APEX SOLAR

USER MANUAL

Semi-solid State Lithium-ion Battery ESS

APEX 16KM/S

Version: 1.0



About this manual

This manual is intended for the APEX 16KM/S Energy Storage battery.This batteries can be installed in Parallel and Series, pay more attention for the DIP setting and address selection.

Statement

Compliant to Best Practice Guide for Battery Storage Equipment—Electrical Safety.Requirements- version 1- Pre-assembled integrated battery energy storage system equipment – Method 1 mandatory requirements and Optional requirements – a), c), e), f), g), h), i), j), k), l), m), n), o), p), q).

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1. Safety Introduction

1.1 Important Safety Instructions

This manual contains important instructions for:
APEX 16KM/S Energy Storage product and this manual must be followed when installing and using this product.

This product is designed and tested in accordance with international safety requirements CE IEC 62040 and IEC 62619, but as with all electrical and electronic equipment, certain precautions must be observed when installing and / or operating the product. To reduce the risk of personal injury and ensure the safe installation and operation of the product, you must read carefully and follow all instructions, cautions and warnings in this manual.

1.2 Warnings in this Document

A warning describes a hazard to equipment or personnel. It calls attention to a procedure or practice which if not correctly performed, could result in damage to or destruction of part or all of the APEX equipment and/or other equipment connected to the APEX equipment or personal injury.

Symbol	Description
	Caution, risk of electric shock
	Heavy enough may cause severe injure
	Keep the battery away from open flame or ignition sources
	Keep the battery away from children
	Dispose of waste batteries according to local laws and regulations
	Recycling
	Read this manual before installation and operation

For safety reasons, installers are responsible for familiarizing themselves with the contents of this manual and all warnings before performing installation.

1.3 Battery Handling Guide

- Use the battery pack only as directed.
- If the battery defective, appears cracked, broken or otherwise damaged, or fails to operate, contact the APEX **hot line** immediately.
- Do not attempt to open, disassemble, repair, tamper, or modify the battery.

The battery is not suitable for users to use by themselves.

- To protect the battery and its components from damage when transporting, handle with care.
- Do not subject it to any strong force.
- Do not insert foreign objects into any part of the battery pack.
- Do not use cleaning solvents to clean the battery.
- The battery not be connected directly to SELV circuit.

1.4 Response to Emergency Situations

The APEX battery is designed with multiple safety strategies to prevent hazards resulting from failures. However, APEX cannot guarantee their absolute safety for uncertain situations.

1.4.1 Leaking Batteries

If the battery pack leaks electrolyte, avoid contact with the leaking liquid or gas. Electrolyte is corrosive and contact may cause skin irritation and chemical burns. If one is exposed to the leaked substance, do these actions:

Inhalation: Evacuate the contaminated area, and seek medical attention immediately.
Eyes contact: Rinse eyes with flowing water for 15 minutes, and seek medical attention immediately.
Skin contact: Wash the affected area thoroughly with soap and water, and seek medical attention immediately.
Ingestion: Induce vomiting as soon as possible, and seek medical attention immediately.

1.4.2 Fire

In case of a fire, make sure that an ABC or carbon dioxide extinguisher is



nearby and does not use water to extinguish the fire.

WARNING
The battery pack may catch fire when heated above 150°C

If a fire breaks out where the battery is installed, do these actions:

1. Extinguish the fire before the battery catches fire.
2. If the battery has caught fire, do not try to extinguish the fire. Evacuate people immediately.

WARNING
If the battery catches fire, it will produce poisonous gases. Do not approach.

1.4.3 Wet battery

If the battery is wet or submerged in water, do not try to access it. Contact **APEX Customer Service** or your distributor for technical assistance.

1.4.4 Damaged Battery

If the battery damaged, please contact APEX **customer service** or your distributor for help as soon as possible, because damaged battery is dangerous and must be handled with extreme caution. Damaged battery is not suit for use and may pose a danger to people or property. If the battery seems to be damaged, return it to APEX or your distributor.

CAUTION
Damaged battery might export electrolyte or flammable gas, so contact APEX for advice and information immediately we will deal with it.

1.5 Installers

APEX Energy Storage battery is suggested installing by skilled worker or electrician.
A skilled worker is defined as a people who had been trained and qualified electrician or had all of the following skills and experience:

- Knowledge of the functional principles and operation of on-grid Energy Storage systems.
- Knowledge of the dangers and risks associated with installing and using electrical devices and acceptable mitigation methods.
- Knowledge of the installation of electrical devices
- Knowledge of and adherence to this manual and all safety precautions and best practices.

1.6 Scrap Battery

For scrap battery(-ies), please treat with local laws or regulations to recycle or scrap.

2.Guidance for Disconnection of Batteries During Shipment

- APEX 16KM/S is not suit for air transport.
- Cartons that have been crushed, punctured, or torn in such a way that contents are revealed shall be set aside in an isolated area and inspected by a skilled person. If the package is deemed to be not shippable, the contents shall be promptly collected, segregated, and either the consignor or consignee contacted.
- The DC circuit of APEX 16KM/S battery has been disconnected before outgoing.
- We have conducted comprehensive tests to ensure the equipment distribute around the world is safe for shipping. These products shall be handled with care and immediately inspected if visibly damaged. If the carton visibly damaged, please contact with APEX **customer service** to confirm whether the battery could be used safely or not.

