I&O Manual

SOLiCORE Solid State Lithium Battery Installation, and Operation Manual

Version 1.0

VALEN Power

AUSTRALIA
1300 734 253
sales@valen.com.au
www.valen.com.au

NEW ZEALAND
0800 734 253
sales@valen.co.nz
www.valen.co.nz

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1. SUMMARY

This product type model is 48V100Ah semi-solid lithium iron phosphate battery pack, this battery pack is mainly used in the field of energy storage, such as home energy storage, telecom energy storage, lighthouse energy storage and so on.

2. DESCRIPTION OF BATTERY PACK SYMBOLS

Symbol	Description
	Dangerous
	Dangerous Voltage, Risk of Electric Shock
	Prohibition of throwing in the garbage
	Environmentally friendly and recyclable
	Read the Instructions before use
	Banning of Flames
	Upward Pointing

3. INTODUCTION

3.1 System diagram (home energy storage scenario as an example)

This system diagram is a scenario for reference only

Caution:

1. Before communicating between the lithium battery pack and the inverter, you need to make sure that the inverter protocol matches the battery pack.
2. Match the inverter and circuit breaker according to the actual, theoretically the rated power of the inverter and circuit breaker should be ≤ the output power of the lithium battery.

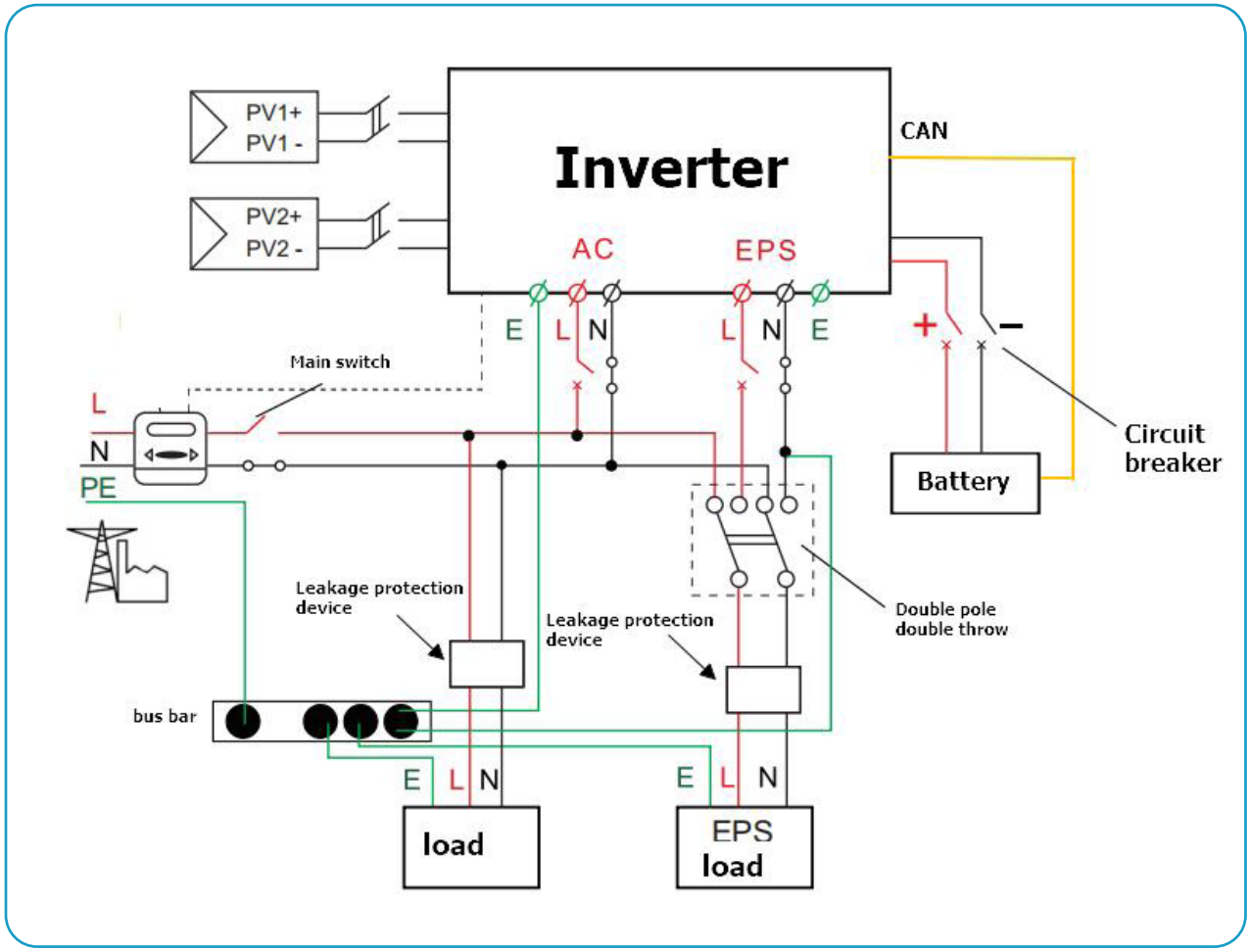


Table 3.1 Battery pack external connection diagram (for Reference)

