



IEC 60205

Edition 4.0 2016-11

# INTERNATIONAL STANDARD

---

**Calculation of the effective parameters of magnetic piece parts**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

---

ICS 29.100.10

ISBN 978-2-8322-3775-5

**Warning! Make sure that you obtained this publication from an authorized distributor.**

## CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1    Scope .....	7
2    Normative references.....	7
3    Terms and definitions.....	7
4    Basic rules applicable to this standard.....	7
5    Formulae for the various types of cores.....	8
5.1    Ring cores .....	8
5.1.1    Ring cores in general .....	8
5.1.2    For ring cores of rectangular cross-section with sharp corners.....	9
5.1.3    For ring cores of rectangular cross-section with an appreciable average rounding radius $r_0$ .....	9
5.1.4    For ring cores of rectangular cross-section with appreciable chamfer $c_0$ .....	9
5.1.5    For ring cores of trapezoidal cross-section with sharp corners .....	9
5.1.6    For ring cores of trapezoidal cross-section with an appreciable average rounding radius $r_0$ .....	9
5.1.7    For ring cores of cross-section with circular arc frontal sides .....	9
5.2    Pair of U-cores of rectangular section.....	10
5.3    Pair of U-cores of rounded section .....	10
5.4    Pair of E-cores of rectangular section.....	11
5.5    Pair of ETD/EER-cores.....	12
5.6    Pair of pot-cores .....	14
5.7    Pair of RM-cores .....	16
5.8    Pair of EP-cores.....	20
5.9    Pair of PM-cores .....	21
5.10    Pair of EL-cores .....	23
5.11    Pair of ER-cores (low profile).....	25
5.12    Pair of PQ-cores .....	28
5.13    Pair of EFD-cores.....	31
5.14    Pair of E planar-cores .....	33
5.15    Pair of EC-cores.....	34
Bibliography .....	37
Figure 1 – Ring cores .....	8
Figure 2 – Pair of U-cores of the rectangular section .....	10
Figure 3 – Pair of U-cores of rounded section .....	11
Figure 4 – Pair of E-cores of rectangular section .....	12
Figure 5 – Pair of ETD/EER-cores .....	13
Figure 6 – Pair of pot-cores .....	14
Figure 7 – Pair of RM-cores .....	18
Figure 8 – Pair of EP-cores .....	20
Figure 9 – Pair of PM-cores .....	22
Figure 10 – Pair of EL-cores.....	23

Figure 11 – PLT(plate)-cores .....	24
Figure 12 – Pair of ER-cores (low profile) .....	26
Figure 13 – PLT(plate)-cores .....	26
Figure 14 – Pair of PQ-cores .....	28
Figure 15 – PQ-cores .....	29
Figure 16 – PLT(plate)-cores .....	29
Figure 17 – Pair of EFD-cores .....	31
Figure 18 – Pair of E planar-cores .....	33
Figure 19 – PLT(plate)-cores .....	33
Figure 20 – Pair of EC-cores .....	35

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

---

**CALCULATION OF THE EFFECTIVE PARAMETERS  
OF MAGNETIC PIECE PARTS****FOREWORD**

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60205 has been prepared by IEC technical committee 51: Magnetic components, ferrite and and magnetic powder materials.

This fourth edition cancels and replaces the third edition published in 2006 and Amendment 1:2009. This edition constitutes a technical revision.

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

- a) addition, in 5.1, of the drawing of a core of rectangular cross-section with chamfer;
- b) addition, in 5.1.3, of the equation of a core of rectangular cross-section with chamfer;
- c) equations in 5.1.4, 5.6, 5.7, 5.8, 5.9, 5.11, 5.12, 5.14 are amended or replaced;
- d) drawings RM6-S and RM6-R in 5.7 are amended;
- e) addition of EC-cores, see 5.15.

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

FDIS	Report on voting
51/1149/FDIS	51/1156/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.

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

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

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

The contents of the corrigendum of July 2018 have been included in this copy.

## INTRODUCTION

The purpose of this revision is to provide formulae by which everybody can reach the same effective parameter values. Firstly, it is necessary to have a sufficient number of significant figures when figures are rounded off in the process of calculation. Additionally, some of the calculation formulae have been changed to get closer to the actual shape.

In this revision, the basic idea of calculation has not been changed. Recently, analysis of the magnetic field in the core has been considerably improved, so that, based on these ideas, development of new approaches and formulae can be expected.

Furthermore, the new “EC-cores” have been added.

The parameters in the existing IEC standards will be revised with the outcome from the formulae of this document.

## **CALCULATION OF THE EFFECTIVE PARAMETERS OF MAGNETIC PIECE PARTS**

### **1 Scope**

This document specifies uniform rules for the calculation of the effective parameters of closed circuits of ferromagnetic material.

### **2 Normative references**

There are no normative references in this document.