INTERNATIONAL STANDARD

ISO 6362-4

Second edition
2012-07-01

Wrought aluminium and aluminium alloys — Extruded rods/bars, tubes and profiles —

Part 4: Profiles — Tolerances on shape and dimensions

Aluminium et alliages d'aluminium corroyés — Barres, tubes et profilés filés —

Partie 4: Profilés — Tolérances sur forme et dimensions

Reference number
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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 6362-4 was prepared by Technical Committee ISO/TC 79, *Light metals and their alloys*, Subcommittee SC 6, *Wrought aluminium and aluminium alloys*.

This second edition cancels and replaces the first edition (ISO 6362-4:1988), which has been technically revised.

ISO 6362 consists of the following parts, under the general title *Wrought aluminium and aluminium alloys — Extruded rods/bars, tubes and profiles*:

— *Part 1: Technical conditions for inspection and delivery*

— *Part 2: Mechanical properties*

— *Part 3: Extruded rectangular bars — Tolerances on shape and dimensions*

— *Part 4: Profiles — Tolerances on shape and dimensions*

— *Part 5: Round, square and hexagonal bars — Tolerances on shape and dimensions*

— *Part 6: Round, square, rectangular and hexagonal tubes — Tolerances on shape and dimensions*

— *Part 7: Chemical composition*

Wrought aluminium and aluminium alloys — Extruded rods/ bars, tubes and profiles —

Part 4: Profiles — Tolerances on shape and dimensions

1 Scope

This part of ISO 6362 specifies the tolerances on dimensions and shape of wrought aluminium and aluminium alloy extruded profiles with a cross-section contained within a circumscribing circle not greater than 800 mm.

This part of ISO 6362 applies to extruded profiles for general engineering applications only.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 6362-1, *Wrought aluminium and aluminium alloys — Extruded rods/bars, tubes and profiles — Part 1: Technical conditions for inspection and delivery*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 6362-1 apply.

4 Materials

For the purposes of this part of ISO 6362, wrought aluminium and aluminium alloys are divided into two groups, which correspond to varying difficulty when manufacturing the products.

The division into Group I and Group II of the most commonly used general engineering alloys is specified in Tables 1 and 2.

Table 1 — Alloy group I

Alloy system	Alloy number
Pure aluminium	1070, 1070A, 1060, 1050, 1050A, 1100, 1200, 1350
Al-Mn system alloy	3003, 3102, 3103, 3203
Al-Mg system alloy	5005, 5005A, 5051A, 5251
Al-Mg-Si system alloy	6005, 6005A, 6005C, 6008, 6012, 6014, 6018, 6023, 6060, 6061, 6063, 6063A, 6065, 6081, 6082, 6182, 6101, 6101A, 6101B, 6106, 6110A, 6261, 6262, 6262A, 6351, 6360, 6463

Table 2 — Alloy group II (all aluminium alloys except those given in alloy group I)

Alloy system	Alloy number
Al-Mg system alloy	5019, 5049, 5052, 5083, 5086, 5154A, 5454, 5754
Al-Cu-Mg system alloy	2007, 2014, 2014A, 2017, 2017A, 2024, 2030
Al-Zn-Mg system alloy	7204, 7003, 7005, 7020, 7021, 7022, 7049A, 7050, 7075, 7108, 7108A

5 Tolerances on shape and dimensions

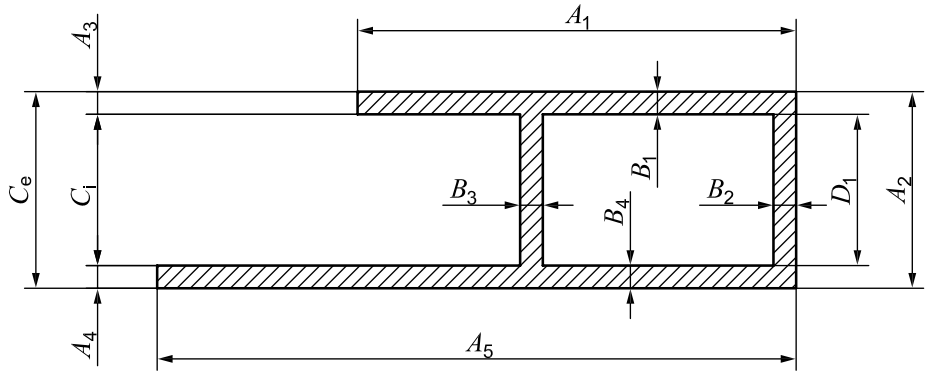
5.1 Dimensional tolerances

5.1.1 General

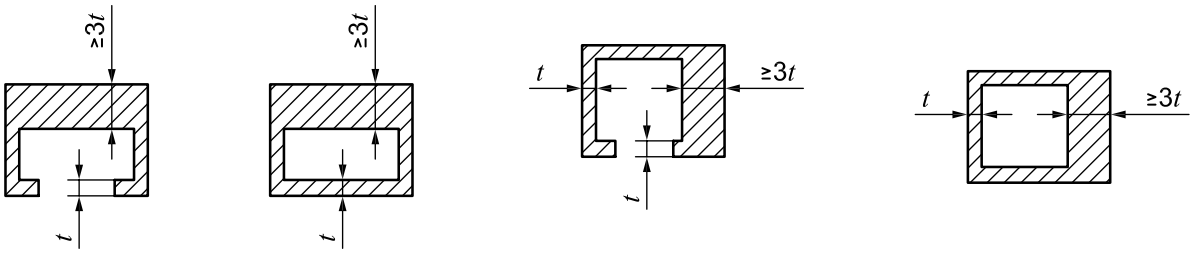
Tolerances on dimensions (see Figures 1 and 2) are specified in Tables 3 to 5.

The tolerances to be applied to the sectional dimensions as shown in Figure 1, where the nominal thickness of one wall is equal to or greater than three times the thickness of the other wall, t, shall be agreed between the purchaser and supplier.

