
Turbo H1 Series

User Manual

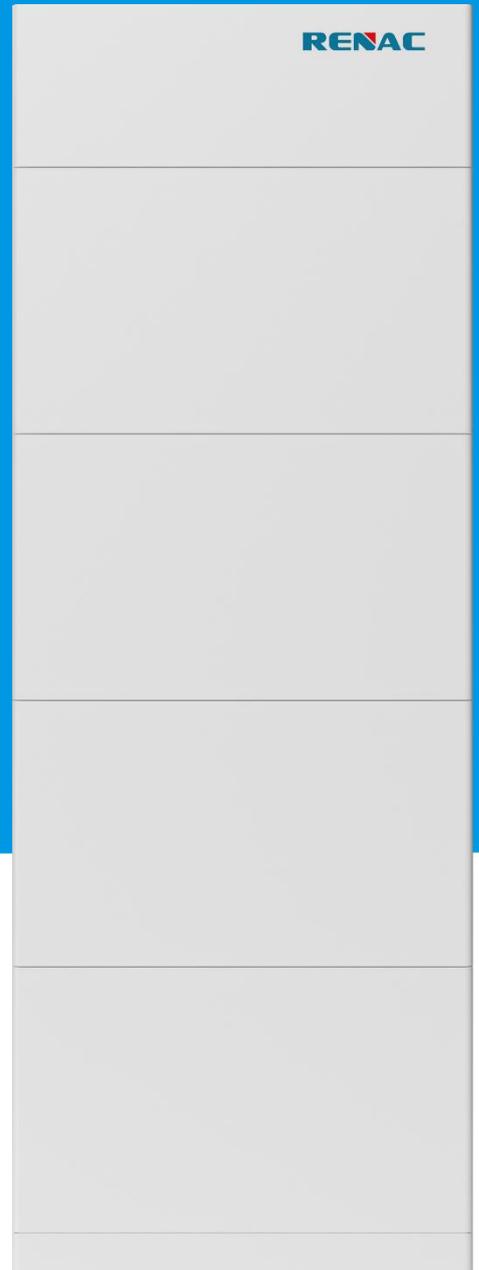
TB-H1-3.74

TB-H1-7.48

TB-H1-11.23

TB-H1-14.97

TB-H1-18.7



RENAC

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Notice

This manual contains important safety instructions that must be followed during installation and maintenance of the equipment.

Save the manual!

This manual must be stored carefully and be available at all times.

Copyright Declaration

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1. About this manual

1.1 Applicability

Please read the product manual carefully before installation, operation or maintenance. This manual contains important safety instructions and installation instructions that must be followed during installation and maintenance of the equipment.

TB-H1-3.74 TB-H1-7.48 TB-H1-11.23 TB-H1-14.97 TB-H1-18.7

1.2 Target group

The instructions in this document may only be performed by qualified persons who must have the following skills:

- Knowledge of how batteries work and are operated
- Knowledge of how an inverter works and is operated
- Knowledge of and adherence to the locally applicable connection requirements, standards, and directives.
- Knowledge of and adherence to this document and the associated system documentation, including all safety instructions
- Training in dealing with the hazards associated with the installation and operation of electrical equipment and batteries
- Training in the installation and commissioning of electrical equipment
- Failure to do so will make any manufacturer's warranty, guarantee or liability null, and void unless you can prove that the damage was not due to non-compliance.

1.3 Symbols used

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

	DANGER! 'Danger' indicates a hazard with a high level of risk that, if not avoided, will result in death or serious injury.
	WARNING! 'Warning' indicates a hazard with a medium level of risk that, if not avoided, will result in death or serious injury.
	CAUTION! 'Caution' indicates a hazard with a low level of risk that, if not avoided, could result in minor or moderate injury.
NOTICE	NOTICE! 'Notice' indicates a situation that, if not avoided, could result in equipment or property damage.
	NOTE! 'Note' provides tips that are valuable for the optimal operation of your product.

1.4 Designation in the document

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

Designation in this document	Designation in this document Complete designation
BMC	Battery Master Controller
RBS	Rechargeable Li-ion Battery Stack
SOC	State of Charge
DOD	Depth of Discharge

2. Safety

2.1 General safety

The Turbo H1 Series battery is for residential and works with a photovoltaic system. It is a high voltage Li-ion battery storage system, with the control module on itself. It could be operated in on-grid, off-grid and backup modes with compatible inverters. The battery system could be connected to the Internet through network cable for maintenance and firmware updating. Read safety instructions carefully prior to any work and observe them at all times when working on or with Turbo H1 Series battery. Incorrect operation or work may cause:

- ◆ Injury or death to the operator or a third party;
- ◆ Damage to the inverter or other properties.

2.2 Important safety instructions

	<p>DANGER!</p> <ul style="list-style-type: none"> ◆ Danger to life due to electric shock when live components or DC cables are touched. <p>The DC cables connected to an inverter may be live. Touching live DC cables results in death or serious injury due to electric shock.</p> <p>Disconnect the battery system and inverter from voltage sources and make sure it cannot be reconnected before working on the device.</p> <p>Do not touch non-insulated parts or cables.</p> <p>Do not remove the terminal block with the connected DC conductors from the slot under load.</p> <p>Wear suitable personal protective equipment for all work on the battery system.</p> <p>Observe all safety information of the inverter</p>
	<p>WARNING!</p> <ul style="list-style-type: none"> ◆ Battery Module Leakage. <p>If the battery modules leak electrolytes, contact with the leaking liquid or gas should be avoided. The electrolyte is corrosive, and the contact may cause skin irritation and chemical burns. If one is exposed to the leaked substance, do these actions:</p> <ul style="list-style-type: none"> • Inhalation: Evacuate the contaminated area, and seek medical help immediately. • Eye contact: Rinse eyes with flowing water for 15 minutes and seek medical help immediately. • Skin contact: Wash the affected area thoroughly with soap and water and seek medical help immediately. <p>Ingestion: Induce vomiting and seek medical help immediately.</p> <ul style="list-style-type: none"> ◆ The battery modules and its components should be protected from damage when transporting and handling. <ul style="list-style-type: none"> • Do not impact, pull, drag, or step on the battery modules. • Do not insert unrelated objects into any part of the battery modules. • Do not throw the battery module into a fire. • Do not soak the battery modules in water or seawater. • Do not expose to strong oxidizers. • Do not short circuit the battery modules.

