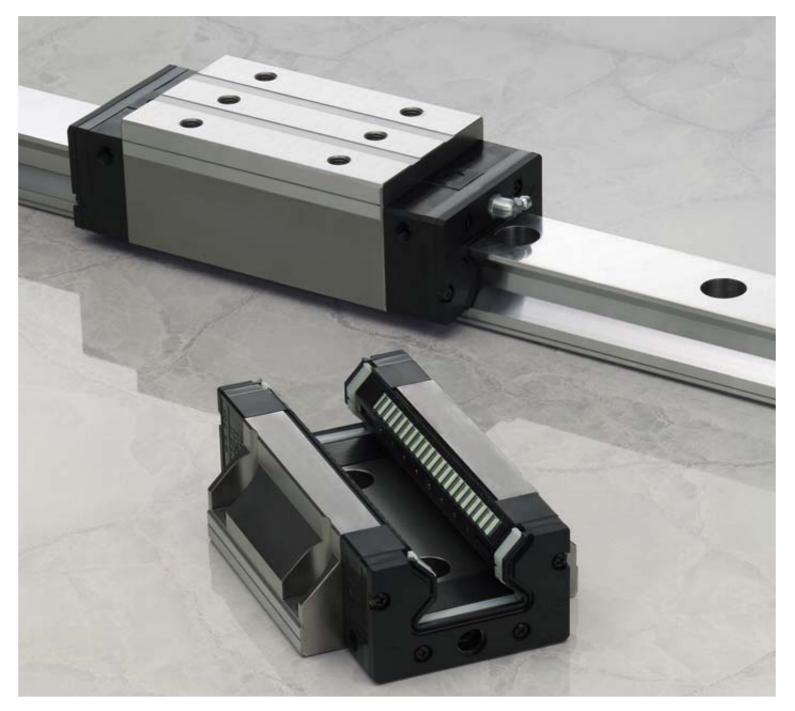


# NSK Linear Guides<sup>™</sup> Roller Guide RA Series

A roller guide series employing advanced analysis technology offers super-high load capacity and rigidity. The latest series is now available in the random matching of rails and roller slides, which includes random matching with preload for higher accuracy and rigidity, allowing the users to select rails and roller slides in single unit quantities.



## The fruits of comprehensive technology of NSK. RA series roller guides handle a diversity of applications

The RA series of roller guides is the product of a combination of NSK's extensive experience in roller bearings and linear guide technologies. The result is an optimal design that takes full advantage of NSK's unique expertise to realize super-high load capacity, rigidity and motion accuracy, plus smooth motion. Capable of handling a variety of applications, the RA series supports high machine performance.

## **RA** series features support high machine performance

## Super-long Life

#### Super-high load capacity

NSK has realized super-high load capacity, now the highest performance in the world, and achieved unprecedented operating life.

#### Maintenance-free

Installing an NSK K1<sup>™</sup> lubrication unit assures long-term, maintenance-free operation.

#### Highly dust-proof

The high performance seals as standard equipment completely block the entry of foreign matter and maintain primary performance over the long term.

#### **Contribution to High-precision Manufacturing**

#### Super-high rigidity

Super-high rigidity provides high-precision manufacturing.

#### Super-high motion accuracy

Coupled with NSK's unique design approach, the vibration caused by roller passage has been substantially reduced. This will greatly contribute to improve machining quality.

#### Smooth motion

The installation of a retaining piece achieves smooth motion, resulting in stable positioning accuracy.

The RA series is available in eight models: RA15, 20, 25, 30, 35, 45, 55 and 65.

## **Used in Many Fields**

#### **Complete series**

Series includes a full lineup from small to large, including low-profile sizes. You can choose the model according to the application.

#### Interchangeable mounting dimensions

Outside dimensions and mounting dimensions conform to standard dimensions for the market, so RA series roller guides can be used without having to alter machine design. (See page 13 for mounting surface dimensions)

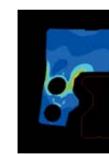
#### Low friction

Uses rollers for rolling elements to hold down dynamic friction.



NSK executed a comprehensive, detailed performance simulation of roller guides by integrating its analysis technology and the tribology technology that the company had been developing over many years. Down to the dimensions and shapes of component details. we have attained an optimal

design completely.



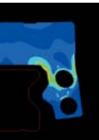
pieces

analysis

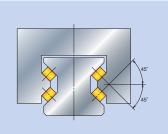




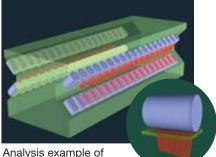
Smooth motion by use of retaining



Example of roller slide deformation



Balanced four-directional iso-load specifications



contact pressure distribution of rollers

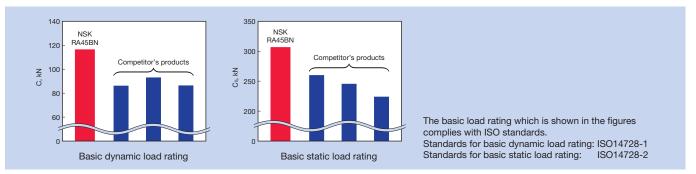
The rails and roller slides can be selected in single unit quantities.

#### **Features**

#### 1. Super-high load capacity

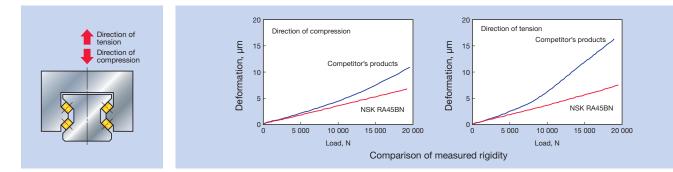
By installing rollers that are the largest possible diameter and length within the existing standard cross-section dimension in a rational layout based on analysis technology, we have realized the world's highest load capacity\*, far superior to conventional roller guides. Super-long life is achieved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

\*Compared with products of the same size, as of September 1, 2003, researched by NSK



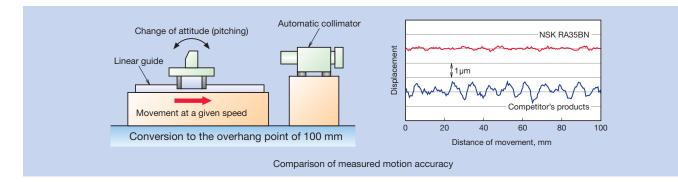
## 2. Super-high rigidity

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.

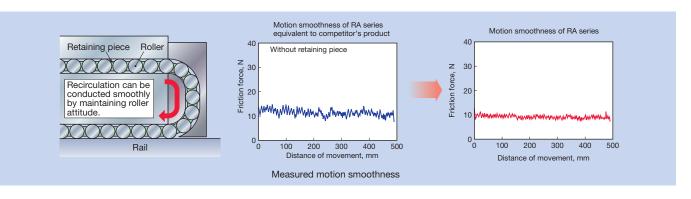


#### 4. Mounting dimensions compatibility

The outer and mounting dimensions of RA series are based on market standards. RA series can be replaced without altering equipment design. (See page 13 for mounting surface dimensions)

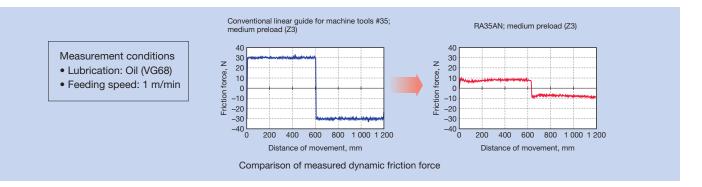
#### 5. Smooth motion

Installing a retaining piece between rollers and restraining the skew peculiar to roller bearings achieve smooth motion. The reduction of friction variation provides stable tracking in the complicated trajectory control.



## 6. Low friction

Using rollers for rolling elements helps minimize dynamic friction.



#### 7. Highly dust-proof and maintenance-free operation

Roller slides include high performance seals as standard equipment. The seal completely blocks the entry of foreign matter into the rolling surface and prevents loss of performance. In addition, rail covers\* are also available for severe operating conditions. (Rail covers reduce the amount of foreign matter to 1/10 that of conventional linear guide for machine tools.)

