
**Continuously hot-rolled stainless steel —
Tolerances on dimensions and form —**

Part 2:
Wide strip and sheet/plate

*Acier inoxydable laminé à chaud en continu — Tolérances sur les
dimensions et la forme —*

Partie 2: Grandes bandes et tôles



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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 9444-2 was prepared by Technical Committee ISO/TC 17, *Steel*, Subcommittee SC 4, *Heat treatable and alloy steels*.

This first edition of ISO 9444-2 cancels and replaces the second edition of ISO 9444:2002, the contents of which has been technically revised and separated into two parts.

ISO 9444 consists of the following parts, under the general title *Continuously hot-rolled stainless steel — Tolerances on dimensions and form*:

- *Part 1: Narrow strip and cut lengths*
- *Part 2: Wide strip and sheet/plate*

Continuously hot-rolled stainless steel — Tolerances on dimensions and form —

Part 2: Wide strip and sheet/plate

1 Scope

This part of ISO 9444 specifies the tolerances on dimensions and form for continuously hot-rolled stainless steel wide strip in actual widths from 600 mm to 2 500 mm and for sheet/plate cut from such strip.

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 6929:1987, *Steel products — Definitions and classification*

3 Terms and definitions

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

3.1

hot-rolled sheet/plate

flat rolled product, the edges being allowed to deform freely, supplied flat and generally square or rectangular, but also in any other shape, for example circular or according to the design sketch; the edges are as-rolled or sheared or flame-cut or chamfered

NOTE 1 The product may also be delivered precurved.

NOTE 2 Hot-rolled sheet/plate may be produced:

- a) directly rolled on a reversing mill, or by cutting from a parent plate rolled on a reversing mill;
- b) by cutting from hot-rolled strip rolled on a continuous mill.

NOTE 3 Reversing-mill plate is known generally as “quarto-plate”.

Continuous-mill sheet/plate is known generally as “hot-rolled sheet/plate”.

NOTE 4 Where further subdivision is required to be made on the basis of thickness for statistical purposes, the following is recommended:

- a) **sheet**: thickness less than 3 mm (except electrical sheet);
- b) **plate**: thickness equal to or greater than 3 mm.

NOTE 5 Adapted from ISO 6929:1987, definition 6.2.6.2.2.2.

3.2 hot-rolled strip
hot-rolled flat product which immediately after the final rolling pass or after pickling or annealing is wound into laps so as to form a coil

NOTE 1 Hot-rolled strip as-rolled has slightly convex edges, but it may also be supplied with sheared edges or be obtained by slitting wider hot-rolled strip.

[ISO 6929:1987, definition 6.2.6.2.2.3.1]

NOTE 2 According to its actual width, including hot-rolled slit strips irrespective of the rolling width, hot-rolled strip is classified as

- hot-rolled wide strip: strip of a width equal to or greater than 600 mm, or
- hot-rolled narrow strip: strip of a width less than 600 mm.

After decoiling and cutting to length, hot-rolled narrow strip may be supplied as cut lengths.

4 Information to be supplied by the purchaser

4.1 It shall be the responsibility of the purchaser to specify all requirements that are necessary for products under this specification. Such requirements to be considered include, in the order listed, but not limited to, the following:

- a) the type of delivery [see 5.1 a) and 5.1 b)];
- b) the number of this part of ISO 9444, i.e. ISO 9444-2;
- c) the thickness, in millimetres (if necessary, accurate to two decimal places);
- d) the width, in millimetres;
- e) the condition of the edges (M = mill edges, T = trimmed edges);
- f) for wide strip [see 5.1 a)], the condition of the ends [R = rolled (mill) ends, C = cropped ends];
- g) for sheet/plate, the length, in millimetres;
- h) any special delivery condition (see 5.2).

EXAMPLE 1 Plate in accordance with this International Standard, with a specified thickness of 4,0 mm, a specified width of 1 200 mm, with trimmed edges (T) and a specified length of 2 500 mm.

