UDC 669.14-122.2-41 : 621.713.14 January 1992

Cold rolled uncoated low carbon and high yield strength steel flats for cold forming

Tolerances on size and geometrical tolerances
English version of DIN EN 10 131

DIN
EN 10 131

Kaltgewalzte Flacherzeugnisse ohne Überzug aus weichen Stählen sowie aus Stählen mit höherer Streckgrenze zum Kaltumformen; Grenzabmaße und Formtoleranzen

Supersedes DIN 1541, August 1975 edition.

European Standard EN 10 131 : 1991 has the status of a DIN Standard.

A comma is used as the decimal marker.

National foreword

This standard has been prepared by ECISS/TC 13.

The responsible German body involved in the preparation of this standard was the *Normenausschuß Eisen und Stahl* (Steel and iron Standards Committee), Technical Committee *Maßnormen für kaltgewalzte Flacherzeugnisse*.

DIN EN 10 079 is the standard corresponding to EN 10 079 referred to in clause 2.

Standard referred to

(and not included in **Normative reference**)

DIN EN 10 079 Definition and classification of steel products by shape and dimensions

Previous editions

DIN 1541 Parts 1 and 2: 05.32; DIN 1541: 08.75.

Amendments

In comparison with DIN 1541, August 1975 edition, the following amendments have been made.

a) The scope of the standard has been extended to cover steel with a high yield strength.
b) Closer tolerances on thickness and width have been specified for some sizes.
c) A new tolerance class has been introduced for slit wide strip less than 600 mm in width (cf. table 4).
d) For low carbon sheet steel, specifications for the waviness have been introduced (cf. subclause 9.1).

International Patent Classification

C 22 F 1/00
G 01 B 21/00

Continued overleaf.
EN comprises 6 pages.

Editor's note

This standard reproduces the official text of the English version of EN 10 131 as issued by CEN. In its preparation for publication as DIN EN 10 131 (English version), certain points have been noted which we consider to be in need of correction. These have been marked +). The suggested amendments are given below and will be forwarded to the responsible CEN Secretariat for its consideration.

In presentation, orthography, punctuation and hyphenation, the aim has been to implement the PNE Rules consistently. Obvious errors (e.g. redundancies and omissions) have been rectified without further reference.

Suggested amendments

1 *For ease of comprehension, in tables 1 (footnote), 3, 4 and 5, 'Lower deviation' and 'Upper deviation' should be substituted for 'Under' and 'Over' respectively.*

2 *Re clause 12*

To avoid possible misunderstandings arising from the non-existence of the term 'superimposement', we suggest the following amendment which is also more consistent with the German version:

'Alternative order specification

By agreement at the time of ordering, the requirements regarding tolerance on out-of-squareness and edge camber may be replaced by the requirement that each sheet supplied contain a rectangle corresponding in terms of length and width to the dimensions as ordered.'

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 10 131

November 1991

UDC 669.14-122.2-41 : 621.753.1

Descriptors: Iron and steel products, cold rolled products, metal plate, wide strip, low carbon steel, high yield strength steel, dimensional tolerances, form tolerances.

English version

Cold rolled uncoated low carbon and high yield strength steel flats for cold forming

Tolerances on dimensions and shape

Produits plats laminés à froid, non revêtus, en acier doux et en acier à haute limite d'élasticité pour emboutissage et pliage à froid; tolerances sur les dimensions et sur la forme

Kaltgewalzte Flacherzeugnisse ohne Überzug aus weichen Stählen sowie aus Stählen mit höherer Streckgrenze zum Kaltumformen; Grenzabmaße und Formtoleranzen

This European Standard was approved by CEN on 1991-11-30. CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CEN

European Committee for Standardization

Comité Européen de Normalisation

Europäisches Komitee für Normung

Central Secretariat: rue de Stassart 36, B-1050 Brussels

Ref. No. EN 10 131 : 1991 E

Contents

Foreword

The European Committee for Iron and Steel Standardization (ECISS) asked Technical Committee 13 (Secretariat: Belgium) to transform EURONORM 131-77, Cold rolled non-coated mild unalloyed steel flat products for cold forming; tolerances on dimensions and shape, into a European Standard and to enlarge its field of application to incorporate steels with high yield strength.

