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General requirements for swappable battery pack of electric vehicles

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1 Scope

This Standard specifies the functional requirements, structural process requirements, technical parameter requirements, and transport and storage requirements for swappable battery pack of electric vehicles (hereinafter referred to as the battery pack).

This Standard is applicable to the battery pack that uses replacement mode such as bottom replacement, side replacement and end replacement.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

GB/T 2423.17, *Environmental testing for electric and electronic products - Part 2: Test method - Test Ka: Salt mist*

GB/T 2423.34, *Environmental testing - Part 2: Test methods - Test Z/AD: Composite temperature/humidity cyclic test*

GB 4208, *Degrees of protection provided by enclosure (IP code)*

GB/T 17626.2-2006, *Electromagnetic compatibility（EMC） - Testing and measurement techniques - Electrostatic discharge immunity test*

GB/T 17626.3-2006, *Electromagnetic compatibility - Testing and measurement techniques - Radiated radio-frequency electromagnetic field immunity test*

GB/T 17626.4-2008, *Electromagnetic compatibility - Testing and measurement techniques - Electrical fast transient/burst immunity test*

GB/T 17626.6-2008, *Electromagnetic compatibility - Testing and measurement techniques - Immunity to conducted disturbances induced by radio-frequency fields*

GB/T 17626.8-2008, *Electromagnetic compatibility (EMC) - Part 8: Testing and measurement techniques - Power frequency magnetic field immunity test*

GB/T 17626.10-1998, *Electromagnetic compatibility - Testing and measurement techniques - Damped oscillatory magnetic field immunity test*

GB/T 17626.12-2013, *Electromagnetic compatibility - Testing and measurement techniques - Ring wave immunity test*

GB/T 18384.3-2015, *Electrically propelled road vehicles - Safety specifications - Part 3: Protection of persons against electric shock*

GB/T 19596, *Terminology of electric vehicles*

GB/T 19666, *Flame retardant and fire resistant wires and cables*

GB/T 29317, *Terminology of electric vehicle charging/battery swap infrastructure*

GB/T 32879-2016, *General technical requirements for battery box connectors for replacement of electric vehicles*

QC/T 413-2002, *Basic Technical Requirements for Automotive Electric Equipment*

QC/T 417.1, *Road Vehicles - Connections for On-board Electrical Wiring Harnesses - Part 1: Definitions, Test Methods and General Performance Requirements (the Automobile Part)*

QC/T 743, *Lithium-ion batteries for electric vehicles*

QC/T 897-2011, *Technical specification of battery management system for electric vehicles*

3 Terms and definitions

For the purposes of this document, the terms and definitions defined in GB/T 19596 and GB/T 29317 and the followings apply.

3.1 swappable battery pack

a battery pack that is installed on the bottom, side, or end of an electric vehicle, consists of a number of individual batteries or battery modules, housings, electronic control units, and related electrical and mechanical accessories, and enables rapid replacement

3.2 lock mechanism

4.2.1 Group requirements

a) Group battery consistency shall meet the requirements of enterprise product standards.

b) Battery layout shall be conducive to ventilation and heat dissipation and easy installation and fastening.

4.2.2 Performance requirements

The battery shall meet the requirements of QC/T 743.

5 Functional requirements

5.1 Battery pack connector

The structure and performance of battery pack shall comply with GB/T 32879-2016 "General technical requirements for battery box connectors for replacement of electric vehicles".

5.2 Electro control unit

5.2.1 It shall have total voltage or current of battery pack, single or battery module voltage, battery temperature (not less than 4 detection points), and strong electrical contact temperature of battery pack connector and other data acquisition functions.

