

Fig. 1 RA Series

1. Features

(1) Super-high load capacity

By installing rollers that are the largest possible diameter and length within the existing standard cross-section dimension in a rational layout based on our advanced analysis technology, we have realized the world's highest load capacity,* far superior to conventional roller guides. Super-long life is achieved and impact load can be sufficiently handled.

* As of September 1, 2003; NSK's research and comparison on the existing products of the same sizes.

(2) Super-high rigidity

Using NSK's advanced analysis technology, we pursued a complete, optimal design, down to the detailed shape of roller slides and rails, thereby realizing super-high rigidity superior to that of competitor's roller guides.

(3) Super-high motion accuracy

NSK has developed its own unique method of simulating rolling element passage vibration and method of designing optimal roller slide specifications for damping roller passage vibration. These developments have dramatically enhanced roller slide motion accuracy for the RA series.

(4) Smooth motion

Installation of a retaining piece between rollers restrains the roller skew peculiar to roller slides, thereby achieving smooth motion.

(5) Low friction

Using rollers for rolling elements helps minimize dynamic friction.

(6) Random matching

Random-matching of rails and roller slides are available. (RA25 to RA65)

(7) Specification with highly dustproof V1 seal

Specification with newly developed, highly dustproof V1 seal which is the end seal with enhanced abrasion resistance is also available. (RA35 - 55)

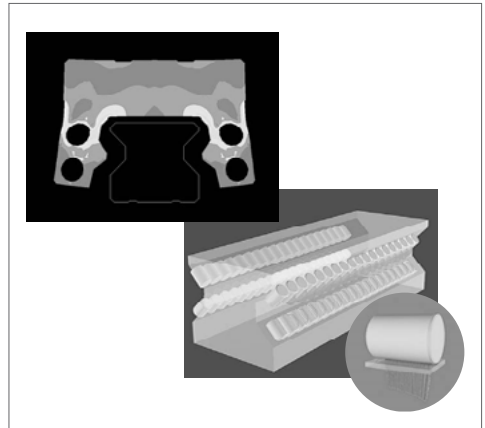


Fig. 2 Analysis example

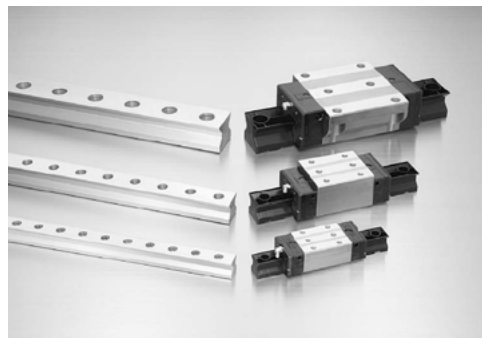


Fig. 3 Random-matching type

2. Roller slide shape

Roller slide model	Shape/installation method	Type (Upper row, Rating: Lower row, Roller slide length)	
		High-load type	Super-high-load type
		Standard	Long
AN BN		AN 	BN
AL BL		AL 	BL
EM GM		EM 	GM

3. Accuracy and preload

(1) Running parallelism of roller slide

Table 1

Rail length (mm)	Ultra precision P3	Super precision P4	High precision P5	Precision grade P6
	Preloaded assembly	Preloaded assembly	Preloaded assembly Random-matching type	Preloaded assembly
- 50	2	2	2	4.5
50 - 80	2	2	3	5
80 - 125	2	2	3.5	5.5
125 - 200	2	2	4	6
200 - 250	2	2.5	5	7
250 - 315	2	2.5	5	8
315 - 400	2	3	6	9
400 - 500	2	3	6	10
500 - 630	2	3.5	7	12
630 - 800	2	4	8	14
800 - 1 000	2.5	4.5	9	16
1 000 - 1 250	3	5	10	17
1 250 - 1 600	4	6	11	19
1 600 - 2 000	4.5	7	13	21
2 000 - 2 500	5	8	15	22
2 500 - 3 150	6	9.5	17	25
3 150 - 3 500	9	16	23	30

Unit: μm

(2) Accuracy standard

The preloaded assembly has four accuracy grades; Ultra precision P3, Super precision P4, High precision P5, and Precision P6 grades, while the random-matching type has High precision PH grade only.

