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Dimensions, marking and testing of carbon brushes and dimensions of brush-holders for electrical machinery

Dimensions, marquages et essais des balais et dimensions des porte-balais pour machines électriques

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**DIMENSIONS, MARKING AND TESTING OF CARBON BRUSHES AND
DIMENSIONS OF BRUSH-HOLDERS FOR ELECTRICAL MACHINERY**

FOREWORD

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This third edition cancels and replaces the second edition published in 1986 and Amendment 1:1995. This edition constitutes a technical revision.

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

Title: modified.

Clause or subclause	Previous clause	Change
1	I-1	Clarification and extension of the scope.
2	None	New clause introduced.
3	None	New clause introduced.
4	I-4 and II-7.5	Addition of units and extension of marking.
5.1	I-2	Addition of cylindrical and wedge-shape brushes.
5.2	I-3	Distinction of dimensions between t , a and r .
6.1	II-7.1	Revision of the chamfer dimension table and addition of non-reversing chamfer.
6.2	II-7.2	Revision of angles dimensions and addition of typical combination of angles.
6.4	II-7.4	Clarification of the definition of the depth of insertion and modification of maximum values.
6.5	None	New subclause introducing the concept of residual material width.
7.1.2	II-8.7	Change of definition of flexibles area and diameter.
7.1.4	None	Addition of flexible protection.
7.2	II-8.1 to II-8.5	Clarification. Addition of other types of terminals.
8	Annex C	Clarification of the method of measurement of electrical resistance and addition of graphical method.
9.2 and 9.3	Clause A.3	Brush-holder: Separation of Dimensions and Control of brush box in two different subclauses.
Annex A	None	Compilation of tables with inches dimensions from the previous edition.
Annex B	None	Addition of recommended dimensions for metal-graphite grades.
Annex C	None	Explanation of stability of brushes (linked to 6.2).
Annex D	II-8.7	Addition of examples of configuration of flexibles.
Annex E	None	Addition of recommended standardization of flexibles' location
Annex F	Annex D and II-8.8	Link between the thickness of terminals and the screw diameter.
Annex G	Annex B	Simplification of the questionnaire, to include only elements defined in this document.

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

Draft	Report on voting
2/2180/FDIS	2/2189/RVD

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

The language used for the development of this International Standard is English.

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DIMENSIONS, MARKING AND TESTING OF CARBON BRUSHES AND DIMENSIONS OF BRUSH-HOLDERS FOR ELECTRICAL MACHINERY

1 Scope

This document applies primarily to brushes and brush-holders for cylindrical commutators and slip rings for electrical rotating machines. Some clauses of this document may cover other configurations, such as flat commutators or plain disks.

It defines the dimensions of brushes and their components, together with their tolerances:

- dimensions of brush block (t , a , r),
- angles α and β ,
- chamfer,
- flexibles (shunts),
- standard terminals.

It also covers the conventional designation of principal dimensions, the marking of brushes and the testing methods for the qualification of brushes after their manufacturing (except the brush grade material, covered by IEC 60413).

And finally, it specifies dimensions of the brush-holders that are linked to brushes.

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 60276:2018, *Carbon brushes, brush holders, commutators and slip-rings – Definitions and nomenclature*

IEC 60560, *Definitions and terminology of brush-holders for electrical machines*

ISO 129-1, *Technical product documentation (TPD) – Presentation of dimensions and tolerances – Part 1: General principles*

ISO 197-1:1983, *Copper and copper alloys – Terms and definitions – Part 1: Materials*

ISO 286-2:2010, *Geometrical product specifications (GPS) – ISO code system for tolerances on linear sizes – Part 2: Tables of standard tolerance classes and limit deviations for holes and shafts*

3 Terms, definitions and symbols

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60276:2018 and IEC 60560, and the following apply.

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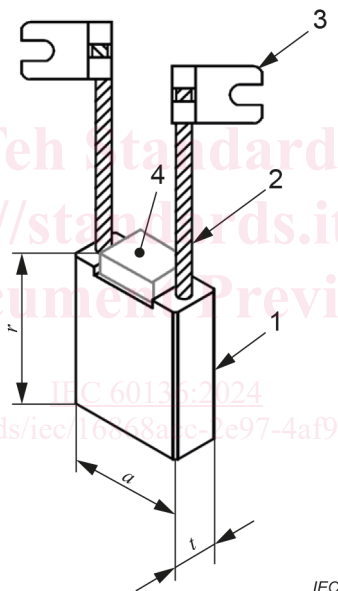
- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1.1

component

<of the brush> element assembled onto the brush block and having a specific feature

Note 1 to entry: Figure 1 shows an example of a carbon brush designed for a DC machine, comprising the following components: two flexibles, two terminals and one top plate.



Key

- 1 block
- 2 flexible
- 3 terminal
- 4 top plate
- t tangential dimension of the brush
- a axial dimension of the brush
- r radial dimension of the brush

Figure 1 – Examples of brush components

3.1.2

chamfer height

c

smaller side of the isosceles rectangle triangle formed by the chamfer, as illustrated by Figure 2

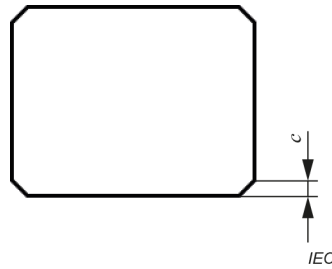


Figure 2 – Chamfer height

Note 1 to entry: c is expressed in millimetres (mm).

Note 2 to entry: In USA, c is also named depth of chamfer.

Note 3 to entry: The source of Figure 2 is IEC 60276:2018, item 147.

3.1.3
contact bevel angle
bottom bevel angle

α
angle between the centre line of the brush and the radial axis of the commutator or slip-ring, as shown in Figure 3

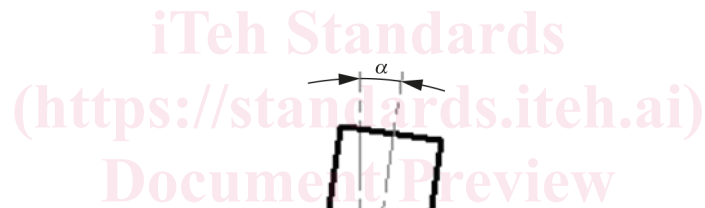


Figure 3 – Contact bevel angle α

Note 1 to entry: α is expressed in degrees ($^{\circ}$).

[SOURCE: IEC 60276:2018, item 106]

3.1.4
top bevel angle
 β

angle between the centre line and the top surface of the carbon brush, as shown in Figure 4