

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Terms and nomenclature for cores made of magnetically soft ferrites –
Part 1: Terms used for physical irregularities and reference of dimensions
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Termes et nomenclature pour noyaux en matériaux ferrites magnétiquement
doux –
IEC 60401-1:2020

<https://standards.iteh.ai/catalog/standards/sist/6c93c5bd-a99c-49b6-a098-60401-1-2020>
Partie 1: Termes utilisés pour les irrégularités physiques et références
dimensionnelles



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IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

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dimensionnelles**

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CONTENTS

FOREWORD	5
1 Scope	7
2 Normative references	7
3 Terms and definitions	7
4 Physical irregularities	7
4.1 General overview	7
4.2 General terms for physical irregularities	8
4.3 Surface irregularities	8
4.3.1 Chip irregularities	8
4.3.2 Protruding (convex) irregularities	10
4.3.3 Edge irregularities	11
4.3.4 Crack irregularities	11
4.3.5 Colour irregularities	13
4.3.6 Machining-related irregularities	15
4.4 Interior irregularities	16
4.5 Shape irregularities (deformations)	16
4.5.1 Non-flat irregularities	16
4.5.2 Simple geometry irregularities	18
4.5.3 Grinding related irregularities	20
4.5.4 Other shape irregularities	20
5 Reference of dimensions	21
5.1 General specifications	21
5.2 Dimension descriptions	21
5.3 Core illustrations	22
Annex A (informative) Location related terms	26
A.1 General	26
A.2 Surfaces	26
A.3 Shape	27
A.4 Specific parts location qualifiers	27
Figure 1 – Surface chip	9
Figure 2 – Edge chip	9
Figure 3 – Corner chip	9
Figure 4 – Pull-out	10
Figure 5 – Pores	10
Figure 6 – Hump	10
Figure 7 – Attached particle	10
Figure 8 – Ragged edge	11
Figure 9 – Flash	11
Figure 10 – Single-surface narrow crack	11
Figure 11 – Single-surface broad crack	12
Figure 12 – Edge narrow crack	12
Figure 13 – Edge broad crack	12
Figure 14 – Inner channel crack	13

Figure 15 – Lamination	13
Figure 16 – Crazeing	13
Figure 17 – Difference in colour tones.....	14
Figure 18 – Discoloration	14
Figure 19 – Stain	14
Figure 20 – Crystallite.....	14
Figure 21 – Roughness	15
Figure 22 – Short-ground surface.....	15
Figure 23 – Scratch	15
Figure 24 – Convexity	16
Figure 25 – Concavity	16
Figure 26 – Warping	16
Figure 27 – Deflection-out.....	17
Figure 28 – Deflection-in	17
Figure 29 – Transverse deflection	17
Figure 30 – Undulation.....	18
Figure 31 – Non-parallelism	18
Figure 32 – Non-perpendicularity	18
Figure 33 – Non-coplanarity	18
Figure 34 – Non-circularity	19
Figure 35 – Ovality	19
Figure 36 – Non-concentricity of co-planar circles.....	19
Figure 37 – Non-concentricity of circles lying on two planes.....	20
Figure 38 – Steplike ground surface.....	20
Figure 39 – Uneven grinding slant.....	20
Figure 40 – Un-matching.....	21
Figure 41 – Profile deformation	21
Figure 42 – Ring-cores	22
Figure 43 – E-core	22
Figure 44 – ETD- or EER-core	23
Figure 45 – EC-core.....	23
Figure 46 – Planar E-core	23
Figure 47 – Planar EL-core	23
Figure 48 – Planar ER-core	23
Figure 49 – Plate-core mating planar cores.....	23
Figure 50 – EFD-core	24
Figure 51 – Drum-core	24
Figure 52 – EP-core.....	24
Figure 53 – PQ-core	24
Figure 54 – Pot-core and half pot-core for inductive proximity switches	24
Figure 55 – PM-core	24
Figure 56 – RM-core	25
Figure 57 – U-core	25

Figure 58 – UR-core	25
Figure 59 – Balun-core	25
Figure 60 – Multi hole bead.....	25
Figure A.1 – E-core.....	28
Figure A.2 – RM-core.....	28
Table 1 – Ring-core dimension designations	21
Table 2 – Other ferrite shape dimension designations	22

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International Standard IEC 60401-1 has been prepared by IEC technical committee 51: Magnetic components, ferrite and magnetic powder materials.

