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**General requirements for swapping battery pack lock
mechanism of electric vehicle**

电动汽车快速更换电池箱锁止机构 通用技术要求

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Swapping battery pack lock mechanism of electric vehicle

1 Scope

This document specifies the general technical requirements, test methods, inspection rules, and requirements for marking, packaging, transportation, and storage of the swapping battery pack lock mechanism of electric vehicle.

This document applies to swapping battery pack lock mechanism of electric vehicle (referred to as lock mechanism).

2 Normative references

The following documents are normatively referenced in this document and are indispensable for its application. For dated references, only the version corresponding to that date is applicable to this document; for undated references, the latest version (including all amendments) is applicable to this document.

GB/T 191, Packaging - Pictorial marking for handling of goods

GB/T 10125, Corrosion tests in artificial atmospheres - Salt spray tests

GB/T 19596, Terminology of electric vehicles

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

GB/T 30512, Requirements for prohibited substances on automobiles

GB/T 31588.1-2015, Paints and varnishes - Determination of resistance to cyclic corrosion conditions - Part 1: Wet (salt fog)/ dry/ humidity

GB 38031-2020, Electric vehicles traction battery safety requirements

3 Terms and definitions

Terms and definitions determined by GB/T 19596 and GB/T 29317, as well as the following, are applicable to this document.

3.1 Lock mechanism

A mechanism that secures the battery pack to the battery pack frame or the electric vehicle.

4 Classification

The battery pack lock mechanism – which can be divided into thread, lock pin, rotation, flip, top-pressure, staggered teeth, plug pin, push-pull, etc. – are used to fix the battery pack and the vehicle body. For examples of lock mechanisms, see Appendix A; for the performance and test of the thread lock mechanism, see Appendix B.

5 Functional requirements

Basic function of the lock mechanism include:

- a) Realize the reliable connection between the electric vehicle battery pack and the vehicle body and meet the needs of swapping battery; at the same time, it shall enable fastening and separation the vehicle body and the battery pack by manual methods.
- b) The lock mechanism shall be able to securely fix the battery pack on the vehicle body, without generating relative displacement or mechanical noise under the frequent vibration caused by vehicle running.

6 General technical requirements

6.1 Environmental conditions

The operating environment of the lock mechanism shall meet the following requirements:

- a) Ambient temperature: $-40\text{ }^{\circ}\text{C} \sim 85\text{ }^{\circ}\text{C}$.
- b) Relative humidity: daily average maximum 95%, monthly average maximum 90%.

6.2 Guiding and floating

The lock mechanism should have the function of guiding and floating.

6.3 Service life

Under normal operation, after 3 000 times of swapping battery pack, the function shall not fail.

6.4 Resistance to temperature shock

The lock mechanism shall be such that, after the temperature shock test, the appearance shall not be deformed or cracked.

7.3 Resistance to temperature shock

The temperature shock test shall be performed according to 8.2.8 in GB 38031-2020.

7.4 Resistance to damp and hot cycle

The damp and hot cycle test shall be performed according to 8.2.5 in GB 38031-2020.

7.5 Vibration

The vibration test shall be performed according to 8.2.1 in GB 38031-2020.

7.6 Mechanical shock

The mechanical shock test shall be performed according to 8.2.2 in GB 38031-2020.

7.7 Resistance to neutral salt spray

The neutral salt spray test shall be performed according to GB/T 10125.

7.8 Resistance to comprehensive cyclic corrosion

The test of comprehensive cyclic corrosion conditions shall be carried out according to cycle B in GB/T 31588.1-2015.

7.9 Prohibited substances

The test of prohibited substances shall be carried out according to the requirements of GB/T 30512.

8 Inspection rules

8.1 Testing of products

Product testing is divided into type inspection and ex-factory inspection.

8.2 Type inspection

In any of the following cases of the lock mechanism, the manufacturer shall carry out a type inspection:

- a) during the ex-situ production of old products or trial-type identification of new products.
- b) after the official production, if the structure, material and process are greatly changed, which may affect the performance of the product.

items in the re-inspection, judge this batch of products as unqualified. The type inspection shall comply with the technical regulations of the product. If all the items are qualified, judge the products as qualified; if any item is unqualified, judge the product as unqualified.

9 Marking, packaging, transportation and storage

9.1 Marking

The marking shall be clear, conspicuous, firm and reliable. Contents include:

- a) name and trademark of the manufacturer.
- b) product model and name.
- c) product specifications and parameters.
- d) the year and month of product manufacture.
- e) number or serial number of the product.

9.2 Packaging

The packaging shall comply with the provisions of GB/T 191.

9.3 Transportation

During transportation, the products shall not be subject to severe mechanical impact, exposure to the sun or rain. During the loading and unloading process, the products shall be handled with care, and throwing and heavy pressure are strictly prohibited.

9.4 Storage

The products shall be stored in a dry, clean, and well-ventilated room where the surrounding air does not contain acidic or other corrosive and explosive substances. They shall not be exposed to direct sunlight, and the distance from the heat source shall not be less than 2 m; they shall not be under heavy pressure. During storage, they shall not be exposed to rain, sun, condensation and frost.

Appendix B

(Informative)

Performance and test of swapping battery pack thread lock mechanism of electric vehicle

B.1 Technical requirements for thread lock

B.1.1 Mechanical and physical properties of bolts

The mechanical and physical properties of the bolts at room temperature shall meet the requirements of Table 3 ~ Table 7 in GB/T 3098.1-2010.

B.1.2 Mechanical properties of nuts

The mechanical properties of nuts at room temperature shall meet the requirements of Table 4 ~ Table 7 in GB/T 3098.2-2015.

B.1.3 Surface treatment

Surface treatment shall meet the requirements of GB/T 5267.2.

B.1.4 Thread accuracy grade

It is recommended to use ordinary threads, and the thread fit accuracy shall be in accordance with the requirements of Chapter 8 in GB/T 197-2018.

The tolerance accuracy grade of the thread is medium tolerance accuracy, and it is recommended to use 6H/6g or 6H/6h fit after coating.

B.2 Test method of thread lock

B.2.1 Mechanical and physical properties of bolts

The mechanical and physical property tests of bolts shall be carried out in accordance with the requirements of Chapter 9 of GB/T 3098.1-2010.

B.2.2 Mechanical properties of nuts

The mechanical property test of nuts shall be carried out in accordance with the requirements of Chapter 9 of GB/T 3098.2-2015.

B.2.3 Surface treatment

Surface treatment shall be carried out according to the requirements of GB/T 5267.2.

B.2.4 Thread accuracy grade

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