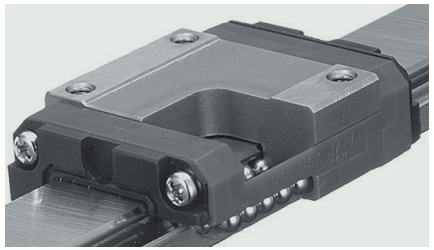
A-5-2.1 PU Series (Miniature type)



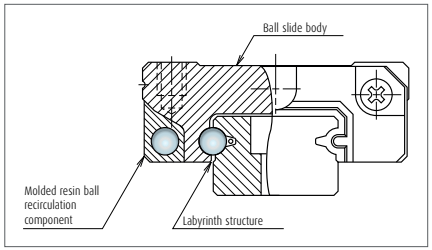


Fig. 1

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.

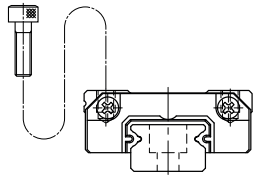
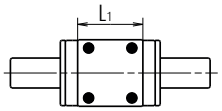
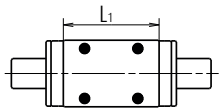
(8) Long-term maintenance-free

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)

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, 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 (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

(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 (All ball slides on a set of rails)	5	7	15	25
Mounting width W_2 or W_3	±15	±20	±30	±50
Variation of W_2 or W_3 (All ball slides on reference rail)	7	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.	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

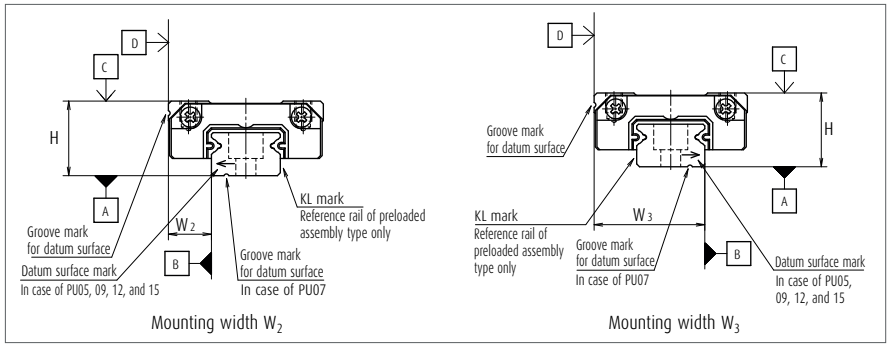


Fig. 2

Note Please refer to page A67 for marks on the datum surfaces.

(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) Slight preload (Z1)	Rigidity (N/μm) 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.

5. Installation

(1) Permissible values of mounting error

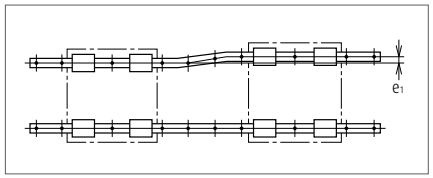


Fig. 3

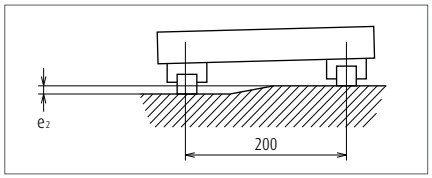


Fig. 4

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

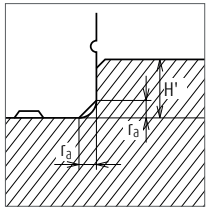


Fig. 5 Shoulder for the rail datum face

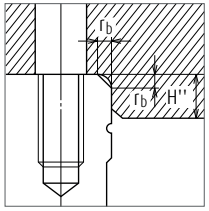


Fig. 6 Shoulder for the ball slide datum face

Table 8

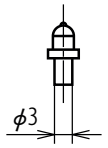
Unit: mm

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

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.

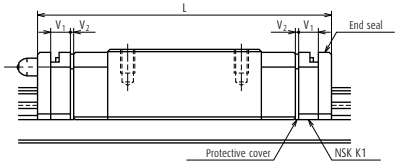


Table 10

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 $V_2 \times 2$)

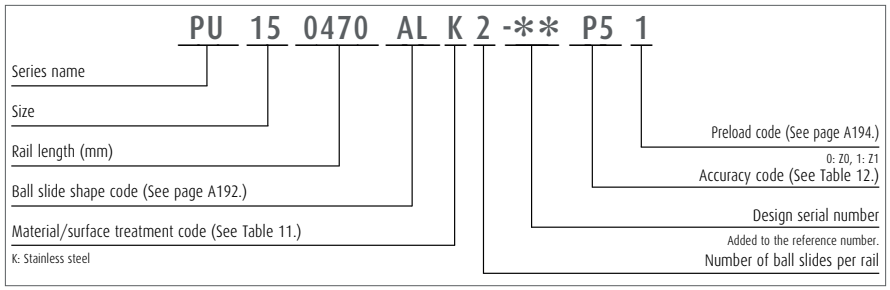
A-5-2.1 PU Series (Miniature type)

8. Reference number

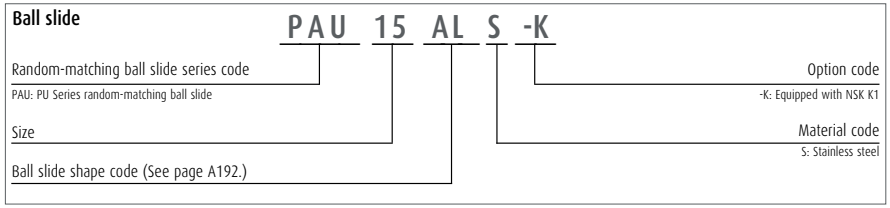
Reference numbers shall be set to individual NSK linear guide when its specifications are finalized, and it is indicated on its specification drawing.

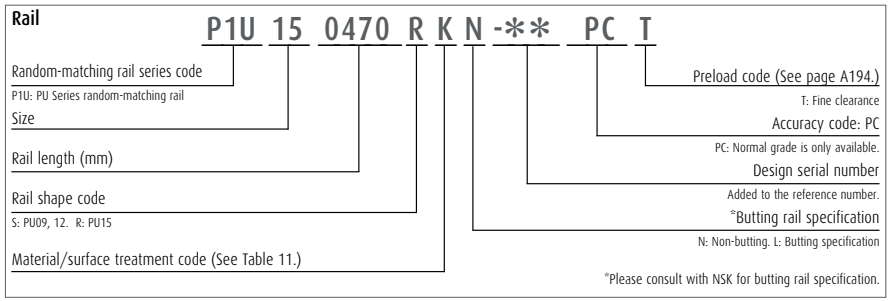
Please specify the reference number, except design serial number, to identify the product when ordering, requiring estimates, or inquiring about specifications from NSK.

(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 (refer to page A194).

Table 11 Material/surface treatment code

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

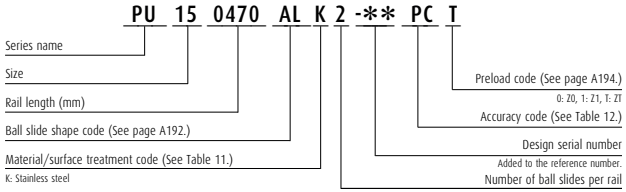
Table 12 Accuracy code

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

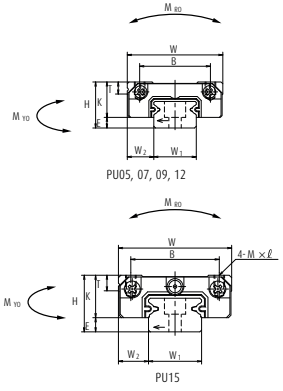
Note Refer to pages A38 and A61 for the NSK K1 lubrication unit.

9. Dimensions

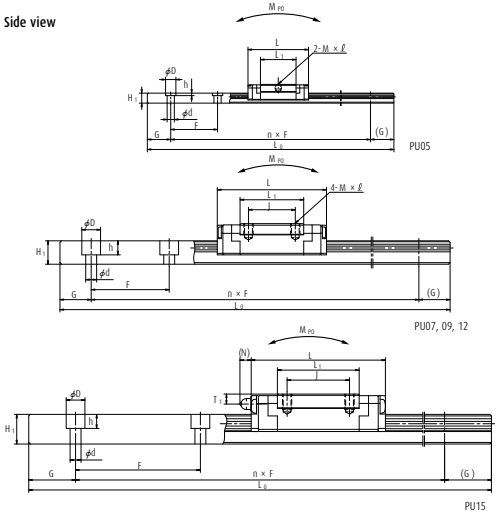
PU-TR, AR, AL (Standard type / Standard)
PU-UR, BL (High-load type / Long)



Front view



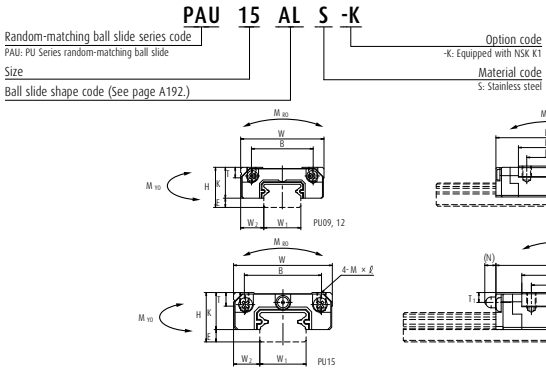
Side view



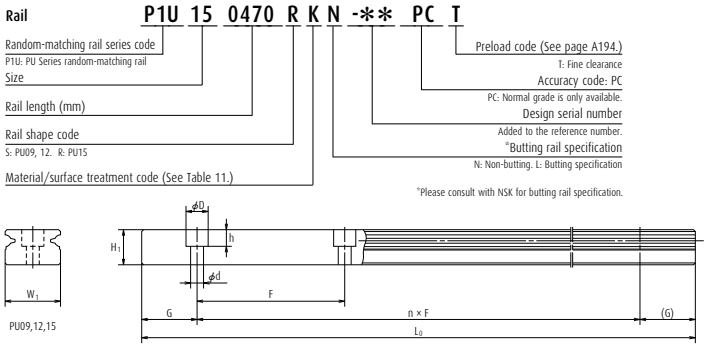
Model No.	Assembly			Ball slide												Width	Height
	Height			Width	Length	Mounting hole						Oil hole					
	H	E	W_2	W	L	B	J	M × pitch × ℓ	L_1	K	T	Hole size	T_1	N	W_1	H_1
PU05TR	6	1	3.5	12	19.4	8	–	M2×0.4×1.5	11.4	5	2.3	ϕ 0.9	1.5	–	5	3.2
PU07AR	8	1.5	5	17	23.4	12	8	M2×0.4×2.4	13.3	6.5	2.45	ϕ 1.5	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.

