Specification Approval Sheet

Name：Polymer Lithium-Ion Battery

Model： AKYGA M9440S1

SPEC：3.8V / 25mAh

Specification Modification Records

Modification Time	Descriptions	Issued Date	Approved By
	Release 1	2023-03-30	

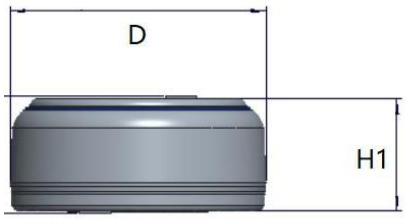
Contents

Specification Approval sheet

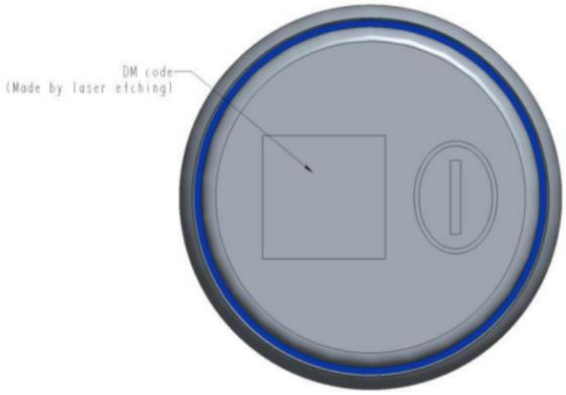
1. Scope

This document describes the specification of rechargeable Li-ion battery pack which is provided by Akyga Battery

2.Battery specification :

No.	Item	Parameters	
1	Battery cell model	**M9440S1**	
2	Minimum capacity (0.2C discharge current	**23mAh**	
3	Typical capacity (0.2C discharge current	**25mAh**	
4	Nominal voltage	**3.8V**	
5	Shipment Status of charge	**65%~85%**	
6	Shipment voltage	**3.8-4.0V**	
7	Charge ending voltage	**4.35V**	
8	Discharge ending voltage	**3.00V**	
9	Maximum cell dimension	**D：9.5mm ，H:4.0mm**	
10	Cell weight	**Appr 0.8g**	
11	Cell Impedance V=3.8-4.0V	**≤1000m**	
12	Max charge current	**25mA, 1C**	**15℃≤T≤45℃**
		5.0mA, 0.2C	**0℃≤T<15℃**
13	Max discharge current	**25mA, 1C**	**15℃≤T≤60℃**
		5.0mA, 0.2C	**-20℃≤T<15℃**
14	Operating temperature	**Charge 充电： 0-45℃** **Discharge 放电：-20-60℃**	
15	Cycle life RT) (0.2C charge 0.2C discharge	**After 700cycles charge/discharge, battery can recover 80% of its initial capacity，Cell expansivity ≤1%.**	
16	Storage period	**1 Month at -20 to 60 °C**	**Capacity Recovery Rate > 85%**
		3 Month at -20 to 45 °C	**Capacity Recovery Rate > 90%**
		1 Year at -20 to 20 °C	**Capacity Recovery Rate > 90%**
17	Other	**UL1642, IEC62133, UN38.3, Reach, ROHS**	

2.1 Battery laser etching content :



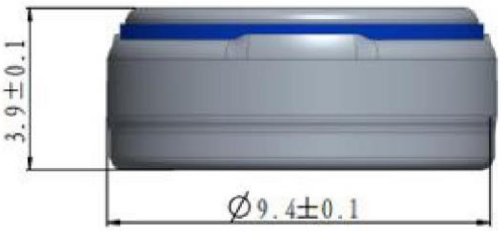
DM code:

Size:3.0±0.5mm

M9440 XX D WW YY T T M 000001

- 000001 → (Serial number) 000001 ~ 999999
- M → Battery production stage（S, P, M）
- T → The first T represents assembly line No. : 1~9, A~Z
- T → The second T represents equipment No. : 1~9, A~Z
- YY → Represents manufacture year : 19, 20……
- WW → Represents manufacture week, 01, 02, ……, 52
- D → Represents manufacture day of the week, 1, 2, ……, 7
- XX → battery version （01、02...09）
- M9440 → Battery series

2.2 Cell drawing :



3.Environmental characteristics

No.	Test item	Test Method	Pass Criteria
1	**Charged Storage Characteristics**	Battery cell is fully charged by standard charge process. Battery cell idle at 23±3°C for 28days. At 23±3°C, battery cell is discharged battery by 0.2C until 3.0V.	Discharge time⩾4.25hrs

4. Safety Test

Battery can meet several international safety standards. Below is part of safety tests which are referred to international standard.

