



# **LEDVANCE USER MANUAL**

## **HYBRID INVERTER**

LHT-HV-12K F2

LHT-HV-15K F2

LHT-HV-20K F2

[LEDVANCE.COM](http://LEDVANCE.COM)



**LEDVANCE**

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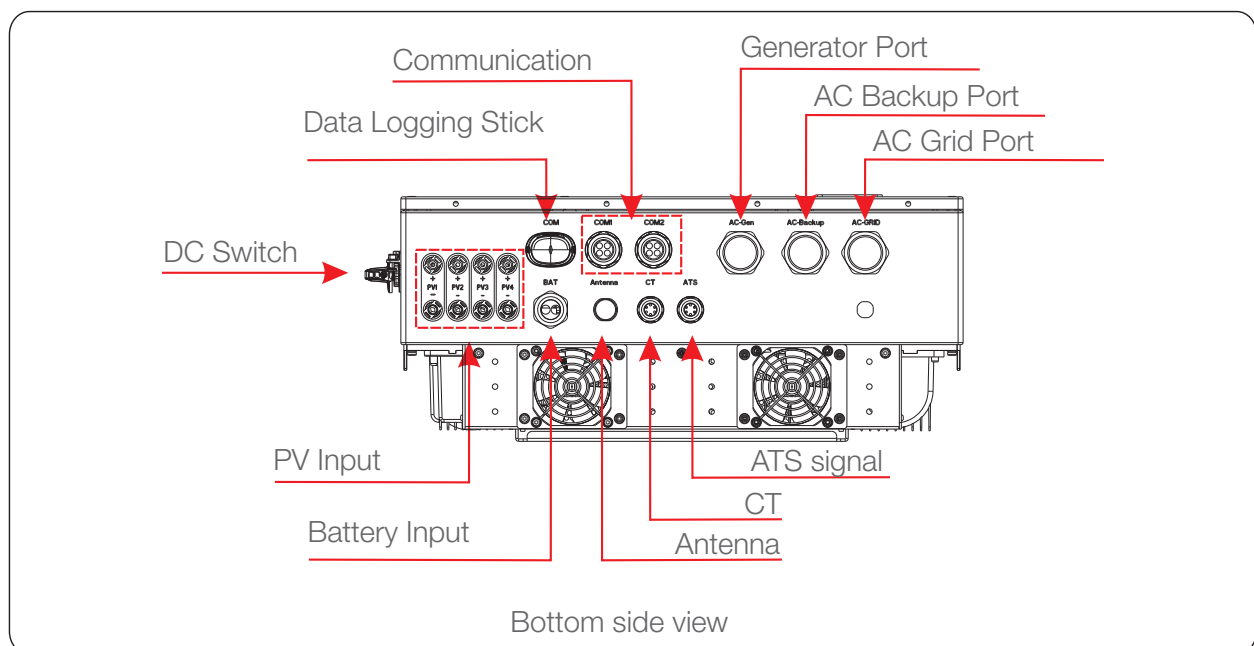
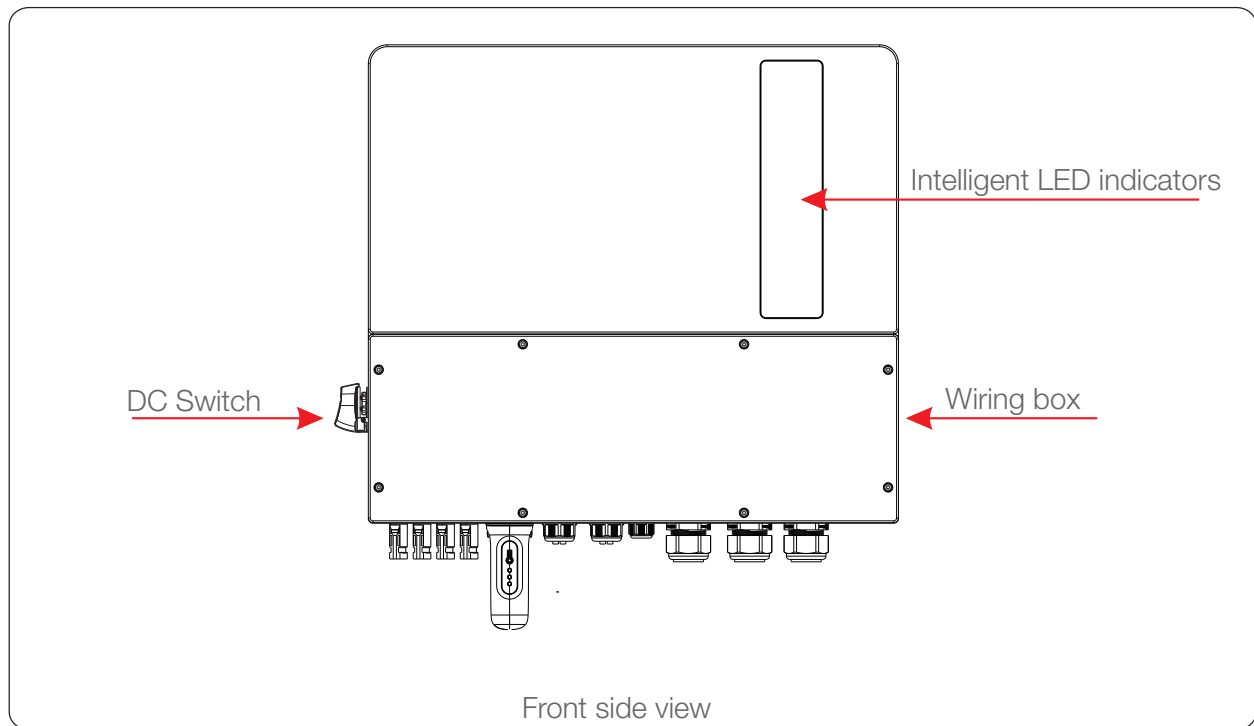
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## Product description

The LEDVANCE Series is designed for residential hybrid systems, which can work with batteries to optimize self-consumption. The unit can operate in both off- and on- grid modes.

This manual covers the LEDVANCE Series inverter model listed below:

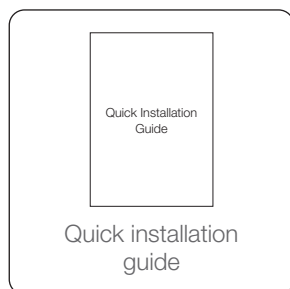
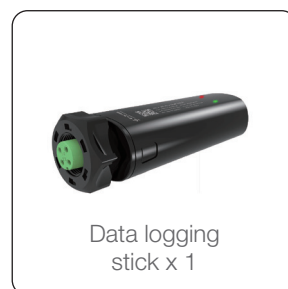
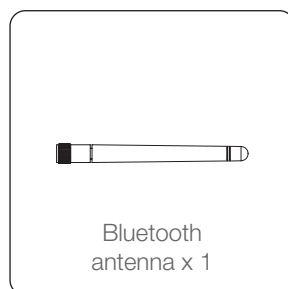
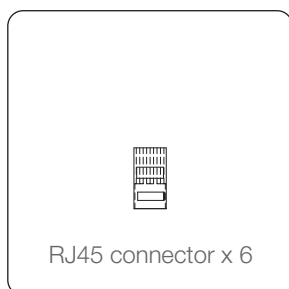
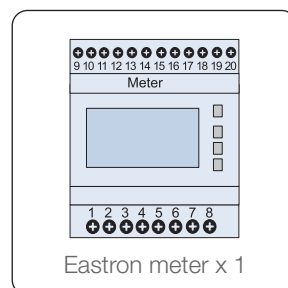
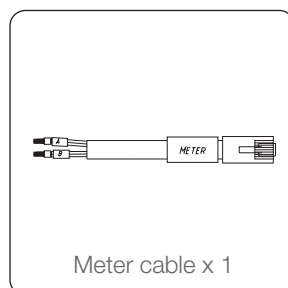
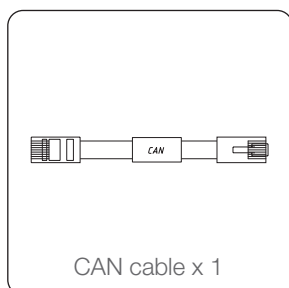
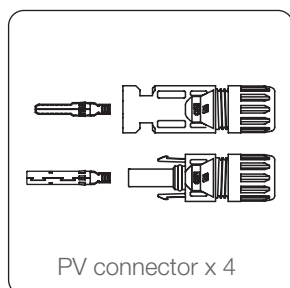
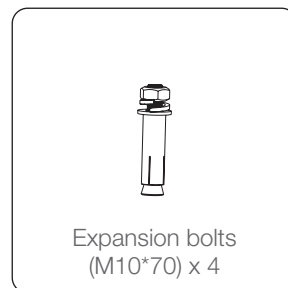
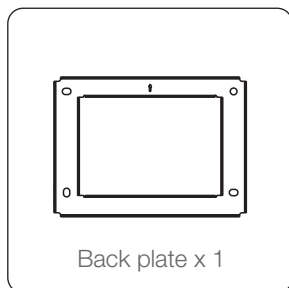
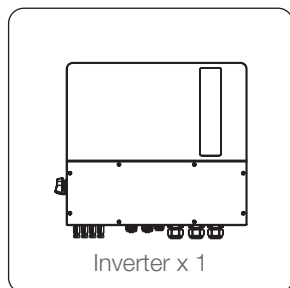
LHT-HV-12K F2, LHT-HV-15K F2, LHT-HV-20K F2



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## Packaging

Please ensure that the following items are included in the packaging with your inverter:

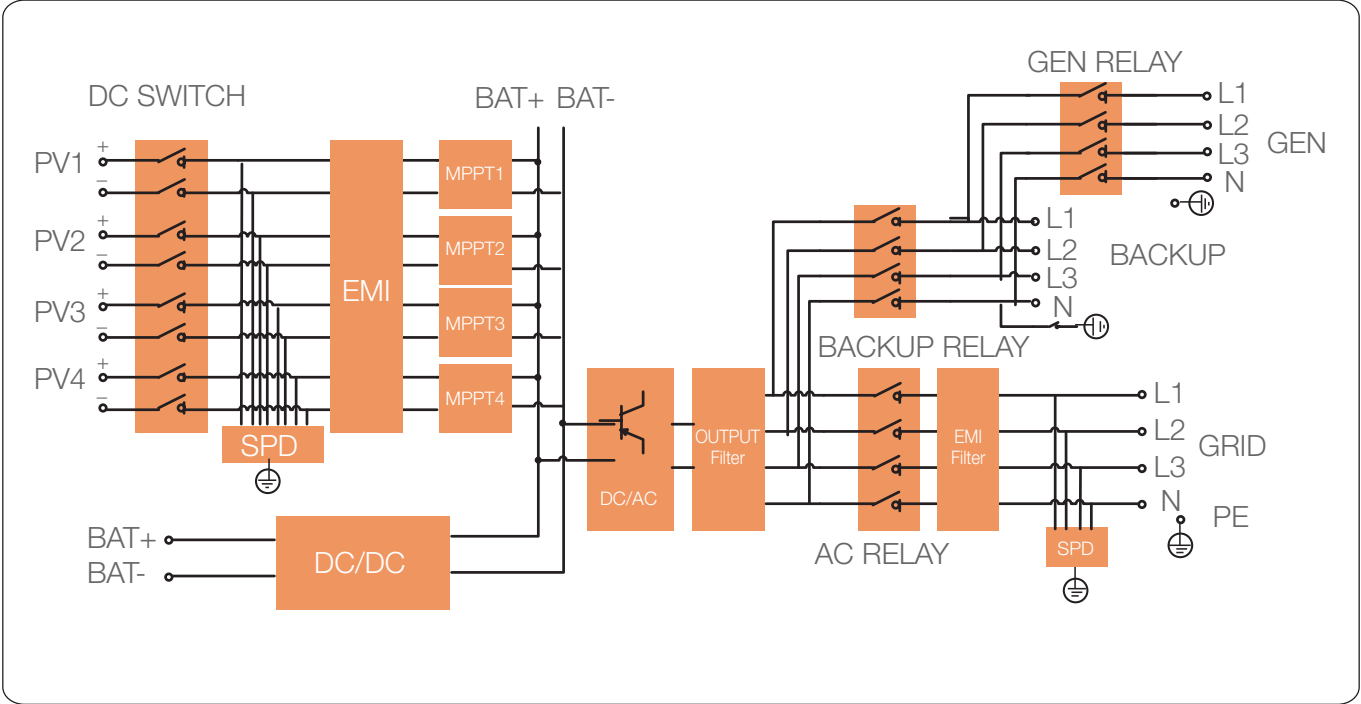


### Note:

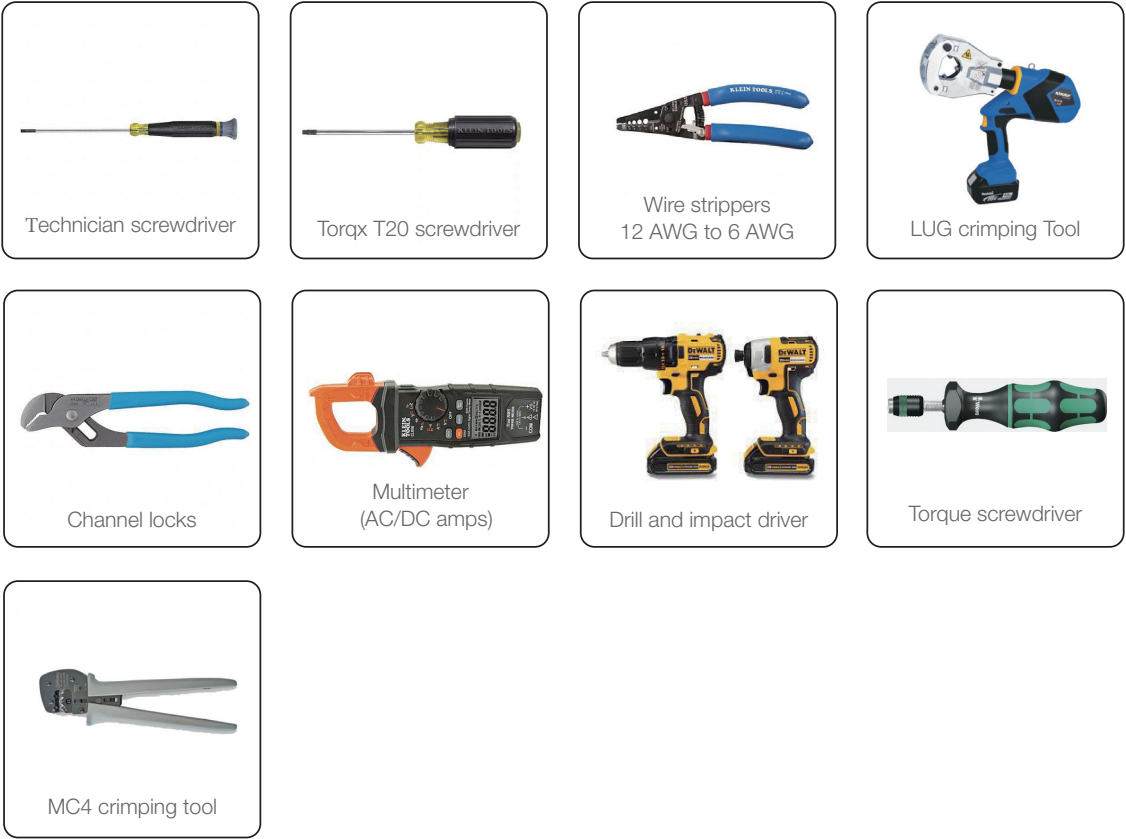
If customer purchases the CT configuration scheme, the attachment only contains CT.  
If the meter configuration plan is purchased, the accessories include CT, the meter, and the meter communication cable.

# CONTENTS

## Inverter circuit diagram



## Tools required for installation



# CONTENTS

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## Safety

The following types of safety instructions and general information appear in this document as described below:

**Danger:**

“Danger” indicates a hazardous situation which if not avoided, will result in death or serious injury.

**Warning:**

“Warning” indicates a hazardous situation which if not avoided, could result in death or serious injury.

**Caution:**

“Caution” indicates a hazardous situation which if not avoided, could result in minor or moderate injury.

**Note:**

“Note” provides tips that are valuable for the optimal operation of your product.

**Note:**

Despite careful construction, electrical devices can cause fires.

- Do not install the inverter in areas containing highly flammable materials or gases.
- Do not install the inverter in potentially explosive environment.

## General safety instructions

**Warning:**

Only devices in compliance with SELV (EN 69050) may be connected to the RS485 and USB interfaces.

**Warning:**

Please don't connect PV array positive (+) or negative (-) to ground, it could cause serious damage to the inverter.

**Warning:**

Electrical installations must be done in accordance with the local and national electrical safety standards.

**Warning:**

Do not touch any inner live parts until 5 minutes after disconnection from the utility grid and the PV input.

# CONTENTS

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**Danger:**

To reduce the risk of fire, over-current protective devices (OCPD) are required for circuits connected to the inverter.  
The DC OCPD shall be installed per local requirements. All photovoltaic source and output circuit conductors shall have isolators that comply with the NEC Article 690, Part II.

**Caution:**

Risk of electric shock, do not remove cover. There is no user serviceable parts inside, refer servicing to qualified and accredited service technicians.

**Caution:**

The PV array supplies a DC voltage when they are exposed to sunlight.

**Caution:**

The surface temperature of the inverter can reach up to 75°C (167°F). To avoid risk of burns, do not touch the surface of the inverter while it's operating. Inverter must be installed out of the reach of children.

**Note:**

PV module used with inverter must have an IEC 61730 Class a rating.

**Warning:**

Operations below must be accomplished by licensed technician or LEDVANCE authorized person.

**Warning:**

Operator must put on the technicians' gloves during the whole process in case of any electrical hazards.

**Warning:**

AC BACKUP Port of LEDVANCE is not allowed to connect to the grid.

**Warning:**

Please refer to the specification of the battery before configuration.

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## Notice for use

The inverter has been constructed according to the applicable safety and technical guidelines. Use the inverter in installations that meet the following specifications ONLY:

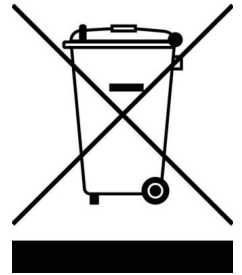
- Permanent installation is required.
- The electrical installation must meet all the applicable regulations and standards.
- The inverter must be installed according to the instructions stated in this manual.
- The inverter must be installed according to the correct technical specifications.

## Notice for disposal

This product shall not be disposed of with household waste.

They should be segregated and brought to an appropriate collection point to enable recycling and avoid potential impacts on the environment and human health.


Local rules in waste management shall be respected.





# OVERVIEW




## HMI screen

There are 3 indicators and 4 operation button on the 12-20K hybrid inverters.  
Three LED indicators on the hybrid inverter (Red, Green, and Orange) which indicate the working status of the inverter.

  
POWER

  
OPERATION

  
ALARM

Light	Status	Description
 POWER	ON	The inverter can detect DC power
	OFF	No DC power
 OPERATION	ON	The inverter is fully operational
	OFF	The inverter has stopped operating
	FLASHING	The inverter has stopped operating
 ALARM	ON	The inverter is initializing
	OFF	Emergency Fault
	FLASHING	Warning and Normal Fault

Status Indicator Lights

## Description of buttons:

  
ESC

  
UP

  
DOWN

  
ENTER

Button	Description
ESC	“Escape”, allows the user to exit, or cancel the operation.
UP	Upwards key, allows the user to increase the value or move forward to the next option.
DOWN	Downwards key, allows the user to decrease the value or move backward to the previous option.
ENTER	Running or executing command.



**Note:**

The screen will be automatically turn off after being idle for a few minutes to save power, click any operation button ("ESC"/"UP"/"DOWN"/"ENTER") to restart the screen, then press "Enter" into the main operation interface.

