ALMOTION

MOTION & CONTROL™
NSK

LINEAR MOTION CONTROL

STANDARD RANGE

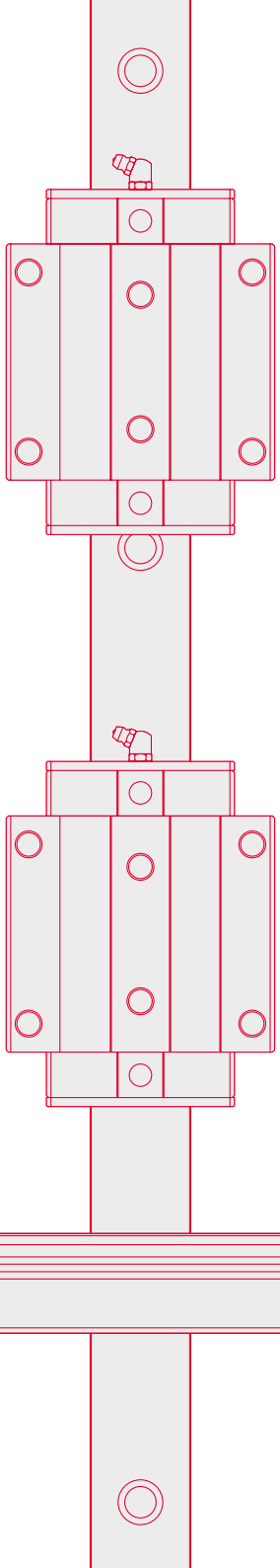


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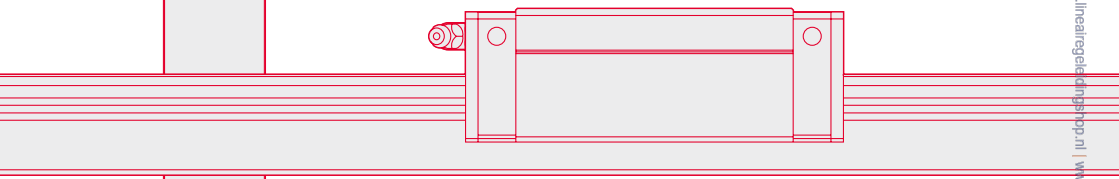
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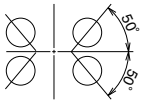
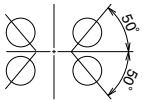
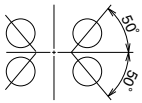
Linear Guides

- Quick delivery due to advanced random-matching
- Wide ranging series of ball and roller guides available

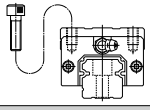
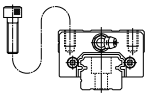
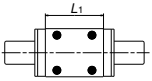
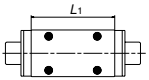
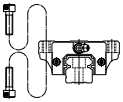
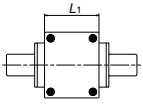
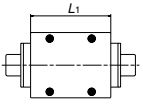


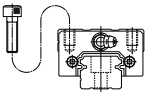
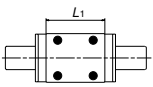
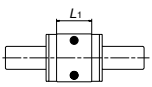
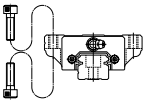
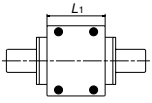
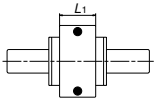
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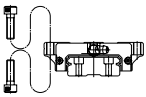
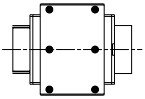
1. Types of NSK Linear Rolling Guides

Series		Features
NH Series		The NH series is applicable to a wide range of uses from general industrial use to high-accuracy application. Random-matching of rails and ball slides is available as a standard. › The contact angle between the ball and ball groove is set at 50 degrees. This design increases the load carrying capacity against the vertical directions, which is the main load acting direction in most operations. › The DF contact structure greatly absorbs the installation error in the perpendicular direction to the rail. › Balls make contact at two points thanks to the offset Gothic arch groove. This keeps friction to a minimum. › High resistance against shock load due to the unique load-carrying structure. › Standardized random-matching type allows separate purchase of rails and ball slides. › Stainless steel standard type is also available for small sizes (NH15 to NH30).
		
NS Series		The NS series is low in height, and is applicable to a wide range of uses from general industrial use to high-accuracy application. Random-matching of rails and ball slides is available as a standard. › Compact and low profile. › The contact angle between the ball and the groove is set at 50 degrees. This design increases the load carrying capacity against vertical directions, which is the main load direction prevalent in most operations. › The DF contact structure greatly absorbs the installation error in the perpendicular direction of the rail. › Thanks to the offset Gothic arch groove, balls make contacts at two points. This keeps friction to a minimum. › High resistance against shock load due to the unique load carrying structure. › Standardized random-matching type allows separate purchase of rails and ball slides. › Stainless steel type is also available.
		
LW Series		High-moment rigidity and low profile products are most suited for a single rail linear guideway system. Random-matching of rails and ball slides is available as a standard. › The wide rail contributes to a high rolling moment carrying capacity and to great moment rigidity of a single rail linear guideway system. › Balls contact at two points in the Gothic arch groove, thus keeping friction to a minimum. › High resistance against shock load › Standardized random-matching type allows separate purchase of rails and ball slides.
		

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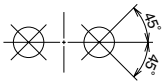
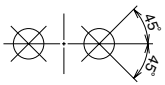
Ball slide model				Size & Preload		Dimension table
AN, BN	AL, BL	AN, AL	BN, BL	Size	Preload	
				NH15 NH20 NH25 NH30 NH35 NH45 NH55 NH65	Slight preload ZZ	Page 30-45
EM, GM		EM	GM			
						

AL, CL	AL	CL	Size	Preload	
			NS15 NS20	Slight preload ZZ	Page 46-59
EM, JM	EM	JM	NS25 NS30 NS35		
					

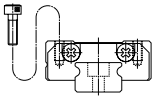
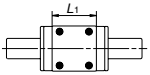
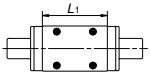
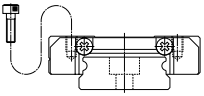
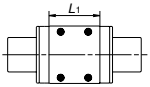
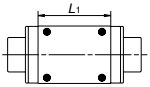
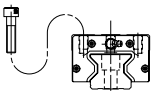
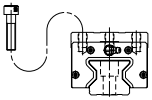
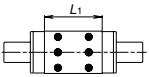
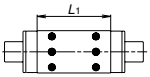
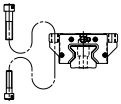
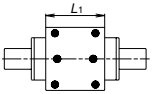
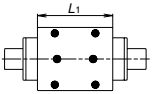
EL	EL	Size	Preload	
		LW17 LW21 LW27 LW35 LW50	Slight preload ZZ	Page 60-69

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1. Types of NSK Linear Rolling Guides

Series		Features
PU Series		Low inertia and low dust generation miniature series. › Low dust generation and highly smooth operation › Super-compact size › Stainless steel is the standard material. › A ball retainer is a standard equipment. › Standardized random-matching type allows separate purchase of rails and ball slides.
		
PE Series		Wide rail miniature with low inertia and low dust generation. › Low dust generation and highly smooth operation › Super-compact size › Stainless steel is the standard material. › A ball retainer is a standard equipment. › Standardized random-matching type allows separate purchase of rails and ball slides.
		
RA Series		The RA series roller guides have realized the world highest load capacity. Super-high rigidity and smooth motion contribute to higher performance of machine tools. › Unique and optimum design of rollers and other component facilitate the high-load capacity and high rigidity. › High-performance seals, a standard feature in the roller guides, maintain the initial performance for a prolonged time. › The installation of retaining piece achieves smooth motion. › Standardized random-matching type (RA25 to RA65) allows separate purchase of rails and roller slides.
		

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Ball slide model			Size & Preload		Dimension table
AL, AR, TR, UR, BL	AL, AR, TR	BL, UR	Size	Preload	
			PU05 PU07 PU09 PU12 PU15	Maximum clearance 5µm ZT	Page 70-79
AR, TR, UR, BR	AR, TR	BR, UR	Size	Preload	
			PE05 PE07 PE09 PE12 PE15	Maximum clearance 5µm ZT	Page 80-89
AL, BL	AN, BN	AL, AN	BL, BN	Size	Preload	
				RA15 RA20 RA25 RA30 RA35 RA45 RA55 RA65	High preload ZH	Page 90-107
EM, GM		EM	GM			
						

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2. Accuracy

1. Accuracy Standard

› **Table 1, Figure 1** and **Figure 2** show accuracy characteristics.

Table 1 Definition of accuracy

Characteristics	Definition (Figures 1, 2)
Mounting height *H*	Distance from A (rail bottom datum face) to C (slide top surface)
Variation of *H*	Variation of H in slides assembled to the rails of a set of linear guides
Mounting width W_2 or W_3	Distance from B (rail side datum surface) to D (slide side datum surface). Applicable only to the reference linear guide.
Variation of W_2 or W_3	Difference of the width (W_2 or W_3) between the assembled ball slides, which are installed in the same rail. Applicable only to the reference linear guide.
Running parallelism of ball slide, face C to face A	Variation of C (slide top surface) to A (rail bottom datum surface) when ball slide is moving
Running parallelism of ball slide, face D to face B	Variation of D (slide side datum surface) to B (rail side datum surface) when ball slide is moving

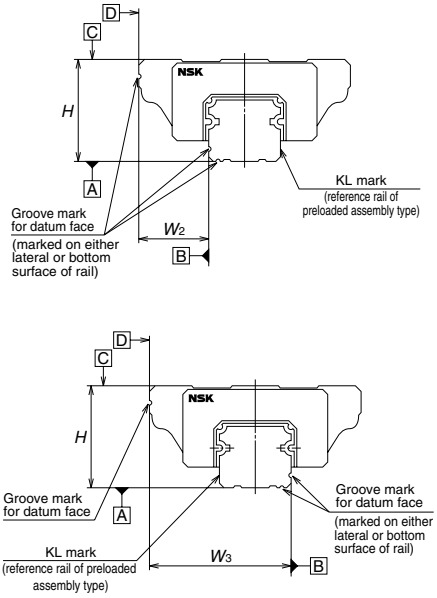


Fig. 1 Assembled accuracy (height and width)

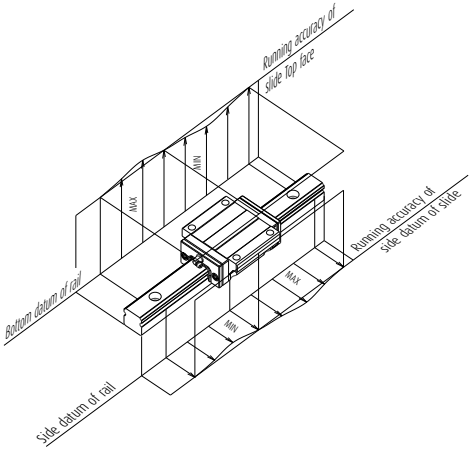


Fig. 2 Running parallelism of ball slide

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Table 2 Assembly dimension tolerance of random-matching type

Unit: μm

Series	NH Series		NS Series	LW Series	PU/PE Series	RA Series
Size	15 – 35	45 – 65	15 – 35	17 – 50	05 – 15	15 – 65
Mounting height *H*	±20	±30	±20	±20	±20	±20
Variation of mounting height *H*	15*1 30*2	20*1 35*2	15*1 30*2	15*1 30*2	15*1 30*2	15*1 25*2
Mounting width W_2 or W_3	±30	±35	±30	±30	±20	±25
Variation of Mounting width W_2 or W_3	25	30	25	25	20	20

*1 Variation of mounting height *H* is specified on one rail.
*2 Variation of mounting height *H* is specified on multiple rails.

Table 3 Running parallelism tolerance of random-matching type: A//C or B//D

Unit: μm

Rail length (mm) over or under	Random-matching type		
	High precision grade PH	Normal grade PC	RA Series/High precision grade PH
– 50	2	6	4.5
50 – 80	3	6	5
80 – 125	3.5	6.5	5.5
125 – 200	4	7	6
200 – 250	5	8	7
250 – 315	5	9	8
315 – 400	6	11	9
400 – 500	6	12	10
500 – 630	7	14	12
630 – 800	8	16	14
800 – 1 000	9	18	16
1 000 – 1 250	10	20	17
1 250 – 1 600	11	23	19
1 600 – 2 000	13	26	21
2 000 – 2 500	15	29	22
2 500 – 3 150	17	32	25
3 150 – 4 000	23	34	30

Table 4 Available rail length (max. length)

Unit: mm

Series	NH Series		NS Series		PU Series	PE Series	RA Series
Size	Std. steel	Stainless	Std. steel	Stainless	Stainless	Stainless	Std. steel
05	–	–	–	–	210	150	–
07	–	–	–	–	375	600	–
09	–	–	–	–	600	380	–
12	–	–	–	–	800	790	–
15	3 980	1 780	2 920	1 800	1 000	1 200	2 000
20	3 960	3 460	3 960	3 500	–	–	3 000
25	3 960	3 460	3 960	3 500	–	–	3 900
30	4 000	3 500	4 000	3 500	–	–	3 900
35	4 000	–	4 000	3 500	–	–	3 900
45	3 990	–	–	–	–	–	3 650
55	3 960	–	–	–	–	–	3 600
65	3 900	–	–	–	–	–	3 600

Unit: mm

LW Series	
Size	Std. steel
17	1 000
21	1 600
27	2 000
35	2 000
50	2 000

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3. Accessories

1. Double Seal and Protector

› Double seal (a combination of two end seals) to enhance seal function.
› Protector (a steel plate added on end seal) to prevent high temperature fine particles, such as welding spatter and other foreign matter, from entering the ball slide.
› When a double seal or protector is installed, the ball slide becomes longer by the sizes shown in Tables 1 and 2.
› When attaching a grease fitting to the end-cap after the double seal or protector is equipped, a connector, shown in Fig. 1, is required. Please specify the connector set when ordering.

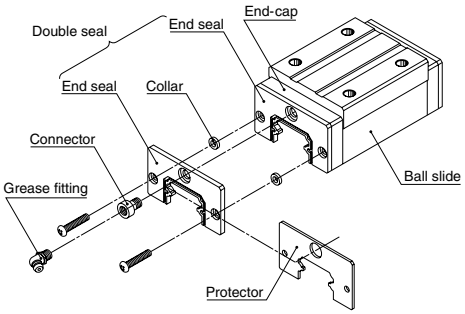


Fig. 1

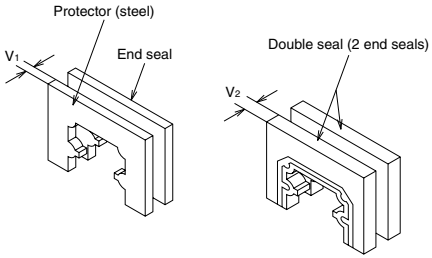


Fig. 2

Table 1 Double-seal set Unit: mm

Model No.	Part No.		Increased thickness V_2
	Without connector	With connector	
NH15	LH15WS-01	***	2.5
NH20	LH20WS-01	LH20WSC-01	2.5
NH25	LH25WS-01	LH25WSC-01	2.8
NH30	LH30WS-01	LH30WSC-01	3.6
NH35	LH35WS-01	LH35WSC-01	3.6
NH45	LH45WS-01	LH45WSC-01	4.3
NH55	LH55WS-01	LH55WSC-01	4.3
NH65	LH65WS-01	LH65WSC-01	4.9
NS15	LS15WS-01	***	2.8
NS20	LS20WS-01	LS20WSC-01	2.5
NS25	LS25WS-01	LS25WSC-01	2.8
NS30	LS30WS-01	LS30WSC-01	3.6
NS35	LS35WS-01	LS35WSC-01	3.6
LW17	LW17WS-01	***	2.6
LW21	LW21WS-01	LW21WSC-01	2.8
LW27	LW27WS-01	LW27WSC-01	2.5
LW35	LW35WS-01	LW35WSC-01	3
LW50	LW50WS-01	LW50WSC-01	3.6

*** Consult with NSK when attaching a connector to a drive-in type grease fitting.

Table 2 Protector set Unit: mm

Model No.	Part No.		Increased thickness V_1
	Without connector	With connector	
NH15	LH15PT-01	***	2.7
NH20	LH20PT-01	LH20PTC-01	2.9
NH25	LH25PT-01	LH25PTC-01	3.2
NH30	LH30PT-01	LH30PTC-01	4.2
NH35	LH35PT-01	LH35PTC-01	4.2
NH45	LH45PT-01	LH45PTC-01	4.9
NH55	LH55PT-01	LH55PTC-01	4.9
NH65	LH65PT-01	LH65PTC-01	5.5
NS15	LS15PT-01	***	3
NS20	LS20PT-01	LS20PTC-01	2.7
NS25	LS25PT-01	LS25PTC-01	3.2
NS30	LS30PT-01	LS30PTC-01	4.2
NS35	LS35PT-01	LS35PTC-01	4.2
LW17	LW17PT-01	***	3.2
LW21	LW21PT-01	LW21PTC-01	3.2
LW27	LW27PT-01	LW27PTC-01	2.9
LW35	LW35PT-01	LW35PTC-01	3.6
LW50	LW50PT-01	LW50PTC-01	4.2

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2. Cap to Cover Bolt Hole for Rail Mounting

› After the rail is mounted to the machine base, a cap is used to cover the bolt hole to prevent foreign matter from clogging up the hole or from entering the ball slide (Fig. 3).
› The cap for the bolt hole is made of synthetic resin, which is superb in its resistance to oil and wear.
› Table 3 shows sizes of the bolts for each model number as well as reference numbers of caps.
› To insert a cap into the rail bolt hole, use a flat tool (Fig. 4). Pound the cap gradually until its top becomes flush with the rail top face.

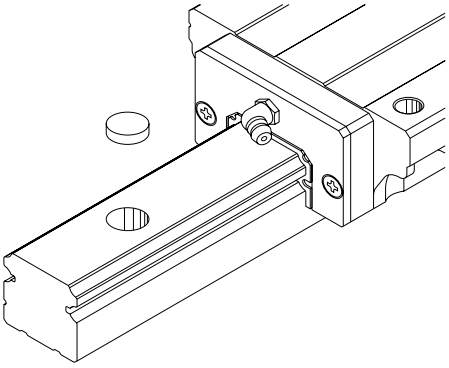


Fig. 3

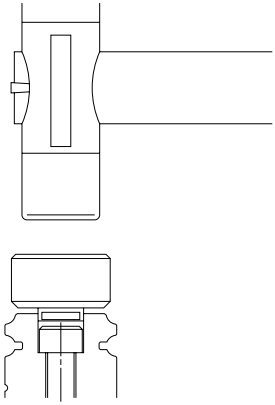


Fig. 4

Table 3 Caps to cover rail bolt hole

Model No.	Bolt to secure rail	Cap Part No.	Quantity/ case
NS15 (for M3) PU09 (TR, UR) PU12 (TR, UR) PU15 PE09 (TR, UR)	M3	LG-CAP/M3	20
NH15 NS15 (for M4) RA15 LW17 LW21 LW27	M4	LG-CAP/M4	20
NH20 NS20 RA20	M5	LG-CAP/M5	20
NH25 NS25 NS30 RA25 LW35	M6	LG-CAP/M6	20
NH30 NH35 NS35 RA30 RA35 LW50	M8	LG-CAP/M8	20
NH45 RA45	M12	LG-CAP/M12	20
NH55 RA55	M14	LG-CAP/M14	20
NH65 RA65	M16	LG-CAP/M16	20

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4. Arrangement and Mounting of Linear Guide

1. Arrangement

› For NSK linear guides, the datum surfaces of the rail and of the slide are either marked with a "datum surface groove" or with an "arrow."

› In case that two or more linear guides are used together, one linear guide is designated as a reference side guide, and the rest is adjusting side guide(s). The reference side linear guide has its reference number, serial number, and "KL" mark on the opposite side of the datum surface (**Fig. 1**).

› When the datum surfaces of the reference side rail and slides are pressed to their mounting datum surfaces respectively, the variation of distance (mounting width W_2 or W_3) between the datum surfaces of the rails and that of the slides must be a minimum and therefore, it is specified as the standard. (**Figs. 2** and **3**)

› The ways to indicate the datum surfaces of each series are shown in **Table 1**.

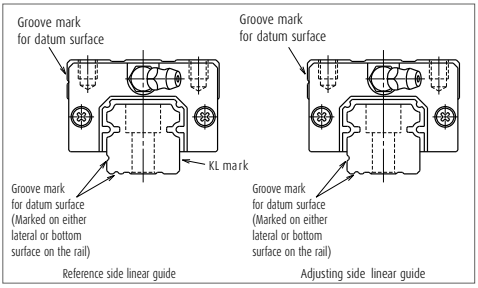


Fig. 1 Datum surface

Example of arrangement

› The arrangement of the linear guides must be determined taking into account the table mounting position (horizontal, vertical, inclined, or upside-down), strokes and the size of the machine base to which the table is mounted. **Table 2** shows common arrangement examples and their properties (features/precautions).

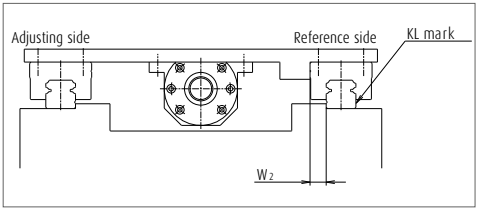


Fig. 2 Most common setting of the reference side rail

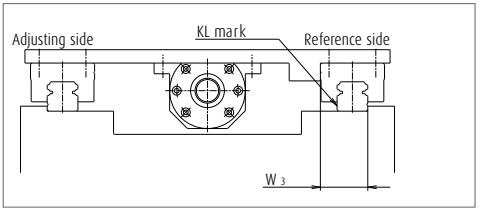
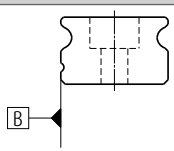
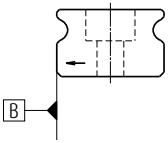
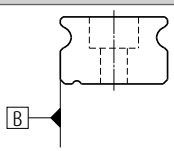
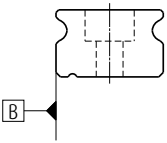
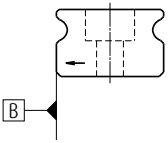
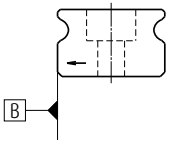


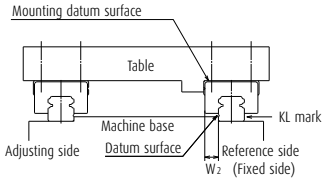
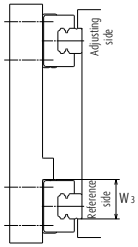
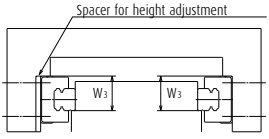
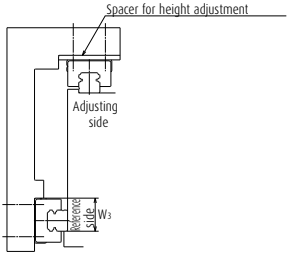
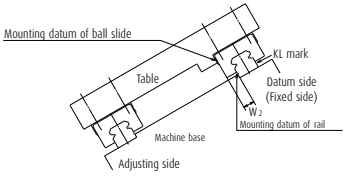
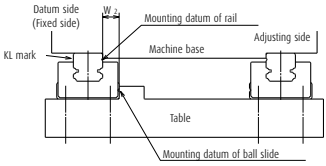
Fig. 3 Setting of the reference side rail in certain occasions

Table 1 Marks on the rail datum surfaces in each series

Material \ Model No.	Standard	LU05, 07, 09 PU05, 09, 12, 15 LE07, 09, 12	LU12, 15, NH15, NS15	PU07 LE05, 15 LE09, 12 (with a ball retainer) PE series LH08, 10, 12 LW17, 21 RA15
Special high carbon steel				
Stainless steel				

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Table 2 Arrangement example

Arrangement	Features/Precautions
	› Easy for a highly-accurate installation (recommended arrangement)
	› Easy in highly-accurate installation › The lubricant oil may not be supplied to slides. When oil lubricant is used, special care is required to design the oil supply routing.
	› Slightly difficult for a highly-accurate installation › The life of the linear guides is affected by the mounting accuracy. › When oil lubricant is used, special care is required to design the oil supply routing.
	› Difficult for a highly-accurate installation › When oil lubricant is used, special care is required to design the oil supply routing.
	› Rather easy for a highly-accurate installation › When oil lubricant is used, special care is required to design the oil supply routing.
	› Easy in highly-accurate installation if the linear guides are installed to the machine base first, and then hung them upside down along with the machine base. › The slide may detach from the rail and fall down if the linear guide is damaged and rolling elements in the slide fall out. It is necessary to take preventive measures against the falling of the ball slide.

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4. Arrangement and Mounting of Linear Guide

2. Mounting accuracy

(1) Accuracy of the mounting base of machine

› The mounting accuracy of linear guide usually copies the accuracy of the machine base.

› However, when two or more slides are assembled to each rail, the table stroke becomes shorter than the mounting surface. This, along with the fact that the mounting error is evenly spread, contributes to a higher table accuracy than the mounting surface accuracy, reducing the error to about 1/3 in average (**Fig. 4**).

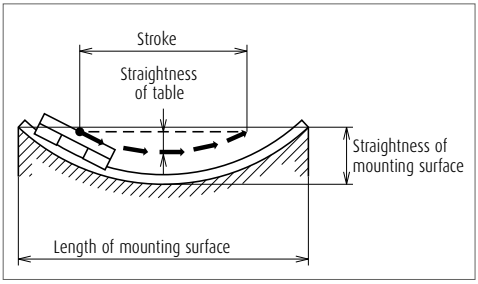
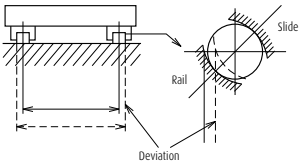
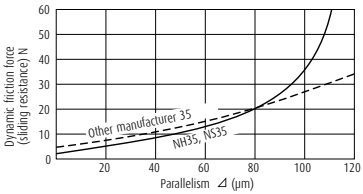
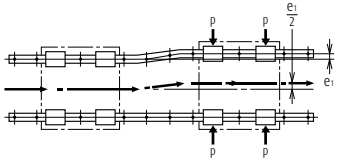


Fig. 4

(2) Installation error

› Mounting error affects mainly three factors: life, friction and accuracy (**Table 3**).

Table 3 Influence of mounting error

Factor	Influence	
Life		› Large mounting error generates a force which twists the slide and reduces its life. › It also distorts the contact point of the ball and the groove, and changes contact angle, thus lowering the table rigidity.
Friction		› NH and NS Series are affected very little by mounting error thanks to their small friction. (self aligning capability) › However, because of off-set Gothic arch grooves, their friction suddenly soars once the mounting error exceeds a certain level. › The mounting error severely affects friction of LA Series with heavy preload.
Accuracy		› When the rigidity of four slides is equal, the theoretical straightness becomes 1/2 of the installation error "e1". › However, this value becomes slightly larger due to the deformation of the rail and the machine base.

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(3) Permissible values of mounting error

› Among the three factors of life, friction, and accuracy, which are affected by the mounting error, NSK focuses on the life factor to determine the permissible mounting accuracy. The specifications are based on the following conditions.

For ball linear guides

› The permissible load per ball slide due to the mounting error is 10% of the basic dynamic load rating C_{50}.

› The rated life is 5 000 km.

› The rigidity of the machine base is infinite.

For roller linear guide

› The permissible load per roller slide due to the mounting error is 10% of the basic dynamic load rating C_{100}.

› The rated life is 10 000 km.

› The rigidity of the machine base is infinite.

C_{50} ; Basic dynamic load rating for 50 km rated fatigue life
C_{100} ; Basic dynamic load rating for 100 km rated fatigue life

› **Figs. 5** and **6** are representing the mounting errors of e_1 and e_2. Their permissible values are shown in the description of the installation of each series.

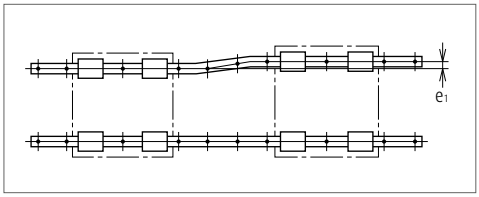


Fig. 5

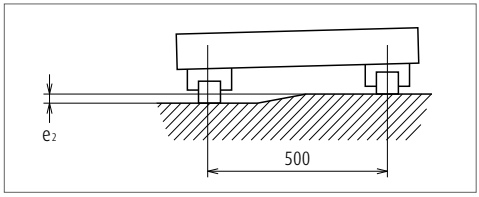


Fig. 6

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(4) Running accuracy and the influence of even-off effect

› When mounting on a machine base, the linear guide is affected by the flatness of the mounting surface. However, in the case of two-rail/four-slide specification, which is most widely used, the straightness as a table unit is generally less than the straightness as a single component. This is due to the even-off effect generated by the shorter table stroke, compared to the rail length, as well as by interaction between the rails and slides.

› **Fig. 9** shows an actually measured straightness of the table which uses NSK linear guides. In this case, the final straightness of the table is about 1/5 of the straightness of the mounting surface.

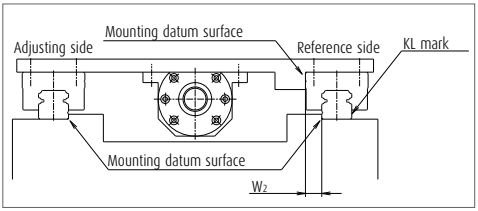


Fig. 7

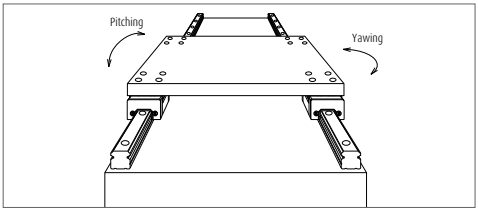


Fig. 8

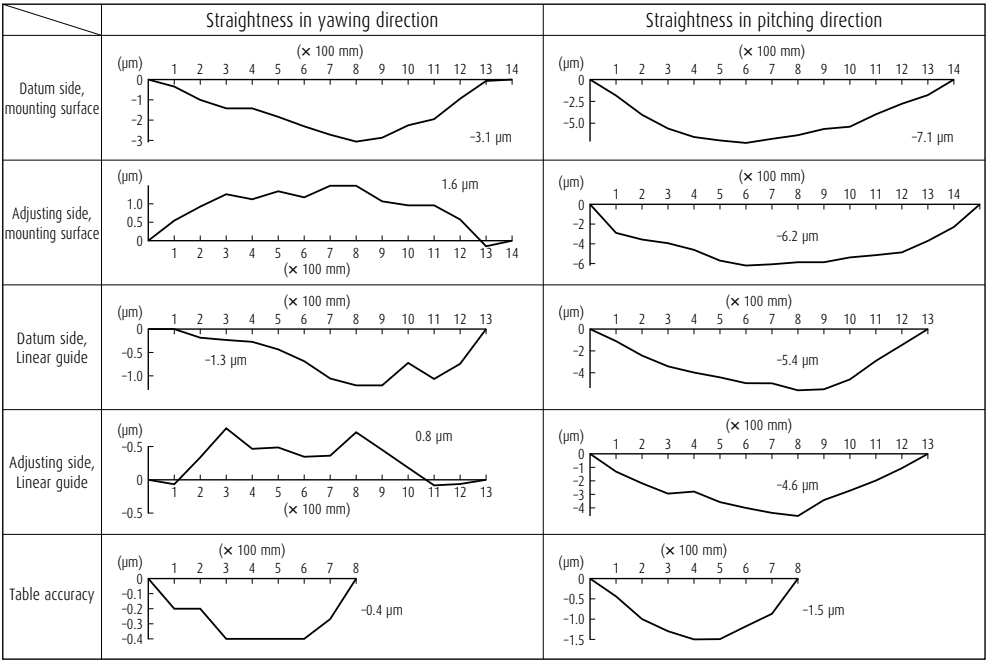


Fig. 9 Straightness of the table equipped with linear guide

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3. Installation

(1) Shoulder height of the mounting surface of the machine base and corner radius r

› **Figs. 10** and **11**, show shoulder height of the mounting surface of the machine base and the size of corner radius. These figures are relevant when the linear guide is pressed to the shoulder of the machine base or table (the raised section from where the mounting surface begins), and horizontally secured to it. Recommended sizes are shown in the clause of "Shoulder height and corner radius r" of each series introduction.

› The shoulder should be thick (wide) enough, so it is not deformed by the pressing force.

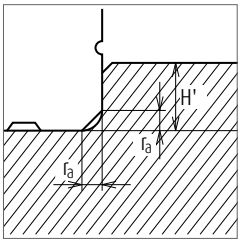


Fig. 10 Shoulder for the rail datum face

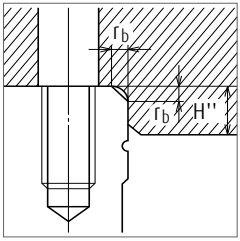


Fig. 11 Shoulder for the slide datum face

(2) Tightening torque of the bolt

› **Table 4** shows tightening torque of the bolt when the rail is secured to the fixture of race way grinding machine.

› Apply same torque in this table when securing the rail to the machine base. Equal accuracy at the time of grinding can be obtained.

Table 4 Bolt tightening torque (Bolt material: High carbon chromium steel)

Unit: N·m

Bolt size	Tightening torque	Bolt size	Tightening torque
M2	0.27	M8	22
M2.3	0.38	M10	43
M2.5	0.58	M12	76
M3	1.06	M14	122
M4	2.5	M16	196
M5	5.1	M18	265
M6	8.6	M22	520

(3) Installation procedures

› There are two installation ways depending on the accuracy requirement.
  a. Installation with high accuracy
  b. Accuracy is not high, but easy to install

› For both methods, wipe off the rust preventive oil applied to the linear guide. Remove burrs and small bumps on the machine base and table mounting surface with an oilstone (**Fig. 12**).

› Apply machine oil or similar oil with low viscosity to the mounting surface to increase the rust preventive effect.

› Linear guides are precision products. Handle them with care.

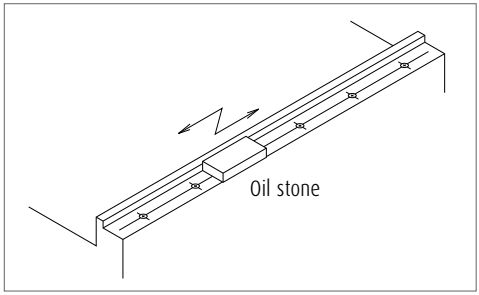


Fig. 12

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1) Highly accurate installation

A) Rail installation procedures

a) When the machine base has a shoulder for the reference side rail.

[1] Confirm that the rail is reference side rail, and the datum surface of the rail comes to face to face with the shoulder of the machine base. Keep the slides on the rail, and carefully place the rail on the machine base on its mounting surface. Loosely tighten the bolts.

At this time, press the rail from sideways to make the rail tightly contact to the shoulder of the machine base. When using a shoulder plate, refer to **Table 4** for the bolt tightening torque (**Fig. 13**).

Refer to "**4. Various methods to press linear guide sideways.**"

[2] For final tightening of the bolts to secure the rail, tighten the bolt on either end of the rail, then proceed to other end.

If the datum surface is on the left side as shown in **Fig. 14**, tighten the bolt at the farthest end first, then proceed to the near end.

This way, creates a bolt rotating force that presses the rail against the shoulder. (Therefore, the rail is pressed sufficiently tight against the shoulder by merely pressing the rail by hand. However, if there is a possibility applying a lateral impact load, it is necessary to use a shoulder plate to prevent the rail from slipping.)

[3] If the mounting surface of the machine base where the adjusting side rail is installed also has a shoulder, repeat the steps **[1] - [2]**.

[4] If there is no shoulder on the mounting surface of the machine base for the adjusting side rail: Secure a measuring table to the slides of the reference side rail (**Fig. 15**). Use this to adjust the parallelism of the adjusting side rail. Check parallelism of the adjusting side rail with a dial indicator from one end of the rail, tightening the bolts one by one.

The measuring table is more stable if secured to two slides, but one slides is sufficient.

Parallelism between two rails can also be checked by the same method in **Fig. 15** when there is a shoulder on the surface where the adjusting side rail is installed.

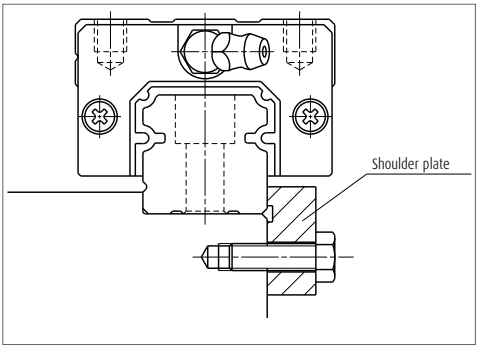


Fig. 13 Pressing the rail from sideways

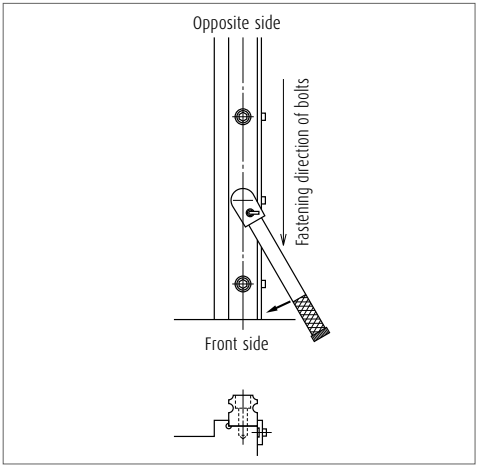


Fig. 14 Rail installation

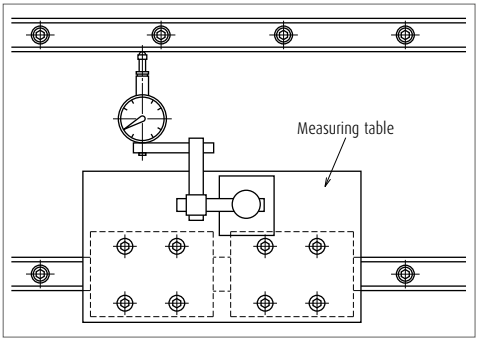


Fig. 15 Measuring parallelism

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b) When the machine base does not have a shoulder on the side where the reference side rail is installed

[1] Carefully place the reference side rail on its mounting surface of the machine base. Loosely tighten the bolts. Do not tighten the bolts all the way, but stop tightening when the bolt enters halfway into the bolt hole. This makes the proceeding steps easier.

[2] Place the straight edge almost parallel to the reference side rail which is temporarily secured by the bolts. (At both ends of the rail and straight edge, the distance between them shall be almost same.)

[3] Once the position of the straight edge is determined, use it as the reference. With a dial indicator, check parallelism with the rail, and adjust the rail if necessary. Then tighten the bolts.

Ensure that the straight edge does not move while the bolts are being tightened.

This procedure should be carried out starting from one end of the rail to the other end (**Fig. 16**).

[4] Finally tighten all bolts with specified torque.

[5] There are two ways for installation of adjusting side rail:

1. Based on the straight edge which is used for reference side rail installation
2. Based on the reference side rail which is installed prior to the adjusting side rail.

In both cases, use a dial indicator to measure parallelism.

Other procedures are the same as **[1] - [4]** above, and the **[4]** for the case where there is a shoulder on the machine base.

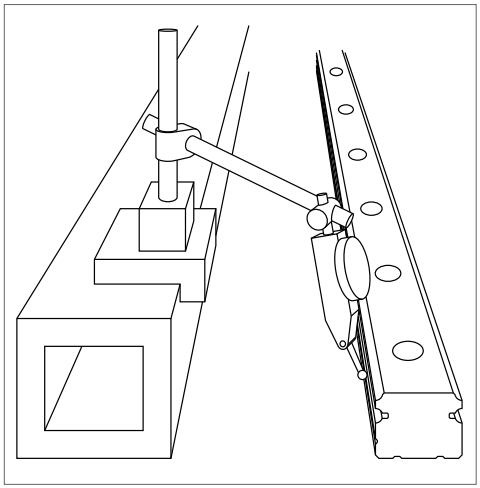


Fig. 16

B) Procedures for slide installation

a) When the table has a shoulder

[1] Arrange the slides so that locations match to their mounting section of the table. Carefully place the table on the slides. Loosely tighten all bolts.

[2] While pressing the table from sideways, further tighten the bolts which secure the slides on the reference side, so the table shoulder and the slide's mounting datum surface are sufficiently tightly pressed.

