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# NB

ENERGY INDUSTRY STANDARD  
OF THE PEOPLE'S REPUBLIC OF CHINA

## NB/T 33001-2010

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### Specification for electric vehicle off-board conductive charger

电动汽车非车载传导式充电机技术条件

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## Foreword

This standard was proposed by the China Electricity Council.

This standard shall be under the jurisdiction of the Energy Industry Electric Vehicle Charging Facilities Standardization Technical Committee.

The drafting organizations of this standard: State Grid Corporation of China, China Electric Power Research Institute, State Grid Electric Power Research Institute, Guangdong Power Grid Corporation Electric Power Research Institute, Shenzhen Power Supply Bureau, Xu Ji Power Co., Ltd., Shanghai Electric Power Company, Zhejiang Electric Power Company.

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The recommendations and opinions of this standard are fed back to the Standardization Center of China Electricity Council (No. 1, BaiGuang Road, Beijing, 100761).

# Specification for electric vehicle off-board conductive charger

## 1 Scope

This standard specifies the basic structure, functional requirements, technical requirements, test methods, inspection rules and identification of off-board conductive chargers for electric vehicles (abbreviated as chargers).

This standard applies to the off-board charger used for the electric vehicles which adopt conductive charging method.

## 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/T 2421.1-2008 Environmental testing for electric and electronic products – General and guidance

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 A: Dry heat

GB/T 2423.4-2008 Basic environmental testing procedures for electric and electronic products – Test Db: Damp heat, cycle

GB/T 2423.55-2008 Environmental testing for electric and electronic products – Part 2: Test methods – Test Eh: hammer tests

GB/T 3859.1-2008 Semiconductor convertors – Specification of basic requirement

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

GB/T 4797.5-1992 Environmental conditions appearing in nature of electric and electronic products – Precipitation and wind

**6.7.4** The charger shall have emergency shutdown switch, AND through manual operation OR remote communication command, emergency stop charging.

**6.7.5** The charger shall, when being initiated for charging, be manually confirmed for activation.

**6.7.6** The charger shall have soft-start function, AND the soft-start time is 3 s ~ 8 s.

**6.7.7** In the charging process, the charger shall ensure that the battery's charging voltage and charge current do not exceed the allowable value.

**6.7.8** In the charging process, when the temperature of the battery exceeds the allowable limit, the charger shall stop charging.

**6.7.9** Only after the charger is correctly connected to the battery system of the electric vehicle, it is allowed for the charger to start the charging process; when the charger detects abnormal connection to the battery system of the electric vehicle, it must cut off the DC output immediately.

**6.7.10** The charger shall have an interlocking function to ensure that, before being separated from the electric vehicle, the vehicle cannot be started.

**6.7.11** In the charging process, the charger shall have obvious status indication and text prompts, so as to prevent personnel from mis-operation.

## **6.8 Charging output requirements**

### **6.8.1 Outputs voltage and current range**

a) Output voltage. Based on the battery voltage range, the charger output voltage is divided into three levels: 150 V ~ 350 V, 300 V ~ 500 V, 450 V ~ 700 V;

b) Output current. The charger DC output rated current shall adopt: 10 A, 20 A, 50 A, 100 A, 160 A, 200 A, 315 A, 400 A (500 A).

### **6.8.2 Constant current accuracy**

When the AC power supply voltage changes within the range  $\pm 15\%$  of the nominal value, the output DC voltage changes within the corresponding regulating range as specified in 6.8.1 a) of this standard, the output DC current shall, at any value within the range 20% ~ 100% of the rated value, keep constant; AND the charger output current's constant current accuracy shall not exceed  $\pm 1\%$ .

When the output power is 50% ~ 100% of the rated power, the power factor shall not be less than 0.9, AND the efficiency shall not be less than 90%.

### **6.10 Current imbalance**

When multiple high frequency switching power supply modules of same model work in parallel, the modules shall be able to share the load in proportion; when the average output current of all modulus is 50% ~ 100% of the rated current value, the current imbalance shall not exceed  $\pm 5\%$ .

### **6.11 Harmonic current**

The harmonic current as generated by the charger shall not exceed the limits as specified in 5.4.2.2 of GB/T 19826-2005.

### **6.12 Electromagnetic compatibility**

#### **6.12.1 Immunity requirements**

##### **6.12.1.1 Electrostatic discharge immunity**

The charger shall be able to withstand the level 3 electrostatic discharge immunity test as specified in Chapter 5 of GB/T 17626.2-2006.

##### **6.12.1.2 Radiated radio-frequency electromagnetic field immunity**

The charger shall be able to withstand the level 3 radiated radio-frequency electromagnetic field immunity test as specified in Chapter 5 of GB/T 17626.3-2006.

##### **6.12.1.3 Electrical fast transient/burst immunity**

The charger shall be able to withstand the level 3 electrical fast transient/burst immunity test as specified in Clause 5 of 17626.4-2008.

##### **6.12.1.4 Surge immunity**

The charger shall be able to withstand the level 3 surge immunity test as specified in Clause 5 of 17626.5-2008.

#### **6.12.2 Radio disturbance limits**

##### **6.12.2.1 Radiation disturbance limits**

The charger shall comply with the radiation disturbance limits as specified in Table 4.

**8.1.2.3** The charger under test shall, before being energized, be balanced with the ambient temperature.

### **8.1.3 Measurement instruments for test**

**8.1.3.1** The instruments and equipment for test purposes shall have the qualification certificate AND the metering verification certificate within the valid period.