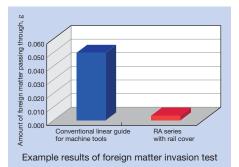
The highly regarded NSK K1<sup>™</sup> lubrication unit is also available to satisfy customer needs for long-term, maintenance-free operation.

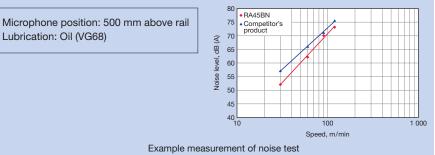
\* Rail covers are only available for the models of RA25 to RA65.

#### 8. Low noise

A retaining piece is provided between rollers to prevent collision of rollers to minimize noise.

Lubrication: Oil (VG68)



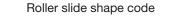


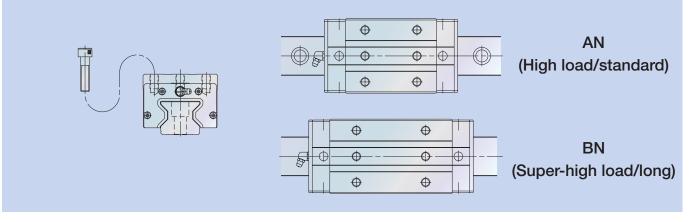
## **Specifications**

#### 1. Roller Slide Types and Shapes

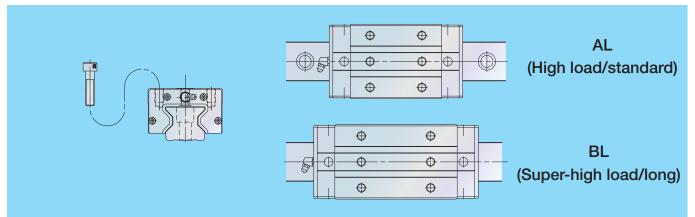
- Two types of roller slides are available in this series: one with a mounting flange and a square type with tapped holes and no flange.
- A compact, low-profile square type is now available.
- On the mounting hole of the flange type, the tapped part is used to fix the roller slide from the top surface, and the minor diameter can be used as a bolt hole from the bottom. This provides mounting from both directions, top and bottom.
- Roller slide length can be specified by standard high load type or special long, super-high load type.

#### Fig. 1 Square type

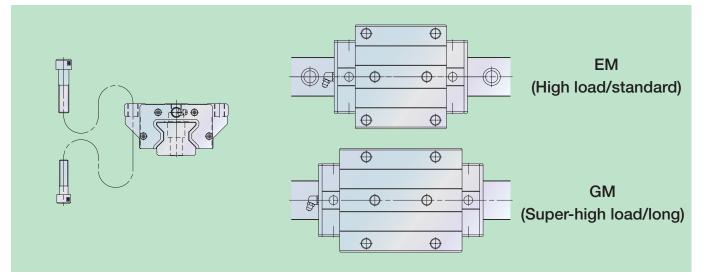




#### Fig. 2 Low-profile type



#### Fig. 3 Flange type



#### 2. Accuracy

Table 1 Accuracy standards

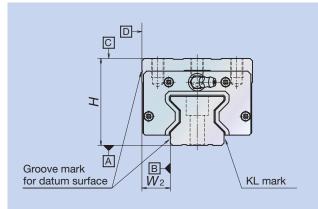
	Accuracy grades						
Accuracy standards	Ultra super precision	Super precision	High precision	Precision	Random-matching Precision		
	P3	P4	P5	P6	P6		
Mounting height: Dimensions in mounting height <i>H</i>	±0.008	±0.010	±0.020	±0.040	±0.020		
Mounting width: Dimensions in mounting width $W_2$ or $W_3$	±0.010	±0.015	±0.025	±0.050	±0.025		
Variation of mounting height dimension H	0.003	0.005	0.007	0.015	0.015		
Variation of mounting width dimension $W_2$ or $W_3^*$	0.003	0.007	0.010	0.020	0.020		
Running parallelism of face C against face A Running parallelism of face D against face B	Reter to Table 2						

\* Difference in roller slides on the reference side roller guide.

#### Table 2 Running parallelism

Rail length (mm)	Ultra super precision P3	Super precision P4	High precision P5	Precision P6
Over – 50 or less	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 - 3 000	6	9.5	17	25
3 150 – 3 500	9	16	23	30

#### Fig. 4 Specifications of accuracy

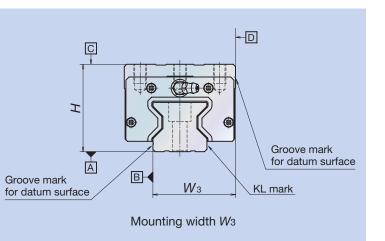


Mounting width W<sub>2</sub>

## Four accuracy grades are available: ultra super precision P3, super precision P4, high precision P5, and precision P6.

#### Unit: mm

#### Unit: µm



#### 3. Preload and Rigidity

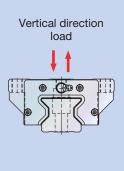
Preload is set for the RA series by slightly changing the size of the roller used. Applying preload enhances rigidity and minimizes elastic deformation. With the characteristics of the roller guide, there is minimal variation in rigidity according to amount of preload. Because the RA series offers stable, high rigidity, only medium preload type Z3 (preload: 10% of C, where C is the basic dynamic load rating) is set. Typical measurements for preload and rigidity are as follows.

## Table 3 Preload

Model No.	High-load type/standard Medium preload (Z3)	Super-high-load type/long Medium preload (Z3)
RA15	1 030	1 300
RA20	1 920	2 400
RA25	2 920	3 540
RA30	3 890	4 760
RA35	5 330	6 740
RA45	9 280	11 600
RA55	12 900	16 800
RA65	21 000	28 800

#### Fig. 5 Direction of load

Unit: N



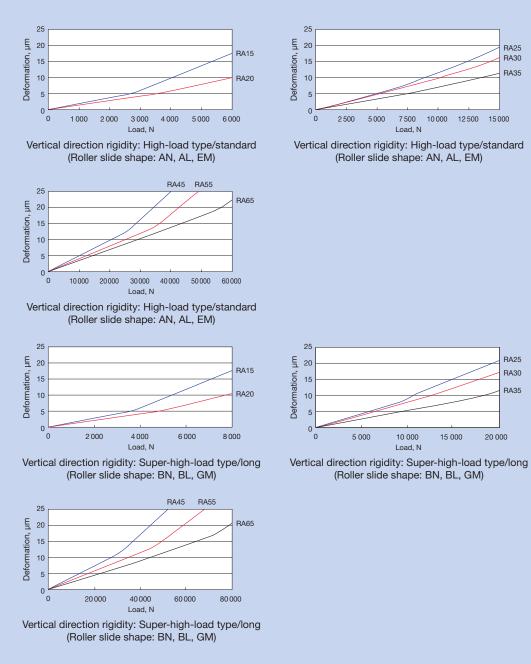
RA25

RA30

BA35

20 000

#### Fig. 6 Rigidity measurement data





 $L = 100 \times \left(\frac{C}{fw \cdot F}\right)^{\frac{10}{3}} \text{ (km)}$ 

• This life formula is different from that for linear guides with ball rolling elements.

• fw is load factor. Refer to the respective value from the following table 4 as a

guideline according to potential vibration and the impact of the machine in

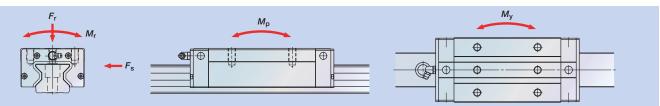
which the linear guide is used, and select the load factor.

4. Basic Load Rating and Rated Life

Load applied to the linear guide (ball slide load) comes from various directions up/down and right/left directions and/or as moment load. Sometimes more than one type of load is applied simultaneously. Sometimes volume and direction of the load may change.

Varying load cannot be used as it is to calculate life of linear guide. Therefore, it is necessary to use a hypothetical load to ball slide with a constant volume, which would generate a value equivalent to an actual fatigue life. This is called "dynamic equivalent load." For actual calculation, use the loads of Table 5.