3. Product Introduction

3.1 Technical Specifications

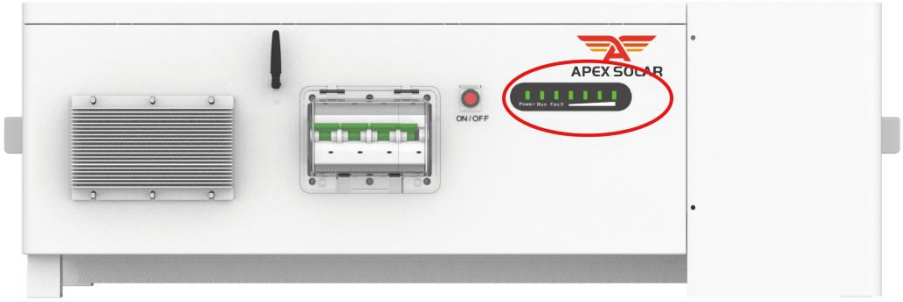
Model	APEX 16KM(Master)	APEX 16S(Slave)
Battery Type	Semi-solid state Prismatic	
Nominal Energy	16.076kWh	
Usable Energy*	14.95kWh	
Nominal Capacity	314Ah	
Nominal Voltage	51.2V	
Operating Voltage	48~56V	
Max Dis~/Charge Voltage	41.6-57.6V	
Recommended Charge&Discharge Current	100A/100A	
Max Charge/Discharge Current	150A/150A	
Peak Discharge Current(2min 25℃)	175A	
Peak Discharge Power(2min 25℃)	8.96kW	
Recommended Depth of Discharge(DOD)	93%	
Charging Temp.Range	From 0~55℃	
Discharging Temp.Range	From -20~55℃	
Cycle Life	≥8000@25℃	
Scalability	1 Master series	Up to 12Slave series
WIFI Module	Built-in	
Communication	CAN/RS485	
IP Rating	IP65	
Recommended Humidity	5%~95%(No condensed water)	
Cooling Type	Forced cooling	
Color	White(optional)	
Installation	Stack-mounting	
Net Weight	128kg±2	123kg±2
Dimension(W*H*D)	790*260*485mm	
Protection	Over-current/Over-voltage/Short circuit/Under-voltage/Over temperature	
Heating Module	Yes	
Balancing Module	Yes	
Fire Protection	Built-in aerosol(optional)	
Certification	CE/UN38.3/IEC62619/IEC62477	

Testing conditions based on temperature 25C at the beginning of life.
*Total Energy/Usable Energy measured under specific conditions by APEX 0.2C CC-CV and based on recommended DOD(93%);

3.2 Indicator and Ports

3.2.1 Indicators of APEX 16KM/S

There are 7 LED indicators on the front of the master battery and 2 LED indicators on the front of the slave battery as shown in the following figures.



Item	Designation	Definition
1	Power	Battery power supply status
2	Run	Battery working normally
3	Fault	Battery failures
4	SOC	Display the state of charge (SOC) of the battery
Remark: SOC is indicated by four LED lights		



Item	Designation	Definition
1	Run	Battery working normally
2	Fault	Battery failures

3.2.2 Ports of APEX 16KM/S

The power supply interface,power cable interface and communication cable interface.

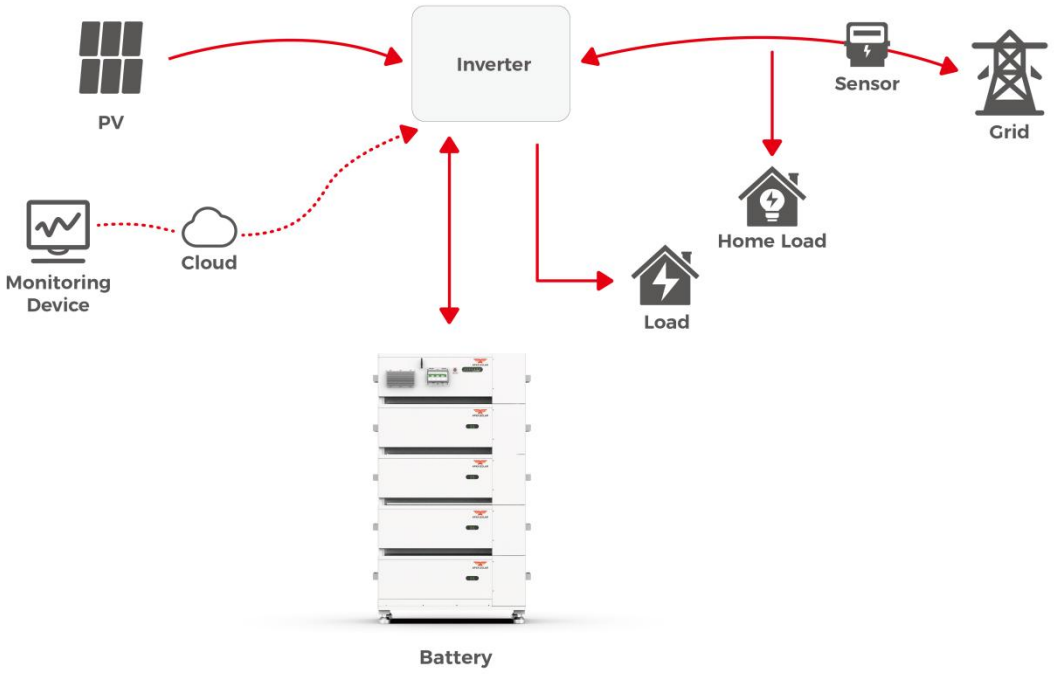


Item	Designation	Definition
1	P+	PACK+
2	P-	PACK-
3	B+ OUT	The interface between the slave battery and the host battery
4	B+ IN	The interface between the slave battery and the host battery
5	WAN	External network interface
6	INV	Communication port for connecting inverter
7	M/S	Communication port for connecting next slave battery
8	LP	24V low-voltage auxiliary power interface
9	SM M/S	Parallel communication port of the master battery
10	SM M/S	Parallel communication port of the master battery
11	⏚	Ground port



Item	Designation	Definition
1	B-	Positive electrode of battery
2	B+	Negative electrode of battery
3	LP-IN	24V low-voltage auxiliary power(Input port)
4	LP-OUT	24V low-voltage auxiliary power(Output port)
5	M/S	Communication between batteries
6	M/S	Communication between batteries
7	⏚	Ground port

