FIVEPOWER

Product specification

Product name: 51.1V117Ah Li-ion Battery System

Project name	Configuration
External switch function	Yes
Current limiting function	Yes
Display screens	Yes
Storage functions	Yes
Pre-charge function	Yes
Communication functions	CAN
Secondary protection	Yes

Update records

Versions	Description	Date	Status
A	First Edition Release	2022.09.09	Controlled

Catalogue

1. Basic introduction

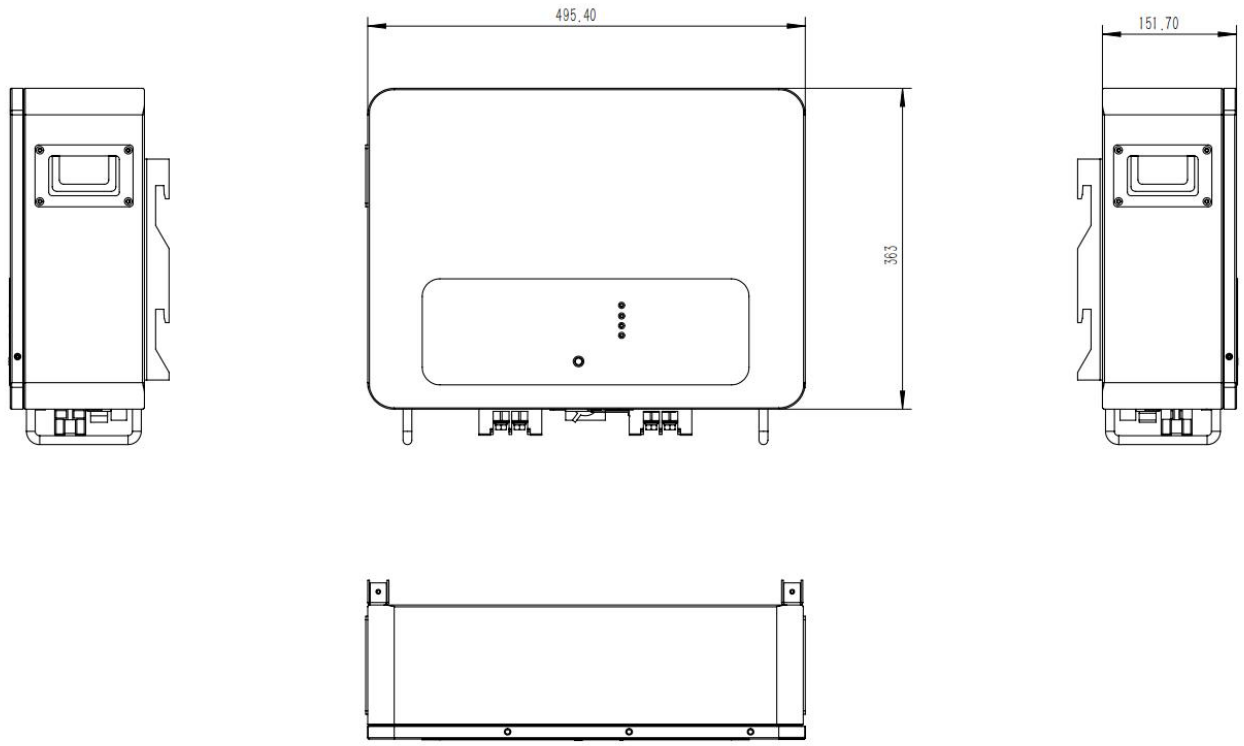
The battery system is suitable for home energy storage, small and medium-sized commercial storage battery system. It uses 3.6V 117AH lithium cells to form a 1 and 14 string battery module and an intelligent BMS to form a lithium system. The system supports a maximum of 14 batteries in parallel. The system is not allowed to be used in series and mixed with other batteries of different brands and types.

2. Features introduction

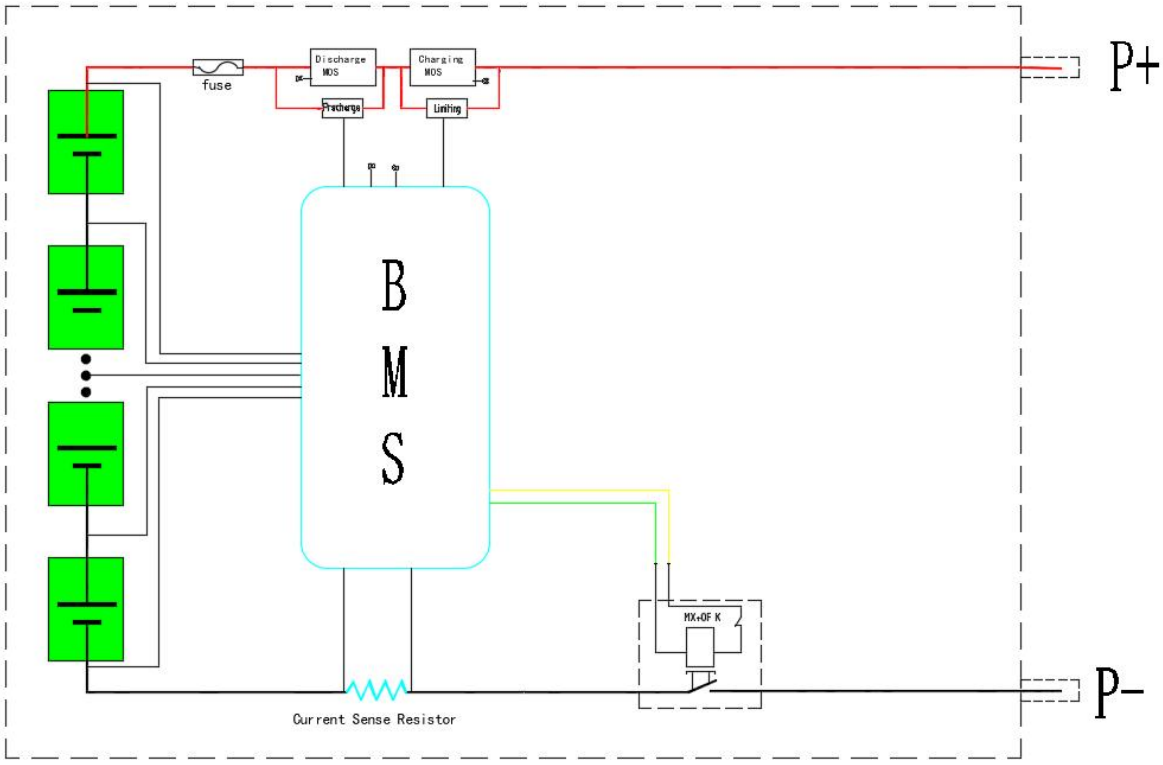
- Battery voltage calculation: 14 cell voltage sampling test, deviation ±20mV.
- Battery and ambient temperature detection: 4 battery temperature sensors, 1 ambient temperature sensor, 1 MOS temperature sensor, deviation ±2° C
- Battery capacity and number of cycles: Complete a full charge/discharge cycle to set the actual capacity. The remaining capacity of the battery is monitored with an accuracy of up to 5% deviation in capacity estimation. In addition, the charge and discharge cycle times as well as the complete charge and discharge cycle times can be configured.
- Intelligent cell balancing: charging and static balancing strategies can be set flexibly to effectively extend service life.
- Communication interface: PC or intelligent front-end can monitor battery pack data, control operation and set parameters through telemetry, telematics, telecontrol and remote control commands. The communication protocol meets the requirements of YD/T 1363.3 and also enables cascade communication.
- Historical data recording, saving and reading: records and saves real-time battery status and alarm information when the battery becomes abnormal. Up to 500 historical fault data can currently be stored.
- Battery management system parameter setting: Battery management system parameters, including cell battery over/under voltage, total battery voltage over/under voltage, charge/discharge over current, battery high/low temperature, battery capacity, operating mode, charge/discharge limit current, etc., can be set in the battery monitoring system.
- Operating modes: Current limiting, constant voltage output, direct output and other operating modes can be set in the monitoring system.
- Multiple protection functions: hardware protection, battery protection, high and low temperature protection, output short circuit protection, etc.

