INTERNATIONAL STANDARD

ISO 12090-1

First edition
2011-08-01

Rolling bearings — Profiled rail guides for linear motion rolling bearings —

Part 1: Boundary dimensions and tolerances for series 1, 2 and 3

Roulements — Guidages sur rail profilé pour roulements pour mouvement linéaire —

Partie 1: Dimensions d'encombrement et tolérances pour les séries 1, 2 et 3

Reference number
ISO 12090-1:2011(E)

COPYRIGHT PROTECTED DOCUMENT

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

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 12090-1 was prepared by Technical Committee ISO/TC 4, *Rolling bearings*, Subcommittee SC 11, *Linear motion rolling bearings*.

ISO 12090 consists of the following parts, under the general title *Rolling bearings — Profiled rail guides for linear motion rolling bearings*:

— *Part 1: Boundary dimensions and tolerances for series 1, 2 and 3*

— *Part 2: Boundary dimensions and tolerances for series 4 and 5*

Rolling bearings — Profiled rail guides for linear motion rolling bearings —

Part 1: Boundary dimensions and tolerances for series 1, 2 and 3

1 Scope

This part of ISO 12090 establishes the boundary dimensions and tolerances for series 1, 2 and 3 of linear motion rolling bearings, profiled rail guides.

These bearings consist of profiled rails with carriages, which can support forces from all perpendicular directions and moments around all axes and consist of recirculating rolling elements. The internal design of these profiled rail guides is at the discretion of the manufacturer.

An assembly, as specified by the manufacturer, can comprise one or more carriages on a profiled rail. Therefore, the interchange or combination of these elements can only be carried out within the limits permitted by the manufacturer.

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

ISO 5593, *Rolling bearings — Vocabulary*

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 24393 and the following apply.

3.1
linear rail guide
profiled rail guide
⟨monorail guidance system⟩ linear motion rolling bearing unit consisting of a profiled rail or profiled guideway and one or more ball carriages or roller carriages

NOTE Adapted from ISO 24393:2008, definition 02.02.01.

3.2
ball carriage profiled rail guide
linear rail guide consisting of one or more ball carriages and a profiled rail or profiled guideway

[ISO 24393:2008, definition 02.02.03]

NOTE The amount of linear movement (stroke length) is unlimited as the ball carriage has a ball recirculating feature.

3.3
roller carriage profiled rail guide
linear rail guide consisting of one or more roller carriages and a profiled rail or profiled guideway

[ISO 24393:2008, definition 02.02.04]

NOTE The amount of linear movement (stroke length) is unlimited as the roller carriage has a roller recirculating feature.

3.4
ball carriage
linear bearing subassembly consisting of a ball carriage body and a number of closed loops of recirculating balls, which is designed to achieve unlimited motion along a profiled rail or profiled guideway

[ISO 24393:2008, definition 03.01.02]

3.5
roller carriage
linear bearing subassembly consisting of a roller carriage body and a number of closed loops of recirculating rollers, which is designed to achieve unlimited motion along a profiled rail or profiled guideway

[ISO 24393:2008, definition 03.01.03]

3.6
profiled rail
profiled guideway
rail or guideway having a profiled cross-section incorporating a number of raceways along which a ball carriage or a roller carriage traverses

NOTE Adapted from ISO 24393:2008, definition 04.01.15.

3.7
nominal carriage width
A
distance between the two faces of a carriage

3.8
reference face of a carriage
face of a carriage designated as the reference face by the manufacturer of the guide and which can be the datum for measurements

3.9
reference face of a profiled rail
face of a profiled rail designated as the reference face by the manufacturer of the guide and which can be the datum for measurements

3.10
nominal distance between the reference face of carriage and the reference face of the rail
A_1
distance between the two reference faces of the carriage and profiled rail (of profiled rail guide)

3.11
deviation of the distance between the reference faces of several carriages on one rail and profiled rail
ΔA_1
dimensional difference between the reference faces of several carriages on one rail, measured at the same point on the rail and at the centre point of the faces of several carriages

3.12
variation of the distance between the reference faces of several carriages on several rails and profiled rail
V_{A1}
dimensional variation between the reference faces of several carriages on several rails, measured at any point on the rails and at the centre point of the reference faces of several carriages

NOTE The variation of the distance between the reference faces of carriage on several rails is calculated using Equation (1):

$$V_{A1} = A_{1,\max} - A_{1,\min} \quad (1)$$

where

$A_{1,\max}$ is the maximum distance between the reference faces of the carriages and profiled rails;

$A_{1,\min}$ is the minimum distance between the reference faces of the carriages and profiled rails.

3.13
nominal carriage length
B
distance between the two end faces of the carriage designated to bound its length

3.14
nominal height of profiled rail guide
H
distance between the bottom face of the profiled rail and the top face of the carriage

3.15
deviation of the height of several carriages on one rail
ΔH
height difference between the top faces of several carriages on one rail, measured at the same point on the rail and at the centre point of the top faces of several carriages

3.16
variation of the height of several carriages on several rails
V_H
height variation between the top faces of several carriages on several rails, measured at any point on the rails and at the centre point of the top faces of several carriages

NOTE The variation of the height of several carriages on several rails is calculated using Equation (2):

$$V_H = H_{\max} - H_{\min} \quad (2)$$

where

$H_{\max}$ is the maximum height of profiled rail guide;

$H_{\min}$ is the minimum height of profiled rail guide.

