
British Standard

General requirements for rotating electrical machines

Part 147. Specification for dimensions of brushes and brush-holders for electrical machinery

Règles générales pour les machines électriques tournantes
Partie 147. Dimensions des balais et porte-balais pour machines électriques—Spécifications

Allgemeine Anforderungen an umlaufende elektrische Maschinen
Teil 147. Abmessungen von Bürsten und Bürstenhalter in elektrischen Maschinen

National foreword

This Part of BS 4999 has been prepared under the direction of the Power Electrical Engineering Standards Committee and is identical with IEC Publication 136 : 1986 ‘Dimensions of brushes and brush-holders for electrical machinery’, published by the International Electrotechnical Commission (IEC). It supersedes BS 96 : 1954 and all of BS 4362 : Section A1 : 1968 with the exception of appendix A. These two standards are now withdrawn. Appendix A of BS 4362 : Section A1 : 1968 is superseded by BS 4999 : Part 146 ‘Definitions and nomenclature for carbon brushes, brush-holders, commutators and slip-rings’ *, which is identical with IEC Publication 276 : 1968 ‘Definitions and nomenclature for carbon brushes, brush-holders, commutators and slip-rings’, including Amendment No. 1 (1987).

Terminology and conventions. The text of the international standard has been approved as suitable for publication as a British Standard without deviation. Some terminology and certain conventions are not identical with those used in British Standards; attention is drawn especially to the following.

The comma has been used as a decimal marker. In British Standards it is current practice to use a full point on the baseline as the decimal marker.

Wherever page numbers are quoted in the text, they are the IEC page numbers stated in brackets at the bottom of each page.

Wherever ‘IEC’ and ‘the IEC’ are given, they should both be read as ‘BSI’.

Cross-references

International standard	Corresponding British Standard
ISO 68-1973	BS 3643 ISO metric screw threads Part 1 : 1981 Principles and basic data (Technically equivalent)

In addition to the technically equivalent British Standard, a related British Standard to ISO 68 is BS 1580 ‘Specification for unified screw threads’ Part 3 : 1965 ‘Diameters below ¼ in.’.

The Technical Committee has reviewed the provisions of IEC Publication 228, to which reference is made in the text, and has decided that they are acceptable for use in conjunction with this standard. A related British Standard to IEC Publication 228 is BS 6360 : 1981 ‘Specification for conductors in insulated cables and cords’.

In tables XIV, XV and XVI, reference is made to ISO Recommendation 388. Since publication of IEC Publication 136 this document has been withdrawn, and the material thicknesses given in table XXI should be used. It should also be noted that in footnote 2) to table I, the first sentence should read ‘The tolerances for the brush-holders are in accordance with E10 of ISO/R 286.’, the previous standard having been superseded by ISO/R 286 ‘ISO system of limits and fits–Part 1: General, tolerances and deviations’. BS 4500 ‘ISO limits and fits’ Part 1 : 1969 ‘General, tolerances and deviations’ is technically equivalent to ISO/R 286.

Additional information. In addition to IEC Publications 136 and 276 there are a number of other IEC Publications dealing with brushes, brush-holders, commutators and slip-rings which are not so widely used as to warrant publication as British Standards, but which are, nevertheless, useful for reference purposes. A list of these IEC Publications is given in national appendix X.

NOTE. *Typographical error.* The title of clause 7.1 should be read as ‘Chamfers of brushes’.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

* In preparation.



Amendment No. 1
published and effective from 15 October 1995
to BS 4999 : Part 147 : 1988

General requirements for rotating electrical machines
Part 147. Specification for dimensions of brushes and
brush-holders for electrical machinery

Revised text

National foreword

In paragraph 1, line 2, after 'electrical machinery' insert ' , including Amendment 1'.

AMD 8834/October 1995

IEC text

Amend the text of the international standard in accordance with the details given on the attached pages.

AMD 8834/October 1995

CONTENTS

Add the title of the new appendix D as follows:

Appendix D – Recommended values of thickness for spade, flag and double shoe terminals

For figures 1 and 2 replace the explanation for t by the following:

t = tangential dimension of a brush (or set of split brushes)

5 Limits and tolerances on principal dimensions t and a of the carbon brushes and brush-holders and on dimension r of carbon brushes

Replace, on page 13, the existing text of b) split brushes by the following:

Unless otherwise agreed by the user and the supplier, the tolerance of the value t of a set of split brushes is increased by 20 μm (or 0,8 thousandths of an inch) by reducing its lower limit, whilst maintaining its upper limit unchanged.