Fig. 7 Direction of load



#### Table 5 Loads in the arrangement of linear guide

		Loads neo	cessary to c	alcurate dy	namic equiv	alent load			Dynamic ed	quivalent coeff	ficient (1/m)
Pattern	Arrangement of linear guide	Lo			/loment loa	d	Dynamic equivalent load	Model No.	$\mathcal{E}_{r}$	$\mathcal{E}_{p}$	Ey
	inical guide	Up/down (vertical)	Right/left (lateral)	Rolling	Pitching	Yawing		RA15 High load type	105	95	95
								RA15 Super-high load type	105	70	70
1		F,	Fs	M <sub>r</sub>	M <sub>p</sub>	My		RA20 High load type	79	74	74
	Y L	′r	's	, vir	p // p	l <sup>n</sup> y	$F_r = F_r$	RA20 Super-high load type	79	55	55
							$F_{\rm se} = F_{\rm s}$ tan $\alpha$	RA25 High load type	71	64	64
							$F_{\rm re} = \mathcal{E}_{\rm r} \qquad M_{\rm r}$	RA25 Super-high load type	71	50	50
2		Fr	Fs	M <sub>r</sub>			$F_{\rm pe} = \mathcal{E}_{\rm p}  M_{\rm p}$	RA30 High load type	56	58	58
							$F_{ye} = \mathcal{E}_y  M_y$	RA30 Super-high load type	56	44	44
							$\alpha$ : Contact angle (=45°)	RA35 High load type	46	53	53
							Dynamic equivalent	RA35 Super-high load type	46	39	39
3		F <sub>r</sub>	Fs		Mp	My	coefficient	RA45 High load type	37	40	40
	Ч <u></u>						$\mathcal{E}_r$ : Rolling direction	RA45 Super-high load type	37	30	30
							$\mathcal{E}_{p}$ : Pitching direction	RA55 High load type	33	34	34
		-	-				$\mathcal{E}_{y}$ : Yawing direction	RA55 Super-high load type	33	24	24
4		F <sub>r</sub>	Fs					RA65 High load type	26	28	28
								RA65 Super-high load type	26	19	19

Formula is determined by the relationship of loads in terms of volume. Full dynamic equivalent load can be easily obtained by using each coefficient. After obtaining the dynamic equivalent of the necessary load directions from Table 6, use the formulas below to

calculate full dynamic equivalent loads.

- · When  $F_r$  is the largest load:  $F_e = F_r + 0.5F_{se} + 0.5F_{re} + 0.5F_{pe} + 0.5F_{ve}$
- · When  $F_{se}$  is the largest load:  $F_{e} = 0.5F_{r} + F_{se} + 0.5F_{re} + 0.5F_{pe} + 0.5F_{ve}$
- · When  $F_{re}$  is the largest load:  $F_{e} = 0.5F_{r} + 0.5F_{se} + F_{re} + 0.5F_{pe} + 0.5F_{ve}$

· When  $F_{pe}$  is the largest load:  $F_e = 0.5F_r + 0.5F_{se} + 0.5F_{re} + F_{pe} + 0.5F_{ve}$ 

· When  $F_{ve}$  is the largest load:  $F_e = 0.5F_r + 0.5F_{se} + 0.5F_{re} + 0.5F_{pe} + F_{ve}$ 

For the values of each dynamic equivalent load in the formulas above, disregard load directions and take the absolute value. NSK 8

Basic dynamic load rating that expresses load capacity is established by ISO standards (ISO14728-1) for linear guides. With basic dynamic load rating, direction and size do not fluctuate so that rated fatigue life is 100 km. Load rating for NSK Linear Guides™ complies with ISO standards. With the RA series, dynamic load rating is the same in both the vertical and horizontal directions (4-way equal load specs.). Rated fatigue life L is calculated by the following formula when load F is applied to the roller slide in the horizontal or vertical direction only.

Table 4 Load factor fw

Impact and/or vibration	Load factor
No impact and vibration from the outside	1.0 – 1.5
With impact and/or vibration from the outside	1.5 – 2.0
With heavy impact and/or vibration from the outside	2.0 - 3.0

Table 6 Dy	namic eo	quivalent	coefficient
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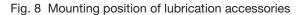
## 5. Lubrication Specifications

#### (1) Mounting position of lubrication accessories

- The standard position of grease fittings and tube fittings is the end face of the roller slide. (Fig. 8) A lubrication hole can be provided on the side or the top face of the end cap or roller slide. Mounting positions are shown in the Figs. 8 and 9, and Tables 7.1 and 7.2.
- For mounting on top of the face of end cap, an O ring is required. For the model AN and BN, two O rings as well as spacers are required.
- When using a piping unit with a thread of  $M6 \times 1$ , a connector is required to connect the piping unit to a grease fitting mounting hole with  $M6 \times 7.5$ . Connectors are available from NSK.

#### (2) Cautions for oil lubrication

- If oil lubrication is used, the oil may not pervade the rolling surface in accordance with the roller slide mounting conditions such as upside down mounting and wall mounting. In these situations, consult with NSK.
- When using an oil mist lubricating system, please confirm how much oil is needed for each outlet port.



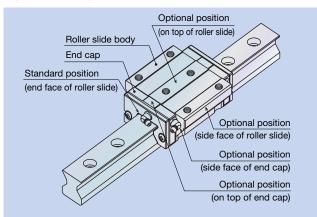
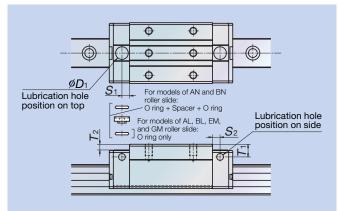


Fig. 9 Top and side lubrication hole positions



Unit: mm

#### Table 7.1 Lubrication hole positions

Table 7.1 Lubrication hole positions							Unit: mm	
Model No.	Roller slide shape code	Grease nipple size	s <sub>2</sub>	<i>T</i> <sub>1</sub>	Spacer	<i>D</i> <sub>1</sub>	s <sub>1</sub>	<i>T</i> <sub>2</sub>
RA15		φ3	4	7	Necessory	8.2	4.4	4.2
RA20		φ3	4	4	_	9.2	5.4	0.2
RA25		M6×0.75	6	10	Necessory	10.2	6	4.5
RA30	AN, BN	M6×0.75	5	10	Necessory	10.2	6	3.5
RA35	AN, DN	M6×0.75	5.5	15	Necessory	10.2	7	7.4
RA45		Rc 1/8	7.2	20	Necessory	10.2	7.2	10.4
RA55		Rc 1/8	7.2	21	Necessory	10.2	7.2	10.4
RA65		Rc 1/8	7.2	19	-	10.2	7.2	0.4

#### Table 7.2 Lubrication hole positions

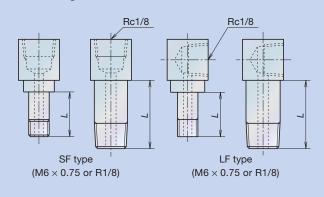
Model No.	Roller slide shape code	Grease nipple size	s <sub>2</sub>	<i>T</i> <sub>1</sub>	D <sub>1</sub>	s <sub>1</sub>	<i>T</i> <sub>2</sub>
RA15	AL, BL, EM, GM	φ3	4	3	8.2	4.4	0.2
RA20	EM, GM	φ3	4	4	9.2	5.4	0.2
RA25		M6×0.75	6	6	10.2	6	0.4
RA30		M6×0.75	5	7	10.2	6	0.4
RA35	AL, BL, EM, GM	M6×0.75	5.5	8	10.2	7	0.4
RA45		Rc 1/8	7.2	10	10.2	7.2	0.4
RA55		Rc 1/8	7.2	11	10.2	7.2	0.4
RA65	EM, GM	Rc 1/8	7.2	19	10.2	7.2	0.4

# Grease fitting

Drive-in type (Ø3) A type (M6  $\times$  0.75 or R1/8)

