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Lithium-ion battery for electric mopeds and motorcycles

电动摩托车和电动轻便摩托车用锂离子电池

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Foreword

This document was drafted in accordance with the rules given in GB/T 1.1-2009 "Directives for standardization - Part 1: Rules for the structure and drafting of standards".

This is the first edition of the standard: it does not replace an earlier document.

The document was proposed by the Ministry of Industry and Information Technology of the People's Republic of China and is under the jurisdiction of the National Technical Committee of Auto Standardization (SAC/TC 114).

Drafting organizations: Shanghai Motor Vehicle Inspection Certification & Tech Innovation Center Co., Ltd.; Shanghai Edrive Co., Ltd.; Zhejiang CFMOTO Power Co., Ltd.; Zongshen Industrial Group Co., Ltd.; Shanghai Jinen Power System Co., Ltd.; Wuyang-Honda Motors (Guangzhou) Co., Ltd.; Jiangmen Dachangjiang Group Co., Ltd.; Hangzhou Tianfeng Power Co., Ltd.

Principal drafters: Xie Xianyu, Shen Jianping, Liu Zhiyong, Yuan Zhangping, Jin Minggang, Wu Hongjie, Gong Jun, Shu Guoyong, Tu Xuefeng.

1 Scope

This standard specifies the battery module models, the battery system requirements, the test methods, the identification, and the packaging, transportation and storage of lithium-ion batteries for electric motorcycles and electric mopeds.

It applies to the lithium-ion battery systems fitted to electric motorcycles and electric mopeds.

2 Normative references

The following documents are essential to the application of this document. For dated references, only the edition cited applies; for undated references, the latest edition (including all amendments) applies.

GB 2894-2008 Safety signs and guideline for the use · GB/T 2900.41 Electrotechnical terminology - Primary and secondary cells and batteries · GB/T 4208 Degrees of protection provided by enclosure (IP code) · GB/T 5013.1 Rubber insulated cables of rated voltages up to and including 450/750 V - Part 1: General requirements · GB/T 5023.1 Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V - Part 1: General requirements · GB/T 18384.1-2015 Electrically propelled road vehicles - Safety specifications - Part 1: On-board rechargeable energy storage system (REESS) · GB/T 18384.3-2015 Electrically propelled road vehicles - Safety specifications - Part 3: Protection of persons against electric shock · GB/T 18455-2010 Package recycling marking · GB/T 19596 Terminology of electric vehicles · GB/T 19666 Flame retardant and fire resistant wires and cables · GB 21966-2008 Safety of primary and secondary lithium cells and batteries during transport · GB/T 31467.3-2015 Lithium-ion traction battery pack and system for electric vehicles - Part 3: Safety requirements and test methods · GB/T 31485 Safety requirements and test methods for traction battery of electric vehicle · GB/T 31486 Electrical performance requirements and test methods for traction battery of electric vehicle · QC/T 413 Basic technical specifications for automotive electrical equipment · QC/T 417.2 Connections for on-board electrical wiring harnesses of road vehicles - Part 2 · QC/T 1067.1-2017 Connectors for automobile wiring harness and electrical equipment - Part 1: Definitions, test methods and general performance requirements · QC/T 1067.2-2017 Connectors for automobile wiring harness and electrical equipment - Part 2: Types and dimensions of plug terminals · QC/T 1067.3-2017 Connectors for automobile wiring harness and electrical equipment - Part 3: Types, dimensions and special requirements of ring terminals

3 Terms, definitions, symbols

The terms and definitions given in GB/T 2900.41 and GB/T 19596 apply, together with those set out below. For ease of use, a few of the terms defined in GB/T 19596 are repeated here.

3.1 Secondary cell - the basic device that converts chemical energy directly into electrical energy, made up of electrodes, separators, electrolyte, housing and terminals, and designed to be rechargeable.

3.2 Battery module - more than one cell connected in series, in parallel or in series-parallel, having a single pair of positive and negative output terminals and used as a power source.

3.3 Battery system - an energy storage device made up of one or more battery modules and their accessories: management system, high-voltage circuits, low-voltage circuits, thermal management equipment, mechanical assemblies and the like.

3.4 Explosion - violent rupture of the battery case, accompanied by a loud noise, with the main solid contents ejected.

3.5 Fire - any part of the battery continuing to burn for longer than 1 s. Sparks and arcs are not counted as combustion.

