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Rolling bearings — Symbols for quantities

Roulements — Symboles relatifs aux grandeurs

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 15241 was prepared by Technical Committee ISO/TC 4, *Rolling bearings*.

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Rolling bearings — Symbols for quantities

1 Scope

This International Standard defines the presentation of symbols for physical quantities — dimensions, dimensional tolerances, accuracy, load ratings, life, etc. — in the field of rolling bearings. These symbols are primarily intended for use in ISO Standards and ISO documents relating to rolling bearings, but they are also suitable for use in other printed materials such as catalogues, drawings and pamphlets.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 31-0:1992, *Quantities and units — Part 0: General principles*

ISO 31-11:1992, *Quantities and units — Part 11: Mathematical signs and symbols for use in the physical sciences and technology*

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ISO 281:1990/Amd. 2:2000, *Rolling bearings — Dynamic load ratings and rating life — Amendment 2: Life modification factor a_{XYZ}*

ISO 1132-1:2000, *Rolling bearings — Tolerances — Part 1: Terms and definitions*

ISO 5593:1997, *Rolling bearings — Vocabulary*

3 Symbols for quantities

3.1 Principles of symbol system

The following principles have been applied in this International Standard.

- Principles of the symbol system are generally in accordance with ISO 31-0 and ISO 31-11.
- Symbols for physical quantities used in the field of rolling bearings are defined as quantities in physics. Symbols for dimensionless values such as coefficients, factors and parameters are thus also involved. Mathematical variables are also included, e.g. probability (n).
- Subscripts of subscripts should not be adopted; e.g. the subscript letters “*dmp*” of V_{dmp} should be printed in the same point size. The form V_{dmp} should not be used (see Figure 1).
- Superscripts should not be used.

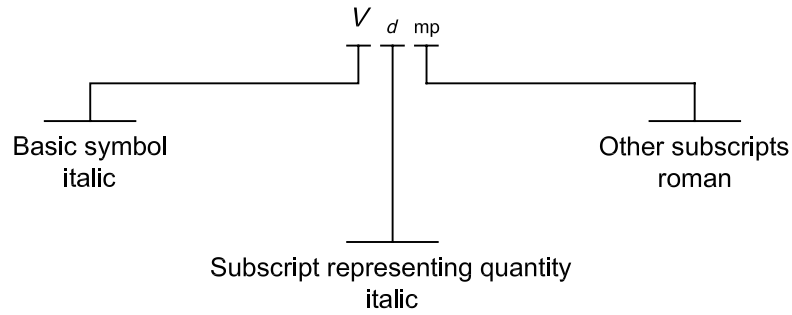


Figure 1 — Principle of symbols

3.2 Symbols

The symbols for quantities are shown by basic symbols, which are single letters from the Latin or Greek alphabet, or basic symbols with subscripts, composed of one or more letters of the Latin alphabet or Arabic numerals. They are not followed by a full stop.

3.3 Basic symbols

Basic symbols represent physical quantities and may sometimes represent different quantities. The typical basic symbols are shown in Table 1.

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3.4 Subscripts

Subscripts appended to a basic symbol modify the basic physical quantity with respect to properties, feature, numbering, etc. The subscripts currently used are shown in Table 2. Subscripts representing physical quantities have the same typography as the basic symbols (e.g. V_{dmp}).

3.5 Style of printing symbols

Basic symbols are printed in italic (sloping) type with serifs. Subscripts representing physical quantities are printed in italic type with serifs. Subscripts representing numbers and other symbols are printed in roman (upright) type, e.g. e (with respect to outer ring), r (radial), d (with respect to bore). All subscript characters should be of the same point size.

EXAMPLE 1 In V_{dmp} (variation of mean bore diameter), subscript “ d ” represents “bore diameter” and is printed in italic type. Subscripts “ m ” representing “mean” and “ p ” representing “in a single plane” are printed in roman type. The subscript characters have the same point size.

EXAMPLE 2 In S_d (perpendicularity of inner ring face with respect to the bore), “ d ” represents “per bore surface” and is printed in roman type.

4 Classification of symbols for quantities

Symbols are classified as follows in Tables 3 to 10.

