BS EN 60424-8:2015

BSI Standards Publication

Ferrite cores — Guidelines on the limits of surface irregularities

Part 8: PQ-cores

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National foreword

This British Standard is the UK implementation of EN 60424-8:2015. It is identical to IEC 60424-8:2015.

The UK participation in its preparation was entrusted to Technical Committee EPL/51, Transformers, inductors, magnetic components and ferrite materials.

A list of organizations represented on this committee can be obtained on request to its secretary.

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EN 60424-8

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English Version

Ferrite cores - Guidelines on the limits of surface irregularities - Part 8: PQ-cores (IEC 60424-8:2015)

Noyaux ferrites - Lignes directrices relatives aux limites des irrégularités de surface - Partie 8: Noyaux PQ (IEC 60424-8:2015)

Ferritkerne - Leitfaden für Grenzwerte von sichtbaren Beschädigungen der Kernoberfläche - Teil 8: PQ-Kerne (IEC 60424-8:2015)

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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European foreword

The text of document 51/1078/CDV, future edition 1 of IEC 60424-8, prepared by IEC/TC 51 "Magnetic components and ferrite materials" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 60424-8:2015.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2016-06-09
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2018-09-09

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The text of the International Standard IEC 60424-8:2015 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60401-2	NOTE	Harmonized as EN 60401-2.
IEC 62317-13	NOTE	Harmonized as EN 62317-13.

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

Publication	Year	Title	EN/HD	Year
IEC 60401-1	-	Terms and nomenclature for cores made of magnetically soft ferrites - Part 1: Terms used for physical irregularities	EN 60401-1	-
IEC 60424-1	-	Ferrite cores - Guide on the limits of surface irregularities - Part 1: General specification	EN 60424-1	-

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

FERRITE CORES – GUIDELINES ON THE LIMITS OF SURFACE IRREGULARITIES –

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FOREWORD

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International Standard IEC 60424-8 has been prepared by technical committee 51: Magnetic components and ferrite materials.

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

CDV	Report on voting
51/1078/CDV	51/1084/RVC

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

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

A list of all parts in the IEC 60424 series, published under the general title *Ferrite cores – Guidelines on the limits of surface irregularities*, can be found on the IEC website.

Future standards in this series will carry the new general title as cited above. Titles of existing standards in this series will be updated at the time of the next edition.

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

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

FERRITE CORES – GUIDELINES ON THE LIMITS OF SURFACE IRREGULARITIES –

Part 8: PQ-cores

1 Scope

This part of IEC 60424 gives guidance on allowable limits of surface irregularities applicable to PQ-cores in accordance with the relevant generic specification.

This standard is considered as a sectional specification useful in the negotiation between ferrite core manufacturers and users about surface irregularities.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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 60424-1, *Ferrite cores – Guide on 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 60424-1 and IEC 60401-1, as well as the following apply.

3.1
pores
holes left on the surface of cores after sintering and surface finishing

SEE: Figure 1.

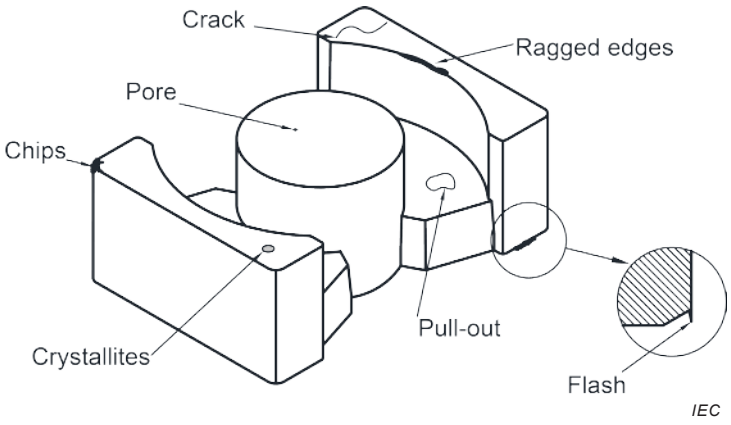


Figure 1 – Examples of surface irregularities

4 Limits of surface irregularities

4.1 Chips and ragged edges

4.1.1 Chips and ragged edges located on the mating surface

The areas of the chips located on the mating surface (see C1 and C1' irregularities in Figure 2) shall not exceed the following limits:

