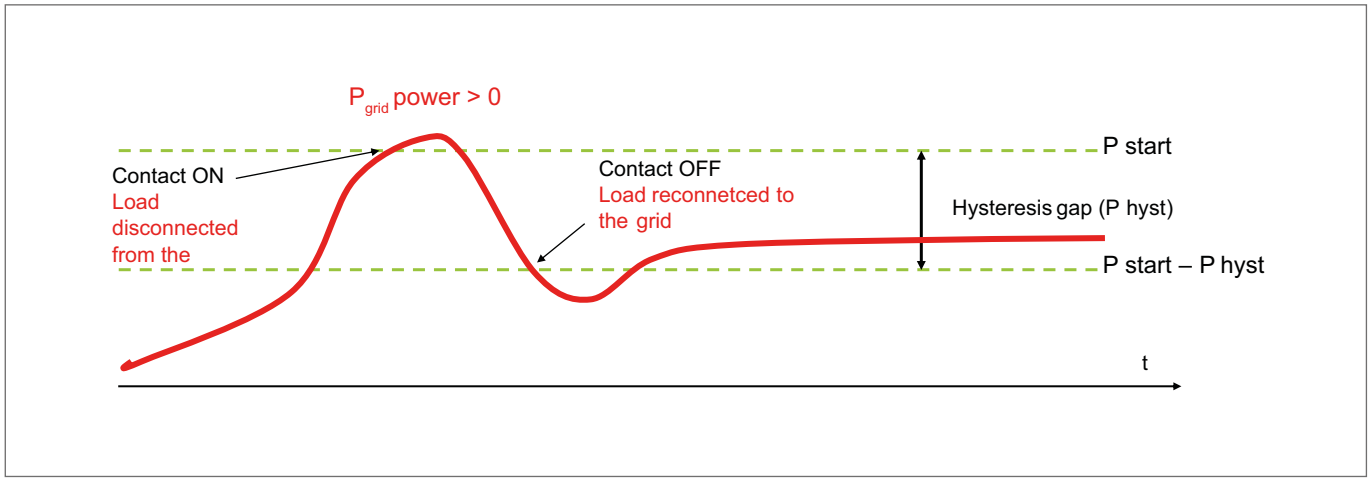
LD-SEL	Pstart LD	TRIGGER CONDITION	STATUS
PV	**P (W) > 0**	$P_{PV} > P_{start\ LD}$	ON
		$P_{PV} < (P_{start\ LD} - P_{hyst\ LD})$	OFF
P_{GRID}	**P(W) > 0 (prelievo)**	$P_{GRID} > P_{start\ LD}$	ON
		$P_{GRID} < (P_{start\ LD} - P_{hyst\ LD})$	OFF
P_{GRID}	**P(W) < 0 (immissione)**	$P_{GRID} < P_{start\ LD}$	ON
		$P_{GRID} > (P_{start\ LD} + P_{hyst\ LD})$	OFF

- **Contact triggering on "PV" threshold**



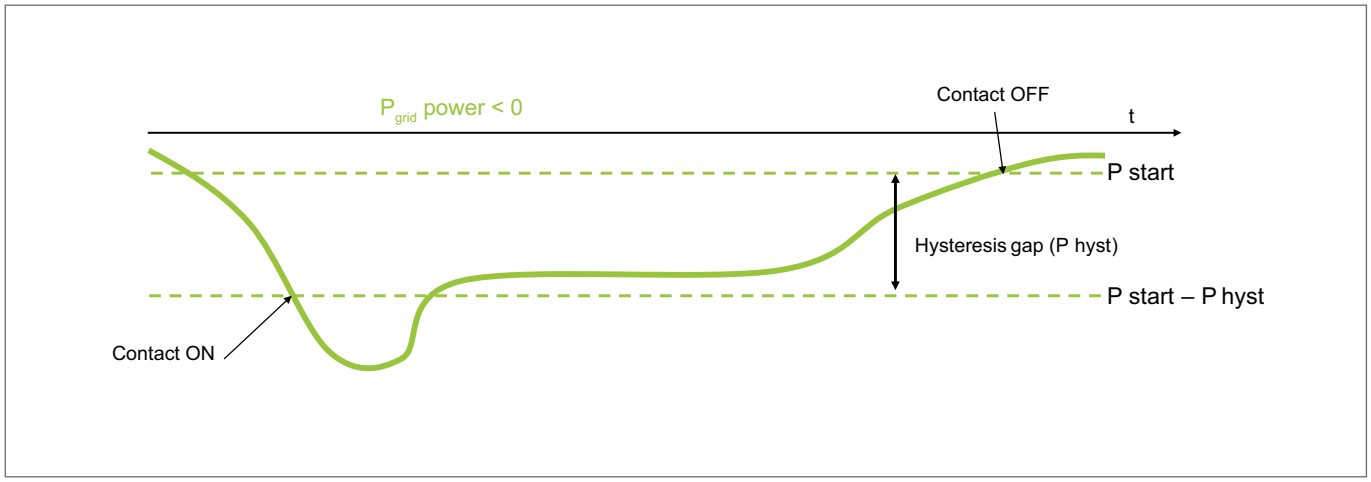
When the enrgy produced by photovoltaic panels exceeds the set threshold, the load/secondary storage system (e.g. heater, heat pump, air conditioner) is activated through the SMARTLOAD contact.
The function is usefuel to maximize the self-consumption of the energy produced by the plant.

- **Contact triggering on "P_{GRID} > 0 - Power consumption from the grid"**



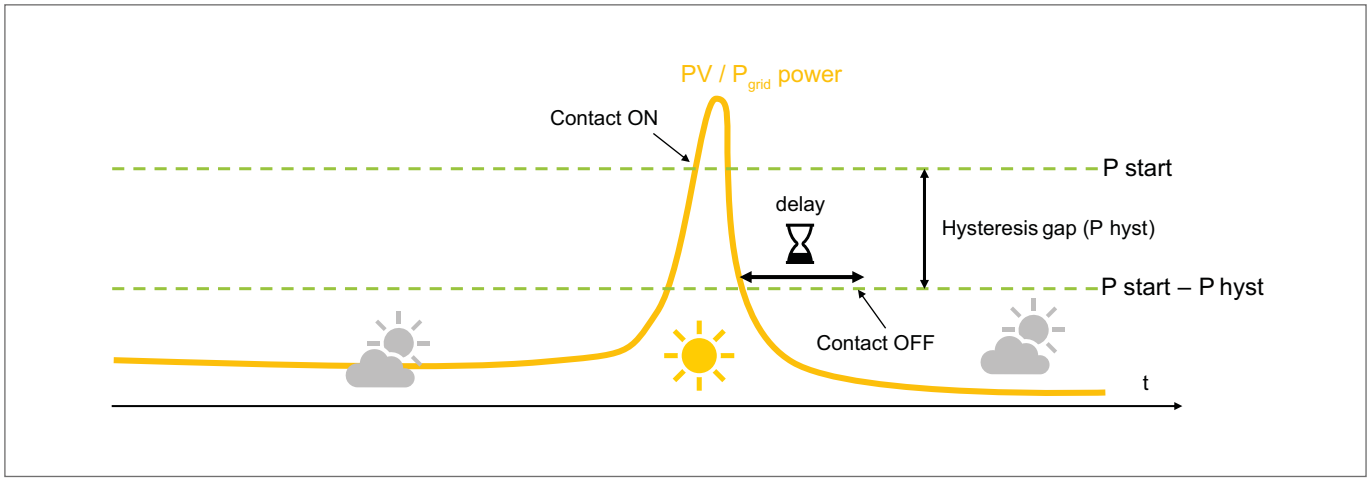
The load is normally connected to the grid. When the consumption exceeds the set threshold, the SMART LOAD contact disconnects the oad from the grid and reconnects when the consumption falls within the set limits.
The function is usefuel you to reduce grid consumption.

- **Contact triggering on "P_{GRID} < 0 - Power feed-in the grid"**



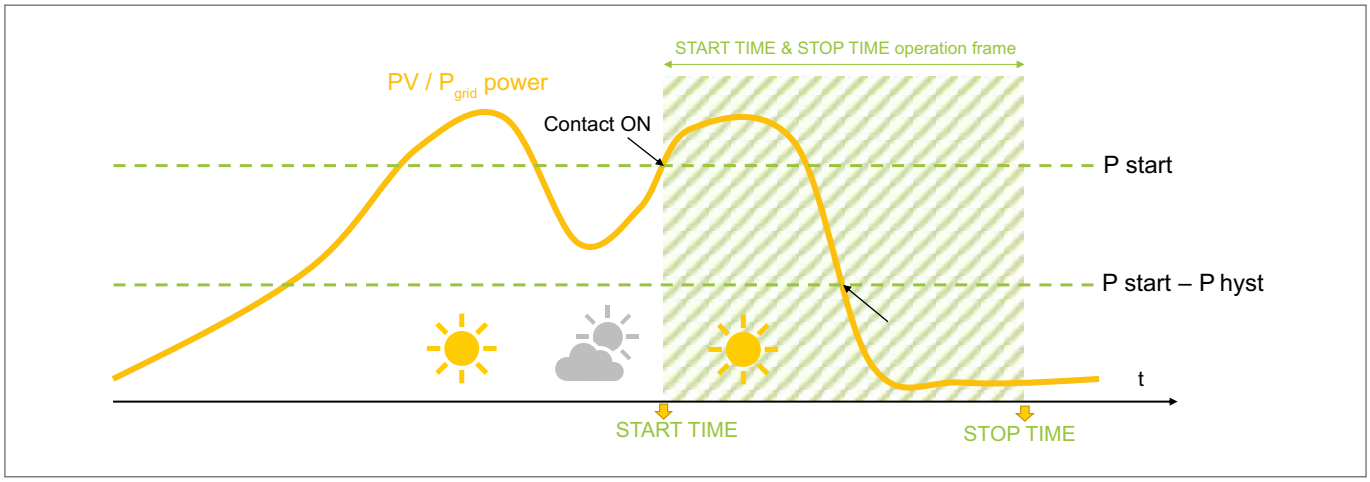
When the ernergy fed into the grid exceeds the set threshold, the SMARTLOAD contact activates the secondary load/storage system (e.g. heater, heaat pummp, air conditioner).
The function is usefuel to maximize the self-consumption of the energy produced by the plant.