3.17
nominal height between the bottom faces of profiled rail guide
H_1
distance between the bottom face of the profiled rail and that of the carriage designated to bound the clearance between the bottom of the carriage and the bottom of the profiled rail

3.18
nominal profiled rail width
W
distance between the two faces of the profiled rail

3.19
vertical running parallelism
P_V
running parallelism of the carriage measured at the centre point of the top face of the carriage and bottom face of the rail along the length of the rail

3.20
horizontal running parallelism
P_H
running parallelism of the carriage measured at the centre point of the reference face of the carriage and reference face of the rail along the length of the rail

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 6 and the values given in Tables 1 to 8 denote nominal dimensions unless specified otherwise.

A nominal carriage width

A_1 nominal distance between the reference face of the carriage and the reference face of the rail

B nominal carriage length

d_1 minor diameter of internal screw thread of carriage

d_2 diameter of bore (or recess) for bolt mounting from the bottom of the carriage

G designation of internal screw thread of carriage

G_1 designation of internal screw thread of profiled rail

H nominal height of profiled rail guide

H_1 nominal height between the bottom faces of carriage and profiled rail

H_2 height of reference face of carriage

h depth of bolt hole counterbore of profiled rail

h_1 height from counterbore face to mounting face of carriage

J centre distance between bolt holes of carriage (width)

J_1 centre distance between bolt holes of carriage (length)

J_2 centre distance between bolt holes of profiled rail (length)

J_3 distance from the end face to the first bolt hole of profiled rail (length)

J_5 distance between the fifth and sixth holes in carriage (length)

J_{11} half of the centre distance between bolt holes of carriages (length)

l_G length of internal screw thread of carriage

l_{G1} length of internal screw thread of profiled rail

N diameter of bolt hole of carriage

N_1 diameter of bolt hole of profiled rail

N_2 diameter of bolt hole counterbore of profiled rail

P_H horizontal running parallelism

P_V vertical running parallelism

V_{A1} variation of the distance between the reference faces of carriage on several rails

V_H variation of the height of several carriages on several rails

W nominal profiled rail width

ΔA_1 deviation of the distance between the reference faces of carriages on one rail

ΔH deviation of the height of several carriages on one rail

5 Design types

5.1 Carriages

The design types of carriages are given in Table 1.

Table 1 — Carriages for profiled rail types T and B

Series	Design	Type
1	Standard	1M
	Standard, long	1L
2	Narrow	2M
	Narrow, long	2L
3	Narrow, increased height	3M
	Narrow, increased height, long	3L

5.2 Profiled rails

The design types of profiled rails are given in Table 2.

