Howell Energy Co., Ltd

深圳市鸿伟高能科技有限公司

Specification

Model: LiFePO4 51.2V 100Ah

P/N： HWE-16F100L

Date 2021.12.21

Customer Approval

Comment: (Please return one copy with your approval signature)

Customer's Signature:

Prepared By	Checked By	Approved By
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1.Scope

This specification is applied to the LiFePO4 battery which manufactured by Howell Energy Co., Ltd.

2.Specifications

No.	Item	General Parameter	Remark
1	Rated Capacity	100Ah	Standard discharge(0.2C) After standard charge(0.2C)
2	Nominal Voltage	51.2V	
3	Cycle Life	Higher than 80% of the Initial Capacity	◆Charge:CC@0.5C to 58.4V, then CV till current to 0.05C ◆Rest: 30min ◆Discharge: 0.5C to 40.0V ◆Temperature:20± 5℃ ◆Carry out 6000cycles
4	Charging cut-off voltage	58.4V	
5	Discharge cut-off voltage	40.0V	
6	Cell and assembly method	16S1P	
7	Energy	5120Wh	
8	Housing material	Metal Shell	
9	Standard Charge	20.0A	Charge time : Approx 6.5h
10	Max. Charge	100.0A	Charge time : Approx 1.5h
11	Standard Discharge	50.0A	
12	Max. Discharge	100.0A	
13	Internal Impedance	≤35mΩ	Internal resistance measured atAC 1KHZafter 50% charge
14	Operation Temperature Range	Charge: 0~45℃	60±25%R.H.
		Discharge: -20~60℃	
15	Storage Temperature Range	Less than 1 year : 0~35℃	60±25%R.H. at the shipment state
		Less than 3 months : -20~45℃	
16	Weight	Approx: 48.0Kg	
17	Dimension	High: 176.3±3mm	Initial battery dimensions
		Width: 481.5±3mm	
		Length: 440±3mm	

3.Test Conditions, Methods and Electrical Performance

3-1 Test conditions

All tests shall be done under temperature: 15℃～35℃, relative humidity: (RH) 25%～85%, air pressure: 86kPa～106kPa except special appointment.

3-2 Measuring apparatus

a)Voltage is measured by D.C. voltmeter which precision is higher than 0.5 grade and self resistance is higher than 1kΩ/V.

b)Current is measured by D.C. meter which precision is higher than 0.5 grade.

c)Temperature is measured by thermometer which has proper measuring range and division value is lower than 0.5℃.

d)The timer used in measuring should be degreed in hour, minute and second, and should have degree of accuracy no more than ±1%.

3-3 Standard charge

Charge the battery with DC stabilized power supply 58.4V, constant-current 0.2C(A) until current reach to 0.05C（A）.

3-4 Standard discharge

After charged by (3-3）, discharge the battery with constant current 0.2C(A) until the battery reach to over discharge protection or total voltage reach to 40.0V.

3-5 Battery capacity

Discharge battery by（3-4）, and write down discharge time (hour), then capacity (Ah)=0.2C (A) * discharge time (hour).

