SEM3

Multi-function 3-phase energy meter



- Multi-parameter measurements
- Accuracy Class 1 active energy
- Support Wi-Fi/Bluetooth dual-mode communication
- 2 Measurement modes
- Easy connection solution
- Compact design
- Support 1x3p or 3x1p load measurements
- Phase sequence error warning
- Four-quadrants reactive energy

Rev1.0
20251107

Statements

All rights reserved. Without the written permission of the company, no paragraphs or chapters in this manual can be extracted, copied or reproduced in any form. Otherwise, the violator shall bear all consequences.
APsystems reserves all legal rights.

APsystems reserves the right to amend the product specifications in this manual without prior notice. Before placing an order, please contact our company or local agent to get the latest specifications.

Content

Version History 1
Risk Information 2
Chapter 1. Introduction 3
1.1 Introduction 3
Chapter 2. Technical Parameters 4
2.1 Specifications 4
2.2 Marking 7
2.3 Dimensions 8
2.4 Mounting 8
2.4.1 Spare Parts List 8
2.4.2 Installation steps 9
2.5 Wiring Diagram 11
Chapter 3. Operation 12
3.1 Definition of button and LEDs 12
3.2 Maintenance 12
Chapter 4. Using the App 13

Version History

Version	Date	Changes
1.00	2024-8-30	Initial issue
1.01	2025-2-12	Modifiy Communication Protocol

Risk Information

Information for Your Own Safety

This manual does not contain all of the safety measures operating the equipment (module, device) for different conditions and requirements. However, it does contain information which you must know for your own safety and to avoid damages. These information are highlighted by a warning triangle indicating the degree of potential danger.



Warning

This means that failure to observe the instruction can result in death, serious injury or considerable material damage.



Caution

This means hazard of electric shock and failure to take the necessary safety precautions will result in death, serious injury or considerable material damage.

Qualified personnel

Operation of the equipment (module, device) described in this manual may only be performed by qualified personnel. Qualified personnel in this manual means person who are authorized to commission, start up, ground and label devices, systems and circuits according to safety and Regulatory standards.

Proper handling

The prerequisites for perfect, reliable operation of the product are proper transport, proper storage, installation and proper operation and maintenance. When operating electrical equipment, parts of this equipment automatically carry dangerous voltages. Improper handling can therefore result in serious injuries or material damage.

- ✧ Use only insulating tools.
- ✧ Do not connect while circuit is live (hot).
- ✧ Place the meter only in dry surroundings.
- ✧ Do not mount the meter in an explosive area or expose the meter to dust, mildew and insects.
- ✧ Make sure the wires are suitable for the maximum current of this meter.
- ✧ Make sure the AC wires are connected correctly before activating the current/voltage to the meter.
- ✧ Do not touch the meter connecting clamps directly with metal, b1lank wire and your bare hands as you may get electrical shock.
- ✧ Make sure the protection cover is placed after installation.
- ✧ Installation, maintenance and reparation should only be done by qualified personnel.
- ✧ Never break the seals and open the front cover as this might influence the function of the meter, and will cause no warranty.
- ✧ Do not drop, or allow strong physical impact on the meter as the high precisely components inside may be damaged.
- ✧ Designed to be mounted inside of switchboards or cabinet on DIN rail.
- ✧ This device must have a suitable sized Circuit Breaker feeding the Multi Function Energy Meter so it does not exceed the maximum rated current.
- ✧ The supply wiring of this device shall be suitable sized cable to match the installed circuit breaker.
- ✧ A Disconnection Device (Circuit Breaker) should be installed close to the Multi Function Energy Meter.
- ✧ The Disconnection Device shall be marked as the Disconnection Device for the Multi Function Energy Meter.

Disclaimer

We have checked the contents of this publication and every effort has been made to ensure that the descriptions are as accurate as possible.

However, deviations from the description cannot be completely ruled out, so that no liability can be accepted for any errors contained in the information given. The data in this manual is checked regularly and the necessary corrections are included in subsequent editions. We are grateful for any improvements that you suggest.

Chapter 1. Introduction

1.1 Introduction

The SEM3 three-phase electricity meter is designed for three-phase four-wire power grids and can accurately measure various critical electrical parameters: voltage, current, power, frequency, active energy, reactive energy, forward and reverse energy, etc. It is suitable for real-time power monitoring systems, featuring multifunctionality, versatility, high stability, and long service life.

The SEM3 is a three-phase electricity meter designed for power monitoring needs in power systems, public utilities, industrial applications, and residential settings. It can be used in scenarios such as power transmission and distribution, AC charging piles, and solar photovoltaic systems. Its comprehensive communication capabilities make it highly suitable for various real-time power monitoring systems.