Table 2 — Profiled rails

Method of fixing	Type
From above	T
From below	B

6 Boundary dimensions

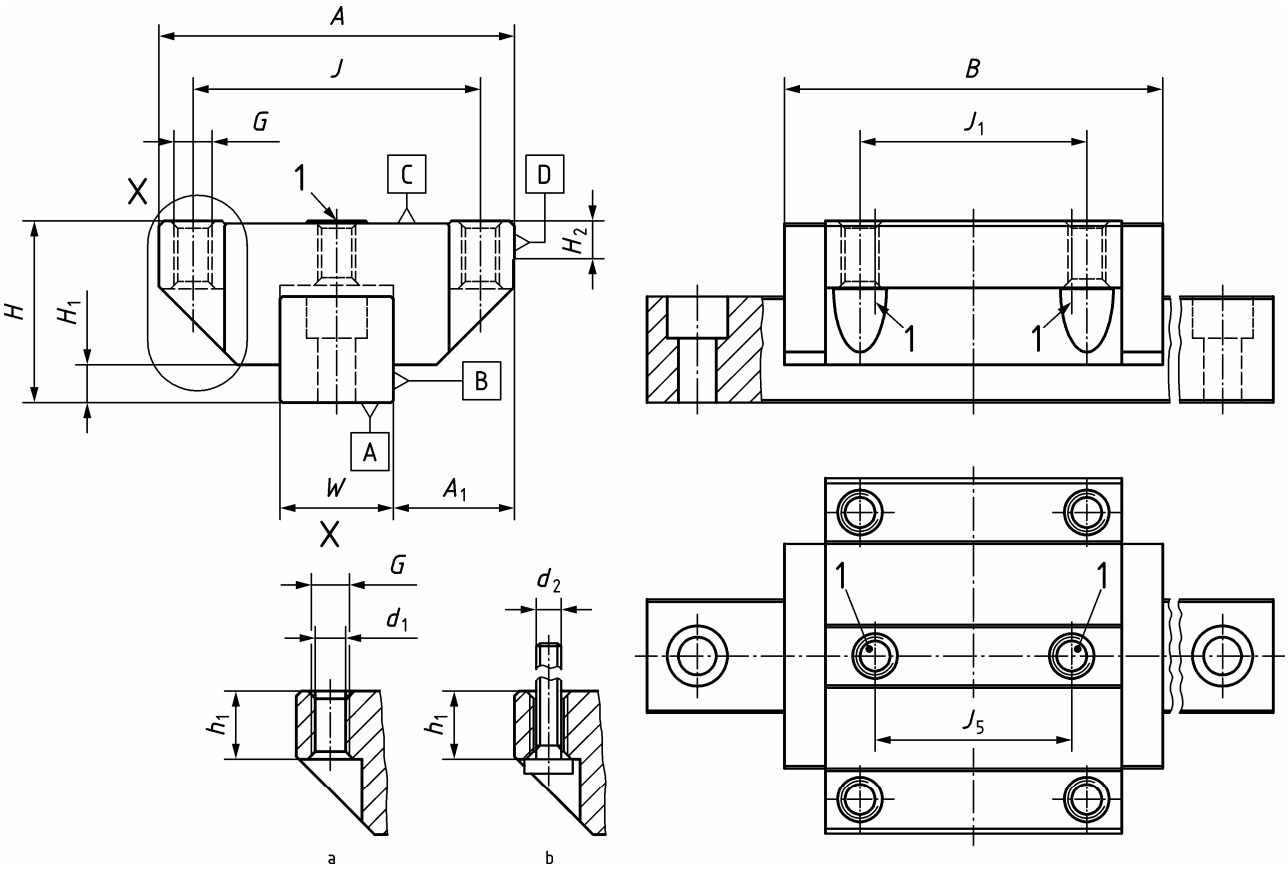
6.1 Profiled rail guides

6.1.1 General

Boundary dimensions for profiled rail guides of series 1, 2 and 3 are given in Tables 3, 4 and 5, respectively.

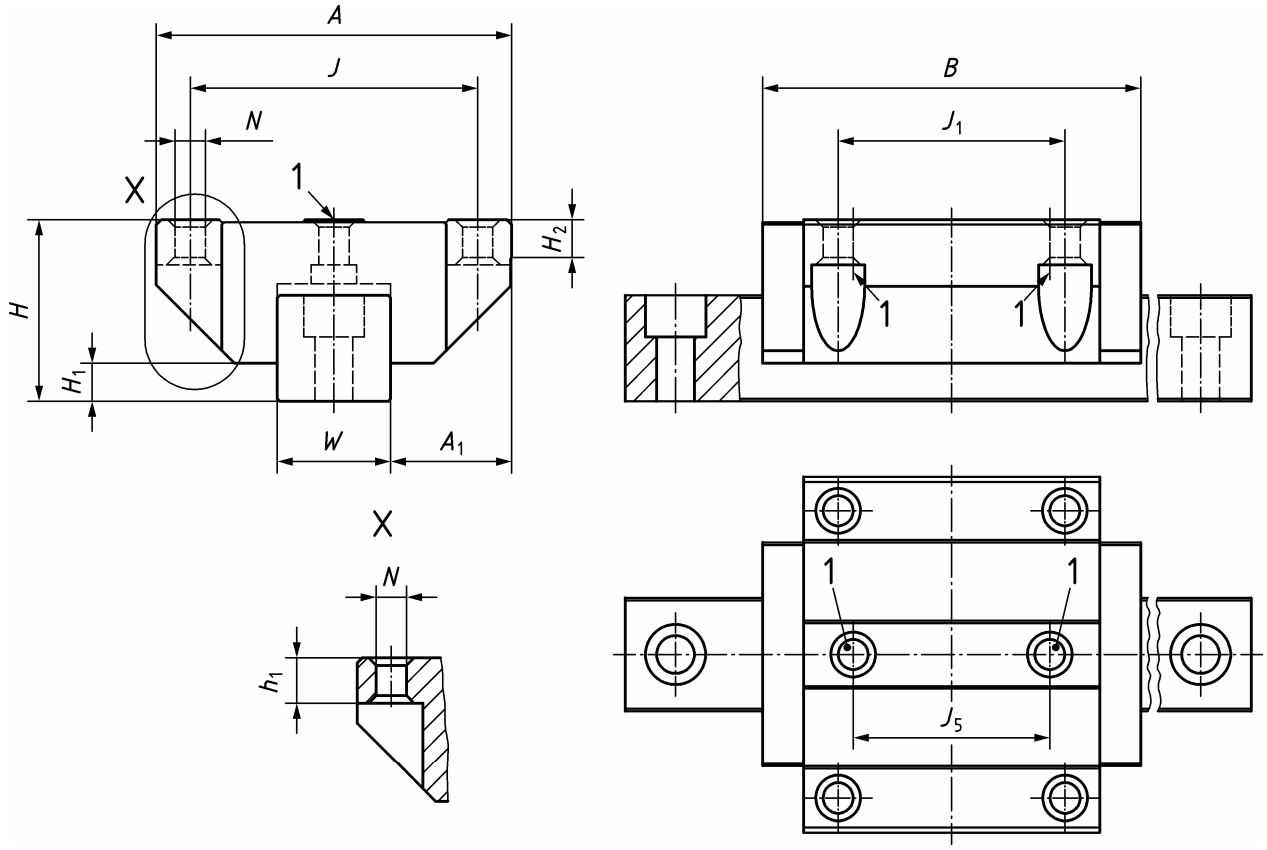
6.1.2 Series 1

The boundary dimensions for profiled rail guides of series 1 are given in Figure 1.

