SLOVENSKI STANDARD

SIST EN 10106:1997

01-december-1997

Hladno valjana neorientirana elektroploļevina in trakovi

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

Kaltgewalztes nichtkornorientiertes Elektroblech und -band im schlußgeglühten Zustand

Tôles magnétiques a grains non orientés laminées a froid et livrées a l'état fini

Ta slovenski standard je istoveten z: **EN 10106:1995**

ICS:

77.140.50	Ploģļati jekleni izdelki in polizdelki	Flat steel products and semi-products

SIST EN 10106:1997 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 10106

December 1995

ICS 29.040.10; 77.140.50

Descriptors: cold rolled products, metal plates, magnetic alloys, magnetic circuits, steels, classifications, designation, delivery, magnetic properties, geometric characteristics, physical properties, acceptance tests, quality

English version

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

Tôles magnétiques à grains non orientés laminées à froid et livrées à l'état fini

Kaltgewalztes nichtkornorientiertes Elektroblech und -band im schlußgeglühten Zustand

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

Content

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.

1 Scope

This European Standard defines the grades of cold-rolled non-oriented electrical steel sheet and strip 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 Clause C21 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 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 : Magnetic materials and components
IEC 404-1	:	Magnetic materials - Part 1 : Classification
IEC 404-2	:	Magnetic materials - Part 2 : Methods of measurements of 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
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 [1] : 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 European Standard are given in IEC 50(121) and IEC 50(221).

In addition, for the purposes 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 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 in the base metal of the first crack 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

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 (0,35 mm, 0,50 mm, 0,65 mm and 1,00 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 1.5 T at 50 Hz, in watts per kilogram and corresponding to the nominal product thickness,

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

4) the characteristic letter A for non-oriented electrical sheet or strip supplied in the fully processed state.

EXAMPLE : M250-35A for electrical non-oriented 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.

---

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

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 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 in order that they do not collapse under their own weight.

Strip can occasionally exhibit welds or interleaves resulting from the removal of defective zones, subject to prior agreement between the parties. If necessary, marking of welds or interleaves may be agreed at the time of ordering.

For coils containing welds or interleaves, 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

The material can be supplied either without insulation or with insulation on one or both sides. If the material is supplied with insulation, the nature of the insulation, its properties, and the stacking factor and their verification shall be agreed at the time of ordering.

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 thickness tolerances and if they are not detrimental to the correct use of the supplied material.

---

[2] This should not be confused with some colouration of the insulation coating inherent in the manufacturing process.

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 bent test (see 8.4.3.2), 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, the 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 without causing premature wear of tools ; it shall be able to be cut at any point and into the usual shapes, thus ensuring accurate working with the correct cutting tools. If there are special requirements with regard to a suitability test for cutting or punching, these shall be established by agreement between the manufacturer and the purchaser.

7 Technical requirements

7.1 Magnetic properties

The properties defined in 7.1.1 to 7.1.3 are applicable to products in the delivery conditions defined in 6.3. For coated products, the mass of the insulation coating shall be taken into account.

7.1.1 Magnetic polarization

The minimum specified values of magnetic polarization for magnetic field strengths H of 2 500 A/m, 5 000 A/m and 10 000 A/m shall be as given in table 2.

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 shall be as given in table 2. They apply :

- for the thicknesses 0,35 mm, 0,50 mm and 0,65 mm to aged test pieces (see 8.3.1),

- for the thickness 1,00 mm to non-aged test pieces.

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 A 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.

7.1.3 Anisotropy of loss

This is specified at a polarization of 1,5 T. The maximum permitted values shall be as specified in table 2.

7.2 Geometric characteristics and tolerances

7.2.1 Thickness

The nominal thicknesses of the material are 0,35 mm, 0,50 mm, 0,65 mm and 1,00 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,

- 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 be ± 8 % of the nominal value for the thickness 0,35 mm and 0,50 mm and ± 6 % of the nominal value for the thicknesses 0,65 mm and 1,00 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 (see 8.3.2) in a direction parallel to the direction of rolling shall not exceed 8 % for nominal thicknesses 0,35 mm and 0,50 mm, and 6 % for nominal thicknesses 0,65 mm and 1,00 mm.

The difference in thickness in a direction perpendicular to the direction of rolling shall not exceed 0,020 mm for thicknesses of 0,35 mm and 0,50 mm, and 0,030 mm for the thicknesses of 0,65 mm and 1,00 mm, the measurements being made at least 30 mm from the edges. This tolerance applies only to materials with a width greater than 150 mm. For narrow strip, other agreements may be reached.

7.2.2 Width

The available nominal widths are less than or equal to 1 250 mm.

For the width tolerances a distinction is made between material supplied with edges in the as-rolled condition and material delivered with trimmed edges.

For materials supplied with trimmed edges, the tolerances of table 1 shall apply :

Table 1 : Tolerances on nominal width

Nominal width l (mm)	Tolerance (mm)
$l \leq 150$	$\begin{pmatrix} +0,2 \\ 0 \end{pmatrix}$
$150 < l \leq 300$	$\begin{pmatrix} +0,3 \\ 0 \end{pmatrix}$
$300 < l \leq 600$	$\begin{pmatrix} +0,5 \\ 0 \end{pmatrix}$
$600 < l \leq 1\,000$	$\begin{pmatrix} +1,0 \\ 0 \end{pmatrix}$
$1\,000 < l \leq 1\,250$	$\begin{pmatrix} +1,5 \\ 0 \end{pmatrix}$

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

For materials supplied with as-rolled edges, the tolerances on nominal width should be the subject of agreement when ordering.

7.2.3 Length

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

7.2.4 Edge camber

The verification of edge camber applies only to material supplied with trimmed edges and width greater than 30 mm.

The edge camber shall not exceed for a measuring length of 1 m :

- 0,5 mm for a nominal width l > 150 mm,
- 1,0 mm for a nominal width l, such that 30 mm < l ≤ 150 mm.

7.2.5 Flatness (wave factor)

The verification of flatness does not apply to material of width less than or equal to 100 mm. The wave factor (see 8.4.2.4), expressed as a percentage, shall not exceed 2.

7.2.6 Residual curvature

The verification of residual curvature does not apply to material of width less than or equal to 100 mm.

A requirement concerning residual curvature can be specified by agreement when ordering ; in this case, the distance between the bottom edge of the test specimen and the supporting plate shall not exceed 35 mm for the products with thicknesses 0,35 mm, 0,50 mm and 0,65 mm. For the thickness 1,00 mm this distance shall be subject to an agreement between the supplier and the purchaser.