If a shoulder plate is provided, first tighten the bolts of the plate, then further tighten the bolts to the slides (**Fig. 17**).

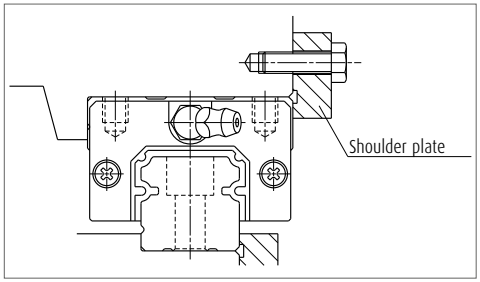


Fig. 17 Pressing slide from sideways

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[3] Then, further tighten the bolts for slides on the adjusting side rail.

Move the table by hand to confirm that there is no abnormality such as excessive friction force during stroking. (This confirms that the correct installation steps were taken.)

[4] Finally, tighten all bolts with standard torque.

b) When table does not have a shoulder

[1] Arrange the slides so that locations match to their mounting section of the table. Carefully place the table on the slides. Loosely tighten bolts to secure the slides.

[2] Since the table does not have a shoulder, immediately tighten the bolts further to secure slides.

[3] Move the table by hand to confirm that there is no abnormality. Finally, tighten all bolts with the specified torque.

2) Easy installation

[1] Carefully place the reference side rail on the machine base. Then tighten the bolts to the specified torque.

[2] Loosely tighten the bolts on the adjusting side rail.

[3] Tighten the slides on the reference side rail and one slide on the adjustment side rail with the specified torque. Leave the rest of the slide on the adjusting side rail loosely tightened (**Fig. 18**).

[4] While moving the table with each pitch of the bolt for rail: With the specified torque, tighten the rail mounting bolt which is located immediately adjacent to the slide on the adjusting side rail that had been firmly tightened.

Take this procedure from one end to the other.

[5] Return the table to the original position once. Then, tighten the rest of the slides on the adjusting side to the specified torque. By the same procedure as in [4], tighten the rest of the rail mounting bolts to the specified torque. Move the table to check any abnormality such as large friction force.

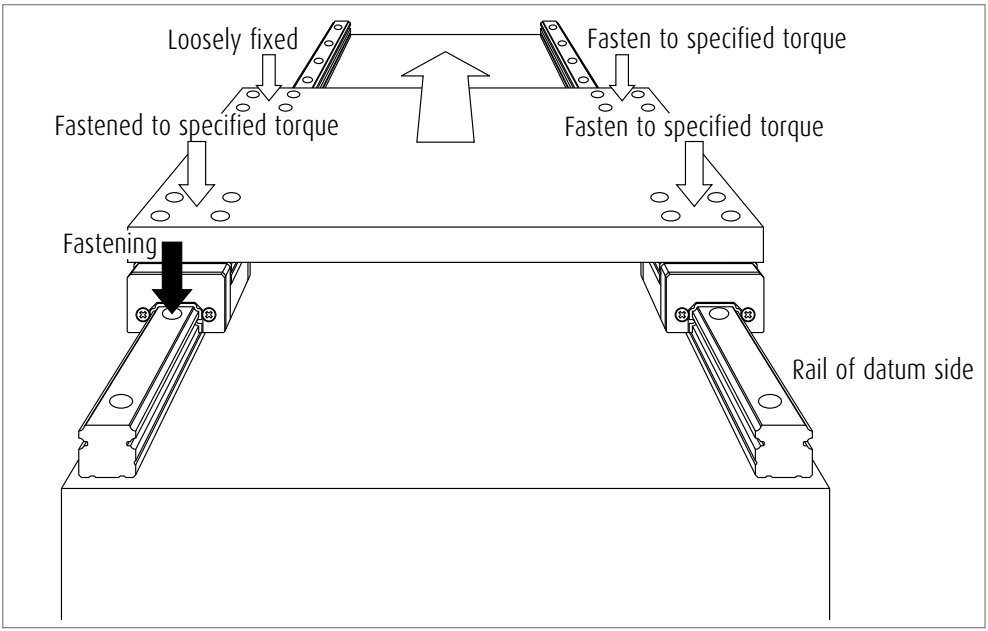


Fig. 18 Easy installation

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(4) Various methods to press linear guide sideways

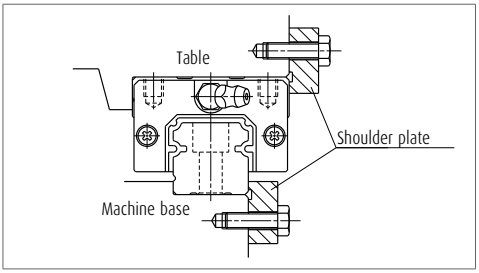


Fig. 19 Recommended method

› This method is most widely used, and generally recommended. The slides and the rail should protrude slightly from the sides of the table and the machine base. The shoulder plate should have a recess, so that the corners of the rail and slide do not touch the shoulder plate.

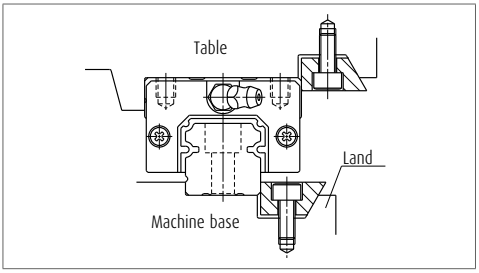


Fig. 20 Installation that requires caution

› A tapered block is squeezed in. However, the slightest tightening of the bolt generates a large pressing force to the side. Too much tightening may cause the rail to deform, or the land (shown in the figure left) to warp to the right. This method requires caution.

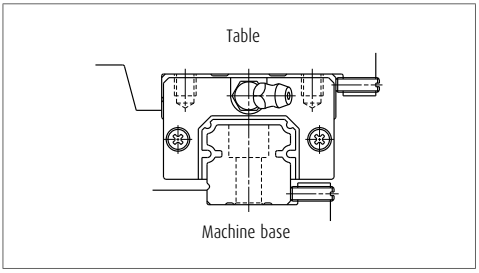


Fig. 21

› The bolt that presses rail must be thin due to limited space.

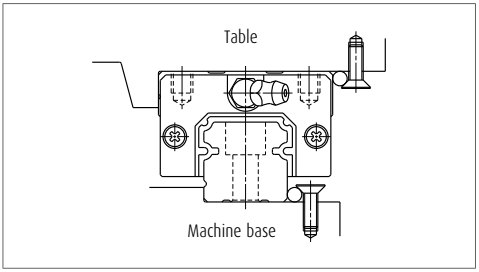


Fig. 22

› Press a needle roller with a taper section of the head of a slotted pan head screw. Watch out for the position of the screw.

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4. Assembly random-matching type linear guide

› Slides of random-matching type are assembled on a provisional rail (an inserting tool) when it is delivered (**Fig. 23**).

› NSK standard grease is packed into the slide, allowing immediate use.

Assembly procedures of a random-matching type linear guide

Follow steps as described below.

(1) Wipe off the rust preventive oil from the rail and slide.

(2) Please match a groove mark for the datum surface of slide and rail to set a desired assembling state W_2 or W_3.

(3) Align the provisional rail to the rail in the bottom and side surfaces. Press the provisional rail lightly against the rail, and move the slide over the rail (**Fig. 23**).

5. Butting rail specification

› A rail which requires the length that exceeds the machine capacity manufactured maximum length comes in butting specification.

› The rails with butting specification are marked with alphabet (A, B, C ...) and an arrow on the opposite side of the mounting datum surface. Use the alphabets and arrows for assembly order and direction of the rail (**Fig. 25**).

The random-matching rails for butting specification are only marked with the arrows.

› The pitch of the rail mounting hole on the butting section should be as F in **Fig. 26**. When two rails are used in parallel, the butted sections should not align. This is to avoid change in the running accuracy of the table at the butted sections.

› We recommend shifting the butting sections more than the length of a slide. If the higher running accuracy is required, consider installing the slides into the table so that they do not simultaneously pass the butting sections.

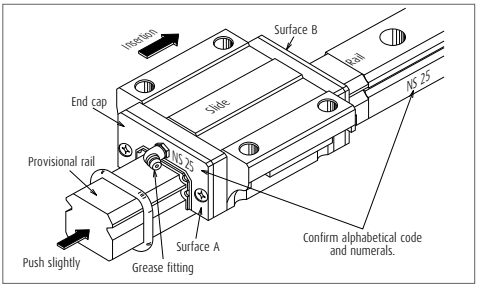


Fig. 23 Inserting slide into the rail

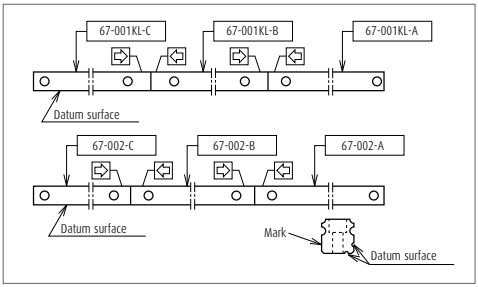


Fig. 25

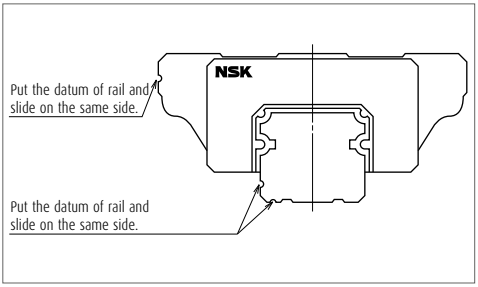


Fig. 24

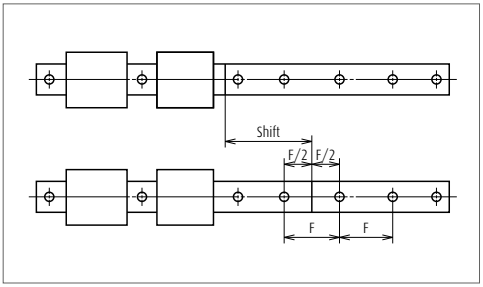


Fig. 26

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6. Handling preloaded assembly

› In case of the preloaded assembly (not random-matching type), do not remove slides from the rail as a general rule.

› If it is unavoidable to remove slides from the rail, make certain to use a provisional rail (a jig used to insert a slide to the rail) as shown in **Fig. 27**.

› The provisional rails for each series and sizes are available.

› Pay due attention to the assembly mark when returning the slide back to the rail. Follow the cautions described below.

Mark for assembling ball slide and rail

› Rails of preloaded assembly (not random-matching type) are marked with a reference number and a serial number on the opposite of the datum surface.

› Slides to be combined are also marked with the same serial number (the reference number is not marked).

› Furthermore, slides are marked with an arrow. Slides should be positioned with their arrows facing each other.

› In case that the slides had to be removed from the rail, confirm their serial numbers and the directions of arrows for re-assembly (**Fig. 28**).

› When two or more rails are used in a single set, serial numbers are in sequence if their reference numbers are the same. The linear guide with smallest serial number has the "KL" mark (**Fig. 29**).

› When two or more rails of different reference number are used in a single set, the rails and slides have the same serial number. In this case, when slides are removed from the rail, it is unclear which rail each slide was previously installed on. When removing ball slides from the rail for an unavoidable reason (**Fig. 30**), sufficient precaution is required.

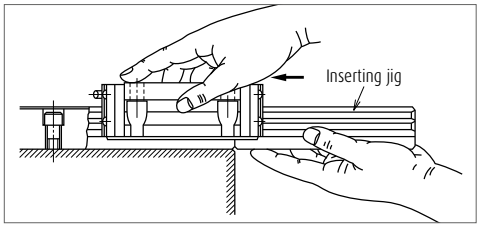


Fig. 27

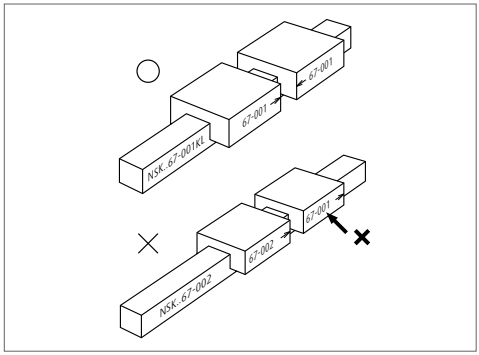


Fig. 28

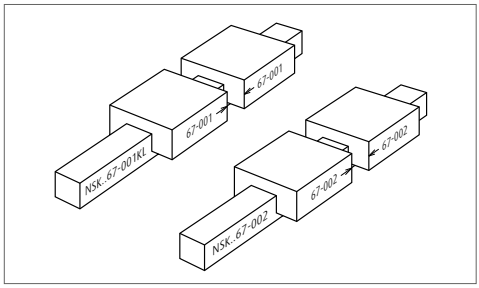


Fig. 29 When two rails have the same reference number

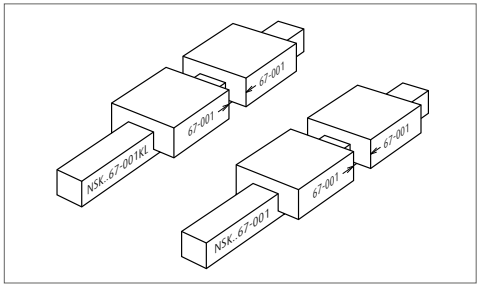


Fig. 30 When two rails have different reference number

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5. Handling Precautions of Linear Guides

1. Handling Precautions

NSK linear guides are high quality and are easy to use. NSK places importance on safety in design. For maximum safety, please follow precautions as outlined below.

(1) Lubrication



Confirm lubrication.

a. If your linear guide is rust prevention specification, thoroughly wipe the rust prevention oil and put lubricant inside of slide before using. For seal lubrication products, put lubricant on the rail.

b. Do not mix greases of different brands.

c. If your linear guide is rust prevention specification, put lubricant inside of slide before using.

(2) Handling



Handle with care.



Do not disassemble.



Do not drop.



Do not give impact.

a. Slides for random-matching are mounted on a provisional rail when they leave the factory. Handle the slide with care during installation on the rail.

b. Do not disassemble the linear guide unless absolutely necessary. Not only does it allow dust to enter, but it lessens precision.

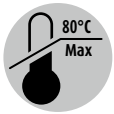
c. The slide may move by simply tilting the rail. Make sure that the slide does not disengage from the rail.

d. Standard end cap is made of plastic. Striking it or hitting it against an object may cause damage.

(3) Precautions in use



Do not contaminate.



Temperature limitation.



Do not hang upside down.

a. Make every effort not to allow dust and foreign objects to enter.

b. Please apply splash guard or bellows to the linear guide to prevent sticking resolvent or coolant when it contains corrosive material.

c. The temperature of the place where linear guides are used should not exceed 80°C (excluding heat-resistant type linear guides). A higher temperature may damage the plastic end cap.

d. If the user cuts the rail, thoroughly remove burrs and sharp edges on the cut surface.

e. When hanging upside-down (e.g. the rail is installed upside-down on the ceiling in which the slide faces downward), should the end cap be damaged, causing the balls or rollers to fall out, the slide may be detached from the rail and fall. For such use, take measures including installing a safety device.

(4) Storage



Store in the correct position.

a. Linear guide may bend if the rail is stored in inappropriate position. Place it on a suitable surface, and store it in a flat position.

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2. Design Precautions

The following points must be heeded in examining the life.



In case of oscillating stroke

› If the balls or rollers do not rotate all the way, but only halfway, and if this minute stroke is repeated, lubricant disappears from the contact surface of balls or rollers and raceways. This generates "fretting," a premature wear. Fretting cannot be entirely prevented in such a case but it can be mitigated.

› We recommend anti-fretting grease for oscillating stroke operations. Even in a case using a standard grease, the life can be markedly prolonged by adding a normal stroke travel (about the slide length) once every several thousand cycles.



When applying pitching or yawing moment

› Load applied to the ball or roller rows inside the slide is inconsistent if pitching or yawing moment load is applied. Loads are heavy on the balls or rollers on each end of the row.

› In such a case, a heavy load lubricant grease or oil is recommended. Another countermeasure is using one size larger model of linear guide to reduce the load per ball or roller.

› Moment load is insignificant for 2-rail, 4-slide combination which is commonly used.



When an extraordinary large load is applied during stroke

› If an extraordinary large load is applied at certain position of the stroke, calculate not only the life based on the mean effective load, but also the life based on the load in this range.

› When an extraordinary heavy load is applied and thus the application of high tensile stress to fixing bolts of the rails and slides is foreseen, the strength of the bolts should be considered.



When calculated life is extraordinarily short

(Less than 3000 km in calculated life.)

› In such a case, the contact pressure to the balls or rollers and the rolling contact surface is extraordinarily high.

› When a linear guide is operated under such state continually, the life is significantly affected by the loss of lubrication and the presence of dust, and thus the actual life becomes shorter than calculated.

› It is necessary to reconsider the number of slides, the arrangement of slides, and the type of model in order to reduce the load to the slide.

› It is necessary to consider preload for calculation of rating life when selecting Z3 (medium preload) or Z4 (heavy preload) as a preload. Please consult NSK for details.



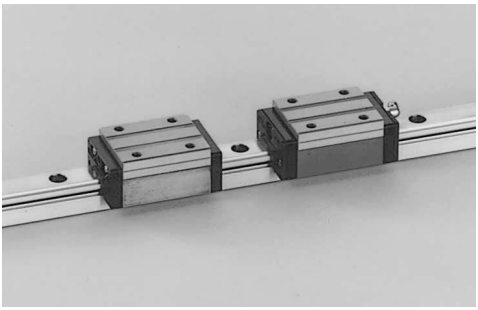
Application at high speed

› The standard maximum allowable speed of a linear guide under normal conditions is 100 m/min. However, the maximum allowable speed can be affected by accuracy of installation, temperature, external loading etc.

› The end cap with high speed specification must be used when operating speed exceeds the permissible speed. In such a case, please consult NSK.

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6. NH-Series: Linear Ball Guides



1. Features

(1) Improve rating life dramatically

Based on the LH series characterized by reliability and performance, a significant increase in durability has been attained. New ball groove geometry is introduced, which has been developed by utilizing NSK's state-of-the-art tribological and analytical technologies. Due to the optimized distribution of contact surface pressures, the rating life has dramatically increased.

As compared with the LH Series, the load rating capacity of the NH series has increased by 1.3 times, while the life span has increased doubled*1. These features enable you to design a machine with a longer life and downsize the machine. Thus, your design capability is greatly enhanced.

*1: Representative values of series.

(2) Ball circulation path with excellent high-speed property

By reexamining the design practice for the ball circulation path, we have attained smooth ball circulation and reduced noise level. So, NH series is suited for high-speed applications compared with the LH Series.

(3) All mounting dimensions are the same as those for the LH and SH Series

Regarding the mounting dimensions, such as the mounting height, mounting width, mounting hole diameter/pitch of the linear guide, etc., the mounting dimensions of the NH Series remain the same as those of the conventional LH series and SH series. So, the new NH Series linear guides can be used without making any design changes.

(4) High self-aligning capability (rolling direction)

Same as the DF combination in angular contact bearings, self-aligning capability is high because the cross point of the contact lines of balls and grooves comes inside, and thus reducing moment rigidity.

This increases the capacity to absorb errors in installation.

(5) High load carrying capacity in vertical direction

The contact angle is set at 50 degrees, and thus increasing load carrying capacity as well as rigidity in vertical direction.

(6) High resistance against impact load

The bottom ball groove is formed in Gothic arch and the center of the top and bottom grooves are offset as shown in **Fig. 2**. The vertical load is generally carried by the top ball rows, where balls are contacting at two points. Because of this design, the bottom ball rows will carry load when a large impact load is applied vertically as shown in **Fig. 3**. This assures high resistance to the impact load.

(7) High accuracy

As showing in **Fig. 4**, fixing the master rollers to the ball grooves is easy thanks to the Gothic arch groove. This makes easy and accurate measuring of ball grooves.

(8) Easy to handle, and designed with safety in mind.

Balls are retained in the retainer, therefore they do not fall out when the ball slide is withdrawn from the rail.

(9) Abundant models and sizes

Each size of NH Series has various models of ball slides, rendering the linear guide available for numerous uses.

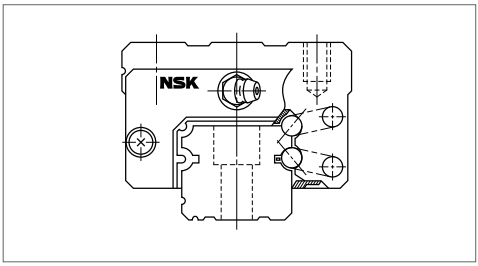


Fig. 1 NH Series

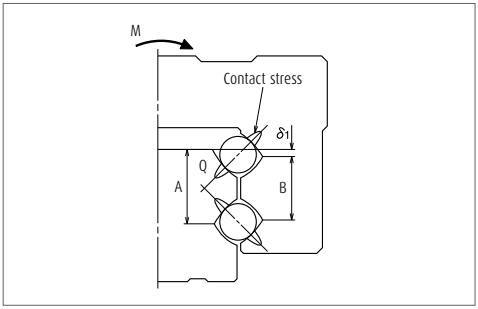


Fig. 2 Enlarged illustration of the offset Gothic arch groove

Note For customers who have used the former LH or SH series, NH series is recommended as a substitute. Please confirm the correlation between NH series and former ones on the comparative table at page 108.

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(10) Fast delivery

Lineup of random-matching rails and ball slides supports and facilitates fast delivery.

High precision grade and medium preload types are also available in randam matching. (Special high-carbon steel products)

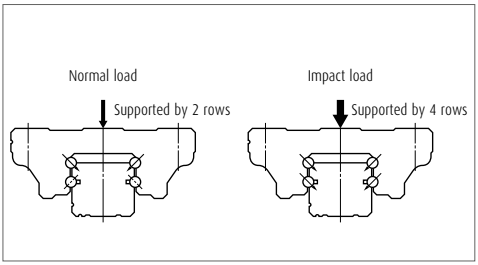


Fig. 3 When load is applied

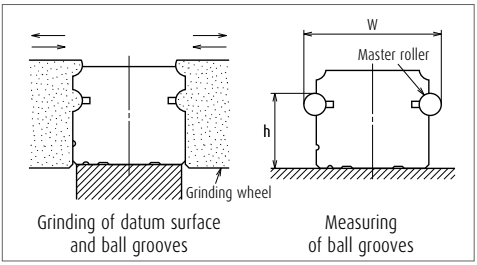
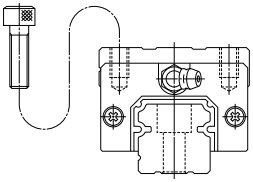
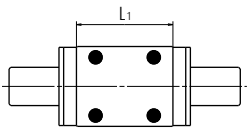
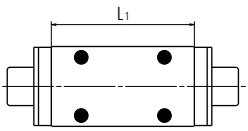
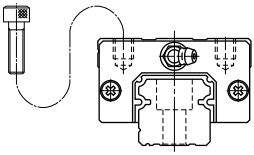
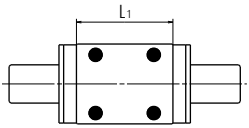
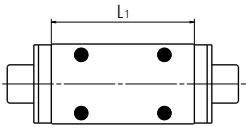
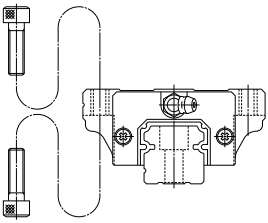
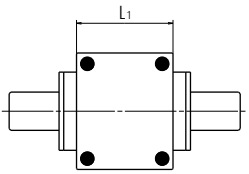
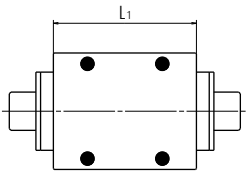


Fig. 4 Rail grinding and measuring

2. Ball slide shape

Ball slide Model	Shape/installation method	Type	
		High-load type	Super-high-load type
		Standard	Long
AN BN		AN 	BN 
AL BL		AL 	BL 
EM GM		EM 	GM 

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3. Accuracy and preload

(1) Running parallelism of ball slide

Table 1

Unit: μm

Rail over all length (mm) over	or less	Preloaded assembly (not random matching) Ultra precision P3	Super precision P4	High precision P5	Precision grade P6	Normal grade PN	Random-matching type High precision PH	Normal grade PC
–	50	2	2	2	4.5	6	2	6
50 –	80	2	2	3	5	6	3	6
80 –	125	2	2	3.5	5.5	6.5	3.5	6.5
125 –	200	2	2	4	6	7	4	7
200 –	250	2	2.5	5	7	8	5	8
250 –	315	2	2.5	5	8	9	5	9
315 –	400	2	3	6	9	11	6	11
400 –	500	2	3	6	10	12	6	12
500 –	630	2	3.5	7	12	14	7	14
630 –	800	2	4.5	8	14	16	8	16
800 –	1000	2.5	5	9	16	18	9	18
1 000 –	1 250	3	6	10	17	20	10	20
1 250 –	1 600	4	7	11	19	23	11	23
1 600 –	2 000	4.5	8	13	21	26	13	26
2 000 –	2 500	5	10	15	22	29	15	29
2 500 –	3 150	6	11	17	25	32	17	32
3 150 –	4 000	9	16	23	30	34	23	34

(2) Accuracy standard

The preloaded assembly has five accuracy grades; Ultra precision P3, Super precision P4, High precision P5, Precision P6 and Normal PN grades, while the random-matching type has High precision PH and Normal PC grade.

› **Tolerance of preloaded assembly**

Table 2

Unit: μm

Characteristics \ Accuracy grade	Ultra precision P3	Super precision P4	High precision P5	Precision grade P6	Normal grade PN
Mounting height H Variation of H (All ball slides on a set of rails)	±10 3	±10 5	±20 7	±40 15	±80 25
Mounting width W_2 or W_3 Variation of W_2 or W_3 (All ball slides on reference rail)	±15 3	±15 7	±25 10	±50 20	±100 30
Running parallelism of surface C to surface A Running parallelism of surface D to surface B	Shown in **Table 1**, **Fig. 5** and **Fig. 6**				

› **Tolerance of random-matching type**

Table 3

Unit: μm

Accuracy grade	High precision grade PH		Normal grade PC	
Characteristics \ Model No.	NH15, 20, 25, 30, 35	NH45, 55, 65	NH15, 20, 25, 30, 35	NH45, 55, 65
Mounting height H	±20	±30	±20	±30
Variation of mounting height H	15(1) 30(2)	20(1) 35(2)	15(1) 30(2)	20(1) 35(2)
Mounting width W_2 or W_3	±30	±35	±30	±35
Variation of mounting width W_2 or W_3	25	30	25	30
Running parallelism of surface C to surface A Running parallelism of surface D to surface B	See **Table 1**, **Fig. 5** and **Fig. 6**			

Notes ① Variation on the same rail ② Variation on multiple rails

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(3) Combinations of accuracy and preload

Table 4

		Accuracy grade						
		Ultra precision	Super precision	High precision	Precision grade	Normal grade	High precision	Normal grade
Without NSK K1 lubrication unit		P3	P4	P5	P6	PN	PH	PC
With NSK K1 lubrication unit		K3	K4	K5	K6	KN	KH	KC
With NSK K1-L lubrication unit		L3	L4	L5	L6	LN	LH	LC
With NSK K1 for food and medical equipment		F3	F4	F5	F6	FN	FH	FC
Preload	Fine clearance Z0	○	○	○	○	○	–	–
	Slight preload Z1	○	○	○	○	○	–	–
	Medium preload Z3	○	○	○	○	–	–	–
	Random-matching type with fine clearance ZT	–	–	–	–	–	–	○
	Random-matching type with slight preload ZZ	–	–	–	–	–	○	○
	Random-matching type with medium preload ZH	–	–	–	–	–	○	○

(4) Assembled accuracy

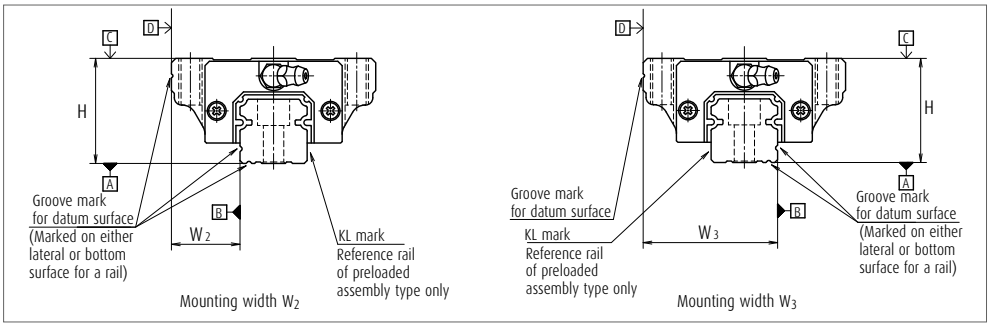


Fig. 5 Special high carbon steel

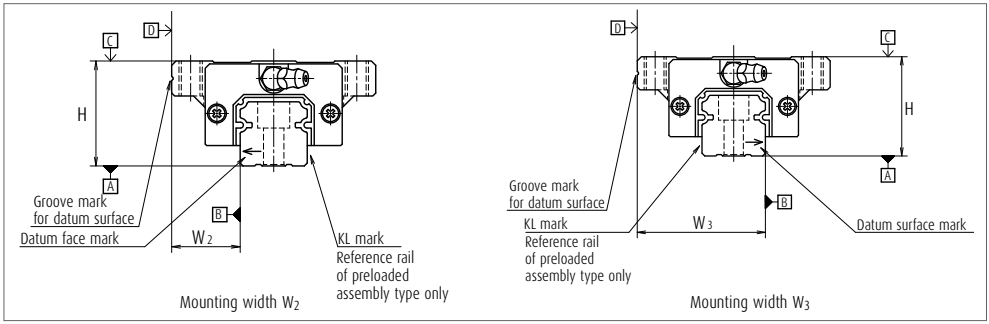


Fig. 6 Stainless steel

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(5) Preload and rigidity

We offer six levels of preload: Slight preload Z1, Medium preload Z3 and Fine clearance Z0, along with random-matching type of Medium preload ZH, Slight preload ZZ and Fine clearance ZT.

› Preload and rigidity of preloaded assembly

Table 5

	Model No.	Preload (N)		Rigidity (N/μm)			
				Vertical direction		Lateral direction	
		Slight preload (Z1)	Medium preload (Z3)	Slight preload (Z1)	Medium preload (Z3)	Slight preload (Z1)	Medium preload (Z3)
High-load type	NH15 AN, EM	78	490	137	226	98	186
	NH20 AN, EM	147	835	186	335	137	245
	NH25 AL, AN, EM	196	1 270	206	380	147	284
	NH30 AL, AN	245	1 570	216	400	157	294
	NH30 EM	294	1 770	265	480	186	355
	NH35 AL, AN, EM	390	2 350	305	560	216	390
	NH45 AL, AN, EM	635	3 900	400	745	284	540
	NH55 AL, AN, EM	980	5 900	490	910	345	645
	NH65 AN, EM	1 470	8 900	580	1 070	400	755
Super-high-load type	NH15 BN, GM	98	685	196	345	137	284
	NH20 BN, GM	196	1 080	265	480	196	355
	NH25 BL, BN, GM	245	1 570	294	560	216	400
	NH30 BL, BN, GM	390	2 260	360	665	265	480
	NH35 BL, BN, GM	490	2 940	430	795	305	570
	NH45 BL, BN, GM	785	4 800	520	960	370	695
	NH55 BL, BN, GM	1 180	7 050	635	1 170	440	835
	NH65 BN, GM	1 860	11 300	805	1 480	550	1 040

Note Clearance for Fine clearance Z0 is 0 to 3μm. Therefore, preload is zero. However, Z0 of PN grade is 0 to 15μm.

› Clearance and preload of random-matching type

Table 6

Unit : μm

Model No.	Fine clearance ZT	Slight preload ZZ	Medium preload ZH
NH15	−4 – 15	-4 – 0	-7 – -3
NH20		-5 – 0	-8 – -3
NH25		-5 – 0	-9 – -4
NH30		-7 – 0	-12 – -5
NH35	−5 – 15	-7 – 0	-12 – -5
NH45		-7 – 0	-14 – -7
NH55		-9 – 0	-18 – -9
NH65		-9 – 0	-19 – -10

Note Minus sign denotes that a value is an amount of preload (elastic deformation of balls).

4. Maximum rail length

Table 7 shows the limitations of rail length (maximum length). However, the limitations vary by accuracy grades.

Table 7 Length limitations of rails

Unit : mm

Series	Size / Material	15	20	25	30	35	45	55	65
NH	Special high carbon steel	2 980	3 960	3 960	4 000	4 000	3 990	3 960	3 900
	Stainless steel	1 800	3 500	3 500	3 500				

Note Rails can be butted if user requirement exceeds the rail length shown in the table. Please consult NSK.

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5. Installation

(1) Permissible values of mounting error

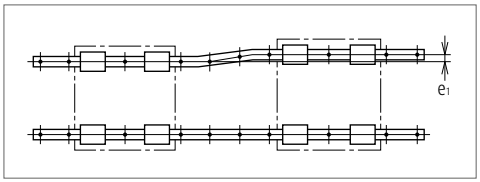


Fig. 7

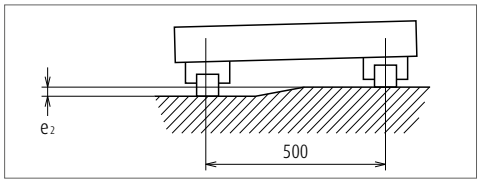


Fig. 8

Table 8

Unit : μm

Value	Preload	Model No.							
		NH15	NH20	NH25	NH30	NH35	NH45	NH55	NH65
Permissible values of parallelism in two rails e_1	Z0, ZT	22	30	40	45	55	65	80	110
	Z1, ZZ	18	20	25	30	35	45	55	70
	Z3, ZH	13	15	20	25	30	40	45	60
Permissible values of parallelism (height) in two rails e_2	Z0, ZT	375 μm/500 mm							
	Z1, ZZ, Z3, ZH	330 μm/500 mm							

(2) Shoulder height of the mounting surface and corner radius r

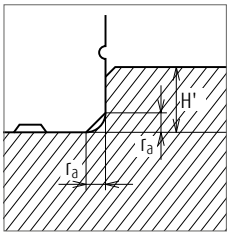


Fig. 9 Shoulder for the rail datum face

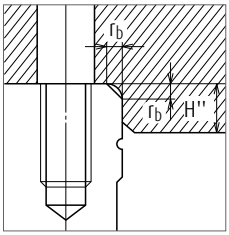


Fig. 10 Shoulder for the ball slide datum face

Table 9

Unit : mm

Model No.	Corner radius (maximum)		Shoulder height	
	r_a	r_b	H'	H"
NH15	0.5	0.5	4	4
NH20	0.5	0.5	4.5	5
NH25	0.5	0.5	5	5
NH30	0.5	0.5	6	6
NH35	0.5	0.5	6	6
NH45	0.7	0.7	8	8
NH55	0.7	0.7	10	10
NH65	1	1	11	11

6. Maximum allowable speed

An indication of the standard maximum allowable speed aiming at 10,000km operation with NH series under normal conditions is shown in Table 10. However, the maximum allowable speed can be affected by accuracy of installation, operating temperature, external load, etc. If the operation is made exceeding the permissible distance and speed, please consult NSK.

Table 10 Maximum allowable speed

Unit : m/min

Size \ Series	15	20	25	30	30	35	45	55
NH	300					200		150

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7. Dust proof components

(1) Standard specification

The NH Series can be readily used as they have a dust protection means for normal conditions. As the standard equipment, the ball slides have an end seal on both ends, and bottom seals at the bottom.

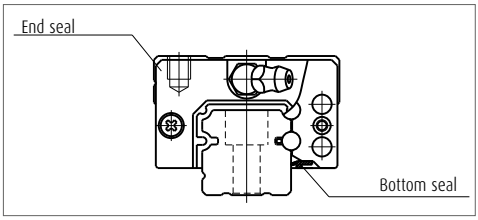


Fig. 11

Table 11 Seal friction per ball slide (maximum value)

Unit : N

Size \ Series	15	20	25	30	35	45	55	65
NH	8	9	10	10	12	17	22	29

(2) NSK K1-L lubrication unit

Table 12 shows the dimension of linear guides equipped with the NSK K1-L lubrication unit.

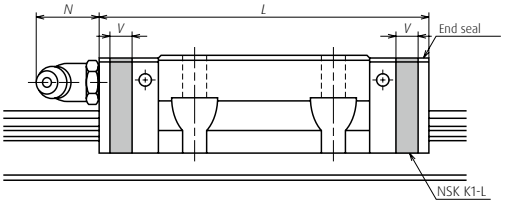


Table 12

Model No.	Ball slide length	Ball slide model	Standard ball slide length	Ball slide length installed with two NSK K1-L	NSK K1-L thickness V	Protruding area of the grease fitting N
NH15	Standard	AN, EM	55	65.6	5.3	(5)
	Long	BN, GM	74	84.6	5.3	(5)
NH20	Standard	AN, EM	69.8	80.4	5.3	(14)
	Long	BN, GM	91.8	102.4	5.3	(14)
NH25	Standard	AL, AN, EM	79	90.6	5.8	(14)
	Long	BL, BN, GM	107	118.6	5.8	(14)
NH30	Standard	AL, AN	85.6	97.6	6	(14)
	Standard	EM	98.6	110.6	6	(14)
	Long	BL, BN, GM	124.6	136.6	6	(14)
NH35	Standard	AL, AN, EM	109	122	6.5	(14)
	Long	BL, BN, GM	143	156	6.5	(14)
NH45	Standard	AL, AN, EM	139	154	7.5	(15)
	Long	BL, BN, GM	171	186	7.5	(15)
NH55	Standard	AL, AN, EM	163	178	7.5	(15)
	Long	BL, BN, GM	201	216	7.5	(15)
NH65	Standard	AN, EM	193	211	9	(16)
	Long	BN, GM	253	271	9	(16)

Notes 1) NSK K1 for food and medical equipment are available for NH15-35.
2) Ball slide length equipped with NSK K1-L = (Standard ball slide length) + (Thickness of NSK K1-L, V)

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(3) Double seal

Use a double seal set as showing in **Table 13**, when installing an extra seal to completed standard products. **(Fig. 12)**

When installing a grease fitting after the installation of double seals, a connector as showing in **Fig.12** is required.

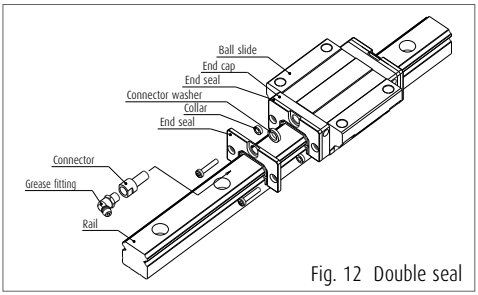


Fig. 12 Double seal

(4) Protector

Use a protector set as showing **Table 13**, when installing a protector to completed standard products. **(Fig.13)**

When installing a grease fitting after the installation of protectors, a connector as showing in **Fig.13** is required.

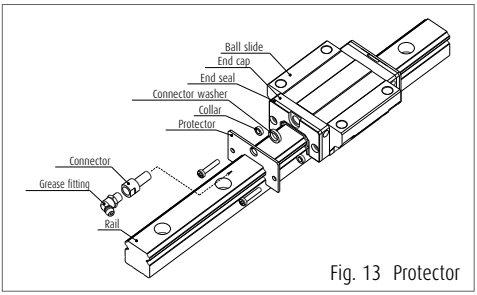


Fig. 13 Protector

Table 13 Double-seal set

Model No.	Reference No.		Increased thickness V_3 (mm)
	Without connector	With connector	
NH15	LH15WS-01	*	2.5
NH20	LH20WS-01	LH20WSC-01	2.5
NH25	LH25WS-01	LH25WSC-01	2.8
NH30	LH30WS-01	LH30WSC-01	3.6
NH35	LH35WS-01	LH35WSC-01	3.6
NH45	LH45WS-01	LH45WSC-01	4.3
NH55	LH55WS-01	LH55WSC-01	4.3
NH65	LH65WS-01	LH65WSC-01	4.9

Table 14 Protector set

Model No.	Reference No.		Increased thickness V_4 (mm)
	Without connector	With connector	
NH15	LH15PT-01	*	2.7
NH20	LH20PT-01	LH20PTC-01	2.9
NH25	LH25PT-01	LH25PTC-01	3.2
NH30	LH30PT-01	LH30PTC-01	4.2
NH35	LH35PT-01	LH35PTC-01	4.2
NH45	LH45PT-01	LH45PTC-01	4.9
NH55	LH55PT-01	LH55PTC-01	4.9
NH65	LH65PT-01	LH65PTC-01	5.5

*) For installation of a connector to a drive-in type grease fitting, contact NSK.

