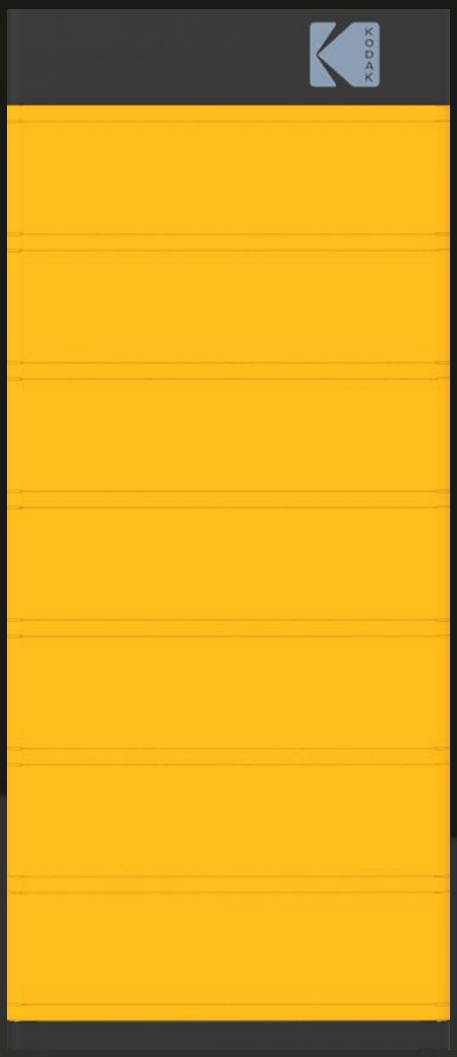
KODAK Solar Battery Storage

L1-BMU-BASE
L1-BATT



L1 Operation Manual

Information Version 1.0

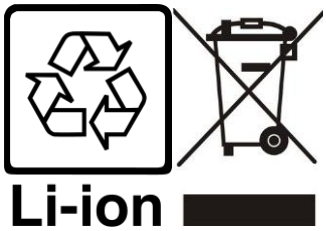
Please read this manual carefully before installing and operating the storage battery.
Please keep this manual with you for further reference.

Table of Contents

1. Safety Precautions

Reminding

1) It is very important and necessary to read the user manual carefully (in the accessories) before installing or using battery. Failure to do so or to follow any of the instructions or warnings in this document can result in electrical shock, serious injury, or death, or can damage battery, potentially rendering it inoperable.
2) If the battery is stored for long time, it is required to charge them every six months, and the SOC should be no less than 90%;
3) Battery needs to be recharged within 12 hours, after fully discharged;
4) Do not expose cable outside;
5) All the battery terminals must be disconnected for maintenance;
6) Please contact the supplier within 24 hours if there is something abnormal.
7) Do not use cleaning solvents to clean battery;
8) Do not expose battery to flammable or harsh chemicals or vapors;
9) Do not paint any part of battery, include any internal or external components;
10) Do not connect battery with PV solar wiring directly;
11) The warranty claims are excluded for direct or indirect damage due to items above.
12) Any foreign object is prohibited to insert into any part of battery.



Warning

1.1 Before Connecting

1) After unpacking, please check product and packing list first, if product is damaged or lack of parts, please contact with the local retailer;
2) Before installation, be sure to cut off the grid power and make sure the battery is in the turned-off mode;
3) Wiring must be correct, do not mistake the positive and negative cables, and ensure no short circuit with the external device;
4) It is prohibited to connect the battery with AC power directly;
5) The embedded BMS in the battery is designed for 48VDC, please DO NOT connect battery in series;
6) Battery system must be well grounded and the resistance must be less than 1Ω;
7) Please ensured the electrical parameters of battery system are compatible to related equipment;
8) Keep the battery away from water and fire.

1.2 In Using

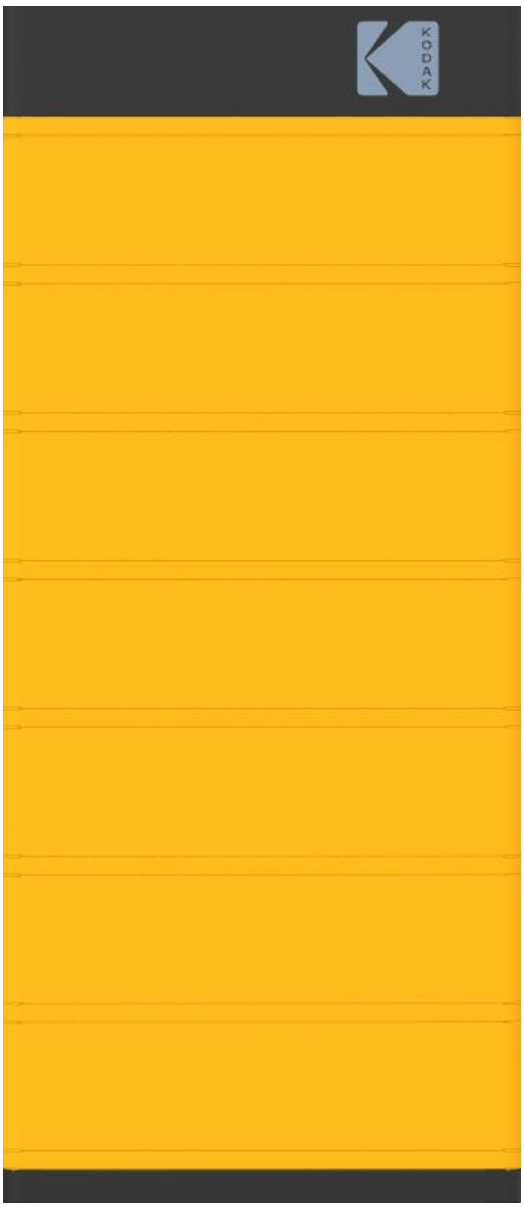
1) If the battery system needs to be moved or repaired, the power must be cut off and the battery is completely shut down;
2) It is prohibited to connect the battery with different type of battery.
3) It is prohibited to put the batteries working with faulty or incompatible inverter;
4) It is prohibited to disassemble the battery (QC tab removed or damaged);
5) In case of fire, only dry powder fire extinguisher can be used, liquid fire extinguishers are prohibited;

Please do not open, repair or disassemble the battery except staffs from an authorized distributor. We do not undertake any consequences or related responsibility which because of violation of safety operation or violating of design, production and equipment safety standards.

2. System Introduction

2.1 Product Introduction

The L1 is the most recent released low voltage solar battery storage system. The newly designed system provides simplified connection to save valuable time for installers. The stacking system provides flexible configurations from 7.10 kWh to 24.86 kWh capacity. The indoor/outdoor compatible feature provides more possibilities of installation. Ideal for large home and small commercial application.



L1

SPECIFICATIONS						
Battery Module	2	3	4	5	6	7
Nominal Capacity(kWh)	7.10	10.65	14.20	17.75	21.30	24.85
Voltage Range (Vdc)			45 - 54			
Dimension(W*D*H cm)	60*38*53	60*38*70	60*38*87	60*38*104	60*38*121	60*38*138
Weight(kg)	84	119	154	189	225	260
Depth of Discharge	90%	90%	90%	90%	90%	90%
(Recommend)	30	45	60	75	90	100
Current(A)(Continuous)	74	100	100	100	100	100
(Peak@15S)	110	110	110	110	110	110
Communication			CAN, RS485			
Protection Class			IP 55			
Working Temperature(℃)			0-50			
Storage Temperature(℃)			-20-60			
Humidity(%)			5 - 95			
Design Life			15 $^{+}$Years(25℃)			
Authentication Level			IEC62619/CE/UN38.3			

Remark: The parameter will be changed when the battery modules in different series (**2~7** pcs battery modules).

