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Passenger car tyres — Method for measuring ice grip performance — Loaded new tyres

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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*.

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.

Introduction

The method for measuring ice grip performance described in this document is meant to reduce the variability of the performance measurement. The use of the proper reference tyres limits the variability of the testing method procedures.

Passenger car tyres — Method for measuring ice grip performance — Loaded new tyres

1 Scope

This document specifies the method for measuring the relative ice grip performance index of a candidate tyre compared with a reference tyre under loaded conditions for new tyres intended to be used for passenger cars on surfaces made of ice.

This document applies to all passenger car tyres, except for T-type temporary-spare 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 4000-1, *Passenger car tyres and rims — Part 1: Tyres (metric series)*

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

ASTM F2493, *Standard Specification for P225/60R16 97S Radial Standard Reference Test Tire*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 4000-1 and 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 tyre
candidate tyre (3.3), *reference tyre* (3.4) or *control tyre* (3.5)

3.2
test run
single pass of a loaded tyre over a given test surface

3.3
candidate tyre
T
test tyre (3.1) that is part of an evaluation programme

3.4
reference tyre
SRTT
R
special *test tyre* (3.1) that is used as a benchmark in an evaluation programme

Note 1 to entry: The reference tyre is defined in ASTM F2493.

Note 2 to entry: Reference tyres have carefully controlled design features to minimize variation and shall be stored in accordance with ASTM F2493.

Note 3 to entry: The reference tyre shall not be older than 30 months starting from the production week.

3.5
control tyre
C
intermediate *test tyre* (3.1) that is used when the *candidate tyre* (3.3) and the *reference tyre* (3.4) cannot be directly compared on the same vehicle

Note 1 to entry: The control tyre shall pass the ice grip index threshold defined in 4.4.7.5.

3.6
braking test
series of a specified number of *test runs* (3.2) of the same *test tyre* (3.1) repeated within a short time frame

3.7
braking test cycle
series of *braking tests* (3.6) that consist of an initial braking test of the *reference tyre* (3.4) or the *control tyre* (3.5), of up to two braking tests of *candidate tyres* (3.3), control tyres or both, and a final braking test of the same reference tyre or control tyre

3.8
non-consecutive braking test cycle
braking test cycles (3.7) performed at least after minimum refreshing (or new preparation) of the ice surface, or on a different test lane, or on a different day

3.9
mean fully developed deceleration
d_m
average deceleration calculated on the basis of the measured distance recorded when decelerating a vehicle between two specified speeds

3.10
ice grip index
G_I
ratio between the *mean fully developed deceleration* (3.9) of a *test tyre* (3.1) and that of the *reference tyre* (3.4) or that of the *control tyre* (3.5)

3.11
reference load
Q_{ref}
theoretical load capacity of a tyre at the test inflation pressure

Note 1 to entry: It is expressed in kilograms.

Note 2 to entry: It may exceed the maximum load-carrying capacity of the test tyre as indicated by its load index

3.12
load-on-tyre rate
R_{LoT}
actual tyre load on test vehicle divided by *reference load* (3.11)

Note 1 to entry: It is expressed as a percentage of the reference load.

3.13
tyre set
set of four tyres

4 Test methods

4.1 Braking on ice method for passenger car tyres

4.1.1 General

The ice performance is determined by a test method in which the mean fully developed deceleration of a candidate tyre in an ABS braking test on a flat surface made of ice is compared with that of a reference tyre.

For determination of the ice performance, braking tests of a candidate tyre shall be performed in three non-consecutive braking test cycles.

The relative performance shall be indicated by an ice grip index (G_I).

4.1.2 Test course

The braking tests shall be done on a flat test surface of sufficient length and width covered with smooth ice with a maximum of 2 % gradient.

