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Rolling bearings — Accessories for sleeve type linear ball bearings —

Part 1: Boundary dimensions and tolerances for series 1 and 3

Roulements — Accessoires pour douilles à billes linéaires —

Partie 1: Dimensions d'encombrement et tolérances pour les séries 1 et 3

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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 2.

The main task of technical committees is to prepare International Standards. 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 document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 13012-1 was prepared by Technical Committee ISO/TC 4, *Rolling bearings*, Subcommittee SC 11, *Linear motion rolling bearings*.

This first edition of ISO 13012-1 cancels and replaces ISO 13012:1998, which has been technically revised. It also incorporates the Technical Corrigendum, ISO 13012:1998/Cor.1:1999.

ISO 13012 consists of the following parts, under the general title *Rolling bearings — Accessories for sleeve type linear ball bearings*:

— *Part 1: Boundary dimensions and tolerances for series 1 and 3*

— *Part 2: Boundary dimensions and tolerances for series 5*

Introduction

The use of sleeve type linear ball bearings can be facilitated by the selection of bearing housings, shafts, shaft support blocks, and shaft support rails. These items, referred to as accessories, can aid in the application of the sleeve type linear ball bearings to achieve the desired criteria of smooth, accurate, low friction linear motion free from chatter or stick-slip.

The appropriate selection of bearing housing type, shaft, and shaft support should be established between the manufacturer and the user.

This part of ISO 13012 was developed to be used with ISO 10285.

Rolling bearings — Accessories for sleeve type linear ball bearings —

Part 1: Boundary dimensions and tolerances for series 1 and 3

1 Scope

This part of ISO 13012 specifies the boundary dimensions, other relevant dimensions and their tolerances of accessories for sleeve type linear ball bearings which are specified in ISO 10285.

This part of ISO 13012 applies to:

housings —

- closed and adjustable flangeless housings for series 1 sleeve type linear ball bearings,
- closed and adjustable flanged housings for series 3 sleeve type linear ball bearings,
- open flanged housings for series 3 sleeve type linear ball bearings,
- closed and adjustable flangeless housings for series 3 sleeve type linear ball bearings,
- open and open adjustable flangeless housings for series 3 sleeve type linear ball bearings;

shaft support rails —

- standard height shaft support rails for series 3 sleeve type linear ball bearings,
- low height shaft support rails for series 3 sleeve type linear ball bearings;

shaft support blocks —

- flanged shaft support blocks for series 1 and 3 sleeve type linear ball bearings,
- flangeless shaft support blocks for series 1 and 3 sleeve type linear ball bearings;

shafts —

- solid and tubular shafts for series 1 and 3 sleeve type linear ball bearings.

2 Normative references

The following referenced documents are indispensable for the application 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.

ISO 286-2, *ISO system of limits and fits — Part 2: Tables of standard tolerance grades and limit deviations for holes and shafts*

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

ISO 1302, *Geometrical Product Specifications (GPS) — Indication of surface texture in technical product documentation*

ISO 3754, *Steel — Determination of effective depth of hardening after flame or induction hardening*

ISO 5593, *Rolling bearings — Vocabulary*

ISO 10285:2007, *Rolling bearings — Sleeve type linear ball bearings — Boundary dimensions and tolerances*

ISO 15241, *Rolling bearings — Symbols for quantities*

ISO 24393, *Rolling bearings — Linear motion rolling bearings — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 1132-1, ISO 5593, ISO 10285, ISO 24393 and the following apply.

3.1
flangeless housing
⟨sleeve type linear ball bearing⟩ bearing housing which has a face with bolt holes or threaded holes for attachment to a support surface nominally parallel to the bearing axis

3.2
flanged housing
⟨sleeve type linear ball bearing⟩ bearing housing which has a mounting face with projecting lugs having bolt holes for attachment to a support surface nominally parallel to the bearing axis

3.3
closed housing
⟨sleeve type linear ball bearing⟩ bearing housing in which the bearing seating is circumferentially continuous

3.4
adjustable housing
⟨sleeve type linear ball bearing⟩ bearing housing with a longitudinal slit across its bearing seating which facilitates the mechanical adjustment of the bearing seating diameter

3.5
open housing
⟨sleeve type linear ball bearing⟩ bearing housing with a longitudinal section removed to provide clearance over a shaft and support rail unit

3.6
open adjustable housing
⟨sleeve type linear ball bearing⟩ bearing housing which has the features of both open and adjustable sleeve type linear ball bearing housings

3.7
shaft support rail
longitudinal pedestal which provides continuous support to a shaft

NOTE Shaft support rails may be used with open sleeve type linear ball bearings.

3.8
shaft support block
block which provides support to a shaft

NOTE Shaft support blocks are normally used to support the shaft at its ends and can be used with closed sleeve type, adjustable sleeve type or open sleeve type linear ball bearings.

3.9
shaft
basically cylindrical rod along which a linear ball bearing traverses.

4 Symbols

For the purposes of this document, the symbols given in ISO 15241 and the following apply.

The symbols (except those for tolerances) shown in Figures 1 to 10, and the values given in Tables 1 to 11, denote nominal dimensions unless specified otherwise.

NOTE Figures 1 to 10 are drawn schematically and do not necessarily show all design details.

4.1 Closed and adjustable flangeless housings for series 1 sleeve type linear ball bearings

See Table 1 and Figure 1.

A (overall) width

D_a seating diameter

F_w bore diameter of ball complement of sleeve type linear ball bearing (reference)

G designation of screw thread of attachment hole

H distance from mounting face to centreline of seating diameter

H_1 (overall) height

J centre distance between mounting bolt holes (length)

L length of housing

N diameter of bolt hole

4.2 Closed and adjustable flanged housings for series 3 sleeve type linear ball bearings

See Table 2 and Figure 2.

A (overall) width

A_1 width of seating

D_a seating diameter

F_w bore diameter of ball complement of sleeve type linear ball bearing (reference)

H distance from mounting face to centreline of seating diameter

H_1 height of flange

H_2 (overall) height

J centre distance between bolt holes (length)

J_1 centre distance between bolt holes (width)

L length of housing

N diameter of bolt hole

4.3 Open flanged housings for series 3 sleeve type linear ball bearings

See Table 3 and Figure 3.