2.2 Features

- Cathode material made from LiFePO4 with safety performance and long cycle life;
- Battery management system (BMS) has protection functions including over-discharge, over-charge, over-current and high/low temperature;
- Automatically manage charge and discharge state and balance current and voltage of each cell;
- Flexible configuration, multiple battery modules can be in parallel for expanding capacity and power
- Adopted self-cooling mode rapidly reduced system entire noise;
- Quite less self-discharge, up to 6 months without charging it on shelf, no memory effect, excellent performance of shallow charge and discharge;
- Smaller size and light weight, stackable connection comfortable for installation and maintenance;

3. Installation

3.1 Tools

The following tools are required to install the battery pack:

 **Wire Cutter**	 **Crimping Modular Plier**	 **Cable Ties**
 **Screw Driver Set**	 **Electric Screw Driver**	 **Multimeter**
 **Adjustable Wrench**	 **Sleeve Piece**	

NOTE

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

3.2 Safety Gear

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

Insulated gloves

Safety goggles

Safety shoes

3.3 System Working Environments Checking

3.3.1 Cleaning

Before installation and system power on, the dust and iron scurf must be removed to keep a clean environment.

3.3.2 Temperature

L1 system working temperature range: 0℃～50℃; Optimum temperature: 18℃～28℃.

Caution: L1 system is out-door design. But please avoid frost or direct sunlight. Out of the working temperature range will cause the battery system over / low temperature alarm or protection which further lead to the cycle life reduction. According to the environment, the cooling system or heating system should be installed if it is necessary.

3.3.3 Fire-extinguisher System

It will be better if equipped with fire-extinguisher system for safety purpose.
The fire system needs to be regularly checked to be in normal condition. Refer to the using and maintenance requirements please follow local fire equipment guidance.

3.3.4 Grounding System

Before the battery installation must make sure the grounding point of the basement is stable and reliable. If the battery system is installed in an independent equipment cabin (e.g. container), must make sure the grounding of the cabin is stable and reliable.

The resistance of the grounding system must ≤100mΩ

3.4 Handling and placement

Single battery module is 35kg. If without handling tools must have more than 2 men to handling with it.

After unpacking, please finish installation asap, do not expose battery and controller outside too long.

3.4.2 Handling and placement of the base

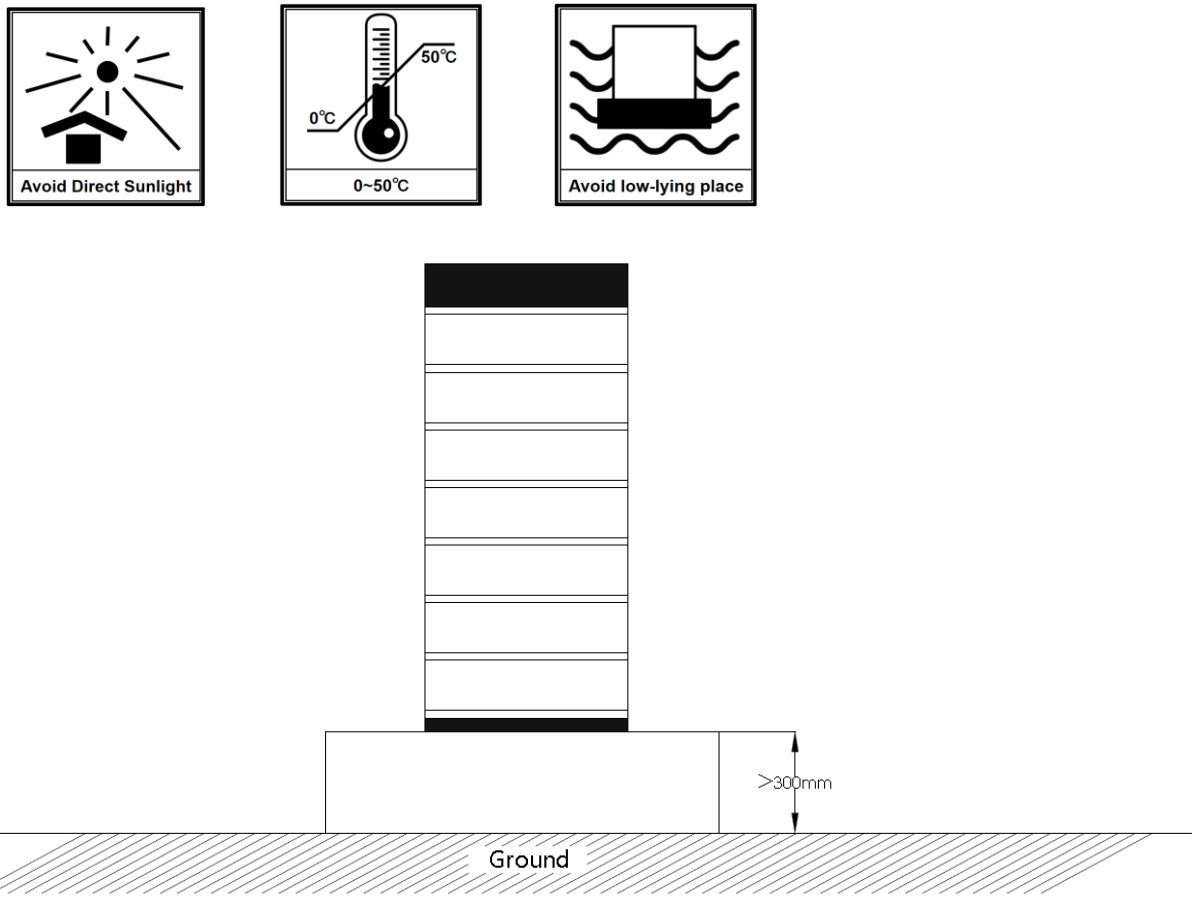
The base is light, single person can handle with it.

3.4.3 Selection of installation sites

A. L1 system working temperature range: 0℃～50℃; Optimum temperature: 18℃～28℃. Do not place the battery system in direct sun light. It is suggested to build sunshade equipment. In cold area the heating system is required.

B. L1 system must not be immersed in water. Cannot be placed the battery base in rain or other water sources. As a suggestion, the base's height should >300mm above the ground.

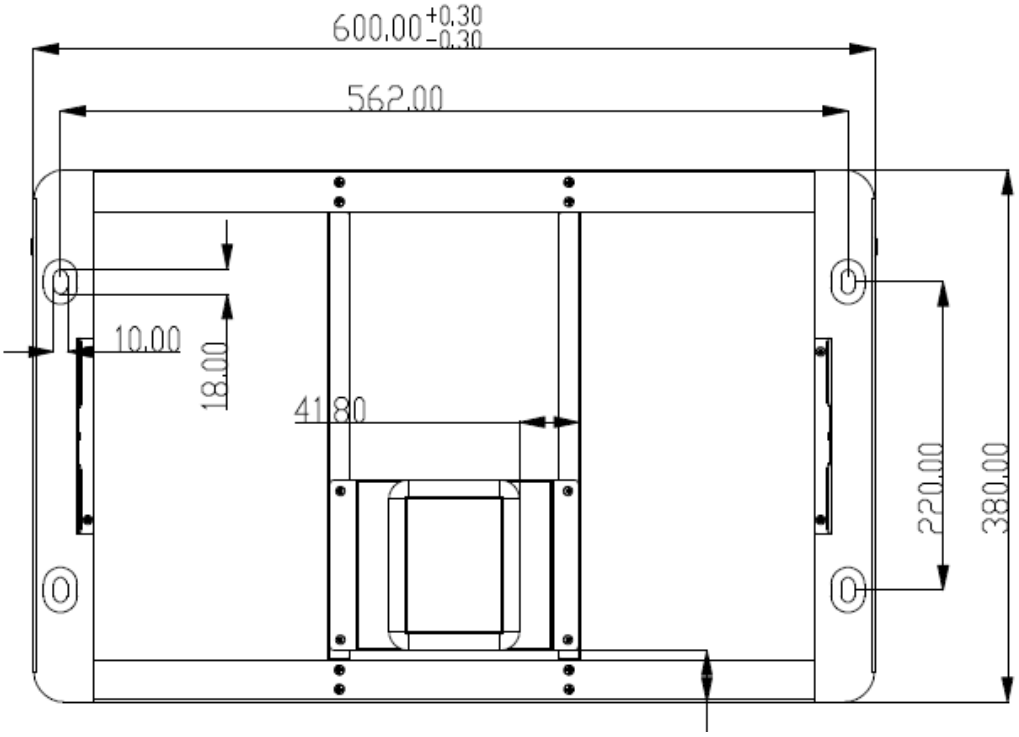
C. The base's weight capacity should support the weight of whole battery system (119~260kg).

