



GUANGZHOU MARKYN BATTERY CO., LTD

Li-ion Rechargeable Battery

Customer: _____

Li-ion Rechargeable Battery Specification

Model: GMB18650H

Prepared By/Date	Checked By/Date	Approved By/Date

Note: 1. Kindly please sign on the above and send it back to us if the sample is approved.
2. Kindly please contact us as soon as possible if the sample isn't approved. Thanks!

Customer confirmation	
Date	

Edition	Design	Reason	Approved	Date
A		First Edition		





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Li-ion Rechargeable Battery

1. Scope

This specification is applied to GMB18650H Manufactured by GUANGZHOU MARKYN BATTERY CO., LTD.

2. Product Specification Table 1

No.	Item	Rated Performance		Remark
		Typical		
1	Rated Capacity	Typical	2200mAh	Standard discharge (0.2C C ₅ A) after Standard charge
		Minimum	2150mAh	
2	Nominal Voltage	3.7V		Mean Operation Voltage During Standard Discharge After Standard Charge
3	Voltage at end of Discharge	2.75V		Discharge Cut-off Voltage
4	Charging Voltage	4.2 ± 0.03V		
5	AC (1KHz) Impedance New Cell Max.(mΩ)	≤ 80mΩ		
6	Standard charge	Constant Current 0.5C ₅ A Constant Voltage 4.2V 0.01 C ₅ A cut-off		Charge time : Approx 4.0h
7	Standard discharge	Constant current 0.2 C ₅ A end voltage 2.75V		
8	Fast charge	Constant Current 1C ₅ A Constant Voltage 4.2V 0.01 C ₅ A cut-off		Charge time : Approx 2.5h
9	Fast discharge	Constant current 1 C ₅ A end voltage 2.75V		
10	Maximum Continuous Charge Current	1 C ₅ A		
11	Maximum Continuous Discharge Current	1.5C ₅ A		
12	Operation Temperature Range	Charge: 0~45°C		60 ± 25% R.H. Bare Cell
		Discharge: -20~60°C		
13	Storage Temperature Range	Less than 1 year: -20~25°C		60 ± 25% R.H. at the shipment state
		less than 3 months: -20~40°C		
14	Weight	Approx 45g		Bare Cell
15	Cell Dimension	Height: 64.5(±0.5)mm		Bare Cell Initial Dimension
		Diameter: Φ 18.1(±0.2) mm		





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3. Performance And Test Conditions

3.1 Standard Test Conditions

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 otherwise defined, test and measurement shall be done under temperature of $20 \pm 5^\circ\text{C}$ 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°C and humidity 25~85%RH.

3.2 Measuring Instrument or Apparatus

3.2.1 Dimension Measuring Instrument

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

3.2.2 Voltmeter

Standard class specified in the national standard or more sensitive class having inner impedance more than $10\text{k}\Omega/V$

3.2.3 Ammeter

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

3.2.4 Impedance Meter

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

3.3 Standard Charge\Discharge

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

$$0.5C_5A = 1100\text{mA}$$

Charging shall consist of charging at a $0.5C_5A$ constant current rate until the cell reaches 4.2V. The cell shall then be charged at constant voltage of 4.2 volts while tapering the charge current. Charging shall be terminated when the charging current has tapered to $0.01 C_5A$. Charge time : Approx 4.0h, The cell shall demonstrate no permanent degradation when charged between 0°C and 45°C .

3.3.2 Standard Discharge

$$0.2C_5A = 440\text{mA}$$

Cells shall be discharged at a constant current of $0.2 C_5A$ to 2.75 volts @ $20^\circ \pm 5\text{C}$

3.4 Appearance

There shall be no such defect as flaw, crack, rust, leakage, which may adversely affect commercial value of battery.

3.5 Initial Performance Test

Table 2

Item	Measuring Procedure	Requirements
(1) Open-Circuit Voltage	The open-circuit voltage shall be measured within 24 hours after standard charge.	$\geq 4.08\text{V}$
(2) AC Impedance Resistance	The Impedance shall be measured in an alternating current method (1kHz LCR meter) after standard charge at $20 \pm 5^\circ\text{C}$.	$\leq 80\text{m}\Omega$
(3) Nominal Capacity	The capacity on $0.2C_5A$ discharge shall be measured after standard charge at $20 \pm 5^\circ\text{C}$.	Discharge Capacity $\geq 2150\text{mAh}$





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3.6 Temperature Dependence of Capacity (Discharge)

Cells shall be charged per 3.3.1. and discharged @0.2C_{5A} to 2.75 volts. except to be discharged at temperatures per Table 3. 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 °C and the percentage shall be calculated. Each cell shall meet or exceed the requirements of Table 3.

