INTERNATIONAL STANDARD

ISO 13012

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1998-04-01

Rolling bearings, linear motion, recirculating ball, sleeve type — Accessories

Roulements à mouvement linéaire à recirculation de billes, douilles à billes — Accessoires

Reference number
ISO 13012:1998(E)

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.

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.

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

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Introduction

The use of linear motion rolling 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 linear motion rolling 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.

Rolling bearings, linear motion, recirculating ball, sleeve type — Accessories

1 Scope

This International Standard gives the boundary dimensions and other relevant dimensions of accessories for rolling bearings, linear motion, recirculating ball, sleeve type - metric series. The essential dimensions for housings, shaft support rails and shaft support blocks are given and generally without tolerance. This standard was developed to be used with International Standard ISO 10285.

This standard includes the following accessories:

Housings:

flangeless, closed and adjustable types for series 1
flanged, closed and adjustable types for series 3
flanged, open type for series 3
flangeless, closed and adjustable types for series 3
flangeless, open and open adjustable types for series 3

Shaft support rails
Shaft support rails, low height type
Shaft support blocks, flanged type
Shaft support blocks, flangeless type
Shafts, Solid and tubular for linear motion rolling bearings

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 286-2:1988, *ISO system of limits and fits — Part 2: Tables of standard tolerance grades and limit deviations for holes and shafts*.

ISO 468:1982, *Surface roughness — Parameters, their values and general rules for specifying requirements*.

ISO 3754:1976, *Steel — Determination of effective depth of hardening after flame or induction hardening.*

ISO 10285:1992, *Rolling bearings, linear motion, recirculating ball, sleeve type — Metric series.*

3 Symbols

The symbols (except those for tolerances) shown in the figures and the values given in the tables denote nominal dimensions unless specified otherwise.

3.1 Housings, flangeless, closed and adjustable types for series 1 linear motion rolling bearings

See table 1

A	housing width
D_a	seating diameter
F_w	ball complement bore diameter (reference)
H	distance from mounting face to centreline of seating diameter
H_1	height (overall)
J	bolt hole centre distance
L	housing length
N	bolt hole diameter
N_1	threaded attachment hole

3.2 Housings, flanged, closed and adjustable types for series 3 linear motion rolling bearings

See table 2

A	base width
A_1	seating width
D_a	seating diameter
F_w	ball complement bore diameter (reference)
H	distance from mounting face to centreline of seating diameter
H_1	feet height
H_2	height (overall)
J	bolt hole centre distance (length)
J_1	bolt hole centre distance (width)
L	base length
N	bolt hole diameter

3.3 Housings, flanged, open type for series 3 linear motion rolling bearings

See table 3

A	housing width
A_1	seating width
D_a	seating diameter
F_w	ball complement bore diameter (reference)
G	width of sector opening (at diameter D_a)
H	distance from mounting face to centreline of seating diameter

H_1 feet height
H_2 height (overall)
J bolt hole centre distance (length)
J_1 bolt hole centre distance (width)
N bolt hole diameter
L base length
α angle of sector opening

3.4 Housings, flangeless, closed and adjustable types for series 3 linear motion rolling bearings

See table 4

A housing width
D_a seating diameter
F_w ball complement bore diameter (reference)
H distance from mounting face to centreline of seating diameter
H_1 height (overall)
J bolt hole centre distance (length)
J_1 bolt hole centre distance (width)
L housing length
L_1 distance from side face to centreline of seating diameter
N bolt hole diameter
N_1 threaded attachment hole

3.5 Housing, flangeless, open and open adjustable types for series 3 linear motion rolling bearings

See table 5

A housing width
D_a seating diameter
F_w ball complement bore diameter (reference)
G width of sector opening (at diameter D_a)
H distance from mounting face to centreline of seating diameter
H_1 height (overall)
J bolt hole centre distance (length)
J_1 bolt hole centre distance (width)
N bolt hole diameter
N_1 threaded attachment hole
L housing length
L_1 distance from side face to centreline of seating diameter
α angle of sector opening

3.6 Shaft support rails for linear motion rolling bearings

See table 6

A base width
d shaft diameter (reference)
H distance from mounting face to centreline of shaft
H_1 flange height
J bolt hole centre distance (length)
J_1 bolt hole centre distance (width)

