













Contents

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Please read this manual before you install the battery and follow the instruction carefully during installation process. Electrical installation, maintenance must be performed by professional/qualified personnel. Please contact us immediately for advice and clarification if you have any question.

1 Symbol Description

	Do not place near open fire or flammable materials.
	A potential hazard exists when the equipment is working. Wear personal protective equipment during operation.
	Warning electric shock. Power off the equipment before any operation.
	Grounding: indicate PE cable connection position.
	Do not place in areas accessible to children.
	Keep the battery away from open fire or ignition sources.
	Please use the equipment reasonably. In extreme cases, the equipment may cause explosion risk.
	The equipment contains corrosive electrolyte. Please avoid contact with leaked electrolyte or volatile gas.
	Read the product and operation manual before operating the battery system.
	Label for Waste Electrical and Electronic Equipment (WEEE) Directive (2012/19/EU)
	The certificate label for CE.
	Recycle label.

2 Safety Precautions



Alert

- (1) It is important and necessary to read the user manual carefully (and attachment) before installing or using battery. Failure to do so or to follow any instruction or warning in this document can result in electrical shock, serious injury, and death, or damage battery, potentially rendering it unusable.
- (2) After battery module lack of electricity, it needs to be recharged within 12h.
- (3) Do not connect power terminal reversely.
- (4) All power supplies must be disconnected during maintenance.
- (5) Do not expose cable outside.
- (6) Do not use any liquid to clean the battery.
- (7) Do not expose battery to flammable or irritating chemicals or vapor.
- (8) Do not paint any part of battery, including any internal or external components.
- (9) Do not connect battery with PV solar wiring directly.
- (10) Do not install or use this product beyond provisions of the manual.
- (11) Direct or indirect damages caused by the above reasons are not covered by warranty claim.
- (12) Please contact the supplier or retailer within 24 hours if there is something abnormal.



Warning

2.1 Before Connecting

- (1) Please check the external packaging condition before unpacking. If it is damaged, contact the supplier or retailer.
- (2) After unpacking, please check the products and spare parts according to spare parts list. If the product is damaged or missing, please contact the supplier or retailer.
- (3) Connect to specified matching inverter.
- (4) Before installation, be sure to cut off the grid power and make sure battery is in turned-off mode.
- (5) It is prohibited to connect the battery and AC power directly.
- (6) All electrical wiring must be connected in accordance with local regulations.
- (7) Battery must connect to ground and the resistance must be less than 0.1Ω .
- (8) Wiring must be correct, do not misconnect the positive and negative cables, and ensure no short circuit with the external device.
- (9) The battery is designed in parallel, please DO NOT connect battery in series.

- (10) Please ensure that electrical performance of battery system is compatible with the equipment.
- (11) The installation onsite shall be equipped with fire-fighting facilities that meet relevant requirements, such as fire sand, dry powder fire extinguisher, etc.

2.2 In Using

- (1) If battery system needs to be moved or repaired, power must be cut off and battery is completely shut down.
- (2) Do not connect battery to faulty inverter.
- (3) In case of fire, only dry powder fire extinguisher can be used, liquid fire extinguishers are prohibited.
- (4) Do not open, repair or disassemble the battery except NAHUI personnel or other authorized personnel. The company shall not bear any liability or responsibility caused by violation of any safety operation or design standard, production standard, equipment safety standards or any other standards or requirements.

3 Introduction

NLW-1Y5K energy storage system battery is a new energy storage product developed and produced by NAHUI, which can provide reliable power supply for all kinds of equipment or systems.

NLW-1Y5K has built-in BMS battery management system, which can manage and monitor cells information including voltage, current and temperature.

3.1 Features

- (1) When multiple modules are parallel connected, module addresses are set automatically.
- (2) The battery module can be managed and maintained through RS232, RS485, CAN.
- (3) Cathode material is made from LiFePO_4 with safety performance and long cycle life.
- (4) Battery management system (BMS) has protection functions including over-discharge, over-charge, over-current and high/low temperature.
- (5) The system can automatically manage charge and discharge state and balance voltage of each cell.
- (6) Flexible configuration, multiple battery modules can be in parallel for expanding capacity and power. Expandable to 40kwh (8*NLW-1Y5K connected in parallel), Three in parallel is recommended.
- (7) Adopted self-cooling mode rapidly reduced system entire noise.
- (8) Small size and light weight, wall mounted and ground mounted designed module is comfortable for installation and maintenance.