– the cumulative area of the chips located on the mating surface shall be less than 4 % of the total mating surface;

– the cumulative area of the chips located on the centre post mating surface shall be less than 2 % of the total mating surface;

– the cumulative area of the chips located on the mating surface of one outer leg shall be less than 1 % of the total mating surface;

The total length of the ragged edges shall be less than 25 % of the perimeter of the relevant mating surface.

4.1.2 Chips located on other surfaces

The areas of the chips located on the other surfaces (see C2, C2', C3 and C3' irregularities in Figure 2) shall not exceed the following limits:

– the allowable chipping areas are doubled as compared to the limits for the whole mating surfaces (see Table 1);

– the rule for the ragged edges is the same as for the mating surfaces;

– chips and ragged edges are not acceptable on the inner edges of the wire slot area.

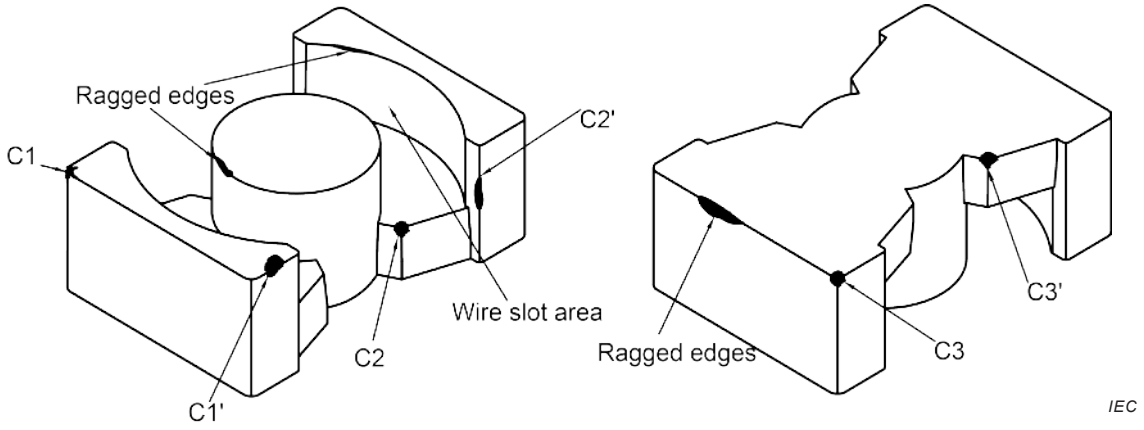


Figure 2 – Chips and ragged edges location

The limits of allowable chipping areas shall be in accordance with Table 1.

