

Rechargeable Lithium-ion Battery Specification

Shenzhen HTE Co., Ltd.	
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Product Modified Record List

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1. Scope

This product specification has been prepared to specify the energy storage power supply to be supplied to the customer by Shenzhen Happy times New Energy Co.,Ltd. (hereinafter referred to as HTE) .

2. Product introduction

This product uses the car-level Lithium iron phosphate cell as the energy storage main body, high cycle life, the use of spray technology cold rolled steel plate as the shell, integral firm structure, built-in intelligent BMS with high reliability, good stability, equipped with Canbus/RS485/RS232 communication interface, compatible with all kinds of mainstream brands on the market inverter.

3. Battery Nominal Specifications

NO.	Item	Specification	Note
1	Nominal Voltage	51.2V	
2	Typical Capacity	100Ah/5.12kWh	At 0.2C Rate
3	Inner Resistance	$\leq 100\text{m}\Omega$	At AC 1kHz
4	Charging Voltage	58.4V	Proposed Value
5	Standard Charge Current	50A	
6	Max. Charge Current	100A	
7	Discharge Cut Of Voltage	44.0V	
8	Standard Discharge Current	50A	
9	Max. Discharge Current	100A	
10	Peak Discharge Current	120A/3S	
11	Outline Dimension	L520*W440*H155mm	19inch-3.5U
12	Pack Method	16S1P	
13	Cell Type	LFP 3.2V 100Ah	
14	Main Shell Material	SPCC	
15	IP Class	IP50	
16	Net Weight	Approx. 48KG	
17	Cooling method	Natural Cooling	
18	Operation Temperature Range	Charge: 0°C~45°C Discharge: -20°C~60°C	10%~90%RH
19	Storage Temperature Range	15°C~25°C: 9 Months 0°C~35°C: 6 Months -20°C~45°C: 1 Months	50%~60% SOC
20	Storage Humidity	10%-90%RH	

***Remark:

From item 3.1 to 3.10, the testing condition is following item 4 “standard testing condition”. If the battery working condition is out of item 4 , the performance will be some shift。

4. Standard Testing Conditions

4.1 Testing Conditions

No.	Conditions
1	Test should be implemented with new batteries within 7 days of delivery, and the cells shall be cycled less than 5 times before the test.
2	Test should be performed per the conditions described in 4.2.

4.2 Environmental Conditions

Unless otherwise specified, the default test environment is as follows.

No.	Item	Conditions
1	Temperature	25±2°C
2	Humidity	60±20%RH

4.3 Standard Test Method

No.	Item	Method
1	Standard Charge	At standard testing condition, 0.5C constant current charge to Charge Voltage, then constant voltage charge mode, cut off current 0.02C. Charging is to be performed at 25±2 °C unless otherwise noted.
2	Standard Discharge	At standard testing condition, 0.5C constant current discharge, cut off discharge cut of voltage. Discharging is to be performed at 25 °C ± 2 °C unless otherwise noted.
3	Charge-Discharge Cycle	The battery is fully charged according to item 4.3.1, stand for 0.5-1 hour, and then discharge according to item 4.3.2 until the discharge is complete.Repeat above steps, within 0.5~1h shelving period is required after each charge and discharge.

5. General Performance

No.	Item	Conditions	Request
1	Initial Capacity	At standard testing condition, new battery is fully charged according to item 4.3.1, stand for 0.5~1 hours, and then discharge according to item 4.3.2 until the discharge is complete.	$C(\text{initial}) \geq 98\text{Ah}$
2	Cycle Life	At standard testing condition, new battery shall be charged and discharged according to item 4.3.3, repeat the above steps until 6000 cycles.	$C(6000\text{cycles}) \geq 70\text{Ah}$
3	Capacity Retention	At standard testing condition, new battery is fully charged according to item 4.3.1. Lay the battery opened circuit storage at $25 \pm 2^\circ\text{C}$ for 28 days, and then discharge according to item 4.3.2 until the discharge is complete.	$C(\text{remaining}) \geq C(\text{initial}) * 95\%$
4	Storage Performance	At standard testing condition, the new battery shall be fully charged according to item 4.3.1, and discharged for 1 hour according to item 4.3.2. Then, the battery shall be placed and stored at $20 \pm 3^\circ\text{C}$ for 90 days. Repeat the battery charging and discharging cycle for 5 times according to item 4.3.3, and the capacity of at least one cycle meets the standard requirements.	$\text{Capacity}(\text{Releasey}) \geq C(\text{initial}) * 90\%$