3.3 Product parameters

No.	Items	Specification
1	Module Model	NLW-1Y5K
2	Battery Type	LFP 16S1P
3	Total Capacity*1	5.32kWh
4	Rated Capacity*2	5.05kWh (95%DOD)
5	Nominal Voltage	51.2V
6	Working Voltage	43.2~57.6V
7	Charging Voltage	57.6
8	Max. Charge Current*3	50A
9	Max. Discharge Current*4	100A
10	Communication	RS485,CAN,WIFI
11	Storage Temperature	0℃ ~ 45℃(Recommended)
12	Storage Humidity	≤85%(RH)
13	Working Temperature	Charging: -10℃ ~ 50℃、 Discharging: -20℃ ~ 50℃
14	Working Humidity	≤95%(RH) No Condensation
15	Working Altitude	≤2000m
16	Ingress Protection	IP65
17	Protective Class	I
18	Weight	45kg
19	Dimension(W*D*H)	420mm*140mm*650mm
20	Design Life	15Years (25℃)
21	Cycle Life	> 6000(25℃, (25℃, 0.5C/1C,95%DOD)
22	Scalability	Recommended ≤3, (Max. 8 in parallel)
23	Certification	CE, IEC62619, IEC/EN 61000-6-1/3, UN38.3, IEC62368
24	Warranty	10 years

*Test conditions: cell voltage 2.0~3.65V, 25 ± 2 ℃ , 0.5C charge and 1C discharge.

*2 Test conditions: 95% depth of cell discharge ,25 ± 2 ℃ , 0.5C charge and 1C discharge.

*3、*4 Depend on the temperature and SOC of battery.

3.4 Dimensions instruction

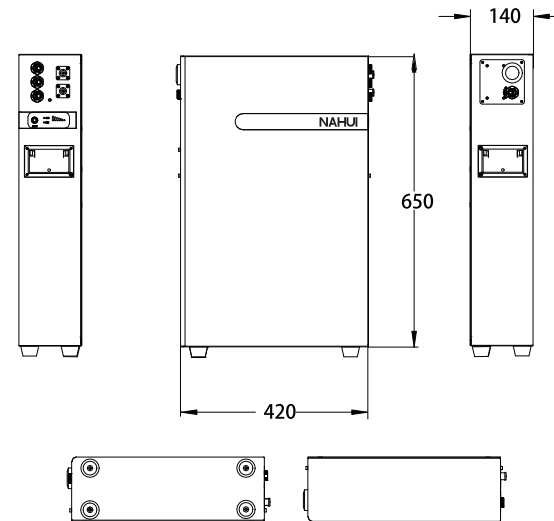


Figure 3-1

3.5 Equipment interface instruction

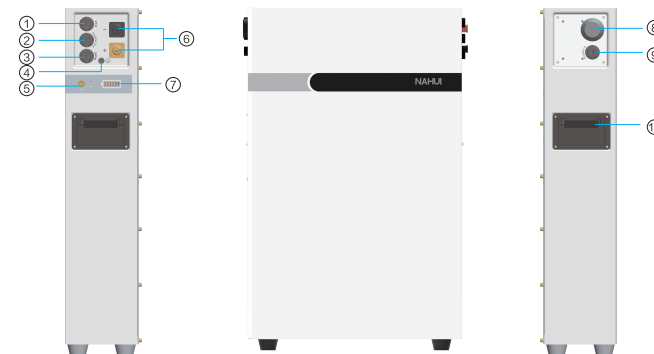


Figure 3-2

- ① PCS(to pcs communication)
- ② Parallel out(communication)
- ③ Debug
- ④ Grounding point
- ⑤ Start
- ⑥ Power terminal
- ⑦ Battery status indicator
- ⑧ Antenna
- ⑨ Parallel in(communication)
- ⑩ Handle

Start & Off

Turn on: When battery is dormant, press the START button for 3–6 seconds to start the battery module.

Turn off: When battery is active, press for 3–6 seconds and then release to turn off the battery module.

Run

Green LED lighting to show the battery running status.

ALM

Red LED flashing to show the battery has alarm; lighting to show the battery is under protection.

Inform the manufacturer or professional engineer for commissioning or maintenance.

(See LED indicator table for details)

Status	Mode	Run	ALM	Capacity Indicator LED						Description	
				6	5	4	3	2	1		
Power Off	Sleep	○	○	○	○	○	○	○	○	All OFF	
Stand by	Normal	①	○	Display according to actual power						Stand by	
	ALM	①	③	Display according to actual power							
CH	Normal	●	○	Display according to actual power						Corresponding led light flashes to indicate charging progress.	
	ALM	●	③	Display according to actual power							
	OCH Protection	●	●	●	●	●	●	●	●	Stop charging	
	T/OC/F Protection	○	●	○	○	○	○	○	○	○	Stop charging
DCH	Normal	③	○	Display according to actual power							
	ALM	③	③	Display according to actual power							
	UV Protection	○	●	○	○	○	○	○	○	○	Stop discharging
	T/OC/SC/RC/F Protection	○	●	○	○	○	○	○	○	○	Stop discharging
Failure		○	●	○	○	○	○	○	○	Stop charging and discharging	

Note

1. Description of indicator light

- ○ The indicator light is off.
- ● The indicator light is on.
- ① ② The indicator light is flashing, and below table shows the flashing type.

