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**Electric motorcycles and electric mopeds - Power  
performance - Test method**

电动摩托车和电动轻便摩托车 动力性能 试验方法

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# Electric motorcycles and electric mopeds - Power performance - Test method

## 1 Scope

This Standard specifies the test methods for the maximum speed, acceleration performance and climbing capacity of electric motorcycles and electric mopeds.

This Standard applies to the power performance test of pure electric motorcycles and electric mopeds (unless otherwise specified, hereinafter referred to as electric motorcycles).

## 2 Normative references

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

GB/T 5359.1, Term for motorcycles and mopeds - Part 1: Types of vehicles

GB/T 5378, Methods of road test for motorcycles and mopeds

GB 14622-2016, Limits and measurement methods for motorcycle pollutant discharge (China stage IV)

GB 18176-2016, Limits and measurement methods for emissions of pollutants from mopeds (CHINA IV)

GB/T 18385-2005, Electric vehicles - Power performance - Test method

GB/T 19596, Terminology of electric vehicles

## 3 Terms and definitions

Terms and definitions determined by GB/T 5359.1 and GB/T 19596, as well as the following, are applicable to this document.

### 3.1 Maximum speed

$V_{200}$

The speed for an electric motorcycle to pass a distance of 200 m in the shortest time.

### **3.2 Maximum 10 minutes speed**

$V_{10}$

The maximum average speed for an electric motorcycle to run for 10 minutes.

## **4 Test conditions**

### **4.1 Test vehicle**

**4.1.1** The traction battery for the test vehicle shall be a new traction battery, which is fully charged according to the charging procedure provided by the manufacturer. If the manufacturer does not specify the charging procedure, follow the provisions of 5.1.1 ~ 5.1.3 in GB/T 18385-2005. Within 10 days before the test, the test vehicle shall drive at least 300 km with the battery installed on the test vehicle in accordance with the manufacturer's regulations.

**4.1.2** The mechanical moving parts of the test vehicle shall be lubricated according to the manufacturer's regulations.

**4.1.3** The tire pressure of the test vehicle shall comply with the manufacturer's regulations.

**4.1.4** The loading mass of the test vehicle during the test (unless otherwise specified) shall comply with the corresponding provisions of GB/T 5378.

**4.1.5** During the test, except for the necessary equipment and daily control parts of the vehicle, the lighting, signals and auxiliary devices of the test vehicle shall be turned off.

**4.1.6** Before the test starts, the battery is allowed to stand at a temperature of  $(25 \pm 5) ^\circ\text{C}$  for 8 hours.

**4.1.7** If the test equipment is installed on the test vehicle, the impact on the load distribution of each wheel and the impact of wind resistance shall be reduced as much as possible.

**4.1.8** The vehicle shall be clean and tidy, and the windows and vents that shall not be opened for the normal operation of the vehicle and drive system shall be closed through normal operations.

### **4.2 Test equipment**

The requirements for the test equipment shall comply with the provisions of GB/T 5378.

### **4.3 Test site**

The battery is considered to be fully charged if the end-of-charge criteria is reached according to the conventional charging procedure.

## **5.2 Warm-up**

The test vehicle shall be driven for 2 km at 80% of the maximum 10 minutes speed ( $V_{10}$ ) declared by the manufacturer, so as to warm up the motor and transmission system.

# **6 Test procedure**

## **6.1 Test sequence**

The test shall be carried out in the following order:

- vehicle preparation (see Chapter 5);
- maximum 10 minutes speed ( $V_{10}$ ) test (see 7.1);
- complete discharge of traction battery (see 7.2);
- vehicle preparation (see Chapter 5);
- maximum speed ( $V_{200}$ ) test (see 7.3);
- acceleration performance test (see 7.4);
- climbing capacity test (see 7.5).

## **6.2 Test status**

At the beginning of each test, the charging state of the traction battery is the state after the previous test (in the process of changing the test site, avoid consumption of power of the traction battery). When the maximum speed test starts, the traction battery shall be in a fully charged state. If each test is carried out separately, the test conditions of each test shall be in accordance with the provisions in Chapter 4, and the vehicle shall be preheated according to the provisions in 5.2. At the beginning of each test, the traction battery shall be in a fully charged state.