- **"TIMER LD" Function**



The TIMER LD function allows you to set a smart load contact deactivation delay.
The function is useful to prevent sudden and repeated activations/deactivations of the contact that could damage the loads subjected to it (e.g. heat pump, air conditioner).

- **-"START TIME & STOP TIME" Function**



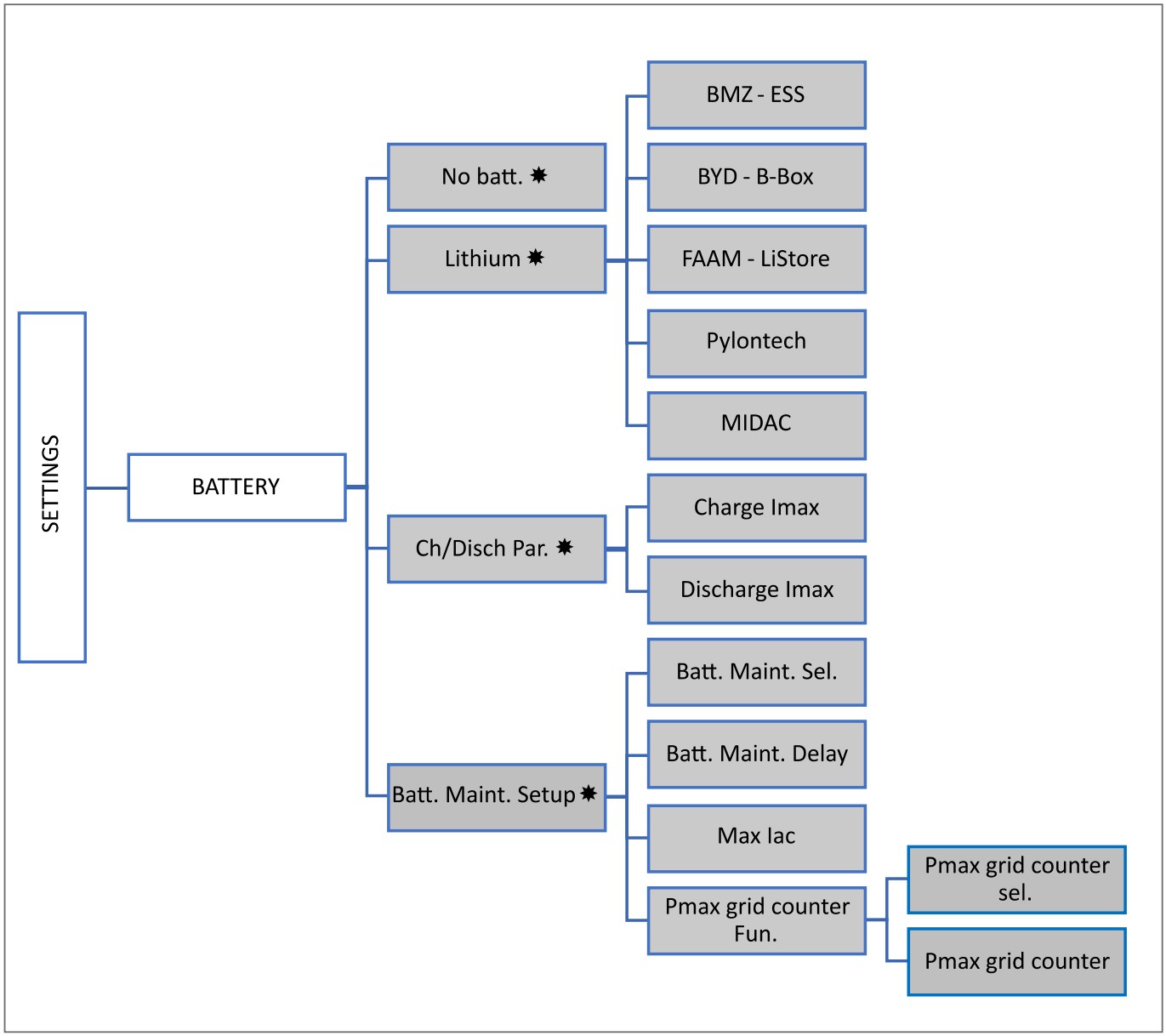
The START TIME & STOP TIME time function allows you to set a time frame to activate the SMART LOAD contact.
Events that exceed the set thresholds outside the set time frame are ignored by the system.

2. **"BATTERY MANAGER"** - The page allows to set the BATTERY MANAGER operating mode. The settings are accessible only in the INSTALLER mode which require a password to be logged in (see the "LOGIN menu" section).

PARAMETER	VALUE	DESCRIPTION
Battery Manager Sel.	**ON/OFF**	BATTERY MANAGER operation enable (Default = OFF)
Batt. Disch. - Start Time	**hh:mm**	Battery discharge start time
Batt. Disch. - Stop Time	**hh:mm**	Battery discharge stop time
Batt. Ch. - Start Time	**hh:mm**	Battery charge start time

7.7.4 "BATTERY" Menu

Access to the "BATTERY" menu allows to configure the type, brand and the model of the lithium battery among those supported by the DLS system and perform further settings of the usage parameters. The settings are accessible only in the INSTALLER mode which require a password to be logged in (see the "LOGIN menu" section).



1. **"NO BATT"** - The page allows to set the operating mode without a battery connected to the system. The DLS in-verter acts like an on-grid inverter and the advanced features of SELF-CONSUMPTION, BATTERY MANAGEMENT, EPS and BATTERY MANAGEMENT are not available. The settings are accessible only in the INSTALLER mode which require a password to be logged in (see the "LOGIN menu" sec-tion).

2. **"LITHIUM"** - The page allows to select the type, brand and model of the lithium battery among those supported by the DLS system. The selection of a lithium battery configures the DLS system to interact exclu-sively with the type, brand and model of battery selected. The settings are accessible only in the INSTALLER mode which require a password to be logged in (see the "LOGIN menu" section). **WARNING - The type, brand and model of the approved and listed batteries may be subject to**

change at any time and without notice.

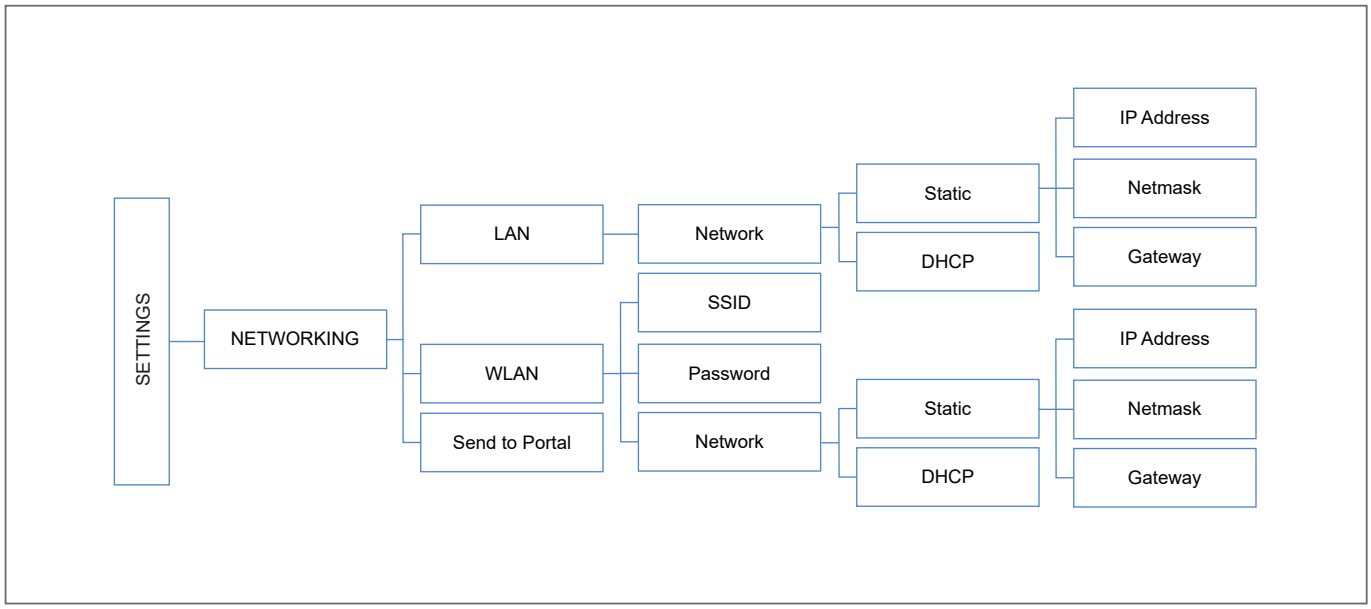
3. **"CH/DISCH PAR."** - The page allows to set the maximum charge and discharge current. The set value represents the maximum value allowed by the inverter. The charge/discharge set-point is anyway defined by the bat-tery BMS which is based on the state of charge and the temperature of the battery itself. The set-tings are accessible only in the INSTALLER mode which require a password to be logged in (see the "LOGIN menu" section).

4. **"BATT. MAINT. SETUP"** - The page allows to set the battery maintenance parameters. The settings are accessible only in the INSTALLER mode which require a password to be logged in (see the "LOGIN menu" section).

