

User Manual

TSOL-ACU3. 0K



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1 Notes on this Manual

1.1 Scope of Validity

This manual is an integral part of TSOL-ACU3.0K AC Coupled Unit, it describes the assembly, installation, commissioning, maintenance and failure of the product. Please read it carefully before operating.

1.2 Target Group

This manual is for qualified electricians. The tasks described in this manual only can be performed by qualified personnel.

1.3 Symbols Used

The following types of safety instructions and general information appear in this document as described below:

**Danger !**

“Danger” indicates a hazardous situation which, if not avoided, will result in death or serious injury.

**Warning !**

“Warning” indicates a hazardous situation which, if not avoided, could result in death or serious injury.

**Caution !**

“Caution” indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

**Note !**

“Note” provides tips that are valuable for the optimal operation of our product.

2 Safety

2.1 Important Safety Instructions

**Danger!**

- Electric shock and high voltage.
- Do not expose the inverter to temperatures in excess of 45°C.
- Do not subject the inverter to any strong force.
- Do not touch uninsulated cable termination.
- Do not soak the inverter in water or expose it to moisture environment.
- Do not touch the case of the inverter when it is wet in case of electric shock.
- Do not dispose of batteries in fire. The batteries may explode!
- Do not place the inverter near a heat source, such as direct sunlight, a fireplace.
- Keep inflammable and explosive dangerous items or flames away from the inverter.
- Do not charge or discharge damaged inverter.
- Before performing any work on the inverter or battery pack, please disconnect the inverter from all voltage sources as described in this document.

**Warning!**

- Installation, repair, recycling, and disposal of ACU must be performed by qualified personnel in accordance with national and local standards and regulations.
- Risks of chemical burn electrolyte or toxic gases.
- Do not place heavy objects on the top of the system.
- Do not connect any un-dedicated battery pack to the ACU.
- If the moisture penetrates the system (e.g., due to casing damage), please do not install or operate the system.
- Do not use wet hands to touch the system.
- Any behavior to change the functionality of the product without permission will cause fatal injury to the operator, third parties, and equipment. TSUNESS is not responsible for these losses and warranty claims.
- To ensure property and personal safety, the battery modules and inverter shall be well grounded.

**Caution!**







- Do not modify or tamper with ACU and other components of the system.
- Risk of injury by hoisting or falling system
- Inverters and batteries are heavy and personal injury can be caused if the inverter or battery is improperly lifted or dropped during transport or improper operation when attached or removed from walls. Lifting and moved the products shall be conducted by more than **one** person.





**Note !**

- This device has a built-in lithium battery and a dedicated extended battery. Do not extend other brands of batteries at the battery port.
- ACU outputs AC power directly to the utility grid side and the backup loads side. Do not reverse output of the two AC terminals of the inverter.

2.2 Explanation of Symbols

This section explains all the symbols shown on the inverter and on the type label.

	CE mark. The inverter complies with the requirements of the applicable CE guild lines.
	Dangerous electrical voltage The device is directly connected to public grid, thus all work to the battery shall only be carried out by qualified personnel.
	No open flames Do not place or install near flammable or explosive materials.
	Corrosive substance Keep the inverter away from corrosive substance.
	Attention Install the product out of reach of children
	Danger of hot surface The components inside the device will release a lot of heat during operation. Do not touch metal plate housing of the inverter during operating.

	Danger. Risk of electric shock!
	An error occurred Read the usage manual to troubleshoot problems
	This device SHALL NOT be disposed of in residential waste Please go to Chapter Seven "Battery maintenance" for proper treatment.
	Recyclable

2.3 Emergency situation

Despite of its careful and professional protection design against any hazard results, damage of the battery may still occur. If a small amount of battery electrolyte is released due to a serious damage of the outer casing; or if the battery explodes due to not being treated timely after a fire breaks out nearby, and leaks out poisonous gases such as carbon monoxide, carbon dioxide etc., the following actions are recommended:

- 1) Eye contact: Rinse eyes with a large amount of running water and seek medical advice
- 2) Contact with skin: Wash the contacted area with soap thoroughly and seek medical advice
- 3) Inhalation: If you feel discomfort, dizziness or vomiting, seek medical advice immediately.
- 4) Use a FM-200 or Carbon Dioxide (CO₂) fire extinguishers to extinguish the fire if there is a fire in the area where the battery pack is installed. Wear a gas mask and avoid inhaling toxic gases and harmful substances produced by the fire.
- 5) Use an ABC fire extinguisher, if the fire is not caused by battery and not spread to it yet.



Warning!

- If a fire has just occurred, try to disconnect the battery circuit breaker and cut off the power supply first, but only if you can do so without endangering yourself.
- If the battery is on fire, do not attempt to extinguish the fire and evacuate the crowd immediately.

Potential danger of damaged battery:

Chemical Hazard: Despite of its careful and professional protection design against any hazard results, rupture of battery shall still occur due to mechanical damage, internal pressure etc., and may result in a leakage of battery electrolyte. The electrolyte is corrosive and flammable. When there is fire, the toxic gases produced will cause skin and eyes irritation, and discomfort after inhalation. Therefore:

- 1) Do not open damaged batteries.
- 2) Do not damage the battery again (shock, fall, trample, etc.).
- 3) Keep damaged batteries away from water (except to prevent an energy storage system from catching fire).
- 4) Do not expose the damaged battery to the sun to prevent internal heating of the battery.

Electrical hazard: The reason of fire and explosion accidents in lithium batteries is battery explosion. Here are the main factors of battery explosion:

- 1) Short circuit of battery. Short circuit will generate high heat inside battery, resulting in partial electrolyte gasification, which will stretch the battery shell. The temperature reaching ignition point of internal material will lead to explosive combustion.
- 2) Overcharge of battery. Overcharge of battery may precipitate lithium metal. If the shell is broken, it will come into direct contact with the air, resulting in combustion. The electrolyte will be ignited at the same time, resulting in strong flame, rapid expansion of gas and explosion.

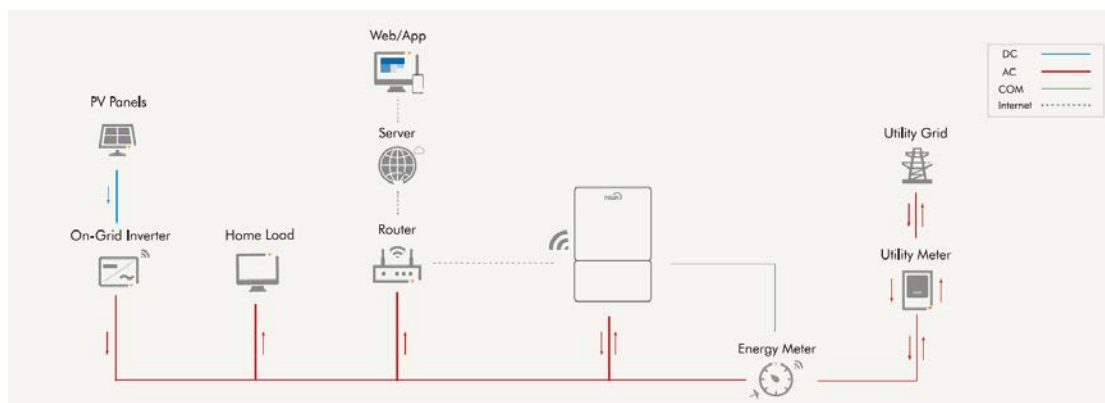
3 Introduction

3.1 Scope of application

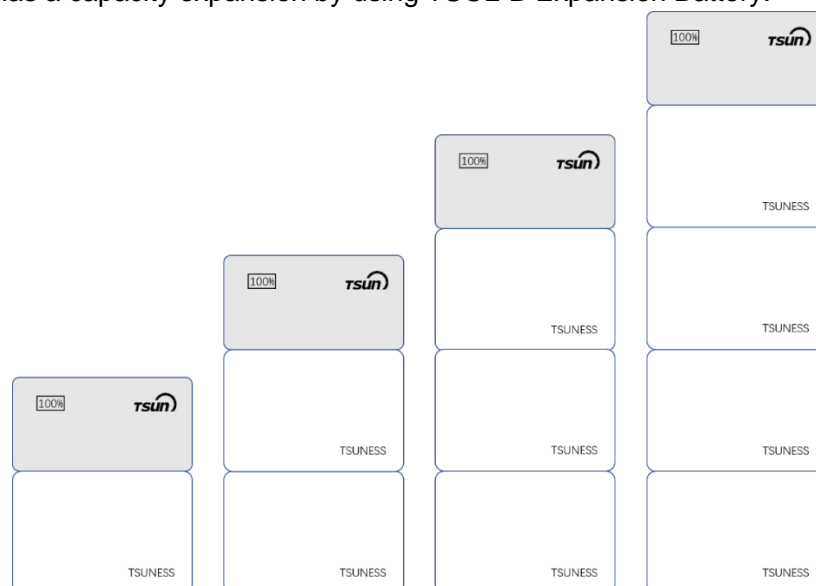
ACU series is used in energy storage retrofits and is a new type of AC coupled energy storage system. The built-in lithium battery inside ACU can be expanded in capacity according to user demands, and the modular design of the slave device makes it easy to install wiring. ACU can has a capacity expansion by using TSOL-B Expansion Battery.

In daytime, solar power supports the loads first while the surplus power will be stored by ACU, to improve self-consumption rate.

In peak power price hours, power from ACU supports the loads; while in valley power price hours, ACU is charged by the grid. Finally, a balance could be realized. In case of grid fault, ACU will make sure no outage in the loads, achieving UPS function



ACU can has a capacity expansion by using TSOL-B Expansion Battery.



Quantity of ACU	Quantity of Expansion Battery	System Capacity
1	0	5.1kWh
1	1	10.2kWh
1	2	15.3kWh
1	3	20.4kWh

3.2 Product Model Description

TSOL - ACU 3.0K

- ① ② ③
- ① TSUN of the brand.
 - ② ACU represents the product series.
 - ③ 3.0K indicates the rated power of the product, such as 3.0K for 3KW.

3.3 Datasheet

Type	TSOL-ACU3.0K
Battery Data	
Battery Type	Lithium ion
Total Energy Capacity [Wh]	5120
Battery Capacity [Ah]	100
Rated Voltage [V]	51.2
Voltage range [V]	42~58.4
Depth Of Discharge [DOD]	≤90%
Cycle Life	≥6000
Max.Charge Current [A]	60
Max.Discharge Current [A]	60
Scalability	Yes (up to 20.4kWh)
Grid Data	
Max. Continuable Output Power [VA]	3000
Max.Output Current [A]@230Vac	13.1
Max.Output Fault Current [A]	28
Inrush Current [A]	50
Max.Output Overcurrent Protection [A]	28
Rated Grid/Backup Voltage/Range [V]	220, 230, 240/180-280
Rated Grid/Backup Frequency/Range [Hz]	50, 60/±5
Power factor [cos φ]	0.8 leading~0.8lagging
Feed-in	L+N+PE
AC Output [Back-up Mode]	
Max. Continuable Output Power [VA]	3000
Output Voltage [V]	220/230/240
Max.Output Current [A]@230Vac	13.1
Output Frequency [Hz]	50/60
Max.Output Power [VA]	3600 ,10sec
General Data	
Communication Mode	Wi-Fi/GPRS
Operating Temperature Range	0°C~50°C (>45°C derating)
Cooling Method	Natural Convection
Ambient Humidity	0-95% non-condensing
Noise[dBA]	<29
Ingress Protection	IP65
Dimensions [H*W*D][mm]	738*650*186
Weight [kg]	64
Standard Warranty [Year]	5
Applicable Standard	AS 4777.2, VDE 4105, G98, C10/26, CEI 0-21, IEC 62619, IEC 62040

4 Installation Instructions

4.1 Safety Tips



Danger!


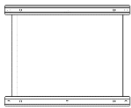





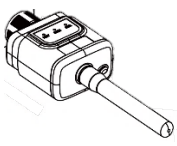
- Potential fires and electric shocks that are life threatening.
- Do not place any flammable or explosive materials beside ACU.
- Equipment connected to high-voltage power generation equipment must be performed by qualified personnel in compliance with national and local standards and regulations.



Note!

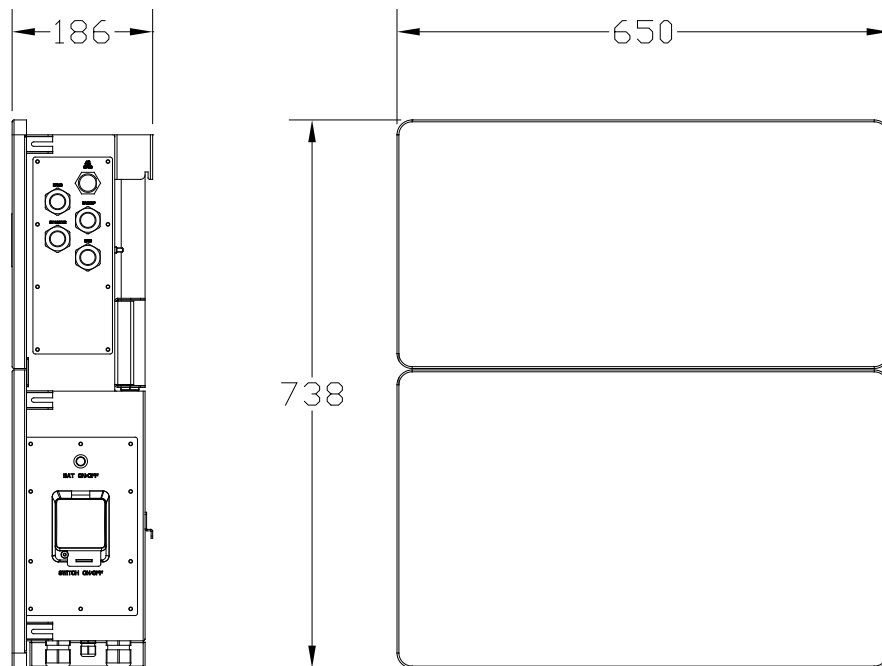
- The pollution level applicable to ACU is Class II.
- Inappropriate or inconsistent installation environment can shorten the life of ACU.
- Do not install ACU directly by exposing it under strong sunlight.
- Please do not install in damp places.
- The installation location must be well ventilated.
- TSOL-ACU3.0K (hereinafter also referred to as the master device) can be used independently. If the battery capacity needs to be expanded, please use TSOL-B100E-S (slave device), and maximum 3 slave devices can be accessed.