6. Safety Performance

No.	Item	Conditions	Reques
1	Short Test	At standard testing condition, the fully charged battery is to be short-circuited by connecting the positive and negative terminals with resistance load not exceed 10mΩ.	No leakage, no smoke, no fire, no explosion. The battery works properly after removing the load.
2	Temperature Shock Test	Put the fully charged battery into the constant temperature and humidity test chamber and test as follows: a. Adjust the temperature of the test chamber to 75°C and keep it for 6 hours. b. Adjust the temperature of the test chamber to -40°C, the conversion time is less than 1 hour, and keep it for 6 hours. c. Adjust the temperature of the test chamber to 75°C, and the conversion time is less than 1 hour. d. Repeat steps A, B and C for a total of 10 cycles.	No leakage, no smoke, no fire, no explosion.
3	Low Pressure Test	Put the fully charged battery into the low pressure experiment box, adjust air pressure in the test chamber is 11.6 KP, Temperature to room temperature, take out after 6 h, observe 2h.	No leakage, no smoke, no fire, no explosion.

*****Remark:**

Safety performance test is a dangerous operation and must be carried out under the condition of safety protection.

7. Special Performance

No.	Item	Performance Specification	
1	Unit Parallel Used	Supports a maximum of 15 external groups in parallel used	
2	Communications	Equipped with Canbus/RS485/RS232 communication interface	
3	Compatible With Inverter Brand	Canbus	SMA、Victron、Pylontech、Growatt、Deye、MegaRevo、Sofar、GoodWe、Solax、Must、LuxPower、TBB.....etc
		RS485	Pylontech、Growatt、Deye、Voltronic、Sren、Sanj.....etc

8. BMS Specification BMS

No.	Item		Standard
1	Single Over Charge Protection	Single Over Charge Alarm Voltage	3600mV
		Single Over Charge Protection Voltage 1	3700mV
		Single Over Charge Protection 1 Delay Time	1000mS
		Single Over Charge Protection Voltage 2	3800mV
		Single Over Charge Protection 2 Delay Time	1000mS
	Single Over Charge Protection Release	Single Over Charge Release Voltage	3500mV
		Pack Discharge Release	Current > 1000mA
		Pack Capacity Release	SOC < 96%
2	Single Over Discharge Protection	Single Over Discharge Alarm Voltage	2850mV
		Single Over Discharge Protection Voltage 1	2750mV
		Single Over Discharge Protection 1 Delay Time	1000mS
		Single Over Discharge Protection Voltage 2	2600mV
		Single Over Discharge Protection 2 Delay Time	1000mS
	Single Over Discharge Protection Release	Single Over Discharge Release Voltage	3100mV
		Pack Charge Release	Current > 1000mA
		Single Over Discharge Release Delay Time	3000mS
3	Pack Over Charge Protection	Pack Over Charge Alarm Voltage	57.6V
		Pack Over Charge Protection Voltage	59.2V
		Pack Over Charge Protection Delay Time	1000mS
	Pack Over Charge Protection Release	Pack Over Charge Release Voltage	56.0V
		Pack Discharge Release	Current > 1000mA
		Pack Capacity Release	SOC < 96%

No.	Item	Standard	No.
4	Pack Over Discharge Protection	Pack Over Discharge Alarm Voltage	45.6V
		Pack Over Discharge Protection Voltage	44.0V
		Pack Over Discharge Protection Delay Time	1000mS
	Pack Over Discharge Protection Release	Pack Over Discharge Release Voltage	49.6V
		Pack Charge Release	Current > 1000mA
5	Charging Over Current Protection	Charging Over Current Alarm Current	110A
		Charging Over Current Protection Current	120A
		Charging Over Current Protection Delay Time	1000mS
	Charging Over Current Protection Release	Automatically Released Condition	30S
		Pack Discharge Release	Current > 1000mA
6	Discharging Over Current Protection	Discharging Over Current Alarm Current	110A
		Discharging Over Current Protection Current 1	120A
		Discharging Over Current Protection 1 Delay Time	3000mS
		Discharging Over Current Protection Current 2	250A
		Discharging Over Current Protection 2 Delay Time	160mS
	Discharging Over Current Protection Release	Automatically Released Condition	30S
		Pack Charge Release	Current > 1000mA
7	Short Circuit Protection	Short Circuit Protection Current	600A
		Short Circuit Protection Delay Time	300uS
	Short Circuit Protection Release	Automatically Released Condition	30S
		Pack Charge Release	Current > 1000mA

