

A-5-3.1 PU Series (Miniature type)

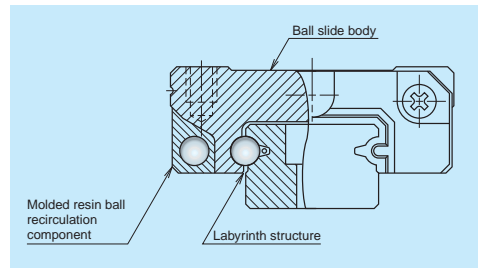
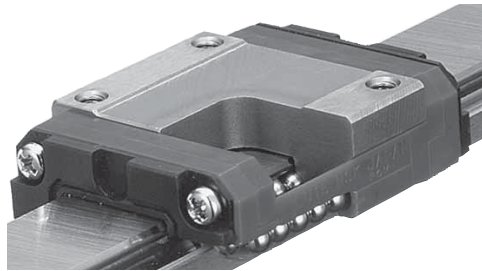


Fig. 1

(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 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. (PU09 to PU15)

(2) Ball slide shape

Ball slide Model	Shape/installation method	Type	
		Standard type	High-load type
AR TR AL UR BL		TR, AR, AL 	UR, BL

(3) Accuracy and preload

1. Runing parallelism tolerance

Table 1

Unit: μm

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 grade P6, and normal grade PN, while the random-matching type has a normal grade PC.

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 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

Table 3 Unit: μm

Characteristics	Accuracy grade	Normal grade PC
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 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

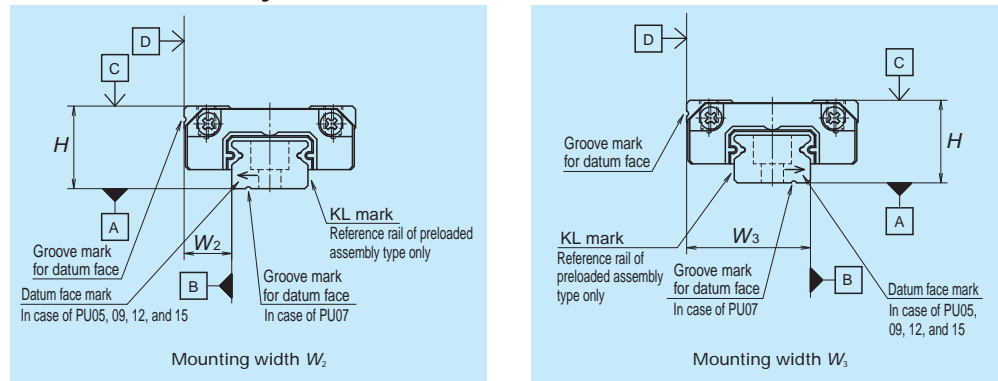


Fig. 2

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

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

• Preload and rigidity of preloaded assembly

Table 4

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

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

Clearance values of the random-matching type are shown in Tables 5.

• Clearance of random-matching type

Table 5 Unit: μm

Model No.	Fine clearance ZT
PU09TR	3 or less
PU12TR	
PU15AL	

(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 Unit: mm

Series	Material	Size				
		05	07	09	12	15
PU	Stainless steel	210	375	600	800	1000

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

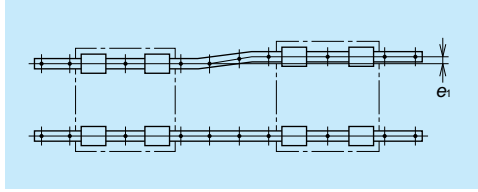


Fig. 3

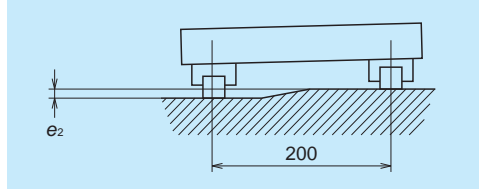


Fig. 4

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 $\mu\text{m}/200\text{ mm}$				
	Z1	90 $\mu\text{m}/200\text{ mm}$				

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

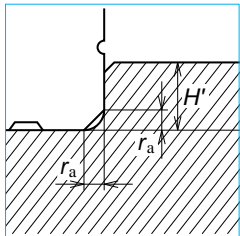


Fig. 5 Shoulder for the rail datum face

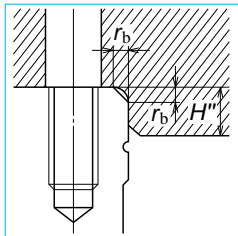


Fig. 6 Shoulder for the ball slide datum face

Table 8

Unit: mm

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

PU15 can select drive-in type grease fitting as an option.

