

Tolerances for processing plastics



Plastics are subject to different physical properties from e.g. metals. For this reason, changes in volume and therefore dimensions due to absorption of moisture and significantly higher thermal expansion must be taken into account for any design. These characteristics that occur after processing and are not unrelated to storage mean that tolerances of around 1/100 mm can be produced but may change just a short time after production.

Yet another property of plastics is that changes in dimensions occur due to residual tension and tensions occurring during processing. Moreover, the elasticity of the material must be taken into account.

Types of plastic

Different types of plastic material are subject to the above-mentioned special properties to different degrees. In light of this, the plastic materials have been divided into two groups for further processing to differentiate the effects on each material.

Category A

Thermoplastics with/without reinforcements and low moisture absorption POM, PET, PVDF, PVC-hard, PMMA, PC, PEEK and PPS.

Category B

Soft thermoplastics and polyamide with high moisture absorption PE, PA and PTFE.

Tolerances for chip removing processes

Tolerances in line with ISO 2768-m can be achieved for milled components made of plastics of both categories. The following table lists these tolerances subject to the nominal dimension:

Limit deviations for nominal dimension ranges (value in mm)								
	up 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	2000 and up
Category A	± 0,1	± 0,1	± 0,2	± 0,3	± 0,5	± 0,8	± 1,2	± 2,0
Category B	± 0,1	± 0,15	± 0,3	± 0,4	± 0,6	± 0,8	± 1,2	± 2,0

ISO tolerances can be achieved in the following qualities for these categories:

Category A: IT10 - IT13					Category B: IT11 - IT14						
Nominal dimension range in mm	ISO tolerance series										
	6	7	8	9	10	11	12	13	14	15	16
from 1 to 3	6	10	14	25	40	60	100	140	250	400	600
from 3 to 6	8	12	18	30	48	75	120	180	300	480	750
from 6 to 10	9	15	22	36	58	90	150	220	360	580	900
from 10 to 18	11	18	27	43	70	110	180	270	430	700	1100
from 18 to 30	13	21	33	52	84	130	210	330	520	840	1300
from 30 to 50	16	25	39	62	100	160	250	390	620	1000	1600
from 50 to 80	19	30	46	74	129	190	300	460	740	1200	1900
from 80 to 120	22	35	54	87	140	220	350	540	870	1400	2200
from 120 to 180	25	40	63	100	160	250	400	630	1000	1600	2500
from 180 to 250	29	46	72	115	185	290	460	720	1150	1850	2900
from 250 to 315	32	52	81	130	210	320	520	810	1300	2100	3200
from 315 to 400	36	57	89	140	230	360	570	890	1400	2300	3600
from 400 to 500	40	63	97	155	250	400	630	970	1550	2500	4000

ISO tolerance quality in 0.001 mm (µm)

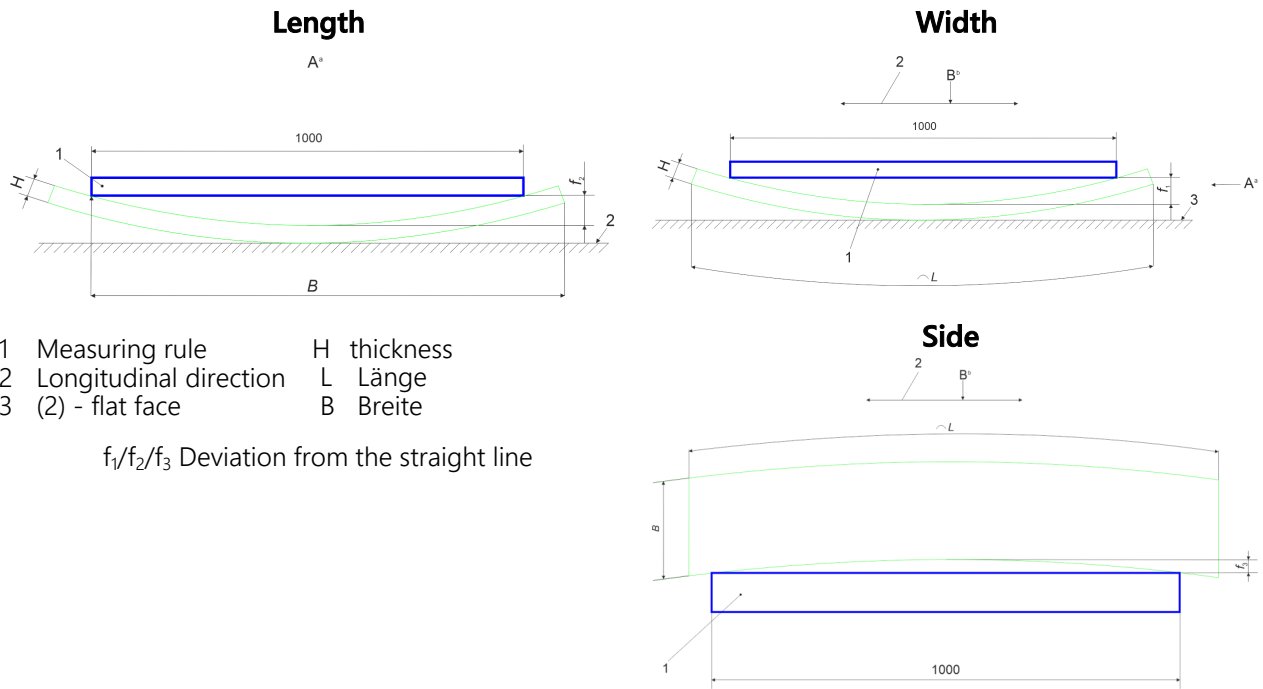
Depth of roughness for chip removing processes

The maximum achievable roughness class is N7. This corresponds to an average roughness value $R_a = 1.6 \mu\text{m}$ and an average depth of roughness $R_z = 8 \mu\text{m}$.

Lower tolerances and depths of roughness only after consultation with and approval by Production.

Straightness for milled components made from planed plates

The straightness of planed plates from which milled components are manufactured is defined in DIN EN ISO 15860. This is based on the following data.



Straightness acc. to DIN EN 15860			
Measuring accuracy: 0.1 mm 1m rule + test gauge			
Thickness dimension*	along the length*	along the width*	along the side*
up to 6	6,0	7,0	4,0
over 6 - 16	4,0	5,0	
over 16 - 25	2,5	3,5	
over 16 - 25	2,0		
over 25 - 50	1,5		

* in mm

Bending (f) measured with a reference length of 1000 mm	Bending converted to length of:		
	500 mm	2000 mm	3000 mm
1,5	0,37	6,00	13,50
2,5	0,62	10,00	22,50
3,5	0,87	14,00	31,51
4,0	1,00	16,00	36,02
5,0	1,25	20,01	45,04
6,5	1,62	26,01	58,58
7,5	1,87	30,02	72,15

Tolerances for edging (cold or warm)

The following tolerances subject to the nominal dimensions can be achieved for cold and warm edging:

Limit deviations for nominal dimension ranges (value in mm)			
	up to 200	over 200 up to 500	over 500
	± 0,5	± 1,0	± 1,5

Tolerances for glued and welded hollow elements

These values apply to components made of thermoplastics of category A. The tolerance values refer to the main dimensions!

Limit deviations for nominal dimension ranges (value in mm)			
	up to 250	over 250 up to 1000	over 1000 up to 2000
	±1,0	±2,0	±3,0
			±4,0