

# Installation Manual



## Grid-Connected Photovoltaic Inverter

(ST-INV-S3.0)

(ST-INV-S5.0)

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# 1 About This Manual

This manual describes the product information, installation, electrical connection, commissioning, troubleshooting, and maintenance. Read through this manual before installing and operating the product. All the installers and users have to be familiar with the product features, functions, and safety precautions. This manual is subject to update without notice.

## 1.1 Applicable Model

This manual applies to the ST series inverters below:

ST-INV-S3.0

ST-INV-S5.0

## 1.2 Target Audience

This manual applies to trained and knowledgeable technical professionals. The technical personnel have to be familiar with the product, local standards, and electric systems.

## 1.3 Symbol Definition

Different levels of warning messages in this manual are defined as follows:

 <b>DANGER</b>
Indicates a high-level hazard that, if not avoided, will result in death or serious injury.
 <b>WARNING</b>
Indicates a medium-level hazard that, if not avoided, could result in death or serious injury.
 <b>CAUTION</b>
Indicates a low-level hazard that, if not avoided, could result in minor or moderate injury.
<b>NOTICE</b>
Highlights and supplements the texts. Or some skills and methods to solve product-related problems to save time.

## 2 Safety Precaution

Please strictly follow these safety instructions in the installation manual during the operation.

### NOTICE

The inverters are designed and tested strictly in compliance with related safety rules. Read and follow all the safety instructions and cautions before any operations. Improper operation might cause personal injury or property damage as the inverters are electrical equipment.

### 2.1 General Safety

#### NOTICE

- The information in this installation manual is subject to change due to product updates or other reasons. This guide cannot replace the product warning labels unless otherwise specified. All descriptions here are for guidance only.
- Before installations, read through the installation manual to learn about the product and the precautions.
- All operations should be performed by trained and knowledgeable technicians who are familiar with local standards and safety regulations.
- Use insulating tools and wear personal protective equipment when operating the equipment to ensure personal safety. Wear anti-static gloves, clothes, and wrist strips when touching electron devices to protect the inverter from damage.
- Strictly follow the installation, operation, and configuration instructions in this manual. The manufacturer shall not be liable for equipment damage or personal injury if you do not follow the instructions.

### 2.2 PV String Safety

#### DANGER

Connect the DC cables of the inverter to the delivered DC terminals. Severe damage might happen if other types of DC terminals are used, which are beyond the manufacturer's liability.

#### WARNING

- Ensure the component frames and the bracket system are securely grounded.
- Ensure the DC cables are connected tightly, securely and correctly.
- Measure the DC cables with a multi-meter to avoid reverse polarity connection. Also, the voltage should be under the permissible range.
- Do not connect one PV string to more than one inverter at the same time. Otherwise, it may cause damage to the inverter.

## 2.3 Inverter Safety

### WARNING

- The voltage and frequency at the connection point meet the inverter grid connection requirements.
- Additional protective devices like circuit breakers or fuses are recommended on the DC/AC side. Specification of the protective device should be at least 1.25 times the maximum current.
- Backup is not recommended if the PV system is not configured with batteries. Otherwise, the risk in system power usage is beyond the equipment manufacturer's warranty scope.
- Make sure that all the groundings are tightly connected.
- Testing to AS/NZS 4777.2:2020 to multiple inverter combinations has not been conducted that the product is not to be used in multiple inverter combinations.

### DANGER

- All labels and warning marks should be visible after the installation. Do not cover, scrawl, or damage any label on the equipment.
- Warning labels on the inverter are as follows:

	Beware of a danger zone This symbol indicates that the product must be additionally grounded if additional grounding or equipotential bonding is required at the installation site
	Delayed discharge Wait 5 minutes after power off until the components are completely discharged
	High-temperature hazard Do not touch the product under operation to avoid being burnt
	Observe the documentations Read through the installation manual before any operations
	WEEE designation Do not dispose of the product together with the household waste but in accordance with the disposal regulations for electronic waste applicable at the installation site
	CE marking The product complies with the requirements of the applicable EU directives
	TÜV mark of conformity

## 2.4 Battery Safety

### WARNING

- The battery used with the inverter shall be approved by the inverter manufacturer.
- Before installations, read through the corresponding battery's installation manual to learn about the product and the precautions. Strictly follow its requirements.
- If the battery discharged completely, please charge it in strict accordance with the corresponding installation manual.
- Factors such as: temperature, humidity, weather conditions, etc. may limit the battery's current and affect its load.
- Contact after-sale service immediately if the battery is not able to be started. Otherwise, the battery might be damaged permanently.
- Use the multi-meter to measure the DC cable to avoid reverse polarity connection. Also, the voltage should be under the permissible range.
- Do not connect one battery group to several inverters at the same time. Otherwise, it may cause damage to the inverter.

## 2.5 Personal Safety

### WARNING

- Personnel who install or maintain the equipment must be strictly trained, learn about safety precautions and correct operations.
- Only qualified professionals or trained personnel are allowed to install, operate, maintain, and replace the equipment or parts.

## 2.6 Safe Transport of Inverter

Transport the inverter in its original packaging, facing up and without exposing it to unnecessary shocks. If the original package is no longer available, use a similar box that can withstand the weight of the inverter (refer to the inverter weight in "9.1 Technical Data" on page 62), has a handle system and can be closed fully.

## 3 Product Introduction

### 3.1 Overview

#### Function:

Inverters control and optimize the power in PV systems through an integrated energy management system. The power generated in the PV system can be used, stored in the battery, output to the utility grid, etc.

#### Model:

This manual applies to the listed inverters below:

- ST-INV-S3.0
- ST-INV-S5.0

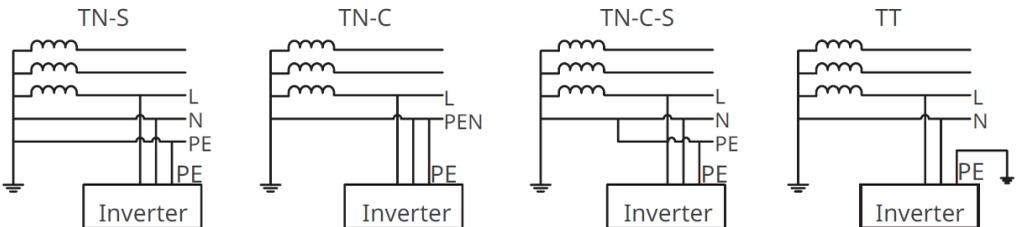
#### Model description:

**ST - INV-S 3.0**

1      2      3      4

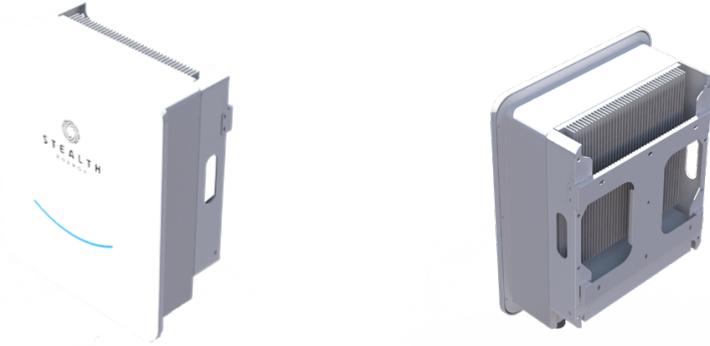
No.	Referring to	Explanation
1	Brand Code	STEALTH ENERGY
2	Product Feature	PV Inverter
3	S	Single-phase
4	Rated apparent power	The rated output power is 3000VA

#### Supported grid types:

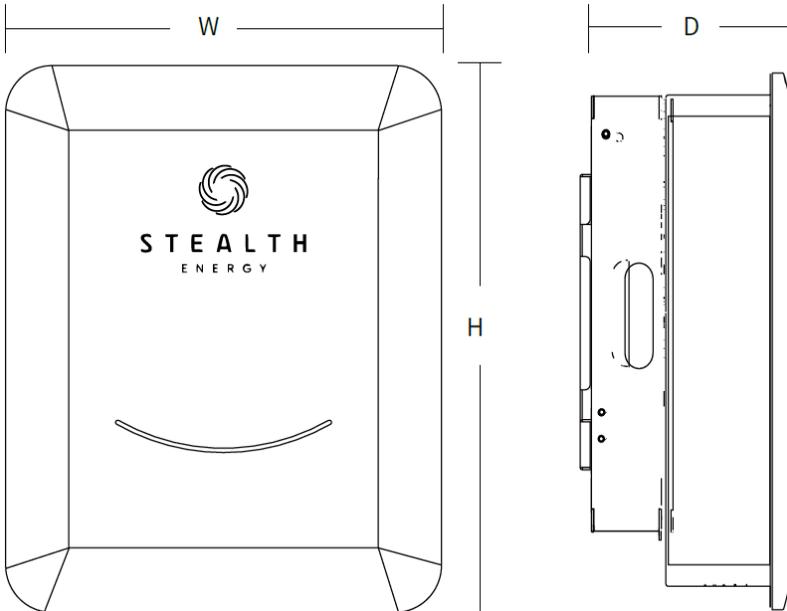


### 3.2 Appearance

The following illustrations are for reference only, please refer to the actual objects.



### 3.3 Dimensions and Weight



Model	Width [mm]	Height [mm]	Depth [mm]	Net weight [kg]
ST-INV-S3.0	411	505	195	18.6
ST-INV-S5.0	411	505	195	18.6

### 3.4 Nameplate

The nameplate is for reference only

 <b>Grid-Connected Photovoltaic Inverter</b> Model: ST-INV-S5.0								
<b>PV Input</b>	Max. input power	6000 W						
	Absolute max. voltage	550 Vd.c.						
	MPPT voltage range	125~530 Vd.c.						
	Nominal operating voltage	360 Vd.c.						
	Max. input current	11/11 Ad.c.						
	Max. short circuit current	13.8/13.8 Ad.c.						
<b>Battery</b>	Battery type	Lithium						
	Battery voltage range	85~400 Vd.c.						
	Max. charge/discharge current	25 Ad.c.						
<b>AC Input</b>	Nominal voltage	230 Va.c.						
	Nominal frequency	50/60 Hz						
	Rated input current	40 Aa.c.						
<b>AC Output</b>	Rated apparent power	9200 VA						
	Nominal voltage	230 Va.c.						
	Nominal frequency	50/60 Hz						
<b>EPS</b>	Rated output current	21.7 Aa.c.						
	Rated apparent power	4991 VA						
	Power factor	0.8leading...0.8lagging						
	Rated output current	20 Aa.c.						
<b>Others</b>	Rated apparent power	4600 VA						
	Ingress protection	IP65						
	Operation temperature range	-25...+60C°						
	Overvoltage category	DC II AC III						
	Protective class	I						
	Inverter topology	Non-isolated						
*IEC62109: Rated current=Maximum continuous current Rated power=Maximum continuous power								
DRM0	DRM1	DRM2	DRM3	DRM4	DRM5	DRM6	DRM7	DRM8
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
S/N	 S5INVD1009001							
								
Suzhou Stealth Energy Technology Co., Ltd.					Made in China			

Trademark, product type, and product model

Technical parameters

Serial number

Safety symbols and marks

Country of manufacture.

### 3.5 Application Scenarios



#### WARNING

- The PV system is not suitable to connect equipment that relies on a stable power supply, such as medical equipment to sustain life. Ensure that no personal injury is occurred when the system is disconnected.
- Avoid loads with high starting current like high-power water pumps in the PV system. Otherwise, the off-grid output may fail due to excessive instantaneous power.
- Backup is not recommended if the PV system is not configured with batteries. Otherwise, the risk in system power usage is beyond the equipment manufacturer's warranty scope.
- Factors such as: temperature, humidity, weather conditions, etc. may limit the battery's current and affect its load.
- The inverter offers EPS (Emergency Power Supply) function, when the mains is de-energized or disconnected.
- When single overload protection occurs, the inverter can restart automatically; however, the restarting time will be extended if it happens several times. For a faster restarting, try it via Stealth 'app setting.
- When the grid is disconnected, the off-grid function of the inverter will be closed automatically if the load capacity exceeds the inverter's rated power; to enable it, turn off the large loads and ensure the load power is less than the rated power of the inverter.
- Normal household loads can be supported when the inverter is in backup mode. Accepted loads as below:
  - Inductive loads: 1.5P non-inverter air conditioner can be connected to the inverter. If two or more non-inverter air conditioners are connected, the EPS may be unstable.
  - Capacitive load: total power  $\leq 0.6$  times of the inverter's rated output power.

### 3.6 Working Modes

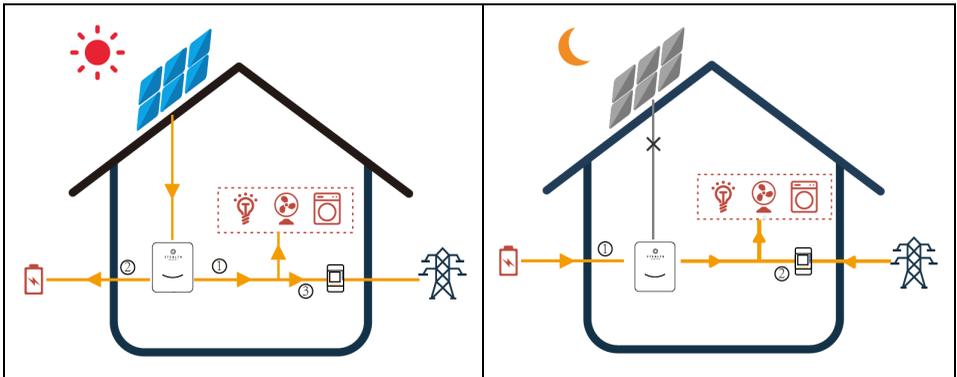
STEALTH ST Series, also known as hybrid or bidirectional solar inverters, is suitable for solar systems with PV, battery, load and grid systems for energy management. The energy generated by the photovoltaic system.

The power is first used to provide the load, the excess power can be used to charge the battery, and the remaining power can be used for grid connection. When the PV power is not sufficient to meet the requirements, the battery should be discharged to support the load consumption. If both photovoltaic power and battery power are insufficient, the system will use grid power to support the load.

The above introduction describes the general working of a photovoltaic system. The operation mode can be adjusted according to the system layout on the Stealth "PV Pro" App. The following are the general operating modes of photovoltaic energy storage systems.

Depending on your configuration and layout conditions, PV energy storage systems typically have the following modes of operation:

#### 3.6.1 Self-use mode



The self-use mode is suitable for areas with low feed-in subsidies and high electricity prices.

