eManager

SMART ENERGY CONTROLLER

USER MANUAL

Preface

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

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

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

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

Guangzhou Sanjing Electric Co., Ltd.

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1. About this Document

1.1. Application scope

This user manual provides instructions and detailed procedures for installing, operating, and maintaining the following SAJ smart communication device for energy management:

- eManager
- eManager-Pro (eManager with a Pro-Mate module)

1.2. Safety

CAUTION:

ONLY qualified and trained electricians who have read and fully understood all safety regulations contained in this manual can install, maintain, and repair the equipment. Access to the equipment is by the use of a tool, lock and key, or other means of security.

1.3. Safety levels

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 condition which, if not avoided, could result in minor or moderate injury.

NOTICE
Indicates a situation which, if not avoided, can result in property damage.

1.4. Symbol explanation

Symbol	Description
	**DANGER of electrical voltage** This device is directly connected to the public grid, thus all work to the device shall only be carried out by qualified personnel.
	**No open flames** Do not place or install near flammable or explosive materials.
	**ATTENTION: Keep the product out of reach of children.**
	**This device shall NOT be disposed of in residential waste.**
	**CE Mark** Equipment with the CE mark fulfills the basic requirements of the Guideline Governing Low-Voltage and Electro-magnetic Compatibility.
	**Avoid liquid or moisture**
	**Recyclable**

1.5. Safety instructions

Keep the manual at a proper location for future reference after installation.

To prevent personal injury and property damage and to ensure long-term operation of the product, be sure to read all the safety instructions in this section carefully prior to any works and observe the appropriate rules and regulations of the country or region where you install the device.

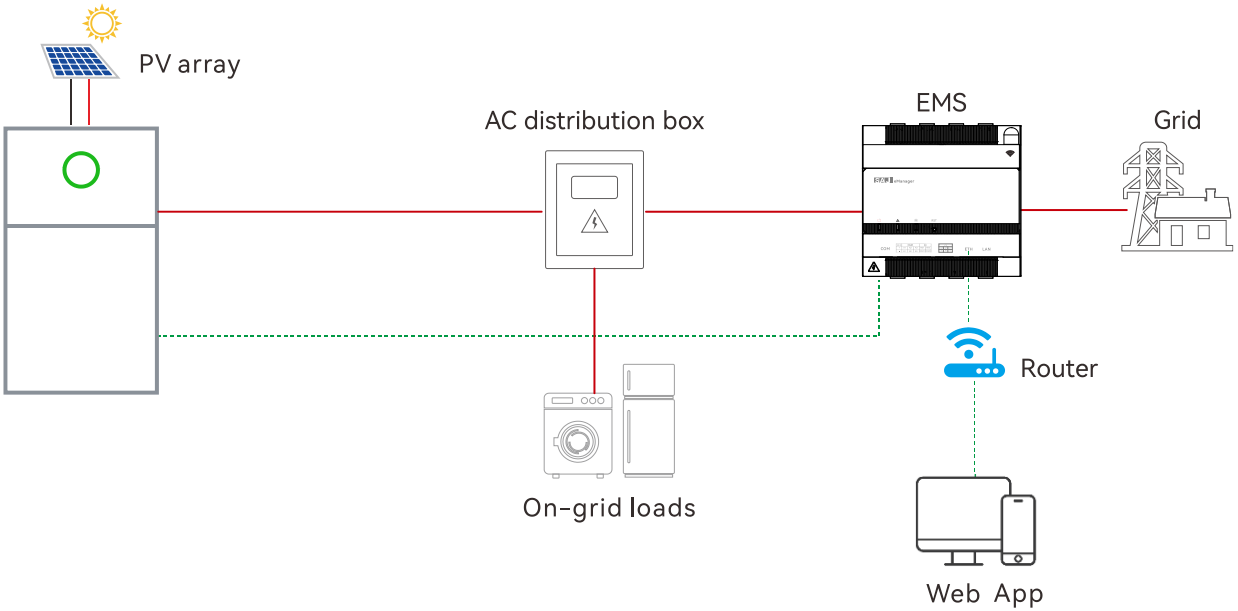
1.6. Safe handling

The product has been designed and tested strictly in accordance with international safety regulations. As an electrical and electronic equipment, it must be installed, commissioned, operated, and maintained in strict accordance with related safety instructions. Incorrect operation or misuse of this device may cause personal injury or device damage. This will void the limit warranty and SAJ will not be responsible for the loss caused by those behaviors.

- The eManager must be installed and maintained by authorized technicians based on local laws and regulations.
- Before installing or maintaining the eManager, make sure that it is disconnected from the grid.
- When the eManager is working, do not touch the internal component or cable to avoid electric shock.
- Before replacing an internal component within the eManager, make sure that the eManager is disconnected from the grid and the new component meets the usage requirement.
- When the eManager is working, do not plug or unplug the cables.
- Make sure that the AC input voltage and current are compatible with the rated voltage and current of the eManager; otherwise, the components might be damaged, or the device cannot work properly.

2. Product Information

2.1. Application topology diagram



2.2. Main features

SAJ eManager is applied to the photovoltaic (PV) energy storage system (ESS) to provide the following functions:

- Schedule the energy to the loads, batteries, and the grid based on user requirements
- Work as a smart meter to monitor the power and meter the energy
- Collect and transmit data of inverters, batteries, and other equipment

In addition, it provides the following functions:

- Smart and flexible support of RS485, Ethernet, Wi-Fi, and Bluetooth communications
- Convenient operation and maintenance
  - Easy installation
  - 24-hour local and remote monitoring
  - Remote operation: PV-plant maintenance on App or Web

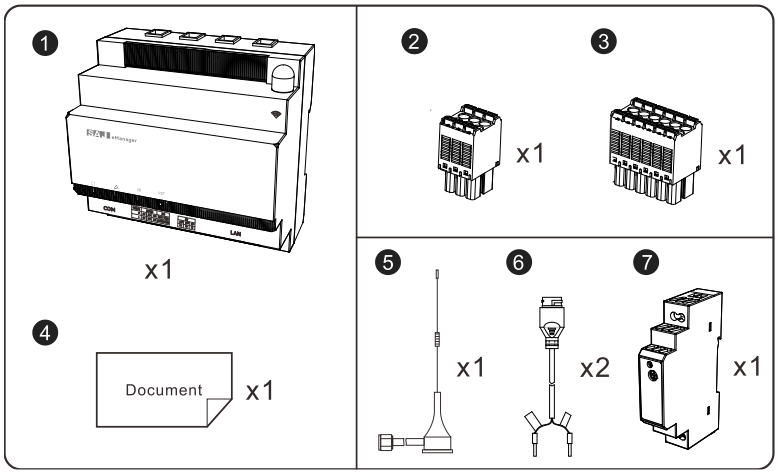
Working with the Pro-Mate module, SAJ eManager-Pro provides the following extra support:

- Demand response mode (DRM) connection in Australia and New Zealand
- Ripple control receiver (RCR) connection in Germany
- 4G communication

With the AC-DC power supply module, when the eManager needs to work during the off-grid time, the ESS can provide the power supply to the eManager.

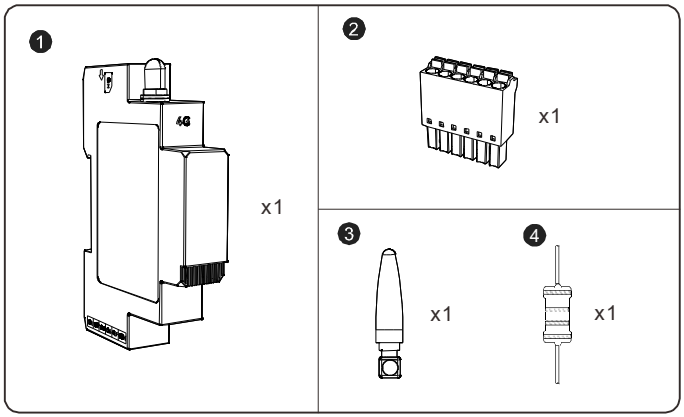
2.3. Package contents

2.3.1. eManager



Callout	Description	Quantity	Callout	Description	Quantity
❶	eManager	1	❷	6-pin connector	1
❸	12-pin connector	1	❹	Quick Guide	1
❺	Antenna	1	❻	RS485 communication cable	2
❼	AC-DC power supply module (optional)	1			

2.3.2. Pro-Mate

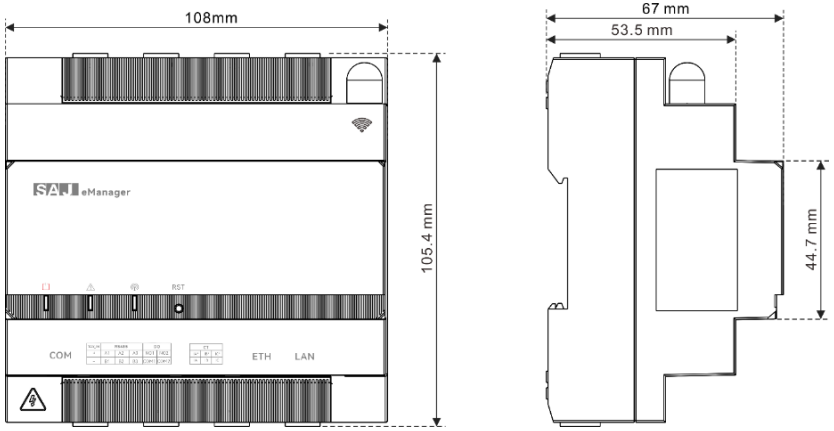


Callout	Description	Quantity	Callout	Description	Quantity
❶	Pro-Mate	1	❷	6-pin connector	1
❸	Antenna	1	❹	15 kΩ resistance	1

2.4. Product dimension

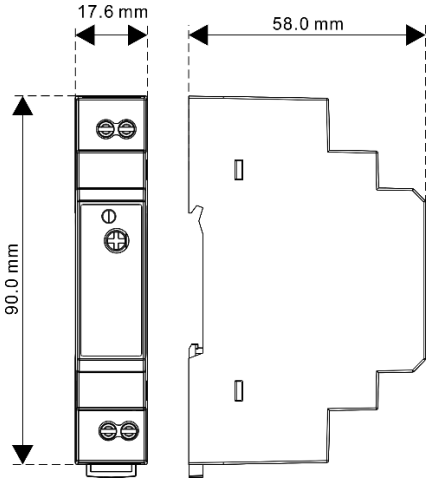
2.4.1. eManager

Height x Width x Depth (mm): 105.4 x 108 x 67



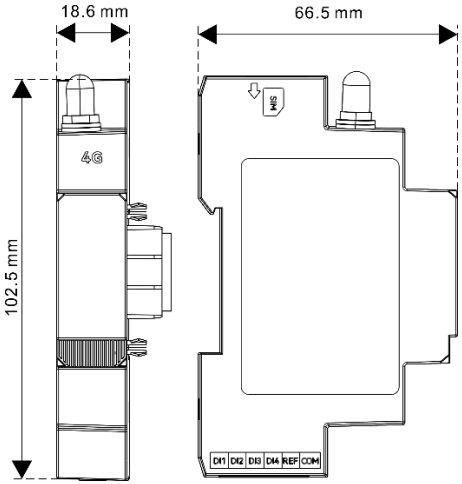
2.4.2. AC-DC power supply module

Height x Width x Depth (mm): 90 x 17.6 x 58



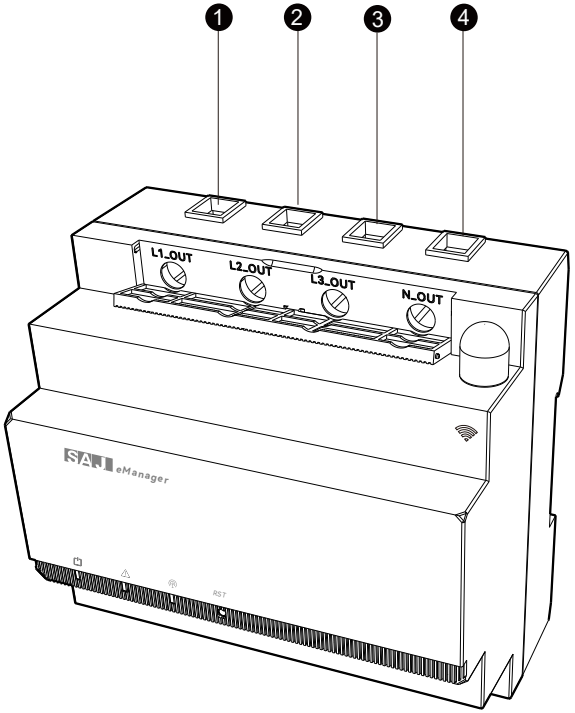
2.4.3. Pro-Mate module

Height x Width x Depth (mm): 102.5 x 18.6 x 66.5



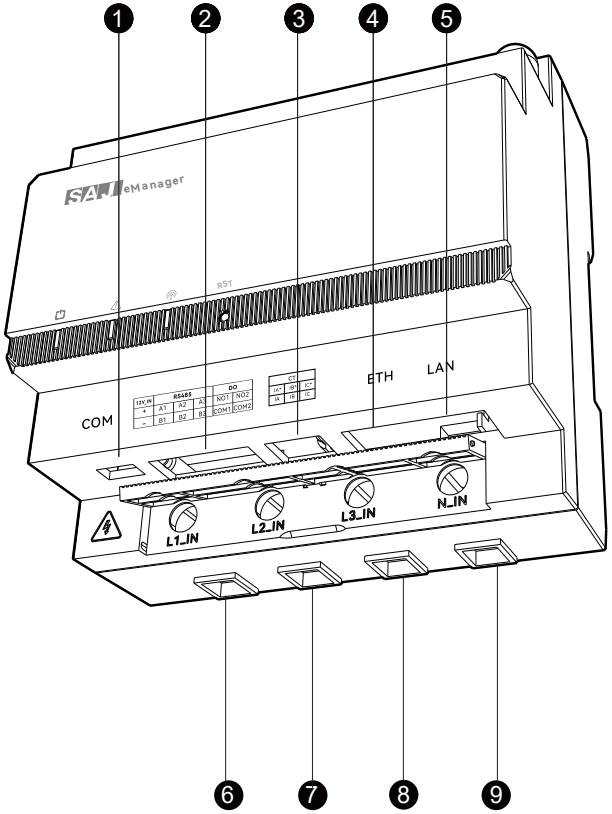
2.5. Upper view

The four output ports are for connecting the AC power cables for grid phase L1, L2, L3, and N. They are only applicable in the internal CT solutions.

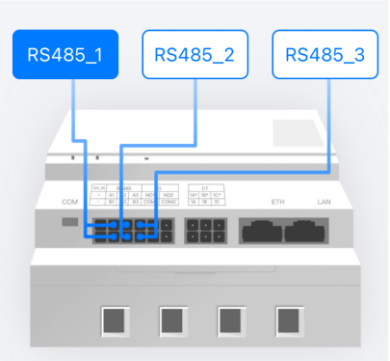


Callout	Name	Description
❶	L1_OUT	For connecting the AC power cable for grid phase L1.
❷	L2_OUT	For connecting the AC power cable for grid phase L2.
❸	L3_OUT	For connecting the AC power cable for grid phase L3.
❹	N_OUT	For connecting the AC power cable for grid phase N.

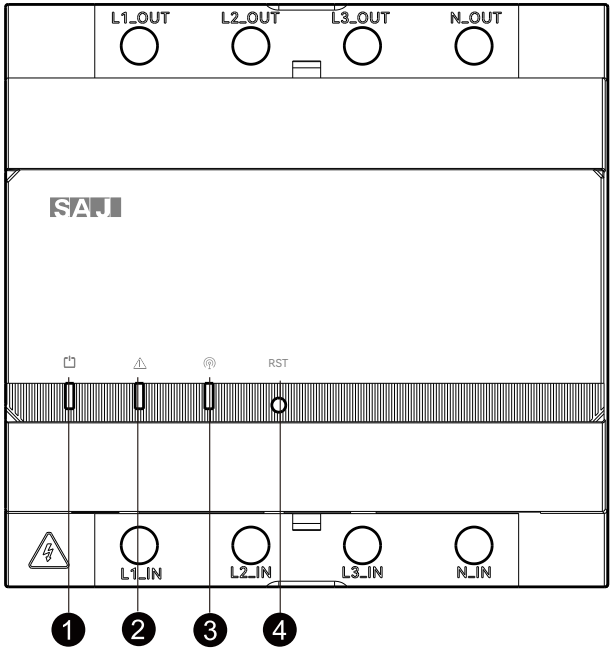
2.6. Bottom view



Callout	Name	Description
❶	COM	For debugging during maintenance.
❷	12V_IN+ and 12V_IN-	Input ports connecting to the DC output of the AC-DC power supply module for eManager backup power supply.

	RS485 A1 and B1 RS485 A2 and B2 RS485 A3 and B3	 For communication with the devices like inverters, EV charger, and meter.
	DO NO1 and DO COM1 DO NO2 and DO COM2	For connecting the DI terminals of external devices to control the startup and shutdown of the connected external devices.
❸	CT IA* and CT IA CT IB* and CT IB CT IC* and CT IC	For connecting the wires of three CTs. **Note:** The asterisk (*) symbol indicates the positive wire of the CT.
❹	ETH	To connect to the router for data transmission in Ethernet network configuration mode.
❺	LAN	For Modbus TCP communication.
❻	L1_IN	AC power cable input for grid phase L1.
❼	L2_IN	AC power cable input for grid phase L2.
❽	L3_IN	AC power cable input for grid phase L3.
❾	N_IN	AC power cable input for grid phase N.

2.7. LED indicators



LED and button	Status	Color	Description
❶ Power status LED	On	Green	The eManager is powered on.
	Off	None	The eManager is powered off.
❷ Fault LED	On	Red	An error has occurred.
	Off	None	The eManager is working properly.
❸ Communication status LED	Blinking	Green	The eManager is connected to the cloud platform.
	Off	None	The eManager is not connected to the cloud platform.
❹ Reset button	/	/	You can use a clip to press the button to reset the system.

2.8. Product specifications

General parameters	
Application	Home usage
Communication	Bluetooth, Ethernet, Wi-Fi, RS485
Data collection interval (Min)	5 by default
Firmware update	Remote or local (Bluetooth) update
Data access	App or Web
Software maintenance period (year)[1]	0.5
Hardware warranty period (year)	3
Electrical parameters	
Input AC voltage	96–264 V AC
Input DC voltage	12 V DC
Input frequency	50/60 Hz
Max. power	3 W
Nominal current/limiting current per line conductor	63 A
Max. switching current of DO ports	4 A
Max. switching voltage of DO ports	250 V AC
Max. switching power of DO ports	125 VA / 120 W
Operating temperature range	-25℃ to +40℃ (-13℉ to +104℉)
Storage temperature range	-25℃ to +70℃ (-13℉ to +158℉)
Ambient humidity	0%–95% (non-condensing)
Dimension (H x W x D) (mm)	105 x 108 x 67
Weight (g)	500
Ingress protection	IP20
Mounting	Rail-mounted
Warranty	Three years

Note: [1] Software maintenance primarily includes bug fixes, fixes for customer-reported issues, and continuous improvements.

3. Installation

About this task

The eManager, Pro-Mate module, and AC-DC power supply module need to be installed inside the AC distribution box.

Before you start

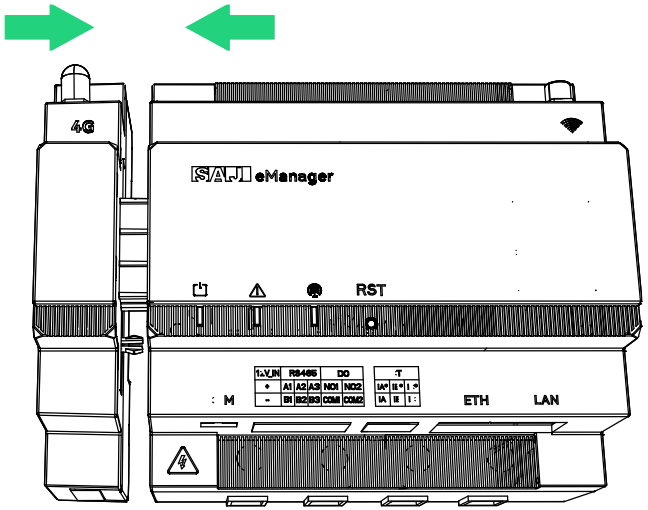
- Make sure that the AC distribution box meets the following requirements:
  - It has a surge protective device configured.
  - It must be locked by a tool for safety, so that it cannot be opened easily.
- Make sure that the length of the rail meets the following requirement:
  - When only the eManager needs to be installed, the length of the rail is no less than 108 mm.
  - When the AC-DC power supply module needs to be installed with the eManager, the length of the rail is no less than 126 mm. Alternatively, the module can be installed in another rail inside the AC distribution box.

3.1. Install the eManager

Procedure

Step 1. (Optional) Install the Pro-Mate module.

a. Remove the port cover on the left side of the eManager.

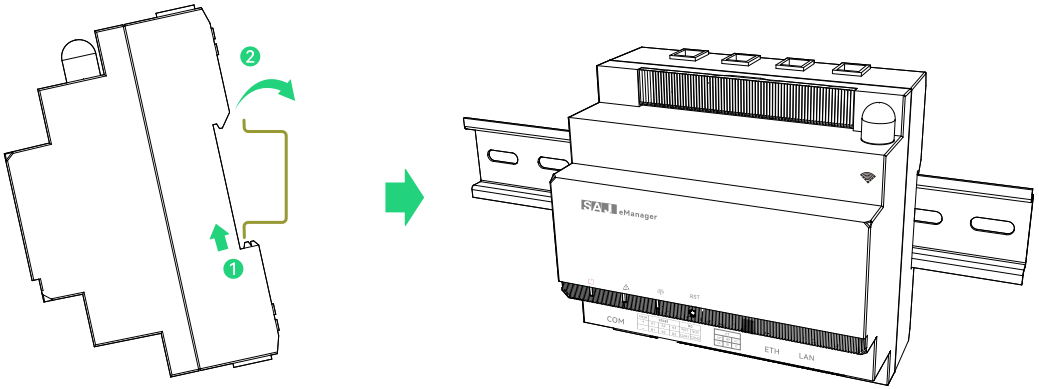


Step 2. Install the eManager or eManager-Pro to the rail.

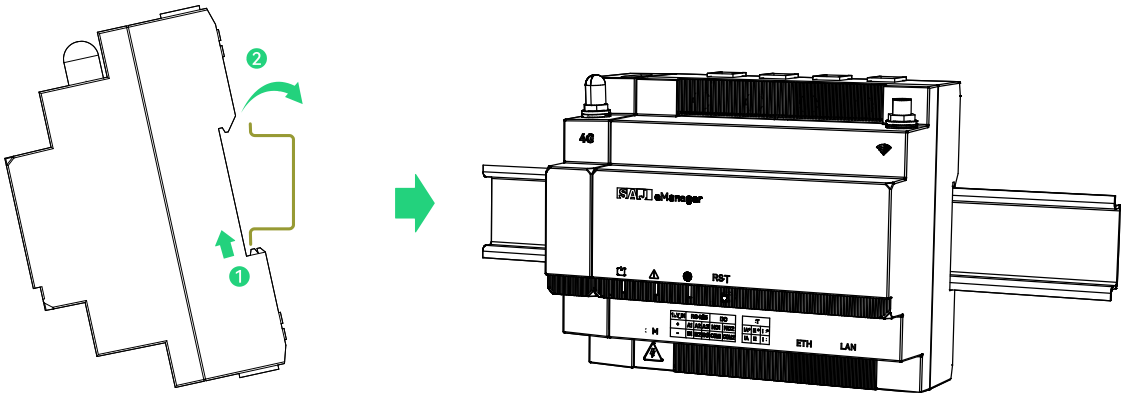
a. Insert the lower side of the rail into the lower slot on the back of the eManager. Push the eManager upwards until it is secured to the rail.

b. Pivot the eManager until the upper side of the rail is inserted into the upper slot of the eManager.

eManager



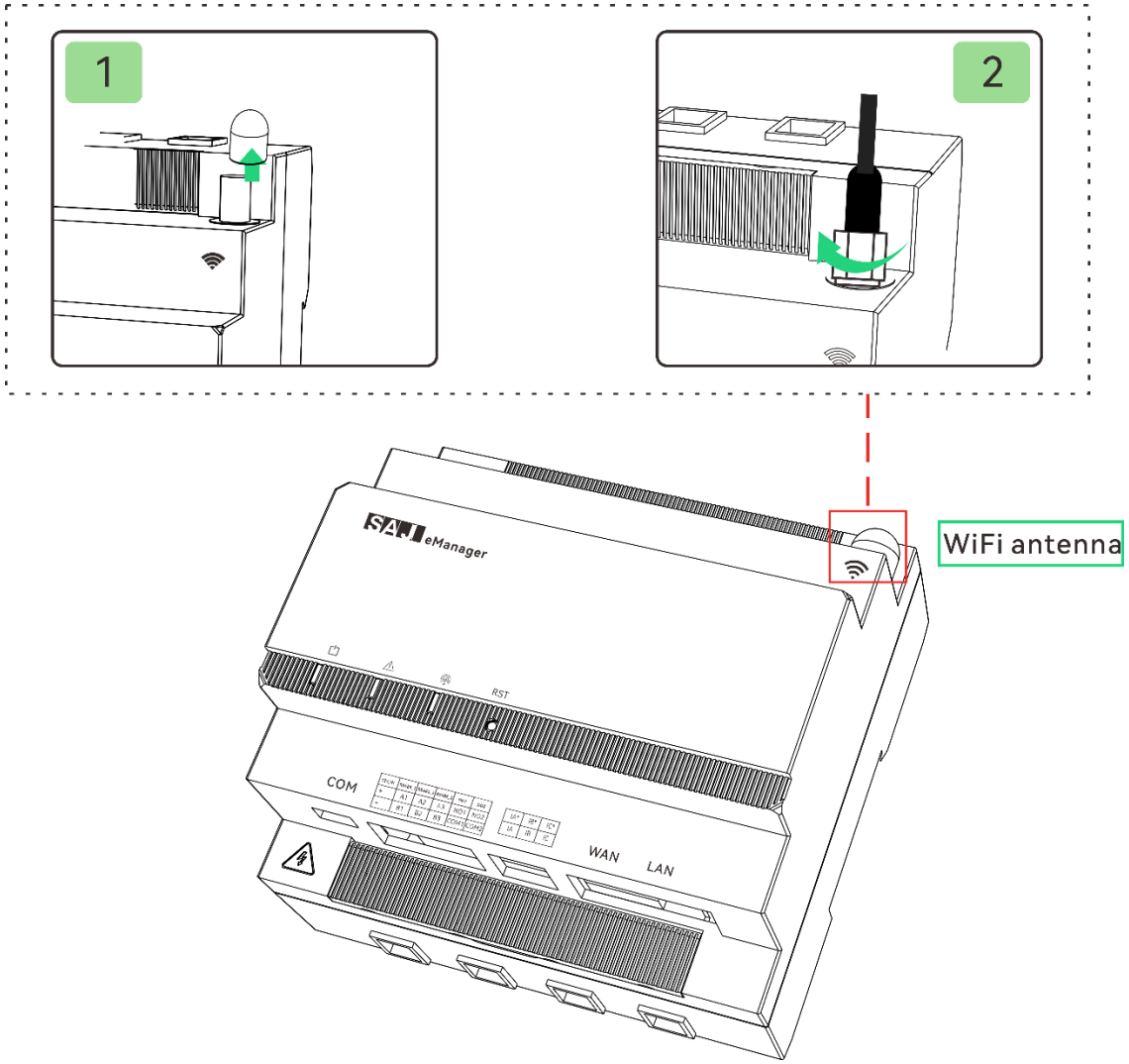
eManager-Pro



Step 3. Install the antenna to the eManager.

a. Remove the stud cap on the upper right corner of the eManager.

b. Install the antenna to the stud and tighten it.