Plate ISO 9444-2 – 4,0 × 1200T × 2500

EXAMPLE 2 Hot-rolled wide strip in accordance with this International Standard, with a specified thickness of 6,0 mm, a specified width of 1 500 mm, with mill edges (M) and mill (rolled = R) ends:

Hot-rolled wide strip ISO 9444-2 – 6,0 × 1500M-R

4.2 In the absence of information in the order concerning special requirements for tolerances on dimension and shape [see 4.1 c) to 4.1 h)], hot-rolled products covered by this part of ISO 9444 will be delivered in accordance with the basic specifications of this part of ISO 9444, i.e. with normal tolerances and/or in the usual delivery condition.

5 Type of delivery and delivery condition

5.1 Type of delivery

Flat products in accordance with this part of ISO 9444 can be supplied as

- a) hot-rolled wide strip (strip in actual widths from 600 mm to 2 500 mm), or
- b) hot-rolled sheet/plate [cut from hot-rolled wide strip in accordance with 5.1 a)];

5.2 Delivery condition

5.2.1 Hot-rolled wide strip and sheet/plate covered by this part of ISO 9444 are supplied in the as-rolled (U) condition, unless the annealed and/or descaled conditions has been agreed upon.

5.2.2 Hot-rolled, or hot-rolled and annealed, wide strip is supplied with mill edges and mill ends. Delivery with trimmed (slit) edges shall be by special agreement.

5.2.3 Annealed and descaled wide strip and sheet/plate are supplied with trimmed (slit) edges and cut ends.

5.3 General information

In the absence of agreements at the time of enquiry and order concerning special requirements for the delivery condition given in 5.2, flat products covered by this part of ISO 9444 will be delivered in accordance with the basic specifications of this part of ISO 9444.

6 Tolerances on thickness for hot-rolled wide strip and sheet/plate

6.1 The tolerances on thickness, which include crown, are given in Table 1.

Table 1 — Tolerances on specified thickness for hot-rolled wide strip and sheet/plate ^a

Dimensions in millimetres

Specified thickness t	Tolerances on specified thickness ^b for nominal width of	
	$w \leq 1\,400$	$1\,400 < w \leq 2\,500$
$t \leq 2,0$	$\pm 0,22$	$\pm 0,27$
$2,0 < t \leq 2,5$	$\pm 0,23$	$\pm 0,30$
$2,5 < t \leq 3,0$	$\pm 0,26$	$\pm 0,31$
$3,0 < t \leq 4,0$	$\pm 0,29$	$\pm 0,34$
$4,0 < t \leq 5,0$	$\pm 0,31$	$\pm 0,36$
$5,0 < t \leq 6,0$	$\pm 0,34$	$\pm 0,38$
$6,0 < t \leq 8,0$	$\pm 0,38$	$\pm 0,40$
$8,0 < t \leq 10,0$	$\pm 0,42$	$\pm 0,44$
$10,0 < t \leq 13,0$	$\pm 0,46$	$\pm 0,48$
$t > 13,0$	The tolerances have to be agreed upon at the time of enquiry and order.	

^a For wide strip, the specified values for tolerances shall not apply to the mill ends of the coil for a total length l which is calculated using the formula:

$$l(\text{m}) = \frac{90}{\text{nominal thickness (mm)}}$$

with a maximum total length (both ends) of 20 m per coil.

^b Trimmed edges or sheared ends may have burrs.

6.2 If required for hot-rolled wide strip intended for cold rolling, the difference in thickness throughout one coil shall not exceed the values given in Table 2.

6.3 If the purchaser requires tolerances on crown tighter than those implicit in the tolerance on thickness, the tolerances on crown shall be subject to agreement between the manufacturer and purchaser, and shall be specified on the purchase order.

