

A-5-3.3 LU Series (Miniature type)

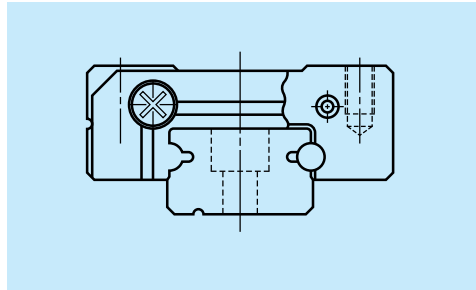


Fig. 1 LU Series

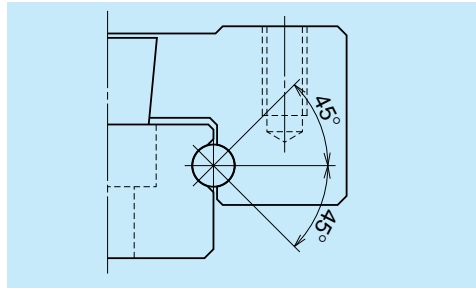


Fig. 2 Balls are in contact.

(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

Contact angle is set at 45 degrees, equally 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 Balls are retained in the retainer and do not fall out when the bearing is withdrawn from the rail. (Ball slides of random-matching parts as well as LU15 come with ball retainer.)

5. Fast delivery

The series enables random matching of rails and ball slides for prompt delivery. (LU09 to LU15)

(2) Ball slide shape

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

(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 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**

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		Refer to Table 1 and Fig. 3			

• **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		40
Mounting width W_2 or W_3		± 20
Variation of mounting width W_2 or W_3		40
Running parallelism of face C to face A Running parallelism of face D to face B		Refer to Table 1 and Fig. 3

3. Assembled accuracy

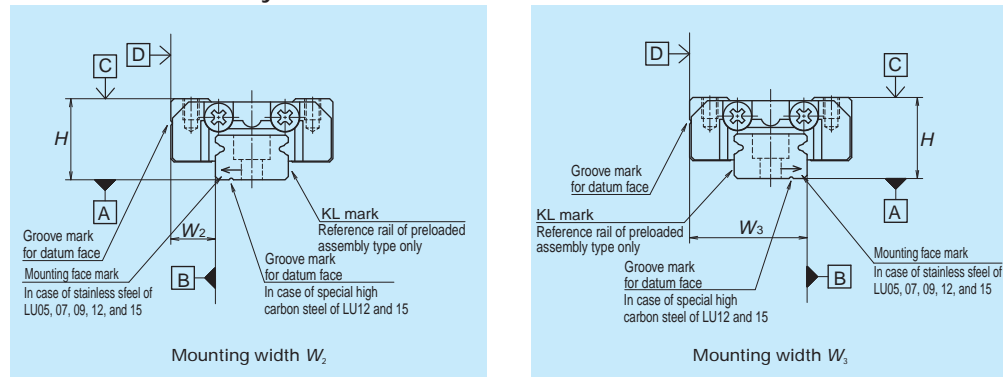


Fig. 3

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 preloaded 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, Z0 of PN grade is 3 to 10 μm .

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

• **Clearance of random-matching type**

Table 5 Unit: μm

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

(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 limitation of rails

Unit: mm

Series	Size					
	Material	05	07	09	12	15
LU	Special high carbon steel	-	-	1200	1800	2000
	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

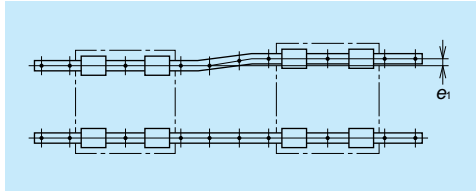


Fig. 4

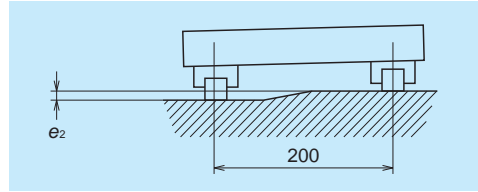


Fig. 5

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

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

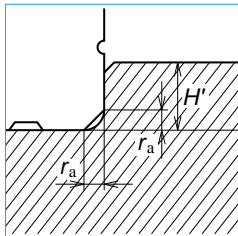


Fig. 6 Shoulder for the rail datum face

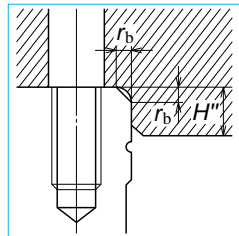


Fig. 7 Shoulder for the ball slide datum face

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 LU Series, apply grease directly to ball groove, etc. 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 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™

Dimension of installing NSK K1 shown in Table 10.