8 Terminations of brushes

In the note of Table XIV, in note 2 of Table XV and in note 3 of Table XVI, referring to material (strip) thickness, replace the following words:

R20 series size listed in ISO Recommendation 388.

by:

the recommended values given in Appendix D.

8.8 Current capacity and minimum thickness of terminals

Delete the second paragraph below Table XXI, on page 43, and substitute the following new paragraph:

The values of current relate to terminals with a rolled or crimped shank. The values of current for box terminals or terminals made from tubes are not included in this standard.

Add the following new Appendix D

Appendix D

Recommended values of thickness for spade, flag and double shoe terminals

(see Tables XIV, XV and XVI)

mm	inches	mm	inches
0,56	0,02205	1,40	0,0551
0,63	0,02480	1,60	0,0630
0,71	0,02795	1,80	0,0709
0,80	0,03150	2,00	0,0787
0,90	0,03543	2,24	0,0882
1,00	0,0394	2,50	0,0984
1,12	0,0441	2,80	0,1102
1,25	0,0492	3,15	0,1240

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British Standard

General requirements for rotating electrical machines

Part 147. Specification for dimensions of brushes and brush-holders for electrical machinery

SECTION ONE — PRINCIPAL DIMENSIONS AND TOLERANCES

1. Scope

This standard applies to brushes and brush-holders for electrical machinery. For the present it applies only to brushes and brush-holders for cylindrical commutators and slip rings.

2. Letter symbols for the principal dimensions of brushes for cylindrical commutators and slip rings

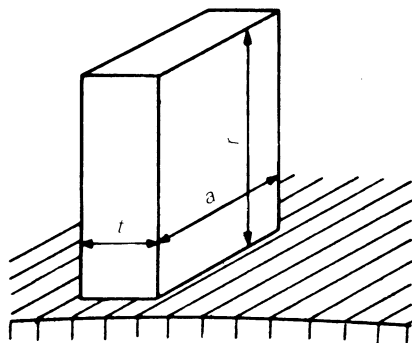


FIG. 1. — Brushes for cylindrical commutators.

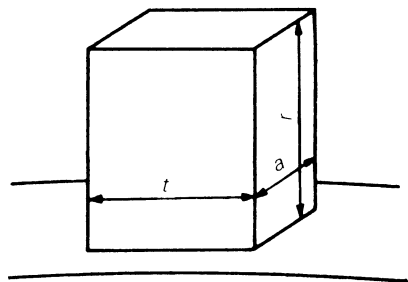


FIG. 2. — Brushes for cylindrical slip rings.

t = tangential dimension
 a = axial dimension
 r = radial dimension

Note. — See Sub-clause 7.5.

The dimensions should be stated in the following sequence:

$$t \times a \times r$$

The sign $\times$ is to be placed between the symbols.

3. Standard dimensions

Dimensions in millimetres

1.6	16
2	20
2.5	25
3.2	32
4	40
5	50
6.3	64
8	80
10	100
12.5	125

The metric dimensions are those recommended by the IEC, but since two systems of units are in use, namely, millimetres and inches, and until all countries adopt the metric dimensions, the following dimensions in inches are included.

Dimensions in inches

$\frac{1}{16}$	1
$\frac{1}{8}$	1 $\frac{1}{4}$
$\frac{3}{16}$	1 $\frac{1}{2}$
$\frac{1}{4}$	1 $\frac{3}{4}$
$\frac{5}{16}$	2
$\frac{3}{8}$	2 $\frac{1}{4}$
$\frac{7}{16}$	2 $\frac{1}{2}$
$\frac{1}{2}$	2 $\frac{3}{4}$
$\frac{5}{8}$	3
$\frac{3}{4}$	3 $\frac{1}{2}$
$\frac{7}{8}$	4
	5

4. Marking

To avoid confusion between dimensions in millimetres and in inches, brushes and brush-holders should be marked as follows:

Metric dimensions □

Inch dimensions △

On brushes, this marking shall preferably be applied on the same face as the grade marking and may be combined with the grade marking. It should be so placed that it will still be visible when the brush is fully worn. If the manufacturer prefers, the marking may be applied to the opposite face to that carrying the grade marking.

