INTERNATIONAL STANDARD

ISO 9445

Second edition
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Continuously cold-rolled stainless steel narrow strip, wide strip, plate/sheet and cut lengths — Tolerances on dimensions and form

Feuillards, larges bandes, tôles et feuillards coupés à longueur en acier inoxydable laminés à froid en continu — 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 3.

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 International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 9445 was prepared by Technical Committee ISO/TC 17, *Steel*, Subcommittee SC 4, *Heat treatable and alloy steels*.

This second edition cancels and replaces the first edition (ISO 9445:1990) as well as ISO 9447:1990, the contents of which have been combined and technically revised.

Continuously cold-rolled stainless steel narrow strip, wide strip, plate/sheet and cut lengths — Tolerances on dimensions and form

1 Scope

1.1 This International Standard specifies the tolerances on dimensions and form for continuously cold-rolled stainless steel narrow strip, in thicknesses of up to and including 3 mm and in rolling widths of less than 600 mm. It also applies to cut lengths taken from such strip.

1.2 This International Standard also specifies the tolerances on dimensions and form for continuously cold-rolled stainless steel wide strip and plate/sheet, in thicknesses from 0,3 mm to 8,0 mm and in rolling widths from 600 mm to 2 100 mm. It also applies to slit cold-rolled wide strip in widths less than 600 mm manufactured from wide strip by longitudinal slitting and to cut lengths manufactured from such strip.

2 Normative reference

The following normative document contains provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent edition of the normative document indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

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

3 Terms and definitions

For the purposes of this International Standard, the terms and definitions given in ISO 6929 shall apply.

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 5.2 a) to f)];

b) the number of this International Standard, i.e. ISO 9445;

c) the thickness, in millimetres, (if necessary accurate to two decimal places) and, if required, including the relevant code letter (F or P) for a fine or precision tolerance in the case of cold-rolled narrow strip and products obtained from such strip or including the relevant code letter (S) for a special tolerance in the case of cold-rolled wide strip and products obtained from such strip;

d) for cold-rolled wide strip and products cut from it, the measurement of thickness method to be used, either method A in accordance with 17.2.2 and tolerances according to Table 2 with the relevant code letter (A) or method B in accordance with 17.2.3 and tolerances according to Table 3 with the relevant code letter (B);

e) the width, in millimetres, and if required, including the relevant code letter (F or P) for a fine or precision tolerance in the case of cold-rolled narrow strip and products obtained from such strip or including the relevant code letter (S) for a special tolerance in the case of cold-rolled wide strip and products obtained from such strip;

f) for cold-rolled wide strip and products obtained from such strip, the condition of the edges (M = mill edges, T = trimmed edges);

g) for plate/sheet and cut lengths, the length, in millimetres, and if a special tolerance is required, the code letter S;

h) for cold-rolled narrow strip and cut lengths obtained from cold-rolled narrow strip, the code letter R where a restricted tolerance on edge camber is required;

i) for cold-rolled plate/sheet and cut lengths, the code letter FS where a special tolerance is required for flatness.

EXAMPLE 1 Cold-rolled narrow strip according to this International Standard with a specified thickness of 0,25 mm, precision thickness tolerance (P), with a specified width of 250 mm, precision tolerance on width (P), and with restricted tolerance on edge camber (R).

Cold-rolled narrow strip ISO 9445-0,25P × 250P-R

EXAMPLE 2 Cut length obtained from slit cold-rolled wide strip according to this International Standard with a specified thickness of 1,5 mm, special thickness tolerance (S), measuring method A, with a specified width of 200 mm, special tolerance on width (S), with a specified length of 500 mm, special tolerance on length (S) and a special tolerance on flatness (FS).

Cut length from slit cold-rolled wide strip ISO 9445-1,5SA × 200S × 500S-FS

4.2 In the absence of information in the order concerning special requirements for tolerances on dimension and shape [see 4.1 c), e), g), h) and i)], flat products covered by this International Standard shall be delivered according to the basic specifications of this International Standard, i.e. with normal tolerances.