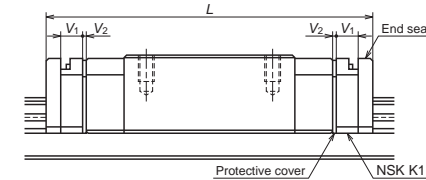


Table 10

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
	Standard	AL, TL	26.8*	34.2		
LU12	Long	BL, UL	41	47.4	3.0	0.5
	Standard	AR	35.2	42.2		
LU15	Standard	AL, TL	34	41	3.5	0.6
	Long	BL, UL	47.5	54.5		
LU15	Standard	AL	43.6	51.8	3.5	0.6
	Long	BL	61	69.2		

*) Standard ball slide length of LU05TL, LU07AL, LU09AL and LU09TL does not include thickness of the end seal thickness (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 =

$$(\text{Standard ball slide length}) + (\text{Thickness of NSK K1, } V_1 \times \text{Number of NSK K1}) + (\text{Thickness of the protective cover } V_2 \times 2)$$

(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

LU 12 0270 ARK 2 - P5 1**

Series name						
Size						Preload code (See page A312)
Rail length (mm)						Accuracy code (See Table 12)
Ball slide shape code (See page A310)						Design serial number
Material/surface treatment code (See Table 11)						Added to the reference number.
						Number of ball slides per rail

2. Reference number for random-matching type

LAU 12 ARK -PCT**

Ball slide						
Random-matching ball slide series code						Preload code
LAU : LU Series random-matching ball slide						T: Fine clearance (See page A312)
Size						Accuracy code : PC
Ball slide shape code (See page A310)						PC: Normal grade is only available
Material/surface treatment code (See Table 11)						Design serial number
						Added to the reference number.

Rail
L1U12 0270 RKN - PC T**

Random-matching rail series code						
L1U : LU Series random-matching rail						Preload code
Size						T: Fine clearance (See page A312)
Rail length (mm)						Accuracy code : PC
Rail shape code						PC: Normal grade is only available
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						Design serial number
Material/surface treatment code (See Table 11)						Added to the reference number.
						*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 A312).

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

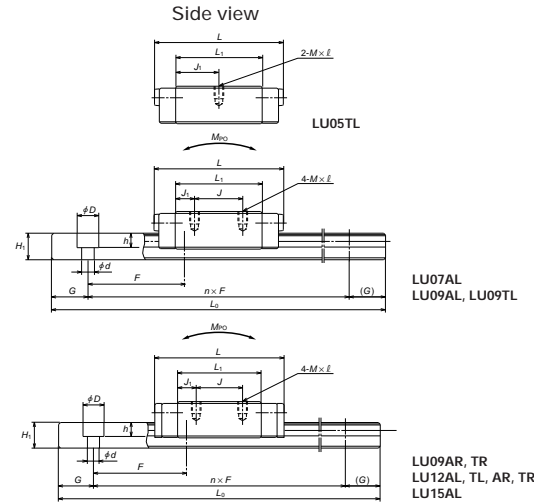
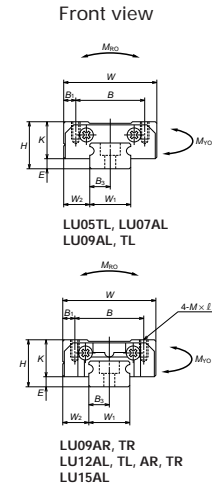
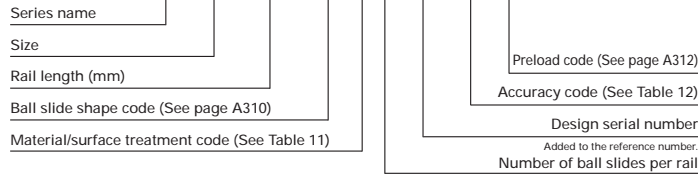
Accuracy	Standard (Without NSK K1)	With NSK K1
Super precision grade	P4	K4
High precision grade	P5	K5
Precision grade	P6	K6
Normal grade	PN	KN
Normal grade (random-matching type)	PC	KC

