User Manual

1K5-BAT-4660

In order to prevent improper operation before use, please carefully read this manual.

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1. Introduction

The document describes the installation, commissioning, maintenance and troubleshooting of the following high voltage battery listed below.
1K5-BAT-4660
Note: 1K5-BAT-4660 = (1K5-BAT-M-4660)+(1K5-BAT-S-4660)
The battery chemistry of these products is Lithium Iron Phosphate. This manual is designed for qualified personnel only. The tasks described in this document should be performed by authorized and qualified technicians only.
After Installation the Installer must explain the user manual to the end user.

2. Symbols

	Symbol Explanation CE mark. The inverter complies with the requirements of the applicable CE guidelines.
	This mark indicates compound UK product safety certification requirements.
	Caution, risk of electric shock.
	Do not place nor install near flammable or explosive materials.
	Install the product out of reach of children.
	Read the instruction manual before starting installation and operation.
	Do not dispose of the product with household wastes.
	Disconnect the equipment before carrying out maintenance or repair.
	Observe precautions for handling electrostatic discharge sensitive devices.
	PE conductor terminal
	Caution, risk of electric shock, energy storage timed discharge.

3. Safety

Any work on the Batteries should be handled by authorized technicians and hence it is understood that the technicians should familiarize themselves with the contents of this manual before any maintenance or installation is carried out on the system.

3.1 Handling

- Do not expose battery to open flame.
- Do not place the product under direct sunlight.
- Do not place the product near flammable materials. It may lead to fire or explosion in case of accident.
- Store in a cool and dry place with ample ventilation.
- Do not store the product near water sources.
- Store the product on a flat surface.
- Store the product out of reach of children and animals.
- Do not damage the unit by dropping, deforming, impacting, cutting or penetrating with a sharp object. It may cause leakage of electrolyte or fire.
- Do not touch any liquid spilled from the product. There is a risk of electric shock or damage to skin.
- Always handle the battery wearing the insulated gloves.
- Do not step on the product or place any foreign objects on it. This can result in damage.
- Do not charge or discharge damaged battery.
- Do not store the battery near water sources.

3.2 Installation

- Do not connect the to inverter conductors or Photo-Voltaic conductors. This will damage the battery and may result in explosion.
- After unpacking, please check the product for damages and missing parts.
- Make sure that the inverter and battery is completely turned off before commencing installation.
- Do not interchange the positive and negative terminals of the battery.
- Ensure that there is no short circuit of the terminals or with any external device.
- Do not exceed the battery voltage rating of the inverter.
- Do not connect the battery to any incompatible inverter.
- Do not connect different battery types together.
- Please ensure that all the batteries are grounded properly.
- Do not open the battery to repair or disassemble. Only professional maintenance personnel are allowed to carry out any such repairs.
- In case of fire, use only dry powder fire extinguisher. Liquid extinguishers should not be used.
- Do not install the battery near water sources or places where the battery can get flooded.
- Install the battery away from children or pets.
- Do not use battery in high static environment where the protection device might be damaged.
- Do not install with other batteries or cells.
- Please ensure on installation site that the deviation of voltages between new batteries and every single present battery is less than 0.5V.
- Please ensure the new batteries mounted on-site comply to the warranty scope or have ever been re-charged within 5 months; on top of that, please make sure the SOC of present battery system onsite is 50%±5%.

4. Response to Emergency Situations

The batteries comprise of multiple batteries connected in series. It is designed to prevent hazards or failures. However, Cannot guarantee their absolute safety.
Under exposure to the internal materials of the battery the following recommendations should be carried out by the user.

- If there has been inhalation, please leave the contaminated area immediately and seek medical attention.
- If there has been contact with eyes, rinse the eyes with running water for 15 minutes and seek medical attention immediately.
- If there has been contact with the skin, wash the contacted area with soap thoroughly and seek medical attention immediately.
- If there has been ingestion, induce vomiting and seek medical attention.

Fire Situation
In situations where the battery is on fire, if it is safe to do so, disconnect the battery pack by turn off the circuit breaker to shut off the power to the system. Use FM-200 or Co2 fire extinguisher for the battery and an ABC fire extinguisher for the other parts of the system.
Under any fire situation, please evacuate the people from the building immediately before trying to extinguish it.
Water Situation
The battery modules are not water resistant. Hence care should be taken not to get it wet. If you find the battery completely or partially submerged in water do not try to open. Contact an authorized personnel for further instructions.

5. Product Information

1. 1K5-BAT-S-4660 is the battery module, and 1K5-BAT-M-4660 includes system controller and battery module;
2. 1K5-BAT-M-4660 contains the controller of the entire system, so each system must have one 1K5-BAT-M-4660;
3. Our system consists of at least one piece of 1K5-BAT-M-4660 and one piece of 1K5-BAT-S-4660 and up to one piece of 1K5-BAT-M-4660 and eight pieces of 1K5-BAT-S-4660.