For 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

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
PU		0.3	0.3	0.5	0.5	0.5

2. NSK K1™

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

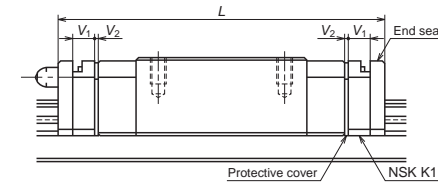


Table 10

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
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
	Long	UR	41	47.4		
PU12	Standard	TR	35	42	3	0.5
	Long	UR	48.7	55.7		
PU15	Standard	AL	43	51.2	3.5	0.6
	Long	BL	61	69.2		

Note: Ball slide length equipped with NSK K1 =

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

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

PU 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

PU 15 0470 AL K 2 - P5 1**

Series name	PU	Size	15	Rail length (mm)	0470	Ball slide shape code (See page A290)	AL	Material/surface treatment code (See Table 11)	K	Accuracy code (See Table 12)	2	Design serial number	-**	Preload code (See page A292)	P5	Number of ball slides per rail	1
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2. Reference number for random-matching type

Ball slide

PAU 15 AL K -PCT**

Random-matching ball slide series code PAU : PU Series random-matching ball slide	PAU	Size	15	Ball slide shape code (See page A290)	AL	Material/surface treatment code (See Table 11)	K	Accuracy code : PC	-**	Design serial number	PCT	Preload code	T: Fine clearance (See page A292)
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PC: Normal grade is only available

Rail

P1U15 0470 RKN - PC T**

Random-matching rail series code P1U : PU Series random-matching rail	P1U	Size	15	Rail length (mm)	0470	Rail shape code S: PU09, 12. R: PU15	R	Material/surface treatment code (See Table 11)	K	Accuracy code : PC	-**	Design serial number	PC	Preload code	T: Fine clearance (See page A292)
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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 A292).

Table 11 Material/surface treatment code

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

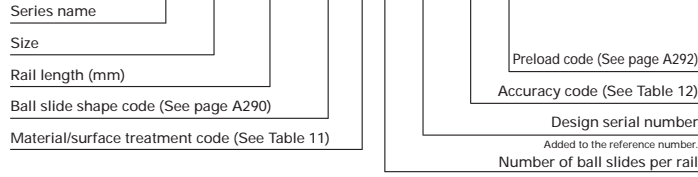
Table 12 Accuracy code

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

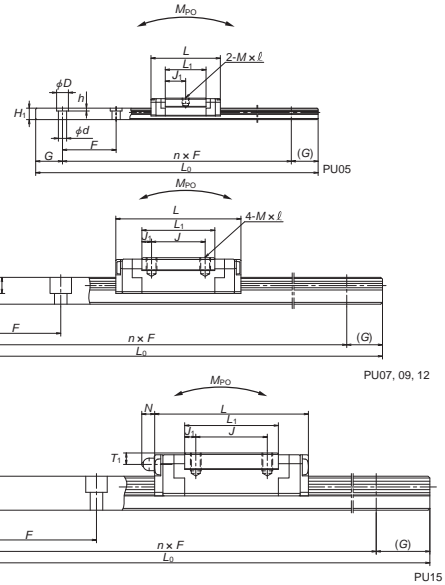
Note: Refer to Page A38 and A61 for NSK K1 lubrication unit.

