



**SLOVENSKI STANDARD**  
**SIST EN 10107:1997**  
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Grain-oriented electrical steel sheet and strip delivered in the fully processed state

Kornorientiertes Elektroblech und -band im schlußgeglühten Zustand

Bandes et tôles magnétiques a grains orientés livrées a l'état fini

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**Ta slovenski standard je istoveten z: EN 10107:1995**

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**ICS:**

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EUROPEAN STANDARD

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English version

## Grain-oriented electrical steel sheet and strip delivered in the fully processed state

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This European Standard was approved by CEN on 1995-11-23. 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, 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

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## Foreword

This European Standard has been prepared by the Technical Committee ECISS/TC 24 "Electrical steel and strip qualities - Qualities, dimensions, tolerances and specific tests" of which the secretariat is held by AFNOR.

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of an identical text or by endorsement, at the latest by June 1996, and conflicting national standards shall be withdrawn at the latest by June 1996.

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 the United Kingdom.

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## 1 Scope

This European Standard defines the grades of grain-oriented electrical sheet steel in nominal thicknesses of 0,23 mm, 0,27 mm, 0,30 mm and 0,35 mm. In particular, it gives general requirements, magnetic properties, geometric characteristics and tolerances and technological characteristics, as well as inspection procedures.

This European Standard applies to Goss textured grain-oriented magnetic sheet steel supplied in the final annealed condition in sheets or coils, and intended for the construction of magnetic circuits.

The materials are grouped into three classes :

- normal material ;
- material with reduced loss ;
- material with high permeability.

They correspond to Clause C22 of IEC 404-1.

## 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.

[SIST EN 10107:1997](https://standards.iteh.ai/catalog/standards/sist/10283ed1-65ae-4718-a248-)

IEC 50 (121)	<a href="https://standards.iteh.ai/catalog/standards/sist/10283ed1-65ae-4718-a248-">https://standards.iteh.ai/catalog/standards/sist/10283ed1-65ae-4718-a248-</a> International Electrotechnical Vocabulary (IEV) - Chapter 121 : Electromagnetism
IEC 50(221)	International Electrotechnical Vocabulary (IEV) - Chapter 221 : Magnetic materials and components
IEC 404-1	Magnetic materials - Part 1 : Classification
IEC 404-2	Magnetic materials - Part 2 : Methods of measurement of magnetic magnetic, electrical and physical properties of magnetic sheet and strip
IEC 404-3	Magnetic materials - Part 3 : Methods of measurement of the magnetic properties of magnetic sheet and strip by means of a single sheet tester
IEC 404-11	Magnetic materials - Part 11 : Methods of test for the determination of surface insulation resistance
ISO 7799	Metallic materials - Sheet and strip 3 mm thick or less - Reverse bend test
EN 10021	General technical delivery requirements for steel and steel products
EN 10027-1	Designation systems for steel - Part 1 : Steel name - Principal symbols
EN 10027-2	Designation systems for steel - Part 2 : Numerical system

EN 10204	Metallic products - Types of inspection documents
EN 10251	Magnetic materials - Methods of determination of the geometrical characteristics of magnetic steel sheet and strip
EURONORM 118 <sup>1)</sup>	Methods for determination of magnetic characteristics of magnetic sheets by means of the 25 cm Epstein frame.

### 3 Definitions

The definitions of the principal terms relative to magnetic properties employed in this standard are given in IEC 50(121) and IEC 50 (221).

In addition for the purpose of this European Standard the following definitions apply :

**3.1 edge camber :** The greatest distance between a longitudinal edge of the sheet and the line joining the two extremities of the measured length of this edge.

**3.2 flatness :** Property of a sheet or of a length of strip which is characterized by the wave factor i.e. by the relation of the height of the wave to its length.

**3.3 number of bends :** The number of alternate bends possible before the appearance of the first crack in the base metal visible to the naked eye ; it constitutes an indication of the ductility of the material.

