HJ-51.2135 HOME STORAGE BATTERY PACK SPECIFICATION

Prepared by	Checked by
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Product Modification Record List

Revision	Date	Mark	Modified content	Approved by
A/0	2023-03-27	/	NEW RELEASE	/

1 Scope

This specification only applies to the reference battery in this specification and manufactured by Changsha Lead Power Technology Co., Ltd.

2 main parameters

Item		parameters	Note
电芯 Cell	Type	LiFePO4 Battery	
	Cell Model	PR79148102-135CF01 3.2V135Ah	LFP
	Nominal Capacity	135Ah	Discharge : 0.5C Cut-off Voltage:2.5V
	Nominal voltage	3.2V	
	Internal Impedance	≤0.5mΩ	ACR
	Dimension	Max.79±0.3x148±0.5x106.35±0.5mm	
	Weight	Approx.2570±100g	
Batterypack	Pack Method	16S1P	
	Nominal Capacity	135AH	Discharge : 0.5C Cut-off Voltage:40.0V
	Nominal Voltage	51.2V	
	Energy	6912Wh	
	Charge Voltage	58.4V	
	Discharge cut-off voltage	40.0V	
	Charge Method	CC/CV	
	Standard Charge Current	67.5A	
	Max. Charge Current	135A	
	Standard Discharge Current	67.5A	
	Max. Continues Discharge current	135A	
	Cycle Life	6000 times	
	Internal Impedance	≤25mΩ	
	Dimension	L452xD150XH650mm	
	Output Wire	/	
	Output Connector	FSP840180TZ-35U0A1J/FSP840180TW-35U0B1J	Charge discharge port
	Communication	RS485/RS232/CAN	

		Weight	Approx.58kg	
		Working Temperature Range	Charge: 0°C--45°C Discharge: -20°C--60°C	
		Storage Temperature	-10°C--50°C	

3 BMS Parameters

3.1 main parameters setting

No.	Item		Default parameters	Setting or not	note
1	Cell overcharge protection	Alarm voltage	3600mV	Yes	
		Protection voltage	3700mV	Yes	
		Protection time delay	4.0S	Yes	
	Cell overcharge protection released	Released voltage	3380mV	Yes	
		Released Capacity	SOC < 96%	Yes	
		Discharging released	Discharging current > 1A		
2	Cell over discharge protection	Alarm voltage	2800mV	Yes	After 30 seconds of over-discharge protection, if it still cannot be recovered, it will enter the low
		Protection voltage	2500mV	Yes	
		Protection time delay	1.0S	Yes	
	Cell over discharge protection released	Released voltage	2900mV	Yes	
		Charging	Connect with charger		
3	Pack overcharge protection	Alarm voltage	57.6V	Yes	
		Protection voltage	59.2V	Yes	
		Protection time delay	1.0S	Yes	
	Pack overcharge protection released	Released voltage	54V	Yes	
		Released Capacity	SOC < 96%	Yes	
		Discharging released	Discharging current > 1A		
4	Pack over discharge protection	Alarm voltage	44.8V	Yes	After 30 seconds of over-discharge protection, if it still cannot be recovered, it will enter the low
		Protection voltage	40V	Yes	
		Protection time delay	1.0S	Yes	
	Pack over discharge protection released	Released voltage	46.4V	Yes	
		Charging	Connect with charger		
5	Over charge current protection	Alarm current	155A	Yes	10 times consecutive occurrences will lock this state and will no longer be automatically released
		Protection current	160A	Yes	
		Protection time delay	1.0S	Yes	
	Released over charge current protection	Automatic release	After 1min		
		Charging	Discharging current > 1A		
6	Over discharge current protection 1	Alarm current	155A	Yes	10 times consecutive occurrences will lock this state and will no longer be automatically released
		Protection current	160A	Yes	
		Protection time delay	1.0S	Yes	
	Released over discharge current protection 1	Automatic release	After 1min		