Fig. 10 Grease fitting and Tube fitting

Tube fitting



B type

C type

Table 8

Unit: mm

Model No.Dust-proof specificationGrease fitting Drive-in typeTube fittingRA15Standard5-RA15With NSK K110-Double seal8-Protector8-Protector8-RA20Standard5-With NSK K110-Double seal8-Protector8-Protector8-Double seal8-Protector8-Protector109Protector109Protector109Protector109Protector1211Protector1211Protector1211Protector1211Protector1211Protector1211Protector1211Protector1211Protector1211Protector1417Protector1417Protector1417Protector1417Protector1417Protector1417				Unit: mm
Induct No.         specification         Thread body length L         Thread body length L           RA15         Standard         5         -           With NSK K1         10         -           Double seal         8         -           Protector         8         -           Protector         8         -           RA20         With NSK K1         10         -           Double seal         8         -           Protector         8         -           Double seal         8         -           Protector         8         -           Protector         10         9           Protector         11         15           Double seal         12         11           Protector         12 </td <td>Madal No.</td> <td>Dust-proof</td> <td></td> <td>Tube fitting</td>	Madal No.	Dust-proof		Tube fitting
BA15         With NSK K1         10         -           Double seal         8         -         -           Protector         8         -         -           Protector         8         -         -           RA20         Standard         5         -           With NSK K1         10         -         -           Double seal         8         -         -           Protector         8         -         -           Double seal         8         -         -           Protector         8         -         -           Double seal         10         9         -           Protector         11         15         -           Double seal         12         11         -           Protector         12         11         -           RA35         Double seal	woder no.			
RA15         Init Horitity         He           Double seal         8         -           Protector         8         -           RA20         Standard         5         -           With NSK K1         10         -         Double seal         8         -           Protector         8         -         -         Double seal         8         -           Protector         8         -         -         Double seal         6         -           RA25         With NSK K1         12         12         12         12         -           Protector         10         9         9         -		Standard	5	_
Double seal         8         -           Protector         8         -           Protector         8         -           RA20         Standard         5         -           With NSK K1         10         -         -           Double seal         8         -         -           Double seal         8         -         -           Protector         8         -         -           Protector         8         -         -           Protector         12         12         12           Double seal         10         9         -           Protector         10         9         -           Protector         10         9         -           Protector         10         9         -           BA30         Standard         5         6           With NSK K1         14         15         -           Double seal         12         11           Protector         12         11           Protector         12         11           Protector         12         11           Protector         14         17     <		With NSK K1	10	_
RA20         Standard         5         -           With NSK K1         10         -         -           Double seal         8         -         -           Protector         8         -         -           Protector         8         -         -           RA25         Standard         5         5           With NSK K1         12         12         12           Double seal         10         9         9           Protector         10         9         9           Protector         10         9         9           RA30         Standard         5         6           With NSK K1         14         15         0           Double seal         12         11         11           Protector         14         17         11           Protector	RAIS	Double seal	8	_
RA20         With NSK K1         10         -           Double seal         8         -           Protector         8         -           RA25         Standard         5         5           With NSK K1         12         12         12           Double seal         10         9         9           Protector         10         9         9           RA30         Standard         5         6           With NSK K1         14         15         0           Double seal         12         11         11           Protector         12         11         14         15           Double seal         12         11         14         15           Double seal         12         11         14         17           Protector         12         11         14         17           Protector         14         17         14		Protector	8	_
RA20         Double seal         8         -           Protector         8         -           Protector         8         -           RA25         Standard         5         5           With NSK K1         12         12         12           Double seal         10         9         9           Protector         10         9         9           Protector         10         9         9           RA30         Standard         5         6           With NSK K1         14         15         0           Double seal         12         11         11           Protector         12         11         11           Protector         12         11         14         15           Double seal         14         17         14         17           RA45         With NSK K1         18         21.5         0           Double seal		Standard	5	_
Double seal         8         -           Protector         8         -           RA25         Standard         5         5           With NSK K1         12         12           Double seal         10         9           Protector         10         9           Protector         10         9           Protector         10         9           Standard         5         6           With NSK K1         14         15           Double seal         12         11           Protector         14         17           Standard         8         17           With NSK K1         18         21.5           Double seal	DAGO	With NSK K1	10	_
Standard         5           RA25         Standard         5         5           With NSK K1         12         12           Double seal         10         9           Protector         10         9           RA30         Standard         5         6           With NSK K1         14         15         0           Double seal         12         11         11           Protector         14         17         11           Protector         14         17         11           Protector         14         17         11           Pr	RA20	Double seal	8	_
RA25         With NSK K1         12         12           Double seal         10         9           Protector         10         9           Protector         10         9           RA30         Standard         5         6           With NSK K1         14         15         0           Double seal         12         11         11           Protector         14         17         11           Protector         14         17         11           RA55         Double seal         14		Protector	8	_
RA25         Double seal         10         9           Protector         10         9           Protector         10         9           RA30         Standard         5         6           With NSK K1         14         15           Double seal         12         11           Protector         14         17           D		Standard	5	5
Double seal         10         9           Protector         10         9           RA30         Standard         5         6           With NSK K1         14         15           Double seal         12         11           Protector         14         17           Double seal	DAGE	With NSK K1	12	12
RA30         Standard         5         6           With NSK K1         14         15           Double seal         12         11           Protector         12         11           Protector         12         11           Standard         5         6           With NSK K1         14         15           Double seal         12         11           Protector         14         17           Double seal	RAZO	Double seal	10	9
RA30         With NSK K1         14         15           Double seal         12         11           Protector         12         11           Protector         12         11           RA35         Standard         5         6           With NSK K1         14         15         0           RA35         With NSK K1         14         15           Double seal         12         11           Protector         14         17           With NSK K1         18         21.5           Double seal         14         17           Protector         14         17           With NSK K1         18         21.5           Double seal         14         17           Protector         14         17           Protector         14         17           Protector         14         17           Double seal <t< td=""><td></td><td>Protector</td><td>10</td><td>9</td></t<>		Protector	10	9
RA30         Double seal         12         11           Protector         12         11           Protector         12         11           Standard         5         6           With NSK K1         14         15           Double seal         12         11           Protector         14         17           Ouble seal		Standard	5	6
Double seal         12         11           Protector         12         11           Protector         12         11           Standard         5         6           With NSK K1         14         15           Double seal         12         11           Protector         12         11           Protector         12         11           Protector         12         11           Protector         12         11           Vith NSK K1         18         21.5           Double seal         14         17           Protector         14         17           Protector         14         17           Protector         14         17           Protector         14         17           Standard         8         17           With NSK K1         18         21.5           Double seal         14         17           Protector         14         17           Protector         14         17           Protector         14         17           Double seal         14         17           With NSK K1         2	DAGO	With NSK K1	14	15
Standard         5         6           RA35         Standard         5         6           With NSK K1         14         15           Double seal         12         11           Protector         12         11           Protector         12         11           Vith NSK K1         18         21.5           Double seal         14         17           Protector         14         17           Standard         8         17           With NSK K1         18         21.5           Double seal         14         17           Protector         14         17           Standard         8         17           With NSK K1         20         20           Double seal         14         17           With NSK K1         20         20           Double seal         14         17	RA30	Double seal	12	11
RA35         With NSK K1         14         15           Double seal         12         11           Protector         12         11           Protector         12         11           Standard         8         17           With NSK K1         18         21.5           Double seal         14         17           Protector         14         17           Protector         14         17           Vith NSK K1         18         21.5           Double seal         14         17           Protector         14         17           Protector         14         17           Standard         8         17           With NSK K1         18         21.5           Double seal         14         17           Protector         14         17           Standard         8         17           With NSK K1         20         20           Double seal         14         17		Protector	12	11
RA35         Double seal         12         11           Protector         12         11           Protector         12         11           Standard         8         17           With NSK K1         18         21.5           Double seal         14         17           Protector         14         17           Protector         14         17           Standard         8         17           With NSK K1         18         21.5           Double seal         14         17           Protector         14         17           Protector         14         17           Standard         8         17           Protector         14         17           Protector         14         17           Standard         8         17           With NSK K1         20         20           Double seal         14         17           Standard         8         17           With NSK K1         20         20           Double seal         14         17		Standard	5	6
Double seal         12         11           Protector         12         11           Protector         12         11           Standard         8         17           With NSK K1         18         21.5           Double seal         14         17           Protector         14         17           Protector         14         17           Vith NSK K1         18         21.5           Double seal         14         17           Protector         14         17           Standard         8         17           With NSK K1         18         21.5           Double seal         14         17           Protector         14         17           Standard         8         17           With NSK K1         20         20           Double seal         14         17           With NSK K1         20         20           Double seal         14         17	DAGE	With NSK K1	14	15
Standard         8         17           RA45         Standard         8         17           With NSK K1         18         21.5           Double seal         14         17           Protector         14         17           Standard         8         17           With NSK K1         18         21.5           Double seal         14         17           Vith NSK K1         18         21.5           Double seal         14         17           Protector         14         17           Standard         8         17           With NSK K1         18         21.5           Double seal         14         17           Standard         8         17           With NSK K1         20         20           Double seal         14         17	RASS	Double seal	12	11
RA45         With NSK K1         18         21.5           Double seal         14         17           Protector         14         17           Standard         8         17           With NSK K1         18         21.5           Double seal         14         17           With NSK K1         18         21.5           Double seal         14         17           Protector         14         17           Protector         14         17           Standard         8         17           With NSK K1         20         20           Double seal         14         17		Protector	12	11
RA45         Double seal         14         17           Protector         14         17           Protector         14         17           Standard         8         17           With NSK K1         18         21.5           Double seal         14         17           Protector         14         17           Standard         8         17           Protector         14         17           Standard         8         17           With NSK K1         20         20           Double seal         14         17		Standard	8	17
Double seal         14         17           Protector         14         17           Standard         8         17           With NSK K1         18         21.5           Double seal         14         17           Protector         14         17           Standard         8         17           With NSK K1         18         21.5           Double seal         14         17           Protector         14         17           Standard         8         17           With NSK K1         20         20           Double seal         14         17		With NSK K1	18	21.5
Standard         8         17           RA55         Standard         8         17           With NSK K1         18         21.5           Double seal         14         17           Protector         14         17           Standard         8         17           With NSK K1         20         20           Double seal         14         17	RA45	Double seal	14	17
RA55         With NSK K1         18         21.5           Double seal         14         17           Protector         14         17           Standard         8         17           With NSK K1         20         20           Double seal         14         17		Protector	14	17
Double seal         14         17           Protector         14         17           Standard         8         17           With NSK K1         20         20           Double seal         14         17		Standard	8	17
Double seal         14         17           Protector         14         17           Standard         8         17           With NSK K1         20         20           Double seal         14         17		With NSK K1	18	21.5
Standard         8         17           With NSK K1         20         20           Double seal         14         17	RADD	Double seal	14	17
RA65         With NSK K1         20         20           Double seal         14         17		Protector	14	17
RA65 Double seal 14 17		Standard	8	17
Double seal 14 17	DAGE	With NSK K1	20	20
Protector 14 17	RAOD	Double seal	14	17
		Protector	14	17