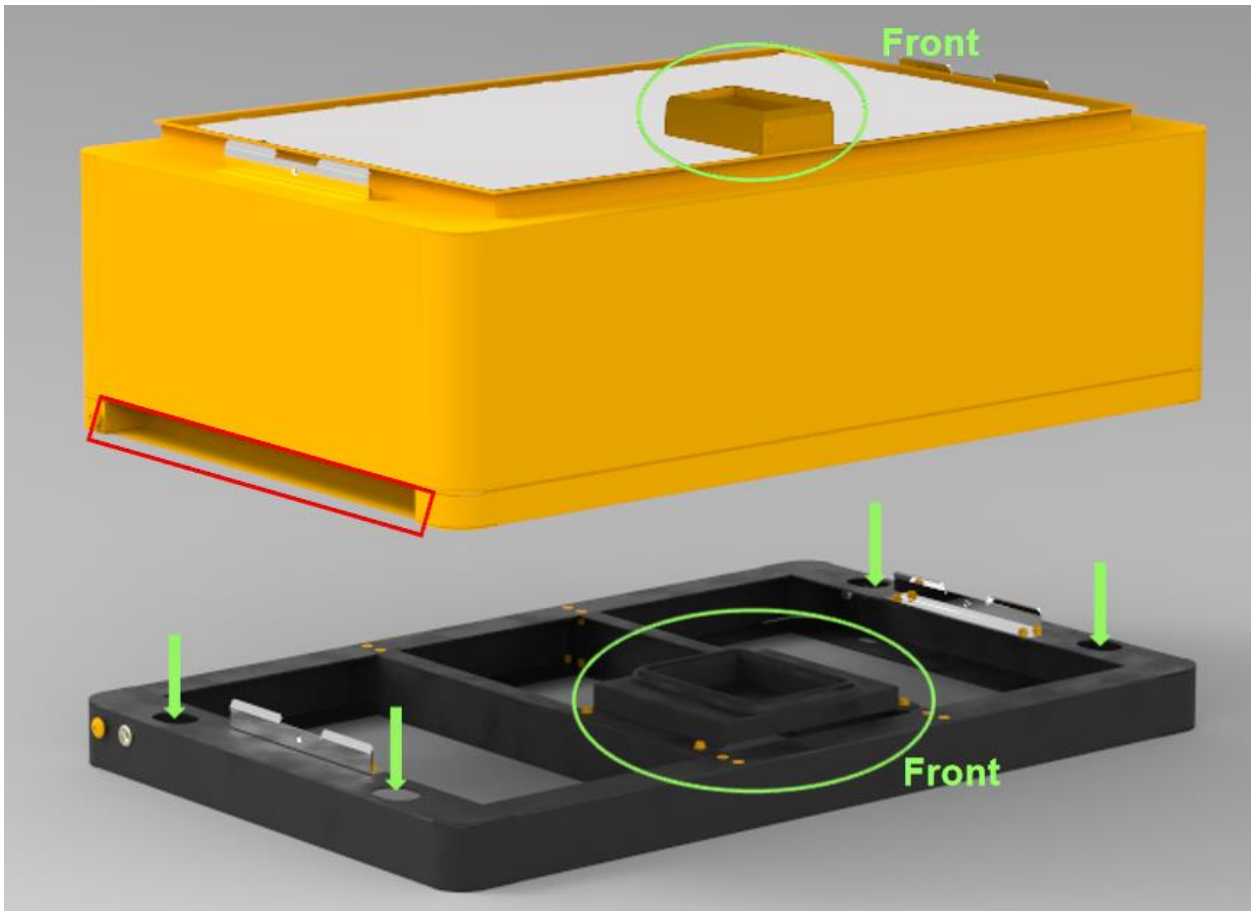


3.4.4 The fix and installation of the base

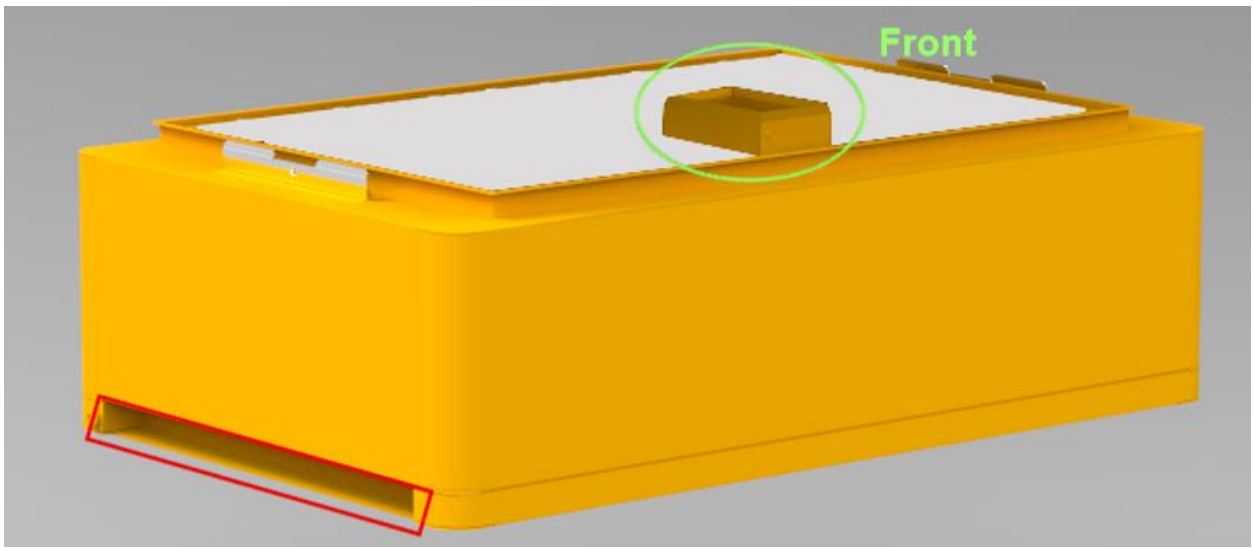
The base must be fixed installed on the basement with 4pcs M8×80 foundation bolts.

Battery rack basement holes bitmap (unit: mm):


600.00 +0.30 -0.30
562.00
10.00
18.00
41.80
220.00
380.00


Front
Front

3.4.5 Battery Modules and Control Module (BMS) pile up



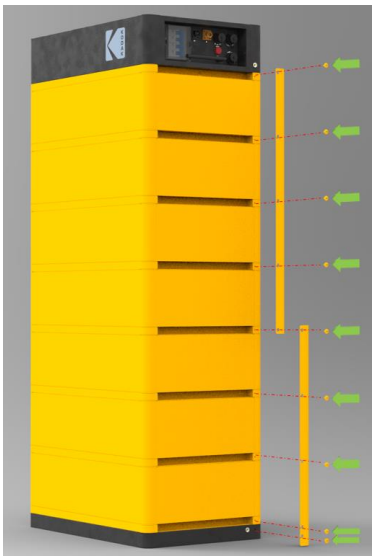
Handle above the red marked edgings of the both side of these battery modules and control module (BMS).
Caution: If hands under this red marked side, hands will get hurt.