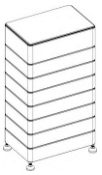
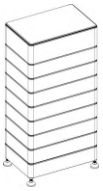
5.1 1K5-BAT-S-4660 Specifications

Specifications for 1K5-BAT-S-4660	
Model NO.	1K5-BAT-S-4660
Max. charge/discharge current (A)	50
Operating temperature (°C)	Charge: 0~55 Discharge: -10~55
Storage temperature (°C)	-10~35
Humidity (%)	5~95
Normal voltage (V)	44.8
Normal capacity (Ah)	104
Normal energy (kWh)	4.66
Usable Energy (kWh)*1	4.19
Battery voltage range (V)	40.6~51.5
Max. Continuous discharge/charge current (A)	50/50
(CC-CV) Standard charging current (A)	30
Constant current and voltage charging cut-off current (A)	5.3
Peak discharge current (60s) (A)	65
Altitude (m)	≤2000
Dimensions (L*W*H) (mm)	570*380*172
Weight (Kg)	39±1
Communication interfaces	CAN

5.2 1K5-BAT-M-4660 Specifications

Specifications for 1K5-BAT-M-4660	
Model NO.	1K5-BAT-M-4660
Max. charge/discharge current (A)	50
Operating temperature (°C)	Charge: 0~55 Discharge: -10~55
Storage temperature (°C)	-10~35
Humidity (%)	5~95
Normal voltage (V)	44.8
Normal capacity (Ah)	104
Normal energy (kWh)	4.66
Usable Energy (kWh)*1	4.19
Battery voltage range (V)	40.6~51.5
Max. Continuous discharge/charge current (A)	50/50
(CC-CV) Standard charging current (A)	30
Constant current and voltage charging cut-off current (A)	5.3
Peak discharge current (60s) (A)	65
Altitude (m)	≤2000
Dimensions (L*W*H) (mm)	570*380*188
Weight (Kg)	43±1
Communication interfaces	CAN

5.3 Battery System Specifications for 1K5-BAT-4660

Specifications for 1K5-BAT-4660								
Model No.	1K5-BAT-4660-L2	1K5-BAT-4660-L3	1K5-BAT-4660-L4	1K5-BAT-4660-L5	1K5-BAT-4660-L6	1K5-BAT-4660-L7	1K5-BAT-4660-L8	1K5-BAT-4660-L9
Technical Properties								
Battery designation*	IFpP53/149/113/[(14S)2S]E/-10+50/90	IFpP53/149/113/[(14S)3S]E/-10+50/90	IFpP53/149/113/[(14S)4S]E/-10+50/90	IFpP53/149/113/[(14S)5S]E/-10+50/90	IFpP53/149/113/[(14S)6S]E/-10+50/90	IFpP53/149/113/[(14S)7S]E/-10+50/90	IFpP53/149/113/[(14S)8S]E/-10+50/90	IFpP53/149/113/[(14S)9S]E/-10+50/90
The number of batteries	1(1K5-BAT-M-4660)+1(1K5-BAT-S-4660)	1(1K5-BAT-M-4660)+2(1K5-BAT-S-4660)	1(1K5-BAT-M-4660)+3(1K5-BAT-S-4660)	1(1K5-BAT-M-4660)+4(1K5-BAT-S-4660)	1(1K5-BAT-M-4660)+5(1K5-BAT-S-4660)	1(1K5-BAT-M-4660)+6(1K5-BAT-S-4660)	1(1K5-BAT-M-4660)+7(1K5-BAT-S-4660)	1(1K5-BAT-M-4660)+8(1K5-BAT-S-4660)
Normal voltage (V)	89.6	134.4	179.2	224.0	268.8	313.6	358.4	403.2
Normal capacity (Ah)	104	104	104	104	104	104	104	104
Normal energy (kWh)	9.32	13.98	18.64	23.30	27.96	32.61	37.27	41.93
Battery voltage range (V)	81.2~103.0	121.8~154.5	162.4~206.0	203.0~257.6	243.6~309.1	284.2~360.6	324.8~412.2	365.4~463.7
Max.charge/ discharge current (A)	50/50							
(CC-CV) Standard charging current (A)	30							
Constant current and constant voltage charging cut-off current (A)	5.3							
Peak discharge Current (60s) (A)	65							
Storage temperature (°C)	-10~35							
Operating Temperature range (°C)	Charge: 0~55 Discharge: -10~55							
Discharge capacity (Ah)	90@-20±2°C @1/3C 104@25±2°C @1C 104@55±2°C @1C							
Cycle life	≥6000 @25°C @ 70%SOH							
Ingress protection	IP65							
Protective class	Class I							
Demensions (L x W x H) (mm)	570*380*386	570*380*524	570*380*662	570*380*800	570*380*938	570*380*1076	570*380*1214	570*380*1352
Weight (kg)	83.5	122.5	161.5	200.5	239.5	278.5	317.5	356.5
Communication interfaces	CAN							
Standard	IEC 62477-1;IEC 62619							

Note:The battery designation is a series of numbers that represent the battery's positive and negative electrode types, structure and size, charge and discharge rate, and operating temperature range.

6. Product Features

6.1 Battery System Features

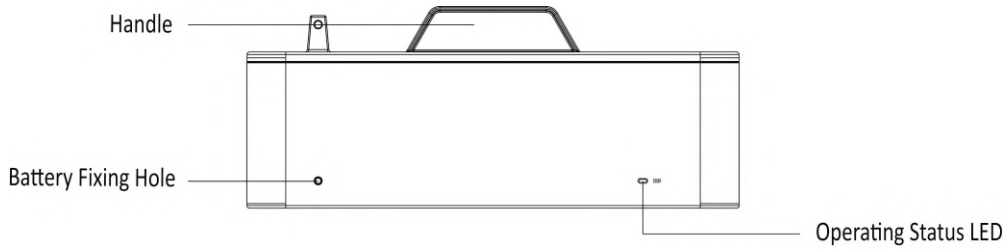
The batteries have been fitted with multiple protection systems to ensure the safe operation of the system. Some of the protection system includes:

- Inverter interface protection: Over voltage, Over current, External Short Circuit, Reverse Polarity, Ground Fault, Over Temp, In rush current
- Battery Protection: Internal Short Circuit, Over voltage, over current, over temp, Under voltage

The battery system contains the following Interface to allow it to connect and operate efficiently.

