



**User Manual of Home Energy Storage
System(Split Type)**

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Version 1.0	2022.03.12	/	/

Security Disclaimer

Users must read this chapter carefully and operate it according to the safety precautions required by this chapter before installing, using and repairing the battery. Our company will be responsible for nothing if it happens to any injuries and losses caused by improper operations.

Attention
It may cause moderate injury or minor injury to human beings, or even damages to product because of the danger caused by failure to operate as requirements.
Danger
It may cause fire or serious personal injury, or even death because of the danger caused by failure to operate as requirements.

Precautions for Safe Use

We feel quite thankful that you choose AMPLENESS Home Energy Storage System (Split Type). In order to enable you to use and maintain it in a better way, please kind read this user manual carefully before use.

Unpacking Examination	Attention
	<ol style="list-style-type: none"> Please don't install the battery if it is found damage or lack of parts. Otherwise, it may be malfunction. Please don't install battery and connect with supplier in time if the packing list doesn't same as that of the real one.
Installation	Danger
	<ol style="list-style-type: none"> The wiring work must be performed by the qualified electrical personnel, otherwise there will be a danger of electric shock or damage to product; Please ensure that the power is cut off before wiring, otherwise, there will be a danger of electric shock or catching fire. The installed cables must be meet requirements, and the part of power distribution must comply with safety regulations. Please carry out the installation strictly in accordance with the installation steps in the following chapters, otherwise it will cause the damage to product;
	Attention
	<ol style="list-style-type: none"> Please lift and put it down gently to avoid hurting feet or damage to product during transportation and installation.

	<ol style="list-style-type: none"> 2. Please keep battery away from the flammable objects and heat sources. 3. Please don't drop any sundries into battery during installation. Otherwise, it may cause system error.
Working	Danger
	<ol style="list-style-type: none"> 1. Please don't directly plug or unplug the DC input socket or other sockets like the terminal block socket, input socket and output socket to avoid the danger of electric shock. 2. Please don't directly open the battery shell to avoid the danger of electric shock.
	Attention
	<ol style="list-style-type: none"> 1. Please ensure that the battery will be work within the allowable range before operating to avoid damage to product. 2. Please ensure that the battery is fully charged and the power is cut off if it is not used for a long time, to the electricity power is empty due to long-term standing. 3. Please charge the battery regularly and disconnect the switch after the charging is completed if the product is not used for a long time.
Maintenance and Overhaul	Danger
	<ol style="list-style-type: none"> 1. Please ensure to disconnect the DC input, DC output and switch before disassembling the shell, to avoid the danger of electric shock. 2. Please don't touch directly the exposed parts of circuit to avoid the danger of electric shock, as there is still residual electricity inside the battery even after the shell is disassembled. 3. Please ask the professional personnel to perform the maintenance and overhaul. Please don't disassemble the battery by yourself. Otherwise, it may cause product damage and personal injury.
Transportation	Danger
	<ol style="list-style-type: none"> 1. Please avoid strong vibration, falling and bumping during transportation. Don't place the package upside down. Don't lose any accessories and user manual when unpacking package or transporting battery.
	Attention
	<ol style="list-style-type: none"> 1. Please be careful of your security and avoid hurting yourself in transportation.
Others	Danger
	<ol style="list-style-type: none"> 1. Please don't modify the system by yourself to avoid happening serious accidents. 2. Please immediately cut off the switch and input/output cables if it happens to abnormal conditions inside the system. 3. Please cut off all switches and put out the fire by using dry powder extinguisher if battery catches fire.

Manual Instruction: The Home Energy Storage System (Split Type) provides the energy storage for PV users and backup power support for the important electrical equipment. The battery system can store excessive power generated by PV system at daytime, and can utilize the stored energy (if necessary) to supply power for electrical equipment at night, thus improving the utilization efficiency of photovoltaic power generation, shaving peaks and filling valleys, providing backup power for emergency and important electrical equipment to avoid data and financial loss caused by sudden power outage.

The user manual introduces battery details like the basic structure, parameters, procedures and methods of installation, operation and maintenance.

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1. Product Introduction

The split type battery is a kind of energy storage product based on 51.2V lithium iron phosphate battery. This product configured a customized battery management system (BMS) is designed according to the energy storage requirements of home PV users. The battery system can store excessive power generated by PV system at daytime, and can utilize the stored energy (if necessary) to supply power for electrical equipment at night, thus improving the utilization efficiency of photovoltaic power generation, shaving peaks and filling valleys, providing backup power for emergency, etc.

