

# INTERNATIONAL STANDARD

**ISO  
9444**

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## Hot-rolled stainless steel wide strip and sheet — Tolerances on dimensions and form

**iTeh STANDARD PREVIEW**  
*Larges bandes et tôles en acier inoxydable laminées à chaud —  
Tolérances sur dimensions et forme*  
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ISO 9444:1990

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Reference number  
ISO 9444:1990(E)

## 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.

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.

International Standard ISO 9444 was prepared by Technical Committee ISO/TC 17, *Steel*.

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# Hot-rolled stainless steel wide strip and sheet — Tolerances on dimensions and form

## 1 Scope

1.1 This International Standard specifies the tolerances on dimensions and form for continuously hot-rolled stainless steel<sup>1)</sup> wide strip and sheet cut from such strip, in thicknesses from 2,0 mm to 8,0 mm and in rolling widths from 600 mm to 1 600 mm.

1.2 This International Standard also applies to strip in widths less than 600 mm manufactured from wide strip by longitudinal slitting, and to cut lengths manufactured from such strip.

1.3 For hot-rolled flat products of stainless steels in rolling widths less than 600 mm, ISO 9446 applies.

## 2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 683-13:1986, *Heat-treatable steels, alloy steels and free-cutting steels — Part 13: Wrought stainless steels*.

ISO 683-16:1976, *Heat-treated steels, alloy steels and free-cutting steels — Part 16: Precipitation hardening stainless steels*.

ISO 2604-4:1975, *Steel products for pressure purposes — Quality requirements — Part 4: Plates*.

ISO 4955:1983, *Heat-resisting steels and alloys*.

ISO/TR 4956:1984, *Wrought steels for use at elevated temperatures in engines*.

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

ISO 9446:1990, *Hot-rolled stainless steel narrow strip — Tolerances on dimensions and form*.

## 3 Definitions

For the purposes of this International Standard, the following definitions apply.

**3.1 stainless steels:** Steels with a carbon content of up to and including 1,2 % and a chromium content of 10,5 % and over.

NOTE 1 This definition covers the ferritic, martensitic and austenitic steels of ISO 683-13 and ISO 683-16, the steels P 46 to P 69 of ISO 2604-4, the heat-resisting steels of ISO 4955, and some of the creep-resisting steels of ISO/TR 4956.

## 3.2 product forms

The definitions given in ISO 6929 apply.

## 4 Designation on ordering

For complete designation in the order the following should be stated in the sequence given:

- the denomination (strip, sheet or cut length);
- the number of this International Standard;
- the thickness in millimetres (if necessary accurate to two decimal places);
- the width in millimetres;

1) See 3.1.

- for wide strip, the condition of the edges (M = mill edges, T = trimmed edges);
- for wide strip, the condition of the ends [R = mill (rolled) ends, C = cropped ends];
- for sheet and cut length, the length in millimetres.

**EXAMPLE 1**

Strip ISO 9444 - 2,20 × 800 MC

**EXAMPLE 2**

Sheet ISO 9444 - 2,00 × 1 000 T × 2 000

**5 Type of delivery**

**5.1** Hot-rolled flat products according to this International Standard can be supplied as

- a) wide strip (coils with a width of 600 mm and over);
- b) sheet cut from wide strip;
- c) slit strip in widths less than 600 mm, manufactured by longitudinal slitting of wide strip;
- d) cut lengths of strip according to item c).

**5.2** Wide strip in the hot-rolled and not mechanically or chemically descaled condition (conditions F1 and F3 in ISO 683-13) shall be delivered, according to the agreements at the time of enquiry and order,

- either with mill ends (symbol R),
  - or with cropped ends (symbol C),
- and
- either with mill edges (symbol M),
  - or with trimmed edges (symbol T).

Hot-rolled descaled wide strip (conditions F4 and F5 of ISO 683-13) and all other products covered in this International Standard [see 5.1b) to 5.1d)] shall be delivered with cropped ends and

- either with mill edges (symbol M),
- or with trimmed edges (symbol T).

**6 Tolerances on dimensions and form**

**6.1 Thickness**

The tolerances on thickness are given in table 1. See also 7.1.