No.	Item		Standard
8	Low Temp Charge Protection	Low Temp Charge Alarm Temp	5°C
		Low Temp Charge Protection Temp	0°C
		Low Temp Charge Protection Release Temp	5°C
	Low Temp Discharge Protection	Low Temp Discharge Alarm Temp	-10°C
		Low Temp Discharge Protection Temp	-20°C
		Low Temp Discharge Protection Release Temp	-10°C
9	High Temp Charge Protection	High Temp Charge Alarm Temp	50°C
		High Temp Charge Protection Temp	55°C
		High Temp Charge Protection Release Temp	50°C
	High Temp Discharge Protection	High Temp Discharge Alarm Temp	50°C
		High Temp Discharge Protection Temp	60°C
		High Temp Discharge Protection Release Temp	55°C
10	Cell Balancing	MOS High Temp Protection	110°C
		MOS High Temp Protection Release Temp	80°C
		Charging Balancing Open Voltage	3400mV
		Balancing Open Voltage Difference	30mV
		Balancing Closed Voltage Difference	20mV
		Balancing Current	50±10mA
11	Self-Consuming	Work Mode Self-Discharge Current	≤25mA
		Sleep Mode Self-Discharge Current	≤100uA
12	Capacity Setting	Full Capacity Setting Range	100Ah
		Low Battery Alarm	SOC < 10%

Note: Some parameters can be set.

9. Battery Drawing

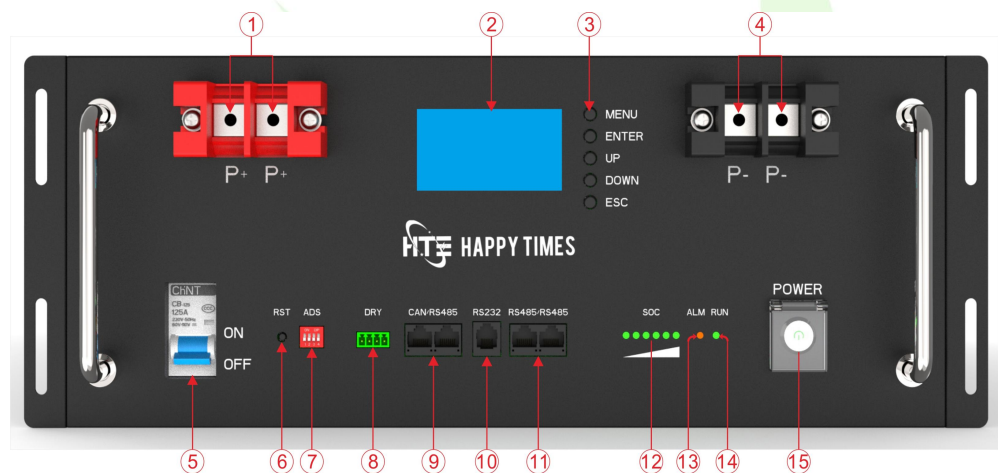
9.1 Finished Dimension Drawing

Dimension	Length	520mm	Width	440mm	Height	155mm
Note	The width of the two side baffles is 482.5mm					
Diagram	 					

9.2 Front View Diagram

NO.	Marking	Description	Remarks
1	P+	Positive Terminal	
2		LCD Display Monitor LCD	
3	MENU	Menu Key	
	ENTER	Enter Key	
	UP	Page UP Key	
	DOWN	Page Down Key	
	ESC	Esc Key	
4	P-	Negative Terminal	
5	ON/OFF	Direct Current Breakers	
6	RST	Resetting Key	
7	ADS	Dial Switch	
8	DRY	Dry Contact	
9	CAN/RS485	Inverter Communication Interface	
10	RS232	PC Communication Interface	
11	RS485/RS485	Battery Parallel Communication Interface	
12	SOC	Battery Level Indicator	
13	ALM	Alarm Light	
14	RUN	Run Light	
15	POWER	Power Switch	

Diagram



9.3 Parallel Wiring Diagram

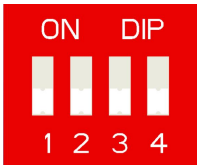


Note: This diagram is for reference only. The positive and negative wiring should be adjusted according to the working power of the battery.

