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

Pneumatiques pour véhicules de tourisme — Méthode de mesure de l'adhérence relative sur glace — Pneumatiques neufs en charge

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Contents

Page

Forew	ord		iv			
Introd	uction		v			
1	Scope					
2	Normative references					
3	Terms and definitions					
4	Test methods					
	4.1	Braking on ice method for passenger car tyres	2			
		4.1.1 Test course	2			
	4.2	Vehicle	3			
	4.3	Standard reference test tyre	3			
	4.4	Tyres preparation				
		4.4.1 Stud protrusion measurement procedure	4			
		4.4.2 Tyre load and inflation pressure	4			
		4.4.3 Instrumentation	5			
		4.4.4 Testing order and sequences	5			
		4.4.5 Test procedure	6			
		4.4.6 Data evaluation and presentation of results	6			
		4.4.7 Ice grip performance comparison between a candidate tyre and a				
		reference tyre using a control tyre	8			
Annex	A (info	ormative) Example of a possible test report of ice grip index for a passenger car	tyre 9			
Annex	B (info	ormative) (standards.iteh.ai)	14			

ISO/DIS 19447 https://standards.iteh.ai/catalog/standards/sist/afb57560-c4fa-47e7-85f0f9da3f6ca6f6/iso-dis-19447

Foreword

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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, Tyres, rims and valves.

This is the first edition of the standards.iteh.ai/catalog/standards/sist/afb57560-c4fa-47e7-85f0f9da3f6ca6f6/iso-dis-19447

Introduction

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

1 Scope

This International Standard specifies the method for measuring relative ice grip performance index of a candidate tyre compared to a reference, under loaded conditions for new tyres intended to be used on passenger car on an ice surface.

The method developed here is meant to reduce the variability of the performance measurement. The use of the proper reference tyre is necessary to limit the variability of the testing method procedures.

This International Standard applies to all passenger car tyres.

2 Normative references

The following referenced documents are indispensable for the application 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 (metric series) Part 1: Tyres

ISO 4000-2, Passenger car tyres and rims (metric series) Part 2: Rims

ISO 4223-1, Definitions of some terms used in the tyre industry — Part 1: Pneumatic tyres https://standards.iteh.ai/catalog/standards/sist/afb57560-c4fa-47e7-85f0-ISO 8855, Road Vehicles – Vehicle dynamics and road-holding ability – Vocabulary

ASTM Standards

ASTM F2493, SRTT P225/60R16 97S – Passenger Standard Reference Tire

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1

passenger car tyre tyres conforming to ISO 4000-1

3.2

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

3.3

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candidate tyre "T" (set)
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a test tyre set of 4 tyres that is part of an evaluation program

3.4

reference tyre "R" (set)

a special test tyre set (4 tyres), also known as a Standard Reference Test Tyre (SRTT), that is used as a benchmark in an evaluation program. In order to minimize their variation, these tyres have carefully controlled design features and for this reason they are produced, controlled and stored in accordance with the ASTM (American Society for Testing and Materials) standard.

— F2493, SRTT P225/60 R 16 97S

— The SRTT shall not be older than 30 months starting from the production week.

3.5

control tyre "C" (set)

a tyre set (4 tyres) that is part of an evaluation program

Note 1 to entry: It is an intermediate set of tyres which is used when the candidate tyre and the reference tyre cannot be directly compared on the same vehicle.

3.6

braking test

a series of a specified number of ABS-braking test runs of the same tyre repeated within a short time frame

3.7

sequence

means the order of testing candidates and reference tyre

3.8

non-consecutive sequence

means sequences performed at least after minimum refreshing (or new preparation) of the ice surface, or on a different test lane, or in a different day

3.9

mean fully developed deceleration 'mfddANDARD PREVIEW

the average deceleration calculated on the basis of the measured distance recorded when decelerating a vehicle between two specified speeds (Standards.iten.al)

3.10

<u>ISO/DIS 19447</u>

ice grip index "IGI" https://standards.iteh.ai/catalog/standards/sist/afb57560-c4fa-47e7-85f0-The ratio between the performance of the candidate type and the performance of the proper standard reference test type

3.11

Load capacity

the maximum load that a tyre is able to carry subject to the tyre operating speed, the tyre speed symbol and the tyre class (passenger car tyres).

3.12

Load on tyre rate

Actual tyre load on test vehicle divided by tyre load capacity at test inflation pressure

4 Test methods

4.1 Braking on ice method for passenger car tyres

Ice performance is based on a test method by which the mean fully developed deceleration (*mfdd*) in a braking test, of a candidate tyre is compared to that of a standard reference tyre.

Test shall be repeated at least 3 times (3 non-consecutive sequences).

The relative performance shall be indicated by an Ice Grip Index (IGI).

4.1.1 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 per cent gradient.

The test course surface shall be flat, smooth, polished ice and watered around 1 hour 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 braking test with tyre not involved in test program until the friction level stabilizes. In case of testing studdless tyres the exact same test line shall be used for all braking test repetitions. In case of testing studded tyres, the braking lines must 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, measured with the Reference tyre C1 SRTT 16, shall be controlled. The average deceleration of the SRTT shall be between 0,9 to 1,6 m/s^2 for each SRTT braking test.