Flashing Type	Duration of indicator on	Duration of indicator off
① ①	0.25s	3.75s
② ②	0.5s	0.5s
③ ③	0.5s	1.5s

2. Description of abbreviation

Please see description of abbreviation mentioned in the table below.

Abbreviation	Full Name	Abbreviation	Full Name
CH	Charge	T	Temperature
DCH	Discharge	C	Current
RUN	Work normally	SC	Short-circuit
ALM	Alarm	RC	Reverse connection
UV	Under-voltage	F	Failure
OCH	Overcharge		

SOC

Six green LEDs are used to show the battery's remaining capacity.

State	Charge						Discharge						
	Capacity Indicator LED	L6	L5	L4	L3	L2	L1	L6	L5	L4	L3	L2	L1
Power	0 ~ 8%	○	○	○	○	○	②	○	○	○	○	○	○
	8 ~ 26%	○	○	○	○	②	●	○	○	○	○	○	○
	26 ~ 50%	○	○	○	②	●	●	○	○	○	○	○	○
	50 ~ 74%	○	○	②	●	●	●	○	○	○	○	○	○
	74 ~ 92%	○	②	●	●	●	●	○	○	○	○	○	○
	92 ~ 100%	②	●	●	●	●	●	○	○	○	○	○	○
Indicator Light	●						③						

Note

- The indicator light is off.
- The indicator light is on.
- Ⓛ The indicator light is flashing, and below shows the flashing type.

Flashing Type	Duration of indicator on	Duration of indicator off
①	0.25s	3.75s
②	0.5s	0.5s
③	0.5s	1.5s

Power Terminal

Power cable terminals: There are two pairs of terminals with the same function, which are respectively connected to the inverter and battery module.

For power cables uses water-proofed connectors. Must keep pressing this Lock Button while pulling out the power plug.



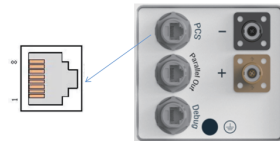
To PCS

Be used to communicate with inverter or upper battery. The default baud rate is 500 kbps.

Terminal resistance is required to connect with inverter can communication, and 120 Ω resistance is recommended.

Be used to communicate with inverter. The default baud rate is 9600 bps.

Pin	Definition
1	RS485B
2	RS485A
3	GND
4	CANH
5	CANL



Parallel Communcion

For communication between multiple parallel batteries, supports RS485 communication.

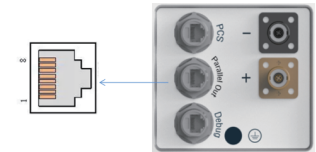
The output port of Parallel OUT is connected to the input port Parallel IN of the next machine, and so on. Up to 8 machines can be connected in parallel.

The module communicating with the inverter is the master.

After the high-voltage line and communication line of the parallel machine are connected, turn on the master battery. The system starts up and carries out automatic coding, and If the coding fails, the red light will flash.

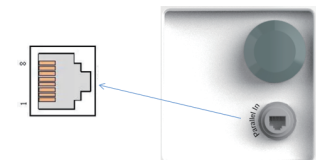
Parallel Out

Pin	Definition
1, 8	RS485-B
2, 7	RS485-A
3, 6	GND
4	CANL
5	CANH



Parallel In

Pin	Definition
1, 8	RS485-B
2, 7	RS485-A
3, 6	GND
4	CANL
5	CANH



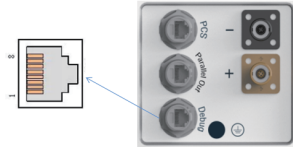
Debug

Dry contact 1: On – closed at low capacity. (NO1 COM1)

Dry contact 2: On – closed under protection status. (NO2 COM2)

RS 232: Software upgrade and debugging port.