Chapter 2. Technical Parameters

2.1 Specifications

Table 1

Electrical Characteristics		
Type of Measurement		RMS Including Harmonics on Three Phase AC System (3P, 3P+N)
Measurement Accuracy	Power	± 1% IEC 61557-12 Class 1
	Active Energy	± 1%
	Reactive Energy	± 2%
	Frequency	± 0.2%
	Current	± 0.5% (4A to 120A) ± 1% (1A to 4A) ± 3% (0.06A to 1A)
	Voltage	± 0.5%
	Power Factor	± 0.1
Data Update Rate		Active Power:50mS(RS485), 500mS(Wi-Fi)
Input-Voltage	Un	3*230V(L-N)/400V(L-L)
	Working Voltage Range	90 to 277 V ac L-N 156 to 480 V ac L-L
	Frequency Range	50/60Hz
Mechanical Characteristics		
Net Weight		≈100g (SEM3)
IP Degree of Protection (IEC 60529)		IP51 Front Display IP20 Whole Meter
Dimensions (DxHxW)		68.5*90*19mm
Mounting		DIN Rail 35mm
Material of Meter Case		Self-extinguishing UL 94 V-0
Mechanical Environment		M1
Environmental Characteristics		
Operating Temperature		-40 °C to +70°C
Storage Temperature		-40 °C to +85°C
Humidity Rating		≤95% RH , non-condensing
Pollution Degree		2
Altitude		Up to 2000m
Vibration		10Hz to 50Hz, IEC 60068-2-6
Electromagnetic Compatibility		
Electrostatic Discharge		IEC 61000-4-2
Immunity to Radiated Fields		IEC 61000-4-3
Immunity to Fast Transients		IEC 61000-4-4
Immunity to Impulse Waves		IEC 61000-4-5
Conducted Immunity		IEC 61000-4-6
Immunity to Magnetic Fields		IEC 61000-4-8
Immunity to Voltage Dips		IEC 61000-4-11
Radiated Emissions		EN55032 Class B
Conducted Emissions		EN55032 Class B
Safety		
Measurement Category		Per IEC61010-1 CAT III
Current Inputs		Require External Current Transformer for Insulation
Over-voltage Category		CAT III
Protective Class		II

Communications	
Interface 1	RS485 Port
Interface 1 Protocol	MODBUS RTU
Communication Address	1 to 247
Transmission Mode	Half Duplex
Data Type	Floating Point
Transmission Distance	1000m Maximum
Transmission Speed	2400/4800/9600(Default)/19200/38400/115200bps
Parity	NONE(Default)/ ODD / EVEN
Stop Bits	1 or 2
Response Time	<50 ms
Interface 2	Wi-Fi
RF Band	2.4 GHz to 2.5 GHz
Max. RF Power	<20 dBm
Wi-Fi Protocol	802.11 b/g/n
Wi-Fi Range	Up to 30m / 100ft indoors and 50m / 160ft outdoors (Depends on local conditions)
Interface 3	Bluetooth
Bluetooth Protocol	Bluetooth 4.2
Bluetooth Range	Up to 10m / 33ft indoors and 50m / 160ft outdoors (Depends on local conditions)

Table 2

Note: ● = included

— = excluded

Features	Models
	SEM3-WL
Instantaneous Measurements	
Current	●
Voltage L-N	●
Voltage L-L	●
Frequency	●
Active Power	●
Reactive Power	●
Apparent Power	●
Power Factor	●
Energy Values	
Active Energy	●
Reactive Energy	●
Apparent Energy	●
Demand Values	
Current	●
Active, Reactive, Apparent Power	●
Maximum Demand Values	
Maximum Current	●
Maximum Active Power	●
Maximum Reactive Power	—
Maximum Apparent Power	—

Min. and Max. Value	
Active Power Per Phase and Total	—
Reactive Power Per Phase and Total	—
Apparent Power Per Phase and Total	—
PF Per Phase and Total	—
Current Per Phase and Average	—
THDi Per Phase	—
THDu L-L and L-N	—
Power-Quality Values	
Total Harmonic Distortion	●
Individual Harmonic Distortion	—
Running Hour	●
Network	
1 Phase 2 Wires	●
2 Phase 3 Wires	●
3 Phase 3 Wires	●
3 Phase 4 Wires	●
CT Programmable	●
PT Programmable	—
Inputs and Outputs	
Alarms	—
Communications	
RS485	●
Wi-Fi	●
Bluetooth	●

Technical Standards:

[1] EN IEC61326-1: 2021 Electromagnetic Compatibility Directive - Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements

[2] EN IEC 61326-2-3: 2021 Electromagnetic Compatibility Directive

[3] EN61010-1:2010+A1:2019 Low Voltage Directive 2014/35/EU - Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements

[4] EN61010-2-030:2010 Low Voltage Directive 2014/35/EU - Particular requirements for testing and measuring circuits

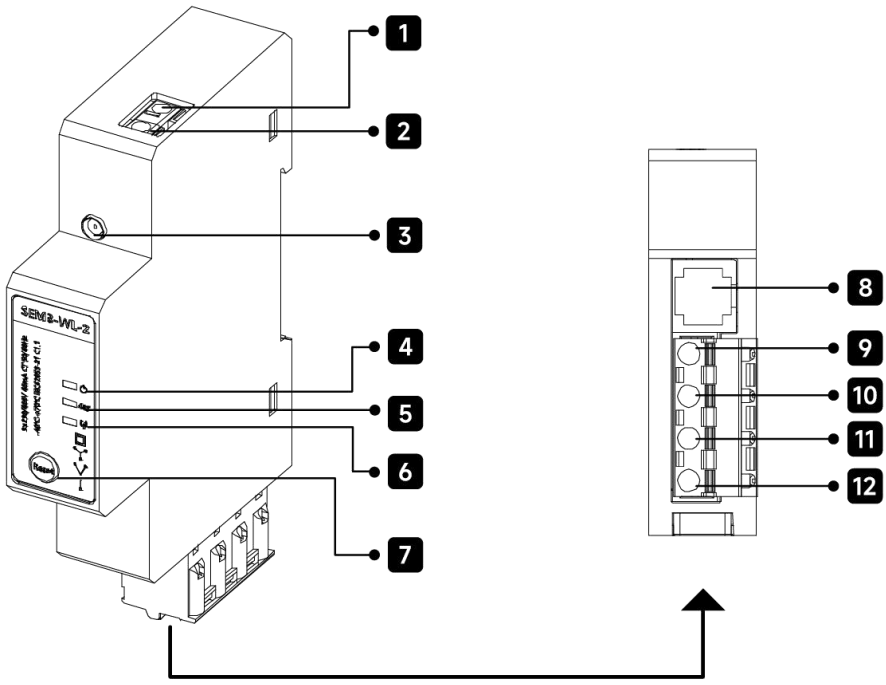
[5] EN 50470-3:2022 Electricity metering equipment - Part 3: Particular requirements - Static meters for AC active energy (class indexes A, B and C)

[6] IEC62053-21:

2.2 Marking

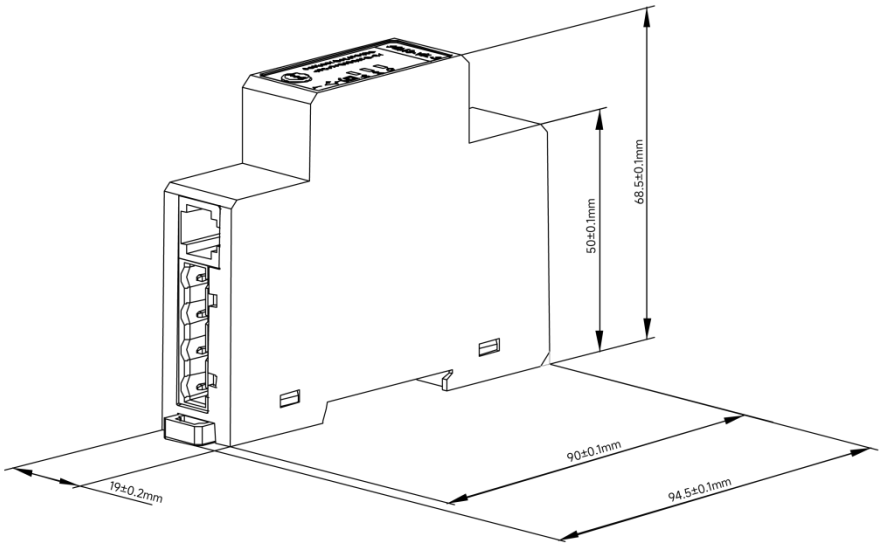


(SEM3-WL nameplate and laser printing)



1 RS485 A Through Hole
2 RS485 B Through Hole
3 Antenna
4 Power indicator
5 RS485 indicator
6 Wi-Fi indicator
7 Reset
8 CT
9 L1 Input
10 L2 Input
11 L3 Input
12 N Input

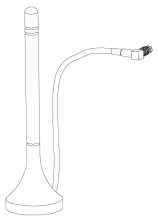
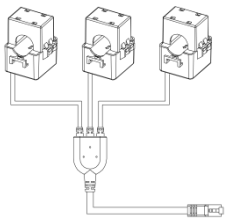
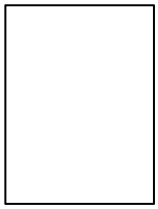
2.3 Dimensions