3.2. (Optional) Install the AC-DC power supply module

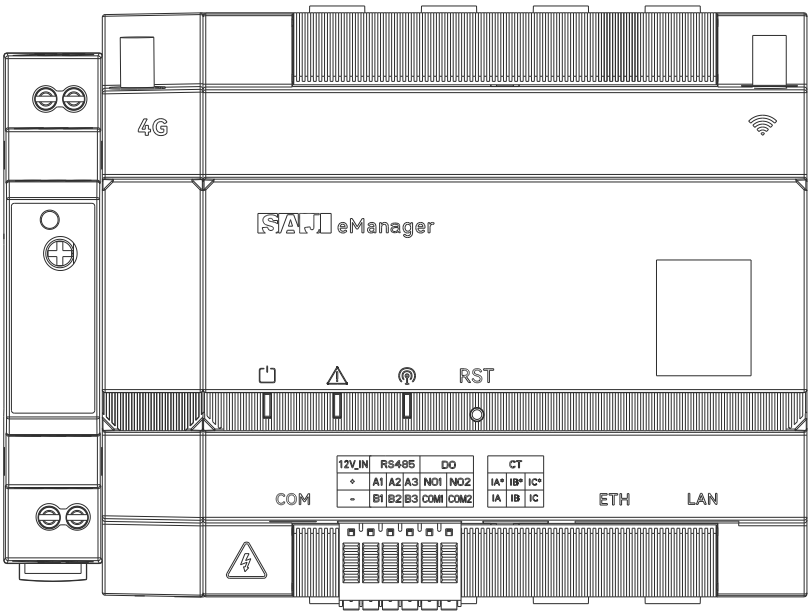
This module is required when the eManager needs to work during the off-grid time. When the grid connection is off, the ESS can provide

the power supply to the eManager with this power supply module.

Procedure

Step 1. Install the AC-DC power supply module to the eManager or eManager-Pro.

Here takes the eManager-Pro as an example:



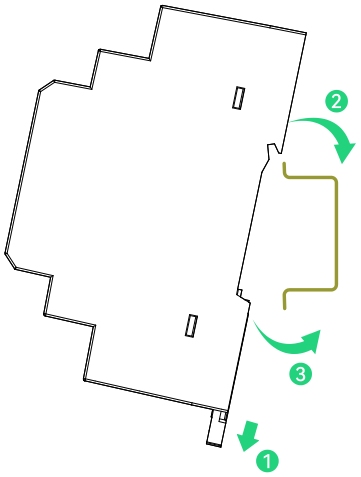
Step 2. Install the AC-DC power supply module to the rail.

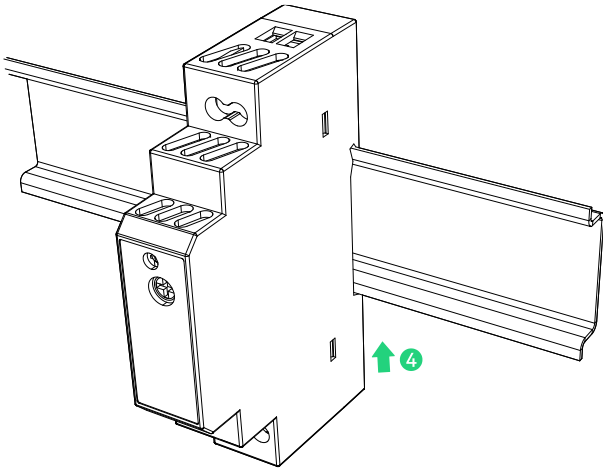
a. Pull the tab at the bottom of the module downwards.

b. Insert the upper side of the rail into the upper slot on the back of the module.

c. Pivot the module until the lower side of the rail is inserted into the lower slot of the module.

d. Push the tab at the bottom of the module upwards to secure module to the rail.





4. Electrical Connections Introduction

Device connections

The eManager supports to communicate with the devices through RS485 or LAN communication as the following table shows:

Device type	Inverter series	Communication
Inverter	R5 series solar inverters	RS485
	R6 series solar inverters	RS485
	H2 series single-phase hybrid inverters HS2 series single-phase energy storage system	RS485
	H2-(5K-10K)-T2 hybrid inverters HS2-(5K-10K)-T2 energy storage system	RS485
	H2-(10K-30K)-(T2,T3) hybrid inverters	RS485/LAN
	HS3 series energy storage system	LAN
Meter	/	RS485
EV charger	/	RS485

- **RS485 communication connection**

The eManager provides three pairs of RS485 ports A1/B1, A2/B2, and A3/B3. One pair of ports can only be connected with the same type of devices.

Device type	Connection
Inverter	• A maximum of six inverters can be connected in parallel. • One pair of port can be connected with two inverters at maximum. • For one pair of port, only inverters of the same type can be connected. A hybrid inverter and a solar inverter cannot be connected to the same pair of ports.
Meter	Connect meters to A3/B3 ports only.
EV charger	One eManager can be connected with only one EV charger to one of the pairs of the ports.

Connect the communication cables from the eManager **RS485** port to the inverter communication port as follows:

Inverter series	Inverter port		eManager port
	Silkscreen	Pin number	
• R5 series • R6 series	RS485	Pin 7	RS485-A
		Pin 8	RS485-B
H2-(10K-30K)-(T2,T3)	EMS	Pin 7	RS485-A
		Pin 8	RS485-B
Other H2/HS2 series	RS485*	Pin 7	RS485-A
		Pin 8	RS485-B

* When no **RS485** port is available on the inverter, connect to the communication port marked with **EMS/Meter** instead.

- **LAN communication connection**

  In single-inverter deployment, the eManager can be connected to the inverter through the eManager **LAN** port.

  In parallel deployment, the eManager can be connected to a maximum of ten inverters through LAN communication. Connect all the communication cables from the eManager **LAN** port and the inverter **LAN** port to a network switch.

Cloud platform connection

The eManager supports to communicate with the SAJ elekeeper cloud platform in one of the following ways:

- Wi-Fi connection
- Ethernet connection. The eManager can be connected to a router through the **ETH** port.
- 4G connection. This connection is only available when the Pro-Mate module is installed. The customer also needs to prepare a 4G SIM card to be installed in the Pro-Mate module.

Grid meter connection

When the eManager works as a grid meter, either internal CT or external CT can be applied.

- The internal CT solution is available for current smaller than 63 A.
- To use external CTs, select the 50x*N*A/50 mA CT, wherein *N* is equal to or greater than 2.
- When the diameter of the grid AC cable is larger than 48 mm, it is necessary to order an additional DTSU666 (Dual RS485) grid meter from SAJ and prepare external CTs of *N*A/5 A, wherein the secondary current must be of 5 A.

Optional power supply connection

The eManager also provides an optional AC-DC power supply module. This module is only required when the eManager needs to work during the off-grid time.

The cables are connected to the ports on the AC-DC power supply module, inverter, and eManager as follows:

From	To
AC input **L/N** ports of the AC-DC power supply module	**BACKUP** port on the inverter (any phase in three-phase grid connection)
DC output **V+/V-** ports of the AC-DC power supply module	**12V_IN** port at the bottom of the eManager

Typical system connection solutions

The following table describes the typical EMS system connection solutions. RS485 and Ethernet connections are used for illustration.

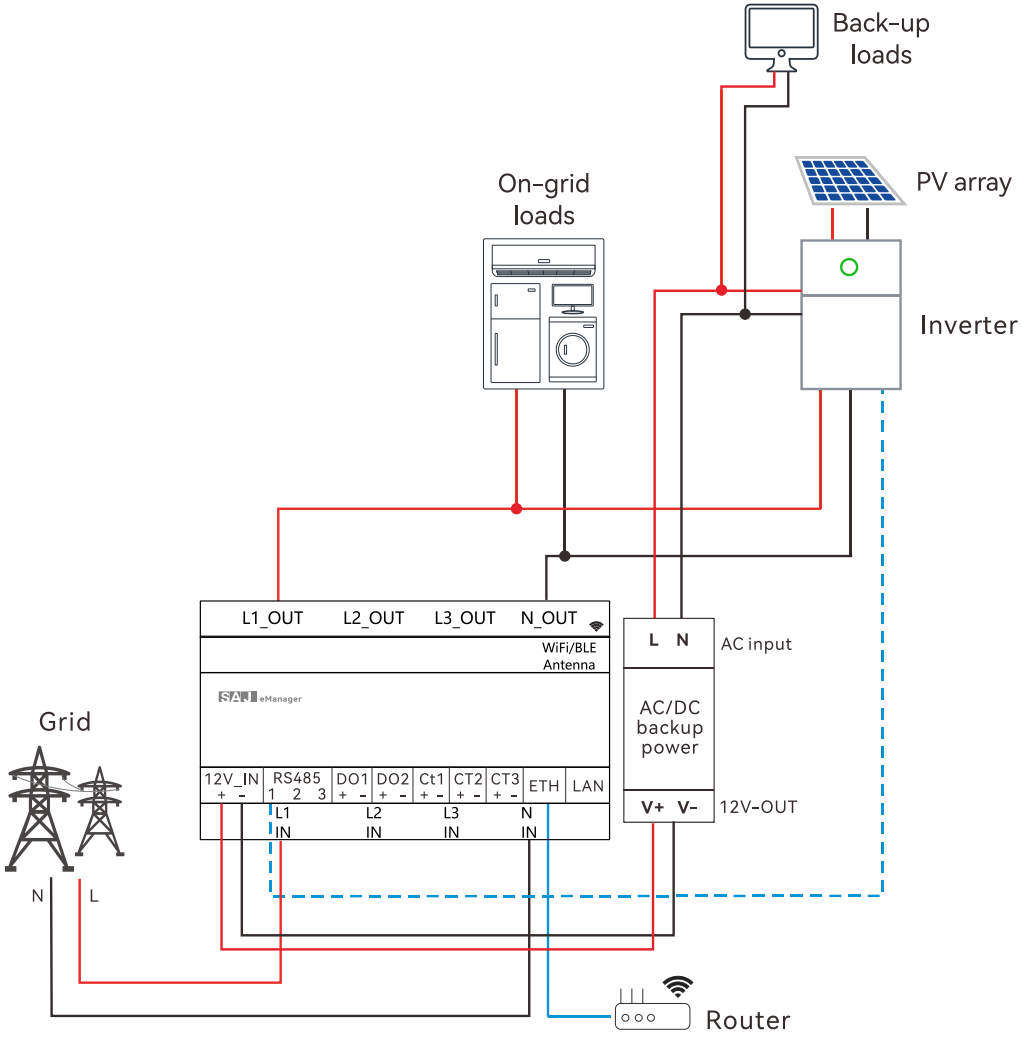
Grid type	Grid meter configuration	Devices	Section
Single-phase	Internal CT	EMS + SAJ inverter	4.1.1 Solution 1: single-phase grid, internal CT, EMS + SAJ inverter, RS485 communication
		EMS + SAJ inverter + third-party solar inverter	4.1.2 Solution 2: single-phase grid, internal CT, EMS + SAJ inverter + third-party solar inverter, RS485 communication
	External CT	EMS + SAJ inverter	4.1.3 Solution 3: single-phase grid, external CT, EMS + SAJ inverter, RS485 communication
		EMS + SAJ inverter + third-party solar inverter	4.1.4 Solution 4: single-phase grid, external CT, EMS + SAJ inverter + third-party solar inverter, RS485 communication
Three-phase	Internal CT	EMS + SAJ inverter	4.1.5 Solution 5: three-phase grid, internal CT, EMS + SAJ inverter, RS485 communication
		EMS + SAJ inverter + third-party solar inverter	4.1.6 Solution 6: three-phase grid, internal CT, EMS + SAJ inverter + third-party solar inverter, RS485 communication
	External CT	EMS + SAJ inverter	4.1.7 Solution 7: three-phase grid, external CT, EMS + SAJ inverter, RS485 communication
	External meter connected	EMS + SAJ inverter + third-party solar inverter	4.1.8 Solution 8: three-phase grid, external meter connected, EMS + SAJ inverter + third-party solar inverter, RS485 communication
		EMS + SAJ inverter	4.1.9 Solution 9: three-phase grid, external meter connected, EMS + SAJ inverter, RS485 communication

The following table describes the EMS-device communication connection solutions for SAJ inverters.

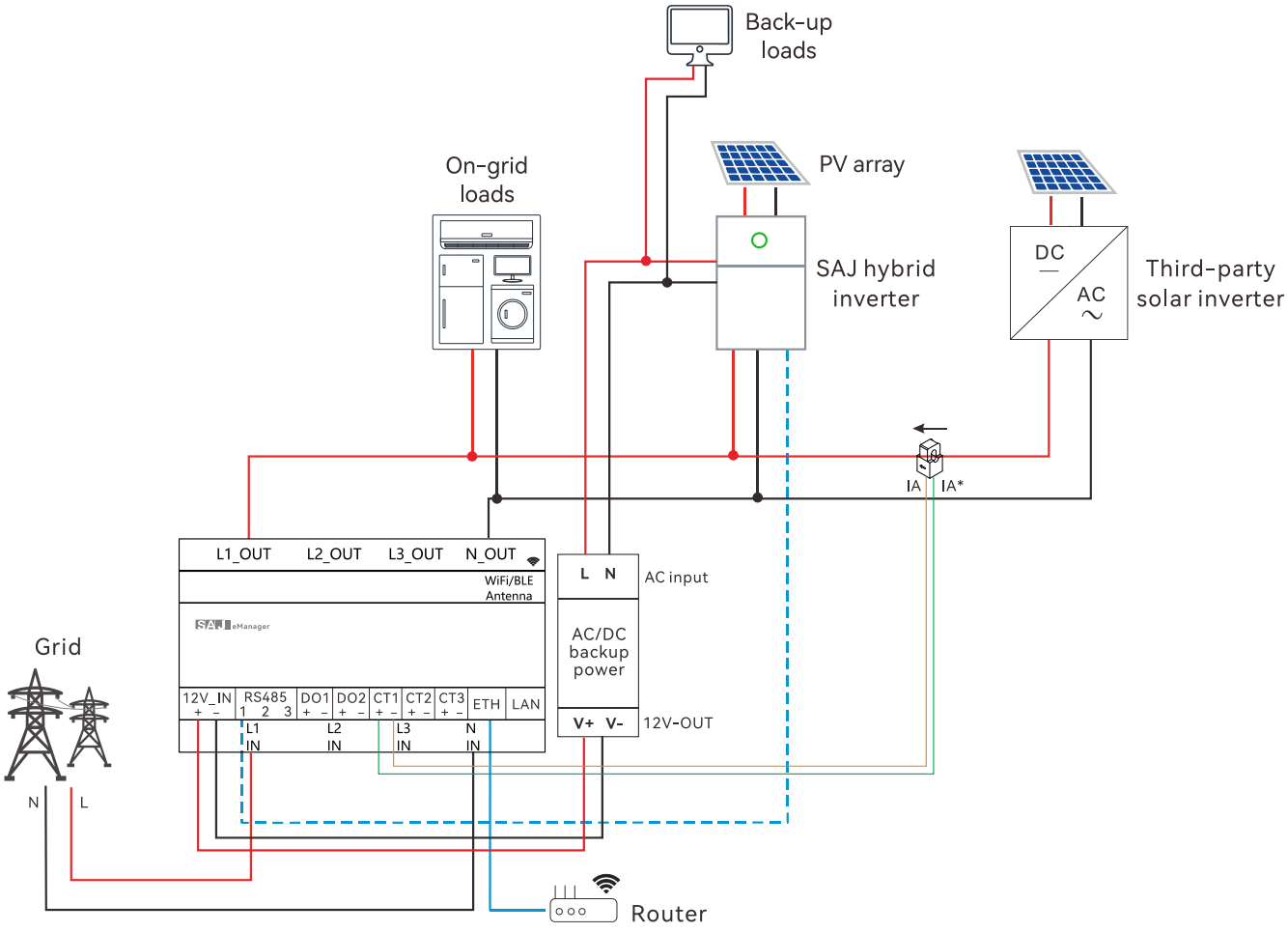
Devices	Communication	Section
One inverter	LAN	4.1.10 Solution 10: One inverter, LAN communication
Multiple inverters	LAN	4.1.11 Solution 11: Multiple-inverters, LAN communication
Multiple inverters	RS485	4.1.12 Solution 12: Multiple-inverters, RS485 communication
Multiple inverters + one EV charger	RS485	4.1.13 Solution 13: Multiple-inverters + one EV charger, RS485 communication

4.1. Connect the devices to the EMS

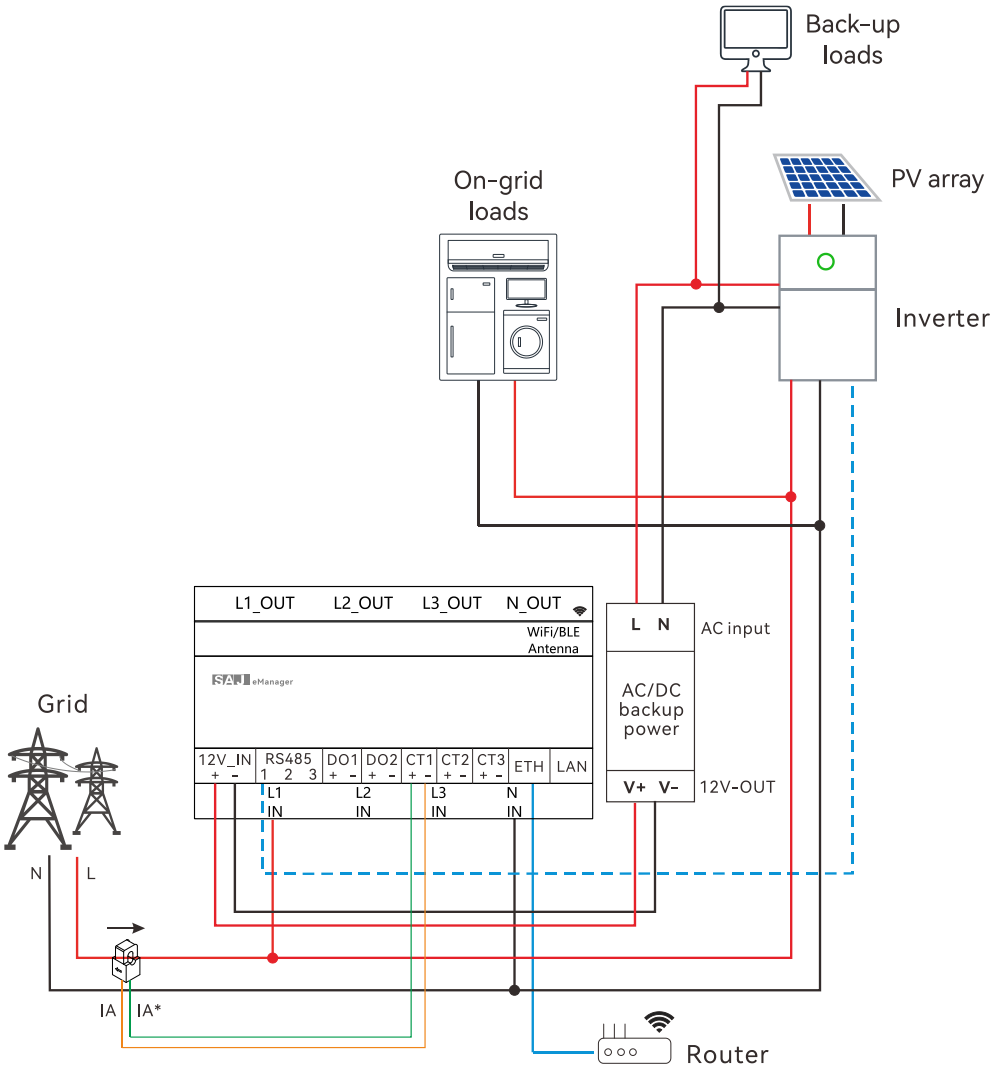
4.1.1. Solution 1: single-phase grid, internal CT, EMS + SAJ inverter, RS485 communication



4.1.2. Solution 2: single-phase grid, internal CT, EMS + SAJ inverter + third-party solar inverter, RS485 communication



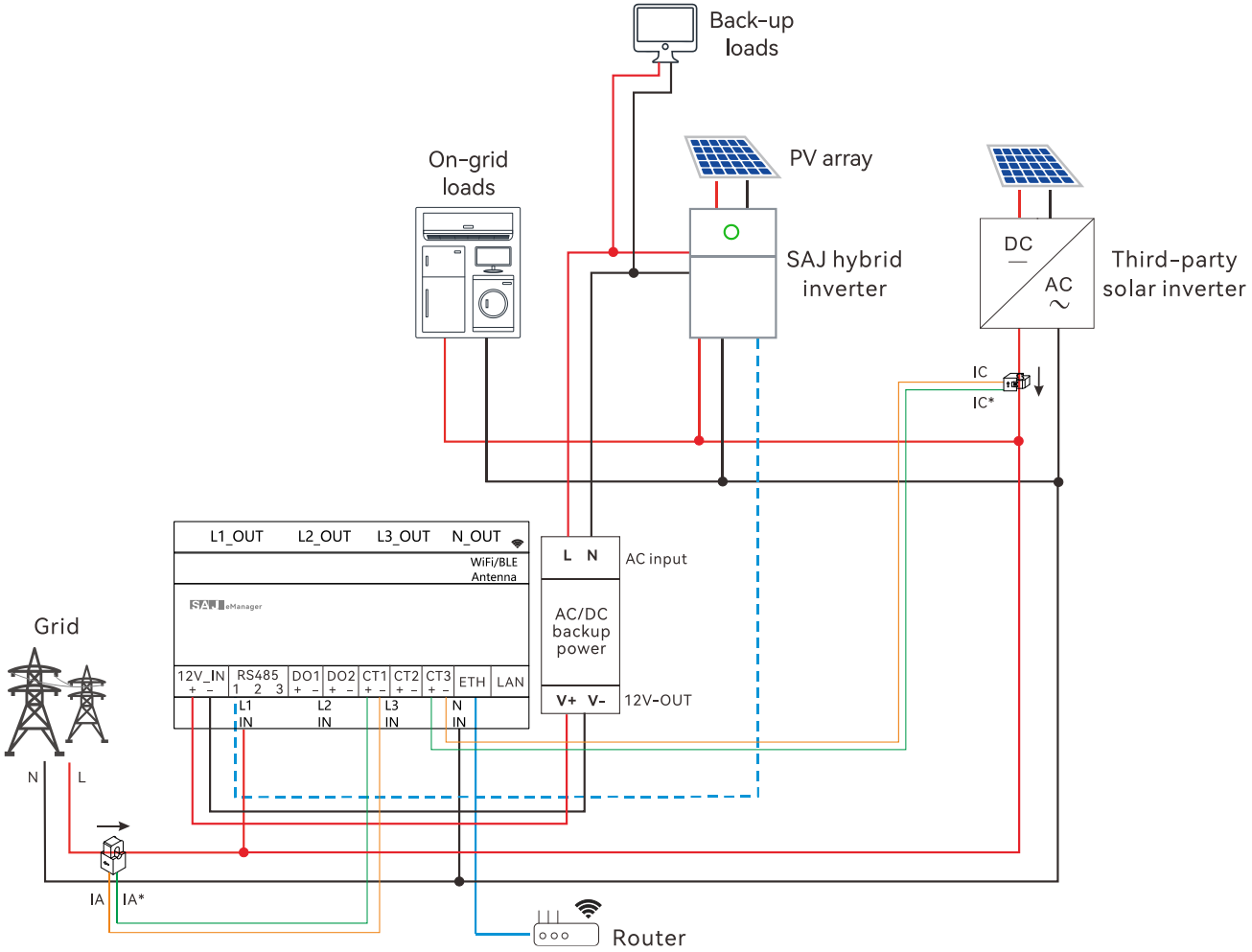
4.1.3. Solution 3: single-phase grid, external CT, EMS + SAJ inverter, RS485 communication



Note:

- The arrow ➔ on the CT points to the inverter or on-grid loads.

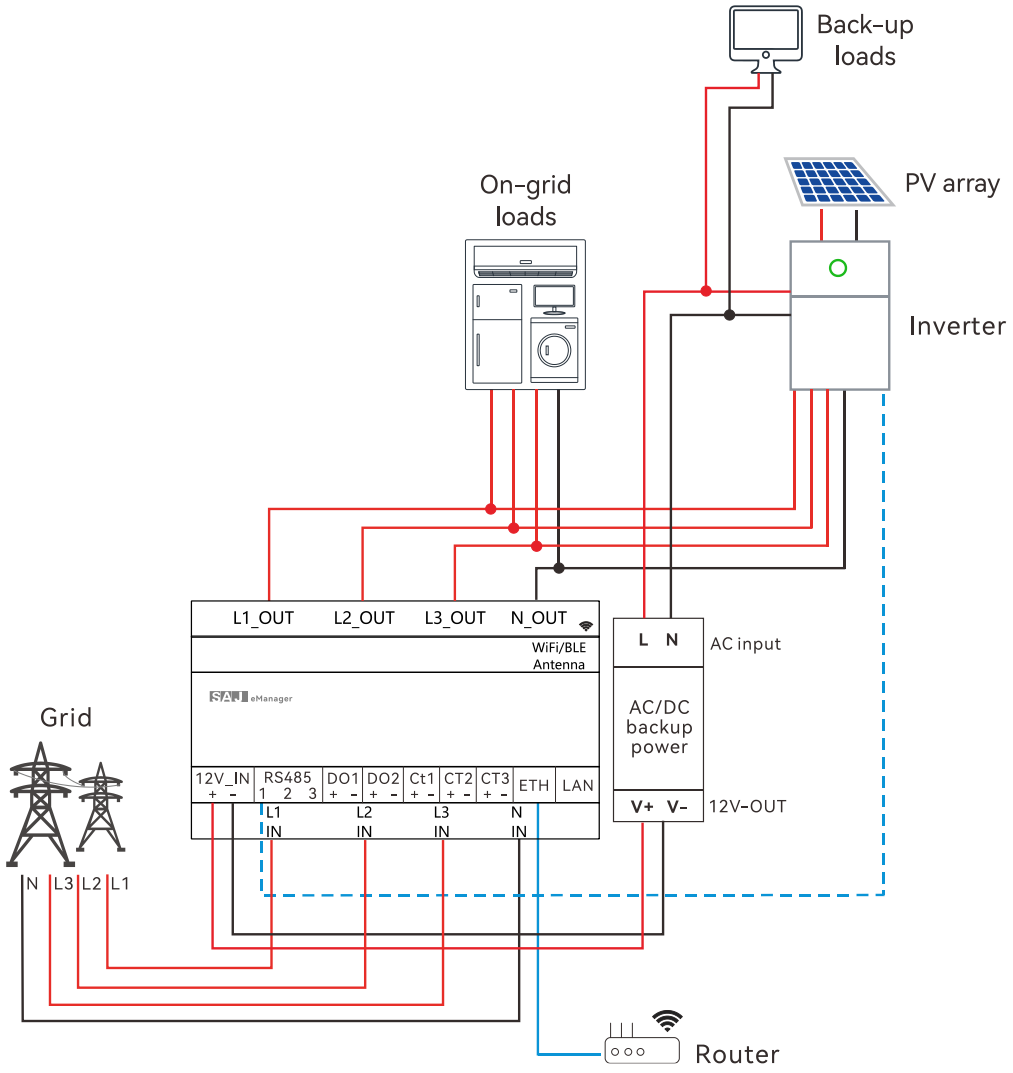
4.1.4. Solution 4: single-phase grid, external CT, EMS + SAJ inverter + third-party solar inverter, RS485 communication



Note:

- The arrow → on the CT points to the inverter or on-grid loads.

