SOFAR

USER MANUAL

ESI-8-12K-S1



Shenzhen SOFARSOLAR Co.,Ltd.

Shenzhen SOFARSOLAR Co., Ltd.

2801, Block A, Kechuang Mansion, 526 Chuangye 2nd Road,

Xin'an, Bao'an District, Shenzhen, China.

Email: service@SOFAR.com

Web: www.sofarsolar.com

Sofarsolar AUSCO Pty Ltd.

Website: au.sofarsolar.com

Tel: +61 1300 176 327

E-mail: service@sofarsolar.com.au

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1 About this manual

This installation and user manual (hereinafter referred to as the manual) describes the installation, electrical connection, commissioning, maintenance and fault elimination procedures of the following products:
ESI-8K-S1, ESI-9.99K-S1-A, ESI-10K-S1 and ESI-12K-S1

- Carefully read this manual before use!
- Treat this manual as an integral part of the device.
- Keep this manual in close proximity to the device, including when it is handed over to another user or moved to a different location.

This manual contains important safety information on installation, operation and maintenance of the device.

- Read and observe all safety information provided.

The products, services or features you purchased shall be subject to the company's commercial contracts and terms. All or part of the products and services described in this document may not be within the scope of your purchase. Unless there are any additional terms and conditions in your contract, the company does not make any statement or guarantee on the contents of this document.

1.1 Copyright declaration

The copyright of this manual is owned by SOFAR. It may not be copied either partially or completely by companies or individuals (including software etc.) and must not be reproduced or distributed in any form or by any means.
SOFAR reserves the right of final interpretation. This manual may be amended based on customer feedback.
Consult our website at https://www.SOFAR.com for the latest version.

1.2 Presentation of warnings

This manual contains information on safe operation and uses symbols to ensure the safety of persons and property as well as the efficient operation of the inverter.

- Read through the following symbol explanations carefully in order to prevent injury and property damage.

1.2.1 Warning symbol

	The general danger symbol warns of the risk of serious injury when used with the signal words CAUTION, WARNING and DANGER.

1.2.2 Signal words

DANGER	Indicates a hazardous situation which, if not avoided, will result in death or serious injury.
WARNING	Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
CAUTION	Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
NOTICE	Indicates a hazard that may cause damage to or even destruction of the inverter, or provides some product usage tips to improve efficiency.

1.2.3 Sectional warnings

Sectional warnings refer to a complete section and are structured as follows:

⚠ WARNING

Type and source of danger

Consequences of non-observance

- Avoiding the danger

1.3 Presentation of action instructions

This table shows the sequence of action steps:

Symbol	Function
✓	This describes an action requirement
1. 2. 3.	This is the sequence of action steps that must be followed step by step
▸	This is a single action step
↳	This describes the result of the action

2 Basic safety information



This chapter details the safety information pertaining to the installation and operation of the device.

If you have any questions or problems after reading the following information, please contact SOFAR.

2.1 Safety information

Read and understand the instructions within this manual and familiarise yourself with the relevant safety symbols in this chapter before beginning with the installation of the device and eliminating any faults.

Before connecting to the power grid, you must obtain official authorisation from the local power grid operator in accordance with the corresponding national and state requirements. Furthermore, operation may only be carried out by qualified electricians.

Please contact the nearest authorised service centre if any maintenance or repairs are required. Please contact your dealer to obtain information about your nearest authorised service centre. Do NOT carry out repairs on the device yourself; this may lead to injury or property damage.

Before installing the device or carrying out maintenance on it, you must turn the DC switch to **OFF** in order to interrupt the DC voltage of the PV generator. You can also switch off the DC voltage by opening the DC switch in the PV combiner box. Not doing this may result in serious injury.

2.1.1 Qualified personnel

Personnel tasked with the operation and maintenance of the device must have the qualifications, competence and experience required to perform the described tasks, while also being capable of fully understanding all instructions contained within the manual. For safety reasons, this inverter may only be installed by a qualified electrician who:

- has received training on occupational safety as well as the installation and commissioning of electrical systems.
- is familiar with the local laws, standards and regulations of the grid operator.

SOFAR assumes no responsibility for the destruction of property or any injuries to personnel caused by improper usage.

2.1.2 Installation requirements

Please install the inverter according to the information contained in the following section. Mount the inverter to a suitable object with a sufficient load-bearing capacity (e.g. walls, PV frames etc.) and ensure that the inverter is upright. Choose a suitable place for the installation of electrical devices. Ensure that there is sufficient space for an emergency exit which is suitable for maintenance. Ensure sufficient ventilation in order to guarantee air circulation for the cooling of the inverter.

2.1.3 Transport requirements

The factory packaging is specifically designed to prevent transport damage, i.e. from violent shocks, moisture and vibrations. The device must not be installed if it is visibly damaged; however, please notify the responsible transport company immediately in this case.

2.1.4 Storage requirements

- The storage environment must be clean and dry.
- The storage environment requirements are as follows:

  Ambient temperature: -40℃~70℃

  Relative humidity: 5%~95%, no condensation.

- The storage environment must be well-ventilated. The air must not contain flammable, explosive, and corrosive matters.
- Do not tilt or invert the outer package. When stacking, place the equipment carefully to avoid personal injury or equipment damage. The height and direction of the stacking equipment should follow the instructions
- When restarting the equipment which has been out of service for a long period of time (more than one year), the equipment shall be thoroughly inspected.

2.1.5 Labelling on the device

The labels must NOT be concealed by items or foreign objects (rags, boxes, devices etc.); they must be regularly cleaned and kept clearly visible at all times.

2.1.6 Electrical connection

Observe all applicable electrical regulations when working with the solar inverter.

⚠ DANGER

Dangerous DC voltage

- Before establishing the electrical connection, cover the PV modules using opaque material or disconnect the PV modules from the inverter. Solar radiation will cause dangerous voltage to be generated by the PV modules!

⚠ DANGER

Danger of electric shock!

- All installations and electrical connections must only be carried out by trained electricians!

NOTICE

Authorisation for grid feed-in

- Obtain authorisation from the local power grid operator before connecting the inverter to the public power grid.
- Do not open the inverter or remove any of the labels. Otherwise, SOFAR shall assume no guarantee.

2.1.7 Operation

⚠ DANGER

Electric shock

- Contact with the electrical grid or the device's terminals may result in an electric shock or fire!
- Do not touch terminals or conductors which are connected to the electrical grid.
- Follow all instructions and observe all safety documents that refer to the grid connection.

⚠ CAUTION

Burns caused by hot housing

- While the inverter is being operated, several internal components become very hot.
- Please wear protective gloves!
- Keep children away from the device!

2.1.8 Repair and maintenance

⚠ DANGER

Dangerous voltage!

- Before carrying out any repair work, first switch off the AC circuit breaker between the inverter and power grid and then switch off the DC switch.

- After switching off the AC circuit breaker and the DC switch, wait a minimum of 15 minutes before starting any maintenance or repair work.

NOTICE

Unauthorised repairs!

- Following the elimination of any faults, the inverter should be fully functional once more. Should any repairs be required, please contact a local authorised service centre.
- The internal components of the inverter must NOT be opened without the relevant authorisation. Shenzhen SOFAR Co., Ltd. assumes no responsibility for any resulting losses or defects.

2.2 Symbols and signs

⚠ WARNING

Damage due to overvoltage

- Ensure that the input voltage does not exceed the maximum permissible voltage. Overvoltage may cause long-term damage to the inverter as well as other damage that is not covered by the warranty!

⚠ CAUTION

Beware of burn hazards due to the hot housing!

- While the inverter is in operation, only touch the display and the buttons, as the housing can become hot.

NOTICE

Implement earthing!

- For reasons of personal safety, we recommend that all PV module frames and inverters of the PV system are reliably earthed.

2.2.1 Symbols on the inverter

Several symbols pertaining to safety can be found on the inverter. Please read and understand the content of these symbols before starting the installation.

Symbol	Description
	Residual voltage is present in the inverter! Before opening the inverter, you should wait fifteen minutes to ensure that the capacitor has been fully discharged.
	Caution! Danger of electric shock
	Caution! Hot surface
	The product is compliant with EU guidelines.
	Earthing point
	Please read the manual before installing the inverter.
	Device degree of protection according to EN 60529
	Positive and negative poles of the DC input voltage
	Items must be stored in a clean and dry place away from moisture and weather.
	The inverter must always be transported and stored with the arrows pointing upward.
	The cartons are packed with fragile goods and should be handled with care.
	A maximum of six layers can be stacked during the stacking process.

Symbol	Description
	The material can be recycled and reused.
	Do not dispose of the equipment with household garbage at its end of life. Dispose of it according to local laws and regulations or send it back to the manufacturer.

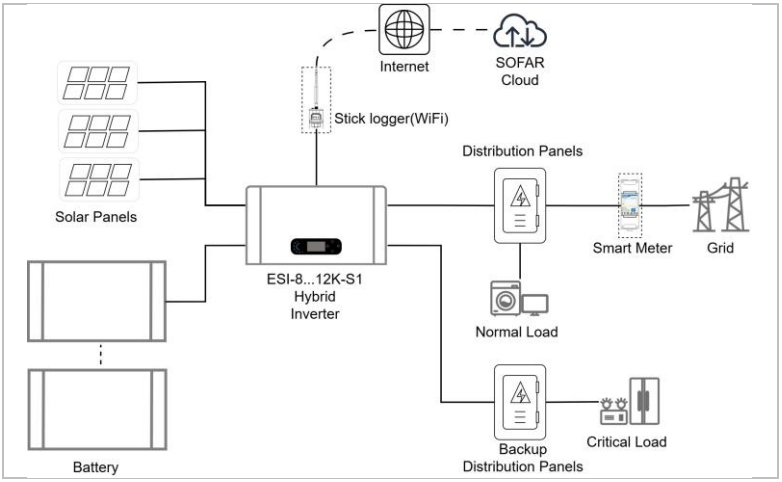
3 Product introduction

This chapter describes the product features, dimensions and efficiency levels.

3.1 System overview

The ESI-8-12K-S1 is a grid-coupled PV and energy storing inverter which can also supply energy in stand-alone operation.

The ESI-8-12K-S1 has integrated energy management functions which cover a wide range of application scenarios.

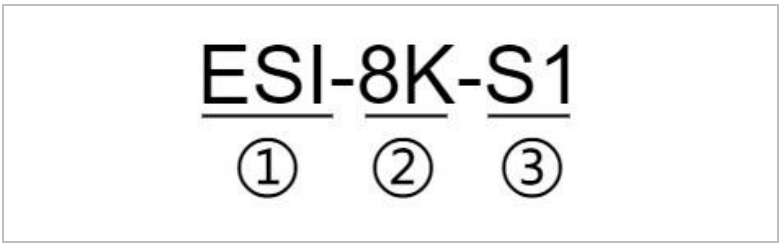


ESI-8-12K-S1 inverters may only be used with photovoltaic modules which do not require one of the poles to be earthed. In normal operation, the operating current must not exceed the limits specified in the technical data.

Selection of the optional inverter parts must be determined by a qualified technician who has thorough knowledge of the installation conditions.

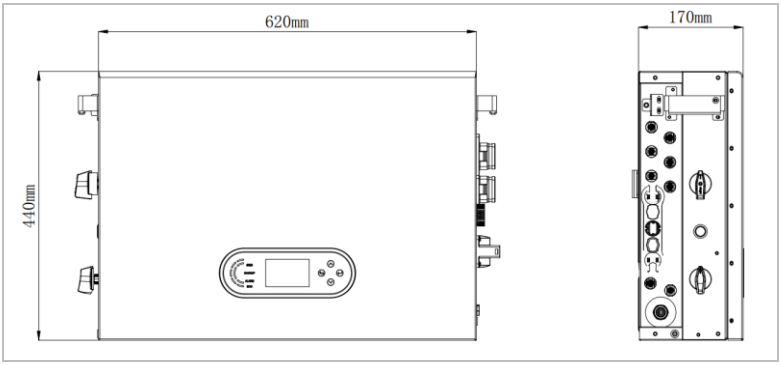
3.2 Product overview

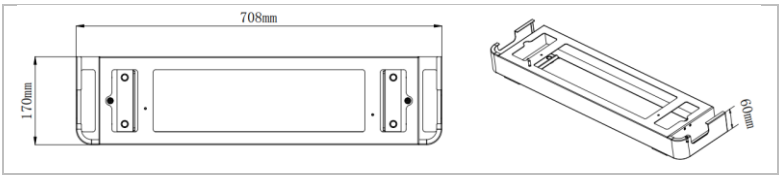
3.2.1 Model

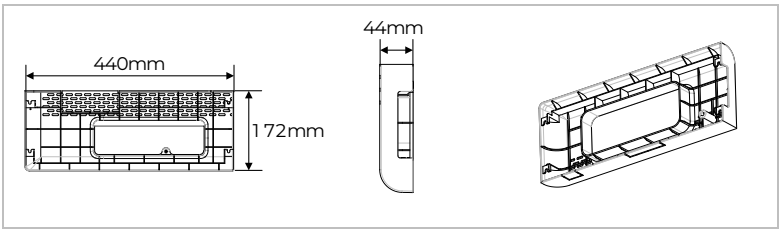


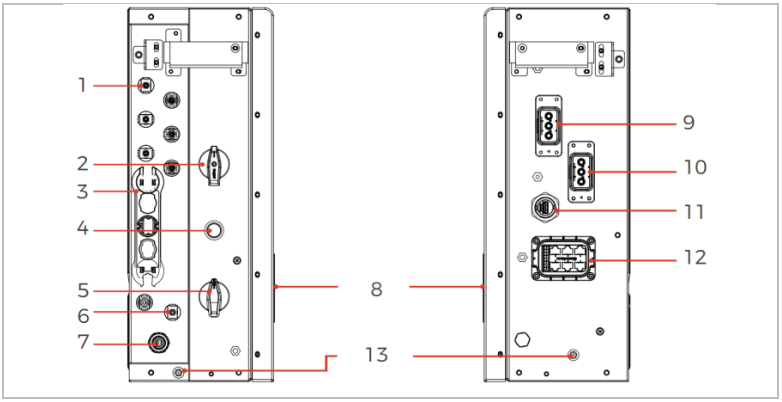
Identifiers	Meaning	Specification
①	Product series name	SOFAR ESI series (Energy Storage Integration)
②	Power rating	8K: Rated power is 8 kW 9.99K: Rated power is 9.99kW 10K: Rated power is 10 kW 12K: Rated power is 12 kW
③	Design code	S1, S1-A

3.2.2 Appearance





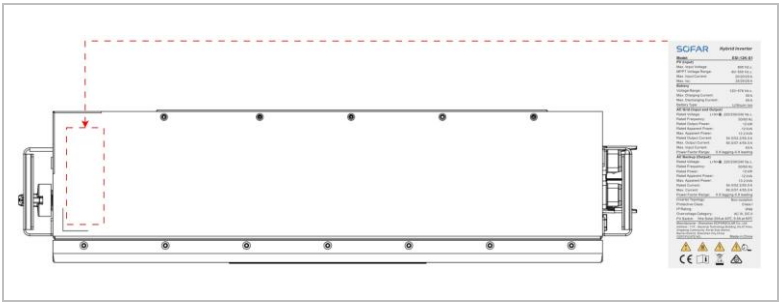




1	PV input terminals	8	LCD display
2	PV switch	9	AC backup connector
3	BAT Terminal remover	10	AC grid connector
4	Battery power button	11	WiFi/4G stick logger connector
5	BAT switch	12	Communication connector
6	BAT input terminals	13	PE terminal
7	BAT communication connector		

3.3 Labelling on the device

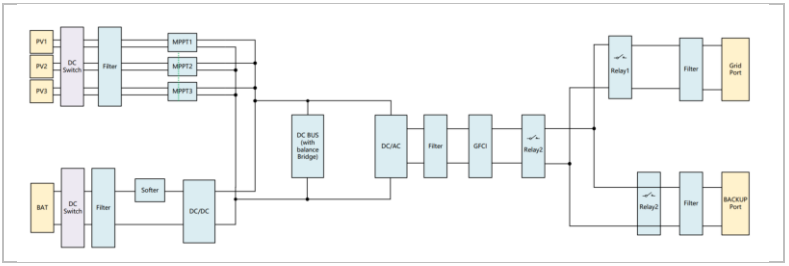
Label must not be covered or removed!



3.4 Functional features

NOTICE
Please refer to the datasheet for specific functional features.

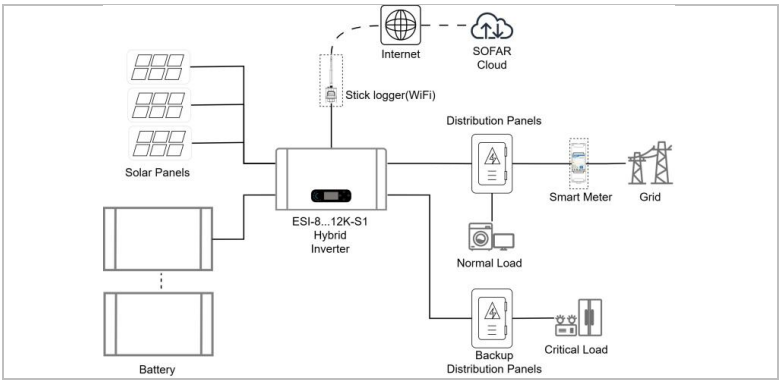
Electrical block diagram



3.5 Application scenarios

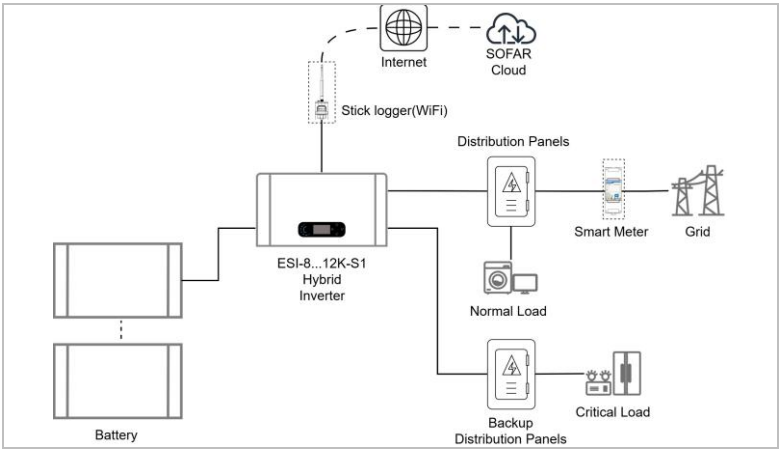
3.5.1 Typical energy storage system

A typical energy storage system with PV panels and battery unit(s) connected to the grid.



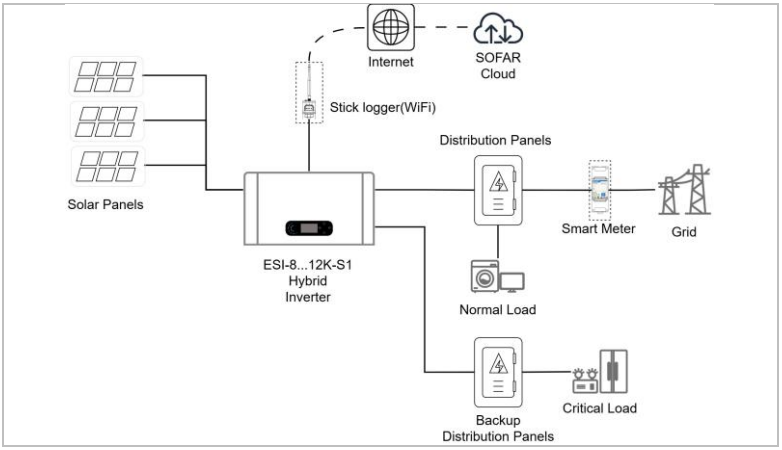
3.5.2 System without PV connection

In this configuration, there are no PV panels connected and the battery is charged through the grid connection.



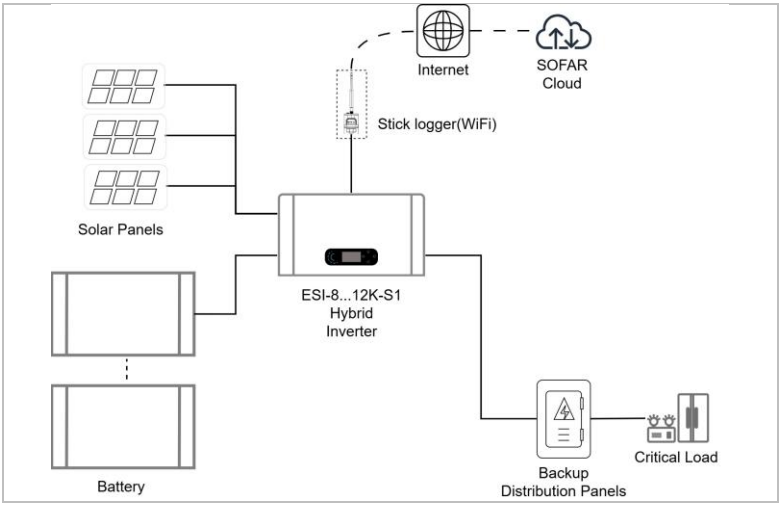
3.5.3 System without battery

In this configuration, the battery unit(s) can be added later.



3.5.4 Backup mode (off-grid)

When there is no grid connection, the PV panels and the battery will provide electricity to the critical load.



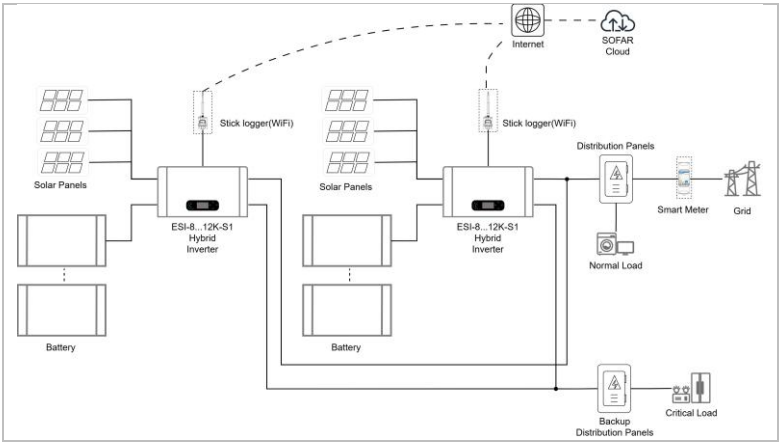
3.5.5 System with multiple inverters

In on-grid mode, a maximum of six inverters can be connected in parallel.

In off-grid mode, a maximum of three inverters can be connected in parallel.

NOTICE

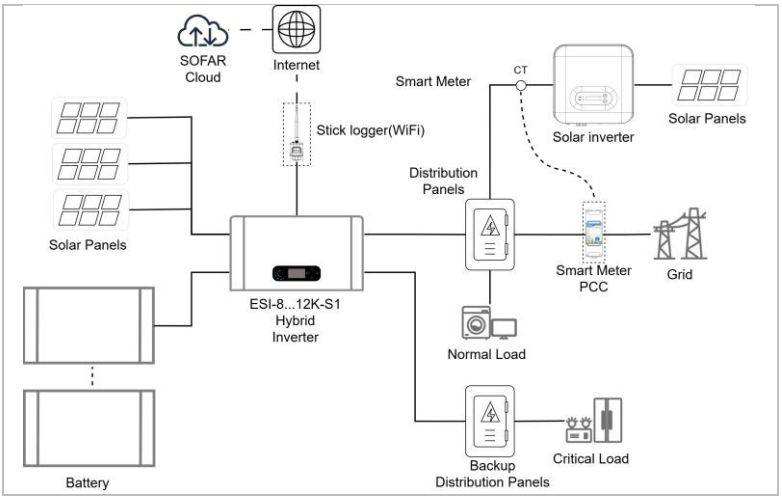
- Multiple inverters connected in parallel must be of the same power model with the same power and battery configuration.
- The energy meters are connected to the master inverter. Control of all inverters takes place via the link cable.
- For the parallel switching of several devices, we recommend using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



3.5.6 AC retrofit system

In this system configuration, the hybrid system for an already existing PV system is supplemented with a solar inverter of any brand. By installing a smart meter which can measure the power of PCC (Point of common coupling) and power of solar inverter simultaneously by using two channel CT, PV production can be taken into account and used for charging the battery.

NOTICE
▶ If multiple PV inverters are present within the system, up to four smart meters can be used. The communication address of the PCC meter should be set to 1. Similarly, the communication address of the PV inverter meters should be set from 2 to 4. For more details, please contact SOFAR.



4 Installation

4.1 Installation information

DANGER

Fire hazard

- Do NOT install the inverter on flammable material.
- Do NOT install the inverter in an area in which flammable or explosive material is stored.

CAUTION

Burn hazard

- Do NOT install the inverter in places where it can be accidentally touched. The housing and heat sink may become very hot while the inverter is in operation.

NOTICE

Weight of the device

- Take into account the weight of the inverter when transporting and moving it.
- Choose a suitable installation location and surface.
- Commission a minimum of two persons with installation of the inverter.

4.2 Installation procedure

Mechanical installation is performed as follows:

1. Examine the inverter before installation
2. Select the mounting location and mounting method
3. Transport the inverter
4. Install the inverter

4.3 Examination before installation

⚠ CAUTION

Damage during transport

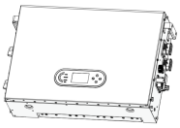
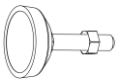
- ▶ Please check the product packaging and connections carefully prior to installation.

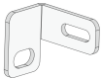
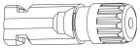
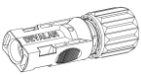
4.3.1 Checking the external packaging materials

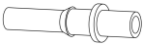
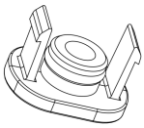
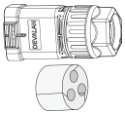
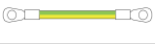
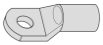
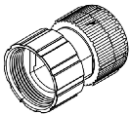
Packaging materials and components may become damaged during transport. For this reason, the external packaging materials must be examined before the inverter is installed. Check the external packaging material for damage, e.g. holes and cracks. If you find any damage, do not unpack the inverter and contact the transport company and/or dealer immediately. We recommend that you remove the packaging material within 24 hours of installing the inverter.

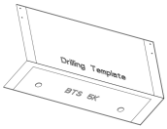
4.3.2 Checking the deliverables

After unpacking the inverter, check that the delivery items are both intact and complete. In the event of any damage or missing components, contact the wholesaler.