5 Type of delivery and delivery condition

5.1 General

In the absence of agreements at the time of enquiry and order concerning special requirements for the delivery conditions given in 5.3 and 5.4, flat products covered by this International Standard will be delivered according to the basic specifications of this International Standard.

5.2 Type of delivery

Flat products according to this International Standard can be supplied as

a) cold-rolled narrow strip (strip in rolled widths less than 600 mm);

b) cut lengths from cold-rolled narrow strip [cut from cold-rolled narrow strip according to item 5.2 a)];

c) cold-rolled wide strip (strip in rolled widths equal to or greater than 600 mm);

d) cold-rolled plate/sheet [cut from cold-rolled wide strip according to item 5.2 c)];

e) slit, cold-rolled wide strip [manufactured by longitudinal slitting of wide strip according to item 5.2 c)];

f) cut lengths from slit, cold-rolled wide strip [cut from slit, cold-rolled wide strip according to item 5.2 e)].

5.3 Delivery condition of cold-rolled narrow strip and products obtained from cold-rolled narrow strip

5.3.1 Cold-rolled narrow strip and cut lengths obtained from cold-rolled narrow strip are usually supplied with cut edges. These products will have burrs caused by cutting. If there are special requirements for these edges, corresponding agreements shall be made on ordering. In this case, the strip is deemed to be cut almost free of burr if the height of the burr is less than 10 % of the product thickness.

5.3.2 By special agreement and depending on the technical equipment of the supplier, cold-rolled narrow strip and cut lengths obtained from cold-rolled narrow strip can be delivered with special edges, e.g. deburred or rounded edges.

5.4 Delivery condition of cold-rolled wide strip and products obtained from cold-rolled wide strip

Cold-rolled wide strip, plate/sheet cut from cold-rolled wide strip, slit cold-rolled wide strip and cut lengths obtained from slit cold-rolled wide strip are usually supplied with mill or trimmed edges. These products may have burrs.

6 Preferred thicknesses

For cold-rolled wide strip and the products obtained from cold-rolled wide strip [see 5.2 c), d), e) and f)] the following preferred thicknesses exist:

0,30 mm; 0,40 mm; 0,50 mm; 0,60 mm; 0,70 mm; 0,80 mm; 1,00 mm; 1,20 mm; 1,50 mm; 2,00 mm; 2,50 mm; 3,00 mm; 4,00 mm; 5,00 mm; 6,00 mm.

7 Tolerances on thickness

7.1 Tolerances on thickness for cold-rolled narrow strip and products obtained from cold-rolled narrow strip

The tolerances on thickness are given in Table 1.

7.2 Tolerances on thickness for cold-rolled wide strip and products obtained from cold-rolled wide strip

The tolerances on thickness can be taken from Table 2 (see 17.2.2 — method A) or Table 3 (see 17.2.3 — method B).

NOTE The two tables are necessary for recognizing different “customs and practices” in different countries with respect to measurement methods.

Table 1 — Tolerances on specified thickness[a] for cold-rolled narrow strip and cut lengths obtained from cold-rolled narrow strip

