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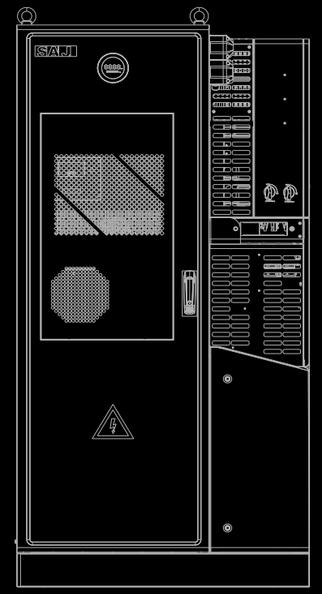
V1.0



CHS2 Series

C&I ENERGY STORAGE SYSTEM

CHS2-(29.9K-50K)-(T4, T5, T6)-X

(X=204.8V/280Ah/51.5kWh, 256.0V/280Ah/64.4kWh, 307.2V/280Ah/77.3kWh, 358.4V/280Ah/90.2kWh)

Preface

Thank you for choosing SAJ products. We are pleased to provide you first-class products and exceptional service.

This manual provides information about installation, operation, maintenance, troubleshooting and safety. Please follow the instructions of this manual so that we can ensure delivery of our professional guidance and whole-hearted service.

Customer-orientation is our forever commitment. We hope this document proves to be of great assistance in your journey for a cleaner and greener world.

We make constant improvements on the products and their documentation. This manual is subject to change without notice; these changes will be incorporated in new editions of the publication. To access the latest documentation, visit the SAJ website at https://www.saj-electric.com/.

Guangzhou Sanjing Electric Co., Ltd.

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1.

SAFETY PRECAUTIONS

1.1 Scope of Application

This User Manual describes instructions and detailed procedures for installing, operating, maintaining, and troubleshooting of the following SAJ products:

CHS2-29.9K-T4-X; CHS2-30K-T4-X; CHS2-40K-T5-X; CHS2-50K-T6-X;

1.2 Safety Instructions

DANGER
· DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING
·WARNING indicates a hazardous situation which, if not avoided, can result in death or serious injury or moderate injury.

CAUTION
· CAUTION indicates a hazardous condition which, if not avoided, can result in minor or moderate injury.

NOTICE
· NOTICE indicates a situation that can result in potential damage, if not avoided.

1.3 Target Group

Only qualified electricians who have read and fully understood all safety regulations contained in this manual can install, maintain and repair the device. Operators must be aware of the high-voltage device.

2.

PREPARATION

2.1 Safety Instructions

For safety, be sure to read all the safety instructions carefully prior to any works, and please observe the appropriate rules and regulations of the country or region where you installed C&I energy storage system.

DANGER

- There is possibility of dying due to electrical shock and high voltage.
- Do not touch the operating component of the inverter; it might result in burning or death.
- To prevent risk of electric shock during installation and maintenance, please make sure that all AC and DC terminals are plugged out.
- Do not touch the surface of the equipment while the housing is wet, otherwise, it might cause electrical shock.
- Do not stay close to the equipment while there are severe weather conditions including storm, lighting, etc.
- Before opening the housing, the SAJ inverter must be disconnected from the grid and PV generator; you must wait for at least five minutes to let the energy storage capacitors completely discharged after disconnecting from power source.
- Please keep the power off prior to any operations
- Do not expose the battery to temperatures in excess of 50℃.
- Do not subject the battery to any strong force.
- Keep inflammable and explosive dangerous items or flames away from the battery.
- Do not soak the battery in water or expose it to moisture or liquids.
- Do not use the battery in areas where the ammonia content of the air exceeds 20ppm.

WARNING

- Only qualified personnel who has full knowledge of local safety regulations and local standards on battery can install, maintain, retrieve and process this product.
- SAJ electric shall not be liable for any loss or warranty claims arising from any unauthorized change of product which may cause fatal injury to the operator, third party or equipment performance.
- For personal and property safety, do not short-circuit the positive (+) and negative (-) electrode terminals.

CAUTION

- Risk of damage due to improper modification
- Use professional tools when operating the products.
- The inverter will become hot during operation. Please do not touch the heat sink or peripheral surface during or shortly after operation.

NOTICE

- During installation of the battery, circuit breaker must be disconnected from the battery pack wiring.

2.2 Explanations of Symbols

Symbol	Description
	**Dangerous electrical voltage** This device is directly connected to public grid, thus all work to the battery shall only be carried out by qualified personnel.
	**No open flames** Do not place or install near flammable or explosive materials.
	**Danger of hot surface** The components inside the battery will release a lot of heat during operation. Do not touch metal plate housing during operating.
	**Attention** Install the product out of reach of children
	**An error has occurred** Please go to Chapter 7 “Troubleshooting” to remedy the error.
	**This device shall NOT be disposed of in residential waste**
	**This battery module shall NOT be disposed of in residential waste**
	**CE Mark** Equipment with the CE mark fulfills the requirements of the Low Voltage Directive and Electro Magnetic Compatibility.
	**Recyclable**

Danger to life due to high electrical voltage!
There might be residual currents in inverter because of large capacitors. Wait 5 MINUTES before you remove the front lid.

2.3 Battery Handling

Operate and use the battery properly according to user manual. Any attempt to modify battery without the permission from SAJ will void the limit warranty for the battery.

- The battery must be installed at a suitable location with sufficient ventilation
- Do not use the battery if it is defective, damaged or broken.
- Only use the battery with compatible inverter.
- Do not use the battery with other type of battery.
- Make sure the battery is grounded prior to use.
- Do not pull out any cables or open the battery enclosure when the battery is powered on.
- Only use the battery as intended and designed.

2.4 Emergency Situation

Despite of its careful and professional protection design against any hazards, damage of the battery may still possible. If a small amount of battery electrolyte is released due to a serious damage of the outer casing; or if the battery explodes due to not being treated timely after a fire breaks out nearby, and leaks out poisonous gases such as carbon monoxide, carbon dioxide and etc., the following actions are recommended:

1) Eye contact: Rinse eyes with a large amount of running water and seek medical advice
2) Contact with skin: Wash the contacted area with soap thoroughly and seek medical advice
3) Inhalation: If you feel discomfort, dizziness or vomiting, seek medical advice immediately.
4) Use a FM-200 or Carbon Dioxide (CO2) fire extinguishers to extinguish the fire if there is a fire in the area where the battery pack is installed. Wear a gas mask and avoid inhaling toxic gases and harmful substances produced by the fire.
5) Use an ABC fire extinguisher, if the fire is not caused by battery and not spread to it yet.

⚠ WARNING
·If a fire has just occurred, try to disconnect the battery circuit breaker and cut off the power supply first, but only if you can do so without endangering yourself. ·If the battery is on fire, do not attempt to extinguish the fire but evacuate the crowd immediately.

Potential danger of damaged battery:

Chemical Hazard: Despite of its careful and professional protection design against any hazard results, rupture of battery may still occur due to mechanical damage, internal pressure etc., and may result in a leakage of battery electrolyte. The electrolyte is corrosive and flammable. When there is fire, the toxic gases produced will cause skin and eyes irritation, and discomfort after inhalation. Therefore:

1) Do not open damaged batteries;

2) Do not damage the battery again (shock, fall, trample, etc.);

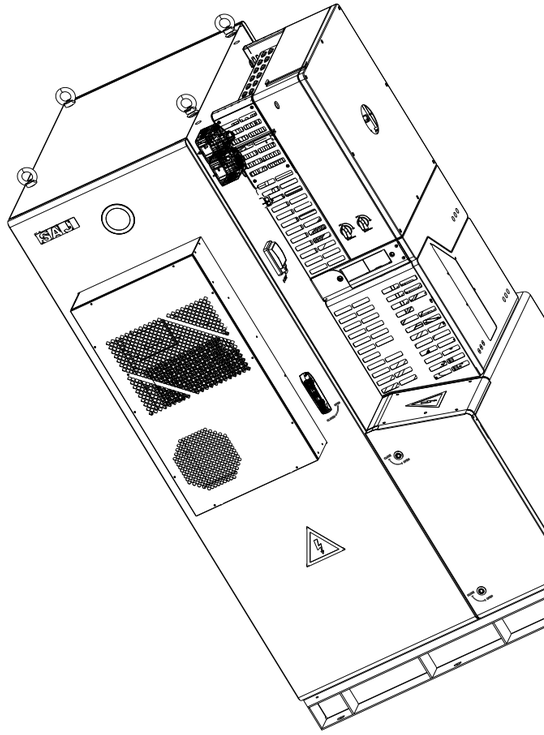
3) Keep damaged batteries away from water (except to prevent an energy storage system from catching fire);

4) Do not expose the damaged battery to the sun to prevent internal heating of the battery.

Electrical hazard: The reason of fire and explosion accidents in lithium batteries is battery explosion. Here are the main factors of battery explosion:

1) Short circuit of battery. Short circuit will generate high heat inside battery, resulting in partial electrolyte gasification, which will stretch the battery shell. The temperature reaching ignition point of internal material will lead to explosive combustion.

2) Overcharge of battery. Overcharge of battery may precipitate lithium metal. If the shell is broken, it will come into direct contact with the air, resulting in combustion. The electrolyte will be ignited at the same time, resulting in strong flame, rapid expansion of gas and explosion.



3.

PRODUCT INFORMATION

3.1 Application Scope

The product is a Commercial & Industrial energy storage system with battery and it is suitable for large residential, small industrial and commercial scenarios. The energy storage system is able to store the energy for future use. It is built internally with a battery management system (BMS), which is used to ensure efficiency of the battery and protect the battery from operating outside its specified limitations.

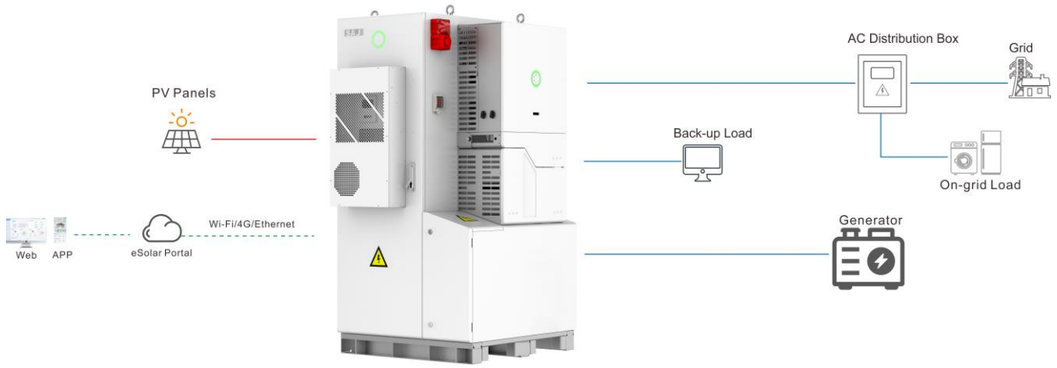


Figure 3.1
System overview

3.2 Specification for Product Model

CHS2 ① - **XK** ② - **T4** ③ - **X** ④

①CHS2 indicates product name.

②XK indicates rated energy XkW of storage system, for example, 30K indicates 30kW.

③T indicates three phases, T4 indicates three phases with 4MPPT.

④X indicates the Battery Rated Voltage/Rated Capacity/Usable Energy.

3.3 Overview of Products

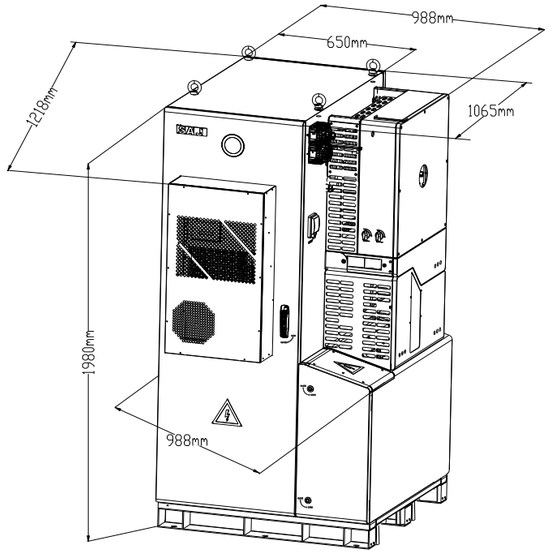


Figure 3.2
Dimensions of inverter

3.4 Terminals Description

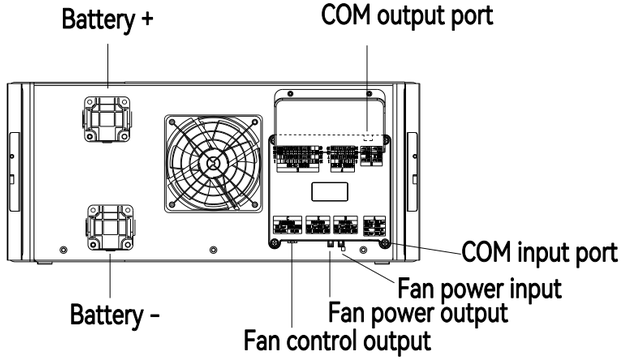


Figure 3.3
Battery module interface

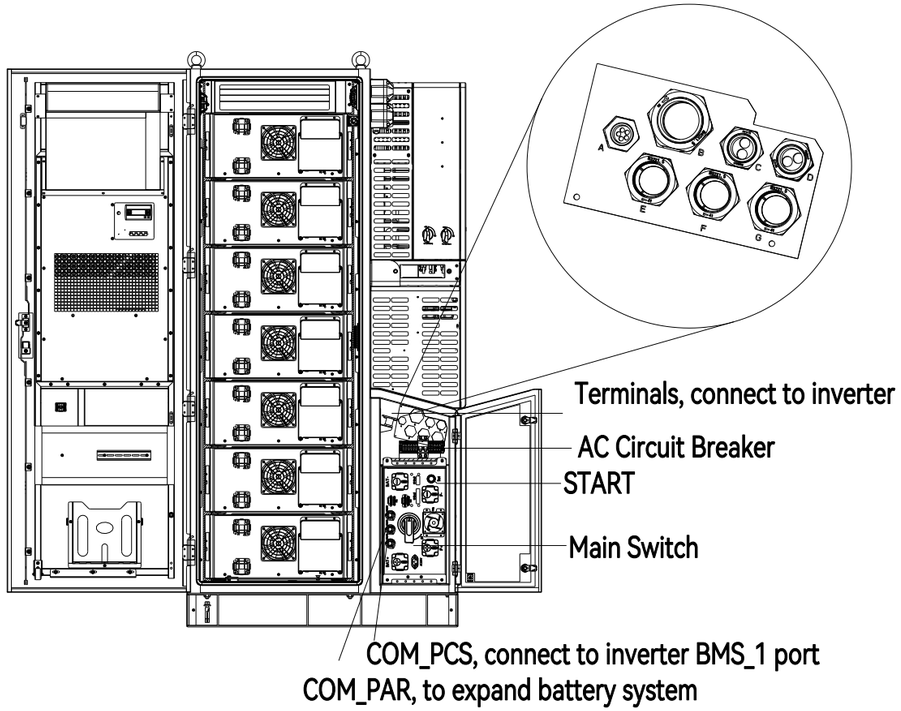


Figure 3.4
Battery control unit interface

A	220V input from CH2
B	High voltage box and CH2 power line
C	CAN communication with CH2 and parallel machine
D	Parallel 220V AC output
E	Parallel DC positive input
F	Parallel DC negative input
G	Parallel DC negative output