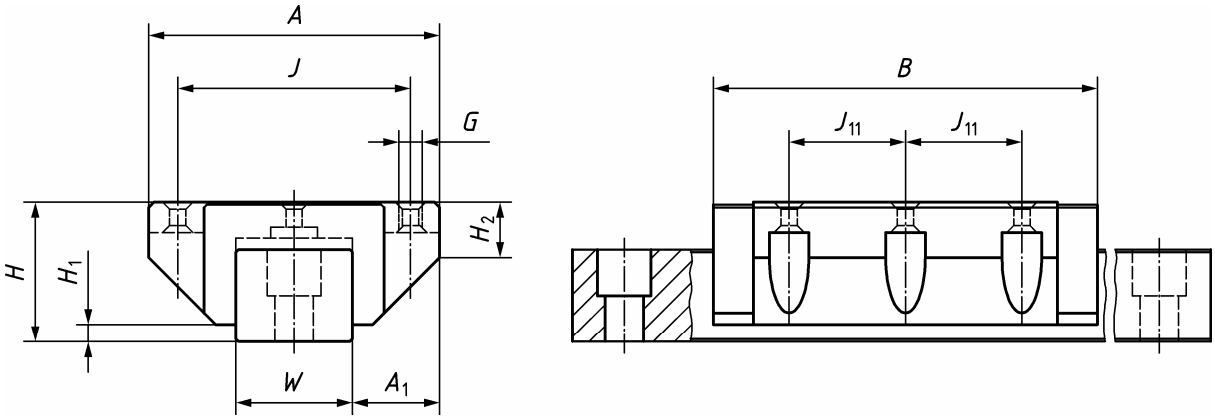


a) Sizes 15 to 85 — Carriages with threaded holes

Figure 1 (*continued*)



b) Sizes 15 to 85 — Carriages with through holes



c) Sizes 100 and 125 — Carriages with threaded and through holes

Key

1 mounting holes (depending on size and on the manufacturer)

a Fixing from the top or bottom (threaded holes).

b Fixing from the bottom (through holes).

A Bottom face of rail

B Reference face of rail

C Top face of carriage

D Reference face of carriage

NOTE 1 Datum A till D applicable for Series 1, 2 and 3

NOTE 2 Carriage for sizes 100 and 125 available with threaded or through holes

Figure 1 — Profiled rail guides — Series 1

Table 3 — Dimensions of series 1

Dimensions in millimetres

Size	W	H	A	A_1	H_1 min.	H_2 min.	Type 1M			Type 1L			J	[a]				
							B max.	J_1	J_{11}	B max.	J_1	J_{11}		G	d_1 max.	d_2[b]	h_1 min.	N max.
15	15	24	47	16	3	4,5	72	30	—	86	30	—	38	M5	4,5	M4	5	4,5
20	20	30	63	21,5	4	5	92	40	—	112	40	—	53	M6	6	M5	5	6
25	23	36	70	23,5	4,5	5	100	45	—	118	45	—	57	M8	7	M6	8	7
30	28	42	90	31	4,5	6	113	52	—	139	52	—	72	M10	9	M8	10	9
35	34	48	100	33	5,5	6,5	130	62	—	155	62	—	82	M10	9	M8	10	9
45	45	60	120	37,5	7	9	159	80	—	194	80	—	100	M12	11	M10	12	11
55	53	70	140	43,5	7,5	11	191	95	—	238	95	—	116	M14	13	M12	14	14
65	63	90	170	53,5	10	14	245	110	—	309	110	—	142	M16	15	M14	16	16
85	85	110	215	65	16	20	300	140	—	350	140	—	185	M20	18	M16	20	18
100	100	120	250	75	14	18	335	150	75	405	200[c] 230[c]	100[c] 115[c]	200[c] 220[c]	M20	19	M16	20	20
125	125	160	320	320	23	25	390	205	102,5	500	205	102,5	270	M27	25,5	M24	30	25,5

NOTE Two additional mounting holes can be added, if required. The size and location are at the discretion of the manufacturer.

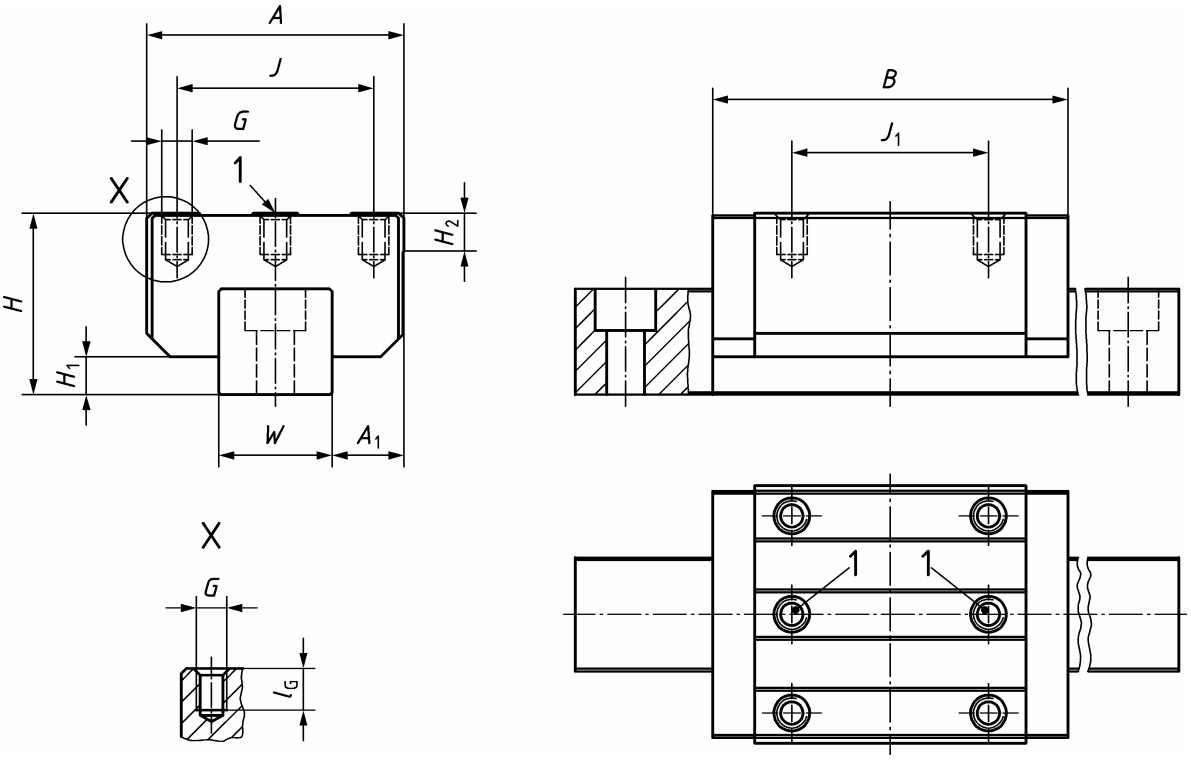
[a] A combination design may also be used to mount from the bottom or the top. The internal thread minor diameter can be specified by the manufacturer.