The test course surface shall be flat, smooth, polished ice and watered at least 1 h before testing. The water used to make the ice shall be clean and free of any solid inclusions. Before starting the test the braking line should be conditioned by conducting a braking test with tyres not involved in the test programme until the friction level stabilizes. When testing studless tyres, the exact same test line shall be used for all braking test repetitions. When testing studded tyres, the braking lines shall not overlap. The reference tyre shall be tested on its own braking line and the studded tyres next to it on their own individual braking lines. The line for the reference tyre shall be kept clean from ice and snow dust. The studded tyres shall be driven on new clean braking lines.

The surface grip level shall be controlled by measurements with the reference tyre. The average mean fully developed deceleration of the reference tyre shall be not less than 0,9 m/s^2 and not greater than 1,6 m/s^2 in each braking test.

The air temperature, measured about 1 m above the ground, shall be between −15 °C and +4 °C; the ice temperature, measured on the surface of the conditioned line, shall be between −15 °C and −5 °C. Both air and ice temperatures shall be reported for each tested tyre.

Tests cannot be conducted during snowfall or rainfall or any atmospheric precipitation. It is recommended that direct sunlight, large variations of sunlight or humidity, and wind are avoided.

Indoor and outdoor facilities for ice tracks are acceptable as long as the above requirements are met.

4.2 Vehicle

The test shall be conducted with a commercial passenger car equipped with an ABS system in mechanical condition according to car manufacturer recommendations. Permitted modifications are as follows: 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. Increasing the load on the tyres by adding weight to the vehicle is permitted. Rim adapters or “spacers” for mounting wheels on the vehicle shall not exceed 60 mm.

4.3 Standard reference test tyre

For the evaluation of the ice grip performance of passenger car tyres, the reference tyre SRTT P225/60R16 97S as defined in ASTM F2493 shall be used.

4.4 Tyre preparation

4.4.1 General

Fit each test tyre on an approved rim in accordance with ISO 4000-1 using conventional mounting methods. The rim width code shall not differ more than 0,5 from the measuring rim. If a commercialized rim is not available for the test vehicle, it will be acceptable to use a rim whose rim width code differs by 1,0 from the measuring rim width code. Ensure proper bead seating with the use of a suitable lubricant. Excessive use of lubricant should be avoided to prevent slipping of the tyre on the wheel rim.

The studless tyres should be broken in prior to testing (at least 100 km on dry roads or with an equivalent method) to ensure stable performance and to remove spew, compound nodules or flash resulting from the moulding process. Studded tyres should be broken in prior to testing (at least 100 km on roads or with an equivalent method) to ensure correct fit of the studs and stable performance. In all cases, tyre designed tread depth and designed tread block or rib integrity shall not change significantly with breaking in, which means the pace and severity of the breaking in run needs to be carefully controlled to avoid such changes. When testing studded tyres, the stud protrusion shall be measured before each braking test according to the procedure described in 4.4.2.

It is acceptable to recondition a test tyre before the braking test. The reconditioning may be performed to reach the stabilized performance level. It can be done, for example, by driving 5 km to 10 km on rough road surfaces or equivalent.

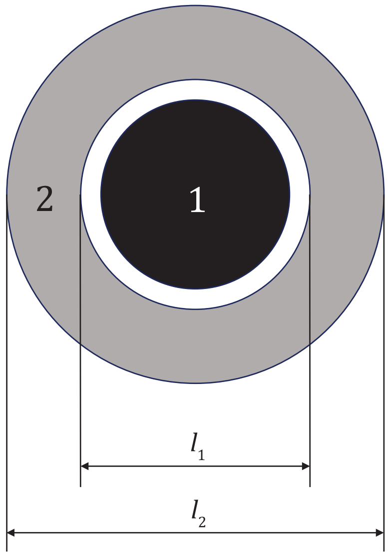
The tyre surface in contact with ice shall be cleaned before performing the test, removing snow and dirt.

Tyre and wheel assemblies shall be conditioned at the ambient temperature (outdoor or indoor, depending on the test facility) at least two hours before they are fitted on the vehicle for tests. Tyre pressures shall then be adjusted to the values specified for the test.

If a vehicle cannot accommodate both the reference and candidate tyres, a third (control) tyre may be used as an intermediate. First, test the control tyre versus the reference on a suitable vehicle, then test the candidate tyre versus the control tyre on the selected vehicle.

