

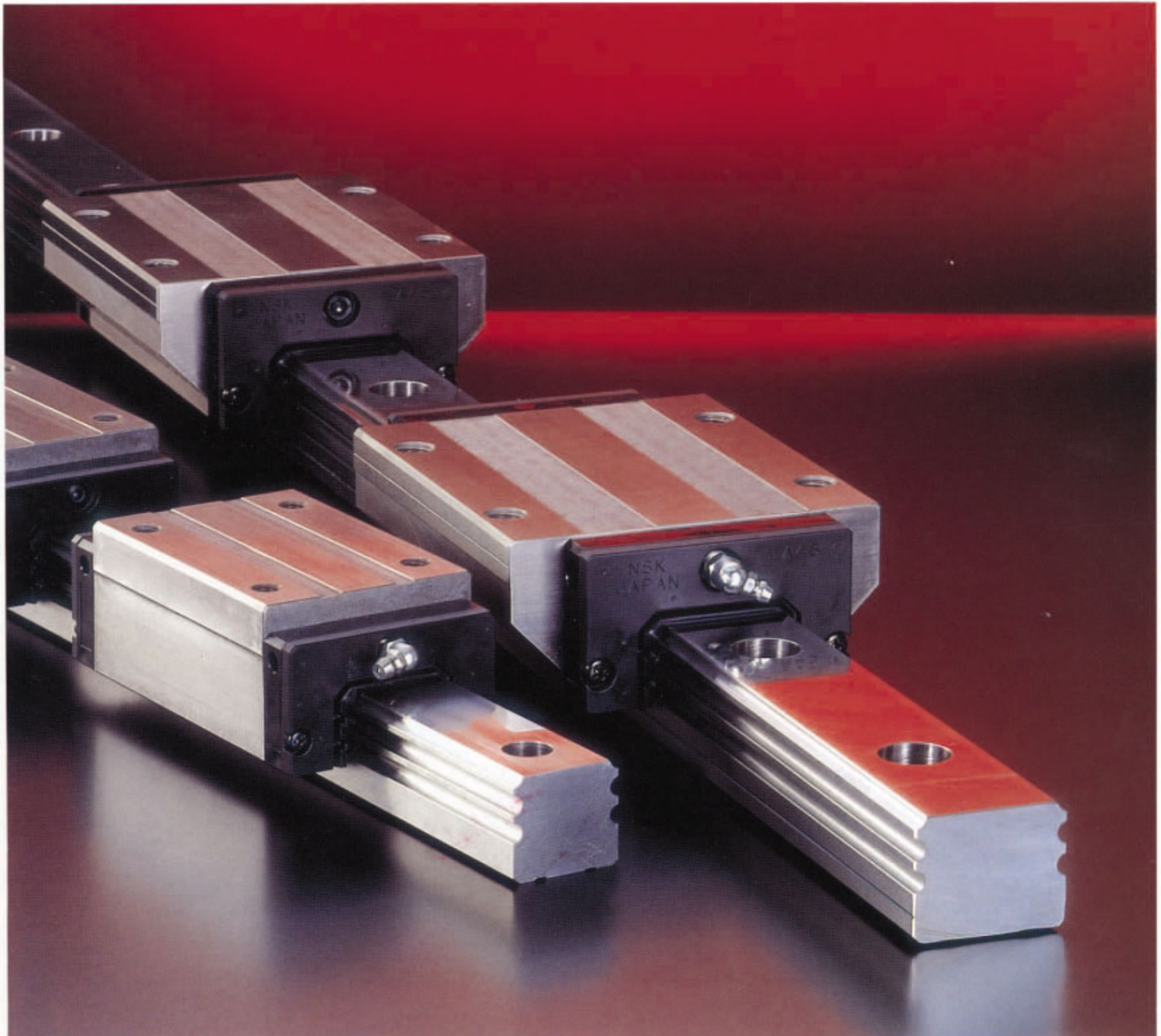
NSK Linear Guides[®]

LA Series

Powerful performance is achieved with three-line grooves. Ball guides can now provide super-high rigidity and high load capacity equivalent to that of roller guides.



Patent Pending



NSK Linear Guides[®] LA Series

Innovative ball guides, with the equivalent capabilities of roller guides, provide new support for machine tools and overcome various obstacles.

NSK is pleased to introduce the new LA Series linear guides to the machine tool industry.