PARAMETER	VALUE	DESCRIPTION
Battery Maint. Sel.	**ON/OFF**	BATTERY MAINTENANCE enable (Default = ON).
Batt. Maint. Delay	**0 -20**	Number of days after which forced maintenance from the grid is activated if the maintenance charge carried out only with PV energy was not sufficient. (Default = 7)
Max Iac	**0 - Inom**	Max AC current from grid during maintenance (Default = 4.3A)
Pmax grid counter Fun.	**--**	Access to the settings for the dynamic charge power control function which prevents the home plant from exceeding the maximum power limit allowed by the grid and prevents disconnections by the grid operator.
Pmax grid counter sel.	**ON/OFF**	PMAX GRID COUNTER enable (Default = OFF)
Pmax grid counter	**0 - 99999**	Maximum power from the grid allowed for the home plant (Default = 3000W)

7.7.5 "NETWORKING" Menu

Access to the "NETWORKING" menu allows to configure how to access a local Wi-Fi or LAN network to enable the remote connection and system monitoring functions.



1. "LAN" - The page allows to set the network parameters for access to a local wired LAN.

PARAMETER	VALUE	DESCRIPTION
Network	**Static/DHCP**	Network parameter setting (Default = DHCP). In the case of a STATIC setting, to access the local network it is necessary to specify IP AD-DRESS, NETMASK and GATEWAY.

2. "WLAN" - The page allows to set the network parameters for access to a local wireless LAN.

PARAMETER	VALUE	DESCRIPTION
SSID	**--**	Automatic scan for available wireless networks and network selection.
Password	**--**	Network password setting.
Network	**Static/DHCP**	Network parameter setting (Default = DHCP). In the case of a STATIC setting, to access the local network it is necessary to specify IP AD-DRESS, NETMASK and GATEWAY.

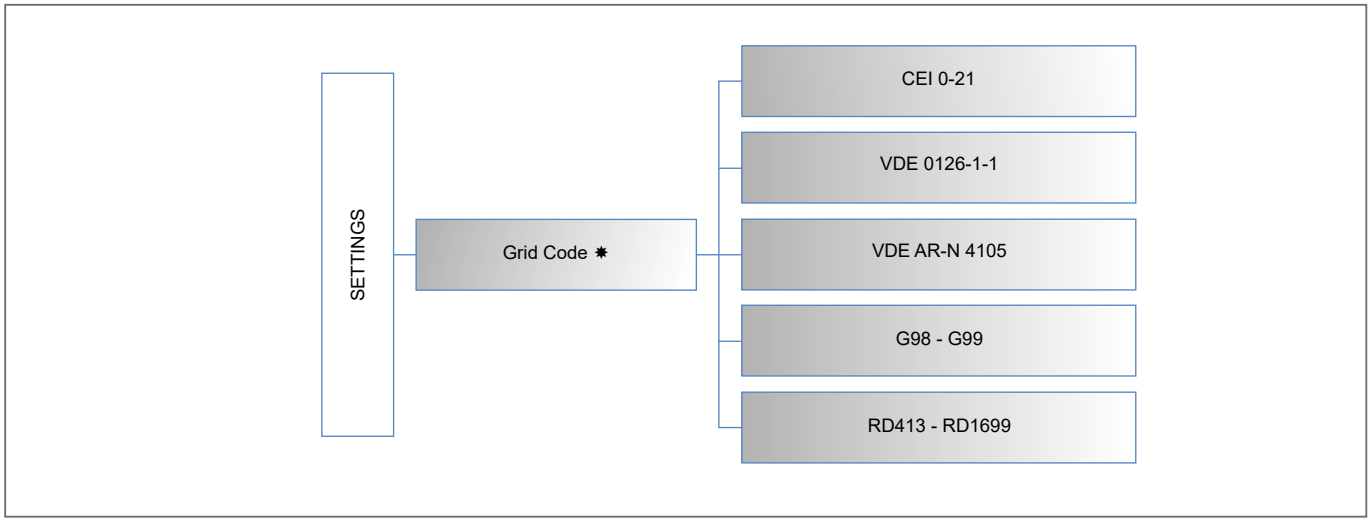
3. "SEND TO PORTAL" - The page allows to enable the sending of data to the monitoring portal.

PARAMETER	VALUE	DESCRIPTION
Send To Portal	**ON/OFF**	Data sending enable to the monitoring portal (Default = OFF)

7.7.6 "GRID CODE" Menu

Access to the "GRID CODE" menu allows advanced settings related to the local regulations in force for the connection to the public network in the country of installation. The settings are accessible only in the INSTALLER mode which require a password to be logged in (see the "LOGIN menu" section).

WARNING - The settings of the GRID CODE can be accessed only by qualified personnel. Changing the parameters at the installer level by unqualified staff can affect the correct functioning of the system and relieves the manufacturer from all liabilities and invalidates the warranty.



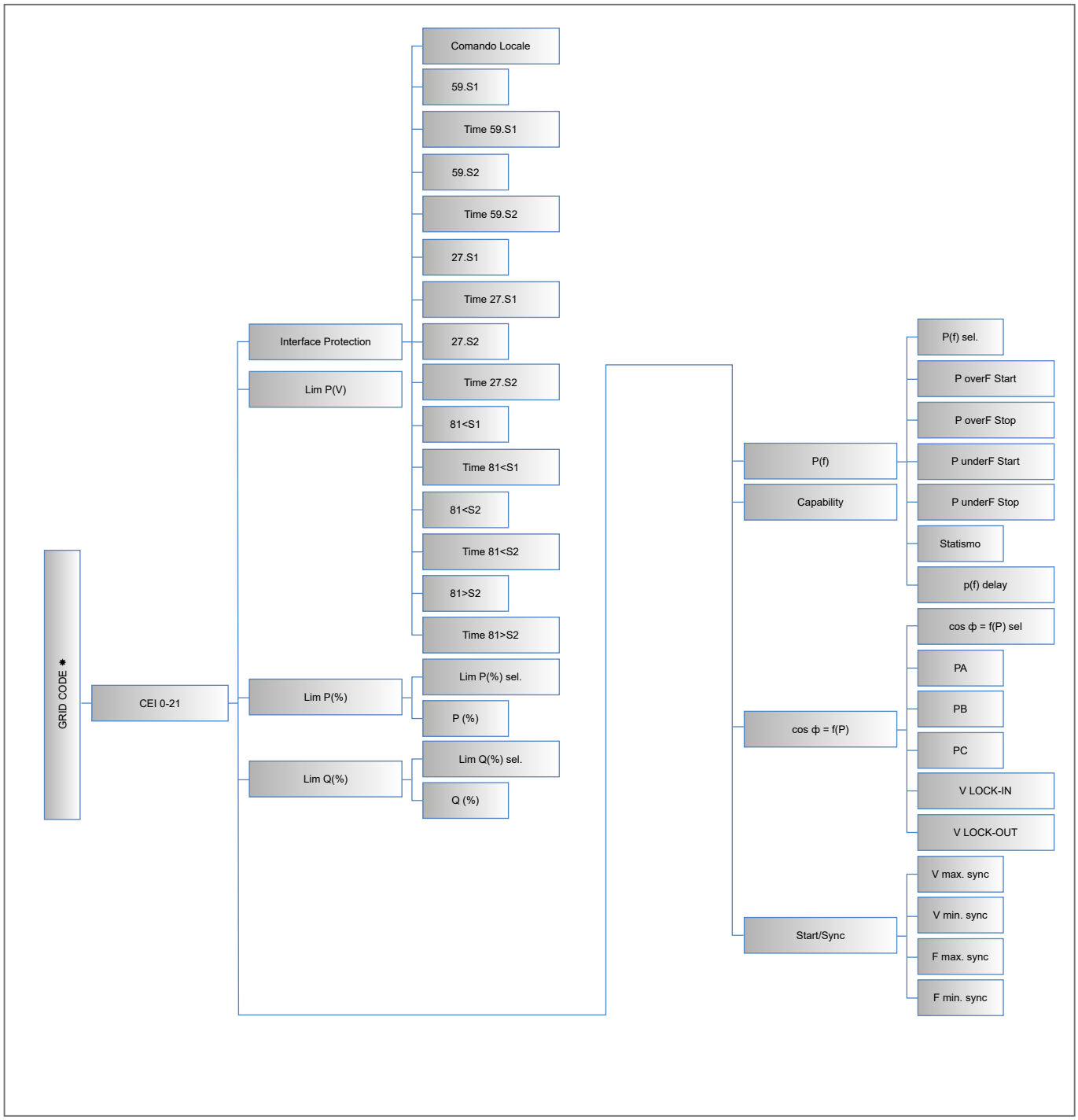
1. **"GRID CODE"** - The page allows to select the grid code and the related parameter setting.

PARAMETER	DESCRIPTION
CEI 0-21	CEI 0-21 (IT) enable and parameters setting
VDE 0126-1-1	VDE 0126-1-1 (DE) enable and parameters setting
VDE AR-N 4105	VDE AR-N 4105 (DE) enable and parameters setting
G98 – G99	G98 – G99 (UK) enable and parameters setting
RD413 - RD1699	RD413 - RD1699 (ES) enable and parameters setting

7.7.6.1 "CEI 0-21" Menu

Access to the CEI 0-21 menu allows to change the standard settings.

WARNING - The modification of the parameters shall be made only with the authorization of the distribution network operator and can be performed only by qualified personnel. The modification of these parameters without authorization can affect the correct functioning of the system and relieves the manufacturer from all liabilities and invalidates the warranty.

