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General tolerances for welded constructions — Dimensions for lengths and angles — Shape and position

Soudage — Tolérances générales relatives aux constructions soudées — Dimensions des longueurs et angles — Formes et positions

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see ~~www.iso.org/directives~~www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see ~~www.iso.org/patents~~www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see ~~www.iso.org/iso/foreword.html~~www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC ~~44~~, *Welding and allied processes*, Subcommittee SC ~~10~~, *Quality management in the field of welding*~~.~~, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 121, *Welding and allied processes*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO ~~13920:2022~~1996). which has been technically revised.

The main changes are as follows:

— references have been updated;

— presentation has been updated to the latest ISO styles.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at ~~www.iso.org/members.html~~.

www.iso.org/members.html. Official interpretations of ISO/TC 44 documents, where they exist, are available from this page: ~~https://committee.iso.org/sites/tc44/home/interpretation.html~~https://committee.iso.org/sites/tc44/home/interpretation.html.

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General tolerances for welded constructions – Dimensions for lengths and angles – Shape and position

1 Scope

This document specifies general tolerances for linear and angular dimensions and for shape and position of welded structures in four tolerance classes, based on customary workshop accuracy. The main criterion for selection of a particular tolerance class is based on the functional requirements which are to be met.

The applicable tolerances are always those which are stated in the drawing. Instead of specifying individual tolerances the tolerance classes according to this document can be used.

General tolerances for linear and angular dimensions and for shape and position as specified in this document apply for weldments, welding assemblies and welded structures etc.

Special provisions can be necessary for complex structures.

The specifications given in this document are based on the ~~principle of~~ independency ~~as specified in~~principle of ISO 8015, according to which the dimensional and geometrical tolerances apply independently of each other.

Manufacturing documentation in which linear and angular dimensions or indications for shape and position are presented without individually indicated tolerances shall be deemed incomplete if there is no, or inadequate, reference to general tolerances. This does not apply to temporary dimensions.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

~~<std>~~ISO 463, *Geometrical Product Specifications (GPS) — Dimensional measuring equipment — Design and metrological characteristics of mechanical dial gauges*~~</std>~~

~~<std>~~ISO 1101, *Geometrical product specifications (GPS) — Geometrical tolerancing — Tolerances of form, orientation, location and run-out*~~</std>~~

~~<std>~~ISO 13385-1, *Geometrical product specifications (GPS) — Dimensional measuring equipment — Part 1: Design and metrological characteristics of callipers*~~</std>~~

~~<std>~~ISO 13385-2, *Geometrical product specifications (GPS) — Dimensional measuring equipment — Part 2: Design and metrological characteristics of calliper depth gauges*~~</std>~~

~~<std>ISO 8015, *Geometrical product specifications (GPS) — Fundamentals — Concepts, principles and rules*</std>~~

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3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 1101 apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at ~~https://www.iso.org/obp~~https://www.iso.org/obp

— IEC Electropedia: available at ~~https://www.electropedia.org/~~https://www.electropedia.org/

4 General tolerances

4.1 Tolerances for linear dimensions

See Table 1.

Table 1 — Tolerances for linear dimensions

Tolerance class	**Range of nominal sizes**~~,~~ *l*~~, in~~ mm										
	~~2 <~~ *t* ≤ 30	~~30 <~~ *t* ≤ 120	120 < *t* ≤ 400	400 < *t* ≤ 1 000	1 000 < *t* ≤ 2 000	2 000 < *t* ≤ 4 000	4 000 < *t* ≤ 8 000	8 000 < *t* ≤ 12 000	12 000 < *t* ≤ 16 000	16 000 < *t* ≤ 20 000	*t* > 20 000
	Tolerances~~,~~ *t*~~, in~~ mm										
A	±1	±1	±1	±2	±3	±4	±5	±6	±7	±8	±9
B		±2	±2	±3	±4	±6	±8	±10	±12	±14	±16
C		±3	±4	±6	±8	±11	±14	±18	±21	±24	±27
D		±4	±7	±9	±12	±16	±21	±27	±32	±36	±40

4.2 Tolerances for angular dimensions

The length of the shorter angle leg shall be used, in accordance with Table 2, to determine which tolerances apply. The length of the leg can also be assumed to extend to a specified reference point. In this case, the reference point concerned shall be indicated on the drawing.

