

## 8. LW-Series: Linear Wide Body Ball Guides

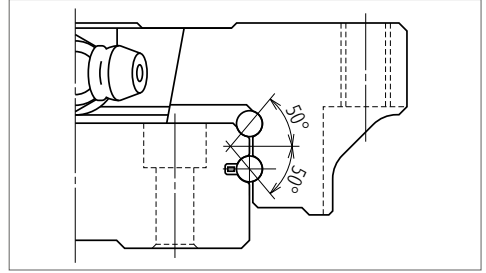
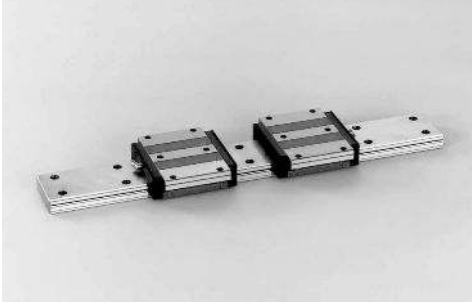


Fig. 1 Balls in contact

### 1. Features

#### (1) Ideal for use of single rail

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

#### (2) High load carrying capacity to vertical direction

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

#### (3) High resistance against impact load

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

### 2. Ball slide shape

#### (4) High accuracy

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

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

Balls are retained in the retainer and do not fall out when a ball slide is withdrawn from the rail.

#### (6) Fast delivery

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

Ball slide Model	Shape/installation method	Type
EL		

### 3. Accuracy and preload

#### (1) Running parallelism of ball slide

Table 1

Unit:  $\mu\text{m}$

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

#### (2) Accuracy standard

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

##### > Tolerance of preloaded assembly type

Table 2

Unit:  $\mu\text{m}$

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

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

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

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### (3) Combinations of accuracy and preload

Table 4

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

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

### (4) Assembled accuracy

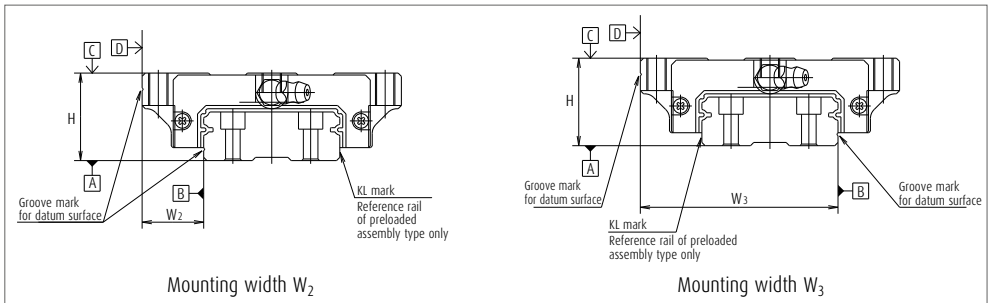


Fig. 2

### (5) Preload and rigidity

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

#### > Preload and rigidity of preloaded assembly

Table 5

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

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

## > Clearance and preload of random-matching type

**Table 6**

Unit:  $\mu\text{m}$

Model No.	Fine clearance Z1	Slight preload Z2
LW17	-3 - 15	-3.5 - 0
LW21	-3 - 15	-3.5 - 0
LW27	-4 - 15	-4 - 0
LW35	-5 - 15	-5 - 0
LW50	-5 - 15	-7 - 0

