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Truck and bus tyres — Method for measuring relative wet grip performance — Loaded new tyres

Pneumatiques pour camions et autobus — Méthode de mesure de l'adhérence relative sur revêtement mouillé — Pneumatiques neufs en charge

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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).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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*.

This second edition cancels and replaces the first edition (ISO 15222:2011), which has been technically revised.

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

— the SRTT for tracks validation has been changed (from SRTT 14” to SRTT 16” due to SRTT 14” discontinuation);

— the SRTT selection rules (wide SRTT or narrow SRTT) have been revised;

— test results' calculations and validation have been clarified and simplified;

— the wording and designations have been aligned with ISO 23671 for better consistency.

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.

Truck and bus 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 commercial vehicles on a wet-paved surface.

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

This document applies to all commercial vehicle, truck and bus tyres.

This document does not apply to:

— tyres fitted with additional devices to improve traction properties (e.g. studded tyres);

— professional off-road 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 4209-1, *Truck and bus tyres and rims (metric series) — Part 1: Tyres*

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

ISO 23671, *Passenger car tyres — Method for measuring relative wet grip performance — Loaded new tyres*

ASTM E965-15, *Standard Test Method for Measuring Pavement Macrotexture Depth Using a Volumetric Technique*

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 terminology databases for use in standardization at the following addresses:

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

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

3.1
test run
single pass of a loaded tyre over a given test surface

3.2
candidate tyre
T
test tyre that is part of an evaluation programme

3.3
reference tyre
R
standard reference test tyre (3.17) that is used as a benchmark in an evaluation programme

Note 1 to entry: These tyres usually have carefully controlled design features to minimize variation.

3.4
control tyre
C
intermediate tyre that is used when the *candidate tyre* (3.2) and the *reference tyre* (3.3) cannot be directly compared on the same vehicle

3.5
braking force
longitudinal force between a tyre and the road resulting from braking torque application

Note 1 to entry: It is expressed in newtons.

3.6
braking force coefficient
BFC
<vehicle method> ratio between the average deceleration in a *test run* (3.1) and the acceleration gravity (9,81 $m \cdot s^{-2}$)

3.7
dynamic tyre braking force coefficient
$\mu(t)$
<trailer (or tyre test vehicle) method> ratio between the *braking force* (3.5) and the *vertical load* (3.10) acquired in real time

3.8
peak braking force coefficient
μ_{peak}
<trailer or tyre test vehicle method> maximum value of the *dynamic tyre braking force coefficient* (3.7) that occurs prior to the *lockup of a wheel* (3.9) as the braking torque is progressively increased

3.9
lockup of a wheel
condition of a wheel in which its rotational velocity about the wheel spin axis is zero and it is prevented from rotating in the presence of applied wheel torque

3.10
vertical load
normal force (Z-direction) of a tyre exerted on the road resulting from the mass supported by the tyre

Note 1 to entry: It is expressed in newtons.

3.11
tyre test vehicle
trailer vehicle
special purpose tyre evaluation vehicle which has instruments to measure the vertical and longitudinal forces on one tyre during braking

3.12
hitch height
coupling height
height when measured perpendicularly from the centre of the articulation point of the trailer towing coupling or hitch to the ground, when the towing vehicle and trailer are coupled together

Note 1 to entry: The vehicle and trailer shall be standing on level pavement surface in their test mode complete with the appropriate tyre(s) to be used in the particular test.

3.13
braking test
series of a specified number of *test runs* (3.1) of the same tyre repeated within a short time frame

3.14
braking test cycle
series of *braking tests* (3.13) that consist of an initial braking test of the *reference tyre* (3.3) set, of up to three braking tests of either *candidate tyre* (3.2) sets or *control tyre* (3.4) sets, or both, and a final braking test of the same reference *tyre set* (3.16)

3.15
tyre set
<vehicle method> four or six tyres depending on the test vehicle

3.16
tyre set
<trailer or a tyre test vehicle method> one or two tyres

3.17
standard reference test tyre
SRTT
tyre that is produced, controlled and stored under specific conditions, in order to be used as reference tyre for testing

Note 1 to entry: These tyres usually have carefully controlled design features to minimize variation. The requirements for SRTTs are given in ASTM international standards.

4 Methods for measuring wet grip

Relative wet grip braking performance for loaded commercial vehicle new tyres travelling straight ahead on a wet, paved surface can be measured by one of the following methods:

— a vehicle method consisting of testing a tyre set mounted on a standard vehicle;

— a test method using a trailer or a tyre test vehicle equipped with a test tyre set.

5 General test conditions

5.1 Track characteristics

5.1.1 General

The surface shall be a dense asphalt surface with a uniform gradient of not more than 2 % 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 or foreign deposits.