1.1 Support Large-capacity Energy Storage

Multiple batteries can be connected in parallel to enlarge capacity.

1.2 High Reliability System

Adopting high-performance processor and configuring a customized BMS protection board to guarantee the system can operate stably.

Monitoring battery conditions in real-time. Providing many functions like short circuit protection, reverse polarity protection, high voltage protection, low voltage protection, over-current protection in charge, over-current protection in discharge, overcharge protection, over-discharge protection, high temperature protection, low temperature protection, balance cells, etc.

1.3 Strong Communication Function

Configuring multiple communication interfaces: RS-485, CAN; Knowing battery working status at any time through the master computer.

Multiple cascades: Obtaining address automatically; Non-human operation.

1.4 Leading Advantages in Product

Supporting charge and discharge by large current, 85A (1C) charging and discharging modular design, Small volume, Light weight, adopting multi-level energy consumption management, Operation and wiring on front panel, Easy to installation and maintenance; Excellent compatibility; Seamless connection between BMS and inverter; More convenient operation in one switch; Suitable for long-term cycles of charge-discharge.

2. Specification

2.1 Battery Specification

Type	Parameters	
Inverter Input (AC/DC)	Rated input voltage	54.4V
	Input voltage range	$36V \leq U \leq 60V$
	Input current	$\leq 85A$
	Input power	$< 5000W$
System Output(DC)	Nominal output voltage	51.2V
	Output voltage range	$44.8V < U < 58.4V$
	Output current	$\leq 85A$
	Output power	$< 5000W$
	Output overload	Protection board is outage and

		stops discharging power if current is over 110A and lasts 10S.
	Short circuit	System shuts down automatically
PACK Capacity	85Ah	
Production Board Function	Provide over-charge protection, over-discharge protection, over-current protection, high-temperature production, short circuit protection, etc.	
Battery Type	Quadrate lithium iron phosphate battery	
Working Temperature	Charge	0°C-55°C
	Discharge	-10°C-55°C
Relative Humidity	≤90%	
Dimension	[500mm(L)×446mm(W)×312mm(H)]±2mm (Not include bulge part)	
Weight	≤77±2Kg (Subject to real battery)	

Attention: The continuous charge/discharge current of each battery should $\leq 85A$ to guarantee battery the best using performance.

2.2 Product Standard Configuration

Name	No.	Unit	Specification	Remark
Home energy storage system(split type)	1	set	LiPO4 Cells, capacity 51.2V/85Ah, BMS, reserve 1 CAN and 2 RS485 interfaces, LED indicators, metal shell coated with insulating materials	
Output power cable	2	section	25 mm ² , 3 meters long	
Parallel power cable	2	section	25 mm ² , used in parallel	
Output communication cable(network line)	1	section	shielded Twisted Pair (STP), 3.5 meters long	
Product parallel line	1	section	shielded Twisted Pair (STP), 0.35 meters long	

2.3 Accessory List

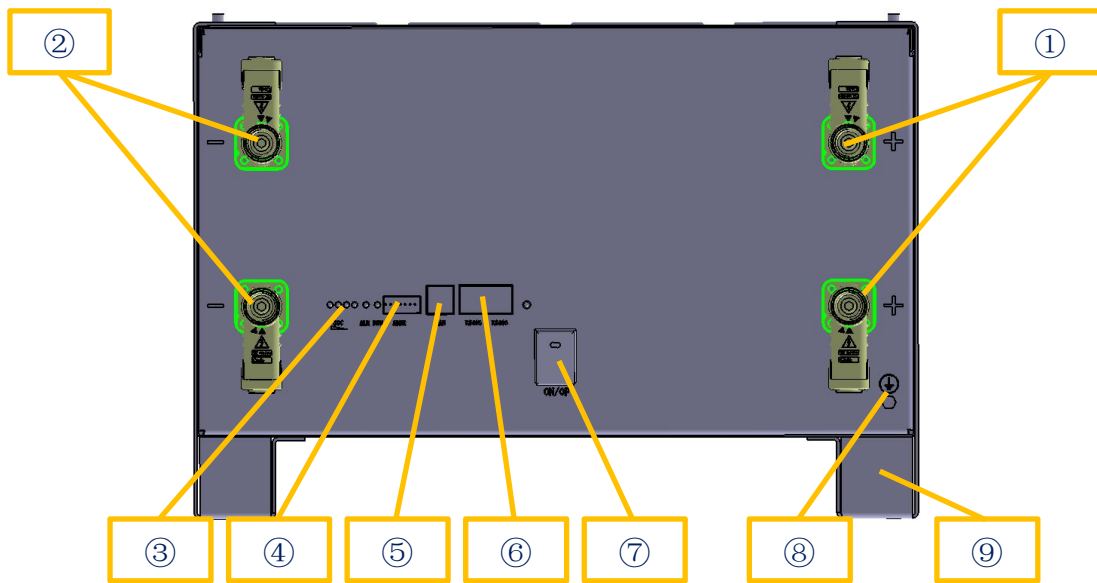
Name	No.	Unit	Specification	Remark
Ground wire	1	section	4 square, yellow and green	
Nuts, Screws, Bolts	1	set	/	