Table 3.1
Waterproof connector wiring identification

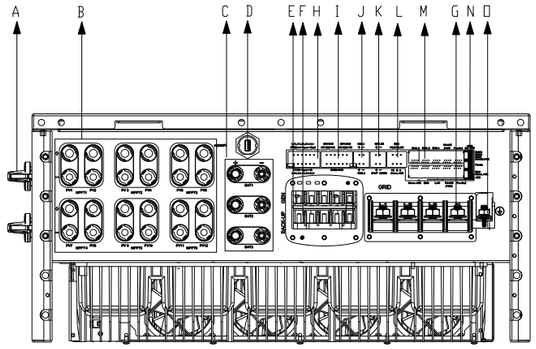


Figure 3.5
Electrical interface of Inverter

Code	Name
A	DC Switch
B	PV Input
C	Battery Port
D	4G/ Wi-Fi
E	Generator
F	Backup
G	Grid
H	CT
I	DRY/DRED/RCR
J	RSD
K	DRY/SHUT DOWN
L	Generator /Meter
M	BMS/ LAN/ EMS/ METER/ PARELLE
N	120Ω Resistor
O	Ground Connection

Table 3.2
Terminals description

3.5 Datasheet

Model	CHS2-29.9K-T4-X	CHS2-30K-T4-X	CHS2-40K-T5-X	CHS2-50K-T6-X
DC Input				
Max. PV Array Power [Wp]@STC	59998	60000	80000	100000
Max. DC Voltage [V]	1000			
MPPT Voltage Range [V]	180 - 850			
Rated DC Voltage [V]	600			
Start Voltage [V]	200			
Max. DC Input Current [A]	4*45		5*45	6*45
Max. DC input current of a single string [A]	22.5			
Max. DC Short Circuit Current [A]	4*55		5*55	6*55
Number of Strings per MPPT	2			
Battery Parameters				
Battery Type	LiFePO4			
Rated Energy [kWh]	57.3 - 100.3			
Battery Voltage Range [V]	179.2 - 403.2			
Max. Charging/Discharging Current [A]	140			
AC Output [On-grid]				
Rated AC Power [W]	29999	30000	40000	50000
Max. Apparent Power [VA]	29999	33000	44000	55000
Rated Output Current [A]@230Vac	43.3	43.5	58.0	72.5
Max. AC Output Current to Utility Grid [A]	43.3	47.9	63.8	79.8
Current Inrush[A]	192			
Max. AC Fault Current[A]	182.6			
Max. AC Over Current Protection[A]	86.6	87	116	145
Rated AC Voltage [V]	3+N+PE,380/400			
Rated Output Frequency/Range [Hz]	50,60/45 - 55,55 - 65			
Power Factor [cos ϕ]	0i - 1 - 0c			
Total Harmonic Distortion [THDi]	<3%			
AC Input [On-grid]				
Rated AC Voltage [V]	3+N+PE, 380/400			
Rated Input Frequency [Hz]	50,60			
Max. Input Current [A]	150			
AC Input [Generator]				
Max. Input Power [W]	29999	30000	40000	50000
Max. Input Current [A]@230V	43.3	43.5	58.0	72.5
Rated Input Voltage [v]	3+N+PE, 380/400			
Rated Input Frequency/Range [Hz]	50,60/45 - 55,55 - 65			

Model	CHS2-29.9K-T4-X	CHS2-30K-T4-X	CHS2-40K-T5-X	CHS2-50K-T6-X
AC Output [Back-up]				
Max. Apparent Power [VA]	29999	33000	44000	55000
Peak Output Apparent Power [VA]	29999	45000,5s	60000,5s	75000,5s
Rated AC Voltage [V]	3+N+PE, 380/400			
Rated Output Frequency/Range [Hz]	50,60/45 - 55,55 - 65			
Output THDv (@ Linear Load)	<3%			
Efficiency				
Max. Efficiency	≥98.0%			
Euro Efficiency	97.3%			
Max. Battery to AC Efficiency	96.0%			
Protection				
PV String Current Monitoring	Integrated			
PV Insulation Resistance Detection	Integrated			
Residual Current Monitoring	Integrated			
PV Reverse Polarity Protection	Integrated			
Anti-islanding Protection	AFD			
AC Overcurrent Protection	Integrated			
AC Short Circuit Protection	Integrated			
AC Overvoltage Protection	Integrated			
DC switch	Integrated			
DC Surge Protection	II			
AC Surge Protection	II			
AFCI	Integrated			
RSD	Optional			
General Parameters				
Communication	Wi-Fi/Ethernet/CAN/RS485			
Topology	Non-isolated			
Operating Temperature Range	-30℃ to +50℃ (45℃ to 50℃ with derating)			
Cooling Method	Air Conditioner			
Ambient Humidity	0-100% Non-condensing			
Altitude	2000m			
Ingress Protection	IP55, IP66(Inverter)			
Dimensions [H*W*D] [mm]	1980*988*1065			
Weight [kg]	1050(57.3kWh)/1150(71.6kWh)/1250(85.9kWh)/1350(100.3kWh)			
Warranty [Year]	5/10			
Standard	VDE4105, IEC61727/62116, VDE0126, AS4777.2, CEI 0 21,EN50549-1,G98,G99,C10-11,UNE217002,NBR16149/NBR16150 IEC62109-1/-2, NB/T32004-2018, EN61000-6-1, EN61000-6-2, EN61000-6-3, EN61000-6-			

Note: X=204.8V/280Ah/51.5kWh,256.0V/280Ah/64.4kWh,307.2V/280Ah/77.3kWh,358.4V/280Ah/90.2kWh

Battery

Model	CB2-57.3-HV5	CB2-71.6-HV5	CB2-85.9-HV5	CB2-100.3-HV5
Rated Energy [kWh]	57.3	71.6	85.9	100.3
Usable Energy [kWh]	51.5	64.4	77.3	90.2
Rated Capacity [Ah]	280	280	280	280
No. of Modules	4	5	6	7
Nominal Voltage [V]	204.8	256	307.2	358.4
Voltage Range [V]	179.2 - 230.4	224 - 288	268.8 - 345.6	313.6 - 403.2
Charge/Discharge Current [A]	140	140	140	140
Rated Power [kW]	28.6	35.6	42.9	50.1
Weight [kg]	960	1060	1160	1260
Dimension [mm]	1980*988*1065			
Communication	CAN			
Operating Temperature Range [℃]	-30 - 50			
Cooling Method	Air Conditioner			
Relative Humidity	5 - 95% (non-condensing)			
Altitude [m]	2000			
Ingress Protection	IP55			
Mounting	Ground-Mounted			
Control Module	**CBC2-HV5**			
Dimension (H*W*D)[mm]	225*483*610			
Weight [kg]	28			
Battery Module	**CBU2-14.33-HV5**			
Rated Energy [kWh]	14.33			
Weight [kg]	115			
Dimension [mm]	231*523*805			
Applicable Standard	IEC62619-2017, UN38.3, IEC61000-6-2/4, IEC62477			

4.

INSTRUCTIONS FOR INSTALLATION

4.1 Unpacking and Inspection

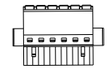
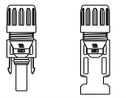
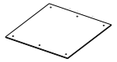
4.1.1 Checking the Package

Although SAJ's product have thoroughly tested and checked before delivery, it is uncertain that the product may suffer damages during transportation. Please check the package for any obvious signs of damage, and if such evidence is present, do not open the package and contact your dealer as soon as possible

4.1.2 Scope of Delivery

Please contact after sales if there are missing or damaged components.

Inverter Package

					
CHS2 inverter *1	RJ45 plug *10	Plug 2 pin *4	Plug 3 pin *2	Plug 6 pin *4	PV terminal T4*8 *2 T5*10 *2 T6*12 *2
					
Terminals (RNBS 38-8) *2 (RNB70-10) *4	Terminals (SQNBS22-5) *10	M4*10 flathead Screw *4	M8*16 screw *2 M6*12 screw *1	Expansion screw M12*80 *6	Removal tool *1
					
Key 1 *2	Key 2 *2	Socket wrench *1	Cardboard *1	Communication Module *1 (Optional)	Documents
					
Mounting bracket *4					

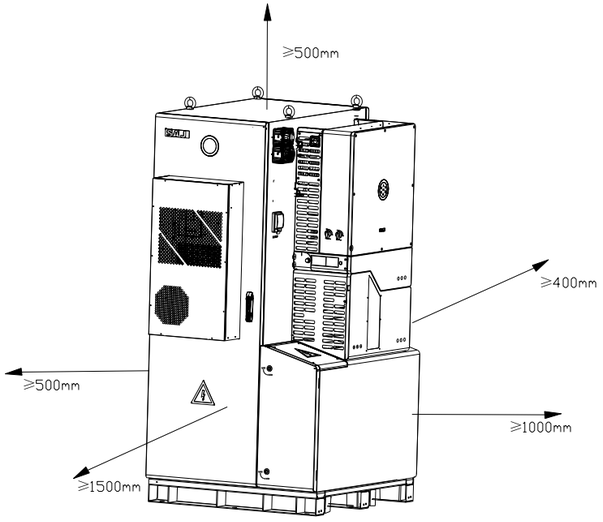
The documents include the user manual, quick installation guide and packaging list.

4.2 Installation Method and Position

4.2.1 Installation Position and Clearance

This device adopts air conditioner convention. It is suggested to install it indoor or under a sheltered place to prevent it from exposure to direct sunlight, rain, and snow erosion.

Please reserve enough clearance around the product to ensure a good air circulation at the installation area. Because poor air ventilation will affect the working performance of internal electronic components and shorten the service life of the system.



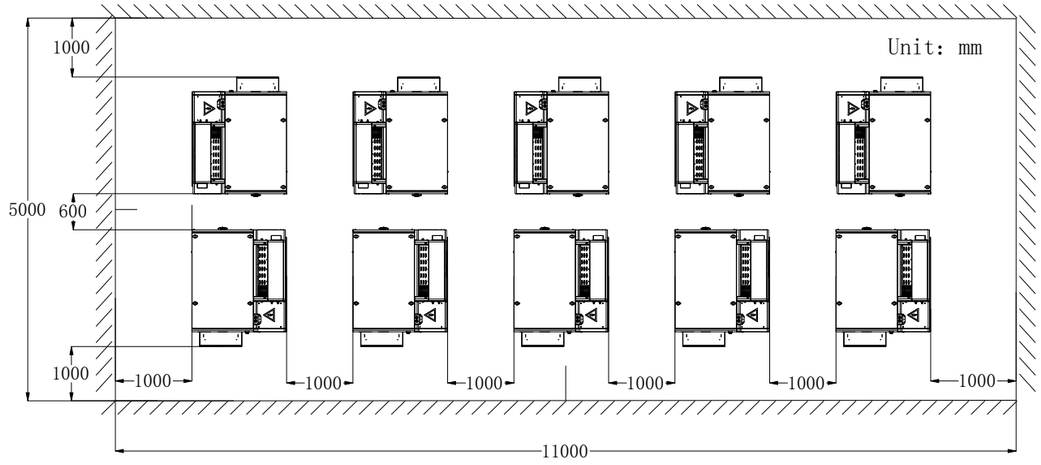


Figure 4.1
Installation clearance

4.2.2 Mounting Method

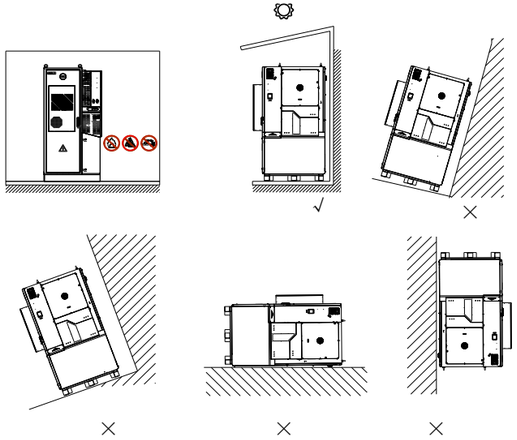


Figure 4.2
Mounting method

- The equipment employs air conditioner convection cooling, and it can be installed indoor or outdoor.
- Mount vertically. Never install the device tilted forwards, sideways, horizontally or upside down.
- The ground should be flat and no inclination. The load-bearing capacity of the ground should reach 1.5 tons.