No.	Image	Description	Quantity (pcs.)
01		ESI-8-12K-S1 inverter	1
02		Base	1
03		Adjustable foot pads	4

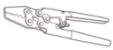
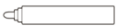
No.	Image	Description	Quantity (pcs.)
04		Decorative cover with screw (left side)	1
05		Decorative cover with screw (right side)	1
06		Wall bracket	1
07		Expansion bolt	8
08		Anti-tip bracket (right)	1
09		Anti-tip bracket (left)	1
10		M6*14 screws	4
11		M5*12 screws	5
12		Connection plate	2
13		M4*12 screws	6
14		PV+ terminal insulating part	3
15		PV– terminal insulating part	3
16		PV+ terminal metal pin	3
17		PV– terminal metal pin	3
18		BAT+ terminal insulating part	1
19		BAT– terminal insulating part	1

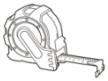
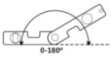
No.	Image	Description	Quantity (pcs.)
20		BAT+ terminal metal pin	1
21		BAT- terminal metal pin	1
22		BAT+ terminal cover with lock	1
23		BAT- terminal cover with lock	1
24		AC connector accessories	1
25		Backup connector accessories	1
26		Communication connector	1
27		2 channel current transformer	1
28		Stick logger (Wi-Fi)	1
29		PE cable	1
30		OT terminal (M6, 8AWG)	2
31		Battery communication connector	1

No.	Image	Description	Quantity (pcs.)
32		RJ45 terminal	4
33		Wall mounting bracket	1
34		QR code	1
35		Nameplate, SN code	1
36		Inspection & Testing report	1
37		Quick installation guide	1
38		Drilling template	1

4.4 Tools

Prepare the tools required for the installation and electrical connection.

No.	Tool	Type	Function
01		Hammer drill Recommended drill diameter: 10 mm	For drilling holes
02		Screwdriver	For driving screws
03		3 mm Allen key 4 mm Allen key	For installation of AC connector
04		Removal tool	For removing the PV/battery terminal
05		Wire stripper	For stripping the wire
06		Adjustable wrench	For securing the nuts
07		Socket wrench	For securing the nuts
08		Heat shrinkable tube	Insulation for terminals
09		Heat gun	For shrinking the tube
10		Rubber mallet	Installation for expansion bolts
11		Crimping tool	For crimping the power cables
12		Multimeter	For measuring voltage and polarity
13		Marker	For marking

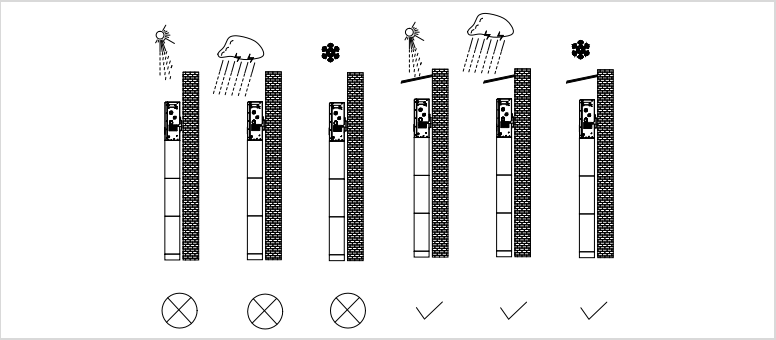
No.	Tool	Type	Function
14		Measuring tape	For measuring distance
15		Spirit level	Verification for installation
16		Protective gloves Insulating gloves	Personal protective equipment
17		Safety goggles	Personal protective equipment
18		Anti-dust respiratory mask	Personal protective equipment
19		Safety helmet	Personal protective equipment
20		Safety shoes	Personal protective equipment

4.5 Installation environment requirements

- Choose a dry, clean and tidy place that is convenient for installation.
- Operating temperature range: –30 to +60 °C.
- Relative humidity: 5 to 95% (non-condensed).
- The inverter must be installed in a well-ventilated place.
- Do not place the inverter close to flammable or explosive materials.
- The AC overvoltage category of the inverter is category III.
- Maximum altitude: 4,000 m
- The product shall be installed indoor or outdoor with proper shelter to protect the product from sunshine, rain and so on.

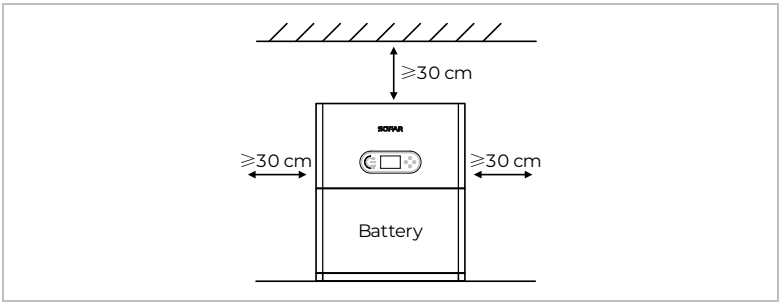
4.6 Installation location

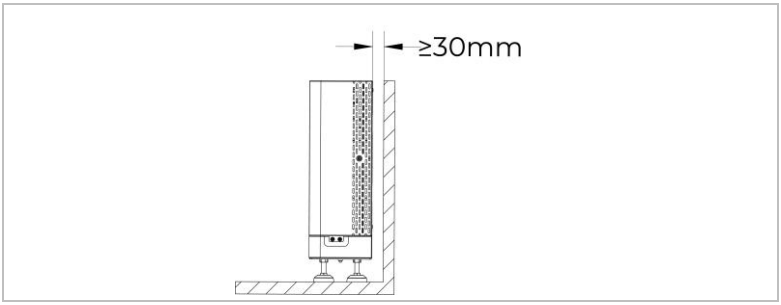
Choose a suitable location for the installation of the inverter. Ensure that the following requirements are met:



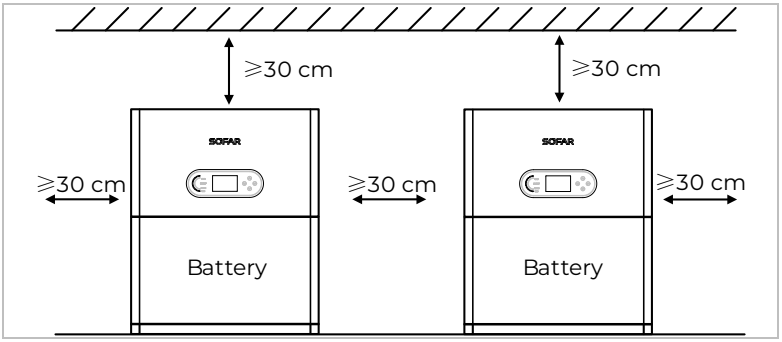
Installation space requirement

Minimum distances for individual ESI-8-12K-S1 inverter with BTS5K batteries.

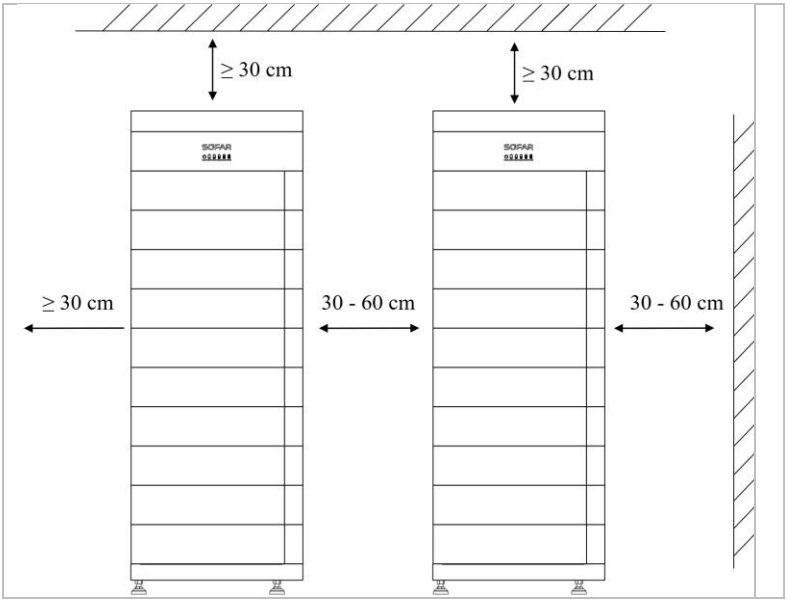


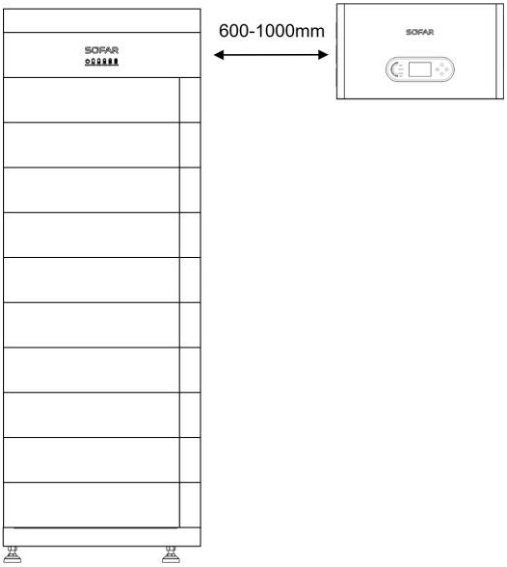


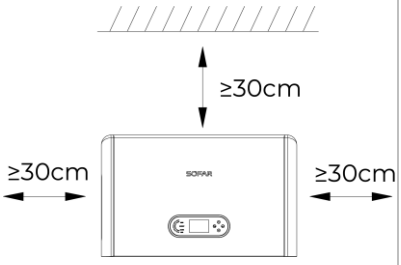
Minimum distances for several ESI-8-12K-S1 inverters with BTS 5K batteries.

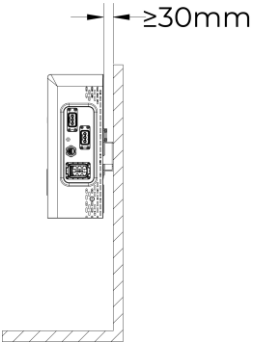


Minimum distances for ESI-8-12K-S1 inverter with CBS5000 batteries.





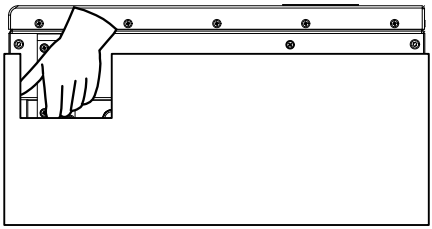




By correctly installing the wall-mounted bracket provided in the accessory package, the requirement of ≥30mm can be met.

4.7 Unpacking the inverter

1. Open the package and hold the handles above the inverter on both sides with both hands.



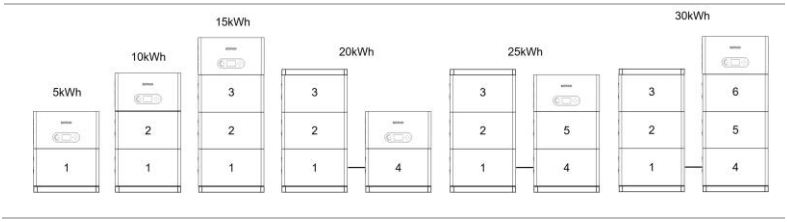
2. Lift the inverter out of the packaging and move it to its installation position.

NOTICE
Mechanical damage ▶ In order to prevent injuries and damage to the device, ensure that the inverter is kept balanced while it is being moved (it is very heavy). ▶ Do not place the inverter on its connections, as they are not designed to bear its weight. Place the inverter horizontally on the floor. ▶ When you place the inverter on the floor, place foam material or paper underneath it in order to protect its housing.

4.8 Energy storage system with BTS 5K batteries

4.8.1 Configurations of BTS battery for stacked inverter

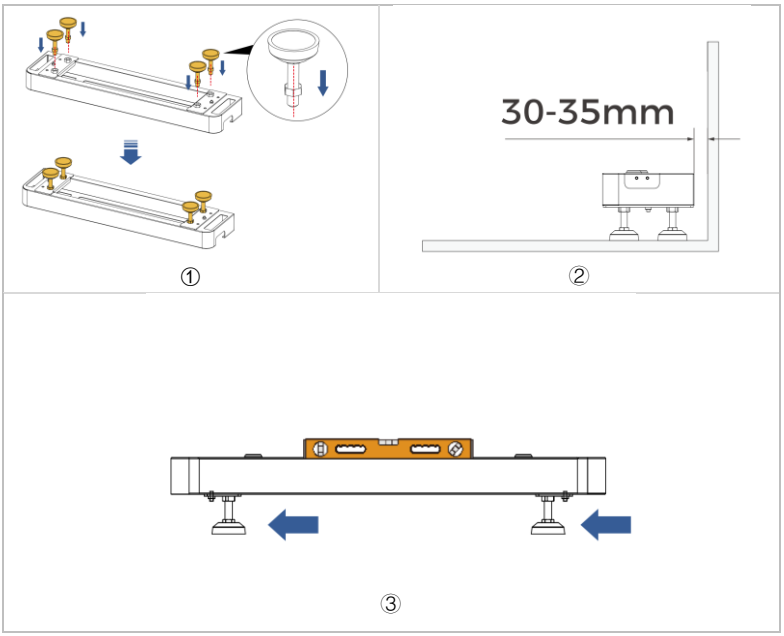
Stacked installation supports expansion of up to six batteries. One inverter module supports up to six battery expansion modules. The BTS 5K battery system has a nominal capacity of 5.12 kWh, and an ESI system is available in configurations from 5.12 kWh to 30.72 kWh.



4.8.2 Battery base installation

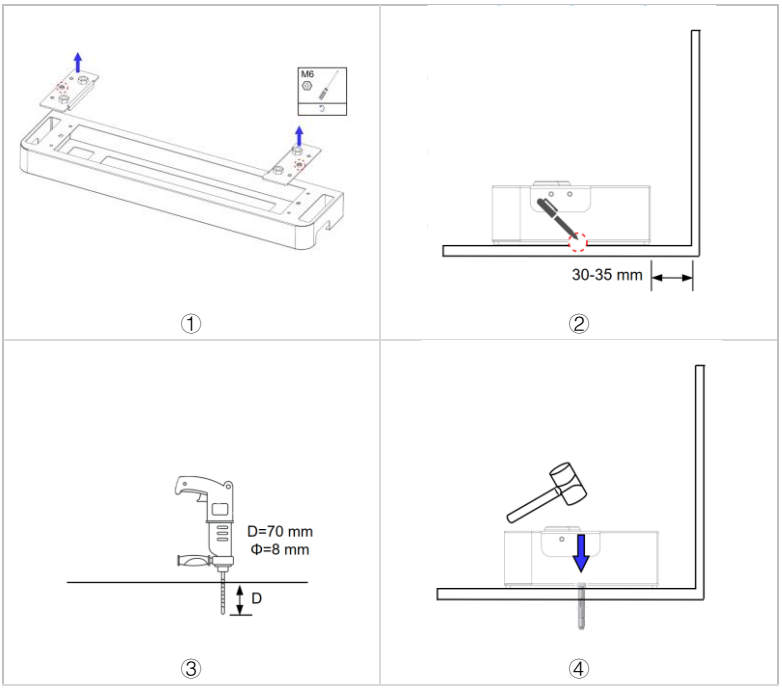
Install on the ground with adjustable foot pads

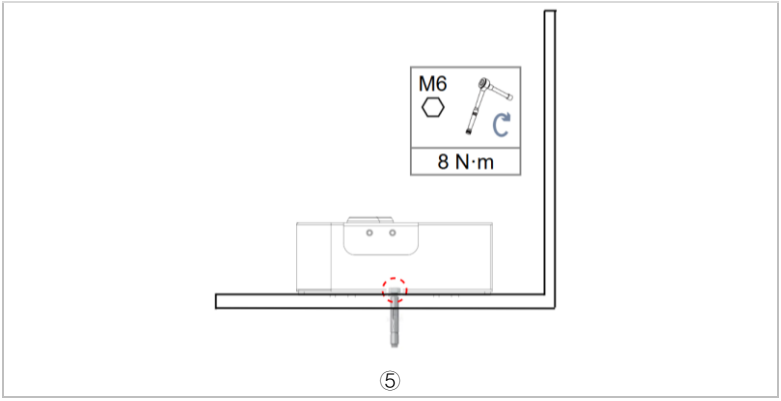
1. Install the adjustable foot pads at the bottom of the battery base.
2. Place the base 30-35mm away from the wall and ensure it is parallel to the wall.
3. Put the spirit level on the battery base for checking. If level bubble is not in the center, please adjust the foot pads to level the base.



Install on the ground directly

1. Remove M5 screws using screwdriver and remove the rear plate.
2. Place the base 30-35mm away from the wall and ensure it is parallel to the wall. Mark the hole positions by using a marker pen.
3. To install the battery base, first remove the base then drill holes by using a hammer drill and clean the holes.
1. Use a rubber mallet to install the expansion bolts and battery base on the ground.
2. Tighten expansion bolts to ensure that the base is securely installed.

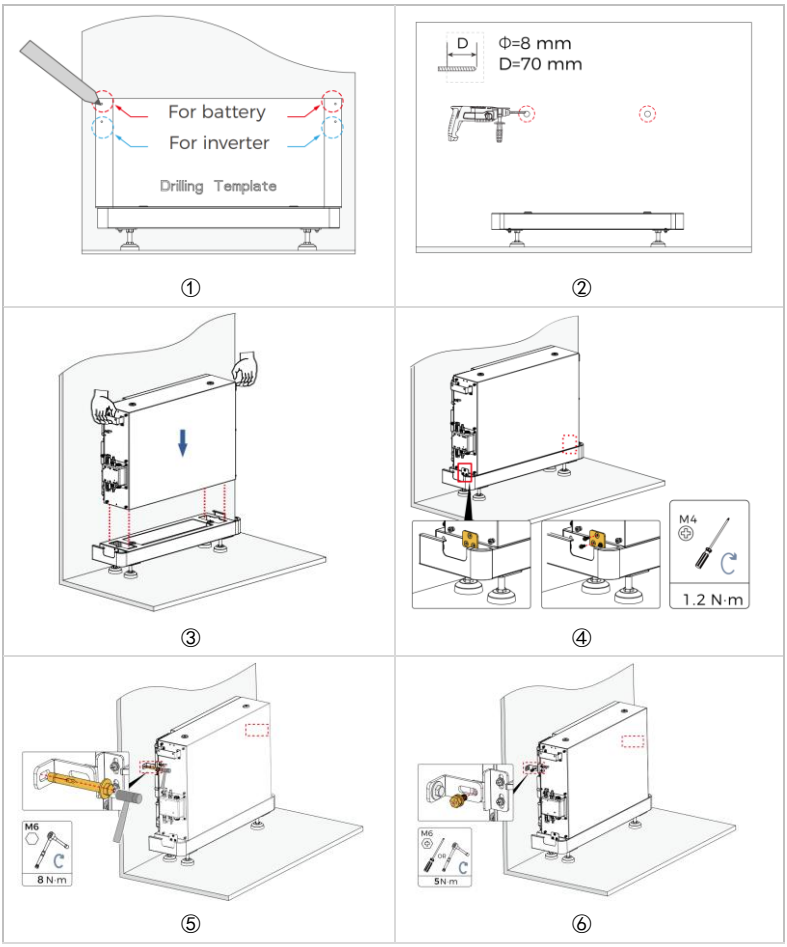




4.8.3 Stacked batteries & inverters

First battery installation

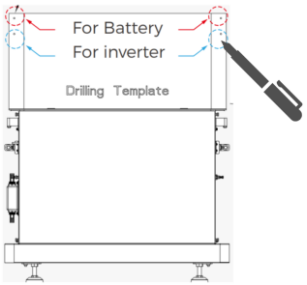
1. After installation of battery base, put the drilling template on the base and keep it close to the wall. Choose the hole positions for battery and mark the hole positions using a marker pen. Please ensure that the hollow area at the bottom of the drilling template matches the positioning plate on top of the base. Once marking is completed, remove the drilling template.
2. Use the hammer drill to drill holes on the wall and clean them.
3. Place the first battery module on the base.
4. Install connection plates on the both sides and tighten six of M4*10 screws.
5. Use a rubber mallet to install the expansion bolts and anti-tip bracket on the wall. Tighten the expansion bolts to ensure that the anti-tip bracket is securely installed.
6. Connect the left and right anti-tip bracket to battery module with M6*14 screws.



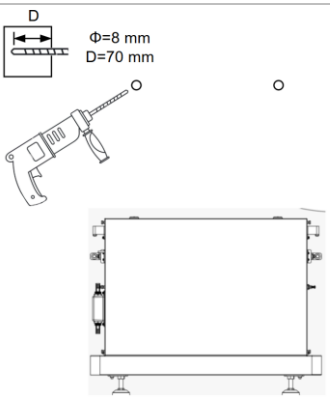
NOTICE
▶ To install multiple batteries, please repeat **multiple batteries installation** procedure.

Multiple batteries installation

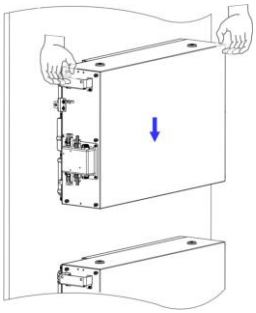
1. Put the drilling template on the top of the first battery module and keep it close to the wall. Choose the hole positions for battery and mark the hole positions using a marker pen. Please ensure that the hollow area at the bottom of the drilling template matches the positioning plate on the top of the battery module. Once marking is completed, remove the drilling template.
2. Use the hammer drill to drill holes on the wall and clean them.
3. Place the second battery module on the top of the first battery module.
4. Install connection plates on the both sides and tighten six of M4*10 screws.
5. Use a rubber mallet to install the expansion bolts and anti-tip bracket on the wall. Tighten the expansion bolts to ensure that the anti-tip bracket is securely installed.
6. Connect the left and right anti-tip bracket to battery module with M6*14 screws.


For Battery
For inverter
Drilling Template

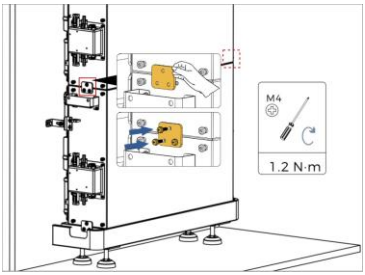
①


D
Φ=8 mm
D=70 mm

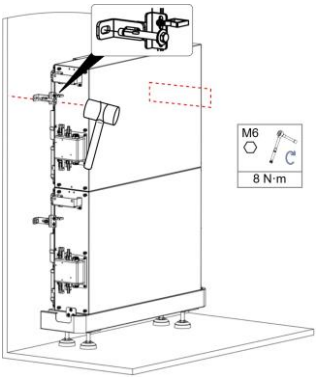
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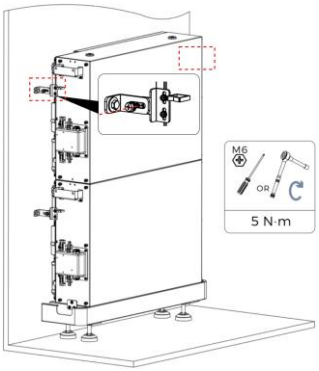
③


M4
1.2 N·m

④


M6
8 N·m

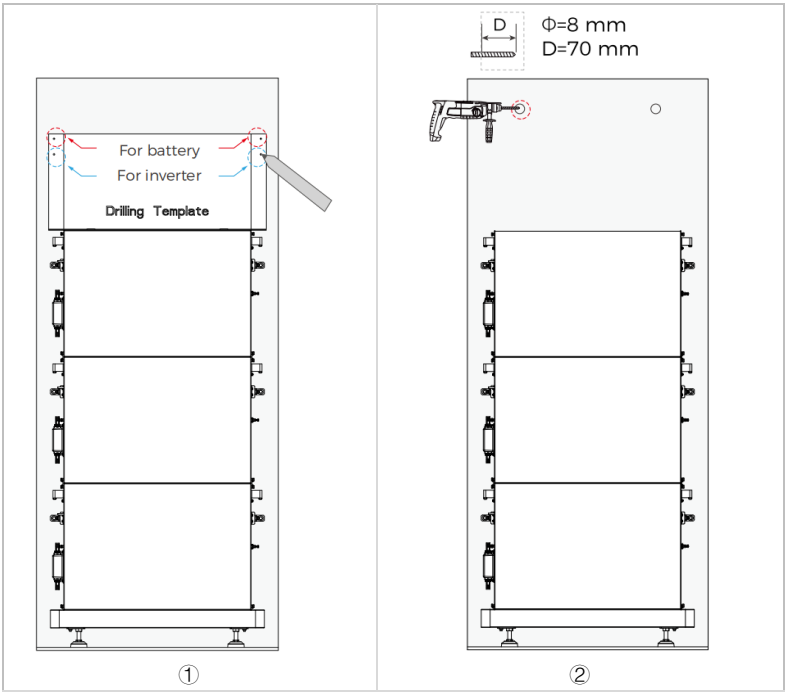
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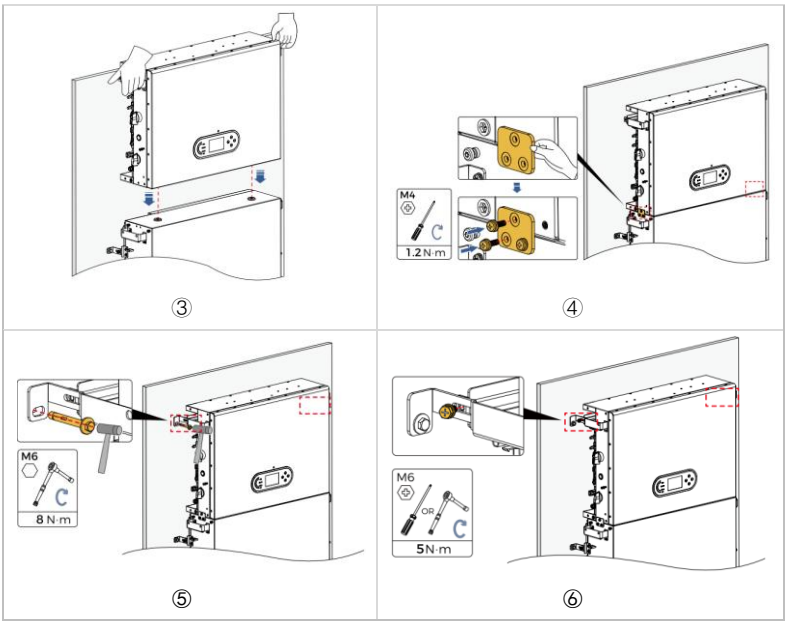

M6
OR
5 N·m

⑥

Inverter installation

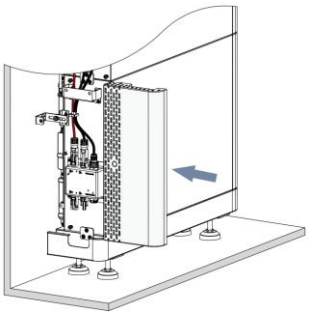
1. Put the drilling template on the top of the battery module and keep it close to the wall. Choose the hole positions for inverter and mark the hole positions using a marker pen. Please ensure that the hollow area at the bottom of the drilling template matches the positioning plate on top of the battery module. Once marking is completed, remove the drilling template.
2. Use the hammer drill to drill holes on the wall and clean them.
3. Place the inverter on the top of the battery module.
4. Install connection plates on the both sides and tighten six of M4*10 screws.
5. Use a rubber mallet to install the expansion bolts and anti-tip bracket on the wall. Tighten the expansion bolts to ensure that the anti-tip bracket is securely installed.
6. Connect the left and right anti-tip bracket to inverter with M6*14 screws



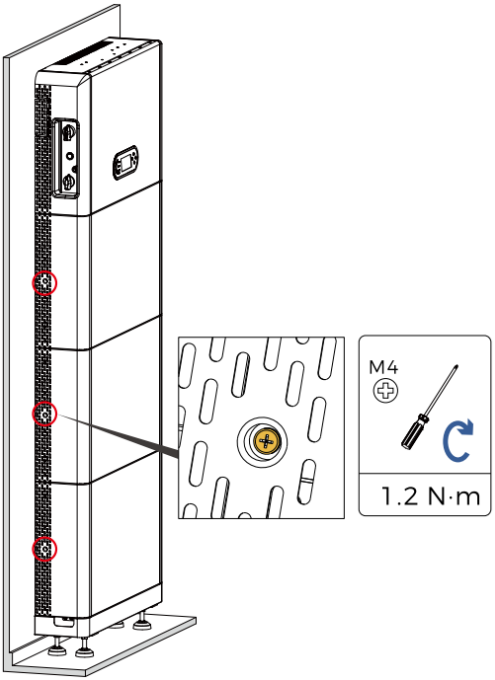

③
M4
1.2N·m
④
M6
8N·m
⑤
M6
OR
5N·m
⑥

4.8.4 Installing the cover

When the electrical connections are complete and cable connections are correct and reliable, install the external protective cover and secure it using screws.



