

## A-5-3.2 PE Series (Miniature type)

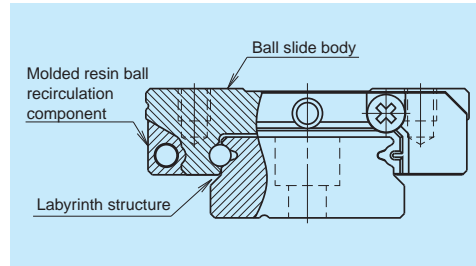


Fig. 1

## (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 LE 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 of the ball slide is designed to prevent dust generation.

## 5. Excellent dust-proofing

The labyrinth structure adopted for the side of the rails and the inner walls of the ball slide allows effects equivalent to a bottom seal.

## 6. High corrosion resistance

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

## 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

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

## 9. 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	
		Standard type	High-load type
AR, TR, UR, BR		AR, TR 	UR, BL 

## (3) Accuracy and preload

## 1. Runing parallelism tolerance

Table 1

Unit:  $\mu\text{m}$ 

Rail length (mm) over   or less	Preloaded assembly type (not random matching)				Random-matching type
	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 - 1000	5	9	16	18	18
1000 - 1250	6	10	17	20	20

### 2. Accuracy standard

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

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

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)		$\pm 10$ 5	$\pm 15$ 7	$\pm 20$ 15	$\pm 40$ 25
Mounting width $W_2$ or $W_3$ Variation of $W_2$ or $W_3$ (All ball slides on reference rail)		$\pm 15$ 7	$\pm 20$ 10	$\pm 30$ 20	$\pm 50$ 30
Running parallelism of face C to face A Running parallelism of face D to face B		Shown in Table 1 and Fig. 2			

• Tolerance of random-matching type: Normal grade PC

Characteristics	Accuracy grade	Normal grade PC
Mounting height $H$ Variation of mounting height $H$		$\pm 20$ 15 <sup>①</sup> 30 <sup>②</sup>
Mounting width $W_2$ or $W_3$ Variation of mounting width $W_2$ or $W_3$		$\pm 20$ 20
Running parallelism of face C to face A Running parallelism of face D to face B		Shown in Table 1 and Fig. 2

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

### 3. Assembled accuracy

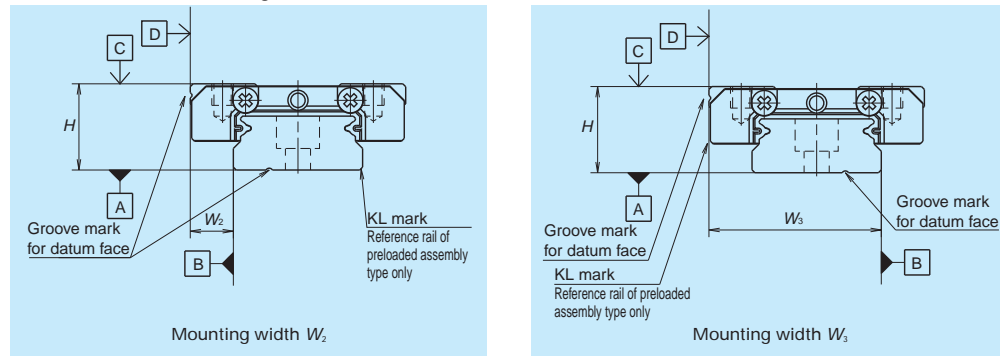


Fig. 2

### 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 Tables 4. Rigidities are for the median of the preload range.

Table 4 Preload and rigidity of preloaded assembly

Model No.	Preload (N)	Rigidity (N/ $\mu\text{m}$ )
	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  $\mu\text{m}$ . Therefore, preload is zero. However, Z0 of PN grade is 3 to 10  $\mu\text{m}$ . Clearance values of the random-matching types are shown in Tables 5.