This second edition cancels and replaces the first edition of IEC 60401-1 published in 2002 and the second edition of IEC 60401-2 published in 2009. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous editions of IEC 60401-1 and IEC 60401-2:

- a) added the surface irregularity term "pores" in 4.3.1.6;
- b) added the surface irregularity term "scratch" in 4.3.6.3;
- c) removed the surface irregularity term "crater" in 4.1.5 of IEC 60401-1: 2002;

- d) removed the bulk irregularity terms “superpores” in 5.1, “inclusions” in 5.2, “internal stratification” in 5.3 and “internal crack” in 5.4 of IEC 60401-1: 2002;
- e) removed the contents related to “yoke ring cores” in 7.1.3 and 7.4 of IEC 60401-1:2002;
- f) replaced the surface irregularity term “stratification” with “lamination” in 4.3.4.7;
- g) replaced the location related terms “upper surface of back” with “bottom surface” and “lower surface of back” with “back surface” in Figure A.1;
- h) changed Clause 7 of IEC 60401-1:2002 into Annex A.

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

CDV	Report on voting
51/1313/CDV	51/1332/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.

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

A list of all parts in the IEC 60401 series, published under the general title *Terms and nomenclature for cores made of magnetically soft ferrites* can be found on the IEC website.

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

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- amended.

TERMS AND NOMENCLATURE FOR CORES MADE OF MAGNETICALLY SOFT FERRITES –

Part 1: Terms used for physical irregularities and reference of dimensions

1 Scope

This part of IEC 60401 provides a nomenclature of the most frequent surface, bulk and shape irregularities relevant to cores made of soft ferrites (magnetic oxides). Most irregularities are graphically exemplified as visual aids. A general recommendation is also given in Annex A for a consistent scheme for specifying the exact location of the irregularity, combining a general name for the location with more detailed qualifiers of the specified location. This document can also be useful as a terminology reference when preparing technical documentation, irregularity inspection specifications, etc.

This document also presents a method for defining the designation nomenclature for the major physical attributes of soft ferrite core shapes. The purpose of this document is to facilitate uniform usage of dimensional characters by manufacturers, specifiers, and users when describing core dimensions on drawings, in tables, and on catalogue specification sheets.

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2 Normative references

There are no normative references in this document.
IEC 60401-1:2020
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3 Terms and definitions

For the purposes of this document, the terms and definitions given in 4.2, 4.3, 4.5 and Annex A 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 Physical irregularities

4.1 General overview

Physical irregularities mean here the surface irregularities, bulk irregularities and shape irregularities. The irregularity here stands for inconsistency of the state or quality of the part's surface, bulk or shape with its intended regularity. These irregularities are considered here in the macroscopic scale, i.e. within the range of linear dimensions of irregularities from one micrometre to tens of millimetres.

There is a great variety of surface, bulk and shape irregularities degrading the quality of parts made of ferrites. Different types of these irregularities can often occur together and overlap one another.

Each type of irregularity is, in general, produced by one or more of the following: process variability in a manufacturing step, handling, grinding, packing or transportation.

The extent of the quality degradation is dependent on the type, scale, and combination of irregularities being present as well as on their locations on the part. There are locations particularly sensitive to the degrading effect of the specific types of irregularities.

The irregularities can in extreme cases have a detrimental or critical effect on magnetic, electric and mechanical performances of the part. Operations performed on the part, such as marking, winding, assembling and mounting, can also be adversely affected by the irregularities.

An ongoing tendency to upgrade the overall quality of the parts results in more stringent restrictions being imposed on the quantity of irregularities in these parts.

This brings about a need for a set of definitions, or nomenclature, which would be a primary basis for approaches to irregularities and their location issues.

Therefore, this nomenclature is intended to be used as a uniform reference when formulating more detailed descriptions of irregularities at specified locations, requirements and procedures related to the inspection and assessment of irregularities. This nomenclature can also be useful with regard to methods and tools used for detection, recognition and classification of irregularities.

4.2 General terms for physical irregularities

4.2.1

surface irregularity

unintentional state or appearance of the surfaces, edges and corners of the part

Note 1 to entry: Some surface irregularities, if excessive, can so deform contours and surfaces of the part, that they may also be classified as shape irregularities.

4.2.2

interior irregularity

unintentional inhomogeneity inside the part

4.2.3

shape irregularity

unintentional deformation of the contour lines or surfaces delimiting the shape of the part

Note 1 to entry: In some cases, shape irregularities smaller than quoted tolerances can still disqualify the part.