> Tolerance of preloaded assembly

Table 2

Unit: μm

Characteristics	Accuracy grade	Ultra precision P3	Super precision P4	High precision P5	Precision grade P6
Mounting height H		± 8	± 10	± 20	± 40
Variation of H (All ball slides on a set of rails)		3	5	7	15
Mounting width W_2 or W_3		± 10	± 15	± 25	± 50
Variation of W_2 or W_3 (All ball slides on reference rail)		3	7	10	20
Running parallelism of surface C to surface A Running parallelism of surface D to surface B		Shown in Table 1 and Fig. 4			

> Tolerance of random-matching type

Table 3

Unit: μm

Characteristics	Accuracy grade	High precision PH
Mounting height H		± 20
Variation of mounting height H		15 ^①
		25 ^②
Mounting width W_2 or W_3		± 25
Variation of mounting width W_2 or W_3		20
Running parallelism of surface C to surface A Running parallelism of surface D to surface B		See Table 1 and Fig. 4

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

(3) Combination of accuracy and preload

Table 4

		Accuracy grade				
		Ultra precision	Super precision	High precision	Precision grade	High precision
Without NSK K1 lubrication unit		P3	P4	P5	P6	PH
With NSK K1 lubrication unit		K3	K4	K5	K6	KH
Preload	Slight preload Z1	○	○	○	○	—
	Medium preload Z3	○	○	○	○	—
	Random-matching type with slight preload ZZ	—	—	—	—	○
	Random-matching type with medium preload ZH	—	—	—	—	○

(4) Assembled accuracy

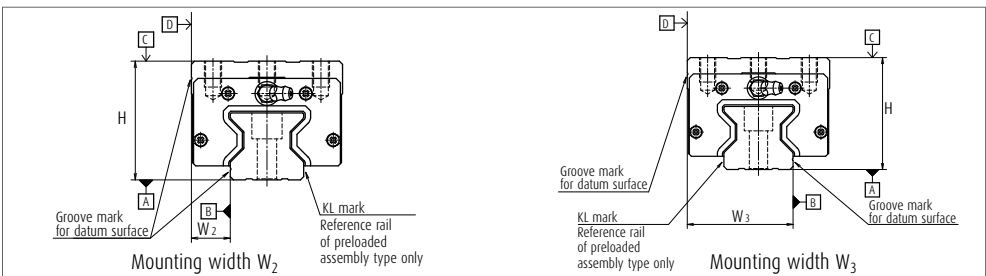


Fig. 3

(5) Preload and rigidity

Four types of preload are available: Medium preload Z3 and Slight preload Z1 for preloaded assembly, and Medium preload ZH and slight preload ZZ for Random-matching type.

› Preload of preloaded assembly

Table 5

Model No.		Preload (N)	
		Slight preload (Z1)	Medium preload (Z3)
High-load type	RA15 AN, AL, EM	—	1 030
	RA20 AN, EM	—	1 920
	RA25 AN, AL, EM	880	2 920
	RA30 AN, AL, EM	1 170	3 890
	RA35 AN, AL, EM	1 600	5 330
	RA45 AN, AL, EM	2 780	9 280
	RA55 AN, AL, EM	3 870	12 900
	RA65 AN, EM	6 300	21 000
Super-high-load type	RA15 BN, BL, GM	—	1 300
	RA20 BN, GM	—	2 400
	RA25 BN, BL, GM	1 060	3 540
	RA30 BN, BL, GM	1 430	4 760
	RA35 BN, BL, GM	2 020	6 740
	RA45 BN, BL, GM	3 480	11 600
	RA55 BN, BL, GM	5 040	16 800
	RA65 BN, GM	8 640	28 800

