BRITISH STANDARD

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62044-1:2002

Cores made of soft magnetic materials — Measuring methods —

Part 1: Generic specification

The European Standard EN 62044-1:2002 has the status of a British Standard

ICS 29.100.10

BSI
British Standards

National foreword

This British Standard is the official English language version of EN 62044-1:2002. It is identical with IEC 62044-1:2002.

The UK participation in its preparation was entrusted to Technical Committee EPL/51, Transformers, inductors, magnetic components and ferrite materials, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

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This British Standard, having been prepared under the direction of the Electrotechnical Sector Policy and Strategy Committee, was published under the authority of the Standards Policy and Strategy Committee on 28 October 2002

Summary of pages

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English version

Cores made of soft magnetic materials - Measuring methods Part 1: Generic specification

(IEC 62044-1:2002)

Noyaux en matériaux magnétiques doux - Méthodes de mesure
Partie 1: Spécification générique
(CEI 62044-1:2002)

Kerne aus weichmagnetischen Werkstoffen - Messmethoden
Teil 1: Fachgrundspezifikation
(IEC 62044-1:2002)

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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

Ref. No. EN 62044-1:2002 E

Foreword

The text of document 51/660/FDIS, future edition 1 of IEC 62044-1, prepared by IEC TC 51, Magnetic components and ferrite materials, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 62044-1 on 2002-07-01.

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)	2003-04-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2005-07-01

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.

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Endorsement notice

The text of the International Standard IEC 62044-1:2002 was approved by CENELEC as a European Standard without any modification.

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CORES MADE OF SOFT MAGNETIC MATERIALS – MEASURING METHODS –

Part 1: Generic specifications

1 Scope and object

This International standard applies to magnetic cores made of soft magnetic materials used in inductors, transformers and devices used to suppress electromagnetic interference.

This standard is to provide guidance for the specification of measuring methods for both magnetic and non-magnetic (for example, mechanical, electrical, etc.) properties.

This standard is limited to the general principles to be followed for the various possible test methods. For the magnetic properties, it should be considered that the measurement result using a measuring coil can be directly related to a specified parameter (for example inductance) of a magnetic component using the magnetic core. In this case, the measuring method should be chosen in order to obtain a good correlation with the corresponding magnetic component measurement results.

2 Normative references

The following referenced documents are indispensable for the application 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 60068 (all parts), *Environmental testing*

3 Environmental conditions

3.1 General

The cores are magnetically conditioned in accordance with clause 4, if required, for a given measurement method. During the whole procedure, the core shall be protected against mechanical and magnetic disturbances. Condensation on measuring windings, which may occur at changing temperature, should be avoided.

3.2 Ambient Temperature

Unless otherwise specified, the whole measurement procedure shall take place at a temperature within the range of standard atmospheric conditions for testing according to IEC 60068.

During the whole period of the measurement, however, the temperature shall not vary to such an extent as to have an appreciable effect on the measuring results. In some cases, this may necessitate the use of a temperature controlled chamber. The assembled cores with measuring coil and clamping devices shall be kept in this environment for a sufficient time to reach thermal equilibrium. The temperature during measurement shall be stated.

NOTE This subclause means that the measurements may be made at any temperature within the range of 15 °C to 35 °C but preferably at (25 ± 3) °C.

4 General precautions

4.1 Relation to practice

The measuring conditions shall be so chosen that the measured results are suitable for predicting the performance of the core. This does not imply that all conditions have to correspond to those prevailing in practice.

4.2 Mounting of cores consisting of more than one part

For cores consisting of more than one part and which are assembled around the measuring coil, a clamping device shall be used throughout the measurements. This clamping device shall be able to distribute the force uniformly over the contact surfaces and hold the core parts rigidly in position relative to each other. The clamping force shall be specified within a region where the variation of the parameter to be measured is as small as possible. This force shall be kept constant within ±10 % during the total period of the measurement.