Pin	Definition
1	NO1
2	COM1
3	TX (single plate)
4	RX (single plate)
5	SGND
6	NO2
7	COM2



4 Safe Handling of Lithium-iron ESS Batteries Guide

4.1 Solution Diagram

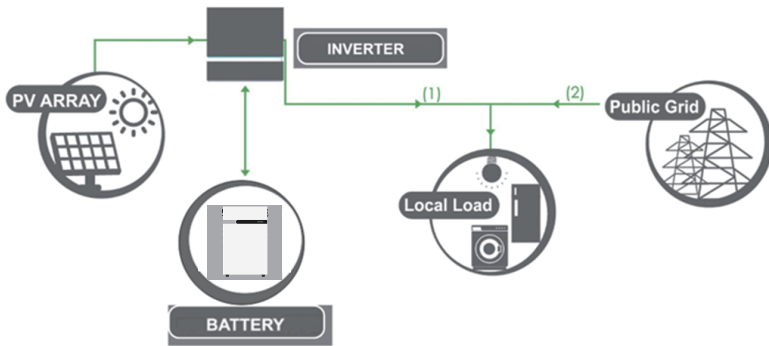


Figure 4-1

4.2 Danger label



- * Do not disconnect or disassemble by non-professional personnel.
- * Do not drop, deform, impact, cut or spear with sharp objects.
- * Do not place near open flame or flammable materials.
- * Do not cover or wrap the product case.
- * Do not come into contact with liquids.
- * Be aware of high temperature.
- * Avoid direct sunlight.
- * Follow the product manual for wire connection.
- * If any leakage, fire, wet or damage occur, switch off the breaker on DC side and stay away from the battery.
- * Contact the supplier within 24 hours if failure occurs.

4.3 Tool



Wire Cutter

Modular Crimping Plier

Screwdriver

Electric drill

Note

Properly use insulated tools to prevent accidental electric shock or short circuits. If insulated tools are not available, cover the entire exposed metal surfaces of the available tools, except their tips, with electrical tape.

4.4 Safety Gear

It is recommended to wear the following safety gear when dealing with battery pack.



Insulated Gloves



Safety Goggles



Safety Shoes

5 Installation and operation

5.1 Package items

Unpacking and check the Package items

- 1 * 500mm RJ45 communication cable. (communication cascade cable)
- 1 * 1000mm 10AWG grounding cable.
- 2 * 2000mm power cables (4 AWG, peak current capacity 120A, constant 100A)
- 1 * 3000mm RJ45 communication cable (battery to PCS communication)

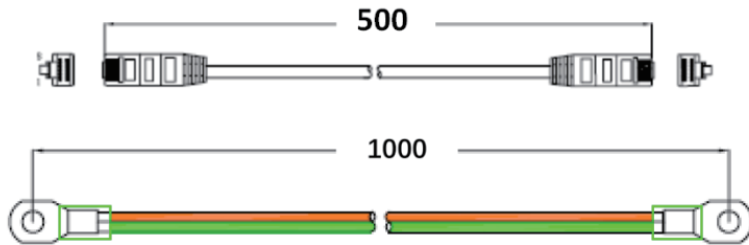


Figure 5-1

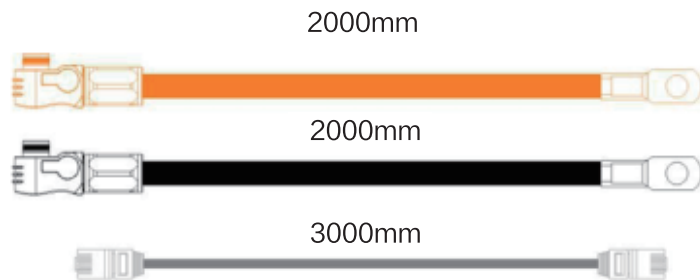


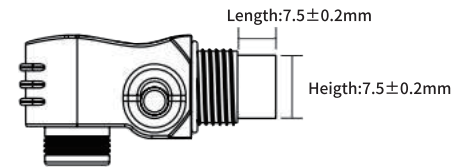
Figure 5-2

5.2 Cable Requirements

(1) Power cable

Connect orange power cable to orange harness and black power cable to black harness. The cross-sectional area of crimping part is 25 mm². Withstand voltage is DC1500V, temperature range is -40 °C~ 125 °C, and stripped conductor length is 23 ± 1 mm. Secure back shell and check if there is any clearance. Recommended tool: manual hydraulic tong (die: 25mm) 2) tensile force after crimping ≥ 1200 N.

If the battery is not connected, cover the port with a protective cover.



