# IEC 63093-8

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# INTERNATIONAL STANDARD

## Ferrite cores – Guidelines on dimensions and the limits of surface irregularities – Part 8: E-cores

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# CONTENTS

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

## Part 8: E-cores

## FOREWORD

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International Standard IEC 63093-8 has been prepared by IEC technical committee 51: Magnetic components, ferrite and magnetic powder materials.

This first edition cancels and replaces the first edition of IEC 62317-8 published in 2006 and the second edition of IEC 60424-3 published in 2015. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to IEC 62317-8:2006 and IEC 60424-3:2015:

a) This document integrates IEC 62317-8:2006 and IEC 60424-3:2015;
b) Table 4 – Allowable areas of chips for E-cores, of IEC 60424-3:2015, has been moved to Annex C (informative) of this document.

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

| CDV | Report on voting |
|---|---|
| 51/1213/CDV | 51/1235/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 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- withdrawn,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.

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

# Part 8: E-cores

## 1 Scope

This part of IEC 63093 specifies the dimensions that are of importance for mechanical interchangeability for a preferred range of E-cores made of ferrite and the essential dimensions of coil formers to be used with them, as well the effective parameter values to be used in calculations involving them. It also gives guidelines on allowable limits of surface irregularities applicable to E-cores.

The specifications contained in this document are useful in negotiations between ferrite core manufacturers and customers about surface irregularities.

The use of derived standards, which give more detailed specifications of component parts while still permitting compliance with this standard, is discussed in Annex A.

## 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 60205, *Calculation of the effective parameters of magnetic piece parts*

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

IEC 60424-1, *Ferrite cores – Guidelines on the limits of surface irregularities – Part 1: General specification*

## 3 Terms and definitions

For the purpose of this document, the terms and definitions given in IEC 60401-1 and IEC 60424-1 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 Primary dimensions

### 4.1 General

Compliance with the following requirements ensures mechanical interchangeability of complete assemblies and coil formers.

## 4.2 Dimensions of E-cores

### 4.2.1 Main dimensions

The main dimensions of E-cores with rectangular cross-section shall be those given in Table 1.

The dimensions of the cores can be checked by means of gauges, an example of which is given in Annex B. In order to facilitate production it can be necessary to use gauges with dimensions differing from those given in Annex B, although no relaxation of the requirements for the dimensions of the cores given in Table 1 is thereby permitted. The dimensions specified in Table 1 are illustrated in Figure 1.

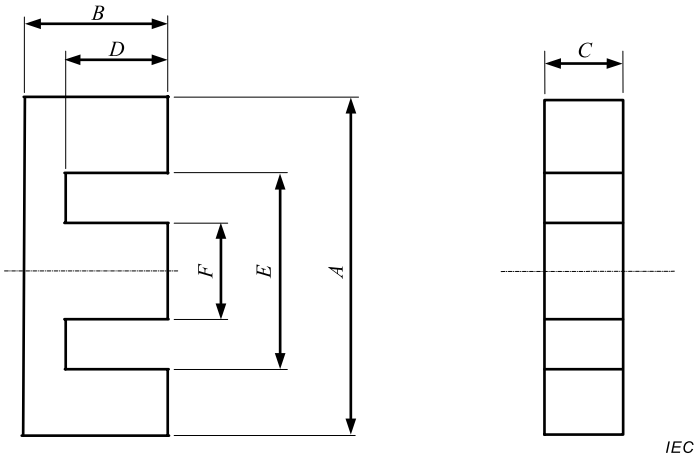



**Figure 1 – Dimensions of E-cores with rectangular cross-section**

**Table 1 – Dimensions of E-cores with rectangular cross-section**

| Size | *A* mm | | *B* mm | | *C* mm | | *D* mm | | *E* mm | | *F* mm | | IEC 61246[a] references | Industrial references |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | | |
| E5,3/2 | 5,15 | 5,35 | 2,57 | 2,73 | 1,90 | 2,00 | 1,92 | 2,08 | 3,80 | 4,00 | 1,30 | 1,40 | E5,3/2 | FEE5,25; EE5 |
| E6,3/2 | 6,05 | 6,30 | 2,80 | 2,90 | 1,90 | 2,00 | 1,85 | 2,05 | 3,60 | 3,80 | 1,30 | 1,40 | E6,3/2 | FEE6,18 |
| E8/2 | 7,85 | 8,15 | 3,95 | 4,05 | 2,30 | 2,40 | 2,85 | 2,95 | 5,60 | 5,80 | 2,30 | 2,40 | E8/2 | FEE8 |
| E8,3/4 | 8,10 | 8,60 | 3,90 | 4,10 | 3,40 | 3,80 | 2,90 | 3,10 | 6,10 | 6,50 | 1,60 | 2,00 | | FEE8,3; EE8 |
| E8,8/2 | 8,60 | 9,40 | 3,85 | 4,15 | 1,78 | 2,02 | 2,03 | 2,40 | 5,07 | 5,33 | 1,78 | 2,02 | E8,8/2 | FEE9 |
| E10/3 | 9,80 | 10,2 | 4,88 | 5,00 | 2,88 | 3,00 | 3,50 | 3,62 | 7,00 | 7,30 | 2,88 | 3,00 | E10/3 | FEE10 |
| E10,2/5 | 10,0 | 10,5 | 5,35 | 5,65 | 4,50 | 4,90 | 4,05 | 4,35 | 7,60 | 8,00 | 2,20 | 2,60 | | FEE10,2; EE10/11 |
| E13/4 | 12,2 | 13,1 | 6,30 | 6,50 | 3,40 | 3,70 | 4,50 | 4,80 | 8,90 | 9,50 | 3,40 | 3,70 | E13/4 | FEE12,7A; EF12,6 |
| E13/6 | 12,8 | 13,2 | 5,85 | 6,15 | 6,00 | 6,30 | 4,50 | 4,70 | 10,0 | 10,4 | 2,60 | 2,90 | | EE13 |
| E16/4,8 | 15,7 | 16,3 | 7,00 | 7,30 | 4,60 | 5,00 | 5,00 | 5,40 | 11,7 | 12,3 | 3,80 | 4,20 | | FEE16A; EE16 |
| E16/5 | 15,5 | 16,7 | 7,90 | 8,20 | 4,30 | 4,70 | 5,70 | 6,10 | 11,3 | 11,9 | 4,40 | 4,70 | E16/5 | FEE16,1; EF16 |
| E19/5 | 18,6 | 19,4 | 7,80 | 8,20 | 4,80 | 5,20 | 5,40 | 5,80 | 14,2 | 14,8 | 4,30 | 4,70 | | FEE19A; EE19 |
| E19,3/4,8 | 18,97 | 19,61 | 7,92 | 8,28 | 4,63 | 4,88 | 5,59 | 5,84 | 14,05 | 14,7 | 4,67 | 4,83 | | EE-187; EE19/16 |
| E20/6 | 19,4 | 20,8 | 9,80 | 10,2 | 5,40 | 5,90 | 7,00 | 7,40 | 14,1 | 14,7 | 5,50 | 5,90 | E20/6 | FEE20,1; EF20 |
| E25/7 | 24,3 | 25,8 | 12,3 | 12,8 | 6,90 | 7,50 | 8,70 | 9,20 | 17,5 | 18,3 | 7,00 | 7,50 | E25/7 | FEE25,1; EF25 |
| E25,4/6 | 24,9 | 25,9 | 9,30 | 9,70 | 6,05 | 6,65 | 6,20 | 6,60 | 18,6 | 19,4 | 6,05 | 6,65 | | FEE25,4A |
| E25,4/6,3 | 24,9 | 25,9 | 9,27 | 9,65 | 6,10 | 6,48 | 6,22 | 6,60 | 18,55 | 19,81 | 6,10 | 6,60 | | EE24/25; EE25/19 |
| E30/11 | 29,5 | 30,6 | 12,9 | 13,5 | 10,4 | 11,0 | 7,90 | 8,50 | 19,5 | 20,5 | 10,4 | 11,0 | | FEE30A; EE30 |
| E32/9 | 31,3 | 32,9 | 15,8 | 16,4 | 8,80 | 9,50 | 11,2 | 11,8 | 22,7 | 23,7 | 8,90 | 9,50 | E32/9 | FEE32,1; EF32 |
| E33/13 | 32,5 | 33,9 | 13,5 | 14,1 | 12,4 | 13,0 | 9,00 | 9,60 | 23,1 | 24,1 | 9,40 | 10,0 | | FEE33A; EE33 |
| E34,6/9 | 33,9 | 35,3 | 13,9 | 14,64 | 8,90 | 9,72 | 9,51 | 10,05 | 25,0 | 26,2 | 9,10 | 9,70 | | EE375; EE35/28B |
| E35/10 | 34,5 | 35,7 | 15,2 | 15,8 | 9,70 | 10,3 | 9,20 | 9,80 | 24,5 | 25,5 | 9,70 | 10,3 | | FEE35A; EE35 |
| E40/11 | 39,5 | 40,7 | 16,7 | 17,3 | 10,4 | 11,0 | 10,0 | 10,6 | 27,5 | 28,5 | 9,70 | 11,0 | | FEE40A; EE40 |
| E41/13 | 40,27 | 41,87 | 16,38 | 17,18 | 12,19 | 12,95 | 10,08 | 10,68 | 28,55 | 29,59 | 12,19 | 13,1 | | EE21; EE41/33C |

