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Rubber — Tolerances for products —

Part 2: Geometrical tolerances

Caoutchouc — Tolérances pour produits —

Partie 2: Tolérances géométriques

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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).

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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 45, *Rubber and rubber products*, Subcommittee SC 4, *Products (other than hoses)*.

This third edition cancels and replaces the second edition (ISO 3302-2:2008), of which it constitutes a minor revision. The changes are as follows:

— update of the references to ISO 1101;

— addition of Clause 3, Terms and definitions, which results in renumbering of the following clauses.

A list of all parts in the ISO 3302 series can be found on the ISO website.

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 — Tolerances for products —

Part 2:
Geometrical tolerances

1 Scope

This document specifies the following geometrical tolerances for moulded and extruded solid rubber products, including those with metal inserts:

— flatness tolerance;

— parallelism tolerance;

— perpendicularity tolerance;

— coaxiality tolerance;

— positional tolerance.

The tolerances are primarily intended for use with vulcanized rubber but can also be suitable for products made of thermoplastic rubbers.

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 1101:2017, *Geometrical product specifications (GPS) — Geometrical tolerancing — Tolerances of form, orientation, location and run-out*

ISO 23529, *Rubber — General procedures for preparing and conditioning test pieces for physical test methods*

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 Classes of tolerances

Three classes of tolerance are specified, as follows:

P Precision

M Medium

N Non-critical

The necessary tolerance class depends on the requirements of the application. Tolerance classes M and P require more manufacturing effort and to some extent finishing, e.g. by grinding.

It is impossible to illustrate every design of moulded product and the cross-section of every extruded product. Therefore, the tolerances shown in Figures 1 to 6 should be regarded simply as examples.

Details and descriptions of the so-called "tolerance frame" and "tolerance zone" are given in ISO 1101:2017, Clauses 7 and 8.2.

It shall be noted that the closest tolerances are not applicable to all rubber hardnesses. In general, products made from soft vulcanizates need greater tolerances than harder ones.

5 Measurement of dimensions

5.1 General

For solid products, measurements of dimensions shall not be made until 16 h have elapsed after vulcanization, this minimum time being extended to 72 h in cases of dispute. Measurements shall be completed within 3 months after the date of despatch to the purchaser or before the product is put into use, whichever is the shorter time.

Measurements shall be made at standard temperature, after conditioning (see ISO 23529). Care shall be taken to ensure that the products are not subjected to adverse storage conditions (see ISO 2230) and that they are not distorted during measurement.

5.2 Test instruments

5.2.1 Measurements shall be made in accordance with ISO 23529.

5.2.2 All instruments shall be capable of measuring the dimension with an error within the tolerances specified.

5.2.3 In all measurements intended to be comparative, the same measuring device shall be used.

6 Flatness tolerance

The toleranced surface is contained between two parallel planes a distance *t* apart (see Figure 1 and also ISO 1101:2017, Figure 97).

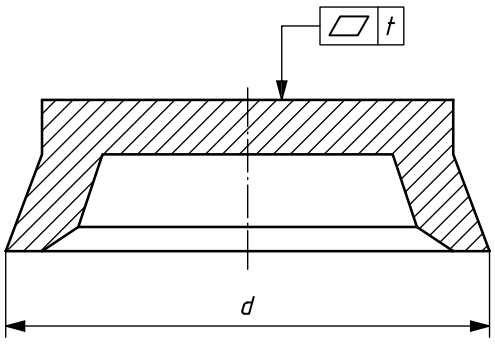


Figure 1 — Example of a flatness tolerance

The required flatness tolerances are given in Table 1.

Table 1 — Required flatness tolerances

Values in millimetres (unless indicated otherwise)

Nominal dimension *d*		Class P	Class M	Class N
Above	Up to and including	Flatness tolerance, *t*		
0	16	0,1	0,15	0,25
16	25	0,15	0,20	0,35
25	40	0,15	0,25	0,4
40	63	0,2	0,35	0,5
63	100	0,25	0,4	0,7
100	—	0,3 %	0,5 %	0,8 %

7 Parallelism tolerance

7.1 Sandwich structure (rubber between two metal plates)

The toleranced surface is contained between two parallel planes a distance *t* apart and parallel to the datum surface D (see Figure 2 and also ISO 1101:2017, Figure 113).