① When the power of PV is sufficient

PV will power the loads firstly, and surplus power will charge to the battery. If the battery is fully charged, then sell the surplus power to the grid;

( $PV > Load$ ,  $PV \rightarrow Load \rightarrow Battery \rightarrow Grid$ )

② When the power of PV is insufficient

PV will power the loads firstly, the remaining power will be taken from the grid, the battery will not discharge at this time.

( $PV < Load$ ,  $PV + Grid \rightarrow Load$ )

PV+BAT will power the loads together. If the power is still not enough, the remaining power will be taken from the grid.

(PV < Load, PV + Battery + Grid → Load)

③ Without PV power

The grid supplies the loads and also can charge the battery;

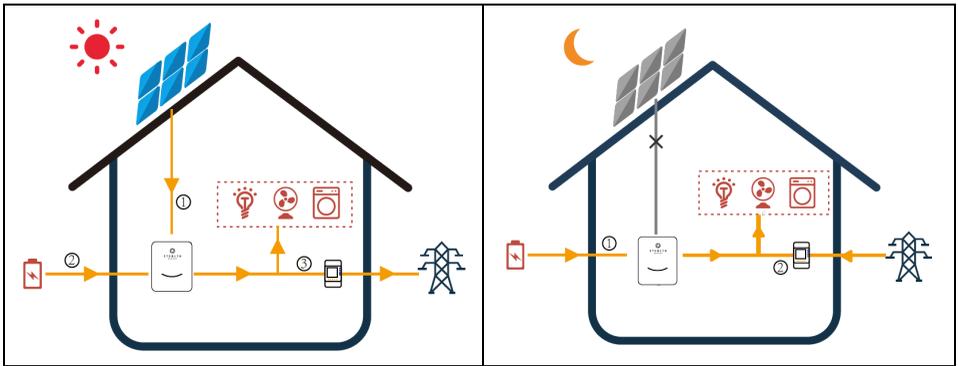
(PV=0, Grid → Load + Battery)

The battery will power the home loads. If the battery power is not enough, the remaining power will be taken from the grid. The inverter will enter into the standby state.

(PV=0, Battery + Grid → Load)

Battery min SOC can be set:10%-100%

### 3.6.2 Feed-in priority mode



The Feed-in priority mode is suitable for areas with high feed-in subsidies, but has feed-in power limitation.

① When the power of PV is sufficient

First, PV supply power to the load, then sell the power to the grid. If the local grid company limits the grid-connected power of the inverter, the excess energy continues to charge the battery.

(PV > Load, PV → Load → Grid → Battery)

PV will power the loads firstly, and surplus power will feed-in to the grid.

(PV > Load, PV → Load → Grid)

② When the power of PV is insufficient

PV will power the loads firstly; The battery also will power the home loads. If the battery power is not enough, the remaining power will be taken from the grid.

(PV < Load, PV + Grid → Load)

PV + BAT will power the loads together. If the power is still not enough, the remaining power will be taken from the grid.

(PV < Load, PV + Battery + Grid → Load)

③ Without PV power

The grid will power the home loads and also charge the battery;

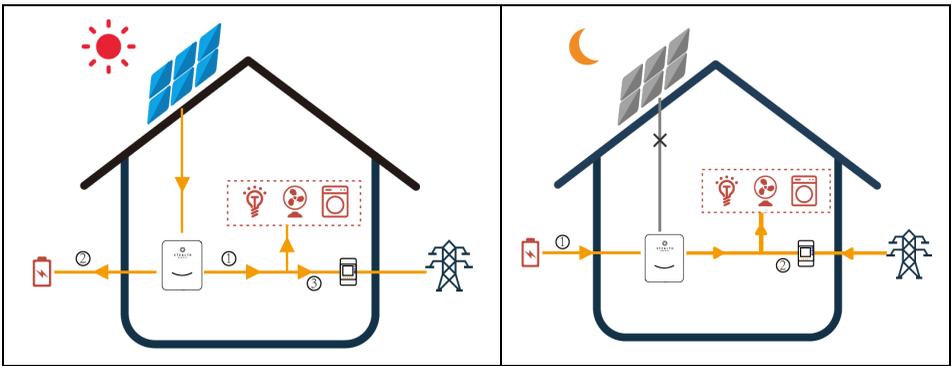
(PV=0, Grid → Load +Battery)

The battery will power the home loads firstly. If the battery power is not enough, the remaining power will be taken from the grid. The inverter will enter into the standby state.

(PV=0, Battery + Grid → Load)

Battery min SOC can be set: 10%-100%

3.6.3 Backup mode

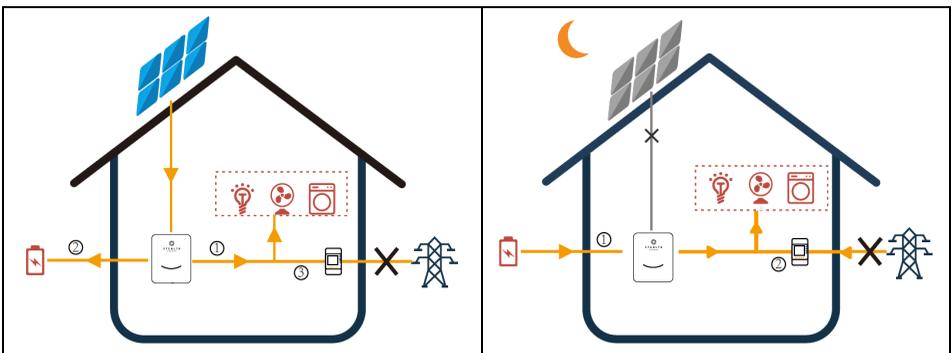


The back-up mode is suitable for areas with frequent grid loss.

This mode will maintain the battery capacity at a relatively high level, to ensure that the emergency loads can be used when the grid is off. Customers no need to worry about the battery capacity.

Battery min SOC can be set: 10%-100%.

3.6.4 EPS mode (off-grid)



The EPS mode is used when the power grid is off.

System will provide emergency power through PV and batteries to supply power to the household loads.

(Battery must be installed for this mode)

① When the power of PV is sufficient

PV will power the loads firstly, and surplus power will charge to the battery.

( $PV > Load$ ,  $PV \rightarrow Load \rightarrow Battery$ )

② When the power of PV is insufficient

The remaining power will be taken from the battery.

( $PV < Load$ ,  $PV + Battery \rightarrow Load$ )

③ Without PV power

The battery will power the emergency loads until the battery reached the min SOC, then the inverter will enter into the idle mode.

( $PV=0$ ,  $Battery \rightarrow Load$ )

EPS SOC-min condition is adjustable within the range of 10%-25%;

#### NOTICE

in the case of grid connection, all working modes work normally when the battery SOC >10%. When the battery charge rate is below 10%, the PV or Grid will first charge the battery SOC15%, and then return to the working mode selected by the user.

## 3.7 Features

### 3.7.1 Basic information

Model Number	Series Type	Number of Phase	Rated AC Output (VA)	Integrated PV Isolator	Integrated PV Isolator EESS Registered	Inverter Grid Settings Access Method
ST-INV-S3.0	ST	1	3000	NA	NO	Monitoring App
ST-INV-S5.0	ST	1	4991	NA	NO	Monitoring App

### 3.7.2 Systems with direct functional earthing of the PV array

The inverter is not intended for functionally earthed PV arrays

### 3.7.3 Multiple inverter combinations

The inverter is not to be used in multiple inverter combinations.

### 3.7.4 Earth Fault Alarm

According to AS/NZS 5033, The alarm system shall continue repeating its operation at least at hourly intervals until the earth fault is corrected or until the fault is acknowledged.

The earth fault alarm shall be at least one of the following types:

- (a) Remote communication (such as email, SMS or similar).
- (b) Local indication.

Where local indication is used for the earth fault alarm, it shall be either an audible or visual signal placed in an area that will be noticed.

The ST Series inverter integrated earth fault alarm system, once an earth fault occurs, the LED indicator will light up (red), the inside buzzer will alarm at the same time. And the system will email the fault information to the customer. Install the inverter in a high traffic area where the indicators would be noticed.

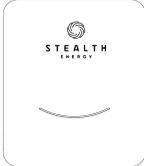
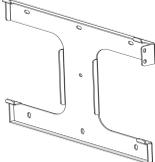
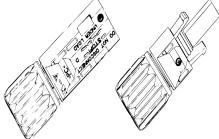
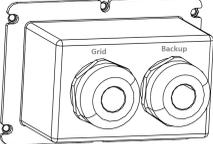
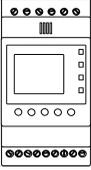
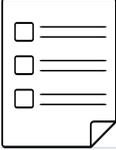
## 4 Check and Storage

### 4.1 Check Before Receiving

Check the following items before receiving the product.

1. Check the outer packing box for damage, such as holes, cracks, deformation, and other signs of equipment damage. Do not unpack the contents from the box and contact the supplier as soon as possible if any damage is found.
2. Check the inverter model. If the inverter model is not what you requested, do not unpack the product and contact the supplier.
3. Check the deliverables for correct model, complete contents, and intact appearance. Contact the supplier as soon as possible if any damage is found.

### 4.2 Delivery List

 <p>Inverter x 1</p>	 <p>Mounting plate x 1</p>	 <p>Expansion bolts x N</p>
 <p>PV connectors x 2 pair</p>	 <p>Battery connectors x 1 pair</p>	 <p>AC Cover x 1</p>
 <p>Meter x 1</p>	 <p>Documents x 1</p>	 <p>Screw x N</p>
 <p>PE terminal x 1</p>	 <p>Wi-Fi module x 1</p>	

 **WARNING**

Connect the DC cables with the included terminals. The manufacturer shall not be liable for the damage if other terminals are used.

### 4.3 Storage

If the equipment is not to be installed or used immediately, please ensure that the storage environment meets the following requirements:

1. Do not unpack the outer package or throw the desiccant away.
2. Store the inverter in a dry place where ambient temperatures are  $-30^{\circ}\text{C} \dots +70^{\circ}\text{C}$ .
3. The height and direction of the stacking inverters should follow the instructions on the packing box.
4. The inverters must be stacked with caution to prevent them from falling.
5. If the inverter has been long term stored, it should be checked by professionals before being put into use.

## 5 Installation Requirements

### 5.1 Installation Precautions

 **DANGER**

Before Installing the inverter, make sure the inverter has no electrical connections. Before drilling, make sure to avoid the water and electricity wiring in the wall to avoid danger !

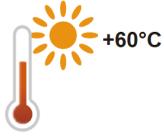
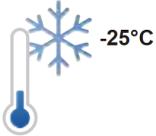
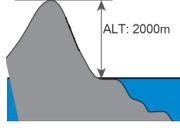
 **CAUTION**

Improper handling may result in personal injury! The instructions in the manual must be followed when handling and placing the equipment. Poor ventilation in the Installation environment will affect system performance!

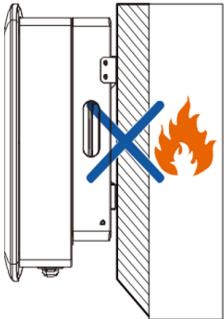
- It is necessary to ensure good ventilation during the operation of the equipment.
- The device must be kept upright and the heat sink uncovered to ensure adequate cooling inside the device.

## 5.2 Installation Location

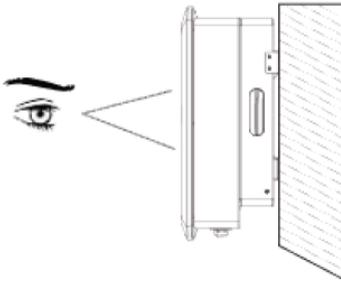
- The inverter is IP65 rating and can be used for indoor or outdoor environment.
- Do not install the equipment in a place near flammable, explosive, or corrosive materials.
- The Installation wall must have the ability to support at least 4 times the weight of the inverter.
- The Installation location should be easy for electrical connection, operation and maintenance.
- Do not Install inverter in the living area.
- Do not Install inverter where children can reach it.
- The Installation environment must meet the following conditions:

Max. ambient temperature	Min. ambient temperature	Max. relative humidity	Max. operating altitude
			

- The Installation wall must have fire resistance, and there must be no flammable substances or flammable gas in the Installation space.

Wall material flammability	Flammable materials or gases are found near the Installation point
	

- The installation height should facilitate the observation of LED indicators. Vertical installation for better heat dissipation



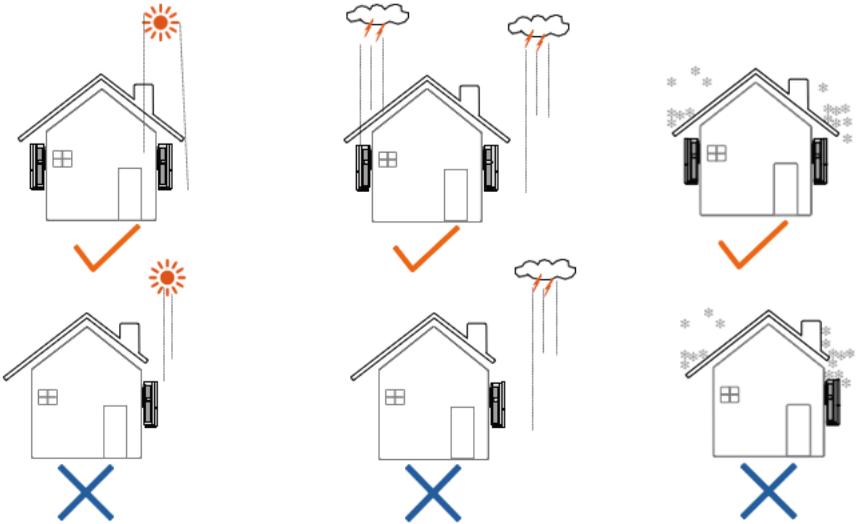
- Do not install tilted, horizontally or upside down.

Forward lean	Backward lean	Flat	Inverted

**NOTICE**

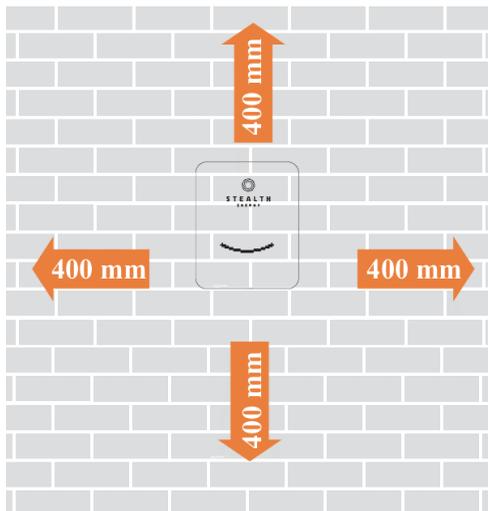
Inverter cannot be Installed horizontally, otherwise the equipment will be damaged.