4.2 Packing List

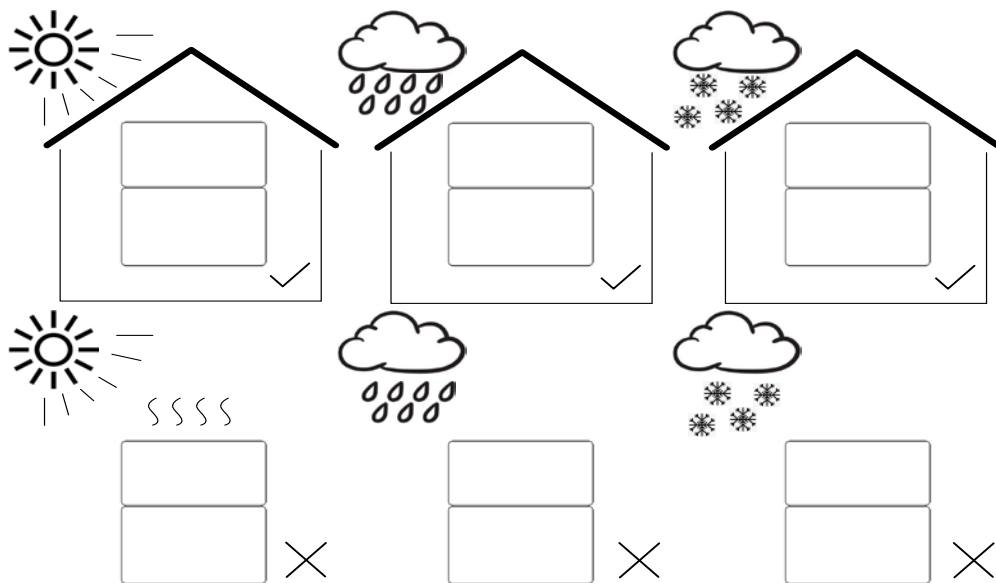
			
1 * TSOL-ACU	1* Mounting Bracket	6*Hexagon head wood screw 6* Expansion tube 6* Screw washer	2* CT
			
1* User Manual	6* E6012 tubular insulator terminal	1* Cross recessed hexagon bolts group (M6*12)	1* Monitor Module

4.3 Determine the installation method and location

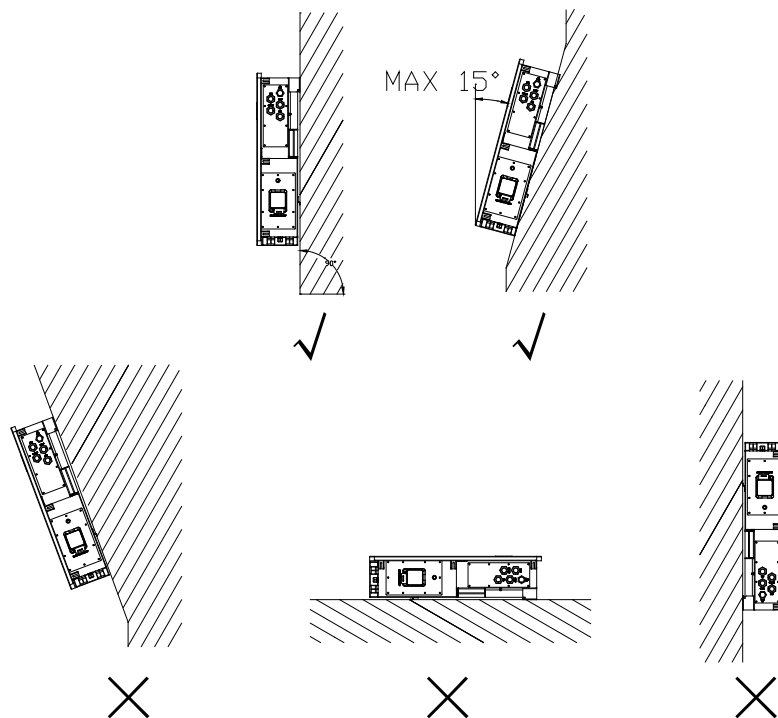
ACU series product dimension:



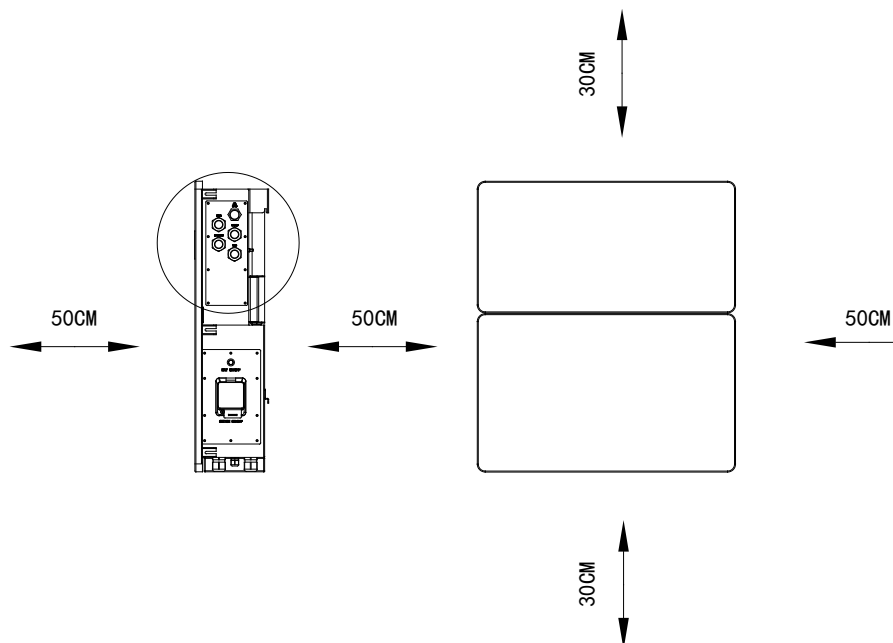
ACU3.0K is cooled by natural wind convection. It is recommended to install in indoors or sheltered areas to avoid direct sunlight, rain and snow.



Vertical ground mounting method is recommended and it's allowed to be installed by maximum tilting 15° backward. Do not install it horizontally or reversely.



Please ensure that the air at the installation point is circulated. Bad air ventilation will affect the working performance of internal electronic components and shorten the service life of ACU.



The following sites are not allowed for installation:

- a. within 600mm of any exit.
- b. within 600mm of any vertical side of a window or building ventilation that ventilates a habitable room.
- c. in ceiling spaces.

- d. in wall cavities or under stairways.
- e. on roofs, except for were specially deemed suitable.
- f. under access walkways.
- g. sites where the freezing point is reached, like garages, carports or other places.
- h. sites with humidity and condensation are above 85%.
- i. places with plenty of salt.
- j. flooded areas.
- k. within 600mm of any hot water unit, air conditioning unit or any other appliance associated with the pre-assembled integrated battery energy storage system.

4.4 Installation steps for ACU

Note!



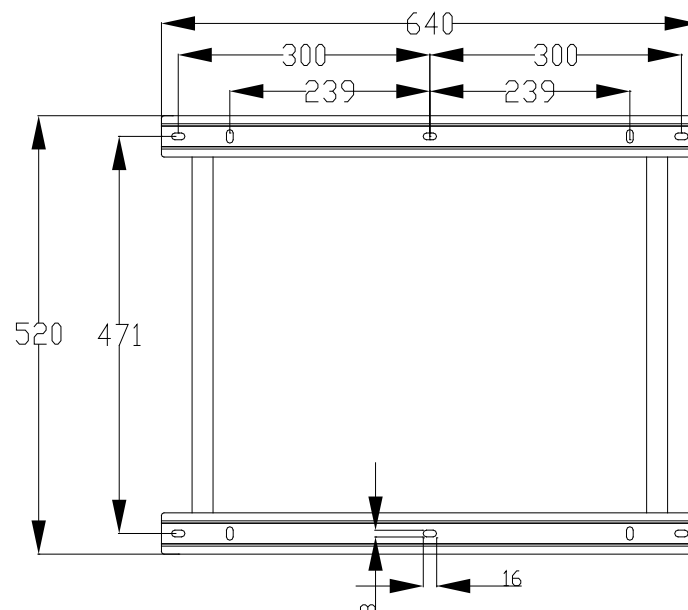
- If any Expansion Battery connected to the ACU, please refer to Chapter 4.5 first.
- If ONLY installing the ACU without any Expansion Battery connection, please go forward to install the ACU with instructions in this section.

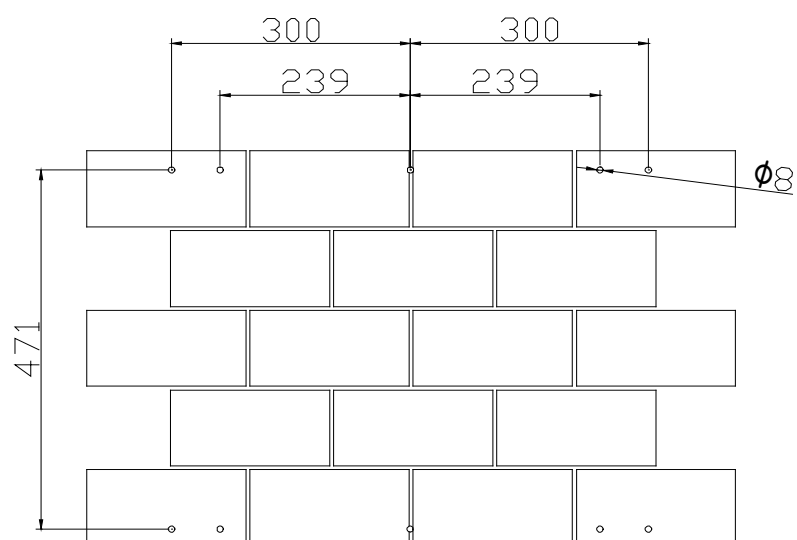
Before installation, please make sure that the wall has sufficient strength to fix the screws and bear the weight of ACU.

Step 1: Pre-check the installation distance of the ACU to other items.

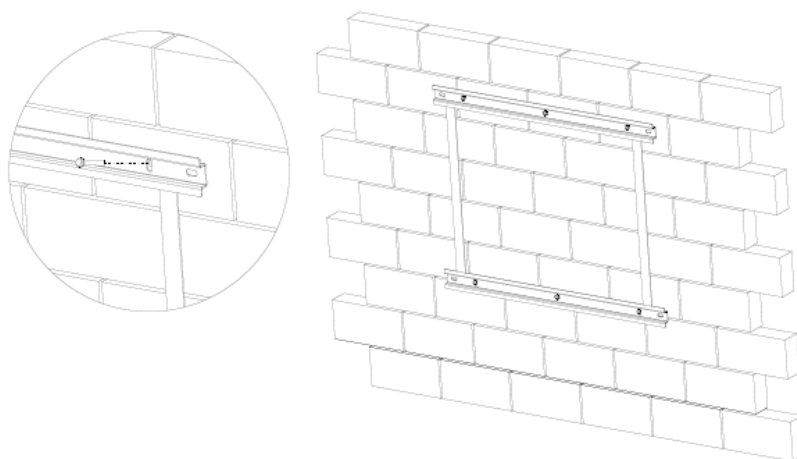
Step 2: Positioning the Mounting bracket of the ACU to the wall.

Mark the proper positions of mounting bracket and drill holes on those positions (8mm in diameter, 50mm in depth) by using the mounting bracket as a template, and then use a rubber hammer to drive the screw fixing seat into the holes to fix the bracket.

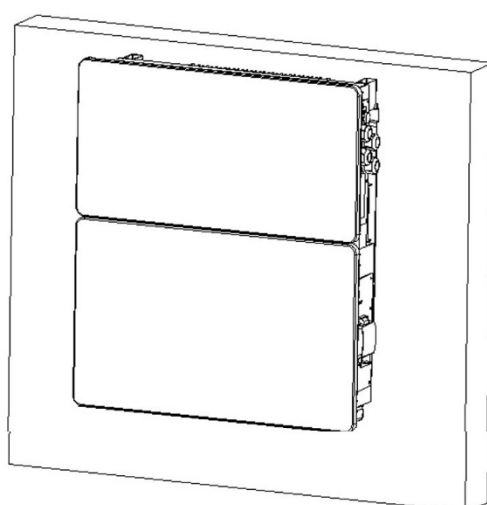




Fix the mounting bracket with hex head screw on the installation positions.



Step 3: Hang the ACU to the mounting bracket and make sure the device is snugly fits with the bracket.



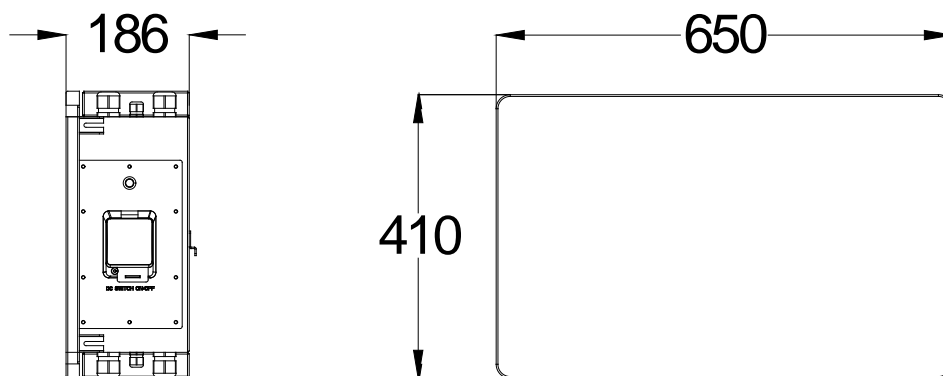
4.5 Installation steps for Expansion Battery

Note!

