

Continuously hot-rolled uncoated unalloyed  
and alloy steel plate, sheet and strip  
Tolerances on dimensions and shape (includes Amendment A1 : 1997)  
English version of DIN EN 10051 : 1991 + A1 : 1997

**DIN**  
**EN 10051**

ICS 77.140.50

Supersedes  
February 1992 edition.

Descriptors: Steel, plate, sheet, tolerances.

Kontinuierlich warmgewalztes Blech und Band ohne Überzug aus  
unlegierten und legierten Stählen – Grenzabmaße und Formtoleranzen  
(enthält Änderung A1 : 1997)

**European Standard EN 10051 : 1991 + A1 : 1997 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 12.

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 warmgewalzte Flacherzeugnisse*.

DIN 17350 is the DIN Standard corresponding to EURONORM 96 referred to in clause 2 of the EN.

### Amendments

In comparison with the February 1992 edition, the following amendments have been made.

- a) Steel designations have been brought into line with the specifications of DIN EN 10027-1.
- b) Tolerances on the thickness of hot-rolled low carbon steel plate/sheet have been specified (cf. table 2). The previous table 2 has been renumbered to become table 3.

### Previous editions

DIN 1016: 1941x-10, 1959-01, 1972-11, 1987-06; DIN 1541-1 and DIN 1541-2: 1932-05;  
DIN EN 10051: 1992-02.

### National Annex NA

#### Standards referred to

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

DIN 17350 Tool steel – Technical delivery conditions

DIN EN 10027-1 Designation systems for steels – Steel names and principal symbols

EN comprises 22 pages.

Bearbeitet: **Normung**

**4.16.00**

ICS 77.140.50

Supersedes EN 10051 : 1991.

Descriptors: Steel, plate, sheet, tolerances.

**English version**

**Continuously hot-rolled uncoated plate, sheet  
and strip of non-alloy and alloy steels**

**Tolerances on dimensions and shape  
(includes Amendment A1 : 1997)**

Tôles, larges bandes et larges bandes  
refendues non revêtues, laminées à  
chaud en continu en aciers alliés et non  
alliés – Tolérances sur les dimensions  
et la forme  
(amendement A1 : 1997 inclus)

Kontinuierlich warmgewalztes Blech  
und Band ohne Überzug aus legierten  
und unlegierten Stählen – Grenz-  
abmaße und Formtoleranzen  
(enthält Änderung A1 : 1997)

This European Standard was approved by CEN on 1991-12-20 and Amendment A1 on 1997-07-24.

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.

The European Standards exist 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.

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**CEN**

European Committee for Standardization  
Comité Européen de Normalisation  
Europäisches Komitee für Normung

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

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### Foreword

This European Standard including Amendment A1 has been prepared by Technical Committee ECISS/TC 12 "Structural steels and steels for pressure purposes, flat products - Dimensions and tolerances", the secretariat of which is held by NNI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by March 1998, and conflicting national standards shall be withdrawn at the latest by March 1998.

This document established by the secretariat of ECISS/TC 12 incorporates the text of EN 10051:1991 with the text of the amendment A1:1997. This amendment was prepared on request of ECISS/TC 13 "Steel flat products for cold working - Qualities, dimensions, tolerances and specific tests". ECISS/TC 12 was asked to prepare an Amendment to EN 10051, in which a table for tolerances on thickness for continuously hot-rolled low carbon steel sheet/plate for cold forming, as proposed by ECISS/TC 13 was added. Also the new designations according to EN 10027 Parts 1 and 2 and CR 10260 (ECISS/IC 10) and an updating of in the meantime published EN's are incorporated in this Amendment.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

## 1 Scope

This European Standard applies to continuously hot-rolled uncoated flat products with a maximum width of 2200 mm of non-alloy and alloy steels including stainless steels in accordance with table 1.

This European Standard also applies to hot-rolled strip for cold rolling.

Table 1: Field of application

Product	Thickness mm	Steel grades according to
Sheet/plate, wide strip (minimum width 600 mm), strip < 600 mm wide slit from wide strip	≤ 25	EURONORM 96, EN 10025, EN 10028-2, EN 10028-3, EN 10028-4, EN 10028-5, EN 10028-6, EN 10083-1, EN 10083-2, EN 10083-3, EN 10088-2, EN 10111, EN 10113-2, EN 10113-3, EN 10120, EN 10137-2, EN 10137-3, EN 10149-2, EN 10149-3, EN 10155, EN 10207, EN 10208-2 prEN 10028-7 and prEN 10084

This European Standard does not apply to hot-rolled strip rolled in widths < 600 mm (see EN 10048).

## 2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 10020	Definition and classification of grades of steel
EN 10025	Hot-rolled products of non-alloy structural steels - Technical delivery conditions
EN 10028-2	Flat products made of steels for pressure purposes - Part 2: Non-alloy and alloy steels with specified elevated temperature properties
EN 10028-3	Flat products made of steels for pressure purposes - Part 3: Weldable fine grain steels, normalized
EN 10028-4	Flat products made of steels for pressure purposes - Part 4: Nickel alloy steels with specified low temperature properties
EN 10028-5	Flat products made of steels for pressure purposes - Part 5: Weldable fine grain steels, thermomechanically rolled