Reference number for ball slide of random-matching type



Reference number for rail of random-matching type

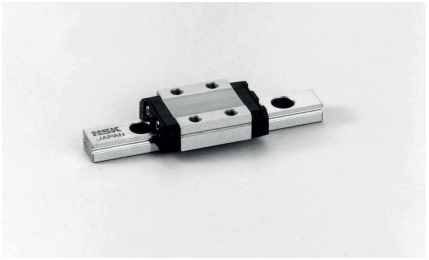


Unit: mm

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_{PO}		M_{YO}			
F	d × D × h	(reference)	L_{0max}	C_{50}(N)	C_{100}(N)	C_0 (N)	M_{RO}	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.)

A-5-2.2 LU Series (Miniature type)



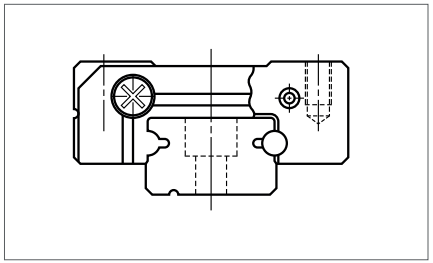


Fig. 1 LU Series

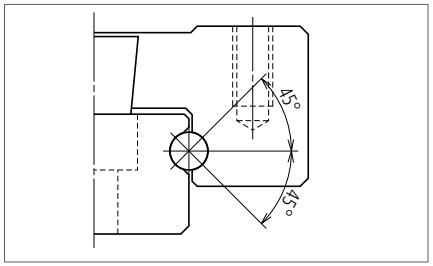


Fig. 2 Balls are in contact.

1. Features

(1) Super-small type

This compact guide owes its design to the single ball groove on both right and left sides (Gothic arch).

(2) Equal load carrying capacity in vertical and lateral directions

The contact angle is set at 45 degrees, thus facilitating the equal load carrying capacity in vertical and lateral directions. This also provides equal rigidity in both directions.

(3) Stainless steel is also standardized

Items made of the martensitic stainless steel are available as standard.

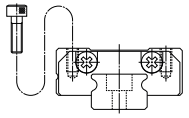
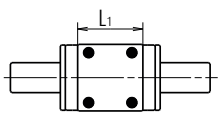
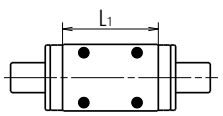
(4) Some series have a ball retainer

Ball slide types AR and TR come with a ball retainer. Balls are retained in the retainer and do not fall out when the ball slide is withdrawn from the rail. (Ball slides of random-matching type as well as LU15 come with ball retainer.)

(5) Fast delivery

Random-matching of rails and ball slides are available. (LU09 to LU15)

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
AL TL AR TR BL UL		AL, TL, TR, AR 	BL, UL 

Specification	Detail	Type	
Mounting hole	Normal	AL, AR	BL
	Large	TL, TR	UL
Ball retainer	Without	AL*, TL	BL*, UL
	With	AR, TR	–

*) LU15 is equipped with ball retainer

3. Accuracy and preload

(1) Running parallelism of ball slide

Table 1

Unit: μm

Rail length (mm)		Preloaded assembly type (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

(2) Accuracy standard

The preloaded assembly type has four accuracy grades; Super precision P4, High precision P5, Precision 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 type.

› 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	Refer to **Table 1** and **Fig. 3**			

› Tolerance of random-matching type: Normal grade PC

Table 3

Unit: μm

Characteristics \ Accuracy grade	LU09, 12, 15
Mounting height H	±20
Variation of mounting height H	40
Mounting width W_2 or W_3	±20
Variation of mounting width W_2 or W_3	40
Running parallelism of surface C to surface A Running parallelism of surface D to surface B	Refer to **Table 1** and **Fig. 3**

(3) Assembled accuracy

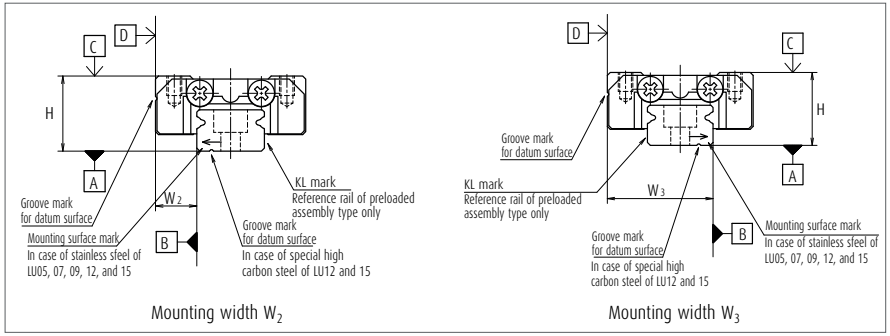


Fig. 3

Note Please refer to page A67 for marks on the datum surfaces.

(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 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	LU05 TL	0 – 3	15
	LU07 AL	0 – 8	22
	LU09 AL, TL	0 – 12	26
	LU09 AR, TR	0 – 10	30
	LU12 AL, TL	0 – 17	33
	LU12 AR, TR	0 – 17	33
	LU15 AL	0 – 33	45
High-load type	LU09 BL, UL	0 – 17	43
	LU12 BL, UL	0 – 25	52
	LU15 BL	0 – 51	75

Note Clearance of Fine clearance Z0 is 0 to 3 μm. Therefore, preload is zero. However, the clearance of the Z0 of PN grade is 3 to 10 μm.

› Clearance of random-matching type

Table 5

Unit: μm

Model No.	Fine clearance ZT
LU09	0 – 15
LU12	0 – 15
LU15	0 – 15

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	Material \ Size	05	07	09	12	15
LU	Special high carbon steel	–	–	1 200	1 800	2 000
	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.

5. Installation

(1) Permissible values of mounting error

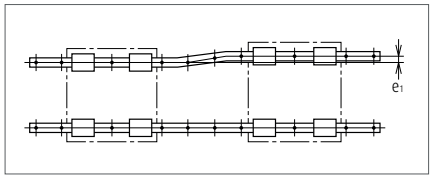


Fig. 4

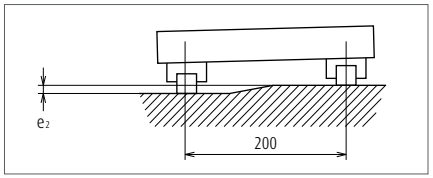


Fig. 5

Table 7

Unit: μm

Value	Preload	Model No.				
		LU05	LU07	LU09	LU12	LU15
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

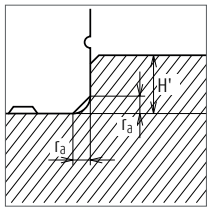


Fig. 6 Shoulder for the rail datum surface

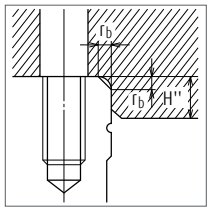


Fig. 7 Shoulder for the ball slide datum surface

Table 8

Unit: mm

Model No.	Corner radius (maximum)		Shoulder height	
	r_a	r_b	H'	H"
LU05	0.2	0.2	0.7	2
LU07	0.2	0.3	1.2	3
LU09	0.3	0.3	1.9	3
LU12	0.3	0.3	2.5	4
LU15	0.3	0.5	3.5	5

6. Lubrication accessories

There is no standard grease fitting for LU05 to LU15.
For the LU Series, apply grease directly to the ball grooves of rail using a point nozzle.

7. Dust-proof components

(1) Standard specification

End seal: Provided to both ends of the ball slide as a standard feature.
LU05TL, LU07AL, LU09AL, and LU09TL can install the side seal as an option.
› 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
LU	0.3	0.3	0.5	0.5	0.5

(2) NSK K1 lubrication unit

The installed dimensions of the NSK K1 lubrication unit are shown in **Table 10**.

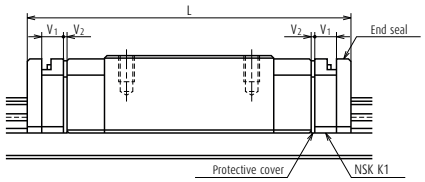


Table 10

Unit: mm

Model No.	Ball slide length	Ball slide model	Standard ball slide length	Ball slide length installed with two NSK K1 L	Per NSK K1 thickness V_1	Protective cover thickness V_2
LU05	Standard	TL	18*	24.4	2.0	0.5
LU07	Standard	AL	20.4*	29.4	2.5	0.5
LU09	Standard	AR, TR	30	36.4	2.7	0.5
LU09	Standard	AL, TL	26.8*	34.2	2.7	0.5
LU09	Long	BL, UL	41	47.4	2.7	0.5
LU12	Standard	AR, TR	35.2	42.2	3.0	0.5
LU12	Standard	AL, TL	34	41	3.0	0.5
LU12	Long	BL, UL	47.5	54.5	3.0	0.5
LU15	Standard	AL	43.6	51.8	3.5	0.6
LU15	Long	BL	61	69.2	3.5	0.6

*) Standard ball slide length of LU05TL, LU07AL, LU09AL and LU09TL does not include the thickness of the end seal (1.5 mm). However, it includes the height of the screw head for end cap installation (Included length – LU05, 0.8 mm; LU07, no projection; LU09, 1 mm)

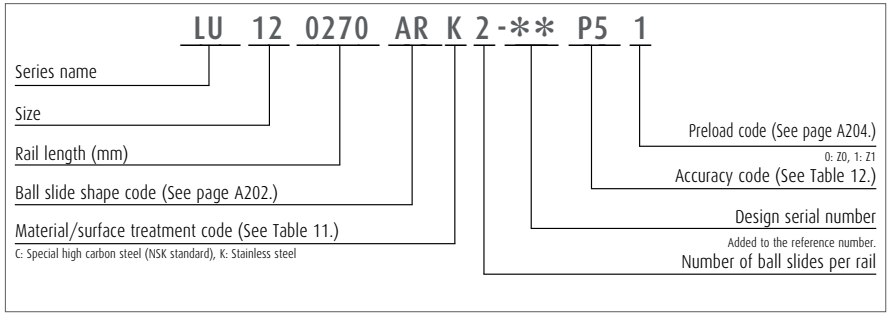
Note Ball slide length equipped with NSK K1 =
(Standard ball slide length) + (Thickness of NSK K1, V_1 × Number of NSK K1) +
(Thickness of the protective cover V_2 × 2)

8. Reference number

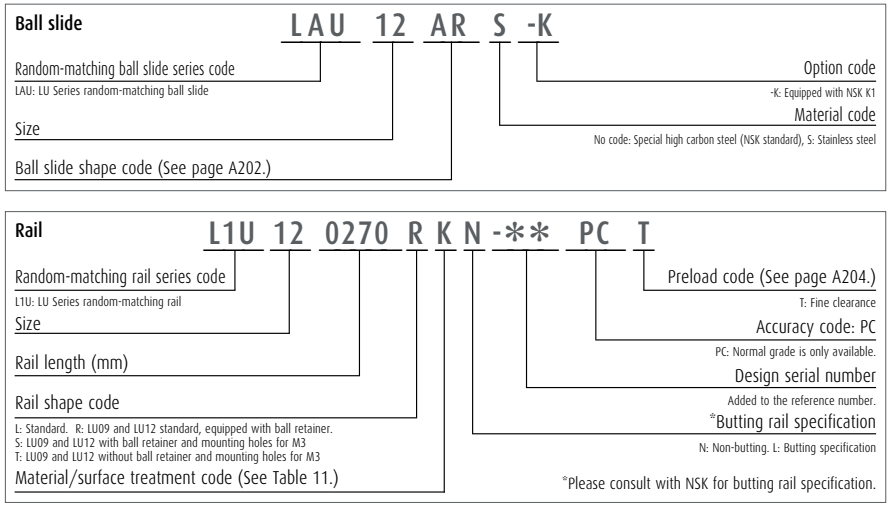
Reference numbers shall be set to individual NSK linear guide when its specifications are finalized, and it is indicated on its specification drawing.