3. Product details

3.1 Outline dimensions and interface schematic



3.2 Electrical schematics



3.3 Battery performance parameters

Serial number	Projects	Specification
1	Battery configuration	1P14S
2	Rated voltage	51.1V
3	Operating voltage range	42V~58.1V
4	Rated capacity	117Ah
5	Rated	5.67KWh (95% DOD)
6	Standard charge/discharge current	50A @25±2° C
7	Max. charging current	100A@25±2° C
8	Max. discharge current	100A @25±2° C
9	Operating ambient temperature	0～40℃(Charge)
		-20～40℃(Discharge)
10	Storage temperature and humidity	-10° C~35° C (within one month of storage) 25±2° C (within three months of storage)
11	Dimensions (L x W x H)	(495.4)x(363)x(151.7)mm
12	Weight	38Kg±3kg
13	Cycle life	4000 cycles @25° C 50A charge/discharge current 80% DOD
18	IP Rating	IP 2X
19	Communication methods	CAN or RS485
20	Elevation	0-3000m
21	Humidity range	5 to 80%

3.4 Battery protection parameters

Function name	Function settings	Project List	Set values	Setting range
Individual voltage alarms	Open	Single high voltage alarms	4200mV	Single high voltage recovery ~ Single overvoltage protection
		Monoblock high voltage recovery	4000mV	3000mV~Single high voltage
	Open	Single low voltage alarm	3100mV	Single undervoltage protection ~ single low voltage recovery
		Monoblock low pressure recovery	3300mV	Single low voltage alarm ~3300mV
Single unit overvoltage protection	Open	Single unit overvoltage protection	4150mV	Single high voltage alarm ~4500mV
		Single unit overvoltage recovery	4000mV	Single high voltage recovery ~ single overvoltage
		Overpressure recovery conditions	1. Monomer voltage drops to overvoltage recovery point 2. Residual capacity below 96% of intermittent make-up capacity Two conditions must be met to restore	
			A discharge current of >1A is detected in the battery	
Single unit undervoltage protection	Open	Undervoltage protection voltage	2900mV	1500mV~Single undervoltage recovery

		Undervoltage recovery voltage	3300mV	Single under-voltage protection ~ single low voltage alarm
		Single undervoltage shutdown	Shutdown and maintain communication for 1 minute after undervoltage protection	
		Undervoltage recovery conditions	Charging current detected (>1A)	
Battery total voltage alarm	Open	Total pressure high voltage alarm	57.4V	General high voltage recovery ~ General over-voltage protection
		Total pressure high voltage recovery	56.0V	53.0V ~ total voltage high voltage
	Open	Total low pressure alarm	43.4V	General undervoltage protection ~ General undervoltage recovery
		Total pressure low pressure recovery	46.2V	Total voltage low alarm ~55.0V
General over-voltage protection	Open	General over-voltage protection	58.0V	Total voltage high voltage alarm ~60.0V
		General pressure overpressure recovery	56.0V	General High Voltage Recovery ~ General Overvoltage
		Overpressure recovery conditions	1. Monomer voltage drops to overvoltage recovery point 2. Residual capacity below 96% of intermittent make-up capacity Two conditions must be met to restore	

			A discharge current of >1A is detected in the battery	
Under-voltage protection of the mains voltage	Open	Under-voltage protection of the mains voltage	40.6V	36.0V ~ total voltage undervoltage recovery
		Total voltage undervoltage recovery	46.2V	General under-voltage protection ~ General under-voltage alarm
		Total voltage undervoltage shutdown	Shutdown and maintain communication for 1 minute after undervoltage protection	
		Undervoltage recovery conditions	Charging current detected (>1A)	
Cell temperature ban on charging	Open	Charging high temperature alarm	50°C	Charging high temperature recovery ~ Charging over temperature protection
		Charging high temperature recovery	47°C	35° C~Charge High Temperature Alarm
		Charging over-temperature protection	55°C	Charge over temperature recovery ~80°C
		Charge over temperature recovery	50°C	Charging high temperature recovery ~ Charging over temperature protection
		Charging low temperature alarm	2°C	Charging under temperature protection ~ Charging low temperature recovery