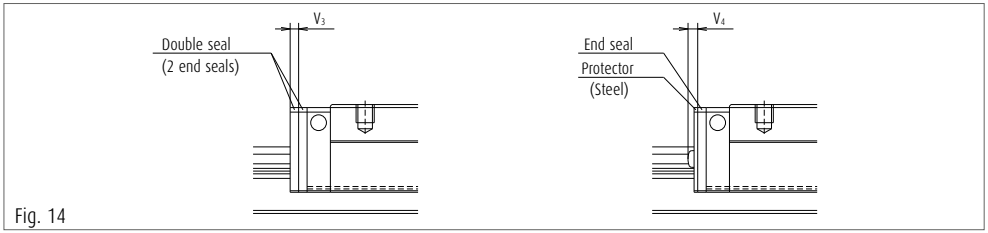


Fig. 14

(5) Cap to plug the rail mounting bolt hole

Table 15 Caps to plug rail bolt hole

Modell No.	Bolt to secure rail	Cap reference No.	Quantity/case
NH15	M4	LG-CAP/M4	20
NH20	M5	LG-CAP/M5	20
NH25	M6	LG-CAP/M6	20
NH30, NH35	M8	LG-CAP/M8	20
NH45	M12	LG-CAP/M12	20
NH55	M14	LG-CAP/M14	20
NH65	M16	LG-CAP/M16	20

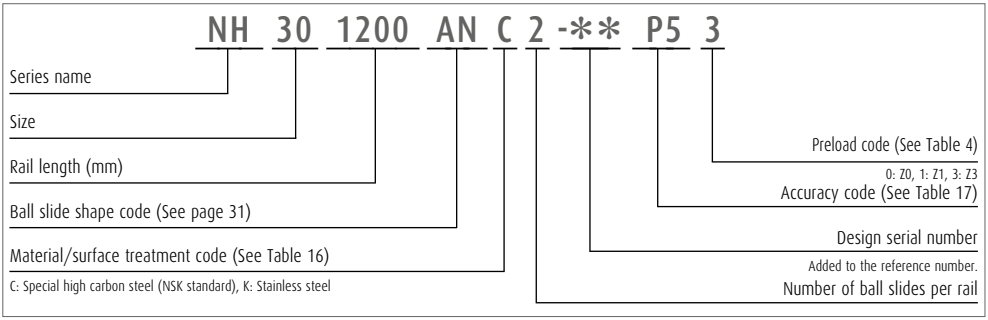
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8. Reference number

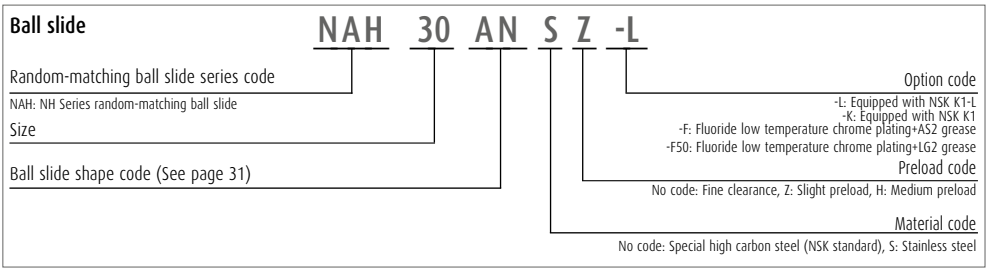
Reference numbers shall be set to individual NSK linear guide when its specifications are finalized, and it is indicated on its specification drawing.

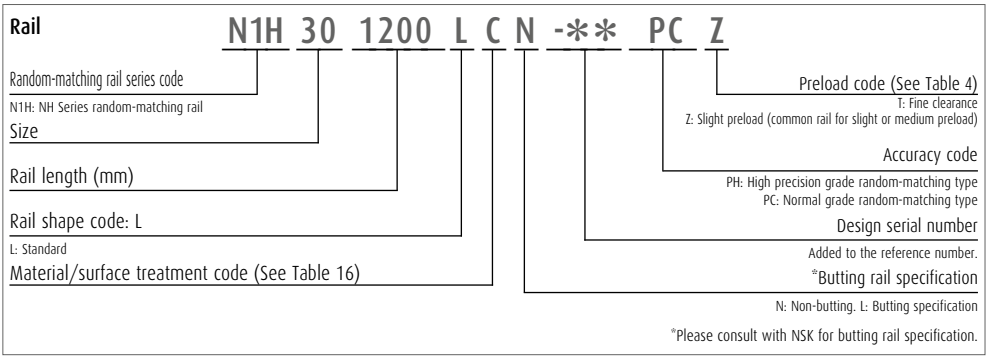
Please specify the reference number, except design serial number, to identify the product when ordering, requiring estimates, or inquiring about specifications from NSK.

(1) Reference number for preloaded assembly



(2) Reference number for random-matching type





The reference number coding for the assembly of random-matching type is the same as that of the preloaded assembly. However, only preload codes of "fine clearance T", "slight preload Z" and "medium preload H" are available (See Table 4, page 33).

Click!Speedy NSK Linear Guide Quick Delivery System uses a new numbering system. For details, please refer to the Click!Speedy general catalog CAT. No. E3191.

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Table 16 Material/surface treatment code

Code	Description
C	Special high carbon steel (NSK standard)
K	Stainless steel (NH15 to NH30 only)
D	Special high carbon steel with surface treatment
H	Stainless steel with surface treatment
Z	Other, special

Note High-precision grade and medium preload of random-matching type are not available in stainless steel.

Table 17 Accuracy code

Accuracy	Standard (Without NSK K1)	With NSK K1	With NSK K1-L	With NSK K1 for food and medical equipment
Ultra precision grade	P3	K3	L3	F3
Super precision grade	P4	K4	L4	F4
High precision grade	P5	K5	L5	F5
Precision grade	P6	K6	L6	F6
Normal grade	PN	KN	LN	FN
High precision grade (random-matching type)	PH	KH	LH	FH
Normal grade (random-matching type)	PC	KC	LC	FC

Note Refer to pages 454 to 460 for NSK K1/K1-L lubrication unit.

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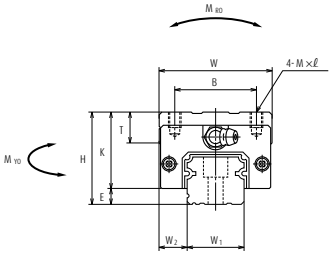
9. Dimensions

NH-AN (High-load type / Standard)
NH-BN (Super-high-load type / Long)

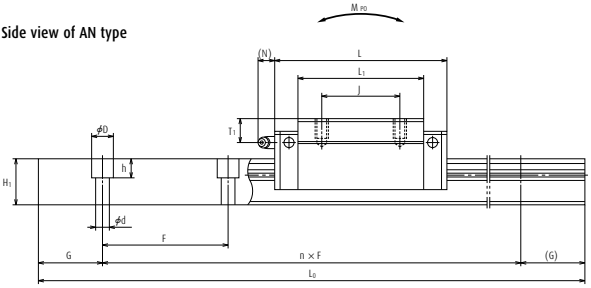
NH 30 1200 AN C 2 -** PC Z

- Series name
- Size
- Rail length (mm)
- Ball slide shape code (See page 31)
- Material/surface treatment code (See Table 16)
  C: Special high carbon steel (NSK standard), K: Stainless steel
- Number of ball slides per rail
- Design serial number
  Added to the reference number.
- Accuracy code (See Table 17)
- Preload code (See Table 4)
  0: Z0, 1: Z1, 3: Z3, T: ZT, Z: ZZ, H: ZH

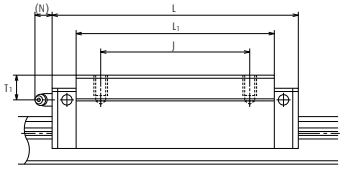
Front view of AN and BN types



Side view of AN type



Side view of BN type



Model No.	Assembly			Ball slide									Grease fitting			Width	Height
	Height			Width	Length	Mounting hole											
	H	E	W_2	W	L	B	J	M × pitch × ℓ	L_1	K	T	Hole size	T_1	N	W_1	H_1
NH15AN	28	4.6	9.5	34	55	26	26	M4×0.7×6	39	23.4	8	φ 3	8.5	3.3	15	15
NH15BN	28	4.6	9.5	34	74	26	26	M4×0.7×6	58	23.4	8	φ 3	8.5	3.3	15	15
NH20AN	30	5	12	44	69.8	32	36	M5×0.8×6	50	25	12	M6×0.75	5	11	20	18
NH20BN	30	5	12	44	91.8	32	50	M5×0.8×6	72	25	12	M6×0.75	5	11	20	18
NH25AN	40	7	12.5	48	79	35	35	M6×1×9	58	33	12	M6×0.75	10	11	23	22
NH25BN	40	7	12.5	48	107	35	50	M6×1×9	86	33	12	M6×0.75	10	11	23	22
NH30AN	45	9	16	60	85.6	40	40	M8×1.25×10	59	36	14	M6×0.75	10	11	28	26
NH30BN	45	9	16	60	124.6	40	60	M8×1.25×10	98	36	14	M6×0.75	10	11	28	26
NH35AN	55	9.5	18	70	109	50	50	M8×1.25×12	80	45.5	15	M6×0.75	15	11	34	29
NH35BN	55	9.5	18	70	143	50	72	M8×1.25×12	114	45.5	15	M6×0.75	15	11	34	29
NH45AN	70	14	20.5	86	139	60	60	M10×1.5×17	105	56	17	Rc1/8	20	13	45	38
NH45BN	70	14	20.5	86	171	60	80	M10×1.5×17	137	56	17	Rc1/8	20	13	45	38
NH55AN	80	15	23.5	100	163	75	75	M12×1.75×18	126	65	18	Rc1/8	21	13	53	44
NH55BN	80	15	23.5	100	201	75	95	M12×1.75×18	164	65	18	Rc1/8	21	13	53	44
NH65AN	90	16	31.5	126	193	76	70	M16×2×20	147	74	23	Rc1/8	19	13	63	53
NH65BN	90	16	31.5	126	253	76	120	M16×2×20	207	74	23	Rc1/8	19	13	63	53

Notes 1) External appearance of stainless steel ball slides differs from those of carbon steel ball slides.

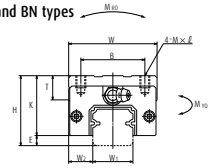
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Reference number for ball slide of random-matching type

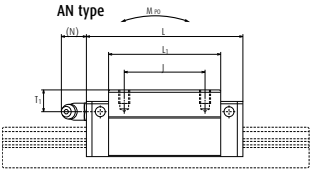
Ball slide NAH 30 AN S Z -L

- Random-matching ball slide series code — NAH: NH Series random-matching ball slide
- Size
- Ball slide shape code (See page 31)
- Material code — No code: Special high carbon steel (NSK standard), S: Stainless steel
- Preload code — No code: Fine clearance, Z: Slight preload, H: Medium preload
- Option code — -L: Equipped with NSK K1-L; -K: Equipped with NSK K1; -F: Fluoride low temperature chrome plating+AS2 grease; -F50: Fluoride low temperature chrome plating+LG2 grease

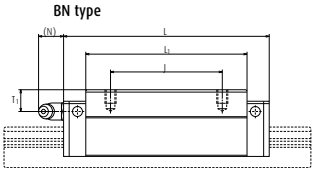
AN and BN types



AN type



BN type

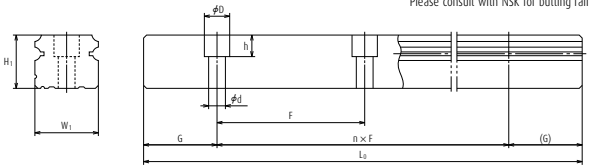


Reference number for rail of random-matching type

Rail N1H 30 1200 L C N -** PC Z

- Random-matching rail series code — N1H: NH Series random-matching rail
- Size
- Rail length (mm)
- Rail shape code: L — L: Standard
- Material/surface treatment code (See Table 16)
- *Butting rail specification — N: Non-butting, L: Butting specification
- Design serial number — Added to the reference number.
- Accuracy code — PH: High precision grade, PC: Normal grade
- Preload code (See Table 4) — T: Fine clearance, Z: Slight preload (common rail for medium preload)

*Please consult with NSK for butting rail specification.



Unit: mm

Rail				Basic load rating						Weight	
Pitch	Mounting bolt hole	G	Maximum length	2) Dynamic		Static	Static moment (N·m)					Ball slide	Rail
								M_{PO}		M_{YO}			
F	d × D × h	(reference)	L_{0max} ( ) for stainless	[50km] C_{50}(N)	[100km] C_{100}(N)	C_0 (N)	M_{RO}	One slide	Two slides	One slide	Two slides	(kg)	(kg/m)
60	4.5×7.5×5.3	20	2 980	14 200	11 300	20 700	108	94.5	575	79.5	480	0.18	1.6
60	4.5×7.5×5.3	20	(1 800)	18 100	14 400	32 000	166	216	1 150	181	965	0.26	1.6
60	6×9.5×8.5	20	3 960	23 700	18 800	32 500	219	185	1 140	155	955	0.33	2.6
60	6×9.5×8.5	20	(3 500)	30 000	24 000	50 500	340	420	2 230	355	1 870	0.48	2.6
60	7×11×9	20	3 960	33 500	26 800	46 000	360	320	1 840	267	1 540	0.55	3.6
60	7×11×9	20	(3 500)	45 500	36 500	71 000	555	725	3 700	610	3 100	0.82	3.6
80	9×14×12	20	4 000	41 000	32 500	51 500	490	350	2 290	292	1 920	0.77	5.2
80	9×14×12	20	(3 500)	61 000	48 500	91 500	870	1 030	5 600	865	4 700	1.3	5.2
80	9×14×12	20	4 000	62 500	49 500	80 500	950	755	4 500	630	3 800	1.5	7.2
80	9×14×12	20	4 000	81 000	64 500	117 000	1 380	1 530	8 350	1 280	7 000	2.1	7.2
105	14×20×17	22.5	3 990	107 000	84 500	140 000	2 140	1 740	9 750	1 460	8 150	3.0	12.3
105	14×20×17	22.5	3 990	131 000	104 000	187 000	2 860	3 000	15 600	2 520	13 100	3.9	12.3
120	16×23×20	30	3 960	158 000	125 000	198 000	3 600	3 000	16 300	2 510	13 700	4.7	16.9
120	16×23×20	30	3 960	193 000	153 000	264 000	4 850	5 150	26 300	4 350	22 100	6.1	16.9
150	18×26×22	35	3 900	239 000	190 000	281 000	6 150	4 950	27 900	4 150	23 400	7.7	24.3
150	18×26×22	35	3 900	310 000	246 000	410 000	8 950	10 100	51 500	8 450	43 500	10.8	24.3

2) The basic load rating comply with the ISO standard. (ISO 14728-1, 14728-2)
C_{50}; the basic dynamic load rating for 50 km rated fatigue life C_{100}; the basic dynamic load rating for 100 km rated fatigue life
The basic static load rating shows static permissible load.

3) High-precision grade and medium preload of random-matching type are available for high-carbon steel products.

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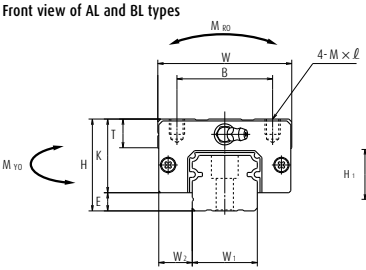
6. NH-Series: Linear Ball Guides

NH-AL (High-load type / Standard)
NH-BL (Super-high-load type / Long)

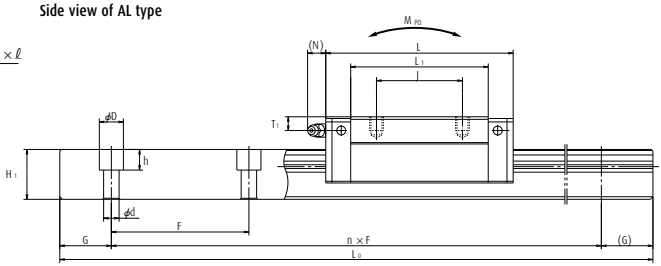
NH 30 1200 AL C 2 - ** PC Z**

- Series name
- Size
- Rail length (mm)
- Ball slide shape code (See page 31)
- Material/surface treatment code (See Table 16)
  C: Special high carbon steel (NSK standard), K: Stainless steel
- Number of ball slides per rail
- Design serial number
  Added to the reference number.
- Accuracy code (See Table 17)
- Preload code (See Table 4)
  0: Z0, 1: Z1, 3: Z3, T: ZT, Z: ZZ, H: ZH

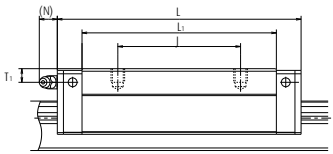
Front view of AL and BL types



Side view of AL type



Side view of BL type



Model No.	Assembly			Ball slide												Width	Height
	Height			Width	Length	Mounting hole						Grease fitting					
	H	E	W_2	W	L	B	J	M × pitch × ℓ	L_1	K	T	Hole size	T_1	N		W_1	H_1
NH25AL	36	7	12.5	48	79	35	35	M6×1×6	58	29	12	M6×0.75	6	11		23	22
NH25BL	36	7	12.5	48	107	35	50	M6×1×6	86	29	12	M6×0.75	6	11		23	22
NH30AL	42	9	16	60	85.6	40	40	M8×1.25×8	59	33	14	M6×0.75	7	11		28	26
NH30BL	42	9	16	60	124.6	40	60	M8×1.25×8	98	33	14	M6×0.75	7	11		28	26
NH35AL	48	9.5	18	70	109	50	50	M8×1.25×8	80	38.5	15	M6×0.75	8	11		34	29
NH35BL	48	9.5	18	70	143	50	72	M8×1.25×8	114	38.5	15	M6×0.75	8	11		34	29
NH45AL	60	14	20.5	86	139	60	60	M10×1.5×10	105	46	17	Rc1/8	10	13		45	38
NH45BL	60	14	20.5	86	171	60	80	M10×1.5×10	137	46	17	Rc1/8	10	13		45	38
NH55AL	70	15	23.5	100	163	75	75	M12×1.75×13	126	55	15	Rc1/8	11	13		53	44
NH55BL	70	15	23.5	100	201	75	95	M12×1.75×13	164	55	15	Rc1/8	11	13		53	44

Notes 1) External appearance of stainless steel ball slides differs from those of carbon steel ball slides.

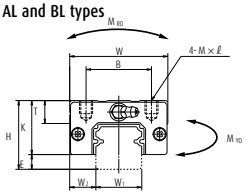
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Reference number for ball slide of random-matching type

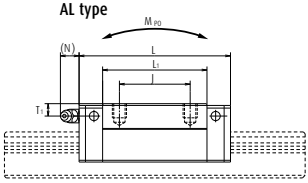
Ball slide NAH 30 AL S Z -L

- Random-matching ball slide series code
  - NAH: NH Series random-matching ball slide
- Size
- Ball slide shape code (See page 31)
- Material code
  - No code: Special high carbon steel (NSK standard), S: Stainless steel
- Preload code
  - No code: Fine clearance, Z: Slight preload, H: Medium preload
- Option code
  - -L: Equipped with NSK K1-L
  - -K: Equipped with NSK K1
  - -F: Fluoride low temperature chrome plating+AS2 grease
  - -F50: Fluoride low temperature chrome plating+LG2 grease

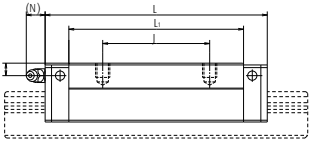
AL and BL types



AL type



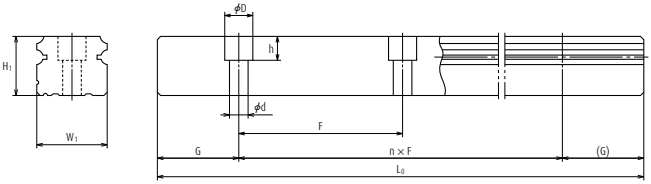
BL type



Reference number for rail of random-matching type

Rail N1H 30 1200 L C N -** PC Z

- Random-matching rail series code
  - N1H: NH Series random-matching rail
- Size
- Rail length (mm)
- Rail shape code: L
  - L: Standard
- Material/surface treatment code (See Table 16)
- *Butting rail specification
  - N: Non-butting, L: Butting specification
  - *Please consult with NSK for butting rail specification.
- Design serial number
  - Added to the reference number.
- Accuracy code
  - PH: High precision grade
  - PC: Normal grade
- Preload code (See Table 4)
  - T: Fine clearance.
  - Z: Slight preload (common rail for medium preload)



Unit: mm

Rail				Basic load rating								Weight	
Pitch	Mounting bolt hole	G	Maximum length	2) Dynamic		Static	Static moment (N·m)					Ball slide	Rail
F	d × D × h	(reference)	L_{0max} ( ) for stainless	[50km] C_{50}(N)	[100km] C_{100}(N)	C_0 (N)	M_{RO}	M_{PO} One slide	M_{PO} Two slides	M_{YO} One slide	M_{YO} Two slides	(kg)	(kg/m)
60	7×11×9	20	3 960	33 500	26 800	46 000	360	320	1 840	267	1 540	0.46	3.6
60	7×11×9	20	(3 500)	45 500	36 500	71 000	555	725	3 700	610	3 100	0.69	3.6
80	9×14×12	20	4 000	41 000	32 500	51 500	490	350	2 290	292	1 920	0.69	5.2
80	9×14×12	20	(3 500)	61 000	48 500	91 500	870	1 030	5 600	865	4 700	1.16	5.2
80	9×14×12	20	4 000	62 500	49 500	80 500	950	755	4 500	630	3 800	1.2	7.2
80	9×14×12	20	4 000	81 000	64 500	117 000	1 380	1 530	8 350	1 280	7 000	1.7	7.2
105	14×20×17	22.5	3 990	107 000	84 500	140 000	2 140	1 740	9 750	1 460	8 150	2.2	12.3
105	14×20×17	22.5	3 990	131 000	104 000	187 000	2 860	3 000	15 600	2 520	13 100	2.9	12.3
120	16×23×20	30	3 960	158 000	125 000	198 000	3 600	3 000	16 300	2 510	13 700	3.7	16.9
120	16×23×20	30	3 960	193 000	153 000	264 000	4 850	5 150	26 300	4 350	22 100	4.7	16.9

2) The basic load rating comply with the ISO standard. (ISO 14728-1, 14728-2)
C_{50}; the basic dynamic load rating for 50 km rated fatigue life C_{100}; the basic dynamic load rating for 100 km rated fatigue life
The basic static load rating shows static permissible load.
3) High-precision grade and medium preload of random-matching type are available for high-carbon steel products.

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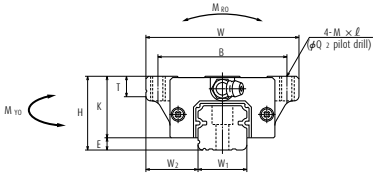
6. NH-Series: Linear Ball Guides

NH-EM (High-load type / Standard)
NH-GM (Super-high-load type / Long)

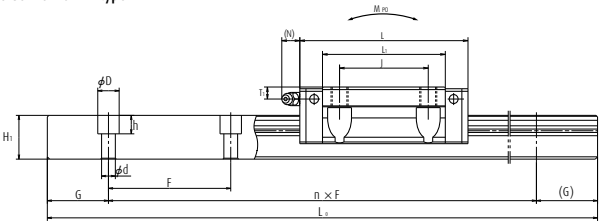
NH 30 1200 EM C 2 - ** PC Z**

- Series name
- Size
- Rail length (mm)
- Ball slide shape code (See page 31)
- Material/surface treatment code (See Table 16)
  C: Special high carbon steel (NSK standard), K: Stainless steel
- Number of ball slides per rail
- Design serial number
  Added t the reference number.
- Accuracy code (See Table 17)
- Preload code (See Table 4)
  0: Z0, 1: Z1, 3: Z3, T: ZT, Z: ZZ, H: ZH

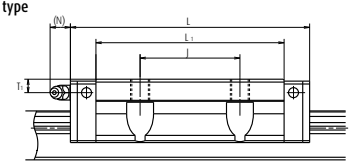
Front view of EM and GM types



Side view of EM type



Side view of GM type



Model No.	Assembly			Ball slide									Grease fitting			Width	Height
	Height			Width	Length	Mounting hole											
	H	E	W_2	W	L	B	J	M × pitch × ℓ	Q_2	L_1	K	T	Hole size	T_1	N	W_1	H_1
NH15EM	24	4.6	16	47	55	38	30	M5×0.8×7	4.4	39	19.4	8	φ 3	4.5	3.3	15	15
NH15GM	24	4.6	16	47	74	38	30	M5×0.8×7	4.4	58	19.4	8	φ 3	4.5	3.3	15	15
NH20EM	30	5	21.5	63	69.8	53	40	M6×1×9.5	5.3	50	25	10	M6×0.75	5	11	20	18
NH20GM	30	5	21.5	63	91.8	53	40	M6×1×9.5	5.3	72	25	10	M6×0.75	5	11	20	18
NH25EM	36	7	23.5	70	79	57	45	M8×1.25×10	6.8	58	29	11	M6×0.75	6	11	23	22
NH25GM	36	7	23.5	70	107	57	45	(M8×1.25×11.5)	6.8	86	29	(12)	M6×0.75	6	11	23	22
NH30EM	42	9	31	90	98.6	72	52	M10×1.5×12	8.6	72	33	11	M6×0.75	7	11	28	26
NH30GM	42	9	31	90	124.6	72	52	(M10×1.5×14.5)	8.6	98	33	(15)	M6×0.75	7	11	28	26
NH35EM	48	9.5	33	100	109	82	62	M10×1.5×13	8.6	80	38.5	12	M6×0.75	8	11	34	29
NH35GM	48	9.5	33	100	143	82	62	M10×1.5×13	8.6	114	38.5	12	M6×0.75	8	11	34	29
NH45EM	60	14	37.5	120	139	100	80	M12×1.75×15	10.5	105	46	13	Rc1/8	10	13	45	38
NH45GM	60	14	37.5	120	171	100	80	M12×1.75×15	10.5	137	46	13	Rc1/8	10	13	45	38
NH55EM	70	15	43.5	140	163	116	95	M14×2×18	12.5	126	55	15	Rc1/8	11	13	53	44
NH55GM	70	15	43.5	140	201	116	95	M14×2×18	12.5	164	55	15	Rc1/8	11	13	53	44
NH65EM	90	16	53.5	170	193	142	110	M16×2×24	14.6	147	74	23	Rc1/8	19	13	63	53
NH65GM	90	16	53.5	170	253	142	110	M16×2×24	14.6	207	74	23	Rc1/8	19	13	63	53

Notes
1) Parenthesized dimensions are for items made of stainless steel.
2) External appearance of stainless steel ball slides differs from those of carbon steel ball slides.

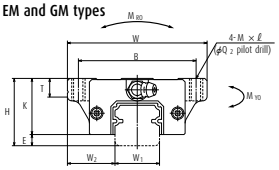
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Reference number for ball slide of random-matching type

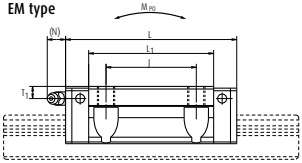
Ball slide NAH 30 EM S Z -L

- Random-matching ball slide series code
  - NAH: NH Series random-matching ball slide
- Size
- Ball slide shape code (See page 31)
- Material code
  - No code: Special high carbon steel (NSK standard), S: Stainless steel
- Preload code
  - No code: Fine clearance, Z: Slight preload, H: Medium preload
- Option code
  - -L: Equipped with NSK K1-L
  - -K: Equipped with NSK K1
  - -F: Fluoride low temperature chrome plating+AS2 grease
  - -F50: Fluoride low temperature chrome plating+LG2 grease

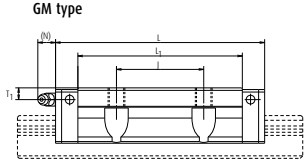
EM and GM types



EM type



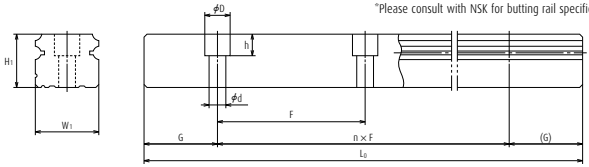
GM type



Reference number for rail of random-matching type

Rail N1H 30 1200 L C N -** PC Z

- Random-matching rail series code
  - N1H: NH Series random-matching rail
- Size
- Rail length (mm)
- Rail shape code: L
  - L: Standard
- Material/surface treatment code (See Table 16)
- *Butting rail specification
  - N: Non-butting. L: Butting specification
  - *Please consult with NSK for butting rail specification.
- Design serial number
  - Added to the reference number.
- Accuracy code
  - PH: High precision grade
  - PC: Normal grade
- Preload code (See Table 4)
  - T: Fine clearance.
  - Z: Slight preload (common rail for medium preload)



Unit: mm

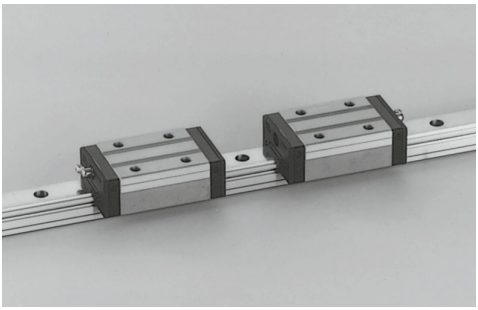
Rail				Basic load rating								Weight	
Pitch	Mounting bolt hole	G	Maximum length	3) Dynamic		Static	Static moment (N·m)					Ball slide	Rail
								M_{PO}		M_{YO}			
F	d × D × h	(reference)	L_{0max} ( ) for stainless	[50km] C_{50}(N)	[100km] C_{100}(N)	C_0 (N)	M_{RO}	One slide	Two slides	One slide	Two slides	(kg)	(kg/m)
60	4.5×7.5×5.3	20	2 980	14 200	11 300	20 700	108	94.5	575	79.5	480	0.17	1.6
60	4.5×7.5×5.3	20	(1 800)	18 100	14 400	32 000	166	216.0	1 150	181.0	965	0.25	1.6
60	6×9.5×8.5	20	3 960	23 700	18 800	32 500	219	185.0	1 140	155.0	955	0.45	2.6
60	6×9.5×8.5	20	(3 500)	30 000	24 000	50 500	340	420.0	2 230	355.0	1 870	0.65	2.6
60	7×11×9	20	3 960	33 500	26 800	46 000	360	320.0	1 840	267.0	1 540	0.63	3.6
60	7×11×9	20	(3 500)	45 500	36 500	71 000	555	725.0	3 700	610.0	3 100	0.93	3.6
80	9×14×12	20	4 000	47 000	37 500	63 000	600	505.0	3 150	425.0	2 650	1.2	5.2
80	9×14×12	20	(3 500)	61 000	48 500	91 500	870	1 030.0	5 600	865.0	4 700	1.6	5.2
80	9×14×12	20	4 000	62 500	49 500	80 500	950	755.0	4 500	630.0	3 800	1.7	7.2
80	9×14×12	20	4 000	81 000	64 500	117 000	1 380	1 530.0	8 350	1 280.0	7 000	2.4	7.2
105	14×20×17	22.5	3 990	107 000	84 500	140 000	2 140	1 740.0	9 750	1 460.0	8 150	3	12.3
105	14×20×17	22.5	3 990	131 000	104 000	187 000	2 860	3 000.0	15 600	2 520.0	13 100	3.9	12.3
120	16×23×20	30	3 960	158 000	125 000	198 000	3 600	3 000.0	16 300	2 510.0	13 700	5	16.9
120	16×23×20	30	3 960	193 000	153 000	264 000	4 850	5 150.0	26 300	4 350.0	22 100	6.5	16.9
150	18×26×22	35	3 900	239 000	190 000	281 000	6 150	4 950.0	27 900	4 150.0	23 400	10	24.3
150	18×26×22	35	3 900	310 000	246 000	410 000	8 950	10 100.0	51 500	8 450.0	43 500	14.1	24.3

3) The basic load rating comply with the ISO standard. (ISO 14728-1, 14728-2)
C_{50}; the basic dynamic load rating for 50 km rated fatigue life C_{100}; the basic dynamic load rating for 100 km rated fatigue life
The basic static load rating shows static permissible load.

4) High-precision grade and medium preload of random-matching type are available for high-carbon steel products.

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7. NS-Series: Linear Ball Guides



1. Features

(1) Improve rating life dramatically

Based on the LS series characterized by reliability and performance, a significant increase in durability has been attained. New ball groove geometry is introduced, which has been developed by utilizing NSK's state-of-the-art tribological and analytical technologies. Due to the optimized distribution of contact surface pressures, the rating life has dramatically increased.

As compared with the LS Series, the load rating capacity of the NS series has increased to 1.3 times, while the life span has increased to twice*1). These features enable you to design a machine with a longer life and downsize the machine. Thus, your design capability is greatly enhanced.

*1): Representative values of series.

(2) Ball circulation path with excellent high-speed property

By reexamining the design practice for the ball circulation path, we have attained smooth ball circulation and reduced noise level. So, NS series is suited for high-speed applications compared with the LS Series.

(3) All mounting dimensions are the same as those for the LS and SS Series

Regarding the mounting dimensions (mounting parts' dimensions), such as the mounting height, mounting width, mounting hole diameter/pitch of the linear guide, etc., the mounting dimensions of the NS Series remain the same as those of the conventional LS series and SS series. So, the new NS Series linear guides can be used without making any design changes.

(4) High self aligning capability (rolling direction)

Same as the DF combination in angular contact bearings, self-aligning capability is high because the cross point of the contact lines of balls and grooves comes inside, and thus reducing moment rigidity. This increases the capacity to absorb errors in installation.

(5) High load carrying capacity to vertical direction

The contact angle is set at 50 degrees, and thus increasing load carrying capacity as well as rigidity against the load in vertical direction.

(6) High resistance against impact load

The bottom ball groove is formed in Gothic arch and the center of the top and bottom grooves are offset as shown in **Fig. 2**. The vertical load is usually carried by top 2 rows, where balls are contacting at two points. Because of this design, the bottom rows will carry the load when a large impact load is applied as shown in **Fig. 3**. This assures high resistance to the impact load.

(7) High accuracy

As showing in **Fig. 4**, fixing the measuring rollers to the ball grooves is simple thanks to the Gothic arch groove. This makes easy and accurate measuring of ball grooves.

(8) Easy to handle, and designed with safety in mind.

Balls are retained in the retainer and do not fall out when the ball slide is withdrawn from the rail.

(9) Abundant models and sizes come in series.

Each size of NS Series has several ball slide models, rendering the linear guide available for numerous uses. The NS Series also has standardized long stainless-steel rail (maximum 3 500 mm).

(10) Fast delivery

Lineup of random-matching rails and ball slides supports and facilitates fast delivery.

High precision grade and medium preload types are also available in random matching. (Special high-carbon steel products)

Note: For customers who have used the former LS or SS series, NS series is recommended as a substitute. Please confirm the correlation between NS series and former ones on the comparative table at page 108.

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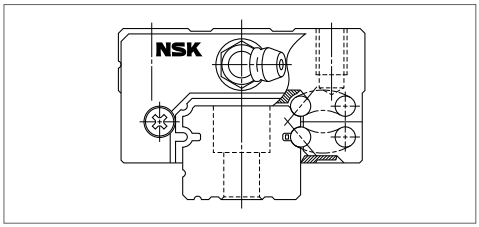


Fig. 1 NS Series

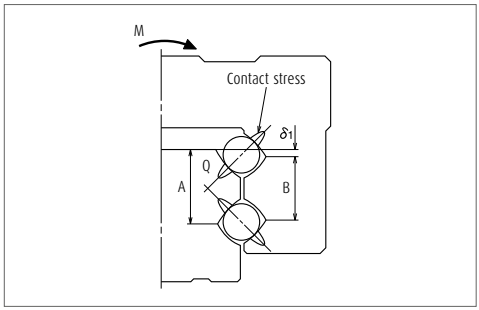


Fig. 2 Enlarged illustration of the offset Gothic arch groove

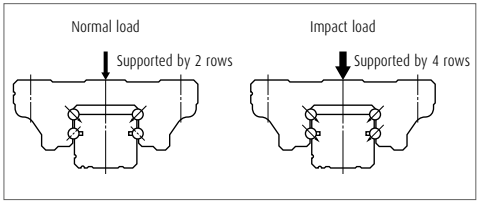


Fig. 3 When load is applied

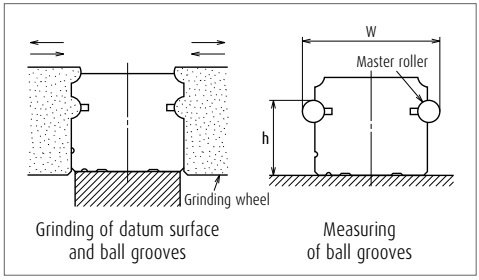
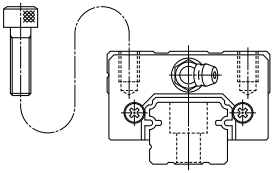
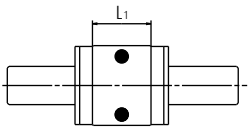
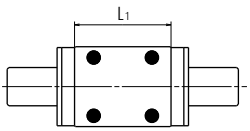
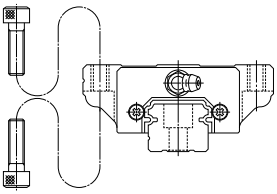
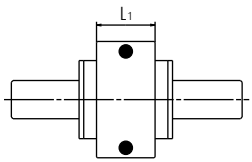
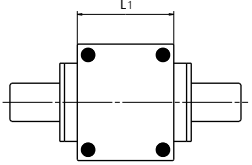


Fig. 4 Rail-grinding and measuring

2. Ball slide shape

Ball slide Model	Shape/installation method	Type (Upper row, Rating: Lower row, Ball slide length)	
		Medium-load type	High-load type
		Standard	Long
AL CL		CL 	AL 
EM JM		JM 	EM 

Note High-precision grade and medium preload of random-matching type are not applicable to EL, JL, FL and KL models.
Not applicable to EM and JM models.

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3. Accuracy and preload

(1) Running parallelism of ball slide

Table 1

Unit: μm

Rail length (mm) over	or less	Preloaded assembly (not random matching) Ultra precision P3	Super precision P4	High precision P5	Precision grade P6	Normal grade PN	Random-matching type High precision PH	Normal grade PC
–	50	2	2	2	4.5	6	2	6
50	80	2	2	3	5	6	3	6
80	125	2	2	3.5	5.5	6.5	3.5	6.5
125	200	2	2	4	6	7	4	7
200	250	2	2.5	5	7	8	5	8
250	315	2	2.5	5	8	9	5	9
315	400	2	3	6	9	11	6	11
400	500	2	3	6	10	12	6	12
500	630	2	3.5	7	12	14	7	14
630	800	2	4.5	8	14	16	8	16
800	1000	2.5	5	9	16	18	9	18
1 000	1 250	3	6	10	17	20	10	20
1 250	1 600	4	7	11	19	23	11	23
1 600	2 000	4.5	8	13	21	26	13	26
2 000	2 500	5	10	15	22	29	15	29
2 500	3 150	6	11	17	25	32	17	32
3 150	4 000	9	16	23	30	34	23	34

(2) Accuracy standard

The preloaded assembly has five accuracy grades; Ultra precision P3, Super precision P4, High precision P5, Precision P6 and Normal PN grades, while the random-matching type has High-precision PH and Normal PC grade.