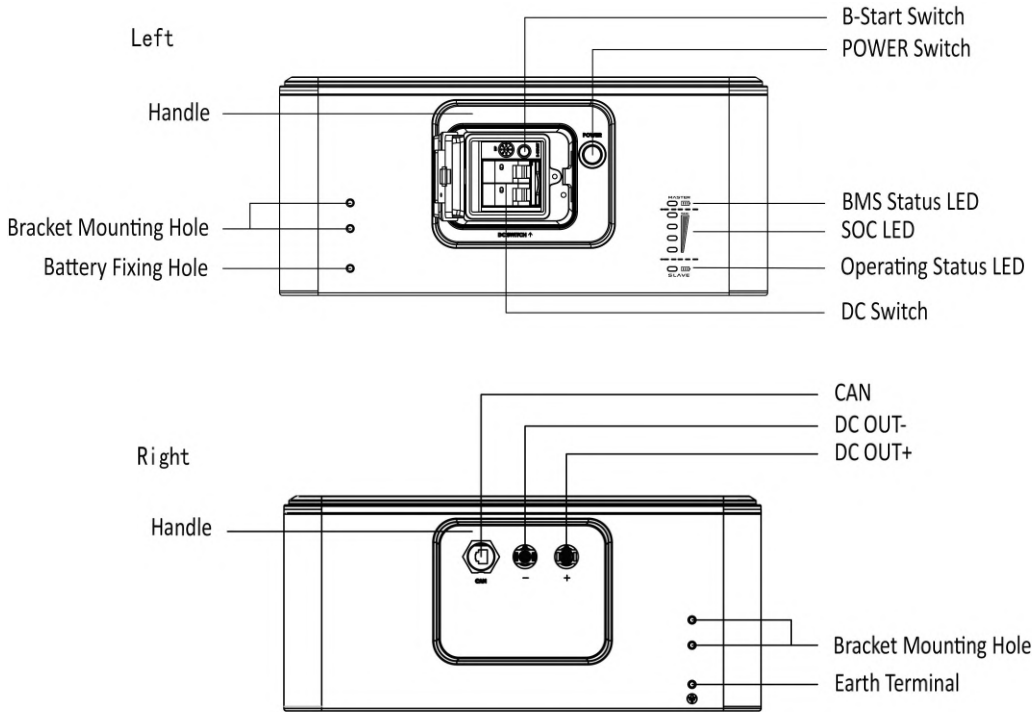
1K5-BAT-S-4660 Features:

- interface:



1K5-BAT-M-4660 Features:

- interface:



DC switch
Power switch, battery charge and discharge circuit switch.
DC OUT +
Connect bat + of inverter.
DC OUT -
Connect bat - of inverter.
POWER switches
System power on switch, press this switch, the system starts to work.

B-Start switches
After power on, press this button for 5s.
BMS Status LED and SOC LED
LED display specific alarm information and battery system power.
Operating status LED
This LED is used to indicate if the battery is operating effectively. A green light on this LED means the battery is ON and operating normally. If the battery is operating failure, a red light on this LED means the battery is operating abnormally.

6.2 Monitoring Methods

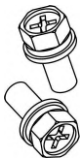
Battery system remote monitoring available via inverter app.

7. Installation

7.1 Items in the package

Please check if following items are including with the package:

For 1K5-BAT-S-4660



A

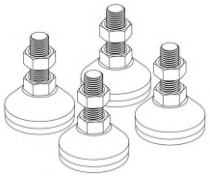
B

No.	Items
A	Mounting screw pack
B	Installation guide

For 1K5-BAT-M-4660

C

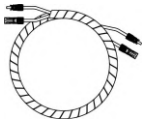
D



E

F

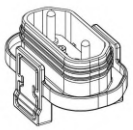
G



H

I

J



K

L

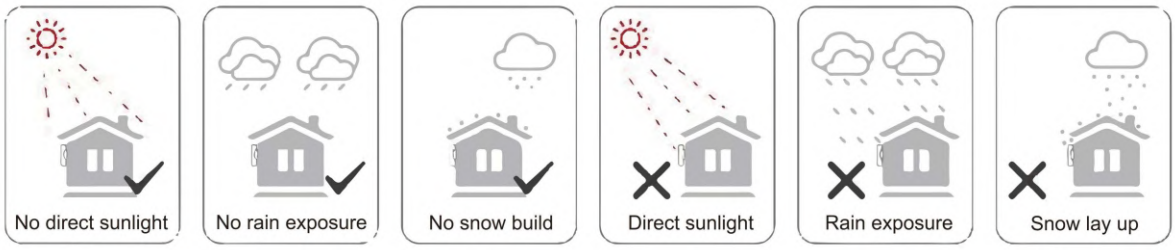
No.	Items	No.	Items
C	Mounting screw pack	H	DC output cable
D	Fixing bracket	I	Installation guide
E	Footstand	J	Expansion tube*2 & Expansion screw*2
F	Communication cable (BMS-Inverter)	K	Waterproof cover
G	Grounding cable	L	RJ45