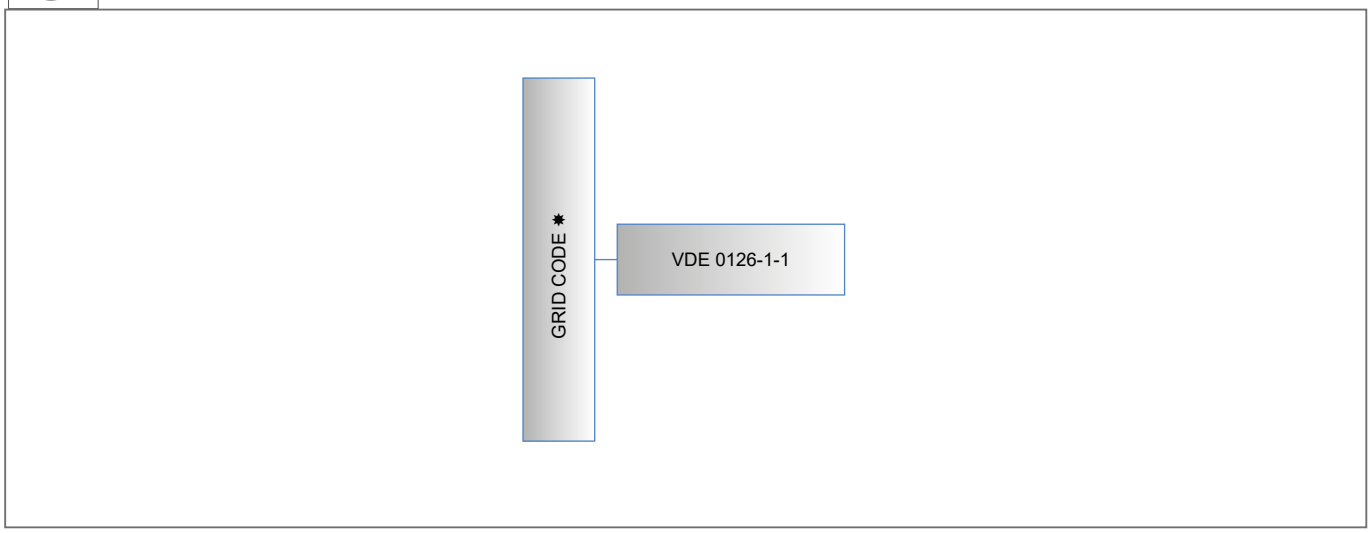


Contact the Technical Service of DELIOS s.r.l. for further details.

7.7.6.1 "VDE 0126-1-1" Menu

Access to the VDE 0126-1-1 menu allows to enable the standard settings.

WARNING - The modification of the parameters of standard VDE 0126-1-1 is not allowed and therefore no settings other than the factory ones that are provided for by default are made available.

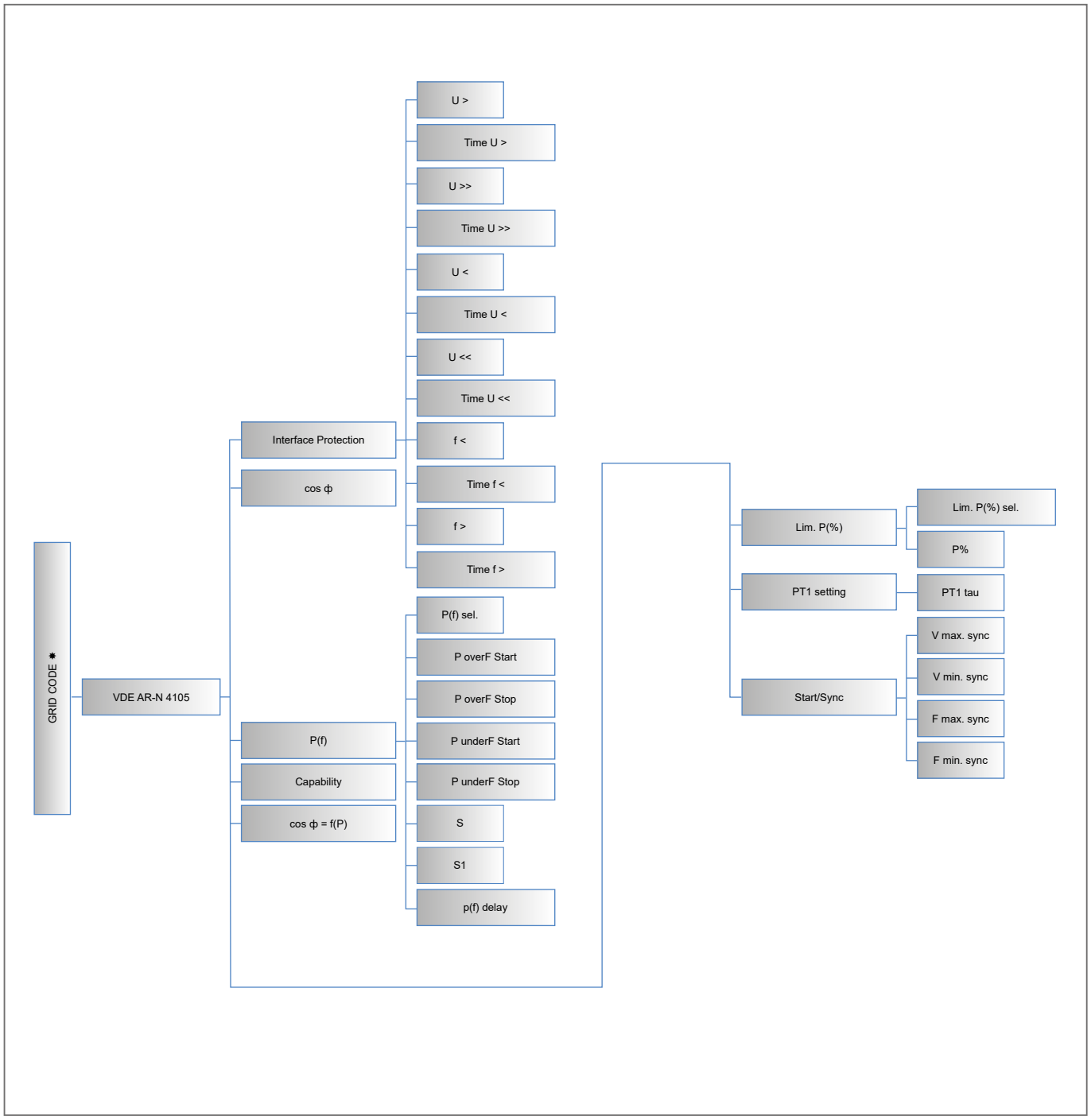


Contact the Technical Service of DELIOS s.r.l. for further details.

7.7.6.3 "VDE AR-N 4105" Menu

Access to the VDE AR-N 4105 menu allows to change the standard settings.

WARNING - The modification of the parameters shall be made only with the authorization of the distribution network operator and can be performed only by qualified personnel. The modification of these parameters without authorization can affect the correct functioning of the system and relieves the manufacturer from all liabilities and invalidates the warranty.

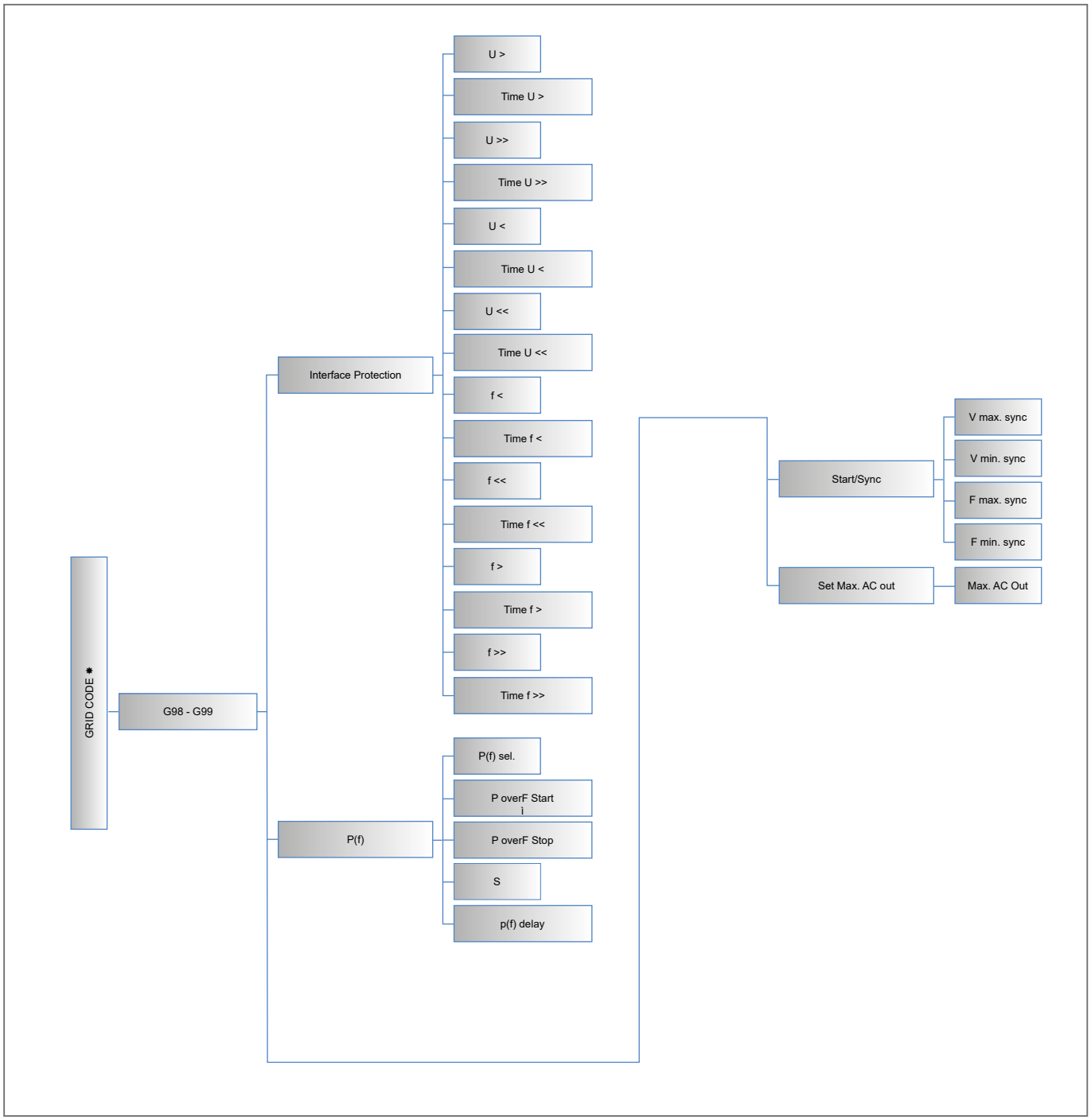


Contact the Technical Service of DELIOS s.r.l. for further details.

