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Magnetic powder cores - Guidelines on dimensions and the limits of surface irregularities - Part 3: E-cores

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| IEC TC 51 : MAGNETIC COMPONENTS, FERRITE AND MAGNETIC POWDER MATERIALS | |
| SECRETARIAT: Japan | SECRETARY: Mr Takeshi Abe |
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TITLE:

Magnetic powder cores - Guidelines on dimensions and the limits of surface irregularities - Part 3: E-cores

PROPOSED STABILITY DATE: 2027

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38 **MAGNETIC POWDER CORES – GUIDELINES ON DIMENSIONS**
39 **AND THE LIMITS OF SURFACE IRREGULARITIES –**40 **Part 3: E-cores**41 **FOREWORD**

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73 International Standard IEC 63182-3 has been prepared by IEC technical committee 51:
74 Magnetic components, ferrite and magnetic powder materials.

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

| | |
|-------------|------------------|
| FDIS | Report on voting |
| 51/XXX/FDIS | 51/XXX/RVD |

76 Full information on the voting for the approval of this International Standard can be found in the
77 report on voting indicated in the above table.

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

79 A list of all parts in the IEC 63182 series, published under the general title *Magnetic powder*
80 *cores - Guidelines on dimensions and the limits of surface irregularities* can be found on the
81 IEC website.

82 The committee has decided that the contents of this document will remain unchanged until the
83 stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to
84 the specific document. At this date, the document will be

- 85 • reconfirmed,
- 86 • withdrawn,
- 87 • replaced by a revised edition, or
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MAGNETIC POWDER CORES – GUIDELINES ON DIMENSIONS AND THE LIMITS OF SURFACE IRREGULARITIES –

Part 3: E-cores

1 Scope

This part of IEC 63182 specifies the dimensions that are of importance for mechanical interchangeability for a preferred range of E-cores made of metallic magnetic powder, the essential dimensions of coil formers to be used with them as well the effective parameter values to be used in calculations involving them, and gives guidelines on allowable limits of surface irregularities applicable to E-cores.

This document is a specification useful in the negotiations between magnetic powder core suppliers and users 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*

<https://standards.iteh.ai/catalog/standards/sist/9b137c12-7d02-491f-9a1a->

IEC 63182-1, *Magnetic powder cores – Guidelines on dimensions and the limits of surface irregularities – Part 1: General specification*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 63182-1 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

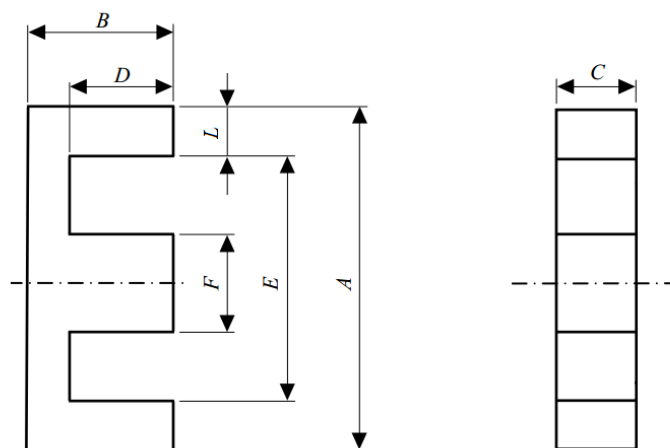
4.1 General

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 specified in Table 1 are illustrated in Figure 1.