- Dimensions and features for bearings, rings and washers (Table 3).
- Dimensions and tolerances for bearings, rings and washers (Table 4).
- Running accuracy for bearings, rings and washers (Table 5).
- Dimensions and tolerances for subunits (Table 6).

- Dimensions and tolerances for rolling elements (Table 7).
- Dimensions for shafts and housings (Table 8).
- Bearing loads and load ratings (Table 9).
- Bearing life (Table 10).

5 Definitions of physical quantities

Definitions of physical quantities in this International Standard are in accordance with ISO 5593, ISO 1132-1 and other ISO International Standards concerning rolling bearings.

6 Use of square brackets

When two closely-related quantities in the tables are defined by the same text, apart from a few words, the quantities and their descriptions are grouped in a single entry. The words to be substituted for those which precede them in order to obtain the different meanings are placed in square brackets, i.e. “[]”.

7 Presentation of symbols for physical quantities

The symbols used in the field of rolling bearings are presented in Tables 1 to 10.

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Table 1 — Basic symbols

Property	Basic symbol	Quantity
Dimension	<i>A</i>	width of housing
	<i>B</i>	width
		height of shaft washer
	<i>C</i>	width of outer ring
		height of housing washer
	<i>D</i>	outside diameter
		diameter of outer ring or housing washer except diameter of raceway
		diameter of bearing seat
	<i>d</i>	bore diameter
		diameter of inner ring or shaft washer except diameter of raceway
	<i>E</i>	diameter of raceway for outer ring
	<i>F</i>	diameter of raceway for inner ring
	<i>G</i>	designation of a screw thread
	<i>H</i>	eccentricity
		centre height of housing
	<i>J</i>	centre distance between bolt holes
	<i>L</i>	length of housing or roller
	<i>l</i>	length of screw thread
	<i>N</i>	dimension of bolt hole
<i>r</i>	chamfer dimension	
	(groove) radius	
<i>s</i>	(washer) thickness	
<i>T</i>	(assembled) width	
	height	
Tolerance and running accuracy	<i>K</i>	radial runout
		variation in thickness
	<i>S</i>	axial runout
		variation in thickness
<i>V</i>	variation of dimension	
Δ	deviation from nominal dimension	
Load and life	<i>C</i>	load rating
	<i>F</i>	bearing load
	<i>L</i>	life
	<i>P</i>	equivalent load
	<i>Q</i>	load on rolling element
Others	<i>G</i>	internal clearance
	<i>i</i>	number of rows of rolling elements
	<i>Z</i>	number of rolling elements per row
	α	contact angle or angle of taper

Table 2 — Subscripts (see 3.4)

Property	Subscript	Definition
General	e	effective
	m	arithmetical mean
	max	maximum limit
	min	minimum limit
	p	plane in which measurement is made
	s	single or actual
	0	static (zero)
Direction	a	axial
	r	radial
Part or feature	a	assembled
	a, b, c, . . .	identification symbol when there is more than one diameter applied to closely associated parts (e.g. shaft, housing, spacer, collar)
	c	cage
	D	per outside diameter surface
	d	per bore surface
	e	outer ring or housing washer
	i	inner ring or shaft washer
	w	rolling element
	1, 2, 3	identification number when there is more than one diameter, width or height applied to primarily associated parts (e.g. aligning housing ring, aligning seat washer, locating snap ring, loose rib)
Life	a	adjusted
	h	time, hours
	m	modified
	<i>n</i>	probability of failure [related to (100 – <i>n</i>) % reliability]
	10	90 % reliability (<i>n</i> = 10)
	50	50 % reliability (<i>n</i> = 50)
Others	L	lot or gauge lot