The LA Series was developed with the innovative idea that ball guides can have the same high rigidity as roller guides. The three-line grooves of the LA Series solve conventional problems, which had been difficult to overcome with existing roller guides, such as the skew of rollers during high-speed reverse and stress concentration on rollers. With less friction and 1.5 times higher rigidity than that of the existing LY Series, LA Series linear guides have finally satisfied the demand for high-speed performance of machine tools. LA Series linear guides not only provide rigidity and high speed, but are also compact in size making them easier to incorporate into systems. The LA Series is highly recommended as the guide system for the machine tool industry.



1. Ball Groove Design and Features

NSK LA Series linear guides are designed with three-line grooves—circular arc grooves for upper and lower lines, and a gothic arc groove for the center line—on each side of the rail (Figure 1).

Features of the LA series include the following:

High load capacity and rigidity

Six grooves and a unique ball-groove curvature provide high load capacity and rigidity equivalent to that of a roller guide—and 1.5 times higher than that of the NSK LY Series.

Graphs for rigidity are shown in Figures 2-1 and 2-2.

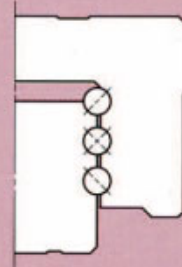


Figure 1 Super-high rigidity design (DB)

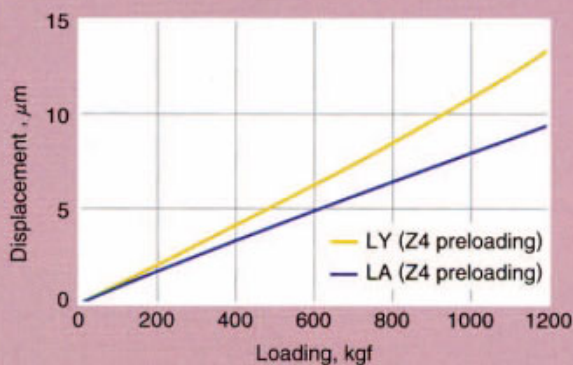


Figure 2-1 LA45AL (standard high load) rigidity

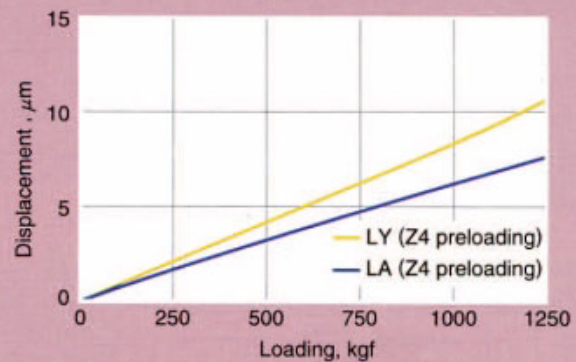


Figure 2-2 LA45BL (super-high load) rigidity

Moderate friction

The four contact points at the center gothic arc groove allow a setting of moderate friction.

High accuracy

As with other series, the three-line grooves on the sides of rails of the LA Series linear guide can be ground simultaneously with one grinding wheel (Figure 3).

The gothic arc grooves enable fast and accurate groove profile measurement thanks to their four contact points, making production of highly accurate rails possible.

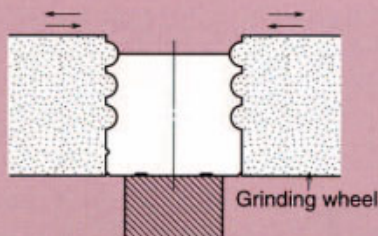


Figure 3 Grinding of rail

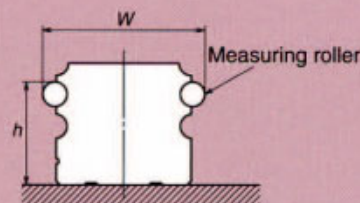


Figure 4 Measurement of groove accuracy

Four-directional iso-load

The LA Series, along with the LY Series, is defined by the setting of 45° for all contact angles, which results equal load capacity and high rigidity in all four directions (up, down, left, and right).

Dimensions interchangeable with existing series

The mounting dimensions and envelope of installation are equivalent to existing series (LY and LH Series).

5. Accuracy Standard

LA Series accuracy standards are classified into four grades: ultra precision P3, super precision P4, precision P5 and semi-precision P6.