Publication of European Standard EN 10 131 was agreed at a meeting of ECISS/TC13 in October 1991, and accepted by COCOR on 1991-05-27 for submission to CEN Formal Vote.

This European Standard replaces EURONORM 131-77.

According to the CEN/CENELEC Internal Regulations, the following countries are bound to implement this European Standard:

Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

1 Scope

This European Standard applies to cold rolled uncoated low carbon and high yield strength steel flat products for cold forming with a minimum thickness of 0,35 mm and, unless otherwise agreed at the time of ordering, less than or equal to 3 mm thick, delivered in sheet, wide strip, slit wide strip, or cut lengths obtained from slit wide strip or sheet.

It does not apply to cold rolled strip (rolled width <600 mm), or to flat cold rolled products for which there is a specific standard, in particular the following:

- cold rolled not grain-oriented magnetic steel sheet and strip (EURONORM 106);
- semi-processed steel strip for the construction of magnetic circuits (EURONORMs 126 and 165);
- blackplate in sheet form (EURONORM 145);
- blackplate in coils (EN 10 205);
- cold rolled uncoated non-alloy mild steel narrow strip for cold forming (EURONORM 139).

2 Normative reference

EN 10 079 Definition of steel products

3 Definitions

For the purposes of this European Standard, the definitions of the cold rolled flat products listed in clause 1 are those given in EN 10 079.

4 Designation

4.1 Products conforming to this European Standard shall be designated in the following order (see also clause 5):

a) type of product (wide strip, sheet or cut length);
b) the number of this standard (EN 10 131);
c) nominal thickness, in millimetres;
d) the letter S for products ordered with special tolerances on thickness;
e) nominal width, in millimetres;
f) the letter S for products ordered with special tolerances on width;
g) nominal length, in millimetres;

h) the letter S for products ordered with special tolerances on length (sheets and cut lengths only);

i) the letter FS for sheets or cut lengths ordered with special tolerances on flatness;

j) the letter CS for slit strip ordered with special tolerances on camber.

4.2 The product designation in accordance with 4.1 shall be followed by the complete designation of the steel ordered (according to EN 10 130, for example).

4.3 Examples of designation

a) Wide strip according to this European Standard, of nominal thickness 1,20 mm, nominal width of 1500 mm, in steel Fe P04 Am, as specified in EN 10 130:

Wide strip EN 10 131 – 1,20 × 1500
Steel EN 10 130 – Fe P04 Am

b) Sheet according to this European Standard, of nominal thickness 0,80 mm, ordered with special thickness tolerance (S), nominal width of 1200 mm, with special tolerances on width (S), nominal length of 2500 mm, and with special tolerances on flatness, in steel Fe P06 Bg as specified in EN 10 130:

Sheet EN 10 131 – 0,80 S × 1200 S × 2500 FS
Steel EN 10 130 – Fe P06 Bg

5 Condition of delivery

5.1 Flat products according to this European Standard may be delivered as follows:

a) with normal or special thickness tolerances (see table 1);

b) with normal or special width tolerances (see tables 3 and 4);

c) with normal or special length tolerances for sheet or cut lengths (see table 5);

d) with normal or special flatness tolerances for sheet or cut lengths (see tables 6 and 7);

e) with normal or special tolerances on camber for slit strip of width less than 600 mm (see clause 11).

5.2 In the absence of information on the order in respect of the condition of delivery given in 5.1, the flat products shall be delivered with normal tolerances on thickness, width, length, flatness and camber.

6 Tolerances on thickness

The tolerances on thickness are given in 6.1 for low carbon steel flat products and in 6.2 for high yield strength steel flat products.

6.1 Low carbon steel flat products

The tolerances on thickness shall be as given in table 1 and apply over the whole length.

Tolerances more severe than the special tolerances may be agreed at the time of ordering.

