Lithium-Ion Phosphate Energy Storage System

Product Manual

Information Version: 1.2

Revision History

Vision	DATE	Comments
V1.0	2020/9/9	First issue
V1.1	2020/9/21	Add the all in one product
V1.2	2020/11/4	Add product naming rules
	2020/11/25	Add product dimension

This manual introduces from Koyoe Energy. Please read this manual before you install the battery and follow the instruction carefully during the installation process. Any confusion, please contact Koyoe immediately for advice and clarification.

Content

1. Safe handling of lithium batteries Guide

Warning: This product is a DC-AC voltage system, operated by authorized person only.

Before installation or operation you must read <Operation Menu>(page15)carefully.

Warning

Before Connecting

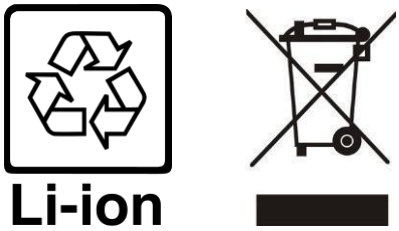
1) After unpacking, please check product and packing list first, if product is damaged or lack of parts, please contact with the local retailer;
2) Before installation, make sure the battery is in the turned-off mode;
3) Wiring must be correct, do not mistake the positive and negative cables, and ensure no short circuit with the external device;
4) It is prohibited to connect the battery and AC or DC power directly;
5) Battery system must be well grounded and the resistance must be less than 100mΩ;
6) Please ensured the electrical parameters of battery system are compatible to related equipment;
7) Keep the battery away from water and fire.

In Using

1) If the battery system needs to be moved or repaired, the power must be cut off and the battery is completely shutdown;
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;
6) Please do not open, repair or disassemble the battery except staffs from Koyoe or authorized by Koyoe. 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.

Reminded

1) Please read this user manual carefully (in the accessories);
2) This system needs to be used indoors.
3) If the integrated switch does not meet the local requirements, external bi pole DC isolator between the battery system and the inverter is required。
4) 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 80%;
5) Battery needs to be recharged within 12 hours, after fully discharged;
6) Do not expose cable outside;
7) All the battery terminals must be disconnected for maintenance;
8) Please contact the supplier within 24 hours if there is something abnormal.
9) If you need to shut down the system in an emergency, you need to turn off the control module switch.
10) The warranty claims are excluded for direct or indirect damage due to items above.



2. Introduction

This is a high voltage battery storage system based on lithium iron phosphate battery, is one of new energy storage products developed and produced by Koyoe Energy, it can be used to support reliable power for various types of equipments and systems. This is especially suitable for application scene of high power, limited installation space, restricted load-bearing and long cycle life.

This product has 3 levels BMS (battery management system) , which can manage and monitor cells information including voltage, current and temperature. What's more, BMS can balance cells charging and discharging to extend cycle life. Multiple batteries can connected in parallel to expand capacity and power in parallel for larger capacity and longer power supporting duration requirements.

2.1 features

- The whole module is non-toxic, non-polluting and environmentally friendly;
- Cathode material is made from $LiFePO_4$ 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;
- The system can automatically manage charge and discharge state and balance current and voltage of each cell;
- Flexible configuration, multiple battery modules can be in serial for expanding voltage and Capacity.
- The module has less self-discharged, up to 6 months without charging ion shelf; no memory effect, excellent performance of shallow charge and discharge;
- Working temperature range is from 0℃ to 45℃, with excellent discharge performance and cycle life;
- Design for home appliances,easy to install and handle;

2.2.1 Battery system naming rules

Battery system： SBM (Slave Battery Management)