Table 3

Discharge Temperature	-10°C	0°C	23°C	60°C
Discharge Capacity (0.2C _{5A})	50%	80%	100%	95%

3.7 Cycle Life and Leakage-Proof Table 4

No.	Item	Criteria	Test Conditions
1	Cycle Life (0.5 C _{5A})	Higher than 70% of the Initial Capacities of the Cells	Carry out 500cycle charging/ Discharging in the below condition. ◆Charge: Standard Charge, per 3.3.1 ◆Di scharge: 0.5 C _{5A} to 2.75V ◆Rest Time between charge/di scharge: 30mi n. ◆Temperature: 20±5°C
2	Leakage-Proof	No leakage (visual inspection)	After full charge, store at 60±3°C 60±10%RH for 1month.



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4.Safety Test

Item	Battery Condition	Test Method	Requirements
Crush	Fresh, Fully charged	Crush between two flat plates. Applied force is about 13kN(1.72Mpa) for 30min.	No explosion, No fire
Short Circuit	Fresh, Fully charged	Each test sample battery, in turn, is to be short-circuited by connecting the (+) and (-) terminals of the battery with a Cu wire having a maximum resistance load of 0.1 Ω .Tests are to be conducted at room temperature($20 \pm 2^{\circ}\text{C}$).	No explosion, No fire The Temperature of the surface of the Cells are lower than 150°C
Short Circuit	Fresh, Fully charged	Each test sample battery, in turn, is to be short-circuited by connecting the (+) and (-) terminals of the battery with a Cu wire having a maximum resistance load of 0.1 Ω .Tests are to be conducted at temperature($60 \pm 2^{\circ}\text{C}$).	No explosion, No fire The Temperature of the surface of the Cells are lower than 150°C
Impact	Fresh, Fully charged	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
Forced Discharge	Fresh, Fully charged	Discharge at a current of 1CmA for 2.5h.	No explosion, No fire
Nail Pricking (3mm)	Fresh, Fully charged	Prick through the sample battery with a nail having a diameter of 3mm and remain 2h.	No explosion, No fire

5.WARRANTY PERIOD & PRODUCT LIABILITY

Warranty period of this product is 6 months from delivery date.

GMB POWER is not responsible for the troubles caused by mishandling of the battery that is clearly against the instructions in this specification.

6.Highlight in Handling

To prevent a possibility of the battery from leaking, heating or explosion please observe the following precautions:

Warning in use:



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- When recharging, use the battery charger specifically for that purpose.
- Do not reverse the position (+) and negative (-) terminals.
- Do not connect the battery to an electrical outlet.
- Do not use or leave the battery near a heat source as fire or heater.
- Do not immerse the battery in water or seawater, and keep the battery in a cool dry surrounding if it stands by.
- Do not use it in a location where static electricity is great, otherwise, the safety devices may be damaged, causing hidden trouble of safety.
- Do not use or leave the battery at very high temperature (for example, at strong direct sunlight or in a vehicle in extremely hot weather). Otherwise, it can overheat or fire or its performance will be degenerate and its service life will be decreased.
- Do not short-circuit the battery by directly connecting the positive (+) and negative (-) terminal with metal objects such as wire.
- Do not strike or throw the battery.
- Do not directly solder the battery and pierce the battery with a nail or other sharp object.
- If the battery gives off an odor, generates heat, becomes discolored or deformed, or in any way appear abnormal during use, recharging or storage, immediately remove it from the device or battery charger and stop using.
- If the battery leaks, and the electrolyte get into the eyes. Do not rub eyes, instead, rinse the eyes with clean running water, and immediately seek medical attention. Otherwise, it may injure eyes or cause a loss of sight.
- Be aware discarded batteries may cause fire, tape the battery terminals to insulate them.
- Disposal regulation may vary depending on local government.
- Don't disassembly the battery.

7. Storing the Batteries

The batteries should be stored at room temperature, charged to about 30% to 50% of capacity. We recommend that batteries be charged about once per year to prevent over discharge.