7.2 Installation Precaution

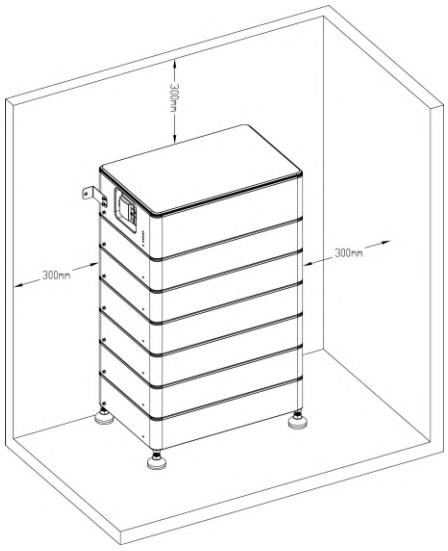
Make sure the installation site meets the following conditions:

- Not in direct sunlight.
- Not in areas where highly flammable materials are stored.
- Not in potential explosive areas.
- Not in the cool air directly.
- Not within two meters from heat source such as radiator
- Not near the television antenna or antenna cable.
- Not higher than altitude of about 2000m above sea level.
- Not in environment of precipitation or humidity (> 95%).
- Under good ventilation condition.
- Suitable for Indoor and outdoor.

Please avoid direct sunlight, rain exposure, snow laying up during installation and operation.



7.3 Clearance



Note:Make sure to leave a space of at least 300 mm. A clearance of at least 300 mm must be left around the battery pack for proper cooling.
Note: Make sure that the battery pack is always exposed to the ambient air. The battery pack is cooled by natural convection. If the battery pack is entirely or partially covered or shielded, it may cause the battery pack to stop operating.

7.4 Tools

The following tools will be required to install 1K5-BAT-M-4660 and 1K5-BAT-S-4660.

6mm Magnetic Phillips Screwdriver

Crimpers

Safety Shoes

Multimeter

Safety Gloves

Safety Glasses

Plier

Cable Ties

Hammer Drill @φ8mm

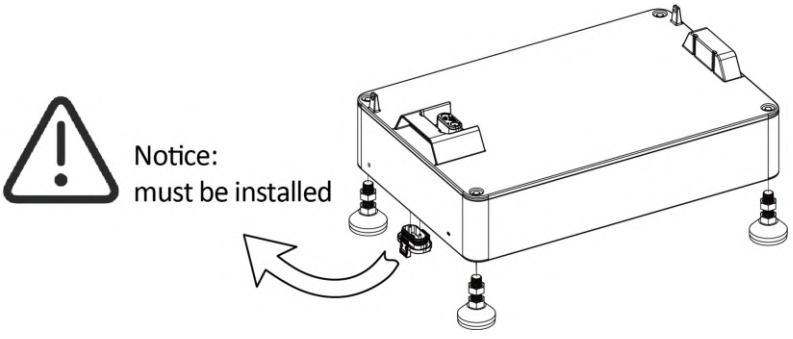
Spirit Level

Tape

Marker

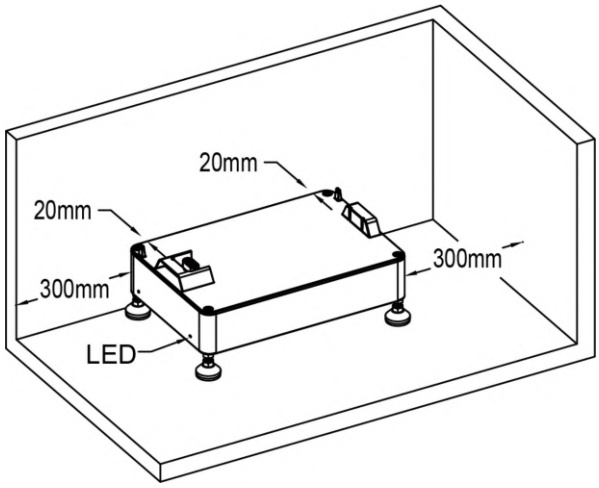
7.5 Installation Steps

Step 1: Install a 1K5-BAT-S-4660 with four footstand (Item E) and place it on the ground and adjust it to the level. After installing the footstand, use a track level bar to confirm the level. Insert the waterproof cover(Item K) into the bottom of the battery and lock it in place with the clip.

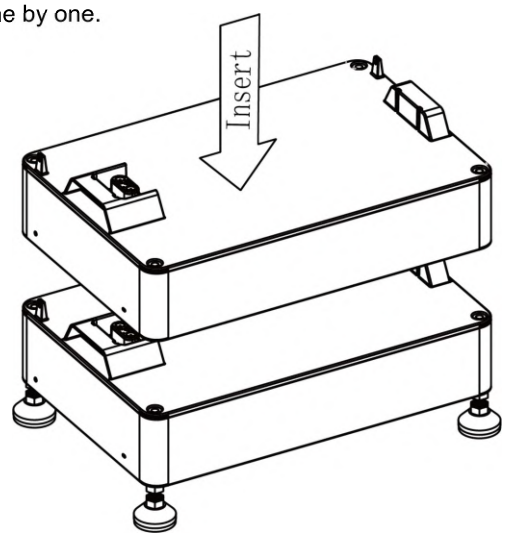


Step 2: Place the battery 20mm against the wall.

