SINEXCEL
isuna

User Manual

Three phase HV Hybrid Inverter

Isuna 5000T-20000T

Shenzhen Sinexcel Isuna
Energy Technology Co.,LTD

Catalogue

1.Overview

This document describes the product information, installation, electrical connection, configuration and commissioning, troubleshooting and maintenance, and technical specifications of the three phase hybrid inverter. Before installing and using the product, read this manual carefully to familiarize yourself with the safety information and functions and features of the product. Manuals may be updated from time to time, please obtain the latest version from the official website for more product information.

1.1 Scope of Application

This manual is applicable to the following inverters:

Model	Rate output power	Rated output voltage
Isuna 5000T	5000W	3L/N/PE,220/380Vac，230/400Vac
Isuna 6000T	6000W	
Isuna 8000T	8000W	
Isuna 10000T	10000W	
Isuna 12000T	12000W	
Isuna 15000T	15000W	
Isuna 18000T	18000W	
Isuna 20000T	20000W	

Note: Since the product will be overload protected at an ambient temperature above 40 ℃, the high temperature mode test in the Italian Grid Specification certification will be carried out at an ambient temperature of 40 ℃.

1.2 Applicable Personnel

This document is intended for only professional and technical personnel who are familiar with local regulations, standards, and electrical systems, and have professional training and knowledge about this product.

1.3 Symbol Definition

In order to ensure the personal and property safety of users when using three phase hybrid inverters, as well as the efficient use of this product, the manual provides relevant safe operation information and uses corresponding symbols to highlight. To avoid personal injury

and property damage, please fully understand and absolutely comply with these stressed information. The symbols used in this manual are listed below.

⚠ Danger
Indicates a highly hazardous situation which, if not avoided, will result in death or serious injury.
⚠ Warning
Indicates a hazard with a medium level of risk that could result in death or serious injury if not avoided.
⚠ Caution
Indicates a hazard with a low level of potential that, if not avoided, could result in moderate or minor injury.
⚠ Attenion
Indicates a potentially hazardous situation that, if not avoided, may cause equipment failure or property damage.

2. Safety Precautions

The safety precautions contained in this document must be followed when operating the device.

⚠ Attenion
➢ The inverter has been designed in strict accordance with safety regulations and has passed the tests. However, as an electrical device, you must comply with relevant safety instructions before performing any operation on the device. Improper operation may result in serious injury or property damage.

2.1 Operation Safety

⚠ Attenion
➢ Read this manual carefully before installing the device to understand the products and precautions. ➢ All operations on the equipment must be carried out by professional electrical

technicians who are familiar with the local standards and safety regulations.

- When operating inverters, use insulation tools and wear personal protective equipment. Wear ESD gloves, an ESD wrist strap, and an ESD suit when touching electronic components to prevent damage caused by static electricity.
- The manufacturer shall not be liable for inverter damage or personal injury caused by failure to install, use, or configure the equipment in accordance with the requirements of this manual.

2.2 PV String Safety

Danger

- Use the DC wiring terminal delivered with the chassis to connect the DC cables of the inverter. Use of other types of DC terminals may cause serious consequences. Therefore, the manufacturer is not responsible for the damage to the device.

Warning

- Ensure that the assembly frame is properly grounded to the support system.
- After connecting DC cables, ensure that the cables are securely connected.
- Use a multimeter to check whether the positive and negative DC wiring terminals of the battery are connected correctly and the voltage is within the allowable range.
- Do not connect the same PV series to multiple inverters; otherwise, the inverters will be damaged.

2.3 Battery Safety

Warning

- Read the battery safety contents in the user manual carefully before installing the device, and strictly follow the instructions in the user manual.
- The battery current may be affected by external environment, such as temperature and humidity, which may cause battery current limiting and affect battery on-load performance.
- 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 check whether the positive and negative DC wiring terminals of the

battery are connected properly and the voltage is within the allowable range.

- Do not connect the same battery string to multiple inverters. Otherwise, the inverters may be damaged.

2.4 Inverter Safety

⚠ Warning

- Ensure that the voltage and frequency of the grid-connected access point comply with the inverter grid-connected specifications.
- A protection device, such as a circuit breaker or fuse, is recommended for the AC side of the inverter. Ensure that the protection device is greater than 1.25 times the maximum AC output current of the inverter.
- The GND cable for the inverters must be securely connected. When multiple inverters are combined, ensure that the protection ground points on all inverters' chassis shells are equipotential connected.
- If the battery is not configured in the photovoltaic system, it is not recommended to use the off-grid function, and the resulting system electricity risk will not be covered by the equipment manufacturer's warranty.

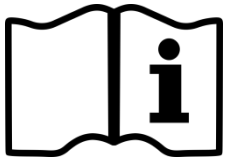
2.5 Personnel Requirements

⚠ Attenion

- When the inverter is running, some components may be charged or hot. Improper use, incorrect installation, or operation may result in serious injury to person or property. Transportation, loading, unloading, installation, starting and maintenance operations must be performed by qualified electrical engineers.

2.6 Description of Symbols

There are some safety-related labels on the three phase hybrid inverter. Please read and fully understand these labels before installing the product.

Symbol	Symbol name	Symbol meaning
	It indicates the danger of residual voltage in the inverter.	Please wait for 5 minutes until the capacitor is completely discharged after the DC side of the inverter has been disconnected with power for a period of time.
	It indicates the danger of high voltage.	High voltage exists during inverter operation. If you need to operate the inverter, please make sure the inverter is disconnected.
	It indicates to be careful of high temperature surface.	The temperature of inverter housing is high during operation, so do not touch it, otherwise it may cause burns.
	It indicates grounding terminal.	Connect the inverter to ground for grounding protection purpose.
	It indicates reading the manual.	Please read and understand this manual carefully before installing the inverter.

3.Equipment Inspection and Storage

3.1 Pre-signing Inspection

Before signing for the product, please check the following:

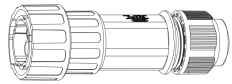
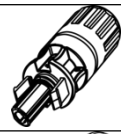
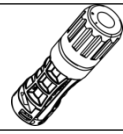
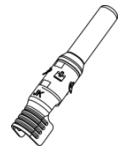
- Check the outer packing for holes, distortions, cracks, or other signs that may cause damage to the equipment in the packing case. If so, do not open the packing and contact your distributor.
- Check whether the inverter type is correct. If not, do not open the package and contact your dealer.
- Check whether the type and quantity of the delivered package are correct and whether the appearance is damaged. If damaged, please contact your dealer.

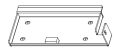
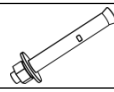
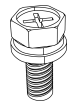
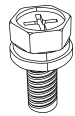
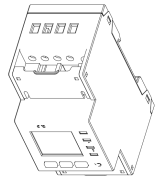
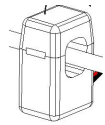
3.2 Packing List

After the inverter is unpacked, check whether the delivered package are complete. If any components are found missing or incomplete, contact the dealer in time.

Table 3-1 Components and mechanical parts to be delivered

No.	photos	descriptions	quantity
1		Inverter	1 PCS
2		WIFI dongle (optional)	1 PCS
3		User manual	1 PCS
4		Certificate, Quality assurance card	1 PCS
5		Delivery inspection report	1 PCS
6		AC load terminal	1 PCS

7		Black 6.0mm² cable lugs (for load side wiring)	5 PCS
8		AC grid terminal	1 PCS
9		Red 10mm² cable lugs (for power grid side wiring)	5 PCS
10		BAT+ wire end input terminal plastic case	2 PCS
11		BAT- wire end input terminal plastic case	2 PCS
12		PV+ wire end input terminal plastic case	4 PCS
13		PV- wire end input terminal plastic case	4 PCS
14		PV-&BAT-wire end input terminal metal core	6 PCS

15		PV+&BAT+ wire end input terminal metal core	6 PCS
16		Wall-mounted rear cover	1 PCS
17		M8*80 expansion bolt	4 PCS
18		Waterproof cover	1 PCS
19		Cross recessed hexagon head combination screw M4*10	4 PCS
20		Cross recessed hexagon head combination screw M6*16	2 PCS
21		Smart meter	1PC
22		CT (used with the meter)	3PCS

23		Meter communication line	1 PCS
24		BMS communication line	2 PCS
25		PV＆BAT Disassembly wrench	1 PCS
26		6mm hex wrench	1 PCS
27		Desiccant	1 PCS

3.3 Equipment Storage

If the inverter is not put into use immediately, store it according to the following requirements:

- Ensure that the outer packing case is not removed and the desiccant is not lost.
- Ensure that the storage environment is clean and within appropriate temperature and humidity ranges.
- Ensure that inverters are placed in the height and direction according to the labels on the packing cases.
- Ensure that there is no tilt and fall risk after inverters are stacked.
- After the inverter is stored for a long time, check and confirm the inverter before it can be used.

4.Product Description

4.1 Product Overview

Three phase hybrid inverter is a photovoltaic grid-connected inverter and battery energy storage as one, with a variety of built-in working modes to suit the diversified needs of users. In the period of rising energy costs such as oil and coal, the continuous decline of energy subsidies for photovoltaic grid-connected systems, mountain areas or base stations without grid, uninterrupted power supply and emergency power supply needs, three phase hybrid inverters can provide a complete solution.

4.2 Application Scenario

⚠ Warning
➢ The photovoltaic system is not suitable for devices that rely on stable power supply, such as life-sustaining medical devices. Ensure that no personal injury is caused when the system is powered off. ➢ Do not use a load with a high starting current in the photovoltaic system. Otherwise, the off-grid output may fail due to excessive instantaneous power. ➢ When the inverter overload protection occurs for a single time, the inverter can automatically restart; If it happens several times, the inverter will stop, and after the fault is rectified, the inverter can be restarted immediately through the App. ➢ If the load capacity exceeds the rated power of the inverter during power failure, the off-grid function of the inverter automatically shuts down. To start, turn off the large load and ensure that the load power is smaller than the rated power of the inverter. ➢ When the inverter is in off-grid mode, it can be used normally for ordinary household load. ➢ Inductive load: 1.5P non-variable frequency air conditioners are supported. The standby mode may be unstable if two or more non-variable frequency air conditioners are connected. ➢ Capacitive load: total power ≤0.7 x rated output power of inverter.

4.3 Appearance Description

4.3.1 Appearance Description

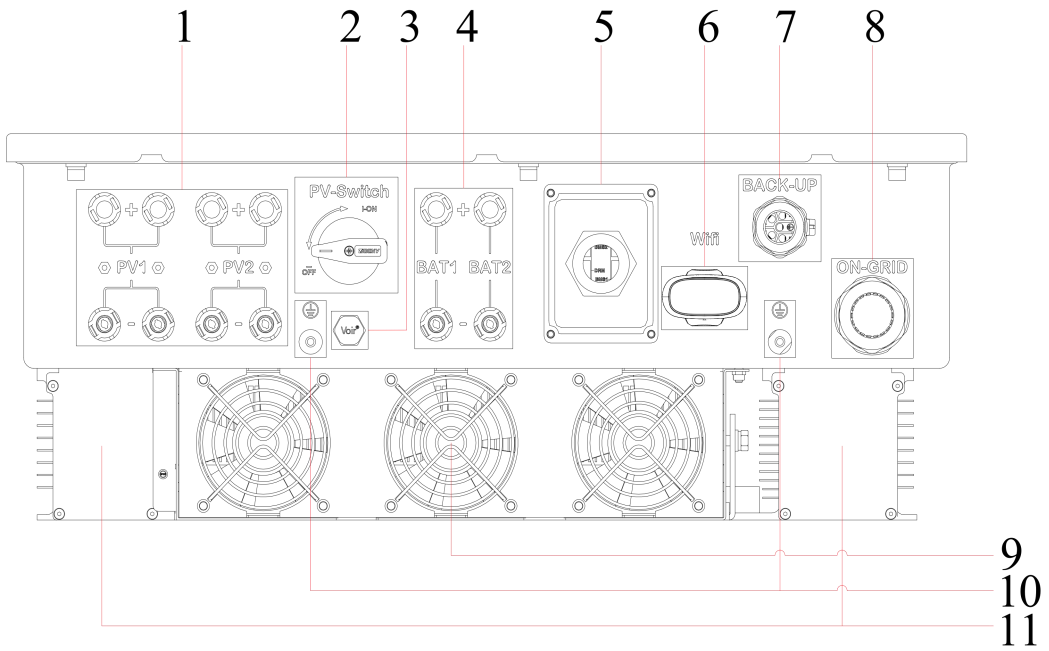


Figure 4.1 Illustration of the appearance of the inverter

Table 4-1 Appearance of the inverter

1	PV DC input port (PV+/-)	2	PV DC input switch
3	Waterproof and breathable device	4	Battery DC input port (BAT+/-)
5	Communication module interface	6	WiFi/4G interface
7	Off-grid AC wiring port	8	Grid-connected AC wiring port
9	Fan assembly	10	Protective ground terminal
11	Inductive cooling box		