M shaft support width
N bolt hole diameter
N_1 bolt hole diameter (shaft attachment)

3.7 Shaft support rails, low height type for linear motion rolling bearings

See table 7

A base width
d shaft diameter (reference)
H distance from mounting face to centreline of shaft
H_1 flange height
H_2 distance from mounting face to top of attachment screw head
J bolt hole centre distance (length)
J_1 bolt hole centre distance (width)
M shaft support width
N bolt hole diameter
β shaft support angle

3.8 Shaft support blocks, flanged type

See table 8

A base width
D_a seating diameter
H distance from mounting face to centreline of seating diameter
H_1 feet height
H_2 height (overall)
J bolt hole centre distance (length)
L base length
N bolt hole diameter

3.9 Shaft support blocks, flangeless type

See table 9

A base width
D_a seating diameter
H distance from mounting face to centreline of seating diameter
H_1 height (overall)
J bolt hole centre distance
L base length
N bolt hole diameter
N_1 threaded attachment hole

3.10 Shafts, solid and tubular for linear motion rolling bearings

See table 10

d shaft outside diameter
d_s single shaft outside diameter
L shaft length
L_s actual shaft length
V_{dp} variation of shaft outside diameter in a single radial plane
V_{dmp} variation of mean shaft outside diameter

Δ_{ds} deviation of a single shaft outside diameter

ΔL_s deviation of the actual shaft length

4 Housings

To facilitate the design and assembly of linear motion systems, specifically designed housings are available. Included in this International Standard are the boundary dimensions and other related dimensions of closed and adjustable housings for linear motion rolling bearings series 1, and closed, adjustable, open and open adjustable housings for linear motion rolling bearings, series 3, as specified in ISO 10285.

The housings specified in tables 1 to 5, and the respective linear motion rolling bearings should be supplied by the same producer as the fixation of the bearings in the housings will be specified by the producer and is not covered by this International Standard.

4.1 Housings, closed and adjustable types for series 1 linear motion rolling bearings

This International Standard includes the following housing design for series 1 linear motion rolling bearings:

— flangeless, closed and adjustable types (table 1)

4.2 Housings, closed, adjustable, open and open adjustable types for series 3 linear motion rolling bearings

This International Standard includes the following housing designs for series 3 linear motion rolling bearings:

— flanged, closed and adjustable types (table 2)
— flanged, open type (table 3)
— flangeless, closed and adjustable types (table 4)
— flangeless, open and open adjustable types (table 5).

5 Shaft support rails

Shaft support rails are used to support the shaft on which the open type linear motion rolling bearing traverses. This International Standard includes the following shaft support rails for linear motion rolling bearings.

— shaft support rails (table 6)
— shaft support rails, low height type (table 7).

6 Shaft support blocks

Shaft support blocks are used to support the shaft (usually at the ends) on which the closed and adjustable type linear motion rolling bearing traverses. This International Standard gives the essential dimensions of two commonly used types, shaft support blocks, flanged type shaft support blocks (table 8) and flangeless type (table 9).

7 Shafts

7.1 Material

Shafts covered by this International Standard 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 case hardened or through hardened.

7.2 Heat treatment

7.2.1 Case 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.

7.2.2. Through hardened shafts

The shafts are heat-treated to give a surface hardness of not less than 653 HV (58 HRC) over the entire operating length.

7.3 Geometrical tolerances

7.3.1 Tolerance classes

The precision hardened and ground solid and tubular shafts are available in two diameter tolerance classes: h6 and h7.

7.3.2 Geometric form

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

Circularity (roundness): variation of shaft outside diameter in a single plane.
Cylindricity (taper, concavity, convexity): variation of mean shaft outside diameter.
Straightness (per metre).

These tolerances for classes h6 and h7 are shown in table 10. A method for measuring straightness is illustrated and defined in this table.

7.3.3 Shaft length tolerance

These tolerances are given in table 11.