3-6 Electrochemistry performance

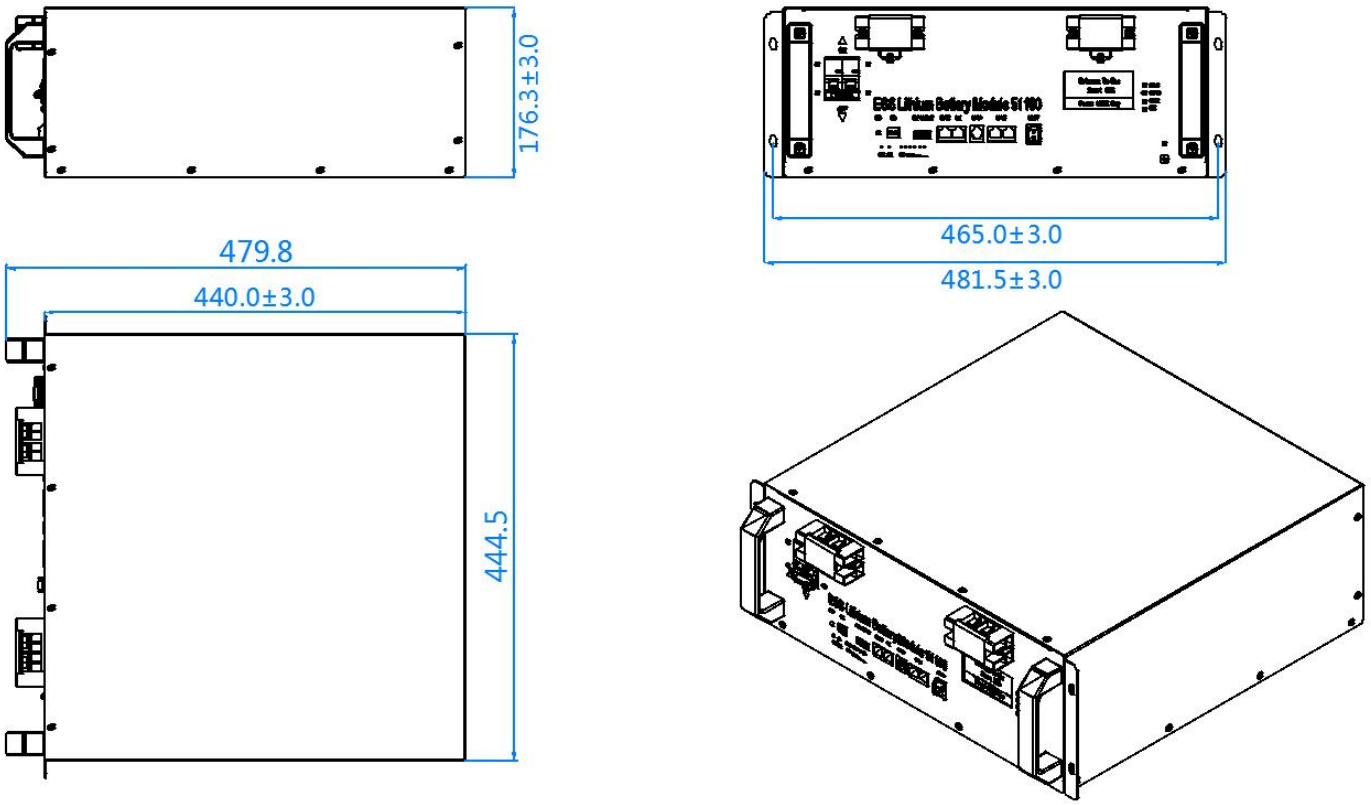
Items	Test Method	Technical requirements
25℃ discharge capacity	Battery charge with standard methods, discharge at 0.2C（A）, write down discharge capacity	≥100% nominal capacity
55℃discharge capacity	Battery charge with standard methods, stored for 5h in 55℃±2℃, then discharge at 0.2C（A）to cut-off voltage, write down discharge capacity	≥95% nominal capacity
Charge retainability and recover capability	Battery charge with standard methods, stored for 28d in normal temperature 7d in 55℃	capacity retention rate≥80% capacity retention rate≥90%
Multiplying power discharge capacity	Battery charge with standard methods, discharge at 1C, write down discharge capacity	≥90% nominal capacity
Cycle life	Under the condition of 20℃±5℃, charge the battery in 0.5C（A）; discharge at 0.5C（A）to terminal condition, repeat like this. Test the capacity every 25 times in standard charge and discharge, stop testing when the capacity is lower than 80%.	≥6000 cycles