› Tolerance of preloaded assembly

Table 2

Unit : μm

Characteristics \ Accuracy grade	Ultra precision P3	Super precision P4	High precision P5	Precision grade P6	Normal grade PN
Mounting height H	±10	±10	±20	±40	±80
Variation of H	3	5	7	15	25
(All ball slides on a set of rails)					
Mounting width W_2 or W_3	±15	±15	±25	±50	±100
Variation of W_2 or W_3	3	7	10	20	30
(All ball slides on reference rail)					
Running parallelism of surface C to surface A Running parallelism of surface D to surface B	See **Table 1**, **Fig. 5** and **Fig. 6**				

› Tolerance of random-matching type

Table 3

Unit : μm

Characteristics \ Model No.	High precision grade PH	Normal grade PC
Mounting height H	±20	±20
Variation of mounting height H	15 ① 30 ②	15 ① 30 ②
Mounting width W_2 or W_3	±30	±30
Variation of mounting width W_2 or W_3	20	25
Running parallelism of surface C to surface A Running parallelism of surface D to surface B	See **Table 1**, **Fig. 5** and **Fig. 6**	

Notes: ① Variation on the same rail / ② Variation on multiple rails

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(3) Combinations of accuracy and preload

Table 4

		Accuracy grade						
		Ultra precision	Super precision	High precision	Precision grade	Normal grade	High precision	Normal grade
Without NSK K1 lubrication unit		P3	P4	P5	P6	PN	PH	PC
With NSK K1 lubrication unit		K3	K4	K5	K6	KN	KH	KC
With NSK K1-L lubrication unit		L3	L4	L5	L6	LN	LH	LC
With NSK K1 for food and medical equipment		F3	F4	F5	F6	FN	FH	FC
Preload	Fine clearance Z0	○	○	○	○	○	–	–
	Slight preload Z1	○	○	○	○	○	–	–
	Medium preload Z3	○	○	○	○	–	–	–
	Random-matching type with fine clearance ZT	–	–	–	–	–	–	○
	Random-matching type with slight preload ZZ	–	–	–	–	–	○	○
	Random-matching type with medium preload ZH	–	–	–	–	–	○	○

(4) Assembled accuracy

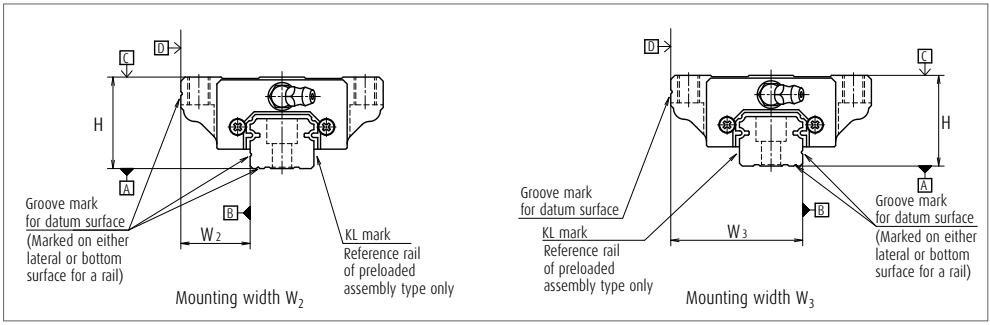


Fig. 5 Special high carbon steel

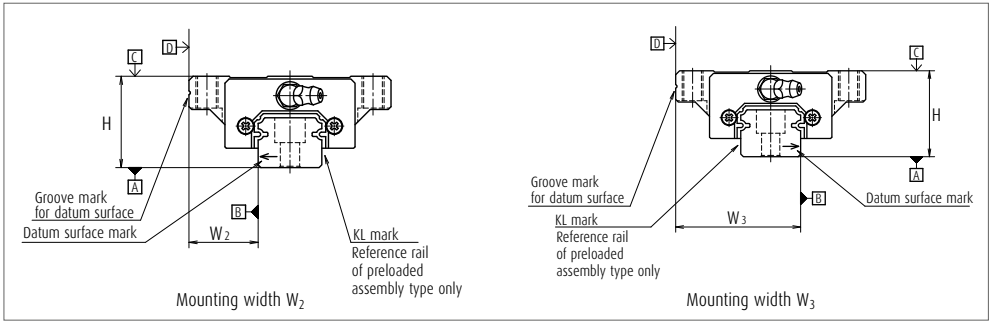


Fig. 6 Stainless steel

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(5) Preload and rigidity

We offer six levels of preload: Slight preload Z1, Medium preload Z3 and Fine clearance Z0, along with random-matching type of Medium preload ZH, Fine clearance ZT and Slight preload ZZ.

› Preload and rigidity of preloaded assembly

Table 5

	Model No.	Preload (N)		Rigidity (N/μm)			
				Vertical direction		Lateral direction	
		Slight preload Z1	Medium preload Z3	Slight preload Z1	Medium preload Z3	Slight preload Z1	Medium preload Z3
High-load type	NS15 AL, EM	69	390	127	226	88	167
	NS20 AL, EM	88	540	147	284	108	206
	NS25 AL, EM	147	880	206	370	147	275
	NS30 AL, EM	245	1 370	255	460	186	345
	NS35 AL, EM	345	1 960	305	550	216	400
Medium-load type	NS15 CL, JM	49	294	78	147	59	108
	NS20 CL, JM	69	390	108	186	78	137
	NS25 CL, JM	98	635	127	235	88	177
	NS30 CL, JM	147	980	147	275	108	206
	NS35 CL, JM	245	1 370	186	335	137	245

Note Clearance for Fine clearance Z0 is 0 to 3μm. Therefore, preload is zero. However, Z0 of PN grade is 0 to 15μm.

› Clearance and preload of random-matching type

Table 6

Unit : μm

Model No.	Fine clearance ZT	Slight preload ZZ	Medium preload ZH
NS15	−4 — 15	−4 — 0	−7 — −3
NS20	−4 — 15	−4 — 0	−7 — −3
NS25	−5 — 15	−5 — 0	−9 — −4
NS30	−5 — 15	−5 — 0	−9 — −4
NS35	−5 — 15	−6 — 0	−10 — −4

Note Minus sign denotes that a value is an amount of preload (elastic deformation of balls).

4. Maximum rail length

Table 7 shows the limitations of rail length (maximum length). However, the limitations vary by accuracy grade.

Table 7 Length limitations of rails

Unit : mm

Series	Size / Material	15	20	25	30	35
NS	Special high carbon steel	2 920	3 960	3 960	4 000	4 000
	Stainless steel	1 700	3 500	3 500	3 500	3 500

Note Rails can be butted if user requirement exceeds the rail length shown in the table. Please consult NSK

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5. Installation

(1) Permissible values of mounting error

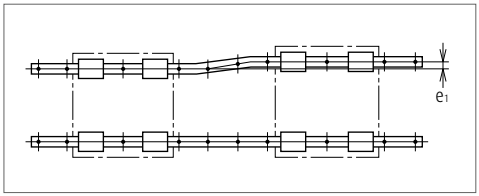


Fig. 7

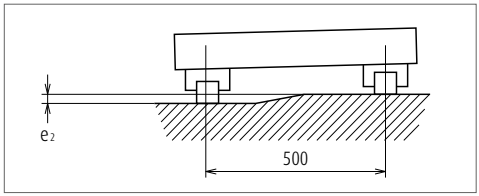


Fig. 8

Table 8

Unit : μm

Value	Preload	Model No.				
		NS15	NS20	NS25	NS30	NS35
Permissible values of parallelism in two rails e_1	Z0, ZT	20	22	30	35	40
	Z1, ZZ	15	17	20	25	30
	Z3, ZH	12	15	15	20	25
Permissible values of parallelism (height) in two rails e_2	Z0, ZT	375 μm/500 mm				
	Z1, ZZ, Z3, ZH	330 μm/500 mm				

(2) Shoulder height of the mounting surface and corner radius r

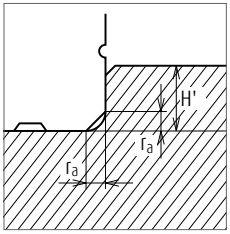


Fig. 9 Shoulder for the rail datum face

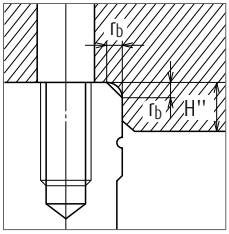


Fig. 10 Shoulder for the ball slide datum face

Table 9

Unit : mm

Model No.	Corner radius (maximum)		Shoulder height	
	r_a	r_b	H'	H"
NS15	0.5	0.5	4	4
NS20	0.5	0.5	4.5	5
NS25	0.5	0.5	5	5
NS30	0.5	0.5	6	6
NS35	0.5	0.5	6	6

6. Maximum allowable speed

An indication of the standard maximum allowable speed aiming at 10,000km operation with NS series under normal conditions is shown in Table 10. However, the maximum allowable speed can be affected by accuracy of installation, operating temperature, external load, etc. If the operation is made exceeding the permissible distance and speed, please consult NSK.

Table 10 Maximum allowable speed

Unit : m/min

Size \ Series	15	20	25	30	30	35
NS	300					

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7. Dust proof components

(1) Standard specification

The NS Series can be readily used as they have a dust protection for normal conditions. As the standard equipment, the ball slides have an end seal on both ends, and bottom seals at the bottom.

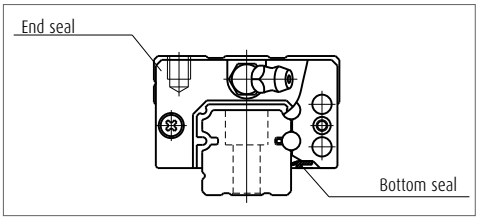


Fig. 11

Table 11 Seal friction per ball slide (maximum value)

Unit : N

Size \ Series	15	20	25	30	35
NS	8	9	9	9	10

(2) NSK K1-L lubrication unit

Table 12 shows the dimension of linear guides equipped with the NSK K1-L lubrication unit.

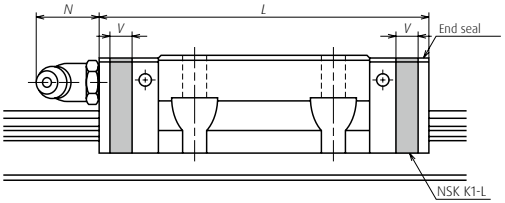


Table 12

Model No.	Ball slide length	Ball slide model	Standard ball slide length	Ball slide length installed with two NSK K1-L	NSK K1-L thickness V	Protruding area of the grease fitting N
NS15	Standard	AL, EM	56.8	66.4	4.8	(5)
	Short	CL, JM	40.4	50		
NS20	Standard	AL, EM	65.2	75.8	5.3	(14)
	Short	CL, JM	47.2	57.8		
NS25	Standard	AL, EM	81.6	92.2	5.3	(14)
	Short	CL, JM	59.6	70.2		
NS30	Standard	AL, EM	96.4	108.4	6	(14)
	Short	CL, JM	67.4	79.4		
NS35	Standard	AL, EM	108	121	6.5	(14)
	Short	CL, JM	77	90		

Notes 1) NSK K1 for food and medical equipment are available for NS15-35.
2) Ball slide length equipped with NSK K1-L = (Standard ball slide length) + (Thickness of NSK K1-L, V)

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(3) Double seal

Use a double seal set as shown in **Table 13**, when installing an extra seal to completed standard products. **(Fig. 12)**

When installing a grease fitting after the installation of double seals, a connector as shown in **Fig.12** is required.

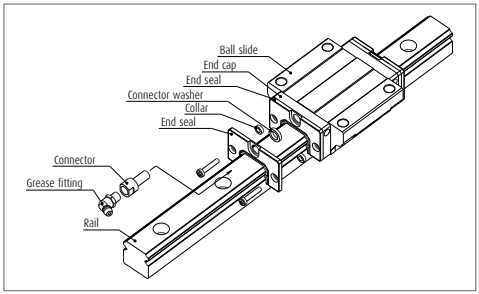


Fig. 12 Double seal

(4) Protector

Use a protector set as shown in **Table 14**, when installing a protector to completed standard products. **(Fig.13)**

When installing a grease fitting after the installation of protectors, a connector as shown in **Fig.13** is required.

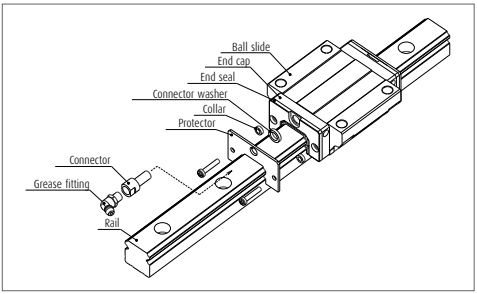


Fig. 13 Protector

Table 13 Double-seal set

Model No.	Reference No.		Increased thickness V_3 (mm)
	Without connector	With connector	
NS15	LS15WS-01	*	2.8
NS20	LS20WS-01	LS20WSC-01	2.5
NS25	LS25WS-01	LS25WSC-01	2.8
NS30	LS30WS-01	LS30WSC-01	3.6
NS35	LS35WS-01	LS35WSC-01	3.6

Table 14 Protector set

Model No.	Reference No.		Increased thickness V_4 (mm)
	Without connector	With connector	
NS15	LS15PT-01	*	3
NS20	LS20PT-01	LS20PTC-01	2.7
NS25	LS25PT-01	LS25PTC-01	3.2
NS30	LS30PT-01	LS30PTC-01	4.2
NS35	LS35PT-01	LS35PTC-01	4.2

*) For installation of a connector to a drive-in type grease fitting, contact NSK.

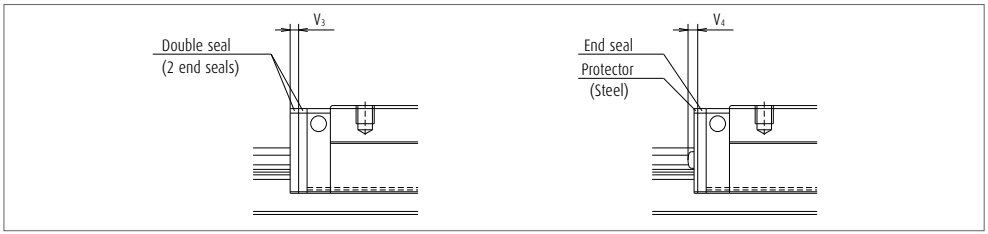


Fig. 14

(5) Cap to plug the rail mounting bolt hole

Table 15 Caps to plug rail bolt hole

Modell No.	Bolt to secure rail	Cap reference No.	Quantity/case
NS15	M3	LG-CAP/M3	20
NS15	M4	LG-CAP/M4	20
NS20	M5	LG-CAP/M5	20
NS25, NS30	M6	LG-CAP/M6	20
NS35	M8	LG-CAP/M8	20

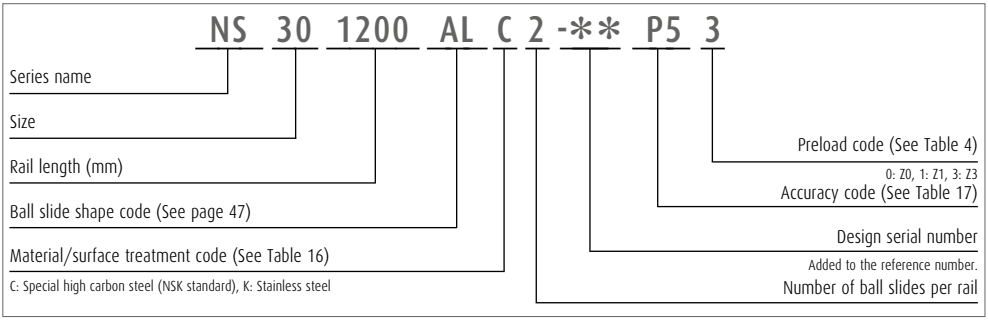
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8. Reference number

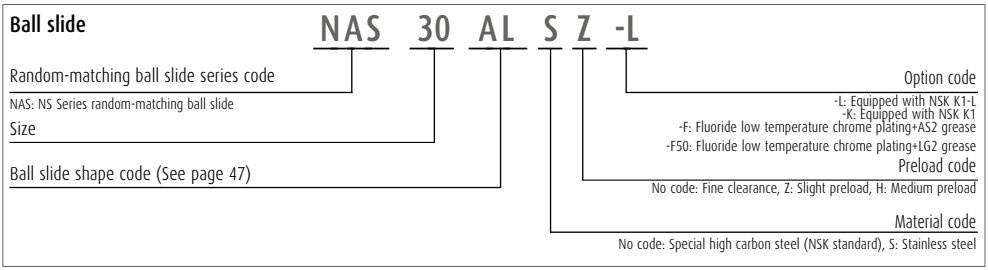
Reference numbers shall be set to individual NSK linear guide when its specifications are finalized, and it is indicated on its specification drawing.

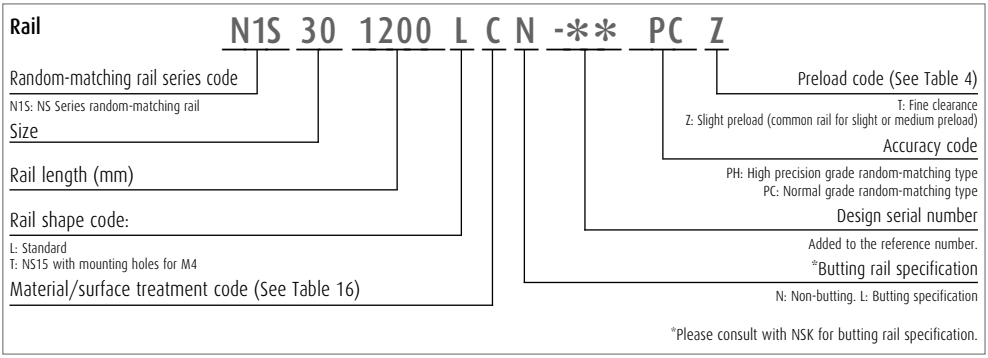
Please specify the reference number, except design serial number, to identify the product when ordering, requiring estimates, or inquiring about specifications from NSK.

(1) Reference number for preloaded assembly



(2) Reference number for random-matching type





The reference number coding for the assembly of random-matching type is the same as that of the preloaded assembly. However, only preload codes of "fine clearance T" and "slight preload Z" are available (See Table 4, page 49).

Click!Speedy NSK Linear Guide Quick Delivery System uses a new numbering system. For details, please refer to the Click!Speedy general catalog CAT. No. E3191.

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Table 16 Material/surface treatment code

Code	Description
C	Special high carbon steel (NSK standard)
K	Stainless steel
D	Special high carbon steel with surface treatment
H	Stainless steel with surface treatment
Z	Other, special

Note High-precision grade and medium preload of random-matching type are not available in stainless steel.

Table 17 Accuracy code

Accuracy	Standard (Without NSK K1)	With NSK K1	With NSK K1-L	With NSK K1 for food and medical equipment
Ultra precision grade	P3	K3	L3	F3
Super precision grade	P4	K4	L4	F4
High precision grade	P5	K5	L5	F5
Precision grade	P6	K6	L6	F6
Normal grade	PN	KN	LN	FN
High precision grade (random-matching type)	PH	KH	LH	FH
Normal grade (random-matching type)	PC	KC	LC	FC

Note Refer to pages 454 to 460 for NSK K1/K1-L lubrication unit.

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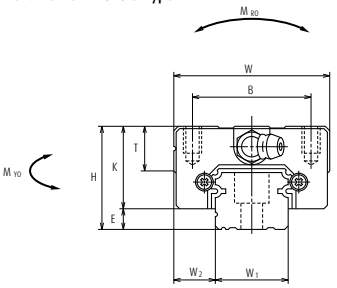
9. Dimensions

NS-CL (Medium-load type / Short)
NS-AL (High-load type / Standard)

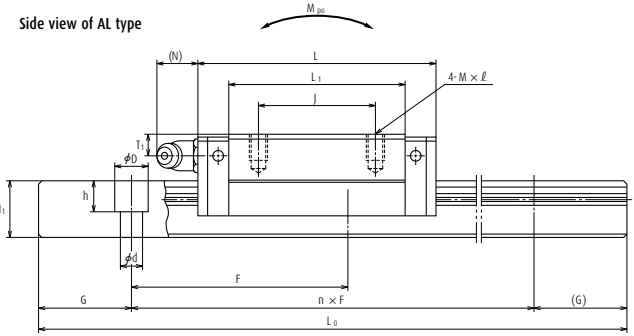
NS 30 1200 AL C 2 -** PC Z

- Series name
- Size
- Rail length (mm)
- Ball slide shape code (See page 47)
- Material/surface treatment code (See Table 16)
  C: Special high carbon steel (NSK standard), K: Stainless steel
- Number of ball slides per rail
- Design serial number
  Added to the reference number.
- Accuracy code (See Table 17)
- Preload code (See Table 4)
  0: Z0, 1: Z1, 3: Z3, T: ZT, Z: ZZ, H: ZH

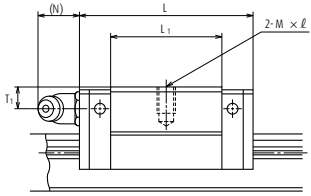
Front view of AL and CL type



Side view of AL type



Side view of CL type



Model No.	Assembly			Ball slide												Grease fitting			Width	Height
	Height			Width	Length	Mounting hole			L_1	K	T	Hole size	T_1	N	W_1	H_1				
	H	E	W_2	W	L	B	J	M × pitch × ℓ												
NS15CL	24	4.6	9.5	34	40.4	26	–	M4×0.7×6	23.6	19.4	10	φ 3	6	3	15	12.5				
NS15AL	24	4.6	9.5	34	56.8	26	26	M4×0.7×6	40	19.4	10	φ 3	6	3	15	12.5				
NS20CL	28	6	11	42	47.2	32	–	M5×0.8×7	30	22	12	M6×0.75	5.5	11	20	15.5				
NS20AL	28	6	11	42	65.2	32	32	M5×0.8×7	48	22	12	M6×0.75	5.5	11	20	15.5				
NS25CL	33	7	12.5	48	59.6	35	–	M6×1×9	38	26	12	M6×0.75	7	11	23	18				
NS25AL	33	7	12.5	48	81.6	35	35	M6×1×9	60	26	12	M6×0.75	7	11	23	18				
NS30CL	42	9	16	60	67.4	40	–	M8×1,25×12	42	33	13	M6×0.75	8	11	28	23				
NS30AL	42	9	16	60	96.4	40	40	M8×1,25×12	71	33	13	M6×0.75	8	11	28	23				
NS35CL	48	10.5	18	70	77	50	–	M8×1,25×12	49	37.5	14	M6×0.75	8.5	11	34	27.5				
NS35AL	48	10.5	18	70	108	50	50	M8×1,25×12	80	37.5	14	M6×0.75	8.5	11	34	27.5				

Notes 1) External appearance of stainless steel ball slides differs from those of carbon steel ball slides.

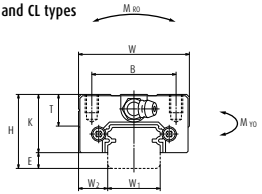
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Reference number for ball slide of random-matching type

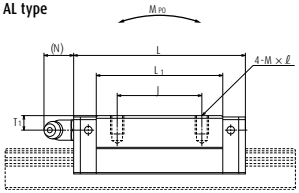
Ball slide NAS 30 AL S Z -L

- Random-matching ball slide series code — NAS: NS Series random-matching ball slide
- Size
- Ball slide shape code (See page 47)
- Material code — No code: Special high carbon steel (NSK standard), S: Stainless steel
- Preload code — No code: Fine clearance, Z: Slight preload, H: Medium preload
- Option code — -L: Equipped with NSK K1-L; -K: Equipped with NSK K1; -F: Fluoride low temperature chrome plating+AS2 grease; -F50: Fluoride low temperature chrome plating+LG2 grease

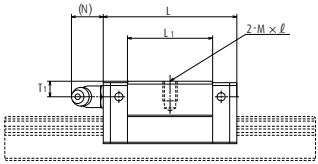
AL and CL types



AL type



CL type

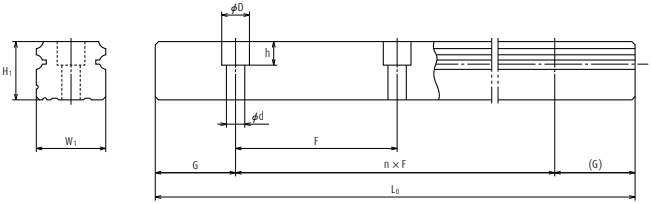


Reference number for rail of random-matching type

Rail N1S 30 1200 L C N -** PC Z

- Random-matching rail series code — N1S: NS Series random-matching rail
- Size
- Rail length (mm)
- Rail shape code — L: Standard; T: NS15 with mounting holes for M4
- Material/surface treatment code (See Table 16)
- Butting rail specification* — N: Non-butting, L: Butting specification
- Design serial number — Added to the reference number.
- Accuracy code — PH: High precision grade, PC: Normal grade
- Preload code (See Table 4) — T: Fine clearance, Z: Slight preload (common rail for medium preload)

*Please consult with NSK for butting rail specification.



Unit: mm

Rail				Basic load rating								Weight	
Pitch	Mounting bolt hole	G	Maximum length	2) Dynamic		Static	Static moment (N·m)					Ball slide	Rail
								M_{PO}		M_{YO}			
F	d × D × h	(reference)	L_{0max} ( ) for stainless	[50km] C_{50}(N)	[100km] C_{100}(N)	C_0 (N)	M_{RO}	One slide	Two slides	One slide	Two slides	(kg)	(kg/m)
60	*3.5×6×4.5	20	2 920	7 250	5 750	9 100	45.5	24.5	196	20.5	165	0.14	1.4
60	4.5×7.5×5.3	20	(1 700)	11 200	8 850	16 900	84.5	77	470	64.5	395	0.20	1.4
60	6×9.5×8.5	20	3 960	10 600	8 400	13 400	91.5	46.5	330	39	279	0.19	2.3
60	6×9.5×8.5	20	(3 500)	15 600	12 400	23 500	160	133	755	111	630	0.28	2.3
60	7×11×9	20	3 960	17 700	14 000	20 800	164	91	655	76	550	0.34	3.1
60	7×11×9	20	(3 500)	26 100	20 700	36 500	286	258	1 470	217	1 230	0.51	3.1
80	7×11×9	20	4 000	24 700	19 600	29 600	282	139	1 080	116	905	0.58	4.8
80	7×11×9	20	(3 500)	38 000	30 000	55 000	520	435	2 650	365	2 220	0.85	4.8
80	9×14×12	20	4 000	34 500	27 300	40 000	465	220	1 670	185	1 400	0.86	7.0
80	9×14×12	20	(3 500)	52 500	42 000	74 500	865	695	4 000	580	3 350	1.3	7.0

2) The basic load rating comply with the ISO standard. (ISO 14728-1, 14728-2)
C_{50}; the basic dynamic load rating for 50 km rated fatigue life C_{100}; the basic dynamic load rating for 100 km rated fatigue life
The basic static load rating shows static permissible load.

3) High-precision grade and medium preload of random-matching type are available for special high carbon steel products.

* Standard mounting hole of NS15 rail is for M4 bolts (Hole size: 4.5 × 7.5 × 5.3).
If you require mounting hole for M3 bolts (Hole size: 3.5 × 6 × 4.5), please specify when ordering.

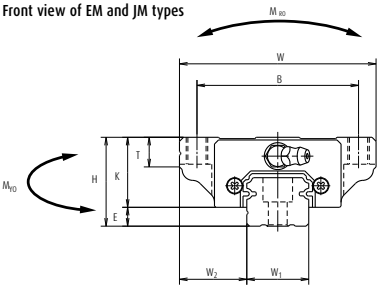
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NS-JM (Medium-load type / Short)
NS-EM (High-load type / Standard)

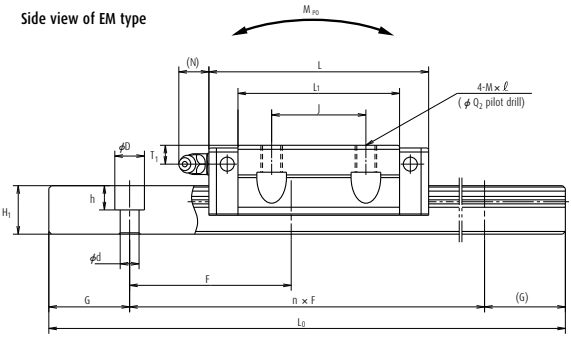
NS 30 1200 EM C 2 - ** PC Z**

- Series name
- Size
- Rail length (mm)
- Ball slide shape code (See page 47)
- Material/surface treatment code (See Table 16)
  C: Special high carbon steel (NSK standard), K: Stainless steel
- Number of ball slides per rail
- Design serial number
  Added to the reference number.
- Accuracy code (See Table 17)
- Preload code (See Table 4)
  0: Z0, 1: Z1, 3: Z3, T: ZT, Z: ZZ, H: ZH

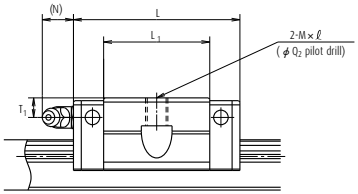
Front view of EM and JM types



Side view of EM type



Side view of JM type



Model No.	Assembly			Ball slide													Width	Height
	Height			Width	Length	Mounting hole							Grease fitting					
	H	E	W_2	W	L	B	J	M × pitch × ℓ	Q_2	L_1	K	T	Hole size	T_1	N		W_1	H_1
NS15JM	24	4.6	18.5	52	40.4	41	–	M5×0.8×7	4.4	23.6	19.4	8	ϕ 3	6	3		15	12.5
NS15EM	24	4.6	18.5	52	56.8	41	26	M5×0.8×7	4.4	40	19.4	8	ϕ 3	6	3		15	12.5
NS20JM	28	6	19.5	59	47.2	49	–	M6×1×9	5.3	30	22	10	M6×0.75	5.5	11		20	15.5
NS20EM	28	6	19.5	59	65.2	49	32	(M6×1×9.5)	5.3	48	22	10	M6×0.75	5.5	11		20	15.5
NS25JM	33	7	25	73	59.6	60	–	M8×1.25×10	6.8	38	26	11	M6×0.75	7	11		23	18
NS25EM	33	7	25	73	81.6	60	35	(M8×1.25×11.5)	6.8	60	26	(12)	M6×0.75	7	11		23	18
NS30JM	42	9	31	90	67.4	72	–	M10×1.5×12	8.6	42	33	11	M6×0.75	8	11		28	23
NS30EM	42	9	31	90	96.4	72	40	(M10×1.5×14.5)	8.6	71	33	(15)	M6×0.75	8	11		28	23
NS35JM	48	10.5	33	100	77	82	–	M10×1.5×13	8.6	49	37.5	12	M6×0.75	8.5	11		34	27.5
NS35EM	48	10.5	33	100	108	82	50	(M10×1.5×14.5)	8.6	80	37.5	(15)	M6×0.75	8.5	11		34	27.5

Notes
1) External appearance of stainless steel ball slides differs from those of carbon steel ball slides.
2) Parenthesized dimensions are for items made of stainless steel.

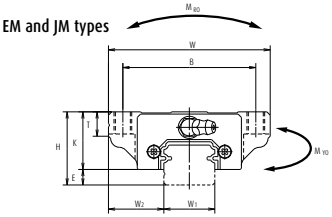
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Reference number for ball slide of random-matching type

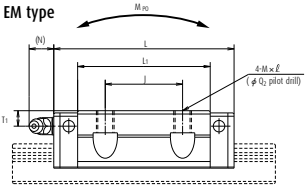
Ball slide NAS 30 EM S Z -L

- Random-matching ball slide series code — NAS: NS Series random-matching ball slide
- Size
- Ball slide shape code (See page 47)
- Material code — No code: Special high carbon steel (NSK standard), S: Stainless steel
- Preload code — No code: Fine clearance, Z: Slight preload, H: Medium preload
- Option code — -L: Equipped with NSK K1-L; -K: Equipped with NSK K1; -F: Fluoride low temperature chrome plating+AS2 grease; -F50: Fluoride low temperature chrome plating+LG2 grease

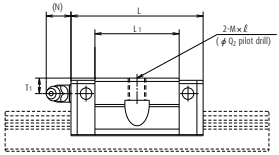
EM and JM types



EM type



JM type

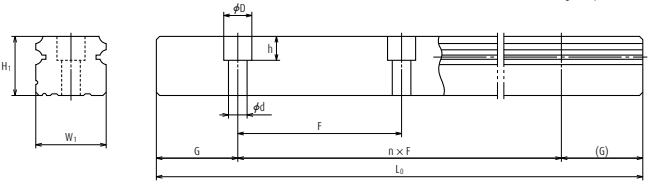


Reference number for rail of random-matching type

Rail N1S 30 1200 L C N -** PC Z

- Random-matching rail series code — N1S: NS Series random-matching rail
- Size
- Rail length (mm)
- Rail shape code — L: Standard; T: NS15 with mounting holes for M4
- Material/surface treatment code (See Table 16)
- Butting rail specification* — N: Non-butting, L: Butting specification
- Design serial number — Added to the reference number.
- Accuracy code — PH: High precision grade; PC: Normal grade
- Preload code (See Table 4) — T: Fine clearance; Z: Slight preload (common rail for medium preload)

*Please consult with NSK for butting rail specification.

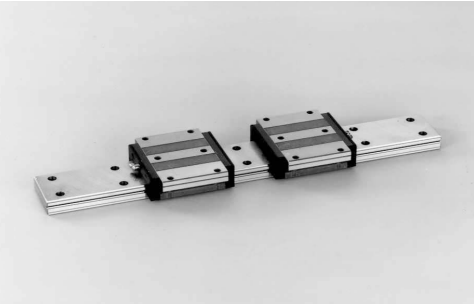


Unit: mm

Rail				Basic load rating								Weight	
Pitch	Mounting bolt hole	G	Maximum length	3) Dynamic		Static	Static moment (N·m)					Ball slide	Rail
								M_{PO}		M_{YO}			
F	d × D × h	(reference)	L_{0max} ( ) for stainless	[50km] C_{50}(N)	[100km] C_{100}(N)	C_0 (N)	M_{RO}	One slide	Two slides	One slide	Two slides	(kg)	(kg/m)
60	*3.5×6×4.5	20	2 920	7 250	5 750	9 100	45.5	24.5	196	20.5	165	0.17	1.4
60	4.5×7.5×5.3	20	(1 700)	11 200	8 850	16 900	84.5	77	470	64.5	395	0.26	1.4
60	6×9.5×8.5	20	3 960	10 600	8 400	13 400	91.5	46.5	330	39	279	0.24	2.3
60	6×9.5×8.5	20	(3 500)	15 600	12 400	23 500	160	133	755	111	630	0.35	2.3
60	7×11×9	20	3 960	17 700	14 000	20 800	164	91	655	76	550	0.44	3.1
60	7×11×9	20	(3 500)	26 100	20 700	36 500	286	258	1 470	217	1 230	0.66	3.1
80	7×11×9	20	4 000	24 700	19 600	29 600	282	139	1 080	116	905	0.76	4.8
80	7×11×9	20	(3 500)	38 000	30 000	55 000	520	435	2 650	365	2 220	1.2	4.8
80	9×14×12	20	4 000	34 500	27 300	40 000	465	220	1 670	185	1 400	1.2	7.0
80	9×14×12	20	(3 500)	52 500	42 000	74 500	865	695	4 000	580	3 350	1.7	7.0

3) The basic load rating comply with the ISO standard. (ISO 14728-1, 14728-2)
C_{50}; the basic dynamic load rating for 50 km rated fatigue life C_{100}; the basic dynamic load rating for 100 km rated fatigue life
The basic static load rating shows static permissible load.
4) High-precision grade and medium preload of random-matching type are available for special high carbon steel products.
* Standard mounting hole of NS15 rail is for M4 bolts (Hole size: 4.5 × 7.5 × 5.3).
If you require mounting hole for M3 bolts (Hole size: 3.5 × 6 × 4.5), please specify when ordering.

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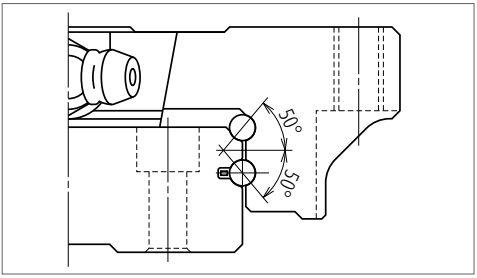


Fig. 1 Balls in contact

1. Features

(1) Ideal for use of single rail

Thanks to the wide rail, rigidity and load carrying capacity are high against moment load from rolling direction. This makes the LW Series ideal for a single rail, compact linear guideway system.

(2) High load carrying capacity to vertical direction

The contact angle is set at 50 degrees, increasing load carrying capacity as well as rigidity in vertical direction.

(3) High resistance against impact load

Same as the NH and NS series, the offset Gothic arch grooves support a large load, such as an impact, by four rows.

(4) High accuracy

Fixing master rollers to ball grooves is easy thanks to the Gothic arch groove. This makes easy and accurate measuring of ball grooves.

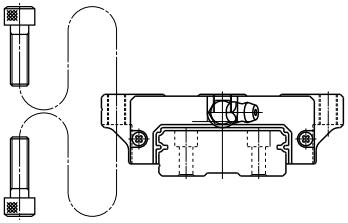
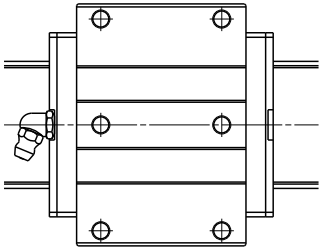
(5) Easy to handle, and designed with safety in mind

Balls are retained in the retainer and do not fall out when a ball slide is withdrawn from the rail.

(6) Fast delivery

Lineup of random-matching rails and ball slides supports and facilitates fast delivery.

2. Ball slide shape

Ball slide Model	Shape/installation method	Type
EL		EL 

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3. Accuracy and preload

(1) Running parallelism of ball slide

Table 1

Unit: μm

Rail length (mm) over	or less	Preloaded assembly (not random matching) High precision P5	Precision grade P6	Normal grade PN	Random-matching type Normal grade PC
–	50	2	4.5	6	6
50	80	3	5	6	6
80	125	3.5	5.5	6.5	6.5
125	200	4	6	7	7
200	250	5	7	8	8
250	315	5	8	9	9
315	400	6	9	11	11
400	500	6	10	12	12
500	630	7	12	14	14
630	800	8	14	16	16
800	1 000	9	16	18	18
1 000	1 250	10	17	20	20
1 250	1 600	11	19	23	23
1 600	2 000	13	21	26	26
2 000	2 500	15	22	29	29
2 500	3 150	17	25	32	32
3 150	4 000	23	30	34	34

(2) Accuracy standard

The preloaded assembly has three accuracy grades; High precision P5, Precision P6, and Normal PN grades, while the random-matching type has Normal PC grade only.

› Tolerance of preloaded assembly type

Table 2

Unit: μm

Characteristics \ Accuracy grade	High precision P5	Precision grade P6	Normal grade PN
Mounting height H	±20	±40	±80
Variation of H (All ball slides on a set of rails)	7	15	25
Mounting width W_2 or W_3	±25	±50	±100
Variation of W_2 or W_3 (All ball slides on reference rail)	10	20	30
Running parallelism of surface C to surface A Running parallelism of surface D to surface B	Shown in **Table 1** and **Fig. 2**		

› Tolerance of random-matching type: Normal grade PC

Table 3

Unit: μm

Characteristics \ Model No.	LW17, 21, 27, 35, 50
Mounting height H	±20
Variation of mounting height H	15 ① 30 ②
Mounting width W_2 or W_3	±30
Variation of mounting width W_2 or W_3	25
Running parallelism of surface C to surface A Running parallelism of surface D to surface B	See **Table 1** and **Fig. 2**

Notes ① Variation on the same rail / ② Variation on multiple rails

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(3) Combinations of accuracy and preload

Table 4

		Accuracy grade			
		High precision	Precision grade	Normal grade	Normal grade
Without NSK K1 lubrication unit		P5	P6	PN	PC
With NSK K1 lubrication unit		K5	K6	KN	KC
With NSK K1 for food and medical equipment		F5	F6	FN	FC
Preload	Fine clearance Z0	○	○	○	—
	Slight preload Z1	○	○	○	—
	Medium preload Z3	○	○	—	—
	Random-matching type with fine clearance ZT	—	—	—	○
	Random-matching type with slight preload ZZ	—	—	—	○

Note Z3 medium preload is only applicable to models of LW35 and LW50.