125

Figure 1 – Main dimensions of E-cores

126

Table 1 – Main dimensions of E-cores

| Size ^a | A mm | | B mm | | C mm | | D mm | E mm | F mm | | L mm |
|-------------------|---------|-------|---------|-------|---------|-------|---------|---------|---------|-------|---------|
| | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | Nom. |
| E12/7/4 | 12,5 | 12,9 | 6,30 | 6,50 | 3,41 | 3,71 | 4,42 | 8,89 | 3,43 | 3,69 | 1,8 |
| E19/8/5 | 19,0 | 19,6 | 7,92 | 8,28 | 4,63 | 4,93 | 5,5 | 13,9 | 4,65 | 4,91 | 2,4 |
| E25/10/7 | 25,0 | 25,8 | 9,32 | 9,72 | 6,17 | 6,53 | 6,2 | 18,8 | 6,15 | 6,55 | 3,2 |
| E30/15/7 | 29,6 | 30,5 | 14,77 | 15,23 | 6,88 | 7,24 | 9,7 | 19,5 | 6,76 | 7,16 | 5,1 |
| E35/14/9 | 34,0 | 35,0 | 13,92 | 14,38 | 9,14 | 9,56 | 9,6 | 25,3 | 9,10 | 9,50 | 4,4 |
| E41/17/13 | 40,3 | 41,5 | 16,25 | 16,75 | 12,25 | 12,75 | 10,4 | 28,3 | 12,25 | 12,75 | 6,0 |
| E43/21/11 | 42,2 | 43,5 | 20,77 | 21,43 | 10,55 | 11,05 | 15,0 | 30,4 | 11,65 | 12,15 | 5,9 |
| E43/21/15 | 42,2 | 43,5 | 20,77 | 21,43 | 15,10 | 15,70 | 15,0 | 30,4 | 11,65 | 12,15 | 5,9 |
| E43/21/20 | 42,2 | 43,5 | 20,77 | 21,43 | 19,59 | 20,41 | 15,0 | 30,4 | 11,65 | 12,15 | 5,9 |
| E55/28/21 | 54,1 | 55,7 | 27,15 | 28,01 | 20,19 | 21,01 | 18,5 | 37,5 | 16,42 | 17,18 | 8,4 |
| E55/28/25 | 54,1 | 55,7 | 27,17 | 28,03 | 24,13 | 25,07 | 18,5 | 37,5 | 16,42 | 17,18 | 8,4 |
| E65/33/27 | 64,1 | 66,1 | 32,00 | 33,00 | 26,47 | 27,53 | 22,2 | 44,2 | 19,29 | 20,11 | 10,0 |
| E72/28/19 | 71,3 | 73,5 | 27,51 | 28,37 | 18,66 | 19,44 | 17,8 | 52,6 | 18,72 | 19,48 | 9,6 |
| E80/38/20 | 78,8 | 81,2 | 37,50 | 38,70 | 19,39 | 20,21 | 28,1 | 59,3 | 19,39 | 20,21 | 9,9 |
| E80/45/20 | 78,8 | 81,2 | 43,89 | 45,29 | 19,39 | 20,21 | 34,4 | 59,3 | 19,39 | 20,21 | 9,9 |
| E130/33/54 | 128,3 | 132,3 | 32,00 | 33,00 | 52,90 | 54,80 | 22,0 | 108,4 | 19,59 | 20,41 | 10,0 |
| E160/38/40 | 157,5 | 162,5 | 37,50 | 38,70 | 38,90 | 40,30 | 28,1 | 138,2 | 19,40 | 20,20 | 9,9 |

NOTE When new cores are designed, the tolerance ranges of dimensions should be calculated as follows:

Tolerance range of dimension *A* is approximately 3,0 % of the centre value of dimension *A*.

Tolerance range of dimension *B* is approximately 3,0 % of the centre value of dimension *B*.

Tolerance range of dimension *C* is approximately 3,5 % of the centre value of dimension *C*.

Tolerance range of dimension *F* is approximately 4,0 % of the centre value of dimension *F*.

For the dimension *B*, *C* or *F* of 5 mm or less, the tolerance range may be larger than the recommended values.

^a The core size designation consists of three parts; the first one indicates the length *A* of the core, the second one its width *B* and the third one its thickness *C*.