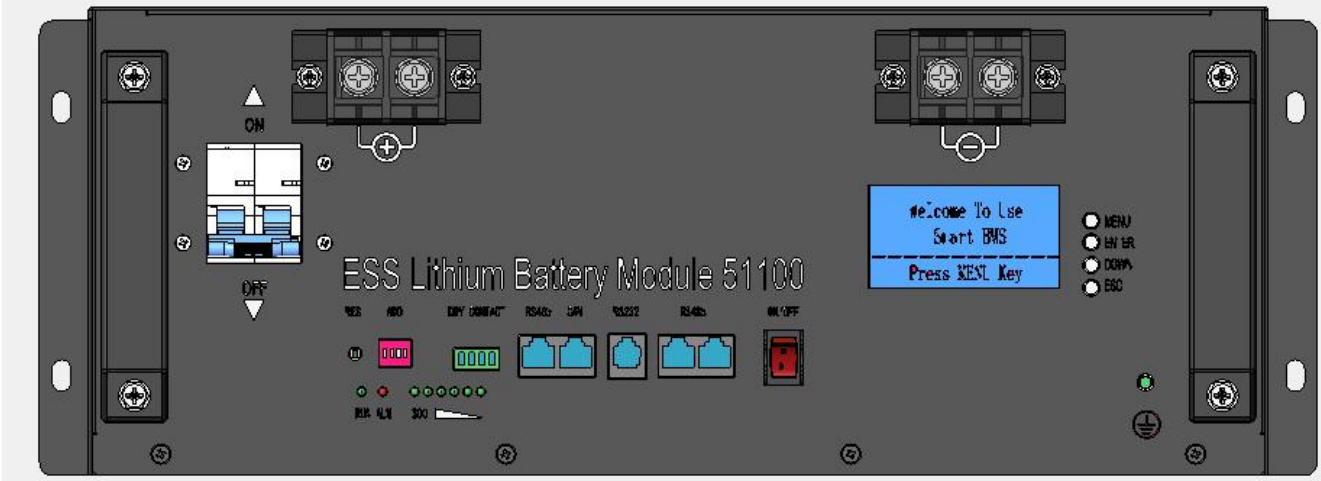
3-7 Safety performance（Cell）

Items	Test Method and Condition	Criteria
Thermal exposure test	Each fully chargedcell,placed in a circulating air-convectionoven.The oven temperature is raised at a rate of 5 °C/min ± 2 °C/min to a temperature of 130 °C ± 2 °C.The cell remains at thistemperature for 30 min before the test is discontinued.	No explosion,No fire
Short test	The fully charged battery is to be short-circuited by connecting the positive and negative terminals with resistance load not exceed 5mΩ.Tests are to be conducted at temperature 25±2℃.	No explosion,No fire The Temperature of the Battery surface not exceeded than 150℃
Over discharge test	After 1C charge，With 1C 90 minutes of constant current discharge and observed for 1 hour.	No explosion, No fire, No leakage
Over charge test	After 1C charge, continue to charge with a constant voltage 5.5V per a cell, holding 1h.	No explosion, No fire
Nail pierce	After standard charge, 5~8mm diameter nail transpierce cell with peed 20~30mm/s and observe 1h	No explosion, No fire
Free fall test	After 1C charge, then drop the battery three times from a height of 1.5 m onto a concrete floor. The batteries are dropped so as to obtain impacts in random orientations and observe 1h.	No explosion, No fire， No leakage
Crush test	After 1C charge, Half a cylinder with a radius of 75 mm to (5 + 1mm)/s velocity perpendicular to the cell pressure, when the battery voltage reaches 0 v or deformation of 30% or stop pressing after extrusion of 200 kn.	No explosion,No fire

4.Product Structural Characteristic

4-1Product appearance(for reference only)





Outline diagram(For reference only, subject to the actual object)

4-2Interface Instruction

This section details the front and back panel of the interface functions.

48100LFP Product Front Interface

ON/OFF

Power Switch: to turn ON the whole battery BMS enter to running status, to turn OFF the whole battery BMS shut down.

RUN

RUN light: green LED flashing to show the battery running status.