		Charging low temperature recovery	5°C	Charging low temperature warning ~10°C
		Charging under-temperature protection	-10°C	-20° C~Charging under-temperature recovery
		Charge under temperature recovery	0°C	Charging under temperature protection ~ Charging low temperature recovery
Cell temperature ban	Open	Discharge high temperature alarm	52°C	Discharge High Temperature Recovery ~ Discharge Over Temperature Protection
		High temperature recovery from discharge	47°C	35°C ~ discharge high temperature alarm
		Discharge over-temperature protection	55°C	Discharge overtemperature recovery ~80°C
		Discharge overtemperature recovery	50°C	Discharge High Temperature Recovery ~ Discharge Over Temperature Protection
		Discharge low temperature alarm	-10°C	Discharge under-temperature protection ~ discharge low temperature recovery
		Discharge low temperature recovery	3°C	Discharge low temperature warning ~10°C

		Discharge under-temperature protection	-15°C	-30° C~Discharge under-temperature recovery
		Discharge under-temperature recovery	0°C	Discharge under-temperature protection ~ discharge low temperature recovery
Ambient temperature protection	Open	High ambient temperature alarm	50°C	Ambient High Temperature Recovery ~ Ambient Over Temperature Protection
		Environmental heat recovery	47°C	-20°C ~ ambient high temperature alarm
		Environmental overtemperature protection	60°C	Ambient overtemperature recovery ~80°C
		Environmental overtemperature recovery	55°C	Environmental heat recovery~ Environmental overtemperature protection
		Ambient low temperature warning	0°C	Environmental under-temperature protection~ Environmental low temperature recovery
		Environmental low temperature recovery	3°C	Ambient low temperature warning ~60°C
		Environmental under-temperature protection	-10° C	-30°C~ Environmental under-temperature recovery

		Environmental under-temperature recovery	0° C	Ambient under-temperature protection ~ Ambient low temperature recovery
Power temperature protection	Open	Power high temperature alarm	90°C	Power High Temperature Recovery ~ Power Over Temperature Protection
		Power high temperature recovery	85°C	60°C ~ power high temperature alarm
		Power over-temperature protection	100°C	Power high temperature alarm ~120°C
		Power over-temperature recovery	85°C	Power High Temperature Recovery ~ Power Over Temperature Protection
Charging current limit	Close	Active flow restriction	10A	Charger current greater than 10A, current limit on
	Open	Passive flow restriction		Charger current greater than charging overcurrent alarm (value settable), current limit on
		Charging current limit delay	5 minutes	Re-check if current limit is on after 5 minutes after it is turned on

Charging overcurrent alarm	Open	Charging overcurrent alarm	100A	Charging overcurrent recovery ~ Charging overcurrent protection
		Charge overcurrent recovery	95A	0A~Charging overcurrent alarm
Charging overcurrent protection	Open	Charging overcurrent protection	110A	0A~150A
		Charge overcurrent delay	10S	Can be set up
		Overcurrent recovery conditions	Immediate recovery after discharge, or automatic recovery after 60S	
Effective charging current	Charge entry current		1000mA	
	Charge exit current		700mA	
Discharge overcurrent alarm	Open	Discharge overcurrent alarm	-105A	Discharge overcurrent protection ~ put into overcurrent recovery
		Put to overcurrent recovery	-103A	Discharge overcurrent alarm ~0A
Discharge overcurrent protection	Open	Discharge overcurrent protection	-110A	Transient overcurrent protection ~0A
		Discharge overcurrent delay	10S	Can be set
		Overcurrent recovery conditions	Charging resumes immediately, or automatically after 60S	

Transient overcurrent protection	Open	Transient overcurrent protection	-220A	Discharge overcurrent protection value To 300A
		Transient overcurrent delay	30mS	Can be set
		Transient overcurrent recovery	Charging resumes immediately, or automatically after 60S	
	Close	Transient overcurrent lockout	Continuous secondary overcurrent, exceeding the number of overcurrent lockouts	
		Number of overcurrent lockouts	5 times	
		Transient lock release	Connecting the charger	
Output short circuit protection	Open (Currently no support for turning off settings)	Short-circuit protection current and time delay	Write-in procedure (not configurable)	
		Short circuit protection recovery	Charging resumes immediately, or automatically after 60S	
	Open	Short circuit protection lockout	Continuous short-circuiting of the output, exceeding the number of overcurrent lockouts	
		Number of short-circuit lockouts	5 times	
		Short circuit lockout release	Connecting the charger	
Effective discharge current	Discharge into current		-1000mA	
	Discharge exit current		-700mA	
Cell balancing function	Open	Standby balance	No charge/discharge state to turn on equalisation	

		Standby equalisation time	10 hours	Can be set up
	Open	Charge balance	Equalisation on charge and floating charge	
	Turn-on voltage conditions	Balanced opening voltage	3350mV	Can be set
		Balanced opening differential pressure	30mV	

		Equalisation of end pressure differential	20mV	
	Open	Equalisation of temperature limits	Equalisation off temperature range based on (ambient alarm temperature decision)	
		Balanced heat ban	50°C	Can be set up
		Balanced low temperature ban	0°C	
Battery failure warning	Open	Cell failure differential pressure	500mV	Can be set up
		Cell recovery differential pressure	300mV	
Battery capacity setting	Battery rated capacity		111Ah	5Ah To 200Ah
	Battery capacity remaining		Estimation based on cell voltage	Can be set
	Cycle accumulation capacity		80%	Number of cycles (configurable)
	Open	Remaining capacity alarm	15%	

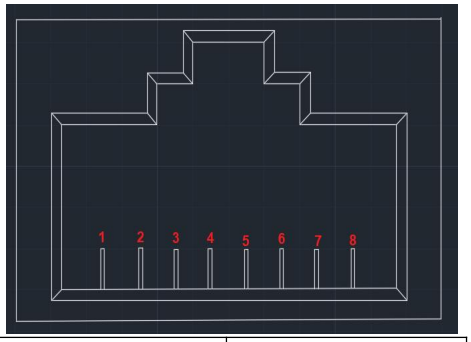
	Open	Residual capacity protection	5%	Turn off output
Reset button	Power on/activation		When the BMS is in a dormant state, press the 1S reset button, the BMS is activated and the LEDs light up in turn and then turn into a normal working state.	
	Shutdown / Hibernation		When the BMS is in standby or working state (except charging), press the 3S reset button, the BMS is put to sleep and the LEDs light up in turn and then turn to sleep.	
Pre-charge function	2000ms	0~5000ms configurable	Pre-charge function activated instantly when the BMS is switched on	
BMS power management	Open	Maximum standby time	48h (charger not present and no effective discharge current)	
Low temperature heating of the battery core	Close	Low temperature heating of the battery core	0° C	Can be set
		Cell heating recovery	10° C	
External switches	Close	The BMS can be switched off and on with an external switch when the BMS is in standby		
LCD screen	Open	Simple monitoring software to view cell, temperature, current and other data		
Manual charge activation	Open	1 mark	BMS shutdown after undervoltage protection, manual key press to activate clear undervoltage protection forced output	Can be set
Compensation impedance	Connection fault impedance	10m Ω	Between 8 and 9 by default	Battery connection cable impedance compensation
	Compensation point 1	0m Ω	9	Can be set
	Compensation point 2	0m Ω	13	