3.3 Solution of APEX



3.4 Feature

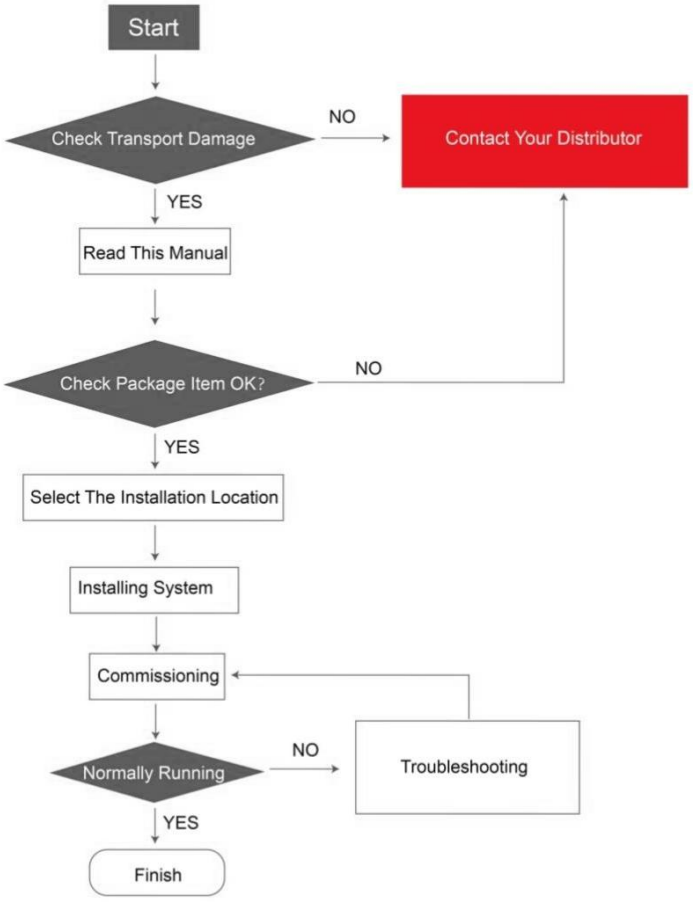
The APEX Energy Storage battery has following features:

- **Energy storage unit**: This battery is suit for photovoltaic system compatibility.
- **Battery management system (BMS)**: The battery built-in BMS monitors its operation
- and prevents the battery from operating outside design limitations.
- **Monitor:** The battery BMS built-in with WIFI module, the battery running information could be seeing in mobile phone and computer.
- **Easy firmware update**: The BMS firmware can be updated to the latest version.
- **Expandability:** The battery capacity can be increased by adding another battery.

4. Installation Prerequisites

4.1 Installation Process

The battery should be installed according to the following flow chart. The detail installation process described in chapter **5 Install process**.



4.2 Installation Position

Make sure that the installation position meets the following conditions:

- The building is designed to withstand earthquakes.
- Far away from the sea to avoid salt water and humidity.
- The floor is flat and level.
- No flammable or explosive materials nearby.
- Optimal ambient temperature is between 15℃ and 30°C.
- Temperature and humidity stays at a constant level.
- Minimal dust and dirt in the area.
- No corrosive gases present, including ammonia and acid vapor.
- The battery is rated at IP20, therefore the battery is only suit for indoor usage.

If the ambient temperature is out of the operating range, battery will protect itself by shutting down. The battery optimal operate temperature is 15°C to 30°C. Frequent exposure to severe operating condition would exacerbate the performance and lifetime of the battery.

4.3 Tools

To install the battery pack, those following tools are required:

			
Phillips screwdriver	**Torque wrench**	**Cable crimper**	**Wire clamp**
			
Voltmeter	**Tape measure**	**Drill**	**Flat-head screwdriver**

In order to protect operator and installer's safety, please select and use suitable tools and measuring instruments that are certified for precision and accuracy.

4.4 Safety Instruments

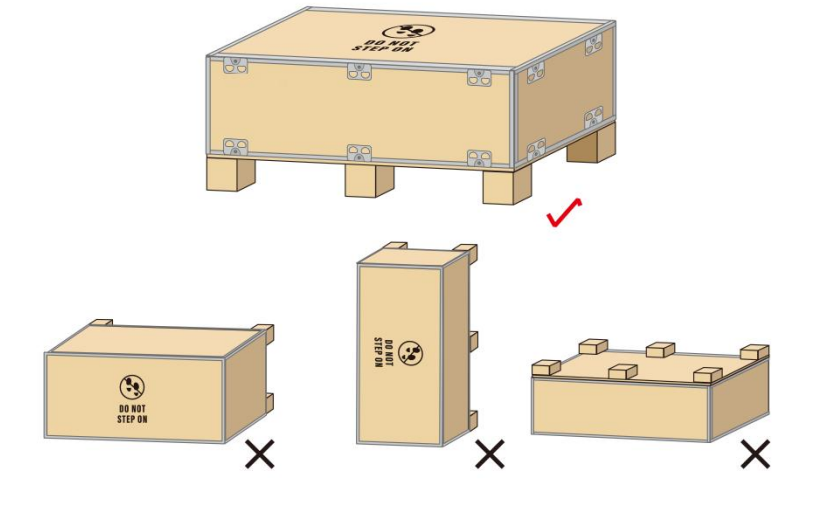
When dealing with the battery, following safety gears should be equipped. Installers must meet the relevant requirements of IEC 62040 and IEC 62619 or the domestic legislation and other relevant international standards.

		
Insulated glove	**Safety goggles**	**Safety shoes**

4.5 Storage

If the battery is not to be installed immediately, and needs to be stored for a long period, please choose an appropriate location to store it. Instructions for storage are:

- Do not stack more than four battery boxes.
- The temperature of battery stored recommended in the range of -20°C to 30°C.
- Do not expose to water
- The battery box should be upright as shown in the following figure and not stacked upside down when storing the battery box.



- If the battery needs to be stored over 3 months, the battery would discharge at a minimum rate and capacity degrades depended on storage time.
- If the battery stored over 6 months, it is suggested to connect the battery with inverter and commissioning the system.

5. Battery Installation

5.1 Package Items

You can receive one packing cartons about the batteries, all items are summarized as follow:
(Product accessories are customized according to customer needs, the following is standard accessories list.)

