

General requirements for rotating electrical machines —

Part 141: Specification for standard dimensions

UDC 621.313—13:006.78

NO COPYING WITHOUT BSI PERMISSION EXCEPT AS PERMITTED BY COPYRIGHT LAW

BSI
Documents

AVA

Document Sharing Hub

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Power Electrical Engineering Standards Committee (PEL/-) to Technical Committee PEL/1, upon which the following bodies were represented:

- Association of Consulting Engineers
- Association of Electrical Machinery Trades
- Association of Manufacturers Allied to the Electrical and Electronic Industry (BEAMA Ltd.)
- Association of Supervisory and Executive Engineers
- British Coal
- Bureau of Engineer Surveyors
- ERA Technology Ltd.
- Electricity Supply Industry in England and Wales
- Engineer Surveyors Section of the ASTMS
- Engineering Equipment and Materials Users' Association
- Health and Safety Executive
- Ministry of Defence
- Power Generation Association (BEAMA Ltd.)
- Rotating Electrical Machines Association (BEAMA Ltd.)
- South of Scotland Electricity Board

This British Standard, having been prepared under the direction of the Power Electrical Engineering Standards Committee, was published under the authority of the Board of BSI and comes into effect on 27 February 1987

© BSI 02-1999

First published as BS 4999-10 May 1976
First revision as BS 4999-141 February 1987

The following BSI references relate to the work on this standard:
Committee reference PEL/1
Revision announced in *BSI News* October 1986

ISBN 0 580 15781 4

Amendments issued since publication

Amd. No.	Date of issue	Comments

Contents

	Page
Committees responsible	Inside front cover
Foreword	ii
1 Scope	1
2 References	1
3 General	1
4 Shaft end dimensions	2
5 Dimensions of foot-mounted frames	5
6 Dimensions of flange-mounted frames	7
7 Dimensions of skirt-mounted frames	8
8 Dimensions of face-flange frames	10
9 Dimensions of large foot-mounted frames	12
10 Dimensions of pad-mounted or rod-mounted frames	12
11 Dimensions of slide rails	13
Figure 1 — Indicator mounting for measurement of spigot run-out and shaft extension run-out	1
Figure 2 — Indicator mounting for measurement of squareness of mounting face of flange to shaft	2
Figure 3 — Symbols for shaft end dimensions	2
Figure 4 — Symbols for foot-mounted machines	6
Figure 5 — Symbols for flange-mounted machines	8
Figure 6 — Symbols for skirt-mounted machines	10
Figure 7 — Symbols for face-flange mounted machines	11
Figure 8 — Symbols for pad-mounted or rod-mounted machines	14
Figure 9 — Symbols for slide rails	15
Table 1 — Dimensions of shaft ends and keyways	3
Table 2 — Dimensions of single tapped hole in shaft extension	4
Table 3 — Dimensions of two tapped holes in shaft extension	4
Table 4 — Fixing dimensions of foot-mounted frames, all enclosures	5
Table 5 — Fixing dimensions of foot-mounted frames, ventilated enclosure, for d.c. machines	6
Table 6 — Fixing dimensions of flange-mounted frames, enclosure D	7
Table 7 — Fixing dimensions of flange-mounted frames, enclosure C	8
Table 8 — Fixing dimensions of skirt-mounted frames, enclosure D	9
Table 9 — Fixing dimensions of skirt-mounted frames, enclosure C	9
Table 10 — Fixing dimensions of face-flange frames, enclosures C and D	11
Table 11 — Preferred fixing dimensions for large horizontal shaft motors with high shaft centres	12
Table 12 — Preferred fixing dimensions for large horizontal shaft motors with low shaft centres	13
Table 13 — Fixing dimensions of pad-mounted or rod-mounted frames, enclosure D	13
Table 14 — Standard dimensions of slide rails	14
Table 15 — Dimension <i>AT</i> for fabrication	15
Publications referred to	Inside back cover

Foreword

This Part of BS 4999 has been prepared under the direction of the Power Electrical Engineering Standards Committee and supersedes BS 4999-10:1976, which is withdrawn.

This Part has been issued to implement the decision to renumber all the Parts of BS 4999 to bring the Part numbers more into line with those of IEC Publication 34. In addition to the renumbering of the Part, the inclusion of the Part number in the point numbering system adopted in Part 10, has been abandoned. No technical changes have been made to the text of BS 4999-10:1976.