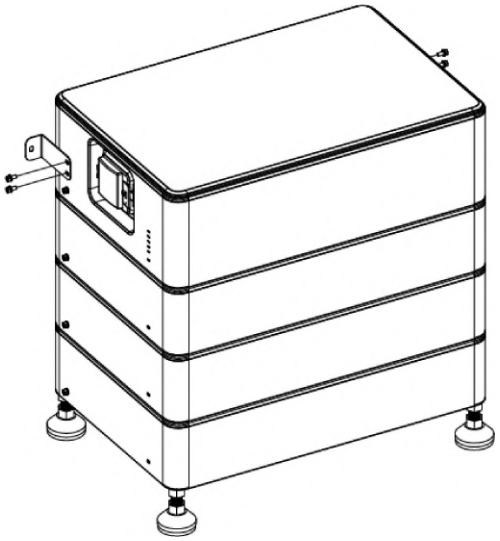
Note: Please make sure the Operating Status LED is on your left handside when you facing the battery model.



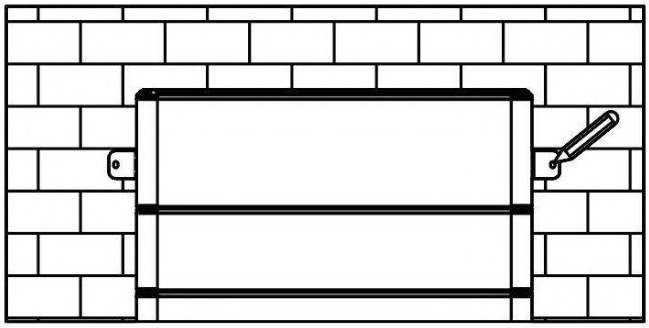
Step 3: Stack the batteries one by one.



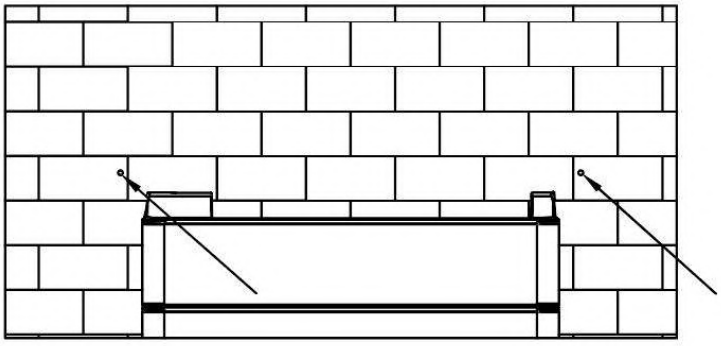
Step 4: Place the two fixing brackets (Item D) close to the wall and install them on both sides of the battery.



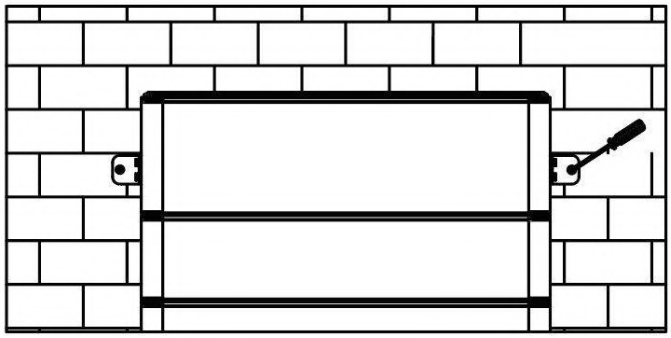
Step 5: Mark the wall through the bracket hole.



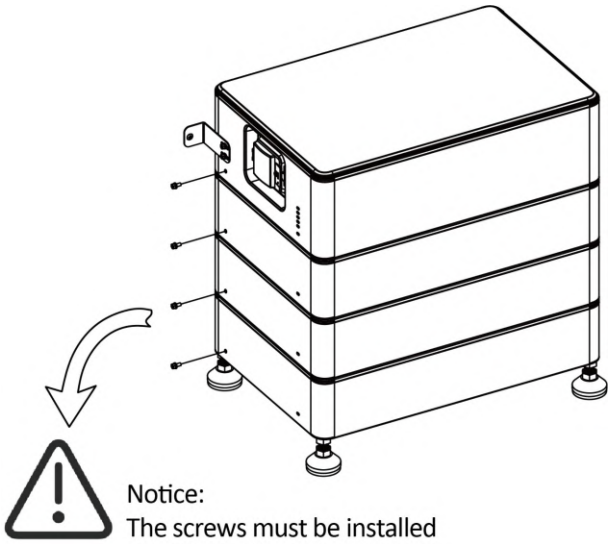
Step 6: Punch after removing the 1K5-BAT-M-4660. Drill holes with electric drill, make sure the holes are at least 50mm deep, and then tighten the expansion tubes (Item J).