Table 2 — Permitted thickness differences within one coil for hot-rolled wide strip intended for cold rolling

Dimensions in millimetres

Specified thickness <i>t</i>	Permitted thickness differences for width of strip ^a		
	$w \leq 1\,200$	$1\,200 < w \leq 1\,500$	$1\,500 < w \leq 2\,500$
$t \leq 2,0$	0,20	0,24	0,28
$2,0 < t \leq 3,0$	0,22	0,27	0,33
$3,0 < t \leq 13,0$	0,28	0,32	0,40

^a The thickness (within one coil) shall change gradually and shall not occur with visible discontinuity.

7 Tolerances on width for hot-rolled wide strip and sheet/plate

Unless otherwise agreed, the tolerances on width for hot-rolled wide strip and sheet/plate with mill (as-rolled) edges and with trimmed (slit) edges shall be as given in Table 3.

Table 3 — Tolerances on width for hot-rolled wide strip and sheet/plate with mill (as rolled) or with trimmed (slit) edges

Dimensions in millimetres

Tolerances	
Mill edges ^a	Trimmed edges ^b
+20 0	+5 0

^a For wide strip, the specified values for tolerances shall not apply to the mill ends of the coil for a total length *l* which is calculated using the formula:

$$l(m) = \frac{90}{\text{nominal thickness (mm)}}$$
 with a maximum total length (both ends) of 20 m per coil.

^b Tolerances for trimmed (slit) edges apply to products with specified thicknesses ≤ 10 mm; for specified thicknesses > 10 mm, the upper tolerances shall be agreed upon at the time of enquiry and order.

8 Tolerances on length for sheet/plate

The tolerances on length for sheet/plate are given in Table 4.

Table 4 — Length tolerances for sheet/plate

Dimensions in millimetres

Specified length, l	Tolerances
$l < 2\,000$	+10 0
$2\,000 \leq l < 20\,000$	$+0,005 \times \text{specified length}$ 0
$l \geq 20\,000$	To be agreed

9 Tolerances on edge camber for hot-rolled wide strip and sheet/plate

For hot-rolled wide strip, the edge camber shall not exceed 20 mm of any length of 5 000 mm in the case of strip with mill (as-rolled) edges and 15 mm in the case of strip with trimmed (slit) edges.

For sheet/plate cut from hot-rolled wide strip, the edge camber shall not exceed 0,5 % of the specified length of the sheet for a specified length < 5 000 mm.

For sheet/plate with a specified length $\geq 5\,000$ mm, the edge camber shall not exceed 20 mm for any length of 5 000 mm in the case of sheet/plate with mill (as-rolled) edges and 15 mm in the case of sheet/plate with trimmed (slit) edges.

10 Tolerances on squareness for sheet/plate

The out-of-squareness for sheet/plate shall not exceed 1 % of the specified width of the product.

11 Tolerances on flatness for sheet/plate

The flatness tolerances are given in Table 5.

Table 5 — Tolerances on flatness for sheet/plate

Dimensions in millimetres

Specified thickness t	Specified width w	Tolerances on flatness
$t \leq 13$	$600 \leq w \leq 1\,200$	23
	$1\,200 < w \leq 1\,500$	30
	$w > 1\,500$	38

12 Form of coils

The coils delivered in accordance with this part of ISO 9444 shall be tightly wound, as round as possible.

The edges of the coil are permitted to show a gradual displacement to one side which shall not exceed 35 mm in the case of trimmed (slit) edges and 70 mm in the case of mill (as-rolled) edges.

13 Ordered format for sheet/plate

13.1 Except as described in 13.2, sheet/plate shall conform to the thickness, width, length, edge camber and out-of-squareness tolerances shown in the applicable tables and text.

13.2 By agreement at the time of enquiry and order, the tolerances on squareness and edge camber may be replaced by the requirement that a perfect rectangle formed by the ordered width and length dimensions can be superimposed on the products delivered.

14 Measurement of thickness for hot-rolled wide strip and sheet/plate

14.1 The thickness shall be measured at any point situated at least 40 mm from the edges for products with mill (as-rolled) edges and at least 25 mm from the edges for products with trimmed (slit) edges.