3. Function Description

3.1 Physical Figure of Front Panel



3.2 Front Panel Schematic



3.3 Parts Description

NO.	Name	Function	Remark
①	Positive electrode	connect the positive electrode of external device	
②	Negative electrode	connect the negative electrode of external device	
③	Capacity indicator, alarm indicator	Indicate working status, battery capacity	
④	Address DIP switch	Change product code when multiple units are connected in parallel	

⑤	CAN interface	Connect external device	
⑥	RS485 interface	Connect external device	
⑦	Battery switch	Battery switch	
⑧	Ground point	Avoid accidental leakage of electricity	
⑨	Support rack	Fix product on the support	

3.4 Battery Management System (BMS protection board) Function

3.4.1 Voltage Protection Function

Discharging low-voltage protection	Charging over-voltage protection
In discharging, the over-discharge protection will start and battery stops to supply electricity if the voltage of any single cell is lower than the protection value. The protection will be dismissed after the voltage of all cells returns to the range of rated hysteresis value.	In charging, the system will stop charging if the voltage of battery module or any single cell reaches to the protection value. The protection will be dismissed after the battery module voltage and cell voltage return to the range of rated hysteresis value.

3.4.2 Current Protection Function

Charging over-current protection	Discharging over-current protection
System stops charging if charging current is over the protection value. Protection is dismissed after a period of time. Please pay attention that the maximum charging current shouldn't exceed to the protection value when using the battery.	System stops discharging if discharging current is over the protection value. Protection is dismissed after a period of time. Please pay attention that the current required by electrical equipment shouldn't exceed to the protection value when using the battery.

3.4.3 Temperature Protection Function

Charging low/over-temperature protection	Discharging low/over-temperature protection
In charging, system starts charging temperature protection and stops charging if the battery temperature is over protection range, and dismisses protection after temperature returns to rated hysteresis value.	In discharging, system starts discharging temperature protection and stops supplying electricity if the battery temperature is over the protection range, and dismisses protection after temperature returns to rated hysteresis value.

3.4.4 Other Protection Function

Short circuit protection	Automatic shutdown
System starts short circuit protection if it occurs to short circuit when battery starts working from a shutdown state.	Battery will shut down automatically after it has no external loads and power supply for 48 hours.

4. Running Environment

Running Environment	Condition
Working temperature	0°C - 50 °C
Relative humidity	5% - 95% , no condensation
Altitude	2000m
On-site environment	Away from heat source, avoid direct sunlight, no corrosive gas, no explosive gas, non-destructive insulation gas, non-destructive insulation conductive dust

5. Requirements of Package, Transportation, Storage

Items	Methods	Requirements
Transportation	Transport	Please avoid violent vibration, impact or extrusion, and protect it from sun and rain during transportation.
	Loading and unloading	Please move it gently, and avoid falling, tumbling and pressing.
Storage	Storage environment	Storage temperature: -20 °C~55°C; relative humidity ≤85%; Stored in the clean, dry, ventilated room and avoid the direct sunlight.
	Gas environment	Please prohibit harmful gas, flammable and explosive products, corrosive chemicals.
	Away from danger	Please keep away from corrosive substances, fire and heat sources
	Battery storage SOC	20%--50%
	Long-term storage	Storage for more than 6 months, please ensure that the battery is charged for more than 80% capacity before storage, and charged once every 6 months with over 80% supplementary power.

6. Installation and Configuration

6.1 Installation Preparation

6.1.1 Security regulations

Only those people who master the knowledge of power-supply system and electricity precautions are allowed to install this device. In installation, please always observe the local safety regulations and meet the security requirements listed below.

Please ensure that the battery is uncharged and in shutdown state before installing or disassembling it.

Please ensure that the power distribution cables are routed properly and have protection, avoiding touching these cables when people operate the device.