Dimensions in millimetres

Specified thickness t	Tolerance on specified thickness for nominal width of								
	$w < 125$			$125 \leqslant w < 250$			$250 \leqslant w < 600$		
	Normal	Fine (F)	Precision (P)	Normal	Fine (F)	Precision (P)	Normal	Fine (F)	Precision (P)
0,05[b] $\leqslant t <$ 0,10	± 0,10 t	± 0,06 t	± 0,04 t	± 0,12 t	± 0,10 t	± 0,08 t	± 0,15 t	± 0,10 t	± 0,08 t
0,10 $\leqslant t <$ 0,15	± 0,010	± 0,008	± 0,006	± 0,015	± 0,012	± 0,008	± 0,020	± 0,015	± 0,010
0,15 $\leqslant t <$ 0,20	± 0,015	± 0,010	± 0,008	± 0,020	± 0,012	± 0,010	± 0,025	± 0,015	± 0,012
0,20 $\leqslant t <$ 0,25	± 0,015	± 0,012	± 0,008	± 0,020	± 0,015	± 0,010	± 0,025	± 0,020	± 0,012
0,25 $\leqslant t <$ 0,30	± 0,017	± 0,012	± 0,009	± 0,025	± 0,015	± 0,012	± 0,030	± 0,020	± 0,015
0,30 $\leqslant t <$ 0,40	± 0,020	± 0,015	± 0,010	± 0,025	± 0,020	± 0,012	± 0,030	± 0,025	± 0,015
0,40 $\leqslant t <$ 0,50	± 0,025	± 0,020	± 0,012	± 0,030	± 0,020	± 0,015	± 0,035	± 0,025	± 0,018
0,50 $\leqslant t <$ 0,60	± 0,030	± 0,020	± 0,014	± 0,030	± 0,025	± 0,015	± 0,040	± 0,030	± 0,020
0,60 $\leqslant t <$ 0,80	± 0,030	± 0,025	± 0,015	± 0,035	± 0,030	± 0,018	± 0,040	± 0,035	± 0,025
0,80 $\leqslant t <$ 1,00	± 0,030	± 0,025	± 0,018	± 0,040	± 0,030	± 0,020	± 0,050	± 0,035	± 0,025
1,00 $\leqslant t <$ 1,20	± 0,035	± 0,030	± 0,020	± 0,045	± 0,035	± 0,025	± 0,050	± 0,040	± 0,030
1,20 $\leqslant t <$ 1,50	± 0,040	± 0,030	± 0,020	± 0,050	± 0,035	± 0,025	± 0,060	± 0,045	± 0,030
1,50 $\leqslant t <$ 2,00	± 0,050	± 0,035	± 0,025	± 0,060	± 0,040	± 0,030	± 0,070	± 0,050	± 0,035
2,00 $\leqslant t <$ 2,50	± 0,050	± 0,035	± 0,025	± 0,070	± 0,045	± 0,030	± 0,080	± 0,060	± 0,040
2,50 $\leqslant t \leqslant$ 3,00	± 0,060	± 0,045	± 0,030	± 0,070	± 0,050	± 0,035	± 0,090	± 0,070	± 0,045

[a] By agreement, the tolerances may alternatively be totally + or totally − or unevenly distributed. In any case, the total range of the tolerance shall remain as in the table.

[b] For thicknesses below 0,05 mm, the values for the tolerances are to be agreed at the time of enquiry and order.

Table 2 — Tolerances on specified thickness for cold-rolled wide strip, plate/sheet cut from cold-rolled wide strip, slit cold-rolled wide strip and cut lengths obtained from slit cold-rolled wide strip

Dimensions in millimetres

Specified thickness	**Normal tolerances** for a specified width of			**Special tolerances** (S) for a specified width of		
t	$w \leqslant 1\,000$	$1\,000 < w \leqslant 1\,300$	$1\,300 < w \leqslant 2\,100$	$w \leqslant 1\,000$	$1\,000 < w \leqslant 1\,300$	$1\,300 < w \leqslant 2\,100$
$t < 0{,}30$	± 0,030	—	—	± 0,020	—	—
$0{,}30 \leqslant t < 0{,}50$	± 0,04	± 0,04	—	± 0,025	± 0,030	—
$0{,}50 \leqslant t < 0{,}60$	± 0,045	± 0,05	—	± 0,030	± 0,035	—
$0{,}60 \leqslant t < 0{,}80$	± 0,05	± 0,05	—	± 0,035	± 0,040	—
$0{,}80 \leqslant t < 1{,}00$	± 0,055	± 0,06	± 0,06	± 0,040	± 0,045	± 0,050
$1{,}00 \leqslant t < 1{,}20$	± 0,06	± 0,07	± 0,07	± 0,045	± 0,045	± 0,050
$1{,}20 \leqslant t < 1{,}50$	± 0,07	± 0,08	± 0,08	± 0,050	± 0,055	± 0,060
$1{,}50 \leqslant t < 2{,}00$	± 0,08	± 0,09	± 0,10	± 0,055	± 0,060	± 0,070
$2{,}00 \leqslant t < 2{,}50$	± 0,09	± 0,10	± 0,11	—	—	—
$2{,}50 \leqslant t < 3{,}00$	± 0,11	± 0,12	± 0,12	—	—	—
$3{,}00 \leqslant t < 4{,}00$	± 0,13	± 0,14	± 0,14	—	—	—
$4{,}00 \leqslant t < 5{,}00$	± 0,14	± 0,15	± 0,15	—	—	—
$5{,}00 \leqslant t < 6{,}50$	± 0,15	± 0,15	± 0,16	—	—	—
$6{,}50 \leqslant t \leqslant 8{,}00$	± 0,16	± 0,17	± 0,17	—	—	—