| Size | *A* mm | | *B* mm | | *C* mm | | *D* mm | | *E* mm | | *F* mm | | IEC 61246[a] references | Industrial references |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | | |
| E42/15 | 41,3 | 43,0 | 20,8 | 21,2 | 14,7 | 15,2 | 14,8 | 15,5 | 29,5 | 30,7 | 11,7 | 12,2 | E42/15 | FEE42A |
| E42/20 | 41,3 | 43,0 | 20,8 | 21,2 | 19,2 | 20,0 | 14,8 | 15,5 | 29,5 | 30,7 | 11,7 | 12,2 | E42/20 | FEE42B |
| E47/16 | 46,1 | 47,88 | 19,4 | 19,83 | 15,35 | 15,87 | 12,07 | 12,5 | 31,72 | 32,56 | 15,35 | 15,87 | | EE625; EE47/39 |
| E50/15 | 49,3 | 51,0 | 21,0 | 21,6 | 14,2 | 15,0 | 12,5 | 13,1 | 34,3 | 35,7 | 14,2 | 15,0 | | EE50A; EE50 |
| E55/21 | 54,1 | 56,2 | 27,2 | 27,8 | 20,4 | 21,0 | 18,5 | 19,3 | 37,5 | 38,7 | 16,7 | 17,2 | E55/21 | FEE55,2A |
| E55/25 | 54,1 | 56,2 | 27,2 | 27,8 | 24,2 | 25,0 | 18,5 | 19,3 | 37,5 | 38,7 | 16,7 | 17,2 | E55/25 | FEE55,2B |
| E60/16 | 59,2 | 61,1 | 22,0 | 22,6 | 15,2 | 16,0 | 13,7 | 14,0 | 43,7 | 45,3 | 15,2 | 16,0 | | FEE60A; EE60 |
| E65/27 | 63,8 | 66,5 | 32,2 | 32,8 | 26,6 | 27,4 | 22,2 | 23,0 | 44,2 | 45,7 | 19,3 | 20,0 | E65/27 | FEE65,2 |

[a] Withdrawn publication.

### 4.2.2 Effective parameter and $A_{min}$ values

The effective parameter values of a pair of cores whose dimensions comply with 4.2.1 shall be as given in Table 2. For the definitions of these parameters and their calculations, reference shall be made to IEC 60205.

**Table 2 – Effective parameter and $A_{min}$ values**

| Size[a] | $C_1$ $mm^{-1}$ | $C_2$ $mm^{-3}$ | $l_e$ mm | $A_e$ $mm^2$ | $V_e$ $mm^3$ | $A_{min}$[b] $mm^2$ | IEC 61246[c] references | Industrial references |
|---|---|---|---|---|---|---|---|---|
| E5,3/2 | 4,850 4 | 1,863 0 | 12,6 | 2,60 | 32,9 | 2,54 B | | |
| E6,3/2 | 3,764 6 | 1,148 7 | 12,3 | 3,28 | 40,4 | 2,63 C | E6,3/2 | FEE6,18 |
| E8/2 | 3,439 7 | 0,639 76 | 18,5 | 5,38 | 99,4 | 5,17 B | E8/2 | FEE8 |
| E8,3/4 | 2,800 3 | 0,401 68 | 19,5 | 6,97 | 136 | 6,48 C | | FEE8,3; EE8 |
| E8,8/2 | 3,154 0 | 0,635 22 | 15,7 | 4,97 | 77,8 | 3,61 C | E8,8/2 | FEE9 |
| E10/3 | 2,726 6 | 0,324 93 | 22,9 | 8,40 | 192 | 8,11 B | E10/3 | FEE10 |
| E10,2/5 | 2,250 3 | 0,193 83 | 26,1 | 11,6 | 303 | 11,3 C | | FEE10,2; EE10/11 |
| E13/4 | 2,394 6 | 0,192 77 | 29,7 | 12,4 | 369 | 12,2 L | E13/4 | FEE12,7A; EF12,6 |
| E13/6 | 1,766 3 | 0,103 21 | 30,2 | 17,1 | 517 | 16,9 C | | EE13 |
| E16/4,8 | 1,837 9 | $9,651\ 2 \times 10^{-2}$ | 35,0 | 19,0 | 667 | 18,7 B | | FEE16A; EE16 |
| E16/5 | 1,872 4 | $9,333\ 3 \times 10^{-2}$ | 37,6 | 20,1 | 754 | 19,4 B | E16/5 | FEE16,1; EF16 |
| E19/5 | 1,726 4 | $7,512\ 0 \times 10^{-2}$ | 39,7 | 23,0 | 912 | 22,5 C | | FEE19A; EE19 |
| E19,3/4,8 | 1,751 0 | $7,661\ 8 \times 10^{-2}$ | 40,0 | 22,9 | 914 | 22,6 C | | EE-187; EE19/16 |
| E20/6 | 1,447 3 | $4,516\ 8 \times 10^{-2}$ | 46,4 | 32,0 | 1 490 | 31,6 B | E20/6 | FEE20,1; EF20 |
| E25/7 | 1,114 2 | $2,149\ 5 \times 10^{-2}$ | 57,8 | 51,8 | 2 990 | 51,5 L | E25/7 | FEE25,1; EF25 |
| E25,4/6 | 1,198 6 | $2,984\ 8 \times 10^{-2}$ | 48,1 | 40,2 | 1 930 | 39,4 B | | FEE25,4A |
| E25,4/6,3 | 1,232 8 | $3,153\ 8 \times 10^{-2}$ | 74,2 | 39,1 | 1 880 | 38,4 B | | EE24/25; EE25/19 |
| E30/11 | 0,529 47 | $4,828\ 8 \times 10^{-3}$ | 58,1 | 110 | 6 370 | 107 B | | FEE30A; EE30 |
| E32/9 | 0,893 64 | $10,746 \times 10^{-3}$ | 74,3 | 83,2 | 6 180 | 81,4 L | E32/9 | FEE32,1; EF32 |
| E33/13 | 0,548 84 | $4,585\ 3 \times 10^{-3}$ | 65,7 | 120 | 7 860 | 114 B | | FEE33A; EE33 |
| E34,6/9 | 0,819 44 | $9,651\ 6 \times 10^{-3}$ | 69,5 | 84,9 | 5 910 | 83,6 B | | EE375; EE35/28B |
| E35/10 | 0,660 20 | $6,229\ 0 \times 10^{-3}$ | 70,0 | 106 | 7 420 | 100 C | | FEE35A; EE35 |
| E40/11 | 0,606 50 | $4,749\ 4 \times 10^{-3}$ | 77,5 | 128 | 9 890 | 114 C | | FEE40A; EE40 |
| E41/13 | 0,495 37 | $3,161\ 1 \times 10^{-3}$ | 77,6 | 157 | 12 200 | 151 L | | EE21; EE41/33C |

