

English version

Aluminium and aluminium alloys
**Extruded precision profiles in alloys EN AW-6060 and
EN AW-6063**

Part 2: Tolerances on dimensions and form

Aluminium et alliages d'aluminium –
Profils de précision filés en alliages
EN AW-6060 et EN AW-6063 –
Partie 2: Tolérances sur dimensions
et forme

Aluminium und Aluminiumlegierungen
– Stranggepresste Präzisionsprofile
aus Legierungen EN AW-6060 und
EN AW-6063 – Teil 2: Grenzabmaße
und Formtoleranzen

This European Standard was approved by CEN on 2001-02-18.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Management Centre or to any CEN member.

The European Standards exist in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, the Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom.

CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Management Centre: rue de Stassart 36, B-1050 Brussels

Aluminium and aluminium alloys
Extruded precision profiles in alloys
EN AW-6060 and EN AW-6063
Part 2: Tolerances on dimensions and form
English version of DIN EN 12020-2

DIN
EN 12020-2

ICS 77.150.10

Supersedes DIN 17615-3,
January 1987 edition.

Aluminium und Aluminiumlegierungen – Stranggepresste Präzisions-
profile aus Legierungen EN AW-6060 und EN AW-6063 – Teil 2:
Grenzabmaße und Formtoleranzen

European Standard EN 12020-2 : 2001 has the status of a DIN Standard.

A comma is used as the decimal marker.

National foreword

This standard has been prepared by CEN/TC 132 'Aluminium and aluminium alloys' (Secretariat: France).
The responsible German body involved in its preparation was the *Normenausschuss Nichteisenmetalle*
(Nonferrous Metals Standards Committee), Technical Committee *Strangpresserzeugnisse*.

Amendments

DIN 17615-3, January 1987 edition, has been superseded by the specifications of EN 12020-2.

Previous editions

DIN 17615-3: 1976-12, 1987-01.

EN comprises 13 pages.

Contents

Page

Foreword.....	2
1 Scope	3
2 Tolerances on dimensions.....	4
2.1 General.....	4
2.2 Cross-sectional dimensions	4
2.3 Length	6
2.4 Squareness of cut ends	6
2.5 Length offset for profiles with a thermal barrier.....	7
3 Tolerance on form.....	7
3.1 Straightness	7
3.2 Convexity - Concavity	8
3.3 Contour	9
3.4 Twist.....	9
3.5 Angularity	11
3.6 Corner and fillet radii.....	12

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 132 "Aluminium and aluminium alloys", the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by October 2001, and conflicting national standards shall be withdrawn at the latest by October 2001.

Within its programme of work, Technical Committee CEN/TC 132 entrusted CEN/TC 132/WG5 "Extruded and drawn products" to prepare the following standard :

EN 12020-2, Aluminium and aluminium alloys – Extruded precision profiles in alloys EN AW-6060 and EN AW-6063 – Part 2 : Tolerances on dimensions and form.

This standard is part of a set of two standards. The other standard deals with :

EN 12020-1, Aluminium and aluminium alloys – Extruded precision profiles in alloys EN AW-6060 and EN AW-6063 – Part 1: Technical conditions for inspection and delivery.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This part of EN 12020 specifies tolerances on dimensions and form of extruded precision profiles, in alloys EN AW-6060 and EN AW-6063 manufactured with and without a thermal barrier (see Figures 1 and 2). It applies to as extruded products supplied without further surface treatment. Precision profiles covered in this standard are distinguished from extruded profiles for general applications covered in EN 755-9 by the following characteristics :

- they are mainly for architectural applications ;
- they meet more stringent requirements regarding the surface condition of visible surfaces ;
- the maximum diameter of the circumscribing circle *CD* is 300 mm ;
- they are made to closer tolerances on dimensions and form.