(4) Assembled accuracy

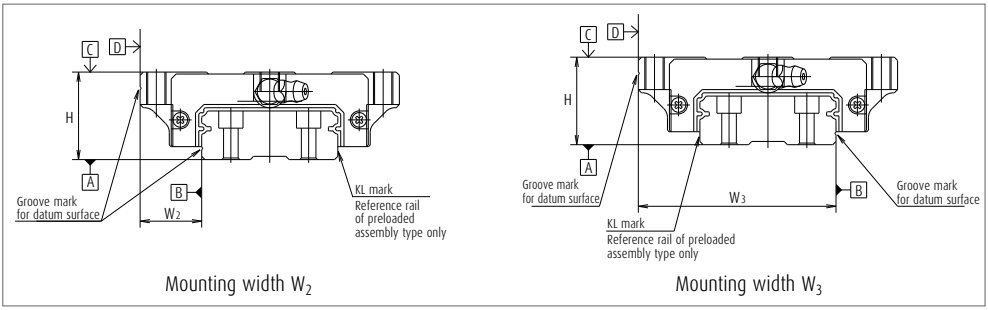


Fig. 2

(5) Preload and rigidity

We offer five levels of preload: Slight preload Z1, Medium preload Z3 and Fine clearance Z0, along with Random-matching type of Fine clearance ZT and Slight preload ZZ. Rigidities are for the median of the preload range.

› Preload and rigidity of preloaded assembly

Table 5

Model No.	Preload (N)		Rigidity (N/μm)			
			Vertical direction		Lateral direction	
	Slight preload Z1	Medium preload Z3	Slight preload Z1	Medium preload Z3	Slight preload Z1	Medium preload Z3
LW17 EL	0 - 245	—	156	—	112	—
LW21 EL	0 - 294	—	181	—	130	—
LW27 EL	0 - 390	—	226	—	167	—
LW35 EL	0 - 490	785	295	440	213	315
LW50 EL	0 - 590	1 470	345	600	246	425

Note Clearance for Fine clearance Z0 is 0 to 3μm. Therefore, preload is zero.
However, Z0 of PN grade is 0 to 15μm.

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› Clearance and preload of random-matching type

Table 6

Unit: μm

Model No.	Fine clearance ZT	Slight preload ZZ
LW17	−3 — 15	−3.5 — 0
LW21	−3 — 15	−3.5 — 0
LW27	−4 — 15	−4 — 0
LW35	−5 — 15	−5 — 0
LW50	−5 — 15	−7 — 0

Note Minus sign denotes elastic deformation of balls representing.

4. Maximum rail length

Table 7 shows the limitations of rail length (maximum length). However, the limitations vary by accuracy grade.

Table 7 Length limitations of rails

Unit: mm

Model No.	Size / Material	17	21	27	35	50
LW	Special high carbon steel	1 000	1 600	2 000	2 000	2 000

Note Rails can be butted if user requirement exceeds the rail length shown in the table. Please consult NSK.

5. Installation

(1) Permissible values of mounting error

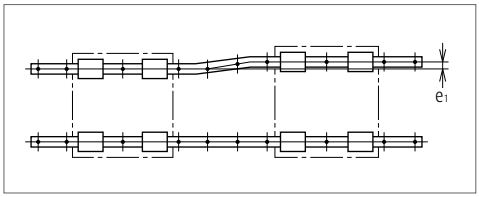


Fig. 3

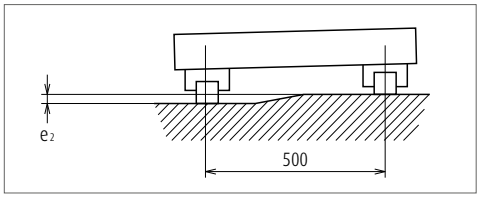


Fig. 4

Table 8

Unit: μm

Value	Preload	Model No. LW17	LW21	LW27	LW35	LW50
Permissible values of parallelism in two rails e_1	Z0, ZT	20	20	25	38	50
	Z1, ZZ	9	9	13	23	34
Permissible values of parallelism (height) in two rails e_2	Z0, ZT	100 μm/500 mm				
	Z1, ZZ	45 μm/500 mm				

(2) Shoulder height of the mounting surface and corner radius r

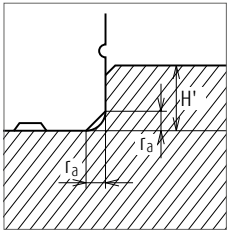


Fig. 5 Shoulder for the rail datum face

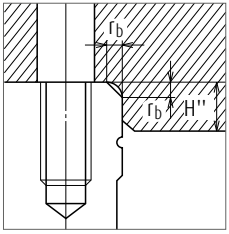


Fig. 6 Shoulder for the ball slide datum face

Table 9

Unit: mm

Model No.	Corner radius (maximum) r_a	r_b	Shoulder height H'	H''
LW17	0.3	0.3	2.2	4
LW21	0.3	0.3	2.5	5
LW27	0.5	0.5	3.5	5
LW35	0.5	0.8	3.5	5
LW50	0.8	0.8	4	6

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7. Dust-proof components

(1) Standard specification

The LW Series can be readily used as they have a dust protection means for normal conditions. As the standard equipment, the series has an end seal on both ends and bottom seals at the bottom.

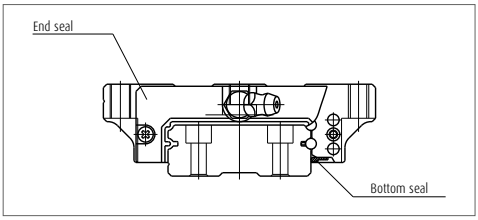


Fig. 13

Table 11 Seal friction per ball slide (maximum value)

Unit: N

Size \ Series	17	21	27	35	50
LW	6	8	12	16	20

(2) NSK K1 lubrication unit

Table 12 shows the dimension of linear guides equipped with the NSK K1 lubrication unit.

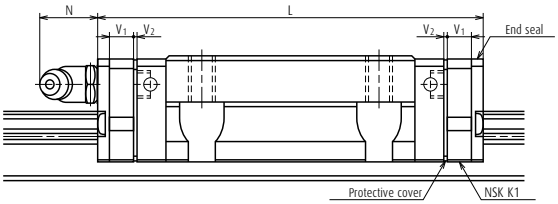


Table 12

Unit: mm

Model No.	Ball slide length	Ball slide model	Standard ball slide length	Ball slide length installed with two NSK K1 L	Per NSK K1 thickness V_1	Protective cover thickness V_2	Protruding area of the grease fitting N
LW17	Standard	EL	51.4	61.6	4.5	0.6	(5)
LW21	Standard	EL	58.8	71.4	5.5	0.8	(13)
LW27	Standard	EL	74	86.6	5.5	0.8	(13)
LW35	Standard	EL	108	123	6.5	1.0	(13)
LW50	Standard	EL	140.6	155.6	6.5	1.0	(14)

Note 1) NSK K1 for food and medical equipments are available for the models of LW17 to LW35.
2) Ball slide length equipped with NSK K1 = (Standard ball slide length) + (Thickness of NSK K1, $V_1 \times$ Number of NSK K1) + (Thickness of the protective cover, $V_2 \times 2$)

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(3) Double seal

Use a double seal set as showing in **Table 13**, when installing an extra seal to completed standard products. **(Fig. 10)**

When installing a grease fitting after the installation of double seals, a connector as showing **Fig.10** is required.

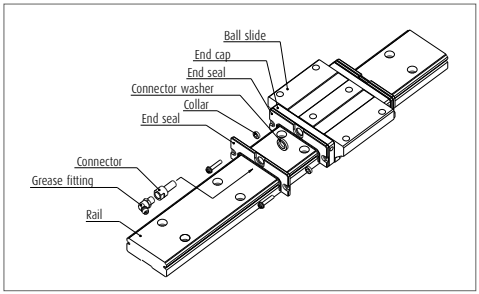


Fig. 10 Double seal

(4) Protector

Use a protector set as showing **Table 14**, when installing a protector to completed standard products. **(Fig.11)**

When installing a grease fitting after the installation of protectors, a connector as showing **Fig.11** is required.

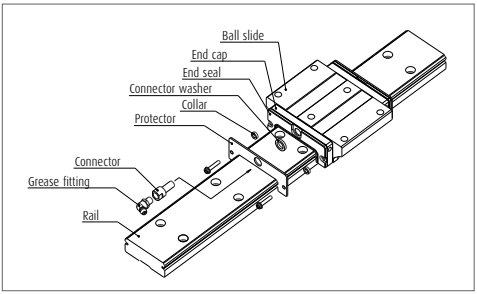


Fig. 11 Protector seal

Table 13 Double-seal set

Model No.	Reference No.		Increased thickness V_3 (mm)
	Without connector	With connector	
LW17	LW17WS-01	*	2.6
LW21	LW21WS-01	LW21WSC-01	2.8
LW27	LW27WS-01	LW27WSC-01	2.5
LW35	LW35WS-01	LW35WSC-01	3
LW50	LW50WS-01	LW50WSC-01	3.6

Table 14 Protector set

Model No.	Reference No.		Increased thickness V_4 (mm)
	Without connector	With connector	
LW17	LW17PT-01	*	3.2
LW21	LW21PT-01	LW21PTC-01	3.2
LW27	LW27PT-01	LW27PTC-01	2.9
LW35	LW35PT-01	LW35PTC-01	3.6
LW50	LW50PT-01	LW50PTC-01	4.2

*) For installation of a connector to a drive-in type grease fitting, contact NSK.

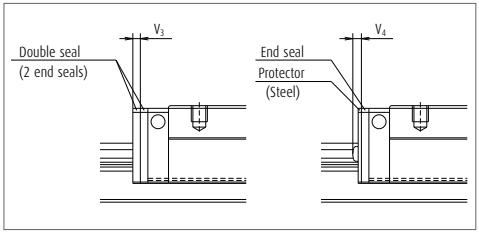


Fig. 12

(5) Cap to plug the rail mounting bolt hole

Table 15 Caps to plug rail bolt hole

Modell No.	Bolt to secure rail	Cap reference No.	Quantity/case
LW17, LW21, LW27	M4	LG-CAP/M4	20
LW35	M6	LG-CAP/M6	20
LW50	M8	LG-CAP/M8	20

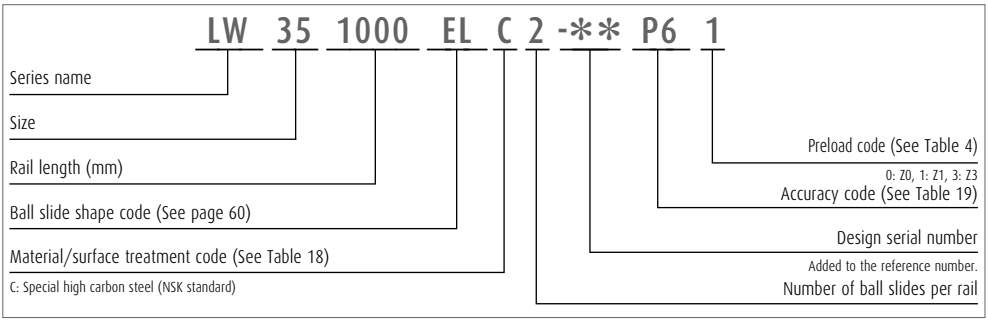
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8. Reference number

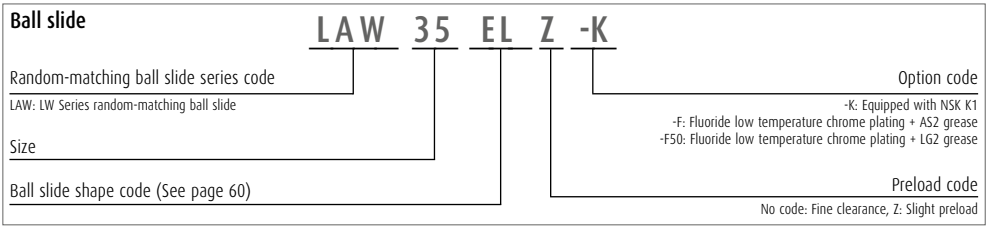
Reference numbers shall be set to individual NSK linear guide when its specifications are finalized, and it is indicated on its specification drawing.

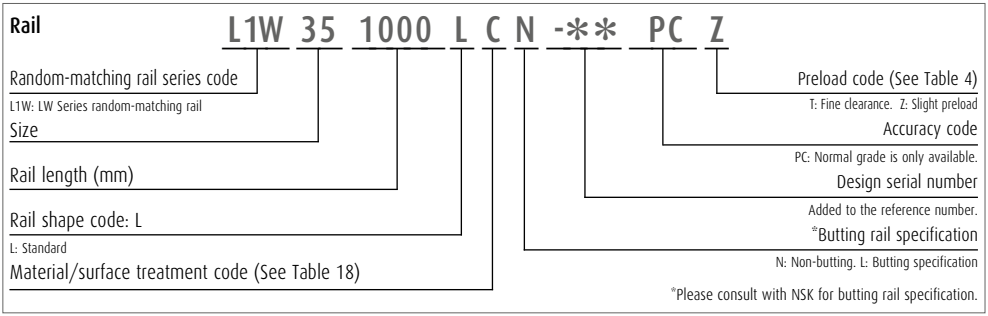
Please specify the reference number, except design serial number, to identify the product when ordering, requiring estimates, or inquiring about specifications from NSK.

(1) Reference number for preloaded assembly



(2) Reference number for random-matching type





The reference number coding for the assembly of random-matching type is the same as that of preloaded assembly. However, only preload codes of "fine clearance T" and "slight preload Z" are available (See Table 4, page 62).

Click!Speedy NSK Linear Guide Quick Delivery System uses a new numbering system. For details, please refer to the Click!Speedy general catalog CAT. No. E3191.

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Table 18 Material/surface treatment code

Code	Description
C	Special high carbon steel (NSK standard)
D	Special high carbon steel with surface treatment
Z	Other, special

Table 19 Accuracy code

Accuracy	Standard (Without NSK K1)	With NSK K1	With NSK K1 for food and medical equipment
High precision grade	P5	K5	F5
Precision grade	P6	K6	F6
Normal grade	PN	KN	FN
Normal grade (random-matching type)	PC	KC	FC

Note Refer to pages 454 to 459 for NSK K1 lubrication unit.

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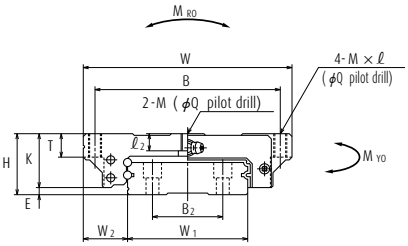
(9) Dimensions

LW-EL

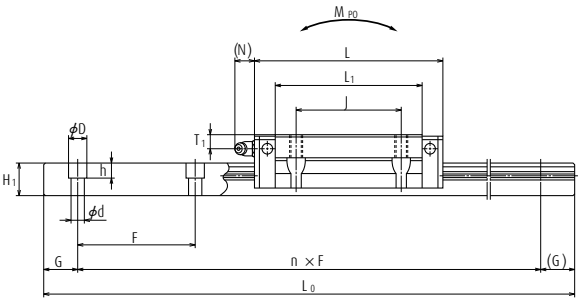
LW 35 1000 EL C 2 -** PC Z

- Series name
- Size
- Rail length (mm)
- Ball slide shape code (See page 60)
- Material/surface treatment code (See Table 18)
  C: Special high carbon steel (NSK standard)
- Number of ball slides per rail
- Added to the reference number.
- Design serial number
- Accuracy code (See Table 19)
- Preload code (See Table 4)
  0: Z0, 1: Z1, 3: Z3, T: ZT, Z: ZZ

Front view



Side view



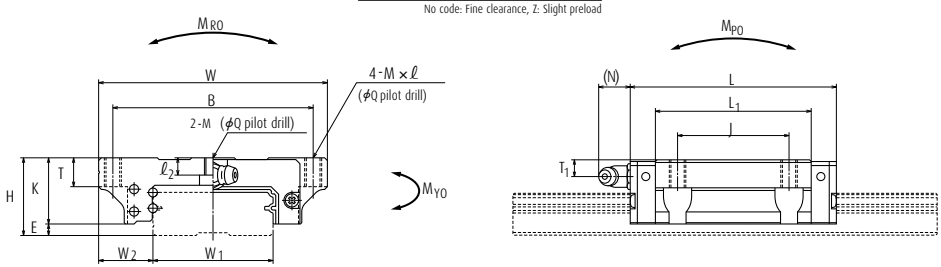
Model No.	Assembly			Ball slide														Width	Height
	Height			Width	Length	Mounting hole									Grease fitting				
	H	E	W_2	W	L	B	J	M × pitch × ℓ	ℓ_2	Q	L_1	K	T	Hole size	T_1	N	W_1	H_1
LW17EL	17	2.5	13.5	60	51.4	53	26	M4×0.7×6	3.2	3.3	35	14.5	6	φ 3	4	3	33	8.7
LW21EL	21	3	15.5	68	58.8	60	29	M5×0.8×8	3.7	4.4	41	18	8	M6×0.75	4.5	11	37	10.5
LW27EL	27	4	19	80	74	70	40	M6×1×10	6	5.3	56	23	10	M6×0.75	6	11	42	15
LW35EL	35	4	25.5	120	108	107	60	M8×1.25×14	9	6.8	84	31	14	M6×0.75	8	11	69	19
LW50EL	50	4.5	36	162	140.6	144	80	M10×1.5×18	14	8.6	108	45.5	18	Rc1/8	14	14	90	24

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Reference number for ball slide of random-matching type

LAW 35 EL Z -K

- Random-matching ball slide series code — LAW: LW Series random-matching ball slide
- Size
- Ball slide shape code (See page 60)
- Preload code — No code: Fine clearance, Z: Slight preload
- Option code — -K: Equipped with NSK K1; -F: Fluoride low temperature chrome plating + AS2 grease; -F50: Fluoride low temperature chrome plating + LG2 grease

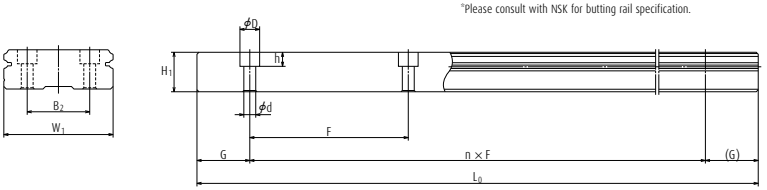


Reference number for rail of random-matching type

Rail L1W 35 1000 L C N -** PC Z

- Random-matching rail series code — L1W: LW Series random-matching rail
- Size
- Rail length (mm)
- Rail shape code: L — L: Standard
- Material/surface treatment code (See Table 18)
- *Butting rail specification — N: Non-butting. L: Butting specification
- Design serial number — Added to the reference number.
- Accuracy code: PC — PC: Normal grade is only available.
- Preload code (See Table 4) — T: Fine clearance. Z: Slight preload

*Please consult with NSK for butting rail specification.



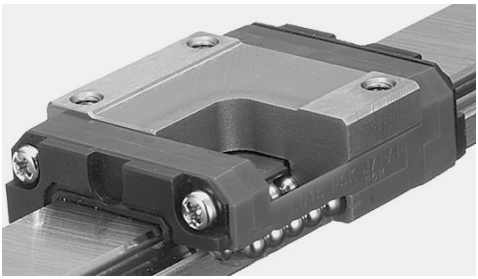
Unit: mm

Rail					Basic load rating								Weight	
	Pitch	Mounting bolt hole	G	Maximum length	1) Dynamic		Static	Static moment (N·m)					Ball slide	Rail
									M_{PO}		M_{YO}			
B_2	F	d × D × h	(reference)	L_{0max} ( ) for stainless	[50km] C_{50}(N)	[100km] C_{100}(N)	C_0 (N)	M_{RO}	One slide	Two slides	One slide	Two slides	(kg)	(kg/m)
18	40	4.5×7.5×5.3	15	1 000	5 600	4 450	11 300	135	44	288	37	242	0.2	2.1
22	50	4.5×7.5×5.3	15	1 600	6 450	5 150	13 900	185	65.5	400	55	335	0.3	2.9
24	60	4.5×7.5×5.3	20	2 000	12 800	10 200	26 900	400	171	970	143	815	0.5	4.7
40	80	7×11×9	20	2 000	33 000	26 400	66 500	1 690	645	3 550	545	2 990	1.5	9.6
60	80	9×14×12	20	2 000	61 500	48 500	117 000	3 900	1 530	8 200	1 280	6 900	4.0	15.8

Note The basic load rating comply with the ISO standard. (ISO 14728-1, 14728-2)
C_{50}: the basic dynamic load rating for 50 km rated fatigue life C_{100}: the basic dynamic load rating for 100 km rated fatigue life

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9. PU-Series: Miniature Linear Ball Guides



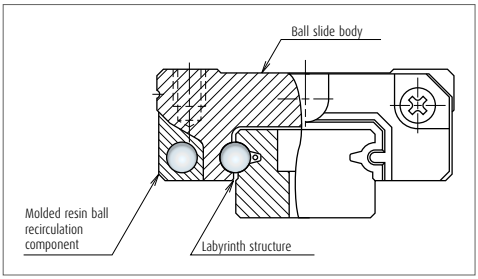


Fig. 1

1. Features

(1) Motion performance

Newly designed recirculation component facilitates smooth circulation of steel balls.

(2) Lightweight

The ball slide is fabricated to be approximately 20% lighter than LU Series by the application of resin to a part of its body.

(3) Reduced noise intensity

Resin components applied in ball circulating circuits reduce collision noise between steel balls and the inner wall of circulating circuits.

(4) Low dust generation

The structure is designed to prevent dust generation.

(5) Excellent dust-proofing

It is designed to minimize the clearance between the side of rails and the inner walls of the slide, and prevent foreign matters from entering the ball slide.

(6) High corrosion resistance

High corrosion-resistant martensite stainless steel is incorporated as a standard feature to provides excellent corrosion resistance.

(7) Easy to handle

Safety design includes a retainer that prevents steel balls from dropping out of the ball slide even when the slide is removed from the rail.

(8) Long-term maintenance-free

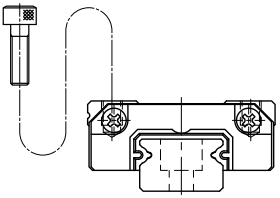
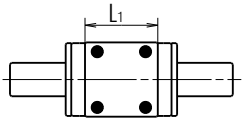
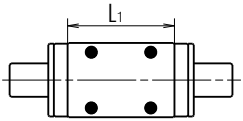
Superb features of NSK K1 Lubrication unit realize a long-term, maintenance-free operation.

(9) Fast delivery

Lineup of random-matching rails and ball slides facilitates fast delivery. (PU09 to PU15)

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2. Ball slide shape

Ball slide Model	Shape/installation method	Type (Upper row, Rating: Lower row, Ball slide length)	
		Standard type	High-load type
		Standard	Long
AR TR AL UR BL BR		TR, AR, AL 	UR, BL 

3. Accuracy and preload

(1) Running parallelism of ball slide

Table 1

Unit: μm

Rail length (mm)		Preloaded assembly (not random matching)				Random-matching type
over	or less	Super precision P4	High precision P5	Precision grade P6	Normal grade PN	Normal grade PC
–	50	2	2	4.5	6	6
50	80	2	3	5	6	6
80	125	2	3.5	5.5	6.5	6.5
125	200	2	4	6	7	7
200	250	2.5	5	7	8	8
250	315	2.5	5	8	9	9
315	400	3	6	9	11	11
400	500	3	6	10	12	12
500	630	3.5	7	12	14	14
630	800	4.5	8	14	16	16
800	1 000	5	9	16	18	18
1 000	1 250	6	10	17	20	20

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(2) Accuracy standard

The preloaded assembly has four accuracy grades; Super precision P4, High precision P5, Precision grade P6, and normal grade PN, while the random-matching type has Normal grade PC only.

Table 2 shows the accuracy standard for the preloaded assembly type while **Table 3** shows the accuracy standard for the random-matching types.

› Tolerance of preloaded assembly type

Table 2

Unit: µm

Characteristics \ Accuracy grade	Super precision P4	High precision P5	Precision grade P6	Normal grade PN
Mounting height H	±10	±15	±20	±40
Variation of H	5	7	15	25
(All ball slides on a set of rails)				
Mounting width W_2 or W_3	±15	±20	±30	±50
Variation of W_2 or W_3	7	10	20	30
(All ball slides on reference rail)				
Running parallelism of surface C to surface A Running parallelism of surface D to surface B	Shown in **Table 1** and **Fig. 2**			

› Tolerance of random-matching type: Normal grade PC

Table 3

Unit: µm

Characteristics \ Model No.	PU09, 12 and 15
Mounting height H	±20
Variation of mounting height H	15 ① 30 ②
Mounting width W_2 or W_3	±20
Variation of mounting width W_2 or W_3	20
Running parallelism of surface C to surface A Running parallelism of surface D to surface B	Shown in **Table 1** and **Fig. 2**

Notes ① Variation on the same rail / ② Variation on multiple rails

(3) Assembled accuracy

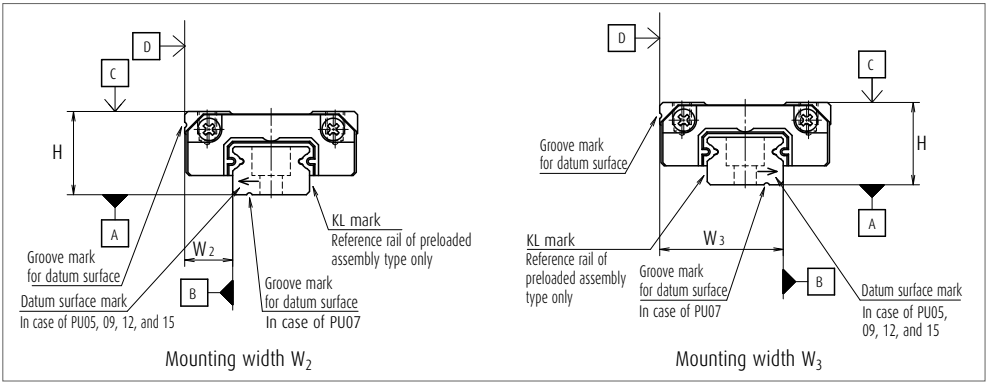


Fig. 2

Note Please refer to page 16 for marks on the datum surfaces.

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(4) Preload and rigidity

We offer three levels of preload: Slight preload Z1 and Fine clearance Z0 for preloaded assembly type, along with Fine clearance ZT for random-matching type. Values for preload and rigidity of the preloaded assembly type are shown in **Table 4**. Rigidities are for the median of the preload range.

› Preload and rigidity of preloaded assembly

Table 4

Model No.		Preload (N)	Rigidity (N/μm)
		Slight preload (Z1)	Slight preload (Z1)
Standard type	PU05TR	0 – 3	17
	PU07AR	0 – 8	22
	PU09TR	0 – 10	30
	PU12TR	0 – 17	33
	PU15AL	0 – 33	45
High-load type	PU09UR	0 – 14	46
	PU12UR	0 – 25	52
	PU15BL	0 – 51	75

Note Clearance of Fine clearance Z0 is 0 to 3 μm. Therefore, preload is zero.

› Clearance of random-matching type

Table 5

Unit : μm

Model No.		Fine clearance ZT
Standard type	PU09TR	3 or less
	PU12TR	
	PU15AL	
High-load typ	PU09UR	5 or less
	PU12UR	
	PU15BL	

4. Maximum rail length

Table 6 shows the limitations of rail length (maximum length). However, the limitations vary by accuracy grade.

Table 6 Length limitations of rails

Unit: mm

Series	Material \ Size	05	07	09	12	15
PU	Stainless steel	210	375	600	800	1 000

Note Rails can be butted if user requirement exceeds the rail length shown in the table. Please consult NSK.

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5. Installation

(1) Permissible values of mounting error

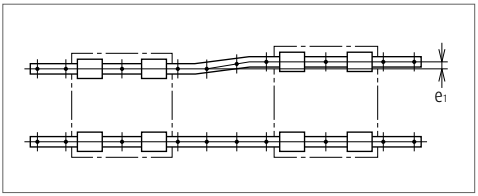


Fig. 3

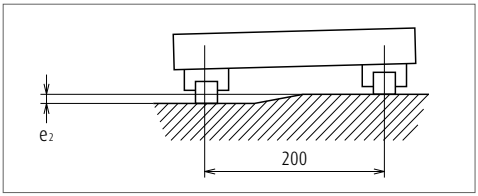


Fig. 4

Table 7

Unit: µm

Value	Preload	Model No.				
		PU05	PU07	PU09	PU12	PU15
Permissible values of parallelism in two rails e_1	Z0, ZT	10	12	15	20	25
	Z1	7	10	13	15	21
Permissible values of parallelism (height) in two rails e_2	Z0, ZT	150 µm/200 mm				
	Z1	90 µm/200 mm				

(2) Shoulder height of the mounting surface and corner radius r

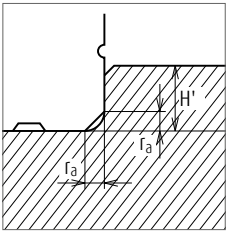


Fig. 5 Shoulder for the rail datum face

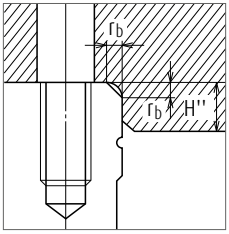


Fig. 6 Shoulder for the ball slide datum face

Table 8

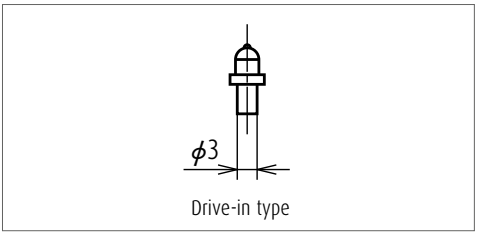
Unit: mm

Model No.	Corner radius (maximum)		Shoulder height	
	r_a	r_b	H'	H"*
PU05	0.2	0.2	0.7	2.3
PU07	0.2	0.3	1.2	2.5
PU09	0.3	0.3	1.9	2.6
PU12	0.3	0.3	2.5	3.4
PU15	0.3	0.5	3.5	4.4

*) H" is the minimum recommended value based on the dimension T in dimension table.

6. Lubrication accessory

Model of PU15 can select drive-in type grease fitting as an option.
For the models of PU05 to PU12, apply grease directly to the ball grooves of rail using a point nozzle.



Drive-in type

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7. Dust-proof components

(1) Standard specification

An end seal provided to both ends of a ball slide as a standard feature.

Seal friction per standard ball slide is shown in **Table 9**.

Table 9 Seal friction per ball slide (maximum value)

Unit: N

Size \ Series	05	07	09	12	15
PU	0.3	0.3	0.5	0.5	0.5

(2) NSK K1 lubrication unit

Table 10 shows the dimension of linear guides equipped with the NSK K1 lubrication unit.

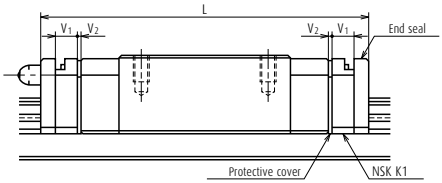


Table 10

Unit: mm

Model No.	Ball slide length	Ball slide model	Standard ball slide length	Ball slide length installed with two NSK K1 L	Thickness of NSK K1, V_1	Thickness of protective cover, V_2
PU05	Standard	TR	19.4	24.4	2	0.5
PU07	Standard	AR	23.4	29.4	2.5	0.5
PU09	Standard	TR	30	36.4	2.7	0.5
PU09	Long	UR	41	47.4	2.7	0.5
PU12	Standard	TR	35	42	3	0.5
PU12	Long	UR	48.7	55.7	3	0.5
PU15	Standard	AL	43	51.2	3.5	0.6
PU15	Long	BL	61	69.2	3.5	0.6

Note Ball slide length equipped with NSK K1 = (Standard ball slide length) + (Thickness of NSK K1, V1 × Number of NSK K1) + (Thickness of the protective cover $V_2 \times 2$)

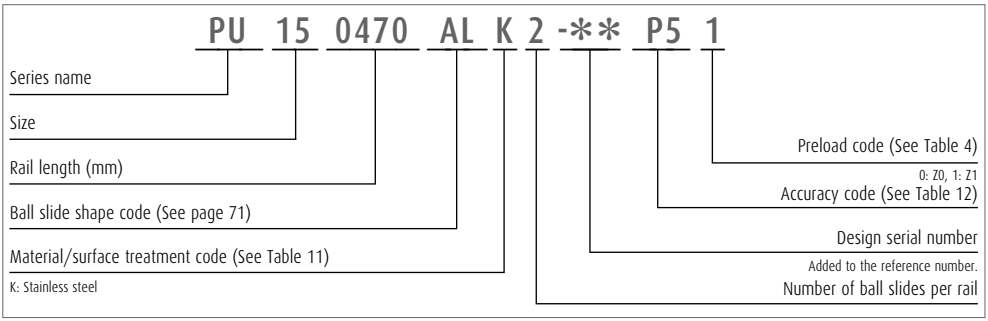
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8. Reference number

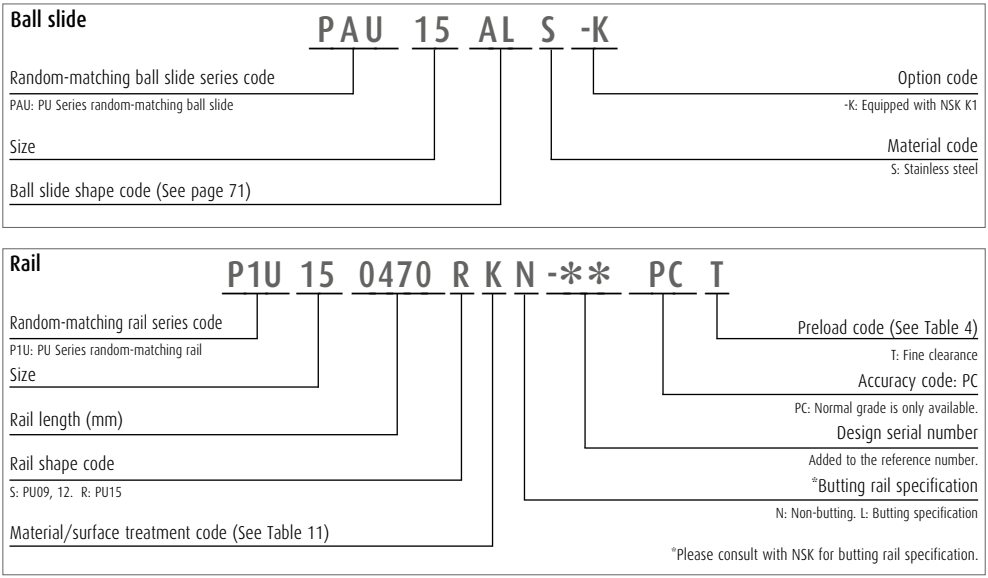
Reference numbers shall be set to individual NSK linear guide when its specifications are finalized, and it is indicated on its specification drawing.

Please specify the reference number, except design serial number, to identify the product when ordering, requiring estimates, or inquiring about specifications from NSK.

(1) Reference number for preloaded assembly



(2) Reference number for random-matching type



The reference number coding for the assembly of random-matching type is the same as that of preloaded assembly. However, only preload code of "fine clearance T" is available (See Table 4, page 73).

Click!Speedy NSK Linear Guide Quick Delivery System uses a new numbering system. For details, please refer to the Click!Speedy general catalog CAT. No. E3191.

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Table 11 Material/surface treatment code

Code	Description
K	Stainless steel
H	Stainless steel with surface treatment
Z	Other, special

Table 12 Accuracy code

Accuracy	Standard (Without NSK K1)	With NSK K1	With NSK K1 for food and medical equipment
Super precision grade	P4	K4	F4
High precision grade	P5	K5	F5
Precision grade	P6	K6	F6
Normal grade	PN	KN	FN
Normal grade (random-matching type)	PC	KC	FC

Note Refer to pages 454 to 459 for NSK K1 lubrication unit.

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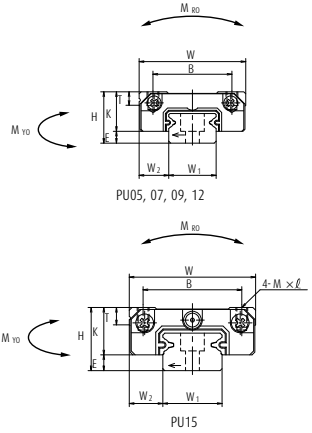
9. Dimensions

PU-TR, AR, AL (Standard type / Standard)
PU-UR, BL (High-load type / Long)

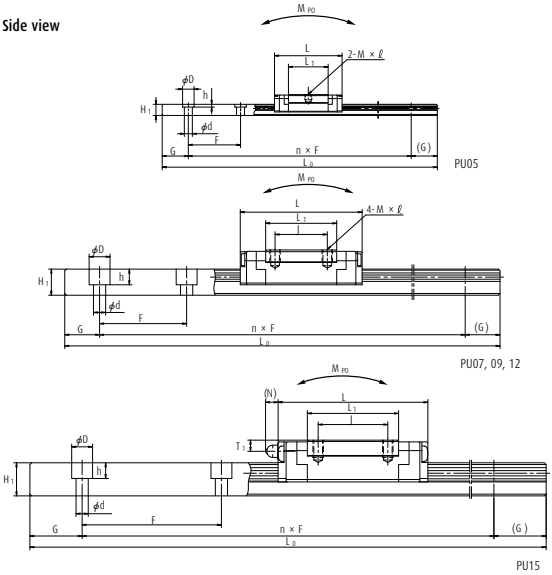
PU 15 0470 AL K 2 -** PC T

- Series name
- Size
- Rail length (mm)
- Ball slide shape code (See page 71)
- Material/surface treatment code (See Table 11)
  K: Stainless steel
- Number of ball slides per rail
- Added to the reference number.
- Design serial number
- Accuracy code (See Table 12)
- Preload code (See Table 4)
  0: Z0, 1: Z1, T: ZT

Front view



Side view



Model No.	Assembly			Ball slide											Width	Height
	Height			Width	Length	Mounting hole						Oil hole				
	H	E	W_2	W	L	B	J	M × pitch × ℓ	L_1	K	T	Hole size	T_1	N	W_1	H_1
PU05TR	6	1	3.5	12	19.4	8	–	M2×0.4×1.5	11.4	5	2.3	φ 0.9	1.5	–	5	3.2
PU07AR	8	1.5	5	17	23.4	12	8	M2×0.4×2.4	13.3	6.5	2.45	φ 1.5	1.8	–	7	4.7
PU09TR	10	2.2	5.5	20	30	15	10	M3×0.5×3	19.6	7.8	2.6	–	–	–	9	5.5
PU09UR	10	2.2	5.5	20	41	15	16	M3×0.5×3	30.6	7.8	2.6	–	–	–	9	5.5
PU12TR	13	3	7.5	27	35	20	15	M3×0.5×3.5	20.4	10	3.4	–	–	–	12	7.5
PU12UR	13	3	7.5	27	48.7	20	20	M3×0.5×3.5	34.1	10	3.4	–	–	–	12	7.5
PU15AL	16	4	8.5	32	43	25	20	M3×0.5×5	26.2	12	4.4	φ 3	3.2	(3.6)	15	9.5
PU15BL	16	4	8.5	32	61	25	25	M3×0.5×5	44.2	12	4.4	φ 3	3.2	(3.6)	15	9.5

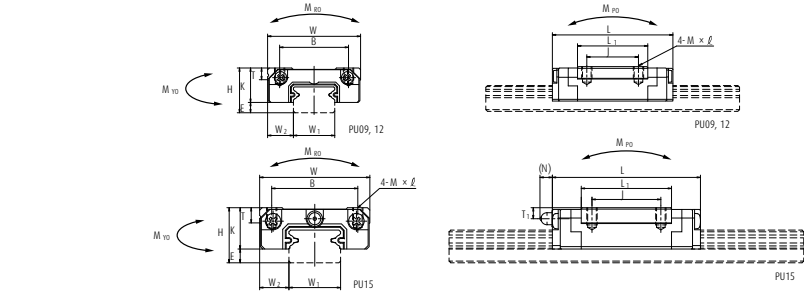
Notes 1) The ball slide of PU05TR has only two mounting tap holes in the center.

