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Passenger cars - Light alloy wheels - 90° impact test procedure

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1 Scope

This standard specifies two laboratory test methods, I and II, to assess the strength and safety performance of the wheel when the wheel is subjected to the impact perpendicular to the axis. It may select either of the two methods to carry out test.

This standard applies to light alloy wheels of passenger cars.

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 2933 Wheels and rims for pneumatic tires - Vocabulary, designation and marking, (GB/T 2933-2009, ISO 3911:2004 IDT)

3 Terms and definitions

The terms and definitions as defined in GB/T 2933 apply to this standard.

4 Test samples

The representative new wheel which has undergone all processing steps, is equipped with tires, is applicable to the vehicles.

The wheels and tires used in this test are no longer available for use on vehicles.

5 Method I

5.1 Test equipment

Figure 1 shows a schematic diagram of a typical test equipment for Method I. It consists mainly of a hammer that can move in the vertical direction and a wheel

& tire assembly mounting bracket. The main requirements are as follows:

a) Hammer: The angle of the impact surface is 150°, the radius of the fillet is R_2, the width is 195 mm, the length is 500 mm.

b) The basic weight of the hammer is 150 kg, the maximum weight is 315 kg, the minimum adjustable weight is 5 kg;

c) All weights of the hammer can be fixed in one integral piece, the falling time shall not exceed 2% of the theoretical free-fall time;

d) There shall be means to prevent secondary impact after the hammer is rebounded;

e) The mounting bracket has two pivotable fulcrums which have a spacing of 200 mm;

f) Two disc-springs, the combined stiffness C_f = (85 ± 5) kN/mm, the pre-compression amount of the disc spring is 0.2 mm;

g) The horizontal position of the bracket is inclined downward by 1°;

h) The wheel's fixing device can adapt to the change of the wheel offset, ensure that the distance between the center of the tire section and the left fulcrum as shown in Figure 1 is 450 mm, meanwhile align the center line of the hammer.

5.2 Test methods

5.2.3.1 Install the wheel & tire assembly on the test machine. Ensure that the size of the fixing device of the wheel on the test machine is appropriate to that of the fixing device which is used on the vehicle. Adjust the axial position of the wheel, so that the centerline of the tire's section is aligned with the centerline of the hammerhead (see Figure 1), then lock the axial adjustment mechanism. Adjust the position of the wheel in the circumferential direction, so that the impacted portion is directly under the hammerhead.

For the two impact energies, E_1 and E_2, it may impact the same wheel. Each impact corresponds to a different window. It is recommended to use E_2 energy to impact the valve window's position, and make the interval between the two impact positions as large as possible.

5.2.3.2 Manually tighten the nut or bolt to the specified torque value, or use the methods as recommended by the vehicle or wheel manufacturer to tighten it. If there is no torque requirement, it is recommended to use the torque of (110 ± 10) N • m.

5.2.3.3 In accordance with the calculated energy, refer to Table 1 to select and adjust the hammer's mass, calculate the falling height (gravity acceleration value is 9.81 m/s^2).

When the impact energy is less than 2000 J, the weight of the hammer is 150 kg; when the impact energy is above 2000 J, the mass of the hammer is increased by the amplitude of 5 kg, and the impact velocity is kept in the range of (5 ± 0.2) m/s. The impact energy is allowed to adjust within ± 2%.

with the lowest section height which is applicable for the wheels. The inflation pressure is the value specified by the vehicle manufacturer and, if not specified, it shall be (200 ± 10) kPa. The test ambient temperature shall be maintained between 10 °C ~ 30 °C.

6.2.2 Calculation of hammer's falling height.

$$H = K \times F_r$$

Where:

H - The falling height of hammer, mm;

F_r - The maximum static load of the wheel as specified by the wheel or vehicle manufacturer, kg.

K - Coefficient, mm/kg. There are usually two values: K_1 = 0.05 and K_2 = 0.28.

6.2.3 Test procedure.

6.2.3.1 Install the wheel & tire assembly on the test machine. Ensure that the size of the fixing device of the wheel on the test machine is appropriate to that of the fixing device which is used on the vehicle. Adjust the axial position of the wheel, so that the centerline of the tire's section is aligned with the edge of the hammerhead's impact surface (see Figure 2). Adjust the position of the wheel in the circumferential direction, so that the impacted portion is directly under the hammer.

For the two impact heights, H_1 and H_2, it may impact the same wheel. Each impact corresponds to a different window. It is recommended to use DH_2 height to impact the valve window's position, make the interval between the two impact positions as large as possible.

6.2.3.2 Manually tighten the nut or bolt to the specified torque value, or use the methods as recommended by the vehicle or wheel manufacturer to tighten it. If there is no torque requirement, it is recommended to use the torque of (110 ± 10) N • m.

6.2.3.3 Adjust the distance from the impact surface to the highest point of the tire, make it equal to the falling height H of the hammer.

6.2.3.4 Release the hammer to carry out impact.

6.2.3.5 Check the deformation or crack of the rim. The measurement method of rim deformation is as shown in Appendix A.

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