		
Mater Battery*1	**Slave Battery*1**	**User Manual*1**
		
Communication Cable*1	**Grounding Cable *1**	**Grounding Cable *1**

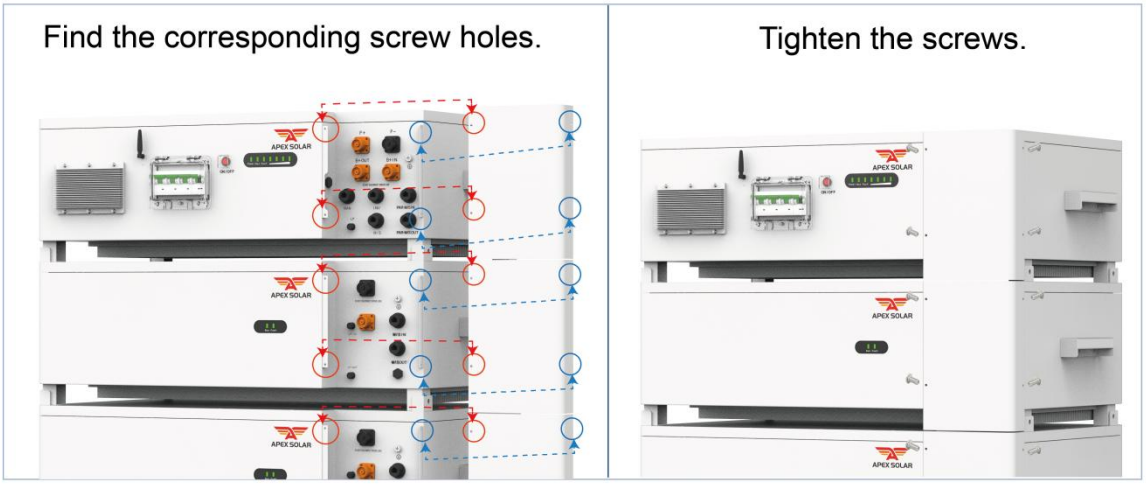
5.2 Checks before Installation

There are few things to check before installing the battery to ensure that it has no defects.

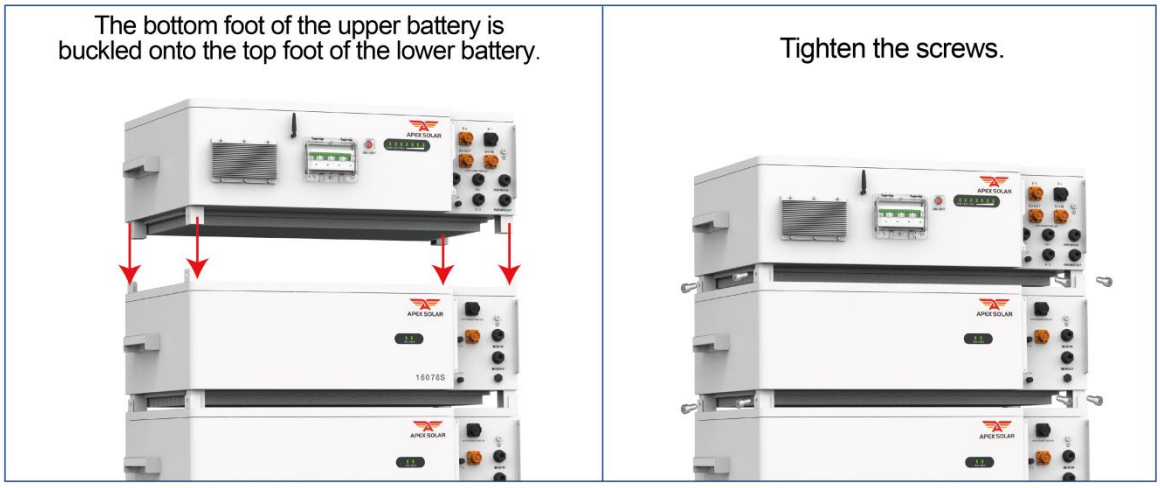
- Check the battery voltage using following instruction.
- Press and hold the power button for 4s and release after two indicators turn on.
- Measure the voltage at the terminal interface with a voltmeter. If the voltage is lower than 48V, do not use the battery and contact customer service.

5.3 Battery Installation

The installation diagram for the battery front cover is as follows：



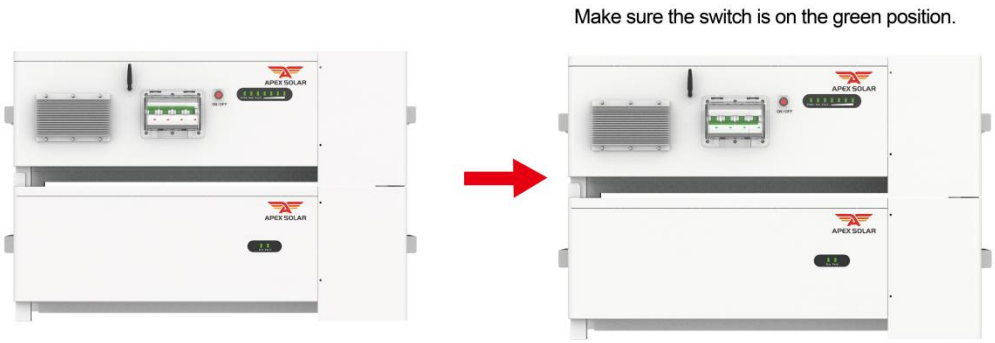
The operation of stacking and fixing the batteries is shown in the following figure：



5.4 Cable Connections of the Battery

WARNING
Precautions for battery or system maintenance: 1. When performing maintenance and overhaul on the battery or system, **please ensure the system is in a shutdown state**; 2. To shut down the battery system, first press the button to shut it down, and then disconnect the DC circuit breaker;3. When connecting or disconnecting the battery power cable, it is necessary to confirm that **the battery is in a shutdown state**;

WARNING
Connect cables according to local installation laws and regulations. Before connecting the cable, make sure the battery is turned off. And disconnect all DC circuit breakers. Otherwise, electric shock or personal injury may occur



sPlease connect the grounding cable before wiring，there is a grounding icon on the front of the battery:

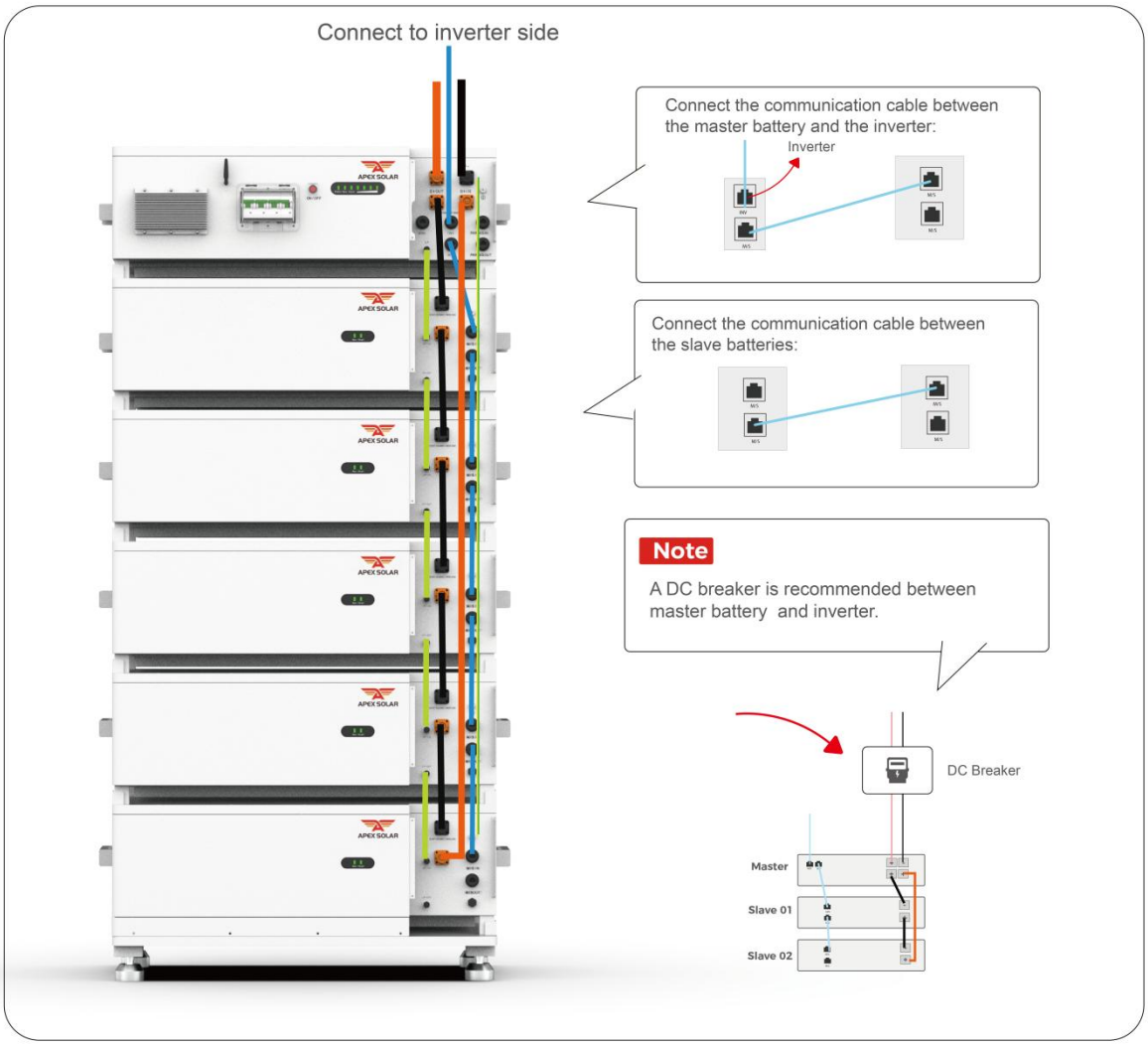


5.4.1 Series Connection

NOTICE
When installing in series, please check the voltage of each battery. It is recommended to use with a voltage difference between batteries of less than 1.0V.

*** Stack mounting**

1. Connect all the communication cables and power cables showing as below.



NOTICE

When the number of stacks exceeds 6, please place them in two or more separate piles.Taking the stacking and series connection of 12 batteries as an example, they can be placed in 2 or 3 piles according to the diagram below, and the wiring can also refer to the diagram below:



【2 Piles ▲】



【3 Piles ▲】

5.4.2 Multi-cluster parallel computing

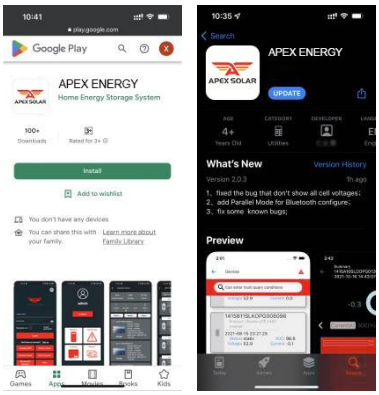
In the case of multiple cluster batteries, the universal wiring for parallel operation of the MASTER BATTERY is shown in the following figure:



6. Configuration

6.1 APP Download

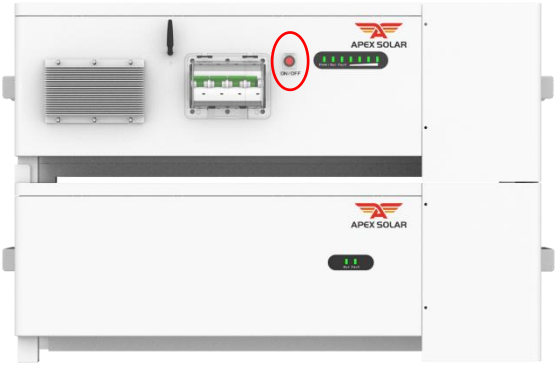
Search for the **APEX Energy APP** in the Google or Appstore and download.