| Size[a] | $C_1$ $mm^{-1}$ | $C_2$ $mm^{-3}$ | $l_e$ mm | $A_e$ $mm^2$ | $V_e$ $mm^3$ | $A_{min}$[b] $mm^2$ | IEC 61246[c] references | Industrial references |
|---|---|---|---|---|---|---|---|---|
| E42/15 | 0,546 63 | $3{,}069\ 3 \times 10^{-3}$ | 97,4 | 178 | 17 300 | 175 B | E42/15 | FEE42A |
| E42/20 | 0,416 95 | $1{,}785\ 7 \times 10^{-3}$ | 97,4 | 233 | 22 700 | 229 B | E42/20 | FEE42B |
| E47/16 | 0,379 69 | $1{,}618\ 1 \times 10^{-3}$ | 89,1 | 235 | 20 900 | 229 B | | EE625; EE47/39 |
| E50/15 | 0,425 62 | $1{,}880\ 2 \times 10^{-3}$ | 96,3 | 226 | 21 800 | 213 C | | EE50A; EE50 |
| E55/21 | 0,350 12 | $9{,}917\ 4 \times 10^{-4}$ | 124 | 353 | 43 600 | 350 C | E55/21 | FEE55,2A |
| E55/25 | 0,294 62 | $7{,}022\ 1 \times 10^{-4}$ | 124 | 420 | 51 900 | 417 C | E55/25 | FEE55,2B |
| E60/16 | 0,441 67 | $17{,}708 \times 10^{-4}$ | 110 | 249 | 27 300 | 243 C | | FEE60A; EE60 |
| E65/27 | 0,273 57 | $5{,}095\ 4 \times 10^{-4}$ | 147 | 537 | 78 900 | 530 C | E65/27 | FEE65,2 |

NOTE 1 Manufacturers can indicate more precise values in their catalogues than those given in Table 2.

NOTE 2 The above values have been calculated using the method given in IEC 60205.

[a] The core size designation contains a combination of two numbers; the first one indicates the length $A$ of the core and the second one its thickness $C$ (see Table 1).

[b] IEC 60205 shall be referred to for definition of $A_{min}$. The letters after the $A_{min}$ values give the location of $A_{min}$: C is centre leg, L is outer leg, B is back wall.

[c] Withdrawn publication.

### 4.3 Dimensional limits for coil formers

The dimensional limits for coil formers suitable for use with a pair of E-cores of size greater than E8/2 shall be as given in Table 3. See Figure 2 for main dimensions of coil formers.

