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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

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Safety Requirements of Conductive Charging and Discharging for Electric Vehicles
电动汽车传导充放电安全要求

(*ISO 17409: 2020, Electrically propelled road vehicles-Conductive power transfer-Safety requirements, MOD*)

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FOREWORD

This document is drafted in accordance with the rules given in GB/T 1.1-2020 "*Directives for standardization - Part 1: Rules for the structure and drafting of standardizing documents*".

This document is modified in relation to ISO 17409: 2020 "*Electrically propelled road vehicles - Conductive power transfer – Safety requirements*".

With respect to ISO 17409: 2020, major structural adjustments have been made to this document, and a list of the clauses in this document and the equivalent clauses in ISO 17409: 2020 is given in Annex A.

The technical deviations between this document and ISO 17409: 2020, together with their justifications, are described as below:

— Modified the scope of this document (See Clause 1 vs. Clause 1 of ISO 17409: 2020), i.e., this document is applicable to the electric vehicles using voltage class B electric circuit conforming to our domestic charging coupler standards, so as to adapt to the practical situations of charging system in China;

— Added the normative reference to GB/T 1002 and GB/T 2099.1 (See Clause 1 and 4.1), so as to adapt to the practical situations of charging system in China;

— Added GB/T 19596 (See Clause 3) in the normative references, so as to meet the technical requirements for EVs in China;

— Deleted the information concerning the automatic connection to charging device (See 3.61, 6.2, 6.3, 6.5, 7.1, 7.2, 7.4, 10.1, 10.2, 13.2, 13.3 and 13.4 of ISO 17409: 2020), so as to adapt to the practical situations of charging system in China;

— Modified the normative reference for general requirements for charging connection set, i.e., replacing IEC 62196-1 with GB/T 20234.1 (See 4.1, 4.2 and 11.3 vs. 5.1 and 5.2 of ISO 17409:2020), so as to meet our domestic technical conditions;

— Modified the normative reference for AC charging coupler, i.e., replacing IEC 62196-2 with GB/T 20234.2 (See 4.1, 4.2, 5.2 and 9.1 vs. 5.1 of ISO 17409:2020), so as to meet our domestic technical conditions;

— Modified the normative reference for DC charging coupler, i.e., replacing IEC 62196-3:2015 with GB/T 20234.3 (See 4.2, 5.2, 9.1 and 13.8 vs. 5.2, 6.4.2, 7.2.4, 9.9, 13.7 and 13.8 of ISO 17409: 2020), so as to meet our domestic technical conditions;

— Deleted the normative reference to IEC/TS 62196-3-1 for DC charging connection set with thermal management system (See 5.2, 7.1, 9.7 and 13.7 of ISO 17409:2020), so as to meet our domestic technical conditions;

— Modified the normative reference for electric vehicles safety requirements, i.e., replacing ISO 6469-3 with GB 18384 (See 5.1, 5.4.2, 8.1, 11.2, 12.2 and 13.3.2 vs. 6.1, 6.4.2, 6.5.1, 9.1, 10.3.3, 12.2, 13.3, and 13.4 of ISO 17409:2020), so as to meet our domestic technical conditions;

— Modified the normative reference for requirements for degrees of equipment protection, i.e., replacing ISO 20653 with GB/T 30038 (See 5.2, 5.5 and 11.2 vs. 6.2 and 6.5 of ISO 17409:2020), so as to meet our domestic technical conditions and improve operability;

— Modified the normative reference for design requirements for cross-sectional area of productive conductor, i.e., replacing IEC 60364-5-54 with GB/T 16895.3 (See 5.3.4 vs. 6.3 of ISO 17409:2020), so as to meet our domestic technical conditions;

— Modified the normative reference for test probe for enclosure protection, i.e., replacing IEC 61032 with GB/T 16842 (See 5.5.1 vs. 6.5.1 of ISO 17409:2020), so as to meet our domestic technical conditions;

— Modified the normative reference for insulation coordination, i.e., replacing IEC 60664-1 with GB/T 16935.1 (See 5.6.1 and 13.4.4 vs. 6.6.1 and 13.4.2 of ISO 17409:2020), so as to meet our domestic technical conditions;