4. Communication notes

4.1 CAN communication

The BMS has a CAN communication function for battery pack uploads at a baud rate of 500 K. The CAN communication interface uses an 8P8C network cable interface. The CAN interface can be used to communicate with the inverter or CAN TEST. When the batteries are connected together, they are connected together through RS485 communication and finally the battery data, status and information are uploaded to PCS through CAN communication.

CAN communication interface definition.

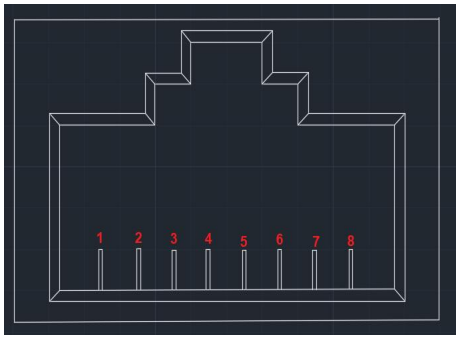


1, 2, 7, 8	NC
4	CAN-L
5	CAN-H
3, 6	Ground

4.2 RS485 communication

The BMS is equipped with RS485 communication for the battery set connection at a baud rate of 19200 bps. the RS485 communication interface uses an 8P8C network cable interface.

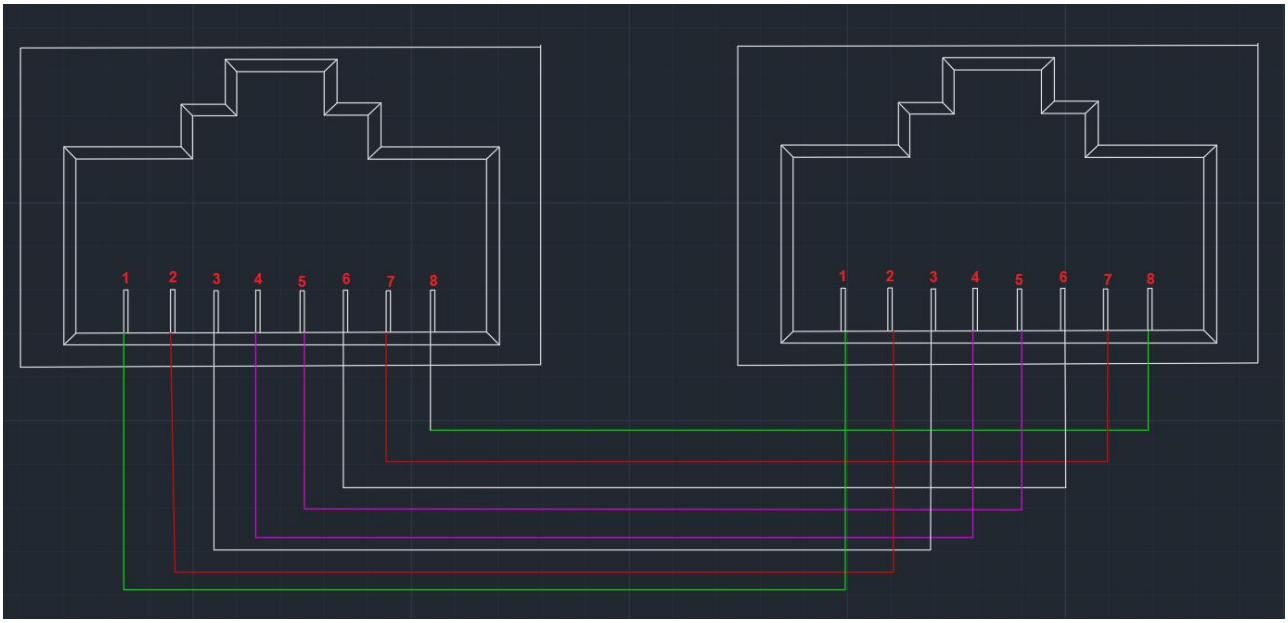
RS485 communication interface definition.



Pins	Definition notes
1, 8	RS485-B
2, 7	RS485-A
3, 6	Ground
4, 5	NC (overhang)

4.3 Parallel communication

The RS485 interface is used as the parallel communication interface when multiple units are connected in parallel and the CAN interface is used as the uplink communication interface. The terminal device can read the sum of the battery data of all parallel PACKs via the CAN interface. For parallel connection of multiple machines, the RS485 interface connection is shown in the following diagram.



4.4 Dialing address selection

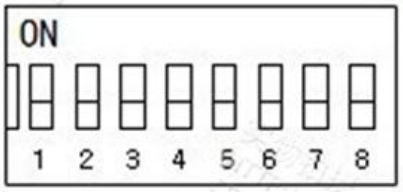
Definition of parallel dipswitches: For multi-machine communication when batteries are connected in parallel, the dipswitches are used to distinguish between different Pack addresses, the hardware address can be set via the dipswitches on the board.

Dipswitches bit1 to bit8 are defined: bit1 to bit4 for setting the address, bit5 to bit8 for the number of slaves.

Host settings: bit1 to bit4 are 0, the host address is fixed to 0, bit5 to bit8 are set according to the number of slaves connected in parallel. (as in Table 2)

Slave settings: bit1 to bit4 are set according to the device order, slave address range 1 to 15. bit5 to bit8 are fixed to 0. (see table 1)

Address setting for parallel use: refer to the following table for the definition of the dipswitches



5 Basic working modes

5.1 Charging modes

The BMS turns on the charging MOSFET for charging when it detects that the charger is connected and that the external charging voltage is greater than the internal battery voltage by more than 0.5V. The charging mode is entered when the charging current reaches the effective charging flow. Both charge and discharge MOSFETs are closed in charge mode.