A (overall) width

A_1 width of seating

D_a seating diameter

E width of sector opening (at diameter D_a)

F_w bore diameter of ball complement of sleeve type linear ball bearing (reference)

H distance from mounting face to centreline of seating diameter

H_1 height of flange

H_2 (overall) height

J centre distance between bolt holes (length)

J_1 centre distance between bolt holes (width)

L length of housing

N diameter of bolt hole

α angle of sector opening

4.4 Closed and adjustable flangeless housings for series 3 sleeve type linear ball bearings

See Table 4 and Figure 4.

A (overall) width

D_a seating diameter

F_w bore diameter of ball complement of sleeve type linear ball bearing (reference)

G designation of screw thread of attachment hole

H distance from mounting face to centreline of seating diameter

H_1 (overall) height

J centre distance between bolt holes (length)

J_1 centre distance between bolt holes (width)

L length of housing

L_1 distance from side face to centreline of seating diameter

N diameter of bolt hole

4.5 Open and open adjustable flangeless housings for series 3 sleeve type linear ball bearings

See Table 5 and Figure 5.

A (overall) width

D_a seating diameter

E width of sector opening (at diameter D_a)

F_w bore diameter of ball complement of sleeve type linear ball bearing (reference)

G designation of screw thread of attachment hole

H distance from mounting face to centreline of seating diameter

H_1 (overall) height

J centre distance between bolt holes (length)

J_1 centre distance between bolt holes (width)

L length of housing

L_1 distance from side face to centreline of seating diameter

N diameter of bolt hole

α angle of sector opening

4.6 Standard height shaft support rails for series 3 sleeve type linear ball bearings

See Table 6 and Figure 6.

A (overall) width

d outside diameter of shaft (reference)

H distance from mounting face to centreline of shaft

H_1 height of flange

J centre distance between bolt holes (length)

J_1 centre distance between bolt holes (width)

M width of shaft support

N diameter of bolt hole

N_1 diameter of bolt hole (shaft attachment)

4.7 Low height shaft support rails for series 3 sleeve type linear ball bearings

See Table 7 and Figure 7.

A (overall) width

d outside diameter of shaft (reference)

H distance from mounting face to centreline of shaft

H_1 height of flange

H_2 distance from mounting face to top of attachment screw head

J centre distance between bolt holes (length)

J_1 centre distance between bolt holes (width)

M width of shaft support

N diameter of bolt hole

N_1 diameter of bolt hole (shaft attachment)

β angle of shaft support

4.8 Flanged shaft support blocks for series 1 and 3 sleeve type linear ball bearings

See Table 8 and Figure 8.

A (overall) width

D_a seating diameter

H distance from mounting face to centreline of seating diameter

H_1 height of flange

H_2 (overall) height

J centre distance between bolt holes (length)

L length of base

N diameter of bolt hole

4.9 Flangeless shaft support blocks for series 1 and 3 sleeve type linear ball bearings

See Table 9 and Figure 9.

A (overall) width

D_a seating diameter

G designation of screw thread of attachment hole

H distance from mounting face to centreline of seating diameter

H_1 (overall) height

J centre distance between bolt holes

L length of base

N diameter of bolt hole

4.10 Solid and tubular shafts for series 1 and 3 sleeve type linear ball bearings

See Tables 10 and 11, and Figure 10.

d outside diameter of shaft

d_s single outside diameter of shaft

L length of shaft

L_s actual length of shaft

t straightness of shaft

V_{dmp} variation of mean outside diameter of shaft

V_{dsp} variation of outside diameter of shaft in a single plane

Δ_{ds} deviation of a single outside diameter of shaft

Δ_{Ls} deviation of the actual length of shaft

5 Housings

5.1 General

To facilitate the design and assembly of sleeve type linear ball bearings, specifically designed housings are available. Included in this part of ISO 13012 are the boundary dimensions and other related dimensions of sleeve type linear ball bearings series 1 and 3 as specified in ISO 10285:2007.

The housings specified in Tables 1 to 5 and the corresponding sleeve type linear ball bearings should be supplied by the same producer. The reason for this is that the fixation of the bearings in the housings is specified by the producer and is not covered by this part of ISO 13012.

5.2 Housings for series 1 sleeve type linear ball bearings

This part of ISO 13012 includes the following housing design for series 1 sleeve type linear ball bearings:

— closed and adjustable flangeless housings (Table 1).

5.3 Housings for series 3 sleeve type linear ball bearings

This part of ISO 13012 includes the following housing designs for series 3 sleeve type linear ball bearings:

— closed and adjustable flanged housings (Table 2);

— open flanged housings (Table 3);

— closed and adjustable flangeless housings (Table 4);

— open and open adjustable flangeless housings (Table 5).

6 Shaft support rails

This part of ISO 13012 includes the following shaft support rails for sleeve type linear ball bearings:

— standard height shaft support rails for series 3 sleeve type linear ball bearings (Table 6);

— low height shaft support rails for series 3 sleeve type linear ball bearings (Table 7).

7 Shaft support blocks

This part of ISO 13012 includes the following shaft support blocks for sleeve type linear ball bearings:

— flanged shaft support blocks for series 1 and 3 sleeve type linear ball bearings (Table 8);

— flangeless shaft support blocks for series 1 and 3 sleeve type linear ball bearings (Table 9).

8 Shafts

8.1 Material

Shafts covered by this part of ISO 13012 are precision hardened and ground steel shafts in both solid and tubular section. They are manufactured from high quality carbon steel or high quality carbon chrome steel and are either surface hardened or through hardened.

8.2 Heat treatment

8.2.1 Surface hardened shafts

The cylindrical surface of the shafts is heat treated to provide a basically uniform effective depth of hardening and a surface hardness of not less than 653 HV (58 HRC) over the entire operating length. The effective depth of hardening shall be determined in accordance with ISO 3754. This effective depth of hardening is the distance from the outside surface of the shaft to a material layer at which the hardness is approximately 80 % of the specified minimum surface hardness. End faces of shafts may remain unhardened.

8.2.2 Through hardened shafts

The shafts shall be heat treated to give a surface hardness of no less than 653 HV (58 HRC) over the entire operating length.