9.4 Dial Switch

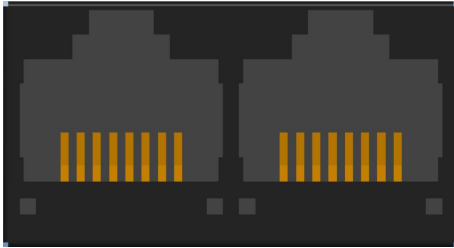
When batteries are used in parallel, users can set the address by dial switch to distinguish different battery strings.

For details about battery string addresses, see the following table.

Pack Set Address					Diagram
UP	ON	ON	ON	ON	
DOWN	OFF	OFF	OFF	OFF	
Pack Ads	Switch 1#	Switch 2#	Switch 3#	Switch 4#	Note
0	OFF	OFF	OFF	OFF	A single battery is used, no parallel.
1	ON	OFF	OFF	OFF	Address of parallel main pack
2	OFF	ON	OFF	OFF	Address of parallel slave pack 2
3	ON	ON	OFF	OFF	Address of parallel slave pack 3
4	OFF	OFF	ON	OFF	Address of parallel slave pack 4
5	ON	OFF	ON	OFF	Address of parallel slave pack 5
6	OFF	ON	ON	OFF	Address of parallel slave pack 6
7	ON	ON	ON	OFF	Address of parallel slave pack 7
8	OFF	OFF	OFF	ON	Address of parallel slave pack 8
9	ON	OFF	OFF	ON	Address of parallel slave pack 9
10	OFF	ON	OFF	ON	Address of parallel slave pack 10
11	ON	ON	OFF	ON	Address of parallel slave pack 11
12	OFF	OFF	ON	ON	Address of parallel slave pack 12
13	ON	OFF	ON	ON	Address of parallel slave pack 13
14	OFF	ON	ON	ON	Address of parallel slave pack 14
15	ON	ON	ON	ON	Address of parallel slave pack 15

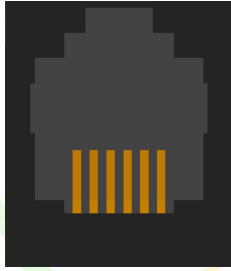
9.5 Inverter Communication Interface

CAN and RS485 communication interfaces used 8P8C vertical RJ45 socket.

Pin Number	Pin Definition	Diagram
1, 8, 9, 6	RS485_B	
2, 7, 10, 15	RS485_A	
3, 6	GND	
4, 12	CANH	
5, 13	CANL	
11, 14	GND	

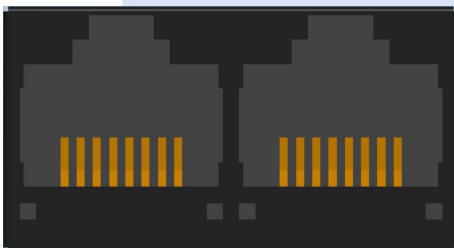
9.6 PC Communication Interface

RS232 communication interfaces used 6P6C vertical RJ11 socket.

Pin Number	Pin Definition	Diagram
1, 2, 6	NC	
3	TX (one board)	
4	RX (one board)	
5	GND	

9.7 Battery Parallel Communication Interface

Double RS485 communication interfaces used 8P8C vertical RJ45 socket.

Pin Number	Pin Definition	Diagram
1, 8, 9, 6	RS485_B	
2, 7, 10, 15	RS485_A	
3, 6, 11, 14	GND	
4, 5, 12, 13	NC	

10 Delivery Capacity Condition

Air Delivery Capacity: 20%-30% SOC

Sea or Land Delivery Capacity: 40%-60% SOC

11 Operating Instruction

11.1 Charging requirements

11.1.1 Charging Current

Charging current should be less than the maximum charge current specified in the product specification.

11.1.2 Charging Voltage

Charging shall be down by voltage less than that specified in the product specification. Charging beyond the max charging voltage, which is the absolute maximum voltage, must be strictly prohibited. The charger shall be designed to comply with this condition.

11.1.3 Charging Temperature

The battery shall be charged within range in the product specification.

