

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

**Ferrite cores – Guidelines on dimensions and the limits of  
surface irregularities –  
Part 1: General specification**

**Noyaux ferrites – Lignes directrices relatives aux dimensions  
et aux limites des irrégularités de surface –  
Partie 1: Spécification générale**



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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**FERRITE CORES –  
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THE LIMITS OF SURFACE IRREGULARITIES –****Part 1: General specification****FOREWORD**

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International Standard IEC 63093-1 has been prepared by IEC technical committee 51: Magnetic components, ferrite and magnetic powder materials.

This first edition cancels and replaces the second edition of IEC 60424-1 published in 2015 and the first edition of IEC 62317-1 published in 2007. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous editions of IEC 60424-1 and IEC 62317-1:

- a) this document integrates IEC 60424-1 and IEC 62317-1.

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

CDV	Report on voting
51/1309/CDV	51/1327/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 63093 series, published under the general title *Ferrite cores – Guidelines on dimensions and the limits of surface irregularities*, 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 publication will be

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IEC 63093-1:2020

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## INTRODUCTION

Due to the method of manufacture and the physical nature of the products, ferrite cores can be expected to exhibit some degree of physical irregularities such as chips, ragged edges, cracks, flashing, and pull-outs.

The permissible extent of these surface irregularities will depend on the type, position and size of the defect and on the function of the core. Thus, in order to establish limits of surface irregularities for a given series of ferrite cores, for example RM-cores, pot-cores, E-cores, U-cores and ring-cores, a particular specification should be prepared for each, setting out in detail the permissible extent of the various types of irregularities.

All surfaces of the core should be clean and free from loose ferrite particles or any other foreign matter. This is more critical for mating surfaces that should make good contact with one another. Stains, discolorations, surface crazing or crystallization are acceptable if they do not affect the normal performance of the core. The irregularities described below are considered as being detectable without the use of any magnifying equipment.

The limits of surface irregularities are set for control of the cosmetic appearance, and not for control of the magnetic performance. Surface irregularities do not substantially affect core magnetic function, nor do they affect reliability. Reliability should be assessed for wound magnetics, rather than for cores alone. See IEC 60401-3 for more details concerning the reliability of ferrite cores and devices built with them.

A list of the IEC 63093 series is shown in Annex A.

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# FERRITE CORES – GUIDELINES ON DIMENSIONS AND THE LIMITS OF SURFACE IRREGULARITIES –

## Part 1: General specification

### 1 Scope

This part of IEC 63093 specifies the dimensions and allowable limits of surface irregularities of ferrite cores.

It is intended that this document includes ferrite cores which are widely used and referenced in industry, either because they are included in national standards, or because they are seen to have broad-based use in industry. Where applicable, it is intended that the existing industrial name for each standard part appears with the part within this series.

It is intended that this document excludes ferrite cores which are specialty cores with limited use. Also, special cores which are only marginal variations upon standard cores are excluded.

A ferrite core produced by only one or two suppliers can generally be considered a specialty part, and not suitable as a standard core within this series. A ferrite core produced by three or more competing manufacturers can generally be considered to be a candidate to be included in this series.

IEC publishes electrical standards for families of ferrite cores, as well as this series of dimensional standards for families of ferrite cores. Modifications to the ferrite cores listed in one type of standard are reflected in the other type.

This document is considered as a general specification useful in the dialogue between ferrite core suppliers and users about surface irregularities.

### 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 60401-1, *Terms and nomenclature for cores made of magnetically soft ferrites – Part 1: Terms used for physical irregularities*

IEC 60401-2, *Terms and nomenclature for cores made of magnetically soft ferrites – Part 2: Reference of dimensions*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60401-1 and the following 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>

### 3.1

#### **chips and ragged edges**, pl.

areas with missing surface material as a result of mechanical impact during handling

### 3.2

#### **crack**

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

### 3.3

#### **flash**

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

### 3.4

#### **pull-out**

removal of a surface layer of the core due to die "sticking"