	<ul style="list-style-type: none"> • The battery modules cannot be stored at high temperatures (more than 50°C). • The battery modules cannot be stored directly under the sun. • The battery modules cannot be stored in a high humidity environment. • Do not use the battery modules if it is defective, or appears cracked, broken or otherwise damaged, or fails to operate • Do not attempt to open, disassemble, repair, tamper with, or modify the battery modules. The battery modules are not user-serviceable. • Do not use cleaning solvents to clean the battery modules
	<p>CAUTION!</p> <ul style="list-style-type: none"> ◆ Risk of injury due to weight of the battery module <p>Injuries may result if the battery module is lifted incorrectly or dropped while being transported or installed.</p> <ul style="list-style-type: none"> • Transport and lift the battery module carefully. Take the weight of the battery module into account. • Wear suitable personal protective equipment for all work on the battery system. <ul style="list-style-type: none"> ◆ If the battery is not installed within one month after receiving the battery, the battery must be charged till the SOC is more than 50% for maintains.
<p>NOTICE</p>	<p>NOTICE!</p> <p>Firefighting Measures</p> <p>The battery modules may catch fire when it is put into the fire. In case of a fire, please make sure that an ABC or carbon dioxide extinguisher is nearby. Water cannot be used to extinguish the fire.</p> <p>Full protective clothing and self-contained breathing apparatus are for the firefighters to extinguish the fire.</p> <p>Damage to the battery system due to under voltages</p> <p>If the battery system doesn't start at all, please contact Renac after-sales service within 48 hours. Otherwise, the battery could be permanently damaged.</p>
	<p>NOTE!</p> <p>Electrical installation and maintenance must be carried out by competent electricians according to local regulations.</p>

2.3 Explanation of symbols

This section gives an explanation of all the symbols shown on the type label.

Symbols on the Type Label

Symbol	Explanation
	<p>TUV mark</p>
	<p>Do not disconnect or disassemble by untrained personnel</p>
	<p>Do not short circuit.</p>
	<p>Do not expose the battery to open flame, heat or sparks, as there is a risk of fire or explosion.</p>

	Keep the battery modules away from children.
	Observe the documents Observe all documents supplied with the system.
	Warning! Metal parts of the batteries are always under voltage. Do not short-circuit the batteries! In case of a short-circuit may flow very high currents and cause burns. By Touching conductive parts can cause cardiac arrhythmia and shock.
	The battery contains corrosive electrolytes. Please avoid contact with the leaked substance.
	WEEE designation Do not dispose of the system together with the household waste but in accordance with the disposal regulations for electronic waste applicable at the installation site.

3 Introduction

3.1 Product overview

The Turbo H1 series battery can be integrated with high voltage hybrid inverter for PV energy storage system

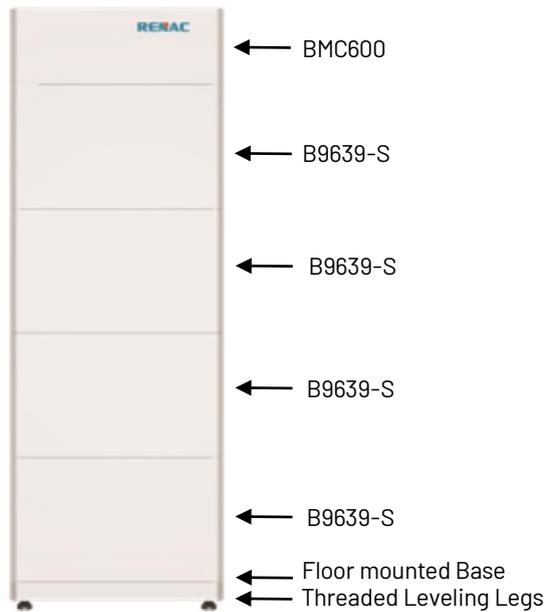


Figure 3-1 PV Energy Storage System (TB-H1-14.97 is used as example)

Note: The Turbo H1 series battery consists of a battery master controller and rechargeable battery stacks. BMC model name is BMC600.RBS model name is B9639-S.

Battery Capacity Description

The battery supports power and capacity expansion. One BMC supports a maximum of five RBS expansion modules.

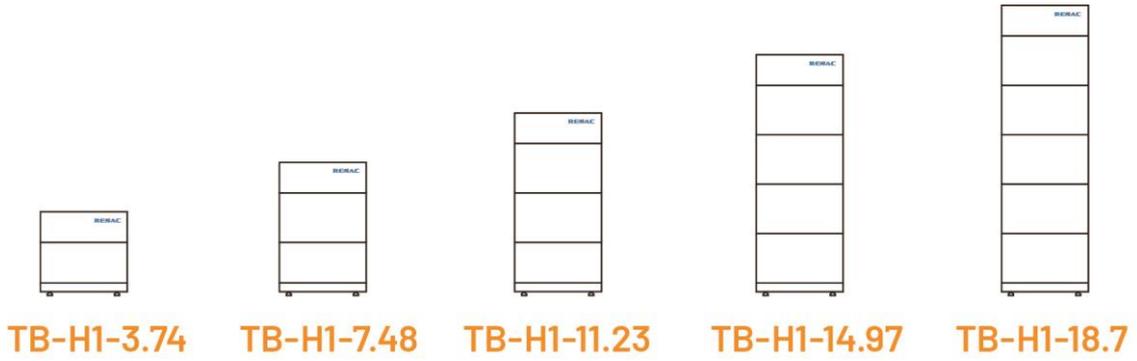


Figure 3-2 Battery Capacity Description

3.2 Terminal

BMC view:

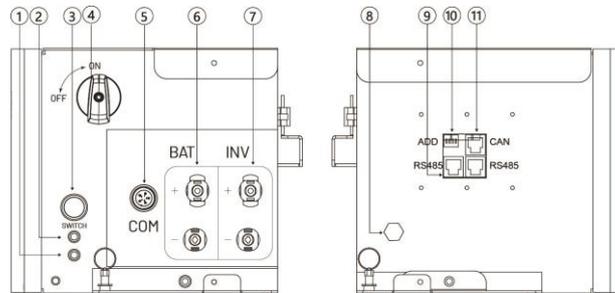


Figure 3-3 Terminals of BMC600

Object	Description
1	Alarm LED
2	Running LED
3	Start button
4	DC isolator
5	Communication port
6	Battery terminals connect with B9639-S (BAT+/BAT-)
7	Battery terminals connect with hybrid inverter (BAT+/BAT-)
8	Ventilator valve
9	RS485 port
10	Parallel communication Add
11	CAN port

RBS view:

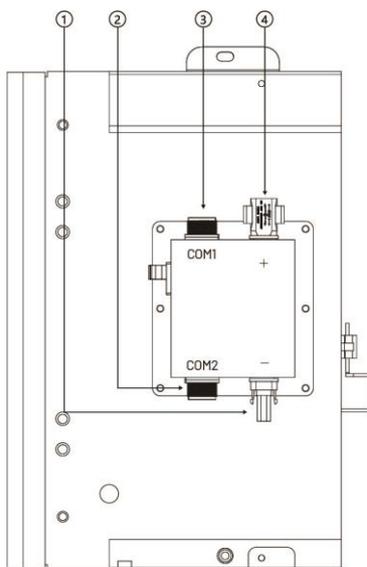


Figure 3-4

Object	Description
1	BAT- connector
2	COM 1
3	COM 2
4	BAT+ connector

4. Technical data

Model	TB-H1-3.74	TB-H1-7.48	TB-H1-11.23	TB-H1-14.97	TB-H1-18.7
Electrical Parameters					
Nominal Energy[1](kWh)	3.74	7.48	11.23	14.97	18.7
Usable Energy (90%DODX)(kWh)	3.36	6.73	10.1	13.47	16.83
Nominal Voltage(V)	96	192	288	384	480
Voltage range(V)	81~108	162~216	243~324	324~432	405~540
Maximum charge / discharge current(A)[2]	30 / 30				
Depth of Discharge	90%				
Cooling	Natural				
General					
Battery technology	LiFePO4				
Dimensions(HW*D)(mm)	606*561*217	932*561*217	1258*561*217	1584*561*217	1910*561*217
Weight(kg)	49.5	86.8	124.1	161.4	198.7
Number of battery units	1	2	3	4	5
Enclosure	IP65				
Type of installation	Floor stand / indoor				
Operating temperature range(°C)[3]	-10 ~ +50				

