INTERNATIONAL STANDARD

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Third edition
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Hot-rolled steel plates — Tolerances on dimensions and shape

Tôles en acier laminées à chaud — Tolérances sur les dimensions et la forme

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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 7452 was prepared by Technical Committee ISO/TC 17, *Steel*, Subcommittee SC 3, *Steels for structural purposes*.

This third edition cancels and replaces the second edition (ISO 7452:2002), which has been technically revised.

Hot-rolled steel plates — Tolerances on dimensions and shape

1 Scope

This International Standard specifies requirements for tolerances for hot-rolled steel plates made on a reversing mill with the following characteristics:

a) nominal thickness: 3 mm ≤ t ≤ 400 mm;

b) nominal width: w ≥ 600 mm.

NOTE 1 Tolerances for products of width < 600 mm, cut or slit from plate, may be agreed between the manufacturer and purchaser at the time of ordering.

This International Standard applies to, but is not limited to, steel grades defined in all parts of ISO 630, in ISO 9328-1 to ISO 9328-6 and in ISO 683-1, ISO 683-2, ISO 683-10 and ISO 683-11.

This International Standard does not apply to stainless steel.

If not otherwise agreed, the tables in Annex A apply to steel grades defined in Annex A of all parts (except Part 1) of ISO 630 or in ISO 9328-1 to ISO 9328-6.

If not otherwise agreed, the tables in Annex B apply to steel grades defined in Annex B of all parts (except Part 1) of ISO 630 or in ISO 9328-1 to ISO 9328-6.

For steel grades defined in ISO 683-1, ISO 683-2, ISO 683-10 and ISO 683-11, the selection of Annex A or B is done at the time of enquiry and order.

This International Standard does not include continuous mill products, custom-made plate, checker plate or bulb plate for flooring or wide flats.

This International Standard does not include the following steel products, which are covered by other International Standards:

— sheet and strip – refer to ISO/TC 17/SC 12 “Continuous mill flat rolled products”;

— tubular products – refer to ISO/TC 5/SC 1 “Steel tubes”.

NOTE 2 Lists of standards covered by ISO/TC 17/SC 12 and ISO/TC 5/SC 1 are available on the ISO Website.

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 6929, *Steel products — Vocabulary* [1)]

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 6929 apply.

1) To be published. (Revision of ISO 6929:1987)

4 Information to be supplied by the purchaser

4.1 General

The following information shall be supplied by the purchaser at the time of enquiry and order:

a) description of the product (plate);

b) selection of Annex A or B of ISO 7452;

c) nominal thickness, in millimetres;

d) the thickness tolerance table and class required (see 6.1);

e) nominal width and width tolerance table to be applied (see 6.2);

f) nominal length and length tolerance table to be applied (see 6.3);

g) the flatness tolerance table to be applied (see 7.2).

If no information concerning points a) to g) is given by the purchaser, the supplier shall refer back to the purchaser.

4.2 Options

A number of options are specified. In the event that the purchaser does not indicate his wish to implement any of these options, the supplier shall supply the products in accordance with the basic specifications of this International Standard (see 5.2):

a) whether untrimmed edges (letter NK) are required; when NK is specified, the maximum length and width shall be agreed;

b) whether a limited edge camber and out-of-straightness (letter G) is required; when G is specified, the maximum tolerances for camber and out-of-squareness shall be agreed;

c) whether tolerances on length for plates with a nominal length > 20 000 mm are required (see Table A.3).

5 Form of supply

5.1 Selection of tolerances, edge camber and out-of-squareness

Plate according to this International Standard can be supplied with:

— thickness tolerances according to Table A.1, B1 (class D) or B.2 (classes A, B and C) (see 6.1);

— width tolerances according to Table A.2 or B.3;

— length tolerances according to Table A.3 or B.4;

— trimmed edges or with untrimmed edges (NK);

— normal or limited edge camber and out-of-squareness (G);

— normal (N) flatness tolerances (see Table A.4 or B.5) or special (S) flatness tolerances (see Table A.5).