8.3 Geometrical tolerances

8.3.1 Tolerance classes

The precision hardened and ground solid and tubular shafts are specified in two diameter tolerance classes to match the sleeve type linear ball bearing and housing series.

8.3.2 Geometric form

The geometric form of each tolerance class is controlled by the following features:

a) circularity (roundness): variation of shaft outside diameter in a single plane;

b) cylindricity (taper, concavity, convexity): variation of mean shaft outside diameter;

c) straightness (per metre).

These tolerances for both classes are shown in Table 10. A method for measuring straightness is illustrated in Figure 10 and defined in Table 10.

8.3.3 Shaft length tolerances

These tolerances are given in Table 11.

8.3.4 Chamfers

The shaft ends are provided with chamfers to facilitate entry of the shaft into the sleeve type linear ball bearing. The ends of shafts with machined end faces are usually provided with chamfers that are shallow in the radial direction and long in the axial direction. The length of the chamfer is shown in Table 10. Shafts for use with sealed sleeve type linear ball bearings shall have a chamfer angle less than 30°.

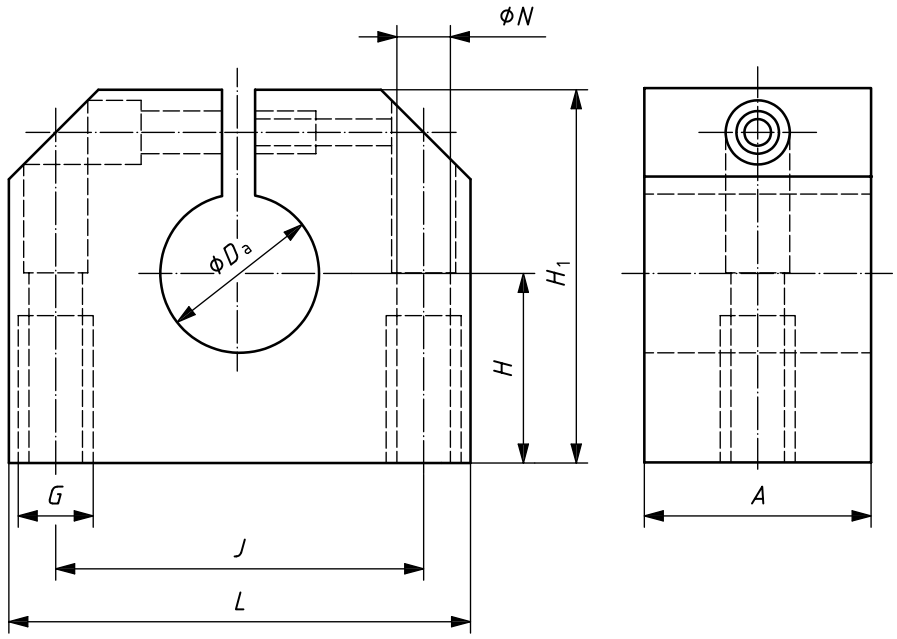
8.3.5 Surface roughness

The roughness of the cylindrical surface of the steel shaft is given in Table 10 in accordance with ISO 1302.

9 Boundary dimensions and tolerances

9.1 Housings

Boundary dimensions and tolerances for housings are given in Tables 1 to 5.



NOTE This figure shows an adjustable type housing.

Figure 1 — Closed and adjustable flangeless housings for series 1 sleeve type linear ball bearings

Table 1 — Closed and adjustable flangeless housings for series 1 sleeve type linear ball bearings

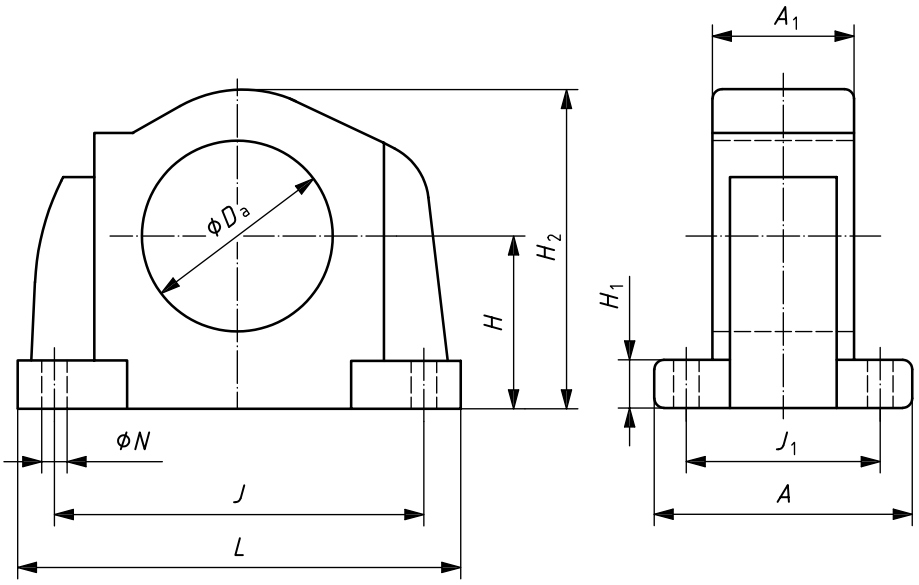
Dimensions in millimetres

F_w Ref.	D_a K7 [a] or H7 [b]	H [c] ± 0,02	H_1 max.	L max.	A max.	J	N	G
3	7	10	18	26	11	16	2,7	M3
4	8	11	20	27	13	17	2,7	M3
5	10	12	22	28	16	18	2,7	M3
6	12	14	26	32	20	22	3,4	M4
8	15	15	29	35	25	25	3,4	M4
10	17	16	32	39	27	27	4,3	M5
12	19	17	34	41	29	29	4,3	M5
14	21	18	39	46	29	34	4,3	M5
16	24	19	39	46	31	34	4,3	M5
20	28	23	46	54	31	40	5,3	M6
25	35	27	55	63	41	48	6,6	M8
30	40	30	61	68	51	53	6,6	M8
40	52	39	77	88	61	69	8,4	M10
50	62	47	93	104	71	82	10,5	M12
60	75	57	113	122	86	100	10,5	M12

[a] Seating diameter tolerance for aluminium housings for closed type bearings (see ISO 286-2).

