



BSI Standards Publication

Passenger car tyres — Verifying tyre capabilities — Laboratory test methods

National foreword

This British Standard is the UK implementation of [ISO 10191:2021](#). It supersedes [BS ISO 10191:2010](#), which is withdrawn.

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

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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](http://www.iso.org/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](http://www.iso.org/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.

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]

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 \pm 1 % or 2,0 m \pm 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.

5 Testing of tyres with diagonal or bias-belted structure and of T-type temporary-use spare tyres

5.1 Endurance test

5.1.1 Preparation of tyre

5.1.1.1 Mount the tyre on a test rim and inflate it to the pressure specified in Table 1.

Table 1 — Test inflation pressures for endurance test

Tyre type	Test inflation pressure
	kPa
Standard	180
Reinforced/extra load	220
T type (temporary use)	360

5.1.1.2 Maintain the tyre and rim assembly at an ambient temperature of not less than 35 °C for at least 3 h.

5.1.2 Test procedure

5.1.2.1 Readjust the inflation pressure to the value specified in [Table 1](#) immediately before testing.

5.1.2.2 Mount the tyre and rim assembly on a test axle and press the tyre radially against the outer face of the test drum.

5.1.2.3 During the test, the ambient temperature, at a distance of not less than 150 mm and not more than 1,0 m from the tyre, shall be at least 35 °C. No provision shall be made for cooling the tyre during the test.

5.1.2.4 Conduct the test, without interruptions, at not less than 80 km/h test speed with loads and test periods not less than those shown in [Table 2](#).

Table 2 — Test parameters for endurance test of tyres with diagonal or bias-belted structure

Test period	Duration	Test load as percentage of maximum load rating
	min.	min.
1	4 h	85 %
2	6 h	90 %
3	24 h	100 %

5.1.2.5 Throughout the test, the inflation pressure shall not be corrected, and the test loads shall be kept constant at the value corresponding to each test period.

5.2 High-speed test

5.2.1 General

For those tyres not marked with a service description, note should be taken of the additional test conditions given in [Annex A](#).

5.2.2 Preparation of tyre

5.2.2.1 Mount the tyre on a test rim, inflate it to a pressure related to its speed symbol, tyre version and load type, as shown in [Table 3](#).

In exceptional cases, a different test inflation pressure may be used. In such a case, the tyre shall be inflated to that pressure.

Table 3 — Test inflation pressures for high-speed test

Speed symbol	Test inflation pressure				
	kPa				
	Diagonal			Bias-belted	
	LR B / 4PR	LR C / 6PR	LR D / 8PR	Normal (stand-ard)	Reinforced (extra load)
L, M, N	230	270	300	240	280
P, Q, R, S	260	300	330	260	300
T, U, H	280	320	350	280	320
V	300	340	370	300	340
W, Y	n. def.	n. def.	n. def.	320	360
In the case of T-type temporary-use spare tyres, the tyre shall be inflated to 420 kPa.					

5.2.2.2 Maintain the tyre and rim assembly at test room temperature for at least 3 h.

5.2.3 Test method

5.2.3.1 Before or after mounting the tyre and rim assembly on a test axle, re-adjust the inflation pressure to that specified in 5.2.2.

5.2.3.2 Press the tyre and rim assembly against the outer face of the test drum.

5.2.3.3 Apply a load to the test axle according to Table 4.

Table 4 — Test loads for high-speed test

Speed symbol	Test load as percentage of the maximum load rating
L, M, N, P, Q, R, S, T, U, H	80 %
V	73 %
W, Y	68 %

5.2.3.4 Throughout the test, the inflation pressure shall not be corrected, and the test load shall be kept constant.

5.2.4.5 During the test, the temperature in the test room, measured at a distance of not less than 150 mm and not more than 1,0 m from the tyre, shall be maintained at between 20 °C and 30 °C.

5.2.4.6 The initial test speed is equal to the tyre’s speed category:

- less 40 km/h on a 1,7 m drum; or
- less 30 km/h on a 2,0 m drum.