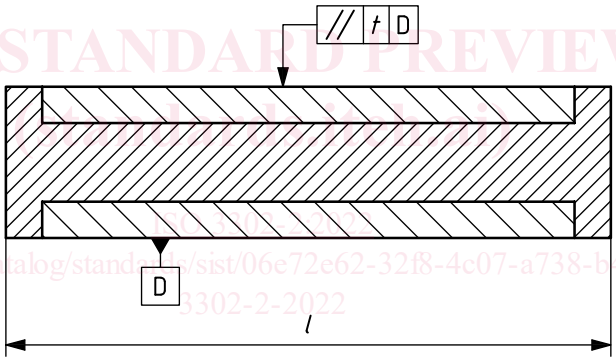


Figure 2 — Example of a parallelism tolerance: sandwich structure

The required parallelism tolerances for a sandwich structure are given in Table 2.

Table 2 — Required parallelism tolerances: sandwich structure

Values in millimetres (unless indicated otherwise)

Nominal dimension *l*		Class P	Class M	Class N
Above	Up to and including	Parallelism tolerance, *t*		
0	40	0,15	0,2	0,35
40	100	0,2	0,35	0,5
100	250	0,35	0,5	0,8
250	—	0,15 %	0,25 %	0,4 %

7.2 Extruded-product cut section (e.g. lathe-cut rings)

The toleranced surface is contained between two parallel planes a distance *t* apart and parallel to the datum surface E (see Figure 3 and also ISO 1101:2017, Figure 113).

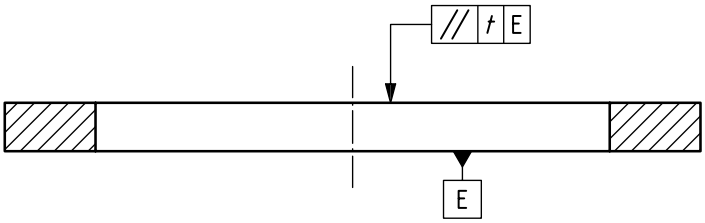


Figure 3 — Example of a parallelism tolerance: extruded-product cut section

The required parallelism tolerances for an extruded-product cut section are given in Table 3.

Table 3 — Required parallelism tolerances: extruded-product cut section

Values in millimetres

Class P	Class M	Class N
Parallelism tolerance, *t*		
0,1	0,2	0,3

8 Perpendicularity tolerance

The toleranced face of the product is contained between two parallel planes a distance *t* apart and perpendicular to the axis A (datum line) (see Figure 4 and also ISO 1101:2017, Figure 136).

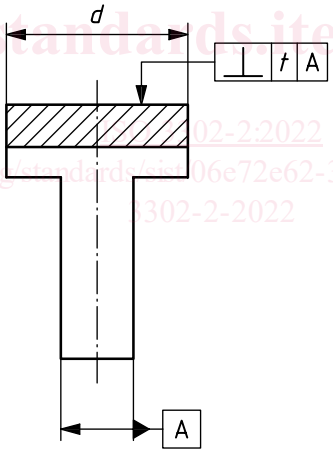


Figure 4 — Example of a perpendicularity tolerance

The required perpendicularity tolerances are given in Table 4.

Table 4 — Required perpendicularity tolerances

Values in millimetres (unless indicated otherwise)

Nominal dimension *d*		Class P	Class M	Class N
Above	Up to and including	Perpendicularity tolerance, *t*		
0	16	0,1	0,15	0,25
16	25	0,15	0,25	0,4
25	40	0,25	0,4	0,7
40	63	0,4	0,6	1,0
63	100	0,7	1,0	1,6
100	—	0,7 %	1,0 %	1,6 %

9 Coaxiality tolerance

9.1 Moulded products

The axis of each cylinder to which a tolerance frame is linked is contained in a cylindrical zone of diameter t_C or t_F, respectively, coaxial with the datum axis D (see Figure 5 and also ISO 1101:2017, Figure 165), a distinction being made between

— tolerances on fixed dimensions (subscript F), which are the dimensions defining a part of the moulded product that are not affected by deforming influences like flash thickness or the lateral displacement of mould parts (upper and lower parts or cores) (see Figure 5, diameters *a* and *b*);

and

— tolerances on closure dimensions (subscript C), which are the dimensions which can be altered by variation in the flash thickness or lateral displacement of the mould parts (see Figure 5, diameter *c*).