EN 10028-6	Flat products made of steels for pressure purposes - Part 6: Weldable fine grain steels, quenched and tempered
EN 10048	Hot-rolled narrow steel strip - Tolerances on dimensions and shape
EN 10079	Definitions of steel products
EN 10083-1	Quenched and tempered steels - Part 1: Technical delivery conditions for special steels
EN 10083-2	Quenched and tempered steels - Part 2: Technical delivery conditions for unalloyed quality steels
EN 10083-3	Quenched and tempered steels - Part 3: Technical delivery conditions for boron steels
EN 10088-2	Stainless steels - Part 2: Technical delivery conditions for sheet/plate and strip for general purposes
EN 10111	Continuously hot-rolled low carbon steel sheet and strip for cold forming - Technical delivery conditions
EN 10113-2	Hot-rolled products in weldable fine grain structural steels - Part 2: Delivery conditions for normalized/normalized rolled steels
EN 10113-3	Hot-rolled products in weldable fine grain structural steels - Part 3: Delivery conditions for thermomechanical rolled steels
EN 10120	Steel sheet and strip for welded gas cylinders
EN 10137-2	Plates and wide flats made of high yield strength structural steels in the quenched and tempered or precipitation hardened conditions - Part 2: Delivery conditions for quenched and tempered steels
EN 10137-3	Plates and wide flats made of high yield strength structural steels in the quenched and tempered or precipitation hardened conditions - Part 3: Delivery conditions for precipitation hardened steels
EN 10149-2	Hot-rolled flat products made of high yield strength steels for cold forming - Part 2: Delivery conditions for thermomechanically rolled steels
EN 10149-3	Hot-rolled flat products made of high yield strength steels for cold forming - Part 3: Delivery conditions for normalized or normalized rolled steels
EN 10155	Structural steels with improved atmospheric corrosion resistance - Technical delivery conditions
EN 10207	Steels for simple pressure vessels - Technical delivery requirements for plates, strips and bars
EN 10208-2	Steel pipes for pipelines for combustible fluids - Technical delivery conditions - Part 2: Pipes of requirement class B
prEN 10028-7 <sup>1)</sup>	Flat products made of steels for pressure purposes - Part 7: Stainless steels
prEN 10084 <sup>1)</sup>	Case hardening steels - Technical delivery conditions
EURONORM 96 (1979) <sup>2)</sup>	Tool steels - Quality requirements

1) Draft is under discussion.

2) Until EURONORM 96 is transformed into a European Standard, it can either be implemented or reference made to the corresponding national standard, the list of which is given in Annex B of this European Standard.

### 3 Definitions

For the purpose of this European standard the following definitions apply:

- non-alloy and alloy steels, see EN 10020;
- wide strip and sheet/plate, see EN 10079.

### 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 (strip, sheet/plate);
- b) number of this European standard (EN 10051);
- c) nominal thickness and width in mm;
- d) the letters GK if strip and sheet/plate with trimmed edges is ordered (see 6.2);  
See clause 10, option 1.
- e) nominal length in mm (for sheet and plate);
- f) width tolerances for products with thickness > 10 mm (see 7.3);
- g) tolerances on flatness for products of category D (see table 7);
- h) flatness requirements for wide strip and strip < 600 mm wide slit from strip (see 8.4);
- i) edge camber requirements for strip < 600 mm wide slit from wide strip (see 8.5).

Where no specific choice is made by the purchaser concerning point f, g, h and i the supplier shall refer back to the purchaser.

#### 4.2 Options

A number of options are specified in clause 10. In the event that the purchaser does not indicate his wish to implement any of these options, the supplier shall supply in accordance with the basic specification (see 6.2).

### 5 Designation

The designation of products in accordance with 4.1 shall also include the exact designation of the ordered steel grade.

Examples of designation:

- a) sheet according to this European standard with nominal thickness of 2,0 mm, nominal width 1200 mm, with trimmed edges (GK), nominal length 2500 mm of steel 34Cr4 as specified in EN 10083-1:

sheet EN 10051 - 2,0 × 1200GK × 2500  
steel EN 10083-1 - 34Cr4

b) strip according to this European standard with nominal thickness of 4,5 mm, nominal width 1500 mm, with mill edges of steel S235JR, as specified in EN 10025:

strip EN 10051 - 4,5 × 1500  
steel EN 10025 - S235JR

## 6 Form of supply

6.1 Sheet/plate and strip shall be supplied with mill edges or with trimmed edges (GK), as agreed at the time of enquiry and order.

6.2 In the absence of information on the form of supply, sheet/plate and strip shall be supplied with mill edges.

6.3 The possibility of delivering coils with welding seams can be agreed at the time of enquiry and order. The indication of the location of the weld can be agreed at the same time.

See clause 10, option 2.

## 7 Tolerances for sheet and plate

### 7.1 Thickness

7.1.1 The tolerances on thickness for continuously hot-rolled low carbon steel sheet/plate for cold forming according to EN 10111 are given in table 2.

Table 2: Tolerances on thickness for continuously hot-rolled low carbon steel sheet/plate for cold forming

Dimensions in mm

Nominal thickness	Tolerances for a nominal width			
	≤ 1200	> 1200 ≤ 1500	> 1500 ≤ 1800	> 1800
≤ 2,00	± 0,13	± 0,14	± 0,16	-
> 2,00 ≤ 2,50	± 0,14	± 0,16	± 0,17	± 0,19
> 2,50 ≤ 3,00	± 0,15	± 0,17	± 0,18	± 0,20
> 3,00 ≤ 4,00	± 0,17	± 0,18	± 0,20	± 0,20
> 4,00 ≤ 5,00	± 0,18	± 0,20	± 0,21	± 0,22
> 5,00 ≤ 6,00	± 0,20	± 0,21	± 0,22	± 0,23
> 6,00 ≤ 8,00	± 0,22	± 0,23	± 0,23	± 0,26

7.1.2 The tolerances on thickness for steels with normal deformation resistance at elevated temperatures are given in table 3. These tolerances are indicated as category A.

7.1.3 For steels exhibiting a high deformation resistance at elevated temperatures the values of table 3 shall be increased by the amounts specified in table 4.

This results in the following categories and increments:

- for steels of category B of table 4 the values in table 3 shall be increased by 15 %;
- for steels of category C of table 4 the values in table 3 shall be increased by 30 %;
- for steels of category D of table 4 the values in table 3 shall be increased by 40 %.