Naming rules：

□□ - □□□ - □□□□□ - □
1 2 3 4

1. Company：KY

2. Standard Battery Voltage （Vdc）

3. Capacity (Ah)

4. Product type：
A：all in one

P(Product) Whole machine

E.g. KY-48V105AH

KY-48V105AH-A

2.2.2 The parameter of battery system

No.	Item	Parameter									
1	Model	KY-48V105AH	KY-96V105AH	KY-144V105AH	KY-192V105AH	KY-240V105AH	KY-288V105AH	KY-336V105AH	KY-384V105AH	KY-432V105AH	KY-480V105AH
2	Cell Technology	Li-ion(LFP)									
3	Capacity (Ah)	105									
4	Capacity(KWh)	5.0	10.0	15.0	20.0	25.0	30.0	35.0	40.0	45.0	50.0
5	Number of strings	15	30	45	60	75	90	105	120	135	150
6	Standard Voltage(V)	48	96	144	192	240	288	336	384	432	480
7	Max Voltage (V)	54.75	109.5	164.25	219	273.75	328.5	383.25	438	492.75	547.5
8	Standard Charge Current (A)	50									
9	Max Charge Current (A)	55									
10	Max diacharge Voltage (V)	53.25	106.5	159.75	213	266.25	319.5	372.75	426	479.25	532.5
11	Standard Discharge Current (A)	50									
12	Max Discharge Current (A)	55									
13	Communication	RS485/CAN									
14	Protection Class	IP20									
15	Weight (kg)	41	82	123	164	205	246	287	328	369	410
16	Operation Life (Years)	10									
17	Signel Pack Dimension (mm)	452*300*245									
18	Operation Cycle Life	3500,25℃,90%DOD									
19	Operation Temperature (℃)	0~50									
20	Storage Temperature (℃)	-20~60									
21	Humidity	＜45%									
22	Altitude (m)	＜2000									
23	Product Certificate	IEC62619,UN38.3									

2.3.1 Battery Module Front Interface

Power Terminal +/-

To connect Battery series power cables.

Status

Status light: to show the battery module's status (Normal●, Fault●,COM●) and the SOC.

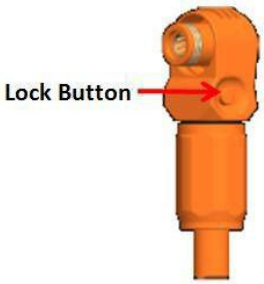
Link Port 0, 1

Link Port 0, 1 Communication Terminal: (RJ45 port) follow CAN protocol, for communication between multiple serial battery modules and control module.

Power Terminals

Power cable terminals: there are two pairs of terminals with same function, one connect to equipment, the other one paralleling to other battery module for capacity expanding. For each single module, each terminal can achieve charging and discharging function.

For power cables uses water-proofed AMPHENOL connectors. It must keep pressing this Lock Button during pulling out the power plug.



2.4.1 Automatic configuration the battery address

When connecting to the control moudle,every battery moudles needs address configuration,The control module will automatically detect the number of PACKS and assign addresses,Assigned during power-on self-test.

2.4.2 Battery Master Control Unit naming rules

Battery system： BCU (Battery Control Unit)