#### 6. Dust-proof

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.

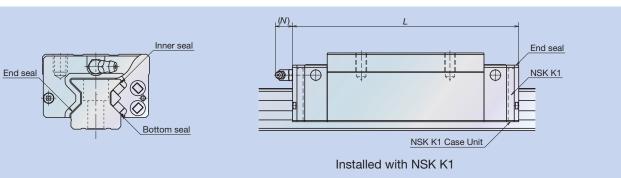
For severe usage conditions, optional rail covers are available. Contact NSK for information on how to mount the cover. The linear guide can also be equipped with a lubrication unit NSK K1 that has already proven its effectiveness with other NSK Linear Guides.

#### Table 9 Optional parts for dust-proofing

Name	Objective
NSK K1	Porous part containing oil enhances lubrication function.
Double seal	Sealing effect is enhanced by using pairs of side seals.
Protector	Removes large dust particles and protects side seals from hot and hard dust particles.
Rail cover**	Covers top of rail to prevent foreign matter from getting in the rail mounting holes.
Bolt hole cap	Prevents foreign matter such as cutting dust from collecting in the rail mounting holes.

\* Inner seals for RA15 and RA20 are available as options. \*\* Rail cover is applicable to RA25 to RA65.

#### Fig. 12 View of the roller slide equipped with the dust-proof parts



#### Table 10 Dimensions of roller slide assembly equipped with the optional parts

		Roller slide length					
Model No.	Roller slide shape code	Standard roller slide length	Roller slide length installed with NSK K1	Roller slide length installed with protector	Roller slide length installed with double seal		
	AN, AL, EM	70	79	75.4	76		
RA15	BN, BL, GM	85.4	94.4	90.8	91.4		
RA20	AN, EM	86.5	95.5	93.1	92.5		
TIA20	BN, GM	106.3	115.3	112.9	112.3		
RA25	AN, AL, EM	97.5	107.5	104.1	103.9		
na23	BN, BL, GM	115.5	125.5	122.1	121.9		
RA30	AN, AL, EM	110.8	122.8	118	117.6		
11430	BN, BL, GM	135.4	147.4	142.6	142.2		
RA35	AN, AL, EM	123.8	136.8	131	130.6		
najj	BN, BL, GM	152	165	159.2	158.8		
RA45	AN, AL, EM	154	168	162.4	162		
nA43	BN, BL, GM	190	204	198.4	198		
RA55	AN, AL, EM	184	198	192.4	192		
TA33	BN, BL, GM	234	248	242.4	242		
RA65	AN, EM	228.4	243.4	239.4	238.4		
11405	BN, GM	302.5	317.5	313.5	312.5		

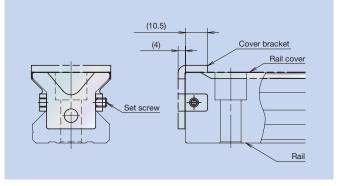
Above dimensions are for the assembly length of a roller slide equipped with one of the optional dust-proof parts on each end. Please consult with NSK for the dimensions when more than one kind of optional parts are used.

#### Fig. 11 Rail cover





#### Fig. 13 End configuration of rail equipped with the rail cover



#### Table 11 Height of rails equipped with rail cover

Model No.	Standard rail height $H_1$	Rail height installed with rail cover
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

#### Table 12 Cap to plug rail mounting bolt hole

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

When the rail cover is used, use the cover bracket to secure the rail cover. Fig. 13 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 11.

Bolt size for rail mounting and cap reference number are shown in Table 12.

## 7. Installation

#### (1) Mounting tolerance

Mounting tolerance results in harmful effects such as shortened operating life, deterioration in motion accuracy, and friction variation.

NSK particularly focuses on operating life, and sets an operating life value of more than 10 000 km calculated under the following conditions as mounting tolerance:

- The load per roller slide is 10% of basic dynamic load rating *C*.
- The rigidity of machine is infinite.

The tolerance in Fig. 14 is shown in the Table 13 as typical tolerance.

#### Fig. 14 Mounting tolerance

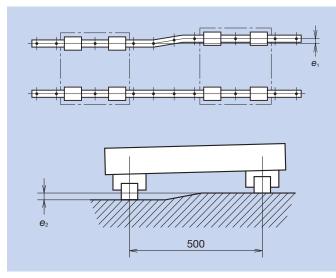


Table 13 Mounting tolerance of RA series

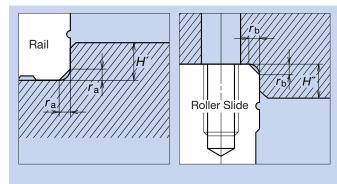
Model No.	Parallelism tolerance of two roller guides <i>e</i> <sub>1</sub>	Height tolerance of two roller guides $e_2$
RA15	5	
RA20	7	
RA25	9	
RA30	11	150 µm / 500 mm
RA35	13	
RA45	17	
RA55	19	
RA65	30	

Unit: µm

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

When using the shoulders, which rise perpendicularly to the mounting surface, for accurate installation of a roller guide, refer to Fig. 15 and Table 14 for the dimensions.

#### Fig. 15 Datum face of roller guide and shoulder



	houlder height attachment	and corner	radius	Unit: mm		
Model No.	Shoulde	er Height	Chamfer (	maximum)		
Model No.	Η΄	Н″	r <sub>a</sub>	r <sub>b</sub>		
RA15	3	4	0.5	0.5		
RA20	4	5	0.5	0.5		
RA25	4	5	0.5	1.0		
RA30	5	6	1.0	1.0		
RA35	5	6	1.0	1.0		
RA45	6	8	1.5	1.0		
RA55	7	10	1.5	1.5		
RA65	11	11	1.5	1.5		

#### 8. Maximum rail length

Table15 shows the limitations of rail length. However, the limitations vary by accuracy grades.