AIM

Alarm light: red LED flashing to show the battery has alarm, and lighting to show the battery is under protection.

SOC

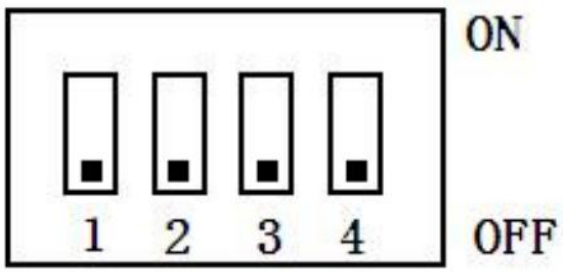
SOC light: green LED to show the battery's current capacity.

GND

GND: Use the force of 4 N/m to fix a screw M5x12mm, connect battery to equipment's GND.

ADD Switch

ADD Switch: 6 ADD switches, Dip1 to definite master or slave ("0"is master, "1"is slave). Dip2-Dip5 to definite slave numbers or slave address. Dip6 is reserve.



The slave battery module's address will be assigned automatically. 1 master battery module can supervise 15 slave battery modules.

Multiple battery group should setup the master battery modules' ADD switch.

address	Dial code switch position				Group Address Number
	#1	#2	#3	#4	
0	OFF	OFF	OFF	OFF	Pack0
1	ON	OFF	OFF	OFF	Pack1
2	OFF	ON	OFF	OFF	Pack2
3	ON	ON	OFF	OFF	Pack3
4	OFF	OFF	ON	OFF	Pack4
5	ON	OFF	ON	OFF	Pack5
6	OFF	ON	ON	OFF	Pack6
7	ON	ON	ON	OFF	Pack7
8	OFF	OFF	OFF	ON	Pack8
9	ON	OFF	OFF	ON	Pack9
10	OFF	ON	OFF	ON	Pack10
11	ON	ON	OFF	ON	Pack11
12	OFF	OFF	ON	ON	Pack12
13	ON	OFF	ON	ON	Pack13
14	OFF	ON	ON	ON	Pack14
15	ON	ON	ON	ON	Pack15

RS232

RS232 Communication Terminal: (RJ11 port) follow RS232 protocol, for output batteries information.

CAN

CAN Communication Terminal: (RJ45 port) follow CAN protocol, for output batteries information.

RS485

RS485 Communication Terminal: (RJ45 port) follow RS485 protocol, for output batteries information.

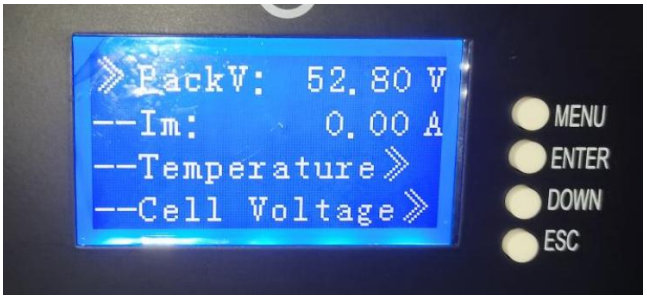
Definition of RJ45 RJ11 RJ45Port Pin

No.	RS485 Pin	RS232 Pin	CAN Pin
1	RS485 B	NC	
2	RS485 A	NC	
3	GND	TX	
4	NC	RX	CANL
5	NC	GND	CANH
6	GND	NC	
7	RS485 A	--	
8	RS485 B	--	

Dry Contact Terminal

Dry Contact Terminal: provided2 ways output dry contact signal.

LCD



LED Status Indicators

RUN Lamp: green, long lighting when discharging and flash when charging;

ALM Lamp: red, flashes when alarm and long bright if equipment failure or protected;

Battery capacity indicator: 4 green lamps, each light represents 25% capacity.

