



**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

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**Lithium ion cells and batteries used in self-balancing vehicle -
Safety requirements**

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1 Scope

This Standard specifies the safety requirements for lithium ion cells and batteries used in self-balancing vehicle, and describes the corresponding test methods.

This Standard applies to lithium ion cells and batteries used in self-balancing vehicle, as well as lithium ion cells and batteries for similar products such as electric scooters without self-balancing function.

2 Normative references

The following documents are indispensable for the application of this document.

For dated references, only the dated version applies to this document. For undated references, the latest edition (including all amendments) applies to this document.

GB/T 2423.5, Environmental testing - Part 2. Test methods - Test Ea and guidance. Shock

GB/T 2423.10, Environmental testing - Part 2. Test methods - Test Fc.

Vibration (sinusoidal)

GB/T 2423.21, Environmental testing - Part 2. Test methods - Test M. Low air pressure

GB/T 2423.22, Environmental testing - Part 2. Test methods - Test N.

Change of temperature

GB 4943.1-2011, Information technology equipment - Safety - Part 1. General requirements

GB/T 5169.5-2008, Fire hazard testing for electric and electronic products - Part 5. Test flames - Needle test method - Apparatus confirmatory arrangement and guidance

GB/T 5330-2003, Industrial woven metal wire cloth (square opening series)

GB/T 6005-2008, Test sieves - Metal wire cloth perforated metal plate and electroformed sheet - Nominal sizes of openings to constant voltage charging until the charging current is less than or equal to 0.02It; then, stop charging. The longest charging time shall not exceed 8 hours.

b) Charge at 1It at an ambient temperature of $20\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$. When the cell or battery terminal voltage reaches the limited charging voltage, change to constant voltage charging until the charging current is less than or equal to 0.02It. The longest charging time shall not exceed 4 hours.

When there is disagreement with the capacity test result, the test can be re-performed at the ambient temperature of $23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$, which is used as the arbitration condition.

Note. It represents the reference test current; its value is the same as the rated capacity (C), and the unit is ampere (A) or milliampere (mA).

4.5.2 Discharging procedure for the test The cell or battery is discharged to the end of discharge voltage at a constant current according to the current specified by the manufacturer.

4.6 Type test

4.6.1 Overview Unless otherwise specified, the tests specified in this Standard are type tests.

Unless otherwise specified, the tests are only carried out on products which are produced within one year.

4.6.2 Requirements for samples Unless otherwise specified, the tested samples shall be representative samples of the products which are going to be accepted by the customer, including a small batch of trial production samples or products that are ready to delivered to the customer.

If the test requires the introduction of wire load test or connection, unless otherwise specified, the total resistance generated by the introduction of wire test or connection shall be less than 20 mohm.

4.6.3 Pretreatment of samples The cell or battery is subjected to two charge-discharge cycles in accordance with the charge-discharge procedures specified in 4.5; it is left for 5 minutes between the charge-discharge cycles.

The identification and warning instructions on the battery body shall be clear and legible.

Any identifications and warning instructions on the battery body, which are required by this Standard, shall be durable and eye-catching. When considering its durability, the effect of normal use shall be taken into consideration.

Check and wipe the identification and warning instruction, to verify whether it is qualified. When wiping the identifications and warning instructions, use a cotton cloth that is dipped in water to wipe it by hand for 15 seconds; then, use a cotton cloth that is dipped in 75% medical alcohol to wipe it by hand for 15 seconds.

After the test, the identifications and warning instructions shall still be clear; the nameplate shall not be easily removed, and there shall be no curling.

6 Cell electrical safety test

6.1 High temperature external short circuit After fully charging the cell in accordance with the test method that is specified in 4.5.1, place it in an environment of $57\text{ }^{\circ}\text{C} \pm 4\text{ }^{\circ}\text{C}$; after the cell temperature reaches $57\text{ }^{\circ}\text{C} \pm 4\text{ }^{\circ}\text{C}$, place it for another 30 minutes. Then, use wires to connect the positive and negative terminals of the cell; ensure that all external resistances are not higher than 20 mohm. During the test, monitor the cell temperature change. In any of the following conditions, terminate the test.

- a) The cell temperature drop reaches 20% of the peak temperature rise;
- b) The short-circuit time reaches 24 hours.

The cell shall not have fire or explosion.

Note. The resistivity temperature coefficient of the wire is less than $5 \times 10^{-3} \text{ }^{\circ}\text{C}^{-1}$, such as constantan wire.

6.2 Overcharge After discharging the cell according to the test method that is specified in 4.5.2, use the maximum continuous charging current, which is specified by the manufacturer, to charge it to 4.8 V or a higher value specified by the manufacturer at room