5.2.4.7 Test procedure

Conduct the test, without interruptions, according to Table 5 in relation to the tyre’s speed symbol.

Table 5 — Test speed steps for high-speed test of tyres

Step	Test drum speed	Minimum duration for tyres with speed category 270 km/h (speed symbol W) or below	Minimum duration for tyres with speed cate- gory 300 km/h (speed symbol Y)
1	Acceleration from zero to initial test speed ^a	10 min	10 min
2	initial test speed	10 min	20 min
3	initial test speed plus 10 km/h	10 min	10 min
4	initial test speed plus 20 km/h	10 min	10 min
5	initial test speed plus 30 km/h	10 min	10 min
6	initial test speed plus 30 km/h ^b	10 min	not applicable

^a The acceleration from zero to the initial test speed can be done at a constant rate or in several steps, whereby the area under the speed-time curve shall not be smaller than that with constant acceleration.

^b On 1,7 m drums, the tyre manufacturer may use a test drum speed equal to the initial test speed plus 40 km/h, if increasing test severity is desired.

5.3 Strength test

The strength test shall be performed pursuant to ASTM F414-15.

5.4 Bead unseating test (of tubeless tyres)

The bead unseating test of tubeless tyres shall be performed pursuant to ASTM F2663-15.

6 Requirements for tyres with diagonal or bias-belted structure and for T-type temporary-use spare tyres

6.1 Test sample

Two or three tyres with identical characteristics, e.g. size designation and service description or maximum load rating and speed capability, shall comprise a test sample:

- a) one tyre shall be used for the endurance test;
- b) a second tyre shall be used for the high-speed performance test;
- c) for tyres with diagonal or bias-belted structure, a third tyre shall be used for the measurement of bead unseating, if applicable, and then of strength.

The inflation pressures, loads, speeds and durations shall be as specified for each test method.

Each test sample shall conform to the requirements specified in 6.2 to 6.5.

6.2 Endurance test

6.2.1 When a tyre has been subjected to the laboratory endurance test specified in 5.1, using a test rim and a valve that undergo no permanent deformation and allow no loss of air, there shall be no visual evidence of tread, sidewall, ply, cord, inner liner, belt or bead separation, chunking, open splices, cracking or broken cords. Notwithstanding the above, PTBC would be acceptable.

6.2.2 The inflation pressure measured immediately after the test shall not be less than the initial pressure specified in 5.1.1.1.

6.3 High-speed test

- 6.3.1 When a tyre has been subjected to the laboratory high-speed test specified in 5.2, using a test rim and a valve that undergo no permanent deformation and allow no loss of air, there shall be no visual evidence of tread, sidewall, ply, cord, inner liner, belt or bead separation, chunking (including PTBC), open splices, cracking or broken cords.
- 6.3.2 The inflation pressure measured immediately after the test shall not be less than the initial pressure specified in 5.2.2.2.
- 6.3.3 The outer diameter of the tyre, measured 2 h after completion of the laboratory high-speed test, shall not differ by more than ±3,5 % from the outer diameter as measured before the test.

6.4 Strength test

- 6.4.1 When tested in accordance with ASTM F414-15, a tyre with diagonal or bias-belted structure shall meet the requirements for minimum breaking energy specified in 6.4.2 or 6.4.3, as applicable.
- 6.4.2 For tyres in a standard or reinforced version with a nominal section width of 160 mm or above, the minimum breaking energy value is that specified in Table 6.

For tyres in a light load, standard load or reinforced version with a nominal section width less than 160 mm, the minimum breaking energy value shall be reduced by 25 % compared with those specified in Table 6.

Table 6 — Minimum breaking energy

Tyre version	Minimum breaking energy
	J
Light load, standard load	295
Reinforced/extra load	585
In the case of other tyre versions or when test inflation pressures differ from those recommended for tyre measurements in Table 1, the value of the minimum breaking energy, E_{min} , in joules, is calculated using the equation: $E_{min} = 7,35 \frac{J}{kPa} (p_1 - 140kPa)$ where p_1 is the test inflation pressure, in kilopascals, specified for the test, provided that the test inflation pressure is 165 kPa or more.	