5.2 Discharge mode

The BMS enters discharge mode when it detects a load connection and the discharge current reaches the effective discharge current.

5.3 Standby mode

When neither of the above two modes is satisfied, the standby mode is entered.

5.4 Shutdown mode

The BMS enters shutdown mode after 48 hours of normal standby, when the battery triggers undervoltage protection, performs a push-button shutdown or an external switch shutdown.
Wake up conditions for off mode: 1. charge activation; 2. 48V activation; 3. key on.

6.1 Description of the LED indication

6.2.1 LED light sequence

1 operating light, 1 warning light, 4 capacity indicators

6.1.2 Capacity indication

Status		Charging				Discharge			
Capacity indicator		L4●	L3●	L2●	L1●	L4●	L3●	L2●	L1●
	0 to 25%	extinguish	extinguish	extinguish	Blinking	extinguish	extinguish	extinguish	Always bright
	25 to 50%	extinguish	extinguish	Blinking	Always bright	extinguish	extinguish	Always bright	Always bright
	50-75%	extinguish	Blinking	Always bright	Always bright	extinguish	Always bright	Always bright	Always bright
	⩾75%	Blinking	Always bright	Always bright	Always bright	Always bright	Always bright	Always bright	Always bright
Operating light ●		Long light				Blinking			

6.1.3, Flashing instructions

Flashing method	Bright	extinguish
Flash 1	0.25s	3.75s
Flash 2	0.5s	0.5s
Flash 3	0.5s	1.5s

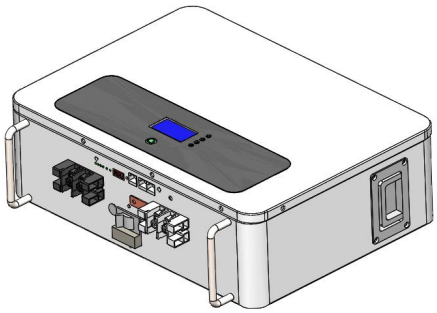
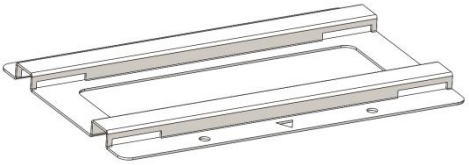
6.2. Status indication

System Status	Operational status	RUN	ALM	SOC				Description
		●	●	●	●	●	●	
Shutdown	Dormancy	extinguish	extinguish	extinguish	extinguish	extinguish	extinguish	Total extermination
Standby	Normal	Blinking	extinguish	extinguish	extinguish	extinguish	extinguish	Standby status
Charging	Normal	Always bright	extinguish	Based on power indicator				Maximum LED flashing 2
	Overcurrent alarm	Always bright	Flash 2	Based on power indicator				Maximum LED flashing 2
	Overvoltage protection	Flash 1	extinguish	extinguish	extinguish	extinguish	extinguish	
	Temperature, overcurrent protection	Flash 1	extinguish	extinguish	extinguish	extinguish	extinguish	
Discharge	Normal	Flash 3	extinguish	Based on power indicator				Constant light indication based on battery level

	Alerts	Flash 3	Flash 3					
	Temperature, overcurrent, short circuit, etc. protection	extinguish	Always bright	extinguish	extinguish	extinguish	extinguish	Stops discharging, no action after 48h forced sleep when the mains is offline
	Undervoltage protection	extinguish	extinguish	extinguish	extinguish	extinguish	extinguish	Stop discharge

7 Installation and commissioning

7.1 List of goods

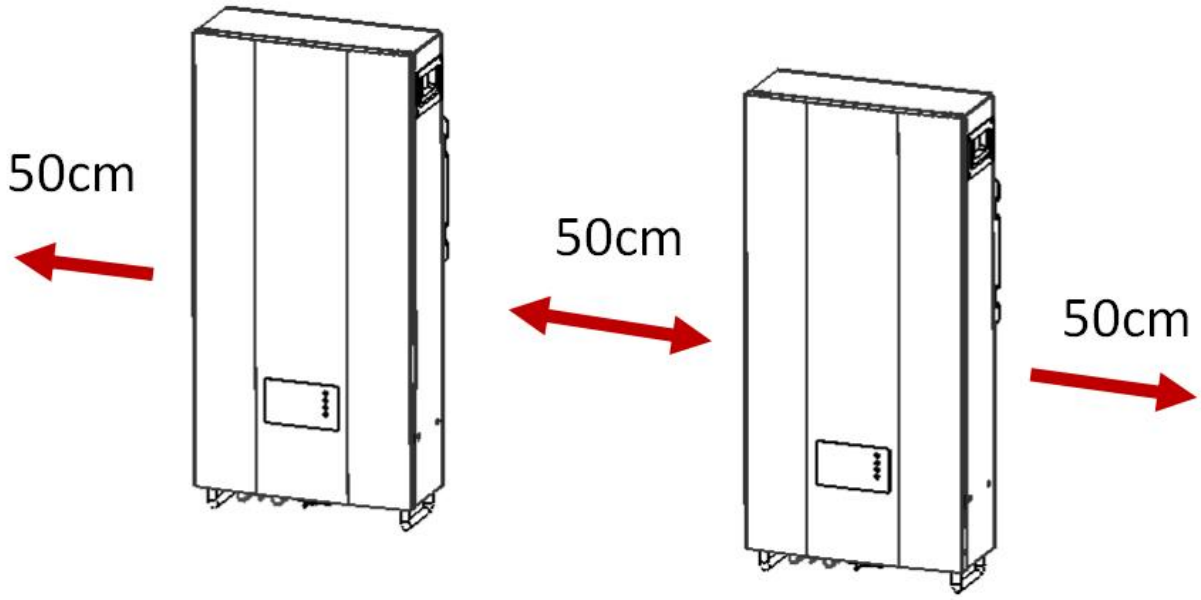
Serial number	Name	Number	Photos
1.	Battery pack	1 PCS	
2.	Wall mounted pegboard	1pcs	
3.	Expansion screws	4pcs	