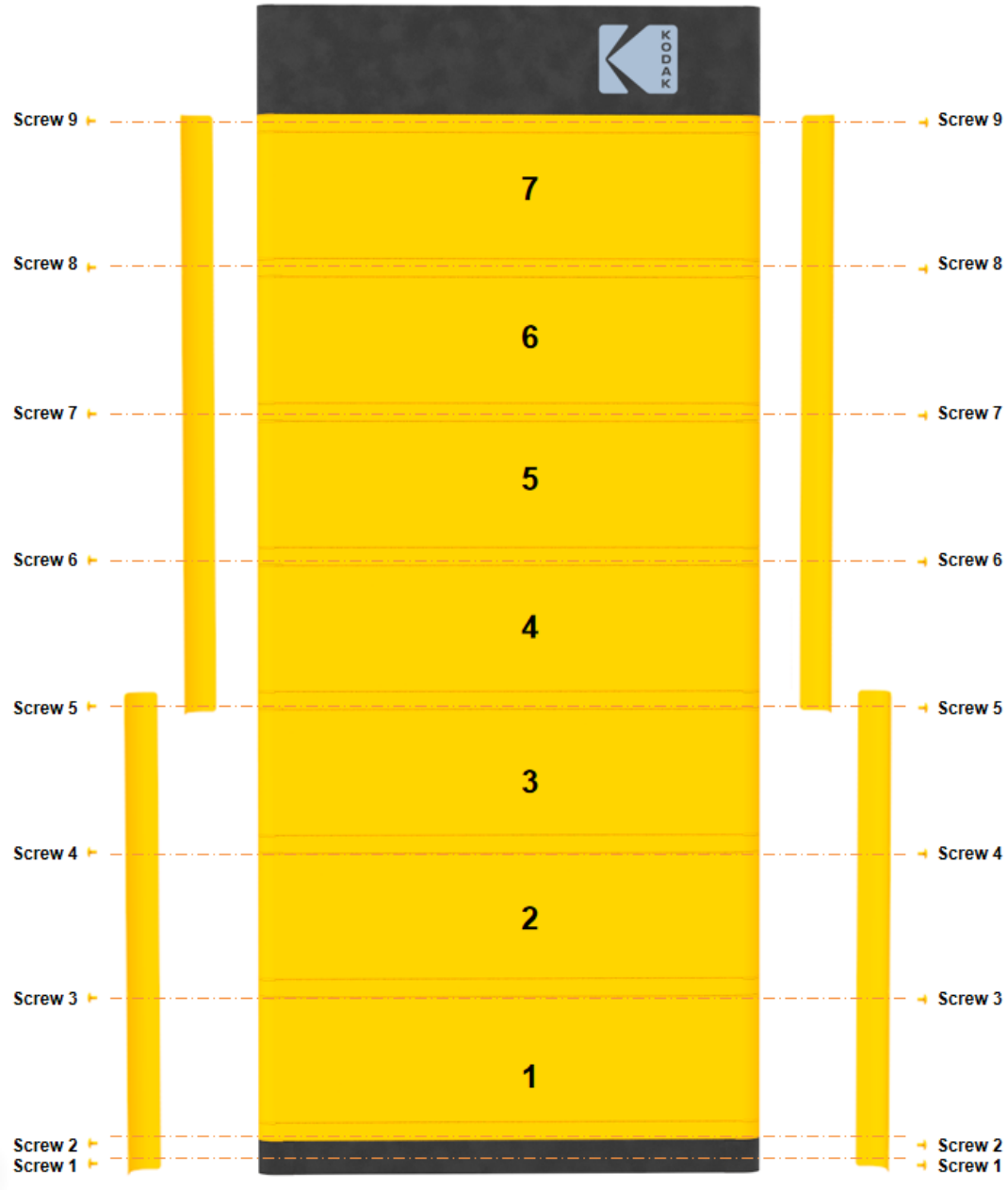
Before installation the breaker on controller must at OFF position.

3.4.6 Install the fix rod for the system

In control module's package, there are 2pcs 2-modules-rod, 2pcs 3-modules-rod, and 2pcs 4-modules-rod.

Fix these rods at the both back side corners.

