



**SLOVENSKI STANDARD**  
**SIST EN 10106:2016**

**01-januar-2016**

**Nadomešča:**  
**SIST EN 10106:2007**

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**Hladno valjana neorientirana elektropločevina in trakovi, dobavljeni v končnem stanju**

Cold rolled non-oriented electrical steel sheet and strip delivered in the fully processed state

Kaltgewalztes nicht kornorientiertes Elektroblech und -band im schlussgeglühten Zustand

Bandes et tôles magnétiques en acier à grains non orientés laminées à froid et livrées à l'état fini

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**Ta slovenski standard je istoveten z: EN 10106:2015**

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**ICS:**

77.140.50	Ploščati jekleni izdelki in polizdelki	Flat steel products and semi-products
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EUROPEAN STANDARD

EN 10106

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## Cold rolled non-oriented electrical steel strip and sheet delivered in the fully processed state

Bandes et tôles en acier électrique à grains non  
orientés laminées à froid et livrées à l'état fini

Kaltgewalztes nicht kornorientiertes Elektroband und -  
blech im schlussgeglühten Zustand

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

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

**CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels**

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**EN 10106:2015 (E)****European foreword**

This document (EN 10106:2015) 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of an identical text or by endorsement, at the latest by April 2016, and conflicting national standards shall be withdrawn at the latest by April 2016.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 10106:2007.

Regarding the changes that were made in this new edition of EN 10106, 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 specifies cold-rolled non-oriented electrical steel strip and sheet in nominal thicknesses of 0,35 mm, 0,50 mm, 0,65 mm and 1,00 mm. In particular, it specifies general requirements, the magnetic properties, geometric characteristics and tolerances, technological characteristics as well as the inspection procedure.

This European Standard applies to materials supplied in the fully annealed condition intended for the construction of magnetic circuits. It does not apply to semi-processed material.

These magnetic materials correspond to IEC 60404-1:2000, C.2.3.2.1.

## 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 10027-1, *Designation systems for steels — Part 1: Steel names*

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

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 10280, *Magnetic materials — Methods of measurement of the magnetic properties of electrical sheet and strip by means of a single sheet tester*

EN 10342, *Magnetic materials — Classification of surface insulations of electrical steel sheet, strip and laminations*

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 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*

## 3 Terms and definitions

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

**EN 10106:2015 (E)****3.1****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

**3.2****flatness**

property of a sheet or 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**

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

**3.4****internal stresses**

stresses that are characterized by a deviation in relation to the line of cutting

**4 Classification and designation****4.1 Classification**

The grades covered by this European Standard are classified according to the value of the maximum specific total loss in watts per kilogram and according to the nominal thickness of the material (0,35 mm, 0,50 mm, 0,65 mm and 1,00 mm).

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**4.2 Designation**

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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.

The steel name comprises the following in the order given:

- a) capital letter M for electrical steel;
- b) number of one hundred times the specified value of maximum specific total loss at 50 Hz, in watts per kilogram and corresponding to the nominal product thickness, at 1,5 T;
- c) one hundred times the nominal thickness of the material, in millimetres;
- d) characteristic letter A for non-oriented electrical sheet or strip supplied in the fully processed state.

**EXAMPLE** Non-oriented electrical steel sheet or strip with a maximum specific total loss at 1,5 T of 2,50 W/kg at 50 Hz, a nominal thickness of 0,35 mm, supplied in the fully processed state: M250-35A.

**5 Information supplied by the purchaser****5.1 Mandatory information**

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



- a) quantity;
- b) type of product (strip or sheet);
- c) number of this European Standard (EN 10106);
- d) steel name or number (see 4.2);
- e) dimensions of sheets or strips required (including any limitation on the external diameter of a coil) (see 6.2 and 7.2.2);
- f) axis of coil (horizontal or vertical) (see 6.2);
- g) internal diameter of coil (508 mm or 610 mm) (see 6.2);
- h) limitation on the mass of a bundle of sheets or of a coil or limitation of external diameter (see 6.2);
- i) limitation of the mass of the packing unit (see 6.2);
- j) type of inspection procedure, and – for specific inspection – type of the related document (see 8.1).

## 5.2 Options

A number of options are specified in this standard and listed in Annex A. 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 5.1).

## 5.3 Example of an order

18 t strip with 0,35 mm thickness in accordance with EN 10106, made of steel grade M270-35A, delivered in coils with a width of 1 000 mm and a maximum mass of 3 500 kg, vertical coil axis (v), with specific inspection, inspection report 3.1 in accordance with EN 10204:

**18 t - strip - EN 10106 — M270-35A - 1000 mm - max. 3500 kg - v - 3.1**

## 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

For sheets the material is supplied in bundles and for strip the material is supplied in coils.

The mass of bundles of sheets or the mass and/or the external diameter of coils shall be agreed at the time of enquiry and order.

The mass of the package unit shall be agreed at the time of enquiry and order.

The recommended value for the internal diameter of coils is 508 mm or 610 mm.