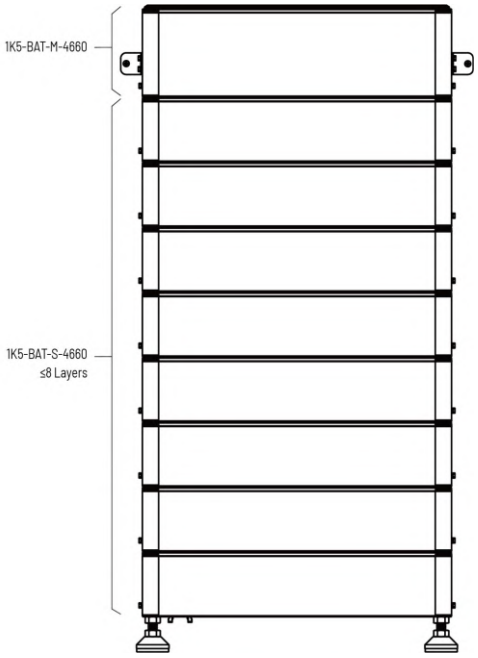
Step 7: After stacking 1K5-BAT-M-4660 again, fix the battery on the wall.



Step 8: Fix the mounting screw packs (Item C) on both sides of the battery, the installation is over.



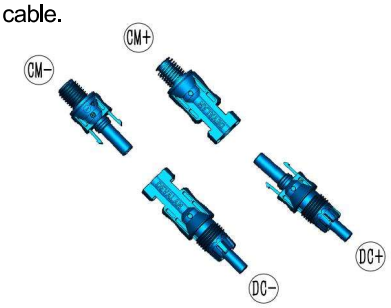
Note: Please make sure each system including 1 1K5-BAT-M-4660 and 1 1K5-BAT-S-4660. 1K5-BAT-S-4660 less than 8(1~8) pieces:



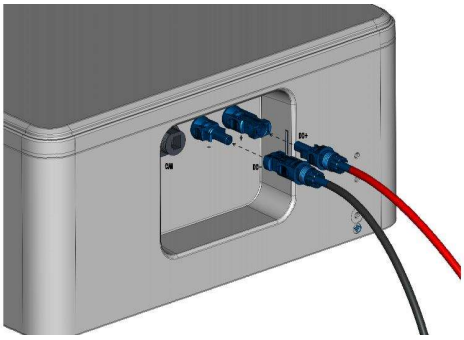
Note:When used with an inverter, the battery system voltage must meet the inverter battery port voltage range.
After the battery modules are stacked and installed, DC connectors and communication cables are installed separately.

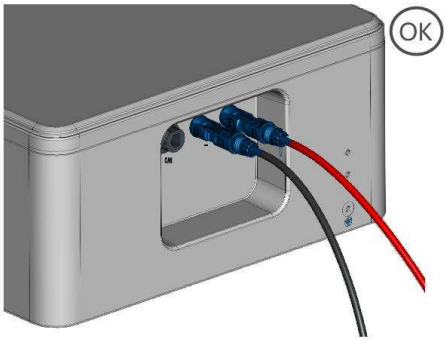
7.6 Wiring Steps

A: The connection steps of the battery CM power cable are presented below. CM+ and CM- are the connectors on the CM module. DC+ and DC- are the connectors of the supplied power cable. Follow the steps below to securely connect the CM power cable.

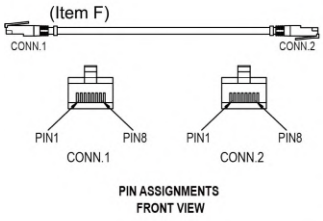


Step 1: Connect the supplied power cable to the DC connectors of the CM module. The DC+ is connected to the CM+ connector and the DC- is connected to the CM- connector.
Step 2: Push the connectors until they are locked with a 'click' sound.
Note: The opposite side of the supplied power cable is connected to the inverter battery DC port. For the wiring on the inverter side, please refer to the inverter manual.



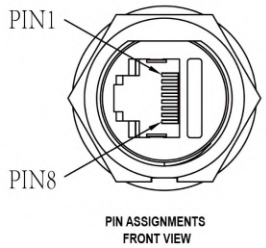


For indoor use, please use item F for the communication cable.
Step 1: Insert the communication cable connector into CM communication port. The other side is connected to the bottom of the inverter.

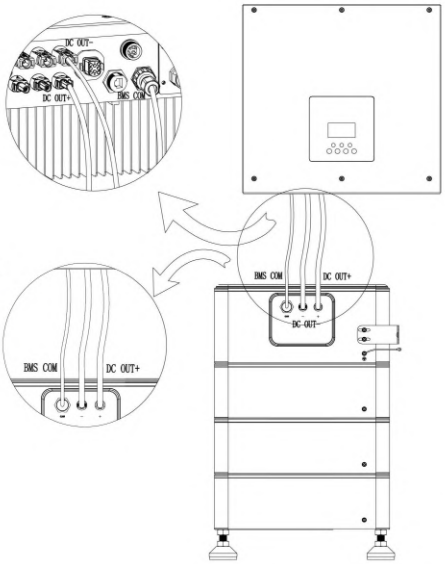


CONN.1 PIN	CONN.2 PIN
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8

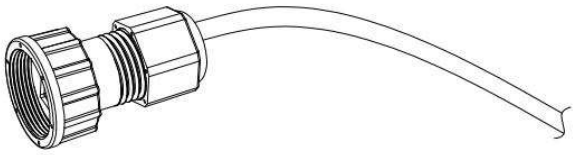
Note: Default wire harness PIN to PIN



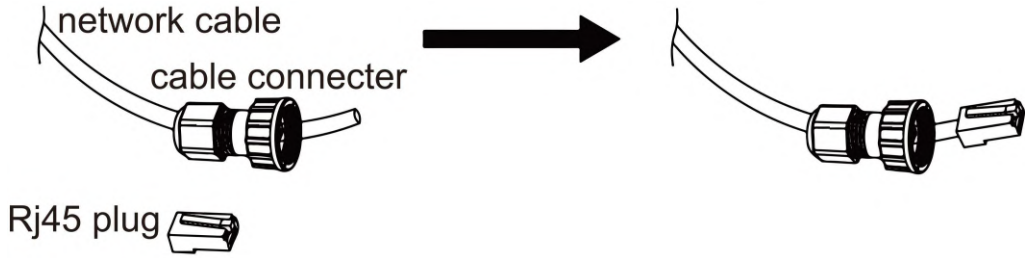
PIN	Function Definitions
1	A-START
2	GND
3	RS485-B
4	BMS-CANL
5	BMS-CANH
6	BMS-CANH
7	BMS-CANL
8	RS485-A