Installation Environment Requirements

- The installation environment must be free of inflammable or explosive materials.
- Install the device away from heat source.
- Do not install the device at a place where the temperature changes extremely.
- Keep the device away from children.
- Do not install the device at daily working or living arears, including but not limited to the following areas: bedroom, lounge, living room, study, toilet, bathroom, theater and attic.

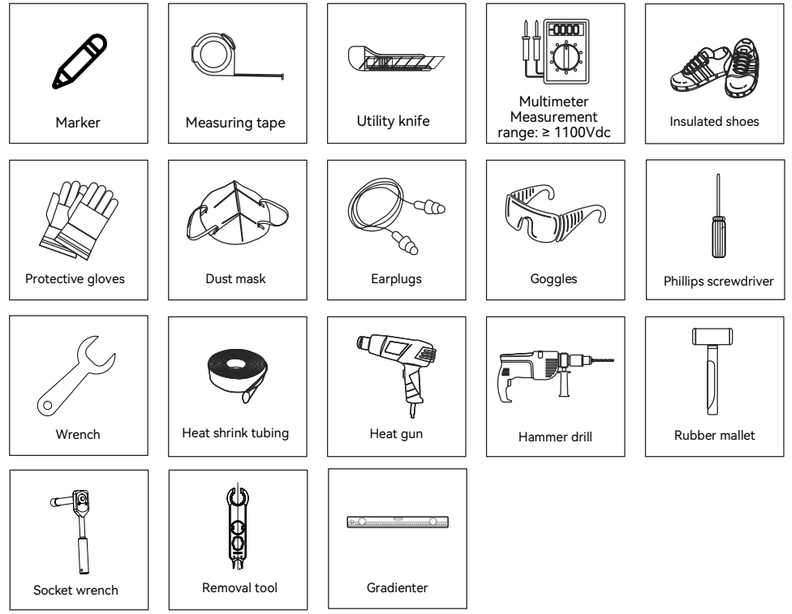
- When installing the device at the garage, please keep it away from drive way.
- Keep the device from water sources such as taps, sewer pipes and sprinklers to prevent water seepage.

Note: Depending on the site environment, when the device is installed outdoors, the distance between the device and the ground should be taken into consideration to prevent the device from soaking in water.

4.3 Mounting Procedure

4.3.1 Installation Tools

Installation tools include but are not limited to the following recommended ones. Please use other auxiliary tools on site if necessary.



4.3.2 Mounting Procedures

Ground Mounting 1

The ground should be flat and no inclination.

Step 1: Place the cardboard flat on the floor, mark the location of the holes with a marker, then remove the cardboard. Drill the holes by using an electric drill (18mm in diameter, 80-90mm in depth). Disassemble the M12*80 expansion screws and put the screws sleeves into the holes.

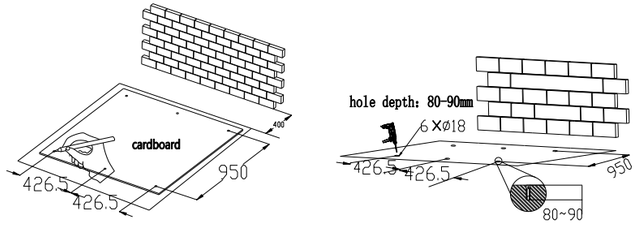


Figure 4.3
Drilling holes

Step 2: Install the cabinet to the designated location

By using a crane:

As shown in the following figure, lift the cabinet, align the holes at the cabinet bottom with the drilled holes, and place it onto the floor. A force greater than 2t is required to move this device, the height between the sling and the top surface must be greater than or equal to 1.5 meter.

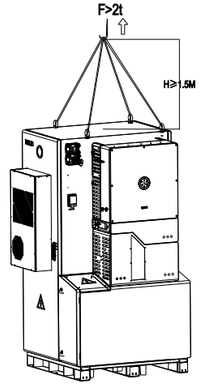


Figure 4.4
Placing the cabinet

By using a forklift:

As shown in the following figure, move the cabinet, align the holes at the cabinet bottom with the drilled holes, and place it onto the floor.

To choose a right forklift, refer to the following requirements:
- Load capacity must be greater than 2 tons.
- The length of the metal forks must be greater than 1.2 meter. Use fork extensions if needed.
- The forks can slide under the cabinet bottom without damaging the cabinet.

To use the forklift, make sure that:
- The forks should be extend out of the cabinet.
- Adjust the distance between the two forks to ensure load stability.

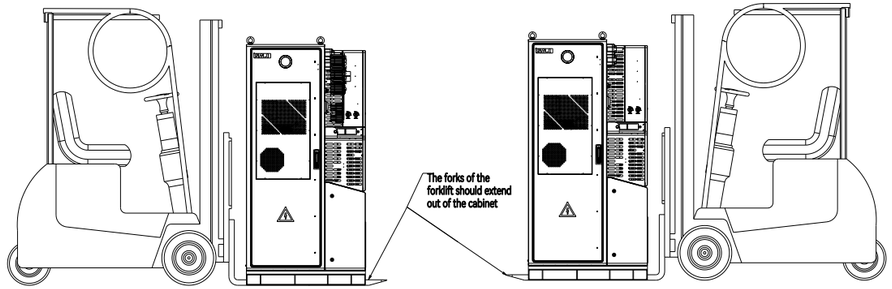


Figure 4.5
Forklift transportation

Step 3: Install the M12*80 screw bolt at the bottom of the cabinet and secure them by using a wrench.

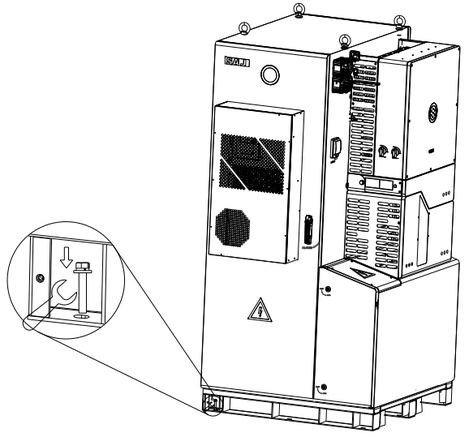


Figure 4.6
Securing the base

Ground Mounting 2

Step 1: Same as step 2 in ground mounting 1, place the machine stably on the ground.
Step 2: Take out the accessories as shown in the picture, mark the four corners of the cabinet, and then drill holes according to the marked positions with a depth of 80 - 90mm.

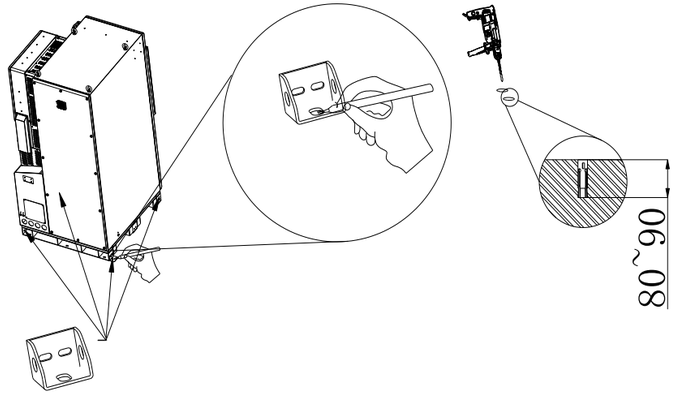


Figure 4.7
Drilling holes

Step 3: Find 4 mounting brackets as shown in the picture among the accessories, and install them on the 4 corners of the cabinet respectively.

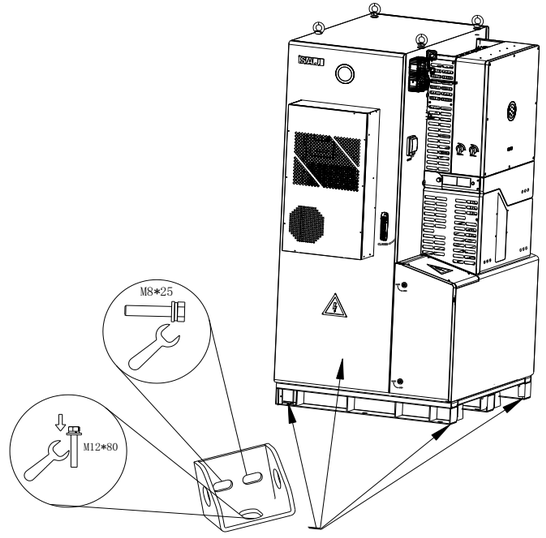


Figure 4.8
Securing the base

5.

ELECTRICAL CONNECTION

5.1 Grounding Connection

Electrical connection must only be operated by professional technicians. Before connection, necessary protective equipment must be employed by technicians, including insulating gloves, insulating shoes and safety helmet.

⚠WARNING

- Connect this additional grounding cable before other electrical connection.

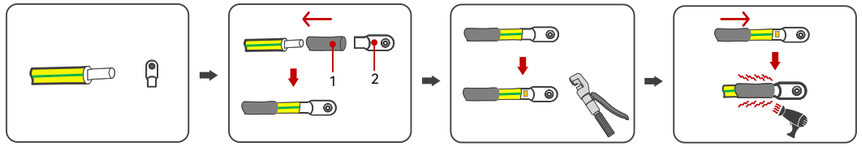


Figure 5.1
Preparing additional grounding cable

1. Heat shrink tubing 2. OT/DT terminal

Remove the screw of grounding terminal and secure the additional grounding cable by insert a screw into the screw hole in the OT/DT terminal. Connect the grounding cables as the following diagram.

Note: A 6 mm^2 conductor cross-sectional area of cable is recommended for additional grounding cable.

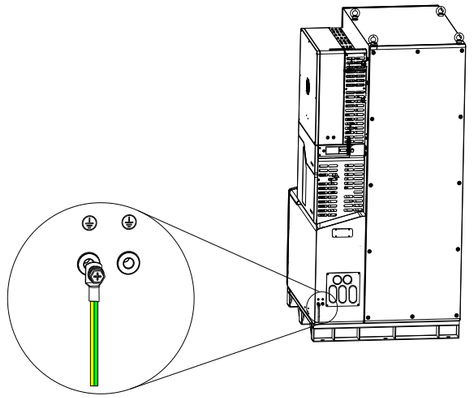


Figure 5.2
Connecting the additional grounding cable

5.2 Preparation Before Installation

Note: When the machine is wired to the outside, these cables need to pass through the hole in the lower right corner of the machine.

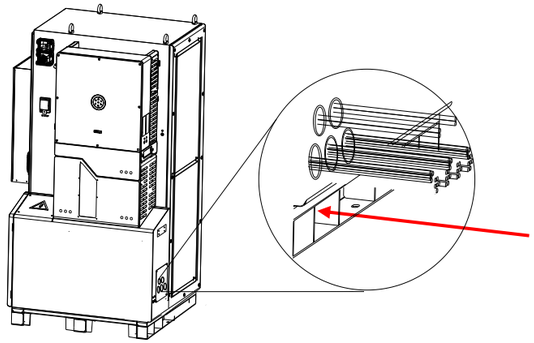


Figure 5.3
Cabinet outlet hole position

1. Disassemble the metal plate at the outlet to facilitate wiring operations.
2. Use a knife to cut the end of the cable sleeve at the cable outlet hole.
3. Remove the decorative panel of the inverter.
4. Remove the AC cover.
5. Loosen the beam suspended in the middle of the inverter.
6. Remove the baffle under the inverter.

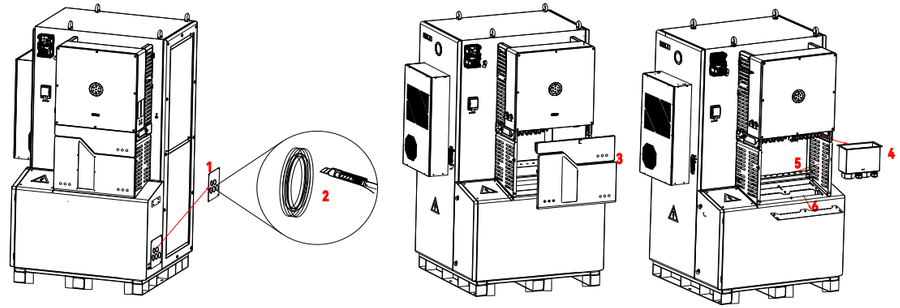


Figure 5.4
Preparation Before Installation

5.3 Connecting the AC Cable

Type	Cable cross-sectional area（mm²）		Conductor material
	Range	Recommend	
CHS2-(29.9K-50K)-(T4, T5, T6)-X	35 - 70	50	Copper
Grounding cable cross-sectional area (mm²): 25			

Table 5.1
Recommended specifications of GRID cables

Note: If the grid-connection distance is too far, please select an AC cable with larger diameter as per the actual condition.

Type	Cable cross-sectional area（mm²）		Conductor material
	Range	Recommend	
CHS2-(29.9K-50K)-(T4, T5, T6)-X	16 - 25	25	Copper
Grounding cable cross-sectional area (mm²): 25			

Table 5.2
Recommended specifications of GEN and Back-up cables

Procedure:
Step 1: Pass the cables to be connected through the corresponding waterproof holes.