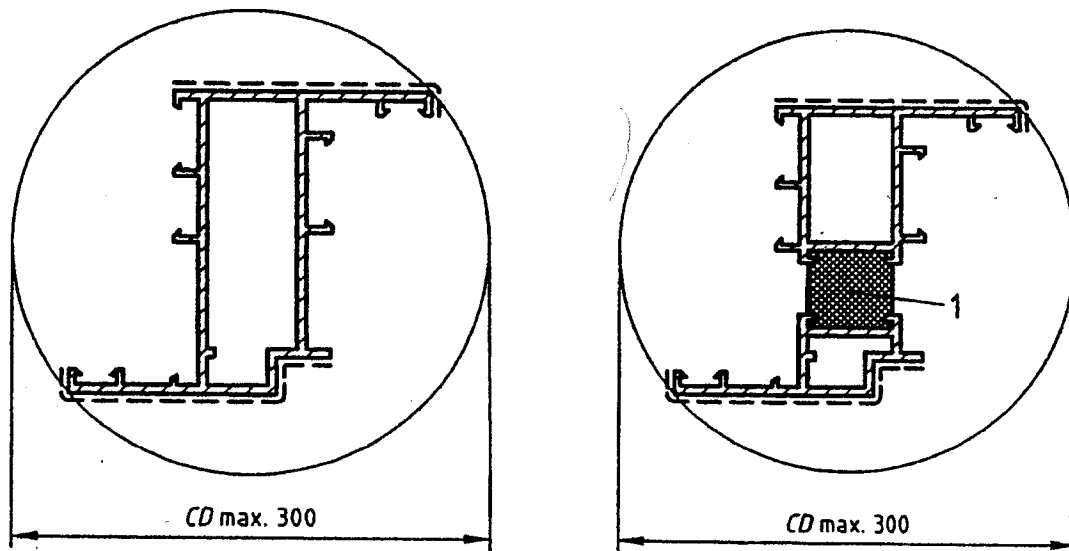
In the case of profiles which, due to the complexity of their design, are difficult to manufacture and specify, then special agreements between purchaser and manufacturer may need to be reached.

NOTE 1 The thermal barrier material is not covered by this standard.

NOTE 2 Some of the products listed in the present standard can be subject to patent or patent applications, and their listing herein does not in any way imply the granting of a licence under such patent right.

CEN/TC 132 affirms it is its policy that in the case when a patentee refuses to grant licences on standardised standard products under reasonable and not discriminatory conditions then this product shall be removed from the corresponding standard.

Dimensions in millimetres



Key

1 Thermal barrier

Figure 1 — Profile without thermal barrier
(example)

Figure 2 — Profile with thermal barrier
(example)

2 Tolerances on dimensions

2.1 General

If, for compelling reasons, tolerances closer than those specified in 2.2.1 and 2.2.2 are required, these shall only be specified for dimensions that are critical to the function, subject to particular agreement. Any such reduction shall not exceed two-thirds of the values specified in this standard and is subject to a minimum tolerance band of 0,3 mm.

2.2 Cross-sectional dimensions

2.2.1 General

The tolerances of the following dimensions (see Figure 3) are specified in the relevant Tables 1 and 2.

- *A*: wall thicknesses except those enclosing the hollow spaces in hollow profiles ;
- *B*: wall thicknesses enclosing the hollow spaces in hollow profiles, except those between two hollow spaces ;
- *C*: wall thicknesses between two hollow spaces in hollow profiles ;
- *E*: the length of the shorter leg of profiles with open ends ;
- *H*: all dimensions except wall thickness.