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Reference number for ball slide of random-matching type

PAU 15 AL S -K

- Random-matching ball slide series code — PAU: PU Series random-matching ball slide
- Size — 15
- Ball slide shape code (See page 71) — AL
- Material code — S: Stainless steel
- Option code — -K: Equipped with NSK K1

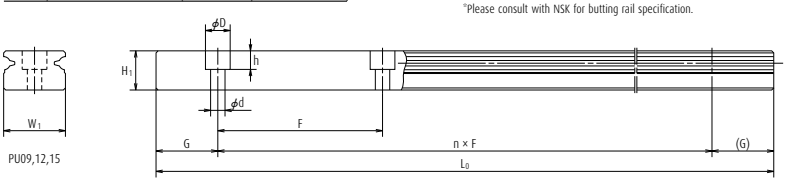


Reference number for rail of random-matching type

Rail P1U 15 0470 R K N - PC T**

- Random-matching rail series code — P1U: PU Series random-matching rail
- Size — 15
- Rail length (mm) — 0470
- Rail shape code — S: PU09, 12. R: PU15
- Material/surface treatment code (See Table 11) — K
- *Butting rail specification — N: Non-butting. L: Butting specification
- Design serial number — Added to the reference number.
- Accuracy code: PC — PC: Normal grade is only available.
- Preload code (See Table 4) — T: Fine clearance

*Please consult with NSK for butting rail specification.



Unit: mm

Rail				Basic load rating								Weight	
Pitch	Mounting bolt hole	G	Maximum length	2) Dynamic		Static	Static moment (N·m)					Ball slide	Rail
				[50km]	[100km]		M_{RO}	M_{PO}		M_{YO}			
F	d × D × h	(reference)	L_{0max}	C_{50}(N)	C_{100}(N)	C_0 (N)		One slide	Two slides	One slide	Two slides	(g)	(g/100mm)
15	2.3×3.3×0.8	5	210	520	410	775	2.06	1.28	9.90	1.28	9.90	4	11
15	2.4×4.2×2.3	5	375	1 090	860	1 370	5.20	2.70	21.8	2.70	21.8	8	23
20	3.5×6×4.5	7.5	600	1 490	1 180	2 150	9.90	6.10	41.0	6.10	41.0	16	35
20	3.5×6×4.5	7.5	600	2 100	1 670	3 500	16.2	15.6	88.0	15.6	88.0	25	35
25	3.5×6×4.5	10	800	2 830	2 250	3 500	21.1	11.4	73.5	11.4	73.5	32	65
25	3.5×6×4.5	10	800	4 000	3 150	5 700	34.5	28.3	174	28.3	174	53	65
40	3.5×6×4.5	15	1 000	5 550	4 400	6 600	49.5	25.6	190	25.6	190	59	105
40	3.5×6×4.5	15	1 000	8 100	6 400	11 300	84.5	69.5	435	69.5	435	100	105

2) The basic load rating comply with the ISO standard. (ISO 14728-1, 14728-2)
C_{50}; the basic dynamic load rating for 50 km rated fatigue life C_{100}; the basic dynamic load rating for 100 km rated fatigue life
3) To fix rail of PU05TR, use M2 × 0.4 cross-recessed pan head machine screw for precision instrument.
(JCIS 10-70 No. 0 pan head machine screw No.1.)
(JCIS: Japanese Camera Industrial Standard.)

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10. PE-Series: Miniature Linear Wide Body Ball Guides



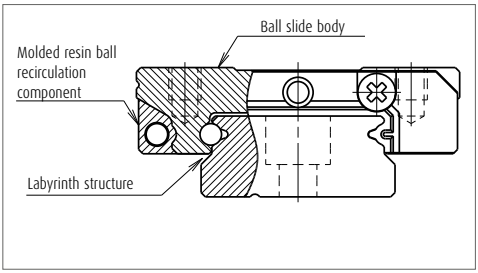


Fig. 1

1. Features

(1) Ideal for use of single rail

The PE Series linear guides are miniature and wide rail type. Thanks to the wide rail, load carrying capacity is high against moment load from rolling direction.

(2) Motion performance

Newly designed recirculation component facilitates smooth circulation of steel balls.

(3) Lightweight

The ball slide is fabricated to be approximately 20% lighter than that of the LE Series by the application of resin to a part of its body.

(4) Reduced noise intensity

Resin components applied in ball circulating circuits reduce collision noise between steel balls and the inner wall of circulating circuits.

(5) Low dust generation

The structure is designed to prevent dust generation.

(6) Excellent dust-proofing

It is designed to minimize the clearance between the side of rails and the inner walls of the slide, and prevent foreign matters from entering the ball slide.

(7) High corrosion resistance

High corrosion-resistant martensite stainless steel incorporated as a standard feature provides excellent resistance to corrosion.

(8) Easy to handle

Safety design includes a retainer that prevents steel balls from dropping out of the ball slide even when the slide is removed from the rail.

(9) Long-term maintenance-free

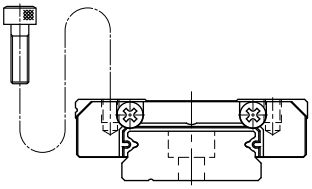
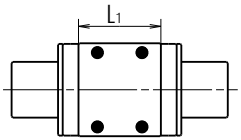
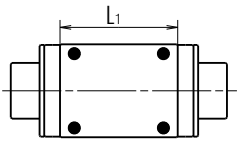
Equipped with NSK K1 Lubrication Unit realizes long-term, maintenance-free use.

(10) Fast delivery

Lineup of random-matching rails and ball slides in the series supports random matching and facilitates fast delivery. (PE09 to PE15)

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2. Ball slide shape

Ball slide Model	Shape/installation method	Type (Upper row, Rating: Lower row, Ball slide length)	
		Standard type	High-load type
		Standard	Long
AR TR UR BR		AR, TR 	UR, BR 

3. Accuracy and preload

(1) Running parallelism of ball slide

Table 1

Unit: μm

Rail length (mm) over	Rail length (mm) or less	Preloaded assembly type (not random matching) Super precision P4	High precision P5	Precision grade P6	Normal grade PN	Random-matching type Normal grade PC
–	50	2	2	4.5	6	6
50	80	2	3	5	6	6
80	125	2	3.5	5.5	6.5	6.5
125	200	2	4	6	7	7
200	250	2.5	5	7	8	8
250	315	2.5	5	8	9	9
315	400	3	6	9	11	11
400	500	3	6	10	12	12
500	630	3.5	7	12	14	14
630	800	4.5	8	14	16	16
800	1 000	5	9	16	18	18
1 000	1 250	6	10	17	20	20

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(2) Accuracy standard

The preloaded assembly type has four accuracy grades; Super precision P4, High precision P5, Precision P6, and Normal PN grades, while the random-matching type has Normal grade PC only.

Table 2 shows the accuracy standard for the preloaded assembly type while **Table 3** shows the accuracy standard for the random-matching types.

› Tolerance of preloaded assembly

Table 2

Unit: μm

Characteristics \ Accuracy grade	Super precision P4	High precision P5	Precision grade P6	Normal grade PN
Mounting height H Variation of H (All ball slides on a set of rails)	±10 5	±15 7	±20 15	±40 25
Mounting width W_2 or W_3 Variation of W_2 or W_3 (All ball slides on reference rail)	±15 7	±20 10	±30 20	±50 30
Running parallelism of surface C to surface A Running parallelism of surface D to surface B	Shown in **Table 1** and **Fig. 2**			

› Tolerance of random-matching type: Normal grade PC

Table 3

Unit: μm

Characteristics \ Model No.	PE09, 12 and 15
Mounting height H	±20
Variation of mounting height H	15① 30②
Mounting width W_2 or W_3	±20
Variation of mounting width W_2 or W_3	20
Running parallelism of surface C to surface A Running parallelism of surface D to surface B	Shown in **Table 1** and **Fig. 2**

Note ① Variation on the same rail ② Variation on multiple rails

(3) Assembled accuracy

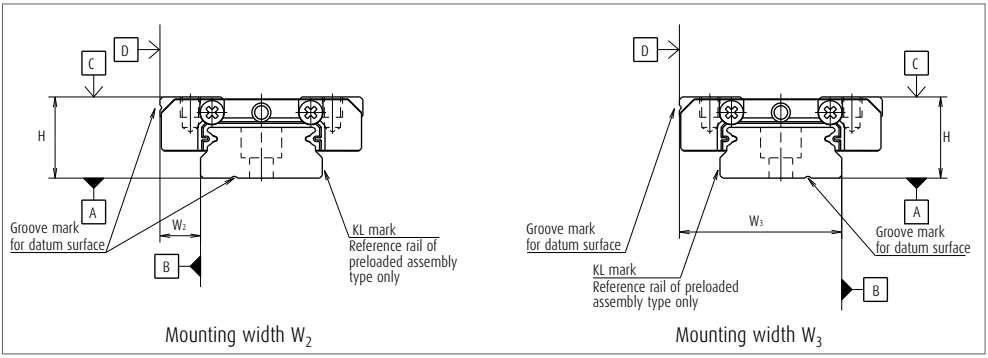


Fig. 2

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(4) Preload and rigidity

We offer three levels of preload: Slight preload Z1 and Fine clearance Z0, along with random-matching type of Fine clearance ZT. Values for preload and rigidity of the preloaded assembly types are shown in **Table 4**. Rigidities are for the median of the preload range.

› Preload and rigidity of preloaded assembly

Table 4

Model No.		Preload (N)	Rigidity (N/μm)
		Slight preload (Z1)	Slight preload (Z1)
Standard type	PE05AR	0 – 28	45
	PE07TR	0 – 29	46
	PE09TR	0 – 37	61
	PE12AR	0 – 40	63
	PE15AR	0 – 49	66
High-load type	PE09UR	0 – 54	86
	PE12BR	0 – 59	97
	PE15BR	0 – 75	114

Note Clearance of Fine clearance Z0 is 0 to 3 μm. Therefore, preload is zero.

› Clearance of random-matching typ

Table 5

Unit: μm

Model No.		Fine clearance ZT
Standard type	PE09TR	3 or less
	PE12AR	3 or less
	PE15AR	3 or less
High-load type	PE09UR	5 or less
	PE12BR	5 or less
	PE15BR	5 or less

4. Maximum rail length

Table 6 shows the limitations of rail length.
However, the limitations vary by accuracy grades.

Table 6 Length limitation of rails

Unit: mm

Series	Size / Material	05	07	09	12	15
PE	Stainless steel	150	600	800	1 000	1 200

Note Rails can be butted if user requirement exceeds the rail length shown in the table. Please consult NSK.

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5. Installation

(1) Permissible values of mounting error

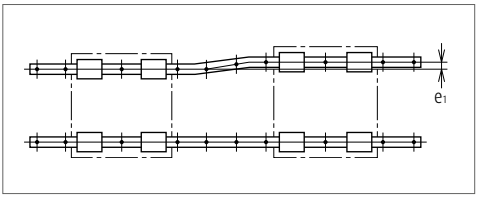


Fig. 3

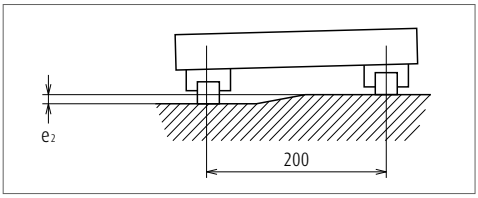


Fig. 4

Table 7

Unit: μm

Value	Preload	Model No.				
		PE05	PE07	PE09	PE12	PE15
Permissible values of parallelism in two rails e_1	Z0, ZT	10	12	15	18	22
	Z1	5	7	10	13	17
Permissible values of parallelism (height) in two rails e_2	Z0, ZT	50 μm/200 mm				
	Z1	35 μm/200 mm				

(2) Shoulder height of the mounting surface and corner radius r

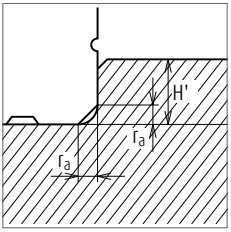


Fig. 5 Shoulder for the rail datum surface

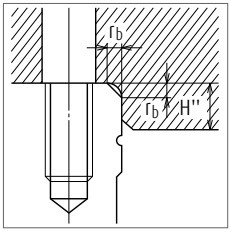


Fig. 6 Shoulder for the ball slide datum surface

Table 8

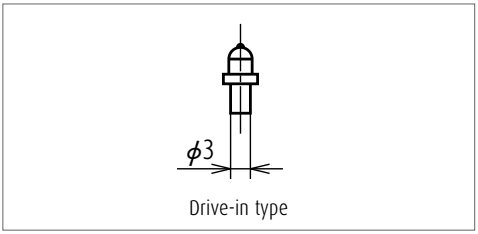
Unit: mm

Model No.	Corner radius (maximum)		Shoulder height	
	r_a	r_b	H′	H″*
PE05	0.2	0.2	1.1	2.5
PE07	0.2	0.3	1.7	3
PE09	0.3	0.3	3.5	2.8
PE12	0.3	0.3	3.5	3.2
PE15	0.3	0.5	3.5	4.1

*) H″ is the minimum recommended value based on the dimension T in dimension table.

6. Lubrication accessory

Model of PE15 can select drive-in type grease fitting as an option.
For the model of PE05 to PE12, apply grease directly to the ball grooves of rail using a point nozzle.



Drive-in type

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7. Dust-proof components

(1) Standard specification

End seal: Provided to both ends of the ball slide as a standard feature.
Seal friction per standard ball slide is shown in **Table 9**.

Table 9 Seal friction per ball slide (maximum value)

Unit: N

Series \ Size	05	07	09	12	15
PE	0.4	0.4	0.8	1	1.2

(2) NSK K1 lubrication unit

Table 10 shows the dimension of linear guides equipped with the NSK K1 lubrication unit.

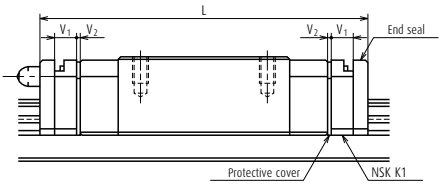


Table 10

Unit: mm

Model No.	Ball slide length	Ball slide model	Standard ball slide length	Ball slide length equipped with two NSK K1 L	Thickness of NSK K1, V_1	Thickness of protective cover, V_2
PE05	Standard	AR	24.1	28.9	2	0.4
PE07	Standard	TR	31.1	37.1	2.5	0.5
PE09	Standard	TR	39.8	46.8	3	0.5
PE09	Long	UR	51.2	58.2	3	0.5
PE12	Standard	AR	45	53	3.5	0.5
PE12	Long	BR	60	68	3.5	0.5
PE15	Standard	AR	56.6	66.2	4	0.8
PE15	Long	BR	76	85.6	4	0.8

Note Ball slide length equipped with NSK K1 =
(Standard ball slide length) + (Thickness of NSK K1, V_1 × Number of NSK K1) +
(Thickness of the protective cover V_2 × 2)

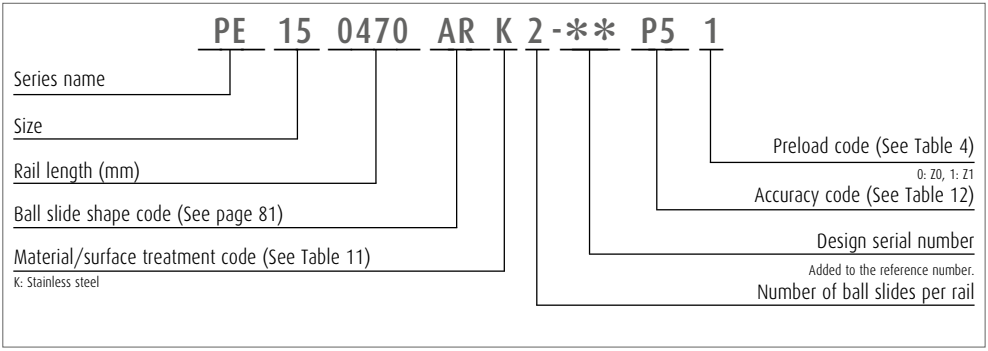
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8. Reference number

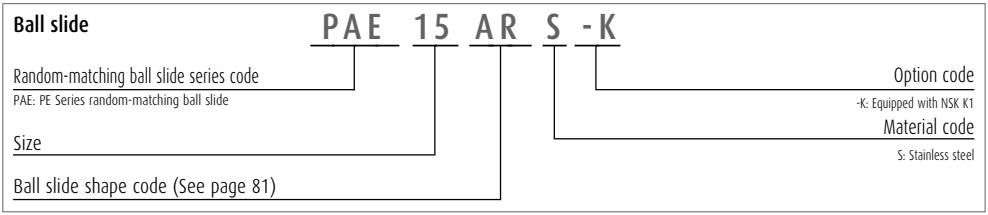
Reference numbers shall be set to individual NSK linear guide when its specifications are finalized, and it is indicated on its specification drawing.

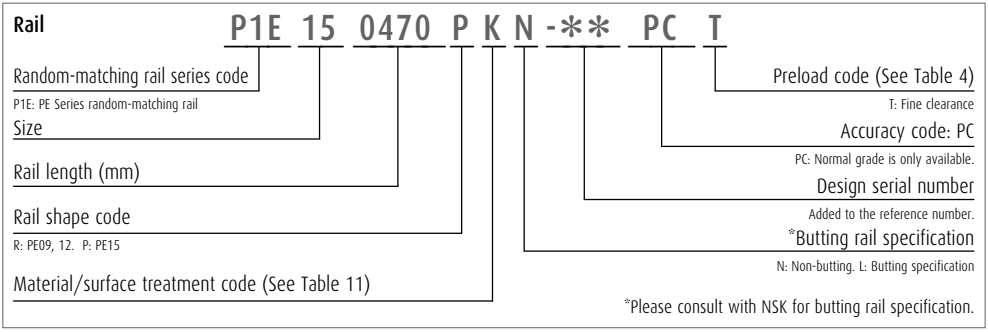
Please specify the reference number, except design serial number, to identify the product when ordering, requiring estimates, or inquiring about specifications from NSK.

(1) Reference number for preloaded assembly



(2) Reference number for random-matching type





Reference number coding for the assembly of random-matching type is the same as that of the preloaded assembly. However, only preload code of "Fine clearance T" is available (See Table 4, page 83).

Click!Speedy NSK Linear Guide Quick Delivery System uses a new numbering system. For details, please refer to the Click!Speedy general catalog CAT. No. E3191.

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Table 11 Material/surface treatment code

Code	Description
K	Stainless steel
H	Stainless steel with surface treatment
Z	Other, special

Table 12 Accuracy code

Accuracy	Standard (Without NSK K1)	With NSK K1	With NSK K1 for food and medical equipment
Super precision grade	P4	K4	F4
High precision grade	P5	K5	F5
Precision grade	P6	K6	F6
Normal grade	PN	KN	FN
Normal grade (random-matching type)	PC	KC	FC

Note Refer to pages 454 to 459 for NSK K1 lubrication unit.

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9. Dimensions

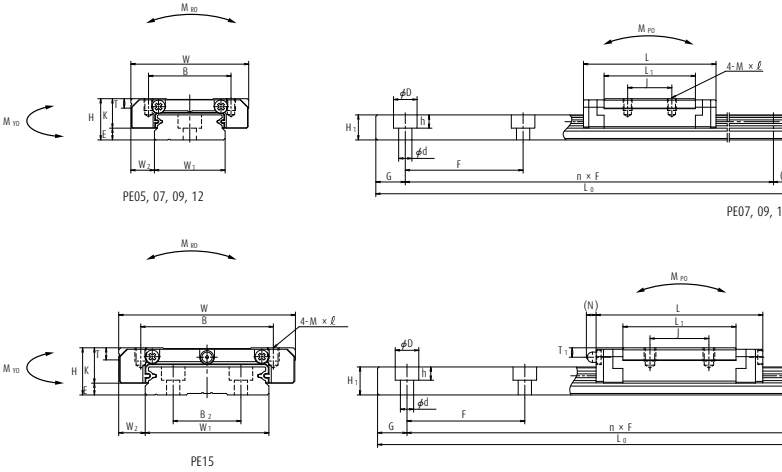
PE-AR, TR (Standard type / Standard)
PE-UR, BR (High-load type / Long)

PE 15 0470 AR K 2 -** PC T

- Series name
- Size
- Rail length (mm)
- Ball slide shape code (See page 81)
- Material/surface treatment code (See Table 11)
  K: Stainless steel
- Number of ball slides per rail
- Design serial number
  Added to the reference number.
- Accuracy code (See Table 12)
- Preload code (See Table 4)
  0: Z0, 1: Z1, T: ZT

Front view

Side view



Model No.	Assembly			Ball slide											Width	Height
	Height			Width	Length	Mounting hole						Oil hole				
	H	E	W_2	W	L	B	J	M × pitch × ℓ	L_1	K	T	Hole size	T_1	N	W_1	H_1
PE05AR	6.5	1.4	3.5	17	24.1	13	—	M2.5×0.45×1.5	16.4	5.1	2.5	ϕ 0.9	1.3	—	10	4
PE07TR	9	2	5.5	25	31.1	19	10	M3×0.5×2.8	20.8	7	3	ϕ 1.9	1.9	—	14	5.2
PE09TR	12	4	6	30	39.8	21	12	M3×0.5×3	26.6	8	2.8	ϕ 2	2.3	—	18	7.5
PE09UR	12	4	6	30	51.2	23	24	M3×0.5×3	38	8	2.8	ϕ 2	2.3	—	18	7.5
PE12AR	14	4	8	40	45	28	15	M3×0.5×4	31	10	3.2	ϕ 2.5	2.7	—	24	8.5
PE12BR	14	4	8	40	60	28	28	M3×0.5×4	46	10	3.2	ϕ 2.5	2.7	—	24	8.5
PE15AR	16	4	9	60	56.6	45	20	M4×0.7×4.5	38.4	12	4.1	ϕ 3	3.2	(3.3)	42	9.5
PE15BR	16	4	9	60	76	45	35	M4×0.7×4.5	57.8	12	4.1	ϕ 3	3.2	(3.3)	42	9.5

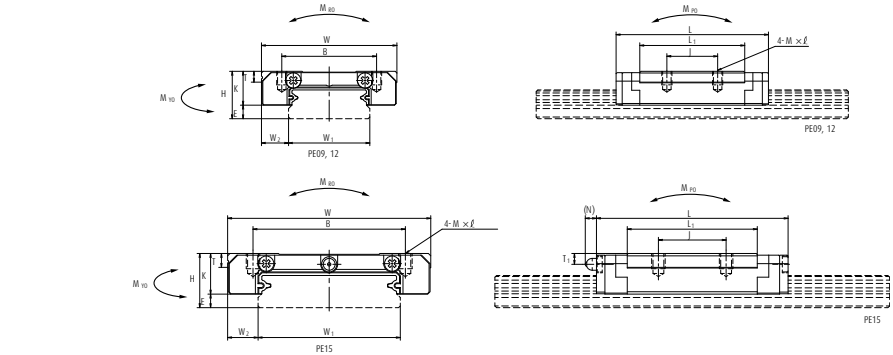
Notes 1) Ball slide of PE05AR has only two mounting tap holes in the center.

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Reference number for ball slide of random-matching type

PAE 15 AR S -K

- Random-matching ball slide series code — PAE: PE Series random-matching ball slide
- Size
- Ball slide shape code (See page 81)
- Material code — S: Stainless steel
- Option code — -K: Equipped with NSK K1

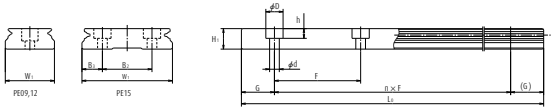


Reference number for rail of random-matching type

P1E 15 0470 P K N -** PC T

- Random-matching rail series code — P1E: PE Series random-matching rail
- Size
- Rail length (mm)
- Rail shape code — R: PE09, 12. P: PE15
- Material/surface treatment code (See Table 11)
- Preload code (See Table 4) — T: Fine clearance
- Accuracy code: PC — PC: Normal grade is only available.
- Design serial number — Added to the reference number.
- *Butting rail specification — N: Non-butting. L: Butting specification

*Please consult with NSK for butting rail specification.



Unit: mm

Rail					Basic load rating				Static moment (N·m)					Weight	
					2) Dynamic		Static		M_{PO}		M_{YO}			Ball slide	Rail
B_2	F	Mounting bolt hole d × D × h	G (reference)	Maximum length L_{0max}	[50km] C_{50}(N)	[100km] C_{100}(N)	C_0 (N)	M_{RO}	One slide	Two slides	One slide	Two slides		(g)	(g/100 mm)
—	20	3×5×1.6	7.5	150	690	550	1 160	6.00	2.75	17.5	2.75	17.5		7	34
—	30	3.5×6×3.2	10	600	1 580	1 260	2 350	16.7	7.20	46.0	7.20	46.0		19	55
—	30	3.5×6×4.5	10	800	3 000	2 390	4 500	36.5	17.3	113	17.3	113		35	95
—	30	3.5×6×4.5	10	800	4 000	3 150	6 700	54.5	37.5	210	37.5	210		50	95
—	40	4.5×8×4.5	15	1 000	4 350	3 450	6 350	70.5	29.3	180	29.3	180		66	140
—	40	4.5×8×4.5	15	1 000	5 800	4 600	9 550	106	63.5	345	63.5	345		98	140
23	40	4.5×8×4.5	15	1 200	7 600	6 050	10 400	207	59.0	370	59.0	370		140	275
23	40	4.5×8×4.5	15	1 200	10 300	8 200	16 000	320	135	740	135	740		211	275

2) The basic load rating comply with the ISO standard. (ISO 14728-1, 14728-2)
C_{50}: the basic dynamic load rating for 50 km rated fatigue life C_{100}: the basic dynamic load rating for 100 km rated fatigue life

5) To fix rail of PE05AR, use M2.5 × 0.45 cross-recessed pan head machine screw for precision instrument.
(JCIS 10-70 No. 0 pan head machine screw No.3.)
(JCIS: Japanese Camera Industrial Standard.)

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11. RA-Series: Linear Roller Guides



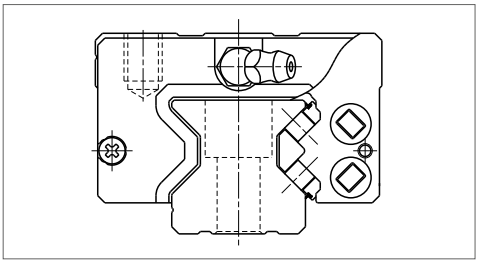


Fig. 1 RA Series

1. Features

(1) Super-high load capacity

By installing rollers that are the largest possible diameter and length within the existing standard cross-section dimension in a rational layout based on our advanced analysis technology, we have realized the world's highest load capacity,* far superior to conventional roller guides. Super-long life is achieved and impact load can be sufficiently handled.

* As of September 1, 2003; NSK's research and comparison on the existing products of the same sizes.

(2) Super-high rigidity

Using NSK's advanced analysis technology, we pursued a complete, optimal design, down to the detailed shape of roller slides and rails, thereby realizing super-high rigidity superior to that of competitor's roller guides.

(3) Super-high motion accuracy

NSK has developed its own unique method of simulating rolling element passage vibration and method of designing optimal roller slide specifications for damping roller passage vibration. These developments have dramatically enhanced roller slide motion accuracy for the RA series.

(4) Smooth motion

Installation of a retaining piece between rollers restrains the roller skew peculiar to roller slides, thereby achieving smooth motion.

(5) Low friction

Using rollers for rolling elements helps minimize dynamic friction.

(6) Random matching

Random-matching of rails and roller slides are available. (RA25 to RA65)

(7) Specification with highly dustproof V1 seal

Specification with newly developed, highly dustproof V1 seal which is the end seal with enhanced abrasion resistance is also available. (RA35 – 55)

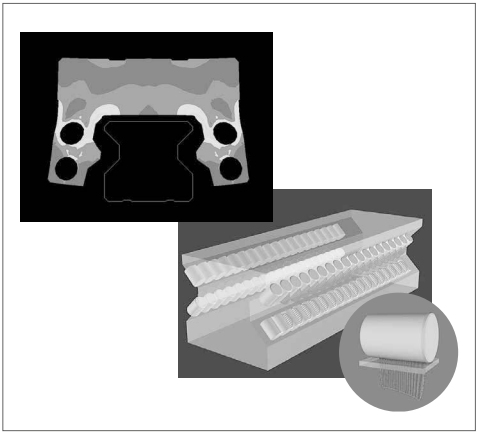


Fig. 2 Analysis example

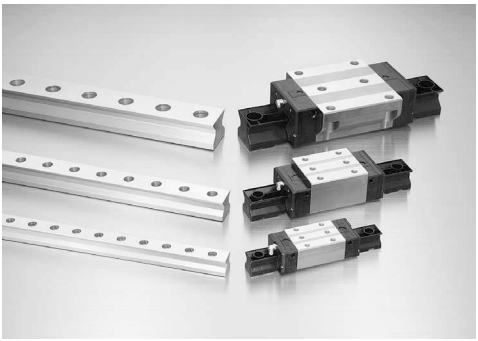
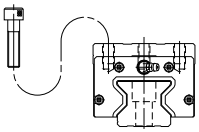
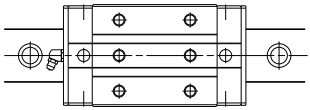
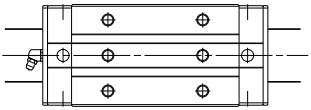
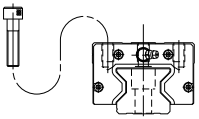
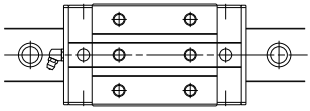
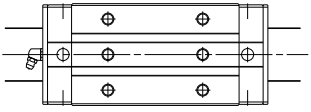
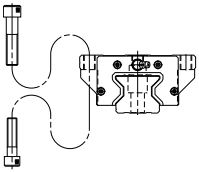
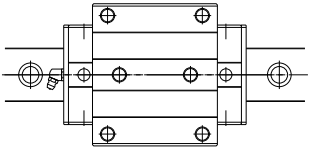
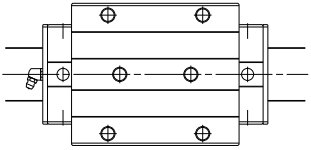


Fig. 3 Random-matching type

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2. Roller slide shape

Roller slide model	Shape/installation method	Type (Upper row, Rating: Lower row, Roller slide length)	
		High-load type	Super-high-load type
		Standard	Long
AN BN		AN 	BN 
AL BL		AL 	BL 
EM GM		EM 	GM 

3. Accuracy and preload

(1) Running parallelism of roller slide

Table 1

Unit: μm

Rail length (mm)	Ultra precision P3	Super precision P4	High precision P5	Precision grade P6
	Preloaded assembly	Preloaded assembly	Preloaded assembly Random-matching type	Preloaded assembly
– 50	2	2	2	4.5
50 – 80	2	2	3	5
80 – 125	2	2	3.5	5.5
125 – 200	2	2	4	6
200 – 250	2	2.5	5	7
250 – 315	2	2.5	5	8
315 – 400	2	3	6	9
400 – 500	2	3	6	10
500 – 630	2	3.5	7	12
630 – 800	2	4	8	14
800 – 1 000	2.5	4.5	9	16
1 000 – 1 250	3	5	10	17
1 250 – 1 600	4	6	11	19
1 600 – 2 000	4.5	7	13	21
2 000 – 2 500	5	8	15	22
2 500 – 3 150	6	9.5	17	25
3 150 – 3 900	9	16	23	30

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(2) Accuracy standard

The preloaded assembly has four accuracy grades; Ultra precision P3, Super precision P4, High precision P5, and Precision P6 grades, while the random-matching type has High precision PH grade only.

› Tolerance of preloaded assembly

Table 2

Unit: μm

Characteristics \ Accuracy grade	Ultra precision P3	Super precision P4	High precision P5	Precision grade P6
Mounting height H Variation of H (All ball slides on a set of rails)	±8 3	±10 5	±20 7	±40 15
Mounting width W_2 or W_3 Variation of W_2 or W_3 (All ball slides on reference rail)	±10 3	±15 7	±25 10	±50 20
Running parallelism of surface C to surface A Running parallelism of surface D to surface B	Shown in **Table 1** and **Fig. 4**			

› Tolerance of random-matching type

Table 3

Unit: μm

Characteristics \ Accuracy grade	High precision PH
Mounting height H	±20
Variation of mounting height H	15① 25②
Mounting width W_2 or W_3	±25
Variation of mounting width W_2 or W_3	20
Running parallelism of surface C to surface A Running parallelism of surface D to surface B	See **Table 1** and **Fig. 4**

Note ① Variation on the same rail ② Variation on multiple rails

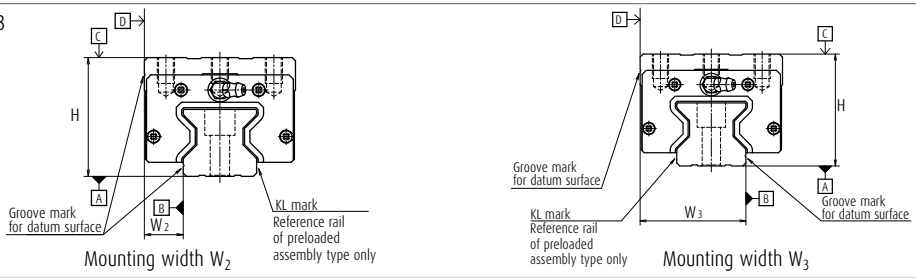
(3) Combination of accuracy and preload

Table 4

		Accuracy grade				
		Ultra precision	Super precision	High precision	Precision grade	High precision
Without NSK K1 lubrication unit		P3	P4	P5	P6	PH
With NSK K1 lubrication unit		K3	K4	K5	K6	KH
With NSK K1-L lubrication unit		L3	L4	L5	L6	LH
Preload	Slight preload Z1	○	○	○	○	—
	Medium preload Z3	○	○	○	○	—
	Random-matching type with slight preload ZZ	—	—	—	—	○
	Random-matching type with medium preload ZH	—	—	—	—	○

(4) Assembled accuracy

Fig. 3



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(5) Preload and rigidity

Four types of preload are available: Medium preload Z3 and Slight preload Z1 for preloaded assembly, and Medium preload ZH and slight preload ZZ for Random-matching type.

› **Preload of preloaded assembly**

Table 5

	Model No.	Preload (N)	
		Slight preload (Z1)	Medium preload (Z3)
High-load type	RA15 AN, AL, EM	—	1 030
	RA20 AN, EM	—	1 920
	RA25 AN, AL, EM	880	2 920
	RA30 AN, AL, EM	1 170	3 890
	RA35 AN, AL, EM	1 600	5 330
	RA45 AN, AL, EM	2 780	9 280
	RA55 AN, AL, EM	3 870	12 900
	RA65 AN, EM	6 300	21 000
Super-high-load type	RA15 BN, BL, GM	—	1 300
	RA20 BN, GM	—	2 400
	RA25 BN, BL, GM	1 060	3 540
	RA30 BN, BL, GM	1 430	4 760
	RA35 BN, BL, GM	2 020	6 740
	RA45 BN, BL, GM	3 480	11 600
	RA55 BN, BL, GM	5 040	16 800
	RA65 BN, GM	8 640	28 800

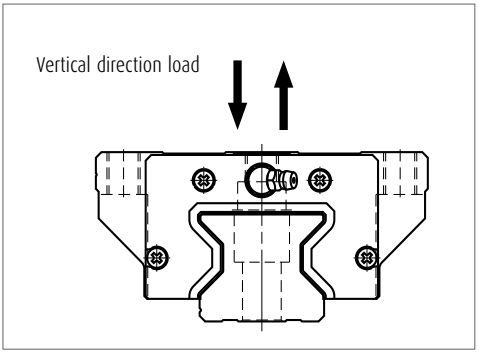
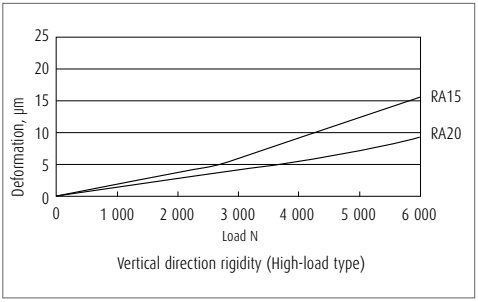
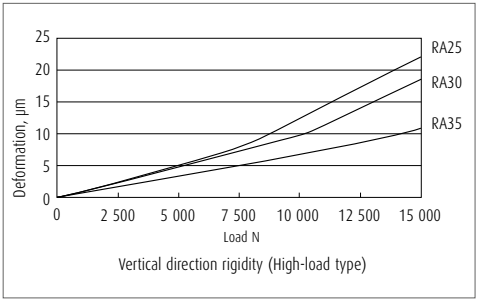


Fig. 5 Direction of load

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› Rigidity of medium preload





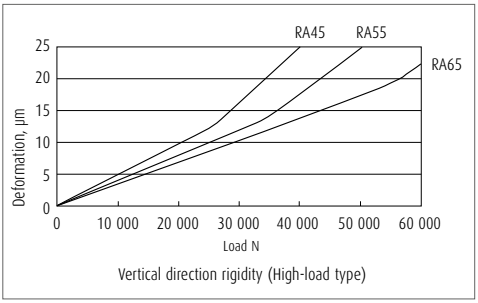
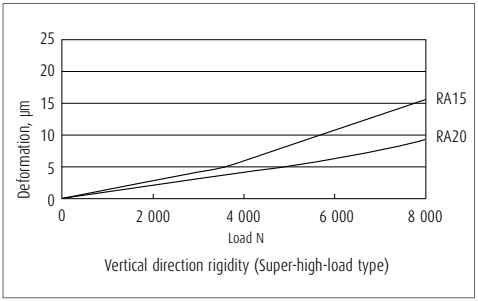
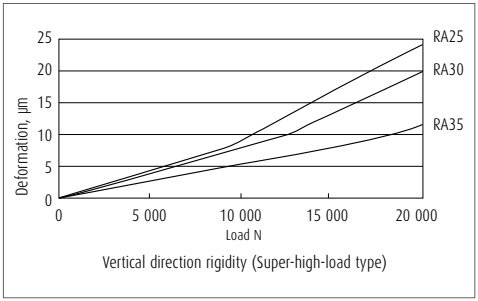


Fig. 6 Vertical direction theoretical rigidity line:
High-load type (Roller slide shape: AN, AL, EM)





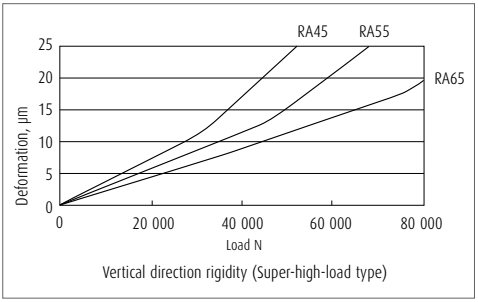


Fig. 7 Vertical direction theoretical rigidity line:
Super-high-load type (Roller slide shape: BN, BL, GM)

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4. Maximum rail length

Table 5 shows the limitations of rail length (maximum length). However, the limitations vary by accuracy grades.

Table 6 Length limitation of rails

Unit: mm

Series \ Size	15	20	25	30	35	45	55	65
RA	2 000	3 000	3 900	3 900	3 900	3 650	3 600	3 600

Note Rails can be butted if user requirement exceeds the rail length shown in the table. Please consult NSK.

5. Installation

(1) Permissible values of mounting error

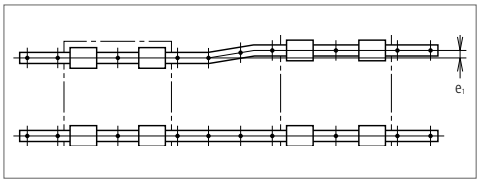


Fig. 8

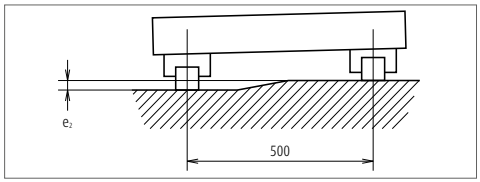


Fig. 9

Table 7

Unit : μm

Value	Preload	Model No.							
		RA15	RA20	RA25	RA30	RA35	RA45	RA55	RA65
Permissible values of parallelism in two rails e_1	Z1, ZZ	—	—	14	18	21	27	31	49
	Z3 , ZH	5	7	9	11	13	17	19	30
Permissible values of parallelism (height) in two rails e_2	Z1, ZZ	—		290 μm / 500 mm					
	Z3 , ZH	150 μm / 500 mm							

(2) Shoulder height of the mounting surface and corner radius r

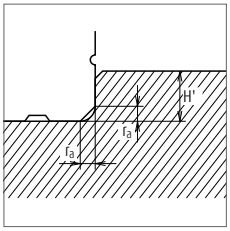


Fig. 10 Shoulder for the rail datum surface

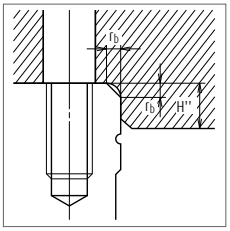


Fig. 11 Shoulder for the roller slide datum surface

Table 8

Unit : mm

Model No.	Corner radius (maximum)		Shoulder height	
	r_a	r_b	H'	H"
RA15	0.5	0.5	3	4
RA20	0.5	0.5	4	5
RA25	0.5	1	4	5
RA30	1	1	5	6
RA35	1	1	5	6
RA45	1.5	1	6	8
RA55	1.5	1.5	7	10
RA65	1.5	1.5	11	11

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6. Lubrication components

Refer to pages 432 and 444 for the lubrication of linear guides.