NOTE Since the inductance is generally the property most sensitive to force variations, a specific clamping force may be specified for the inductance measurement and adopted for the measurement of other parameters.

The mating surfaces shall be cleaned before the measurement. The cleaning procedure shall be able to remove dust particles, particularly from polished or fine ground surfaces. The core parts shall then be assembled around the measuring coil, the latter being locked in position with respect to the core by suitable means, for example washer. The core parts shall be centred and the specified force applied for a sufficient time to allow any variations with time of the parameter to be measured to become negligible.

4.3 Selection of the measuring coil

The measuring coil shall be selected according to the following considerations:

– The number of turns should be specified in relation to the measurement conditions, the equipment used and the accuracy to be obtained.
– The resistance and self-capacitance of a winding should be as low as possible to make the related errors negligible.

For coils consisting of more than one winding the inter-winding capacitance should be also kept as low as possible.

– The windings should be wound as close to the core as possible, to make the coupling as close to 100 % as possible.
– For toroidal cores, the turns shall be evenly distributed around the core. For other core shapes, the windings shall occupy as much of the window area as possible. This is particularly important for inductance measurements on cores with large air gaps.

5 Magnetic conditioning

5.1 Object

In order to obtain a well-defined and reproducible magnetic state of a core before measurements, magnetic conditioning shall be carried out as specified.

5.2 Principles of the methods

There are two main methods:

a) the electrical method in which the specimen is subjected to an alternating magnetic field of sufficient magnitude, of which the amplitude is gradually reduced to zero;

b) the thermal method in which the specimen is taken above the Curie point.

5.3 Procedure for the electrical method

The initial peak of the field strength shall take the core well above the knee of the magnetization curve and during the reduction of amplitude there shall be two flux reversals in the core for each complete cycle.

There are two possibilities:

a) A decreasing alternating current is passed through the measuring coil on the specimen obliterating its magnetic history. The current decrease may be:

   1) Linear: a sine-wave generator supplies the input signal to the power amplifier. A suitable gain control circuit is used to shape the amplitude of the amplifier output over a time interval so as to provide a current in the test winding on the core to be conditioned with the desired frequency and with a prescribed peak amplitude variation. The amplitude reduction shall then extend over not less than 50 cycles;

   2) Exponential: a capacitor is charged to a pre-set voltage and then discharged through an indicator in series with a test winding on the core to be conditioned. The capacitor and inductor together with the winding on the core and any other elements in the discharge circuit determine the oscillatory discharge current. The ratio of two consecutive current peaks in the same direction shall be not less than 0,78.

   The coil shall not be appreciably heated by the current during conditioning.

b) The specimen is passed through the alternating field in the air-gap of an electromagnet. The number of turns of the windings, the current through them and the dimensions of the air-gap shall be so chosen so as to obtain a field strength of approximately 25 kA/m in the air-gap.

5.4 Procedure for the thermal method

The core shall be heated at a specified rate of temperature change and maintained for 30 min to 60 min at a temperature approximately 25 °C in excess of the Curie point. The heating rate shall not exceed 2 °C/min. Cooling shall also take place at a rate not exceeding 5 °C/min.

Before using this method, it shall be verified that, as a result of the heating cycle, the core material will not show irreversible changes (such as may occur in materials with a constricted loop). During the whole procedure, the core shall be protected against magnetic and mechanical disturbances.

6 Measurement accuracy

The accuracy attained during the measurement of a parameter is related to the measuring method. This should be chosen so that its accuracy fits the specified limits of the parameter to be measured.

The accuracy is limited not only by the intrinsic accuracy of the measuring equipment used but also by the environmental conditions and by the assembly of the core and measuring coil (see 4.2). This is a consequence of the fact that core and measuring coil are assembled in a provisional way.

The accuracy of the measurement methods for soft magnetic material cores is inherently limited and different from the accuracy of methods used for magnetic components. This should be considered for the required correlation between the measurements on a core and on a magnetic component using the core.

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 60068	Series	Environmental testing	EN 60068	Series

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