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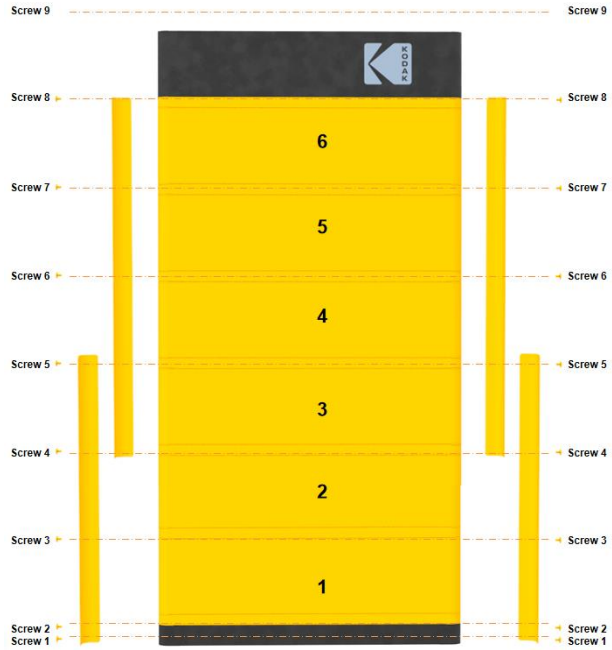
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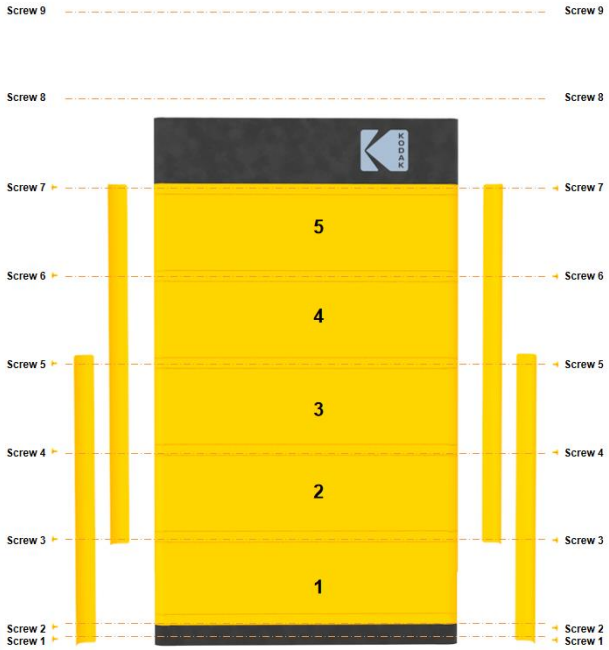
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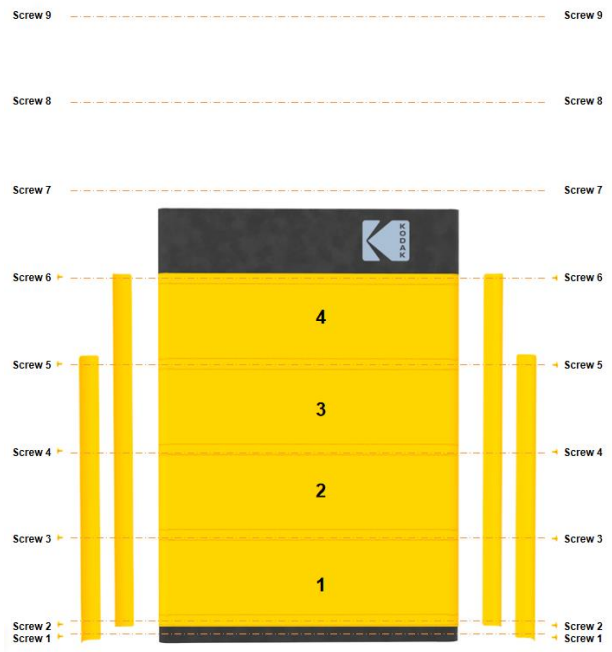
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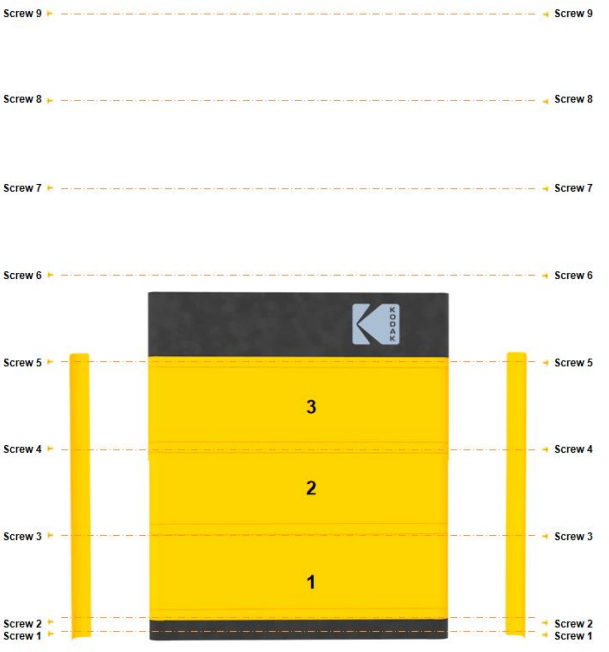
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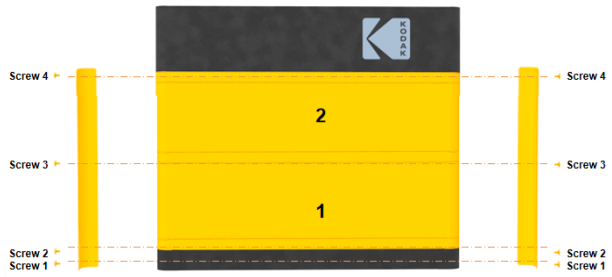
Screw 4
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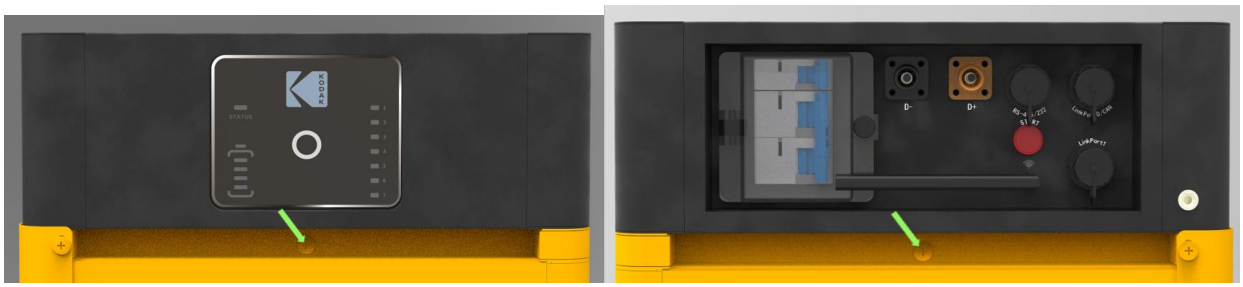
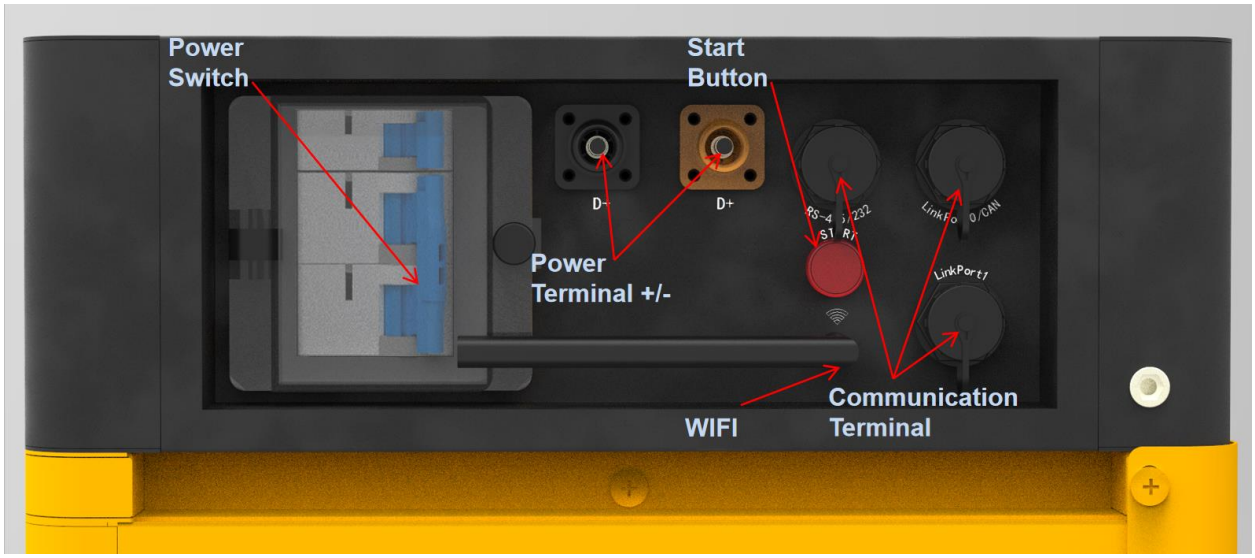
3.4.7 Lock the control Module's fix screw of left and right side



3.5 Cables connection



Danger: All the plugs and sockets of the power cables must be not reverse connection.

Danger: No short circuit or reserved connection of the battery system's positive and negative port.

Caution: Wrong communication cables connection will cause the battery system failure.

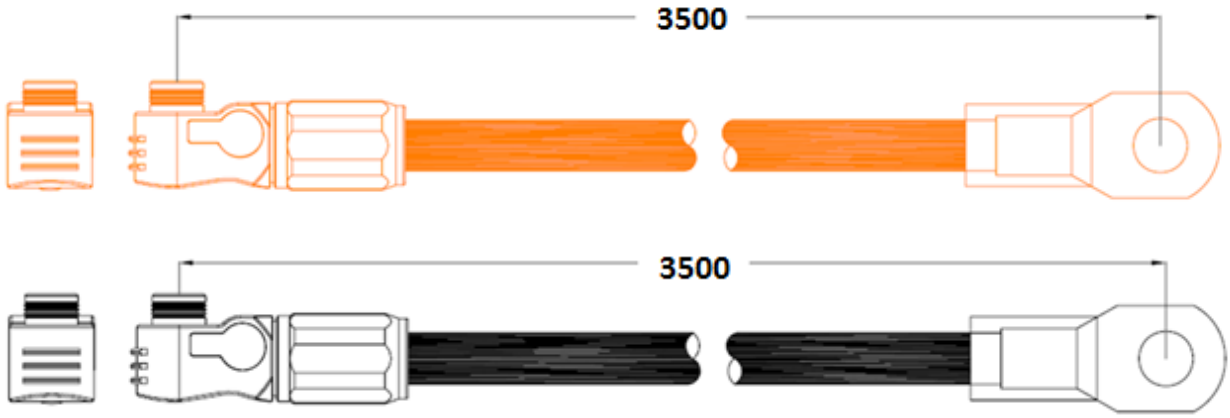
3.5.1 Grounding

The L1 modules' grounding cable on the grounding point (right side of top rod screw or screw 1).

3.5.2 Cables Connection

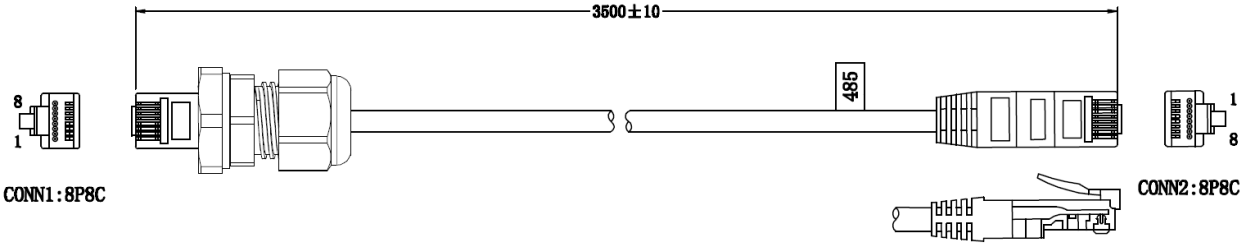
Note: Power cable uses water-proofed connectors.

Connect power cables of battery system with Inverter.