The purchaser should specify whether ordinary or special tolerances are required.



a)

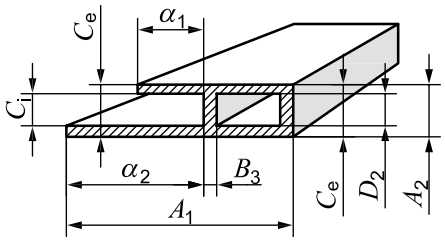


b) c) d) e)

Key

A_1 to A_5	dimensions of metallic parts except the thickness of wall surface at hollow place (B)
B_1 to B_4	thickness of wall surface at hollow place
C_e, C_i	dimensions of empty space at opening
D_1	dimensions of empty space at hollow place

Figure 1 — Sectional dimensions



Key

α_1, α_2 distance between specified point and root of let

Figure 2 —Definition of α_1, α_2 on sectional dimensions

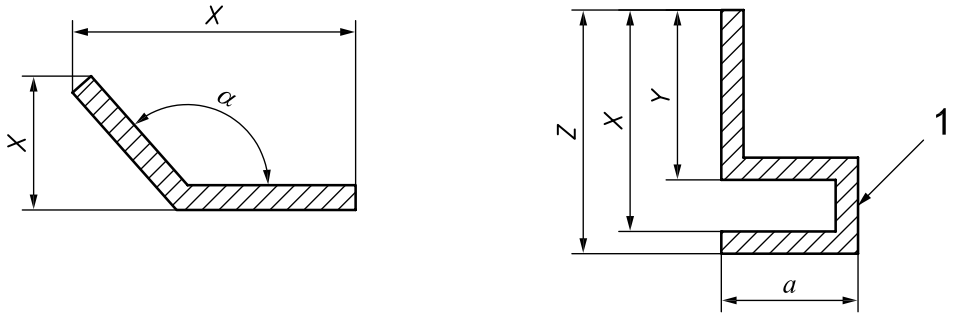


Figure 3 — Sectional dimensions

Table 3 — Tolerance (ordinary class) on sectional dimensions

Dimensions in millimetres

Diameter of circum-scribing circle[a]	Dimension at specified part	Tolerance[b]															
		Metallic part[c,d] (where 75 % or more is metal)				**Hollow part** (where more than 25 % is hollow space, i.e. less then 75 % is metal) C_i or C_e[e]											
		Metallic part other than that in the right column A_1, A_2		**Thickness of wall surface at hollow part**[f] B		**Distance between specified point and root of let** α[g]											
		$5 < \alpha \leq 15$		$15 < \alpha \leq 30$		$30 < \alpha \leq 60$		$60 < \alpha \leq 100$		$100 < \alpha \leq 150$		$150 < \alpha \leq 200$					
	Alloy group	**I**	**II**	**I**	**II**	**I**	**II**	**I**	**II**	**I**	**II**	**I**	**II**	**I**	**II**	**I**	**II**
$250 \leq D$	$A \leq 3{,}20$	± 0,23	± 0,35	± 15 % but, ± 2,3 max. ± 0,38 min.	± 20 % but, ± 3,4 max. ± 0,57 min.	± 0,33	± 0,43	± 0,38	± 0,48								
	$3{,}20 < A \leq 6{,}30$	± 0,27	± 0,42			± 0,39	± 0,53	± 0,45	± 0,58	± 0,51	± 0,64						
	$6{,}30 < A \leq 12{,}50$	± 0,30	± 0,45			± 0,47	± 0,60	± 0,51	± 0,64	± 0,58	± 0,70	± 0,61	± 0,73				
	$12{,}50 < A \leq 20{,}00$	± 0,35	± 0,54			± 0,53	± 0,69	± 0,58	± 0,73	± 0,64	± 0,80	± 0,67	± 0,83				
	$20{,}00 < A \leq 25{,}00$	± 0,38	± 0,57			± 0,60	± 0,75	± 0,64	± 0,80	± 0,70	± 0,86	± 0,77	± 0,91	± 0,89	± 1,0		
	$25{,}00 < A \leq 40{,}00$	± 0,45	± 0,69			± 0,69	± 0,90	± 0,73	± 0,93	± 0,83	± 1,0	± 0,91	± 1,1	± 1,0	± 1,2		
	$40{,}00 < A \leq 50{,}00$	± 0,54	± 0,80			± 0,79	± 1,0	± 0,83	± 1,1	± 0,99	± 1,2	± 1,1	± 1,3	± 1,2	± 1,4	± 1,4	± 1,7
	$50{,}00 < A \leq 100{,}00$	± 0,92	± 1,4			± 1,1	± 1,5	± 1,2	± 1,6	± 1,5	± 1,9	± 1,7	± 2,1	± 2,0	± 2,1	± 2,3	± 2,7
	$100{,}00 < A \leq 150{,}00$	± 1,3	± 2,0			± 1,5	± 2,0	± 1,6	± 2,1	± 2,0	± 2,6	± 2,4	± 2,9	± 2,8	± 3,3	± 3,2	± 3,7
	$150{,}00 < A \leq 200{,}00$	± 1,7	± 2,5			± 1,8	± 2,5	± 2,0	± 2,7	± 2,6	± 3,3	± 3,0	± 3,7	± 3,6	± 4,2	± 4,1	± 4,7
	$200{,}00 < A \leq 250{,}00$	± 2,1	± 3,1			± 2,1	± 3,0	± 2,4	± 3,2	± 3,2	± 4,0	± 3,7	± 4,5	± 4,3	± 5,4	± 4,9	± 5,7
$250 < D \leq 800$	$A \leq 3{,}20$	± 0,54	± 0,80	± 20 % but, ± 3,4 max. ± 0,57 min.	± 20 % but, ± 3,4 max. ± 0,95 min.	± 0,64	± 0,90	± 0,69	± 0,93								
	$3{,}20 < A \leq 6{,}30$	± 0,57	± 0,84			± 0,67	± 0,92	± 0,76	± 1,0	± 0,89	± 1,1						
	$6{,}30 < A \leq 12{,}50$	± 0,62	± 0,92			± 0,71	± 0,99	± 0,82	± 1,1	± 0,95	± 1,2	± 1,5	± 1,7				
	$12{,}50 < A \leq 20{,}00$	± 0,65	± 0,96			± 0,78	± 1,1	± 0,93	± 1,2	± 1,3	± 1,6	± 1,7	± 2,0				
	$20{,}00 < A \leq 25{,}00$	± 0,69	± 1,0			± 0,81	± 1,1	± 1,0	± 1,3	± 1,6	± 1,8	± 2,0	± 2,3	± 2,7	± 2,9		
	$25{,}00 < A \leq 40{,}00$	± 0,72	± 1,1			± 0,85	± 1,2	± 1,2	± 1,5	± 1,9	± 2,2	± 2,3	± 2,6	± 3,0	± 3,2		
	$40{,}00 < A \leq 50{,}00$	± 0,92	± 1,4			± 1,2	± 1,6	± 1,5	± 1,9	± 2,2	± 2,6	± 2,6	± 3,0	± 3,3	± 3,6	± 4,6	± 4,9
	$50{,}00 < A \leq 100{,}00$	± 1,3	± 2,0			± 1,6	± 2,2	± 1,8	± 2,4	± 2,5	± 3,1	± 2,9	± 3,4	± 3,6	± 4,1	± 4,9	± 5,4
	$100{,}00 < A \leq 150{,}00$	± 1,7	± 2,5			± 1,9	± 2,7	± 2,2	± 2,9	± 2,9	± 3,6	± 3,2	± 3,9	± 3,8	± 4,5	± 5,2	± 5,8
	$150{,}00 < A \leq 200{,}00$	± 2,1	± 3,1			± 2,3	± 3,2	± 2,5	± 3,5	± 3,2	± 4,0	± 3,5	± 4,3	± 4,1	± 4,9	± 5,4	± 6,2
	$200{,}00 < A \leq 250{,}00$	± 2,4	± 3,7			± 2,6	± 3,8	± 2,9	± 4,0	± 3,5	± 4,5	± 3,8	± 4,7	± 4,4	± 5,4	± 5,7	± 6,6