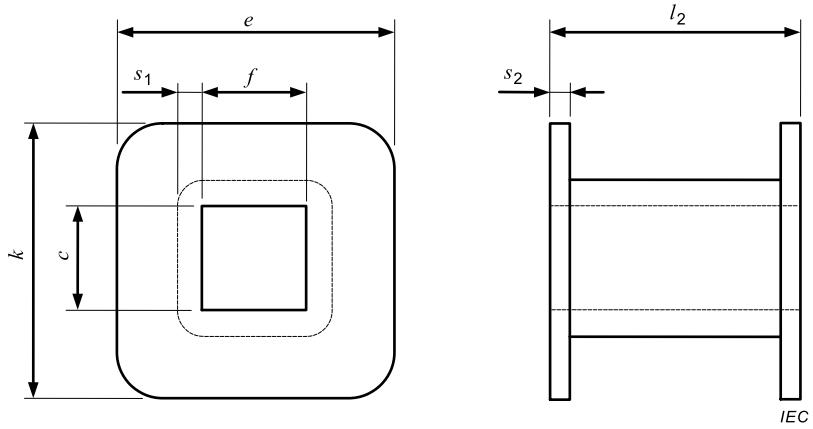



**Figure 2 – Main dimensions of coil formers**

**Table 3 – Dimensional limits for coil formers**

| Size | $c$ mm | $e$ mm | $f$ mm | $k$ mm | $l_2$ mm | $s_1$ mm | $s_2$ mm | IEC 61246[a] references | Industrial references |
|---|---|---|---|---|---|---|---|---|---|
| | Min. | Max. | Min. | Min. | Max. | Min. | Min. | | |
| E8/2 | 2,55 | 5,40 | 2,55 | 5,40 | 5,50 | 0,35 | 0,4 | E8/2 | FEE8 |
| E8,3/4 | 3,95 | 5,90 | 2,15 | 5,90 | 5,60 | 0,35 | 0,4 | | FEE8,3; EE8 |
| E8,8/2 | 2,17 | 4,87 | 2,17 | 4,87 | 3,86 | 0,35 | 0,4 | E8,8/2 | FEE9 |
| E10/3 | 3,15 | 6,80 | 3,15 | 6,80 | 6,80 | 0,4 | 0,4 | E10/3 | FEE10 |
| E10,2/5 | 5,05 | 7,40 | 2,75 | 7,40 | 7,90 | 0,4 | 0,5 | | FEE10,2; EE10/11 |
| E13/4 | 3,90 | 8,70 | 3,90 | 8,70 | 8,80 | 0,5 | 0,5 | E13/4 | FEE12,7A; EF12,6 |
| E13/6 | 6,45 | 9,80 | 3,05 | 9,80 | 8,80 | 0,4 | 0,5 | | EE13 |
| E16/4,8 | 5,15 | 11,5 | 4,35 | 11,5 | 9,80 | 0,5 | 0,5 | | FEE16A; EE16 |
| E16/5 | 4,90 | 11,1 | 4,90 | 11,1 | 11,2 | 0,5 | 0,5 | E16/5 | FEE16,1; EF16 |
| E19/5 | 5,35 | 14,0 | 4,85 | 14,0 | 10,6 | 0,8 | 0,8 | | FEE19A; EE19 |
| E19,3/4,8 | 5,98 | 13,85 | 5,98 | 13,85 | 11,0 | 0,8 | 0,8 | | EE-187; EE19/16 |
| E20/6 | 6,10 | 13,9 | 6,10 | 13,9 | 13,8 | 0,5 | 0,6 | E20/6 | FEE20,1; EF20 |
| E25/7 | 7,70 | 17,3 | 7,70 | 17,3 | 17,2 | 0,6 | 0,7 | E25/7 | FEE25,1; EF25 |
| E25,4/6 | 6,80 | 18,4 | 6,80 | 18,4 | 12,2 | 0,8 | 0,8 | | FEE25,4A |
| E25,4/6,3 | 6,63 | 18,35 | 6,75 | 18,35 | 12,2 | 0,8 | 0,8 | | EE24/25; EE25/19 |
| E30/11 | 11,2 | 19,3 | 11,2 | 19,3 | 15,6 | 0,8 | 0,8 | | FEE30A; EE30 |
| E32/9 | 9,80 | 22,4 | 9,80 | 22,4 | 22,1 | 0,7 | 0,8 | E32/9 | FEE32,1; EF32 |
| E33/13 | 13,2 | 22,9 | 10,2 | 22,9 | 17,7 | 0,8 | 0,8 | | FEE33A; EE33 |
| E34,6/9 | 9,95 | 24,8 | 9,90 | 24,8 | 18,7 | 0,8 | 0,8 | | EE375; EE35/28B |
| E35/10 | 10,5 | 24,3 | 10,5 | 24,3 | 18,1 | 0,8 | 0,8 | | FEE35A; EE35 |
| E40/11 | 11,3 | 27,3 | 11,3 | 27,3 | 19,7 | 0,8 | 0,8 | | FEE40A; EE40 |
| E41/13 | 13,3 | 28,3 | 13,4 | 28,3 | 19,9 | 0,8 | 0,8 | | EE21; EE41/33C |
| E42/15 | 15,7 | 29,2 | 12,6 | 29,2 | 29,3 | 0,9 | 1,0 | E42/15 | FEE42A |
| E42/20 | 20,5 | 29,2 | 12,6 | 29,2 | 29,3 | 0,9 | 1,0 | E42/20 | FEE42B |

| Size | $c$ mm | $e$ mm | $f$ mm | $k$ mm | $l_2$ mm | $s_1$ mm | $s_2$ mm | IEC 61246[a] references | Industrial references |
|---|---|---|---|---|---|---|---|---|---|
| | Min. | Max. | Min. | Min. | Max. | Min. | Min. | | |
| E47/16 | 16,2 | 31,4 | 16,2 | 31,4 | 23,8 | 0,8 | 0,8 | | EE625; EE47/39 |
| E50/15 | 15,3 | 34,0 | 15,3 | 34,0 | 24,7 | 0,8 | 0,8 | | EE50A; EE50 |
| E55/21 | 21,7 | 37,1 | 17,6 | 37,1 | 36,7 | 1,0 | 1,0 | E55/21 | FEE55,2A |
| E55/25 | 25,7 | 37,1 | 17,6 | 37,1 | 36,7 | 1,0 | 1,0 | E55/25 | FEE55,2B |
| E60/16 | 16,3 | 43,3 | 16,3 | 43,3 | 27,1 | 0,8 | 0,8 | | FEE60A; EE60 |
| E65/27 | 27,8 | 43,7 | 20,5 | 43,7 | 44,1 | 1,0 | 1,0 | E65/27 | FEE65,2 |

[a] Withdrawn publication.

# 5 Limits of surface irregularities

## 5.1 General

Surface irregularities are defined in IEC 60424-1.

## 5.2 Examples of surface irregularities

Figure 3 shows different examples of surface irregularities of an E-core.

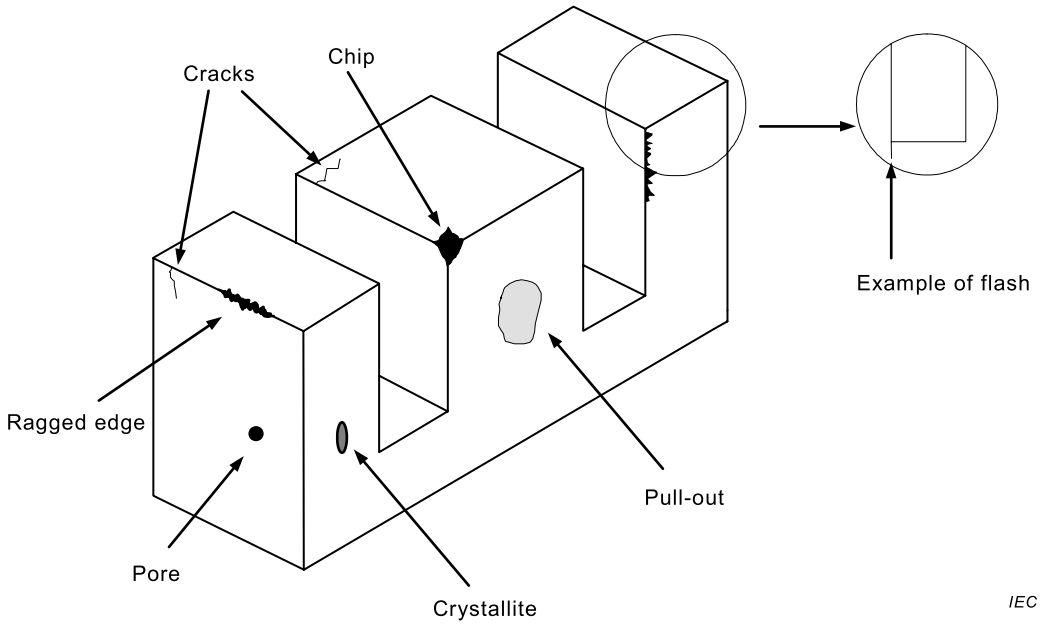



**Figure 3 – Examples of surface irregularities**

## 5.3 Chips and ragged edges

### 5.3.1 General

The minimum area is taken as 0,5 $mm^2$, to be distinguishable to the naked eye, and the maximum allowable area is 30 $mm^2$.

Examples of allowable areas of chips are given in Annex C.

### 5.3.2 Chips and ragged edges on the mating surfaces

The areas of the chips located on the mating surfaces (chip 1 and chip 1' irregularities in Figure 4) shall not exceed the following limits:

- the cumulative area of the chips shall be less than 6 % of the mating surface (whether gapped or ungapped) of the centre leg;
- the total length of the ragged edges shall be less than 25 % of the perimeter of the relevant surface.

