

Specification for

Harmonized system of quality assessment for electronic components: Generic specification: Inductor and transformer cores for telecommunications

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- Institution of Electronic and Radio Engineers
- Ministry of Defence*
- National Supervising Inspectorate*
- Post Office
- Radio and Electronic Components Manufacturers' Federation*
- Society of British Aerospace Companies Limited*
- Telecommunication Engineering and Manufacturing Association (TEMA)*
- Trades Union Congress

The organizations marked with an asterisk in the above list were directly represented on the committee entrusted with the preparation of this British Standard.

This British Standard, having been prepared under the direction of the Electronic Components Standards Committee, was published under the authority of the Executive Board on 31 May 1977

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National foreword

This British Standard has been prepared under the authority of the Electronic Components Standards Committee. It is identical with CENELEC Electronic Components Committee (CECC) 25000 “*Harmonized inductor and transformer cores for telecommunications*”, including Amendment No. 1.

This standard gives the terminology, quality assessment procedures and test and measurement conditions applicable to the entire family of inductor and transformer cores for telecommunications.

Any sectional specification dealing with a particular sub-family of cores required to be used in conjunction with this standard will select those tests which are considered appropriate to the sub-family and will also give more detailed information relative to the sub-family.

This standard is a harmonized specification within the CECC system. The existing non-harmonized British Standard BS 9630:1973 “*Magnetic oxide (ferrite) cores of assessed quality, intended for linear inductor and transformer applications: Generic data and methods of test*” will eventually be superseded by this standard, but for a period both standards will remain in force because of current approvals to BS 9630.

Terminology and conventions. The text of the CECC specification has been accepted as suitable for publication, without deviation, as a British Standard. Certain terminology and conventions are used, however, that are not identical with those used in British Standards. Attention is particularly drawn to the following.

NOTE The final sentence of the foreword is not applicable to this British Standard.

The comma has been used throughout as a decimal marker. In British Standards it is current practice to use a full point (a full stop on the baseline) as the decimal marker.

Cross references. For each of the references in the text to a Part of IEC 68 there is an equivalent British Standard, each published as one of a series of Parts of BS 2011 “*Methods for the environmental testing of electronic components and electronic equipment*”.

The British Standard harmonized with CECC 00100 is BS 9000 “*General requirements for electronic components of assessed quality*”.

For each of the following references to other international publications that are given in the text, there is an equivalent British Standard; these are as listed below.

Reference to international publication	Equivalent British Standard	
ISO/R 497	BS 2045	<i>Preferred numbers</i>
ISO/R 1000	PD 5686	<i>The use of SI units</i>
IEC 27-1	BS 1991	<i>Letter symbols, signs and abbreviations</i>
IEC 50	BS 4727	<i>Glossary of electrotechnical, power, telecommunications, electronics, lighting and colour terms</i>
IEC 117	BS 3939	<i>Graphical symbols for electrical power, telecommunications and electronics diagrams</i>
IEC 410	BS 6001	<i>Sampling tables and inspection by attributes</i>
CECC 00006	BS E9006	<i>Basic specifications and environmental test procedures</i>
CECC 00007	BS E9007	<i>Basic specification sampling plan and procedures for inspection by attributes</i>
IEC 133:1967	BS 4061	<i>Dimensions of pot cores made of ferromagnetic oxides for use in telecommunication and allied electronic equipment</i>

NOTE There is as yet no equivalent British Standard for IEC 205, IEC 226 and IEC 226A, IEC 367-1 and 367-2, IEC 424, or IEC 431. The committee responsible for this standard has studied these and confirms that, for the purposes of this standard, their technical requirements are acceptable.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, the CECC title page, pages ii to vi, pages 1 to 36 and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

Harmonized System of Quality Assessment for
Electronic Components

**GENERIC SPECIFICATION :
INDUCTOR AND TRANSFORMER
CORES FOR
TELECOMMUNICATIONS**

Système Harmonisé d' Assurance de la Qualité
des Composants Electroniques

**SPECIFICATION GENERIQUE :
NOYAUX D' INDUCTANCE ET DE
TRANSFORMATEURS DESTINES
AUX TELECOMMUNICATIONS**

Harmonisiertes Gütebestätigungssystem für
Bauelemente der Elektronik

**FACHGRUNDSPEZIFIKATION :
KERNE IN SPULEN UND
ÜBERTRAGERN FÜR DIE
NACHRICHTENTECHNIK**



CECC 25000



Documents

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Foreword

The CENELEC Electronic Components Committee (CECC) is composed of those member countries of the European Committee for Electrotechnical Standardization (CENELEC) who wish to take part in a harmonized System for electronic components of assessed quality.

