INTERNATIONAL STANDARD

ISO 3302-2

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Rubber — Tolerances for products —

Part 2: Geometrical tolerances

Caoutchouc — Tolérances pour produits —

Partie 2: Tolérances géométriques

ISO 3302-2:1998(E)

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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 3302-2 was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products,* Subcommittee SC 4, *Miscellaneous products.*

ISO 3302 consists of the following parts, under the general title *Rubber — Tolerances for products*:

— *Part 1: Dimensional tolerances*

— *Part 2: Geometrical tolerances*

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Rubber — Tolerances for products —

Part 2:
Geometrical tolerances

1 Scope

This part of ISO 3302 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 may also be suitable for products made of thermoplastic rubbers.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 3302. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 3302 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 48:1994, *Rubber, vulcanized or thermoplastic – Determination of hardness (hardness between 10 IRHD and 100 IRHD).*

ISO 471:1995, *Rubber – Temperatures, humidities and times for conditioning and testing.*

ISO 1101:1983, *Technical drawings – Geometrical tolerancing – Tolerancing of form, orientation, location and run-out – Generalities, definitions, symbols, indications on drawings.*

ISO 2230:1973, *Vulcanized rubber – Guide to storage.*

ISO 4648:1991, *Rubber, vulcanized or thermoplastic – Determination of dimensions of test pieces and products for test purposes.*

3 Classes of tolerances

Three classes of tolerances 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 *tolerance frame* and the *tolerance zone* are given in clauses 5 and 7 of ISO 1101:1983.

It should 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.

4 Measurement of dimensions

4.1 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 471). 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.

4.2 Test instruments

4.2.1 Depending on circumstances, measurements shall be made using one or more of the following types of instrument:

4.2.1.1 For solid products, a **micrometer dial gauge**, the foot of which shall exert a pressure of 22 kPa ± 5 kPa for rubber of hardness equal to or greater than 35 IRHD or of 10 kPa ± 2 kPa for rubber of hardness less than 35 IRHD (see ISO 4648 and ISO 48).

4.2.1.2 A suitable optical measuring instrument.

4.2.1.3 Fixed gauges, for upper and lower limits appropriate to the dimensions being measured.

4.2.1.4 Other devices, including tape measures (with or without vernier), sliding calipers and micrometer calipers.

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

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

5 Flatness tolerance

The toleranced surface is contained between two parallel planes a distance *t* apart (see figure 1 and also ISO 1101:1983, subclause 14.2).

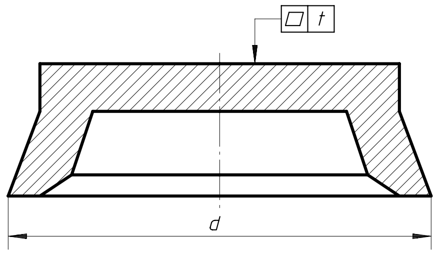


Figure 1 — Example of a flatness tolerance

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 %

6 Parallelism tolerance

6.1 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 1101:1983, subclause 14.7.4).

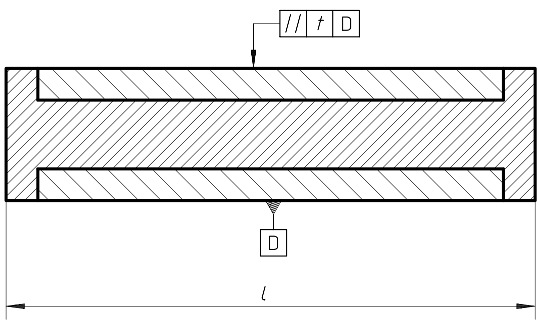


Figure 2 — Example of a parallelism tolerance: sandwich structure

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 %

6.2 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 1101:1983, subclause 14.7.4).

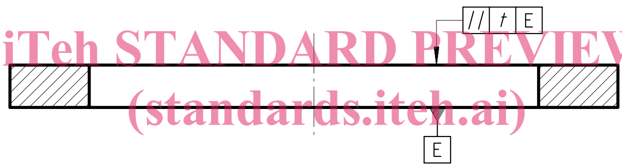


Figure 3 — Example of a parallelism tolerance: extruded-product cut section

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

7 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 1101:1983, subclause 14.8.3).

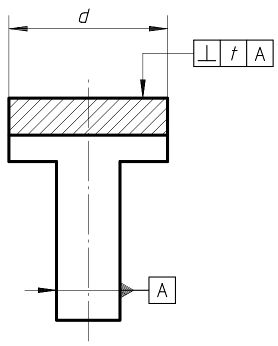


Figure 4 — Example of a perpendicularity tolerance

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 %

8 Coaxiality tolerance

8.1 Moulded products

The axis of each cylinder, to which the tolerance frame is connected, 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 1101:1983, subclause 14.11.2), a distinction being made between

tolerances on fixed dimensions (F), which are the dimensions within one mould part 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 (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*).

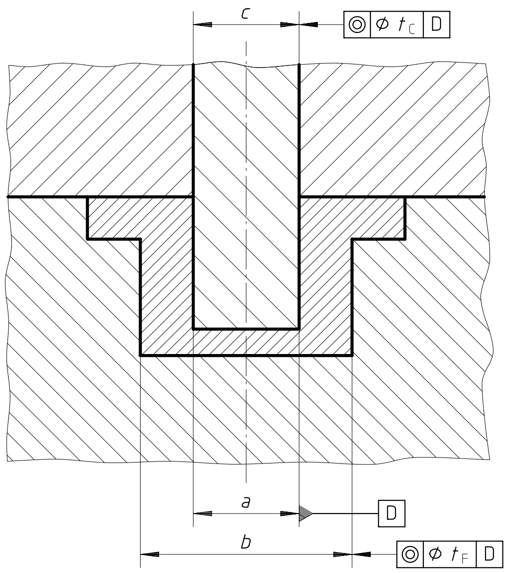


Figure 5 — Example of a coaxiality tolerance for a moulded product

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

Table 5 — Required coaxiality tolerances for moulded products

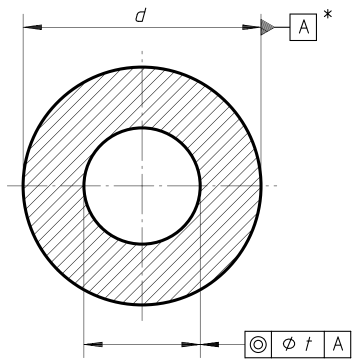
Values in millimetres

		Coaxiality tolerance					
		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

* Coaxiality tolerances are determined by the largest dimension (see dimension *b* in figure 5).

8.2 Mandrel-supported extruded products

The centre of the circle, to which the tolerance frame is connected, is contained in a circle of diameter *t* concentric with the centre of the datum circle A (see figure 6 and also ISO 1101:1983, subclause 14.11.1).



* Applicable at 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 ϕt		
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
63	100	0,6	1,3	2,0
100	–	0,8	1,6	2,5

8.3 Rotating parts

The tolerances on rotating parts shall not be described by a coaxiality tolerance but by a circular run-out tolerance in accordance with ISO 1101:1983, subclause 14.13.

Tolerance values shall be agreed between the interested parties.

9 Positional tolerances

Positional tolerances may be specified for example for the position of metal inserts in rubber products in relation to an agreed point, e.g. the centre of a bushing (see ISO 1101:1983, subclause 14.10).

Due to the variety of applications, positional tolerances shall be agreed between the interested parties.