- Modified the normative reference for charging system, i.e., replacing IEC 61851-1:2017 with GB/T 18487.1-2023 (See 5.8 and 7.2.1 vs. 6.8, 8.2.1, 9.2, 9.5, 10.2.2.4 and 13.6.1 of ISO 17409:2020), so as to meet our domestic technical conditions;
- Modified the normative reference for overcurrent protection requirements, i.e., replacing IEC 60364-4-43:2008 with GB/T 16895.5-2012 (See 6.2.3.1 and 6.2.4.1 vs. 7.2.3 and 7.2.4 of ISO 17409:2020), so as to meet our domestic technical conditions;
- Deleted the normative reference to IEC 61851-23 for DC charging system (See 7.2.4.1, 7.5, 9.3, 9.5, 9.8, 10.3.1, 10.3.4 and 13.6.1 of ISO 17409:2020), so as to adapt to the practical situations of charging system in China;
- Added the I^2t value applicable to our domestic charging system (See 6.2.4.1 and 6.2.4.2.1 vs. 7.2.4.1 and 7.2.4.2 of ISO 17409:2020), so as to adapt to the practical situations of charging system in China;
- Deleted the normative reference to IEC 60038 for standard voltage (See 8.1 and 10.2.2.1 of ISO 17409:2020), so as to adapt to the voltage class in China;
- Deleted the normative reference to ISO 15118 (all parts) for communication protocol (See 8.2.1 and 8.3 of ISO 17409:2020), so as to adapt to the practical situations of charging system in China;
- Modified the normative reference for EMC limits, i.e., replacing IEC 61000-3-3 with GB/T 17625.2 (See 7.2.2 vs. 8.2.2 of ISO 17409:2020), so as to meet our domestic technical conditions;
- Modified the normative reference for EMC limits, i.e., replacing IEC 61000-3-11 with GB/T 17625.7 (See 7.2.2 vs. 8.2.2 of ISO 17409:2020), so as to meet our domestic technical conditions;
- Deleted the normative reference to ISO 26262 (all parts) for vehicle functional safety (See 9.6 of ISO 17409:2020), so as to adapt to the practical situations of charging system in China;
- Deleted the normative reference for requirements for combined contact for both AC and DC charging (See 9.6 of ISO 17409:2020), so as to adapt to the practical situations of charging system in China;
- Modified the normative reference for vehicle inlet cooling requirements (See 8.6.2 vs. 9.7 of ISO 17409:2020), so as to meet our domestic technical conditions;
- Modified the normative reference for output energy quality of AC discharging (See 9.2.2 vs. 10.2.2 of ISO 17409:2020), so as to meet our domestic requirements for energy quality;
- Modified the normative reference for requirements for protection against electric shock, i.e., replacing IEC 60364-4-41:2005 with GB/T 16895.21 (See 9.2.2 vs. 10.2.2 of ISO 17409:2020), so as to meet our domestic technical conditions;
- Added the normative reference to GB 38031 for traction battery safety requirements (See 9.3.3), so as to meet our domestic technical conditions;
- Added the requirements for charging operation and EMI (See 10.2 and 10.3), so as to supplement and improve the charging safety requirements;
- Added the normative reference to GB/T 34657.2-2017 for charging interoperability (See 10.2.1.1 and 10.2.2.1), so as to adapt to the practical situations of charging system in China;
- Added the normative reference to GB/T 40428-2021 for charging EMC (See 10.3 and 11.4), so as to adapt to the practical situations of charging system in China;
- Added the requirements for degree of protection and EMC (See 10.3, 11.2 and 11.4), so as to meet the demands of designing and developing practical products in China;
- Added the requirements for accuracy of measuring instruments and apparatus (See 13.1.5), so as to guide the practical test operations;
- Modified the normative reference for electric installation testing requirements, i.e., replacing IEC 60364-6 with GB/T 16895.23 (See 13.5.1 vs. 13.5.1 of ISO 17409:2020), so as to meet our domestic technical conditions;

— Modified the normative reference for touch current measurement method, i.e., replacing IEC 60990:2016 with GB/T 12113 (See 13.6.1 vs. 13.6.1 of ISO 17409:2020), so as to meet our domestic technical conditions.

