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Passenger cars - Biaxial fatigue test method for wheels

乘用车车轮 双轴疲劳试验方法

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Passenger cars - Biaxial fatigue test method for wheels

1 Scope

This standard specifies the biaxial fatigue test method for wheels of passenger car. This method is to apply a series of time-varying wheel load pairs, to a rotating wheel-tire assembly in a laboratory environment, to evaluate the fatigue performance of the wheel under road load conditions.

This standard applies to passenger car wheels.

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 2933 Terms, specification codes and labels for wheels and wheels for pneumatic tires

3 Terms and definitions

The following terms and definitions, as defined in GB/T 2933, apply to this document.

3.1

Wheel-tire assembly

Assembled assembly of wheels, tires, valves.

3.2

Wheel radial load

The load acting on the wheel-tire assembly, along the radial direction of the wheel.

3.3

Wheel lateral load

The load acting on the wheel-tire assembly, along the axis of the wheel. The

direction pointing to the inner side of the rim is positive; otherwise, it is negative, as shown in Figure 1 and Figure 2.

3.4

Wheel load pair

The combination of a pair of radial and lateral loads, which act simultaneously on the wheel-tire assembly.

3.5

Wheel load sequence

It is composed of wheel load pair sequence, including such factors as wheel load pair and the corresponding test mileage, etc.

3.6

Wheel camber angle

In a biaxial fatigue test, the camber angle is the angle, which is formed by the center plane of the wheel rim and the normal to the tangential plane of the tire drum.

As shown in Figure 1 and Figure 2, cambering inside is positive, cambering outside is negative.

3.7

Wheel slip angle

In the biaxial fatigue test, the wheel slip angle is the slip angle of the center plane of the wheel rim, with the radial load acting line as the axis, as shown in Figure 1.

When the lateral load is positive, the slip angle is positive; otherwise, it is negative.

3.8

Curb

On the inner drum biaxial fatigue testing machine, the annular device which is installed on the inner surface of the drum to apply lateral load to the wheel, as shown in Figure 2.

4 Test equipment

4.1 General equipment requirements

7 Test method

7.1 Select the tires, which are specified by the entrusted testing agency.

7.2 Install tires on the wheels and inflate them. The recommended inflation pressure is $450 \text{ kPa} \pm 10 \text{ kPa}$.

7.3 Perform dynamic balance correction on the test wheel-tire assembly. The remaining unbalanced mass of the inner and outer sides should be controlled within 5 g.

7.4 For aluminum alloy wheels, the inner rim of the wheel shall be pre-damaged before the test; the method shall be in accordance with Appendix A.

7.5 Adjust the inflation pressure of the pre-damaged aluminum alloy wheel-tire assembly to $450 \text{ kPa} \pm 10 \text{ kPa}$.

7.6 Adjust the test equipment, according to the requirements in Chapter 4. When choosing an inner drum testing machine, it should choose the drum, according to the principle that the outer diameter of the tire is 60% ~ 80% of the inner diameter of the drum.

7.7 Install the wheel-tire assembly on the biaxial fatigue testing machine. The fixing device of the wheel on the testing machine shall be equivalent in size to the fixing device used on the vehicle. Tighten the bolts or nuts to the specified torque value, when loading the vehicle. If there is no specification, the recommended tightening torque is $120 \text{ N} \cdot \text{m} \pm 10 \text{ N} \cdot \text{m}$.

7.8 Input the test parameters and wheel load sequence on the biaxial test equipment. The recommended surface linear speed of the drum is 105 km/h.

7.9 Adjust the safety protection limit, to carry out the load spectrum test run, to confirm that the wheel-tire assembly can operate normally, under each correct test load pair.

7.10 Run the test load sequence cyclically on the test equipment, to test the wheel-tire assembly. It is recommended to stop when running to 100 km; continue the test after checking the bolt torque. During the test, if the tire is damaged or the bolt is broken, the test can be continued after replacement.

7.11 After completing the specified test mileage, inspect the wheel using the dye penetrant method.

Note: The specified test mileage is set by the wheel or vehicle manufacturer, according to the service requirements of the wheel.

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