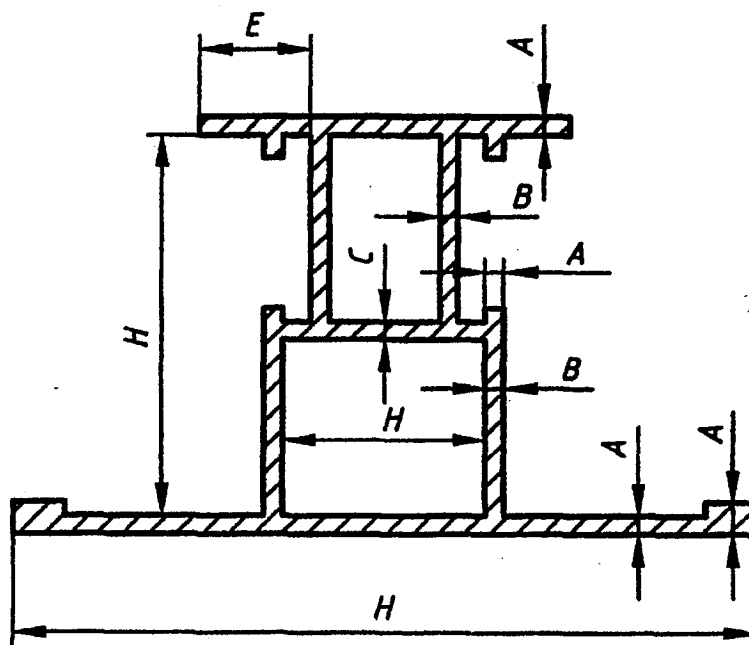


Figure 3 — Definition of dimensions *A*, *B*, *C*, *E*, *H*

2.2.2 Tolerances on dimensions other than wall thickness

The tolerances for dimension H shall be as specified in Table 1.

Table 1 — Tolerances on cross-sectional dimensions

Dimensions in millimetres

Dimension H		Tolerances on H (except open ends)	Tolerances on H (open ends)	
Over	Up to and including		$E \leq 60$	$60 < E \leq 120$ ^a
-	10	$\pm 0,15$	$\pm 0,15$	b
10	15	$\pm 0,20$	$\pm 0,20$	b
15	30	$\pm 0,25$	$\pm 0,25$	b
30	45	$\pm 0,30$	$\pm 0,30$	$\pm 0,45$
45	60	$\pm 0,40$	$\pm 0,40$	$\pm 0,55$
60	90	$\pm 0,45$	$\pm 0,45$	$\pm 0,65$
90	120	$\pm 0,60$	$\pm 0,60$	$\pm 0,80$
120	150	$\pm 0,80$	$\pm 0,80$	$\pm 1,0$
150	180	$\pm 1,0$	$\pm 1,0$	$\pm 1,3$
180	240	$\pm 1,2$	$\pm 1,2$	$\pm 1,5$
240	300	$\pm 1,5$	$\pm 1,5$	$\pm 1,8$

^a Tolerances for values of dimension E over 120 mm shall be subject to agreement between purchaser and supplier.
^b Shall be subject to agreement between purchaser and supplier.

2.2.3 Tolerances on wall thickness of solid and hollow profiles

The tolerances on wall thickness (see Figure 3) of solid and hollow profiles shall be as specified in Table 2.

Table 2 — Tolerances on wall thickness

Dimensions in millimetres

Nominal wall thickness <i>A, B</i> or <i>C</i>		Tolerances on :			
		Wall thickness <i>A</i>		Wall thickness <i>B</i> and <i>C</i>	
Over	Up to and including	Circumscribing circle <i>CD</i> ≤ 100	Circumscribing circle 100 < <i>CD</i> ≤ 300	Circumscribing circle <i>CD</i> ≤ 100	Circumscribing circle 100 < <i>CD</i> ≤ 300
-	1,5	± 0,15	± 0,20	± 0,20	± 0,30
1,5	3	± 0,15	± 0,25	± 0,25	± 0,40
3	6	± 0,20	± 0,30	± 0,40	± 0,60
6	10	± 0,25	± 0,35	± 0,60	± 0,80
10	15	± 0,30	± 0,40	± 0,80	± 1,0
15	20	± 0,35	± 0,45	± 1,2	± 1,5
20	30	± 0,40	± 0,50	-	-
30	40	± 0,45	± 0,60	-	-

When, for functional reasons, tolerances are specified for both the outside and inside dimensions of hollow sections, then the deviations given in Table 2 shall not apply as a wall thickness tolerance, but as a tolerance on the difference in wall thickness. This difference shall be determined by measuring the maximum and minimum wall thickness in the same plane.

2.3 Length

If fixed lengths are to be supplied, this shall be stated on the order. The fixed length tolerances shall be as specified in Table 3.