# OVERVIEW

## System description

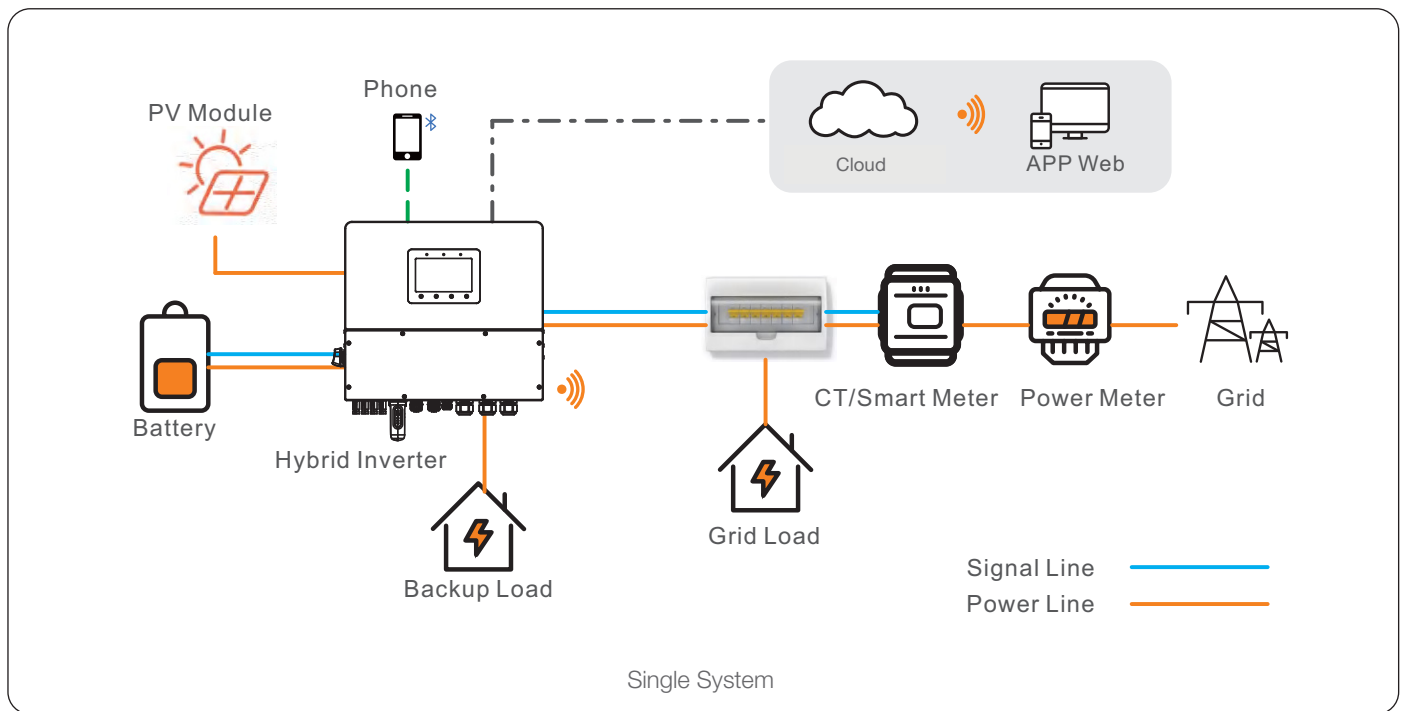
### Single system

The single system consists of PV module, battery, hybrid inverter, CT or smart meter.

The PV Module converts solar energy into electric energy, which is then converted by the inverter to charge the battery or power loads or feed into the grid.

User can connect heat pump, existing PV plant, generator and ATS according to the actual scenario.

The system has three working modes: self-use mode, feed in priority mode and off-grid mode.



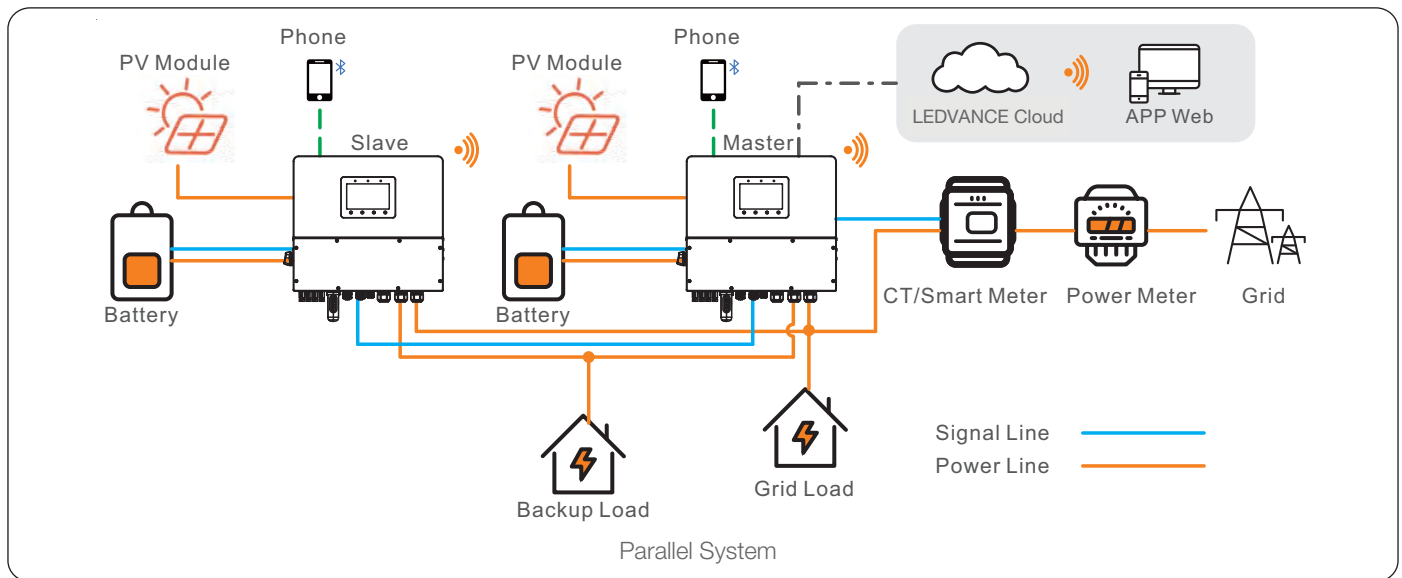
#### Note:

- If the CTs are connected, the Smart meter is not essential.
- you can choose CT scheme or Meter scheme deliver with inverter.
- In the event of a power outage on the grid, the system will seamlessly transition into off-grid mode, providing power exclusively to essential backup loads.
- When the grid recovers, the system switches back to the on-grid operation.

# OVERVIEW

## Parallel system

User can add inverters and batteries to increase capacity. The system supports up to 6 inverters in parallel. Each battery connects to the inverter with an independent CAN line and is managed by the inverter connected to it.



### Note:

In parallel-system scenarios, maximum support 6 parallel connections.  
Parallel connection of different models is not supported. (Like 12 K and 15 K can't be connected in parallel) .  
The AC-Backup port can be connected in parallel, and the single-phase output power is 1/2 of the total AC power.  
Parallel connection of BAT port is not supported.  
In parallel-system scenarios, connecting DG via ATS is recommended;  
In the parallel system, each inverter is recommended to plug in the datalogger, otherwise, the remote upgrade cannot be performed. The parallel cable between the two inverters should not exceed 5 m.



### Note:

Single inverter noise is less than 65 dB (A) . When using multiple inverters to combine, pay attention to noise protection.

## OVERVIEW

Scenarios	12 K	15 K	20 K	8 K-LV	10 K-LV	12 K-LV	Backup single-phase output power (For example 12 K)	Recommended Battery Capacity (For example, 12 K&Backup 2 h)
	AC capacity							
1 single	12 K	15 K	20 K	8 K	10 K	12 K	6 K	24 kWh
2 in parallel	24 K	30 K	40 K	16 K	20 K	24 K	12 K	24 kWh*2
3 in parallel	36 K	45 K	60 K	24 K	30 K	36 K	18 K	24 kWh*3
4 in parallel	48 K	60 K	80 K	32 K	40 K	48 K	24 K	24 kWh*4
5 in parallel	60 K	75 K	100 K	40 K	50 K	60 K	30 K	24 kWh*5
6 in parallel	72 K	90 K	120 K	48 K	60 K	72 K	36 K	24 kWh*6

### System with generator

The access of Diesel Generator is in the off-grid scenario.

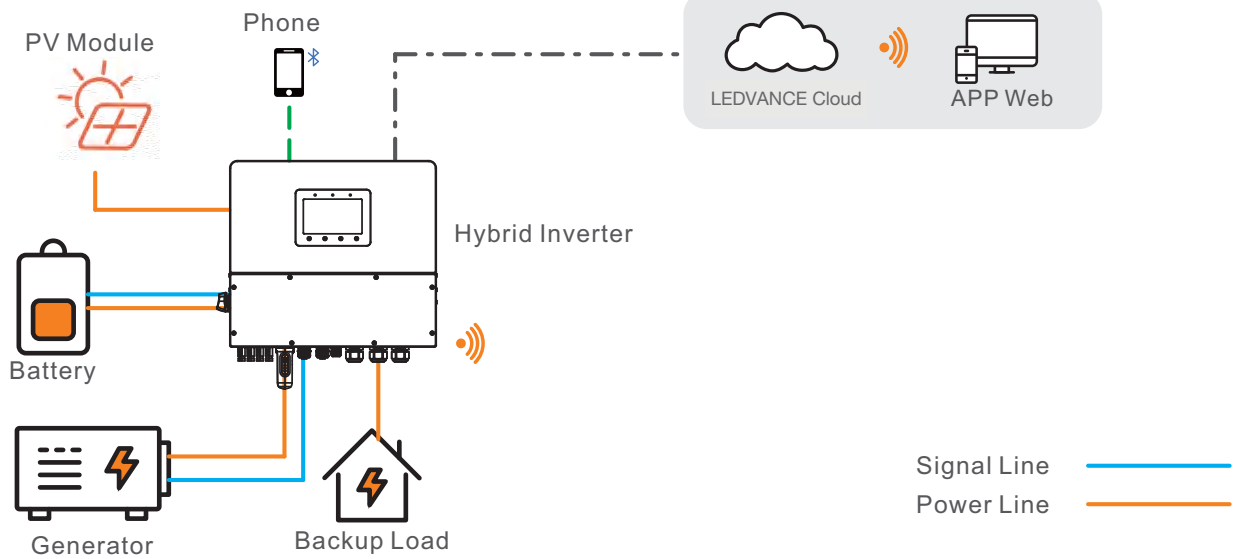
The system stores PV energy in batteries during daytime, provided that there is energy surplus and supplies power to loads when the PV energy is insufficient or there is no PV energy at night.

When the battery power drops to a certain value, and a power outage occurs in the grid, the system will start the generator to power the load and charge the battery.

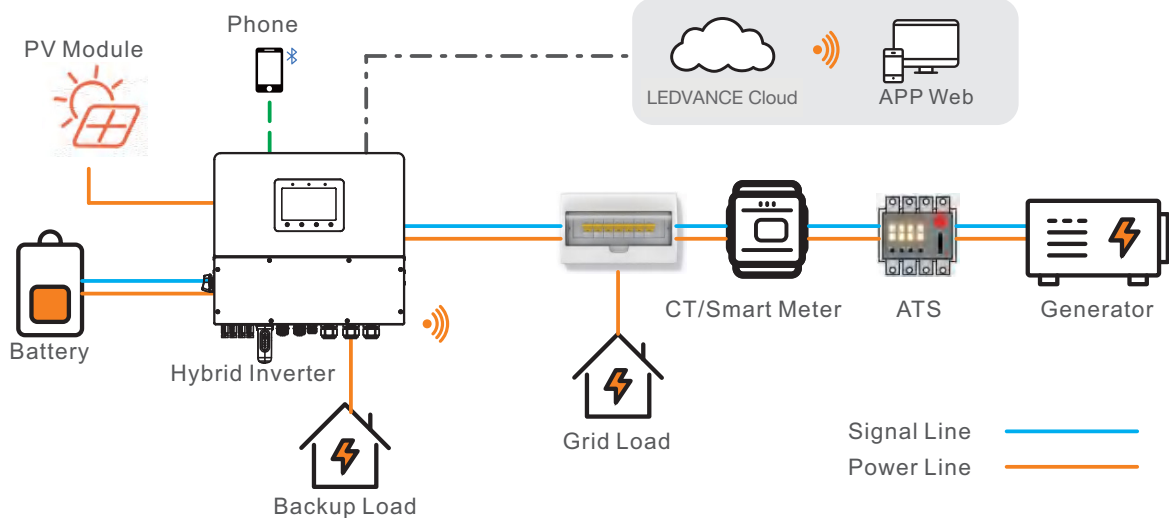
Generator's work logic is as follows:

- ( i ) When the grid is not available and the battery is discharged to GEN\_Start\_SOC, the generator starts to power the load and charges the battery to GEN\_Exit\_SOC, then the generator stops.
- ( ii ) If the load power > the generator rated power in ( i ), the battery will be discharged to power the load until Overdischarge\_SOC, then generator may shutdown due to overload and the load will be powered off.
- ( iii ) If the generator fails to start in ( i ), the battery will be discharged to Overdischarge\_SOC, then the load power off.
- ( iv ) If the system goes into the end of ( iii ), the battery will not discharge before it is charged to Overdischarge\_SOC + Overdischarge\_Hysteresis SOC (set by user).

## OVERVIEW



Typical off-grid scenario diagram (Generator on Gen port)



Typical off-grid scenario diagram (Generator on ATS)



### Note:

- In single system, a diesel generator can be connected via both AC-Gen port and ATS. If via AC-Gen port, it will only supply power to the backup load; if it is necessary to supply power to the grid side, it is recommended that the generator be connected through ATS.
- In parallel-system scenarios, connecting a diesel generator via ATS is recommended.
- When the system is connected to the generator, it cannot be connected to a grid-tied inverter, because of a risk of damaging the generator.
- It is recommended that the generator power be greater than the backup load power.
- If the generator is connected through an ATS on the grid side. then CT or smart meter is required.

## OVERVIEW



### Caution:

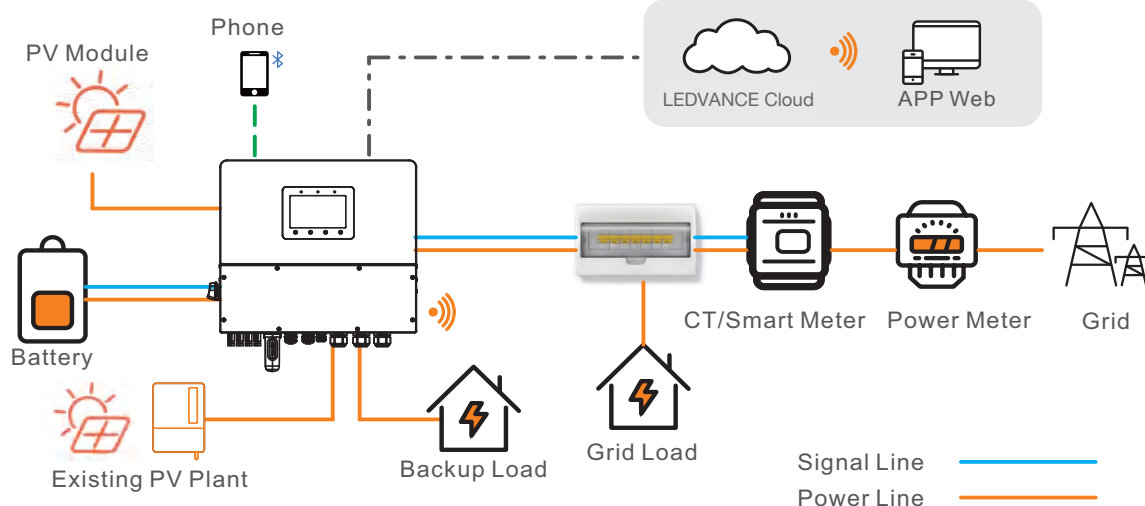
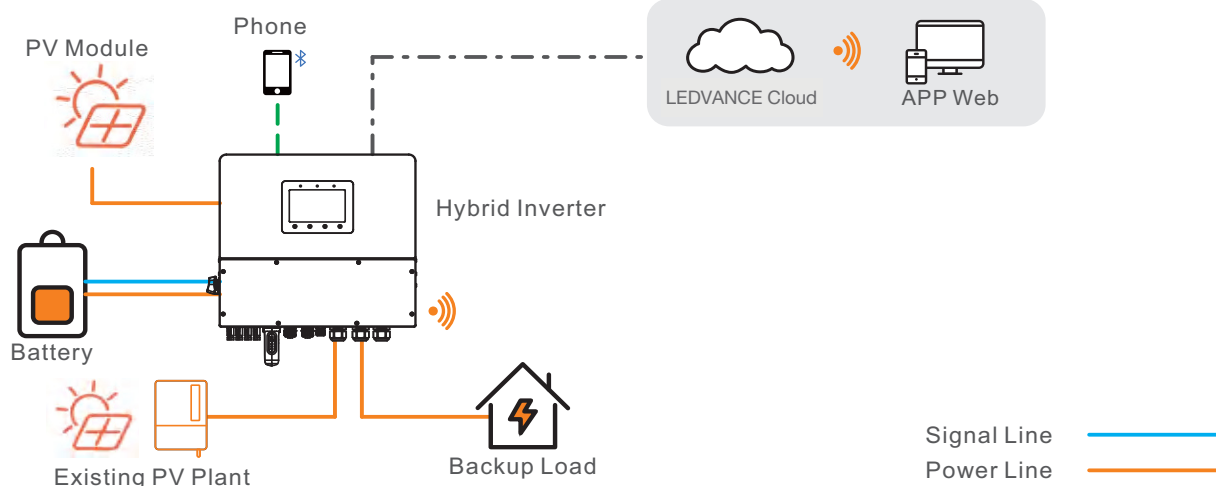
When the generator is connected, it is essential to correctly select the generator position on the APP, otherwise it may cause system failure or damage to the generator.

### System with grid-tied inverter

Generally, the access of grid-tied inverter is for the retrofit of an existing PV plant.

The LEDVANCE hybrid inverter supports access of both LEDVANCE grid-tied inverter and third-party grid-tied inverter.

### Access of third-party grid-tied inverter



## OVERVIEW

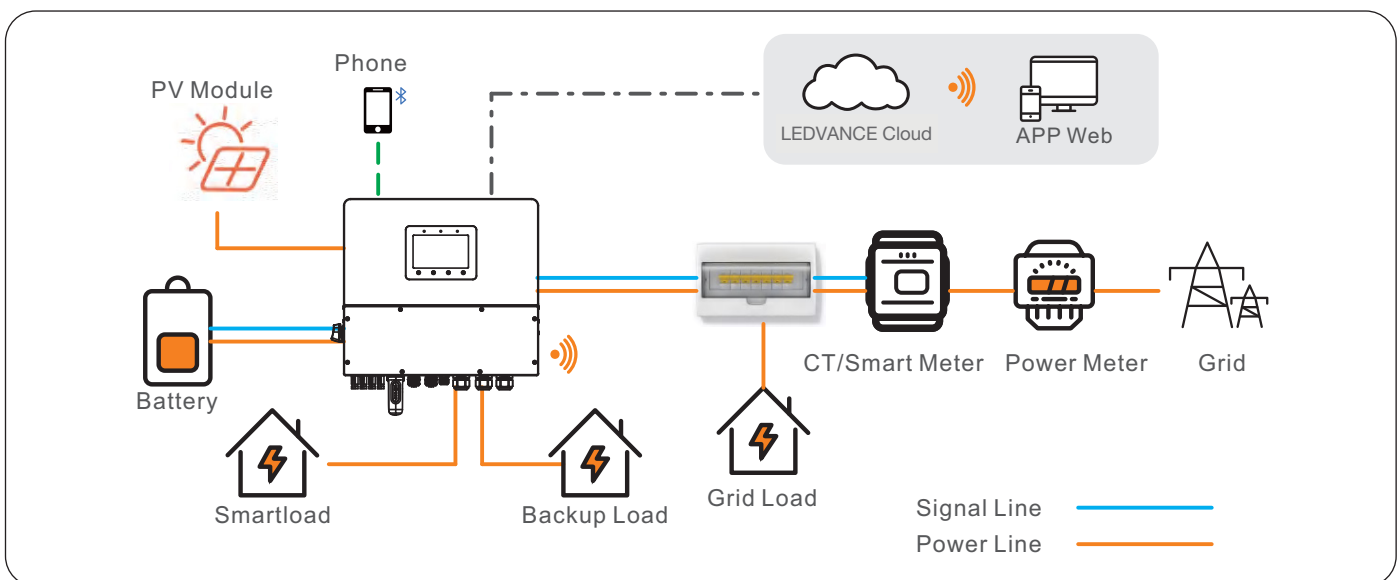
- Third-party grid-tied inverter can be connected via AC-Gen port.
- With third-party grid-tied inverter connected to the system, it is recommended that:  
Grid-tied inverter power < rated AC power of LEDVANCE inverter.
- In on-grid scenario, when the third-party grid-tied inverter is connected, the system cannot control the output power of the third-party grid-tied inverter, so Feed-in limitation cannot be realized.
- In off-grid scenario, the third-party grid-tied inverter must be configured with the correct grid code and equipped with over-frequency load shedding and under-frequency load rising functionalities. These features allow the system to dynamically adjust the frequency, effectively controlling the output power of the grid-tied inverter.

### System with smartload

The Gen port has extended power, which can be used as Smart load output.

You can use the smartload function to connect critical loads to the backup port and non-critical loads to the Gen port. This allows you to manage the power supply of different loads when off-grid.

When the battery SOC/Volt reach the ON set value, the smart port will supply power to the load. When the battery SOC/Volt drops to OFF SOC / Volt, it will cut off the power of the load.

