Specification

Product Name： 48V100A Lithium Battery Management System

Product Number： 48100-1103-1CE-EJ01-16S

Version	Date	Editor	Version Revision Note
V1.0	2024.10.24	Zhou Guinan	Create first draft

Function configuration table	
Customer name	
Cell type	☑Lithium iron phosphate　　☐Trihydride lithium　　☐Sodium ion　　☐ELse
Number of cell strings	☐7S　☐8S　☐9S　☐10S　☐11S　☐12S　☐13S　☐14S　☐15S　☑16S
10ACurrent limiting	☐Active current limiting　　☐Passive current limiting　　☑No
Precharge function	☑Yes　　　　　　☐No
Storage function	☑Yes　　　　　　☐No
Inverter communication mode	☑CAN　　　　☑RS485　　　　Note：485 Adaptive does not need to switch protocols
Optional function	☐Low temperature heating　　☐Heat dissipation at high temperature　　☐External switch ☐Two-stage trip　　　　☐LCD Display screen
	Board　type：　☑　Integrated　board　☐Split plate　　Note:Split board communication port, dip, capacity light can be independently led out
Other parameters	Battery capacity（AH）：

Signature and seal of supplier		Customer's signature and seal	
Executed By	Xie Huajun	Checked By	We Qi	Approved By	Huang Bin
Date		Date		Date	

Content

1、System overview

1.1、Summarize

This product is a full-featured support 8-16 serial lithium-ion battery pack management system; 15 series and 16 series can be fully compatible, only need to change the cell sampling line to connect the 15 series and 16 series together, and configure the string number and total voltage protection parameters through the host computer. BMS has protection and recovery functions such as cell overvoltage/undervoltage, total undervoltage/overvoltage, charge/discharge overcurrent, high temperature, low temperature and short circuit, and meets the requirements of IEC62619/UL1973 certification functional safety standards. Achieve accurate SOC measurement and SOH health status statistics during charge and discharge. Realize voltage equalization during charging and at rest. Data communication with the host is carried out through RS485 communication, and parameter configuration and data monitoring are carried out through human-computer interaction with the host software.

Note：Baud rate of the upper computer19200

1.2、Enjie Internal product model definition

48 100-1103-10 E-EJ 01-16S
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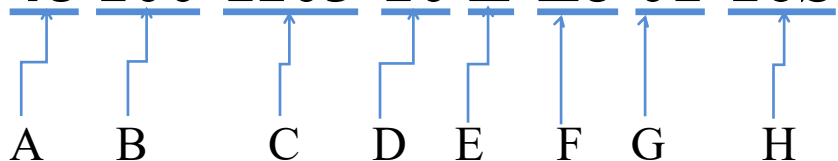
Serial number	definition	content
A	voltage	24V、48V
B	Electric current	50A、75V、100A
C	Plate cut	1101、1102、1103、1203
D	Infinite flow	10A
E	communication	CAN、RS485
F	Customer name	It consists of the first letter of the customer's Chinese name，Such as：EJ

G	Model number	The same customer orders different models, and the models are stacked repeatedly
H	Sampling string number	07S、08S、09S、10S、11S、12S、13S、14S、15S、16S

2、Normative citation documents

The following documents are essential for the application of this document. The date-only version of the reference file is applicable to this file. The latest version of any undated reference file (including all modifications) applies to this file.

GB/T 191   Marking of Packaging Storage and Transportation

GB/T 2408-2008   plastic Determination of combustion properties Horizontal and vertical test

YD/T 983-2013   Electromagnetic Compatibility Limit and Measurement Method for Communication Power Equipment

GB/T 17626.5-2008   Electromagnetic compatibility test and surge (shock) immunity test for measuring technology

GB/T 17626.2-2006   Electromagnetic Compatibility Test and Measurement Technology

YD/T 2344.1—2011   Lithium iron phosphate battery pack for communications – Part 1: integrated battery pack

YD/T 2344.2—2015   Lithium iron phosphate battery pack for communications – Part 2: discrete batteries

YD/T 1363.3   Communications Bureau (Station) Power, Air Conditioning and Environmental Centralized Monitoring Management System Part 3:Front-end Intelligent Equipment Protocol

YD/T 1058-2015   High Frequency Switching Power Supply System for Communication

3、Functional characteristics

3.1、Battery voltage detection

Real-time acquisition and monitoring of the voltage of the series cell to realize the alarm and protection of overvoltage and undervoltage.The voltage detection accuracy of

the cell is ±10mV at 0 ~ 45℃ .

Alarm, protection parameter setting can be changed by the upper computer.

3.2、Cell, environment and power temperature detection

The NTC collects and monitors 4 cell temperatures, 1 ambient temperature and 1 power temperature in real time to realize high and low temperature alarm and protection. The measured temperature difference is within ±2℃. Cell temperature sensor USES 10K, B value 3435.

Alarm, protection parameter setting can be changed by the upper computer.

3.3、Battery charge/discharge current detection

The charge and discharge current of the battery pack is collected and monitored in real time by detecting the resistance of the current connected in the charge and discharge main circuit, The current accuracy is better than ±1%.

Alarm, protection parameter setting can be changed by the upper computer.

3.4、Short circuit protection function

Has the function of detecting and protecting the output short circuit.

3.5、Battery capacity and cycle times

Real-time calculation of battery residual capacity, complete the learning of total charging and discharging capacity at one time, SOC estimation accuracy is better than ±5%. It has the function of counting the number of charge and discharge cycles. When the accumulative discharge capacity of the battery pack reaches 80% of the set full capacity, the number of cycles will increase once.

Alarm, protection parameter setting can be changed by the upper computer.

3.6、Charge, Discharge MOSFET switch

Low internal resistance, high current, high capacitance for backup power applications load startup, zero switching, double charging voltage optimization design.

3.7、Balance of intelligent single cell

Unbalanced cells can be balanced when charging or standby, which can effectively improve the service time and cycle life of the battery.

Equalizing open voltage and equalizing differential voltage can be set by upper computer.

3.8、PC

The host computer uses BatteryMonitorV2.1.13 and above， It can switch between English and Chinese （English protocol is loaded when switching to English）， and the loading protocol (Chinese file name：16S_V20_ADDR，English protocol name：16S_V20_ADDR_EN）。.Please check the operation method in the file of host computer for the operation instructions.

3.9、Program upgrades

The main program version can be upgraded through the firmware update in the upper computer software.
The upper computer and the BMS are connected via RS485.