①

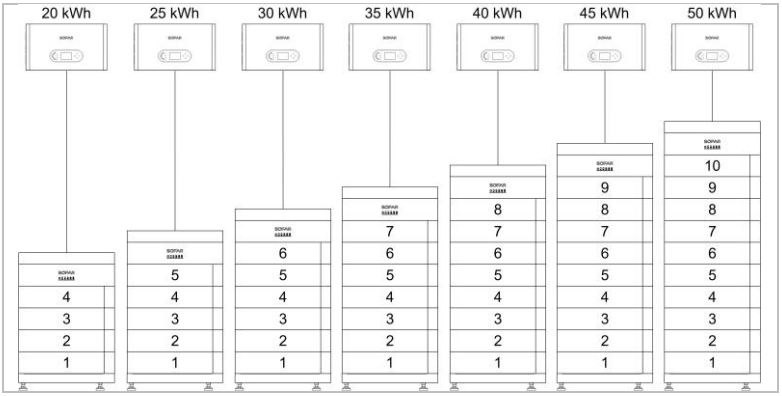


②

4.9 Energy storage system with CBS5000

4.9.1 Configurations of CBS5000 battery for inverter

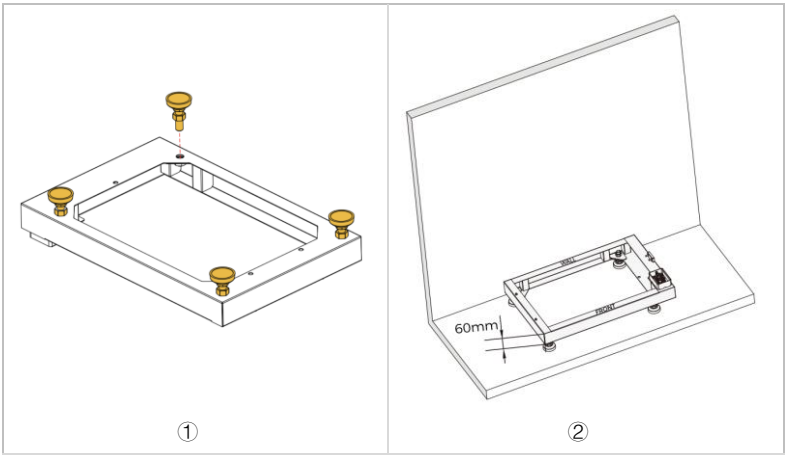
One inverter module supports up to ten battery modules (CBS5000 BMU). Single battery has a nominal capacity of 5.12 kWh, and an ESI system is available in configurations from 20.48 kWh (4 batteries) to 51.20 kWh (10 batteries). The inverter must be connected to the battery through a CBS5000 BCU which is on the top of the stacked batteries.

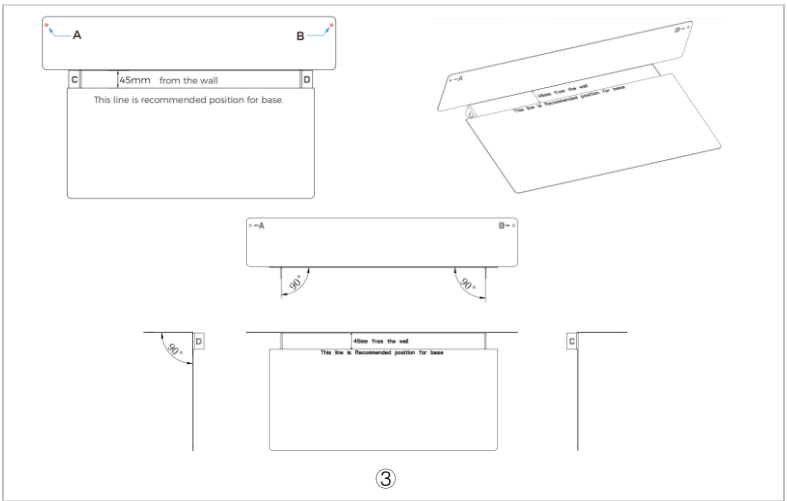


4.9.2 CBS5000 system (BMU and BCU) installation

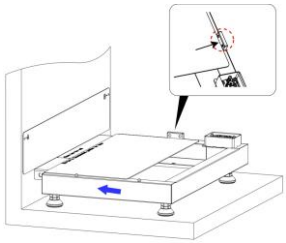
1. Install the adjustable foot pads at the bottom of the battery base.
2. Place the base 30-60mm away from the wall. Put the spirit level on the battery base for checking. If level bubble is not in the center, please adjust the foot pads to level the base.
3. Take the installation template from the box and fold the installation template as shown below.
4. Put the installation template on the top of the battery base and ensure that the installation template is in contact with the connector base which is on the right of the battery base. Move the battery base towards the wall until the installation template contacts the wall, and remove the installation template.
5. Place the first battery (CBS5000 BMU) on the base.

6. Remove the anti-dust cover and film.
7. Secure the battery and the base using a screwdriver.
8. Place the second battery. To install multiple batteries, please repeat procedure 5 to 8.
9. Place the installation template on the top of the batteries. Once again, please ensure that installation template is in contact with the connector base which is on the right of the battery. Please note that to flip up the area C and D of the template as shown below. Move the battery base towards the wall until the installation template contacts the wall.
10. Mark the hole positions by using a marker pen.
11. Remove the installation template then drill holes by using a hammer drill and clean the holes.
12. Place the CBS5000 BCU on the top of the batteries.
13. Secure the BCU and battery using a screwdriver.
14. Use a rubber mallet to install the expansion bolts and BCU on the wall. Tighten the expansion bolts to ensure that the BCU is securely installed.
15. Connect the left and right anti-tip bracket to the BCU with M6*14 screws.

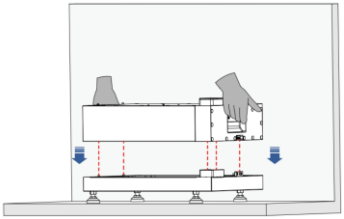



A
B
C
45mm from the wall
D
This line is recommended position for base.
90°
90°
90°
45mm from the wall
This line is Recommended position for base

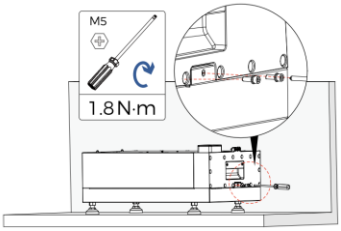
③



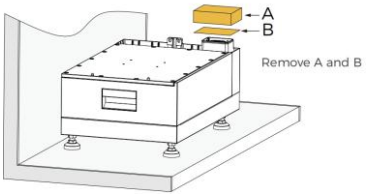
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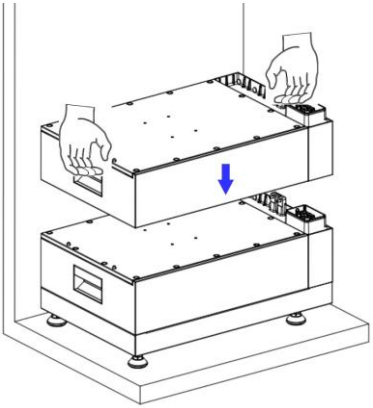
⑤


M5
1.8N·m

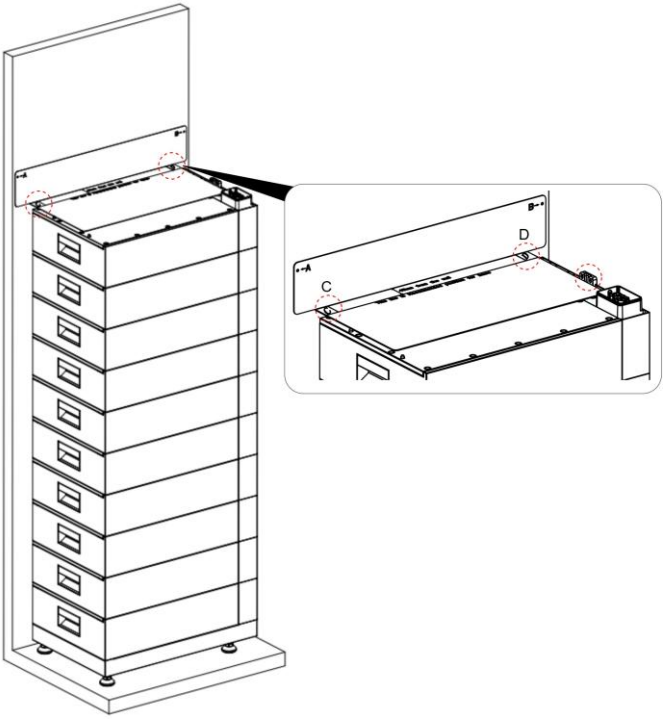
⑥


A
B
Remove A and B

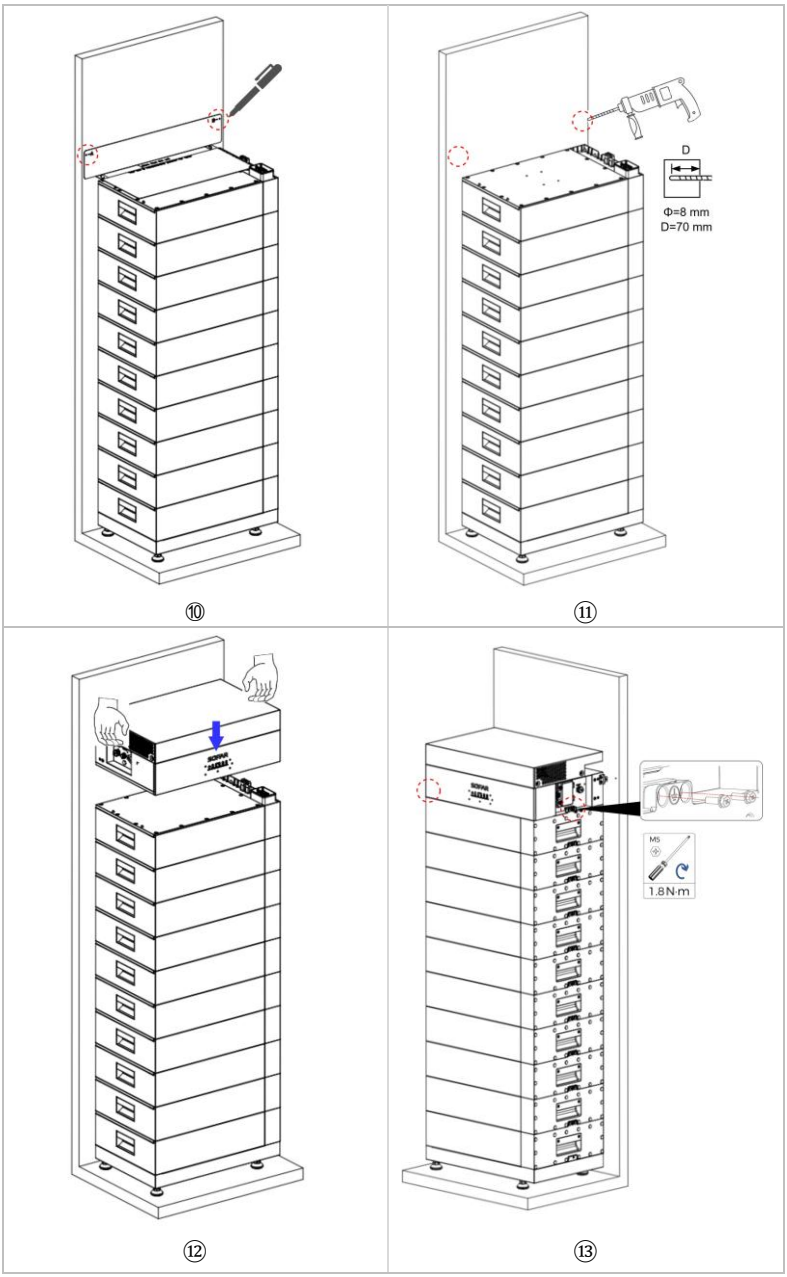
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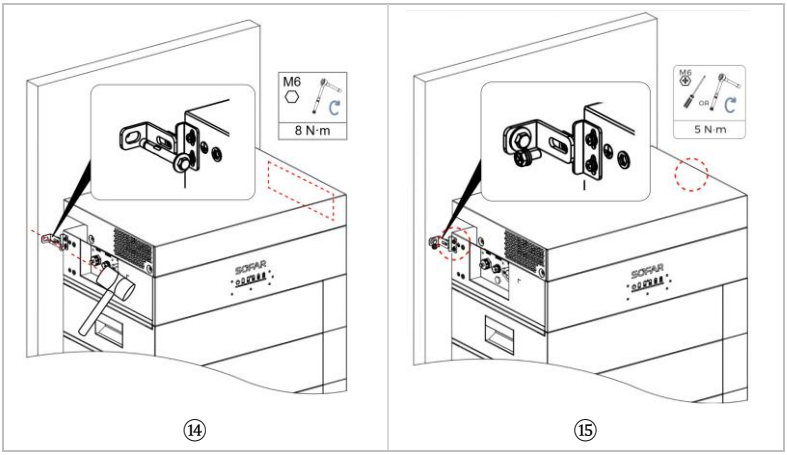
⑧



⑨

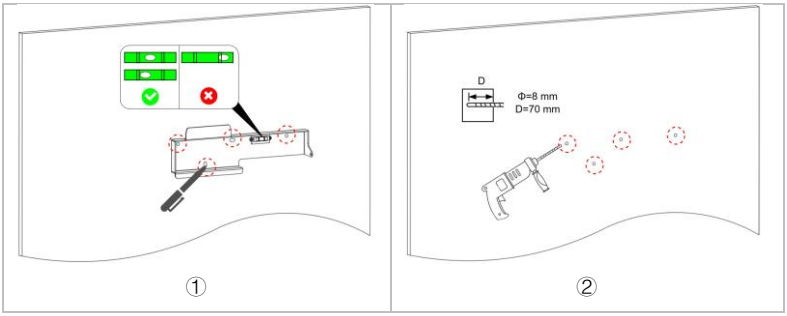


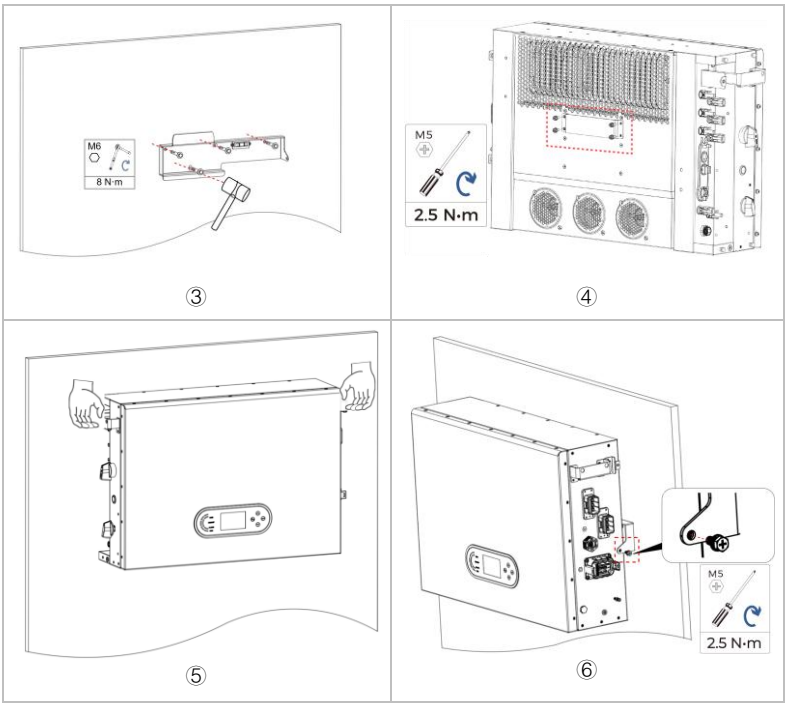
⑩ ⑪ ⑫ ⑬



4.9.3 Wall-mounted inverter installation

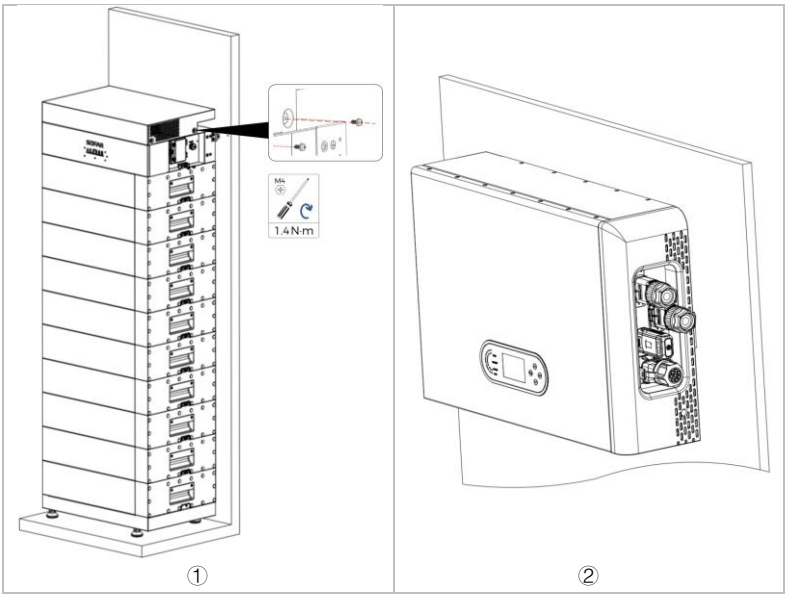
1. Put the wall bracket on the wall horizontally and check the level bubble in the center. Mark four holes by using marker pen.
2. Use the hammer drill to drill holes on the wall and clean them.
3. Use a rubber mallet to install the expansion bolts and wall bracket on the wall. Tighten the expansion bolts to ensure that the wall bracket is securely installed
4. Use M5 screws to install the wall-mounted bracket onto the back of the inverter.
5. Lift the inverter to put on the wall bracket.
6. Tighten the M5 screws to secure the inverter and the wall bracket.




M6
8 N·m
③
M5
2.5 N·m
④
⑤
M5
2.5 N·m
⑥

4.9.4 Installing the cover

When the electrical connections are complete and cable connections are correct and reliable, install the external protective cover and secure it using screws.



5 System wiring

5.1 Safety instructions

This topic describes the electrical connections of the ESI-8-12K-S1 inverter. Read this section thoroughly and carefully before connecting the cables.

⚠ DANGER

- Electrical connection shall be compliance with local laws and regulations.
- Ensure that the DC switch is OFF before establishing the electrical connection. The reason for this is that an electrical charge remains in the capacitor after the DC switch has been switched off. For this reason, please wait for at least 15 minutes to ensure that capacitor has been fully discharged.
- PV modules generate electrical energy when exposed to sunlight, and this may present an electrical shock hazard. For this reason, cover the PV modules with an opaque sheet before connecting the DC input power cable.

NOTICE

- The installation and maintenance of the inverter must be carried out by a qualified electrician.
- Wear rubber gloves and protective clothing (safety goggles and boots) when working on high-voltage/high-current systems such as inverter and battery systems.

5.2 Wiring overview

The electrical connection is established as follows:

1. Connect PE cable
2. Connect DC input cable
3. Connect battery cable
4. Connect AC output power cable
5. Connect communication cable (optional)

NOTICE
▶ Selection of the cable cross-section must take into account the length of the cable used and the circuit breaker according to the national standard.

Component	Description	Recommended cable type
PE cable	Protective earthing	Outdoor copper cable Cross-section area: ≥10 mm²
BAT cable	Battery connection	Outdoor copper cable Cross-section area: 8 to 13 mm² Cable outer diameter: 6 to 9mm
PV cable	PV panels connection	Outdoor copper cable Cross-section area: 4 to 6 mm² Cable outer diameter: 5.5 to 9mm
Backup cable	AC Backup connection	Multi-core outdoor copper cable Cross-section area: 10 to 13 mm² Cable outer diameter: 11 to 25mm Single-core outdoor copper cable Cross-section area: 10 to 13 mm² Cable outer diameter: 6 to 9.5mm

Component	Description	Recommended cable type
Grid cable	AC grid connection	Multi-core outdoor copper cable Cross-section area: 10 to 16 mm² Cable outer diameter: 19 to 30mm Single-core outdoor copper cable Cross-section area: 10 to 16 mm² Cable outer diameter: 6 to 9.5mm
COM cable	Inverter parallel communication Port: Link0, Link1	CAT 5E or higher specification network cable: Straight through Cable length:≤10m
	Wall box Communication Port: Wall box	
	Ethernet communication Port: Ethernet	
	DRMs communication Port: DRMs	
	Meter communication Port: Meter/CT	
	Emergency stop dry contact input Port: E-stop	Outdoor shielded twisted pair cable Cross-section area: 0.2 to 0.5mm² Cable outer diameter: 4 to 6.5mm Cable length: ≤10m
	Heat pump control Port: SG-0, SG-1	

Component	Description	Recommended cable type
	ATS control Port: ATS/12V	
BAT communication cable	Battery communication	CAT 5E or higher specification network cable

5.3 System electrical topology

There is a different N and PE wiring system depending on the regulatory requirements in different regions. For users in Australia, South Africa and New Zealand, please use the system electrical topology in system 2, otherwise use the system 1

NOTICE

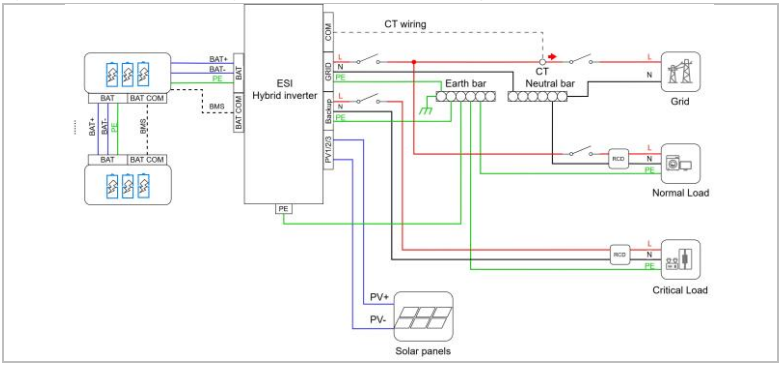
- Ensure that both the BACKUP and GRID PE wires are grounded at the same time as shown in the system 1. Otherwise, the inverter may function abnormally in off-grid mode.
- In system 2, neutral point earthing function is disabled by default. Check whether neutral point earthing function is enabled. If not, enable it manually: LCD setting –> Advanced Settings –> Neutral Point Grounding -> Enable.
- The ESI-8-12K-S1 inverter has a built-in RCD (residual current detect). If an external RCD device is required, we recommend an RCD of type A featuring a residual current of 300 mA (suggested value) or higher.
- AC switch shall be installed to the Grid port and Backup port to make sure that inverter can safely disconnect the grid or load when an exception occurs. Please select the suitable AC switch in compliance with the local laws and regulations. SOFAR recommends the following switch specification (for grid and backup):

Rated voltage: ≥250V

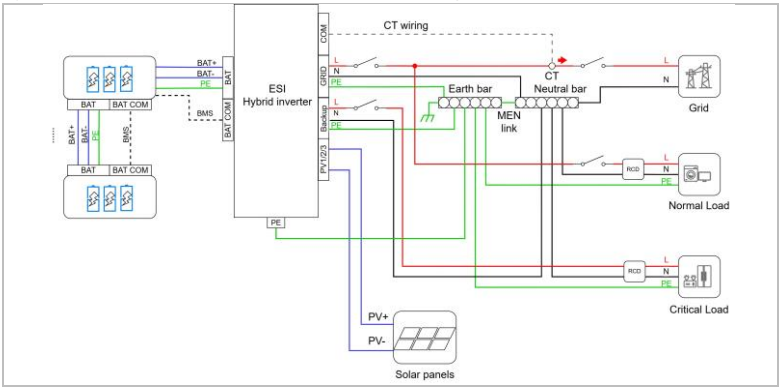
Rated current: 63A (ESI-8K-S1, ESI-9.99K-S1-A, ESI-10K-S1, ESI-12K-S1)

- Install one AC switch for each inverter.
- Do not connect the load between inverter's grid port and AC switch.

System 1: Internal relay controls N-PE earthing



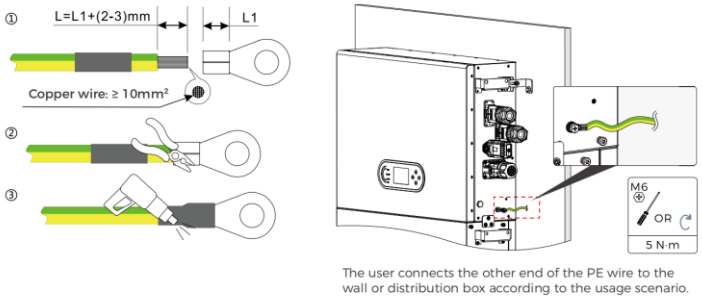
System 2: N and PE wires are connected together



5.4 Connecting the PE cables

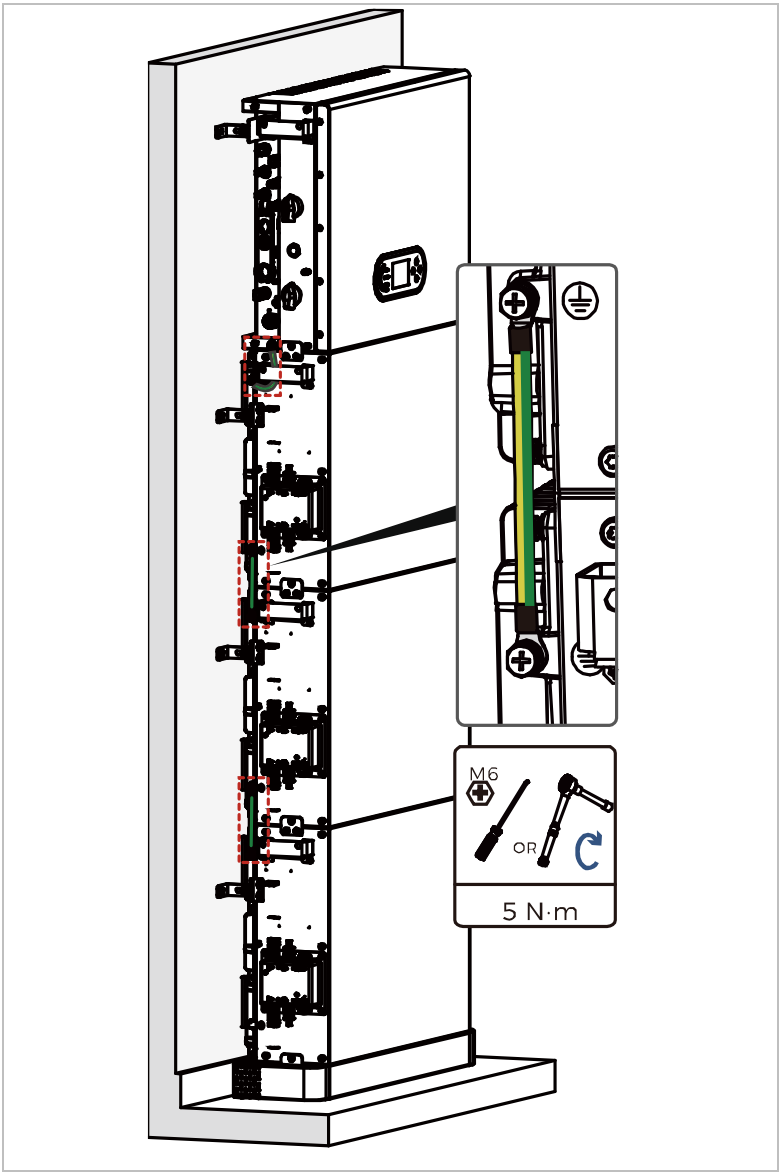
Connect the inverter to the earth bar using the protective earth cable (PE) for earthing.