Table 3 — Tolerances on fixed length

Dimensions in millimetres

Circumscribing circle <i>CD</i>		Tolerances on fixed length <i>L</i>			
Over	Up to and including	<i>L</i> ≤ 2 000	2 000 < <i>L</i> ≤ 5 000	5 000 < <i>L</i> ≤ 10 000	<i>L</i> > 10 000
-	100	+5 0	+7 0	+10 0	Subject to agreement
100	200	+7 0	+9 0	+12 0	
200	300	+8 0	+11 0	+14 0	

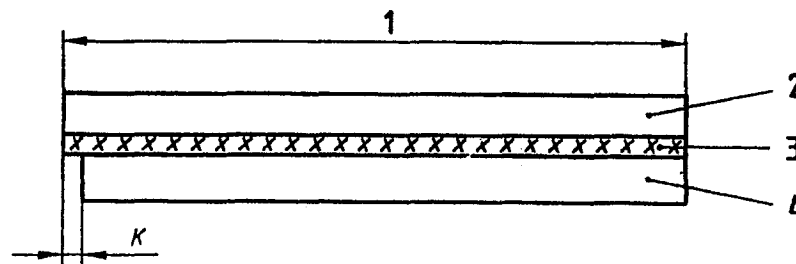
If no fixed or minimum length is specified in the order, profiles may be delivered in random lengths. The length range and the tolerances on the random lengths shall be subject to agreement between purchaser and supplier.

2.4 Squareness of cut ends

The squareness of cut ends shall be within half of the fixed length tolerance range specified in table 3 for both fixed and random lengths, e.g. for a fixed length tolerance of $^{+10}_0$ mm the squareness of cut ends shall be within 5 mm.

2.5 Length offset for profiles with a thermal barrier

Length offset K , see Figure 4, for profiles with a thermal barrier shall be within the tolerance range for the fixed length specified in Table 3, e.g. for a fixed length tolerance of + 10 mm the length offset shall be within 10 mm.



Key

- 1 Length of profile
- 2 Profile 1
- 3 Thermal barrier
- 4 Profile 2

Figure 4 — Length offset K

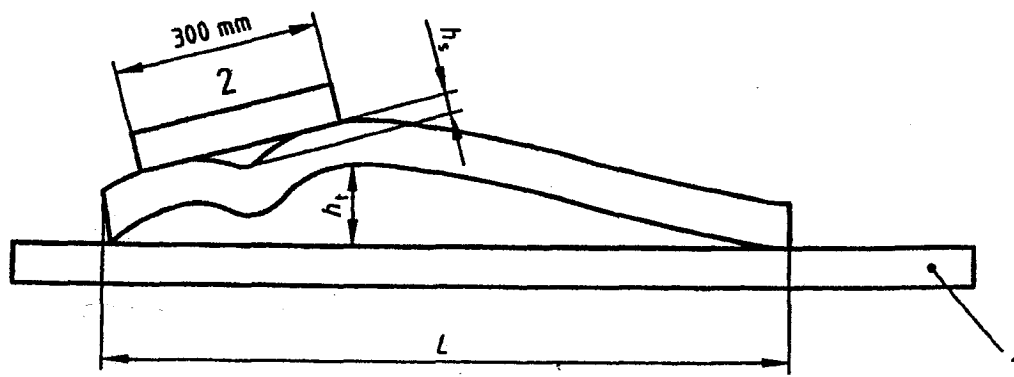
3 Tolerance on form

3.1 Straightness

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

The straightness tolerance h_t shall be as specified in Table 4.

The local deviation from straightness h_s shall not exceed 0,3 mm per 300 mm length.