Communication	CAN / RS485
Cycle Life(90%DOD)	> 6000 cycles
Warranty[4]	10 Years
Operating Altitude(m)	≤ 2000
Certification	UN38.3, EN/IEC62619, IEC62040, EN 62477-1, IEC 62040-1, EN 61000-6-1/-3

[1] Nominal Energy: Test conditions: 100% DOD, 0.2C charge & discharge at + 25C.

[2] The recommended charging and discharging current is 20/20A.

[3] Ambient temperature : Charging (0 ~ +40°C), Discharging (-10 ~ +50°C).

[4] Conditions apply. Refer to Renac Power Battery Warranty Policy!

5. Installation

5.1 Unpacking

Check the delivery for completeness. Contact your dealer at once if anything is missing.

Battery Master Controller(BMC)

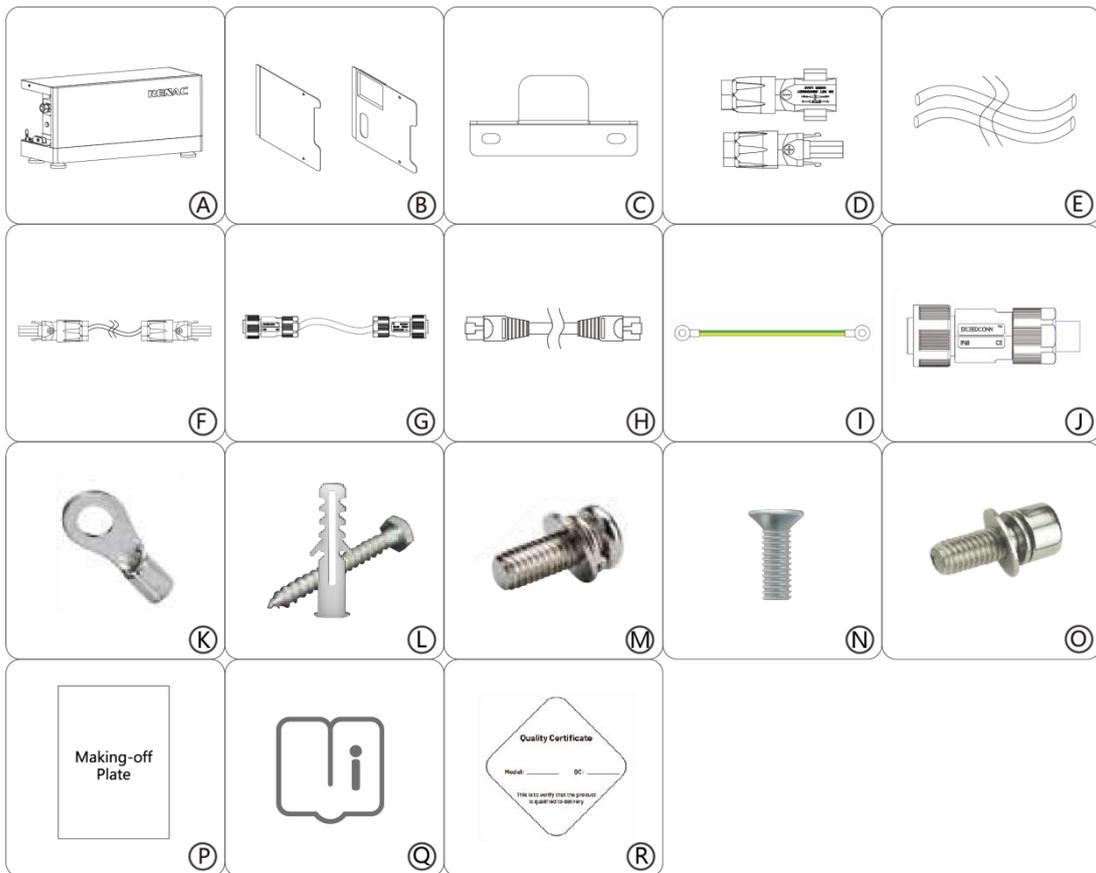


Figure 5-1

Object	Quantity	Description
A	1	Battery Master Controller (BMC600) with floor-mounted base
B	2	BMC protective cover
C	1	Bracket
D	4	Battery Connectors(1* positive,3*negative)
E	3	DC input power cable(inverter to battery, 1.5m, B- to B-, 2m)
F	1	DC input power cable (B+ to B+)
G	1	Signal cable(BMC to RBS)
H	1	Signal cable(1.5m)
I	1	Ground cable
J	1	Communication terminator resistor
K	1	Ring terminal(for 10AWG cable)for grounding
L	2	Expansion tubes & Expansion screws
M	4	M5*10 pan head combination screws
N	1	M4*7.5 flat head screws
O	1	M5*12 hexagon socket head cap screw
P	1	Making-off plate
Q	1	User Manual
R	1	Quality Certificate

Rechargeable Battery Stack (RBS)