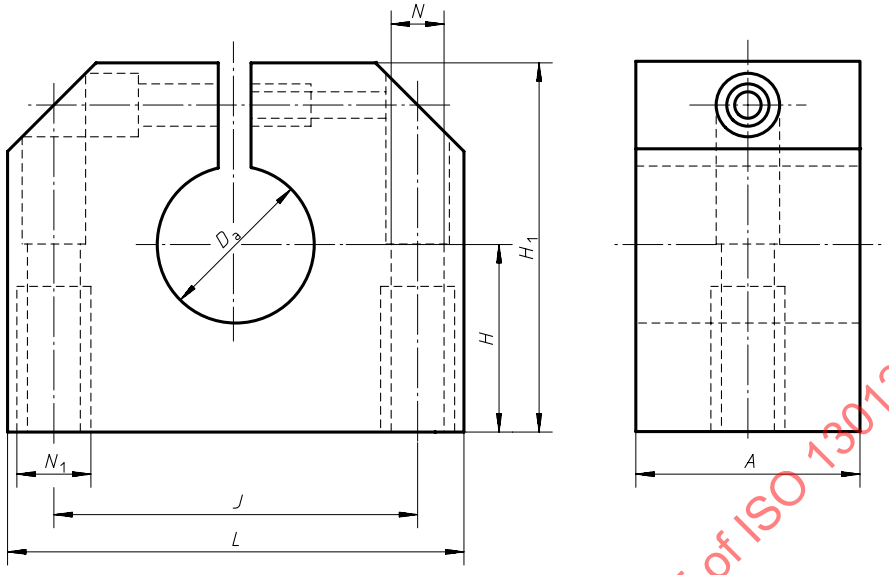
7.3.4 Chamfers

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

7.3.5 Surface roughness

The roughness of the cylindrical surface of the steel shaft should be 0,32 µm R_a maximum, in accordance with ISO 468. See table 10.

Table 1 — Housings, flangeless, closed and adjustable types for series 1 linear motion rolling bearings



Dimensions in millimetres

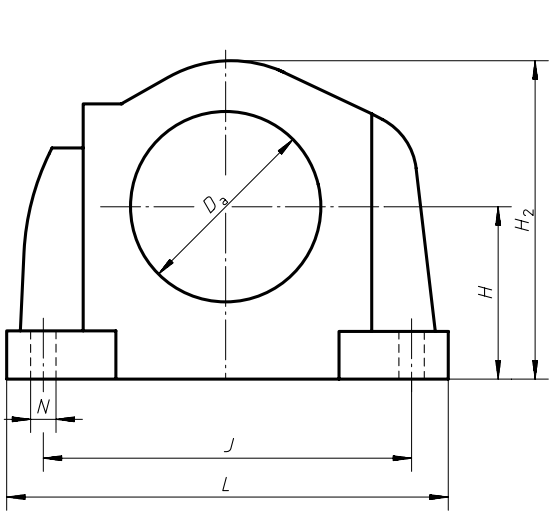
F_w Ref.	D_a K7[1] or H7[2]	H ± 0,02	H_1 max.	L max.	A max.	J	N	N_1
3	7	10	18	26	11	16	2,7	M3
4	8	11	20	27	13	17	2,7	M3
5	10	12	22	28	16	18	2,7	M3
6	12	14	26	32	20	22	3,4	M4
8	15	15	29	35	25	25	3,4	M4
10	17	16	32	39	27	27	4,3	M5
12	19	17	34	41	29	29	4,3	M5
16	24	19	39	46	31	34	4,3	M5
20	28	23	46	54	31	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

1) Seating diameter tolerance for aluminium housings for closed type bearings (see ISO286-2).

2) Seating diameter tolerance for steel or aluminium for closed adjustable type bearings and for steel housings for closed type bearings (see ISO286-2).

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.

Table 2 — Housings, flanged, closed and adjustable types for series 3 linear motion rolling bearings