3.2 Product Introduction

3.2.1 Dimensional Drawings

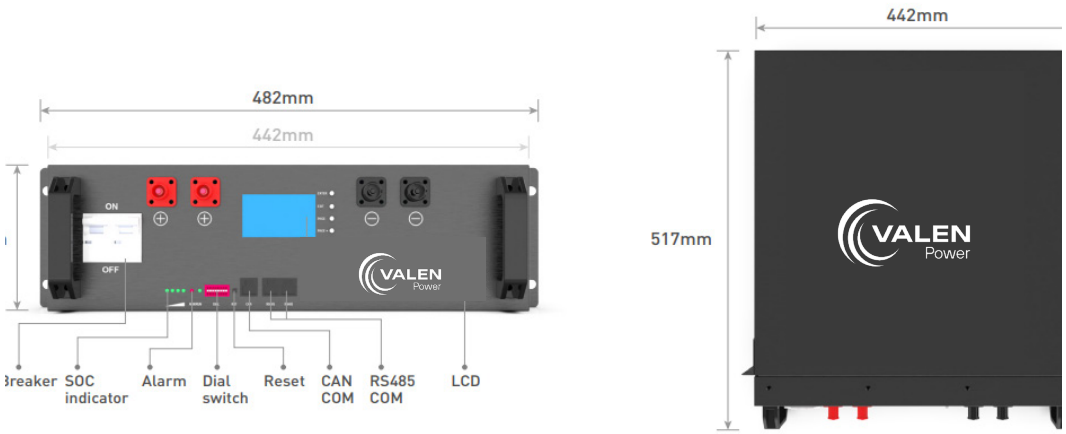


Table 3.2.1

3.2.2 Description

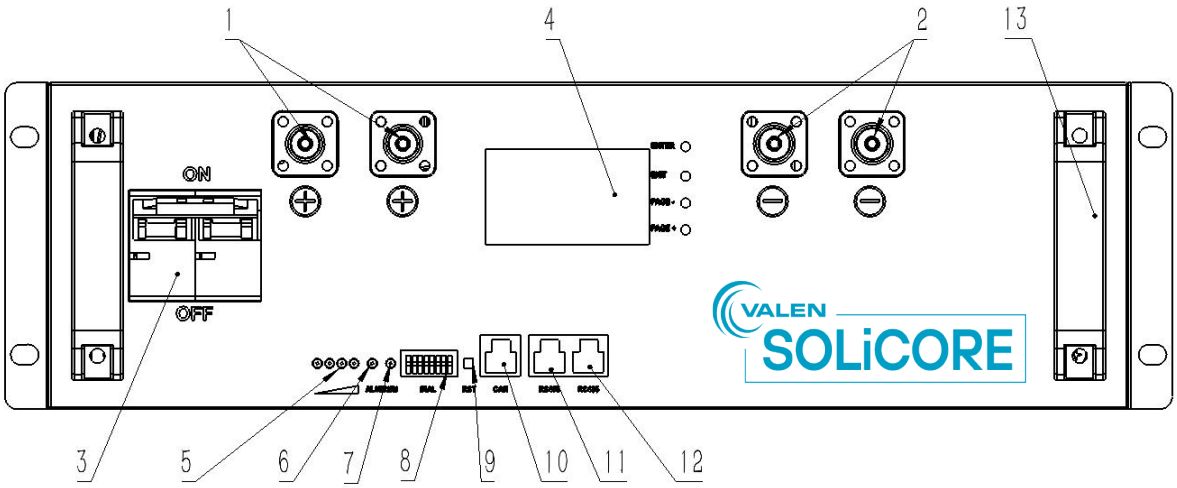


Table 3.2.2

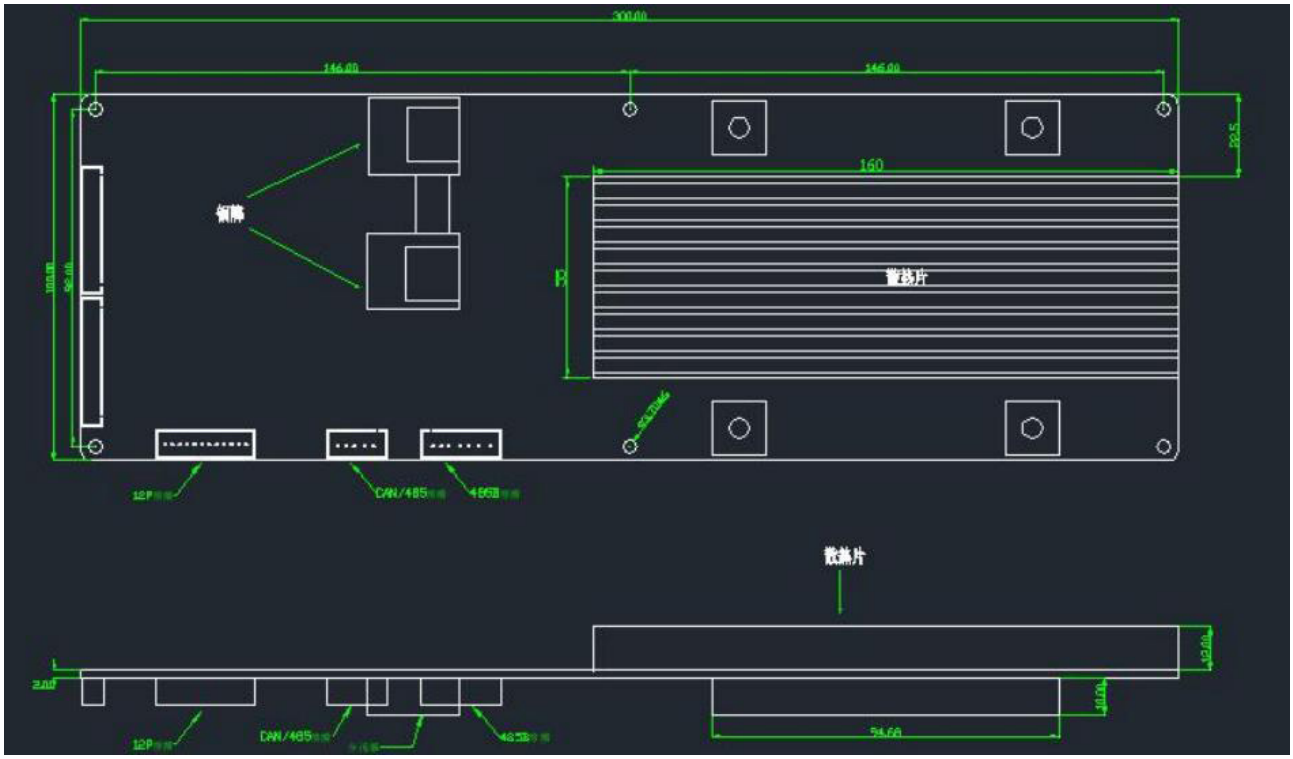
No	Item	Description	
1	Output Positive	ES08-RH5S-02-BK	
2	Output Negative	ES08-RH5S-02-BK	
3	Circuit Breaker	Noark/2P/B1E2P125	
4	LCD	View battery pack information, status and alarms	
5	Soc Display	4.2 See 4.2	
6	Warning Light	4.2 See 4.2	
7	Running Light	4.2 See 4.2	
8	Battery Pack Parallel ID address Setting	Cancel	
9	Reset Switch	Power On/Activation	When BMS is in sleep state, press 1S reset button, BMS will be activated, and the LEDs will light up sequentially, and then transfer to normal working state;
		Power off/Sleep	When the BMS is in standby or working status (except charging), press the reset button for 3S, the BMS will be put to sleep, and the LEDs will light up sequentially, and then turn to sleep status.
10	CAN communication interface	For communication with inverters(see 4.4.1)	
11	RS485 communication interface (OUT)	For parallel communication or connection to a host computer (see 4.4.2)	
12	RS485 communication interface (IN)	For parallel communication or connection to a host computer (see 4.4.2)	
13	Handle		

Table 3.2.2-1

3.2.3 Battery Parameters

Item		Parameter
Cell Model		48ELSS100
Cell Nominal Voltage		3.2V
Cell Rated Capacity		50Ah
Cell Type		Semi-solid lithium iron phosphate battery pack