1. Crimp the power cable.
2. Put the rubber seal ring.
3. Secure the back shell.

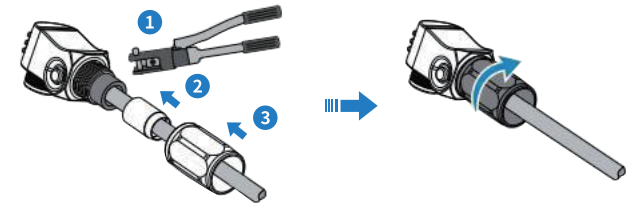


Figure 5-3

(2) PE cable

Disconnect power supply and use PE cable before disassembling equipment. After crimping, traction force of cable shall be at least 400N, and any one of the two grounding cables shall be connected to the ground. Keep other grounding cables. Specification of PE cable: 10AWG, and the cable should meet the requirement for outdoor use.

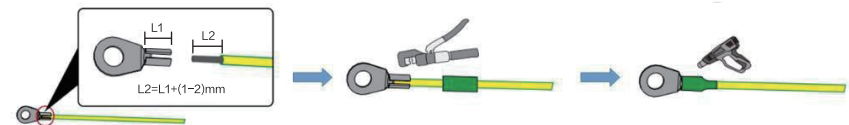


Figure 5-4

5.3 Installation Location

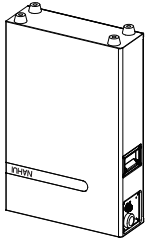
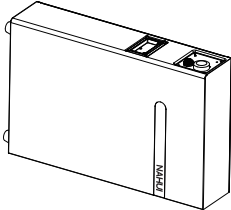
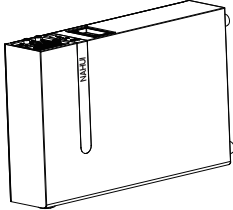
Make sure that installation location should meet the following condition:

- (1)The area should be completely water-proof.
- (2)The floor should be flat and level.
- (3)No flammable or explosive materials.
- (4)The ambient temperature is within the range from 0°C to 45°C.
- (5)The temperature and humidity are maintained at a constant level.
- (6)There is just a little dust and dirt in the area.
- (7)The distance from heat source should be more than 2 meters.
- (8)The distance from air outlet of inverter is more than 0.5 meters.
- (9)Installation areas should avoid direct sunlight.
- (10)No forced ventilation requirement for battery module, but please install in the environment allowed by the product parameters.
- (11)Before installing, check the output voltage of each module. Ensure the voltage difference of module is within 2V. If it is beyond this range, please discharge (charge) the modules or consult supplier or retailer.

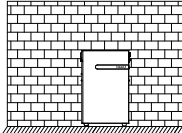
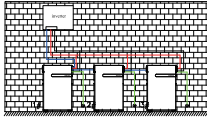
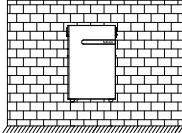
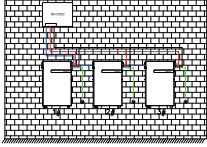
5.4 Installation Direction



Warning

Upside down	Sidelong	Sidelong
		
NOT allowed	NOT allowed	NOT allowed

The following placements are recommended.

	Method	Cautions	
1	Ground mounted 	1.Ensure that the Angle of the battery pack is less than 5° . 2.The ground is smooth and there is no water. The recommended distance between battery packs is 200 mm to 400mm.	
2	Wall mounted 	1.Ensure that each installation point of the battery pack can weigh at least 50kg. 2.Ensure that the bracket is close to the wall. 3.Ensure that the Angle of the battery pack is less than 5° . 4.The recommended distance between battery packs is 200 mm to 400mm.	

5.5 Installation Steps



Warning

- (1)Follow local electric safety and installation policy, a suitable breaker between battery system and inverter is required.
- (2)All installation and operation must follow local electric standard and requirements.
- (3)When battery modules are paralleled, the system should be powered off before installation operation.

Method 1: Ground mounted

- 1.Install the supports to the bottom of the battery pack using four M5 crown bolts with locking torque of 2N · m.

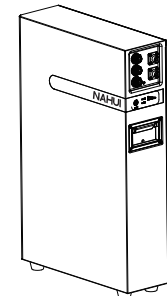
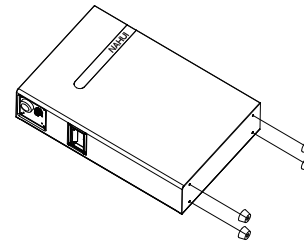