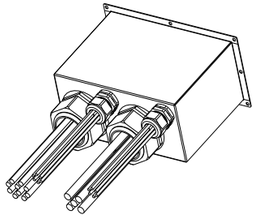


Figure 5.5
Thread the cables

Step 2: Fix the inner core wires of the GRID, GEN, and backup cables to the terminals marked L1, L2, L3, N, and PE on the machine.

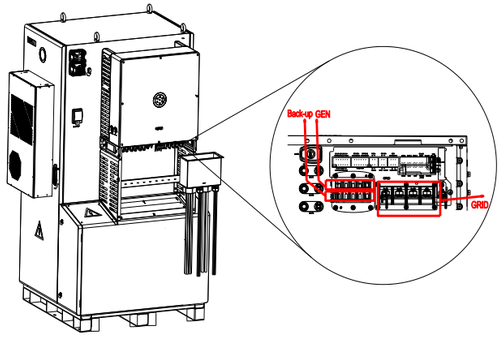


Figure 5.6
Connect the Cables

5.3.1 Earth Fault Alarm

This inverter complies with IEC 62109-2 clause 13.9 for earth fault alarm monitoring. If an earth fault alarm occurs, the ring light on the inverter LED panel will be lit up in red and an error code <31> can be viewed on the Elekeeper (used to be called eSAJ Home) App.
Note: The inverter cannot be used with functionally earthed PV Arrays.

5.3.2 External AC Circuit Breaker and Residual Current Device

Please install a circuit breaker to ensure the inverter is able to disconnect from grid safely. The integrated leakage current detector of inverter is able to detect the real time external current leakage. When a leakage current detected exceeds the limitation, the inverter will be disconnected from grid quickly.
The inverter does not require an external residual current device, as it has integrated with a RCMU. If local regulations require the application of external residual current device, either type A or type B RCD is compatible with the inverter. The action current of external residual current device should be 300mA.

Inverter type	Recommended breaker specification
CHS2-(29.9K-50K)-(T4, T5, T6)-X	200A
Notice: Do not connect multiple inverters to one AC circuit breaker.	

Table 5.3
Recommended circuit breaker specification

5.4 PV Side Connection

⚠WARNING
· Make sure the PV array is well insulated to ground before connecting it to the inverter.

Conductor cross-sectional area of cables（mm²）		Conductor material
Scope	Recommended value	Copper wire cable, complying with 1000Vdc
4.0 - 6.0	4.0	

Table5.4
Recommended specifications of DC cable

Note: When the inverters are used in parallel, it is necessary to ensure that the PV power of all inverters is consistent as much as possible.

5.4.1 PV Connector Assembly

⚠WARNING

Dangerous to life due to electric shock when live components or DC cables are touched.
· when the photovoltaic array is exposed to light, it supplies a d.c. voltage to the PCE.. Touching live DC cables results in death or lethal injures.
· DO NOT touch non-insulated parts or cables
· Disconnect inverter from voltage sources.
· DO NOT disconnect DC connectors under load.
· Wear suitable personal protective equipment for all work.

DC connector is made up of positive connector and the negative connector

Figure 5.7
Positive connector
& Negative connector

!NOTICE

· Please place the connector separately after unpacking in order to avoid confusion for connection of cables.
· Please connect the positive connector to the positive side of the solar panels, and connect the negative connector to the negative side of the solar side. Be sure to connect them in right position.

Connecting Procedures:

1. Loosen the lock screws on positive and negative connector.
2. Use a 3-mm wide-bladed screwdriver to strip the insulation layer around 8 to 10 mm length from one end of each cable.

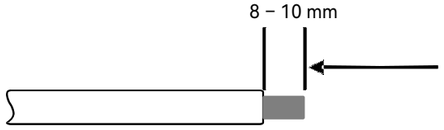


Figure 5.8
Striping off the insulation skin of cables

3. Insert the cable ends to the sleeves. Use a crimping plier to assembly the cable ends.

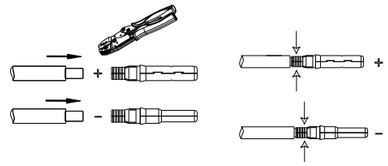


Figure 5.9
Inserting cables to lock screws

4. Insert the assembled cable ends into the positive and negative connectors. Gently pull the cables backwards to ensure firm connection.

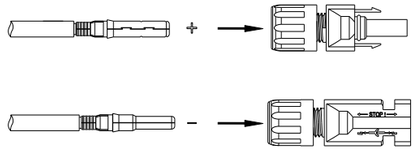


Figure 5.10
Inserting crimped cables to connectors

5. Tighten the lock screws on the positive and negative cable connectors.

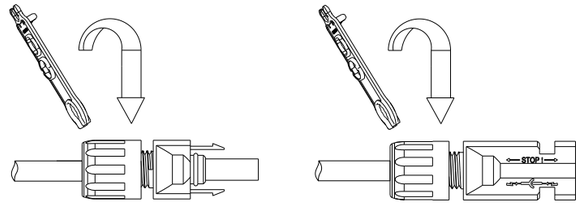


Figure 5.11
Securing the connectors

6.Make sure the DC switch is at OFF position.

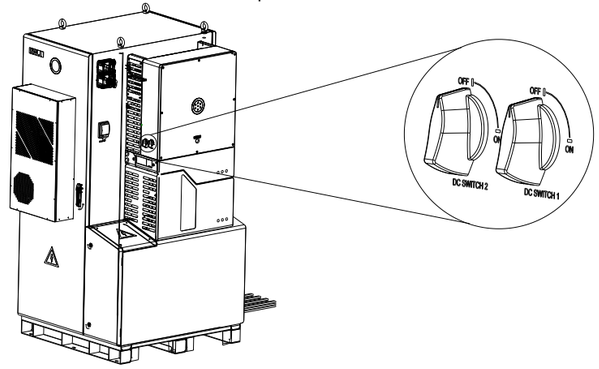


Figure 5.12
DC switch

7. Insert the positive and negative cable connectors into the positive and negative PV ports on the inverter until you hear a “click” sound to ensure firm connection.

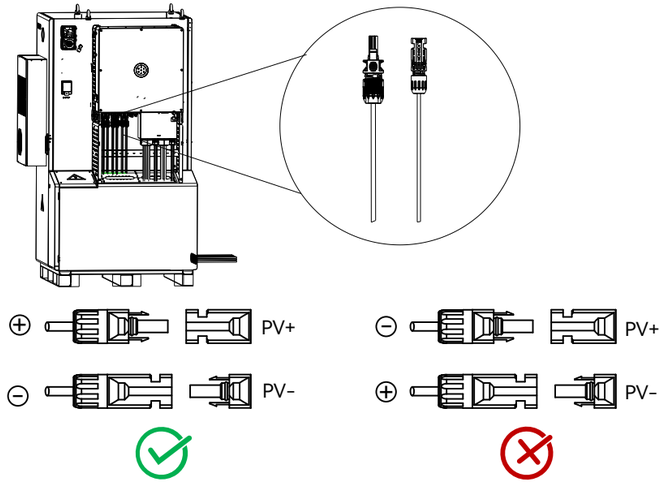


Figure 5.13
Plug in PV connectors

5.5 Communication Cable Connection

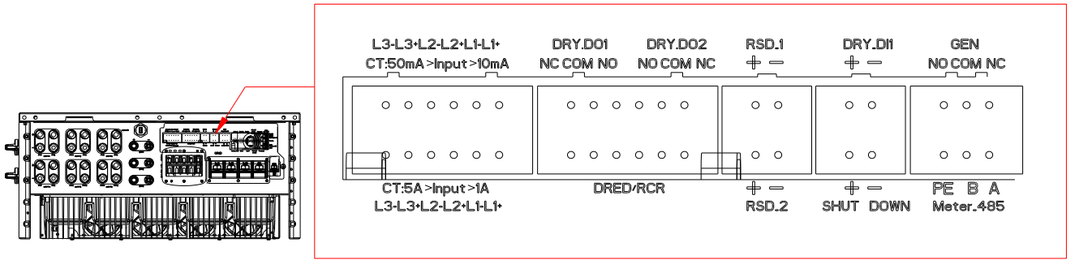
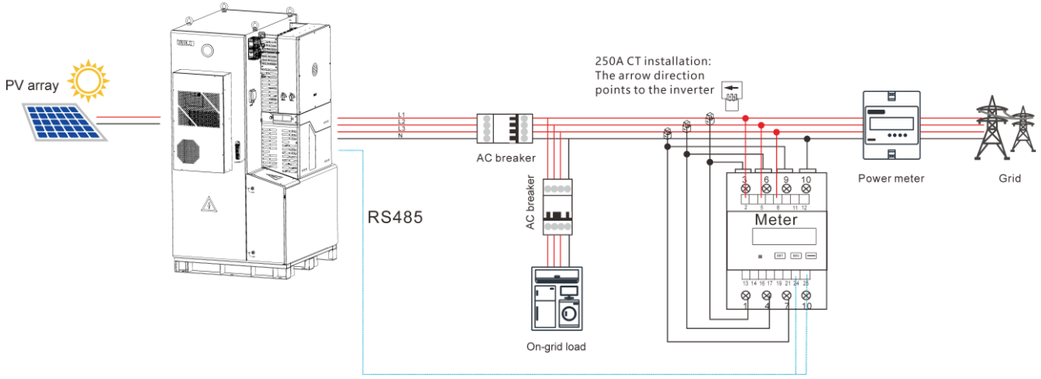


Figure 5.14
Ports definition

5.5.1 Export Limit Setting

The meter communication cable can be connected to the Meter_485 of the Phoenix terminal of the inverter and the METER interface of the RS485.

Note: The electric meter needs to be CHINT’s DTSU666 electric meter.



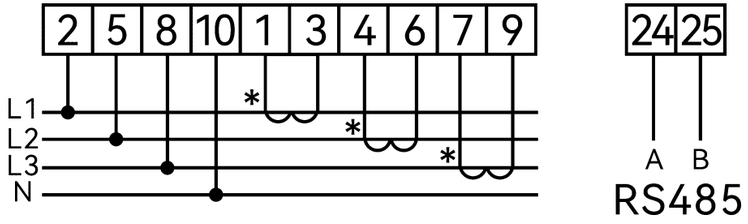
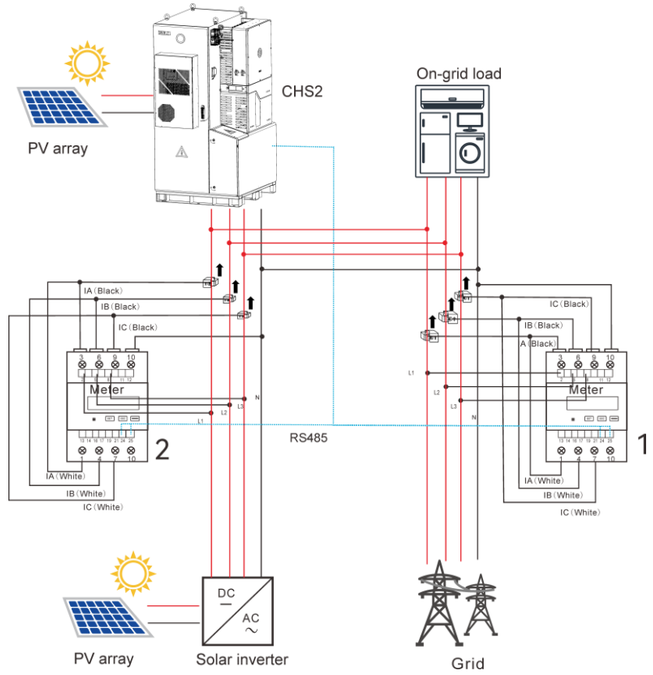


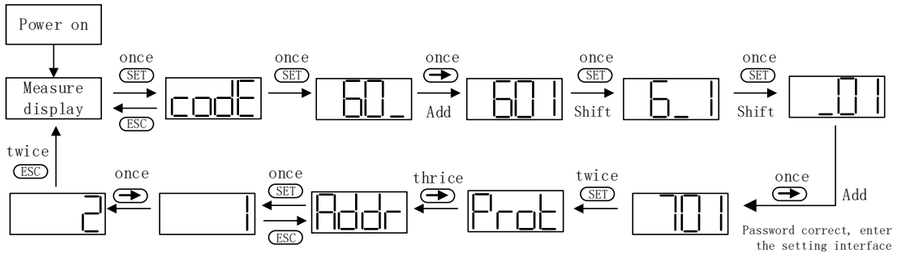
Figure 5.15
Export Limit Setting

If two meters are used, set the address of the inverter-side meter to 2. Do NOT change the default address 1 of the grid-side meter. The CT arrow direction points to the CHS2 inverter.



DTSU666		
	**Button**	**Description**
	SET	Confirmation or cursor shift (when input digits)
	ESC	Exit
	→	Add

To set a three-phase meter, perform the following operations:



a. Power on the meter and enter the “Measure display” interface, and then press SET twice to enter the password 701.
b. Press → once to adjust the value of the first digit. One increment per button pressing.
c. Pressing SET once to shift to the second digit and adjust the third digit in the same way. Set the default password to 701.
d. When the password is entered correctly, press SET twice to enter the port interface and press → for three times to enter the address page. Then, press SET once to start to set the meter address.
e. Press → to adjust the value of the address. One increment per button pressing.
f. After the address is set successfully, press ESC twice to exit to the Measure display interface to get the meter work.

