



**SLOVENSKI STANDARD**  
**SIST EN 10265:1997**

**01-december-1997**

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**Magnetni materiali - Specifikacija jeklenih pločevin in trakov s specifičnimi mehanskimi lastnostmi in magnetno permeabilnostjo**

Magnetic materials - Specification for steel sheet and strip with specified mechanical properties and magnetic permeability

Magnetische Werkstoffe - Anforderungen an Blech und Band aus Stahl mit festgelegten mechanischen und magnetischen Eigenschaften

Matériaux magnétiques - Spécification des tôles en acier a caractéristiques mécaniques et perméabilité magnétique garanties

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**Ta slovenski standard je istoveten z: EN 10265:1995**

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**ICS:**

29.030	Magnetni materiali	Magnetic materials
77.140.50	Ploščati jekleni izdelki in polizdelki	Flat steel products and semi-products

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**en**

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EUROPEAN STANDARD

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Descriptors: metal plates, steels, magnetic alloys, specifications, mechanical properties, magnetic permeability

English version

**Magnetic materials - Specification for steel sheet  
and strip with specified mechanical properties and  
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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.

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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

## Contents list

### Foreword

<b>1</b>	<b>Scope</b>
<b>2</b>	<b>Normative references</b>
<b>3</b>	<b>Definitions</b>
3.1	Flatness
3.2	Edge camber
<b>4</b>	<b>Classification</b>
<b>5</b>	<b>Designation</b>
<b>6</b>	<b>General requirements</b>
6.1	Production process
6.2	Form of supply
6.3	Delivery condition
6.4	Surface condition
6.5	Suitability for cutting
6.6	Suitability for welding
<b>7</b>	<b>Technical requirements</b>
7.1	Mechanical properties
7.2	Magnetic properties
7.3	Geometrical characteristics and tolerances
<b>8</b>	<b>Inspection</b>
8.1	General
8.2	Selection of samples
8.3	Preparation of test specimens
8.4	Test method
<b>9</b>	<b>Additional tests</b>
<b>10</b>	<b>Complaints</b>
<b>11</b>	<b>Ordering information</b>

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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.

IEC Publication 404-8-5 was submitted to the primary questionnaire (PQ) procedure in CEN and CENELEC.

This European Standard is technically in accordance with IEC 404-8-5 with some editorial amendments.

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 steel sheet and strip with specified mechanical properties and magnetic permeability. In particular it gives the technological, mechanical and magnetic properties, the dimensional tolerances as well as the conditions of acceptance.

This European Standard applies to material used for the poles and rims of rotating electrical machines.

These materials correspond to clause D2 of IEC 404-1.

## 2 Normative references

This European Standard incorporates by dated or undated references 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.

IEC 50 (121)	International Electrotechnical Vocabulary (IEV), Chapter 121; Electromagnetism
IEC 50 (221)	International Electrotechnical Vocabulary (IEV), Chapter 221; Magnetism
IEC 404-1	Magnetic materials - Part 1: Classification
IEC 404-2	Magnetic materials - Part 2: Methods of measurement of magnetic, electrical and physical properties of magnetic sheet and strip
IEC 404-4	Magnetic materials - Part 4: Methods of measurement of the d.c. magnetic properties of solid steels
EN 10002-1	Metallic materials - Tensile testing - Part 1: Method of test (at ambient temperature)
EN 10021	General technical delivery conditions for iron and steel products
EN 10027-2	Designation system for steels - Part 2: Numerical system
ISO 2566-1	Steel - Conversion of elongation values - Part 1: Carbon and low alloy steels

## 3 Definitions

The definition of the principal terms relative to magnetic characteristics 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 flatness

#### 3.1.1 flatness of a sheet:

The maximum height of any point of the sheet above a flat horizontal surface, the sheet resting freely on this surface.

#### 3.1.2 flatness of a strip:

The property 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.

### 3.2 edge camber:

The greatest distance between one longitudinal edge of a length of strip and the line joining the two ends of the measured section corresponding to this edge.

## 4 Classification

The grades covered by this standard are classified according to the minimum value of the 0,2 % proof stress in newtons per square millimetre<sup>1)</sup> and according to the minimum value of the magnetic flux density for a magnetic field strength of 15 kA/m.

The grades are classified in two groups according to their manufacturing process: hot-rolled materials and cold-rolled materials.

## 5 Designation

5.1 The conventional designation<sup>2)</sup> of the different grades comprises the following in the order given:

- 1) the specified minimum value of the 0,2 % proof stress of the material, in newtons per square millimetre;
- 2) one hundred times the nominal thickness of the product, in millimetres;
- 3) one hundred times the specified minimum value of the magnetic flux density in teslas for a magnetic field strength of 15 kA/m.