		Charging release	Discharging current > 1A		
7	Over discharge current protection 2	Protection current	≥250A	Yes	10 times consecutive occurrences will lock this state and will no longer be automatically
		Protection time delay	100mS	Yes	
	Released over discharge current	Automatic release	After 1min		
		Charging release	Discharging current > 1A		
8	short-circuit protection	Protection current	≥200A		
		Protection time delay	≤100mS		
		Protection released	charging		
			Off load		
9	MOS High temperature protection	Alarm temperature	90℃	Yes	
		Protection Temperature	110℃	Yes	
		Released temperature	85℃	Yes	
10	Cell temperature protection	Low temperature charging	0℃	Yes	
		Low temperature charging Protection	-5℃	Yes	
		Low temperature charging Protection released	0℃	Yes	
		High temperature charging alarm	55℃	Yes	
		High temperature charging Protection	60℃	Yes	
		High temperature charging Protection released	50℃	Yes	
		Low temperature discharging alarm	-15℃	Yes	
		Low temperature discharging Protection	-20℃	Yes	
		Low temperature discharging Protection	-15℃	Yes	
		High temperature discharging alarm	60℃	Yes	
		High temperature discharging Protection	65℃	Yes	
		High temperature discharging Protection	55℃	Yes	
11	Ambient temperature protection	Low temperature alarm	-15℃	Yes	
		Low temperature protection	-20℃	Yes	
		Low temperature protection released	-15℃	Yes	
		high temperature alarm	65℃	Yes	
		High temperature	75℃	Yes	
		High temperature protection released	65℃	Yes	
	Current consumption	Working self-consumption	≤45mA （with display）		

12		current	≤40mA（without display）		
		Low Energy running mode	≤100μA		
13	Balancing	Pack voltage difference	3500mV	Yes	open
		Cell Voltage difference	30mV	Yes	
14	Default capacity	Low capacity alarm	SOC < 5%	Yes	There is no alarm when charging
15	Sleep feature	sleep Voltage	3150mV	Yes	
		Time delay	5min	Yes	
16	Cell failure protection	Monomer pressure difference	＞1V	NO	Charging and discharging are not allowed
17	Full charge judgment	Full charge voltage	＞56V	Yes	It is judged as full charge if the charging voltage and current meet at the same time
		Cut off current	＜2A	Yes	

3.2.LED instruction

Table 1   LED Working status indicator

Status	Normal/Alarm /Protection	ON/ OFF 🟢	RUN 🟢	ALM 🔴	LED status						Note
					🟢	🟢	🟢	🟢	🟢	🟢	
Shutdown	Sleep	Off	Off	Off	Off	Off	Off	Off	Off	Off	All off
Standby	Normal	Normally on	flicker 1	Off	The battery capacity status						
	Alarm	Normally on	Flicker1	Flicker3							Low voltage
Charging	Normal	Normally on	Normally on	Off	The battery capacity status (max capacity LED flicker 2)						Over charge status, the ALM light will not flicker
	Alarm	Normally on	Normally on	Flicker3							
	Over charge protection	Normally on	Normally on	Off	on	on	on	on	on	on	If no charging, the LED status will be standby
	Temperature、over current 、 failure protection	Normally on	Off	Normally on	Off	Off	Off	Off	Off	Off	Stop charging
Discharging	Normal	Normally on	Flicker3	Off	The battery capacity status						
	Alarm	Normally on	Flicker3	Flicker3							
	Low voltage protection	Normally on	Off	Off	Off	Off	Off	Off	Off	Off	Stop discharging
	Temperature、over current 、 failure protection	Normally on	Off	Normally on	Off	Off	Off	Off	Off	Off	Stop discharging

Failure		OFF	Off	Normally on	Off	Off	Off	Off	Off	Off	Stop charging or discharging