4.2.4

tolerance

<dimensional> allowable difference between the nominal and permissible limit dimensions of the contour lines defining the part's shape

4.2.5

location

<of the irregularity> position on or within the part where the irregularity is present

4.3 Surface irregularities

4.3.1 Chip irregularities

4.3.1.1

chip

lack of surface material generally caused by mechanical impact during handling or transportation

Note 1 to entry: In almost all cases, chips are located on the edges of surfaces.

4.3.1.2

surface chip

chip located only on the core surface

SEE: Figure 1.



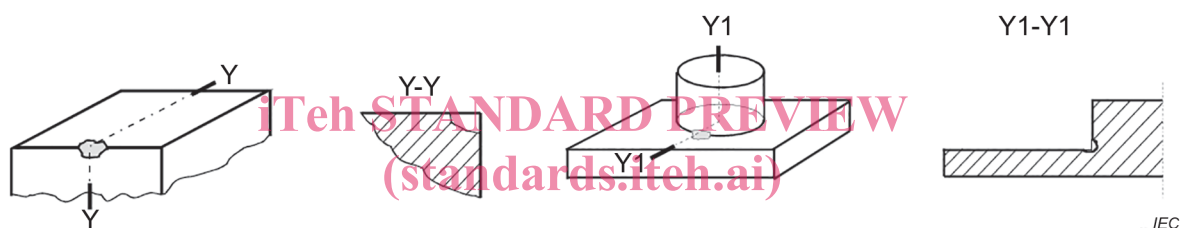
Figure 1 – Surface chip

4.3.1.3

edge chip

chip located only on the core edge

SEE: Figure 2.



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Figure 2 – Edge chip

4.3.1.4

corner chip

chip located only in a corner

SEE: Figure 3.

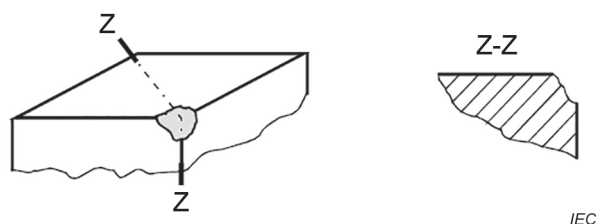


Figure 3 – Corner chip

4.3.1.5

pull-out

consequence of the removal of the surface layer of the core due to die “sticking”, which occurs on surfaces perpendicular to the direction of the pressing action

Note 1 to entry: A pull-out with a depth greater than 1 mm should be considered as a chip.

SEE: Figure 4.

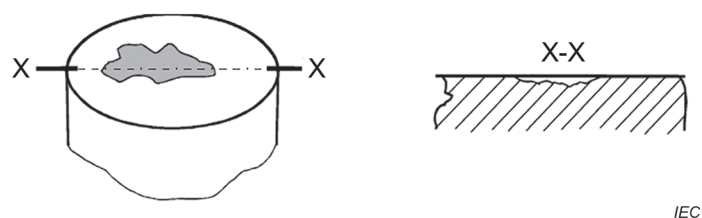


Figure 4 – Pull-out

4.3.1.6

pore

hole left on the surface of cores after sintering and surface finishing

SEE: Figure 5.

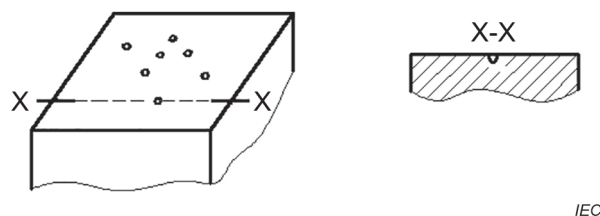


Figure 5 – Pores

4.3.2 Protruding (convex) irregularities

4.3.2.1

hump

elevation of a rounded contour on the relevant surface

SEE: Figure 6.



Figure 6 – Hump

4.3.2.2

attached particle

any particle on the surface which cannot be removed by compressed-air, cleaning, washing or wiping

SEE: Figure 7.



Figure 7 – Attached particle

4.3.2.3**inclusion**

millimetre or sub-millimetre-sized foreign body located in the surface of the part

4.3.3 Edge irregularities**4.3.3.1****ragged edge**

edge affected by a series of small chips

SEE: Figure 8.

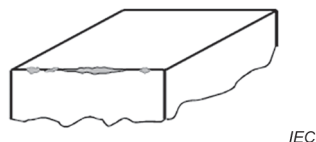


Figure 8 – Ragged edge

4.3.3.2**flash**

sharp feather-edge wall extending beyond the intended contour surface of the core

SEE: Figure 9.