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 the preload code of "Fine clearance T" is available (refer to page A204).

Table 11 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

Table 12 Accuracy code

Accuracy	Standard (Without NSK K1)	With NSK K1
Super precision grade	P4	K4
High precision grade	P5	K5
Precision grade	P6	K6
Normal grade	PN	KN
Normal grade (random-matching type)	PC	KC

Note Refer to page A38 for NSK K1 lubrication unit.

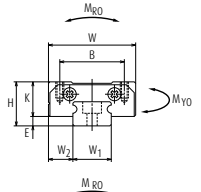
9. Dimensions

LU-AL (Standard type / Standard, LU15 is equipped with ball retainer)
LU-TL (Standard type / Standard, Large mounting hole)
LU-AR (Standard type / Standard, With ball retainer)
LU-TR (Standard type / Standard, Large mounting hole, with ball retainer)

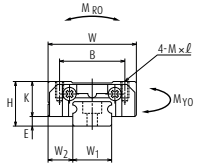
LU 12 0270 AR K 2 -** PC T

- Series name: LU
- Size: 12
- Rail length (mm): 0270
- Ball slide shape code (See page A202.): AR
- Material/surface treatment code (See Table 11.): K
  L: Standard. R: LU09 and LU12 standard, equipped with ball retainer.
- Number of ball slides per rail: 2
- Design serial number: -**
  Added to the reference number.
- Accuracy code (See Table 12.): PC
- Preload code (See page A204.): T
  0: Z0, 1: Z1, T: ZT

Front view

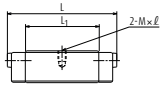


LU05TL, LU07AL
LU09AL, TL

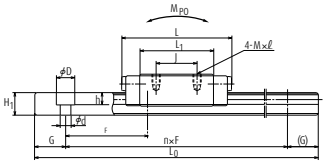


LU09AR, TR
LU12AL, TL, AR, TR
LU15AL

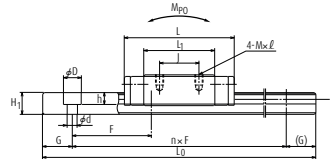
Side view



LU05TL



LU07AL
LU09AL, TL



LU09AR, TR
LU12AL, TL, AR, TR
LU15AL

Model No.	Assembly			Ball slide							Rail		
	Height			Width	Length	Mounting hole					Width	Height	Pitch
	H	E	W_2	W	L	B	J	M × pitch × ℓ	L_1	K	W_1	H_1	F
LU05TL	6	1	3.5	12	18	8	—	M2×0.4×1.5	12	5	5	3.2	15
LU05TL	6	1	3.5	12	18	8	—	M2×0.4×1.5	12	5	5	3.2	15
LU07AL	8	1.5	5	17	20.4	12	8	M2×0.4×2.4	13.6	6.5	7	4.7	15
LU07AL	8	1.5	5	17	20.4	12	8	M2×0.4×2.4	13.6	6.5	7	4.7	15
LU09AL	10	2.2	5.5	20	26.8	15	13	M2×0.4×2.5	18	7.8	9	5.5	20
LU09TL	10	2.2	5.5	20	26.8	15	10	M3×0.5×3	18	7.8	9	5.5	20
LU09AR	10	2.2	5.5	20	30	15	13	M2×0.4×2.5	20	7.8	9	5.5	20
LU09TR	10	2.2	5.5	20	30	15	10	M3×0.5×3	20	7.8	9	5.5	20
LU12AL	13	3	7.5	27	34	20	15	M2.5×0.45×3	21.8	10	12	7.5	25
LU12TL	13	3	7.5	27	34	20	15	M3×0.5×3.5	21.8	10	12	7.5	25
LU12AR	13	3	7.5	27	35.2	20	15	M2.5×0.45×3	21.8	10	12	7.5	25
LU12TR	13	3	7.5	27	35.2	20	15	M3×0.5×3.5	21.8	10	12	7.5	25
LU15AL	16	4	8.5	32	43.6	25	20	M3×0.5×4	27	12	15	9.5	40
LU15AL	16	4	8.5	32	43.6	25	20	M3×0.5×4	27	12	15	9.5	40

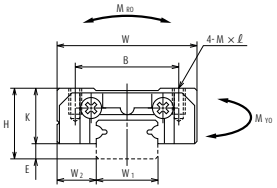
Notes
1) LU05TL, LU07AL, LU09TL, LU09AR, LU09TR, LU12AR and LU12TR come in stainless steel only.
2) Ball slide of LU05TL has only two mounting tap holes in the center.
3) End seals of LU05TL, LU07AL, LU09AL and LU09TL are available on request.

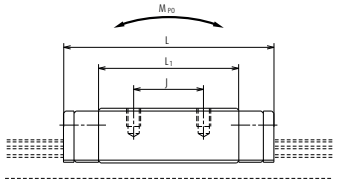
Reference number for ball slide of random-matching type

Random matching with retainer: LU09 - 12 are AR/TR, LU15 is AL.
LAU-AR (With ball retainer)
LAU-TR (Large mounting hole, with ball retainer)
LAU-AL (LU15 is equipped with ball retainer)

LAU 12 AR S -K

- Random-matching ball slide series code: LAU
  LAU: LU Series random-matching ball slide
- Size: 12
- Ball slide shape code (See page A202.): AR
- Material code: S
  No code: Special high carbon steel (NSK standard), S: Stainless steel
- Option code: -K
  -K: Equipped with NSK K1



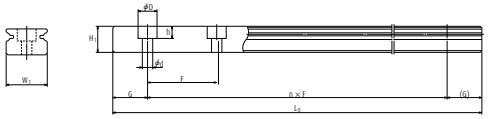


Reference number for rail of random-matching type

L1U 12 0270 R K N -** PC T

- Random-matching rail series code: L1U
  L1U: LU Series random-matching rail
- Size: 12
- Rail length (mm): 0270
- Rail shape code: R
  L: Standard. R: LU09 and LU12 standard equipped with ball retainer.
  S: LU09 and LU12 with ball retainer and mounting holes for M3
  T: LU09 and LU12 without ball retainer and mounting holes for M3
- Material/surface treatment code (See Table 11.): K
- *Butting rail specification: N
  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 page A204.): T
  T: Fine clearance

*Please consult with NSK for butting rail specification.



Unit: mm

Rail			Basic load rating								Weight	
Mounting bolt hole d × D × h	G (reference)	Max. length L_{0max} ( ) for stainless	5) Dynamic [50km] C_{50}(N)	5) Dynamic [100km] C_{100}(N)	Static C_0 (N)	Static moment (N·m) M_{RO}	M_{PO} One slide	M_{PO} Two slides	M_{YO} One slide	M_{YO} Two slides	Ball slide (g)	Rail (g/100 mm)
2.3×3.3×1.5	5	—	545	435	740	1.93	1.22	8.85	1.22	8.85	4	11
2.3×3.3×1.5	5	(210)	545	435	740	1.93	1.22	8.85	1.22	8.85	4	11
2.4×4.2×2.3	5	—	1 090	865	1 370	4.90	2.66	18.6	2.66	18.6	10	23
2.4×4.2×2.3	5	(375)	1 090	865	1 370	4.90	2.66	18.6	2.66	18.6	10	23
2.6×4.5×3	7.5	1 200	1 760	1 400	2 220	10.2	6.10	38.5	6.10	38.5	17	35
3.5×6×4.5	7.5	(600)	1 760	1 400	2 220	10.2	6.10	38.5	6.10	38.5	17	35
2.6×4.5×3	7.5	—	1 490	1 180	2 150	9.9	6.10	41.0	6.10	41.0	19	35
3.5×6×4.5	7.5	(600)	1 490	1 180	2 150	9.9	6.10	41.0	6.10	41.0	19	35
3×5.5×3.5	10	1 800	2 830	2 250	3 500	21.1	11.4	78.5	11.4	78.5	38	65
3.5×6×4.5	10	(800)	2 830	2 250	3 500	21.1	11.4	78.5	11.4	78.5	38	65
3×5.5×3.5	10	—	2 830	2 250	3 500	21.1	11.4	81.5	11.4	81.5	38	65
3.5×6×4.5	10	(800)	2 830	2 250	3 500	21.1	11.4	81.5	11.4	81.5	38	65
3.5×6×4.5	15	2 000	5 550	4 400	6 600	49.5	25.6	193	25.6	193	70	105
3.5×6×4.5	15	(1 000)	5 550	4 400	6 600	49.5	25.6	193	25.6	193	70	105

4) To fix rail of LU05TL, 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.)
5) 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

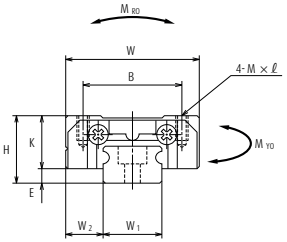
A-5-2.2 LU Series (Miniature type)

LU-BL (High-load type / Long)
LU-UL (High-load type / Long, large mounting hole)

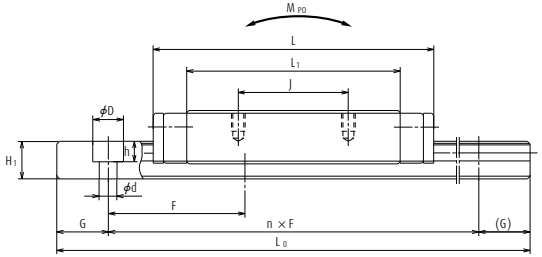
LU 12 0270 BL K 2 -** P5 1

- Series name
- Size
- Rail length (mm)
- Ball slide shape code (See page A202.)
- Material/surface treatment code (See Table 11.)
  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 12.)
- Preload code (See page A204.)
  0: Z0, 1: Z1

Front view



Side view



Unit: mm

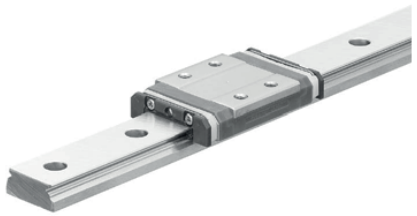
Model No.	Assembly			Ball slide							Rail			Weight	
	Height			Width	Length	Mounting hole					Width	Height	Pitch		
	H	E	W_2	W	L	B	J	M × pitch × ℓ	L_1	K	W_1	H_1	F		
LU09BL	10	2.2	5.5	20	41	15	16	M2×0.4×2.5	31.2	7.8	9	5.5	20		
LU09UL	10	2.2	5.5	20	41	15	16	M3×0.5×3	31.2	7.8	9	5.5	20		
LU12BL	13	3	7.5	27	47.5	20	20	M2.5×0.45×3	35.3	10	12	7.5	25		
LU12UL	13	3	7.5	27	47.5	20	20	M3×0.5×3.5	35.3	10	12	7.5	25		
LU15BL	16	4	8.5	32	61	25	25	M3×0.5×4	44.4	12	15	9.5	40		

Notes 1) LU09UL is available only in stainless steel.
2) LU15BL is equipped with ball retainer.