4.3.2 Size Description

Figure 4.2 Overall size of inverter

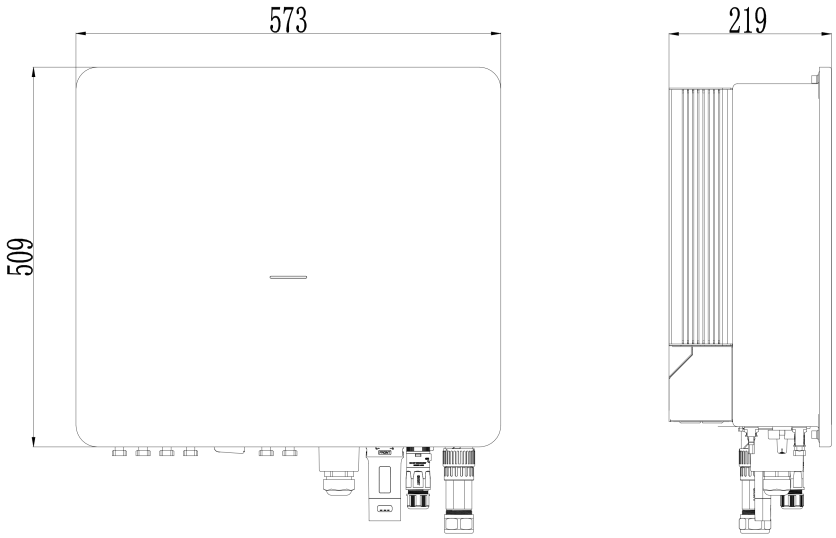


Figure 4.3 Dimensions of wall mount

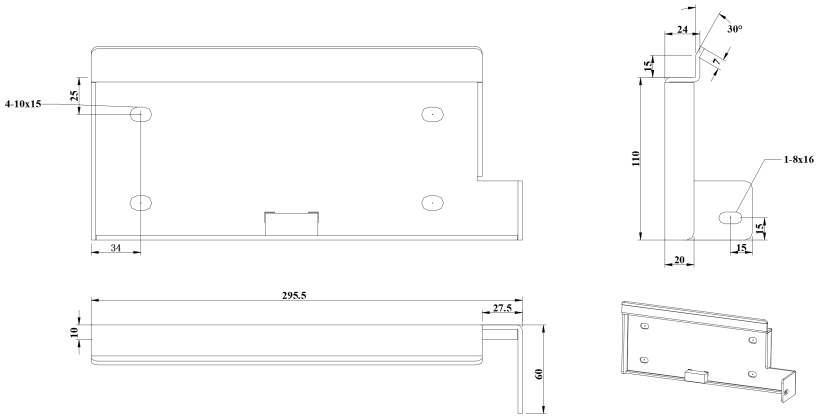


Figure 4.3 Dimensions of wall mount

5 Installation

5.1 Installation Requirements

5.1.1 Installation Environment Requirements

1) The equipment must not be installed in flammable, explosive, corrosive and other environments.

2) The installation position should be away from water pipes and cables in the wall to avoid danger during drilling.

3) The installation position should be out of the reach of children, and avoid installation in a position that is easy to touch. There may be high temperature on the surface of the equipment during operation to prevent burns.

4) The inverter should avoid the installation environment such as sun, rain, snow, etc. It is recommended to install it in a sheltered installation position. If necessary, an awning can be built.

5) The installation space must meet the requirements of ventilation, heat dissipation and operation space.

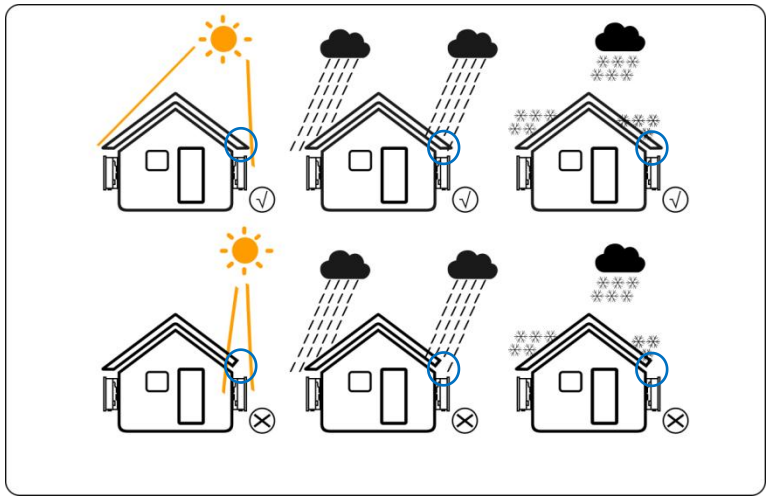
6) The protection level of the equipment complies with the requirements for indoor and outdoor installation, and the installation environment temperature and humidity must be within the appropriate range.

7) Make sure that the inverter indicator light and all labels are easy to view and that the terminal is easy to operate.

8) The inverter installation altitude should lower than the maximum working altitude 4000m.

9) Stay away from strong magnetic field environment to avoid electromagnetic interference. If a radio station or a wireless communication device below 30MHz is located near the installation location, install the device according to the following requirements:

- Add a ferrite core with multi-turn winding at the inverter DC input line or AC output line, or add a low-pass EMI filter.
- The distance between the inverter and the wireless electromagnetic interference device exceeds 30m.



5.1.2 Mounting Carrier Requirements

1) The installation carrier must not be flammable material and must have fire resistance.

2) Please ensure that the installation carrier is solid and reliable, and can carry the weight of the inverter.

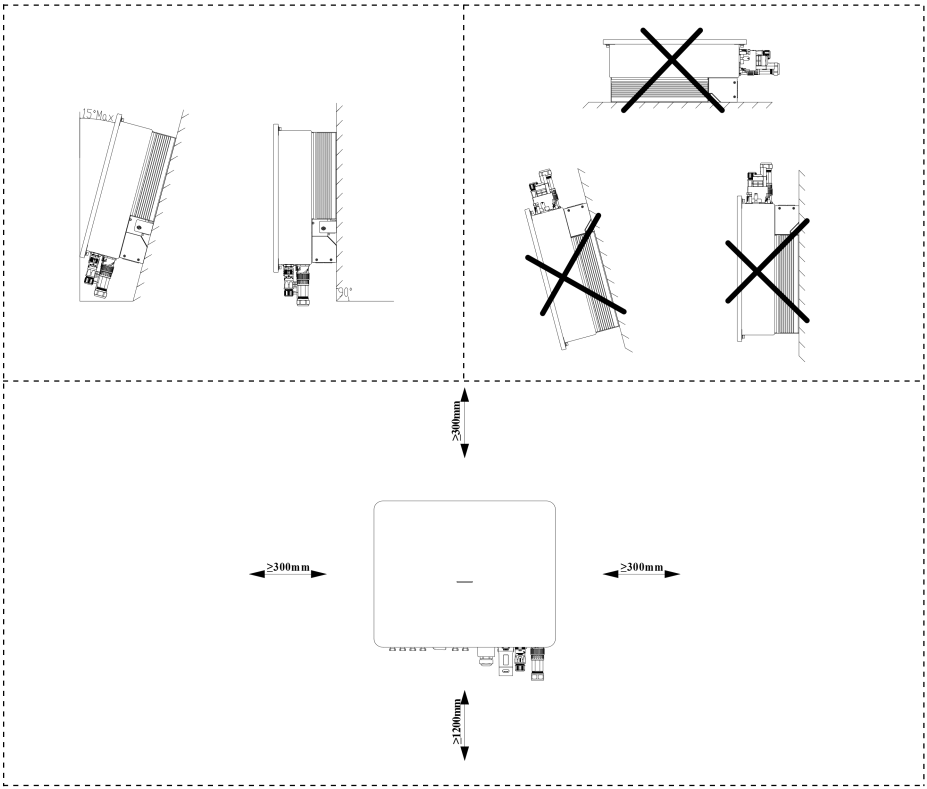
3) When the equipment is running, it will make noise. Do not install it on the carrier with poor sound insulation, so as to avoid the noise emitted by the equipment when it is working, which will cause trouble to residents in the living area.

5.1.3 Mounting Angle Requirements

1) Recommended inverter installation Angle: vertical or backward ≤15°.

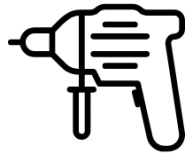
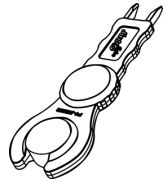
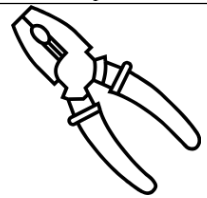
2) Do not invert, tilt forward, tilt back beyond the Angle, horizontal installation.

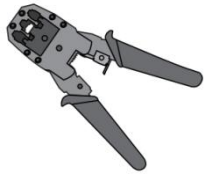
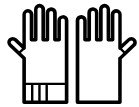
3) At least 1.2m from the ground below the inverter, about at least 300mm.


15°Max
30°
≥300mm
≥300mm
≥300mm
≥1200mm

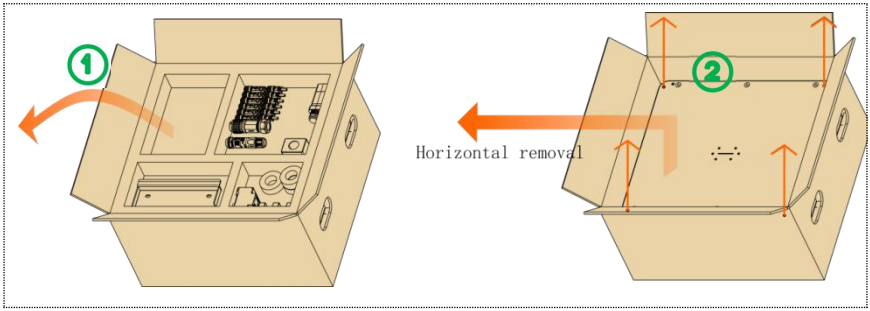
5.2 Mounting Tools

Table 5-1 List of installation tools

Series No.	Tools	Description	Function
1		Percussion drill Recommended 10mm drill	Wall drilling
2		6mm cross-head screwdriver	Removing, installing screws and wiring
3		4mm cross-head screwdriver	Removing and installing load terminal screws
4		Removal tool	Removal of PV, BAT line end terminals
5		Wire strippers	Stripping wire
6		Crimping pliers	Crimping PV and BAT cables

7		Crimping pliers	Pressure welding grid, load end cable
8		6mm hex wrench	Fasten the grid terminal to the cable
9		Multimeter	Check whether the cable wiring is correct, the positive and negative battery terminals are correct and voltage, and grounding is reliable
10		Marking pen	Drilling mark
11		Tape	Measurement distance
12		Protective gloves	Wear when setting up the inverter
13		Goggles	Wear when drilling holes
14		Dust mask	Wear when drilling holes

5.3 Inverter Transportation

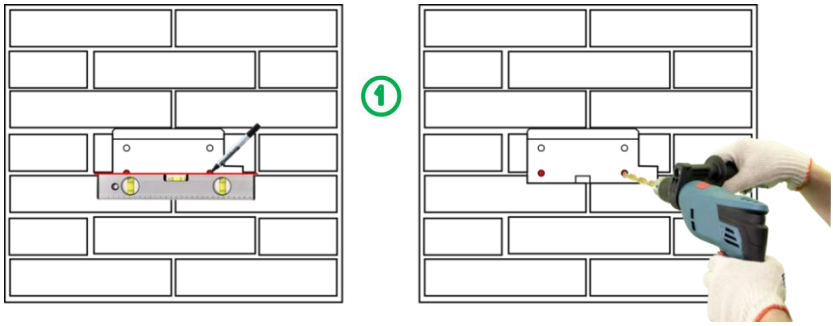


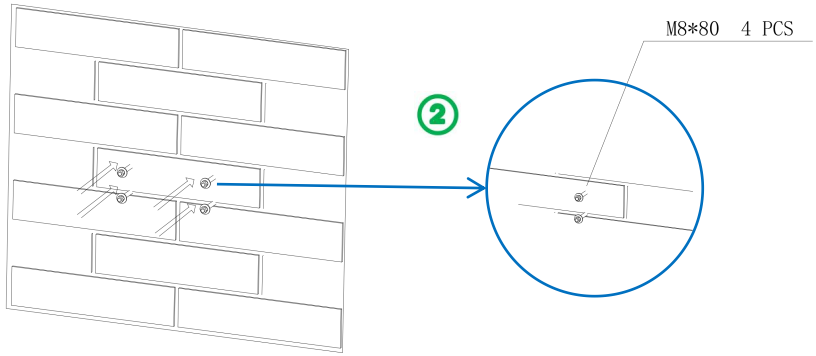
Caution
➢ When transporting, turning around, installing and other operations, it must comply with the laws and regulations and relevant standards of the country or region where it is located. ➢ The inverter is heavy. Please keep it balanced during handling to prevent the inverter from falling and injuring the operator. ➢ The power cable and signal cable ports at the bottom of the inverter cannot bear any weight. Do not touch wiring terminals directly. Place the inverter horizontally. ➢ When the inverter is placed on the ground, put foam or paper under it to avoid damage to the shell.