5.2.2 It shall have the function of charge and discharge parameter management of the battery pack.

5.2.3 It shall have CAN communication interface for data communication with vehicle controller or off-board charger.

5.2.4 It shall have the function of thermal management and control of the battery pack.

5.2.5 It shall have a balanced function of single battery or battery module.

5.3 Lock mechanism

5.3.1 The battery pack shall be fixed with a mechanical lock mechanism and have a function to prevent lock failure.

5.3.2 The lock mechanism shall be able to hold the battery pack on the bracket on three mutually perpendicular axes. Under the frequent vibration caused by the vehicle, there shall be no harmful relative displacement or obvious mechanical noise.

6.2 Non-electrical accessories

The non-electrical accessories of the battery pack, such as the battery pack skeleton, separators, heating materials, heat preservation materials, and bellows and ties for harness protection, shall be resistant to temperature, abrasion, water, corrosion, oxidation, flame retardant.

6.3 Wiring harness

6.3.1 The wiring harness shall be resistant to temperature, abrasion, water, corrosion, oxidation, flame retardant. Flame-retardant and fire-resistant performance shall comply with the provisions of GB/T 19666. Connector wire harness crimping and tensile force shall comply with QC/T 417.1.

6.3.2 The power line shall use low smoke, halogen-free stranded copper wire or flexible copper bar. The rated voltage shall not be lower than 750V, and the temperature resistance shall not be lower than 125°C. The harnesses shall be clearly marked and clearly distinguished with positive and negative.

6.3.3 If internal and external power wire terminal blocks for connecting internal modules of the battery pack and connecting the battery pack connector use crimping method, it shall be tin-impregnated.

6.3.4 The power lines and control lines shall be bundled independently. The wires shall be smooth. Measures shall be taken to prevent vibration and friction.

6.3.5 The control line shall be made of multi-strand wire, whose rated voltage shall not be less than 300V, and the temperature resistance shall not be lower than 200°C.

6.3.6 The communication line shall be shielded twisted pair, and the screen shall be grounded.

6.4 Technology

6.4.1 The positive and negative poles of the battery module shall be clearly marked and have corresponding protective measures.

6.4.2 The group of battery modules shall be conducive to heat dissipation and adopt a uniform arrangement for maintaining the thermal field.

6.4.3 The battery module shall be installed with measures to prevent vibration and scratches, and use a firm positioning and clamping device.

6.4.4 The installation of electro control unit shall be isolated from the battery module.

6.4.5 The mechanical and electrical connection points shall maintain sufficient

7.4.1 Oscillatory wave immunity

The battery pack shall be capable of withstanding the 1MHz and 100kHz oscillatory wave immunity tests of level 3 specified in Clause 5 in GB/T 17626.12-2013.

7.4.2 Electrostatic discharge immunity

The battery pack shall withstand the electrostatic discharge immunity test of level 3 specified in Clause 5 of GB/T 17626.2-2006.

7.4.3 RF electromagnetic radiation immunity

The battery pack shall be able to withstand the radio frequency electromagnetic field radiation immunity test of level 3 specified in Clause 5 of GB/T 17626.3-2006.

7.4.4 Electrical fast transient burst immunity

The battery pack shall be capable of withstanding the electrical fast transient burst immunity test of level 3 specified in Clause 5 of GB/T 17626.4-2008.

7.4.5 RF field induced conducted disturbance immunity

The battery pack shall be capable of withstanding the RF field induced conducted disturbance immunity test of level 3 specified in Clause 5 of GB/T 17626.6-2008.

7.4.6 Power frequency magnetic field immunity

The battery pack shall be capable of withstanding the power frequency magnetic field immunity test of level 4 specified in Clause 5 of GB/T 17626.8-2008.

7.4.7 Damped oscillating magnetic field immunity

The battery pack shall be capable of withstanding the damped oscillating magnetic field immunity test of level 4 specified in Clause 5 of GB/T 17626.10-1998.

8 Marks, transport and storage

8.1 Marks

In the obvious position of the battery pack, there shall be a safety warning mark and nameplate mark, which are clear, firm and reliable. The nameplate shall contain:

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