Table 3 *(continued)*

Diameter of circum-scribing circle[a]	Dimension at specified part	Tolerance[b]															
		Metallic part[c,d] (where 75 % or more is metal)				**Hollow part** (where more than 25 % is hollow space, i.e. less then 75 % is metal) C_i or C_e[e]											
		Metallic part other than that in the right column A_1, A_2		**Thickness of wall surface at hollow part**[f] B		**Distance between specified point and root of let** α[g]											
		$5 < \alpha \leq 15$		$15 < \alpha \leq 30$		$30 < \alpha \leq 60$		$60 < \alpha \leq 100$		$100 < \alpha \leq 150$		$150 < \alpha \leq 200$					
	Alloy group	**I**	**II**	**I**	**II**	**I**	**II**	**I**	**II**	**I**	**II**	**I**	**II**	**I**	**II**	**I**	**II**
$250 < D \leq 800$	$250{,}00 < A \leq 300{,}00$	± 2,8	± 4,2	± 20 % but, ± 3,4 max. ± 0,57 min.	± 20 % but, ± 3,4 max. ± 0,95 min.	± 3,0	± 4,3	± 3,2	± 4,5	± 3,8	± 5,0	± 4,1	± 5,2	± 4,7	± 5,8	± 6,0	± 7,0
	$300{,}00 < A \leq 350{,}00$	± 3,2	± 4,8			± 3,3	± 4,8	± 3,6	± 5,0	± 4,1	± 5,5	± 4,4	± 5,6	± 5,0	± 6,3	± 6,2	± 7,4
	$350{,}00 < A \leq 400{,}00$	± 3,6	± 5,4			± 3,7	± 5,4	± 3,9	± 5,5	± 4,5	± 5,9	± 4,7	± 6,0	± 5,3	± 6,7	± 6,5	± 7,8
	$400{,}00 < A \leq 450{,}00$	± 4,0	± 5,9			± 4,1	± 5,9	± 4,3	± 6,0	± 4,8	± 6,4	± 5,0	± 6,5	± 5,6	± 7,2	± 6,8	± 8,2
	$450{,}00 < A \leq 500{,}00$	± 4,4	± 6,5			± 4,4	± 6,4	± 4,6	± 6,5	± 5,1	± 6,9	± 5,3	± 6,9	± 5,9	± 7,6	± 7,1	± 8,6
	$500{,}00 < A \leq 550{,}00$	± 4,7	± 7,1			± 4,8	± 7,0	± 4,9	± 7,1	± 5,4	± 7,4	± 5,6	± 7,4	± 6,2	± 8,1	± 7,3	± 9,0
	$550{,}00 < A \leq 800{,}00$	± 5,1	± 7,7			± 5,1	± 7,5	± 5,3	± 7,6	± 5,7	± 7,8	± 5,8	± 7,8	± 6,5	± 8,5	± 7,6	± 9,4

NOTE 1 Dimensional tolerances for the space portions of hollow parts shall be as given in Table 5 (column D).

NOTE 2 When either only a minus or plus side tolerance is specified, the value in this table shall be doubled.

[a] The circumscribing circle is the smallest circle which encloses entirely the cross-section of the shape. However, this dimension may have to be increased when shapes are subjected to corrections of the uneven thickness or in the case of hollow shapes for which the centre of the circumscribing circle needs to be considered, based on the void. These matters should be confirmed with the supplier beforehand as required.

[b] When the dimensional tolerance is not made equal at the plus side and minus side, determine the value in the column corresponding to the centre of allowable range, and use this value as a standard to decide the tolerance.

[c] In the case of angled shapes as shown in Figure 3, the tolerances shall be decided not on the base of the length of dimension X, but on the base of the angle α (see 6.6).

[d] Even when value Y in Figure 3 is equal to or greater than 75 % of value X, these tolerances are not applied to the dimension X or Z. The tolerances for X and Y shall conform to the column corresponding to space dimension C_i and C_e depending on the distance from the reference base.

[e] If the purchaser and the supplier agree, the outside dimension C_e may be specified instead of the inside dimension C_i.

[f] This is applicable when the space volume enveloped with hollow part is 70 mm² or larger. If less than 70 mm², employ column A.

[g] If 5 mm or under, employ column A.