5.5.2 Dry Contact Connection

Reserved output dry contact

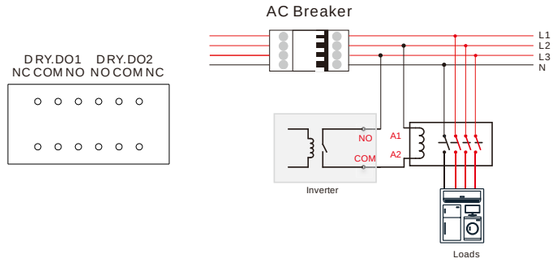


Figure 5.17
Connect the Reserved output dry contact

Generator start and stop control signal

Note: When the inverters are used in parallel, the generator needs to be connected to the DO4 interface of the EMS device.

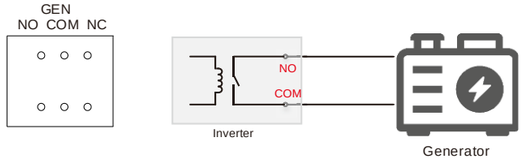


Figure 5.18
Connect the Generator

5.5.3 RCR Connection

RCR provides RCR signal control ports to meet the power grid dispatching requirements in Germany and other regions.

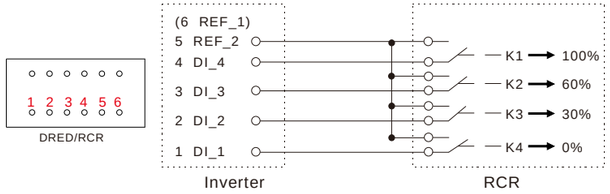


Figure 5.19
Connect the RCR

5.5.4 12V Power Output

RSD_1, RSD_2 supplies power to the external photovoltaic fast shutdown module, and controls the power on and off by controlling the power of the module.

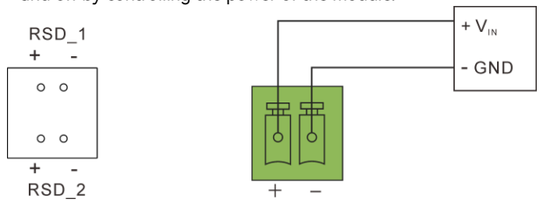


Figure 5.20
Connect the Power Output

RSD_1, RSD_2 supplies power to the external EMS.
Note: The machines in the parallel machine supply power to the EMS at the same time, and the power supply equipment must be at least two inverters. RSD_1, RSD_2 The length of the wire supplying power to EMS equipment is limited to 6 meters.

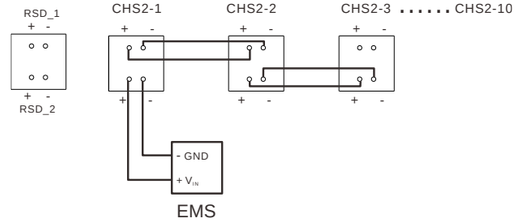


Figure 5.21
Connect the Power Output

5.5.5 Emergency Stop Dry Contact

When + contact and - contact are shorted by external controlled switch, the inverter will stop immediately.
DRY_DI1: Reserved input dry contact.

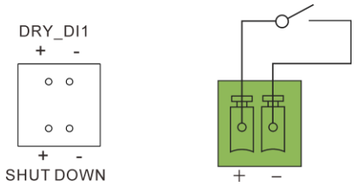


Figure 5.22
Connect the Emergency Stop Dry Contact

5.5.6 DIP Switch

The DIP switch is a switch that determines whether to select the 120Ω terminal resistor.

When the inverters are used in parallel, the two inverters that are physically farthest apart need to select 120Ω terminal resistors, so the SW2 DIP switches 3 and 4 of the two inverters need to be turned to the ON position.

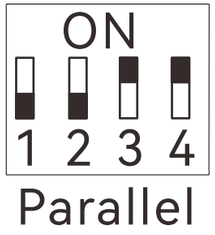
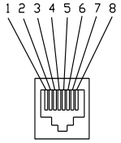


Figure 5.23
DIP Switch

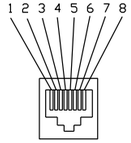
5.5.7 RJ45 Pin Port Definition

Figure 5.24
Pinout of RJ45

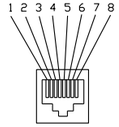
EMS	
1	NC
2	NC
3	NC
4	NC
5	NC
6	NC
7	RS485-A
8	RS485-B



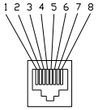
RS485_PAR1/RS485_PAR2	
1	NC
2	NC
3	NC
4	NC
5	NC
6	NC
7	RS485-A
8	RS485-B



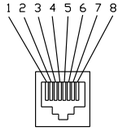
METER	
1	RS485-1B
2	RS485-1A
3	NC
4	RS485-2B
5	RS485-2A
6	NC
7	RS485-3A
8	RS485-3B



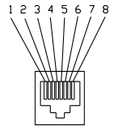
BMS_1/ BMS_2/ BMS_3	
1	Shut down—BMS
2	GND_S
3	NC
4	CANH
5	CANL
6	NC
7	NC
8	NC



Parelle1/ Parelle2	
1	SYN B
2	SYN A
3	SYN B
4	SYN B
5	SYN A
6	SYN A
7	CANL
8	CANH



LAN	
1	TX_D1+
2	TX_D1-
3	RX_D2+
4	BI_D3+
5	BI_D3-
6	RX_D2-
7	BI_D4+
8	BI_D4-



5.5.8 Communication Cable Connection

1. Connect the communication cables to the appropriate ports.

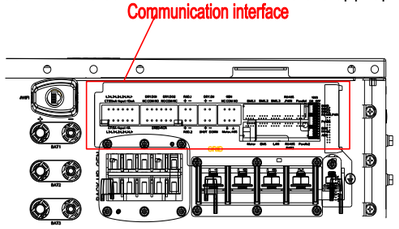


Figure 5.25
Connect the Cables

2. Install the crossbeam suspended in the middle of the inverter and the baffle under the inverter back to their original positions.
3. Secure all parts of the grid and backup connector tightly.

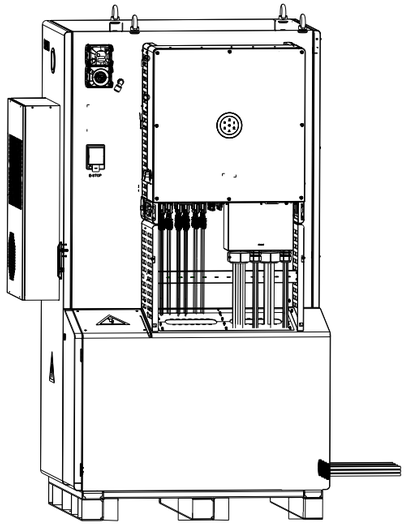


Figure 5.26
Screw the Connector

5.6 Communication Module Installation

Plug in the communication module to 4G/WIFI port and secure the module by rotating the nut.

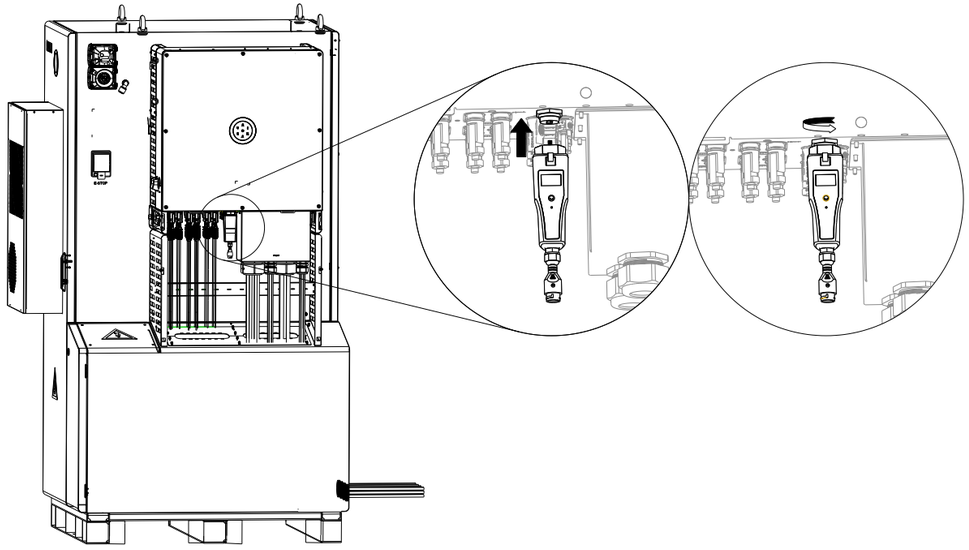


Figure 5.27
4G/WiFI port

1. Either an eSolar 4G module, eSolar Wi-Fi module, or eSolar AIO3 module can be connected to the 4G/WIFI port. For operation details, refer to the documentation shipped in the module package or go to https://www.saj-electric.com/ for downloads.
2. When the inverters are used in parallel, it needs to be connected to the EMS device for communication. For operation details, please refer to the user manual provided with the EMS Pro product.

5.7 Install Decorative Panels

Reinstall the removed panel onto the machine.

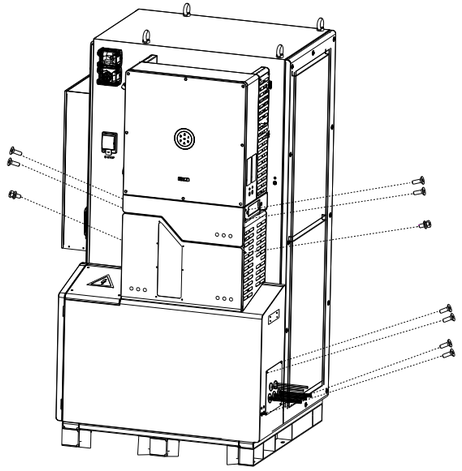
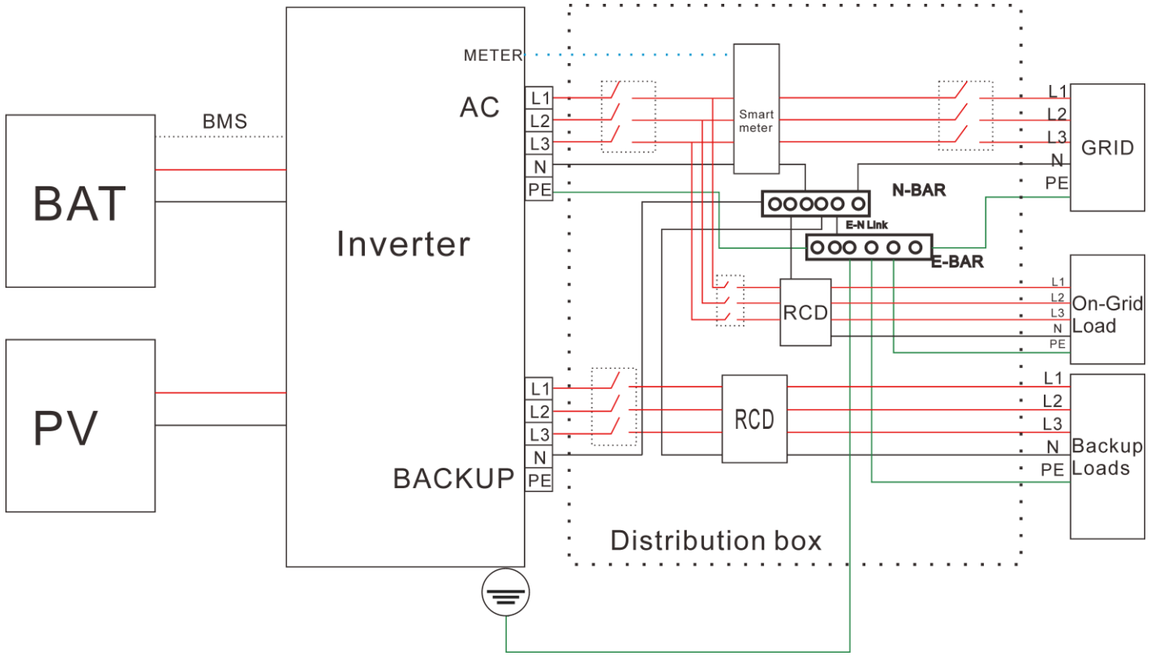


Figure 5.28
Install Decorative Panels

5.8 System Connection

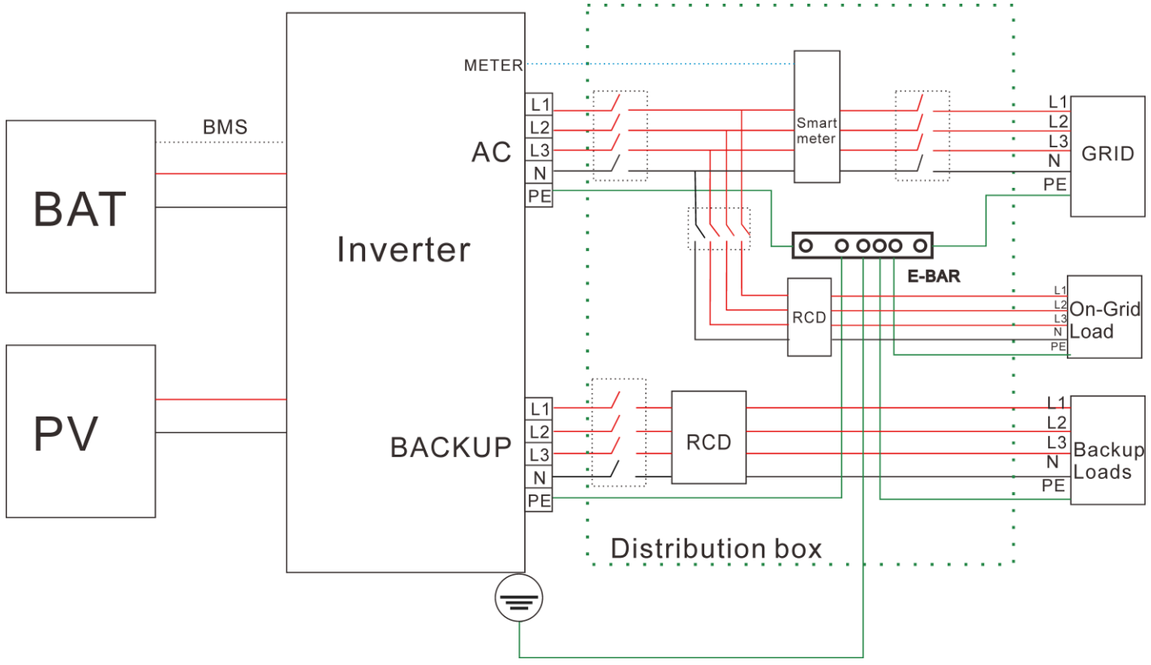
The system connection in Australia and New Zealand is as below.