4、Functional frame diagram
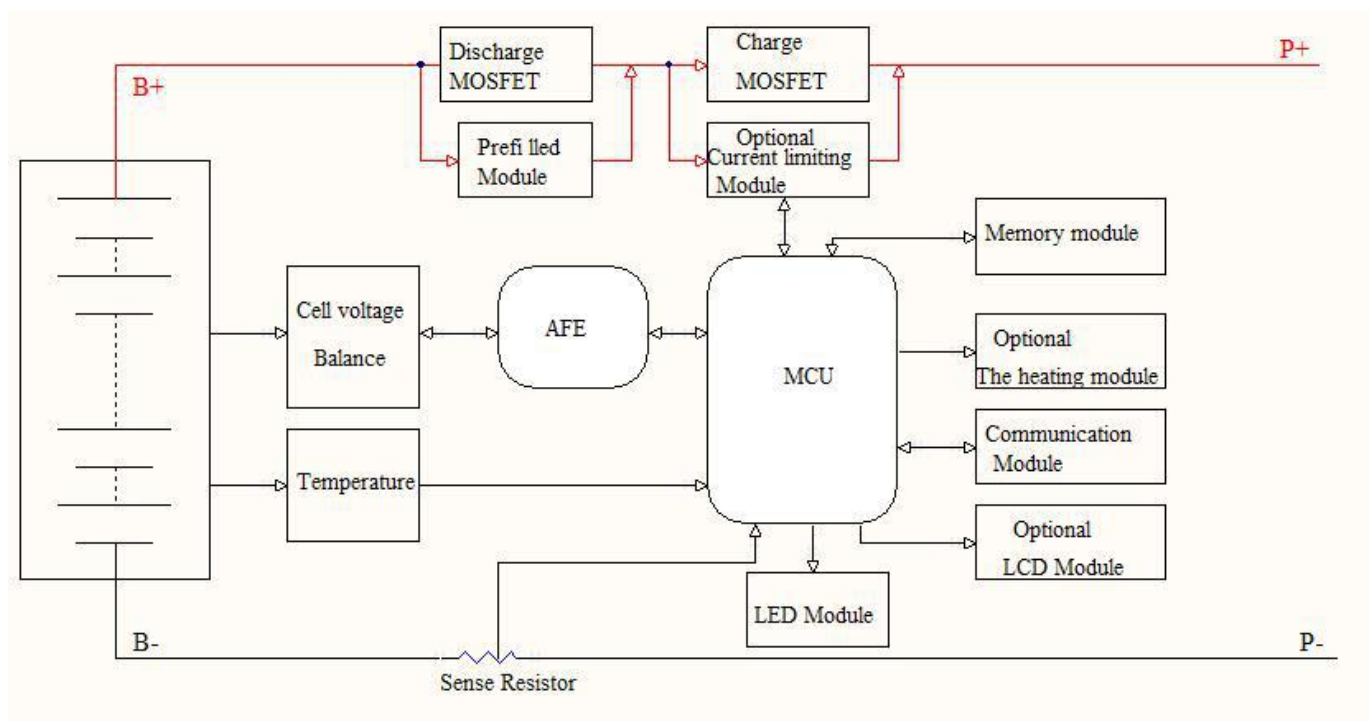
5、Electrical characteristics

Project	Min	Max	Type	Unit
Normal operating voltage	40	59	48	V
Normal charging voltage	/	60	54	V
Operating temperature range	-20	70	25	℃
Storage temperature	-40	85	25	℃
Use environment humidity	10	85	/	%
Continuous charging current	/	110	100	A
Continuous discharge current	/	110	100	A
Discharge output resistance	<2			mΩ
Normal operating power	<40			mA
Dormancy power consumption		50	0	uA

6、Basic parameters

6.1、Basic parameters

Function name	Function settings	Item list	Set value	Setting range
Single voltage alarm	Open	Single high voltage alarm	3500mV	Can be set
		High voltage recovery of monomer	3400mV	Can be set
	Open	Single low voltage alarm	2900mV	Can be set
		Low voltage recovery of monomer	3100mV	Can be set
Monomer overweight protection	Open	Monomer overweight protection	3650mV	Can be set
		Recovery of monomeric overvoltage	3400mV	Can be set

		Overvoltage recovery conditions	1.monomer voltage drop overvoltage recovery point 2.residual capacity below intermittent recharge capacity 96% **Note: Two conditions must be met to recover**	
			It is detected that the battery has a discharge current＞10A	
Monomer undervoltage protection	<mark>Open</mark>	Under voltage protection voltage	2700mV	Can be set
		Under voltage recovery voltage	3100mV	Can be set
		Single under voltage shutdown	Shut down after undervoltage protection and maintain 1 minute communication	
		Under voltage recovery conditions	Charging current detected >3 A	
Battery Total voltage Alarm	<mark>Open</mark>	Total voltage high voltage alarm	52.5V	Can be set
		Total voltage recovery	50.5V	Can be set
		Total voltage Low voltage Alarm	43.5V	Can be set
	<mark>Open</mark>	Total voltage and low voltage recovery	45.0V	Can be set
Total voltage overvoltage protection	<mark>Open</mark>	Total voltage overvoltage protection	54.0V	Can be set
		Total voltage relief	50.5V	Can be set

		Overvoltage recovery conditions	1.monomer voltage drop overvoltage recovery point 2.residual capacity below intermittent recharge capacity 96% **Note: Two conditions must be met to recover**	
			It is detected that the battery has a discharge current> 10A	
Total voltage undervoltage protection	Open	Total voltage undervoltage protection	40.5V	Can be set
		Total undervoltage recovery	45.0V	Can be set
		Total undervoltage shutdown	Shut down after undervoltage protection and maintain 1 minute communication	
		Undervoltage recovery conditions	Charging current detected >3A	
Cell temperature forbidden to charge	Open	Charge High Temperature Alarm	50℃	Can be set
		Charging High Temperature Recovery	47℃	Can be set
		Overcharge protection	55℃	Can be set
		Overcharge recovery	50℃	Can be set
		Charge Low Temperature Alarm	2℃	Can be set
		Low temperature charging recovery	5℃	Can be set
		Undercharge protection	-10℃	Can be set
		Recovery of undercharging	0℃	Can be set

Cell temperature forbidden to discharge	Open	High Temperature Discharge Alarm	52℃	Can be set
		High temperature discharge recovery	47℃	Can be set
		Discharge overtemperature protection	55℃	Can be set
		Discharge overtemperature recovery	50℃	Can be set
		Low temperature discharge alarm	-10℃	Can be set
		Low temperature discharge recovery	3℃	Can be set
		Discharge undertemperature protection	-15℃	Can be set
		Discharge undertemperature recovery	0℃	Can be set
Environmental temperature protection	Open	Environmental High Temperature Alarm	50℃	Can be set
		Environmental High Temperature Recovery	47℃	Can be set
		Environmental Over-temperature Protection	60℃	Can be set

		Environmental Overheating Recovery	55℃	Can be set
		Environmental Low Temperature Warning	0℃	Can be set
		Environmental Low Temperature Recovery	3℃	Can be set
		Environmental under-temperature protection	-10℃	Can be set
		Environmental undertemperature recovery	0℃	Can be set
Power temperature protection	Open	Power High Temperature Alarm	90°C	Can be set
		Power High Temperature Recovery	85°C	Can be set
		Overpower protection	100°C	Can be set
		Power overtemperature recovery	85°C	Can be set
Charging Current Limit	Closed	Active Current	10A	Charger current greater than 10A,opening limit
		Passive limit flow		Charger current is greater than charging overcurrent alarm (value can be set), start current limit
	Open	Charge Limit Delay	5 minutes	After the current limit is switched on, check again 5 minutes later whether the current limit is switched on or not