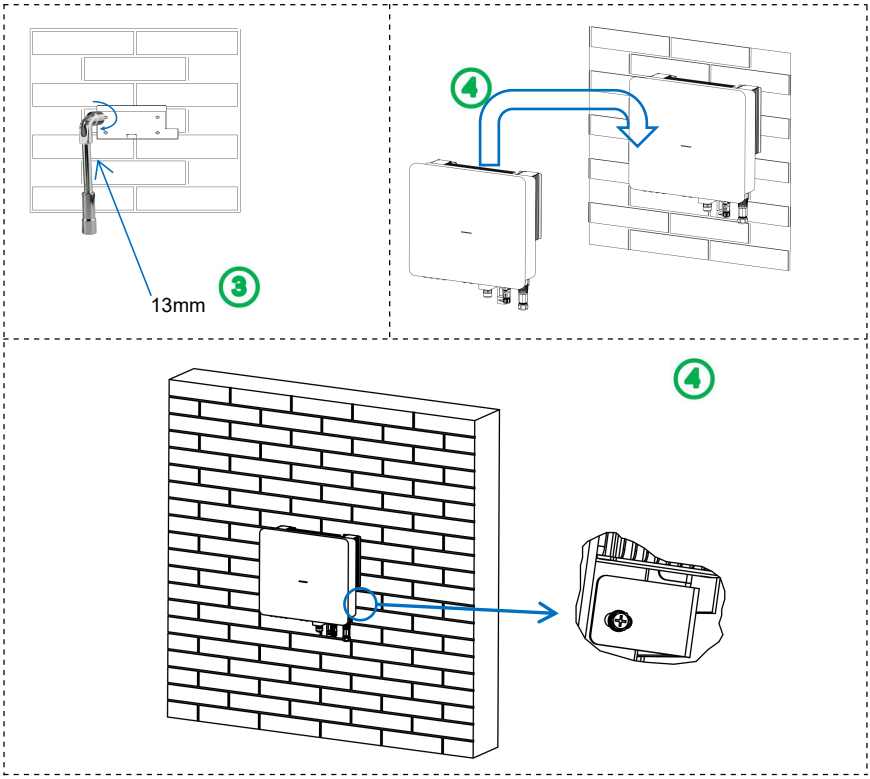
5.4 Wall Mounted

Attenion

- When drilling holes, ensure that the holes are drilled away from water pipes and cables in the wall to avoid dangers.
- When drilling holes, wear goggles and a dust mask to prevent dust from inhaling into the respiratory tract or falling into the eyes.






13mm
3
4
4

6. Electrical Connection

Before installation and maintenance, ensure that the AC/DC side is not powered on. The capacitors are still powered on for a period of time after the inverter is powered off. Therefore, wait at least five minutes to ensure that the capacitors are fully discharged. Three phase hybrid inverters are used in battery energy storage photovoltaic systems. Equipment can be damaged if not used as intended.

6.1 Electrical System Connection Diagram

⚠ Attenion
➢ Connect the N and PE cables to the ON-GRID and BACK-UP ports of the inverters in different regions according to local regulations. For details, see local regulations. ➢ If the BACK-UP AC port is powered on after the inverter is started, power off the inverter to maintain the backup load. Otherwise, electric shocks may occur. ➢ Inverter ON-GRID and BACK-UP AC ports have built-in relays. When the inverter is in off-grid state, the built-in ON-GRID relay is in disconnected state; When the inverter is in the on-grid state, the built-in ON-GRID relay is in the closed state.

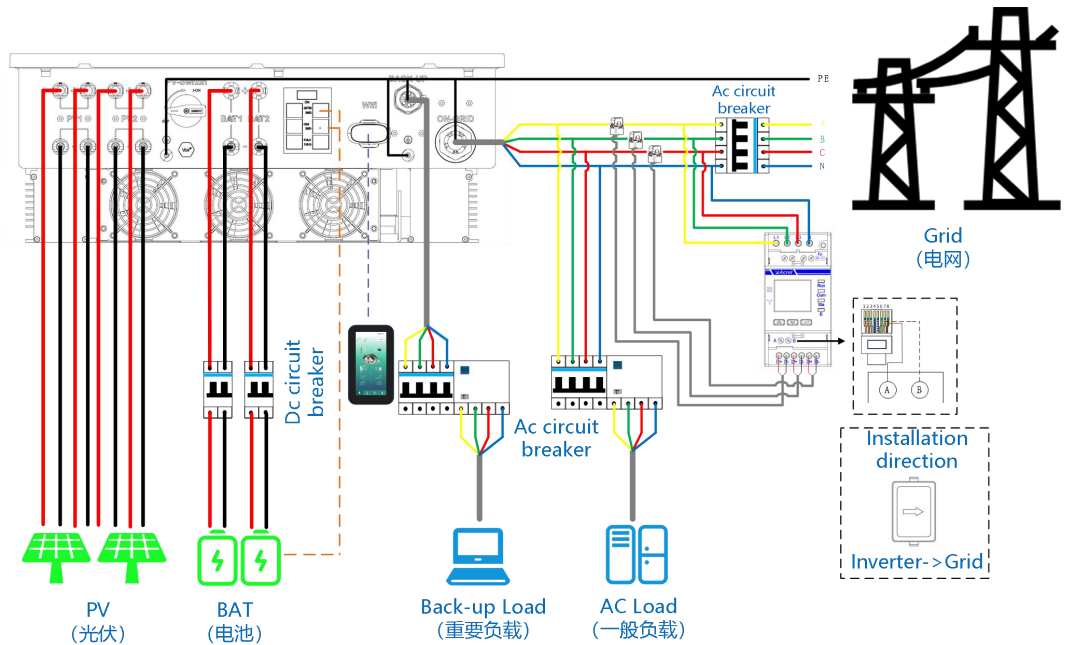
NOTE：

1、Recommended parameters for DC circuit breakers on the battery side: Rated voltage ≥ 1000V, rated current ≥63A

2、Power grid side AC circuit breaker parameters recommended: rated voltage ≥500V, rated current ≥63A

3、Back-up AC circuit breaker parameters recommended: rated voltage ≥500V, rated current ≥40A

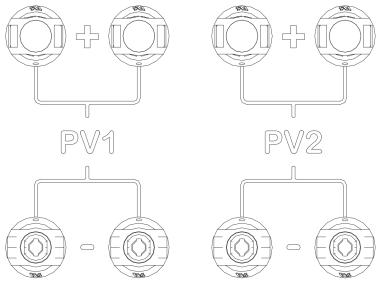
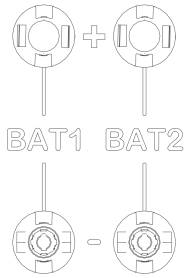
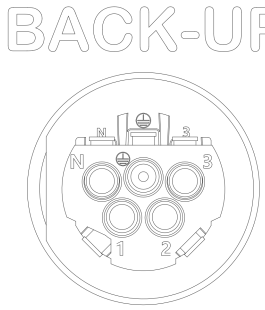
Figure 6.1 Electrical connection diagram

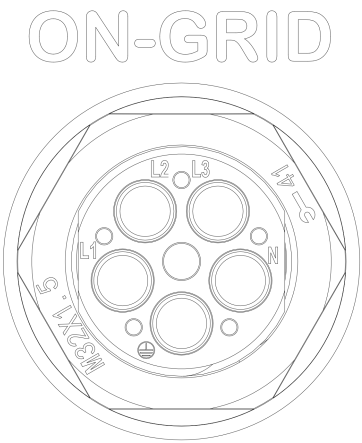


Note: During final installation, circuit breakers for external connections to the inverter shall comply with IEC 60947-1 and IEC 60947-2 certification requirements。

6.2 External Port Wiring Instructions

Table 6-1 Cable Model and Specification Descriptions

Port	Definition		Cable type	Cable specification
	+: Connect to PV positive pole		Outdoor Multi-Core Copper Cable	Recommended 6mm² cross-sectional area of conductor, maximum current through the wire is 30A
	-: Connect to PV negative pole			
	+: Connect to battery positive pole		Outdoor Multi-Core Copper Cable	Recommended 6mm² cross-sectional area of conductor, the maximum current through the wire shall be 30A
	-: Connect to battery negative pole			
	AC load port	L1	Outdoor Multi-Core Copper Cable	Recommended 6mm² cross-sectional area of conductor, maximum current through the leading wire
		L2		
		L3		
		N		

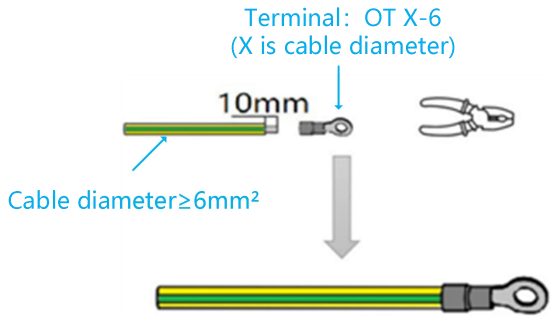
		PE		is 30A, grounding cable specifications are the same as the phase conductor
	AC grid port	L1	Outdoor Multi-Core Copper Cable	Recommended 10mm² cross-sectional area of conductor, maximum current through the wire is 60A, grounding cable specifications are the same as the phase conductor
		L2		
		L3		
		N		
		PE		

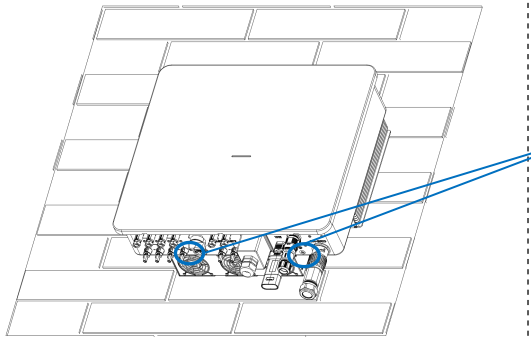
6.3 Connecting the Ground Cable (PE)

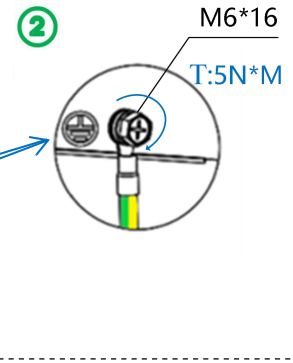
Attenion
➢ Since the inverter is a transformer-less type, it is required that the positive and negative electrodes of the photovoltaic array cannot be grounded, otherwise the inverter will fail. In the photovoltaic power system, all non-current-carrying metal components (such as brackets, distribution cabinet enclosures, inverter enclosures, etc.) should be connected to the ground.