[b] Seating diameter tolerance for steel or aluminium housings for adjustable type bearings and for steel housings for closed type bearings (see ISO 286-2).

[c] The dimension H shall be measured with the nominal seating bore diameter. For adjustable type housings, the tolerance for D_a shall apply before the housing is split.



NOTE This figure shows a closed type housing.

Figure 2 — Closed and adjustable flanged housings for series 3 sleeve type linear ball bearings

Table 2 — Closed and adjustable flanged housings for series 3 sleeve type linear ball bearings

Dimensions in millimetres

F_w	D_a	H [b]	H_1	H_2	L	A	A_1		J	J_1	N
Ref.	H7 [a]	± 0,02	max.	max.	max.	max.	max.	min.			
5	12	11	4	22	33	25	12,1	11,7	24	16	3,4
6	13	12	5	24	34	26	12,1	11,7	25	18	3,4
8	16	15	6	29	46	29	14,1	13,7	25	20	3,4
10	19	17	6	30	50	30	20,1	19,7	34	21	4,5
12	22	18	7	36	54	33	20,1	19,7	32	23	4,5
16	26	22	8	43	58	36	22,1	21,7	40	26	4,5
20	32	25	9	51	72	43	28,1	27,7	45	32	4,5
25	40	30	10	62	82	56	40,1	39,6	60	40	5,5
30	47	35	11	72	90	62	48,1	47,5	68	45	6,6
35	52	40	12	80	96	68	45,1	44,5	76	50	6,6
40	62	45	13	92	110	80	56,1	55,5	86	58	9
50	75	50	15	107	137	72	72,1	71,5	108	50	9
60	90	60	18	131	162	94	95,1	94,5	132	65	11
80	120	80	23	176	207	124	125,1	124,5	170	90	13,5
100	150	100	30	210	250	135	135,1	134,5	210	100	17,5

[a] Seating diameter tolerance (see ISO 286-2).

[b] The dimension H shall be measured with the nominal seating bore diameter. For adjustable type housings, the tolerance for D_a shall apply before the housing is split.

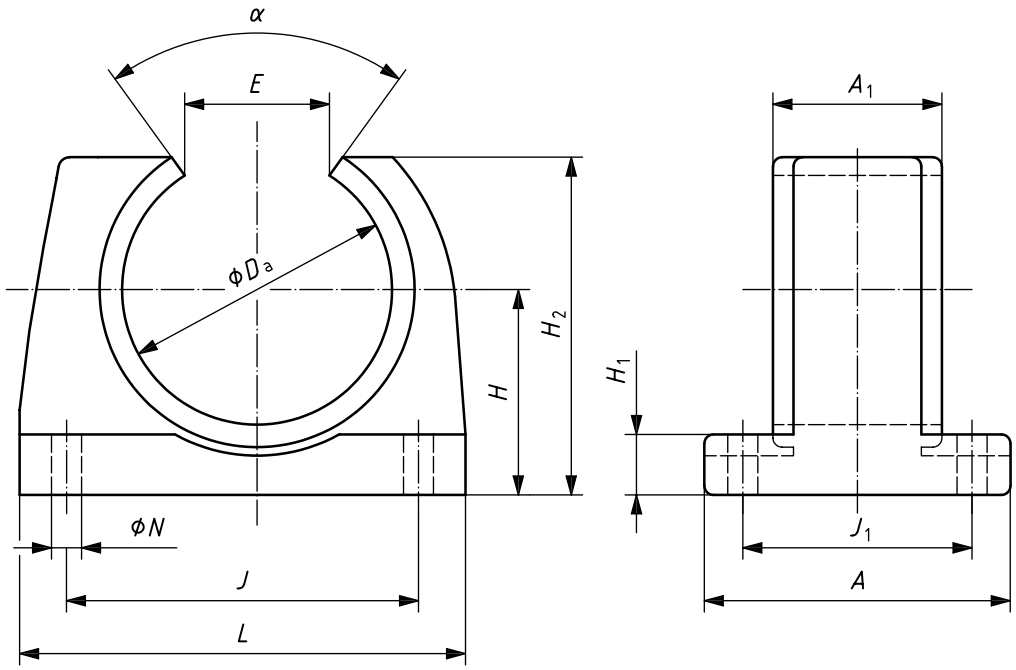


Figure 3 — Open flanged housings for series 3 sleeve type linear ball bearings

Table 3 — Open flanged housings for series 3 sleeve type linear ball bearings

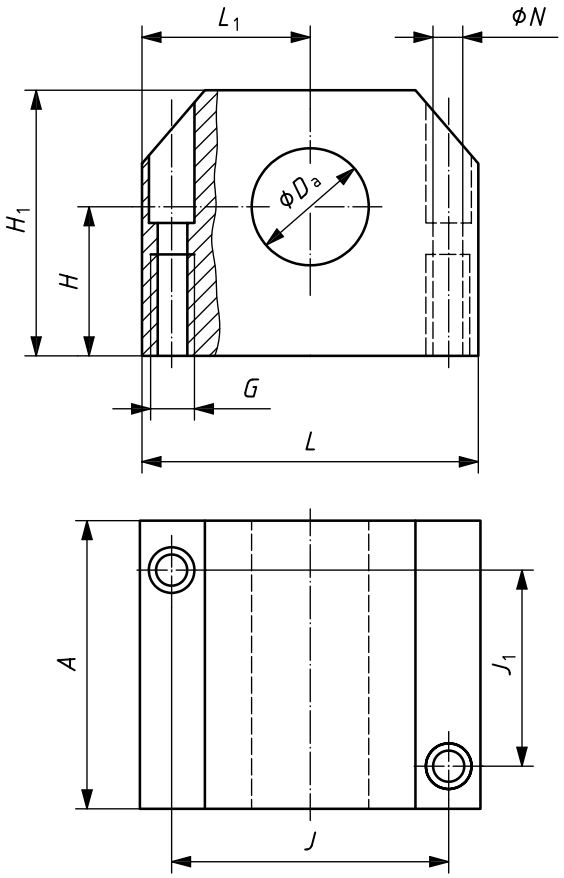
Dimensions in millimetres and angles in degrees