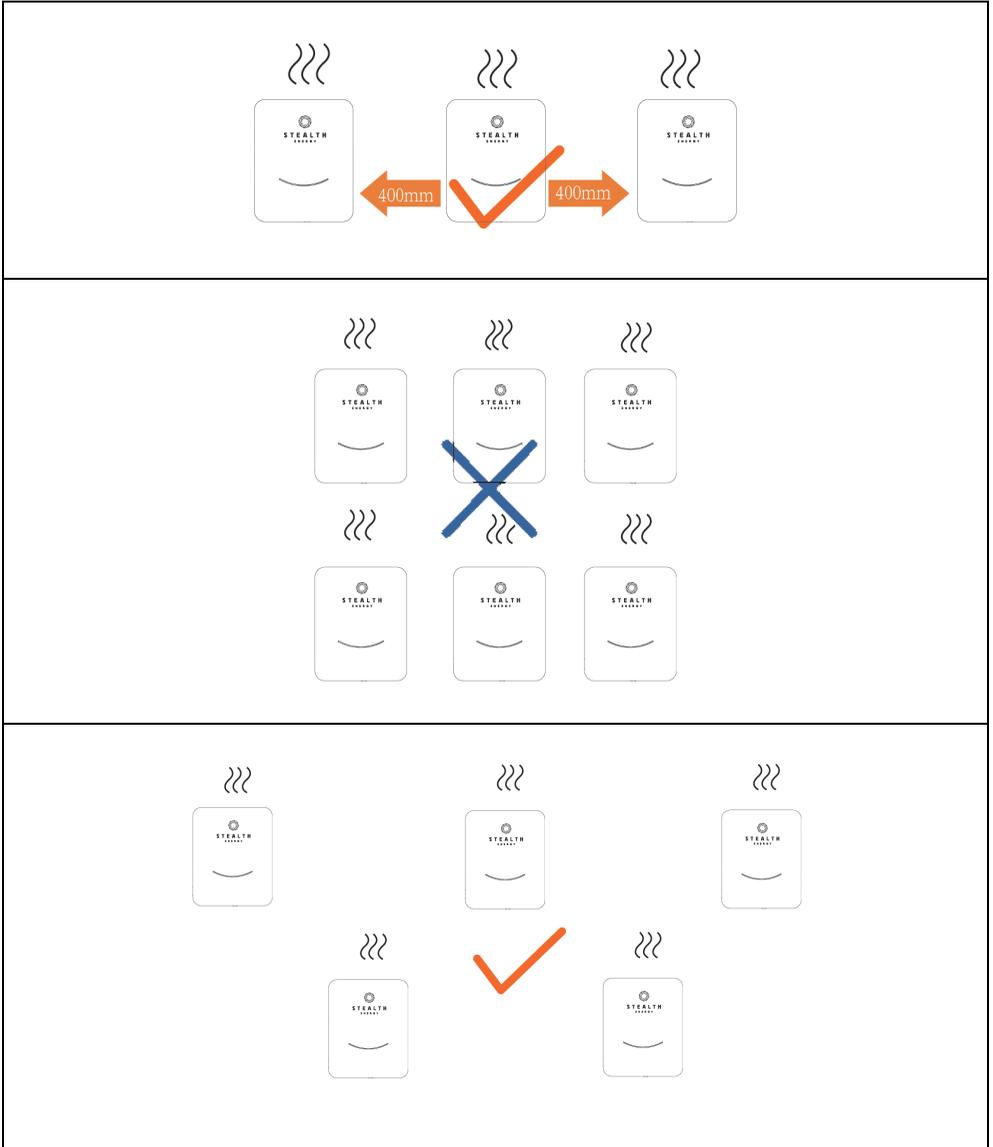
- Avoid direct sunlight, rain and snow, and it is best to choose a sheltered installation site, which can prolong the service life of the equipment.



- Reserve enough clearance around the inverter to ensure sufficient space for heat dissipation.

Position	Left	Right	Top	Bottom	Front
Minimize	400mm	400mm	400mm	400mm	400mm



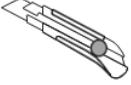
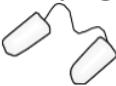
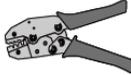
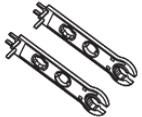
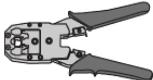


### NOTICE

It is very important to ensure smooth ventilation and heat dissipation of inverter. Please install the inverter in a ventilated environment. Do not install the inverter in a closed box, otherwise it will affect the power generation of inverter.

### 5.3 Installation Tools

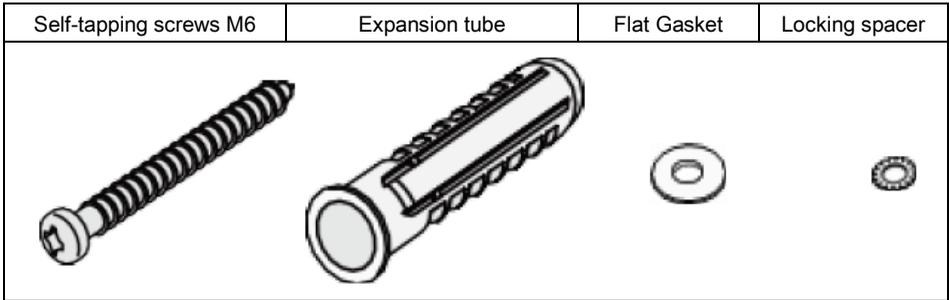
The following tools are recommended when installing the equipment. Use other auxiliary tools on site if necessary.

Type	Tools			
General	Tape 	Pen 	Tape ruler 	Knife 
	meter ( $\geq 1100V$ ) 	Protective suit 	Anti-static bracelets 	Protective gloves 
	Masks 	Earplug 	Eye protector 	Insulated shoes 
	Hoovers 	Spirit level 		
Installation	Hammer : $\phi 10$ 	Rubber hammer 	Electric screwdrivers 	Cross screwdriver 
	Wire stripper 	hydraulic clamp 	wire crimpers 2.5-6mm <sup>2</sup> 	MC4 Terminal wrench 
	wire cutters 	Crystal head crimping pliers 		

## 5.4 Installing the Inverter

After transporting the inverter to the installation location, install the hanging plate on the wall with the expansion bolt assembly, and then hang the inverter on the hanging plate.

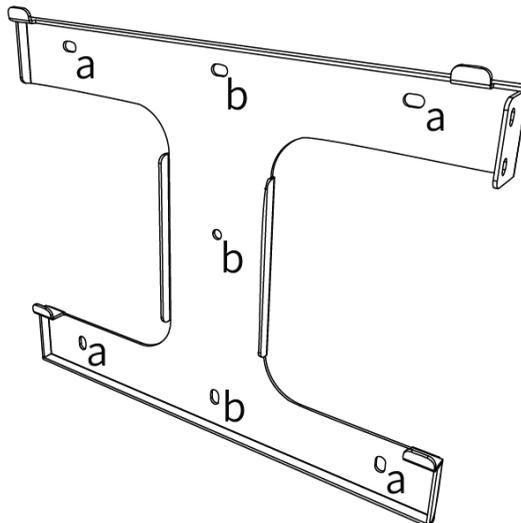
The expansion bolt assembly is shown in the figure below.



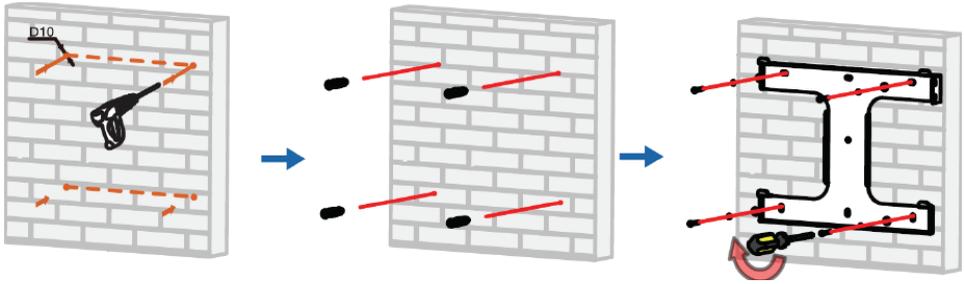
### Installation steps:

1. Please the hanging board horizontally on the wall, and mark the position of drilling holes on the wall with a hole.

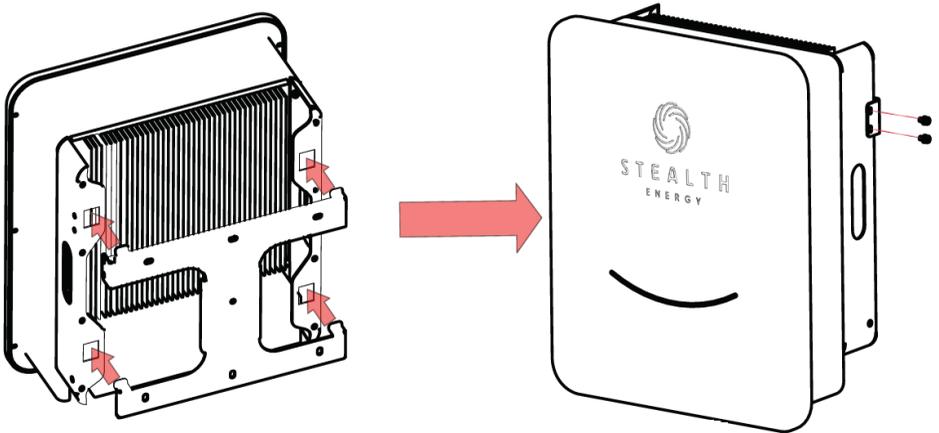
Tip: When installing on a post, please use the b hole on the vertical direction of the hanging plate.



2. Drill holes (about 70mm in depth) and install the hanging plate.



3. Lift the inverter and hang the back mounting ear holes on the mounting plate. Use 2 M5x12 screws to fasten the inverter to the mounting plate with a torque of 1.5N·m.



## 6 Electrical connection

### 6.1 Safety Instructions

 <b>DANGER</b>
<p>There may be high voltage in the unit.</p> <p>Operators must wear proper personal protective equipment during electrical connections.</p> <p>Pay attention to safety before making electrical connections. Exposure of PV strings to sunlight will generate dangerous voltages.</p> <p>Make sure all cables are de-energized before making electrical connections, and do not close the DC/AC circuit breaker until electrical connections are complete.</p>
 <b>WARNING</b>
<p>Any improper operation during wiring may result in equipment damage or personal injury. Wiring must be done only by professional technicians. Cables used in photovoltaic power generation systems must be firmly connected, undamaged, well insulated, and of appropriate size.</p>
<b>NOTICE</b>
<p>The relevant rules of the local power grid and the relevant safety instructions for PV strings and battery systems must be followed. All electrical Installations must comply with the electrical standards of the country in which they are Installed.</p> <p>Connect the inverter to the grid only with permission from the local power department.</p> <p>*The product should not be installed in multiple phase combinations</p>

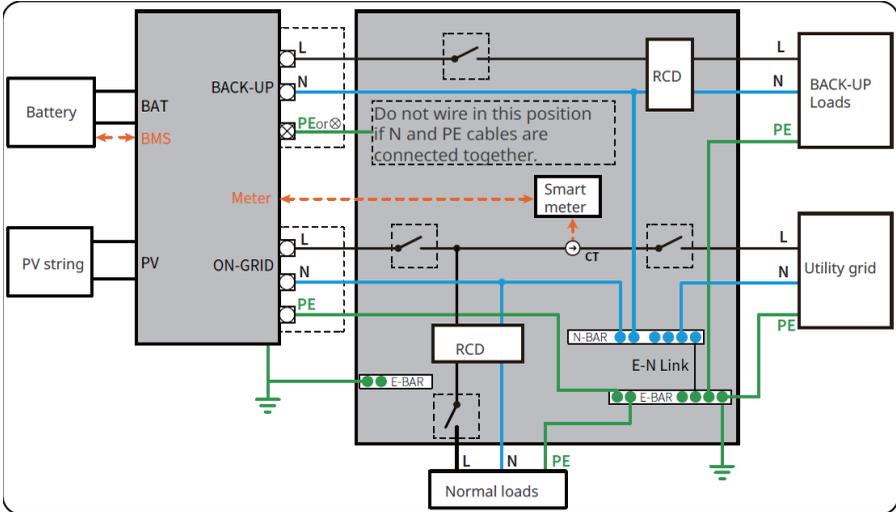
### 6.2 System Wiring Diagram

<b>NOTICE</b>
<ul style="list-style-type: none"> <li>• N and PE wiring via ON-GRID and BACK-UP ports of the inverter are different based on the regulation requirements of different regions. Refer to the specific requirements of local regulations.</li> <li>• There are integrated relays inside of the inverter's ON-GRID and BACK-UP AC ports. When the inverter is in the off-grid mode, the ON-GRID relay is disconnected; while when the inverter is in grid-tied mode, it is connected.</li> <li>• When the inverter is powered on, the BACK-UP AC port is live. Power off the inverter first if maintenance is required for the loads connected to BACK-UP ports. Otherwise, it may cause electric shock.</li> </ul>

**NOTICE**

N and PE cables are connected together in the Main Panel for wiring.

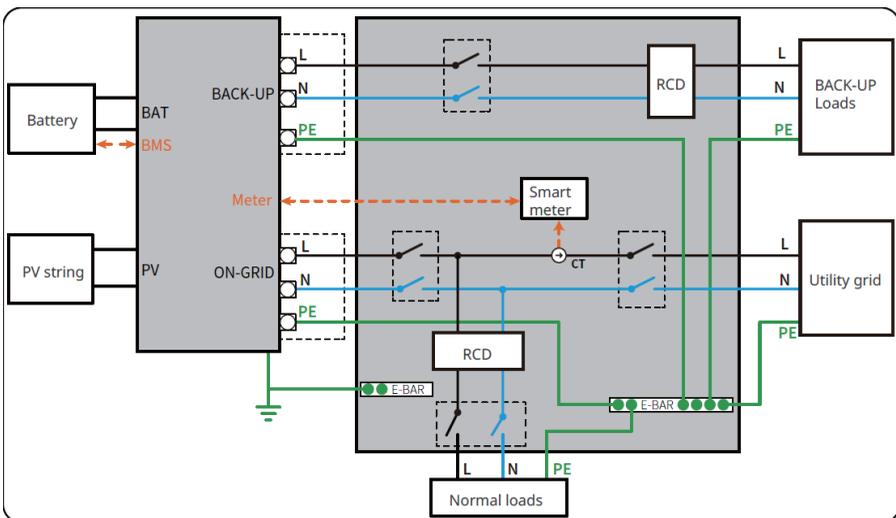
The following diagram is applicable to areas in Australia, New Zealand, South Africa, etc.



