



SLOVENSKI STANDARD

SIST EN 10107:2014

01-julij-2014

Nadomešča:
SIST EN 10107:2005

Orientirana elektropločevina in trakovi, dobavljeni v končnem žarjenem stanju

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

Kornorientiertes Elektroband und -blech im schlussgeglühten Zustand

Bandes et tôles et magnétiques en acier à grains orientés livrées à l'état fini
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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 10107

NORME EUROPÉENNE

EUROPÄISCHE NORM

March 2014

ICS 77.140.50

Supersedes EN 10107:2005

English Version

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

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

Kornorientiertes Elektroband und -blech im
schlussgeglühten Zustand

This European Standard was approved by CEN on 6 February 2014.

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

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Foreword

This document (EN 10107:2014) 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of an identical text or by endorsement, at the latest by September 2014 and conflicting national standards shall be withdrawn at the latest by September 2014.

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.

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EN 10107:2014 (E)**1 Scope**

This European Standard defines the steel grades of grain-oriented electrical strip and sheet in nominal thicknesses of 0,23 mm, 0,27 mm, 0,30 mm and 0,35 mm and specifies in particular, 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 electrical strip and sheet supplied in the final annealed condition in sheets or coils, and intended for the construction of magnetic circuits.

The materials are grouped into two classes:

- a) conventional grain oriented material;
- b) high permeability grain oriented material.

They correspond to Clause C.22 of IEC 60404-1:2000.

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 steel — Part 1: Steel names*

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

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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 10282:2001, *Magnetic materials — Method of test for the determination of surface insulation resistance of electrical sheet and strip*

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 sheet and strip by means of an Epstein frame (IEC 60404-2)*

EN 60404-11:2013, *Magnetic materials — Part 11: method of test for the determination of surface insulation resistance of magnetic sheet and strip*

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 7799:2000, *Metallic materials — Sheet and strip 3 mm thick or less — Reverse bend test (ISO 7799:1985)*

IEC 60050-121:1998, *International Electrotechnical Vocabulary — Chapter 121: Electromagnetism*

IEC 60050-221:1990, *International Electrotechnical Vocabulary — Chapter 221: Magnetic materials and components*

IEC 60404-3, *Magnetic materials — Part 3: Methods of measurement of the magnetic properties of electrical steel strip and sheet by means of a single sheet tester*

3 Terms and definitions

For the purposes of this document, the terms and definitions of the principal terms relating to magnetic properties given in IEC 60050-121:1998 and IEC 60050-221:1990 and the following apply.

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 of a length of strip which is characterised 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 which are characterised by a deviation in relation to the line of cutting

4 Classification and designation

4.1 Classification

The steel 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).

4.2 Designation

4.2.1 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.

4.2.2 The steel names comprise the following in the order given:

- a) capital letter M for electrical steel;
- b) a number of one hundred times the specified value of maximum specific total loss at 1,7 T and 50 Hz, in watts per kilogram corresponding to the nominal product thickness;
- c) one hundred times the nominal thickness of the product, in millimetres;
- d) the characteristic letter:
 - S for conventional grain oriented products;

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— P for high permeability grain oriented products.

EXAMPLE M140-30S for conventional grain oriented electrical steel strip or sheet with a maximum specific total loss of 1,40 W/kg at 1,7 T , 50 Hz and a nominal thickness of 0,30 mm, supplied in the fully processed state.

5 Information to be supplied by the purchaser**5.1 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) quantity;
- b) type of product (strip or sheet);
- c) number of this European Standard (EN 10107);
- d) steel name or number (see 4.2.1);
- e) dimensions of sheets or strips required (including any limitations on the external diameter of a coil) (see 6.2 and 7.2.2);
- f) limitations on the mass of a bundle of sheets or of a coil (see 6.2);
- g) residual curvature for coils (see 7.2.6);
- h) inspection procedure required including the nature of the related documents (see 8.1).

