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**Safety guide for charging
electrical system and equipment**

充电电气系统与设备安全导则

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Foreword

This Standard is drafted in accordance with the rules given in GB/T 1.1-2009.

This Standard is proposed by National Technical Committee on Electrical Safety of Standardization Administration of China (SAC/TC 25).

Main drafting organizations of this Standard: Machinery Industry Beijing Electrotechnical Institute of Economic Research, Shanghai Electric Tool Research Institute, Shanghai Testing & Inspection Institute for Electrical Equipment, Suzhou Electrical Apparatus Science Research Institute Co., Ltd., Vkan Certification & Testing Co., Ltd., Shenzhen Institute of Standards and Technology, Siemens (China) Co., Ltd., ABB (China) Co., Ltd., Hangzhou Zhijiang Switch Co., Ltd., Guangdong Testing Institute of Product Quality Supervision, Dongguan Guang'an Electric Testing Center Co., Ltd., Schneider (China) Co., Ltd.

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Safety guide for charging electrical system and equipment

1 Scope

This Standard specifies the use environmental conditions, rated value, electrical safety, mechanical safety, charging coupler and connection, grounding device, operational safety, electromagnetic compatibility, safety information, etc. of charging electrical systems and equipment with rated voltage AC 1000 V and below and DC 1500 V and below.

This Standard applies to charging electrical systems and equipment (hereinafter referred to as systems and equipment).

NOTE: This Standard is the basic and general guide for electrical safety. If the relevant requirements are inconsistent with the requirements of product standards, it shall meet the requirements of product standards.

2 Normative references

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

GB/T 2423.1 Environmental testing - Part 2: Test methods - Tests A: Cold

GB/T 2423.2 Environmental testing - Part 2: Test methods - Tests B: Dry heat

GB/T 2423.4 Environmental testing for electric and electronic products - Part 2: Test method - Test Db: Damp heat, cyclic (12h+12h cycle)

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

GB/T 2423.55 Environmental testing for electric and electronic products - Part 2: Test methods - Test Eh: Hammer tests

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

GB 4824 Industrial, scientific and medical equipment - Radio-frequency disturbance

characteristics - Limits and methods of measurement

GB/T 11918.1 Plugs, socket-outlet and couplers for industrial purposes - Part 1: General requirements

GB/T 16935.1 Insulation coordination for equipment within low-voltage systems - Part 1: Principles, requirements and tests

GB 17625.1 Electromagnetic compatibility - Limits - Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)

GB/Z 17625.6 Electromagnetic compatibility - Limits - Limitation of emission of harmonic currents in low-voltage power supply systems for equipment with rated current greater than 16 A

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

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

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

GB/T 17626.5 Electromagnetic compatibility - Testing and measurement techniques - Surge immunity test

GB/T 17626.11 Electromagnetic compatibility - Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests

GB/T 18039.3-2003 Electromagnetic compatibility - Environment - Compatibility levels for low-frequency conducted disturbances and signalling in public low-voltage power supply systems

GB 19212.3 Safety of power transformers, power supplies, reactors and similar products - Part 3: Particular requirements and tests for control transformers and power supplies incorporating control transformers

GB/T 19596-2004 Terminology of electric vehicles

GB/T 20234.1-2015 Connection set for conductive charging of electric vehicles - Part 1: General requirements

3 Terms and definitions

For the purpose of this document, the following terms and definitions apply.

- non-TN-C system, that is the system of incorporating the function of the non-neutral conductor and the function of the protective conductor into a wire (PEN); or
- use isolating transformers in accordance with GB 19222.3 or additional protective devices with equivalent functions, such as residual current devices that can open and close protective grounding (SPE-RCD) to meet the requirements for Class I electric shock protection; or
- use separate protection provided by residual current devices (RCD, PRCD) with a rated residual operating current not exceeding 30 mA and capable of disconnecting all live conductors, including systems of neutral lines, to meet the requirements for Class II electric shock protection;
- the input end shall be independently protected by type A residual current device (RCD) or type B residual current device (RCD);
- the power cord to be connected to shall be rubber insulated flexible cable or cord, the green/yellow cable in the power cord is the protective grounding cable.

7.1.3 The output current of Class II equipment shall not be connected to accessible live parts or ground terminals. Insulation between parts operating at safety low voltages and live parts shall comply with the requirements for double insulation or reinforced insulation.

7.2 High and low temperature and damp heat

Systems and equipment shall have specified high temperature and low temperature resistances. The fixed type shall at least have the ability to withstand the high temperatures and low temperatures present in the environment and shall comply with:

- GB/T 2423.1 test Ab, test of continuously operating 16 h in the temperature of - 40 °C;
- GB/T 2423.2 test Bb, test of continuously operating 16 h in the temperature of 55 °C.

