Specification Approval Sheet

Powerizer LFP-RCR123A rechargeable LiFePo4 battery

1. Scope

This specification is suitable for the performance of rechargeable lithium iron phosphate battery by AA Portable Power Corp. (http://www.batteryspace.com)

2. Model

LFP-RCR123A rechargeable LiFePO4 battery

3. Reference Document

IEC 61960-1: 2000 *Secondary lithium cells and batteries for portable applications-Part1: Secondary lithium cells*

4. Specification

No.	Item	Specifications	
1	Nominal Voltage	3.2V	
2	Rated Capacity	450 mAh @ 0.2C Discharge	
3	Minimal Capacity	400 mAh @ 0.2C Discharge	
4	Discharge Cut-off Voltage	2.0V	
5	Charging Voltage	3.6±0.1V	
6	Max Charging Voltage	3.8V	
7	AC (1KHz) Impedance New Cell Max.(mΩ)	≤400mΩ	
8	Standard charge	0.2CC charge to 3.6V, then CV charge (3.6V) till charge current decline to 0.01C.	
9	Standard discharge	Constant current 100mA end voltage2.0V	
10	Self-discharge	≤10％After Standard Charge, at 23±2 ℃, stores 30 day to measure it's capacity	
11	Max. Charge Current	450mA	
12	Max. Discharge Current	450mA	
13	Operating Temperature	Charge: 0~45℃	.60±25%R.H
		Discharge: -20~60℃	
14	Storage Temperature	Less than 1 year: -20~25℃	.60±25%R.H
		Less than 3 months: -20~40℃	
15	Weight	Approx. 16.5g	
16	Cell Dimension	Diameter: Φ16.7 mm Max Height: 34.5 mm Max	

5. Test Conditions and Performance

5.1 Measuring Instrument or Apparatus

5.1.1 Dimension Measuring Instrument

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

5.1.2 Voltmeter

Standard class specified in the national standard or more sensitive class having inner impedance more than 10kΩ/V

5.1.3 Ammeter

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

5.1.4 Impedance Meter

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

5.2 Standard Test Conditions

5.2.1 Temperature and humidity

Test should be conducted with new batteries within one week after shipment from our factory and the cells shall not be cycled more than five times before the test. Unless other defined, test and measurement shall be done under temperature of 20±5℃ and relative humidity of 45~85%. If it is judged that the test results are not affected by such conditions, the tests may be conducted at temperature 15~30℃ and humidity 25~85%RH.

5.2.2 Charge and Discharge

a. Standard Charge ： Test procedure and its criteria are referred as follows:

$0.2C_5A$ =90mA

Charging shall consist of charging at a $0.2C_5A$ constant current rate until the cell reaches 3.6V. The cell shall then be charged at constant voltage of 3.6volts while tapering the charge current. Charging shall be terminated when the charging current has tapered to $0.01C_5A$. Charge time: Approx 8.0h, The cell shall demonstrate no permanent degradation when charged between 0 ºC and 45 ºC.

b. Standard Discharge: Cells shall be discharged at a constant current of $0.2\ C_5A$ to 2.0 volts @ 20º ± 5C

$0.2C_5A$ =90mA

5.3 Electrical Characteristics

No.	Item	Measuring Procedure	Criteria
1	Open-Circuit Voltage	The open-circuit voltage shall be measured within 24 hours after standard charge.	3.4 V
2	AC Impedance Resistance	The Impedance shall be measured in an alternating current method (1kHz LCR meter) after standard charge at 20±5℃.	≤400mΩ
3	Rated Capacity	The capacity means the discharge capacity of the cell, which is measured by constant 100mA current discharging to 2.0V.	≥450 mAh
4	Cycle Life	Carry out 200 cycle charging / Discharging in the below condition. ▪ Standard Charge, per 5.2.2 a. ▪ Discharge: At 225mA current (0.5C) to 2.0V ▪ Rest Time between Charge / discharge: 30min. ▪ Temperature:20±5℃	Higher than 80% of the initial capacities of the Cells.
5	Self-discharge	After the standard charging, storied the cells under the condition as 5.2.1 for 30days, then measured the capacity with 0.2C to 2.0V.	Residual capacity ≥90%

5.4 Electrical Abuse Characteristics

1	External Short Circuit	Positive and negative of fresh battery are connected by a Cu wire. This short-circuit condition is continued for 1 day at room temperature (20±2℃).	No leakage; No explosion. Temp. of cell surface≤150℃
2	Over Discharge	After standard discharge, discharge at a current of $1C_5A$ for 2.5h	No explosion; No fire
3	Over Charge	After standard charge, 3C current charge to 12V and constant voltage at 12V for 1h.	No leakage; No explosion. Temp. of cell surface≤100℃