Table 2 battery capacity status specification

status		charging						discharging					
		L6	L5	L4	L3	L2	L1	L6	L5	L4	L3	L2	L1
Capacity LED light		●	●	●	●	●	●	●	●	●	●	●	●
capacity（%）	0～16.6%	Off	Off	Off	Off	Off	F2	Off	Off	Off	Off	Off	ON 1
	16.6～33.2%	Off	Off	Off	Off	F2	On 1	Off	Off	Off	Off	On 1	On 1
	33.2～49.8%	Off	Off	Off	F2	On 1	On 1	Off	Off	Off	On 1	On 1	On 1
	49.8～66.4%	Off	Off	F2	On 1	On 1	On 1	Off	Off	On 1	On 1	On 1	On 1
	66.4～83.0%	Off	F2	On 1	On 1	On 1	On 1	Off	On 1	On 1	On 1	On 1	On 1
	83.0～100%	F2	On 1	On 1	On 1	On 1	On 1	On 1	On 1	On 1	On 1	On 1	On 1
Running LED ●		Normally on						F3					

Note: F2: flicker 2 ; On 1: normally on ; F3: flicker 3

Table 3 LED flicker status

Flicker model	on	off
Flicker 1	0.25S	3.75S
Flicker 2	0.5S	0.5S
Flicker 3	0.5S	1.5S

3.3 Description of buzzer action

Fault: Every second, Buzzer works 0.25S；

Protection: Every 2 seconds, Buzzer works 0.25S；(except over voltage protection)

Alarm: Every 3 seconds, Buzzer works 0.25S；(except over voltage protection)

The buzzer function can be enabled or disabled by the host computer, and the factory default is disabled.

3.4 Buttons Description

When the BMS is in the sleep state, press the button (3~6S) and release, the protection board is activated, and the LED indicator lights up in sequence from "RUN" for 0.5 seconds.

When the BMS is activated, press the button (3~6S) and release it, the protection board is dormant, and the LED indicator lights up in order from the lowest battery light for 0.5 seconds.

When the BMS is in the activated state, press the button (6~10S) and release it, the protection board is reset, and the LED lights are all lit simultaneously for 1.5 seconds.

After the BMS is reset, the parameters and functions set by the host computer are retained. If you need to restore the initial parameters, you can use the "restore default value" of the host computer to achieve, but the related operating records and stored data remain unchanged (such as power, cycle number, Record protection, etc.)

3.5 Sleep and wake up status

3.5.1 Sleep status

When any of the following conditions are met, the system enters a low-power mode:

1) The single or overall over-discharge protection has not been released within 60 seconds.

2) Press the button (3~6S) and release it.

3) The lowest monomer voltage is lower than the sleep voltage, and the duration reaches the sleep delay time (at the same time, no communication, no protection, no balance, no current).

4) Standby time exceeds 24 hours (no communication, no charge and discharge, no commercialpower).

5) Forced shutdown by the host computer software. Before entering sleep, make sure that the input terminal is not connected to an external voltage, otherwise it will not be able to enter the low power consumptionmode.

3.5.2 Wake up status

When the system is in low-power mode and meets any of the following conditions, the system will exit low-power mode and enter normal operation mode:

1) Connect the charger, and the charger output voltage must be greater than 51.2V.

2) Press the button (3~6S) and release it.

3) RS232 communication is activated (this method cannot wake up the motherboard due toover-discharge).

Remarks: After single or total over-discharge protection enters low power consumption mode, it wakes up regularly every 4 hours and turns on charge and discharge MOS. If it can be charged, it will exit the sleep state and enter normal charging; if it can not be charged after 10 consecutive automatic wakeups, it will no longer automatically wakeup.

When the system is defined as the end of charging, the recovery voltage has not been reached after 2 days of standby (standby time setting value), and the charging is forced to resume until the end of recharging.

4 Appearance

It shall be free from any defects such as scratch, distortion, contamination and leakage.

5 Performance

5.1 Standard Test Condition

5.2 The battery shall be evaluated within 1 month from the arrival date.

5.3 Unless otherwise stated in these specifications, the following test shall be carried out in an ambient temperature of 20±5℃, relative humidity of 65±20%

5.4 Discharge capacity when the battery is discharged at 50A to 40.0V after being standard charged. Five cycles are permitted for this test. The test shall be terminated at the end of the first cycle which meets the requirement.

5.5 Testing Instrument or Apparatus

5.5.1 Dimension Measuring Instrument

The dimension measurement shall be implemented by instruments with equal or more precision scale of 0.01mm specified.