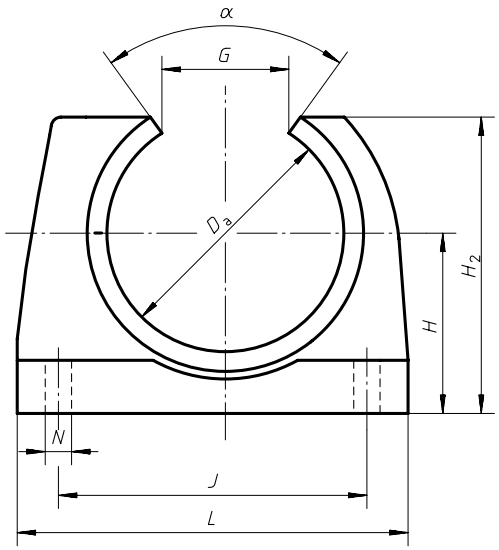
Dimensions in millimetres

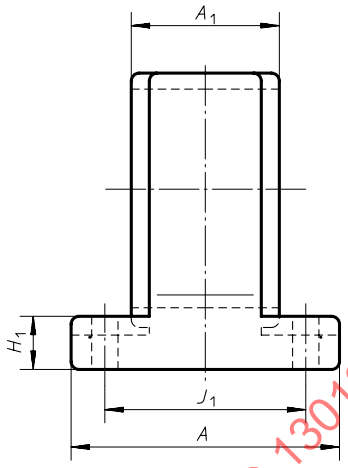
F_w Ref.	D_a H7[1)]	H ± 0,02	H_1 max.	H_2 max.	L max.	A max.	A_1 max.	A_1 min.	J	J_1	N
5	12	11	4	22	33	25	12,1	11,7	24	16	3,4
6	13	12	5	24	34	26	12,1	11,7	25	18	3,4
8	16	15	6	29	46	29	14,1	13,7	25	20	3,4
10	19	17	6	30	50	30	20,1	19,7	34	21	4,5
12	22	18	7	36	54	33	20,1	19,7	32	23	4,5
16	26	22	8	43	58	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

1) Seating diameter tolerance (see ISO286-2)

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.

Table 3 — Housings, flanged, open type for series 3 linear motion rolling bearings





Dimensions in millimetres, angles in degrees

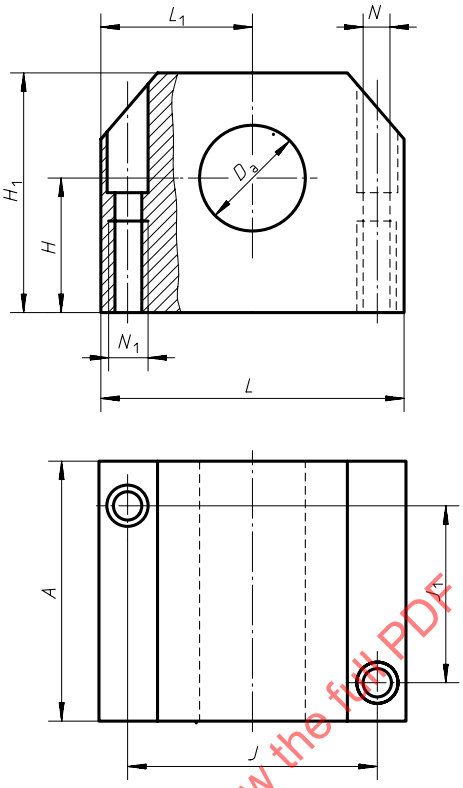
F_w	D_a [1]	H	H_1	H_2	L	A	A_1		J	J_1	N	α	G
Ref.	JS7[2]	± 0,02	max	max.	max.	max.	max.	min.				min.	min.
10	19	17	6	27	50	30	20,1	19,7	32	21	4,5	65	11
12	22	18	7	29	54	33	20,1	19,7	32	23	4,5	65	12
16	26	22	8	36	58	36	22,1	21,7	40	26	4,5	50	13,5
20	32	25	9	43	72	43	28,1	27,7	45	32	4,5	50	14,5
25	40	30	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

1) Diameter D_a can only be measured when housing is fastened to a plane surface.

2) Seating diameter tolerance (see ISO286-2).