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

(9) Dimensions

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

LU 12 0270 AR K 2 - P5 1**



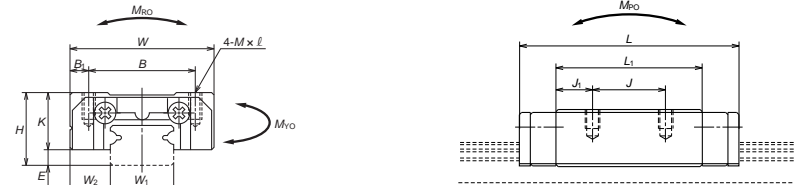
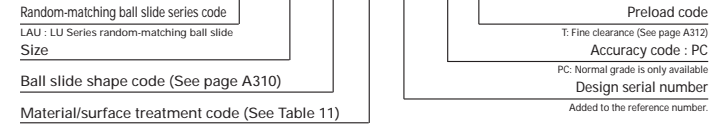
Model No.	Assembly			Ball slide												
	Height H	E	W ₂	Width W	Length L	Mounting hole					B ₁	L ₁	J ₁	K	W ₁	Height H ₁
						B	J	Mxpitchxℓ	B ₁	L ₁						
LU05TL	6	1	3.5	12	18	8	—	M2×0.4×1.5	2	12	6	5	5	3.2		
LU07AL	8	1.5	5	17	20.4	12	8	M2×0.4×2.4	2.5	13.6	2.8	6.5	7	4.7		
LU09AL LU09TL	10	2.2	5.5	20	26.8	15	13	M2×0.4×2.5 M3×0.5×3	2.5	18	2.5 4	7.8	9	5.5		
LU09AR LU09TR	10	2.2	5.5	20	30	15	13	M2×0.4×2.5 M3×0.5×3	2.5	20	3.5 5	7.8	9	5.5		
LU12AL LU12TL	13	3	7.5	27	34	20	15	M2.5×0.45×3 M3×0.5×3.5	3.5	21.8	3.4	10	12	7.5		
LU12AR LU12TR	13	3	7.5	27	35.2	20	15	M2.5×0.45×3 M3×0.5×3.5	3.5	21.8	3.4	10	12	7.5		
LU15AL	16	4	8.5	32	43.6	25	20	M3×0.5×4	3.5	27	3.5	12	15	9.5		

Remarks 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.

Random matching with retainer: LU09 - 12 are AR/TR, LU15 is AL.
 Reference number for ball slide of random-matching type

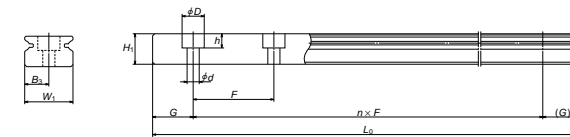
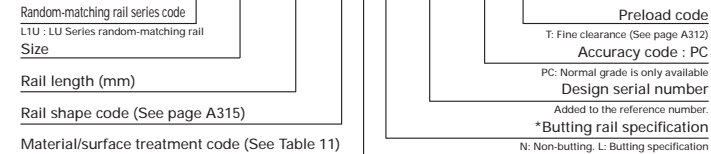
LAU-AR (With ball retainer)
 LAU-TR (Large mounting hole, with ball retainer)
 LAU-AL (LU15 is equipped with ball retainer)

LAU 12 AR K -PCT**



Reference number for rail of random-matching type

L1U12 0270 RKN - PC T**



*Please consult with NSK for butting rail specification.