5.5.2 Voltmeter and Ammeter

Voltmeters and ammeters shall be equal or more precision instruments of 10KΩ/V and 0.01Ω.

5.5.3 Impedance Meter

Impedance shall be measured by a sinusoidal alternating current method (1kHz LCR meter)

5.6 Electrical Performance

Item	Condition	要求 Specification
Open-Circuit Voltage	The open-circuit voltage shall be measured within 24hours after standard charge	≥52.8V
Battery Capacity	The discharge time at 67.5A shall be measured after standard charge at 20±5℃ and rest 30mins	≥100%
Cycle Life	The discharge time on standard discharge shall be measured after 6000 cycles of standard charge and discharge at 20±5℃，0.5C charge and discharge.	≥80%

Charge(capacity) retention	The discharge time at 67.5A shall be measured after standard charge and then storage at 20±5 ℃ for 28days	≥90%
Temperature Characteristic1	After standard charging at 20±5℃, laying the battery at 55℃ for 2hour, then discharge at 67.5A to 40.4V, record the discharge time	≥80%
Temperature Characteristic2	After standard charging at 20±5℃, laying the battery at -10 ℃ for 4hour, then discharge at 67.5A to 40.0V, record the discharge time	≥60%

6 Mechanical Performance

Item	Condition	Specification
Crush Test	A battery is to be crushed between two flat surfaces. The force for the crushing is to be applied by a hydraulic ram with a 32mm diameter piston. The crushing is to be continued until a pressure reading of 17.2mmPa is reached on the hydraulic ram, applied force of 13kN. Once the maximum pressure has been obtained it is to be released.	No fire, No explosion
Drop Test	The battery has only two axes of symmetry in which case only two directions shall be tested. The battery is to be dropped from a height of 1 meter twice onto concrete ground.	No explosion, No fire, No smoke
Vibration	A full-charged battery is to be subjected to simple harmonic motion with an amplitude of 1.6mm total maximum excursion. The frequency is to be varied at the rate of 1 hertz per minute between 10 and 55 hertz. The cell shall be vibrated for 30 minutes per axis o XYZ axes.	No leakage, No Fire, No explosion

7 Cell Safety Performance

| Item	Condition	Specification
Over charge	At 20±5℃, charging battery with constant current 1C to voltage 4V, then with constant voltage 4V till current decline to 0.	No explosion, No fire

Over discharge	At 20±5℃, according to the requirement of the standard of discharge after discharge to termination voltage, 30 m Ω external load discharge within 24 hours.	No explosion, No fire
Short-circuit	At 20±5℃, Standard charge, across the electrodes of the battery with a less than 50 m Ω wire connection, 6 hours	No explosion, No fire The temperature of the surface of the cell are lower than 150℃
Heating	Battery is heated in a circulating air oven at a rate of 5±2℃ per mins to 130℃, an then placed 30 mins at 130℃	No explosion, no fire