The air temperature, measured about one meter 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.

Test cannot be conducted during snow fall or rain fall or any atmospheric precipitation. It is recommended to avoid direct sunlight, large variations of sunlight or humidity, as well as wind.

Indoor as well as outdoor facilities for ice tracks are accepted as far as the above requirements are met.

4.2 Vehicle

The test shall be conducted with a commercialized-model 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 tyres 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 load on tyre by adding weight into the vehicle is permitted. Rim adapters or "spacers" for mounting wheels on the vehicle shall not exceed 60 mm.

ISO/DIS 19447

4.3 Standard reference test tyre atalog/standards/sist/afb57560-c4fa-47e7-85f0-

9da3f6ca6f6/iso-dis-19447

The proper reference tyre to be used to evaluate passenger car tyre ice grip performance is ASTM F2493, SRTT P225/60R16 97S.

4.4 Tyres preparation

Fit the test tyres on rims as per ISO 4000-1 using conventional mounting methods. Rim width shall not differ more than 0.5 inches from the measuring rim. On exception basis only, if a commercially available rim does not exist, it will be acceptable to allow 1.0 inch variance from measuring rim. Ensure proper bead seating by the use of a suitable lubricant. Excessive use of lubricant should be avoided to prevent slipping of the tyre on the wheel rim.

The studdless 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 break-in, which means the pace and "severity" of the break-in run needs to be carefully controlled to avoid such changes. In case of testing studded tyres the stud protrusion shall be measured before each braking test according to the procedure described in <u>4.4.1</u>.

The tyre surface in contact with ice shall be cleaned before performing the test.

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.

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

4.4.1 Stud protrusion measurement procedure

The stud protrusion measurement shall be done under the test inflation pressure conditions. The stud protrusion device shall be equipped with a support plate of 20 mm diameter and 12mm diameter hole for the measurement head. The measurement head shall be pressed perpendicular to the tread surface with a force of 15 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.



Figure 1 — stud protrusion device sketch

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4.4.2 Tyre load and inflation pressure

Tyre load and inflation pressure shall be adjusted according to <u>Table 1</u> (depending on a direct comparison of candidate and SRTT, or an indirect comparison by using a control tyre and another vehicle).

	SRTT Condition	Control tyre condition	Candidate tyre condition
Direct comparison	<u>Vehicle 1 :</u>		Vehicle 1 :
test the candidate on the same vehicle than	- Load on tyre rate at selected infl. pressure : 65% to 75%		- Load on tyre rate at selected infl. pressure: SRTT load rate +/- 15%
the SRTT)	- Pressure : 230 to 260kPa		- Pressure : adjusted in the range 190 to 270 kPa *

Table 1 — Tyre load and inflation pressure

	SRTT Condition	Control tyre condition	Candidate tyre condition		
Indirect comparison	<u>Vehicle 1 :</u>	<u>Vehicle 1 :</u>			
	- Load on tyre rate at selected infl. pressure : 65% to 75%	- Control tire shall pass the ice threshold itself			
	- Pressure : 230 to 260kPa	- Load on tyre rate : SRTT load rate +/- 15%			
		- Pressure : adjusted in the	<u>Vehicle 2 :</u>		
		range 190 to 270 kPa*	- Load on tyre rate : 60% to 90%		
			- Pressure : adjusted in the range		
		<u>Vehicle 2 :</u>	190 to 270 kPa*		
		- Load on tyre rate at selected infl. pressure : 60% to 90% and same load on tyre rate than on the vehicle 1 with a maximum tolerance of 15%			
		- Pressure : adjusted in the range 190 to 270 kPa *			
I gad on tyre rate - vehicle load / load canacity of the tyre at the test pressure					

Table 1 (continued)

Load on tyre rate = vehicle load / load capacity of the tyre at the test pressure

The load capacity (Q cap.) of the tyre at the inflation pressure is determined according to

Q cap. = Q Ref. * (P test/P ref.)^{0.8} NDARD PREVIEW

(standards.iteh.ai)

Inflation pressure reference (P Ref.) for the SRTT P225/60 R 16 97S is 250 kPa

Inflation pressure reference (P. Ref.) for the reinforced tyre (XL) is 250 kPa and for the Standard load tyre (SL) is 250 kPa.

An example of the calculation for the tyre load and inflation pressure conditions could be found in annex B (informative).

4.4.3 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 shall be such that the relative uncertainty of the measured or computed mean fully developed decelerations is less than 1 per cent.

4.4.4 Testing order and sequences

For every candidate tyre and the standard reference tyre, ABS-braking test runs shall be repeated a minimum of 9 times as indicated below.

Required runs in the sequence:

At least 9 valid repeats SRTT, then to test next tyre

9 valid repeats Candidate 1, then

9 valid repeats Candidate 2, then

9 valid repeats SRTT

For each candidate/SRTT the highest and lowest value (in total 2 runs) shall be eliminated