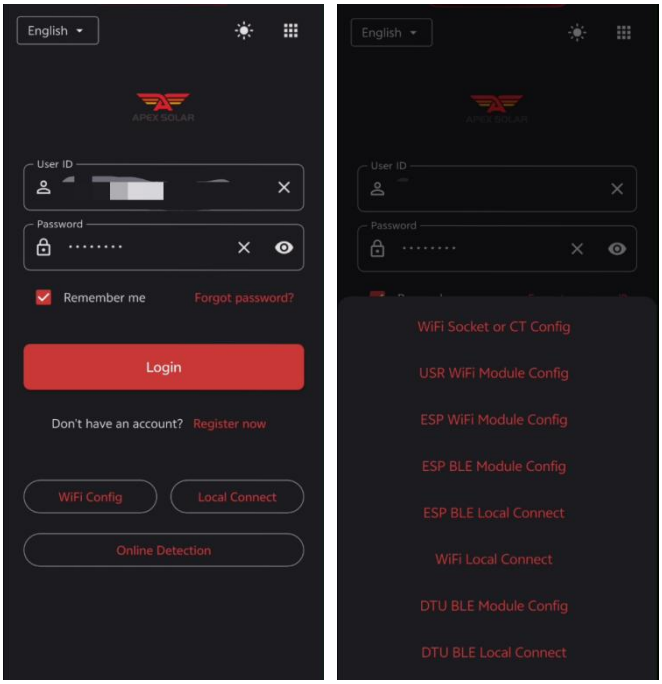
6.2 Configure Battery WIFI

The battery has a built-in WIFI module for use with the App.

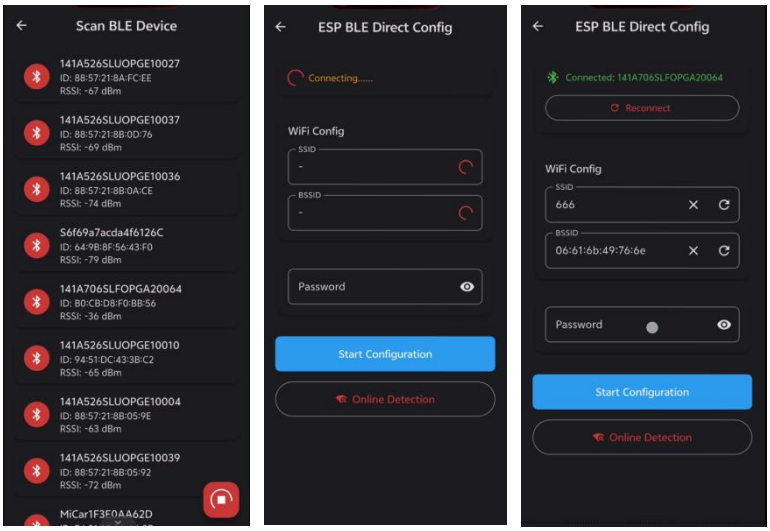
1. Turn on the battery .



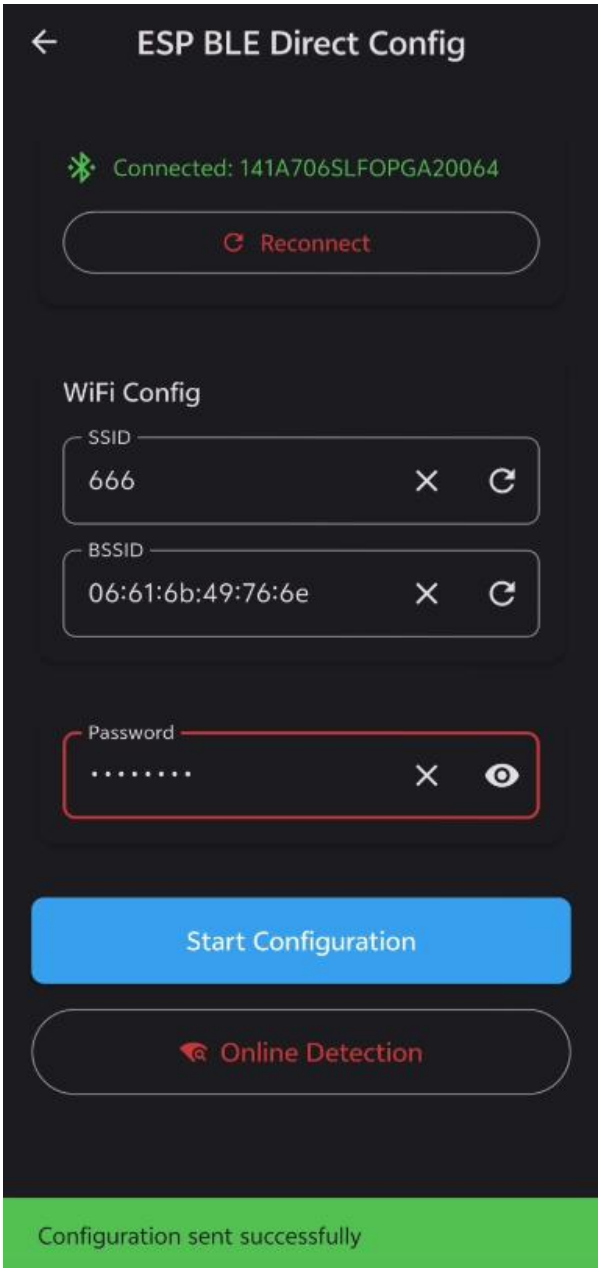
2.Select **‘Config WIFI’**, and select **‘ESP BIe’**.



3. Select the correct SN code of battery and connect, showing as below:



4. Enter the local wifi password, then press **Start Configuration.**Just wait until "Configuration sent successfully" pops up at the bottom of the page.



NOTICE
Make sure the WIFI connected is 2.4GHz, if not, that is not work.

