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Lithium Ion Cells and Batteries Used in Stationary Electronic Equipment - Safety Technical Specification

固定式电子设备用锂离子电池和电池组 安全技术规范

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Lithium Ion Cells and Batteries Used in Stationary Electronic Equipment - Safety Technical Specification

1 Scope

This Standard specifies the safety requirements and test methods for lithium ion cells and battery packs used in stationary electronic equipment.

This Standard is applicable to lithium ion cells and battery packs used in stationary electronic equipment (hereinafter referred to as cells and battery packs). The stationary electronic equipment includes:

a) Stationary information technology equipment (IT equipment);

b) Stationary audio and video equipment (AV equipment) and similar equipment;

c) Stationary communication technology equipment (CT equipment);

d) Stationary measurement control and laboratory electronic equipment and similar equipment.

NOTE: the stationary electronic equipment listed above does not include all equipment, and hence, equipment not listed may also be included in the scope of this Standard.

This Standard is also applicable to uninterruptible power supply (UPS) and emergency power supply (EPS) that use lithium ion cells and battery packs.

2 Normative References

The following documents are indispensable to the application of this document. In terms of references with a specified date, only versions with a specified date are applicable to this document. In terms of references without a specified date, the latest version (including all the modifications) is applicable 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 for Electric and Electronic Products - Part 2: Test Methods - Test M: Low Air Pressure

GB/T 2423.22 Environmental Testing - Part 2: Test Methods - Test N: Change of

Battery / battery pack refers to an energy storage device electrically connected by one or multiple cells or modules.

NOTE 1: it may include protective and monitoring devices that provide information (for example, cell voltage) to the battery system.

NOTE 2: it may include protective covers provided by the terminal or other interconnection devices.

NOTE 3: definition 3.10 of IEC 62619:2017 is modified.

3.6 Battery System

Battery system refers to a system composed of one or multiple cells, modules or battery packs.

NOTE 1: it has a battery management system, and in case of overcharge, overcurrent, over-discharge and overheating, the battery management system will act.

NOTE 2: if the cell manufacturer and the user reach an agreement, the over-discharge cut-off is not mandatory.

NOTE 3: it may include cooling or heating devices, and some even contain charging and discharging modules, and inverter modules.

NOTE 4: in this Standard, the requirements for battery system are equivalent to the requirements for battery pack.

NOTE 5: definition 3.11 of IEC 62619:2017 is modified.

3.7 Large Lithium Ion Battery

Large lithium ion battery refers to lithium ion battery whose total mass exceeds 12 kg.

NOTE: this term is abbreviated as large battery in this Standard.

3.8 Battery Management System; BMS

Battery management system refers to an electronic system connected to the battery pack and can cut off the circuit in case of overcharge, overcurrent, over-discharge and overheating. It is used to monitor and (or) manage the state of the battery pack; calculate secondary data, report data and (or) control the environment, so as to affect the safety, performance and (or) service life of the battery pack. The functions of BMS may be allocated to the battery pack or equipment that use the battery pack.

NOTE 1: if the cell manufacturer and the user reach an agreement, the over-discharge cut-off is not mandatory.

NOTE 2: the functions of BMS may be on the battery pack, or on the equipment that use

3.12 Discharge Cut off Voltage

U_{do}

Discharge cut off volage refers to the minimum load voltage, at which, the cell or battery pack can be safely discharged, as specified by the manufacturer.

3.13 End of Discharge Voltage

U_{de}

End of discharge voltage refers to the load voltage, at which, the discharging behavior of the cell or battery pack is terminated during the cycle use as specified by the manufacturer.

3.14 Recommendation Charging Current

I_{cr}

Recommendation charging current refers to the constant-current charging current recommended by the manufacturer.

3.15 Maximum Continual Charging Current

I_{cm}

Maximum continual charging current refers to the maximum constant-current charging current specified by the manufacturer.

3.16 Recommendation Continual Discharging Current

I_{dr}

Recommendation continual discharging current refers to the continual discharging current recommended by the manufacturer.

3.17 Maximum Discharging Current

I_{dm}

Maximum discharging current refers to the maximum continual discharging current specified by the manufacturer.

3.18 Upper Limited Charging Temperature

T_{cm}

Upper limited charging temperature refers to the maximum ambient temperature specified by the manufacturer when the cell or battery pack is charged.

3.25 Type Test

Type test refers to the test carried out on a representative sample, and the purpose of which is to determine whether its design and manufacturing can comply with the requirements of this Standard.

[GB 31241-2014, Definition 3.27]

NOTE: unless it is otherwise specified, the tests specified in this Standard are all type tests.

4 Test Conditions

4.1 Applicability of Tests

The tests specified in this Standard are only carried out when safety is involved.

When the content of the Standard stipulates that a certain type of cell or battery pack is clearly not applicable to the product test due to the product's design, structural and functional constraints, it may be exempted from the test. If the cell or battery pack cannot be tested due to the product's design, structural or functional constraints, and this test must be carried out, relevant tests may be carried out on the cell or battery pack, together with the electronic equipment using the cell or battery pack, the charger attached to the electronic equipment or the components constituting part of the electronic equipment.

NOTE: stationary electronic equipment and its attached charger, or components constituting part of the electronic equipment come from the manufacturer of the cell or battery pack, or the manufacturer of the electronic equipment; the manufacturer shall provide operating instructions.

Unless it is otherwise specified, the samples after the test are not required to be normally used.