Table 3: Tolerances on thickness for sheet/plate made of steels with a normal deformation resistance at elevated temperatures (category A)

Dimensions in mm

Nominal thickness	Tolerances for a nominal width			
	≤ 1200	> 1200 ≤ 1500	> 1500 ≤ 1800	> 1800
≤ 2,00	± 0,17	± 0,19	± 0,21	-
> 2,00 ≤ 2,50	± 0,18	± 0,21	± 0,23	± 0,25
> 2,50 ≤ 3,00	± 0,20	± 0,22	± 0,24	± 0,26
> 3,00 ≤ 4,00	± 0,22	± 0,24	± 0,26	± 0,27
> 4,00 ≤ 5,00	± 0,24	± 0,26	± 0,28	± 0,29
> 5,00 ≤ 6,00	± 0,26	± 0,28	± 0,29	± 0,31
> 6,00 ≤ 8,00	± 0,29	± 0,30	± 0,31	± 0,35
> 8,00 ≤ 10,00	± 0,32	± 0,33	± 0,34	± 0,40
> 10,00 ≤ 12,50	± 0,35	± 0,36	± 0,37	± 0,43
> 12,50 ≤ 15,00	± 0,37	± 0,38	± 0,40	± 0,46
> 15,00 ≤ 25,00	± 0,40	± 0,42	± 0,45	± 0,50

Table 4: Thickness tolerance increments for steels exhibiting a high deformation resistance at elevated temperatures <sup>1) 2)</sup>

Category B (increment of 15 %)		Category C (increment of 30 %)		Category D (increment of 40 %)	
Designation	Standardized in:	Designation	Standardized in:	Designation	Standardized in:
E295; E335; E360 S355 S355 S355 S355 P295; P355	EN 10025 EN 10025 EN 10155 EN 10149-2; -3 EN 10113-2; -3 EN 10028-2	L360; L415; L445 S420; S460 S420; S460 P460 S460	EN 10208-2 EN 10113-2; -3 EN 10149-2; -3 EN 10028-3; -6 EN 10137-2	L480; L550 S500; S650; S600; S650; S700 S500; S550; S620; S690; S890; S960 P500; P550 P620; P690	EN 10208-2 EN 10149-2   EN 10137-2   EN 10028-6
C35 C35E C 36 C45 C45E C 46 C50 C50E	EN 10083-2 EN 10083-1 EU 86-70 EN 10083-2 EN 10083-1 EU 86-70 EN 10083-2 EN 10083-1	C 53 C55 C55E 1 CS 55 C60 C60E 1 CS 60 1 CS 67	EU 86-70 EN 10083-2 EN 10083-1 EU 132-79 EN 10083-2 EN 10083-1 EU 132-79 EU 132-79	CT 70 1 CS 75 CT 80 2 CS 85 2 CS 100 CT 105 CT 120	EU 96-79 EU 132-79 EU 96-79 EU 132-79 EU 132-79 EU 96-79 EU 96-79
16Mo3 20Mn85 30Mn85 38Mn85 28Mn6 27MnCrB5-2 33MnCrB5-2 39MnCrB6-2 38Cr2 46Cr2 34Cr4 41Cr4 45 Cr 2 38 Cr 4 16MnCr5 13CrMo4-5 10CrMo9-10	EN 10028-2 EN 10083-3 EN 10083-3 EN 10083-3 EN 10083-1 EN 10083-3 EN 10083-3 EN 10083-3 EN 10083-1 EN 10083-1 EN 10083-1 EN 10083-1 EU 86-70 EU 86-70 prEN 10084 EN 10028-2 EN 10028-2	25CrMo4 34CrMo4 41 CrMo 4 42CrMo4 17CrNi6-6 20NiCrMo2-2 18CrNiMo7-6	EN 10083-1 EN 10083-1 EU 86-70 EN 10083-1 prEN 10084 prEN 10084 prEN 10084	50CrMo4 36CrNiMo4 34CrNiMo6 30CrNiMo8 51CrV4 all grades for instance 39 CrMoV 13 31 CrMo 12 34 CrAlMo 5 41 CrAlMo 7 all grades for instance 60 CrV 4 67 SiCr 5 50 CrV 4	EN 10083-1 EN 10083-1 EN 10083-1 EN 10083-1 EN 10083-1 EU 85-70 EU 85-70 EU 85-70 EU 85-70 EU 85-70 EU 89-70 EU 89-71 EU 132-79 EU 132-79
All ferritic and martensitic stainless steels	EN 10088-2	All non-Mo-alloyed austenitic stainless steels	EN 10088-2	All Mo-alloyed austenitic stainless steels	EN 10088-2

1) A list of corresponding national designations and standards are given in Annex A, tables A.1 to A.3. In the event of a national standard having been recently replaced by a European standard, the old designation and corresponding standard are indicated in brackets.

2) In this table not all steel grades and quality classes covered by the present European Standards and EURONORMS are mentioned. Other grades, the designation of which is based on the same characteristic values (similar values or values of the same order) for the mechanical properties ( $R_e$ ,  $R_m$ , etc.) or for the chemical composition or intermediate grades shall be classified in the same categories as the comparable grades mentioned in this table.

EXAMPLES: Grades P460NH or P460NL1 (according to EN 10028-3): category C (as P460).  
Grade 2 CS 75 (EU 132-79): category D (as 1 CS 75).  
Grade 37Cr4 (EN 10083-1): category B (as 34Cr4 and 38Cr4).

## 7.2 Length

The tolerances on length shall be as given in table 5.

Table 5: Tolerances on length

Dimensions in mm

Nominal length	Tolerances	
	Lower	Upper
< 2000	0	+ 10
≥ 2000 < 8000	0	+ 0,005 × nominal length
≥ 8000	0	+ 40

## 7.3 Width

The tolerances on width for sheet/plate shall be as given in table 6.

Table 6: Tolerances on width for sheet/plate

Dimensions in mm

Nominal width	Tolerances			
	Mill edges		Trimmed edges <sup>1)</sup>	
	Lower	Upper	Lower	Upper
≤ 1200	0	+ 20	0	+ 3
> 1200 ≤ 1500	0	+ 20	0	+ 5
> 1500	0	+ 25	0	+ 6

1) Tolerances for trimmed edges apply to products with nominal thicknesses ≤ 10 mm, for nominal thickness > 10 mm the upper tolerances shall be agreed at the time of enquiry and order.