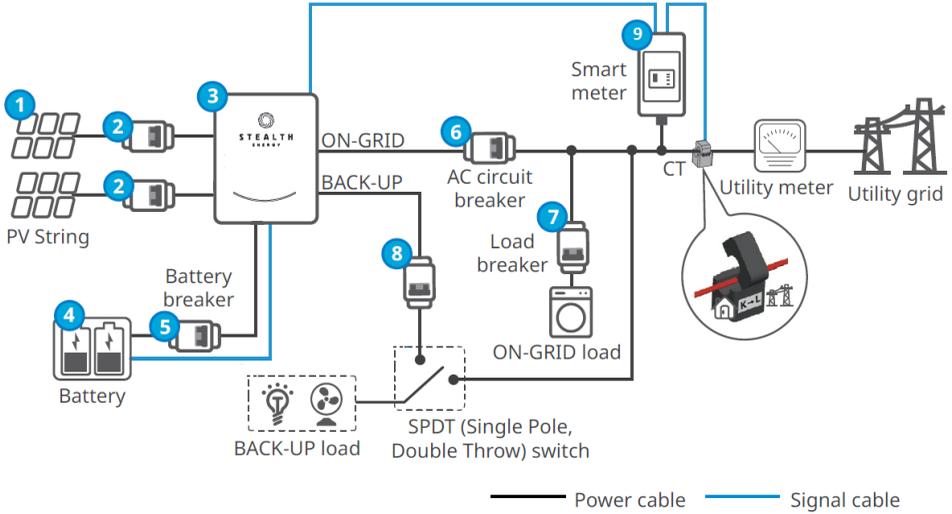
**NOTICE**

N and PE cables are separately wired in the Main Panel.

The following diagram is applicable to areas except Australia, New Zealand, South Africa.



### 6.3 Overview of Electrical Connection



No.	Parts	Description
1	PV String	The PV string consists of PV modules
2	PV breaker	Recommended specifications: rated voltage $\geq$ d.c. 600V, rated current $\geq$ d.c. 20A
3	Inverter	Support ST series inverters
4	Battery	Select the battery model according to the inverter model and the approved battery
5	Battery breaker	Recommended specifications: rated voltage $\geq$ d.c. 600V, rated current $\geq$ d.c. 40A
6	AC Breaker (grid port)	Recommended a.c. circuit breaker specifications: ST-INV-S3.0: rated voltage $\geq$ a.c. 230V, rated current $\geq$ a.c. 40A, external RCD Type A 300 mA ST-INV-S5.0: rated voltage $\geq$ a.c. 230V, rated current $\geq$ a.c. 63A, external RCD Type A 300 mA
7	AC Breaker (user load)	Depend on the actual home used load, recommended general loads.

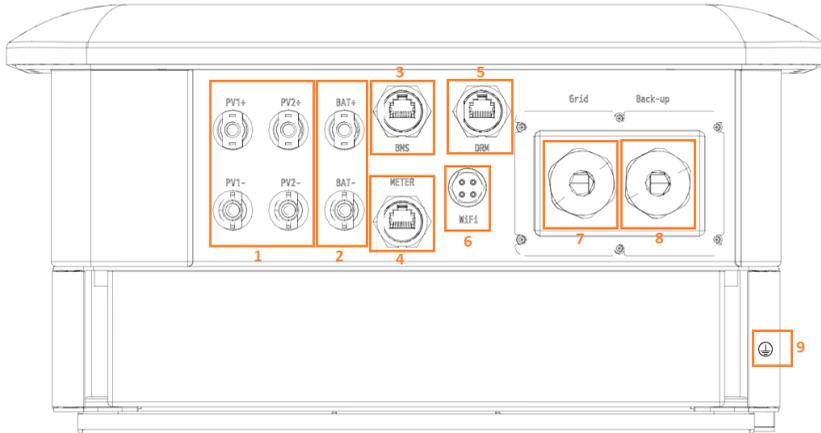
8	AC Breaker (backup port)	<p>Recommended need 24-hour power supply or other important loads. (e.g. lamp, fan, refrigerator)</p> <p>Recommended breaker specifications:                      ST-INV-S3.0: rated voltage <math>\geq</math> a.c. 230V, rated current <math>\geq</math> a.c. 25A,                      external RCD Type A 30 mA                      ST-INV-S5.0: rated voltage <math>\geq</math> a.c. 230V, rated current <math>\geq</math> a.c. 32A,                      external RCD Type A 30 mA</p>
9	Smart meter	The meter with RS485 communication port and CT port

**Recommended ratings as below:**

Model	ST-INV-S3.0	ST-INV-S5.0
<b>Cable:</b>		
<b>PV Cable</b>		
Conductor cross-sectional area	4-6 mm <sup>2</sup> / 12-10 AWG	4-6 mm <sup>2</sup> / 12-10 AWG
<b>Battery cable</b>		
Conductor cross-sectional area	4-6 mm <sup>2</sup> / 12-10 AWG	4-6 mm <sup>2</sup> / 12-10 AWG
<b>Grid cable</b>		
Conductor cross-sectional area	4-6 mm <sup>2</sup> / 12-10 AWG	6-10 mm <sup>2</sup> / 8 AWG
<b>Backup cable</b>		
Conductor cross-sectional area	4-6 mm <sup>2</sup> / 12-10 AWG	4-6 mm <sup>2</sup> / 12-10 AWG
<b>PE cable</b>		
Conductor cross-sectional area	4-6 mm <sup>2</sup> / 12-10 AWG	6-10 mm <sup>2</sup> / 8 AWG
<b>Breaker:</b>		
<b>PV breaker</b>		
Rated voltage	d.c. 600 V	d.c. 600 V
Rated current (per input)	d.c. 20 A	d.c. 20 A
<b>Battery breaker</b>		
Rated voltage	d.c. 600 V	d.c. 600 V
Rated current	d.c. 40 A	d.c. 40 A
<b>Grid breaker</b>		
Rated voltage	a.c. 230 V	a.c. 230 V
Rated current	a.c. 40 A	a.c. 63 A
RCD	Type A 300 mA	Type A 300 mA
<b>Backup breaker</b>		
Rated voltage	a.c. 230 V	a.c. 230 V
Rated current	a.c. 25 A	a.c. 32 A
RCD	Type A 30 mA	Type A 30 mA

## 6.4 Terminal Introduction

The external wiring terminals are located on the side of the inverter, as shown in the figure below. The picture is for reference only, please refer to the actual product.



1	PV input terminal (PV1/PV2)
2	Battery terminal (BAT +/-)
3	BMS communication port
4	Meter communication port
5	DRED communication port
6	Wi-Fi module port
7	Grid port
8	Backup port
9	PE terminal

### NOTICE

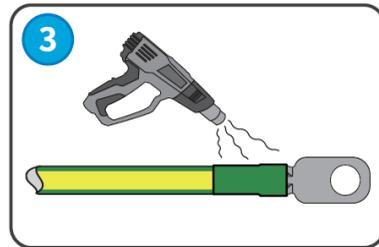
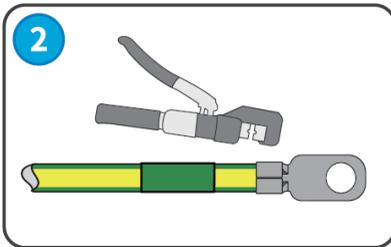
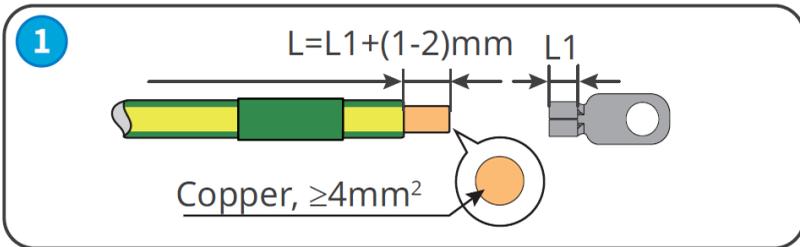
The ST series inverter is not equipped with PV switch; an external PV breaker shall be added. The external PV breaker shall be AU/NZ certified; Complied to AS60947.3; Be classified as DC-PV2; With ratings and properties suitable for the intended application conditions such as outdoor, exposed to sunshine, on non-combustible material surface.

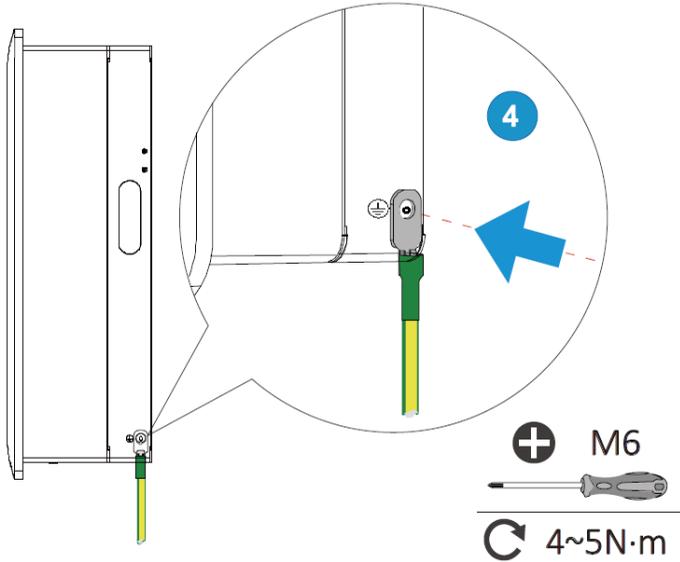
## 6.5 Connecting the PE Cable

**WARNING**

- The PE cable connected to the enclosure of the inverter cannot replace the PE cable connected to the AC output port. Make sure that both of the two PE cables are securely connected.
- Make sure that all the grounding points on the enclosures are equipotential connected
- To improve the corrosion resistance of the terminal, you are recommended to apply silica gel or paint on the ground terminal after installing the PE cable.
- The PE cable should be prepared by the customer. Recommended specifications Type: single-core outdoor copper cable

Model	ST-INV-S3.0	ST-INV-S5.0
PE cable		
Conductor cross-sectional area	4-6 mm <sup>2</sup> / 12-10 AWG	6-10 mm <sup>2</sup> / 8 AWG





## 6.6 Connecting the PV Input

### DANGER

- Do not connect one PV string to more than one inverter at the same time. Otherwise, it may cause damage to the inverter.
- Confirm the following information before connecting the PV string to the inverter. Otherwise, the inverter may be damaged permanently or even cause fire and cause personal and property losses.
  1. Make sure that the max. short circuit current and the max input voltage per MPPT are within the permissible range.
  2. Make sure that the positive pole of the PV string connects to the PV+ of the inverter. And the negative pole of the PV string connects to the PV- of the inverter.

### WARNING

The PV strings cannot be grounded; the inverter is not suitable for use with functionally earthed PV arrays.

Ensure the minimum insulation resistance of the PV string to the ground meets the minimum insulation resistance requirements before connecting the PV string to the inverter ( $R = \text{maximum input voltage} / 30\text{mA}$ ).

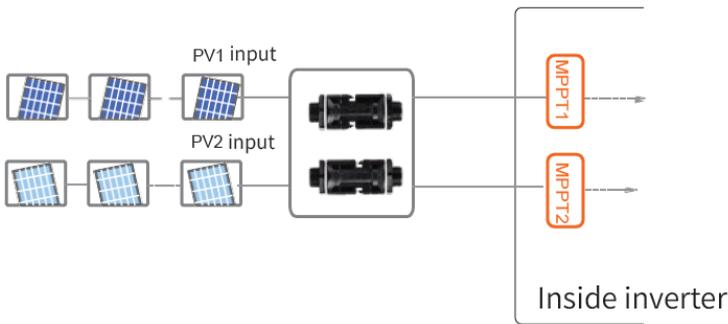
### 6.6.1 PV Input Configuration

ST-INV-S3.0 and ST-INV-S5.0 each input has a pair of PV terminals. Two PV inputs, each with independent MPPT, can be configured in independent mode or parallel mode.

- independent mode

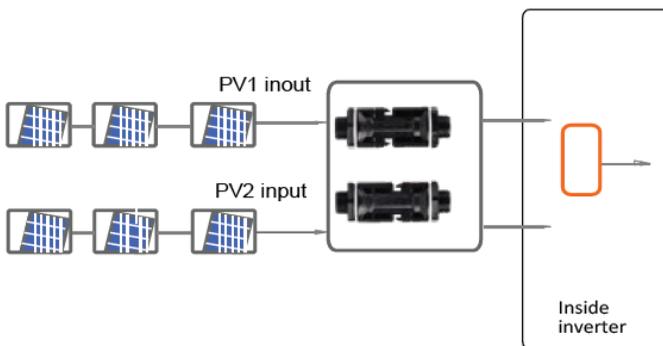
In the independent mode, the two PV string inputs operate independently, and the two strings can be different from each other, including: different panel types, different numbers of panels forming a string, different inclination angles, and different azimuth angles.

As shown in the figure below, the inclination angles of the input panels of the two PV strings are different, and Inverter should select the independent mode.



- Parallel mode

In parallel configuration mode, all PV strings connected to Inverter must have exactly the same characteristics, including: the same model, the same number of panels, the same inclination, and the same azimuth.



**NOTICE**

In order to avoid the unbalance of the two input powers, or even the input load limit, the two PV input cables are required to be of the same type.

### 6.6.2 Assembling the cable to the PV connector

Assemble the DC cable to the in-line PV connector that mates with the PV terminals on the side of the unit. The specifications of the DC cables are shown in the following table.

NOTICE		
The DC cable must be single-core.		
To ensure the IP65 degree of protection of the inverter unit, only use the supplied connectors or products with the same degree of protection.		

