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Rubber flaps for tyres — Requirements and test methods

Flaps en caoutchouc pour pneumatiques – Exigences et méthodes d'essai

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

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Foreword

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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.

Rubber flaps for tyres — Requirements and test methods

1 Scope

This document specifies requirements and test methods for tube-type tyres in automotive vehicles that require rubber flaps, in order to ensure they are protected against damages to the inner tube caused by the rim or tyre.

This document is applicable to tyres for road vehicles. It does not apply to 2/3 wheeler and non-road tyres.

Requirements and test methods for rubber flaps for non-road tyres are provided in Annex E.

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 37, *Rubber, vulcanized or thermoplastic — Determination of tensile stress-strain properties*

ISO 48-2, *Rubber, vulcanized or thermoplastic — Determination of hardness — Part 2: Hardness between 10 IRHD and 100 IRHD*

ISO 188, *Rubber, vulcanized or thermoplastic — Accelerated ageing and heat resistance tests*

ISO 4209-2, *Truck and bus tyres and rims (metric series) — Part 2: Rims*

ASTM D412, *Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers — Tension*

ASTM D573, *Standard Test Method for Rubber — Deterioration in an Air Oven*

ASTM D2240, *Standard Test Method for Rubber Property — Durometer Hardness*

3 Terms and definitions

No terms and definitions are listed in this document.

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/

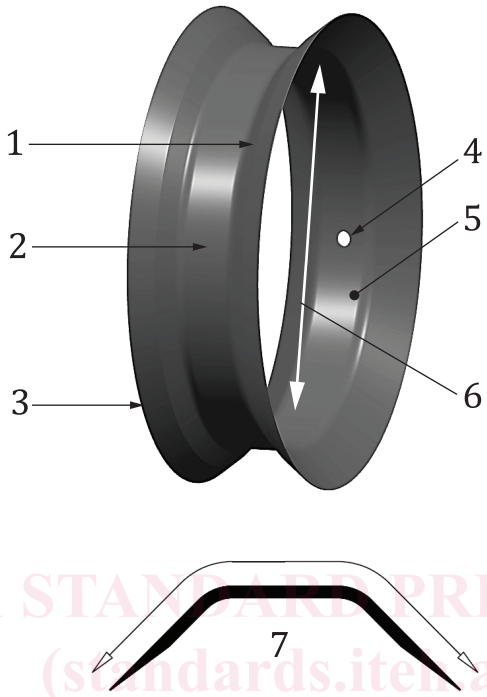
4 Materials, form and fit

4.1 Flaps shall be manufactured, using a suitable compound of natural or synthetic rubber or a blend thereof, to the design requirements given in 4.2 and 4.3 and shall be of the endless type.

4.2 Flaps shall be free from flaws and shall be suitable for tyre/rim/inner tube combinations for the minimum widths, which shall be in accordance with Annex A.

4.3 The inside diameter (see key 6 in Figure 1) of a flap, which is determined by measuring the circumference of the flap on the rim-side surface (see key 5 in Figure 1) at the centre region using

an inextensible tape, shall be more than the nominal rim diameter (i.e. nominal rim diameter code marked on the flap × 25,4 mm) but less than the nominal rim diameter plus 25 mm. To determine the circumference, paste the inextensible tape on the inner surface, then cut the tape and measure the length of the tape using a measuring tape of least count 1,0 mm. Calculate the diameter by dividing the circumference so obtained by 3,141 59. Other equivalent measurement methods may be used.



Key

1 shoulder
2 tube side surface
3 edge
4 valve hole
5 rim side surface
6 inside diameter
7 flap profile width

Figure 1 — Description of flap

4.4 A valve hole (see key 4 in Figure 1) shall be provided in each flap with a diameter of at least 12 mm, depending on the tube valve stem. It shall be positioned at the centre of the flap sectional width except where meant for fitment to rims having an off-central valve hole. A working tolerance of ±8 mm is allowed on the design location of the valve hole in the flap. Additional thickness may be provided around the valve hole on the flap to prevent the flap from flowing into the valve slot on the rim. This may be provided in the form of additional thickness of rubber, layers of rubberized fabric and/or metal or plastic strips. The total thickness in the region shall be less than the valve bent height of the tube that is used along with the flap.