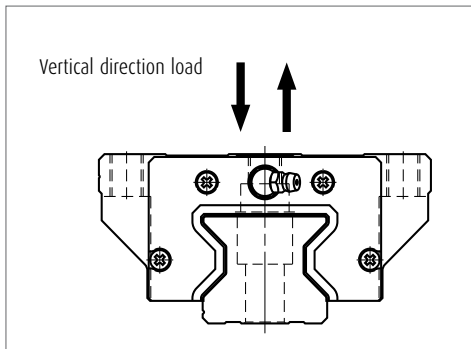


Fig. 5 Direction of load

> Rigidity of medium preload

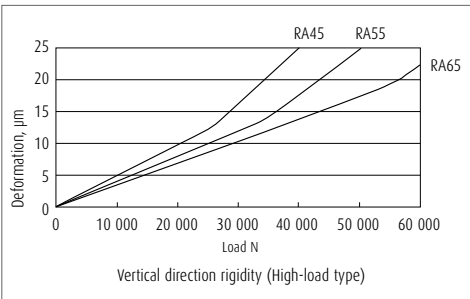
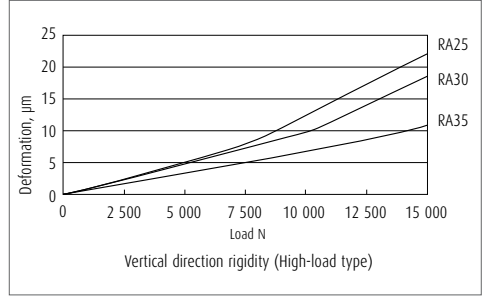
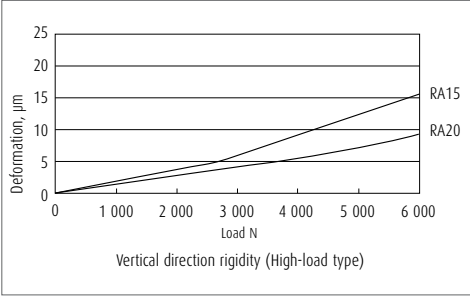


Fig. 6 Vertical direction theoretical rigidity line:
High-load type (Roller slide shape: AN, AL, EM)

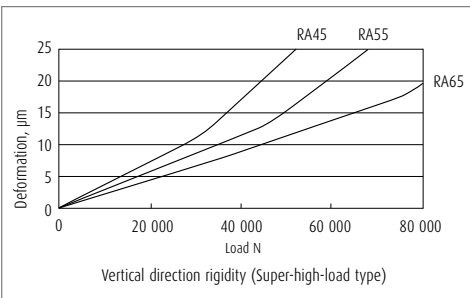
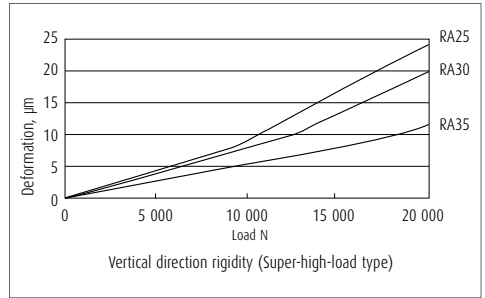
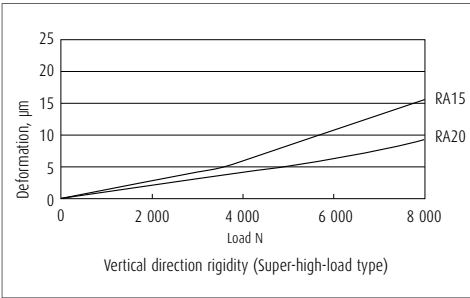


Fig. 7 Vertical direction theoretical rigidity line:
Super-high-load type (Roller slide shape: BN, BL, GM)

4. Maximum rail length

Table 5 shows the limitations of rail length (maximum length). However, the limitations vary by accuracy grades.

Table 6 Length limitation of rails

Unit: mm

Series	Size	15	20	25	30	35	45	55	65
RA		2 000	3 000	3 900	3 900	3 900	3 650	3 600	3 600

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

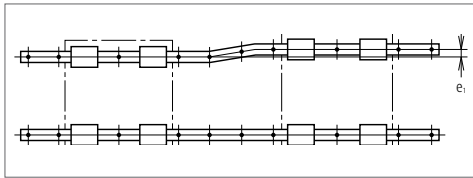


Fig. 8

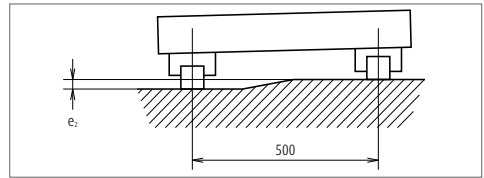


Fig. 9

Table 7

Unit : μm

Value	Preload	Model No.							
		RA15	RA20	RA25	RA30	RA35	RA45	RA55	RA65
Permissible values of parallelism in two rails e_1	Z1, ZZ	—	—	14	18	21	27	31	49
	Z3, ZH	5	7	9	11	13	17	19	30
Permissible values of parallelism (height) in two rails e_2	Z1, ZZ	290 μm / 500 mm							
	Z3, ZH	150 μm / 500 mm							