**Note** Minus sign denotes elastic deformation of balls representing.

## 5. Installation

### (1) Permissible values of mounting error

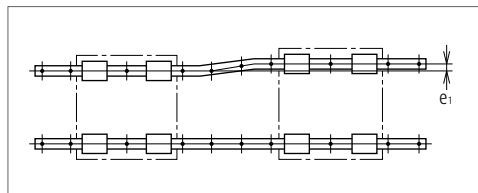


Fig. 3

## 4. Maximum rail length

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

**Table 7** Length limitations of rails

Unit: mm

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

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

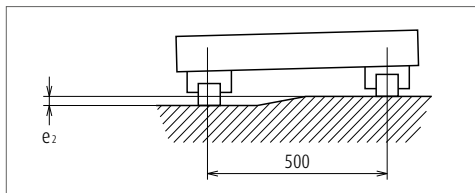


Fig. 4

**Table 8**

Unit:  $\mu\text{m}$

Value	Preload	Model No.				
		LW17	LW21	LW27	LW35	LW50
Permissible values of parallelism in two rails $e_1$	Z0, Z1	20	20	25	38	50
	Z1, Z2	9	9	13	23	34
Permissible values of parallelism (height) in two rails $e_2$	Z0, Z1	100 $\mu\text{m}/500$ mm				
	Z1, Z2	45 $\mu\text{m}/500$ mm				

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

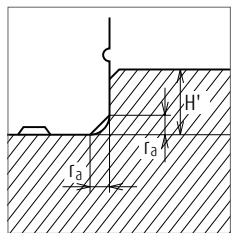


Fig. 5 Shoulder for the rail datum face

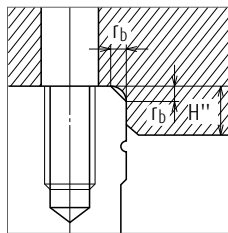


Fig. 6 Shoulder for the ball slide datum face

**Table 9**

Unit: mm

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

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### 7. Dust-proof components

#### (1) Standard specification

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

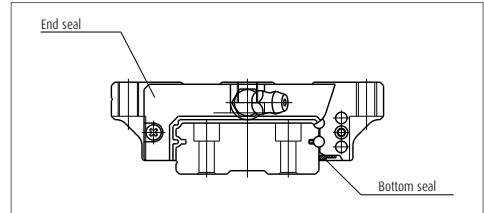


Fig. 13

Table 11 Seal friction per ball slide (maximum value)

Unit: N

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

#### (2) NSK K1 lubrication unit

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

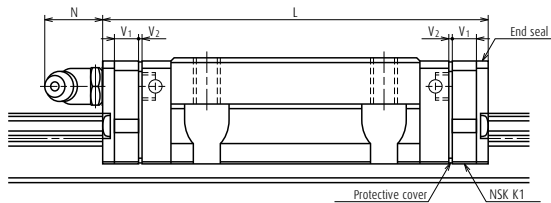


Table 12

Unit: mm

Model No.	Ball slide length	Ball slide model	Standard ball slide length	Ball slide length installed with two NSK K1	Per NSK K1 thickness	Protective cover thickness	Protruding area of the grease fitting
				L	V <sub>1</sub>	V <sub>2</sub>	N
LW17	Standard	EL	51.4	61.6	4.5	0.6	(5)
LW21	Standard	EL	58.8	71.4	5.5	0.8	(13)
LW27	Standard	EL	74	86.6	5.5	0.8	(13)
LW35	Standard	EL	108	123	6.5	1.0	(13)
LW50	Standard	EL	140.6	155.6	6.5	1.0	(14)

- Note**
- 1) NSK K1 for food and medical equipments are available for the models of LW17 to LW35.
  - 2) Ball slide length equipped with NSK K1 = (Standard ball slide length) + (Thickness of NSK K1, V<sub>1</sub> × Number of NSK K1) + (Thickness of the protective cover, V<sub>2</sub> × 2)

### (3) Double seal

Use a double seal set as showing in **Table 13**, when installing an extra seal to completed standard products. **(Fig. 10)**  
When installing a grease fitting after the installation of double seals, a connector as showing **Fig.10** is required.

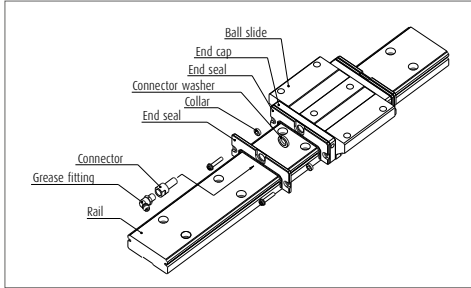


Fig. 10 Double seal

### (4) Protector

Use a protector set as showing **Table 14**, when installing a protector to completed standard products. **(Fig.11)**  
When installing a grease fitting after the installation of protectors, a connector as showing **Fig.11** is required.