4.4.2 Stud protrusion measurement procedure

The stud protrusion measurement shall be done under the test inflation pressure conditions. Figure 1 illustrates the stud protrusion device. It shall be equipped with a support plate (2) of 20 mm diameter and 12 mm diameter hole for the measurement head (1). The measurement head shall be pressed perpendicular to the tread surface with a force of 15 N to 20 N to trigger the measurement. The stud protrusion shall be measured from every test tyre, from 20 consecutive studs over the whole width of the tread and in circumferential direction, and at the same stud positions each time. Define in the test report whether tested with or without studs, and accordingly the stud type, name or main dimensions.



Key

1 measurement head

2 support plate

l_1 12 mm

l_2 20 mm

Figure 1 — Stud protrusion device sketch

4.4.3 Tyre load and inflation pressure

Tyre load and inflation pressure shall be adjusted according to Table 1 (depending on a direct comparison of the candidate and reference tyres on the same vehicle, or an indirect comparison by using a control tyre and another vehicle).

Table 1 — Tyre load and inflation pressure

<table>
<tr><th></th><th>Reference tyre</th><th>Control tyre</th><th>Candidate tyre</th></tr>
<tr><td>Direct comparison</td><td>Inflation pressure:
230 kPa ≤ p_{test} ≤ 260 kPa
Load-on-tyre rate:
65 % ≤ $R_{LoT}(R)$ ≤ 75 %</td><td></td><td>Inflation pressure:
190 kPa ≤ p_{test} ≤ 270 kPa
Load-on-tyre rate:
$R_{LoT}(R) - 15\ \% \le R_{LoT}(T) \le R_{LoT}(R) + 15\ \%$</td></tr>
<tr><td colspan="4">Load-on-tyre rate R_{LoT} is given by:
$$R_{LoT} = 100\ \% \times \frac{Q_{tyre}}{Q_{ref}}$$
where
Q_{tyre} is the actual tyre load on the test vehicle;
Q_{ref} is the reference load at the test inflation pressure as determined according to Formula (1).</td></tr>
</table>

Table 1 *(continued)*

	Reference tyre	Control tyre	Candidate tyre
Indirect comparison	**Vehicle 1** Inflation pressure: 230 kPa ≤ p_{test} ≤ 260 kPa Load-on-tyre rate: 65 % ≤ R_{LoT}(R) ≤ 75 %	**Vehicle 1** Inflation pressure: 190 kPa ≤ p_{test} ≤ 270 kPa Load-on-tyre rate: $R_{LoT,1}$(R) − 15 % ≤ $R_{LoT,1}$(C) ≤ $R_{LoT,1}$(R) + 15 %	
		Vehicle 2 Inflation pressure: 190 kPa ≤ p_{test} ≤ 270 kPa Load-on-tyre rate: 60 % ≤ $R_{LoT,2}$(C) ≤ 90 % and $R_{LoT,1}$(C) − 15 % ≤ $R_{LoT,2}$(C) ≤ $R_{LoT,1}$(C) + 15 %	**Vehicle 2** Inflation pressure: 190 kPa ≤ p_{test} ≤ 270 kPa Load-on-tyre rate: 60 % ≤ R_{LoT}(T) ≤ 90 %
Load-on-tyre rate R_{LoT} is given by: $R_{LoT} = 100\ \% \times \frac{Q_{tyre}}{Q_{ref}}$ where Q_{tyre} is the actual tyre load on the test vehicle; Q_{ref} is the reference load at the test inflation pressure as determined according to Formula (1).			

The reference load Q_{ref} at the test inflation pressure p_{test} is determined according to Formula (1).

$$Q_{ref} = Q_{LI} \times \left(\frac{p_{test}}{p_{ref}} \right)^{0,8} \tag{1}$$

where

Q_{LI} is the maximum tyre load-carrying capacity according to its load index;

p_{ref} is the reference inflation pressure as defined in Table 2.