Naming rules：

□□ - □□□ □□□□ - □
1 2 3 4

1. Company：KY

2. Battery Control Unit：BCU

3. Capacity (KWH):050K means max Capacity 50KWH

4. Product type：
A：all in one

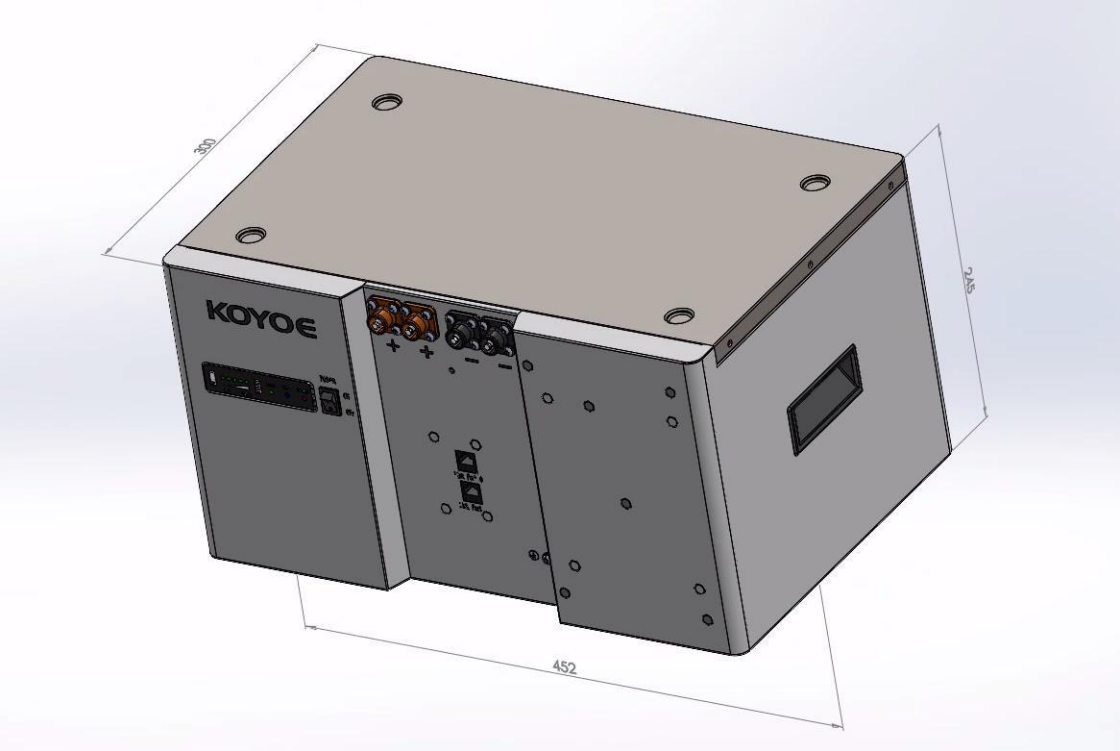
P(Product) Whole machine

E.g. KY-BCU050K

KY-BCU050K-A

2.4.3 The parameter of Master Control Unit

No.	Item	Control module
1	Voltage Range(Vdc)	85-550V
2	Minimum starting voltage	85V
3	Maximum system voltage	550V
4	Max charge Current (A)	55
5	Max discharge Current (A)	55
6	Communication port	RS485\CAN
7	Battery string quantity	2-10
8	Dimension (W*D*H, mm)	452*260*75
9	Protection Class	IP20
10	Weight (kg)	4.5
11	Warranty	5/10years
12	Operation Temperature (℃)	0~50
13	Altitude (m)	<2000



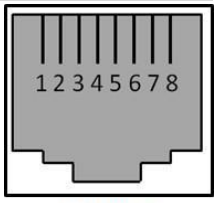
2.5 Control Module Rear Interface

RJ45

Three RJ45 ports: follow CAN protocol, for communication between multiple serial battery modules and control module,the control module and the inverter.

Definition of RJ45 Port Pin

No.	CAN	RS485
1	---	---
2	---	---
3	GND	GND
4	CANH	RS485B
5	CANL	RS485A
6	---	---
7	---	---
8	---	---



RJ45 Port

RJ45 Plug

Power Terminal +/-

B+/B- to connect Battery series power cables

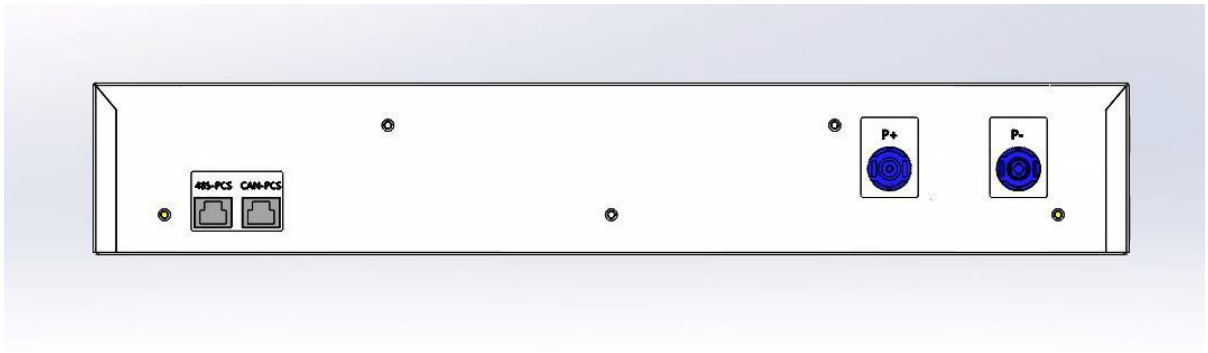
Power Switch

Switch Button: Press this button to restart the battery system.