7.7.6.4 "G98-G99" Menu

Access to the G98-G99 menu allows to change the standard settings.

WARNING - The modification of the parameters shall be made only with the authorization of the distribution network operator and can be performed only by qualified personnel. The modification of these parameters without authorization can affect the correct functioning of the system and relieves the manufacturer from all liabilities and invalidates the warranty.

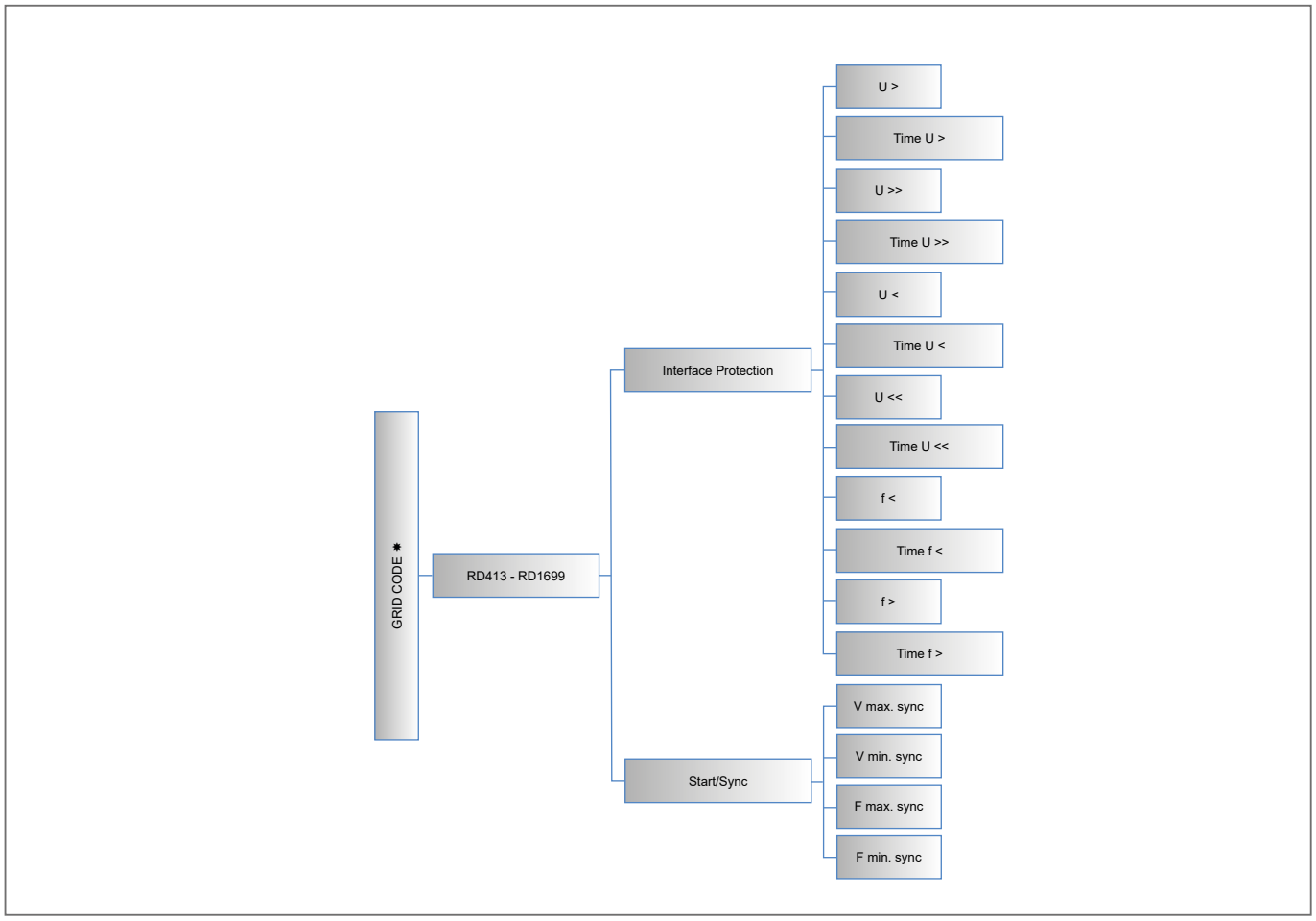


Contact the Technical Service of DELIOS s.r.l. for further details.

7.7.6.5 "RD413 - RD1699" Menu

Access to the RD413-RD1699 menu allows to change the standard settings.

WARNING - The modification of the parameters shall be made only with the authorization of the distribution network operator and can be performed only by qualified personnel. The modification of these parameters without authorization can affect the correct functioning of the system and relieves the manufacturer from all liabilities and invalidates the warranty.



Contact the Technical Service of DELIOS s.r.l. for further details.

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7.8 System Update

The firmware of the DLS inverter can be updated by using an external USB memory which must be connected to the USB port available on the control panel.

Before starting the update procedure, make sure that the AC BYPASS switch is in the "1" position and that the inverter is STAND-BY mode.

Make sure you have connected an external USB memory where has been uploaded the ".DLS" update file. The external USB memory must be large enough and must have at least 128Mb of free space.

Make sure that the external USB memory has been recognized by the system (the USB icon in the status bar of the display is shown).

Access to "**SETTINGS → GENERAL → FW UPGRADE**" menu.

Perform the update procedure following the instructions displayed on the front panel.

During the update procedure the DLS enters safety mode and interrupts its functions for the entire dura-tion of the procedure (a few minutes).

WARNING - Do not power-off (AC and DC) the system during the update procedure. We recommend that the update procedure is only carried out when the system is on and there is enough energy pro-duced by the solar PV panels (at least 1kW). A power supply outage during the update procedure could affect the correct operation of the system and relieves the manufacturer from all liabilities, as well as in-validate the warranty.

WARNING - Do not remove the external USB memory during the update procedure. Removal of the external USB memory during the update could affect the correct operation of the system and relieves the manufacturer from all liabilities, as well as invalidate the warranty.

The inverter restarts automatically once the update is complete.

If the update procedure is not successful and a control panel lockout occurs, please contact the Tech-nical Service of DELIOS s.r.l. to carry out a recovery procedure.

8 MONITORING SYSTEM

8.1 General Information

The DELIOS monitoring system is an integrated and online datalogging platform (for registered devices) that allows to access DLS devices and check their operating status at any time and from anywhere in the world if an INTERNET connection is available.

Registered DLS systems send operating data at regular intervals which are collected and organized by the integrated data logger and the DELIOS portal in order to provide system status in a simple and im-mediate way.

There are two types of remote access to DLS systems:

a. DIRECT access on local Wi-Fi / LAN network via web browser

b. WEB access via https://webportal.delios-srl.it/ portal or via **Delios Solar App** available for Android and iOS devices on local Wi-Fi / LAN network with INTERNET access.

8.2 Getting Started - Preparing to Wi-Fi/LAN connection

Make sure the DLS system is operating (green LED (1) blinking or steady on)

Make sure that the home Wi-Fi / LAN router is switched on and working properly.

Refer to the ELECTRICAL CONNECTIONS - Wi-Fi CONNECTION section for creating a Wi-Fi connection with the router.

Refer to the ELECTRICAL CONNECTIONS - LAN CONNECTION section for creating a wired LAN connection with the router.

8.2.1 Connecting to a Wi-Fi network

1. 1. **Access, from the user panel, to the setup page through the following path:**

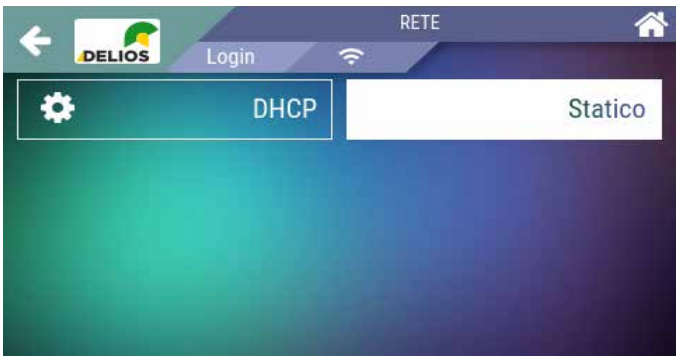
➢ **MENU → SETTINGS → NETWORKING → WLAN**

2. Access the "**SSID**" menu and start scanning the available Wi-Fi networks.
3. Select the Wi-Fi network for the router to which the inverter is to be connected. The selection will be confirmed by a check mark next to the selected network.
4. Access the "**PASSWORD**" menu and enter the security password for the selected Wi-Fi network and confirm.
5. Wait for the connection to be established (blue LED (3) on and icon (5) highlighted)
6. The DLS system is now connected to the Wi-Fi network of the selected router.

8.2.2 Wi-Fi/LAN network settings

Based on the connection you made, access the "**NETWORK**" menu to perform the Wi-Fi / LAN network settings by following the following paths:

➢ **MENU → SETTINGS → NETWORKING → WLAN → NETWORK**
➢ **MENU → SETTINGS → NETWORKING → LAN → NETWORK**



8.2.2.1 STATIC IP

This type of setting allows you to keep the DLS configured to the selected IP even when the router is re-started. This functionality is useful if you want to make direct remote access to the DLS system using a smartphone / tablet / PC device using any browser and the selected IP address.

1. Access the "**STATIC**" menu to assign a static IP address to those available on the router network. The selected IP address must be selected between the free and currently unassigned to other de-vices attached to the selected Wi-Fi / LAN network.

2. Access the "**GATEWAY**" menu to assign the IP address of the router

3. Access the "**NETMASK**" menu to assign the value (255.255.255.0 default setting).

8.2.2.2 Dynamic IP (DHCP)

In this type of setting the router dynamically and automatically assigns the IP address to the DLS system within the selected Wi-Fi / LAN network.