NOTICE
▶ The protective earthing of the chassis cannot replace the PE cable of the Grid port or Backup port. Ensure that both PE cables are reliably connected. ▶ When multiple batteries are used, ensure that the protective earth points of all inverters are equipotentially connected. ▶ When multiple inverters are used, ensure that the protective earth points of all inverters are equipotentially connected. ▶ Protective earth cable must be installed first. ▶ Protective earth cable shall be provided with sufficient length to ensure that it shall be the last to be subjected to stress when there is unavoidable force.

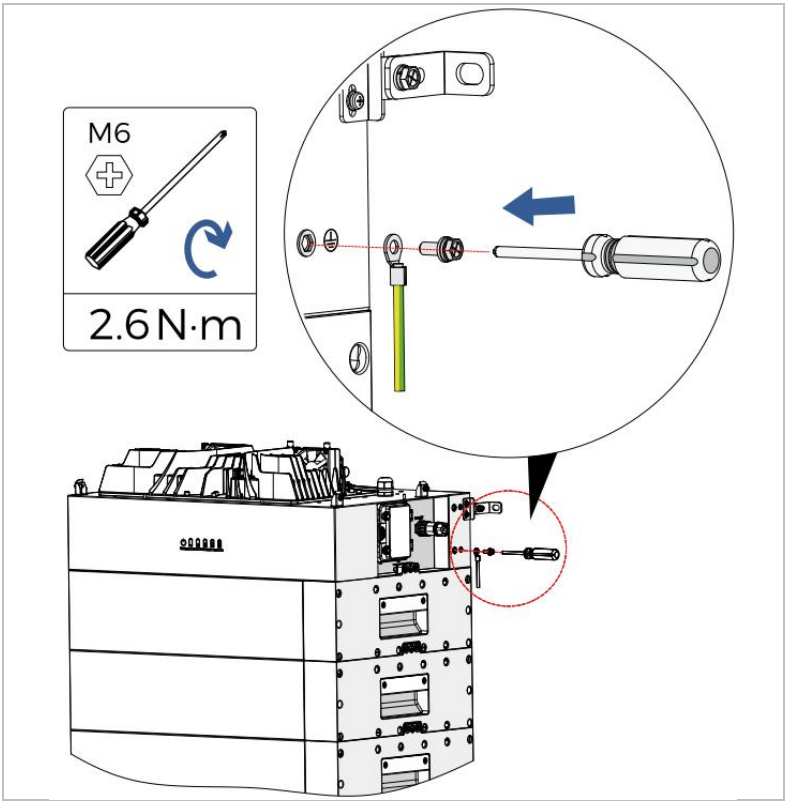


The user connects the other end of the PE wire to the wall or distribution box according to the usage scenario.

BTS 5K PE connection



CBS5000 PE connection



5.5 Connecting the DC cables for the PV and battery

⚠ WARNING

- Ensure that the input voltage does not exceed the maximum permissible voltage. Overvoltage may cause long-term damage to the inverter as well as other damage that is not covered by the warranty!
- Ensure that the maximum short circuit current is within the allowable range.
- As the inverter is transformer-less, the positive and negative poles of the PV panels must NOT be earthed. Otherwise, the inverter will malfunction. If an earth fault alarm occurs, the error is displayed on the LCD screen, the red light illuminates and the error can be found in the error history log.

⚠ CAUTION

Risk of DC arcing

- Before removing the DC connectors, ensure that the DC switch has been set to OFF.

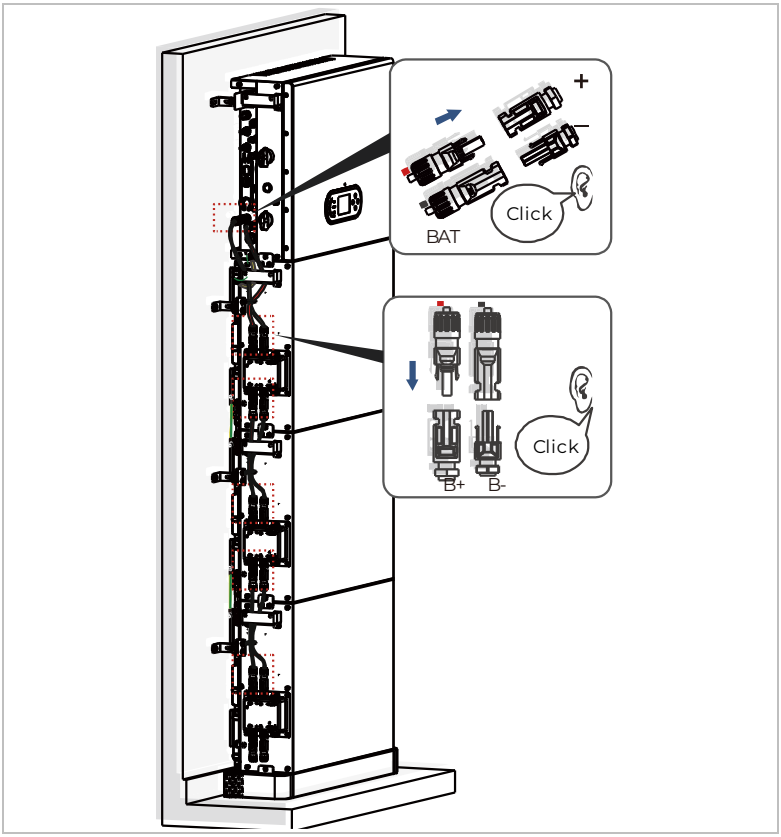
NOTICE

- Use multi-meter to check polarity and measure voltage between positive and negative poles of DC cables. Please ensure the polarity is correct and voltage is within the allowable range.
- After wiring is completed, please check all the terminals and ensure that connections are secured.
- Insert the protective caps into the unused DC connections.
- BTS 5K battery's deliverables include BAT cables for stacked batteries and ESI-8-12K-S1 inverters.
- For CBS5000 connection, please contact the supplier to purchase BAT cables

▶ The battery inputs of different inverters should not be connected in parallel.

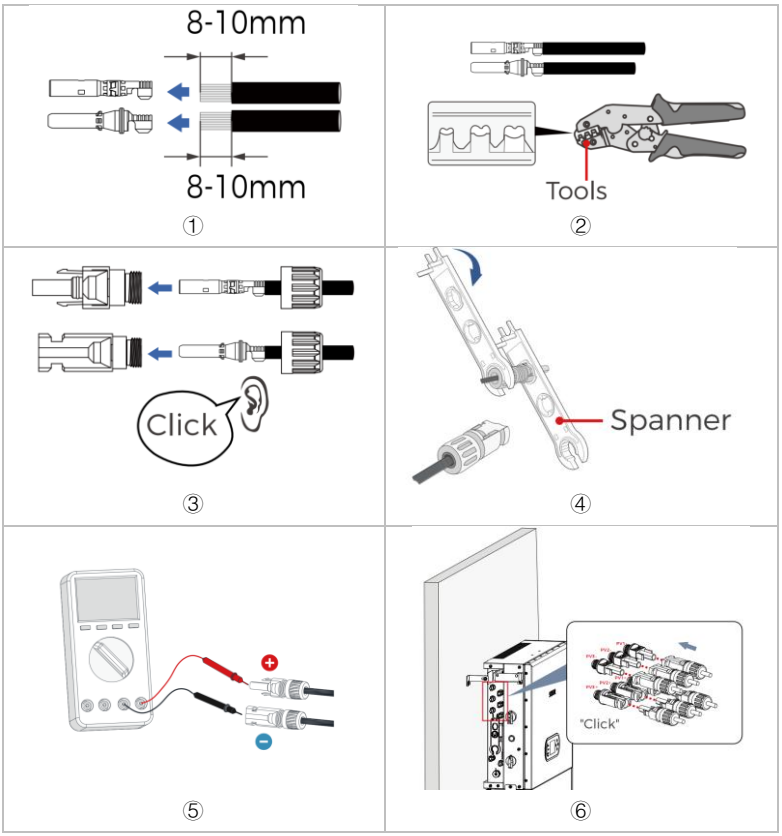
BTS 5K connection

Connect the power ports (BAT+, BAT–) of the inverter to the cascading positive and negative power cables (B+, B–) of the battery module. Connect the remaining battery modules from top to bottom and secure the cables with cable ties. Ensure that the cables are securely connected.



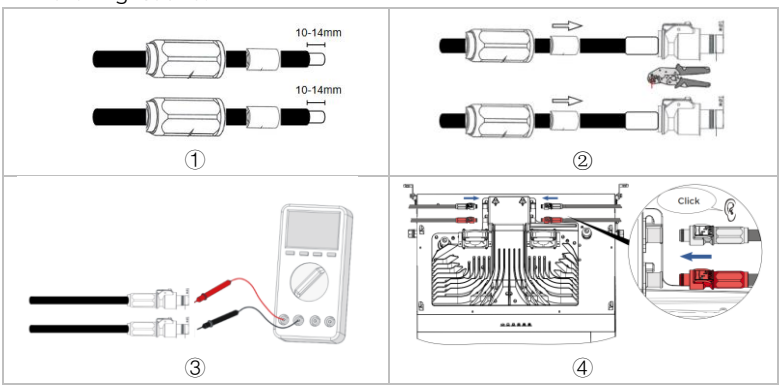
CBS5000 connection: inverter side

1. Remove the insulation of the cables. Insert the positive and negative BAT cables into the corresponding cable glands.
2. Crimp the BAT cables. The crimped cable must be able to withstand a tractive force of 400 Nm.
3. Insert the crimped BAT cables into the corresponding connector housing until you hear a "clicking" sound.
4. Screw the cable glands back into the connector housing.
5. Use a multi-meter to measure the voltage at both ends of the positive and negative terminals to ensure that the terminals are connected reliably.

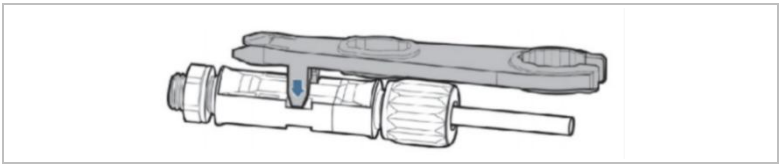


CBS5000 connection: battery side

1. Remove the insulation of the cables. Insert the positive and negative BAT cables into the corresponding cable glands.
2. Crimp the BAT cables and screw the cable glands back into the connector housing.
3. Use a multi-meter to measure the voltage at both ends of the positive and negative terminals to ensure that the terminals are connected reliably.
4. Insert the BAT cables into the corresponding connector until you hear a "clicking" sound.

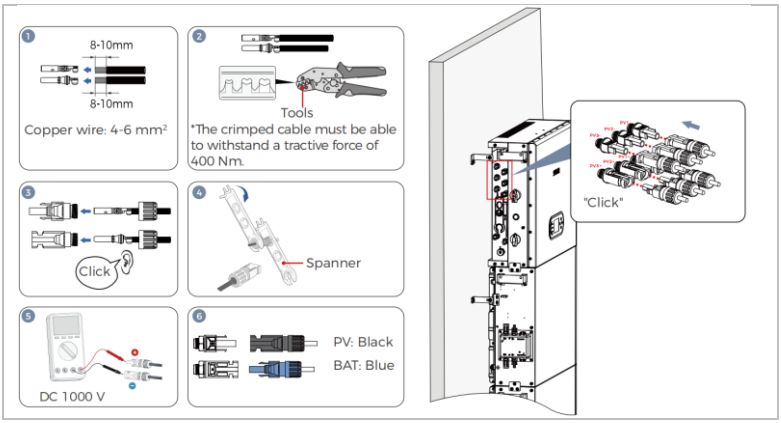


To remove the positive and negative connections from the inverter, insert a removal key into the lock and press on the key with adequate force as shown in the following figure:



PV connection

1. Remove the insulation of the cables. Insert the positive and negative PV cables into the corresponding cable glands.
2. Crimp the PV cables. The crimped cable must be able to withstand a tractive force of 400 Nm.
3. Insert the crimped PV cables into the corresponding connector housing until you hear a "clicking" sound.
4. Screw the cable glands back into the connector housing.
5. Use a multi-meter to measure the voltage at both ends of the positive and negative terminals to ensure that the terminals are connected reliably.

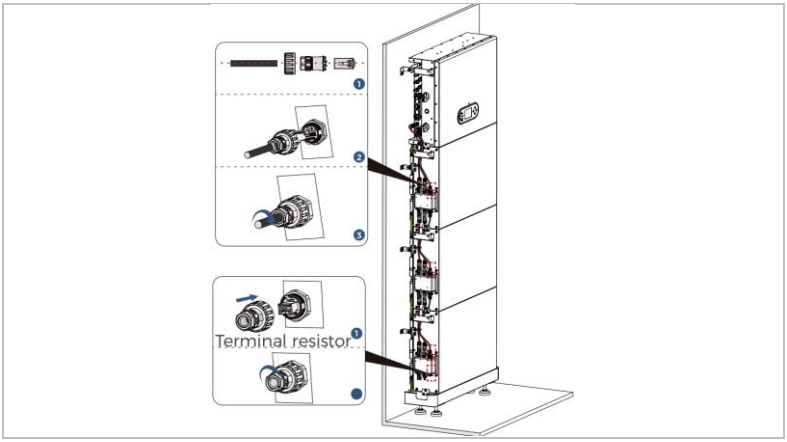


5.6 Connecting the BMS cables for battery

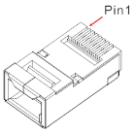
NOTICE
▶ BTS 5K battery's deliverables include BMS cables for stacked batteries and ESI-8-12K-S1 inverters. ▶ For CBS5000 connection, please contact the supplier to purchase BMS cables. The product also provides waterproof housings for self-made BMS cables. Please check the deliverables respectively. ▶ The battery inputs of different inverters should not be connected in parallel.

BTS 5K BMS connection

Connect the inverter "BAT CAN" to the battery module Link Port in. Connect the communication terminals of the inverter and the battery module from top to bottom according to the figure below and secure them with cable ties. For the communication cables, tighten the large nut first and then the small nut. In addition, install a terminal resistor at the communication port of the last battery module in the system.



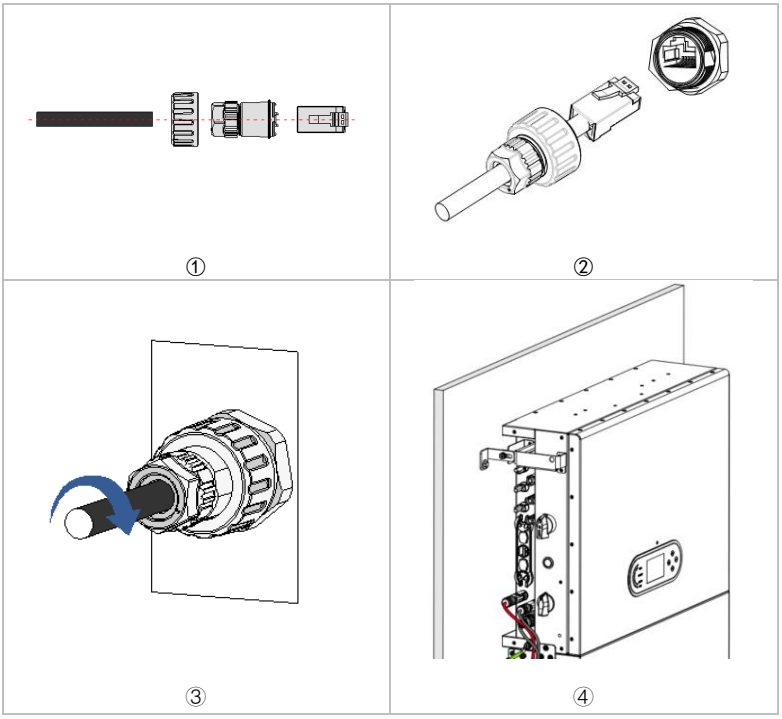
RJ45 PIN definition



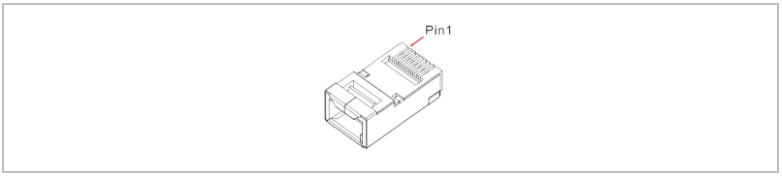
Pin（ESI）	Wire color	Pin（BTS 5K）	Definition
PIN1	Orange White	**PIN1**	
PIN2	Orange	**PIN2**	
PIN3	Green White	**PIN3**	
PIN4	Blue	**PIN4**	CAN-H
PIN5	Blue White	**PIN5**	CAN-L
PIN6	Green	**PIN6**	
PIN7	Brown White	**PIN7**	Switch
PIN8	Brown	**PIN8**	Switch

CBS5000 BMS connection: inverter side

1. Prepare an RJ45 cable according to the length of the connector and remove the outer layer using wire stripper.
2. Pass the cable through the connector gland, connector clip and connector through-hole. Crimp the cable to the RJ45 terminal.
3. After assembling the connectors in order, insert the RJ45 connector into the corresponding terminal of the COM port and tighten the large nut first and then the small nut.



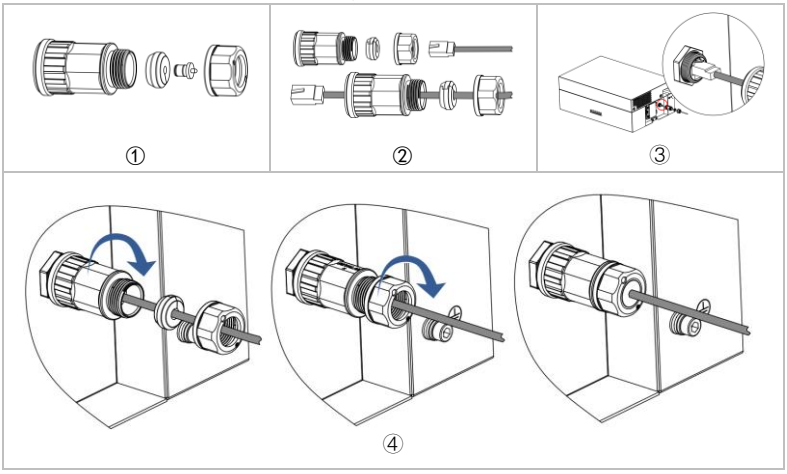
RJ45 PIN definition



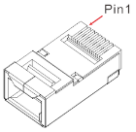
Pin	Wire color	Definition
PIN1	Orange White	
PIN2	Orange	
PIN3	Green White	
PIN4	Blue	CAN-H
PIN5	Blue White	CAN-L

Pin	Wire color	Definition
PIN6	Green	
PIN7	Brown White	
PIN8	Brown	

CBS5000 BMS connection: battery side



RJ45 PIN definition



Pin	Wire color	Definition
PIN1	Orange White	
PIN2	Orange	
PIN3	Green White	CAN-H
PIN4	Blue	
PIN5	Blue White	

Pin	Wire color	Definition
PIN6	Green	CAN-L
PIN7	Brown White	
PIN8	Brown	

5.7 Connecting the AC power cables

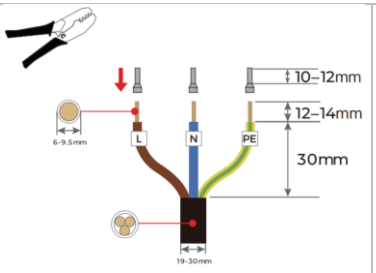
The AC power cables are used to connect the inverter to critical loads (through the BACKUP port) and the AC power distributor or the power grid.

⚠ CAUTION

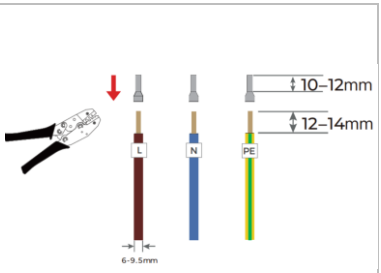
- Ensure that the grid power has been switched off before removing the AC connector
- Each inverter must have its own circuit breaker.
- The AC disconnecting device must be easily accessible.

AC grid cables connection

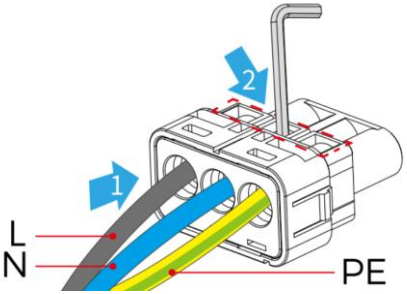
1. Remove the insulating layer of the AC grid cables using a wire stripper and crimp the cord end terminal.
2. Select a suitable seal ring and guide the cables through the cable gland and seal ring.
3. Connect the cables to the terminal and tighten the screws with allen key.
4. Assembling the connectors in order and you can hear a “clicking” sound.
5. Use a screwdriver to remove the protective cap from grid connector.
6. Plug the connector into the port and stop when you hear a click.

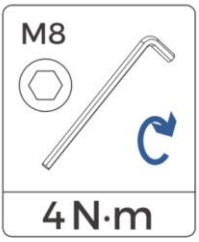


①Multi-core cable

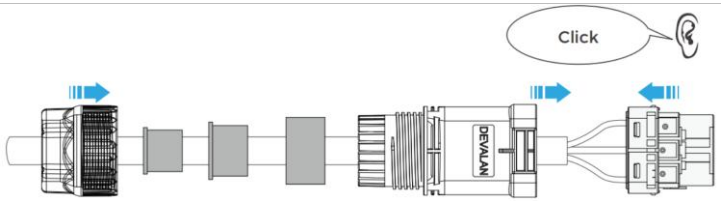


②Single-core cable

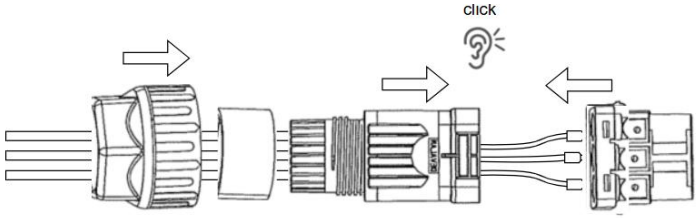




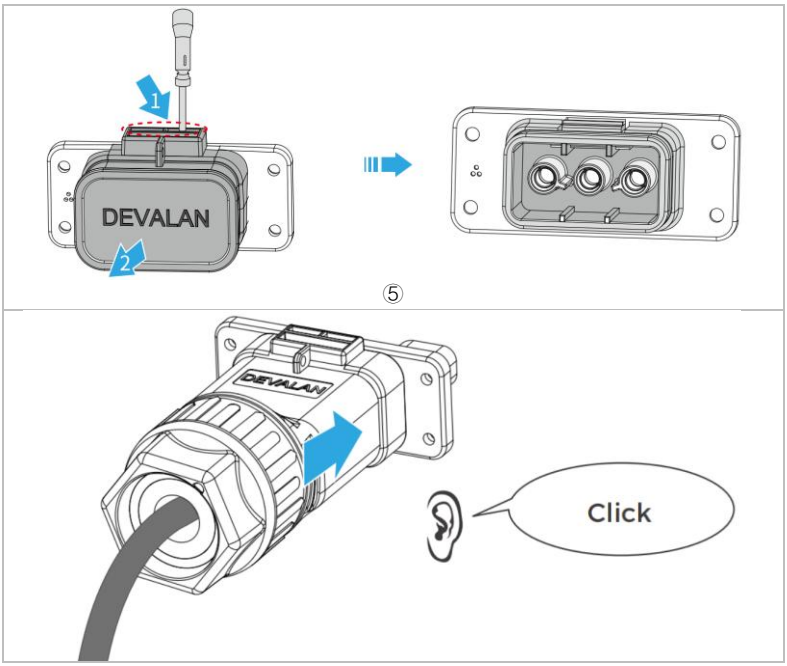
③



④(a)multi-core cable

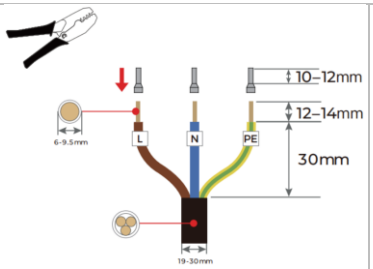


④(b)Single-core cable

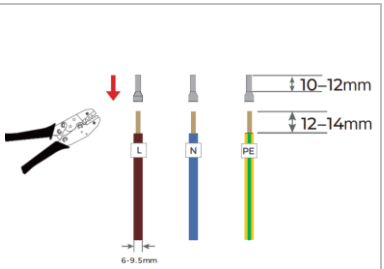


AC backup cables connection

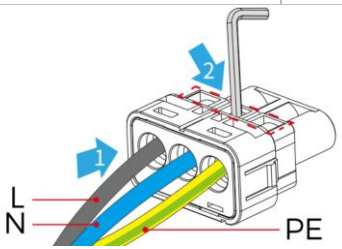
1. Remove the insulating layer of the AC grid cables using a wire stripper and crimp the cord end terminal.
2. Select a suitable seal ring and guide the cables through the cable gland and seal ring.
3. Connect the cables to the terminal and tighten the screws with allen key.
4. Assembling the connectors in order and you can hear a “clicking” sound.
5. Use a screwdriver to remove the protective cap from grid connector.
6. Plug the connector into the port and stop when you hear a click.