5.2 Options

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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 5.1).

- 1) permissibility of welds and its marking (see 6.2);
- 2) compatibility between fluid and coating (see 6.4);
- 3) plus tolerances for nominal width (see Table 3, footnote a);
- 4) requirement concerning residual curvature (see 7.2.6);
- 5) acceptance unit other than 3 t (see 8.1);
- 6) test temperature other than $(23 \pm 5) ^\circ\text{C}$ (see 8.4.1);
- 7) alternative method for determination of magnetic properties (see 8.4.2);
- 8) marking of the products (see Clause 9);
- 9) requirement concerning the minimum insulation coating resistance (see 7.3.5).

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 coils in the case of strip and bundles in the case of sheets.

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

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

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 sufficiently tightly wound so 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 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 the further processing of the material.

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

6.3 Delivery condition

Cold rolled grain oriented electrical steel is usually supplied with an insulating coating on both sides. This coating generally consists of an EC-5-G coating on an EC-2 coating in accordance with EN 10342¹⁾.

6.4 Surface condition

The surfaces shall be smooth and clean, free from grease and rust ²⁾. 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.

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 suitable for cutting accurately into the usual shapes at any point when appropriate cutting tools are used.

¹⁾ Other types of coating exist which are used only when particularly specified.

²⁾ Not to be confused with some colouration of the insulating coating inherent in the manufacturing process.

EN 10107:2014 (E)**7 Technical requirements****7.1 Magnetic properties****7.1.1 General**

The properties defined in 7.1.2 and 7.1.3 are applicable to materials in the delivery conditions defined in 6.3.

7.1.2 Magnetic polarization

The specified minimum values of the magnetic polarization determined for an alternating magnetic field strength of 800 A/m (peak value) at 50 Hz, shall be as given in Tables 1 and 2.

7.1.3 Specific total loss

The specified values of maximum specific total loss at 50 Hz shall be as given in Tables 1 and 2. They apply to test specimens cut parallel to the axis of rolling and reflect the aged condition. In the case of Epstein strips, they shall receive, after cutting, a stress relief heat treatment under conditions left to the discretion of the manufacturer.

NOTE A stress relief heat treatment is not normally applied to single sheet test specimens.

Annex A gives, for guidance, the maximum specific total loss at 60 Hz for a magnetic polarization of 1,7 T.

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Table 1 — Technological and magnetic properties of conventional products

Steel grade		Nominal thickness mm	Maximum specific total loss [W/kg] at 50 Hz and		Minimum magnetic polarization ^a for H = 800 A/m T	Minimum stacking factor
Steel name	Steel number		1,5 T	1,7 T		
M110-23S	1.0863	0,23	0,73	1,10	1,78	0,945
M120-23S	1.0864	0,23	0,77	1,20	1,78	0,945
M127-23S	1.0860	0,23	0,80	1,27	1,75	0,945
M120-27S	1.0868	0,27	0,80	1,20	1,78	0,950
M130-27S	1.0866	0,27	0,85	1,30	1,78	0,950
M140-27S	1.0865	0,27	0,89	1,40	1,75	0,950
M120-30S	1.9858	0,30	0,83	1,20	1,78	0,955
M130-30S	1.0859	0,30	0,85	1,30	1,78	0,955
M140-30S	1.0862	0,30	0,92	1,40	1,78	0,955
M150-30S	1.0861	0,30	0,97	1,50	1,75	0,955
M135-35S	1.9854	0,35	0,97	1,35	1,78	0,960
M145-35S	1.9855	0,35	1,03	1,45	1,78	0,960
M155-35S	1.9856	0,35	1,07	1,55	1,78	0,960
M165-35S	1.0856	0,35	1,11	1,65	1,75	0,960

^a It has been common practice for many years to give values of magnetic flux density. 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;
- μ_0 is the magnetic constant: $4 \pi \times 10^{-7} \text{ H m}^{-1}$;
- H is the magnetic field strength.

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