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

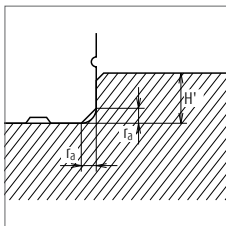


Fig. 10 Shoulder for the rail datum surface

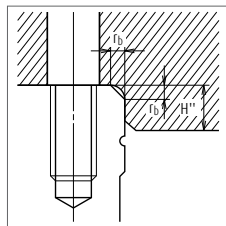


Fig. 11 Shoulder for the roller slide datum surface

Table 8

Unit : mm

Model No.	Corner radius (maximum)		Shoulder height	
	r_a	r_b	H'	H''
RA15	0.5	0.5	3	4
RA20	0.5	0.5	4	5
RA25	0.5	1	4	5
RA30	1	1	5	6
RA35	1	1	5	6
RA45	1.5	1	6	8
RA55	1.5	1.5	7	10
RA65	1.5	1.5	11	11

6. Lubrication components

Refer to pages A38 and D13 for the lubrication of linear guides.

(1) Types of lubrication accessories

Fig. 14 and Table 11 show grease fittings and tube fittings.

(2) Mounting position of lubrication accessories

- > The standard position of grease fittings and tube fittings is the end face of roller slide. We can mount them on a side of end cap for an option. (Fig. 12) Please consult NSK for installation of grease or tube fittings to the roller slide body or the side of end cap.
- > A lubrication hole can also be provided on the top of the end cap. Fig.13, Table 9 and Table 10 show the mounting position. A spacer is required for AN and BN shape roller slides. The spacers are available from NSK.
- > When using a piping unit with thread of M6 × 1, you require a connector to connect it to a grease fitting mounting hole with M6 × 0.75. The connectors are available from NSK.

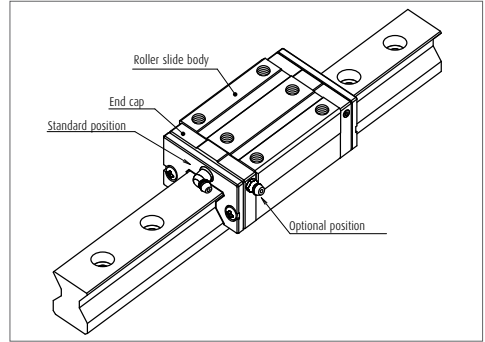


Fig. 12 Mounting position of lubrication accessories

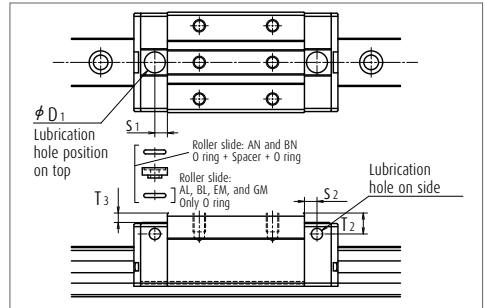


Fig.13 Top and side lubrication hole positions

Table 9 Top and side lubrication hole positions

Unit : mm

Model No.	Roller slide model	Grease fitting size	s_2	T_2	O ring (JIS)	Spacer	D_1	s_1	T_3
RA15	AN, BN	$\phi 3$	4	7	P5	Necessary	8.2	4.4	4.2
RA20	AN, BN	$\phi 3$	4	4	P6	—	9.2	5.4	0.2
RA25	AN, BN	M6×0.75	6	10	P7	Necessary	10.2	6	4.5
RA30	AN, BN	M6×0.75	5	10	P7	Necessary	10.2	6	3.5
RA35	AN, BN	M6×0.75	5.5	15	P7	Necessary	10.2	7	7.4
RA45	AN, BN	Rc 1/8	7.2	20	P7	Necessary	10.2	7.2	10.4
RA55	AN, BN	Rc 1/8	7.2	21	P7	Necessary	10.2	7.2	10.4
RA65	AN, BN	Rc 1/8	7.2	19	P7	—	10.2	7.2	0.4

