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# INTERNATIONAL STANDARD



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**Cores made of soft magnetic materials – Measuring methods –  
Part 3: Magnetic properties at high excitation level**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

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MEASURING METHODS –****Part 3: Magnetic properties at high excitation level****FOREWORD**

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IEC 62044-3 has been prepared by IEC technical committee 51: Magnetic components, ferrite and magnetic powder materials. It is an International Standard.

This second edition cancels and replaces the first edition published in 2000. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) addition of Annex F and Annex G.

The text of this International Standard is based on the following documents:

Draft	Report on voting
51/1426/CDV	51/1439/RVC

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at [www.iec.ch/members\\_experts/refdocs](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/publications](http://www.iec.ch/publications).

A list of all parts in the IEC 62044 series, published under the general title *Cores made of soft magnetic materials – Measuring methods*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under [webstore.iec.ch](http://webstore.iec.ch) in the data related to the specific document. At this date, the document will be

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## INTRODUCTION

IEC 62044, under the general title *Cores made of soft magnetic materials – Measuring methods*, includes the following parts:

IEC 62044-1: Generic specification

IEC 62044-2: Magnetic properties at low excitation level

IEC 62044-3: Magnetic properties at high excitation level

# CORES MADE OF SOFT MAGNETIC MATERIALS – MEASURING METHODS –

## Part 3: Magnetic properties at high excitation level

### 1 Scope

This part of IEC 62044 ~~provides~~ **specifies** measuring methods for power loss and amplitude permeability of magnetic cores forming the closed magnetic circuits intended for use at high excitation levels in inductors, chokes, transformers and similar devices for power electronics applications.

The methods given in this document can cover the measurement of magnetic properties for frequencies ranging practically from direct current to 10 MHz, and even possibly higher, for the calorimetric and reflection methods. The applicability of the individual methods to specific frequency ranges is dependent on the level of accuracy that is to be obtained.

The methods in this document are basically the most suitable for sine-wave excitations. Other periodic waveforms can also be used; however, adequate accuracy can only be obtained if the measuring circuitry and instruments used are able to handle and process the amplitudes and phases of the signals involved within the frequency spectrum corresponding to the given ~~induction~~ **magnetic flux density** and field strength waveforms with only slightly degraded accuracy.

NOTE It ~~may~~ can be necessary for some magnetically soft metallic materials to follow specific general principles, customary for these materials, related to the preparation of specimens and ~~prescribed~~ specified calculations. These principles are formulated in IEC 60404-8-6.

### 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

~~IEC 60050(221):1990, International Electrotechnical Vocabulary (IEV) — Chapter 221: Magnetic materials and components~~

~~Amendment 1 (1993)~~

~~Amendment 2 (1999)~~

~~IEC 60205:1966, Calculation of the effective parameters of magnetic piece parts~~

~~IEC 60367-1:1982, Cores for inductors and transformers for telecommunications — Part 1: Measuring methods~~

~~IEC 60401:1993, Ferrite materials — Guide on the format of data appearing in manufacturers' catalogues of transformer and inductor cores~~

~~IEC 60404-8-6:1999, Magnetic materials — Part 8-6: Specifications for individual materials — Soft magnetic metallic materials~~

~~IEC 61332:1995, Soft ferrite material classification~~

IEC 62044-1:2002, *Cores made of soft magnetic materials – Measuring methods – Part 1: Generic specification*



# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

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**Cores made of soft magnetic materials – Measuring methods –  
Part 3: Magnetic properties at high excitation level**

**Noyaux en matériaux magnétiques doux – Méthodes de mesure –  
Partie 3: Propriétés magnétiques à niveau élevé d'excitation**



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**CORES MADE OF SOFT MAGNETIC MATERIALS –  
MEASURING METHODS –****Part 3: Magnetic properties at high excitation level**

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The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at [www.iec.ch/members\\_experts/refdocs](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/publications](http://www.iec.ch/publications).