Rail					Basic load rating					Ball dia.		Weight	
Pitch F	Mounting bolt hole d×D×h	B ₃	G (Reference)	Max. length L _{ORMAX} () for stainless	Dynamic C (N)	Static C ₀ (N)	Static moment			D _w	Ball slide (g)	Rail (g/100mm)	
							M _{RO} (N·m)	M _{PO} (N·m)	M _{VO} (N·m)				
15	2.3×3.3×1.5	2.5	5	— (210)	545	740	1.93	1.22	1.22	1.2	4	11	
15	2.4×4.2×2.3	3.5	5	— (375)	1090	1370	4.90	2.66	2.66	1.587	10	23	
20	2.6×4.5×3 3.5×6×4.5	4.5	7.5	1200 (600)	1760	2220	10.2	6.10	6.10	2	17	35	
20	2.6×4.5×3 3.5×6×4.5	4.5	7.5	— (600)	1490	2150	9.9	6.10	6.10	1.587	19	35	
25	3×5.5×3.5 3.5×6×4.5	6	10	1800 (800)	2830	3500	21.1	11.4	11.4	2.381	38	65	
25	3×5.5×3.5 3.5×6×4.5	6	10	— (800)	2830	3500	21.1	11.4	11.4	2.381	38	65	
40	3.5×6×4.5	7.5	15	2000 (1000)	5550	6600	49.5	25.6	25.6	3.175	70	105	

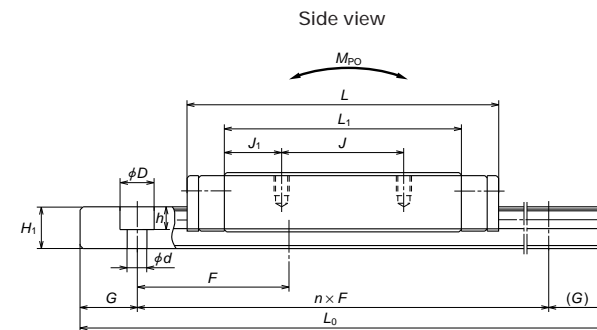
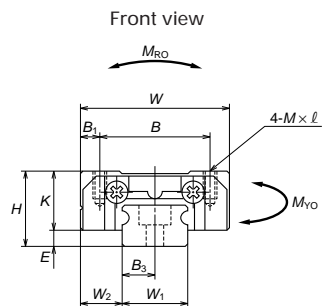
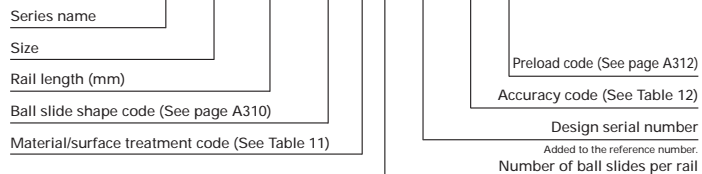
Unit: mm

4) To fix rail of LU05TL, use M2 x 0.4 cross-recessed pan head machine screw for precision instrument.
 (JCS 10-70 No. 0 pan head machine screw No.1.)
 (JCS : Japanese Camera Industrial Standard.)

5) 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.

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

LU 12 0270 BL K 2 - P5 1**



Model No.	Assembly			Ball slide								Width	Height	
	Height	E	W ₂	Width	Length	Mounting hole			B ₁	L ₁	J ₁			K
						B	J	M x pitch x l						
LU09BL	10	2.2	5.5	20	41	15	16	M2x0.4x2.5	2.5	31.2	7.6	7.8	9	5.5
LU09UL								M3x0.5x3						
LU12BL	13	3	7.5	27	47.5	20	20	M2.5x0.45x3	3.5	35.3	7.65	10	12	7.5
LU12UL								M3x0.5x3.5						
LU15BL	16	4	8.5	32	61	25	25	M3x0.5x4	3.5	44.4	9.7	12	15	9.5

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

Unit: mm

Pitch	Rail				Basic load rating					Ball dia.	Weight	
	Mounting bolt hole	B ₃	G	Max. length L _{GR} MAX. (°) for stainless	Dynamic C (N)	Static C ₀ (N)	Static moment				Ball slide (g)	Rail (g/100mm)
							M _{RO} (N·m)	M _{PO} (N·m)	M _{VO} (N·m)			
20	2.6x4.5x3 3.5x6x4.5	4.5	7.5	1200 (600)	2600	3900	17.9	17.2	17.2	2	29	35
25	3x5.5x3.5 3.5x6x4.5	6	10	1800 (800)	4000	5700	34.5	28.3	28.3	2.381	59	65
40	3.5x6x4.5	7.5	15	2000 (1000)	8100	11300	84.5	69.5	69.5	3.175	107	105

3) 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.