14.2 When crown is specified separately from the thickness tolerance, it shall be measured as the thickness difference between the centre-line of the product and a measuring point at 40 mm from any edge of the product in the case of mill (as-rolled) edges, and at 25 mm in the case of trimmed (slit) edges.

14.3 The difference in thickness within one coil shall be measured at a line with an invariable distance from the longitudinal edges (minimum distance from the edges in accordance with 14.1).

15 Measurement of width

The width is measured perpendicularly to the rolling direction of the product and outside the area of any end tongues.

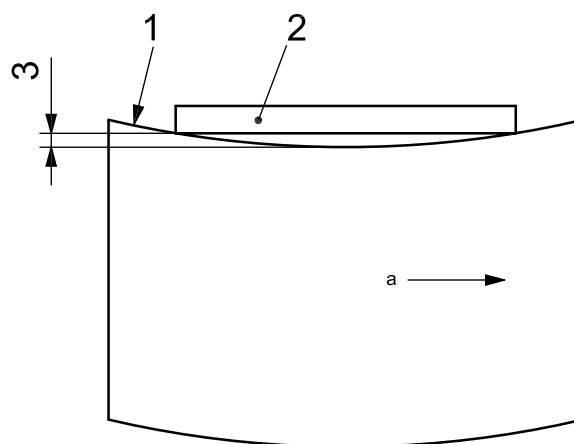
16 Measurement of length

The length of sheet/plate is measured along one of the longer edges of the product.

17 Measurement of edge camber

17.1 Edge camber is the greatest deviation of a side edge from a straight line, the measurement being taken on the concave side with a straight-edge (see Figure 1).

17.2 Edge camber is not normally measured by the manufacturer, unless compliance is in doubt.



Key

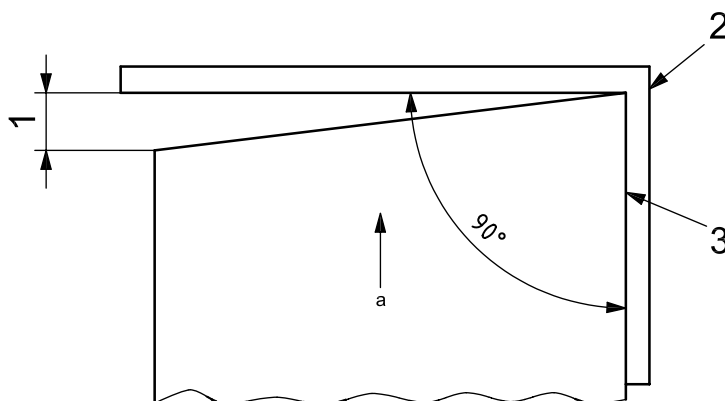
- 1 side edge (concave side)
- 2 straight-edge
- 3 edge camber
- a Rolling direction.

Figure 1 — Measurement of edge camber

18 Measurement of squareness

18.1 Out-of-squareness is the greatest deviation of an end edge from a straight edge of a square placed at right angles to a side and touching one corner (see Figure 2).

18.2 The out-of-squareness is not normally measured by the manufacturer, unless compliance is in doubt.



Key

- 1 out-of-square
- 2 square
- 3 side edge
- ^a Rolling direction.

Figure 2 — Measurement of out-of-squareness

19 Measurement of flatness

19.1 Verification of flatness tolerances, if required, shall be measured in the following way.

For a maximum deviation from a flat horizontal surface, with the product lying under its own mass on a flat surface, the maximum deviation from flatness is the maximum distance between the lower surface of the product and the flat horizontal surface.

19.2 Flatness is not normally measured by the manufacturer, unless compliance is in doubt.

Bibliography

- [1] ISO 9444-1, *Continuously hot-rolled stainless steel — Tolerances on dimensions and form — Part 1: Narrow strip and cut lengths*
- [2] ISO 18286, *Hot-rolled stainless steel plates — Tolerances on dimensions and shape*

