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QC/T 1023-2015

General requirement of traction battery system for electric vehicles

电动汽车用动力蓄电池系统通用要求

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Annex:

13 automotive industry standard numbers, standard names and date of implementation

No.	Standard No.	Standard name	Standard No. substituted	Date of implementation
649	QC/T 1014-2015	The starting motor commutator for Automobile and motorcycle		March 1, 2016
650	QC/T 1015-2015	Automotive air conditioner controller		March 1, 2016
651	QC/T 501-2015	Automotive Signal Flasher	QC/T 501-1999	March 1, 2016
652	QC/T 1016-2015	Door trim panel assembly for passenger cars		March 1, 2016
653	QC/T 1017-2015	Headlamp cleaning nozzle assembly		March 1, 2016
654	QC/T 1018-2015	Step Plate for Automotive		March 1, 2016
655	QC/T 1019-2015	Performance requirements and bench test methods of automobile gear shifting control device		March 1, 2016
656	QC/T 1020-2015	Test methods for constant velocity universal joint and assemblies for Automobiles		March 1, 2016
657	QC/T 1021-2015	Performance requirements and bench test methods of ball stud assy of automotive suspension		March 1, 2016
658	QC/T 648-2015	Performance requirements and bench test methods of automotive steering tie rod assy	QC/T 304-1999 QC/T 648-2000 QC/T 650-2000	March 1, 2016
659	QC/T 1022-2015	Technical specification for reduction gearbox of battery electric passenger cars		March 1, 2016
660	QC/T 1023-2015	General Requirement of Traction Battery System for Electric Vehicles		March 1, 2016
661	QC/T 1024-2015	One-part polyurethane sealant for automobiles		March 1, 2016

General requirement of traction battery system for electric vehicles

1 Scope

This standard specifies the general requirements of traction battery system for electric vehicles.

This standard is applicable to traction battery systems for electric vehicles.

2 Normative references

The following documents are essential to the application of this document. For the dated documents, only the versions with the dates indicated are applicable to this document; for the undated documents, only the latest version (including all the amendments) are applicable to this Standard.

GB 2893 Safety colors

GB 2894-2008 Safety signs and guideline for the use

GB 4208-2008 Degrees of protection provided by enclosure (IP code)

GB 21966 Safety of primary and secondary lithium cells and batteries during transport

GB/T 2423.1-2008 Environmental testing for electric and electronic products - Part 2: Test methods - Test A: Cold

GB/T 2423.2-2008 Environmental testing for electric and electronic products - Part 2: Test methods - Test B: Dry heat

GB/T 2423.3-2006 Environmental testing for electric and electronic products - Part 2: Test methods - Test Cab: Damp heat steady state

GB/T 2423.5-1995 Environmental testing for electric and electronic products - Part 2: Test methods - Test Ea and guidance: Shock

GB/T 2423.10-2008 Environmental testing for electric and electronic products - Part 2: Test methods - Test Fc: Vibration (sinusoidal)

GB/T 2423.17-2008 Environmental testing for electric and electronic products - Part 2: Test methods - Test Ka: salt mist

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 450/7 50 V - Part 1: General requirements

GB/T 18384.1-2001 Electric vehicles - Safety specification - Part 1: On-board energy storage

GB/T 18384.2-2001 Electric vehicles - Safety specification - Part 2: Functional means and protection against failure

GB/T 18384.3-2001 Electric vehicles - Safety specification - Part 3: Protection of persons against electric hazards

GB/T 18455-2010 Package recycling marking

GB/T 18487.1-2001 Electric vehicle conductive charging system – Part 1: General requirements

GB/T 19596 Terminology of electric vehicles

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

GB/T 20234.1 Connection set for conductive charging of electric vehicles – Part 1: General requirements

GB/T 20234.2 Connection set for conductive charging of electric vehicles – Part 2: AC charging coupler

GB/T 20234.3 Connection set for conductive charging of electric vehicles – Part 3: DC charging coupler

GB/T 27930 Communication protocols between off-board conductive charger and battery management system for electric vehicle

GB/T 31467.3 - 2015 Lithium-ion battery pack and system for electric vehicles - Part 3: Safety requirements and test methods

GB/T 31486-2015 Technical requirements and test methods for traction battery of electric vehicle electrical performance

QC/T 413 Basic technical requirements for automotive electric equipment

QC/T 417.1 Road vehicles – Connection for on-board electrical wiring harnesses – Part 1: Definitions, test methods and general performance requirements (the automobile part)

QC/T 417.3 Road vehicles – Connection for on-board electrical wiring harnesses – Part 3: Tabs for single-pole connections – Dimensions and specific requirements

5.4.6.1 It shall maintain the uniformity of the internal temperature field of the traction battery system. When the traction battery system is tested in accordance with 8.5.4, the temperature difference of the internal temperature field in the traction battery pack shall not exceed 5 °C.