Charge Overcurrent Alarm	Open	Charge Overcurrent Alarm	100A	Can be set
		Charging Overcurrent Recovery	95A	Can be set
Charging Overcurrent Protection	Open	Charging Overcurrent Protection	110A	Can be set
		Charge Overcurrent Delay	10S	Can be set
		Overcurrent recovery conditions	Discharge recovered immediately or automatically after 60 S	
Effective charging current	Charge into current		600mA	
	Charge Exit Current		500mA	
Discharge Overflow Warning	Open	Discharge Overflow Warning	-105A	Can be set
		Discharge overcurrent recovery	-103A	Can be set
Discharge over-current protection	Open	Discharge over-current protection	-110A	Can be set
		Discharge Overcurrent Delay	10S	Can be set
		Overcurrent recovery conditions	Charge immediately, or after 60 S automatically	
Transient Overcurrent Protection	Open	Transient Overcurrent Protection	-250A	Can be set

		Transient Overcurrent Delay	30mS	Can be set
		Transient Overcurrent Recovery	Charge immediately, or after 60 S automatically	
	Closed	Transient Overcurrent Lock	Continuous secondary overcurrent, exceeding the number of overcurrent locks	
		Overcurrent locking times	5 times	
		Transient lockout	Connect charger	
Output short circuit	Open	Short circuit protection current and delay	Write program (**Note: Cannot be set**)	
		Recovery of short circuit protection	Charge immediately, or after 60 S automatically	
	Open	Short circuit protection lock	Continuous output short circuit, over-current lock times	
		Short circuit locking times	5 times	
		Short circuit lock release	Connect charger	
Effective discharge current	Discharge into current		-500mA	
	Discharge withdrawal current		-400mA	
Core equalization functio	Open	Standby balance	Uncharged/discharge state open equilibrium	
		Standby equalization time	10 hours	Can be set
	Open	Charge Balance	Open equalization in charging state and floating state	
	On voltage condition	Balanced on voltage	3400mV	Can be set
		Equilibrium Open voltage	30mV	

		Equilibrium end differential voltage	20mV	
	Open	Equilibrium temperature limits	Close the temperature range evenly according to the (**ambient alarm temperature**)	
		Equilibrium High Temperature Ban	50℃	Can be set
		Equilibrium cryogenic prohibition	0℃	
Core Failure Alarm	Open	Failure voltage Differential	500mV	Can be set
		Core recovery voltage differential	300mV	
Battery capacity setting		Battery rated capacity	100Ah	5Ah~200Ah
		Battery residual capacity	Estimation of core voltage	Can be set
		Accumulated cycle capacity	80%	Number of cycles（Set）
	Open	Residual capacity alarm	15%	
	Open	Residual capacity protection	5%	Turn off output
Precharge function	2000ms	0~5000ms	BMS boot up precharge function	
BMS Power Management	Open	Maximum standby time	48h（Charger is not present and no effective discharge current）	
Low temperature heating of core	Open	Low temperature heating of core	0℃	Can be set
		Core heating recovery	10℃	

		Heating on logic	The charger is on line and the temperature of the cell reaches the opening condition. Turn on and heat up.No heating in standby state and discharge state	
External switches	Open	BMS in standby state can operate external switch off and turn on BMS.		
LCD screen	Open	Simple monitoring software, can view the core,temperature, current and other data.		
Manual charging activation	Open	1 point	After undervoltage protection BMS shut down,manually press the button to clear the undervoltage protection Forced output	Can be set
Compensation impedance	Compensation point 1	0mΩ	9	Can be set
	Compensation point 2	0mΩ	13	

6.2、 Basic mode of work

Charging mode	When the BMS detects that the charger is connected and the external charging voltage is greater than the internal battery voltage by more than 0.5V, when the charging current reaches the effective charging current, it enters the charging mode.	
Discharge mode	BMS into discharge mode when the load connection is detected and the discharge current reaches the effective discharge current.	
Standby mode	When the above two modes are not satisfied, enter standby mode.	
Shutdown mode	Shutdown condition： 1）Normal standby for 48 hours 2）Battery triggers under-voltage protection 3）key-press shutdown 4）external switch shutdown.	Wake-up conditions for shutdown mode: 1）Charge activation 2）48V voltage activation 3）Press the key to turn on 4）External switch.Charge activation.

6.3、 LED light indication instructions

6.3.1、 LED

1 operational light ,1 alarm light ,4 capacity indicator lights

L1 🟢	L2 🟢	L3 🟢	L4 🟢	🔴	🟢
SOC				ALARM	RUN

6.3.2、Capacity indication

Status		Status				Discharge			
Capacity indicator		L4 🟢	L3 🟢	L2 🟢	L1 🟢	L4 🟢	L3 🟢	L2 🟢	L1 🟢
The remaining capacity	0～25%	OFF	OFF	OFF	Flash	OFF	OFF	OFF	Solid Green
	25～50%	OFF	OFF	Flash	Solid Green	OFF	OFF	Solid Green	Solid Green
	50～75%	OFF	Flash	Solid Green	Solid Green	OFF	Solid Green	Solid Green	Solid Green
	≥75%	Flash	Solid Green	Solid Green	Solid Green	Solid Green	Solid Green	Solid Green	Solid Green
Running indicator light 🟢		Solid Green				Flash			

6.3.3、Light Blink explanation

Flash Mode	ON	OFF
Flash 1	0.25s	3.75s
Flash 2	0.5s	0.5s
Flash 3	0.5s	1.5s

6.3.4、State indication

System state	Running state	RUN 🟢	ALM 🔴	SOC				Note
				L4 🟢	L3 🟢	L2 🟢	L1 🟢	
Shutdown	Sleep	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Standby	Normal	Flash1	OFF	OFF	OFF	OFF	OFF	Standby status
Charge	Normal	Solid Green	OFF	According to battery indicator				Highest LED flash 2
	Alarm	Solid Green	Flash2	According to battery indicator				Highest LED flash 2
	overvoltage protection	Flash1	OFF	OFF	OFF	OFF	OFF	
	Temperature	Flash1	Flash1	OFF	OFF	OFF	OFF	

	,overcurrent protection							
Discharge	Normal	Flash3	OFF	According to battery indicator				According to battery indicator
	Alarm	Flash3	Flash3					
	Temperature ,overcurrent , short circuit protection	OFF	Solid Green	OFF	OFF	OFF	OFF	Stop discharging, forced dormancy without action after 48h when the mains is offline
	Under-voltage protection	OFF	OFF	OFF	OFF	OFF	OFF	Stopping Discharge

7、 Functional description

7.1、Standby state

No.	Feature	Definition
1	Power on	When the BMS is in hibernation state, press the reset button to start the BMS.After the LED indicator light shines in turn, it turns into normal working state.
2	Power off	When the BMS is in the standby or discharge state, press this key and continue for 6s (including 3s flashing time), the BMS will be hibernated, and the LED indicator will flash successively and then turn to hibernation state. The BMS has no power consumption after hibernation.
3	External switch	External switch can control the BMS switch, the external switch is preferred.
4	Standby mode	BMS the correct connection on the power, in no overvoltage, undervoltage, overcurrent, short circuit, over temperature, under temperature and other protection state, press the reset button to boot, BMS in standby state.BMS standby state, the running lamp flashes, and the battery can be charged and discharged.