• Clearance of random matching type

Model No.	Fine clearance ZT
PE09TR	3 or less
PE12AR	
PE15AR	

#### (4) Available length of rail

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

Table 6 Length limitations of rails

Series	Material	Size				
		05	07	09	12	15
PE	Stainless steel	150	600	800	1000	1200

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

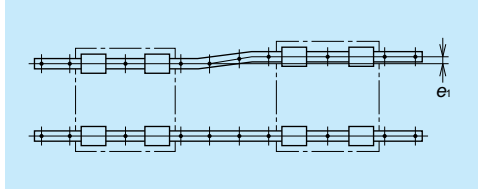


Fig. 3

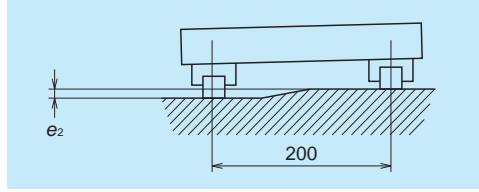


Fig. 4

Table 7

Unit:  $\mu\text{m}$

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 $\mu\text{m}/200\text{ mm}$				
	Z1	35 $\mu\text{m}/200\text{ mm}$				

2. Shoulder height of the mounting face and corner radius r

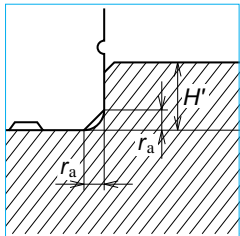


Fig. 5 Shoulder for the rail datum face

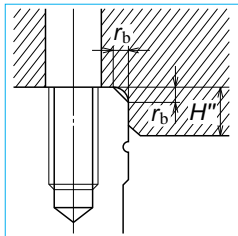


Fig. 6 Shoulder for the ball slide datum face

Table 8

Unit: mm

Model No.	Corner radius (maximum)		Shoulder height	
	$r_a$	$r_b$	$H'$	$H''^*$
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

PE15 can select drive-in type grease fitting as an option.

For 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.

Bottom seal function: A labyrinth structure of the ball slide bottom face functions as sealing effect.

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™

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

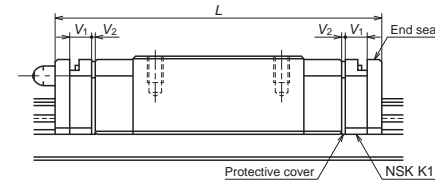


Table 10

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
	Long	UR	51.2	58.2		
PE12	Standard	AR	45	53	3.5	0.5
	Long	BR	60	68		
PE15	Standard	AR	56.6	66.2	4	0.8
	Long	BR	76	85.6		

Note: Ball slide length equipped with NSK K1 =

$$(\text{Standard ball slide length}) + (\text{Thickness of NSK K1, } V_1 \times \text{Number of NSK K1}) +$$

$$(\text{Thickness of the protective cover } V_2 \times 2)$$

PE Series

(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

**PE 15 0470 ARK 2 -\*\* P5 1**

Series name	PE	Size	15	Rail length (mm)	0470	Material/surface treatment code (See Table 11)	ARK	Accuracy code (See Table 12)	2	Design serial number	-**	Preload code (See page A302)	P5	Number of ball slides per rail	1
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2. Reference number for random-matching type

**Ball slide**

**PAE 15 ARK -\*\*PCT**

Random-matching ball slide series code	PAE	Size	15	Ball slide shape code (See page A300)	ARK	Material/surface treatment code (See Table 11)	-**	Accuracy code : PC	P	Design serial number	C	Preload code	T
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PAE : PE Series random-matching ball slide  
T: Fine clearance (See page A302)  
PC: Normal grade is only available

**Rail**

**P1E15 0470 RKN -\*\* PC T**

Random-matching rail series code	P1E	Size	15	Rail length (mm)	0470	Rail shape code	RKN	Material/surface treatment code (See Table 11)	-**	Accuracy code : PC	P	Design serial number	C	Preload code	T
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P1E : PE Series random-matching rail  
R: PE09, 12. P: PE15  
T: Fine clearance (See page A302)  
PC: Normal grade is only available  
\*Butting rail specification  
N: Non-butting. L: Butting specification

\*Please consult with NSK for butting rail specification.