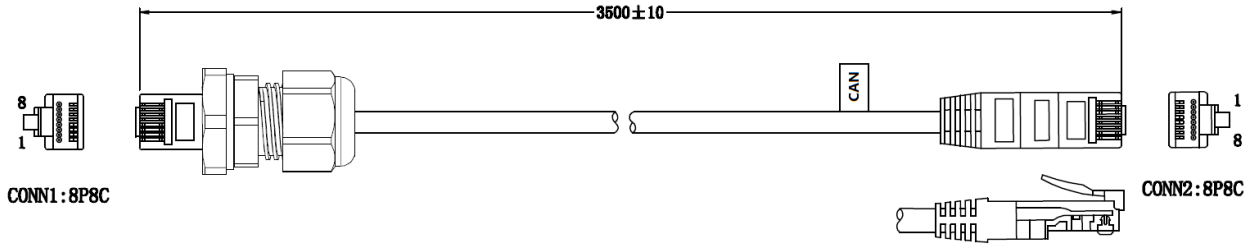


Communication Terminal (RS485 / CAN / RS232 / Link Port 0 / Link Port 1)

RS485 Communication Terminal: (RJ45 port) follow RS485 protocol, for communication between battery system and inverter.



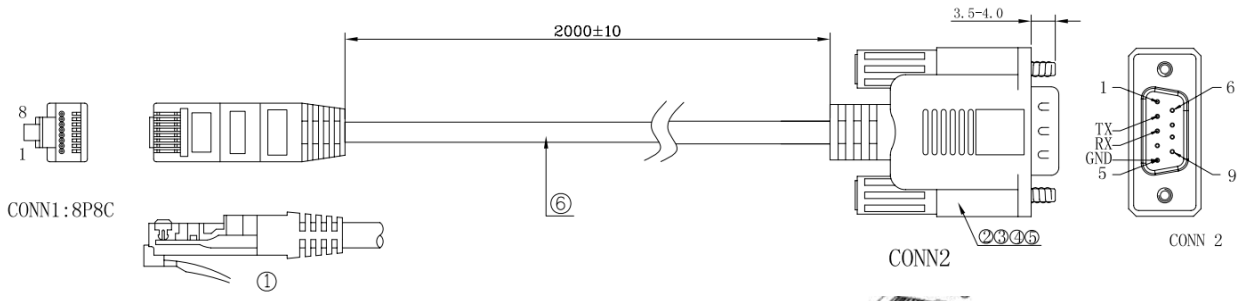
CAN Communication Terminal: (RJ45 port) follow CAN protocol, for communication between battery system and inverter.

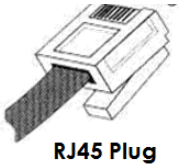


CAN Communication Terminal: (RJ45 port) follow CAN protocol,

Link port0/1 for communication between battery piles.

RS232 Communication Terminal: (RJ45 port) follow RS232 protocol, for manufacturer or professional engineer to debug or service.





RJ45 Plug

Definition of RJ45 Port Pin

CAN	RS485	RS232
---	---	---
---	---	---
---	---	TX
CANH	---	---
CANL	---	---
GND		RX
---	RS485A	---
---	RS485B	---

Note: Other Pin must be NULL, if not may influence the communication of system.

3.5.3 System turns on

Warning: Double check all the power cables and communication cables. Make sure the voltage of

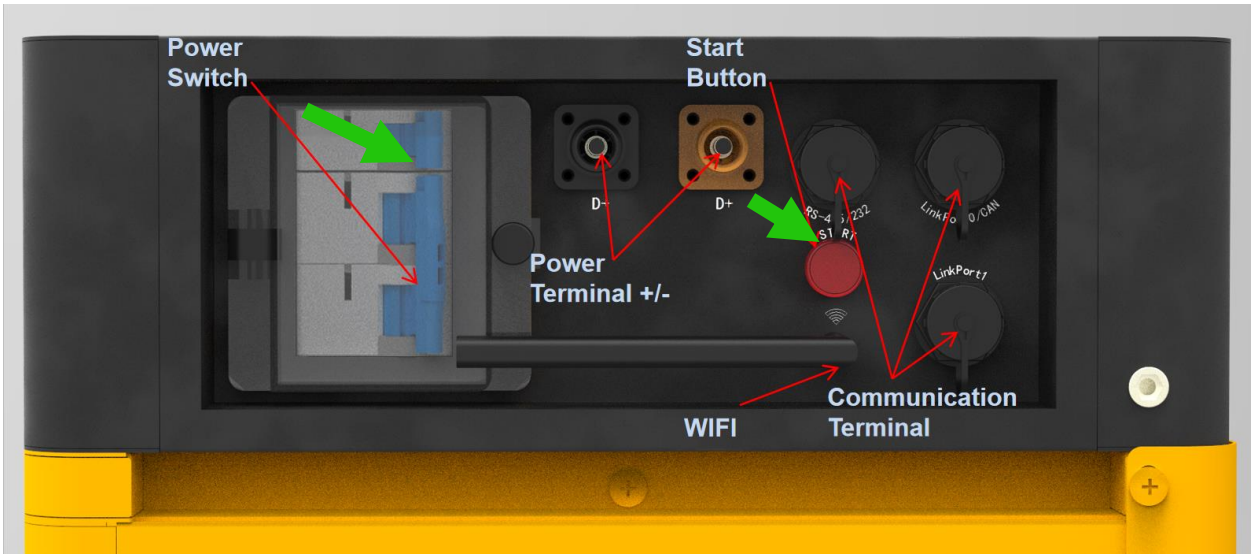
the inverter is same level with the battery system before connection. Check all the power switch of every battery system is OFF.

System turns on step:

(1) For inverter can turn on without battery: switch the external power or inverter on, make sure all the power equipment can work normally.
For inverter cannot turn on without battery. Checking the cable connection of inverter.

(2) Turn on the “POWER SWITCH”

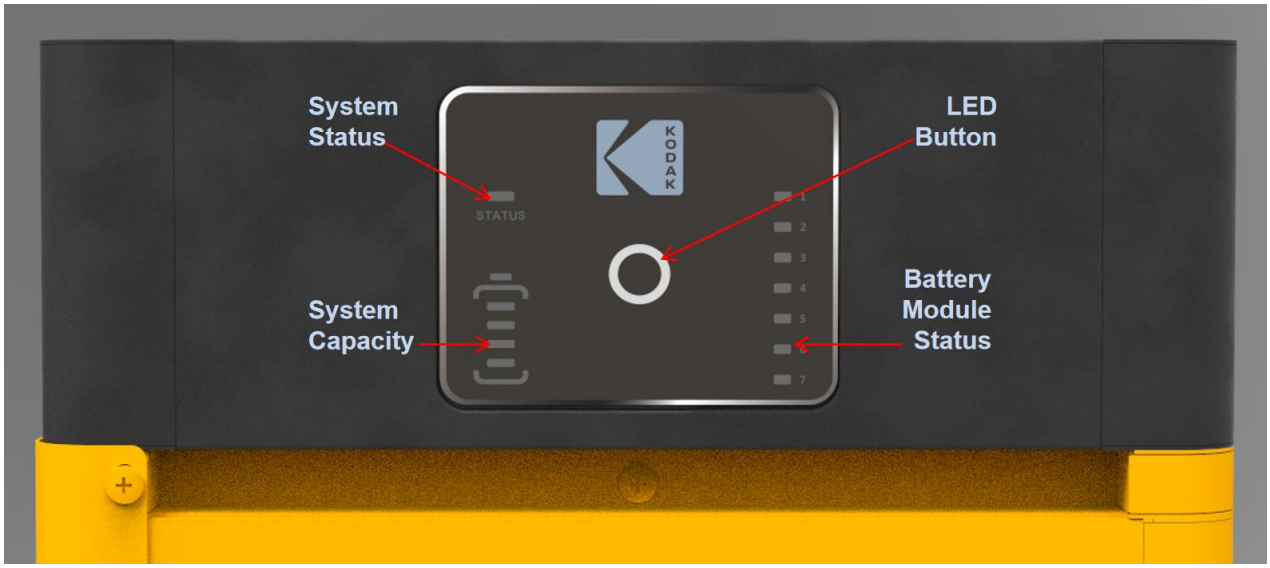
(3) Turn on the “BMS SWITCH”



- Turn on the “POWER SWITCH”;

Caution: When the breaker is tripped off because of over current or short circuit, must wait after 30min to turn on it again, otherwise may cause the breaker damage.