Figure 5-5

2. Ground wire connection of each module.

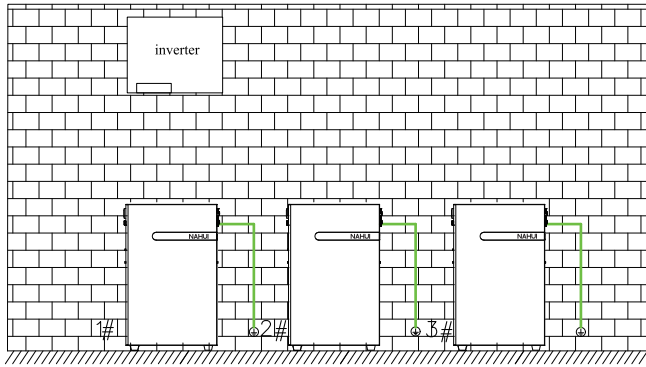


Figure 5-6

3. Connect communication cable.

First connect the parallel communication cable between the batteries. The Parallel Out of battery 1 is connected to the Parallel In of battery 2, and the Parallel Out of battery 2 is connected to the Parallel In of battery 3, and so on. Then connect the CAN or RS485 communication cable between the battery 1 (the master battery) and the inverter.

If one battery is running, there is no need to connect the parallel communication cable between the batteries.

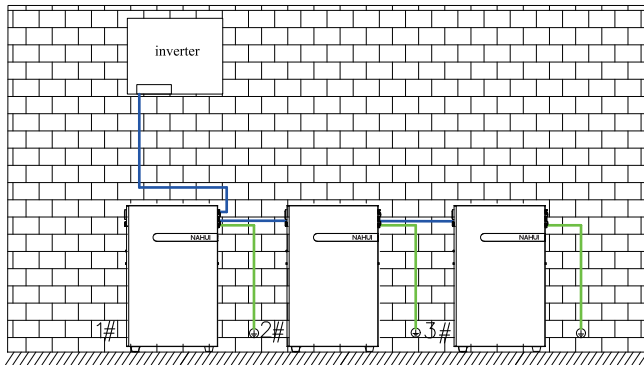


Figure 5-7

4. Connect power cable to the inverter.

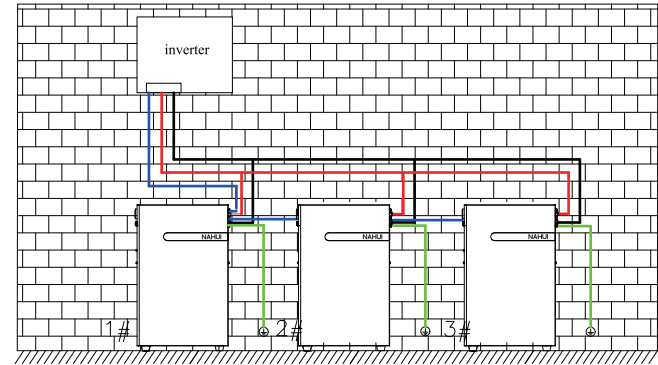


Figure 5-8

5. Press START switch of the master battery to start up, and if the system fails, the fault light will be on.

Method 2: Wall mounted

1. Mount the wall bracket to the wall using six expansion screws.

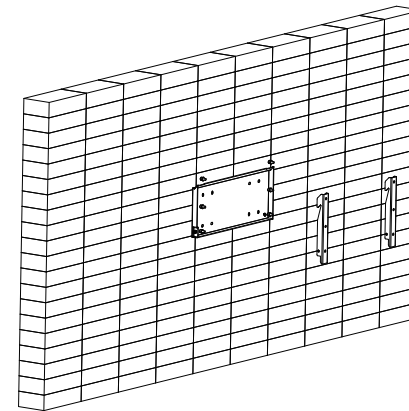


Figure 5-9

2. Install the bracket into the battery pack using six M6 bolts with locking torque of $9\text{N} \cdot \text{m}$.

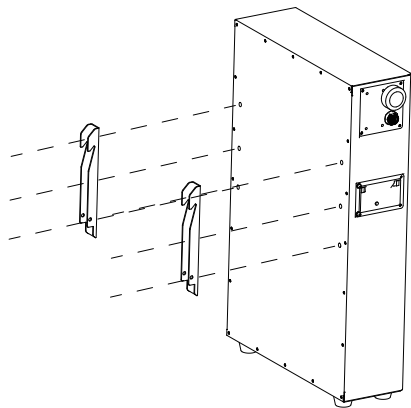


Figure 5-10

3. Install the battery pack on the wall bracket.

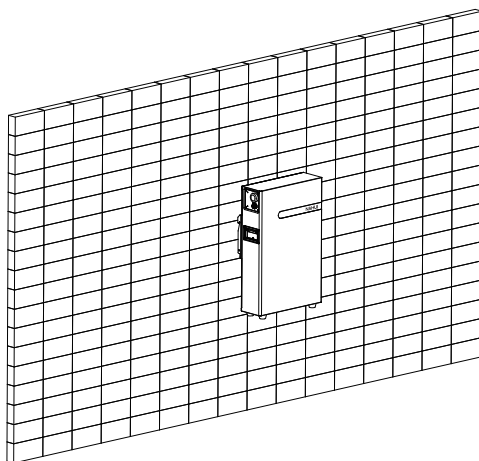


Figure 5-11

4. After connecting the cable between the battery and the inverter, reference the step in ground mounting to start the system.