5.2 Absence of information

In the absence of information in the order of code letters for the supply, plate shall be supplied as follows:

— trimmed edges in accordance with 6.2;

— edge camber and out-of-squareness in accordance with 7.1.

6 Tolerances and dimensions

6.1 Thickness

Tolerances on thickness are given in Tables A.1, B.1 and B.2.

Plates may be supplied to any of the following classes:

— Class A: for thickness tolerances depending on the nominal thickness;

— Class B: for a fixed minus tolerance of 0,3 mm;

— Class C: for a fixed minus tolerance of 0,0 mm;

— Class D: for symmetrical tolerances.

NOTE The special provision applicable to ground parts of the surface of the plates are given in the International Standards for the corresponding products.

6.2 Width

For trimmed edges, the requirements on width tolerances are given in Tables A.2 and B.3.

For untrimmed edges, see 4.2 Option a).

6.3 Length

Tolerances on length are given in Tables A.3 and B.4.

7 Tolerances on shape

7.1 Edge camber and out-of-squareness

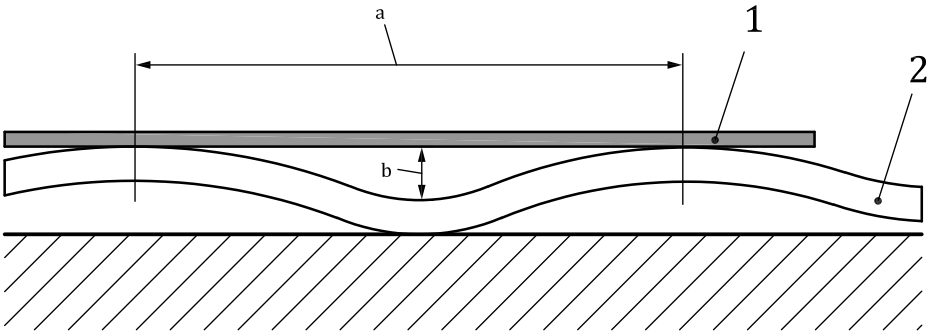
The edge camber and the out-of-squareness of a plate shall be limited so that it shall be possible to inscribe a rectangle with the dimensions of the ordered plate, within the size of the delivered products.

7.2 Flatness

See Figure 1.

The requirements on flatness tolerances are given in Tables A.4, A.5 and B.5.

NOTE It is pointed out that bad handling and storage can adversely affect the flatness of the product.



Key

1 Straight edge
2 Plate

a Wave pitch
b Flatness

Figure 1 — Measuring of flatness on wave pitch

8 Measurements

8.1 General

Measurements shall be carried out at ambient temperature.

8.2 Thickness

For plates with trimmed edges, thickness shall be measured at any point situated more than 25 mm from the transverse or longitudinal edges of the plate, other than locally ground areas (see the NOTE in 6.1).

For plates with untrimmed edges, the measuring points shall be agreed upon at the time of enquiry and order.

8.3 Width

Width shall be measured perpendicular to the major axis of the plate.

8.4 Length

The length of the plate is the length of the shorter of both longitudinal edges.