- Press the Start Button more than 2sec, the led lamp on the indicator panel will be on if the start-up is successful;
- The battery string’s system will check itself, if passed the battery system will working normally.

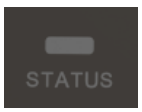


LED Button

	Short Press	Display the LED panel for 20sec.
	Long Press (more than 5sec)	When status LED fast flash blue ●, loss the button, then it is chosen 115200 baud rate of RS485.
		When status LED fast flash orange ●, loss the button, then it is chosen 9600 baud rate of RS485.

Status

System Status: blue means working normally; Orange means protection or failure.

	Blue, slow flashing.	Power Relay CLOSE. Alarm exist but can work continue.
	Blue, solid.	Power Relay CLOSE. Normal.
	Orange, slow flashing.	Power Relay OPEN. Normal protection, can recover on its own (Over Voltage, Under Voltage, etc.).
	Orange, solid.	Power Relay OPEN. Important protection, failure, lost efficacy etc. Or failed to assign address.

Battery Module Status

Battery Module Status: blue means working normally; Orange means protection or failure

	Blue, slow flashing.	Alarm exist but can work continue.
	Blue, solid.	Normal.
	Blue, light once.	1~n LED lights on one by one, for address distribution.
	Orange, slow flashing.	Module offline.
	Orange, solid.	Module protection, failure, etc.

System Capacity

Indicate the system SOC.

	Blue, slow flashing.	Each LED indicate 25%SOC. **Idle**
	Blue, flashing.	Each LED indicate 25%SOC. **Discharge**
	Blue, solid.	Each LED indicate 25%SOC. **Charge**

Remark: Slow flashing: 1.5s ON/0.5s OFF. Flashing 0.5s ON/0.5s OFF.

Fast flashing: 0.1s ON/0.1s OFF.

Warning: If has failure during the self-check, must debug the failure then can start next step.
If the "STATUS" lamp shows orange from beginning, it means there has some failure in the battery string, the Power Relays in BMS will open, must debug.
Note: The LED lamp will be off in 20sec without any operation.

Caution: There will be a regularly (3 month) fully charge requesting during continuous operation it will be handled automatically by the communication between BESS and external device.

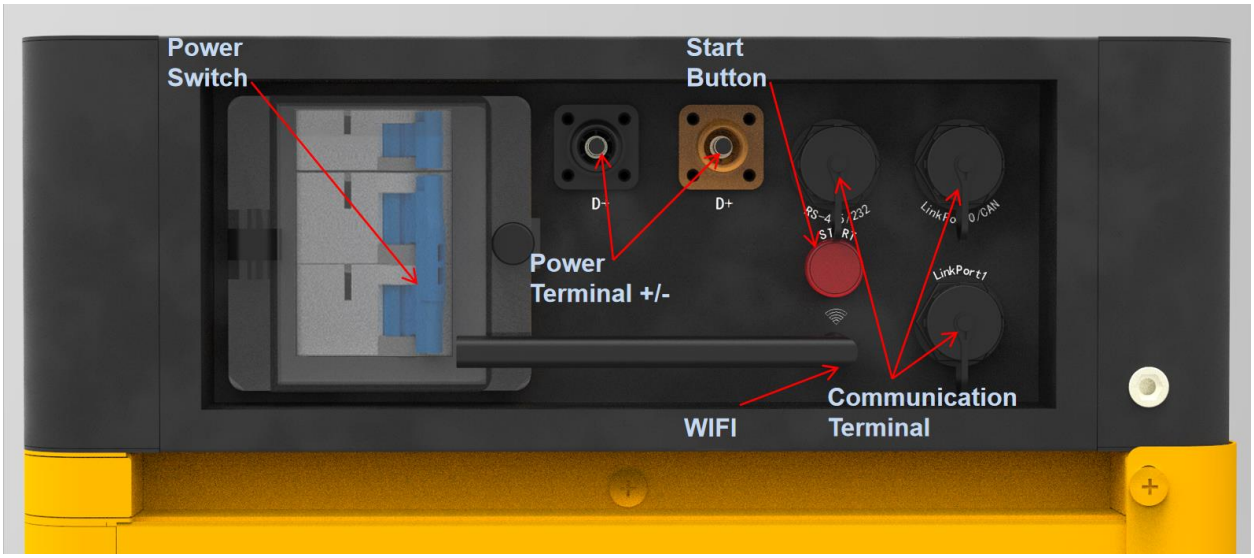
3.5.4 System turns off

When failure or before service, must turn the battery storage system off:
(1) Soft-off the inverter through it's control panel.

(2) Turn off the "BMS SWITCH"

(3) Turn off the “POWER SWITCH” and breaker between battery system and inverter.

NOTE: after the controller turned off please wait for 15s, then battery module will turn off automatically. By then it is allowed to restart or debug or maintains the battery system.



Caution: Before replace the battery module for service, it is suggest to charge/discharge all batteries to the similar SOC/Voltage level, to avoid long term balancing period.

4. System Debug

This system debug is for BESS system (Battery Energy Storage System). BESS system can't do the debug itself. It must operation with configured inverter, UPS and EMS system together.

Debug Step	Content
Prepare of debug.	Turn on the BESS system, refer to chapter 3. Before turn on the whole BESS system turn on the load is **not allowed!** Remark: Except the BESS, if other equipment have its own system turn on step, must follow its own system operation manual.
System function test.	Each component system debug: **Power supply** Check if the External Power Supply (e.g. UPS) is working normally. (If configured.) **Communication Test:** Check the communication between the BESS system and communicated devices normal or not, has alarm or not. **Power Conversion System Test:** Before conjoint test must test the Inverter System turn on progress at first. And check the parameters meet BESS requirement or not. **BESS Test:** Charge/Discharge test; Test stop charging, stop discharging, current limiting functions, etc. **Caution:** Before turn on the BESS system must setup all the parameters of the inverter and EMS at first.
Monitor function test. (If configured.)	Check whether the data of the BESS system is showing on the monitor system normally.
EMS conjoint test (If configured.)	If the EMS system has running monitor requirements, check if the BESS system is following EMS instructions.

5. Maintenance

5.1 Troubleshooting:

No	Problem	Possible Reason	Solution
1	Turn on the BMS. All battery modules' status LED is not working.	● The DC/DC power board or control board is failure. ● The communication cable from BMS to the first battery module is broken; ● Power cable is broken; ● The time of pressing the Start Button is not enough.	● Change the control module (BMS module).. ● Change the broken communication cable; ● Check all the power cables and connections are fine or not; ● Press the Start Button longer time until the cue sound of start up.
2	Turn on the BMS. The Status LED for BMS is not working. But all battery modules' status LED is lighting blue.	● The control board is failure.	● Change the control module (BMS module).
3	Turn on the BMS. The Status LED is lighting red. But all battery modules' status LED is lighting blue.	● This battery string is under protection. It is possible Over Current Protection or Failure Protection. ● Communication cables failure; ● Battery String is reversed connection.	● Through the monitor or maintenance software check the battery cell, battery module has alarm or not. ● Check the Communication Cables; ● **Reversed connection is serious danger!**
4	The BMS's Status LED is lighting red and some the battery module's status LED is lighting blue but some is lighting red.	● This battery string is under protection. It is possible Over Current, Over Voltage, Low Voltage, Over Temperature, Low Temperature or Failure Protection.	● Use the monitor or maintenance software to check the battery cell, battery module has protection and failure or not.
5	Cannot close the power Switch.	● DC Output breaker is fault.	Check the DC output breaker is fault or not. If it is fault, change the control module (BMS module).
6	Turn on the BMS. The Status LED is flashing red.	Self-check can't pass.	If something is wrong, please contact with seller or