[b] Designation for screws fixing from below; recess is also permissible for d_2.

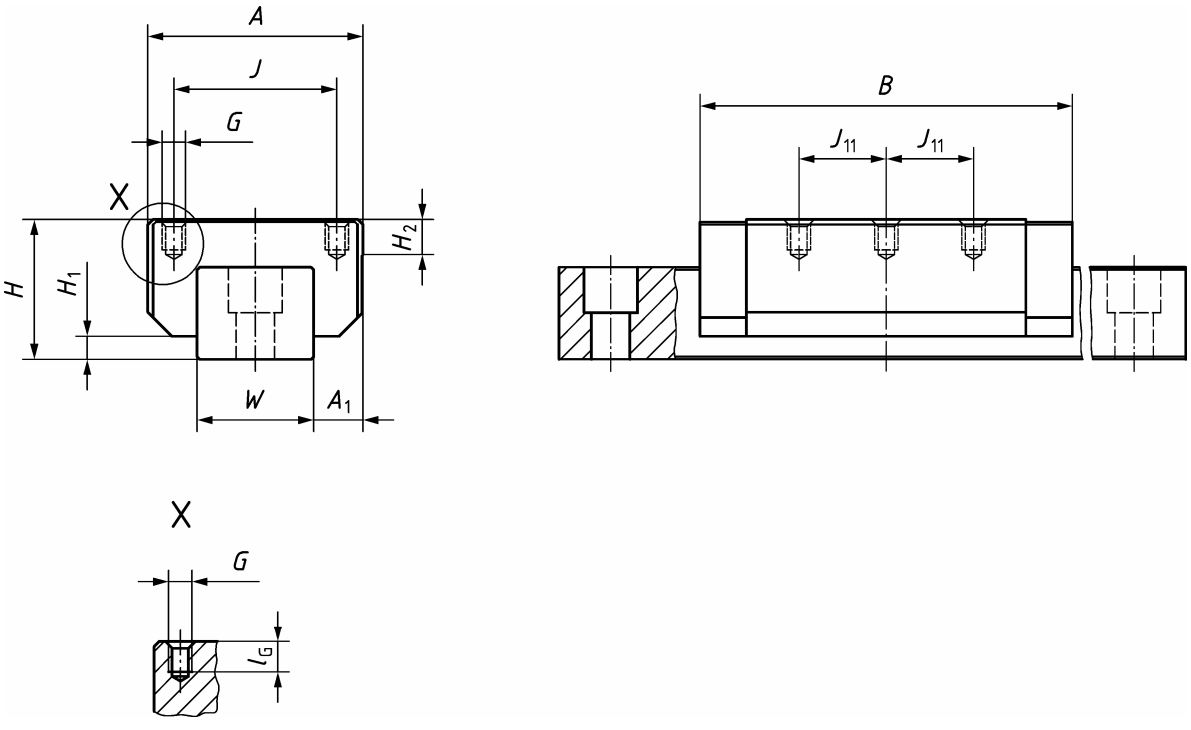
[c] The design is at the discretion of the manufacturer(s). Therefore, two different sizes for J_1 and J_{11} for Type 1L and for J, respectively, are usual.

6.1.3 Series 2

The boundary dimensions for profiled rail guides of series 2 are given in Figure 2.



a) Sizes 15 to 65



b) Sizes 100 and 125

Key

1 mounting holes (depending on size and on the manufacturer)

