

User Manual

Three-phase Hybrid Solar Inverter



Foreword

The Manual describes the inverter in terms of product details, installation, operation, and maintenance, except for all information of photovoltaic system (PV system). Welcome to visit www.slenergy.com for more details.

Scope

The Manual applies to the following models:

SL5KRH-W, SL6KRH-W, SL8KRH-W, SL10KRH-W, SL12KRH-W

Intended audience

The Manual is available for technical personnel who install, operate, and maintain the inverters and users who check the inverter parameters on the Manual.

The installation and service require knowledge of high voltage electricity and should only be performed by qualified individuals. Slenergy assumes no liability for injury or property damage due to repairs attempted by unqualified individuals or a failure to properly follow this Guide.

The qualified individuals shall satisfy the following requirements:

- They shall be familiar with electronic, electrical wiring and mechanical expertise, and understand electrical and mechanical schematics;
- They shall have received the professional training on installation and commissioning of electrical equipment;
- They shall be able to tackle with hazards or emergencies during installation or commissioning;
- They shall be acquainted with local standards and relevant safety codes for electrical systems;
- They must read the whole Manual carefully and master the related safety precautions.

Although we are constantly updating and amending the Manual, Product in kind prevail, specifications maybe change without notice.

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Symbols

This manual contains important safety instructions, which are highlighted with the following symbols, to ensure personal and property safety during usage, or to help optimize the product performance in an efficient way.

Please carefully understand the meaning of these warning symbols to better use the manual.

DANGER

Indicates high-risk potential hazards that, if not avoided, may lead to death or serious injury.

WARNING

Indicates moderate-risk potential hazards that, if not avoided, may lead to death or serious injury.

CAUTION

Indicates low-risk potential hazards that, if not avoided, may lead to minor or moderate injury.

NOTICE

Indicates potential risks that, if not avoided, may lead to device malfunctions or financial losses.









1. Safety Precaution

Safety code shall be followed during the installation, commissioning, operation, and maintenance of inverter. A failure to properly follow this Manual.

- Threatening the personal safety of the operator or third party;
 - Damaging the inverter or other property of the operator or third party.
- The manual includes not all safety precautions to be followed, but only serves as a supplement. Therefore, the user shall operate according to the actual situation.
 - When installing, operating, and maintaining the equipment, users shall comply with local laws and regulations and codes, supplemented by safety precautions in the Manual.

***To avoid the above hazards, please follow the Manual strictly.**

1.1 Warning Symbol

Symbol	Description
	Switch off the machine before any operation and maintenance.
	Beware of scalding due to the equipment surface temperature maybe higher than 60°C.
	Before wiring and checking, ensure that the DC/AC circuit breakers of inverter have been disconnected and wait at least 5 minutes.
	Read the Manual before any operations on the inverter.
	Do not connect and disconnect wires, dismantle the case, and replace devices under electric condition due to the fatal high-voltage risk.
	Comply with the CE certification.
	Do not discard the inverter as the household waste.
	Reliably earth the inverter for protective grounding.

1.2 Unpacking for Inspection

WARNING

- Inspect all safety signs, warning labels, and nameplates on the inverter;
- Ensure that safety signs, warning labels, and nameplates are clearly visible, and not removed or covered before the inverter is discarded.

1.3 Installation Security

DANGER

- Ensure the product has no electrical connections prior to installation;
- Ensure that the drilling, if required during installation, has avoided the electrical wiring inside the wall.

CAUTION

Improper installation may cause personnel injury!

- Do not stay under the inverter when it is carried and lifted by lifting tools;
- Control the weight when the inverter is carried to keep balance, thus avoiding products toppling or falling.

1.4 Electrical Connection Security

WARNING

- Before electrical connections, ensure that the inverter is intact.
- Before electrical connections, be sure to keep the inverter and all connected switches in "OFF" state to avoid electric shock.

DANGER

The exposure of PV string to sunlight may cause danger!

- For electrical connections, wear personal protective equipment;
- Ensure that the cable is not charged through checking with test equipment before touching the DC cable;
- Read the safety precautions listed in the PV string-related documents;
- Do not connect the inverter with the PV string that needs either positive or negative grounding.

DANGER

There may be fatal high voltage inside the inverter!

- Please use special insulation tools when wiring;
- Operate in compliance with the instructions of warning symbols;
- Read safety precautions listed in the Manual and other inverter-related documents.

WARNING

- Verify the PV string's positive and negative polarities so that the DC connector is connected to the inverter and inserted to the corresponding DC terminal;
- When the inverter is installed and operated, ensure that the positive and the negative of the PV string do not short circuit to the ground. Otherwise, it may lead to inverter AC/DC short circuit, resulting in product damage, which is not covered under warranty.

WARNING

- Note that the incorrect wiring may damage the product, which is not covered under warranty;
- Electrical connection must be done by qualified individuals;
- Ensure that cables used in the PV system are properly sized, reliably connected, and well insulated.

1.5 Operation Security

DANGER

- Do not touch the product enclosure when it is in operation;
- Do not insert or remove connectors on the inverter when it is in operation;
- Do not touch any terminals on the inverter when it is in operation to avoid electric shock;
- Do not remove any parts of the inverter when it is in operation to avoid electric shock;
- Do not touch the scorching parts of the inverter (e.g. heat sink) when it is in operation to avoid burns;
- Do not shift the DC switch on the product when it is in operation to avoid equipment damage or personnel injury.

1.6 Maintenance Security

DANGER

- Do not touch the Grid or contacts and terminals that are connected to or inside the product to avoid electric shock;
- Use a standard voltmeter to confirm that the Grid is free of voltage before touching to avoid electrical shock.

DANGER

The improper maintenance may cause personnel injury or product damage!

- Before maintenance, disconnect the Grid-side AC circuit breaker and check the inverter status. switch off the DC switch at night as the inverter indicator is off, and if it is still on, switch off the DC switch directly;
- Use test equipment to check that the inverter is free of voltage and current after 9 min's power off, and then maintain the inverter with protective equipment;
- Avoid burns even after the inverter is shut down. Operate with protective gloves after the inverter has cooled down.

CAUTION

To avoid unrelated personnel from mishandling or accidents, place obvious warning signs or alarm belts around the products.

1.7 Disposing Security

⚠ WARNING

Discard products based on the relevant local regulations and standards to avoid property losses or casualties.

1.8 Battery Safety

⚠ DANGER

- Batteries used with the inverter need to be approved by the inverter manufacturer, a list of approved batteries is available through the official website.
- Before installing the device, read the battery user manual carefully to understand the products and precautions, and strictly follow the battery user manual.
- If the battery is fully discharged, charge the battery strictly according to the battery user manual of the corresponding model.
- Battery current may be affected by some factors, such as temperature, humidity, and weather conditions, which may cause battery current limiting and affect the carrying capacity.
- If the battery does not start, contact the after-sales service center as soon as possible. Otherwise, the battery may be permanently damaged.
- Use a multimeter to measure the positive and negative terminals of the DC cable and ensure that the positive and negative terminals are correct. And the voltage is within the allowable range.
- Do not connect the same battery pack to multiple inverters. Otherwise, the inverters may be damaged.

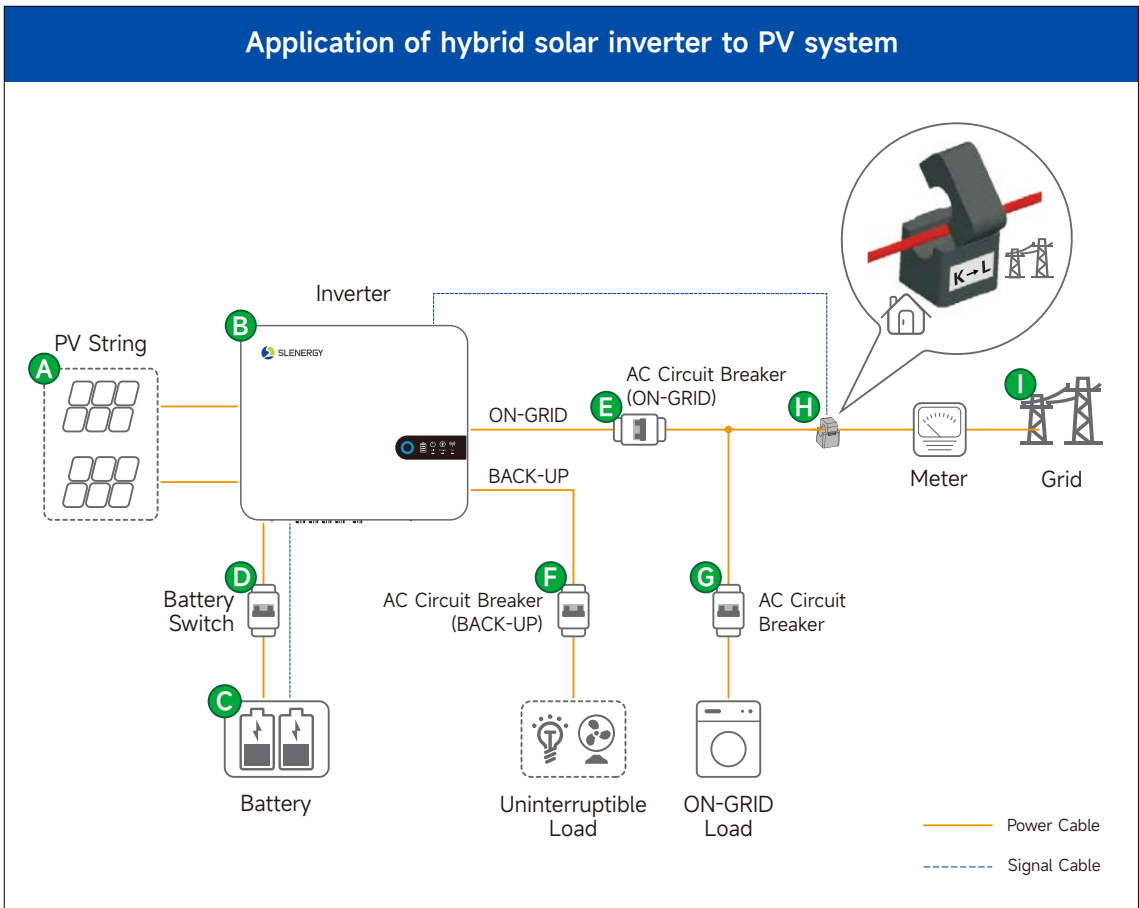
2. Product Overview

2.1 Photovoltaic System

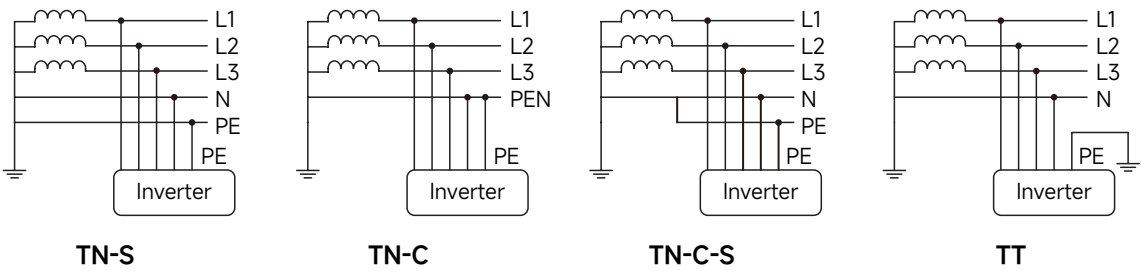
This product is a Three-phase photovoltaic energy storage hybrid inverter, which is an important part of photovoltaic power generation and energy storage systems.

Inverters control and optimize energy flow in photovoltaic systems through an integrated energy management system. The electricity generated in the photovoltaic system can be used by load devices, stored in the battery, and output to the power grid.

A typical application scenario is shown in the following figure:



No.	Name	Description
A	PV Modules	Monocrystalline silicon, polycrystalline silicon, and thin-film cell without grounding.
B	Inverter	SL5-12KRH-W
C	Battery	The battery model is to be selected based on the matching list of inverters and batteries.
D	Battery Switch	It is recommended that customers prepare a 2P DC switch on their own, with specifications required.
E	AC Circuit Breaker	<ul style="list-style-type: none"> • The specifications of ON-GRID load circuit breakers for the same model are higher than those of uninterruptible load circuit breakers. • Customers prepare an AC circuit breaker on their own, with specifications required.
F	AC Circuit Breaker	<ul style="list-style-type: none"> • The specifications of BACK-UP load circuit breakers for the same model are higher than those of uninterruptible load circuit breakers. • Customers prepare an AC circuit breaker on their own, with specifications required.
G	AC Circuit Breaker	The specification requirements shall be determined based on the actual working load.
H	CT	It will come with the inverter.
I	Power Grid	<p>The power grids supported by the inverter is shown in the following figure.</p> <p>For a power grid with N lines, the N line-to-ground voltage shall be less than 10V.</p>



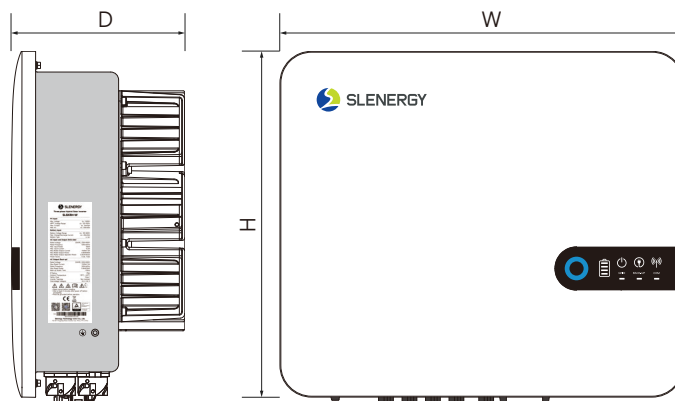
NOTICE

- The system is not suitable for supplying life-sustaining medical devices.
- It cannot guarantee backup power in all circumstances.

⚠ WARNING

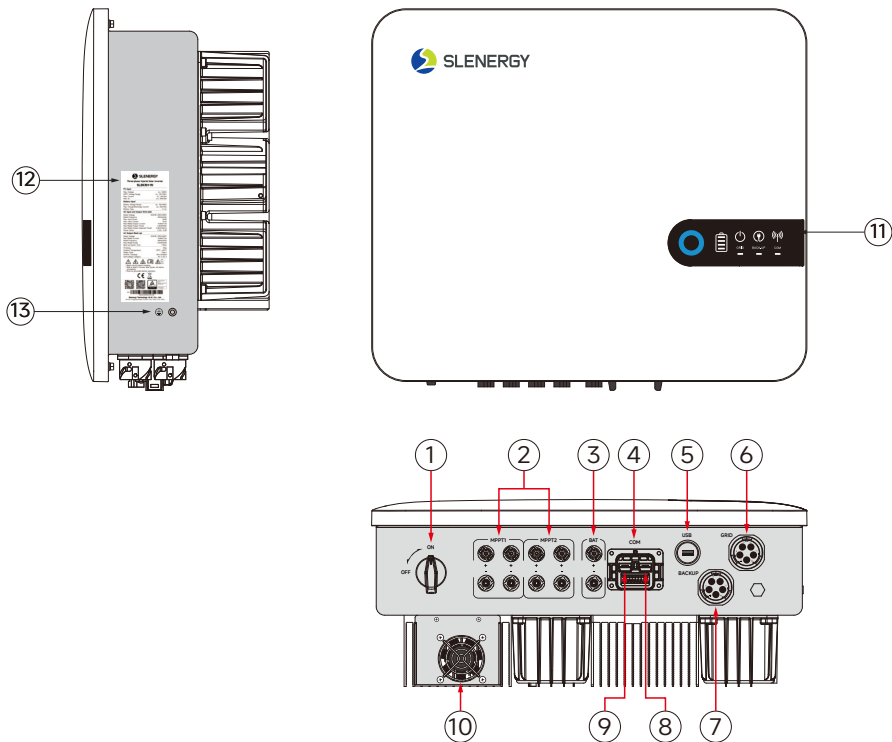
- The inverter cannot be connected to photovoltaic strings that require positive or negative grounding.
- During the installation and operation of the inverter, please ensure that the positive or negative pole of the photovoltaic strings is not short circuited to ground. If there is a short circuit, it may cause an AC/DC short circuit in the inverter, resulting in equipment damage, which will not be covered by the warranty.
- Do not connect local loads between the inverter and the AC circuit breaker.
- The inverter is only applicable to the scenarios described herein and cannot be used in other scenarios.
- The photovoltaic modules used in conjunction with the inverter must comply with the IEC61730 Class A standards.
- Paired with lithium batteries, the battery ranges 135-800V.