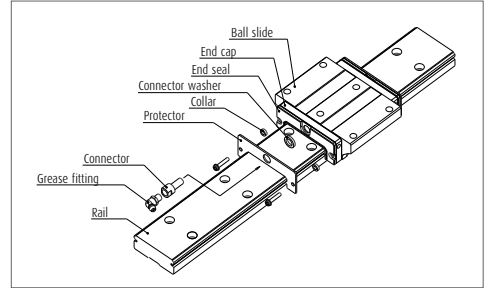


Fig. 11 Protector seal

**Table 13 Double-seal set**

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

**Table 14 Protector set**

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

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

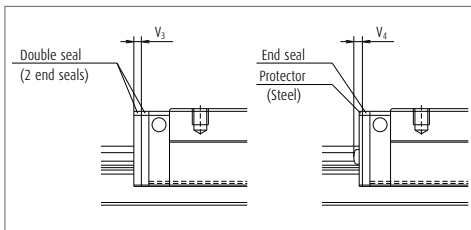


Fig. 12

### (5) Cap to plug the rail mounting bolt hole

**Table 15 Caps to plug rail bolt hole**

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

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### 8. Reference number

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

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

#### (1) Reference number for preloaded assembly

	<b>LW</b>	<b>35</b>	<b>1000</b>	<b>EL</b>	<b>C</b>	<b>2</b>	<b>-**</b>	<b>P6</b>	<b>1</b>	
Series name									Preload code (See Table 4)	
Size									0: Z0, 1: Z1, 3: Z3	
Rail length (mm)									Accuracy code (See Table 19)	
Ball slide shape code (See page 60)									Design serial number	
Material/surface treatment code (See Table 18)									Added to the reference number.	
C: Special high carbon steel (NSK standard)									Number of ball slides per rail	

#### (2) Reference number for random-matching type

<b>Ball slide</b>	<b>LAW</b>	<b>35</b>	<b>EL</b>	<b>Z</b>	<b>-K</b>	
Random-matching ball slide series code					Option code	
LAW: LW Series random-matching ball slide					-K: Equipped with NSK K1	
Size					-F: Fluoride low temperature chrome plating + AS2 grease	
Ball slide shape code (See page 60)					-F50: Fluoride low temperature chrome plating + LG2 grease	
					Preload code	
					No code: Fine clearance, Z: Slight preload	

<b>Rail</b>	<b>L1W</b>	<b>35</b>	<b>1000</b>	<b>L</b>	<b>C</b>	<b>N</b>	<b>-**</b>	<b>PC</b>	<b>Z</b>	
Random-matching rail series code									Preload code (See Table 4)	
L1W: LW Series random-matching rail									T: Fine clearance, Z: Slight preload	
Size									Accuracy code	
Rail length (mm)									PC: Normal grade is only available.	
Rail shape code: L									Design serial number	
L: Standard									Added to the reference number.	
Material/surface treatment code (See Table 18)									*Butting rail specification	
									N: Non-butting, L: Butting specification	
									*Please consult with NSK for butting rail specification.	

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

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

**Table 18 Material/surface treatment code**

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

**Table 19 Accuracy code**

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

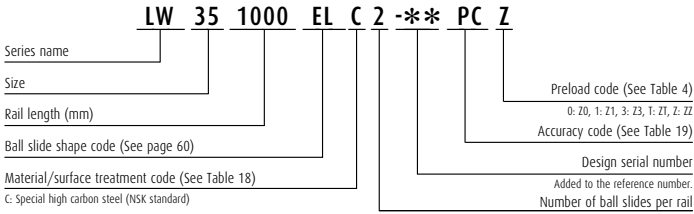
**Note** Refer to pages 454 to 459 for NSK K1 lubrication unit.



