



SLOVENSKI STANDARD
oSIST prEN IEC 60136:2022

01-oktober-2022

Mere, označevanje in preskušanje ogljikovih ščetk ter mere držal ščetk za električne stroje

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

iTeh STANDARD PREVIEW
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Dimensions des balais et porte-balais pour machines électriques

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ICS:

29.160.10	Sestavni deli rotacijskih strojev	Components for rotating machines
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<input checked="" type="checkbox"/> SUBMITTED FOR CENELEC PARALLEL VOTING Attention IEC-CENELEC parallel voting The attention of IEC National Committees, members of CENELEC, is drawn to the fact that this Committee Draft for Vote (CDV) is submitted for parallel voting. The CENELEC members are invited to vote through the CENELEC online voting system.	<input type="checkbox"/> NOT SUBMITTED FOR CENELEC PARALLEL VOTING

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TITLE:

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

PROPOSED STABILITY DATE: 2025

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

FOREWORD

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IEC 60136 has been prepared by IEC technical committee TC2:Rotating Machinery. It is an International Standard.

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

Compared to the previous edition the structure has been modified to conform to ISO/IEC Directives.

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

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.

Clause or subclause	Previous clause	Change
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 sub-clause 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	Annex A.3	Brush-holder: Separation of sub-clauses dimensions and control of brush box.
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 flexible's 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 the present document.

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

FDIS	Report on voting
XX/XX/FDIS	XX/XX/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 was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at <http://www.iec.ch/standardsdev/publications>.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under 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.

DIMENSIONS, MARKING AND TEST METHODS FOR BRUSHES AND DIMENSIONS OF BRUSH-HOLDERS FOR ELECTRICAL MACHINERY

1 Scope

This standard applies primarily to brushes and brush-holders for cylindrical commutators and slip rings for electrical rotating machines. Some parts of this standard 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 197-1:1983 - *Copper and copper alloys - Terms and definitions - Part 1: Materials*

ISO 286-2 – *Geometrical product specifications (GPS) – ISO code system for tolerances on linear sizes – Part 1: Basis of tolerances, deviations and fits*

ISO 179-1 – *Technical product documentation (TPD) – Presentation of dimensions and tolerances – Part 1: General principles*

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.

37 ISO and IEC maintain terminological databases for use in standardization at the following
38 addresses:

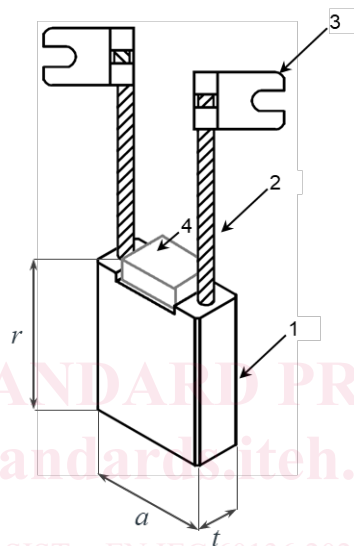
- 39 • IEC Electropedia: available at <http://www.electropedia.org/>
- 40 • ISO Online browsing platform: available at <http://www.iso.org/obp>

41 3.1.1

42 component (of the brush)

43 element assembled onto the brush block and having a specific feature

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



46

47 Key:

48 1 block

49 2 flexible

50 3 terminal

51 4 top plate

52 t tangential dimension of the brush

53 a axial dimension of the brush

54 r radial dimension of the brush

55

Figure 1 – Examples of brush components

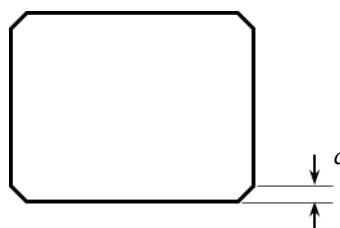
56 3.1.2

57 chamfer height

58 c

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

60 2



61

62

Figure 2 – Chamfer height

63 [SOURCE: IEC 60276:2018 - item 147]

64 Note 1 to entry: c is expressed in millimetres.

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

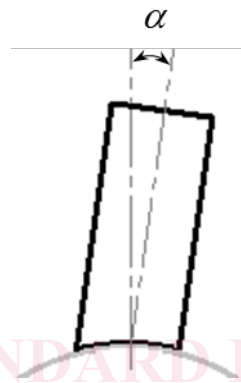
66 3.1.3

67 contact bevel angle

68 bottom bevel angle

69 α

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



72

73

Figure 3 – Contact bevel angle α

74 Note 1 to entry: α is expressed in degree (°).

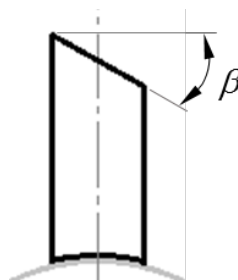
75 [SOURCE: IEC 60276:2018 - item 106]