The object of the System is to facilitate international trade by the harmonization of the specifications and quality assessment procedures for electronic components, and by the grant of an internationally recognized Mark, or Certificate, of Conformity. The components produced under the System are thereby accepted by all member countries without further testing.

This specification has been formally approved by the CECC, and has been prepared for those countries taking part in the System who wish to issue national harmonized specifications for MAGNETIC INDUCTOR AND TRANSFORMER CORES. It should be read in conjunction with document CECC 00100: Basic Rules (1974).

Preface

This document was prepared by CECC Working Group 12: “Magnetic Components”.

The first amendment to the generic specification CECC 25000 introduces the measuring methods: Total core loss and amplitude permeability.

In accordance with the requirements of document CECC 00100, it is based, wherever possible, on the Recommendations of the International Electrotechnical Commission and in particular on IEC 367: Cores for inductors and transformers for telecommunications,

367-1, *Part 1 — Measuring methods*;

367-2, *Part 2 — Guides for the drafting of performance specifications*.

The text of this specification with its amendment was circulated to the CECC for voting in the documents listed below, and was ratified by the President of the CECC for printing.

Document	Voting date	Report on the voting
CECC(Secretariat) 264	March 1975	CECC(Secretariat) 341
CECC(Secretariat) 857	August 1980	CECC(Secretariat) 955

Section 1. Scope

This document applies to magnetic cores, mainly made of magnetic oxides or metallic powders, used in inductors and transformers for telecommunication equipment and electronic devices employing similar techniques.

Section 2. General

2.1 Order of precedence

Where any discrepancies occur for any reasons, documents shall rank in the following order of authority:

- the detail specification
- this generic specification
- document CECC 00100
- or any other international (e.g. IEC) documents to which reference is made.

The same order of precedence shall apply to equivalent national documents.

2.2 Related documents

ISO 497	(1966)	<i>Guide to the choice of series of preferred numbers and of series containing more rounded values of preferred numbers.</i>
ISO 1000	(1973)	<i>SI units and recommendations for the use of their multiples and of certain other units.</i>
IEC 27	(1971)	<i>Letter symbols to be used in electrical technology.</i>
IEC 50	—	<i>International Electrotechnical Vocabulary (including the Advanced Edition of Section 901 on magnetic materials).</i>
IEC 68	—	<i>Basic environmental testing procedures (see CECC 00006).</i>
IEC 117	—	<i>Recommended graphical symbols.</i>
IEC 133	(1967)	<i>Dimensions for pot-cores made of magnetic oxides and associated parts.</i>
IEC 205	(1966)	<i>Calculation of the effective parameters of magnetic piece parts.</i>
IEC 226	(1967)	<i>Dimensions of cross (X) cores made of magnetic oxides and associated parts.</i>
IEC 367		<i>Cores for inductors and transformers for telecommunications.</i>
	(1971)	<i>367-1 Part 1. Measuring methods.</i>
	(1973)	<i>367-1A First supplement to Publication 367-1.</i>
	(1973)	<i>367-1B Second supplement to Publication 367-1.</i>
	(1974)	<i>367-1C Third supplement to Publication 367-1.</i>
	(1974)	<i>367-2 Part 2. Guides for the drafting of performance specifications.</i>
	(1976)	<i>367-2A</i>
IEC 410	(1973)	<i>Sampling plans and procedures for inspection by attributes (see CECC 00007).</i>
IEC 424	(1973)	<i>Guide to the specification of limits for physical imperfections for parts made from magnetic oxides.</i>
IEC 431	(1973)	<i>Dimensions of square cores (RM-cores) made of magnetic oxides and associated parts.</i>
CECC 00100	(1974)	<i>Basic Rules.</i>
CECC 00006	(1973)	<i>Basic specification: Environmental Testing procedures.</i>
CECC 00007	(1973)	<i>Basic Specification: Sampling plans and procedures for inspection by attributes.</i>

2.3 Units, symbols and terminology

2.3.1 General

Units, graphical symbols, letter symbols and terminology shall, whenever possible, be taken from the following documents:

ISO 1000, *SI units and recommendations for the use of their multiples and of certain other units*.

IEC 27, *Letter symbols to be used in electrical technology*.

IEC 50, *International Electrotechnical Vocabulary*.