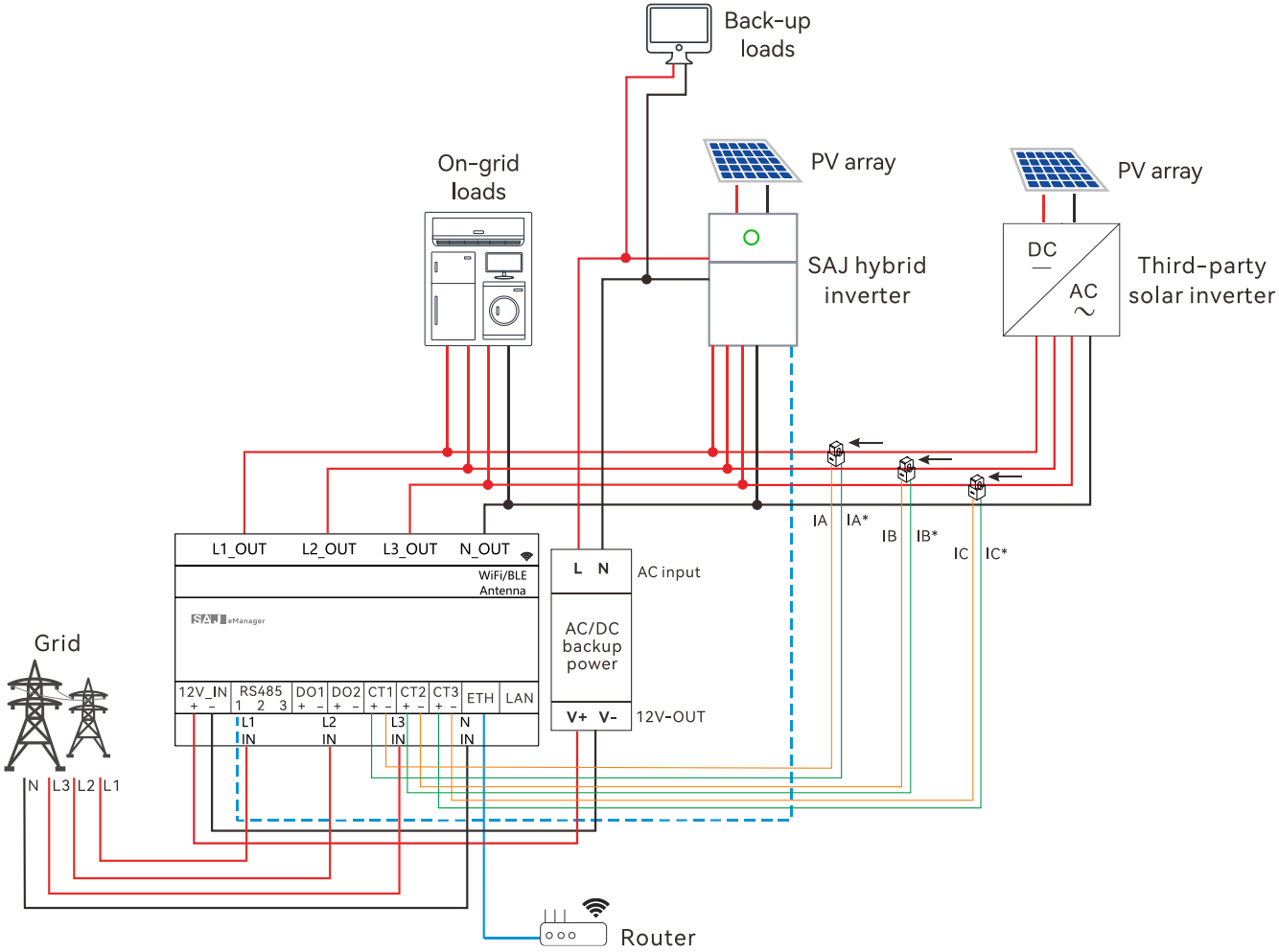
4.1.5. Solution 5: three-phase grid, internal CT, EMS + SAJ inverter, RS485 communication



Note:

- The Backup load can be either single-phase or three-phase depending on the actual requirement.

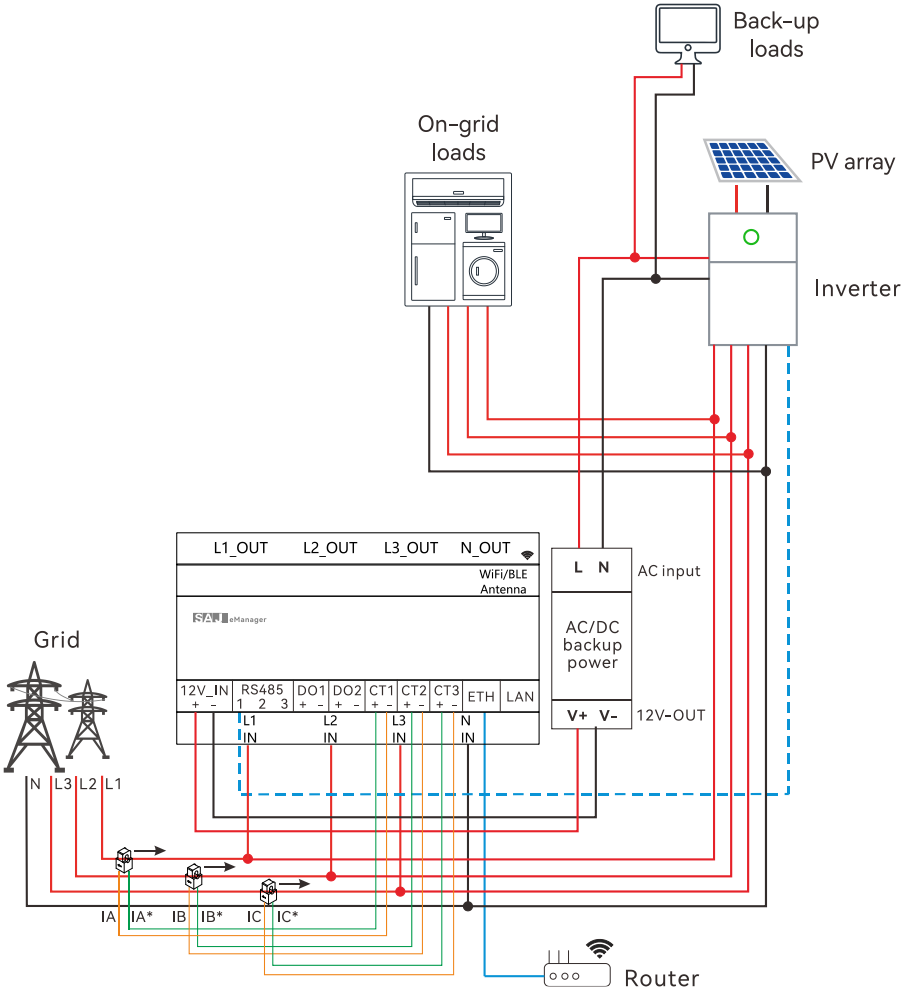
4.1.6. Solution 6: three-phase grid, internal CT, EMS + SAJ inverter + third-party solar inverter, RS485 communication



Note:

- The arrow ➔ on the CT points to the inverter or on-grid loads. In the three-phase grid, the CT wires for the L1, L2, and L3 lines must be connected to the three pairs of CT ports in order: IA* and IA, IB* and IB, IC* and IC.
- The Backup load can be either single-phase or three-phase depending on the actual requirement.

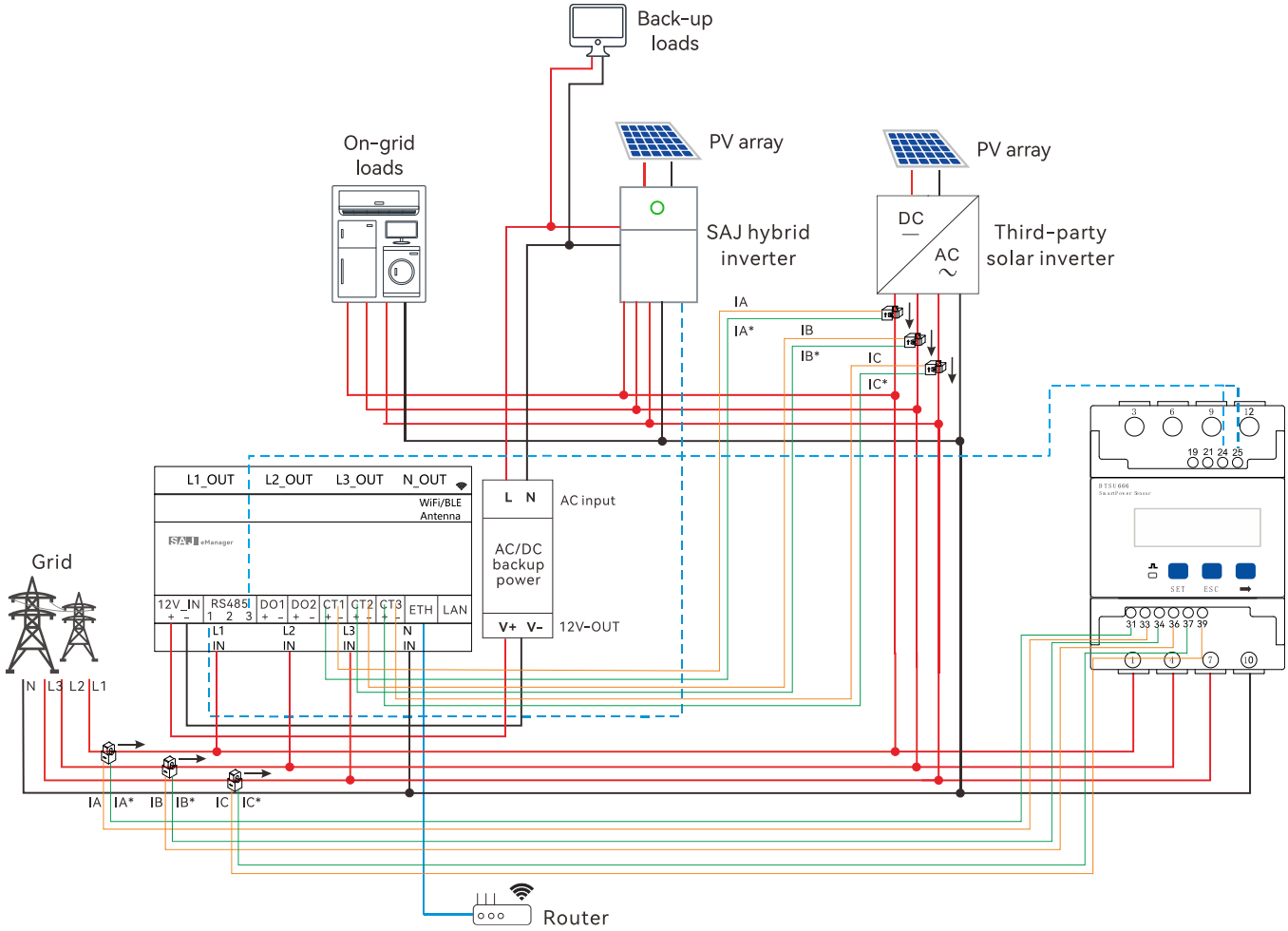
4.1.7. Solution 7: three-phase grid, external CT, EMS + SAJ inverter, RS485 communication



Note:

- The arrow ➔ on the CT points to the inverter or on-grid loads. In the three-phase grid, the CT wires for the L1, L2, and L3 lines must be connected to the three pairs of CT ports in order: IA* and IA, IB* and IB, IC* and IC.
- The Backup load can be either single-phase or three-phase depending on the actual requirement.

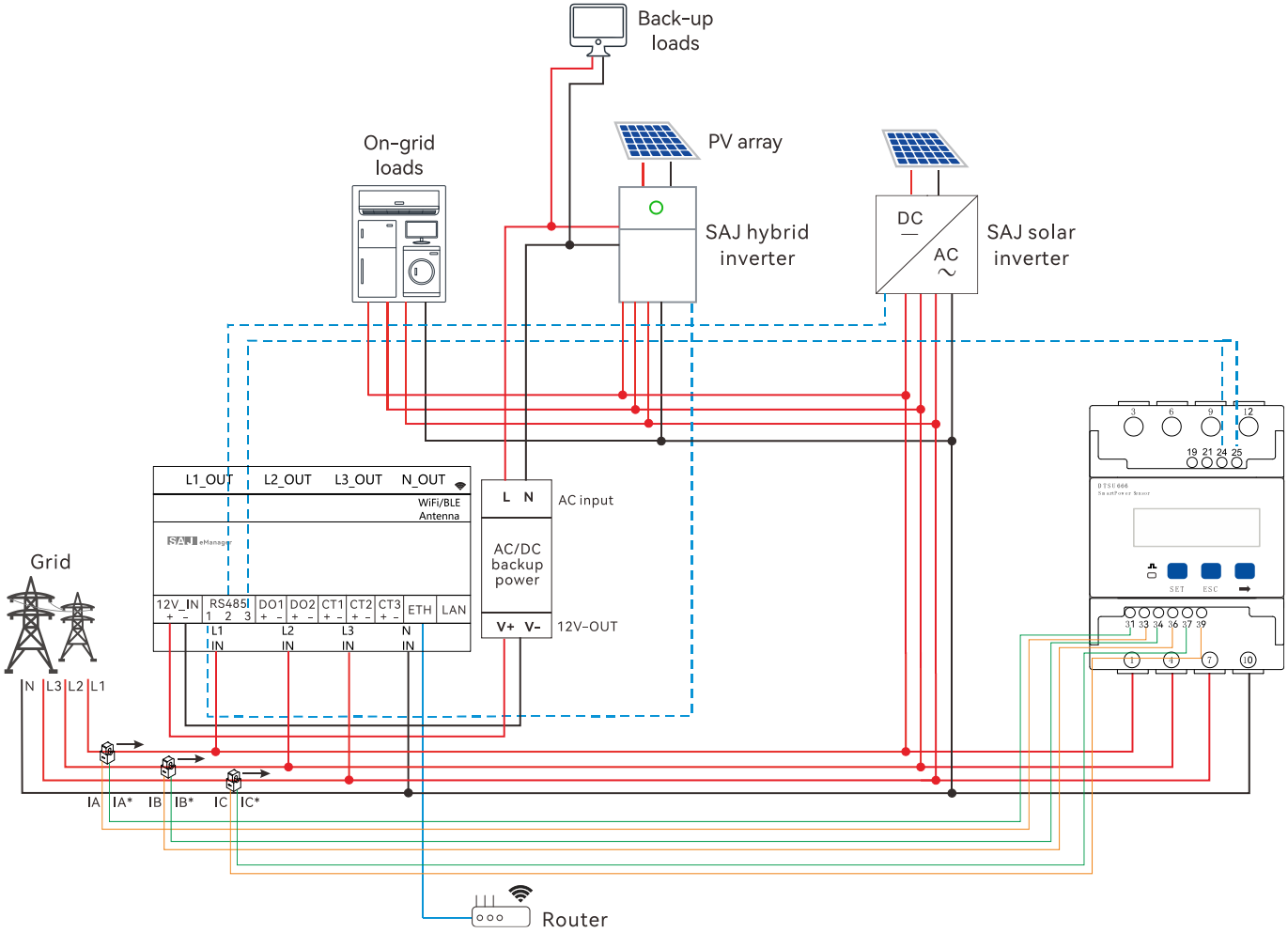
4.1.8. Solution 8: three-phase grid, external meter connected, EMS + SAJ inverter + third-party solar inverter, RS485 communication



Note:

- The arrow ➔ on the CT points to the inverter or on-grid loads. In the three-phase grid, the CT wires for the L1, L2, and L3 lines must be connected to the three pairs of CT ports in order: IA* and IA, IB* and IB, IC* and IC.
- The Backup load can be either single-phase or three-phase depending on the actual requirement.

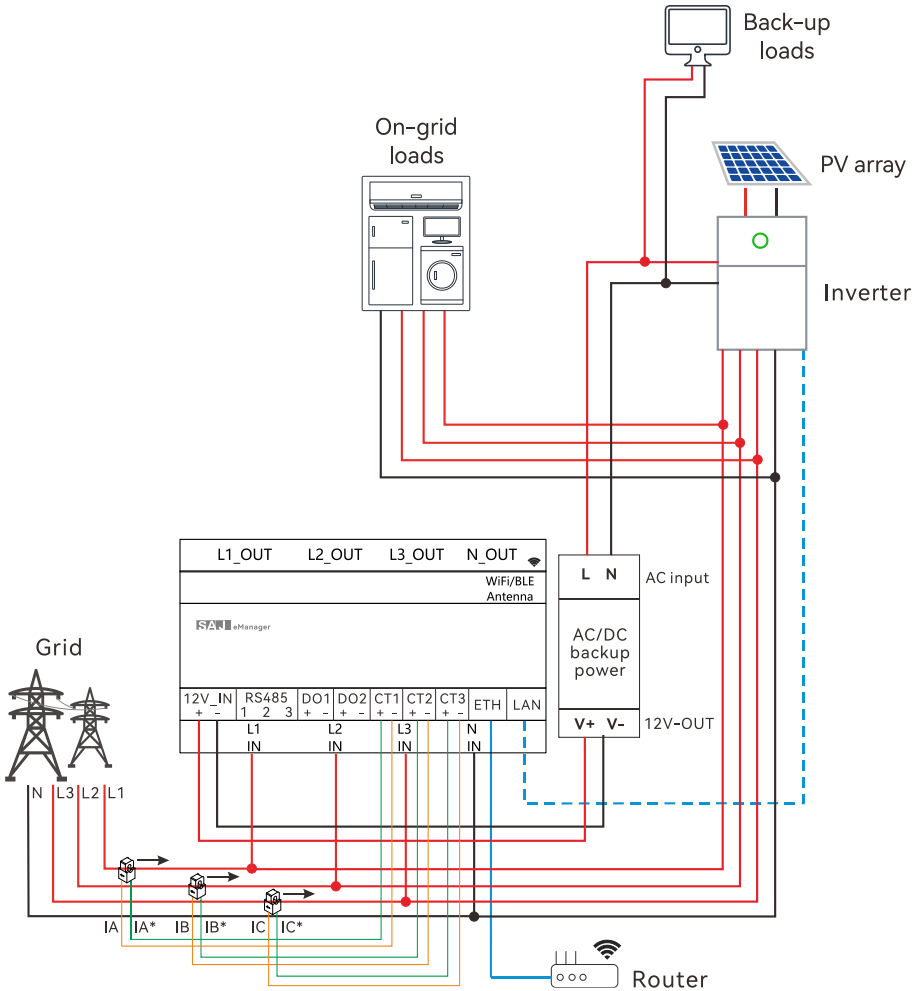
4.1.9. Solution 9: three-phase grid, external meter connected, EMS + SAJ inverter, RS485 communication



Note:

- The arrow ➔ on the CT points to the inverter or on-grid loads. In the three-phase grid, the CT wires for the L1, L2, and L3 lines must be connected to the three pairs of CT ports in order: IA* and IA, IB* and IB, IC* and IC.
- The Backup load can be either single-phase or three-phase depending on the actual requirement.

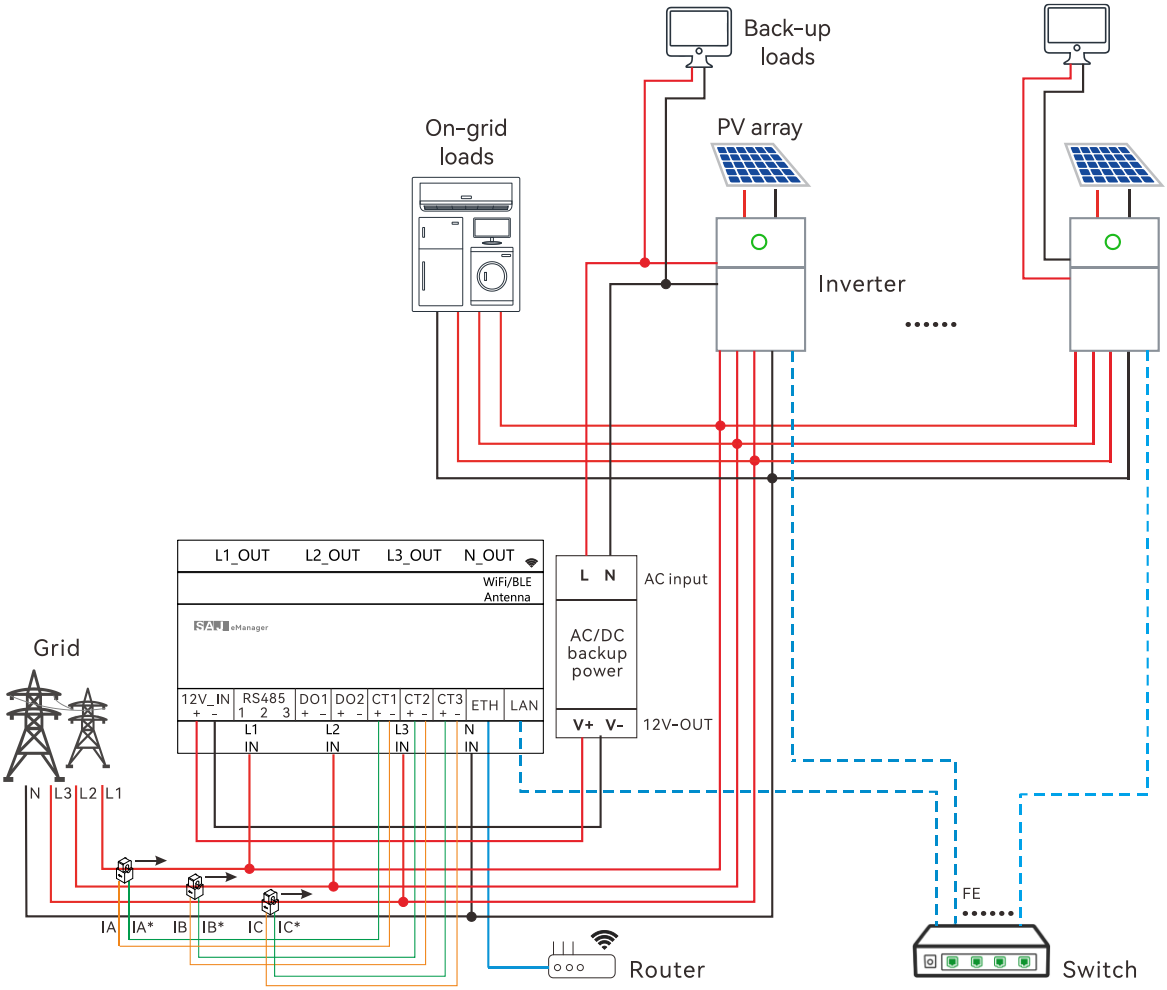
4.1.10. Solution 10: One inverter, LAN communication



Note:

- The arrow ➔ on the CT points to the inverter or on-grid loads. In the three-phase grid, the CT wires for the L1, L2, and L3 lines must be connected to the three pairs of CT ports in order: IA* and IA, IB* and IB, IC* and IC.
- The Backup load can be either single-phase or three-phase depending on the actual requirement.

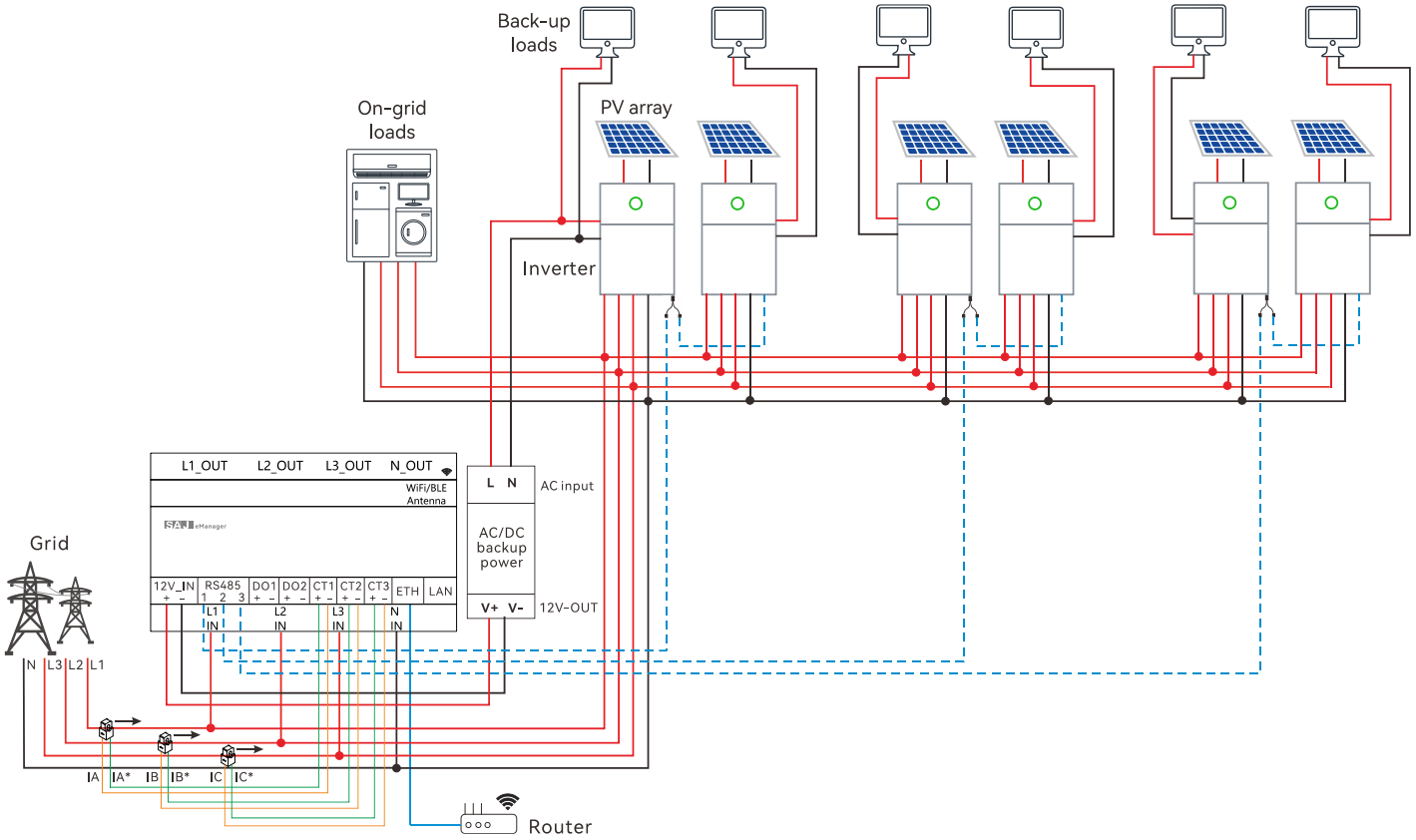
4.1.11. Solution 11: Multiple-inverters, LAN communication



Note:

- The arrow ➔ on the CT points to the inverter or on-grid loads. In the three-phase grid, the CT wires for the L1, L2, and L3 lines must be connected to the three pairs of CT ports in order: IA* and IA, IB* and IB, IC* and IC.
- The Backup load can be either single-phase or three-phase depending on the actual requirement.