F_w Ref.	D_a [a] JS7 [b]	H [c] ± 0,02	H_1 max.	H_2 max.	L max.	A max.	A_1 max.	A_1 min.	J	J_1	N	α min.	E min.
10	19	17	6	27	50	30	20,1	19,7	32	21	4,5	65	11
12	22	18	7	29	54	33	20,1	19,7	32	23	4,5	65	12
16	26	22	8	36	58	36	22,1	21,7	40	26	4,5	50	13,5
20	32	25	9	43	72	43	28,1	27,7	45	32	4,5	50	14,5
25	40	30	10	52,5	82	56	40,1	39,6	60	40	5,5	50	17,5
30	47	35	11	61,5	90	62	48,1	47,5	68	45	6,6	50	20
35	52	40	12	69	96	68	45,1	44,5	76	50	6,6	50	22
40	62	45	13	78,5	110	80	56,1	55,5	86	58	9	50	26
50	75	50	15	89,5	137	72	72,1	71,5	108	50	9	50	32
60	90	60	18	106,5	162	94	95,1	94,5	132	65	11	50	39
80	120	80	23	141,5	207	124	125,1	124,5	170	90	13,5	50	53
100	150	100	30	177	250	135	135,1	134,5	210	100	17,5	50	66

[a] Diameter D_a can only be measured when the housing is fastened to a plane surface.

[b] Seating diameter tolerance (see ISO 286-2).

[c] The dimension H shall be measured with the nominal seating bore diameter.



NOTE 1 Alternatively, there can be four attachment holes.

NOTE 2 This figure shows a closed type housing.

Figure 4 — Closed and adjustable flangeless housings for series 3 sleeve type linear ball bearings

Table 4 — Closed and adjustable flangeless housings for series 3 sleeve type linear ball bearings

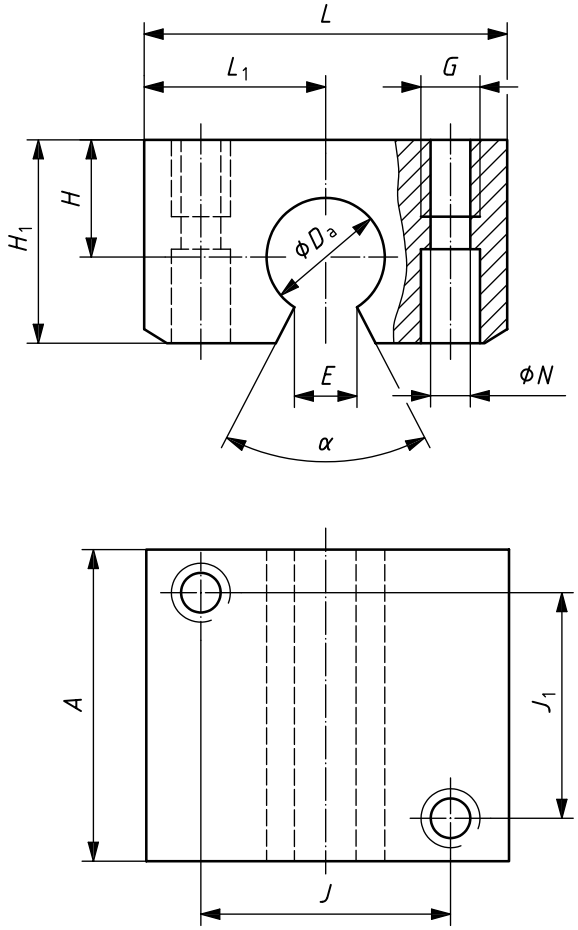
Dimensions in millimetres

F_w Ref.	D_a [a] H7 [b]	H [c] ± 0,02	H_1 max.	L max.	L_1 ± 0,02	A max.	J	J_1	N	G
10	19	16	32	40	20	37	29	20	4,3	M5
12	22	18	36	43	21,5	40	32	23	4,3	M5
16	26	22	43	53	26,5	44	40	26	5,3	M6
20	32	25	51	60	30	56	45	32	6,6	M8
25	40	30	62	78	39	69	60	40	8,4	M10
30	47	35	72	87	43,5	81	68	45	8,4	M10
40	62	45	92	108	54	93	86	58	10,5	M12
50	75	50	107	132	66	115	108	50	13,5	M16

[a] For adjustable type housings, D_a can only be measured when the housing is fastened to a plane surface.

[b] Seating diameter tolerance (see ISO 286-2).

[c] The dimension H shall be measured with the nominal seating bore diameter. For adjustable type housings the tolerance for D_a shall apply before the housing is split.



NOTE 1 Alternatively, there can be four attachment holes.

NOTE 2 This figure shows an open type housing.

Figure 5 — Open and open adjustable flangeless housings for series 3 sleeve type linear ball bearings

Table 5 — Open and open adjustable flangeless housings for series 3 sleeve type linear ball bearings

Dimensions in millimetres and angles in degrees

F_w Ref.	D_a [a] JS7 [b]	H [c] ± 0,02	H_1 max.	L max.	L_1 ± 0,02	A max.	J	J_1	N	G	α min.	E min.
12	22	18	29	43	21,5	40	32	23	4,3	M5	65	12
16	26	22	36	53	26,5	44	40	26	5,3	M6	50	13,5
20	32	25	43	60	30	56	45	32	6,6	M8	50	14,5
25	40	30	52,5	78	39	69	60	40	8,4	M10	50	17,5
30	47	35	61,5	87	43,5	81	68	45	8,4	M10	50	20
40	62	45	78,5	108	54	93	86	58	10,5	M12	50	26
50	75	50	89,5	132	66	115	108	50	13,5	M16	50	32

[a] Diameter D_a can only be measured when the housing is fastened to a plane surface.

[b] Seating diameter tolerance (see ISO 286-2).

[c] The dimension H shall be measured with the nominal seating bore diameter.

9.2 Shaft support rails

Boundary dimensions are given in Tables 6 and 7.