Key

- 1 Baseplate
- 2 Ruler

Figure 5 — Measurement of deviation from straightness

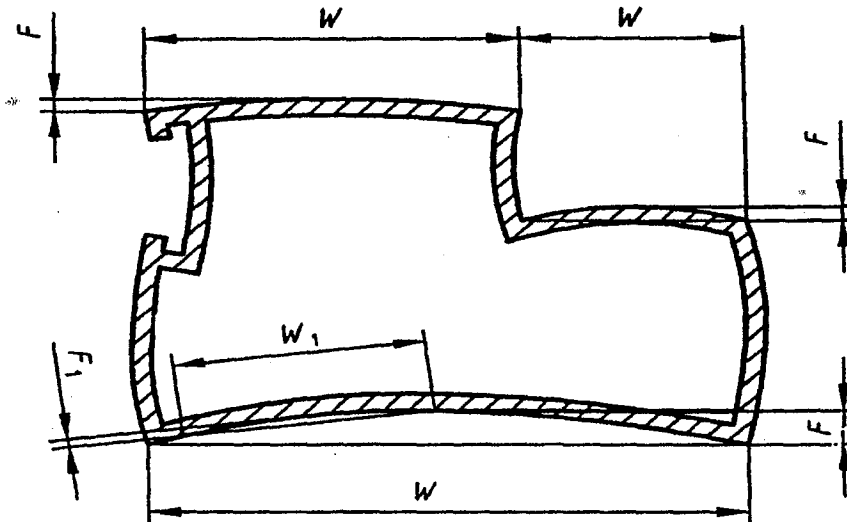
Table 4 — Straightness tolerances

Dimensions in millimetres

Straightness tolerance h_t for specified length L						
$L \leq 1\ 000$	$1\ 000 < L \leq 2\ 000$	$2\ 000 < L \leq 3\ 000$	$3\ 000 < L \leq 4\ 000$	$4\ 000 < L \leq 5\ 000$	$5\ 000 < L \leq 6\ 000$	$L > 6\ 000$
0,7	1,3	1,8	2,2	2,6	3,0	3,5

3.2 Convexity - Concavity

The convexity - concavity shall be measured as shown in figure 6. The tolerances shall be as specified in Table 5.



Key

- W = width
- F = Deviation
- $W_1 = 100$ mm
- $F_1 = 0,5$ mm maximum

Figure 6 — Measurement of convexity - concavity

Table 5 — Convexity - concavity tolerances

Dimensions in millimetres

Width W		Maximum allowable deviation F
Over	Up to and including	
-	30	0,20
30	60	0,30
60	100	0,40
100	150	0,50
150	200	0,70
200	250	0,85
250	300	1,0

In the case of profiles with a width W of at least 200 mm, the local deviation F_1 shall not exceed 0,5 mm for any 100 mm of width, W_1 .

3.3 Contour

For profiles with curved cross sections, 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 C specified in Table 6.

Considering all points on the curve, a tolerance zone shall be defined as the zone between two envelopes running tangentially to all circles of diameter C which can be drawn with their centres lying along the theoretically exact line ; this is shown in Figure 7 (a and b).