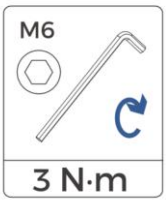
①Multi-core cable

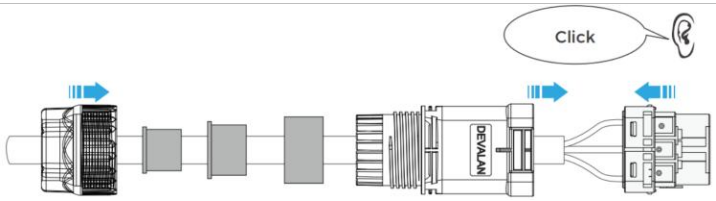


②Single-core cable

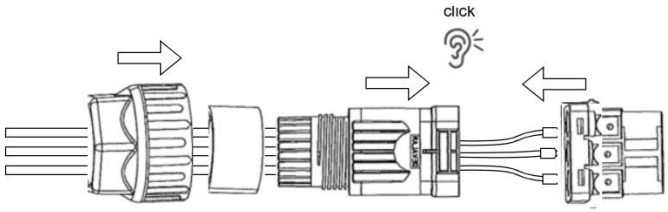


③

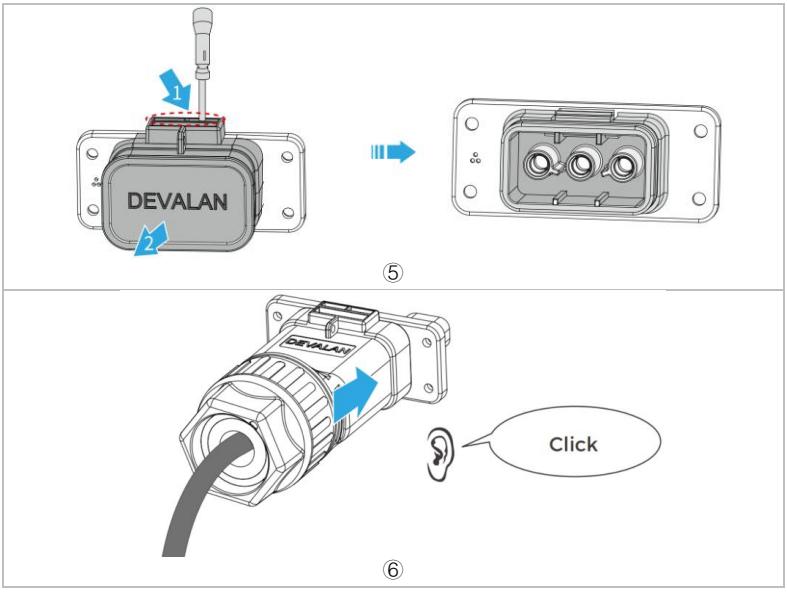




④(a)multi-core cable

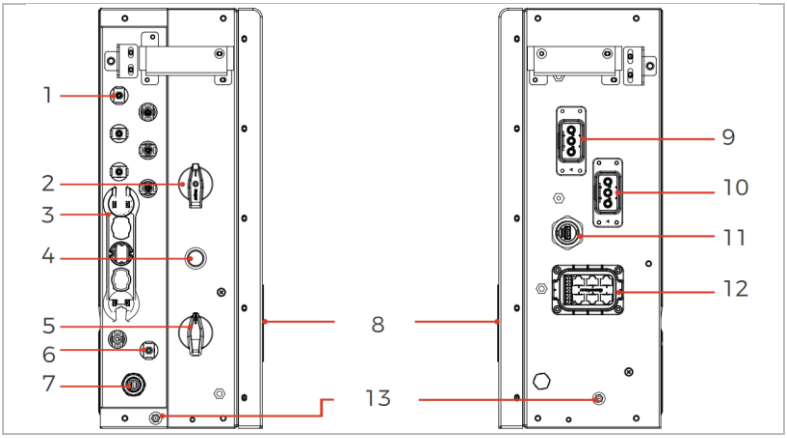


④(b)Single-core cable



5.8 Communication interfaces

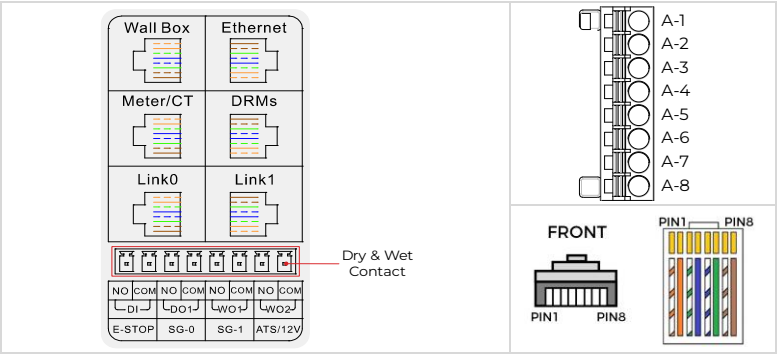
The positions of the communication interfaces of the ESI-8-12K-S1 are shown below:



No.	Connection	Function
7	BAT communication port	Connect the battery to read battery information or assist with battery software upgrades.
11	WiFi/4G	USB port for firmware upgrade and safety parameter import; port for connection of stick logger (WiFi).
12	Communication connection	Multifunctional communication ports, including parallel, Ethernet, Meter/CT, DRMS, charging pile, dry contact etc.

5.8.1 Multifunctional communication port definition

Please refer to the following table for the specific PIN assignments.



Wall box			
Pin	**Colour**	**Connection**	**Function**
1	Orange/White	Wall box RS485 A	Wall box RS485 differential signal+
2	Orange	Wall box RS485 B	Wall box RS485 differential signal–

Meter/CT			
Pin	**Colour**	**Connection**	**Function**
1	Orange/White	Meter RS485 A	Meter RS485 differential signal+
2	Orange	Meter RS485 B	Meter RS485 differential signal–
3	Green/White	CT A+	CT A differential signal+
4	Blue	CT B+	CT B differential signal+
5	Blue/White	CT B–	CT B differential signal–
6	Green	CT A–	CT A differential signal–
7	Brown/White	CT C+	CT C differential signal+
8	Brown	CT C–	CT C differential signal–

DRMs			
Pin	**Colour**	**Connection**	**Function**
1	Orange/White	DRM1/5	DRM1/5
2	Orange	DRM2/6	DRM2/6
3	Green/White	DRM3/7	DRM3/7
4	Blue	DRM4/8	DRM4/8
5	Blue/White	GND	GND
6	Green	DRM0	DRM0
7	Brown/White	/	Internally shorted
8	Brown	/	

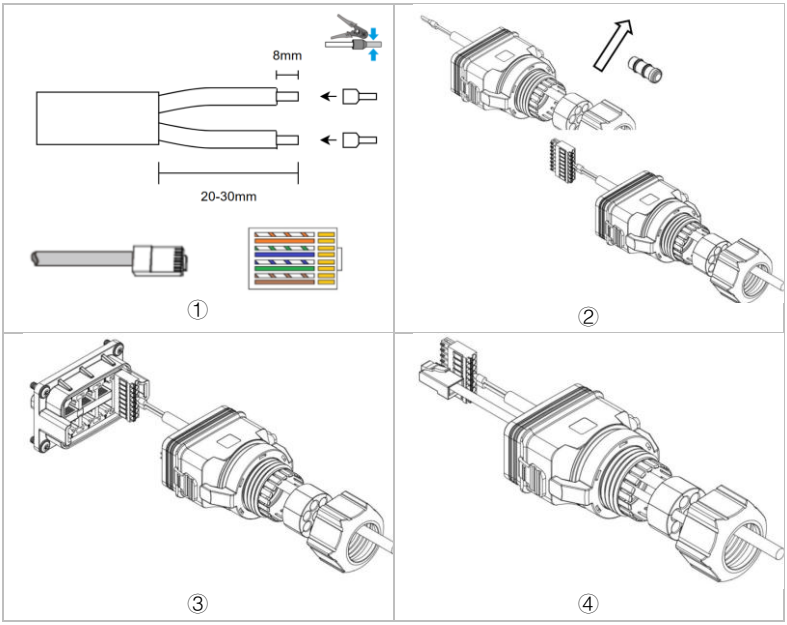
Link0 and Link1			
Pin	**Colour**	**Connection**	**Function**
1	Orange/White	RS485 A	Upper computer RS485A
2	Orange	RS485 B	Upper computer RS485B
3	Green/White	SYN_GND	Synchronising signal GND
4	Blue	CANH	CAN high data
5	Blue/White	CANL	CAN low data
6	Green	IN_SYN0	Synchronising signal 0
7	Brown/White	IN_SYN1	Synchronising signal 1
8	Brown	IN_SYN2	Synchronising signal 2

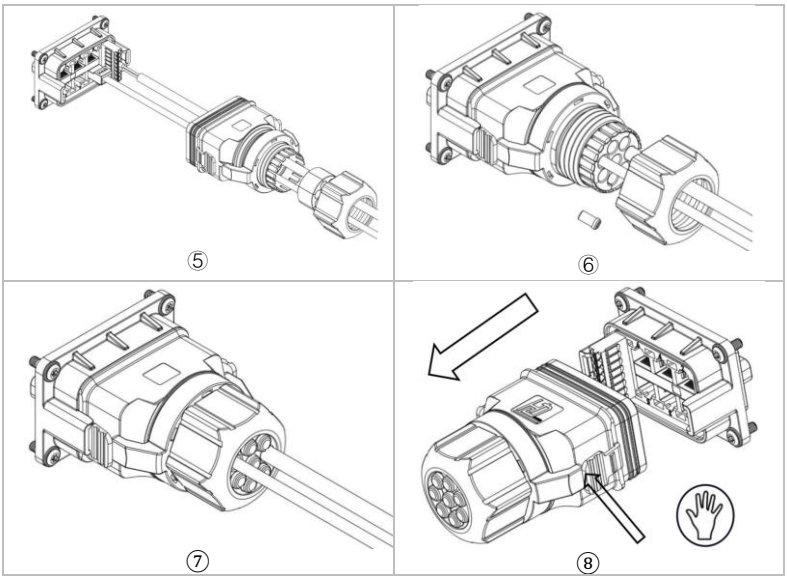
Dry & Wet Contact			
PIN	**Ports**	**Connection**	**Function**
1	E-STOP	DI NO	Use for Emergency STOP (If ENABLE) DI NO connects with DI COM: RUN DI NO disconnects with DI COM: STOP More details please refer to **4.18.7**
2		DI COM	
3	SG-0	DO1 NO	It can be controlled through the LCD. More details please refer to **4.18.8**
4		DO1 COM	
5	SG-1	WO1 NO	
6		WO1 COM	
7	ATS/12V	WO2 NO	It can be controlled through the LCD. More details please refer to **4.18.9**
8		WO2 COM	

▶ Ethernet function and wall box function are reserved.

5.8.2 Connecting the multifunctional communication cable

1. Prepare a RJ45 cable or outdoor shielded twisted pair cable according to the length of the connector and remove the outer layer using wire stripper.
2. Remove the rubber plugs from the COM connector and pull out the correct number of plugs according to the desired function.
3. After removing the stopper, pass the cable through the connector gland, connector clip and connector through-hole. Crimp the cable to the terminal connector in the colour shown below.
4. After assembling the connectors in order, insert the connector into the corresponding terminal of the COM port.
5. Locking the connector housing to inverter COM port.

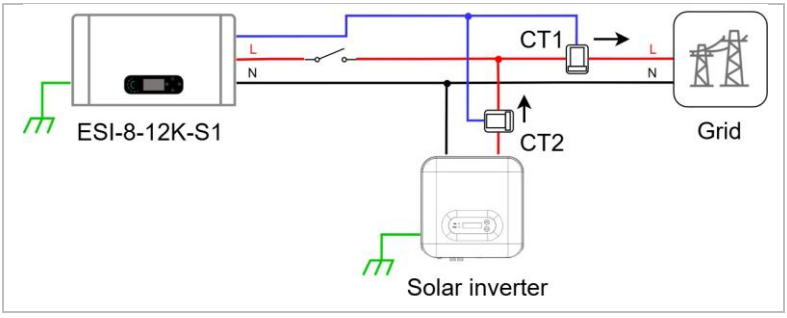




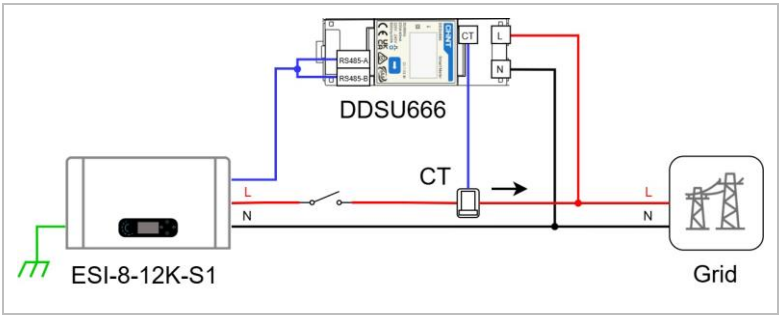
5.8.3 Smart meter/CT

The integrated energy management functions integrated in the ESI 8...12K-S1 require measuring the power flow at the point of grid interconnection. Different system configurations are possible. There are two system configurations:

- System A: direct measurement of energy with two CTs (3,000:1) – Default configuration.

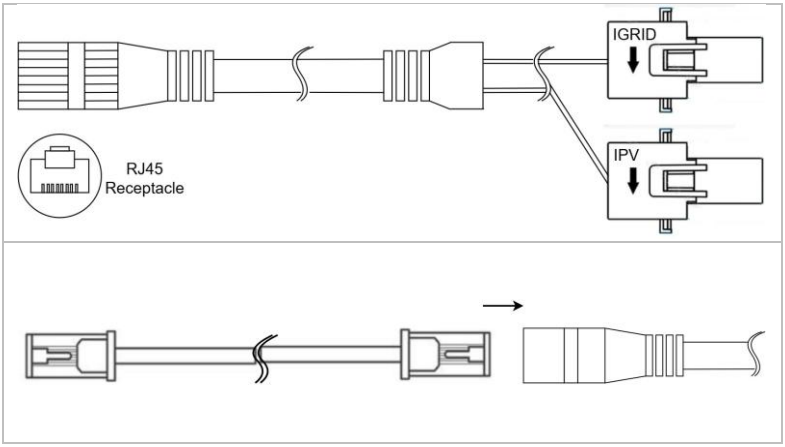


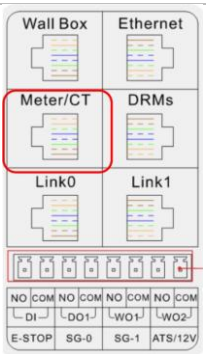
- System B: measurement of energy with smart meter (with one CT).



Inverter and two CTs connection

NOTICE
▶ Keep away from power cables and other electric fields.





Smart meter and inverter connection

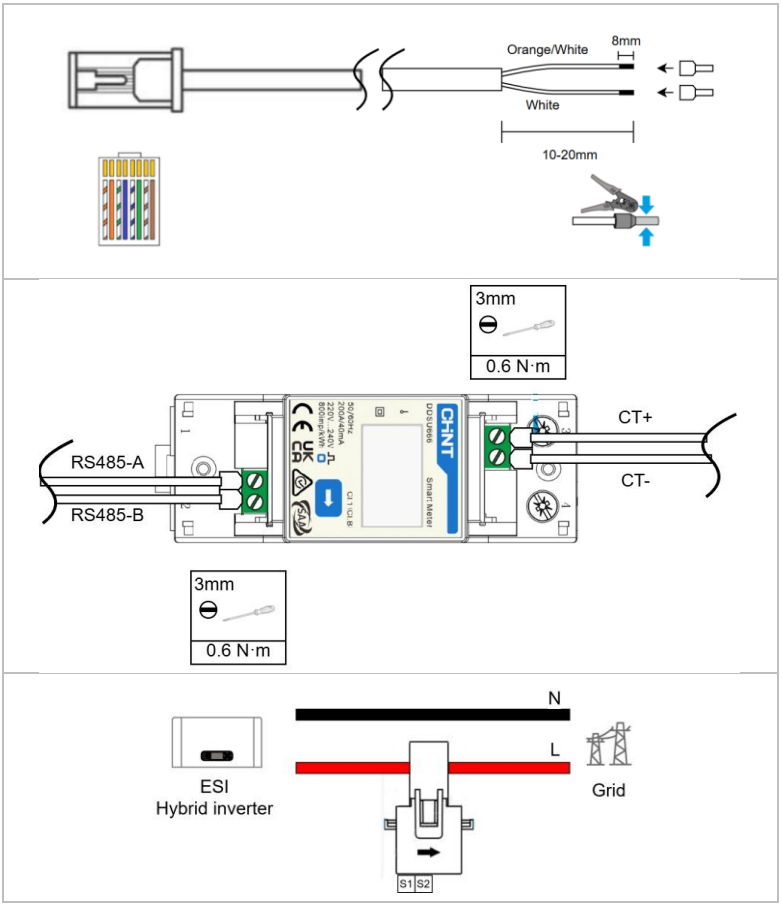
NOTICE
▶ The smart meter shows a positive power value for feed-in to the grid and a negative value for energy purchase from the grid. ▶ Keep away from power cables and other electric fields. ▶ Use terminating resistors at the ends of the RS485 line to improve signal quality.

The pin assignment for the RS485 connection between the inverter and smart meter can be found in the table below.

Inverter COM port pin	Function	Meter pin
Meter/CT PIN1	Meter RS485 A	Pin 24
Meter/CT PIN2	Meter RS485 B	Pin 25

The pin assignment for the CT connection between the CT and smart meter can be found in the table below.

CT	Function	Meter pin
S1	CT+	Pin 9
S2	CT-	Pin 10



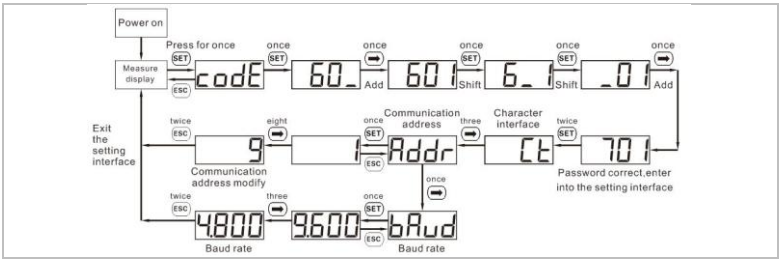
Smart meter configuration

The smart meter is pre-configured to be used with the inverter with these settings:

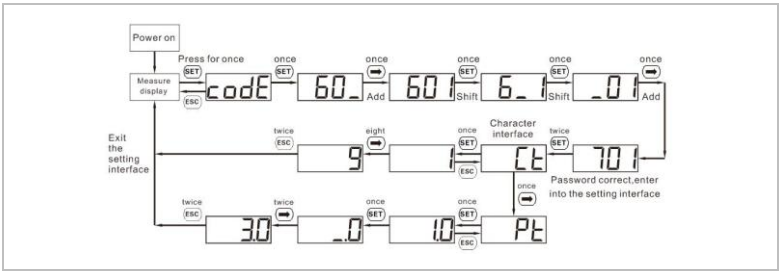
- Modbus address: 1
- Baud rate: 9,600
- Current ratio:3000:1

In case you want to change or check the settings, please refer to the procedure below:

Modbus address and baud rate setting



Current ratio setting



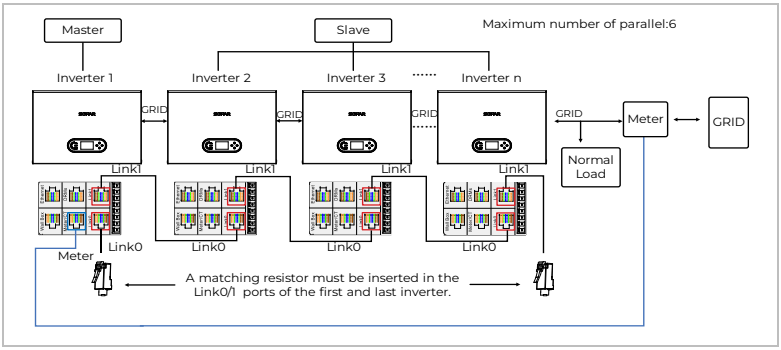
5.8.4 Parallel port

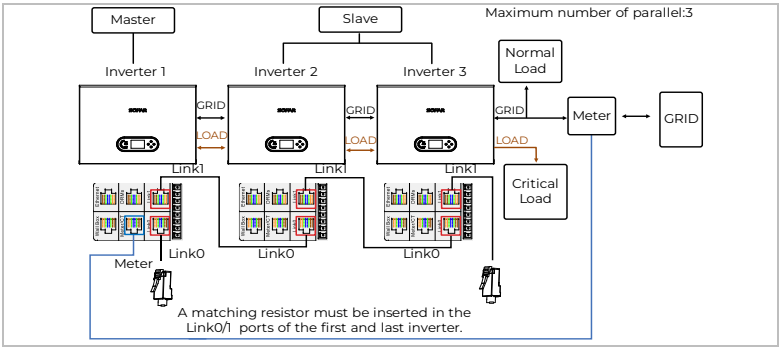
In systems with multiple inverters, you can connect the devices in a master/slave configuration. In this configuration, only one energy meter is connected to the master inverter for system control.

The inverter has not been tested to AS/NZS 4777.2:2020 for multiple inverter combinations and/or multiple phase inverter combinations so combinations should not be used or external devices should be used in accordance with the requirements of AS/NZS 4777.1

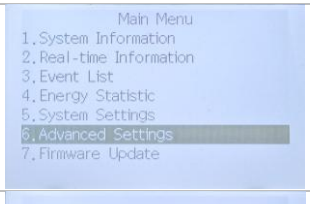
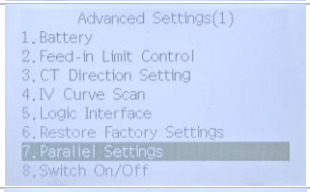
NOTICE
▶ In **off-grid mode**, a maximum of three inverters can be connected in parallel. ▶ In **on-grid mode**, a maximum of six inverters can be connected in parallel.

- In the parallel operating mode, emergency power supply, generator mode and unbalanced support need to be turned off remotely first. The settings for the slave units must be made on the master machine after remote shutdown.
- Be careful when the parallel inverters are connected; the communication cable should not be bundled with the power cable (GRID – BACKUP) in one cable channel or be very close to it, as it may cause abnormal faults in the parallel system. It is preferable to pass the communications cables through a separate cable channel.





Parallel setting

	**Select Advanced Settings.**
	Enter the password 0715.
	Select Parallel Settings.
	**Master inverter** Select inverter 1. Switch the parallel control from disabled to enabled. The default state of inverter 1 is that it is in master mode.
	**Slave inverters** Configure inverters 2 to n in sequence based on the number of parallel units. The maximum number of parallel units for a Single-phase ESI inverter is six. Set parallel address from 2 to 6 for slave inverter.

5.8.5 DRMs/logic interface

The DRMs/logic interface is used to control the inverters feed-in or purchase of power by external signals, usually provided from grid operators with ripple control receivers or other means. DRM0 can be used for a switch-off signal from external grid protection devices.

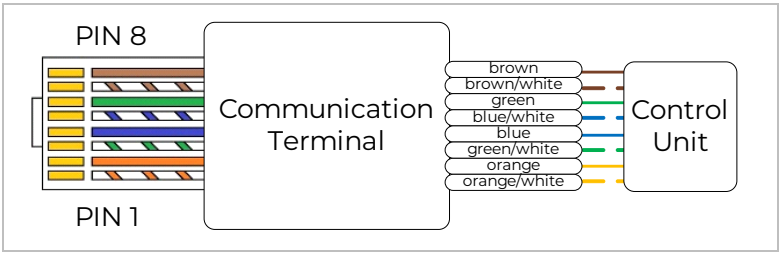
The logical interface pins are defined according to the requirements of different standards. Please connect according to the safety requirements of your country (see below for a brief description of the safety requirements).

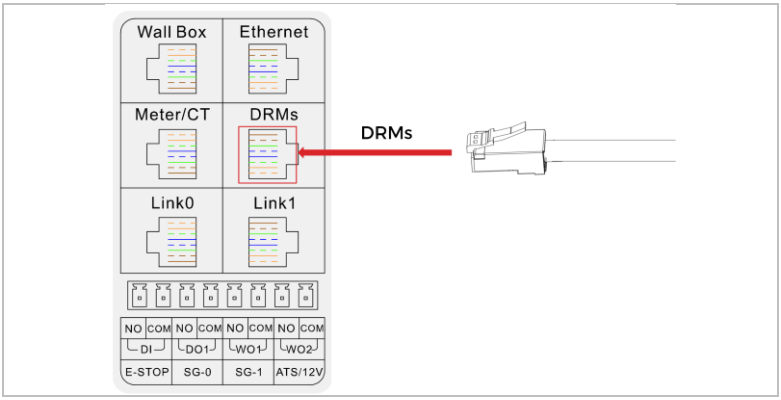
Enable the function using the LCD

Main Menu → Advanced Settings → (Passwords: 0715) → Logic Interface → DRM0/DRMn → Enable/Disable

▶ DRMs/logic interface connection

1. Connect the DRMs port cable to the COM port of the control unit in accordance with the wire sequence required by the safety regulations.
2. Connect the RJ45 terminal on the other end of the COM connector to the DRMs port.

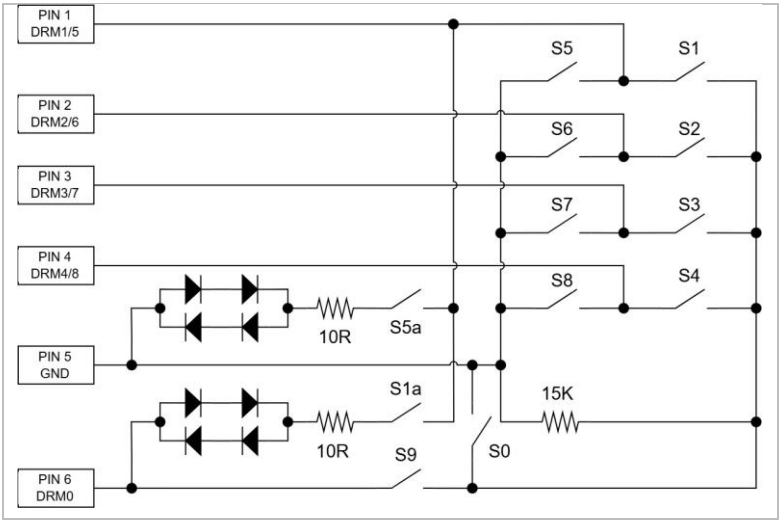




- **DRMs for AS/NZS 4777.2:2015 and AS/NZS 4777.2:2020**

Also known as inverter Demand Response Modes (DRMs).

The inverter detects all supported demand response commands and initiates the reaction within two seconds. The inverter will continue to respond while the mode remains asserted.