**3.4 internal stresses :** Stresses which are characterized by a deviation in relation to the line of cutting.

### 4 Classification

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The grades covered by this European Standard are classified according to the value of maximum specific total loss in watts per kilogram and according to the nominal thickness of the material (0,23 mm, 0,27 mm, 0,30 mm, 0,35 mm).

### 5 Designation

**5.1** For the steel grades covered by this European Standard, the steel names are allocated in accordance with EN 10027-1 ; the steel numbers are allocated in accordance with EN 10027-2.

**5.2** The steel name comprises the following in the order given:

1) the letter M for electrical steel,

2) one hundred times the specified value of maximum specific total loss at 50 Hz, in watts per kilogram corresponding to the nominal product thickness, at :

- 1,5 T for normal material,

- 1,7 T for material with reduced loss and for material with high permeability,

3) one hundred times the nominal thickness of the material, in millimetres,

<sup>1)</sup> Until this EURONORM is transformed into European Standard, it can either be implemented or reference made to the corresponding national standard.

## 4) the characteristic letter :

- N for grain oriented materials with normal loss ;
- S for grain oriented materials with reduced loss ;
- P for grain oriented materials with high permeability.

**EXAMPLE :** M097-30N for normal grain oriented electrical steel sheet or strip with a maximum specific total loss at 1,5 T of 0,97 W/kg at 50 Hz and a nominal thickness of 0,30 mm, supplied in the fully processed state.

## 6 General requirements

### 6.1 Production process

The production process of the steel and its chemical composition are left to the discretion of the manufacturer.

### 6.2 Form of supply

The material is supplied in bundles in the case of sheets and in coils in the case of strip.

The mass of bundles of sheets or of coils shall be agreed at the time of ordering.

The recommended value for the internal diameter of coils is approximately 500 mm.

Sheets which make up each bundle shall be stacked so that the side faces are substantially flat and approximately perpendicular to the top face.

Strip shall be of constant width and wound in such a manner that the edges are superimposed in a regular manner and that the side faces of the coil are substantially flat.

Coils shall be wound sufficiently tightly in order that they do not collapse under their own weight.

Strip may exhibit welds resulting from the removal of defective zones if agreed at the time of enquiry. If necessary the marking of welds may be agreed at the time of ordering.

For coils containing repair welds, each part of the strip shall be of the same grade.

The edges of parts welded together shall not be so much out of alignment as to affect the further processing of the material.

### 6.3 Delivery condition

Grain-oriented materials are usually supplied with an insulating coating on both sides. This coating generally consists of a vitrified film composed essentially of silicates of magnesium on which has been deposited a second coating of inorganic constituents such as phosphates, normally as part of a thermal flattening operation <sup>2)</sup>.

<sup>2)</sup> Other types of coating exist which are used only when particularly specified.



## 6.4 Surface condition

The surfaces shall be smooth and clean, free from grease and rust <sup>3)</sup>. Dispersed defects such as scratches, blisters, cracks, etc., are permitted if they are within the limits of the tolerances on thickness and if they are not detrimental to the correct use of the supplied material.

The insulation coating present on the surface of the material shall be sufficiently adherent so that it does not become detached during cutting operations or heat treatment under conditions specified by the supplier.

NOTE : If the product is to be immersed in a fluid, an agreement, initiated by the purchaser, should be reached to ensure compatibility between the fluid and the coating.

## 6.5 Suitability for cutting

The material shall be able to be cut at any point and into the usual shapes thus ensuring accurate working with the correct cutting tools.

## 7 Technical requirements

### 7.1 Magnetic properties

The properties defined in 7.1.1 and 7.1.2 are applicable to materials in the delivery conditions defined in 6.3.

#### 7.1.1 Magnetic polarization (standards.iteh.ai)

The specified minimum values of a magnetic polarization for magnetic field strength of 800 A/m (peak value) shall be as given in tables 2, 3 and 4.

The magnetic polarization shall be determined in an alternating magnetic field (expressed as a peak value) at 50 Hz.

#### 7.1.2 Specific total loss

The specified values of maximum specific total loss at 50 Hz shall be as given in tables 2, 3 and 4. They apply to aged test specimens cut parallel to the axis of rolling that have received, after cutting, a stress relief heat treatment under conditions specified by the manufacturer.