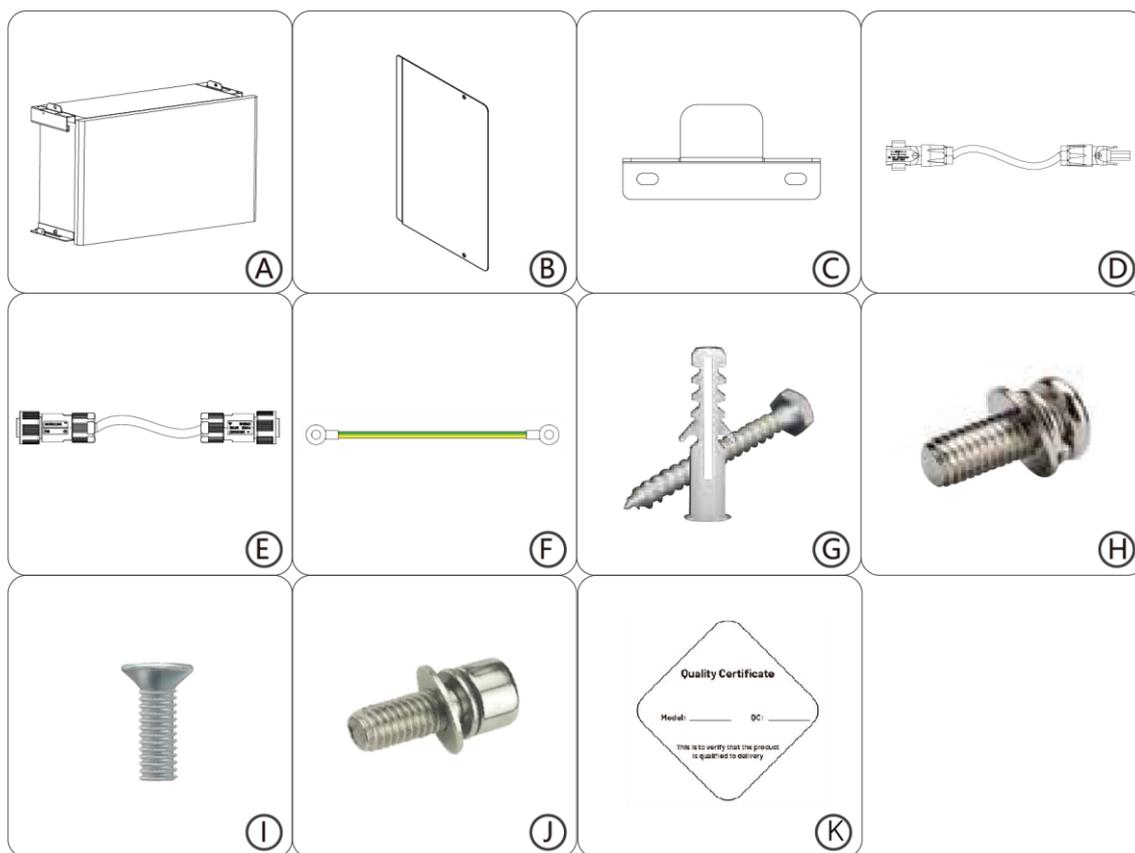


Figure 5-2

Object	Quantity	Description
A	1	Rechargeable Battery Stack(B9639-S)
B	2	RBS protective cover
C	1	Bracket
D	1	DC input power cable(B+ to B-)
E	1	Signal cable(RBS to RBS)
F	1	Ground cable
G	2	Expansion tubes& Expansion screws
H	5	M5*10 pan head combination screws
I	4	M4*7.5 flat head screws
J	1	M5*12 hexagon socket head cap screw
K	1	Quality Certificate

Open the package and pick the product, check that if there is any distortion or impaired during the transportation. Meanwhile, check that if the relating accessories and the materials are here, you can see the accessories list in the table.

The instruction manual is an integral part of the unit and should therefore be read and kept carefully.

It is recommended that the packaging should not be removed until the unit is located in the installation site.

Combiner Box (Optional)

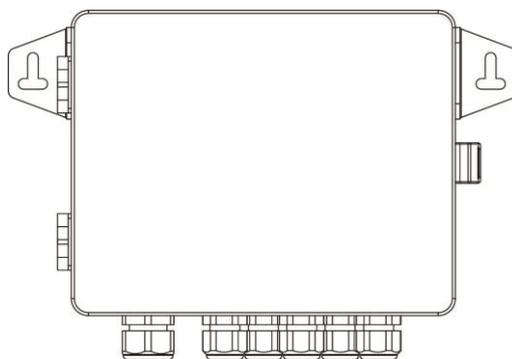


Figure 5-3

If one cluster of battery systems is insufficient, multiple clusters of battery systems need to be connected in parallel. In this case, a combiner box is required.

5.2 Check for transport damage

Check if the Turbo H1 series battery has some visible external damage, such as cracks in the housing or display please contact with your dealer if you find any damage.

5.3 Installation precaution

Requirements for Installation Location

- a) A solid support surface must be available (e.g., concrete or masonry).
- b) The installation location must be inaccessible to children.
- c) The installation location must be suitable for the weight and dimensions of the battery system.
- d) The installation location must not be exposed to direct solar irradiation.
- e) The installation location must not be close to the fire.

- f) The altitude of the installation location should be less than 2000m.
- g) The ambient temperature should be between -10°C and +55°C.
- h) The ambient humidity should be between 5-95%.



Figure 5-4

5.4 Available space

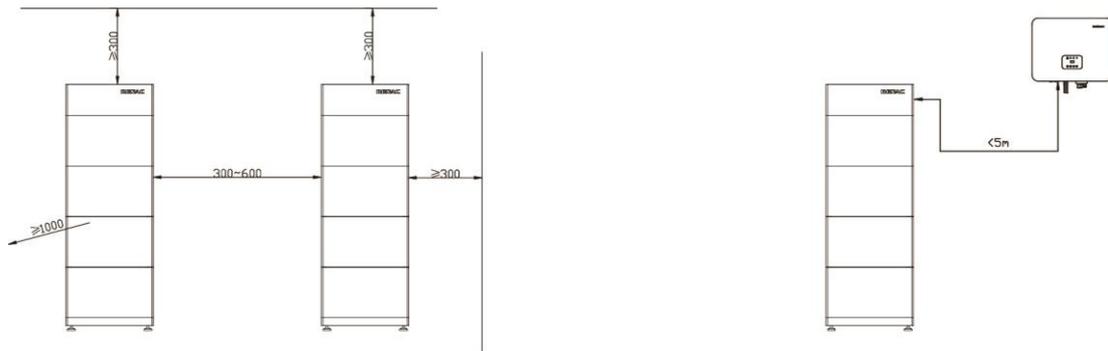


Figure 5-5 Battery space size

5.5 Preparation

The following tools shall be prepared before installation.

Installation Tools

No.	Tool	Model	Function
1		Level	Make sure the bracket is properly installed
2		BOSCH HD18-2 Two-Speed Hammer Drill	Drill holes on the wall

3		Hammer	Hanging the bracket
4		KIMO 20V 1/2 Cordless Brushless Impact Wrench Set	Hanging the bracket
5		Screwdriver	Wiring
6		RJ45 Crimping Tool	Crimping plier for PV cable
7		Crimping plier	Crimping Tool For Insulated Electrical Connectors

5.6 Installation steps

1. Take the BMC and base out of the package.
2. Loosen the two screws with screwdriver.

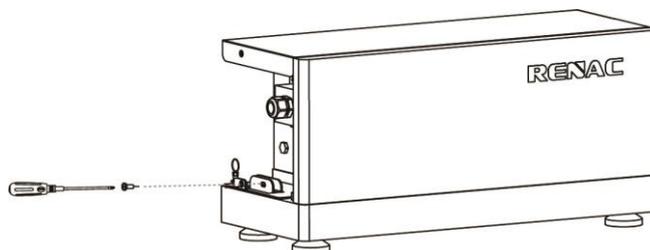


Figure 5-6

3. Take the BMC from the base.
4. Put the installed base and feet along the wall, and keep the distance of 20 mm between the wall and the base.