Rail			Basic load rating								Weight	
Mounting bolt hole	G	Maximum length	3) Dynamic		Static	Static moment (N·m)					Ball slide	Rail
			[50km]	[100km]			M_{PO}		M_{YO}			
d × D × h	(reference)	L_{0max} ( ) for stainless	C_{50}(N)	C_{100}(N)	C_0 (N)	M_{RO}	One slide	Two slides	One slide	Two slides	(g)	(g/100 mm)
2.6×4.5×3	7.5	1 200	2 600	2 070	3 900	17.9	17.2	98.0	17.2	98.0	29	35
3.5×6×4.5	7.5	(600)	2 600	2 070	3 900	17.9	17.2	98.0	17.2	98.0	29	35
3×5.5×3.5	10	1 800	4 000	3 150	5 700	34.5	28.3	169	28.3	169	59	65
3.5×6×4.5	10	(800)	4 000	3 150	5 700	34.5	28.3	169	28.3	169	59	65
3.5×6×4.5	15	2 000	8 100	6 400	11 300	84.5	69.5	435	69.5	435	107	105
3.5×6×4.5	15	(1 000)	8 100	6 400	11 300	84.5	69.5	435	69.5	435	107	105

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

A-5-2.3 PE Series (Miniature wide type)



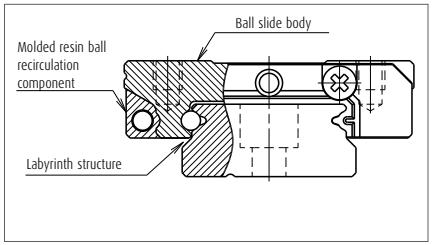


Fig. 1

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.

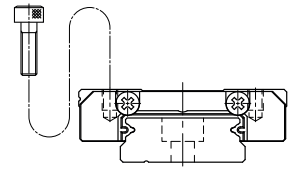
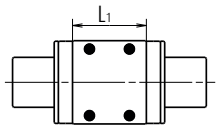
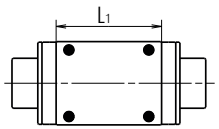
(9) Long-term maintenance-free

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)

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

(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

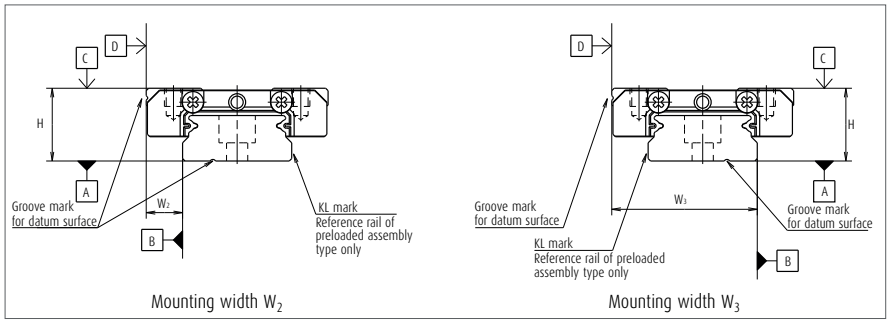


Fig. 2

(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	Material \ Size	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.

5. Installation

(1) Permissible values of mounting error

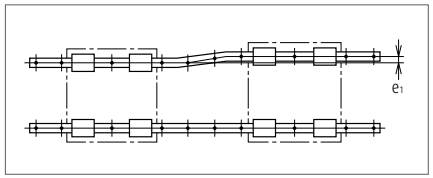


Fig. 3

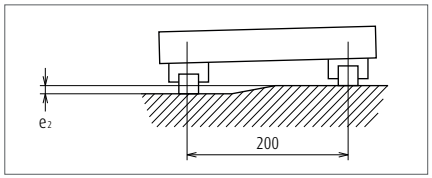


Fig. 4

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

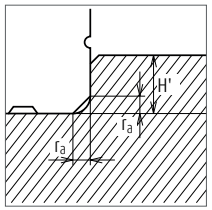


Fig. 5 Shoulder for the rail datum surface

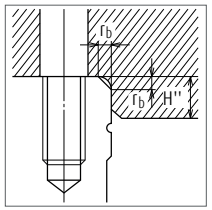


Fig. 6 Shoulder for the ball slide datum surface

Table 8

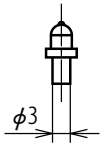
Unit: mm

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

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.

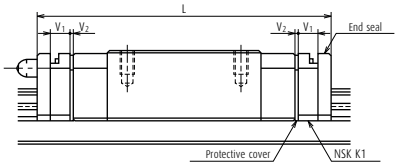


Table 10

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)

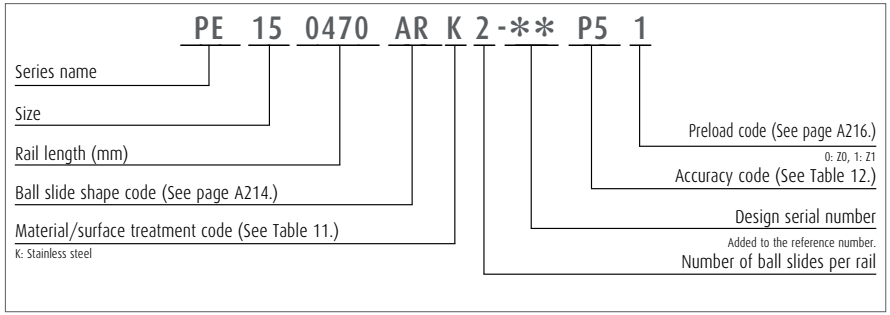
A-5-2.3 PE Series (Miniature wide type)

8. Reference number

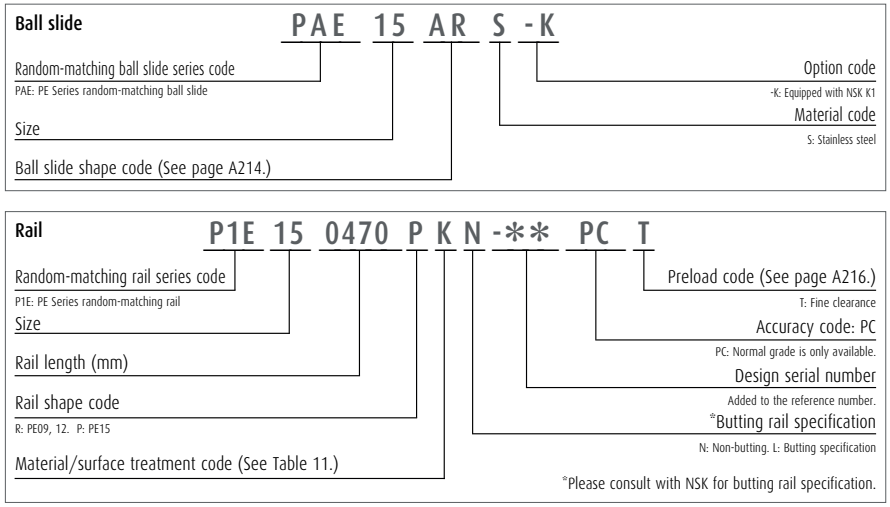
Reference numbers shall be set to individual NSK linear guide when its specifications are finalized, and it is indicated on its specification drawing.

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 (refer to page A216).

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 A38 and A61 for NSK K1 lubrication unit.

9. Dimensions

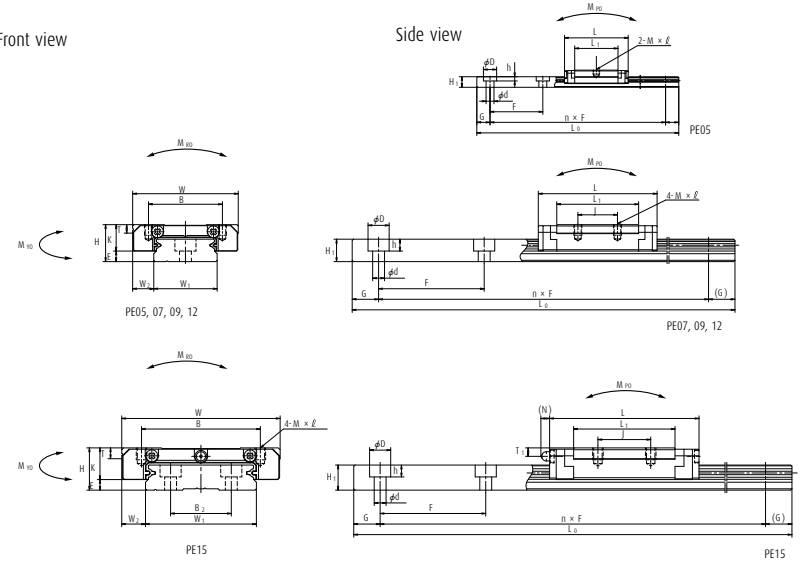
PE-AR, TR (Standard type / Standard)
PE-UR, BR (High-load type / Long)

PE 15 0470 AR K 2 -** PC T

- Series name
- Size
- Rail length (mm)
- Ball slide shape code (See page A214.)
- 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 page A216.)
  0: Z0, 1: Z1, T: ZT

Front view

Side view



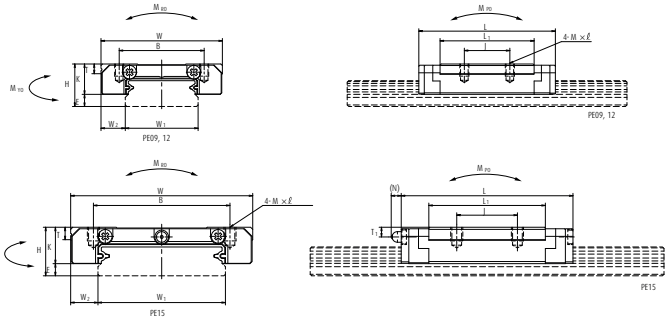
Model No.	Assembly			Ball slide											Width	Height
	Height			Width	Length	Mounting hole						Oil hole				
	H	E	W_2	W	L	B	J	M × pitch × ℓ	L_1	K	T	Hole size	T_1	N	W_1	H_1
PE05AR	6.5	1.4	3.5	17	24.1	13	—	M2.5×0.45×1.5	16.4	5.1	2.5	ϕ 0.9	1.3	—	10	4
PE07TR	9	2	5.5	25	31.1	19	10	M3×0.5×2.8	20.8	7	3	ϕ 1.9	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.

