SLOVENSKI STANDARD
SIST EN 60404-2:2002

01-september-2002

Magnetic materials - Part 2: Methods of measurement of the magnetic properties of electrical steel sheet and strip by means of an Epstain frame (IEC 60404-2:1996)

Magnetic materials -- Part 2: Methods of measurement of the magnetic properties of electrical steel sheet and strip by means of an Epstein frame

Magnetische Werkstoffe -- Teil 2: Verfahren zur Bestimmung der magnetischen Eigenschaften von Elektroblech und -band mit Hilfe eines Epsteinrahmens

Matériaux magnétiques -- Partie 2: Méthodes de mesure des propriétés magnétiques des tôles et bandes magnétiques au moyen d'un cadre Epstein

Ta slovenski standard je istoveten z: **EN 60404-2:1998**

ICS:

17.220.20	Merjenje električnih in magnetnih veličin	Measurement of electrical and magnetic quantities
29.030	Magnetni materiali	Magnetic materials

SIST EN 60404-2:2002 **en**

EUROPEAN STANDARD

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EUROPÄISCHE NORM

EN 60404-2

February 1998

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Descriptors: Magnetic materials, measurement of magnetic properties of electrical steel sheet and strip, general principle, procedure, Epstein frame

English version

Magnetic materials
Part 2: Methods of measurement of the magnetic properties of electrical steel sheet and strip by means of an Epstein frame
(IEC 60404-2:1996)

Matériaux magnétiques
Partie 2: Méthodes de mesure des propriétés magnétiques des tôles et bandes magnétiques au moyen d'un cadre Epstein
(CEI 60404-2:1996)

Magnetische Werkstoffe
Teil 2: Verfahren zur Bestimmung der magnetischen Eigenschaften von Elektroblech und -band mit Hilfe eines Epsteinrahmens
(IEC 60404-2:1996)

This European Standard was approved by CENELEC on 1998-01-01. CENELEC 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 CENELEC 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 CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CENELEC
European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

The text of the International Standard IEC 60404-2:1996, prepared by IEC TC 68, Magnetic alloys and steels, was submitted to the formal vote and was approved by CENELEC as EN 60404-2 on 1998-01-01 without any modification.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 1998-12-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 1998-12-01

Annexes designated "normative" are part of the body of the standard.
In this standard, annex ZA is normative.
Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60404-2:1996 was approved by CENELEC as a European Standard without any modification.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

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 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 (including amendments).

NOTE: When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC 60050(221)	1990	International Electrotechnical Vocabulary (IEV) Chapter 221: Magnetic materials and components	-	-
IEC 60404-4	1995	Magnetic materials Part 4: Methods of measurement of d.c. magnetic properties of iron and steel	EN 60404-4	1997
IEC 60404-8-2	1985	Part 8: Specifications for individual materials Section 2: Specification for cold-rolled magnetic alloyed steel strip delivered in the semi-processed state	-	-
IEC 60404-8-3	1985	Section 3: Specification for cold-rolled magnetic non-alloyed steel strip delivered in the semi-processed state	-	-
IEC 60404-8-4	1986	Section 4: Specification for cold-rolled non-oriented magnetic steel sheet and strip	-	-
IEC 60404-8-7	1988	Section 7: Specification for grain-oriented magnetic steel sheet and strip	-	-
IEC 60404-10	1988	Part 10: Methods of measurement of magnetic properties of magnetic steel sheet and strip at medium frequencies	-	-
IEC 60404-13	1995	Part 13: Methods of measurement of density, resistivity and stacking factor of electrical steel sheet and strip	-	-

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Matériaux magnétiques –

Partie 2:
Méthodes de mesure des propriétés magnétiques des tôles et bandes magnétiques au moyen d'un cadre Epstein

Magnetic materials –

Part 2:
Methods of measurement of the magnetic properties of electrical steel sheet and strip by means of an Epstein frame

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INTERNATIONAL ELECTROTECHNICAL COMMISSSION

MAGNETIC MATERIALS –

Part 2: Methods of measurement of the magnetic properties of electrical steel sheet and strip by means of an Epstein frame

FOREWORD

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.

2) The formal decisions or agreements of the IEC on technical matters, express as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.

3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical reports or guides and they are accepted by the National Committees in that sense.

4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.

5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.