2.2 Dimension & Weight



Models	Dimension (W×D×H)	Weight
SL5-12KRH-W	516 x 222 x 442mm	24kg








2.3 Product Appearance



S.N.	Part Name	Description
1	DC Switch	For controlling the shutdown of PV input.
2	DC Input Terminals	SL5/6/8KRH-W 2 pairs of PV connectors SL10/12KRH-W 3 pairs of PV connectors
3	Battery Input Terminals	1 pair of connectorsc
4	Communication Terminal	Communication interface of CT, RS485(Meter) and DRM.
5	USB Interface	For the WiFi/4G monitoring module wiring.
6	Gird Wiring Port	For the grid output wiring.
7	Back-up Wiring Port	For the uninterruptible load wiring.
8	Meter & CT(RJ45) Interface	Battery BMS.
9	BMS(RJ45) Interface	
10	External Fan	Smart Cooling.
11	LED indicator	For indicating the current inverter status.
12	Labels	Including nameplate, warning label, and QR code.
13	External Grounding Terminal	For reliable grounding of inverters.

2.4 LED Indicator

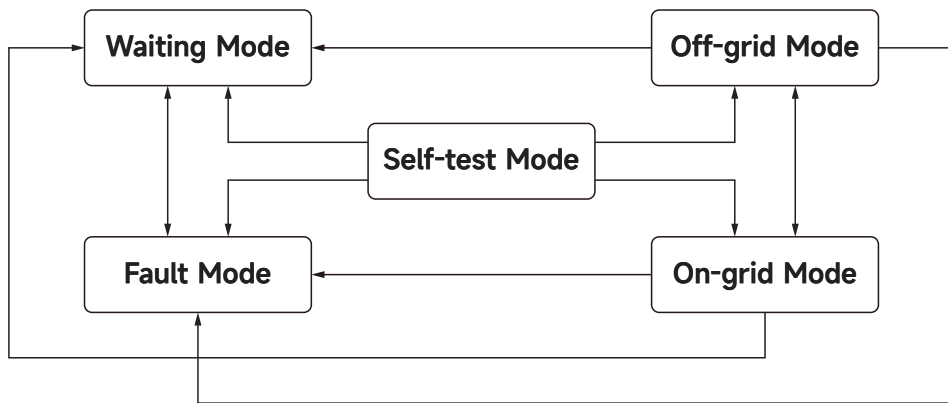
The LED on the front panel of the inverter indicate the current working status of the inverter.

Indicator	Status	Indication
	Steady Blue	The inverter is in Grid-connected mode.
	Blinking Blue at 2s intervals	DC or AC is on, and the inverter is in UPS or Start-up mode.
	Steady Yellow	The inverter is Alarm.
	Blinking Yellow at 0.2s intervals	Program download/upgrade
	Steady Red	The inverter is faulty.
	Steady White	It indicates battery level.
	Blinking White at 2s intervals	The BMS experiences a communication failure or abnormal. (battery internal overtemperature, overcurrent, etc.)
	Off	The battery is not connected.
	Steady White	The power grid is normal.
	Blinking White at 0.2s intervals	The power grid is abnormal, and the grid connection is not accessible.
	Off	The grid is not connected.
	Steady White	There is a normal voltage in the back-up output port.
	Blinking White at 0.2s intervals	The inverter is overload.
	Off	There is no voltage in the back-up output port.
	Steady White	Wifi/4G monitoring is normal.
	Blinking White at 0.2s intervals	No communication module is installed or the communication is abnormal.

NOTICE

When the indicator is off, it may be in poor contact but may still be energized. Therefore, it is very necessary to pay attention to electrical safety when you need operate the inverter.

2.5 Operating State



State	Description
Standby	<p>The waiting mode will be on after the inverter is powered on.</p> <ul style="list-style-type: none"> The self-test mode will be on when conditions are met. The fault mode will be on if there is a fault.
Self-test	<p>Before starting up, the inverter keeps performing self-tests and initializations.</p> <ul style="list-style-type: none"> If the conditions are met, the on-grid mode will be on and the inverter will operate in an on-grid mode. If the power grid is not detected, the off-grid mode will be on and the inverter will operate in an off-grid mode. If the off-grid function is unavailable to the inverter, the waiting mode will be on. If the self-test fails, the fault mode will be on.
On-grid	<p>The inverter normally operates in an on-grid mode.</p> <ul style="list-style-type: none"> If no grid is detected, the off-grid mode will be on. If a fault is detected, the fault mode will be on. If it detects that the grid conditions do not meet the grid-connection requirements and the off-grid output function is off, the waiting mode will be on.
Off-grid	<p>When the power grid is powered off, the inverter switches to the off-grid mode, and the BACK-UP port continues to supply power to the load.</p> <ul style="list-style-type: none"> If a fault is detected, the fault mode will be on. If it detects that the grid conditions do not meet the grid-connection requirements and the off-grid output function is off, the waiting mode will be on. If it detects that the grid conditions meet the grid-connection requirements and the off-grid output function is on, the self-test mode will be on.
Fault	<p>If a fault is detected, the fault mode will be on. After fault clearance, the waiting mode will be on.</p>

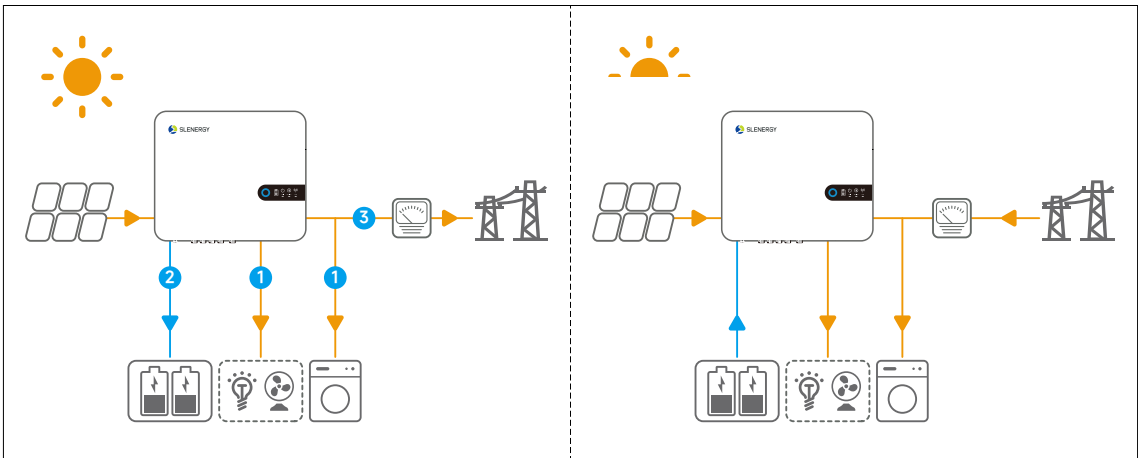
2.6 Working Mode

There are three modes in the on-grid state: self-generating-and-use mode, peaking shift mode and UPS mode. The self-generating-and-use mode is enabled by default without setting, while the peaking shift mode and UPS mode are not enabled by default, which can be enabled through the APP/cloud platform. If the UPS mode and peaking shift mode are enabled at the same time, the former will be prioritized, and the peaking shift mode and self-generating-and-use mode will not respond. If the UPS mode is not enabled and the peaking shift mode is enabled, the peaking shift mode will be on in the set charge and discharge period, and the self-generating-and-use mode will be on in other periods.

Working Mode → Self-generating-and-use Mode

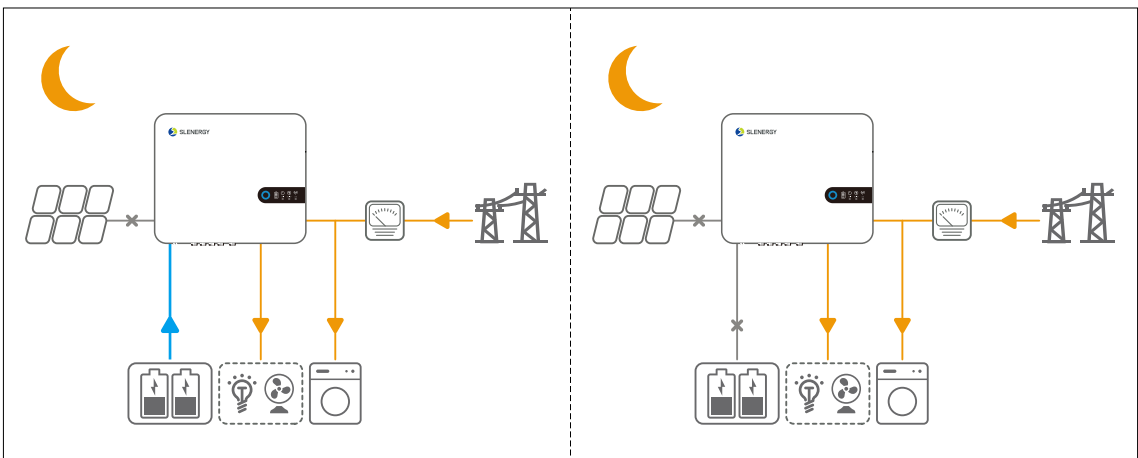
NOTICE

- Solar power generation is prioritized for self use, and the excess electricity is employed for battery charging. When there is no solar power generation at night, batteries are used to power the loads. In this way, we can improve the self-generating-and-use rate of solar power generation system and save power cost.
- It is applicable to areas with high electricity prices and little or no subsidy for solar power on-grid price.



During the day

- When the power generated in the photovoltaic system is sufficient, it is preferentially used for household loads, the excess power is employed for battery charging, and the remaining power is sold to the grid.
- When the power generated in the photovoltaic system is insufficient, the battery power is preferentially used for the loads. If the battery power is insufficient, the power grid will power the loads.



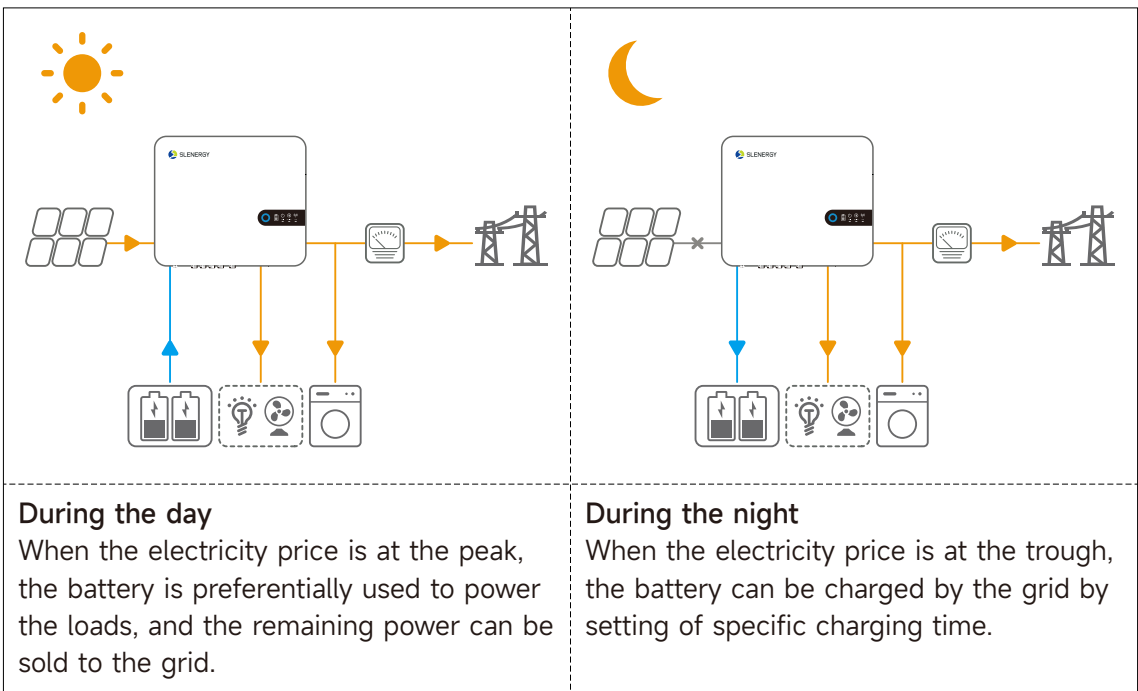
During the night:

- If the battery is fully charged, the battery will power the loads.
- If the battery power is insufficient, the power grid will power the loads.

Working Mode → Peaking shift Mode

NOTICE

- Peaking shift mode can be adopted only when local laws and regulations are met. For example, whether the grid is allowed to charge the battery. If not, do not use this mode.
- Through APP/cloud platform, the Peaking shift mode can be enabled, and charging period and discharging period can be set, with three groups each.
- If the AC charging is required, the function shall be enabled on the APP/cloud platform first, and the period during which the AC charging is allowed shall be set, with a maximum of three groups.
- It is recommended to adopt the Peaking shift mode in scenarios where the peak and trough electricity prices differ greatly.



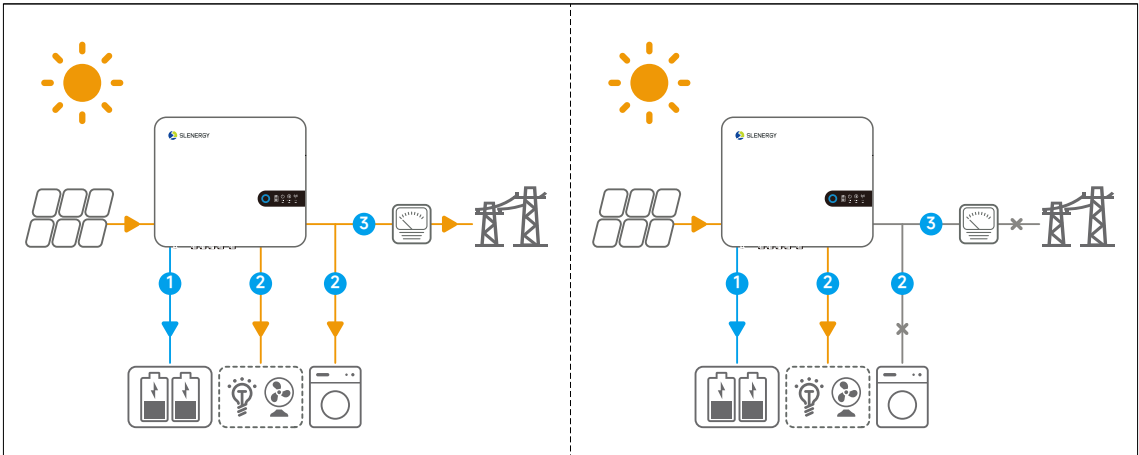
Working Mode → UPS Mode

NOTICE

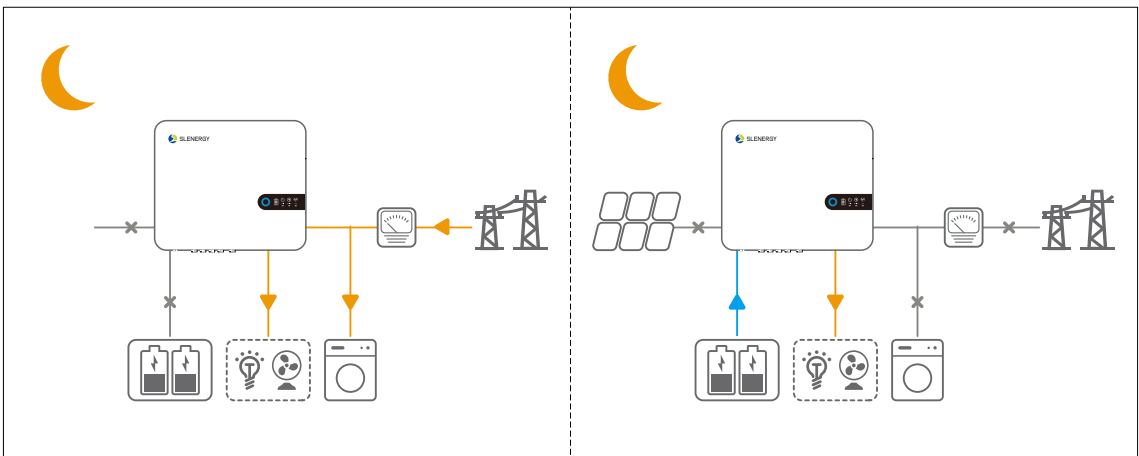
The UPS mode applies to the scenario where the power grid is unstable and there are important loads. When the power grid is powered off, the inverter switches to off-grid mode to supply power to the loads. When the power grid is restored, the inverter is switched to on-grid mode.

