SLOVENSKI STANDARD
oSIST prEN IEC 63299:2022

01-april-2022

Klasifikacija jeder iz magnetnega prahu

Classification of magnetic powder cores

Ta slovenski standard je istoveten z: **prEN IEC 63299:2022**

ICS:		
29.030	Magnetni materiali	Magnetic materials
29.100.10	Magnetne komponente	Magnetic components

oSIST prEN IEC 63299:2022 **en**

51/1403/CDV

COMMITTEE DRAFT FOR VOTE (CDV)

PROJECT NUMBER:	
IEC 63299 ED1	
DATE OF CIRCULATION:	CLOSING DATE FOR VOTING:
2022-01-28	**2022-04-22**
SUPERSEDES DOCUMENTS:	
51/1376/CD, 51/1387/CC	

IEC TC 51 : MAGNETIC COMPONENTS, FERRITE AND MAGNETIC POWDER MATERIALS	
SECRETARIAT:	SECRETARY:
Japan	Mr Takeshi Abe
OF INTEREST TO THE FOLLOWING COMMITTEES:	PROPOSED HORIZONTAL STANDARD:
TC 68	☐
	Other TC/SCs are requested to indicate their interest, if any, in this CDV to the secretary.

FUNCTIONS CONCERNED:

☐ EMC ☐ ENVIRONMENT ☐ QUALITY ASSURANCE ☐ SAFETY

☒ SUBMITTED FOR CENELEC PARALLEL VOTING ☐ NOT SUBMITTED FOR CENELEC PARALLEL VOTING

Attention IEC-CENELEC parallel voting

The attention of IEC National Committees, members of CENELEC, is drawn to the fact that this Committee Draft for Vote (CDV) is submitted for parallel voting.

The CENELEC members are invited to vote through the CENELEC online voting system.

This document is still under study and subject to change. It should not be used for reference purposes.

Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

TITLE:

Classification of magnetic powder cores

PROPOSED STABILITY DATE: 2027

NOTE FROM TC/SC OFFICERS:

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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CLASSIFICATION OF MAGNETIC POWDER CORES

FOREWORD

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IEC 63299 has been prepared by IEC technical committee 51: Magnetic components, ferrite and magnetic powder materials. It is an international standard.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
XX/XX/FDIS	XX/XX/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.

The language used for the development of this International Standard 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 http://www.iec.ch/standardsdev/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,
- replaced by a revised edition, or
- amended.

CLASSIFICATION OF MAGNETIC POWDER CORES

1 Scope

This International Standard specifies classification rules for metallic magnetic powder cores used in inductive components fulfilling the requirements of the electronics industries.

This standard addresses the following purposes for magnetic powder cores suppliers and users:

– cross-reference between core materials from multiple suppliers;

– assistance to users in understanding the published technical data in catalogues when comparing multiple suppliers;

– guidance to users in selecting the most applicable core for each application;

– establishing uniform benchmarks for suppliers for performance in new development of core material.

The numerical values given in this standard are typical values of parameters of the related material. 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 supplier.

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 60050-221, *International Electrotechnical Vocabulary (IEV) – Chapter 221: Magnetic materials and components*

IEC 60404-1, *Magnetic materials – Part 1: Classification*

IEC 63300, *Test methods for electrical and magnetic properties of magnetic powder cores*

3 Terms and definitions

For the purpose of this document, the terms and definitions given in IEC 60050-221, IEC 60404-1 and IEC 63300.

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 General

Magnetic powder cores consist of a basic metallic soft magnetic powder and inorganic or organic electrically insulating additives and binders. The magnetic powder core materials may be divided into some main classes according to the composition and crystal structure of metallic magnetic powder. The relevant main classes are pure iron (Fe) powder, iron-silicon (Fe-Si) powder, iron-silicon-aluminium (Fe-Si-Al) powder, iron-nickel (Fe-Ni) powder, iron-nickel-molybdenum (Fe-Ni-Mo) powder, iron-based amorphous powder (typically Fe-Si-B), and iron-based nanocrystalline (typically Fe-Cu-Nb-Si-B) powder.

The subclassification of powder cores of each material is based on their (effective) initial permeability.

A 060

Permeability code, e.g. 060 for permeability μ = 60

Powder composition code, I, K, S, H, M, A and N

I: iron

K: Fe-Si

S: Fe-Si-Al

H: Fe-Ni

M: Fe-Ni-Mo

A: Amorphous

N: Nanocrystal

Magnetic powder core materials are mainly used for inductive components. The shapes produced include rings, blocks, cylinders, ellipses, E types, EQ types, EER types, U types and pot types. The shape and dimension of the cores shall be determined in the detailed specification.

4.2 Iron powder core materials

4.2.1 Chemical composition

Iron powder cores consist of basic pure iron powder, inorganic or organic electrically insulating additives and binders.

4.2.2 Characteristics

A more complete definition of this material can be based on the following characteristics:

– magnetic: initial permeability, saturation magnetic flux density, DC-bias characteristic, power loss density, temperature coefficient of permeability;

– mechanical: density, mechanical strength, thermal conductivity.

The typical magnetic properties of iron powder core materials are given in Table 1.