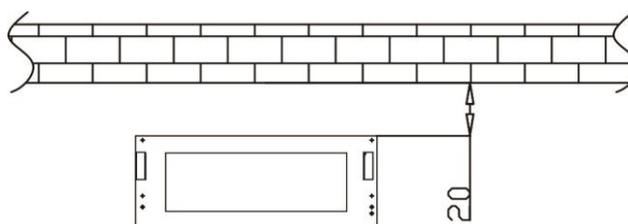


Figure 5-7

5. Align the marking-off plate with the upper surface of the base.

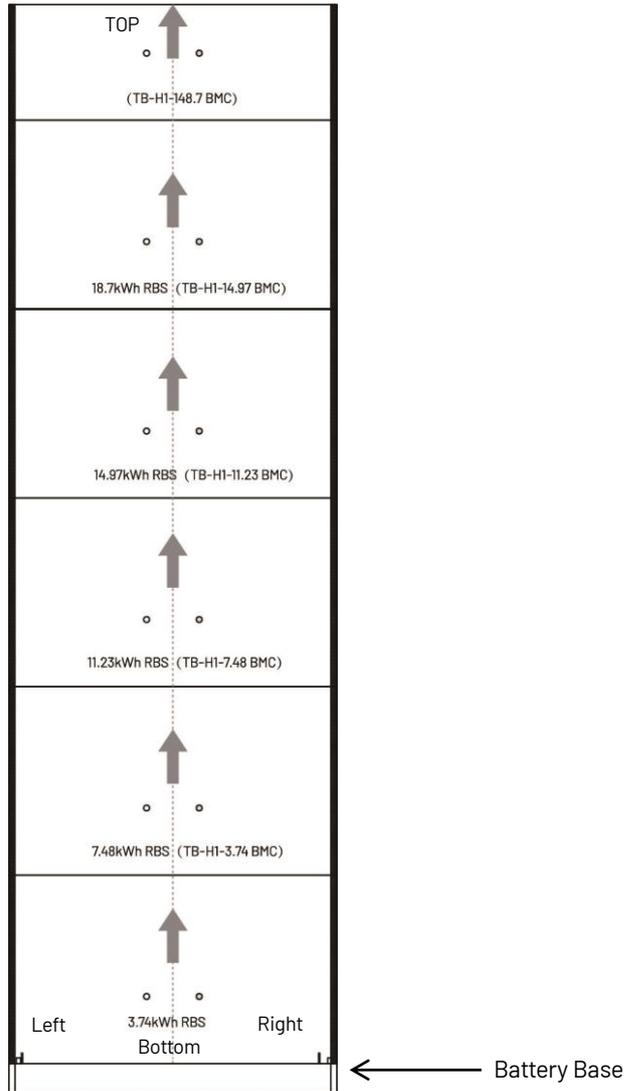


Figure 5-8

6. Drill holes with $\Phi 10$ driller carefully, make sure the holes are deep enough(at least 45mm)for installation, and tighten the expansion tubes.
7. Install the expansion tubes in the holes, and tight them. Install the wall bracket using the expansion screws in the screw package.
8. Take a battery module from the package out. Hang the RBS on the bracket, pull the latches on the left and right sides, and put one battery module on the base. Pay attention to the direction of the module.
9. Repeat the operations for other battery modules.
10. Put the BMC on top of the RBSs.

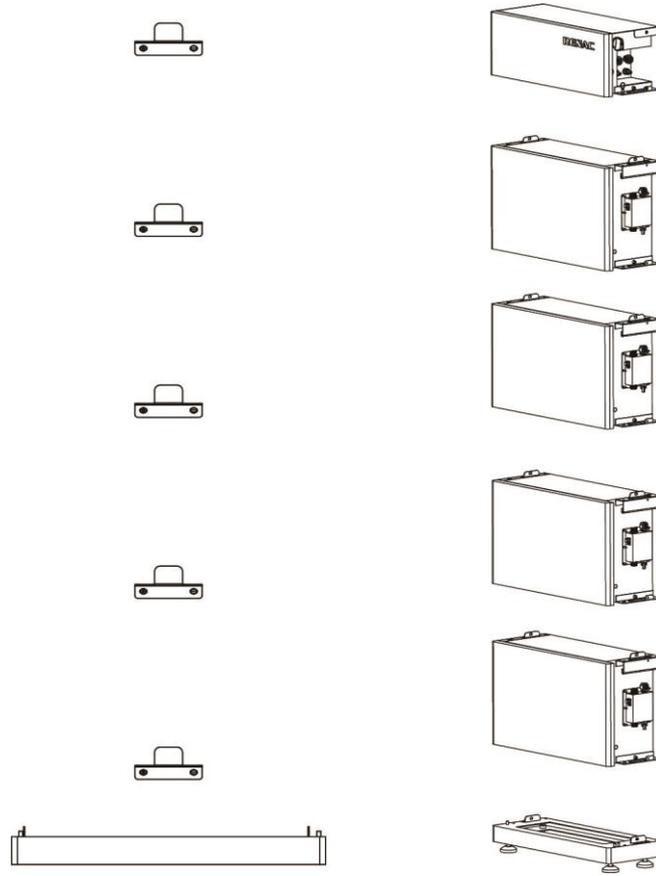


Figure 5-9

11. Secure the RBSs each other and BMC with RBS using M5 screws.



NOTE!

The number of RBS is determined by the customer's actual usage. The installation illustration is based on five battery clusters as an example. The RBS bracket can be dispensed with.

5.7 Electrical wiring connection

5.7.1 Internal electrical connection of the battery

DC power cable (B-to B-) should be prepared by following battery power cable connection, and others cables you can find in the accessory package.

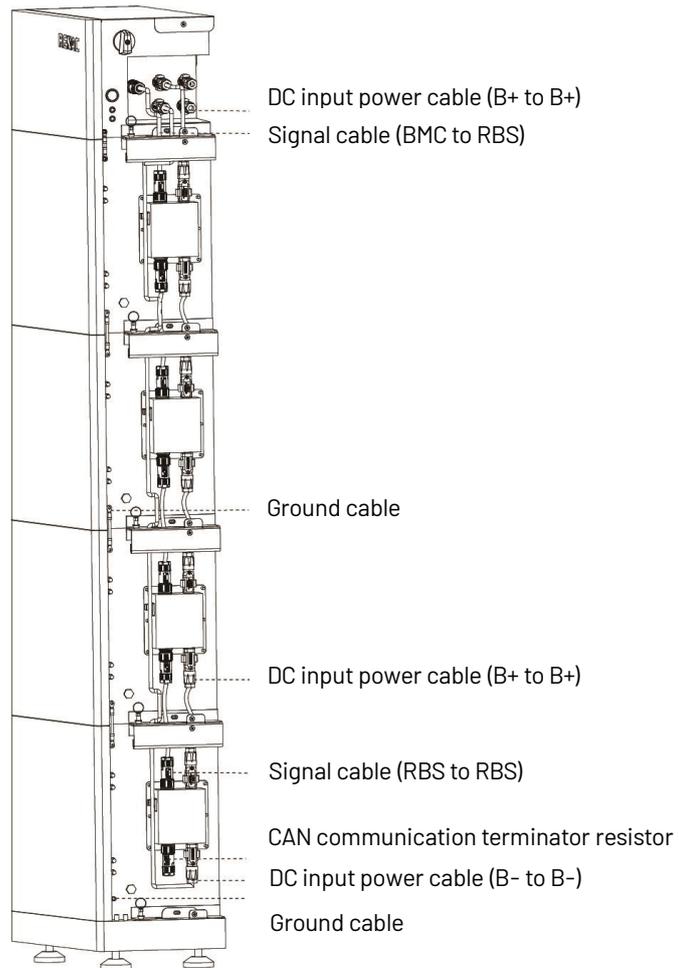


Figure 5-10

5.7.2 External electrical connection of the battery

5.7.2.1 Battery power cable connection

1. Prepare the tin-plated cables with a conductor cross section of 4 to 6 mm² (AWG 10).
2. Strip 15mm off the conductor. Use a suitable stripping tool for this (e.g. "Knipex Solar 121211").
3. Open the spring using a screwdriver (Figure 5-11).