When the battery is discharged to the SOC limit, it will no longer discharge. When there is sunlight the next day and the battery is charged to a certain amount of power, the battery will start to supply power to the loads.

The UPS mode can be enabled through the APP/cloud platform. If the UPS mode is enabled, it will be the first priority of the three modes, and the battery will be kept fully charged and will not discharge when there is a power grid.



- When the power generated in the photovoltaic system is sufficient and the power grid is normal, the power so generated is preferentially used for charging the battery, the excess power is used for the loads, and the remaining power is sold to the power grid.
- When the power generated in the photovoltaic system is sufficient and the power grid is abnormal, the power so generated is preferentially used for charging the battery, and the excess power is used for the uninterruptible loads.

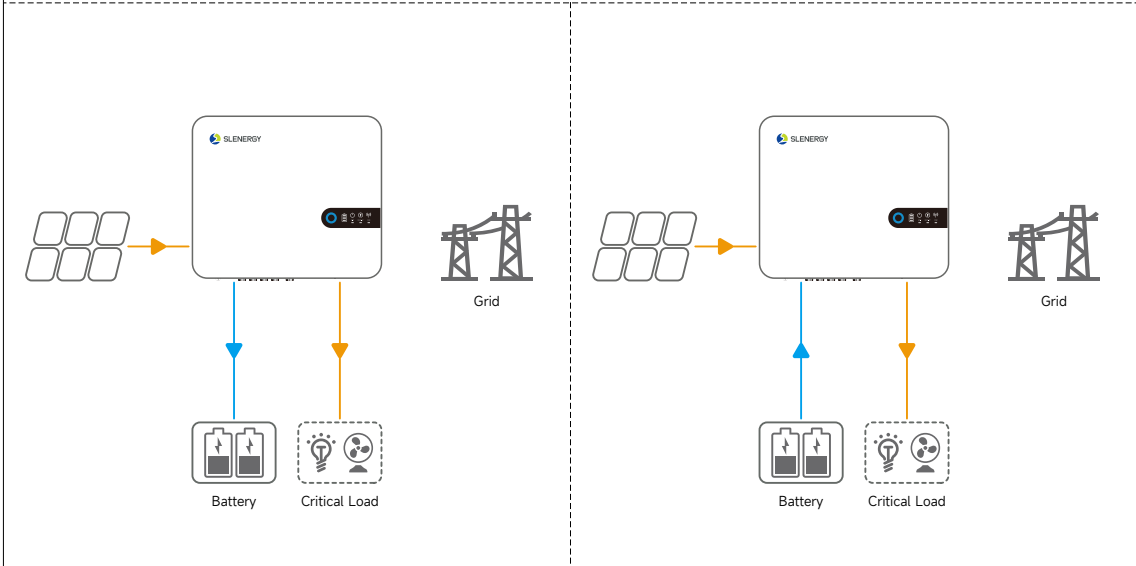


- When there is no PV generation in the photovoltaic system and the power grid is normal, the power grid supply power to the loads.
- When there is no PV generation in the photovoltaic system and the power grid is abnormal, the inverter operates in off-grid mode and the battery supplies power to the loads.

2.7 Off-grid Mode

In the purely off-grid mode, power from PV will supply the back-up loads first and then charge the battery if there's surplus power.

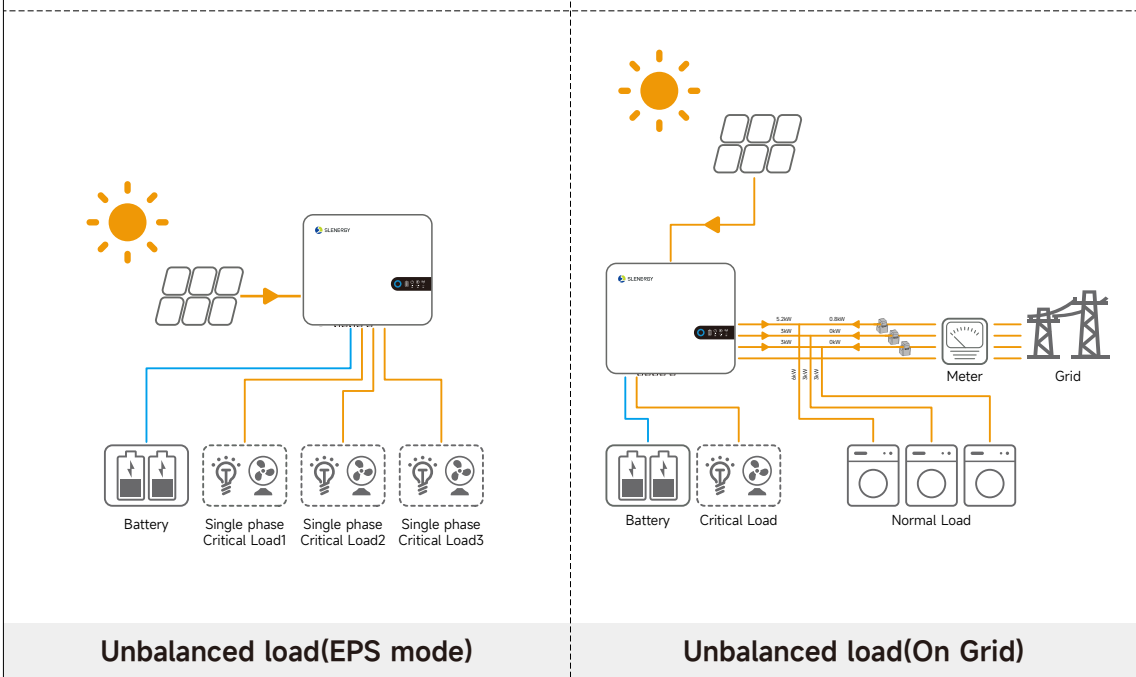
When the power from PV isn't enough, the battery will discharge to supply back-up loads together with PV.



2.8 Unbalanced Load

The system supports unbalanced loads in EPS mode by default.

By enabling the “Anti-reverse Current” option, the inverter compensates unbalanced loads either in On-grid.



2.9 Back-Up and Off-Grid Output

Normally, the Back-Up switching time is less than 10ms. However, some external factors may cause the system to fail on switching to Back-Up mode. Therefore, the conditions for using the Back-Up function smoothly are as follows for your awareness.

- ① Do not connect loads that are dependent on a stable energy supply for a reliable operation.
- ② Do not connect the loads whose total capacity is greater than the maximum Back-Up capacity.
- ③ Do not connect the loads that may cause very high start-up current surges, such as non-frequency conversion air conditioning, vacuum cleaner or half-wave loads such as hair dryer, heat gun, hammer drill.
- ④ Due to the condition of the battery itself, battery current might be limited by some factors, including but not limited to the temperature and weather.

Solinteg SL5-12KHR-W hybrid inverter overloading ability in off-grid work mode describes as follows:

Off-grid Overloading Ability Illustration					
Status	Mode	Phase 1	Phase 2	Phase 3	Duration
Off-grid	Balance Output Mode	1.1times	1.1times	1.1times	Continuous
		2times	2times	2times	10s
	Unbalance Output Mode	1.3times*	1.3times*	1.3times*	Continuous

The multiples above are calculated based on rated output power.

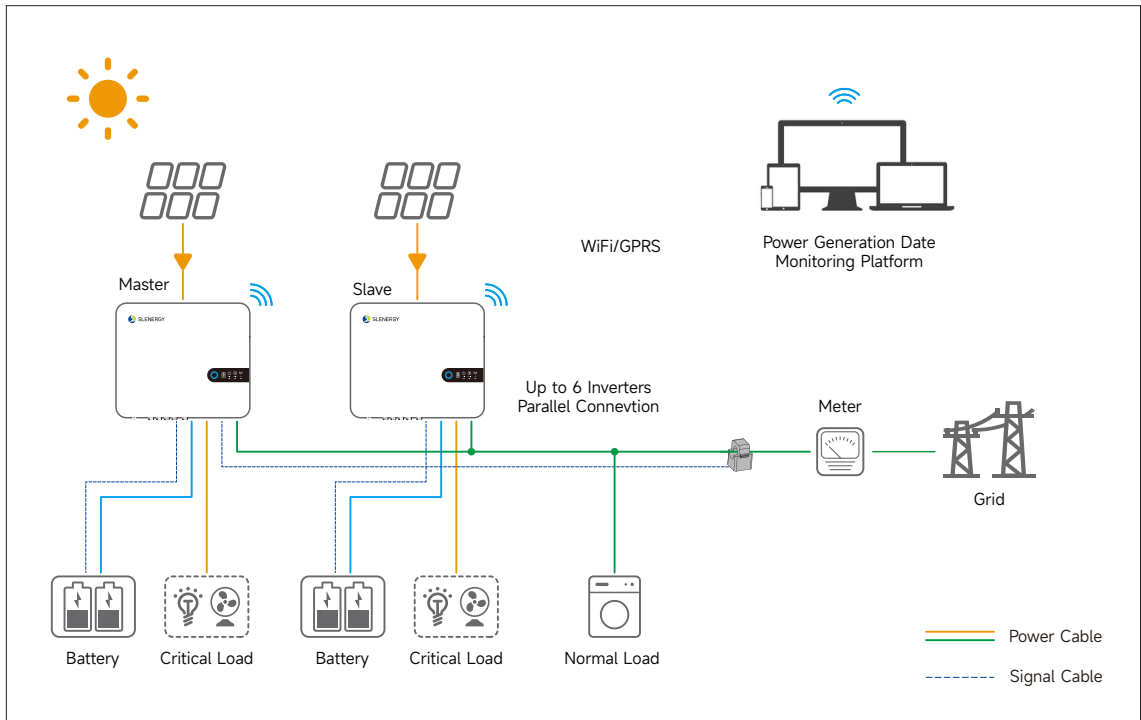
SL5-12KHR-W instantaneous max output power is 13.2kW.

*Only one of the three phases can reach up to 1.3times, and the other two phases should be less than 1.1times.

The inverter will restart in case of overload protection. The time required for restarting will increase (5 min at most) if overload protection repeats. Try to reduce Back-Up load power within maximum limitation or remove the loads which may cause very high start-up current surges.

2.10 System with multiple inverters

Up to 6 inverters can be connected in parallel, to the grid connections.



NOTICE

- Multiple inverters connected in parallel shall be of the same power model with the same power and battery configuration.
- The smart meter or CTs are connected to the Master inverter. Control of all inverters takes place via the link cable.
- For the parallel switching of several devices, it is recommended to use a joint AC load break switch for the connected loads at the LOAD connection.
- For the parallel switching of several devices, it is recommended to use a joint AC load break switch for the connected loads at the GRID connection.
- In order to evenly distribute the loads among the inverters, the cable length between each output and the load must be the same.
- If the maximum apparent power of a load is greater than 110% of the inverter' s rated output, the device must not be connected via the AC LOAD terminal, but rather directly to the grid.

Requirements for multiple inverters in parallel.

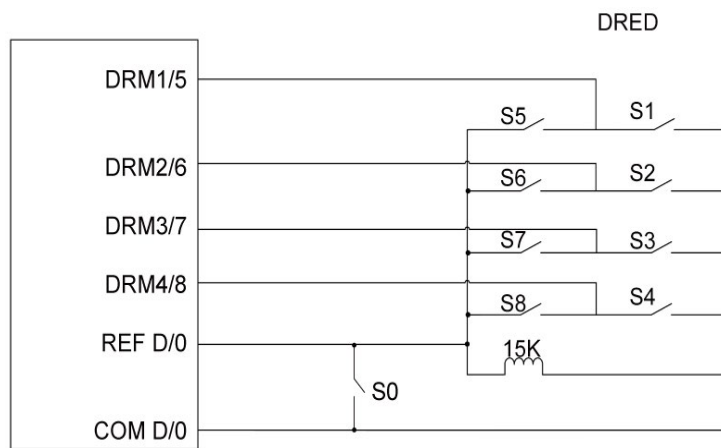
When multiple inverters are connected to the power grid in parallel, please ensure that the total number of inverters in parallel does not exceed 6. Otherwise, please contact us to confirm the technical solution.

2.11 DI Control

DRM and Ripple Control support only one function at the same time.

DRED (Demand Response Enabling Device) interface is special reserved for Australia and New Zealand according to their safety regulation, and Solinteg doesn't provide the DRED device for the customer. The inverter supports the demand response modes as specified in the standard AS/NZS 4777. The inverter has integrated a terminal block for connecting to a DRED.

DRED wiring diagram (hybrid inverter) as below:



DRED mode as shown in table below:

Mode	Function
DRM 0	Operate the disconnection device
DRM 1	Do not consume power
DRM 2	Do not consume at more than 50% of rated power
DRM 3	Do not consume at more than 75% of rated power and source reactive power if capable
DRM 4	Increase power consumption (subject to constraints from other active DRMs)
DRM 5	Do not generate power
DRM 6	Do not generate at more than 50% of rated power
DRM 7	Do not generate at more than 75% of rated power and sink reactive power if capable.
DRM 8	Increase power generation (subject to constraints from other active DRMs)
Priority	DRM1 > DRM2 > DRM3 > DRM4 DRM5 > DRM6 > DRM7 > DRM8

NOTICE

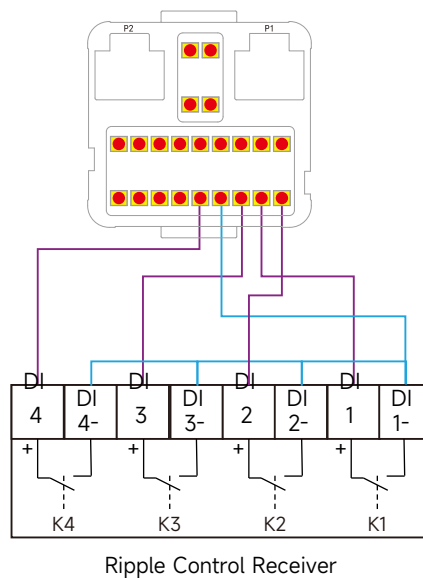
There is a resistor between 15(COM D/0) and 16(REF D/0), do not move the resistor while wiring.

2.12 RCR

RCR (Ripple Control Receiver) interface is special reserved for Germany and some other European country according to their safety regulation, and Solinteg doesn't provide the RCR device for the customer.

In Germany and some European areas, a ripple control receiver is used to convert a power grid dispatching signal to a dry contact signal. The dry contact is required for receiving the power grid dispatching signal.

RCR wiring diagram (hybrid inverter) as below:



RCR operation mode as shown in table below:

Switch mode (External RCR device)	Feed-in output power (in % of the Rated AC output power)
K1	Turn on 100%
K2	Turn on 60%
K3	Turn on 30%
K4	Turn on 0%
RCR priority: K1<K2<K3<K4	

2.13 Function Description

The functions of the inverter are summarized as follows:

On-grid Power Generation

The inverter converts DC into AC that meets the requirements of the grid and feeds it into the grid.