Figure 9 – Flash

4.3.4 Crack irregularities**4.3.4.1****crack**

surface irregularity which has a width much smaller than its length and penetrates into the core

4.3.4.2**single-surface narrow crack**

crack located on a single surface, not going beyond its edges, and with a width not exceeding a specified limit (e.g. 0,1 mm) anywhere along the crack path on the surface

SEE: Figure 10.

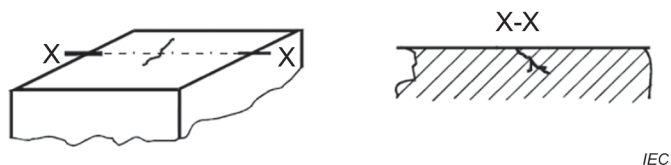


Figure 10 – Single-surface narrow crack

4.3.4.3

single-surface broad crack

crack located on a single surface, not going beyond its edges, and with a width equal to or exceeding the limit specified for the narrow crack anywhere along the crack path on the surface

SEE: Figure 11.



Figure 11 – Single-surface broad crack

4.3.4.4

edge narrow crack

crack located on two adjacent surfaces and crossing their common edge, with a width not exceeding a specified limit (e.g. 0,1 mm) anywhere along the crack path on these surfaces

SEE: Figure 12.



Figure 12 – Edge narrow crack

4.3.4.5

edge broad crack

crack located on two adjacent surfaces and crossing their common edge, with a width equal to or exceeding the limit specified for the narrow crack anywhere along the crack path on these surfaces

SEE: Figure 13.

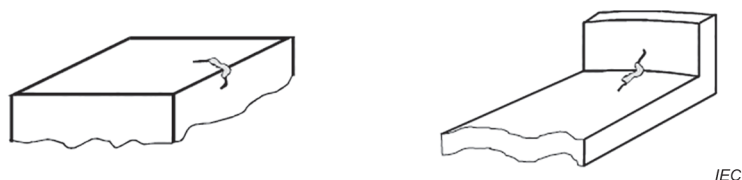


Figure 13 – Edge broad crack

4.3.4.6

inner channel crack

narrow or broad crack along an inner edge of the core

SEE: Figure 14.

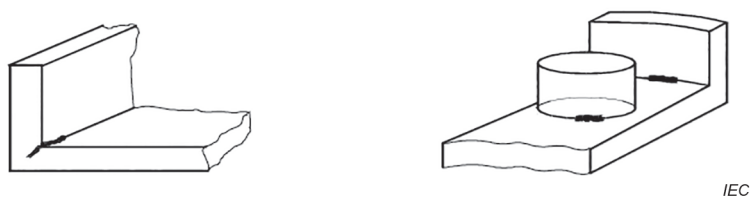


Figure 14 – Inner channel crack

4.3.4.7

lamination

series of cracks located side by side which are more or less parallel, or single crack, which runs along a significant portion (e.g. 20 %) of the periphery of the part

Note 1 to entry: Lamination is usually positioned transversely to the direction of the pressing of the core.

SEE: Figure 15.

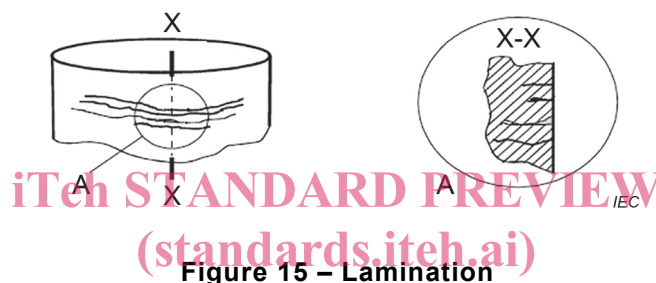


Figure 15 – Lamination

4.3.4.8

crazing

grid-like pattern of superficial cracks of a depth not exceeding a specified limit (e.g. 0,3 mm)

SEE: Figure 16.

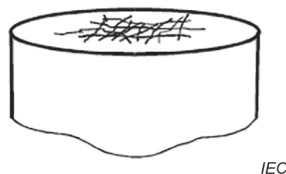


Figure 16 – Crazing

4.3.5 Colour irregularities

4.3.5.1

difference in colour tone

slight but visible local change(s) in the tint of the natural colour or shading of an area of a surface from the surrounding background

SEE: Figure 17.