127 **4.2.2 Effective parameter and A_{\min} values**

128 The effective parameter values of a pair of cores having the dimensions given in 4.2.1 are as
 129 shown in Table 2. For the definitions of these parameters and their calculations, see IEC
 130 60205.

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

| Size | C_1 mm ⁻¹ | C_2 mm ⁻³ | l_e mm | A_e mm ² | V_e mm ³ | A_{\min}^a mm ² |
|------------|---------------------------|---------------------------|-------------|--------------------------|--------------------------|---------------------------------|
| E12/7/4 | 2,300 8 | 0,179 42 | 29,5 | 12,8 | 378 | 12,7 C |
| E19/8/5 | 1,730 7 | $7,501 9 \times 10^{-2}$ | 39,9 | 23,1 | 921 | 22,8 C |
| E25/10/7 | 1,189 0 | $2,943 3 \times 10^{-2}$ | 48,0 | 40,4 | 1 940 | 40,3 C, B |
| E30/15/7 | 1,074 2 | $1,775 9 \times 10^{-2}$ | 65,0 | 60,5 | 3 930 | 49,1 C |
| E35/14/9 | 0,828 57 | $9,895 4 \times 10^{-3}$ | 69,4 | 83,7 | 5 810 | 82,3 L, B |
| E41/17/13 | 0,511 62 | $3,375 9 \times 10^{-3}$ | 77,5 | 152 | 11 800 | 149 B |
| E43/21/11 | 0,767 97 | $5,993 5 \times 10^{-3}$ | 98,4 | 128 | 12 600 | 127 L |
| E43/21/15 | 0,538 58 | $2,947 7 \times 10^{-3}$ | 98,4 | 183 | 18 000 | 182 L |
| E43/21/20 | 0,414 70 | $1,747 7 \times 10^{-3}$ | 98,4 | 237 | 23 300 | 236 L |
| E55/28/21 | 0,349 70 | $9,938 0 \times 10^{-4}$ | 123 | 352 | 43 300 | 346 C, L |
| E55/28/25 | 0,292 73 | $6,962 2 \times 10^{-4}$ | 123 | 420 | 51 800 | 413 C, L |
| E65/33/27 | 0,271 34 | $5,031 7 \times 10^{-4}$ | 146 | 539 | 78 900 | 532 C |
| E72/28/19 | 0,368 86 | $9,961 3 \times 10^{-4}$ | 137 | 370 | 50 600 | 365 C |
| E80/38/20 | 0,471 14 | $1,203 6 \times 10^{-3}$ | 184 | 391 | 72 200 | 390 B |
| E80/45/20 | 0,533 46 | $1,355 7 \times 10^{-3}$ | 210 | 393 | 82 600 | 392 C, L |
| E130/33/54 | 0,192 44 | $1,756 8 \times 10^{-4}$ | 211 | 1 100 | 231 000 | 1 080 C, L |
| E160/38/40 | 0,338 12 | $4,323 6 \times 10^{-4}$ | 264 | 782 | 207 000 | 780 B |

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

NOTE 2 The above values have been calculated using the method given in IEC 60205. D and E used to calculate the effective parameters are $D=D_{\min}+0.15$ and $E=(A_{\max}+A_{\min})/2-2 \times L_{\text{nom}}$ respectively.

NOTE 3 Because of the magnetic leakage effect, the actual inductance factors of the E-cores will be higher than that calculated based on the effective parameters. The lower the permeability of the core, the more significant the magnetic leakage effect, and the larger the difference between the actual value and the calculated value of the inductance factor.

^a See IEC 60205 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 and B is back wall.

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134 **4.3 Dimensional limits for coil formers**

135 The main dimensions of coil formers suitable for use with a pair of E-cores shall be as given in
 136 Figure 2 and Table 3.

