



# SLOVENSKI STANDARD

## SIST EN 10303:2016

01-januar-2016

Nadomešča:  
SIST EN 10303:2002

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**Tanka magnetna jeklena pločevina in trakovi za uporabo pri srednjih frekvencah**

Thin magnetic steel sheet and strip for use at medium frequencies

Dünnes Elektroblech und -band aus Stahl zur Verwendung bei mittleren Frequenzen

Tôles et bandes magnétiques extra-minces en acier pour utilisation à moyennes fréquences  
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**Ta slovenski standard je istoveten z: EN 10303:2015**  
SIST EN 10303:2016  
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**ICS:**

77.140.40	Jekla s posebnimi magnetnimi lastnostmi	Steels with special magnetic properties
77.140.50	Ploščati jekleni izdelki in polizdelki	Flat steel products and semi-products

**SIST EN 10303:2016**

**en,fr,de**

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EUROPEAN STANDARD

EN 10303

NORME EUROPÉENNE

EUROPÄISCHE NORM

October 2015

ICS 77.140.40; 77.140.50

Supersedes EN 10303:2001

English Version

## Thin magnetic steel strip and sheet for use at medium frequencies

Bandes et tôles extra-minces en acier électrique pour utilisation à moyennes fréquences

Dünnes Elektrobund und -blech aus Stahl zur Verwendung bei mittleren Frequenzen

This European Standard was approved by CEN on 29 August 2015.

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 CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

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**EN 10303:2015 (E)****European foreword**

This document (EN 10303:2015) has been prepared by Technical Committee ECISS/TC 108 “Steel sheet and strip for electrical applications”, the secretariat of which is held by DIN.

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 April 2016, and conflicting national standards shall be withdrawn at the latest by April 2016.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 10303:2001.

Regarding the changes that were made in this new edition of EN 10303, see Annex E.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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## 1 Scope

This European Standard defines the grades of thin non-oriented magnetic steel strip and sheet in nominal thicknesses of 0,05 mm, 0,10 mm, 0,15 mm, 0,20 mm, 0,25 mm, 0,27 mm, 0,30 mm and 0,35 mm, and of thin grain-oriented magnetic steel strip and sheet in nominal thicknesses of 0,05 mm, 0,10 mm, 0,15 mm and 0,18 mm. In particular, it gives general requirements, magnetic properties, geometric characteristics and tolerances and technological characteristics, as well as inspection procedure.

This European Standard applies to magnetic steel strip and sheet supplied in the finally annealed condition in coils and intended for the construction of magnetic circuits used at frequencies equal to or higher than 100 Hz.

## 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 10021, *General technical delivery conditions for steel products*

EN 10204, *Metallic products — Types of inspection documents*

EN 10251, *Magnetic materials — Methods of determination of the geometrical characteristics of electrical steel sheet and strip*

EN 60404-2, *Magnetic materials — Part 2: Methods of measurement of the magnetic properties of electrical steel strip and sheet by means of an Epstein frame (IEC 60404-2)*

EN 60404-13, *Magnetic materials — Part 13: Methods of measurement of density, resistivity and stacking factor of electrical steel sheet and strip (IEC 60404-13)*

EN ISO 377, *Steel and steel products — Location and preparation of samples and test pieces for mechanical testing (ISO 377)*

EN ISO 6892-1, *Metallic materials — Tensile testing — Part 1: Method of test at room temperature (ISO 6892-1)*

EN ISO 7799, *Metallic materials — Sheet and strip 3 mm thick or less — Reverse bend test (ISO 7799)*

IEC 60050-121, *International Electrotechnical Vocabulary — Chapter 121: Electromagnetism*

IEC 60050-221, *International Electrotechnical Vocabulary — Chapter 221: Magnetic materials and components*

IEC 60404-10, *Magnetic materials — Part 10: Methods of measurement of magnetic properties of magnetic sheet and strip at medium frequencies*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-121, IEC 60050-221 and the following apply.

**EN 10303:2015 (E)**

**3.1 number of bends**  
number of alternate bends possible before the appearance of the first crack in the base metal visible to the naked eye indicating the ductility of the material

**3.2 edge camber**  
greatest distance between a longitudinal edge of the sheet and the line joining the two extremities of the measured length of this edge

**4 Classification**

The grades covered by this European Standard are classified according to the maximum value of the specific total loss, in watts per kilogram, and according to the nominal thickness of the material (0,05 mm; 0,10 mm; 0,15 mm; 0,20 mm; 0,25 mm, 0,27 mm, 0,30 mm and 0,35 mm for non-oriented steel, respectively 0,05 mm; 0,10 mm, 0,15 mm and 0,18 mm for grain-oriented steel).

**5 Designation**

The conventional designation of the different grades comprises the following in the order:

- a) the characteristic letters:
  - 1) NO for non-oriented strip and sheet;
  - 2) GO for grain-oriented strip and sheet;
- b) 100 times the nominal thickness of the material, in millimetres;

EXAMPLE NO 20: non-oriented strip in thickness of 0,20 mm.