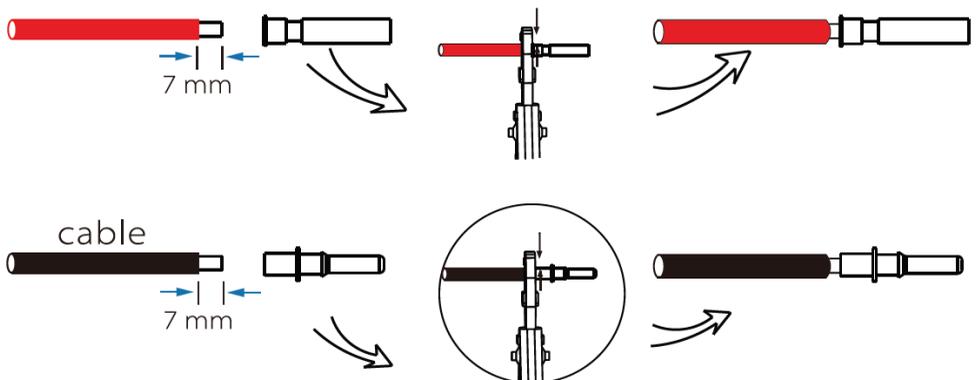
Model	ST-INV-S3.0	ST-INV-S5.0
<b>PV Cable</b>		
Conductor cross-sectional	4-6 mm <sup>2</sup> / 12-10 AWG	4-6 mm <sup>2</sup> / 12-10 AWG
<b>PV breaker</b>		
Rated voltage	d.c. 600 V	d.c. 600 V
Rated current (per input)	d.c. 20 A	d.c. 20 A

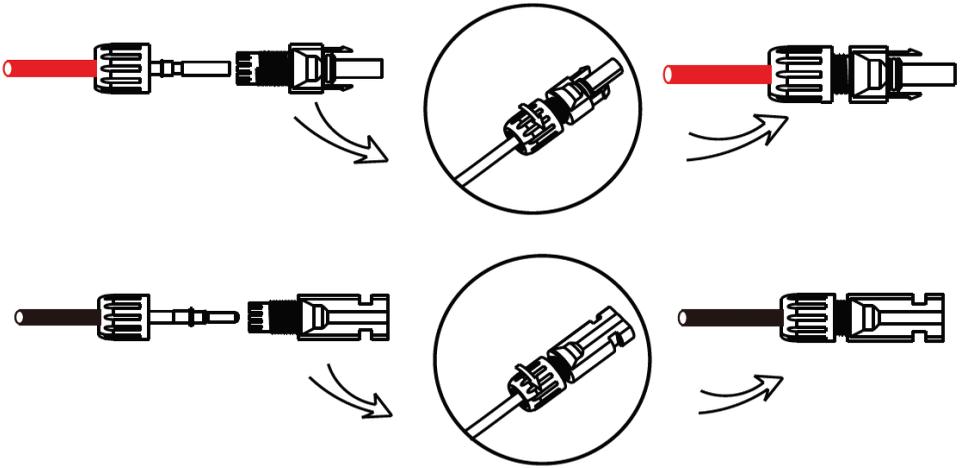
Step 1: Strip all DC cable insulation about 7mm.

Step 2: Use crimping pliers to bundle the cable ends on the terminal.

Step 3: Pass the cable through the cable gland and insert the insulating sleeve until it snaps shut. Pull lightly on the cable to make sure it is securely connected. Tighten the sealing sleeve and insulating sleeve with a force of 2.5~3N·m.

Step 4: Check that the polarities of the cables connecting the PV strings are correct.





**NOTICE**

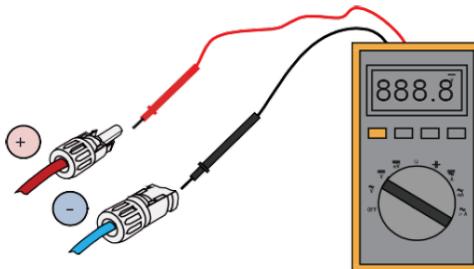
If the PV input polarity is reversed, the inverter will not operate normally.

If the PV connector is not properly assembled, it may cause arcing or overheating in the connector, which will not be covered by the warranty.

**6.6.3 Installing the PV Connector**

Installation steps:

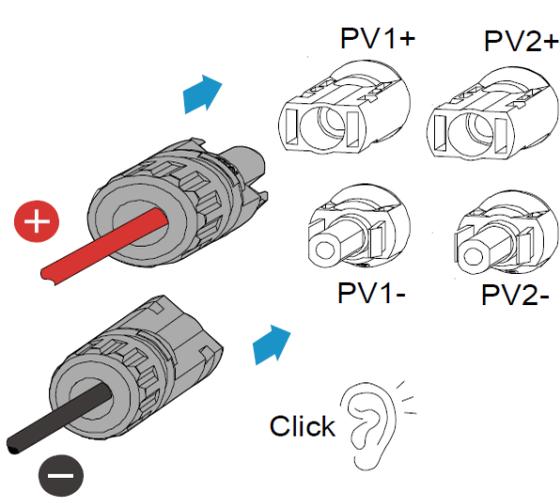
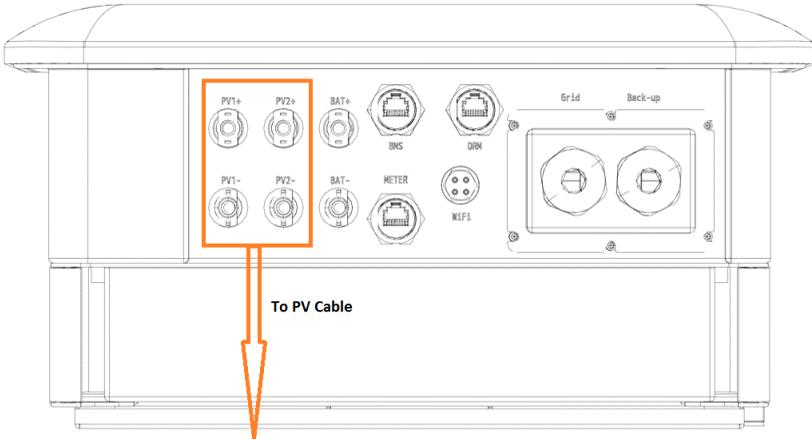
Step 1: Check whether the polarity of the connecting cables of the PV strings is correct, and ensure that the open-circuit voltage does not exceed the upper limit of the inverter input of d.c. 550V under any circumstances.



**NOTICE**

Before connecting the PV connector to the inverter, check the positive and negative polarities of the solar panel, and then insert the PV connector into the corresponding PV terminal after confirmation.

Step 2: Insert the PV connector into the corresponding PV terminal until you hear a "click".



## 6.7 Connecting the Battery Cable

### DANGER

- The battery used with the inverter shall be approved by the inverter manufacturer.
- A short circuit in the battery may cause personal injury. The instantaneous high current caused by a short circuit can release a large amount of energy and may cause a fire.
- Before connecting the battery cable, ensure the inverter and the battery, and Downstream & upstream switches, are all disconnected.
- It is forbidden to connect and disconnect the battery cables when the inverter is running. Otherwise it may cause electric shock.
- Do not connect one battery pack to more than one inverter at the same time. Otherwise, it may cause damage to the inverter.
- It is forbidden to connect loads between the inverter and batteries.
- When connecting battery cables, use insulated tools to prevent accidental electric shock or short circuit to the batteries.
- Ensure that the open circuit voltage of the battery is within the permissible range of the inverter.

### WARNING

- Connect the battery cables to the corresponding terminals such BAT+, BAT- and grounding ports correctly. Otherwise it will cause damage to the inverter.
- Ensure that the whole cable cores are inserted into the terminal holes. No part of the cable core can be exposed.
- Ensure that the cables are connected securely. Otherwise it will cause damage to the inverter due to overheat during its operation.
- An external d.c. circuit breaker is recommended if there is no integrated d.c. circuit breaker inside the battery. Recommended specifications: d.c. 600V,40A

### NOTICE

Because of the battery is inflammable and explosive, the following requirements must be met when connecting the battery.

- Make sure that the battery box is free from bulging, peculiar smell and other special conditions.
- Ensure that the battery voltage does not exceed the upper and lower voltage limits that the battery can withstand under any circumstances.
- Ensure that the battery box is kept away from fire sources.
- Ensure that the battery ports are sealed properly if there is no battery connected.

### 6.7.1 Assembling the cable to the Bat connector

Assemble the DC cables to the in-line Bat connectors that mate with the Bat terminals on the bottom of the inverter.

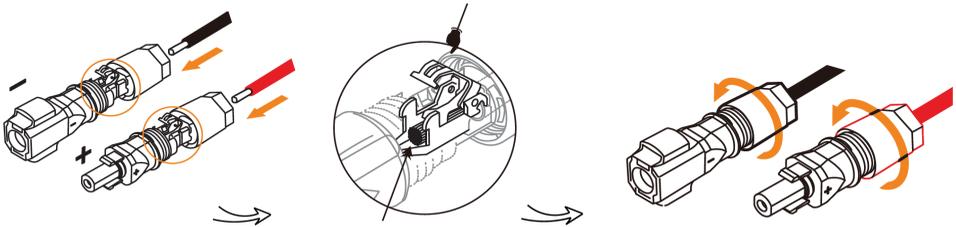
Model	ST-INV-S3.0	ST-INV-S5.0
<b>Battery cable</b>		
Conductor cross-sectional	4-6 mm <sup>2</sup> / 12-10 AWG	4-6 mm <sup>2</sup> / 12-10 AWG
<b>Battery breaker</b>		
Rated voltage	d.c. 600 V	d.c. 600 V
Rated current	d.c. 40 A	d.c. 40 A

Step 1: Strip all DC cable insulation about 7mm, then insert the cable end into the orange part of the terminal in the picture.

Step 2: Depress the spring until you hear a "click". Pull lightly on the cable to make sure it is securely connected.

Step 3: Use a force of 2.5~3N·m to fasten the sealing sleeve and insulating sleeve.

Step 4: Check that the polarity of the battery connection cable is correct



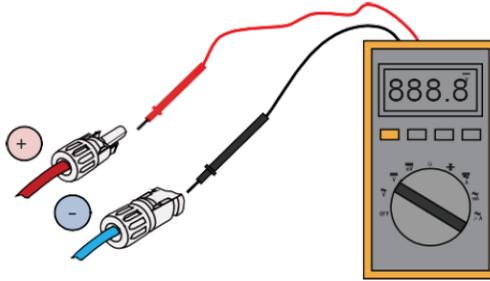
#### NOTICE

If the Bat input polarity is reversed, the inverter will not operate properly. If the Bat connector is not properly assembled; it may cause arcing or overheating of the connector, which will not be covered by the warranty.

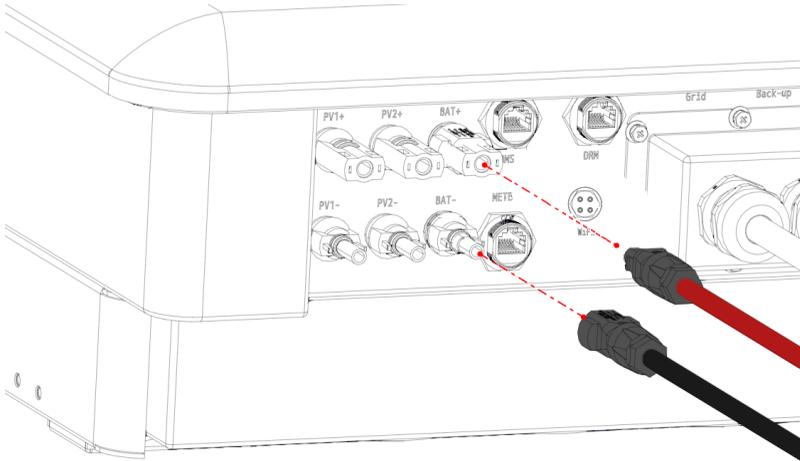
### 6.7.2 Installing the Bat Connector

Step 1: Disconnect the battery circuit breaker.

Step 2: Check whether the polarity of the connecting cable of the battery is correct, and make sure that the open circuit voltage does not exceed the upper limit of the inverter input d.c. 400V under any circumstances.



Step 3: Insert the Bat connector into the corresponding Bat terminal until you hear a "click".



#### NOTICE

Before connecting the Bat connector to the inverter, check the positive and negative polarity of the battery, and then insert the Bat connector into the corresponding Bat terminal after confirmation.

## 6.8 Connecting the AC Cable (grid and backup port)

### WARNING

- Connect the AC cables to the corresponding terminals such as “L”, “N”, and PE correctly. Otherwise it will cause damage to the inverter.
- Ensure that the whole cable cores are inserted into the terminal holes. No part of the cable core can be exposed.
- Ensure that the cables are connected securely. Otherwise it will cause damage to the inverter due to overheat during its operation.
- Do not connect any AC generator to the grid or backup port.
- The Residual Current Monitoring Unit (RCMU) is integrated into the inverter. The inverter will disconnect the utility grid rapidly once it detects any leak current over the permissible range.
- There are integrated relays inside of the inverter’s grid and backup ports. When the inverter is in the off-grid mode, the grid relay is disconnected; while when the inverter is in grid-tied mode, it is connected.
- When the inverter is powered on, the backup port is live. Power off the inverter first if maintenance is required for the loads connected with backup ports. Otherwise, it may cause electric shock.
- The type and rating of external residual current devices (RCD) compatible with inverter (for where an external RCD is required based on local laws and regulations).  
Type A RCD can be connected to the inverter for protection when DC component of the leakage exceeds the limit. Recommended external RCD specifications:  
AC-Grid: Type A RCD 300mA;  
AC-Backup: Type A RCD 30mA.

### NOTICE

- Install one AC circuit breaker for each inverter. Multiple inverters cannot share one AC circuit breaker. Do not connect loads between the inverter and the AC switch directly connected to the inverter.
- An AC circuit breaker shall be installed on the AC side to make sure that the inverter can safely disconnect the grid when an exception happens. Select an appropriate AC circuit breaker in compliance with local laws and regulations.
- For AC cable, the PE conductor shall be longer than N&L conductors, so that once the AC cable slips or taken out, the protecting earth conductor will be the last to take the strain.