- 6.4.3 For T-type temporary-use spare tyres, the minimum breaking energy required shall be:
- a) 295 J for tyres with a maximum load rating of 400 kg (load index 76) and above;
 - b) 220 J for tyres with a maximum load rating below 400 kg (load index 76).

6.5 Bead unseating test (of tubeless tyres)

- 6.5.1 When tested in accordance with ASTM F2663-15, a tubeless tyre with diagonal or bias-belted structure shall meet the requirements for the applied force required to unseat the tyre bead at the point of contact specified in 6.5.2 or 6.5.3, as applicable.
- 6.5.2 For normal or reinforced tyres, the applied force required to unseat the tyre bead at the point of contact shall not be less, in relation to the nominal section width of the tyre, than that shown in Table 7.

Table 7 — Minimum bead unseating force

Nominal section width, <i>SN</i> mm	Minimum force N
$SN < 160$	6 670
$160 \leq SN < 205$	8 890
$SN \leq 205$	11 120

6.5.3 For T-type temporary-use spare tyres, the force required to unseat the tyre bead shall not be less, in relation to the tyre load index, than that shown in [Table 8](#).

Table 8 — Minimum bead unseating force for T-type temporary-use spare tyres

Load index, <i>LI</i>	Minimum force N
$LI \leq 75$	6 670
$76 \leq LI \leq 92$	8 890
$93 \leq LI$	11 120

7 Testing of radial tyres

7.1 Endurance test and low-pressure performance test

7.1.1 Preparation of tyre

- 7.1.1.1 Mount the tyre on a test rim and inflate it to the pressure specified in [Table 1](#).
- 7.1.1.2 Maintain the tyre and rim assembly at an ambient temperature of $(35 \pm 3) \text{ }^{\circ}\text{C}$ for at least 3 h.
- 7.1.1.3 Readjust the tyre pressure to the value specified in [Table 1](#) immediately before testing.

7.1.2 Test procedure for endurance test

- 7.1.2.1 Mount the tyre and rim assembly on a test axle and press the tyre radially against the outer face of the test drum having a diameter of $1,7 \text{ m} \pm 1 \text{ } \%$. In line with the provisions detailed in [4.1](#), the surface of the drum may be coated with a thin layer of non-stick material to eliminate PTBC. Provided that multiple severe snow-use tyres are tested on one drum at the same time, the tyres may run in different tracks to minimize the occurrence of PTBC.
- 7.1.2.2 During the test, the ambient temperature, at a distance of not less than 150 mm and not more than 1,0 m from the tyre, shall be $(35 \pm 3) \text{ }^{\circ}\text{C}$. No provision shall be made for cooling the tyre during the test.
- 7.1.2.3 Conduct the test, without interruptions, at not less than 120 km/h (110 km/h for severe snow-use tyres when tested on a drum without coating with non-stick material) test speed with loads and test periods not less than those shown in [Table 9](#).

Table 9 — Test parameters for endurance of tyres with radial structure

Test period	Duration	Test load as percentage of maximum load rating
	min.	min.
1	4 h	85 %
2	6 h	90 %
3	24 h	100 %

7.1.2.4 Throughout the test, the inflation pressure shall not be corrected, and the test loads shall be kept constant at the value corresponding to each test period.

7.1.2.5 Allow the tyre to cool for between 15 min and 25 min, then measure its inflation pressure. The tyre shall be inspected externally on the test rim for the conditions specified in 8.2.1.

7.1.3 Preparation of tyre for low-pressure performance test

7.1.3.1 This test is conducted following completion of the endurance test using the same tyre and rim assembly tested in accordance with 7.1.2, with the tyre deflated to the pressures shown in Table 10.

Table 10 — Test inflation pressure for low inflation pressure performance test

Tyre version	Test inflation pressure
	kPa
Light load/standard load	140
Extra load	160

7.1.3.2 After the tyre is deflated to the appropriate test inflation pressure at the completion of the endurance test, condition the assembly at $(35 \pm 3)^\circ\text{C}$ for not less than 2 h.

