

ICS 43.120
CCS T35



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

GB/T 37133-2025

High voltage connection systems for electric vehicles

电动汽车用高压连接系统

Issued on: February 28, 2025

Implemented on: February 28, 2025

**Issued by: State Administration for Market Regulation;
Standardization Administration of the PRC**

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1 Scope

China's national standard for the high voltage connection systems of electric vehicles. It specifies the terms and definitions, the general requirements, the technical requirements, the test methods and the inspection rules. The high voltage system is the orange-sheathed cabling and connectors that run between the battery, the inverter, the motor, the charger and the heating and air conditioning compressor, at four hundred or eight hundred volts direct current. Everything about it is unlike the twelve volt wiring alongside it. The voltage is lethal on contact, so every connector must be touch-proof and must disconnect its power before the contacts separate, through an interlock loop that the vehicle monitors continuously. The currents are hundreds of amperes, so contact resistance is a heating problem rather than a voltage drop one. And the whole assembly is subject to a vehicle's vibration, temperature range and moisture for fifteen years, during which nobody will inspect it.

This document specifies the requirements, test methods, inspection rules for high-voltage connection systems for electric vehicles. This document applies to connection systems for electric vehicles that meet the B-level voltage circuit specified in GB 18384-2020. The part in the connection system to conduct A-level voltage circuit makes reference to this document. This document does not apply to the conductive charging connection device of electric vehicles. This document does not apply to the battery swap interface.

2 Normative references

The contents of the following documents constitute the essential terms of this document through normative references in the text. Among them, for the referenced documents with dates, only the versions corresponding to the dates are applicable to this document; for the referenced documents without dates, the latest versions (including all amendments) are applicable to this document.

GB/T 2423.8 Environmental testing for electric and electronic products - Part

3 Terms and definitions

The terms and definitions as defined in GB 18384-2020, GB/T 19596, GB/T 43332-2023, as well as the following terms and definitions, apply to this document.

3.1 High voltage connector A component consisting of one or more sets of conductor terminals and insulating sheaths, that provide electrical connection and separation functions between high voltage cables of electric vehicles and between high voltage cables and high voltage components.

3.2 High voltage connection system A connection device composed of high voltage cables, high voltage connectors and/or other conductor components that conducts Class B voltage between high voltage components of electric vehicles.

3.3 Flexible copper busbar A conductor busbar made of flexible copper busbar.

4.1 Appearance

4.1.1 The appearance of the high-voltage connection system shall be clearly and firmly marked with basic product information.

4.1.2 The marking of the high-voltage connection system shall comply with the provisions of 5.1.2 of GB 18384-2020.

4.1.3 The easily accessible surfaces of the high-voltage connection system shall be free of burrs, flash, similar sharp edges.

4.1.4 The high-voltage connection system shall be free of defects such as damage and deformation.

4.2 Structure

4.2.1 When normally connected, the protection level of the high-voltage connection system shall meet IPXXD. If the high-voltage connection system can be manually disconnected without tools, the protection level of each part of the high-voltage connection system in the non-connected state shall meet IPXXB.

4.2.2 For high-voltage connection systems with high-voltage interlocking function, the power and signal/control contacts of the system shall meet the following requirements.

4.2.3 There shall be no connection defects such as loosening and breaking in the cable crimping, threaded connection, welding and other connection positions of the high-voltage connection system.

4.2.4 If the high-voltage connection system has a shielding layer, the connection system shall have a groundable structure.

4.2.5 After the connectors of the high-voltage connection system are fully connected,

4.3.1 The temperature of the working environment of the high-voltage connection

4.4 Components in the system In the high-voltage connection system, the requirements of the high-voltage connector part shall meet Appendix A; the requirements of the high-voltage cable part shall meet Appendix B; the requirements of the soft copper busbar can refer to Appendix C. The installation dimensions of the typical connector fixed end can refer to Appendix D; the typical connector interface structure dimensions can refer to Appendix E.

5 Technical requirements

5.1 Withstand voltage The insulation resistance between the conductors of different circuits of the high-voltage connection system, between the conductors and the shell, between the conductors and the shielding layer, between the shielding layer and the shell shall be able to withstand the specified voltage without dielectric breakdown or arcing. Unless otherwise specified, the leakage current during the test shall meet the requirements of

5.2 Insulation resistance The insulation resistance between the conductors of different circuits of the high-voltage connection system, between the conductors and the shell, between the conductors and the shielding layer, between the shielding layer and the shell shall not be less than 100 MΩ.

5.3 Insulation coordination The insulation coordination of the high-voltage connection system shall comply with the requirements of Table 3.

5.4 Current carrying capacity The current carrying capacity of the current-carrying components in the high-voltage connection system shall be tested; the current carrying

capacity curve can be used as a reference for product selection.

5.5 Temperature rise Unless otherwise specified, the temperature rise of each point of the high-voltage connection system shall not be greater than 55 K, when the high-voltage connection system is in normal connection operation.

5.6 Short-term low-current overload The current carrying capacity of the high-voltage connection system shall be able to withstand a test of 2 times the rated current for 30 seconds. After the test, the high-voltage connection system shall meet the requirements of 5.1, 5.2, 5.5.

5.7 Instantaneous high-current overload The high-voltage connection system shall be able to withstand a shock test at 10-times rated current for 1 s. After the test, the high-voltage connection system shall meet the requirements of 5.1, 5.2, 5.5.

5.8 Protection level After the high-voltage connection system is connected, the protection level of each connection part of the system shall meet the requirements of Table 4.

5.9 Low-temperature storage The high-voltage connection system shall be tested for low-temperature storage according to the lower temperature limit specified in 4.3.1. After the test, the high-voltage connection system shall meet the requirements of 5.1, 5.2, 5.8.

5.10 High-temperature storage The high-voltage connection system shall be tested for high-temperature storage according to the upper temperature limit specified in 4.3.1. After the test, the high-voltage connection system shall meet the requirements of 5.1, 5.2, 5.8.

5.11 Salt spray resistance Unless otherwise specified, the high-voltage connection system shall be subjected to a salt spray resistance test with a test period of 96 h. After the test, the high-voltage connection system shall meet the requirements of 5.1, 5.2, 5.8.

5.12 Chemical reagent resistance The high-voltage connection system shall be subjected to a chemical reagent resistance test. After the test, the high-voltage connection system shall meet the requirements of 5.1, 5.2, 5.8.

5.13 Vibration The high-voltage connection system shall be subjected to a random vibration test; the severity limit of random vibration and the test duration shall comply with the provisions of ISO 16750-3:2023. During the test, the circuit continuity of the high-voltage connection system shall be monitored; there shall be no momentary interruption with a duration greater than 1 μ s and a resistance greater than 7 Ω .

5.14 High-temperature durability The high-voltage connection system shall be subjected to high-temperature durability test; the test method shall be in accordance with the provisions of 6.16. After the test, the high-voltage connection system shall meet the requirements of 5.1, 5.2, 5.5, 5.8. The insulation resistance of the product shall be tested under high temperature conditions; the insulation resistance shall not be less than 10 M Ω .