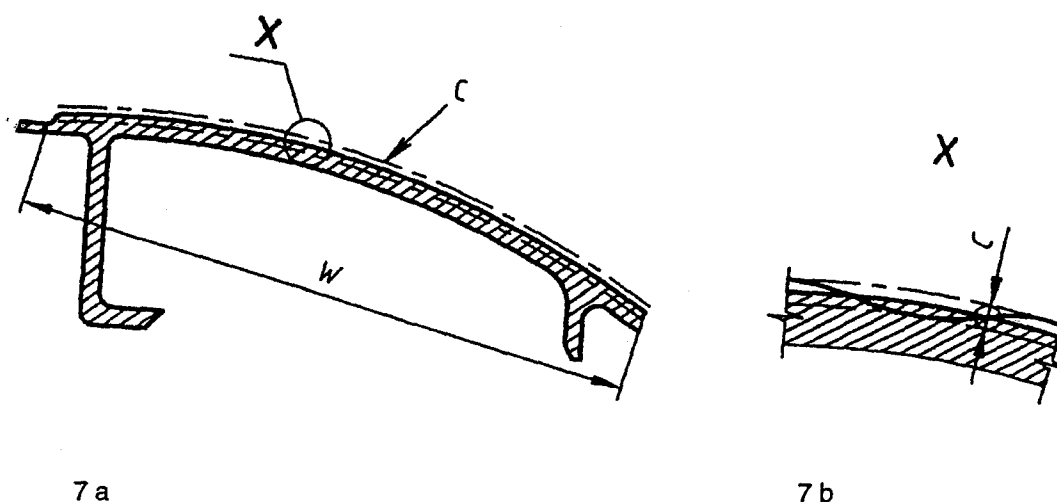


Figure 7 — Definition of contour tolerances

Table 6 — Contour tolerances

Dimensions in millimetres

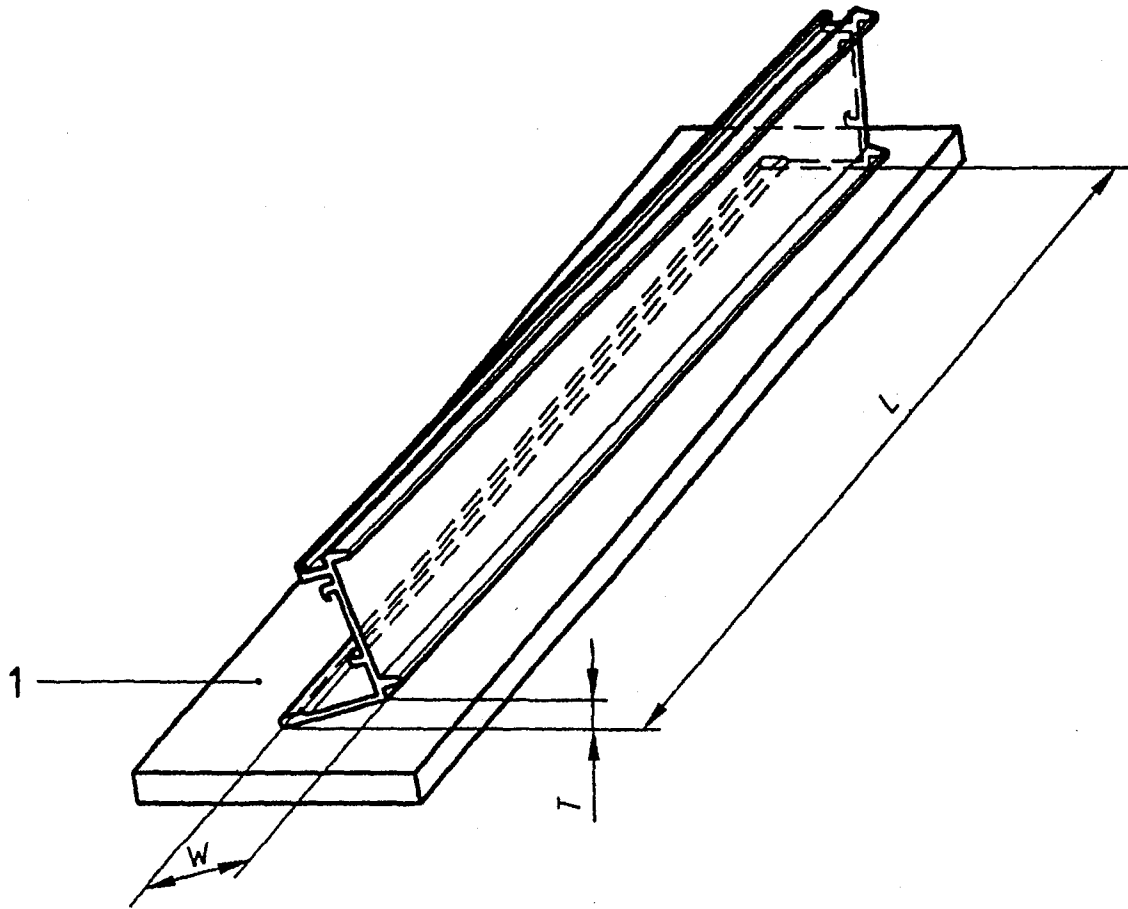
Width W of the contour		Contour tolerance = diameter C of the tolerance circle
Over	Up to and including	
-	30	0,30
30	60	0,50
60	90	0,70
90	120	1,0
120	150	1,2
150	200	1,5
200	250	2,0
250	300	2,5

NOTE Contour tolerances can be checked by placing a section of the profile on a scale projection of the drawing with the contour tolerance indicated on the drawing. Another recommended method is the use of suitable gauge (min./max.).

3.4 Twist

Twist T shall be measured as shown in Figure 8 by placing the profile on a flat baseplate, the profile resting under its own mass and measuring the maximum distance at any point along the length between the bottom surface of

the profile and the baseplate surface. Tolerances shall be specified in Table 7 as a function of the width W and the length L of the profile.