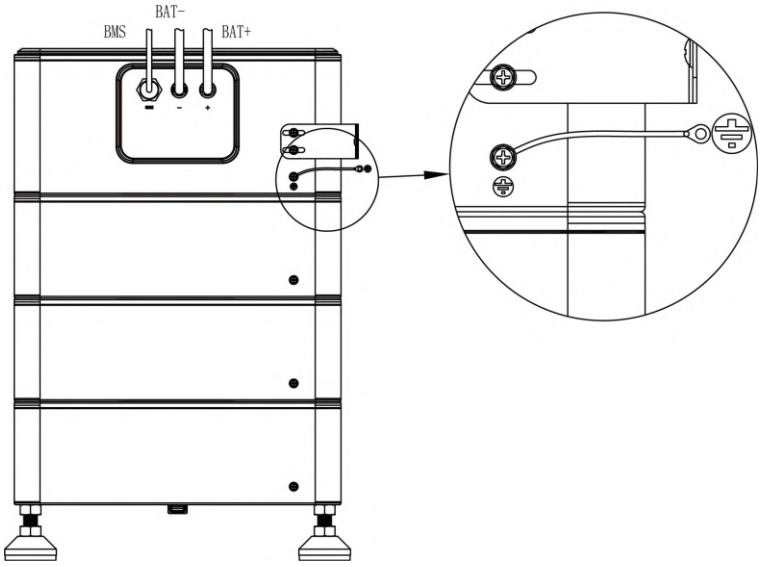
For outdoor use, please use item L for the communication cable.
Step 1: Prepare a standard network cable and cable connector, then insert the network cable through the cable connector.



Step 2: Crimp the cable with a Rj45 plug which is inside of the cable connector.



B: Connect the grounding cable to ensure that all batteries are grounded. Wiring shall be connected in the sequence as shown in below.



7.7 System Start up

- When the grid connected system is started, the inverter should be turned on first to avoid the current pulse of the inverter increasing to the battery pack.
- All installation and operation must comply with local electrical standards.
- Check all power cables and communication cables carefully.

1.**Turn on the POWER switch**

- Turn on DC switch and press the POWER switch, firstly Mater LED will light up once, and then the BMS Status LED will light up for 0.5s,Operating Status LED will light up for 1s at the same time,it means that the system works normally.

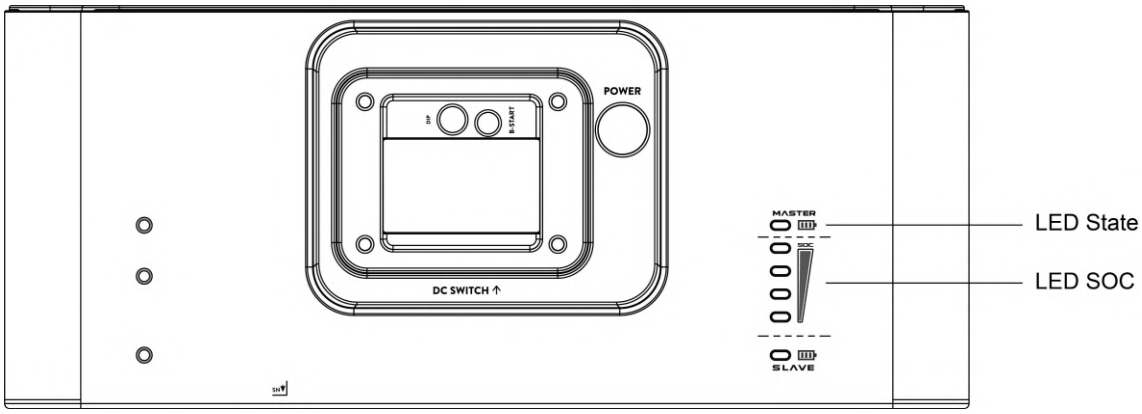
8. Commissioning

The operating status light on the left side of the battery pack shows its working status.