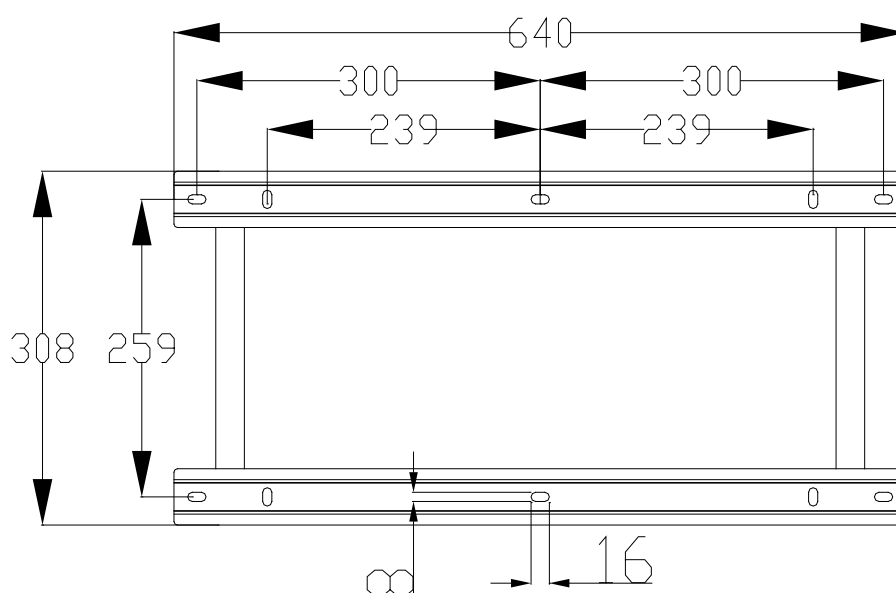


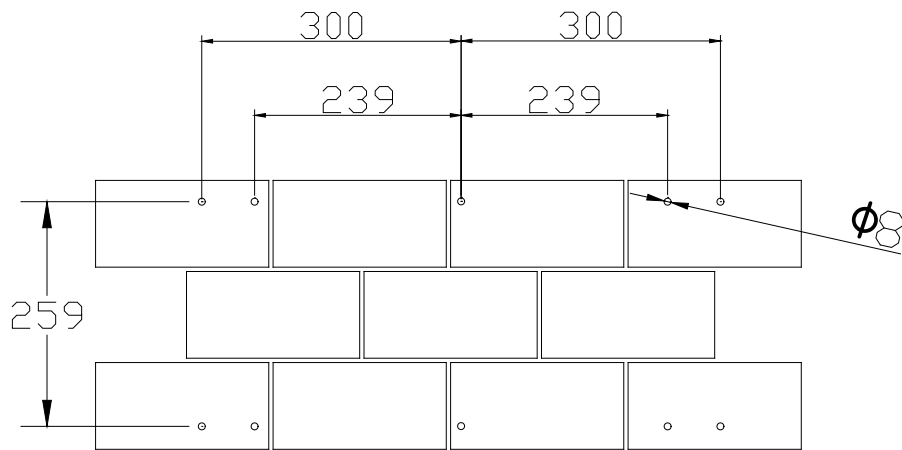
- If any Expansion Battery is connected to the ACU, please install the Expansion Battery prior to ACU installation in case the space is not enough.
- If no Expansion Battery connected to the ACU, please ignore this section.

Step 1: Pre-check the installation distance of the Expansion Battery to other items.

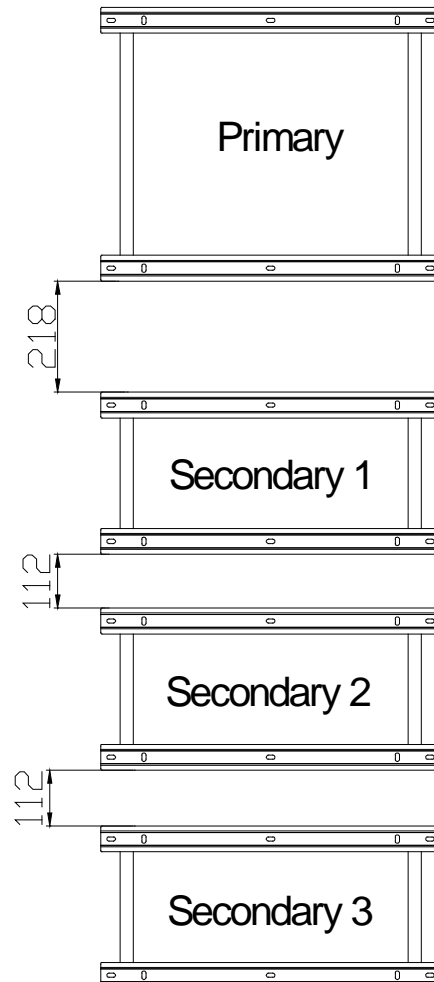


Step 2: Mark the proper positions of mounting bracket and drill holes on those positions (8mm in diameter, 50mm in depth) by using the mounting bracket as a template, and then use a rubber hammer to drive the screw fixing seat into the holes to fix the bracket.

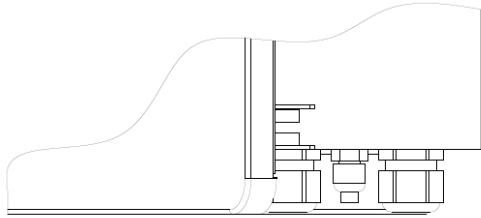




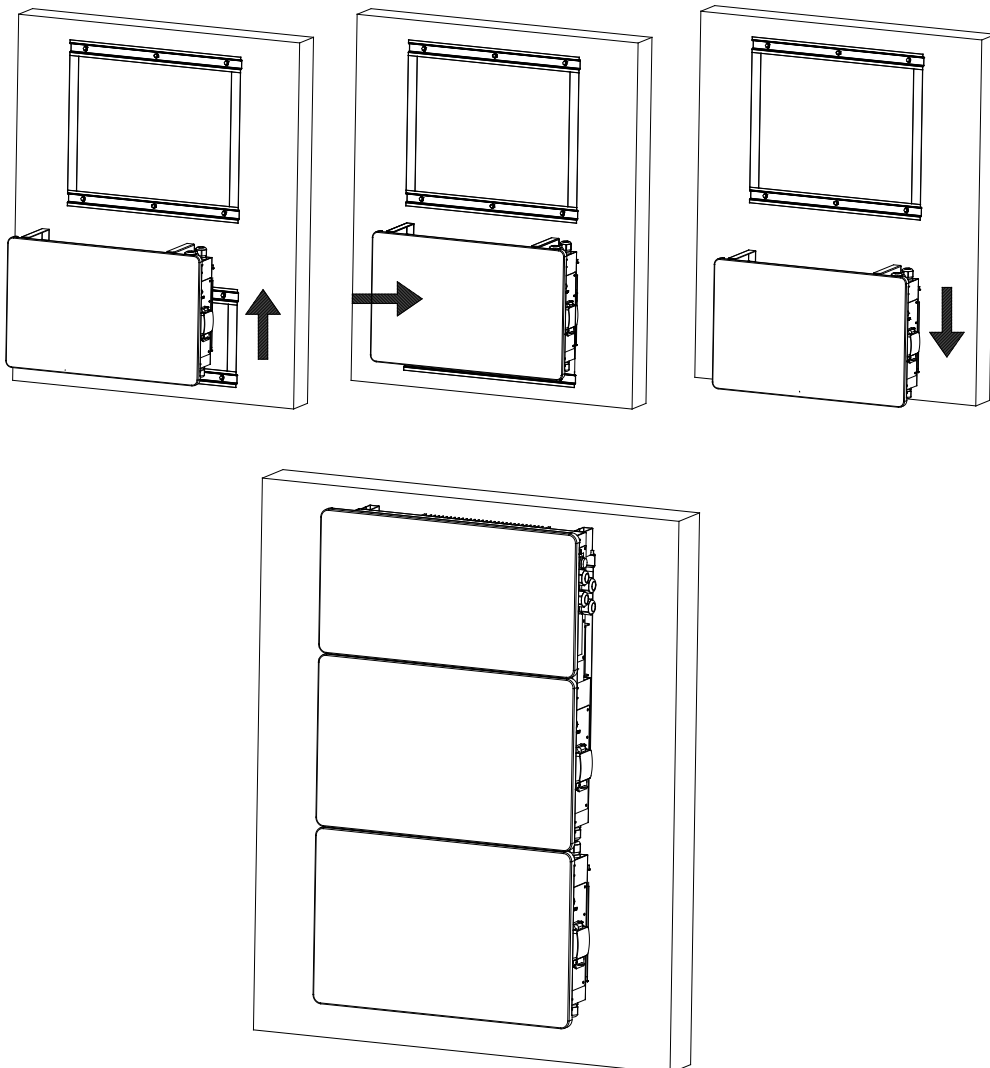
The recommended installation distances among the ACU and the Expansion Battery mounting brackets can be found below:



Step 3: After the mounting bracket fixed and before hanging the ACU/ Expansion Battery on the mounting bracket, please remove the plug from the waterproof nut of the ACU and Expansion Battery, then put on the cable gland but not tighten it up yet.

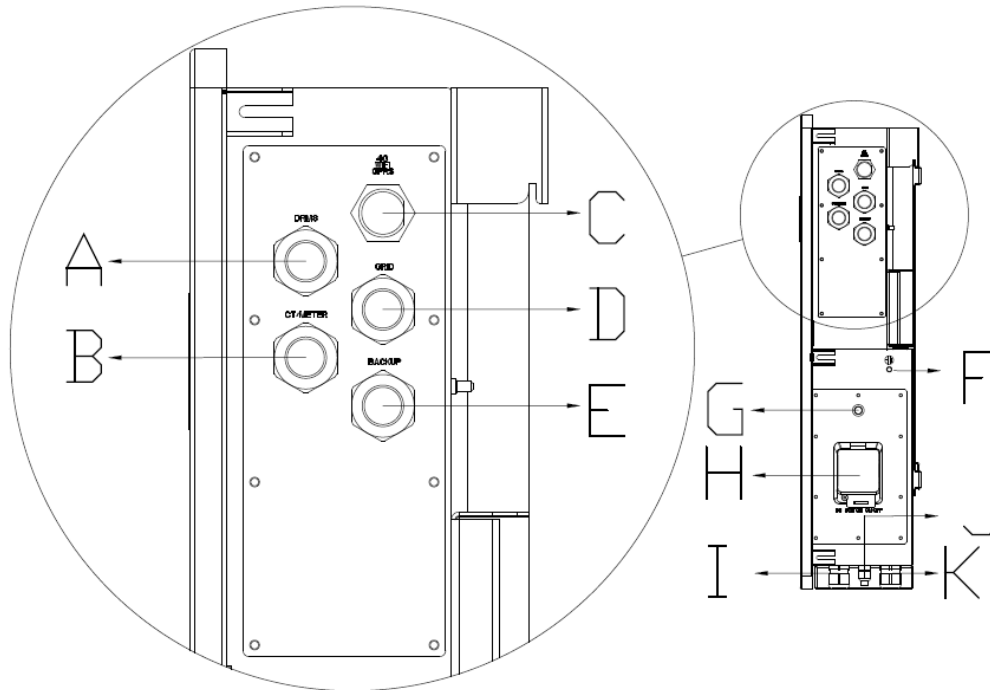


Step 4: If there are more than one unit of Expansion Battery connected to the ACU, please install Expansion Battery No.3 first, Expansion Battery No.2 secondly, Expansion Battery No.1 thirdly and ACU finally, from bottom to top. Please hang the ACU & Expansion Battery to the mounting bracket with the order as mentioned above and make sure all equipment are attached to the bracket well.



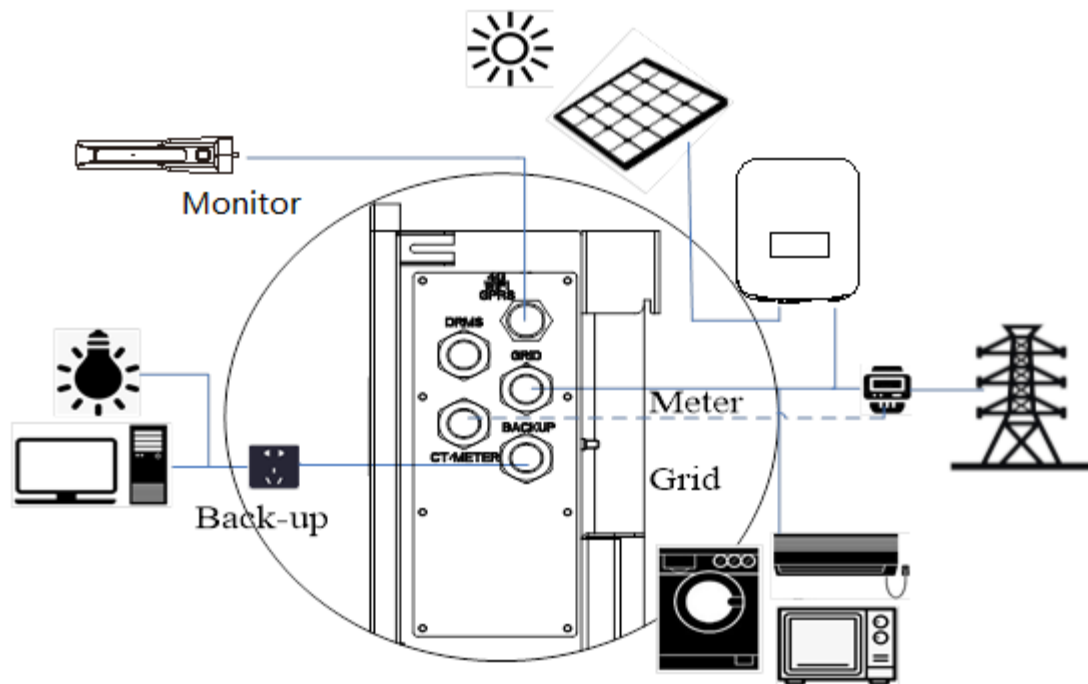
5 Electrical Connections

5.1 Electrical Interface Description

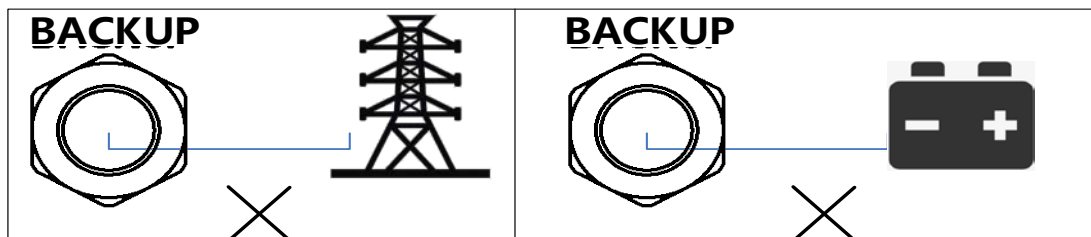


Object	Description
A	DRMS Port
B	CT/Meter connection
C	RS232 communication
D	Grid connection
E	Backup connection
F	Ground
G	BMS switches
H	Battery switches
I	BAT+
J	BMS LINK
K	BAT-