Status

Status light: to show the battery module's status (Normal●, Fault●,COM●) and the SOC.

Control Module Front Interface

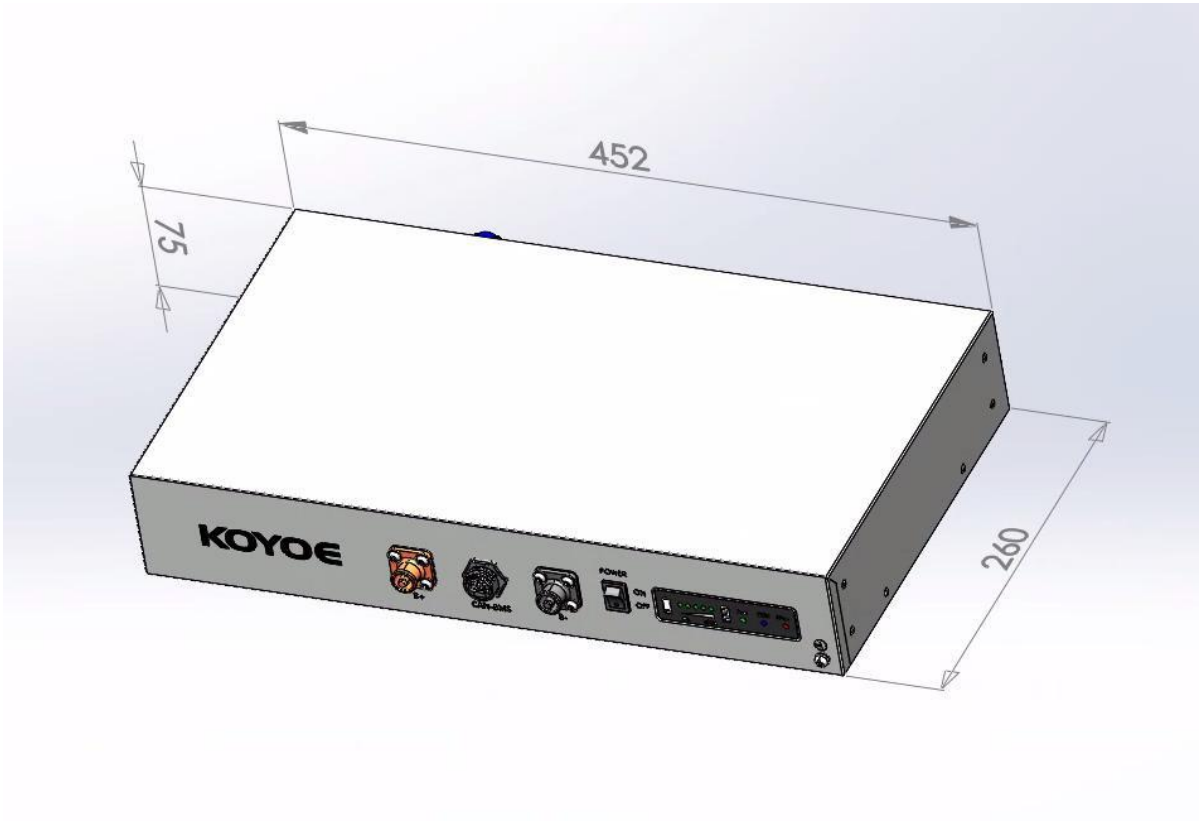


Power Terminal +/-

P+/P- to connect inverter power cables.

RJ45

Three RJ45 ports: follow CAN&RS485 protocol, for communication between multiple serial battery modules and control module,the control module and the inverter.