4.1.12. Solution 12: Multiple-inverters, RS485 communication

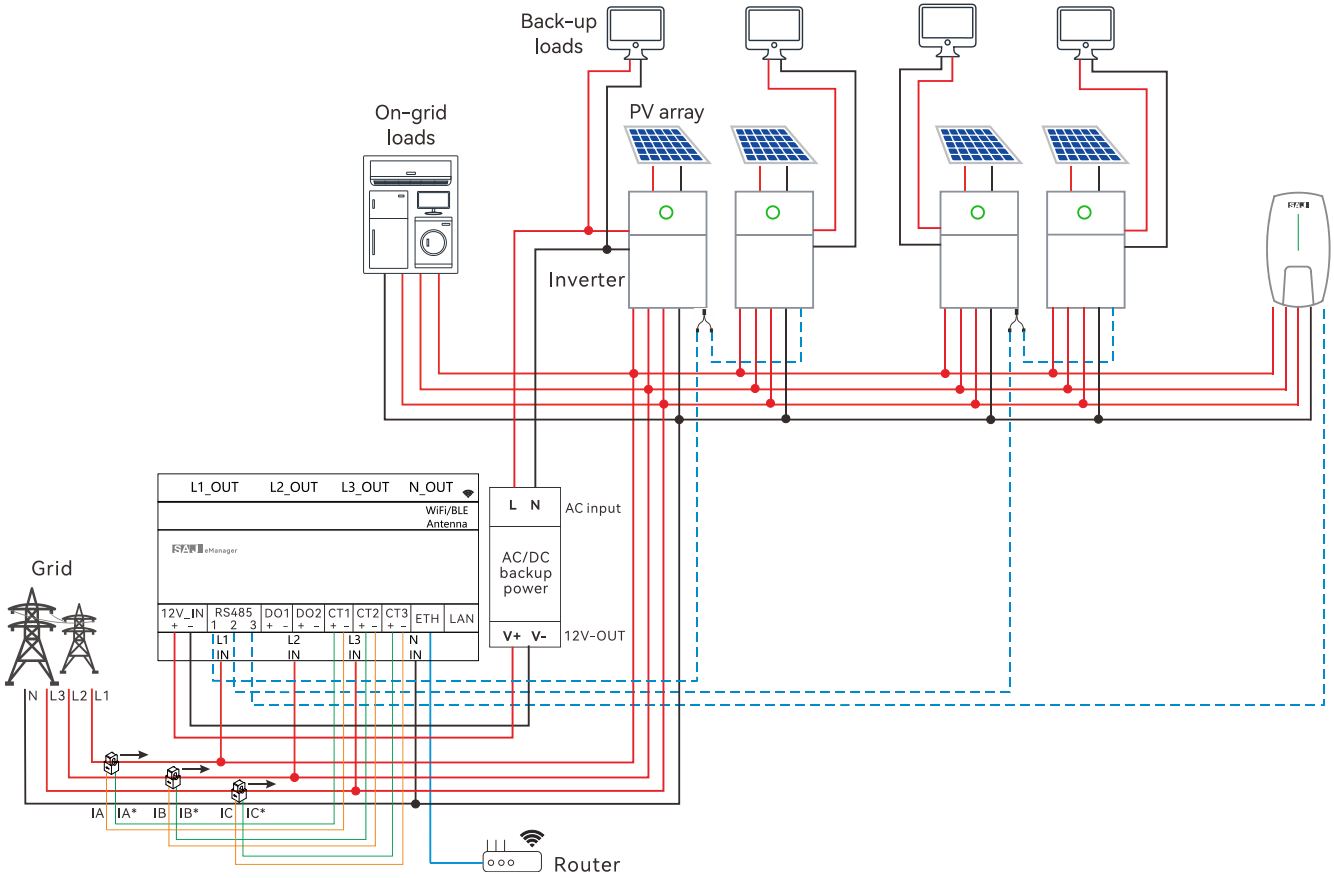


Notes:

- The arrow ➔ on the CT points to the inverter or on-grid loads. In the three-phase grid, the CT wires for the L1, L2, and L3 lines must be connected to the three pairs of CT ports in order: IA* and IA, IB* and IB, IC* and IC.
- The cable splitter between the two inverters for RS485 connection needs to be ordered separately from SAJ as needed.
- The Backup load can be either single-phase or three-phase depending on the actual requirement.

4.1.13. Solution 13: Multiple-inverters + one EV charger, RS485 communication

When an electric vehicle (EV) charger (AC7000-AE-35 or AC011K-AE-35) needs to be used, you can connect the communication cable of the EV charger to any available pair of RS485 ports on the eManager. One eManager can only connect with one EV charger. For example: connect to RS485 A3 and B3 as illustrated below:



Notes:

- The arrow ➔ on the CT points to the inverter or on-grid loads. In the three-phase grid, the CT wires for the L1, L2, and L3 lines must be connected to the three pairs of CT ports in order: IA* and IA, IB* and IB, IC* and IC.
- The Backup load can be either single-phase or three-phase depending on the actual requirement.
- The cable splitter between the two inverters for RS485 connection needs to be ordered separately from SAJ as needed.

4.2. (Optional) Dry contact device connection

4.2.1. Connection of devices with DI ports

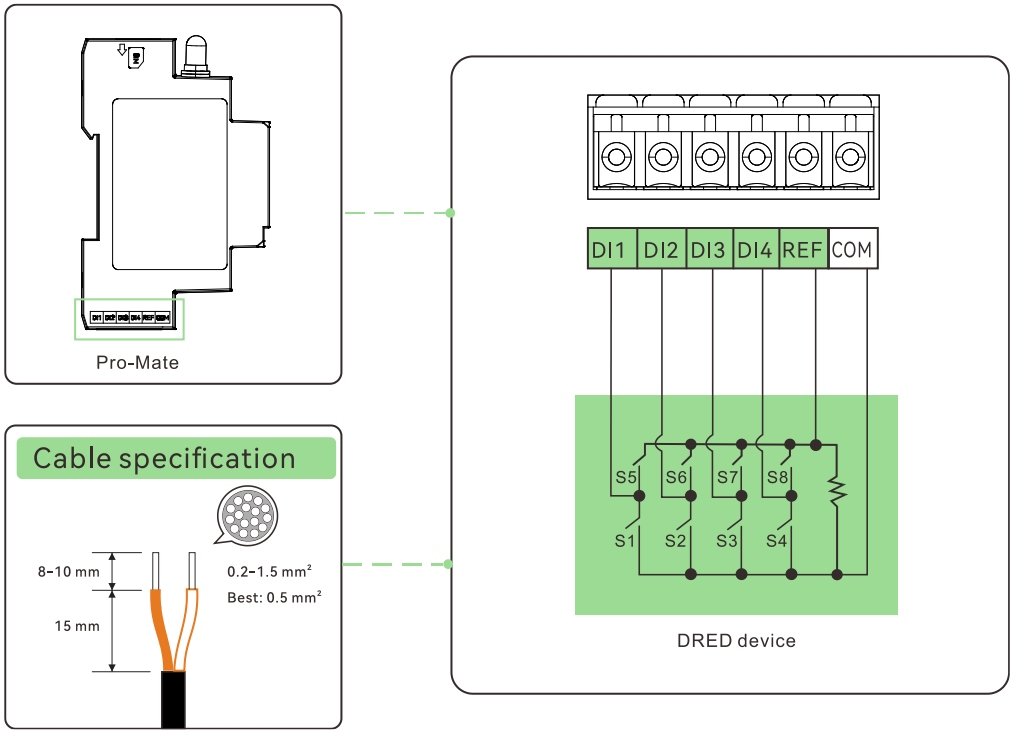
The eManager supports the devices with DI ports to connect to the eManager DO ports to control the start and stop of such devices. For example, a heat pump.

The eManager can be connected to one device at a time. The device can be connected to either pair of the following eManager ports:

- **NO1** and **COM1**
- **NO2** and **COM2**

4.2.2. (In Australia and New Zealand) Connection of DRED devices

According to the local regulations in Australia and New Zealand, a DRED device is required for demand response modes (DRM) control. You can connect the DRED device to the following DI terminals (highlighted in green) at the bottom of the Pro-Mate module.



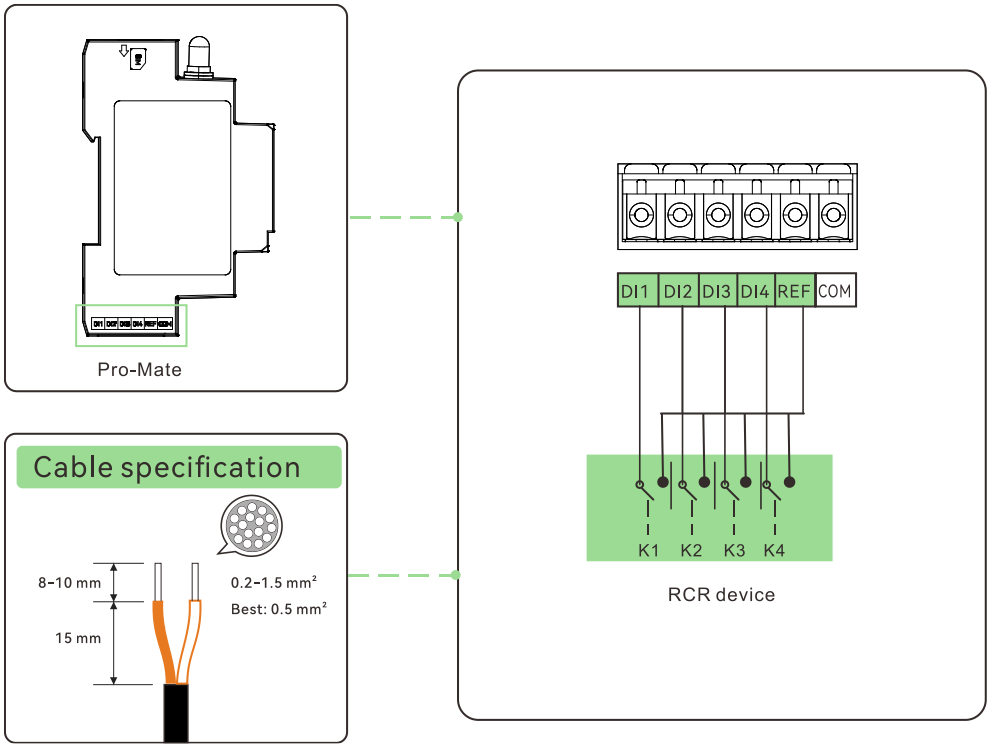
4.2.3. (In Germany) RCR connection for output power control to the grid

According to the local regulations in Germany, a ripple control receiver (RCR) device is required to control the maximum output power that is exported to the grid.

When the RCR device connecting to the DI port is closed, the device signals the inverter to export power to the grid at the corresponding level that is configured for the **RCR Power Settings** on the elekeeper App. Each port corresponds to the following setting on the App:

- DI1: LEVEL1
- DI2: LEVEL2
- DI3: LEVEL3
- DI4: LEVEL4

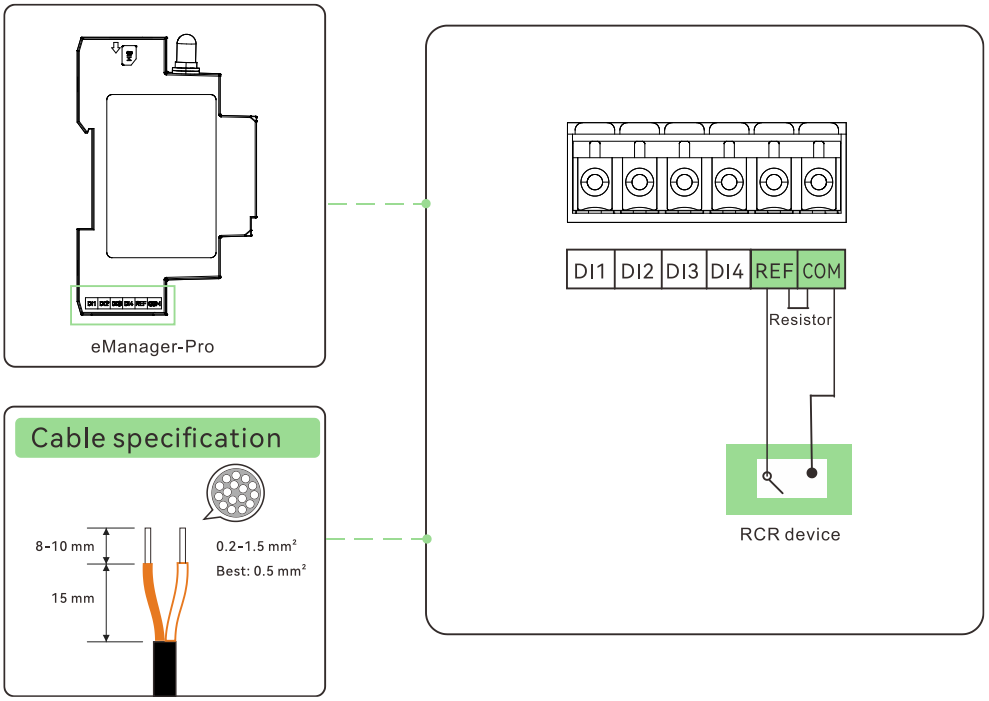
The rated power control limit of K1 to K4 devices increases. Connect the devices accordingly to the **DI1** to **DI4** ports at the bottom of the Pro-Mate module.



4.2.4. (In Germany) RCR connection for complying with 14a of the EnWG

In Germany, to comply with § 14a of the Energy Industry Act (EnWG), the eManager is required to connect to an RCR device. Upon receiving an overload signal from the grid company, the RCR device will notify the EV charger or battery system to downgrade the power to 4.2 kW.

To use this function, connect the RCR device and a 15 kΩ resistor to the **REF** and **COM** terminals at the bottom of the Pro-Mate module as follows:

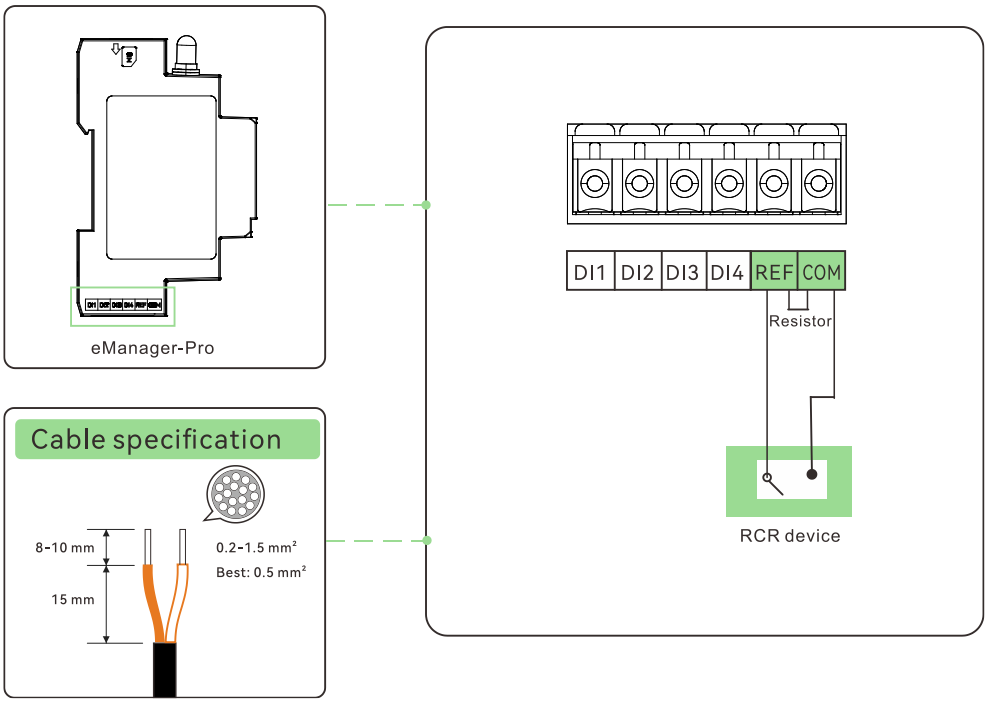


4.2.5. (In Germany) RCR connection for inverter emergency stop

In Germany, the RCR device can be connected to trigger an immediate stop of the inverters in emergent situations.

To use this function, connect an RCR device and a 15 kΩ resistor to the **REF** and **COM** terminals at the bottom of the Pro-Mate module as follows:

Note: This function cannot be used together with the EnWG 14a power control function.



5. Firmware Update (Optional)

This operation is only applicable when the inverter firmware version is not compatible with the EMS firmware version. In this case, you need to upgrade the current inverter firmware version to a compatible one.

1. Check whether your inverter firmware version (DSP version and ARM version) is earlier than the below listed ones.

Inverter model	DSP version	ARM version
H2-(3K-6K)-S2	V1.030	V6.040
H2-(5K-10K)-T2	V4.066	V1.070
HS2-(5K-10K)-T2	V4.066	V1.070
HS2-(3K-6K)-S2	V1.030	V6.040
R6-(5K-10K)-(S2, S3)	V1.041	V1.069
R6-(5K-15K)-T2	V2.318	V1.069
R6-(15K-50K)-(T2, T3, T4)	V2.580	V6.196
R5-(0.7K-3K)-S1	V1.234	V3.100
R5-(3K-8K)-S2	V1.524	V3.100
H2-(10K-30K)-(T2, T3)	V3.061	V8.035
HS3-(3K-6K)-S2	V1.135	V1.040
HS3-(5K-12K)-T2	V2.103	V2.030

2. If yes, choose one of the following upgrade procedures to upgrade the inverter firmware:

   - Remote upgrade (on the elekeeper web platform)
   - Local upgrade (on the elekeeper web platform and the elekeeper App) (Bluetooth connection)

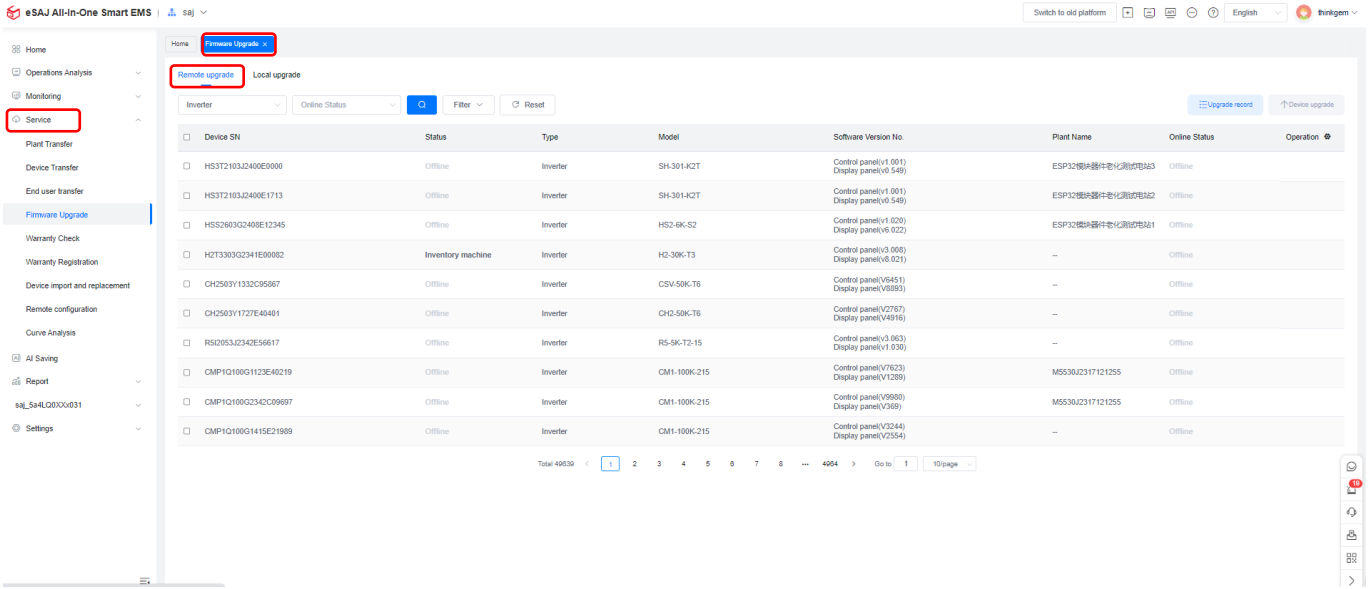
   Note: The operations on the App and web platform might vary, depending on the versions that you are using.

5.1. Remote upgrade (Web platform)

Step 1. Log in to the elekeeper web platform:

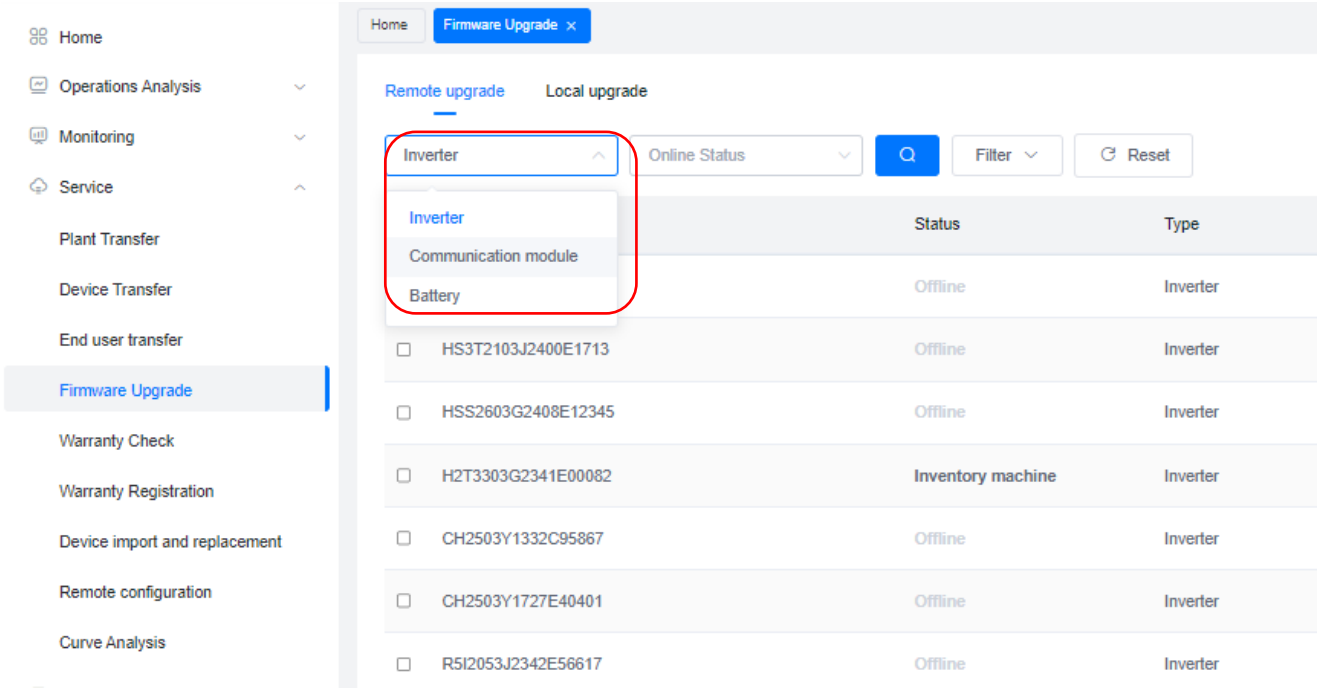
- Europe: https://eop.saj-electric.com
- China: https://op.saj-electric.cn
- Other countries or regions: https://iop.saj-electric.com/

Step 2. On the left navigation pane, choose **Service** > **Firmware Upgrade**. On the right pane, click **Remote upgrade**.

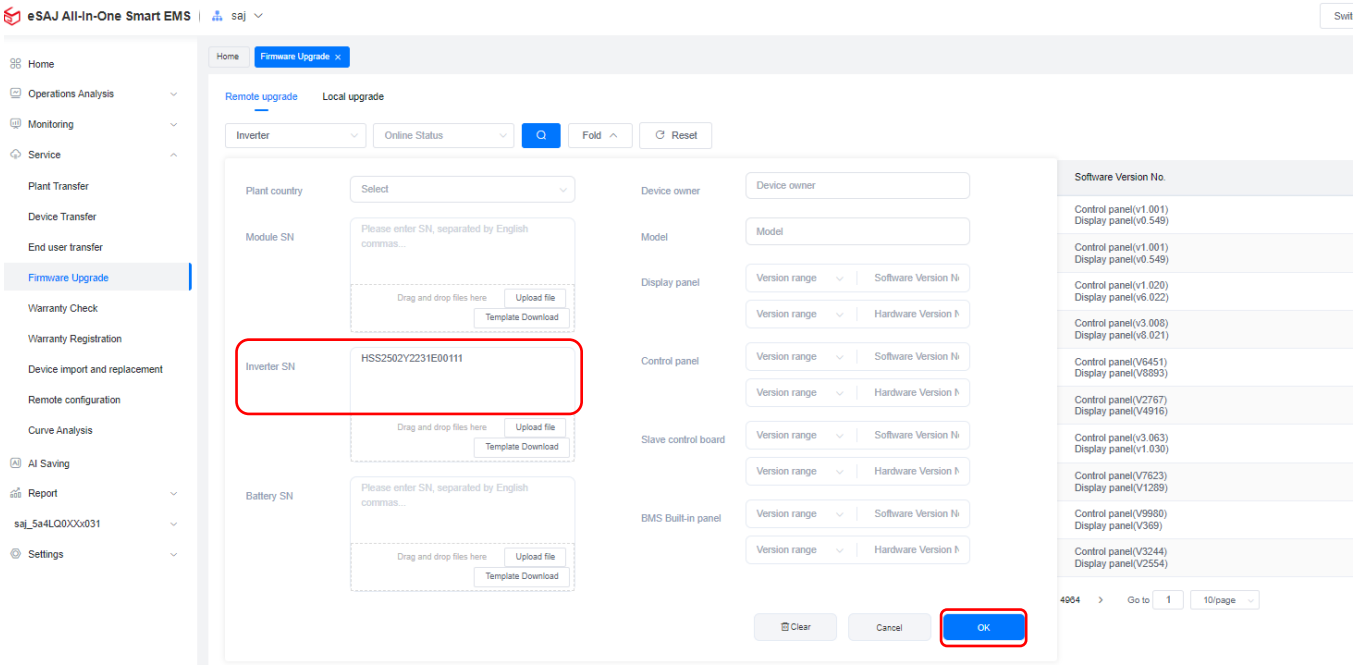


Step 3. Select **Inverter** or **Communication module** to display corresponding devices.