Off-grid Energy Storage

The inverter stores the DC from the photovoltaic panel to the battery, and inverts and releases AC for load use when needed.

Data Storage

The inverter stores system information such as operating information and fault records.

Parameter Configuration

The inverter provides a variety of parameter configurations, and users can configure parameters through the App to make it meet various needs or adjust its operating performance to the best.

Communication Interface

The inverter provides a communication accessory port for connecting to the communication module and uploading monitoring data to the background monitor through wireless communication.

After the successful establishment of communication between the inverter and the communication device, the user can view the relevant information of the inverter or set the operation parameters and protection parameters through the smart energy management platform.

Protection

The inverter is equipped with islanding protection, Direct Current Reverse Polarity protection, AC short-circuit protection, leakage current protection, surge protection, etc.

3. Unpacking and Storage

3.1 Unpacking for Inspection

Although the equipment is completely tested and inspected before shipping, damages may still occur during transportation. So, users shall inspect the product in detail before signing.

- Check packing boxes for damages;
- Check if the goods are complete and consistent as per the packing list;
- Unpack and check if the internal parts are intact;
- In case of any damage or incomplete goods, contact the transport company or Slenergy and provide photos of the damage for accurate service;
- Do not discard the shipping packaging of equipment after it is removed, but store it in the original packing box.

3.2 Inverter Storage

The inverter shall be stored in a specific condition if it is not operated at once:

- It shall be repacked by the shipping packing box with the desiccant;
- It shall be stored at a temperature range from -30°C ~ 70°C , with a relative humidity range from 0% ~ 95% and without condensation;
- The stacking of multiple inverters shall adhere to the "maximum stacking layers limit" indicated on the outer box;
- The packaging box may not be tilted or reversed;
- The inverter shall be carefully packaged before re-transportation;
- It shall not be stored in places exposed to direct sunlight, moisture from rain, strong electric fields, etc.;
- It shall not be stored together with objects that may damage the inverter;
- It shall be stored in a clean and dry place to protect it from the erosion of dust and water vapor;
- It shall not be stored in places with chemical corrosive substances or susceptible to pest infestation;
- Regular inspections shall be conducted at least half a year. In case of any signs of pest or rodent damage, the packaging materials need to be replaced;
- If the inverter has been in warehouse for one year or longer, it requires professional inspection and testing before operation.

3.3 The packing list

Name	Quantity	Name	Quantity
Inverter	1	22pin Communication Connection	1
Wall Mounting Bracket	1	Back up AC Quick Connector	1
External CT	1	GRID AC Quick Connector	1
Datalogger	1	Quick Installation Guide	1
PV DC Connector(pair)	2(For 5-8kW) 3(For 10-12kW)	3m Network Cables and Waterproof Connector	1
BAT DC Connector(pair)	1	Factory Inspection Report	1
OT Terminal	1	Screw Mounting Kit	1

4. Mechanical Installation

4.1 Installation Precautions

This chapter describes the inverter installation and its connection to the PV system; For connection of the PV inverter to the PV system, it includes inverter's connection to the PV string and public grid;

Prior to inverter installation, users shall read this chapter and ensure it is installed by professional personnel after meeting all installation conditions.

DANGER

- Ensure that the product has no electrical connections before installation;
- Ensure that the drilling, if required during installation, has avoided the electrical wiring inside the wall.

WARNING


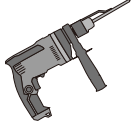


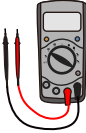
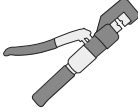

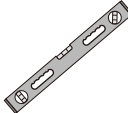
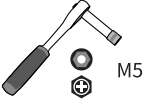
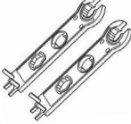


- Avoid improper installation conditions affecting the inverter's performance;
- Install the inverter in a well-ventilated place;
- Ensure that product cooling system or ventilation port is uncovered;
- Do not install the inverter in a flammable, explosive, or smoky environment.

CAUTION

- Improper installation may cause personnel injury!
- Control the weight when the inverter is carried to keep balance, thus avoiding the inverter toppling or falling;
- Wear suitable protective equipment when operating the inverter;
- Do not expose the inverter and its bottom terminals and interfaces directly to the ground or other supports.

4.2 Tool Preparation for Installation

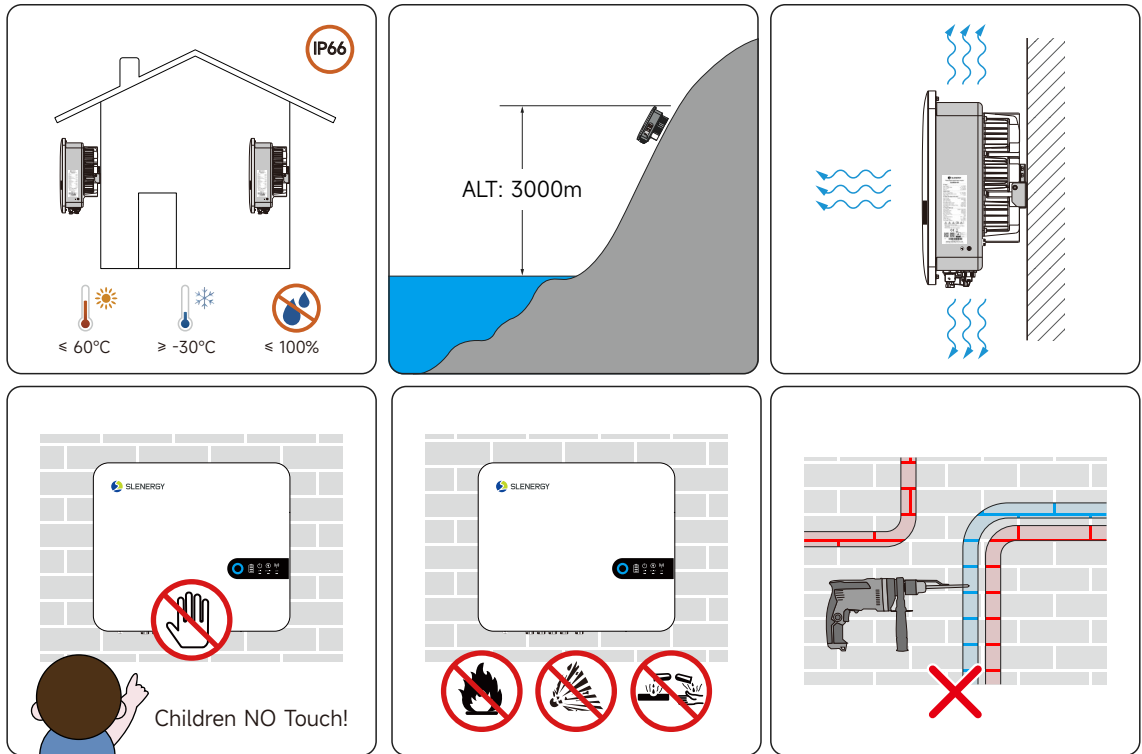
Before installation, the prepared tools include but are not limited to the recommended tools below, with other auxiliary tools available if needed.

 <p>Marker</p>	 <p>Electric drill</p>	 <p>Hammer</p>	 <p>Wrench</p>
 <p>Electric meter</p>	 <p>Hydraulic clamp</p>	 <p>MC4 crimping pliers</p>	 <p>Spirit level</p>
 <p>Socket wrench</p>	 <p>MC4 wrench</p>	 <p>Utility knife</p>	 <p>Cross screwdriver</p>

4.3 Installation Site

For the inverter, optional installation sites play a vital role in ensuring its safe operation, long service life, and good performance.

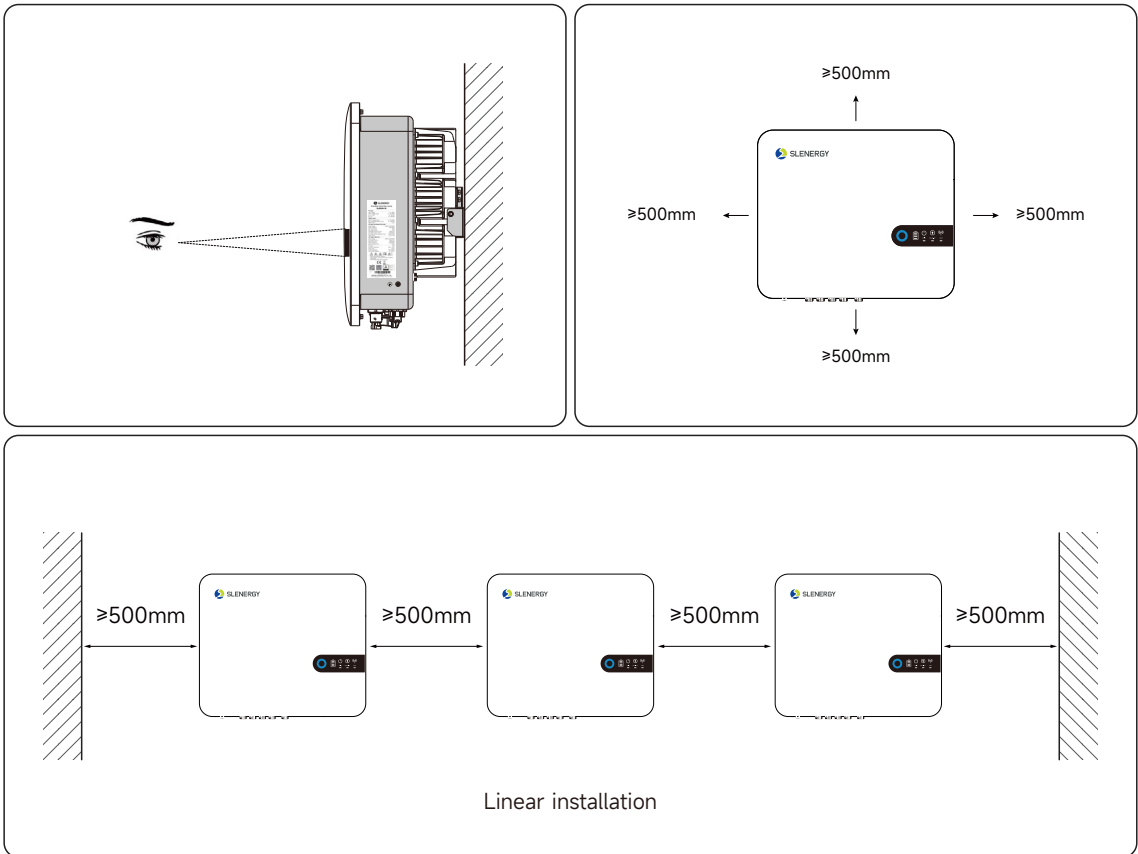
With IP66 protection class, the inverter may be installed indoors or outdoors, but for longer service life, it is more suitable for installation in a sheltered place, such as with an awning.



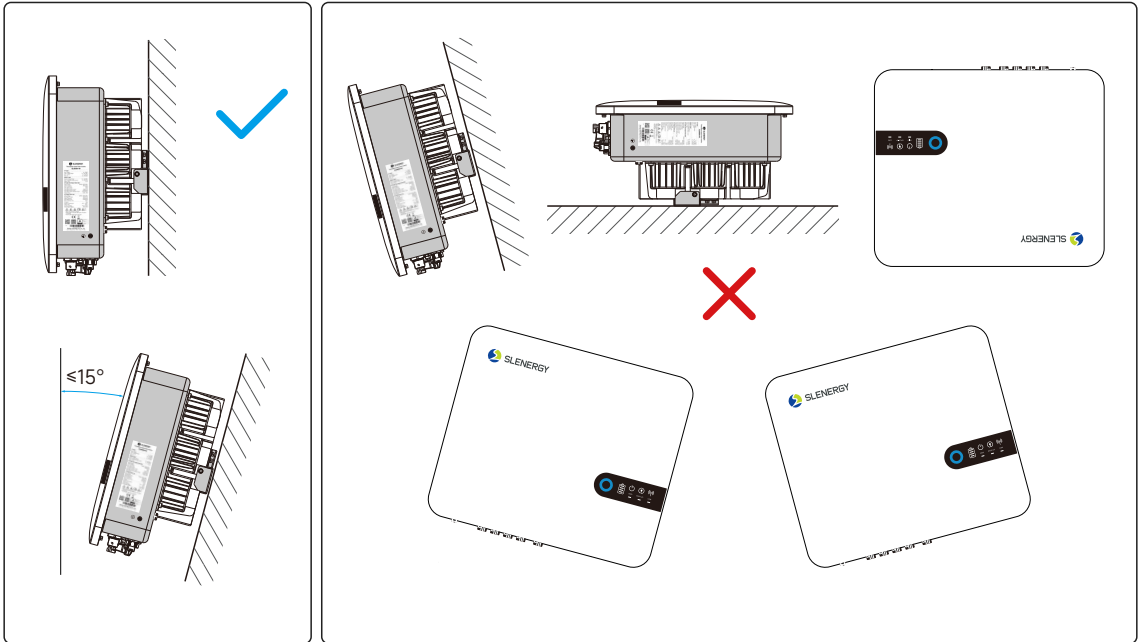
- The installation site shall be easily accessible for electrical connections, operation, and maintenance;
- Due to relatively high temperature at case and heat sink during operation, the inverter shall be placed in a site that is not easily accessible;
- The inverter shall not be installed in a flammable and explosive site;
- The inverter shall be installed in an airy place for good heat dissipation;
- The temperature for installation shall be $-30^{\circ}\text{C} \sim 60^{\circ}\text{C}$;
- The installation site shall be away from electronic equipment with strong electromagnetic interference;
- The installation site shall be a fixed and solid surface, such as wall, metal bracket, etc.;
- In a suitable installation location, the inverter shall be reliably grounded and the grounding metal conductor material shall be consistent with that of the inverter reserved grounding.

4.4 Space Requirements

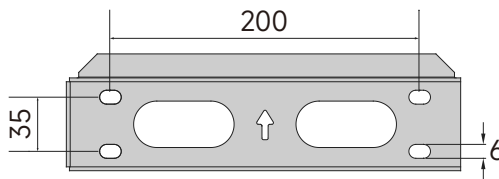
- At a suitable installation height, the user's sight is at the same level as the display window of LED, making it easy to check the inverter status.
- When multiple inverters are installed, a certain distance shall be reserved between inverters, and a linear installation is recommended. The left and right spacing is shown below.
- Sufficient reserved space around the installation site may facilitate the inverter disassembly and air convection. The installation space requirements for a inverter are illustrated on the right.



The inverter is recommended to be installed vertically for heat dissipation, avoiding forward-leaning, backward-leaning, reverse, horizontal, or inclined installations.

