

Continuously hot-rolled low carbon steel sheet  
and strip for cold formingTechnical delivery conditions  
English version of DIN EN 10111**DIN**  
EN 10111

ICS 77.140.50

Supersedes DIN 1614-2,  
March 1986 edition.

Descriptors: Steel, strip.

Kontinuierlich warmgewalztes Band und Blech aus weichen Stählen  
zum Kaltumformen – Technische Lieferbedingungen**European Standard EN 10111 : 1998 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 its preparation was the *Normenausschuß Eisen und Stahl* (Steel and Iron Standards Committee), Technical Committee *Flacherzeugnisse aus Stahl zum Kaltumformen*.

The DIN Standards corresponding to the CEN document and EURONORMs referred to in clause 2 of the EN are as follows:

CR 10260	DIN V 17006-100
EURONORM 6	DIN 50111
EURONORM 12	DIN 50111

**Amendments**

DIN 1614-2, March 1986 edition, has been superseded by the specifications of EN 10111.

**Previous editions**

DIN 1614-1: 1974-09; DIN 1614-2: 1986-03.

**National Annex NA****Standards referred to**(and not included in **Normative references**)

DIN V 17006-100	Designation systems for steel – Additional symbols for steel names
DIN 50111	Bend testing of metallic materials

EN comprises 11 pages.



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**English version**

**Continuously hot-rolled low carbon steel sheet  
and strip for cold forming**

Technical delivery conditions

Bandes et tôles laminées à chaud en continu, en acier doux pour emboutissage ou pliage à froid – Conditions techniques de livraison

Kontinuierlich warmgewalztes Band und Blech aus weichen Stählen zum Kaltumformen – Technische Lieferbedingungen

This European Standard was approved by CEN on 1996-06-30.

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.

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.

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

**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 has been prepared by Technical Committee ECISS/TC 13 "Flat products for cold working - Qualities, dimensions, tolerances and specific tests", the secretariat of which is held by IBN/BIN.

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 August 1998, and conflicting national standards shall be withdrawn at the latest by August 1998.

The European Committee for Iron and Steel Standardization (ECISS) charged ECISS/TC 13 (Secretariat : IBN) with preparing a European Standard EN 10111 to replace EURONORM 111-1977.

ECISS/TC 13 met on 1994-09-16 in Brussels and agreed on the text for publication as a European Standard. The following countries were represented in that meeting : France, Germany, Netherlands, Sweden and United Kingdom.

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 specifies the grades of continuously hot rolled low carbon steel sheet and strip (in coils) for cold forming.

Depending on its actual width, strip is classified as :

- hot rolled wide strip if its width is greater than or equal to 600 mm;
- hot rolled slit wide strip, if its width is less than 600 mm.

For each grade, it specifies the chemical composition and the mechanical properties.

This European Standard is applicable to products of thickness not less than 1,5 mm and not exceeding 8 mm.

This European Standard is not applicable to products covered by other standards, such as :

- hot rolled products of non-alloy structural steels for general use (EN 10025);
- steel sheet for pressure purposes (EN 10028);
- steel sheet for welded gas cylinders (EN 10120);
- quenched and tempered steels (EN 10083-1 and EN 10083-2).

## 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 10002-1 - Metallic materials - Tensile testing - Part 1 : Method of test (at ambient temperature)

EN 10021 - Steel and iron products - General technical delivery requirements

EN 10027-1 - Designation systems for steels - Part 1 : Steel names, principal symbols

EN 10027-2 - Designation systems for steels - Part 2 : Numerical system

EN 10051 - Continuously hot-rolled uncoated plate, sheet and strip of non-alloy and alloy steels - Tolerances on dimensions and shape

EN 10079 - Definition of steel products

EN 10204 - Metallic products - Types of inspection documents

CR 10260 - Designation systems for steel - Additional symbols for steel names

EURONORM 6 - Bend test for steel

EURONORM 12 - Bend test on steel sheet and strip less than 3 mm thick

## 3 CLASSIFICATION OF GRADES

The choice of the steel grade and product type is left to the purchaser. For this choice, he may be advised by the manufacturer, but without any liability on the part of the latter, unless agreed at the time of ordering.

Hot rolled products are classified into four grades DD 11, DD 12, DD 13 and DD 14 defined by chemical composition, mechanical and forming characteristics (see table 1).

#### 4 DESIGNATION

4.1 Steel symbols are attributed in accordance with EN 10027-1 and CR 10260; numerical designations are attributed in accordance with EN 10027-2.

NOTE : Annex A gives the correspondence with former national designations.

4.2 Products conforming to this draft European Standard shall be designated, in order, in the following way :

- a) Product designation (e.g. "strip", "sheet" or "slit strip cut longitudinally") in line with EN 10079;
- b) Number of this European Standard (EN 10111);
- c) Symbolic or numerical designation of the steel, shown in table 1.  
Example : Strip EN 10111 - DD 13 or strip EN 10111 - 1.0335.