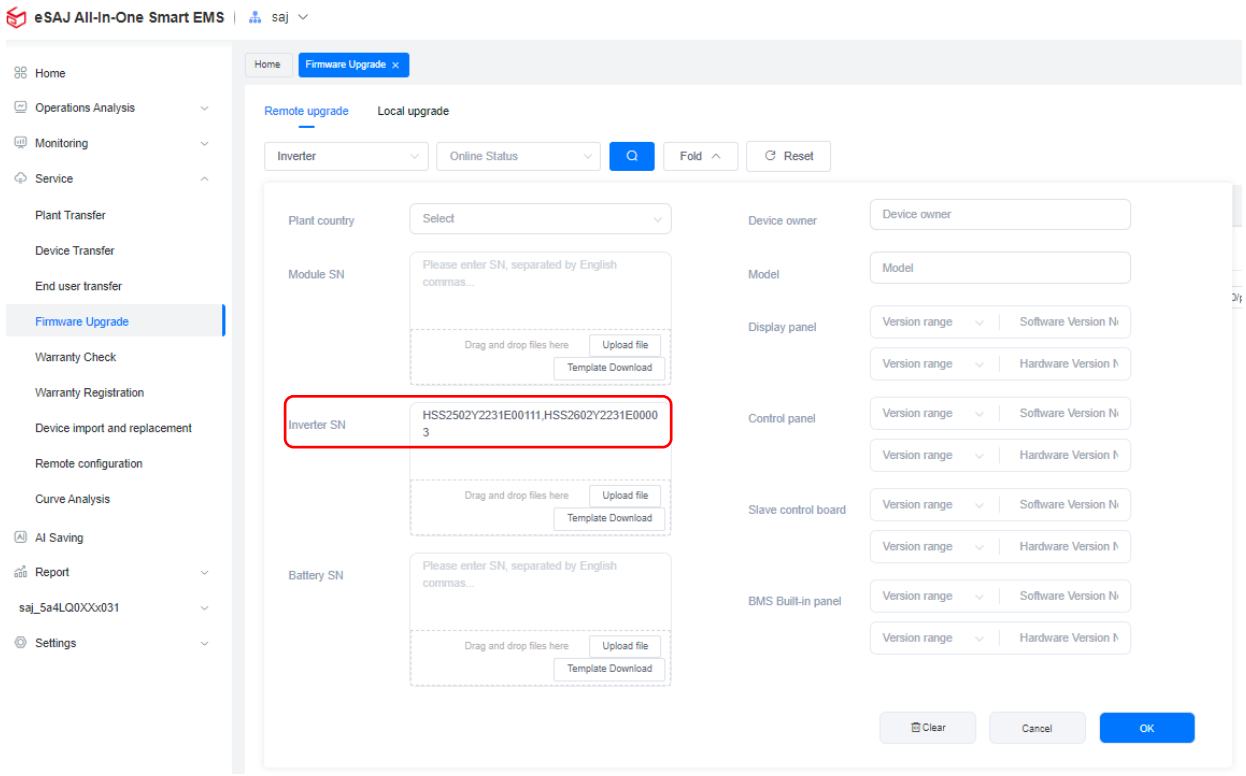
Note: No need to upgrade the battery.



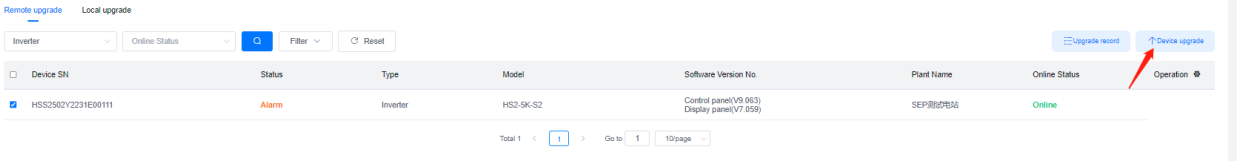
Alternatively, locate the required device based on its SN: Click **Filter** to display the detailed search box. Input the SN and click **OK**.



Note: For batch upgrade, separate the device SNs with comma (,).



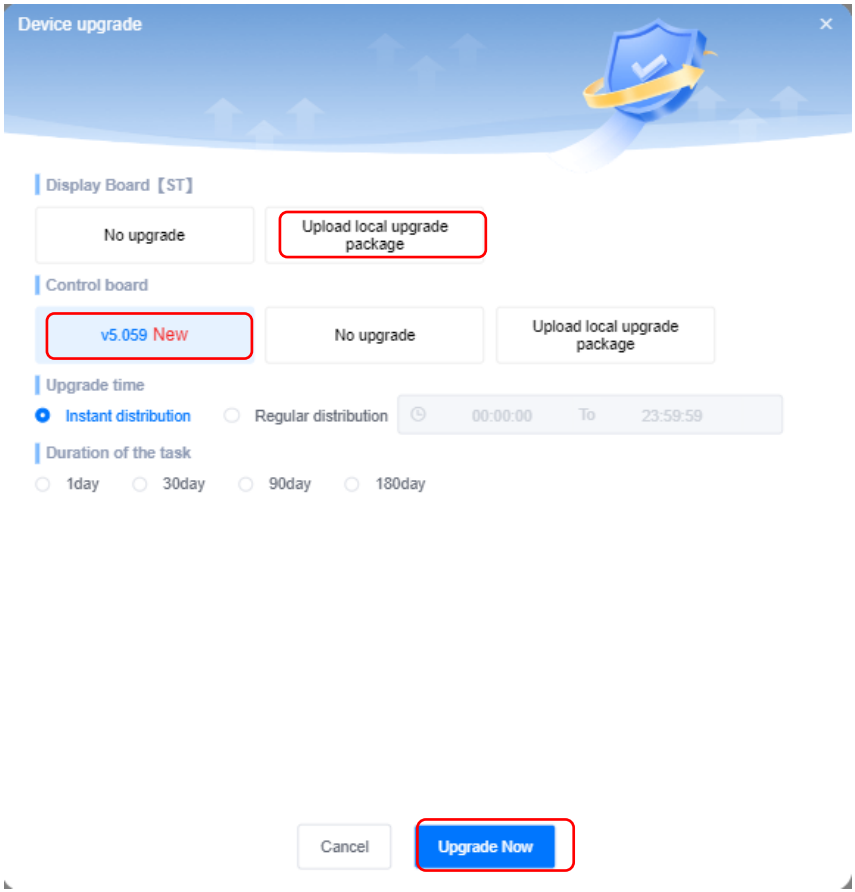
Step 4. Select the required device and click **Device upgrade**.



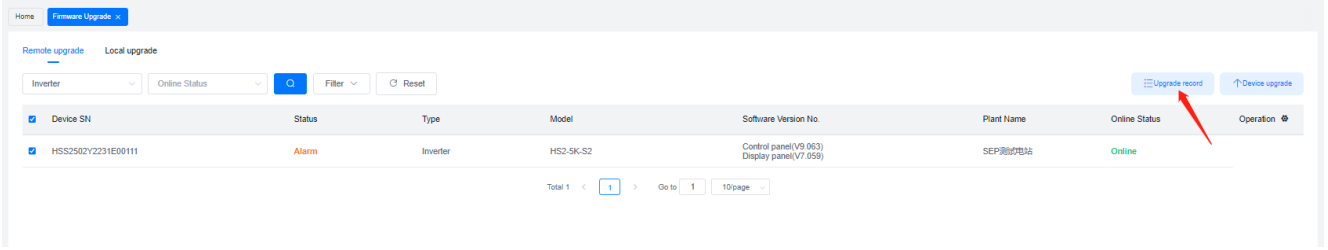
Step 5. Select the firmware version: To upgrade to the up-to-date firmware version, select the latest firmware version; to upgrade to a specific firmware version, click **Upload local upgrade package** to upload the local upgrade file.

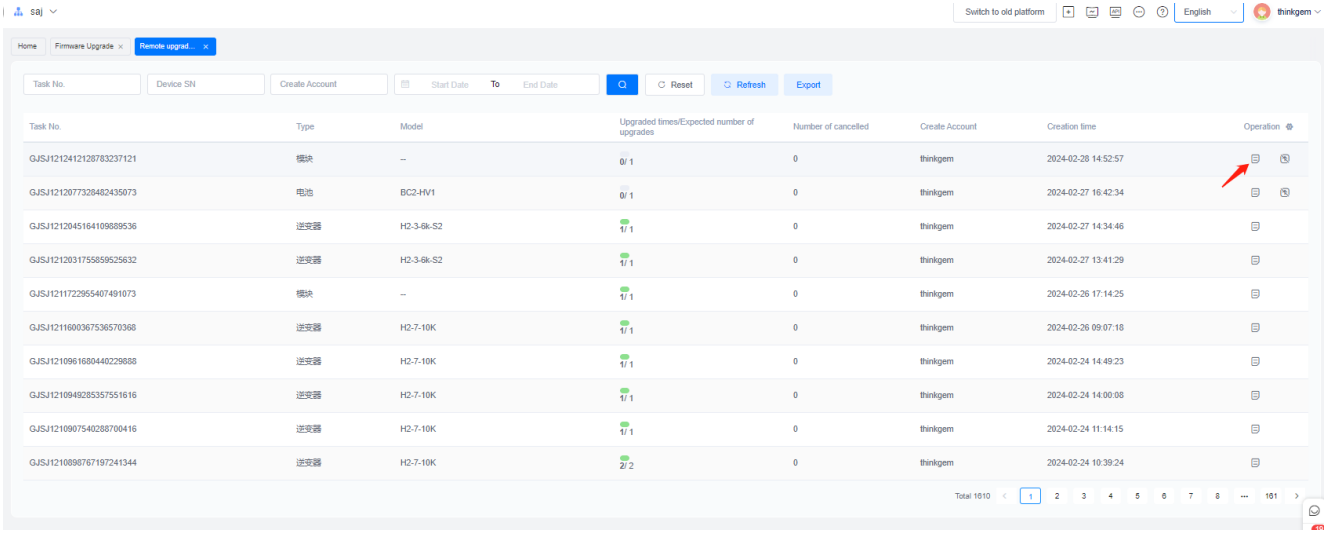
Set the upgrade time: Depending on your needs, upgrade the firmware right now or in a specific time:

- Upgrade now: Select **Instant distribution** and click **Upgrade Now**.
- Upgrade later: Select **Regular distribution**, set the specific upgrade time, and click **Upgrade Now**. The upgrade will start according to the configured time.



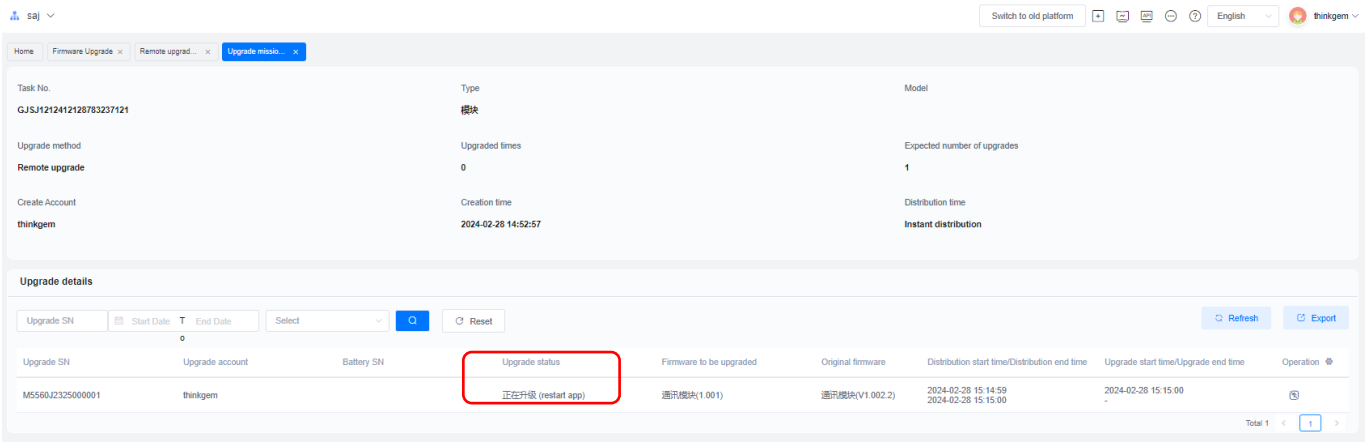
Step 6. Click **Upgrade record** and then click the icon under **Operation** to view the upgrade details (including the upgrade status and result).





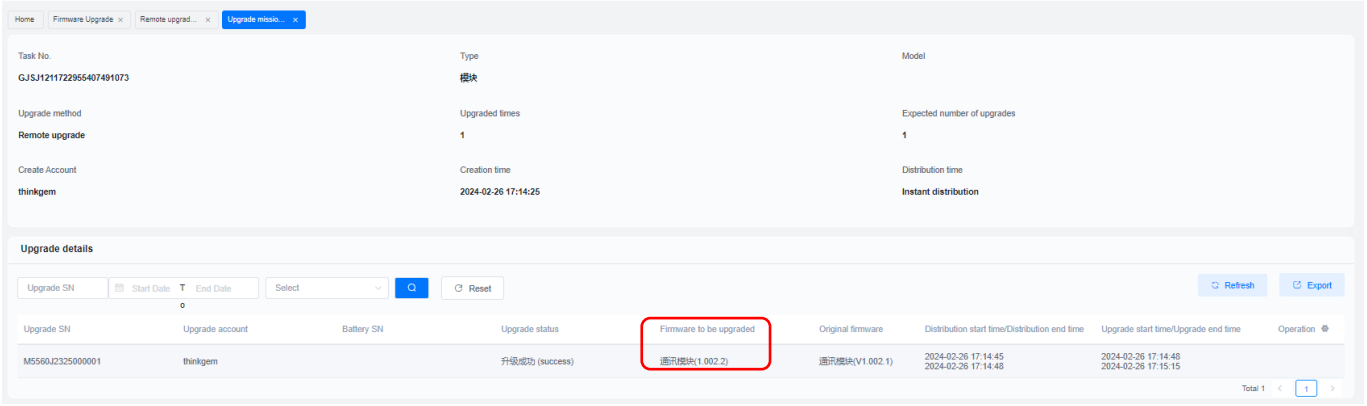
Upgrade status: Being upgraded.

Note: Here takes the communication module as an example.



Upgrade status: Upgrade successfully.

Note: Here takes the communication module as an example.



5.2. Local Upgrade (Web page and App) (Bluetooth connection)

Before you start

The firmware package has been uploaded. If any question, contact SAJ technical support.

Procedure

Step 1. Log in to the elekeeper web platform:

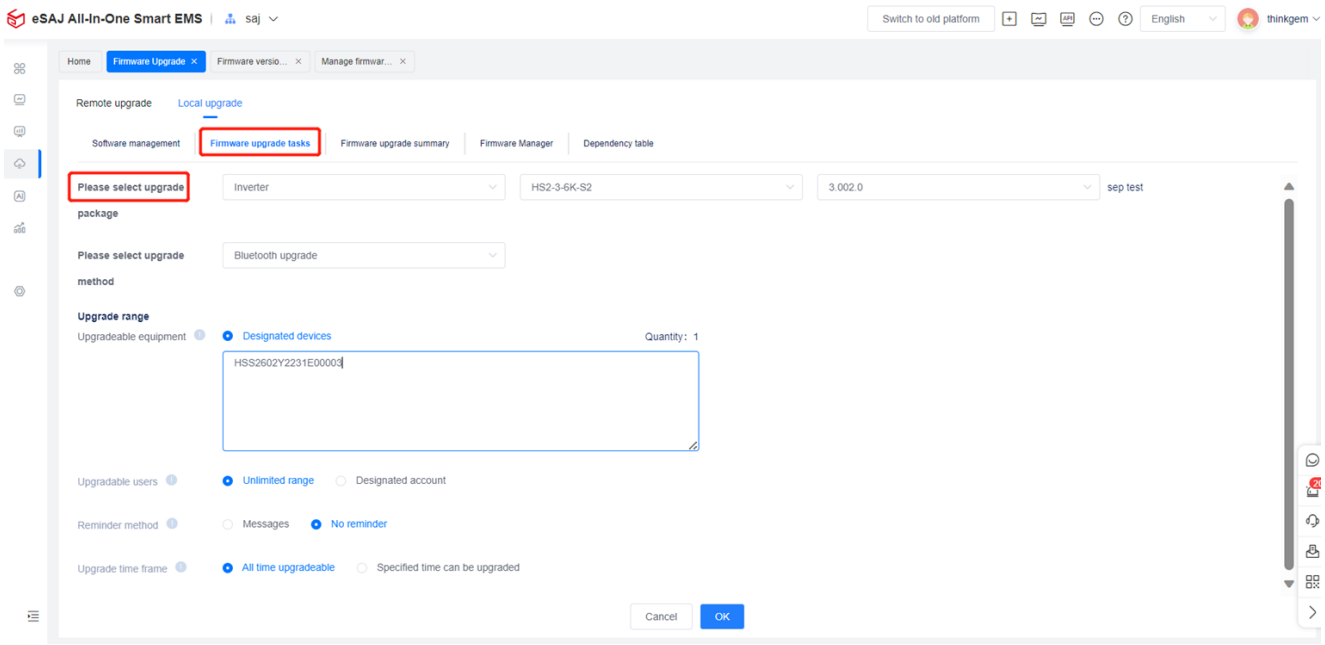
- Europe: https://eop.saj-electric.com
- China: https://op.saj-electric.cn
- Other countries or regions: https://iop.saj-electric.com/

a. On the left navigation pane, click the icon and choose **Local upgrade** > **Firmware upgrade tasks**.

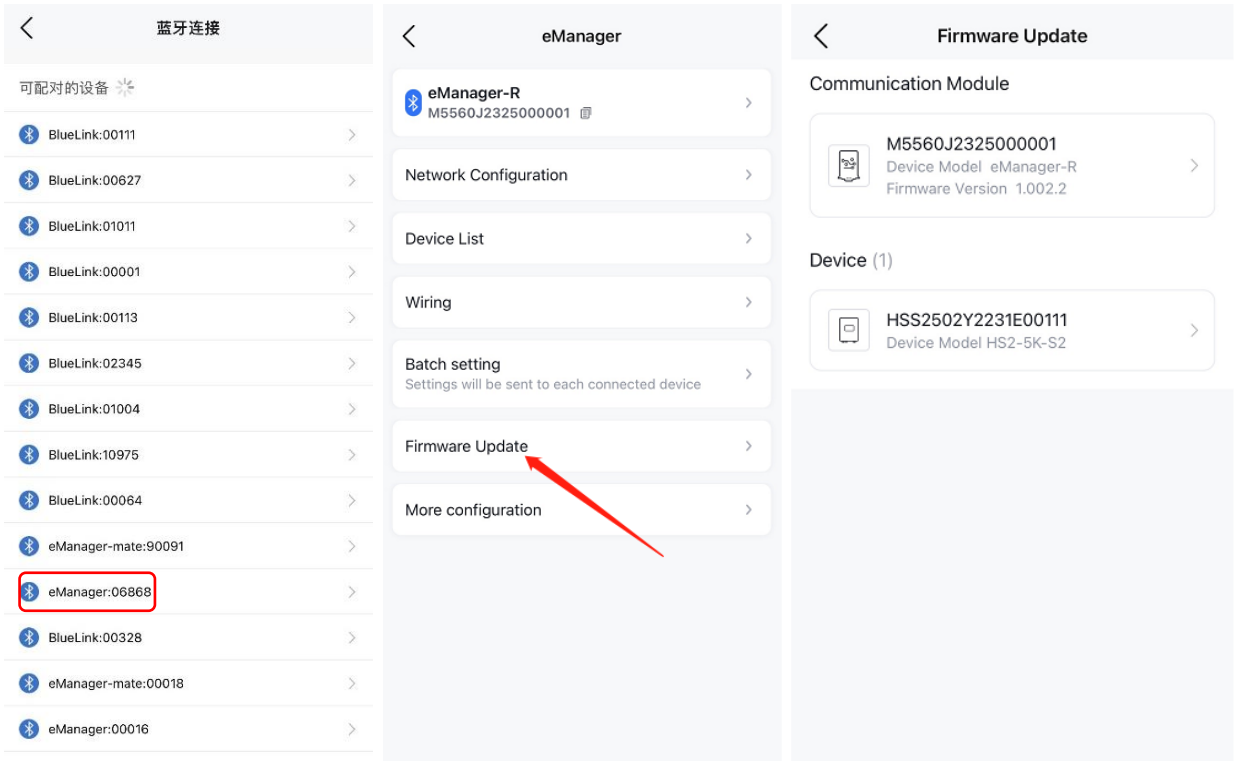
b. On the **Please select upgrade** section, select the device type, model name, and required firmware version.

c. On the **Upgradable equipment** section, input the device SN.

d. Click **OK**.



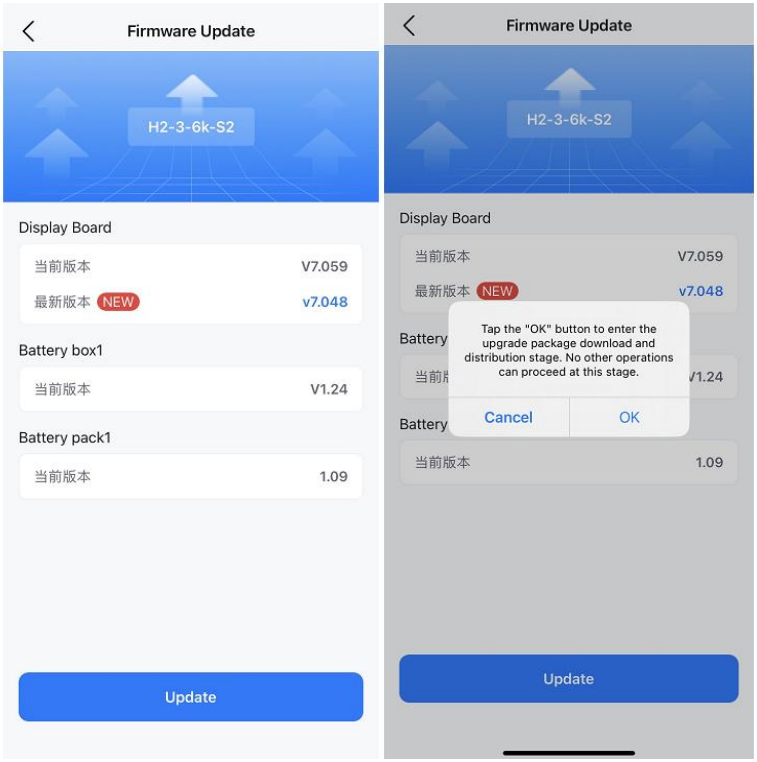
Step 2. Log in to the elekeeper App. Select the required EMS device (eManager:*xxxxx*, wherein *xxxxx* indicates the last five digits of the EMS device SN). Tap **Firmware Update** and then tap the device to be upgraded.



Step 3. On **Firmware Update**, select the latest version and tap **Update**. On the displayed dialog box, tap **OK** to confirm the upgrade.

During the upgrade, the Bluetooth connection will be disconnected.

After the upgrade, reconnect the Bluetooth and tap **Firmware Update** again to check the upgrade result.



5.3. Operations After the upgrade

Step 1. Use the AIO3 module installed on the inverter to make sure that all the following conditions are met:

a. The inverter is set to no meter status.

b. The parallel mode is disabled.

c. The export limit function is disabled.

Step 2. When the AIO3 module is installed on the inverter, remove it from the inverter. When the AIO3 module is embedded in the inverter, set it to Ethernet connection mode and then disconnect the Ethernet cable from the LAN port on the inverter.

6. Commissioning by the App

The elekeeper App can be used for both nearby and remote monitoring. It communicates with different devices through Bluetooth or Ethernet connection.

The detailed operations on the App might vary, depending on the version you are using.

6.1. Install the App

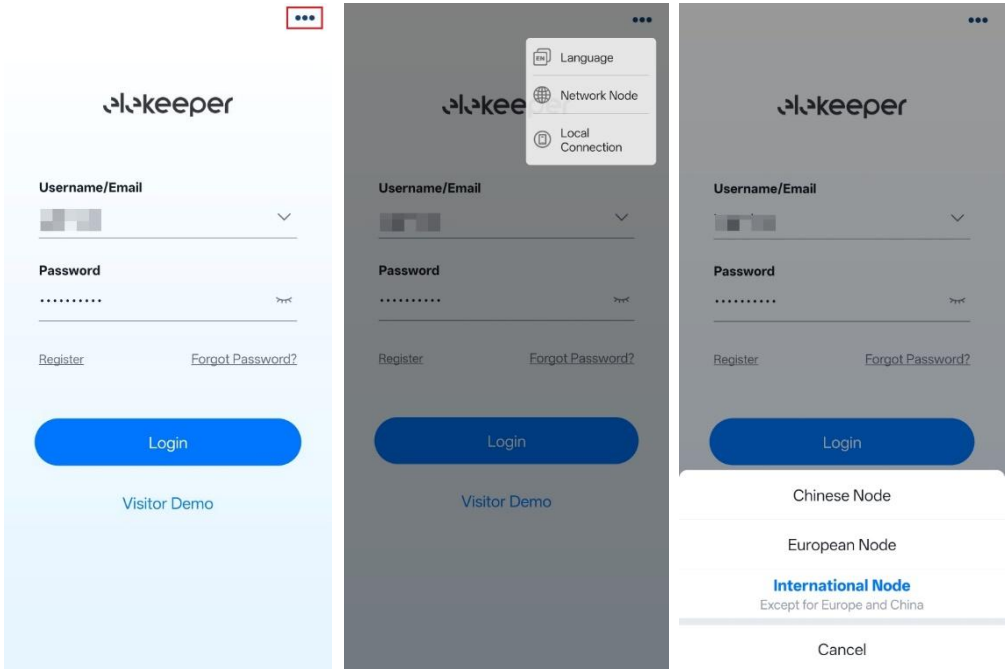
On your mobile phone, search for “elekeeper” in the App store. Download and install the App.

6.2. Log in to the App

Have an account? — Log in to the App.

1. Tap the three-dot icon ••• on the top right corner. Choose the language and network node based on your installation site.

Use your account and password for login.

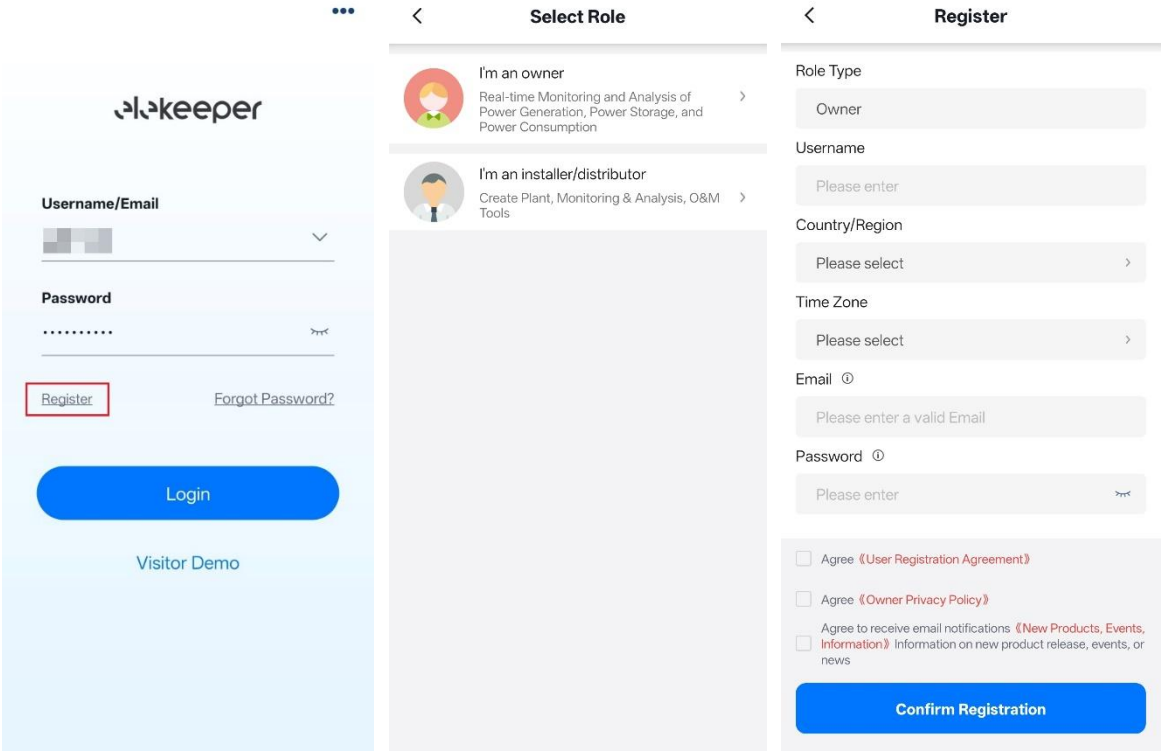


No account? — Apply for a new account for login.