Table 4 — Tolerance (special class) on sectional dimensions

Dimensions in millimetres

Diameter of circum-scribing circle[a]	Dimension at specified part	Tolerance[b]															
		Metallic part[c,d] (where 75 % or more is metal)				**Hollow part** (where more than 25 % is hollow space, i.e. less then 75 % is metal) C_i or C_e[e]											
		Metallic part other than that in the right column A_1, A_2		**Thickness of wall surface at hollow part**[f] B		**Distance between specified point and root of let** α[g]											
		$5 < \alpha \leq 15$				$15 < \alpha \leq 30$		$30 < \alpha \leq 60$		$60 < \alpha \leq 100$		$100 < \alpha \leq 150$		$150 < \alpha \leq 200$			
	Alloy group	**I**	**II**	**I**	**II**	**I**	**II**	**I**	**II**	**I**	**II**	**I**	**II**	**I**	**II**	**I**	**II**
$250 \leq D$	$A \leq 3{,}20$	± 0,15	± 0,23	± 10 % but, ± 1,50 max. ± 0,25 min.	± 15 % but, ± 2,30 max. ± 0,38 min.	± 0,25	± 0,33	± 0,30	± 0,38								
	$3{,}20 < A \leq 6{,}30$	± 0,18	± 0,28			± 0,30	± 0,41	± 0,36	± 0,46	± 0,41	± 0,50						
	$6{,}30 < A \leq 12{,}50$	± 0,20	± 0,30			± 0,36	± 0,46	± 0,41	± 0,50	± 0,46	± 0,56	± 0,50	± 0,60				
	$12{,}50 < A \leq 20{,}00$	± 0,23	± 0,36			± 0,41	± 0,52	± 0,46	± 0,58	± 0,50	± 0,64	± 0,56	± 0,70				
	$20{,}00 < A \leq 25{,}00$	± 0,25	± 0,38			± 0,46	± 0,58	± 0,50	± 0,64	± 0,56	± 0,70	± 0,64	± 0,76	± 0,76	± 0,88		
	$25{,}00 < A \leq 40{,}00$	± 0,30	± 0,46			± 0,54	± 0,68	± 0,58	± 0,74	± 0,66	± 0,80	± 0,76	± 0,92	± 0,88	± 1,05		
	$40{,}00 < A \leq 50{,}00$	± 0,36	± 0,54			± 0,60	± 0,78	± 0,66	± 0,84	± 0,78	± 0,96	± 0,92	± 1,10	± 1,05	± 1,25	± 1,25	± 1,45
	$50{,}00 < A \leq 100{,}00$	± 0,60	± 0,90			± 0,86	± 1,15	± 0,96	± 1,25	± 1,20	± 1,50	± 1,45	± 1,75	± 1,70	± 2,05	± 2,05	± 2,35
	$100{,}00 < A \leq 150{,}00$	± 0,86	± 1,30			± 1,10	± 1,55	± 1,25	± 1,70	± 1,65	± 2,05	± 2,00	± 2,40	± 2,40	± 2,80	± 2,80	± 3,25
	$150{,}00 < A \leq 200{,}00$	± 1,10	± 1,70			± 1,35	± 1,95	± 1,55	± 2,15	± 2,10	± 2,65	± 2,50	± 3,05	± 3,05	± 3,60	± 3,55	± 4,10
	$200{,}00 < A \leq 250{,}00$	± 1,35	± 2,05			± 1,65	± 2,30	± 1,90	± 2,55	± 2,50	± 3,25	± 3,05	± 3,75	± 3,70	± 4,60	± 4,30	± 5,00

Table 4 *(continued)*

Diameter of circum-scribing circle[a]	Dimension at specified part	Tolerance[b]															
		Metallic part[c,d] (where 75 % or more is metal)				**Hollow part** (where more than 25 % is hollow space, i.e. less then 75 % is metal) C_i or C_e[e]											
		Metallic part other than that in the right column A_1, A_2		**Thickness of wall surface at hollow part**[f] B		**Distance between specified point and root of let** α[g]											
						$5 < \alpha \leq 15$		$15 < \alpha \leq 30$		$30 < \alpha \leq 60$		$60 < \alpha \leq 100$		$100 < \alpha \leq 150$		$150 < \alpha \leq 200$	
	Alloy group	**I**	**II**	**I**	**II**	**I**	**II**	**I**	**II**	**I**	**II**	**I**	**II**	**I**	**II**	**I**	**II**
$250 < D \leq 800$	$A \leq 3{,}20$	± 0,36	± 0,54	± 15 % but, ± 2,30 max. ± 0,38 min.	± 15 % but, ± 2,30 max. ± 0,65 min.	± 0,48	± 0,64	± 0,50	± 0,68								
	$3{,}20 < A \leq 6{,}30$	± 0,38	± 0,56			± 0,48	± 0,66	± 0,56	± 0,74	± 0,72	± 0,88						
	$6{,}30 < A \leq 12{,}50$	± 0,41	± 0,60			± 0,50	± 0,72	± 0,60	± 0,80	± 0,76	± 0,96	± 1,25	± 1,45				
	$12{,}50 < A \leq 20{,}00$	± 0,43	± 0,64			± 0,56	± 0,76	± 0,68	± 0,88	± 1,00	± 1,25	± 1,50	± 1,75				
	$20{,}00 < A \leq 25{,}00$	± 0,46	± 0,68			± 0,58	± 0,78	± 0,76	± 1,00	± 1,25	± 1,45	± 1,80	± 2,00	± 2,30	± 2,50		
	$25{,}00 < A \leq 40{,}00$	± 0,48	± 0,72			± 0,60	± 0,84	± 0,86	± 1,10	± 1,50	± 1,75	± 2,05	± 2,25	± 2,55	± 2,75		
	$40{,}00 < A \leq 50{,}00$	± 0,60	± 0,92			± 0,86	± 1,15	± 1,10	± 1,40	± 1,80	± 2,10	± 2,30	± 2,60	± 2,80	± 3,10	± 4,30	± 4,60
	$50{,}00 < A \leq 100{,}00$	± 0,86	± 1,30			± 1,10	± 1,55	± 1,35	± 1,80	± 2,05	± 2,45	± 2,55	± 2,95	± 3,05	± 3,50	± 4,55	± 5,00
	$100{,}00 < A \leq 150{,}00$	± 1,10	± 1,70			± 1,35	± 1,95	± 1,65	± 2,20	± 2,30	± 2,85	± 2,80	± 3,35	± 3,30	± 3,85	± 4,85	± 5,40
	$150{,}00 < A \leq 200{,}00$	± 1,35	± 2,05			± 1,65	± 2,30	± 1,90	± 2,55	± 2,55	± 3,25	± 3,05	± 3,75	± 3,55	± 4,25	± 5,10	± 5,75
	$200{,}00 < A \leq 250{,}00$	± 1,65	± 2,45			± 1,90	± 2,70	± 2,15	± 2,95	± 2,80	± 3,60	± 3,30	± 4,10	± 3,80	± 4,60	± 5,35	± 6,15
	$250{,}00 < A \leq 300{,}00$	± 1,90	± 2,80			± 2,15	± 3,05	± 2,40	± 3,35	± 3,05	± 4,00	± 3,55	± 4,50	± 4,05	± 5,00	± 5,60	± 6,55
	$300{,}00 < A \leq 350{,}00$	± 2,15	± 3,20			± 2,40	± 3,45	± 2,65	± 3,70	± 3,30	± 4,35	± 3,80	± 4,90	± 4,30	± 5,40	± 5,85	± 6,90
	$350{,}00 < A \leq 400{,}00$	± 2,40	± 3,60			± 2,65	± 3,85	± 2,90	± 4,10	± 3,55	± 4,75	± 4,05	± 5,25	± 4,55	± 5,75	± 6,10	± 7,30
	$400{,}00 < A \leq 450{,}00$	± 2,65	± 3,95			± 2,90	± 4,20	± 3,15	± 4,45	± 3,80	± 5,15	± 4,30	± 5,65	± 4,85	± 6,15	± 6,35	± 7,65
	$500{,}00 < A \leq 550{,}00$	± 3,15	± 4,70			± 3,40	± 5,00	± 3,65	± 5,25	± 4,30	± 5,90	± 4,85	± 6,40	± 5,35	± 6,90	± 6,85	± 8,45
	$550{,}00 < A \leq 800{,}00$	± 3,40	± 5,10			± 3,65	± 5,35	± 3,90	± 5,60	± 4,55	± 6,25	± 5,10	± 6,80	± 5,60	± 7,30	± 7,10	± 8,80