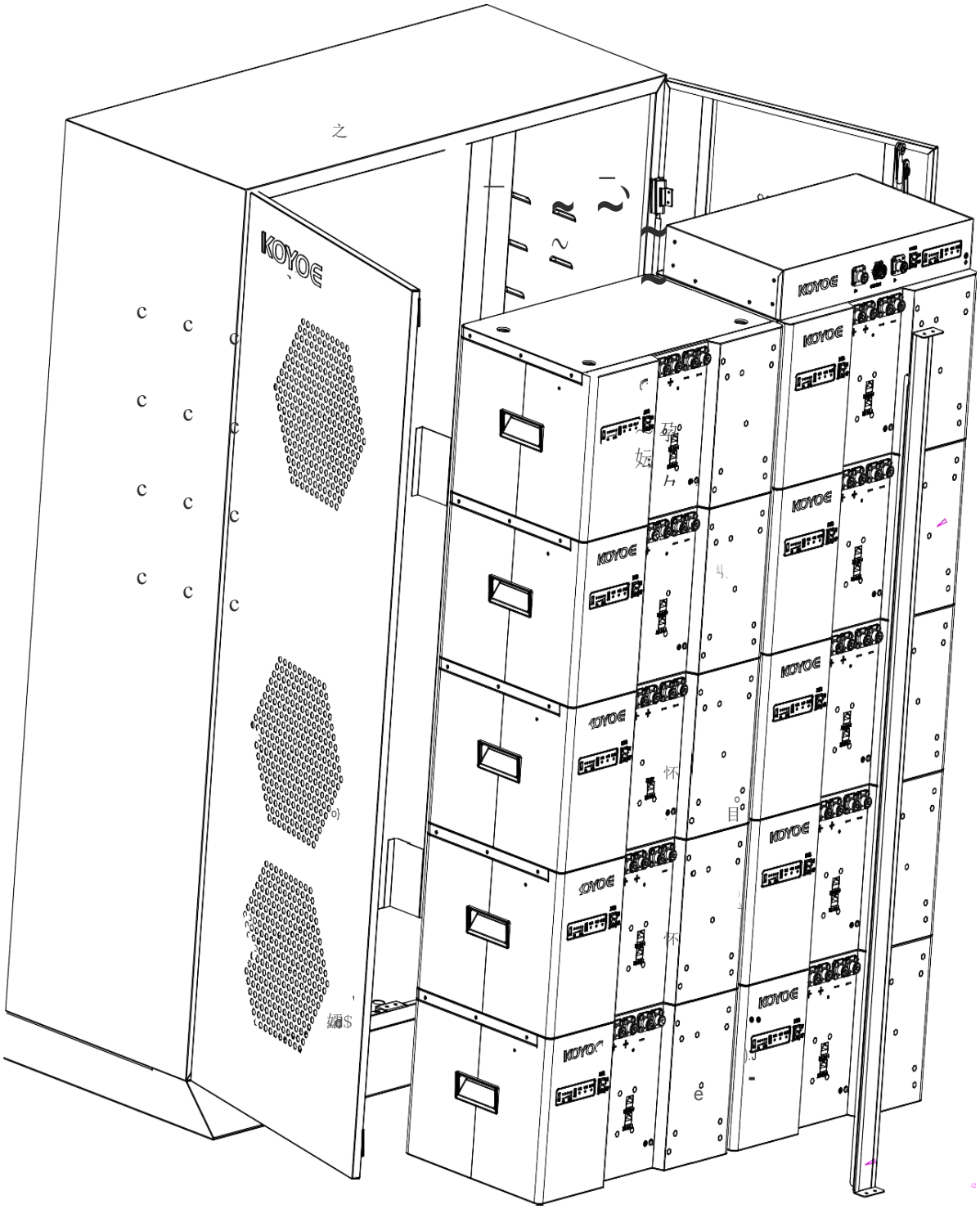


2.6 LED Status Indicators

Battery capacity indicator: 5green lamps, each light represent 20% capacity.

Battery Status	Protection / Alarm / Normal	RUN	COM	FAULT	Capacity SOC					Descriptions
		●	●	●	●	●	●	●	●	
Shut Down	NO POWER	Off	Off	Off	Off	Off	Off	Off	Off	All off
Standby	Normal	ON	Flash	Off	ON	Off	Off	Off	Off	Indicates power Standby mode.
	Alarm	ON	Off	ON	Off	Off	Off	Off	Off	communication fault
	Alarm	ON	Flash	ON	Off	Off	Off	Off	Off	Indicates the battery is low.
Charge	Normal	ON	Flash	Off	ON	Flash	Off	Off	Off	The highest capacity indicator LED flashes others lighting.
	Alarm	ON	Flash	ON	ON	Off	Off	Off	Off	
	Protection	Off	Flash	ON	ON	Off	Off	Off	Off	Stop charging, FAULT lighting
Discharge	Normal	ON	Flash	Off	ON	Off	Off	Off	Off	Indicate based on capacity
	Alarm	ON	Flash	ON	ON	Off	Off	Off	Off	
	Protection	Off	Flash	ON	ON	Off	Off	Off	Off	Stop discharging, PRC lighting
Abnormal	Protection	Off	Flash	ON	Off	Off	Off	Off	Off	Stop charging/ discharging, FAULT lighting