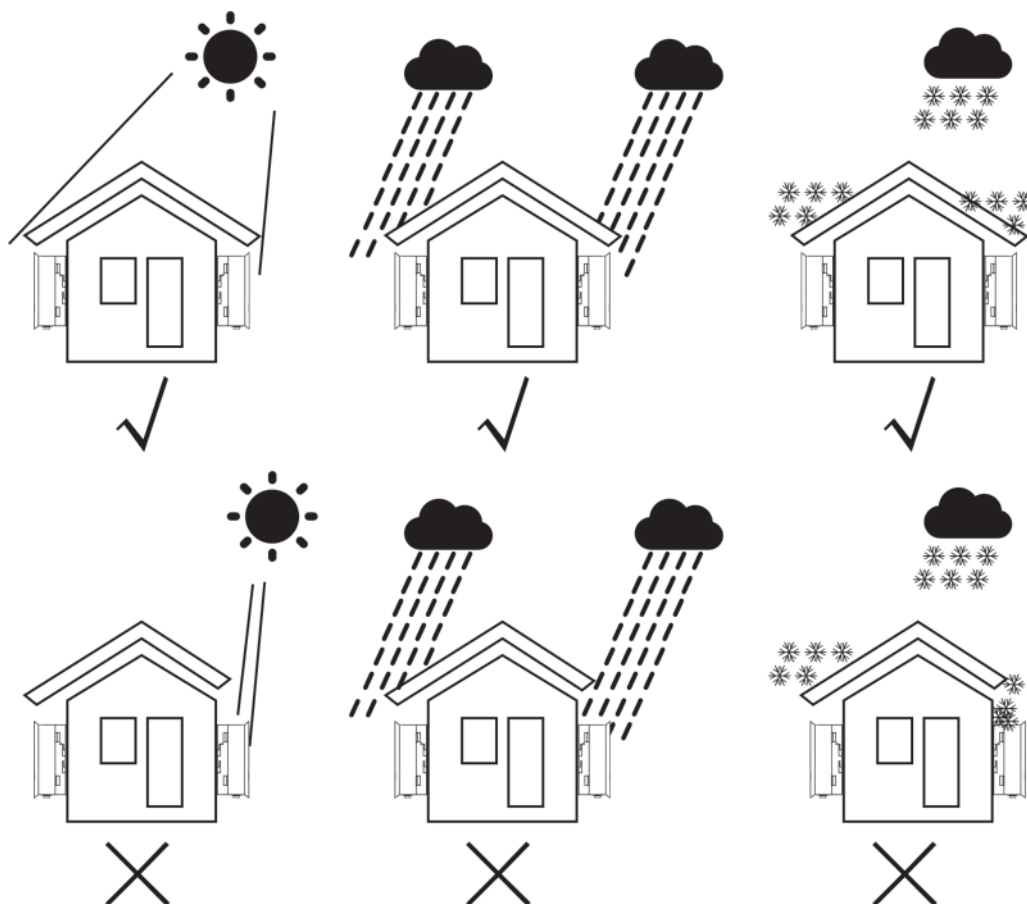


# INSTALLATION

## Select a location for the inverter

To select a location for the inverter, the following criteria should be considered:

- Exposure to direct sunlight may cause output power derating. It is recommended to avoid installing the inverter in direct sunlight.
- It is recommended that the inverter is installed in a cooler ambient which doesn't exceed 104°F/40°C.
- To select a location for the battery, please follow the battery manual specifications.



Recommended Installation locations

### Warning: risk of fire

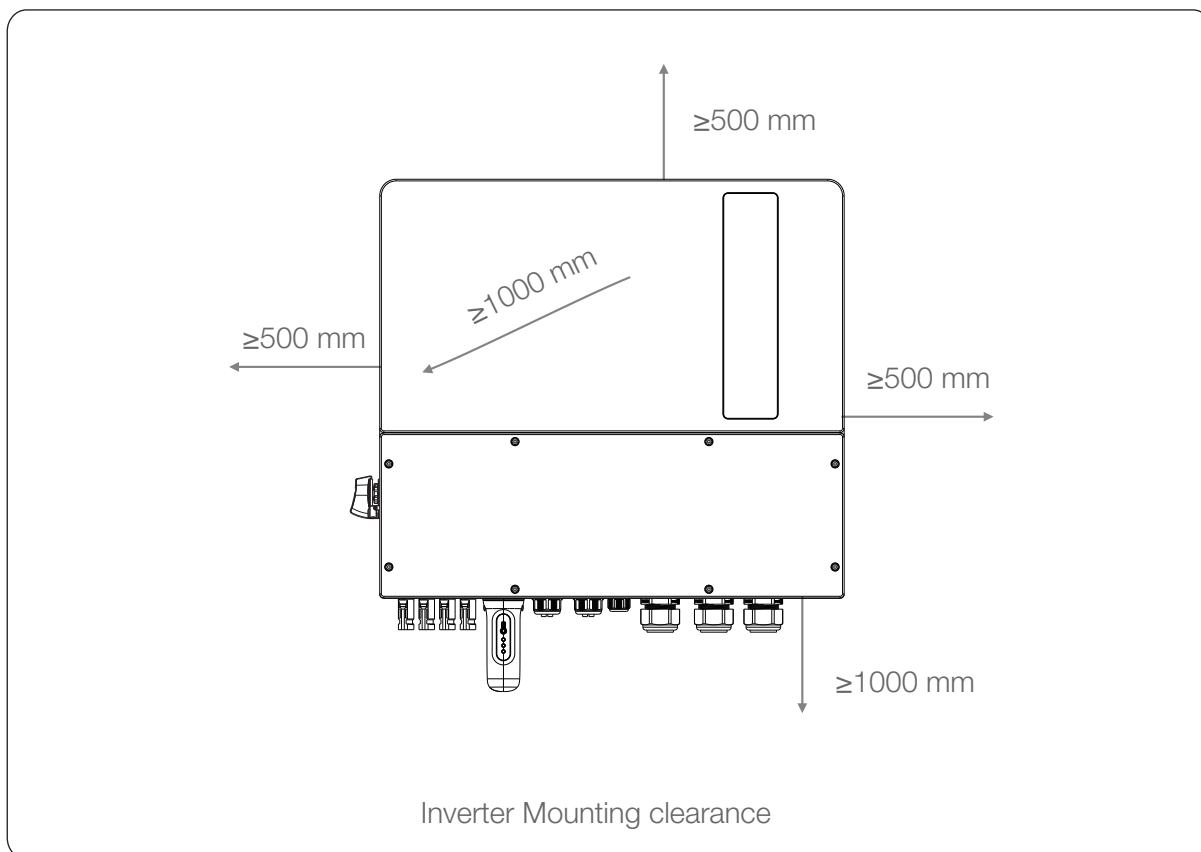


Despite careful construction, electrical devices can cause fires.

- Do not install the inverter in areas containing highly flammable materials or gases.
- Do not install the inverter in potentially explosive atmospheres.
- The mounting structure where the inverter is installed must be fireproof.

## INSTALLATION

- Install on a wall or strong structure capable of bearing the weight of the inverter (33.4 kg) .
- Install vertically with a maximum incline of +/- 5 degrees, exceeding this may cause output power derating.
- To avoid overheating, always make sure the flow of air around the inverter is not blocked. A minimum clearance of 500 mm should be kept between inverters or objects and 1000 mm clearance between the bottom of the inverter and the ground.



- Adequate ventilation must be provided.



**Note:**

Nothing should be stored on or placed against the inverter.



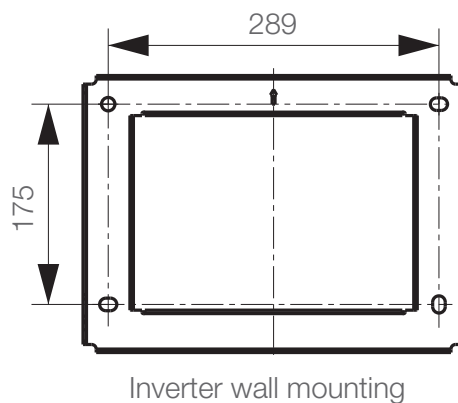
**Note:**

If the inverter is installed in areas with high wind and sand, it is recommended to install a windproof and sand barrier above the inverter.

# INSTALLATION

## Mounting the inverter

Dimensions of mounting bracket:



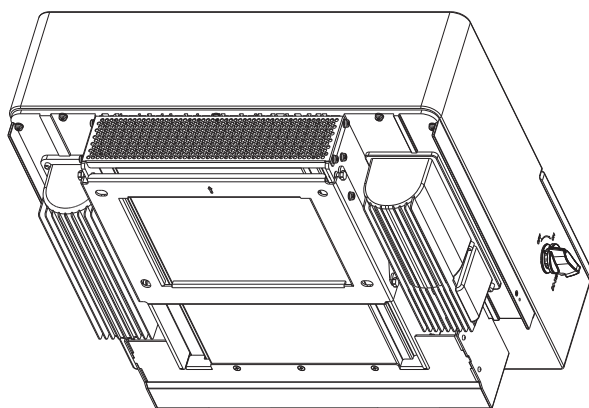
unit:mm

Once a suitable location has been found, firmly attach the wall bracket to the wall.

The inverter shall be mounted vertically.

The steps to mount the inverter are listed below:

- Select the mounting height of the bracket and mark the mounting holes.  
For brick walls, the position of the holes should be suitable for the expansion bolts.
- Lift up the inverter (be careful to avoid body strain) , and align the back bracket on the inverter with the convex section of the mounting bracket. Hang the inverter on the mounting bracket and make sure the inverter is secure.



Wall mount bracket



### Warning:

The inverter must be mounted vertically.

# INSTALLATION

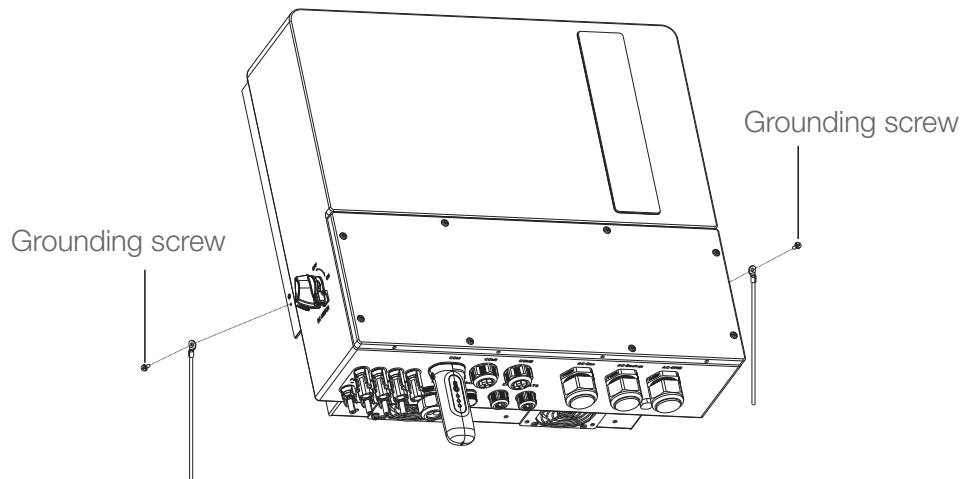
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## PE cable installation

An external ground connection is provided at the right side of inverter.

Prepare OT terminals: M4. Use proper tooling to crimp the lug to the terminal.

Connect the OT terminal with ground cable to the both sides of inverter. The torque is 2 Nm.



Connect the external grounding conductor

# INSTALLATION

## PV input cable installation



Before connecting inverter, please make sure the PV array open circuit voltage is within the limit of the inverter.

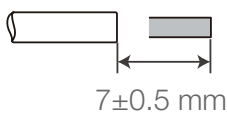


Before connection, please make sure the polarity of the output voltage of PV array matches the “DC + ” and “DC - ” symbols.



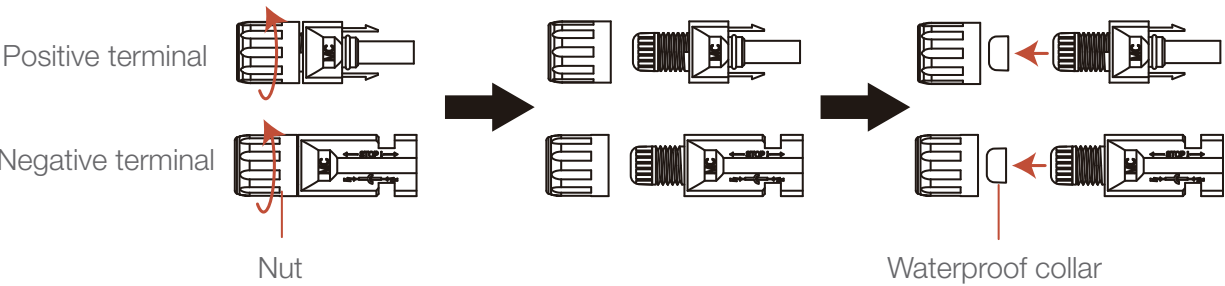
Please use approved DC cable for PV system.

- Select a suitable DC cable and strip the wires out by  $7\pm0.5$  mm. Please refer to the table below for specific specifications.



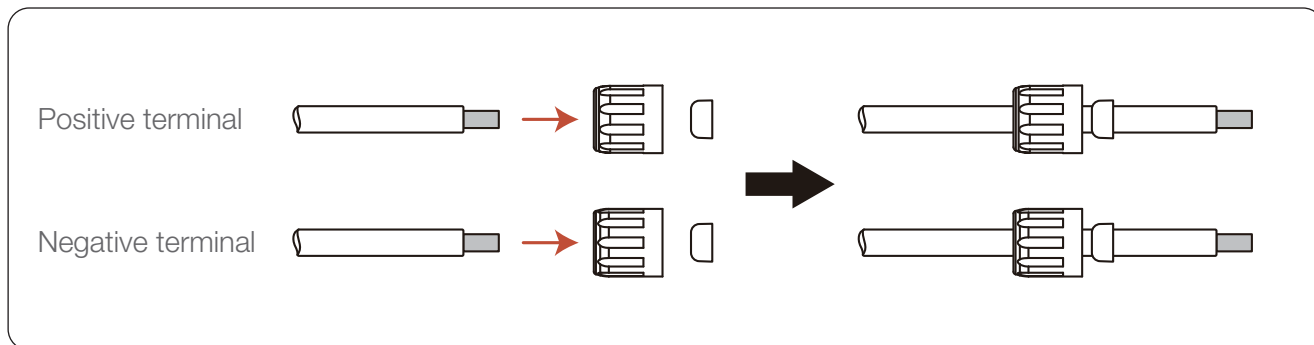
Cable type	Cross section (mm <sup>2</sup> )	
	Range	Recommended value
Industry generic PV cable	4.0~6.0 (10~8 AWG)	4.0 (10 AWG)

- Take the DC terminal out of the accessory bag, turn the screw cap to disassemble it, and take out the waterproof rubber ring.

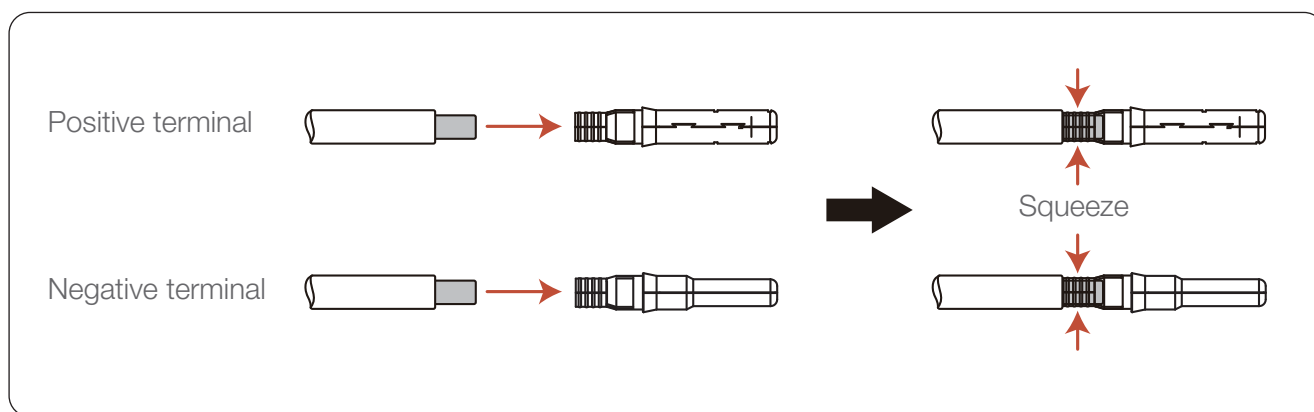


## INSTALLATION

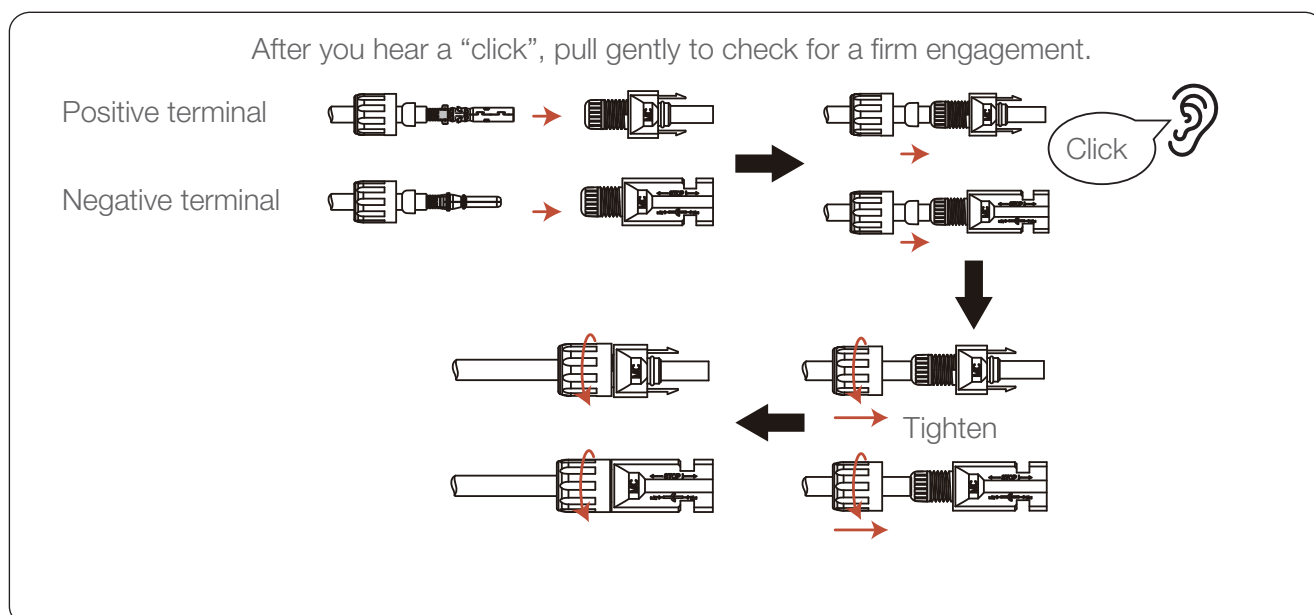
- Pass the stripped DC cable through the nut and waterproof rubber ring.



- Connect the wire part of the DC cable to the metal DC terminal and crimp it with the MC4 crimping tool.

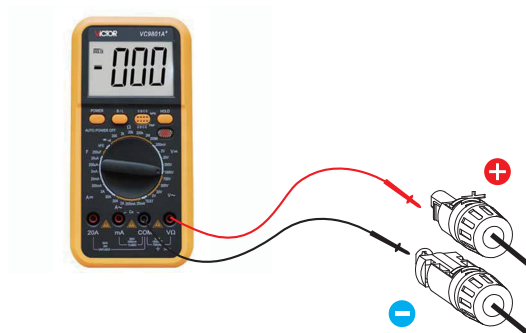


- Insert the crimped DC cable into the DC terminal firmly, then insert the waterproof rubber ring into the DC terminal and tighten the nut.

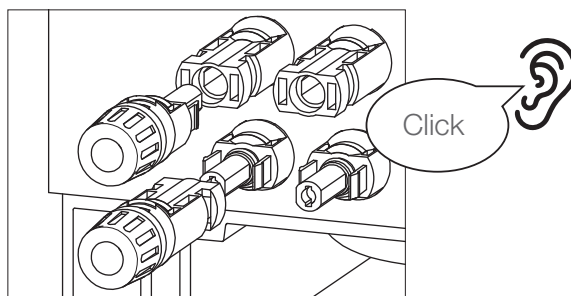


## INSTALLATION

- Measure PV voltage of DC input with multimeter, verify DC input cable polarity.



- Connect the wired DC terminal to the inverter as shown, and a slight “click” is heard to prove the connection is correct.



### Caution:

If DC inputs are accidentally reversely connected or inverter is faulty or not working properly, it is NOT allowed to turn off the DC switch. Otherwise it may cause DC arc and damage the inverter or even lead to a fire disaster. The correct actions are:

- Use a clip-on ammeter to measure the DC string current.
- If it is above 0.5 A, please wait for the solar irradiance to get reduced until the current decreases to below 0.5 A.
- Only after the current is below 0.5 A, you are allowed to turn off the DC switches and disconnect the PV strings.
- In order to completely eliminate the possibility of failure, please disconnect the PV strings after turning off the DC switch to avoid secondary failures due to continuous PV energy on the next day.

Please note that any damages due to wrong operations are not covered in the device warranty.

# INSTALLATION

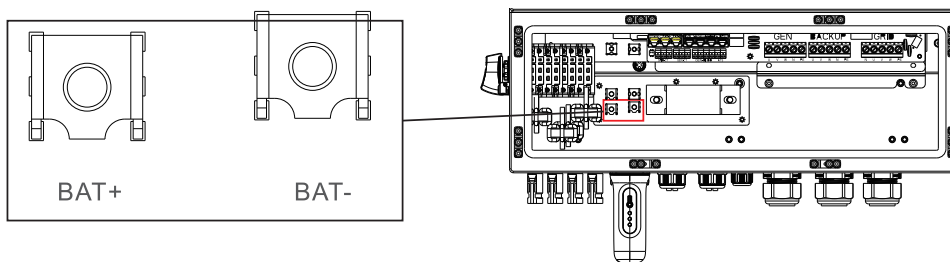
## Battery cable installation



### Danger:

Before installing the battery cables, be sure that the battery is turned off. Use a multimeter to verify that the battery voltage is 0 V<sub>dc</sub> before proceeding. Consult the battery product manual for instructions on how to turn it off.