6.1.2 Running environment examination

The running environment should meet the above referred requirements. If it is not as request, please rectify it and re-examine running environment.

6.1.3 Tools and data

Required tools and instruments are as following form:

Name	Remark
Multimeter	Examine product status. Please avoid operating it with electricity.
Screwdriver (slotted, cross)	Disassemble, install screw bolt
Wrench	Fix the bracket
Diagonal pliers	Cut off cables

6.1.4 Technical Preparation

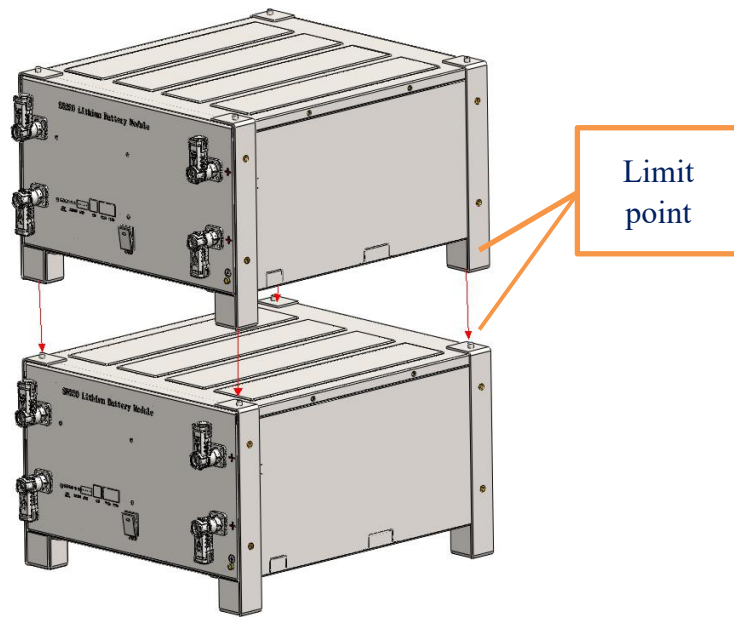
Electrical interface setting	Security examination
<p>Please kind do the following examination if the battery connects with the user's device directly:</p> <p>Check whether the DC charging interface of inverter meets requirements of specification, voltage, current of battery pack.</p> <p>Check whether power of electrical device matches with the parameters of battery pack.</p>	<p>Fire-fighting equipment should be prepared near the battery, like, the portable dry powder fire extinguisher. It is strictly forbidden to place flammable, explosive and other dangerous items next to the battery.</p>

6.1.5 Installation Instruction

Please take reference for the structure diagram of split type battery. The product includes battery module and fixed bracket. For using one battery alone, you just need to connect with an inverter by placing the product on flat ground.

For using in parallel, the battery packs can be stacked up to 4 layers.

Limit points are designed on top of and at bottom of battery bracket, which can strengthen stability and practicality, thus avoiding the danger of accidental displacement, side slip and others in working.



6.2 Unpacking

Please unload the product as requirements and prevent it from sun and rain when the device arrives at installing site. Before unpacking, please check the total number of materials in **【Shipping List】** attached on package, and check whether is package is well packed or not.

In the process of unpacking, please pay attention to lift and put it down gently and protect its surface coating.

The installing person should read technical document, check the list, confirm whether accessories are completed and intact according to **【Configuration Table】** and **【Packing List】** at first after unpacking. If internal packages are damaged, please check it carefully and take records.

6.3 Preparation



- 1) Please ensure the POWER buttons of all batteries are in cut-off status.
- 2) Please ensure the charging voltage of the device is within the product allowable range.
- 3) Please cut off power to all related devices.

6.4 Installation and wiring

6.4.1 Device installation

Please take reference of the way recommended by manual to place the product. All devices must be firm during installation. Please arrange the stacked number of devices flexibly as actual needs. Don't install batteries on sloping and unstable ground.

6.4.2 Ground wire connection

Please unscrew the screw at the ground hole on front panel, install the ground terminal on the screw and tighten it with a screwdriver. The other end of ground wire is connected to the nearby bracket, and the whole is connected to a reliable ground point.

Attention: the ground resistance $< 4\Omega$.

6.4.3 Power cable connection

Please check the continuity of the cable, distinguish the positive and negative terminals, and label the cables before connecting power cable. Please also check whether there is short circuit and reverse connection after the cable connection is finished. The checking method is as follows:

Cable continuity: please adjust to the buzzer gear of multimeter and test two ends of the cable by a probe. If the buzzer sounds, the cable is available.