NOTE The tolerances are measured in accordance with 17.2.2 — method A.

Table 3 — Tolerances on specified thickness for cold-rolled wide strip, plate/sheet cut from cold-rolled wide strip, slit cold-rolled wide strip and cut lengths obtained from slit cold-rolled wide strip

Dimensions in millimetres

Specified thickness	**Normal tolerances** for a specified width of			**Special tolerances** (S) for a specified width of		
t	$w \leqslant 1\,000$	$1\,000 < w \leqslant 1\,300$	$1\,300 < w \leqslant 2\,100$	$w \leqslant 1\,000$	$1\,000 < w \leqslant 1\,300$	$1\,300 < w \leqslant 2\,100$
$t < 0{,}30$	± 0,030	—	—	± 0,030	—	—
$0{,}30 \leqslant t < 0{,}40$	± 0,04	± 0,04	—	± 0,030	± 0,035	—
$0{,}40 \leqslant t < 0{,}50$	± 0,04	± 0,04	—	± 0,035	± 0,035	—
$0{,}50 \leqslant t < 0{,}60$	± 0,045	± 0,05	—	± 0,035	± 0,035	—
$0{,}60 \leqslant t < 0{,}80$	± 0,05	± 0,05	—	± 0,040	± 0,040	—
$0{,}80 \leqslant t < 1{,}00$	± 0,055	± 0,06	± 0,07	± 0,040	± 0,050	± 0,050
$1{,}00 \leqslant t < 1{,}20$	± 0,06	± 0,07	± 0,08	± 0,050	± 0,055	± 0,060
$1{,}20 \leqslant t < 1{,}50$	± 0,08	± 0,08	± 0,10	± 0,055	± 0,060	± 0,060
$1{,}50 \leqslant t < 2{,}00$	± 0,08	± 0,09	± 0,11	± 0,065	± 0,070	± 0,080
$2{,}00 \leqslant t < 2{,}50$	± 0,09	± 0,11	± 0,13	—	—	—
$2{,}50 \leqslant t < 3{,}00$	± 0,11	± 0,13	± 0,15	—	—	—
$3{,}00 \leqslant t < 4{,}00$	± 0,14	± 0,15	± 0,16	—	—	—
$4{,}00 \leqslant t < 5{,}00$	± 0,15	± 0,17	± 0,19	—	—	—
$5{,}00 \leqslant t < 6{,}00$	± 0,17	± 0,20	± 0,23	—	—	—
$6{,}00 \leqslant t \leqslant 8{,}00$	± 0,17	± 0,22	± 0,25	—	—	—

NOTE The tolerances are measured in accordance with 17.2.3 — method B.

8 Tolerances on width

8.1 Tolerances on width for cold-rolled narrow strip and products obtained from cold-rolled narrow strip

The tolerances on width are given in Table 4.