76 3.1.4

77 top bevel angle

78 β

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



80

81

Figure 4 – Top bevel angle β

82 Note 1 to entry: β is expressed in degree (°).

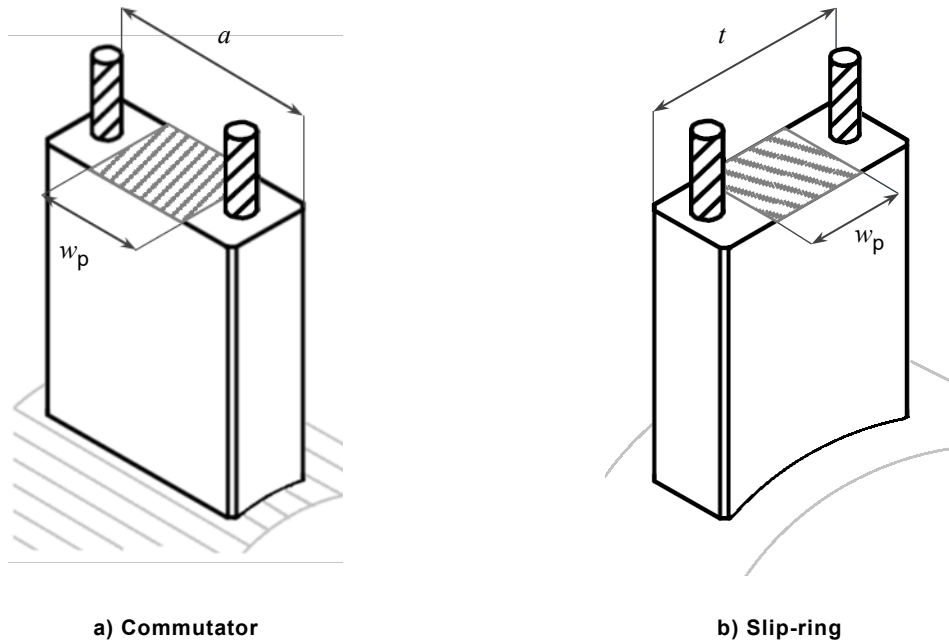
83 [SOURCE: IEC 60276: 2018 - item 110]

84 3.1.5

85 pressure area width

86 w_p

87 width of the area on the top of the brush where the pressure system applies, as shown in
88 Figure 5