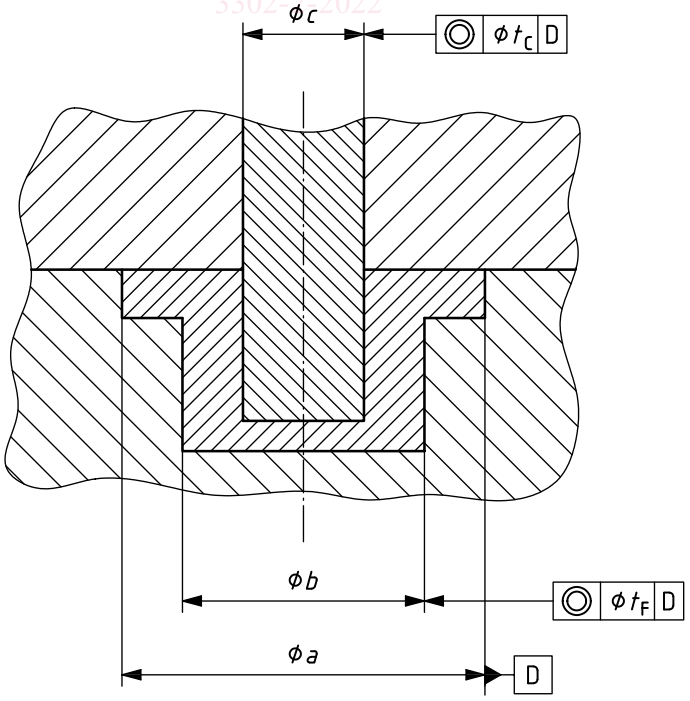


Figure 5 — Example of coaxiality tolerances for a moulded product

The required coaxiality tolerances for moulded products are given in Table 5.

Table 5 — Required coaxiality tolerances for moulded products

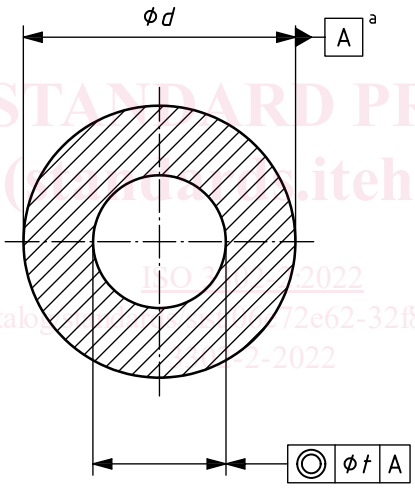
Values in millimetres

Nominal dimension [a] *d*		Class P		Class M		Class N	
		Coaxiality tolerance, *t*					
Above	Up to and including	t_F	t_C	t_F	t_C	t_F	t_C
0	16	0,1	0,2	0,15	0,3	0,2	0,4
16	25	0,15	0,3	0,2	0,4	0,25	0,5
25	40	0,2	0,4	0,25	0,5	0,3	0,6
40	63	0,25	0,5	0,3	0,6	0,35	0,7
63	100	0,3	0,6	0,35	0,7	0,4	0,8
100	—	0,4	0,7	0,5	0,9	0,6	1,2

[a] Coaxiality tolerances are determined by the largest dimension (see dimension *a* in Figure 5).

9.2 Mandrel-supported extruded products

The centre of the circle to which the tolerance frame is linked is contained in a circle of diameter *t* concentric with the centre of the datum circle A (see Figure 6 and also ISO 1101:2017, Figure 98).



[a] Applicable to each section only.

Figure 6 — Example of a coaxiality tolerance for mandrel-supported extruded products

The required coaxiality tolerances for mandrel-supported extruded products are given in Table 6.

Table 6 — Required coaxiality tolerances for mandrel-supported extruded products

Values in millimetres

Nominal dimension *d*		Class P	Class M	Class N
Above	Up to and including	Coaxiality tolerance, *t*		
0	10	0,2	0,4	0,6
10	16	0,25	0,5	0,8
16	25	0,35	0,6	1,0
25	40	0,40	0,8	1,3
40	63	0,5	1,0	1,6