7.1.3.3 Before or after mounting the assembly on a test axle, readjust the tyre pressure to that specified in Table 10.

7.1.4 Test procedure for low-pressure performance test

7.1.4.1 The test is conducted for 90 min at the end of the test specified in 7.1.2, continuously and uninterrupted, at a speed of 120 km/h (110 km/h for severe snow-use tyres when tested on a drum without coating with non-stick material).

7.1.4.2 Press the assembly against the outer face of a test drum having a diameter of $1,7\text{ m} \pm 1\%$.

7.1.4.3 Apply a load equal to 100 % of the maximum load rating to the test axle.

7.1.4.4 Throughout the test, the inflation pressure is not corrected, and the test load is maintained at the initial level.

7.1.4.5 During the test, the ambient temperature, at a distance of not less than 150 mm and not more than 1,0 m from the tyre, shall be $(35 \pm 3)^\circ\text{C}$.

7.1.4.6 Allow the tyre to cool for between 15 min and 25 min. Measure its inflation pressure. Then deflate the tyre, remove it from the test rim, and inspect it for the conditions specified in 8.2.3.

7.1.5 Test report

The test report shall clearly mention if the drum has been covered with the non-stick material during the test, the material used and if the layer is still present after the completion of the test.

7.2 High-speed test

7.2.1 General

For those tyres not marked with a service description, note should be taken of the additional test conditions given in [Annex A](#).

The test room temperature shall be chosen according to [Table 11](#).

Table 11 — Test room temperature for high-speed test

Tyres designed for a maximum speed of	Test room temperature
180 km/h or below	(35 ± 3) °C
190 km/h or above	Between 20 °C and 30 °C

7.2.2 Preparation of tyre

7.2.2.1 Mount the tyre on a test rim and inflate it to a pressure related to its speed symbol, tyre version and load type, as shown in [Table 12](#).

A different test inflation pressure may be used, if sufficient reason is given. In such a case, the tyre shall be inflated to that pressure.

Table 12 — Test inflation pressures for high-speed test

Speed symbol	Test inflation pressure	
	kPa	
	Normal (standard load)	Reinforced (extra load)
F, G, J, K	220	260
L, M, N	220	260
P, Q, R, S	220	260
T, U, H	280	320
V	300	340
W, Y	320	360

7.2.2.2 Maintain the tyre and rim assembly at test room temperature as defined in [7.2.1](#) (see [Table 11](#)) for at least 3 h.

7.2.3 Test method for tyres with speed symbols F, G, J, K, L, M, N, P, Q, R or S

7.2.3.1 Before or after mounting the tyre and rim assembly on a test axle, re-adjust the tyre pressure to that specified in [7.2.2.1](#) (see [Table 12](#)).

7.2.3.2 Press the tyre and rim assembly against the outer face of the test drum with a diameter of 1,7 m ± 1 %.

7.2.3.3 Apply a load equal to 85 % of the maximum load rating of the tyre to the test axle.

- 7.2.3.4** Break in the tyre by running it for minimum 1 h at 80 km/h.
- 7.2.3.5** Allow the tyre to cool to within 3 °C of the test room temperature and readjust the inflation pressure to the applicable inflation pressure specified in [7.2.2.1](#) (see [Table 12](#)) immediately before the test.
- 7.2.3.6** Throughout the test, the inflation pressure shall not be corrected, and the test load shall be kept constant.
- 7.2.3.7** During the test, the temperature in the test room, measured at a distance of not less than 150 mm and not more than 1,0 m from the tyre, shall be maintained at between (35 ± 3) °C.
- 7.2.3.8** Conduct the test, continuously and uninterrupted, according to [Table 13](#).