- The battery (+) and (-) cables shall only be connected to the inverter BAT terminals.
- Run the cables into the wire box. Strip 13 mm off the ends of each cable.
- Crimp the R-type connectors onto the cables. Do not over crimp the connectors.
- Remove the terminal bolts and then insert them through the connector holes.
- Put each bolt back into the proper place, be sure to not reverse the polarity.
- Tighten the bolts with a torque wrench screwdriver following the torque specs.
- Battery Breaker recommended size: two-pole, 63 A, leakage current protector recommended Type C,  $I_{cc} \geq 20$  kA,  $I_{cp}$ ,  $m_r \geq 350$  A fault current interrupting capacity at 800 V /pole.



OT Terminal: R60-8, Recommended cable diameter: 8 AWG (10 mm<sup>2</sup>)



### Note:

The battery fuse in the inverter wire box is replaceable.  
The replacement can only be done by a technician authorized by LEDVANCE.  
Fuse specification: 1000 V / 100 A.  
The Max. temperature for connecting battery terminals is 105 °C.



### Note:

Before connecting the battery, please carefully read the product manual of the battery and perform the installation exactly as the battery manufacturer specifies in the manual.

# INSTALLATION

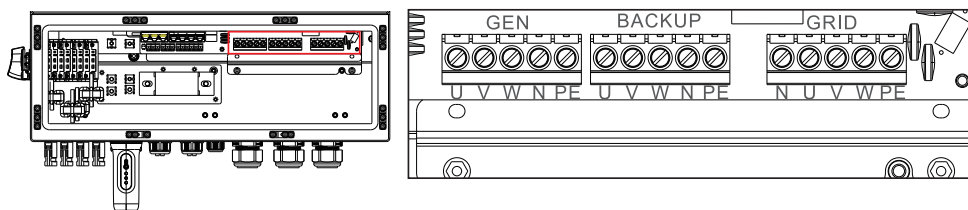
## AC wiring



### Danger:

Before installing the AC cables, be sure that the OCPDs (breakers) are turned off. Use a multimeter to verify that the AC voltages are 0 V<sub>ac</sub> before proceeding.

There are three sets of AC output terminals and the installation steps for both are the same.



AC output terminals

Model	AC Grid	AC Backup / AC Gen	PE
Terminal	C10-12	C6-12	/
Torque	4-5 Nm	4-5 Nm	4-5 Nm
Recommend cross section	8-6 AWG (6 mm <sup>2</sup> ~10 mm <sup>2</sup> )	10-6 AWG (4 mm <sup>2</sup> ~10 mm <sup>2</sup> )	6 AWG

- Bring the AC cables for the backup loads panel (backup) and the main service panel (grid) into the inverter wire box. The backup loads panel should not be electrically connected to the main service panel.
- Strip 13 mm from the ends of each cable. Crimp the R-type connectors onto the ends.
- Remove the terminal bolts, insert them into the connectors, then use a torque wrench to tighten the bolts down.
- Please refer to the terminal labels to connect the AC wires to the correct terminals.
- The grid inrush current is 8.5 A and the duration is less than 5 ms.
- AC Breaker recommended size: four-pole, 63 A, leakage current protector recommended Type C,  $I_{cc} \geq 20$  kA,  $I_{n\ nbbvvvvbf_1\ mr} \geq 350$  A fault current interrupting capacity at 230 V / pole.
- Cable Gland are recommended torque for installation is 4-5 Nm. In order to ensure waterproof effect, the operator regularly checks whether the installation is tight.



### Note:

The Max. temperature for connecting AC terminals is 105 °C.

# INSTALLATION

## CT connection



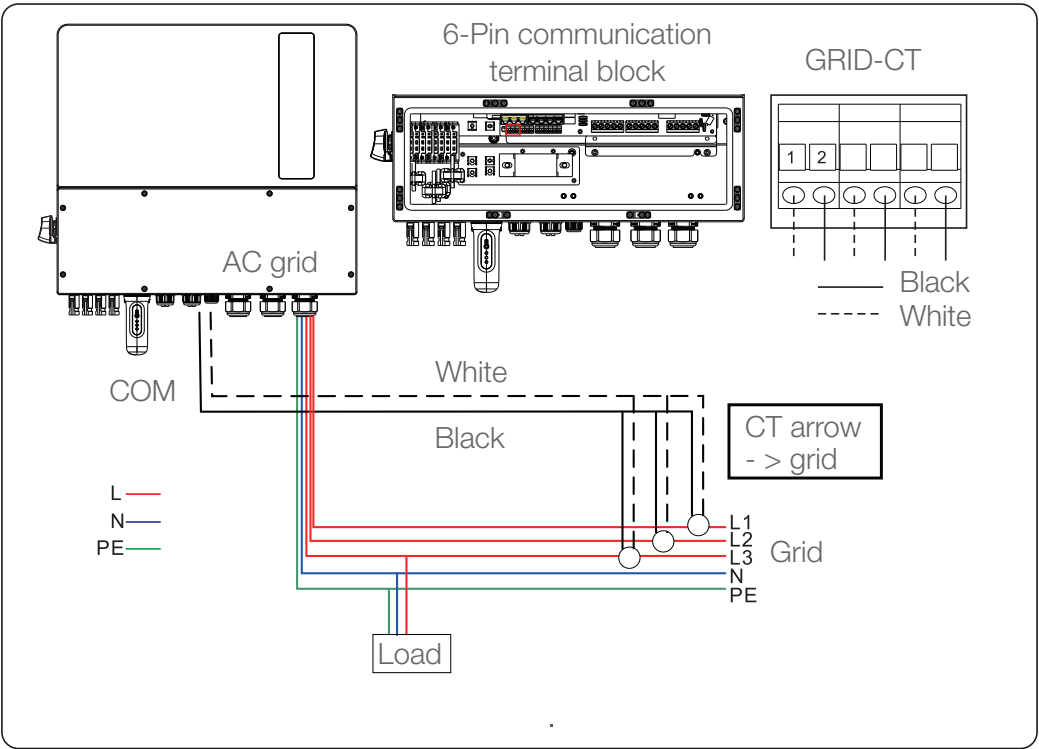
**Caution:**  
Make sure the AC cable is totally isolated from AC power before connecting the smart meter or CT.

The CT provided in the product box is compulsory for hybrid system installation. It can be used to detect the grid current direction and provide the system operating condition to hybrid inverter.  
CT Model: 120 A /40 mA\_0.5 %, ESCT-TA16 120 A /40 mA  
CT Cable: Size – 2.3 mm<sup>2</sup>, Length – 1 m

Please install the CT on the phase lines at the system grid connection point and the arrow on the CT needs to point to the grid direction.

Lead the CT wires through the CT port at the bottom of the inverter and connect the CT wires to the 6 pin communication terminal block.

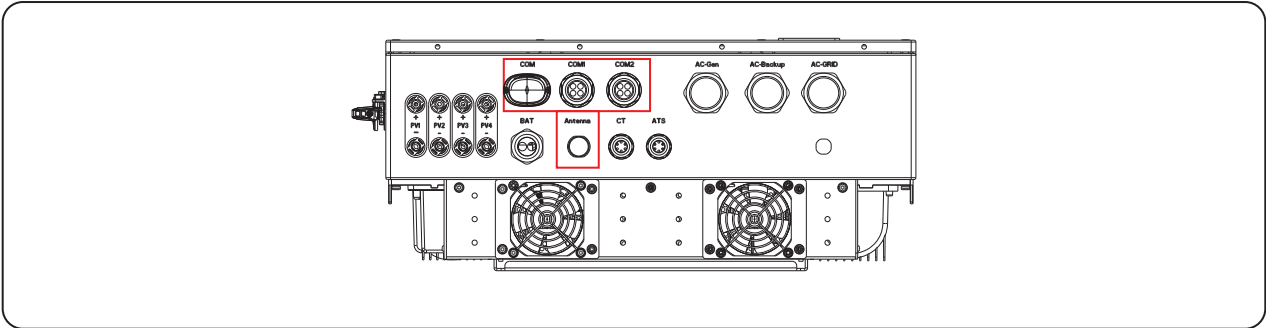
CT Wire	6 PIN Communication Terminal Block
White	Pin 1 (From Left to Right)
Black	Pin 2 (From Left to Right)



# INSTALLATION

## Inverter communication

### Communication ports



Port	Port Type	Description
COM	USB	Used for LEDVANCE data logger connection
ANTENNA	Antenna	Used for antenna connection for built in Bluetooth signal
COM1	4 hole watertight cable gland	Used for RJ45 connection inside wiring box
COM2	4 hole watertight cable gland	Used for RJ45 connection inside wiring box

Wiring steps for COM1-COM2:

Step1. Loose the cable gland and remove the watertight caps inside the cable gland based on the number of the cables and keep the unused holes with watertight cap.

Step2. Lead the cable into the holes in the cable gland. (COM1-COM2 Hole Diameter: 6 mm)

Step3. Connect the cable to the corresponding terminals inside the wiring box.

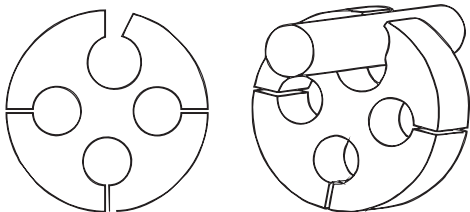
Step4. Reassemble the cable gland and ensure there is no bending or stretching of the cables inside the wiring box.



**Note:**

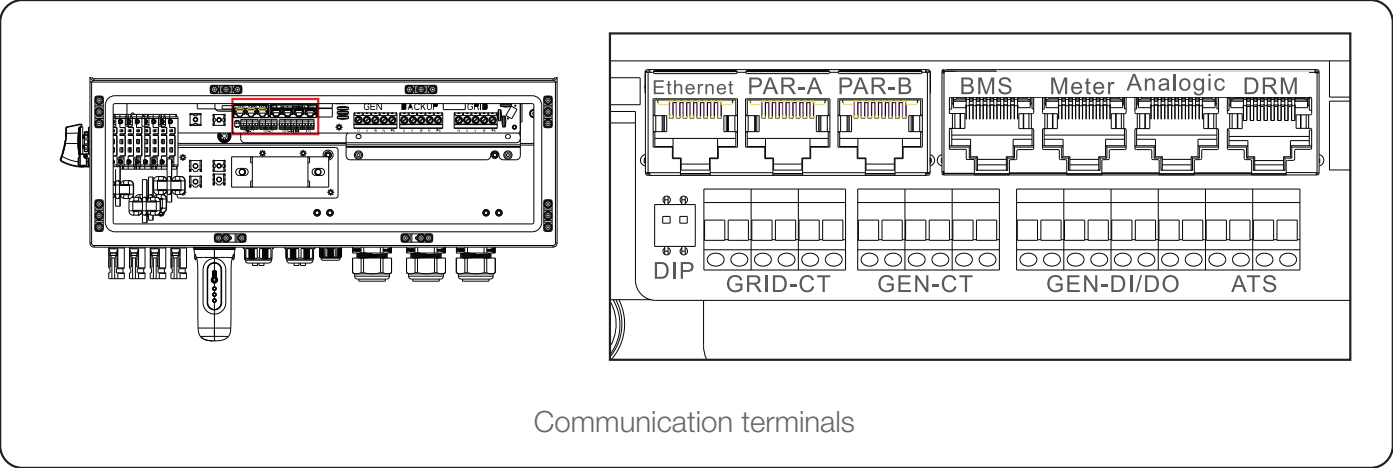
The 4-hole fastening rings inside the cable gland for COM1 and COM2 are with openings on the side.

Please separate the gap with hand and squeeze the cables into the holes from the side openings.



# INSTALLATION

## Communication terminals



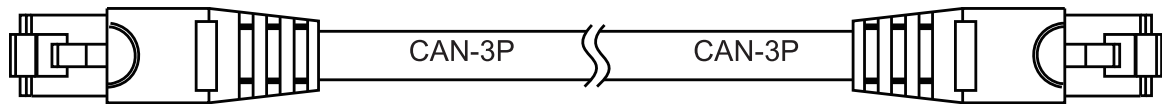
Terminal	Type	Description
Ethernet	RJ45	Used for Ethernet communication.
PAR-A	RJ45	(Optional) Parallel operation communication port.
PAR-B	RJ45	(Optional) Parallel operation communication port.
BMS	RJ45	Used for CAN communication between inverter and Lithium battery BMS.
Meter	RJ45	Used for RS485 communication between inverter and the smart meter.
Analogic	RJ45	Used for output analogic signal.
DRM	RJ45	(Optional) To realize demand response or logic interface function, this function may be required in UK and Australia.
DIP Switch (2-1)	-	When a single inverter is running, DIP switch 1 and 2 shall be both at the bottom position. When multiple inverters are paralleled, DIP switch: Option 1: Both the first and last inverter (INV1 & INV3) have1 of the DIP switch enabled (Either Pin1 or Pin2). Option 2: One of the first and the last inverter (INV1 or INV3) has 2 DIP switches enabled (Both Pin1 & Pin2)

# INSTALLATION

## BMS terminal connection

### With lithium battery

CAN communication is supported between inverter and compatible battery models. Please lead the CAN cable through the COM1 or COM2 port of the inverter and connect to the BMS terminal with RJ45 connector.



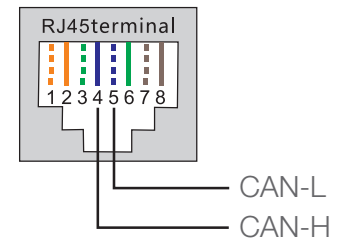
#### Note:

Before connecting CAN cable with the battery, please check whether the communication pin sequence of the inverter and the battery match; If it does not match, you need to cut off the RJ45 connector at one end of the CAN cable and adjust the pin sequence according to the pin definitions of both inverter and battery.

Pin definition of the inverter BMS port is following EIA/TIA 568 B.

CAN-H on Pin 4: blue

CAN-L on Pin 5: blue/white



# INSTALLATION

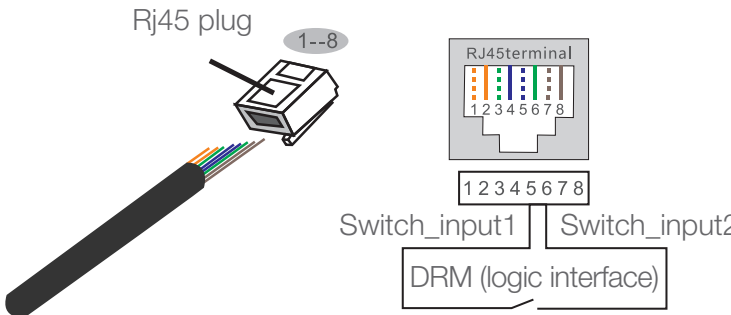
## DRM port connection (optional)

### For remote shutdown function

LEDNACE inverters support remote shutdown function to remotely control the inverter to power on and off through logic signals.

The DRM port is provided with an RJ45 terminal and its Pin5 and Pin6 can be used for remote shutdown function.

Signal	Function
Short Pin5 and Pin6	Inverter generates
Open Pin5 and Pin6	Inverter shutdown in 5 s



Correspondence between the cables and the stitches of plug, Pin5 and Pin6 of RJ45 terminal is used for the logic interface, other Pins are reserved.

Pin 1: Reserved; Pin 2: Reserved  
Pin 3: Reserved; Pin 4: Reserved  
Pin 5: Switch\_input1; Pin 6: Switch\_input2  
Pin 7: Reserved; Pin 8: Reserved

### For DRED control function (for AU and NZ only)

DRED means demand response enable device. The AS/NZS 4777. 2: 2020 required inverter need to support demand response mode (DRM).

This function is for inverter that comply with AS/NZS 4777. 2: 2020 standard.

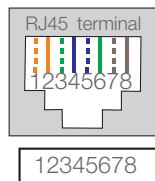
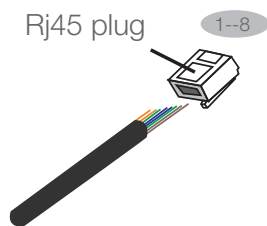
A RJ45 terminal is used for DRM connection.

Pin	Assignment for inverters capable of both charging and discharging	Pin	Assignment for inverters capable of both charging and discharging
1	DRM 1/5	5	RefGen
2	DRM 2/6	6	Com/DRM0
3	DRM 3/7	7	V+
4	DRM 4/8	8	V-



**Note:**  
LEDVANCE hybrid inverter is designed to provide 12 V power for DRED.

## INSTALLATION



Correspondence between the cables and the stitches of plug  
Pin 1: white and orange; Pin 2: orange  
Pin 3: white and green; Pin 4: blue  
Pin 5: white and blue; Pin 6: green  
Pin 7: white and brown; Pin 8: brown

Strip the insulation layer and connect to RJ45 plug

### RS485 port connection

If a 3rd party external device or controller needs to communicate with the inverter, the RS485 port can be used. Modbus RTU protocol is supported by LEDVANCE inverters.

To acquire latest protocol document, please contact LEDVANCE local service team or LEDVANCE sales.

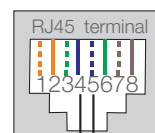


#### Note:

Pin definition of the RS485 Port is following EIA/TIA 568B.

RS485A on Pin 5: blue/white

RS485B on Pin 4: blue



RS485A  
RS485B

### Pin Communication Terminal Block

Terminal Block Connection Steps:

Step 1. Lead the wires through the hole in COM1 or COM2 port (Hole Diameter: 2 mm) .

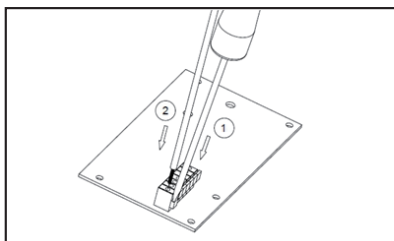
Step 2. Strip the wires for 9 mm length.

Step 3. Use slot type screwdriver to press the block on the top

Step 4. Insert the exposed copper part of the cable into the terminal.

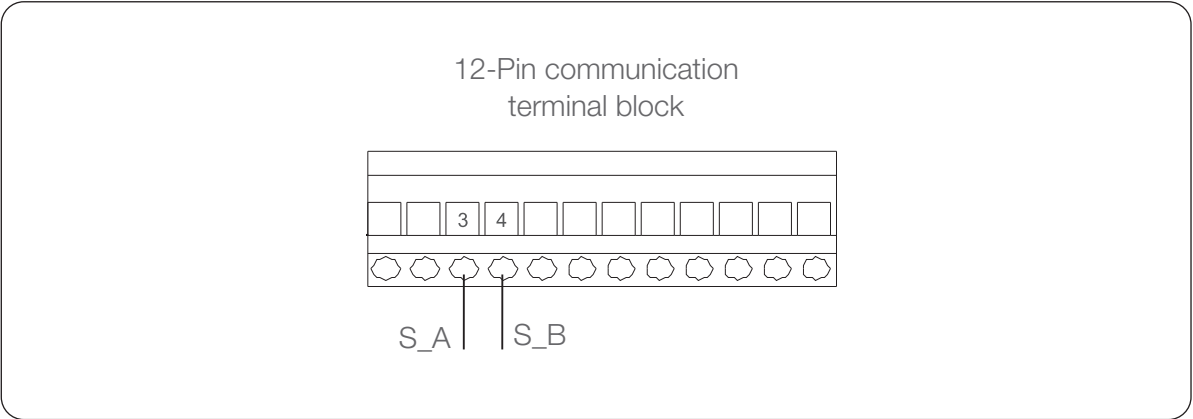
Step 5. Remove the screwdriver and the terminal will clamp down on the exposed copper part.

Step 6. Give the cable a gentle tug to ensure that it is firmly secured.



# INSTALLATION

## Heat pump control signal connection

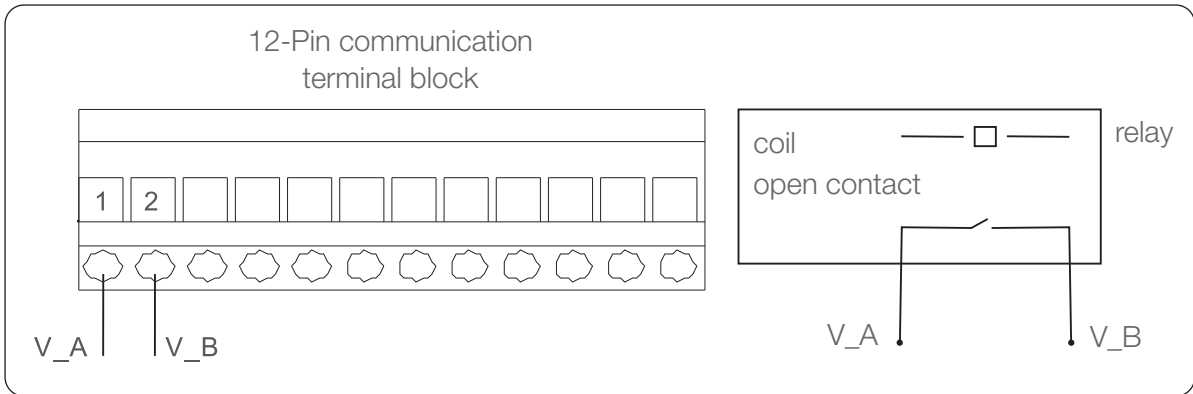


## G-V terminal connection

The G-V terminal is a voltage-free dry contact signal for connecting with generator's NO relay to start up the generator when necessary.

When generator operation is not needed, Pin3 and Pin4 is in open circuit.

When generator operation is needed, Pin3 and Pin4 is in short circuit.