Reference number for assembly of random-matching ball slide and rail is the same as the coding of preloaded assembly. However, preload code is fine clearance "T" (Refer to page A302).

Table 11 Material/surface treatment code

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

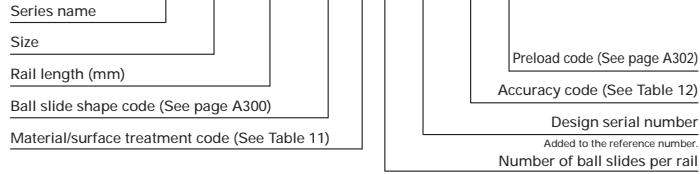
Table 12 Accuracy code

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

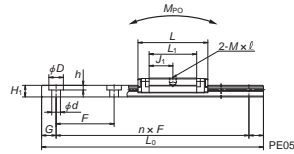
Note: Refer to Page A125 for NSK K1 lubrication unit.

(9) Dimensions

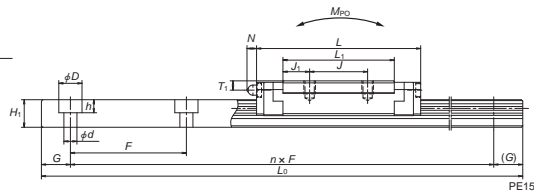
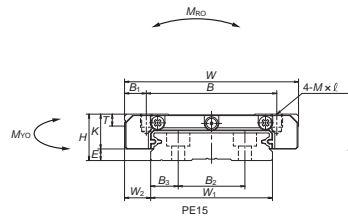
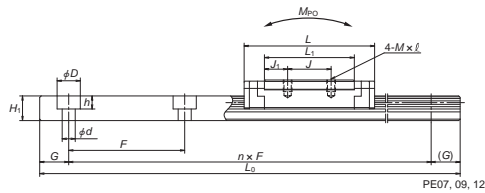
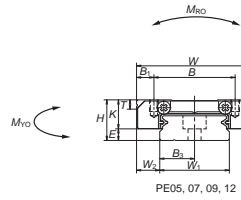
**PE 15 0470 ARK 2 -\*\* P5 1**



Side view



Front view

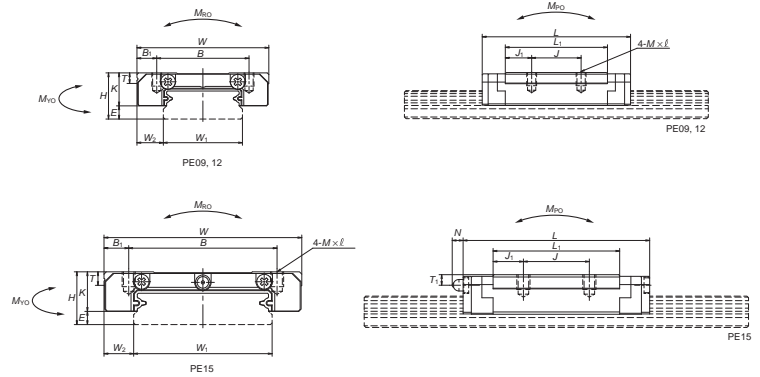
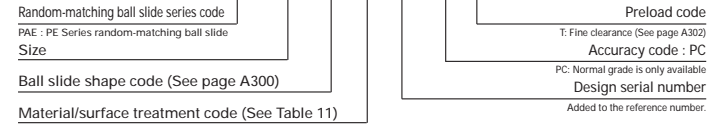