#### 5 REQUIREMENTS

##### 5.1 Steel-making and manufacturing process

Unless otherwise agreed at the time of ordering, the steel-making and manufacturing processes are left to the discretion of the manufacturer. The purchaser shall be informed of these processes, if he specifies it.

##### 5.2 Method of deoxidation

For grade DD 11 the method of deoxidation shall be at the manufacturer's discretion. Grades DD 12, DD 13 and DD 14 shall be fully killed.

##### 5.3 Chemical composition

Table 1 gives the permissible chemical composition limits in the cast.  
Table 2 gives the permissible deviations for the product analysis.

##### 5.4 Delivery condition

5.4.1 The products shall normally be delivered with their surface as rolled. By agreement at the time of ordering, the products may be delivered with descaled surface. When they are delivered as rolled, they are covered with a thin layer of scale of variable coloration.

The products may be supplied with a light skin-pass, either at the manufacturer's discretion or by agreement at the time of ordering.

5.4.2 The descaled products are normally delivered oiled. In this case, both surfaces are preserved by a layer of neutral non-drying oil, free of foreign bodies, and uniformly spread in such a way that under normal conditions of packaging, transportation, handling and storage the products will show no corrosion for up to three months.

The layer of oil shall be capable of being removed by alkaline solutions or normal solvents.

The choice of protective oils may be the subject of special agreement at the time of ordering.

If the conditions of transportation or storage are such that special protection against corrosion is required, the purchaser shall inform the manufacturer at the time of ordering.

If the purchaser does not require the surfaces to be oiled, this shall be clearly indicated at the time of ordering.

NOTE : If the order is for un-oiled products, the manufacturer is not responsible for the risk of rust.  
The purchaser is also advised that there is a greater risk of the appearance of light scratches during handling, transportation and putting into application.

**5.4.3** Descaled products may be supplied with trimmed edges upon agreement at the time of ordering (designation GK following EN 10051).

### **5.5 Choice of properties**

The products covered by this standard correspond to the requirements of table 1.

Subject to special agreement, they may be supplied with special suitability for the production of a specific part. In this case, a maximum rejection percentage may be set by mutual agreement and acceptance on the basis of mechanical properties does not apply.

### **5.6 Mechanical properties**

Table 1 gives the basic mechanical properties valid for the four grades.

The four grades correspond to the increasing formability in the order DD 11 to DD 14.

The characteristics indicated in table 1 are valid for the period specified in the same table 1, from the date on which the products are made available.

The date of availability shall be notified to the purchaser with reasonable prior notice compatible with the validity of the mechanical properties.

### **5.7 Surface appearance**

The sheets shall not have any slivers, blow holes, seams, cracks or scratches which would adversely affect their use.

Pores, small pits, small marks, small scratches, kinks from pay-off reels and a slight coloration are permitted.

The defects shall not be of such an extent that they might run the risk of causing failure or damage to tooling or welding difficulties when in use.

The surface appearances of the unwound coil are assessed as for sheets. However, the percentage of surface defects is generally greater than when supplied in sheets. The maximum percentage of permissible rejections shall be fixed by special agreement at the time of ordering.

### **5.8 Weldability**

Suitability for normal welding processes is ensured. It is, however, desirable to state the welding procedure at the time of ordering but essential to do so in the case of gas welding.

For non-descaled products, the welding process shall take into account the presence of a layer of scale.

### **5.9 Tolerances on dimensions and shape**

The tolerances on dimensions and shape are given in EN 10051.



Table 1 : Characteristics 1)

Designation in accordance with EN 10027-1 and IC 10	Designation in accordance with EN 10027-2	Method of deoxidation	Chemical composition (max) from ladle analysis <sup>2)</sup>				Tensile properties <sup>3)</sup>				Bend test radius <sup>4)</sup>	Validity of mechanical properties		
			%				$R_m$	Minimum elongation after fracture %		Bend test radius <sup>4)</sup>				
			C	Mn	P	S		$R_d$ N/mm <sup>2</sup>	$R_m$ N/mm <sup>2</sup>				Minimum elongation after fracture %	
DD 11	1.0332	At the discretion of the manufacturer	0,12	0,60	0,045	0,045	170 - 360	170 - 340	440	23	24	28	1 e	1 month
DD 12	1.0398	Fully killed	0,10	0,45	0,035	0,035	170 - 340	170 - 320	420	25	26	30	0	6 months
DD 13	1.0335	Fully killed	0,08	0,40	0,030	0,030	170 - 330	170 - 310	400	28	29	33	0	6 months
DD 14	1.0389	Fully killed	0,08	0,35	0,025	0,025	170 - 310	170 - 290	380	31	32	36	0	6 months

1) The mechanical characteristics relate only to hot rolled non-descaled or chemically descaled and oiled products, skin-passed or not.

2) Unless otherwise agreed at the time of ordering, nitrogen-fixing elements such as titanium and boron may be added at the discretion of the manufacturer.

3) As long as the width of the product permits, the test pieces for the tensile tests shall be taken perpendicular to the direction of rolling.