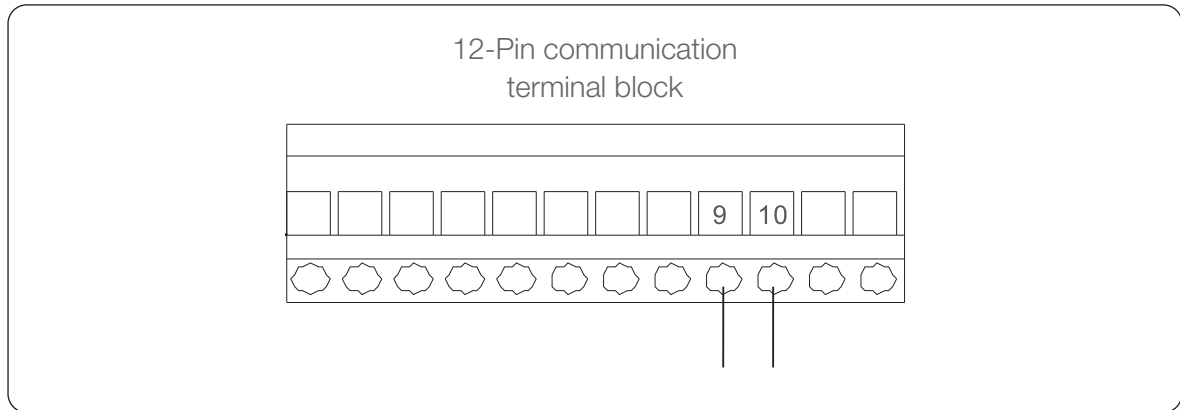


# INSTALLATION

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## ATS 240 V terminal connection

The ATS 240 V terminal will output 230 V AC voltage when inverter is connected to the grid, when the grid is not available, it will output 0 V, then the ATS will transfer to generator.



# INSTALLATION

## Inverter remote monitoring connection

The inverter can be remotely monitored via WiFi, LAN or 4 G.

The USB type COM port at the bottom of the inverter can connect to different kinds of LEDVANCE dataloggers, enabling remote monitoring through the LEDVANCE cloud platform.

To install LEDVANCE data loggers, please refer to the corresponding user manuals of LEDVANCE data loggers.

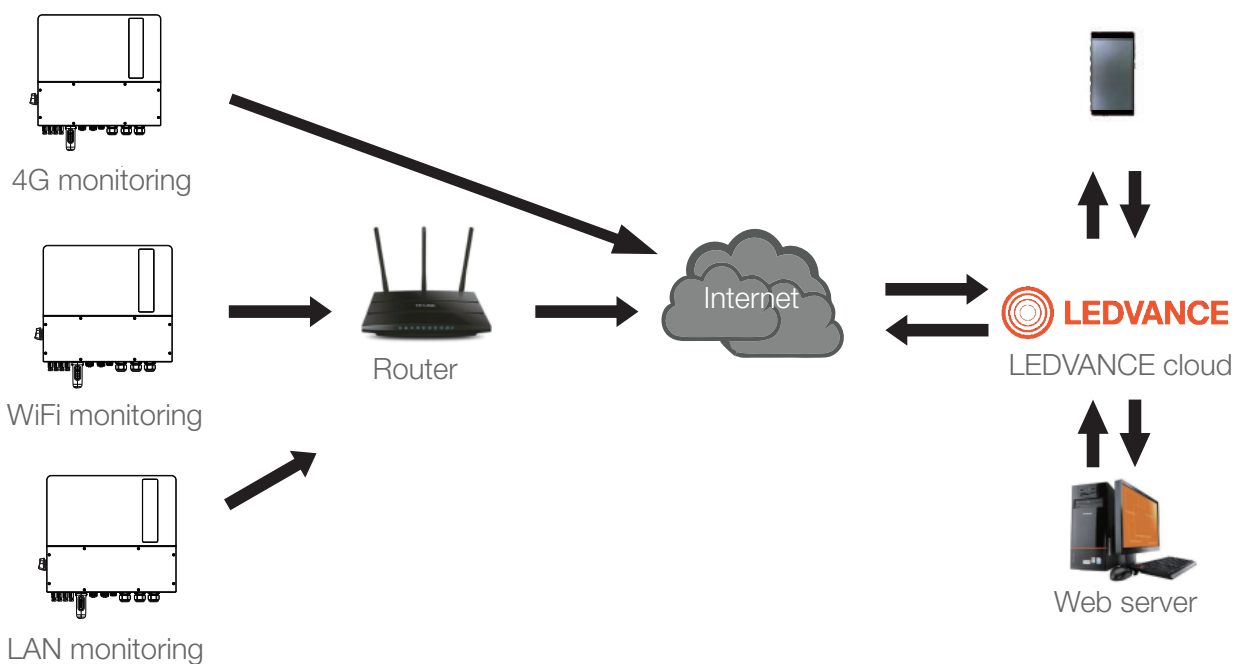
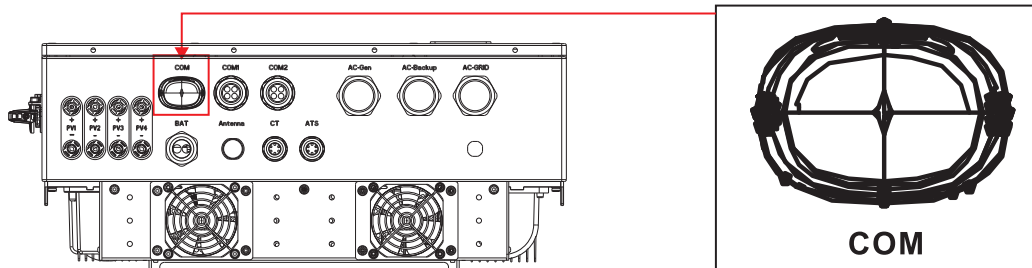
The LEDVANCE data loggers are optional and can be purchased separately.

Dust cover is provided in the inverter package in case the port is not used.



### Warning:

The USB type COM port only supports LEDVANCE dataloggers. It is forbidden to be used for other purposes.



Wireless communication function

# COMMISSIONING & SHUTDOWN

## Preparation of commissioning

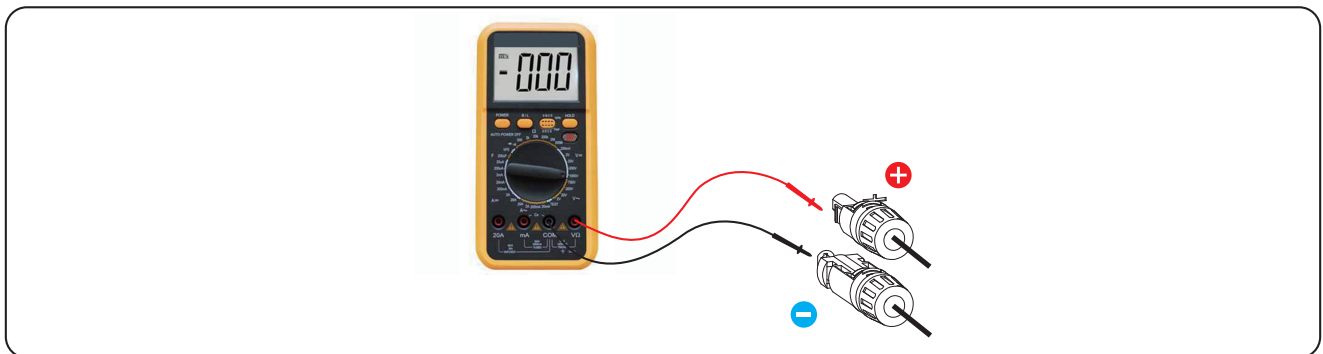
- Ensure that all the devices are accessible for operation, maintenance and service.
- Check and confirm that the inverter is firmly installed.
- Space for ventilation is sufficient for one inverter or multiple inverters.
- Nothing is left on the top of the inverter or battery module.
- Inverter and accessories are correctly connected.
- Cables are routed in safe place or protected against mechanical damage.
- Warning signs and labels are suitably affixed and durable.
- Bluetooth Antenna has been connected to the Antenna port of the inverter.
- An Android or IOS mobile phone with Bluetooth function is available.
- LEDVANCE APP is installed on the mobile phone.

There are two ways to download and install the latest APP:

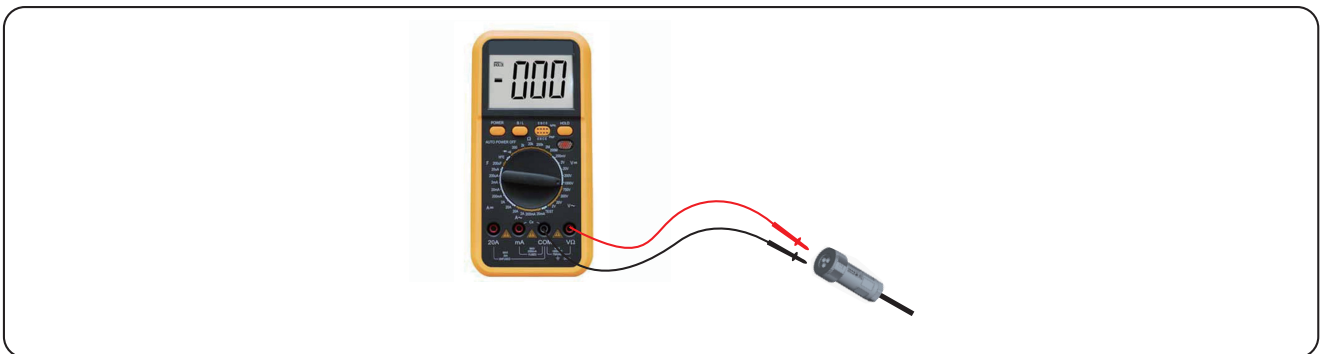
- You can visit [www.Ledvance.com](http://www.Ledvance.com) to download the latest version APP
- You can search "LEDVANCE RE" in Google Play or App Store.

## Commissioning procedure

Step 1: Measure DC voltage of PV strings and battery and ensure the polarity is correct.



Step 2: Measure AC voltage and frequency and ensure they are within local standard.



Step 3: Switch on the external AC breaker to power on the inverter control board. (Bluetooth signal available)

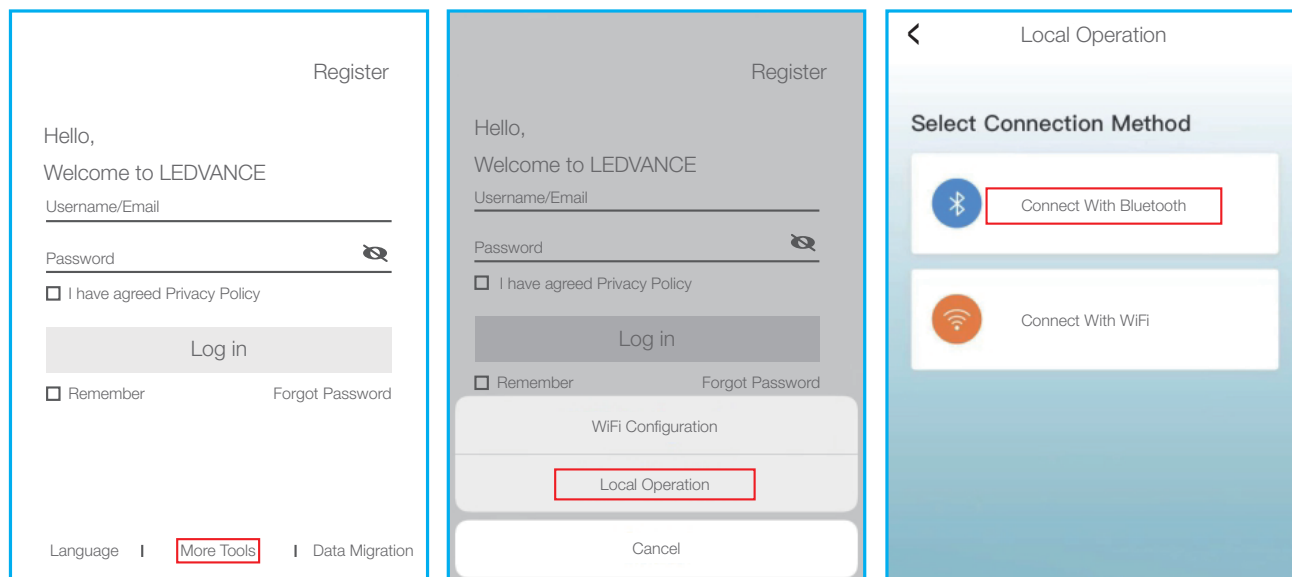
# COMMISSIONING & SHUTDOWN

## Quick settings

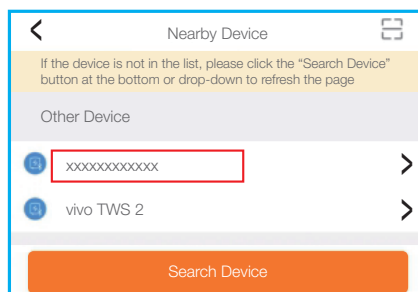
Step 1: Connect with Bluetooth.

Turn on Bluetooth switch on your mobile phone and then open the LEDVANCE APP.

Click “More Tools” - > “Local Operation” - > “Connect with Bluetooth”

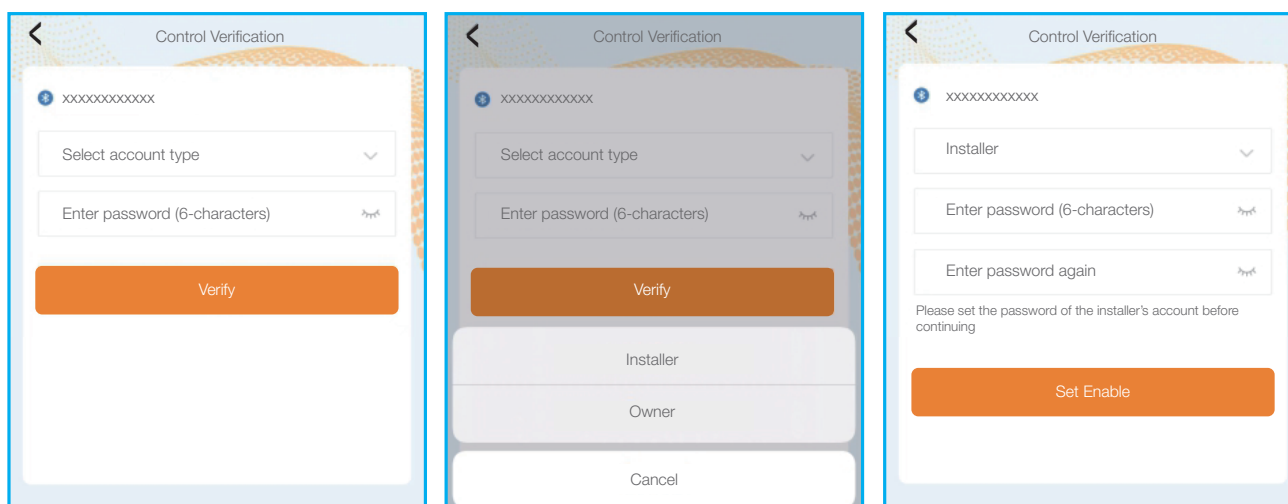


Step 2: Select the Bluetooth signal from the inverter. (Bluetooth Name: Inverter SN)



Step 3: Login account.

If you are the installer, please select the account type as Installer. If you are the plant owner, please select the account type as Owner. Then set your own initial password for control verification. (The first log-in must be finished by an installer in order to do the initial set up)



# COMMISSIONING & SHUTDOWN

Step 4: After the log in for the first time, initial settings are required.

Step 4.1: Set the inverter date and time.  
You can set to follow the time on your mobile phone.

Step 4.2: Set the battery model.  
It must be based on the battery model that is actually connected to the inverter. If there is no battery connected for the moment, please select “No Battery” to avoid alarms.  
The default setting for battery over discharge SOC is 20 %, force charge SOC is 10 %.

Step 4.3: Set the meter setting.  
It must be based on the meter type that is actually connected to the inverter.  
if the grid does not need to be connected to an N-Line, select disconnected If there is no meter connected for the moment, please select “No Meter” to avoid alarms. It is suggested to install the meter at the system grid connection point and select “Meter inGrid” .

Quick Setting

Battery

Grid Code

Inverter Time

Meter/CT Setting

Storage Mode

Inverter Current Time

2024-09-19 08:55:19

Follow Phone Time

☒

Inverter Time Setting

2024-09-19 08:55:19 >

Skip

Next Step

Quick Setting

Battery

Grid Code

Inverter Time

Meter/CT Setting

Storage Mode

Battery Type

Lithium Battery

Lead-acid Battery

48V Lithium Battery (Without COMM)

51.2V Lithium Battery (Without COMM)

No Battery

Battery Model

WECO HV

AMPACE\_HV

PYLON\_HV

Ucanpower

Alpha HV

Dyness HV

BYD\_WTS\_HVL

Back

Next Step

Quick Setting

Battery

Grid Code

Inverter Time

Meter/CT Setting

Storage Mode

CT Setting

CT >

Meter Installation Location

Grid side >

CT Direction

Forward >

CT Ratio

2000 >

Back

Next Step

34

## COMMISSIONING & SHUTDOWN

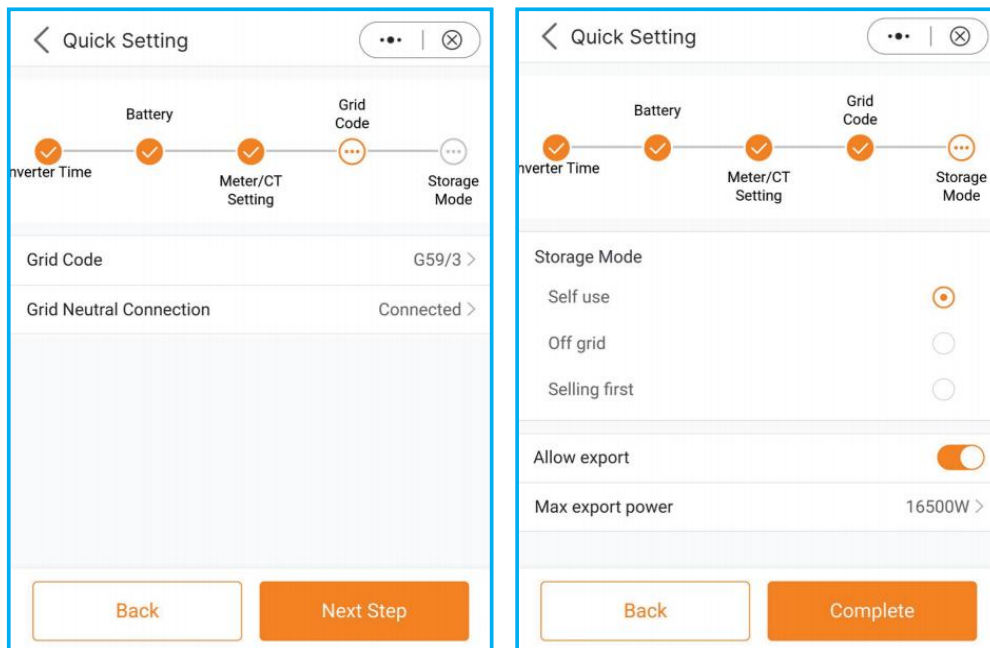
Step 4.4: Set the grid code setting.

Please select the grid code based on the local grid network requirements.

Step 4.5: Set the work mode setting. Recommended setting is Self-Use Mode. This mode will maximize the use of PV power generation for household electricity, or store it in batteries and use it for household electricity.

Allow export: Allow power output to the grid in Self-use mode. If you do not want to send power to the grid, do not turn it on.

Max export power: Limit the maximum power sold to the grid.



Step 5: Setup complete.

Now the initial settings on the inverter have been set and you can switch on the inverter's DC switch and switch on battery breaker to start up the system. You can also explore in the APP to check the operating data, alarm message or other advanced settings.

### Shutdown procedure

Step 1. Turn off the AC breaker at the grid connection point.

Step 2. Turn off the DC switch of the inverter.