For brush-holders, taking into account the great variety of shapes and constructions, the marking may be applied where the manufacturer prefers, provided it is visible by the user when the brush-holders are mounted on the machine.

5. Limits and tolerances on principal dimensions t and a of the carbon brushes and brush-holders and on dimension r of carbon brushes

TABLE I

Limits for t and a in micrometres and in thousandths of an inch¹⁾, r in millimetres and inches¹⁾

Nominal values		Brush-holder ²⁾			Brush			Clearance		Brush
		t	a		t	a				r
mm	in	Max.	Min.	Diff.	Max.	Min.	Diff.	Max.	Min.	
1.6 2 2.5		+ 54	+ 14	40	− 90	− 30	60	144	44	± 0.3
	$\frac{1}{16}$	+ 2.1	+ 0.55	1.55	− 3.5	− 1.20	2.3	5.6	1.75	± 0.0118
3.2	$\frac{1}{8}$	+ 68 + 2.7	+ 20 + 0.80	48 1.90	− 90 − 3.5	− 30 − 1.20	60 2.3	158 6.2	50 2.0	± 0.3 ± 0.0118
4 5	$\frac{3}{16}$	+ 68 + 2.7	+ 20 + 0.80	48 1.90	− 110 − 4.3	− 30 − 1.20	80 3.1	178 7.0	50 2.0	± 0.3 ± 0.0118
6.3 8 10	$\frac{1}{4}$ $\frac{5}{16}$ $\frac{3}{8}$	+ 83 + 3.3	+ 25 + 1.00	58 2.3	− 110 − 4.3	− 30 − 1.20	80 3.1	193 7.6	55 2.2	± 0.3 ± 0.0118
12.5 16	$\frac{7}{16}$ $\frac{1}{2}$ $\frac{5}{8}$	+ 102 + 4.0	+ 32 + 1.25	70 2.8	− 130 − 5.1	− 40 − 1.60	90 3.5	232 9.1	72 2.8	± 0.5 ± 0.0197
20 25	$\frac{3}{4}$ $\frac{7}{8}$ 1	+ 124 + 4.9	+ 40 + 1.60	84 3.3	− 130 − 5.1	− 40 − 1.60	90 3.5	254 10.0	80 3.2	± 0.5 ± 0.0197
32 40 50	$1\frac{1}{4}$ $1\frac{1}{2}$	+ 150 + 5.9	+ 50 + 1.95	100 3.9	− 150 − 5.9	− 50 − 1.95	100 3.9	300 11.8	100 3.9	± 0.8 ± 0.0315
64 80	$1\frac{3}{4}$ 2	+ 180 + 7.1	+ 60 + 2.4	120 4.7	− 150 − 5.9	− 50 − 1.95	100 3.9	330 13.0	110 4.3	± 0.8 ± 0.0315
100 125										± 1.0
	$2\frac{1}{4}$.3 $2\frac{1}{2}$.4 $2\frac{3}{4}$.5									± 0.040

¹⁾ The tolerance values in inches are given in *italic type*.

²⁾ The tolerances for the brush-holders are in accordance with ISA Tol. E 10.

In order to check the brush holder dimensions, full form "go" and "not go" plug gauges must be used.

a) Tolerances for brush-holders

The tolerance values for the t dimension shown in Table I are mainly for use with radial brushes. It is recognized that, under certain conditions (e.g. with reaction brush-holders) where the brush stability does not depend on the fit of the brush in the holder, the maximum clearance between the brush and the brush-holder is unimportant.

b) Split brushes

The tolerance of the value t of a set of split brushes is increased by 20 μm (or 0.8 thousandths of an inch) unless otherwise agreed by the user and the supplier. The maximum dimensions of a set remains unchanged.

c) Metal-graphite brushes

For those grades of brushes which have an abnormally high thermal expansion, for example certain metal graphite and unburnt graphite grades, the nominal dimensions given in Table I shall be reduced by an amount at the discretion of the brush manufacturer, and the above tolerances be applied to the dimensions so reduced.

These brushes shall, however, be designated by the nominal values of Table I.

In order to facilitate inspection, the brush manufacturer shall state the reduced nominal dimensions when dispatching the brushes.