Table 13 — Test speed steps for high-speed test of tyres designed for a maximum speed of 180 km/h or below

Step	Test drum speed	Duration
1	140 km/h	30 min
2	150 km/h	30 min
3	160 km/h	30 min

7.2.4 Test method for tyres with speed symbols T, U, H, V, W or Y

- 7.2.4.1** Before or after mounting the tyre and rim assembly on a test axle, re-adjust the tyre pressure to that specified in [7.2.2.1](#) (see [Table 12](#)).
- 7.2.4.2** Press the tyre and rim assembly against the outer face of the test drum.
- 7.2.4.3** Apply a load to the test axle according to [Table 14](#).

Table 14 — Test loads for high-speed test

Speed symbol	Test load as percentage of the maximum load rating
T, U, H	80 %
V	73 %
W, Y	68 %

- 7.2.4.4** Throughout the test the tyre pressure shall not be corrected, and the test load shall be kept constant.
- 7.2.4.5** During the test, the temperature in the test room, measured at a distance of not less than 150 mm and not more than 1,0 m from the tyre, shall be maintained at between 20 °C and 30 °C or at a higher temperature if the manufacturer desires to increase test severity.
- 7.2.4.6** The initial test speed is equal to the tyre’s speed category:
- less 40 km/h on a 1,7 m drum; or
 - less 30 km/h on a 2,0 m drum.
- 7.2.4.7** Conduct the test, without interruptions, according to [Table 15](#) in relation to the tyre’s speed symbol.

Table 15 — Test speed steps for high-speed test of tyres designed for a maximum speed of 190 km/h or above

Step	Test drum speed	Duration for tyres with speed symbols T, U, H, V or W	Duration for tyres with speed symbol Y
1	Acceleration from zero to initial test speed ^a	10 min	10 min
2	Initial test speed	10 min	20 min
3	Initial test speed plus 10 km/h	10 min	10 min
4	Initial test speed plus 20 km/h	10 min	10 min
5	Initial test speed plus 30 km/h	20 min	10 min
^a The acceleration from zero to the initial test speed can be done at a constant rate or in several steps, whereby the area under the speed-time curve shall not be smaller than that with constant acceleration.			

7.2.5 Test method for tyres with the code letters ZR in the size designation and both the load index and the speed symbol Y placed within parentheses intended for use at speeds greater than 300 km/h

7.2.5.1 Test the tyre at the load and inflation for a speed symbol Y tyre according to the procedure specified in [7.2.4](#).

7.2.5.2 Test a further sample of the same type according to the following.

- Inflate the tyre to 320 kPa for standard load tyres and 360 kPa for extra load tyres.
- Apply a load to the test axle that is equal to 80 % of the load capacity specified by the tyre manufacturer for the maximum speed.
- Accelerate the equipment such that the maximum speed of the tyre specified by the tyre manufacturer is reached at the end of 10 min from the start-up.
- Then test at the maximum speed for 5 min.

8 Requirements for radial tyres

8.1 Test sample

Two or three tyres with identical characteristics, e.g. size designation and service description or maximum load rating and speed capability, shall comprise a test sample:

- a) one tyre shall be used for the endurance test;
- b) a second tyre and if applicable a third tyre shall be used for the high-speed performance test.

The inflation pressures, loads, speeds and durations shall be as specified for each test method.

Each test sample shall conform to the requirements specified in [8.2](#) and [8.3](#).

8.2 Endurance test and low-pressure performance test

8.2.1 When a tyre has been subjected to the laboratory endurance test specified in [7.1.2](#), using a test rim and a valve that undergo no permanent deformation and allow no loss of air, there shall be no visual evidence of tread, sidewall, ply, cord, belt or bead separation, chunking, open splices, cracking or broken cords. Notwithstanding the above, PTBC would be acceptable.

8.2.2 The tyre pressure measured at any time between 15 min and 25 min after the end of the laboratory endurance test specified in [7.1.2](#), shall not be less than 95 % of the initial pressure specified in [7.1.1.1](#).

8.2.3 When a tyre has been subjected to the laboratory low-pressure performance test specified in [7.1.4](#), using a test rim and a valve that undergo no permanent deformation and allow no loss of air, there shall be no visual evidence of tread, sidewall, ply, cord, inner liner, belt or bead separation, chunking, open splices, cracking or broken cords. Notwithstanding the above, PTBC would be acceptable.