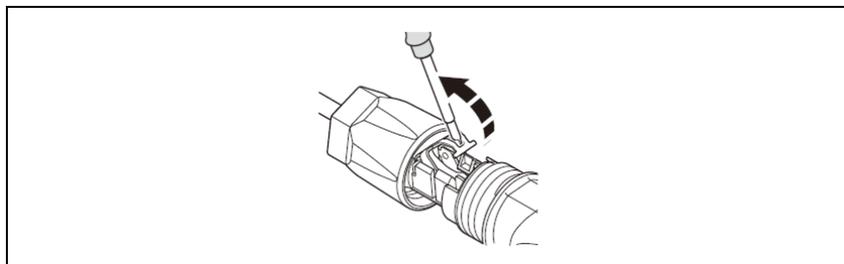


Figure 5-11

4. Carefully insert the stripped wire with twisted litz wires all the way in (Figure 5-12, A). The litz wire ends have to be visible in the spring.
5. Close the spring. Make sure that the spring is snapped in (Figure 5-12, B).

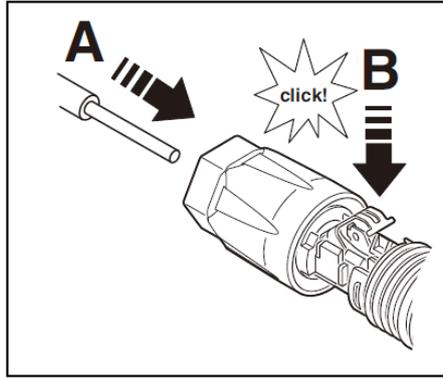


Figure 5-12

6. Push the insert into the sleeve (Figure 5-13, C).
7. Tighten the cable gland to 2 Nm (Figure 5-13, D) Use a suitable and calibrated torque wrench, size 15. Use an open-jaw wrench, size 16 to hold the connector in place.

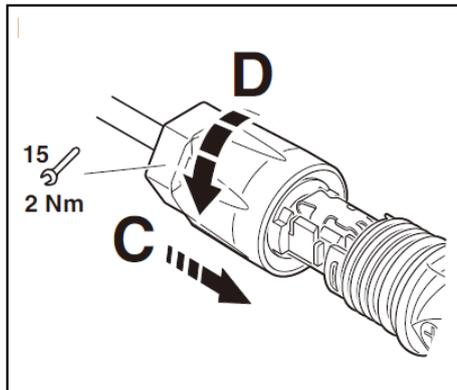


Figure 5-13

8. Fit the two connectors together until the connection audibly locks into place.
9. Check to make sure the connection is securely locked.
10. Separating connectors
 - 1). Insert the screwdriver into one of the four openings (Figure 5-14.A)
 - 2). Leave the screwdriver in the opening. Pull the two connectors apart (Figure 5-14.B).

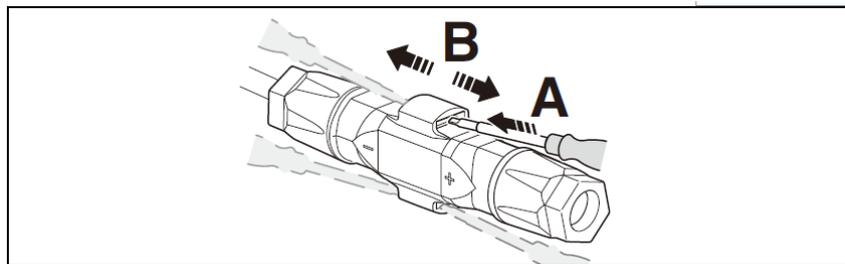


Figure 5-14

5.7.2.2 Battery communication connection

The communication interface between battery and inverter is CAN with a RJ45 connector. The Pins definition is as below.

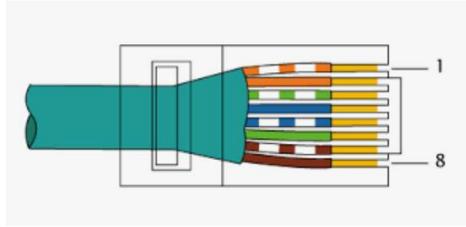


Figure 5-15

Pin	1	2	3	4	5	6	7	8
Function	NC	NC	NC	CANH	CANL	NC	NC	NC

Overview for all battery connections

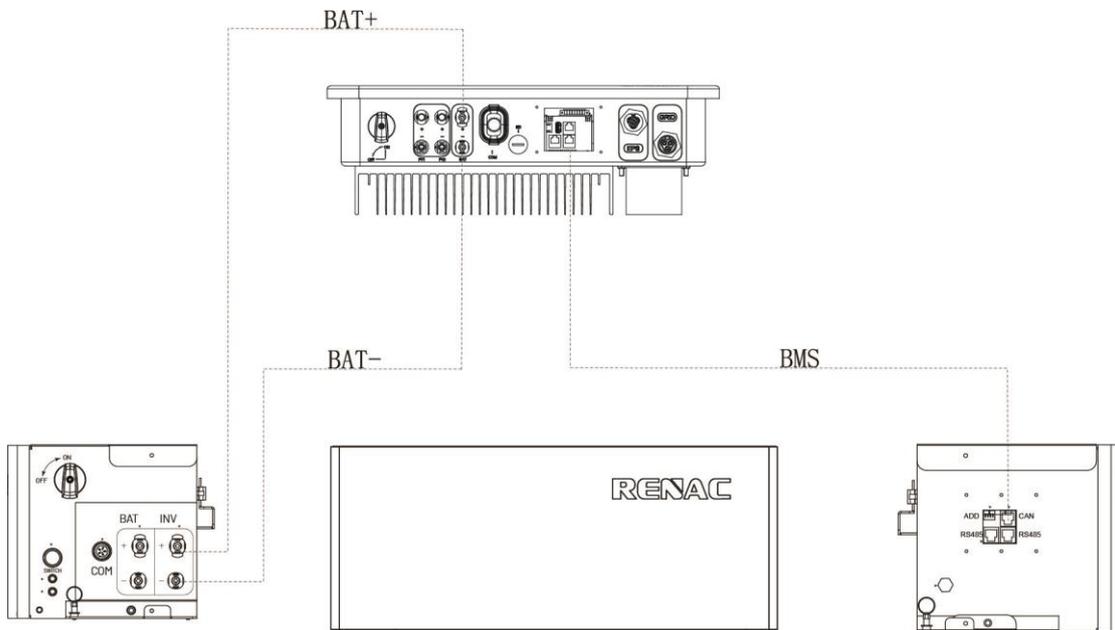


Figure 5-16

5.7.3 Earth connection

The BMC and RBSs must be connected to a protective conductor. For this purpose, a line from the potential equalization rail to the floor mounted base must be installed expertly.