Table 3 Accuracy standards

Accuracy grades		Ultra precision	Super precision	Precision	Semi-precision
		P3	P4	P5	P6
Mounting height H	(All slides on a pair of rails)	±10	±10	±20	±40
Variation in mounting height H		3	5	7	15
Mounting width W2 or W3	(All slides on datum rails)	±15	±15	±25	±50
Variation in mounting width W2 or W3		3	7	10	20
Running parallelism tolerances of face C to face A		Shown in Table 4, Fig. 8, and Fig. 9.			
Running parallelism tolerances of face D to face B					

Unit: μm

Table 4 Running parallelism tolerance

Unit: μm

Travel (mm)	Accuracy grade			
	P3	P4	P5	P6
~ 50	2	2	2	6
50 ~ 80	2	2	3	7
80 ~ 125	2	2	3.5	8
125 ~ 200	2	2	4	9
200 ~ 250	2	2.5	5	10
250 ~ 315	2	2.5	5	11
315 ~ 400	2	3	6	11
400 ~ 500	2	3	6	12
500 ~ 630	2	3.5	7	13
630 ~ 800	2	4.5	8	14
800 ~ 1000	2.5	5	9	16
1000 ~ 1250	3	6	10	17
1250 ~ 1600	4	7	11	19
1600 ~ 2000	4.5	8	13	21
2000 ~ 2500	5	10	15	22
2500 ~ 3150	6	11	17	25
3150 ~ 4000	9	16	23	30

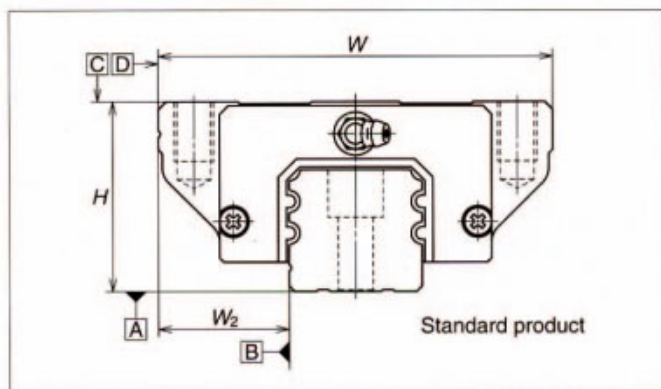


Figure 8 Accuracy-standard description (Standard product)

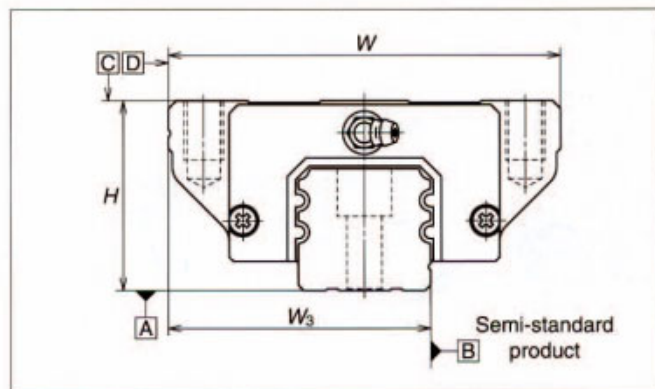


Figure 9 Accuracy-standard description (Semi-standard product)

6. Preload and Rigidity

LA Series super-high rigidity linear guides are available in two preload types, Z3 and Z4.

Table 5 Preload type and load

Unit: kgf

Series	Preload code		Heavy preload	Medium preload
	Model number		Z4	Z3
Heavy load type	LA25	AN, EL, FL	215	170
	LA30	AN, EL, FL	320	250
	LA35	AL, AN, EL, FL	440	350
	LA45	AL, AN, EL, FL	650	515
	LA55	AL, AN, EL, FL	1040	825
	LA65	AN, EL, FL	1920	1410
Ultra-heavy load capacity (long type)	LA25	BN, GL, HL	290	230
	LA30	BN, GL, HL	415	330
	LA35	BL, BN, GL, HL	575	455
	LA45	BL, BN, GL, HL	790	630
	LA55	BL, BN, GL, HL	1230	975
	LA65	BN, GL, HL	2490	1840