It is important to note that the IP address assigned automatically by the router to the inverter may vary when the router restarts. At any time, the IP address assigned to the DLS system can be retrieved by accessing the "**INFO**" menu and the "**NETWORKING**" submenu:

- **MENU → INFO → NETWORKING → WLAN**
- **MENU → INFO → NETWORKING → LAN**

8.3 DIRECT Access over local Wi-Fi/LAN network

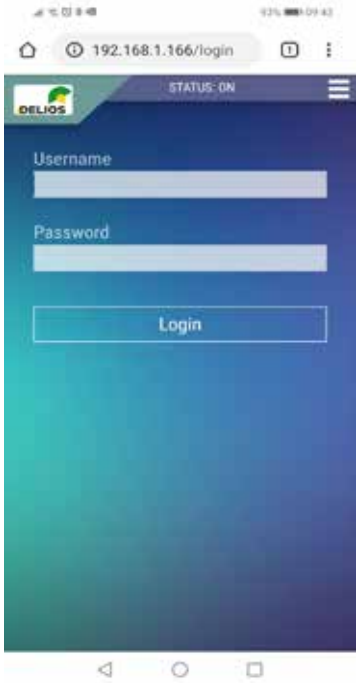
The following remote access mode to the DLS system allows to get the system control panel onto the de-vice used for the remote connection. No parameters changes are allowed on the remote control panel, but only system checks.

1. Make sure that the DLS system is operating (green LED (1) blinking or steady on) and that the Wi-Fi connection to the local network is active (blue LED (3) on and icon (5) highlighted).

2. Make sure that the remote device (smartphone / tablet / PC / Laptop) that you want to use to access the DLS is connected to the same local LAN / WLAN.

3. Start the system web browser on the remote device (smartphone / tablet / PC / Laptop) and enter the IP address assigned to the DLS system on the search bar to visit the login page. In the case of STATIC assignment, type in the chosen IP address, while, in the case of dynamic DHCP as-signment, retrieve the address assigned by the router to the DLS by consulting the "**IN-FO**" menu on the "**NETWORKING**" page.

• Login page:

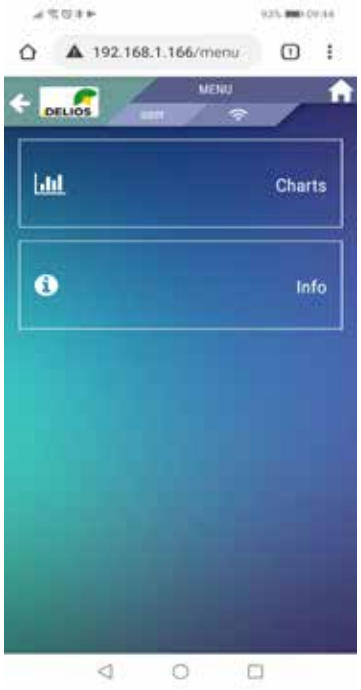


• Enter the default credentials on the system login page:

Username: **user**
Password: **user**

• "**HOME**" page:

- Main **"MENU"** - Select the **"MENU"** button to see the **"CHARTS"** or **"INFO"** section of the system.



- "**CHARTS**" menu - Access to the "**CHARTS**" menu allows you to view the data stored by the integrated data logger with the same functionality provided by the DLS control panel. Refer to the DLS user manual for operating details.

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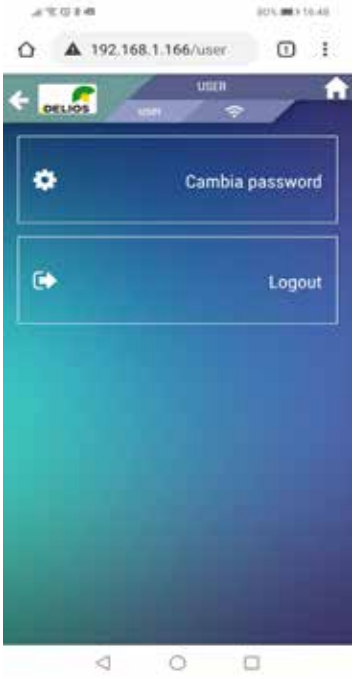
- "**INFO**" menu - Access to the "**INFO**" menu allows you to view general system information. Refer to the DLS user manual for operating details.

- "**USER**" menu - Access the "**USER**" menu to change the default access password ("**PASSWORD CHANGE**" menu) or to disconnect from the system ("**LOGOUT**" menu).



8.4 DELIOS WEB PORTAL and DELIOS SOLAR APP Access

The DELIOS monitoring system is an integrated and online datalogging platform (for registered devices) that allows to access DLS devices and check their operating status at any time and from anywhere in the world if an INTERNET connection is available.

Registered DLS systems send operating data at regular intervals which are collected and organized by the integrated data logger and the DELIOS portal in order to provide system status in a simple and immediate way.

WEB access can be made from the portal https://webportal.delios-srl.it/ or via **Delios Solar App** available for Android and iOS devices and downloadable for free from the re-spective online stores.

GET IT ON Google play

Download on the App Store

8.4.1 Getting Started

Before to access online services, it is necessary to configure the DLS for the data sending to the portal and check that the connection to the INTERNET is working properly.

Proceed following the instructions reported below:

1. Make sure that the DLS system is operating (green LED (1) blinking or steady on) and that the Wi-Fi connection to the local network is active (blue LED (3) on and icon (5) highlighted).
2. Make sure that the Wi-Fi / LAN network to which the DLS system is connected has access to the INTERNET.
3. Enable the DLS system to send data to the portal. At this purpose, access the setting page from the control panel through the following path:

➢ **MENU → SETTINGS → NETWORKING**

4. Access the **"SEND DATA TO PORTAL"** menu and select **"ON".**

5. After having set **"ON"**, make sure that the blue LED (3) remains permanently on. This confirms that the DLS system has effective access to the INTERNET. The DLS system is now enabled to send data to the DELIOS portal.

6. If the blue LED (3) remains off after having enabled the data sending to the portal, it means that the DLS system is unable to access the INTERNET. Check the router settings which may block da-ta transmission.

7. Make sure that the remote device (smartphone / tablet / PC / Laptop) used to access the remote mo-nitoring system is connected to the network and has access to the Internet.

8.4.2 User Registration

PBefore being able to access the online services, it is necessary to create an user account through the registration procedure available on the portal page.

Proceed following the instructions reported below:

1. Access the DELIOS portal via smartphone / tablet / PC / Laptop by typing the following address on the web browser:

   https://webportal.delios-srl.it/

2. Access the registration page and fill out the proposed form.

3. After registration, the portal will send an automatic e-mail to confirm the registration and set the access password.

4. Register and keep the credentials for future access via the portal or Delios Solar App.

9 MANTEINANCE

9.1 General Information

Any repair or replacement of parts of the system must be performed exclusively by qualified staff.
The repair or replacement of parts of the system by unauthorized staff will immediately invalidate the product warranty.
Only genuine spare parts must be used. Using non genuine spare parts will immediately invalidate the product warranty.
Immediately replace the components that do not appear in perfect conditions.

Before starting any maintenance operations, make sure that the system has been switched off, and that the AC line external main switch has been set to off..

Do not carry out other operations on the inverter for at least 10 minutes. The inverter contains capacitors that need a minimum time to discharge.

Never disconnect the AC or DC connectors connected to the DLS system before having disconnected the protection switches (external and internal). Any disconnection of the connectors during operation can generate large electrical arcs.

An electric shock shock can be fatal.
An electric discharge can set fire to the inverter.
An electrical discharge can cause fires capable of spreading to the surrounding areas.

It is absolutely forbidden to open the DLS system except as provided in this manual.

The DLS system must not be subjected to any type of modification.
If the operator does not comply with what is described, the manufacturer declines all responsibility.

9.2 System switching off

Proceed as follows to switch off the system:

1. Enable the inverter stand-by by placing the AC BYPASS switch in the "1" position.
2. Disconnect the DC switch (position 1).
3. Disconnect the AC GRID and AC OUT circuit breakers.
4. Disconnect the BATTERY circuit breaker (where present) and turn off the LV battery.
5. Wait for the display to turn off.
6. Do not carry out other operations on the inverter for at least 10 minutes. The inverter contains capacitors that need a minimum time to discharge.

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9.3 Uninstall

Before starting any maintenance operations, make sure that the system has been switched off, and that the AC line external main switch has been set to off.

Wait at least 10 min. before removing the DLS system from the wall.
The inverter enclosure could overheat during its operation and cause burns by contact.

Do not carry out other operations on the inverter for at least 10 minutes. The inverter contains capacitors that need a minimum time to discharge.

Batteries produce electricity and can cause electric shock or fire in the event of a short circuit or incor-rect installation.

The conductors from the solar panels are always live. The voltage from a string of solar panels can reach 1000 V!!

1. Disconnect the battery cable connectors from the BAT inputs.
2. Disconnect the DC connectors of the photovoltaic panel strings from the inputs PV1 and PV2.
3. Open the connection compartment by removing the fixing screws.
4. Disconnect the GRID IN, GRID OUT and AC OUT (if present) conductors.
5. Disconnect the communication wires and external controls where present.
6. The DLS can now be removed for disposal or repair.

9.4 Disposal

To comply with the 2002/96 / EC European Directive relating to electrical and electronic waste and its im-plementation as national law, electrical equipment that has reached the end of its useful life and dis-charged batteries must be separated from general waste and disposed to the appropriate authorized col-lection and recycling centers.

Any device that is no longer needed must therefore be returned to the distributor or disposed to an au-thorized collection and recycling center in your area. Ignoring this European Directive can have potential-ly negative effects on the environment and your health!

10 TROUBLESHOOTING

This section contains information and procedures for solving possible problems with DLS inverters.

Check the warnings or error messages on the system control panel or the error codes on the inverter information panel and act as indicated in the table.

If the problem persists, contact the Technical Support Service.