7.2、Overcharge protection and recovery

Overcharge	monomer	Protection	When any section is higher than the set value of the single overcharge protection, the charging device cannot charge the battery.

		recover	When the maximum cell voltage falls below the cell overcharge recovery value and the SOC is lower than 96%, the overcharge protection state is removed. Can also discharge discharges.
	Total voltage	Protection	When the battery voltage is higher than the total voltage overcharge protection set value, the BMS enters the overcharge protection state, and the charging device cannot charge the battery.
		recover	When the total voltage drops below the total voltage overcharge recovery value and the SOC is lower than 96%, the overcharge protection state is removed. Can also discharge discharges.

7.3、Overdischarge protection and recovery

overshoot	monomer	Protection	When any section is lower than the set value of single overdischarge protection, the BMS enters the overdischarge protection state, and the load cannot discharge the battery. After 1 minute of communication, the BMS shuts down.
		recover	After the overdischarge protection, charge the battery pack to release the overdischarge protection state. Or press the reset button, the BMS will turn on the battery to check whether the voltage reaches the recovery value.
	Total voltage	Protection	When the total voltage overdischarge protection is lower than the set value, the BMS enters the overdischarge protection state, and the load cannot discharge the battery. After 1 minute of communication, the BMS shuts down.
		recover	After the overdischarge protection, charge the battery pack to release the overdischarge protection state. Or press the reset button, the BMS will turn on the battery to check whether the voltage reaches the recovery value.

Note: After the BMS discharges under-voltage protection, it is shut down, and the button is activated or the charging is activated. The BMS keeps the output voltage for 1 minute for the inverter to detect the battery voltage, so it is not allowed to discharge within 1 minute.

7.4、Overcurrent protection and recovery

Charge overcurrent	Protection	Exceeds the set value of charge overcurrent protection and reaches the delay time. The BMS enters charge overcurrent protection, and the charging device cannot charge the battery.
	recover	After overcurrent protection, the BMS automatically delays recovery and re-detects the external charger current. Discharge can also remove charge overcurrent protection.

Discharge overcurrent	Protection	Exceeds the set value of the discharge overcurrent protection and reaches the delay time. The BMS enters the discharge overcurrent protection, and the load cannot charge the battery.
	recover	After overcurrent protection, the BMS automatically delays recovery and re-detects the external load current. Charging can also remove the discharge overcurrent protection.

Note：1）When there is no charge current limiting function, the charge overcurrent protection can be triggered.

2）The discharge overcurrent protection has two levels of protection to achieve the same recovery as the transient overcurrent protection and discharge overcurrent protection. The transient overcurrent protection will be locked when the number of occurrences reaches the condition, and the recovery must be turned off at the start or the charge is discharged.
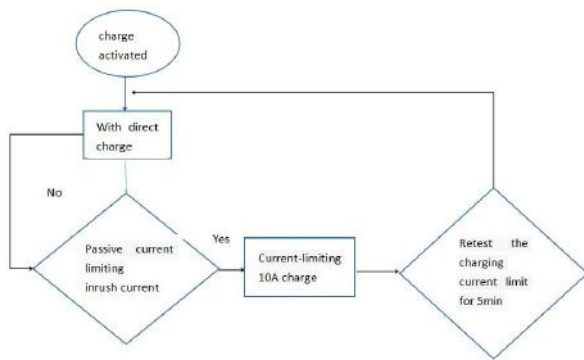
7.5、Temperature protection and recovery

Note：BMS has 6 temperature detection ports to monitor temperature changes to achieve protective measures.

Charge and discharge	hyperthermia	Protection	When the NTC of any cell is higher than the high temperature protection setting value, the BMS enters the high temperature protection. The BMS stops charging or discharging.
		recover	When the cell temperature is lower than the high temperature recovery value, the BMS resumes charging or discharging.
	hypothermy	Protection	When the NTC of any cell is lower than the low temperature protection setting value, the BMS enters the low temperature protection. The BMS stops charging or discharging.
		recover	When the cell temperature is higher than the low temperature recovery value, the BMS resumes charging or discharging.
Ambient temperature protection	overtemperature	Protection	When the NTC detects that the ambient temperature is higher than the ambient high temperature setting value, the BMS enters the ambient overtemperature protection. The BMS stops charging and discharging.
		recover	When the ambient temperature is lower than the ambient recovery value, the BMS resumes charging

		or discharging.
	undertemperature Protection	When the NTC detects that the ambient temperature is lower than the ambient low temperature setting value, the BMS enters the environment under temperature protection. The BMS stops charging and discharging.
	recover	When the ambient temperature is higher than the ambient recovery value, the BMS resumes charging or discharging.
Power temperature protection		When the NTC detects that the power temperature is higher than the power protection set value, the BMS enters the power high-temperature protection. The BMS stops charging and discharging.

7.6、Optional function

Optional function	Low temperature heating	When the low temperature of the battery cell is met and the charger is online, the output voltage through the heating port supplies power to the optional heating film to realize the heating function. The standby state and discharge state do not heat.
	Heat dissipation at high temperature	When the conditions for enabling heat dissipation in the high temperature are met (the normal logic is to achieve the high temperature alarm for charging and discharging, and the environment high temperature alarm, you can customize the software logic), the output voltage of the heat dissipation port supplies power to the optional fan for heat dissipation.
	Two-stage trip	The two-level trip signal realizes two-layer protection by controlling the external actuator. Trigger trip condition： 1）Temperature sensing failure； 2）The maximum voltage of a cell is greater than "Cell overvoltage protection + 50mV"； 3）The minimum voltage of a cell is less than "Cell undervoltage protection -200mV".； 4）The current still exceeds the "Discharge overcurrent protection value" after discharge overcurrent protection； 5）The current is still greater than the "charge overcurrent protection value" after charging overcurrent protection； One of the above five triggers and maintains the state for more than 5 seconds, executes and continues to trip； Recovery condition: The BMS needs to be restarted.

Bluetooth	Configurable Bluetooth display. Through the wireless connection between the Bluetooth of the mobile phone and the Bluetooth module of the battery pack, various functions such as battery pack management and alarm information collection, query, display, and configuration modification are implemented. Bluetooth APP can achieve the following functions: 1) Battery pack basic information display; 2) BMS and inverter communication configuration; 3)Battery pack alarm/protection parameters and control switch configuration; 4) Support single machine and parallel machine; Support real-time switching of single battery pack connection; 5) Chinese and English display switch.	
Automatic dip	Users can choose to enable the automatic DIP switch function. After the automatic DIP switch function is enabled, the connection is connected according to the automatic DIP switch.	
Charging current limit	Active current limiting： In the charging state of BMS, BMS keeps the current limiting module MOS tube open and actively restricts the charging current to 10A.	Passive current limiting： In the charging state of BMS, BMS opens the charging module MOS tube. If the charging current reaches the overcurrent warning value of charging (Note: current setting 100A), open the current limiting module MOS tube 10A, and re-test whether the charger current reaches the passive current limiting condition after 5 minutes of current limiting.(The passive current limit value can be set on)