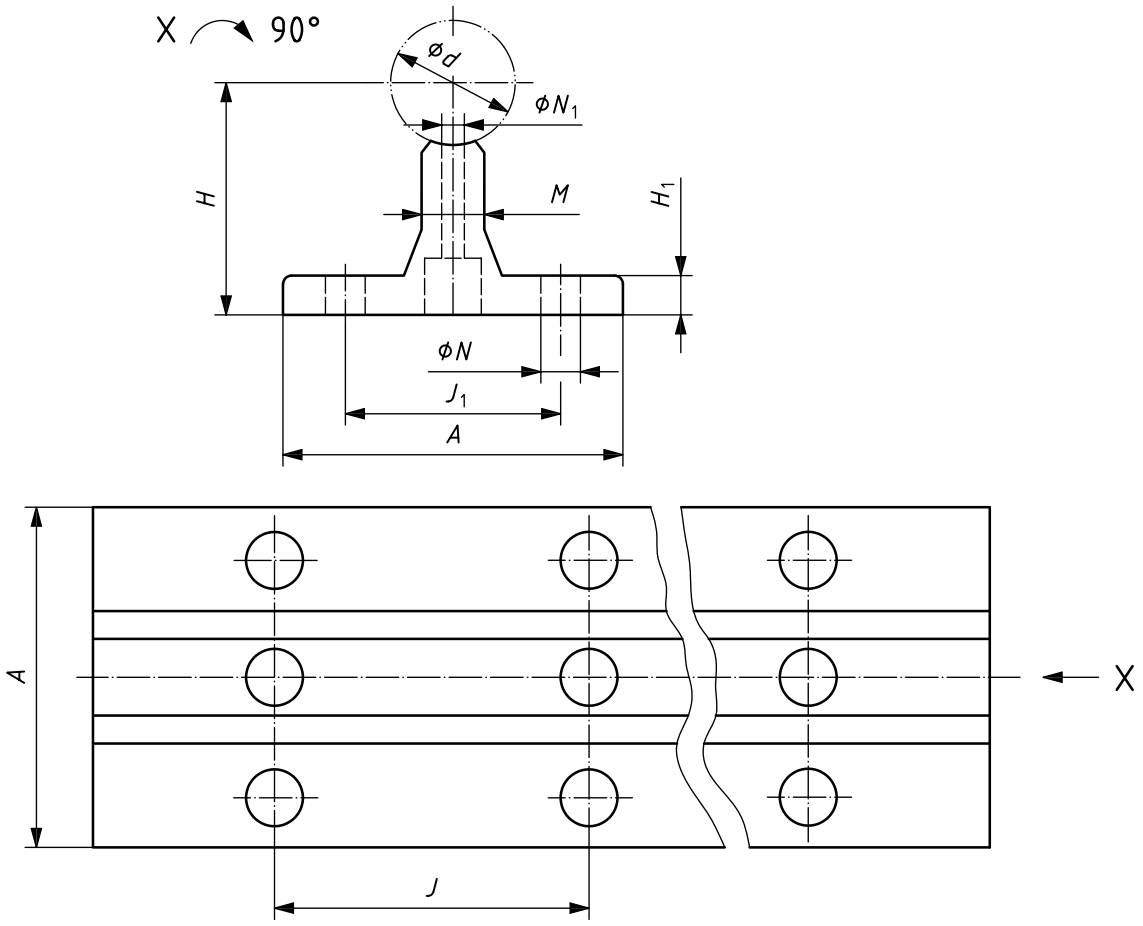


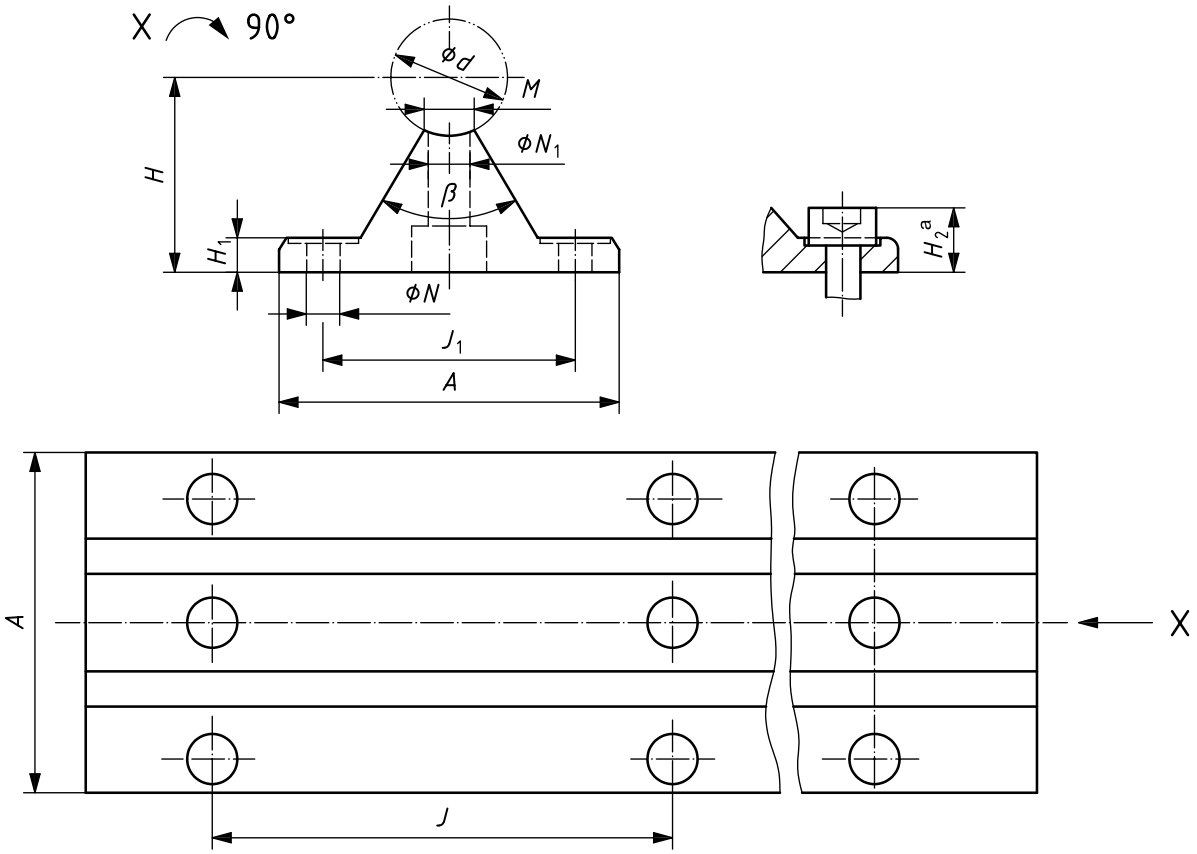
Figure 6 — Standard height shaft support rails for series 3 sleeve type linear ball bearings