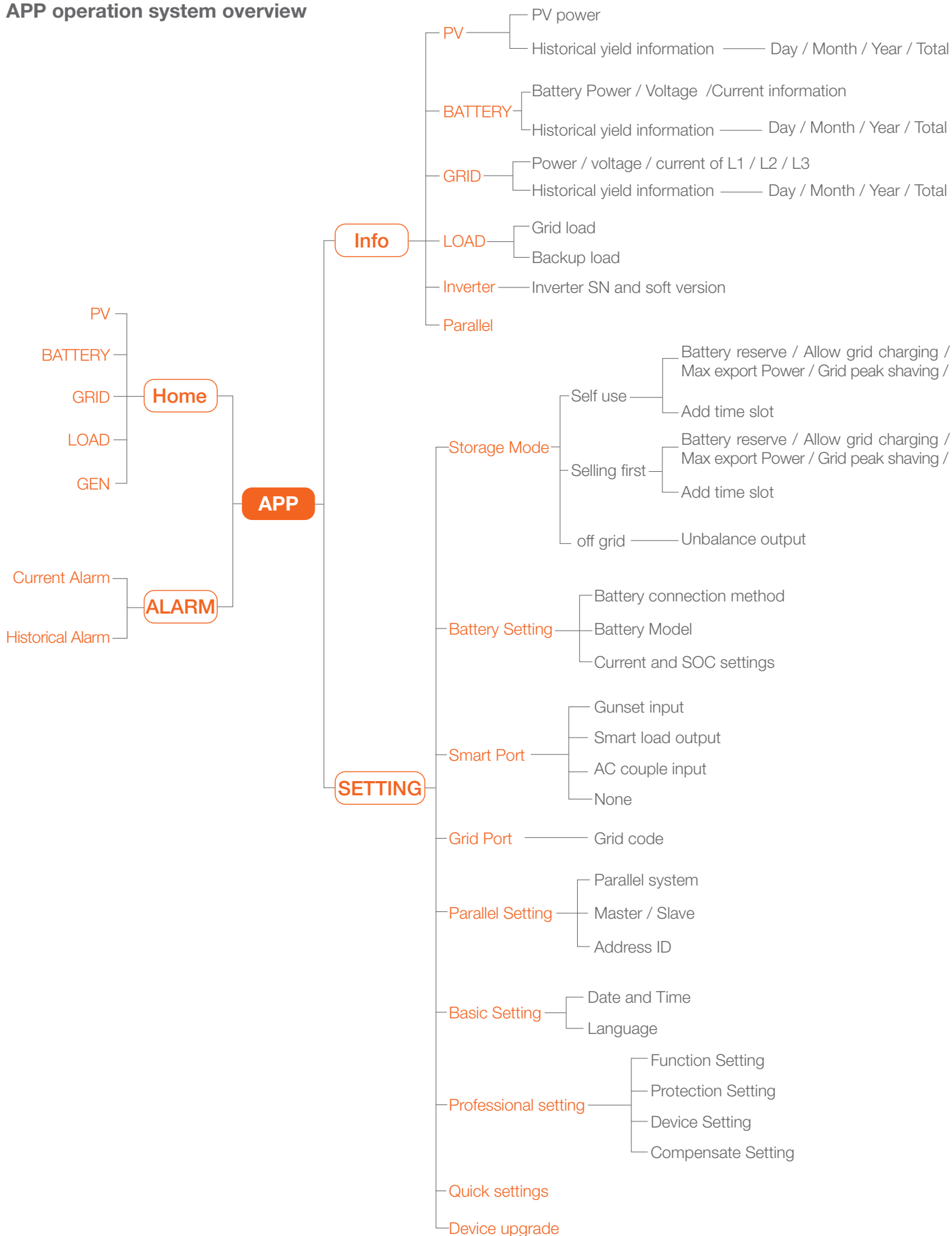
Step 3. Turn off the battery breaker.

Step 4. Wait until the device is powered off, and the system shutdown is complete.

# COMMISSIONING & SHUTDOWN

## Work mode and settings

### APP operation system overview



# COMMISSIONING & SHUTDOWN

---

## Self-use mode

Load priority: load > battery > grid

Power supply priority: PV > battery > grid > DG

This mode applies to the area that has low feed-in tariff and high energy price.

The PV power will prioritize supplying energy to the load and charging the battery, with any surplus power being fed into the grid. During periods without PV power at night or when the PV power is insufficient, the battery will discharge to support the load.

- Supports TOU settings in this mode.
- Supports Battery Reserve function in this mode.

## How to set self-use mode?

APP: setting--storage mode-self use

A. Self-Use Mode is activated without any specific times set for the battery to be charged / discharged, and the battery reserve is not switched on.

Note: LEDVANCE recommends activating the “Allow Grid Charge” option. Once the battery reaches the Force charge SOC, it will use the grid to charge the battery, preventing it from being deep discharged.

B. The Self-Use Mode provides you with the option to set a Battery reserve value. Please toggle the switch to activate the battery reserve mode.

C. The Self-Use Mode provides you with the option to set whether allow power output to the grid and the max value.

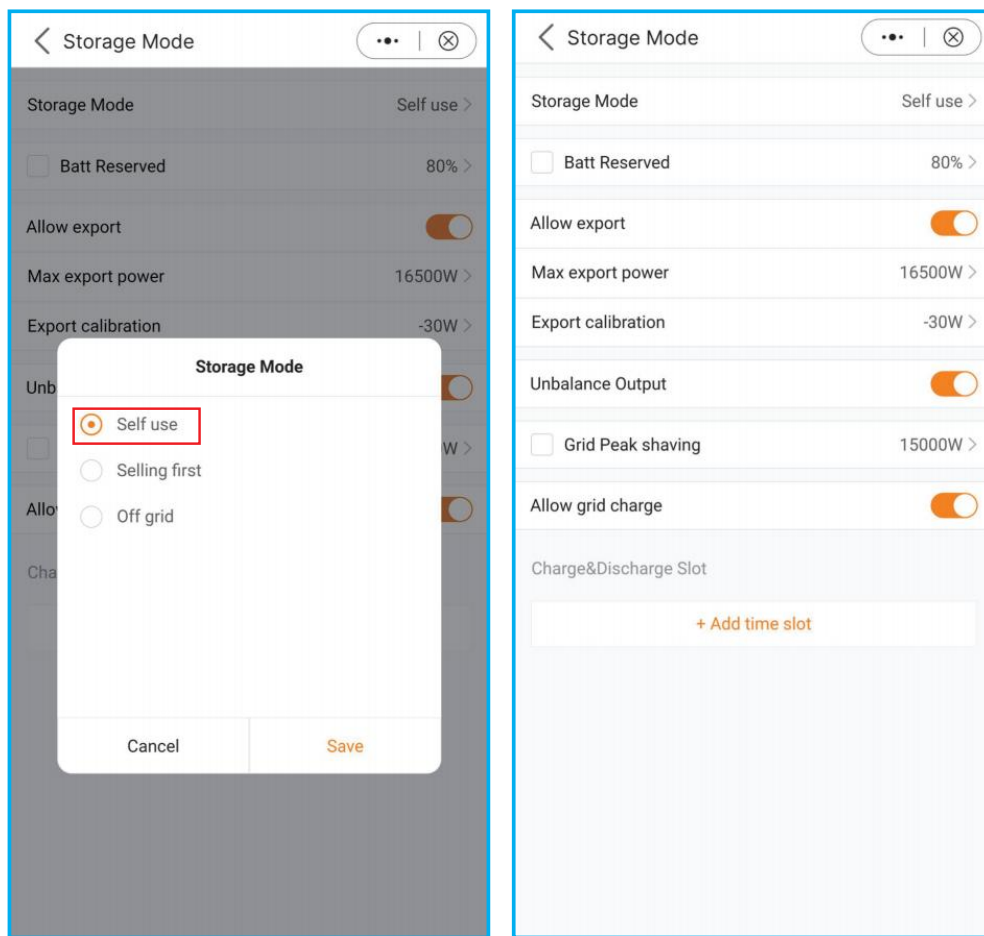
D. If there is an error with your meter or CTs, open “Export power calibration” to calibration; In addition, you can set a small negative value (like: -50 W) to ensure that no power is sent to the grid to achieve Zero export Power.

E. When your load is unbalanced in the three-phase distribution, turn on unbalanced output Supports 150 % Unbalanced Loads on both the Grid and Backup Port, single-phase load 1/2 rated power.

F. You can set the value of Grid peak shaving, limit the power that inverters can obtain from the grid to prevent exceeding regulatory requirements or the power line capacity due to excessive power.

G. With the Add time slot, you can customize 6 stages of charging and 6 stages of discharging in one day.

## COMMISSIONING & SHUTDOWN



Batt reserved: Lithium battery: default 80 %, adjustable range (the recommended value is more than 80 %) , to ensure that the battery has enough energy to supply the load after the grid is off ;

Lead acid battery: Default 100%, cannot be set.

Allow export: Allow power output to the grid in Self-use mode. If you do not want to send power to the grid, do not turn it on.

Max export power: Limit the maximum power sold to the grid.

Export power calibration: As some CTs / meters may have errors in practical applications, this setting value can be used for compensation. The range is “-500 W ~ +500 W”

Unbalanced output: Allow three-phase output imbalance, single-phase maximum load 50 % of rated power. For example: 15 kW inverter, single-phase maximum load 7.5 kW.

Grid peak shaving: Limit the power that inverters can obtain from the grid to prevent exceeding regulatory requirements or the power line capacity due to excessive power. When the grid supplies power to the load while charging the battery, it will limit the power used to charge the battery, so that the total power does not exceed the set value. If the grid only supplies power to the load and does not charging the battery, it is not limited by the setting value.

Allow grid charging: Allow the battery to be charged by the grid

Charge/Discharge Slot: When the time is between Start and Stop, the system will charge / discharge the battery according to the set Current until the set “SOC/voltage” is reached.

# COMMISSIONING & SHUTDOWN

## Selling first mode

Load priority: load > grid > battery

Power supply priority: PV > battery > grid > DG

This mode applies to the area that has high feed-in tariff and export control.

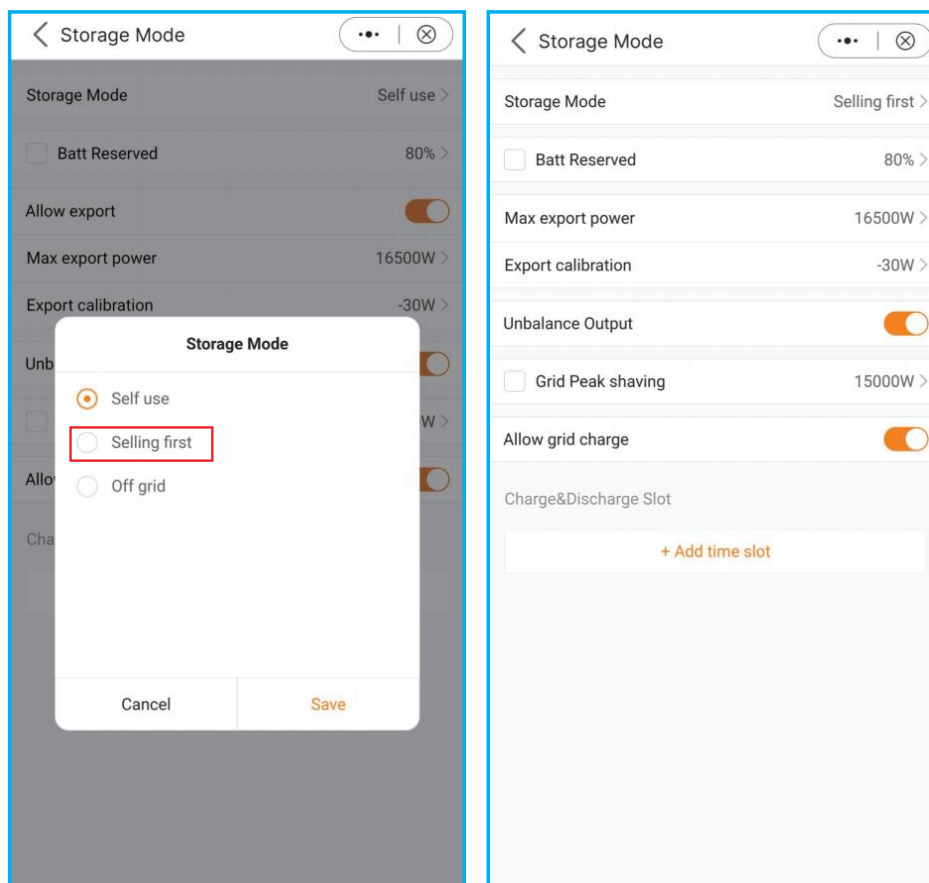
The PV power will prioritize supplying energy to the load. Then any surplus is directed into the grid.

If there is a feed-in limitation, the excess power will charge the battery.

- Supports TOU setting in this mode.
- Supports Battery Reserve function in this mode.

How to set selling first mode?

APP: setting-storage mode-selling first.



# COMMISSIONING & SHUTDOWN

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## Off-grid mode

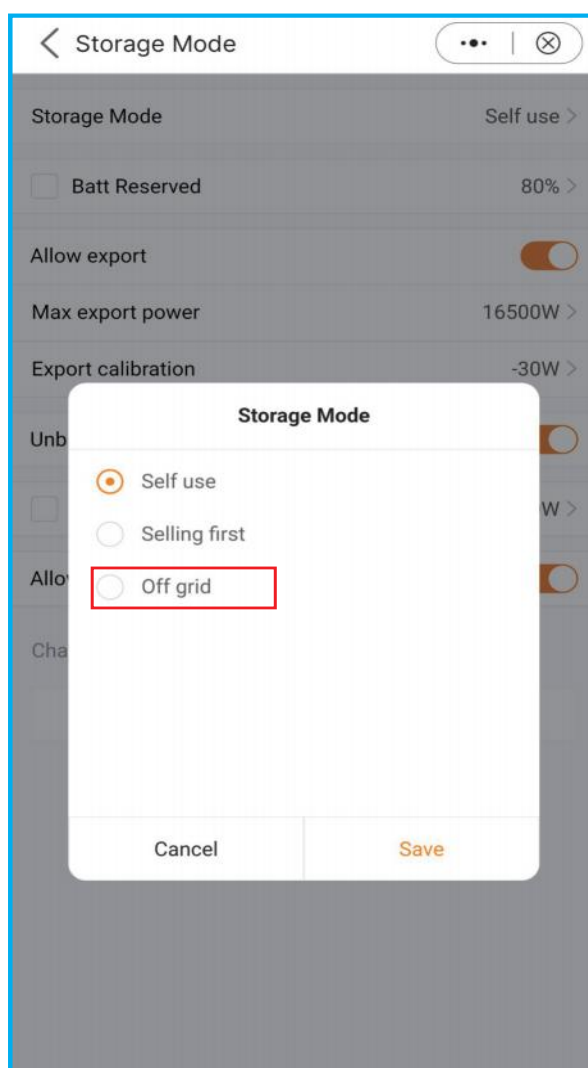
Load priority: load > battery

Power supply priority: PV > battery > DG

- This mode applies to the area not covered by the grid or when the system is not connected to the grid.
- When a power outage is detected in a grid-tied system, the system will automatically enter in the off-grid, supplying only the backup load.
- The user can also manually set this mode, supplying only the backup load.

How to set selling first mode?

APP: setting-storage mode-off-grid



# COMMISSIONING & SHUTDOWN

## TOU function settings

This function applies to the area with peak-valley price. Set the system to charge the battery in valley price and discharge in peak price to improve benefits.

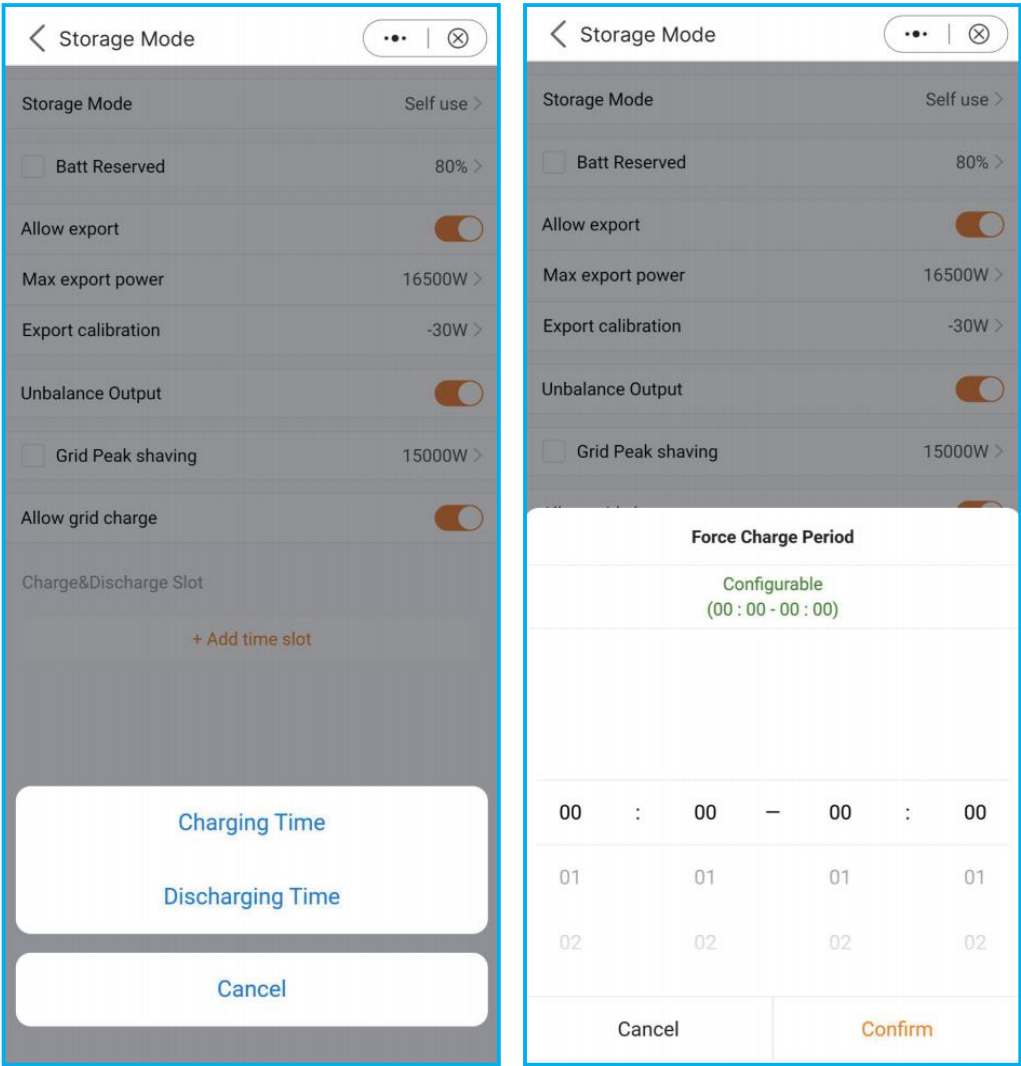
Supports 6 customizable charge / discharge time settings, while the battery will charge / discharge at a set current.

Supports TOU function settings in self-use mode, feed in priority mode.

There are 6 customizable charging settings and 6 customizable discharging settings.

How to set TOU Function?

Press “+ Add Time Slot” to add a charging / discharging time period.



# COMMISSIONING & SHUTDOWN

## Battery settings

The battery section of the app offers numerous options to customize the interaction between the inverter and the battery. Here, we provide explanations for the function sand features available in this section, allowing users to tailor the inverter's behavior to their specific preferences and requirements.

Battery Type: Please select the correct Type of the battery. Lead-acid battery and lithium battery.

Battery Mode: Please select the correct model of the battery. If you don't have a battery, choose “No battery” to ensure accurate configuration.

Max Charging / Discharching Current: Choose the maximum charge / discharge current that you wish to. This selection allows you to customize the charging and discharging parameters based on your preferences and requirements.

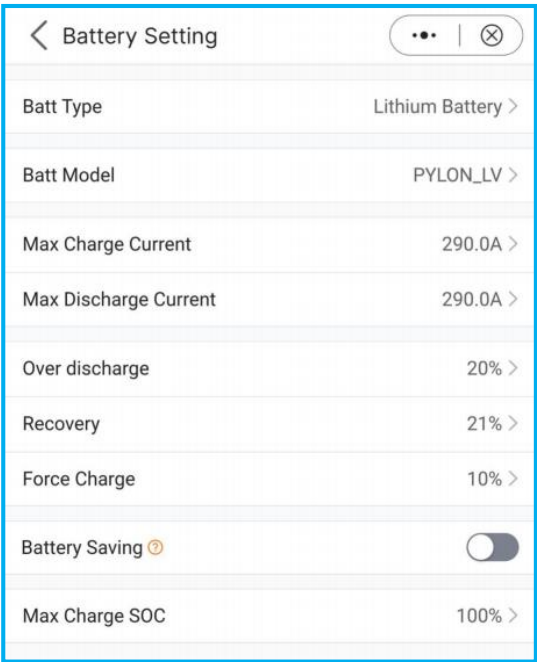
Overdischarge SOC: The Overdischarge SOC (State of Charge) is the minimum battery charge level to which the inverter will discharge. It acts as a safeguard to prevent the battery from discharging beyond this specified threshold, ensuring its longevity and health.

Recovery: The battery can discharge when the SOC / Voltage reaches the set value.

Forcecharge: The Forcecharge SOC for the battery is the minimum state of charge (SOC) at which the inverter initiates charging the battery from the grid. It specifies the threshold below which the inverter actively engages in recharging the battery to maintain optimal performance.

Battery saving: Reduce battery loss. The necessary power for the operation of the inverter preferentially obtains from the grid, not from the battery.

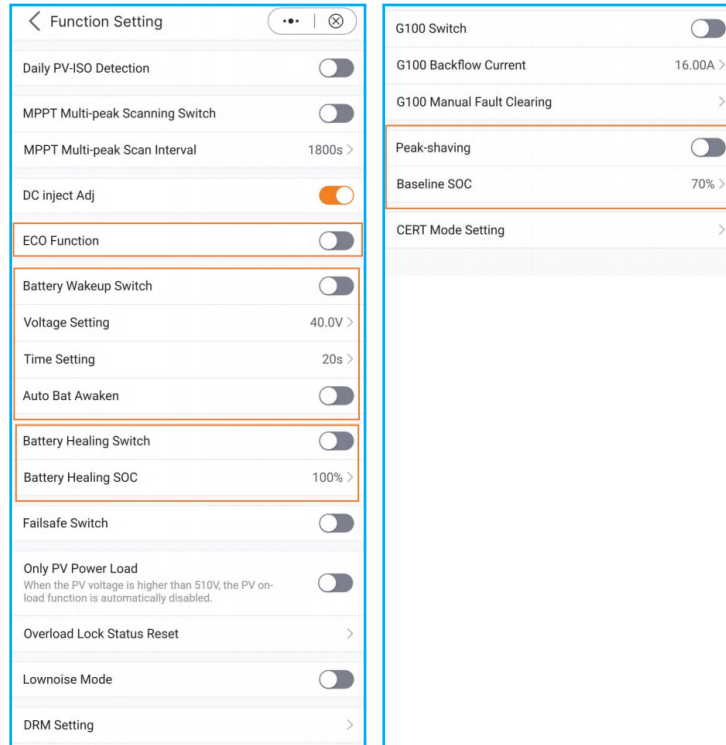
Max charge SOC: The maximum SOC / Voltage that the battery can be charged to. Default 100 %. Some batteries may alarm over voltage when fully charged, and limiting protection will not be triggered if not fully charged.