The following editorial changes have been made to this document:

— In order to coordinate with the existing standards, the standard name is changed into “Safety Requirements of Conductive Charging and Discharging for Electric Vehicles”;

— For the convenience of standard understanding and application, deleted the notes not applicable to our domestic charging system, modified and added some notes;

— Added Annex A (informative).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. The organizations issuing this document shall not be held responsible for identifying any or all such patent rights.

This document was proposed by the Ministry of Industry and Information Technology of the People's Republic of China.

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INTRODUCTION

When electric vehicles are connected to an external electric power supply or an external electric load for conductive charging and discharging, safety problems such as electric shock, fire, and functional failure may occur, thus it is necessary to standardize the safety requirements related to conductive charging and discharging for electric vehicles.

This document gives the basic safety requirements for conductive charging and discharging of electric vehicles, and also gives the basic principles used to guide the functional design of conductive charging and discharging for electric vehicles, but some principle requirements may not be applicable to testing or inspection.

This document only specifies the safety requirements related to conductive charging and discharging for electric vehicles. The safety requirements for electric vehicles in scenarios, e.g., driving, other than conductive charging and discharging are specified in GB 18384 and GB 38032, the safety requirements for traction battery of electric vehicles in scenarios, e.g., normal use, abuse, charging and discharging, are specified in GB 38031, and the safety requirements for electric vehicle supply equipment are specified in GB/T 18487.1-2023 and GB/T 39752.

Safety Requirements of Conductive Charging and Discharging for Electric Vehicles

1 SCOPE

This document specifies the safety requirements for conductive connection of electric vehicles (hereinafter referred to as “EV” or “Vehicle”) to external electric power supplies or external electric loads for conductive charging and discharging.

This document is applicable to the vehicles which use the vehicle inlet (case B and case C connection) conforming to GB/T 20234.2 and/or GB/T 20234.3 and the plug (case A connection) conforming to GB/T 1002 and/or GB/T 20234.2.

This document is applicable to the off-vehicle-chargeable/dischargeable vehicles of which the vehicle power supply circuit is of voltage class B, while the vehicles of which the vehicle power supply circuit is of voltage class A may use this document as a reference.

This document is applicable to the charging modes 2, 3 and 4 defined in GB/T 18487.1-2023. For charging mode 4, this document is applicable to the conductive charging by connection to an isolated off-board charger.

Note 1: This document doesn’t give the requirements for charging mode 1.

Note 2: The external electric power supply is not a part of vehicle.

This document is applicable to the onboard sections of vehicle power supply circuits, and also applies to charging and discharging control functions used for conductive connection of the vehicle to an external electric power supply or an external electric load.

This document is not applicable to the comprehensive safety precautions for manufacturing, maintenance and repair personnel.

Note 3: See GB 18384 for the general safety requirements for vehicles.

2 NORMATIVE REFERENCES

The following normative documents contain provisions which, through normative reference in this text, constitute essential provision of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendment) applies.

GB/T 1002	Single phase plugs and socket-outlets for household and similar purposes—Types, basic parameters and dimensions
GB/T 2099.1	Plugs and socket-outlets for household and similar purposes—Part 1: General requirements (GB/T 2099.1-2021, IEC 60884-1:2013, MOD)
GB/T 12113	Methods of measurement of touch current and protective conductor current (GB/T 12113-2023, IEC 60990:2016, IDT)
GB/T 16842	Protection of persons and equipment by enclosures—Probe for verification (GB/T 16842-2016, IEC 61032:1997, IDT)
GB/T 16895.3	Low-voltage electrical installations—Part 5-54: Selection and erection of electrical equipment—Earthing arrangements and protective conductors (GB/T 16895.3-2017, IEC 60364-5-54:2011, IDT)
GB/T 16895.5-2012	Low-voltage electrical installations - Part 4-43: Protection for safety - Protection against overcurrent (IEC 60364-4-43:2008, IDT)
GB/T 16895.21	Low-voltage electrical installations—Part 4‑41: Protection for safety—Protection against electric shock (GB/T 16895.21-2020, IEC 60364-4-41:2017, IDT)
GB/T 16895.23	Low-voltage electrical installations—Part 6: Verification (GB/T 16895.23-

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