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GB/T 41321-2022

Test method for stiffness of self-supporting run-flat tyres

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1 Scope

This document specifies the test method (including measurement test equipment and its accuracy requirements, test conditions and test procedures) and test report for stiffness of self-supporting run-flat tyres.

This document applies to the measurement of the stiffness of self-supporting run-flat passenger car radial tyres.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the version corresponding to that date is applicable to this document; for undated references, the latest version (including all amendments) is applicable to this document.

GB/T 2978, Size designation, dimensions, inflation pressure and load capacity for passenger car tyres

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

GB/T 30196, Self-supporting run flat tyres (GB/T 30196-2022, ISO 16992:2018, MOD)

3 Terms and definitions

Terms and definitions determined by GB/T 6326 and GB/T 30196, as well as the following ones, are applicable to this document.

3.1 Reference inflation pressure pref Inflation pressure to be used as a first step in test conditions.

Note: in kilopascals (kPa).

3.2 Test inflation pressure pi Inflation pressure at the step "i".

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Note: in kilopascals (kPa).

3.3 Vertical stiffness KZ Tyre stiffness measured under vertical force input in inflated conditions.

Note: in Newtons per millimeter (N/mm).

3.4 Structural stiffness Kstr Tyre vertical stiffness measured in zero i.p. running mode.

Note: Structural stiffness is a function of the tyre's construction and technological content, in Newtons per millimeter (N/mm).

3.5 Air stiffness Kair A tyre characteristic, which is calculated as the difference between tyre vertical stiffness (inflated) and tyre structural stiffness (uninflated).

Note: Air stiffness is a function of the air volume and the inflation pressure of the tyre itself, in Newtons per millimeter (N/mm).

3.6 Deflection SZ Vertical displacement of the plate in the Z direction.

Note: in millimeters (mm).

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4.1 General

Self-supporting run-flat tyres shall comply with the requirements of GB/T 30196.

4.2.1 Preparation of tyres

The inflation pressure is 250 kPa for the standard load tyres, and 290 kPa for the reinforced load tyres. Fix the tyre on the test rim as specified in 4.2.3, and store for at least 3 h at (25+/-3) °C. The deviation for the inflation pressure shall be +/-3 kPa.

4.2.2 Tyre measurement positions

Take 3 equally distributed positions on the circumference of the tyre for measurement.

-- The reference position, which can be freely chosen, needs to be in contact with the bearing plate. The splices, if visible, shall be avoided.

-- The other two positions shall be equally distributed around the tyre's circumference: distance between measurement positions approximately 120°.

4.2.3 Test rims

The test rims shall have humps (flat or round) on both rim sides, where the width shall be in accordance with GB/T 2978. Stiff alloy or heavy duty rims shall be used as test rims.

4.2.4.1 The test equipment shall be able to apply a corresponding load between the tyre

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and the bearing plate; the bearing plate dimensions shall be larger than the tyre footprint, and can realize relative movement between the two (tyre towards bearing plate or bearing plate towards tyre).

4.2.4.2 The rotational axis of the test tyre shall be parallel to the bearing plate, and the

relative movement between the two shall be as such to be able to keep the parallelism;

the maximum movement speed shall be 1 mm/s, and the acquisition rate shall be at least

5 data points for each millimetre of displacement.

4.2.5 Test equipment set-up

4.2.5.1 Before the test, the load cells shall start the data acquisition at 100 N.

4.2.5.2 At least the following data shall be recorded:

-- loading force (FZ) (N), accuracy +/-0.5% of maximum load cell capacity, but in any case, maximum 100 N;

-- absolute position (z) (mm) accuracy +/-0.5 mm.

One vertical load value (FZ) shall correspond to only one absolute position value (z)

and vice versa.

4.2.5.3. The ambient temperature at the test equipment shall be (25+/-3) °C.

4.2.5.4 The total number of acquired data points shall be in the range of 100 ~ 1 000 per inflation pressure step (refer to Table 1). The surface of the bearing plate in contact with the tyre during the measurement shall be smooth steel.

4.2.6 Maximum test load The maximum test load under the tyre reference inflation pressure (pref) is 150% of the load capacity corresponding to the load index value.

4.2.7 Test procedure

4.2.7.1 Mount the test tyre on the test equipment.

4.2.7.2 The initial distance between the test tyre and the bearing plate shall be at least

10 mm, measured as vertical distance between the lowest tyre point and the bearing plate. To set the starting point for data acquisition, the inflated tyre is loaded with a light load (FZ <= 100 N) to determine the contact point between the tyre and the bearing plate.

From this point, the tyre is moved back by at least 10 mm. This last position is the starting point (0,0) to be used for all of the next inflation pressure steps.

4.2.7.3 Start the data recording.

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4.2.7.4 Start loading the tyre using a constant loading speed of maximum 1 mm/s.

4.2.7.5 Inflation pressure step 1 is stopped at the maximum load (150% loading capacity corresponding to load index), where the maximum deflection (SZmax) is recorded and set as stopping criterion for the following inflation pressure steps.

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