Table 4 *(continued)*

Diameter of circumscribing circle[a]	Dimension at specified part	Tolerance[b]															
		Metallic part[c,d] (where 75 % or more is metal)				**Hollow part** (where more than 25 % is hollow space, i.e. less then 75 % is metal) C_i or C_e[e]											
		Metallic part other than that in the right column A_1, A_2		**Thickness of wall surface at hollow part**[f] B		**Distance between specified point and root of let** α[g]											
		$5 < \alpha \leq 15$		$15 < \alpha \leq 30$		$30 < \alpha \leq 60$		$60 < \alpha \leq 100$		$100 < \alpha \leq 150$		$150 < \alpha \leq 200$					
	Alloy group	**I**	**II**	**I**	**II**	**I**	**II**	**I**	**II**	**I**	**II**	**I**	**II**	**I**	**II**	**I**	**II**

NOTE Dimensional tolerances for the space portions of hollow parts shall be as given in Table 5 (column D).

[a] The circumscribing circle is the smallest circle which encloses entirely the cross-section of the shape. However, this dimension may have to be increased when shapes are subjected to corrections of the uneven thickness or in the case of hollow shapes for which the centre of the circumscribing circle needs to be considered, based on the void. These matters should be confirmed with the supplier beforehand as required.

[b] When the dimensional tolerance is not made equal at the plus side and minus side, determine the value in the column corresponding to the centre of allowable range, and use this value as a standard to decide the tolerance.

[c] In the case of angled shapes as shown in Figure 3, the tolerances shall be decided not on the base of the length of dimension X, but on the base of the angle α (see 6.6).

[d] Even when value Y in Figure 3 is equal to or greater than 75 % of value X, these tolerances are not applied to the dimension X or Z. The tolerances for X and Y shall conform to the column corresponding to space dimension C_i and C_e depending on the distance a from the reference base.

[e] If the purchaser and the supplier agree, the outside dimension C_e may be specified instead of the inside dimension C_i.

[f] This is applicable when the space volume enveloped with hollow part is 70 mm² or larger. If less than 70 mm^2, employ column A.

[g] If 5 mm or under, employ column A.

Table 5 — Tolerances D for space portion of hollow part

Dimensions in millimetres

Diameter of circumscribing circle[a]	Dimension at specified point	Tolerance D			
		(ordinary class)		(special class)	
		Alloy I	Alloy II	Alloy I	Alloy II
$250 \leq D$	$A \leq 3{,}20$	± 0,38	± 0,50	± 0,25	± 0,33
	$3{,}20 < A \leq 6{,}30$	± 0,45	± 0,62	± 0,30	± 0,41
	$6{,}30 < A \leq 12{,}50$	± 0,54	± 0,69	± 0,36	± 0,46
	$12{,}50 < A \leq 20{,}00$	± 0,62	± 0,78	± 0,41	± 0,52
	$20{,}00 < A \leq 25{,}00$	± 0,69	± 0,87	± 0,46	± 0,58
	$25{,}00 < A \leq 40{,}00$	± 0,81	± 1,02	± 0,54	± 0,68
	$40{,}00 < A \leq 50{,}00$	± 0,90	± 1,17	± 0,60	± 0,78
	$50{,}00 < A \leq 100{,}00$	± 1,29	± 1,73	± 0,86	± 1,15
	$100{,}00 < A \leq 150{,}00$	± 1,65	± 2,33	± 1,10	± 1,55
	$150{,}00 < A \leq 200{,}00$	± 2,03	± 2,93	± 1,35	± 1,95
	$200{,}00 < A \leq 250{,}00$	± 2,48	± 3,45	± 1,65	± 2,30
$250 < D \leq 800$	$A \leq 3{,}20$	± 0,69	± 0,96	± 0,46	± 0,64
	$3{,}20 < A \leq 6{,}30$	± 0,72	± 0,99	± 0,48	± 0,66
	$6{,}30 < A \leq 12{,}50$	± 0,75	± 1,08	± 0,50	± 0,72
	$12{,}50 < A \leq 20{,}00$	± 0,84	± 1,14	± 0,56	± 0,76
	$20{,}00 < A \leq 25{,}00$	± 0,87	± 1,17	± 0,58	± 0,78
	$25{,}00 < A \leq 40{,}00$	± 0,90	± 1,26	± 0,60	± 0,84
	$40{,}00 < A \leq 50{,}00$	± 1,29	± 1,73	± 0,86	± 1,15
	$50{,}00 < A \leq 100{,}00$	± 1,65	± 2,33	± 1,10	± 1,55
	$100{,}00 < A \leq 150{,}00$	± 2,03	± 2,93	± 1,35	± 1,95
	$150{,}00 < A \leq 200{,}00$	± 2,48	± 3,45	± 1,65	± 2.30
	$200{,}00 < A \leq 250{,}00$	± 2,85	± 4,05	± 1,90	± 2,70
	$250{,}00 < A \leq 300{,}00$	± 3,23	± 4,58	± 2,15	± 3,05
	$300{,}00 < A \leq 350{,}00$	± 3,60	± 5,18	± 2,40	± 3,45
	$350{,}00 < A \leq 400{,}00$	± 3,98	± 5,78	± 2,65	± 3,85
	$400{,}00 < A \leq 450{,}00$	± 4,35	± 6,30	± 2,90	± 4,20
	$450{,}00 < A \leq 500{,}00$	± 4,73	± 6,90	± 3,15	± 4,60
	$500{,}00 < A \leq 550{,}00$	± 5,10	± 7,50	± 3,40	± 5,00
	$550{,}00 < A \leq 800{,}00$	± 5,48	± 8,03	± 3,65	± 5,35

NOTE The tolerances for the space dimension d and w shown in Figure 4 are determined as follows. The tolerance of w is applied to the dimension d in column D. The tolerance of d is applied to the dimension w in column D. Furthermore, when tolerances as described above are smaller than the values in the A_1, A_2 columns of Tables 3 and 4 corresponding to the width w or depth d, the values in the A_1 and A_2 columns apply.

