MAX MACHINING

Tolerance and Finish Chart

ISO 2768 general tolerances, surface roughness, thread classes, and the Max Machining laser cut tolerance guide.

MAXMACHINING.COM · REV. NOV 2026

ISO 2768-1 general tolerances LINEAR DIMENSIONS, MM, PLUS OR MINUS

CLASS	0.5 TO 3 mm	3 TO 6 mm	6 TO 30 mm	30 TO 120 mm	120 TO 400 mm	400 TO 1000 mm	1000 TO 2000 mm	2000 TO 4000 mm
f (fine)	±0.05	±0.05	±0.1	±0.15	±0.2	±0.3	±0.5	·
m (medium)	±0.1	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±2
c (coarse)	±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3	±4
v (very coarse)	·	±0.5	±1	±1.5	±2.5	±4	±6	±8

External radii and chamfer heights (mm)

CLASS	0.5 TO 3 mm	3 TO 6 mm	OVER 6 mm
f and m	±0.2	±0.5	±1
c and v	±0.4	±1	±2

Angular, by length of the shorter side (mm)

CLASS	UP TO 10 mm, shorter side	10 TO 50 mm, shorter side	50 TO 120 mm, shorter side	120 TO 400 mm, shorter side	OVER 400 mm, shorter side
f and m	±1°	±0°30'	±0°20'	±0°10'	±0°5'
c	±1°30'	±1°	±0°30'	±0°15'	±0°10'
v	±3°	±2°	±1°	±0°30'	±0°20'

HOW TO CALL IT OUT

`ISO 2768-mK` on the title block means medium linear tolerances and class K geometric tolerances for everything not dimensioned otherwise. Inch prints usually carry a block instead: `.X ±.030 .XX ±.010 .XXX ±.005 ANGLES ±0°30'` . Both are fine. Say which.

ISO 2768-2 general geometric tolerances MM

Straightness and flatness, by length

CLASS	UP TO 10 mm	10 TO 30 mm	30 TO 100 mm	100 TO 300 mm	300 TO 1000 mm	1000 TO 3000 mm
H	0.02	0.05	0.1	0.2	0.3	0.4
K	0.05	0.1	0.2	0.4	0.6	0.8
L	0.1	0.2	0.4	0.8	1.2	1.6

Perpendicularity, by shorter side

CLASS	UP TO 100 mm	100 TO 300 mm	300 TO 1000 mm	1000 TO 3000 mm
H	0.2	0.3	0.4	0.5
K	0.4	0.6	0.8	1
L	0.6	1	1.5	2

Symmetry, by length

CLASS	UP TO 100 mm	100 TO 300 mm	300 TO 1000 mm	1000 TO 3000 mm
H	0.5	0.5	0.5	0.5
K	0.6	0.6	0.8	1
L	0.6	1	1.5	2

Circular runout

CLASS	CIRCULAR RUNOUT mm
H	0.1
K	0.2
L	0.5

Surface roughness RA, WITH THE PROCESS THAT MAKES IT

GRADE ISO 1302	RA µm	RA µin	TYPICAL PROCESS	WHERE YOU SEE IT
N12	50	2000	Flame cutting, rough sawing	Raw stock faces
N11	25	1000	Sand casting, hot rolling, rough turning	Casting skin, hot rolled plate
N10	12.5	500	Rough milling, sawing, laser cut edge as cut (thick)	Non-critical faces
N9	6.3	250	Milling and turning, roughing passes, laser cut edge as cut	Default when nothing is specified
N8	3.2	125	Milling, turning, drilling, laser cut edge deburred	The common "125" callout on machined parts
N7	1.6	63	Fine milling and turning, reaming, boring	Sealing faces, bearing shoulders, cosmetic machined surfaces
N6	0.8	32	Fine turning, fine boring, grinding, reaming	Static seal faces, press fits
N5	0.4	16	Grinding, honing, fine reaming	Dynamic seals, bearing journals
N4	0.2	8	Honing, lapping, polishing	Gage surfaces, hydraulic spools
N3	0.1	4	Lapping, superfinishing	Valve seats, optical mounts
N2	0.05	2	Lapping, polishing	Mirror finishes
N1	0.025	1	Superfinishing	Gage blocks

ON THE PRINT

Ra 125 µin (3.2 µm) is the common machined default. Ra 63 is a fine machined finish without grinding. Below Ra 32 you are paying for grinding, honing or lapping, so call it out only where a seal or bearing needs it.

Thread class guide UNIFIED AND METRIC

CLASS	FIT	ALLOWANCE	USE
1A / 1B	Loose	Yes (1A)	Quick assembly, dirty or coated threads, field hardware. Rare on prints.
2A / 2B	Standard	Yes (2A)	The commercial default. Most fasteners, most tapped holes. Assumed when the print is silent.
3A / 3B	Close	None	Aerospace fasteners, socket set screws, anything that must not rattle. Costs more to gage and hold.
6g / 6H	Medium (metric)	Yes (6g)	The metric default, equivalent to 2A / 2B.
4g6g / 4H5H	Close (metric)	Small	Metric close fit, equivalent to 3A / 3B.
8g / 7H	Loose (metric)	Yes	Hot dip galvanized or heavy coated threads.

Laser cut tolerance guide MAX MACHINING, 12 KW FIBER LASER

Typical tolerance by thickness

MATERIAL THICKNESS in	TYPICAL TOLERANCE
up to .060	**±.0050** ±0.13 mm
.061 to .125	**±.0080** ±0.20 mm
.126 to .250	**±.0120** ±0.30 mm
.251 to .500	**±.0150** ±0.38 mm
over .500	**±.0250** ±0.64 mm

Edge finish options

EDGE FINISH	WHAT YOU GET
As cut	Fastest, lowest cost. Visible edge texture, small burr possible.
Deburred	Smooth, safe edges. The most common choice.
Tumbled	Uniform matte, softened edges. A cosmetic step up.
Brushed	Directional grain. Premium appearance for visible panels.
Powder coated	Final product finish. Durable and corrosion resistant, RAL colors.

Minimum hole size, 60 percent of thickness

THICKNESS in	MINIMUM HOLE 60% of thickness
.0600	**.0360** 0.91 mm
.1250	**.0750** 1.90 mm
.1870	**.1120** 2.84 mm
.2500	**.1500** 3.81 mm
.3750	**.2250** 5.71 mm
.5000	**.3000** 7.62 mm

WATCH FOR

Holes under 60 percent of thickness (drill them after). Expecting a cosmetic edge without specifying one. Tight tolerances on laser-only features: anything tighter than the table gets machined after cutting. Ignoring edge condition on parts that get handled or coated.