IEC 60072-1

Edition 7.0 2022-03

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Rotating electrical machines – Dimensions and output series – Part 1: Frame numbers 56 to 400 and flange numbers 55 to 1080

Machines électriques tournantes – Dimensions et séries de puissances – Partie 1: Désignation des carcasses entre 56 et 400 et des brides entre 55 et 1080

IEC 60072-1:2022-03(en-fr)

IEC Secretariat
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC
The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications
The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform
The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, …). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished
Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc
If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch
Discover our powerful search engine and read freely all the publications previews. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org
The world's leading online dictionary on electrotechnology, containing more than 22 300 terminological entries in English and French, with equivalent terms in 19 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

A propos de l'IEC
La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC
Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Recherche de publications IEC - webstore.iec.ch/advsearchform
La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études, …). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished
Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et une fois par mois par email.

Service Clients - webstore.iec.ch/csc
Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch
Découvrez notre puissant moteur de recherche et consultez gratuitement tous les aperçus des publications. Avec un abonnement, vous aurez toujours accès à un contenu à jour adapté à vos besoins.

Electropedia - www.electropedia.org
Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 300 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 19 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

IEC 60072-1

Edition 7.0 2022-03

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Rotating electrical machines – Dimensions and output series – Part 1: Frame numbers 56 to 400 and flange numbers 55 to 1080

Machines électriques tournantes – Dimensions et séries de puissances – Partie 1: Désignation des carcasses entre 56 et 400 et des brides entre 55 et 1080

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

ICS 29.160.01

ISBN 978-2-8322-1093-0

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

____

**ROTATING ELECTRICAL MACHINES –
DIMENSIONS AND OUTPUT SERIES –**

Part 1: Frame numbers 56 to 400 and flange numbers 55 to 1080

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60072-1 has been prepared by IEC technical committee 2: Rotating machinery.

This seventh edition cancels and replaces the sixth edition published in 1991. This edition constitutes a technical revision.

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

a) modification of the series title;
b) complete revision on the basis of EN 50347;
c) integration of the relationships between frame size, shaft extensions, rated outputs and flange numbers;
d) additional tolerances and measurements for shafts;

e) modification of Annex A with additional frame numbers and relationships between frame size and rated power.

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

Draft	Report on voting
2/2059/CDV	2/2082/RVC

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.

A list of all parts in the IEC 60072 series, published under the general title *Rotating electrical machines – Dimensions and output series*, can be found on the IEC website.

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

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 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.

ROTATING ELECTRICAL MACHINES – DIMENSIONS AND OUTPUT SERIES –

Part 1: Frame numbers 56 to 400 and flange numbers 55 to 1080

1 Scope

This part of IEC 60072 is applicable for the majority of rotating electrical machines for industrial purposes within the dimension range and output powers:

Foot- mounted:	shaft heights: 56 mm to 400 mm.
Flange- mounted:	pitch circle diameter of flange: 55 mm to 1 080 mm.

It specifies the fixing dimensions, shaft extension dimensions and the assignment of output powers and frame sizes.

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 60079-0, *Explosive atmospheres – Part 0: Equipment – Generel requirements*

ISO 128-3:2020, *Technical product documentation (TPD) – General principles of representation – Part 3: Views, sections and cuts*

ISO 273, *Fasteners – Clearance holes for bolts and screws*

ISO 286 (all parts), *Geometrical product specifications (GPS) – ISO code system for tolerances on linear sizes*

ISO 1101, *Geometrical product specifications (GPS) – Geometrical tolerancing – Tolerances of form, orientation, location and run-out*

ISO 2768-1, *General tolerances – Part 1: Tolerances for linear and angular dimensions without individual tolerance indications*

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

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

4 Symbols

4.1 Letter symbols for dimensions

The dimensional sketches in Figure 1 illustrate the symbols defined below. Mandatory dimensions are marked with *.