Table 2 — Reference inflation pressures

Tyre	p_{ref} kPa
Reference tyre	250
Light load (LL) and standard load (SL) versions	250
Reinforced or extra load (XL) version	290

An example of the calculation for the tyre load and inflation pressure conditions can be found in Annex B.

4.4.4 Instrumentation

The vehicle shall be fitted with calibrated sensors suitable for measurements in cold and icy conditions. There shall be a data acquisition system to store measurements.

The accuracy of measurement sensors and systems should allow a relative uncertainty of less than or equal to 1 % on the measured or computed mean fully developed deceleration.

If the mean fully developed deceleration is computed according to Formula (2), for example, the accuracy of the measurements sensors or systems for the measurements of the distance (s) and of the speeds (v_i and v_f) should be such that the composition of their relative uncertainties, based on Formula (2), allows the mean fully developed deceleration to be determined with a relative uncertainty of less than or equal to 1%.

NOTE Suitable methods for determining the relative measurement uncertainty can be found in ISO/IEC Guide 98-3.

4.4.5 Testing order and braking test cycles

For each braking test of a test tyre, at least nine valid test runs shall be performed.

Within one braking test cycle, up to two candidate tyres may be tested. Several braking test cycles may be combined and the final braking test of the reference tyre of one braking test cycle may serve as the initial braking test of the subsequent braking test cycle.

EXAMPLE 1 For a braking test cycle with two candidate tyres, the order of testing is:

$R_i – T_1 – T_2 – R_f$

where

R_i is the initial braking test of the reference tyre;

R_f is the final braking test of the reference tyre;

T_1, T_2 are the braking tests of the two candidate tyres to be evaluated.

EXAMPLE 2 The run order for a series of braking test cycles with a total of four candidate tyre sets (T_1 to T_4) is:

$R_i – T_1 – T_2 – R_f/R_i – T_3 – T_4 – R_f$

where the final braking test of the reference tyre set (R_f) of the first braking test cycle serves as initial braking test (R_i) of the second braking test cycle.

For any candidate tyre at least three non-consecutive braking test cycles shall be performed.

4.4.6 Test procedure

The vehicle shall be fitted on all four positions with the same tyres.

Drive the vehicle in a straight line at a speed about 5 km/h higher than the upper speed of the evaluation interval.

When the measuring zone has been reached, set the vehicle gear into neutral, press the brake pedal sharply down with a force sufficient to cause operation of the ABS on all wheels of the vehicle and to result in a stable deceleration of the vehicle and hold it down until the speed is 0 km/h.

The mean fully developed deceleration d_m shall be determined either between 15 km/h and 5 km/h, or between 20 km/h and 5 km/h. It shall be computed from measurements of either time (expressed in s), distance (expressed in m) or deceleration (expressed in m/s^2). For each test run in the braking tests (3 or 4) of a braking test cycle and for all test tyres, the same evaluation speed interval shall be used

4.4.7 Data evaluation and presentation of results

4.4.7.1 Data evaluation

For a distance measurement, the mean fully developed deceleration, d_m, in a test run is computed using Formula (2):

$$d_m = \frac{v_i^2 - v_f^2}{2s} \quad (2)$$

where

v_i is the initial speed, expressed in m/s;

v_f is the final speed, expressed in m/s;

s is the distance covered between the initial speed and the final speed, expressed in m.

The highest and the lowest values (in total two runs) of the at least nine valid test runs shall be disregarded in the evaluation of each braking test.

For each braking test in a braking test cycle, the arithmetic mean $d_{m,ave}$ and the standard deviation σ_d of the mean fully developed deceleration and the coefficient of variation CV_d shall be computed and reported according to Formula (3) and Formula (4):

$$\sigma_d = \sqrt{\frac{1}{N-1} \times \sum_{j=1}^{N} \left(d_{m,j} - d_{m,ave}\right)^2} \quad (3)$$

and

$$CV_d = 100\ \% \times \frac{\sigma_d}{d_{m,ave}} \quad (4)$$

4.4.7.2 Calculation of the braking test ice grip index

For the calculation of the ice grip index $G_{I,k}(T_n)$ for an individual braking test, the mean fully developed deceleration of the reference tyre is adjusted according to the positioning of each candidate tyre (T_n) within a braking test cycle.