# COMMISSIONING & SHUTDOWN

## Battery functions setting

If you need more Function Settings for the battery, you can go to Setting-Professional Setting-Function Setting.



**ECO function:** To protect the battery, If PV power is lower than 100 W and SOC below overdischarge SOC, The inverter will take power from the grid instead of battery, to maintain stand by state, indicator and communication.

**Battery Wakeup Switch:** Battery wake-up can be supported in case of only PV or only Grid. This function supports manual and automatic operation, the battery can be awakened from the dormant state and charged above the overdischarge SOC.

Wake up voltage & time can be set:

Voltage: default 120 V, range: 120 - 600 V;

Time: default 180 s, range: 20 s - 300 s,

The wake up current depends on the battery, up to 6 A

**Battery Healing Switch:** When the lithium battery maintains low power for a long time the battery SOC measurement is not accurate, It is necessary to charge the battery to 100 % from low power level to ensure the healthy and stable operation of the battery.

**Working logic:** PV + grid charge the battery from Forcecharge SOC to overdischarge SOC, then grid stops charging, PV gives priority to charging the battery to Battery Healing SOC.

And the battery does not discharge before reaching the set Battery Healing SOC.

**Battery Peak shaving:** In this function, the force charge power will be dynamically adjusted and not exceed the set value minus the load power when force charging.

# COMMISSIONING & SHUTDOWN

## Smart port settings

### Generator setting

APP: setting Smart Port

In single system, Diesel Generator can be connected via GEN port or ATS on Grid side. If though GEN port, it will only supply power to the Backup load. It is recommended that the power be greater than the backup load power.

If it is necessary to supply power to the grid side load, it is recommended that the generator be connected through ATS on grid side;

In parallel-system scenarios, connecting DG via ATS is recommended, Gen port is also supported;

When the generator is connected to the system, it is necessary to correctly select the location of the generator to avoid system failure or generator damage.

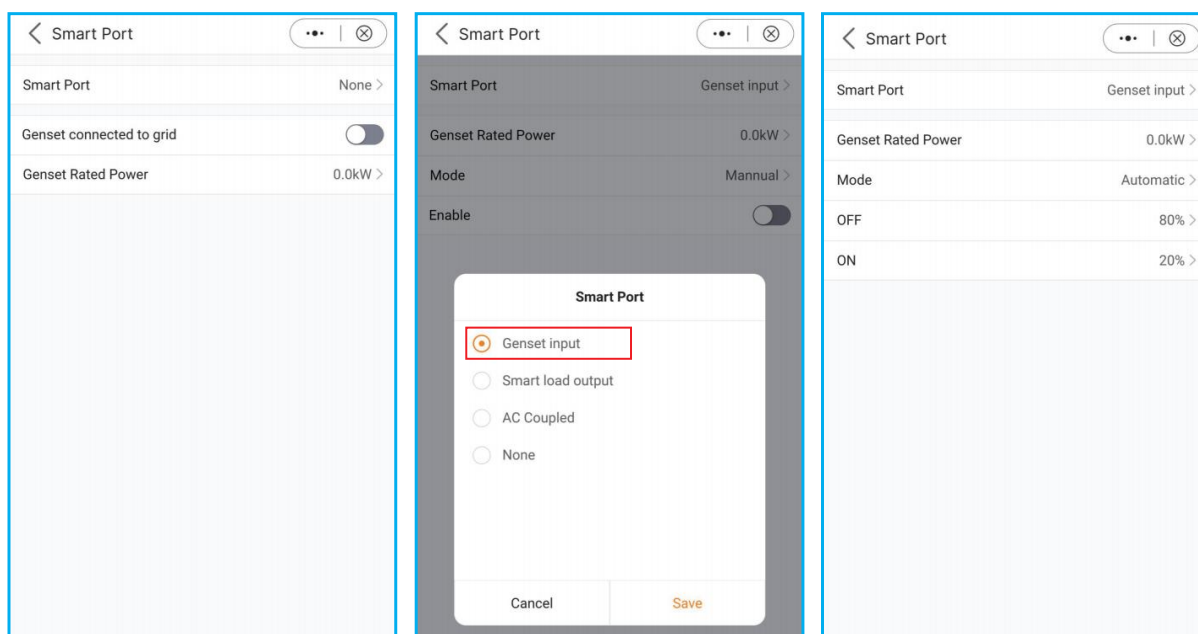
A. Select Genseting put

B. Set the Gensetrated power.

C. When you want to manually control the start and stop of the generator, enable needs to be selected.

D. When you want the generator to automatically start and stop according to the battery SOC, please select the Automatic.

The generator will start when the battery SOC drops to the ON SOC, and stop when the SOC reaches the OFF value.



# COMMISSIONING & SHUTDOWN

## AC coupled setting

APP: setting Smart Port with an existing PV plant connected to the system, it is recommended that:

Grid-tied inverter power < rated AC power of LEDVANCE inverter.

In an on-grid scenario, when the third-party grid-connected inverter is connected, the system cannot control the output power of the third-party grid-tied inverter, so feed-in limitation cannot be achieved;

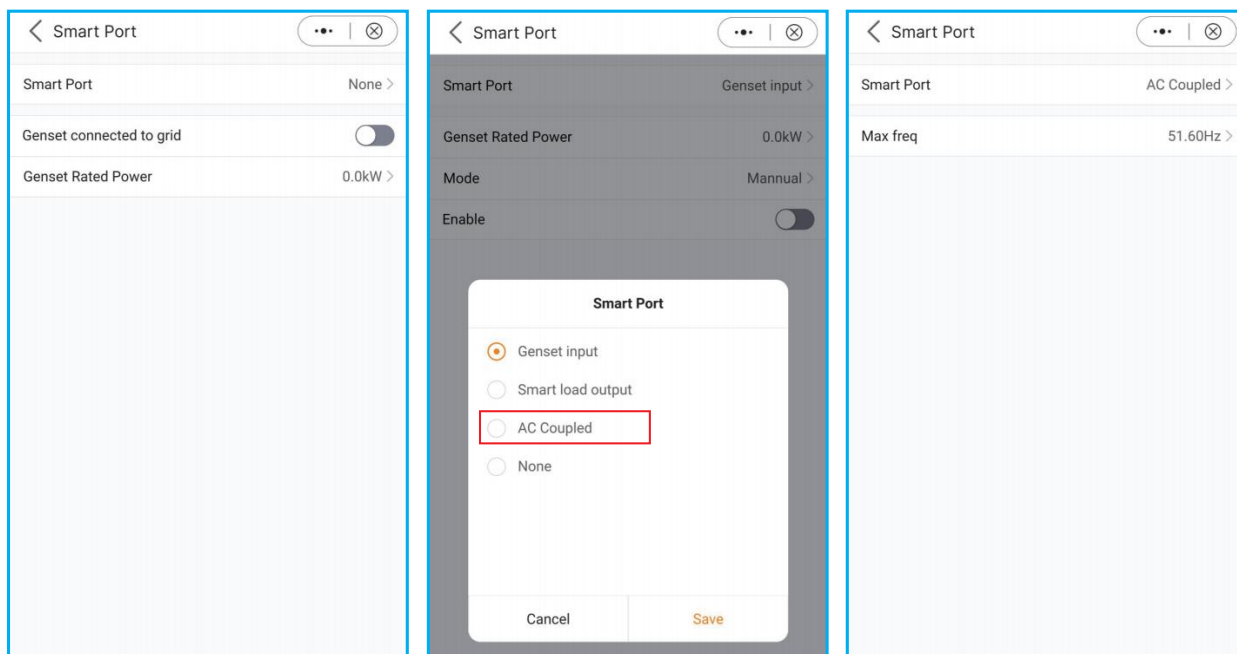
When connected in off-grid scenario, the third-party grid-tied inverter needs to set the correct grid code, and has the function of over-frequency load shedding & under-frequency load rising, so that the system can adjust the frequency to control the output power of the grid-tied inverter.

When the system is connected to the generator, it cannot be connected to the grid-tied inverter, as there's a risk of damaging the generator.

- A. Select the AC couple input.
- B. Set the Max frequency according to the specification of the PV inverter.

The hybrid uses Freq-Watt to control the output of the PV inverter. Please consult with the PV inverter's manufacturer to confirm the correct setting procedures of its Freq-Watt response first.

When  $SOC \leq 70\%$ , start inverter, when  $SOC \geq 85\%$ , hybrid raises the frequency to the set value. Stop inverter.



# COMMISSIONING & SHUTDOWN

## Smartload setting

APP: setting-Smart Port

The Gen port has extended power, which can be used as Smart load output. When the battery SOC/Volt reach the ON set value, the smart port will supply power to the load.

When the battery SOC/Volt drops to OFF SOC/Volt, it will cut off the power of the load.

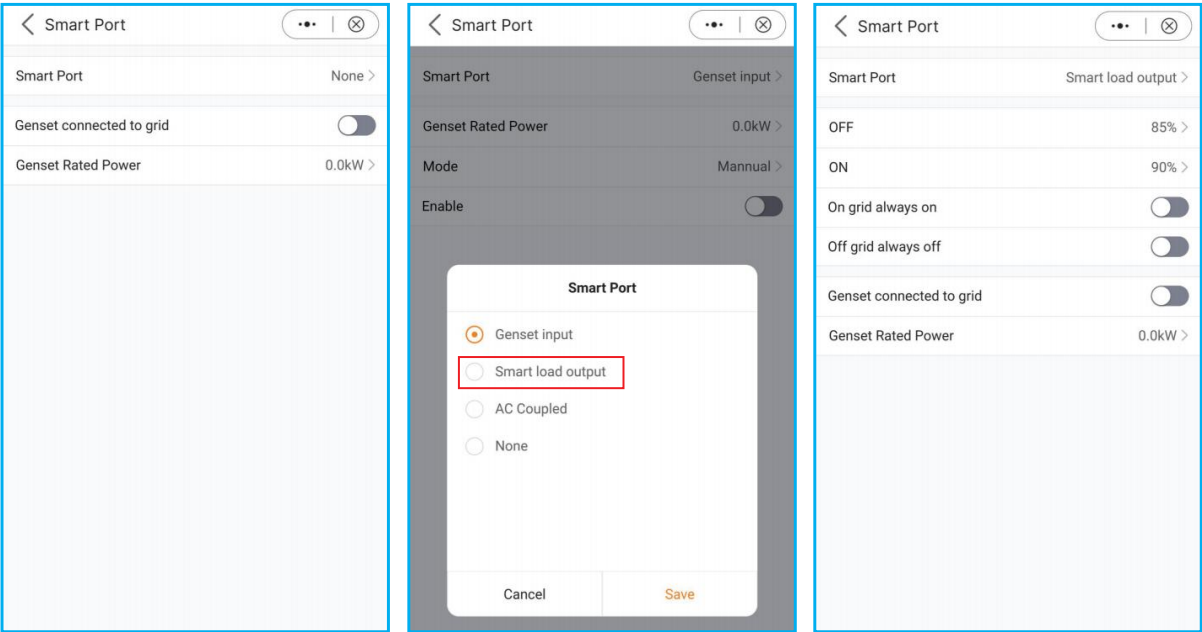
- A. Select Smart load output.
- B. Select On grid always on or off grid always off.

On grid always on: smart port will always supply power to smart load when the grid is available.

Off grid always off: smart port will cut off power supply to smart load when the grid is off.

- C. Set the OFF value and ON value to control the on/off of the load based on the battery level.

When the battery SOC/Volt drops to the OFF SOC/Volt, the system will cut off the power of smart load to ensure sufficient power for Backup load. When the battery SOC/Volt reaches the ON SOC/Volt, the smart port will supply power to smart load.



# CONTENTSCOMMISSIONING & SHUTDOWN

## Grid port settings

APP: setting-Grid Port

Select grid code that meet the local regulations; If the grid is three-phase and three-line choose Disconnected the N-line.

< Grid Port

Grid Code

G59/3 >

Grid Neutral Connection

Connected >

HV1

262.2V

-

1.00s

HV1\_T

HV2

273.7V

-

0.50s

HV2\_T

HV3

0.0V

-

0.00s

HV3\_T

LV1

200.1V

-

2.50s

LV1\_T

LV2

184.0V

-

0.50s

LV2\_T

LV3

57.5V

-

0.40s

LV3\_T

HF1

51.50Hz

-

90.00s

HF1\_T

HF2

52.00Hz

-

0.50s

HF2\_T

LF1

47.50Hz

-

20.00s

LF1\_T

LF2

47.00Hz

-

0.50s

LF2\_T

Startup

VL

190.0V

-

254.0V

VH

FL

48.00Hz

-

51.00Hz

FH

T

30s

Cancel

Grid Code

SN:103316023C120058

Save

Current Value: G99

User defined50

User-define 60

User-define

GN-L

GNL-A

ESB-Mini

CQC-DZ

Iran

MEX-CFE

Brazil-H

BRAZIL

Chile

Barbados

Mala-LV

GN-DZL

MEA

< Grid Port

Grid Code

G59/3 >

Grid Neutral Connection

Connected >

HV1

262.2V

-

1.00s

HV1\_T

HV2

273.7V

-

0.50s

HV2\_T

HV3

0.0V

-

0.00s

HV3\_T

LV1

200.1V

-

2.50s

LV1\_T

LV2

184.0V

-

0.50s

LV2\_T

LV3

57.5V

-

0.40s

LV3\_T

HF1

51.50Hz

-

90.00s

HF1\_T

HF2

52.00Hz

-

0.50s

HF2\_T

LF1

47.50Hz

-

20.00s

LF1\_T

LF2

47.00Hz

-

0.50s

LF2\_T

Startup

VL

190.0V

-

254.0V

VH

FL

48.00Hz

-

51.00Hz

FH

T

30s

Grid Neutral Connection

☒ Connected

☐ Disconnected

Cancel

Save

# COMMISSIONING & SHUTDOWN

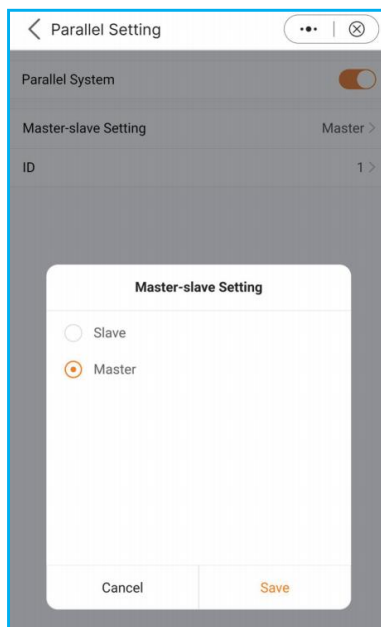
## Parallel settings

APP: setting-Parallel setting

The first inverter must be set as the Master.

The first inverter address is set to 1, the second to 2, and so on

(Note: that the address cannot be set to 0 and the physical address of the master must be 1)



## Only PV powerload function

### 1.Function definition

For PV generation is not stable, the default setting of LEDVANCE energy storage machine don't support only PV power the load.

But for meeting the some customers' special requirements, we develop the Only PV Power Load function, when the PV power > the load power, you can use this function.

Because the PV power is not stable and the load is also not always stable, it is possible to happen that PV power < load power, when it occurred, the load will shut down and after 3 minutes, the inverter tries to restart the load for the first time, after 5 minutes, the second time, and after 10 minutes, the third time. If the third attempt to restart the load is still not successful, the inverter will not try to restart, and it needs to be manually reset and restarted.



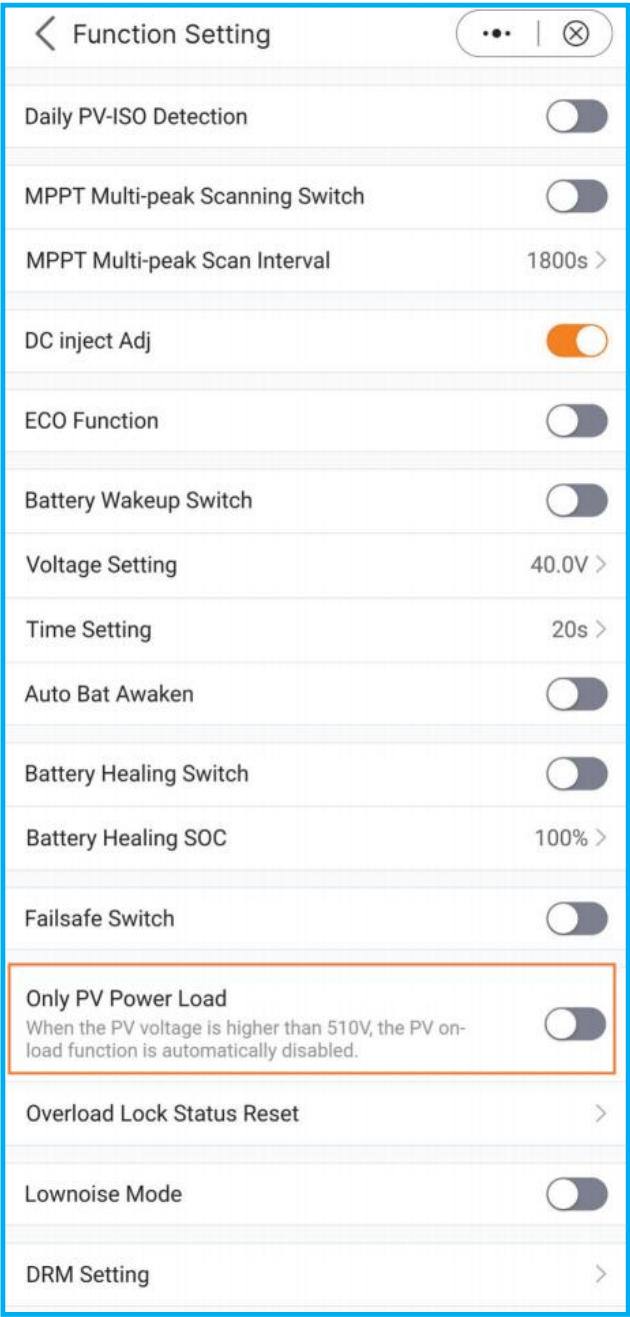
#### Note:

- 1.Only PV Power Load function is closed by default. If you need to use it, you need to open it by yourself.
- 2.Software: Ensure that the current DSP and HMI software is the latest version.

# COMMISSIONING & SHUTDOWN

## 2. LEDVANCE APP setting

Setting-Professional Setting-function setting



# COMMISSIONING & SHUTDOWN

## HMI screen setting

### HMI quick setting

If this is the first time the inverter has been commissioned, you will need to first go through the Quick Settings. Once this has been done, these settings can be changed later.

Inverter Time -> Meter Setting -> Grid Code -> Storage mode -> Battery Model

The screenshot shows the 'QUICK SETUP' screen with a timestamp of 2024/01/01 12:00:00. It is divided into four main sections: 1. Inverter time: Fields for Year (2024), Month (01), Day (01), Hour (12), Minute (00), and Second (00). 2. CT/METER settings: Radio buttons for 'CT' (selected) and 'METER'. A dropdown menu shows 'Eastron 1P'. Below are fields for 'Location' (Grid), 'Direction' (forward), and 'CT ratio' (4000:1). 3. Grid settings: A dropdown menu for 'Grid code' showing 'G95'. 4. Storage mode: Radio buttons for 'Self-use', 'Selling first' (selected), and 'Off grid'. Below are fields for 'Max export power' (200W), 'Export calibration' (20W), and 'Grid Peak shaving' (2000W). A 'NEXT' button is at the bottom right.

#### 1. Inverter time:

Set inverter time and date, default follow the phone.

#### 2. CT/Meter setting:

Select the CT or Meter, LEDVANCE provide Eastron 3 phase meter, it is self-identifiable.

Set installation location: Grid side/Load side/Grid + PV inverter;

CT direction: When CT installed correctly, select "Forward": when CT installed direction wrong, the sampling current of CT will be reversed when calculating the power, select "Reversal" to correct it.

Set CT ratio: default 3000 (LEDVANCE provide ESCT - T50 - 120 A/40 m ACT) , if the user install their own CT, then need to set the CT ratio manually. If the system connected to Meter then CT ratio need to be set on Meter.

#### 3. Grid code:

Select grid code that meet the local regulations.

#### 4. Storage mode:

All modes first priority is to use the available PV power to support loads. The different modes determine what the second priority, or use of the excess PV power, will be.

Self-use / Selling first / Off-grid are exclusive, the user could select only one mode.