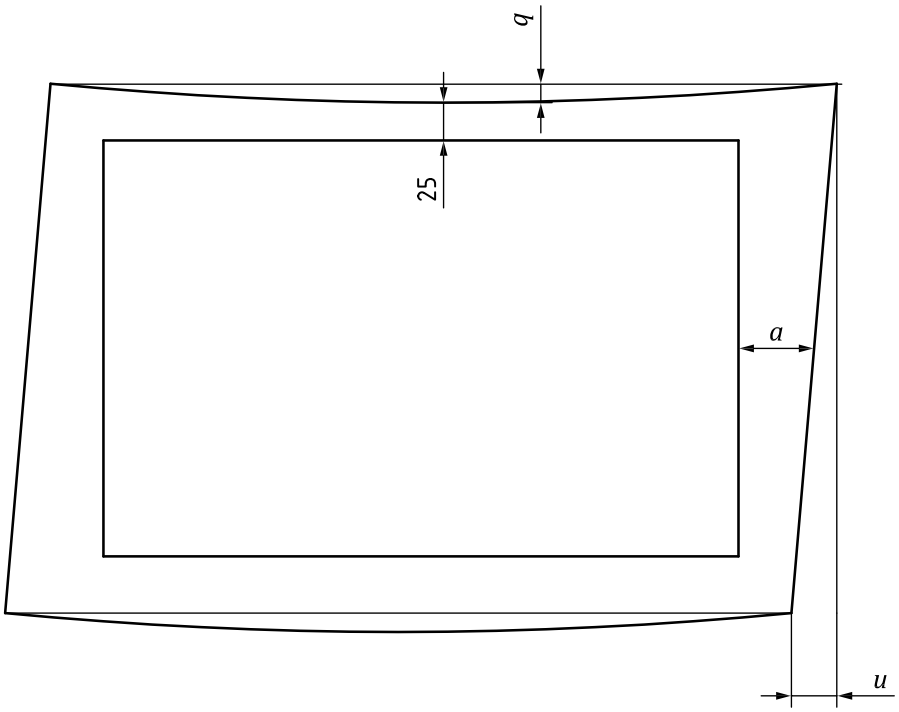
8.5 Edge camber

The edge camber value, *q*, is the maximum deviation between the longitudinal edge and the straight line joining the two ends of this edge. It is measured on the concave edge of the plate (see Figure 2).

8.6 Out-of-squareness

The out-of-square value, *u*, is the orthogonal projection of one transverse edge on one longitudinal edge (see Figure 2).

Dimensions in millimetres



Key

a 200 mm for flatness tolerances in accordance with Tables A.4 and B.5 or 100 mm for flatness tolerances in accordance with Table A.5

q edge camber

u out-of-squareness

Figure 2 — Measuring of edge camber, out-of-square and flatness

8.7 Flatness

To measure flatness the plates shall be placed on a flat surface at the end of production line.

Deviation from flatness shall be determined by measuring the deviation in distance between the plates and a straight edge of length 1 000 mm, 2 000 mm or 4 000 mm (see Tables A.4, A.5 and B.5) which may be placed in any direction.

Only the part situated between two points of contact between the straight edge and the plate shall be taken into consideration. Deviations shall be measured at a point at least 25 mm for the longitudinal edges and at a distance of at least 200 mm (for normal tolerances in accordance with Table A.4 or B.5) or 100 mm (for special tolerances in accordance with Table A.5) from the plate ends (see Figure 2).

The measuring length of 1 000 mm is used when the wave pitches (distance between the points of contact the straight edges and the plate) are smaller or equal to 1 000 mm. For longer wave pitches,

straight edges of 2 000 mm or 4 000 mm are used. Deviation from flatness smaller or equal 2 mm shall not be considered as a wave and not be taken into account.

Annex A
(normative)

Tolerance values

A.1 Tolerances on thickness

For tolerances on thickness, Table A.1 applies.