Figure 6.2 Schematic diagram of protection grounding

For yellow-green outdoor cables, use a wire stripper to strip the insulation layer of the ground cable to an appropriate length. Insert the wire core stripped of the insulation layer into the conductor crimping area of the OT terminal, and press it tightly with wire crimping pliers.







6.4 Connecting the PV Cable and the Battery Cable

Danger

PV series connection:

- Do not connect the same PV series to multiple inverters. Otherwise, the inverters may be damaged.

- Before connecting the PV series to the inverter, confirm the following information. Otherwise, the inverter may be permanently damaged or fire may occur, which may cause personal and property loss.
- Ensure that the maximum short circuit current and maximum input voltage of each PV are within the allowable range of the inverter.
- Ensure that the positive terminal of the PV string is connected to the PV+ of the inverter, and the negative terminal of the PV string is connected to the PV- of the inverter.

Battery cable connection:

- A battery short circuit may cause personal injury. However, a short circuit may release a large amount of energy, which may cause fire.
- Before connecting the battery cable, ensure that the inverter and battery are powered off, and the front and rear switches of the device are off.
- Do not connect or disconnect battery cables when the inverter is running. 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 loads between the inverter and the battery.
- When connecting battery cables, use insulation tools to prevent accidental electric shock or battery short circuit.
- Ensure that the open circuit battery voltage is within the allowable range of the inverter.

⚠ Warning

PV series connection:

- The PV string output does not allow for grounding. Before connecting the PV string to the inverter, ensure that the minimum insulation resistance to the ground of the PV string meets the minimum insulation impedance requirement.

Battery cable connection:

- When connecting cables, the battery cable matches BAT+ and BAT- on the battery terminal.
- Ensure that the cable core is fully connected into the wiring hole of the terminal.

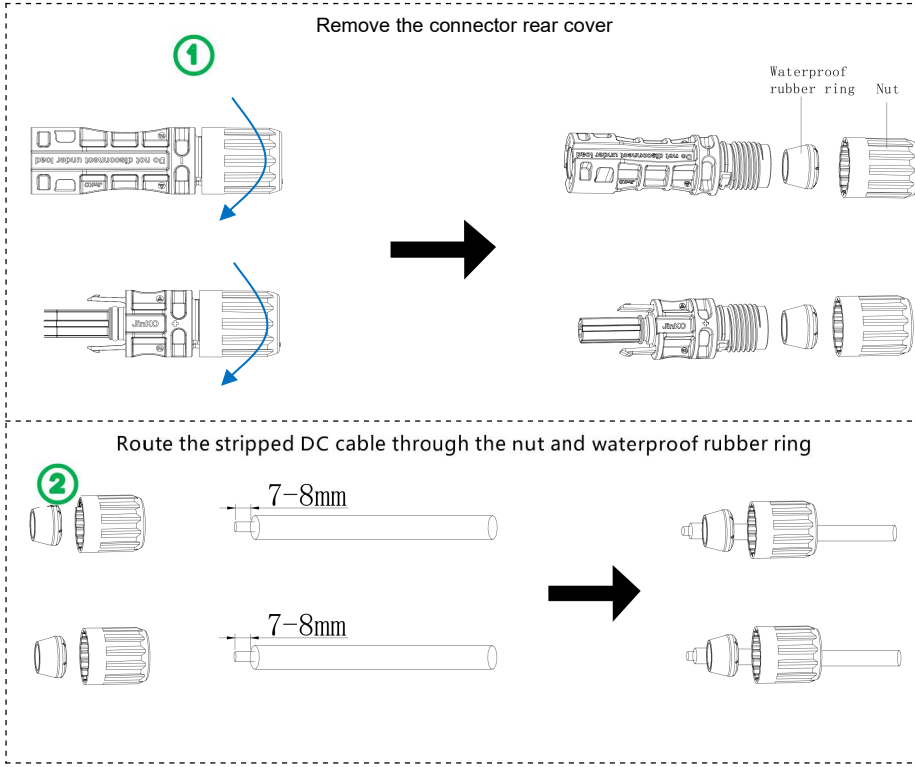
➢ Ensure that the cables are securely connected. Otherwise, the terminal may overheat and damage the device.

NOTE:

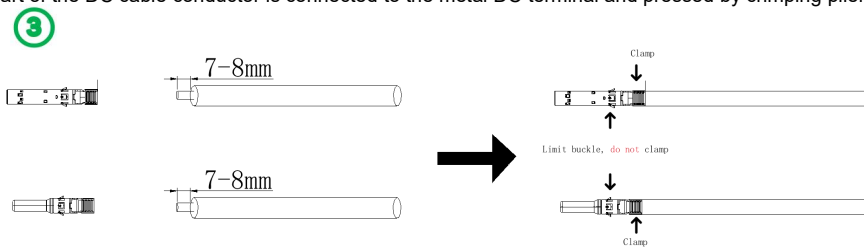
1.Before crimping the PV and BAT cables, ensure that the PV knob switch is set to OFF and the battery is powered off.

2.The photovoltaic module used to connect to the inverter should meet the IEC 61730 certification of grade A standard requirements, each photovoltaic series and battery input from the external circuit breaker allowed through the maximum current should be more than or equal to 30A.

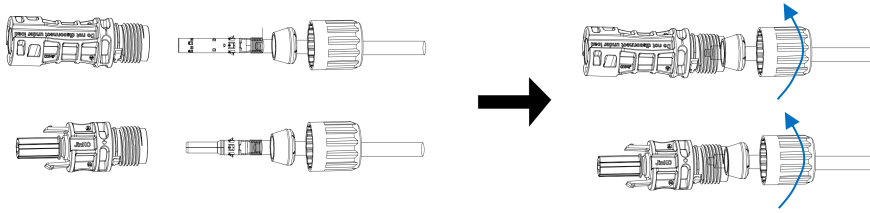
Figure 6.3 Connecting PV&BAT cables



Part of the DC cable conductor is connected to the metal DC terminal and pressed by crimping pliers

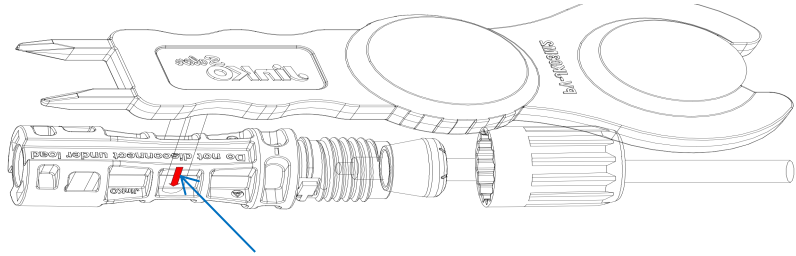


Insert the DC cable into the DC terminal, insert the waterproof rubber ring into the DC terminal, and tighten the nut



After hearing a click sound, gently pull the cable to check whether it is fastened

Remove Terminal



After clamping, pull out the terminal

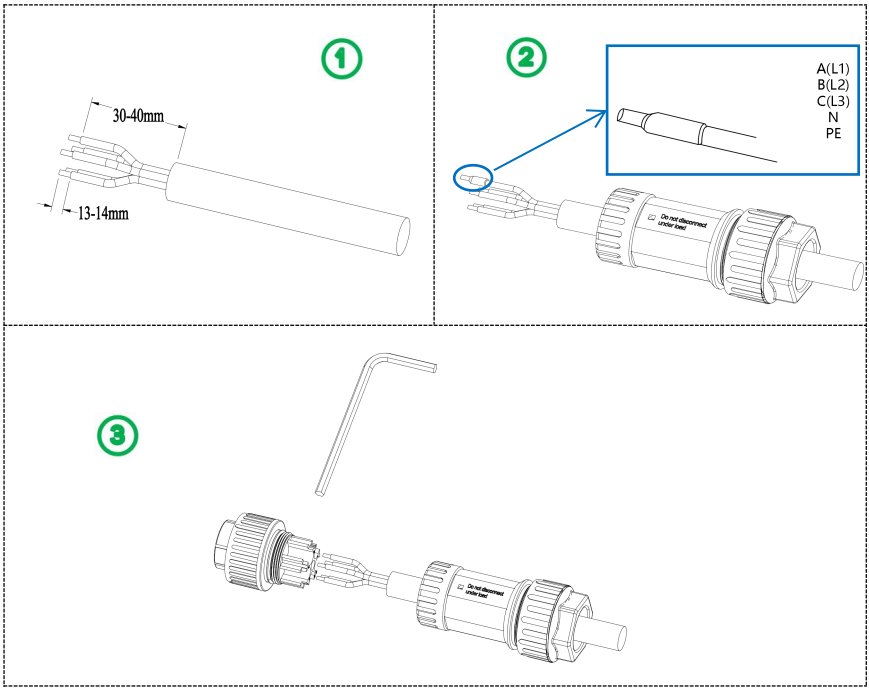
6.5 Connecting the AC Grid-Connected Cable

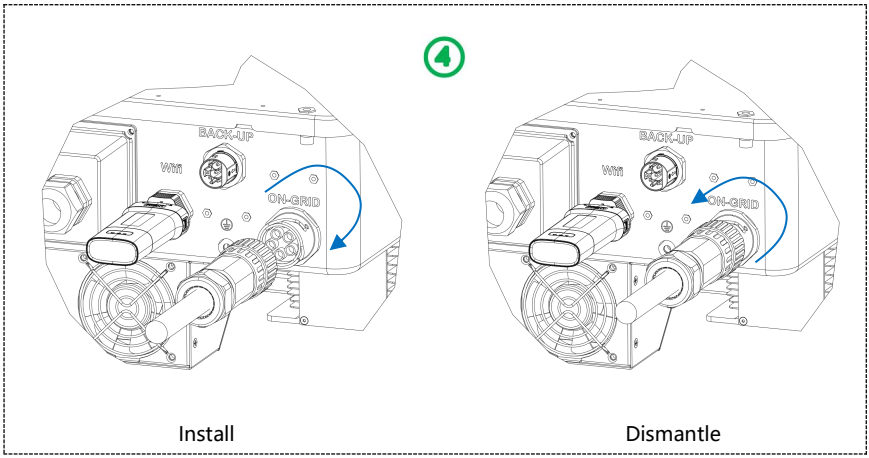
Warning

- Ensure that the AC cable matches the L1, L2, L3, N, and ground ports of the AC terminal properly. Incorrect connection may cause device damage.
- Ensure that the cable core is fully connected into the wiring hole of the terminal.
- Ensure that the insulation board at the AC terminal is tightly fastened.

Ensure that the cables are securely connected. Otherwise, the terminal may overheat and damage the device.

Figure 6.4 Connecting AC grid-connected cables

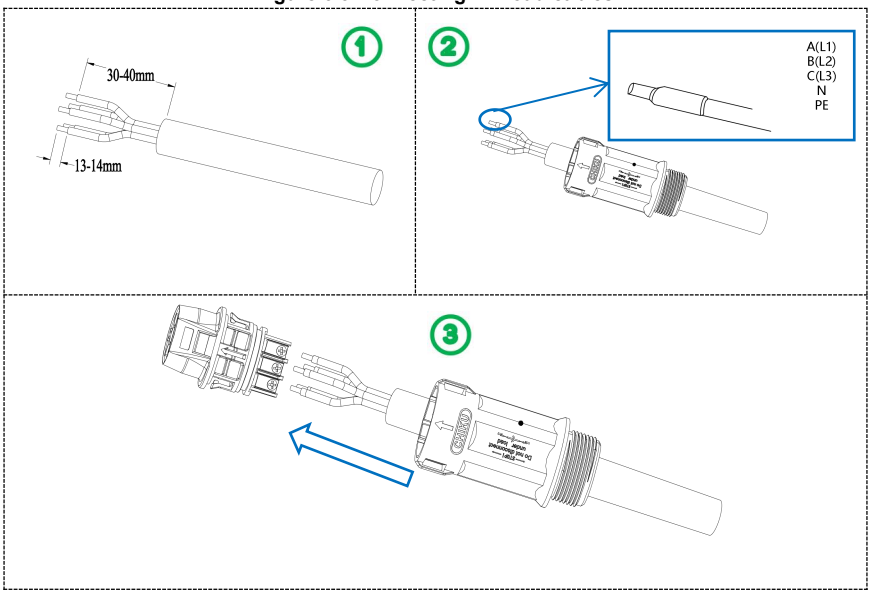


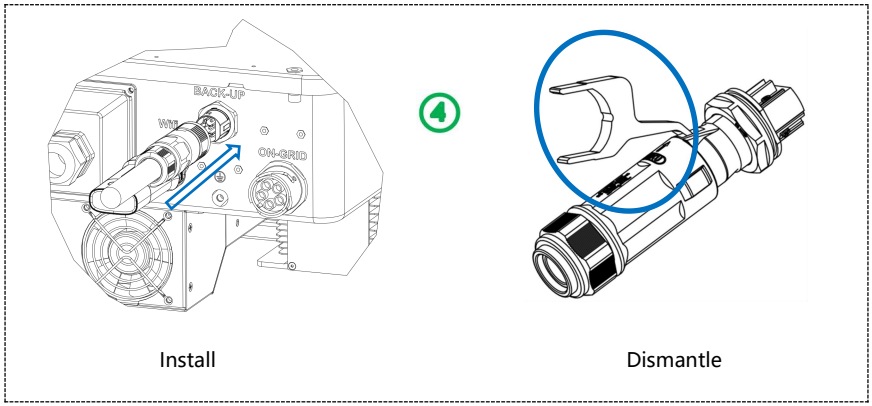


The maximum current allowed to pass through the circuit breaker used for the power grid should be greater than or equal to 60A.

