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Magnetic materials - Part 6: Methods of measurement of the magnetic properties of magnetically soft metallic and powder materials at frequencies in the range of 20 Hz to 200 kHz by the use of ring specimens (IEC 60404-6:2003)

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**Magnetic materials**  
**Part 6: Methods of measurement of the magnetic properties**  
**of magnetically soft metallic and powder materials**  
**at frequencies in the range 20 Hz to 200 kHz**  
**by the use of ring specimens**  
**(IEC 60404-6:2003)**

Matériaux magnétiques  
Partie 6: Méthodes de mesure  
des propriétés magnétiques  
des matériaux métalliques  
et des matériaux en poudre,  
magnétiquement doux, aux fréquences  
comprises entre 20 Hz et 200 kHz,  
sur des éprouvettes en forme de tore  
(CEI 60404-6:2003)

Magnetische Werkstoffe  
Teil 6: Verfahren zur Messung der  
magnetischen Eigenschaften  
weichmagnetischer und pulverförmiger  
Werkstoffe bei Frequenzen im Bereich  
20 Hz bis 200 kHz mit Hilfe von  
Ringproben  
(IEC 60404-6:2003)

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This European Standard was approved by CENELEC on 2003-09-01. 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, Hungary, Iceland, Ireland, Italy, Lithuania, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, 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 document 68/271/FDIS, future edition 2 of IEC 60404-6, prepared by IEC TC 68, Magnetic alloys and steels, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60404-6 on 2003-09-01.

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) 2004-06-01
- latest date by which the national standards conflicting  
with the EN have to be withdrawn (dow) 2006-09-01

Annexes designated "normative" are part of the body of the standard.

Annexes designated "informative" are given for information only.

In this standard, annex ZA is normative and annexes A and B are informative.

Annex ZA has been added by CENELEC.

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## Endorsement notice

The text of the International Standard IEC 60404-6:2003 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following note has to be added for the standard indicated:

IEC 62044

NOTE

Harmonized in the series EN 62044 (not modified).

## 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.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 62044-3	2000	Cores made of soft magnetic materials - Measuring methods Part 3: Magnetic properties at high excitation level	EN 62044-3	2001
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	EN 60404-2	1998
IEC 60404-4	1995	Part 4: Methods of measurement of d.c. magnetic properties of magnetically soft materials	EN 60404-4	1997
A1	2000		A1	2002
IEC 60404-8-6	1999	Part 8-6: Specifications for individual materials - Soft magnetic metallic materials	-	-
IEC 60404-8-9	1994	Part 8: Specification for individual materials Section 9: Standard specification for sintered soft magnetic materials	-	-
ISO/IEC	1993	Guide to the expression of uncertainty in measurement	-	-

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NORME  
INTERNATIONALE  
INTERNATIONAL  
STANDARD

CEI  
IEC

60404-6

Deuxième édition  
Second edition  
2003-06

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**Matériaux magnétiques –**

**Partie 6:**

**Méthodes de mesure des propriétés magnétiques  
des matériaux métalliques et des matériaux en  
poudre magnétiquement doux, aux fréquences  
comprises entre 20 Hz et 200 kHz, sur des  
éprouvettes en forme de tore**

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Commission Electrotechnique Internationale  
International Electrotechnical Commission  
Международная Электротехническая Комиссия

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Pour prix, voir catalogue en vigueur  
For price, see current catalogue

## CONTENTS

FOREWORD .....	5
INTRODUCTION .....	9
1 Scope .....	11
2 Normative references .....	11
3 General principles of measurement .....	13
3.1 Test specimen .....	13
3.2 Windings .....	15
4 Temperature measurements .....	15
5 Measurement of magnetic permeability and magnetization curve using the voltmeter-ammeter method .....	17
5.1 Introduction.....	17
5.2 Apparatus and connections .....	17
5.3 Determination of magnetic field strength.....	19
5.4 Determination of the magnetic flux density .....	21
5.5 Determination of the r.m.s. amplitude permeability and the relative amplitude permeability .....	21
5.6 Determination of magnetization curve.....	23
6 Measurement of specific total loss by the wattmeter method .....	23
6.1 Principle of measurement.....	23
7 Measurement of magnetic properties using a digital impedance bridge .....	25
7.1 Principle of measurement.....	25
7.2 Apparatus .....	27
7.3 Procedure .....	27
7.4 Determination of the relative a.c. inductance permeability.....	29
7.5 Determination of the specific total loss .....	29
8 Measurement of magnetic properties using digital methods .....	29
8.1 Introduction.....	29
8.2 Apparatus and connections .....	31
8.3 Magnetizing current waveform.....	31
8.4 Magnetizing winding.....	31
8.5 Determination of the magnetic field strength.....	31
8.6 Determination of the magnetic flux density .....	33
8.7 Determination of the relative a.c. permeability .....	33
8.8 Determination of a.c. magnetization curve.....	33
8.9 Determination of the specific total loss .....	33
9 Uncertainties.....	35
10 Test report.....	35
Annex A (informative) Guidance on requirements for windings and instrumentation in order to minimise additional losses .....	41
Annex B (informative) Sinusoidal waveform control by digital means .....	43
Bibliography .....	45



## INTERNATIONAL ELECTROTECHNICAL COMMISSION

## MAGNETIC MATERIALS –

**Part 6: Methods of measurement of the magnetic properties  
of magnetically soft metallic and powder materials at frequencies  
in the range 20 Hz to 200 kHz by the use of ring specimens**

## 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 specifications, 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. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60404-6 has been prepared by IEC technical committee 68: Magnetic alloys and steels.

This second edition cancels and replaces the first edition published in 1986 and constitutes a technical revision.

The scope of the first edition has been extended to include all magnetically soft materials except ferrites. Chapter 1 of the first edition relating to d.c. measurements is covered by IEC 60404-4 (1995) and its amendment 1 (2000).

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

FDIS	Report on voting
68/271/FDIS	68/275/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.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until 2007. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

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## INTRODUCTION

This edition of IEC 60404-6 has been prepared by WG2 in the TC68 maintenance programme of publications. The d.c. measurements in the first edition of this standard are now covered in IEC 60404-4 and Amendment 1 to that standard. This edition of IEC 60404-6 includes measurements on magnetically soft powder materials. Since measurements on these materials at high frequencies employ some of the techniques used to measure magnetic components, there has been active collaboration with IEC TC51. IEC TC51 recently started to publish the new IEC 62044 series which will be composed of four parts. IEC 62044-3 presents methods of measurement of magnetic properties at high excitation levels appropriate to various ferrite core applications, whereas this edition of IEC 60404-6 covers the requirements of material measurements excluding ferrites, so that the two standards do not overlap.

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