Table 6 — Standard height shaft support rails for series 3 sleeve type linear ball bearings

Dimensions in millimetres

d Ref.	H [a] ± 0,02	J_1	J	N	N_1	A	H_1	M
10	25	27	75	3,4	4,5	40	5	8
12	28	29	75	4,5	4,5	43	5	9
16	30	33	100	5,5	5,5	48	5	10
20	38	37	100	6,6	6,6	56	6	11
25	42	42	120	6,6	9	60	6	14
30	53	51	150	9	11	74	8	14
35	55	53	200	9	11	76	8	16
40	60	55	200	9	11	78	8	18
50	75	63	200	11	13,5	90	10	22
60	80	72	300	11	15,5	100	12	30
80	100	92	300	13,5	17,5	125	14	42
100	120	112	300	17,5	22	160	16	55

[a] The dimension H shall be measured with the nominal shaft diameter under mounting condition.



[a] As an option, use shallow head hexagonal socket head cap screws or counterbore the flange to comply with H_2 max.

Figure 7 — Low height shaft support rails for series 3 sleeve type linear ball bearings

Table 7 — Low height shaft support rails for series 3 sleeve type linear ball bearings

Dimensions in millimetres and angles in degrees

d Ref.	H [a] ± 0,02	A max.	H_1 ± 0,5	H_2 max.	J_1	J	M max.	N	N_1	β max.
10	20	35	4	8	25	75	4,7	4,5	4,5	50
12	22	40	5	10	29	75	5,8	4,5	4,5	50
16	26	45	5	11	33	100	7	5,5	5,5	50
20	32	52	6	13	37	100	8,3	6,6	6,6	50
25	36	57	6	13	42	120	10,8	6,6	9	50
30	42	69	7	15	51	150	11	9	11	50
35	46	69	8	16	51	200	13	9	11	50
40	50	73	8	16	55	200	15	9	11	50
50	60	84	9	20	63	200	19	11	13,5	46
60	68	94	10	21	72	300	25	11	15,5	46
80	86	116	12	24	92	300	34	13,5	17,5	46
100	110	146	15	31	126	300	45	17,5	22	46

[a] The dimension H shall be measured with the nominal shaft diameter under mounting condition.

9.3 Shaft support blocks

Boundary dimensions are given in Tables 8 and 9.

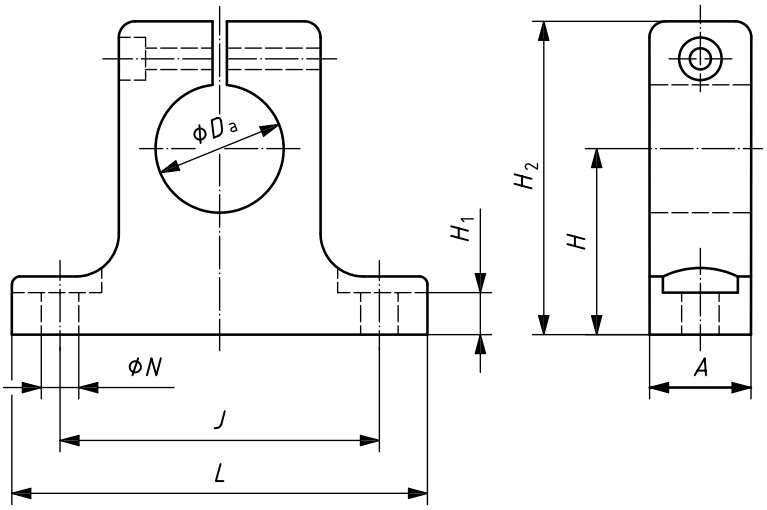


Figure 8 — Flanged shaft support blocks for series 1 and 3 sleeve type linear ball bearings

Table 8 — Flanged shaft support blocks for series 1 and 3 sleeve type linear ball bearings

Dimensions in millimetres

D_a H8 [a]	H [b] ± 0,02	A max.	J	N	L max.	H_1 max.	H_2 max.
5	13	9	20	3,4	32	5	24
6	14	11	23	4,5	32	5,5	27,5
8	15	11	25	4,5	46	5,5	28
10	17	11	28	4,5	50	5,5	30,5
12	20	13	32	5,5	54	5,5	36
14	22	15	36	5,5	56	6	39
16	25	17	40	5,5	58	6,5	43
20	30	21	45	5,5	72	8	51
25	35	29	60	6,6	82	9	61
30	40	31	68	9	90	10	71
35	45	32	74	9	100	12	82
40	50	37	86	11	110	12	91
50	60	50	108	11	137	14	106
60	75	63	132	13,5	162	15	131
80	100	86	170	17,5	207	22	176
100	125	80	200	22	250	30	200

[a] Seating diameter tolerance (see ISO 286-2). The tolerance shall apply before the support block is split.

[b] The dimension H shall be measured with the nominal seating bore diameter.