*A distance between centre-lines of fixing holes (end view)

AA width of the end of the feet (end view)

AB overall dimension across the feet (end view)

AC maximum width (envelope size) of the machine (e.g. fan cover; excluded are terminal box and feet)

AC’ maximum height (envelope size) of the machine

AD distance from the centre-line of the machine to extreme outside of the terminal box or other most salient part mounted on the side of the machine

*B distance between the centre-lines of the fixing holes (side view)

BA length of the feet (drive end side; side view)

BB overall dimension across the feet (side view)

BC distance from the shoulder on the shaft at D-end to the beginning of the foot (side view)

BD length of the feet (non-drive end side; side view)

*C distance from the shoulder on the shaft at D-end to the centre-line of the mounting holes in the nearest feet

CA distance from the shoulder on the shaft at N-end to the centre-line of the mounting holes in the nearest feet

*CB rounding fillet at the shoulder on the shaft at D-end

CC rounding fillet at the shoulder on the shaft at N-end

*D diameter of the shaft extension at D-end

DA diameter of the shaft extension at N-end

*DB thread-size in the centre hole at D-end

DC thread-size in the centre hole at N-end

*E length of the shaft extension from the shoulder at D-end

EA length of the shaft extension from the shoulder at N-end

*EB length of the key at D-end

EC length of the key at N-end

*ED distance from the shoulder on the shaft at D-end to the nearest end of the keyway

EE distance from the shoulder on the shaft at N-end to the nearest end of the keyway

*F width of the keyway or key of the shaft extension at D-end

FA width of the keyway or key of the shaft extension at N-end

*FB rounding fillet in the bottom of the keyway at D-end

FC rounding fillet in the bottom of the keyway at N-end

G distance from the bottom of the keyway to the opposite surface of the shaft extension at D-end

*GA distance from the top of the key to the opposite surface of the shaft extension at D-end

GB distance from the bottom of the keyway to the opposite surface of the shaft extension at N-end

GC distance from the top of the key to the opposite surface of the shaft extension at N-end

*GD height of the key of the shaft extension at D-end

*GE depth of the keyway at the crown of the shaft extension at D-end

GF height of the key of the shaft extension at N-end

GH depth of the keyway at the crown of the shaft extension at N-end

*H distance form the centre-line of the shaft to the bottom of the feet (basic dimension)

HA thickness of the feet

HC distance from the top of the horizontal machine to the bottom of the feet

HD distance from the top of the lifting eye, the terminal box or other most salient part mounted on the top of the machine to the bottom of the feet

*K diameter of the holes or width of the slots (end view) in the feet of the machine

KA in case of long holes: width of the slots (side view) in the feet

L overall length of the machine with a single shaft extension

LA thickness of the flange

LB distance from the mounting surface of the flange to the end of the machine

LC overall length of the machine when there is a shaft extension at N-end

LR distance from the end of the machine to the ring bolt

*M pitch circle diameter of the fixing holes

*N diameter of the spigot

*P outside diameter of the flange, or in the case of a non-circular outline twice the maximum radial dimension