Mode	Real current limit (referenced to inverter rated per phase current)	Asserted by shorting pins	
DRM0	Shutdown	5	6
DRM1	Import = 0	1	6
DRM2	Import < 50%	2	6
DRM3	Import < 75%	3	6
DRM4	100%	4	6
DRM5	Generate = 0	1	5
DRM6	Generate < 50%	2	5
DRM7	Generate < 75%	3	5
DRM8	100%	4	5

Note: The inverter only shutdown in DRM0 mode. In DRM1~4 mode, the inverter will limit the power import from the grid. In DRM5~8 mode, the inverter will limit the power generate to the grid

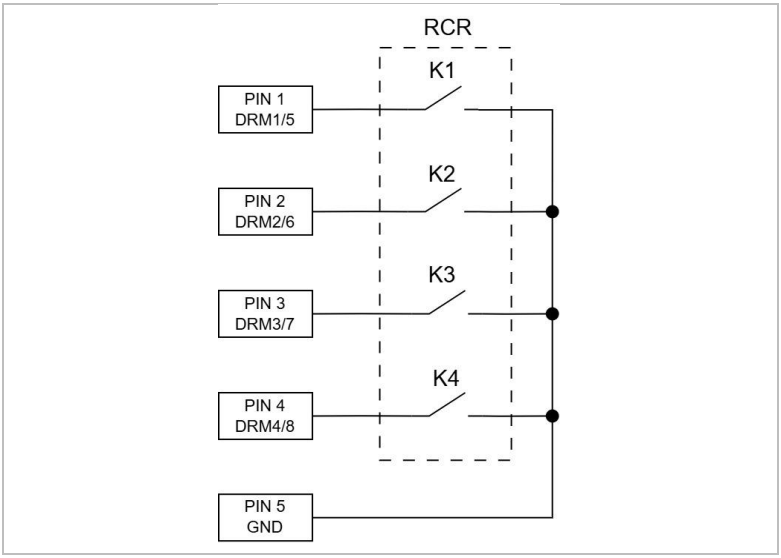
This function is disabled by default. If you are certain that this function needs to be enabled, please refer to the safety requirements of your country. Otherwise, the inverter may not operate as expected.

LCD configuration: DRM0=Enable, DRMn=Enable.

- **Logic interface for VDE-AR-N 4105:2018-11**

This function serves to control and/or limit the output power of the inverter. The inverter can be connected to a radio ripple control receiver in order to dynamically limit the output power of all inverters within the system.

RCR: Ripple control receiver is an interface between a PV system and power grid company.



The inverter is preconfigured on the following power levels:

No.	Parameter	Pre-configuration Power Limit
1	K1 operate	0%
2	K1 operate	30%
3	K1 operate	60%
4	K1 operate	100%

Note:

When using this function on your own, make sure that the normally open relay is disconnected before use and provide the drive signal for the relay on your own.

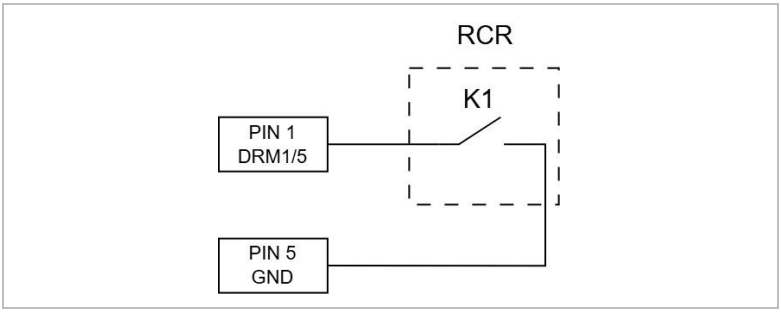
Priority: No.1 > No.2 > No.3 > No.4

Customized limits with SOFAR Cloud/SOFAR APP.

LCD configuration: DRM0=Disable, DRMn=Enable.

- **Logic interface for EN50549-1:2019(Remote shutdown)**

Active power output can be ended within five seconds following a command to the input interface.



No.	Parameter	Pre-configuration Power Limit
1	K1 operate	0%
2	K1 operate	30%
3	K1 operate	60%
4	K1 operate	100%

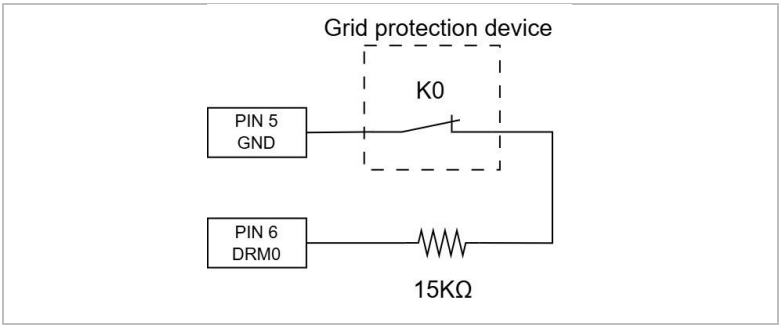
Note:

Customized limits with SOFAR Cloud/SOFAR APP.

LCD configuration: DRM0=Disable, DRMn=Enable.

- **Logic interface for EN50549-1:2019/ VDE-AR-N 4105:2018-11 DRM0 Shutdown**

Integrated coupling switch that can also be used in conjunction with a central NS protection in accordance with (VDE-AR-N 4105:2018-11, §6.4.1).

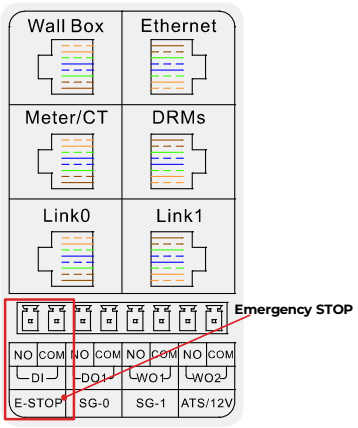


5.8.6 Emergency STOP

The ESI-8-12K-S1 has Emergency STOP function. To enable this function, please refer to the following steps:

Emergency STOP connection

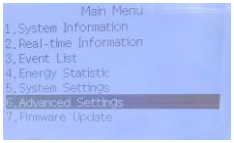
DI NO and DI COM are used for Emergency STOP.

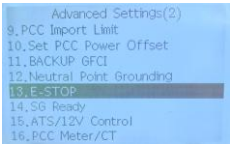


Function setting

Enable the function using the LCD:

Main Menu → Advanced Settings → (Passwords: 0715) → E-STOP → Enable







DI NO connects with DI COM: RUN

DI NO disconnects with DI COM: STOP

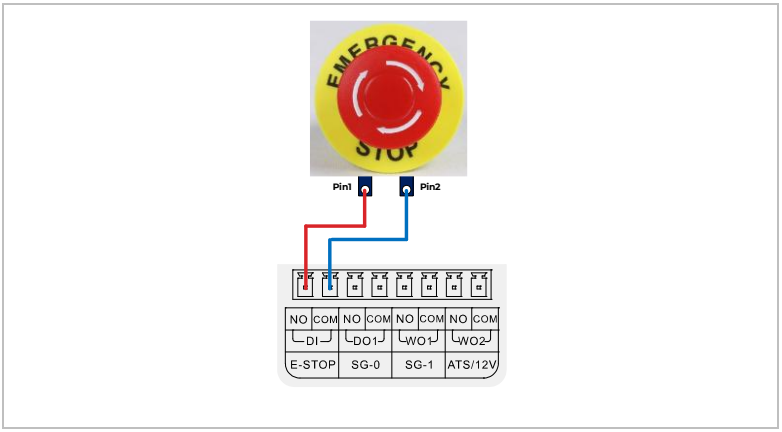
Application example

Normal work:

Pin1(DI NO) is connected with Pin2(DI COM) by the button.

Emergency STOP:

PUSH the button. Pin1(DI NO) disconnects with Pin2(DI COM). The inverter will stop working.



5.8.7 SG-0 & SG-1

Based on the different settings, they can serve as signals to control the load or diesel generator.

Grid port	SG-0(DO1) Function	SG-1(WO1) Function
GRID or Gen Manual	Load control signal	Load control signal
GEN Auto	Diesel generator control signal	Load control signal

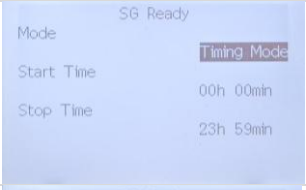
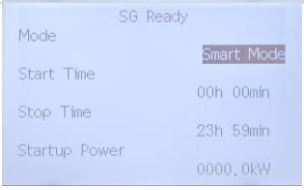
Configure the function using the LCD:

Main Menu → System Settings → Device Port Management → GRID

Mode	LCD	Description
GRID		Grid port is configured as power grid.
GEN AUTO		Grid port is configured as diesel generator. The system automatically turns on or off the generator according to the battery SOC and rated power set by user
GEN MANUAL		Grid port is configured as diesel generator. Please set the rated power correctly. Users need to turn on or off the generator manually.

Main Menu → Advanced Settings → (Passwords: 0715) → SG Ready → Stop/Start/Timing Mode/Smart Mode

Mode	LCD	Description
Stop		Default setting. DO1 NO disconnects with DO1 COM WO1 NO disconnects with WO1 COM and no voltage output
Start		DO1 NO connects with DO1 COM WO1 NO outputs +12V(WO1 COM is the GND)

Mode	LCD	Description
Timing Mode		Set the start time and stop time, turn on the smart load within the start time range and turn off the smart load outside the start time range.
Smart Mode		Set the start time and stop time in the start time range. generating power - load power > startup power (hysteresis loop parameter reservation can be set), last for 5 minutes to turn on the intelligent load; load power - generating power > startup power, last for 1 minute to turn off the intelligent load.

5.8.8 ATS/12V

This signal can distinguish whether the inverter is working in off-grid mode.

Control the function using the LCD:

Main Menu → Advanced Settings → (Passwords: 0715) →ATS/12V Control → Disable/Off-grid: 12V Turn On/Off-grid: 12V Turn Off

Mode	Description
Disable	WO2_NO maintains no voltage output regardless of whether the inverter is working in off-grid mode or not.
Off-grid: 12V Turn On	When the inverter is working in off-grid mode → WO2_NO outputs +12V(WO2 COM is the GND) When the inverter is **NOT** working in off-grid mode → WO2_NO maintains no voltage output.
Off-grid: 12V Turn Off	When the inverter is working in off-grid mode → WO2_NO maintains no voltage output.

Mode	Description
	When the inverter is **NOT** working in off-grid mode → WO2_NO outputs +12V(WO2 COM is the GND)

5.9 System monitoring

ESI-8-12K-S1 inverters provide various communication methods for system monitoring:

RS485 or WiFi stick (standard).

5.9.1 RS485

You can connect RS485-linked devices to your PC or a data logger using an RS485 USB adapter.

Assign each inverter its own Modbus address (1 to 31) via the LCD display.

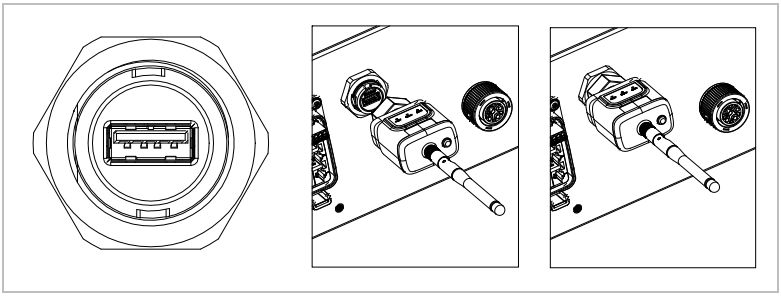
Link0 and Link1			
Pin	**Colour**	**Connection**	**Function**
1	Orange/White	RS485 A	Upper computer RS485A
2	Orange	RS485 B	Upper computer RS485B

5.9.2 WiFi/4G

When you have installed the stick logger, the inverters can directly upload your operating, energy and alarm data in the SofarCloud monitoring portal.

5.10 Installation of WiFi

1. Remove the protective cap from the USB interface.
2. Install the stick logger.
3. Tighten the connecting nut.



5.10.1 Configuration of the stick logger via the web browser

Preparation: The stick logger is installed in accordance with the previous section, and the SOFAR inverter must be in operation.

- ▶ WiFi network must support 2.4 GHz mode. WiFi stick logger does not support the 5 GHz network!
- ▶ The stick loggers use outgoing TCP port 10000. In case your router has limited ports, please expand it for the stick logger.

Carry out the following steps in order to configure the stick logger:

1. Connect your PC or smartphone with the WiFi network of the WiFi stick. The name of this WiFi network is "AP", followed by the serial number of the WiFi stick (see rating plate). When you are prompted for a password, you can find it on the label of the WiFi stick (PWD).
2. Open an Internet browser and enter the address **10.10.100.254**.
3. Enter the username and password, which are both set to "**admin**" by default. The "Status" page will be opened.
4. Click the "Wizard" in order to configure the WiFi stick for Internet access.

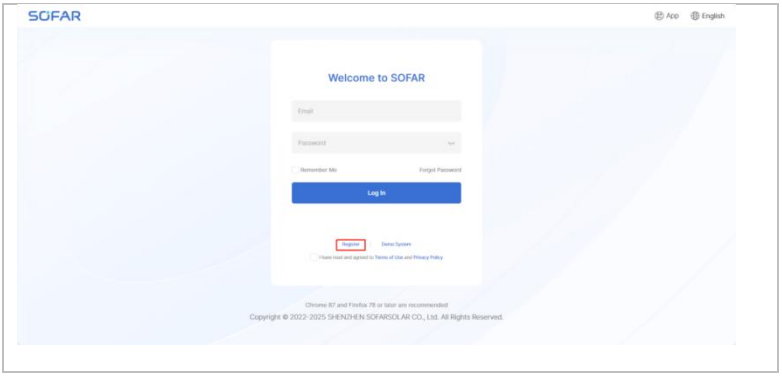
Result: The WiFi stick begins to send data to SofarCloud.

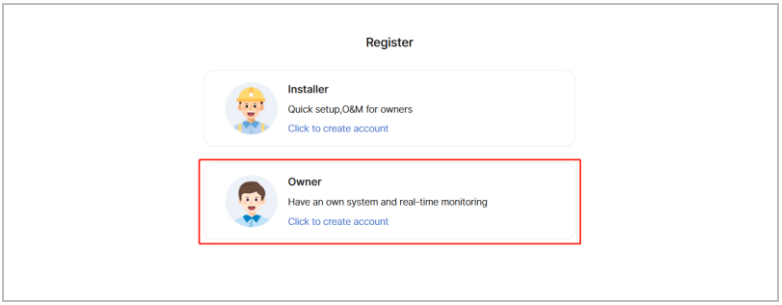
If you have never registered an account in the management system, you can register it using the Installer Registration function. Registering the first installer user also enrols a company.

Registration

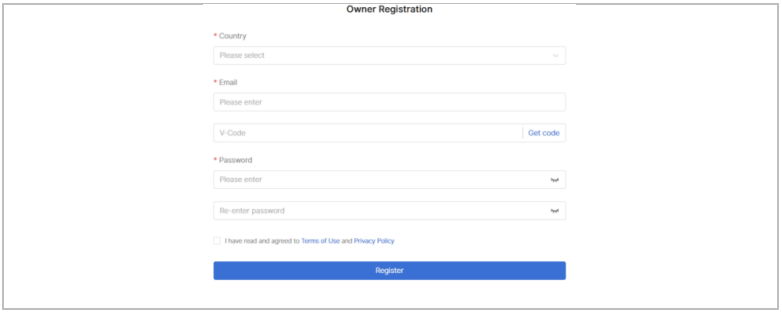
1.Open a web browser, enter https://eu.sofarcloud.com in the address box and press **Enter**. The login page is displayed.

2.Click **Register**. The **Registration** page is displayed.





3.Sign up as an owner as prompted.



5.10.2 Setting up the stick logger with the app

To download the app, search for "SofarCloud" in the Apple or Google Play Store, or use the following QR codes:

SofarCloud (for end customers):

Scan the QR code on the inverter using the app or connect the inverter with Bluetooth to set the inverter data.

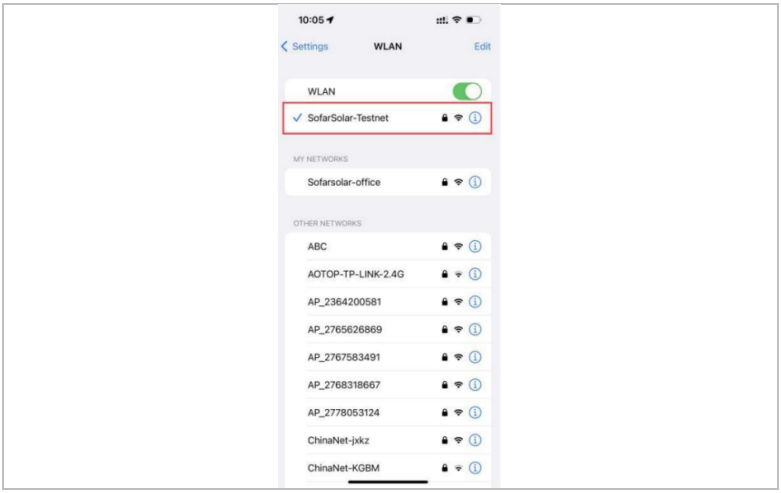
If Bluetooth connection fails repeatedly, please contact SOFAR. For additional app permissions like firmware upgrade or safety settings, please contact your local SOFAR service location.

Configuration steps

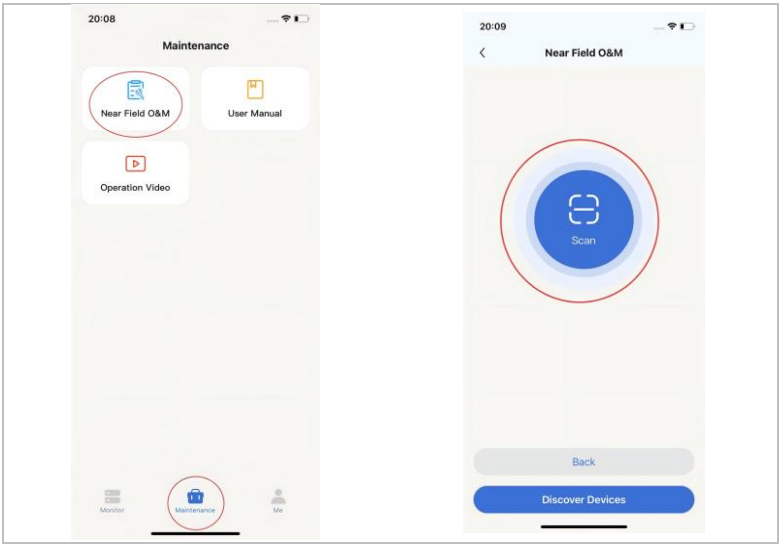
1. After starting the app, register as a new user or enter the current SofarCloud access data.
2. Create a new system and save the system data.
3. Scan the barcode of the stick logger to assign an inverter to the system.
4. Go to the newly created system in order to configure the stick logger (device/logger).
5. Press the button on the stick logger for 1 second to activate the WPS mode of the stick so that the smartphone can be connected to the stick logger.
6. Now select your local WiFi network for Internet access and enter your WiFi password.
7. The stick logger is configured with the access data.

WiFi logger configuration network

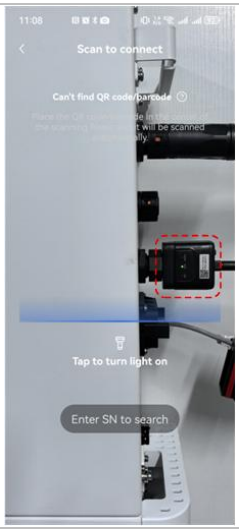
Step 1 Connect yout phone to the WiFi, but it should be noted that the WiFi needs to be the same as the WiFi that the logger is connected to.



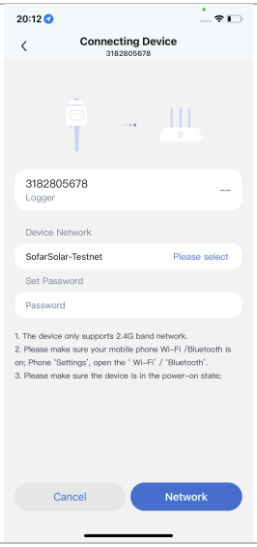
Step 2 Open SofarCloud, go to "Maintenance" and click "Near Field O&M", go to "Near Field O&M" and click "Scan".

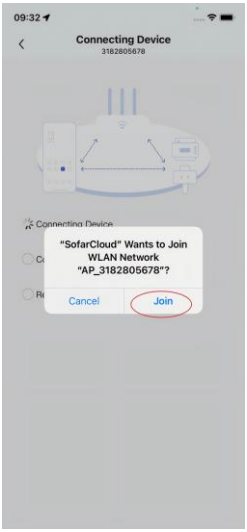


Step 3 The app aligns the QR code of the logger and scans it.

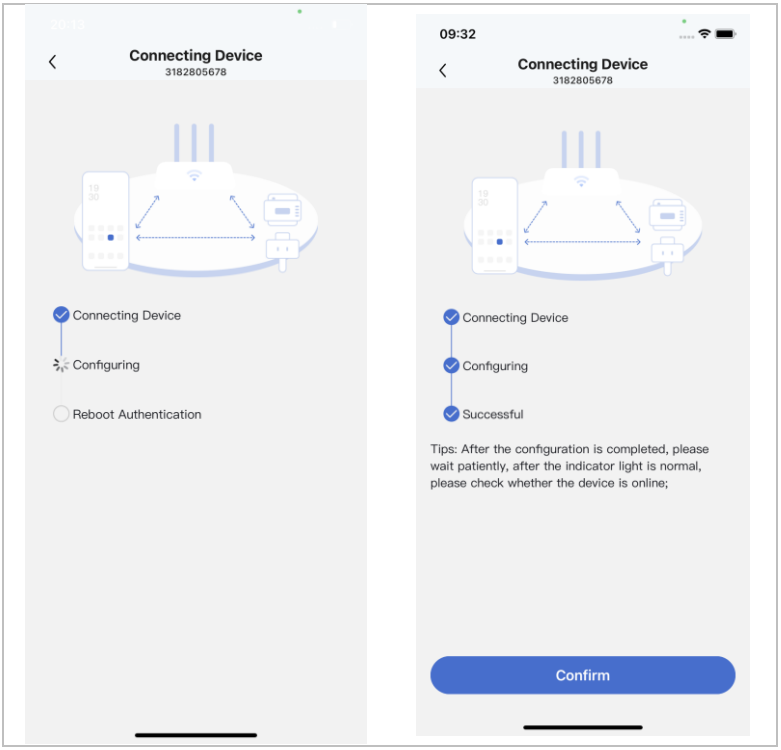


Step 4 Select Device Network and enter the WiFi password manually,click "Network" and click "Join".





Step 5 Wait for the app to connect to the stick logger. After successful configuration, wait for about 5 minutes for SofarCloud to have the data reported.



Stick logger status

The LEDs on the stick logger provide information regarding the status:

LED	Status	Description
NET	Communication with router	On: Connection to server successful
		Flashing (1 sec): Connection to router successful
		Flashing (0.1 sec): WPS mode active
		Off: No connection to router
COM	Communication with inverter	Flashing (1 sec): Communication with inverter

LED	Status	Description
		On: Logger connected to inverter
		Off: No connection to inverter
READY	Logger status	Flashing (1 sec): Normal status
		Flashing (0.1 sec): Reset in progress
		Off: Error status

Reset button

Push duration	Description
1 sec	WPS mode
5 sec	Restart
10 sec	Restart (reset)

6 System Commissioning

6.1 Double checking

Please ensure that the inverter and all wiring are installed correctly, securely and reliably and that all environmental requirements are met.

1. Inverter is firmly fastened to the wall.
2. PV+/PV– wires are firmly connected, and polarity and voltage are correct.
3. BAT+/BAT– wires are firmly connected, and polarity and voltage are correct.
4. GRID/BACKUP cables are securely/correctly connected.
5. AC circuit breaker is correctly connected between inverter GRID port & GRID, and circuit breaker is OFF.
6. AC circuit breaker is correctly connected between inverter BACKUP port & critical load, and circuit breaker is OFF.
7. Battery communication cable has been correctly connected.

6.2 System Power-On

Please follow the steps below to switch the inverter ON.

1. Make sure there is no power generation in inverter from grid.
2. (Optional) Remove the lock from DC switch.
3. Turn DC switch ON.
4. Switch the battery ON.
5. Turn AC circuit breaker between the inverter GRID port & GRID ON.
6. Turn AC circuit breaker between the inverter BACKUP port & critical load ON.
7. Inverter should start to operate now.

6.3 Initial setup

6.3.1 Configuring the inverter setup

You need to set the following parameters before the inverter will start to operate.

Parameter	Note
1.Language setting	The default is English
2.System time setting	If you are connected to the server or using the app, the time is set to the local time automatically
3.Safety parameter import	Refer to the grid code table and select the grid code
4.Application scenario setting	According to the user application scenario configuration, set the parameters of the PV port, BAT port, GRID port and BACKUP port
5.Work mode setting	Set different working modes, configure parameters for different working modes (Self-use, Feed-in Priority, Peak Shaving, Time-of-use, Passive) and set battery energy storage parameters (Charge Limit SOC, On-grid Discharge Limit SOC, Off-grid Discharge Limit SOC, Off-grid Recovery Discharge SOC).

The default operating mode is Self-use mode.

6.3.2 Check or change the GRID code

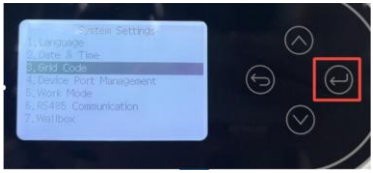
You can check or change the GRID code through the LCD screen:

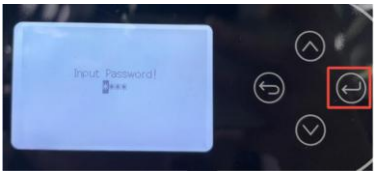
Main Menu → System Settings → Grid Code → Password xxxx → Confirm

- Different distribution network operators in various countries have differing requirements for the grid connection of grid-coupled PV inverters.
- Ensure that you have selected the correct country code according to the requirements of the regional authorities and consult a qualified electrician or employees of electrical safety authorities.
- SOFAR is not responsible for the consequences of selecting an incorrect country code.

- The selected country code defines the grid compliance limits.
- The inverter monitors these limits continuously and will disconnect from the grid if they are violated. Users are not able to change the grid compliance limits.
- The end users is allowed to view the country, grid code, and Safety version. Specific parameters are not displayed. The user access permissions are formally defined under Section 4.5.1.2 of Sofar Cloud User Manual.

The figure below shows an operation example.

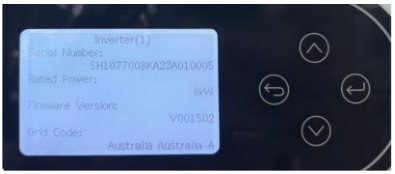
 ①	1. Click the left button to enter the main menu interface
 ②	2. Click the down button until you reach "Grid Code", then click the right button to enter.
 ③	3. Enter the password XXXX

   ④	4. Click the right button to access the menu, where you can you can check or change the "Grid code"

6.3.3 Check the inverter firmware version

The current firmware version of the inverter can be viewed on the LCD screen by performing the following steps.

 ①	1. Click the left button to enter the main menu interface

 ②	2. Click the right button to enter the system information interface.
  ③	3. Click the right button to enter the inverter information interface, where you can view the firmware version information.

6.3.4 Configuring parallel inverter system

Connect all the Grid ports of the ESI-8-12K-S1 inverters in parallel, and connect all the Backup ports in parallel as well.

For communication setup, please follow the following steps:

1.Set the master unit

2.Set the slave units

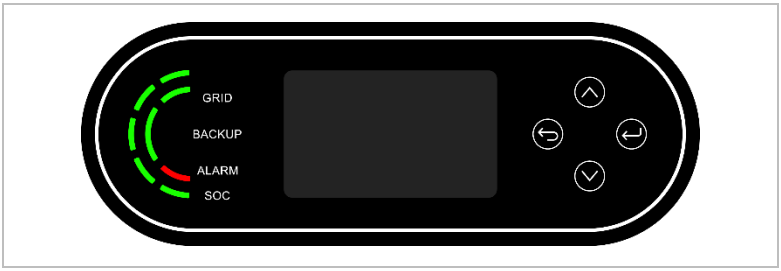
Each inverter must have a unique parallel address.

