RECHARGEABLE LITHIUM ION BATTERY

PRODUCT SPECIFICATION

MODEL NO.: VHR CES32100LFP

DESCRIPTION: 32V 100Ah LITHIUM ION(LFP) BATTERY

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Revision History

VERSION NO.	DATE	DESCRIPTION	APPROVAL
VER-01	12th June, 2020	First Edition (EN)	

Content

1. General Information

1.1. Scope

This specification defines the product specification of the rechargeable Lithium Ion Battery supplied by Zhejiang Hengrui Technology Co., Ltd.

1.2. Applications

Commercial energy storage system, Industrial energy storage system, Small or Medium-Sized Renewable Energy Storage System

1.3. Product Classification

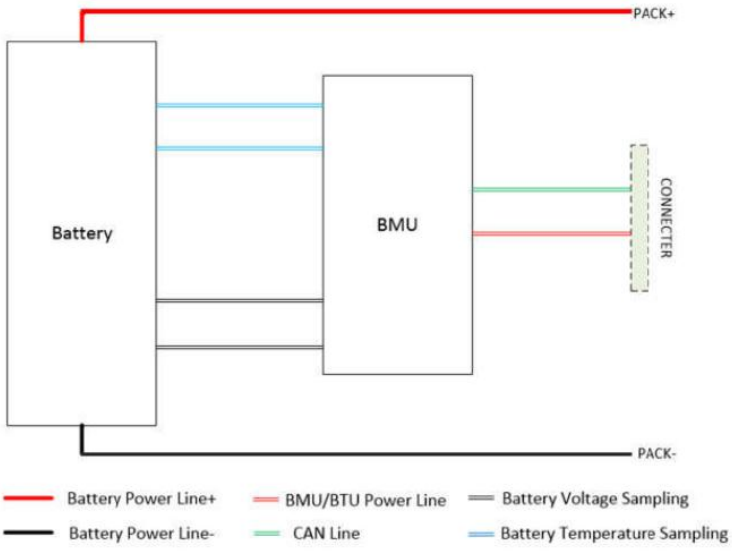
19" Standard Cabinet Suited Rechargeable Lithium Ion ($LiFePO_4$) Battery Pack.

1.4. Model No.

VHR CES32100LFP

1.5. Working Principal and Working Status

HRESYS Commercial Energy Storage Lithium-ion Battery utilizes advanced LFP technology and high reliable integrated BMS to ensure the benefits of long cyclic life, high energy density, compact size and weight, high safety and reliability, and environment friendly as well. The 32V Lithium Ion Battery Pack is mainly working as 32V DC power source, and it consists of 10 cells of Lithium Iron Phosphate Battery Cells connected in series. HRESYS CES-LFP Lithium-ion Battery is widely used in Commercial energy storage system, Industrial energy storage system, Small or Medium-Sized Renewable Energy Storage System, etc.



Product Working Principal

1.6. Electrical Specification

No.	Item	Specification	Remarks
1.6.1	Nominal Capacity	100Ah	Standard discharge (1) capacity after standard charge (2)
1.6.2	Nominal Voltage	32.0V	Configuration: 10S1P - VHR 27173204LFP-100Ah. Voltage of single cell is 3.2V.
1.6.3	Charge Voltage	36.0V	@ 25 ± 3℃
1.6.4	Voltage at End of Discharge	26.7V	@ 25 ± 3℃
1.6.5	Maximum Continuous Charge Current (CC Threshold)	50A	@ 25 ± 3℃
1.6.6	Charge Voltage-cell	3.80V/cell	N.A.
1.6.7	Maximum Continuous Discharge Current	100A	@ 25 ± 3℃
1.6.8	Voltage at End of Discharge-cell	2.50V/cell	N.A.
1.6.9	Operation Allowable Temperature Range	Charge: 0～60°C	N.A.
		Discharge: -20～60°C	N.A.
1.6.10	Self-discharge Rate/Month	≤4%	@ 25 ± 3℃,50%SOC
1.6.11	Cycle Life(cycles)	≥5000	@ 25 ± 3℃,0.2C/0.5C @80%DOD
1.6.12	Operation Allowable Humidity Range	≤95% RH	Operation
		≤85% RH	Storage
1.6.13	Recommended Storage temperature	0～40°C	Max. 6 month
1.6.14	Weight	35(±2)kg	N.A.