5.2 System Wiring Schematic



Don't connect the backup loads side with the grid or battery



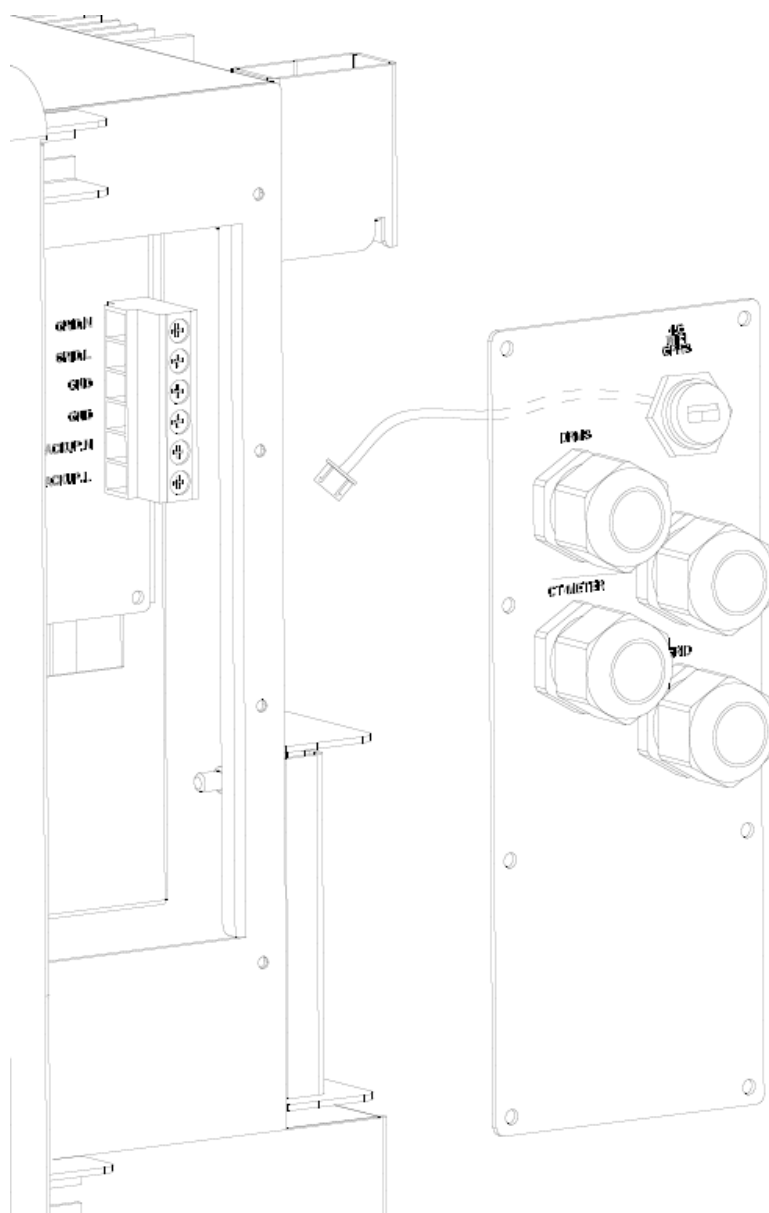
5.3 ACU Wiring



Warning!

- Turn off the Battery Switch and BMS Switch as well as external AC breaker after unpacking in any cases before and during wiring in case of electric shock.

Step 1: Please unscrew the screws and remove the cover plates on right UPPER side of the ACU for wiring. Please be cautious when unplug battery switch cable during dismantling.



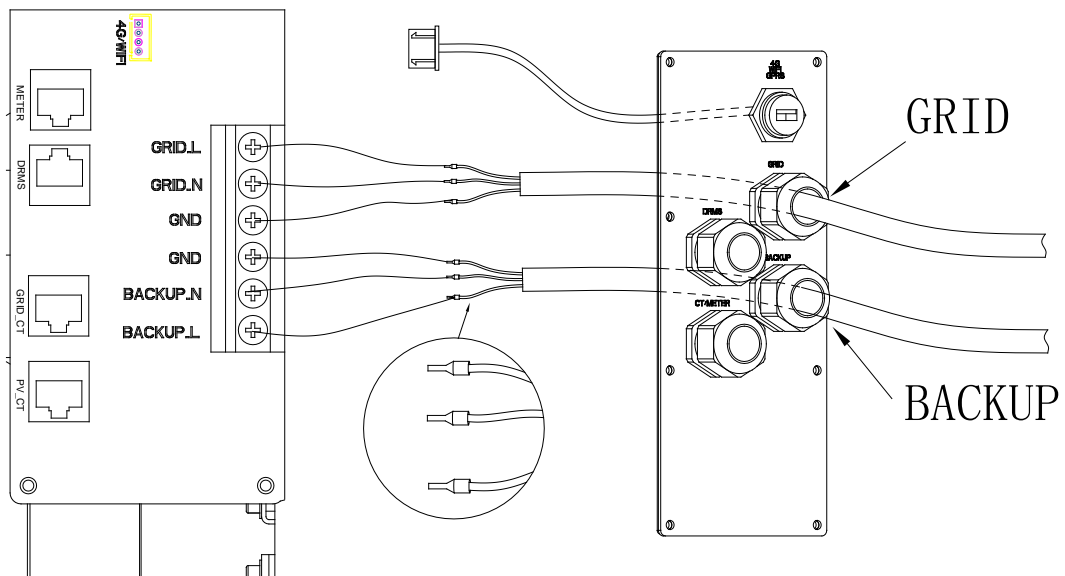
Step 2: After the cover plate removed, please lead one cable (Recommend conductor core size: 2.5 mm²) through the waterproof nut (GRID) and then use E6012 wire crimps to connect the wires to the terminal of GRIDL, GRIDN and GND2 properly.

Step 3: Lead another cable (Recommend conductor core size: 2.5 mm²) through the waterproof nut (BACKUP) and then use E6012 wire crimps to connect the wires to the terminal of BACKUP-L, BACKUP-N and GND1 accordingly.

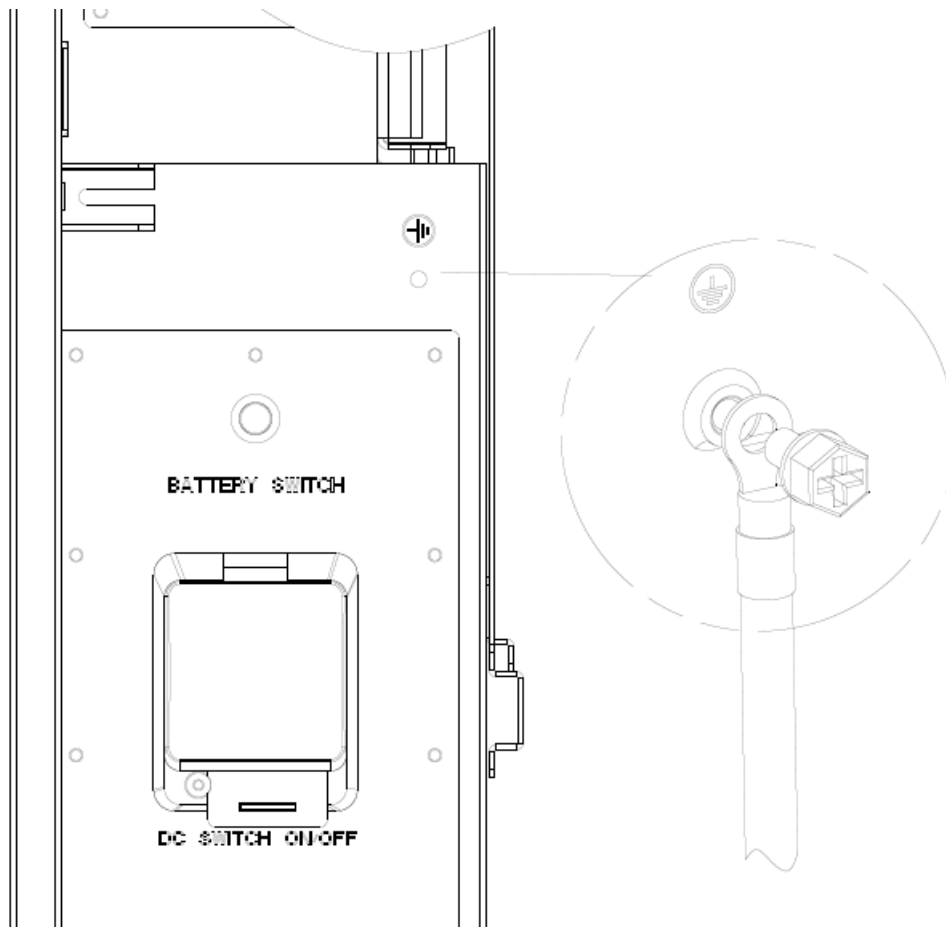
Note !



- When you removed the cover plate, if the 4 pins connector that connected with the WIFI/GPRS port is removed, please remember to re-plug it into the terminal.



Step 4: Remove the external hex head screw and lead a grounding line through OT terminal, screw it into the grounding port of ACU enclosure (in clockwise direction) and make sure it is screwed up tightly.



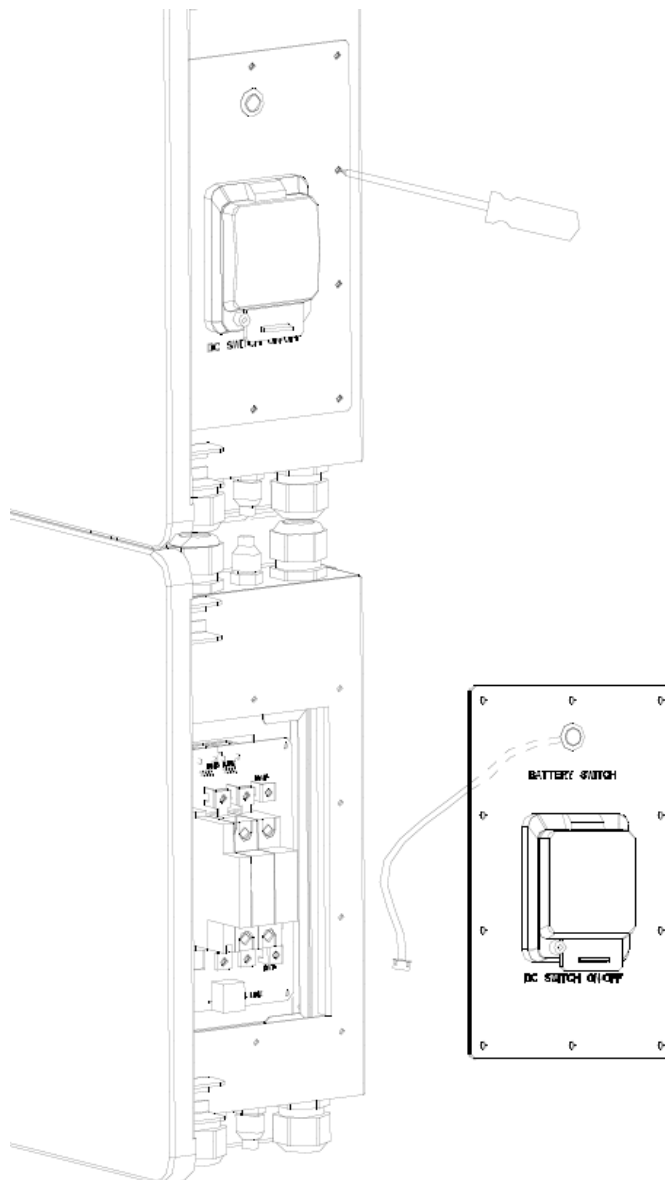
5.4 Expansion Battery Wiring

Warning!

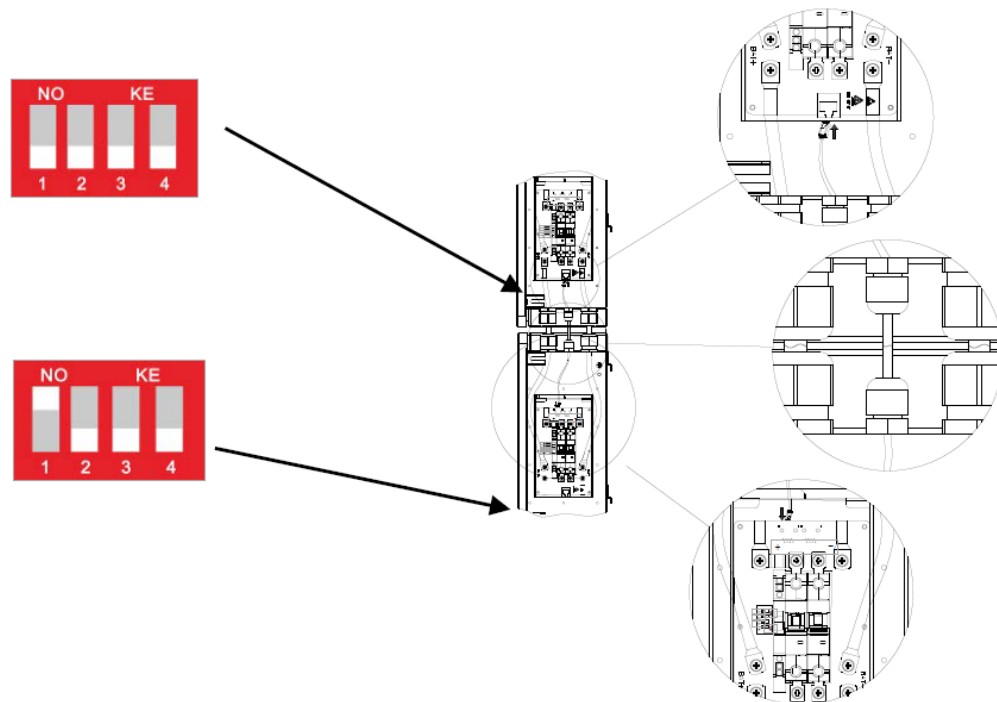


- If no Expansion Battery device wired to the ACU, please ignore this section.
- For expanding the system capacity, the Expansion Battery (s) shall be paralleled to the ACU.
- Ensure Battery switch is off during installation to avoid the risk of short circuit caused by wrong operation during battery wiring.