Key

1 Baseplate

Figure 8 — Measurement of twist

Table 7 — Twist tolerances

Dimensions in millimetres

Width <i>W</i>		Twist tolerances <i>T</i> for specified length <i>L</i>						
Over	Up to and including	$L \leq 1\,000$	$1\,000 < L \leq 2\,000$	$2\,000 < L \leq 3\,000$	$3\,000 < L \leq 4\,000$	$4\,000 < L \leq 5\,000$	$5\,000 < L \leq 6\,000$	$L > 6\,000$
-	25	1,0	1,5	1,5	2,0	2,0	2,0	subject to agreement
25	50	1,0	1,2	1,5	1,8	2,0	2,0	
50	75	1,0	1,2	1,2	1,5	2,0	2,0	
75	100	1,0	1,2	1,5	2,0	2,2	2,5	
100	125	1,0	1,5	1,8	2,2	2,5	3,0	
125	150	1,2	1,5	1,8	2,2	2,5	3,0	
150	200	1,5	1,8	2,2	2,6	3,0	3,5	
200	300	1,8	2,5	3,0	3,5	4,0	4,5	

3.5 Angularity

The deviation from a specified angle shall be measured as shown in Figures 9 and 10.

The angularity tolerances for right angles shall be as specified in table 8 as a function of profile width *W*.

The maximum allowable deviation α for angles other than a right shall be $\pm 1^\circ$ (see Figure 10).

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

Table 8 — Angularity tolerances for right angles

Dimensions in millimetres

Width <i>W</i>		Maximum allowable deviation <i>Z</i> from a right angle
Over	Up to and including	
	30	0,3
30	50	0,4
50	80	0,5
80	100	0,6
100	120	0,7
120	140	0,8
140	160	0,9
160	180	1,0
180	200	1,2
200	240	1,5

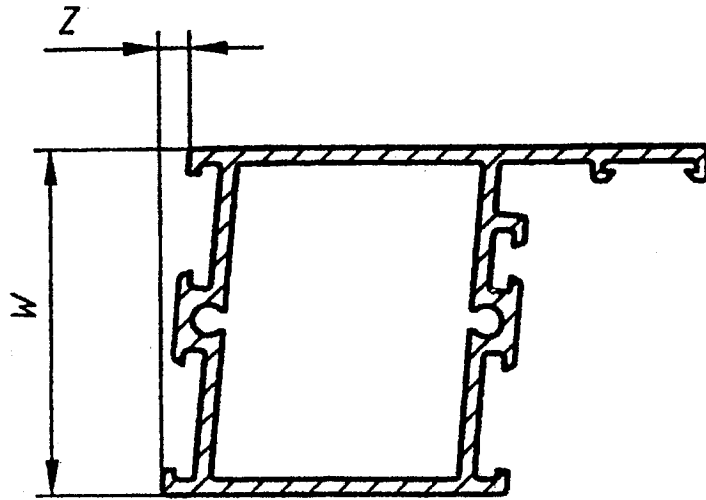


Figure 9 — Measurement of angularity in a right angle

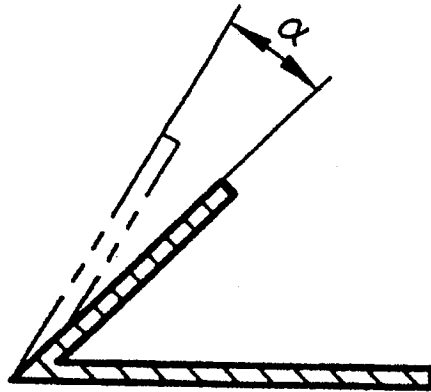


Figure 10 — Measurement of angularity in an angle other than a right angle

3.6 Corner and fillet radii

Sharp corners and fillets may be slightly rounded, unless otherwise indicated on the drawing. The maximum allowable corner and fillet radii shall be as specified in Table 9.

When a corner or fillet radius is specified, the maximum allowable deviation from this specified radius shall be as specified in Table 10.

Table 9 — Maximum allowable corner and fillet radii

Dimensions in millimetres

Wall thickness <i>A</i> , <i>B</i> ^a or <i>C</i> ^a		Maximum allowable corner and fillet radii
Over	Up to and including	
-	3	0,5
3	6	0,6
6	10	0,8
10	20	1,0
20	40	1,5

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

Table 10 — Maximum allowable deviations from specified corner and fillet radii

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