For 1K5-BAT-S-4660

Green LED	Red LED	Batteries Status
On for 0.5s, Off for 0.5s	On for 0.5s, Off for 0.5s	Runing in boot
On for 0.1s, Off for 0.1s	On for 0.1s, Off for 0.1s	Upgrading
On for 1s, Off for 1s	Off	Normal Working
Off	On for 1s, Off for 1s	Alarm

For 1K5-BAT-M-4660



SOC	System Status	LED State	LED SOC			
=100%	Standby	■	●	●	●	●
100% > SOC >= 75%		■	●	●	●	●
75% > SOC >= 50%		■	/	●	●	●
50% > SOC >= 25%		■	/	/	●	●
25% > SOC >= 0%		■	/	/	/	●
=100%	Discharge	●	●	●	●	●
100% > SOC >= 75%		●	●	●	●	●
75% > SOC >= 50%		●	/	●	●	●
50% > SOC >= 25%		●	/	/	●	●
25% > SOC >= 0%		●	/	/	/	●
=100%	Charge	●	■	■	■	■
100% > SOC >= 75%		●	■	■	■	■
75% > SOC >= 50%		●	/	■	■	■
50% > SOC >= 25%		●	/	/	■	■
25% > SOC >= 0%		●	/	/	/	■

Fault	LED State	LED SOC			
Under voltage fault	■	/	/	/	●
Over voltage fault	■	/	/	●	/
Over temperature fault	■	/	/	●	●
Under temperature fault	■	/	●	/	/
Discharge over current	■	/	●	/	●
Charge over current	■	/	●	●	/
Discharge over power	■	/	●	●	●
Charge over power	■	●	/	/	/
Pre-Charge failed	■	●	/	/	●
Short circuit Protection	■	●	/	●	/
AFE communication failed	■	●	/	●	●
Module Addressing failed	■	●	●	/	/
IVU Communication failed	■	●	●	/	●
BMU Communication failed	■	●	●	●	/
PCS Communication failed	■	●	●	●	●
HVB FUSE fault	●	/	/	/	●
Module FUSE fault	●	/	/	●	/
Power failed	●	/	/	●	●
Internal total voltage sampling failed	●	/	●	/	/
Temperature sampling failed	●	/	●	/	●
Relay adhesion	●	/	●	●	/
Relay Not Close	●	/	●	●	●
Relay drive failed	●	●	/	/	/
Single Cell "0V" fault	●	●	/	/	●
Temperature high permanent failed	●	●	/	●	/
The Single voltage high permanently failed	●	●	/	●	●
SOH low protection	●	●	●	/	/
AFE failed (UV/OV/UT/OT)	●	●	●	/	●
Shutdown failed	●	●	●	●	/
Other fault	●	●	●	●	●

Remark:
■: LED flash display (on: 0.5s, off: 0.5s)
●: LED on display

9. System Shut Down

First turn off the Power Switch, and then turn off the DC switch,all LEDs are off when POWER switch is turned off.

10. Exclusion

The warranty shall not cover the defects caused by normal wear and tear, inadequate maintenance, handling, storage faulty repair, modifications to the battery or pack by a third party other than agent, failure to observe the product specification provided herein or improper use or installation, including but not limited to the following.

- Damage during transport or storage.
- Incorrect Installation of battery into pack or maintenance.
- Use of battery pr pack in inappropriate environment.
- Improper, inadequate, or incorrect charge, discharge or production circuit other than stipulated herein.
- Incorrect use or inappropriate use.
- Insufficient ventilation.
- Ignoring applicable safety warnings and instructions.
- Altering or attempted repairs y unauthorized personnel.
- In case of force majeure (ex: lightning, storm, flood, fire, earthquake, etc.).
- There are no warranties-implied or express-other than those stipulated herein. Shall not be liable for any consequential or indirect damages arising or in connection with the product specification, battery or pack.

11. Troubleshooting and Maintenance

11.1 Maintenance

A. Regularly check whether the service environment of the battery meets the requirements, and the installation position should be far away from the heat source.

B. The battery module should be stored in an environment with a temperature range between -20°C-+55°C, and charged regularly according to the table below with no more than 0.5 C(A C-rate is a measure of the rate at which a battery is discharged relative to its maximum capacity.) to the SOC of 50% after a long time of storage.

Storage environment temperature	Relative humidity of the storage environment	Storage time	SOC
Below -20°C	/	Not allowed	/
-20~35°C	5%~70%	≤ 6 months	20%≤SOC≤60%
35~55°C	5%~70%	≤ 3 months	20%≤SOC≤60%
Above 55°C	/	Not allowed	/

NOTICE
Damage to the system due to under voltages ● Charge the over-discharged system within seven days when the temperature is above 25℃. ● Charge the over-discharged system within seven days when the temperature is below 25℃.

C. Regularly check whether the battery and its supporting terminals, connecting cables and indicator lights are normal.

11.2 Troubleshooting

When the red / green LED on the panel is flashing or normally on, it does not mean that the 1K5-BAT-S-4660 is abnormal, it may be just an alarm or protection. Please check the 'LED status indicators' in chapter 8 for the detailed faulty definition before any trouble-shooting steps. In general, the alarm indication is normal without manual intervention. When the alarm triggering state is removed, 1K5-BAT-S-4660 will automatically return to normal use.

- Problem determination based on the following points

1) Whether the green light on the power switch is on;
2) Whether the buzzer in 1K5-BAT-M-4660 on;
3) Whether the battery system can be communicated with inverter;
4) Whether the battery can be output voltage or not.

- Preliminary determination steps

Battery system cannot work, when DC switch on and POWER on, the LED doesn't light up or flash, please consider contact the local distributor.

1) The LED display of 1K5-BAT-M-4660 and 1K5-BAT-S-4660 is normal, but it cannot charge and discharge. Observe the display screen of inverter and there is no SOC. Please check whether the CAN communication between 1K5-BAT-M-4660 to inverter is well connected. If the connection is good, please replace a CAN communication cable. If the SOC is still not visible on the inverter display screen, please contact the local distributor.
2) After the battery system is powered on, if you can see the alarm information on the LED and inverter display screen at the same time, please contact the local distributor.

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