3.6 Leakage - liquid from inside the battery flowing or seeping out of the battery case.

4 Models of battery module

4.1 The specifications and models of the battery modules are given in Table 1. The model of a module shall be carried on its identification plate.

4.2 The model is written as a string of codes. 4.2.1 The lithium-ion battery module for electric motorcycles and electric mopeds is designated by the two capital letters EM. 4.2.2 The cathode material is designated by a single capital letter taken from Table 2; where the system is a multi-component mixture, the letter is that of the component present in the largest amount.

4.2.3 The size codes give the external dimensions and the specification series of the module. 4.2.3.1 The length code X2X3X4 is three digits from 0 to 9, an integer in millimetres, padded with leading zeros when the value does not reach the hundreds place.

4.2.4 The mass code X11X12X13 is three digits from 0 to 9, an integer in kilograms, zero-padded in the same way. 4.2.5 The energy code X14X15X16 is three digits from 0 to 9 in kilowatt-hours, with one figure after the decimal point, zero-padded. 4.2.6 The rated voltage code X17X18X19 is three digits from 0 to 9, an integer in volts, zero-padded.

4.3 Example of a battery module model: EMD439220080014021061.

5 Battery system requirements

5.1 General. The battery system shall provide information collection, information transmission and safety monitoring. It should have a thermal management system that keeps it working inside its normal operating temperature range. Appendix B shows a typical structure of the battery system.

5.2 Working environment. Working temperature $\geq 20\text{ }^{\circ}\text{C}$ to $60\text{ }^{\circ}\text{C}$; relative humidity 5 % to 95 %.

5.3 Electrical performance. 5.3.1 Tested according to 6.2.1, the discharge capacity at room temperature shall be not lower than the rated capacity and not higher than 110 % of the rated capacity, and the spread of initial capacity across all test samples shall not exceed 7 % of their average initial capacity. 5.3.2 The electrical performance of cells and modules shall meet GB/T 31486.

5.4 Environmental reliability. 5.4.1 Temperature shock, tested according to 6.3.1. 5.4.2 Damp heat cycling, tested according to 6.3.2, shall meet the requirements of 5.4.1 a) and 5.4.1 b). 5.4.3 After the salt spray test of 6.3.3 the system shall show no leakage, case rupture, fire, explosion or rust. 5.4.4 High altitude, tested according to 6.3.4, shall meet 5.4.1 a) and 5.4.1 b). 5.4.5 The shield or enclosure of the battery system shall meet 6.6 of GB/T 18384.3-2015, and its waterproof and dustproof performance shall reach IP57 of GB/T 4208.

5.5 Mechanical reliability. 5.5.1 Vibration resistance strength, tested according to 6.4.1. 5.5.2 Impact strength, tested according to 6.4.2, shall meet the requirements of 5.5.1 a), 5.4.1 a) and 5.4.1 b).

5.6 Safety. 5.6.1 When cells and modules are tested for safety according to 6.5.1, the results shall meet GB/T 31485.

5.7 Battery control unit (BCU).

5.8 Power circuit. 5.8.1 Fuse control: the battery system shall have a circuit fuse controller; the fast fuse shall break the arc reliably on DC interruption, with the casing intact and no arcing. 5.8.2 Power cable and installation.

5.9 Control wiring. 5.9.1 The wire harness material shall meet QC/T 413. 5.9.2 The wire harness shall meet QC/T 417.2, and its flame retardancy and fire resistance shall meet GB/T 19666. 5.9.3 Connectors for the low-voltage control lines and the acquisition lines shall meet QC/T 1067.1 to QC/T 1067.3; the structure of the control line connector and the pin definitions of the terminal interface are given in Appendix D.

6 Test methods

6.1 General test conditions. 6.1.1 Unless otherwise specified, tests are carried out at a temperature of $25\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$, a relative humidity of 15 % to 90 % and an atmospheric pressure of 86 kPa to 106 kPa. 6.1.2 Measuring instruments and meters shall meet the stated accuracy requirements. 6.1.3 Unless otherwise specified, the environmental reliability, mechanical reliability and safety tests are carried out with the battery system in the fully charged state defined by the manufacturer.

6.2 Electrical properties. 6.2.1 Discharge capacity at room temperature. 6.2.2 Standard