4) See EURONORM 6 and EURONORM 12.

**Table 2 :** Permissible deviations of the product analysis from the specified limits of the ladle analysis

Element	Limit of the ladle analysis %	Permissible deviation of the product analysis from the specified limit of the ladle analysis %
C	≤ 0,12	+ 0,02
Mn	≤ 0,60	+ 0,05
P	≤ 0,045	+ 0,005
S	≤ 0,045	+ 0,005

**5.10 Suitability for surface coating**

The products covered by the standard are suitable for surface coatings. However, the type of coating should be indicated to the manufacturer at the time of ordering.

**6 TESTS**

**6.1 General**

6.1.1 The purchaser shall specify at the time of ordering his requirements for :

- type of inspection : in accordance with EN 10021.
- type of inspection document for the products : in accordance with EN 10204.

6.1.2 Specific inspection and testing shall be carried out in accordance with 6.2 to 6.7.

**6.2 Inspection unit**

The inspection unit for products of the same grade and nominal thickness is given in table 3.

**Table 3 :** Inspection unit

Steel designation	Inspection unit t
DD 11	150
DD 12	100
DD 13	60
DD 14	40

**6.3 Number of tests**

A series of tests comprises all the tests necessary to verify the specified characteristics :

- a tensile test;
- by agreement at the time of ordering, a product chemical analysis.

**6.4 Sampling**

For sheets, the selection of the product(s) for testing is left to the discretion of the inspection representative.

For wide strips and slit wide strips, the samples should preferably be taken from the outer end.

For sheets and wide strips, the samples shall be taken so that the axis of the test pieces is at half distance between the edge and the axis of the products.

The test pieces for the tensile tests shall be taken perpendicular to the direction of rolling unless otherwise agreed at the time of ordering.

## 6.5 Test method

The tensile tests shall be carried out in accordance with EN 10002-1.

The lower yield point ( $R_{eL}$ ) shall be determined to verify the yield stress values indicated in table 1.

If there are no yield point phenomena, the 0,2 % proof stress ( $R_{p0.2}$ ) shall be determined and shall satisfy the values in table 1. In cases of dispute, the 0,2 % proof stress value ( $R_{p0.2}$ ) shall be determined.

### 6.5.1 Product thickness less than 3 mm

The test piece used (initial gauge length  $L_0 = 80$  mm, width  $b = 20$  mm) shall be of type 2 as described in Annex A of EN 10002-1 : the thickness of the test piece is that of the sheet.

### 6.5.2 Product thickness greater than or equal to 3 mm

The test piece used is the proportional test piece with an initial gauge length  $L_0$  given by the formula :

$$L_0 = 5,65 \sqrt{S_0}$$

where  $S_0$  is the original cross-sectional area of the parallel length of the test piece; the maximum parallel width is 30 mm and the thickness is that of the sheet.

## 6.6 Interpretation of results

### 6.6.1 Acceptance of the goods supplied

All the conditions imposed shall be met for the goods supplied to be accepted.

### 6.6.2 Invalidation of tests

If a test is incorrectly executed, it is invalidated.

Incorrect execution means defective machining, incorrect assembly in the testing machine, incorrect functioning of the testing machine or any other similar fault.

## 6.7 Inspection documents

Following agreement at the time of ordering, an inspection document from those specified in EN 10204 shall be completed.

## 7 MARKING

When marking is specified, the following information shall be given :

- the grade designation, in accordance with the designation rules given in clause 4 of this standard;
- the cast number;
- indication of the origin or mark of the supplier.

If the goods are supplied in coils or sheets in bound bundles, the marking may be on a label attached to the coil or bundle.

## **8 PACKAGING**

The packaging requirements shall be agreed at the time of ordering.

## **9 DISPUTES AFTER DELIVERY**

With regard to any claims and actions arising therefrom, EN 10021 shall apply.

**Annex A**  
(informative)

**Corresponding former steel designations**

**Table A.1 : List of corresponding former national designations**

Designation			Corresponding previous designations in				
following	following	following	Germany	France	United Kingdom	Spain	Italy
EN 10027-1 and CR 10260	EN 10027-2	EU 111.77	DIN 1614	NF A 36-301	BS 1449	UNE 36.086	UNI 5867
DD 11	1.0332	FeP11	SiW22	1C	HR3	AP11	FeP11
DD 12	1.0398	FeP12	RRSiW23				
DD 13	1.0335	FeP13	SiW24	3C	HR1	AP13	FeP13
DD 14	1.0389			3CT			

**ANNEX B**  
(informative)

**Bibliography**

- EN 10025      Hot-rolled products of non alloy structural steels - Technical delivery conditions
- EN 10028-1    Flat products made of steels for pressure purposes - Part 1 : General requirements
- 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 10083-1    Quenched and tempered steels - Part 1 : Technical delivery conditions for special steels
- EN 10083-2    Quenched and tempered steels - Part 2 : Technical conditions for unalloyed quality steels
- EN 10120      Steel sheet and strip for welded gas cylinders