ALARM	TYPE	SOLUTION
E001	Converter control system fault.	• Switch off and restart the system. • Refer to the sections "System switching off" and "System switching on" • Should the problem persist, contact our technical support service.
E002	Converter control system fault.	• Switch off and restart the system. • Refer to the sections "System switching off" and "System switching on" • Should the problem persist, contact our technical support service.
E003	Incorrectly configured system.	• Contact the Technical Support Service.
E004	AC overcurrent.	• Check the sizing and the output connections to the system. • Refer to the section "Electrical connections". • If the problem persists, contact the technical support service.
E005	Faulty protection interface device integrated in the system.	• Switch off and restart the system. • Refer to the sections "System switching off" and "System switching on" • Should the problem persist, contact our technical support service.
E006	Faulty interlock device integrated in the system.	• Switch off and restart the system. • Refer to the sections "System switching off" and "System switching on" • Should the problem persist, contact our technical support service.
E007	High internal temperature	• Check the correct positioning of the inverter and that the installation complies with the provisions contained in this manual in the "Position-ing" and "Mounting" sections. • Check that the ambient temperature is within the allowed range. • Check the correct operation of the cooling fans. • Check that there is no accumulation of dust near the ventilation open-ings. • If the problem persists, contact the technical support service.
E008	Internal current leakage	• Switch off and restart the system. • Refer to the sections "System switching off" and "System switching on" • Should the problem persist, contact our technical support service.
E009	NEUTRAL line wrongly connected	• Check that the connections of the AC input and output lines respect the assigned polarity. • If the problem persists, contact the technical support service.
E010	Failed AUTOTEST (relevant only for CEI 0-21)	• Check the integrity of the electrical connections. • Make sure that the mains voltage and frequency are within the range allowed by the CEI 0-21 standard. • If the problem persists, contact the technical support service.

ALARM	TYPE	SOLUTION
E011	High grid voltage	• Make sure that the mains voltage is within the range allowed by local regulations. • Check the network impedance. • If the mains voltage is not within the permitted range for reasons due to the local grid conditions, contact the grid operator to evaluate the possibility of adapting the voltages at the connection point or request approval for the change to the operating limits. • If the mains voltage is within the allowed range, but the alarm persists, contact the technical support service.
E012	High grid voltage	• Make sure that the mains voltage is within the range allowed by local regulations. • Check the network impedance. • If the mains voltage is not within the permitted range for reasons due to the local grid conditions, contact the grid operator to evaluate the possibility of adapting the voltages at the connection point or request approval for the change to the operating limits. • If the mains voltage is within the allowed range, but the alarm persists, contact the technical support service.
E013	Low grid voltage	• Make sure that the mains voltage is within the range allowed by local regulations. • Check the network impedance. • If the mains voltage is not within the permitted range for reasons due to the local grid conditions, contact the grid operator to evaluate the possibility of adapting the voltages at the connection point or request approval for the change to the operating limits. • If the mains voltage is within the allowed range, but the alarm persists, contact the technical support service.
E014	Low grid voltage	• Make sure that the mains voltage is within the range allowed by local regulations. • Check the network impedance. • If the mains voltage is not within the permitted range for reasons due to the local grid conditions, contact the grid operator to evaluate the possibility of adapting the voltages at the connection point or request approval for the change to the operating limits. • If the mains voltage is within the allowed range, but the alarm persists, contact the technical support service.
E015	High grid frequency	• Make sure that the grid frequency is within the range allowed by local regulations. • If the grid frequency is not within the permitted range for reasons due to the local grid conditions, contact the grid operator to request ap-proval for the change to the operating limits. • If the grid frequency is within the allowed range, but the alarm persists, contact the technical support service.
E016	High grid frequency	• Make sure that the grid frequency is within the range allowed by local regulations. • If the grid frequency is not within the permitted range for reasons due to the local grid conditions, contact the grid operator to request ap-proval for the change to the operating limits. • If the grid frequency is within the allowed range, but the alarm persists, contact the technical support service.

ALARM	TYPE	SOLUTION
E017	High grid frequency	• Make sure that the grid frequency is within the range allowed by local regulations. • If the grid frequency is not within the permitted range for reasons due to the local grid conditions, contact the grid operator to request approval for the change to the operating limits. • If the grid frequency is within the allowed range, but the alarm persists, contact the technical support service.
E018	Low grid frequency	• Make sure that the grid frequency is within the range allowed by local regulations. • If the grid frequency is not within the permitted range for reasons due to the local grid conditions, contact the grid operator to request ap-proval for the change to the operating limits. • If the grid frequency is within the allowed range, but the alarm persists, contact the technical support service.
E019	Disconnection from the gird imposed by the distribution network operator.	• Intervention of the interface device imposed by the network operator.
E020	Feeding in a direct current with a value higher than the admitted threshold.	• Make sure that there is a direct current fed into the grid. • If the direct current fed into the grid does not fall within the permitted range for reasons due to the local grid conditions, contact the grid operator to request approval for the modification to the operating limits. • If the direct current fed into the grid it is within the allowed range, but the alarm persists, contact the technical support service.
E021	Feeding in a direct current with a value higher than the maximum instantaneous admitted threshold.	• Make sure that there is a direct current fed into the grid. • If the direct current fed into the grid does not fall within the permitted range for reasons due to the local grid conditions, contact the grid operator to request approval for the modification to the operating limits. • If the direct current fed into the grid it is within the allowed range, but the alarm persists, contact the technical support service.
E022	Converter control system fault.	• Switch off and restart the system. • Refer to the sections "System switching off" and "System switching on" • Should the problem persist, contact our technical support service.
E023	DC overcurrent.	• Check the sizing and connections to the DC inputs of the system. • Refer to the section "Electrical connections". • If the problem persists, contact the technical support service.
E024	DC overcurrent.	• Check the sizing and connections to the DC inputs of the system. • Refer to the section "Electrical connections". • If the problem persists, contact the technical support service.
E025	Loss of isolation of the PV generator.	• Check the DC lines leakage to ground.
E026	DC voltage out of range.	• Immediately disconnect the system from the photovoltaic generator as it could be damaged. • Check the sizing of the system. • Check the no-load voltage of the photovoltaic generator.
E027	BATTERY overcurrent.	• Check the sizing and connections at the BATTERY inputs. • Refer to the section "Electrical connections". • If the problem persists, contact the technical support service

ALARM	TYPE	SOLUTION
E028	Battery not recognized.	• Check the connections and polarity at the BATTERY inputs. • Check the battery voltage and make sure it is within the limits allowed for operation. • Refer to the section "Electrical connections". • If the problem persists, contact the technical support service.
E029	Circuit breaker tripped.	• Check the correct positioning of the inverter and that the installation complies with the provisions contained in this manual in the "Position-ing" and "Mounting" sections. • Check that the ambient temperature is within the allowed range. • Check the correct operation of the cooling fans. • Check that there is no accumulation of dust near the ventilation openings. • If the problem persists, contact the technical support service.
E030	Overload protection (EPS & SMART ISLAND operating mode)	• Check the sizing and the output connections to the system. • Reduce the domestic and/or privileged loads connected to the inverter. • Refer to the section "Electrical connections". • If the problem persists, contact the technical assistance service.
E031	Wrong AC connection.	• Check the sizing and the output connections to the system. • Refer to the section "Electrical connections". • If the problem persists, contact the technical assistance service.
E032	Communication fault with the external energy meter.	• Check the communication cable and connection with the energy meter. Check the energy meter configuration and system settings. • Switch off and restart the system. • Refer to the sections "System switching off" and "System switching on" • Should the problem persist, contact our technical support service.
E033	Converter control system fault.	• Switch off and restart the system. • Refer to the sections "System switching off" and "System switching on" • Should the problem persist, contact our technical support service.
E034	Converter control system fault.	• Switch off and restart the system. • Refer to the sections "System switching off" and "System switching on" • Should the problem persist, contact our technical support service.
E035	Converter control system fault.	• Switch off and restart the system. • Refer to the sections "System switching off" and "System switching on" • Should the problem persist, contact our technical support service.
E036	Battery temperature out of range (only LEAD AC-ID).	• Check the presence and connections of the battery temperature sen-sor (lead-acid battery). • Check the battery voltage and make sure it is within the limits allowed for operation. • Check that the ambient temperature is within the allowed range. • Check the correct positioning of the battery and that the installation complies with the requirements contained in this manual. • Refer to the section "Electrical connections". • If the problem persists, contact the technical support service.
E037	Converter control system fault.	• Switch off and restart the system. • Refer to the sections "System switching off" and "System switching on" • Should the problem persist, contact our technical support service.

ALARM	TYPE	SOLUTION
E038	Converter control system fault.	• Switch off and restart the system. • Refer to the sections "System switching off" and "System switching on" • Should the problem persist, contact our technical support service.
E001LI ÷ E0031LI	Lithium battery alarms from battery BMS.	• Check the connections and polarity at the BATTERY inputs of the system. • Check the battery voltage and make sure it is within the limits allowed for operation. • Refer to the section "Electrical connections". • If the problem persists, contact the technical support service.
W001LI ÷ W0031LI	Lithium battery warnings from battery BMS.	• Check the connections and polarity at the BATTERY inputs of the sys-tem. • Check the battery voltage and make sure it is within the limits allowed for operation. • Refer to the section "Electrical connections". • If the problem persists, contact the technical support service.
EV001LI ÷ EV0031LI	Lithium battery messaging from battery BMS.	• Check the connections and polarity at the BATTERY inputs of the system. • Check the battery voltage and make sure it is within the limits allowed for operation. • Refer to the section "Electrical connections". • If the problem persists, contact the technical support service.

11 TECHINCAL DATA

11.1 Rating Plate

To locate the rating plate on the equipment, refer to **Figure 21**.

The technical specifications shown in this manual do not replace those appearing on the rating plate attached to the equipment.

The labels attached on the equipment must NEVER be removed, damaged, soiled or hidden for any reason.

The information reported on the rating plate:
1. Manufacturer
2. Model
3. Ratings
4. Certification marks
5. Warnings and usage instructions.