			sells agent.
7	Turn on the BMS. The Status LED is lighting red. And the buzzer is noising.	● Output relay is non-separable switching,. ● The buzzer is failure ; ● Output relay False alarm;	● Check the output relay. If fault find out the short circuit reason. Change the relay or the control module (BMS module). ● Change the control module (BMS module).
8	Turn on the BMS. The Status LED shows normal. But the output relay can't be actuation.	● The wire of the output relay or the wire of the power relay switch in the BMS is broken. ● Power Relay Switch is open;	● Check the wire got loose or broken? Fix it. Or change the control module (BMS module). ● Close the Power Relay Switch.
9	Turn on the BMS. The one and the following of the battery module's Status LED lighting red or not lighting.	● This battery module has failure; ● Its communication cable failure; ● Its Address Distribution failure.	● Change this battery module; ● Check the communication cable; ● Check by professional stuff.
10	Single Cell is over voltage/ low voltage. (Check through the monitor or maintenance software.)	● Cell voltage sampling failure. ● Cell failure;	● Check the wires of cell sampling module; ● Change this battery module.
11	Battery module shows the temperature is -40℃. (Check through the monitor or maintenance software.)	The wires of temperature sampling failure.	Check the wires of temperature sampling module. Or change this battery module.
12	Another failure	Cell failure or electrical board failure.	Can't find out failure point or can't check. Please contact with distributor.

5.2 Replacement of main component

Caution: Before replace the main component must shut off the maintenance battery string's power. The turn off progress refer to chapter 3.6.5.

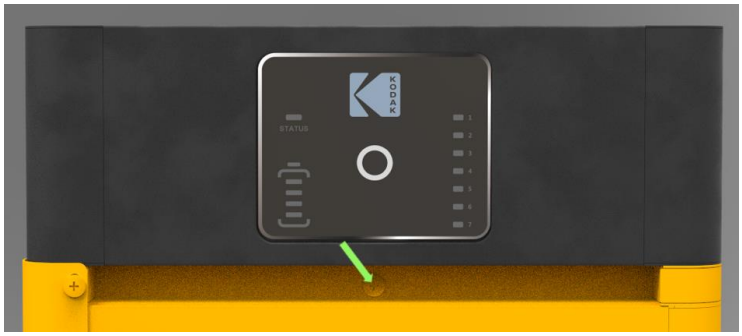
5.2.1 Replacement of Battery Module

5.2.1.1 Use a charger to charge the new battery module and existing module to full (SOC 100%)

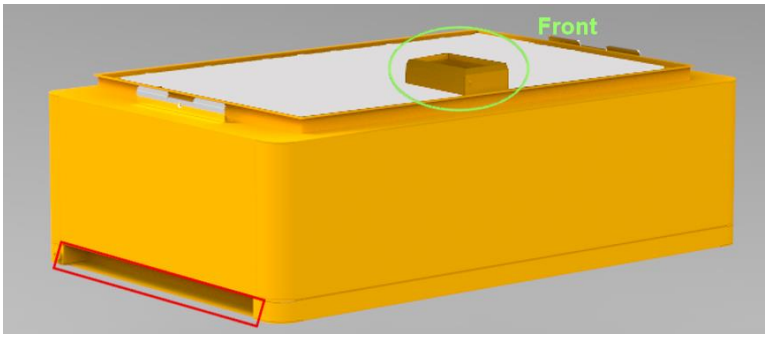
5.2.1.2 Turn off the whole battery string's power. Must confirm the **D+** and **D-** terminal are without power. The turn off progress refer to chapter 3.6.5.

5.2.1.3 Dismantle **D+** and **D-** Power Cable, Communication Cable and Grounding Cable.

5.2.1.4 Dismantle the control Module's fix screw of left and right side. And dismantle the fix rods.



5.2.1.5 Move the control module and each battery module one by one.



Handle above the red marked edgings of the both side of these battery modules and control module (BMS).

Caution: If hands under this red marked side, hands will get hurt.

Warning: Single battery module is 35kg. If without handling tools must more than 2 men to handling with it.

5.2.1.6 Pile up the new battery module. And pile up the battery modules and control module.

5.2.1.7 Install the control Module's fix screw of left and right side. And Install back the rods.

5.2.1.8 Install Grounding Cable, Communication Cable and the **D+** and **D-** Power Cable.

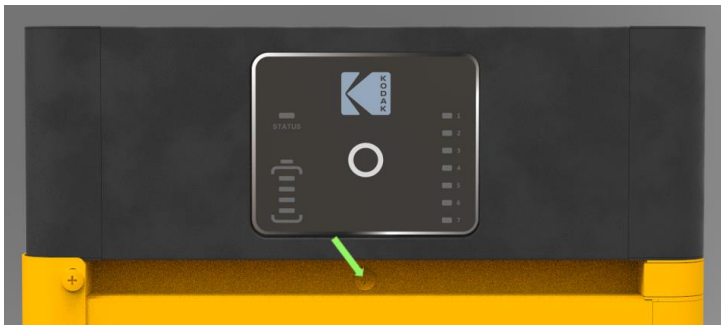
5.2.1.9 Turn on this battery string. Refer to chapter 3.6.

5.2.2 Replacement of Control Module (BMS)

5.2.2.1 Turn off the whole battery string's power. Must confirm the **D+** and **D-** terminal are without power. The turn off progress refer to chapter 3.6.5.

5.2.2.2 Dismantle **D+** and **D-** Power Cable, Communication Cable and Grounding Cable.

5.2.2.3 Dismantle the control Module's fix screw of left and right side. And dismantle the fix rods.



5.2.2.4 Remove the control module.

5.2.2.5 Pile up the new control module.

5.2.2.6 Install the control Module's fix screw of left and right side. And Install back the rods

5.2.2.7 Install the Grounding Cable, Communication Cable and the **D+** and **D-** Power Cable.

5.2.2.8 Turn on this battery string. Refer to chapter 3.6.

5.3 Battery Maintenance

5.3.1 Voltage Inspection:

[Periodical Maintenance] Check the voltage of battery system through the monitor system. Check the system abnormal voltage or not. For example: Single cell's voltage is abnormal high or low.

5.3.2 SOC Inspection:

[Periodical Maintenance] Check the SOC of battery system through the monitor system. Check the battery string abnormal SOC or not.

5.3.3 Cables Inspection:

[Periodical Maintenance] Visual inspect all the cables of battery system. Check the cables has broken, aging, getting loose or not.

5.3.4 Balancing:

[Periodical Maintenance] The battery strings will become unbalance if long time not be full charged. Solution: every 3 month should do the balancing maintenance (charge to full), normally it will been done automatically by the communication between system and external device.

5.3.5 Output Relay Inspection:

[Periodical Maintenance] Under low load condition (low current), control the output relay OFF and ON to hear the relay has click voice, that's mean this relay can off and on normally.

5.3.6 History Inspection:

[Periodical Maintenance] Analysis the history record to check has accident (alarm and protection) or not, and analysis its reason.

5.3.7 Shutdown and Maintenance:

[Periodical Maintenance]

Some system function must be maintenance during the EMS restart, it is recommended to maintenance the system every 6 months.

6. Storage Recommendations

b) For long-term storage (more than 3 months), the battery cells should be stored in the temperature range of 5~45℃, relative humidity <65% and contains no corrosive gas environment.

The battery module should shelfed in range of 5~45℃, dry, clean and well ventilated environment. Before storage the battery should be charged to 50~55% SoC;

It is recommended to active the chemical (discharge and charge) of the battery every 3 months, and the longest discharge and charge interval shall not exceed 6 months.

Caution: If not follow the above instructions for long term store the battery, The cycle life will have relative heavily reduction.

7. Shipment

Battery module will pre-charged to 50%SOC or according to customer requirement before shipment. The remaining capacity of battery cell, after shipment and before charge, is determined by the storage time and condition.

1. The battery modules meet the UN38.3 certificate standard.
2. In particular, special rules for the carriage of goods on the road and the current dangerous goods law, specifically ADR (European Convention on the International Carriage of Dangerous Goods by Road), as amended, must be observed.

For further information visit www.bluemountainpv.co.za

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