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Replacing GB/T 19389-2003

Test Method of Measuring Rolling Circumference for Truck Tyres

(ISO 9112:2008, Truck and Bus Tyres – Methods of
Measuring Tyre Rolling Circumference – Loaded New Tyres, MOD)

载重汽车轮胎滚动周长试验方法

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Foreword

This Standard was drafted as per the rules specified in GB/T 1.1-2009.

This Standard replaced GB/T 19389-2003 *Test Method of Measuring Rolling Circumference for Truck Tyres*; compared with GB/T 19389-2003, this Standard has the major technical differences as follows

- Add Terms and Definitions (see Clause 3 of this Edition);
- Add Rotary Drum Method for Measuring the Rolling Circumference of Tyre (see Clause 4 of this Edition);
- Amend the “climate during the test” into “test temperature and wind speed” (see Sub-clause 5.3 of this Edition; Sub-clause 5.2 of 2003 Edition);
- Modify the classification criteria of test speed by vehicle method, and the test speed value (see Sub-clause 5.4 of this Edition; Sub-clause 5.3 of 2003 Edition);
- Increase the provision only two shafts exist on the tested vehicle of the vehicle method (see Sub-clause 5.6.1 of this Edition; Sub-clause 6.1 of 2003 Edition);
- Modify the ratio of the test load to the maximum load, and the definition of maximum load of the specified tyres (see Sub-clause 5.6.2 of this Edition; Sub-clause 6.2 of 2003 Edition);
- Add the national standard for the method of measuring the outer diameter of tyres in vehicle method (see Sub-clause 5.7.1 of this Edition; Sub-clause 7.1 of 2003 Edition);
- Modify the test speed and running time of the tyre trial running in vehicle method (see Sub-clause 5.7.4 of this Edition; Sub-clause 7.3 of 2003 Edition);
- Modify the duration of tyre pre-heating test in vehicle method (see Sub-clause 5.8.3 of this Edition; Sub-clause 8.3 of 2003 Edition);
- Modify the rolling circumference calculation rounding off in the vehicle method from “closest integer” to “one digit after the decimal point” (see Sub-clause 5.9.1 of this Edition; Sub-clause 9.1 of 2003 Edition);
- Modify the revolution per meter of tyre and the calculation formula in vehicle method (see Sub-clause 5.9.2 of this Edition; Sub-clause 9.2 of 2003 Edition);
- Modify the calculation formula for the rolling circumference of tyre in the vehicle method (see Sub-clause 5.9.3 of this Edition; Sub-clause 9.3 of 2003 Edition);
- Modify the “revolution of tyre per unit distance” into “revolution of tyre per

kilometer (including non-full-turn)" that shall be included in the test report [see Item 6i) of this Edition; Item 6i) of 2003 Edition];

- Increase the "tested tyre manufacturing number", "rotary drum method: rotary drum diameter, surface quality", "tyre outer diameter on the test stage", "rotary drum revolution (including non-full-turn)", "tyre revolution (including non-full-turn)", "laboratory name, test site name", "testing staff" [see Item 6b), d), f), g), j), k) of this Edition];
- Modify the test device tolerance (see Appendix A of this Edition; Appendix A of 2003 Edition).

This Standard adopts re-drafting method to modify and use ISO 9112:2008 *Truck and Bus Tyres – Methods of Measuring Tyre Rolling Circumference – Loaded New Tyres*.

Compared with ISO 9112:2008, this Standard has major technical differences and causes as follows:

- Modify the Normative References (see Clause 2 of this Edition);
- In order to be more precise, add the requirements of "if the diameter tolerance of rotary drum is $\pm 1\%$, the tyre vertically presses on the driving rotary drum with specified diameter" (see Sub-clause 4.2.1 of this Edition);
- For the sake of safety and accuracy, add rotary drum method requirements of "measuring position of test environment temperature" (see Sub-clause 4.3 of this Edition);
- Modify the test speed classification criteria of rotary drum method, more details (see Sub-clause 4.4 of this Edition; Sub-clause 4.4 of ISO 9112:2008);
- Increase the comparison of test results obtained by different rotary drum diameters through empirical formula (2), so that improve the applicability of the standard (see Sub-clause 4.9.2 of this Edition);
- Increase the results obtained on the flat simulated road surface, which is obtained through correcting the rolling circumference gotten by rotary drum method through the empirical formula (3), so that improve the applicability of the standard (see Sub-clause 4.9.3 of this Edition);
- It is more accurate to modify the rolling circumference calculation value in the vehicle method from "closest integer" into "one digit after the decimal point" (see Sub-clause 5.9.1 of this Edition; Sub-clause 5.9.1 of ISO 9112:2008);
- Increase the contents of the test report according to the due contents of test report that shall be included in the country's standard for conventional test methods (see Clause 6 of this Standard).

Test Method of Measuring Rolling Circumference for Truck Tyres

1 Scope

This Standard specifies, under the load condition of truck tyre, two test methods to measure the rolling circumference and revolution per unit distance (kilometer).

This Standard is applicable to all new truck tyres.

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 document.

GB/T 521 Test Method of Measuring Peripheral Dimensions for Tyres

GB/T 6326 Tyre Terms and Definitions (GB/T 6326-2014, ISO 4223-1:2002, NEQ)

3 Terms and Definitions

The following terms and definitions and those ones stipulated in GB/T 6326 are applicable to this document.