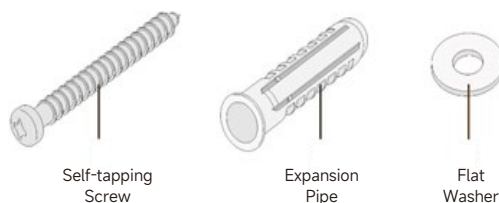


4.5 Dimensions of Wall-mounted Plate



4.6 Installation Steps of Wall-mounted Plate

- After moving the inverter to the installation site, install the hanging plate onto the wall by fixing the bolt assembly, and then hang the inverter onto the hanging plate.
- The attachment of the mounting screw package is shown below:

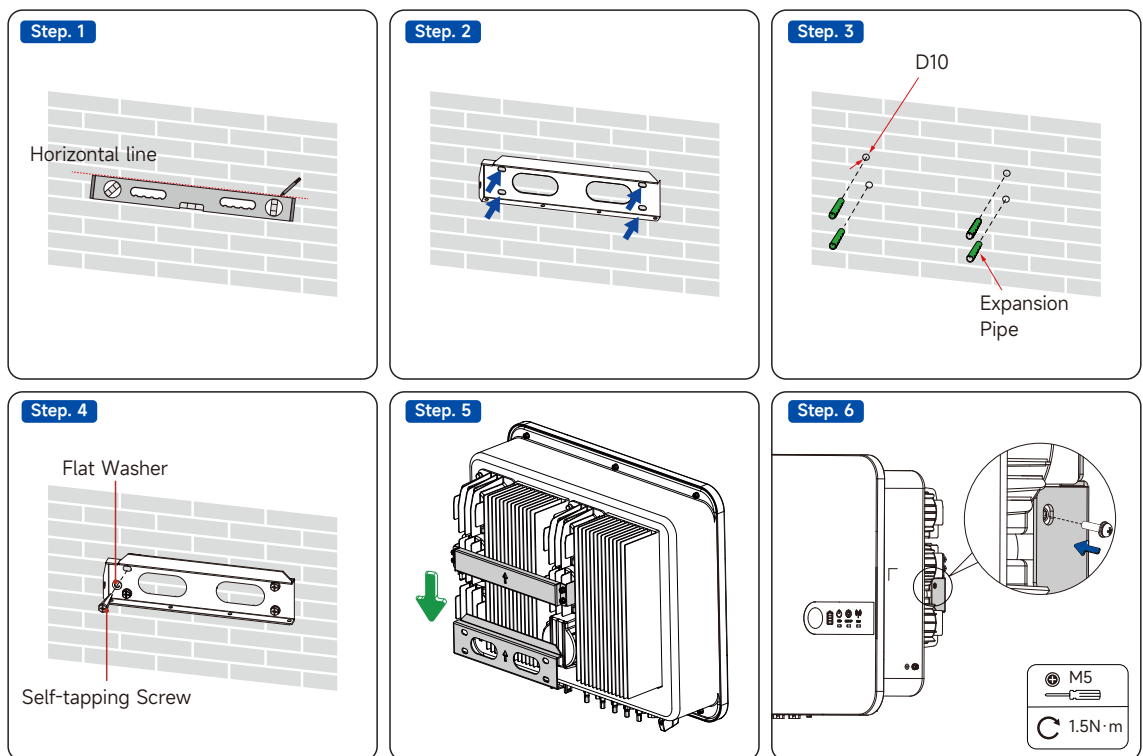


4.7 Installation Steps

NOTICE

Before drilling, avoid the electrical wiring inside the wall.

- STEP 1:** Draw a horizontal reference line with a level on the wall.
- STEP 2:** Place the hanging plate flush on the wall, mark the recommended holes as shown, and drill the holes to a depth of about 70 mm.
- STEP 3:** Knock the plastic expansion pipe into the hole.
Ensure that the PV string is connected to the correct cable polarity.
- STEP 4:** Use the self-tapping screw+flat washer to fix the hanging plate on the wall with a tightening torque of 9 N.m.
- STEP 5:** Lift the inverter and hang the installation lug to the hanging plate. Release your hands until the inverter has been fixed in the backing plate.
- STEP 6:** In terms of the left side hole of case and wall hangings, fasten the inverter to the hanging plate using M4x12 screws, with a torque of 1.5 N.m.



5 Electrical Connection

5.1 Safety Precautions

DANGER

- Beware of high voltage in the inverter;
- Avoid the exposure of PV string to sunlight, otherwise, it may cause hazardous voltage;
- Keep the AC/DC circuit breaker switch off before connecting to avoid a false connection;
- Ensure all cables are uncharged before electrical connection.


WARNING

- During wiring, avoid any improper operation that may cause product damage or personnel injury;
- Complete wiring operations only by professional personnel;
- Use solid, intact, well-insulated and properly sized cables for PV systems.

CAUTION

- Follow local Grid-related rules and PV string-related safety instructions during wiring;
- Ensure that all electrical installations meet the relevant standards of the country/region in which it is located;
- Connect the inverter to Grid only with the permission of local power department.

Before electrical connection, please keep in mind that the inverter has three power sources. During electrical operation, operators must wear protective equipment.

Name	Screen Printing	NOTICE
PV DC Input Terminal	MPPT1+ MPPT1- MPPT2+ MPPT2-	/
BAT DC Input Terminal	BAT+ BAT-	It is connected to the battery.
On-grid AC Output Terminal	GRID	It is connected to the power grid with the aviation connector in the delivery accessories.
Off-grid AC Output Terminal	BACK UP	It is connected to critical loads with the aviation connector in the delivery accessories.
Cloud Platform Datalogger	USB	It is configurable with WIFI/4G communication module.
Communication Terminal	COM	It is configurable with communication of host computer/DRM/RS485/CT/DRY/electricity meter.
BMS Communication	BMS	Cable with waterproof connectors included in the accessories
Protective Grounding Terminal		Secondary protective grounding terminal for reliable grounding of the inverter

5.2 Cable Requirements

Name	Type	Specification/ Outer Diameter (mm)	Conductor Cross-sectional Area (mm ²)
DC Cable --PV	Multi-core photovoltaic cable with maximum withstand voltage of 1000V	6~9	4~6
Bat DC Cable-Bat	Multi-core cable with maximum withstand voltage of 800V	8~12	6~8
Grounding Cable	Outdoor copper core cable	8~12	6~8
On-grid AC Cable	Outdoor copper core cable	6~8	6~8
Off-grid AC Cable	Outdoor copper core cable	6~8	6~8

5.3 System Wire Frame Diagram

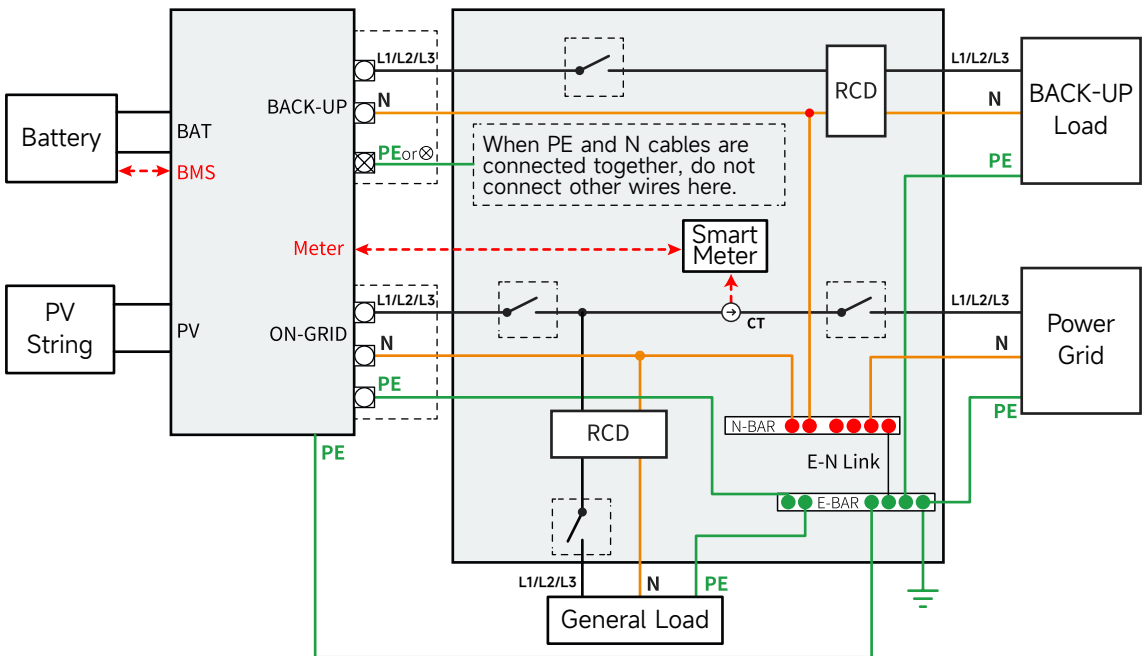
NOTICE

- The N and PE cables of the ON-GRID and BACK-UP ports of inverter are connected in different ways based on local regulations. For specific requirements, please refer to local regulations.
- The ON-GRID and BACK-UP AC ports of inverter are equipped with built-in relays. When the inverter is in off-grid mode, the built-in ON-GRID relay is in the disconnected state. When the inverter is in grid-connected operating mode, the built-in ON-GRID relay is in the closed state.
- After the inverter is powered on, the BACK-UP AC port is powered on. If it requires to maintain the BACK-UP load, the inverter shall be powered off. Otherwise, electric shocks may occur.
- Do not connect the load between the inverter and the AC switch directly connected to the inverter.

1) Wiring mode for connecting N and PE lines together in the distribution box

NOTICE

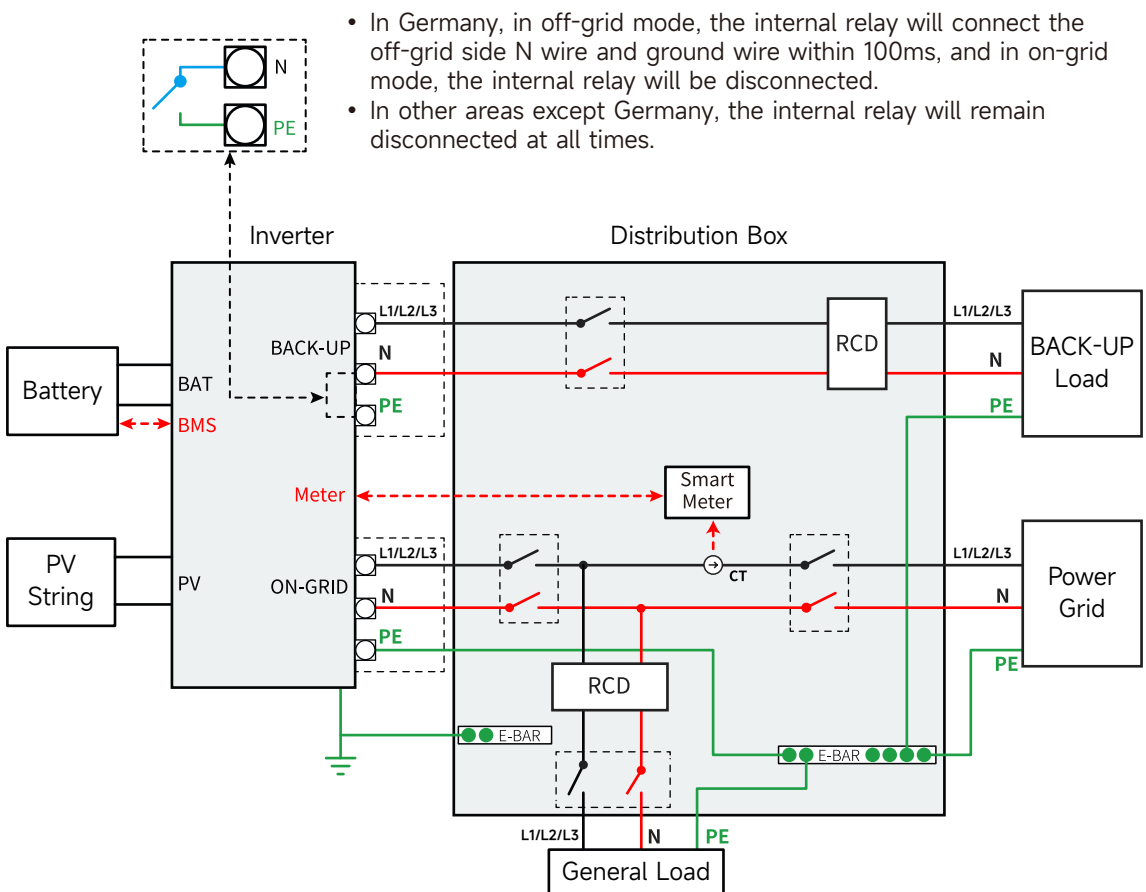
The following wiring mode is applicable to Australia, New Zealand, South Africa and other regions:



2) Wiring mode for separating N and PE lines in the distribution box

NOTICE

- Please ensure that the BACK-UP protective ground wire is properly connected and secured. Otherwise, the BACK-UP function may be abnormal when the power grid experiences a fault.
- The following wiring mode is applicable to the regions except Australia, New Zealand and South Africa:



5.4 External Grounding Connection

- Since the inverter is transformer free, both positive and negative poles of the PV string cannot be grounded, otherwise the inverter would not function properly.
- An external grounding connection is required before PV string and communication connections on the AC side.
- The grounding connection of the external protection grounding terminal cannot replace the PE terminal connection in the AC wiring. It shall be ensured that both of them are reliably grounded. Otherwise, Slenergy shall not be liable for any consequences that may occur.

5.4.1 Requirements for External Grounding

- In photovoltaic power generation system, all non-current-carrying metal components and equipment housing should be grounded (such as photovoltaic bracket, inverter housing, etc.).
- The external grounding terminal of a single inverter shall be near-end grounded.
- If multiple inverters are deployed, external grounding terminals of all inverters and grounding points of the photovoltaic bracket shall be connected to the equipotential line (based on site conditions) to ensure the equipotential connection.

5.4.2 Wiring Steps

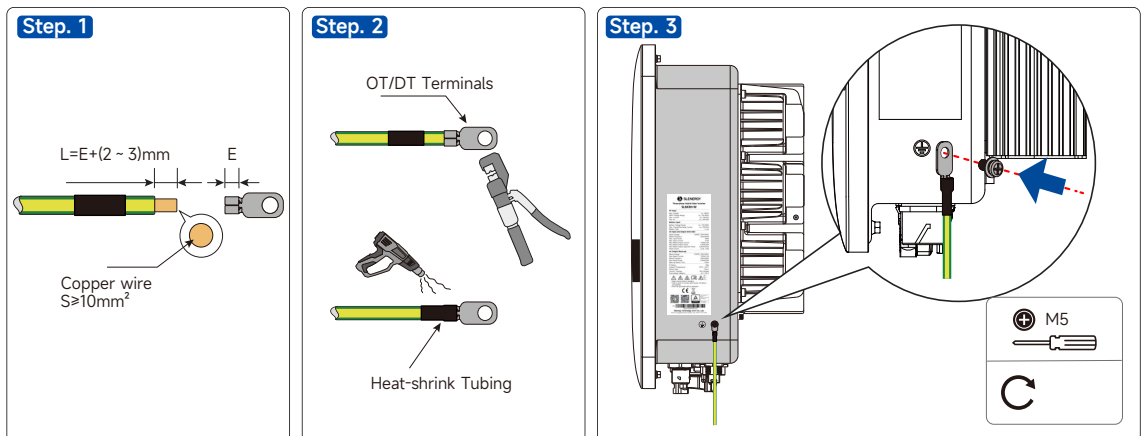
- The cross sectional area of the secondary grounding cable must be the same as that of the PE core wires in the AC cable.
- The secondary grounding cable and OT/DT terminals shall be prepared by the customer on its own.

STEP 1: Prepare cables and crimp OT/DT terminals.

STEP 2: Remove the screw from the grounding terminal and secure the cable with a screwdriver.

STEP 3: Apply silicone gel or paint to the grounding terminal to enhance its corrosion resistance.

END



5.5 AC Side Connection

5.5.1 Requirements on AC Side

Before connecting to the power grid, please ensure that the power grid voltage and frequency meet the requirements of the inverter. Please see “Technical Data” for details, or contact the power company to solve the problem.

***Inverters can only be connected to the grid with access permission by the local power company.**

AC Circuit Breaker

An independent circuit breaker is configured on the AC side of each inverter to safely disconnect the inverter from the power grid.

Model Number of the Inverter	Recommended AC Circuit Breaker Parameters
SL5KRH-W, SL6KRH-W	25A/400~
SL8KRH-W	32A/400~
SL10KRH-W	40A/400~
SL12KRH-W	50A/400~

- Multiple inverters cannot share one AC circuit breaker.
- The load cannot be connected between the inverter and the AC circuit breaker.
- When the inverter is used as an electrical appliance, the maximum AC input current is 36.4A.

Leakage-current Protector

The inverter is equipped with an integrated comprehensive leakage current monitoring unit. When the inverter detects a leakage current greater than the allowable value, it will quickly disconnect from the power grid.

