Customer's Name：

Spec.No. ：
File. No.：
Ver： A/0
Date：

POWERV ENERGY SYSTEM LIMITED

Specification For Approval

Specifications： 24140160-15S4P-48V 200Ah

Approval	Checke	Draft
Customer Approval		

Factory address：Room E110, building 1, 1378 Wenyi West Road, Cangqian street, Yuhang District, Hangzhou City, Zhejiang Province

History of specification

Date	Contents	Remarks
2020-10-13	First issue	

Contents

1.Scope

The specification shall be applied to Li-ion rechargeable battery pack of 48V200AH-4U which is manufactured by POWERV ENERGY SYSTEMLIMITED.

2. Main specifications

2.1 Battery Cell Specification

	No.	Item	General Parameter		Remark
Cell	1	Rated Capacity	Typical	50Ah	Standard discharge（0.2C_5A) after Standard charge
			Minimum	50Ah	
	2	Nominal Voltage	3.2V		Mean Operation Voltage
	3	Internal Impedance	≤0.65 mΩ		Internal resistance measured at AC 1KH_Z after 50% charge The measure must uses the new batteries that within one week after shipment and cycles less than 5 times
	4	Dimension	Thickness:Max 24.0mm		Initial Dimension
			Width：Max 140.5mm		
			Height：Max 160.5mm		
	5	Weight	1.15kg		APPROX
	6	Standard charge	Constant Current 0.33C_5A Constant Voltage 3.65V 0.02C_5A cut-off		Charge time : Approx3.5h
	7	Rapid Charge	Constant Current 1C_5A Constant Voltage 3.65V 0.01C_5A cut-off		Charge time : Approx1.5h@≧10℃
	8	Standard discharge	Constant current 0.33C_5A end voltage 2.5 V		
	9	Maximum discharge current	Constant current：1C_5A end voltage：2.5 V		100A@≧0℃
	10	Volumetric specific energy	295 WH/L		APPROX
	11	Gravimetric specific energy	139WH/KG		APPROX

2.2 Battery Pack Specification

	No.	Item	General Parameter		Remark
Package	1	Combination method	15S4P		
	2	Rated Capacity	Typical	200Ah	Standard discharge after Standard charge（package)

			Minimum	198Ah	
	3	Factory Voltage	49.0V-51.0V		Mean Operation Voltage
	4	Voltage at end of Discharge	42.0V		Discharge Cut-off Voltage
	5	Charging Voltage	53.3V		
	6	Internal Impedance	≤80mΩ		Internal resistance measured at AC 1KHz after 50% charge The measure must uses the new batteries that within one week after shipment and cycles less than 5 times
	7	Standard charge	Constant Current 20A Constant Voltage see No.5 0.02CA cut-off		Charge time : Approx 6 h
		Limiting current	20A		
	8	Standard discharge	Constant current：20A end voltage see NO.4		
	9	Maximum Continuous Charge Current	100A		T≥10ºC
	10	Maximum Continuous Discharge Current	100A		T≥10ºC
	11	Operation Temperature Range	Charge: 0~45℃		60±25%R.H. Bare Cell
			Discharge: -20~55℃		
	12	Storage Temperature Range	Less than 12 months : -10~35℃		60±25%R.H. at the shipment state
			less than 3 months: -10~45℃		
			Less than 7 day : -20~65℃		
	13	Dimensions	442*680*177 mm		Include case
	14	Weight	约 95kg		Include case

3.Battery Management System

3.1BMS Specification

1）：The BMS is designed for 15/16 series lithium battery.

2）：The BMS have all functions which are :

- ◆ overcharge detection function
- ◆ over discharge detection function
- ◆ over current detection function
- ◆ short detection function
- ◆ Temperature detection function
- ◆ balance function
- ◆ communicate function

- Alarm function
- Total capacity function
- Storage history function

3.2 BMS Protect parameter

Typical value specifications

Items	Details	Standard
Cell overcharge protection	Overcharge detection voltage	3.65±0.025V
	Overcharge detection delay time	Typical:1.0s
	Overcharge release voltage	3.38±0.02V
Cell over-discharge protection	Over-discharge detection voltage	2.5±0.02V
	Over-discharge detection delay time	Typical:1.0s
	Over-discharge release voltage	2.9±0.02V or charge release
Over-current protection	discharge Over-current protection current1	100±10A
	discharge Over-current detection delay time 1	1S
	discharge Over-current protection current 2	150±10A
	discharge Over-current detection delay time 2	≤100m±50ms
	Charge OC protection current	130±10A
Short protection	Short protection current	350±10A
	Protection condition	Load short
	Detection delay time	≤300us
	Protection release condition	Charging release
Temperature(T) protection	Charge high T protection	55±3℃
	Charge high T recover	50±5℃
	Discharge high T protection	65±5℃
	Discharge high T recover	60±5℃
	Charge low T protection	-5±5℃
	Charge low T recover	0±5℃
	Discharge low T protection	-20±5℃
	Discharge low T recover	-15±5℃
Balance	Balance threshold voltage	3.45V
Communication	It has RS232 and RS485 standard communication interface, it can real-time monitoring the capacity of battery bank, the voltage, current, environment temperature, and charging/discharging current.	
Alarm	It has over-temperature, over charge, under-voltage, over-current, short circuit alarm Function.	