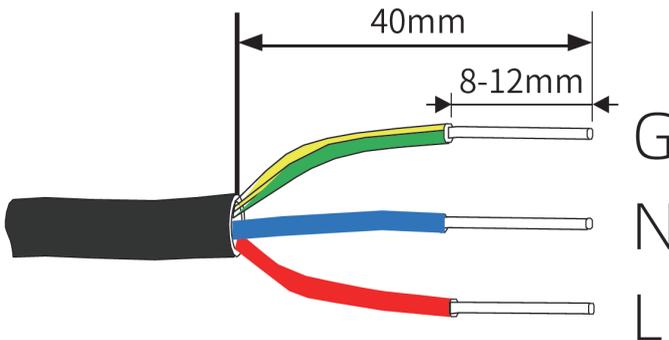
### 6.8.1 Assembling the cable to AC connector

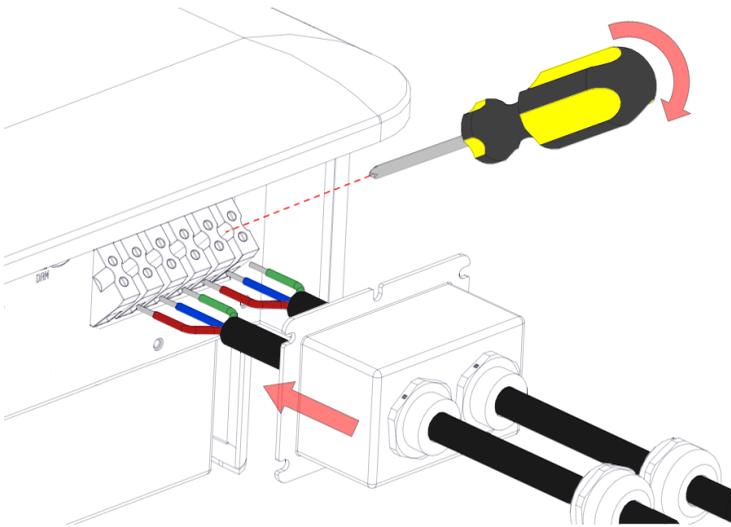
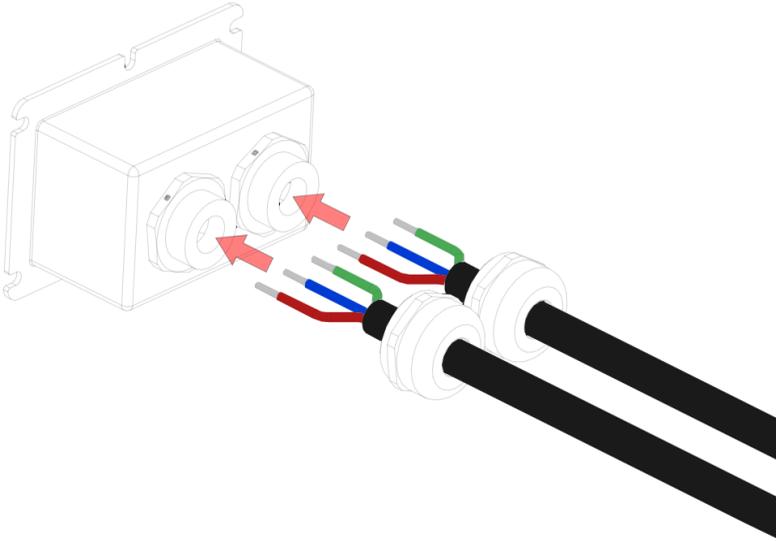
Model	ST-INV-S3.0	ST-INV-S5.0
<b>Grid cable</b>		
Conductor cross-sectional area	4-6 mm <sup>2</sup> / 12-10 AWG	6-10 mm <sup>2</sup> / 8 AWG
<b>Backup cable</b>		
Conductor cross-sectional area	4-6 mm <sup>2</sup> / 12-10 AWG	4-6 mm <sup>2</sup> / 12-10 AWG
<b>Grid breaker</b>		
Rated voltage	a.c. 230 V	a.c. 230 V
Rated current	a.c. 40 A	a.c. 63 A
RCD	Type A 300 mA	Type A 300 mA
<b>Backup breaker</b>		
Rated voltage	a.c. 230 V	a.c. 230 V
Rated current	a.c. 25 A	a.c. 32 A
RCD	Type A 30 mA	Type A 30 mA

Step 1: Strip the cable jacket and core wire insulation.

Step 2: Pass the stripped wires through the AC junction box (including grid and back-up wires)

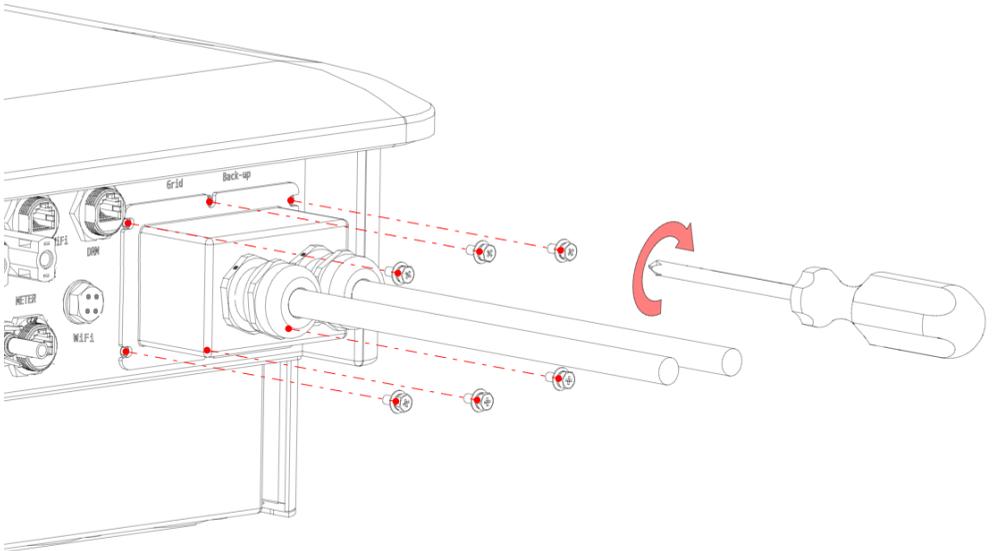
Step 3: Use a screw driver to fasten all the core wires to the corresponding wiring ports on the fence terminals in the order of Grid\_L, Grid\_N, Grid\_G, Backup\_L, Backup\_N, Backup\_G, and pull the cables outward to confirm that connection is firm (Recommended torque: 0.8 N·m).





### 6.8.2 Installing the AC Connector

- Step 1: Disconnect the AC side circuit breaker and prevent it from being accidentally reconnected.
- Step 2: Measure the voltage and frequency of the grid-connected access point to ensure that it meets the grid-connected specifications of the inverter.
- Step 3: Lock the AC junction box to the bottom of the inverter.
- Step 4: Connect the "PE" (earth) core wire at the other end of the AC cable to the ground bar, "L" (live wire) and "N" (neutral) core wire is connected to the AC circuit breaker.
- Step 5: Connect the other end of the AC circuit breaker to the power grid, and check that all cables are securely connected.



## 6.9 Connecting the Communication Cable

### NOTICE

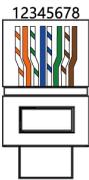
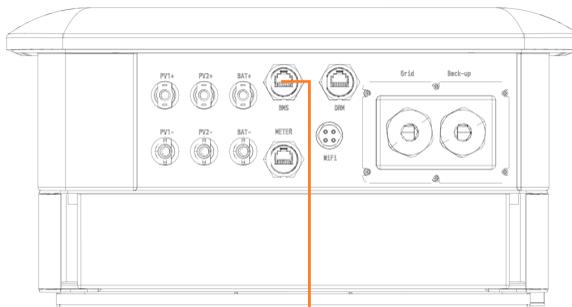
- Make sure that the communication device is connected to the right COM port. Route the communication cable far away from any interference source or power cable to prevent the signal from being influenced.
- DRED is only for Australia and New Zealand, the unit can only support DRM 0.
- The communication cable and third-party DRED device should be prepared by customers.

### 6.9.1 Connecting BMS Cable

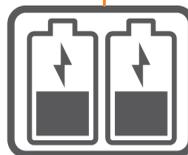
The BMS communication cable between the inverter and the battery system. The BMS protocol is CAN with RJ45 connector.

RJ45 Pin definition:

PIN	Color	INV_BMS	BAT_COM5
4	Blue	CAN_H	CAN_H
5	Blue/White	CAN_L	CAN_L

To battery cable



Battery

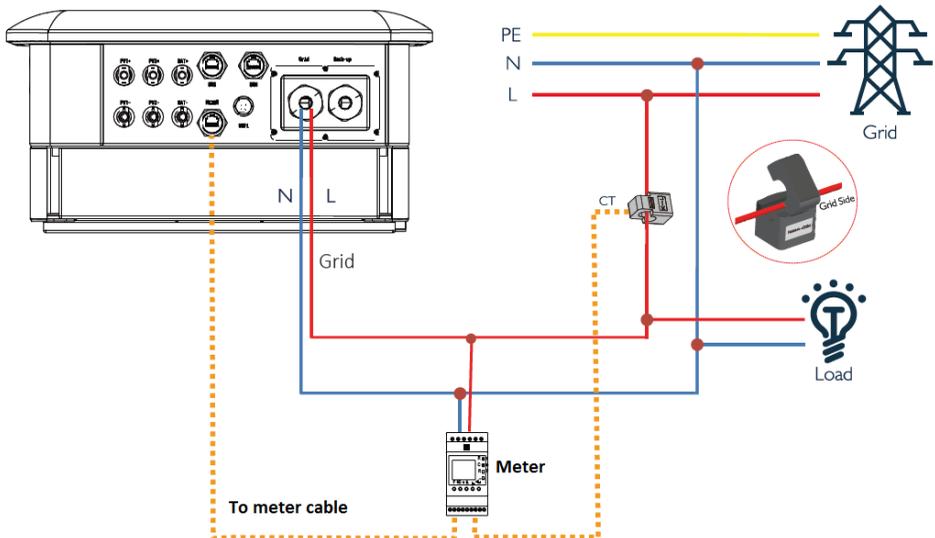
### 6.9.2 Connecting Meter Cable

#### NOTICE

Smart meters must be authorized; any third-party or unauthorized meters may not be compatible with the Inverter.

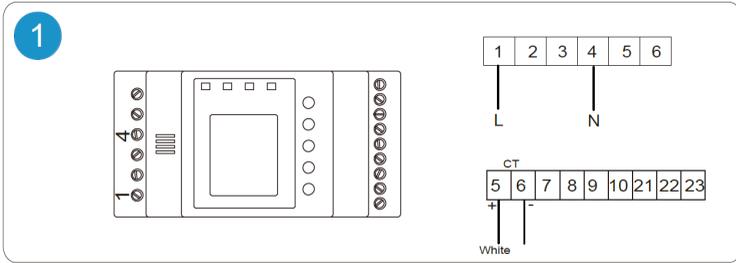
The ST series adopts Acrel's smart meter with CT, which is used to detect the grid voltage, current direction and magnitude, and further indicate the operation status of the grid. The meter must be connected to the inverter when installing the inverter, otherwise the inverter will shut down with a "meter failure" alarm. It is a mandatory product for inverter installation, and communicates with the inverter through RS485. The CT must be installed on the live wire, and make sure that the arrow on the CT points to the grid side.

- Smart Meter and CT are configured correctly, please do not change any settings on Smart Meter.
- One smart meter can only be used for one inverter.
- CT must be connected in the same direction as the indicated CT.

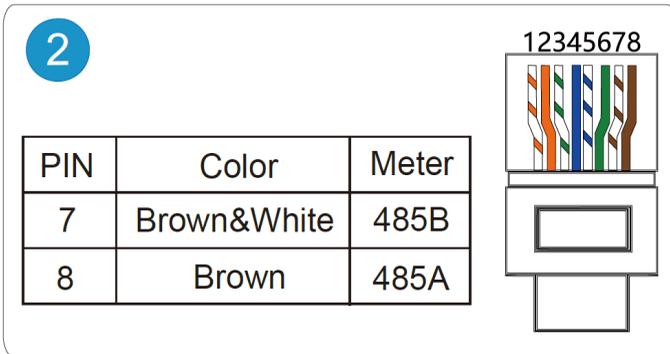


The default CT line is 3m, and the maximum can be extended to 5m. The smart meter communication cable (RJ45) is attached to the inverter ("connect to smart meter" cable), can extend up to 100m and must use a standard RJ45 cable and plug as shown below.

Meter Pin definition:



RJ45 Pin definition:



Smart Meter LED Indication

	OFF	Steady	Flashing
Run (Green)	Not operating	/	Operating normally
Com (Red)	Not communicating	/	Communicating
R_P (Red)	Power is positive	Power is negative	/
- (Red)	/	Negative indicator	/

### 6.9.3 Connecting DRED device for DRM control

#### NOTICE

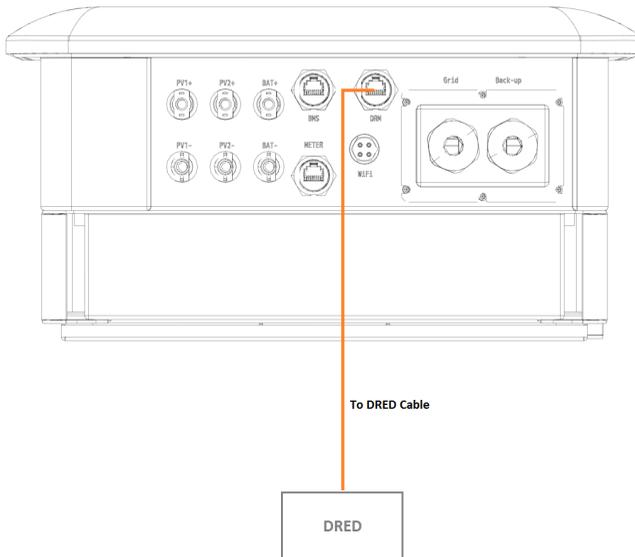
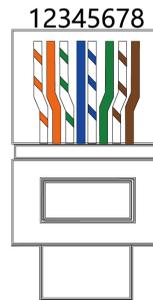
The unit can only support DRM0

Mode	Requirement
DRM 0	Operate the disconnection device

The DRM communication cable (RJ45) is attached to the inverter ("Connect to Peripheral DRED Device" cable), a standard RJ45 cable and plug must be used as shown below:

#### RJ45 socket pin assignment

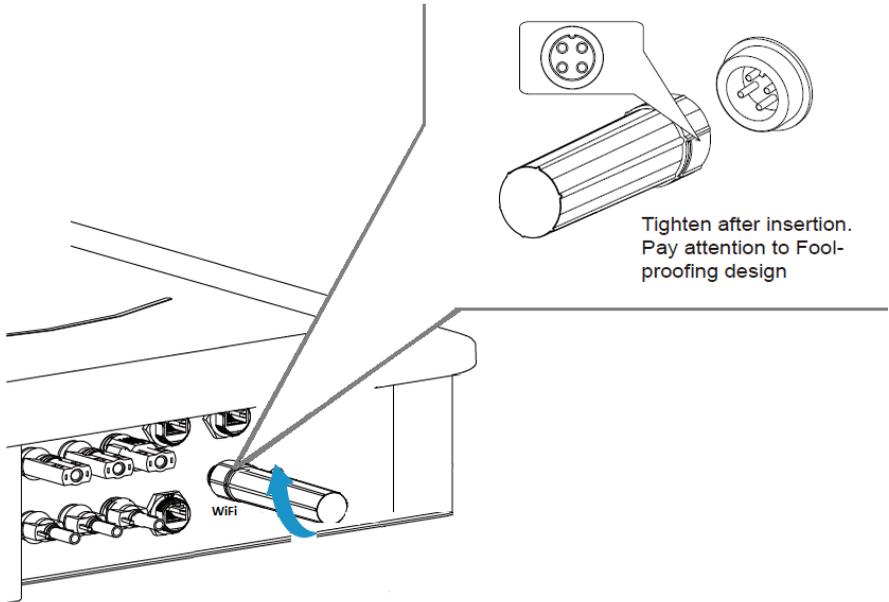
Pin	Assignment for inverters capable of both charging and discharging
1	
2	
3	
4	
5	REF GEN/0
6	COM LOAD/0
7	V+
8	V-



### 6.8.3 Installing the Wi-Fi Module

Plug a Wi-Fi module into the inverter to establish a connection between the inverter and the smartphone or web pages, which allows set inverter parameters, check running information and fault information, and observe system status in time.