Table 10 Top and side lubrication hole positions

Unit : mm

Model No.	Roller slide model	Grease fitting size	s_2	T_2	O ring (JIS)	D_1	s_1	T_3
RA15	AL, BL, EM, GM	$\phi 3$	4	3	P5	8.2	4.4	0.2
RA20	EM, GM	$\phi 3$	4	4	P6	9.2	5.4	0.2
RA25	AL, BL, EM, GM	M6×0.75	6	6	P7	10.2	6	0.4
RA30	AL, BL, EM, GM	M6×0.75	5	7	P7	10.2	6	0.4
RA35	AL, BL, EM, GM	M6×0.75	5.5	8	P7	10.2	7	0.4
RA45	AL, BL, EM, GM	Rc 1/8	7.2	10	P7	10.2	7.2	0.4
RA55	AL, BL, EM, GM	Rc 1/8	7.2	11	P7	10.2	7.2	0.4
RA65	EM, GM	Rc 1/8	7.2	19	P7	10.2	7.2	0.4

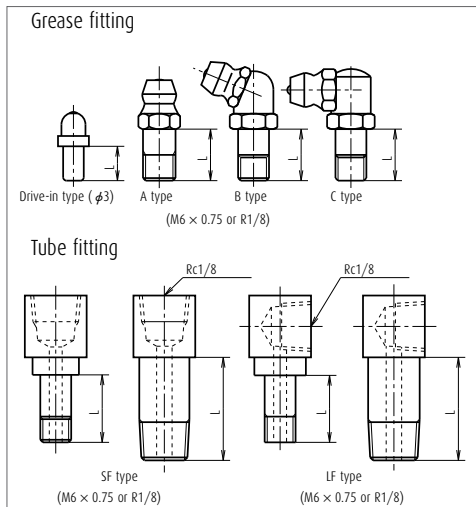


Fig. 14 Grease fitting and tube fitting

7. Dust-proof components

(1) Standard specification

The RA series is equipped with end, inner* and bottom seals to prevent foreign matter from entering the inside of the roller slide. Under normal applications, the RA series can be used without modification.

For severe usage conditions, optional rail covers** are available. Contact NSK for information on how to mount the cover.

*) Inner seals for the models of RA15 and RA20 are available as options.

***) The rail cover is available to the models of RA25 to RA65.

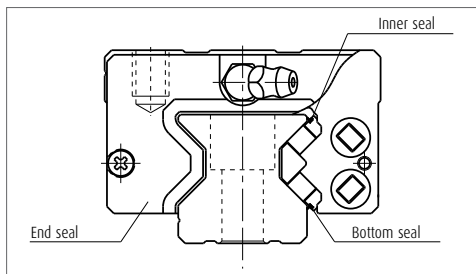


Fig. 15

Table 11

Model No.	Dust proof specification	Dimension L		
		Grease fitting/ Drive-in fitting	Tube fitting SF Type	LF Type
RA15	Standard	5	-	-
RA15	With NSK K1	10	-	-
RA15	Double seal	8	-	-
RA15	Protector	8	-	-
RA20	Standard	5	-	-
RA20	With NSK K1	10	-	-
RA20	Double seal	8	-	-
RA20	Protector	10	-	-
RA25	Standard	5	5	5
RA25	With NSK K1	12	12	12
RA25	Double seal	10	9	9
RA25	Protector	10	9	9
RA30	Standard	5	6	6
RA30	With NSK K1	14	14	15
RA30	Double seal	12	12	11
RA30	Protector	12	10	11
RA35	Standard	5	6	6
RA35	With NSK K1	14	14	15
RA35	Double seal	12	12	11
RA35	Protector	12	10	11
RA45	Standard	8	13.5	17
RA45	With NSK K1	18	20	21.5
RA45	Double seal	14	16	17
RA45	Protector	14	16	17
RA55	Standard	8	13.5	17
RA55	With NSK K1	18	20	21.5
RA55	Double seal	14	16	17
RA55	Protector	14	16	17
RA65	Standard	8	13.5	17
RA65	With NSK K1	20	20	20
RA65	Double seal	14	18	17
RA65	Protector	14	16	17