# **7 Test methods**

## **7.1 Maximum 10 minutes speed ( $V_{10}$ ) test**

**7.1.1** The maximum 10 minutes speed ( $V_{10}$ ) test can be carried out on a circular track or on a chassis dynamometer in accordance with 4.3.

**7.1.2** Drive the test vehicle at a speed of  $\pm 5\%$  the estimated maximum 10 minutes speed ( $V_{10}$ ) of the vehicle for 10 minutes. If the vehicle speed changes during the test, it may

be compensated by the speed regulating device (acceleration), so that the vehicle speed meets the requirement of  $\pm 5\%$  of the estimated maximum 10 minutes speed ( $V_{10}$ ).

**7.1.3** If the vehicle speed in the test does not reach 95% the estimated maximum 10 minutes speed ( $V_{10}$ ), repeat the test, the vehicle speed may be the above estimated maximum 10 minutes speed ( $V_{10}$ ) OR another maximum 10 minutes speed ( $V_{10}$ ) re-estimated by the manufacturer.

**7.1.4** Calculate the maximum 10 minutes speed ( $V_{10}$ ) according to Formula (1).

$$V_{10} = 3S_1/500 \quad \dots\dots\dots (1)$$

Where:

$S_1$  – the mileage traveled by the vehicle, in meters (m);

$V_{10}$  – the maximum 10 minutes speed, in kilometers per hour (km/h).

Retain the value of the calculation result to one significant figure after the decimal point.

**7.1.5** Record the test data and results in Table A.1 of Appendix A.

## **7.2 Complete discharge of traction battery**

After completing the test in 7.1, park the test vehicle for 30 minutes; then, resume driving at 70% of  $V_{10}$  speed until the vehicle speed drops to 50% of  $V_{10}$ , or until the signal device on the dashboard prompts the parking information; record the mileage.

Calculate the total mileage, including the mileage during the warm-up phase, the mileage during the  $V_{10}$  test, and the mileage when the discharge is completed.

## **7.3 Maximum speed ( $V_{200}$ ) test**

### **7.3.1 Road driving test**

**7.3.1.1** Accelerate the test vehicle on a straight runway or a circular runway, so that the vehicle can reach the maximum stable speed before entering the measurement area; keep driving at this speed for 200 m (the length of the measurement area). Record the time  $t_1$  when the vehicle continues to drive for 200 m.

**7.3.1.2** Immediately do a test in the opposite direction, and record the passing time  $t_2$ . Count one round-trip as one test, and the test shall be carried out at least three times in a row.

**7.3.1.3** Calculate the maximum speed ( $V_{200}$ ) according to Formula (2).

$$V_{200} = 3.6S/t \quad \dots\dots\dots (2)$$

Record the test data and results in Table A.3.

## 7.5 Climbing capacity test

### 7.5.1 Test conditions

Shall comply with the relevant requirements in Chapter 4.

### 7.5.2 Test

#### 7.5.2.1 Maximum climbing capacity road driving test

Perform the test according to the corresponding method of GB/T 5378.

#### 7.5.2.2 Chassis dynamometer driving test

##### 7.5.2.2.1 Constant speed climbing capacity test

**7.5.2.2.1.1** Place the test vehicle on the chassis dynamometer. Set the chassis dynamometer to the constant speed control mode, and make chassis dynamometer to drag the test vehicle back to the set speed.

**7.5.2.2.1.2** After the vehicle speed reaches the set speed and stabilizes, fully open the accelerator; after the test vehicle is stabilized again, record the output power  $P$  of the test vehicle, and calculate the maximum climbing angle at this vehicle speed according to Formula (7).

$$P_1 = aV + bV^3 \quad \dots\dots\dots (4)$$

$$P = P_1 + P_2 \quad \dots\dots\dots (5)$$

$$P_2 = M \times \sin\theta \times V \times 9.8 \quad \dots\dots\dots (6)$$

$$\theta = \sin^{-1}[(P - P_1)/(9.8 \times M \times V)] \quad \dots\dots\dots (7)$$

Where:

$P_1$  – forward power, in watts (W);

$a$  – rolling resistance, in Newtons (N);

$b$  – air resistance coefficient, in  $N/(km/h)^2$ ;

$V$  – set speed, in kilometers per hour (km/h);

$P$  – the climbing output power of the test vehicle when the accelerator is fully open, in watts (W);

$P_2$  – power to overcome sliding, in watts (W);

$M$  – total mass during the test, in kilograms (kg);

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