Table 15 Length limitation of rails

Table 15 Length lir	nitation of rail	ls						Unit: mm
Size	RA15	RA20	RA25	RA30	RA35	RA45	RA55	RA65
Length	2 000	3 000	3 000	3 500	3 500	3 500	3 500	3 500

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

① Operating temperature limits should normally be less than 80°C.

the unit in a location exposed to white kerosene or rust prevention oil containing white kerosene.

③ When transferring the roller slide onto the rail, or vice versa:

- Do not remove an unnecessary roller slide from the rail as much as you can.
- Use the provided provisional rail to prevent dents or scratches on the raceways caused by the roller slide that is jammed into the one from the other. It also prevents the rollers from dropping.
- When transferring the roller slide onto the rail, or vice versa, butt the provisional rail up against the rail and slide it directly from one onto the other.
- Use a clean provisional rail. Do not use the provisional rail that is contaminated with particles or uses different grease from that of the relevant roller slide.

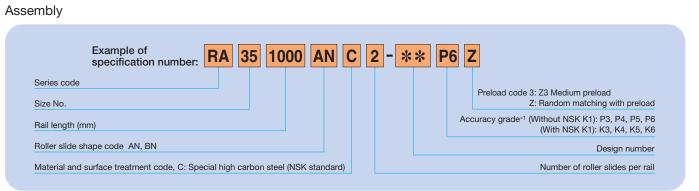
#### **Handling Precautions**

② If using NSK K1<sup>™</sup>, service temperature should not exceed 50°C (or 80°C instantaneously). Make sure the unit does not come in contact with organic solvents with that can be used for degreasing. Do not place



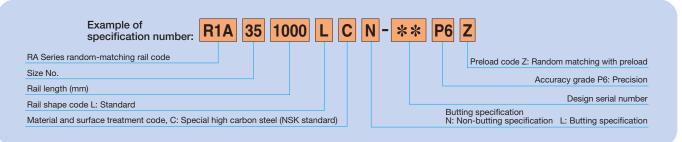
## Square type (tapped mounting holes)

RA-AN (High-load type/standard), RA-BN (Super-high-load type/long)

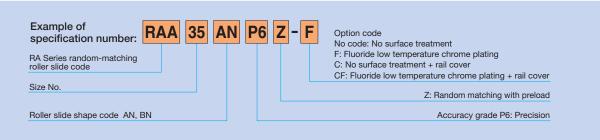


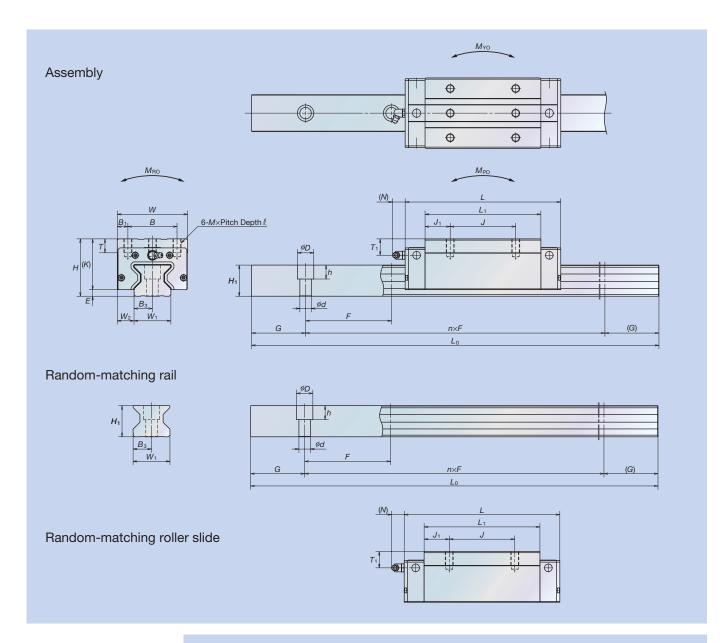
\*1 Only P6 and K6 grades are available for the random-matching type.

#### Random-matching rail



#### Random-matching roller slide





The basic load rating complies with
If the above basic dynamic load rati
$C_{50 \text{ km}} = 1.23 \times C_{100 \text{ km}}$

	A	ssembl	у					Roller s	lide											Rail					Ba	sic load rati	ng		Weig	ght
Model No.	Height			Width	Length		Moun	ting hole						Grease f	fitting		Rail width	Rail height	Bolt pitch	Bolt hole		G	Maximum length	Dynamic	Static	Stati	c moment (N	l∙m)	Roller slide	Rail
	Н	Е	W2	W	L	В	J	$M \times \text{Pitch} \times \ell$	<i>B</i> <sub>1</sub>	L <sub>1</sub>	$J_1$	K	Т	Mounting hole	<i>T</i> <sub>1</sub>	Ν	<i>W</i> <sub>1</sub>	H <sub>1</sub>	F	d×D×h	B <sub>3</sub>	(recommended)	$L_{0max}$	C (N)	C <sub>0</sub> (N)	$M_{\rm R0}$	M <sub>P0</sub>	M <sub>Y0</sub>	(kg)	(kg/m)
RA15AN RA15BN	28	4	9.5	34	70 85.4	26	26	M4×0.7×6	4	44.8 60.2	9.4 17.1	24	8	φ3	8	3	15	16.3	60 (30)	4.5×7.5×5.3	7.5	20	2 000	10 300 13 000	27 500 37 000	260 350	210 375	210 375	0.21 0.30	1.6
RA20AN RA20BN	30	5	12	44	86.5 106.3	32	36 50	M5×0.8×6	6	57.5 77.3	10.75 13.65	25	12	фЗ	4	3	20	20.8	60 (30)	6×9.5×8.5	10	20	3 000	19 200 24 000	52 500 70 000	665 890	505 900	505 900	0.38 0.50	2.6
RA25AN RA25BN	40	5	12.5	48	97.5 115.5	35	35 50	M6×1×9	6.5	65.5 83.5	15.25 16.75	35	12	<i>M</i> 6×0.75	10	11	23	24	30	7×11×9	11.5	20	3 000	29 200 35 400	72 700 92 900	970 1 240	760 1 240	760 1 240	0.60 0.91	3.4
RA30AN RA30BN	45	6.5	16	60	110.8 135.4	40	40 60	M8×1.25×11	10	74 98.6	17 19.3	38.5	14	<i>M</i> 6×0.75	10	11	28	28	40	9×14×12	14	20	3 500	38 900 47 600	93 500 121 000	1 670 2 170	1 140 1 950	1 140 1 950	1.0 1.3	4.9
RA35AN RA35BN	55	6.5	18	70	123.8 152	50	50 72	M8×1.25×12	10	83.2 111.4	16.6 19.7	48.5	15	<i>M</i> 6×0.75	15	11	34	31	40	9×14×12	17	20	3 500	53 300 67 400	129 000 175 000	2 810 3 810	1 800 3 250	1 800 3 250	1.6 2.1	6.8
RA45AN RA45BN	70	8	20.5	86	154 190	60	60 80	M10×1.5×17	13	105.4 141.4	22.7 30.7	62	17	<i>R</i> <sub>C</sub> 1/8	20	14	45	38	52.5	14×20×17	22.5	22.5	3 500	92 800 116 000	229 000 305 000	6 180 8 240	4 080 7 150	4 080 7 150	3.0 4.1	10.9
RA55AN RA55BN	80	9	23.5	100	184 234	75	75 95	M12×1.75×18	12.5	128 178	26.5 41.5	71	18	<i>R</i> <sub>C</sub> 1/8	21	14	53	43.5	60	16×23×20	26.5	30	3 500	129 000 168 000	330 000 462 000	10 200 14 300	7 060 13 600	7 060 13 600	4.9 6.7	14.6
RA65AN RA65BN	90	13	31.5	126	228.4 302.5	76	70 120	M16×2×20	25	155.4 229.5	42.7 54.75	77	22	<i>R</i> <sub>C</sub> 1/8	19	14	63	55	75	18×26×22	31.5	35	3 500	210 000 288 000	504 000 756 000	19 200 28 700	12 700 28 600	12 700 28 600	9.3 12.2	22.0

\* Select either one of two F dimensions, the standard or the parenthesized semi-standard dimensions, for the pitch of rail fixing bolt holes. If not specified, the standard dimension of F is applied.