Figure 2 — Profiled rail guides — Series 2

Table 4 — Dimensions of series 2

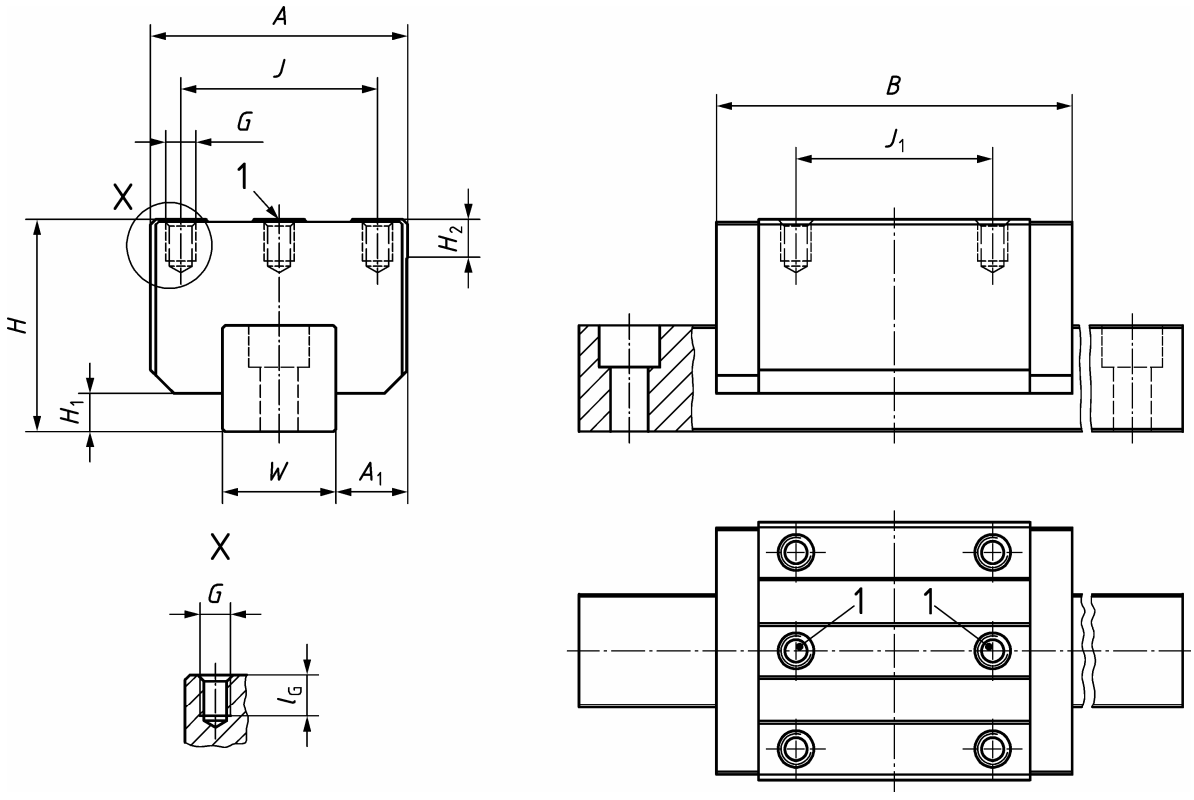
Dimensions in millimetres

Size	W	H	A	A_1	H_1 min.	H_2 min.	Type 2M B max.	Type 2M J_1	Type 2M J_{11}	Type 2L B max.	Type 2L J_1	Type 2L J_{11}	J	G	l_G min.
15	15	24	34	9,5	3	4,5	72	26	—	86	26	—	26	M4	4
20	20	30	44	12	4	5	92	36	—	112	50	—	32	M5	5
25	23	36	48	12,5	4,5	5	100	35	—	118	50	—	35	M6	6
30	28	42	60	16	4,5	6	113	40	—	139	60	—	40	M8	8
35	34	48	70	18	5,5	6,5	130	50	—	155	72	—	50	M8	8
45	45	60	86	20,5	7	9	159	60	—	194	80	—	60	M10	10
55	53	70	100	23,5	7,5	11	191	75	—	238	95	—	75	M12	13
65	63	90	126	31,5	10	14	245	70	—	309	120	—	76	M16	18
100	100	120	185	42,5	14	20	335	150	75	400	230	115	140	M16	20
125	125	160	235	55	23	25	390	205	102,5	500	205	102,5	180	M24	30

NOTE Two additional mounting holes can be added, if required. The size and location are at the discretion of the manufacturer.

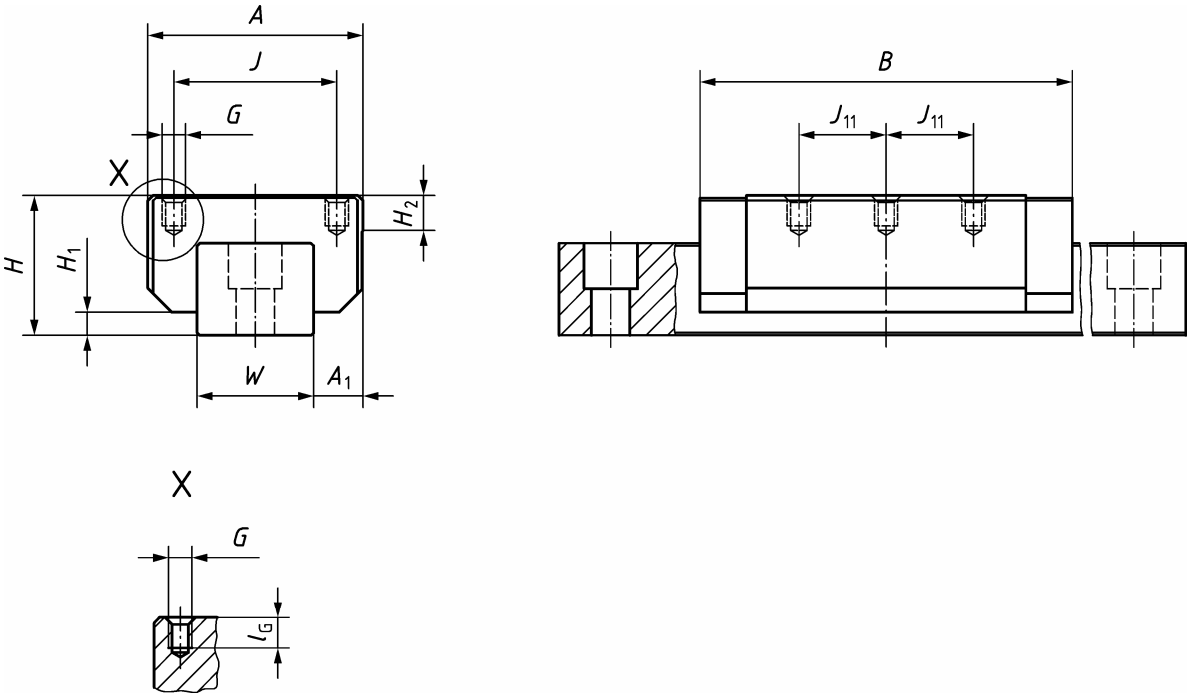
6.1.4 Series 3

The boundary dimensions for profiled rail guides of series 3 are given in Figure 3.