For details, see the “PV Pro” App User Manual.



## 7 System Commissioning



Wear personal protective equipment and use dedicated insulated tools to avoid electric shocks or short circuits.

### 7.1 Check Before Power On

No.	Check Item
1	The product is firmly installed at a clean place that is well-ventilated and easy-to operate.
2	The PE, DC input, AC output, and communication cables are connected correctly and securely.
3	Cable ties are intact, routed properly and evenly.
4	Unused cable holes are fitted using the waterproof nuts.
5	The voltage and frequency at the connection point meet the inverter grid connection requirements.

### 7.2 Startup Procedure

**Step 1:** Turn on the battery breaker between the inverter and the battery.

**Step 2:** Turn on the PV breaker of the inverter.

**Step 3:** Turn on the AC breaker on the backup side of the inverter.

**Step 4:** Turn on the AC breaker on the grid side of the inverter.

### 7.3 Shutdown Procedure

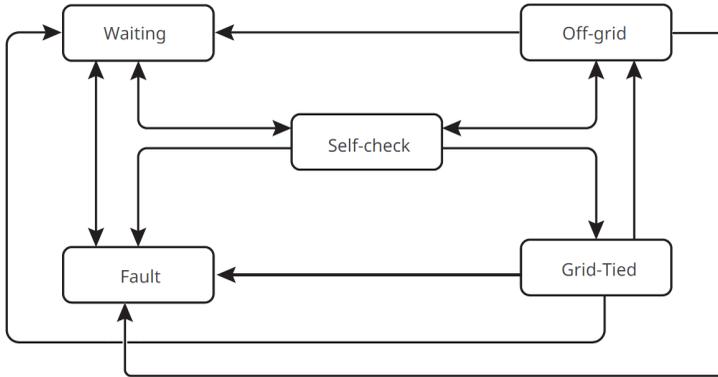
**Step 1:** Turn off the battery breaker between the inverter and the battery.

**Step 2:** Turn off the PV breaker of the inverter.

**Step 3:** Turn off the AC breaker on the backup side of the inverter.

**Step 4:** Turn off the AC breaker on the grid side of the inverter.

## 7.4 System Status



No.	Parts	Description
1	Waiting mode	<p>Waiting stage after the inverter is powered on.</p> <ul style="list-style-type: none"> <li>When the conditions are met, it enters the self-check mode.</li> <li>If there is a fault, the inverter enters the fault mode.</li> </ul>
2	Self-check mode	<p>Before the inverter starts up, it continuously performs self-check, initialization, etc.</p> <ul style="list-style-type: none"> <li>When the conditions are met, it enters the grid-tied mode, and the inverter starts on grid connection.</li> <li>If the grid is not detected, it enters the off-grid mode and the inverter runs off-grid; if the inverter has no off-grid function, it enters the wait mode.</li> <li>If the self-check is not passed, it enters the fault mode.</li> </ul>
3	Grid-tied mode	<p>The inverter is grid-tied successfully.</p> <ul style="list-style-type: none"> <li>If the grid is not detected, it enters the off-grid mode.</li> <li>If a fault is detected, it enters the fault mode.</li> <li>If the conditions do not meet grid-tied requirements and the off-grid output function is not turned on, it enters the wait mode.</li> </ul>
4	Off-grid mode	<p>When the grid is powered off, the inverter switches to the EPS (off-grid) mode and continues to supply power to the load via backup port.</p> <ul style="list-style-type: none"> <li>If a fault is detected, it enters the fault mode.</li> <li>If the conditions do not meet grid-tied requirements and the off-grid output function is not turned on; it enters the wait mode.</li> <li>If the conditions meet grid-tied requirements and the off-grid output function is turned on, it enters the self-check mode.</li> </ul>
5	Fault mode	<p>If a fault is detected, the inverter enters the fault mode. When the fault is cleared, it enters the waiting mode.</p>

## 7.5 LED Indicator Light

The LED indicators are located on the front of the inverter. By observing the flashing color and speed of the indicator light, the user can obtain the current working status of the inverter. Please refer to table for the description of indicator status.

LED Status	Description
No Light	The system is not working.
Blue Light flashing	The system is checking
Blue Light always on	The system is normal running
Red Light always on	The system has a fault occurred.



LED indicator light

## 7.6 Setting Up Remote Monitoring

### NOTICE

Please set the inverter parameters first via “PV Pro” App to ensure its normal operation. If your app has connected the inverter, the device performance can be monitored.

“PV Pro” App is one smart phone application used to communicate with the inverter’s Wi-Fi modules. Setting up internet connections and remote inverter monitoring via “PV Pro” App.

For inverters compliant to AS/NZS 4777.2: 2020 the following information should be available in the “PV Pro” user manual:

- Instructions for how to view inverter firmware version.
- Instructions on how to select/activate country grid code, protection settings, power quality response modes, and region settings as per AS/NZS4777.2: 2020 during inverter commissioning.
- Instructions on how to view country grid code, protection settings, power quality response modes, and region settings after inverter commissioning.
- Instructions on how to set up generation limit and export limit control is available as per AS/NZS 4777.2: 2020.

For more details, refer to “PV Pro” User Manual.



**STL\_PV Pro App  
User Manual EN-**

### NOTICE

AS/NZS 4777.2:2020 requires power quality response modes and grid protection settings to be protected against inadvertent or unauthorized changes.

Once the power quality and grid settings have been selected at commissioning these settings should be locked from editing (unless with Password or special tool).

For Australian customers please select from Australia Region A/B/C to comply with AS/NZS 4777.2:2020. Contact local grid operator to see which Region to select. After setting the safety region, some parameters in the inverter system will take effect according to the corresponding safety regulations, such as PU curve, QU curve, trip protection, etc. For Australian and European users, if you need to change the configuration parameters, please refer to the “PV Pro” user manual.

## 8 Maintenance

### DANGER

- Shutdown the inverter system before maintenance. Otherwise, the inverter may be damaged or electric shocks may occur.
- Delayed discharge. Wait until the components are discharged after power off.

### 8.1 Removing the Inverter

#### WARNING

- Make sure that the inverter is powered off.
- Wear proper PPE before any operations.

Step 1: Disconnect all the cables, including battery cable, PV cable, backup cable, grid cable, communication cable and PE cable.

Step 2: Remove smart meter and CT

Step 3: Remove communication module from the inverter.

Step 4: Remove the inverter from the mounting plate.

Step 5: Remove the mounting plate.

Step 6: Store the inverter properly. If the inverter needs to be used later, ensure that the storage conditions meet the requirements.

### 8.2 Disposing of the Inverter

If the inverter cannot work anymore, dispose of it according to the local disposal requirements for electrical equipment waste. The inverter cannot be disposed of together with household waste.

### 8.3 Troubleshooting

Perform troubleshooting according to the following methods. Contact the after-sales service if these methods do not work.

Collect the information below before contacting the after-sales service, so that the problems can be solved quickly.

1. Inverter information likes serial number, software version, installation date, installation location, failure warning, etc.
2. Installation environment, including weather conditions, whether the PV modules are sheltered or shadowed, etc. It is recommended to provide some photos and videos to assist in analyzing the problem.
3. Utility grid situation.

No.	Fault	Cause	Solutions
1	Utility Loss	1. Utility grid power fails. 2. The AC cable is disconnected, or the AC breaker is off.	1. The alarm is automatically cleared after the grid power supply is restored. 2. Check whether the AC cable is connected and the AC breaker is on.
2	Grid Overvoltage	The grid voltage exceeds the permissible range, or the duration of high voltage exceeds the requirement of HVRT.	1. If the problem occurs occasionally, the utility grid may be abnormal temporarily. The inverter will recover automatically after detecting that the utility grid is normal. 2. If the problem occurs frequently, check whether the grid voltage is within the permissible range. <ul style="list-style-type: none"> <li>• Contact the local power company if the grid voltage exceeds the permissible range.</li> <li>• Modify the overvoltage protection threshold, HVRT or disable the overvoltage protection function after obtaining the consent of the local power company if the grid frequency is within the permissible range.</li> </ul> 3. Check whether the AC breaker and the output cables are connected securely and correctly if the problem persists.
3	Grid Rapid Overvoltage	The grid voltage is abnormal or ultra-high.	1. If the problem occurs occasionally, the utility grid may be abnormal temporarily. The inverter will recover automatically after detecting that the utility grid is normal. 2. If the problem occurs frequently, check whether the grid voltage is within the permissible range. <ul style="list-style-type: none"> <li>• Contact the local power company if the grid voltage exceeds the permissible range.</li> <li>• Modify the grid overvoltage rapid protection threshold after obtaining the consent of the local power company if the grid voltage is within the permissible range.</li> </ul>

No.	Fault	Cause	Solutions
4	Grid Under-voltage	The grid voltage is lower than the permissible range, or the duration of low voltage exceeds the requirement of LVRT.	<ol style="list-style-type: none"> <li>1. If the problem occurs occasionally, the utility grid may be abnormal temporarily. The inverter will recover automatically after detecting that the utility grid is normal.</li> <li>2. If the problem occurs frequently, check whether the grid voltage is within the permissible range. <ul style="list-style-type: none"> <li>• Contact the local power company if the grid voltage exceeds the permissible range.</li> <li>• Modify the under-voltage protection threshold, LVRT or disable the under-voltage protection function after obtaining the consent of the local power company if the grid frequency is within the permissible range.</li> </ul> </li> <li>3. Check whether the AC breaker and the output cables are connected securely and correctly if the problem persists.</li> </ol>
5	Grid 10min Over-voltage	The moving average of grid voltage in 10min exceeds the range of safety requirements.	<ol style="list-style-type: none"> <li>1. If the problem occurs occasionally, the utility grid may be abnormal temporarily. The inverter will recover automatically after detecting that the utility grid is normal.</li> <li>2. If the problem occurs frequently, check whether the grid voltage is within the permissible range. <ul style="list-style-type: none"> <li>• Contact the local power company if the grid voltage exceeds the permissible range.</li> <li>• Modify the grid overvoltage rapid protection threshold after obtaining the consent of the local power company if the grid voltage is within the permissible range.</li> </ul> </li> </ol>

No.	Fault	Cause	Solutions
6	Grid Over-frequency	Utility grid exception. The actual grid frequency exceeds the requirement of the local grid standard.	<ol style="list-style-type: none"> <li>If the problem occurs occasionally, the utility grid may be abnormal temporarily. The inverter will recover automatically after detecting that the utility grid is normal.</li> <li>If the problem occurs frequently, check whether the grid frequency is within the permissible range.                             <ul style="list-style-type: none"> <li>Contact the local power company if the grid frequency exceeds the permissible range.</li> <li>Modify the over-frequency protection threshold or disable the over-frequency protection function after obtaining the consent of the local power company if the grid frequency is within the permissible range.</li> </ul> </li> </ol>
7	Anti-islanding	The utility grid is disconnected. The utility grid is disconnected according to the safety regulations, but the grid voltage is maintained due to the loads.	<ol style="list-style-type: none"> <li>Check whether the utility grid is disconnected.</li> </ol> Contact the dealer or the after-sales service.
8	Grid Under-frequency	Utility grid exception. The actual grid frequency is lower than the requirement of the local grid standard.	<ol style="list-style-type: none"> <li>If the problem occurs occasionally, the utility grid may be abnormal temporarily. The inverter will recover automatically after detecting that the utility grid is normal.</li> <li>If the problem occurs frequently, check whether the grid frequency is within the permissible range.                             <ul style="list-style-type: none"> <li>Contact the local power company if the grid frequency exceeds the permissible range.</li> <li>Modify the under-frequency protection threshold or disable the under-frequency protection function after obtaining the consent of the local power company if the grid frequency is within the permissible range.</li> </ul> </li> </ol>

No.	Fault	Cause	Solutions
9	Grid Frequency Instability	Utility grid exception. The actual grid frequency change rate does not meet the requirement of the local grid standard.	<ol style="list-style-type: none"> <li>1. If the problem occurs occasionally, the utility grid may be abnormal temporarily. The inverter will recover automatically after detecting that the utility grid is normal.</li> <li>2. If the problem occurs frequently, check whether the grid frequency is within the permissible range. <ul style="list-style-type: none"> <li>• Contact the local power company if the grid frequency exceeds the permissible range.</li> <li>• Contact the dealer or the after-sales service if the grid frequency is within the permissible range.</li> </ul> </li> </ol>
10	LVRT Under-voltage	Utility grid exception. The duration of the utility grid exception exceeds the set time of LVRT.	<ol style="list-style-type: none"> <li>1. If the problem occurs occasionally, the utility grid may be abnormal temporarily. The inverter will recover automatically after detecting that the utility grid is normal.</li> </ol>
11	HVRT Overvoltage	Utility grid exception. The duration of utility grid exception exceeds the set time of HVRT.	<ol style="list-style-type: none"> <li>2. If the problem occurs frequently, check whether the grid frequency is within the permissible range. If not, contact the local power company. If yes, contact the dealer or the after-sales service.</li> </ol>