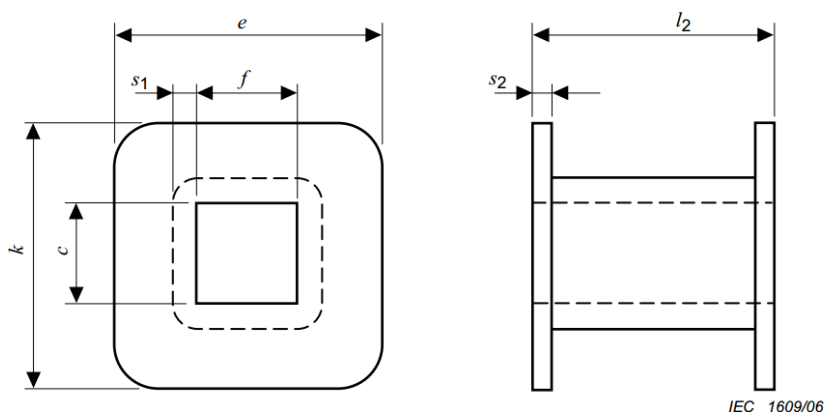


Figure 2 – Main dimensions of coil formers for E-cores

Table 3 – Dimensional limits for coil formers for E-cores

| Size | <i>c</i> mm | <i>e</i> mm | <i>f</i> mm | <i>k</i> mm | <i>l</i> ₂ mm | <i>s</i> ₁ mm | <i>s</i> ₂ mm |
|------------|----------------|----------------|----------------|----------------|-----------------------------|-----------------------------|-----------------------------|
| | Min. | Max. | Min. | Min. | Max. | Min. | Min. |
| E12/7/4 | 3,85 | 8,70 | 3,85 | 8,70 | 8,65 | 0,5 | 0,5 |
| E19/8/5 | 5,1 | 13,7 | 5,1 | 13,7 | 10,8 | 0,5 | 0,5 |
| E25/10/7 | 6,7 | 18,6 | 6,7 | 18,6 | 12,2 | 0,8 | 0,8 |
| E30/15/7 | 7,4 | 19,3 | 7,4 | 19,3 | 19,2 | 0,8 | 0,8 |
| E35/14/9 | 9,8 | 25,1 | 9,8 | 25,1 | 18,9 | 0,8 | 0,8 |
| E41/17/13 | 13,0 | 28,0 | 13,0 | 28,0 | 20,5 | 0,8 | 0,8 |
| E43/21/11 | 11,3 | 30,1 | 12,5 | 28,9 | 29,7 | 0,8 | 0,8 |
| E43/21/15 | 16,0 | 30,1 | 12,5 | 33,6 | 29,7 | 0,8 | 0,8 |
| E43/21/20 | 20,7 | 30,1 | 12,5 | 38,3 | 29,7 | 0,8 | 0,8 |
| E55/28/21 | 21,4 | 37,1 | 17,5 | 41,0 | 36,6 | 1,0 | 1,0 |
| E55/28/25 | 25,5 | 37,1 | 17,5 | 45,1 | 36,6 | 1,0 | 1,0 |
| E65/33/27 | 28,0 | 43,7 | 20,5 | 51,1 | 43,9 | 1,0 | 1,0 |
| E72/28/19 | 19,9 | 52,0 | 20,0 | 52,0 | 35,1 | 1,0 | 1,0 |
| E80/38/20 | 20,8 | 58,6 | 20,8 | 58,6 | 55,6 | 1,0 | 1,0 |
| E80/45/20 | 20,8 | 58,6 | 20,8 | 58,6 | 68,8 | 1,0 | 1,0 |
| E130/33/54 | 55,4 | 107 | 21,1 | 141 | 43,4 | 1,2 | 1,2 |
| E160/38/40 | 40,8 | 137 | 20,9 | 157 | 55,6 | 1,2 | 1,2 |

140 5 Limits of surface irregularities

141 5.1 General

142 Surface irregularities are defined in IEC 63182-1.

143 5.2 Examples of surface irregularities

144 Figure 3 shows different examples of surface irregularities of E-cores.