7.7、Other functions

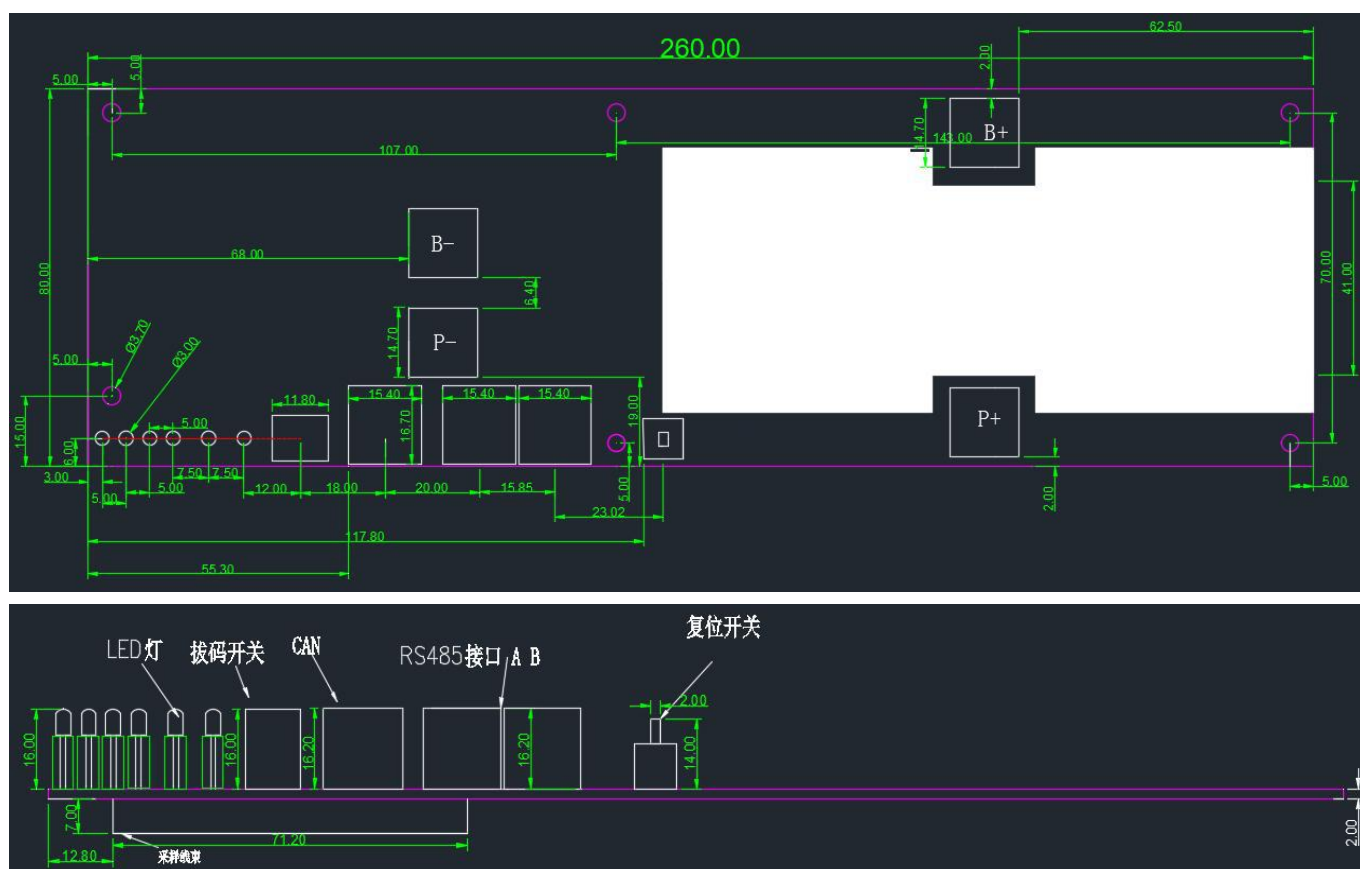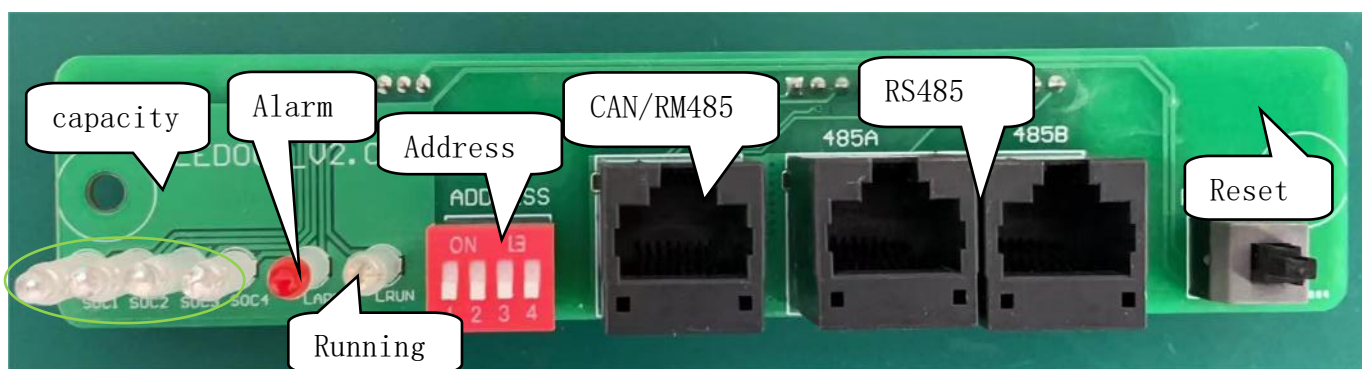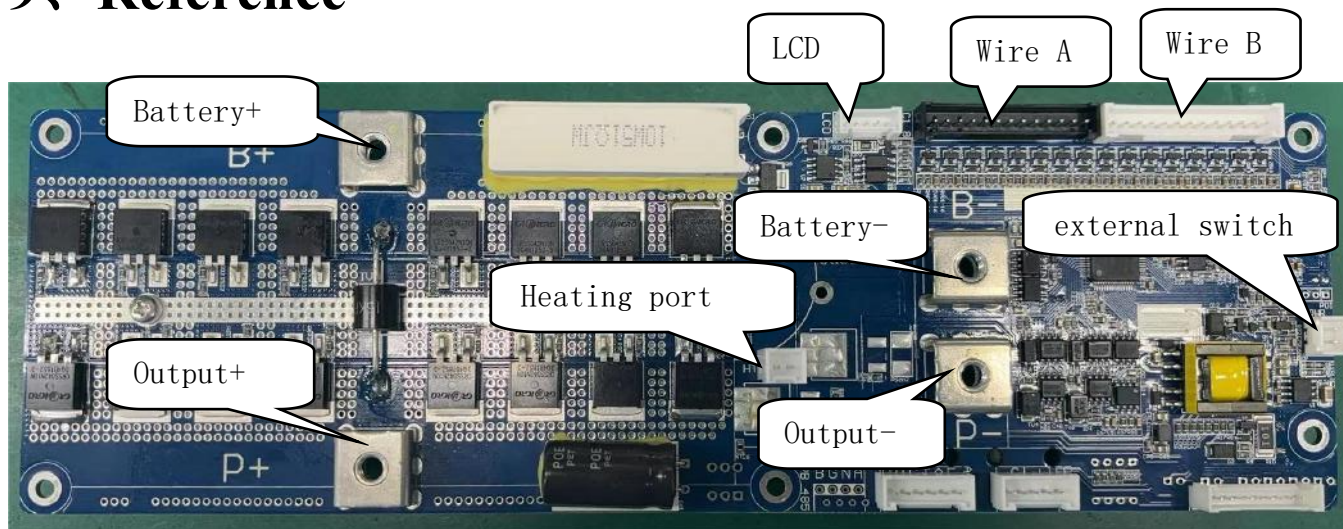| Others		
	Balanced function	BMS should have standby and charge equalization function, the system adopts energy consumption type equalization circuit, the equalization open voltage softwareis adjustable, the equalization open condition any section is higher than the equalization open voltage and the voltage difference reaches the conditiion together.
	Historical data records are stored and read	Historical data is to store a piece of data according to the BMS state transition; to store all kinds of alarm, protection trigger and elimination measurement data in real time; to store the measurement data in a certain time period by setting the record start time, record end time and record interval time. Currently can store not less than 500 historical data records, through the PC to read historical data and save as excel files into the computer.
	Dormant function	Automatic sleep function： The battery will automatically sleep for 48 hours when there is no external charging or discharging. When the battery pack is over-discharged, the communication is maintained for 1 minute, and the BMS enters the dormant state.	Manual sleep function： 1）By manually pressing the 6S reset button, the BMS enters sleep after the 6 LED lights light up in sequence. 2）The switch is controlled by an external switch, the switch is turned on when the switch is closed, and the switch is turned off when the switch is off. 3）The standby and hibernation can be set through the host computer.
	One-key switch machine	BMS in parallel, the host can control the slave machine and boot. The host must dial the code according to the parallel mode, the host dial code address can not achieve one-click switch machine. (The batteries return to each other during the machine and can not be shut down by one button)	
	Precharge function	The precharge function can be started immediately after starting up or discharging tube is turned on. The precharge time can be set (1mS to 5000mS) to cope with various capacitiy load scenarios and avoid short circuit protection of BMS output.	
	Connect the compensation	To prevent excessive voltage difference between cells or modules, 2 compensation points can be provided. When a wire or a long copper bar is used between the cells, a voltage difference will be generated, and impedance compensation is required. You can check whether the voltage difference between the cells is too large through the host computer. 　　When discharging, measure the voltage difference between the wire and the long copper bar; if the voltage difference is too large, according to the voltage difference/current=impedance, manually fill in the calculated	

