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Passenger car tyres — Verifying tyre capabilities — Laboratory test methods

Pneumatiques pour voitures particulières — Vérification de l'aptitude des pneumatiques — Méthodes d'essai en laboratoire

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 31, *Tyres, rims and valves*, Subcommittee SC 3, *Passenger car tyres and rims*.

This fourth edition cancels and replaces the third edition (ISO 10191:2010), which has been technically revised. The main changes compared with the previous edition are as follows:

— separation of test methods and requirements for radial tyres and diagonal tyres, bias-belted tyres and T-type temporary spare tyres;

— replace the descriptions of strength test and bead unseating test by reference to the corresponding ASTM standards;

— align endurance test and high-speed test for radial tyres with UN GTR No. 16[1];

— allow PTFE coating of drums for endurance test;

— reduce conditioning time for high-speed test;

— allow drum acceleration in steps;

— editorial changes to improve consistency of the text and align with terms defined in ISO 4223-1:2017.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Passenger car tyres — Verifying tyre capabilities — Laboratory test methods

1 Scope

This document specifies test methods for verifying the capabilities of tyres for passenger cars. Of the test methods presented, it is possible that only some will be required depending on the construction of the tyre (diagonal, bias-belted, radial or T-type construction) to be tested. The tests are carried out in a laboratory under controlled conditions.

This document includes endurance tests, a low-pressure performance test, high-speed tests and requirements for bead unseating and tyre strength.

The test methods presented in this document are not intended for gradation of tyre performance or quality levels. This document applies to all passenger car tyres.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

ISO 4223-1:2017, *Definitions of some terms used in the tyre industry — Part 1: Pneumatic tyres*

ASTM F414-15, *Standard Test Method for Energy Absorbed by a Tire When Deformed by Slow-Moving Plunger*

ASTM F2663-15, *Standard Test Method for Bead Unseating of Tubeless Passenger and Light Truck Tires*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 4223-1:2017 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
bead separation
breakdown of bond between components in the bead area

[SOURCE: ISO 4223-1:2017, 3.8.1]

3.2
belt separation
parting of rubber compound between belt layers or between belts and plies

[SOURCE: ISO 4223-1:2017, 3.8.2]

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3.3
chunking
breaking away of pieces of rubber from the tread that can expose reinforcing material

Note 1 to entry: Examples for reinforcing material that can be exposed include a polyamide overlay or steel belts.

3.3.1
parasitic tread block chunking
PTBC
breaking away of pieces, or tearing, of rubber within a tread block without exposing reinforcing material

Note 1 to entry: PTBC is an artefact of testing a loaded tire on a roadwheel; it is not indicative of a tire structural problem and does not occur in real-world operation. It generally occurs in the endurance test of tyres with soft tread compounds and/or complex tread geometry, e.g. including many sipes.

Note 2 to entry: Examples for reinforcing material that shall not be exposed include a polyamide overlay or steel belts.

3.4
cord separation
parting of the cords from their rubber coating

[SOURCE: ISO 4223-1:2017, 3.8.4]

3.5
cracking
any parting within the tread, sidewall or inner liner of the tyre that may extend to cord material

[SOURCE: ISO 4223-1:2017, 3.8.5]

3.6
inner liner separation
parting of inner liner from cord material in the carcass

[SOURCE: ISO 4223-1:2017, 3.8.6]

3.7
open splice
any parting at any junction of tread, sidewall or inner liner that that may extend to cord material

[SOURCE: ISO 4223-1:2017, 3.8.11]

3.8
ply separation
parting of adjacent plies

[SOURCE: ISO 4223-1:2017, 3.8.7]

3.9
sidewall separation
parting of the rubber compound from the cord material in the sidewall

[SOURCE: ISO 4223-1:2017, 3.8.13]

3.10
tread separation
pulling away of the tread from the carcass

[SOURCE: ISO 4223-1:2017, 3.8.9]

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3.11
test rim
rim on which the tyre is fitted for specific testing and, unless specified otherwise, approved or recommended or permitted in one of the regional tyre standards for a tyre of that size designation and type

[SOURCE: ISO 4223-1:2017, 3.8.8, modified — "pneumatic tyre" has been changed to "tyre".]

3.12
test drum speed
peripheral speed of the steel test drum

3.13
maximum load rating
reference mass corresponding to the load index used to define the *load capacity* (3.14) of a tyre

3.14
load capacity
maximum load that the tyre is able to carry subject to its operating speed and its speed category

4 Test equipment and conditions

4.1 Test drum, cylindrical driven flywheel (drum) having a diameter of 1,7 m ± 1 % or 2,0 m ± 1 %.

The surface of the drum shall be smooth steel. For the endurance test and low-pressure performance test according to 7.1, the drum may be coated with a thin layer of non-stick material, e.g. polytetrafluoroethylene (PTFE), to eliminate parasitic tread block chunking (PTBC), provided that the total drum diameter remains within above limits. The width of the test surface and, if applicable, the width of the thin layer of the non-stick material shall be equal to or exceed the overall width of the test tyre.

When PTFE lubricant is used as non-stick material, care shall be taken that the composition of the lubricant is suitable for use with rubber compounds. For example, silicone-oil-based lubricants with PTFE content between 40 % and 55 % have shown appropriate performance for this purpose.

For the test drum, the loading device shall have a capacity of at least 1 000 kg and the accuracy shall be within ±1 % of the full scale. The speed capability of the equipment shall be adequate for the requirements of the test methods. The accuracy of the test drum speed shall be within $^{+2}_{0}$ km/h.

4.2 Inflation pressure gauges, with a maximum scale value of at least 500 kPa and an accuracy within ±5 kPa.

4.3 Conditioning and test room temperature: If a tyre manufacture desires to increase test severity, tyre conditioning and the tests may be carried out at a higher temperature than specified in the respective subclauses.

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