- For safety, the neutral (N) cables of the grid and backup-load sides must be connected together.
- The PE terminal of the BACK-UP port is not connected.
- The E-BAR and the N-BAR must be short-circuited.



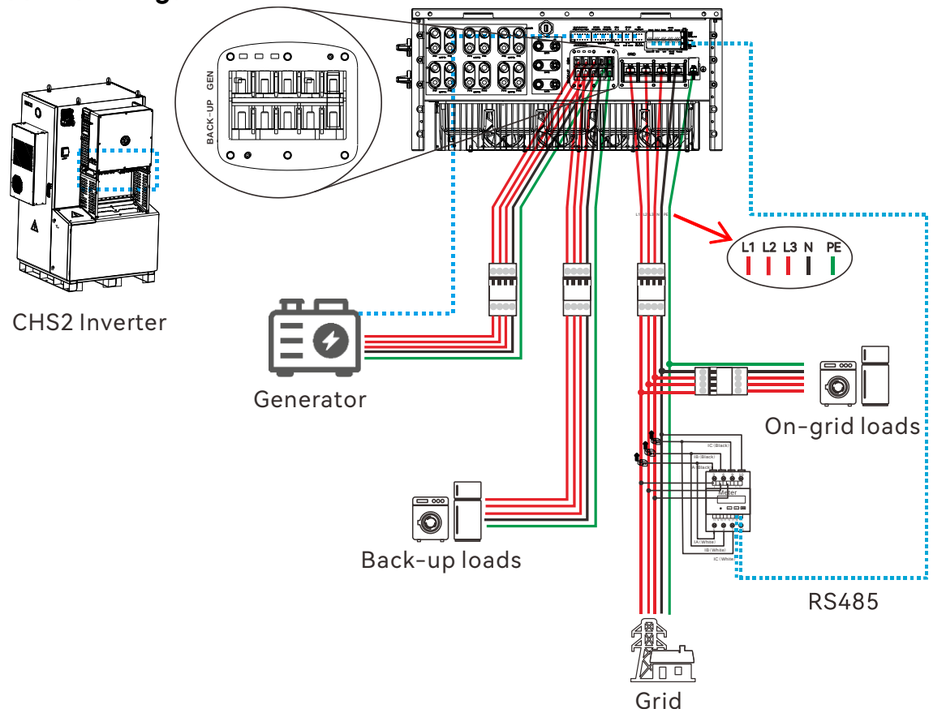
The system connection for grid system without special requirements is as below.

Note: The backup PE line and earthing bar must be grounded properly. Otherwise, backup function may be inactive during blackout.

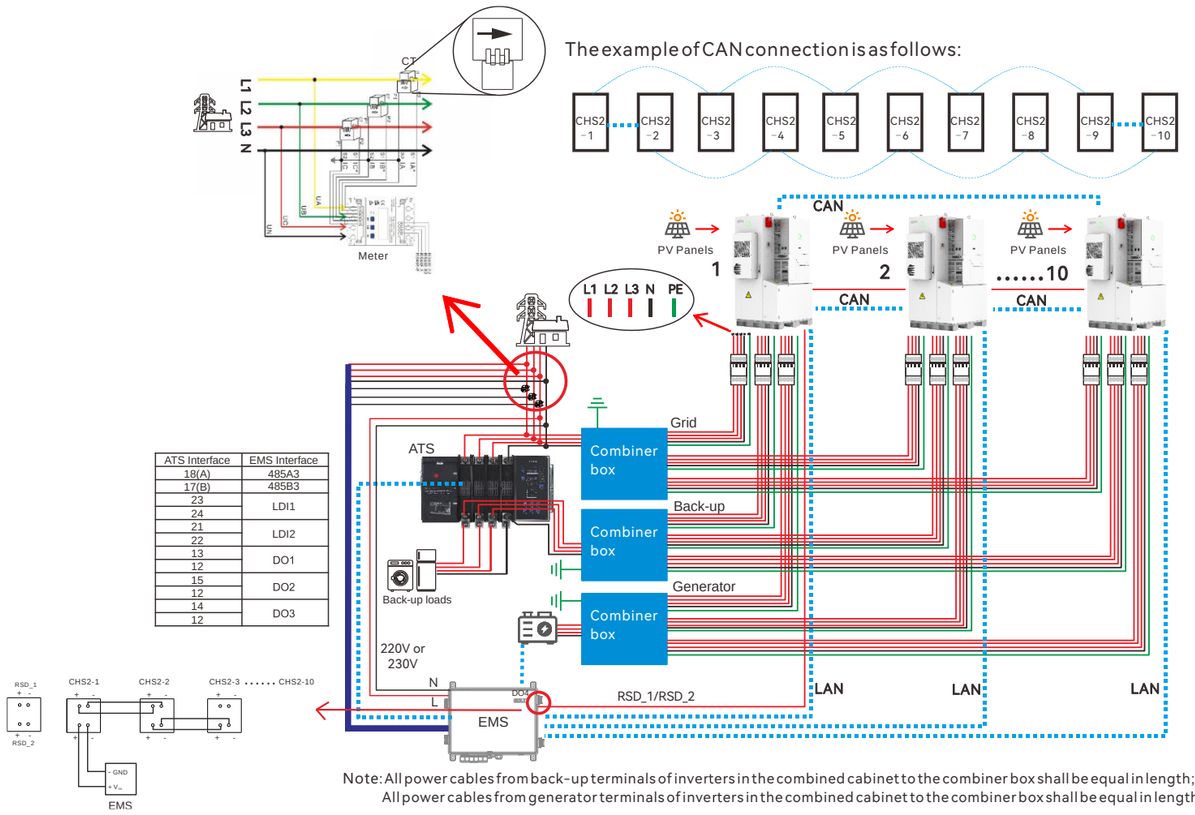


5.9 Wiring diagram

Single machine wiring:



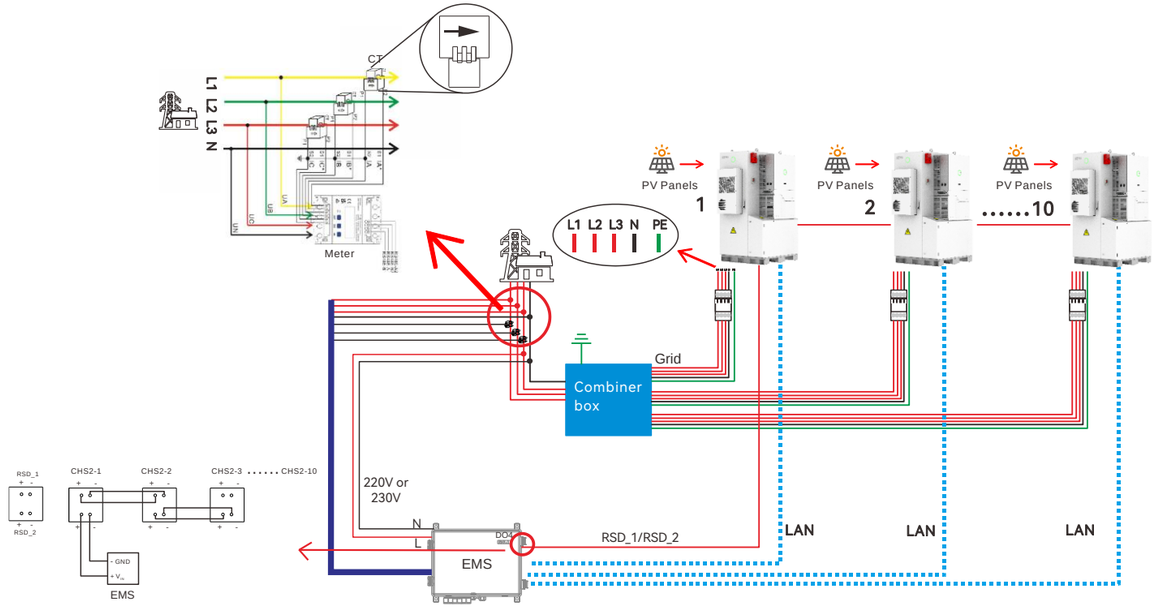
Back-up Parallel wiring:



ATS Interface	EMS Interface
18(A)	485A3
17(B)	485B3
23	LDI1
24	
21	LDI2
22	
13	DO1
12	
15	DO2
12	
14	DO3
12	

Note: All power cables from back-up terminals of inverters in the combined cabinet to the combiner box shall be equal in length;
All power cables from generator terminals of inverters in the combined cabinet to the combiner box shall be equal in length.

On-grid Parallel wiring:



5.10 AFCI

The inverter is equipped with arc-fault circuit interrupter (AFCI). With AFCI protection, when there is an arc signal on the DC side due to aging of the cable or loose contact, inverter can quickly detect and cut off the power to prevent fire, making the PV system run more safely.

6.

COMMISSIONING

6.1 Start Up and Shut Down the Energy Storage System

6.1.1 Start Up

Step 1: Turn ON the DC switch on the inverter.

Step 2: Turn on the AC Circuit Breaker.

Step 3: Rotate the Main Switch to ON position.

Step 4: Press and hold the START switch for 3 seconds until the LED light flashes.

Note: If the Main Switch suddenly trips while the machine is running, it is required to reset the Main Switch and re-rotate the Main Switch to **ON** position.

6.1.2 Shut Down

Step 1: Turn off the AC Circuit Breaker.

Step 2: Rotate the Main Switch to OFF position.

Step 3: Turn off the DC switch on the inverter.

Note: When closing the chassis door, both locks on the door handle need to be locked.

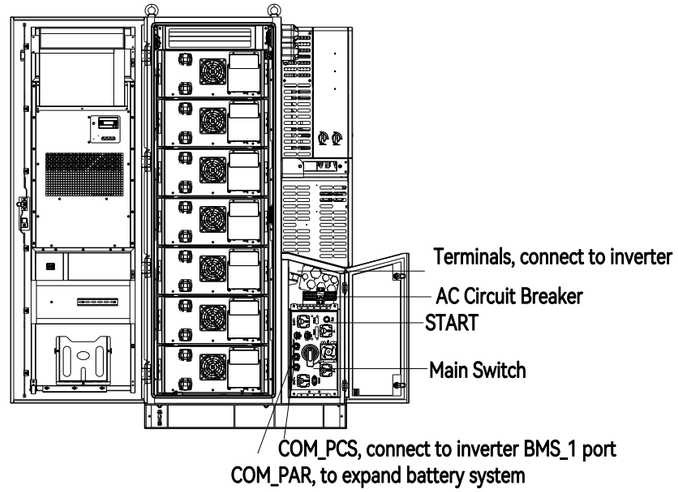


Figure 6.1
Circuit breaker of inverter

6.2 Introduction of Human-computer Interface

System commissioning

After the wiring is completed, please refer to the inverter manual for system commission and operation.

Note: Turn on the circuit breaker and main switch when using battery.

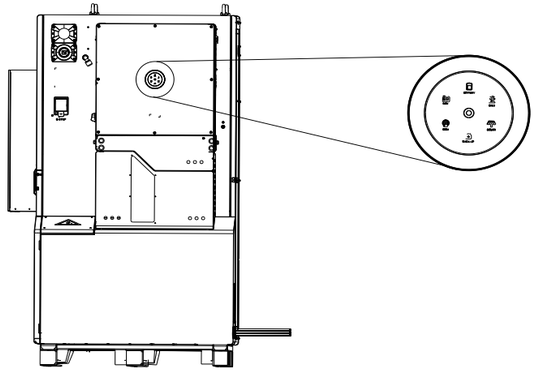


Figure 6.2
Human-computer interface

Table 6.1
Interface description

LED indicator	Status	Description
	LED off	Inverter power off
	Breathing	Inverter is at initial state or standby state
	Solid	Inverter running properly
	Breathing	Inverter is upgrading
	Solid	Inverter is not working properly

LED indicator	Status	Description
System	Solid	Importing electricity from grid
	On 1s, off 1s	Exporting electricity to grid
	On 1s, off 3s	Not importing and exporting at all
	Off	Off-grid
Battery	Solid	Battery is discharging
	On 1s, off 1s	Battery is charging
	On 1s, off 3s	SOC low
	Off	Battery is disconnected or inactive
Grid	Solid	Connected to grid
	On 1s, off 1s	Counting down to grid connection
	On 1s, off 3s	Grid is faulty
	Off	No grid
PV	Solid	PV array is running properly
	On 1s, off 1s	PV array is faulty
	Off	PV array is not operating
Backup	Solid	AC side load is running properly
	On 1s, off 1s	AC side load overload
	Off	AC side is turned off
Communication	Solid	Both BMS and meter communication are good
	On 1s, off 1s	Meter communication is good, BMS communication is lost
	On 1s, off 3s	Meter communication is lost, BMS communication is good
	Off	Both meter and BMS communication are lost
GEN	Solid	Power input connected
	On 1s, off 1s	Power output connected
	Off	Disconnected

Note: One breathing cycle is 6 seconds

6.3 Installing the App

The Elekeeper (used to be called eSAJ Home) App can be used for both nearby and remote monitoring. It supports Bluetooth/4G or Bluetooth/Wi-Fi to communicate with the device.