## 7.4 Flatness

7.4.1 For continuously hot-rolled low carbon steel sheet/plate for cold forming and for steels with normal deformation resistance at elevated temperatures the deviation from flatness shall not exceed the tolerances given in table 7.

Closer flatness tolerances shall be agreed at the time of enquiry and order.

See clause 10, option 3.

Table 7: Tolerances on flatness for steels with normal deformation resistance at elevated temperatures (category A)

Dimensions in mm			
Nominal thickness	Nominal width	Tolerances on flatness	Special tolerances on flatness
≤ 2,00	≤ 1200	18	9
	> 1200 ≤ 1500	20	10
	> 1500	25	13
> 2,00 ≤ 25	≤ 1200	15	8
	> 1200 ≤ 1500	18	9
	> 1500	23	12

7.4.2 For steels exhibiting a high deformation resistance at elevated temperatures the deviation from flatness shall not exceed the tolerances given in table 8. Closer tolerances for categories B and C shall be agreed at the time of enquiry and order.

See clause 10, option 4.

Table 8: Tolerances on flatness for steels exhibiting a high deformation resistance at elevated temperatures

Dimensions in mm				
Nominal thickness	Nominal width	Tolerances on flatness for category <sup>1)</sup>		
		B	C	D
≤ 25	≤ 1200	18	23	shall be agreed at the time of enquiry and order
	> 1200 ≤ 1500	23	30	
	> 1500	28	38	

1) The categories B, C and D are defined in 7.1.3 and table 4.

### 7.5 Out-of-squareness

The out-of-squareness *u* measured in accordance with 9.5 shall not exceed 1 % of the actual width of the sheet/plate.

### 7.6 Edge camber

The edge camber shall not exceed 0,5 % of the actual length of the sheet/plate for a nominal length < 5000 mm.

For sheet/plate with a nominal length ≥ 5000 mm and widths ≥ 600 mm, the edge camber shall not exceed 20 mm for any length of 5000 mm in the case of sheet/plate with mill edges and 15 mm in the case of sheet with trimmed edges.

## 7.7 Superimposition of dimensions

By agreement at the time of enquiry and order the tolerances 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 into the sheets delivered.

See clause 10, option 5.

## 8 Tolerances for wide strip and strip slit from wide strip

### 8.1 General

The specified values for tolerances shall not apply to the uncropped ends of the coil for a total length  $l$  which is calculated using the formula:

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

provided that the result does not exceed 20 m.

### 8.2 Thickness

8.2.1 The tolerances on thickness shall be the same as those for sheet/plate (see 7.1).

8.2.2 For hot-rolled strip for cold rolling of category A of 7.1.2, maximum values for crown as given in table 9 and permissible thickness differences within one coil as given in table 10 shall apply if agreed at the time of enquiry and order.

See clause 10, option 6.

**NOTE:** For coils not slitted in longitudinal direction the crown should be aimed to be as constant and symmetrical from the middle of the coil as possible.

The thickness (within one coil) shall change gradually; the changes should not be discontinuous.

8.2.3 More severe tolerances on thickness and crown may be agreed at the time of enquiry and order.

See clause 10, option 7.

Table 9: Maximum values for crown for hot-rolled strip for cold rolling for steel grades of category A

Dimensions in mm

Nominal width	Permissible crown <sup>1)</sup>
$\leq 1200$	0 till 0,10
$> 1200 \leq 1500$	0 till 0,13
$> 1500 \leq 1800$	0 till 0,16
$> 1800 \leq 2200$	0 till 0,20
1) The values for permissible crown shall be lowered by 20 % for hot-rolled strip slit from wide strip meant for cold rolling.	

Table 10: Permissible thickness differences within one coil for hot-rolled strip for cold rolling

Dimensions in mm

Nominal thickness	Permissible thickness differences for nominal width of strip		
	$\leq 1200$	$> 1200 \leq 1500$	$> 1500 < 2200$
$\geq 0,8 \leq 2,0$	0,20	0,24	0,28
$> 2,0 \leq 3,0$	0,22	0,27	0,33
$> 3,0 \leq 4,0$	0,28	0,32	0,40
$> 4,0 \leq 8,0$	0,28	0,32	0,40

### 8.3 Width

The tolerances on width for strip shall be the same as for sheet/plate (see 7.3).

### 8.4 Flatness

Requirements concerning flatness shall be agreed at the time of enquiry and order.

NOTE: Any requirements agreed shall take into account the processing equipment at the user's disposal.

### 8.5 Edge camber

For strip  $\geq 600$  mm, the edge camber shall not exceed 20 mm for any length of

5000 mm in the case of strip with mill edges and 15 mm in the case of strip with trimmed edges.

For strip < 600 mm wide slit from wide strip, the tolerances on edge camber shall be agreed at the time of enquiry and order.

## **9 Measurement**

### **9.1 Thickness**

9.1.1 The thickness shall be measured at any point situated at least 40 mm from the edges for products with mill edges and at least 25 mm from the edges for products with trimmed edges.

9.1.2 The crown shall be measured as the thickness difference between the center line of the product and a measuring point at 40 mm from any edge of the product in case of mill edges and at 25 mm in case of trimmed edges.

9.1.3 The difference in thickness within one coil shall be measured at a line with a invariable distance from the longitudinal edges (minimum distance from the edges in accordance with 9.1.1).

### **9.2 Length**

The length shall be measured along one of the longer edges of the sheet/plate.

### **9.3 Width**

The width shall be measured at right angles to the longitudinal axis of the product.

### **9.4 Flatness**

Deviation from flatness shall be determined by measuring the deviation in distance between the product and a flat horizontal surface on which it is placed.