Nominal Voltage of Battery Pack		51.2V
Typical Cpacity		100± 1Ah (0.5C discharge rate)
Discharge	Standard Operating Current	60A
	Max. Discharge Current	100A
	Discharge Cut-Off Voltage	About 40V
Charge	Charge Voltage	57.6±0.1V
	Rated Charging Current	50A
	Max. Charging Current	50A
	Charging Method	It means that under the environment of temperature 25±2° and humidity 15-90%RH, the constant current charging is carried out at the rate of 0.5C to the cut-off voltage, and then the constant voltage charging is carried out until the charging current is less than 0.05C and then stops charging.
Working Temperature	Charging Temperature	0°C to +45°C
	Discharging Temperature	-20C to +45°C
	Charge/Discharge Humidity	RH≤85%, when > 85% need to pay attention to waterproofing
Storage Temperature	Temperature	20°C to +45°C about 80% capacity) Long-term storage temperature at -10°C to +30°C
Packaging Material	Black Iron Case	
Weight	44±0.5kg	
External Dimensions	≤482*517*133.5mm	
Protection Function	Over-charging protection, over-discharging protection, temperature protection, equalization function, over-current protection, short-circuit proection, secondary decoupling	
Others	CAN+RS485, supports parallel connection with16 units battery packs	
Cycle	Charge according to standard charging, set aside for 0.5~1h, then discharge according to standard discharging, set aside for 0.5~1h, and then proceed to the next charging/discharging cycle.	
IP Rate	IP54	