### EXAMPLE:

350-100 - TF 181 for a cold-rolled material with a minimum magnetic flux density of 1,81 T for a magnetic field strength of 15 kA/m, a specified minimum 0,2 % proof stress of 350 N/mm<sup>2</sup>, and a nominal thickness of 1,0 mm.

5.2 The numerical designation is in accordance with EN 10027-2.

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<sup>1)</sup> 1 N/mm<sup>2</sup> = 1 MPa

<sup>2)</sup> The designation of steel products specified in this standard is not included in EN 10027-1, therefore, the designations used are those in IEC 404-8-5

## 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 sheets which make up each bundle shall be stacked so that their edges are superimposed in a regular manner.

The strip shall be of constant width, and wound in such a way that the edges are superimposed in a regular manner and the end faces of the coil are substantially flat.

The coils shall be sufficiently tightly wound that they do not collapse under their own weight.

The strips may occasionally exhibit welds or interleaves resulting from the junction made after removal of the defective zones or from the joining of several lengths to obtain the sizes of the coils required by the user. In the absence of prior agreement, the form of repair is left to the discretion of the manufacturer. The welds or interleaves shall be marked.

For coils containing repair welds or interleaves, each part of the strip shall be of the same quality. The edges of the parts welded together shall not be so much out of alignment that their ability to be worked is affected.

SIST EN 10265:1997

Material supplied in sheets shall not contain any welds.

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

### 6.3 Delivery condition

The materials are normally supplied without an insulating coating. By agreement, the materials can be supplied with an insulating coating on one or both sides. In this case, the nature of the insulating coating, its properties and their verification shall be subject to special agreement when ordering.

Materials produced by hot-rolling are normally supplied with an oxide scale coating unless they have been ordered pickled.

By agreement, the products can be supplied lightly coated with oil.

Coils supplied with trimmed edges and sheets shall not contain burrs or cutting distortions which are prejudicial to the method of working of the material.

### 6.4 Surface condition

Unless indicated otherwise, the surfaces shall be smooth and clean, free from grease and rust as well as all other defects such as scratches, blisters, cracks etc. (see clause 10). However,



dispersed defects can be tolerated if they are within the tolerance limits for thickness and if they are not detrimental to the correct use of the finished product.

### 6.5 Suitability for cutting

The material shall be capable of being cut or punched without causing premature wear of tools; it shall be able to be cut at any point and in the usual shapes thus ensuring precise working with appropriate tools in good condition. If there are special requirements for an acceptance test for punching or shearing, these shall be established between the supplier and the purchaser.

### 6.6 Suitability for welding

The suitability for welding of the material can be the subject of agreement when ordering.

## 7 Technical requirements

### 7.1 Mechanical properties

The minimum specified values of the 0,2 % proof stress ( $R_{p0,2}$ ), of the tensile strength ( $R_m$ ) and of the percentage elongation after fracture ( $A_{80mm}$ ) are given in Tables 1 and 2.

### 7.3 Magnetic properties

The minimum specified values for the magnetic flux density for magnetic field strengths of 5000 and 15 000 A/m are given in Tables 1 and 2.

### 7.3 Geometrical characteristics and tolerances

SIST EN 10265:1997

#### 7.3.1 Thickness

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The recommended nominal thicknesses are the following:

- hot-rolled materials: 1,6 mm, 1,8 mm, 2,0 mm, 2,5 mm, 3,0 mm, 3,2 mm and 4,5 mm;
- cold-rolled materials: 0,5 mm, 1,0 mm, 1,6 mm, 1,8 mm, and 2,0 mm.

For thickness tolerance, a distinction is made between:

- the variation in nominal thickness within the same unit of acceptance;
- the variation in thickness of a sheet or in a length of strip in a direction parallel to the direction of rolling;
- the variation in thickness of a sheet or in a length of strip in a direction perpendicular to the direction of rolling. This tolerance applies only to material with a width greater than 150 mm.

7.3.1.1 The allowable tolerance on the nominal thickness within the same unit of acceptance is dependent on the type of rolling and on the grade of the material:

a) Hot-rolled materials:

- i) grades with a proof stress equal to or less than 300 N/mm<sup>2</sup>;

The following table gives the permitted tolerances as a function of the nominal width of the material:

Nominal width l (mm)	Permitted tolerances for nominal thickness e (mm)					
	$e \leq 1,5$	$1,5 < e \leq 2$	$2 < e \leq 2,5$	$2,5 < e \leq 3$	$3 < e \leq 4$	$4 < e \leq 5$
$l \leq 600$	$\pm 0,14$	$\pm 0,16$	$\pm 0,17$	$\pm 0,17$	$\pm 0,17$	$\pm 0,18$
$600 < l \leq 1\ 200$	$\pm 0,16$	$\pm 0,18$	$\pm 0,20$	$\pm 0,21$	$\pm 0,23$	$\pm 0,27$
$l > 1\ 200$	$\pm 0,18$	$\pm 0,20$	$\pm 0,22$	$\pm 0,23$	$\pm 0,25$	$\pm 0,28$

ii) grades with a proof stress greater than  $300\text{ N/mm}^2$  and less than or equal to  $400\text{ N/mm}^2$ :