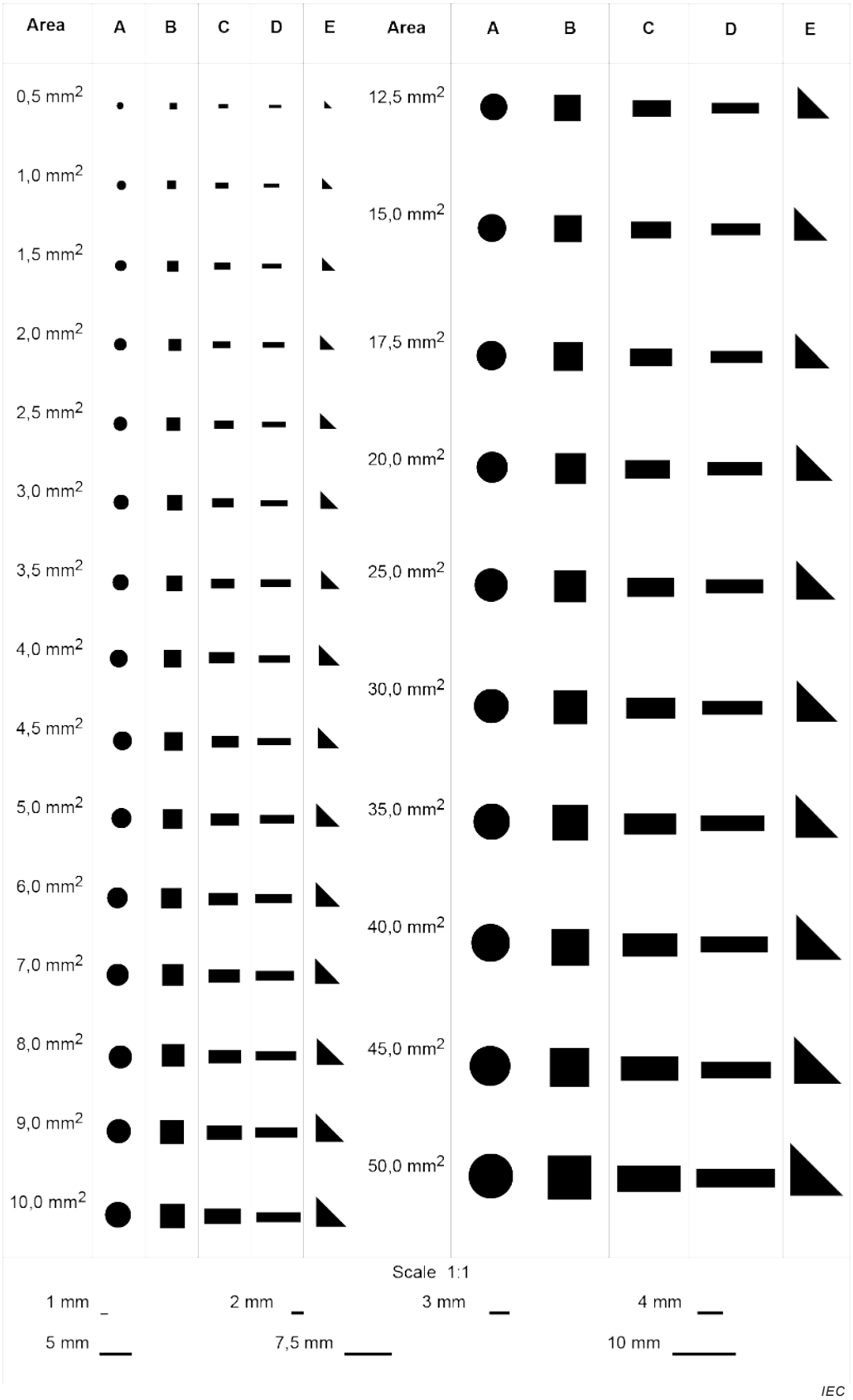
Table 1 – Limits for allowable chipping areas

Unit: mm^2

Core size	Chipping on mating surface of one outer leg	Chipping on mating surface of centre post	Overall chipping on mating surface	Overall chipping on other surfaces
PQ20/16	< 1,0	< 2,0	< 4,5	< 9,0
PQ20/20	< 1,0	< 2,0	< 4,5	< 9,0
PQ26/20	< 2,0	< 4,5	< 9,5	< 19,0
PQ26/25	< 2,0	< 4,5	< 9,5	< 19,0
PQ32/20	< 3,0	< 6,0	< 12,0	< 24,0
PQ32/30	< 3,0	< 6,0	< 12,0	< 24,0
PQ35/35	< 3,0	< 6,5	< 13,0	< 26,0
PQ40/40	< 3,5	< 7,0	< 14,0	< 28,0
PQ50/50	< 6,0	< 12,5	< 25,0	< 50,0
NOTE For the relevant core sizes refer to IEC 62317-13.				