### 5.3.3 Chips and ragged edges on the other surfaces

The allowable areas of chips on the other surfaces are doubled as compared to the limits for the mating surface (see Figure 4).

The rule for ragged edges is the same as that for the mating surface.

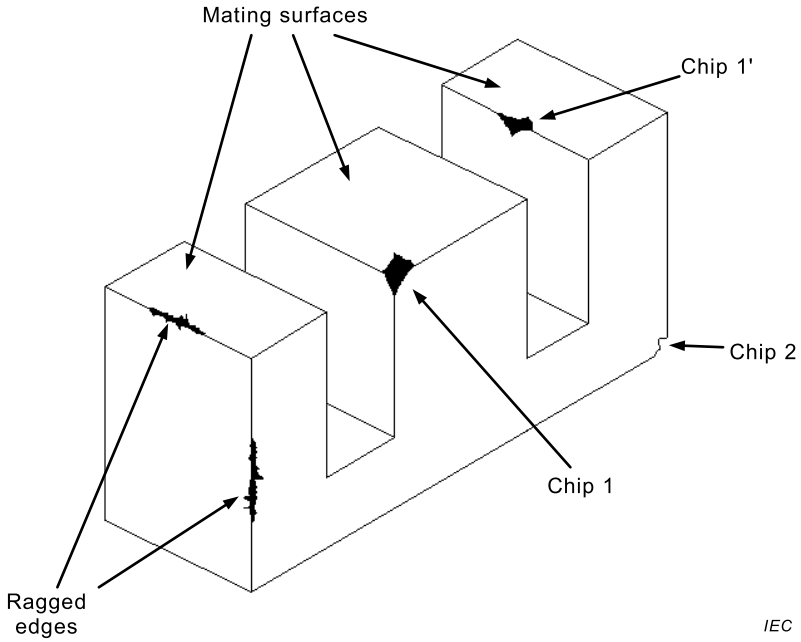
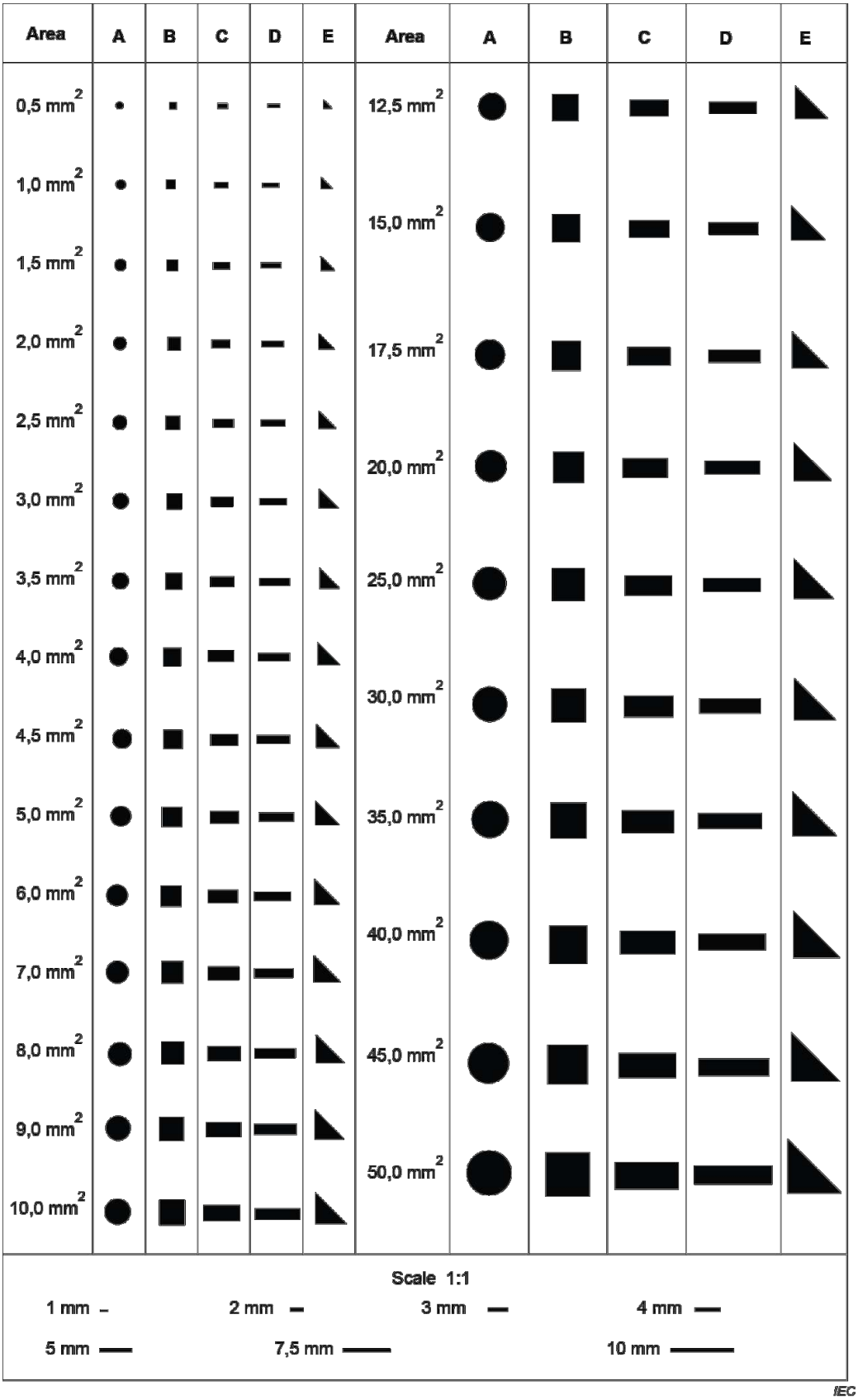



**Figure 4 – Chip location for E-cores**

Area and length reference for visual inspection is given in Table 4.

Examples of allowable areas of chips are given in Annex C.

**Table 4 – Area and length reference for visual inspection**



### 5.4 Cracks

The limits for cracks at various locations shown in Figure 5 are given in Table 5.

### 5.5 Flash

There shall be no flash extending from the core into the wire slot (see Figure 5).

### 5.6 Pull-outs

For E-cores the cumulative area of pull-outs of the core shall be less than 25 % of the total area of a side surface (see Figure 5).