1. Tap the three-dot icon ••• on the top right corner. Choose the language and network node based on your needs.
2. Tap **Register.** Choose whether you are an owner, an installer, or a distributor.

   Note: For commissioning convenience, it is suggested that the install apply for the owner account.
3. Set your username, country/region, time zone, email, and password. Select the registration agreements and confirm the registration.

   Use the applied account and the password for login



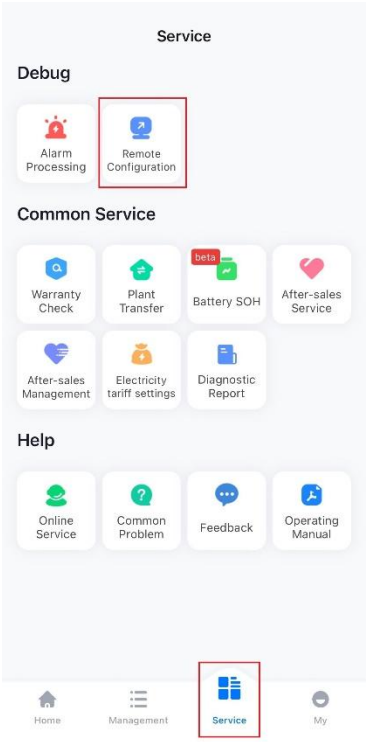
6.3. Perform the initialization settings

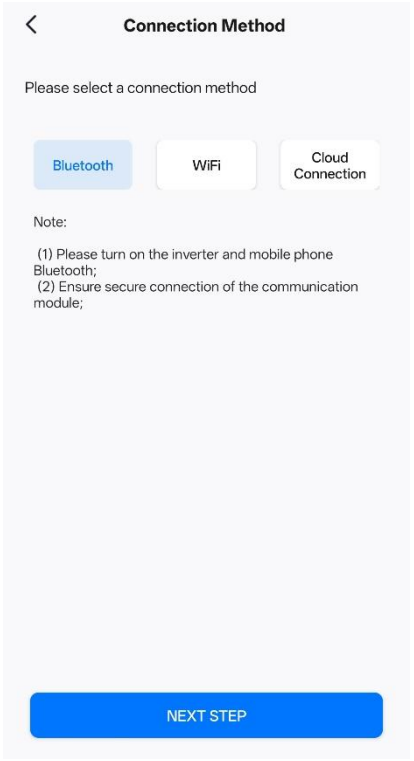
Before you start

Enable the Bluetooth function on your mobile phone.

Procedure

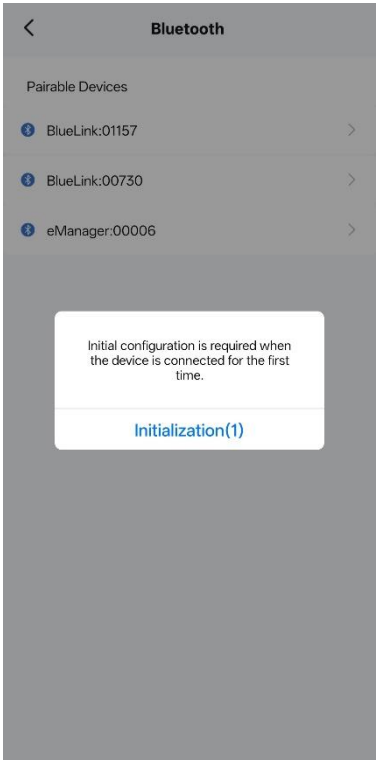
1. On the **Home** or **Service** page, tap **Remote Configuration**. Tap **Bluetooth** and then **Next Step**.



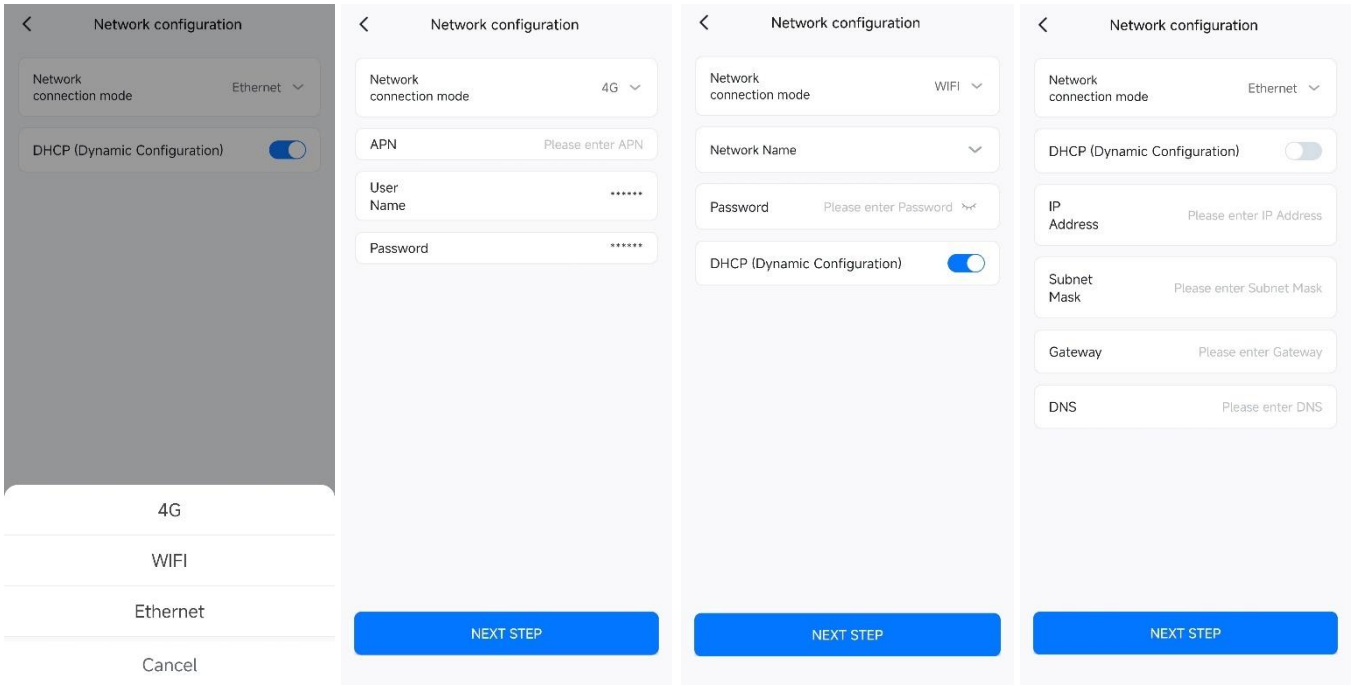


2. Choose your EMS device (eManager:*xxxxx*) from the device list. Then, tap **Initialization** to start the initialization of the eManager.

   Note: *xxxxx* are the last five digits of the serial number (SN) of the eManager.



3. Select and configure the network configuration parameters according to the actual situation of the customer.
   - **4G**: Configure the APN name of the local network service provider.
   - **WiFi**: The network name must be composed by letters and alphanumeric characters only, without any special characters.
   - **Ethernet**: Make sure that the Ethernet cable is connected from the **ETH** port on the eManager to the router **LAN** port.



4. Add the devices that are connected to the eManager.

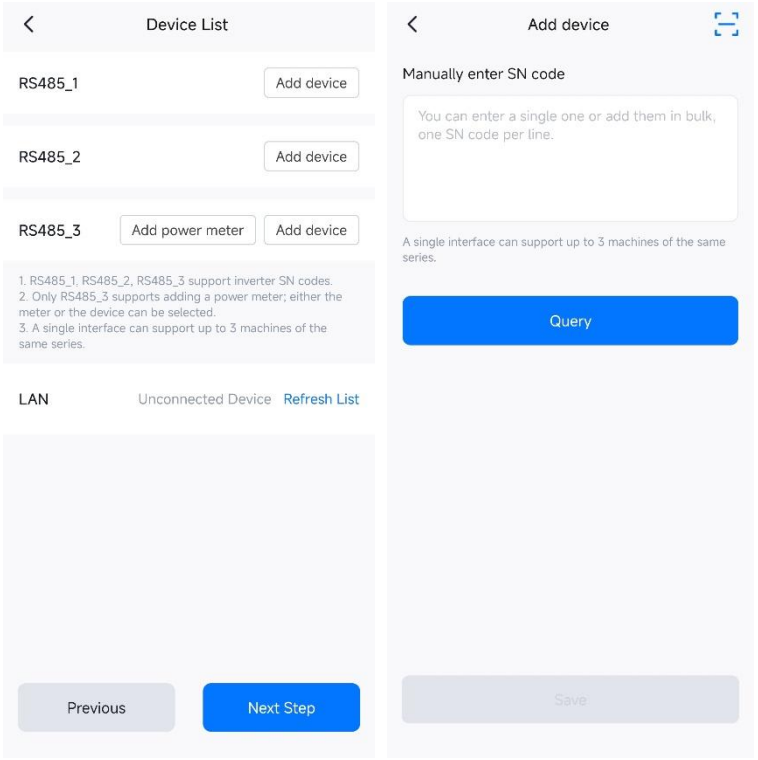
   Depending on your inverter model, use one of the following connection manners.

   - RS485 parallel connection

     - To add an inverter, locate its RS485 connection (**RS485_1**, **RS485_2**, or **RS485_3**), tap **Add device**, and scan the SN barcode or input the SN manually.

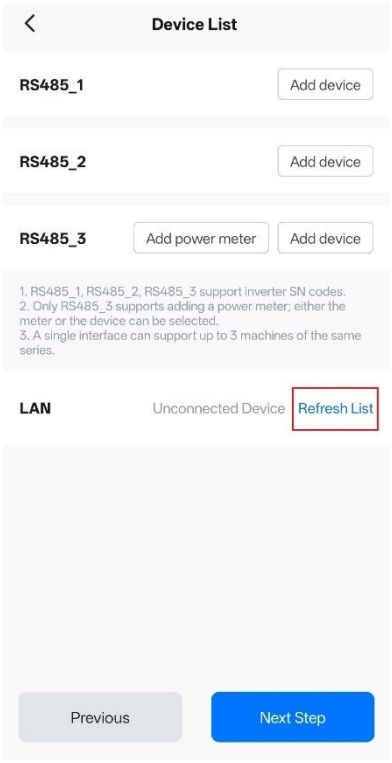
       Notes: Make sure that all inverters are added in the corresponding RS485 connection setting area. For example, when two inverters are connected to the RS485_A1 and RS485_B1 ports of the eManager, both inverters must be added to the **RS485_1** setting area.

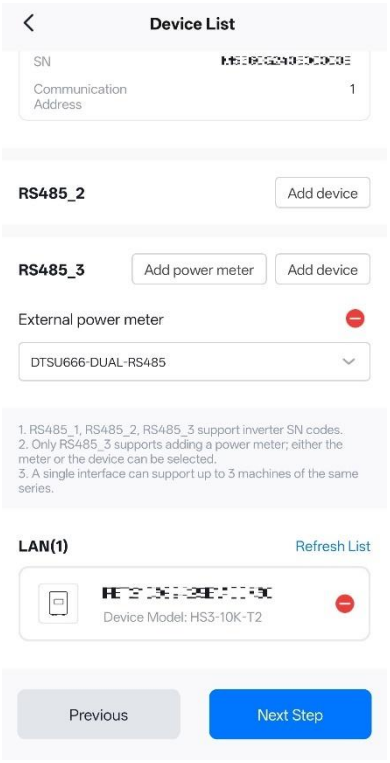
     - To add an external grid meter, select **RS485_3** > **Add power meter** to add the device.

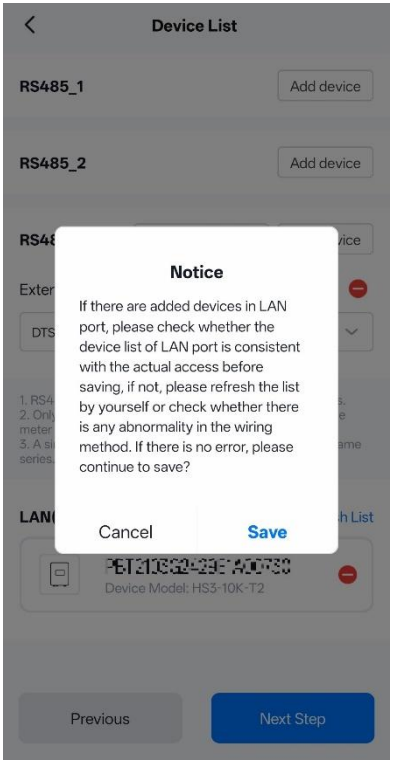


- LAN parallel connection

  Tap **Refresh List** in the **LAN** setting area to display the connected devices. Make sure that the devices connected through LAN communication are displayed as expected.



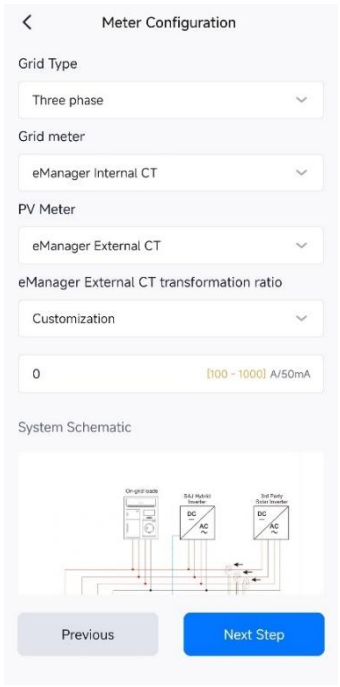


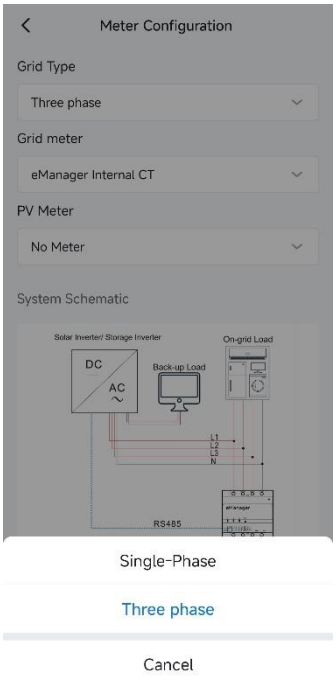


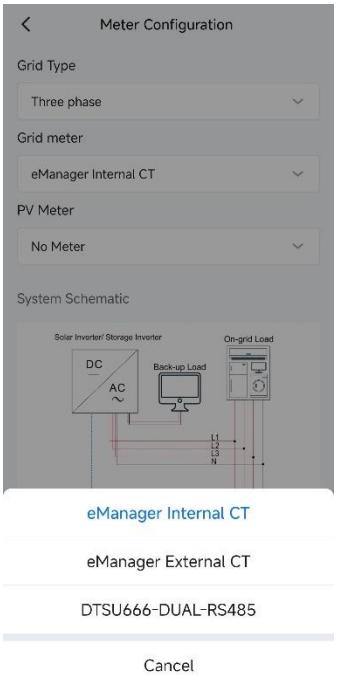
5. Select and configure the meter connection.

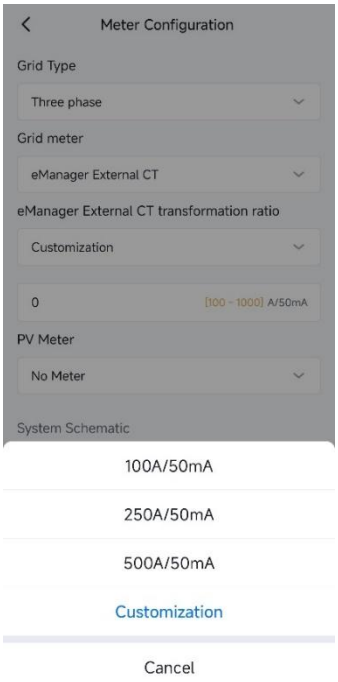
   When **eManager External CT** is selected for either grid meter or PV meter, configure the ratio of the external CT(s) used in the actual system.

   When external grid meter like DTSU666 (Dual RS485) is connected, the default CT ratio is 50. When the ratio of the connected CT is other than 50, configure the actual CT ratio on the meter, wherein the secondary current must be of 5 A.







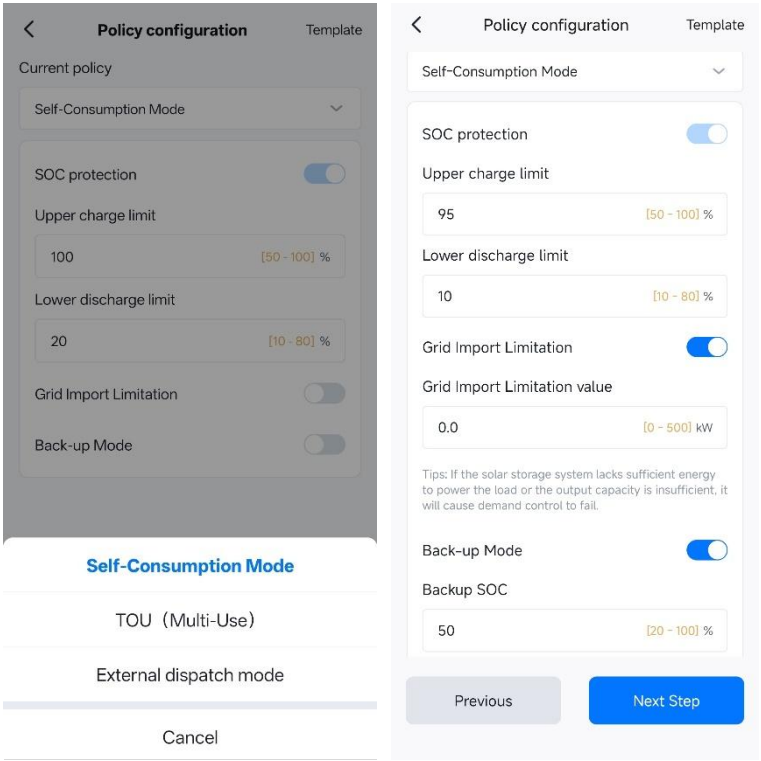


6. Configure the working mode as needed.

- **Self-Consumption Mode**: When the solar is sufficient, the electricity generated by photovoltaic (PV) system will be supplied to load first, the surplus energy will be stored in battery, and then the remaining electricity will be exported to the grid. When the solar is insufficient, the battery will release electricity to supply load.

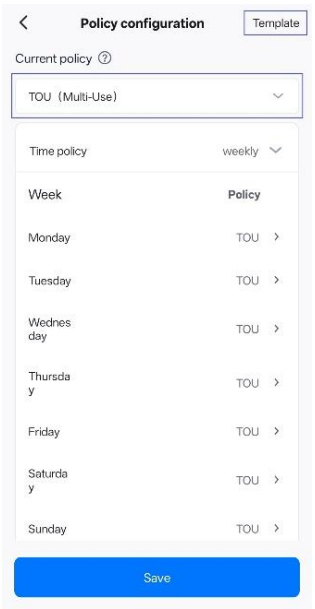
  This mode is set with recommended values by default. For more customized requirements, modify the working mode as needed.

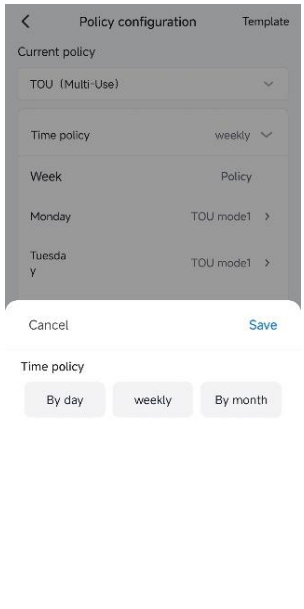
- **TOU (Multi-Use) Mode**: In the TOU (time-of-use) mode, the battery charges or discharges during the set period. For the other periods, the battery works in the self-consumption mode as configured. In this mode, advanced settings like back-mode and peak shaving are available for various power consumption requirements and local grid policies.
- **External dispatch mode**: The eManager allows the third-party EMS platform to pass working mode commands according to the MODBUS protocol. Contact SAJ technical support when it is necessary to use function.

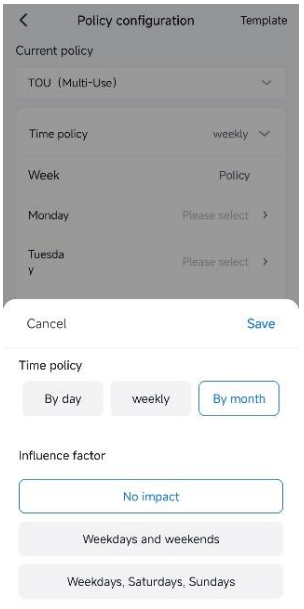


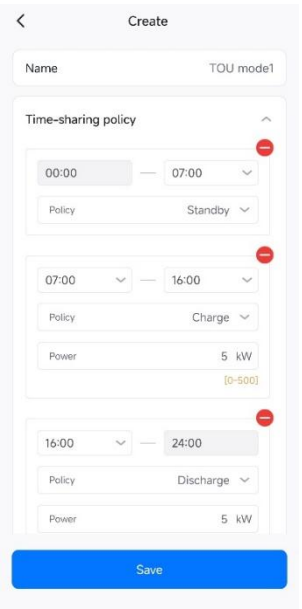
a. For TOU mode, tap **Template** to create customized working mode for different time-slots.

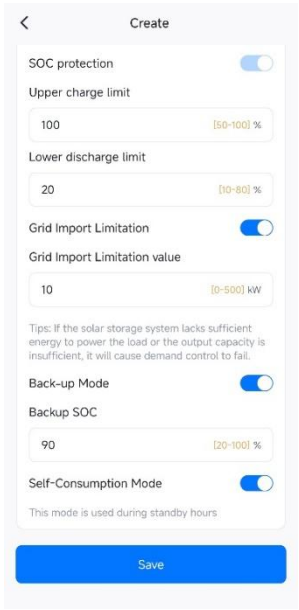
- **Name**: the policy name. For example, TOU mode1.
- **Time policy**: the running frequency of the working mode.
  - **By day**: The same policy runs everyday.
  - **weekly**: The configured polices run on a weekly basis. Different policies can be configured for each day.
  - **By month**: The configured policies run on a monthly basis. Different policies can be configured for each month.
    - **No impact**: Different policies can be configured for each month.
    - **Working days, weekends**: Different policies can be configured for working days and weekends in a month.
    - **Working days, Saturdays, Sundays**: Different policies can be configured for working days, Saturdays, and Sundays in a month.
- **Time-sharing policy**: the working mode of the inverter at different time periods.
  - The different time periods. A maximum of 12 periods can be set for 24 hours. For example, 00:00-07:00, 07:00-16:00, 16:00-24:00.
  - **Policy**: the working mode of the inverter, including **Charge**, **Discharge**, or **Standby**.
  - **Power**: the charging or discharging power.
- **SOC Protection**: The upper charging threshold and the lower discharging threshold to prevent battery over-charging or over-discharging.
- **Grid Import Limitation**: The upper threshold of importing from the grid.
- **Back-up Mode**: Whether to discharge only when the actual SOC is higher than the configured threshold when the grid connection is working. When enabled, the battery starts charging when the actual SOC is lower than the configured threshold. The **Backup SOC** threshold must be higher than the lower discharging threshold that is set in **SOC Protection**.
- **Self-Consumption Mode**: Whether the inverter works in the self-consumption mode in standby status. It is suggested to enable this function.
- To apply a working mode for multiple time periods when the **Time policy** is **weekly** or **By month**, tap a specific period like Monday or Weekday. Then select **Single modification** to set the policy for each period one by one; or select **Modify all** to apply the same policy to all periods.

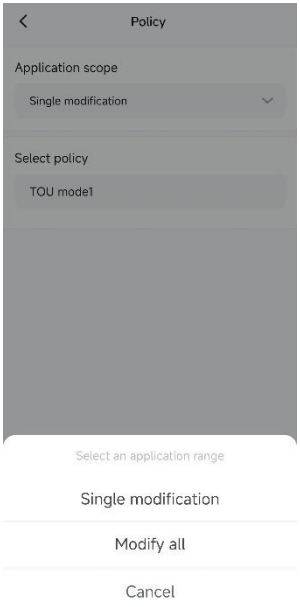

Policy configuration
Template
Current policy
TOU (Multi-Use)
Time policy
weekly
Week
Policy
Monday
TOU
Tuesday
TOU
Wednesday
TOU
Thursday
TOU
Friday
TOU
Saturday
TOU
Sunday
TOU
Save


Policy configuration
Template
Current policy
TOU (Multi-Use)
Time policy
weekly
Week
Policy
Monday
TOU mode1
Tuesday
TOU mode1
Cancel
Save
Time policy
By day
weekly
By month

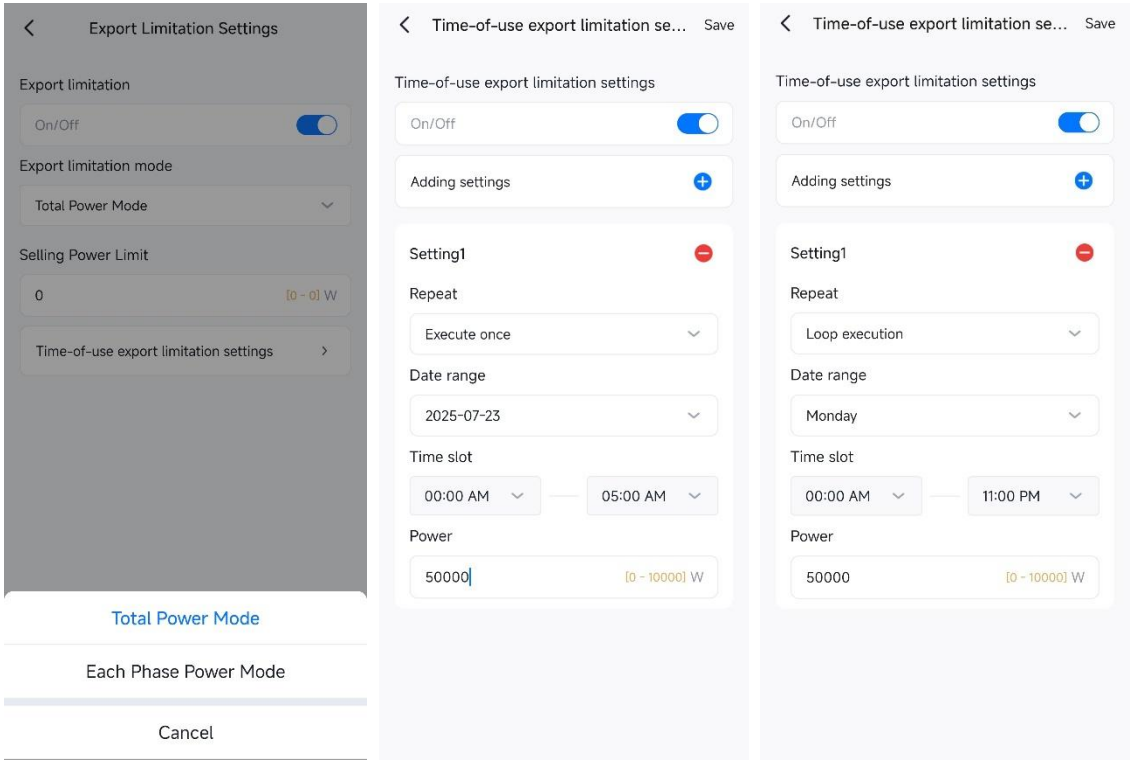

Policy configuration
Template
Current policy
TOU (Multi-Use)
Time policy
weekly
Week
Policy
Monday
Please select
Tuesday
Please select
Cancel
Save
Time policy
By day
weekly
By month
Influence factor
No impact
Weekdays and weekends
Weekdays, Saturdays, Sundays


Create
Name
TOU mode1
Time-sharing policy
00:00
07:00
Policy
Standby
07:00
16:00
Policy
Charge
Power
5 kW
[0-500]
16:00
24:00
Policy
Discharge
Power
5 kW
Save

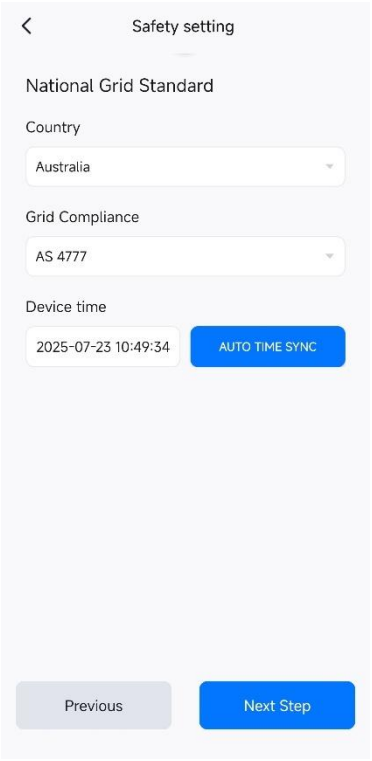

Create
SOC protection
Upper charge limit
100
[50-100] %
Lower discharge limit
20
[10-80] %
Grid Import Limitation
Grid Import Limitation value
10
[0-500] kW
Tips: If the solar storage system lacks sufficient energy to power the load or the output capacity is insufficient, it will cause demand control to fail.
Back-up Mode
Backup SOC
90
[20-100] %
Self-Consumption Mode
This mode is used during standby hours
Save

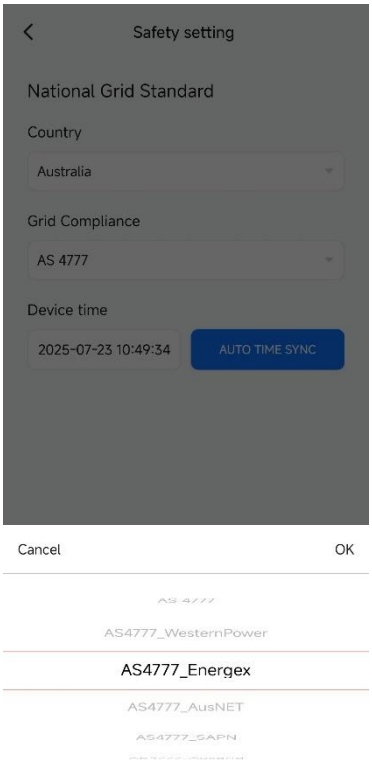

Policy
Application scope
Single modification
Select policy
TOU mode1
Select an application range
Single modification
Modify all
Cancel

7. Configure the export limitation function as needed.
    - **Export limitation mode**: Whether to control the selling power limit per total power or per phase.
    - **Selling Power Limit**: The total power or phase power to be exported to the grid depending on the mode.
    - **Time-of-use export limitation settings**: the time-specific settings that take priority over the overall selling power limit. The settings can executed once on specific time and date or repeatedly as a loop.