### **9.5 Out-of-squareness**

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

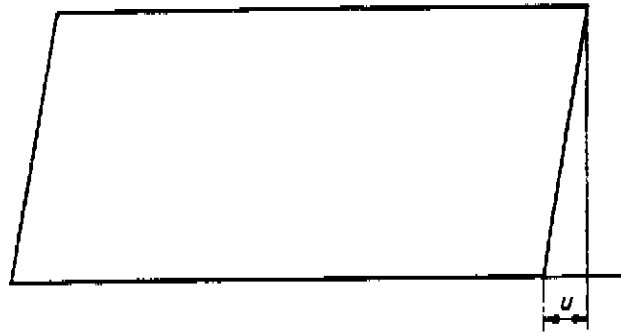


Figure 1: Out-of-squareness  $u$

#### 9.6 Edge camber

The edge camber is the maximum deviation of a longitudinal edge from a straight edge measuring base applied to it.

The camber is measured on the concave edge.

For sheet/plate the measuring base shall be the length of the product for a nominal length  $< 5000$  mm.

For strip and sheet/plate with a nominal length  $\geq 5000$  mm, the measuring base shall be 5000 mm, taken anywhere along the edge but excluding the uncropped ends.

#### 10 Options (see 4.2)

- 1) Whether trimmed edges are required (see 4.1 and 6.2).
- 2) Whether coils may be delivered with welded seams (see 6.3).
- 3) Whether for steels with normal deformation resistance at elevated temperatures closer tolerances on flatness are required (see 7.4.1).
- 4) Whether for steels with high deformation resistance at elevated temperatures of categories B and C closer tolerances on flatness are required (see 7.4.2).
- 5) Whether the tolerances on out-of-squareness and edge camber shall be replaced by a requirement that a perfect rectangle formed by the ordered width and length dimensions can be superimposed into the sheets delivered (see 7.7).
- 6) Whether for hot-rolled strip for cold rolling, maximum values for crown according to table 9 and permissible thickness differences within one coil according to table 10 are required (see 8.2.2).
- 7) Whether more severe tolerances on thickness and crown are required (see 8.2.3).

**Annex A**  
(informative)

**List of corresponding national designations, standards or specifications for categories B, C and D of table 4**

As a supplement to table 4, tables A.1 to A.3 include the corresponding national designations, standards or specifications for categories B, C and D.

In these tables, in the event of a national standard having been recently replaced by a European standard, the old designation and corresponding standard are indicated in brackets.

**Table A.1: Corresponding national designations and standards for category B (15 % increase)**

Europe		Germany		France	
Designation	Standardized in:	Designation	Standardized in:	Designation	Standardized in:
E295; E335; E360	EN 10025	(St 60-2; St 60-2; St 70-2)	(DIN 17 100)	(A 50-2; A 60-2; A 70-2)	(NF A 35-501)
S355	EN 10025	(St 52-3)	(DIN 17 100)	(E 36-3; E 36-4)	(NF A 36-101)
S355	EN 10155	(WTS 52)	(SEW 087)	(E 36 W)	(NF A 35-502)
S355	EN 10149-2; -3	(QStE 340)	(SEW 092)	(E 335 D)	(NF A 36-231)
S355	EN 10113-2; -3	(StE 355; BStE 355)	(DIN 17 102; SEW 083)	(E 355)	(NF A 36-201)
P295; P355	EN 10028-2	(17 Mn 4; 19 Mn 5)	(DIN 17 155)	(A 48; A 52)	(NF A 36-205)
C35	EN 10083-2	(C 35)	(DIN 17 200)	(AF 55 C 35)	(NF A 33-101)
C35E	EN 10083-1	(Ck 35)	(DIN 17 200)	(XC 38)	(NF A 35-553)
C 36	EU 86-70	Cf 35	DIN 17 212	XC 38 TC	not standardized
C45	EN 10083-2	(C 45)	(DIN 17 200)	(AF 65 C 45)	(NF A 33-101)
C45E	EN 10083-1	(Ck 45)	(DIN 17 200)	(XC 45)	(NF A 35-553)
-	-	C 45 W	DIN 17 350	-	-
C 46	EU 86-70	Cf 45	DIN 17 212	XC 42 H 1	NF A 35-552
C50	EN 10083-2	(C 50)	(DIN 17 200)	-	-
C50E	EN 10083-1	(Ck 50)	(DIN 17 200)	(XC 50)	(NF A 35-553)
16Mo3	EN 10028-2	(15 Mo 3)	(DIN 17 155)	(15 D 3)	(NF A 36-206)
20Mn85	EN 10083-3	(19 MnB 4)	(DIN 1654 T4)	(20 MB 5)	(NF A 35-556)
30Mn85	EN 10083-3	-	-	-	-
38Mn85	EN 10083-3	-	-	(38 MB 5)	(NF A 35-556)
28Mn6	EN 10083-1	(28 Mn 6)	(DIN 17 200)	-	-
27MnCrB5-2	EN 10083-3	-	-	-	-
33MnCrB5-2	EN 10083-3	-	-	-	-
39MnCrB6-2	EN 10083-3	-	-	-	-
-	-	(32 Cr 2)	(DIN 17 200)	-	-
38Cr2	EN 10083-1	(38 Cr 2)	(DIN 17 200)	(38 C 2)	(NF A 35-552)
46Cr2	EN 10083-1	(46 Cr 2)	(DIN 17 200)	-	-
-	-	(28 Cr 4)	(DIN 17 200)	-	-
34Cr4	EN 10083-1	(34 Cr 4)	(DIN 17 200)	(32 C 4)	(NF A 35-552)
41Cr4	EN 10083-1	(41 Cr 4)	(DIN 17 200)	(42 C 4)	(NF A 35-552)
-	-	17 Cr 3	DIN 17 210	-	-
-	-	20 Cr 4	DIN 17 210	-	-
45 Cr 2	EU 86-70	45 Cr 2	DIN 17 212	42 C 2	NF A 35-552
38 Cr 4	EU 86-70	38 Cr 4	DIN 17 212	-	-
-	-	42 Cr 4	DIN 17 212	42 C 4	NF A 35-552
16MnCr5	prEN 10084	16 MnCr 5	DIN 17 210	16 MC 5	NF A 35-551
-	-	20 MnCr 5	DIN 17 210	20 MC 5	NF A 35-551
-	-	22 CrMoS 35	DIN 17 210	-	-
13CrMo4-5	EN 10028-2	(13 CrMo 4 4)	(DIN 17 155)	(15 CD 2.05)	(NF A 36-206)
-	-	-	-	(15 CD 4.05)	(NF A 36-206)
10CrMo9-10	EN 10028-2	(10 CrMo 9 10)	(DIN 17 155)	(12 CD 9.10)	(NF A 36-210)
-	-	-	-	-	(NF A 36-206)
All ferritic and martensitic stainless steels	EN 10088-2	All ferritic and martensitic stainless steels	(DIN 17 440)	All ferritic and martensitic stainless steels	(NF A 35-573)

