

General tolerances for linear and angular dimensions and geometrical tolerances

(not to be used for new designs)

DIN
7168

Allgemeintoleranzen, Längen- und Winkelmaße, Form und Lage
(nicht für Neukonstruktionen)

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Part 2

This standard is not to be used for new designs. General tolerances for these are now covered by ISO 2768 Parts 1 and 2. See also clause 1 and the explanatory notes.

In keeping with current practice in standards published by the International Organization for Standardization (ISO), a comma has been used throughout as the decimal marker.

1 Scope

This standard is intended to ensure that all drawings prepared to date in which general tolerances have been specified on the basis of DIN 7168 will remain intelligible and be interpreted correctly, and also to inform the user of this standard that, for all new designs, to France and to be specified on the basis of ISO 2768 Parts 1 and 2.

2 Field of application

General tolerances as specified in this standard are applicable for the dimensions of parts produced by metal removal (i.e. chip removal), unless this involves special manufacturing processes for which other standards specifying general tolerances apply.

General tolerances as specified here shall apply when reference is made to this standard in drawings or associated documents (e.g. delivery conditions) in accordance with clause 5.

If special general tolerances are specified in accordance with other standards (cf. page 6) the standards concerned shall be indicated on the drawing or in the associated documents. If, in cases where production specifications contain references to more than one standard on general tolerances, there is any doubt as to which standard is to apply for a given linear or angular dimension, then the standard specifying the larger tolerance shall be deemed to apply.

Accordingly, a dimension between an unfinished and a finished surface on a blank (e.g. on a casting blank or forging blank) for which no individual tolerance has been indicated, will be required to meet the general tolerance given in the relevant standard on blanks, provided that is indeed the larger tolerance. However, for a dimension between two finished surfaces, the general tolerance specified in DIN 7168 shall always apply.

Production specifications in which linear or angular dimensions (but not auxiliary dimensions) appear without individually indicated tolerances shall be considered incomplete if there is no reference, or inadequate reference, to general tolerances.

General tolerances as specified in this standard apply for:

- linear dimensions, such as external size, internal sizes, step sizes, diameters, clearances (cf. table 1), external radii and chamfer heights for broken edges (cf. table 2);
- angular dimensions (cf. table 3), both those indicated and those not usually indicated on drawings, such as 90° angles or the angles of regular polygons;
- linear and angular dimensions produced by machining assembled parts;
- workpiece features for which no individual tolerances of form and position are indicated.

General tolerances as specified in this standard do not apply for:

- linear and angular dimensions and workpiece features for which tolerances have been individually indicated;
- linear and angular dimensions and workpiece features for which other standards or general tolerances are specified in drawings or associated documents;
- auxiliary dimensions enclosed in brackets (cf. DIN 406 Part 2);
- theoretically exact dimensions enclosed in rectangular frames as specified in ISO 1101;
- angular dimensions on circular graduations;
- 90° angles, not indicated on the drawing, between lines forming coordinate axes;
- linear and angular dimensions produced by the assembly of parts;
- workpiece features which are not produced by removal of material, in accordance with the indication of a semi-finished product on drawings.

For concepts relating to manufacturing processes, see DIN 8580.

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3 General tolerances for linear and angular dimensions

3.1 Linear dimensions

Table 1 Permissible deviations for linear dimensions, except for external radii and chamfer heights

Tolerance class	Permissible deviations, in mm, for nominal sizes, in mm,											
	from 0,5 ¹⁾ to 3	over 3 up to 6	over 6 up to 30	over 30 up to 120	over 120 up to 400	over 400 up to 1000	over 1000 up to 2000	over 2000 up to 4000	over 4000 up to 8000	over 8000 up to 12000	over 12000 up to 18000	over 18000 up to 25000
f (fine)	± 0,05	± 0,05	± 0,1	± 0,15	± 0,2	± 0,3	± 0,5	± 0,8	-	-	-	-
m (medium)	± 0,1	± 0,1	± 0,2	± 0,3	± 0,5	± 0,8	± 1,2	± 2	± 3	± 4	± 5	± 6
g (coarse)	± 0,15	± 0,2	± 0,3	± 0,5	± 1,2	± 2	± 3	± 4	± 5	± 6	± 7	± 8
sg (very coarse)	-	± 0,5	± 1	± 1,5	± 2	± 3	± 4	± 6	± 8	± 10	± 12	± 12