4.Case Structure of Battery Pack

4.1 Appearance

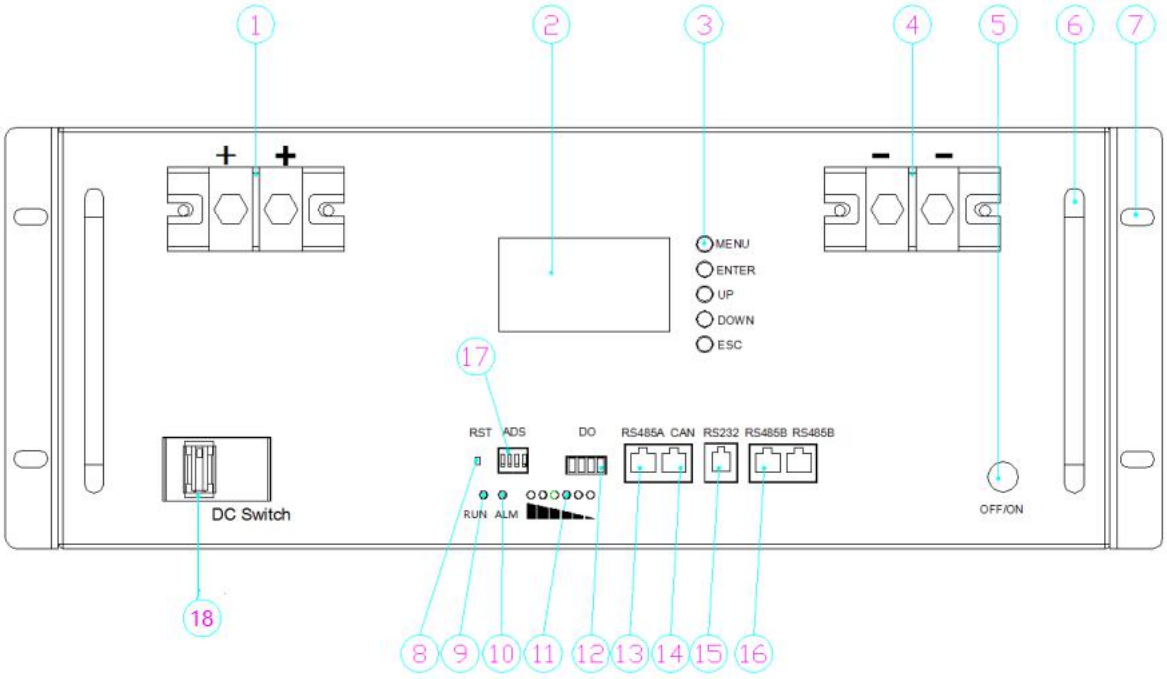
There shall be no such defect as scratch, bur and other mechanical scratch, and the connector should be no rust dirt.

The structure and dimensions see attached drawing of the battery.

4.2 Structure size and outline drawing

Unit （mm）					
L	450	W	442（483）	T	177
L	/	WIRE	/	Terminal type	Fence terminal
remarks	Terminal screw model M6				