3.1 All-in-one Energy Storage Solution



3.2.1 Photovoltaic Energy Storage System naming rules

Product： AES (All In One Energy System)

Naming rules：

□□ □ □□□ - □□□□□ - □
1 2 3 4 5

1. Company：KY

2. Phase：S single-phase
T three-phase

3.Rated power (KW)

4.Battery Capacity (KWH)

5.Product type：
I : Indoor
O: outdoor

P(Product) Whole machine

E.g. KYS5kw-10kwh-I

KYS5kw-10kwh-O

3.2.2 The parameter of Energy Storage Solution

No.	Item	All-in-one
1	MPPT efficiency	99.90%
2	Max efficiency	97.60%
3	Battery charge & discharge efficiency	98.10%
4	Operating DC voltage range	85~110V
5	Charge/Discharge power(Watt)	2500/3000
6	Max Charge/Discharge Current	25A/30A
7	Communication interfaces	RS485/CAN
8	Reverse connect protection	Y
9	Operating MPPT voltage range	120V-550V
10	Rated PV input voltage	380V
11	Number of MPPT trackers	2
12	MaxPV input power for each MPPT	3300V
13	MaxPV input current for each MPPT	13A/13A
14	Mzx input short circuit current for each MPPT	15A/15A
15	DC connection switch	Optional
16	Nominal AC power	5000W
17	Rated grid voltage/grid connected voltage range	230V/180V~280V
18	Rate grid frequency	50Hz/60Hz
19	Nominal grid current	21.7A
20	Nominal power factor and adjustable range	1 and 0.8 leading-0.8 lagging
21	THD	<3%
22	Rated AC voltage	230V
23	Peak power and duration	7000W/10s
24	Out frequency range	45Hz-55Hz/55Hz-65Hz
25	Dimensions(W*H*D)[mm]	590*1270*465mm
26	Weight	410kg
27	IP grade	IP20
28	Cooling	Wind cooling
29	Mounting	Wall bracket
30	Ambirnt temperature	0°C-50°C
31	Relative humidity	≤95%(non-condensing)
32	Altitude	Dreating at 2000m
33	Acoustic noise emission level	<35dB @ 1m
34	Over voltage category	Ⅲ (AC side), Ⅱ (PV side)
35	Start voltage	83V
36	Stangard warranty	5/10 years
37	Safety	IEC62109-1/-2,IEC62477-1,IEC62619

4 Operation Menu

Before unpacking the product, check the outer packing materials for damage, such as holes and cracks, and check the model. If any damage is found or the model is not what you requested, do not unpack the product and contact your supplier as soon as possible.

4.1 Requirements

Basic Requirements

- This product can be installed indoors only.
- Do not install This product in a place where people are likely to come into.
- Do not install This product in areas with flammable or explosive materials.
- Install This product in a place out of reach of children.

Installation Environment Requirements

- This product must be installed in a well-ventilated environment .
- Avoid installing in direct sunlight .

Mounting Structure Requirements

- Do not install This product on flammable building materials.
- Ensure that the installation ground surface is flat and sturdy enough to bear the weight load.