*R distance from the mounting surface of the flange to the shoulder on the shaft

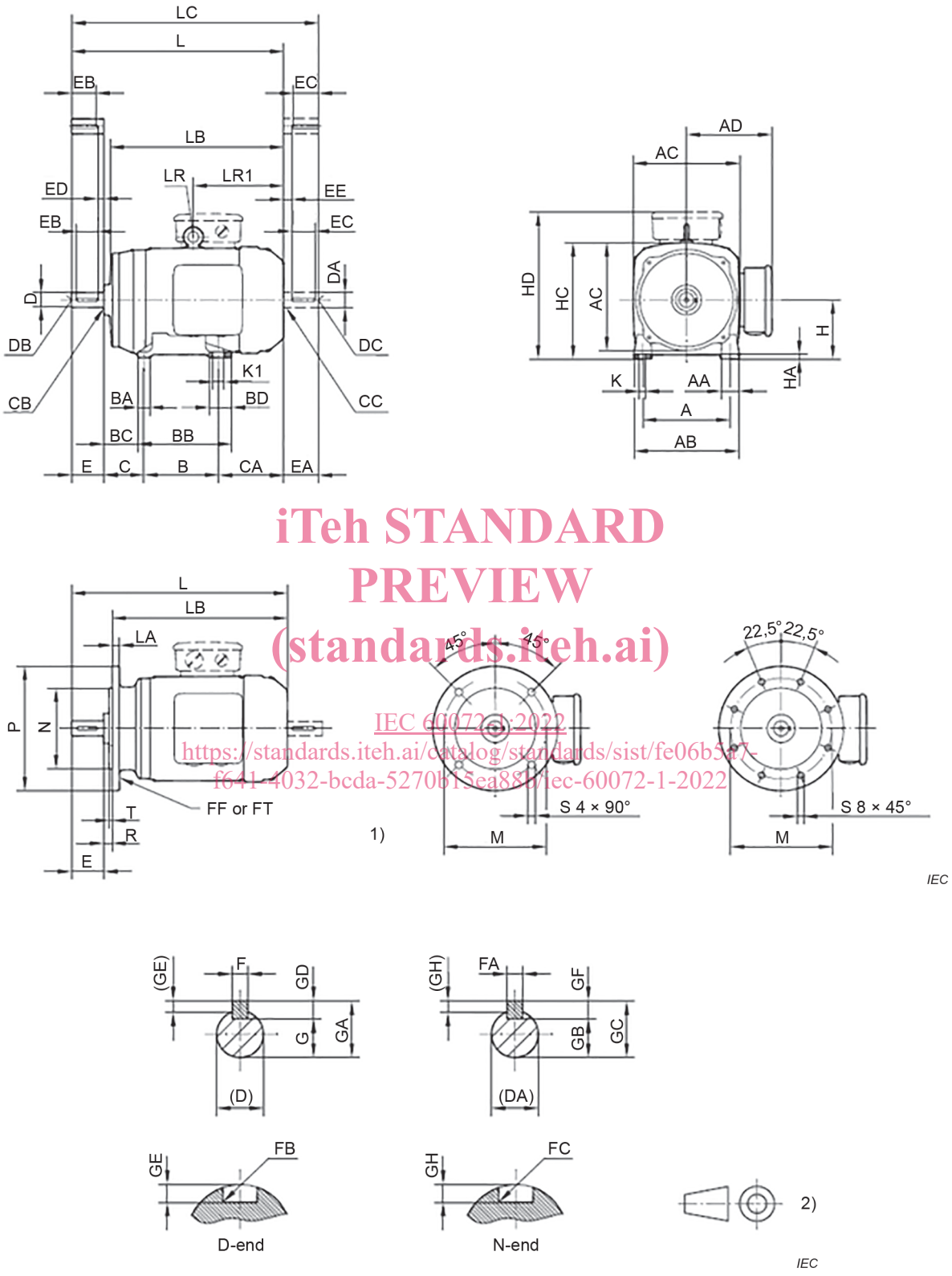
*S diameter of the fixing holes in the mounting flange or nominal diameter of thread

SR thread diameter of ring bolt

*T depth of the spigot

NOTE The definition of D-end and N-end of a motor is given in IEC 60034-7.

4.2 Dimensional sketches



Key

1) FF - flange with through holes; access to back; FT - flange with thread; no access to back

2) This ISO symbol indicates the projection method used (ISO 128-3:2020)

Figure 1 – Dimensional sketches

5 Designations of machines

5.1 Frame sizes

Electrical machines may be designated by the frame size. The frame sizes are defined as the distance from the centre line of the shaft to the bottom of the feet (H dimension). The dimensions for H and the correlation to the fixing dimensions (A, B, C and K) are given in Table 1.

Recommended letters for frame sizes:

S short length frame size;

M middle length frame size;

L long length frame size.