6.6 Connect AC Load Cable

Figure 6.5 Connecting AC load cables





The maximum current allowed through the circuit breaker for off-grid load to the external connection should be greater than or equal to 30A.

6.7 Installation of Communication Dongle

The communication collector is an external component that you need to select by yourself.

The collector is connected. The default WIFI/ Bluetooth module is used for remote monitoring and control of the inverter.

Figure 6.6 Communication interface and installation and disassembly diagram

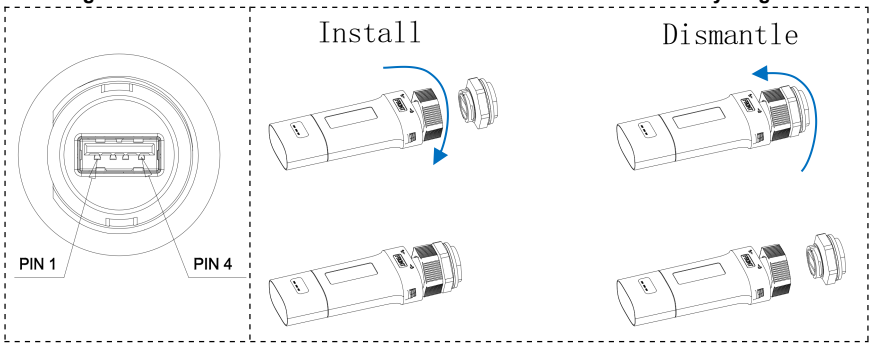


Table 6-2 Indicators on the AGN8 WIFI Dongle

LED	state	Specific meanings
RUN&COM&NET	Alternating flashing (cycle 1500ms, each light flashes for 500ms in sequence)	Self test mode
	Flashing together (cycle 1 second, off 900ms, on 100ms)	Dongle is currently upgrading (including Bluetooth App upgrade)
	Illuminate together for 5 seconds	Dongle upgrade failed
RUN	Slow flashing (on for 1 second and off for 1 second)	Dongle is running normally
	Light off	Dongle running abnormally
	Twice flashing (on (off) 100ms, off (on) 100ms, twice)	Dongle sends Bluetooth data to the app
COM	Flash (on for 200ms, off for 200ms)	Dongle time not synchronized (scanning will not start)
	Light off	Abnormal southbound communication
	Flashing once (on (off) 100ms, off (on) 100ms, once)	Normal southbound communication
NET	Flash	Connecting to WiFi
	Light off	Connecting to MQTT
	Slow flashing	Connecting to platform
	Always on	Successfully connected to the platform
	Twice flashing	Dongle sends platform data

Table 6-3 Meaning of AGN9 4G Dongle indicator light

LED	state	Specific meanings
RUN&COM&NET	/	/
RUN	Always on	The process from power on to initialization
	Flash (with an interval of 100ms)	Gateway initialization completed, flashing for 5 seconds
	Twice flashing (on (off) 100ms, off (on) 100ms, twice)	Slow flashing (with an interval of 1 second)
COM	/	/
NET	Always on	Looking for the internet or on a call
	Flash (interval 200ms)	Data connection established or network registered
	Slow flashing (with an interval of 800ms)	2G/3G network registered
	Light off	Shutdown or module sleep

6.8 Connecting the Communication Port

Multifunctional communication port, including meter communication, BMS communication, DRMS, parallel communication and external dry contact signal.

Step 1: Route the communication cables through the waterproof cover and waterproof plug of the signal port, and connect the cables to the communication port on the corresponding device.

Step 2: Fasten the waterproof cover with screws and tighten the waterproof nut.

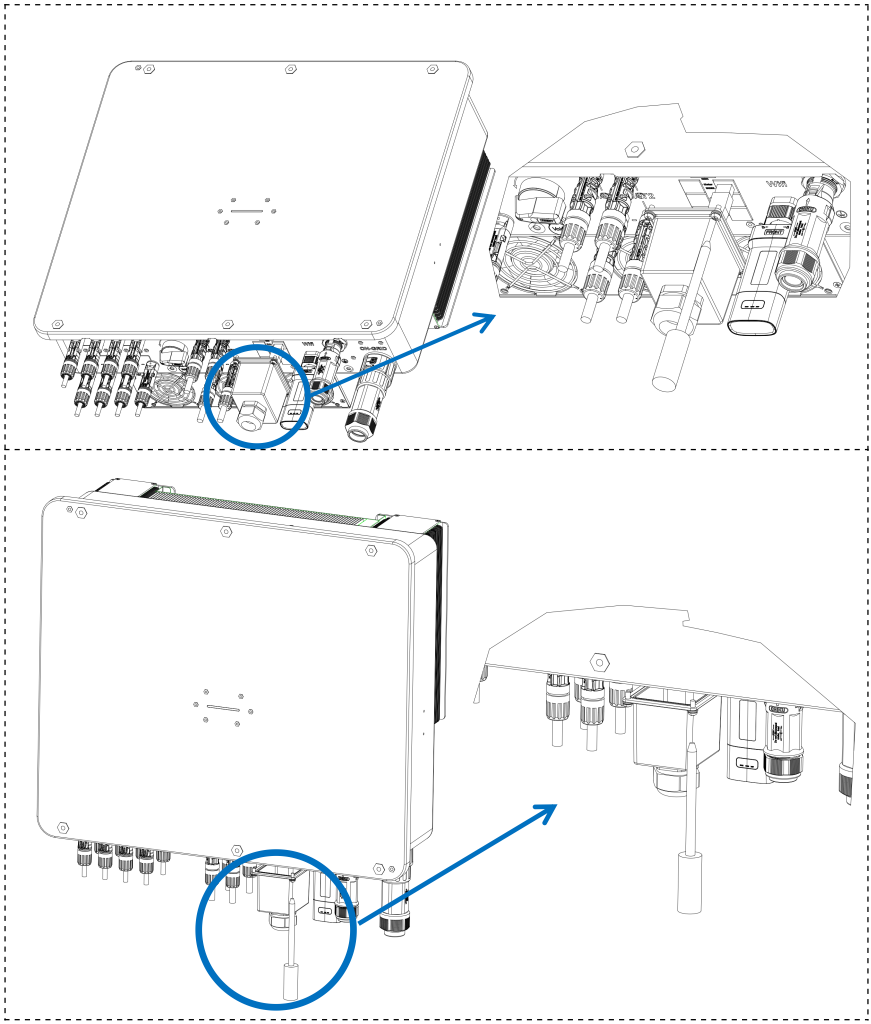


Figure 6.7 Interface diagram

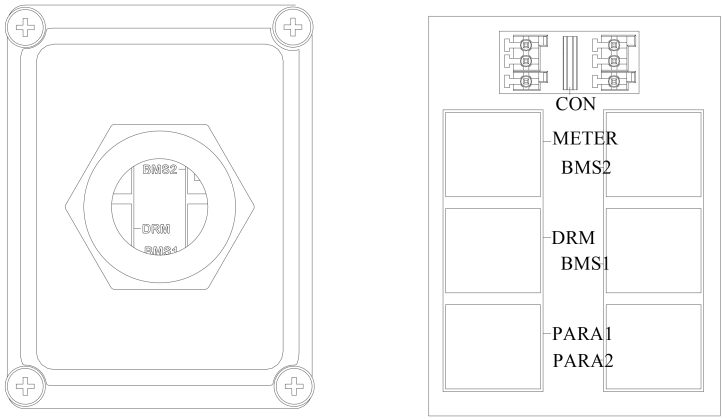


Table 6-4 Port description

PIN	Definition
CON	Function of heat pump/diesel generator multiplexed DO interface
METER	Electric meter communication interface
BMS1	BMS1 CAN port &EMS RS485 multiplex port
BMS2	BMS2 CAN port &EMS RS485 multiplex port
DRM	DRMs/ diesel generator/lead-acid battery temperature sampling function multiplex interface
PARA1	Parallel communication interface
PARA2	Parallel communication interface

Figure 6.8 Sequence of RJ45 crystal terminals

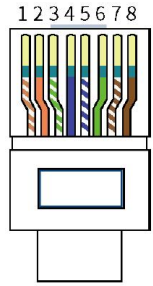


Table 6-5 RJ45 cable sequence colors

1	2	3	4	5	6	7	8
Orange &White	Orange	Green& White	Blue	Blue& White	Green	Brown& White	Brown

6.8.1 BMS Communication Connection

Table 6-6 Description of BMS1 ports

PIN	Color	Definition	Function	Note
1	Orange& White	RS485-A1-BMS	RS485 differential signal A1	BMS1 CAN port &EMS RS485 multiplex port
2	Orange	RS485-B1-BMS	RS485 differential signal B1	
3	/	/	/	
4	Blue	CANA-H1-BMS	CAN high level data	
5	Blue& White	CANA-L1-BMS	CAN low level data	
6-8	/	/	/	/

Table 6-7 Description of BMS2 ports

PIN	Color	Definition	Function	Note
1	Orange& White	RS485-A2-BMS	RS485 differential signal A2	BMS2 CAN port &EMS RS485 multiplex port
2	Orange	RS485-B2-BMS	RS485 differential signal B2	
3	/	/	/	
4	Blue	CANA-H2-BMS	CAN high level data	
5	Blue& White	CANA-L2-BMS	CAN low level data	
6-8	/	/	/	/

Note: Communication with lithium batteries requires attention to the battery's communication port sequence and pin definition.

6.8.2 DRMS/DI Connection

Table 6-8 Description of DRM ports

PIN	Color	Definition	Function	Note
1	Orange &White	DRM1/5	① The DRMS interface is applicable to the Australian AS-NZS-4777.2 (some European requirements) safety standard ②Chai hair function DI input ③Lead-acid battery temperature sampling	DRMs/diesel generator/lead-acid temperature sampling function multiplexed port
2	Orange	DRM2/6		
3	Green& White	DRM3/7		
4	Blue	DRM4/8		
5	Blue& White	REF GEN		
6	Green	COM LOAD		
7	Brown& White	/	/	/

8	Brown	/	/	/

NTC connection for lead acid battery:

① Cut one end of the standard network cable

② Strip the green, green&white, and blue wires at the fracture by 5mm

③ Weld it together with the NTC pin as shown in the following figure (After confirming that the welding is solid, wrap the welding place with insulation tape respectively, pay attention to avoid contact with bare metal, prevent short circuit, and affect normal use)

④ Insert the finished NTC crystal head into the DRMS connector, and attach the NTC to the outside of the lead battery

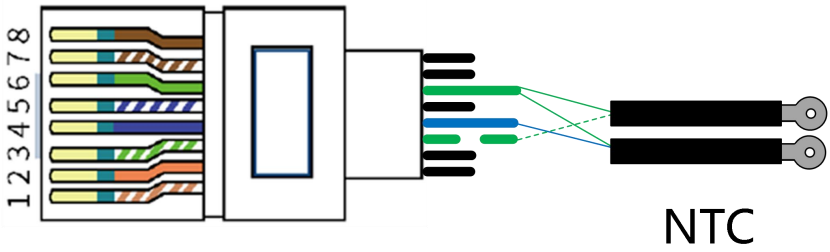


Table 6-9 Description of dry contact ports

	PIN	Definition	Note
DO 1	2	OP1_NO	External dry contact port
	4	OP1_COM	
DO 2	1	OP2_NO	
	3	OP2_COM	
/	5-6	/	/

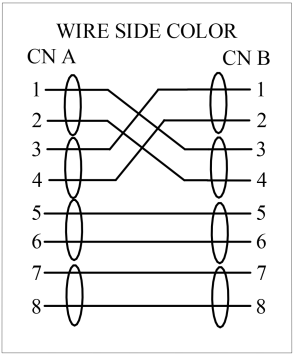
6.8.3 Paralleling

If multiple inverters are used, connect the terminal of the network cable to Pa1 of the first inverter, connect the other end to Pa2 of the second inverter, and so on. Table 6-10 describes the signal of the network cable. Figure 6.8 shows the sequence of the network cable connection.