¹⁾ For nominal sizes below 0,5 mm, the deviations shall be indicated adjacent to the relevant nominal size.

Table 2 Permissible deviations for external radii, r (cf. Figure 1 for example), and chamfer heights, h (cf. Figure 2 for example)

Tolerance class	Permissible deviations, in mm, for nominal sizes, in mm				
	from 0,5 ¹⁾ to 3	over 3 up to 6	over 6 up to 30	over 30 up to 120	over 120 up to 400
f (fine)	± 0,2	± 0,5	± 1	± 2	± 4
m (medium)	± 0,2	± 0,5	± 1	± 2	± 4
g (coarse)	± 0,2	± 0,5	± 1	± 2	± 4
sg (very coarse)	± 0,2	± 1	± 2	± 4	± 8

¹⁾ For nominal sizes below 0,5 mm, the deviations shall be indicated adjacent to the relevant nominal size.



Figure 1

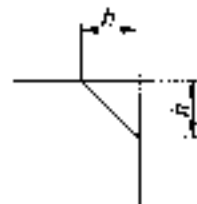


Figure 2

3.2 Angular dimensions

General tolerances for angular dimensions apply irrespective of the actual dimensions of the lengths, i.e. the angular deviations may occur both on workpieces with maximum material sizes and on workpieces with minimum-material sizes. The upper and lower deviations do not limit the form deviations of the edges or surfaces forming the angle.

Note In the case of workpieces exhibiting deviations of form, the angle is defined by the direction of the straight lines or planes applied to the two angle legs under the minimum material conditions (cf. ISO 1101 for the definition of the minimum condition).

Table 3 Permissible deviations for angular dimensions

Tolerance class	Permissible deviations, in units of angle, for nominal sizes of the shorter leg, in mm,				
	over 10	over 10 up to 50	over 50 up to 120	over 120 up to 400	over 400
f (fine)	± 1°	± 30'	± 20'	± 10'	± 5'
m (medium)	± 1°	± 30'	± 20'	± 10'	± 5'
g (coarse)	± 1° 30'	± 50'	± 25'	± 15'	± 10'
sg (very coarse)	± 3°	± 2°	± 1°	± 30'	± 20'

4 General geometrical tolerances

4.1 Tolerancing principle as specified in ISO 8015

General tolerances based on the tolerancing principle specified in ISO 8015 are only to be applied when the drawing concerned contains the reference. To errand to ISO 8015, where that is the case, the general geometrical tolerances (i.e. the tolerances of form and position) apply independently of the actual local sizes of the workpiece feature. Each individual tolerance requirement must be met. The general geometrical tolerances may thus also be applied even if the features are everywhere at their maximum material size. For fits, the envelope requirements must also be specified, and this shall be individually indicated on the drawings (cf. Explanatory notes).

4.1.1 General tolerances of form

4.1.1.1 Straightness and flatness

The general tolerances on straightness and flatness shall be as specified in table 4. Tolerances on straightness shall be selected from the table on the basis of the length of the corresponding line, while, for flatness tolerances, selection shall be based on the longer lateral length of the surface or on the diameter of the circular surface.

4.1.1.2 Circularity

The general tolerance on circularity shall be equal to the numerical value of the diameter concerned, but in no case shall it be greater than the respective tolerance on radial run-out given in table 6 (cf. Explanatory notes).