Additional recommended frame number letters are given in Annex B, Table B.1.

NOTE The frame sizes are also applicable for non feet motors.

5.2 Flange numbers

The flange numbers are defined as the pitch circle diameter M. The dimensions for M and the correlation to the fixing dimensions (N, P, R, S and T) are given in Table 2. The location of the holes in the mounting flange are shown in Figure 1.

Recommended letters for flange numbers:

FF flange with through holes;

FT flange with thread.

5.3 Shaft extension

The designation of the shaft is defined with the diameter of the shaft extension D. The dimensions for D and the correlation to the relevant dimensions (e.g. E, Key) are given in Table 3.

6 Location of the terminal box

6.1 Machines with feet

The terminal box on a motor should be situated with its centre-line within a sector ranging from the top to 10° below the horizontal centre-line of the motor on the right hand side, when looking at the D-end of the motor.

It is recommended that unless the terminal box is on the top, motors be so constructed that the terminal box may be located on the left-hand side by the manufacturer, if requested by the user at the time when the motor is ordered.

NOTE Provision is preferably made so as to enable the cable entry to the terminal box to be in any one of the four directions at right angles.

6.2 Machines without feet

No recommendation.

7 Fixing dimensions and tolerances

7.1 General

Shaft extension, flange numbers, foot dimension and output allocation to frame size are given in Clause 11, Table 7 through Table 10.

7.2 Foot-mounted machines

A, B, C and K dimensions shall be selected from Table 1.

Table 1 – Dimensions for machines with shaft height from 56 mm to 400 mm

Frame number [a]	H		A[d]	B[d]	C[d]	K[b]	Bolt[c] or screw
			mm	mm	mm	Nominal mm	
	Nominal mm	Maximum deviation mm					
56M	56	−0,5	90	71	36	5,8	M5
63M	63	−0,5	100	80	40	7	M6
71M	71	−0,5	112	90	45	7	M6
80M	80	−0,5	125	100	50	10	M8
90S	90	−0,5	140	100	56	10	M8
90L	90	−0,5	140	125	56	10	M8
100L	100	−0,5	160	140	63	12	M10
(112S)	112	−0,5	190	114	70	12	M10
112M	112	−0,5	190	140	70	12	M10
(112L)	112	−0,5	190	159	70	12	M10
132S	132	−0,5	216	140	89	12	M10
132M	132	−0,5	216	178	89	12	M10
(132L)	132	−0,5	216	203	89	12	M10
(160S)	160	−0,5	254	178	108	14,5	M12
160M	160	−0,5	254	210	108	14,5	M12
160L	160	−0,5	254	254	108	14,5	M12
(180S)	180	−0,5	279	203	121	14,5	M12
180M	180	−0,5	279	241	121	14,5	M12
180L	180	−0,5	279	279	121	14,5	M12
(200S)	200	−0,5	318	228	133	18,5	M16
200M	200	−0,5	318	267	133	18,5	M16
200L	200	−0,5	318	305	133	18,5	M16
225S	225	−0,5	356	286	149	18,5	M16
225M	225	−0,5	356	311	149	18,5	M16
(225L)	225	−0,5	356	356	149	18,5	M16
250S	250	−0,5	406	311	168	24	M20
250M	250	−0,5	406	349	168	24	M20
(250L)	250	−0,5	406	406	168	24	M20

Frame number [a]	H		A[d]	B[d]	C[d]	K[b] Nominal	Bolt[c] or screw
			mm	mm	mm	mm	
	Nominal	Maximum deviation					
	mm	mm					
280S	280	−1	457	368	190	24	M20
280M	280	−1	457	419	190	24	M20
(280L)	280	−1	457	457	190	24	M20
315S	315	−1	508	406	216	28	M24
315M	315	−1	508	457	216	28	M24
(315L)	315	−1	508	508	216	28	M24
355S	355	−1	610	500	254	28	M24
355M	355	−1	610	560	254	28	M24
355L	355	−1	610	630	254	28	M24
400S	400	−1	686	560	280	35	M30
400M	400	−1	686	630	280	35	M30
400L	400	−1	686	710	280	35	M30

[a] Frame numbers within brackets should be regarded as non preferred for AC induction machines.