(9) Dimensions

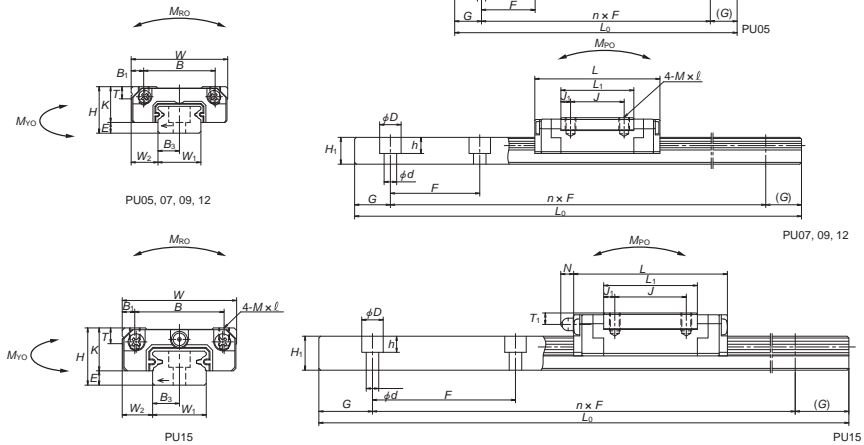
PU 15 0470 AL K 2 - P5 1**



Side view



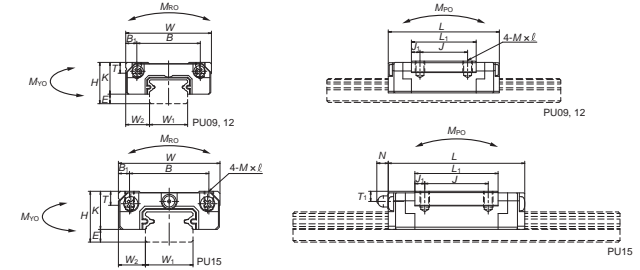
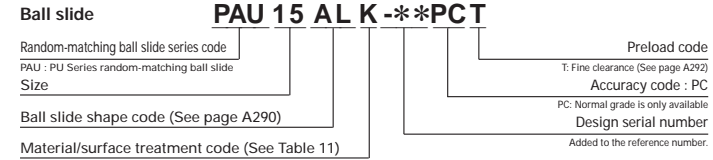
Front view



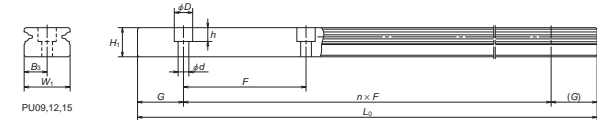
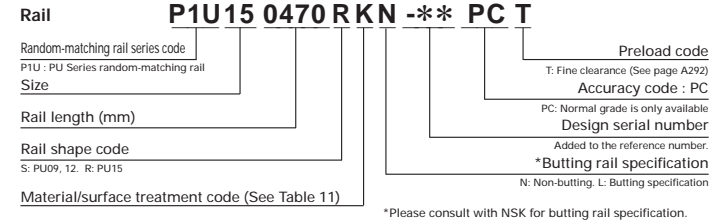
Model No.	Assembly				Ball slide											
	Height	E	W ₂	W	Length	Mounting hole							Grease fitting			
						B	J	MxPitchxℓ	B ₁	L ₁	J ₁	K	T	Hole size	T ₁	N
PU05TR	6	1	3.5	12	19.4	8	—	M2x0.4x1.5	2	11.4	5.7	5	2.3	—	—	—
PU07AR	8	1.5	5	17	23.4	12	8	M2x0.4x2.4	2.5	13.3	2.65	6.5	2.45	—	—	—
PU09TR	10	2.2	5.5	20	30	15	10	M3x0.5x3	2.5	19.6	4.8	7.8	2.6	—	—	—
PU09UR					41		16			30.6	7.3					
PU12TR	13	3	7.5	27	35	20	15	M3x0.5x3.5	3.5	20.4	2.7	10	3.4	—	—	—
PU12UR					48.7					20	34.1					
PU15AL	16	4	8.5	32	43	25	20	M3x0.5x5	3.5	26.2	3.1	12	4.4	φ 3	3.2	(3.6)
PU15BL					61					25	44.2					

Remarks: 1) 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



Rail								Basic load rating					Ball dia.	Weight	
Width	Height	Pitch	Mounting bolt hole	B ₃	G	Maximum length	Dynamic	Static	Static moment			D _w	Ball slide (g)	Rail (g/100mm)	
W ₁	H ₁	F	d x D x h	B ₃	(Reference)	L _{0max}	C (N)	C ₀ (N)	M _{RO} (N·m)	M _{PO} (N·m)	M _{YO} (N·m)				
5	3.2	15	2.3x3.3x0.8	2.5	5	210	520	775	2.06	1.28	1.28	1	4	11	
7	4.7	15	2.4x4.2x2.3	3.5	5	375	1 090	1 370	5.20	2.70	2.70	1.5875	8	23	
9	5.5	20	3.5x6x4.5	4.5	7.5	600	1 490	2 150	9.90	6.10	6.10	1.5875	16	35	
							2100	3 500	16.2	15.6	15.6		25		
12	7.5	25	3.5x6x4.5	6	10	800	2 830	3 500	21.1	11.4	11.4	2.3812	32	65	
							4 000	5 700	34.5	28.3	28.3		53		
15	9.5	40	3.5x6x4.5	7.5	15	1 000	5 550	6 600	49.5	25.6	25.6	3.175	59	105	
							8 100	11 300	84.5	69.5	69.5		100		

- 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 C₁₀₀ for 100 km rating fatigue life, divide the C by 1.26.
- To fix rail of PU05TR, use M2 x 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.)