8. Configure the safety settings.
    - **Country**: The country where the system is installed.
    - **Grid Compliance**: Select the value according to your region of installation.
    - **AUTO TIME SYNC**: Synchronize the eManager time to the mobile phone where the App is installed.



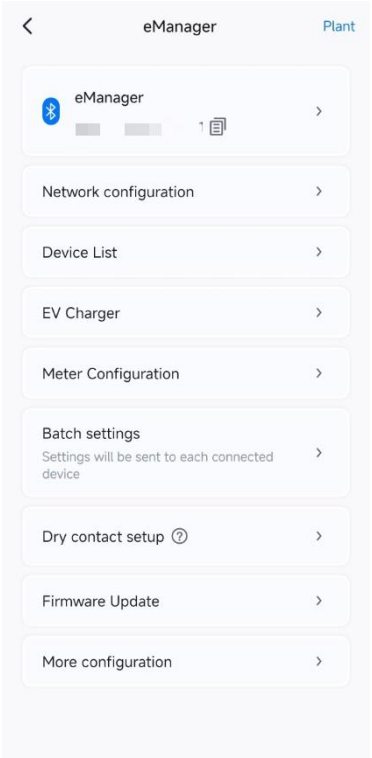


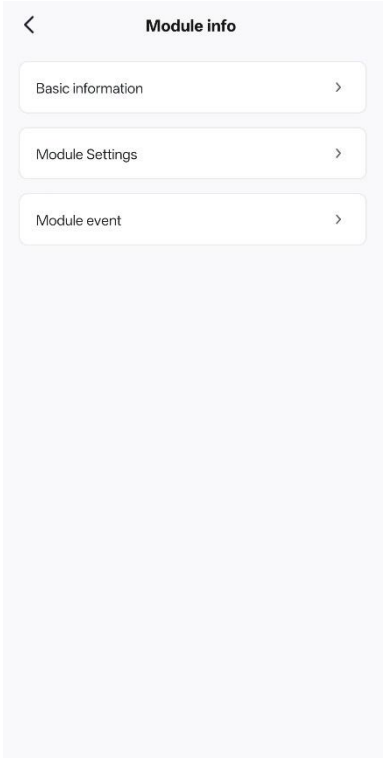
6.4. View and modify the EMS settings

After the initialization is completed, view the EMS settings for confirmation, especially check the followings:

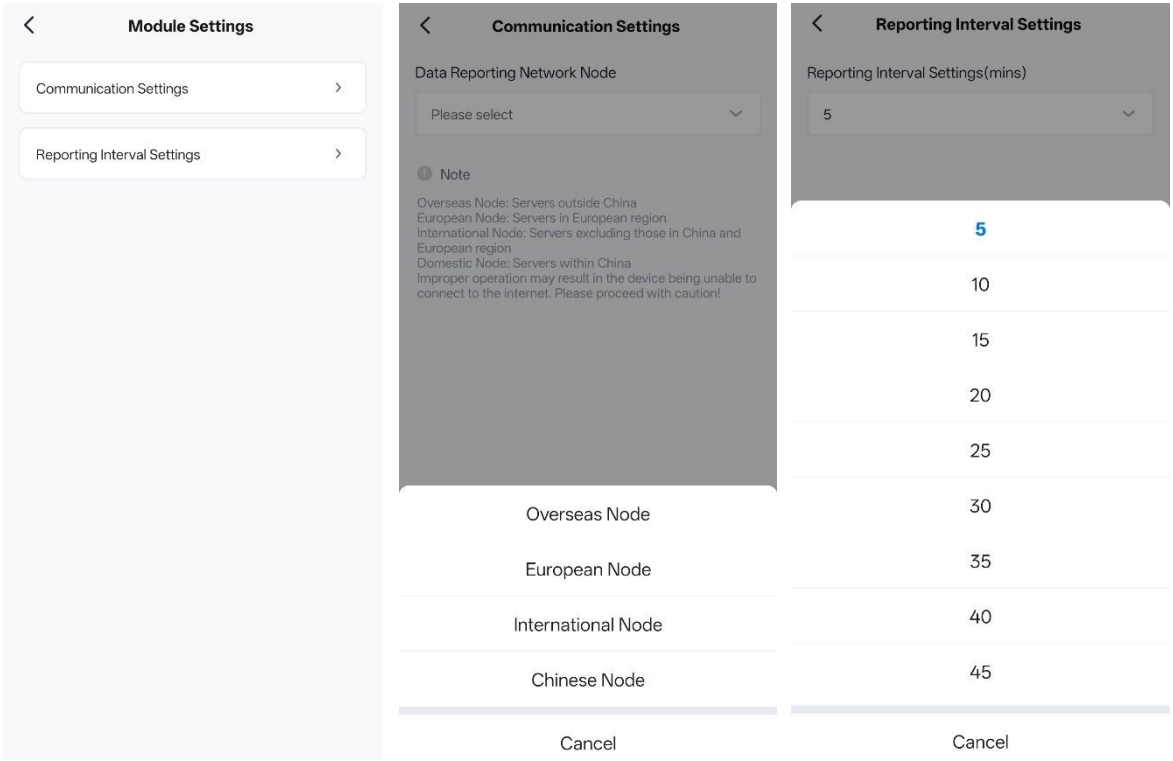
1. Tap **eManager** to view its information.
   - **Basic information**: Check the detailed information as shown below.

     Note: Make sure that **Connect** is **up**. If **Router Signal** is lower than -70 dBm, it is recommended to use Ethernet connection manner.
   - **Module event**: You can view the history events reported.



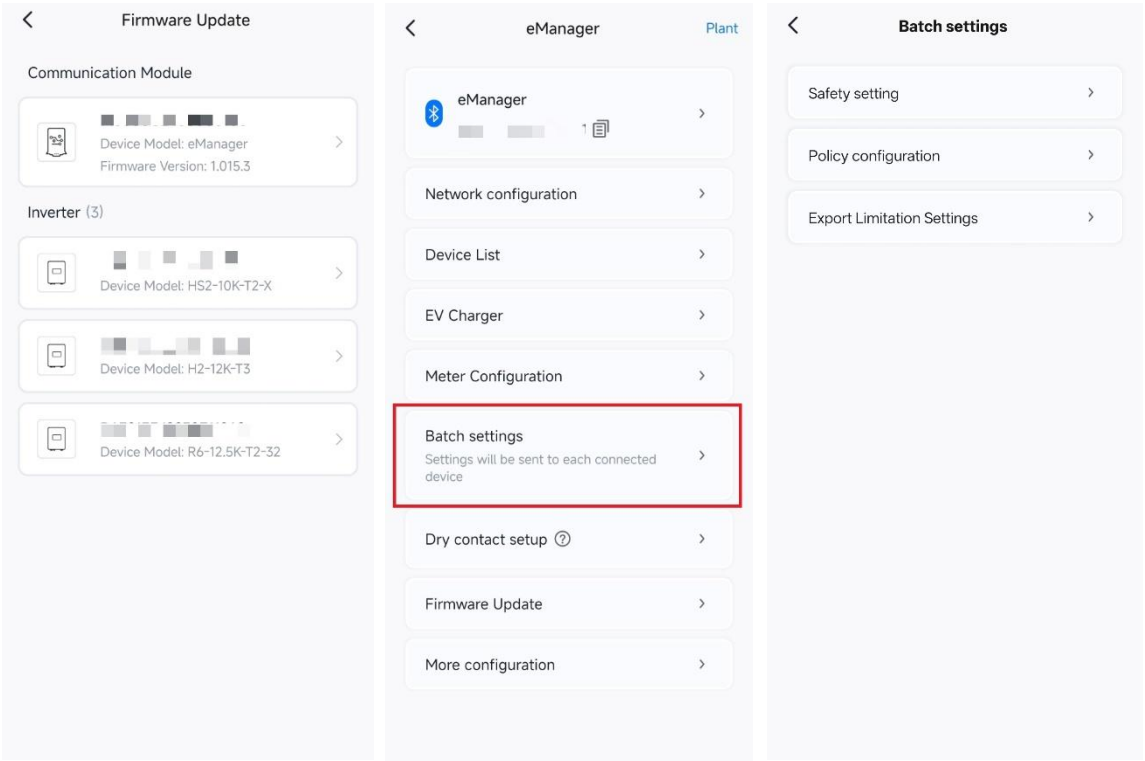


- **Module settings**: You can view or change the current node and the interval for reporting the real-time statistics.

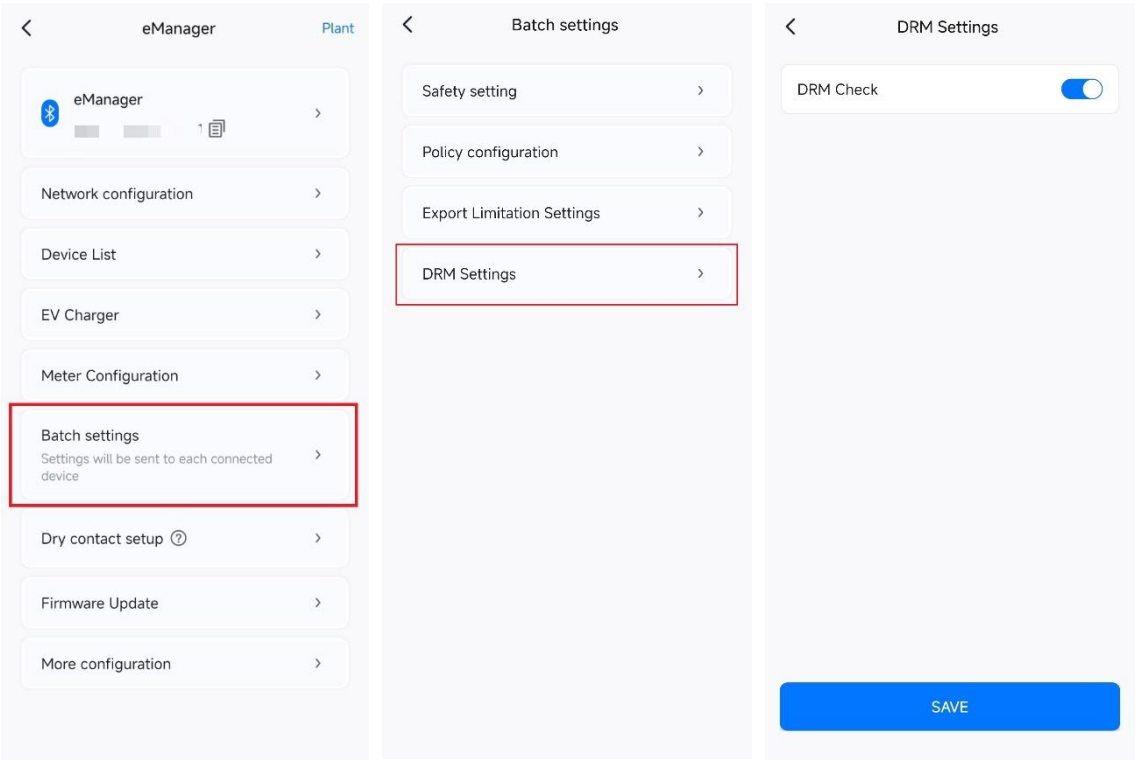


2. On the **eManager** page, choose **Network configuration** > **Network Diagnosis** to verify that the network connection is normal.
3. Tap **Device List** and verify that all required devices are added.

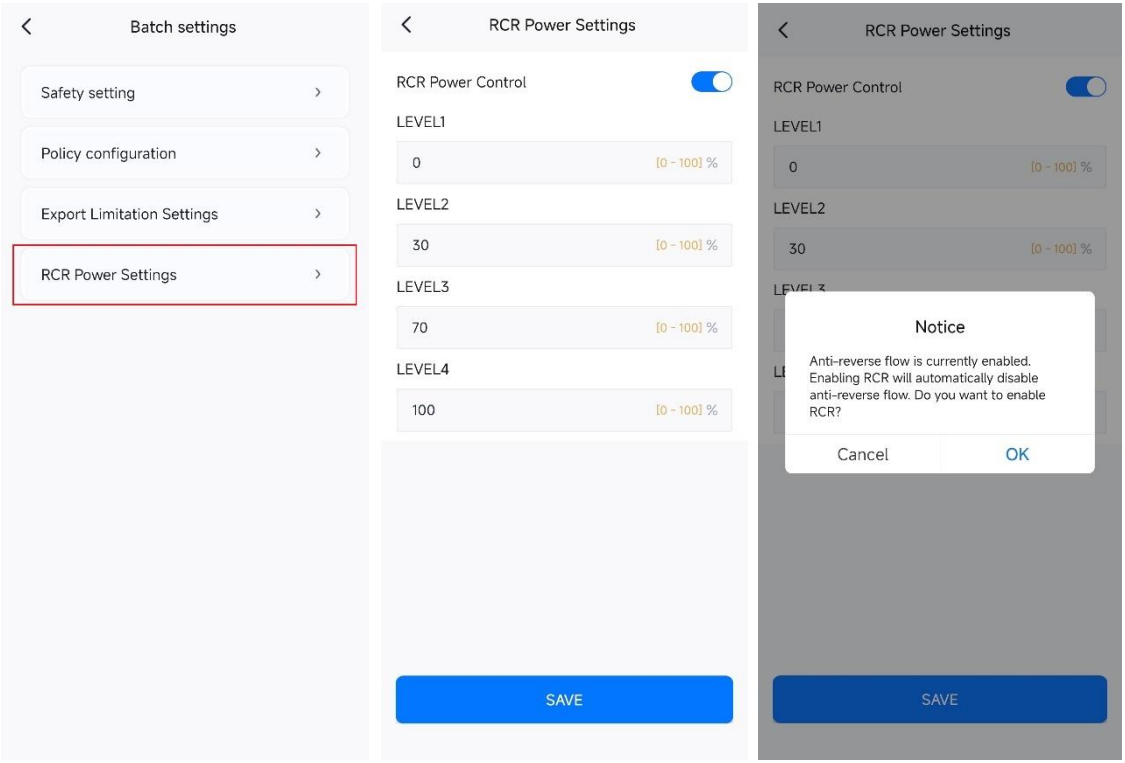
   If you need to change the default settings of the **Battery brand** and **Lower limit of battery charging capacitance (off-grid)** parameters, tap the required device in **Device list**, set the values, and save the changes.
4. Tap **Batch setting** to configure the following parameters for all the connected devices:
   - **Safety Settings**: View or change the country and grid compliance.
   - **Policy configuration**: View or change the working mode.
   - **Export Limitation Settings**: View or change the export limitations.
   - **DRM Settings**: This option is only applicable for Australia.
   - **RCR Power Settings**: This option is only applicable for Germany.
   - **G100 Setting**: This option is only applicable for the United Kingdom.



5. (Optional) For Australia, enable the **DRM Check** when the DRED devices are connected to the eManager.



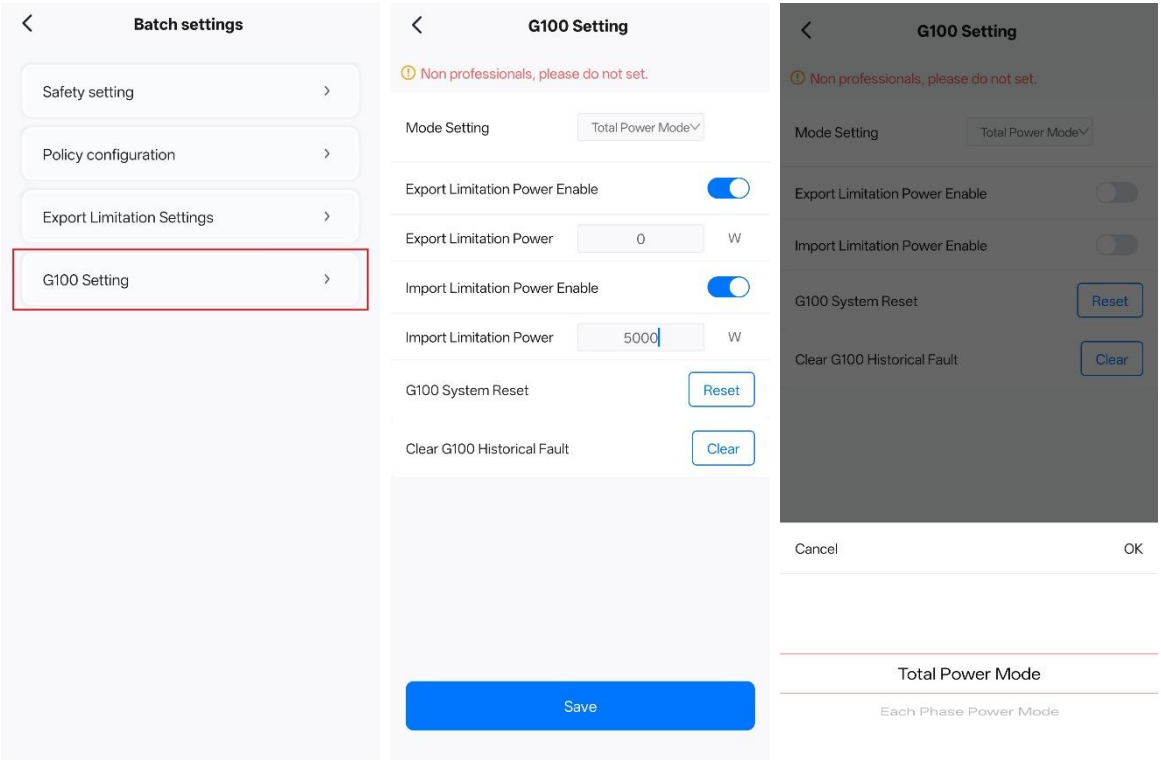
6. (Optional) For Germany, configure **RCR Power Settings** when an RCR device connects with the eManager for output power control to the grid.
   - **LEVEL**: Set the values of **LEVEL1** to **LEVEL4** incrementally as the following example shows. The value is the percentage of the rated power of the plant.
   - When this function is enabled, the export limit control settings are disabled automatically.



7. (Optional) For the United Kingdom, configure **G100 Setting** to control the export and import limit at the connection point of the distribution network.

   If export and import limit control fails at the connection point, the inverter will stop working and can only be restarted by resetting the G100 system. If the failure happens four times within 30 days, the inverter will be locked and can only be restarted by clearing the fault history.

   - **Mode Setting**: Whether to control the export and import power limit per total power or per phase power.
   - **Export Limitation Power**: The total power or phase power to be exported to the grid depending on the mode.
   - **Import Limitation Power**: The total power or phase power to be imported from the grid depending on the mode.
   - **G100 System Reset**: To restart the inverter after an export or import limit control failure happens.
   - **Clear G100 Historical Fault**: To manually clear the history of limit control failures for restarting the inverter.

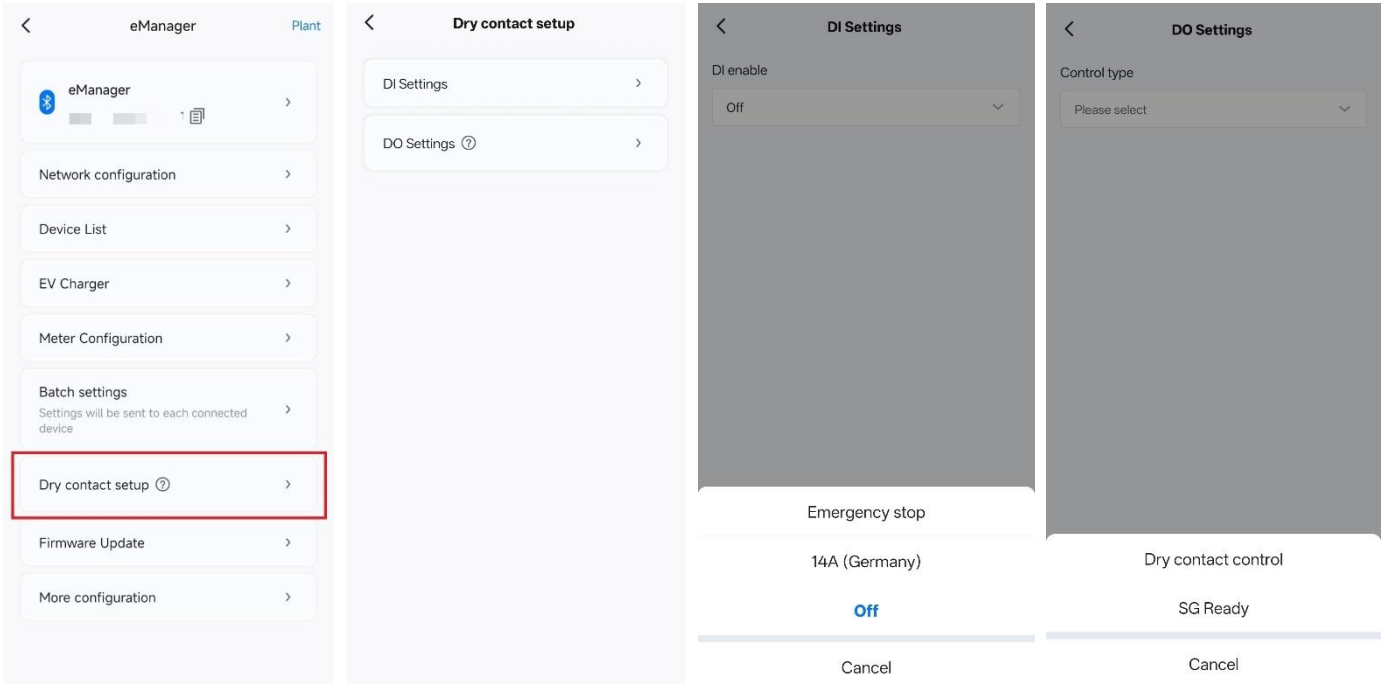


6.5. Set the dry contact function

When external devices are connected to the DO or DI ports of the eManager as instructed in section 4.2 "(Optional) Dry contact device connection", enable the dry contact functions on the elekeeper App.

1. On the **eManager** page, tap **Dry contact setup** > **DI Settings** or **DO Settings** to configure the device connections.

- For **DI Settings**, the following options are available:
  - **Emergency stop**
  - **14A (Germany)**
- For **DO Settings**, the following options are available:
  - **Dry contact control**
  - **SG Ready**

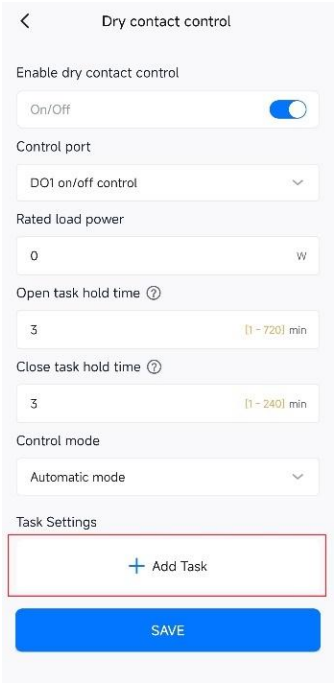


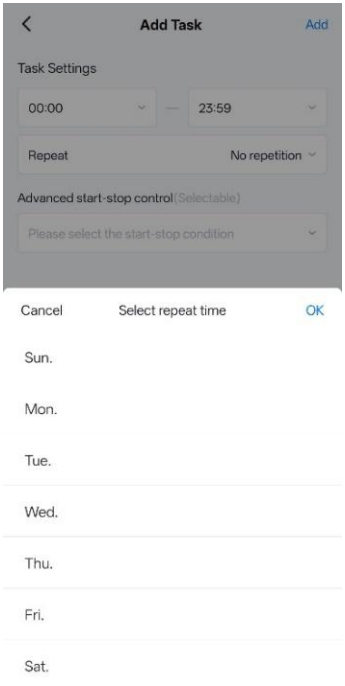
2. Configure the dry contact control parameters as needed:

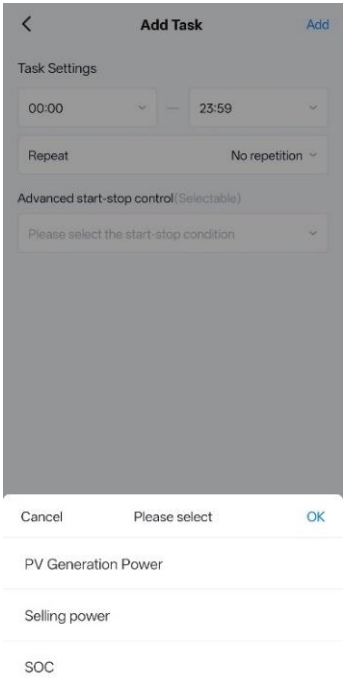
- **Control port**: select one of the following options depending on which port is connected on the eManager:
  - **DO1 on/off control**: For port DO NO1 and DO COM1
  - **DO2 on/off control**: For port DO NO2 and DO COM2
- **Rated load power**: Set the rated load power of the connected device.
- **Task hold time**: Set the following two parameters to avoid frequent start or stop of the connected devices even if the execution conditions of this task are not met during the configured hold time. After that, the device will keep running or stop according to the execution conditions of the task settings.
  - **Open task hold time**: Take value 5 for example, the connected device will run for at least five minutes after starting up.
  - **Close task hold time**: Take value 10 for example, the device will stop for at least 10 minutes after the last stop.
- **Task Settings**

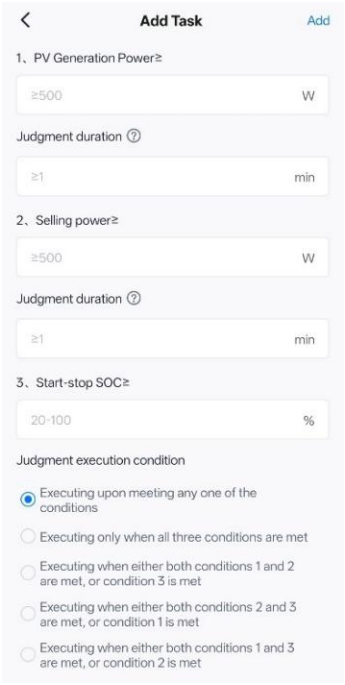
  Tap **Add Task** to schedule the time and start-stop control of the connected device.
  - **Repeat**: The task can be executed repeatedly at specific time periods on specific days.
  - **Advanced start-stop control**: The connected device only starts when the configured execution conditions are met.

