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**Plugs with thermal protection function for charging  
mode 2 of electric vehicles**

用于电动汽车模式 2 充电的具有温度保护的插头

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# Plugs with thermal protection function for charging mode 2 of electric vehicles

## 1 Scope

This standard specifies the technical requirements for the marking, structure, electrical properties, mechanical properties, other technical requirements of plugs with thermal protection function for charging mode 2 of electric vehicles.

This standard applies to the power supply plugs with thermal protection function for charging mode 2 of electric vehicles, which are only used for AC current, have a rated voltage of above 50V but not more than 250V, have a rated current of not more than 16A (hereinafter referred to as the plug).

The plug, which conform to this standard, adopts the type and size of the single-phase two-pole grounding plug in GB/T 1002. It does not use the type and size of single-phase two-pole plug.

Note 1: The plug of GB/T 1003 can be used with reference to this standard.

This standard does not apply to plugs in GB/T 20234-2015.

Plugs, which conform to this standard, are suitable for use in ambient temperatures ranging in  $-40^{\circ}\text{C} \sim 50^{\circ}\text{C}$ .

Note 2: The conductive charging plug, which is connected to the vehicle, complies with GB/T 20234-2015.

## 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) is applicable to this standard.

GB/T 1002 Single phase plugs and socket-outlets for household and similar purposes - Types, basic parameters and dimensions

GB/T 1003 Three phases plugs and socket-outlets for household and similar purposes - Types, basic parameters and dimensions

GB/T 2099.1-2008 Plugs and socket-outlets for household and similar

Meanwhile, it shall add the relevant descriptions on the "safety service life".

The relevant descriptions on the "safety service life" can be marked on the instruction manual OR on the packaging.

Note: See Chapter 28 for "safety service life".

## 8 Dimensions

The type, basic parameters, dimensions of the plug shall meet the requirements of GB/T 1002. Whether it is qualified shall be checked by the test in Chapter 9 of GB/T 2099.1-2008.

## 9 Protection against electric shock

The protection against electric shock of the plug shall meet the requirements of Chapter 10 of GB/T 2099.1-2008.

## 10 Temperature protection function

**10.1** The plug can realize the temperature protection function, through one of the following measures:

- Configure a temperature protection device inside the plug, which is connected in series in the circuit. When the temperature exceeds the specified value, it can cut off the power supply.

Note 1: Temperature protection devices such as temperature switches, electronic protection circuits and other devices. These devices comply with their respective standards.

Note 2: The deviation value of temperature is determined by the manufacturer.

- A temperature sensing device is arranged in the plug, to feed back the temperature change value to the control unit.

Note 3: Temperature sensing devices, such as PTC, NTC, PT, etc. These devices comply with their respective standards.

Note 4: The deviation value of temperature is determined by the manufacturer.

**10.2** The maximum operating temperature of the control unit, for the temperature protection device and the temperature sensing device is 90°C; OR the temperature value is agreed by the supplier and the buyer.

**16.2** Put the plug assembly into the water tank, which has a water depth of 1m. After 12 hours, carry out the test of 16.1.

## **17 Temperature rise**

The temperature rise of the plug shall meet the requirements of Chapter 19 of GB/T 2099.1-2008.

## **18 Flexible cables and their connections**

**18.1** The cable fixing parts of the plug shall meet the requirements of 23.1 of GB/T 2099.1-2008.

**18.2** The effectiveness of the cable fixing of the plug shall meet the requirements of 23.2 of GB/T 2099.1-2008; however, the tensile test of the flexible cable shall be modified to 90N, 25 times.

**18.3** The plug shall be equipped with wires, that meet GB/T 33594 or related standards.

For the 10A plug, the nominal cross-sectional area of the conductor of the non-grounding wire of the equipped wire is not less than 1.5mm<sup>2</sup>.

For the 16A plug, the nominal cross-sectional area of the conductor of the non-earthed wire of the equipped wire is not less than 2.5mm<sup>2</sup>.

**18.4** The bending performance of the plug shall meet the requirements of 23.4 of GB/T 2099.1-2008.

After the bending test, the number of broken wires of each core shall not exceed 10% of the total number of conductors.

**18.5** The connection, between the plug terminal and the wire, shall be reliable; the connection shall not be disconnected, under certain tensile force.

Compliance is checked by the following test.

Apply the following force, between the wire and the terminal, for a duration of 1min; the force moves in the axial direction, at about 100mm/min:

- For a cross-sectional area of 1.5mm<sup>2</sup>, 150N;
- For a cross-sectional area of 2.0mm<sup>2</sup>, 195N;
- For a cross-sectional area of 2.5mm<sup>2</sup>, 200N.

Note: This force can be provided by weights or a pull tester.

When applying force, do not use explosive force.

After the test, the wire shall not be pulled off.

## **19 Mechanical strength**

**19.1** The mechanical strength of the plug shall meet the requirements of Chapter 24 of GB/T 2099.1-2008.

**19.2** The vehicle rolling test of the plug shall meet the requirements of 6.21 and 7.21 of GB/T 20234.1-2015.

After the test, the specimen shall be free of damage, that affects further use, such as the breakage of the plug; however, the plug and pin, that can be corrected with tools, are acceptable.

## **20 Current-carrying parts and their connections**

The current-carrying parts of the plug and their connections shall meet the requirements of Chapter 26 of GB/T 2099.1-2008.

## **21 Creepage distances, clearances, through-sealant distances**

**21.1** The creepage distance, electrical clearance, through-sealant distances of the plug shall meet the requirements of Chapter 27 of GB/T 2099.1-2008.

**21.2** There shall be isolation measures, between the temperature sensor and the live plug, which can be in the form of a cover.

## **22 Heat resistance**

The heat resistance of the plug shall meet the requirements of Chapter 25 of GB/T 2099.1-2008.

## **23 Resistance to abnormal heat, flame, tracking of insulating materials**

**23.1** The abnormal heat and flame resistance of the plug shall meet the

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