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

Table 4 — Housings, flangeless, closed and adjustable types for series 3 linear motion rolling bearings



NOTE — Alternatively four attachment holes

Dimensions in millimetres

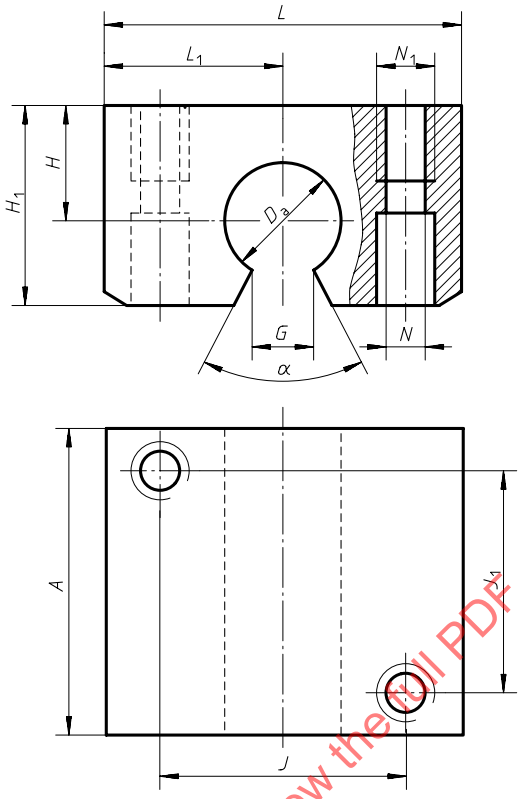
F_w Ref.	D_a [1] H7 [2]	H ± 0,02	H_1 max.	L max.	L_1 ± 0,02	A max.	J	J_1	N	N_1
10	19	16	32	40	20	37	29	20	4,3	M5
12	22	18	36	43	21,5	40	32	23	4,3	M5
16	26	22	43	53	26,5	44	40	26	5,3	M6
20	32	25	51	60	30	56	45	32	6,6	M8
25	40	30	62	78	39	69	60	40	8,4	M10
30	47	35	72	87	43,5	81	68	45	8,4	M10
40	62	45	92	108	54	93	86	58	10,5	M12
50	75	50	107	132	66	115	108	50	13,5	M16

1) For adjustable type housings, D_a can only be measured when housing is fastened to a plane surface.

2) Seating diameter tolerance (see ISO286-2).

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.

Table 5 — Housings, flangeless, open and open adjustable types for series 3 linear motion rolling bearings



NOTE — Alternatively four attachment holes

Dimensions in millimetres, angles in degrees

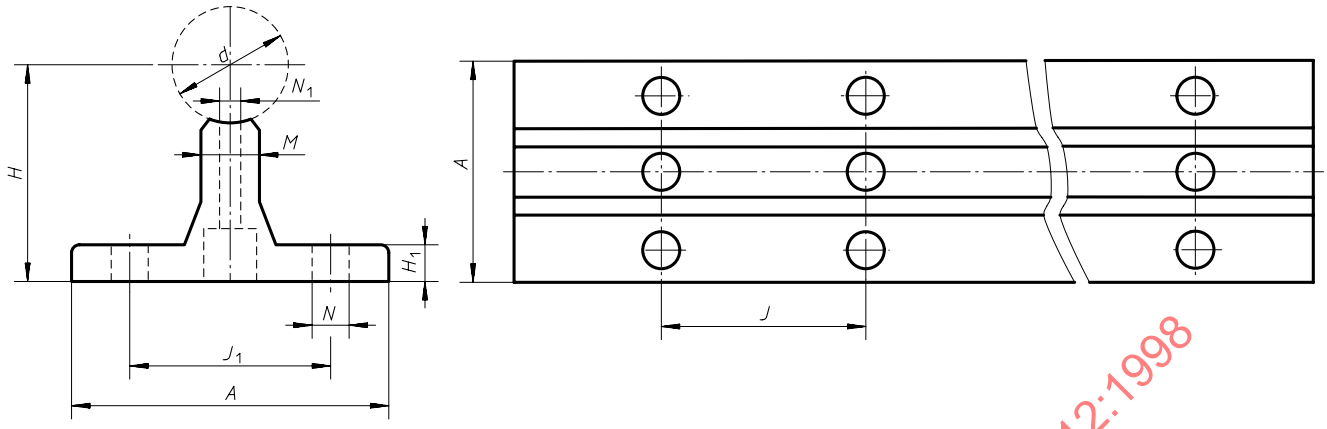
F_w Ref.	D_a [1] JS7[2]	H ± 0,02	H_1 max.	L max.	L_1 ± 0,02	A max.	J	J_1	N	N_1	α min.	G min.
12	22	18	29	43	21,5	40	32	23	4,3	M5	65	12
16	26	22	36	53	26,5	44	40	26	5,3	M6	50	13,5
20	32	25	43	60	30	56	45	32	6,6	M8	50	14,5
25	40	30	52,5	78	39	69	60	40	8,4	M10	50	17,5
30	47	35	61,5	87	43,5	81	68	45	8,4	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

1) Diameter D_a can only be measured when housing is fastened to a plane surface.