  - **PV Generation Power ≥**: The PV generation power equals or exceeds the configured value for the configured duration.
  - **Selling power ≥**: The power sold to the grid equals or exceeds the configured value for the configured duration.
  - **Start-stop SOC ≥**: The battery system SOC equals or exceeds the configured value for the configured duration.

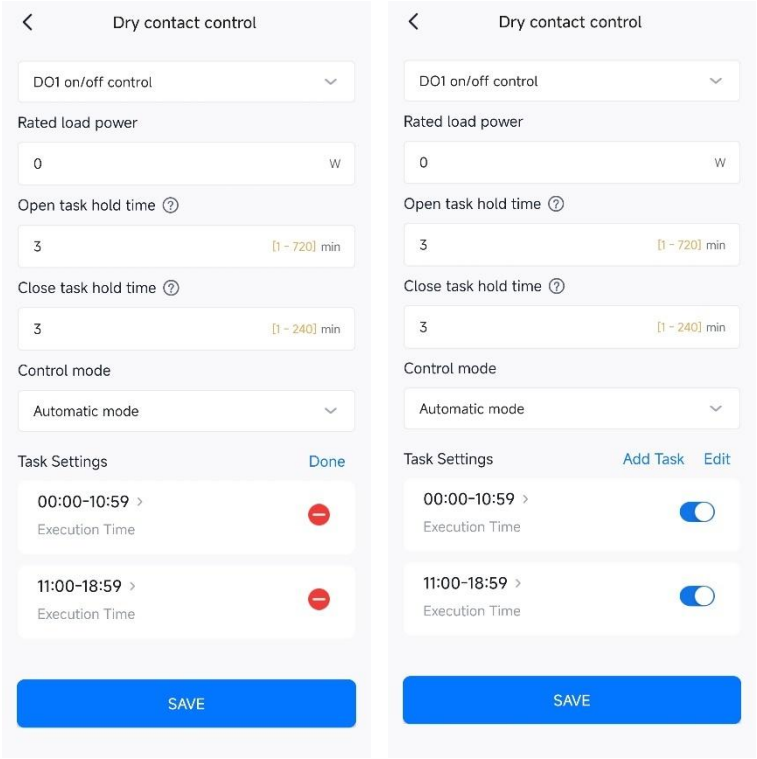

Dry contact control
Enable dry contact control
On/Off
Control port
DO1 on/off control
Rated load power
0
W
Open task hold time
3
[1 - 720] min
Close task hold time
3
[1 - 240] min
Control mode
Automatic mode
Task Settings
Add Task
SAVE


Add Task
Add
Task Settings
00:00
23:59
Repeat
No repetition
Advanced start-stop control(Selectable)
Please select the start-stop condition
Cancel
Select repeat time
OK
Sun.
Mon.
Tue.
Wed.
Thu.
Fri.
Sat.


Add Task
Add
Task Settings
00:00
23:59
Repeat
No repetition
Advanced start-stop control(Selectable)
Please select the start-stop condition
Cancel
Please select
OK
PV Generation Power
Selling power
SOC

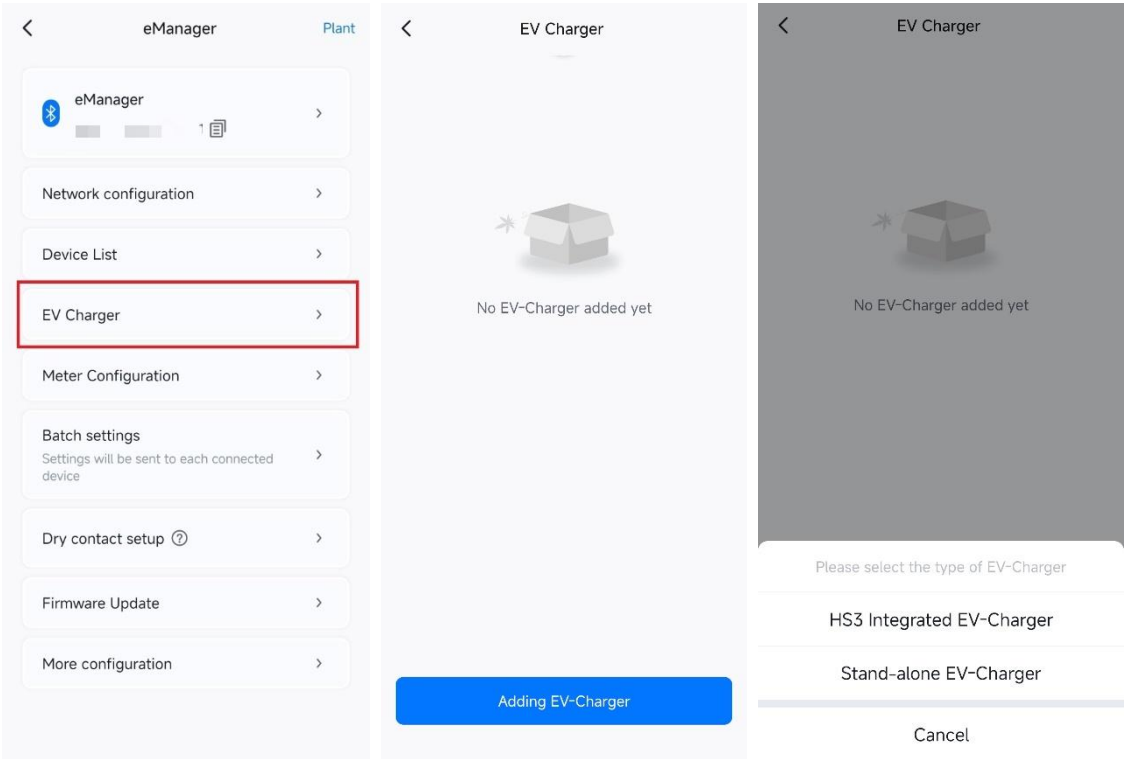

Add Task
Add
1、PV Generation Power≥
≥500
W
Judgment duration
≥1
min
2、Selling power≥
≥500
W
Judgment duration
≥1
min
3、Start-stop SOC≥
20-100
%
Judgment execution condition
Executing upon meeting any one of the conditions
Executing only when all three conditions are met
Executing when either both conditions 1 and 2 are met, or condition 3 is met
Executing when either both conditions 2 and 3 are met, or condition 1 is met
Executing when either both conditions 1 and 3 are met, or condition 2 is met

- To modify a task, tap the period to reset the time and start-stop control manner.
- To remove a task, tap the icon ⛔ of this task.
- To enable or disable a task, tap the icon ⚪ or 🔵 of this task.

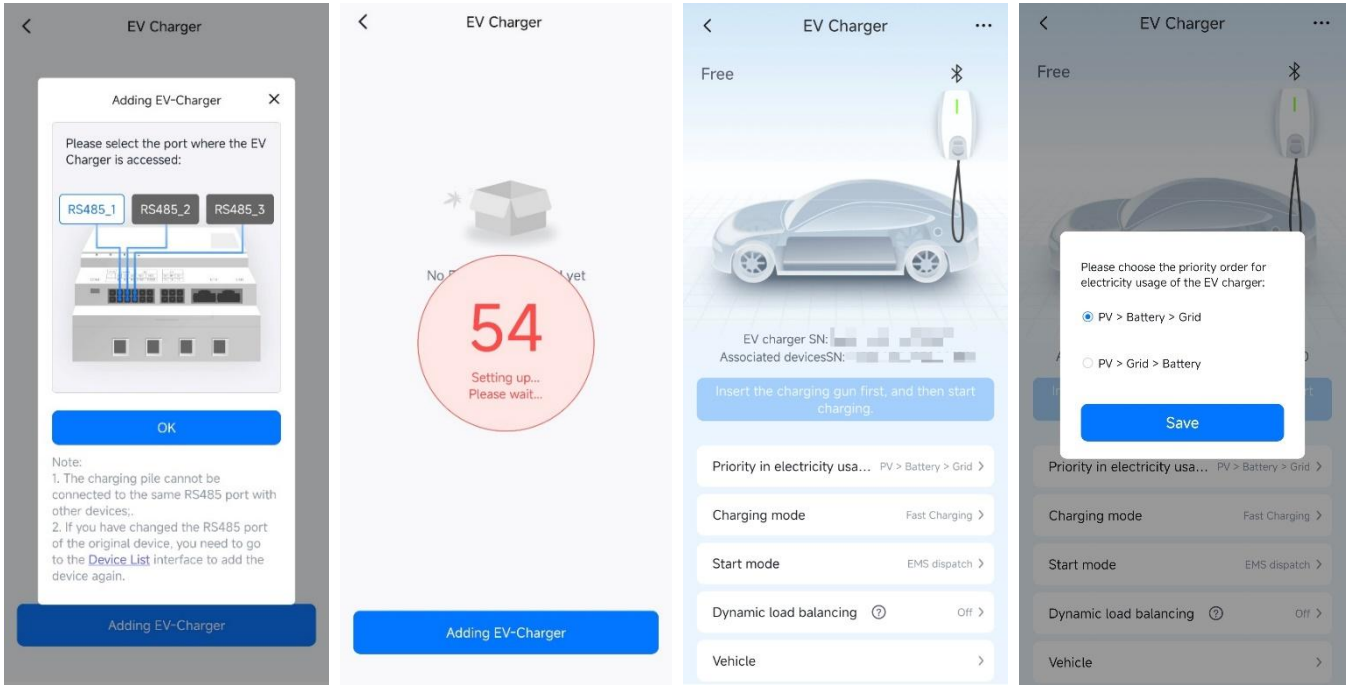


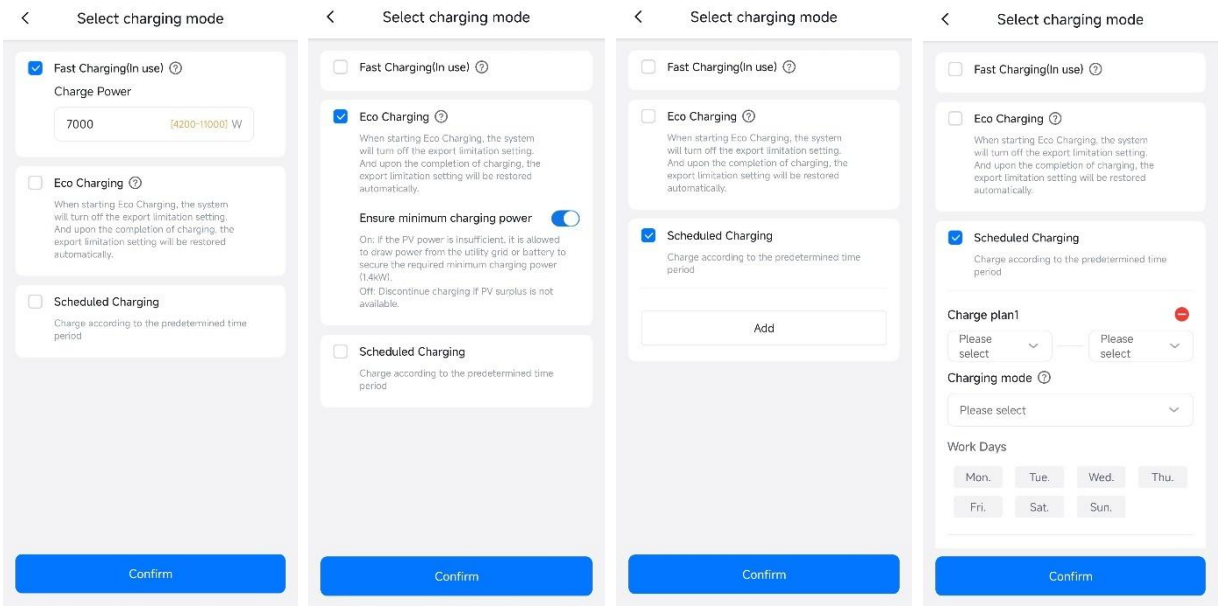
6.6. Add the EV charger

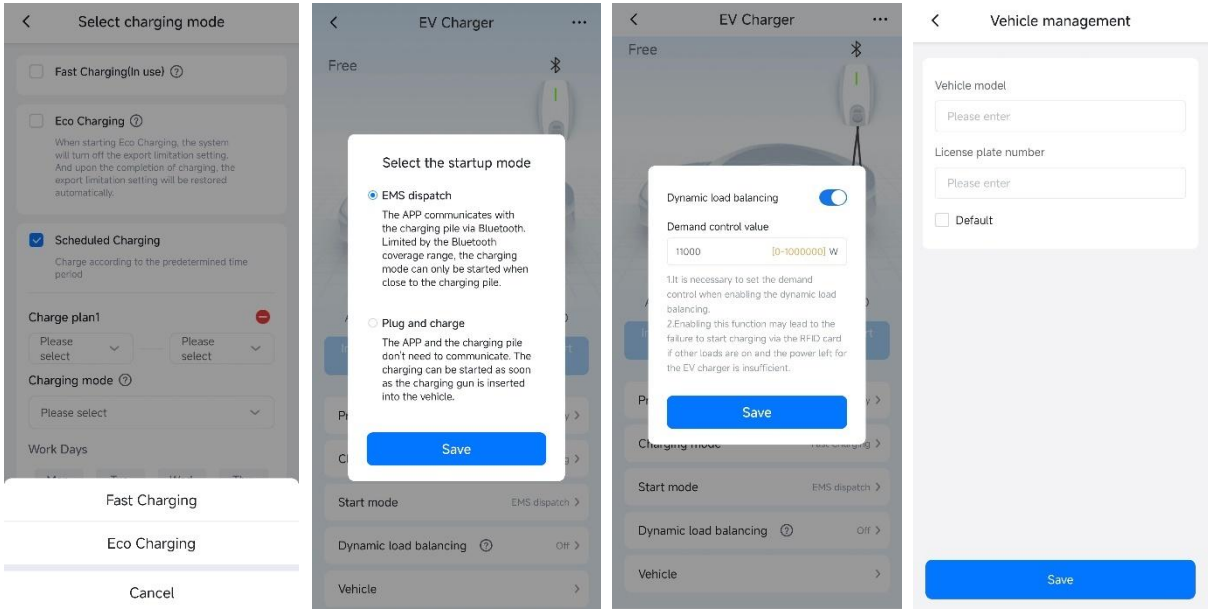
1. On the the **eManager** page, tap **EV Charger** to configure the EV charger connection. Select the connected EV charger as instructed on the screen.



2. Select the RS485 port that the EV charger is connected to. After the charger is added, configure the parameters as needed.
    - **Priority in electricity usage**: Whether to charge from the grid or the battery when the PV power is insufficient.
    - **Charging mode**: Select one of the modes as instructed on the screen.
    - **Start mode**: Select the start mode as instructed on the screen. When the **Plug and charge** mode is selected, no need to configure the other parameters.
    - **Dynamic load balancing**: When enabled, set the **Demand control value** to limit the maximum power that the whole system imports from the grid.
    - **Vehicle**: The customer's vehicles can be added on the App for charging history overview.

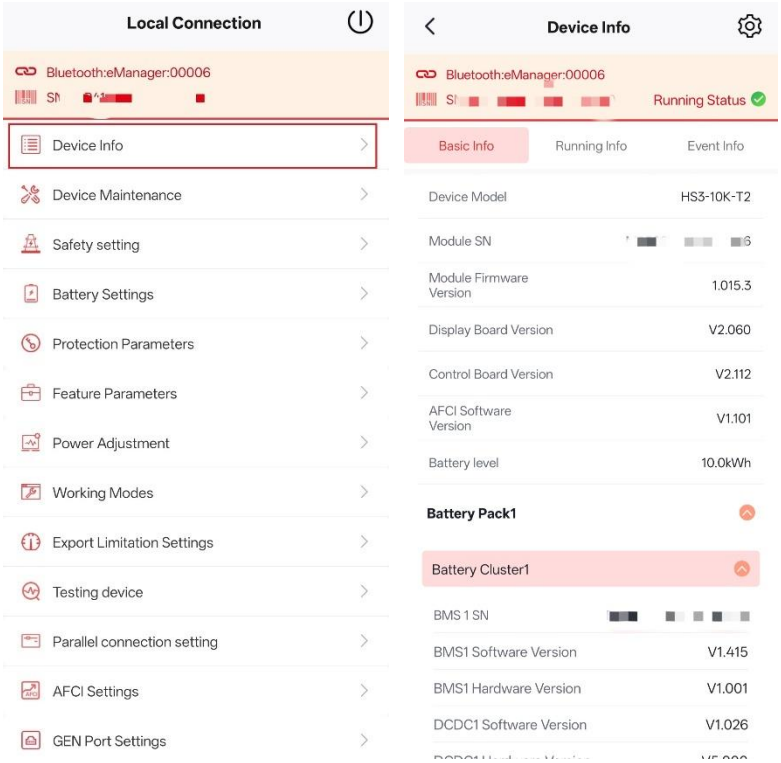



Select charging mode
Fast Charging(In use)
Charge Power
7000
[4200-11000] W
Eco Charging
When starting Eco Charging, the system will turn off the export limitation setting. And upon the completion of charging, the export limitation setting will be restored automatically.
Scheduled Charging
Charge according to the predetermined time period
Confirm
Select charging mode
Fast Charging(In use)
Eco Charging
When starting Eco Charging, the system will turn off the export limitation setting. And upon the completion of charging, the export limitation setting will be restored automatically.
Ensure minimum charging power
On: If the PV power is insufficient, it is allowed to draw power from the utility grid or battery to secure the required minimum charging power (1.4kW).
Off: Discontinue charging if PV surplus is not available.
Scheduled Charging
Charge according to the predetermined time period
Confirm
Select charging mode
Fast Charging(In use)
Eco Charging
When starting Eco Charging, the system will turn off the export limitation setting. And upon the completion of charging, the export limitation setting will be restored automatically.
Scheduled Charging
Charge according to the predetermined time period
Add
Confirm
Select charging mode
Fast Charging(In use)
Eco Charging
When starting Eco Charging, the system will turn off the export limitation setting. And upon the completion of charging, the export limitation setting will be restored automatically.
Scheduled Charging
Charge according to the predetermined time period
Charge plan1
Please select
Please select
Charging mode
Please select
Work Days
Mon.
Tue.
Wed.
Thu.
Fri.
Sat.
Sun.
Confirm


Select charging mode
Fast Charging(In use)
Eco Charging
When starting Eco Charging, the system will turn off the export limitation setting. And upon the completion of charging, the export limitation setting will be restored automatically.
Scheduled Charging
Charge according to the predetermined time period
Charge plan1
Please select
Please select
Charging mode
Please select
Work Days
Fast Charging
Eco Charging
Cancel
EV Charger
Free
Select the startup mode
EMS dispatch
The APP communicates with the charging pile via Bluetooth. Limited by the Bluetooth coverage range, the charging mode can only be started when close to the charging pile.
Plug and charge
The APP and the charging pile don't need to communicate. The charging can be started as soon as the charging gun is inserted into the vehicle.
Save
Start mode
EMS dispatch
Dynamic load balancing
Off
Vehicle
EV Charger
Free
Dynamic load balancing
Demand control value
11000
[0-1000000] W
1.It is necessary to set the demand control when enabling the dynamic load balancing.
2.Enabling this function may lead to the failure to start charging via the RFID card if other loads are on and the power left for the EV charger is insufficient.
Save
Start mode
EMS dispatch
Dynamic load balancing
Off
Vehicle
Vehicle management
Vehicle model
Please enter
License plate number
Please enter
Default
Save

6.7. View the inverter firmware version

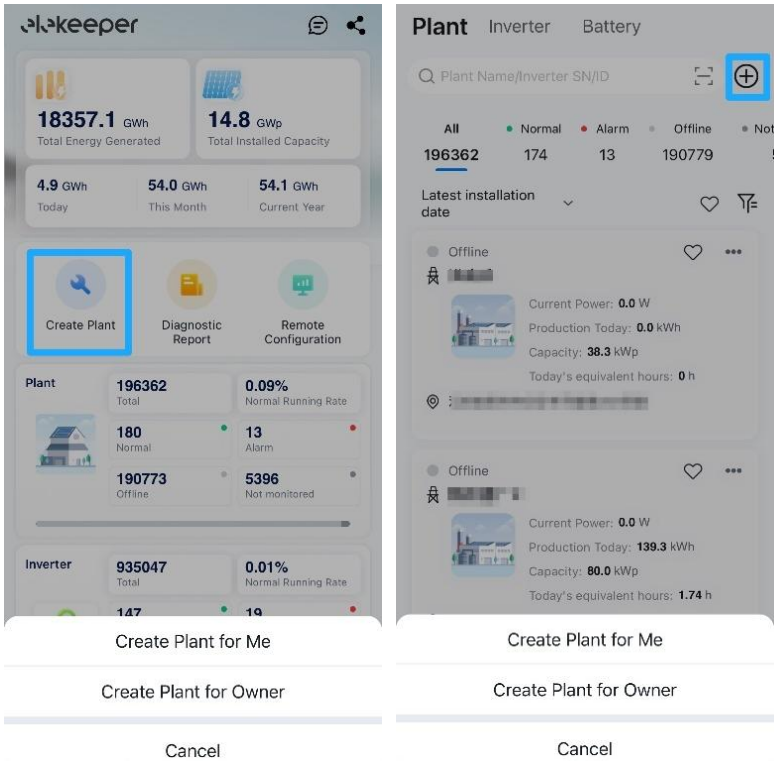
1. On the inverter main page, tap **Device info**.
2. On **Basic info**, view the values of **Display Board Version** (ARM) and **Control Board Version** (DSP).



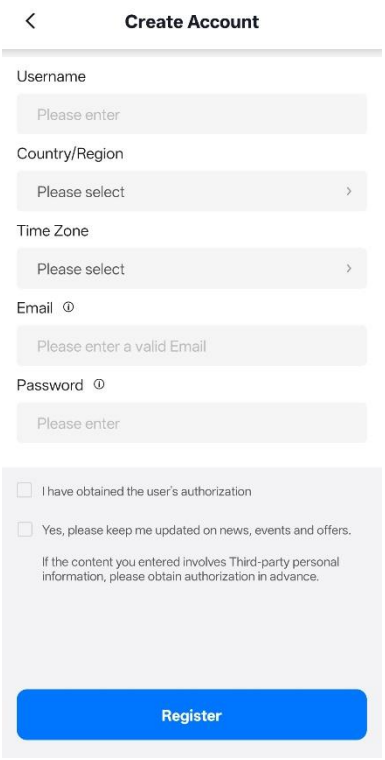
6.8. Create a plant

1. On the **Home** page, tap **Create Plant**. Select **Create Plant for Owner**.

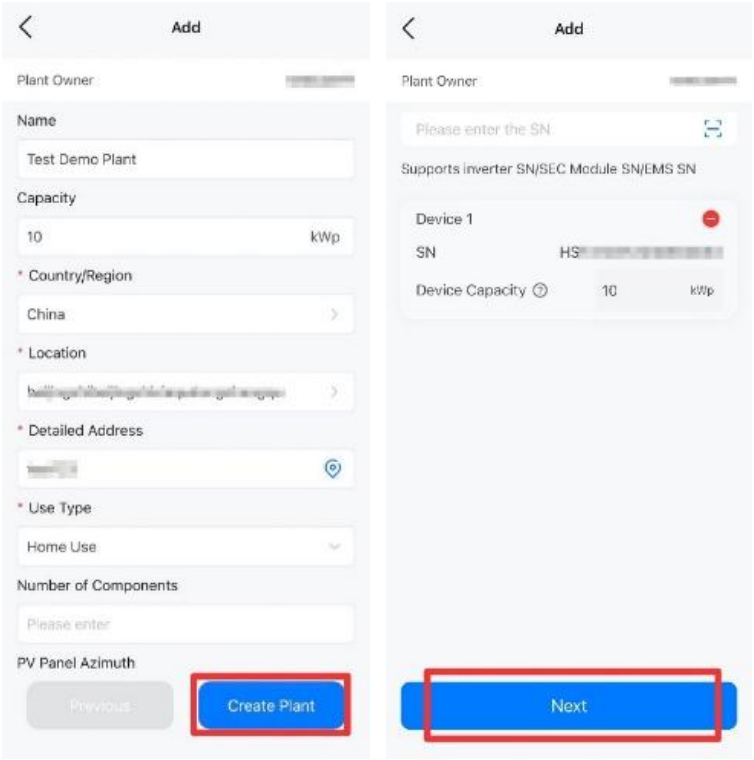
   Alternatively, on the **Management** page, tap the ⊕ icon on the top right corner and select **Create Plant for Owner**.



2. Apply for an account for the end user.
    a. Tap **Register the owner's account**.
    b. Set the required parameters based on the actual conditions of the end user.
    c. After the account is created, tap **Create Plant for Owner**, and then **Register the owner's account**.



3. Configure the plant details based on your actual conditions.
    a. Set the name, capacity, country or region, location, detailed address, user type, number of components, and PV panel azimuth. Tap **Create Plant**.
    b. Scan the EMS SN to add the device. Double check whether all devices added to this EMS are displayed. If not, check whether there is any communication error occurs between the EMS and the inverter. Then, tap **Next**.



7. Appendix

7.1. Recycling and disposal

This device should not be disposed as a residential waste.
The device that has reached the end of its operation life is not required to be returned to your dealer; instead, it must be disposed by an approved collection and recycling facility in your area.

7.2. Warranty

Check the product warranty conditions and terms on the SAJ website: https://www.saj-electric.com/

7.3. Contacting support

Online technical support

Go to https://www.saj-electric.com/services-support-technical to check FAQs or send your message or product enquiry.

Call for assistance

For SAJ support telephone numbers, see https://www.saj-electric.com/locations for your region support details.

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7.4. Trademark

SAJ is the trademark of Sanjing.