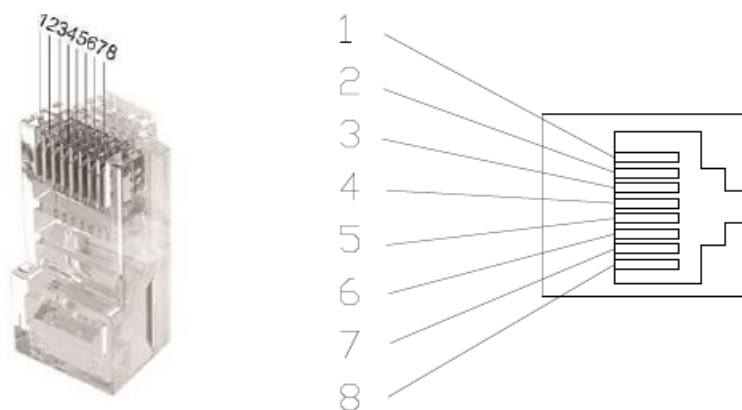
Step 1: Remove battery cover plate of the ACU device from the lower right area and right side of the Expansion Battery unit before wiring. (The cable connected to the BMS Switch inside the cover plate can be plugged out first if needed).



Step 2: Lead power lines through the waterproof nut of the ACU and Expansion Battery respectively, make sure the lines are connected correctly (BAT+ of ACU to BAT+ of Expansion Battery, BAT- of ACU to BAT- of Expansion Battery).


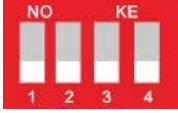

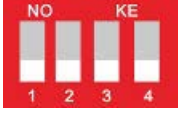
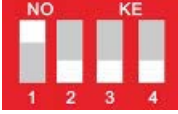

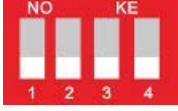





Step 3: Lead the RJ45 communication cable (not press the RJ-45 plugs yet) from the fastening head of ACU to the fastening head of Expansion Battery (30kgf.cm (torque) is recommended). Then press the RJ-45 plugs to the end of the RJ45 cable and connect the cable to the RJ45 terminals in the COMM-3 of ACU and COMM-1 of Expansion Battery separately. So, the ACU can communicate with the Expansion Battery.



Pin Number	Description	Effect	Pin Number	Description	Effect
1	White-orange	NC	5	White-blue	NC
2	Orange	NC	6	Green	NC
3	White-green	NC	7	White-brown	L
4	Blue	NC	8	Brown	H

DIP switch configuration can be found below:

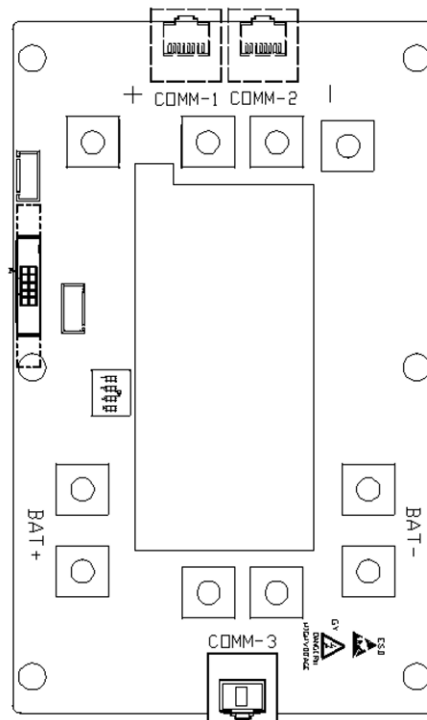
Configuration	ACU	Expansion Battery (No.1)	Expansion Battery (No.2)	Expansion Battery (No.3)
1*ACU				
1*ACU 1*Expansion Battery				
1*ACU 2*Expansion Battery				
1*ACU 3*Expansion Battery				

Note!



- Before setting the DIP switch, make sure there is a BATTERY+ sticker on the expansion battery package and expansion battery itself. Otherwise contact technical support for assistance.

There is a RJ45 plug being plugged on the COMM-3 port of expansion battery originally, please take it out when you are connecting more than one expansion battery, but DO NOT take the RJ45 plug out of the last expansion battery.



For example, while installing one expansion battery, connect COMM-3 of ACU to COMM-1 of Expansion Battery. Leave the plug remained on COMM-3 of expansion battery.

While installing two expansion batteries, connect COMM-3 of ACU to COMM-1 of first expansion battery. Then connect COMM-3 of first expansion battery to COMM-1 of second expansion battery. Leave the plug remained on COMM-3 of second expansion battery.

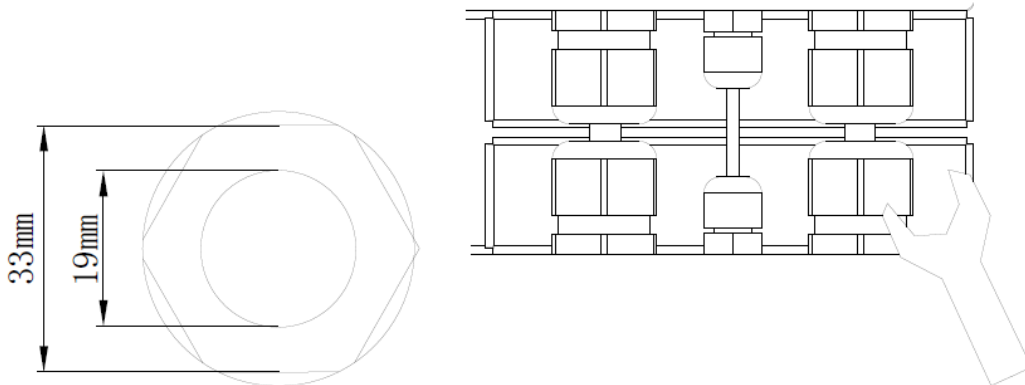
Step 4: Reconnect BMS Switch cable into (PCBA-CN3) port of PCB of the ACU and Expansion Battery before screwing up the plates, then screw up the cover plates back to the ACU and Expansion Battery respectively (14kgf.cm (torque) is recommended).

Note !



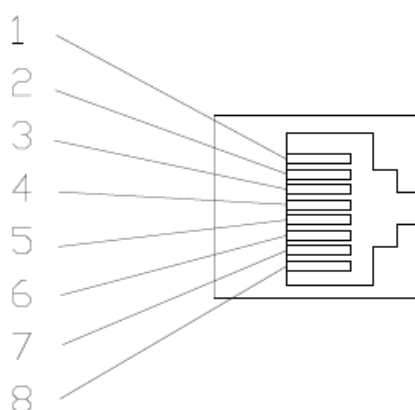
- The wiring methods between Battery No.3 to Battery No.2, Battery No. 2 to Battery No. 1 are the same as the wiring procedures mentioned above in this section. Do not connect one Expansion Battery to two different ACU devices at the same time.

Step 5: Use a wrench to fasten cable gland of the ACU and Expansion Battery (30kgf.cm (torque) is recommended.) And it is recommended to apply fire resistance paint onto the cable between ACU and Expansion Battery cable glands.



5.5 DRM Communication Interface Description

To comply with Australian and New Zealand safety requirements, the DRMs terminals should be connected. A RJ45 plug is being used as the inverter DRED connection.



Object	Corresponding Pins	Requirement
DRM0	5 & 6	The inverter is on standby mode
DRM1	1 & 6	The inverter is not consuming power
DRM2	2 & 6	The inverter is consuming less than 50% of rated power
DRM3	3 & 6	The inverter is consuming less than 75% of rated power AND source reactive power if capable
DRM4	4 & 6	The inverter is consuming 100% of rated power (Subject to constrains from other active DRMs)
DRM5	1 & 5	The inverter is not generating power
DRM6	2 & 5	The inverter is generating less than 50% of the rated power
DRM7	3 & 5	The inverter is generating less than 75% of the rated power AND sink reactive power if capable
DRM8	4 & 5	The inverter is generating 100% of rated power (Subject to constrains from other active DRMs)

5.6 CT/Meter Installation

Different solutions are offered for sampling data from PV and Grid side. The standard solution is CT solution and the optional solution is Meter solutions. Please choose to use one of the solutions to realize the sampling function.



Note!

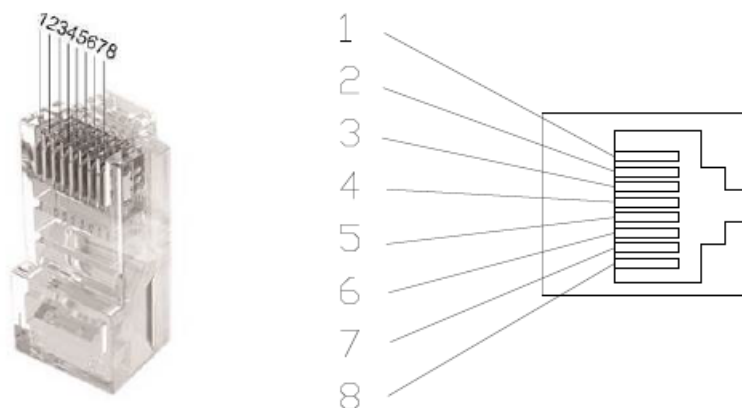
- Please do not use the CT (standard solution) and meters (optional solution) in a same system, otherwise the system will run abnormally.

5.6.1 CT Solution

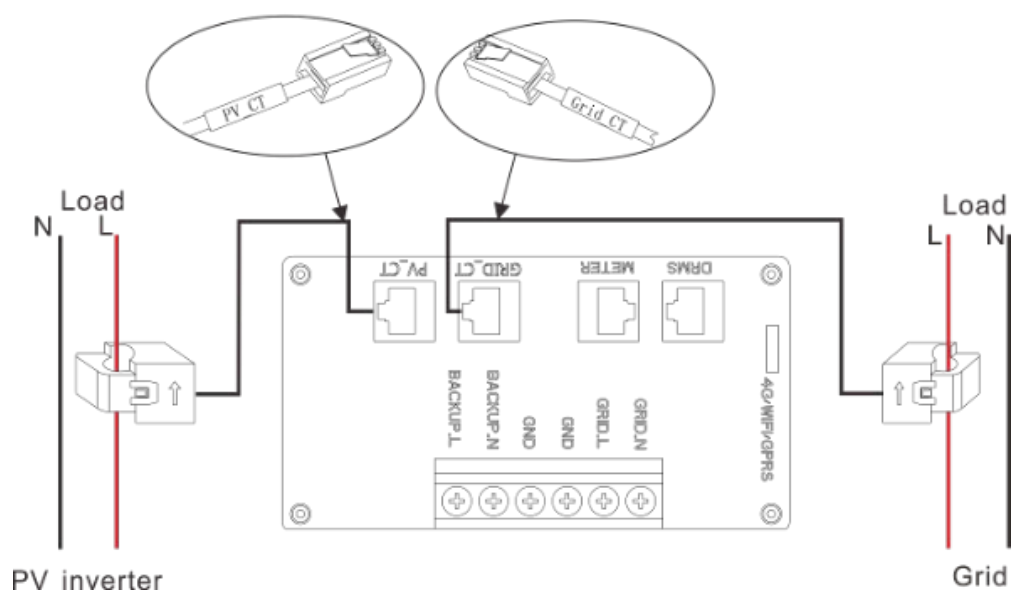
Two CT offered, one is PV_CT and the other one is Grid_CT.

If choose CT solution, please install CTs with instructions as below:

- 1) Remove the cover plate of the ACU.
- 2) Open the Grid_CT by pushing the buckle on its side.
- 3) Lead the Live of the Grid through the Grid_CT.
- 4) Tighten up the Grid_ CT buckles.
- 5) Open the PV_CT by pushing the buckle on its side.
- 6) Lead the Live of PV through the PV_CT.
- 7) Tighten up the PV_CT buckles.
- 8) Lead RJ45 plug of the CT line to pass through waterproof (CT/METER) nut on the ACU and connect the plug to CT/Meter port on the PCBA of the ACU;

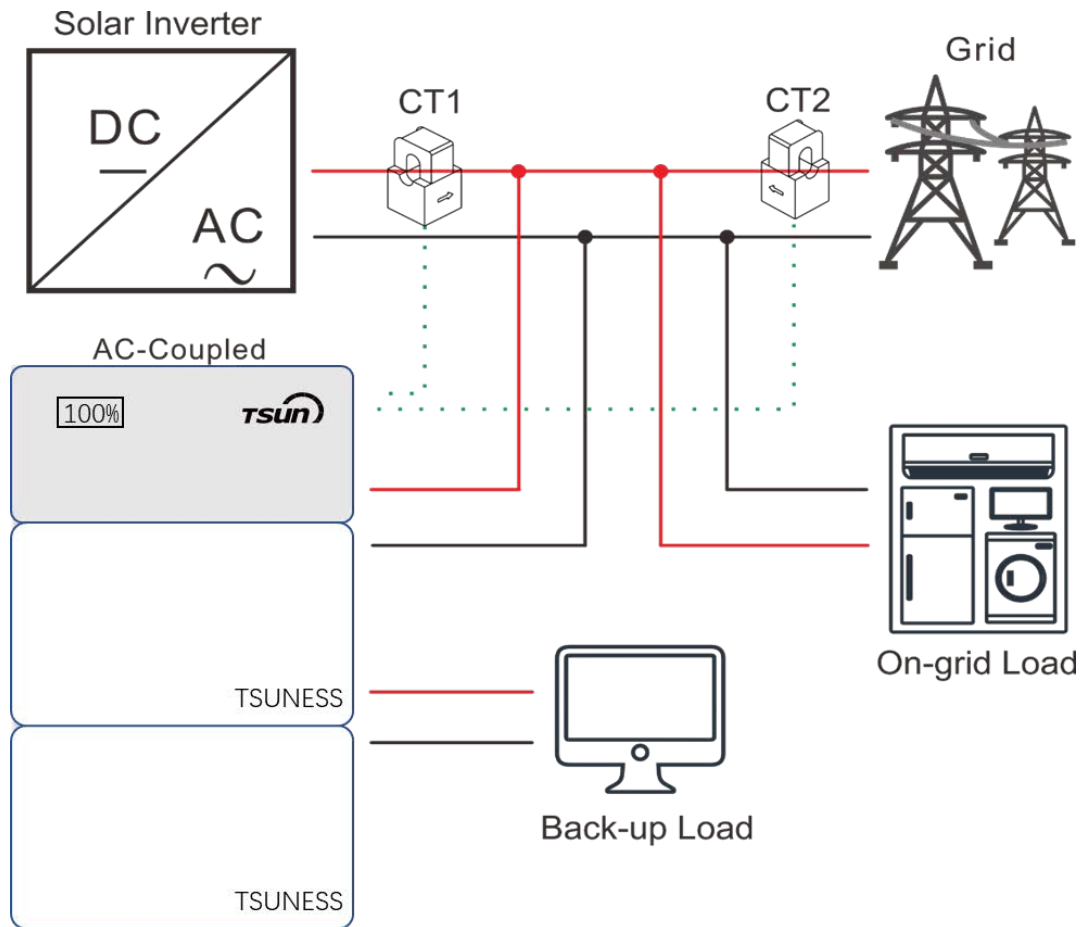


Pin Number	Effect	Pin Number	Effect
1	NC	5	NC
2	NC	6	NC
3	NC	7	RS485A
4	NC	8	RS485B



**Note!**

- Both CTs directions shall point to the load side. Please notice the CT direction.