3.1 Reference speed (V_r)

The given test speed is relevant to the output rolling circumference value.

4 Rotary Drum Method

4.1 Principle

Install the tested tyre rim assembly onto a driven shaft, it vertically presses onto the driving rotary drum with specified diameter, and exert load. The value of rolling circumference shall be determined by the specific speed. Record the number of turns for the tyre and rotary drum; introduce such data into the formula, and calculate the

rolling circumference of the tyre.

4.2 Requirements for test rotary drum

4.2.1 Diameter of rotary drum

The nominal diameter of test rotary drum is at least 1700mm, the diameter tolerance of rotary drum is $\pm 1\%$, the tyre vertically presses on the driving rotary drum with specified diameter, and exert load. Pay attention to the smooth operation during the measuring period.

4.2.2 Surface

The surface of rotary drum shall be smooth steel surface; if using a rotary drum with textured surface, it shall be indicated in the test report. The surface of rotary drum shall be kept clean.

4.2.3 Width

The width of rotary drum surface shall be greater than tread width of the tested tyre.

4.3 Thermal environment

The test shall be performed at a test ambient temperature of 25°C, or be performed in an ambient temperature range of 20°C~30°C, the temperature requires no correction.

The distance between measuring position of test ambient temperature and the tyre shall be in the range of 150mm~1000mm.

4.4 Test speed

4.4.1 Test speed of tyres with single-tire load index of 122 and above

In order to set a reference frame to the rolling circumference of all tyres, the test speed is 80km/h for tyres with speed symbols of K and above; while the test speed is 60km/h for tyres with speed symbols of J and below.

For radial tyres, the rolling circumference measurement can also be performed at a test speed from 30km/h to 130km/h, the rolling circumference value can be calculated by linear interpolation method.

4.4.2 Test speed of tyres with single-tire load index of 121 and below

In order to set a reference frame for the rolling circumference of all tyres, the test speed is 80km/h.

For radial tyres, the rolling circumference measurement can also be performed at a test speed from 30km/h to 130km/h, the rolling circumference value can be calculated

The ambient temperature shall be between 5°C and 30°C. If the road surface is paved by asphalt, the road surface shall be cold enough not to be sticky. The Wind speed shall not exceed 3m/s.

5.4 Test speed

5.4.1 Test speed of tyre with single-tire load index of 122 and above

For the tyre with speed symbols of K and above, the test speed shall be 80km/h $\pm$ 2km/h; for the tyre with speed symbols of F~J, the test speed shall be 60km/h $\pm$ 2km/h.

5.4.2 Test speed of tyre with single-tire load index of 121 and below

The test speed shall be 80km/h $\pm$ 2km/h.

5.5 Accuracy

The minimum number of pulses per revolution (N_i) shall be 16. The total error of the revolution device, including the start and stop, shall not exceed 0.1%.

5.6 Test vehicle

5.6.1 Test vehicle and tyre position

The test vehicle indicates the representative vehicle equipped with the test tyre with the same specification.

The test vehicle shall have only two shafts. Since most speedometers and odometers are driven by the drive shaft, the test tyre shall be installed on the drive shaft. For a four-wheel drive vehicle, during the test period, one of the shafts is disengaged from the transmission system.

Tyres are usually used as twins on the drive shaft and are tested in twins.

5.6.2 Test load

The test load on the drive shaft shall be 85% of the maximum single-tire load of tyre (for the tyres used as twins on the drive shaft, the test load is 85% of the maximum twin-tire load) multiplied by the number of tyres on the shaft; the load range shall be controlled within $\pm 2\%$; the load on other shafts shall be distributed normally.

5.7 Test tyre and rim

5.7.1 Test tyre

The tyres with the same specification, logo, model and trademark shall be used in the test; after inflation, and in case of no load, the outer diameter difference of the tyres shall be within 0.5%.

test wheel and the left test wheel pass the test road.

5.8.6 Repeat the test twice in each direction on the test road.

5.8.7 If the difference between the first and second revolutions of each wheel in the same direction exceeds 0.2%, the test shall be repeated until the revolution (including the non-full-turn) difference of two tests of each wheel in each direction is within 0.2%.

5.9 Calculation

5.9.1 Accuracy

Calculate 8 readings (i.e. 4 reading per drive shaft) on the accuracy requirements specified in Sub-clause 5.8.7 one by one.

Take the average value about the 8 calculated values. The calculated value of the revolution per unit distance (see Sub-clause 5.9.2) and tyre rolling circumference (see Sub-clause 5.9.3) shall be rounded off one digit after the decimal point.

5.9.2 Revolution of tyre per unit distance N_{km}

Revolution of tyre per unit distance N_{km} is determined by the measured revolution (including the non-full-turn) divided by the distance travelled during the test. The revolution per meter shall be calculated as per Formula (4):

$$N_{km} = (N/L) \times 10^3 \dots\dots\dots (4)$$

Where:

N – the measured value of revolution (including the non-full-turn);

L – the length of test segment on test road, in m.

5.9.3 Tyre rolling circumference C_r

The tyre rolling circumference C_r is obtained by the length of test segment on the test road L (m) divided by the measured revolution value. The calculation formula of tyre rolling circumference C_r (mm) is as Formula (5):

$$C_r = (L/N) \times 10^3 \dots\dots\dots (5)$$

Where:

N – the measured value of revolution (including the non-full-turn);

L – the length of test segment on test road, in m.

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