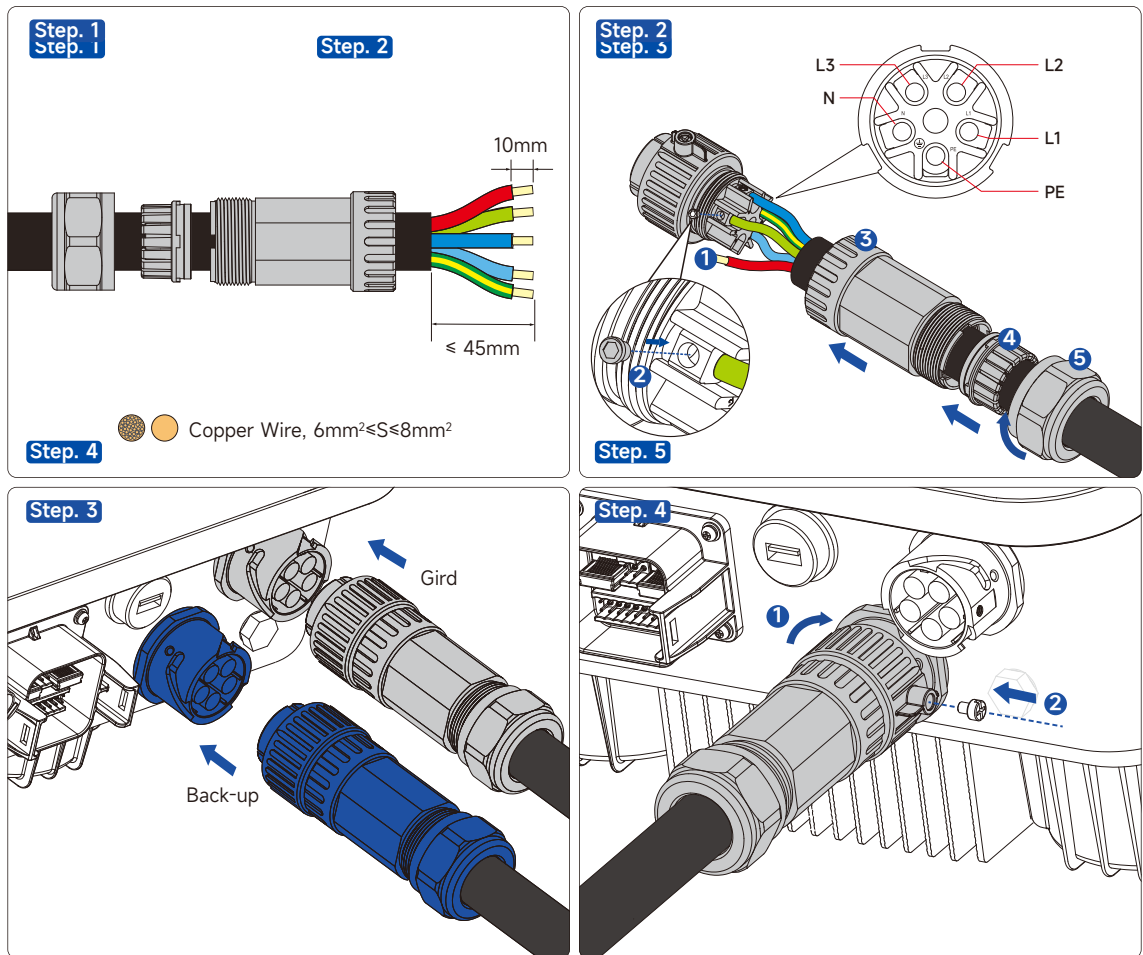
⚠ DANGER

- Install Residual current device (RCD) in front of the load.
- RCD is necessary for critical load, but optional for normal load.
- In off-grid mode, the Entry master switch is unprotected and load leakage could lead to shock danger.
- The Entry master switch installed in the house must have earth leakage protection and its rated earth leakage action current > number of inverters * 100mA.

NOTICE

- The inverter SL5-12KRH has a built-in RCD (univ. sensitive residual current protection). If an external RCD is required, we recommend an RCD type A featuring a residual current of 100 mA or higher.
- Please follow the national rules and regulations for the installation of external relays or circuit breakers!

5.5.2 BACK-UP & GRID



NOTICE

- Position of the PE cable and the N cable. If the phase wire is connected to the PE or N terminals, the inverter may be irreversibly damaged.
- Please ensure that the cable core is fully connected to the terminal wiring hole without any exposure.
- Please ensure that cables are securely connected. Otherwise, the terminal may over-heat, causing damage to the device during operation.
- Ensure that the phase sequence of the mains and the machine is consistent, otherwise the machine will alarm and will not allow the mains to be connected.

5.6 DC-side Connection (PV)

⚠ Danger! Electric shock.

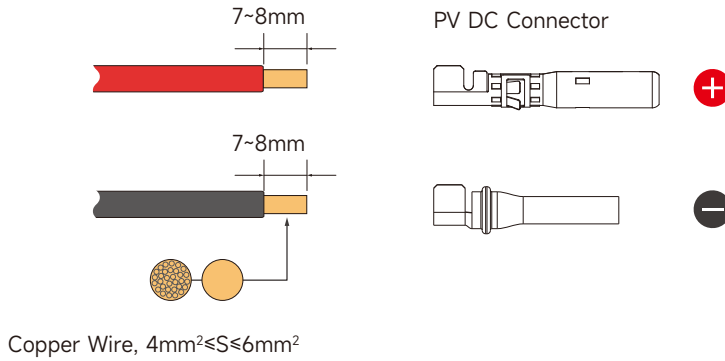
- Please pay attention to safety before electrical connection, and photovoltaic array exposed to sunlight will produce dangerous voltage;
- Before connecting the photovoltaic array to the inverter, please ensure that the photovoltaic array is well insulated from the ground;
- When the inverter is installed and operated, ensure that the PV string is not short-circuit for positive or negative polarity to ground. Otherwise, it may lead to inverter AC/DC short circuit, resulting in product damage, which is not covered under the warranty;
- The connection of the PV string shall meet the following requirements, otherwise the inverter may be permanently damaged, and such damage is not covered under the warranty;
- The voltage and maximum short-circuit current of each PV string shall be within the allowable range. See “Technical Parameter” for details;
- When the same PV string is mixed with different brands or models of PV modules or connected to PV modules with different orientation angles or tilt angles, such conditions may not damage the inverter, but will affect the system performance;
- When the input voltage >1000V, the inverter will be in the Fault mode. When the voltage is restored within the MPPT working voltage range of 135V-900V, the inverter will return to its normal operation.

5.6.1 DC Connector Assembling

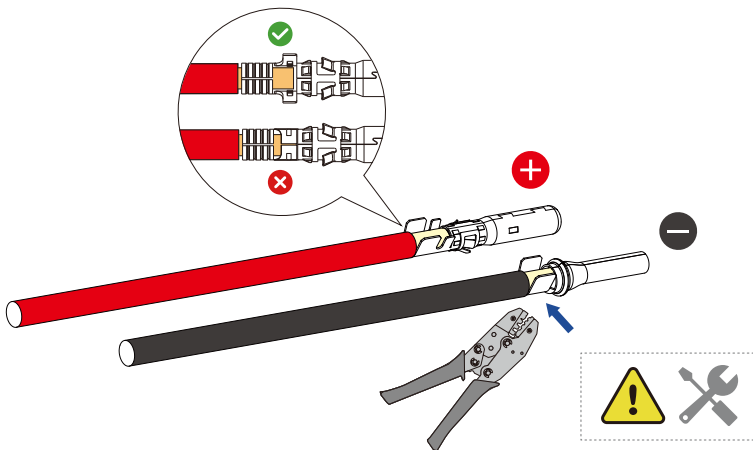
⚠ Beware of high voltage in the inverter!

- Ensure all cables are uncharged before electrical connection;
- Keep the DC circuit breaker switch off till the electrical connection of the inverter is done;
- Use only the supplied connectors to ensure that the inverter has an IP66 protection class.

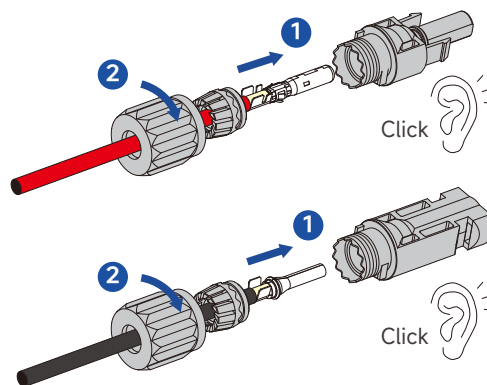
STEP 1: Strip 7mm of insulation layer from each DC cable.



STEP 2: Harness cable wire ends at wire terminals with a crimping plier.



STEP 3: Thread the cable into the cable gland and fasten it by inserting it into the insulating sleeve. Pull the cable lightly to ensure it is connected tightly. Fasten the cable gland and the insulating sleeve with a force of 2.5-3 N·m.



- Ensure that the PV string is connected to the correct cable polarity.
- If the DC input polarity is reversed, the inverter will be in fault or alarm status instead of normal operation.

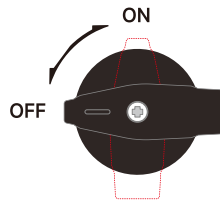
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5.6.2 DC Connector Installation (PV)

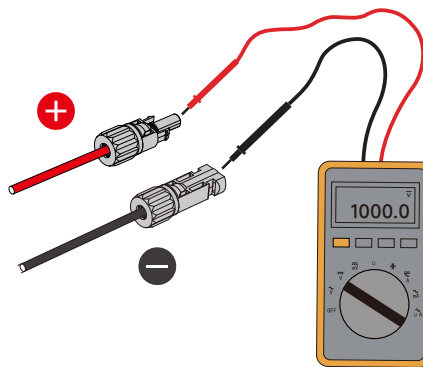
NOTICE

- Before connecting the DC connector to the inverter, please check the positive and negative polarity of the PV string, and then insert the DC connector into the corresponding DC terminal.
- If the DC connector is not properly assembled, it may cause arcing or connector overheating, and the resulting loss will not be covered by the warranty.

STEP 1: Manually turn the DC switch to “OFF”.



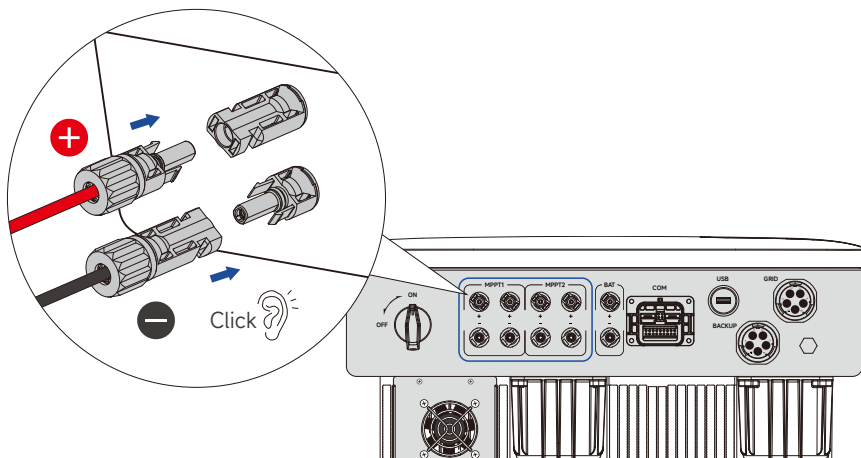
STEP 2: Check whether the PV string is connected to the correct cable polarity, and ensure that the open-circuit voltage never exceeds the upper inverter input limit of 1000V.



STEP 3: Insert the DC connector into the corresponding DC terminal until there is a “click” sound.

STEP 4: Repeat the preceding steps to connect other PV strings.

STEP 5: Use the MC4 waterproof plug to block the vacant DC terminals.



END

5.7 DC-side Connection (BAT)

⚠ Danger

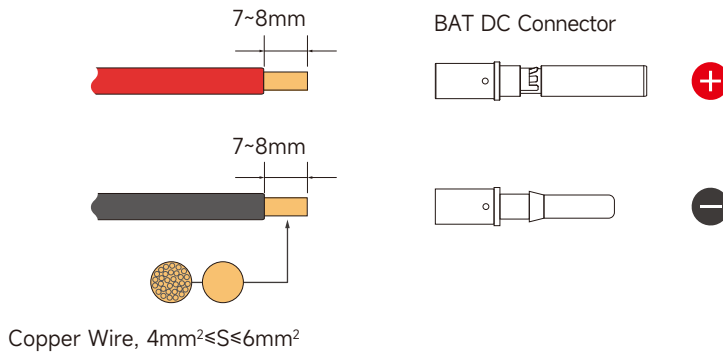
- The battery used with the inverter must be approved by the inverter manufacturer. The list of approved battery is available in the official website.
- Battery short circuit may cause personal injury. The high current caused by short circuit may release a large amount of energy, which may cause fire.
- Before connecting the battery cable, please ensure that the inverter and battery are powered off, and the front and rear switches of the device are disconnected.
- Do not connect or disconnect battery cables when the inverter is operating. Improper operations may result in electric shock.
- Do not connect the same battery string to multiple inverters; otherwise, the inverters may be damaged.
- Do not connect the load between the inverter and the battery.
- Please use insulation tools when connecting battery cables to prevent accidental electric shock or battery short circuit.
- Please ensure that the open-circuit voltage of the battery is within the allowable range of the inverter.
- If there is no DC switch on the battery side, a DC switch shall be installed between the inverter and the battery.

5.7.1 DC Connector Assembling

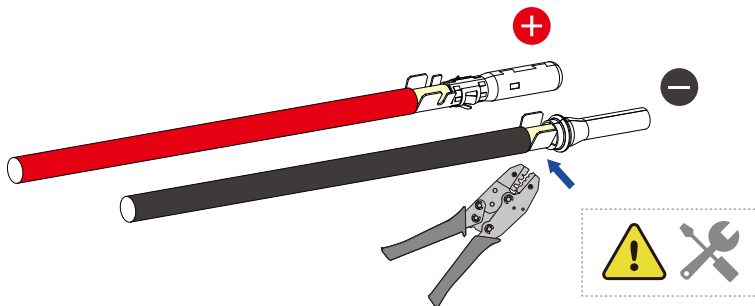
⚠ Beware of high voltage in the inverter!

- Ensure all cables are uncharged before electrical connection;
- Keep the DC circuit breaker switch off till the electrical connection of the inverter is done;
- Use only the supplied connectors to ensure that the inverter has an IP66 protection class.

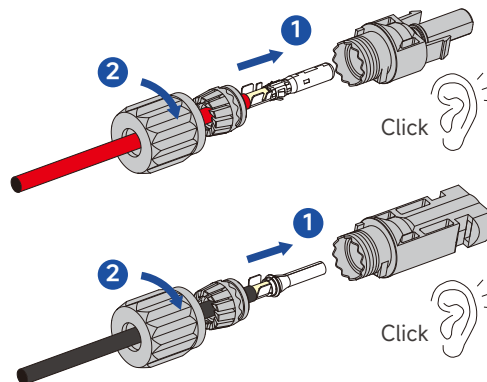
STEP 1: Strip 7mm of insulation layer from each DC cable.



STEP 2: Harness cable wire ends at wire terminals with a crimping plier.



STEP 3: Thread the cable into the cable gland and fasten it by inserting it into the insulating sleeve. Pull the cable lightly to ensure it is connected tightly. Fasten the cable gland and the insulating sleeve with a force of 2.5-3 N·m.



- i** • Ensure that the PV string is connected to the correct cable polarity.
- If the DC input polarity is reversed, the inverter will be in fault or alarm status instead of normal operation.

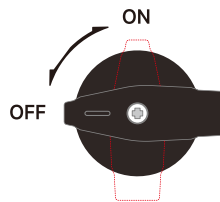
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5.7.2 DC Connector Installation (BAT)

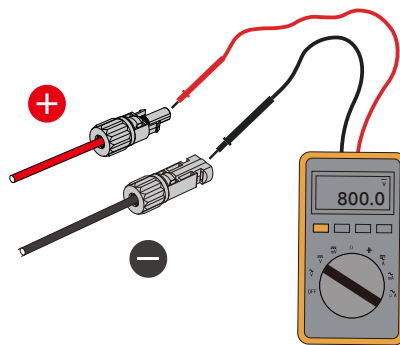
⚠ Beware of high voltage in the inverter!