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 A214.)
- Material code
  S: Stainless steel
- Option code
  -K: Equipped with NSK K1

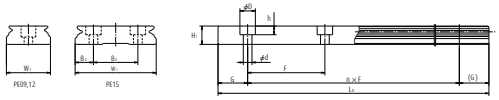


Reference number for rail of random-matching type

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.)
- *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 page A216.)
  T: Fine clearance

*Please consult with NSK for butting rail specification.

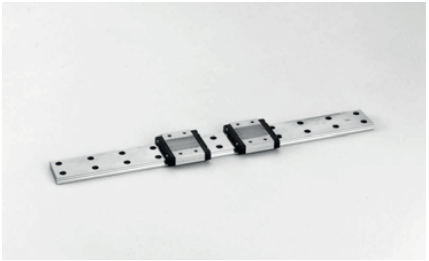


Unit: mm

Rail					Basic load rating								Weight	
					2) Dynamic		Static	Static moment (N·m)					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}	M_{PO} One slide	M_{PO} Two slides	M_{YO} One slide	M_{YO} 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.)

A-5-2.4 LE Series (Miniature wide type)



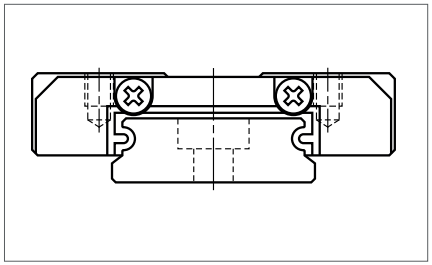


Fig. 1 LE Series

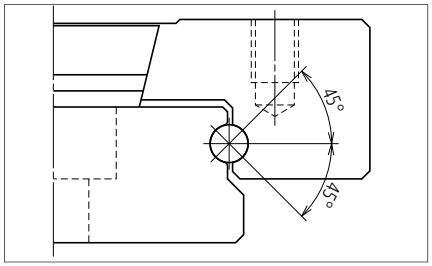


Fig. 2 Balls are in contact.

1. Features

(1) Ideal for use of single rail

The LE 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) Equal load carrying capacity in vertical and lateral directions

Contact angle is set at 45 degrees, equally dispersing the load from vertical and lateral directions. This also provides equal rigidity in the two directions.

(3) Guides are super-thin.

Super-thin guides owe their design to the single ball groove on right and left sides (Gothic arch).

(4) High accuracy

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

(5) Stainless steel is standard.

Rails and ball slides are made of martensitic stainless steel.

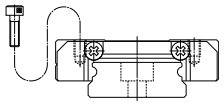
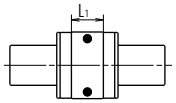
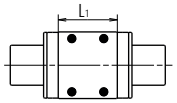
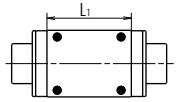
(6) Ball retainer is available in some series.

Some series come with a ball retainer (ball slide shape: AR and TR). Balls are retained in the retainer and do not fall out when a ball slide is withdrawn from the rail (random-maching type ball slides come with a ball retainer).

(7) Fast delivery

Random matching of rails and ball slides are available. (LE09 to LE15)

2. Ball slide shape

Ball slide Model	Shape/installation method	Type (Upper row, Rating: Lower row, Ball slide length)		
		Medium-load type	Standard type	High-load type
		Short	Standard	Long
AL TL AR TR BL UL CL SL		CL, SL 	AL, TL, AR, TR 	BL, UL 

Specification	Detail	Type		
Mounting hole	Normal	CL*	AL, AR	BL*
Mounting hole	Large	SL*	TL, TR	UL*
Ball retainer	Without	CL, SL	AL, TL	BL, UL
Ball retainer	With	—	AR, TR	—

* Only applicable to LE09

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) High precision P5	Preloaded assembly type (not random matching) Precision grade P6	Preloaded assembly type (not random matching) 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

(2) Accuracy standard

The preloaded assembly type has three accuracy grades; 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 type.

› Tolerance of preloaded assembly

Table 2

Unit: μm

Characteristics \ Accuracy grade	High precision P5	Precision grade P6	Normal grade PN
Mounting height H Variation of H (All ball slides on a set of rails)	±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)	±20 10	±30 20	±50 30
Running parallelism of surface C to surface A Running parallelism of surface D to surface B	Refer to **Table 1** and **Fig. 3**		

› Tolerance of random-matching type: Normal grade PC

Table 3

Unit: μm

Characteristics \ Accuracy grade	LU09, 12, 15
Mounting height H	±20
Variation of mounting height H	40
Mounting width W_2 or W_3	±20
Variation of mounting width W_2 or W_3	40
Running parallelism of surface C to surface A Running parallelism of surface D to surface B	Refer to **Table 1** and **Fig. 3**

(3) Assembled accuracy

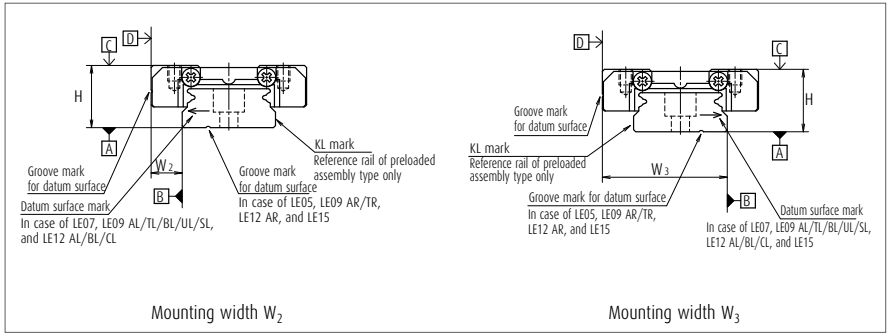


Fig. 3

(4) Preload and rigidity

We offer three levels of preload: Slight preload Z1 and Fine clearance Z0 for the preloaded assembly type, along with Fine clearance ZT for the 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	LE05 AL	0 – 23	36
	LE07 TL	0 – 29	46
	LE09 AL, TL, AR, TR	0 – 37	61
	LE12 AL, AR	0 – 40	63
	LE15 AL, AR	0 – 49	66
Medium-load type	LE05 CL	0 – 18	29
	LE07 SL	0 – 16	28
	LE09 CL, SL	0 – 21	33
	LE12 CL	0 – 23	36
	LE15 CL	0 – 29	44
High-load type	LE07 UL	0 – 43	71
	LE09 BL, UL	0 – 54	86
	LE12 BL	0 – 59	97
	LE15 BL	0 – 75	114

Note The clearance of Fine clearance Z0 is 0 to 3 μm. Therefore, preload is zero. However, the clearance of the Z0 of PN grade is 3 to 10 μm.

› Clearance of random-matching type

Table 5

Unit: μm

Model No.	Fine clearance ZT
LE09	0 – 15
LE12	0 – 15
LE15	0 – 15

4. Maximum rail length

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

Table 6 Length limitation of rails

Unit: mm

Series	Material \ Size	05	07	09	12	15
LE	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.

5. Installation

(1) Permissible values of mounting error

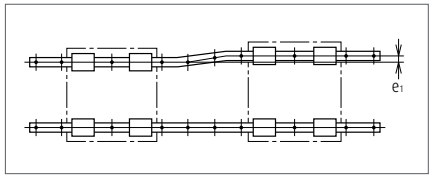


Fig. 4

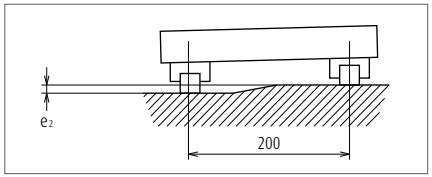


Fig. 5

Table 7

Unit: μm

Value	Preload	Model No.				
		LU05	LU07	LU09	LU12	LU15
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

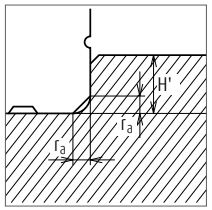


Fig. 6 Shoulder for the rail datum surface

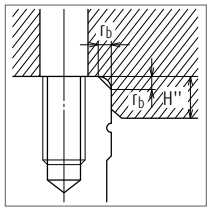


Fig. 7 Shoulder for the ball slide datum surface

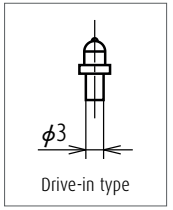
Table 8

Unit: mm

Model No.	Corner radius (maximum)		Shoulder height	
	r_a	r_b	H'	H"
LE05	0.2	0.2	1.1	2
LE07	0.2	0.3	1.7	3
LE09	0.3	0.3	3.5	3
LE12	0.3	0.3	3.5	4
LE15	0.3	0.5	3.5	5

6. Lubrication accessories

Model of LE15AR can select drive-in type grease fitting as option.
There is no standard grease fitting for LE05 to LE12.
For the models of LE05 to LE15 except for LE15AR, apply grease directly to the ball grooves of rail, using a point nozzle.



Drive-in type

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
LE	0.4	0.4	0.8	1.0	1.2

(2) NSK K1 lubrication unit

The installed dimensions of the NSK K1 lubrication unit are shown in **Table 10**.