## COMMISSIONING & SHUTDOWN

MODE	DESCRIPTION
Self-use	<p>PV power flow priority sequence: loads &gt; battery &gt; grid. In this mode, the system stores excess PV power into the battery after the loads are supplied.</p> <p>If "Allow export" turned on, when the battery is charged full, or there is no battery, the excess PV power will be exported (sold) back to the grid.</p> <p>If the system is set to not export any power, then the inverter will curtail the PV power (derate the inverter output power).</p>
Selling first	<p>PV power flow priority sequence: loads &gt; grid &gt; battery. In this mode, the system exports any excess PV power after the loads are supplied. If the export power quota has been met, then the remaining PV power will be stored in the battery.</p> <p>Notice: This mode should not be used if export power set to zero.</p>
Off grid	<p>PV power flow priority sequence: loads &gt; battery. This mode only used when the system are not electrically connected to the grid at all. This mode is like Self-Use Mode, but the PV power will be curtailed if the PV power output is &gt; battery power + load power.</p>

Description of modes

Under each mode, user could set other functions based on their requirements.

SETTINGS	DESCRIPTION
Max export power	<p>Default: 1.1 times of rated power.</p> <p>Notice: if feed-in is not allowed, set Max export power to 0.</p>
Export calibration	<p>Range: -500 W-500 W, default 20 W, settable. To compensate the deviation of CT/ Meter in practical application.</p>
Grid peak shaving	<p>Default enable, default 2 times of rated power. Limit the power drawn from the grid to prevent from exceeding regulatory requirements or the power line capacity. It works only when the "battery reserve" turned on.</p>

Description of mode settings

5.Battery setting:

Select battery brand.  
Set Max charging/discharging current.

BATTERY SETTING2024/01/01 12:00:00

Batt type

Lithium Battery

PYLON\_HV

>

48.0V Lithium Battery (Without COMM)

51.2V Lithium Battery (Without COMM)

Lead-acid Battery

No Battery

Max charge current

100A

Max discharge current

100A

Over discharge

80%

Recovery

80%

Force charge

80%

Max charge SOC

80%

☒ Battery saving

1/2

52

## TROUBLESHOOTING

MESSAGE NAME	INFORMATION DESCRIPTION	TROUBLESHOOTING SUGGESTION
Off	Control device to shutdown	Turn on the device in the ON/OFF Setting
LmtByEPM	The device's output is under controlled	<ol style="list-style-type: none"> <li>1. Confirm whether the inverter is connected to an external EPM/meter to prevent reverse current.</li> <li>2. Confirm whether the inverter is controlled by an external third-party device.</li> <li>3. Confirm whether the power setting of the inverter power control is limited.</li> <li>4. Verify settings and check your meter readings.</li> </ol>
LmtByDRM	DRM Function ON	No need to deal with it
LmtByTemp	Over temperature power limited	No need to deal with it, the device is in normal operation.
LmtByFreq	Frequency power limited	
LmtByVg	The device is in the Volt-Watt mode	<ol style="list-style-type: none"> <li>1. Due to the requirements of local safety regulations, when the grid voltage is high, the Volt-watt working mode is triggered, which generally does not need to be dealt with.</li> <li>2. This mode is enabled by default.</li> </ol>
LmtByVar	The device is in the Volt-Var mode of operation	<ol style="list-style-type: none"> <li>1. Due to the requirements of local safety regulations, when the grid voltage is high, the Volt-watt working mode is triggered, which generally does not need to be dealt with.</li> <li>2. This mode is enabled by default.</li> </ol>
LmtByUnFr	Under frequency limit	No need to deal with it
Standby	Bypass run	
StandbySynoch	Off grid status to On grid status	
GridToLoad	Grid to load	

## TROUBLESHOOTING

MESSAGE NAME	INFORMATION DESCRIPTION	TROUBLESHOOTING SUGGESTION
Surge Alarm	On-site grid surge	1. Grid side fault, restart the device. If it is still not eliminated, please contact the manufacturer's customer service.
OV-G-V01	Grid voltage exceeds the upper voltage range	1. Confirm whether the power grid is abnormal. 2. Confirm that the AC cable is properly connected. 3. Restart the system and check if the fault persists.
UN-G-V01	Grid voltage exceeds the lower voltage range	
OV-G-F01	Grid frequency exceeds the upper frequency range	
UN-G-F01	Grid frequency exceeds the lower frequency range	
G-PHASE	Unbalanced grid voltage	
G-F-GLU	Grid voltage frequency fluctuation	
NO-Grid	No grid	
OV-G-V02	Grid transient overvoltage	
OV-G-V03	Grid transient overvoltage	1. Restart the system, confirm if that the fault continues.
IGFOL-F	Grid current tracking failure	1. Confirm whether the power grid is abnormal. 2. Confirm that the AC cable is properly connected. 3. Restart the system and check if the fault persists.
OV-G-V05	Grid voltage RMS instantaneous overvoltage fault	
OV-G-V04	Grid voltage exceeds the upper voltage range	
UN-G-V02	Grid voltage exceeds the lower voltage range	
OV-G-F02	Grid frequency exceeds the upper frequency range	
UN-G-F02	Grid frequency exceeds the lower frequency range	
NO-Battery	Battery is not connected	1. Check on information page 1 – Verify the battery voltage is within standards. 2. Measure battery voltage at plug.
OV-Vbackup	Inverting overvoltage	1. Check whether the backup port wiring is normal 2. Restart the system, confirm that the fault continues.
Over-Load	Load overload fault	1. Backup load power is too large, or some inductive load startup power is too large, need to remove some backup load, or remove the inductive load on the backup.

# TROUBLESHOOTING

MESSAGE NAME	INFORMATION DESCRIPTION	TROUBLESHOOTING SUGGESTION
BatName-FAIL	Wrong battery brand selection	1. Confirm whether the battery model selection is consistent with the actual one.
CAN Fail	CAN Fail	1. Can failure is a failure of communication between inverter and battery. Check cable conditions. Check to ensure you have it plugged in on the CAN port of the battery and inverter. Check that you are using the right cable. Some batteries require a special battery from the battery manufacturer.
OV-Vbatt	Battery overvoltage detected	1. Verify battery voltage is within standards. Measure battery voltage at inverter connection point. Contact your battery manufacturer for further service.
UN-Vbatt	Battery undervoltage detected	1. Restart the system and check if the fault persists. If it is still not eliminated, please contact the manufacturer's customer service.
Fan Alarm	Fan alarm	1. Check if the internal fan is working correctly or jammed.
OV-DC01 (1020 DATA:0001)	DC 1 input overvoltage	1. Check if the PV voltage is abnormal 2. Restart the system, confirm that the fault continues
OV-DC02 (1020 DATA:0002)	DC 2 input overvoltage	
OV-BUS (1021 DATA:0000)	DC bus overvoltage	1. Restart the system, confirm that the fault continues.
UN-BUS01 (1023 DATA:0001)	DC bus undervoltage	
UNB-BUS (1022 DATA:0000)	DC bus unbalanced voltage	
UN-BUS02 (1023 DATA:0002)	Abnormal detection of DC bus voltage	
DC-INTF. (1027 DATA:0000)	DC hardware overcurrent (1, 2, 3, 4)	1. Check if the DC wires are connected correctly without loose connection.
OV-G-I (1018 DATA:0000)	A phase RMS value overcurrent	1. Confirm that the grid is abnormal. 2. Confirm that the AC cable connection is not abnormal. 3. Restart the system, confirm that the fault continues.
OV-DCA-I (1025 DATA:0000)	DC 1 average overcurrent	1. Restart the system, confirm that the fault continues.
OV-DCB-I (1026 DATA:0000)	DC 2 average overcurrent	
GRID-INTF. (1030 DATA:0000)	AC hardware overcurrent (abc phase)	

# TROUBLESHOOTING

MESSAGE NAME	INFORMATION DESCRIPTION	TROUBLESHOOTING SUGGESTION
DCInj-FAULT (1037 DATA: 0000)	The current DC component exceeds the limit	1. Confirm that the grid is abnormal. 2. Confirm that the AC cable connection is not abnormal. 3. Restart the system, confirm that the fault continues.
IGBT-OV-I (1048 DATA: 0000)	IGBT overcurrent	1. Restart the system, confirm that the fault continues.
OV-TEM (1032 DATA: 0000)	Module over temperature	1. Check whether the surrounding environment of the inverter has poor heat dissipation. 2. Confirm whether the product installation meets the requirements.
RelayChk-FAIL (1035 DATA: 0000)	Relay failure	1. Restart the system, confirm that the fault continues.
UN-TEM (103A DATA: 0000)	Low temperature protection	1. Check the working environment temperature of the inverter. 2. Restart the system to confirm if the fault continues.
PV ISO-PRO01 (1033 DATA: 0001)	PV negative ground fault	1. Check whether the PV strings have insulation problems. 2. Check whether the PV cable is damaged.
PV ISO-PRO02 (1033 DATA: 0002)	PV positive ground fault	
12Power-FAULT (1038 DATA: 0000)	12V undervoltage failure	1. Check current leakage to ground. Verify your grounding. Verify all wires are in good condition and not leaking current to ground.
ILeak-PRO01 (1034 DATA: 0001)	Leakage current failure 01 (30 mA)	
ILeak-PRO02 (1034 DATA: 0002)	Leakage current failure 02 (60 mA)	
ILeak-PRO03 (1034 DATA: 0003)	Leakage current failure 03 (150 mA)	
ILeak-PRO04 (1034 DATA: 0004)	Leakage current failure 04	
ILeak_Check (1039 DATA: 0000)	Leakage current sensor failure	
GRID-INTF02 (1046 DATA: 0000)	Power grid disturbance 02	1. Confirm whether the grid is seriously distorted. 2. Check whether the AC cable is connected reliably.
OV-Vbatt-H/ OV-BUS-H (1051 DATA: 0000)	Battery overvoltage hardware failure/VBUS	1. Check if the battery circuit breaker is tripping. 2. Check if the battery is damaged.

## TROUBLESHOOTING

MESSAGE NAME	INFORMATION DESCRIPTION	TROUBLESHOOTING SUGGESTION
OV-ILLC (1052 DATA: 0000)	LLC hardware overcurrent	1. Check whether the backup load is overloaded. 2. Restart the system, confirm that the fault continues.
INI-FAULT (1031 DATA: 0000)	AD zero drift overlink	1. Restart the system, confirm that the fault continues.
DSP-B-FAULT (1036 DATA: 0000)	The master-slave DSP communication is abnormal	
AFCI-Check (1040 DATA: 0000)	AFCI self-test failure	
ARC- FAULT (1041 DATA: 0000)	AFCI failure	1. Verify connections are tight within your PV system. Arc fault settings can be changed in advanced settings if further adjustment is necessary.

Fault message and description



**Note:**

If the inverter displays any alarm message as listed in Table above; please turn off the inverter and wait for 5 minutes before restarting it.

If the failure persists, please contact your local distributor or the service center.

Please keep ready with you the following information before contacting us.

- Serial number of LEDVANCE three phase inverter;
- The distributor / dealer of LEDVANCE three phase inverter (if available) ;
- Installation date.
- The description of the problem together with necessary information, pictures, attachment.
- The PV array configuration (e.g. number of panels, capacity of panels, number of strings, etc.) ;
- Battery details (brand, model, capacity, data connection, etc) .
- Your contact details.

## SPECIFICATIONS

Technical Data	LHT-HV-12K F2
<b>Input DC (PV side)</b>	
Max. input voltage	19200 V
Rated voltage	1000 V
Start-up voltage	600 V
MPPT voltage range	160 V
Max input power per MPPT	200-850 V
Full load MPPT voltage range	300-850 V
Max. input current	4*20 A
Max. short circuit current	4*30 A
MPPT number/Max input strings number	4/4
<b>Battery</b>	
Battery Type	Li-ion
Battery Voltage range	120 - 800 Vdc
Maximum Charging Power	12 kW
Maximum Charge/discharge current	50 A
Communication	CAN/RS485
<b>Output AC (Grid-side)</b>	
Rated output power	12 kW
Max. apparent output power	12 kVA
Rated grid voltage	3/N/PE, 380 V/400 V
The grid voltage range	320-460 V
AC grid frequency range	45-55 Hz/ 55-65Hz
Rating grid frequency	50 Hz/60 Hz
Rating grid output current	18.2 A/17.3 A
Max. output current	18.2 A/17.3 A
Power factor	> 0.99 (0.8 leading to 0.8 lagging)
THDi	< 3 %
<b>Input AC (Grid-side)</b>	
Max. input power	18 kW
Rated input current	27.3 A/26.0 A
Rated input voltage	3/N/PE, 380 V/400 V
Rated input frequency	50 Hz/60 Hz

## SPECIFICATIONS

Technical Data	50 Hz/60 Hz
<b>Input Generator</b>	
Max. input power	12 kW
Rated input current	18.2 A/17.3 A
Rated input frequency	50 Hz/60 Hz
<b>Output AC (Back-up)</b>	
Rated output power	12 kW
Peak apparent output power	2 time of rated power, 10 s
Back-up switch time	< 10 ms
Rated output voltage	3/N/PE, 380 V/400 V
Rated frequency	50 Hz/60 Hz
Rated output current	18.2 A/17.3 A
THDv (@linear load)	< 3 %
<b>Efficiency</b>	
Max. efficiency	97.7 %
EU efficiency	12 kVA
BAT charged by PV Max. efficiency	97.5 %
BAT charged/discharged to AC Max. efficiency	97.2 %
MPPT efficiency	99.9 %
<b>Input AC (Grid-side)</b>	
Rating grid output current	Yes
Insulation resistance monitoring	Yes
Residual current detection	Yes
Output over voltage protection	Yes
Short circuit protection	Yes
Rated input current	Yes
Integrated AFCI 2.0	Yes
Integrated DC switch	Yes
DC reverse polarity protection	Yes
PV overvoltage protection	Yes
Battery reverse protection	Yes

# SPECIFICATIONS

Technical Data	LHT-HV-12K F2
<b>General data</b>	
Max. allowable phase imbalance (grid & back up)	100 %
Max. power per phase (grid & back up)	50 % rated power
Rated input frequency	563*546*235 mm
Weight	32.6 kg
Topology	Transformerless
Self consumption (Night)	< 25 W
Operation temperature range	-25 °C~+60 °C
Relative humidity	0-95 %
Ingress protection	IP66
Noise emission	< 65 dB (A)
Cooling concept	Smart cooling
Max.operation altitude	2000 m
Grid connection standard	EN 50549-1, VDE4105
Safety/EMC standard	IEC/EN 62109-1/-2, IEC/EN 61000-6-1/-3, IEC 61000-2
<b>Features</b>	
PV connection	MC4 connector
Battery connection	Latched type plug
AC connection	Latched type plug
Display	LED + Bluetooth + APP
Communication	CAN, RS485, Ethernet, optional: Wi-Fi, Cellular, LAN
Warranty	5 years (extendable to 20 years)

# SPECIFICATIONS

Technical Data	LHT-HV-15K F2
<b>Input DC (PV side)</b>	
Max Usable PV Input Power	24000 W
Max. input voltage	1000 V
Rated voltage	600 V
Start-up voltage	160 V
MPPT voltage range	200-850 V
Full load MPPT voltage range	300-850 V
Max. input current	4*20 A
Max.short circuit current	4*30 A
MPPTnumber/Max input strings number	4/4
<b>Battery</b>	
Battery Type	Li-ion
Battery Voltage range	120 - 800 Vdc
Maximum Charging Power	15 kW
Maximum Charge/discharge current	50 A
Communication	CAN / RS485
<b>Output AC (Grid-side)</b>	
Rated output power	15 kW
Max. apparent output power	15 kW
Rated grid voltage	3/N/PE, 380 V/400 V
The grid voltage range	320-460 V
Rating grid frequency	50-60 Hz
AC grid frequency range	45-55 Hz/55-65 Hz
Rating grid output current	22.8 A/21.7 A
Max. output current	22.8 A/21.7 A
Power factor	> 0.99 (0.8 leading to 0.8 lagging)
THDi	< 3 %
<b>Input AC (Grid-side)</b>	
Max. input power	22.5 kW
Rated input current	34.2 A/32.5 A
Rated input voltage	3/N/PE, 380 V/400 V
Rated input frequency	50 Hz/60 Hz

## SPECIFICATIONS

Technical Data	50 Hz/60 Hz
<b>Input Generator</b>	
Max. input power	15 kW
Rated input current	22.8 A / 21.7 A
Rated input frequency	50 Hz / 60 Hz
<b>Output AC (Back-up)</b>	
Rated output power	15 kW
Peak apparent output power	2 time of rated power, 10 s
Back-up switch time	< 10 ms
Rated output voltage	3/N/PE,380 V/400 V
Rated frequency	50 Hz/60 Hz
Rated output current	22.8 A/21.7 A
THDv (@linear load)	< 3 %
<b>Efficiency</b>	
Max. efficiency	97.7 %
EU efficiency	97.5 %
BAT charged by PV Max. efficiency	98.5 %
BAT charged/discharged to AC Max. efficiency	97.2 %
MPPT efficiency	99.9 %
<b>Input AC (Grid-side)</b>	
Anti-islanding protection	Yes
Output over voltage protection	Yes
Insulation resistance monitoring	Yes
Residual current detection	Yes
Output over current protection	Yes
Short circuit protection	Yes
Integrated AFCI 2.0	Yes
Integrated DC switch	Yes
DC reverse polarity protection	Yes
PV overvoltage protection	Yes
Battery reverse protection	Yes

# SPECIFICATIONS

Technical Data	LHT-HV-15K F2
<b>General data</b>	
Max. allowable phase imbalance (grid & back up)	100 %
Max. power per phase (grid & back up)	50 % rated power
Rated input frequency	563*546*235 mm
Weight	32.6 kg
Topology	Transformerless
Self consumption (Night)	< 25 W
Operation temperature range	-25°C~+60°C
Relative humidity	0-95 %
Ingress protection	IP66
Noise emission	< 65 dB (A)
Cooling concept	Smart cooling
Max.operation altitude	2000 m
Grid connection standard	EN 50549-1, VDE4105
Safety/EMC standard	IEC/EN 62109-1/-2, IEC/EN 61000-6-1/-3, IEC 61000-2
<b>Features</b>	
PV connection	MC4 connector
Battery connection	Latched type plug
AC connection	Latched type plug
Display	LED + Bluetooth + APP
Communication	CAN, RS485, Ethernet, optional: Wi-Fi, Cellular, LAN
Warranty	5 years (extendable to 20 years)

# SPECIFICATIONS

Technical Data	LHT-HV-20K F2
<b>Input DC (PV side)</b>	
Max Usable PV Input Power	32000 W
Max. input voltage	1000 V
Rated voltage	600 V
Start-up voltage	160 V
MPPT voltage range	200-850 V
Full load MPPT voltage range	300-850 V
Max. input current	4*20 A
Max.short circuit current	4*30 A
MPPTnumber/Max input strings number	4/4
<b>Battery</b>	
Battery Type	Li-ion
Battery Voltage range	120 - 800 Vdc
Maximum Charging Power	20 kW
Maximum Charge/discharge current	50 A
Communication	CAN/RS485
<b>Output AC (Grid-side)</b>	
Rated output power	20 kW
Max. apparent output power	20 kW
Rated grid voltage	3/N/PE, 380V/400V
The grid voltage range	320-460 V
Rating grid frequency	50-60 Hz
AC grid frequency range	45-55 Hz/55-65 Hz
Rating grid output current	30.4 A/28.9 A
Max. output current	30.4 A/28.9 A
Power factor	> 0.99 (0.8 leading to 0.8 lagging)
THDi	< 3 %
<b>Input AC (Grid-side)</b>	
Max. input power	30 kW
Rated input current	45.6 A/43.3 A
Rated input voltage	3/N/PE, 380 V/400 V
Rated input frequency	50 Hz/60 Hz

## SPECIFICATIONS

Technical Data	LHT-HV-20K F2
<b>Input Generator</b>	
Max. input power	20 kW
Rated input current	30.4 A/28.9 A
Rated input frequency	50 Hz/60 Hz
<b>Output AC (Back-up)</b>	
Rated output power	20 kW
Peak apparent output power	1.6 time of rated power, 10 s
Back-up switch time	< 10 ms
Rated output voltage	3/N/PE,380 V/400 V
Rated frequency	50 Hz/60 Hz
Rated output current	30.4 A/28.9 A
THDv (@linear load)	< 3 %
<b>Efficiency</b>	
Max. efficiency	97.7 %
EU efficiency	97.5 %
BAT charged by PV Max. efficiency	98.5 %
BAT charged/discharged to AC Max. efficiency	97.2 %
MPPT efficiency	99.9 %
<b>Input AC (Grid-side)</b>	
Anti-islanding protection	Yes
Output over voltage protection	Yes
Insulation resistance monitoring	Yes
Residual current detection	Yes
Output over current protection	Yes
Short circuit protection	Yes
Integrated AFCI 2.0	Yes
Integrated DC switch	Yes
DC reverse polarity protection	Yes
PV overvoltage protection	Yes
Battery reverse protection	Yes

# SPECIFICATIONS

Technical Data	LHT-HV-20K F2
<b>General data</b>	
Max. allowable phase imbalance (grid & back up)	100 %
Max. power per phase (grid & back up)	40 % rated power
Rated input frequency	563*546*235 mm
Weight	32.6 kg
Topology	Transformerless
Self consumption (Night)	< 25 W
Operation temperature range	-25 °C~+ 60 °C
Relative humidity	0-95 %
Ingress protection	IP66
Noise emission	< 65 dB (A)
Cooling concept	Smart cooling
Max.operation altitude	2000 m
Grid connection standard	EN 50549-1, VDE4105
Safety/EMC standard	IEC/EN 62109-1/-2, IEC/EN 61000-6-1/-3, IEC 61000-2
<b>Features</b>	
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