\* The random-matching type is available for the model of RA25 to RA65.

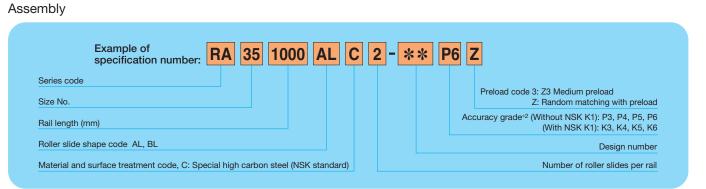
15 **NSK** 

## **Roller Guide RA Series**

h ISO standards (ISO14728-1, ISO14728-2). ting (100 km rating) is converted into 50 km rating, use the following formula:

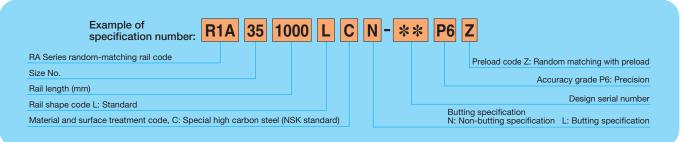
• Rails can be butted if user requirement exceeds the rail length shown above. please consult NSK.

## Low profile type (tapped mounting holes) RA-AL (High-load type/standard), RA-BL (Super-high-load type/long)

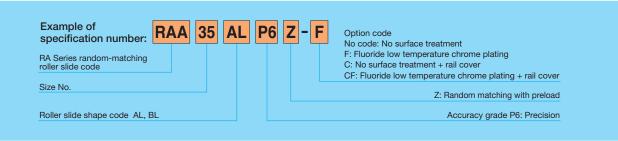


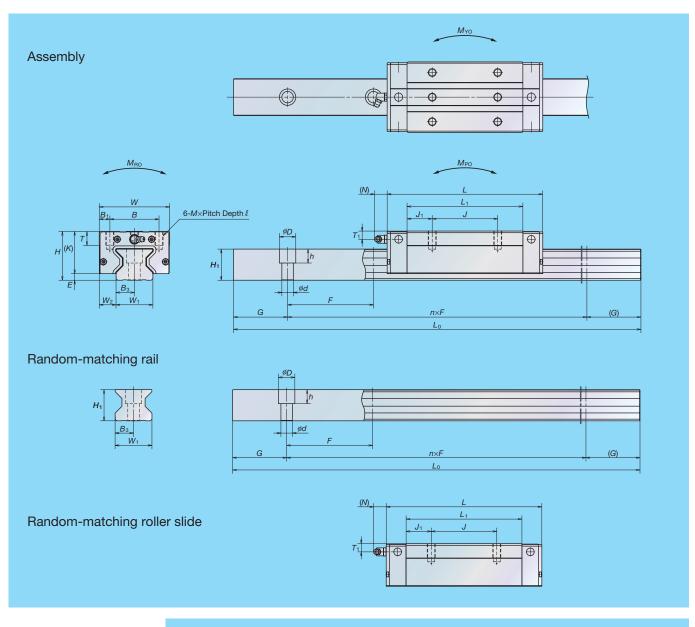
\*1 Only P6 and K6 grades are available for the random-matching type.

#### Random-matching rail



#### Random-matching roller slide





The bas	ic load rating complies with
If the ab	ove basic dynamic load rati
$C_{50 \text{ km}} = 1$	.23 × C <sub>100 km</sub>

	A	Assemb	ly					Roller s	lide										Rail					Ba	sic load rati	ng		Wei	ight
Model No.	Height			Width	Length		Mount	ting hole						Grease f	itting	Rail width	Rail height	Bolt pitch	Bolt hole		G	Maximum length	Dynamic	Static	Stati	c moment (I	N∙m)	Roller slide	Rail
	H	E	W <sub>2</sub>	W	L	В	J	M × Pitch× ℓ	<i>B</i> <sub>1</sub>	L <sub>1</sub>	$J_1$	ĸ	Т	Mounting hole	$T_1 \mid N$	<i>W</i> <sub>1</sub>	H <sub>1</sub>	F	$d \times D \times h$	B <sub>3</sub>	(recommended		C (N)	C <sub>0</sub> (N)	$M_{\rm R0}$	M <sub>P0</sub>	M <sub>Y0</sub>	(kg)	(kg/m)
RA15AL	0.1	4	0.5	0.4	70	00	00		4	44.8	9.4	20	0	10	1 3	10	10.0	60		7.5	00	0.000	10 300	27 500	260	210	210	0.17	10
RA15BL	24	4	9.5	34	85.4	26	26	M4×0.7×5.5	4	60.2	17.1	20	8	φ3	4 3	15	16.3	(30)	4.5×7.5×5.3	7.5	20	2 000	13 000	37 000	350	375	375	0.25	1.6
RA25AL	36	F	12.5	48	97.5	35	35	M6×1×8	6.5	65.5	15.25	01	10	<i>M</i> 6×0.75	6 11	23	24	30	7×11×9	44.5	20	2 000	29 200	72 700	970	760	760	0.45	3.4
RA25BL	30	5	12.5	48	115.5	35	50	11/10×1×8	0.5	83.5	16.75	31	12	IVI0×0.75	0 11	23	24	30	/ * 11×9	11.5	20	3 000	35 400	92 900	1 240	1 240	1 240	0.80	3.4
RA30AL	42	C F	10		110.8	10	40	Mout OFult	10	74	17		- 1 4	MCNO 75	7 11	28		10	0.414.410	14	20	2 5 0 0	38 900	93 500	1 670	1 140	1 140	0.85	4.9
RA30BL	42	6.5	10	60	135.4	40	60	M8×1.25×11	10	98.6	19.3	35.5	14	<i>M</i> 6×0.75	/   11	28	28	40	9×14×12	14	20	3 500	47 600	121 000	2 170	1 950	1 950	1.1	4.9
RA35AL	40	0.5	10	70	123.8	50	50	M01 0510	10	83.2	16.6	44 5	4.5	M0.075	8 11	34	01	10	01410	17	00	0.500	53 300	129 000	2 810	1 800	1 800	1.2	0.0
RA35BL	48	6.5	18	70	152	50	72	M8×1.25×12	10	111.4	19.7	41.5	15	<i>M</i> 6×0.75	8 11	34	31	40	9×14×12	17	20	3 500	67 400	175 000	3 810	3 250	3 250	1.7	6.8
RA45AL		0	00 5	00	154		60		10	105.4	22.7	50	17	D 1/0	10 14	45	00	505	14.00.17	00.5	00 F	0.500	92 800	229 000	6 180	4 080	4 080	2.5	10.0
RA45BL	60	8	20.5	86	190	60	80	M10×1.5×16	13	141.4	30.7	52	17	<i>R</i> <sub>C</sub> 1/8	10 14	45	38	52.5	14×20×17	22.5	22.5	3 500	116 000	305 000	8 240	7 150	7 150	3.4	10.9
RA55AL	70	0	00 F	100	184	75	75	M12×1.75×18	10.5	128	26.5	61	10	D 1/0	11 14	50	43.5	00	10100100	26.5	20	2 500	129 000	330 000	10 200	7 060	7 060	4.1	14.6
RA55BL	70	9	23.5	100	234	/5	95	W12×1.75×18	12.5	178	41.5	01	18	R <sub>C</sub> 1/8	11   14	53	43.5	60	16×23×20	20.5	30	3 500	168 000	462 000	14 300	13 600	13 600	5.7	14.6

\* Select either one of two F dimensions, the standard or the parenthesized semi-standard dimensions, for the pitch of rail fixing bolt holes.