On your mobile phone, search for “Elekeeper” in the App store and download the App.

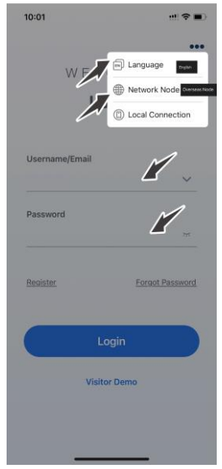
6.4 Logging In to the App and Performing the Initialization Settings

1. Log in to the App by using one of the following manners:

   - **Account Login**

     a. Open the App and tap the three-dot icon ••• on the top right corner. Set the **Language** to **English** and **Network Node** to **European Node** or **International Node**. Then, use your account to log in to the App.

     If you do not have an account, register first.

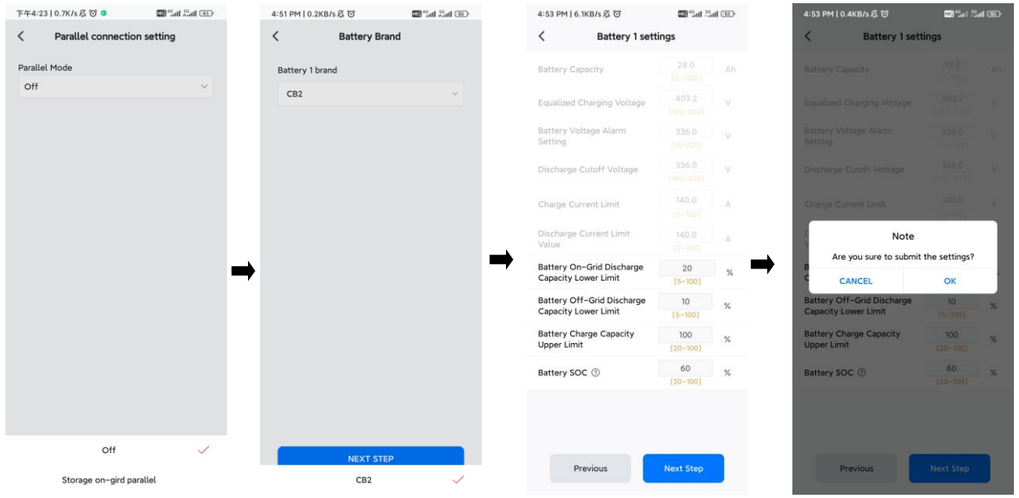


     b. Go to the **Service** interface and select **Remote Configuration**. Tap **Bluetooth** and enable the Bluetooth function on your mobile phone. Then, tap **Next**.

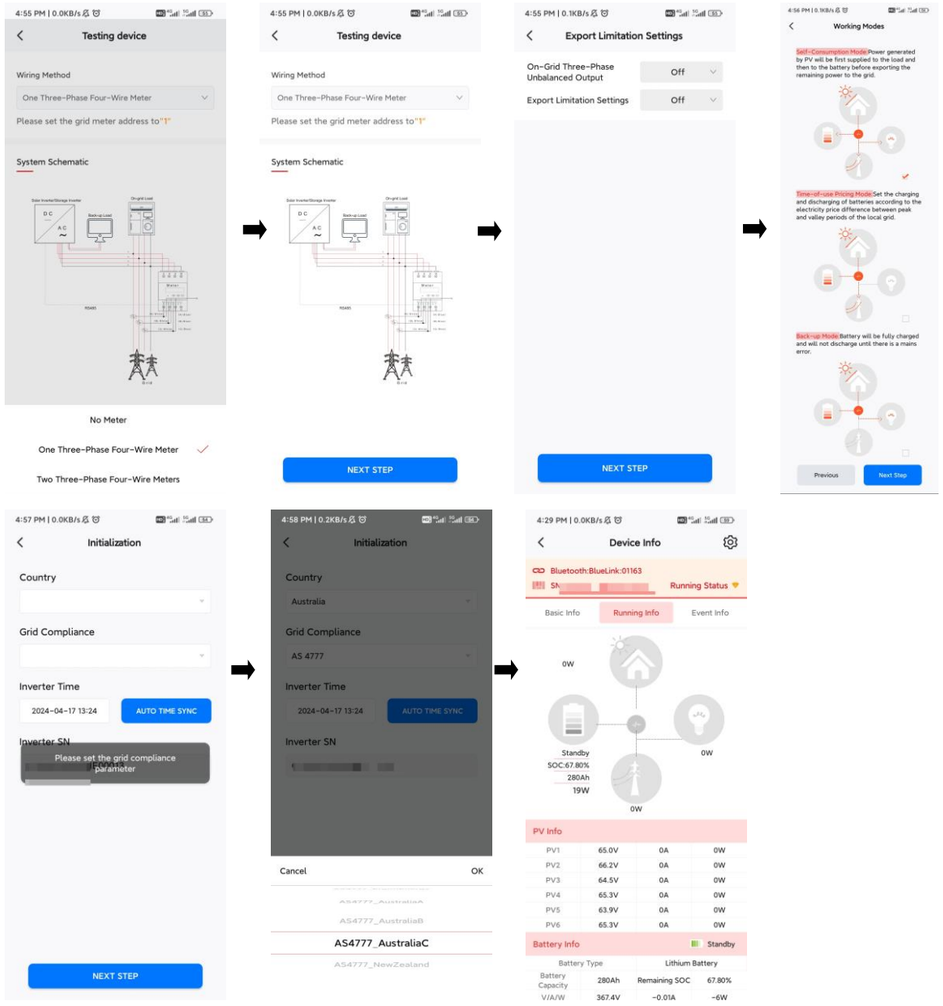
2. Choose your inverter according to your inverter SN. Tap the inverter to enter inverter settings.

3. Complete the inverter settings by following the instructions on the screen.

   Example:



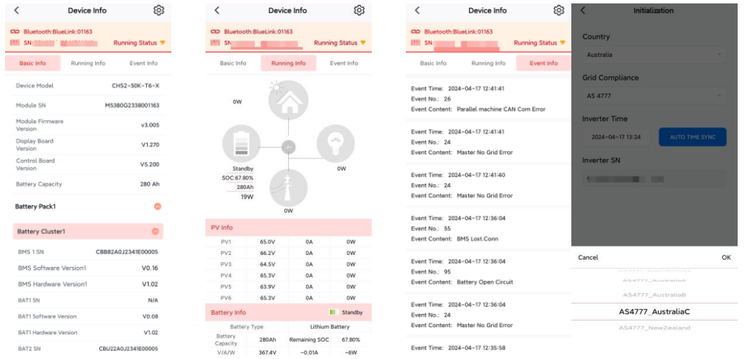
Note: When the inverters are used in parallel, you need to select **Storage on-gird parallel**. For more instructions on parallel App operation, please refer to the user manual provided with the EMS product.



6.5 Inverter Setting Review

After commissioning, the device info including device basic info, running info and event info can be viewed.

Country and grid code can be viewed from initial setting.



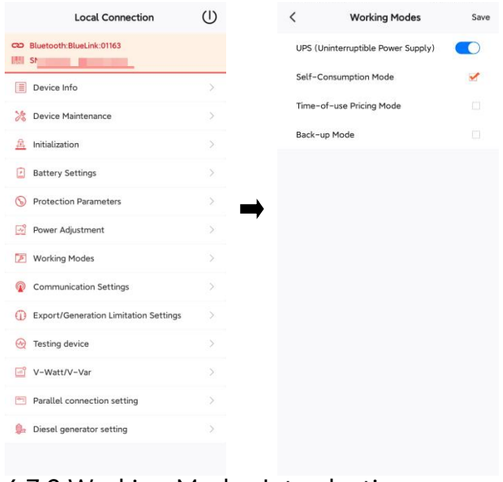
6.6 Remote Monitoring

Connect the internet via the eSolar AIO3 module, and upload the inverter data onto the server and customers could monitor running information of the inverter remotely via the eSolar Web Portal or their mobile customer terminals.

For details, refer to the user manual of the communication module.

6.7 Working Modes

6.7.1 Selecting Working Modes



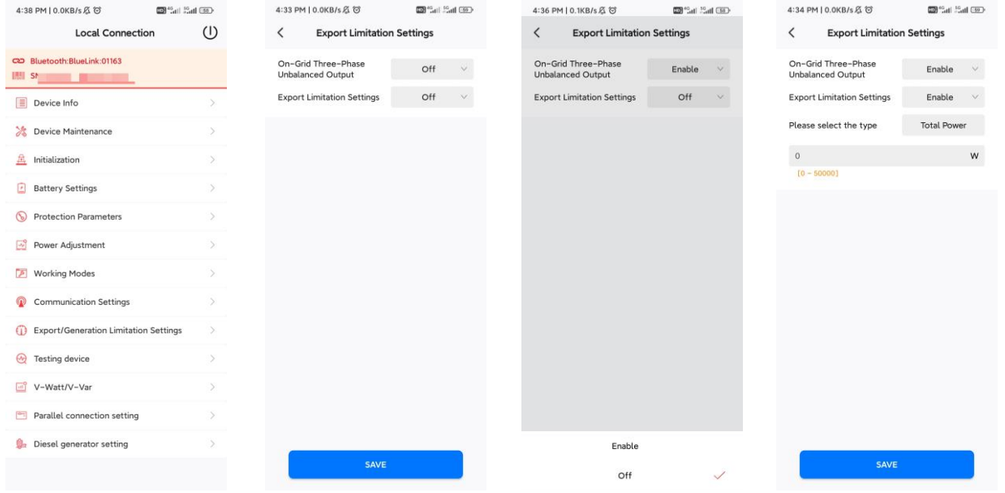
6.7.2 Working Modes Introduction

Self-consumption Mode: When the solar is sufficient, electricity generated by photovoltaic system will be supplied to load first, the surplus energy will be stored in battery, then the excess electricity will be exported to the grid. When the solar is insufficient, the battery will release electricity to supply load.

Back-up Mode: Reserved Backup SOC setting value can be adjusted, when battery SOC is less than reserved SOC value, battery can only be charged, until SOC reaches reserved value, the battery will be stopped charging; when SOC is larger than SOC setting value, battery will behave as Self-use mode.

Time-of-use Mode: Battery charging period and discharging period can be set, during charging period, battery can only be charged, while in discharging period, battery can only be discharged, the rest of the period, battery will behave as Self-use mode.

6.8 Export Limit Setting



On the Local Connection page, tap **Export/Generation Limitation Setting** and enter the password “201561”.

There are two methods to control the export limit, the two methods are alternative to each other.

Method 1: Export limitation setting is to control the electricity exported to the grid.

Method 2: On-Grid Three-Phase Unbalanced Output is to control the electricity generated by the inverter.

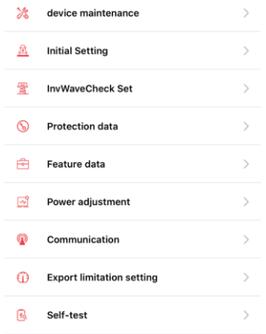
6.9 Self-test (For Italy)

Italian Standard CEI0-21 requires a self-test function for all inverter that connected to utility grid. During the self-testing time, inverter will check the reaction time for over frequency, under frequency, overvoltage and undervoltage. This self-test is to ensure the inverter is able to disconnect from grid when required. If the self-test fails, the inverter will not able to feed into the grid.

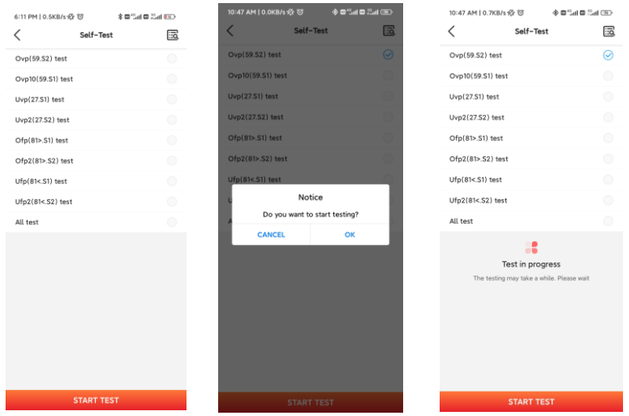
The steps of running Self-test are as followed:

Step 1: Connect a communication module (Wi-Fi/ 4G/Ethernet) with inverter (connection procedure can refer to eSolar Module Quick Installation Manual)

Step 2: Select Italy for Country and choose your corresponding Grid Code from Initial Setting.



Step 3: You can choose self-test item required. Individual self-test time is approx. 5 minutes. All self-test time is approx. 40 minutes. After the self-test is completed, you can save the test report. If self-test is failed, please contact with SAJ or your inverter supplier.