5.Case Structure of Battery Pack



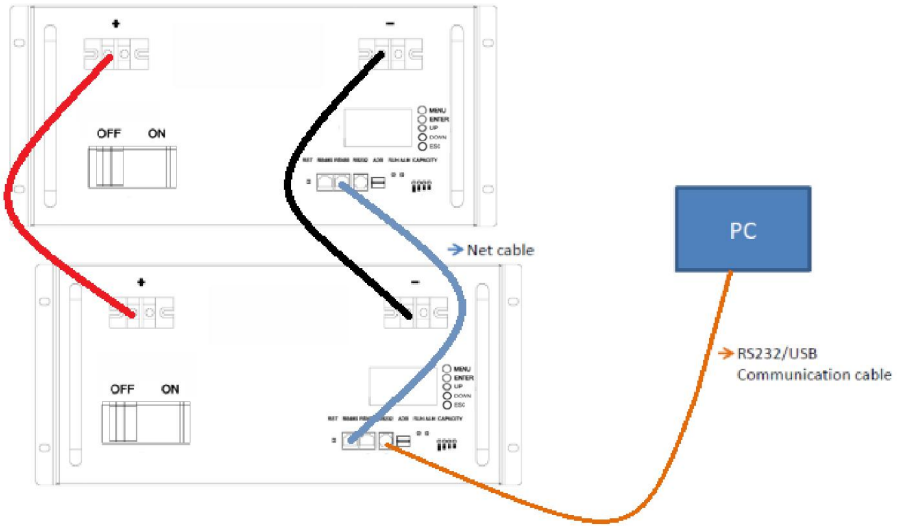
（The image is only a reference）

No.	**Item**	**Functional Description**	Remark
1	Battery +	Positive terminal	
2	LCD		optional
3	LCDKEY		optional
4	Handle		
5	Hanger		For mounting the battery pack
6	Switch	ON/OFF	
7	RST	On/OFF /Reset button	
8	RUN	Working indicator light	Display state information
9	ALM	ALM alarm indicator light	Red-trouble-light on
10	ADS	Battery address dialer	Display connection address
11	CAPACITY	Capacity volume indicator	Display the battery's capacity
12	Dry contact	DO	Normal close
13	RS485	RS485 communication interface	RS485connection port-A
14	CAN port	CAN	CAN communication port
15	RS232 port	RS232	RS232 communication port
16	RS485 port	RS485B	
17	ADS	Battery address dialer	Display connection address
18	Air switch		

6.Connection mode for parallel communication

6.1 RS232+RS485 Parallel Communication

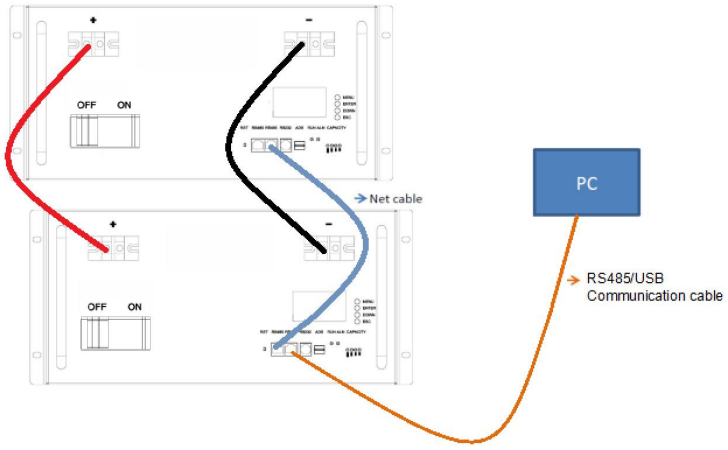
While in RS232 parallel communication, dial-up addresses of battery module are 1，2,3,4……14,15,of which 1 stands for host computer, to which other batteries' data is uploaded; Host computer conducts unified uploading, and host computer with dial-up code of 1 is required to connect with upper computer; FF polling mode used as consulting mode，An address in 1-15 indicates that a battery mode is accessed separately..



Note: In RS232 communication, any address bit can be used in single computer communication. In parallel communication, the host address must be 1, do not have duplicate addresses, otherwise communication may be affected.

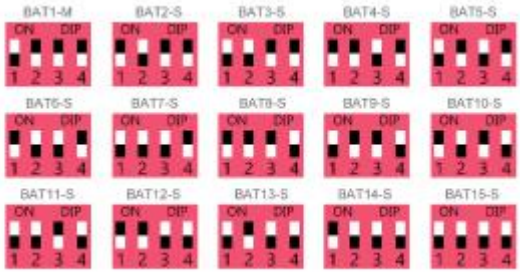
6.2 RS485 Parallel Communication

While in RS485 parallel communication, dial-up addresses of battery module are 1,2,3,4……14,15; By this method, we can be allowed to read each data depending on battery module. Any battery other than address 0 can be connected to the host computer; FF polling mode used as consulting mode.



Note: RS485 communication address can not be 0, the address set by the host computer is required to be the same as the battery communication address, do not have duplicate addresses, otherwise communication may be affected.