Depth: 68.5mm Height: 94.5mm Width: 19mm

2.4 Mounting

2.4.1 Spare Parts List

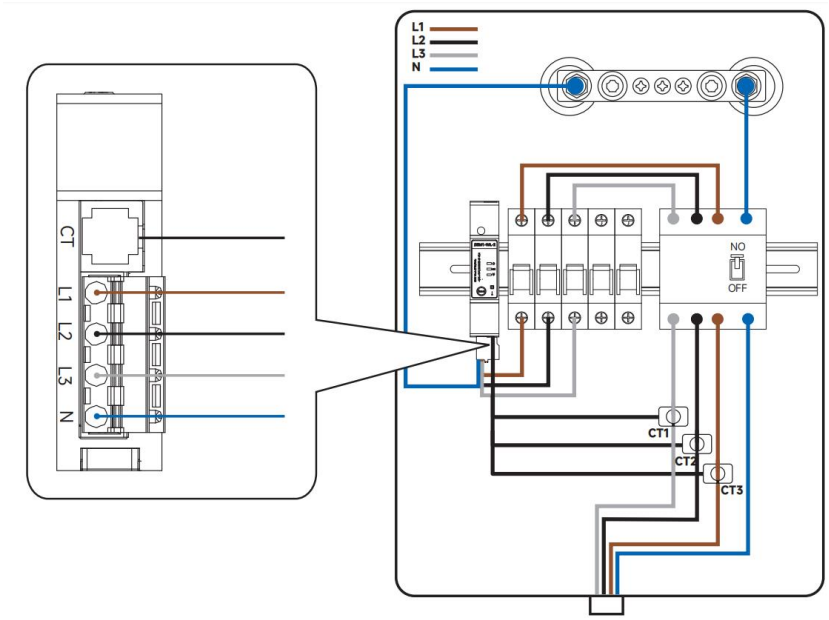
Component Name	Multi- function 3-phase energy meter	Antenna	CT (120A/40mA(standard) 300A/40mA(optional))	Quick Installation Guide
Quantity	1	1	1	1
Graphic				

2.4.2 Installation steps

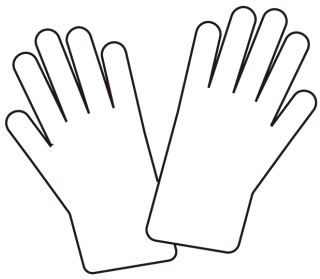
Take out the three-phase electric meter and its matching current transformers (CTs) from the packaging.

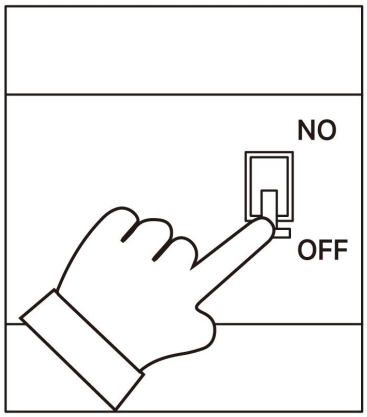
Step 1: First, distinguish the incoming wires. Typically, the brown wire is live wire L1, the black wire is live wire L2, the gray wire is live wire L3, and the blue wire is neutral wire (N).

The actual colors of the wires shall be subject to the wiring conditions in the household. (For the final installation effect, please refer to the wiring method in the figure below.)



Step 2. Put on insulating gloves (prepared by the user themselves) and disconnect the main power supply to eliminate the risk of electric shock.





Step 3: Mount the three-phase electric meter on the guide rail of the distribution box, ensuring it is firmly installed without any looseness.

(1) Select a guide rail with a width of 35mm, and pull down the buckle at the lower end of the three-phase electric meter;

(2) First, clamp the upper end of the guide rail slot of the three-phase electric meter onto the guide rail, as shown in Figure 1;

(3) Then clamp the lower end of the guide rail slot of the three-phase electric meter onto the guide rail, as shown in Figure 2;

(4) Push up the buckle at the lower end of the three-phase electric meter, so that the three-phase electric meter is firmly clamped on the guide rail, as shown in Figure 3.