(1) Standard discharge : Constant current discharge(0.5C) till the discharge end Voltage (26.7V) at 25 ± 3℃.

(2) Standard charge : 36.0V ± 0.05V constant voltage and(0.2C) current limited charge, till the charge end current (5A) at 25 ± 3℃.

(3) Suggest charge method: At the ambient temperature 30℃ ± 5℃, Set charger voltage to 36.0V

a. Charge the battery with 50A(0.5C) until any cell reach 36.0V, to step b;

b. Charge the battery with 20A(0.2C) until any cell reach 36.0V, to step c;

c. Charge the battery with 12A(0.12C) until any rest cell reach 36.0V, charge finish.

1.7. Features

1.7.1 Voltage detection function

The Product has the functions of cell and module voltage detection. The cell voltage detection accuracy is less than ± 15mV under normal temperature static conditions.

1.7.2 Temperature detection and adjustment function

With the function of cell and environment temperature detection, the temperature sampling accuracy is less than ± 2°C within the operating temperature range. Four battery temperature detection points and one ambient temperature detection point (maximum 16 battery temperature detection points) are supported by default.

1.7.3 Balance function

When the battery pack is charged, if the cell voltage reaches the equalization turn-on voltage, and the maximum voltage difference is greater than the equalization voltage difference, the cell that meets the condition turns on the equalization function. Battery supports up to 6 channels simultaneously to turn on equalization. The maximum equalization current is about 75mA.

1.7.4 Communication function

It can communicate with the computer or host through CAN, upload and save the collected information.

1.7.5 Serial port upgrade function

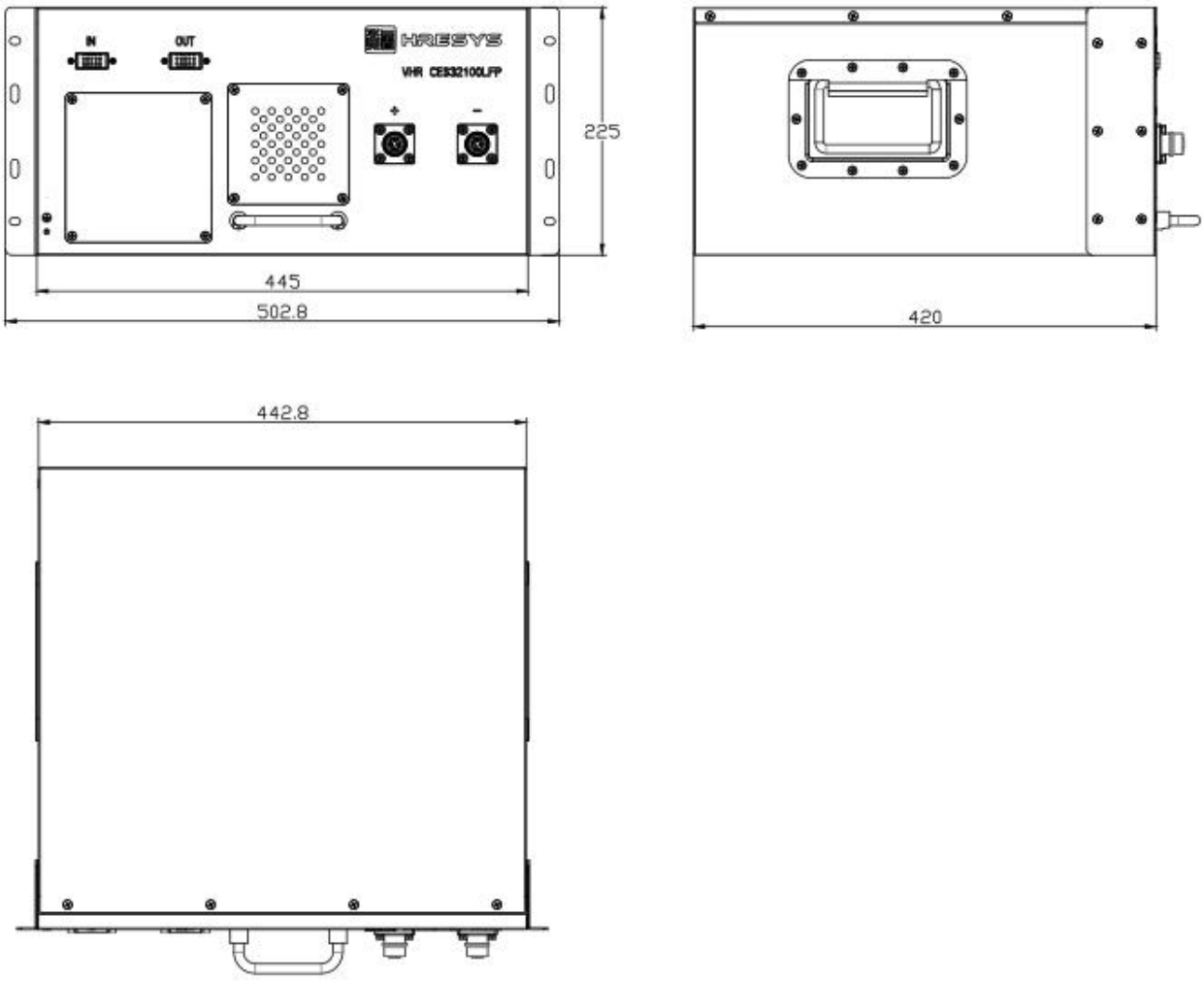
The management system can be upgraded via the CAN interface.