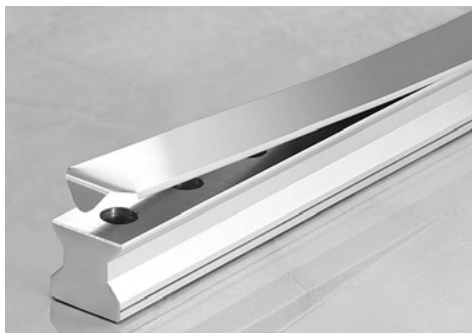


Fig. 16 Rail cover

Table 12 Seal friction per roller side (maximum value)

Series	Size	Unit: mm							
		15	20	25	30	35	45	55	65
RA		4	5.5	5	5	6	8	8	14

(2) NSK K1 lubrication unit

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

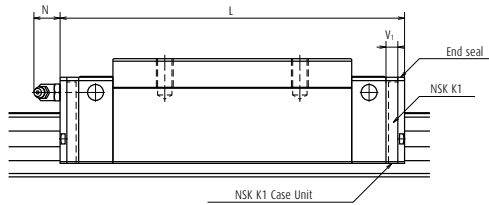


Table 13

Unit: mm

Model No.	Roller slide length	Roller slide model	Standard roller slide length	With two NSK K1	Thickness of NSK K1 V1	Protruding area of the grease fitting N
RA15	Standard	AN, AL, EM	70	79	4.5	(3)
RA15	Long	BN, BL, GM	85.4	94.4	4.5	(3)
RA20	Standard	AN, EM	86.5	95.5	4.5	(3)
RA20	Long	BN, GM	106.3	115.3	4.5	(3)
RA25	Standard	AN, AL, EM	97.5	107.5	5	(11)
RA25	Long	BN, BL, GM	115.5	125.5	5	(11)
RA30	Standard	AN, AL, EM	110.8	122.8	6	(11)
RA30	Long	BN, BL, GM	135.4	147.4	6	(11)
RA35	Standard	AN, AL, EM	123.8	136.8	6.5	(11)
RA35	Long	BN, BL, GM	152	165	6.5	(11)
RA45	Standard	AN, AL, EM	154	168	7	(14)
RA45	Long	BN, BL, GM	190	204	7	(14)
RA55	Standard	AN, AL, EM	184	198	7	(14)
RA55	Long	BN, BL, GM	234	248	7	(14)
RA65	Standard	AN, EM	228.4	243.4	7.5	(14)
RA65	Long	BN, GM	302.5	317.5	7.5	(14)

Note Roller slide length equipped with NSK K1 = (Standard roller slide length) + (Thickness of NSK K1 Case Unit × Number of NSK K1 Case Unit)

(3) Double seal and protector

For RA Series, double seal and protector can be installed only before shipping from the factory.

Table 14 shows the increased thickness when end seal and protector are installed.

Table 14

Unit: mm

Modell No.	Thickness of end seal V ₃	Thickness of protector V ₄
RA15	3	2.7
RA20	3	3.3
RA25	3.2	3.3
RA30	3.4	3.6
RA35	3.4	3.6
RA45	4	4.2
RA55	4	4.2
RA65	5	5.5

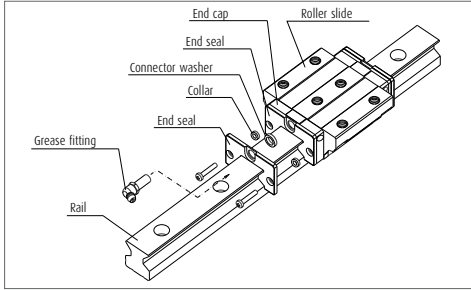


Fig. 17 Double seal

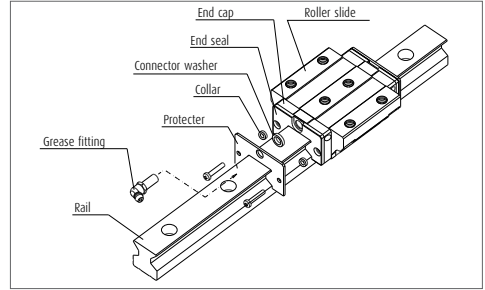


Fig. 18 Protector

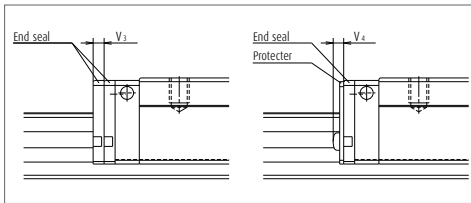


Fig. 19

(4) Rail cover

When the rail cover is used, use the cover bracket to secure the rail cover. Fig.20 shows the dimensions for the cover bracket. The required room at the end of the rail is:

- > Inside: 10.5 mm or less
- > Outside: 4 mm or less (Common to the models of RA25 to RA65)
Please confirm the interference with your machine at the stroke end.
- > Machine stroke
- > Room for the end of the rail

The height of the rail with the rail cover is shown in Table 15.

Table 15 Height of rails equipped with rail cover

Unit: mm

Modell No.	Standard height H1	Cover installation
RA25	24	24.25
RA30	28	28.25
RA35	31	31.25
RA45	38	38.3
RA55	43.5	43.8
RA65	55	55.3

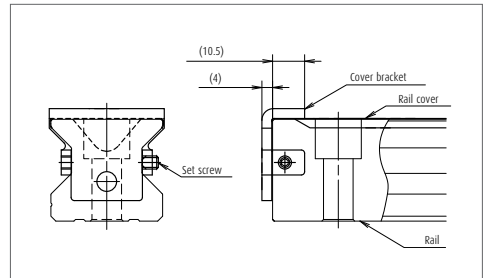


Fig. 20 End configuration of rail equipped with the rail cover

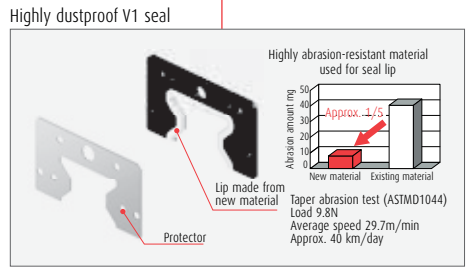
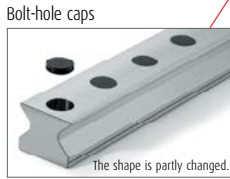
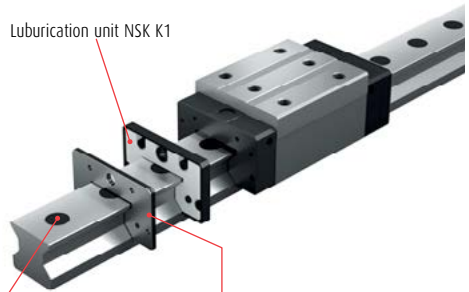
(5) Cap to plug the rail mounting bolt hole

Table 16 Caps to plug rail bolt hole

Modell No.	Bolt to secure rail	Cap reference No.	Quantity /case
RA15	M4	LG-CAP/M4	20
RA20	M5	LG-CAP/M5	20
RA25	M6	LG-CAP/M6	20
RA30, RA35	M8	LG-CAP/M8	20
RA45	M12	LG-CAP/M12	20
RA55	M14	LG-CAP/M14	20
RA65	M16	LG-CAP/M16	20

(6) Specification with highly dustproof V1 seal

RA35, RA45, and RA55 also have the specification with newly developed, highly dustproof V1 seal which is the end seal with enhanced abrasion resistance. Highly dustproof V1 Seal made of new materials and in a new shape for better abrasion resistance prevents foreign matter getting into the roller slide for a long period. Inner seal and bottom seal are equipped as standard. In addition, outstanding lubrication effects by NSK K1 further improves the durability. The bolt hole caps whose shape is partly changed eliminate building up of foreign matter in and around the rail mounting holes and prevent foreign matter from entering into the roller slide. Otherwise, the rail cover with higher dustproofness can be selected. See A262 for the details of the rail cover.



