ICS 29.030 SLOVENSKÁ TECHNICKÁ NORMA December 2025

STN	**Magnetické materiály Časť 1: Klasifikácia Zmena A1**	**STN EN 60404-1/A1 34 5884**

Magnetic materials - Part 1: Classification

Táto norma obsahuje anglickú verziu európskej normy.
This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 11/25

STN EN 60404-1 z júna 2017 sa bez tejto zmeny A1 môže používať do 30. 9. 2028.

Obsahuje: EN 60404-1:2017/A1:2025, IEC 60404-1:2016/AMD1:2025

141403

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 60404-1:2017/A1

September 2025

ICS 29.030

English Version

Magnetic materials - Part 1: Classification (IEC 60404-1:2016/AMD1:2025)

Matériaux magnétiques - Partie 1: Classification (IEC 60404-1:2016/AMD1:2025)

Magnetische Werkstoffe - Teil 1: Einteilung (IEC 60404-1:2016/AMD1:2025)

This amendment A1 modifies the European Standard EN 60404-1:2017; it was approved by CENELEC on 2025-08-29. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this amendment the status of a national standard without any alteration.

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Ref. No. EN 60404-1:2017/A1:2025 E

EN 60404-1:2017/A1:2025 (E)

European foreword

The text of document 68/780/CDV, future edition 3 of IEC 60404-1/AMD1, prepared by TC 68 "Magnetic alloys and steels" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 60404-1:2017/A1:2025.

The following dates are fixed:

• latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2026-09-30
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2028-09-30

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Any feedback and questions on this document should be directed to the users' national committee. A complete listing of these bodies can be found on the CENELEC website.

Endorsement notice

The text of the International Standard IEC 60404-1:2016/AMD1:2025 was approved by CENELEC as a European Standard without any modification.

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cencenelec.eu.

Add the following reference:

Publication	Year	Title	EN/HD	Year
IEC 60404-8-11	-	Magnetic materials - Part 8-11: Specifications for individual materials - Fe-based amorphous strip delivered in the semi-processed state	EN IEC 60404-8-11	-

IEC 60404-1

Edition 3.0 2025-07

INTERNATIONAL STANDARD

AMENDMENT 1

Magnetic materials -
Part 1: Classification

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Magnetic materials - Part 1: Classification

AMENDMENT 1

FOREWORD

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Amendment 1 to IEC 60404-1:2016 has been prepared by IEC technical committee 68: Magnetic alloys and steels.

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

Draft	Report on voting
68/780/CDV	68/791A/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 Amendment 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. The main document types developed by IEC are described in greater detail at www.iec.ch/publications/.

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 in the data related to the specific document. At this date, the document will be

– reconfirmed,
– withdrawn, or
– revised.

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2 Normative references

Add the following new reference to the existing list:

IEC 60404-8-11, *Magnetic materials - Part 8-11: Specifications for individual materials - Fe-based amorphous strip delivered in the semi-processed state*

5.2.5 Class R7 - Rare earth-iron-boron (REFeB) alloys

Replace the existing titles and text of subclauses 5.2.5 and 5.2.5.1 with the following new titles:

5.2.5 Class R7 - Rare earth-iron-boron (REFeB) sintered magnets

5.2.5.1 Void

5.2.5.2 Chemical composition and manufacturing method

Replace the existing first paragraph including the two bullet points with the following:

The sintered magnets are based on the compound $RE_2Fe_{14}B$. RE is mainly neodymium, which may be partially substituted by dysprosium, praseodymium or other rare earths. Iron may be partially substituted by cobalt. The alloys consist of 28 % to 35 % total rare earth, 0 % to 15 % cobalt, 0,85 % to 1,2 % boron, 0 % to 11 % dysprosium and terbium, 0 % to 15 % praseodymium, cerium (Ce), etc., 0 % to 1 % vanadium, niobium, aluminium, gallium and copper and the balance iron.

The sintered magnets are prepared by compacting milled alloy powder in a magnetic field and sintering the compacted body for densification followed by a heat treatment, resulting in a magnet with anisotropic magnetic properties.

Add, after the existing 5.2.5.6, the following new subclause:

5.2.6 Class R8 - Rare earth-iron-boron (REFeB) hot deformed magnets

5.2.6.1 Reference document

These materials are covered by IEC 60404-8-1.

5.2.6.2 Chemical composition and manufacturing method

The hot deformed magnets are based on the compound $RE_2Fe_{14}B$. The composition of the magnets are the same as the REFeB sintered magnets (Class R7).

The hot deformed magnets use rapidly solidified flakes prepared by the melt-spinning process. After obtaining isotropic pressed bodies, the pressed bodies are consolidated and subsequently hot deformed at elevated temperatures. Alignment of grains is obtained along compression stress during die-upsetting or extrusion.

5.2.6.3 Basis of subclassification

The recommended subclassification is based on the degree of magnetic anisotropy and chemical compositions of the material.

5.2.6.4 Available forms

The materials are typically available in the form of rings and plates.

5.2.6.5 Physical characteristics

The physical characteristics of REFeB hot deformed magnets are the same as REFeB sintered magnets (Class R7).

5.2.6.6 Main applications

The main applications of REFeB hot deformed magnets are the same as REFeB sintered magnets (Class R7).

5.3.2 Chemical composition and manufacturing method

Replace the existing first paragraph with the following new paragraph:

The composition of the hard ferrites can be described by the formula $MO{\cdot}n\ Fe_20_3$ (where M is barium, strontium and calcium). The value of n can vary from 4,5 to 6,5. The magnetic properties may be improved by special substitutions. This is particularly so with substitutions of lanthanum for strontium or calcium and of cobalt for iron. The hard ferrites have a hexagonal crystal structure with magnetic anisotropy.

5.5.4.2 Chemical composition and manufacturing method

Replace the existing paragraph with the following new paragraph:

These bonded magnets contain powdered alloys as given in class R7. There are 2 kinds of REFeB powders for isotropic and anisotropic bonded magnets. The isotropic powders have submicron grain size and are produced by the melt-spinning method and subsequent heat treatment. The anisotropic powders are produced by the Hydrogen Disproportionation Desorption Recombination (HDDR) process. The REFeB ingots are heated to absorb hydrogen and cause disproportionation in the hydrogen gas atmosphere (HD) and to desorb hydrogen and produce recombination in a vacuum (DR). The obtained anisotropic powders are around 100 µm in diameter of which alignment is along a certain direction and the grain size is submicron.

5.5.6.2 Chemical composition and manufacturing method

Replace the existing paragraph with the following new text:

The anisotropic bonded magnets contain powdered $Sm_2Fe_{17}N_3$ intermetallic compound. These materials consist of 22 % to 27 % samarium, 3,0 % to 4,0 % nitrogen and the balance iron. The SmFeN powders are manufactured by the reduction diffusion process using Sm_2O_3 and Fe powders with calcium as a reductant followed by nitrogenation. When the size of the processed powders is coarse, a subsequent milling is required.

The isotropic bonded magnets contain powdered $TbCu_7$ type intermetallic compound. These materials consist of 19 % to 25 % samarium, 2,5 % to 3,5 % nitrogen, 0 % to 5 % cobalt, 0 % to 2 % other elements such as zirconium, hafnium and niobium and the balance iron. The SmFeN powders are manufactured by melt spinning process followed by heat treatment and nitrogenation.

The $Sm_2Fe_{17}N_3$ type powder and the $TbCu_7$ type powder are mixed with a suitable binder and the compacts are then formed to shape using injection moulding or compression moulding in a magnetic field and no magnetic field.

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