2. Appearance and Dimension

2.1. Appearance

There shall be no defects (deep scratch, crack, rust, discoloration, leakage, and so on), which may adversely affect the commercial value of the module.

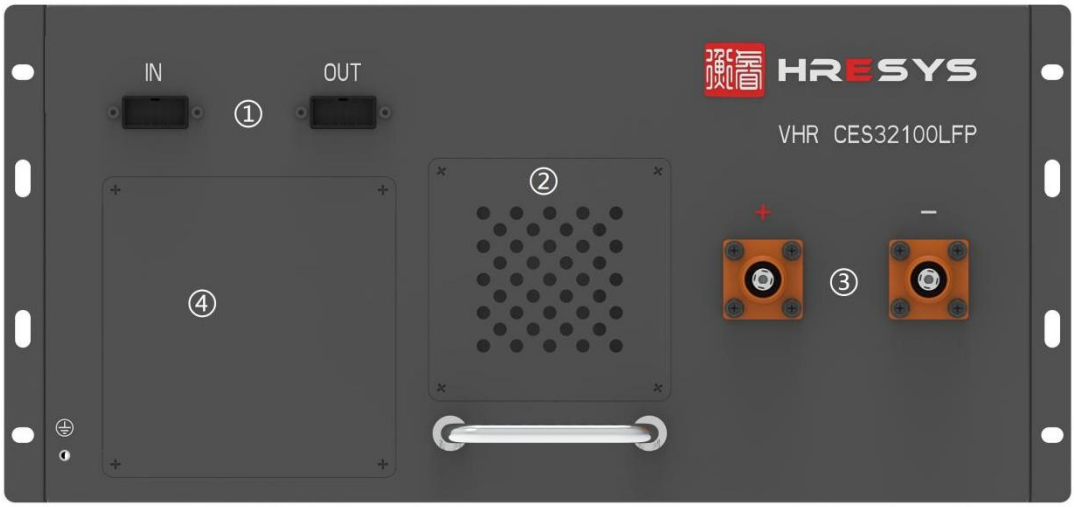
2.2. Dimension



2.3. Interface

Model No.	Nominal Voltage	Nominal Capacity	Dimension (W X D X H, mm)	Weight	Terminal		Remarks
					Material	Type	
VHR CES32100LFP	32.0V	100Ah	Width: 502.0mm (±2) Depth: 420.0mm (±2) Height: 225.0mm (±2)	35.2(±2)kg	Steel	M6	5U

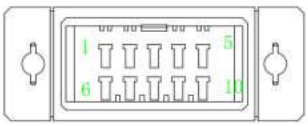
2.3.1 Drawing of Front Panel and Interface Description



No.	Name	Description	Remark
1	CAN port	CAN Communication	2 X CAN are internally parallel.
2	Fan Cooling Hole	Integrate with cooling fan	N.A.
3	Battery Output	Nominal 32V output	Positive/Negative
4	For Maintenance	For maintenance	N.A.