impedance into the upper computer parameters. In the upper computer parameters, the default is the compensation impedance of the 9th and 13th wire connection, and the 2-way compensation impedance can be set according to the actual battery cell module.
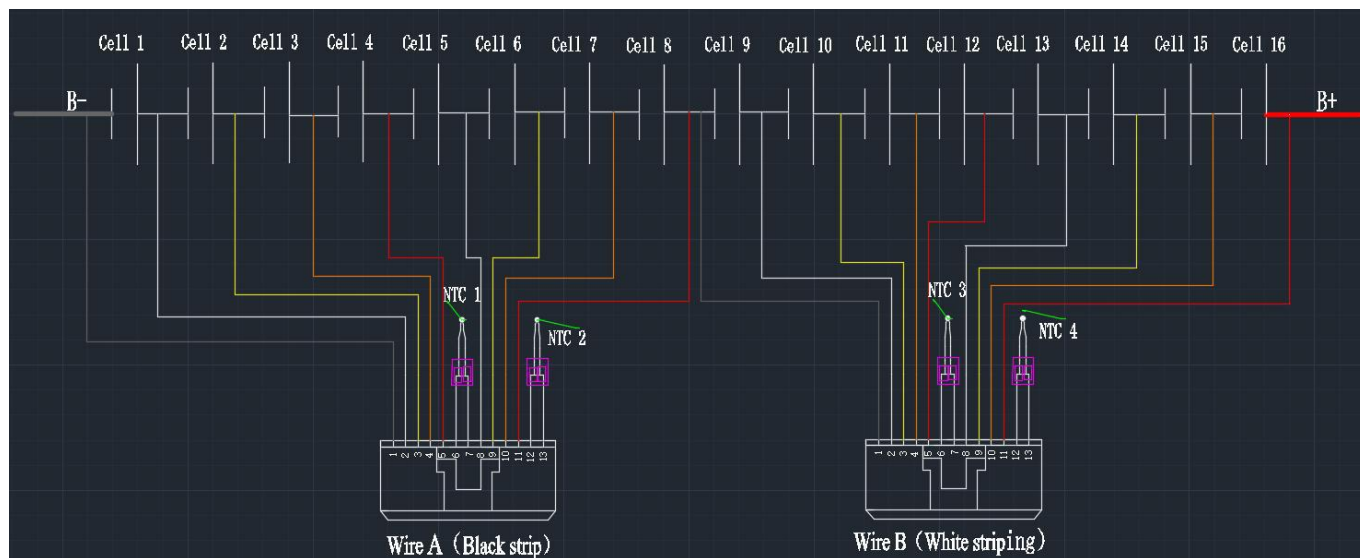
Note: If the battery cell module is assembled with long wires and long copper bars, it must be communicated with the BMS manufacturer for impedance compensation. Otherwise it will affect the battery consistency.
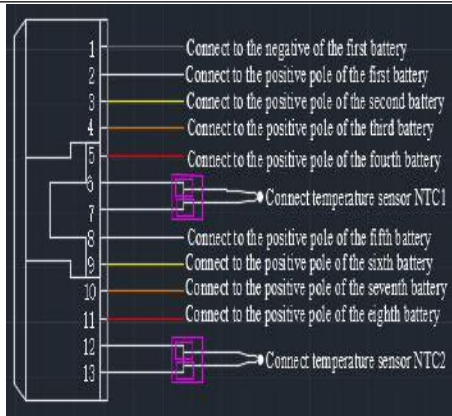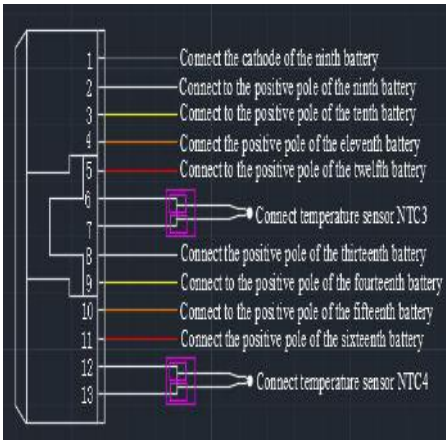
8、 Dimensioning map

9、Reference

Note: There may be some differences between the actual product and the physical drawing of the above products.