7.2 Installation instructions

7.2.1 Before installation Check the battery status

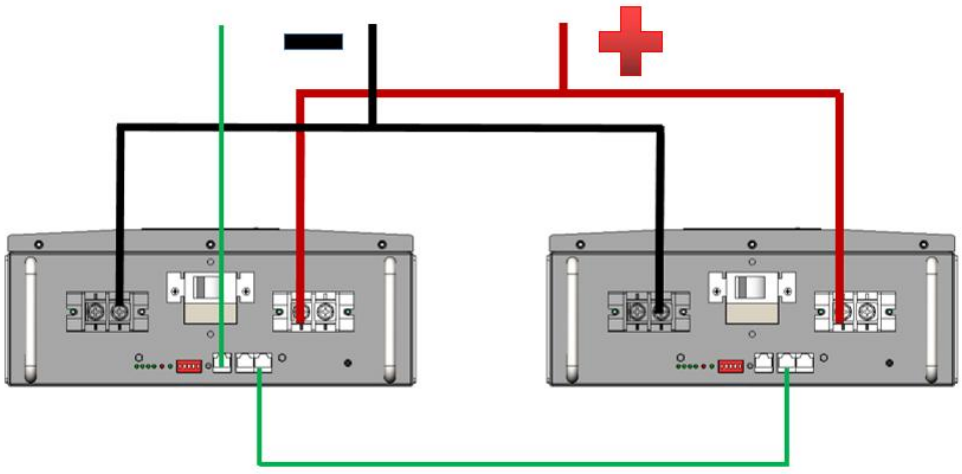
7.2.2 Selecting a suitable mounting position

- Do not install the battery on flammable building materials
- Mount it on a solid wall Place the battery at eye level so that the LCD display can be read at any time
- The temperature should be between 10° C and 30° C to maintain optimum operation. Recommended vertical wall mounting
- There should be some free space around the battery to dissipate heat (as shown below) Suitable for installation on concrete surfaces or other non-flammable surfaces
- Mark the four fixing positions of the wall socket with markers. The expansion screw holes should be angled upwards at an angle of 10° to prevent the expansion screws from falling out.

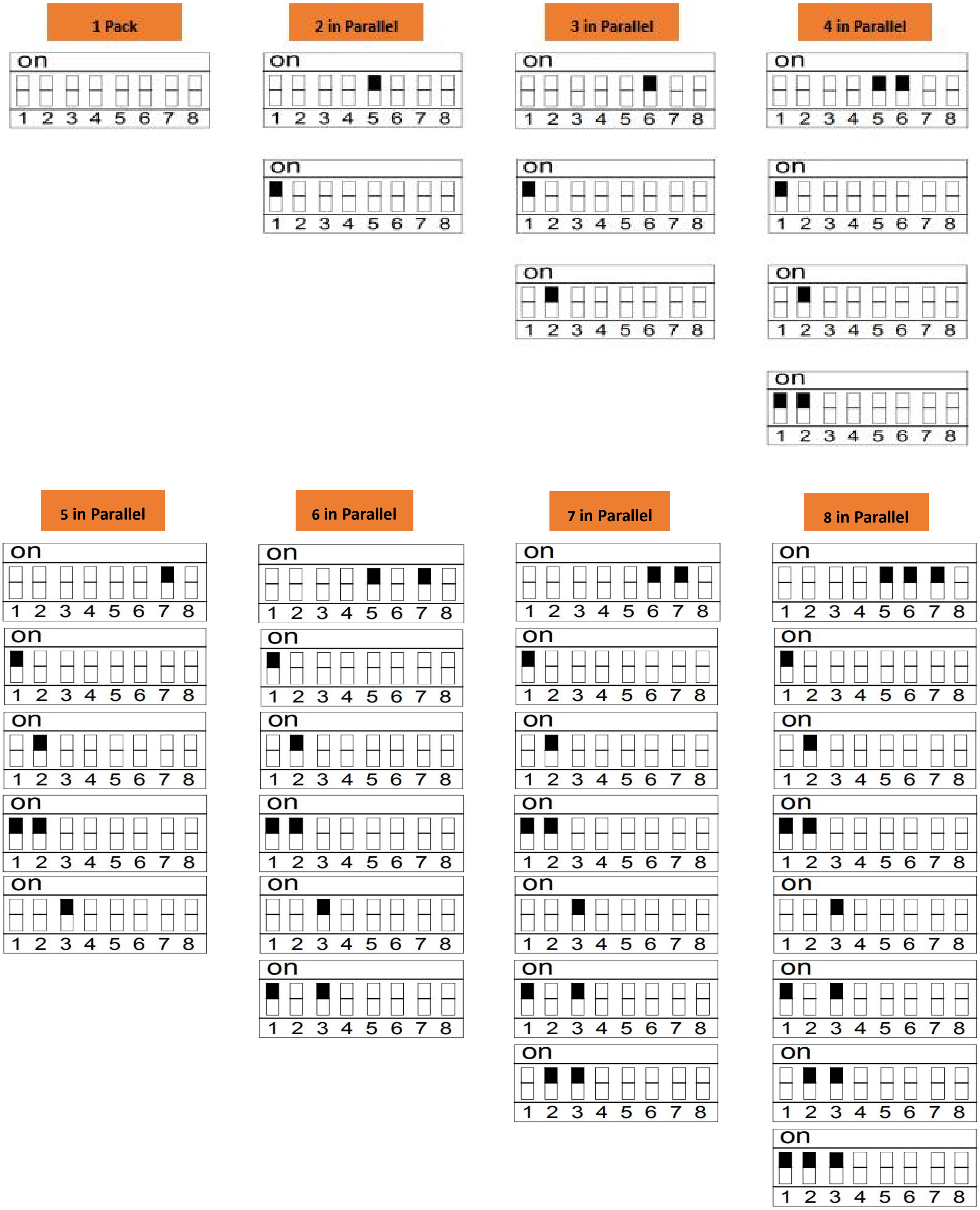


7.2.3 Wiring harness connections

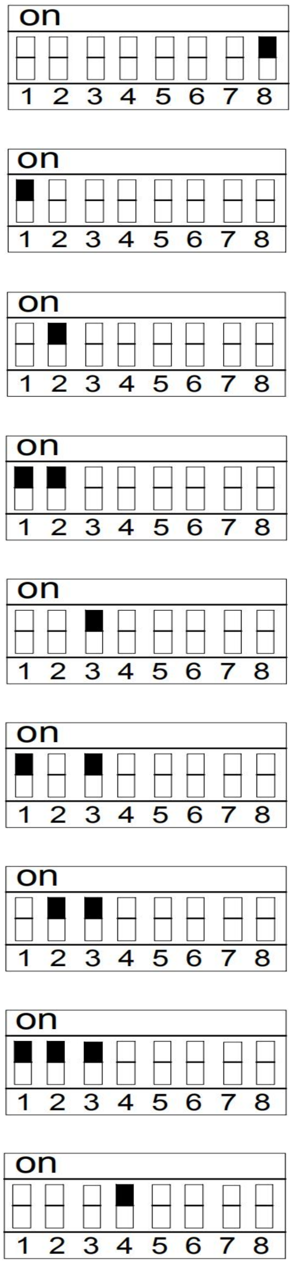
The battery should be switched off before connection.