- Before connecting the DC connector to the inverter, please check the positive and negative polarity of the battery panel, and then insert the DC connector into the corresponding DC terminal.
- If the DC connector is not properly assembled, it may cause arcing or connector overheating, and the resulting loss will not be covered by the warranty.

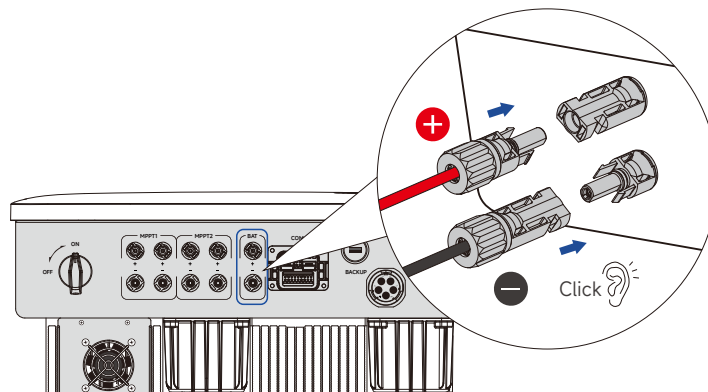
Step 1: Switch on the battery.



Step 2: Check whether the battery is connected to the correct cable polarity, and ensure that the voltage never exceeds the upper inverter input limit of 800V.



Step 3: Insert the connector into the corresponding BAT interface until there is a “click” sound.



- Ensure that the PV string is connected to the correct cable polarity.
- If the DC input polarity is reversed, the inverter will be in fault or alarm status instead of normal operation.

END

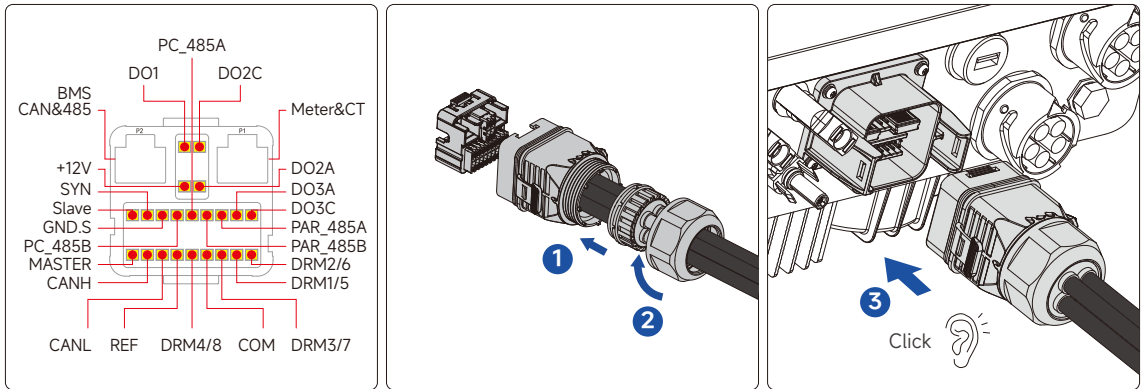
6. Communicating Connection

6.1 Communication Cable Connection

NOTICE

- The inverter comes with a BMS battery communication cable, and the default length of BMS communication cable is 3m;
- There are RS485 and CAN communications between the inverter and the battery BMS, and one of the two options can be used;
- The communication between the battery BMS and the host computer supports the connection of standard RJ45 registered jack, and the port definitions are as follows.

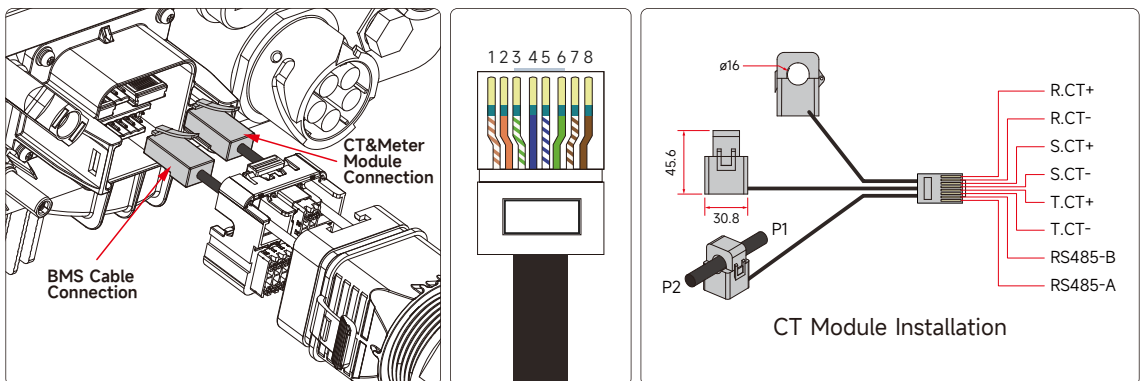
S/N	Port Definition	Function	Functional Description
1	DRM2/6	DRED grid dispatching	DRED (Demand Response Enabling Device): The inverter meets Australian DERD certification requirements and provides a DRED signaling control port.
2	DRM1/5		
3	DRM3/7		
4	COM		
5	DRM4/8		
6	REF		
7	CANL	Parallel communication	Reserved
8	CANH		
9	MASTER		
10	Slave		
11	SYN		
12	GND.S	GND	
13	PC_485B	Parallel RS485 communication	Communication A/B between the inverter and Host computer RS485 or Smart Box RS485. The inverter comes with a CT as standard, and supports optional meters;
14	PC_485A		
15	PAR_485B		
16	PAR_485A		
17	DO3A	Load control	The inverter has a reserved dry contact control port that supports the connection of an additional contactor for controlling the load on or off.
18	DO3C		
19	DO2A		
20	DO2C		
21	+12V		
22	DO1		



6.2 BMS & CT/Meter Cable Connection

NOTICE

When connecting the communication cable, please make sure that the definition of the wiring port is fully matched with the equipment, and the cabling path should avoid sources of interference, power cables, etc., so as not to affect the signal reception.



BMS Cable Connection(P2)

S/N	Color	Interface Definition	Interface Implication
1	Orange&white	RS485-A.BAT	Communication A/B between the inverter and the battery RS485.
2	Orange	RS485-B.BAT	
3	Green&white	NC	Communication H/L between the inverter and the battery CAN.
4	Blue	CANH.BAT	
5	Blue&white	CANL.BAT	
6	Green	NC	
7	Brown&white	NC	
8	Brown	NC	

CT Cable Connection(P1)

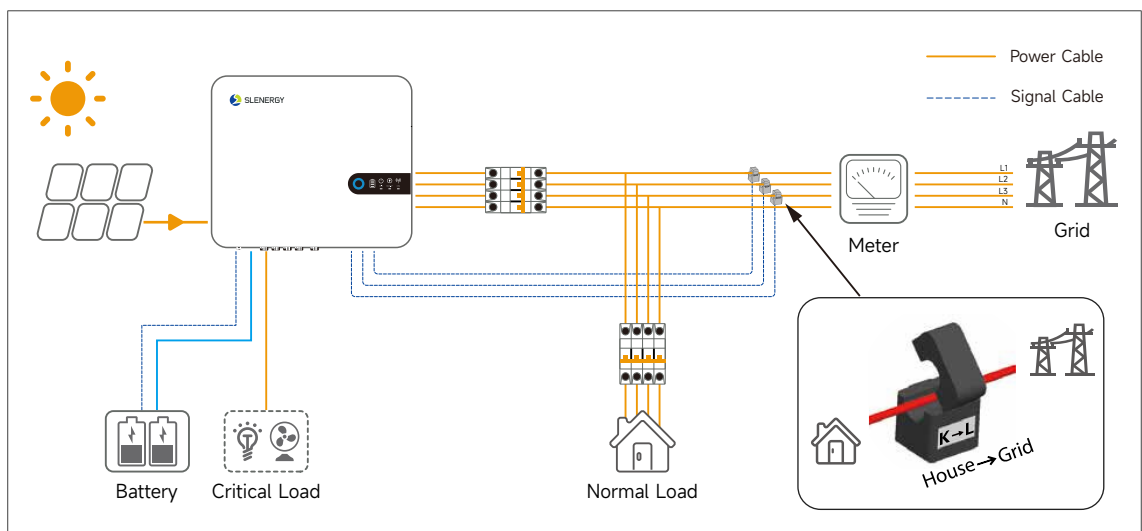
S/N	Color	Interface Definition	Interface Implication
1	Red	R.CT+	Sample the household loads to realize self-generation and self-consumption functions.
2	Black	R.CT-	
3	Red	S.CT+	
4	Black	S.CT-	
5	Red	T.CT+	
6	Black	T.CT-	
7	NC	NC	
8	NC	NC	

Meter Cable Connection(P1)

S/N	Color	Interface Definition	Interface Implication
1	Orange&white	NC	The inverter comes with a CT as standard, and supports optional meters; One of the two options can be used; If you choose a meter, you need to connect the meter to the RS485 communication before connecting it to the inverter.
2	Orange	NC	
3	Green&white	NC	
4	Blue	NC	
5	Blue&white	NC	
6	Green	NC	
7	Brown&white	RS485-B	
8	Brown	RS485-A	

NOTICE

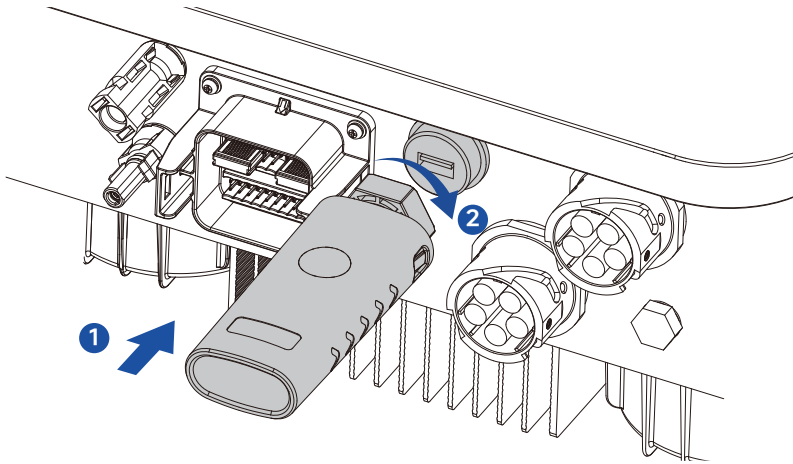
- The external CT is an important part of the system, so the position and direction of the CT need to be installed correctly. Please refer to the figure below.
- Each inverter comes with three CTs as standard. The inverter and CT are calibrated, and replacement of other CTs is not allowed.
- The inverter comes with a CT as standard. If you need a meter, you can contact the manufacturer to purchase a matching one, please refer to the instruction manual for its installation.



6.3 Datalogger Installation

NOTICE

- WIFI communication module is included in the accessories of the inverter. After the inverter is connected to the communication module and accessed to the cloud server, users can set the parameters of the inverter and check the power generation and operation status of the inverter on the App.
- For the detailed configuration of the module and the content of the supporting App, please refer to the manual supplied with the module.



6.4 Setting of Inverter Parameters on APP

SMART M is a cell phone application that can communicate with the inverter via WIFI module or GPRS module. You can download the APP by scanning the following QR code with mobile phone, or searching for “Smart M” in the App Store (Android or iPhone).

You can also go to <https://global.slenergytech.com> to log in to search data.

The following are the commonly used functions.

- Check the inverter’s operation data, power generation, software version, alarm and error messages, etc.
- Enable various functions of the inverter, and set detailed parameters of the functions.
- Maintain the equipment.



7. Commissioning

7.1 Pre-commissioning Checks

Before turning on the inverter for the first time, the following checks need to be done:

S/N	Inspection Item	Inspection Result	
		Normal	Abnormal
1	Check and confirm whether all equipment is reliably installed in place.	<input type="checkbox"/>	<input type="checkbox"/>
2	Check whether the DC switches and AC circuit breakers are “OFF”.	<input type="checkbox"/>	<input type="checkbox"/>
3	Check whether the grounding lines are properly and reliably connected.	<input type="checkbox"/>	<input type="checkbox"/>
4	Check whether the AC cables are properly and reliably connected.	<input type="checkbox"/>	<input type="checkbox"/>
5	Check whether the DC cables are properly and reliably connected.	<input type="checkbox"/>	<input type="checkbox"/>
6	Check whether the communication cables are properly and reliably connected.	<input type="checkbox"/>	<input type="checkbox"/>
7	Check whether the vacant terminals are sealed.	<input type="checkbox"/>	<input type="checkbox"/>
8	Make sure that no construction tools, etc. are left on top of the machine or in the junction box (if any).	<input type="checkbox"/>	<input type="checkbox"/>
9	Select AC circuit breakers as per the Manual and local standards.	<input type="checkbox"/>	<input type="checkbox"/>
10	Ensure that all safety signs and warning labels are fixed and visible.	<input type="checkbox"/>	<input type="checkbox"/>
11	Check if the connector protective sleeve is locked after the installation of the AC circular plug.	<input type="checkbox"/>	<input type="checkbox"/>

7.2 Commissioning Steps(Startup)

STEP 1: Turn the DC switch on the inverter to “ON”.

STEP 2: If a DC switch is equipped between the inverter and the PV string, close the switch.

STEP 3: If an AC switch is equipped between the inverter and the grid, close the switch.

STEP 4: If a DC switch is equipped between the inverter and the batteries, close the switch.

STEP 5: The inverter will operate normally if the sunlight is normal and the grid conditions meet the grid-connection requirements.

STEP 6: Observe the status of LED indicators (see “LED Indicators” for details).

8. Shutdown, Removing and Disposing of the Inverter

8.1 Shutting Down The Inverter

⚠ Danger! Burns

There is still a burn danger after the inverter has been shut down. After the inverter has cooled down, protective gloves are required before operating the inverter.

There is no need to shut down the inverter under normal conditions, but it is necessary to do so when maintenance or repair work is required. Follow the steps below to disconnect the inverter from the AC and DC power sources, otherwise personal injury or equipment damage may occur.

- STEP 1:** Disconnect the external AC(Backup and grid) circuit breaker prevent reconnection due to misoperation.
- STEP 2:** Disconnect the external DC(Battery and PV) circuit breaker and turn the DC switch of the inverter to “OFF”.
- STEP 3:** Wait for at least 10 minutes until the internal capacitance is fully discharged.
- STEP 4:** Check the DC(Battery and PV) cable with a current clamp to make sure there is no current.

8.2 Removing The Inverter

⚠ Danger! Burns and Electric Shock

- After the inverter is disconnected from the grid and the PV panels and battery, it is necessary to wait for at least 10 minutes before touching the internal conductive devices.
- Both AC and DC power must be de-energized before removing the inverter.
- If there are more than two layers of DC terminals in the inverter, the outer DC connector should be removed before the inner DC connector is removed.

- STEP 1:** Refer to “Electrical Connections” and follow the steps in reverse order to disconnect all electrical connections from the inverter. For the removal of the DC connector, an MC4 wrench is required to loosen the locked component, and a waterproof plug should be installed.
- STEP 2:** Refer to “Mechanical Installation” and follow the steps in reverse order to remove the inverter.
- STEP 3:** Remove the panel from the wall, if necessary.
- STEP 4:** If the inverter is to be used in the future, please refer to “Inverter Storage” to store the inverter properly.

8.3 Disposing The Inverter

- It is the responsibility of the user to dispose of the inverter.
- Some parts and equipment of the inverter, such as capacitors, may cause environmental pollution.
- Do not dispose of this product with household waste, but rather dispose of it in accordance with the applicable electronic waste disposal regulations at the installation site.

9. Troubleshooting and Maintenance

9.1 Troubleshooting

The fault codes and troubleshooting methods of the inverter are detailed in the table below. The model you purchased may only contain some of the fault information. When the inverter malfunctions, you can query the corresponding information by the fault codes on the mobile App.