- c) maximum specific total loss by given frequency in cases where steel grades with different values for maximum specific total loss per nominal thickness are stated (see Table 2).

**6 Information to be supplied by purchaser****6.1 Mandatory information**

For material to comply adequately with the requirements of this standard, the purchaser shall include the following information in his enquiry or order:

- a) the quantity required (including any limitations on the mass of a coil) (see 7.2);
- b) type of product (strip or sheet);
- c) number of this European Standard (EN 10303);
- d) the grade designation of the material, in accordance with Clause 5;
- e) the dimensions of strips required (including any limitations of the internal and external diameter of a coil) (see 7.2 and 8.3.2);
- f) the inspection procedure required including the nature of the related documents (see 9.1);



## 6.2 Options

A number of options are specified in this standard and listed below. If the purchaser does not indicate his wish to implement one of these options, the products shall be supplied in accordance with the basis specification of this standard (see 6.1):

- 1) presence of welds or interleaves and their optional marking (see 7.2);
- 2) compatibility of the surface insulation coating (see 7.4);
- 3) residual curvature (see 8.3.5);
- 4) insulation coating resistance (see 8.4.4).
- 5) mechanical properties for non-oriented products (see Table D.1)

## 7 General requirements

### 7.1 Production process

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

### 7.2 Form of supply

The material is supplied in coils.

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

The recommended value for the internal diameter of coils is approximately 400 mm except for non-oriented strip in thickness of 0,20 mm, 0,25 mm, 0,27 mm, 0,30 mm and 0,35 mm, and grain-oriented strip in thickness of 0,18 mm for which the recommended internal diameter is approximately 500 mm.

The strip shall be of constant width and wound in such a manner that the edges are super-imposed in a regular manner and that the side faces of the coil are substantially flat.

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

The strip can occasionally exhibit welds or interleaves resulting from the removal of defective zones, subject to prior agreement between the parties. The value of the additional thickness due to the weld is subject to the agreement. If necessary the marking of welds or interleaves may form the subject of a special agreement.

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

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

### 7.3 Delivery condition

Products according to this standard are delivered either with a coating on one or on both sides but also without coating. Different types of coating can be provided.

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**7.4 Surface condition**

The surfaces shall be smooth and clean and free from grease and rust.<sup>1)</sup> Dispersed defects such as scratches, blisters, cracks, etc. are permitted if the products are within the tolerances and if these defects are not detrimental to the correct use of the supplied material.

Any insulation coating on the surface of the material shall be sufficiently adherent so as not to become detached during heat treatment under conditions specified by the supplier or during cutting operations.

If the product is to be immersed in a fluid or is to be given an additional coating or impregnation, an agreement initiated by the purchaser should be reached with the supplier to ensure compatibility with the surface insulation coating.

**7.5 Suitability for cutting**

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

**8 Technical requirements****8.1 Magnetic properties****8.1.1 Magnetic polarization**

The minimum specified values of magnetic polarization for a magnetic field strength of 800 A/m (peak value) and at the frequency specified in Table 1 for grain-oriented material shall be as given in Table 1.

The minimum specified values of magnetic polarization for a magnetic field strength of 2 500 A/m (peak value) and at the frequency specified in Table 2 for non-oriented material shall be as given in Table 2.

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**8.1.2 Specific total loss**

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The specified maximum values of specific total loss shall be as given in Tables 1 and 2 and reflect the aged conditions (see 9.3.1). For grain-oriented electrical steel they also apply to test specimens that have received, after cutting, a stress relief heat treatment under conditions specified by the manufacturer.

Depending on the thicknesses, the values are specified at 1,0 T for the non-oriented steel and at 1,0 T or 1,5 T for the grain-oriented material and at the frequency specified in Tables 1 and 2.

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1) This should not be confused with some coloration of the insulating coating inherent in the manufacturing process.

Table 1 — Magnetic and technological characteristics of grain-oriented strip

Designation	Nominal thickness [mm]	Maximum specific total loss W/kg at			Minimum magnetic polarization for $H = 800/\text{Am}^a$		Minimum stacking factor	Minimum number of bends
		1,0 T	1,5 T	Frequency [Hz]	T	Frequency [Hz]		
GO 5	0,05	24	-	1 000	1,60	1 000	0,88	1
GO 10	0,10	-	15	400	1,70	400	0,91	1
GO 15	0,15	-	16	400	1,70	400	0,92	1
GO 18	0,18	-	17	400	1,80	400	0,93	1

<sup>a</sup> It has been common practice for many years to give values of magnetic flux density in tables such as the one above. In fact the Epstein frame is used to determine magnetic polarization (intrinsic flux density) which is defined as:

$$J = B - \mu_0 H$$

where

$J$  is the magnetic polarization ;  
 $B$  is the magnetic flux density ;  
 $H$  is the magnetic field strength ;  
 $\mu_0$  is the magnetic constant.

NOTE The difference between B and J at 800 A/m amounts up to 0,001 T.

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