No.	Test item	Test Method	Criteria
1	Constant Humidity and Temperature test	Battery cell is fully charged by standard charge process. Then, battery cell is put into chamber with constant humidity(90~95%) and temperature (40±2°C) for 48hrs. After test, battery idle for 2hrs at 23±3°C and discharge by 0.2C to 3.0V.	After test, battery cell can discharge ⩾3hrs No fire, No leakage, No explosion
2	Overcharge Test	Battery cell is fully charged by standard charge process. Then, the battery is charged by 3.0C rate constant current and voltage to 4.6V for 7hrs.	No fire, No explosion

3	Over discharge Test	At 23±2°C, battery cell is discharged by 0.2C until 3.0V. And then battery cell is connected the load with 30Ω to discharge for 7hours.	No fire, No leakage, No explosion
4	Short test	Battery cell is fully charged by standard charge process. Then, battery cell anode and cathode connected to 80±20mΩ load for 1hour.	No fire, No explosion The Temperature of the Battery surface not exceeded than 150℃
5	Projectile Test	Battery cell is fully charged by standard charge process. Battery cell is placed on the screen which is to be constructed by steel wire mesh. The screen is mounted above the burner. And eight-sided covered wire cage is to be placed over the battery cell. Battery cell is to be heated and remain on the screen until it explodes or has been ignited or burned out.	No part of an exploding cell shall penetrate the wire screen.
6	Drop Test	Battery cell is fully charged by standard charge process. Battery cell is free fall from a height of 1m on the cement floor, from X-axis、Y-axis positive and negative direction. Each direction is free fall 1 time.	No deformation, No fire, No explosion, No leakage

7	Crush test	Battery cell is fully charged by standard charge process. The battery cell is to be crushed with its longitudinal axis parallel to the surfaces of crushing apparatus. The surfaces are to be bought in contact with cell and the crushing is to be continued until an applied force of 13±1kN is reached. Once the maximum force has been obtained, it is to be released.	No fire, No explosion
8	Shock test	Battery cell is fully charged by standard charge process. Battery cell is secured to the testing machine by means of a rigid mount which will support all mounting surfaces of the battery cell. The battery cell is subjected to a total of two shocks of equal magnitude. The shocks are to be applied in each of two mutually perpendicular directions. For each shock the battery cell is accelerated in such a manner that during the initial 3ms the minimum average acceleration is 75g. The peak acceleration shall be between 125 g and 175 g. Battery cell is tested at 20 ±5℃	No fire, No explosion,

5. Performance and Test Criteria

5.1 Standard Test Criteria

If test criteria is not defined, test should be done under the below standard test criteria.

Test Criteria	Parameters
Ambient Temperature	23±3°C
Relative Humidity	65±20%
Atmospheric pressure	86～106 kPa
Charge	Standard charge process
Discharge	Standard discharge process
Delivery Time from Akyga	Within 1month

5.2 Visual Inspection

No crack，no leakage

5.3 Measuring Instrument Standard

Instrument	Standard
Instrument to measure dimension	Precision scale : 0.01mm
Voltmeter	Internal impedance ＜ 10kΩ/V
Ammeter	Impedance of ammeter and wires ＜ 0.01Ω
Impedance meter	Impedance is measured by sinusoidal 1kHz AC current

5.4 Standard charge process

Battery pack is charged by 0.2C constant current at 23±2°C until 4.35V. Then, battery cell is charged by constant voltage until current drop to 0.02C.

5.5 Standard discharge process

Battery pack is discharged by0.2Ccontinuous current at 23±2°C until the voltage drop to 3.0V.

5.6 Maximum charge current

Battery pack is charged by 1.0C constant current at 23±2°C until 4.35V. Then, battery pack is charged by

constant voltage at 4.35V until current drop to 0.02C.
The charging time is limited to 2hours.