This adjusted mean fully developed deceleration $d_{m,adj}(R)$ of the reference tyre is calculated in accordance with Table 3, where $d_{m,ave}(R_i)$ and $d_{m,ave}(R_f)$ are the arithmetic means of the mean fully developed decelerations in the initial and the final braking tests, respectively, of the reference tyre within a braking test cycle.

Table 3 — Calculation of the adjusted mean fully developed deceleration $d_{m,adj}$(R) of the reference tyre

If the number and the sequence of candidate tyres within one braking test cycle are	and the candidate tyre to be qualified is	the corresponding adjusted mean fully developed deceleration $d_{m,adj}$ (*R*) of the reference tyre is calculated as follows
1 $R_i - T_1 - R_f$	T_1	$d_{m,adj}(R) = \frac{1}{2} \times \left[d_{m,ave}(R_i) + d_{m,ave}(R_f) \right]$
2 $R_i - T_1 - T_2 - R_f$	T_1	$d_{m,adj}(R) = \frac{2}{3} \times d_{m,ave}(R_i) + \frac{1}{3} \times d_{m,ave}(R_f)$
	T_2	$d_{m,adj}(R) = \frac{1}{3} \times d_{m,ave}(R_i) + \frac{2}{3} \times d_{m,ave}(R_f)$

For an individual braking test, the ice grip index $G_{I,k}(T_n)$ of the candidate tyre T_n (n = 1, 2) relative to the reference tyre is calculated by Formula (5):

$$G_{I,k}(T_n) = \frac{d_{m,ave}(T_n)}{d_{m,adj}(R)} \tag{5}$$

4.4.7.3 Ice grip index

The ice grip index $G_I(T_n)$ of a candidate tyre shall be computed as the arithmetic mean of the ice grip indices $G_{I,k}(T_n)$ for the individual braking tests in the three non-consecutive braking test cycles as per Formula (6):

$$G_I(T_n) = \frac{1}{3} \times \left[G_{I,1}(T_n) + G_{I,2}(T_n) + G_{I,3}(T_n) \right] \tag{6}$$

An example of a full test report is given in Annex A.

4.4.7.4 Statistical validation

The sets of mean fully developed decelerations d_m within each braking test shall be examined for normality, drift and eventual outliers.

If the coefficient of variation CV_d of a braking test of a candidate tyre (see 4.4.7.1) exceeds 6 %, this braking test shall be discarded.

In the case of one of the following, the complete braking test cycle shall be discarded:

a) the coefficient of variation CV_d of the initial or the final braking test of a reference tyre within a braking test cycle exceeds 6 %;

b) the arithmetic means of the mean fully developed decelerations of the initial and the final braking test of the reference tyre within a braking test cycle exceeds 5 % of the average of the two values, meaning that the validation coefficient (C_{val}) given by Formula (7) shall be less than or equal to 5%.

$$C_{val}(d_m) = 2 \times \left| \frac{d_{m,ave}(R_i) - d_{m,ave}(R_f)}{d_{m,ave}(R_i) + d_{m,ave}(R_f)} \right| \times 100\ \% \tag{7}$$

c) the mean fully developed deceleration of the reference tyre is less than 0,9 m/s^2 or greater than 1,6 m/s^2 in the initial or the final braking test within a braking test cycle.

For each candidate tyre T_n, the coefficient of variation CV_G of the ice grip indices $G_{I,k}(T_n)$ for the individual braking tests in the three non-consecutive braking test cycles shall be calculated according to Formula (8):

$$CV_G = 100\ \% \times \frac{\sigma_G}{G_I(T_n)} \tag{8}$$

where

$$\sigma_G = \sqrt{\frac{1}{2} \times \sum_{k=1}^{3} \left[G_{I,k}(T_n) - G_I(T_n) \right]^2}$$

and $G_I(T_n)$ is the ice grip index of candidate tyre T_n.