6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 404-2 has been prepared by IEC technical committee 68: Magnetic alloys and steels.

This third edition cancels and replaces the second edition published in 1978 and constitutes a technical revision.

This standard supersedes chapters I, II, IV and V of IEC 404-2: 1978.

The standard IEC 404-11 supersedes chapter VIII of IEC 404-2: 1978.

The standard IEC 404-13 supersedes chapters VI, VII and IX of IEC 404-2: 1978.

Chapter III of IEC 404-2: 1978 is cancelled.

The text of this standard is based on the following documents:

FDIS	Report on voting
68/119/FDIS	68/135/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

MAGNETIC MATERIALS –

Part 2: Methods of measurement of the magnetic properties of electrical steel sheet and strip by means of an Epstein frame

1 Scope and object

This part of IEC 404 is applicable to grain oriented and non-oriented electrical sheet and strip for a.c. measurements of magnetic properties at frequencies up to 400 Hz and for d.c. magnetic measurements.

The object of this part is to define the general principles and the technical details of the measurement of the magnetic properties of electrical steel sheet and strip by means of an Epstein frame.

The Epstein frame is applicable to test specimens obtained from electrical steel sheets and strips of any grade. The a.c. magnetic characteristics are determined for sinusoidal induced voltages, for specified peak values of magnetic polarization and for a specified frequency.

The measurements are to be made at an ambient temperature of (23 ± 5) °C on test specimens which have first been demagnetized.

Measurements at higher frequencies are to be made in accordance with IEC 404-10.

NOTE – Throughout this standard the term "magnetic polarization" is used as defined in IEC 50(221). In some standards of the IEC 404 series, the term "magnetic flux density" was used.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 404. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this part of IEC 404 are encouraged to investigate the possibility of applying the most recent editions of the normative documents listed below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 50(221): 1990, *International Electrotechnical Vocabulary (IEV) – Chapter 221: Magnetic materials and components*

IEC 404-4: 1995, *Magnetic materials – Part 4: Methods of measurement of d.c. magnetic properties of iron and steel*

IEC 404-8-2: 1985, *Magnetic materials – Part 8: Specifications for individual materials – Section Two: Specification for cold-rolled magnetic alloyed steel strip delivered in the semi-processed state*

IEC 404-8-3: 1985, *Magnetic materials – Part 8: Specifications for individual materials – Section Three: Specification for cold-rolled magnetic non-alloyed steel strip delivered in the semi-processed state*

IEC 404-8-4: 1986, *Magnetic materials – Part 8: Specifications for individual materials – Section Four: Specification for cold-rolled non-oriented magnetic steel sheet and strip*

IEC 404-8-7: 1988, *Magnetic materials – Part 8: Specifications for individual materials – Section Seven: Specification for grain oriented magnetic steel sheet and strip*

IEC 404-10: 1988, *Magnetic materials – Part 10: Methods of measurement of magnetic properties of magnetic steel sheet and strip at medium frequencies*

IEC 404-13: 1995, *Magnetic materials – Part 13: Methods of measurement of density, resistivity and stacking factor of electrical steel sheet and strip*

3 General principles of a.c. measurements

3.1 *Principle of the 25 cm Epstein frame method*

The 25 cm Epstein frame which comprises a primary winding, a secondary winding and the specimen to be tested as a core, forms an unloaded transformer whose characteristics are measured by the method described in the following subclauses.

3.2 *Test specimen*

The strips to be tested are assembled in a square, having double-lapped joints (see figure 1), thus forming four branches of equal length and equal cross-sectional area.

The strips shall be sampled in accordance with the appropriate product standard in the IEC 404-8 series.

They shall be cut by a method which will produce substantially burr-free edges and, if so specified, heat treated in accordance with the corresponding product standard. They shall have the following dimensions:

- width $b = 30$ mm ± 0,2 mm;
- length 280 mm $\leq l \leq$ 320 mm.

The lengths of the strips shall be equal within a tolerance of ±0,5 mm.

When strips are cut parallel or normal to the direction of rolling, the edge of the parent sheet shall be taken as the reference direction.

The following tolerances shall apply for the angle between the specified and actual direction of cutting:

±1° for grain oriented steel sheet;

±5° for non-oriented steel sheet.

Only flat strips shall be used. Measurements shall be made without additional insulation.