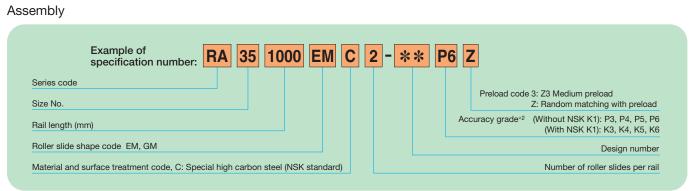
If not specified, the standard dimension of F is applied. \* The random-matching type is available for the model of RA25 to RA65.

## **Roller Guide RA Series**

h ISO standards (ISO14728-1, ISO14728-2). ting (100 km rating) is converted into 50 km rating, use the following formula:

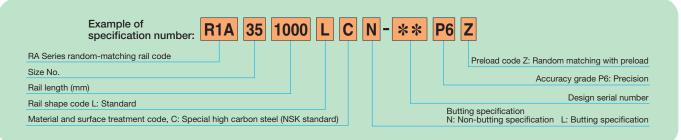
Rails can be butted if user requirement exceeds the rail length shown above. please consult NSK.

## Flange type (for both tapped and bolt mounting holes) RA-EM (High-load type/standard), RA-GM (Super-high-load type/long)

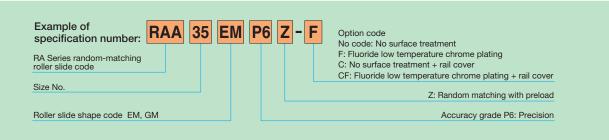


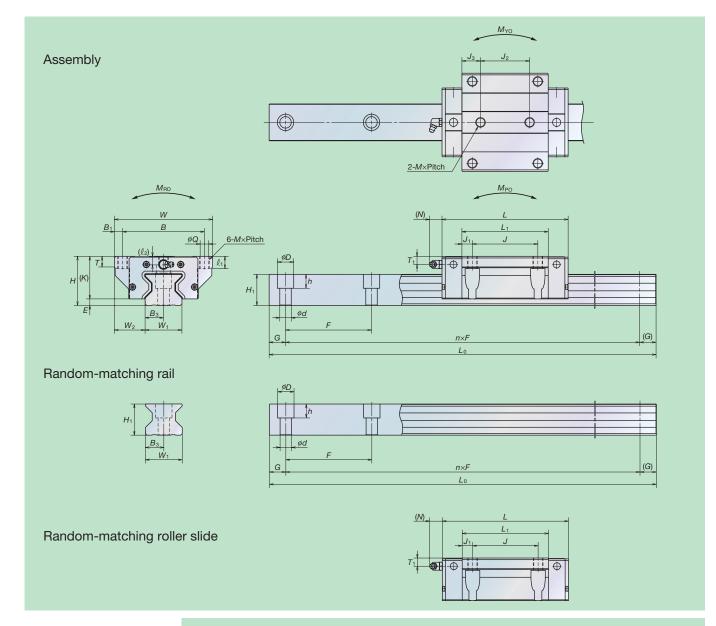
\*1 Only P6 and K6 grades are available for the random-matching type.

#### Random-matching rail



#### Random-matching roller slide





## $C_{50 \text{ km}} = 1.23 \times C_{100 \text{ km}}$

		Assem	bly				Roller slide																Rail					Basic	c load rat	ing		Weigh	nt
Model No.	Heigh	nt		Wid	th Length	1			Mounting hole								Grease fi	tting		Rail width	Rail height	Bolt pitch	Bolt hole		G	Maximum length	Dynamic	Static	Static	moment	(N•m)	Roller slide	Rail
	Н	E	W <sub>2</sub>	W		В	J	$J_2$	$M \times \text{Pitch} \times \ell_1(\ell_2)$	$Q \times l_1(l_2)$	<i>B</i> <sub>1</sub>	L <sub>1</sub>	$J_1$	$J_3$	K	T	Mounting hole	<i>T</i> <sub>1</sub>	N	$W_1$	H <sub>1</sub>	F	d×D×h	B <sub>3</sub>	(recommended)	L <sub>0max</sub>	C (N)	C <sub>0</sub> (N)	$M_{\rm R0}$	$M_{\rm P0}$	$M_{ m Y0}$	(kg)	(kg/m)
RA15EM RA15GM	24	4	16	47	7 70 85.4	38	30	26	M5×0.8×8.5 (6.5)	4.4×8.5 (6.5)	4.5	44.8 60.2	7.4 15.1	9.4 17.1	20	8	φ3	4	3	15	16.3	60 (30)	4.5×7.5×5.3	7.5	20	2 000	10 300 13 000	27 500 37 000	260 350	210 375	210 375	0.21 0.28	1.6
RA20EM RA20GM	30	5	21.5	63	3 86.5 106.3	53	40	35	<i>M</i> 6×1×9.5 (8)	5.3×9.5 (8)	5	57.5 77.3	8.75 18.65	11.25 21.15	25	10	φ3	4	3	20	20.8	60 (30)	6×9.5×8.5	10	20	3 000	19 200 24 000	52 500 70 000	665 890	505 900	505 900	0.45 0.65	2.6
RA25EM RA25GM	36	5	23.5	70	0 97.5 115.5		45	40	M8×1.25×10(11)	6.8×10(11)	6.5	65.5 83.5		12.75 21.75	31	11	<i>M</i> 6×0.75	6	11	23	24	30	7x11x9	11.5	20	3 000	29 200 35 400	72 700 92 900	970 1 240	760 1 240	760 1 240	0.80 1.1	3.4
RA30EM RA30GM	42	6.5	31	90	0 110.8 135.4		52	44	M10×1.5×12 (12.5)	8.6×12 (12.5)	9	74 98.6	11 23.3	15 27.3	35.5	11	<i>M</i> 6×0.75	7	11	28	28	40	9×14×12	14	20	3 500	38 900 47 600	93 500 121 000	1 670 2 170	1 140 1 950	1 140 1 950	1.3 1.7	4.9
RA35EM RA35GM	48	6.5	33	100	0 123.8 152	82	62	52	M10×1.5×13 (7)	8.6×13 (7)	9	83.2 111.4	10.6 24.7	15.6 29.7	41.5	12	<i>M</i> 6×0.75	8	11	34	31	40	9×14×12	17	20	3 500	53 300 67 400	129 000 175 000	2 810 3 810	1 800 3 250	1 800 3 250	1.7 2.3	6.8
RA45EM RA45GM	60	8	37.5	120	0 154 190	100	80	60	M12×1.75×15 (10.5)	10.5×15 (10.5)	10	105.4 141.4	12.7 30.7	22.7 40.7	52	13	<i>R</i> <sub>C</sub> 1/8	10	14	45	38	52.5	14×20×17	22.5	22.5	3 500	92 800 116 000	229 000 305 000	6 180 8 240	4 080 7 150	4 080 7 150	3.2 4.3	10.9
RA55EM RA55GM	70	9	43.5	14(	0 184 234	116	95	70	M14×2×18 (13)	12.5×18 (13)	12	128 178	16.5 41.5	29 54	61	15	<i>R</i> <sub>C</sub> 1/8	11	14	53	43.5	60	16×23×20	26.5	30	3 500	129 000 168 000	330 000 462 000	10 200 14 300	7 060 13 600	7 060 13 600	5.4 7.5	14.6
RA65EM RA65GM	90	13	53.5	17(	0 228.4 302.5	1 1/12	110	82	M16×2×24 (18.5)	14.6×24 (18.5)	14		22.7 59.75	36.7 73.75	77	22	<i>R</i> <sub>C</sub> 1/8	19	14	63	55	75	18×26×22	31.5	35	3 500	210 000 288 000	504 000 756 000	19 200 28 700	12 700 28 600		12.2 16.5	22.0

\* Select either one of two F dimensions, the standard or the parenthesized semi-standard dimensions, for the pitch of rail fixing bolt holes. If not specified, the standard dimension of F is applied.

\* The random-matching type is available for the model of RA25 to RA65.

## **Roller Guide RA Series**

The basic load rating complies with ISO standards (ISO14728-1, ISO14728-2). If the above basic dynamic load rating (100 km rating) is converted into 50 km rating, use the following formula:

• Rails can be butted if user requirement exceeds the rail length shown above. please consult NSK.



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