[b] The nominal K dimensions are selected from the coarse series in ISO 273 and have a tolerance of H17 according to the ISO 286 series. For long holes the tolerance applies to the width of the slot. Open-ended slots are not recommended.

[c] Recommended bolt or screw for fixing the motor-feet to the basement.

[d] The tolerance of this dimension is taken from the coarse series in ISO 2768-1.

7.3 Flange-mounted machines

Machines having both feet and flange shall have A, B and C dimensions selected from Table 1.

Table 2 – Dimensions and tolerances for flanges with pitch circle diameters from 55 mm to 1 080 mm

Flange number (FF/FT)	Pitch circle diameter M [a]	Diameter of the spigot N		Outside diameter P[a]	Distance R	Number of holes	S		Distance T[d]	Concentricity[e] and perpendi-cularity
							Free holes (FF)[b]	Tapped holes (FT)[c]		
-	mm	mm	ISO Tol.	mm max.	mm	-	mm	-	mm max.	µm max.
55	55	40	j6	70	0	4	5,8	M5	2,5	80
65	65	50	j6	80	0	4	5,8	M5	2,5	80
75	75	60	j6	90	0	4	5,8	M5	2,5	80
85	85	70	j6	105	0	4	7	M6	2,5	80
100	100	80	j6	120	0	4	7	M6	3	80
115	115	95	j6	140	0	4	10	M8	3	80
130	130	110	j6	160	0	4	10	M8	3,5	100
165	165	130	j6	200	0	4	12	M10	3,5	100
215	215	180	j6	250	0	4	14,5	M12	4	100

Flange number (FF/FT)	Pitch circle diameter M [a]	Diameter of the spigot N		Outside diameter P[a]	Distance R	Number of holes	S		Distance T[d]	Concentricity[e] and perpendi-cularity
							Free holes (FF)[b]	Tapped holes (FT)[c]		
-	mm	mm	ISO Tol.	mm max.	mm	-	mm	-	mm max.	µm max.
265	265	230	j6	300	0	4	14,5	M12	4	100
300	300	250	j6	350	0	4	18,5	M16	5	125
350	350	300	h6	400	0	4	18,5	M16	5	125
400	400	350	h6	450	0	8	18,5	M16	5	125
500	500	450	h6	550	0	8	18,5	M16	5	125
600	600	550	h6	660	0	8	24	M20	6	160
740	740	680	h6	800	0	8	24	M20	6	160
940	940	880	h6	1 000	0	8	28	M24	6	200
1 080	1 080	1 000	h6	1 150	0	8	28	M24	6	200

[a] By agreement the external outline of mounting flanges may be other than circular. Dimension P may deviate from that given in the table only on the minus side.

[b] The nominal free hole dimensions are selected from the coarse series in ISO 273 and have a tolerance of H17 according to the ISO 286 series.

[c] For FT flange-mounted machines, it is recommended that the free holes in the mounting part should be as shown for the corresponding size of the FF flange.

[d] The corner radius between the spigot and flange face shall not exceed 0,8 mm.

[e] Concentricity (defined in ISO 1101) of spigot to shaft and perpendicularity of flange-face to shaft. The values are the maximum permissible change in the indicator reading, measured according to the methods in 9.3 and 9.4. By agreement values may be reduced to 50 % of the specified dimensions.

NOTE More dimensions are shown for larger sizes in IEC 60072-2 and for smaller built-in motors in IEC 60072-3.

8 Shaft end dimensions and tolerances

8.1 Shaft end dimenions

Table 3 shows the relevant dimensions for shafts, keys and keyways.