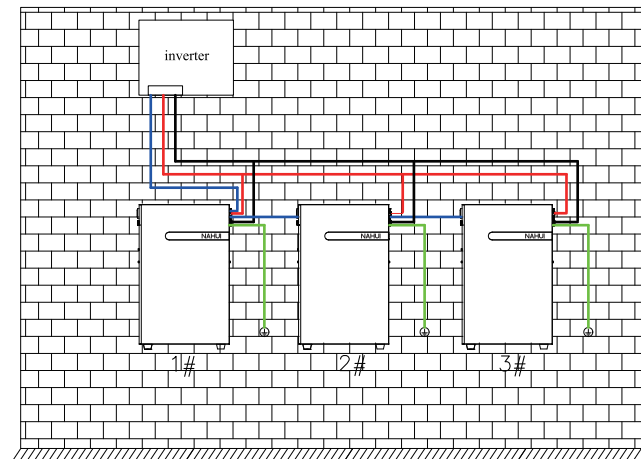


Figure 5-12

5.6 Power On

Double check that all power cables and communication cables should be properly connected.

(1) The battery that communicates with inverter is the master battery and other battery modules are slave battery. (1 master battery and 7 slave battery modules at most can be configured.)

(2) Press START metal switch of the master battery to start up, LED indicator lights turn on successively from "RUN" for 0.5 seconds.

(3) If the system is normal, the fault light is off; Otherwise, please check the wiring or startup steps.

Note

Before capacity expansion, system should be powered off. During capacity expansion or replacement, when modules with different SOC/voltages are connected in parallel, please keep the system idle for ≥ 15 minutes or until SOC LEDs become similar (≤ 1 point difference).

When the system is in the sleep mode and meets any of the following conditions, the system will exit the sleep mode and enter the normal operation mode.

(1) Connect the charger, and the charger output voltage shall be greater than 52V

(2) Press the start button (3-6s) and release the button.

(3) RS232 communication activated

5.7 Power Off

When battery is in working state, press the START metal switch of the master battery and release it. The system will switch to sleep mode, and all LED indicators will be off in turn.

Note

When any of the following conditions is met, the system enters the sleep mode:

- (1) Single cell or module voltage over discharge protection is not released within 300 seconds.
- (2) Press the start button (3~6s) and release the button.
- (3) The lowest unit voltage is lower than the sleep voltage, and duration reaches sleep delay time (and also meets the no communication, no protection, no balance and no current state at the same time.)
- (4) Standby time exceeds 24 hours (no communication, no charge and discharge at the same time).
- (5) Forced shutdown by upper control system.
- (6) System hardware failure.

Before entering sleep mode, ensure that the input side is not connected to external power, otherwise it will not be able to enter the sleep mode.

6 Storage conditions

Storage conditions of module: temperature 0 ~ 45°C, humidity ≤ 85%, state of charge 15%~ 40% SOC.

It is recommended that batteries operate within one month after shipment , so as to avoid the capacity loss and voltage attenuation caused by the self-discharge of lithium ion battery.

6.2 Long-term storage

Storage conditions of module: temperature 0 ~ 45°C, humidity ≤ 85%, state of charge 15% ~ 40% SOC.

If batteries are not charged for over 2 months, please charge and discharge batteries for 2~3 cycles to ensure best performance..

If it is stored for more than 3 months, it shall be tested and maintained every 3 months. If it is not tested or maintained for more than 6 months, NAHUI shall not be liable for any performance defects .

7 Emergency Situations

7.1 Battery Leakage

If the battery pack leaks electrolyte, avoid contact with the leaking liquid or gas. If one is exposed to the leaked substance, immediately perform the actions described below.

- (1) Inhalation: Evacuate contaminated area and seek medical attention.
- (2) Contact with eyes: Rinse eyes with flowing water for 15 minutes and seek medical attention.
- (3) Contact with skin: Wash affected area thoroughly with soap water and seek medical attention.

Ingestion: Induce vomiting and seek medical attention.

7.2 Fire

Only dry powder or carbon dioxide extinguisher can be used; if possible, move the battery module to a safe area before it catches fire.