(1) Mounting position of lubrication accessories

› The standard position of grease fittings and tube fittings is the end face of roller slide. We can mount them on a side of end cap for an option. (**Fig. 12**) Please consult NSK for installation of grease or tube fittings to the roller slide body or the side of end cap.

› A lubrication hole can also be provided on the top of the end cap. **Fig.13, Table 9** and **Table 10** show the mounting position. A spacer is required for AN and BN shape roller slides. The spacers are available from NSK.

› When using a piping unit with thread of M6 × 1, you require a connector to connect it to a grease fitting mounting hole with M6 × 0.75. The connectors are available from NSK.

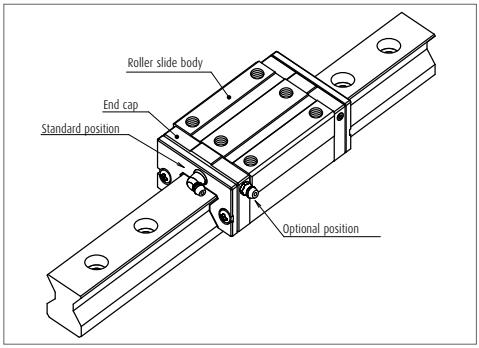


Fig. 12 Mounting position of lubrication accessories

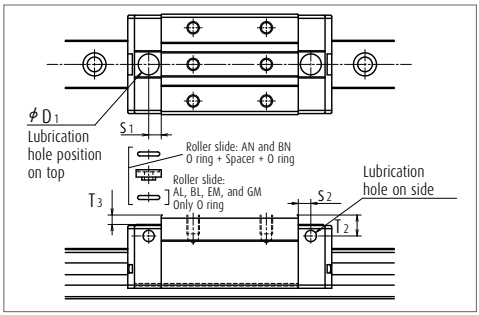


Fig.13 Top and side lubrication hole positions

Table 9 Top and side lubrication hole positions

Unit : mm

Model No.	Roller slide model	Grease fitting size	s_2	T_2	O ring (JIS)	Spacer	D_1	s_1	T_3
RA15	AN, BN	φ 3	4	7	P5	Necessary	8.2	4.4	4.2
RA20	AN, BN	φ 3	4	4	P6	—	9.2	5.4	0.2
RA25	AN, BN	M6×0.75	6	10	P7+P5	Necessary	10.0	6	4.5
RA30	AN, BN	M6×0.75	5	10	P7+P5	Necessary	10.4	6	3.5
RA35	AN, BN	M6×0.75	5.5	15	P7+P5	Necessary	10.4	7	7.4
RA45	AN, BN	Rc 1/8	7.2	20	P7+P5	Necessary	10.4	7.2	10.4
RA55	AN, BN	Rc 1/8	7.2	21	P7	Necessary	10.4	7.2	10.4
RA65	AN, BN	Rc 1/8	7.2	19	P7	—	10.4	7.2	0.4

Table 10 Top and side lubrication hole positions

Unit : mm

Model No.	Roller slide model	Grease fitting size	s_2	T_2	O ring (JIS)	D_1	s_1	T_3
RA15	AL, BL, EM, GM	φ 3	4	3	P5	8.2	4.4	0.2
RA20	EM, GM	φ 3	4	4	P6	9.2	5.4	0.2
RA25	AL, BL, EM, GM	M6×0.75	6	6	P7	10.0	6	0.4
RA30	AL, BL, EM, GM	M6×0.75	5	7	P7	10.4	6	0.4
RA35	AL, BL, EM, GM	M6×0.75	5.5	8	P7	10.4	7	0.4
RA45	AL, BL, EM, GM	Rc 1/8	7.2	10	P7	10.4	7.2	0.4
RA55	AL, BL, EM, GM	Rc 1/8	7.2	11	P7	10.4	7.2	0.4
RA65	EM, GM	Rc 1/8	7.2	19	P7	10.4	7.2	0.4

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7. Dust-proof components

(1) Standard specification

The RA series is equipped with end, inner* and bottom seals to prevent foreign matter from entering the inside of the roller slide. Under normal applications, the RA series can be used without modification.
For severe usage conditions, optional rail covers** are available. Contact NSK for information on how to mount the cover.

*) Inner seals for the models of RA15 and RA20 are available as options.
**) The rail cover is available to the models of RA25 to RA65.

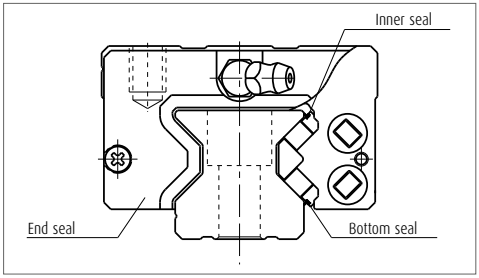


Fig. 14



Fig. 15 Rail cover

Table 11 Seal friction per roller side (maximum value)

Unit: N

Series \ Size	15	20	25	30	35	45	55	65
RA	4	5.5	5	5	6	8	8	14

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(2) NSK K1-L lubrication unit

Table 12 shows the dimension of linear guides equipped with the NSK K1-L lubrication unit.

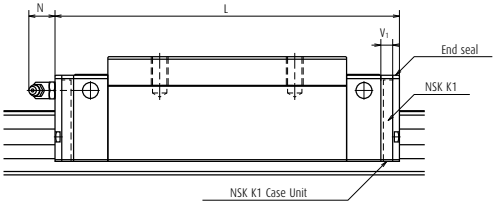


Table 12

Unit: mm

Model No.	Roller slide length	Roller slide model	Standard roller slide length	With two NSK K1	Thickness of NSK K1 and NSK K1-L	Protruding area of the grease fitting N
RA15	Standard	AN, AL, EM	70	79	4.5	(3)
RA15	Long	BN, BL, GM	85.4	94.4	4.5	(3)
RA20	Standard	AN, EM	86.5	95.5	4.5	(3)
RA20	Long	BN, GM	106.3	115.3	4.5	(3)
RA25	Standard	AN, AL, EM	97.5	107.5	5	(11)
RA25	Long	BN, BL, GM	115.5	125.5	5	(11)
RA30	Standard	AN, AL, EM	110.8	122.8	6	(11)
RA30	Long	BN, BL, GM	135.4	147.4	6	(11)
RA35	Standard	AN, AL, EM	123.8	136.8	6.5	(11)
RA35	Long	BN, BL, GM	152	165	6.5	(11)
RA45	Standard	AN, AL, EM	154	168	7	(14)
RA45	Long	BN, BL, GM	190	204	7	(14)
RA55	Standard	AN, AL, EM	184	198	7	(14)
RA55	Long	BN, BL, GM	234	248	7	(14)
RA65	Standard	AN, EM	228.4	243.4	7.5	(14)
RA65	Long	BN, GM	302.5	317.5	7.5	(14)

Note 1) Roller slide length equipped with NSK K1 = (Standard roller slide length) + (Thickness of NSK K1 Case Unit × Number of NSK K1 Case Unit)
2) Roller slide length equipped with NSK K1-L = (Standard roller slide length) + (Thickness of NSK K1-L Case Unit x Number of NSK K1-L Case Unit).

(3) Double seal and protector

For RA Series, double seal and protector can be installed only before shipping from the factory.
Table 13 shows the increased thickness when end seal and protector are installed.

Table 13

Unit: mm

Modell No.	Thickness of end seal V_3	Thickness of protector V_4
RA15	3	2.7
RA20	3	3.3
RA25	3.2	3.3
RA30	3.4	3.6
RA35	3.4	3.6
RA45	4	4.2
RA55	4	4.2
RA65	5	5.5

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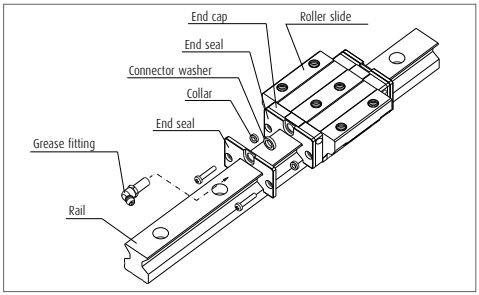


Fig. 16 Double seal

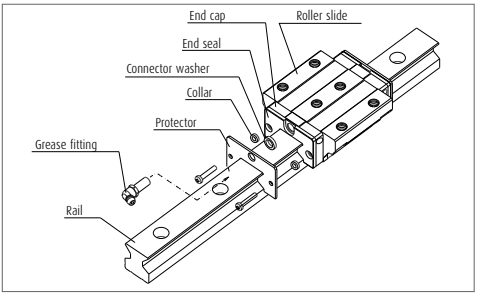


Fig. 17 Protector

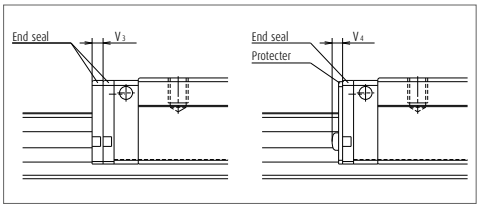


Fig. 18

(4) Rail cover

When the rail cover is used, use the cover bracket to secure the rail cover. **Fig.19** shows the dimensions for the cover bracket. The required room at the end of the rail is:

- Inside: 10.5 mm or less
- Outside: 4 mm or less (Common to the models of RA25 to RA65)
  Please confirm the interference with your machine at the stroke end.
- Machine stroke
- Room for the end of the rail

The height of the rail with the rail cover is shown in **Table 14**.

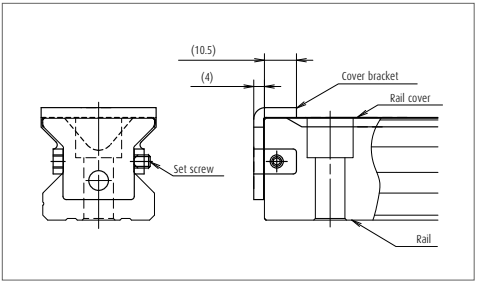


Fig. 19 End configuration of rail equipped with the rail cover

Table 14 Height of rails equipped with rail cover

Unit: mm

Modell No.	Standard height H1	Cover installation
RA25	24	24.2
RA30	28	28.2
RA35	31	31.25
RA45	38	38.3
RA55	43.5	43.8
RA65	55	55.3

(5) Cap to plug the rail mounting bolt hole

Table 15 Caps to plug rail bolt hole

Modell No.	Bolt to secure rail	Cap reference No.	Quantity /case
RA15	M4	LG-CAP/M4	20
RA20	M5	LG-CAP/M5	20
RA25	M6	LG-CAP/M6	20
RA30, RA35	M8	LG-CAP/M8	20
RA45	M12	LG-CAP/M12	20
RA55	M14	LG-CAP/M14	20
RA65	M16	LG-CAP/M16	20

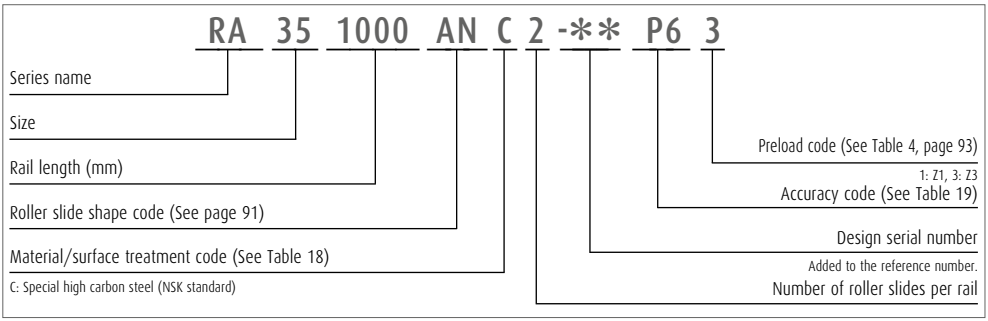
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9. Reference number

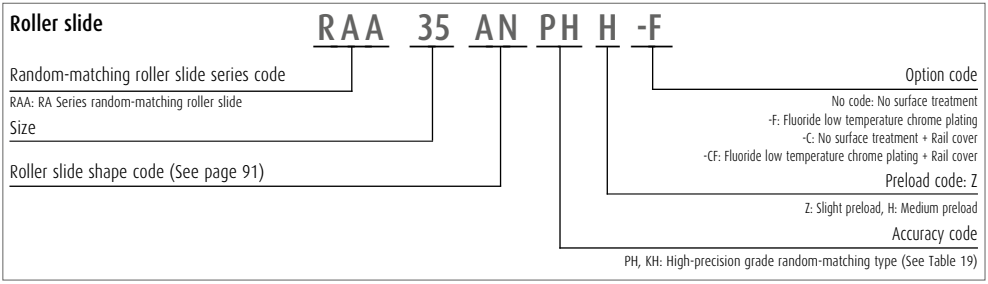
Reference numbers shall be set to individual NSK linear guide when its specifications are finalized, and it is indicated on its specification drawing.

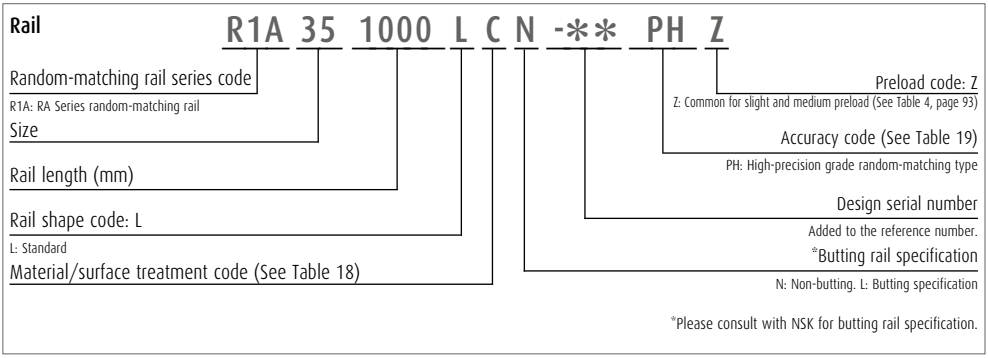
Please specify the reference number, except design serial number, to identify the product when ordering, requiring estimates, or inquiring about specifications from NSK.

(1) Reference number for preloaded assembly



(2) Reference number for random-matching type





The reference number coding for the assembly of random-matching type is the same as that of the preloaded assembly. However, the applicable preload codes are "slight preload Z" and "medium preload H" (See Table 4, page 93).

Click!Speedy NSK Linear Guide Quick Delivery System uses a new numbering system. For details, please refer to the Click!Speedy general catalog CAT. No. E3191.

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Table 18 Material/surface treatment code

Code	Description
C	Special high carbon steel (NSK standard)
D	Special high carbon steel with surface treatment
P	Special high carbon steel with V1 seal
R	Special high carbon steel with surface treatment and V1 seal
Z	Other, special

Note P and R are not available for randommatching slides and rails.

Table 19 Accuracy code

Accuracy	Standard (Without NSK K1)	With NSK K1	With NSK K1-L
Ultra precision grade	P3	K3	L3
Super precision grade	P4	K4	L4
High precision grade	P5	K5	L5
Precision grade	P6	K6	L6
High precision grade (random-matching type)	PH	KH	LH

Note Refer to pages 454 to 460 for NSK K1/K1-L lubrication unit.

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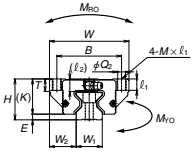
10. Dimensions

RA-AN (High-load type / Standard)
RA-BN (Super-high-load type / Long)

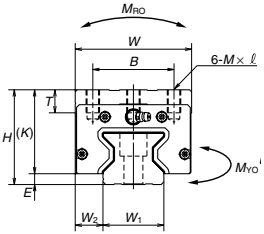
RA 35 1000 AN C 2 -** PH H

- Series name
- Size
- Rail length (mm)
- Roller slide shape code (See page 91)
- Material/surface treatment code (See Table 18)
  - C: Special high carbon steel (NSK standard)
- Number of ball slides per rail
- Design serial number
  - Added to the reference number.
- Accuracy code (See Table 19)
- Preload code (See Table 4, page 93)
  - 1: Z1, 3: Z3, Z: ZZ, H: ZH

Front view of EM and GM types

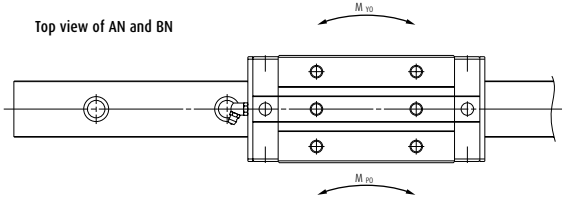


RA15, 20, 25, 30

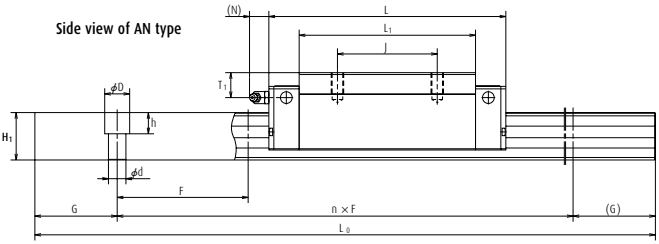


RA35, 45, 55, 65

Top view of AN and BN



Side view of AN type



Model No.	Assembly			Ball slide											Grease fitting			Width	Height
	Height			Width	Length	Mounting hole			L_1	K	T							W_1	H_1
	H	E	W_2	W	L	B	J	M × pitch × ℓ							Hole size	T_1	N		
RA15AN	28	4	9.5	34	70	26	26	M4×0.7×6	44.8	24	8				ϕ 3	8	3	15	16.3
RA15BN	28	4	9.5	34	85.4	26	26	M4×0.7×6	60.2	24	8				ϕ 3	8	3	15	16.3
RA20AN	30	5	12	44	86.5	32	36	M5×0.8×6	57.5	25	12				ϕ 3	4	3	20	20.8
RA20BN	30	5	12	44	106.3	32	50	M5×0.8×6	77.3	25	12				ϕ 3	4	3	20	20.8
RA25AN	40	5	12.5	48	97.5	35	35	M6×1×9	65.5	35	12				M6×0.75	10	11	23	24
RA25BN	40	5	12.5	48	115.5	35	50	M6×1×9	83.5	35	12				M6×0.75	10	11	23	24
RA30AN	45	6.5	16	60	110.8	40	40	M8×1.25×11	74	38.5	14				M6×0.75	10	11	28	28
RA30BN	45	6.5	16	60	135.4	40	60	M8×1.25×11	98.6	38.5	14				M6×0.75	10	11	28	28
RA35AN	55	6.5	18	70	123.8	50	50	M8×1.25×12	83.2	48.5	15				M6×0.75	15	11	34	31
RA35BN	55	6.5	18	70	152	50	72	M8×1.25×12	111.4	48.5	15				M6×0.75	15	11	34	31
RA45AN	70	8	20.5	86	154	60	60	M10×1.5×17	105.4	62	17				Rc1/8	20	14	45	38
RA45BN	70	8	20.5	86	190	60	80	M10×1.5×17	141.4	62	17				Rc1/8	20	14	45	38
RA55AN	80	9	23.5	100	184	75	75	M12×1.75×18	128	71	18				Rc1/8	21	14	53	43.5
RA55BN	80	9	23.5	100	234	75	95	M12×1.75×18	178	71	18				Rc1/8	21	14	53	43.5
RA65AN	90	13	31.5	126	228.4	76	70	M16×2×20	155.4	77	22				Rc1/8	19	14	63	55
RA65BN	90	13	31.5	126	302.5	76	120	M16×2×20	229.5	77	22				Rc1/8	19	14	63	55

Notes 1) Select either one of two F dimensions, the standard or the parenthesized semi-standard dimension, for the pitch of rail fixing bolt holes. If not specified, the standard dimension of F is applied.

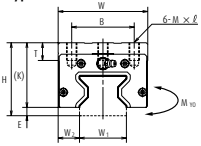
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Reference number for roller slide of random-matching type

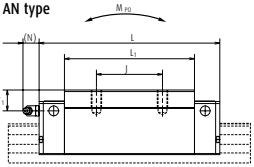
Ball slide RAA 35 AN PH H -F

- Random-matching roller slide series code — RAA: RA Series random-matching roller slide
- Size
- Roller slide shape code (See page 91)
- Accuracy code — PH, KH: High-precision grade random-matching type (See Table 19)
- Preload code: Z — Z: Slight preload, H: Medium preload
- Option code — No code: No surface treatment; -F: Fluoride low temperature chrome plating; -C: No surface treatment + Rail cover; -CF:Fluoride low temperature chrome plating + Rail cover

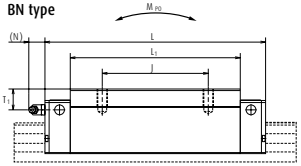
AN and BN types



AN type



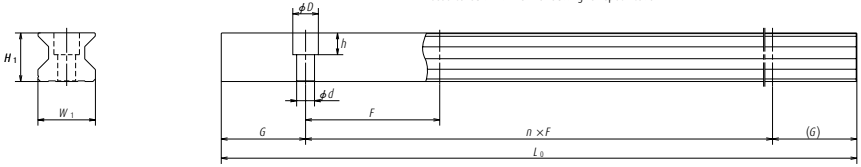
BN type



Reference number for rail of random-matching type

R1A 35 1000 L C N -** PH Z

- Rail
- Random-matching rail series code — R1A: RA Series random-matching rail
- Size
- Rail length (mm)
- Rail shape code: L — L: Standard
- Material/surface treatment code (See Table 18)
- Accuracy code — PH: High-precision grade random-matching type
- Preload code: Z — Z: Common for slight and medium preload (See Table 4, page 93)
- Design serial number — Added to the reference number.
- *Butting rail specification — N: Non-butting, L: Butting specification
- *Please consult with NSK for butting rail specification.



Unit: mm

Rail				Basic load rating								Weight	
Pitch	Mounting bolt hole	G	Maximum length	3) Dynamic		Static	Static moment (N·m)					Ball slide	Rail
								M_{PO}		M_{YO}			
F	d × D × h	(reference)	L_{0max}	[50km] C_{50}(N)	[100km] C_{100}(N)	C_0 (N)	M_{RO}	One slide	Two slides	One slide	Two slides	(kg)	(kg/m)
60	4.5×7.5×5.3	20	2 000	12 600	10 300	27 500	260	210	1 320	210	1 320	0.21	1.6
(30)	4.5×7.5×5.3	20	2 000	16 000	13 000	37 000	350	375	2 130	375	2 130	0.30	1.6
60	6×9.5×8.5	20	3 000	23 600	19 200	52 500	665	505	3 100	505	3 100	0.38	2.6
(30)	6×9.5×8.5	20	3 000	29 500	24 000	70 000	890	900	5 000	900	5 000	0.50	2.6
30	7×11×9	20	3 900	36 000	29 200	72 700	970	760	4 850	760	4 850	0.60	3.4
(60)	7×11×9	20	3 900	43 500	35 400	92 900	1 240	1 240	7 200	1 240	7 200	0.91	3.4
40	9×14×12	20	3 900	47 800	38 900	93 500	1 670	1 140	7 100	1 140	7 100	1.0	4.9
(80)	9×14×12	20	3 900	58 500	47 600	121 000	2 170	1 950	11 500	1 950	11 500	1.3	4.9
40	9×14×12	20	3 900	65 500	53 300	129 000	2 810	1 800	11 000	1 800	11 000	1.6	6.8
(80)	9×14×12	20	3 900	82 900	67 400	175 000	3 810	3 250	17 800	3 250	17 800	2.1	6.8
52.5	14×20×17	22.5	3 650	114 000	92 800	229 000	6 180	4 080	24 000	4 080	24 000	3.0	10.9
(105)	14×20×17	22.5	3 650	143 000	116 000	305 000	8 240	7 150	39 000	7 150	39 000	4.1	10.9
60	16×23×20	30	3 600	159 000	129 000	330 000	10 200	7 060	41 000	7 060	41 000	4.9	14.6
(120)	16×23×20	30	3 600	207 000	168 000	462 000	14 300	13 600	72 000	13 600	72 000	6.7	14.6
75	18×26×22	35	3 600	259 000	210 000	504 000	19 200	12 700	78 500	12 700	78 500	9.3	22.0
(150)	18×26×22	35	3 600	355 000	288 000	756 000	28 700	28 600	153 000	28 600	153 000	12.2	22.0

2) The random-matching type is available for the models of RA25 to RA65.
3) The basic load rating comply with the ISO standard. (ISO 14728-1, 14728-2)
C_{50}; the basic dynamic load rating for 50 km rated fatigue life
C_{100}; the basic dynamic load rating for 100 km rated fatigue life

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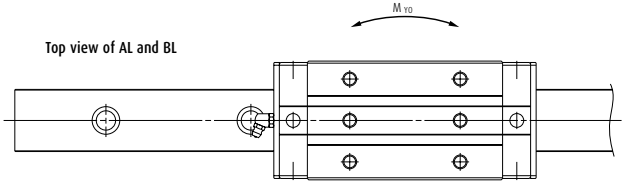
11. RA-Series: Linear Roller Guides

RA-AL (High-load type / Standard)
RA-BL (Super-high-load type / Long)

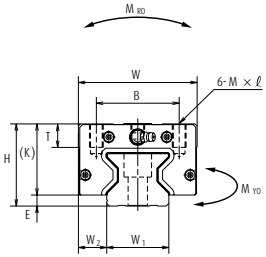
RA 35 1000 AL C 2 -** PH H

- Series name
- Size
- Rail length (mm)
- Roller slide shape code (See page 91)
- Material/surface treatment code (See Table 18)
  C: Special high carbon steel (NSK standard)
- Number of roller slides per rail
- Design serial number
  Added to the reference number.
- Accuracy code (See Table 19)
- Preload code (See Table 4, page 93)
  1: Z1, 3: Z3, Z: ZZ, H: ZH

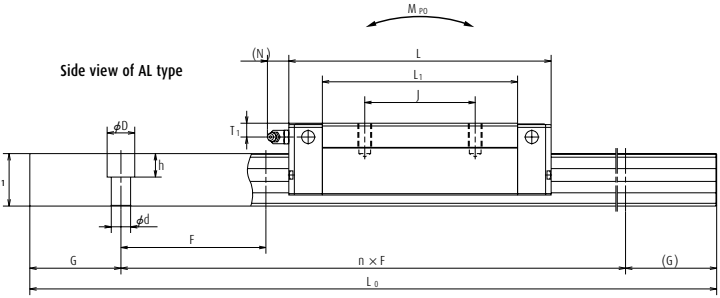
Top view of AL and BL



Front view of AL and BL types



Side view of AL type



Model No.	Assembly			Ball slide												Width	Height
	Height			Width	Length	Mounting hole						Grease fitting					
	H	E	W_2	W	L	B	J	M × pitch × ℓ	L_1	K	T	Hole size	T_1	N		W_1	H_1
RA15AL	24	4	9.5	34	70	26	26	M4×0.7×5.5	44.8	20	8	ϕ 3	4	3		15	16.3
RA15BL	24	4	9.5	34	85.4	26	26	M4×0.7×5.5	60.2	20	8	ϕ 3	4	3		15	16.3
RA25AL	36	5	12.5	48	97.5	35	35	M6×1×8	65.5	31	12	M6×0.75	6	11		23	24
RA25BL	36	5	12.5	48	115.5	35	50	M6×1×8	83.5	31	12	M6×0.75	6	11		23	24
RA30AL	42	6.5	16	60	110.8	40	40	M8×1.25×11	74	35.5	14	M6×0.75	7	11		28	28
RA30BL	42	6.5	16	60	135.4	40	60	M8×1.25×11	98.6	35.5	14	M6×0.75	7	11		28	28
RA35AL	48	6.5	18	70	123.8	50	50	M8×1.25×12	83.2	41.5	15	M6×0.75	8	11		34	31
RA35BL	48	6.5	18	70	152	50	72	M8×1.25×12	111.4	41.5	15	M6×0.75	8	11		34	31
RA45AL	60	8	20.5	86	154	60	60	M10×1.5×16	105.4	52	17	Rc1/8	10	14		45	38
RA45BL	60	8	20.5	86	190	60	80	M10×1.5×16	141.4	52	17	Rc1/8	10	14		45	38
RA55AL	70	9	23.5	100	184	75	75	M12×1.75×18	128	61	18	Rc1/8	11	14		53	43.5
RA55BL	70	9	23.5	100	234	75	95	M12×1.75×18	178	61	18	Rc1/8	11	14		53	43.5

Notes 1) Select either one of two F dimensions, the standard or the parenthesized semi-standard dimension, for the pitch of rail fixing bolt holes. If not specified, the standard dimension of F is applied.

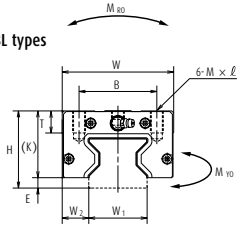
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Reference number for roller slide of random-matching type

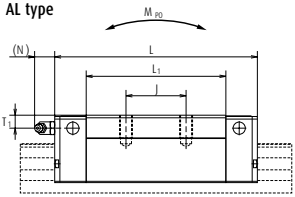
Ball slide RAA 35 AL PH H -F

- Random-matching roller slide series code — RAA: RA Series random-matching roller slide
- Size
- Roller slide shape code (See page 91)
- Accuracy code — PH, KH: High-precision grade random-matching type (See Table 19)
- Preload code: Z — Z: Slight preload, H: Medium preload
- Option code — No code: No surface treatment; -F: Fluoride low temperature chrome plating; -C: No surface treatment + Rail cover; -CF: Fluoride low temperature chrome plating + Rail cover

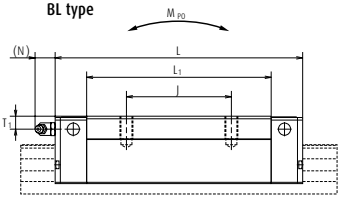
AL and BL types



AL type



BL type

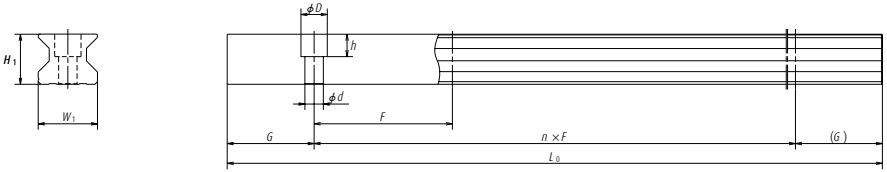


Reference number for rail of random-matching type

Rail R1A 35 1000 L C N -** PH Z

- Random-matching rail series code — R1A: RA Series random-matching rail
- Size
- Rail length (mm)
- Rail shape code: L — L: Standard
- Material/surface treatment code (See Table 18)
- Accuracy code — PH: High-precision grade random-matching type.
- Preload code: Z — Z: Common for slight and medium preload (See Table 4, page 93)
- Design serial number — Added to the reference number.
- *Butting rail specification — N: Non-butting, L: Butting specification

*Please consult with NSK for butting rail specification.



Unit: mm

Rail				Basic load rating								Weight	
Pitch	Mounting bolt hole	G	Maximum length	3) Dynamic		Static	Static moment (N·m)					Ball slide	Rail
								M_{PO}		M_{YO}			
F	d × D × h	(reference)	L_{0max}	[50km] C_{50}(N)	[100km] C_{100}(N)	C_0 (N)	M_{RO}	One slide	Two slides	One slide	Two slides	(kg)	(kg/m)
60	4.5×7.5×5.3	20	2 000	12 600	10 300	27 500	260	210	1 320	210	1 320	0.17	1.6
(30)	4.5×7.5×5.3	20	2 000	16 000	13 000	37 000	350	375	2 130	375	2 130	0.25	1.6
30	7×11×9	20	3 900	36 000	29 200	72 700	970	760	4 850	760	4 850	0.45	3.4
(60)	7×11×9	20	3 900	43 500	35 400	92 900	1 240	1 240	7 200	1 240	7 200	0.80	3.4
40	9×14×12	20	3 900	47 800	38 900	93 500	1 670	1 140	7 100	1 140	7 100	0.85	4.9
(80)	9×14×12	20	3 900	58 500	47 600	121 000	2 170	1 950	11 500	1 950	11 500	1.1	4.9
40	9×14×12	20	3 900	65 500	53 300	129 000	2 810	1 800	11 000	1 800	11 000	1.2	6.8
(80)	9×14×12	20	3 900	82 900	67 400	175 000	3 810	3 250	17 800	3 250	17 800	1.7	6.8
52.5	14×20×17	22.5	3 650	114 000	92 800	229 000	6 180	4 080	24 000	4 080	24 000	2.5	10.9
(105)	14×20×17	22.5	3 650	143 000	116 000	305 000	8 240	7 150	39 000	7 150	39 000	3.4	10.9
60	16×23×20	30	3 600	159 000	129 000	330 000	10 200	7 060	41 000	7 060	41 000	4.1	14.6
(120)	16×23×20	30	3 600	207 000	168 000	462 000	14 300	13 600	72 000	13 600	72 000	5.7	14.6

2) The random-matching type is available for the models of RA25 to RA55.
3) The basic load rating comply with the ISO standard. (ISO 14728-1, 14728-2)
C_{50}; the basic dynamic load rating for 50 km rated fatigue life
C_{100}; the basic dynamic load rating for 100 km rated fatigue life

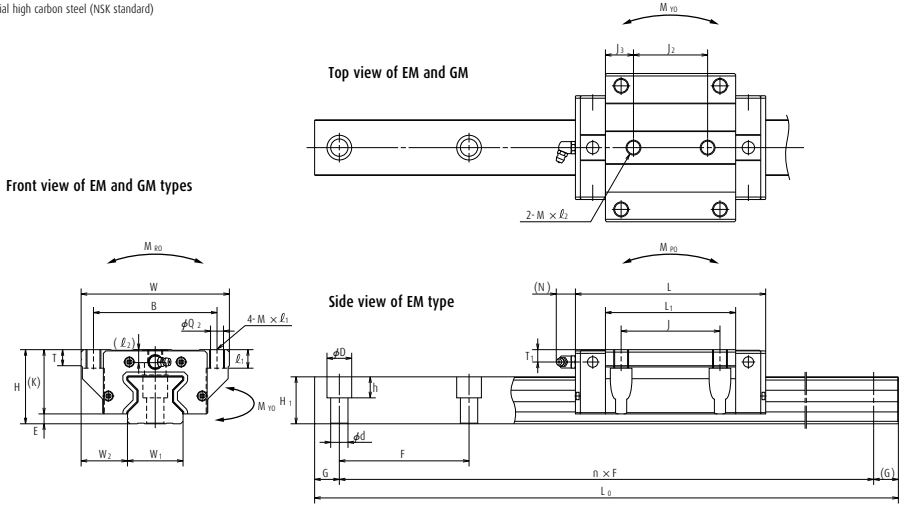
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11. RA-Series: Linear Roller Guides

RA-EM (High-load type / Standard)
RA-GM (Super-high-load type / Long)

RA 35 1000 EM C 2 - PH H**

- Series name: RA
- Size: 35
- Rail length (mm): 1000
- Roller slide shape code (See page 91): EM
- Material/surface treatment code (See Table 18): C: Special high carbon steel (NSK standard)
- Number of roller slides per rail: 2
- Design serial number: - (Added to the reference number.)
- Accuracy code (See Table 19): **
- Preload code (See Table 4, page 93): PH 1: Z1, 3: Z3, Z: ZZ, H: ZH



Model No.	Assembly			Ball slide													
	Height			Width	Length	Mounting hole								Grease fitting		
	H	E	W_2	W	L	B	J	J_2	M × pitch × $\ell_1(\ell_2)$	O_2	L_1	K	T	Hole size	T_1	N
RA15EM	24	4	16	47	70	38	30	26	M5×0.8×8.5 (6.5)	4.4	44.8	20	8	ϕ 3	4	3
RA15GM	24	4	16	47	85.4	38	30	26	M5×0.8×8.5 (6.5)	4.4	60.2	20	8	ϕ 3	4	3
RA20EM	30	5	21.5	63	86.5	53	40	35	M6×1×9.5 (8)	5.3	57.5	25	10	ϕ 3	4	3
RA20GM	30	5	21.5	63	106.3	53	40	35	M6×1×9.5 (8)	5.3	77.3	25	10	ϕ 3	4	3
RA25EM	36	5	23.5	70	97.5	57	45	40	M8×1.25×10 (11)	6.8	65.5	31	11	M6×0.75	6	11
RA25GM	36	5	23.5	70	115.5	57	45	40	M8×1.25×10 (11)	6.8	83.5	31	11	M6×0.75	6	11
RA30EM	42	6.5	31	90	110.8	72	52	44	M10×1.5×12 (12.5)	8.6	74	35.5	11	M6×0.75	7	11
RA30GM	42	6.5	31	90	135.4	72	52	44	M10×1.5×12 (12.5)	8.6	98.6	35.5	11	M6×0.75	7	11
RA35EM	48	6.5	33	100	123.8	82	62	52	M10×1.5×13 (7)	8.6	83.2	41.5	12	M6×0.75	8	11
RA35GM	48	6.5	33	100	152	82	62	52	M10×1.5×13 (7)	8.6	111.4	41.5	12	M6×0.75	8	11
RA45EM	60	8	37.5	120	154	100	80	60	M12×1.75×15 (10.5)	10.5	105.4	52	13	Rc1/8	10	14
RA45GM	60	8	37.5	120	190	100	80	60	M12×1.75×15 (10.5)	10.5	141.4	52	13	Rc1/8	10	14
RA55EM	70	9	43.5	140	184	116	95	70	M14×2×18 (13)	12.5	128	61	15	Rc1/8	11	14
RA55GM	70	9	43.5	140	234	116	95	70	M14×2×18 (13)	12.5	178	61	15	Rc1/8	11	14
RA65EM	90	13	53.5	170	228.4	142	110	82	M16×2×24 (18.5)	14.6	155.4	77	22	Rc1/8	19	14
RA65GM	90	13	53.5	170	302.5	142	110	82	M16×2×24 (18.5)	14.6	229.5	77	22	Rc1/8	19	14

Notes 1) Select either one of two F dimensions, the standard or the parenthesized semi-standard dimension, for the pitch of rail fixing bolt holes. If not specified, the standard dimension of F is applied.

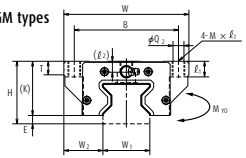
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Reference number for roller slide of random-matching type

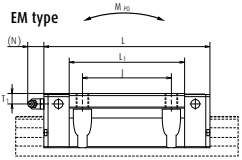
Ball slide RAA 35 EM PH H -F

- Random-matching roller slide series code
  RAA: RA Series random-matching roller slide
- Size
- Roller slide shape code (See page 91)
- Option code
  No code: No surface treatment
  -F: Fluoride low temperature chrome plating
  -C: No surface treatment + Rail cover
  -CF: Fluoride low temperature chrome plating + Rail cover
- Preload code: Z
  Z: Slight preload, H: Medium preload.
- Accuracy code
  PH, KH: High-precision grade random-matching type (See table 19)

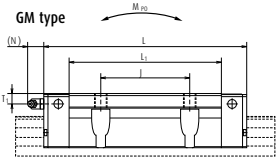
EM and GM types



EM type



GM type

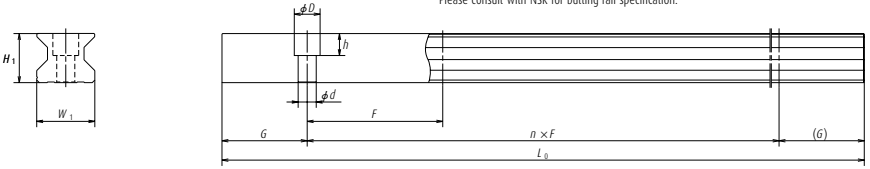


Reference number for rail of random-matching type

Rail R1A 35 1000 L C N -** PH Z

- Random-matching rail series code
  R1A: RA Series random-matching rail
- Size
- Rail length (mm)
- Rail shape code: L
  L: Standard
- Material/surface treatment code (See Table 18)
- Preload code: Z
  Z: Common for slight and medium preload (See Table 4, page 93)
- Accuracy code
  PH: High-precision grade random-matching type.
- Design serial number
  Added to the reference number.
- *Butting rail specification
  N: Non-butting. L: Butting specification

*Please consult with NSK for butting rail specification.