6.4 Operation of the device

This chapter describes the LCD and LED displays of the ESI-8-12K-S1 inverter.

6.4.1 Control panel and display field

6.4.1.1 Buttons and display lights



Buttons

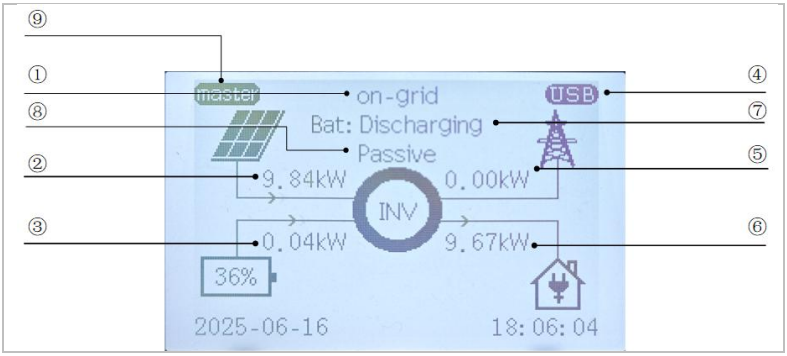
Button	Name	Description
	Back	Previous screen, enter menu
	Up	Select previous menu item, increase setting value
	Down	Select next menu item, decrease setting value
	Enter	Enter menu item, select next digit, confirm setting

LEDs

State	Colour	State
On-grid	Green	Normal
	Green (flashing)	Standby
Off-grid	Green	Normal
	Green (flashing)	Standby
Alarm	Red	Error

6.4.2 Standard display

The screen shows all relevant information of the inverter:



① **Current status of the inverter**	Used to display the current working status of the inverter, including grid-connected, off-grid and standby.	
② **PV power**	For displaying photovoltaic power.	
③ **Battery power**	For displaying BAT charge or discharge power. There is no battery marking here if a battery is not connected.	
④ **Accessory**		This is used to display the accessories currently connected to the inverter, including the stick logger, USB flash drive and smart meter.
⑤ **Grid power**	Power flowing into or out of the grid.	
⑥ **Home consumption**	Energy consumed by household loads.	
⑦ **PV channel enable status and battery status**	Cyclical display of the PV channel enable status and battery status (charging or discharging)	
⑧ **Work mode**	Displays the current operating mode of the inverter.	
⑨ **Master/slave state**		Used to connect multiple inverters in parallel, indicating whether the current inverter is in the master or slave position.

6.4.3 Work modes

The ESI-8-12K-S1 comes with several integrated energy management modes.

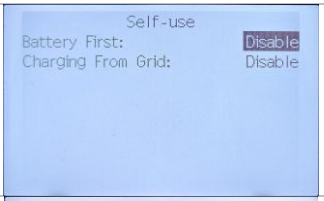
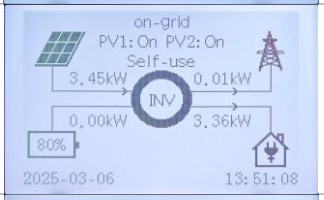
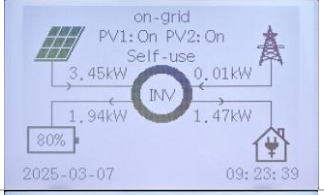
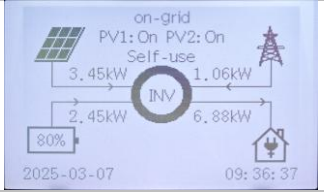
NOTICE
To move to the Work mode setting ▶ Go to **Main menu** → System Settings → Work Mode

6.4.3.1 Self-use mode

In Self-use mode, the inverter will automatically charge and discharge the battery according to the following rules:

Setting method 1: Battery First: Disabled; **Charging From Grid**: Disabled

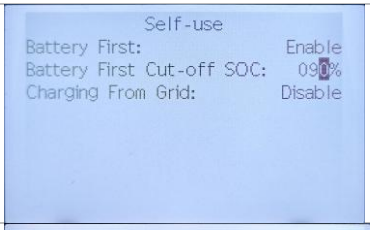
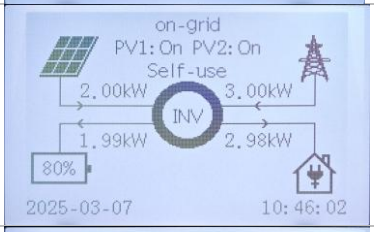
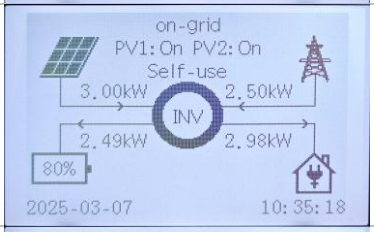
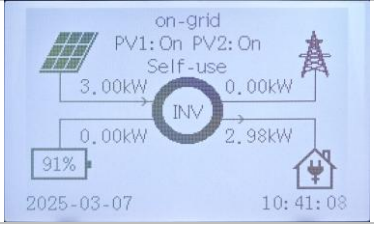
Priority of power supply: PV, battery, grid. Priority of power consumption: loads, battery, grid.

	**Set Self-use mode 1**
	If PV generation equals the load consumption (ΔP < 100 W), the inverter will not charge or discharge the battery.
	If PV generation is larger than the load consumption, the surplus power is stored in the battery.
	If the battery is full or at maximum charging power, the excess power will be exported to the grid.
	If PV generation is less than the load consumption, it will discharge the battery to supply power to the load.
	If PV generation plus battery discharge power is less than the load, the inverter will import power from the grid.

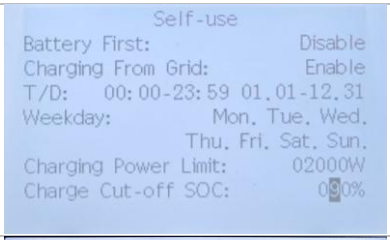
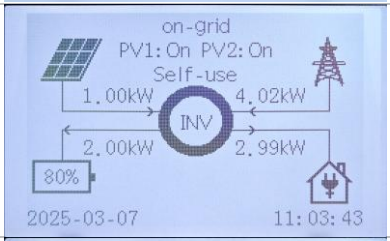
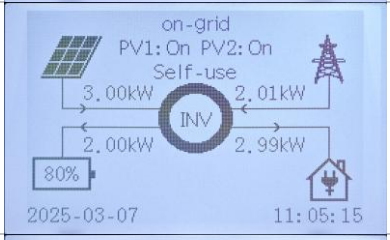
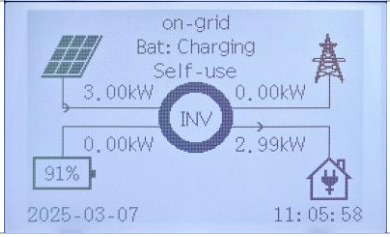
NOTICE
▶ If you are not allowed to export power to the grid, an energy meter and/or CT needs to be installed and the "feed-in limitation" function needs to be enabled

Setting method 2: Battery First: Enabled, **Battery First Cut-off SOC:** 90%; **Charging From Grid**: Disabled.

Priority of power supply: PV, battery, grid. Priority of power consumption: loads, battery, grid.

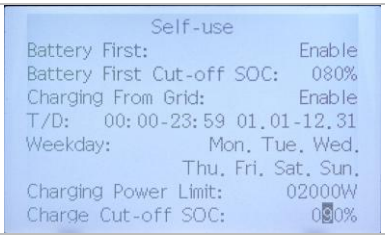
	**Set Self-use mode 2**
	If the PV power is less than or equal to the battery charging power and the battery SOC is less than 90%, the inverter prioritizes charging the battery and the grid supplies power to the household loads.
	If the PV generation power is greater than the battery charging power and the battery SOC is less than 90%, the inverter prioritizes charging the batteries and the remaining energy generated by the PV power is used with the grid to power the household loads.
	If the batteries continue to charge and the battery SOC reaches 90%, the inverter stops charging the batteries and all of the energy generated by the PV power is supplied to the household loads.

Setting method 3: Bat Priority Control: Disabled; **Import to Charge Battery:** Enabled. When the import battery charging enable is turned on, the user can set the specific charging time range, the maximum battery charging power and the maximum cut-off SOC for forced charging through the LCD.

	**Setting method 3**
	If the PV power is less than the battery charging power and the battery SOC is less than 90%, the inverter gives priority to charging the battery while taking power from the grid to charge the battery and the load power is provided by the grid.
	If the PV generation power is greater than the battery charging power and the battery SOC is less than 90%, the inverter prioritizes charging the batteries and the remaining energy generated by the PV power is used with the grid to power the household loads.
	If the batteries continue to charge and the battery SOC reaches 90%, the inverter stops charging the batteries and all of the energy generated by the PV power is supplied to the household loads.

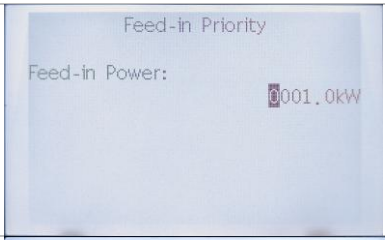
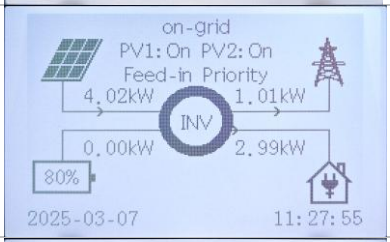
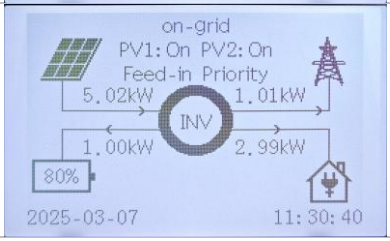
Setting method 4: Battery First: Enabled; **Charging From Grid:** Enabled.

In this mode, the Battery First and Battery First Cut-off SOC functions are active at the same time (see Setting method 2 and 3 for details).

	**Setting method 4**

6.4.3.2 Feed-in Priority mode

With Feed-in Priority mode, the user can set the maximum feeder power, which is used to generate the remaining energy after the PV power meets load consumption.

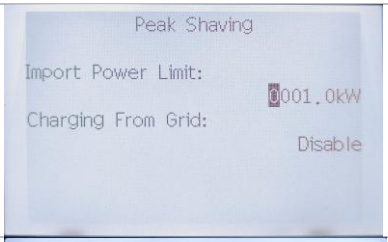
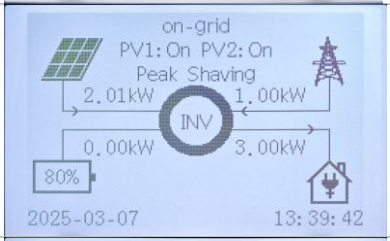
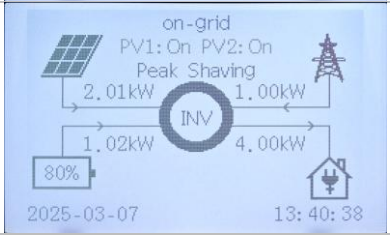
	**Feed-in Priority mode**
	In this mode, the user can set the maximum feed power. When the PV power minus the load consumption power is less than or equal to the feed power (for example, 1 kW), the excess energy generated by the PV power generation is delivered to the grid.
	In this mode, the user can set the maximum feed power. When the PV power minus the load consumption power is greater than the feed power (for example, 1 kW), the extra energy will be used to charge the battery.

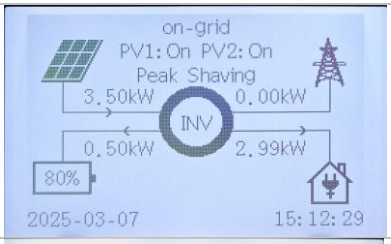
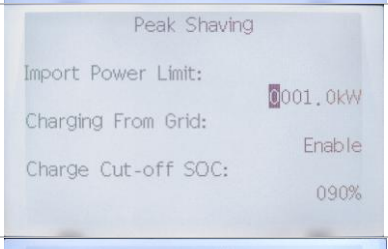
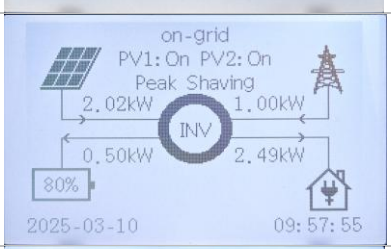
6.4.3.3 Peak Shaving mode

Used to limit the maximum power priority purchased from the grid. The maximum purchasing power can be set in this mode. When the system preferentially buys more power from the grid than the set value, the battery starts discharging and stabilises the system power at the set value.

Application:

Peak Shaving mode allows the grid to supply power to the load first. Applicable to the occasions where electricity price is charged according to electricity consumption and the occasions where the power grid is weak. In a weak grid situation, batteries only start when the load power exceeds a certain value, which reduces 000000 the maximum power of the connecting point and prolongs battery life0.

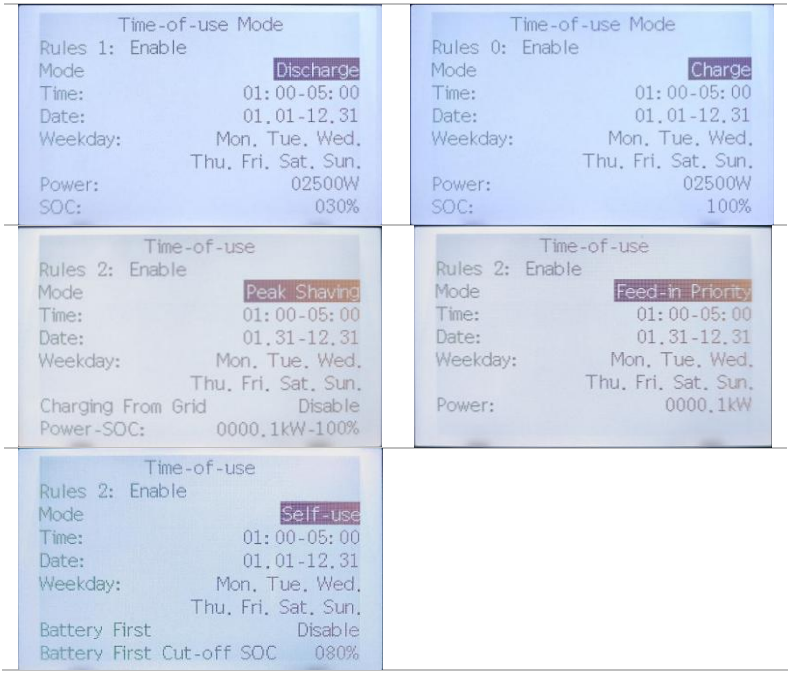
	**Charging From Grid：Disable**
	When the PV power is not enough to supply load consumption, the grid starts to supply power to the load and the maximum power taken from the grid does not exceed the priority import power.
	When the PV power and priority import power are also insufficient for supplying load consumption, the battery starts discharging to supply load consumption at the same time.

	When photovoltaic power generation is greater than the load consumption, the excess energy goes to charge the battery. When the battery SOC is greater than the set value, the excess energy flows to the power grid.
	**Charging From Grid：Enable**
	When "Charging From Grid" is enabled, there is not enough PV power to supply the load and the load consumes less than the import power limit, the grid starts to supply power, which is less than the import power limit setting.
	When the battery SOC is greater than the set value, the battery and the PV supply power to the load at the same time.

6.4.3.4 Time-of-use mode

In Time-of-use mode, the work modes that can be selected in the rule entries include Charge, Discharge, Self-use, Feed-in Priority and Peak Shaving.

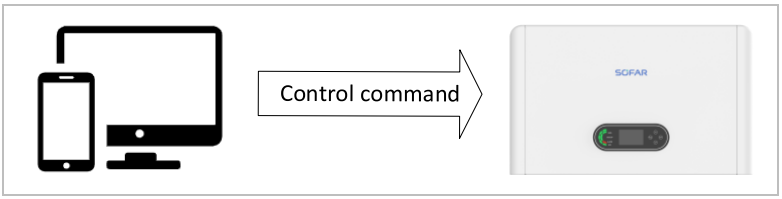
With Discharge or Charge mode, you can define fixed times of the day to charge or discharge the battery with a certain power level. For details on how to use the other modes, please refer to the corresponding mode descriptions in sections 6.4.3.1 through 6.4.3.5.



In the above Discharge/Charge example, Rule 0: the battery will be charged with 2.5 kW between 1 and 5 o'clock at night, and Rule1: discharged with 2.5 kW between 1 and 5 o'clock. In case of conflict between Rule 0 and Rule 1, Rule 0 takes precedence.

6.4.3.5 Passive mode

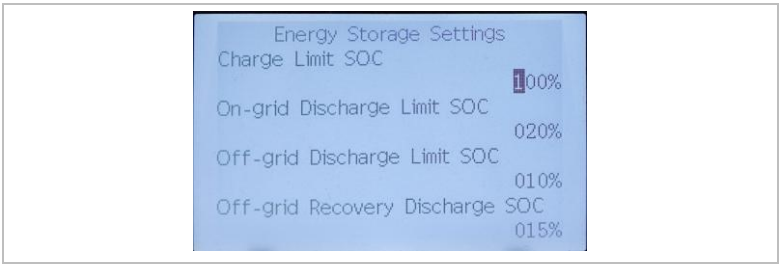
Passive mode is used in systems with external energy management systems. The inverter's operation will be controlled by the external controller using the Modbus RTU protocol. Please contact SOFAR if you need the Modbus protocol definition for this device.





6.4.3.6 Energy storage settings

In this interface, the user can set four battery charging and discharging states, Charge Limit SOC, On-grid Discharge Limit SOC, Off-grid Discharge Limit SOC, Off-grid Recovery Discharge SOC.



6.4.3.7 Feed-in limitation function

The feed-in limitation function is designed to restrict the power fed back into the grid. To enable this function, a power measurement device must be installed in accordance with the specifications of System A or B detailed in Section 5.8.3.

You can set this function through LCD:

Main Menu → Advanced Settings → Password 0715 → Feed-in Limit Control

Feed-in limitation Mode: You can choose to enable or disable the feed-in limit power function.

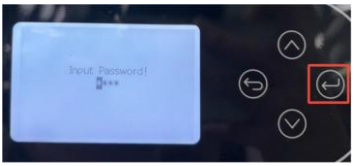
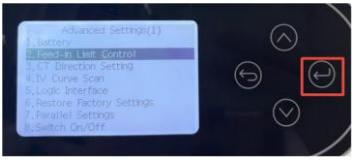
Feed-in Limit Power: The power output of the inverter to the grid must not exceed the set power limit value.

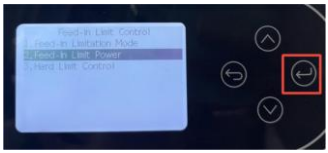
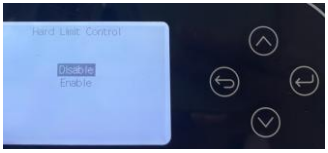
Hard Limit Control: The hard feed-in limit power depends on the selected grid code/region setting. For example, if Australian safety standards are selected, the hard feed-in limit power should not exceed the rated power of the inverter (e.g., for ESI-12K-S1, the feed-in power should not exceed 12 kW); otherwise, the inverter will shut down.

- If communication with the smart meter is interrupted, the inverter limits its output power to the set power limit value.

The figure below shows an operation example.

 ①	1. Click the left button to enter the main menu interface.

 ②	2. Click the down button until you reach “Advanced Settings", then click the right button to enter the “Input Password" interface.
 ③	3. Enter the password **0715** and then press the right button to access the “Advanced Settings (1)” interface.
 ④	4. Click the down button until you reach “Feed-in Limit Control”, then click the right button to enter.
 ⑤	5.Click the right button to enter “Feed-in Limitation Mode” option.

 ⑥	6. Select “Enable” option then click the right button to confirm. The screen will display “Success” and will then automatically return to the previous interface.
  ⑦	7. Click the down button until you reach “Feed-in Limit Power”, then click the right button to enter the power setting.
  ⑧	8. If you need to enable the “Hard Limit Control” function, first, you can click the down button until you reach it, then click the right button to enter the setting page.

6.4.3.8 Generation limit control

The generation limit control function provides control of the active power output level of an inverter.

You can set this function through LCD:

Main Menu → Advanced Settings → Password 0715 → Generation Limit Control

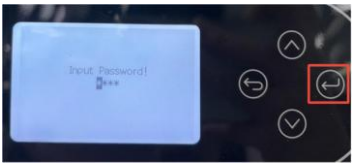
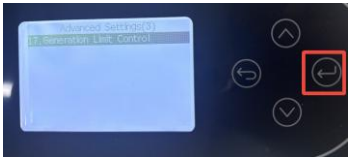
Generation limitation Mode: You can choose to enable or disable the Generation limit power function.

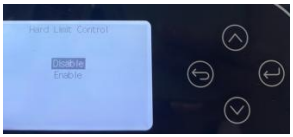
Generation Limit Power: The power output of the inverter to the grid must not exceed the set power limit value.

Hard Limit Control: When the hard limit is exceeded for a duration of 15 seconds, the power generation limit control function will be activated and the inverter will be disconnected within 5 seconds, or each inverter in the multi-machine parallel system.

The figure below shows an operation example.

 ①	1. Click the left button to enter the main menu interface.
 ②	2. Click the down button until you reach “Advanced Settings", then click the right button to enter the “Input Password" interface.

 ③	3. Enter the password **0715** and then press the right button to access the “Advanced Settings (1)” interface.
 ④	4. Click the down button until you reach “Generation Limit Control”, then click the right button to enter.
 ⑤	5. Click the right button to enter “Generation Limitation Mode” option..
 ⑥	6. Select “Enable” option then click the right button to confirm. The screen will display “Success” and will then automatically return to the previous interface.
	7. Click the down button until you reach “Feed-in Limit Power”, then click the right button to enter the power setting.

 ⑦	
  ⑧	8. If you need to enable the “Hard Limit Control” function, first, you can click the down button until you reach it, then click the right button to enter the setting page.

6.4.4 Menu structure

Press the button to bring up the main menu.

6.4.4.1 Main menu

The menu layout may vary according to different firmware versions.

1	System Information
2	Real-time Information
3	Event List
4	Energy Statistics
5	System Settings
6	Advanced Settings
7	Firmware Update

6.4.4.2 "System Information" menu

1. Inverter	
Inverter (1)	Serial Number, Rated Power, Firmware Version, Grid Code
Inverter (2)	Bat Channel, PV Channel 1, PV Channel 2, PV Channel 3
Inverter (3)	Work Mode, RS485 Address, BACKUP, IV Curve Scan
Inverter (4)	Logic Interface, Power Factor, Feed-in Limit, Insulation Resistance
Inverter (5)	Parallel, Automatic Battery Active
2. Battery	
Battery (1)	Battery Type, Max Charge Current, Max Discharge Current
Battery (2)	Charge Limit SOC, On-grid Discharge Limit SOC, Off-grid Discharge Limit SOC, Off-grid Recovery Discharge SOC
Battery (3)	Serial Number 1 ... 6
Battery (4)	Firmware Version 1 ... 6

6.4.4.3 "Real-time Information" menu

1. PV	
1.1 PV (1)	PV1 Voltage, PV1 Current, PV1 Power, PV2 Voltage, PV2 Current, PV2 Power
1.2 PV (2)	PV3 Voltage, PV3 Current, PV3 Power, External PV Power
2. BAT	
2.1 BAT Port Info	Voltage, Current, Power, SOC, State
2.2 BAT real Info	Voltage, Current, SOC, Max Charge Current, Max Discharge Current, Max Cell Temp, Min Cell Temp
3. GRID	Voltage, Power, Frequency
4. BACKUP	Voltage, Power, Frequency
5. Normal Load	Power
6. Total Load	Power
7. Wallbox	
7.1 Wallbox (1)	Communication, State, Power, Total Energy, Fault Code
7.2 Wallbox (2)	Voltage R, Voltage S, Voltage T, Current R, Current S, Current T

6.4.4.4 "Event List" menu

The event list is used to display real-time event recordings, including the total number of events and each specific ID no. and event time. The most recent events are listed at the top.

Event List	
1. Current Event List	Show latest event
2. History Event List	Show event history
Fault information	001 ID04 06150825 (Display of the event sequence number, event ID number and time that the event takes place. Press "<Enter>" to toggle between event name and trigger time.)

6.4.4.5 "Energy Statistics" menu

In this menu, you can view the PV, battery, load and grid energy usage status of different channels in real time and for different years, months and days.

Today	Press the Down button to move between items. Shows PV, Load, Import, Export, Charge, Discharge Energy (kWh) for the selected period.
Month	
Year	
Lifetime	

6.4.4.6 "System Settings" menu

In this menu, you can make the basic settings which are needed to operate the device.

1. Language	**Sets the display language.**
2. Date & Time	Sets the date and time of the inverter.
3. Grid Code	Sets the country and grid code.
4. Device Port Management	Sets the parameters for PV port, BAT port, GRID port and BACKUP port.
4.1 PV	Set PV port.
4.1.1 PV1	Set PV input: Select "PV" for photovoltaic scenarios, otherwise set to disabled.
4.1.2 PV2	
4.1.3 PV3	
4.2 BAT	Set battery port: Select "BTS 5K" or "CBS5000" for battery operation scenarios, otherwise set to disabled.
4.3 GRID	Set grid port mode to grid connection or generator connection.
4.3.1 GRID	Set grid port mode to grid-connected.
4.3.2 GEN	Set grid port mode to generator.
4.3.2.1 Manual	Set the generator to manual mode, then configure its rated power.
4.3.2.1 Auto	Set generator to auto mode with start/stop SOC and rated power.

4.4 BACKUP	Enable/disable off-grid mode. It is only available if a battery is connected.
5. Work Mode	Sets Work mode and the energy storage setting.
5.1 Work Mode	Select between Self-use (standard), Feed-in Priority, Peak Shaving, Time-of-use and Passive. See "7.3 Work Modes" chapter for details.
5.2 Energy Storage Settings	Sets Charge Limit SOC, On-grid Discharge Limit SOC, Off-grid Discharge Limit SOC, Off-grid Recovery Discharge SOC.
6. RS485 Communication	Enter the Modbus address (if several inverters require simultaneous monitoring), default: 01 Baud Rate: The default baud rate is 9,600
7. Wallbox	Setting up the different operating modes of the wall box.
7.1 Charge Now	Sets Wall Box Control, Charging Current, Charging From Battery.
7.2 Scheduled	Sets different rules, Charging Start Time, Charging End Time, Charging Current, Charging From Battery.
7.3 ECO Mode	Sets Charging From Battery.

6.4.4.7 "Advanced Settings" menu

Password

▶ Several settings require a password to be entered (the default password is 0715/0001).

In this menu, you can make advanced settings.