2) Seating diameter tolerance (see ISO286-2)

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

Table 6 — Shaft support rails for linear motion rolling bearings

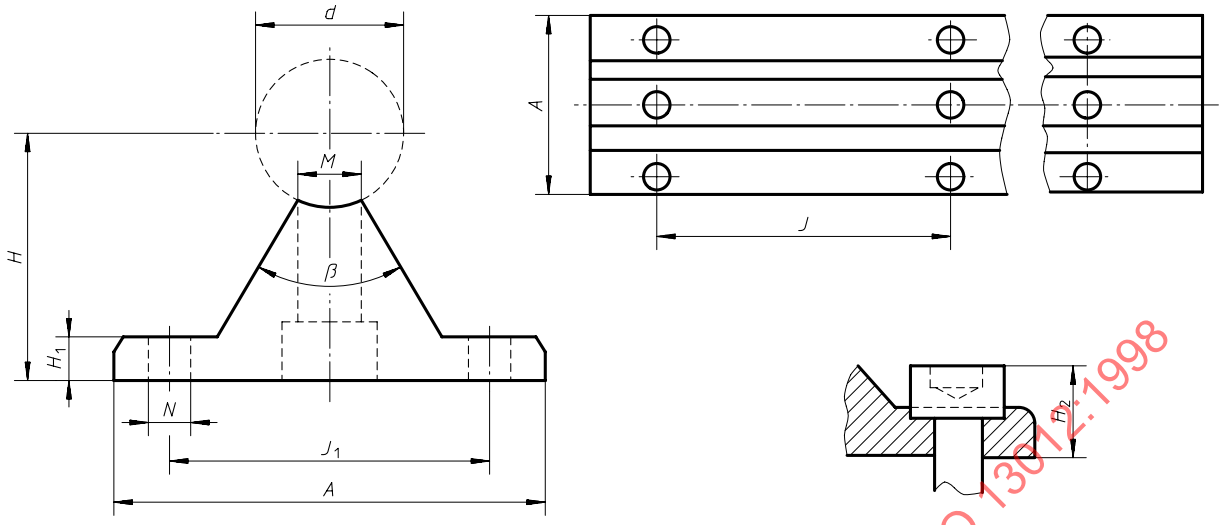


Dimensions in millimetres

d Ref.	*H* ± 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

The dimension *H* shall be measured with the nominal shaft diameter under mounting condition.

Table 7 — Shaft support rails, low height type for linear motion rolling bearings



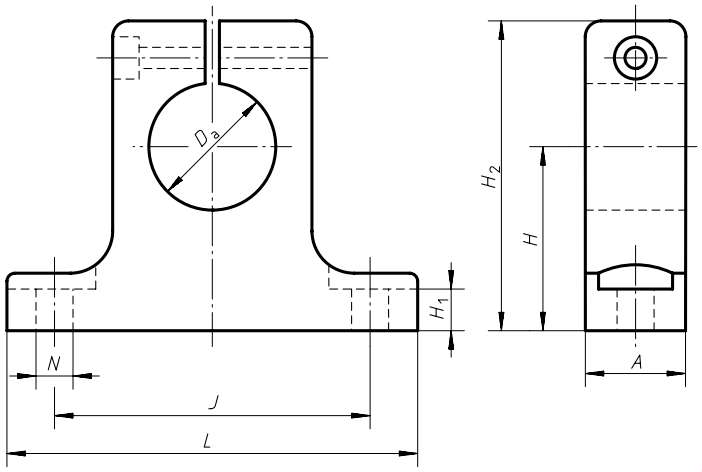
Dimensions in millimetres, angles in degrees

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

The dimension *H* shall be measured with the nominal shaft diameter under mounting condition.

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

Table 8 — Shaft support blocks, flanged type



Dimensions in millimetres

D_a H8 [1)]	H ± 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
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

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

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