Table A.1 — Tolerances on thickness

Dimensions in millimetres

Nominal thickness	Class A		Class B		Class C		Class D	
	lower	upper	lower	upper	lower	upper	lower	upper
$3 \le t < 5$	−0,3	+0,7	−0,3	+0,7	0	+1,0	−0,5	+0,5
$5 \le t < 8$	−0,4	+0,8	−0,3	+0,9	0	+1,2	−0,6	+0,6
$8 \le t < 15$	−0,5	+0,9	−0,3	+1,1	0	+1,4	−0,7	+0,7
$15 \le t < 25$	−0,6	+1,0	−0,3	+1,3	0	+1,6	−0,8	+0,8
$25 \le t < 40$	−0,7	+1,3	−0,3	+1,7	0	+2,0	−1,0	+1,0
$40 \le t < 80$	−0.9	+1,7	−0,3	+2,3	0	+2,6	−1,3	+1,3
$80 \le t < 150$	−1,1	+2,1	−0,3	+2,9	0	+3,2	−1,6	+1,6
$150 \le t < 250$	−1,2	+2,4	−0,3	+3,3	0	+3,6	−1,8	+1,8
$250 \le t \le 400$	−1,3	+3,5	−0,3	+4,5	0	+4,8	−2,4	+2,4
NOTE These thickness tolerances apply to other than locally ground areas.								

A.2 Tolerances on width

For tolerances on width, Table A.2 applies.

Table A.2 — Tolerances on width

Dimensions in millimetres

Nominal thickness t	Tolerances	
	lower	upper
$t < 40$	0	+20
$40 \le t < 150$	0	+25
$150 \le t \le 400$	0	+30

A.3 Tolerances on length

For tolerances on length, Table A.3 applies.

Table A.3 — Tolerances on length

Dimensions in millimetres

Nominal length l	Tolerances	
	lower	upper
$600 \leq l < 4\,000$	0	+20
$4\,000 \leq l < 6\,000$	0	+30
$6\,000 \leq l < 8\,000$	0	+40
$8\,000 \leq l < 10\,000$	0	+50
$10\,000 \leq l < 15\,000$	0	+75
$15\,000 \leq l \leq 20\,000$[a]	0	+100

[a] Tolerances on plates with a nominal length > 20 000 mm shall be agreed upon at the time of enquiry and order [see Clause 4.2, Option c)].

A.4 Normal tolerances on flatness (class N)

The steel types in accordance with Table A.4 are defined as follows:

— steel type L: products with a specified minimum yield strength $R_e \leq 460$ MPa, neither quenched nor quenched and tempered;

— steel type H: products with a specified minimum yield strength $R_e > 460$ MPa and/or all grades of quenched and quenched and tempered products.

Table A.4 — Normal tolerances on flatness (class N)

Dimensions in millimetres

Nominal thickness t	Steel type L			Steel type H		
	Measuring length[a]					
	1 000	2 000	4 000	1 000	2 000	4 000
$3 \leq t < 5$	9	14	28	12	17	34
$5 \leq t < 8$	8	12	24	11	15	30
$8 \leq t < 15$	7	11	22	10	14	28
$15 \leq t < 25$	7	10	20	10	13	26
$25 \leq t < 40$	6	9	18	9	12	24
$40 \leq t < 250$	5	8	16	8	12	24
$250 \leq t \leq 400$	6	9	18	9	13	26

[a] Use 1 000 mm measuring length when wave pitch is ≤ 1 000 mm.

A.5 Special tolerances on flatness (class S)

The steel types in accordance with Table A.5 are defined as follows:

— steel type L: products with a specified minimum yield strength $R_e \leq 460$ MPa, neither quenched nor quenched and tempered;

— steel type H: products with a specified minimum yield strength $R_e > 460$ MPa and/or all grades of quenched and quenched and tempered products.

Table A.5 — Special tolerances on flatness (class S)

Dimensions in millimetres

Nominal thickness t	Steel type L			Steel type H		
	Measuring length[a]					
	1 000	2 000	4 000	1 000	2 000	4 000
$3 \leq t < 5$	5	10	20	7	14	28
$5 \leq t < 8$	5	10	20	7	13	26
$8 \leq t < 15$	3	6	16	7	12	24
$15 \leq t < 25$	3	6	12	7	11	22
$25 \leq t < 40$	3	6	12	7	11	20
$40 \leq t < 250$	3	6	12	6	10	20
$250 \leq t \leq 400$	4	7	14	7	11	22

[a] Use 1 000 mm measuring length when wave pitch is ≤ 1 000 mm.