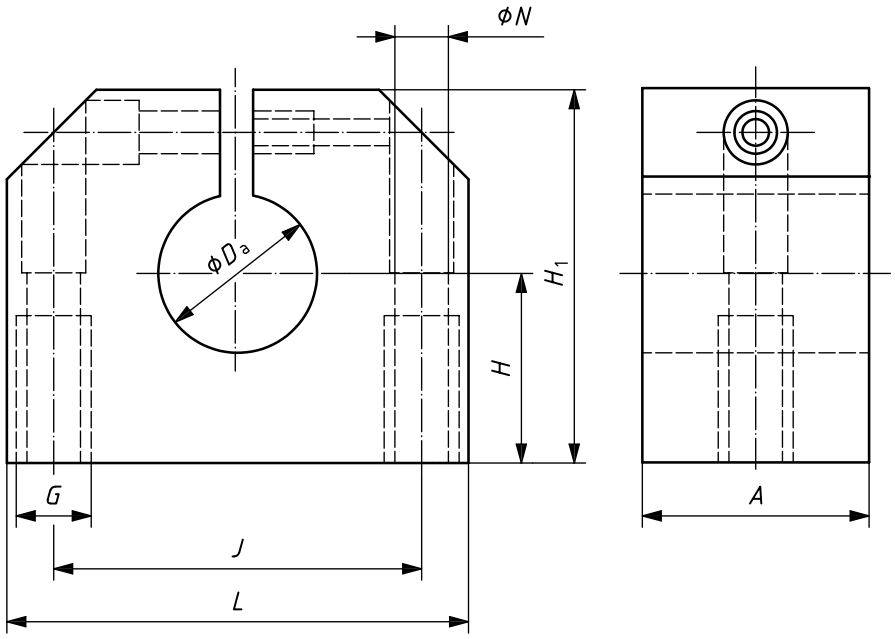


Figure 9 — Flangeless shaft support blocks for series 1 and 3 sleeve type linear ball bearings

Table 9 — Flangeless shaft support blocks for series 1 and 3 sleeve type linear ball bearings

Dimensions in millimetres

D_a H8[a]	L max.	A max.	H [b] ± 0,02	H_1 max.	J	N	G
10	40	21	18	32	27	5,3	M6
12	43	21	20	36	30	5,3	M6
16	53	25	25	43	38	6,6	M8
20	60	31	30	52	42	8,4	M10
25	78	39	35	62	56	10,5	M12
30	87	41	40	71	64	10,5	M12
40	108	49	50	90	82	13,5	M16
50	132	59	60	106	100	17,5	M20

[a] Seating bore diameter tolerance (see ISO 286-2). The tolerance shall apply before the support block is split.

[b] The dimension H shall be measured with the nominal seating bore diameter.

9.4 Shafts

Boundary dimensions and tolerances are given in Tables 10 and 11.

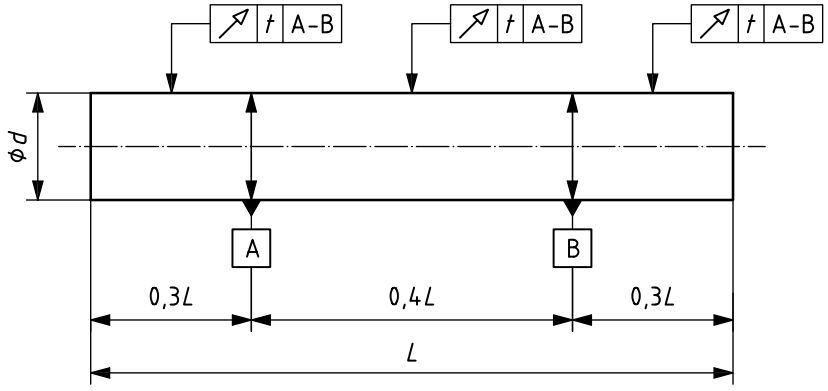


Figure 10 — Solid and tubular shafts for series 1 and 3 sleeve type linear ball bearings

Table 10 — Solid and tubular shafts for series 1 and 3 sleeve type linear ball bearings

d	Δ_{ds}				V_{dsp}		V_{dmp}		t	Surface roughness Ra	Effective depth of hardening [b]	Length of chamfer
	Class h6		Class h7		Class h6	Class h7	Class h6	Class h7	Straightness [a]			
mm	μm	μm	μm	μm	μm	μm	μm	μm	μm/m	μm	mm	mm
	high	low	high	low	max.	max.	max.	max.	max.	max.	min.	min.
3	0	−6	0	−10	3	4	4	6	150	0,32	0,4	0,8
4	0	−8	0	−12	4	5	5	8	150	0,32	0,4	0,8
5	0	−8	0	−12	4	5	5	8	150	0,32	0,4	1
6	0	−8	0	−12	4	5	5	8	150	0,32	0,4	1
8	0	−9	0	−15	4	6	6	9	120	0,32	0,4	1
10	0	−9	0	−15	4	6	6	9	120	0,32	0,4	1
12	0	−11	0	−18	5	8	8	11	100	0,32	0,6	1,5
14	0	−11	0	−18	5	8	8	11	120	0,32	0,6	1,5
16	0	−11	0	−18	5	8	8	11	100	0,32	0,6	1,5
20	0	−13	0	−21	6	9	9	13	100	0,32	0,9	1,5
25	0	−13	0	−21	6	9	9	13	100	0,32	0,9	1,5
30	0	−13	0	−21	6	9	9	13	100	0,32	0,9	1,5
35	0	−16	0	−25	7	11	11	16	100	0,32	1,5	2,5
40	0	−16	0	−25	7	11	11	16	100	0,32	1,5	2,5
50	0	−16	0	−25	7	11	11	16	100	0,32	1,5	2,5
60	0	−19	0	−30	8	13	13	19	100	0,32	2,2	2,5
80	0	−19	0	−30	8	13	13	19	100	0,32	2,2	2,5
100	0	−22	0	−35	10	15	15	22	100	0,32	3,2	3,5

NOTE These shafts are only suitable for use in combination with sleeve type linear ball bearings of series 1 and 3 as specified in ISO 10285:2007.

[a] Straightness specifications measured as in Figure 10. Measurements are taken at points equidistant between support points and overhanging ends of the shaft. A shaft, when supported as shown and rotated through 360° shall not cause a total indicator reading (TIR) in excess of the straightness tolerance stated above. The TIR values given by this measurement method are double the real shaft straightness tolerance values.

[b] For surface hardened shafts.

Table 11 — Shaft length tolerances for series 1 and 3

Dimensions and tolerance values in millimetres

L		Δ_{Ls}	
>	⩽	high	low
30	120	+0,3	−0,3
120	400	+0,5	−0,5
400	1 000	+0,8	−0,8
1 000	2 000	+1,2	−1,2
2 000	4 000	+2	−2
4 000	8 000	+3	−3

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