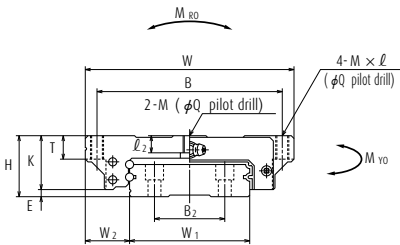
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## (9) Dimensions

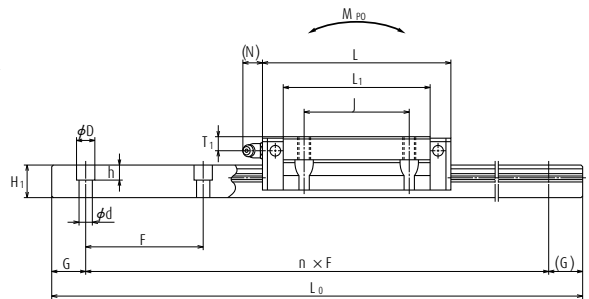
### LW-EL



Front view

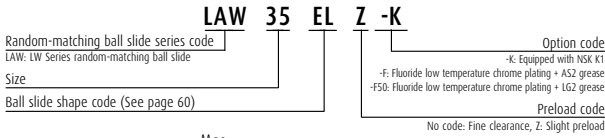


Side view

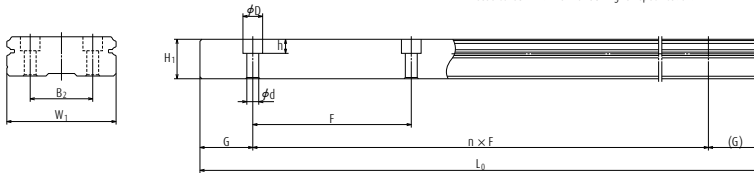
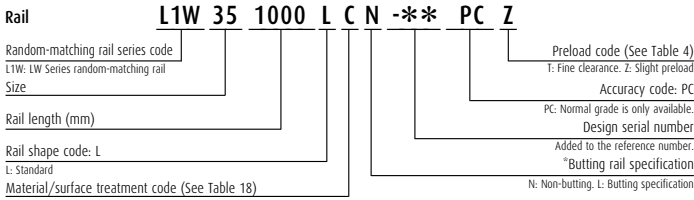


Model No.	Assembly			Ball slide													Width	Height		
	Height	E	W <sub>2</sub>	Width	Length	Mounting hole					L <sub>1</sub>	K	T	Grease fitting					W <sub>1</sub>	H <sub>1</sub>
						B	J	M × pitch × l	l <sub>2</sub>	Q				Hole size	T <sub>1</sub>	N				
LW17EL	17	2.5	13.5	60	51.4	53	26	M4×0.7×6	3.2	3.3	35	14.5	6	φ 3	4	3	33	8.7		
LW21EL	21	3	15.5	68	58.8	60	29	M5×0.8×8	3.7	4.4	41	18	8	M6×0.75	4.5	11	37	10.5		
LW27EL	27	4	19	80	74	70	40	M6×1×10	6	5.3	56	23	10	M6×0.75	6	11	42	15		
LW35EL	35	4	25.5	120	108	107	60	M8×1.25×14	9	6.8	84	31	14	M6×0.75	8	11	69	19		
LW50EL	50	4.5	36	162	140.6	144	80	M10×1.5×18	14	8.6	108	45.5	18	Rc1/8	14	14	90	24		

## Reference number for ball slide of random-matching type



## Reference number for rail of random-matching type



Unit: mm

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

### Note

The basic load rating comply with the ISO standard. (ISO 14728-1, 14728-2)

C<sub>50</sub>: the basic dynamic load rating for 50 km rated fatigue life C<sub>100</sub>: the basic dynamic load rating for 100 km rated fatigue life