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General Tolerance ISO 2768 for CNC Machining

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ISO 2768 - 1: Linear and Angular Dimensions

ISO 2768-1 aims to simplify drawing indications and provides general tolerances categorized into four tolerance classes: fine (f), medium (m), coarse (c), and very coarse (v). It covers dimensions such as external sizes, internal sizes, step sizes, diameters, radii, distances, external radii, and chamfer heights for broken edges.

Based on your machining capabilities and design requirements, you can select the most suitable tolerance class from the following tolerance table, which corresponds to the 4 class precision levels.

Table 1.1 Linear Dimensions

Permissible deviations in mm for ranges in nominal lengths	Tolerance Class Designation (Description)			
	f (fine)	m (medium)	c (coarse)	v (very coarse)
0.5 up to 3	±0.05	±0.1	±0.2	--
over 3 up to 6	±0.05	±0.1	±0.3	±0.5
over 6 up to 30	±0.1	±0.2	±0.5	±1.0
over 30 up to 120	±0.15	±0.3	±0.8	±1.5
over 120 up to 400	±0.2	±0.5	±1.2	±2.5
over 400 up to 1000	±0.3	±0.8	±2.0	±4.0
over 1000 up to 2000	±0.5	±1.2	±3.0	±6.0
over 2000 up to 4000	--	±2.0	±4.0	±8.0

For nominal sizes below 0.5 mm, the deviations shall be indicated adjacent to the relevant nominal size(s).

Table 1.2 External Radii and Chamfer Heights

Permissible deviations in mm for ranges in nominal lengths	Tolerance Class Designation (Description)			
	f (fine)	m (medium)	c (coarse)	v (very coarse)
0.5 up to 3	±0.2	±0.2	±0.4	±0.4
over 3 up to 6	±0.5	±0.5	±1.0	±1.0
over 6	±1.0	±1.0	±2.0	±2.0

For nominal sizes below 0.5 mm, the deviations shall be indicated adjacent to the relevant nominal size(s).

Table 1.3 Angular Dimensions

Permissible deviations in mm for ranges in nominal lengths	Tolerance Class Designation (Description)			
	f (fine)	m (medium)	c (coarse)	v (very coarse)
up to 10	±1°	±1°	±1°30’	±3°
over 10 up to 50	±0°30’	±0°30’	±1°	±2°
over 50 up to 120	±0°20’	±0°20’	±0°30’	±1°
over 120 up to 400	±0°10’	±0°10’	±0°20’	±0°30’
over 400	±0°5’	±0°5’	±0°10’	±0°20’

ISO 2768 - 2: General Tolerances for features

ISO 2768-2 intends to simplify drawings and provides general tolerances categorized into three tolerance classes: H, K, and L. This part of the standard focuses on general geometrical tolerance ranges, including flatness and straightness, cylindricity, and circularity. Similar to ISO 2768 Part 1, ISO 2768 Part 2 also provides nominal ranges and deviations. However, the difference lies in the way we define and specify those deviations.

Table 2.1 provides the general tolerances for straightness and flatness. To determine the appropriate table value, the length of the relevant line is considered for straightness tolerances, while for flatness tolerances, the larger side length of the surface or the diameter of the circular surface is considered.

The general tolerance for roundness is equal to the numerical value of the diameter tolerance. However, it must never exceed the value specified in Table 2.1 for the concentricity tolerance.

The general tolerance for roundness for cylindricity is not specified.

The general tolerance for parallelism is equal to the numerical value of the dimensional tolerance or the flatness or straightness tolerance, whichever is larger.

Table 2.1 General Tolerances on Straightness and Flatness

Permissible deviations in mm for ranges in nominal lengths	Tolerance Class		
	H	K	L
up to 10	0.02	0.05	0.1
over 10 up to 30	0.05	0.1	0.2
over 30 up to 100	0.1	0.2	0.4
over 100 up to 300	0.2	0.4	0.8
over 300 up to 1000	0.3	0.6	1.2
over 1000 up to 3000	0.4	0.8	1.6

The general tolerances for perpendicularity are provided in Table 2.2. The longer of the two legs forming the right angle is used as the reference element. If the form elements have the same nominal dimension, either one can be used as the reference element.

Table 2.2 General Tolerances on Perpendicularity

Permissible deviations in mm for ranges in nominal lengths	Tolerance Class		
	H	K	L
up to 10	0.2	0.4	0.6
over 10 up to 30	0.3	0.6	1.0
over 30 up to 100	0.4	0.8	1.5
over 100 up to 300	0.5	1.0	2.0

The general tolerances for symmetry are established in Table 2.3. The longer of the two form elements is considered as the reference element. If the form elements have the same nominal dimension, either one can be used as the reference element.

Table 2.3 General Tolerances on Perpendicularity

Permissible deviations in mm for ranges in nominal lengths	Tolerance Class		
	H	K	L
up to 10	0.5	0.6	0.6
over 10 up to 30	0.5	0.6	1.0
over 30 up to 100	0.5	0.8	1.5
over 100 up to 300	0.5	1.0	2.0

The general tolerance for coaxiality is not specified. In extreme cases, the coaxiality deviation can be as large as the values indicated in Table 2.4 for concentricity because the roundness deviation consists of both coaxial and circularity deviations.

The general tolerances for runout (circular runout, total runout, and any rotational surfaces) are specified in Table 4. When determining the reference element for general tolerances of runout, the bearing locations are considered if they are marked as such. Otherwise, for runout, the longer of the two form elements is taken as the reference element. If both form elements have the same nominal dimension, either one can be used as the reference element.

Table 2.3 General Tolerances on Circular Run-Out

Permissible deviations in mm for ranges in nominal lengths	Tolerance Class		
	H	K	L
	0.1	0.2	0.5

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