Installation Space Requirements

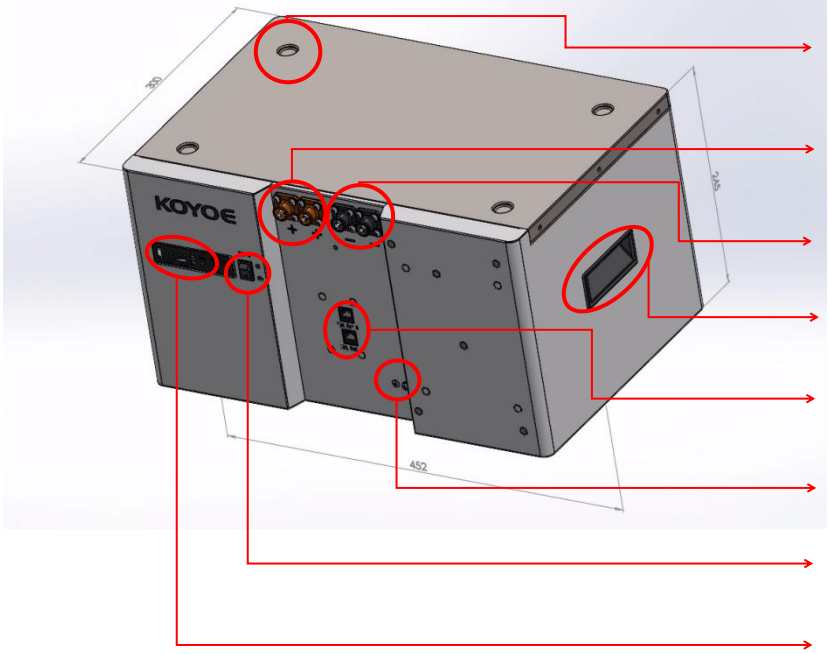
- Reserve 1m around the product to ensure sufficient space for installation.
- Ensure that the ground is flat enough to prevent the product from falling over.

Grounding and earthing

- The ground cable is connected correctly,securely, and reliably.
- The insulation resistance between the system and the ground is not less than 1MΩ .

4.2 Mount batteries

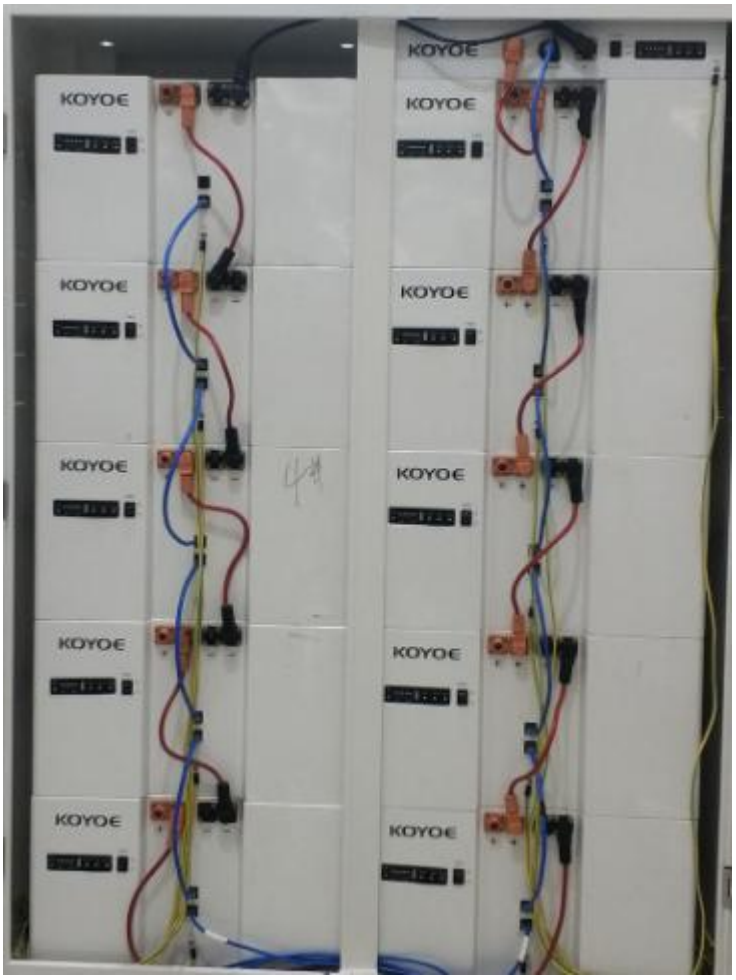
After unpacking the battery pack,check the battery pack interface and accessories,the interface is defined as follows.Stack according to the number of battery packs used,make sure the limit slot is in place.