7.3 Wet Batteries

If the module is wet or submerged in water, do not let people access it, then contact NAHUI or an authorized dealer for technical support. Cut off all power switch on inverter side.

7.4 Damaged Batteries

Damaged batteries are dangerous and must be handled with utmost care. They are not fit for use and may pose a danger to people or property. If the module seems to be damaged, pack it in its original container, then return it to authorized dealer.



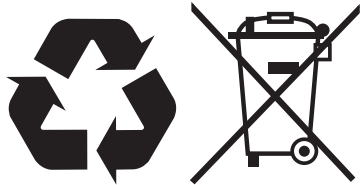
Warning

Damaged batteries may leak electrolyte or produce flammable gas.

8 Remarks

8.1 Recycle and Disposal

In case a battery (normal condition or damaged) needs disposal or needs recycling, it shall follow the local recycling regulation (i.e. Regulation (EC) N° 1013/2006 among European Union) to process, and using the best available techniques to achieve a relevant recycling efficiency.



8.2 Maintenance

- (1) It is required to charge the battery at least once every 6 months, for this charge maintenance make sure the SOC is charged to higher than 85%.
- (2) Check installation environment such as dust, water, insect etc. Make sure it is suitable for IP65 battery system. Connection of power connector, grounding point, power cable and screw are suggested to be checked every year.

8.3 Declaration of conformity

The battery system described in this document complies with the applicable European directives.

9 Troubleshooting

Users can understand the fault status of the battery through indicator lights or monitoring software. Once the user knows the fault Phenomenon, refer to the following sections for solutions.

Fault Phenomenon	Cause	Solution
Button startup failed	The BMS is not activated by the button, and the battery cannot be turned on	1. Check the status of buttons and cables. 2. Start up and check the BMS status through monitoring software. 3. Activate BMS through external voltage. 4. If there is a hardware malfunction, please contact the local engineer.
Charging/discharging Over Temperature Protection	The cell temperature is higher than the cell temperature protection value.	1. Install the battery in the allowed temperature environment. 2. Restart after 1 hour of system shutdown
Charging/discharging Under Temperature Protection	The ambient temperature is too low, causing the cell temperature to be lower than the minimum allowable temperature.	1. Install the battery in the allowed temperature environment. 2. When the temperature of the battery cell exceeds the threshold, turn on the system.
Ambient Over Temperature Protection	The ambient temperature of the battery is higher than the maximum allowable temperature of the system	1. Please install the battery in the allowed temperature environment according to the user manual.
Ambient Under Temperature Protection	The ambient temperature of the battery is lower than the maximum allowable temperature of the system	1. Please install the battery in the allowed temperature environment according to the user manual
MOS Over Temperature Protection	The MOS temperature of the BMS is higher than the maximum allowable temperature.	1. Please shut down the system. 2. Restart after 1 hour. 3. If the malfunction occurs again, please contact the local engineer.
Charging/discharging Over Current Protection	Due to load or hardware reasons, the charging and discharging current is above the threshold.	1. Restart the inverter to see if the fault still exists. If it still exists, please contact the local engineer.
Charging Over Voltage Protection	Cell or battery voltage above threshold.	1. Shut down the system 2. Measure the battery port voltage and the BMS detection voltage to be the same. 3. If the fault cannot be eliminated after 1 hour, please contact the local engineer.
Discharging Under Voltage Protection	Cell or battery voltage below threshold	1. Please charge immediately until the fault disappears. 2. If the fault occurs frequently, please contact the local engineer.
Internal Fault	System production line hardware failure, unable to charge and discharge	1. Check if the internal communication cable. 2. Check BMS for any errors. 3. Check if the sampling line of the battery cell. 4. If the fault cannot be eliminated, please contact the local engineer.
Excessive voltage difference	The voltage difference between battery cells is greater than the threshold	1. Measure the actual voltage of the battery cell through an instrument. 2. Battery damage, please contact the local engineer.
Low Battery	Battery level below threshold due to prolonged standby or discharge	1. Please charge immediately until the fault disappears.

Qingdao Nahui Energy Technology Co., LTD.

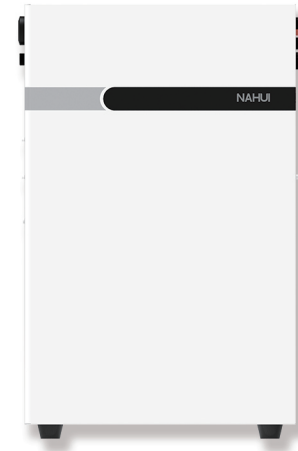
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NAHUI

User manual

Low Voltage Energy Storage System



NLW-1Y5K