Voltage diagnosis: please adjust to the DC voltage gear of multimeter and test the positive and negative electrode of battery by a probe. If it indicates the voltage within the normal range, the product can be used.

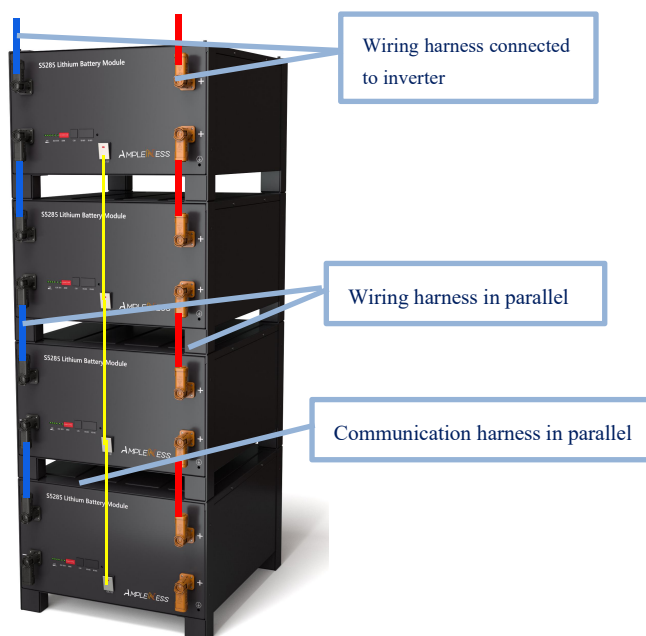
6.4.4 Cables connection

Please take reference of the following description of wiring method for installing battery pack.

A single battery: please connect the positive electrode of battery with the DC positive electrode of inverter by a red cable, and connect the negative electrode of battery with the DC negative electrode of inverter with a black cable.

Multiple batteries: please adopt the parallel connection method between battery and battery or battery and inverter. At first, please connect the positive terminals of the adjacent 2 batteries respectively by a red cable, and connect the negative terminals of the adjacent 2 batteries respectively by a black cable. Second, please connect the positive electrode of battery with the DC positive electrode of inverter by a red cable, and connect the negative electrode of battery with the DC negative electrode of inverter by a black cable.

Communication cable, please connect the CAN interface of battery with the communication interface of inverter. The RS485 interface of battery is used for the communication connection of two batteries.



6.4.5 Communication wire connection

A single battery: just select the corresponding interface according to the communication protocol of inverter.

Multiple batteries: the host and the slave batteries communicate in cascade mode, thereinto, one of them is the host, and the rest are slave batteries. Please take reference for cascade wiring of the above map. Then, the corresponding port can be connected to the host battery according to the communication protocol of inverter.

6.4.6 Start-up

- 1) Please confirm again whether all cables are correctly connected, firmly connected, and not short circuit or reverse connection before starting up.
- 2) Please turn all battery switch buttons to "ON".
- 3) A single battery: If the battery SOC indicator is always on and the alarm indicator is off, it means that the battery has been started.
- 4) Multiple batteries: If all battery SOC indicators are always on and the alarm indicator is off, it means that all batteries have been started.

Attention: please connect the inverter immediately to charge if battery power is too low and cannot be started.

6.4.7 Power-on test

1. Please connect battery and inverter or DC switching power supply.

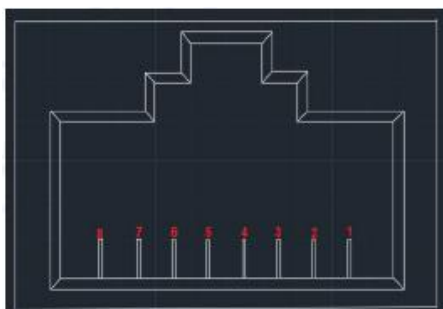
2. Please check whether battery state is normal according to the indicator table:
 - a. battery will be in charging mode if battery power is not full and inverter has successfully charged to battery.
 - b. battery will be in standby mode if battery power is full and is not supply power to loads.
 - c. battery will be in discharging mode if battery is supply power to loads.