Table 1: Tolerances on thickness Dimensions in millimetres

Nominal thickness	Normal tolerances[1] for a nominal width of			Special tolerances (S)[1] for a nominal width of		
	≤ 1200	> 1200 to ≤ 1500	> 1500	≤ 1200	> 1200 to ≤ 1500	> 1500
≥ 0,35 ≤ 0,40	±0,04	± 0,05	–	±0,025	±0,035	–
> 0,40 ≤ 0,60	±0,05	±0,06	±0,07	±0,035	±0,045	±0,05
> 0,60 ≤ 0,80	±0,06	±0,07	±0,08	±0,04	±0,05	±0,05
> 0,80 ≤ 1,00	±0,07	±0,08	±0,09	±0,045	±0,06	±0,06
> 1,00 ≤ 1,20	±0,08	±0,09	±0,10	±0,055	±0,07	±0,07
> 1,20 ≤ 1,60	±0,10	±0,11	±0,11	±0,07	±0,08	±0,08
> 1,60 ≤ 2,00	±0,12	±0,13	±0,13	±0,08	±0,09	±0,09
> 2,00 ≤ 2,50	±0,14	±0,15	±0,15	±0,10	±0,11	±0,11
> 2,50 ≤ 3,00	±0,16	±0,17	±0,17	±0,11	±0,12	±0,12

[1] For wide strip and slit wide strip, the thickness tolerances in the region of cold rolled welds may be increased by a maximum of 60 % over a length of 15 metres.

This increase is applicable to all thicknesses and, unless otherwise agreed at the time of ordering, to normal and special tolerances over or under[+].

6.2 High yield strength steel flat products

The thickness tolerances shall be as given in table 1, subject to the increases given in table 2 as a function of the specified minimum yield strength.

Table 2: Percentage increase in thickness tolerances for high yield strength steel flat products

Specified minimum yield strength N/mm^2	Percentage increase in thickness tolerances over those specified for low carbon steels %
< 280	0
≥ 280 < 360	20
≥ 360	40

7 Tolerances on width

The tolerances on width of flat products in low carbon and high yield strength steels are given in 7.1 for sheet and wide strip and in 7.2 for slit wide strip of width less than 600 mm.

7.1 Sheet and wide strip

The tolerances on width of sheet and wide strip shall be as given in table 3.

Table 3: Tolerances on width of sheet and wide strip[+])

Dimensions in millimetres

Nominal width	Normal tolerances		Special tolerances (S)	
	Under	Over	Under	Over
≤ 1200	0	+4	0	+2
> 1200 to ≤ 1500	0	+5	0	+2
> 1500	0	+6	0	+3

7.2 Slit wide strip of width less than 600 mm

The tolerances on width of slit wide strip of width less than 600 mm shall be as given in table 4.

Table 4: Tolerances on slit wide strip of width less than 600 mm[+])

Dimensions in millimetres

Tolerance class	Nominal thickness	Nominal width							
		< 125		≥ 125 to < 250		≥ 250 to < 400		≥ 400 to < 600	
		Under	Over	Under	Over	Under	Over	Under	Over
Normal	< 0,6	0	+0,4	0	+0,5	0	+0,7	0	+1,0
	≥ 0,6 to < 1,0	0	+0,5	0	+0,6	0	+0,9	0	+1,2
	≥ 1,0 to < 2,0	0	+0,6	0	+0,8	0	+1,1	0	+1,4
	≥ 2,0 to ≤ 3,0	0	+0,7	0	+1,0	0	+1,3	0	+1,6
Special (S)	< 0,6	0	+0,2	0	+0,2	0	+0,3	0	+0,5
	≥ 0,6 to < 1,0	0	+0,2	0	+0,3	0	+0,4	0	+0,6
	≥ 1,0 to < 2,0	0	+0,3	0	+0,4	0	+0,5	0	+0,7
	≥ 2,0 to ≤ 3,0	0	+0,4	0	+0,5	0	+0,6	0	+0,8

8 Tolerances on length

The tolerances on length shall be as given in table 5 and apply to all products covered by this standard including low carbon and high yield strength steels.

Table 5: Tolerances on length[+]) Dimensions in millimetres

Nominal	Tolerances			
	Normal		Special (S)	
	Under	Over	Under	Over
< 2000	0	6	0	3
≥ 2000	0	0,3 % of the length	0	0,15 % of the length

9 Tolerances on flatness

The flatness tolerances apply only to sheet. If sheet is ordered not skin-passed, only the normal tolerances are applicable.

Flatness tolerances closer than special tolerances may be agreed at the time of ordering.