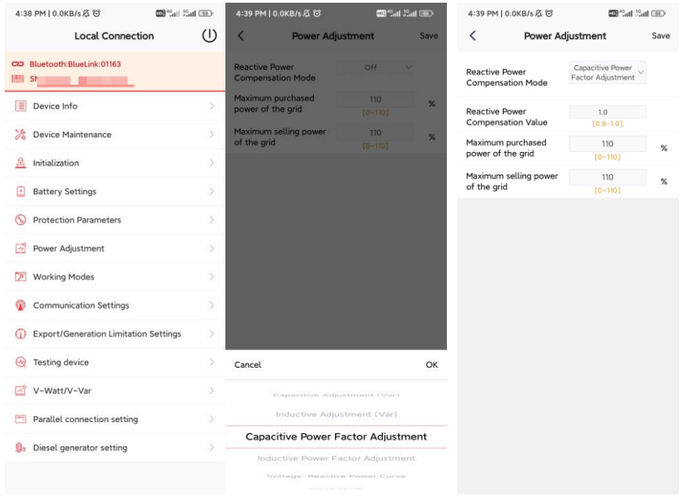
6.10 Configuring the Reactive Power Control (For Australia)

6.10.1 Setting the Fixed Power Factor Mode and Fixed Reactive Power Mode

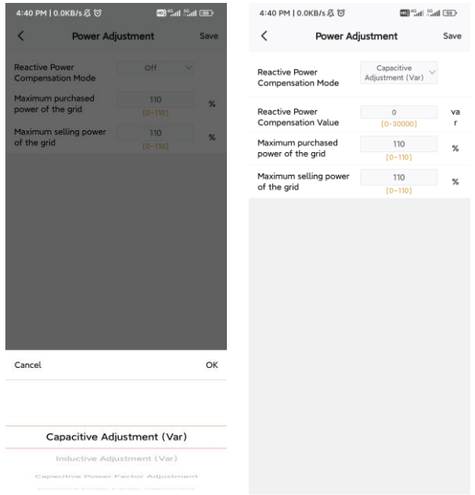
Select **Inductive Adjustment (Var)** or **Capacitive Var** according to your local regulations.
The power ranges from -60% Pn to 60% Pn.

Fixed power factor mode.

Select **Power Adjustment** and enter password “201561”.

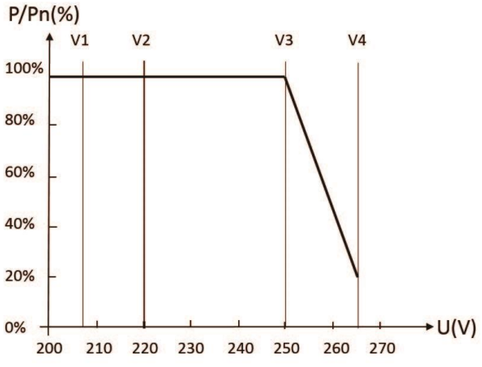


Fixed Reactive Power Mode



6.10.2 Setting the V-Watt and Volt-Var Modes

This inverter complies with AS/NZS 4777.2: 2020 for power quality response modes. The inverter satisfies different regions of DNSPs' grid connection rules requirements for volt-watt and volt-var Settings. e.g.: AS4777 series setting as shown below.



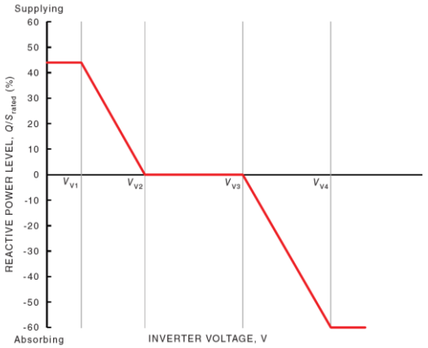
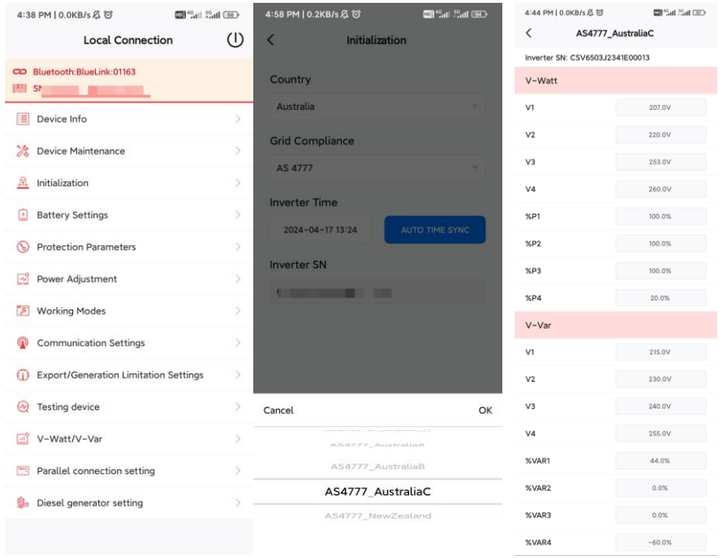


Figure 6.3

Curve for a Volt-Watt response mode (AS4777 Series)

Figure 6.4

Curve for a Volt-Var control mode (AS4777 Series)



Setting procedure:

1. AS4777 grid compliance has been set during production, please select corresponding grid compliance according to state regulation during installation. You can choose a state regulation compliance with your local grid via Elekeeper.
2. Log in to Elekeeper. For connection procedure please refer to chapter 6.4 Logging In to the App and Performing the Initialization Settings.
3. Click “V-Watt/V-Var” to enter DNSPs settings, choose a suitable state regulation from the drop down list.

Note:

With regard to the Power rate limit mode, SAJ sets the product WGra to 16.67%Pn by default in the following cases according to the requirements of 3.3.5.2 as 4777.2: 2020.

1. Soft ramp up after connection.
2. Reconnect or soft ramp up/down following a response to frequency disturbance.

7.

MAINTENANCE

7.1 Transportation

Lithium batteries are dangerous goods. Passed the test of UN38.3, this product meets the transportation requirements for dangerous goods for lithium batteries. After the installation of the battery on site, the original packaging (contains the lithium battery identification) should be kept. When the battery needs to be returned to the factory for repair, please pack the battery with the original packaging to reduce unnecessary trouble.

Take care of the product during transportation and storage. Products are not allowed to be stacked.

7.2 Storage

After purchasing the battery, please store it with following instructions:

1) Please store it in a dry and ventilated environment, keep it away from heat sources;

2) Please keep it in an environment with storage temperature as -20 ° C ~ 40 ° C, humidity <85% RH;

3) For long-term storage (>3 months), please put it in an environment with a temperature of -20 ° C to 25 ° C and a humidity of < 85% RH;

4) The battery should be stored in accordance with the storage requirements mentioned above, and the battery should be installed within 6 months since delivered from the factory and used with compatible inverters;

NOTICE

·The battery remains 50% power when it is sent from the factory.

·The longer the battery is stored, lower the SOC. When the battery remaining voltage fails to reach the startup voltage requirement, the battery may be damaged.

·Judgment condition: Close the battery breaker switch and press the main switch. At this time, if the LED light is solid green, it is running normal. If the LED light is red or off, the battery is in fault.

The battery cannot be disposed of as household refuse. When the service life of the battery reaches to the limit, it is not required to return it to the dealer or SAJ, but it must be recycled to the special waste lithium battery recycling station in the area.

8.

TROUBLESHOOTING & WARRANTY

Troubleshooting

Code	Fault Information
1	Master Relay Error
2	Master EEPROM Error
3	Master Temperature High Error
4	Master Temperature Low Error
5	Lost Communication M<->S
6	GFCI Device Error
7	DCI Device Error
8	Current Sensor Error
9	Master Phase1 Voltage High
10	Master Phase1 Voltage Low
11	Master Phase2 Voltage High
12	Master Phase2 Voltage Low
13	Master Phase3 Voltage High
14	Master Phase3 Voltage Low
15	Grid Voltage 10Min High
16	Off Grid Output Voltage Low
17	Off Grid Output Short Circuit
18	Master Grid Frequency High
19	Master Grid Frequency Low
20	BAT Input Mode Error
21	Phase1 DCV High
22	Phase2 DCV High
23	Phase3 DCV High
24	Master No Grid Error
25	DC Reverse Connect Error
26	Parallel machine CAN Com Error
27	GFCI Error
28	Phase1 DCI Error
29	Phase2 DCI Error
30	Phase3 DCI Error
31	ISO Error
32	Bus Voltage Balance Error
33	Master Bus Voltage High
34	Master Bus Voltage Low
35	Master Grid Phase Lost
36	Master PV Voltage High

Code	Fault Information
37	Master Islanding Error
38	Master HW Bus Voltage High
39	Master HW PV Current High
40	Master Self-Test Failed
41	Master HW Inv Current High
42	Master AC SPD Error
43	Master DC SPD Error
44	Master Grid NE Voltage Error
45	Master Fan1 Error
46	Master Fan2 Error
47	Master Fan3 Error
48	Master Fan4 Error
49	Lost Communication between Master and Meter
50	Lost Communication between M<->S
51	Lost Communication between inverter and Grid Meter
52	HMI EEPROM Error
53	HMI RTC Error
54	BMS Device Error
55	BMS Lost. Conn
56	CT Device Err
57	AFCI Lost Err
58	Lost Com. H<->S Err
59	Lost Communication between inverter and PV Meter
61	Slave Phase1 Voltage High
62	Slave Phase1 Voltage Low
63	Slave Phase2 Voltage High
64	Slave Phase2 Voltage Low
65	Slave Phase3 Voltage High
66	Slave Phase3 Voltage Low
67	Slave Frequency High
68	Slave Frequency Low
73	Slave No Grid Error
74	Slave PV Input Mode Error
75	Slave PV Input Mode Error
76	Slave PV Voltage High
77	Slave HW Bus Volt High

Code	Fault Information
81	Lost Communication D<->C
83	Master Arc Device Error
84	Master PV Mode Error
85	Authority expires
86	DRM0 Error
87	Master Arc Error
88	Master SW PV Current High
89	Battery Voltage High
90	Battery Current High
91	Battery Charge Voltage High
92	Battery Over Load
93	Battery Soft Connect Time Out
94	Output Over Load
95	Battery Open Circuit Error
96	Battery Discharge Voltage Low
97	BMS Internal Communication Error
98	Battery Module Sequence Error
99	Discharge Overcurrent Protection
100	Charge Overcurrent Protection
101	Module Under Voltage Protection
102	Module Over Voltage Protection
103	Single Cell Under Voltage Protection
104	Single Cell Over Voltage Protection
105	BMS hardware error
106	Charging temperature low protection
107	Charging temperature high protection
108	Discharging temperature low protection
109	Discharging temperature high protection
110	BMS relay error
111	Pre-charge error
112	BMS Insulation error
113	BMS supplier incompatibility
114	Battery cell supplier impartibility
115	Battery cell incompatibility
116	The battery pack model does not match
117	Circuit breaker is open
118	Temperature difference is too wide

Code	Fault Information
119	Voltage difference is too wide (Class II)
120	Voltage difference is too wide (Class I)
121	BMS over temperature protect
122	Short circuit protect
123	Total voltage match failed
124	The system is locked
125	FUSE error protection
126	Voltage on charging port is high protection
129	CO sensor triggered
130	Stroke switch triggered
131	Temperature sensor triggered
132	Smoke sensor triggered
133	Water sensor triggered
134	Aerosol triggered
135	Emergency stop
136	T/H sensor communication lost
137	Air conditioning communication lost
138	Temperature inside cabinet too high
139	Temperature inside cabinet too low
140	Humidity too high
141	Humidity too low
142	Coil anti-freeze
143	Defrost probe error
144	Fuse error
145	Condensing temperature probe error
146	Temperature probe inside cabinet error
147	Outlet air temperature probe error
148	Humidity probe error
149	Internal fan error
150	Compressor error
151	High voltage alarm
152	Low voltage alarm
153	High voltage alarm lock alarm
154	Phase sequence alarm

Code	Fault Information
155	CO sensor communication lost
156	Temperature of T/H sensor is too high
162	Gen Start or Stop fail
163	Lost Communication Gen Meter
165	The wood originating port is overloaded

Please contact your supplier for troubleshooting and remedy.

Warranty

Please go to SAJ website for warranty conditions and terms
https://www.saj-electric.com/

9.

ROUTINE MAINTENANCE

Maintenance Suggestion

Category	Operation	Standard	Maintenance interval	Power Off or not
Cabinet	Visual inspection: • Rust • Door locks • Air vents	No obvious coating peeling or scratches. No obvious Paint fading or rust. Door lock is not damaged. No dust accumulation in the vent. No insects, rats, snakes and other animals enter.	One quarterly	No
Air Conditioner	Visual inspection: • Check the appearance • Rust • Fan • Filter	No obvious damage. No obvious Paint fading or rust. No screw loose and falling off. The fan rotates normally, there is no stuck or abnormal sound. The surface of the filter is clean and not blocked.	One quarterly	No
EMS	Viewing the indicator status	The indicator is steady green.	One quarterly	No
Distributor Box	Visual inspection: • Check the appearance • Rust • Anything unusual in the cabinet	No obvious coating peeling, scratches. No obvious Paint fading or rust. The cabinet is clean and free of unusual things.	One quarterly	No
Warring label	Visual inspection	Clearly visible and free from defacement.	One quarterly	No
Air Conditioner External Fan	Clean the external fan filter	The filter surface is clean and free of clogging.	Half a year	No
Battery Package	Visual inspection: • Check the appearance • Rust • Screws • Fan • Front panel vents	No obvious damage. No obvious Paint fading or rust. The screws are not loose or falling off. The fan rotates normally, there is no stuck or abnormal sound. The surface of the front panel vents is clean and not clogged.	One year	Yes
Grounding and Equipotential Junction Point	• Ground wire • Internal equipotential	The grounding resistance must not be greater than 4Ω. Equipotential connections inside the cabinet are correct.	One year	Yes
Security Function	Emergency button	Check emergency stop button stopping function simulated shutdown.	One year	Yes