This Part of BS 4999 is compatible with IEC Publications 72 and 72A.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

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

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 16, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This Part of this British Standard gives dimensions applicable to rotating electrical machines and is compatible with IEC Publications 72 and 72A.

A series of frame sizes up to 400 mm centre height is defined by association of dimensions. These frame sizes are intended primarily for low voltage induction motors but may be used for a variety of types of machine. For large machines from 355 mm centre height upwards, the tables give a number of preferred values from which selection can be made to give the combination necessary for effective design.

Dimensions are given for a limited range of slide rails.

2 References

The titles of the standards publications referred to in this standard are listed on the inside back cover.

3 General

3.1 Tolerances. Where tolerance grades are quoted, they have the meanings defined in BS 4500.

3.2 Run-outs. Where appropriate, shaft extension and spigot run-outs and the squareness of the flange face to the shaft shall not exceed the values specified in Table 1, Table 6, Table 7, Table 8, Table 9 and Table 10.

Measurements shall be made in accordance with 3.2.1, 3.2.2 and 3.2.3.

3.2.1 Shaft extension run-out. To measure the run-out with rotation of the shaft, the point of the indicator shall be applied on the shaft midway along its length E . The maximum and minimum values on the indicator shall be read through one slow revolution of the shaft avoiding the keyway; the difference between the values shall be taken as the full indicator measurement¹⁾.

The indicator shall be mounted as shown in Figure 1.

3.2.2 Spigot run-cut. To measure the run-out the indicator shall be fixed rigidly on the shaft extension by means of a device similar to that shown in Figure 1 at a distance of about 10 mm from the flange face. The maximum and minimum values on the indicator shall be read through one slow revolution of the shaft; the difference between the values shall be taken as the full indicator measurement.

NOTE It is recommended that the test should be carried out on the machine set up with shaft vertical to make the measurement free from the effects of gravity.

3.2.3 Squareness of mounting face of flange to shaft. To measure the run-out the indicator shall be fixed rigidly on the shaft extension by means of a device similar to that shown in Figure 2 at a distance of about 10 mm from the flange face. The maximum and minimum values on the indicator shall be read through one slow revolution of the shaft; the difference between the values shall be taken as the full indicator measurement.

NOTE It is recommended that the test should be carried out on the machine set up with shaft vertical to eliminate the effects of axial clearance in the bearings.

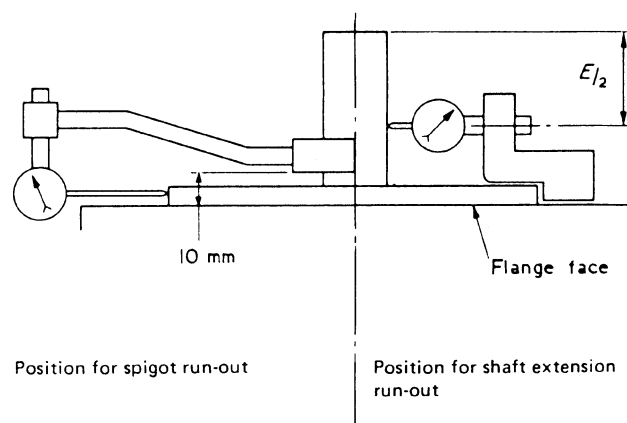
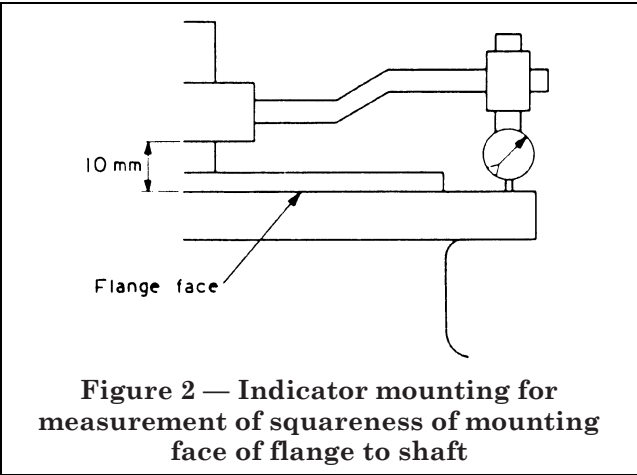


Figure 1 — Indicator mounting for measurement of spigot run-out and shaft extension run-out

¹⁾ This term is synonymous with total indicator reading (t.i.r.).