**6.2 Width**

**6.2.1** The tolerances on width for wide strip with mill edges are given in table 2.

**6.2.2** The tolerances on width for strip, sheets and cut lengths with trimmed edges are given in table 3.

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Table 1 — Thickness tolerances

Values in millimetres

Specified widths		Thickness tolerance for ordered thicknesses					
over	up to and including	from 2,0 to 2,5	over 2,5 up to and including 3,0	over 3,0 up to and including 4,0	over 4,0 up to and including 5,0	over 5,0 up to and including 6,0	over 6,0 up to and including 8,0
	1 200	± 0,25	± 0,28	± 0,31	± 0,34	± 0,36	± 0,41
1 200	1 500	± 0,29	± 0,31	± 0,34	± 0,36	± 0,39	± 0,42
1 500	1 600	± 0,32	± 0,34	± 0,36	± 0,39	± 0,41	± 0,43

## NOTES

1 See 7.1.

2 The tolerance values specified do not apply to the uncropped ends for a length "L" of a mill edge coil. For coils thicker than 4,5 mm the length "L", inclusive of both ends, is calculated by the following formula:

$$\text{Length "L" in metres} = \frac{90}{\text{Thickness in millimetres}}$$

For coils of thickness 2,0 mm to 4,5 mm, "L" is limited to 20 m, inclusive of both ends.

3 For steel types with a minimum Ni content over 20 % or a minimum Mo content over 3 % and a minimum Cu content over 2 %, the tolerances given in this table are increased by 10 %.

4 For steel types with a fully ferritic structure, the tolerances given in this table are lowered by 10 %.

5 Trimmed edges or sheared ends may have burrs.

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Table 2 — Width tolerances for wide strip with mill edges

Values in millimetres

Specified widths		Tolerance <sup>1)</sup>
over	up to and including	
	1 200	+30 0
1 200	1 500	+35 0
1 500	1 600	+40 0

1) The values specified do not apply to the uncropped ends for a length "L" of a mill edge coil.

For coils thicker than 4,5 mm the length "L", inclusive of both ends, is calculated by the following formula:

$$\text{Length "L" in metres} = \frac{90}{\text{Thickness in millimetres}}$$

For coils of thickness 2,0 mm to 4,5 mm, "L" is limited to 20 m, inclusive of both ends.

Table 3 — Width tolerances for strip, sheets and cut lengths with trimmed edges

Values in millimetres

Specified widths		Tolerance
over	up to and including	
	1 200	+8 0
1 200	1 500	+8 0
1 500	1 600	+10 0

**6.3 Length (in the case of sheet or strip in cut lengths)**

When ordering nominal lengths for sheets and cut lengths, the oversizes given in table 4 apply.

**Table 4 — Length tolerances for sheet and cut lengths of width up to and including 1 600 mm**

Values in millimetres

Specified lengths over	Specified lengths up to and including	Tolerance <sup>1)</sup>
	1 500	+25 0
1 500	3 000	+30 0
3 000	6 000	+40 0
6 000	9 000	+85 0
9 000	12 000	+85 0
12 000		+100 0

1) Closer tolerances may be agreed upon at the time of enquiry and order.

**Table 6 — Flatness tolerances for sheets and cut lengths**

Values in millimetres

Specified widths		Flatness tolerances, for measuring length of	
over	up to and including	1 000	2 000
	1 200	20	30
1 200	1 500	25	35
1 500	1 600	30	40

**NOTES**

1 These tolerances are only applicable to sheet up to and including 5 000 mm in length. Tolerances for sheet having a length exceeding 5 000 mm are subject to agreement.

2 See 7.3.

3 The tolerances are applicable for the annealed condition in the case of ferritic and martensitic steels and for the quenched condition in the case of austenitic steels. (Instead of the term "quenched" the term "annealed" is often used for austenitic steels.)

**6.4 Edge camber tolerances**

The edge camber tolerances are given in table 5 (see also 7.2).

**Table 5 — Edge camber tolerances for sheet and cut lengths and coils with trimmed edges**

Values in millimetres

Form	Edge camber tolerance <sup>1)</sup>
Cut lengths	10
Coils 600 and over in width	15
Coils slit to narrow width less than 600	20

1) Applicable for a measuring length of 2 000 mm.

**6.5 Out-of-square tolerances for sheets and cut lengths**

The out-of-square (see 7.4) shall not exceed 1 % of the width of the product.

**6.6 Flatness**

The flatness tolerances for sheets and cut lengths are given in table 6 (see also 7.3).