Unit: mm

Rail						Basic load rating									Weight	
Width	Height	Pitch	Mounting bolt hole	G	Maximum length	3) Dynamic		Static	Static moment (N·m)						Ball slide	Rail
									M_{RO}	M_{PO}		M_{YO}				
W_1	H_1	F	d × D × h	(reference)	L_{0max}	[50km] C_{50}(N)	[100km] C_{100}(N)	C_0 (N)		One slide	Two slides	One slide	Two slides		(kg)	(kg/m)
15	16.3	60	4.5×7.5×5.3	20	2 000	12 600	10 300	27 500	260	210	1 320	210	1 320		0.21	1.6
15	16.3	(30)	4.5×7.5×5.3	20	2 000	16 000	13 000	37 000	350	375	2 130	375	2 130		0.28	1.6
20	20.8	60	6×9.5×8.5	20	3 000	23 600	19 200	52 500	665	505	3 100	505	3 100		0.45	2.6
20	20.8	(30)	6×9.5×8.5	20	3 000	29 500	24 000	70 000	890	900	5 000	900	5 000		0.65	2.6
23	24	30	7×11×9	20	3 900	36 000	29 200	72 700	970	760	4 850	760	4 850		0.80	3.4
23	24	(60)	7×11×9	20	3 900	43 500	35 400	92 900	1 240	1 240	7 200	1 240	7 200		1.1	3.4
28	28	40	9×14×12	20	3 900	47 800	38 900	93 500	1 670	1 140	7 100	1 140	7 100		1.3	4.9
28	28	(80)	9×14×12	20	3 900	58 500	47 600	121 000	2 170	1 950	11 500	1 950	11 500		1.7	4.9
34	31	40	9×14×12	20	3 900	65 500	53 300	129 000	2 810	1 800	11 000	1 800	11 000		1.7	6.8
34	31	(80)	9×14×12	20	3 900	82 900	67 400	175 000	3 810	3 250	17 800	3 250	17 800		2.3	6.8
45	38	52.5	14×20×17	22.5	3 650	114 000	92 800	229 000	6 180	4 080	24 000	4 080	24 000		3.2	10.9
45	38	(105)	14×20×17	22.5	3 650	143 000	116 000	305 000	8 240	7 150	39 000	7 150	39 000		4.3	10.9
53	43.5	60	16×23×20	30	3 600	159 000	129 000	330 000	10 200	7 060	41 000	7 060	41 000		5.4	14.6
53	43.5	(120)	16×23×20	30	3 600	207 000	168 000	462 000	14 300	13 600	72 000	13 600	72 000		7.5	14.6
63	55	75	18×26×22	35	3 600	259 000	210 000	504 000	19 200	12 700	78 500	12 700	78 500		12.2	22.0
63	55	(150)	18×26×22	35	3 600	355 000	288 000	756 000	28 700	28 600	153 000	28 600	153 000		16.5	22.0

2) The random-matching type is available for the models of RA25 to RA65.
3) The basic load rating comply with the ISO standard. (ISO 14728-1, 14728-2)
C_{50}; the basic dynamic load rating for 50 km rated fatigue life
C_{100}; the basic dynamic load rating for 100 km rated fatigue life

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12. The Comparative Table of Old and New Series

New Series			Former series					
Model No.	Ball slide mounting hole dimension M×pitch×ℓ <Q_2> [mm]	Dynamic load rating C_{50} [N]	Model No.	Ball slide mounting hole dimension M×pitch×ℓ <Q_2> Q_1×ℓ [mm]	Dynamic load rating C_{50} [N]	Model No.	Ball slide mounting hole dimension M×pitch×ℓ <Q_2> Q_1×ℓ [mm]	Dynamic load rating C_{50} [N]
NH15AN	M4×0.7×6	14 200	LH15AN	M4×0.7×6	10 800	SH15AN	M4×0.7×6	10 100
NH15BN	M4×0.7×6	18 100	LH15BN	M4×0.7×6	14 600	SH15BN	M4×0.7×6	13 400
			LH15EL	M5×0.8×8	10 800	SH15EL	M5×0.8×8	10 100
NH15EM	M5×0.8×7 <4.4>	14 200	LH15EM	M5×0.8×7 <4.4>	10 800	SH15EM	M5×0.8×7 <4.4>	10 100
			LH15FL	4.5×7	10 800	SH15FL	4.5×7	10 100
			LH15GL	M5×0.8×8	14 600	SH15GL	M5×0.8×8	13 400
NH15GM	M5×0.8×7 <4.4>	18 100	LH15GM	M5×0.8×7 <4.4>	14 600	SH15GM	M5×0.8×7 <4.4>	13 400
			LH15HL	4.5×7	14 600	SH15HL	4.5×7	13 400
NH20AN	M5×0.8×6	23 700	LH20AN	M5×0.8×6	17 400	SH20AN	M5×0.8×6	16 300
NH20BN	M5×0.8×6	30 000	LH20BN	M5×0.8×6	23 500	SH20BN	M5×0.8×6	21 600
			LH20EL	M6×1×10	17 400	SH20EL	M6×1×10	16 300
NH20EM	M6×1×9.5 <5.3>	23 700	LH20EM	M6×1×9.5 <5.3>	17 400	SH20EM	M6×1×9.5 <5.3>	16 300
			LH20FL	6×9.5	17 400	SH20FL	6×9.5	16 300
			LH20GL	M6×1×10	23 500	SH20GL	M6×1×10	21 600
NH20GM	M6×1×9.5 <5.3>	30 000	LH20GM	M6×1×9.5 <5.3>	23 500	SH20GM	M6×1×9.5 <5.3>	21 600
			LH20HL	6×9.5	23 500	SH20HL	6×9.5	21 600
NH25AL	M6×1×6	33 500	LH25AL	M6×1×6	25 600	SH25AL	M6×1×6	22 400
NH25AN	M6×1×9	33 500	LH25AN	M6×1×9	25 600	SH25AN	M6×1×9	22 400
NH25BL	M6×1×6	45 500	LH25BL	M6×1×6	34 500	SH25BL	M6×1×6	32 000
NH25BN	M6×1×9	45 500	LH25BN	M6×1×9	34 500	SH25BN	M6×1×9	32 000
			LH25EL	M8×1.25×16(12)	25 600	SH25EL	M8×1.25×16(12)	22 400
NH25EM	M8×1.25×10(11.5) <6.8>	33 500	LH25EM	M8×1.25×10(11.5) <6.8>	25 600	SH25EM	M8×1.25×10(11.5) <6.8>	22 400
			LH25FL	7×10(11.5)	25 600	SH25FL	7×10(11.5)	22 400
			LH25GL	M8×1.25×16(12)	34 500	SH25GL	M8×1.25×16(12)	32 000
NH25GM	M8×1.25×10(11.5) <6.8>	45 500	LH25GM	M8×1.25×10(11.5) <6.8>	34 500	SH25GM	M8×1.25×10(11.5) <6.8>	32 000
			LH25HL	7×10(11.5)	34 500	SH25HL	7×10(11.5)	32 000
NH30AL	M8×1.25×8	41 000	LH30AL	M8×1.25×8	31 000	SH30AL	M8×1.25×8	31 000
NH30AN	M8×1.25×10	41 000	LH30AN	M8×1.25×10	31 000	SH30AN	M8×1.25×10	31 000
NH30BL	M8×1.25×8	61 000	LH30BL	M8×1.25×8	46 000	SH30BL	M8×1.25×8	46 000
NH30BN	M8×1.25×10	61 000	LH30BN	M8×1.25×10	46 000	SH30BN	M8×1.25×10	46 000
			LH30EL	M10×1.5×18(15)	35 500	SH30EL	M10×1.5×18(15)	35 500
NH30EM	M10×1.5×12(14.5) <8.6>	47 000	LH30EM	M10×1.5×12(14.5) <8.6>	35 500	SH30EM	M10×1.5×12(14.5) <8.6>	35 500
			LH30FL	9×12(14.5)	35 500	SH30FL	9×12(14.5)	35 500
			LH30GL	M10×1.5×18(15)	46 000	SH30GL	M10×1.5×18(15)	46 000
NH30GM	M10×1.5×12(14.5) <8.6>	61 000	LH30GM	M10×1.5×12(14.5) <8.6>	46 000	SH30GM	M10×1.5×12(14.5) <8.6>	46 000
			LH30HL	9×12(14.5)	46 000	SH30HL	9×12(14.5)	46 000
NH35AL	M8×1.25×8	62 500	LH35AL	M8×1.25×8	47 500	SH35AL	M8×1.25×8	47 500
NH35AN	M8×1.25×12	62 500	LH35AN	M8×1.25×12	47 500	SH35AN	M8×1.25×12	47 500
NH35BL	M8×1.25×8	81 000	LH35BL	M8×1.25×8	61 500	SH35BL	M8×1.25×8	61 500
NH35BN	M8×1.25×12	81 000	LH35BN	M8×1.25×12	61 500	SH35BN	M8×1.25×12	61 500
			LH35EL	M10×1.5×20	47 500	SH35EL	M10×1.5×20	47 500
NH35EM	M10×1.5×13 <8.6>	62 500	LH35EM	M10×1.5×13 <8.6>	47 500	SH35EM	M10×1.5×13 <8.6>	47 500
			LH35FL	9×13	47 500	SH35FL	9×13	47 500
			LH35GL	M10×1.5×20	61 500	SH35GL	M10×1.5×20	61 500
NH35GM	M10×1.5×13 <8.6>	81 000	LH35GM	M10×1.5×13 <8.6>	61 500	SH35GM	M10×1.5×13 <8.6>	61 500
			LH35HL	9×13	61 500	SH35HL	9×13	61 500
NH45AL	M10×1.5×10	107 000	LH45AL	M10×1.5×10	81 000	SH45AL	M10×1.5×10	76 500
NH45AN	M10×1.5×17	107 000	LH45AN	M10×1.5×17	81 000	SH45AN	M10×1.5×17	76 500
NH45BL	M10×1.5×10	131 000	LH45BL	M10×1.5×10	99 000	SH45BL	M10×1.5×10	94 500
NH45BN	M10×1.5×17	131 000	LH45BN	M10×1.5×17	99 000	SH45BN	M10×1.5×17	94 500
			LH45EL	M12×1.75×24	81 000	SH45EL	M12×1.75×24	76 500
NH45EM	M12×1.75×15 <10.5>	107 000	LH45EM	M12×1.75×15 <10.5>	81 000	SH45EM	M12×1.75×15 <10.5>	76 500
			LH45FL	11×15	81 000	SH45FL	11×15	76 500
			LH45GL	M12×1.75×24	99 000	SH45GL	M12×1.75×24	94 500
NH45GM	M12×1.75×15 <10.5>	131 000	LH45GM	M12×1.75×15 <10.5>	99 000	SH45GM	M12×1.75×15 <10.5>	94 500
			LH45GM	11×15	99 000	SH45HL	11×15	94 500
NH55AL	M12×1.75×13	158 000	LH55AL	M12×1.75×13	119 000	SH55AL	M12×1.75×13	113 000
NH55AN	M12×1.75×18	158 000	LH55AN	M12×1.75×18	119 000	SH55AN	M12×1.75×18	113 000
NH55BL	M12×1.75×13	193 000	LH55BL	M12×1.75×13	146 000	SH55BL	M12×1.75×13	140 000
NH55BN	M12×1.75×18	193 000	LH55BN	M12×1.75×18	146 000	SH55BN	M12×1.75×18	140 000
			LH55EL	M14×2×18	119 000	SH55EL	M14×2×18	113 000
NH55EM	M14×2×18 <12.5>	158 000	LH55EM	M14×2×18 <12.5>	119 000	SH55EM	M14×2×18 <12.5>	113 000
			LH55FL	14×18	119 000	SH55FL	14×18	113 000
			LH55GL	M14×2×18	146 000	SH55GL	M14×2×18	140 000
NH55GM	M14×2×18 <12.5>	193 000	LH55GM	M14×2×18 <12.5>	146 000	SH55GM	M14×2×18 <12.5>	140 000
			LH55HL	14×18	146 000	SH55HL	14×18	140 000
NH65AN	M16×2×20	239 000	LH65AN	M16×2×20	181 000			
NH65BN	M16×2×20	310 000	LH65BN	M16×2×20	235 000			
			LH65EL	M16×2×24	181 000			
NH65EM	M16×2×24 <14.6>	239 000	LH65EM	M16×2×24 <14.6>	181 000			
			LH65FL	16×24	181 000			
			LH65GL	M16×2×24	235 000			
NH65GM	M16×2×24 <14.6>	310 000	LH65GM	M16×2×24 <14.6>	235 000			
			LH65GM	M16×24	235 000			

Notes 1) Parenthesized dimensions are for items made of stainless steel.
2) Basic dynamic load rating is a load that allows for a 50-km rating fatigue life and is a vertical and constant load on the ball slide mounting surface.

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New Series			Former series					
Model No.	Ball slide mounting hole dimension M×pitch×ℓ <Q_2> [mm]	Dynamic load rating C_{50} [N]	Model No.	Ball slide mounting hole dimension M×pitch×ℓ <Q_2> Q_1×ℓ [mm]	Dynamic load rating C_{50} [N]	Model No.	Ball slide mounting hole dimension M×pitch×ℓ <Q_2> Q_1×ℓ [mm]	Dynamic load rating C_{50} [N]
NS15CL	M4×0.7×6	7 250	**LS15CL**	M4×0.7×6	5 400	**SS15CL**	M4×0.7×6	4 900
NS15AL	M4×0.7×6	11 200	**LS15AL**	M4×0.7×6	8 350	**SS15AL**	M4×0.7×6	7 900
NS15JM	M5×0.8×7 <4.4>	7 250	**LS15JL**	M5×0.8×8	5 400	**SS15JL**	M5×0.8×8	4 900
			LS15JM	M5×0.8×7 <4.4>	5 400	**SS15JM**	M5×0.8×7 <4.4>	4 900
			LS15KL	4.5×7	5 400	**SS15KL**	4.5×7	4 900
NS15EM	M5×0.8×7 <4.4>	11 200	**LS15EL**	M5×0.8×8	8 350	**SS15EL**	M5×0.8×8	7 900
			LS15EM	M5×0.8×7 <4.4>	8 350	**SS15EM**	M5×0.8×7 <4.4>	7 900
			LS15FL	4.5×7	8 350	**SS15FL**	4.5×7	7 900
NS20CL	M5×0.8×7	10 600	**LS20CL**	M5×0.8×7	7 900	**SS20CL**	M5×0.8×7	7 250
NS20AL	M5×0.8×7	15 600	**LS20AL**	M5×0.8×7	11 700	**SS20AL**	M5×0.8×7	11 100
NS20JM	M6×1×9(9.5) <5.3>	10 600	**LS20JL**	M6×1×10	7 900	**SS20JL**	M6×1×10	7 250
			LS20JM	M6×1×9(9.5) <5.3>	7 900	**SS20JM**	M6×1×9(9.5) <5.3>	7 250
			LS20KL	5.5×9(9.5)	7 900	**SS20KL**	5.5×9(9.5)	7 250
NS20EM	M6×1×9(9.5) <5.3>	15 600	**LS20EL**	M6×1×10	11 700	**SS20EL**	M6×1×10	11 100
			LS20EM	M6×1×9(9.5) <5.3>	11 700	**SS20EM**	M6×1×9(9.5) <5.3>	11 100
			LS20FL	5.5×9(9.5)	11 700	**SS20FL**	5.5×9(9.5)	11 100
NS25CL	M6×1×9	17 700	**LS25CL**	M6×1×9	12 700	**SS25CL**	M6×1×9	12 700
NS25AL	M6×1×9	26 100	**LS25AL**	M6×1×9	18 800	**SS25AL**	M6×1×9	17 900
NS25JM	M8×1.25×10(11.5) <6.8>	17 700	**LS25JL**	M8×1.25×12	12 700	**SS25JL**	M8×1.25×12	12 700
			LS25JM	M8×1.25×10(11.5) <6.8>	12 700	**SS25JM**	M8×1.25×10(11.5) <6.8>	12 700
			LS25KL	7×10(11.5)	12 700	**SS25KL**	7×10(11.5)	12 700
NS25EM	M8×1.25×10(11.5) <6.8>	26 100	**LS25EL**	M8×1.25×12	18 800	**SS25EL**	M8×1.25×12	17 900
			LS25EM	M8×1.25×10(11.5) <6.8>	18 800	**SS25EM**	M8×1.25×10(11.5) <6.8>	17 900
			LS25FL	7×10(11.5)	18 800	**SS25FL**	7×10(11.5)	17 900
NS30CL	M8×1.25×12	24 700	**LS30CL**	M8×1.25×12	18 700	**SS30CL**	M8×1.25×12	18 700
NS30AL	M8×1.25×12	38 000	**LS30AL**	M8×1.25×12	28 800	**SS30AL**	M8×1.25×12	27 300
NS30JM	M10×1.5×12(14.5) <8.6>	24 700	**LS30JL**	M10×1.5×18(15)	18 700	**SS30JL**	M10×1.5×18(15)	18 700
			LS30JM	M10×1.5×12(14.5) <8.6>	18 700	**SS30JM**	M10×1.5×12(14.5) <8.6>	18 700
			LS30KL	9×12(14.5)	18 700	**SS30KL**	9×12(14.5)	18 700
NS30EM	M10×1.5×12(14.5) <8.6>	38 000	**LS30EL**	M10×1.5×18(15)	28 800	**SS30EL**	M10×1.5×18(15)	27 300
			LS30EM	M10×1.5×12(14.5) <8.6>	28 800	**SS30EM**	M10×1.5×12(14.5) <8.6>	27 300
			LS30FL	9×12(14.5)	28 800	**SS30FL**	9×12(14.5)	27 300
NS35CL	M8×1.25×12	34 500	**LS35CL**	M8×1.25×12	26 000	**SS35CL**	M8×1.25×12	26 000
NS35AL	M8×1.25×12	52 500	**LS35AL**	M8×1.25×12	40 000	**SS35AL**	M8×1.25×12	38 000
NS35JM	M10×1.5×13(14.5) <8.6>	34 500	**LS35JL**	M10×1.5×20(15)	26 000	**SS35JL**	M10×1.5×20(15)	26 000
			LS35JM	M10×1.5×13(14.5) <8.6>	26 000	**SS35JM**	M10×1.5×13(14.5) <8.6>	26 000
			LS35KL	9×13(14.5)	26 000	**SS35KL**	9×13(14.5)	26 000
NS35EM	M10×1.5×13(14.5) <8.6>	52 500	**LS35EL**	M10×1.5×20(15)	40 000	**SS35EL**	M10×1.5×20(15)	38 000
			LS35EM	M10×1.5×13(14.5) <8.6>	40 000	**SS35EM**	M10×1.5×13(14.5) <8.6>	38 000
			LS35FL	9×13(14.5)	40 000	**SS35FL**	9×13(14.5)	38 000

Notes 1) Parenthesized dimensions are for items made of stainless steel.
2) Basic dynamic load rating is a load that allows for a 50-km rating fatigue life and is a vertical and constant load on the ball slide mounting surface.

In VH series, the slide types in flange shape are focused.

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Table 8 Applicable grease nozzle for ball screws

Series Tap hole for grease fitting			Model no.			Standard grease fitting	Straight nozzle NZ1	Chuck nozzles NZ2	Drive-in fitting nozzle NZ3	Point nozzle NZ4	Flexible nozzle NZ5
Blank shaft end	Compact FA	General	PSS		M5×0.8	A type	○*1	○*1		○	○*1
		Transfer equipment	FSS			A type	○*1	○*1		○	○*1
	Miniature, fine lead		MA	Shaft dia. 12 or less	–	–				○	
				Shaft dia. 16 or over	M6×1	–				○	
	Small equipment		FA		M6×1	–	○*2	○*2		○	○*2
	Stainless steel		KA	Shaft dia. 12 or less and lead 2 or less	M3×0.5	–			○	○	
				except above	M6×1	–	○*2	○*2		○	○*2
	Machine tools		DIN	Shaft dia. 32	M6×1	–	○	○		○	○
				Shaft dia. 32 or over	M8×1	–	○	○		○	○
			SS	Shaft dia. 36 or less	M6×1	–	○	○		○	○
				Shaft dia. 40 or over	Rc1/8	–	○	○		○	○
	Transfer equipment		FCS	Shaft Dia. 12 or over	M6×1	–	○	○		○	○
			VSP	Shaft Dia. 12 or over	M6×1	–	○	○		○	○
			RNFTL	Shaft dia. 12 or less	M3×0.5	–			○	○	
				Shaft dia. 14 or over	M6×1	–	○	○		○	○
			RNFBL	Shaft dia. 12 or less	M3×0.5	–			○	○	
				Shaft dia. 14 or over	M6×1	–	○	○		○	○
			RNCT		–	–				○	
			RNFCL	Shaft dia. 12 or less	M3×0.5	–			○	○	
				Shaft dia. 15 or over	M6×1	–	○	○		○	○
			RNSTL		M6×1	–	○	○		○	○

*1 Unavailable for shaft dia. 25 mm *2 If using A type grease fitting, may not install the nozzle.
Notes 1) Normally, grease fitting is not provided to NSK ball screw except Compact FA Series. Ball nut has a tap hole to install a grease fitting. The user should install a grease fitting if necessary. 2) For M3 × 0.5 tap hole, small fitting (screw-in type) is available. Please contact NSK. 3) MA and RNCT types have no tap hole, apply grease directly to the screw shaft and ball grooves using point nozzle.

Table 9 Applicable grease nozzles for Monocarriers

Series	Model no.	Tap hole for grease fitting	Standard grease fitting	Straight nozzle NZ1	Chuck nozzles NZ2	Drive-in fitting nozzle NZ3	Flexible nozzle NZ5	MCH exclusive fitting nozzle NZ8
MCM	MCM02	–	–					
MCM	MCM03, 05, 08,10	ϕ3	Drive-in type			○		○*
MCM	MCM06	M6×0.75	A type	○	○		○	
MCH	MCH06,09,10	ϕ3	Drive-in type					○

*) Use of NZ3 is recommended.

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7. Oil Lubrication

Required amount of new oil is regularly supplied by:

- Manual or automatic intermittent supply system;
- Oil mist lubricating system via piping.

Equipment for oil lubrication is more costly than grease lubrication. However, oil mist lubricating system supplies air as well as oil, raising the inner pressure of the ball slide. This prevents foreign matters from entering, and the air cools the system. Use an oil of high atomizing rate such as ISO VG 32 to 68 for the oil mist lubrication system.

ISO VG 68 to 220 are recommended for common intermittent replenishment system. Approximate volume of oil Q for a ball slide of linear guide per hour can be obtained by the following formula.

In case of ball type linear guides except the LA Series

$Q = n/150$ (cm^3/hr)

In case of LA Series, RA Series

$Q \geq n/100$ (cm^3/hr)

n: Linear guide code

e.g. When NH45 is used,

$n = 45$

Therefore,

$Q = 45/150 = 0.3$ cm^3/hr

Similarly, approximate oil supply volume Q to ball screw can be obtained by the following formula.

$Q = d/15$ (cm^3/hr)

d: Nominal shaft diameter of the ball screw

e.g. When the shaft diameter is 50,

$d = 50$

Therefore,

$Q = 50/15 = 3.3$ cm^3/hr

For oil lubrication by gravity drip, the oil supply position and installation position of the ball slide or ball nut are crucial. In case of linear guide, unless it is installed to a horizontal position, the oil flows only on the down side, and does not spread to all raceway surface. This may cause insufficient lubrication. For ball screw lubrication as well, oil does not spread if the oil orifice is installed at the bottom, causing insufficient lubrication. Please consult NSK to correct such situations prior to use. NSK has internal design which allows oil lubricant to flow throughout the system. **Table 10** shows the criterion of intervals of oil checks and replenishments.

Table 10 Intervals of checks and replenishments

Method	Intervals of checks	Items to check	Replenishment or intervals of changes
Automatic intermittent supply	Weekly	Volume of oil, dirt, etc.	Replenish at each check. Suitable volume for tank capacity.
Oil bath	Daily before operation	Oil surface	Make a suitable criterion based on consumption

Notes 1) As with grease lubrication, do not mix oil lubricant with different types.
2) Some components of the linear guide and ball screw are made of plastic. Avoid using an oil that adversely affects synthetic resin.
3) When using oil mist lubricating system, please confirm an oil supply amount at the each outlet part.

8. RoHS Compliant

(1) Linear Guides

- Linear Guides listed in the catalog except the products for special environments, are compliant with RoHS.
- Please consult NSK for RoHS of special parts and lubricant provided by customer, and customer-supplied product.

(2) Ball Screws

- Ball screws listed in the catalog except the products for special environments, are compliant with RoHS.

(3) Monocarriers

- Monocarriers listed in the catalog are compliant with RoHS.

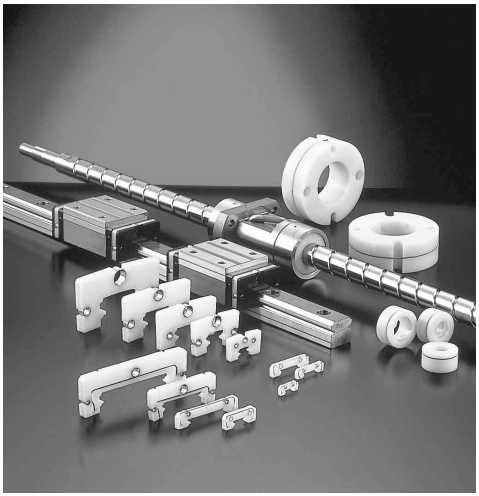
(4) Ball Screw Support Bearings

- Ball screw support bearings listed in the catalog are compliant with RoHS.

*For details of country-specific RoHS, contact NSK.

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9. NSK linear guides equipped with "NSK K1" lubrication unit



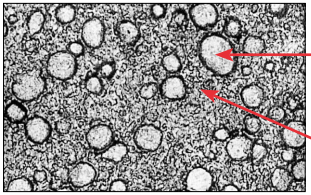
NSK K1 lowers machine operation cost, and reduces impact on the environment.

What is "long-term, maintenance-free" operation?

Ball screws and linear guides which are equipped with NSK K1 do not require maintenance for five years or up to 10 000 km operational distance.

What is NSK K1 lubrication unit?

NSK K1 is a lubrication device which combines oil and resin in a single unit. The porous resin contains a large amount of lubrication oil. Touching its surface to the raceway of a rail close to the ball contact point NSK K1 constantly supplies fresh oil which seeps from the resin.



Enlarged surface of "NSK K1" Lubrication Unit 100µm

Polyolefin

Unlike vinyl chloride products, polyolefin does not produce dioxin. Polyolefin is also being used increasingly at supermarkets for food wrapping.

Lubrication oil

It is mineral oil-based lubricant. The oil has a viscosity of 100 cSt.

Remarkable capacity with new material: NSK K1 lubrication unit information

- NSK K1 lubrication unit (referred to as NSK K1 hereafter) equipped with an NSK linear guide is an outstanding new lubrication material.
- A Newly developed porous synthetic resin contains large volume of lubricant oil that seeps out and enhances lubricating function.
- Simply install NSK K1 inside a standard end seal (rubber).
- We also provide NSK K1 lubrication unit for sanitary environments suited for food processing machinery, medical equipment and their ancillaries for the environment where hygiene control is essential. For details, refer to **458. NSK Linear Guides for Food Processing Equipment and Medical Devices for Sanitary Environment**".

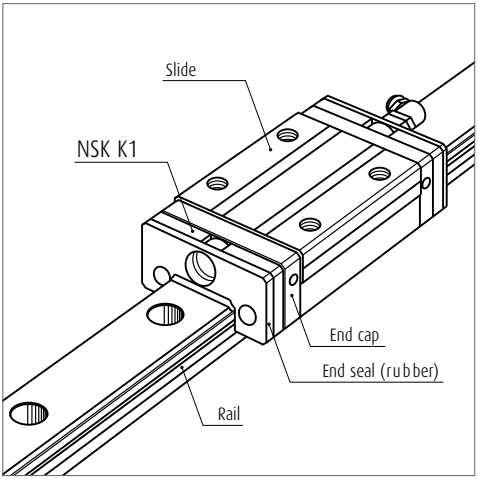


Fig. 4

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(1) Features

NSK K1 comprises a part of the compact and efficient lubrication unit.

1) Maintenance is required only infrequently

Used with grease, the lubrication function lasts for a long time. Ideal for systems/environments in which replenishing is difficult.

▼

For automotive component processing lines, etc.

2) Does not pollute the environment

A very small volume of grease combined with NSK K1 can provide sufficient lubrication in the environment where grease is undesirable as well as in the environment where high cleanliness is required.

▼

Food processing/medical equipment, liquid crystal displays/semiconductor manufacturing equipment, etc.

We also provide NSK K1 lubrication unit for sanitary environment suited for food processing machinery, medical equipment and their ancillaries for the environment where hygiene control is essential. For details, refer to **458. "NSK Linear Guides for Food Processing Equipment and Medical Devices for Sanitary Environment"**.

3) Good for applications where lubricant is washed away

Used with grease, life of the machine is prolonged even when the machine is washed entirely by water, or in an environments where the machine is exposed to rain or wind.

▼

Food processing equipment, housing/construction machines, etc.

4) Maintains efficiency in dusty environments

In environments where oil- and grease-absorbing dust is produced, long-term efficiency in lubrication and prevention from foreign inclusions is maintained by using NSK K1 in combination with grease.

▼

Woodworking machines, etc.

* Stainless steel linear guides are available for use in corrosive environments or other environments where rusting is a potential problem.

(2) Functions

NSK K1 has various superb functions. NSK's ample test data and field performances confirm NSK K1 abilities.

1) Durability test at high speed, with no other lubrication

Fig. 5 shows test results under these conditions.

The linear guide operated with no lubricant is unable to travel after a short period because breakage occurs. Equipped with NSK K1, the linear guide easily travels 25 000 km.

Conditions:	Sample	; LH30AN (preload Z1)
	Travel speed	; 200 m/min
	Stroke	; 1 800 mm
No lubricant:	Completely degreased, no lubrication	
NSK K1:	Completely degreased, no lubrication + NSK K1	

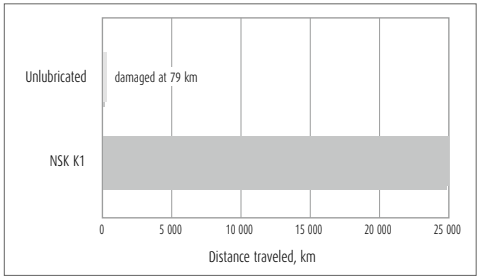


Fig. 5 Durability test at high speed, with no lubrication (lubricated by NSK K1 only)

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2) Immersion test

Fig. 6 shows the test results after a linear guide is immersed in water once per week for 24 hours at a time, then traveled for 2 700 km. Without NSK K1, the ball groove sufrace wore out at an early stage and broke. With NSK K1, the wear was reduced to about 1/3 (**Table 11**). This test proves the effect of NSK K1.

Conditions: Sample ; LS30 Stainless steel (preload Z1)
Travel speed ; 24 m/min
Stroke ; 400 mm
Load ; 4 700 N/Slide
Lubricant ; Fully packed with grease (*) exclusive use for food proccesing machines
Immersing condition:
Immersed and traveled once per week for 24 hours at a time.

* Grease made in U.S.A.

Characteristic
Consistency: 280
Base oil viscosity: 580 (cSt)

Table 11 Comparison in wear of grooves and steel balls (2 700 km)

Unit: µm

Lubricating condition	Ball slide groove	Rail groove	Steel balls
With NSK K1	16 – 18	2 – 3	6 – 8
Without NSK K1	30 – 45	9 – 11	17 – 25

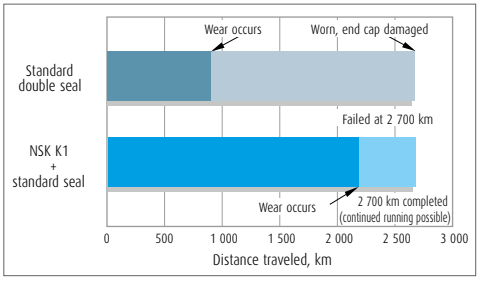


Fig. 6 Durability test immersed in water

3) Durability test with wood chips

Wood chips absorb lubricant. Maintaining lubrication in such environment is extremely difficult. **Fig. 7** shows that the life when NSK K1 is added to a standard seal is two times longer than the life when two seals are combined (standard double seal).

Conditions: Sample ; LH30AN (preload Z1)
Travel speed ; 24 m/min
Stroke ; 400 mm
Load ; 490 N/Slide
Seal specifications/lubricant:
Standard double Seal Standard double Seal + AS2 Grease
NSK K1 NSK K1 + Standard seal + AS2 Grease
Wood chip conditions: 1 Volume of wood chips: Large
2 Volume of wood chips: Medium

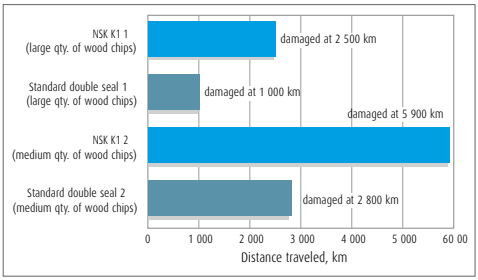


Fig. 7 Durability test with wood chips

4) Dust generation

Fig. 8 is a comparison of dust generation of NSK K1. The combination of NSK K1 and NSK Clean Grease LG2 (low dust generation grease) generates as little dust as fluorine grease (vacuum grease).

Conditions: Sample ; LS20
Travel speed ; 36 m/min

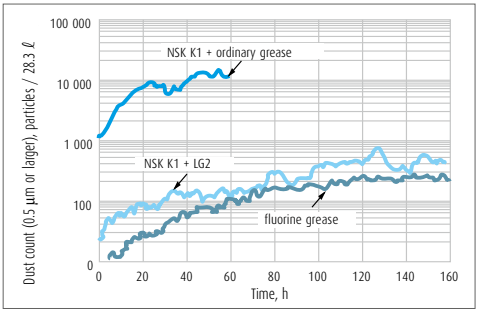


Fig. 8 Comparison of dust emission

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(3) Specifications

1) Applicable series and sizes

a) Can be installed in NH, NS, LW, PU, PE and RA series.

b) Can be used with stainless steel materials and surface-treated items.

2) Standard specifications

a) NSK K1 is installed between the end seal and end cap.

For the TS series, it is installed in the end cap. (Double-seal specification, and specification with protector are also available upon request.)

b) NSK standard grease is packed inside the slide.

(You may specify the type of grease and its volume if required.)

c) Accuracy and preload classifications are the same as standard items. (Dynamic friction increases slightly due to NSK K1.)

3) Number of installed NSK K1

Normally, one NSK K1 should be installed on both ends of slides. (two K1s for one slide)

However, more NSK K1 may be required under more stringent operating conditions and environment. Please consult NSK for details in such a case.

Precautions for handling

To maintain high fuctionality of the NSK K1, observe the following precautions.

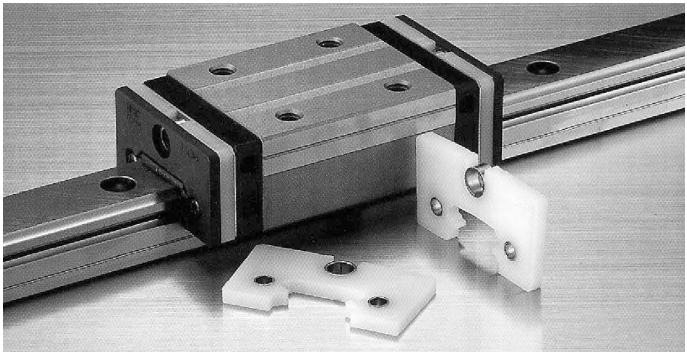
1. Temperature range for use:
   Maximum temperature in use: 50°C
   Momentary maximum temperature in use: 80°C
2. Chemicals that should not come into contact with NSK K1:
   Do not leave the NSK K1 in an organic solvent, such as hexane and thinner that remove oil, or rust preventive oil that contains white kerosene.

Note: Water-type cutting oil, oil-type cutting oil, mineral-oil type grease and ester-type grease do not damage NSK K1.

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10. NSK linear guides for food processing equipment and medical devices for sanitary environment

Used with NSK K1 for food processing equipment and medical devices and grease for food processing equipment.



What is "NSK K1" for food processing equipment and medical devices?

With an amazing innovation lubrication unit, the NSK K1 for food processing equipment and medical devices utilizing the US Food and Drug Administration (FDA) compliant material, provides reliability when used in food processing equipment and medical devices. The newly developed porous synthetic resin contains abundant lubricant.

With the basic function of highly praised NSK K1 lubrication unit for general industry, more sophisticated materials make it applicable in food and medical equipment.

It also offers easy installation: it is installed inside the standard end seal.

(1) Features

1) The highest grade of category H1* grease of USDA** standard is used for NSK K1 lubrication unit.

*category H1: Lubricants permitted for use where there is possibility of incidental food contact

**USDA: USDA (The United States Department of Agriculture)

Features of grease for food processing machines

- This grease is approved by USDA H1. (National Science Foundation [NSF] carries out certification for USDA.)
- Superb water resistance and antirust capability
- Superb wear resistance
- Applicable for a centralized oiling system

2) Appropriate volume of grease

A supply of appropriate volume of grease reduces grease draining and scattering, and maintains a clean environment.

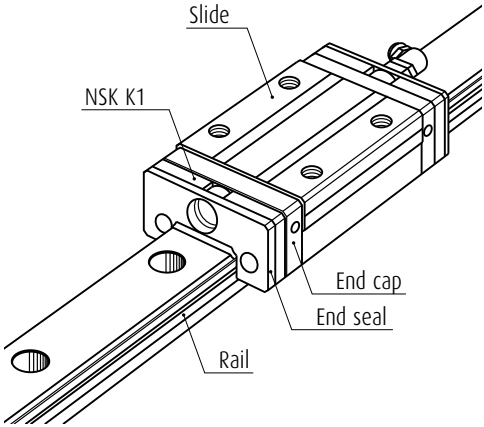
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(2) Available models

Table 12 shows available models.

Table 12

NH Series	NH15, NH20, NH25, NH30 and NH35
NS Series	NS15, NS20, NS25, NS30 and NS35
LW Series	LW17, LW21, LW27 and LW35
PU Series	PU09, PU12 and PU15
PE Series	PE09, PE12 and PE15



Precautions for use

To maintain optimal performance of NSK K1 lubrication unit over a long time, please follow the instructions below:

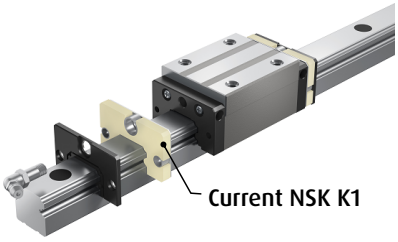
1. Temperatures range for use:	Maximum temperature in use: 50°C Momentary maximum temperature in use: 80°C
2. Chemicals that should not come to contact:	Do not leave NSK K1 lubrication unit in organic solvent, white kerosene such as hexane, thinner which removes oil, and rust prevention oil which contains white kerosene.

Note: Water-type cutting oil, oil-type cutting oil and grease such as mineral-type and ester-type do not damage NSK K1 lubrication unit.

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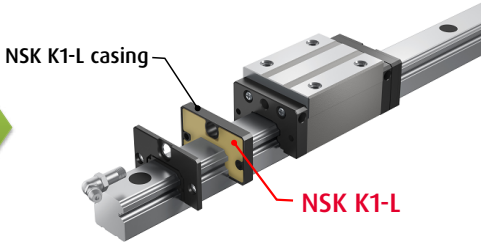
11. Introduction of New Lubrication Unit NSK K1-L for NSK Linear Guides

Current NSK K1



■ Oil content 70% in total weight

New Lubrication Unit NSK K1-L



New NSK K1-L Lubrication Unit will replace the current K1 Lubrication unit.

- Maintains lubrication by optimizing resin content ratio and achieves 85wt% oil content
- Controls amount of lubrication oil released per hour to double the oil supply period
- Increased supply of lubrication oil thanks to newly developed material
  Supply period about twice that of current material
- Casing around oil-retaining material
  Protects oiled components and prevents oil leakage

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