2.3.2 Communication Interfaces Description

CAN adopts 10Pin straight PCB welding socket to provide CAN protocol, the pin assignment is defined as follow:



CAN

	Pin Definition		
	Pin	**Definition**	**Description**
	1	PWR+	Power Positive
	2	PWR-	Power Negative
	3	CAN-G	GND
	4	CAN-L	Dominant Low
	5	CN	N.A.
	6	PWR+	Power Positive
	7	PWR-	Power Negative
	8	ADR	Address Assignment Transmission
	9	CAN-H	Dominant High
	10	CN	N.A.

3. Charge/Discharge Modes and Conditions

3.1. Charge Modes and Conditions

Cell Temperature	Standard Charge	Fast Continuous Charge	Boost Charge(5s)
＜0℃	No Charge Allowed	No Charge Allowed	No Charge Allowed
0℃~ 5℃	Charge Current: 0.1C	No Charge Allowed	No Charge Allowed
5℃~10℃	Charge Current: 0.1C	Charge Current: 0.2C	No Charge Allowed
10℃~20℃	Charge Current: 0.2C	Charge Current: 0.5C	No Charge Allowed
20℃~50℃	Charge Current: 0.5C	Charge Current: 0.75C	1C Charge is allowed when voltage is lower than 3.6V
50℃~60℃	Charge Current: 0.1C		
＞60℃	No Charge Allowed		

3.2. Discharge Modes and Conditions

Cell Temperature	Standard Discharge	Rate Continuous Discharge	Boost Discharge(5s)	Pulse Discharge(15min)
＜-20℃	No Discharge Allowed	No Discharge Allowed	No Discharge Allowed	No Discharge Allowed
-20℃~0℃	Discharge Current: 0.1C	No Charge Allowed	No Charge Allowed	No Discharge Allowed
0℃~20℃	Discharge Current: 0.2C	Discharge Current: 0.5C	No Charge Allowed	No Discharge Allowed
20℃~60℃	Discharge Current: 0.5C	Discharge Current: 1.0C	Discharge Current: 3C	Discharge Current: 2C
＞60℃	No Charge Allowed			

4. Tests

4.1. Measurement Apparatus

A) Dimension Measuring Instrument: The dimension measurement shall be implemented by instruments with equal or more precision scale of 0.01mm;

B) Voltmeter: Standard class specified in the national standard or more sensitive class having inner impedance not less than 10KΩ/V;

C) Impedance Meter: Impedance shall be measured by a sinusoidal alternating current method (500Vac 1 kHz LCR meter).

4.2. Testing Condition

Temperature: 25 ± 3℃;

Relative humidity: 60 ± 20%.

4.3. Test Description

No.	Test Item	Standard	Reference Standard
Basic performance test			
1	Appearance	The appearance of the battery box shall not be deformed, and the protective paint shall fall off. The surface shall be flat, dry and free of trauma.	Visual inspection
2	Dimension	Comply with Technical Design Requirement	Actual measurement
3	Weight		Actual measurement
General performance test			
1	Communication	Comply with Technical Design Requirement	Actual measurement
2	Relay opening and closing		Actual measurement
3	Charge and discharge test		Actual measurement
4	Insulation		Actual measurement
5	Creepage distance		According to the enterprise standard
6	Leakage		Actual measurement
Electrical performance test			
1	Nominal capacity and energy	Comply with Technical Design Requirement	According to the enterprise standard
2	High and low temperature charging performance		According to the enterprise standard
3	High and low temperature discharging performance		According to the enterprise standard
4	C-Rate charging performance		According to the enterprise standard
5	C-Rate discharging performance		According to the enterprise standard