Cable size: 10AWG

Connection step:

- Strip the earthing cable insulation.
- Insert the stripped cable into the ring terminal.
- Clamp the end of the ring terminal.
- Unscrew the screw of the earthing connector.

- Suit the ring terminal on the earthing connector.
- Suit the gasket on the earthing connector.
- Screw the screw of the earthing connector.

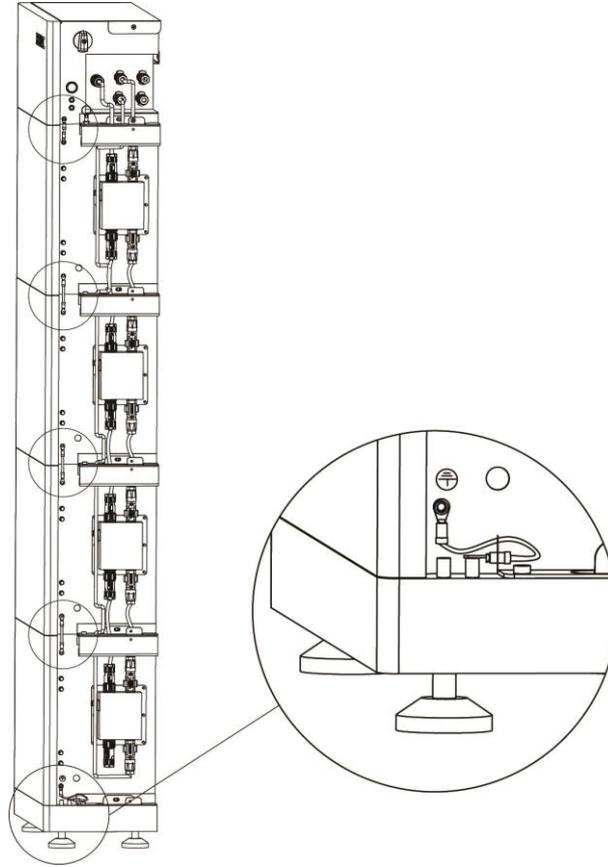


Figure 5-17

Mark the product type on the following label

1)TB-H1-XXX

		Battery master controller Model: BMC600 DC Voltage range: 85V~600V Max charge/discharge current: 30A Operating Temperature: -10°C~50°C ^① Protection Class: I Enclosure: IP65 Serial No: <div style="border: 1px solid black; height: 40px; width: 100%;"></div>		Rechargeable Li-ion Battery System Model: Turbo H1 <input type="checkbox"/> 1)TB-H1-3.74 IFpR34/141/((3P15S)2S)1SJ/E/0+40/90 <input type="checkbox"/> 2)TB-H1-7.48 IFpR34/141/((3P15S)2S)2SJ/E/0+40/90 <input type="checkbox"/> 3)TB-H1-11.23 IFpR34/141/((3P15S)2S)3SJ/E/0+40/90 <input type="checkbox"/> 4)TB-H1-14.97 IFpR34/141/((3P15S)2S)4SJ/E/0+40/90 <input type="checkbox"/> 5)TB-H1-18.7 IFpR34/141/((3P15S)2S)5SJ/E/0+40/90													
① Charging 0~40°C, Discharging -10°C~50°C Use only with suitable batteries		<table border="0"> <tr> <th>Nominal Voltage/Range</th> <th>Capacity/Energy</th> </tr> <tr> <td>1)96V(81~108V)</td> <td>1)39Ah/3.74kWh</td> </tr> <tr> <td>2)192V(162~216V)</td> <td>2)39Ah/7.48kWh</td> </tr> <tr> <td>3)288V(243~324V)</td> <td>3)39Ah/11.23kWh</td> </tr> <tr> <td>4)384V(324~432V)</td> <td>4)39Ah/14.97kWh</td> </tr> <tr> <td>5)480V(405~540V)</td> <td>5)39Ah/18.7kWh</td> </tr> </table>		Nominal Voltage/Range	Capacity/Energy	1)96V(81~108V)	1)39Ah/3.74kWh	2)192V(162~216V)	2)39Ah/7.48kWh	3)288V(243~324V)	3)39Ah/11.23kWh	4)384V(324~432V)	4)39Ah/14.97kWh	5)480V(405~540V)	5)39Ah/18.7kWh		
Nominal Voltage/Range	Capacity/Energy																
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4)384V(324~432V)	4)39Ah/14.97kWh																
5)480V(405~540V)	5)39Ah/18.7kWh																

Figure 5-18

5.8 External protective cover installation

After electrical connections are complete, check all the wiring is correctly and securely connected, install the external protective cover, and secure it using M4 screws.