Table A.1: Corresponding national designations and standards for category B (15 % increase)  
(continued)

Europe		United Kingdom		Italy	
Designation	Standardized in:	Designation	Standardized in:	Designation	Standardized in:
E295; E335; E360	EN 10025	-	-	(Fe 490; Fe 590; Fe 690)	(UNI 7070-82)
S355	EN 10025	(50C; 50D)	(BS 4360)	(Fe 510)	(UNI 7070-82)
S355	EN 10155	(WR50A)	(BS 4360)	-	-
S355	EN 10149-2; -3	(43F35)	(BS 1449:part 1)	(Fe E 355)	(UNI 8890-87)
S355	EN 10113-2; -3	-	-	(Fe E 355)	(UNI 7382-75)
P295; P355	EN 10028-2	-	-	(Fe E 295; Fe E 355)	(UNI EU 28-88)
C35	EN 10083-2	-	-	(1 C 35)	(UNI 8373-82)
C35E	EN 10083-1	(080M36)	(BS 970:part 1)	(C 35)	(UNI 7845-78; UNI 7874-79; UNI 8787-85)
C 36	EU 86-70	060A32	BS 970:part 1	C 36	UNI 7847-79; UNI 8551-84
C45	EN 10083-2	-	-	(1 C 45)	(UNI 8373-82)
C45E	EN 10083-1	(080M46)	(BS 970:part 1)	(C 45)	(UNI 7845-78; UNI 7874-79; UNI 8787-85)
-	-	-	-	-	-
C 46	EU 86-70	080M46	BS 970:part 1	C 46	UNI 7847-79; UNI 8551-84
C50	EN 10083-2	-	-	(1 C 50)	(UNI 8373-82)
C50E	EN 10083-1	(080M50)	(BS 970:part 1)	(C 50)	(UNI 7845-78; UNI 8787-85; UNI 7874-79)
16Mo3	EN 10028-2	(243)	(BS 1501:part 2)	(16 Mo 3)	(UNI EU 28-88)
20MnB5	EN 10083-3	(170H20)	(BS 970:part 1)	-	-
30MnB5	EN 10083-3	-	-	-	-
38MnB5	EN 10083-3	(170H41)	(BS 970:part 1)	-	-
28Mn6	EN 10083-1	(150M19)	(BS 970:part 1)	(C 28 Mn)	(UNI 7874-79)
27MnCrB5-2	EN 10083-3	-	-	-	-
33MnCrB5-2	EN 10083-3	-	-	-	-
39MnCrB6-2	EN 10083-3	(185H40)	(BS 970:part 1)	-	-
-	-	-	-	-	-
38Cr2	EN 10083-1	-	-	(38 Cr 2)	(UNI 7874-79)
46Cr2	EN 10083-1	-	-	-	-
-	-	(580A30)	(BS 970:part 1)	-	-
34Cr4	EN 10083-1	(530H32)	(BS 970:part 1)	(34 Cr 4)	(UNI 7874-79)
41Cr4	EN 10083-1	(530M40)	(BS 970:part 1)	(41 Cr 4)	(UNI 7874-79; UNI 8787-85; UNI 7845-78)
-	-	-	-	-	-
-	-	-	-	-	-
45 Cr 2	EU 86-70	-	-	45 Cr 2	UNI 7847-79; UNI 8551-84
38 Cr 4	EU 86-70	-	-	38 Cr 4	UNI 7847-79; UNI 8551-84
-	-	530A40	BS 970:part 1	41 Cr 4	UNI 7874-79
16MnCr5	prEN 10084	527M17	-	16 MnCr 5	UNI 7846-78; UNI 8550-84; UNI 8788-85
-	-	-	-	20 MnCr 5	UNI 7846-78; UNI 8550-84; UNI 8788-85
-	-	-	-	-	-
13CrMo4-5	EN 10028-2	(620)	(BS 1501:part 2)	(14 CrMo 4 5)	(UNI EU 28-88)
10CrMo9-10	EN 10028-2	(622)	(BS 1501:part 2)	(10 CrMo 9 10)	(UNI EU 28-88)
All ferritic and martensitic stainless steels	EN 10088-2	All ferritic and martensitic stainless steels	(BS 1449:part 2)	All ferritic and martensitic stainless steels	(UNI 6900) (UNI 6901) (UNI 8317)

Table A.2: Corresponding national designations and standards for category C (30 % increase)