4. BMS SPECIFICATION



4.1 Basic Parameters

Item		Parameters	Note
Single-Series Overvoltage Protection		3.65V	
Single-Series Overvoltage Recovery		3.55V	
Charge Overcurrent Proctection		60A	
Charging High Temperature Protection		54°C	
Charging Low Temperature Protection		0°C	
Effective Charging Current	Charge Entry Current	600mA	
	Charge Exit Current	500mA	
Single-series undervoltage protection		2.5V	
Single-series undervoltage recovery		2.7V	
Discharge overcurrent protection		110A	
Discharge High Temperature Protection		54°C	
Discharge Low Temperature Protection		-20°C	
Instantaneous overcurrent value protection		250A (30ms)	
Effective discharge current	Discharge Entry Current	500,A	
	Discharge Exit Current	400mA	
Total voltage-over voltage protection		57.6V	
Total voltage-over voltage recovery		54.V	
Total voltage- under voltage protection		41.6V	
Total voltage- under voltage recovery		46V	
Cell Balancing	Standby Balance	Turn of balance when standby	
	Standby Balance Time	10 Hours	
	Balance Turn-On Voltage	3400mv	
	Balance Turn On Voltage Difference	30mv	
	Balance Turn Off Voltage Difference	20mv	
Short circuit protection		500A (100uS)	
Internal resistance		<mΩ	
Power consumption when running		<40mA	
Power consumption when sleep		50uA	

4.2 LED display

4.2.1 LED sequence

1pc Run light, 1pc Alarm light, 4pcs capacity Indicator lights

●	●	●	●	●	●
Soc				ALARM	RUN

4.2.2 Capacity Indication

State	Charge				Discharge			
Capacity Indicator Light	L4 ●	L3 ●	L2 ●	L1 ●	L4 ●	L3 ●	L2 ●	L1 ●
0 ~ 25%	Off	Off	Off	Flashing	Off	Off	Off	Off
25 ~ 50%	Off	Off	Flashing	On	Off	Off	On	On
50 ~ 75%	Off	Flashing	On	On	Off	On	On	On
≥75%	Flashing	On	On	On	On	On	On	On
Operation Indicator Light	On				Blinking			

4.2.3 Flashing Description

Flashing Mode	ON	OFF
Flash 1	0.25S	3.75S
Flash 2	0.5S	0.5S
Flash 3	0.5S	1.5S

4.2.4 Status Indicator

System State	Running State	RUN	ALM	SOC				Note
		●	●	●	●	●	●	
Shutdown	Sleep	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Standby	Normal	Flash 1	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 Protec-tion	Flash1	OFF	OFF	OFF	OFF	OFF	
	Temperature, Over-current Protection	Flash1	Flash1	OFF	OFF	OFF	OFF	
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	OFF
	Under-voltage pro-tection	OFF	OFF	OFF	OFF	OFF	OFF	OFF

4.3 Communication

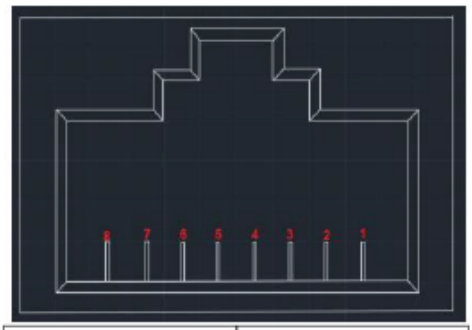
4.3.1 CAN communication

The BMS is equipped with CAN communication function, with baud rate of 500 K. The CAN communication interface adopts 8P8C network cable interface. Through CAN interface, BMS can communicate with inverter or CAN TEST. When the battery packs are grouped together, they are grouped together through RS485 communication, and finally the data, status and information of the battery packs are uploaded through CAN communication. Finally, the battery pack data, status and information are uploaded to PCS through CAN communication.

The BMS is equipped with RS485 communication function, with baud rate of 9600bps, and the RS485 communication interface adopts 8P8C network cable interface.

When the battery packs are grouped together, they are grouped together through RS485 communication, and finally the data, status and information of the battery packs are uploaded to the PCS or the inverter through RS485 communication. The data, status and information of the battery pack will be uploaded to PCS or inverter through RS485 communication.