The following table gives the permitted tolerances as a function of the normal width of the material:

Nominal width l (mm)	Permitted tolerances for nominal thickness e (mm)					
	$e \leq 1,5$	$1,5 < e \leq 2$	$2 < e \leq 2,5$	$2,5 < e \leq 3$	$3 < e \leq 4$	$4 < e \leq 5$
$l \leq 600$	$\pm 0,15$	$\pm 0,18$	$\pm 0,19$	$\pm 0,19$	$\pm 0,19$	$\pm 0,20$
$600 < l \leq 1\ 200$	$\pm 0,21$	$\pm 0,23$	$\pm 0,25$	$\pm 0,26$	$\pm 0,29$	$\pm 0,34$
$l > 1\ 200$	$\pm 0,22$	$\pm 0,25$	$\pm 0,28$	$\pm 0,29$	$\pm 0,31$	$\pm 0,35$

iii) grades with a proof stress greater than  $400\text{ N/mm}^2$ :

The following table gives the permitted tolerances as a function of the nominal width of the material:

Nominal width l (mm)	Permitted tolerances for nominal thickness e (mm)					
	$e \leq 1,5$	$1,5 < e \leq 2$	$2 < e \leq 2,5$	$2,5 < e \leq 3$	$3 < e \leq 4$	$4 < e \leq 5$
$l \leq 600$	$\pm 0,19$	$\pm 0,22$	$\pm 0,24$	$\pm 0,24$	$\pm 0,24$	$\pm 0,24$
$600 < l \leq 1\ 200$	$\pm 0,26$	$\pm 0,29$	$\pm 0,31$	$\pm 0,32$	$\pm 0,36$	$\pm 0,43$
$l > 1\ 200$	$\pm 0,27$	$\pm 0,31$	$\pm 0,35$	$\pm 0,36$	$\pm 0,39$	$\pm 0,44$

## b) Cold-rolled materials:

The following table gives the permitted tolerances for all grades:

Nominal width $l$ (mm)	Permitted tolerances for nominal thickness $e$ (mm)							
	$0,4 < e \leq 0,6$	$0,6 < e \leq 0,8$	$0,8 < e \leq 1$	$1 < e \leq 1,2$	$1,2 < e \leq 1,5$	$1,5 < e \leq 2$	$2 < e \leq 2,5$	$2,5 < e \leq 3$
$l \leq 600$	$\pm 0,04$	$\pm 0,05$	$\pm 0,05$	$\pm 0,07$	$\pm 0,07$	$\pm 0,08$	$\pm 0,08$	$\pm 0,10$
$600 < l \leq 1\ 200$	$\pm 0,08$	$\pm 0,09$	$\pm 0,10$	$\pm 0,12$	$\pm 0,14$	$\pm 0,16$	$\pm 0,18$	$\pm 0,20$
$l > 1\ 200$	$\pm 0,09$	$\pm 0,10$	$\pm 0,11$	$\pm 0,13$	$\pm 0,15$	$\pm 0,17$	$\pm 0,20$	$\pm 0,23$

7.3.1.2 The variation in thickness within a sheet or a length of coil of 2 m in a direction parallel to the direction of rolling shall not exceed:

- 8 % of the nominal value for the thicknesses  $e \leq 1,5$  mm;
- 5 % of the nominal value for the thicknesses  $e > 1,5$  mm.

7.3.1.3 The variation in thickness in a direction perpendicular to the direction of rolling shall not exceed the values in the tables below:

## a) Hot-rolled material

Proof stress $R_{p0,2}$ (N/mm <sup>2</sup> )	Nominal thickness $e$ (mm)	Permitted difference for width $l$ (mm)		
		$150 \leq l \leq 600$	$600 < l \leq 1\ 200$	$l > 1\ 200$
$\leq 450$	$e \leq 1,5$	0,05	0,07	-
	$e > 1,5$	0,06	0,08	0,10
$> 450$	$e \leq 1,5$	0,10	0,12	-
	$e > 1,5$	0,12	0,14	0,16

## b) Cold-rolled material:

Proof stress $R_{p0,2}$ (N/mm <sup>2</sup> )	Nominal thickness $e$ (mm)	Permitted difference for width $l$ (mm)		
		$150 \leq l \leq 600$	$600 < l \leq 1\ 200$	$l > 1\ 200$
$\leq 350$	$e \leq 0,7$	0,03	0,04	0,05
	$e > 0,7$	0,04	0,05	0,06
$> 400$	$e \leq 0,7$	0,04	0,05	0,06
	$e > 0,7$	0,06	0,07	0,08

## 7.3.2 Width

The commonly available nominal widths are less than 1 250 mm.