The keyway corner radius shall be in accordance with the following dimensions, which are abstracted from BS 4235-1.

Shaft number	Radius max. mm	Radius min. mm
9 to 11 inclusive	0.16	0.08
14 to 28 inclusive	0.25	0.16
32 to 65 inclusive	0.40	0.25
70 to 110 inclusive	0.60	0.40
120 to 150 inclusive	1.0	0.70

4.1 When a single tapped hole is required in the shaft extension, the dimensions of the hole shall be in accordance with Table 2. The depth of thread shall be not less than 1.5 diameters, and there shall be a 60° angle at the centre.

In special cases when the purchaser wishes to specify two tapped holes in the shaft extension, as an alternative to the single tapped hole, the dimensions of the holes shall be in accordance with Table 3. The depth of thread shall be not less than 1.75 diameters.

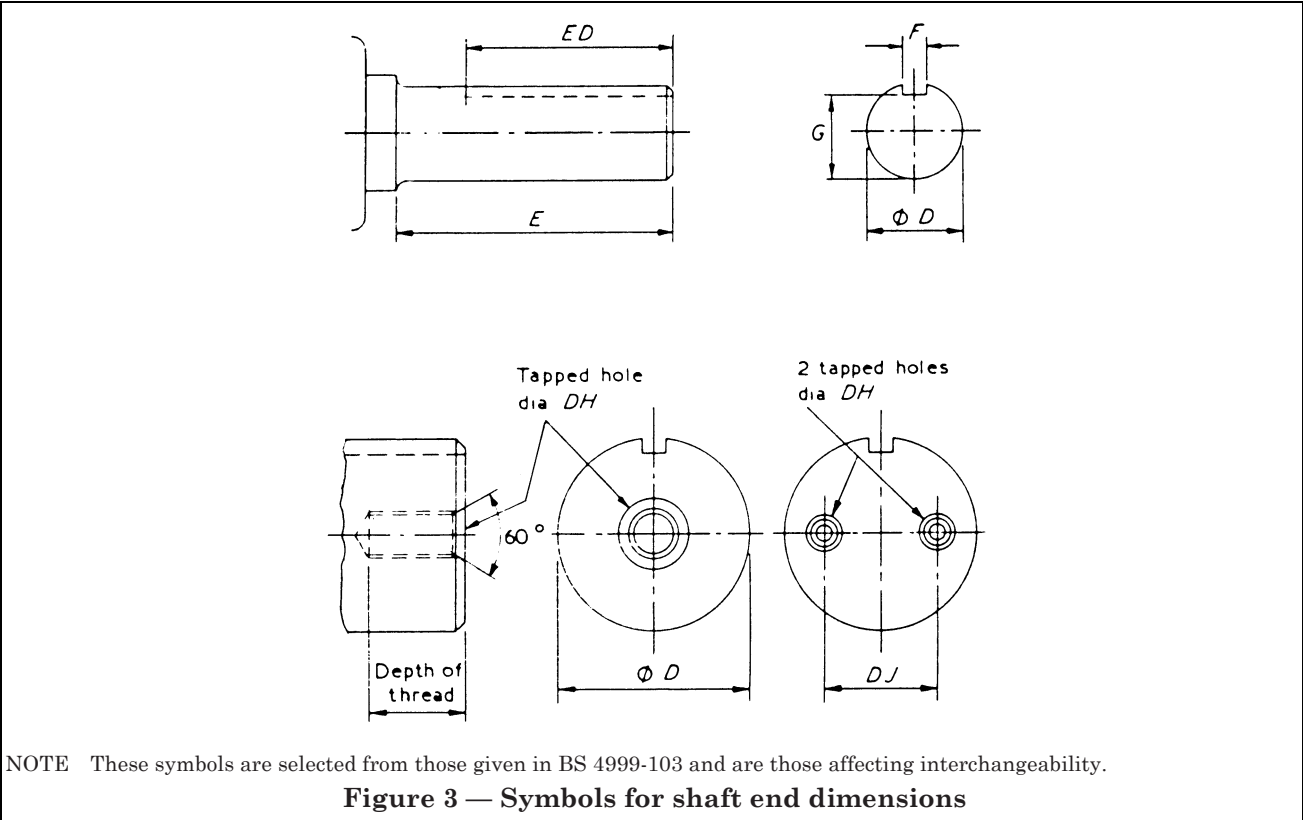
NOTE 1 The provision of a tapped hole or holes is primarily for the attachment of shaft fitments including couplings, and is not intended for the attachment of devices for lifting or handling either the motor or the rotor.