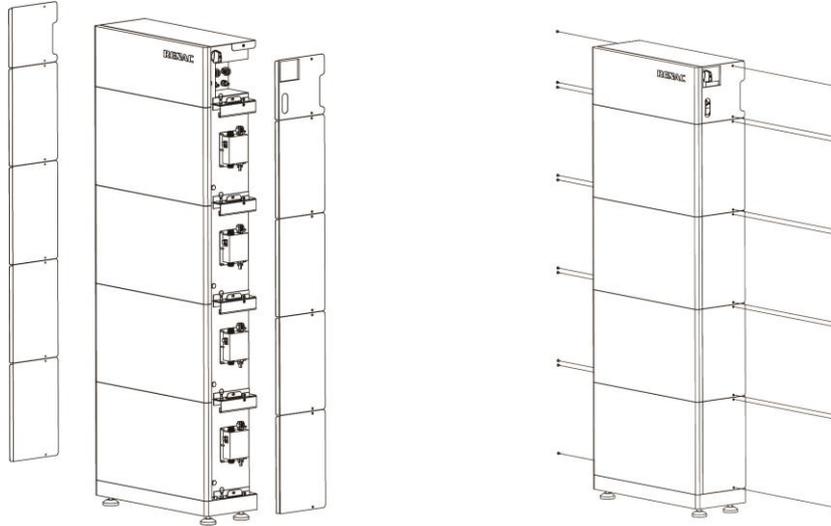


Figure 5-19

5.9 Overview for all battery clusters connectionist

5.9.1 Cables connection

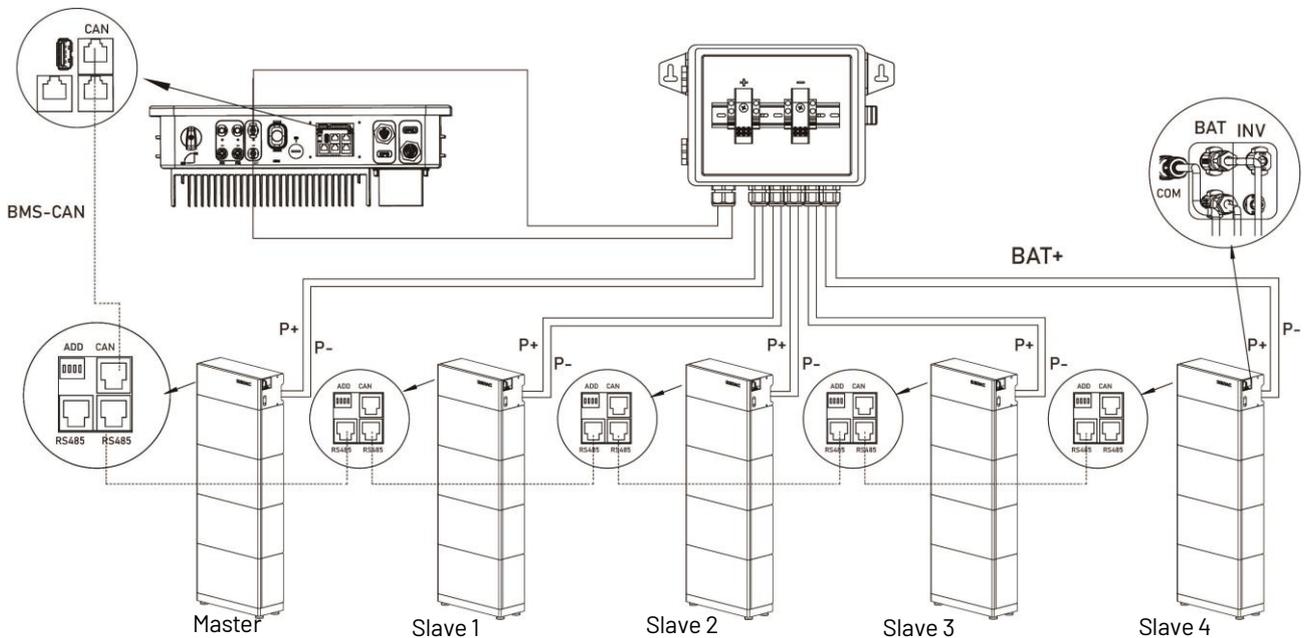


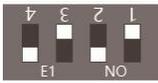
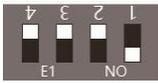
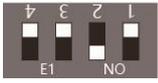
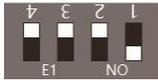
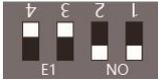
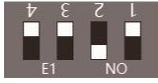
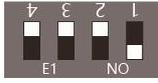
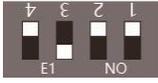
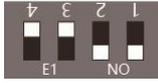
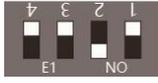
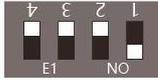
Figure 5-20

Note:

- For the parallel connection of 2 battery clusters and 3 battery clusters, please use the power cable in an accessory bag of the battery package to make the connection.
- For the parallel connection of 4 battery clusters and 5 battery clusters, please use the power cable in an accessory bag of the combiner box to make the connection.
- **The length of power cables between battery clusters and combiner box must be the same.**
- **When connecting multi-cluster battery systems in parallel, ensure that the number of clusters connected in series is the same in each battery system.**

5.9.2 Dip switch description

- ADD switch is a 4-bit dial switch to manually distribute the communication address of battery clusters. 1-3 bit means the communication address of battery clusters, the status of 4th bit means if this BMC is the master or not. For the master, the communication address is largest and the fourth digit must be ON status.
- Please refer to the table below to set the ADD switch for parallel connection of different battery clusters.

	Master	Slave 1	Slave 2	Slave 3	Slave 4
1 battery cluster					
2 battery cluster					
3 battery cluster					
4 battery cluster					
5 battery cluster					

6. Commissioning

6.1 Switch on the system for single battery cluster

1. Switch on the air switch between the battery and inverter if any user has added their air switch.
2. Switch on the DC isolator on BMC.
3. When the running LED flashes, and the interval time between two flashes is 1 second, push the black start button on BMC.

4. If it fails to switch on the battery system, check if all the electrical connection is correct.
5. If the electrical connection is correct, but the battery system is still unable to switch on, contact our after-sale service within 48 hours.

6.2 Switch on the system for multiple battery clusters

Turn on the DC isolator sets (on BMC) of all battery clusters.

Turn on the DC switch of inverter or AC breaker, all battery clusters will be powered on automatically.

Or push the start button on master BMC when the running LED flashes, all battery clusters will be powered on.

If it is failed to switch on the battery system, please check if all the electrical connections are correct or not push the start button of master battery set.

6.3 LED state

The Power Battery has a status signal. About the permanently integrated LED in the housing, displayed are the following states:

LED state	Description
Green blinking (1 times per second)	BMC DC switch on
Green and red blinking(1 times per second)	Push black start button or hybrid inverter awake
Green	Battery system workable
Red	Battery system faults or warning

If faults, warning or events of the battery occur, these are reported on the display of the inverter or can be called up via the Renac SEC.

7. Troubleshooting

LED state	Fault
Green and red always on	1. MCU internal errors
Green always on and red blinking	1. Pre-charge failure; 2. Overpressure (3.64V); 3. Undervoltage (2.6V); 4. Over-temperature charging and discharging; 5. Low-temperature charging and discharging; 6. Charge and discharge overcurrent (33A); 7. Excessive total differential pressure (5%); 8. Low SOC (2.5%); 9. Differential pressure of the core (500mV); 10. Excessive temperature difference (20°C); 11. Contactor sticking.
Green and red blinking	1. Overpressure (3.64V); 2. Undervoltage (2.6V); 3. Over-temperature charging and discharging; 4. Low-temperature charging and discharging; 5. Charge and discharge overcurrent (33A); 6. Low SOC (2.5%); 7. Excessive temperature difference (20°C).

8. Decommissioning

8.1 Dismantling the battery

- Push the start button
- Switch off the DC isolator on BMC
- Disconnect battery wiring
- Wait for 5 minutes for de-energizing.
- Disconnect communication and optional connection wiring.
- Remove the battery from the bracket.

8.2 Packaging

If possible, please pack the battery with the original packaging. If it is no longer available, you can also use an equivalent carton that meets the following requirements.

- Suitable for loads more than 40kg.
- With handle.
- Can be fully closed.

8.3 Storage

The battery module should be stored clean, dry, and ventilated indoors with a temperature range between 0°C ~ +35°C. Avoid contact with corrosive substances, keep away from fire and heat sources, and be charged every six months with no more than 0.5 C (C-rate is a measure of the rate at which a battery is discharged relative to its maximum capacity.) to the SOC of 40% after a long time of storage.

8.4 Disposal

Disposal of the system must comply with the local applicable disposal regulations for electronic waste and used batteries.

- Do not dispose of the battery system with your household waste.
- Avoid exposing the batteries to high temperatures or direct sunlight.
- Avoid exposing the batteries to high humidity or corrosive atmospheres.
- For more information, please contact Renac.



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422-00010-01

SMART ENERGY FOR BETTER LIFE

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