### 3.5

#### **pore**

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

### 3.6

#### **crystallite**

grain of abnormal size distinguishable on the surface, often with sparkling facets

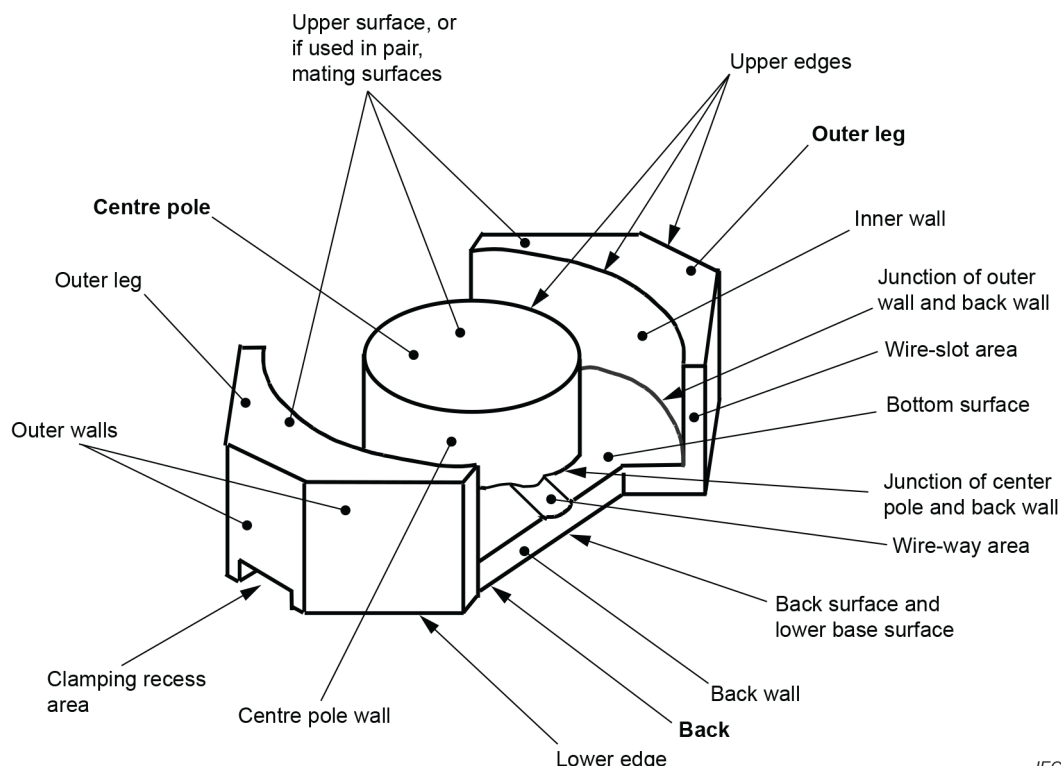
## 4 Dimension descriptions

Dimension descriptions shall be as indicated in IEC 60401-2.

## 5 Location and functions of core parts and surfaces

### 5.1 General

Figure 1 shows the location of the main core parts and surfaces of an RM-core.



IEC

NOTE The back is a three-dimensional area surrounded by the bottom surface, back surface and two back walls.

**Figure 1 – Location of main core parts and surfaces – Example of RM-core type**

## 5.2 Mating surfaces

IEC 63093-1:2020

<https://standards.iteh.ai/catalog/standards/sist/b9943b77-e135-4648-8798-1de24186385e/iec-63093-1-2020>

These surfaces are generally ground in order to limit the residual air gap between the two core halves. Consequently, irregularities on these surfaces have to be considered as major ones, and carefully evaluated with regard to their influence on the magnetic properties of the complete circuit.

## 5.3 Centre post

This should be considered as the most important part of the core due to its function of carrying the total flux generated by the winding. The centre post of ferrite cores is generally circular (with or without a hole) or rectangular. If the centre post is circular, it is called centre pole and if the centre post is rectangular, it is called centre leg.

## 5.4 Outer legs

The main function of the outer legs is to guide the magnetic flux in a closed magnetic circuit.