No.	Fault	Cause	Solutions
12	Abnormal GFCI 30mA	The input insulation impedance becomes low when the inverter is working.	<ol style="list-style-type: none"> <li>1. If the problem occurs occasionally, it may be caused by a cable exception. The inverter will recover automatically after the problem is solved.</li> <li>2. Check whether the impedance between the PV string and PE is too low if the problem occurs frequently or persists.</li> </ol>
13	Abnormal GFCI 60mA		
14	Abnormal GFCI 150mA		
15	Abnormal GFCI		
16	DC current injection failure	The DC component of the output current exceeds the safety range or default range.	<ol style="list-style-type: none"> <li>1. If the problem is caused by an external fault like a utility grid exception or frequency exception, the inverter will recover automatically after solving the problem.</li> <li>2. If the problem occurs frequently and the PV station cannot work properly, contact the dealer or the after-sales service.</li> </ol>
17	Low Insulation Res.	<ol style="list-style-type: none"> <li>1. The PV string is short-circuited to PE.</li> <li>2. The PV system is in a moist environment and the cable is not well insulated to the ground.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check whether the resistance of the PV string to PE exceeds 50kΩ. If no, check the short circuit point.</li> <li>2. Check whether the PE cable is connected correctly.</li> <li>3. If the resistance is lower on rainy days, please reset the ISO.</li> </ol>
18	Abnormal Ground	<ol style="list-style-type: none"> <li>1. The PE cable of the inverter is not connected well.</li> <li>2. The L cable and N cable are connected reversely when output of the PV string is grounded.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check whether the PE cable of the inverter is connected properly.</li> </ol> <p>Check whether the L cable and N cable are connected reversely if output of the PV string is grounded.</p>
19	Anti-Reverse power failure	Abnormal fluctuation of load	<ol style="list-style-type: none"> <li>1. If the exception is caused by an external fault, the inverter will recover automatically after solving the problem.</li> <li>2. If the problem occurs frequently and the PV station cannot work properly, contact the dealer or the after-sales service.</li> </ol>

No.	Fault	Cause	Solutions
20	Internal Comm Loss	<ol style="list-style-type: none"> <li>1. Frame format error</li> <li>2. Parity checking error</li> <li>3. Can bus offline</li> <li>4. Hardware CRC error</li> <li>5. Send (receive) control bit is receive (send).</li> <li>6. Transmit to the unit that is not allowed.</li> </ol>	<p>Disconnect the AC output switch and DC input switch, then connect them 5 minutes later. Contact the dealer or the after-sales service if the problem persists.</p>
21	AC HCT Check abnormal	The sampling of the ACHCT is abnormal.	<p>Disconnect the AC output switch and DC input switch, then connect them 5 minutes later. Contact the dealer or the after-sales service if the problem persists.</p>
22	GFCI HCT Check abnormal	The sampling of the GFCIHCT is abnormal.	<p>Disconnect the AC output switch and DC input switch, then connect them 5 minutes later. Contact the dealer or the after-sales service if the problem persists.</p>
23	Relay Check abnormal	<ol style="list-style-type: none"> <li>1. The relay is abnormal or short-circuited.</li> <li>2. The control circuit is abnormal.</li> </ol> <p>The AC cable connection is abnormal, like a virtual connection or short circuit.</p>	<p>Disconnect the AC output switch and DC input switch, then connect them 5 minutes later. Contact the dealer or the after-sales service if the problem persists.</p>
24	Flash Fault	The internal Flash storage is abnormal.	<p>Disconnect the AC output switch and DC input switch, then connect them 5 minutes later. Contact the dealer or the after-sales service if the problem persists.</p>
25	DC Arc Fault	<ol style="list-style-type: none"> <li>1. The DC terminal is not firmly connected.</li> <li>2. The DC cable is broken.</li> </ol>	<p>Read the Quick Installation Guide and check whether the cables are connected properly.</p>

No.	Fault	Cause	Solutions
26	AFCI Self-test Fault	AFCI detection is abnormal.	Disconnect the AC output switch and DC input switch, then connect them 5 minutes later. Contact the dealer or the after-sales service if the problem persists.
27	Cavity Over temperature	<ol style="list-style-type: none"> <li>1. The inverter is installed in a place with poor ventilation.</li> <li>2. The ambient temperature exceeds 60°C.</li> <li>3. A fault occurs in the internal fan of the inverter.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the ventilation and the ambient temperature at the installation point.</li> <li>2. If the ventilation is poor or the ambient temperature is too high, improve the ventilation and heat dissipation.</li> <li>3. Contact the dealer or after-sales service if both the ventilation and the ambient temperature are normal.</li> </ol>
28	BUS Overvoltage	<ol style="list-style-type: none"> <li>1. The PV voltage is too high.</li> <li>2. The sampling of the inverter BUS voltage is abnormal.</li> </ol>	Disconnect the AC output switch and DC input switch, then connect them 5 minutes later. Contact the dealer or the after-sales service if the problem persists.
29	PV Input Overvoltage	The PV array configuration is not correct. Too many PV panels are connected in series in the PV string.	Check the serial connection of the PV array. Make sure that the open circuit voltage of the PV string is not higher than the maximum operating voltage of the inverter.
30	PV Continuous Hardware Overcurrent	<ol style="list-style-type: none"> <li>1. The PV configuration is not proper.</li> <li>2. The hardware is damaged.</li> </ol>	Disconnect the AC output switch and DC input switch, then connect them 5 minutes later. Contact the dealer or the after-sales service if the problem persists.
31	PV Continuous Software Overcurrent	<ol style="list-style-type: none"> <li>1. The PV configuration is not proper.</li> <li>2. The hardware is damaged.</li> </ol>	Disconnect the AC output switch and DC input switch, then connect them 5 minutes later. Contact the dealer or the after-sales service if the problem persists.
32	String1 PV String Reversed	The PV string is connected reversely.	Check whether the PV strings are connected reversely.
	String2 PV String Reversed		

## 8.4 Routine Maintenance



### WARNING

- Make sure that the inverter is powered off.
- Wear proper PPE before any operations.

Maintaining Item	Maintaining Method	Maintaining Period
System Clean	Check the heat sink, air intake, and air outlet for foreign matter or dust.	Once 6-12 months
Electrical Connection	Check whether the cables are securely connected. Check whether the cables are broken or whether there is any exposed copper core.	Once 6-12 months
Sealing	Check whether all the terminals and ports are properly sealed. Reseal the cable hole if it is not sealed or too big.	Once a year

## 9 Appendix

### 9.1 Technical Data

Model	ST-INV-S3.0	ST-INV-S5.0
<b>PV input:</b>		
Maximum input voltage	d.c. 550 V	d.c. 550 V
Minimum operating voltage	d.c. 70 V	d.c. 70 V
Start-up input voltage	d.c. 100 V	d.c. 100 V
Rated input voltage	d.c. 360 V	d.c. 360 V
MPP voltage range	d.c. 125...530 V	d.c. 125...530 V
Number of independent MPP inputs	2	2
Strings per MPP input	A:1, B:1	A:1, B:1
Maximum input current (input A / input B)	d.c. 11 A / 11 A	d.c. 11 A / 11 A
Maximum short-circuit current (input A / input B)	d.c. 13.8 A / 13.8 A	d.c. 13.8 A / 13.8 A
Maximum input power	4000 W	6000 W
Maximum inverter backfeed current to the array	0 A	0 A
<b>Battery:</b>		
Battery type	Lithium	Lithium
Battery voltage range	d.c. 85...400 V	d.c. 85...400 V
Maximum charge / discharge current	d.c. 25 A	d.c. 25 A
<b>Grid output:</b>		
Grid connection type	Single-phase	Single-phase
Nominal voltage	a.c. 230 V	a.c. 230 V
Nominal frequency	50 Hz / 60 Hz	50 Hz / 60 Hz
Rated output current	a.c. 13.1 A	a.c. 21.7 A
Maximum continuous current	a.c. 13.1 A	a.c. 21.7 A
Inrush current (peak and duration)	a.c. 30 A, 500 $\mu$ s	a.c. 45 A, 500 $\mu$ s
Rated output power	3000 W	4991 W
Maximum apparent power	3000 VA	4991 VA
Rated apparent power	3000 VA	4991 VA
Power factor range	0.8leading...0.8lagging	0.8leading...0.8lagging
Maximum output fault current (peak and duration)	a.c. 50 A, 5 $\mu$ s	a.c. 63 A, 5 $\mu$ s
Maximum output overcurrent protection	a.c. 25 A	a.c. 40 A
Maximum total harmonic distortion	< 3%	< 3%
<b>Grid input:</b>		
Nominal voltage	a.c. 230 V	a.c. 230 V
Nominal frequency	50 Hz / 60 Hz	50 Hz / 60 Hz
Rated input current	a.c. 25 A	a.c. 40 A

Maximum continuous current	a.c. 25 A	a.c. 40 A
Inrush current (peak and duration)	a.c. 45 A, 500 $\mu$ s	a.c. 60 A, 500 $\mu$ s
Rated apparent power	5750 VA	9200 VA
Maximum apparent power	5750 VA	9200 VA
Power factor range	0.8leading...0.8lagging	0.8leading...0.8lagging
<b>Backup output:</b>		
Nominal voltage	a.c. 230 V	a.c. 230 V
Nominal frequency	50 Hz / 60 Hz	50 Hz / 60 Hz
Rated current	a.c. 12.6 A	a.c. 20 A
Maximum continuous current	a.c. 12.6 A	a.c. 20 A
Inrush current (peak and duration)	a.c. 35 A, 200 $\mu$ s	a.c. 60 A, 200 $\mu$ s
Rated apparent power	2900 VA	4600 VA
Maximum apparent power	2900 VA	4600 VA
Maximum output fault current (peak and duration)	40 A, 5 $\mu$ s	63 A, 5 $\mu$ s
Maximum output overcurrent protection	25 A	40 A
Output THDv (@Linear Load)	< 3%	< 3%
<b>Efficiency:</b>		
Maximum efficiency	97.6%	
European weighted efficiency	97.2%	
MPPT efficiency	99.9%	
Maximum battery charge efficiency	98.2%	
Maximum battery discharge efficiency	96.8%	
<b>Decisive voltage classification:</b>		
PV port	DVC-C	
Battery port	DVC-C	
Grid port	DVC-C	
Backup port	DVC-C	
Communication port	DVC-A	
<b>Protection:</b>		
DC reverse polarity protection	Supported	
Insulation resistance detection	Supported	
Residual current monitoring	Supported	
Anti-islanding protection	Supported	
AC overcurrent protection	Supported	
AC short-circuit protection	Supported	
AC overvoltage protection	Supported	
Over temperature protection	Supported	
DC surge protection	Supported	

AC surge protection	Supported
Over load protection	Supported
<b>Communications:</b>	
Interface	Meter, BMS, Wi-Fi, DRM
Meter protocol	RS485
BMS protocol	CAN
Display	LED indicators; WLAN+App
Demand response mode	DRM 0
<b>General Data:</b>	
Protective class	I
Overvoltage category	DC II, AC III
Ingress protection	IP65
Operating temperature range	-25...+60 °C
Relative humidity range	0...100 %
Maximum operating altitude	2000 m
Pollution degree	PD3
Dimensions (W×H×D)	411×505×195 mm
Weight	18.6 kg
Mounting method	Wall-mounting bracket
Cooling method	Natural convection
Night-time power loss	< 10 W
Inverter topology	Non-isolated
Active anti-islanding method	Frequency shift
Country of manufacture	China
Warranty	7 years
<b>Standard compliance:</b>	
Safety	IEC 62109-1, IEC 62109-2
Grid connection standards	VDE-AR-N 4105, CEI 0-21, AS/NZS 4777.2, G98/99, UNE 217001, UNE 217002, NTS, RD 647,413,1699, EN50549-1, NL, C10/11...

## 9.2 Grid Code

Region	Country	ST-INV-S3.0	ST-INV-S5.0
VDE-AR-N 4105	Germany	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
CEI 0-21	Italy	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Australia A-AS4777	Australia	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Australia B-AS4777	Australia	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Australia C-AS4777	Australia	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
New Zealand-NZS4777	New Zealand	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
G98	United Kingdom	<input checked="" type="checkbox"/>	<input type="checkbox"/>
G99	United Kingdom	<input type="checkbox"/>	<input checked="" type="checkbox"/>
EN50549-1	European	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
EN50549-NL	the Netherlands	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
EN50549-CZ	Czech Republic	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
EN50549-PL	Poland	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
EN50549-SE	Sweden	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
EN50549-NO	Norway	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
EN50549-DK	Denmark	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
EN50549-TUR	Turkey	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
EN50549-GR	Greece	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
EN50549-IE	Ireland	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
EN50549-LUX	Luxembourg	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
EN50549-PT	Portugal	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
EN50549-RO	Romania	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
EN50549-SK	Slovakia	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
C10/11	Belgium	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
UNE 217001, UNE 217002, NTS, RD 647,413,1699	Spain	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

### 9.3 Quality Assurance

When product faults occur during the warranty period, STEALTH ENERGY will provide free service or replace the product with a new one.

#### Evidence

During the warranty period, the customer shall provide the product purchase invoice and date. In addition, the trademark on the product shall be undamaged and legible. Otherwise, STEALTH ENERGY has the right to refuse to honor the quality guarantee.

#### Conditions

- After replacement, unqualified products shall be processed by STEALTH ENERGY.
- The customer shall give STEALTH ENERGY a reasonable period to repair the faulty device.

#### Exclusion of Liability

In the following circumstances, STEALTH ENERGY has the right to refuse to honor the quality guarantee:

- The free warranty period for the whole machine/components has expired.
- The device is damaged during transport.
- The device is incorrectly installed, refitted, or used.
- The device operates in harsh conditions beyond those described in this manual.
- The fault or damage is caused by installation, repairs, modification, or disassembly performed by a service provider or personnel not from STEALTH ENERGY.
- The fault or damage is caused by the use of non-standard or non-STEALTH ENERGY components or software.
- The installation and use range are beyond stipulations of relevant international standards.
- The damage is caused by unexpected natural factors.

For faulty products in any of above cases, if the customer requests maintenance, paid maintenance service may be provided based on the judgment of STEALTH ENERGY.

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**Suzhou Stealth Energy Technology Co., Ltd.**

Add: 8F, Zhenghe Mansion No.198, Jinfeng  
Road New District 215000 Suzhou, China  
Email: [services@stealthenergy.cn](mailto:services@stealthenergy.cn)  
Website: [www.stealthenergy.cn](http://www.stealthenergy.cn)