Table 6-10 Description of parallel ports

PIN	Colour	PARA 1	PARA 2	Note
1	Orange & White	CON1_AO	CON2_AO	Parallel signal
2	Orange	CON1_BO	CON2_BO	
3	Green& White	CON1_AI	CON2_AI	
4	Blue	CON1_BI	CON2_BI	
5-6	/	/	/	/
7	Brown& White	CON_SyncH	CON_SyncH	Simultaneous signal
8	Brown	CON_SyncL	CON_SyncL	

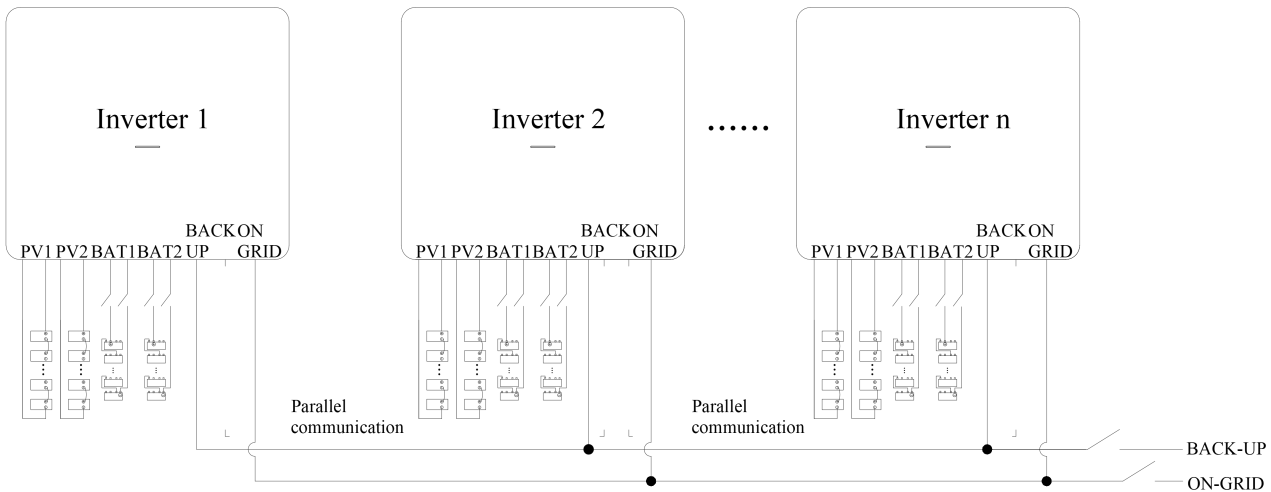
Figure 6.8 Parallel communication line sequence diagram



Application note:

- Supports a maximum of 6 three phase hybrid inverters in parallel;
- Ensure that the inverters are connected to parallel lines;
- Ensure that the load power is less than the maximum parallel power.
- The length of the cable connecting the load end of the inverter to the BACK UP end of each device must be the same to ensure loop impedance;

Parallel standard wiring is shown in the following figure, detailed operation see parallel system operation manual.


Inverter 1
Inverter 2
.....
Inverter n
BACK ON
PV1 PV2 BAT1 BAT2 UP GRID
Parallel communication
Parallel communication
BACK-UP
ON-GRID

7 Inverter Operation

7.1 Pre-power-on Inspection

Serial	Check the entry
1	The inverter is firmly fixed to the mounting bracket on the wall.
2	Cables are bundled according to cable routing requirements, properly distributed, and without damage.
3	PV+/PV-, BAT+/BAT- cables are firmly connected, the polarity is correct, and the voltage is within the accessible range.
4	The DC switch is properly connected between the battery and the inverter, and the DC switch is off.
5	The AC circuit breaker is correctly connected between the inverter port and the power grid, and the circuit breaker is disconnected.
6	The AC circuit breaker is correctly connected between the inverter load port and the power grid, and the circuit breaker is disconnected.
7	For lithium batteries, ensure that the communication cables are properly connected.

7.2 Initial Power-on

Follow these steps to turn on the inverter

1) Ensure that the inverter is not working;
2) Close the AC circuit breaker between the inverter On Grid port and the Grid;
3) Turn on the PV DC switch on the inverter (when connected to PV);
4) Turn on the battery and close the DC switch between the battery and the inverter;
5) The inverter starts to run after the self-test is successful;
6) Close the AC circuit breaker between the inverter Back up port and the load.

7.3 Working Mode

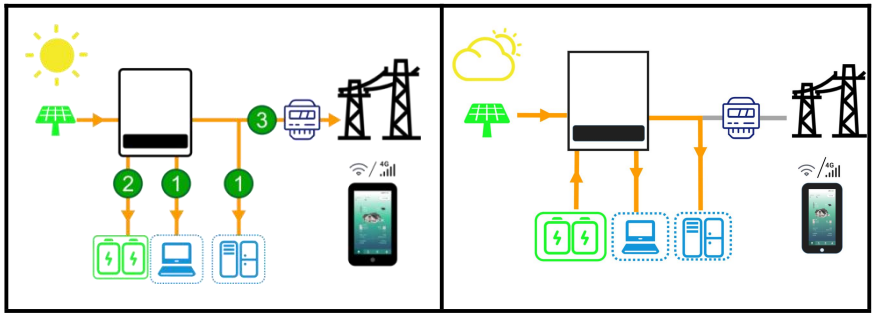
7.3.1 Self-use Mode (default mode)

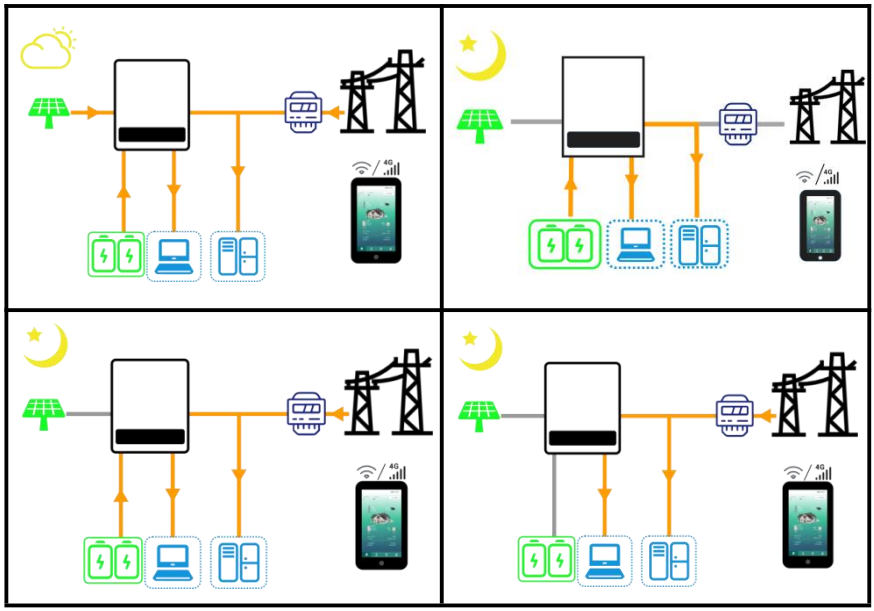
Function:

Give priority to the use of photovoltaic and battery energy, as far as possible not to use the energy of the grid.

Specific working mode:

- When the PV is sufficient, the PV prioritizes supplying power to the load, charging the battery with excess electricity, and the remaining electricity can be feedback to the grid.
- When the PV is insufficient, the PV and battery supply power to the load.
- When the PV and battery are insufficient, the PV, battery, and power grid work together to supply power to the load.
- When the PV is not working and the battery is sufficient, the battery supplies power to the load.
- When the PV is not working and the battery is insufficient, the battery and the grid work together to supply power to the load.
- When the PV and battery are not working, the power grid supplies power to the load, forming a bypass output.
- When the power grid is unable to supply power, the photovoltaic and battery jointly power the load.





7.3.2 Timed Charge Mode

Function:

Set the charging period according to the user's own requirements. For example, when the electricity price is high during the day, the battery and photovoltaic power are used to power the load, and when the electricity price is low at night, the battery is charged with the electricity of the grid, so as to achieve the role of peak cutting and valley filling. Non-charge and non-discharge inverters operate in self-actuating mode.

Specific working methods:

Charging time period:

- When the PV is sufficient, the PV charges the battery, and the remaining electricity supplies power to the load.
- When the PV is insufficient, the photovoltaic and grid work together to charge the battery and supply power to the load.

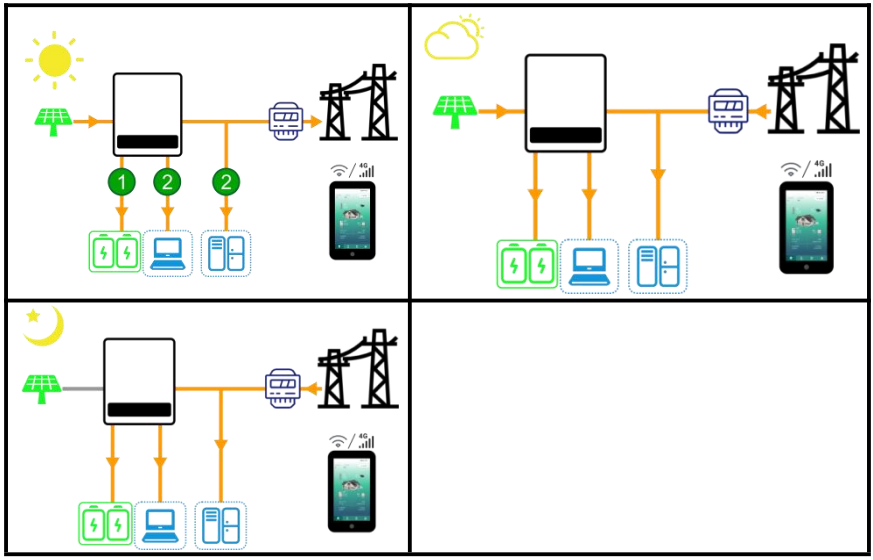
- When PV is not working, the grid charges the battery and supplies power to the load.

