

INTERNATIONAL STANDARD

Soft ferrite material classification

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IEC 61332:2016

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

SOFT FERRITE MATERIAL CLASSIFICATION

FOREWORD

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International Standard IEC 61332 has been prepared IEC technical committee 51: Magnetic components, ferrite and magnetic powder materials.

This third edition cancels and replaces the second edition published in 2005. This edition constitutes a technical revision.

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

- a) deleted "c" rank from subclass from Table 3, because of too large power loss density;
- b) added "a-wide" rank in subclasses PW3, PW4 and PW5 in Table 3;
- c) changed "B" of PW3 class from 100 mT to 200 mT; " $B \times f$ " and "power loss density" have also been changed;
- d) changed "B" of PW4 class from 50 mT to 100 mT; " $B \times f$ " and "power loss density" have also been changed.

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

FDIS	Report on voting
51/1146/FDIS	51/1155/RVD

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

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

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

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- withdrawn,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

A bilingual version of this publication may be issued at a later date.

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SOFT FERRITE MATERIAL CLASSIFICATION

1 Scope

This document specifies classification rules for soft ferrite materials used in inductive components (inductors and transformers) fulfilling the requirements of the electronic industries.

This document addresses the following issues for ferrite suppliers and users:

- cross-reference between materials from multiple suppliers;
- assistance to customers in understanding the published technical data in catalogues when comparing multiple suppliers;
- guidance to customers in selecting the most applicable material for each application;
- setting of nomenclature for IEC standards relating to ferrite;
- establishing uniform benchmarks for suppliers for performance in new development of materials.

The numerical values given in this document are typical values of the parameters (properties) of the related materials. Direct translation from the material specification into the core specification is not always easy or possible.

Every detailed material and core specification should be agreed upon between the user and the manufacturer.

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2 Normative references

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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, *International Electrotechnical Vocabulary – Chapter 221: Magnetic materials and components*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-221 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

4 Classification

4.1 Material classification

Soft ferrite materials may be classified according to the following basic parameters:

- initial permeability and relevant operation frequency and/or applicable maximum frequency;
- initial permeability as a function of the temperature;
- applicable maximum flux density and/or amplitude permeability;
- power loss at a given frequency, temperature and flux density;
- normalized impedance at a given frequency.

4.2 Main classes

Soft ferrite materials may be divided into three main classes identified by two letters as follows:

- class IS materials are for use at AC low flux density as impedances in interference suppression (EMI) applications;
- class SP materials are for use at low flux density in signal processing applications;
- class PW materials are for use at high flux density (power application).

4.3 Subclasses

Each main class is divided into subclasses identified by two letters and a serial number.

Ferrite manufacturers' catalogues may indicate more than one class into which a material grade can fall, where desired.

5 Soft ferrite material classes

5.1 Materials used as impedances in interference suppression applications (IS class)

These materials are mainly used in the shape of rods, tubes, beads, wide band chokes, bobbin cores and rings. The relevant subclasses are given in Table 1.

Table 1 – IS class ferrite materials

Subclasses	Frequency ^a MHz	Normalized impedance ^b Z_N Ω/mm	Initial permeability ^c μ_i	Curie temperature T_C °C
IS1	300	≥ 50	< 100	> 300
IS2a IS2b	300	≥ 50 ≥ 40	100 to 2 000	200 to 300
IS3a IS3b	100	≥ 40 ≥ 30	100 to 2 000	100 to 250
IS4a IS4b	30	≥ 30 ≥ 20	100 to 2 000	100 to 250
IS5a IS5b	10	≥ 30 ≥ 20	2 000 to 6 000	100 to 250
IS6a IS6b	3	≥ 30 ≥ 20	2 000 to 6 000	100 to 150
IS7a IS7b	1	≥ 20 ≥ 10	2 000 to 6 000	100 to 150
IS8a IS8b	1	≥ 20 ≥ 10	6 000 to 10 000	100 to 150
IS9a IS9b	0,5	≥ 10 ≥ 5	10 000 to 15 000	> 100

^a The frequency is the measuring frequency of the normalized impedance.

^b Measured on a bead $\phi 5 \text{ mm} \times \phi 2 \text{ mm} \times 10 \text{ mm}$ and at a temperature of 25 °C.

^c μ_i is measured at $\leq 10 \text{ kHz}$, $\leq 0,5 \text{ mT}$. μ_i is for reference only, indicating typical values seen. μ_i is not a fundamental parameter for class IS materials.

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5.2 Materials used mainly in low flux density applications ($B \leq 5 \text{ mT}$) (SP class)

These materials are mainly used in the shape of ring-cores, pot-cores, EP-cores, RM-cores and E-cores. The relevant subclasses are given in Table 2.