5.6.2 Meter Solution

There are two types of smart meters (built-in CTs) available for varied system types.

Model	Accuracy Class	Frequency	Reference Voltage	Instrument constant
DDSU666	Active Class 1	50Hz	230V	800imp/kWh
DTSU666	Active Class 1	50Hz	380V	400imp/kWh

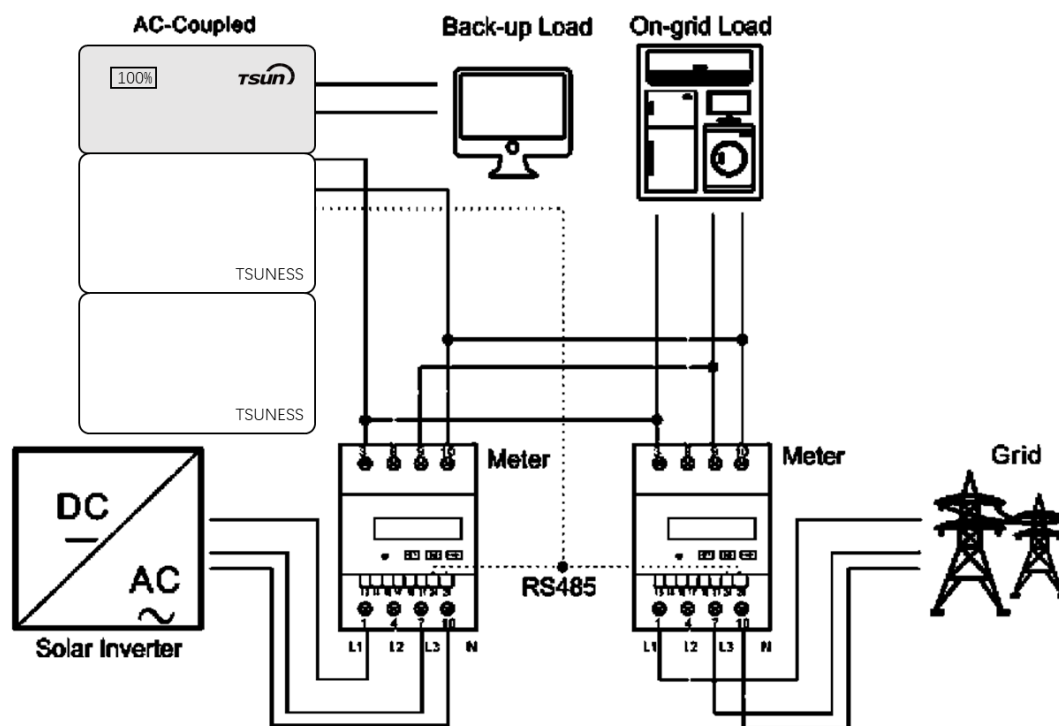
Please choose to use single phase or three phase meters based on the Grid and PV system types. Cannot use single phase and three phase meters at a same time.

5.6.2.1 Two Three Phase Meters

In a three-phase grid & three phase PV system, two units of three-phase meters can be used to sample voltage and current at PV side and grid side separately.

Please install the two units of 3-phase meters with reference diagram as showed below.

After installation, please set the meter (Grid side) address into 1 and set the meter address (PV side) address into 2. (Please refer to section 5.6.3.2 for setting methods.) Usually the default address of meter (Grid side) is 1.

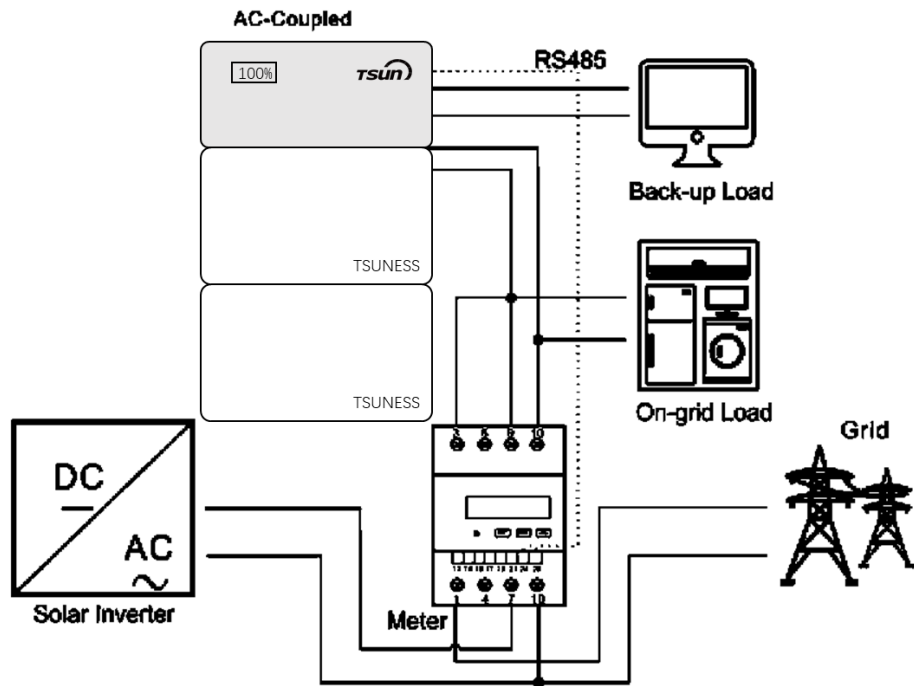


5.6.2.2 One Three Phase Meter

In a single-phase grid & single phase PV system, one unit of three-phase meter shall be used to sample voltage and current.

Phase C of the meter is used to sample voltage and current value of the PV side, while Phase A of the meter is used to sample voltage and current value of the grid side.

Please install the 3-phase meters with reference diagram as showed below.



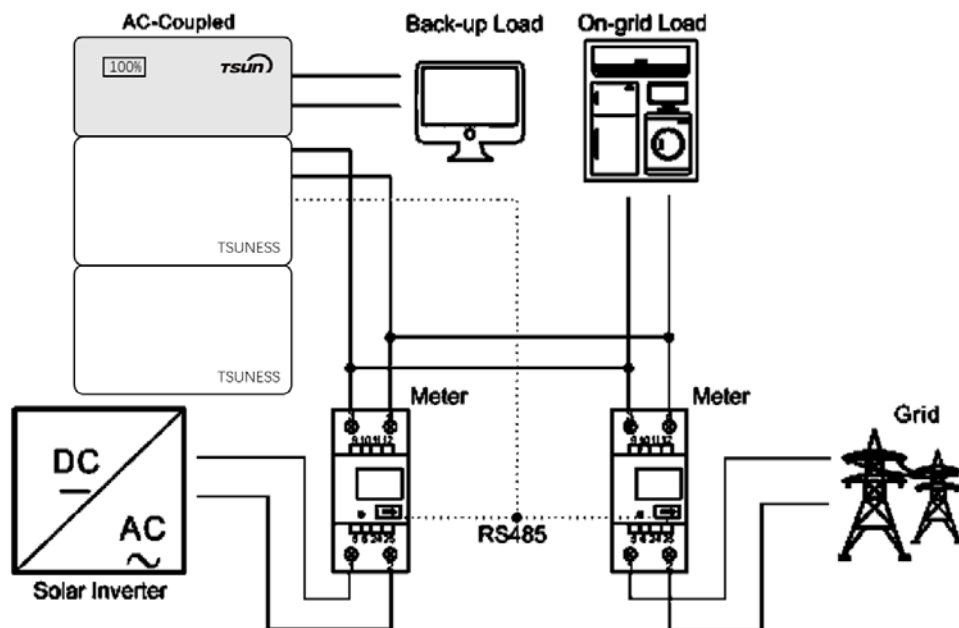
5.6.2.3 Two Single Phase Meters

In a single-phase grid & single phase inverter system, two units of single -phase meters can be used to sample voltage and current at PV side and grid side.

Please install the 1-phase meters with reference diagram as showed below.

Please set the meter address (Grid side) into 1 and set the meter address (PV side) into 2.

Please refers to section 5.6.3.1 for meters setting methods.



5.6.3 Meter Address Setting

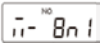


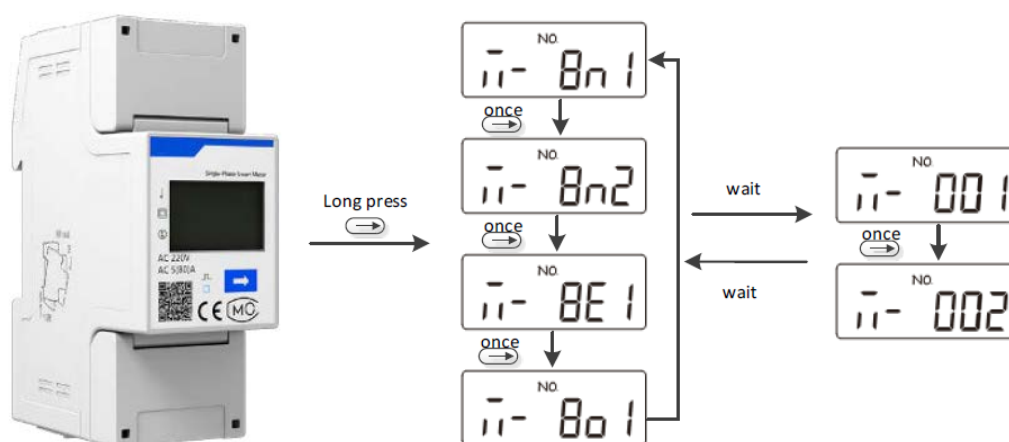
Note!

- If CT solution is adopted, please ignore this section.

5.6.3.1 Single Phase Meter

The setting methods for single-phase meter is as follows:

- ① Power on the meter to the display interface and long press “→” button to enter meter switching interface, select  and wait for 2s to enter meter address page automatically.
- ② After entering the address page, please press “→” to set meter address according to the system type into 1 or 2.
- ③ After the address is set, the interface will jump to the initial display interface and no further operation is required to start the meter.

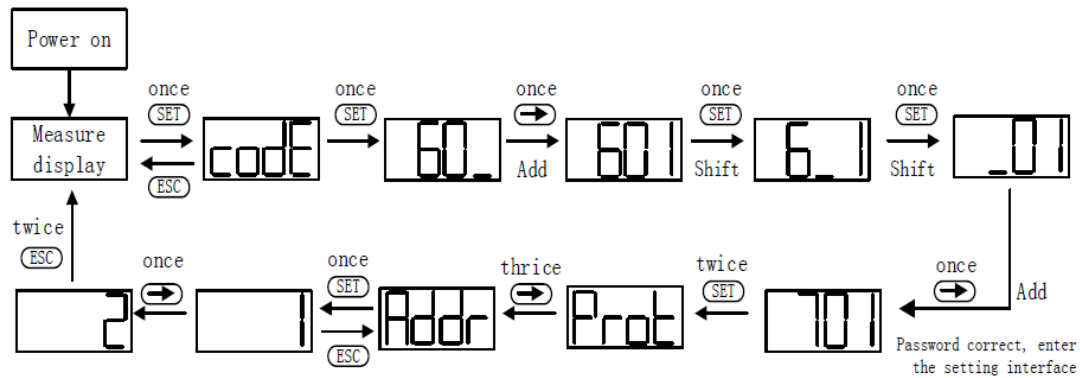


5.6.3.2 Three Phase Meter

The setting methods for three-phase meter is as follows.

- ① Power on the meter and enter the “Measure display” interface, then press “SET” button twice for entering password 701.
- ② Press “→” button once to adjust the value of the first digit, one increment per button pressing.
- ③ Pressing “SET” button once to shift to the second digit, same methods to adjust value as for the first digit, then adjust the third digit in a same way, set the default password into 701.

- ④ When the password entered correctly, press “SET” twice to enter the Port interface then press “→” for three times to enter address page, and press “SET” button once to start to set meter address.
- ⑤ Pressing “→” button to adjust the value of address, one increment per button pressing.
- ⑥ After the address set successfully, press “ESC” button twice to exit to Measure display interface to get the meter work.