Table 6 Preload type and rigidity

Unit: kgf/ μm

Series	Preload code		Heavy preload	Medium preload
	Model number		Z4	Z3
Heavy load type	LA25	AN, EL, FL	66	57
	LA30	AN, EL, FL	85	72
	LA35	AL, AN, EL, FL	99	84
	LA45	AL, AN, EL, FL	126	112
	LA55	AL, AN, EL, FL	157	143
	LA65	AN, EL, FL	207	176
Ultra-heavy load capacity (long type)	LA25	BN, GL, HL	99	85
	LA30	BN, GL, HL	120	102
	LA35	BL, BN, GL, HL	143	122
	LA45	BL, BN, GL, HL	167	148
	LA55	BL, BN, GL, HL	206	188
	LA65	BN, GL, HL	290	250

NSK Linear Guides® LA Series

7. Basic Dynamic Load Rating and Operating Life Calculation

NSK LA Series linear guides with super-high rigidity and high load capacity are four-directional iso-load (up, down, left and right), where the dynamic load rating, C, is equivalent in all four directions.

When load is applied from a single direction (vertical or horizontal), operating life, L (km), is calculated using the following formula, in which fw is the load coefficient, 1.0 to 1.2 at smooth motion, and F indicates calculation load against ball slide.

$$L = 50 \times \left(\frac{C}{f_w F} \right)^3 \dots\dots\dots(1)$$

With a vertical load (R) and a horizontal load (S) simultaneously applied with $R \geq S$, operating life, L, is calculated using formula (2).

$$F = R + 0.5S \dots\dots\dots(2)$$

When $R < S$, operating life L is indicated in formula (3) by value F.

$$F = S + 0.5R \dots\dots\dots(3)$$

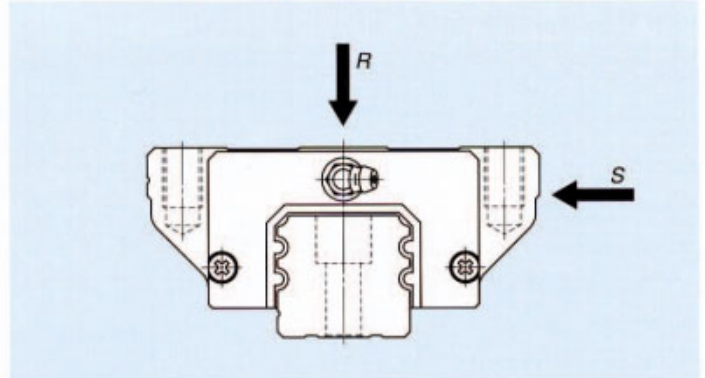


Figure 10 Two directional load

8. Stopper

Since LA Series ball slides do not have ball retainers, balls may drop when ball slides are removed from the rail. Consequently, an easily removable stopper is installed as standard equipment to ensure safe transportation.

9. Option

NSK Linear Guides are equipped with side seals and a bottom seal to prevent foreign matter from entering into the interior of the ball slide, allowing easy use under normal conditions. NSK has also developed other options, such as bellows to further improve the performance of seals; caps for rail mounting holes; protectors to guard against welding spatter; and a double seal to improve the performance of side seals.

Bellows

Bellows have been widely implemented to protect linear guides and ball screws in highly contaminated environments. NSK has specially developed bellows for use with the LA Series.

A bellow is composed of its unit element "block (BL)." The blocks are connected to each other to form a bellow.

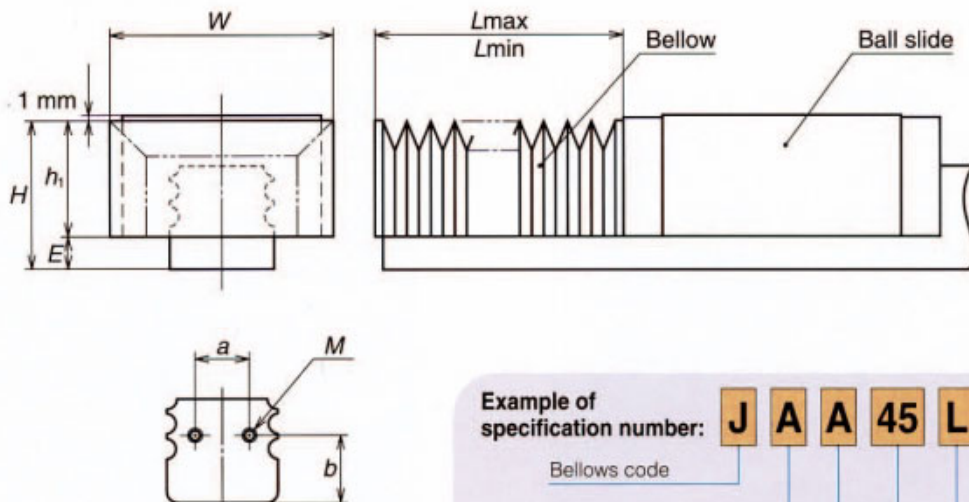


Figure 11 Bellows dimensions

Example of specification number: J A A 45 L 08

Bellevs code	J	A	A	45	L	08	Number of BL (blocks)
A: End bellows							N: Standard (high) profile type
B: Intermediate bellows							L: Low profile type
Bellevs for LA Series							Linear guide size no.