5.5 Mechanical Characteristics

No.	Item	Test Method	Criteria
1	Vibration	Freq: 10~55hz; Amp: 2mm; Three directions; total 90 min	No leakage, No explode, no fire OV changes≤0.02V
2	Impact	A 56mm diameter bar is inlayed into the bottom of a 10kg weight. And the weight is to be dropped from a height of 1m onto a sample battery and then the bar will be across the center of the sample.	No explosion, No fire
3	Crush	Crush between two flat plates. Applied force is about 13kN(1.72Mpa) for 30min.	No explosion, No fire
4	Nail Pricking (3mm)	Prick through the sample battery with a nail having a diameter of 3mm and remain 2h.	No explosion, No fire

5.6 Environmental test

No.	Item	Test Conditions	Criteria
1	High temperature	After fully charged, stored at 60℃ for 30 days. At room temp., 0.2C discharge to 2.0V. Then standard charge and discharge to 2.0V.	No leakage (visual inspection) Residual capacity ≥90%
2	Drop test	After fully charged. Height: 1m, 6 times; Each direction two times; Concrete floor	No leakage No explosion; No fire

5.7 Temperature Dependence of Capacity (Discharge)

Cells shall be charged per 5.2.2 a and discharged @0.2C_5A to 2.0 volts. Except to be discharged at temperatures as the table followed. Cells shall be stored for 3 hours at the test temperature prior to discharging and then shall be discharged at the test temperature. The capacity of a cell at each temperature shall be compared to the capacity achieved at 23 ºC and the percentage shall be calculated. Each cell shall meet

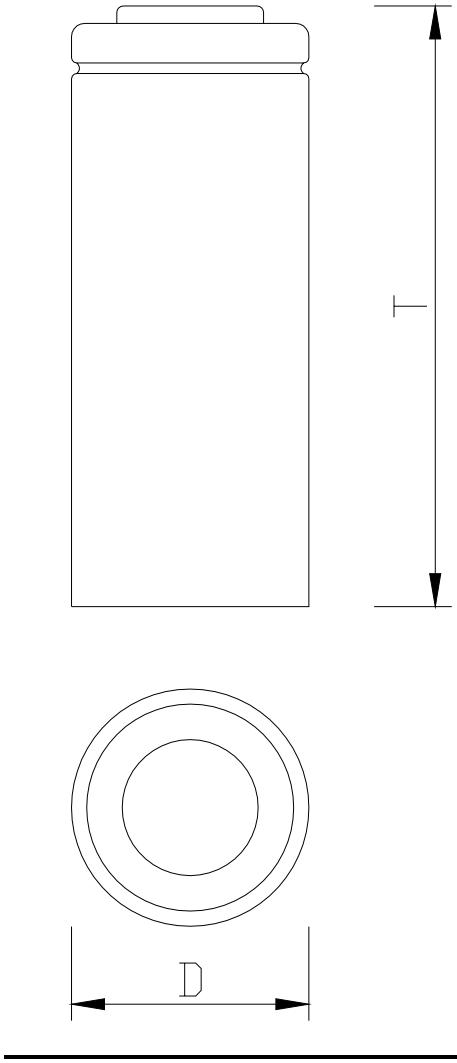
or exceed the requirements of the table as followed.

Discharge Temperature	-10℃	0°C	23℃	60℃
Discharge Capacity (0.2 C_5A)	50%	70%	100%	100%

5.8 Visual inspection

There shall be no such defect as scratch, flaw, crack, and leakage, which may adversely affect commercial value of cell.

6. Drawing (at unit in mm, not in scale)



Items	Description	Dimension
D	Diameter	17.0 mm max
T	Height	34.5 mm max

7. Cautions in use

To ensure proper use of the battery please read the manual carefully before using it.

Handling

- Do not expose to, dispose of the battery in fire.
- Do not put the battery in a charger or equipment with wrong terminals connected.
- Avoid shorting the battery
- Avoid excessive physical shock or vibration.
- Do not disassemble or deform the battery.
- Do not immerse in water.
- Do not use the battery mixed with other different make, type, or model batteries.
- Keep out of the reach of children.

Storage

- Store the battery in a cool, dry and well-ventilated area.

Disposal

- Regulations vary for different countries.
- Dispose of in accordance with local regulations.

8. Battery operation instruction

8.1 Discharging current

The discharging current does not have to surpass this specification book stipulation the biggest discharging current, the oversized electric current electric discharge can cause the battery capacity play to reduce and to cause the battery heat。

8.2 Electric discharge temperature

The battery discharge must carry on in the ambient temperature scope which this specification book stipulated.

8.3 Storing the Batteries

The battery should store in the product specification book stipulation temperature range. If has surpasses above for six months the long time storage, the discharge capacity will decrease sharply。

9. Period of Warranty

The period of warranty is 3 months from the date of shipment. AA Portable Power Corp (http://www.batteryspace.com) will give a replacement in case of cells with defects proven due to manufacturing process instead of the customers' abuse and misuse.

10. Other Chemical Reaction

Because batteries utilize a chemical reaction, battery performance will deteriorate over time even if stored for a long period of time without being used. In addition, if the various usage conditions such as discharge, ambient temperature, are not maintained within the specified ranges the life expectancy of the battery may be shortened or the device in which the battery is used may be damaged by electrolyte leakage. Please change the battery in time.

11. Note

Any other items which are not covered in this specification shall be agreed by both parties.