Annex B
(normative)

Additional tolerance values

B.1 Tolerances on thickness (class D)

For tolerances on thickness (class D), Table B.1 applies.

Table B.1 — Range of tolerances on thickness (class D)

Dimensions in millimetres

Nominal thickness t	**Nominal width**, w					
	$w < 2\,000$		$2\,000 \le w < 4\,000$		$4\,000 \le w$	
	lower	upper	lower	upper	lower	upper
$4 \le t < 5$	- 0,60	+ 0,60	- 0,65	+ 0,65	–	–
$5 \le t < 8$	- 0,60	+ 0,60	- 0,75	+ 0,75	–	–
$8 \le t < 15$	- 0,65	+ 0,65	- 0,80	+ 0,80	- 0,90	+ 0,90
$15 \le t < 25$	- 0,75	+ 0,75	- 0,95	+ 0,95	- 1,10	+ 1,10
$25 \le t < 40$	- 0,80	+ 0,80	- 1,00	+ 1,00	- 1,20	+ 1,20
$40 \le t < 80$	- 1,00	+ 1,00	- 1,20	+ 1,20	- 1,40	+ 1,40
$80 \le t < 150$	- 1,40	+ 1,40	- 1,60	+ 1,60	- 1,80	+ 1,80
$150 \le t < 250$	- 1,80	+ 1,80	- 1,95	+ 1,95	- 2,10	+ 2,10
$250 \le t \le 400$	- 2,00	+ 2,00	- 2,20	+ 2,20	- 2,40	+ 2,40

B.2 Tolerances on thickness (classes A, B and C)

For tolerances on thickness (classes A, B and C), Table B.2 applies.

Table B.2 — Range of tolerances on thickness (classes A, B and C)

Dimensions in millimetres

Nominal thickness t	Nominal width w																	
	$w < 2\ 000$						$2\ 000 \le w < 4\ 000$						$4\ 000 \le w$					
	Class A		Class B		Class C		Class A		Class B		Class C		Class A		Class B		Class C	
	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper
$4 \le t < 5$	- 0,40	+ 0,80	- 0,30	+ 0,90	0	+ 1,20	- 0,45	+ 0,85	- 0,30	+ 1,00	0	+ 1,30	–	–	–	–	–	–
$5 \le t < 8$	- 0,40	+ 0,80	- 0,30	+ 0,90	0	+ 1,20	- 0,50	+ 1,00	- 0,30	+ 1,20	0	+ 1,50	–	–	–	–	–	–
$8 \le t < 15$	- 0,45	+ 0,85	- 0,30	+ 1,00	0	+ 1,30	- 0,50	+ 1,10	- 0,30	+ 1,30	0	+ 1,60	- 0,60	+ 1,20	- 0,3	+ 1,50	0	+ 1,80
$15 \le t < 25$	- 0,50	+ 1,00	- 0,30	+ 1,20	0	+ 1,50	- 0,65	+ 1,25	- 0,30	+ 1,60	0	+ 1,90	- 0,70	+ 1,50	- 0,3	+ 1,90	0	+ 2,20
$25 \le t < 40$	- 0,55	+ 1,05	- 0,30	+ 1,30	0	+ 1,60	- 0,65	+ 1,35	- 0,30	+ 1,70	0	+ 2,00	- 0,80	+ 1,60	- 0,3	+ 2,10	0	+ 2,40
$40 \le t < 80$	- 0,65	+ 1,35	- 0,30	+ 1,70	0	+ 2,00	- 0,80	+ 1,60	- 0,30	+ 2,10	0	+ 2,40	- 0,90	+ 1,90	- 0,3	+ 2,50	0	+ 2,80
$80 \le t < 150$	- 0,90	+ 1,90	- 0,30	+ 2,50	0	+ 2,80	- 1,05	+ 2,15	- 0,30	+ 2,90	0	+ 3,20	- 1,20	+ 2,40	- 0,3	+ 3,30	0	+ 3,60
$150 \le t < 250$	- 1,20	+ 2,40	- 0,30	+ 3,30	0	+ 3,60	- 1,30	+ 2,60	- 0,30	+ 3,60	0	+ 3,90	- 1,40	+ 2,80	- 0,3	+ 3,90	0	+ 4,20
$250 \le t \le 400$	- 1,30	+ 2,70	- 0,30	+ 3,70	0	+ 4,00	- 1,45	+ 2,95	- 0,30	+ 4,10	0	+ 4,40	- 1,60	+ 3,20	- 0,3	+ 4,40	0	+ 4,80