The area and length reference of irregularities for visual inspection are given in Table 2.

Table 2 – Area and length reference of irregularities for visual inspection

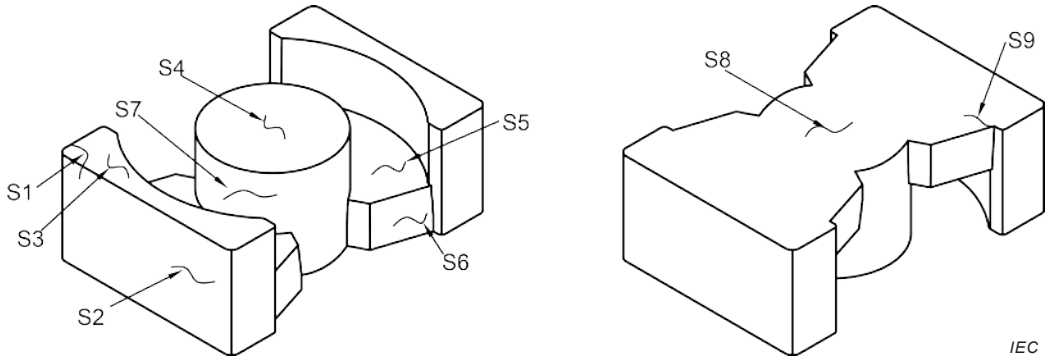


4.2 Cracks

Figure 3 shows examples of cracks location on PQ-cores:

– a single crack which intersects the perimeter of the relevant surface at two points is not acceptable (see S1 in Figure 3);
– the number of the cracks located on the same surface shall not exceed 3.

The limits of cracks at various locations shown in Figure 3 are given in Table 3.

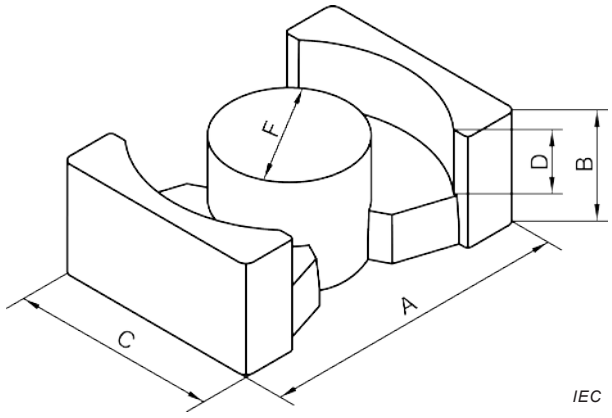


Key

S1 to S8: types of cracks (for limits for cracks, see Table 3)

Figure 3 – Cracks location

The reference dimensions for PQ-cores given in Figure 4 correspond to the cores defined in IEC 60401-2.



Key

A Overall length of the core back
B Outside leg length of core
C Core width
D Inside leg length or available bobbin depth
F Centre post diameter

Figure 4 – Reference dimensions for PQ-cores

Table 3 – Limits for cracks

Type[a]	Location	Limits for single crack	Limits for multiple cracks
S1	Any place	Not acceptable	Not acceptable
S2	Outer wall	20 % × C	40 % × C
S3	Mating surface of outer legs	20 % × C	40 % × C
S4	Mating surface of centre-post	20 % × F	40 % × F
S5	Bottom surface	25 % × (B – D)	50 % × (B – D)
S6	Back wall	25 % × (B – D)	50 % × (B – D)
S7	Centre-post wall	20 % × F	40 % × F
S8	Back surface	25 % × C	50 % × C
S9	Back surface	20 % × C	40 % × C
For, B, C, D, F see Figure 4.			
[a] See Figure 3.			

4.3 Pull-out

Figure 5 shows an example of a pull-out location on the PQ-core.

The cumulative area of the pull-out located on the bottom surface shall be less than 25 % of the total respective surface area.