4.2 Environmental Conditions of Tests

Unless it is otherwise specified, the tests are generally carried out under the following conditions:

a) Temperature: 20 °C ± 5 °C;

b) Relative humidity: not greater than 75%;

c) Atmospheric pressure: 86 kPa ~ 106 kPa.

4.3 Parameter Measurement Tolerances

Relative to the specified values or actual values, the accuracy of all control values or

easily removed, and no curling shall appear.

5.4 Key Safety Components

5.4.1 Basic requirements

Under the circumstance where safety is involved, the components in the cells, modules and battery systems, such as: positive temperature coefficient thermistors (PTC) and thermal fuses, shall comply with the requirements of this Standard, or comply with the requirements of national standards and industrial standards related to components, or safety-related requirements in other specifications.

NOTE: only when a certain component clearly belongs to the national standards, industrial standards or other applicable scopes of a certain component based on its intended use, can the standards be considered relevant.

5.4.2 Evaluation and test of components

The evaluation and test of components shall be carried out in accordance with the following stipulations:

a) When a component has been confirmed to comply with a certain standard coordinated with the national standards, industrial standards or other specifications related to components, it shall be checked whether the component is correctly applied and used in accordance with its rated values. The component shall also withstand the relevant tests specified in this Standard as a constituent part of the equipment, but not the part of tests specified in the national standards, industrial standards or other specifications related to components.

b) When a component has not been confirmed as described above to comply with the relevant standards, it shall be checked whether the component is correctly applied and used in accordance with the specified rated values. The component shall also withstand the relevant tests specified in this Standard as a constituent part of the equipment. It shall also withstand the relevant tests specified in the standard of components in accordance with the conditions of actual existence in the equipment.

NOTE: in order to check whether the component complies with a certain standard of components, usually the relevant tests are separately carried out on the component.

c) If a certain component does not have corresponding national standards, industrial standards or other specifications, or the component is not used in the circuit in accordance with the specified rated values, then, the component shall be tested in accordance with the conditions of actual existence in the equipment. Generally speaking, the quantity of samples required for the tests

method. See 7.4 for the test method of large batteries.

After the test, in accordance with the charge and discharge method specified in 4.5, continue a discharge and charge cycle.

For large batteries, modules with monitoring circuits and their mechanical fixation frames may be selected for this test.

The sample shall not catch fire, explode or leak.

8.4 Drop

In accordance with the test method specified in 4.5.1, fully charge the sample. Then, in accordance with the mass of the sample and Table 5, choose to perform the drop test on the whole or edge and corner. See 7.5 for the test method.

For non-suspended large batteries, modules with monitoring circuits and their mechanical fixation frames may be selected for this test. In accordance with the most unfavorable drop height of the sample, let the sample fall onto the concrete slab with the largest plane facing downwards.

The sample shall not catch fire, explode or leak.

9 Functional Safety of Battery System

9.1 Requirements for Battery Management Unit / Battery Management System

The lithium ion battery system used for stationary electronic equipment shall be designed with battery management unit (BMU) or battery management system (BMS) to ensure that the cell and battery pack can work within the specified working range. BMU / BMS shall be able to detect and control the abnormal state of the voltage, temperature and current of the cell and battery pack.

9.2 Requirements for Test Sample

The test sample is a battery system, or a module with monitoring circuits, or a corresponding circuit.

The sample is tested in normal working conditions (only limited to test sample controlled by BMU / BMS, close the terminal contactor), except for 9.9, if the test sample has a thermal dissipation system, it shall be actuated.

9.3 Overvoltage Charge Control

In accordance with the test method specified in 4.5.2, complete the discharging of the cell. Use the maximum continual charging current of the recommended charger to

conforming to the protection strategy, it may also be determined as qualified, but when unrecoverable short circuit occurs, it cannot be determined as qualified.

9.4 Overcurrent Charge Control

In accordance with the test method specified in 4.5.2, complete the discharging of the sample. Then, charge it with a current exceeding 20% of the maximum continual charging current. Test the sample for 3 times. The data acquisition / monitoring equipment shall maintain for 1 h after the charging is completed. During the test, the various functions of the test sample shall be able to normally work completely in accordance with the design.

BMU / BMS shall detect overcurrent charging and control the charging current to below the maximum continual charging current.

During the test, when unrecoverable open circuit occurs in the protection system conforming to the protection strategy, it may also be determined as qualified, but when unrecoverable short circuit occurs, it cannot be determined as qualified.

9.5 Undervoltage Discharge Control

In accordance with the test method specified in 4.5.1, fully charge the sample. Then, through the maximum discharging current of the sample for electronic load, discharge it, until the discharging voltage of any cell in the sample is 10% lower than the discharge cut off voltage.

If it is difficult to use the entire sample for the test, a part of the sample may be selected for the test.

Discharge it, until BMU / BMS terminates the discharging. This action shall occur when or before the discharging voltage is lower than 90% of the discharge cut off voltage. Test the sample for 3 times. The data acquisition / monitoring equipment shall maintain for 1 h after the discharging is completed. During the test, the various functions of the test sample shall be able to normally work completely in accordance with the design.

BMU / BMS shall take action to cut off the discharging current.

During the test, when unrecoverable open circuit occurs in the protection system conforming to the protection strategy, it may also be determined as qualified, but when unrecoverable short circuit occurs, it cannot be determined as qualified.

9.6 Overload Control

In accordance with the test method specified in 4.5.1, fully charge the sample. Then, discharge it with a current exceeding 20% of the maximum discharging current. Test the sample for 3 times. The data acquisition / monitoring equipment shall maintain for 1 h after the discharging is completed. During the test, the various functions of the test

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