



General Machining Tolerances Guidelines

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Linear Dimensions

In CNC machining, linear dimensions define the exact length, width, or height between features on a part. Typically measured in millimeters or inches, they ensure proper fit and alignment. These dimensions guide tolerances, helping control part accuracy while considering production efficiency and cost.

Permissible deviations in mm for ranges in nominal lengths	Tolerance Class Designation(Description)			
	f(fine)	m(medium)	c(coarse)	v(very coarse)
0.5~3	±0.05	±0.1	±0.2	-
>3~6	±0.05	±0.1	±0.3	±0.5
>6~30	±0.1	±0.2	±0.5	±1
>30~120	±0.15	±0.3	±0.3	±1.5
>120~400	±0.2	±0.5	±1.2	±2.5
>400~1000	±0.3	±0.8	±3	±6
>1000~3000	±0.5	±1.2	±3	±6
>2000~4000	-	±2	±4	±8

Fillet Radius and Chamfer Height Dimensions

Fillet Radius and Chamfer Height dimensions in CNC machining define the size of rounded corners and beveled edges on a part. These dimensions influence stress distribution, assembly compatibility, and the overall look of the component. Properly specifying them helps ensure functional integrity and manufacturing consistency.

Permissible deviations in mm for ranges in nominal lengths	Tolerance Class Designation(Description)			
	f(fine)	m(medium)	c(coarse)	v(very coarse)
0.5~3	±0.05	±0.1	±0.2	-
>3~6	±0.05	±0.1	±0.3	±0.5
>6~30	±0.1	±0.2	±0.5	±0.1
>30	±0.15	±0.3	±0.3	±1.5

Angular Dimensions

Angular dimensions in CNC machining define the exact angles between surfaces or features on a part. They are critical for maintaining geometric relationships, ensuring proper fit, and supporting the mechanical function of assembled components, especially in complex or multi-axis designs.

Permissible deviations in mm for ranges in nominal lengths	Tolerance Class Designation(Description)			
	f(fine)	m(medium)	c(coarse)	v(very coarse)
~10	$\pm 1^\circ$	$\pm 1^\circ$	$\pm 1^\circ 30'$	$\pm 3^\circ$
>10~50	$\pm 30'$	$\pm 30'$	$\pm 1^\circ$	$\pm 2^\circ$
>50~120	$\pm 20'$	$\pm 20'$	$\pm 30'$	$\pm 1^\circ$
>120~400	$\pm 10'$	$\pm 10'$	$\pm 20'$	$\pm 30^\circ$
>400	$\pm 5'$	$\pm 5'$	$\pm 10'$	$\pm 20^\circ$

Straightness and Flatness

Straightness and Flatness dimensions in CNC machining define the ideal linearity of edges and the evenness of surfaces. These measurements are vital for achieving tight fits, smooth assembly, and consistent performance, especially in components requiring accurate alignment and stable contact across mating surfaces.

Permissible deviations in mm for ranges in nominal lengths	Tolerance Class Designation(Description)		
	H	K	L
~10	0.02	0.05	0.1
>10~30	0.05	0.1	0.2
>30~100	0.1	0.2	0.4
>100~300	0.2	0.4	0.8
>300~1000	0.3	0.6	1.2
>1000~3000	0.4	0.8	1.6

Perpendicularity

Perpendicularity in CNC machining defines the exact 90-degree relationship between surfaces or features. It ensures accurate alignment, proper mating of parts, and reliable structural support, making it essential for assemblies where precise right-angle geometry directly affects performance and durability.

Permissible deviations in mm for ranges in nominal lengths	Tolerance Class Designation(Description)		
	H	K	L
~100	0.2	0.4	0.6
>100~300	0.3	0.6	1
>300~1000	0.4	0.8	1.5
>1000~3000	0.5	1	2

Symmetry

Symmetry in CNC machining refers to the exact mirroring of features across a central axis or plane. It is vital for achieving balanced geometry, consistent part behavior, and proper alignment in assemblies, especially in designs where uniform appearance and equal load distribution are critical to performance and reliability.

Permissible deviations in mm for ranges in nominal lengths	Tolerance Class Designation(Description)		
	H	K	L
~100	0.5	0.6	0.5
>100~300	0.5	0.6	1
>300~1000	0.5	0.8	1.5
>1000~3000	0.5	1	2

Runout

Runout in CNC machining refers to the degree to which a rotating part deviates from its intended axis of rotation. It plays a key role in components that require precise circular motion, helping to ensure smooth performance, reduce noise and vibration, and extend the lifespan of both the part and the equipment it interfaces with.

Tolerance Class Designation (Description)		
H	K	L
0.1	0.2	0.5



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