## 5.5 Back, bottom surface and back surfaces

The back has the same magnetic function as the outer legs; it can include wire-slots and wire-way areas (for example on RM-cores), the shapes and dimensions of which are dictated by the winding and isolation requirements.

Besides accommodating clamping, the back surface (ground or not) serves as a reference plane for grinding the mating surface to achieve its required parallelism, flatness and smoothness.

## 5.6 Wire-slot area

The wire-slot area is the lateral area of the outer walls, interfacing with the cut-out portion.

### 5.7 Wire-way area

The wire-way area is located on the bottom (inside) surface of the back, also called the floor. The wire-way runs radially from the centre post to the edge of the back wall, centred with respect to the wire-slot areas. The purpose of the wire-way is to provide a path for leads to reach from the inside of the coil to terminals on the outside.

### 5.8 Clamping recess area

The clamping recess areas on the back accommodate clamping clips, affording secure mounting, and preventing mechanical interference from the clip above the plane of the back surface.

## 6 Area and length reference for visual inspection

Irregularities such as chips, cracks and pull-outs should be compared to five simple geometries which are shown in Table 1.

Such a table should be used as a reference for evaluation by operators either at the outgoing stage (core manufacturers) or at the incoming inspection (customers).

Other methods than visual inspection can be used, such as computerized optical detection.

NOTE The minimum area and length considered are respectively 0,5 mm<sup>2</sup> and 1 mm.

Recommended resolutions are as follows:

a) for the area:

- 0,5 mm<sup>2</sup> up to 5 mm<sup>2</sup>
- 1 mm<sup>2</sup> from 5 mm<sup>2</sup> to 10 mm<sup>2</sup>
- 2,5 mm<sup>2</sup> from 10 mm<sup>2</sup> to 20 mm<sup>2</sup>
- 5 mm<sup>2</sup> from 20 mm<sup>2</sup> to 50 mm<sup>2</sup>

b) for the length:

- 1 mm from 1 mm to 5 mm
- 2,5 mm from 5 mm to 10 mm

**Table 1 – Area and length reference for visual inspection**

Area	A	B	C	D	E	Area	A	B	C	D	E
0,5 mm <sup>2</sup>	•	■	—	—	▲	12,5 mm <sup>2</sup>	●	■	—	—	▲
1,0 mm <sup>2</sup>	•	■	—	—	▲	15,0 mm <sup>2</sup>	●	■	—	—	▲
1,5 mm <sup>2</sup>	•	■	—	—	▲	17,5 mm <sup>2</sup>	●	■	—	—	▲
2,0 mm <sup>2</sup>	•	■	—	—	▲	20,0 mm <sup>2</sup>	●	■	—	—	▲
2,5 mm <sup>2</sup>	•	■	—	—	▲	25,0 mm <sup>2</sup>	●	■	—	—	▲
3,0 mm <sup>2</sup>	•	■	—	—	▲	30,0 mm <sup>2</sup>	●	■	—	—	▲
3,5 mm <sup>2</sup>	•	■	—	—	▲	35,0 mm <sup>2</sup>	●	■	—	—	▲
4,0 mm <sup>2</sup>	•	■	—	—	▲	40,0 mm <sup>2</sup>	●	■	—	—	▲
4,5 mm <sup>2</sup>	•	■	—	—	▲	45,0 mm <sup>2</sup>	●	■	—	—	▲
5,0 mm <sup>2</sup>	•	■	—	—	▲	50,0 mm <sup>2</sup>	●	■	—	—	▲
6,0 mm <sup>2</sup>	•	■	—	—	▲						
7,0 mm <sup>2</sup>	•	■	—	—	▲						
8,0 mm <sup>2</sup>	•	■	—	—	▲						
9,0 mm <sup>2</sup>	•	■	—	—	▲						
10,0 mm <sup>2</sup>	•	■	—	—	▲						

Scale 1:1

1 mm — 2 mm — 3 mm — 4 mm —

5 mm — 7,5 mm — 10 mm —