Europe		Germany		France	
Designation	Standardized in:	Designation	Standardized in:	Designation	Standardized in:
L360; L415; L445	EN 10208-2	StE 360.7; StE 385.7; StE 415.7; StE 445.7	DIN 17 172	-	-
S420; S460	EN 10113-2; -3	(StE 380; StE 420; StE 460; StE 500)	(DIN 17 102)	(E 420; E 460)	(NF A 36-201)
S420; S460	EN 10149-2; -3	(BStE 420; BStE 460; BStE 500; BStE 550)	(SEW 083)	-	-
P460	EN 10028-3; -6	(QStE 380; QStE 420; QStE 460)	(SEW 092)	-	-
S460	EN 10137-2	-	-	(E 460 T)	(NF A 36-204)
C 53	EU 86-70	Cf 53	DIN 17 212	XC 48 TS	not standardized
C55	EN 10083-2	(C 55)	(DIN 17 200)	(AF 70 C 55)	(NF A 33-101)
C55E	EN 10083-1	(Ck 55)	(DIN 17 200)	(XC 54)	(NF A 35-553)
1 CS 55	EU 132-79	C 55	DIN 17 222	42 C 2	NF A 35-552
C60	EN 10083-2	(C 60)	(DIN 17 200)	-	-
C60E	EN 10083-1	(Ck 60)	(DIN 17 200)	(XC 60)	(NF A 35-553)
1 CS 60	EU 132-79	C 60	DIN 17 222	AF 70 C 55	NF A 33-101
-	-	C 60 W	DIN 17 350	-	-
1 CS 67	EU 132-79	C 67	DIN 17 222	-	-
25CrMo4	EN 10083-1	(25 CrMo 4)	(DIN 17 200)	(25 CD 4)	(NF A 35-553)
34CrMo4	EN 10083-1	(34 CrMo 4)	(DIN 17 200)	(35 CD 4)	(NF A 35-553)
41 CrMo 4	EU 86-70	41 CrMo 4	DIN 17 212	42 CD 4	NF A 35-553
42CrMo4	EN 10083-1	(42 CrMo 4)	(DIN 17 200)	(42 CD 4)	(NF A 35-553)
17CrNi6-6	prEN 10084	15 CrNi 6	DIN 17 210	-	-
20NiCrMo2-2	prEN 10084	21 NiCrMo 2	DIN 17 210	20 NCD 2	NF A 35-553
18CrNiMo7-6	prEN 10084	17 CrNiMo 7	DIN 17 210	18 NCD 6	not standardized
All non-Mo-alloyed austenitic stainless steels	EN 10088-2	All non-Mo-alloyed austenitic stainless steels	(DIN 17 440)	All non-Mo-alloyed austenitic stainless steels	(NF A 35-573) (NF A 36-209)

Table A.2: Corresponding national designations and standards for category C (30 % increase) (continued)

Europe		United Kingdom		Italy	
Designation	Standardized in:	Designation	Standardized in:	Designation	Standardized in:
L360; L415; L445 S420; S460 S420; S460	EN 10208-2 EN 10113-2; -3 EN 10149-2; -3	- (55EE)	- (BS 4360)	- (Fe E 390; Fe E 460) (Fe E 380; Fe E 420; Fe E 460)	- (UNI 7382-75) (UNI 8890-87)
P460 S460	EN 10028-3; -6 EN 10137-2	- -	- -	Fe E 460 (Fe E 460)	UNI EU 137-89 (UNI EU 137-89)
C 53 C55 C55E	EU 86-70 EN 10083-2 EN 10083-1	070M55 - (070M55)	BS 970:part 1 - (BS 970:part 1)	C 53 (1 C 55) (C 55)	UNI 7847-79; UNI 8551-84 (UNI 8373-82) (UNI 7895-78; UNI 7874-79 UNI 8787-85)
1 CS 55 C60 C60E	EU 132-79 EN 10083-2 EN 10083-1	070M55 - (070M60)	BS 970:part 1 - -	C 55 (1 C 60) (C 60)	UNI 7064-82 (UNI 8373-82) (UNI 7845-78; UNI 7874-79 UNI 8787-85)
1 CS 60 - 1 CS 67	EU 132-79 - EU 132-79	080A57 - 080A67	BS 970:part 1 - -	C 60 - C 67	UNI 7064-82 - UNI 7064-82
25CrMo4	EN 10083-1	(708A25)	(BS 970:part 1)	(25 CrMo 4)	(UNI 7845-78; UNI 7874-79 UNI 8787-85)
34CrMo4	EN 10083-1	(708A30)	(BS 970:part 1)	(35 CrMo 4)	(UNI 7845-78; UNI 7874-79 UNI 8787-85)
41 CrMo 4 42CrMo4	EU 86-70 EN 10083-1	708M40 (708M40)	BS 970:part 1 (BS 970:part 1)	41 CrMo 4 (42 CrMo 4)	UNI 7847-79; UNI 8551-84 (UNI 7845-78; UNI 7874-79 UNI 8787-85)
17CrNi6-6 20NiCrMo2-2	prEN 10084 prEN 10084	- 805M20	- BS 970:part 1	- 20 NiCrMo 2	- UNI 7846-78; UNI 8550-84 UNI 8788-85
18CrNiMo7-6	prEN 10084	820A16	BS 970:part 1	18 NiCrMo 7	UNI 7846-78; UNI 8550-84 UNI 8788-85
All non-Mo-alloyed austenitic stainless steels	EN 10088-2	All non-Mo alloyed aus- tenitic stainless steels	(BS 1449:part 2) (BS 1501:part 3)	All non-Mo-alloyed austenitic stainless steels	(UNI 6900) (UNI 6901) (UNI 7500) (UNI 8317)

Table A.3: Corresponding national designations and standards for category D (40 % increase)