9.1、Wiring definition

Wire A（Black strip）		
	CELL1−	Connect to the negative of the first battery
	CELL1+	Connect to the positive pole of the first battery
	CELL2+	Connect to the positive pole of the second battery
	CELL3+	Connect to the positive pole of the third battery
	CELL4+	Connect to the positive pole of the fourth battery
	NTC1+	Connect temperature sensor NTC1
	NTC1−	Connect temperature sensor NTC1
	CELL5+	Connect to the positive pole of the fifth battery
	CELL6+	Connect to the positive pole of the sixth battery
	CELL7+	Connect to the positive pole of the seventh battery
	CELL8+	Connect to the positive pole of the eighth battery
	NTC2+	Connect temperature sensor NTC2
	NTC2−	Connect temperature sensor NTC2

Wire B（White strip）		
CELL9−		Connect the cathode of the ninth battery
CELL9+		Connect to the positive pole of the ninth battery
CELL10+		Connect to the positive pole of the tenth battery
CELL11+		Connect the positive pole of the eleventh battery
CELL12+		Connect to the positive pole of the twelfth battery
NTC3+		Connect temperature sensor NTC3
NTC3−		Connect temperature sensor NTC3
CELL13+		Connect the positive pole of the thirteenth battery
CELL14+		Connect to the positive pole of the fourteenth battery
CELL15+		Connect to the positive pole of the fifteenth battery
CELL16+		Connect the positive pole of the sixteenth battery
NTC4+		Connect temperature sensor NTC4
NTC4−		Connect temperature sensor NTC4

Note: There may be some differences between the actual product and the physical drawing of the above products.

9.2、Order of up and down

1) Assembly sequence: Connect the motherboard B- first, connect wiring harness A and Wiring harness B in turn, connect wiring harness B+ in the motherboard, and finally connect wiring P+ and P-to charger or load (Note: After the motherboard is connected to the line, it is turned off, press the reset button to turn on or close the external switch, charging can also activate the BMS)

2) Dismantling sequence：Disconnect charger or load first (Note: Press the 6S reset button or disconnect the external switch, the circulation light will turn off once and shut down), then disconnect B+, wire harness B, wire harness A successively, and finally Disconnect B-.

3) Input and output

When Charging: the positive pole of the charger is connected to the "P+" of the protection plate, and the negative pole of the charger is connected to the "P-" of the protection plate.

When Discharging: The positive pole of the load is connected to the "P+" of the protection plate, and the negative pole of the load is connected to the "P-" of the protection plate.
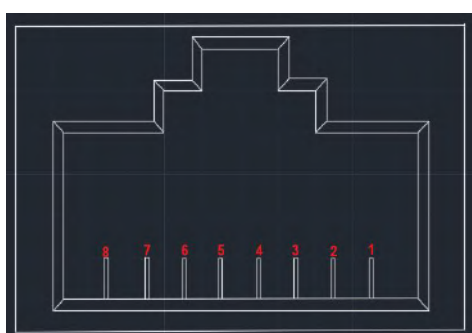
10、Communications

10.1、CAN&RM485 communications

BMS with battery pack upload CAN communication function, baud rate 500K. The CAN

communication interface uses 8P8C network cable interfaces. CAN communicate with the inverter or CAN TEST through the CAN interface. When the battery pack is connected, the communication is connected through RS485, and finally the battery pack data, status, and information are uploaded to the PCS through CAN communication.

BMS with battery pack upload RM485 communication function, baud rate 9600bps. The RM485 uses 8P8C network cable interfaces for communication. When the battery pack is connected, the battery pack data, status, and information are uploaded to PCS or inverters through RS485 communication.
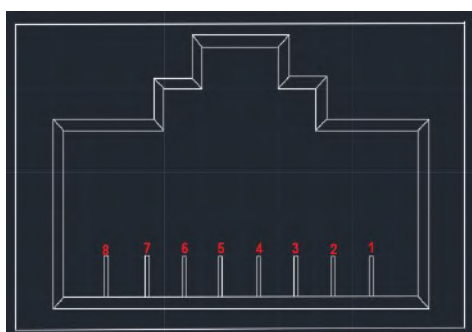
CAN communication interface definition：

PIN	Definitions
1、8	RM485-B
2、7	RM485-A
4	CAN-H
5	CAN-L
3、6	GND

10.2、RS485communications

BMS RS485 communication with battery packs, **baud rate 19200 bps.** RS485 communication interface adopts 8 P8C network interface.

RS485 communication interface definition:

PIN	Definitions

| 1、8	RS485-B
2、7	RS485-A
3、6	GND
4、5	Internal communication

10.3、parallel communication

RS485 interface is used as parallel communication interface and CAN interface as upper communication interface. the terminal device can read the sum of battery data of all parallel PACK through the CAN interface. RS485 interface connection is shown in the following
figure:
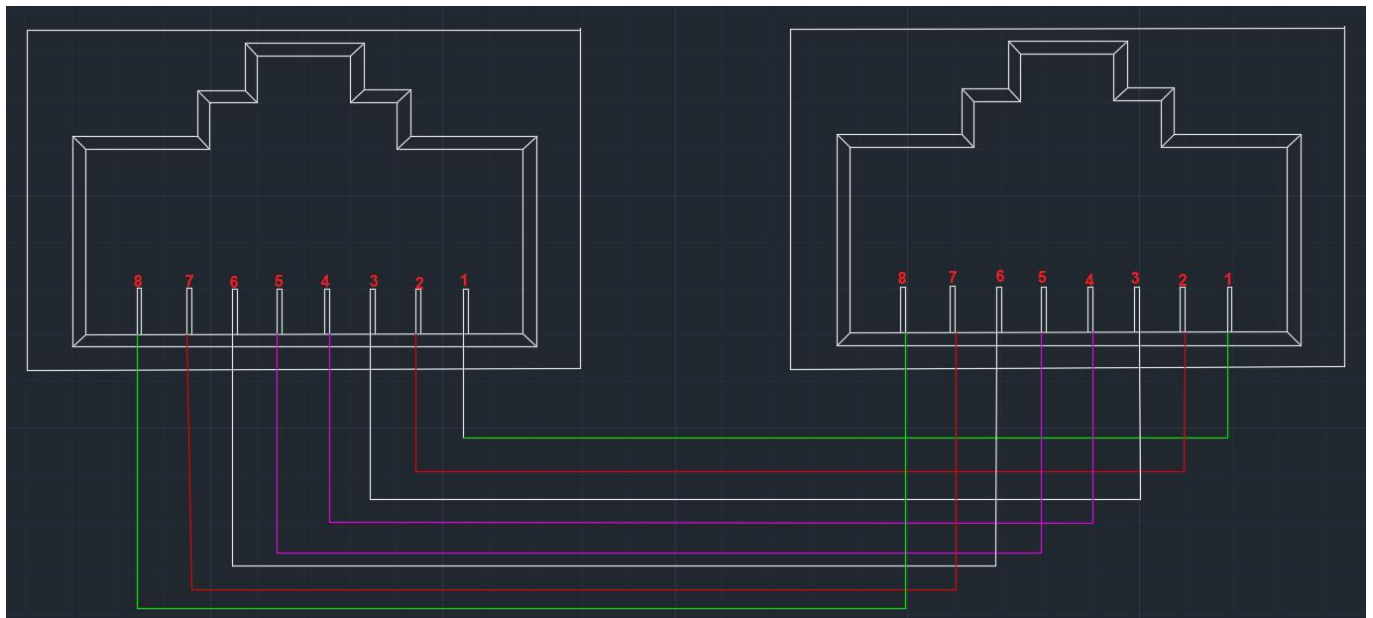
10.4、Automatic DIP switch mode