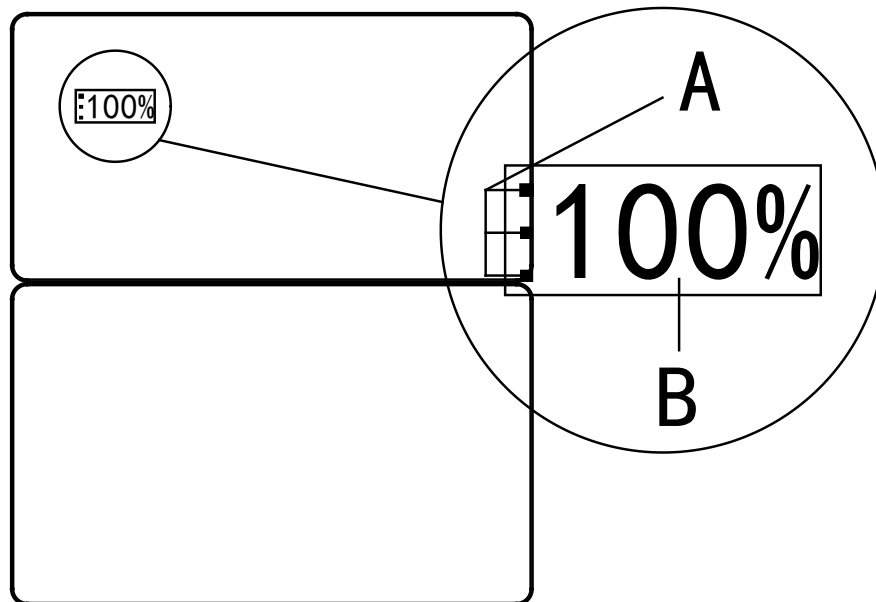
5.7 External AC Circuit Breaker and Residual Current Device

Please install a circuit breaker to ensure the inverter is able to disconnect from grid safely. The inverter is integrated with a RCMU, however, an external RCD is needed to protect the system from tripping, either type A or type B RCD are compatible with the inverter.

The integrated leakage current detector of inverter is able to detect the real time external current leakage. When a leakage current detected exceeds the limitation, the inverter will be disconnected from grid quickly, if an external residual current device is connected, the action current should be 30mA or higher.

6 Debugging Instructions

6.1 Human-computer Interface Introduction



	LED lamps state		Description
A	Green/Red LED lamp	Green lamp flicker from bottom to top	Battery discharging
		Green lamp flicker from top to bottom	Battery charging
		Red lamp flicker:1 s/time	Standby
		Green lamp and red lamp flicker in alternative	Procedures are being upgrade
		Red lamp Always light on	Faults in device
B	Residual battery capacity percentage (SOC)		Total remained battery capacity of the system

6.2 Start up the System

If only ACU is installed, the system shall be turned ON in the correct sequence as follows:

- 1) Turn ON the Battery switch at the right side of the ACU.
- 2) Turn on the BMS switch at the right side of the ACU until it lights in blue.
- 3) Wait for 30s and observe the LED indicators and LCD on the front of ACU to check the running status of the system.

If there is any Expansion Battery connected to the ACU, the system shall be turned ON in the correct sequence as follows:

- 1) Turn ON the Battery switch at the right side of the Battery No.3> Battery No.2> Battery No.1> ACU.
- 2) Turn on the BMS switch at the right side of the Battery No.3> Battery No.2> Battery No.1> ACU;
- 3) Wait for 30s and observe the LCD and LED indicators on the front of ACU to check the running status of the.
- 4) If the system is running normal, please do commission configuration. If the system is not work normally, please re-check the wiring and setting until the system runs normal.

Note!



- If the ACU is connected with Expansion Battery (s), the start-up procedure for the system should be Battery No. 3>> Battery No. 2>> Battery No.1>> ACU.

6.3 Local Setting (Solarman Business APP)

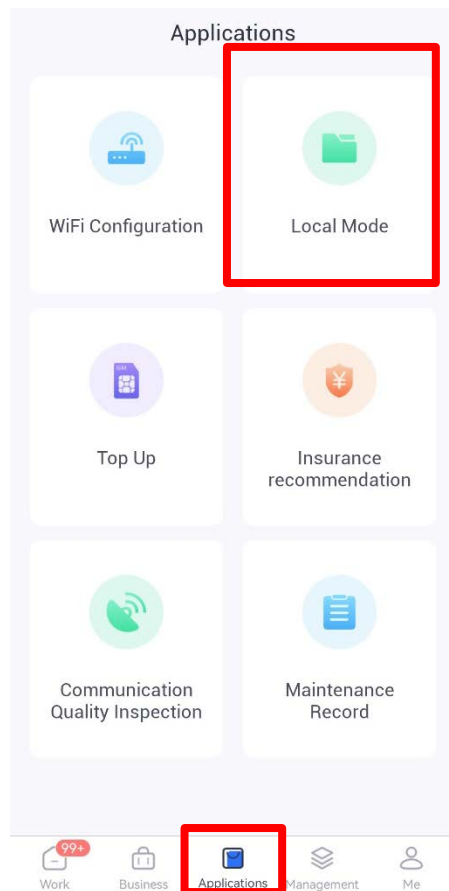
- 1) Visit pro.solarmanpv.com or Scan the Code below to download the Solarman Business APP.



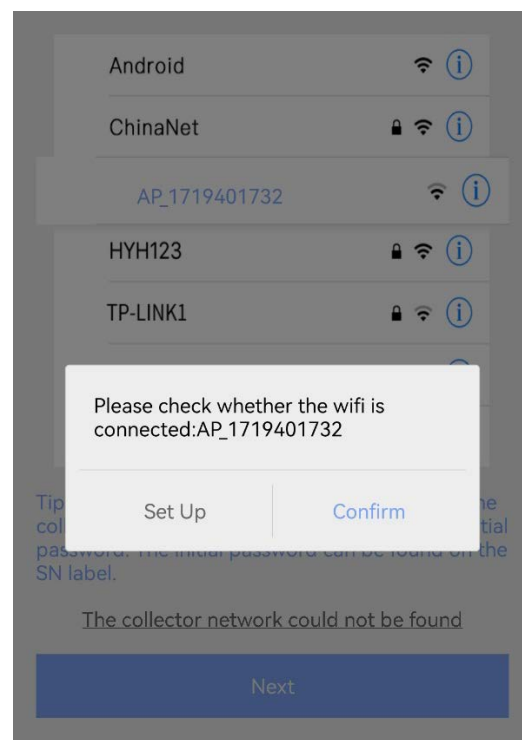
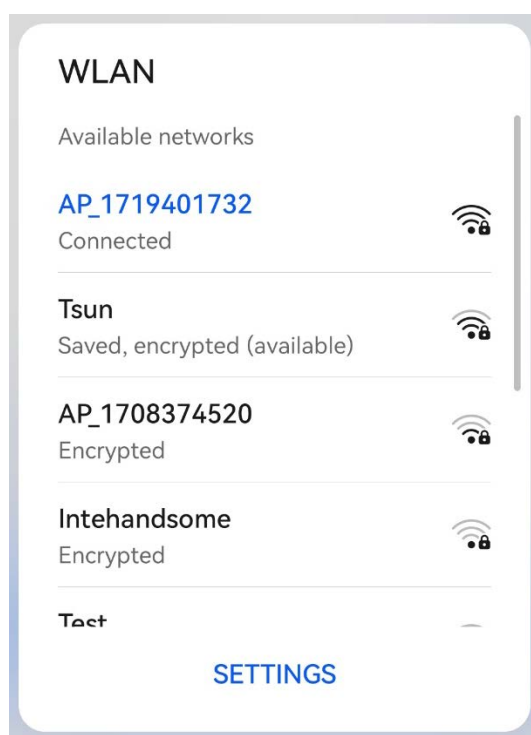
- 2) Register and log in the Solarman Business APP.

The screenshot shows the Solarman Business APP interface. At the top is the Solarman logo with the tagline 'Monitored Analyzed Networked'. Below the logo are three tabs: 'E-mail' (selected), 'Phone Number', and 'Username'. Under the 'E-mail' tab, there is a text input field for 'E-mail' and another for 'Password(6~50 characters)'. At the bottom left is a 'Register' link, and at the bottom right is a 'Forgot your password?' link. A large blue 'Log In' button is centered at the bottom.

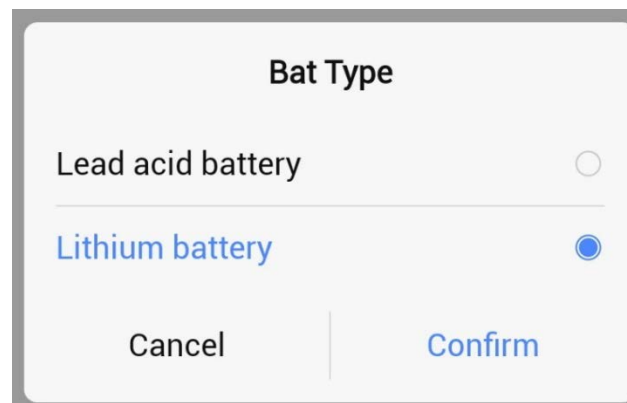
- 3) Do the local setting by “**Applications**” → “**Local Mode**”. Scan the QR code in the monitor logger.



- 4) Connect WLAN to the Wireless Access Point of monitor logger.



- 5) Set the battery type by “**Basic Setting**” → “**Bat Parameters**” → “**Bat Type**”. Select “Lithium battery”.



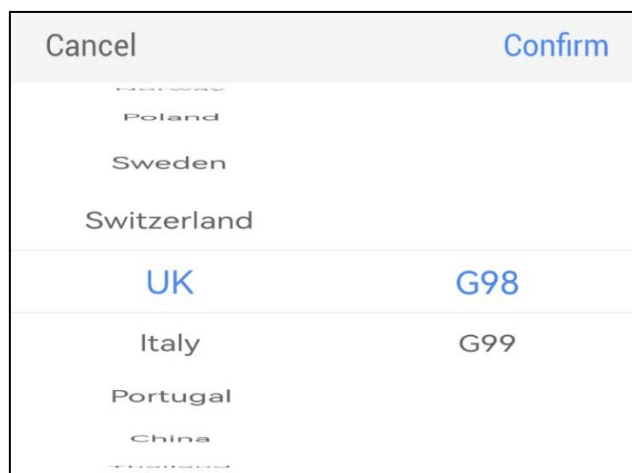
Bat Type

Lead acid battery ☐

Lithium battery ☒

Cancel | Confirm

- 6) Set the Safety Standard by “**Basic Setting**” → “**Safety Type**”.



Cancel | Confirm

Norway

Poland

Sweden

Switzerland

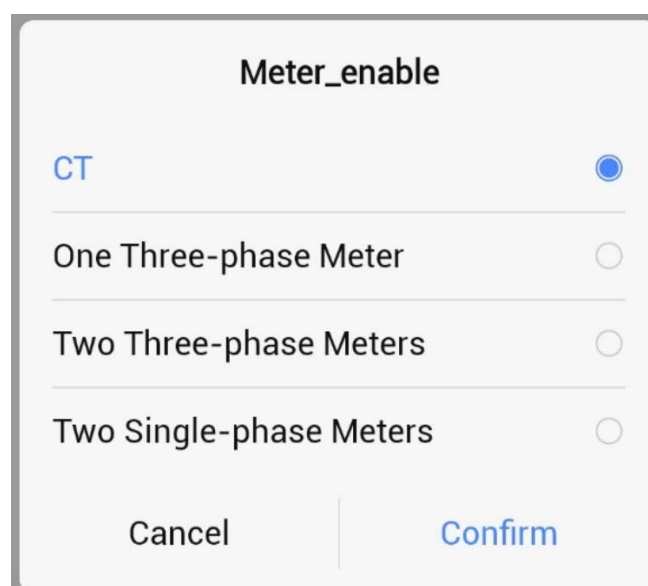
UK G98

Italy G99

Portugal

China

- 7) Set the CT/Meter type by “**Basic Setting**” → “**Meter_enable**”.



Meter_enable

CT ☒

One Three-phase Meter ☐

Two Three-phase Meters ☐

Two Single-phase Meters ☐

Cancel | Confirm

- 8) Set the time by “**Basic Setting**” → “**Time Setting**”.

Cancel			Confirm		
2018	07	06	10	54	10
2019	08	07	11	55	11
2020	09	08	12	56	12
2021	10	09	13	57	13
2022	11	10	14	58	14
2023	12	11	15	59	15
2024		12	16		16

- 9) Set the Working Modes by “**Basic Setting**” → “**System working mode**”.

ACC_UserMode

Auto Scheduling Mode ☒

Time-sharing Tariff Mode ☐

Back up Mode ☐

Manual Maintenance Mode ☐

Cancel
Confirm

Auto Scheduling Mode

The electricity from any power generating system (e.g. solar generating system) will firstly be used to support the home loads. The surplus electricity will be used to charge the battery by ACU. Once the battery of ACU is full, the more surplus electricity will be fed into the grid. When the power generating system can't support the home loads, ACU will discharge and feed electricity back to the grid. Auto Scheduling Mode can effectively improve power generation self-use rate.

ACC_UserMode	Auto Scheduling Mode >
ACC_EPSEn	Enable >

Time-sharing Tariff Mode

Time-sharing Tariff Mode is set based on the time-of-use tariff system. In the electricity market where the time-of-use electricity price is implemented, ACU can be set to charge the battery when the electricity price is low and discharge when the electricity price is high, which can reduce the overall electricity consumption cost. Revenue from TOU price management is mainly obtained through price difference and adjustment of electricity utilization plan.

Up to seven charge and discharge controls can be set in this mode.

ACC_UserMode	Time-sharing Tariff Mode	>
ACC_EPSEn	Enable	>
Charge_time_enable_control	No.1	>
Discharge_time_enable_control	No.1	>

Charge_time_enable_control

No.1	<input checked="" type="checkbox"/>
No.2	<input type="checkbox"/>
No.3	<input type="checkbox"/>
No.4	<input type="checkbox"/>
No.5	<input type="checkbox"/>
No.6	<input type="checkbox"/>
No.7	<input type="checkbox"/>

Cancel Confirm

Time, date and power can be set in each charge or discharge control.

First_charge_start_time	09:00	>
First_charge_end_time	18:00	>
First_charge_date		
Monday	Tuesday	
Wednesday	Thursday	>
Friday		
First_charge_power	50%	>
Cancel	Confirm	

First_discharge_start_time	19:00	>
First_discharge_end_time	20:00	>
First_discharge_date		
Monday	Tuesday	
Wednesday	Thursday	>
Friday		
First_discharge_power	50%	>
Cancel	Confirm	

Back up Mode

Back up Mode is used to improve the power supply reliability of microgrid, which means that when a power failure occurs, the energy storage can supply the stored energy to the end user, thus avoiding power interruption in the fault repair process to ensure the power supply reliability.

In Back-up mode, ACU will supply power to the loads first and store surplus energy in the battery as standby capacity for ensuring stable operation of the system in case of grid blackout.