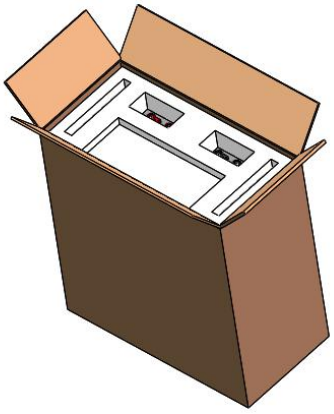
6.3 Address Switch function (Only in Parallel)



6.4 LED Indicators

Status	Normal/ Warning/ Protection	RUN	ALM	Capacity（SOC） LED						Description
		●	●	●	●	●	●	●	●	
Shut Down	Shut down	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	All OFF
Standby	Normal	Flash	OFF	Based on capacity						Standby
	Warning	Flash	Flash							
Charge	Normal	NO	OFF	Based on capacity						ALM light does not flash when overcharge alarm
	Warning	NO	Flash							
	Over Charge Protection	NO	OFF	NO	NO	NO	NO	NO	NO	Switch to standby when there is no charging
	Temperature, Current, Failure protection	OFF	NO	OFF	OFF	OFF	OFF	OFF	OFF	Stop charging
Discharge	Normal	Flash	OFF	Based on capacity						
	Warning	Flash	Flash							
	Over discharge protection	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	Stop discharging
	Temperature, Over current, Short circuit, Reverse connection, Failure protection	OFF	NO	OFF	OFF	OFF	OFF	OFF	OFF	Stop discharging
Fault	/	OFF	NO	OFF	OFF	OFF	OFF	OFF	OFF	Stop charging or discharging

7.Packaging of Battery Pack



8.Battery Testing Equipment and Conditions

8.1 Measurement Apparatus

(1) Dimension Measuring Instrument

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

(2)Voltmeter

Standard class specified in the national standard or more sensitive class having inner impedance not less than 10 KΩ/V.

(3) Ammeter

Standard class specified in the national standard or more sensitive class. Total external resistance including ammeter and wire is less than 0.01Ω.

(4) Impedance Meter

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

8.2 Standard Test Condition

Test should be conducted with new batteries within one month after shipment from our factory and the cells shall not be cycled more than five times before the test. Unless otherwise defined, test and measurement shall be done under temperature of 23±2℃ and relative humidity of less 75%.,air 86Kpa~106Kpa.

8.3 Rest Period

Unless otherwise defined, 30min,rest period after charge,30min,rest period after discharge.

9.Storage and Others

9.1 Long Time Storage

If stored for a long time(don't used, exceed three months), the cell should be stored in drying and cooling place. The cell's storage voltage should be 51V-53V and the cell is to be stored in a condition that the temperature of 23±2℃ and the humidity 0f 45%- 75%. Long-term use of unused batteries to recharge every 3 months。Ensure that the battery voltage is within the above range。

9.2 Others

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

10.Amendment of this Specification

This specification is subject to change with prior notice.

11. Appendix

Handling Precautions and Guideline For Li-ion Rechargeable Batteries

Preface

This document of 'Handling Precautions and Guideline Li-ion Rechargeable Batteries' shall be applied to the battery cells manufactured by POWERV.

Note (1) ：

The customer is requested to contact POWERV ENERGY SYSTEM LIMITED. 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.

Note (2) ：

POWERV ENERGY SYSTEM LIMITED is not responsible for any accidents caused by using the battery under conditions other than those specified in this specification.

Note (3)：

POWERV ENERGY SYSTEM LIMITED will inform, in a written form, the customer of improvement(s) regarding proper use and handling of the cell, if it is deemed necessary.

Danger!

— Do not immerse the battery in water or allow it to get wet.
— Do not use or store the battery near sources of heat such as a fire or heater.
— Do not use any chargers other than those recommended by POWERV.
— Do not reverse the positive(+) and negative(-) terminals.
— Do not connect the battery directly to wall outlets or car cigarette-lighter sockets.
— Do not put the battery into a fire or apply direct heat to it.
— Do not short-circuit the battery by connecting wires or other metal objects to the positive(+) and negative(-) terminals.
— Do not pierce the battery casing with a nail or other sharp object, break it open with a hammer, or step on it.
— Do not strike, throw or subject the battery to sever physical shock.
— Do not directly solder the battery terminals.
— Do not attempt to disassemble or modify the battery in any way.
— Do not place the battery in a microwave oven or pressurized container.
— Do not use the battery in combination with primary batteries(such as dry-cell batteries) or batteries of different capacity, type or brand.
—Do not use the battery if it gives off an odor, generates heat, becomes discolored or deformed, or appears abnormal in any way. If the battery is in use or being recharged, remove it from the device or charger immediately and discontinue use.

Caution!

Do not use or store the battery where is exposed to extremely hot, such as under window of a car in direct sunlight in a hot day. Otherwise, the battery may be overheated. This can also reduce

battery performance and/or shorten service life.

If the battery leaks and electrolyte gets in your eyes, do not rub them. Instead, rinse them with clean running water and immediately seek medical attention. If left as is, electrolyte can cause eye injury.