Annex A gives, for guidance only, the maximum specific total loss at 60 Hz for magnetic polarizations of 1,5 T and 1,7 T.

### 7.2 Geometric characteristics and tolerances

#### 7.2.1 Thickness

The nominal thicknesses of the material are 0,23 mm, 0,27 mm, 0,30 mm and 0,35 mm.

For thickness tolerance, a distinction is made between :

- the allowable tolerance on the nominal thickness within the same acceptance unit,
- the difference in thickness in a sheet or in a length of strip in a direction parallel to the direction of rolling,

<sup>3)</sup> Not to be confused with some colouration of the insulating coating inherent in the manufacturing process.

- the difference in thickness in a direction perpendicular to the direction of rolling. This tolerance applies only to materials with a width greater than 150 mm.

At any point, the allowable tolerance on the nominal thickness within the same acceptance unit shall not exceed  $\pm 0,030$  mm except for the 0,23 mm thickness for which this tolerance shall not exceed  $\pm 0,025$  mm. The additional thickness due to welds with respect to the measured thickness of the steel sheet or strip shall not exceed 0,050 mm.

The difference in thickness in a sheet or in a length of strip of 1,5 m in a direction parallel to the direction of rolling shall not exceed 0,030 mm.

In addition, for material with a width greater than 150 mm, the difference in thickness in a direction perpendicular to the direction of rolling shall not exceed 0,020 mm, the measurements being made at least 40 mm from the edges.

### 7.2.2 Width

The available nominal widths are less than or equal to 1 000 mm.

The material can be supplied either in a width chosen from the specific range of the manufacturer, or in the finally used width.

For width tolerances :

- for material supplied in a width chosen from the specific range of the manufacturer, the tolerances permitted shall be  $+2$  mm,
- for material supplied in the finally used width, the tolerances of table 1 shall apply :

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 Table 1 : Tolerances on nominal width

Nominal width $l$ (mm)	Tolerance (mm)
$l \leq 150$	( 0 ( - 0,2
$150 < l \leq 400$	( 0 ( - 0,3
$400 < l \leq 750$	( 0 ( - 0,5
$l > 750$	( 0 ( - 0,6

NOTE : By agreement when ordering, the tolerances on the nominal width can all be plus tolerances.

### 7.2.3 Length

The tolerance on length of sheets in relation to the length ordered shall be  $\left\{ \begin{array}{l} +0,5\% \\ 0 \end{array} \right.$ , but with a maximum of 6 mm.

### 7.2.4 Edge camber

The verification of edge camber does not apply to material of width less than or equal to 150 mm. The edge camber shall not exceed 0,5 mm for a measuring length of 1,5 m.

### 7.2.5 Flatness (wave factor)

The verification of the flatness does not apply to material of width less than or equal to 150 mm. The wave factor (see 8.4.2.4), expressed as a percentage, shall not exceed 1,5.

### 7.2.6 Residual curvature

A requirement concerning residual curvature may be specified by agreement when ordering, for material of width greater than 150 mm.

In this case the distance between the bottom edge of the test piece and the supporting plate shall not exceed 35 mm for sheets and shall be subject to agreement for coils.

### 7.2.7 Burr height

The determination of the burr height applies only to material delivered in the width in which it will finally be used. The measured burr height shall not exceed 0,025 mm.

## 7.3 Technological characteristics

### 7.3.1 Density

The density of the material is not specified.

The conventional value of density used to calculate the magnetic properties and the stacking factor shall be  $7,65 \text{ kg/dm}^3$ .

### 7.3.2 Stacking factor

The minimum values shall be as specified in tables 2, 3 and 4.

### 7.3.3 Number of bends

The specified minimum number of bends is 1. This value applies to test specimens cut parallel to the direction of rolling.

### 7.3.4 Internal stresses

The material shall be, as far as possible, free from internal stresses.

The verification of internal stress is not applicable to material of width less than 500 mm (slit material). The measured gap shall not exceed 1 mm (see 8.3.3.3).