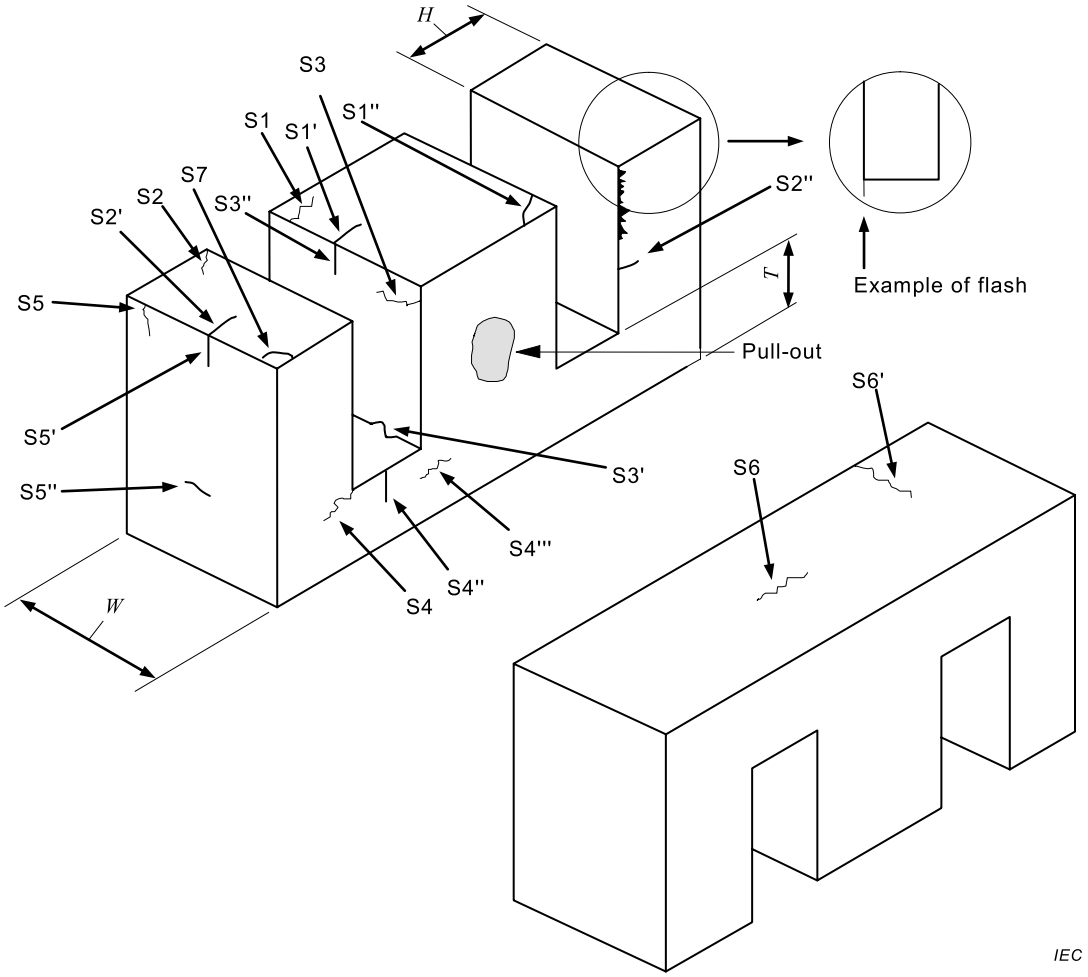



**Figure 5 – Crack and pull-out locations for E-cores**

**Table 5 – Limits for cracks**

| Type | Location | Limits for single crack | Limits for multiple cracks |
|---|---|---|---|
| S1 and S1' | Mating surface of centre pole | < 25 % of dimension $W$ | < 50 % of dimension $W$ |
| S1" | Corner of centre pole | Not acceptable | Not acceptable |
| S2 and S2' | Mating surface of outer leg | < 25 % of dimension $H$ | < 25 % of dimension $H$ |
| S2" | Side of outer leg | < 25 % of dimension $H$ | < 25 % of dimension $H$ |
| S3 and S3" | Centre pole | < 25 % of dimension $W$ | < 25 % of dimension $W$ |
| S3' | Bottom corner of centre pole / back wall and outer leg / back wall | < 25 % of dimension $W$ | < 25 % of dimension $W$ |
| S4 | Bottom corner of outer leg / back wall | < 25 % of dimension $T$ | < 25 % of dimension $T$ |
| S4" | Back wall | < 25 % of dimension $T$ | < 25 % of dimension $T$ |
| S4"' | Back wall | < 50 % of dimension $W$ | < 100 % of dimension $W$ |
| S5, S5' and S5" | Outer leg | < 50 % of dimension $W$ | < 100 % of dimension $W$ |
| S6 | Back surface | < 50 % of dimension $W$ | < 100 % of dimension $W$ |
| S6' | Back surface | < 25 % of dimension $W$ | < 25 % of dimension $W$ |
| S7 | Corner of outer leg | Not acceptable | Not acceptable |

## 5.7 Crystallites

Figure 6 shows an example of crystallite location on E-cores:

- a single area of the crystallites located on any surface shall be less than 2 % of the respective surface area;
- the cumulative area of the crystallites located on any surface shall be less than 4 % of the respective surface area.

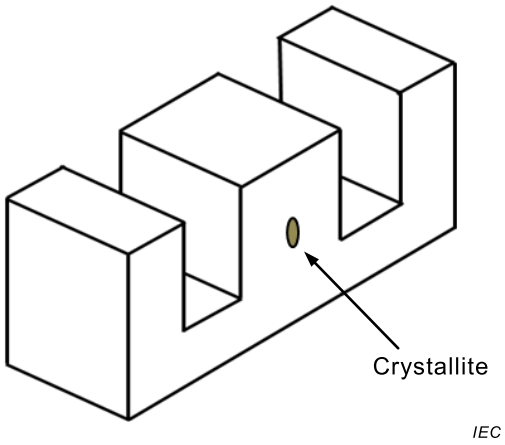



**Figure 6 – Crystallite location for E-cores**

## 5.8 Pores

Figure 7 shows an example of pore location on E-cores:

- the number of pores located on the same surface shall not exceed two; the total number of pores located on all surfaces shall not exceed five;
- a hole with an area larger than 1 $mm^2$ on any surface is not acceptable.

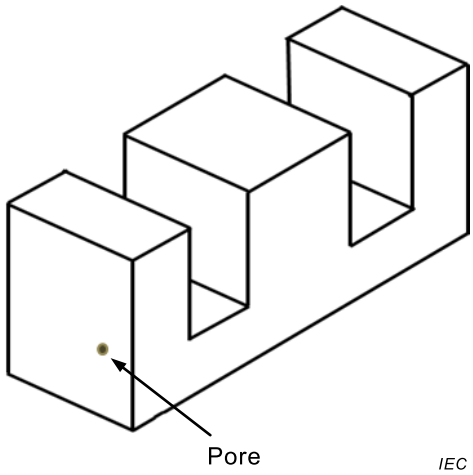



**Figure 7 – Pore location for E-cores**

# Annex A
(normative)

# Derived standards

This document establishes values for the main dimensions of E-cores and coil formers and enables full interchangeability to be achieved for components complying with its provisions.

Parties interested in making or using E-cores may find it desirable to lay down local standards for everyday use that show the dimensions and tolerances in greater detail than those in Clause 4, and correspond to the state of the art in that area. These are known as derived standards. When doing so, care should be taken not to exclude any other type of E-core meeting the requirements in this document that would also satisfy the performance specification valid for a specific case.

It should be noted that even if a component complies with a derived standard and with the requirements of Clause 4 of this document, therefore permitting core assemblies and coil formers to be freely interchanged, its constituent parts may not necessarily be interchangeable.