LED Indicators Instructions

Condition	Status	Run	Alm	SOC LED
Power OFF	Sleep	OFF	OFF	OFF
Power ON	Normal	Flash 1	OFF	Show SOC
Charge	Warn	Flash 1	Flash 3	Show SOC
	Normal	Flash 2	OFF	
Discharge	Warn	Flash 2	Flash 3	Show SOC
	OV	Flash 1	OFF	
	OT/UT/OC/ SC	Flash 1	Flash 2	
	Normal	Light	OFF	
Power ON	Warn	Light	Flash 3	OFF
	UV	Flash 1	OFF	
	OT/UT/OC/ SC	Flash 1	Flash 2	
	BMS Error	OFF	Light	

OV: Over voltage; UV: Under voltage; OT: Over temperature;

UT: Under temperature; OC: Over current; SC: Short circuit;

State	Light	OFF
Flash 1	0.25S	3.75S
Flash 2	0.5S	0.5S
Flash 3	0.5S	1.5S

BMS function:

Protection and Alarm	Management and Monitor
Charge/Discharge End	Cells Balance
Charge Over Voltage	Intelligent Charge Model
Charge/Discharge Over Current	Charge/Discharge Current Limit
High/Low Temperature	Capacity Retention Calculate
Short Circuit	Administrator Monitor
Power Cable Reverse	Operation Record

5. Electrical parameter

5.1 electrical property

Item	Min	Max	Type	Unit
Normal working voltage	40	58.4	52	V
Normal charging voltage	42	58.4	54	V
Working temperature range	-20	70	25	℃
Working humidity range	10	85	/	%
Constant discharge current		100		A
Output impedance at discharge state	<10			mΩ
Normal working energy consumption	<80			mA
Total energy consumption static state		200	150	uA

5.2 Basic parameter setting

Function name	Function status	Item list	Default	Description	Setting
Warning on single cell voltage	Power-on	Over voltage alerting voltage	3600mV		Settable
	Power-on	Under voltage alerting voltage	3700mV		Settable
Overcharge protection on single cell	Power-on	Over voltage protection voltage	3650mV		Settable
		Over voltage protection delay	1S		Settable

		Over voltage protection release voltage	3375mV		Settable
Over-discharge protection on single cell	Power-on	Under voltage protection voltage	2500mV		Settable
		Under voltage protection delay	1S		Settable
		Under voltage release voltage	2900mV		Settable
Warning on total voltage	Power-on	Over voltage alerting voltage	57.6V		Settable
	Power-on	Under voltage alerting voltage	43.2V		Settable
Warning on total overcharge	Power-on	Over voltage protection voltage	58.4V		Settable
		Over voltage protection delay	1S		Settable
		Over voltage release voltage	54.0V		Settable
Warning on total over-dicharge	Power-on	Under voltage protection voltage	40.0V		Settable
		Over voltage protection delay	1S		Settable
		Over voltage release voltage	43.2V		Settable
Warning on cell temperature	Power-on	Charging high temperature alerting	50℃		Settable
		Charging low temperature alerting	0℃		Settable
		Discharging high temperature alerting	50℃		Settable
		Discharging low temperature alerting	0℃		Settable
Limited temperature on cell charge	Power-on	Charging high temperature protection	60℃		Settable
		Charging high temperature release temperature	50℃		Settable
		Charging low temperature protection	-10℃		Settable
		Charging low temperature release temperature	0℃		Settable
Limited temperature on cell dis Charge	Power-on	Discharging high temperature protection	60℃		Settable
		Discharging high temperature release	55℃		Settable
		Discharging low temperature protection	-10℃		Settable
		Discharging low temperature release temperature	0℃		Settable