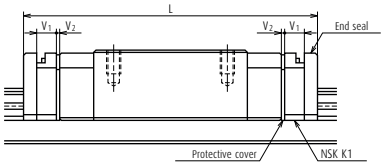


Table 10

Unit: mm

Model No.	Ball slide length	Ball slide model	Standard ball slide length	Ball slide length installed with two NSK K1 L	Per NSK K1 thickness V_1	Protective cover thickness V_2
LE07	Standard	TL	31	37	2.5	0.5
LE07	Long	UL	42	48	2.5	0.5
LE07	Short	SL	22.4	28.4	2.5	0.5
LE09	Standard	AL, TL	39	46	3.0	0.5
LE09	Standard	AR, TR	39.8	46.8	3.0	0.5
LE09	Long	BL, UL	50.4	57.4	3.0	0.5
LE09	Short	CL, SL	26.4	33.4	3.0	0.5
LE12	Standard	AL	44	52	3.5	0.5
LE12	Standard	AR	45	53	3.5	0.5
LE12	Long	BL	59	67	3.5	0.5
LE12	Short	CL	30.5	38.5	3.5	0.5
LE15	Standard	AL	55.0	64.6	4.0	0.8
LE15	Standard	AR	56.6	66.2	4.0	0.8
LE15	Long	BL	74.4	84	4.0	0.8
LE15	Short	CL	41.4	51	4.0	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)

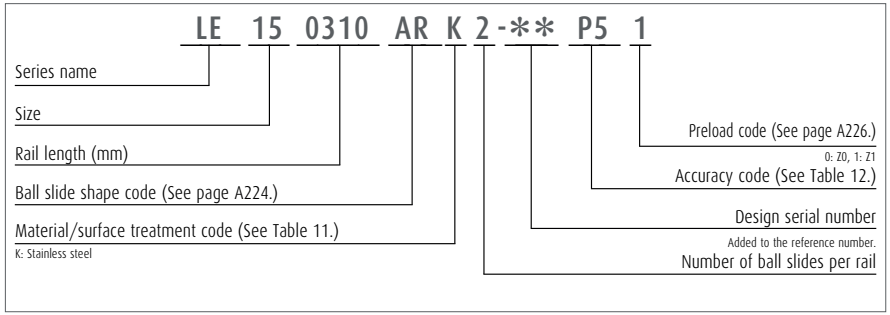
A-5-2.4 LE Series (Miniature wide type)

8. Reference number

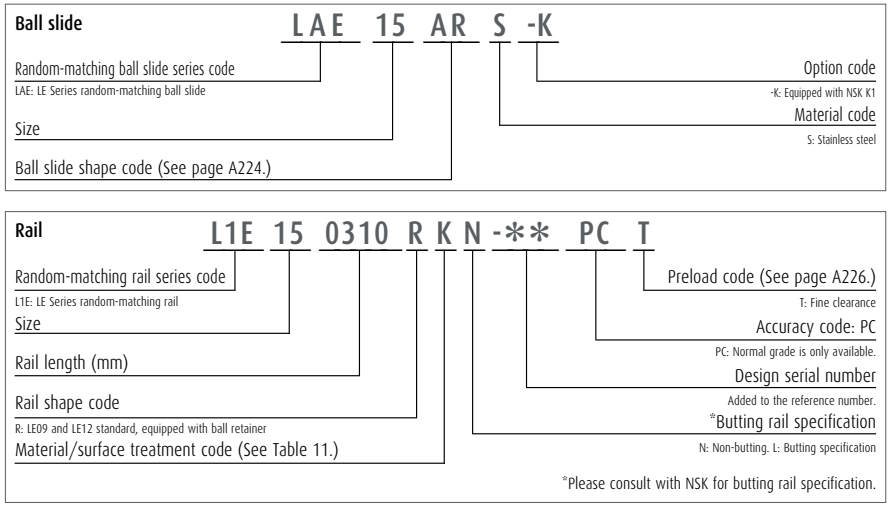
Reference numbers shall be set to individual NSK linear guide when its specifications are finalized, and it is indicated on its specification drawing.

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 the preload code of "Fine clearance T" is available (refer to page A226).

Table 11 Material/surface treatment code

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

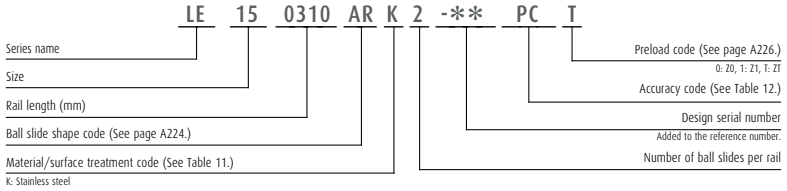
Table 12 Accuracy code

Accuracy	Standard (Without NSK K1)	With NSK K1
High precision grade	P5	K5
Precision grade	P6	K6
Normal grade	PN	KN
Normal grade (random-matching type)	PC	KC

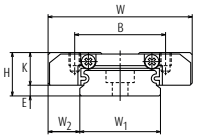
Note Refer to page A38 for NSK K1 lubrication unit.

9. Dimensions

LE-AL (Standard type / Standard)
LE-TL (Standard type / Standard, large mounting hole)
LE-AR (Standard type / Standard, with ball retainer)
LE-TR (Standard type / Standard, large mounting hole, with ball retainer)

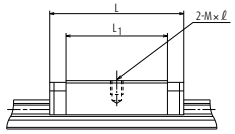


Front view

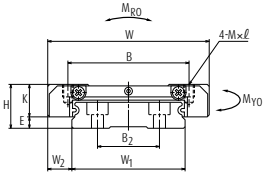


LE05, 07, 09, 12

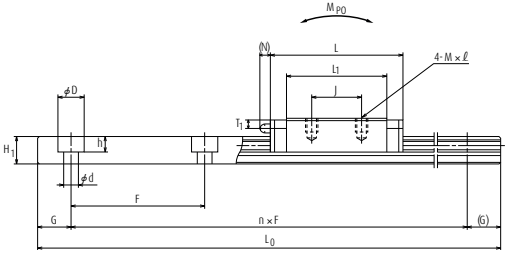
Side view



LE05



LE15



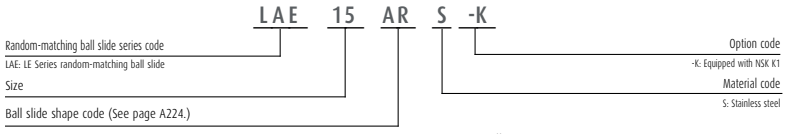
LE07, 09, 12, 15

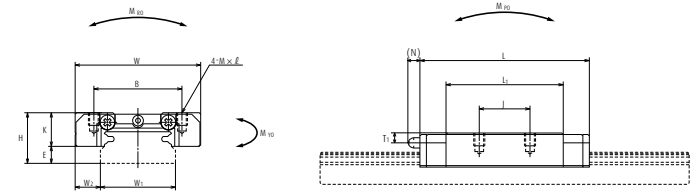
Model No.	Assembly			Ball slide							Grease fitting			Rail			
	Height			Width	Length	Mounting hole								Width	Height		Pitch
	H	E	W_2	W	L	B	J	M × pitch × ℓ	L_1	K	Hole size	T_1	N	W_1	H_1	B_2	F
LE05AL	6.5	1.4	3.5	17	24	13	—	M2.5×0.45×2	17	5.1	—	—	—	10	4	—	20
LE07TL	9	2	5.5	25	31	19	10	M3×0.5×3	21.2	7	—	—	—	14	5.2	—	30
LE09AL	12	4	6	30	39	21	12	M2.6×0.45×3	27.6	8	—	—	—	18	7.5	—	30
LE09TL	12	4	6	30	39	21	12	M3×0.5×3	27.6	8	—	—	—	18	7.5	—	30
LE09AR	12	4	6	30	39.8	21	12	M2.6×0.45×3	27.6	8	—	—	—	18	7.5	—	30
LE09TR	12	4	6	30	39.8	21	12	M3×0.5×3	27.6	8	—	—	—	18	7.5	—	30
LE12AL	14	4	8	40	44	28	15	M3×0.5×4	31	10	—	—	—	24	8.5	—	40
LE12AR	14	4	8	40	45	28	15	M3×0.5×4	31	10	—	—	—	24	8.5	—	40
LE15AL	16	4	9	60	55	45	20	M4×0.7×4.5	38.4	12	—	—	—	42	9.5	23	40
LE15AR	16	4	9	60	56.6	45	20	M4×0.7×4.5	38.4	12	φ3	3.2	3	42	9.5	23	40

Notes 1) Ball slide of LE05 has only two mounting tap holes.

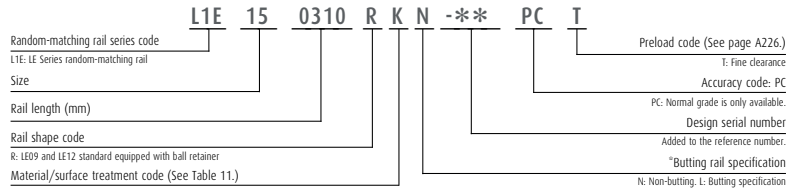
Reference number for ball slide of random-matching type

Random matching with retainer: LAE09AR/TR, LAE12AR, LAE15AR
LAE-AR (With ball retainer)
LAE-TR (Large mounting hole with ball retainer)

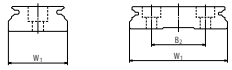




Reference number for rail of random-matching type

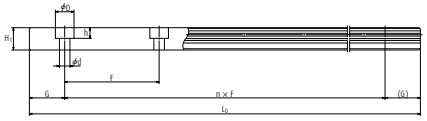


*Please consult with NSK for butting rail specification.



LE09, 12

LE15



Unit: mm

Rail			Basic load rating								Weight	
Mounting bolt hole d × D × h	G (reference)	Max. length L_{0max}	2) Dynamic [50km] C_{50}(N)	2) Dynamic [100km] C_{100}(N)	Static C_0 (N)	Static moment (N·m) M_{RO}	M_{PO} One slide	M_{PO} Two slides	M_{YO} One slide	M_{YO} Two slides	Ball slide (g)	Rail (g/100 mm)
3×5×1.6	7.5	150	725	575	1 110	5.65	2.58	16.9	2.58	16.9	11	34
3.5×6×3.2	10	600	1 580	1 260	2 350	16.7	7.20	46.0	7.20	46.0	25	55
3.5×6×4.5	10	800	3 000	2 400	4 500	36.5	17.3	110	17.3	110	40	95
3.5×6×4.5	10	800	3 000	2 400	4 500	36.5	17.3	110	17.3	110	40	95
3.5×6×4.5	10	800	3 000	2 400	4 500	36.5	17.3	113	17.3	113	40	95
3.5×6×4.5	10	800	3 000	2 400	4 500	36.5	17.3	113	17.3	113	40	95
4.5×8×4.5	15	1 000	4 350	3 450	6 350	70.5	29.3	175	29.3	175	75	140
4.5×8×4.5	15	1 000	4 350	3 450	6 350	70.5	29.3	180	29.3	180	75	140
4.5×8×4.5	15	1 200	7 600	6 050	10 400	207	59.0	360	59.0	360	150	275
4.5×8×4.5	15	1 200	7 600	6 050	10 400	207	59.0	370	59.0	370	150	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
3) For fixing a rail of LE05AL, use M2.5 × 0.45 cross-recessed pan head machine screw for precision instruments.
(JCIS 10-70: No.0 pan head machine screw No.3) (JCIS: Japanese Camera Industrial Standard)