If the coefficient of variation CV_G exceeds 6 %, for this candidate tyre T_n additional braking tests shall be performed in non-consecutive braking cycles, until the coefficient of variation CV_G calculated from any three braking tests of this candidate tyre meets the requirement.

The SRTT tyres shall be discarded if it exhibits irregular wear or damage or when the performance appears to have deteriorated.

4.4.7.5 Ice grip index threshold

A candidate tyre whose ice grip index $G_I(T_n)$ – determined according to Formula (6) – is equal to or higher than 1,18 is eligible to be labelled, marked or both as an “ice grip tyre”.

4.4.8 Ice grip performance comparison between a candidate tyre and a reference tyre using a control tyre

4.4.8.1 General

If the candidate tyre cannot be fitted on the same vehicle as the reference tyre, for example, due to tyre size, inability to achieve required load-on-tyre rate and required test inflation pressure, comparison shall be made using intermediate tyres, herein referred to as “control tyres”, and two different vehicles.

The control tyre shall pass the ice grip index threshold defined in 4.4.7.5.

One vehicle shall be capable of being fitted with the reference tyre and the control tyre, and the other vehicle shall be capable of being fitted with the control tyre and the candidate tyre.

4.4.8.2 Ice grip index calculation in case of a control tyre

In a first series of three non-consecutive braking test cycles, using the procedure described in 4.4.1 to 4.4.7 in which the control tyre shall be treated as a candidate tyre, the ice grip index $G_{I,1}(C)$ of the control tyre relative to the reference tyre shall be established. In a second series of three non-consecutive braking test cycles, in which the control tyre serves as reference tyre, the ice grip index $G_{I,2}(T)$ of the candidate tyre relative to the control tyre shall be established.

The ice grip index $G_I(T)$ of the candidate tyre relative to the reference tyre shall be calculated, according to Formula (9), as the product of the two ice grip indices:

$$G_I(T) = G_{I,1}(C) \times G_{I,2}(T) \tag{9}$$

4.4.8.3 Boundary conditions

The same set of control tyres shall be used for comparison with the SRTT and the candidate tyre and shall be fitted in the same wheel positions.

Control tyres that have been used for testing shall subsequently be stored under the same conditions as required for the SRTT.

The SRTT and control tyres shall be discarded if there is irregular wear or damage or when the performance appears to have deteriorated.

Annex A
(informative)

Example of a possible test report of ice grip index for a passenger car tyre

Part 1 – Report

1) Testing laboratory: [Name]

2) Name and address of applicant, if applicable: [Name]

3) Test report no.: [YYMMDD-xxxxx-xx]

4) Tyre manufacturer and brand name or trade description: [Name]

5) Tyre class: C1

6) Details of test tyre(s): candidate 1 and, if applicable, candidate 2

6.1) Tyre size designation(s) and service description(s): [xxx/xx R xx xx{x} x]

6.2) Tyre brand(s) and trade description(s): [Name]

6.2.1) Production code(s)/manufacturer's code(s), if applicable: [xxxxxx]

7) Ice index relative to SRTT [x,xx]

7.1) Test procedure and SRTT used

Procedure: Braking test method according to ISO 19447

SRTT: ASTM F2493, P225/60R16 97S

Production week and year: [xxxx]

8) Comments (if any):

Test tyre is non-studded/studded

Test tyre made in country:

Test tyre production week:

Testing personnel:

9) Date of test report: [DD.MM.YYYY]

10) Signature: ________________________________

[Firstname Lastname]

Part 2 – Test data: 1st braking test cycle

1) Date of test: [DD.MM.YYYY]

2) Location of test track: [Name]

2.1) Test track characteristics:

	At start of test	At end of test	Specification
Ambient temperature			−15 °C to +4 °C
Ice temperature			−15 °C to −5 °C
Remarks			