5.4.6.2 If the traction battery system consists of multiple traction battery packs, during the layout of the traction battery packs in the vehicle, it shall consider the consistency of the ambient temperature, AND it is preferable for the temperature difference between different traction battery packs to be within the range of 8 °C.

5.5 Safety requirements

5.5.1 IP protection degree.

After the tests of 8.6.1.1 and 8.6.1.2, the protection degree of the traction battery system not be lower than IP55.

5.5.2 Electrical insulation performance.

The electrical insulation performance of the traction battery system shall comply with the calculation requirements of 6.1 in GB/T 18384.1-2001 AND the performance requirements of 6.2 in GB/T 18384.3-2001.

5.5.3 High voltage power-off protection.

The traction battery system having a voltage higher than 60 V shall have an automatic power-off device, AND it is preferable to have a manual power-off device.

5.5.4 Overcurrent protection.

When the output current of the traction battery system rises up to the set overcurrent value, it shall limit the discharge power of the battery system OR otherwise require the vehicle control ECU to perform power limit, AND meanwhile it is preferable for the battery system to be able to output alarm signal.

5.5.5 Overtemperature protection.

When the traction battery system temperature reaches up to the overtemperature protection value, it shall limit the discharge power of the battery system OR otherwise require the vehicle control ECU to perform power limit, AND meanwhile it is preferable for the battery system to be able to output alarm signal.

5.5.6 Shielding/enclosure.

The shielding and enclosure of the traction battery system shall comply with the requirements of 6.3 in GB/T 18384.3-2001.

5.7.3.2 Basic information parameter data records.

Basic information parameter record is the recording file of the basic information parameters of the traction battery and the electric vehicle. This includes important data on charger initialization and charging process control.

5.7.3.3 Data format and data operation.

The traction battery system data recording format and data operation shall comply with the requirements of GB/T 27930.

5.8 Power line requirements

5.8.1 Safety control.

5.8.1.1 The traction battery system shall have safety control function, to prevent system safety incidents.

5.8.1.2 The fast fuse shall, if applied to DC breaking, be able to break arc reliably, its enclosure shall be intact, AND there shall be not arc discharge.

5.8.2 Power lines and installation.

5.8.2.1 In accordance with the maximum current value limit of the traction battery system, SELECT the power line conductor and busbar; the current carrying area of the power line shall comply with the maximum current requirements of the vehicles in use, AND the power line shall comply with requirements of GB/T 5013.1 and GB/T 5023.1.

5.8.2.2 The flame retardant and fire resistance performances of the power line shall comply with the requirements of GB/T 19666.

5.8.2.3 The installation and binding shall ensure that the power line is not loosening AND it has the anti-vibration function, to ensure reliable power transmission.

5.8.3 Power line connector.

5.8.3.1 The power line connector shall have a reliable power transmission capacity.

5.8.3.2 The contact resistance shall comply with the requirements of 6.4.2 of GB/T 18384.3-2001.

5.8.3.3 The power line connector shall work normally in the range of - 40 °C ~ 80 °C.

5.8.3.4 As for the plug-in type power line connector, the insertion force of a single connector shall be not less than 50 N.

b) As for the location having audio and visual indications, it shall use the transparent or acoustic transmission material, so that the observer can clearly perceive the prompt signal.

6.3.2 Sensing elements.

As for the installation of the total current, total voltage and module voltage, temperature and other sensor components, if they cannot be integrated into the corresponding box, it shall take reliable protective measures AND comply with the requirements of 6.3 in GB/T 18384.3-2001.

6.3.3 Acquisition circuit layout.

The wiring harness shall be securely secured, the alignment shall be smooth and reliable, AND it shall be reliably isolated from other circuits.

7 Component interface of traction battery system

7.1 Component requirements

Traction battery charging interface shall comply with the requirements of GB/T 20234.1, GB/T 20234.2 and GB/T 20234.3.

7.2 Mechanical interface

Mechanical interface shall be accurately positioned and reliably fixed; it is preferable to design it into asymmetric structure; AND it shall comply with the accurate interface joint and mis-installation prevention requirements.

7.3 High power electrical interface

High power electrical interface shall have anti-corrosion function, and has anti-loose measures, AND it shall comply with the reliable power transmission requirements in the process of use.

7.4 Monitoring and control interface

Monitoring and control interface shall be accurately positioned and reliably fixed; it is preferable to design it into asymmetric structure; AND it shall comply with the accurate interface joint and mis-installation prevention requirements.

7.5 Thermal management and interface

The control interface of the management module for the ventilation, heating, cooling and other electrical components shall comply with the requirements of GB/T 897.

8 Test methods

8.1 Test conditions

temperature rise regulation period" in GB/T 2423.2-2008. In this test, the high temperature test temperature is taken as 55 °C; AND the test duration is 16 h.

8.3.2 Low temperature test.

Low temperature work test shall be conducted in accordance with the requirements that "Test Ad: low temperature test of temperature gradual change of heat-dissipating sample – The test sample is energized after the temperature starts stabilizing" in GB/T 2423.1-2008. In this test, the low temperature test temperature is taken as - 20 °C; AND the test duration is 24 h.