a) Sizes 15 to 65

Figure 3 (*continued*)



b) Sizes 100 and 125

Key

1 mounting holes (depending on size and on the manufacturer)

Figure 3 — Profiled rail guides — Series 3

Table 5 — Dimensions of series 3

Dimensions in millimetres

Size	W	H	A	A_1	H_1 min.	H_2 min.	Type 3M			Type 3L			J	G	l_G min.
							B max.	J_1	J_{11}	B max.	J_1	J_{11}			
15	15	28	34	9,5	3	4,5	72	26	—	86	26	—	26	M4	5
20	20	30	44	12	4	5	92	36	—	112	50	—	32	M5	5
25	23	40	48	12,5	4,5	5	100	35	—	118	50	—	35	M6	6,5
30	28	45	60	16	4,5	6	113	40	—	139	60	—	40	M8	8
35	34	55	70	18	5,5	6,5	130	50	—	155	72	—	50	M8	10
45	45	70	86	20,5	7	9	159	60	—	194	80	—	60	M10	12
55	53	80	100	23,5	7,5	11	191	75	—	238	95	—	75	M12	14
65	63	100	126	31,5	10	14	245	70	—	309	120	—	76	M16	18
100	100	140	185	42,5	14	20	335	150	75	400	230	115	140	M16	20
125	125	180	235	55	23	25	390	205	102,5	500	205	102,5	180	M24	30

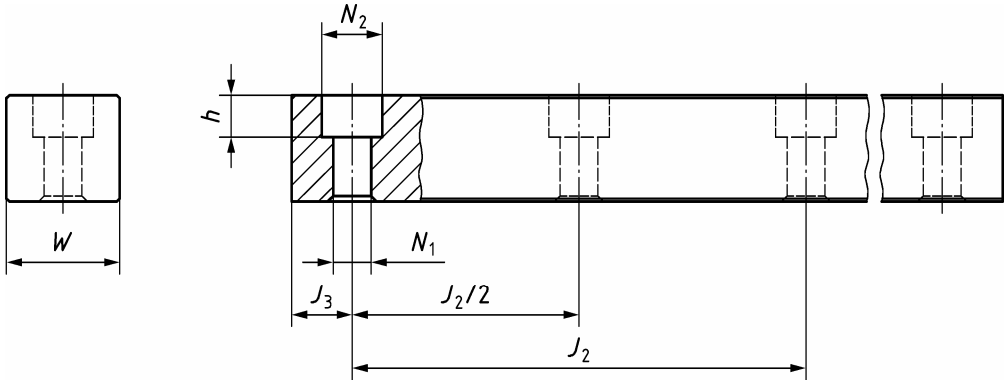
NOTE Two additional mounting holes can be added if required. The size and location are at the discretion of the manufacturer.

6.2 Profiled rails

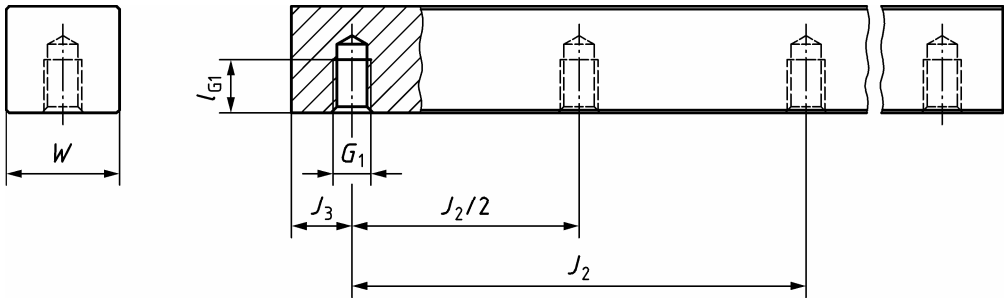
6.2.1 Single-piece profiled rails

Boundary dimensions for profiled rails of type T and B for series 1, 2 and 3 are given in Figure 4 and Table 6.

For roller carriage profiled rail guides, the centre distance between mounting holes, $J_2/2$, may be chosen.



a) Type T with through holes



b) Type B with threaded holes

Figure 4 — Profiled rails — Types T and B

Table 6 — Dimensions of profiled rails — Types T and B

Dimensions in millimetres

Size	Type T and Type B			Type T			Type B	
	W	J_2	J_3 min.	N_1 min.	N_2 min.	h min.	G_1	l_{G1} min.
15	15	60	7	4	7,4	5,3	M5	6,5
20	20	60	8	5,8	9,3	6,8	M6	7,5
25	23	60	9	6,8	11	8,5	M6	7,5
30	28	80	11	9	14	10,5	M8	10
35	34	80	11	9	14	10,5	M8	12
45	45	105	13	14	20	15	M12	15
55	53	120	15	16	23	17	M14	17,5
65	63	150	16	18	26	20	M16	20
85	85	180	22	24	35	28	M20	25
100	100	210	30	26	39	31	M24	30
125	125	240	35	33	49	40	M30	38

NOTE For roller carriage profiled rail guides, the centre distance between mounting holes, $J_2/2$, can be chosen.

6.2.2 Multi-piece profiled rails

For profiled rail guides with a long stroke, it may be necessary for the profiled rail to be manufactured in two or more pieces, which are placed end-to-end during installation.