[a] The circumscribing circle is the smallest circle which encloses entirely the cross-section of the shape. However, this dimension may have to be increased when shapes are subjected to corrections of the uneven thickness or in the case of hollow shapes for which the centre of the circumscribing circle needs to be considered, based on the void. These matters should be confirmed with the supplier beforehand as required.

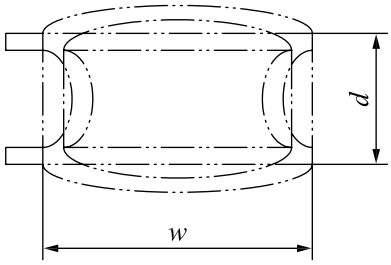


Figure 4 — Sectional dimensions

5.2 Length

If fixed lengths are to be supplied, this shall be stated in the order document. The tolerances on fixed length are given in Table 6.

The length range and the tolerances on the random length shall be subject to agreement between the supplier and purchaser.

Table 6 — Tolerance on fixed length

Dimensions in millimetres

Diameter of circumscribing circle[a]	Tolerances on fixed length L				
	$L \leq 2\,000$	$2\,000 < L \leq 5\,000$	$5\,000 < L \leq 1\,0000$	$1\,0000 < L \leq 15\,000$	$15\,000 < L \leq 25\,000$
$D \leq 100$	$^{+5}_{0}$	$^{+7}_{0}$	$^{+10}_{0}$	$^{+16}_{0}$	$^{+22}_{0}$
$100 < D \leq 200$	$^{+7}_{0}$	$^{+9}_{0}$	$^{+12}_{0}$	$^{+18}_{0}$	$^{+24}_{0}$
$200 < D \leq 450$	$^{+8}_{0}$	$^{+11}_{0}$	$^{+14}_{0}$	$^{+20}_{0}$	$^{+28}_{0}$
$450 < D \leq 800$	$^{+9}_{0}$	$^{+14}_{0}$	$^{+16}_{0}$	$^{+22}_{0}$	$^{+30}_{0}$

NOTE If no fixed length is specified in the order document, profiles may be delivered in random lengths.

[a] The circumscribing circle is the smallest circle which encloses entirely the cross-section of the shape. However, this dimension may have to be increased when shapes are subjected to corrections of the uneven thickness or in the case of hollow shapes for which the centre of the circumscribing circle needs to be considered, based on the void. These matters should be confirmed with the supplier beforehand as required.

5.3 Squareness of cut ends

The squareness of cut ends shall be within half of the fixed-length tolerance range specified in Table 6 for both fixed and random length (e.g. for a fixed-length tolerance of $^{+10}_{0}$ mm, the squareness of cut ends shall be within 5 mm).

6 Tolerances on form

6.1 General

Tolerances on form for O and TX510 tempers shall be subject to agreement between the supplier and purchaser.

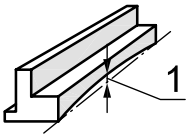
6.2 Straightness

Deviations from straightness h_s and h_t shall be measured as shown in Figure 5 with the profile placed on a horizontal base-plate so that its own mass decreases the deviation.

The tolerances on straightness shall be as specified in Table 7.

Table 7 — Tolerance on straightness

Dimensions in millimetres

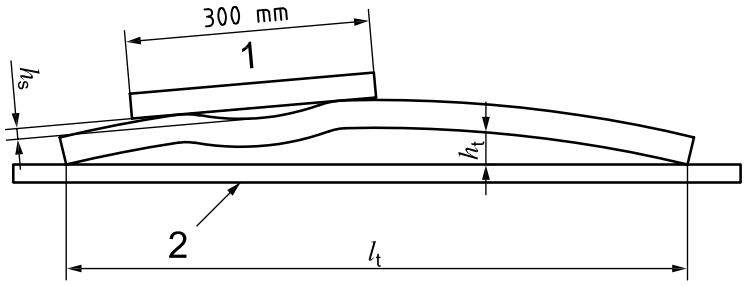
Diameter of circumscribing circle[c]	Minimum wall thickness	Tolerance[a,b]			
		 **Key** 1 camber			
		Ordinary class		Special class	
		Per any length	Per whole length	Per any length	Per whole length
		300 h_s	$(l_t)^d$ h_t	300 h_s	$(l_t)^d$ h_t
$D \leq 38$	$W \leq 2.4$	2 max.	$6{,}6 \times \frac{l_t}{1\,000}$ max.	1,3 max.	$4{,}3 \times \frac{l_t}{1\,000}$ max.
	$2{,}4 < W$	0,6 max.	$2 \times \frac{l_t}{1\,000}$ max.	0,3 max.	$1{,}0 \times \frac{l_t}{1\,000}$ max.
$38 < D \leq 300$					
$300 < D$		0,6 max.	$2 \times \frac{l_t}{1\,000}$ max.	0,5 max.	$1{,}6 \times \frac{l_t}{1\,000}$ max.

[a] Does not apply to temper grade O.

[b] Applicable to the values obtained when the shape is laid on a flat table under its own weight so that the camber is minimum.

[c] The circumscribing circle is the smallest circle which encloses entirely the cross-section of the shape. However, this dimension may have to be increased when shapes are subjected to corrections of the uneven thickness or in the case of hollow shapes for which the centre of the circumscribing circle needs to be considered, based on the void. These matters should be confirmed with the supplier beforehand as required.

[d] Does not apply to the plane with the opening part.