IEC 117, *Recommended graphical symbols*.

2.3.4 to 2.3.17 contain additional terminology and letter symbols applicable to inductor and transformer cores.

2.3.2 Multiple and sub-multiples of units (Note 4 to Clause 2 of IEC 367-2)

Equations are given for basic SI units only. In detail specifications, the following multiples or sub-multiples shall normally be used:

mm ⁻¹	for core factor C ₁
mm ⁻³	for core factor C ₂
kHz	for frequency
mH	for inductance
nH	for inductance factor
mT	for flux density
mA	for current
kA/m	for magnetic field strength.

2.3.3 Letter symbols (Note to Clause 2 of IEC 367-2)

The following standard symbols are used in the formulae of this specification:

t	= time
θ	= temperature
L	= self-inductance
μ ₀	= magnetic constant, 0.4 π × 10 ⁻⁶ H/m
μ _r	= relative permeability (in the case of qualified versions of permeability, such as initial permeability μ _i , the relative quantity is meant unless otherwise stated).
μ _i	= initial permeability
μ _e	= effective permeability:

$$\frac{LC_1}{\mu_0 N^2}$$

μ _{rev}	= reversible permeability
N	= number of turns on the measuring coil
C ₁ and C ₂	= Core factors defined in IEC 205
A _e	= effective cross sectional area
ω	= angular frequency = 2 π × frequency of measuring current.

2.3.4 Type of core (clause 3.2.3 of IEC 367-2, but Note 3 being omitted)

A type comprises cores having similar design features, manufactured by the same techniques and falling within the manufacturer's usual range of characteristics for these cores.

NOTE 1 Mounting accessories are ignored, provided they have no significant effect on the test results.

NOTE 2 Characteristics cover the combination of:

- electromagnetic characteristics
- sizes.

2.3.5 Inductance factor A_L (clause 3.4.4 of 367-2)

The inductance of a coil of specified geometry, placed on a given core in a specified position, divided by the square of the number of turns.

$$A_L = \frac{L}{N^2}$$

N is the number of turns on the specified measuring coil

L is the inductance of the measuring coil when placed on the core.

NOTE 1 This term is of the same kind as permeance (Λ) (IEV 902 02-16)

NOTE 2 In principle, A_L can apply to the several forms of permeability defined in the IEV, e.g.: amplitude permeability, but unless otherwise specified, it should be assumed that they correspond to the initial effective permeability.

2.3.6 Variability (clause 3.4.6 of IEC 367-2)

Changes in the properties of a magnetic material or core assembly with time and with changes in the operating conditions.

NOTE Normally, variability refers more specifically to changes of permeability. Temperature dependence of permeability and disaccommodation are the most common examples of variability.

2.3.7 Temperature factor α_F (clause 3.4.7 of IEC 367-2)

The negative of the change in the reluctivity (reciprocal of permeability) of a material due to change in temperature divided by that change in temperature.

$$\alpha_F = - \frac{\frac{1}{\mu_\theta} - \frac{1}{\mu_{ref}}}{\theta - \theta_{ref}} = \frac{\mu_\theta - \mu_{ref}}{\mu_\theta \mu_{ref} (\theta - \theta_{ref})}$$

μ_θ [μ_{ref}] is the effective permeability at temperature θ [θ_{ref}].

2.3.8 Temperature coefficient (clause 3.4.8 of IEC 367-2)

The fractional change of inductance (or of effective permeability or inductance factor) of an inductor due to a change of temperature divided by that change in temperature:

$$\alpha_L = \frac{L_\theta - L_{ref}}{L_{ref}(\theta - \theta_{ref})}$$

L_θ [L_{ref}] is the inductance at temperature θ [θ_{ref}].

2.3.9 Disaccommodation D (clause 3.4.9 of IEC 367-2)

The fractional decrease of permeability of a magnetic material measured at constant temperature over a given period of time.

$$D = \frac{\mu_1 - \mu_2}{\mu_1}$$

μ_1 and μ_2 are successively measured values of permeability.

2.3.10 Disaccommodation coefficient d (clause 3.4.10 of IEC 367-2)

The disaccommodation after magnetic conditioning divided by the logarithm (to the base of 10) of the ratio of the time intervals between the cessation of that conditioning and the second and first measurements respectively.

$$d = \frac{D}{\log_{10} \frac{t_2}{t_1}}$$

t_2 and t_1 are the intervals of time between the magnetic conditioning and the second and first measurements respectively.