The direction of coils, horizontal (h) or vertical (v), shall be agreed at the time of enquiry and order.

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Sheets that 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 way that the edges are superimposed in a regular manner and that the side faces of the coil are substantially flat. Coils shall be sufficiently tightly wound so that they do not collapse under their own weight.

Strip may exhibit welds resulting from removing defective zones if agreed at the time of enquiry and order. If necessary the marking of welds may be agreed at the time of enquiry and order. For coils containing 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 further processing of the material.

**6.3 Delivery condition**

The material may be supplied either without insulation or with insulation on one or both sides in accordance with EN 10342. If the material is supplied with insulation, the nature of the insulation, its thickness and properties, the stacking factor and their verification shall be agreed at the time of enquiry and order (see Annex A, Option 2) and in accordance with the values stated in Table D.1.

**6.4 Surface condition**

The surfaces shall be smooth and clean, 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.

When an insulation coating is present on the surface of the material, it shall be sufficiently adherent so that the coating does not become detached during cutting operations. During the alternating bend test (see 8.4.4.2), the coating shall not be detached after a bend of 90°. If the coating becomes detached during the test, the piece from which the sample was taken shall be subjected to a shearing test. During this test, it shall not be admissible for large pieces of the coating to become detached; however, slight chipping of this coating at the shearing edges shall be tolerated.

**6.5 Suitability for cutting**

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

**7 Technical requirements****7.1 Magnetic properties****7.1.1 General**

The properties defined in 7.1.2 to 7.1.4 are applicable to products in the delivery conditions defined in 6.3.

For coated products, the mass of the insulation coating should be taken into account.

**7.1.2 Magnetic polarization**

The minimum specified values of peak magnetic polarization and for peak magnetic field strengths  $H$  of 2 500 A/m, 5 000 A/m and 10 000 A/m at 50 Hz shall be as given in Table 1.

1) Not to be confused with some colouration of the insulating coating inherent in the manufacturing process.

### 7.1.3 Specific total loss

The specified values of maximum specific total loss shall be as given in Table 1. They reflect the aged condition (see 8.3.1).

In certain cases, the specified value of maximum specific total loss can be made the subject of agreement for longitudinal test pieces only or for transverse test pieces only.

The values of the specific total loss are specified for a magnetic polarization of 1,5 T. The test shall be made in an alternating magnetic field at 50 Hz.

Annex B gives, for guidance only, the maximum specific total loss for a magnetic polarization of 1,0 T at 50 Hz and for a magnetic polarization of 1,5 T at 60 Hz.

### 7.1.4 Anisotropy of loss

This is specified at a polarization of 1,5 T. The maximum permitted values shall be as specified in Table 1.

**Table 1 — Technological and magnetic properties**

Steel grade		Nominal thickness mm	Maximum specific total loss at 50 Hz and at 1,5 T W/kg	Minimum magnetic polarization <sup>a</sup> <i>T</i> in an alternating magnetic field strength (A/m)			Maximum anisotropy of loss at 50 Hz and 1,5 T %	Minimum stacking factor <sup>b</sup>	Minimum number of bends	Conventional density <sup>c</sup> kg/dm <sup>3</sup>
Steel name	Steel number			2 500	5 000	10 000				
M210-35A	1.0802	0,35	2,10	1,49	1,60	1,70	±17	0,95	2	7,60
M235-35A	1.0890		2,35	1,49	1,60	1,70	±17		2	7,60
M250-35A	1.0800		2,50	1,49	1,60	1,70	±17		2	7,60
M270-35A	1.0801		2,70	1,49	1,60	1,70	±17		2	7,65
M300-35A	1.0803		3,00	1,49	1,60	1,70	±17		3	7,65
M330-35A	1.0804		3,30	1,49	1,60	1,70	±17		3	7,65
M230-50A	1.0837	0,50	2,30	1,49	1,60	1,70	±17	0,96	2	7,60
M250-50A	1.0891		2,50	1,49	1,60	1,70	±17		2	7,60
M270-50A	1.0806		2,70	1,49	1,60	1,70	±17		2	7,60
M290-50A	1.0807		2,90	1,49	1,60	1,70	±17		2	7,60
M310-50A	1.0808		3,10	1,49	1,60	1,70	±14		3	7,65
M330-50A	1.0809		3,30	1,49	1,60	1,70	±14		3	7,65
M350-50A	1.0810		3,50	1,50	1,60	1,70	±12		5	7,65
M400-50A	1.0811		4,00	1,53	1,63	1,73	±12		5	7,70
M470-50A	1.0812		4,70	1,54	1,64	1,74	±10		10	7,70
M530-50A	1.0813		5,30	1,56	1,65	1,75	±10		10	7,70
M600-50A	1.0814		6,00	1,57	1,66	1,76	±10		10	7,75
M700-50A	1.0815		7,00	1,60	1,69	1,77	±10		10	7,80
M800-50A	1.0816	8,00	1,60	1,70	1,78	±10	10	7,80		