**7 Measurement of dimensions**

**7.1 Thickness**

The thickness is measured at any point on the mill-edge sheet not less than 40 mm from a side edge and on a trimmed edge sheet not less than 25 mm from a side edge. Measurement on an untrimmed edge sheet nearer to an edge than 40 mm and on a trimmed edge sheet nearer to an edge than 25 mm and values of tolerances are subject to negotiation.

**7.2 Edge camber**

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).

**7.3 Flatness**

Flatness tolerances can be measured in the following ways.

- a) Maximum deviation from a flat horizontal surface. With the sheet lying under its own mass on a flat surface, the maximum deviation from flatness is the maximum distance between the lower surface of the sheet and the flat horizontal surface.

- b) To measure the flatness, the product shall be laid on an approximately flat surface. Deviation with respect to flatness shall be taken as the greatest distance between the product and a straight-edge placed upon it. The straight-edge should be either 1000 mm or 2000 mm long. It may be placed on the product at any position and in any direction. Only the position of the points of contact of plate and straight-edge shall be taken into account.

Unless otherwise agreed, the choice of measurement is left to the manufacturer.

#### 7.4 Out-of-square

Out-of-square is the greatest deviation of an end edge from a straight line at right angles to a side and touching one corner, the measurement being taken as shown in figure 2.

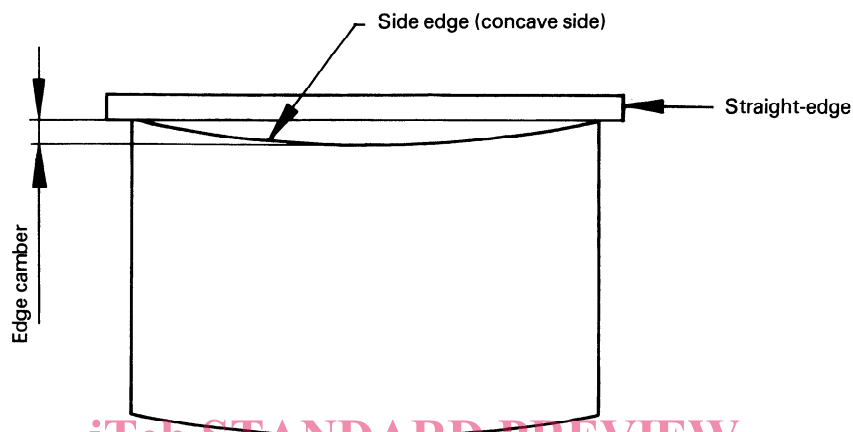


Figure 1 — Measurement of edge camber

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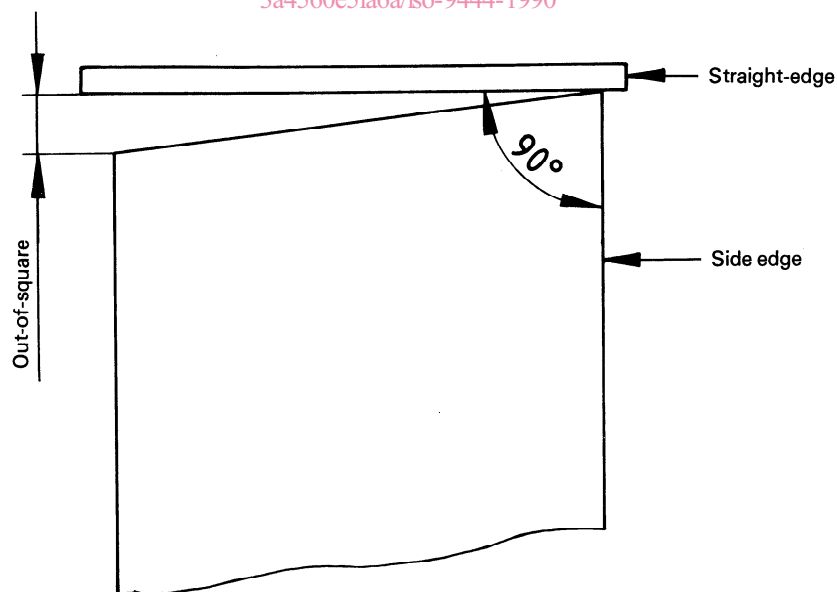


Figure 2 — Measurement of out-of-square

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