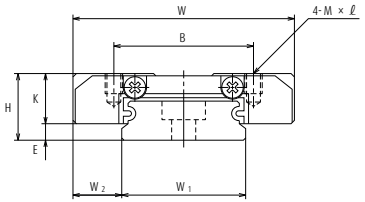
A-5-2.4 LE Series (Miniature wide type)

LE-BL (High-load type / Long)
LE-UL (High-load type / Long, large mounting hole)

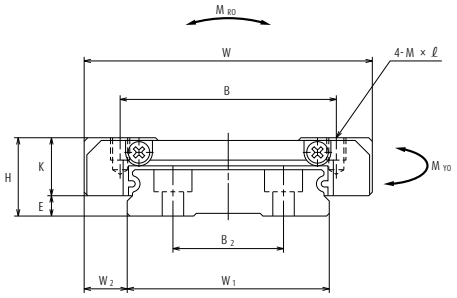
LE 15 0310 BL K 2 -** P5 1

- Series name
- Size
- Rail length (mm)
- Ball slide shape code (See page A224.)
- 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 page A226.)
  0: Z0, 1: Z1

Front view

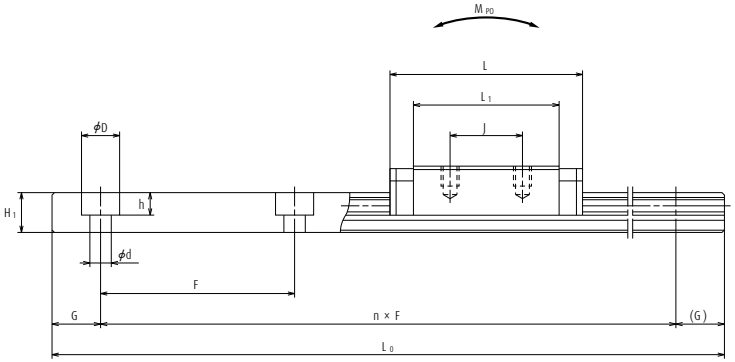


LE07, 09, 12



LE15

Side view



Unit: mm

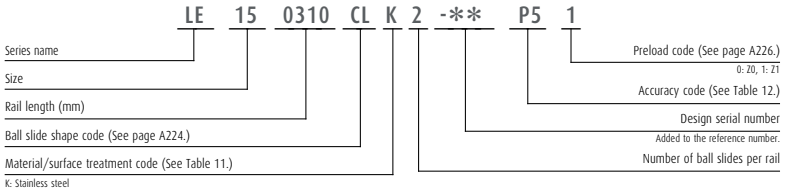
Model No.	Assembly			Ball slide										Pitch
	Height			Width	Length	Mounting hole			L_1	K	Width	Height		
	H	E	W_2	W	L	B	J	M × pitch × ℓ			W_1	H_1	B_2	F
LE07UL	9	2	5.5	25	42	19	19	M3×0.5×3	32.2	7	14	5.2	—	30
LE09BL	12	4	6	30	50.4	23	24	M2.6×0.45×3	39	8	18	7.5	—	30
LE09UL	12	4	6	30	50.4	23	24	M3×0.5×3	39	8	18	7.5	—	30
LE12BL	14	4	8	40	59	28	28	M3×0.5×4	46	10	24	8.5	—	40
LE15BL	16	4	9	60	74.4	45	35	M4×0.7×4.5	57.8	12	42	9.5	23	40

Rail			Basic load rating								Weight	
Mounting bolt hole	G	Maximum length	3) Dynamic		Static	Static moment (N·m)					Ball slide	Rail
			[50km]	[100km]			M_{PO}		M_{YO}			
d × D × h	(reference)	L_{0max}	C_{50}(N)	C_{100}(N)	C_0 (N)	M_{RO}	One slide	Two slides	One slide	Two slides	(g)	(g/100 mm)
3.5×6×3.2	10	600	2 180	1 730	3 700	26.4	17.3	94.5	17.3	94.5	39	55
3.5×6×4.5	10	800	4 000	3 150	6 700	54.5	37.5	206	37.5	206	58	95
3.5×6×4.5	10	800	4 000	3 150	6 700	54.5	37.5	206	37.5	206	58	95
4.5×8×4.5	15	1 000	5 800	4 600	9 550	106	63.5	340	63.5	340	115	140
4.5×8×4.5	15	1 200	10 300	8 200	16 000	320	135	725	135	725	235	275

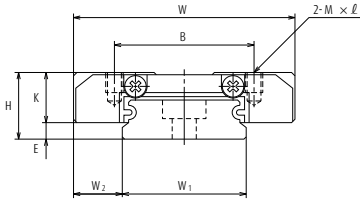
Note 1) The basic load rating comply with the ISO standard. (ISO 14728-1, 14728-2)
C_{50}; the basic dynamic load rating for 50 km rated fatigue life
C_{100}; the basic dynamic load rating for 100 km rated fatigue life

A-5-2.4 LE Series (Miniature wide type)

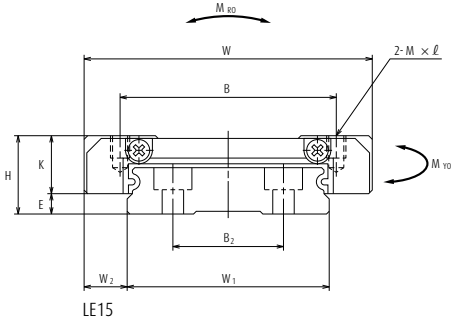
LE-CL (Medium-load type / Short)
LE-SL (Medium-load type / Short, large mounting hole)



Front view

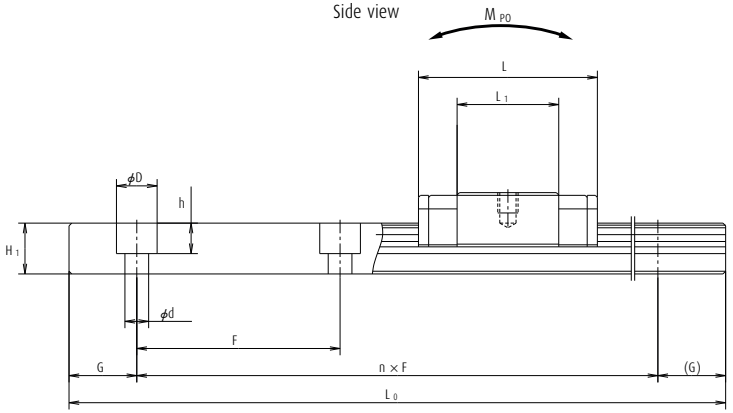


LE05, 07, 09, 12



LE15

Side view



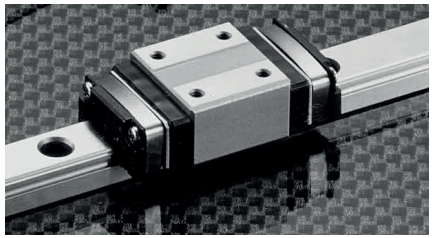
Unit: mm

Model No.	Assembly			Ball slide							Width	Height		Pitch
	Height			Width	Length	Mounting hole			L_1	K	W_1	H_1	B_2	F
	H	E	W_2	W	L	B	J	M × pitch × ℓ						
LE05CL	6.5	1.4	3.5	17	20	13	—	M2.5×0.45×2	13	5.1	10	4	—	20
LE07SL	9	2	5.5	25	22.4	19	—	M3×0.5×3	12.6	7	14	5.2	—	30
LE09CL	12	4	6	30	26.4	21	—	M2.6×0.45×3	15	8	18	7.5	—	30
LE09SL	12	4	6	30	26.4	21	—	M3×0.5×3	15	8	18	7.5	—	30
LE12CL	14	4	8	40	30.5	28	—	M3×0.5×4	17.5	10	24	8.5	—	40
LE15CL	16	4	9	60	41.4	45	—	M4×0.7×4.5	24.8	12	42	9.5	23	40

Notes 1) Ball slide of CL and SL types have only two mounting tap holes in the center.

Rail			Basic load rating								Weight	
Mounting bolt hole	G	Maximum length	3) Dynamic		Static	Static moment (N·m)					Ball slide	Rail
			[50km]	[100km]			M_{PO}		M_{YO}			
d × D × h	(reference)	L_{0max}	C_{50}(N)	C_{100}(N)	C_0 (N)	M_{RO}	One slide	Two slides	One slide	Two slides	(g)	(g/100 mm)
3×5×1.6	7.5	150	595	470	835	4.25	1.51	10.0	1.51	10.0	8	34
3.5×6×3.2	10	600	980	775	1 170	8.35	2.01	18.5	2.01	18.5	17	55
3.5×6×4.5	10	800	1 860	1 480	2 240	18.2	4.85	41.0	4.85	41.0	25	95
3.5×6×4.5	10	800	1 860	1 480	2 240	18.2	4.85	41.0	4.85	41.0	25	95
4.5×8×4.5	15	1 000	2 700	2 140	3 150	35.0	8.15	67.0	8.15	67.0	50	140
4.5×8×4.5	15	1 200	5 000	3 950	5 650	113	19.4	162	19.4	162	110	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
3) For fixing a rail of LE05CL, use cross-recessed pan head machine screw for precision instruments M2.5 × 0.45 (JCIS 10-70: Japan Camera Industry Association, No.0, class 3).



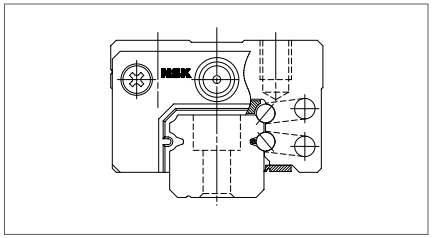


Fig. 1 LH Series

1. Features

(1) 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.

(2) 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 in vertical direction.

(3) 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.

(4) 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.