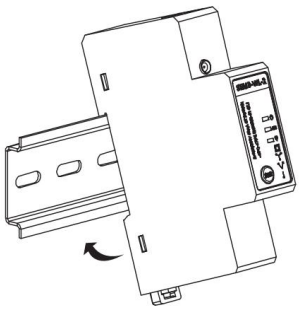


Figure 1

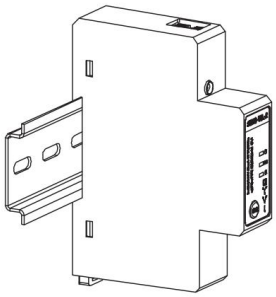


Figure 2

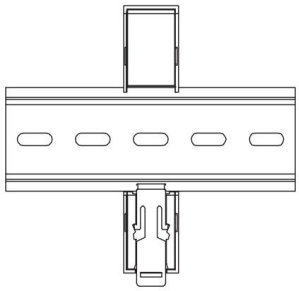
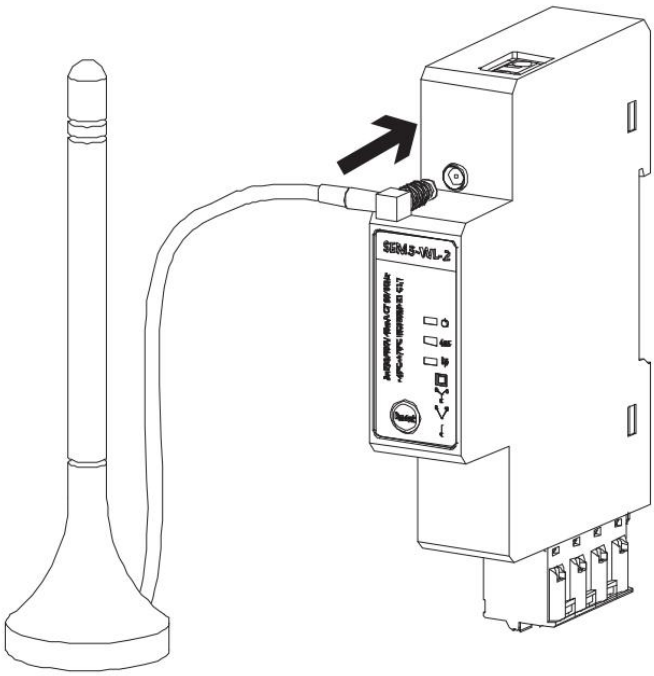


Figure 3

Step 4: Insert the antenna.

Note:

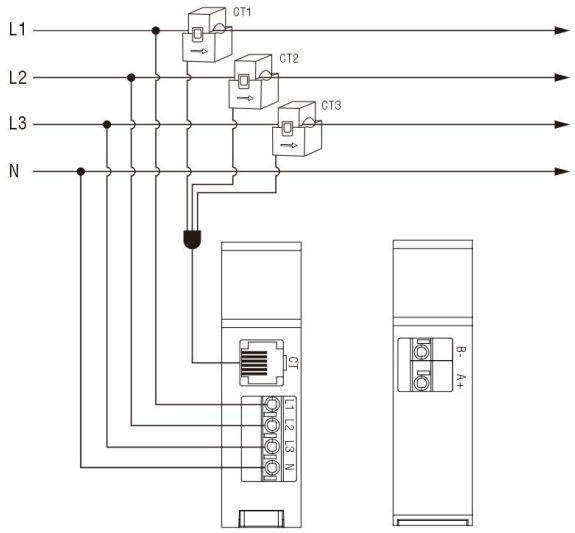
If the three-phase electric meter is installed in a closed distribution box, place the antenna outside the box and ensure unobstructed wireless network signals around the antenna.



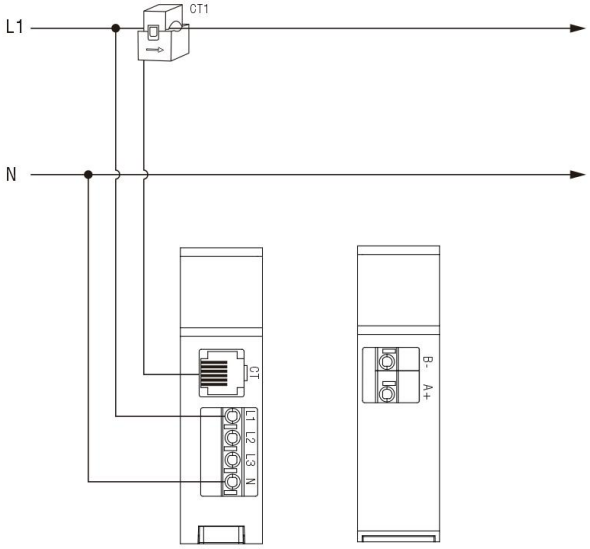
2.5 Wiring Diagram

1. Prepare wires of the corresponding colors and connect them from the circuit breaker to the L1, L2, L3, and N terminals of the three-phase electric meter:
The user shall provide a screwdriver by themselves. Press and hold the red button at the terminal of the three-phase electric meter with the screwdriver before inserting the wires of the corresponding colors.
2. Insert the CT (Current Transformer) connection wires into the dedicated CT interface of the three-phase electric meter.
3. Install the CT on the live wires (L1, L2, L3) in accordance with the current direction marked on the CT.