Table 7 Bellows dimensions

Model number	H	H1	E	W	P	a	b	BL minimum length	M tap × depth
JAA25L, JBA25L	35	29.5	5.5	55	12	12	13.8	17	M3 × 5
JAA25N, JBA25N	39	33.5	5.5	61	15	12	13.8	17	M3 × 5
JAA30L, JBA30L	41	33.5	7.5	60	12	14	17.5	17	M4 × 6
JAA30N, JBA30N	44	36.5	7.5	66	15	14	17.5	17	M4 × 6
JAA35L, JBA35L	47	39.5	7.5	72	15	15	18.8	17	M4 × 6
JAA35N, JBA35N	54	46.5	7.5	82	20	15	18.8	17	M4 × 6
JAA45L, JBA45L	59	49	10	93	20	25	22.5	17	M5 × 8
JAA45N, JBA45N	69	59	10	113	30	25	22.5	17	M5 × 8
JAA55L, JBA55L	69	57	12	101	20	35	27.1	17	M5 × 8
JAA55N, JBA55N	79	67	12	121	30	35	27.1	17	M5 × 8
JAA65N, JBA65N	89	75	14	131	30	40	33.3	17	M5 × 8

Unit: mm

Table 8 Bellows length and number of blocks (BL)

Type	Basic no.	No. of BL	2	4	6	8	10	12	14	16	18	20
			L min	34	68	102	136	170	204	238	272	306
Low type	JAA25L JBA25L	Travel	134	268	402	536	670	804	938	1072	1206	1340
		L max	168	336	504	672	840	1008	1176	1344	1512	1680
High type	JAA25N JBA25N	Travel	176	352	528	704	880	1056	1232	1408	1584	1760
		L max	210	420	630	840	1050	1260	1470	1680	1890	2100
Low type	JAA30L JBA30L	Travel	134	268	402	536	670	804	938	1072	1206	1340
		L max	168	336	504	672	840	1008	1176	1344	1512	1680
High type	JAA30N JBA30N	Travel	176	352	528	704	880	1056	1232	1408	1584	1760
		L max	210	420	630	840	1050	1260	1470	1680	1890	2100
Low type	JAA35L JBA35L	Travel	176	352	528	704	880	1056	1232	1408	1584	1760
		L max	210	420	630	840	1050	1260	1470	1680	1890	2100
High type	JAA35N JBA35N	Travel	246	492	738	984	1230	1476	1722	1968	2214	2460
		L max	280	560	840	1120	1400	1680	1960	2240	2520	2800
Low type	JAA45L JBA45L	Travel	246	492	738	984	1230	1476	1722	1968	2214	2460
		L max	280	560	840	1120	1400	1680	1960	2240	2520	2800
High type	JAA45N JBA45N	Travel	386	772	1158	1544	1930	2316	2702	3088	3474	3860
		L max	420	840	1260	1680	2100	2520	2940	3360	3780	4200
Low type	JAA55L JBA55L	Travel	246	492	738	984	1230	1476	1722	1968	2214	2460
		L max	280	560	840	1120	1400	1680	1960	2240	2520	2800
High type	JAA55N JBA55N	Travel	386	772	1158	1544	1930	2316	2702	3088	3474	3860
		L max	420	840	1260	1680	2100	2520	2940	3360	3780	4200
Low/high type	JAA65N JBA65N	Travel	386	772	1158	1544	1930	2316	2702	3088	3474	3860
		L max	420	840	1260	1680	2100	2520	2940	3360	3780	4200

Unit: mm

The compressed length (L min) and the fully extended length (L max) of bellows which have an even number of blocks are shown in Table 8. For a bellows with an odd number of blocks, determine the middle of the lengths of the adjacent two even numbers in the table.

