



BSI Standards Publication

Passenger car tyres — Method for measuring relative wet grip performance — Loaded new tyres

National foreword

This British Standard is the UK implementation of ISO 23671:2021. It supersedes BS ISO 23671:2015, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee AUE/4, Tyres and wheels for motor vehicles.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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© The British Standards Institution 2021
Published by BSI Standards Limited 2021

ISBN 978 0 539 01659 8

ICS 83.160.10

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 June 2021.

Amendments/corrigenda issued since publication

Date	Text affected
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Passenger car tyres — Method for measuring relative wet grip performance — Loaded new tyres

*Pneumatiques pour voitures particulières — Méthode de mesure de
l'adhérence relative sur revêtement mouillé — Pneumatiques neufs en
charge*





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CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

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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 this document 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).

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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, *Tyre, rims and valves*.

This third edition cancels and replaces the second edition (ISO 23671:2015), which has been technically revised.

The main changes compared to the previous edition are as follows:

- the method accuracy and reproducibility has been improved by updating the formulae and coefficients for wet grip index calculation;
- the method of track validation has been revised to be done only with 16 in SRTT instead of with BPN or 14 in SRTT,
- the wet grip performance measurement using a control tyre in case of vehicle method has been withdrawn.

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.

Passenger car tyres — Method for measuring relative wet grip performance — Loaded new tyres

1 Scope

This document specifies the method for measuring relative wet grip braking performance index to a reference under loaded conditions for new tyres for use on passenger cars on a wet-paved surface.

The methods developed are meant to reduce variability. The use of a reference tyre is necessary to limit the variability of the testing procedures.

This document applies to all passenger car tyres except for:

- special-use tyres marked with "ET";
- T-type temporary spare tyres;
- tyres fitted with additional devices to improve traction properties (e.g. studded 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 edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 4000-1, *Passenger car tyres and rims — Part 1: Tyres (metric series)*

ASTM E965-96, *Standard Test Method for Measuring Pavement Macro texture Depth Using a Volumetric Technique*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 4223-1 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

test run

single pass of a loaded tyre over a given test surface

3.2

braking test

series of a specified number of *test runs* (3.1) of the same tyre repeated within a short time frame

3.3

braking test cycle

series of *braking tests* (3.2) that consist of an initial braking test of the *reference tyre set* (3.6), of up to three braking tests of *candidate tyre sets* (3.5), and a final braking test of the same reference tyre set

3.4

test tyre

tyre that is used for an evaluation programme

3.5

candidate tyre

candidate tyre set

test tyre (3.4) (set) that is part of an evaluation programme and that is evaluated with the reference tyre using the same test method

3.6

reference tyre

reference tyre set

special *test tyre* (3.4) (set) that is used as a benchmark in an evaluation programme

Note 1 to entry: The reference tyre (SRTT) is defined in ASTM F2493-20.

Note 2 to entry: These tyres have carefully controlled design features to minimize variation.

3.7

braking force

longitudinal force between a tyre and the road resulting from braking torque application

Note 1 to entry: It is expressed in newtons.

3.8

peak braking force coefficient

μ_{peak}

<trailer (or tyre test vehicle) method> maximum value of the *dynamic tyre braking force coefficient* (3.9) that occurs prior to the *lockup* (3.11) of a wheel as the braking torque is progressively increased

3.9

dynamic tyre braking force coefficient

$\mu(t)$

<trailer (or tyre test vehicle) method> ratio between the *braking force* (3.7) and the *vertical load* (3.12) acquired in real time

3.10

average braking force coefficient

BFC

<vehicle method> ratio between the average deceleration in a *test run* (3.1) and the acceleration gravity ($9,81 \text{ m}\cdot\text{s}^{-2}$)

3.11

lockup

condition of a wheel in which its rotational velocity about the wheel spin axis is zero and which prevents it from rotating in the presence of applied wheel torque

3.12

vertical load

normal force of a tyre exerted on the road resulting from the mass supported by the tyre

Note 1 to entry: It is expressed in newtons.

3.13

tyre test vehicle

dedicated vehicle which has instruments to measure the vertical and the longitudinal forces on one tyre during braking

3.14**tyre set**

<trailer (or tyre test vehicle) method> set of one (1) tyre

3.15**tyre set**

<vehicle method> set of four (4) tyres

4 Methods for measuring wet grip index

For the evaluation of the wet grip index (G) of a candidate tyre, the wet grip braking performance of the candidate tyre is compared to the wet grip braking performance of the reference tyre on a straight, wet, paved surface. It is measured with one of the following methods:

- vehicle method consisting of testing a tyre set mounted on a commercialized vehicle;
- test method using a trailer or a tyre test vehicle equipped with the test tyre set.

In case of verification of the wet grip index (G) the same test method used for its declaration shall be used.

NOTE Differently from the previous edition of this document, as far as case of vehicle method is concerned, when the candidate tyre size is significantly different from that of the reference tyre, a direct comparison on the same vehicle may not be possible and the test method using a trailer or a tyre test vehicle can be used.

5 General test conditions**5.1 Track characteristics**

The surface shall have a uniform gradient of not more than 2 % in both longitudinal and lateral directions and shall not deviate more than 6 mm when tested with a 3 m straight edge.

The test surface shall have a pavement of uniform age, composition, and wear. The test surface shall be free of loose material and foreign deposits.

It shall be a dense asphalt surface.

The maximum chipping size shall be from 8 mm to 13 mm.

The macro texture depth MTD shall be measured as specified in ASTM E965-96 using the area of the track to be used for the wet grip test and shall be $(0,7 \pm 0,3)$ mm.

In order to verify the frictional properties of the surface, the reference tyre shall be used as follows.

- a) In case of vehicle method, the texture depth is measured in both lanes where the tyres are going to brake.

The temperature-corrected arithmetic mean of the average braking force coefficients (BFC_{corr}) of at least six valid measurements of the reference tyre (see [Clause 6](#)) shall be not less than 0,57 and not greater than 0,79.

The arithmetic mean of the average braking force coefficients (BFC_{ave}) of the reference tyre is corrected by the wetted surface temperature as follows:

$$BFC_{corr} = BFC_{ave} + a \cdot (\vartheta - \vartheta_0)$$

where