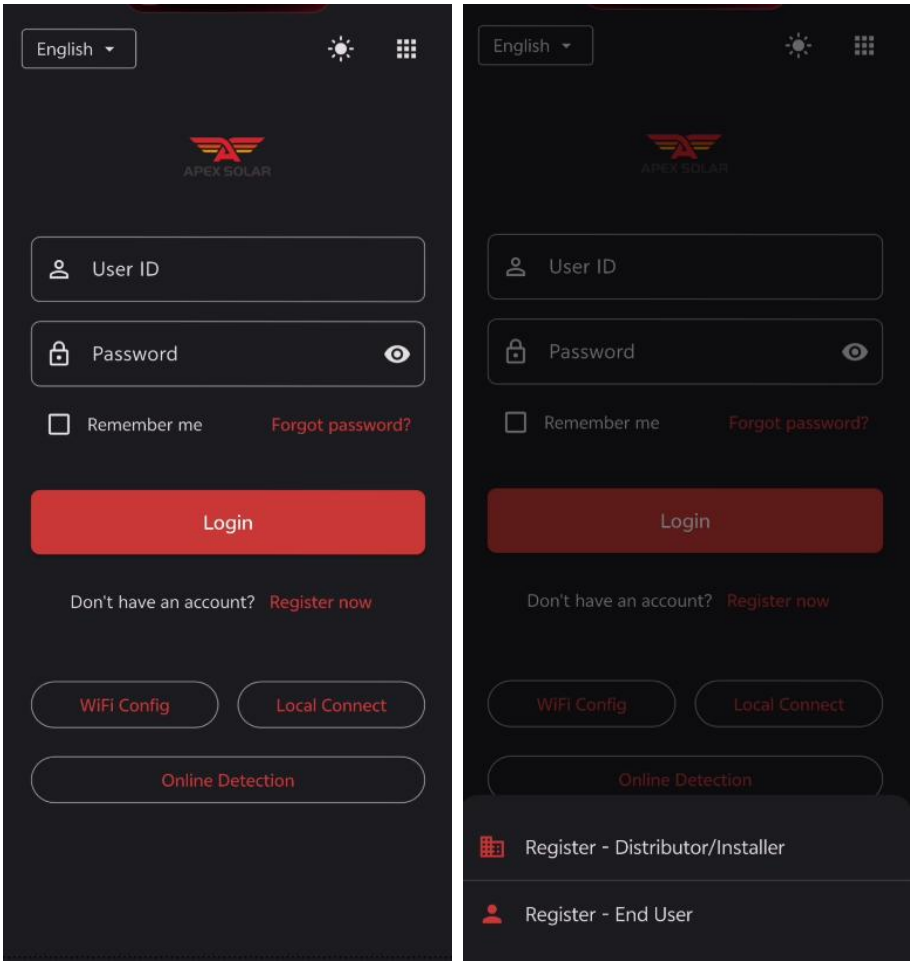
NOTICE
If the WIFI cannot be set or there is no WLAN accessible, the battery can still operate normally.

6.3 Register Account

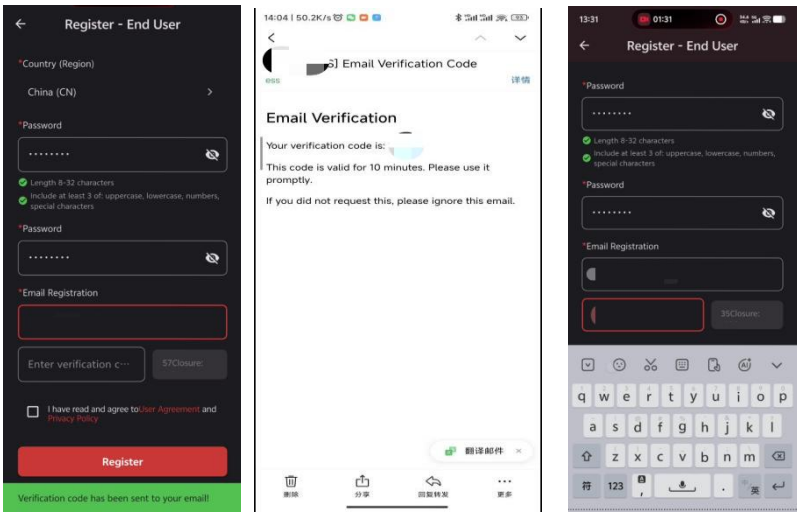
NOTICE
The APEX battery could be registered only one time.

NOTICE
The APEX battery running is not associated with registration or not.

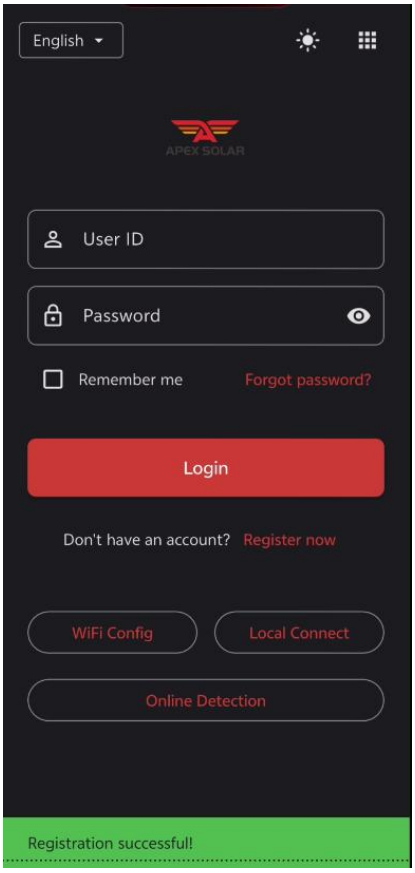
1. Open the APP monitor of battery, select **Register now.**End users just click "**End User**".