> Durability test under extreme conditions - no

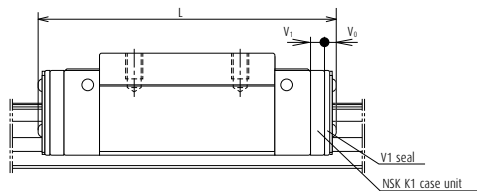
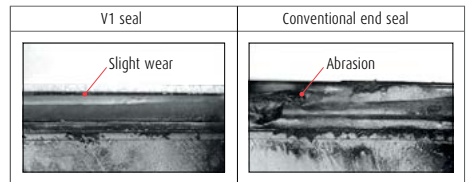
With this new material, even if lubrication is poor, damage such as roughening of surfaces will not occur.

Test sample: RA35

Operation without lubrication on the seal

Feed speed: 500 mm/sec

Table 17 shows the dimension for roller slide with V1 seal.



Since the sealing property (resistance to foreign matter) is affected by usage or the lubrication environment, please conduct an evaluation test for your particular application.

Table 17

Unit: mm

Modell No.	Roller slide length	Roller slide type	Standard roller slide length L	Roller slide length equipped with V1 seal L	Roller slide length equipped with V1 seal and NSK K1 L	Thickness of V1 seal V ₀	Thickness of K1 case unit V ₁
RA35	Standard	AN, AL, EM	123.8	127.8	140.8	3.4	6.5
	Long	BN, BL, GM	152	156	169		
RA45	Standard	AN, AL, EM	154	159.2	173.2	4	7
	Long	BN, BL, GM	190	195.2	209.2		
RA55	Standard	AN, AL, EM	184	189.2	203.2	4	7
	Long	BN, BL, GM	234	239.2	253.2		

(7) Dynamic friction

- > Dynamic friction indications per roller slide are shown in table 18.
- > These values are assumed under actual condition with standard specification (two end seals, inner seal and bottom seal equipped) packed with standard grease (NSK Grease AS2)
- > Dynamic friction varies with grease.

Table 18 Dynamic friction

Unit: N

Modell No.	High-load type	Super-high-load type
RA15	21	24
RA20	22	28
RA25	27	34
RA30	33	42
RA35	42	53
RA45	56	69
RA55	80	95
RA65	120	138

Note Values in Table 18 are indications. Please refer to them.

9. 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

	RA	35	1000	AN	C	2	-**	P6	3	
Series name									Preload code (See page A255.)	
Size									1: Z1, 3: Z3	
Rail length (mm)									Accuracy code (See Table 18.)	
Roller slide shape code (See page A254.)									Design serial number	
Material/surface treatment code (See Table 17.)									Added to the reference number.	
C: Special high carbon steel (NSK standard)									Number of roller slides per rail	

(2) Reference number for random-matching type

Roller slide	RAA	35	AN	PH	H	-F	
Random-matching roller slide series code							Option code
RAA: RA Series random-matching roller slide							No code: No surface treatment
Size							-F: Fluoride low temperature chrome plating
Roller slide shape code (See page A254.)							-C: No surface treatment + Rail cover
							-CF: Fluoride low temperature chrome plating + Rail cover
							Preload code: Z
							Z: Slight preload, H: Medium preload
							Accuracy code
							PH, KH: High-precision grade random-matching type (See Table 18.)

Rail	R1A	35	1000	L	C	N	-**	PH	Z	
Random-matching rail series code									Preload code: Z	
R1A: RA Series random-matching rail									Z: Common for slight and medium preload (See page A255.)	
Size									Accuracy code (See Table 18.)	
Rail length (mm)									PH: High-precision grade random-matching type	
Rail shape code: L									Design serial number	
L: Standard									Added to the reference number.	
Material/surface treatment code (See Table 17.)									*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 the preloaded assembly. However, the applicable preload codes are "slight preload Z" and "medium preload H". (See page A255.)

Table 19 Material/surface treatment code

Code	Description
C	Special high carbon steel (NSK standard)
D	Special high carbon steel with surface treatment
P	Special high carbon steel with V1 seal
R	Special high carbon steel with surface treatment and V1 seal
Z	Other, special

Note P and R are not available for randommatching slides and rails.

Table 20 Accuracy code

Accuracy	Standard (Without NSK K1)	With NSK K1
Ultra precision grade	P3	K3
Super precision grade	P4	K4
High precision grade	P5	K5
Precision grade	P6	K6
High precision grade (random-matching type)	PH	KH

Note Refer to pages A38 for NSK K1 lubrication unit.