5.7Maximum discharge current

Battery pack is discharged by 1.0Ccontinuous current at 23±2°C until the voltage drop to 3.0V.

5.8 Initial impedance

Battery pack is fully charged by standard charge process.
The impedance of fully charged battery cell is tested by AC impedance tester at 1kHz. The initial impedance should be≤1000mΩ.

5.9 Initial capacity

Battery pack is fully charged by standard charge process and then battery cell is fully discharged by standard discharge process.
The initial capacity is≥23mAh.

5.10 Cycle life

Test procedure :

Step 1: 0.2C constant current charge battery until 4.35V, and then, charge battery by 4.35V constant voltage
until current drop to 0.02C.

Step 2: Wait for 10mins

Step 3: 0.2C constant current discharged battery until the voltage drop to 3.0V.

Step 4: Wait for 10mins

Step 5: step1 to step 4 is defined as 1st cycle, repeat step 1 to step 4 at 2nd~49th cycle, at 51th ~99th cycles,
and so forth

Step 6: 0.2C constant current charge battery until 4.35V, and then, charge by 4.35V constant voltage until current drop to 0.02C.

Step 7: Wait for 10mins

Step 8: 0.05C constant current discharged battery until the voltage drop to 3.0V.

Step 9: Wait for 10mins

Step 10: step6 to step 9 is defined as 50th cycle, repeat step 6 to step 9 at 100th cycle, at 150th cycle, and so
forth

Step11: Repeat above steps 700 times, the recovery capacity should be should no less than 80% of initial capacity

Note: Check and record capacity, the impedance, the size and the appearance for each 50 cycles.

6. Usage of battery

Akyga Battery **DO NOT** take responsibility if customer **DO NOT** follow the specification and below instruction using the battery.

To have good performance of battery, battery should follow this battery specification to use and storage.

Recommend charging battery every 6months using standard charge process.

To use the battery safe, battery is prohibited to disassemble, drop, heat, burn, soak, crush, shock, short circuit.

Enough insulation inside the customer' s end product is required to avoid the short circuit of the battery.

Battery should have enough space to install inside the customer' s end product. Please use the maximum dimension of battery pack after cycle life to reserve the space.

To protect the battery, battery should be installed in the customer' s end product with strong mechanical
strength.

Any movement of the battery in the end product should be avoided.

If battery has any abnormal feature such as battery cannot be charged and discharge, abnormal heat generate, deformation, smelling of electrolyte or leakage, battery should be stopped to use immediately. Battery with smelling of electrolyte or leakage should be placed away from fire. Electrolyte is harmful. If electrolyte is contacted the skin or eyes, please flush electrolyte by purified water and consult doctor.

7. Warranty

Akyga Battery guarantees the battery at good condition within **12months** when battery is delivered from factory.

8. Others

8.1 Prohibition of disassembly

1) Never disassemble the cells. The disassembling may generate internal short circuit in the cell, which may cause gassing, firing, explosion, or other problems.

2) Electrolyte is harmful LIP battery should not have liquid from electrolyte flowing, but in case the electrolyte come into contact with the skin, or eyes, physicians shall flush the electrolyte immediately with fresh water and medical advice is to be sought.

8.2 Prohibition of dumping of battery into fire

Never incinerate nor dispose the cells in fire. These may cause explosion of the cells, which is very Dangerous and is prohibited.

8.3 Prohibition of use of damaged battery

The cells might be damaged during shipping by shock. If any abnormal features of the cells are found such as damages in a plastic envelop of the cell, deformation of the cell package, smelling of an electrolyte, an electrolyte leakage and others, the cells shall never be used any more. The Cells with a smell of the electrolyte or a leakage shall be placed away from fire to avoid firing or explosion.

8.4 The following warning language is to be provided with the information packaged with the small cells and batteries or equipment using them

- Keep batteries out of reach of children to avoid being swallowed, Swallowing may lead to burns, perforation of soft tissue, and death. Severe burns can occur within 2 h of ingestion. In case of ingestion of a cell or battery, seek medical assistance promptly.

- If children use the battery, their guardians should explain the proper handling.

8.5 Any other items are not covered in the specification shall be agreed by both parties.