Marking of the individual components and the establishment of the corresponding installation procedures are at the discretion of the manufacturer.

7 Tolerances

The tolerances for profiled rail guide are given in Table 7 and Figure 5.

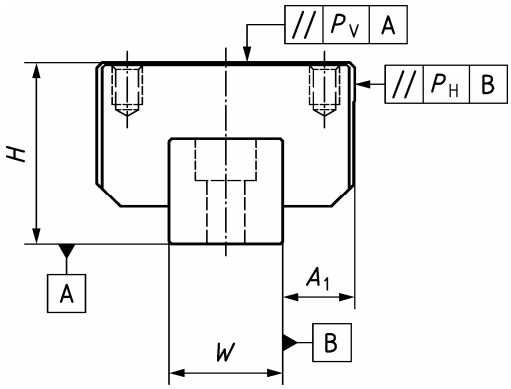


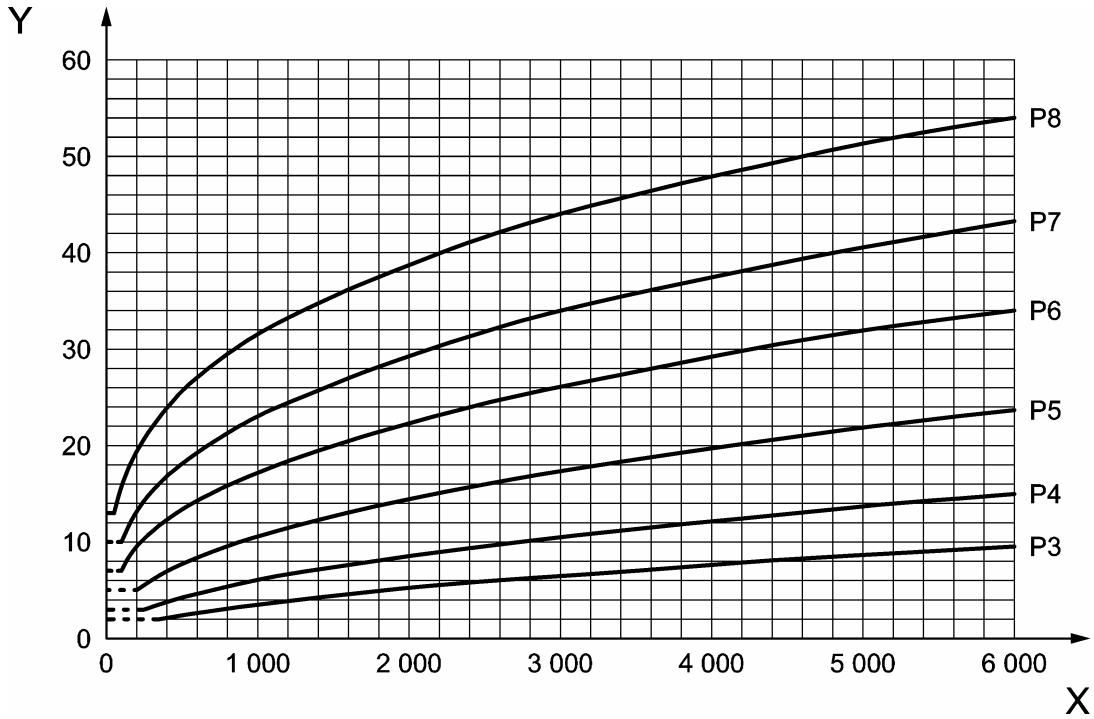
Figure 5 — Measurement guide for running parallelism

Table 7 — Tolerances for carriage and profiled rail guide

Dimensions and tolerance values in millimetres

Symbol	Dimension W		Tolerance class					
	>	≤	P8	P7	P6	P5	P4	P3
ΔH[a]	—	60	±0,12	±0,1	±0,05	±0,025	±0,015	±0,008
	60	—	±0,12	±0,1	±0,05	±0,025	±0,015	±0,015
V_H	—	60	0,06	0,03	0,015	0,01	0,005	0,003
	60	—	0,06	0,03	0,02	0,01	0,007	0,005
ΔA_1[a]	—	60	±0,12	±0,1	±0,05	±0,025	±0,015	±0,01
	60	—	±0,12	±0,1	±0,07	±0,025	±0,025	±0,02
V_{A1}	—	60	0,06	0,03	0,02	0,015	0,007	0,003
	60	—	0,06	0,03	0,025	0,015	0,01	0,005
P_V maximum			See Figures 5 and 6					
P_H maximum			See Figures 5 and 6					

[a] The deviation of the actual height, ΔH, and the deviation of the actual distance between the reference faces, ΔA_1, are the dimensional differences between several carriages on one profiled rail, measured at the same point on the profiled rail and at the centre point of the top face or the reference face of the carriages.



Key

X single-piece profiled rail length, in millimetres

Y P_V and P_H, in micrometres

Figure 6 — Tolerances for P_V and P_H over a single-piece profiled rail length

Annex A
(informative)

General length tolerances for profiled rails

Length tolerances of profiled rail are given in Table A.1.

Table A.1 — General length tolerances for profiled rails

Dimensions and tolerance values in millimetres

Nominal length of rail		Tolerance class
>	≤	All classes
—	6	±0,1
6	30	±0,2
30	120	±0,3
120	400	±0,5
400	1 000	±0,8
1 000	2 000	±1,2
2 000	3 000	±2

ICS 21.100.20

Price based on 15 pages