Discharge time period:

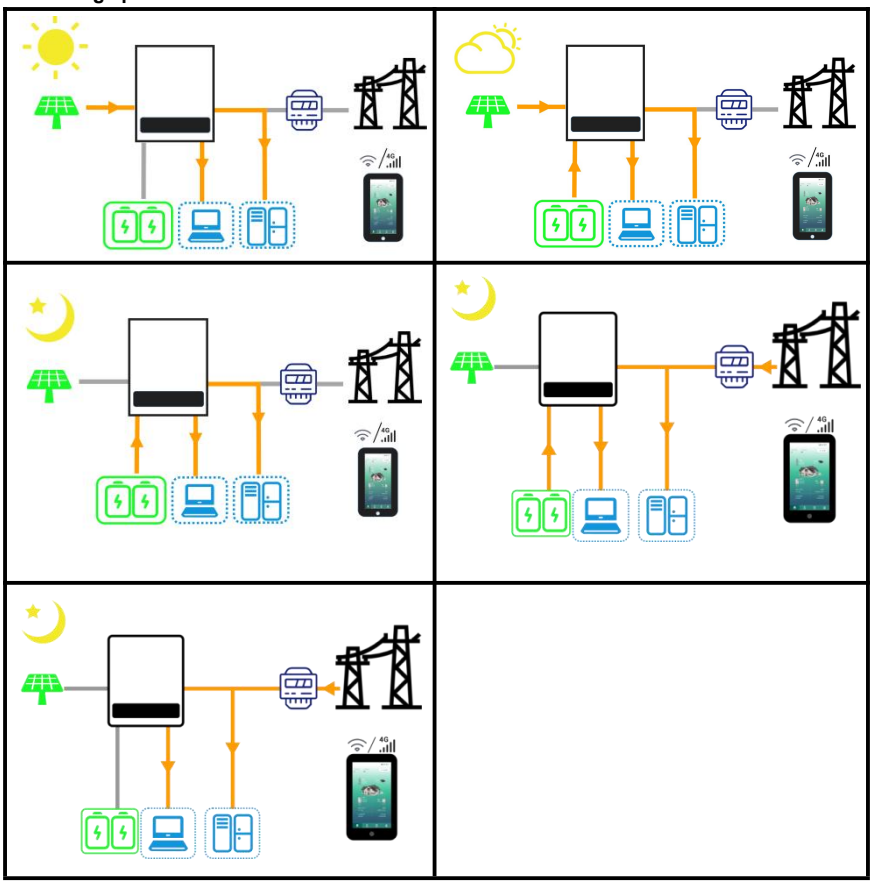
- When PV is sufficient, PV supplies power to the load.
- When the PV is insufficient, the PV and battery supply power to the load.
- When the PV is not working and the battery is sufficient, the battery supplies power to the load.
- PV does not work, and when the battery is insufficient, the battery and grid supply power to the load.
- When the PV is not working and the battery is not working, the grid supplies power to the load.

Note: The charging power is defined as the power of the inverter to charge the battery, and the discharge power is defined as the power of the inverter output.

Charging period:



Discharge period:



7.3.3 Backup Mode/Disaster Recovery Mode

Function:

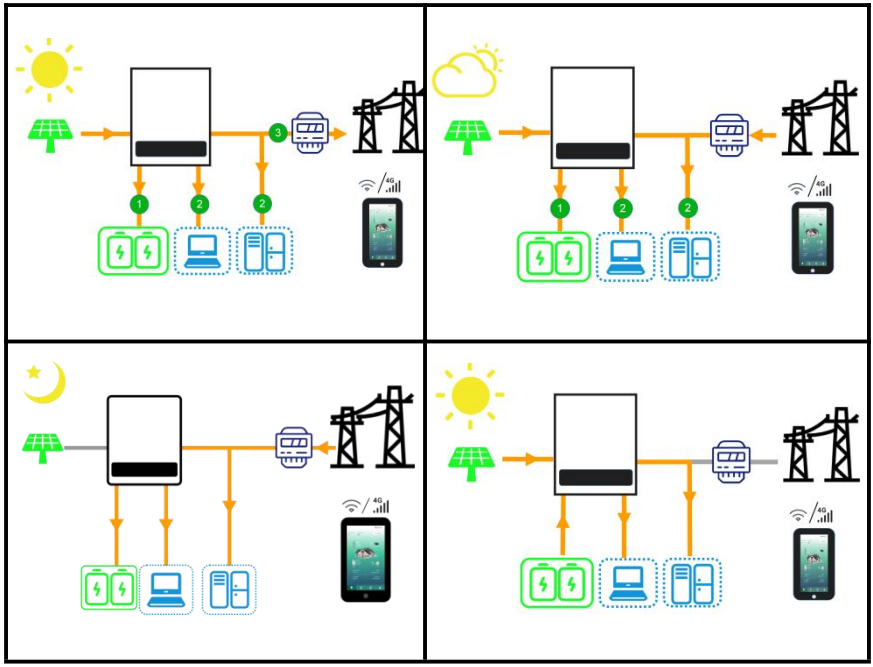
Always keep the battery fully charged to cope with sudden power grid outages or other emergencies, so that users can use the battery power to supply power to the load after an emergency occurs.

Specific working mode:

- When PV is sufficient, PV prioritizes charging the battery before supplying power to the

load, and the remaining electricity can be fed back to the grid.

- When PV is insufficient, the PV and the power grid charge the battery first,then supplies power to the load.
- When PV is not working, the grid charges the battery and supplies power to the load.
- When the power grid is unavailable, the PV and battery supply power to the load.



7.3.4 Priority Feed to Grid Mode

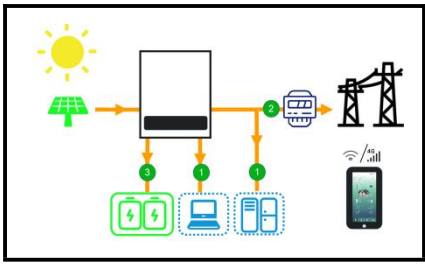
Function:

After meeting the load power consumption, excess PV power generation is preferentially sold to the grid.

Specific working mode:

- If sufficient PV is generated, the PV supplies power to the load first and then to the grid. The remaining power (the part where the PV power exceeds the inverter power) can be used to charge batteries.

- The other cases are in the same self-use mode.



7.4 Operation Mode

7.4.1 Operation Mode Description

Table 7-1 Inverter operating modes

Series No.	Mode	Description
1	Standby	Waiting phase after the inverter is powered on. Enter the self-check state when the conditions are met. If a fault occurs, the inverter enters the fault state.
2	Self-check mode	Before the inverter starts, continue to self-check and initialize. If the conditions are met, the inverter enters the grid-connected state and starts grid-connected operation. If no power grid is detected, the inverter enters the off-grid state and runs off the grid. If the self-check fails, the system enters the fault state.
3	On-grid mode	The inverter is connected to the grid normally If it is detected that the power grid does not exist or the conditions do not meet the requirements for grid connection, it enters the off-grid working state. If a fault is detected, the system enters the fault state. If the power grid conditions do not meet the grid-connection requirements and the off-grid output function is not enabled, the

		system enters the waiting state. If after switching off the grid, it is detected that the grid conditions meet the grid-connected requirements, and the grid-connected function is enabled, it enters the grid-connected state
4	Off-grid mode	When the power grid is powered off or the grid conditions do not meet the grid-connected requirements, the inverter switches to the off-grid state and continues to supply power to the loads. If the grid conditions meet the grid-connected requirements, the system enters the grid-connected state . Before running, the inverter works off the network when the working mode is set to off-network mode. If a fault is detected, the device enters the fault state.
5	Fault mode	If a fault is detected, the inverter enters the fault state. After the fault is rectified, the inverter recovers to its original running state.

7.4.2 Indicator Light Description

The bar indicator in the middle of the device panel indicates the inverter status in red, green, and blue colors.

Table 7-2 Indicator status description

Display item	Indicator light status	Corresponding status description	Notes

Green	Always on	Grid connection	Indicates that the inverter is currently working in a grid connected state and can exchange energy with the power grid. The load can be powered on for operation.
	Flashing 1s/time	Be ready	Indicates that the inverter is in the power-on state and needs to wait until the power-on is completed before the load can be powered on and run.
	Flashing 0.1s/time	The inverter has just been powered on and the program is initialized/Code online upgrade	Indicates that the inverter has just been powered on and the program initialization will flash for 10s; Indicates that the current working status is in shutdown state, and it can be turned on and used normally after the code upgrade is completed.

Blue 	Always on	Off-grid	Indicates that the inverter is currently working in an off-grid state and cannot exchange energy with the power grid. the load can be powered on and run.
Red 	Always on	System error	Indicates that the inverter is currently in shutdown state, a serious alarm occurs on the inverter, and the load cannot be powered on and run.
	Flashing for 0.5s/time	System error	Indicates that the inverter is currently in shutdown state, a relatively serious alarm has occurred on the inverter, and the load cannot be powered on.
	Flashes 2s/time	System error	Indicates that the inverter is currently in shutdown state, an alarm occurs on the inverter, and the load can’t be powered on.

8 App Introduction

Users need to choose WiFi dongle or 4G dongle.

ESS LINK Operation and use Please contact the manufacturer and check the ESS LINK operation and use manual.

Android version: Please scan the QR code below to obtain.

IOS version: Please scan the QR code below to obtain or go to the App Store search ESS LINK to download.

Android apk

Google play

iOS

9. Troubleshooting and Maintenance

This section will help you determine the cause of the problem you may be experiencing.

9.1 Alarm and Processing

Faults not mentioned in the following table still exist after being powered on. Contact your dealer or after-sales service center.

Sequence number	Fault name	Note	Solutions
PV			
	PV 1/2 is not connected	Remind	➢ Check whether the PV 1/2 is correctly connected and whether the photovoltaic DC circuit breaker of the inverter is closed.
	PV 1/2 overvoltage	Fault	➢ Check whether the PV series voltage is higher than the maximum input voltage of the inverter. If so, adjust the number of series PV modules and reduce the PV string voltage to fit the input voltage range of the inverter. After correction, the inverter will automatically return to the normal state.
	PV 1/2 overload time out	Alarm	➢ Check whether the inverter is in the overload state. The alarm is automatically cleared 10 minutes after the inverter is normal or the command is sent to clear the fault.
	PV 1/2 reverse connection	Fault	➢ Check whether the PV 1/2 positive and negative terminals are reversed, and then power on again.
	PV connection mode is incorrect	Alarm	➢ Check whether the PV connection mode set on the APP host is consistent with the actual PV connection mode.

	PV1/2 power tube is faulty	Fault	➢ Disconnect all AC and DC circuit breakers and close the disconnected circuit breakers after 5 minutes. If the fault persists, contact your dealer or after-sales service center.
	PV 1/2 soft start failure	Alarm	
Battery			
	Battery 1/2 is not connected	Remind	➢ Check whether the battery overvoltage is inconsistent with the battery specifications. ➢ Check whether the battery is correctly connected or the voltage is abnormal. If yes, the alarm is automatically cleared or the fault clearing command is sent.
	Battery 1/2 overvoltage	Remind	
	Battery 1/2 undervoltage	Remind	
	Battery 1/2 power is insufficient	Remind	➢ Check whether the battery SOC is too high or too low. The fault is automatically rectified after the SOC returns to normal after the battery is discharged or charged.
	Battery 1/2 do not charge	Alarm	
	Do not discharge battery 1/2	Alarm	
	Battery 1/2 discharge terminates	Alarm	
	Battery is 1/2 full	Remind	
	Battery 1/2 reverse connection	Fault	➢ Check whether the positive and negative battery 1/2 cables are reversed.
	Temperature of the lead-acid battery is abnormal	Alarm	➢ Use the thermal imager to check whether the temperature of the lead-acid battery is too high. The fault will be automatically rectified when the temperature of the lead-acid battery is reduced to normal temperature. ➢ Check whether the wiring sequence between

			the NTC and the network cable is correct. Reinsert the network cable from the communication port.
	Battery connection mode is incorrect	Alarm	➢ Check whether the battery connection mode configured on the APP host is consistent with the actual battery connection mode.
	Battery 1/2 overload timeout	Alarm	➢ Please check whether the maximum battery charging current and maximum battery discharge current are set too high in the battery Settings of the APP, and reduce the values appropriately.
	Battery 1/2 power tube is faulty	Fault	➢ Disconnect all AC and DC circuit breakers and close the disconnected circuit breakers after 5 minutes. If the fault persists, contact your dealer or after-sales service center.
	Battery 1/2 soft startup fails. Procedure	Alarm	
Others			
	Grid voltage anomaly	Alarm	➢ If the alarm is occasionally reported, the power grid may be abnormal for a short time. The inverter will resume normal operation after detecting that the power grid is normal, and no manual intervention is required. ➢ If the alarm is generated frequently, check whether the power grid voltage frequency is within the allowable range. If yes, check whether the AC circuit breaker and AC cable connections of the inverter are correct, and whether the power grid is powered off. ➢ If the power grid voltage/frequency is not
	Network frequency anomaly	Alarm	