**8.1.3.2** The instruments and equipment for testing the performance indicators of the charger shall have adequate resolution, accuracy and stability, AND shall be at least one grade higher than the corresponding technical indicator of the charger under test.

## **8.2 Environmental conditions test**

### **8.2.1 Low temperature test**

In accordance with the provisions of GB/T 2423.1-2008 “Test Ad: the low temperature test of the heat dissipation test sample temperature gradient – the test sample is energized after the start of temperature stability”, CONDUCT test. During test, TAKE the temperature for low temperature test as the minimum working environment temperature as specified in 6.1.1 of this standard, and MAKE the test last for 2 h. Before the test, during the test and after the end of the test, the charger shall be able to work properly, AND the tested constant voltage accuracy shall comply with the provisions of 6.8.3 in this standard.

### **8.2.2 High temperature test**

In accordance with the provisions of GB/T 2423.1-2008 “Test Bd: the high temperature test of the heat dissipation test sample temperature gradient – the test sample is not energized in the temperature rise regulation period”, CONDUCT test. During test, TAKE the temperature for high temperature test as the maximum working environment temperature as specified in 6.1.1 of this standard, and MAKE the test last for 2 h. Before the test, during the test and after the end of the test, the charger shall be able to work properly, AND the tested constant voltage accuracy shall comply with the provisions of 6.8.3 in this standard.

Note: The normal operation refers that the charger is normal in charging, communication, display and the protection function, without any function loss.

### **8.2.3 Wet heat test**

In accordance with the provisions of GB/T 2423.4-2008, CONDUCT test. The high temperature is  $(40 \pm 2)$  °C AND the number of cycles is 2. Before 2 h

### **8.6.2 Power frequency withstand voltage test**

Before the test, the pretreatment against the charger shall be in accordance with the relevant requirements of 6.4.1 of GB/T 3859.1-1993. Between the individual energized circuit AND the individual energized circuit and earth (metal enclosure) that are not electrically connected to the charger, based on their working voltage, they shall be able to withstand 1 min of power frequency withstand voltage test as specified in Table 3; AND in the test process, there shall be no insulation breakdown or flashover phenomenon.

### **8.6.3 Impulse withstand voltage test**

Respectively APPLY the impulse voltage to between the individual energized circuit AND the individual energized circuit and earth (metal enclosure) of the charger, AND the other power circuits and exposed conductive parts are connected together and grounded. Based on the test voltage as specified in Table 3, APPLY 3 times positive polarity and 3 times negative polarity short-term lightning impulse voltage, at the interval not less than 5 s. In the test process, the tested part shall have no breakdown discharge.

## **8.7 Safety test**

### **8.7.1 Input over-voltage protection, under-voltage alarm test**

- a) When the charger is running under rated load, ADJUST the input power supply voltage, to make it more than 115% of the input voltage rating, then the charger shall be able to automatically cut off the main charging circuit, AND issue an alarm;
- b) When the charger is running at rated load, ADJUST the input supply voltage, to make it less than 85% of the input voltage rating, then the charger shall issue an alarm.

### **8.7.2 Output over-voltage, over-current protection test**

- a) SET the DC side over-voltage protection action value; ADJUST the output parameters, and artificially SIMULATE over-voltage fault, then the charger shall be activated of protection as specified in the product standard (automatically cut off the main charging circuit OR issue alarm);
- b) SET the DC side over-current protection action value; ADJUST the output parameters, and artificially SIMULATE over-current fault, then the charger shall be activated of protection as specified in the product standard (automatically cut off the main charging circuit OR issue alarm);



### **8.8.6 Output limit current and limit voltage characteristic test**

- a) When the charger is running at constant current state, ADJUST the load resistance, to increase the DC output voltage; when the output voltage exceeds the limit voltage set value, it shall be able to automatically limit the output DC voltage increase; when the output voltage is reduced to below the limit voltage, it shall be able to automatically resume operation.
- b) When the charger is running at constant voltage state, ADJUST the load resistance, to increase the DC output current; when the output current exceeds the limit current set value, it shall be able to automatically limit the output DC current increase; when the output current is reduced to below the limit current, it shall be able to automatically resume operation.

### **8.9 Efficiency and power factor test**

In accordance with the provisions of 6.6 of GB/T 19826-2005, CONDUCT test, AND the efficiency and power factor of the charger shall comply with the provisions of 6.9 of this standard.

### **8.10 Current imbalance test**

In accordance with the provisions of 6.7 of GB/T 19826-2005, CONDUCT test, AND the current imbalance of high frequency switching power supply module shall comply with the provisions of 6.10 of this standard.

### **8.11 Harmonic current test**

In accordance with the provisions of 6.2 of GB 17625.1-2003 AND the Chapter 7 of GB/Z 17625.6-2003, CONDUCT test, AND both the charger output rated DC current (resistive load) and the power supply side harmonic current shall be comply with the provisions of 6.11 of this standard.

### **8.12 Electromagnetic compatibility test**

#### **8.12.1 Electrostatic discharge immunity test**

In accordance with the methods as specified in GB/T 17626.2-2006, CONDUCT test, AND the test results shall comply with the provisions of 6.12.1.1 of this standard.

#### **8.12.2 Radiated radio-frequency electromagnetic field immunity test**