The automatic DIP connection diagram is as follows：
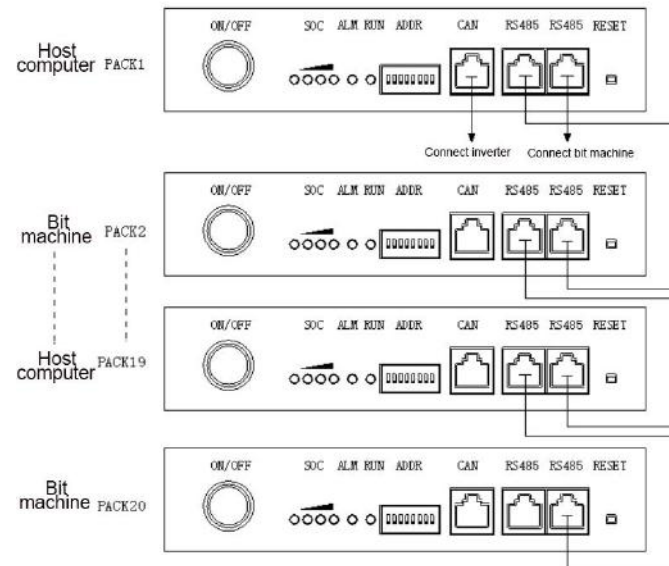
Note: The default limit is 20, if you need special customization, please contact the manufacturer

11、Inverter

Inverter Manufacturer	Protocol	Communication	Protocol switching method
GOODWE	Goodwe protocol	CAN	PC switch PN-GDLT
Solis	CAN communication protocol	CAN	PC switch GINL
SUNGROW	CAN-Bus-protocol-PYLON	CAN	PC switch PN-GDLT
CHINT POWER	Chint+Power CAN bus protocol V1.0.0	CAN	PC switch PN-GDLT
Senergy	SenergyINV&BMS_CAN_Protocols_EN	CAN	PC switch PN-GDLT
SOFAR	Sofar protocol	CAN	PC switch SMA-SF
AISWEI	CAN-Bus-protocol-PYLON	CAN	PC switch PN-GDLT
Growatt-SPF/SPH	Growatt BMS CAN-Bus-protocol-low-voltage	CAN	PC switch GRWT

SMA	FSS-ConnectingBat-TI-en-20W	CAN	PC switch SMA-SF
Victron	can-bus_bms_protocol	CAN	PC switch VCTR
hoymiles	CAN-Bus-protocol-PYLON	CAN	PC switch PN-GDLT
LUXPOWER	Luxpowertek Battery CAN Protocol	CAN	PC switch PN-GDLT
Sol-Ark	Sol-Ark CAN Bus Protocol	CAN	PC switch PN-GDLT
Studer	Technical specification Studer BMS Protocol	CAN	PC switch Studer
TBB	TBB protocol V1.02	CAN	PC switch PN-GDLT
Deye	CAN-Bus-protocol-PYLON-v1.3	CAN	PC switch PN-GDLT
Sunsynk	CAN-Bus-protocol-PYLON	CAN	PC switch PN-GDLT
LIVOLTEK	LIVOLTEK CANBUS Protocol of Low Voltage SystemV1.0	CAN	PC switch PN-GDLT
SOROCEC	2_CAN protocol 1.0	CAN	PC switch PN-GDLT
MEGAREVO	MEGAREVO Protocol V1.01	CAN	PC switch PN-GDLT
Afore	CAN-Bus-protocol-PYLON	CAN	PC switch PN-GDLT
Sacolar	Growatt BMS CAN-Bus-protocol-low-voltage	CAN	PC switch GRWT
Must	CAN-Bus-protocol-PYLON	CAN	PC switch PN-GDLT
invt	CAN-Bus-protocol-PYLON	CAN	PC switch PN-GDLT
RENAC	CAN-Bus-protocol-PYLON	CAN	PC switch PN-GDLT
EACH ENERGY	CAN protocol-PN_GDLT-V2.0.pdf	CAN	PC switch PN-GDLT
OLU	CAN protocol-PN_GDLT-V2.0.pdf	CAN	PC switch PN-GDLT

hinen	CAN protocol-PN_GDLT-V2.0.pdf	CAN	PC switch PN-GDLT
HYPONTECH	CAN protocol-PN_GDLT-V2.0.pdf	CAN	PC switch PN-GDLT
srne	PACE BMS Modbus Protocol for RS485	485	Self adaptation
Deye	RS485-protocol-pylon-low-voltage-9600	485	Self adaptation
Growatt-SPF	SPF BMS RS485 protocol	485	Self adaptation
SMKSOLAR	SMKSOLAR protocol V1.0	485	Self adaptation
Voltronic	Voltronic Inverter and BMS 485 communication protocol	485	Self adaptation
CHISAGE ESS	RS485-protocol-pylon-low-voltage	485	Self adaptation
EASUN	Voltronic Inverter and BMS 485 communication protocol	485	Self adaptation
MPP Solar	Voltronic Inverter and BMS 485 communication protocol	485	Self adaptation
EPEVER	BMS-LinkV1.4.pdf	485	Self adaptation
Bentterson	RS485-protocol-pylon-low-voltage	485	Self adaptation
xindun	SPF BMS RS485 protocol	485	Self adaptation
Techfine	RS485-protocol-pylon-low-voltage	485	Self adaptation
CVTE	RS485-protocol-pylon-low-voltage	485	Self adaptation
GivEnergy	BMS Communication Protocol V1.04	485	Self adaptation
NEXT	RS485-protocol-pylon-low-voltage	485	Self adaptation

12、Parts list

No.	Part name	Quantity	Disposition
1	Voltage acquisition line	1	Select
2	Conventional switching line	1	Select
3	Conventional transfer plate wire	1	Select
4	Conventional heating wire	1	Select
5	M5*12screw	4	Select
6	LCD	1	Select
7	Conventional transfer plate	1	Select

13、Points for attention

❖ Battery management systems can not be used in series.

❖ BMS power components withstand voltage 100V.

❖ If the battery module is assembled in the form of long wire and long copper bar, it must communicate with the BMS manufacturer for impedance compensation.Otherwise, it will affect the consistency of the cell.

❖ The external switch on BMS is prohibited to connect with other equipment. If necessary, please confirm with the technology for docking. Otherwise, BMS will not bear any responsibility for damage.

❖ Do not touch the surface of the core directly when assembling, so as not to damage the core. The assembly should be firm and reliable.

❖ In use pay attention to lead wire head, soldering iron, solder and so on do not touch the components on the circuit board, otherwise it may damage the circuit board.

❖ Use process should pay attention to anti-static, moisture-proof, waterproof and so on.

❖ Please follow the design parameters and use conditions during use, must not exceed the value in this specification, otherwise it may damage the protection board.

❖ After combining the battery pack and the protection plate, if you find no voltage output or charge,

please check the wiring is correct.

❖ The final interpretation right is owned by our company.