Key

l_t total length

h_t camber of the total length

h_s camber at arbitrary position

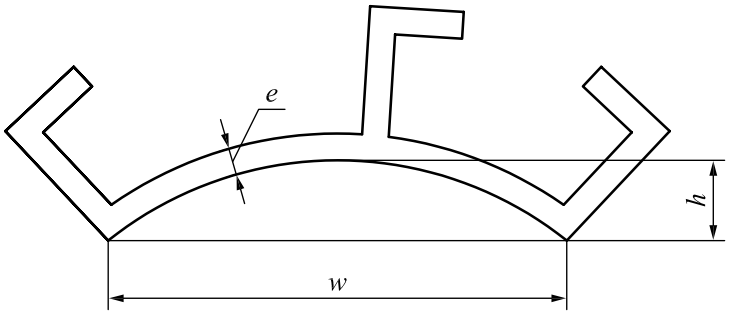
1 ruler

2 flat table

Figure 5 — Straightness

6.3 Convexity/Concavity

The convexity/concavity shall be measured as shown in Figure 6. The maximum allowable deviation on convexity/concavity for solid and hollow profiles shall be as specified in Table 8.



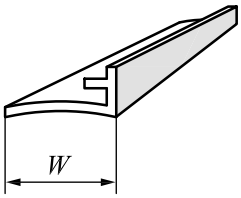
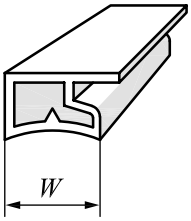
Key

w width
h flatness
e thickness

Figure 6 — Flatness

Table 8 — Tolerance on flatness

Dimensions in millimetres

Width W	Tolerance							
								
	Class							
	Ordinary class		Special class					
	Solid and hollow shapes		Solid shapes		Hollow shapes			
	Minimum thickness at the measurement position							
					5,0 max.		Over 5,0	
	Per any 25 width	Per whole width W	Per any 25 width	Per whole width W	Per any 25 width	Per whole width W	Per any 25 width	Per whole width W
$W \leq 25$		0,20 max.		0,10 max.		0,15 max.		0,10 max.
$25 < W$	0,20 max.	0,008 W max.	0,10 max.	0,004 W max.	0,15 max.	0,006 W max.	0,10 max.	0,004 W max.
NOTE These tolerances do not apply to temper grade O and to the plane with the opening part.								

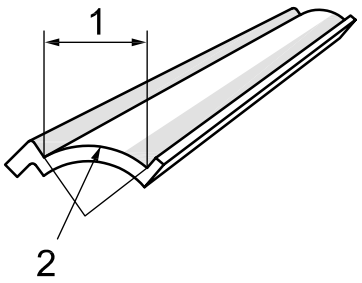
6.4 Curved cross-section or contour

The tolerances for the curved cross-section shall be applied only when required by the purchaser. The tolerances for the cross-section may be substituted by the tolerances for the contour profile, in which case the deviation at any point of the curve from the theoretically exact line as defined by the drawing, shall not be greater than the appropriate tolerance t specified in Table 9 (see Figures 7 and 8).

For the shape with arc length of over 25 mm, the tolerance shall be ± 0,13 mm per 25 mm length of the arc, but when the arc length is less than 25 mm, the tolerance shall be ± 0,13 mm.

When the centre angle at the curved cross-section is 90° or more, measure it every 90° and its fraction.

NOTE These tolerances do not apply to temper grade O.



Key

1 arc

2 curved cross-section

Figure 7 — Tolerances for curved cross-section

Table 9 — Tolerance for contour profile

Dimensions in millimetres

Diameter of circumscribing circle[a]	**Tolerance t for contour profile**[b] (diameter of allowable circle)
$D \leq 30$	0,30
$30 < D \leq 60$	0,50
$60 < D \leq 90$	0,70
$90 < D \leq 120$	1,0
$120 < D \leq 150$	1,2
$150 < D \leq 200$	1,5
$200 < D \leq 250$	2,0
$250 < D \leq 300$	2,5
$300 < D \leq 400$	3,0
$400 < D \leq 500$	3,5
$500 < D \leq 600$	4,0

[a] The circumscribing circle is the smallest circle which encloses entirely the cross-section of the shape. However, this dimension may have to be increased when shapes are subjected to corrections of the uneven thickness or in the case of hollow shapes for which the centre of the circumscribing circle needs to be considered, based on the void. These matters should be confirmed with the supplier beforehand as required.

[b] The tolerance of the contour profile may be confirmed by the method that the section of shape is placed on the actual-sized projection drawing on which tolerance t is written in.

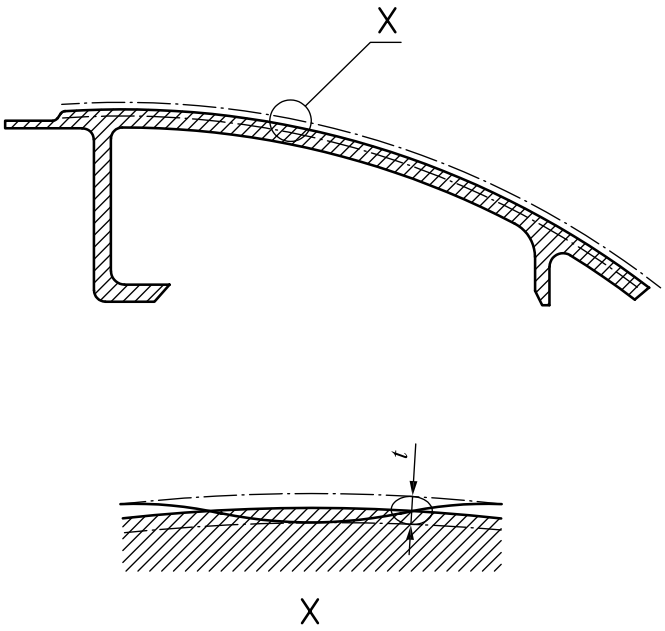


Figure 8 — Arc section

6.5 Twist

Twist shall be measured as shown in Figure 9 by placing the profile on a flat base-plate, the profile resting under own mass, and measuring the maximum distance at any point along the length between the bottom surface of profile and the base-plate surface.