ACC_UserMode	Back up Mode >
ACC_EPSEn	Enable >
BackModSOCRetain	50% >

The spare capacity can be set to satisfy the back-up load.

Manual Maintenance Mode

Manual Maintenance Mode is only used to do the maintenance work by qualified personnel.

10) Set the “ACC_EPSEn” to Enable in the work mode page.

11) Battery info, Inverter info and Power production statistics can be check in the “**Real-Time**” page.

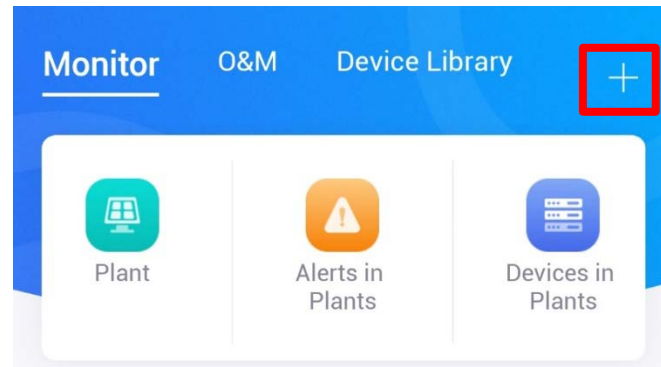
Bat Parameters		Inverter Info	Inverter Power
Bat Type	Lithium battery		
Bat Capacity	100AH		
BMS1_software_Version	1.145		
BMS1_hardware_Version	2.130		
Bat Float Volt	56.8V		

12) More advanced setting can be found in the “**Advanced Settings**”.

Only qualified personnel can change the parameters in the “**Advanced Settings**”.
Warranty cover will be void, if a parameter change has been attempted by any unauthorized personnel.

6.4 Plant creation and authorization (Solarman Business APP)

- 1) Log in Solarman Business APP and find the creating page in “**Business**” → “**Monitor**” → “+”.




- 2) Fill in the information of the plant and click “Save”. **Pay attention that the “System Type” should be “Energy Storage System”.**

Cancel	Create a Plant	Save
Basic Info		
* Plant Name	Please enter	
* Location	Longitude 120°38'35"/Latitude 31°25'3" >	
* Region	China/Jiangsu/Suzhou/Xiangchengqu >	
* Address	Please enter	
* Time Zone	(UTC+08:00) Beijing,Chongqing,Hong Kong,Urumqi >	
Creation Date	2021/10/14	
System Info		
* Plant Type	Residential Rooftop >	
* System Type	Energy Storage System >	
* Installed Capacity(kWp)	Please enter	
Planned Self-used	Please enter(0~100)	

- 3) Click “Add a New Gateway/Logger” and scan the QR code of the monitor logger.

Create a Plant Done



Plant created!
Please do the following operations

Add a New Gateway/Logger >

Please enter a gateway/logger SN which belongs to the plant, system will get data from the gateway/logger and its sub-system.
You can skip it now and do it later in Plant Details.


Authorize Users >

Other users are eligible to check the plant after your authorization.
You can skip it now and do it later in Plant Details.



- 4) Click “Authorize Users” and authorize this plant to the End User.

Create a Plant Done



Plant created!
Please do the following operations


Add a New Gateway/Logger >

Please enter a gateway/logger SN which belongs to the plant, system will get data from the gateway/logger and its sub-system.
You can skip it now and do it later in Plant Details.

Authorize Users >

Other users are eligible to check the plant after your authorization.
You can skip it now and do it later in Plant Details.

Cancel **Please Select Authorization Method** Confirm

Search for System-wide Users	
Create a New User	

If the end user doesn't have an account, click “create a New User” and create a new account for the end user.

← **Create a New User** Save

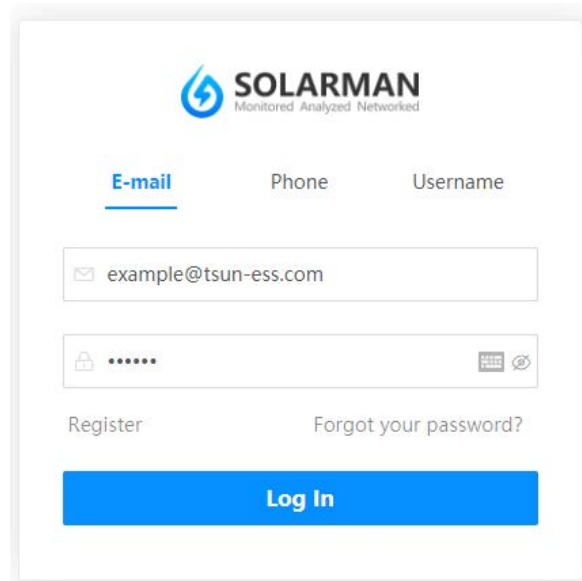
*Name

*Phone Number
(China+86) ▼

Username

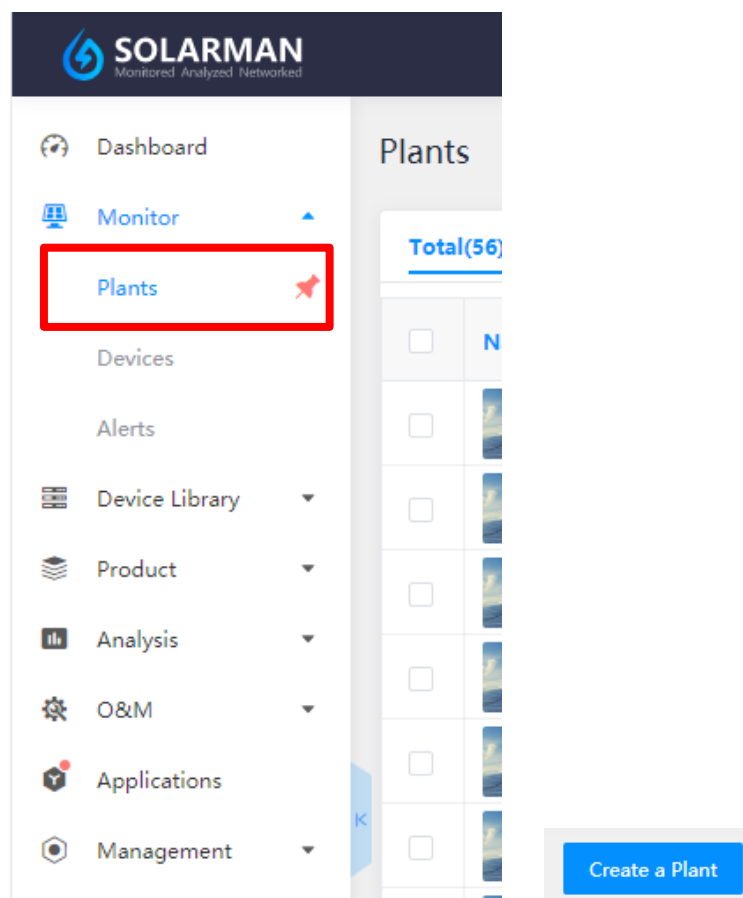
6.5 Plant creation and authorization (Solarman Business Web)

- 1) Visit **pro.solarmanpv.com** and log in Solarman Business Website.



The image shows the Solarman login page. At the top is the Solarman logo with the tagline "Monitored Analyzed Networked". Below the logo are three tabs: "E-mail" (which is underlined), "Phone", and "Username". Under the "E-mail" tab, there is a text input field containing "example@tsun-ess.com". Below this is a password input field with masked characters "*****" and a small icon to toggle visibility. Under the password field are two links: "Register" and "Forgot your password?". At the bottom is a large blue button labeled "Log In".

- 2) Find the creating page in **"Monitor"** → **"Plants"** → **"Create a Plant"**.



- 3) Fill in the information of the plant and click "Save". **Pay attention that the "System Type" should be "Energy Storage"**.

Create a Plant

Cancel

Save

Basic Info

System Info

Yield Info

Owner Info

Basic Info

Name :

Example

Location :

Please enter plant address

Search

System Info

Plant Type :

Residential

System Type :

Energy Storage

- 4) Click "Add a New Gateway/Logger" and input the SN of the monitor logger.

Your plant has been created! Please follow the steps below to complete system commissioning.

Add a New Gateway/Logger

Please enter a gateway/logger SN which belongs to the plant, system will get data from the gateway/logger and its Subsystem.

Unfold

Authorize Users

Other users are eligible to check the plant after your authorization.

Unfold

Authorize Business Units

Other business units are eligible to check the plant after your authorization.

Unfold

Authorize Internal Members

Other members are eligible to check the plant after your authorization. You can skip it now and do it later in Plant Details.

Unfold

Select Tags

You can tag the plant, which is convenient for you to spot it. You can skip it now and do it later in Plant Details.

Unfold

Add a New Subsystem

You can create a Subsystem of the plant by adding devices into the Subsystem, and get a separate view on it.

Unfold

Add a New Gateway/Logger

×

SN:

Add

- 5) Click “Authorize Users” and authorize this plant to the End User.

Authorize Users

[Collapse ^](#)

Other users are eligible to check the plant after your authorization.

[+Users](#)

Search for System-wide Users

Create a New User

If the end user doesn't have an account, click “create a New User” and create a new account for the end user.

☐ E-mail ☒ Phone number

* Name

Username

* Phone Number

+86 Phone Number

Original Password

Original Password123456

* Authorized External Role

-Please Select-

6.6 Shut Down the System



Note!

- If the ACU is connected with Expansion Battery(s), the procedure for turning off the system will be Battery No.3>> Battery No.2>> Battery No.1>> ACU.

System shall be turned OFF in the correct sequence as follows:

- 1) Turn OFF the Battery switch on the right side of the ACU/ Expansion Battery.
- 2) Press (approx. 5 seconds) the BMS switch on the right side of the ACU/ Expansion Battery until the BMS switch is off (not light in blue).
- 3) Disconnect the external grid AC switch.

7 Fault Codes and Common Troubleshooting

	Explanation	Fault type
01	Communication loss of the main and subordinate machine Master	Error
02	High temperature Master	Error
03	Low temperature Master	Error
04	DCI Err Master	Error
05	Synchronizing pulse fault Master	Error
06	Relay fault Master	Error
07	Storage fault Master	Error
08	Battery input short circuit Master	Error
09	Battery overvoltage Master	Error
10	Battery open circuit Master	Error
11	DC side hardware overcurrent Master	Error
12	Battery discharging fault Master	Error
13	Battery controller overcurrent Master	Error
14	Bus soft-start timeout Master	Error
15	Bus voltage high Master	Error
16	Bus voltage low Master	Error
17	Bus voltage high of hardware Master	Error
18	Inverter overcurrent Master	Error
19	Inverter hardware overcurrent Master	Error
20	Inverter short circuit fault Master	Error
21	Output overload Master	Error
25	Voltage of grid high warning Master	Alarm
26	Voltage of grid low warning Master	Alarm
27	Frequency of grid high warning Master	Alarm
28	Frequency of grid low warning Master	Alarm
29	Grid loss warning Master	Alarm
30	Grid average overvoltage within 10 mins Master	Alarm
31	Overload alarm Master	Alarm
33	Fan Err Slave	Error
34	Output terminal abnormal Slave	Error
35	Inverter voltage wave form fault Slave	Error
49	Grid voltage consistent alarm Slave	Alarm
50	Grid frequency consistent alarm Slave	Alarm
51	GND Loss Warn	Alarm
52	LN Wrong Warn	Alarm
53	CAN communication loss Slave	Alarm
54	Low battery SOC alarm Master	Alarm

55	Voltage of battery high alarm Master	Alarm
56	Voltage of battery low alarm Master	Alarm
57	Voltage of grid high warning Slave	Alarm
58	Voltage of grid low warning Slave	Alarm
59	Grid over frequency alarm Slave	Alarm
60	Grid under-frequency alarm Slave	Alarm
61	Grid loss alarm warning Slave	Alarm
65	Communication loss of the main and subordinate machine Slave	Error
66	Storage fault Slave	Error
67	RTC fault Slave	Error
68	BMS equipment fault Slave	Error
81	Unit cell over-voltage alarm Slave	Alarm
82	Unit cell under-voltage alarm Slave	Alarm
83	Over charging current alarm Slave	Alarm
85	Over discharging current alarm Slave	Alarm
86	Over discharging temperature alarm Slave	Alarm
87	Over charging temperature alarm Slave	Alarm
88	Battery low voltage alarm Slave	Alarm
89	BMS communication loss alarm Slave	Alarm
91	Ammeter communication loss alarm Slave	Alarm
92	DRM0 alarm Slave	Alarm

8 Battery maintenance

8.1 Transportation

Lithium batteries are dangerous goods. Passed the test of UN38.3, this product meets the transportation requirements for dangerous goods for lithium batteries. After the installation of the battery on site, the original packaging (contains the lithium battery identification) should be kept. When the battery needs to be returned to the factory for repair, please pack the battery with the original packaging to reduce unnecessary trouble.

8.2 Storage

After purchasing the battery, please store it with following instructions:

- 1) Please store it in a dry and ventilated environment, keep it away from heat sources.
- 2) Please keep it in an environment with storage temperature as $-20^{\circ}\text{C} \sim 50^{\circ}\text{C}$, humidity $<85\% \text{ RH}$.
- 3) For long-term storage (>3 months), please put it in an environment with a temperature of 18°C to 28°C and a humidity of $< 85\% \text{ RH}$.
- 4) The battery should be stored in accordance with the storage requirements mentioned above, and the battery should be installed within 6 months since delivered from the factory and used with compatible inverters.



Note !

- The battery remains 40% power when it is sent from the factory.
- The longer the battery is stored, the DOD value is getting bigger. When the battery remaining voltage fails to reach the startup voltage requirement, the battery may be damaged.
- Judgment condition: Close the battery breaker switch and press the BMS switch. At this time, if the LED light is flashing, it is running normal. If the LED light is off, the battery is in faulty.



The battery cannot be disposed of as household refuse. When the service life of the battery reaches to the limit, it is not required to return it to the dealer or TSUNESS, but it must be recycled to the special waste lithium battery recycling station in the area.


8.3 Cleanliness


Clean the enclosure lid, LCD and LED indicator of the inverter with moistened cloth with clear water only. Do not use any cleaning agents as it may damage the components.



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