11.1.4 Prohibition of Reverse Charging.

Reverse charging is prohibited. The cell shall be connected correctly.

11.2 Discharging requirements

11.2.1 The battery shall be discharged at less than the maximum discharge current specified in the product specification.

11.2.2 Discharging Temperature

The battery shall be discharged within range specified in the product specification

11.2.3 Over-Discharging

In case of over-discharge, pack should be charged for one time every 3 months while storing and batteries should be discharge and charge after being stored more than a half year in order to activate it and restore energy.

11.3 storage requirements

11.3.1 The pack should be stored at room temperature(15~25℃) and humidity: 60±20%RH, charged to about 40% to 60% of capacity.

11.3.2 When the Products are intended to be stored for a prolonged period of time (more than one month), reduce SOC to around 50%. After three months of 50% SOC storage, should be charged and discharged once, reduce SOC to around 50%. 50%SOC storage lasts for more than 6 months, irreversible capacity loss will be about 5% without charge-discharge maintenance. If 50%SOC storage exceeds 9 months without charge and discharge maintenance, HTE will not be responsible for quality protection due to capacity loss or other defects.

12 Warning

To prevent the possibility of the pack from leaking, heating, fire or explode, Please be sure to follow the following rules:

- Do not disassemble or alter the outside structure of the batteries.
- When recharging, use the battery charger specifically for that purpose.
- Do not reverse the position and negative terminals when using the pack.
- Do not connect the pack to an electrical outlet.
- Do not short-circuit the pack by directly connecting the positive and negative terminal with metal object

such wire.

- Do not transport and store the battery together with metal objects such as necklaces, hairpins etc.
- Do not strike or throw the pack.
- Do not strike at pack with any sharp edge parts, and pierce the pack with a nail or other sharp object.
- Do not immerse the pack in water and seawater.
- Do not use and leave the pack near a heat source as fire, heater, for example, at strong direct sunlight or a vehicle in extremely hot conditions etc.
- Do not directly solder the pack or cell,
- Do not use it in a location where static electricity is great, otherwise, the safety devices in the pack may be damaged, which will cause hidden trouble of safety.
- In case of short circuit, impact or fall of the battery, the battery shall be immediately marked and isolated, and the continued use of the battery shall be prohibited, Even if the battery appears to function normally.

13 Cautions

- Load circuit may cause voltage and current, and the voltage or current may add to pack,, the voltage or current must be controlled as lower than RWV and RWI, larger voltage or current may damage the PCM of pack.
- The soft aluminum packing foil is very easily damaged by sharp edge parts such as Ni-tabs、pins and needles.
- If the pack leaks and the electrolyte get into the eyes, do not rub eyes, instead, rinse the eyes, with clean running water, and immediately seek medical attention. Otherwise, eye injury can result.
- If the pack takes off an odor, generates heat, becomes discolored or deformed, or in any way appear abnormal during use,, recharging or storage,, immediately remove it from the device or battery charge and stop using it.
- In case the pack terminals are dirt, clean the terminals with a dry cloth before use. Otherwise power failure or charge failure may occur due to the poor connection with the instrument.
- Be aware discharged battery may cause short circuited、fire or smoke, tape the terminals to insulate them.

14 Period of Warranty

The period of warranty is 12 year from the date of shipment. If it is proved that the defect of the battery is caused by HTE manufacturing process, rather than the user abuse, misuse and intentional damage, HTE is responsible for the warranty, if the battery defect can not be repaired, HTE will give the customer a new battery. If customers have other special needs, please sign a business agreement with HTE.

15 Others

15.1 Please read and follow the handling instructions for the battery before use. Improper use of the battery may cause heat, fire, rupture, damage or capacity deterioration of the battery.

15.2 The customer is requested to contact HTE in advance, if and when the customer needs other

applications or operating conditions than those described in this document. Additional experimentation may be required to verify performance and safety under such conditions.

15.3 HTE will take no responsibility for any accident when the battery is used under other conditions than those described in this Document.

15.4 HTE will inform, in a written form, the customer of improvement regarding proper use and handing of the battery, if it is deemed necessary.

15.5 Any matters that this specification does not cover should be conferred between the customer and HTE.

15.6 In case specification, materials, production process, and control system for the products are changed, the notice of change in writing together with quality and reliability data is to be informed in advance to the buyer.