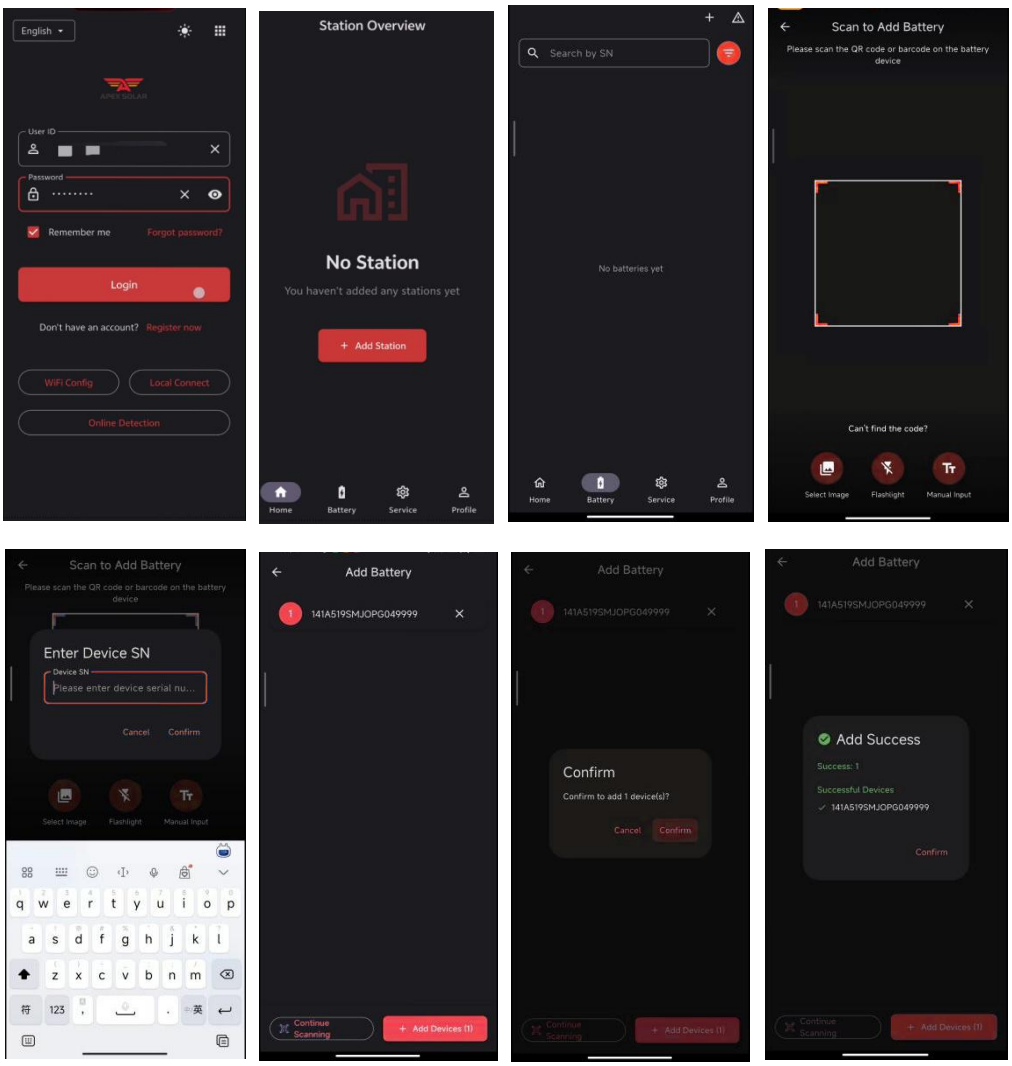
2. Enter the registration page, fill in country, password and email. Go to your mailbox, copy the verification code and paste it here. Check "I have read and agree to User Agreement and Privacy Policy", then click Register.(Set password, email and other info as needed. Verification code is random and differs from the example.)



3. It's done once "Registration successfully" appears at the bottom of the page.



4. If you need to manually add additional information about another set of devices, as shown in the pics.(Battery serial numbers can be added by scanning the SN code on the battery body or entering the SN code manually. You can choose either method.)



7. System maintenance and operation

7.1 System maintenance

1. When installing the battery, please proceed with the battery turned off and the DC circuit breaker disconnected.
2. For battery series connection or output power harness connection, the installation torque of fasteners should be 6-8N.m. Before starting the battery, please check whether the power terminal connection or quick connector connection is reliable.
3. When connecting batteries in series or connecting output power harnesses, it is prohibited to connect them in a short-circuited or reversed manner.

4. The battery usage environment should be as ventilated and dry as possible, and should be kept away from flammable, explosive, and corrosive chemicals.

5.Common fault removal

Item	Fault phenomenon	Root cause analysis	Solution
1	The battery cannot power on	The DC circuit breaker of the host is not turned on The power harness connection between the main and auxiliary batteries is incorrect The DC/DC converter or BMS inside the battery is not functioning properly	1. Close the DC circuit breaker of the host machine 2. Check the battery power connection harness 3. Contact the APEX manufacturer or distributor
2	Unable to establish communication with the inverter	The DC circuit breaker of the host is not turned on The power harness connection between the main and auxiliary batteries is incorrect The DC/DC converter or BMS inside the battery is not functioning properly The battery communication settings are incorrect The inverter battery type is set incorrectly The communication cable is not connected correctly	1. Set the inverter type based on the inverter brand or the inverter protocol compatible with the battery 2. Set the battery type of the inverter correctly 3. Use a dedicated communication cable for batteries or a communication cable that complies with the communication port definition
3	The battery LED fault light is on	View battery fault types through the app	1. Generally, faults related to voltage, temperature, and current are self-recoverable. The system will automatically recover after a period of downtime 2. For system hardware failures, such as sampling line failures and other hardware-related issues, please contact the dealer or manufacturer for service.
4	SOC error	Battery SOC is not calibrated	1. The battery needs a complete charge-discharge

			cycle, charging to 100% and discharging to 10% 2. It is recommended to perform a complete charge-discharge cycle on the battery every month

7.2 Shutting Down Battery

When it is necessary to turn off the battery, please keep it in a stationary state. The following is the standard shutdown sequence for this system:

1. Press and hold the panel button for 3-5 seconds until the internal relay of the system host emits a disconnection sound or the LED indicator light goes out, then release the button.
2. Disconnect the DC circuit breaker of the system host, and turn off all LED indicator lights of the system master and slave battery.

8.Firmware Update

If you need to upgrade the BMS software version, please contact the after-sales staff by email.

NOTICE
When you upgrading the program of the battery in your system, please make sure that the master battery disconnected from inverter.