8 Delivery Conditon

Approx. 20-50% charged

Shipment voltage: 51.5-53.6V

9 Pack Drawing
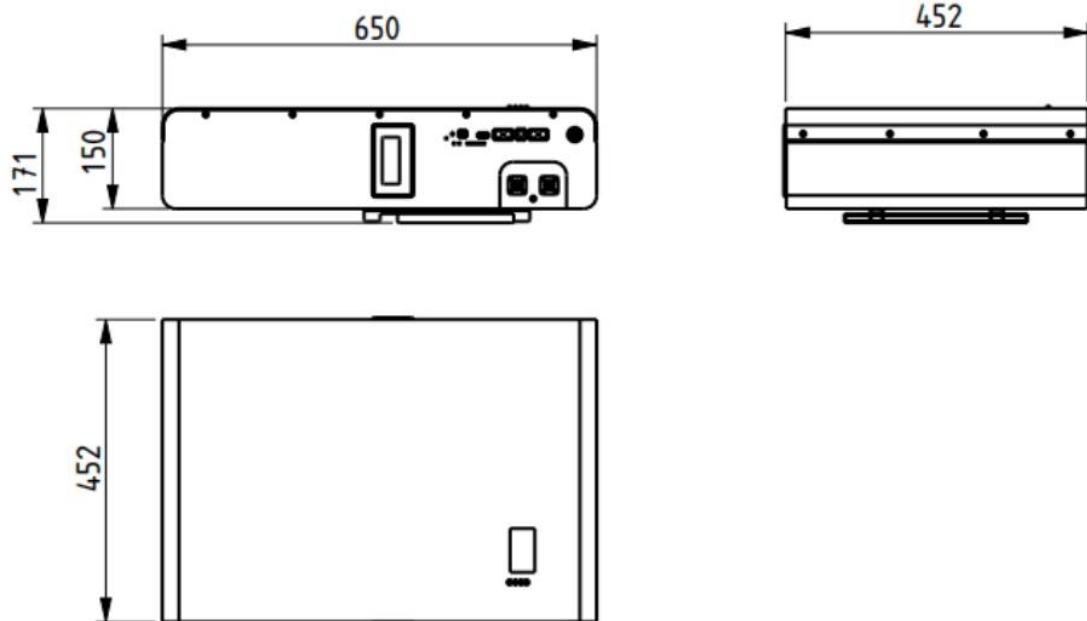
Remarks:
1.Dimension: L452xD150XH650mm
2.FSP840180TZ-35U0A1J/FSP840180TW-35U0B1J
3.Rocker switch 19A-CS-01- 5A250V
4.Iron box color：Yellow

GRE Model	******		LEADPOWER 领湃新能源	
File No.	******		Signature	Date
Revision	A0	Drawed by	Yin	2023-03-27
Unit	mm	Checked by	Allen Wu	2023-03-27

To prevent the possibility of the battery from leaking, heating, fire, Please READ this specification carefully before usage and observe the following precautions:

◎ When recharging, use the LiFePO4 battery charger specifically for that purpose

◎ Do not strike battery with any sharp edge parts, such as Ni-tabs, pins and needles

◎ Do not immerse the battery in water and seawater

◎ Do not use and leave the battery near a heat source as fire or heater

◎ Do not reverse the position and negative terminals

◎ Do not connect the battery to an electrical outlet

◎ Do not discard the battery in fire or heat it

◎ The battery tabs are not so stubborn especially for aluminum tab. Do not bend tab.

◎ Do not short-circuit the battery by directly connecting the positive and negative terminal with metal object.

◎ Do not transport and store the battery together with metal objects such as necklaces, hairpins etc.

◎ Do not directly solder the battery and pierce the battery with a nail or other sharp object.

1. Battery operation instruction

11.1 Charging
Charging current：Do not surpass the biggest charging current which in this specification。Charging voltage：Do not surpass the highest voltage which in this specification。
Charge temperature：The charge temperature is in according to this specification。

11.2 Dischargin
Discharge current: Do not surpass the biggest discharge current which in this specification. Discharge voltage: Do not be less than the lowest voltage which is in thisspecification.
Discharge temperature: The discharge temperature is in according to this specification,

11.3 Over-discharges
After the short time excessively discharges charges immediately cannot affect the use, but the long time excessively discharges can cause the battery the performance, battery function losing. The battery long-term has not used, has the possibility to be able to be at because of its automatic flashover characteristic certain excessively discharges the condition, for prevented excessively discharges the occurrence, the battery should maintain the certain electric quantity.

11.4 Storing the Batteries
The battery should store in the product specification book stipulation temperature range. If has surpasses above for 3 months the long time storage, suggested you should carry on additional charge to the battery.

11.5
Please do not continuously charge the battery over 8hours.

12. Others

◎ If the customer needs to use the battery in equipment beyond the specified conditions, or under conditions beyond the specified conditions, the customer should contact VSTC in advance, as specific experimental tests are required to verify the performance and safety of the battery under such conditions.

◎ We are not responsible for any accidents caused by the use of batteries in conditions beyond those specified in the documents.

◎ If necessary, we will inform the customer in writing of the improvement measures for the correct operation of the battery.

◎ Any matters not mentioned in this Manual shall be determined by both parties through negotiation