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

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Conductive on-board chargers for electric vehicles

电动汽车用传导式车载充电机

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1 Scope

China's national standard for the conductive on-board charger of an electric vehicle. It specifies the terms and definitions and the technical requirements. The on-board charger is the unit that converts alternating current from a domestic or public supply into the direct current the traction battery needs, and it is carried in the vehicle - which is what distinguishes AC charging from DC fast charging, where the conversion happens in the charging station and the vehicle receives DC directly. Being on board sets every constraint on it: it must be light and small, it must survive the vehicle's vibration and temperature range, it must be cooled without a fan if possible, and it must be efficient, because the heat it does not convert has to be removed from a sealed box. Its power rating is a design decision with consequences the owner feels daily, since it sets how long a full charge takes from an ordinary supply.

This document specifies the technical requirements and test methods for conductive on-board chargers for electric vehicles. This document applies to conductive on-board chargers for electric vehicles, which have a nominal input voltage of 220 V (AC) (single-phase) or 380 V (AC) (three-phase) AND an output voltage of not more than 1500 V (DC). Other types of on-board charger may make reference to this standard.

2 Normative references

The provisions in following documents become the provisions of this Standard through reference in this Standard. 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) is applicable to this standard.

GB 4824-2019 Industrial, scientific and medical equipment - Radio- frequency disturbance characteristics - Limits and methods of measurement

GB/T 12113 Methods of measurement of touch current and protective conductor current

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

GB/T 17625.2 Electromagnetic compatibility (EMC) - Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and unconditionally connected in the public low-voltage power supply system

GB/T 17625.7 Electromagnetic compatibility - Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems for equipment with

rated current ≤ 75 A and subject to conditional connection

GB/T 17625.8 Electromagnetic compatibility - Limits - Limits for harmonic currents produced by equipment connected to public low-voltage systems with input current > 16 A and ≤ 75 A per phase

GB/T 17626.4-2018 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

3 Terms and definitions

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

3.1 On-board charger It is a device, which is fixedly installed on a vehicle; converts the electric energy, which conforms to the public power grid into the direct current, which is required by the on-board energy storage device; charges the on-board energy storage device. [Source: GB/T 19596-2017, 3.4.1.5.1, with modification]

3.2 Power factor The ratio of the input active power of the vehicle charger TO the input apparent power.

3.3 Charging efficiency The percentage of the ratio of output power TO the input active power.

3.4 Output voltage tolerance The percentage of the ratio, of the difference between the actual output voltage value and the output voltage setting value, TO the setting voltage value.

3.5 Output current tolerance The percentage of the ratio, of the difference between the actual output current value and the output current setting value, TO the setting current value.

3.6 Voltage ripple factor The ratio, of half of the difference between the peak value and the valley value of the DC pulsating voltage, which is output by the on-board charger, TO the average value of the DC voltage.

4.1 Appearance requirements

4.1.1 Conductive on-board chargers for electric vehicles (hereinafter referred to as "on-board chargers"), shall have no defects, such as obvious damage or deformation, on

the outer surface.

4.1.2 The terminal or lead wire of the on-board charger shall be intact and undamaged; the fastener connection shall not be loose.

4.1.3 The accessible surface of the on-board charger shall be free of burrs, flashes, or similar sharp edges.

4.2.1 AC input conditions

4.2.2 Start input impulse current The peak value of the start input impulse current, of on-board charger, shall not exceed 120% of the input current peak value, when the rated load is in stable operation.

4.2.3 DC output voltage limiting characteristics For vehicle chargers, which have constant voltage output characteristics, when the DC output voltage reaches the set value of output voltage limit, they shall automatically limit the increase in output voltage.

4.2.4 DC output current limiting characteristics For vehicle chargers, which have constant current output characteristics, when the DC output current reaches the set value of output current limit, they shall automatically limit the increase in output current.

4.2.5 DC output power limiting characteristics

4.2.6 DC output voltage tolerance For on-board chargers, which have constant voltage output characteristics, the output voltage tolerance shall not exceed $\pm 1\%$, in the voltage-limiting output state.

4.2.7 DC output current tolerance For the on-board charger in the current-limiting output state, when the output current is greater than 10 A, the output current tolerance shall not exceed $\pm 5\%$; when the output current is not greater than 10 A, the output current deviation shall not exceed $\pm$

0.5 A.

4.2.8 Output voltage ripple factor For on-board chargers, which have constant voltage output characteristics, the output voltage ripple factor shall not be greater than 5%, in the voltage-limiting output state.

4.2.9 Start output overshoot

4.2.10 Output dump requirements When the on-board charger is subject to output load dump, its output voltage overshoot value shall not be greater than the voltage value, which is specified in the product technical file.

4.2.11 Power factor The power factor of the on-board charger shall meet the requirements of Table 2.