NOTE 2 The dimensions *DH* are selected from BS 3643-2 with tolerance class 6H.

4 Shaft end dimensions

Motors shall have shaft dimensions as specified in the appropriate line in Table 1. The significance of the symbols is illustrated by Figure 3.

Each size of shaft is identified by a shaft number in the first column and the number is the nominal diameter of the shaft in millimetres.



NOTE These symbols are selected from those given in BS 4999-103 and are those affecting interchangeability.

Figure 3 — Symbols for shaft end dimensions

Table 1 — Dimensions of shaft ends and keyways

All dimensions are in millimetres.

Shaft number	Diameter <i>D</i>			Length <i>E</i>	Limit of shaft extension run-out (note 1)	Width of keyway <i>F</i>			<i>G</i>		<i>ED</i> (min.)
	Nominal	Tolerance				Nominal	Tolerance		Nominal	Tolerance	
9	9	j6	+ 0.007 − 0.002	20	0.03	3	N9	− 0.004 − 0.029	7.2	+ 0 − 0.1	8
11	11	j6	+ 0.008 − 0.003	23	0.035	4	N9	+ 0 − 0.030		+ 0 − 0.1	10
14	14	j6	+ 0.008 − 0.003	30	0.035	5	N9	+ 0 − 0.030		+ 0 − 0.1	14
19	19	j6	+ 0.009 − 0.004	40	0.04	6	N9	+ 0 − 0.030	15.5	+ 0 − 0.2	25
22	22	j6	+ 0.009 − 0.004	50	0.04	6	N9	+ 0 − 0.030	18.5	+ 0 − 0.2	32
24	24	j6	+ 0.009 − 0.004	50	0.04	8	N9	+ 0 − 0.036	20.0	+ 0 − 0.2	32
28	28	j6	+ 0.009 − 0.004	60	0.04	8	N9	+ 0 − 0.036	24.0	+ 0 − 0.2	40
32	32	k6	+ 0.018 + 0.002	80	0.05	10	N9	+ 0 − 0.036	27.0	+ 0 − 0.2	56
38	38	k6	+ 0.018 + 0.002	80	0.05	10	N9	+ 0 − 0.036	33.0	+ 0 − 0.2	56
42	42	k6	+ 0.018 + 0.002	110	0.05	12	N9	+ 0 − 0.043	37.0	+ 0 − 0.2	80
48	48	k6	+ 0.018 + 0.002	110	0.05	14	N9	+ 0 − 0.043	42.5	+ 0 − 0.2	80
55	55	m6	+ 0.030 + 0.011	110	0.06	16	N9	+ 0 − 0.043	49.0	+ 0 − 0.2	80
60	60	m6	+ 0.030 + 0.011	140	0.06	18	N9	+ 0 − 0.043	53.0	+ 0 − 0.2	110
65	65	m6	+ 0.030 + 0.011	140	0.06	18	N9	+ 0 − 0.043	58.0	+ 0 − 0.2	110
70	70	m6	+ 0.030 + 0.011	140	0.06	20	N9	+ 0 − 0.052	62.5	+ 0 − 0.2	110
75	75	m6	+ 0.030 + 0.011	140	0.06	20	N9	+ 0 − 0.052	67.5	+ 0 − 0.2	110
80	80	m6	+ 0.030 + 0.011	170	0.06	22	N9	+ 0 − 0.052	71.0	+ 0 − 0.2	140
85	85	m6	+ 0.035 + 0.013	170	0.07	22	N9	+ 0 − 0.052	76.0	+ 0 − 0.2	140
90	90	m6	+ 0.035 + 0.013	170	0.07	25	N9	+ 0 − 0.052	81.0	+ 0 − 0.2	140
95	95	m6	+ 0.035 + 0.013	170	0.07	25	N9	+ 0 − 0.052	86.0	+ 0 − 0.2	140