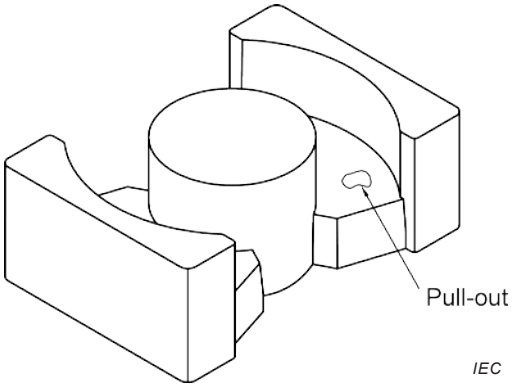


Figure 5 – Pull-out location

4.4 Crystallites

Figure 6 shows an example of crystallites location on the PQ-core:

– the 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.

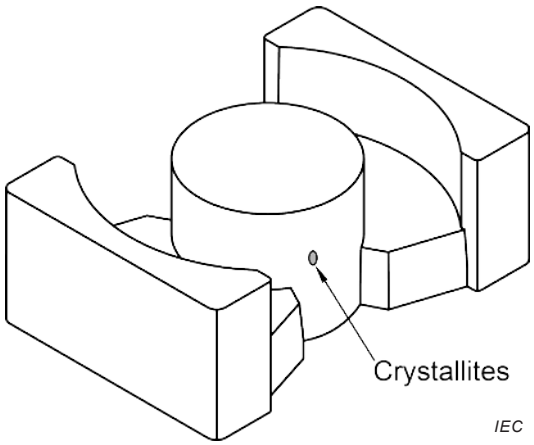


Figure 6 – Crystallites location

4.5 Flash

Figure 7 shows an example of flash location on the PQ-core:

– with chamfering around the back surface, the flash height shall not exceed the back surface of the core;

– without chamfering around the back surface, the flash is not acceptable.

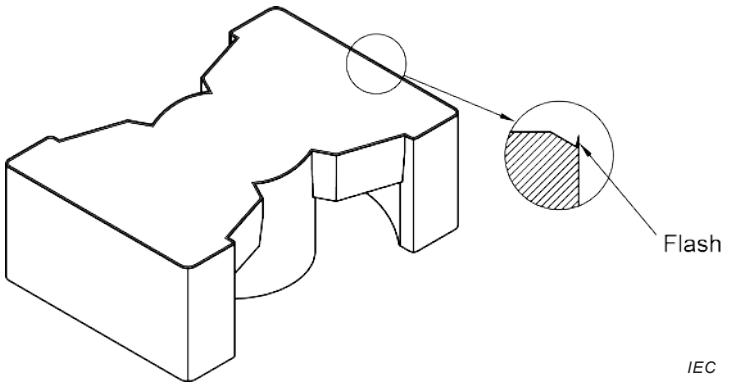


Figure 7 – Flash location

4.6 Pores

Figure 8 shows an example of pores location on the PQ-core:

– the number of pores located on the same surface shall not exceed 2; the total number of pores located on all surfaces shall not exceed 5;

– a hole with an area larger than 1 mm^2 on any surface is not acceptable.

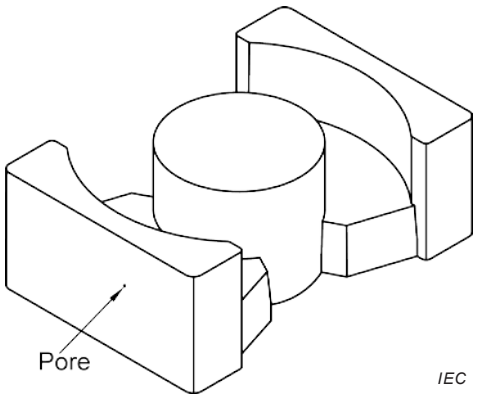


Figure 8 – Pores location

Bibliography

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

IEC 62317-13, *Ferrite cores – Dimensions – Part 13: PQ-cores for use in power supply applications*

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