Warning on ambient temperature	Power-on	High ambient temperature alerting	50℃		Settable
		Low ambient temperature alerting	-20℃		Settable
MOS Warning on MOS overtemperature	Power-on	MOS High MOS temperature alerting	90℃		Settable
Warning on charge overcurrent	Power-on	Charging alerting current	120A		Settable
Charge overcurrent protection	Power-on	Charging over current protection	130A		Settable
		Charging overcurrent delay	1S		Settable
Warning on charge overcurrent	Power-on	Discharging alerting current	100A		Settable
Discharge overcurrent protection	Power-on	Discharging protection current	120A		Settable
		Discharging overcurrent delay	1.0S		Settable
Secondary discharge overcurrent protection	Power-on	Secondary protection current	220A		Settable
		Secondary protection overcurrent delay	100mS		Settable
Output short-circuit protection	Power-on	Short-circuit protection current	350A		
		Short-circuit protection delay	200uS		
		Short-circuit protection release condition	1.Charge release, charge current≥1A 2.Automatic attempt for recover for 10 times		
Discharge overcurrent automatic recovery	Automatic release delay		15mins	Automatic recover after 15 mins	
Cell balancing function	Power-on	Cell charge balancing	Trigging condition: at effective charge current		
		Balancing trigger voltage	3500mV		Settable
		Balancing trigger voltage difference	30mV		Settable

Battery capacity setting	Battery rated capacity		100Ah		Settable
	Power-on	Low power alerting	SOC alerting 6%(settable); Alerting 5%(non settable)		
BMS consumption management	Sleep time		60Min(No communication,no charge and discharge current)		Settable

6.Product storage and transportation

6-1 Storage

If the battery pack need to be stored for a long time, charge the battery for 50% electric quantity (after discharge, charge by charger for 2~3h every 3 months).

Battery pack and the charger should be stored in clean, dry and ventilating place, and should not be together with corrosive material, keep the battery away from fire and heat source.

6-2 Transportation

Battery pack and charger should be transported after packaging, and should avoid severe vibrating, impacting , extrusion, and direct light and rain. They can be transported with automobile, train, ship and plane, etc.

6-3 Maintainance

a）The battery pack should be stored in 40%～60% state-of-charge.

b）If the battery won't be used for a long period, charge it every 3 months, and each time 1~2h.

c）In the process of maintainance, don't assemble and disassemble the battery without permission, other wise, the performance of battery will descend.

d）Don't disassemble the battery without permission.

7. Warnings in using the battery

* Do not immerse the battery into water or seawater.
* Do not use , leave or charge battery near a heat source such as fire or heater. If the battery leaks or smells, move it away from open fire. The battery should be used after fully charged in the first use.
* Do not inversely connect positive and negative polar.
* do not put the battery in fire or heat the battery.
* Do not short-circuit the battery with wires or other metals.
* Do not pierce the shell with nails or other sharp objects. Do not hammer or tread the pack.
* Do not disassemble the pack and battery in any way.
* Do not put the battery pack in microwave oven or pressure vessels.

* If the battery pack smells, fevers, is out of shape, color changes or any other abnormal phenomena which the battery can't be used, if the battery is being charged or used, please take it out of the charger or electrical equipments.
* Do not use the battery in extremely thermal environment, such as direct light or cars in hot day. Other wise, the battery will overheats and the performance and life of battery will be influenced.
* If the battery leaks and the electrolyte get into the eye, do not rub eye. Instead, rinse eye with clean water, and seek medical attention immediately.
*Temperature will influence discharge capacity, if the temperature exceeds standard environment temperature（25±°5℃）, discharge capacity will reduce.

8. Especially attention

* If the battery pack smells or sounds unusual in the process of charging, stop charging immediately.
*If the battery pack smells or sounds unusual in the process of discharging, stop discharging immediately.
* If the above problems appear, please contact Howell Energy, do not disassemble without permission.

9. Product responsibility

* Howell Energy won't responsible for any accident caused by violating the specification.
* Howell Energy won't further notice if the specification changes for the reason of improving the quality of products or upgrade technical parameters. If you want to know latest product information, contact us to ask for it.

History of Revisions

Edition	Description	Prepared by	Approved by	Date
A	For the first time to issue	Joshua	Robert	2021-12-21