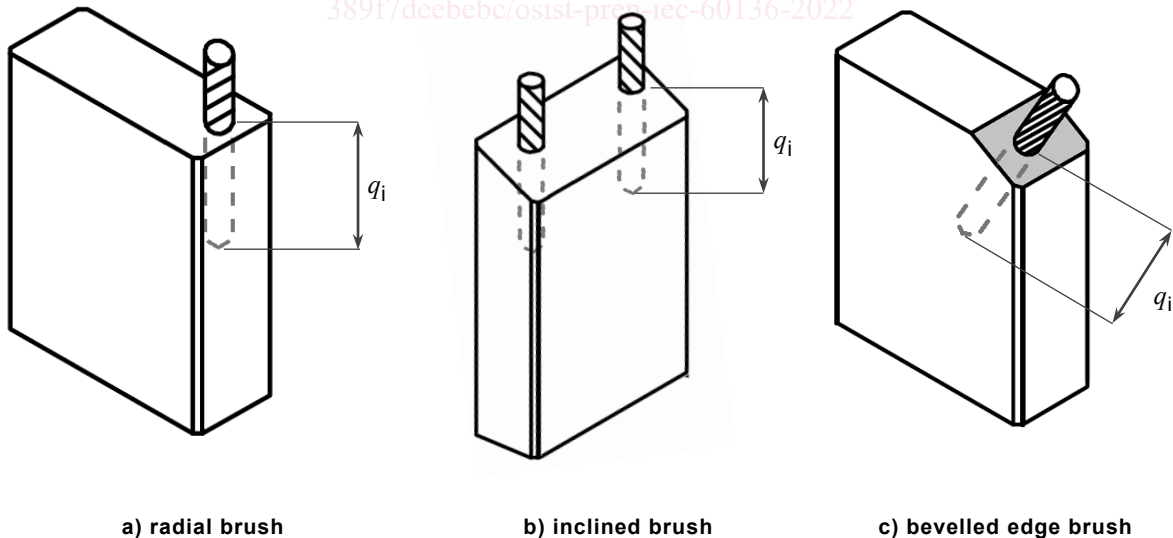


89 **Figure 5 – Pressure area width for commutator and for slip-ring**

90 Note 1 to entry: w_p is expressed in millimetres.

91 **3.1.6**
92 **depth of insertion**

93 q_i
94 distance between the extremity of flexible inside the brush and its insertion location onto the
95 top of the brush, along the flexible direction axis, as illustrated by Figure 6



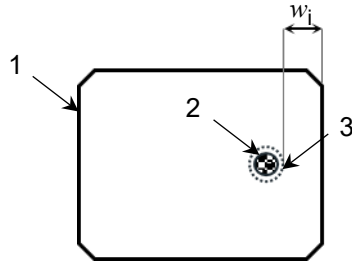
96 **Figure 6 – Depth of insertion**

97 Note 1 to entry: q_i is expressed in millimetres.

98 **3.1.7**
99 **residual material width**

100 w_i
101 width of the residual material adjacent to the flexible (see Figure 7), defined by the distance
102 between:

- 103 – the closest side of the brush block, and
 104 – the periphery of the hole drilled for the insertion of the flexible



105

106 **Key:**

- 107 1 brush
 108 2 flexible
 109 3 hole (for the flexible insertion)

110

Figure 7 – Residual material width

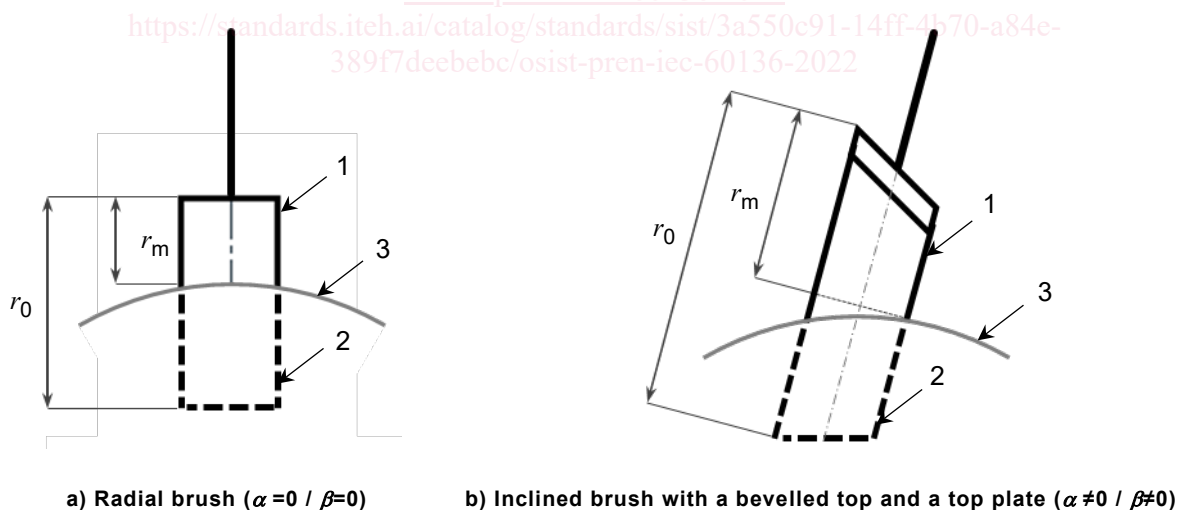
111 Note 1 to entry: w_i is expressed in millimetres.

112 **3.1.8**113 **safe length of a worn brush**114 r_m

115 distance between two planes perpendicular to the centre line, passing over the extremities of:

- 116 – the contact surface at the minimum safe length of worn brush, and
 117 – the elements of brush or parts of elements, which take part in the pressure application

118 Note 1 to entry: Figure 8 below illustrates the definition of r_m for two examples.

119 **Key:**

- 120 1 worn brush
 121 2 initial brush
 122 3 rotating surface
 123 r_0 initial radial dimension
 124 r_m safe length of the worn brush

125 NOTE Dash lines represent the worn part of the brush.

126

Figure 8 – Safe length of a worn brush

127 Note 2 to entry: r_m is expressed in millimetres.