Either plus side (+) or minus side (-) of thickness tolerances given in this table may be limited on request. In all cases the total tolerances shall be equal to those given in Table B.1.

B.3 Tolerances on width

For tolerances on width, Table B.3 applies.

Table B.3 — Tolerances on width

Dimensions in millimetres

Nominal width w	Tolerances	
	lower	upper
$600 \leq w < 2\,000$	0	+ 15
$2\,000 \leq w < 3\,000$	0	+ 20
$w \geq 3\,000$	0	+ 25

B.4 Tolerances on length

For tolerances on length, Table B.4 applies.

Table B.4 — Tolerances on length

Dimensions in millimetres

Nominal length l	Tolerances	
	lower	upper
$600 \leq l < 4\,000$	0	+20
$4\,000 \leq l < 6\,000$	0	+30
$6\,000 \leq l < 8\,000$	0	+40
$8\,000 \leq l < 10\,000$	0	+50
$10\,000 \leq l < 15\,000$	0	+75
$15\,000 \leq l \leq 20\,000$	0	+100
$20\,000 < l$	0	+(5/1 000) x l

B.5 Tolerances on flatness

Table B.5 — Permitted variations from a flat surface (normal tolerances)

Dimensions in millimetres

Thickness	Measuring length				
	2 000		4 000		
	Width		Width		
	$w < 2\,000$	$2\,000 \le w$	$w < 2\,000$	$2\,000 \le w < 3\,000$	$3\,000 \le w$
$4 \le t < 5$	14	24	26	-	-
$5 \le t < 8$	13	21	22	28	-
$8 \le t < 15$	12	16	12	16	24
$15 \le t < 25$	12	16	12	16	22
$25 \le t < 40$	9	13	9	13	19
$40 \le t < 80$	8	11	8	11	16
$80 \le t < 150$	8	10	8	10	15
$150 \le t < 250$	10	15	10	15	20
$250 \le t < 350$	20	20	20	20	20
$350 \le t \le 400$	25	25	25	25	25
For plates specified to a higher minimum yield stress over 460 MPa, or quenched and tempered products, the permitted variations are 1,5 times the amounts in this table.					

Bibliography

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[4] ISO 630-1, *Structural steels — Part 1: General technical delivery conditions for hot-rolled products*

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[14] ISO 9328-2, *Steel flat products for pressure purposes — Technical delivery conditions — Part 2: Non-alloy and alloy steels with specified elevated temperature properties*

[15] ISO 9328-3, *Steel flat products for pressure purposes — Technical delivery conditions — Part 3: Weldable fine grain steels, normalized*

[16] ISO 9328-4, *Steel flat products for pressure purposes — Technical delivery conditions — Part 4: Nickel-alloy steels with specified low temperature properties*

[17] ISO 9328-5, *Steel flat products for pressure purposes — Technical delivery conditions — Part 5: Weldable fine grain steels, thermomechanically rolled*

[18] ISO 9328-6, *Steel flat products for pressure purposes — Technical delivery conditions — Part 6: Weldable fine grain steels, quenched and tempered*

[19] ISO 18286, *Hot-rolled stainless steel plates — Tolerances on dimensions and shape*

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