When requirements lead to the establishment of a national standard, the relevant national standardization body is strongly requested to insert a note in such a national standard stating that:

a) the national standard is in accordance with the dimensional requirements of IEC 63093-8, but that more details are given in order to promote the practical use of the standard;

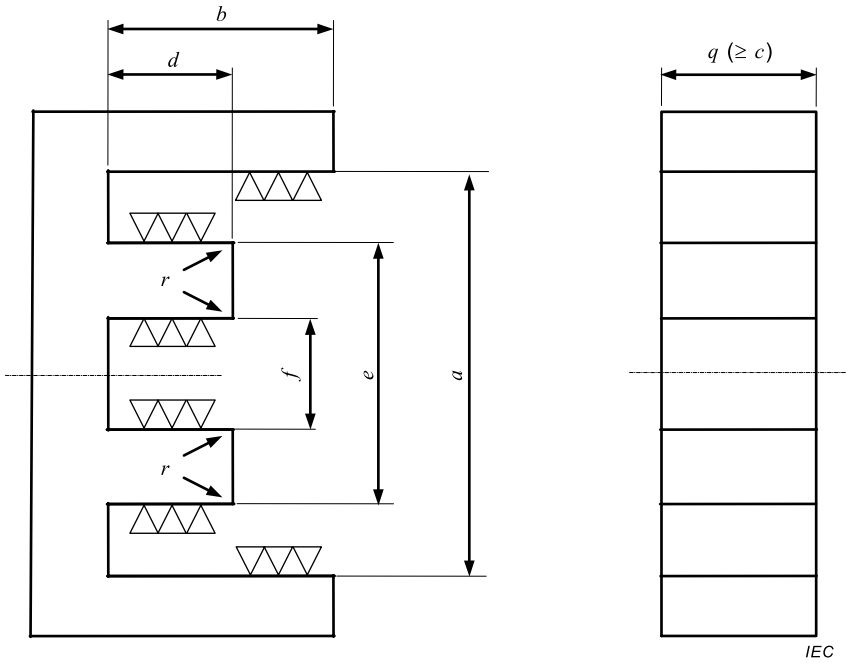
b) other solutions are possible within the framework of IEC 63093-8, and should not be excluded if the resulting cores and coil formers are functionally interchangeable with those in accordance with the national standard.

# Annex B
(normative)

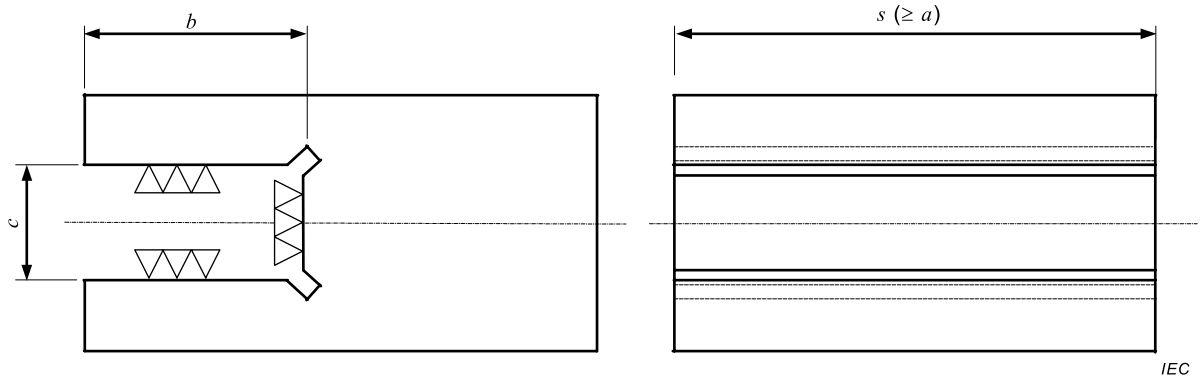
# Example of dimensions for gauges to check the dimensions of E-cores complying with this document

## B.1 General

The gauges shall be in accordance with Figure B.1 and Table B.1.




**a) Gauge to check the dimensions of limbs and the height**




**b) Gauge to check the dimensions of width**

**Figure B.1 – Gauge dimensions**

## Table B.1 – Gauge dimensions

| Size | *a* mm | | *b* mm | *c* mm | | *d* mm | | *e* mm | | *f* mm | | *r* mm | IEC 61246 [a] references | Industrial references |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Min. | Max. | Min. | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | Min. | | |
| E8/2 | 8,155 | 8,165 | 5,0 | 2,405 | 2,415 | 2,85 | 2,86 | 5,585 | 5,595 | 2,405 | 2,415 | 0,5 | E8/2 | FEE8 |
| E8,3/4 | 8,605 | 8,615 | 5,0 | 3,805 | 3,815 | 2,90 | 2,91 | 6,085 | 6,095 | 2,405 | 2,415 | 0,5 | | FEE8,3; EE8 |
| E8,8/2 | 9,405 | 9,415 | 5,0 | 2,025 | 2,035 | 2,03 | 2,04 | 5,055 | 5,065 | 2,025 | 2,035 | 0,5 | E8,8/2 | FEE9 |
| E10/3 | 10,205 | 10,215 | 6,0 | 3,005 | 3,015 | 3,50 | 3,51 | 6,985 | 6,995 | 3,005 | 3,015 | 0,5 | E10/3 | FEE10 |
| E10,2/5 | 10,505 | 10,515 | 6,0 | 4,905 | 4,915 | 4,05 | 4,06 | 7,585 | 7,595 | 2,605 | 2,615 | 0,5 | | FEE10,2; EE10/11 |
| E13/4 | 13,105 | 13,115 | 7,0 | 3,705 | 3,715 | 4,50 | 4,51 | 8,885 | 8,895 | 3,705 | 3,715 | 0,5 | E13/4 | FEE12,7A; EF12,6 |
| E13/6 | 13,205 | 13,215 | 7,0 | 6,305 | 6,315 | 4,50 | 4,51 | 9,985 | 9,995 | 2,905 | 2,915 | 0,5 | | EE13 |
| E16/4,8 | 16,305 | 16,315 | 8,0 | 5,005 | 5,015 | 5,00 | 5,01 | 11,685 | 11,695 | 4,205 | 4,215 | 0,5 | | FEE16A; EE16 |
| E16/5 | 16,705 | 16,715 | 9,0 | 4,705 | 4,715 | 5,70 | 5,71 | 11,285 | 11,295 | 4,705 | 4,715 | 0,5 | E16/5 | FEE16,1; EF16 |
| E19/5 | 19,405 | 19,415 | 9,0 | 5,205 | 5,215 | 5,40 | 5,41 | 14,185 | 14,195 | 4,705 | 4,715 | 0,5 | | FEE19A; EE19 |
| E19,3/4,8 | 19,615 | 19,625 | 9,0 | 4,885 | 4,895 | 5,59 | 5,60 | 14,035 | 14,045 | 4,835 | 4,845 | 0,5 | | EE-187; EE19/16 |
| E20/6 | 20,805 | 20,815 | 11,0 | 5,905 | 5,915 | 7,00 | 7,01 | 14,085 | 14,095 | 5,905 | 5,915 | 0,7 | E20/6 | FEE20,1; EF20 |
| E25/7 | 25,805 | 25,815 | 13,0 | 7,505 | 7,515 | 8,70 | 8,71 | 17,485 | 17,495 | 7,505 | 7,515 | 0,8 | E25/7 | FEE25,1; EF25 |
| E25,4/6 | 25,905 | 25,915 | 11,0 | 6,655 | 6,665 | 6,20 | 6,21 | 18,585 | 18,595 | 6,655 | 6,665 | 0,8 | | FEE25,4A |
| E25,4/6,3 | 25,905 | 25,915 | 11,0 | 6,485 | 6,495 | 6,22 | 6,23 | 18,535 | 18,545 | 6,605 | 6,615 | 0,8 | | EE24/25;EE25/19 |
| E30/11 | 30,605 | 30,615 | 14,0 | 11,005 | 11,015 | 7,90 | 7,91 | 19,485 | 19,495 | 11,005 | 11,015 | 0,8 | | FEE30A; EE30 |
| E32/9 | 32,905 | 32,915 | 17,0 | 9,505 | 9,515 | 11,20 | 11,21 | 22,685 | 22,695 | 9,505 | 9,515 | 1,0 | E32/9 | FEE32,1; EF32 |
| E33/13 | 33,905 | 33,915 | 15,0 | 13,005 | 13,015 | 9,00 | 9,01 | 23,085 | 23,095 | 10,005 | 10,015 | 1,0 | | FEE33A; EE33 |
| E34,6/9 | 35,305 | 35,315 | 15,0 | 9,725 | 9,735 | 9,51 | 9,52 | 24,985 | 24,995 | 9,705 | 9,715 | 1,0 | | EE375; EE35/28B |
| E35/10 | 35,705 | 35,715 | 17,0 | 10,305 | 10,315 | 9,20 | 9,21 | 24,485 | 24,495 | 10,305 | 10,315 | 1,0 | | FEE35A; EE35 |
| E40/11 | 41,875 | 41,885 | 18,0 | 11,005 | 11,015 | 10,00 | 10,01 | 27,485 | 27,495 | 11,005 | 11,015 | 1,0 | | FEE40A; EE40 |
| E41/13 | 41,875 | 41,885 | 18,0 | 12,955 | 12,965 | 10,08 | 10,09 | 28,535 | 28,545 | 13,105 | 13,115 | 1,0 | | EE21; EE41/33C |
| E42/15 | 43,005 | 43,015 | 22,0 | 15,205 | 15,215 | 14,80 | 14,81 | 29,485 | 29,495 | 12,205 | 12,215 | 1,0 | E42/15 | FEE42A |
| E42/20 | 43,005 | 43,015 | 22,0 | 20,005 | 20,015 | 14,80 | 14,81 | 29,485 | 29,495 | 12,205 | 12,215 | 1,0 | E42/20 | FEE42B |