CAN and RM485 Communication Interface Definitions:

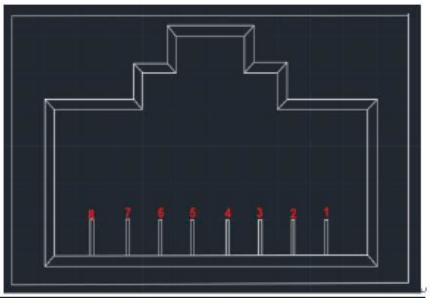


PIN	Definition
1、8	RS485-B
2、7	RS485-A
4	CAN-H
5	CAN-L
3、6	GND

4.3.2 RS485 Communication

The BMS is equipped with RS485 communication for battery pack pooling at a baud rate of 19200bps. 8P8C network cable interface is used for RS485 communication.

RS485 Communication Interface Definition:

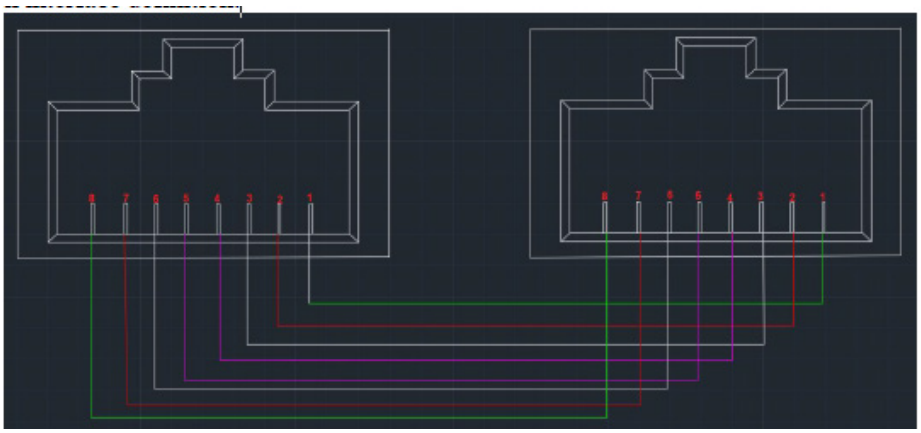


PIN	Definitions
1、8	RS485-B
2、7	RS485-A
3、6	GND
4、5	Internal communication

4.3.3 Parallel Communication

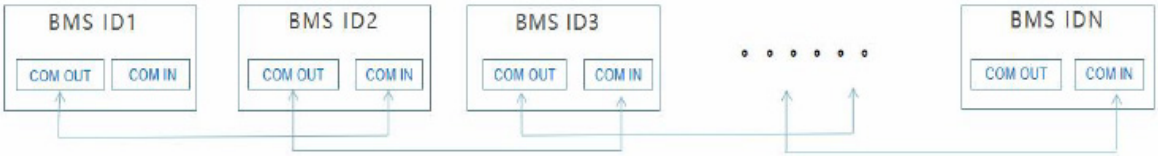
BMS RS485 communication with battery packs, baud rate 9600 bps. RS485 communication interface adopts 8 P8C network interface.

RS485 communication interface definition:



4.4 Automatic DIP switch mode

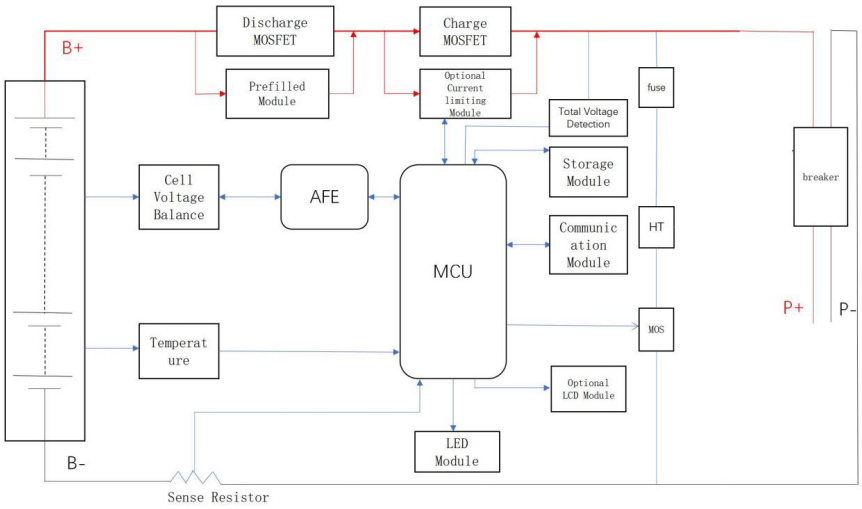
The automatic dip connection diagram is as follows:



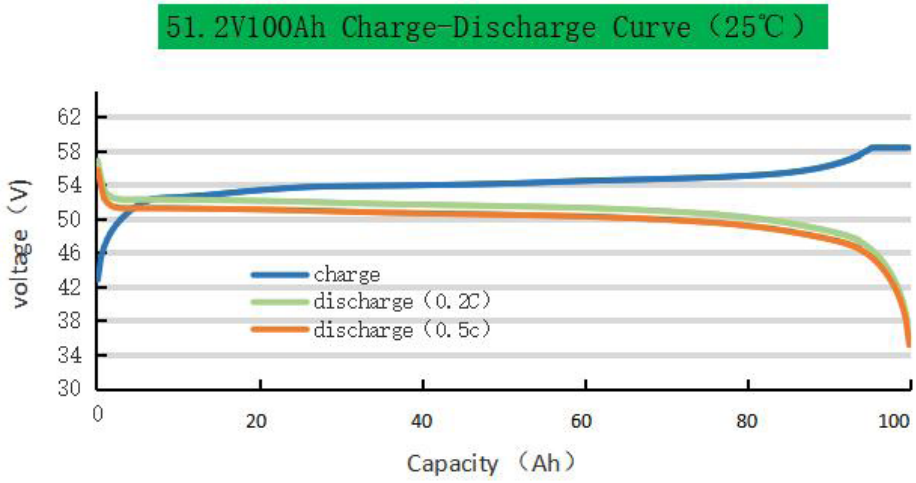
4.5 LCD Display

LCD display can check the status of the battery pack: voltage, current, SOC, voltage of each string, temperature, alarm information, remaining capacity and so on. Long press "ENTER" for 5S to switch between languages

5. ELECTRICAL SCHEMATIC



6.CHARGE AND DISCHARGE CURVE



7. INSTALLATION

Precautions for installing battery packs:

1. Do not wear watches, rings or similar metal objects.
2. Use of insulating tools
3. Wear rubber shoes and gloves.
4. Do not put metal tools and similar metal parts on the battery.
5. Before removing the battery connection terminals, turn off the load to which the battery is connected.
6. Repair and maintenance of batteries can only be carried out by personnel with professional knowledge.
7. Do not install in areas where highly flammable materials are stored.
8. Do not install in potentially explosive areas.
9. Do not expose to precipitation or humidity (>95%).
10. 10. Well ventilated.
11. Ambient temperature in the range of -25°C to 60°C

7.1 Check for physical damage

Please ensure that the battery pack is intact and undamaged during transportation. If there is any visible damage, such as cracks or deformations, please contact your dealer promptly.

8. BATTERY PACK USAGE METHOD

8.1 Charging

Connect the battery pack to an compatible charger (charging voltage of 58.4 ± 0.15V, do not reverse connect) for charging.

8.2 Discharge

Pay attention to the positive and negative poles (as indicated on the battery case label, do not reverse them), and connect them to the matching load.

9. BATTERY PACK TESTING

The parameters of battery and BMS are only standard test data when used as separate accessories for reference.

9.1 Battery Pack Test Requirements

The battery pack for the test will be shipped from the factory not more than one month. If the battery pack has not been tested overtime due to other reasons such as transportation, the battery pack can be tested after charging and discharging cycles again.
The tests in this specification shall be conducted under standard atmospheric conditions: Temperature: 25±2°C; Relative humidity: 65±20%.
The standard charging voltage of the battery pack is 57.6±0.15V, and the standard discharge cut-off voltage is about 40.0V; the standard current is I5 (when I5 is greater than the normal working current, it is tested according to the normal working current).

9.2 Standard charge

Using a special test cabinet for lithium-ion battery packs, with standard charging voltage, standard current, constant current and constant voltage charging until the current drops to 0.05 I5.

9.3 Standard discharge

Using a special test cabinet for lithium-ion battery packs, discharge the battery at a standard current and constant current until the standard discharge cut-off voltage or the battery pack cut-off.

10. ENVIRONMENTAL REQUIREMENTS FOR BATTERY PACKS

Battery pack discharge ambient temperature is -20°C+60°C (when the ambient temperature is greater than 45°C, please pay attention to ventilation and heat dissipation); charging ambient temperature is 0°C +45°C Ambient humidity RH ≤ 85%, when the ambient humidity is greater than 85%, please pay attention to waterproof, and avoid condensation on the surface of the battery pack.

11. SPECIAL ATTENTION

In order to fully utilize the energy efficiency of the lithium-ion battery pack and to prevent accidents such as leakage and heat generation from occurring in the battery pack, the following precautions are prohibited:

- It is strictly prohibited to immerse the battery pack in water, once it enters into water or water enters into the battery, immediately isolate it and ask professional personnel to deal with it;