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

The macro texture depth MTD of the area of the track to be used for the wet grip test shall be measured as specified in ASTM E965-15, and shall be (0,7 ± 0,3) mm.

In order to verify the wetted frictional properties of the surface, the following method in 5.1.2 shall be used.

5.1.2 Standard reference test tyre method

This method uses P225/60R16 97S, defined in ASTM F2493-20, SRTT (SRTT16).

Perform at least six valid measurements of the peak braking force coefficients (μ_{peak}) with SRTT16 using a trailer or special purpose tyre evaluation vehicle test procedure as specified in Clause 7 or in ISO 23671 at 65 km/h and 180 kPa.

The average of the measured peak braking force coefficients ($\mu_{peak,ave}$) shall be corrected for the effects of temperature as follows:

$$\mu_{peak,corr} = \mu_{peak,ave} + a \cdot (\vartheta - \vartheta_0)$$

where

$\mu_{peak,corr}$ is the temperature corrected average peak braking force coefficient;

a is equal to 0,002 °C^{-1};

ϑ is the wetted surface temperature in degree Celsius;

ϑ_0 is equal to 20 °C.

$\mu_{peak,corr}$ shall be not less than 0,65 and not greater than 0,90.

The test shall be conducted using the lanes and length of the track to be used for the wet grip test.

For the trailer method, testing is run in such a way that braking occurs within 10 m distance in length of where the surface was characterized.

5.2 Wetting conditions

The surface may be wetted from the track-side or by a wetting system incorporated into the test vehicle or the trailer.

If “external watering” is used, water the test surface at least half an hour prior to testing in order to equalize the surface temperature and water temperature. External watering should be supplied continuously throughout testing.

For both external watering and self-watering systems, the water depth shall be not less than 0,5 mm and not greater than 2,0 mm measured from the peaks of the pavement for the braking lanes used.

5.3 Atmospheric conditions

The wind conditions shall not interfere with wetting of the surface (windshields are allowed).

The ambient and the wetted surface temperatures shall be between 5 °C and 35 °C and shall not vary during the test by more than 10 °C.

5.4 Reference tyre

In order to cover the range of tyre sizes fitting the commercial vehicles the three standard reference test tyres SRTT16C, SRTT19.5 and SRTT22.5 shall be used to measure the relative wet grip index according to Table 1.

Table 1 — Measurement of the relative wet grip index — Reference tyre

Tyres with one of the following combinations of load index (LI) in single formation and speed category: load index single ≤121 and speed category ≤130 km/h (speed symbol M); or load index single ≥122 and any speed category; 2 specific families defined:	
NARROW family $S_{Nominal}$ **<285 mm**	**WIDE family** $S_{Nominal}$ **≥285 mm**
SRTT19.5 (245/70R19.5 136/134M)	SRTT22.5 (315/70R22.5 154/150L)

Tyres with a load index in single formation load index single ≤121 and a speed category ≥140 km/h (speed symbol N) → Unique family
SRTT16C (225/75 R 16 C 116/114S)

$S_{Nominal}$ **is the tyre nominal section width.**

NOTE 1 The reference tyre SRTT16C (225/75R16C 116/114S) is defined in ASTM F2872.

NOTE 2 The reference tyre SRTT19.5 (245/70R19.5 136/134M) is defined in ASTM F2871.

NOTE 3 The reference tyre SRTT22.5 (315/70R22.5 154/150L) is defined in ASTM F2870.

6 Measurement of tyre wet grip on a standard vehicle

6.1 Principles

The test method covers a procedure for measuring the deceleration performance of commercial vehicle tyres during braking, using a commercial vehicle having an antilock braking system (ABS).

Starting with a defined initial speed, the brakes are applied hard enough on the two axles at the same time to activate the ABS. The braking force coefficient (BFC) is calculated between the initial speed of 60 km/h and the final speed 20 km/h.

6.2 Equipment

6.2.1 Vehicle

The standard equipment is a two-axle standard-model commercial vehicle equipped with four-disc brakes and an ABS. In case tyre fitting is not possible, for example, multi-purpose tyres (MPT) or free rolling tyres (FRT), a vehicle model with drum-brakes and ABS is allowed.

The permitted modifications are:

— those allowing the number of tyre sizes that can be mounted on the vehicle to be increased;

— those permitting automatic activation of the braking device to be installed.

Any other modification of the braking system is prohibited.

6.2.2 Measuring equipment

Measuring device(s) suitable for measuring speed on wet surface and distance covered between two speeds shall be used.

To measure vehicle speed, a fifth wheel or non-contact precision (including, for example, radar, GPS) speed-measuring system shall be used.