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Spoke-plate wheels for motor cycles and mopeds

摩托车和轻便摩托车辐板式车轮

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Spoke-plate wheels for motor cycles and mopeds

1 Scope

This Standard specifies the requirements and test methods for spoke-plate wheels for motor cycles and mopeds.

This Standard applies to spoke-plate wheels for motor cycles and mopeds on the road (hereinafter referred to as “wheels”).

2 Normative references

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

GB/T 13202 Series of motorcycle rims

HG/T 2443 Test method of static loaded performance for tyres

QC/T 722 Test method for contour and mopeds rims - Template test

QC/T 725 Test method for calibrated diameter of motorcycles and mopeds rims using sphere-string ruler

QC/T 726 Test method for calibrated diameter of motorcycles and mopeds rims using even strap ruler

3 Terms and definitions

For the purpose of this document, the following terms and definitions apply.

3.1

spoke-plate wheels

Wheels that are permanently connected to rims and spokes.

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4.1.4.2 After the rotating bending fatigue test, radial load fatigue test and torsional fatigue test, the radial and axial circle runout of the wheel shall comply with the provisions of 4.3.1, 4.3.2 and 4.3.4, respectively.

4.2 Mark

The wheel mark shall be clearly visible. In the position that is easily recognized when the wheel is mounted on the vehicle, the following marks are engraved:

a) rim specification code;

b) the calibrated maximum design load of the wheel;

c) the wheel manufacturer's trademark or name;

d) date of manufacture or batch number.

For tubeless wheels, the words “TUBELESS” or “tubeless” shall be engraved after the standard rim code.

4.3 Performance requirements

4.3.1 Rotating bending fatigue performance

After the test of more than 10^5 cycles according to the provisions of 5.3.1, the wheel shall be free of damage cracks, breakage, obvious deformation and abnormal looseness of the joint. The radial and axial circle runout of the wheel after the test is not more than 2.0 mm.

4.3.2 Radial load fatigue performance

After the test of more than 5×10^5 rpm according to the provisions of 5.3.2, the wheel shall be free of damage cracks, breakage, obvious deformation and abnormal looseness of the joint. The radial and axial circle runout of the wheel after the test is not more than 2.0 mm.

4.3.3 Radial impact performance

After the impact test according to the provisions of 5.3.3, the wheel shall be free of damage cracks, breakage and abnormal looseness of the joint. The tyre pressure shall not fall more than 50 % within 30 s after the impact, and the deformation t ($t = B_2 - B_1$, see Figure 2) at the impact position shall not exceed 7 mm.

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Deformation at $0.7F_{max}$ value S_a/mm	≤ 20
NOTE 1: The deformation energy α is the energy absorbed by the wheel during the static deformation process. NOTE 2: For F_V, see 5.3.1.2.1 for the interpretation of the symbols in formula (1).	

4.3.6 Rim and spoke welding strength

After the rim and spoke welding strength test according to the provisions of 5.3.6, under the test load, the welded parts of the wheel rim and spoke shall be free from tear or visible cracks.

4.3.7 Airtightness (applicable only to tubeless wheels)

In the airtightness test according to the provisions of 5.3.7, when the wheel rim pressure is maintained for more than or equal to 30 s, there shall be no air leakage around the rim.

5 Test methods

5.1 Dimensions and tolerances

5.1.1 Rim contour

Inspection of the rim contour dimension is carried out according to the method specified in QC/T 722.

5.1.2 Rim circumference

Inspection of the rim circumference:

a) Inspection of the diameter (circumference) of MT slant bottom bead seat rims, DT divided bead seat rims and DC deep groove bead seat rims, is carried out according to the method specified in QC/T 725.

b) Inspection of the peak diameter (circumference) of WM cylindrical bead seat rims and slant bottom bead seat rims, is carried out according to the method specified in QC/T 725.

5.1.3 Wheel runout

Inspection of the radial circle runout and axial circle runout of wheels.

INSTALL the wheel on a dedicated measuring table, TURN it, and MEASURE the radial and axial circle runout of the wheel using a measuring tool such as a dial indicator (see Figure 1).

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5.3.1.2 Test conditions

5.3.1.2.1 Bending moment

5.3.1.3 The applied bending moment *M* value is determined according to formula (1).

$$M = 0.7 \times \mu \times F_V \times r \qquad \cdots\cdots (1)$$

where

M - the bending moment, in Newton-meters (N · m);

μ - the coefficient of friction between the tyre and the road surface, the value is 0.7;

F_V - the wheel's maximum vertical static load or wheel's rated load specified by the vehicle manufacturer or the wheel manufacturer, in Newton (N);

r - the tyre radius, the maximum static radius of the maximum applicable tyre or the tyre specified by the wheel manufacturer, determined according to HG/T 2443, in meters (m).