(5) High corrosion resistance

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

(6) 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. (LH10-12)

(7) Long-term maintenance-free

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

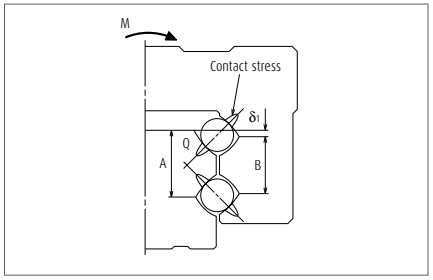


Fig. 2 Enlarged illustration of the offset Gothic arch groove

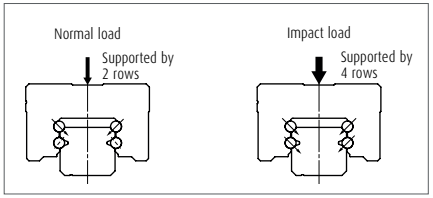


Fig. 3 When load is applied

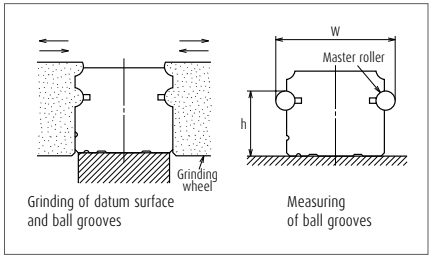
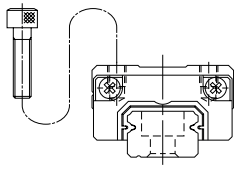
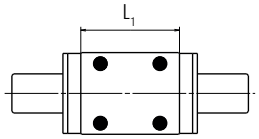


Fig. 4 Rail grinding and measuring

2. Ball slide shape

Ball slide Model	Shape/installation method	Type
AN		AN 

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 Super precision P4	High precision P5	Precision grade P6	Normal grade PN
–	50	2	2	4.5	6
50	80	2	3	5	6
80	125	2	3.5	5.5	6.5
125	200	2	4	6	7
200	250	2.5	5	7	8
250	315	2.5	5	8	9
315	400	3	6	9	11
400	500	3	6	10	12
500	630	3.5	7	12	14
630	800	4.5	8	14	16

(2) Accuracy standard

The preloaded assembly has four accuracy grades; Super precision P4, High precision P5, Precision P6 and Normal PN grades.

› **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 3	±20 5	±40 7	±80 15
Mounting width W_2 or W_3 Variation of W_2 or W_3 (All ball slides on reference rail)	±10 5	±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**, **Fig. 5**			

(3) Combinations of accuracy and preload

Table 3

		Accuracy grade			
		Super precision	High precision	Precision grade	Normal grade
Without NSK K1 lubrication unit		P4	P5	P6	PN
With NSK K1 lubrication unit		K4	K5	K6	KN
With NSK K1 for food and medical equipment		F4	F5	F6	FN
Preload	Fine clearance Z0	○	○	○	○
	Slight preload Z1	○	○	○	○

(4) Assembled accuracy

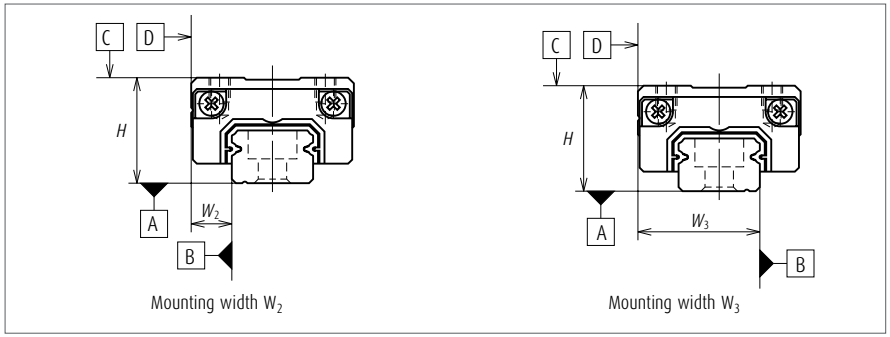


Fig. 5

(5) Preload and rigidity

We offer two levels of preload: Slight preload Z1 and Fine clearance Z0.

› **Preload and rigidity of preloaded assembly**

Table 4

Model No.	Preload (N)	Rigidity (N/μm)	
		Vertical direction	Lateral direction
	Slight preload Z1	Slight preload Z1	Slight preload Z1
LH08AN	5	33	23
LH10AN	9	44	31
LH12AN	22	68	47

Note Clearance for Fine clearance Z0 is 0 to 3μm. Therefore, preload is zero. However, Z0 of PN grade is 0 to 5μm.

4. Maximum rail length

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

Table 5 Length limitation of rails

Unit: mm

Series	Size / Material	08	10	12
LH	Stainless steel	375	600	800

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

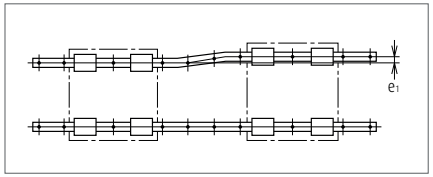


Fig. 6

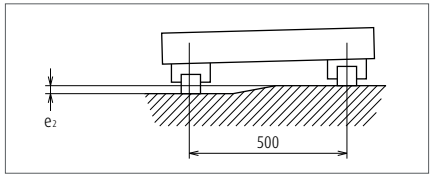


Fig. 7

Table 6

Unit: μm

Value	Preload	Model No.		
		LH08	LH10	LH12
Permissible values of parallelism in two rails e_1	Z0	9	12	19
	Z1	8	11	18
Permissible values of parallelism (height) in two rails e_2	Z0	375 μm/500 mm		
	Z1	330 μm/500 mm		

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

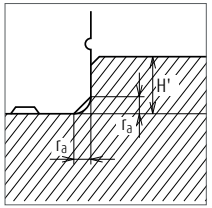


Fig. 8 Shoulder for the rail datum surface

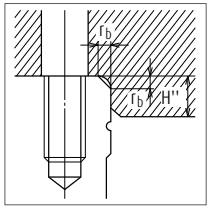


Fig. 9 Shoulder for the ball slide datum surface

Table 7

Unit: mm

Model No.	Corner radius (maximum)		Shoulder height	
	r_a	r_b	H'	H"
LH08	0.3	0.5	1.8	3
LH10	0.3	0.5	2.1	4
LH12	0.3	0.5	2.7	4

6. Lubrication accessory

Model of LH12 can select drive-in type grease fitting as an option.
For the models of LH08 to LH10, apply grease directly to the ball grooves of rail using a point nozzle.

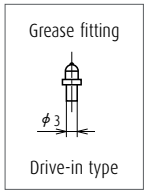


Fig. 10

7. Dust-proof components

(1) Standard specification

The LH 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.
However, the bottom seals are not used to LH08 and 10.

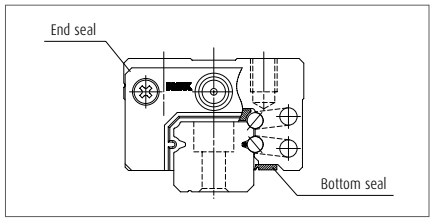


Fig. 11

Table 8 Seal friction per ball slide (maximum value)

Unit: N

Series \ Size	08	10	12
LE	0.5	1	1.5

(2) NSK K1 lubrication unit

Table 9 shows the dimension of linear guides equipped with the NSK K1 lubrication unit

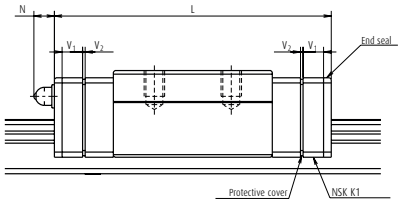


Table 9

Unit: N

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
LH08	Standard	AN	24	31	3	0.5	—
LH10	Standard	AN	31	40	4	0.5	—
LH12	Standard	AN	45	54	4	0.5	(4)

Notes 1) NSK K1 for food and medical equipment are available for LH12.
2) 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)

(3) Cap to plug the rail mounting bolt hole

Table 10 Caps to plug rail bolt hole

Model No.	Bolt to secure rail	Cap reference No.	Quantity /case
LH12	M3	LG-CAP/M3	20

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

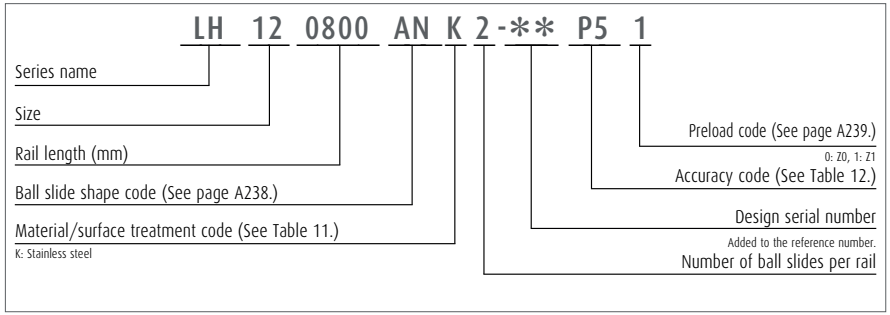


Table 11 Material/surface treatment code

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

Note Refer to pages A38 and A61 for NSK K1 lubrication unit.

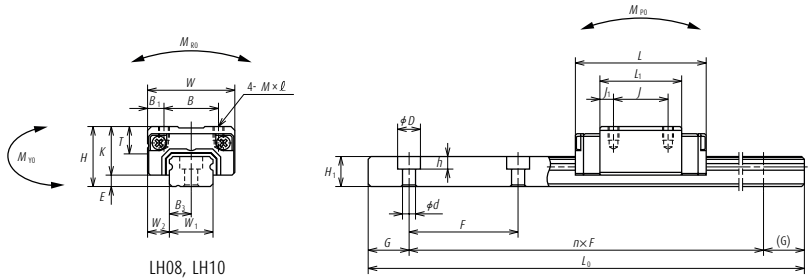
9. Dimensions

LH 12 0800 AN K 2 -** P5 1

- Series name
- Size
- Rail length (mm)
- Ball slide shape code (See page A238.)
- 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 page A239.)
  0: Z0, 1: Z1, T: ZT

Front view

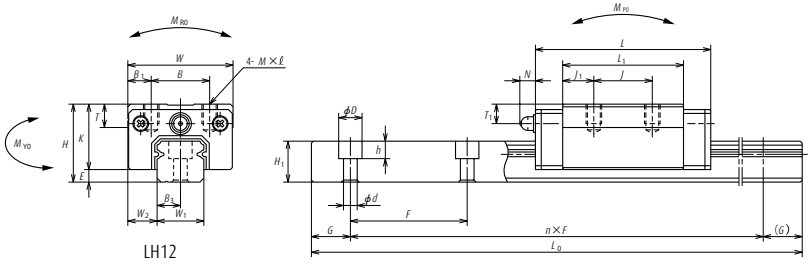
Side view



LH08, LH10

Front view

Side view



LH12

Unit: mm

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
LH08AN	11	2.1	4	16	24	10	10	M2×0.4×2.5	15	8.9	—	—	—	—		8	5.5
LH10AN	13	2.4	5	20	31	13	12	M2.6×0.45×3	20.2	10.6	6	—	—	—		10	6.5
LH12AN	20	3.2	7.5	27	45	15	15	M4×0.7×5	31	16.8	6	φ 3	5	4		12	10.5

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/100 mm)
20	2.4×4.2×2.3	7.5	375	1 240	985	2 630	7.25	4.55	32.5	3.8	27.2	13	31
25	3.5×6×3.5	10	600	2 250	1 790	4 500	16.2	10.5	73.0	8.8	61.0	26	44
40	3.5×6×4.5	15	800	5 650	4 500	11 300	47.5	41.5	254	35	214	82	88

Notes 1) LH08 does not have a ball retainer. Be aware that balls fall out when the ball slide is withdrawn from the rail.

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