Model No.	Assembly				Ball slide											
	Height		Width	Length	Mounting hole							Grease fitting				
	H	E			B	J	MxPitchxℓ	B <sub>1</sub>	L <sub>1</sub>	J <sub>1</sub>	K	T	Hole size	T <sub>1</sub>	N	
PE05AR	6.5	1.4	3.5	17	24.1	13	—	M2.5x0.45x1.5	2	16.4	8.2	5.1	2.5	—	—	—
PE07TR	9	2	5.5	25	31.1	19	10	M3x0.5x2.8	3	20.8	5.4	7	3	—	—	—
PE09TR	12	4	6	30	39.8	21	12	M3x0.5x3	4.5	26.6	7.3	8	2.8	—	—	—
PE09UR	12	4	6	30	51.2	23	24	M3x0.5x3	3.5	38	7	8	2.8	—	—	—
PE12AR	14	4	8	40	45	28	15	M3x0.5x4	6	31	8	10	3.2	—	—	—
PE12BR	14	4	8	40	60	28	28	M3x0.5x4	6	46	9	10	3.2	—	—	—
PE15AR	16	4	9	60	56.6	45	20	M4x0.7x4.5	7.5	38.4	9.2	12	4.1	φ 3	3.2	(3.3)
PE15BR	16	4	9	60	76	45	35	M4x0.7x4.5	7.5	57.8	11.4	12	4.1	φ 3	3.2	(3.3)

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

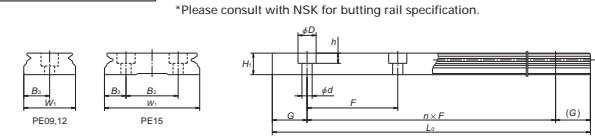
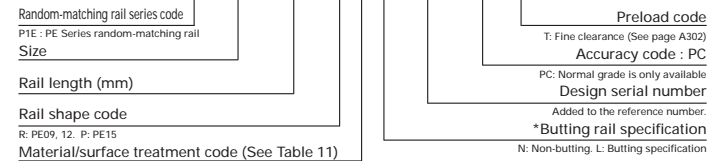
Reference number for ball slide of random-matching type

**PAE 15 ARK -\*\*PCT**



Reference number for rail of random-matching type

**P1E15 0470 RKN -\*\* PC T**



Rail													Basic load rating					Ball dia.	Weight	
Width	Height	Pitch	Mounting bolt hole	G	Maximum length	Dynamic	Static	Static moment			D <sub>w</sub>	Ball slide (g)	Rail (g/100mm)							
W <sub>1</sub>	H <sub>1</sub>	B <sub>2</sub>	F	dxDxh	B <sub>3</sub>	C (N)	C <sub>0</sub> (N)	M <sub>RO</sub> (N·m)	M <sub>PO</sub> (N·m)	M <sub>YO</sub> (N·m)										
10	4	—	20	3x5x1.6	5	690	1 160	6.00	2.75	2.75	1	7	34							
14	5.2	—	30	3.5x6x3.2	7	1 580	2 350	16.7	7.20	7.20	1.5875	19	55							
18	7.5	—	30	3.5x6x4.5	9	3 000	4 500	36.5	17.3	17.3	2.000	35	95							
24	8.5	—	40	4.5x8x4.5	12	4 000	6 700	54.5	37.5	37.5	2.000	50	95							
24	8.5	—	40	4.5x8x4.5	12	4 350	6 350	70.5	29.3	29.3	2.3812	66	140							
42	9.5	23	40	4.5x8x4.5	9.5	5 800	9 550	106	63.5	63.5	2.3812	98	140							
42	9.5	23	40	4.5x8x4.5	9.5	7 600	10 400	207	59.0	59.0	3.175	140	275							
						10 300	16 000	320	135	135		211								

2) The basic dynamic load rating is a load that furnishes 50 km rating fatigue life; it is a vertical and constant load to the ball slide mounting surface.  
 When converting the basic dynamic load rating C to the dynamic load rating C<sub>100</sub> for 100 km rating fatigue life, divide the C by 1.26.  
 3) To fix rail of PE05AR, use M2.5 x 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.)