5.3.1.2.2 Load arm length

The load arm length is recommended to be equal to the tyre radius *r* defined in 5.3.1.2.1.

5.3.1.2.3 Bending moment tolerance

The bending moment *M* tolerance during the test is ±5 % of the calculated value.

5.3.1.3 Test procedure

FIX the edge of the wheel rim to the turntable. FIX the load arm with sufficient rigidity to the wheel as the axle mounting form. The test equipment applies the bending moment *M* calculated by formula (1). Carry out the rotation test (see Figure 3).

5.3.1.4 Inspection of damage crack after test

Damage cracks can be inspected using visual inspection, X-ray flaw detector or penetrant testing.

5.3.2 Radial load fatigue test

5.3.2.1 Test equipment

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Q - the radial load, in Newton (N);

S_r - the strengthen test coefficient, of which the value is 2.25;

F_V - according to the interpretation of the symbols in formula (1) in 5.3.1.2.1.

5.3.2.2.2 Tyre pressure

The test tyre pressure is the pressure corresponding to the maximum design load of the tyre, and the error is ±10 kPa.

5.3.2.2.3 Radial load fluctuation tolerance

The load fluctuation tolerance during the test is ±5 %.

5.3.2.2.4 Tyre failure

In the event of a tyre failure, the test shall continue after the tyre has been replaced.

5.3.2.3 Test procedure

Wheels with tyres shall be installed on the test equipment in the same manner as they are installed on a vehicle (see Figure 4). The tyre pressure shall be inflated as required by 5.3.2.2.2, and then the radial load Q shall be applied according to the calculated value of formula (2). At the same time, the drum is driven to rotate for test. The applied load direction shall be on the line connecting the center of the wheel and the center of the drum.

5.3.2.4 Inspection of damage crack after test

Damage cracks can be inspected using visual inspection, X-ray flaw detector or penetrant testing.

5.3.3 Radial impact test

5.3.3.1 Test equipment

The schematic diagram of the test equipment is as shown in Figure 5 and Figure 6, which shall meet the following requirements:

a) the test fixture for the installation of the wheel shall have sufficient rigidity and strength;

b) the impact hammer with a hammer width not less than 1.5 times the rim width shall be able to fall freely to impact the wheel/tyre assembly.

Figure 5 is the schematic diagram of radial impact test (single hammer)

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m_1 - the mass of the primary hammer, in kilograms (kg);

m_2 - the mass of the secondary hammer including the spring, equal to 40 kg.

5.3.3.2.4 Impact hammer mass and fall height tolerances

The tolerance calculation method is as follows:

a) the impact hammer mass m_s or m_d tolerance is ±2 % of the calculated value;

b) the fall height tolerance shall be ±1 % of the specified value.

5.3.3.3 Test procedure

According to the assembly method of the wheel on the vehicle, the wheel equipped with the minimum applicable tyre or the tyre specified by the manufacturer is installed on the workbench, and the tyre shall be inflated according to the inflation pressure given by the formula (3). According to the hammer mass m_s or m_d given by formula (4) or formula (5) and the fall height given in 5.3.3.2.2, adjust the relative position to ensure that the velocity vector passes the weakest position on the wheel circumference at the moment of impact (see Figure 5, Figure 6). The impact force shall pass through the centerline of the wheel.

5.3.3.4 Inspection of damage crack after test

Damage cracks can be inspected using visual inspection, X-ray flaw detector or penetrant testing.

5.3.3.5 Arbitration after test

In the arbitration test, the single hammer impact test shall prevail.

5.3.4 Torsional fatigue test

5.3.4.1 Test equipment

The test equipment shall be capable of applying a reciprocating torsional moment between the hub and the rim, as shown in Figure 7.

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5.3.4.3 Torsional moment tolerance

The torsional moment *T* tolerance during the test is ±5 %.

5.3.4.4 Load arm length

The load arm length is recommended to be equal to the tyre radius *r* defined in 5.3.1.2.1.

5.3.4.5 Test procedure

FASTEN the edge of the rim to the workbench (see Figure 7), and APPLY the torsional moment *T* given by formula (7) to the rim repeatedly through the hub contact.

5.3.4.6 Inspection of damage crack after test

Damage cracks can be inspected using visual inspection, X-ray flaw detector or penetrant testing.

5.3.5 Static load performance test

5.3.5.1 Test apparatus

The test apparatus is as shown in Figure 8, which shall meet the following requirements:

a) the test apparatus shall be provided with means to apply a radial load to the wheel at a constant speed;

b) the test apparatus shall be provided with means for recording the synchronized deformation produced by the wheel during the loading process;

c) the support table shall have sufficient strength and suitable fixtures to ensure that the wheel do not cause any sloshing during the test;

d) the width of the cylindrical presser foot is not less than 1.5 times the width of the rim.

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