4.5 The thicknesses of finished tyre flaps are specified by category and size.

The indicative main dimensions (thicknesses) of finished tyre flaps for light trucks and trucks/buses are given in Tables D.1 and D.2, respectively.

However, the thicknesses are also determined by the know-how of each company, such as rubber properties and/or severity in market, and thus the flap manufacturer can use different values of the main dimensions.

5 Designations

Designations shall include the nominal rim diameter code and flap-width code. Real flap width in millimetres is also allowed.

A flap is designated by removing the ply rating and other items from the designation of the tyre corresponding to them, as shown below in Example 1. In a flap, however, the applicable rim width codes and the rim flange codes (if there is a rim flange code for the rim) shall be added to the designation in parentheses.

EXAMPLE 1 7.00–16 (5.50F)

For a flap to be used with tyres of two or more of designations, all the corresponding designations of the flap or the rim band can be put together.

In these cases, if the nominal rim diameters or the diameter codes for the applied rim, or the nominal tyre section widths are the same, it is permissible to put these nominal tyre section widths or the nominal rim diameters or the rim diameter codes consecutively, as shown below in Example 2.

EXAMPLE 2 6.00/6.50–16 (4.50E, 5.50F), 16.00–24, 25 (11.25) or 16.00–24/25 (11.25)

If a flap is applicable to all specified rims, the rim-related codes in the designation of the flap (in parentheses) can be omitted.

See also Annex A.

6 Physical tests and other requirements

6.1 Tensile strength and elongation at break

Test pieces having a “type -1/type S2 dumbbell shape” shall be prepared from the flap in accordance with ISO 37. Alternatively, ASTM D412 or DIN 53504 may be used. Dumbbells of type -1 punched directly from the flap from a portion having best possible flatness may also be used for testing.

6.2 Hardness

The hardness shall be measured on test pieces cut from the centre of the flap and tested in accordance with ISO 48-2 or ASTM D2240.

6.3 Ageing

The dumbbells shall be subjected to ageing in an air oven at 100 °C ± 2 °C for 24 h in accordance with ISO 188 or ASTM D573.

Other methods may be used if their equivalence to the prescribed method is demonstrated.

6.4 Properties

The hardness, tensile strength and elongation before and after ageing shall meet the following requirements:

a) Properties before heat ageing:

   i) hardness: (55 ± 10) Shore A;

ii) tensile strength: min. 6,0 N/mm^2;

iii) elongation at break: min. 275 %.

b) Properties after heat ageing:

i) hardness, in Shore A: ±15 units from unaged measured value;

ii) tensile Strength, in N/mm^2: ±30 % from unaged measured value;

iii) elongation at break, in %: +15 % to −50 % max. from unaged measured value.

Flaps with different properties may be used, as long as they ensure the required function of protecting the inner tube.

6.5 Joint tensile strength

6.5.1 Moulded flap

As there is no joint in the moulded flaps, there is no need to test joint strength.

6.5.2 Flap with overlap joint

Where the joint is visible in a finished flap, the tensile strength at the joint may be checked and shall be not less than 1 N/mm^2 when tested in accordance with the test procedure outlined in Annex B.

7 Marking

The flaps shall be permanently and legibly marked with the following:

a) the manufacturer's name or trade name;

b) the flap size designation as given in Clause 5;

c) the applicable tyre size designation(s) and rim combination(s);

d) an indication of the month and year of manufacture as per the scheme in accordance with Annex C;

e) the country of origin.

Flaps shall be marked with at least either b) or c) above.

