

INTERNATIONAL STANDARD

CONSOLIDATED VERSION

**Magnetic materials -
Part 1: Classification**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

Magnetic materials - Part 1: Classification

FOREWORD

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This consolidated version of the official IEC Standard and its amendment has been prepared for user convenience.

IEC 60404-1 edition 3.1 contains the third edition (2016-10) [documents 68/533/CDV and 68/555/RVC] and its amendment 1 (2025-07) [documents 68/780/CDV and 68/791A/RVC].

In this Redline version, a vertical line in the margin shows where the technical content is modified by amendment 1. Additions are in green text, deletions are in strikethrough red text. A separate Final version with all changes accepted is available in this publication.

International Standard IEC 60404-1 has been prepared by IEC technical committee 68: Magnetic alloys and steels.

This bilingual version (2017-12) corresponds to the monolingual English version, published in 2016-10.

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

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

- a) Removal of all tables and values describing typical properties of the material to be consistent with the aim of the document to be a classification and not a specification.
- b) Enlargement of the Ni content for the classes E1 and E3.
- c) Enlargement of the Co content for the classes F3.
- d) Addition of a new class: U5 bonded rare earth-iron-nitrogen magnets.

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

CDV	Report on voting
68/533/CDV	68/555/RVC

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.

The French version of this standard has not been voted upon.

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

A list of all parts in the IEC 60404 series, published under the general title *Magnetic materials*, can be found on the IEC website.

The committee has decided that the contents of this document and its amendment will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

1 Scope

This part of IEC 60404 is intended to classify commercially available magnetic materials.

The term "magnetic materials" denotes substances where the application requires the existence of ferromagnetic or ferrimagnetic properties.

In this document, the classification of magnetic materials is based upon the generally recognized existence of two main groups of products:

- soft magnetic materials (coercivity $\leq 1\,000$ A/m);
- hard magnetic materials (coercivity $> 1\,000$ A/m).

Within these main groups, the classification when appropriate recognizes the following characteristics:

- the main alloying element and the metallurgical state and physical properties of the material;
- when possible and convenient, the relationship between these characteristics is identified.

A classification by specific areas of application cannot be applied to all materials because different materials can very often be used for the same application depending on the characteristics required.

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 60050-121, *International Electrotechnical Vocabulary – Part 121: Electromagnetism*

IEC 60050-151, *International Electrotechnical Vocabulary – Part 151: Electrical and magnetic devices*

IEC 60050-221, *International Electrotechnical Vocabulary – Chapter 221: Magnetic materials and components*

IEC 60401-3, *Terms and nomenclature for cores made of magnetically soft ferrites – Part 3: Guidelines on the format of data appearing in manufacturers catalogues of transformer and inductor cores*

IEC 60404-2, *Magnetic materials – Part 2: Methods of measurement of the magnetic properties of electrical steel sheet and strip by means of an Epstein frame*

IEC 60404-3, *Magnetic materials – Part 3: Methods of measurement of the magnetic properties of magnetic sheet and strip by means of a single sheet tester*

IEC 60404-4, *Magnetic materials – Part 4: Methods of measurement of d.c. magnetic properties of iron and steel*

IEC 60404-6, *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*