Power Grid → Household Load



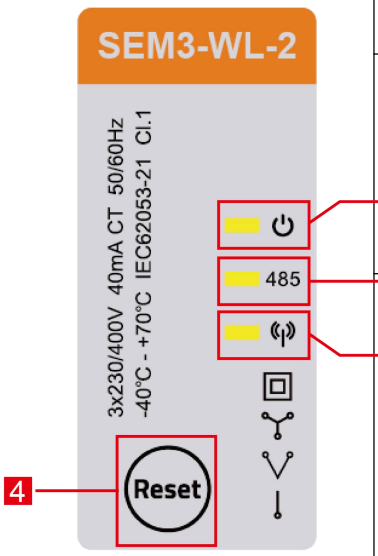
Power Grid → Household Load



NOTE:
1. If the product is used in a single-phase anti-backflow scenario, the phase wire connected to the micro-inverter must be consistent with the phase wire loop-connected to the CT (Current Transformer). For example, if the CT is clamped on L1, the power output of the micro-inverter should also be connected to L1 correspondingly.
2. If the product is applied in a three-phase anti-backflow scenario, the L1, L2, L3, and N wires of the electric meter's power supply line must all be properly connected without omission.
3. The CT (Current Transformer) shall be installed on the live wire, with the arrow pointing to the household load.

Chapter 3. Operation

3.1 Definition of button and LEDs

Interface	Definition	Introduction
	1.Power LED	1. Red light stays on if the meter is powered on with no load. 2. Red light will be flashing if a load is connected.
	2.RS485 LED	Green light will be flashing if the meter is communicating normally.
	3.Wi-Fi LED	1. Blue light stays on if Wi-Fi / Bluetooth is not connected. 2. Green light will be flashing if Wi-Fi / Bluetooth connection completed. 3. Blue/Green lights stay on if OTA update is in progress .
	4.Reset Key	1. Press the key to turn Bluetooth on or off.; 2. Press and hold for 10 seconds to reset communication parameters.

3.2 Maintenance

In normal use, little maintenance is required. As appropriate for service conditions, isolate electrical power, inspect the unit and remove any dust or other foreign material present. Periodically check all connections for freedom from corrosion, particularly if vibration is present.

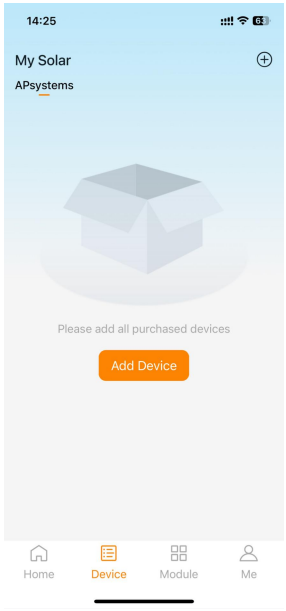
The front of the case should be wiped with a dry cloth only. Use minimal pressure, especially over the viewing window area. If necessary, wipe the case with a dry cloth. Water should not be used. If the case exterior or terminals should be contaminated accidentally with water, the unit must be thoroughly dried before further use. Should it be suspected that water might have entered the unit, factory inspection and refurbishment is recommended.

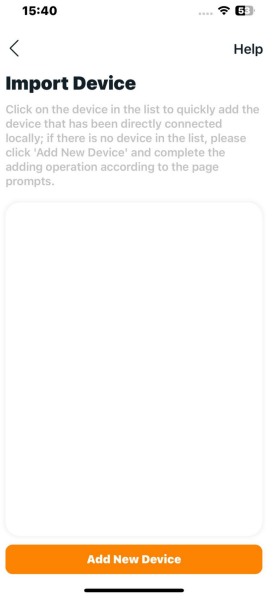
In the unlikely event of a repair being necessary, it is recommended that the unit be returned to the factory or nearest APsystems distributor.

Chapter 4. Using the App

4.1 Method 1: Remote Connection

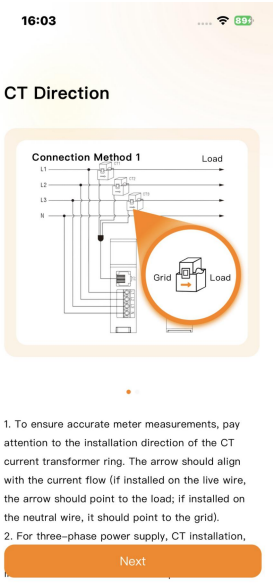
1. Log in to your account, go to the "Devices" page and click "Add Device", then import device via the list or by clicking "Add New Device".