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IEC 62044-2: Magnetic properties at low excitation level

IEC 62044-3: Magnetic properties at high excitation level

# **CORES MADE OF SOFT MAGNETIC MATERIALS – MEASURING METHODS –**

## **Part 3: Magnetic properties at high excitation level**

### **1 Scope**

This part of IEC 62044 specifies measuring methods for power loss and amplitude permeability of magnetic cores forming the closed magnetic circuits intended for use at high excitation levels in inductors, chokes, transformers and similar devices for power electronics applications.

The methods given in this document can cover the measurement of magnetic properties for frequencies ranging practically from direct current to 10 MHz, and even possibly higher, for the calorimetric and reflection methods. The applicability of the individual methods to specific frequency ranges is dependent on the level of accuracy that is to be obtained.

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IEC 62044-1:2002, *Cores made of soft magnetic materials – Measuring methods – Part 1: Generic specification*



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## COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

### NOYAUX EN MATÉRIAUX MAGNÉTIQUES DOUX – MÉTHODES DE MESURE –

#### Partie 3: Propriétés magnétiques à niveau élevé d'excitation

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L'IEC 62044-3 a été établie par le comité d'études 51 de l'IEC: Composants magnétiques, ferrites et matériaux en poudre magnétique. Il s'agit d'une Norme internationale.

Cette deuxième édition annule et remplace la première édition parue en 2000. Cette édition constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

- a) ajout de l'Annexe F et de l'Annexe G.

Le texte de cette Norme internationale est issu des documents suivants:

Projet	Rapport de vote
51/1426/CDV	51/1439/RVC

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à son approbation.

La langue employée pour l'élaboration de cette Norme internationale est l'anglais.

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Une liste de toutes les parties de la série IEC 62044, publiées sous le titre général *Noyaux en matériaux magnétiques doux – Méthodes de mesure*, se trouve sur le site web de l'IEC.

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## INTRODUCTION

L'IEC 62044, publiée sous le titre général *Noyaux en matériaux magnétiques doux – Méthodes de mesure*, comprend les parties suivantes:

IEC 62044-1: Spécification générique

IEC 62044-2: Propriétés magnétiques à niveau d'excitation faible

IEC 62044-3: Propriétés magnétiques à niveau élevé d'excitation

# NOYAUX EN MATÉRIAUX MAGNÉTIQUES DOUX – MÉTHODES DE MESURE –

## Partie 3: Propriétés magnétiques à niveau élevé d'excitation

### 1 Domaine d'application

La présente partie de l'IEC 62044 spécifie les méthodes de mesure de la perte de puissance et de la perméabilité d'amplitude des noyaux magnétiques qui forment les circuits magnétiques fermés destinés à être utilisés à des niveaux élevés d'excitation dans les bobines d'inductance, les bobines d'arrêt, les transformateurs et les dispositifs similaires pour les applications d'électronique de puissance.

Les méthodes contenues dans le présent document peuvent couvrir les mesures des propriétés magnétiques pour des fréquences qui s'étendent dans la pratique du courant continu à 10 MHz, voire éventuellement au-dessus, pour les méthodes calorimétrique et par réflexion. L'applicabilité des différentes méthodes à des plages de fréquences spécifiques dépend du niveau d'exactitude à obtenir.

Les méthodes du présent document sont fondamentalement les mieux adaptées aux excitations sinusoïdales. D'autres formes d'onde périodiques peuvent également être utilisées; cependant, une exactitude appropriée peut être obtenue seulement si les circuits et les instruments de mesure utilisés sont capables de prendre en compte et de traiter les amplitudes et les phases des signaux concernés dans le spectre de fréquences qui correspond à l'induction magnétique indiquée et aux formes d'onde de champ magnétique avec une exactitude à peine dégradée.

NOTE Pour certains matériaux métalliques magnétiques doux, il peut être nécessaire de suivre des principes généraux spécifiques et normaux pour ces matériaux, liés à la préparation des éprouvettes et des calculs spécifiés. Ces principes sont énoncés dans l'IEC 60404-8-6.

### 2 Références normatives

Les documents suivants sont cités dans le texte de sorte qu'ils constituent, pour tout ou partie de leur contenu, des exigences du présent document. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

IEC 62044-1:2002, *Noyaux en matériaux magnétiques doux – Méthodes de mesure – Partie 1: Spécification générique*