The labels must NOT be hidden with foreign objects (rags, boxes, equipment etc.); they must be periodically cleaned and kept always clearly visible.

11.2 DLS Technical Datasheet

	DLS 450 EVO	DLS 600 EVO
DC inputs		
Maximum input power	6 kW	8 kW
Maximum input voltage	600 V	
Minimum input voltage	115 V	
Nominal input voltage	400 V	
FV MPPT voltage range	100 V - 550 V	
Maximum power x MPPT	3 kW	4 kW
DC voltage range - MPPT @ Pdc max	230 V - 550 V @ 3 kW	310 V - 550 V @ 4 kW
Maximum input current x MPPT	20A	20A
Short-circuit current x MPPT	25A	25A
Number of MPPTs	2	
Maximum number of strings x MPPT	2+2	2+2

Battery charger	
Battery type	Litio
Battery voltage range	40 V - 65 V
Max. battery current	100 A
Nominal battery voltage	50 V
Max. charging power	5 kW
Max. discharging power	5 kW
Communication interfaces	CAN

	DLS 450 EVO	DLS 600 EVO
AC output		
Grid connection	1P+N+PE	
Sn nominal power	4.5 kVA	6 kVA
P maximum active power	4.5 kW	6 kW
AC voltage range	230 Vac ± 15% (*)	
Output nominal current	19.6 A	26.1 A
Grid nominal frequency	50 Hz	
Frequency range	47 Hz - 53 Hz (*)	
Cos ϕ	1 (adj ± 0.80)	
THD	< 3 %	
EPS output		
Maximum Smax power (PV+BATT)	4.5 kVA	6 kVA
Maximum Smax power (BATT)	3 kVA / 4.5 kVA	3 kVA / 4.5 kVA
AC voltage range	230 Vac ± 15% (*)	
Output nominal current	19.6 A	26.1 A
Grid nominal frequency	50 Hz	
Intervention time	< 5 sec (*)	
THD	< 3%	
Operating performance		
Maximum Effciency	97 %	
Weighted effciency (Euro)	96 %	
Battery typical effciency	94 %	
Protective devices		
DC polarity reversal	As standard	
BATTERY polarity reversal	As standard	
BATTERY overload protection	As standard	
AC short-circuit protection	As standard	
Isolation monitoring unit	As standard	
Interface protection and anti-islanding	In compliance with local legislation	
RCMU (Residual Current Monitoring Unit)	As standard	
DC Overvoltage protective device	As standard	
AC Overvoltage protective device	As standard	
BATTERY Overvoltage protection	As standard	
Accessories supplied		
DC connectors	Quick connectors	
AC connectors	Screw terminals, M25 cable gland	
BATTERY connection	Screw terminals, M25 cable gland	
DC switch	As standard	
BATTERY automatic switch	Built-in	
User Interface	Graphic Touch Screen 4.3'' colour LCD	
Communication interfaces	USB / CAN Bus / RS485 / Ethernet / Wi-Fi	
External alarm signal	As standard	
Datalogger	Built-in	

	DLS 450 EVO	DLS 600 EVO
Warranties	5 years (as standard)/10 year (optional)	

Environmental conditions	
Ambient temperature	-20°C…+60°C
Power derating temperature range	40°C…+60°C
Storage temperature	-30°C…+70°C
Relative humidity	5%...95% without condensation
Noise levels	< 50 dB(A) @ 1 m
Maximum operating altitude without derating	2000 m
Pollution degree classifcation	PD 3
Installation environmental category	Indoor, unconditioned

Physical	
Protection rating	IP 21
Overvoltage category (IEC 62109-1)	II (DC, BATTERY inputs) III (AC output)
Cooling concept	I-cool, forced cooling
Dimensions (W x H x D) mm	710 x 650 x 150
Weight	30 kg
Fitting system	Staffa a parete

Safety	
Protection class	I
DC to AC isolation	Trasformerless
BATTERY to AC and DC isolation	with safety HF transformer
Certifcations	CE
EMC and Safety standards	EN61000-6-2 (EMC); EN61000-6-3 (EMC); EN 62109-1 (Safety); EN 62109-2 (Safety)
Grid codes	CEI 0-21 (IT); VDE 0126-1-1 (DE); VDE AR-N 4105 (DE); G98/G99 (UK); C10-11 (BE)

Other features	
BACKUP/OFF-GRID mode operation	Yes, with internal interlock (*)
ON-GRID/BACKUP/OFF-GRID selection mode	Yes, automatic
Grid support (grid services)	Yes, if required by the applied grid code
Residential loads management	Yes, 1 dry contact 4A 250Vac

(*) The specifed range or function may vary according to the grid code and safety rules applied in the country of installation..

11.3 DLS-C Technical Datasheet

	DLS 300C EVO	DLS 450C EVO	DLS 600C EVO
DC inputs			
Maximum input power	4.5 kW	6 kW	8 kW
Maximum input voltage	600 V		
Minimum input voltage	115 V		
Nominal input voltage	400 V		
FV MPPT voltage range	100 V - 550 V		
Maximum power x MPPT	2.25 kW	3 kW	4 kW
DC voltage range - MPPT @ Pdc max	175 V - 550 V @ 2.25 kW	230 V - 550 V @ 3 kW	310 V - 550 V @ 4 kW
Maximum input current x MPPT	13A	20A	20A
Short-circuit current x MPPT	15A	25A	25A
Number of MPPTs	2		
Maximum number of strings x MPPT	1+1		
Battery charger			
Battery type	Litio		
Battery voltage range	40 V - 65 V		
Max battery current	50 A		
Nominal battery voltage	50 V		
Max charging power	2.5 kW		
Max discharging power	2.5 kW		
Communication interfaces	CAN		
AC output			
Grid connection	1P+N+PE		
Sn nominal power	3 kVA	4.5 kVA	6 kVA
P maximum active power	3 kW	4.5 kW	6 kW
AC voltage range	230 Vac ± 15% (*)		
Output nominal current	13 A	19.6 A	26.1 A
Grid nominal frequency	50 Hz		
Frequency range	47 Hz - 53 Hz (*)		
Cos ϕ	1 (adj ± 0.80)		
THD	< 3 %		
EPS output			
Maximum Smax power (PV+BATT)	3 kVA	4.5 kVA	6 kVA
Maximum Smax power (BATT)	2.5 kVA		
AC voltage range	230 Vac ± 15% (*)		
Output nominal current	13 A	19.6 A	26.1 A
Grid nominal frequency	50 Hz		
Intervention time	< 5 sec (*)		
THD	< 3%		
Operating performance			
Maximum Effciency	97 %		
Weighted effciency (Euro)	96 %		
Battery typical effciency	94 %		

	DLS 300C EVO	DLS 450C EVO	DLS 600C EVO
Protective devices			
DC polarity reversal	As standard		
BATTERY polarity reversal	As standard		
BATTERY overload protection	As standard		
AC short-circuit protection	As standard		
Isolation monitoring unit	As standard		
Interface protection and anti-islanding	In compliance with local legislation		
RCMU (Residual Current Monitoring Unit)	As standard		
DC Overvoltage protective device	As standard		
AC Overvoltage protective device	As standard		
BATTERY Overvoltage protection	As standard		
Accessories supplied			
DC connectors	Quick connectors		
AC connectors	Screw terminals, M25 cable gland		
BATTERY connection	Screw terminals, PG9 cable gland		
DC switch	As standard		
BATTERY automatic switch	Built-in		
User Interface	Graphic Touch Screen 4.3” colour LCD		
Communication interfaces	USB / CAN Bus / RS485 / Ethernet / Wi-Fi		
External alarm signal	As standard		
Datalogger	Built-in		
Warranties	5 years (as standard)/10 year (optional)		
Environmental conditions			
Ambient temperature	-20°C…+60°C		
Power derating temperature range	40°C…+60°C		
Storage temperature	-30°C…+70°C		
Relative humidity	5%...95% without condensation		
Noise levels	< 50 dB(A) @ 1 m		
Maximum operating altitude without derating	2000 m		
Pollution degree classifcation	PD 3		
Installation environmental category	Indoor, unconditioned		
Physical			
Protection rating	IP 21		
Overvoltage category (IEC 62109-1)	II (DC, BATTERY inputs) III (AC output)		
Cooling concept	I-cool, forced cooling		
Dimensions (W x H x D) mm	480 x 730 x 165		
Weight	21 kg		
Fitting system	Staffa a parete		
Safety			
Protection class	I		
DC to AC isolation	Trasformerless		
BATTERY to AC and DC isolation	with safety HF transformer		

Cod.: 240.010.0051

	DLS 300C EVO	DLS 450C EVO	DLS 600C EVO
Certifcations	CE		
EMC and Safety standards	EN61000-6-2 (EMC); EN61000-6-3 (EMC); EN 62109-1 (Safety); EN 62109-2 (Safety)		
Grid codes	CEI 0-21 (IT); VDE 0126-1-1 (DE); VDE AR-N 4105 (DE); G98/G99 (UK); C10-11 (BE)		

Other features	
BACKUP/OFF-GRID mode operation	Yes, with internal interlock (*)
ON-GRID/BACKUP/OFF-GRID selection mode	Yes, automatic
Grid support (grid services)	Yes, if required by the applied grid code
Residential loads management	Yes, 1 dry contact 4A 250Vac

(*) The specifed range or function may vary according to the grid code and safety rules applied in the country of installation.

Power Derating

To allow the DLS system to operate in both thermal and electrical safety conditions, the unit automatically reduces the value of the managed power.
Power limitation can occur due to adverse environmental conditions or inadequate input voltage values.
The conditions for power reduction due to environmental conditions and input voltage can also occur simultaneously, but the power reduction will always be relative to the most stringent condition.

TECHNICAL SERVICE:

 +39 334 1690149 (8:30 - 12:30 / 14:00 - 17:30)

 +39 334 1690149

 service@delios-srl.it

 The contact information listed above is intended to be used exclusively by qualified installers