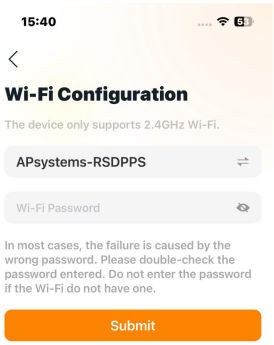


2. Confirm whether the CT is installed correctly.

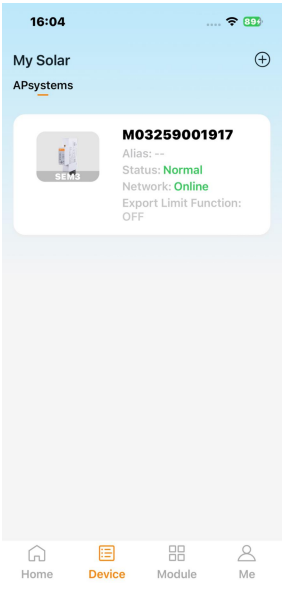
Note: you can also adjust CT direction later through "CT Reversal" function of the App.



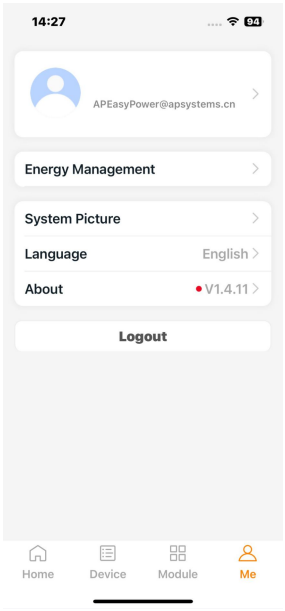
3. Select the Wi-Fi network from the list and enter the password.

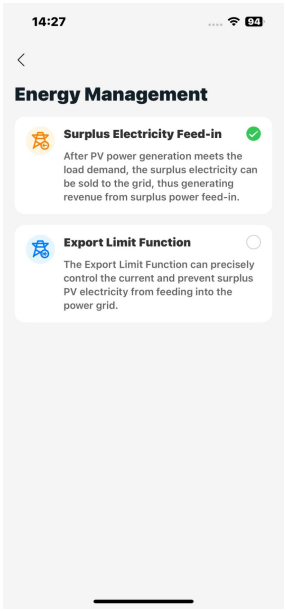


4. Ensure that the smart meter is successfully configured.



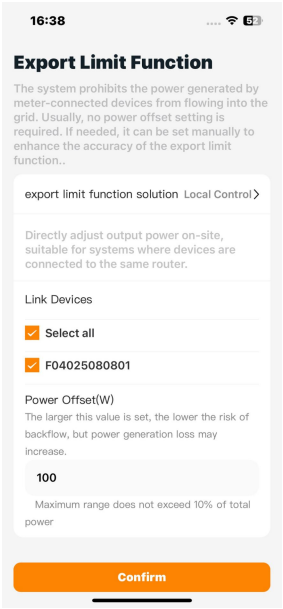
5. Select "Me" page and click "Energy Management " .





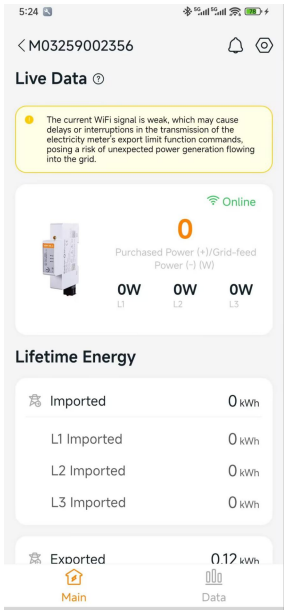
6. Click " Export Limit Function ", Select the devices that need to be associated.

Note: If you want to disable " Export Limit Function ", please select “Surplus Electricity Feed-in” again on the “Energy Management” page



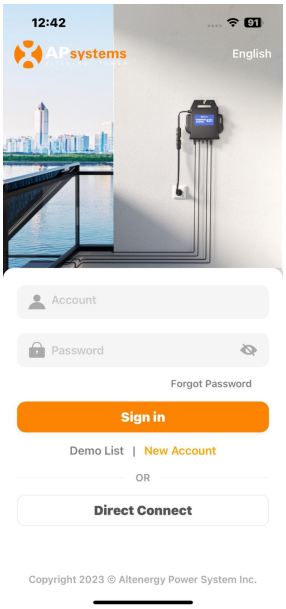
NOTE:

1. If the WiFi signal is weak, it may cause the transmission of the anti-reverse flow command of the electricity meter to be delayed or interrupted, and there is a risk that the generated electricity will accidentally flow into the power grid.