8. Other The Chemical Reaction

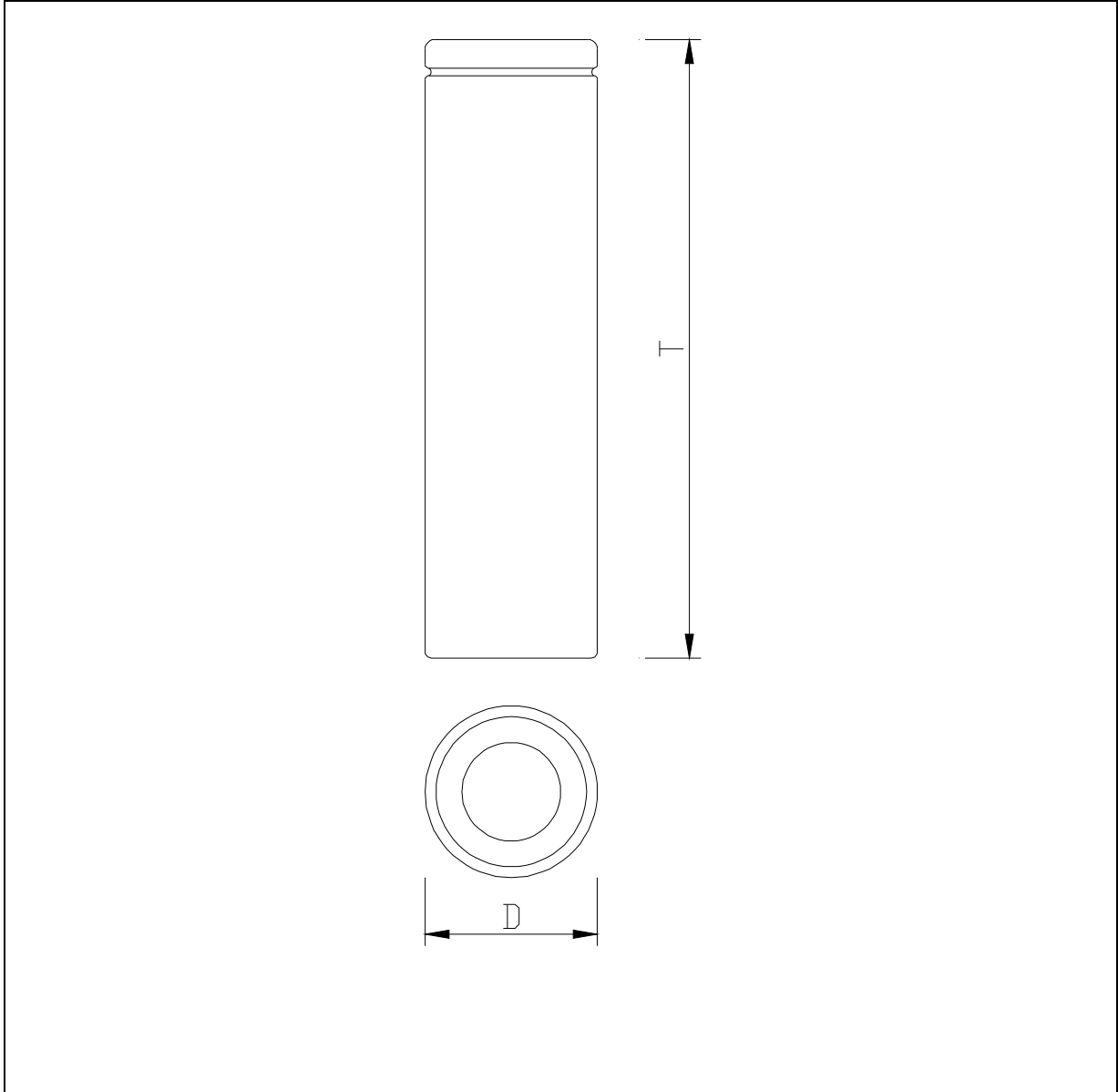
Because batteries utilize a chemical reaction, battery performance will deteriorate over time even if stored for a long period of time without being used. In addition, if the various usage conditions such as charge, discharge, ambient temperature, etc. are not maintained within the specified ranges the life expectancy of the battery may be shortened or the device in which the battery is used may be damaged by electrolyte leakage. If the batteries cannot maintain a charge for long periods of time, even when they are charged correctly, this may indicate it is time to change the battery.



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9. Initial Dimension



D	18.1±0.2	T	64.5±0.5	UNIT	mm
Drawer		Checked		Approved	Date
				GMB 18650H DRAWING	
				Drawing ID	