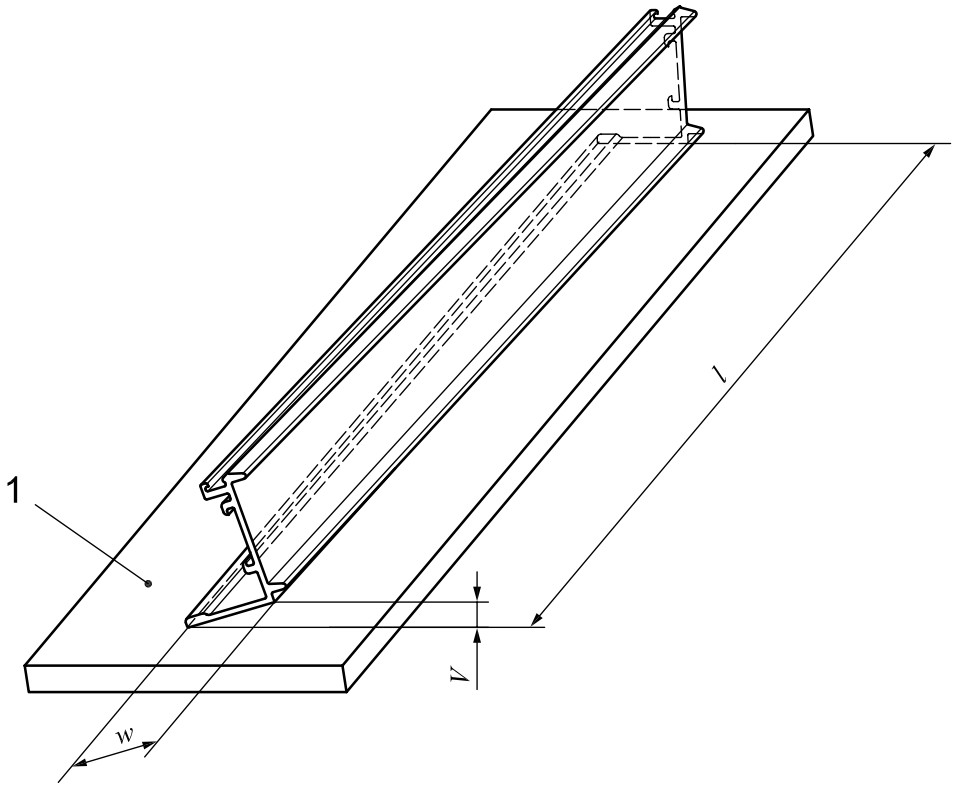
Twist tolerances are specified in Table 10 as a function of the width W and the length l of the profile.

Table 10 — Tolerance on twist (maximum value)

Dimensions in millimetres

Diameter of circumscribing circle[a]	Tolerance [per width (W) 1 mm]			
	Alloy group I		Alloy group II	
	Per 1 m length	Maximum per whole length	Per 1 m length	Maximum per whole length
$12{,}5 < D \leq 40$	0,052	0,122	0,070	0,140
$40 < D \leq 80$	0,026	0,087	0,034	0,105
$80 < D \leq 250$	0,017	0,052	0,026	0,070
$250 < D \leq 600$	0,010	0,040	0,017	0,058

[a] The circumscribing circle is the smallest circle which encloses entirely the cross-section of the shape. However, this dimension may have to be increased when shapes are subjected to corrections of the uneven thickness or in the case of hollow shapes for which the centre of the circumscribing circle needs to be considered, based on the void. These matters should be confirmed with the supplier beforehand as required.



Key

l	whole length
w	width
V	twist
1	flat table

Figure 9 — Twist

6.6 Angularity

The deviation from a specified angle shall be measured as shown in Figures 10 and 11.

The angularity tolerances for right angles shall be as specified in Table 11 as a function of profile width *W*.

The maximum allowable deviation α in an angle other than a right angle shall be $\pm$ 1°.

In the case of unequal side lengths, the tolerance on angularity shall apply to the shorter side of the angle, i.e. it is measured starting from the longer side.

Table 11 — Angularity tolerance for right angles

Dimensions in millimetres

Width W	Maximum allowable deviation from a right angle Z
$W \leq 30$	0,4
$30 < W \leq 50$	0,7
$50 < W \leq 80$	1,0
$80 < W \leq 120$	1,4
$120 < W \leq 180$	2,0
$180 < W \leq 240$	2,6
$240 < W \leq 300$	3,1
$300 < W \leq 400$	3,5

For profiles with a value of W which exceeds 400 mm, the tolerance shall be subject to agreement between the supplier and purchaser.

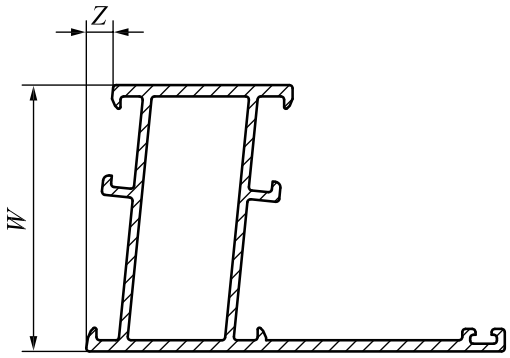


Figure 10 — Measurement of angularity in a right angle

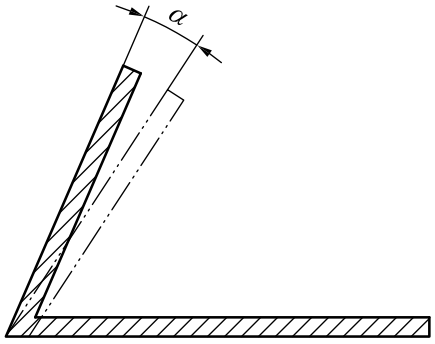


Figure 11 — Measurement of angularity in an angle other than a right angle

6.7 Corner and fillet radii

Sharp corners and fillet may be slightly rounded unless otherwise indicated on the drawing. The maximum allowable corner and fillet radii shall be as specified in Table 12.

When a corner or fillet radius is specified, the maximum allowable deviation from the specified radius shall be as specified in Table 13.

Table 12 — Maximum allowable corner and fillet radii

Dimensions in millimetres

Wall thickness A, B or C[a]	Maximum allowable radius	
	Alloy group I	Alloy group II[b]
≤ 5	0,6	0,8
> 5	1,0	1,5

[a] Where varying wall thicknesses are involved, the maximum allowable radius in the transition zone is a function of the greater wall thickness.

[b] These tolerances only apply to 6xxx series alloys in group II. The maximum allowable radii for the other alloys in group II shall be subject to agreement between the supplier and purchaser.

Table 13 — Maximum allowable deviation from specified corner and fillet radii

Specified radius mm	Maximum allowable deviation from specified radius
≤ 5	± 0,5 mm
> 5	± 10 %

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