8.3.3 Constant damp heat test.

PLACE the traction battery system under test in a constant damp heat test chamber. CONDUCT the test in accordance with the method specified in GB/T 2423.3-2006. After the test is continuously conducted at the temperature of 40 °C ± 2 °C and a relative humidity of (93 ± 3)% for 48 hours, PLACE the traction battery system in the environmental conditions as specified in 8.1.1 of 2 h.

8.4 Mechanical strength test

8.4.1 Vibration test.

With reference to the installation position of the tested device in the vehicle, FIX the traction battery system onto the vibration test bench surface; MAKE the locking device in the locked state. CONDUCT vibration test along three directions; the test is started from axis Z, then axis Y, AND finally axis Z. The vibration frequency range is 10 Hz ~ 55 Hz, the maximum acceleration is 30 m/s^2, CONDUCT 10 sweep cycles respectively along the three vertical axis; AND the sweep rate is 1 oct/min.

8.4.2 Impact test.

FIX the traction battery system on the bench surface of the impact test machine. The locking device is in the locked state. In the test, the impulse pulse is a half-sinusoidal pulse waveform, the peak acceleration is 150 m/s^2, AND the duration is 11 ms.

8.4.3 Locking function test.

After the traction battery system is subjected to vibration, shock and drop test, CHECK the locking device.

8.5 Electrical performance test

8.5.1 Traction battery system energy (kW • h) test.

CHARGE the traction battery system in accordance with the requirements of 8.2. CONNECT the traction battery system to the discharge device; at 25 °C ± 5 °C, MAKE the traction battery system discharge at the current of 1 I_3 (A);

current of 0.1 I_3 for 1 h; after charging, LET it stand for 1 h (or the standing time not more than 1 h as required by the enterprise).

- Discharge process: CONNECT the traction battery pack with the discharge device; MAKE discharge at the constant current of 1 I_3 (A) (or the maximum discharge current of not more than I_3 as allowed by the battery management system); STOP discharge until the unit voltage of the battery reaches the discharge termination voltage as specified by the manufacturer; LET it stand for 1 h.

Record the temperature of each collection points in the entire charge and discharge process; CALCULATE the difference between the maximum temperature and the minimum temperature at each time point.

8.6 Safety test

8.6.1 IP protection test.

8.6.1.1 Dustproof test.

In accordance with the methods as specified in 13.4 and 13.5 of GB 4208-2008, CONDUCT the dustproof test of the battery pack; if the battery pack uses other protective enclosures outside, the battery pack and its protective enclosure shall be tested together.

8.6.1.2 Waterproof test.

In accordance with the method specified in Chapter 14 of GB 4208-2008, CONDUCT the waterproof test of the battery pack. If the battery pack uses other protective enclosures outside, the battery pack and its protective enclosure shall be tested together.

8.6.2 Electrical insulation test.

The connections, terminals, electrical contacts, etc. in the traction battery system shall be subjected to insulation treatment. They shall comply with the requirements of the chapter 6 in GB/T 18384.3-2001. The equipment shall follow the category II requirements. In accordance with the test voltage level as specified in Table 3, USE the megger (or other instrument with the same function and accuracy level) to measure the insulation resistance between the positive or negative pole and the metal enclosure.

8.6.3 Overcurrent protection test.

The test is conducted in accordance with the test method in GB/T 31467.3-2015.

8.6.4 Overtemperature protection test.

8.6.4.1 The traction battery system shall be charged in accordance with the requirements of 8.2.

10.1.2 In the course of transport, it shall prevent severe vibration, shock, sun, and rain, AND it is required to equip the fire extinguishing equipment such as the carbon dioxide fire extinguishers which can put out category E fire.

10.1.3 During transport, it shall protect the electrical interface, AND avoid it from collision or falling; AND it may follow the “cap” requirements in GB/T 20234.1-2015.

10.1.4 The transport of traction battery packs containing lithium-ion batteries shall comply with the requirements of GB 21966.

10.1.5 The transport of traction battery packs containing metal hydride batteries shall comply with the requirements of 8.2 of QC/T 744-2006.

10.1.6 The transport of traction battery packs containing lead-acid batteries shall comply with the requirements of 8.3 in QC/T 742-2008.

10.1.7 The transport of the battery packs containing zinc-air battery shall comply with the requirements of QC/T 990.

10.2 Storage

10.2.1 It is preferable to store the traction battery system at the temperature of 5 °C ~ 40 °C in ventilated, clean, and dry indoor. It shall avoid direct sun exposure, AND the distance to the heat source shall be not less than 2 m.

10.2.2 During the storage of the traction battery system, the remaining charge shall be not less than 40% or the manufacturer's recommended value.

10.2.3 The traction battery system shall not be inverted or horizontally laid, AND shall avoid mechanical shock or heavy pressure.

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