Europe		Germany		France	
Designation	Standardized in:	Designation	Standardized in:	Designation	Standardized in:
L480; L550 S500; S550; S600; S650; S700 S500; S550; S620; S690; S890; S960 P500; P550; P620; P690	EN 10208-2 EN 10149-2  EN 10137-2  EN 10028-6	StE 480.7 (QStE 500; QStE 550)  -  -	DIN 17 172 (SEW 092)  -  -	- -  (E 500 T; E 550 T; E 620 T; E 690 T) -	- -  (NF A 36-204) -
CT 70 1 CS 75 CT 80 - 2 CS 85  2 CS 100  CT 105 CT 120	EU 96-79 EU 132-79 EU 96-79 - EU 132-79  EU 132-79  EU 96-79 EU 96-79	C 70 W 2 C 75 C 80 W 1 C 85 W Ck 85  Ck 101  C 105 W 1 C 125 W	DIN 17 350 DIN 17 222 DIN 17 350 DIN 17 350 DIN 17 222  DIN 17 222  DIN 17 350 not standardized	- C 75 - - XC 90  XC 100  - -	- NF A 37-502 - - NF A 37-502; NF A 35-533 NF A 37-502; NF A 35-533 - -
50CrMo4 36CrNiMo4 34CrNiMo6 30CrNiMo8 - 51CrV4 all grades for instance 39 CrMoV 13 31 CrMo 12 34 CrAlMo 5 41 CrAlMo 7 - - all grades for instance 50 CrV 4 - - 67 SiCr 5 50 CrV 4	EN 10083-1 EN 10083-1 EN 10083-1 EN 10083-1 - EN 10083-1 EU 85-70  EU 85-70 EU 85-70 EU 85-70 - - EU 89-71  EU 89-71 - - EU 132-79 EU 132-79	(50 CrMo 4) (36 CrNiMo 4) (34 CrNiMo 6) (30 CrNiMo 8) 30 CrNiV 8 (50 CrV 4) all grades for instance 39 CrMoV 13 9 31 CrMo 12 34 CrAlMo 5 41 CrAlMo 7 Cf 70 49 CrMo 4 all grades for instance 50 CrV 4 55 Si 7 71 Si 7 67 SiCr 5 50 CrV 4	(DIN 17 200) (DIN 17 200) (DIN 17 200) (DIN 17 200) DIN 17 200 (DIN 17 200) DIN 17 211  DIN 17 211 DIN 17 211 DIN 17 211 DIN 17 211 DIN 17 212 DIN 17 212 DIN 17 221  DIN 17 221 DIN 17 222 DIN 17 222 DIN 17 222 DIN 17 222	- 40 NCD 3 (35 NCD 6) (30 CND 8) - (50 CV 4) - - 30 CD 12 30 CA6.12 - XC 70 - - 50 CV 4 55 S 7 - 50 CV 4	- not standardized - (NF A 35-552) - (NF A 35-553) - - - not standardized - not standardized - - NF A 35-553 NF A 35-533 - NF A 35-571; NF A 35-553
All Mo-alloyed austenitic stainless steels	EN 10088-2	All Mo-alloyed austenitic stainless steels	(DIN 17 440)	All Mo-alloyed austenitic stainless steels	(NF A 35-573; NF A 36-209)

Table A.3: Corresponding national designations and standards for category D (40 % increase)  
(continued)

Europe		United Kingdom		Italy	
Designation	Standardized in:	Designation	Standardized in:	Designation	Standardized in:
L480; L550 S500; S550; S600; S650; S700 S500; S550; S620; S690; S890; S960  P500; P550; P620; P690	EN 10208-2 EN 10149-2  EN 10137-2  EN 10028-6	- - - - -	- - - - -	(Fe E 490; Fe E 560)  (Fe E 500; Fe E 550; Fe E 620; Fe E 690) Fe E 500; Fe E 550; Fe E 620; Fe E 690	- (UNI 8890-84)  (UNI EU 137-89)  UNI EU 137-89
CT 70 1 CS 75 CT 80  2 CS 85 2 CS 100 CT 105 CT 120	EU 96-79 EU 132-79 EU 96-79 - EU 132-79 EU 132-79 EU 96-79 EU 96-79	- 070A72 - - 060A96 - -	- - - - - - -	C 70 KU C 75 C 80 KU - C 85 C 100 C 100 KU C 120 KU	UNI 2955/1-82 UNI 7064-82 UNI 2955/1-82 - UNI 7064-82 UNI 7064-82 UNI 2955/1-82 UNI 2955/1-82
50CrMo4 36CrNiMo4 34CrNiMo6 30CrNiMo8 51CrV4  all grades for instance 39 CrMoV 13 31 CrMo 12 34 CrAlMo 5 41 CrAlMo 7 - - all grades for instance 50 CrV 4 -  67 SiCr 5 50 CrV 4	EN 10083-1 EN 10083-1 EN 10083-1 EN 10083-1 EN 10083-1  EU 85-70  EU 85-70 EU 85-70 EU 85-70 - - EU 89-71  EU 89-71 -  EU 132-79 EU 132-79	(708M40) (817M37) (817M40) (823M30) (735A51)  - 722M24 - - - 735A51 251A58 - 735A51	(BS 970:part 1) - (BS 970:part 1) - (BS 970:part 2)  - BS 970:part 1 - - - BS 970:part 2 BS 970:part 2 - BS 970:part 2	- - - - (50 CrV 4) - - 31 CrMo 12 - 41 CrAlMo 7 - - all grades for instance 50 CrV 4 55 Si 7 - 67 SiCr 5 50 CrV 4	- - - - (UNI 7845-78; UNI 7874-79 UNI 8787-85) - - UNI 8552-84; UNI 8077-80 - UNI 8552-84; UNI 8077-80 - - UNI 3545-80 UNI 3545-80 UNI 3545-80 - UNI 7064-82 UNI 7064-82
All Mo-alloyed austenitic stainless steels	EN 10088-2	All Mo-alloyed austenitic stainless steels	(BS 1449:part 2; BS 1501:part 3)	All Mo-alloyed austenitic stainless steels	(UNI 6900) (UNI 6901) (UNI 7500) (UNI 8317)

**Annex B**  
(informative)

**List of national standards which correspond with EURONORM 96 referenced**

Until the following EURONORM 96 is transformed into a European Standard, it may be either implemented or reference made to the corresponding national standards as listed in table B.1.

Table B.1: EURONORM 96 with corresponding national standards

EURO-NORM	Corresponding national standard in					
	Germany	France	United Kingdom	Spain	Italy	Belgium
96-1979	DIN 17 350	NF A 35-590	BS 4659	UNE 36084-1	UNI 2955/1-2	NBN A 21-227