System State	Running State	RUN	ALM	SOC				Instruction
		●	●	●	●	●	●	
Shutdown	Dormancy	OFF	OFF	OFF	OFF	OFF	OFF	All OFF
Standby	Normal	Flash 1	OFF	OFF	OFF	OFF	OFF	Standby state
Charge	Normal	ON	OFF	Follow battery capacity indication				LED flash 2 maximum
	Over-current warning	ON	Flash 2	Follow battery capacity indication				LED flash 2 maximum
	Over-voltage warning	Flash 1	OFF	OFF	OFF	OFF	OFF	
	Temperature, overcurrent protection	Flash 1	Flash 1	OFF	OFF	OFF	OFF	
Discharge	Normal	Flash 3	OFF	Follow battery capacity indication				Follow battery ON indication
	Warning	Flash 3	Flash 3					

7. Communication Settings

The product is designed with communication interfaces like the RS485 and CAN, and the battery status can be easily obtained or the internal parameters can be modified through the master computer.

7.1 RS485 interface

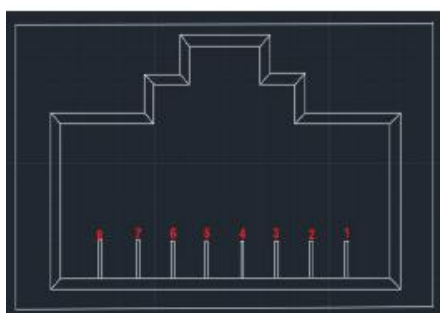


Pin	Definition
1、 8	Ground
2、 7	RS485-B
3、 6	RS485-A
4、 5	NV (hanging)

The product has RS485 communication between battery packs, and baud rate is 19200bps. Please take reference for the above figure of communication interface definition.

7.2 CAN interface

The product has the CAN communication function between battery packs and inverter, and baud rate is 500K. Battery can communication with the inverter and CAN TEST by connecting with standard network cables, and the current battery information can be uploaded to the related device.



Pin	Definition
1、 2、 7、 8	NV (hanging)
4	CAN-H
5	CAN-L
3、 6	Ground

8. Abnormal Conditions and Fault Handling

8.1 Fault and abnormal phenomenon handling

Fault Phenomenon	Fault Causes	Handling Method
DC input fault	No DC input voltage	Please check whether DC input switch is closed, check whether circuit is open
Battery fault	No battery DC output	Please check whether switch is closed, check whether circuit is open
Overload	Too large power or short circuit	Please confirm whether load is less than the rated power, check whether load is short circuit
Abnormal temperature inside system	Over temperature inside box	Please turn off the load and restart it after temperature drops, check

		whether ambient temperature exceeds the standards
Low battery	SOC too low	Please charge the battery
System fault	System operation error	Please cut off load, shutdown switch, and restart battery

The split-type battery is designed with indicators on the upper panel, and has perfect protection function. Battery system will stop to output power and indicators will indicate the abnormal condition once the abnormality or failure occurs.

9. Maintenance and Recycling

Frequent maintenance is required in order to ensure the continuous and normal operation of battery, and recycling of old equipment is also required in order to settle the environmental protection issues.

9.1 Operation environment

The installation and storage of battery should avoid the environment of high corrosiveness, high dust, high temperature and high humidity, especially avoid metal substances falling into the box.

9.2 Security examination

Please check regularly whether connecting line is aging, and whether connection point of cable is tight and safe.

9.3 Maintenance requirement

Please cut off power supply completely before opening the box for maintenance. Please don't damage parts and components when disassembling, and pay attention to the sequence of wiring. Please also perform maintenance by wearing insulting gloves and using insulting tools.

9.4 Specific requirements of maintenance

Please clean the dust and debris in box, and check whether the terminals and screws in box are fastened, whether traces left and damaged components by overheating in the box. Please refer to user manual to deal with problems when the battery is in fault and cannot work normally. If the problem still cannot be solved, please contact with the dealer or the manufacturer as soon as possible. Don't disassemble parts by yourself.

9.5 Battery Recycling

About the information on proper disposal of old battery, please contact with your local recycling center or hazardous waste disposal center. Please don't discard battery into fire as it may lead to the danger of explosion. Please take reference for your local regulations about battery disposal requirements and dispose the wasted battery properly. Don't disassemble

battery randomly as the released electrolyte is harmful to your skins and eyes, and it even has toxic. Please don't discard battery into trash. For more detailed information, please contact with your local recycling/reuse center or hazardous waste disposal center. Don't discard the wasted electrical or electronic devices into trash. Please contact your local recycling/reuse center for proper disposal;

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The product complies with the requirements of environmental protection and personal safety. The storage, use and disposal of product should be carried out in accordance with the product manual, relevant contracts or laws, regulations.

You can check relevant technical information through Ample ESS website when there are product updates and technical changes.

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