8.2.4 The tyre pressure measured at any time between 15 min and 25 min after the end of the laboratory low-pressure performance test specified in [7.1.4](#) shall not be less than 95 % of the initial pressure specified in [7.1.3.1](#).

8.3 High-speed test

8.3.1 When a tyre has been subjected to the laboratory high-speed test specified in [7.2](#) using a test rim and a valve that undergo no permanent deformation and allow no loss of air, there shall be no visual evidence of tread, sidewall, ply, cord, inner liner, belt or bead separation, chunking (including PTBC), open splices, cracking or broken cords. For tyres tested at a speed of 300 km/h (speed symbol Y) or above, superficial blistering in the tyre tread due to localized heat build-up in the test drum is acceptable.

8.3.2 The tyre pressure measured at any time between 15 min and 25 min after the test shall not be less than 95 % of the initial pressure specified in [7.2.2.1](#).

Annex A
(informative)

High-speed test — Test conditions for tyres without service description marking

A.1 General

This annex provides additional information on test conditions for those tyres which are not marked with a service description.

For tyres with diagonal or bias-belted structure, conduct the high-speed test as specified in [5.2](#).

For tyres with radial structure that are not marked “ZR”, conduct the high-speed test specified in [7.2.3](#).

For tyres with radial structure that are marked “ZR”, conduct the high-speed test specified in [7.2.4](#) and if applicable the one specified in [A.2.2.4](#).

The following additional conditions apply.

A.2 Test conditions

A.2.1 Inflation pressure

The inflation pressures (see [5.2.2.1](#) and [7.2.2.1](#)) in [Table A.1](#) shall be used.

Table A.1 — Test inflation pressures

Tyre type	Test inflation pressure
	kPa
ZR	320
Radial	280
Diagonal or bias-belted:	
4PR or LR B	230
6PR or LR C	270
8PR or LR D	300

A.2.2 Load capacity/speed category

A.2.2.1 The load capacity is that specified by the tyre manufacturer (or moulded on the tyre), with reference to the speed categories shown in [Table A.2](#).

Table A.2 — Speed categories

Tyre type	Speed category km/h
ZR	> 240 ^a
Radial	170
Diagonal or bias-belted:	
Rim diameter code	
10	120
12	140
≥ 13	150
^a Consult the tyre manufacturer for the maximum speed.	

A.2.2.2 The test load (see [5.2.3.3](#), [7.2.3.3](#) or [7.2.4.3](#), as applicable) shall be 80 % of the load capacity (see [A.2.2.1](#)).

A.2.2.3 The initial test speed for non-speed-marked tyres is:

- a) for tyres with diagonal or bias-belted structure, the speed category shown reduced as in [5.2.4.6](#);
- b) for tyres with radial structure that are not marked “ZR”, 140 km/h as specified in [7.2.3.8](#);
- c) for tyres marked “ZR”, the speed category shown reduced as in [7.2.4.6](#).

A.2.2.4 In the case of tyres marked “ZR” and suitable for speeds higher than 300 km/h, two separate high-speed tests shall be performed on two samples of the same type.

The first test shall be performed as specified for a radial tyre with speed symbol Y in [7.2.4](#), applying a test load that is 80 % of the load allowed for operation at a speed of 300 km/h.

The second test relative to assessment of top tyre performances shall be performed on the second sample using the following procedure and on a test drum with a diameter of 2,0 m or 1,7 m. The maximum test speed is equal to:

- the maximum speed certified for the tyre less 10 km/h on a 1,7 m drum; or
- the maximum speed certified for the tyre on a 2,0 m drum.

Apply a test load equal to 80 % of the load allowed for operation at the top speed capability. Accelerate the equipment in order to reach the maximum test speed at the end of 10 min from start-up. Operate the equipment with the test drum speed corresponding to the maximum test speed for 5 min.

Bibliography

[1] United Nations Global Technical Regulation No. 16, *United Nations Global Technical Regulation on Tyres*, ECE/TRANS/180/Add.16/Amend.2, 2020

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