Table 3 — Dimensions and features for bearings, rings and washers

Item No.	Symbol	Quantity	Reference No. ISO 5593
1.01	A	centre height of aligning surface	04.03.15
1.02	a	distance specifying the location of a bearing load centre	—
1.03	B	bearing width	04.03.04
1.04		inner ring width	04.04.05
1.05		shaft washer height	04.04.06
1.06	B_1, B_2, \dots	axial dimension of inner ring [shaft washer]	—
1.07		axial dimension of part primarily associated with an inner ring [shaft washer]	
1.08	b	snap ring groove width	—
1.09	C	outer ring width	04.04.05
1.10		housing washer height	04.04.06
1.11	C_1	outer ring flange width	04.03.09
1.12	C_1, C_2, \dots	axial dimension of outer ring [housing washer]	—
1.13		axial dimension of part primarily associated with an outer ring [housing washer]	
1.14	D	bearing outside diameter	04.03.03
1.15		outside diameter of outer ring [housing washer]	—
1.16		outside diameter of thrust washer	—
1.17	D_1	outside diameter of outer ring flange	—
1.18	D_1, D_2, \dots	outer ring [housing washer] diameter (except raceway diameter)	—
1.19	d	bearing bore diameter	04.03.02
1.20		bore diameter of inner ring [shaft washer]	—
1.21		bore diameter of thrust washer	—
1.22	d_G	nominal diameter of screw thread (external or internal)	—
1.23	d_{G1}, d_{G2}, \dots	diameter of part primarily associated with a screw thread	—
1.24	d_1, d_2, \dots	inner ring [shaft washer] diameter (except raceway diameter)	—
1.25	E_w	outside diameter of ball complement	04.04.14
1.26		outside diameter of roller complement	04.04.15
1.27	e	snap ring section height	—
1.28	F_w	bore diameter of ball complement	04.04.14
1.29		bore diameter of roller complement	04.04.15
1.30	f	snap ring thickness	—
1.31	G	designation of a screw thread ^a	—
1.32	i	number of rows of rolling elements	—
1.33	l_G	length of screw thread	—
1.34	l_{G1}, l_{G2}, \dots	axial dimension associated with a screw thread	—
1.35	r	chamfer dimension	04.03.06
1.36	r_e	groove radius of outer ring [housing washer] raceway	—
1.37	r_i	groove radius of inner ring [shaft washer] raceway	—
1.38	r_1, r_2, \dots	chamfer dimension	—
1.39	s	thickness of thrust washer	—

Table 3 (continued)

Item No.	Symbol	Quantity	Reference No. ISO 5593
1.40	T	(assembled) bearing width	04.03.04
1.41		bearing height	04.03.05
1.42	T_1, T_2, \dots	axial dimension of (assembled) bearing	—
1.43	Z	number of rolling elements per row	—
1.44	α	contact angle	04.02.10
1.45		angle of taper (half the cone angle) of inner ring bore	—

^a The designation of a screw thread comprises the thread form symbol, the nominal diameter and, if it is needed, the thread pitch, e.g. M16 × 1,5.

Table 4 — Dimensions and tolerances for bearings, rings and washers

Item No.	Symbol	Quantity	Reference No.	
			ISO 5593	ISO 1132-1
2.01	B	nominal bearing width	05.02.06	5.3.10
2.02		nominal inner ring width	05.02.01	5.3.1
2.03		nominal shaft washer height	—	—
2.04	B_m	mean inner ring width	05.02.05	5.3.5
2.05		mean shaft washer height	—	—
2.06	B_s	single inner ring width	05.02.02	5.3.2
2.07		single shaft washer height	—	—
2.08	C	nominal bearing width	05.02.06	5.3.10
2.09		nominal outer ring width	05.02.01	5.3.5
2.10		nominal housing washer height	—	—
2.11	C_m	mean outer ring width	05.02.05	5.3.5
2.12		mean housing washer height	—	—
2.13	C_s	single outer ring width	05.02.02	5.3.2
2.14		single housing washer height	—	—
2.15	C_1	nominal outer ring flange width	—	5.3.6
2.16	C_{1s}	single outer ring flange width	—	5.3.7
2.17	D	nominal outside diameter	05.01.01	5.2.1
2.18	D_m	mean outside diameter	05.01.05	5.2.6
2.19	D_{mp}	mean outside diameter in a single plane	05.01.07	5.2.8
2.20	D_s	single outside diameter	05.01.02	5.2.2
2.21	D_{sp}	single outside diameter in a single plane	—	5.2.3
2.22	d	nominal bore diameter	05.01.01	5.1.1
2.23	d_m	mean bore diameter	05.01.05	5.1.6
2.24	d_{mp}	mean bore diameter in a single plane	05.01.07	5.1.8
2.25	d_s	single bore diameter	05.01.02	5.1.2
2.26	d_{sp}	single bore diameter in a single plane	—	5.1.3