| Size | *a* mm | | *b* mm | *c* mm | | *d* mm | | *e* mm | | *f* mm | | *r* mm | IEC 61246 [a] references | Industrial references |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Min. | Max. | Min. | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | Min. | | |
| E47/16 | 47,885 | 47,895 | 20,0 | 15,875 | 15,885 | 12,07 | 12,08 | 31,705 | 31,715 | 15,875 | 15,885 | 1,0 | | EE625; EE47/39 |
| E50/15 | 51,005 | 51,015 | 22,0 | 15,005 | 15,015 | 12,50 | 12,51 | 34,285 | 34,295 | 15,005 | 15,015 | 1,0 | | EE50A; EE50 |
| E55/21 | 56,205 | 56,215 | 28,0 | 21,005 | 21,015 | 18,50 | 18,51 | 37,485 | 37,495 | 17,205 | 17,215 | 1,0 | E55/21 | FEE55,2A |
| E55/25 | 56,205 | 56,215 | 28,0 | 25,005 | 25,015 | 18,50 | 18,51 | 37,485 | 37,495 | 17,205 | 17,215 | 1,0 | E55/25 | FEE55,2B |
| E60/16 | 61,105 | 61,115 | 23,0 | 16,005 | 16,015 | 13,70 | 13,71 | 43,685 | 43,695 | 16,005 | 16,015 | 1,0 | | FEE60A; EE60 |
| E65/27 | 66,505 | 66,515 | 33,0 | 27,405 | 27,415 | 22,20 | 22,21 | 44,185 | 44,195 | 20,005 | 20,015 | 1,5 | E65/27 | FEE65,2 |
| NOTE Manufactures can use more precise gauges or gauges for more precise core tolerances. | | | | | | | | | | | | | | |
| [a] Withdrawn publication. | | | | | | | | | | | | | | |

## B.2 Procedure and requirements

To check the winding space, the gauge shall be fully inserted into the core without forcing; when fully inserted, the gauge shall meet the pole faces of the outer legs.

# Annex C
(informative)

## Reference of allowable areas of chips

The reference of allowable areas of chips for a given core is summarized in Table C.1.

NOTE Table C.1 is taken from IEC 60424-3:2015, Table 4, and is included in Annex C for ease of reference.

**Table C.1 – Allowable areas of chips for E-cores**

| Core size | Mating surfaces<br>$mm^2$ | Other surfaces<br>$mm^2$ |
|---|---|---|
| E5,3/2 | < 0,5 | < 0,5 |
| E6,3/2 | < 0,5 | < 0,5 |
| E8/2 | < 0,5 | < 1 |
| E8,3/4 | < 0,5 | < 1 |
| E8,8/2 | < 0,5 | < 1 |
| E10/3 | < 1 | < 1,5 |
| E10,2/5 | < 1 | < 1,5 |
| E13/4 | < 1 | < 2 |
| E13/6 | < 1 | < 2 |
| E16/4,8 | < 1,5 | < 3 |
| E16/5 | < 1,5 | < 3 |
| E19/5 | < 1,5 | < 3 |
| E19,3/4,8 | < 1,5 | < 3 |
| E20/6 | < 2 | < 4 |
| E25/7 | < 4 | < 7 |
| E25,4/6 | < 2,5 | < 5 |
| E25,4/6,3 | < 2,5 | < 5 |
| E30/11 | < 7 | < 14 |
| E32/9 | < 5 | < 10 |
| E33/13 | < 7 | < 14 |
| E34,6/9 | < 6 | < 10 |
| E35/10 | < 6 | < 12,5 |
| E40/11 | < 6 | < 12,5 |
| E41/13 | < 10 | < 20 |
| E42/15 | < 12,5 | < 25 |
| E42/20 | < 15 | < 30 |
| E47/16 | < 15 | < 30 |
| E50/15 | < 12,5 | < 25 |
| E55/21 | < 20 | < 40 |
| E55/25 | < 25 | < 50 |
| E60/16 | < 15 | < 30 |
| E65/27 | < 30 | < 60 |

# Bibliography

IEC 60424-3:2015, *Ferrite cores – Guidelines on the limits of surface irregularities – Part 3: ETD-cores, EER-cores, EC-cores and E-cores*[1]

IEC 61246, *Magnetic oxide cores (E-cores) of rectangular cross-section and associated parts – Dimensions*[2]

IEC 62317-8:2006, *Ferrite cores – Dimensions – Part 8: E-cores*[3]

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1 Withdrawn publication.

2 Withdrawn publication.

3 Withdrawn publication.

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