1. Battery	
1.1 30 Days SOC Calibration	Enable/Disable. When the battery is connected, if "SOC Calibration" is enabled, the inverter will forcibly charge until it is fully charged once a month.
1.2 Battery Active	Sets Auto Active Control and Once Manual Active
1.2.1 Auto Active	Enable/Disable. If automatic activation is enabled, the inverter will activate the battery when the inverter needs to discharge or

	charge the battery according to the activation settings. If automatic activation is disabled, battery activation can be performed once via "Once Manual Active".
1.2.2 Once Manual Active	Select "Once Manual Active" for a one-time battery activation.
2. Feed-in Limit Control	Activates or deactivates the feed-in power function of the inverter and sets the maximum feed-in power. This function must be used together with an external current transformer or the smart meter. Details regarding this can be found in the "Communications interfaces" chapter of this manual.
2.1 Feed-in Limitation Mode	Disable: Do not use this function. Enable: The power of the feeding-in is limited.
2.2 Feed-in Limit Power	Set the power size of the inverter flowing to the grid. When detecting current flowing to the grid (reverse current), reduce the output power of the inverter so that the power flowing from the inverter to the grid is always connected in a state lower than the set value so as to realise the anti-reverse current and not to send the excess power to the grid.
2.3 Hard Limit Control	This feature is required by Australian safety standards.
3. CT direction setting	Set the CT installation direction: Import or Export
4. IV Curve Scan	(Only set with PV channel.) Cyclical scanning of the IV curve in order to find the global point of the maximum output. Advisable in the case of shaded solar generators.
4.1 Scan Control	Enable/disable IV curve scan function.
4.2 Scan Period	Set scan period in minutes.
4.3 Once Manual Scan	Manually start IV curve scanning.
5. Logic Interface	Activates or deactivates logical interfaces. Details regarding this can be found in the "Communications interfaces" chapter of this manual.
5.1 DRM0	Enable/disable DRM0 mode
5.2 DRMn	Enable/disable DRMn mode

6. Restore Factory Settings	Resets stored data in the inverter.
6.1 Clear Energy Data	Clears total power production.
6.2 Clear Events	Clears historical events.
6.3 Reset Settings	Restore parameters to factory default settings.
7. Parallel setting	Defines configuration for parallel inverter operation (master/slave).
7.1 Parallel Control	For inverters connected to each other with a Link port, you set Parallel Control to "Enable".
7.2 Leader-Follower	One inverter needs to be set as master, all other inverters need to be set to slave.
7.3 Parallel Address	Set each inverter with an individual parallel address (this is an independent number from Modbus ID).
8. Switch On/Off	The inverter can be switched on, switched off, set to standby or set to normal operating mode, which can be useful for installation or maintenance work.
9. PCC Import Limit	PCC Import Limit Control: Control whether the PCC power control function is enabled. PCC Import Limit Power: Power upper limit, that is, the maximum power that can be purchased from the PCC (when the load is greater than the maximum power purchased from the PCC, the load power priority is higher to meet the load power priority).
10. Set PCC Power Offset	Calibration for PCC power calculation.
11. BACKUP GFCI	Activates RCD type B monitoring in off-grid mode (300 mA).
12. Neutral Point Grounding	When using off-grid mode, ensure that neutral ground (earth) is enabled. For Australia, South Africa and New Zealand, neutral ground is turned off by default (refer to 5.3 System overview).
13. E-STOP	Enable/disable Emergency Power Off function.
14. SG Ready	Timed Mode: Set the start time and stop time, turn on the smart load within the start time range and turn off the smart load outside the start time range. Smart Mode: Set the start time and stop time in the start time range, generating power – load power > Startup Power

	(hysteresis loop parameter reservation can be set) after 5 minutes to turn on the intelligent load; load power – generating power > Startup Power after 1 minute to turn off the intelligent load.
15. ATS/12V Control	(The inverter cannot be set for the slave machine.) More details please refer to 4.18.9
15.1 Disable	Disable ATS/12V Control function.
15.2 Off-grid: 12V Turn On	In off-grid mode, the dry contact interface will output a 12 V signal; otherwise, the output is disabled.
15.3 Off-grid: 12V Turn Off	In off-grid mode, the output is disabled; otherwise, the dry contact interface will output a 12 V signal.
16. PCC Meter/CT	Enable/disable PCC Meter/CT function.
17. Generation limit control	Activates or deactivates the generation limit control function of the inverter and sets the active power output level.
17.1. Generation limit Enable	Disable: Do not use this function. Enable: The active power output level is limited.
17.2. Generation Limit Power	The active power output of the inverter must not exceed the set value.
17.3. Hard Limit Control	This feature is required by Australian safety standards.
18. Bluetooth Settings	Configure Bluetooth PIN code
18.1. Password Settings	Configure Bluetooth PIN code
18.2. Reset Password	Reset Bluetooth PIN code to 071500

6.4.4.8 "Firmware Update" menu

The user can update the software via the USB flash drive. SOFAR will provide the firmware update when it is required.

NOTICE
▶ If you want to do a firmware update, please update with PV input or grid status, as the update will fail if only the battery is connected.

1. Insert the USB stick into the computer.
2. SOFAR will send the firmware upgrade to the user.

3. Unzip the file and copy the original file to a USB stick. Attention: The firmware upgrade file must be in the "firmware" subfolder!
4. Press "Back" on the main interface to enter the main menu page and select "2. Advanced Settings – Switch On/Off – Switch Off". Make sure the inverter shuts down safely.
5. Insert the USB flash drive into the USB interface of the inverter.
6. Go to menu item "7. Firmware Upgrade" in the LCD display.
7. Enter the password (the default password is 0715) and then select "Firmware Update".
8. Enter the password (the default password is 0715) and then select "Inverter" or "Battery".
9. The system will then sequentially update all parts. Pay attention to the displays.
10. If an error message appears, please upgrade again. If this continues repeatedly, contact technical support for help.
11. When the update is complete, go to the menu item "Advanced Settings – Switch On/Off – Switch On" to cause the inverter start up and run.
12. You can check the current firmware version in item "Inverter (1)" of the "System Information" menu.

7 System maintenance

7.1 System Power-Off

DANGER

- Wear personal protective equipment when operating
- Power off the equipment before operations and maintenance.
- After powering off the equipment, wait a minimum of 15 minutes before starting any maintenance or repair work.

Power off

Please follow the steps below to switch the inverter OFF.

1. Use APP or LCD to switch off the inverter.
2. Turn AC circuit breaker between the inverter BACKUP port & critical load OFF.
3. Turn AC circuit breaker between the inverter GRID port & GRID OFF.
4. Switch the battery OFF.
5. Turn DC switch OFF.
6. (Optional) Install the lock to DC switch.

7.2 Troubleshooting

This section contains information and procedures pertaining to the remedying of potential problems with the inverter.

To carry out troubleshooting, proceed as follows:

- Check the warnings, error messages or error codes displayed on the screen of the inverter.
- If no error information is displayed on the screen, check whether the following requirements have been fulfilled:
- Has the inverter been set up in a clean, dry and well-ventilated area?
- Is the DC switch set to ON?
- Are the cables sufficiently dimensioned and short enough?
- Are the input connections, output connections and wiring all in good condition?

- Are the configuration settings for the relevant installation correct?
- Are the display field and communication cables correctly connected and undamaged?

Please check the “Event list” on the LCD screen. In the case of devices equipped with a stick logger, the alarm information can be viewed in the monitoring portal and retrieved via the smartphone app.

7.3 Fault list

If an earth fault alarm occurs, the error is displayed on the LCD screen, the red light illuminates and the error can be found in the error history log.

- In the case of devices equipped with a stick logger, the alarm information can be viewed on the monitoring portal and retrieved via the smartphone app.

7.3.1 Inverter fault list

ID	Code name	Description	Solution
001	GridOVP	The voltage of the power grid is too high	If the alarm occurs occasionally, the possible cause is that the electric grid is abnormal occasionally. Inverter will automatically return to normal operating status when the electric grid is back to normal. If the alarm occurs frequently, check whether the grid
002	GridUVP	The voltage of the mains is too low	
003	GridOFP	The mains frequency is too high	

ID	Code name	Description	Solution
004	GridUFP	The mains frequency is too low	voltage/frequency is within the acceptable range. If so, please check the AC circuit breaker and AC wiring of the inverter. If the grid voltage/frequency is NOT within the acceptable range and AC wiring is correct, but the alarm occurs repeatedly, contact technical support to change the grid overvoltage, undervoltage, over-frequency and under-frequency protection points after obtaining approval from the local electrical grid operator.
005	GFCI	Charge leakage fault	Check inverter and wiring.
008	IslandFault	Island protection fault	If the alarm occurs occasionally, the possible cause is that the electric grid is abnormal occasionally. Inverter will automatically return to normal operating status when the electric grid is back to normal. If the alarm occurs frequently, check whether the grid voltage/frequency is within the acceptable range. If so, please check the AC circuit breaker and AC wiring of the inverter. If the grid voltage/frequency is NOT within the acceptable range and AC wiring is correct, but the alarm occurs repeatedly, contact technical support to change the grid overvoltage, undervoltage, over-frequency and under-frequency protection points after obtaining approval from the local electrical grid operator.
009-010	GridOVPInstant1/2	Transient overvoltage of mains voltage 1/2	
011	VGridLineFault	Power grid line voltage fault	
012	InvVoltFault	Inverter overvoltage	Internal faults in inverter. Switch inverter OFF, wait for 5 minutes, then switch inverter ON. Check whether the problem is solved. If not, please contact technical support.

ID	Code name	Description	Solution
013	RefluxFault	Feed-in Limit function is faulty	Internal fault in the inverter. Switch the inverter off, wait 5 minutes and then switch the unit on again. If the fault persists, contact technical support.
032	N-PE fault	Neutral earth fault	Internal fault in the inverter. Switch the inverter off, wait 5 minutes and then switch the unit on again. If the fault persists, contact technical support. Internal faults in inverter. Switch inverter OFF, wait for 5 minutes, then switch inverter ON. Check whether the problem is solved. If not, please contact technical support.
033	SpiCommFault(DC)	SPI communication is faulty (DC)	
034	SpiCommFault(AC)	SPI communication is faulty (AC)	
038	InvSoftStartFail	Inverter failed to output	
039	ArcShutdownAlarm	Arc shutdown protection	
040	LowLightChkFail	Low light detection failed	
041	RelayFail	Relay detection failure	Internal fault in the inverter. Switch the inverter off, wait 5 minutes and then switch the unit on again. If the fault persists, contact technical support.
042	IsoFault	Insulation resistance is too low	Check the insulation resistance between the photovoltaic array and earth. If there is a short circuit, the fault should be remedied in a timely manner.
043	PEConnectFault	Earth fault	Check the PE conductor for proper functioning.
044	InputConfigError	Incorrect input mode configuration	Check the input mode (parallel/independent mode) settings for the inverter. If not correct, change the input mode.
045	CTDisconnect	CT fault	Check that the wiring of the current transformer is correct.
046	ReversalConnect	The PV is connected in reverse	Check whether the PV wiring is correct.
047	ParallelFault	Master does not exist or is duplicate	Check the parallel mode settings for the inverter. Check whether the wiring is correct.

ID	Code name	Description	Solution
049	TempErrBat	Battery temperature error	For inner BMS battery, make sure that the battery NTC cable is properly connected. Make sure the inverter is installed in an area without direct sunlight. Please ensure that the inverter is installed in a cool/well-ventilated place. Ensure the inverter is installed vertically and the ambient temperature is below the inverter temperature limit.
050-055	TempErrHeatSink1-6	Temperature error, heat sink 1–6	For AC inverter, make sure that the inverter NTC cable is properly connected. Make sure the inverter is installed in an area without direct sunlight or other heat sources. Please ensure that the inverter is installed in a cool/well-ventilated place. Ensure the inverter is installed vertically and the ambient temperature is below the inverter temperature limit.
057-058	TempErrEnv1/2	Temperature error, ambient temperature 1/2	
059-061	TempErrInv1-3	Module 1–3 temperature protection	
065	BusRmsUnbalance	Asymmetrical bus voltage, RMS	Internal fault in the inverter. Switch the inverter off, wait 5 minutes and then switch the unit on again. If the fault persists, contact technical support.
066	BusInstUnbalance	The transient value of the bus voltage is unbalanced	
067	BusUVP	The DC bus voltage is too low during mains connection	
068	BusZVP	The DC bus voltage is too low	
069	PVOVP	The PV input voltage is too high	Check whether the PV series voltage (Voc) is higher than the maximum input voltage of the inverter. If this is the case, adjust the number of PV modules in series. After the correction, the inverter automatically returns to its normal state.

ID	Code name	Description	Solution
070	BatOVP	Battery overvoltage	Check whether the voltage of the battery is higher than the maximum input voltage of the inverter. If this is the case, adjust the number of battery modules in series.
071	LLCBusOVP	LLC bus overvoltage protection	
072	SwBusRmsOVP	Inverter bus voltage RMS software overvoltage	Internal fault in the inverter. Switch the inverter off, wait 5 minutes and then switch the unit on again. If the fault persists, contact technical support. Internal fault in the inverter. Switch the inverter off, wait 5 minutes and then switch the unit on again. If the fault persists, contact technical support. Internal fault in the inverter. Switch the inverter off, wait 5 minutes and then switch the unit on again. If the fault persists, contact technical support.
073	SwBusIOVP	Inverter bus voltage instantaneous software overvoltage	
081	SwBatOCP	Software overcurrent protection of the battery	
082	DciOCP	Dci overcurrent protection	
083	SwIOCP	Instantaneous output current protection	
085	SwAcRmsOCP	Output RMS current protection	
086	SwPvOCPInstant	PV overcurrent software protection	
087	IpvUnbalance	PV flows with uneven parallelism	
088	IacUnbalance	Unbalanced output current	
089	SwPvOCP	PV software overcurrent protection	
090	IbalanceOCP	Balanced current protection	
096	EPSLoadShortCircuit	Inverter bus hardware overvoltage	

ID	Code name	Description	Solution
098	HwBusOVP	Inverter bus hardware overvoltage	Internal fault in the inverter. Switch the inverter off, wait 5 minutes and then switch the unit on again. If the fault persists, contact technical support. Internal fault in the inverter. Switch the inverter off, wait 5 minutes and then switch the unit on again. If the fault persists, contact technical support.
100	HwBatOCP	Battery hardware overflow	
102	HwPVOCP	PV hardware overflows	
103	HwACOCP	Mains current is too high and has triggered hardware protection	
105	MeterCommFault	Communication fault with meter unit	Check whether the meter is connected correctly.
110-112	Overload1-3	Overload protection 1–3	Check whether the inverter is operating under overload.
113	OverTempDerating	The inverter has throttled due to excessive temperature	Make sure that the inverter has been installed in a cool and well-ventilated place without direct sunlight. Make sure the inverter is installed vertically and the ambient temperature is below the temperature limit of the inverter.
114	FreqDerating	AC frequency is too high	Make sure that the mains frequency and voltage are within the permissible range.
124	BatDchgProhibit	The battery is low	Please check if the battery SOC of the inverter is too low.
125	BatLowVoltShut	No battery protection	Please check if the battery voltage of the inverter is too low.
128	BatReversalConnect	The battery is connected in reverse	Check whether the battery wiring is correct.
129	PermHwAcOCP	Mains current is too high and has caused an unrecoverable hardware fault	Internal fault in the inverter. Switch the inverter off, wait 5 minutes and then switch the unit on again. If the fault persists, contact technical support.

ID	Code name	Description	Solution
145	USBFault	Device cannot read data from USB stick. The USB stick has been damaged or the format of the USB stick is not compatible with the device.	Switch the inverter off, wait 5 minutes and then switch the unit on again. If the fault persists, contact technical support.
147	BluetoothFault	The device's Bluetooth communication has failed	Switch the inverter off, wait 5 minutes and then switch the unit on again. If the fault persists, contact technical support.
151	BatPartOffline	A portion of battery communication is lost	Switch the inverter off, wait 5 minutes and then switch the unit on again. If the fault persists, check the communication line or the connection of the battery and the inverter for faults.
152	SafetyVerFault	The safety version is inconsistent with the internal safety version	Check whether safety regulations comply with local standards and import correct safety parameters.
153	SCILose(DC)	SCI communication error (DC)	Upgrade software
154	SCILose(AC)	SCI communication error (AC)	Upgrade software
156	SoftVerError	Inconsistent software versions	Download the latest firmware from the website and launch the software update. If the fault persists, contact technical support.
157-158	BMS1-2CommFault	Lithium battery 1–2 communication error	Make sure your battery is compatible with the inverter. CAN communication is recommended. Check the communication line or the connection of the battery and the inverter for faults.
162	RemoteShutdown	Remote shutdown	The inverter is shut down remotely.
163	Drms0Shutdown	DRM 0 shutdown	The inverter is running with a Drms0 shutdown.

ID	Code name	Description	Solution
177	BMS OVP	BMS overvoltage alarm	Internal fault in the connected lithium battery. Switch the inverter and lithium battery off, wait 5 minutes and then switch the components on again. If the fault persists, contact technical support.
178	BMS UVP	BMS undervoltage alarm	
179	BMS OTP	BMS high-temperature warning	
180	BMS UTP	BMS low-temperature warning	
181	BMS OCP	BMS overload warning during charging and discharging	
182	BMS Short	BMS short circuit alarm	Please contact technical support.
185	BMS CAN VerLow	Inconsistent software versions	Download the latest firmware from the website and launch the software update. If the fault persists, contact technical support.
186	BatDischargeHTP	BAT high-temperature warning when discharging	Internal fault in the connected lithium battery. Switch the inverter and lithium battery off, wait 5 minutes and then switch the components on again. If the fault persists, contact technical support.
187	BatDischargeLTP	BAT low-temperature warning when discharging	
188	BatChargeHTP	BAT high-temperature warning when charging	
189	AFCICommLose	AFCI communication error	Please ensure proper installation of the AFCI breaker.

ID	Code name	Description	Solution
190	BatChargeLTP	BAT low-temperature warning when charging	Internal fault in the connected lithium battery. Switch the inverter and lithium battery off, wait 5 minutes and then switch the components on again. If the fault persists, contact technical support.
328	AcStartTimeOut	BAT active failed	Internal fault in active lithium battery. Check the power line and CAN line between inverter and battery and then try again. If the fault persists, please contact technical support.
379	AFCICheckError	AFCI chip self-test abnormality	Switch the inverter off, wait 5 minutes and then switch the unit on again. If the fault persists, contact technical support.
401	AFCI0	Arcing detected in AFCI channel	

7.3.2 Battery fault list

ID	Name	Description	Solution
808	HS1HighTempWarning	Radiator 1 high temperature alarm	Check whether the number of batteries is set correctly. If the setting is correct, please contact technical support to upgrade software.
809	EnvHighTempWarning	Ambient high temperature alarm	Please make sure the battery is installed in a cool, well-ventilated place.
813	StopChgWarning	Charging prohibition alarm	If the battery is almost full, no action is required. Otherwise, please contact technical support.
814	StopDchgWarning	Discharging prohibition alarm	If the battery is almost empty, no action is required. Otherwise, please contact technical support.

ID	Name	Description	Solution
864	HS1OverTempFault	Over-temperature protection of radiator 1	Power off and wait for 2 hours. If the problem is not solved, please contact technical support.
865	OverTempFault_Env	Over-temperature protection of ambient temperature	
866	SciCommFault	Internal communication failure of battery	If this fault occurs occasionally, wait a few minutes to see whether the problem is resolved. If this fault occurs frequently, please contact technical support.
867	Can1CommFault	Can1 communication failure	If this fault occurs occasionally, wait a few minutes to see whether the problem is resolved. If this fault occurs frequently, please contact technical support.
872	SwBusInstantOVP	Bus software overvoltage	If this fault occurs occasionally, wait a few minutes to see whether the problem is resolved. If this fault occurs frequently, please contact technical support.
873	SwBusInstantUVP	Bus software undervoltage	
874	SwBatInstantOVP	Battery software overvoltage	
875	SwBatInstantUVP	Battery software undervoltage	
879	HwOCP	Hardware overcurrent	
880	unrecoverBusAvgOV	Permanent bus overvoltage	Restart the battery and wait several minutes. If the problem is not resolved, please contact technical support.
883	unrecoverHwOCP	Permanent hardware overcurrent	
893	unrecoverBusSCP	Permanent short-circuit protection	Restart the battery and wait several minutes. If the problem is not resolved, please contact technical support.
894	unrecoverBatActFail	Permanent battery activation failed	

ID	Name	Description	Solution
895	unrecoverBusRPP	Permanent bus reverse connection	Check whether the wiring is correct and restart the battery. If the problem is not resolved, please contact technical support.
899	BMSOVOCP	BMS overvoltage and overcurrent fault	If this fault occurs occasionally, wait a few minutes to see whether the problem is resolved. If this fault occurs frequently, please contact technical support.
900	SwBatAvgOCP	Battery average overcurrent protection	
901	SwAvgOverloadP	Average overload protection	
902	SwBusInstantOCP	Bus software overcurrent	
903	SwCBCOCP	Software CBC overcurrent protection	
905	StartupBusSCP	Startup short-circuit protection	Restart the battery and wait several minutes. Check whether the power line is short circuited. If the problem is not resolved, please contact technical support.
906	SwBusAvgUVP	Bus average undervoltage	Restart the battery and wait several minutes. If the problem is not resolved, please contact technical support.
907	ChipClockFault	Clock failure of the chip	Restart the battery and wait several minutes. If the problem is not resolved, please contact technical support.
908	PCSCanCommFault	Faulty CAN communication between battery and inverter	Make sure your battery is compatible with the inverter. CAN communication is recommended. Check the communication line or the connection of the battery and the inverter for faults.

ID	Name	Description	Solution
909	HeatsinkLowTempFault	Heat sink low-temperature fault	Please make sure that the heat sink temperature is not lower than the temperature limit of the battery.
910	EnyLowTempFault	Low ambient temperature, battery failure	Please make sure that the ambient temperature is not lower than the temperature limit of the battery.
911	ADOffsetCalibrateFault	Sample offset calibration failure	Restart the battery and wait several minutes. If the problem is not resolved, please contact technical support.

7.4 Maintenance

Inverters do not generally require daily or routine maintenance. Before carrying out cleaning, ensure that the DC switch and AC circuit breaker between the inverter and power grid have been switched off. Wait at least 15 minutes before carrying out cleaning.

7.4.1 Cleaning the inverter

Clean the inverter using an air blower and a dry, soft cloth or a soft-bristle brush. Do not clean the inverter with water, corrosive chemicals, cleaning agents etc.

7.4.2 Cleaning the heat sink

In order to guarantee correct long-term operation of the inverter, make sure that there is sufficient space for ventilation around the heat sink. Check the heat sink for blockages (dust, snow etc.) and remove them if present. Please clean the heat sink using an air blower and a dry, soft cloth or a soft-bristle brush. Do NOT clean the heat sink with water, corrosive chemicals, cleaning agents etc.

8 Data sheet

▶ The following parameters may change without notice, so please refer to the user manual and data sheet on our website.

Model	ESI-8K-S1	ESI-9.99K-S1-A	ESI-10K-S1	ESI-12K-S1
PV input				
Recommended max. PV power	16 kWp	20 kWp	20 kWp	24 kWp
Max. input voltage	600 Vd.c.			
Startup voltage[1]	90 Vd.c.			
Rated input voltage	360 Vd.c.			
MPP voltage range	60-550 Vd.c.			
Number of MPPTs	3			
Max. number of input strings per MPPT	1/1/1			
Max. input current	20/20/20 A			
Max. Isc	25/25/25 A			
Battery				
Voltage range	120-576 Vd.c.			
Nominal Battery Voltage	400 Vd.c.			
Number of battery input channels	1			
Max. charging power	12 kW			
Max. discharging power	8 kW	9.99 kW	10 kW	12 kW
Max. charging current	50 A (CBS 5000/50A, BTS 5K/30A)			
Max. discharging current	50 A (CBS 5000/50A, BTS 5K/30A)			
Battery type[2]	Lithium-ion			
BMS communication	CAN			
AC backup (Output)				
Rated output voltage	L+N+PE, 220/230/240 Va.c.			
Rated output frequency	50/60 Hz			
Rated output power	8 kW	9.99 kW	10 kW	12 kW
Rated output current	36.4/34.8/33.3 A	45.4/43.3/41.6 A	45.5/43.5/41.7 A	54.5/52.2/50.0A
Rated apparent power	8 kVA	9.99 kVA	10 kVA	12 kVA

Model	ESI-8K-S1	ESI-9.99K-S1-A	ESI-10K-S1	ESI-12K-S1
Max. apparent power	8.8 kVA	9.99 kVA	11 kVA	13.2 kVA
Max. output current	40.0/38.3/36.7 A	45.4/43.3/41.6 A	50.0/47.8/45.8 A	60.0/57.4/55.0 A
Peak output apparent power[3]	1.5 times of rated power, 10 s			
THDv (@ linear load)	< 3%			
Switching time	4 ms default			
AC grid (Input and Output)				
Rated voltage	L+N+PE, 220/230/240 Va.c.			
Rated frequency	50/60 Hz			
Rated output power	8 kW	9.99 kW	10 kW	12 kW
Rated output current	36.4/34.8/33.3 A	45.4/43.3/41.6 A	45.5/43.5/41.7 A	54.5/52.2/50.0A
Rated apparent power	8 kVA	9.99 kVA	10 kVA	12 kVA
Max. apparent power	8.8 kVA	9.99 kVA	11 kVA	13.2 kVA
Max. output current	40.0/38.3/36.7 A	45.4/43.3/41.6 A	50.0/47.8/45.8 A	60.0/57.4/55.0 A
Max. input current	63 A			
THDi	< 3%			
Power factor range	0.8 lagging to 0.8 leading			
Efficiency				
Max. MPPT efficiency	99.9%			
Max. efficiency	97.7%			
European efficiency	97%			
Max. efficiency of charging/discharging[4]	97%			
Protection				
DC switch	Yes			
PV reverse connection protection	Yes			
Battery reverse connection protection	Yes			
Output short-circuit protection	Yes			
Output overcurrent protection	Yes			
Output overvoltage protection	Yes			
Insulation impedance detection	Yes			

Model	ESI-8K-S1	ESI-9.99K-S1-A	ESI-10K-S1	ESI-12K-S1
Residual current detection	Yes			
AFCI	Yes			
Anti-island protection	Method (Active frequency shift)			
Surge protection[5]	PV: type II, AC: type II			
General parameters				
Inverter topology	Non-isolation			
Protection class	Class I			
IP rating	IP66			
Overvoltage category	AC III, DC II			
Operating temperature range	–25 °C to +50 °C (derating above +45 °C)			
Relative humidity range	5% to 95%			
Max. operating altitude	4,000 m (derating above 2,000 m)			
Standby self-consumption[6]	< 10 W			
Dimensions (W x H x D)	708 x 440 x 170 mm			
Cooling mode	Intelligent Airflow			
Weight	35 kg			
Communication	CAN/RS485/WiFi,Optional:4G/LAN			
Display	LCD & APP			

[1] Minimum PV voltage to start MPPT operation.
[2] Please refer to document "SOFAR inverter model compatible battery list".
[3] Full battery and sun.
[4] Battery AC maximum efficiency of battery charge and discharge.
[5] According to EN/IEC 61643-11.
[6] Standby loss at rated input voltage.

ENERGY TO POWER YOUR LIFE

ADDRESS
2801,Block A,Kechuang Mansion,526 Chuangye 2nd Road,
Xin'an,Bao'an District,Shenzhen,China.

EMAIL
info@sofarsolar.com

WEBSITE
www.sofarsolar.com

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