Inner seal

The inner seal prevents fine debris that has penetrated the side seals and entered into the interior of the ball slide from interfering at the ball contact point. Since the inner seal is placed in the interior of the ball slide, the external size and shape appear no different than that of standard ball slides.

Double seal and protector

A double seal consists of two side seals combined to provide double protection.

A protector is attached on the outside of side seals to prevent high-temperature matter such as welding spatter and solid debris from entering into the interior of the ball slide.

Lubricating Unit NSK K1

LA Series Linear Guides can be furnished with the NSK K1.

Caps for rail mounting holes

Caps are used in order to prevent foreign debris from accumulating in bolt holes or from entering into the interior of ball slides after a rail is installed on the base.

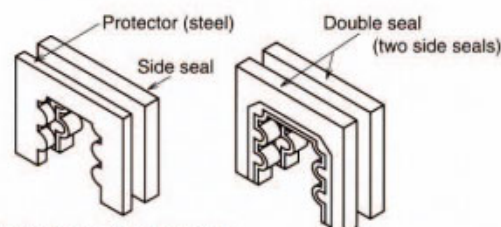
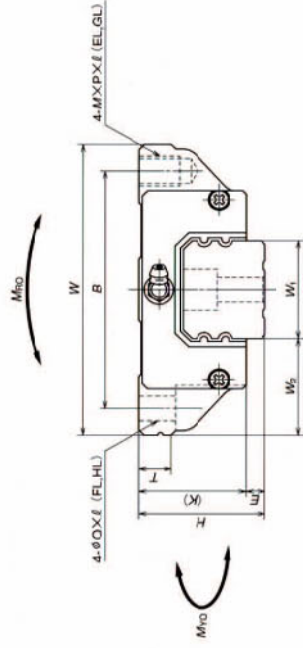
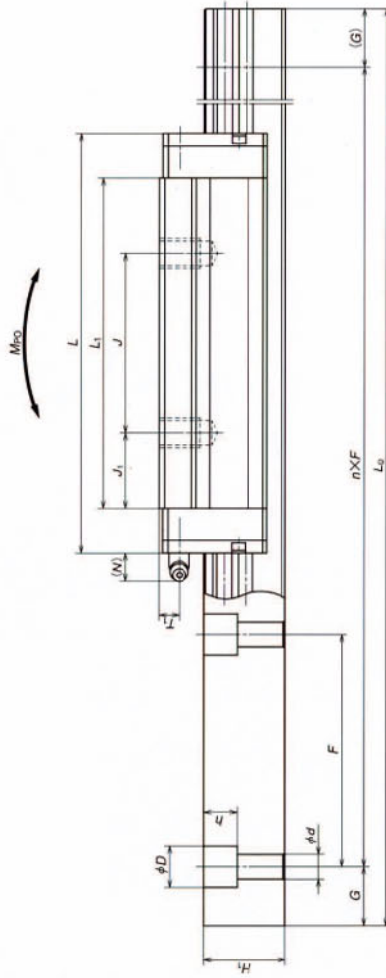