- It is strictly prohibited to charge, discharge or set aside the battery pack at a high temperature of more than 60°C, and at the same time keep it away from fire, heater, corrosive objects, etc., otherwise it may cause the battery pack to overheat, catch fire, or fail to function, shorten its service life, or even become dangerous;
- It is strictly prohibited to charge the battery pack below 0°C.
- Strictly prohibit the use of battery packs with reversed positive and negative terminals, and strictly prohibit short-circuiting the positive and negative terminals of battery packs.
- Series connection of battery packs is strictly prohibited
- It is strictly prohibited to reverse charge the battery pack, and it is strictly prohibited to plug the positive and negative terminals of the battery pack directly into the power socket
- It is strictly prohibited to transport or store the battery pack together with conductive objects (e.g. hairpins, necklaces, etc.).
- Strictly prohibit knocking, throwing, stepping on, dropping, disassembling, impacting the battery pack, etc.
- It is strictly prohibited to weld the battery pack directly or to pierce the battery pack with nails or other sharp objects.
- Strictly prohibit the use of strong static electricity and strong magnetic field environment, otherwise it may damage the battery pack protection circuitry
- Overloading of the battery pack is strictly prohibited.
- Mechanical processing of the circuit board is strictly prohibited, as it may damage the internal circuitry and cause functional failure.
- It is strictly prohibited to deform the product by force, which may cause damage to the electronic components or wiring parts, making the product unstable.
- It is strictly prohibited to disassemble the casing, so as not to bring you unnecessary damage.
- Strictly prohibit the use of overcharging and over-discharging of the battery pack.
- When charging, please use the appropriate charger for lithium-ion battery packs.
- Please charge the battery pack within 12 hours after use. If the battery pack has not been charged for more than 12 hours after use, please test the battery pack voltage before charging. If the voltage value of the battery pack is <32V, it should not be recharged and should be placed in isolation while consulting with a technician.
- If the battery pack leaks and liquid splashes into the eyes or skin, do not rub, flush with water and seek immediate medical attention.
- Use dry powder fire extinguisher or sand to extinguish fire in case of accidental battery pack fire.
- If the battery emits a strange odor, heat, discoloration, deformation, or any abnormality occurs during use, storage, or charging, immediately stop charging, stop using, and remove it from the device and isolate it under the condition of ensuring safety.
- End-of-life battery packs should have insulating paper wrapped around the electrodes at the terminals to minimize safety hazards when shelved at a later date.
- Reversing the positive and negative terminals of the charging port will burn the internal circuit board, please pay attention to the positive and negative terminals of the port when connecting the wires.

12.DAILY USE AND MAINTENANCE OF BATTERY PACKS

12.1 Battery Storage

Storage temperature is -20 °C ~ 40 °C (the best storage temperature is 15°C ~ 25 °C, dry storage), the battery pack performance to play by the temperature, the most intuitive performance is the battery pack capacity changes, this is a normal phenomenon.
Avoid condensation caused by temperature changes during storage, which may lead to rusting of the battery or metal parts.

12.2 Battery pack inspection before use

- After receiving the battery pack, pls check the package carefully for any abnormalities first and avoid impacts during handling.
- Pls check the battery pack casing and accessories for any defective phenomena such as breakage, leakage, missing, etc. If there is any breakage or missing, please contact us.
- Pls check whether the battery pack charging and discharging terminals are correct, measure whether the positive and negative terminals are reversed, and whether the voltage is within the normal working voltage range of the equipment. If there is dirt or rust at the terminals, it should be wiped off with a dry cloth before use, otherwise it may lead to poor contact of the electrode terminals.

12.3 Battery Pack Installation Precautions

- Pls clean the battery pack installation location to ensure that there is no dust, metal foreign objects or other foreign objects, and strictly prohibit smoke and fire during installation to avoid short-circuiting of the battery pack and prevent damage to equipment or injury to personnel.
- Battery pack in place, the battery pack is placed in the installation position, the battery pack should be installed in a well-ventilated, dry and clean environment, the battery pack shall not be installed in a place where there is a possibility of water immersion, the battery pack should be avoided to be close to the flammable and explosive items when it is used and stored.
- Fasten the electrical appliance wire terminals to the battery pack terminals, do not use excessive force or exceed the specified torque when fastening, otherwise terminal damage may result.
- After the installation is completed, check whether the terminal fastening is in place, whether there are debris on the surface of the battery pack, use a dry cloth to clean up the outer package of the battery pack, do not use tools that are prone to static electricity to clean up the outer package of the battery pack, and do not use organic solvents such as volatile organic oils, which will damage the outer package of the battery pack or even make the outer package of the battery pack cracked.
- Take care to ensure that the positive (+) and negative (-) polarity of the terminals are connected correctly. Failure to do so may cause a fire or damage to the battery pack or electrical appliances.
- Conduct test runs of the equipment and observe the equipment and the battery pack for any abnormalities.

12.4 Battery Pack Operating Requirements

- The charging current should not exceed the specified maximum charging current. Charging with a higher than specified current may affect the service life of the battery pack or damage the internal circuits, or even be dangerous.
- Discharge current shall not exceed the specified maximum discharge current. Discharging with a higher current than specified may affect the service life of the battery pack or damage the internal circuits, or even be dangerous.
- When the battery pack is undercharged, it should be charged in time, which is beneficial to extend the life of the battery pack. If the battery pack is not charged in time, the battery pack will be in a state of lack of power for a long time, which will affect the service life of the battery pack.
- Li-ion battery packs are shallowly charged and discharged to improve cycle life, and it is recommended that the user discharges to 80% of the nominal capacity each time.