			within the acceptable range, the AC connection is correct, but the alarm is repeated, please contact technical support to change the power grid overvoltage and underfrequency protection value.
	Power grid voltage reverse sequence	Alarm	➢ Check the phase sequence, voltage, and wiring of the power grid.
	Grid voltage is out of phase	Alarm	
	Neutral wire anomaly	Fault	
	Heat sink temperature is too high	Fault	➢ Ensure that the inverter is installed in a place that is out of direct sunlight, and restart the inverter after the heat sink cools down to 60°C for 5 minutes. ➢ If the fault persists, contact your dealer or after-sales service center.
	Ambient temperature is too high	Alarm	
	The inverter is overheated. Procedure	Alarm	
	Insulation fault	Fault	➢ Check the impedance of the photovoltaic string to the protected area. If the resistance value is greater than 33 kΩ, it is normal. If the resistance value is less than 33 kΩ, check the short circuit point and rectify the fault. Check whether the PGND cable of the inverter is correctly connected. If no alarm is generated, the system automatically clears the fault or sends a command to clear the fault. ➢ If it is confirmed that the impedance is indeed lower than the default value in a cloudy and

			rainy environment, reset the insulation impedance protection point.
	Leakage protection failure	Fault	➢ Please check whether the inverter is connected properly. ➢ Disconnect all AC and DC circuit breakers and close the disconnected circuit breakers after 5 minutes. If the fault persists, contact your dealer or after-sales service center.
	Fan failure	Fault	➢ Check whether the external fan is blocked. ➢ Disconnect all AC and DC circuit breakers and close the disconnected circuit breakers after 5 minutes. If the fault persists, contact your dealer or after-sales service center.
	Model capacity fault	Fault	➢ Please contact your distributor or after-sales service center to check whether the model capacity is set incorrectly in the APP.
	Islanding protection	Alarm	➢ Turn off the AC circuit breaker on the power grid and check whether the power grid quality is poor or abnormal. ➢ Disconnect all AC and DC circuit breakers and close the disconnected circuit breakers after 5 minutes. If the fault persists, contact your dealer or after-sales service center.
	Dc bus undervoltage	Fault	➢ Check whether the battery is exhausted or the power of the inverter is too large. ➢ Disconnect all AC and DC circuit breakers and close the disconnected circuit breakers after 5 minutes. If the fault persists, contact your dealer or after-sales service center.

	Bad earth	Fault	➢ Check whether the ground cable connected to the inverter is damaged or the connection screws are not tightened, resulting in poor contact.
	Parallel communication alarm	Alarm	➢ Only in the case of parallel display, check the parallel communication line sequence is correct; If the sequence is correct, remove and reinsert the network cable from the communication port to prevent poor contact.
	The system runs derated	Alarm	➢ Check whether the external fan of the inverter is blocked. ➢ Whether the ambient temperature is too high.
	The number of parallel modules is abnormal	Fault	➢ Display only in parallel situations. Check whether the parameters related to parallel Settings in the App are set correctly.
	The parallel module number is repeated	Alarm	
	Parameters of parallel modules conflict	Alarm	
	The meter is reversed	Fault	➢ Check that the meter is connected correctly.
	The electricity meter is connected abnormally	Alarm	
	The DSP1/2 parameter Settings are faulty	Fault	➢ Please contact your distributor or after-sales service center to check whether the parameters in the APP are set correctly or the software version is upgraded
	The DSP/CPLD	Fault	

	version is incompatible. Procedure		
	The communication between the DSP and CPLD is faulty	Fault	

Table 9-1 Alarm list and troubleshooting measures

9.2 Regular maintenance

⚠ Warning
➢ Make sure that the inverter is disconnected from power. ➢ Wear personal protective equipment when operating the inverter.

Table 9-2 Maintenance Instructions

Maintenance content	Maintenance methods	Maintenance period
System cleaning	Check the heat sink, air inlet/outlet for foreign objects and dust.	1 time/half year~1 time/year
DC Switch	Turn the DC switch on and off 10 times continuously to ensure proper DC switch function.	1 time/year
Electrical connection	Check whether the electrical connection is loose, whether the cable appearance is broken, and whether there is copper leakage.	1 time/half year~1 time/year

10. Technical Parameters

Table 10 Technical Parameters Description

Product model	Isuna 5000T	Isuna 6000T	Isuna 8000T
Battery parameter			
Number of battery input channels	2		
Battery type	Lithium battery/Lead-acid battery		
Battery voltage range	125~800V		
Full load battery voltage range	125V~800V	125V~800V	160V~800V
Maximum charge and discharge current	25A/25A		
Peak charge/discharge current&duration	35A/35A&（60s）		
Nominal charge/discharge power	5000W	6000W	8000W
Communication Interface	RS485/CAN		
PV input parameters			

Isuna 5000~20000T

Number of PV input channels	2		
Maximum input power	7500WP (3750WP/3750WP)	9000WP (4500WP/4500WP)	12000WP (6000WP/6000WP)
Maximum input voltage	1000V		
MPPT voltage range	130~960V		
MPPT full load voltage range	130V~850V	130V~850V	210V~850V
Starting voltage	130V		
Rated input voltage	600V		
Maximum input current per MPPT	25A/25A		
Maximum short-circuit current per MPPT	30A/30A		
MPPT quantity	2		
Maximum input strings per MPPT	2		
Backfeed current	0A		
Parallel input and output parameters			
Nominal output power	5000W	6000W	8000W
Maximum output power	5.5kVA	6.6kVA	8.8kVA

Isuna 5000~20000T

Maximum grid input power	10kVA	12kVA	16kVA
Maximum grid input current	15A	18A	24A
Maximum current output	8A	10A	13A
Nominal output current	7.5/7.2A	9/8.7A	12/11.6A
Nominal voltage	3L/N/PE，220V/380Vac，230V/400Vac		
Grid voltage range	184~276V		
Rated grid frequency	50/60Hz		
Nominal Grid frequency	45Hz~55Hz/55Hz~65Hz		
Power factor	-0.8~0.8		
THdI(@ Nominal power)	<3%		
Off-grid output parameters			
Nominal output power	5000W	6000W	8000W
Maximum output power	10kVA~60s	10kVA~60s	10kVA~60s
Nominal output current	7.5/7.2A	9/8.7A	12/11.6A
Nominal output voltage	3/N/PE，220V/380Vac，230/400Vac		
Nominal output frequency	50/60Hz		
Thdu(@ linear load)	<3%		
On/off-grid switch-over time	<10ms		
Efficiency			

European efficiency	97.70%
Maximum efficiency	98.20%
Maximum battery charge/discharge efficiency	97.80%
Protection	
DC Switch	Available
Input reverse	Available
Output overvoltage, overcurrent, short circuit	Available
Anti-islanding	Available
Residual current detection	Available
Insulation resistance detection	Available
Overvoltage Category	DC:II ; AC:III
Surge protection level	DC:II ; AC:III
Battery input reverse connection protection	Available
Routine parameters	
Weight	35kg

Noise	<45dB
Topology	No isolation
Working altitude	<4000m
Derating Temperature	>40℃
Ambient Temperature	-25℃~60℃
Ambient Humidity	5%~95%
Cooling method	Air cooling
IP Degrees	IP65
Dimensions	573*509*219mm
Standby loss	<15W
Features	
DC terminal	MC4
AC output terminal	5P connector
interface	RS485/CAN/DRED/DO/Parallel port
Human-computer interaction mode	H5/LED/APP/WIFI/4G/Bluetooth

Isuna 5000~20000T

Scalability in Parallel function	Support
Standard Warranty	5 years
DC terminal	MC4
Certification	
Safety regulations	IEC 62109-1, IEC 62109-2, EN 62109-1, EN 62109-2, IEC62477-1
EMC	EN61000-6-1，EN61000-6-2，EN61000-6-3，EN61000-6-4,EN62920
Grid	VDE-AR-N 4105, EN50549, AS4777.2:2020+Amd 1:2021, IEC 61727, IEC62116, NC RfG

(If 5-8kw models have certification requirements, please contact the inverter manufacturer)

Product model	Isuna 10000T	Isuna 12000T	Isuna 15000T	Isuna 18000T	Isuna 20000T
Battery parameter					
Number of battery input channels	2				
Battery type	Lithium battery/Lead-acid battery				
Battery voltage range	125~800V				

Isuna 5000~20000T

Full load battery voltage range	200V-800V	240V~800V	300V~800V	360V~800V	400V~800V
Maximum charge and discharge current	25A/25A				
Peak charge/discharge current&duration	35A/35A（60s）				
Nominal charge/discharge power	10000W	12000W	15000W	18000W	20000W
Communication Interface	RS485/CAN				
PV input parameters					
Number of PV input channels	2				
Maximum input power	15000WP (7500WP/7500WP)	18000WP (9000WP/9000WP)	22500WP (11250WP/11250WP)	27000WP (13500WP/13500WP)	30000WP (15000WP/15000WP)
Maximum input voltage	1000V				
MPPT voltage range	130~960V				
MPPT full load voltage range	250V~850V	290V~850V	350V~850V	410V~850V	450~850V
Starting voltage	130V				

Isuna 5000~20000T

Rated input voltage	600V				
Maximum input current per MPPT	25A/25A				
Maximum short-circuit current per MPPT	30A/30A				
MPPT quantity	2				
Maximum input strings per MPPT	2				
Backfeed current	0A				
Parallel input and output parameters					
Nominal output power	10000W	12000W	15000W	18000W	20000W
Maximum output power	11kVA	13.2kVA	16.5kVA	19.8kVA	22kVA
Maximum grid input power	20kVA	24kVA	30kVA	36kVA	40kVA
Maximum grid input current	29A	35A	44A	52A	58A
Maximum current output	16A	20A	24A	29A	32A
Nominal output current	15/14.5A	18/17.4A	22.7/21.7A	27/26A	30/29A
Maximum current output	3L/N/PE，220V/380Vac，230V/400Vac				

Isuna 5000~20000T

Nominal output current	184~276V				
Nominal voltage	50/60Hz				
Grid voltage range	45Hz~55Hz/55Hz~65Hz				
Rated grid frequency	-0.8~0.8				
Nominal Grid frequency	<3%				
Off-grid output parameters					
Nominal output power	10000W	12000W	15000W	18000W	20000W
Maximum output power	11kVA~60s	13.2kVA~60s	16.5kVA~60s	19.8kVA~60s	22kVA~60s
Nominal output current	15/14.5A	18/17.4A	22.7/21.7A	27/26A	30/29A
Nominal output voltage	16A~60s	20A~60s	24A~60s	29A~60s	32A~60s
Nominal output frequency	3/N/PE，220V/380Vac，230/400Vac				
Thdu(@ linear load)	50/60Hz				
On/off-grid switch-over time	<3%				
Nominal output power	<10ms				
Efficiency					
European efficiency	97.70%				
Maximum efficiency	98.20%				
Maximum battery	97.80%				

charge/discharge efficiency	
Protection	
DC Switch	Available
Input reverse	Available
Output overvoltage, overcurrent, short circuit	Available
Anti-islanding	Available
Residual current detection	Available
Insulation resistance detection	Available
Overvoltage Category	DC:II ; AC:III
Surge protection level	DC:II ; AC:III
Battery input reverse connection protection	Available
Routine parameters	
Weight	35kg
Noise	<45dB
Topology	No isolation

Isuna 5000~20000T

Working altitude	<4000m
Derating Temperature	>40℃
Ambient Temperature	-25℃~60℃
Ambient Humidity	5%~95%
Cooling method	Air cooling
IP Degrees	IP65
Dimensions	573*509*219mm
Standby loss	<15W
Features	
DC terminal	MC4
AC output terminal	5P connector
interface	RS485/CAN/DRED/DO/Parallel port
Human-computer interaction mode	H5/LED/APP/WIFI/4G/Bluetooth
Scalability in Parallel function	Support
Standard Warranty	5 years

Isuna 5000~20000T

Certification	
Safety regulations	IEC 62109-1, IEC 62109-2, EN 62109-1, EN 62109-2，IEC62477-1
EMC	EN61000-6-1, EN61000-6-2, EN61000-6-3, EN61000-6-4,EN 62920
Grid	VDE-AR-N 4105,C10-11,G98/99,CEI 0-21,EN50549,NRS 097-2-1,R25,UNE217002,NTS 2.1 AS4777.2:2020+Amd 1:2021,PEA,MEA,IEC 61727,IEC62116,NC RfG