Table 4 — Tolerances on width[a] for cold-rolled narrow strip and cut lengths obtained from cold-rolled narrow strip

Dimensions in millimetres

Specified thickness t	Specified width w											
	$w \leqslant 40$			$40 < w \leqslant 125$			$125 < w \leqslant 250$			$250 < w \leqslant 600$		
	Normal	Fine (F)	Precision (P)	Normal	Fine (F)	Precision (P)	Normal	Fine (F)	Precision (P)	Normal	Fine (F)	Precision (P)
$t < 0{,}25$	$^{+0{,}17}_{0}$	$^{+0{,}13}_{0}$	$^{+0{,}10}_{0}$	$^{+0{,}20}_{0}$	$^{+0{,}15}_{0}$	$^{+0{,}12}_{0}$	$^{+0{,}25}_{0}$	$^{+0{,}20}_{0}$	$^{+0{,}15}_{0}$	$^{+0{,}50}_{0}$	$^{+0{,}50}_{0}$	$^{+0{,}40}_{0}$
$0{,}25 \leqslant t < 0{,}50$	$^{+0{,}20}_{0}$	$^{+0{,}15}_{0}$	$^{+0{,}12}_{0}$	$^{+0{,}25}_{0}$	$^{+0{,}20}_{0}$	$^{+0{,}15}_{0}$	$^{+0{,}30}_{0}$	$^{+0{,}22}_{0}$	$^{+0{,}17}_{0}$	$^{+0{,}60}_{0}$	$^{+0{,}50}_{0}$	$^{+0{,}40}_{0}$
$0{,}50 \leqslant t < 1{,}00$	$^{+0{,}25}_{0}$	$^{+0{,}22}_{0}$	$^{+0{,}15}_{0}$	$^{+0{,}25}_{0}$	$^{+0{,}22}_{0}$	$^{+0{,}17}_{0}$	$^{+0{,}40}_{0}$	$^{+0{,}25}_{0}$	$^{+0{,}20}_{0}$	$^{+0{,}70}_{0}$	$^{+0{,}60}_{0}$	$^{+0{,}50}_{0}$
$1{,}00 \leqslant t < 1{,}50$	$^{+0{,}25}_{0}$	$^{+0{,}22}_{0}$	$^{+0{,}15}_{0}$	$^{+0{,}30}_{0}$	$^{+0{,}25}_{0}$	$^{+0{,}17}_{0}$	$^{+0{,}50}_{0}$	$^{+0{,}30}_{0}$	$^{+0{,}22}_{0}$	$^{+1{,}0}_{0}$	$^{+0{,}70}_{0}$	$^{+0{,}60}_{0}$
$1{,}50 \leqslant t < 2{,}50$	—	—	—	$^{+0{,}40}_{0}$	$^{+0{,}25}_{0}$	$^{+0{,}20}_{0}$	$^{+0{,}60}_{0}$	$^{+0{,}40}_{0}$	$^{+0{,}25}_{0}$	$^{+1{,}0}_{0}$	$^{+0{,}80}_{0}$	$^{+0{,}60}_{0}$
$2{,}50 \leqslant t \leqslant 3{,}00$	—	—	—	$^{+0{,}50}_{0}$	$^{+0{,}30}_{0}$	$^{+0{,}25}_{0}$	$^{+0{,}60}_{0}$	$^{+0{,}40}_{0}$	$^{+0{,}25}_{0}$	$^{+1{,}2}_{0}$	$^{+1{,}0}_{0}$	$^{+0{,}80}_{0}$

a By agreement, the tolerance may alternatively be either equally ± or all −. In both cases, the total range of the tolerance shall remain as in Table 4.

8.2 Tolerances on width for cold-rolled wide strip and products obtained from cold-rolled wide strip

The tolerances on width are given in Table 5 (mill edges) and Table 6 (trimmed edges).

Table 5 — Tolerances on width for cold-rolled wide strip and sheet/plate cut from cold-rolled wide strip with mill edges

Dimensions in millimetres

Tolerances for a specified width of		
$600 \leqslant w < 1\,000$	$1\,000 \leqslant w < 1\,500$	$1\,500 \leqslant w$
$^{+25}_{0}$	$^{+30}_{0}$	