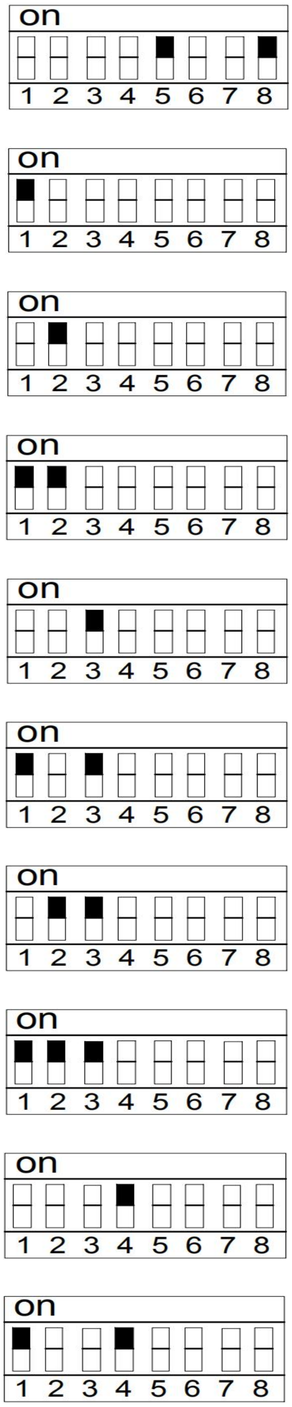
7.2.4 DIP settings



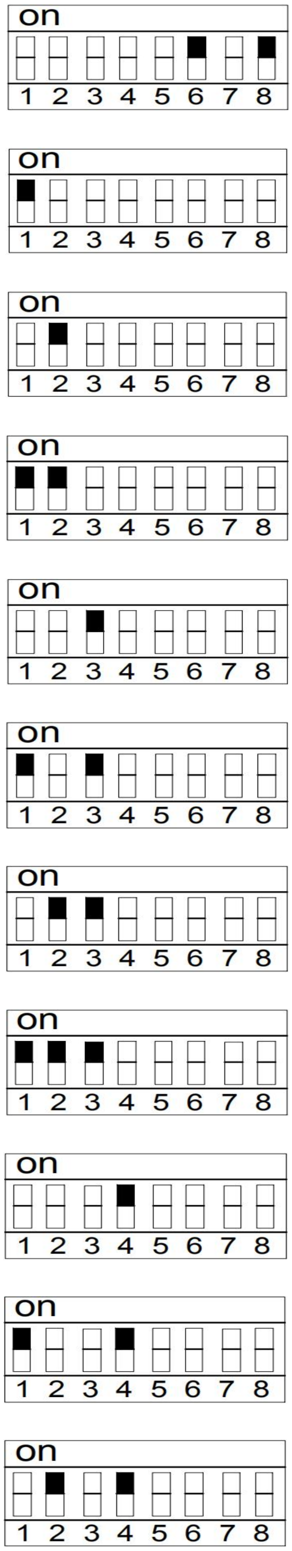
9 in Parallel



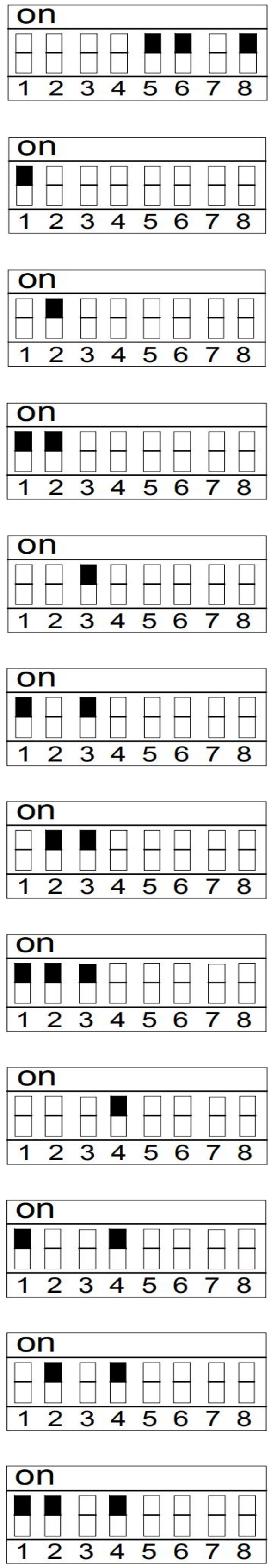
10 in Parallel



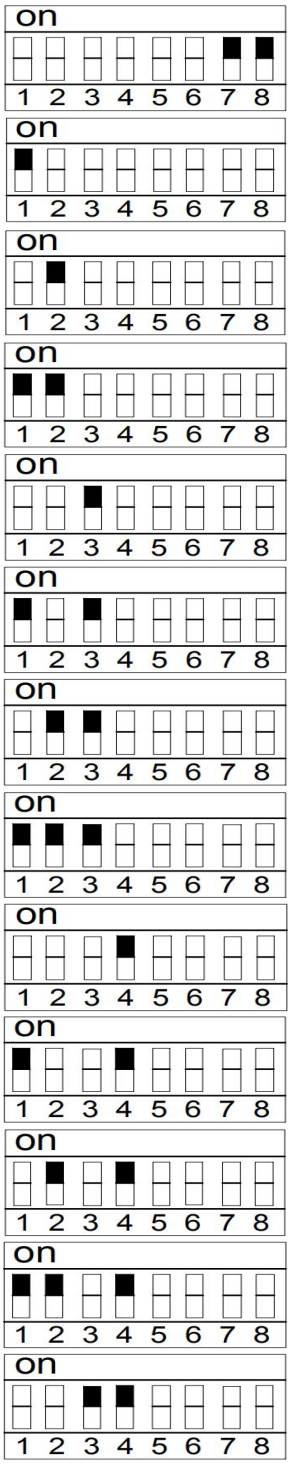
11 in Parallel



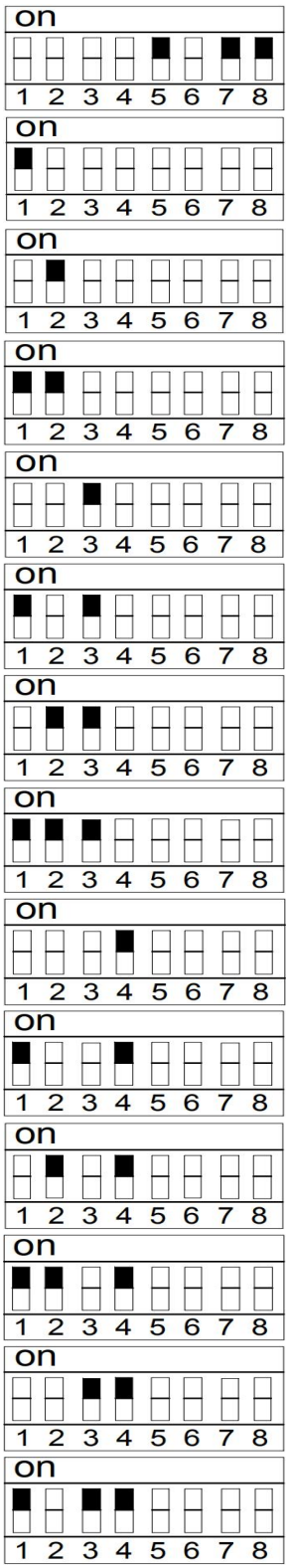
12 in Parallel



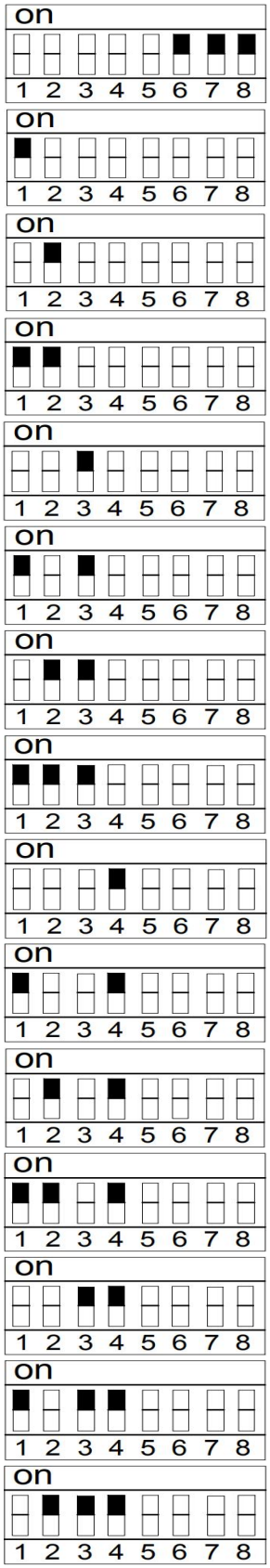
13 in Parallel



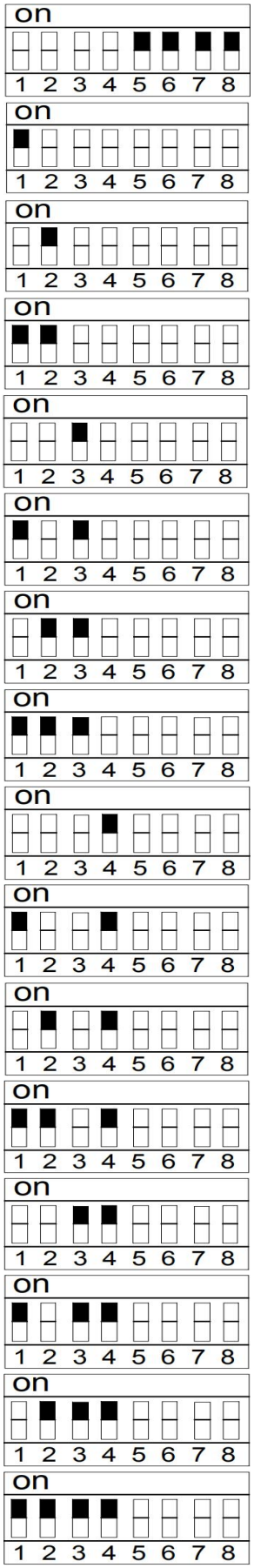
14 in Parallel



15 in Parallel



16 in Parallel



8. Packaging

Packed in boxes that are resistant to dryness, dust and moisture. Products packed in plastic film/EPE in wooden boxes.

Specification: L 1.2m*W 1.0m*H 1.1m Packing quantity 16 units Weight: 650kg

Specification: L 620cm*W 48cm*H 30cm Packing quantity 1 unit Weight: 55kg

9. Notes

- Do not use if the battery has suffered significant impact and deformation
- Do not install the battery multi-layer stacked
- Pay attention to the polarity of the power supply and access terminals.
- Insulate equipment and use tools and instruments correctly.
- The battery installation site should be kept away from fire and flammable objects, and the installation site should be ventilated and dry
- It is absolutely forbidden to plug and unplug plug-ins while the product is running.
- It is strictly forbidden for our non-professional technicians to open the functional modules at their own risk.
- Before using a new battery or using the battery for an extended period of time, fully charge the battery using the special charger.
- Do not disassemble, open, crush, bend, deform, puncture or break the product.
- Do not modify the battery or insert it into any external object. Do not immerse or expose the product to water or other liquids such as fresh water, seawater or beverages (coffee, juice, etc.). And keep away from sources of ignition, explosive substances or other hazards.
- Do not short-circuit the battery and do not allow metal or other conductors to come into contact with the battery contact terminals.
- Do not drop the battery. If it does happen (especially on hard surfaces), please contact the service centre.
- If there is an electrolyte leak, do not allow the battery to come into contact with skin or eyes. If it does occur, wash the contact area with plenty of water or seek medical attention.
- Do not disassemble the battery cells under any circumstances. This may cause an internal short circuit or even lead to fire or other problems.
- Do not burn the battery or throw it into a fire under any circumstances. Failure to do so may cause the battery to burn