See Table 2 for the relevant tolerances.

Figure 1 shows examples of how the shorter angle leg, *l*, is represented.

Table 2 — Tolerances for angular dimensions

Tolerance class	**Range of nominal sizes**~~,~~ *l*~~, in~~ mm (length or shorter leg)		
	l ≤ 400	400 < *l* ≤1 000	*l* > 1 000

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	Tolerances $\Delta\alpha$ (~~in~~ degrees and minutes)		
A	±20'	±15'	±10'
B	±45'	±30'	±20'
C	±1°	±45'	±30'
D	±1° 30 [a]	±1° 15'	±1°
	Calculated and rounded tolerances, *t*, in mm [a]		
A	±6	±4,5	±3
B	±13	±9	±6
C	±18	±13	±9
D	±26	±22	±18

[a] The value indicated in mm/m corresponds to the tangent value of the general tolerance. It is to be multiplied by the length, in m, of the shorter leg.

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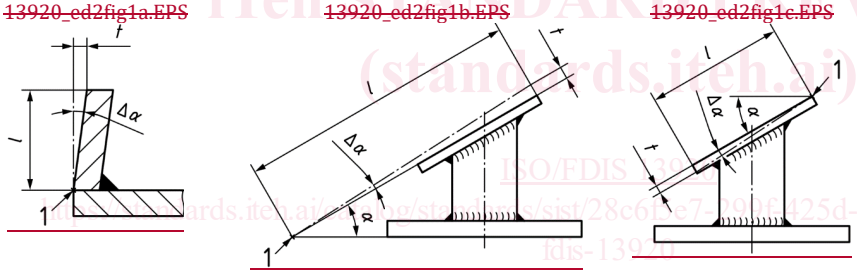

a) **b)** **c)**

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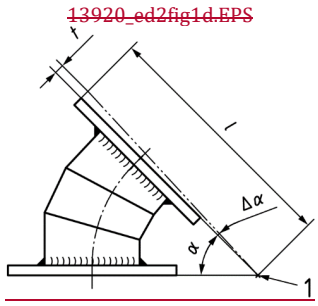

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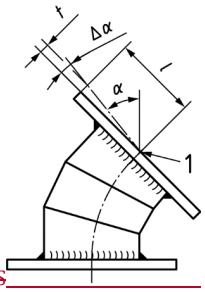

e)

Key

1 reference point

Figure 1 — Examples showing how the shorter angle leg, *l*, is represented

4.3 Straightness, flatness and parallelism tolerances

The straightness, flatness and parallelism tolerances specified in Table 3 apply for:

— the overall dimensions of a weldment,

— a welding assembly, or

— a welded structure, and

— for sections for which the dimensions are indicated.

Other tolerances of form and position, e.g. coaxiality and symmetry tolerances, have not been specified. If such tolerances are required for reasons of function, they shall be indicated on the drawings as specified in ISO 1101.

Table 3 — Straightness, flatness and parallelism tolerances

Tolerance class	Range of nominal sizes, *l*, in mm (relates to longer side of the surface)									
	$30 < t \leq 120$	$120 < t \leq 400$	$400 < t \leq 1\,000$	$1\,000 < t \leq 2\,000$	$2\,000 < t \leq 4\,000$	$4\,000 < t \leq 8\,000$	$8\,000 < t \leq 12\,000$	$12\,000 < t \leq 16\,000$	$16\,000 < t \leq 20\,000$	$t > 20\,000$
	Tolerances, *t*, in mm									
E	0,5	1	1,5	2	3	4	5	6	7	8
F	1	1,5	3	4,5	6	8	10	12	14	16
G	1,5	3	5,5	9	11	16	20	22	25	25
H	2,5	5	9	14	18	26	32	36	40	40

5 Indications on drawings

The designation of the selected tolerance class as specified in Table 1 and Table 2 (e.g. ISO 13920-B) or its combination with a tolerance class as specified in Table 3 (e.g. ISO 13920-BE), shall be entered in the appropriate area on the drawing.