3) Test vehicle (make, model and type, year): [Name]

4) Test tyre data:

	SRTT (initial braking test)	Candidate 1	Candidate 2	SRTT (final braking test)
Tyre size				
Test rim width code				
Tyre load (FL/FR/RL/RR) [kg]				
Load-on-tyre rate (FL/FR/RL/RR) [%]				
Tyre pressure [kPa]				
Ambient temperature [°C]				
Ice temperature [°C]				

5) Measured stud protrusions before braking test [mm]

	Min	Max	Average
Left front			
Left rear			
Right front			
Right rear			

6) Test results: mean fully developed decelerations (m/s^2)

Run number	SRTT (initial braking test)	Candidate 1	Candidate 2	SRTT (final braking test)
1				
2				
3				
4				
5				
6				
7				
8				
9				
$d_{m,ave}$				
σ_d				
CV_d (<6 %)				
$CVal(d_m)$ (<5 %)	–	–	–	
$d_{m,adj}$ (R)	–			–

Run number	SRTT (initial braking test)	Candidate 1	Candidate 2	SRTT (final braking test)
Ice grip index	1,00			–

Part 2 – Test data: 2nd braking test cycle

1) Date of test: [DD.MM.YYYY]

2) Location of test track: [Name]

2.1) Test track characteristics:

	At start of test	At end of test	Specification
Ambient temperature			−15 °C to +4 °C
Ice temperature			−15 °C to −5 °C
Remarks			

3) Test vehicle (make, model and type, year): [Name]

4) Test tyre data:

	SRTT (initial braking test)	Candidate 1	Candidate 2	SRTT (final braking test)
Tyre size				
Test rim width code				
Tyre load (FL/FR/RL/RR) [kg]				
Load-on-tyre rate (FL/FR/RL/RR) [%]				
Tyre pressure [kPa]				
Ambient temperature [°C]				
Ice temperature [°C]				

5) Measured stud protrusions before braking test [mm]

	Min	Max	Average
Left front			
Left rear			
Right front			
Right rear			

6) Test results: mean fully developed decelerations (m/s^2)/traction coefficient (strike out what does not apply).

Run number	SRTT (initial braking test)	Candidate 1	Candidate 2	SRTT (final braking test)
1				
2				
3				
4				

Run number	SRTT (initial braking test)	Candidate 1	Candidate 2	SRTT (final braking test)
5				
6				
7				
8				
9				
$d_{m,ave}$				
σ_d				
CV_d (<6 %)				
$CVal(d_m)$ (<5 %)	–	–	–	
$d_{m,adj}(R)$	–			–
Ice grip index	1,00			–

Part 3 – Test data: 3rd braking test cycle

1) Date of test: [DD.MM.YYYY]

2) Location of test track: [Name]

2.1) Test track characteristics:

	At start of test	At end of test	Specification
Ambient temperature			−15 °C to +4 °C
Ice temperature			−15 °C to −5 °C
Remarks			

3) Test vehicle (make, model and type, year): [Name]

4) Test tyre data:

	SRTT (initial braking test)	Candidate 1	Candidate 2	SRTT (final braking test)
Tyre size				
Test rim width code				
Tyre load (FL/FR/RL/RR) [kg]				
Load-on-tyre rate (FL/FR/RL/RR) [%]				
Tyre pressure [kPa]				
Ambient temperature [°C]				
Ice temperature [°C]				

5) Measured stud protrusions before braking test [mm]

	Min	Max	Average
Left front			
Left rear			

	Min	Max	Average
Right front			
Right rear			

6) Test results: mean fully developed decelerations (m/s^2)/traction coefficient (strike out what does not apply).

Run number	SRTT (initial braking test)	Candidate 1	Candidate 2	SRTT (final braking test)
1				
2				
3				
4				
5				
6				
7				
8				
9				
$d_{m,ave}$				
σ_d				
CV_d (<6 %)				
$CVal(d_m)$ (<5 %)	–	–	–	
$d_{m,adj}$(R)	–			–
Ice grip index	1,00			–