Table 4. General tolerances on straightness and flatness

Tolerance class	General tolerances on straightness and flatness, in mm, for a nominal size, in mm, of								
	up to 6	over 6 up to 30	over 30 up to 120	over 120 up to 400	over 400 up to 1000	over 1000 up to 2000	over 2000 up to 4000	over 4000 up to 6000	over 6000
F	0,024	0,01	0,02	0,04	0,07	0,1	-	-	-
S	0,038	0,02	0,04	0,08	0,15	0,2	0,3	0,4	-
T	0,056	0,06	0,12	0,25	0,4	0,6	0,8	1,2	1,8
U	0,1	0,25	0,5	1	1,5	2,5	3,5	5	7

4.1.1.3 Cylindricity

General tolerances on cylindricity have not been specified.

Note If the envelope requirement is to apply to fits with cylindrical surfaces, the dimension concerned shall be identified by the symbol Ⓢ (e.g. $\text{Ⓢ} 25 \text{Ⓢ}$ or $\text{Ⓢ} 25 \text{ H } 7 \text{Ⓢ}$).

4.1.2 General tolerances of position

4.1.2.1 Parallelism

The limitation of the deviation in parallelism is given either by the general tolerances on straightness or flatness (cf. subclause 4.1.1.1), or by the tolerance on the distance between the parallel lines or surfaces, whichever is the greater.

The longer of the two features shall be taken as the datum. If both features are of the same nominal size, then either may serve as the datum. If, for functional reasons, these datum specifications are not permissible, then the tolerance on parallelism shall be individually indicated as specified in ISO 1101.

Note If the envelope requirement is to apply to fits with mating surfaces, then the dimension concerned shall be identified by the symbol Ⓢ as specified in ISO 8015 (e.g. $\text{Ⓢ} 30 \text{Ⓢ}$ or $\text{Ⓢ} 30 \text{ h } 7 \text{Ⓢ}$).

4.1.2.2 Perpendicularity and inclination

General tolerances on perpendicularity and inclination have not been specified. Instead, the general tolerances on angular dimensions may be applied (cf. subclause 3.2).

4.1.2.3 Symmetry

The general tolerances for asymmetrical, but not axially symmetrical, features are to be taken from table 5. These general tolerances also apply in cases where one of the symmetrical features is axially symmetrical and the other is not.

For general tolerances on symmetry, the longer feature shall be taken as the datum. That applies to all features which may be referred to each other. If both features are of the same nominal length, then either may serve as the datum. If, for functional reasons, these datum specifications are not permissible, the tolerance on symmetry shall be individually indicated as specified in ISO 1101.

4.1.2.4 Coaxiality

General tolerances on coaxiality have not been specified. The deviation in coaxiality may in extreme cases be as great as the tolerance value for radial run-out given in

table 6, since the deviation in radial run-out comprises the deviation in coaxiality and the deviation in circularity (cf. Explanatory annex).

Table 5. General tolerances on symmetry

Tolerance class	Symmetry tolerance, in mm
F	0,3
S	0,5
T	1
U	2

4.1.2.5 Radial run-out

The general tolerances on radial run-out shall be as specified in table 6. For general tolerances on radial run-out, the bearing surfaces shall be taken as the datum, if they are designated as such. Otherwise, the longer of the two features shall be taken as the datum. If both features are of the same nominal size, either may serve as the datum. If, for functional reasons, these datum specifications are not permissible, the tolerance on radial run-out shall be individually indicated as specified in ISO 1101.

4.1.2.6 Axial run-out

The general tolerances on axial run-out shall be as specified in table 6.

For general tolerances on axial run-out, the bearing surfaces shall be taken as the datum, if they are designated as such. Otherwise, each of the axially symmetric features may serve as the datum.

Table 6. General tolerances on radial and axial run-out

Tolerance class	Radial and axial run-out tolerance, in mm
F	0,1
S	0,2
T	0,5
U	1