12.5 Battery Pack Daily Maintenance

- Batteries left unused for long periods of time may cause over-discharged due to their self-discharge characteristics. To prevent over-discharge, batteries should be charged and discharged periodically to maintain their voltage within a certain range (53.28-54.4V). It is recommended that the battery pack be charged and discharged once every 2 months (for battery packs with communication function, it is recommended that the battery pack be charged and discharged at least once every 1 month, in which the SOC/capacity calibration needs to be calibrated, and the method of calibration is to charge the battery pack fully with a charger, and discharge the battery pack until it is protected.
- Organic solvents should not be used to clean the battery pack housing.
- Battery packs are consumables and have a limited lifespan. When the capacity of the battery pack is lower than the usage requirement, please replace the battery pack in time to avoid the loss caused by insufficient capacity.
- In order to prevent the safety problems caused by the failure of the protection board over-charge protection function, also do not charge for a long time, the battery is removed when it is full, in addition to charging must be used when the original or the battery comes with the charger, and according to the instructions for operation and use, or may damage the battery or even dangerous.
- Shallow charging and discharging of batteries ensures that the battery pack is used economically. Overcharging and overdischarging may cause the battery pack to overheat, catch fire, or fail to function, have a shortened life, or even be dangerous.
- The switch, power display board, and USB of the battery pack are wear-and-tear parts, and paid after-sales service is available.
- End-of-life lithium batteries should be recycled and disposed of according to local laws.

12.6 Common faults and solutions of battery packs

The battery pack was charged fully and then left for a period of time,the voltage becomes low or zero. If the battery pack is stored unused for a long time and is not maintained in accordance with the regulations.

- Solution: Please test the voltage of the battery pack, if the battery pack voltage is <32V, do not charge and place it in isolation, consult the relevant technical personnel. If the voltage ≥32V is normal, you can isolate the battery for charging, and check whether it can be charged normally at regular intervals.

Battery Pack Disconnect

- Solution: Disassemble the battery pack, check whether the wiring is broken, check whether the solder joints are off, whether the nickel band is broken, and repair the damage according to the situation.

BMS is not working.

- Solution: First of all, check if the wires of BMS and the BMS contact is good, observe whether the solder joints are off, if the above situation is not abnormal, to test the voltage between the B +, B- and P +, P- voltage, such as the two voltage difference is large, it means that the BMS has been bad. Need conduct detailed test for BMS, if the test failed, need to replace the BMS.

Battery packs that have been subjected to severe impacts, characterized by damage to the exterior of the battery case or battery packs that smell of electrolyte

- Solution: This type of situation is generally not within the scope of warranty, if repair, need to determine whether the output line has a problem, or the battery pack itself has a problem. First of all, the battery case will be disassembled, check the battery pack P + / C + and P - / C - wire or welded joints with or without damage, if there is damage, need to be replaced. Then use sensational smell method to determine the odor of the battery pack, if there is a stimulating electrolyte odor, indicating that the battery pack has been leaking, the need for each string of batteries in the battery pack voltage test, such as if there is a string of voltage and the other several groups of voltage is too large a difference and is very low then you need to replace the string of batteries.

Insufficient capacity

- Solution: Charge/discharge cycle the battery pack, usually 3-5 cycles. Battery pack voltage instability or abnormal charging and discharging

False soldering

- Solution: Test the internal resistance of the battery pack with an internal resistance tester, if it exceeds the specified value, there may be a false weld inside the battery pack, and it is necessary to disassemble the battery pack and re-weld it.

BMS abnormality

- Solution: Replace the BMS

Poor contact on terminals or connectors

- Solution: Replace terminals or connectors

13. OTHER TECHNICAL SPECIFICATIONS

For any matters not covered in this manual and other related parameters, if customers need them, please contact our sales staff or technical personnel. We will try our best to help you, thank you for your understanding.

14. DISCLAIMER

Before the use of the product, please read the product manual carefully, not responsible for accidents caused by not operating in accordance with the provisions of this manual. If the product is used in the wrong way, the circuit connection is not right or the input power supply, load function parameters and product specifications of the performance parameters are inconsistent with the phenomenon of improper use, caused by improper use of the product, the load and the peripheral connectors damage (personal safety), Valen Power does not bear the responsibility. Valen reserves the right to make changes to the contents of this brochure, which are subject to change without prior notice; the final interpretation of this material belongs to Valen Power

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AUSTRALIA

1300 734 253

sales@valen.com.au

www.valen.com.au

NEW ZEALAND

0800 734 253

sales@valen.co.nz

www.valen.co.nz