Figure 12 Protectors and double seal



Model No.	Assembly dimensions			Ball slide dimensions										Rail dimensions					Basic load rating					Weight					
	H	E	W ₂	Width	Length	Mounting holes		Grease fitting		Width	Height	Bolt pitch	Bolt holes	G	Max. length	Dynamic	Static	M _{ko} (N·m)	M _{ko} (kg·m)	Static moment	M _{ko} (N·m)	M _{ko} (kg·m)	Slide	Rail	Model No.				
					L	B × J	M × P × L G × L	L ₁	J ₁	K	T	Thread spec.	T ₁	N	W ₁	H ₁	F	d × D × h	(std)	Max. length	C ₀ (N)	C ₀ (kgf)	M _{ko} (N·m)	M _{ko} (kg·m)		M _{ko} (N·m)	M _{ko} (kg·m)	(kg)	(kg/m)
LA25EL	36	5.5	23.5	70	79.8	57 × 45	M8 × 1.25 × 12	58	6.5	30.5	11	M6 × 0.75	6	11	23	22	60	7 × 11 × 9	20	3960	24,200	42,100	370	335	335	335	0.8	3.7	LA25EL
LA25GL					107.8			86	20.5												32,800	64,600	570	755	755	755	1.1	4.6	LA25GL
LA25FL	35	5.5	23.5	70	79.8	57 × 45	7 × 10	58	6.5	30.5	11	M6 × 0.75	6	11	23	22	60	7 × 11 × 9	20	3960	24,200	42,100	370	335	335	335	0.8	3.7	LA25FL
LA25HL					107.8			86	20.5												32,800	64,600	570	755	755	755	1.1	4.6	LA25HL
LA30EL	42	7.5	31	90	100.2	72 × 52	M10 × 1.5 × Thru	72	10	34.5	11	M6 × 0.75	6.5	11	28	28	80	9 × 14 × 12	20	4000	35,700	60,700	635	580	580	580	1.3	4.7	LA30EL
LA30GL					126.2			98	23												46,500	88,600	940	1,190	1,190	1,190	1.8	6.5	LA30GL
LA30FL	42	7.5	31	90	100.2	72 × 52	9 × 12	72	10	34.5	11	M6 × 0.75	6.5	11	28	28	80	9 × 14 × 12	20	4000	35,700	60,700	635	580	580	580	1.3	4.7	LA30FL
LA30HL					126.2			98	23												46,500	88,600	940	1,190	1,190	1,190	1.8	6.5	LA30HL
LA35EL	40	7.5	33	100	110.6	82 × 62	M10 × 1.5 × 15	80	9	40.5	12	M6 × 0.75	6	11	34	30.8	80	9 × 14 × 12	20	4000	49,400	82,800	1,070	920	920	920	1.9	6.8	LA35EL
LA35GL					144.6			114	26												64,600	120,000	1,560	1,890	1,890	1,890	2.6	9.3	LA35GL
LA35FL	48	7.5	33	100	110.6	82 × 62	9 × 13	80	9	40.5	12	M6 × 0.75	8	11	34	30.8	80	9 × 14 × 12	20	4000	49,400	82,800	1,070	920	920	920	1.9	6.8	LA35FL
LA35HL					144.6			114	26												64,600	120,000	1,560	1,890	1,890	1,890	2.6	9.3	LA35HL
LA45EL	60	10	37.5	120	141.4	100 × 80	M12 × 1.75 × 18	105	12.5	50	13	PT1/8	10	13	45	36	105	14 × 20 × 17	22.5	3990	73,000	124,000	2,190	1,790	1,790	1,790	3.3	11.8	LA45EL
LA45GL					173.4			137	28.5												89,100	166,000	2,910	3,100	3,100	3,100	4.3	15.3	LA45GL
LA45FL	60	10	37.5	120	141.4	100 × 80	11 × 15	105	12.5	50	13	PT1/8	10	13	45	36	105	14 × 20 × 17	22.5	3990	73,000	124,000	2,190	1,790	1,790	1,790	3.3	11.8	LA45FL
LA45HL					173.4			137	28.5												89,100	166,000	2,910	3,100	3,100	3,100	4.3	15.3	LA45HL
LA55EL	70	12	43.5	140	165.4	116 × 95	M14 × 2 × 21	126	15.5	58	15	PT1/8	11	13	53	43.2	120	16 × 23 × 20	30	3960	117,000	195,000	4,000	3,550	3,550	3,550	5.5	19.3	LA55EL
LA55GL					203.4			164	34.5												138,000	246,000	5,100	5,500	5,500	5,500	7.2	25.6	LA55GL
LA55FL	70	12	43.5	140	165.4	116 × 95	14 × 18	126	15.5	58	15	PT1/8	11	13	53	43.2	120	16 × 23 × 20	30	3960	117,000	195,000	4,000	3,550	3,550	3,550	5.5	19.3	LA55FL
LA55HL					203.4			164	34.5												138,000	246,000	5,100	5,500	5,500	5,500	7.2	25.6	LA55HL
LA65EL	90	14	53.5	170	196.2	142 × 110	M16 × 2 × 24	147	18.5	76	22	PT1/8	19	13	63	55	150	18 × 26 × 22	35	3900	210,000	323,000	8,050	6,650	6,650	6,650	11.0	38.7	LA65EL
LA65GL					256.2			207	48.5												275,000	475,000	11,800	13,600	13,600	13,600	15.5	51.1	LA65GL
LA65FL	90	14	53.5	170	196.2	142 × 110	16 × 23	147	18.5	76	22	PT1/8	19	13	63	55	150	18 × 26 × 22	35	3900	210,000	323,000	8,050	6,650	6,650	6,650	11.0	38.7	LA65FL
LA65HL					256.2			207	48.5												275,000	475,000	11,800	13,600	13,600	13,600	15.5	51.1	LA65HL