9.1 Low carbon steel sheet

Flatness tolerances for low carbon steel sheet with R_e < 280 N/mm^2 shall be as given in table 6.

When low carbon steel sheet is ordered with the special tolerances as in table 6, it is necessary, but only in cases of dispute, to verify that the wave height of any edge wave of length equal to or greater than 200 mm is always less than:

- 1 % of its length for a nominal sheet width <1500 mm;
- 1,5 % of its length for a nominal sheet width ≥1500 mm.

If the length of an edge wave is less than 200 mm, it is necessary to verify that its maximum height does not exceed 2 mm.

Table 6: Flatness tolerances for low carbon steel sheet

Dimensions in millimetres

Tolerance class	Nominal width	Nominal thickness		
		< 0,7	≥ 0,7 < 1,2	≥ 1,2
Normal	≥ 600 < 1200	12	10	8
	≥ 1200 < 1500	15	12	10
	≥ 1500	19	17	15
Special (FS)	≥ 600 < 1200	5	4	3
	≥ 1200 < 1500	6	5	4
	≥ 1500	8	7	6

9.2 High yield strength steel sheet

Flatness tolerances for high yield strength steel sheet shall be as given in table 7 and apply to a specified minimum yield strength equal to or greater than 280 N/mm^2 and less than 360 N/mm^2.

For a specified minimum yield strength equal to or greater than 360 N/mm^2, the values for flatness tolerances should be specified at the time of ordering.

Table 7: Flatness tolerances for high yield strength steel sheet
(280 ≤ R_e < 360 N/mm^2) Dimensions in millimetres

Tolerance class	Nominal width	Nominal thickness		
		< 0,7	≥ 0,7 < 1,2	≥ 1,2
Normal	≥ 600 < 1200	15	13	10
	≥ 1200 < 1500	18	15	13
	≥ 1500	22	20	19
Special (FS)	≥ 600 < 1200	8	6	5
	≥ 1200 < 1500	9	8	6
	≥ 1500	12	10	9

10 Tolerances on out-of-squareness

The out-of-squareness shall not exceed 1 % of the actual width of the sheet.

11 Tolerances on edge camber

The edge camber shall not exceed 6 mm over a length of 2 m. For lengths less than 2 m, the edge camber shall not exceed 0,3 % of the actual length.

For slit wide strip of width less than 600 mm, a special edge camber tolerance (CS) of 2 mm maximum on a 2 m length may be specified. This special edge camber tolerance is not applicable to slit wide strip of high yield strength steels.

12 Superimposement of dimensions+)

By agreement at the time of ordering, the tolerance on out-of-squareness and edge camber may be replaced by a requirement that a perfect rectangle formed by the ordered width and length dimensions can be superimposed onto the sheets delivered.

13 Measurement

13.1 Thickness

The thickness may be measured at any point located more than 40 mm from the edges.

In the case of slit coil and cut lengths having a width of 80 mm or below, the position of measurement shall be at the middle axis.

13.2 Length

The length is measured along one of the long sides of the sheet or cut length.

13.3 Width

Width is measured perpendicularly to the longitudinal axis of the product.

13.4 Flatness

The tolerance on flatness is the maximum permitted distance between the sheet and the horizontal surface on which it is placed.

The measurement of waviness is only made on sheet edges.

13.5 Out-of-squareness

The out-of-squareness, u, is the orthogonal projection of a transverse edge over a longitudinal edge (see figure 1).

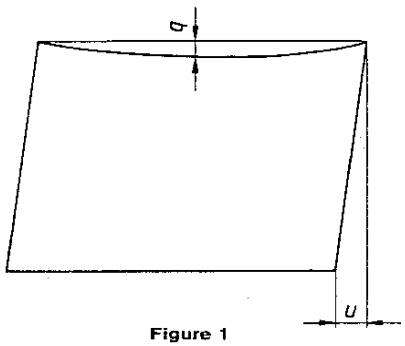

Figure 1

13.6 Edge camber

Edge camber, q, is the maximum distance between a longitudinal edge and a straight edge supported on the latter (see figure 1).

Edge camber shall be measured on the concave edge.

The basis of measurement shall be a distance of 2 m taken at any point on the edge.

In the case of sheet and cut lengths with a length less than 2 m, the basis of measurement shall be equal to their length.