6	Pulse charge and discharge test		According to the enterprise standard
7	Temperature rise		According to the enterprise standard
8	Charge retention and capacity recovery		According to the enterprise standard
9	Storage performance		According to the enterprise standard
10	Cyclic life test		According to the enterprise standard
11	Charge and discharge efficiency test		According to the enterprise standard
Safety Performance Test			
1	Vibration	Comply with the standard requirement	Refer to IEC, EN, UN, ISO
2	Mechanical shock		Refer to IEC, EN, UN, ISO
3	Drop		Refer to IEC, EN, UN, ISO
4	Nail penetration		Refer to IEC, EN, UN, ISO
5	Simulate impact		Refer to IEC, EN, UN, ISO
6	extrusion		Refer to IEC, EN, UN, ISO
7	Temperature impact		Refer to IEC, EN, UN, ISO
8	Temp and humidity cycle		Refer to IEC, EN, UN, ISO
9	Seawater immersion		Refer to IEC, EN, UN, ISO
10	External fire		Refer to IEC, EN, UN, ISO
11	Salt mist		Refer to IEC, EN, UN, ISO
12	High altitude		Refer to IEC, EN, UN, ISO
BMS Test			
1	Sampling error (voltage, temperature, accuracy)	Comply with Technical Design Requirement	SOC estimation accuracy is tested under different voltage, current and temperature: 1. High-precision voltmeter, test monomer voltage and BMS acquisition voltage comparison; 2. Conduct charging and discharging test on the equipment and compare current data. 3. Infrared thermometer, testing temperature comparison between each temperature control point and

			the collected temperature of BMS;
2	Temperature sampling quantity	No less than 8	Checking on host machine

5. Shipment

The battery should be packed in cartons under the condition of half capacity 20%-50% for shipment. The violent vibration, impaction or squeezing should be avoided in the transport process; neither is exposed in the sunlight nor rain. The batteries shall be shipped by normal transportation such as by road, by train, by ocean or by air.

6. Storage

The battery storage shall be in the clean and dry ventilation room at the temperature of 0 ~ 40°C and shall keep out of fire or heat and avoid touching corrosion elements. The batteries shall be charged every 8 or 12 months (0 ~ 30℃ - 12month, 30 ~ 40℃ - 8 month) during storage.

7. Caution and Prohibition in Handling

Warning for using the rechargeable lithium ion battery. Mishandling of the battery may cause heat, fire and deterioration in performance. Please be noticed the following cautions.

Cautions

- Please read the user manual carefully before using the lithium ion battery.
- No human body shall direct contact the positive/negative poles at the same time if the battery's voltage exceeds 36V safety voltage.
- Please read the specific charging device's user manual carefully before charging.
- When the battery is not charged after long exposure to the charger, discontinue charging.
- Please check the positive (+) and negative (-) direction before connection.
- Battery must be stored in a dry area with low temperature (≤25°C) environment for long-term storage.
- Do not expose the battery in direct sunlight or heat.
- Do not use the battery in high static energy environment where the protection device can be damaged.
- When rust or smell is detected on first use, please return the product to the seller immediately.
- Keep the battery out of reach of children and pets.
- When battery life span shortens after long period of usage, please exchange to new battery.
- No metal objects (rings, watches, and other metal accessories, etc.) can be worn during the handling of battery.
- Charge time should not be longer than specified in the manual.
- Do not expose the battery out of the temperature range specified in the specification.

Prohibitions

- Do not use different charger to charge the battery.
- Do not charge with constant current higher than maximum charge current allowed.
- Do not disassemble or reconstruct the battery.

- Do not throw or cause impact.
- Do not pierce a hole in the battery with sharp objects, such as nail, knife, pencil, drill, etc.
- Do not mixing with other batteries.
- Do not solder on battery directly.
- Do not use old and new battery together in connection.
- Do not expose the battery to high heat, such as fire, etc.
- Do not put the battery into a microwave or high-pressure container.
- Do not use the battery in reverse.
- Do not connect positive (+) and negative (-) with conductive materials, such as metal, cables, etc.
- Do not immerge or wet battery with water or sea water.
- Do not bend the battery without prior permission from manufacturer.