6 Testing

6.1 General

Testing and measuring devices used shall be suitable and accurate for their intended purpose:

— graduated steel straightedges;

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— tape measures;

— straightedges;

— squares;

— vernier callipers (in accordance with ISO 13385-1 or ISO 13385-2);

— dial gauges (in accordance with ISO 463).

Other testing and measuring devices may be used by agreement.

The results of measurement can be influenced if they are obtained under unusual temperature or atmospheric conditions, e.g. large constructions in strong sunlight.

The actual size of an angle shall be determined by applying suitable measuring devices tangentially to the weldment, but away from the zone immediately influenced by the weld. The deviation shall be derived from the difference between the nominal size and the actual size. The angular deviation may be measured in degrees and minutes, or in millimetres.

6.2 Straightness

The edge of the weldment and the straightedge shall be aligned in such a way that the greatest distance between the straightedge and the actual surface is at its minimum. The distance between the edge and the straightedge shall be measured (~~example~~e.g. see Figure 2).

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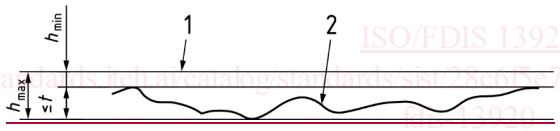

Key

1 straightedge

2 edge of weldment

Note: $h_{max} - h_{min} \leq t$

Figure 2 — Straightness test

6.3 Flatness

The actual surface of the weldment and the measuring plane shall be aligned to each other in such a way that the greatest distance between the measuring plane and the actual surface is at its minimum. This may be achieved, for example, with the aid of optical devices, tubular water levels, span wires, floor plates, surface plates, and machine beds.

The distances between the actual surface and the measuring plane shall be measured (example see Figure 3).

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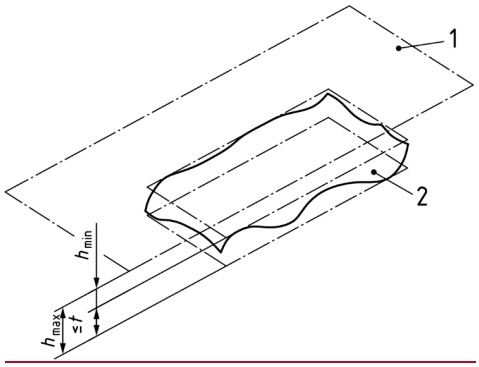

Key

1 measuring plane

2 actual surface

Note: $h_{max} - h_{min} \leq t$

Figure 3 — Flatness test

6.4 Parallelism

The reference surface shall be aligned parallel to the reference plane.

A measuring plane shall be established parallel to the reference plane and apart from the weldment, using the measuring devices referred to in 6.3. The distances between the actual surface and the measuring plane shall be measured (~~example~~e.g. see Figure 4).

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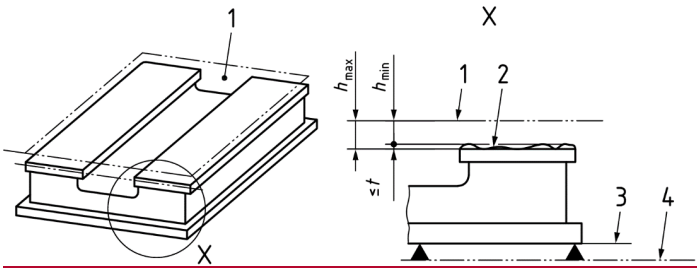

Key

1 measuring plane

2 actual surface

3 reference surface

4 reference plane

Note: $h_{max} - h_{min} \leq t$

Figure 4 — Parallelism test