Table 1 – Typical magnetic properties of iron powder core materials

Subclasses	Initial permeability	Magnetic flux density at f = 50 Hz, H = 20 kA/m T	DC-bias characteristic [a] at f = 10 kHz, B ≤ 0,5 mT %		Power loss density at f = 50 kHz, B = 25 mT kW/m³
			H = 8 kA/m	H = 16 kA/m	
I 010	10 × (1 ± 10 %)	≥ 0,26	-	≥ 85	≤ 40
I 035	35 × (1 ± 10 %)	≥ 0,78	-	≥ 50	≤ 70
I 055	55 × (1 ± 10 %)	≥ 1,03	≥ 43	-	≤ 100
I 060	60 × (1 ± 10 %)	≥ 1,30	≥ 40	-	≤ 150
I 075	75 × (1 ± 10 %)	≥ 1,30	≥ 25	-	≤ 150
Note: The measuring methods for the main magnetic properties are according to International Standard IEC 63300.The specimens are ring-cores whose dimension is Ø 26.9 mm × Ø 14.5 mm × 11.1 mm.					
[a] DC bias characteristic is defined as the ratio of the initial permeability of a magnetic powder core with DC bias magnetic field to that without DC bias magnetic field.					

4.3 Iron-silicon powder core materials

4.3.1 Chemical composition

Iron-silicon powder cores consist of basic iron-silicon powder, inorganic or organic electrically insulating additives and binders.

4.3.2 Characteristics

A more complete definition of this material can be based on the following characteristics:

– magnetic: initial permeability, saturation magnetic flux density, DC-bias characteristic, power loss density, temperature coefficient of permeability;

– mechanical: density, mechanical strength, thermal conductivity.

The typical magnetic properties of iron-silicon powder core materials are given in Table 2.

Table 2 – Typical magnetic properties of iron-silicon powder core materials

Subclasses	Initial permeability	Magnetic flux density at f = 50 Hz, H = 20 kA/m T	DC-bias characteristic [a] at f = 10 kHz, B ≤ 0,5 mT %		Power loss density kW/m^3	
			H = 8 kA/m	H = 16 kA/m	f = 100 kHz, B = 100 mT	f = 500 kHz, B = 20 mT
K 026	26 × (1 ± 8 %)	≥ 0,62	-	≥ 75	≤ 2200	≤ 420
K 040	40 × (1 ± 8 %)	≥ 0,80	-	≥ 63	≤ 1900	≤ 400
K 060	60 × (1 ± 8 %)	≥ 1,03	≥ 67	-	≤ 1700	≤ 400
K 075	75 × (1 ± 8 %)	≥ 1,10	≥ 54	-	≤ 1700	≤ 420
K 090	90 × (1 ± 8 %)	≥ 1,16	≥ 44	-	≤ 1900	≤ 450
Note: The measuring methods for the main magnetic properties are according to International Standard IEC 63300.The specimens are ring-cores whose dimension is Ø 26.9 mm × Ø 14.7 mm × 11.2 mm.						
[a] DC bias characteristic is defined as the ratio of the initial permeability of a magnetic powder core with DC bias magnetic field to that without DC bias magnetic field.						

4.4 Iron-silicon-aluminum powder core materials

4.4.1 Chemical composition

Iron-silicon-aluminum powder cores consist of basic iron-silicon-aluminum powder, inorganic or organic electrically insulating additives and binders.

NOTE These materials are known in the industry as “Sendust”.

4.4.2 Characteristics

A more complete definition of this material can be based on the following characteristics:

– magnetic: initial permeability, saturation magnetic flux density, DC-bias characteristic, power loss density, temperature coefficient of permeability;

– mechanical: density, mechanical strength, thermal conductivity.

The typical magnetic properties of iron-silicon-aluminum powder core materials are given in Table 3.

188 **Table 3 – Typical magnetic properties of iron-silicon-aluminum powder core materials**

Subclasses	Initial permeability	Magnetic flux density at f = 50 Hz, H = 20 kA/m T	DC-bias characteristic [a] at f = 10 kHz, B ≤ 0,5 mT %			Power loss density kW/m^3	
			H = 4 kA/m	H = 8 kA/m	H = 16 kA/m	f = 100 kHz, B = 100 mT	f = 500 kHz, B = 20 mT
S 026	26 × (1 ± 8 %)	≥ 0,43	-	-	≥ 48	≤ 1000	≤ 230
S 060	60 × (1 ± 8 %)	≥ 0,71	-	≥ 43	-	≤ 750	≤ 230
S 075	75 × (1 ± 8 %)	≥ 0,77	≥ 58	-	-	≤ 750	≤ 230
S 090	90 × (1 ± 8 %)	≥ 0,79	≥ 51	-	-	≤ 800	≤ 260
S 125	125 × (1 ± 8 %)	≥ 0,85	≥ 38	-	-	≤ 800	≤ 260
Note: The measuring methods for the main magnetic properties are according to International Standard IEC 63300. The specimens are ring-cores whose dimension is Ø 26.9 mm × Ø 14.7 mm × 11.2 mm.							
[a] DC bias characteristic is defined as the ratio of the initial permeability of a magnetic powder core with DC bias magnetic field to that without DC bias magnetic field.							

189 ## 4.5 Iron-nickel powder core materials

190 ### 4.5.1 Chemical composition

191 Iron-nickel powder cores consist of basic nickel-iron powder, inorganic or organic electrically
192 insulating additives and binders.

193 NOTE These materials are known in the industry as “High Flux”.

194 ### 4.5.2 Characteristics

195 A more complete definition of this material can be based on the following characteristics:

196 – magnetic: initial permeability, saturation magnetic flux density, DC-bias characteristic,
197 power loss density, temperature coefficient of permeability;

198 – mechanical: density, mechanical strength, thermal conductivity.

199 The typical magnetic properties of iron-nickel powder core materials are given in Table 4.