If a flap is only applicable to a public road, it may be marked "ROAD" with the designation. For example: 7.00–16 (5.50F) "ROAD".

Annex A
(normative)

Minimum width of flaps and flap-width codes

The minimum width of flaps and the corresponding width codes shall be as given in Table A.1.

Table A.1 — Minimum width of flaps and flap-width codes

Serial number	Flap-width code	Nominal tyre section (where code not used)	Flap width min. mm
i)[a]	K	Marking optional	100
	KM		124
	M		153
	N		176
	RR		207
	V		225

[a] For example, a flap of 153 mm width and meant for fitment to a rim of nominal diameter code 20 is designated as "20M".

When used, flap-width codes are preceded by the nominal rim diameter size code. Flap width shall be measured using a flexible tape, in its vulcanized shape, over that side of the flap which comes adjacent to the rim during use.

The flap widths shall be the minimum acceptable widths for the tyre on the recommended or alternate rim sizes indicated in ISO 4209-2.

Annex B
(normative)

Test for joint tensile strength

B.1 Test pieces

The test pieces shall be prepared as per the method given in ISO 37, keeping the joint at the middle of the length of the narrow portion of the dumbbell pieces.

If the dumbbell test pieces, when cut from the thickest portion of the flap, shows some concavity at either of the two edges, the arithmetic mean width shall be taken in calculations.

B.2 Test temperature

The test pieces shall be conditioned at (27 ± 2) °C for a period of not less than 12 h before being tested. The testing shall be carried out at (27 ± 2) °C. When testing as per ASTM D412, the temperature shall be (23 ± 2) °C.

B.3 Test procedure

B.3.1 Insert the ends of the test piece into the jaws of a tensile testing machine (sensitive enough to record with accuracy low values in particular). Make sure that the tension is uniformly distributed over the cross-section of the jaws. The lower jaw through which the load is applied shall be capable of a substantially constant rate of traverse at 200 mm/min. Record the breaking load on the machine. When testing as per ASTM D412, the specified rate shall be 500 mm/min.

B.3.2 Testing shall be carried out on three test pieces which shall be taken from the joint. The average of the readings shall be the final result for joint tensile strength.

B.3.3 The joint tensile strength (S_{JT}), in N/mm^2, which is indicated in 6.5.2 shall be calculated using Formula (B.1):

$$S_{JT} = F_{BE} / A \tag{B.1}$$

where

F_{BE} is the force magnitude at rupture, in N;

A is the cross-sectional area of unstrained sample, in mm^2;

Mean stress of three samples should be reported for determination of compliance.

Annex C
(normative)

Identification scheme for month and year of manufacturing

C.1 The flap shall clearly indicate a manufacturer reference.

C.2 The manufacturing month and year shall be engraved as per the scheme depicted in Figure C.1 or as per C.8.

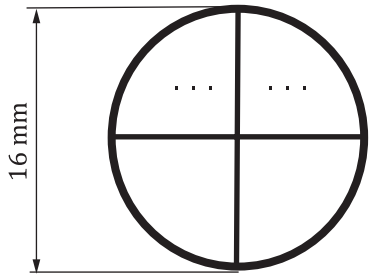


Figure C.1 — Scheme of marking month and year on flap

The identification for June 2022 is depicted. However, the 6 dots can be in any quadrant. The maximum number of dots in any quadrant is three.

C.3 The month code circle and year shall be engraved on the flap body.

C.4 Each month should be identified by a punch marking of at least 0,5 mm diameter in the respective quarter.

C.5 After completing one year, fresh identification shall be started again for the following year.

C.6 After completing the circle, re-engraving can be done after masking the previous engraving/ punch markings.

C.7 The diameter of the circle given in Figure C.1 is the maximum requirement. Instead of a circle, a square or rectangular shape is also acceptable.

C.8 An alternative method which indicates the week and year or month and year of manufacturing is also acceptable.