If the troubleshooting methods cannot help you with your problems, please contact the After-sales Service Center.

When contacting the After-sales Service Center, please collect the following information to facilitate a quick solution to the problem.

1. Inverter information, such as: S/N, software version, equipment installation time, fault occurrence time, fault frequency, etc.
2. Equipment installation environment, such as: weather conditions, whether the components are covered, shadowed, etc. It is recommended to provide photos, videos and other related documents to help analyze the problem in the installation environment.

Main Code	Type	Sub Code	Fault Information	Troubleshooting Method
01	PV Voltage Fault	33	PVA High voltage	Check solar panel configuration to ensure open circuit voltage is less than 1000V.
		34	PVB High voltage	
02	PV Reverse Connection Fault	01	PVA Reverse Connection Fault	Disconnect inverter PV/battery/national grid(utility) input, exchange positive, and negative pole connections of PVA/PVB.
		02	PVB Reverse Connection Fault	
03	PV Short Circuit Fault	01	PVA Short Circuit Fault	Contact the Customer Service Center.
		02	PVB Short Circuit Fault	
04	Abnormal BUS Voltage	01	Low BUS Voltage	<ul style="list-style-type: none"> Restart the inverter: Disconnect the AC output side switch and DC input side switch, and close them after 5 minutes; If the fault still exists after restarting, contact the installer.
		02	High BUS Voltage	
		03	Unbalanced BUS Voltage	
		04	Hardware BUS Overvoltage	
		05	Battery soft start timeout	
		06	Grid supply soft start timeout	
		07	DCDC Soft start timeout	
05	PV/AC Overcurrent Fault	01	Inverter Hardware Overcurrent	<ul style="list-style-type: none"> Check whether the voltage and frequency of the utility/national grid are stable. If the power grid fluctuates greatly, enable the weak current network mode and then restart the inverter; If the fault still exists after restarting, contact the installer.
		02	Inverter Software Overcurrent	
		03	BOOST Hardware Overcurrent	<ul style="list-style-type: none"> Restart inverter; If it still fails after restarting, contact the installer.
		04	BOOST Software Overcurrent	
		05	DCDC Hardware Overcurrent	<ul style="list-style-type: none"> Disconnect the battery, check whether the battery output and inverter battery terminal are short-circuited, and restart the inverter after no short circuit; If the fault still exists after restarting, contact the installer.
		06	DCDC Software Overcurrent	

Main Code	Type	Sub Code	Fault Information	Troubleshooting Method
06	Temperature Fault	01	Inverter Module Over Temperature	Generally, the inverter will operate again after its internal or module temperature returns to normal, but if the fault recurs: <ul style="list-style-type: none"> • Check the inverter for high ambient temperatures; • Check if the inverter is located in an airy site; • Check if the inverter is exposed to direct light, and if so, provide some shelters; • Check the fan for normal operation, and if not, replace it; • Contact the Customer Service Center if the fault still exists not for the above reasons. Shut down and disconnect the inverter, wait for the ambient temperature rising to the normal operating temperature range, and then restart the inverter.
		04	Environment Over Temperature	
		06	DC-DC Module Over Temperature	
		20	Environment Low Temperature	
09	Communication Fault	01	Master DSP to ARM communication fault	Restart the inverter: Disconnect the AC output side switch and DC input side switch and close them after 5 minutes. If the fault still exists, please contact your dealer or After-sales Service Center.
		02	ARM to master DSP communication fault	
		03	Master DSP to slave DSP communication fault	
		09	Abnormal communication between integrated energy storage machine and BMS	
10	Leakage-current Fault	01	30mA abrupt fault	<ul style="list-style-type: none"> • Humid environment of the battery panel or poor sunlight will lead to this fault. Generally, the inverter will be re-connected to the grid after the environment is improved; • If the environment is normal, check whether the insulation of DC and AC cables is normal; • If it is confirmed that the fault is not due to one of the above reasons and it still exists, please contact your dealer or After-sales Service Center.
		02	60mA abrupt fault	
		03	150mA abrupt fault	
		04	High static leakage current	
		05	Leakage current sensor fault	
11	Relay Fault	01	Relay failure	
12	DCI Fault	01	R DC current exceeds the standard	<ul style="list-style-type: none"> • Restart inverter; • If it still fails after restarting, contact the installer.
		02	S DC current exceeds the standard	
		03	T DC current exceeds the standard	
13	Signal Sampling Fault	11	Signal Sampling Fault	
14	Grid Voltage Fault	02	Primary undervoltage on the grid	<ul style="list-style-type: none"> • Check whether the AC circuit breaker is closed; • Check whether the power supply from the grid is reliable; • Check whether the AC wiring is tight; • Check whether the AC cable is connected to the correct wiring terminal (whether the live wire and N wire is reversed); • If it occurs by chance, it may be a short time abnormality of the grid. The inverter will return to normal operation after detecting the normal grid, no manual intervention is required. • If it occurs frequently, please check whether the grid voltage/frequency is within the allowable range for machine operation.
		03	Secondary undervoltage on the grid	
		07	Primary overvoltage on the grid	
		08	Secondary overvoltage on the grid	
		16	10-minute overvoltage on the grid	
15	Grid Frequency Fault	01	Primary underfrequency on the grid	<ul style="list-style-type: none"> • If the grid voltage/frequency is outside the allowable range, please contact the local power operator. • If the grid voltage/frequency is within the allowable range, it is necessary to modify the underfrequency protection point of the grid of the inverter or disable the underfrequency protection function of the grid with the consent of the local power operator.
		02	Secondary underfrequency on the grid	
		06	Primary overfrequency on the grid	
		07	Secondary overfrequency on the grid	

Main Code	Type	Sub Code	Fault Information	Troubleshooting Method
22	System Fault	02	PV Input arc protection	Please make sure the protective grounding wire of the inverter is connected properly.
		04	BOOST NTC open circuit	<ul style="list-style-type: none"> Restart inverter; If it still fails after restarting, contact the installer.
		05	INV NTC open circuit	
		06	Environment NTC open circuit	
		07	Hardware version error	
		14	Auxiliary Power Fault	
29	Grid side Fault	04	Islanding protection fault	<ul style="list-style-type: none"> Please make sure the protective grounding wire of the inverter is connected properly; If the output of the PV string is grounded, please make sure that the AC output cables L and N of the inverter are not connected reversely; Make sure the grid is not lost; Ensure that the phase sequence of the mains and the machine is consistent, otherwise the machine will alarm and will not allow the mains to be connected; Please contact your dealer or After-sales Service Center.
		07	Grid wave abnormality	
30	Battery side Fault	01	Battery high voltage	<ul style="list-style-type: none"> Confirm whether the inverter charging voltage setting matches the battery specification; If the setting is normal and still appears, please contact the installer.
		02	Battery under voltage	
		03	Too high battery temperature	
		05	Overcurrent in battery discharging	
		06	Overcurrent in battery charging	
		09	Battery open circuit	
12	Battery reverse connection	Disconnect inverter PV/national grid (utility) /battery input, adjust battery positive and negative wiring after inverter shutdown, and then restart inverter.		
31	Back-up side Fault	01	Overload	Check whether the load connected to Back-up port exceeds the inverter specifications.
		02	Undervoltage	Restart the inverter: Disconnect the AC output side switch and DC input side switch, and close them after 5 minutes. If the fault still exists, please contact your dealer or After-sales Service Center.
		03	Overvoltage	
		04	Output short circuit	
		06	Off-grid load reverse flow	
		07	Off-grid reverse connection	
33	Fan speed abnormality alarm	01	Outside fan failure	<ul style="list-style-type: none"> Clogged fan or excessive dust on the heat sink. Clean the fan, fan cover or heat sink; Damaged fan. Replace it with a new fan.
		11	Internal fan failure	Please contact the Customer Service Center.
36	Anti-reverse Current Meter Communication Alarm	04	Abnormal Meter Communication Alarm	<ul style="list-style-type: none"> Check whether the meter is connected to the wrong position; Check whether the input and output wiring direction of the meter is reversed; Check whether the communication cables between the meter and the inverter are reliably connected.
44	Inverter Fault	01	Inverter high voltage	<ul style="list-style-type: none"> Restart inverter; Disconnect the off-grid load and restart the inverter. If the restart is normal, increase the battery or reduce the off-grid load; If it still fails after restarting, contact the installer.
		04	Inverter low voltage	
		07	Inverter soft start timeout	
45	Other Fault	15	DC surge protection device	<ul style="list-style-type: none"> Restart inverter; If it still fails after restarting, contact the installer.
		16	AC surge protection device	<ul style="list-style-type: none"> Confirm whether the insulation of PV input wiring is normal; Wait for the inverter to automatically recover, otherwise contact the installer; If it still fails after restarting, contact the installer.
		21	ISO defects abnormality	
46	Remote Shutdown	02	Shutdown instruction	Set to remote power on.

9.2 Maintenance

9.2.1 Maintenance Notes

Please always remember that the inverter is powered by Three sources: the PV string and the public grid and Battery. The following steps must be followed before performing any maintenance operations:

- Disconnect the AC(Backup anc grid) circuit breaker on the grid side, and then the DC switch.
- Wait at least 10 minutes until the internal energy storage components have been fully discharged before performing maintenance or overhaul operations inside the equipment.
- Use testing equipment for inspection to ensure that no voltage or current exists.

Temporary warning signs shall be posted or barriers shall be erected to prevent uninvolved persons from entering the electrical connection or maintenance area when electrical connections and maintenance work is being performed.

The inverter should only be restarted after fault troubleshooting that would affect the safe performance of the inverter.

No maintenance parts are included inside the inverter, no replacement of the internal components of the inverter is allowed without authorization.

If you need any maintenance service, please contact the After-sales Service Center. Otherwise, no warranty and joint liability will be accepted for any damages caused. Touching the printed-circuit board or other static-sensitive components may cause damage to the device.

- Avoid unnecessary circuit board contact.
- Observe electrostatic protection norms and wear anti-static wrist straps.

9.2.2 Routine Maintenance

See the table below for routine maintenance items and intervals of equipment:

Item	Inspection Method	Maintenance Period
System cleaning	Check the air outlet and heat sink for dust and other blockages. If needed, clean the air outlet and heat sink.	Semi-annually-annually (as per the ambient dust content)
Equipment entrance holes	Check whether there is incomplete sealing or large gaps in the equipment entrance holes, and if so, seal it tightly.	Annually
Electrical connection	Check whether the cable connection is loose or detached. Check whether the cable is damaged, especially whether there are cuts on the part in contact with the metal housing.	Semi-annually-annually

10. Appendix

10.1 Quality Warranty

For faulty inverters during the warranty period, Slenergy Technology (A.H.) Co., Ltd. will repair or replace them for free.

Proof

During the warranty period, customers are required to present the invoice and purchase date of inverter. Moreover, the trademark on the inverter shall be clearly visible, or the Slenergy assumes no liability for the warranty.

Condition

- Replaced failed inverters shall be handled by the Company;
- Customers shall reserve a reasonable time for the Company to repair faulty equipment.

Immunity From Liability

The Company assumes no liability for the warranty of the product in the event of:

- Entire inverter and/or parts beyond the free warranty period;
- Damage in transportation;
- Improper installation, modification or use;
- Operation in extremely harsh conditions beyond those described in the Manual;
- Equipment failure or damage not caused from the installation, repair, modification or disassembly by our service team and personnel;
- Non-conformance to the relevant international standards for installation and use;
- Damage caused by abnormal natural environment.

For the product failure caused by above reasons, the Company may provide paid maintenance service based on the customers' service requests which will be decided by the service institute.

10.2 Contact Information

If you have any questions about this product, please contact us, in order to provide you with faster and better after-sales service, we need your assistance to provide the following information:

- Equipment model;
- Device serial number;
- Fault code/name;
- Simple description of the fault symptom.

10.3 Technical Parameters

Datasheet		SL5KRH-W	SL6KRH-W	SL8KRH-W	SL10KRH-W	SL12KRH-W
PV (DC)						
Max. PV Input Power* (kWp)		7.5	9	12	15	18
Max. Input Voltage** (V)		1000				
Start-up Voltage (V)		135				
Rated Input Voltage (V)		600				
MPPT Input Voltage Range** (V)		135-900				
MPPT Max. Input Current (A)		16/16			16/32	
MPPT Short-circuit Current (A)		20/20			20/40	
No. of MPPT		2				
No. of Strings per MPPT		1/1			1/2	
Grid (AC)						
Max. Input Apparent Power*** (kVA)		10	12	16	20	24
Rated Output Power (kW)		5	6	8	10	12
Max. Output Apparent Power (kVA)		5.5	6.6	8.8	11	13.2
Rated AC Voltage (V)		3L/N/PE, 220/380, 230/400, 240/415				
Input/Output Voltage Range (V)		180-300 / 200-253				
Rated Output Voltage Frequency(Hz)		50 / 60				
Input/Output Voltage Frequency Range		(45-55); (55-65)Hz				
Rated Output Current (A)		7.2	8.7	11.6	14.5	17.4
Max. Input/Output Current (A)		15.2/9.8	18.2/11.8	24.2/15.8	30.3/19.7	36.4/23.6
Power Factor (Rated)		>0.99				
Power Factor (Adjustable)		0.8 leading ... 0.8 lagging				
Total Harmonic Distortion		<3% (Rated Power)				
Grid Connection Mode		3L/N/PE				
AC Load Output (Off-grid)						
Rated Output Power (kW)		5	6	8	10	12
Max. Output Apparent Power (kVA)		5.5	6.6	8.8	11	13.2
Rated Output Voltage (V)		3L/N/PE, 220/380, 230/400, 240/415				
Output Voltage Range (V)		200-240				
Rated Output Frequency (Hz)		50 / 60				
Rated Output Current (A)		7.2	8.7	11.6	14.5	17.4
Max. Output Current (A)		9.8	11.8	15.8	19.7	23.6
Total Harmonic Distortion		< 3% (R Load)				
On-grid/Off-grid Switching Time		< 10 ms				
Battery (DC)						
Rated Output Power (kW)		5	6	8	10	12
Max.Charge/Discharge Power (kW)		12.5/5.5	12.5/6.6	12.5/8.8	12.5/11	12.5/13.2
Battery Voltage Range (V)		135-800				
Max. Charge/Discharge Current (A)		25/25				
Communication Port		CAN/RS485				

Datasheet	SL5KRH-W	SL6KRH-W	SL8KRH-W	SL10KRH-W	SL12KRH-W
Efficiency					
Max. Efficiency (%)	97.6				
Max. MPPT Efficiency (%)	99.9				
Max. Euro Efficiency (%)	97.0				
Display and Communication					
Display	LED+APP				
Communication	Yes: RS485 / USB , Optional: 4G / WiFi				
General Data					
Size (WxHxD) (mm)	516 x 442 x 222				
Weight (kg)	24				
Operating Temperature Range (°C)	-30~60				
Noise (dB)	<30				
Cooling	Smart Cooling				
Installation Style	Wall-mounted				
Protection Degree	IP66				
Warranty	10 Years				
Protection					
Integrated Protection	Anti-flow Protection, DC Reverse Protection, DC Circuit Breaker, Insulation Resistor Detection, Leakage Current Monitoring, Output Shorted Protection, Output Over Current Protection, Grid Monitoring, Anti-islanding Protection, Residual Current Monitoring, Reverse Polarity Protection, Off-grid Overload Protection.				
Surge Protection	DC Type II, AC Type II				
Certifications and Standards					
Grid Regulation	EN 50549-1, CEI 0-21, AS 4777.2, G98/G99, EN50438, VDE 4105, VDE 0126				
Safety Regulation	EN/IEC 62109-1/2				
Others	EN/IEC 61000-6-1/2/3/4				

* Recommended distribution board power shall be determined based on the battery capacity and the actual household load for the optimal scheme.

** When the battery input is less than 150V, the maximum input voltage of PV is 460V.

*** Maximum input power & current on the grid side refers to the capability of the grid to charge the battery and bypass the load.



Official website of Slenergy



SMART M

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