The damp heat resistance of systems and equipment shall meet the relevant requirements in GB/T 2423.4.

7.3 Electrical strength

The electrical strength of the insulating medium of systems and equipment shall be capable of withstanding the test of specified sine wave, frequency and test duration.

The electrical strength of the insulating medium of systems and equipment shall be capable of withstanding at least the test of actual sine wave at a frequency of 50 Hz

NOTE: The values in the table are given at ambient temperatures not exceeding 25 °C, but occasionally up to 35 °C.

b) Allowable surface temperature

For handheld part:

- metal part: 50 °C;
- non-metal part: 60 °C.

For exposed enclosure:

- metal part: 60 °C;
- non-metal part: 85 °C.

7.6 Flammability

Non-metal material parts shall have sufficient resistance to flame and flame spread:

- the test temperature of the insulating material parts used for fixing the current-carrying parts is 850 °C;
- the test temperature of other insulating material parts is 650 °C.

7.7 Heat resistance

The following material parts shall have sufficient resistance to heat and deformation:

- external parts of non-metal materials;
- thermoplastic material parts for supporting the current-carrying parts;
- thermoplastic material parts provide additional insulation and reinforced insulation.

7.8 Moisture resistance

Systems and equipment shall be able to withstand the damp conditions that may occur in normal use.

7.9 Electrical clearance and creepage distances

The electrical clearance and creepage distance shall meet:

- the electrical clearance of insulation coordination shall be selected according to GB/T 16935.1;
- the electrical clearance of couplers, plugs and sockets shall comply with the

the provisions of GB/T 11918.1.

The insert and pull out force of plugs and sockets of couplers shall meet:

The insert and pull out force of manual operation is not more than 140 N.

9.2 The structure of plugs and sockets shall meet:

- the enclosure of plugs and sockets shall completely close the terminal and the cable end;
- plugs and sockets shall have protective covers, and there shall be attachment device with function of fixing connection between the protective cover and its components, and the attachment device shall not be removed without using tools;
- plugs and sockets shall contain ground terminals and contacts, the structure shall ensure that the grounding contact shall be connected firstly and disconnected lastly in the connection and disconnection courses;
- plug and socket parts (such as terminals, pins, enclosure, etc.) shall be reliably fixed, shall not loose in normal use, and shall not be removed from the plug without using tools;
- the coupler shall ensure that the user cannot change the position of the ground contact or neutral contact (if any);
- the cable entry of the plug shall be accessible to the cable duct and cable sheath and provide complete mechanical protection;
- insulating liners, insulating compartments and similar parts shall be of sufficient mechanical strength and shall be affixed to the enclosure or body and, if they are not severely damaged, they may not be removed or designed or placed in an incorrect position.

9.3 Cables shall be of considerable flexibility, the characteristics shall meet the 245IEC type cable. The connection between cables and plugs, sockets shall meet:

- the current carrying capacity of the cable's conductive core wire shall comply with the relevant provisions;
- the green/yellow conductor in the cable is only allowed to be connected to the ground terminal in plugs and sockets, and the cross-sectional area of the grounding conductor and the center line (if any) is at least equal to the cross-sectional area of the phase line;
- the connection between cables and plugs, sockets shall be non-detachable.

Systems and equipment shall be able to withstand at least the radio frequency electromagnetic field radiation test in GB/T 17626.3. For test level 3, the test process to cover all frequencies of 0.15 MHz ~ 230 MHz.

12.2.4 Fast transient burst

Systems and equipment shall be able to withstand at least the fast-transient burst test in GB/T 17626.4. For test level 3, the pulse shall be applied at a repetition frequency of 5 kHz in the positive electrode for 2 min and in the negative electrode for 2 min.

12.2.5 Surge

Systems and equipment shall be able to withstand at least the voltage surge test in GB/T 17626.5. On the selected point carry out 5 positive pulse and 5 negative pulse test. Test level 3 is applicable to line-to-line coupling, using generator with power supply impedance of 2 Ω . Test level 4 is applicable to line-to-ground coupling, using generator with power supply impedance of 12 Ω .

12.2.6 Voltage sag and short interruption

Systems and equipment shall be able to withstand at least the voltage sag and short interruption test in GB/T 17626.11. The test is carried out according to the test level and duration of Class 3 products.

13 Safety information

13.1 Markings and symbols

Systems and equipment shall have at least the following rated information:

- rated voltage;
- symbol of power supply type (~ or -), which shall follow the rated voltage marking;
- rated input power (W or kW); or rated current (A);
- Class II structural symbols (回), used only for Class II charging electrical systems;
- enclosure protection class (IP code);
- product name, model, manufacturer's name and address, date of manufacture, etc.

13.2 Instructions

Systems and equipment shall provide use instructions and safety instructions, the use instructions shall:

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