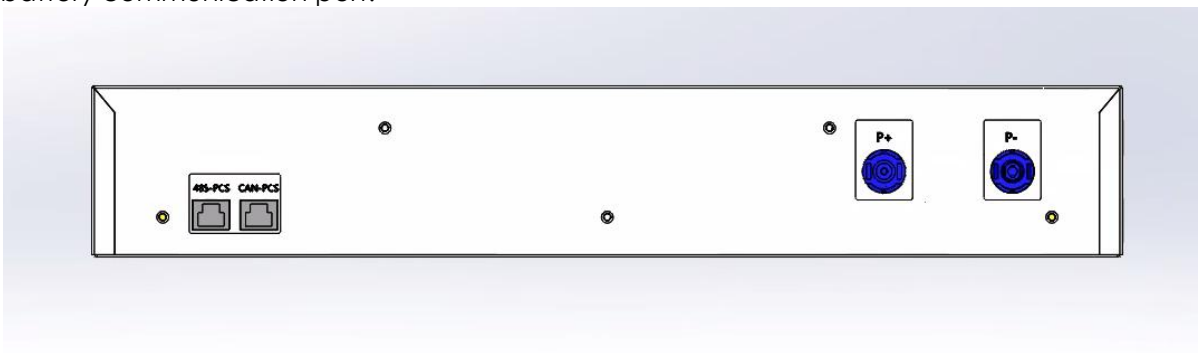
Indentation	Limit the movement of the above products when products are stacked
BAT+	Positive interface
BAT-	Negative interface
Cabinet handle	Easy to carry
RJ45	CAN Communication port
Ground	Ground screw hole
Switch	Main power switch
LED	Power display
Dimension	452*300*245mm

4.3 Cable connection

Battery packs can only be connected in series,connect in series according to the number of battery packs used, and then connect the batteries in series and connect the positive and negative to the control module.Connect the cable as shown in the figure.



P+, P- are connected to the positive and negative ports of the inverter battery,CAN-PCS is connected to the inverter battery communication port.



5.1 Product Warranty

The Product is integrated with Battery Control Modules (BCU) and Battery Modules, which designed for only series connection according to the Product Manual.This warranty of the battery modules' performance commences the period of five (5) years from the date of Product was manufactured.

This warranty does not include any accessories and tool kit items provided along with the Product.

This warranty only covers the repair or replace of a defective Product. We will repair or replace the Product if the Product is defective and returned during the Warranty Period. The repaired or replaced product will continue the original remaining warranty period. In either case it shall not justify as a renewal of the warranty period.

5.2 Warranty Conditions

The warranties in respect of the Product only apply if the Product:
1. is purchased from Koyoe or an Authorised Reseller in the Territory.
2. has the official Koyoe serial number;
3. is installed in the Territory;
4. is installed, operated and maintained in accordance with the Product Manual; and
5. be used on a daily cycle basis, under 90% depth of discharge, Photovoltaic (PV) energy storage.

5.3 Exclusions of Warranty

To the extent permitted by law, Koyoe excludes all liability for the Product to the extent that any damage or defect has been caused or contributed to by the following:
1. Inverter/PCS (power converting system)/EMS failure;
2. The Product being installed with inverters/PCS/EMS which have not been certified by Koyoe;
3. Battery has not been installed or operated properly according to the Product Manual;
4. You treat the Product improperly, negligently or in any other inappropriate way, including using the Product outside the recommended environment, temperature and humidity condition in accordance with the Product Manual;
5. transportation, including but not limited by dropping, trampling, deforming, impacting, or spearing with a sharp item;
6. storage, installation, commissioning, modification or repair of the Product that has been performed by a person other than Koyoe or a Koyoe's certified installer;
7. abuse, misuse, negligence, accidents or force majeure events, including but not limited to lightning, flood, fire, extreme cold weather, or other events outside the reasonable control of Koyoe;
8. any attempt to extend or reduce the life of the product without written confirmation from Koyoe, whether by physical means, programming or others;
9. water, conductive dust or corrosive gas;
10. the Product has been connected with different type battery modules;
11. failure to install, operate or maintain the product in accordance with the Product Manual;
12. normal wear and tear or deterioration, or superficial defects, dents or marks that impact the performance of the Product; and
13. theft or vandalism of the Product or any of its components.

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