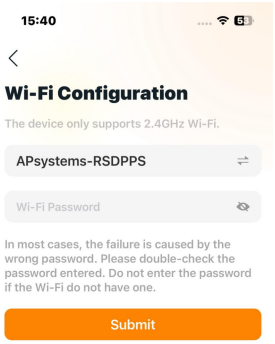
4.2 Method 2:Bluetooth direct connection Settings

1.On the home page, click "Directly Connect" to jump to Directly Connect (Bluetooth). Then click "Connect Device", and select "Bluetooth" or "Scan".

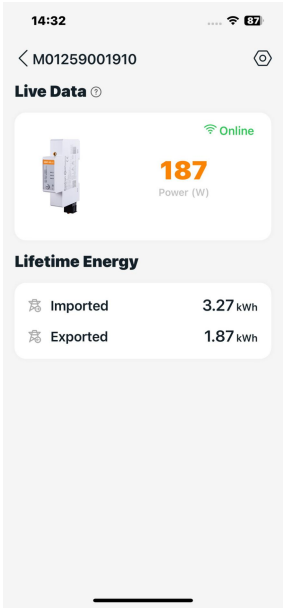


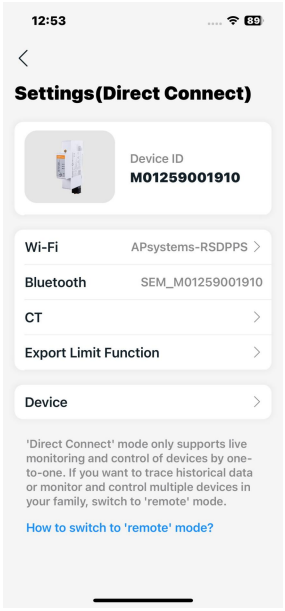


2. Select the Wi-Fi network from the list and enter the password.

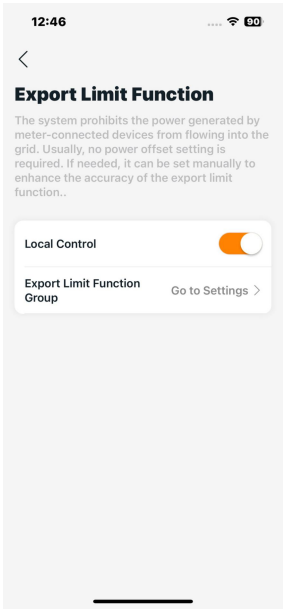


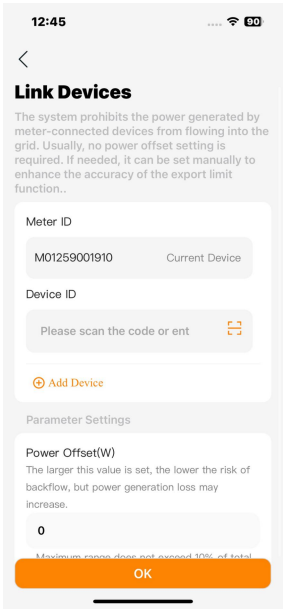
3. Click on "Settings" at the top right corner, and then click on "Export Limit Function".





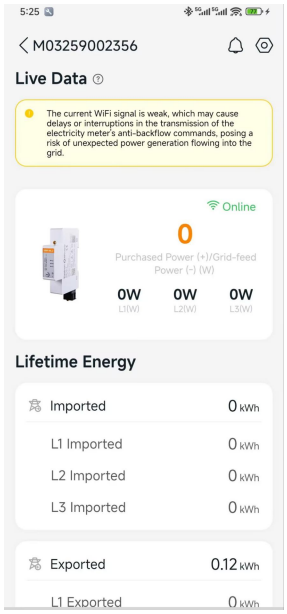
4. Open "Local Control", click on "Export Limit Function Group", manually fill in or scan the code to add the electricity meter ID, device ID and power Offset, and then click "OK".





NOTE:

2. If the WiFi signal is weak, it may cause the transmission of the anti-reverse flow command of the electricity meter to be delayed or interrupted, and there is a risk that the generated electricity will accidentally flow into the power grid.



IF you have any question, please feel free to contact our sales team.

Altenergy Power System Inc.
No. 3535, Linggongtang Road, Nanhu District, Jiaxing, Zhejiang, China
Phone: +86 -573-83986967
Email: info@APsystems.cn
Web: APsystems.cn