

A-5-4.1 HA Series



(1) Features

1. High motion accuracy

High motion accuracy is achieved in both narrow and wide ranges by adopting ultra-long ball slides and optimum design features for the ball recirculation component.

2. Ball passage vibration reduced to one-third of our conventional models

Tests show ball passage vibration has been reduced to one-third of our conventional models, dramatically improving straightness in table unit.

3. Installation of rail with greater accuracy

Increased counterbore depth of the rail mounting hole reduces rail deflection, which is caused by bolt tightening when fixing the rail to the base component, to 50% or less. This feature restrains the pitching motion of ball slide whose frequency matches to the mounting hole pitch.

In addition, the length of mounting hole pitch has been reduced by one-half of the conventional models, so the rail can be more accurately installed in position.

4. High rigidity and load capacity with lower friction

High rigidity, high load capacity and low friction are achieved by increasing the number of balls.

5. Compact design

Reduced body size enables more compact machinery.

6. Load distribution four directions

Contact angle is set at 45 degrees in all grooves, dispersing the load to four rows irrespective of load direction. This realizes equal rigidity and load carrying capacity in vertical and lateral directions and provides well-balanced design.

7. Strong against shock load

Load from any direction, vertical and lateral,

is received by four rows at all times. The number of the row which receives the load is larger than in other linear guides, making this series stronger against shock load.

8. High accuracy at manufacturing

Fixing the measuring rollers is easy thanks to the Gothic arch groove. Ball-groove measuring is accurate and simple. This benefits a highly precise and stable manufacturing.

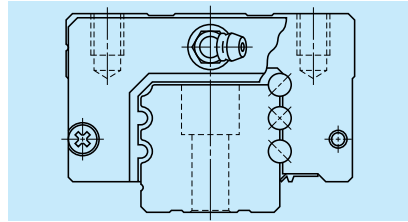


Fig. 1 HA Series

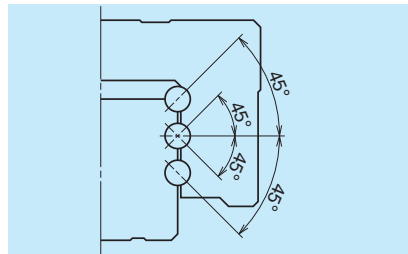


Fig. 2 Super rigidity design

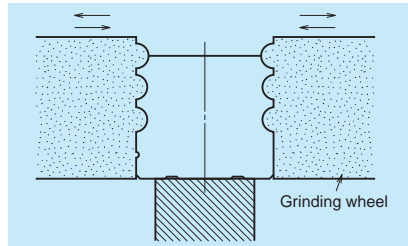


Fig. 3 Rail grinding

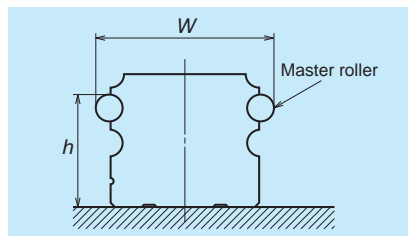


Fig. 4 Measuring groove accuracy

Measurement results of ball passage vibration

Ball passage vibration can translate into posture changes in the ball slide which result from ball passage (circulation). In the HA Series, this vibration has been substantially reduced to one-third of conventional models.

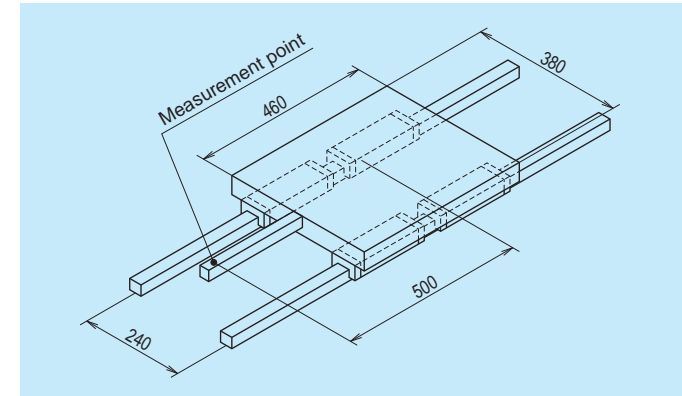
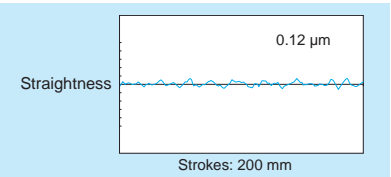
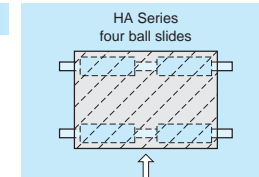


Fig. 5 Schematic view of measurement of ball passage vibration

HA Series

Model No.: HA30
Preload: Z3
Table dimensions: 460 mm x 380 mm



The same table is used.

Conventional Series

Model No.: LA30
Preload: Z3
Table dimensions: 460 mm x 380 mm

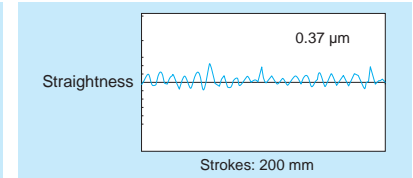
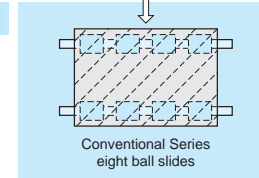


Fig. 6 Measurement results of HA Series and conventional Series

(2) Ball slide shape

Ball slide Model	Shape/installation method	Type
AN		
AL		
EM		

(3) Accuracy and preload

1. Running parallelism of ball slide

Table 1 Unit: μm

Rail over all length (mm) over or less	Preloaded assembly		
	Ultra precision P3	Super precision P4	High precision P5
- 200	2	2	4
200 - 250	2	2.5	5
250 - 315	2	2.5	5
315 - 400	2	3	6
400 - 500	2	3	6
500 - 630	2	3.5	7
630 - 800	2	4.5	8
800 - 1 000	2.5	5	9
1 000 - 1 250	3	6	10
1 250 - 1 600	4	7	11
1 600 - 2 000	4.5	8	13
2 000 - 2 500	5	10	15
2 500 - 3 150	6	11	17
3 150 - 4 000	9	16	23

2. Accuracy standard

Three accuracy grades are available: Ultra precision P3, Super precision P4 and High precision P5.

Table 2 Unit: μm

Characteristics	Ultra precision P3	Super precision P4	High precision P5
Mounting height H	± 10	± 10	± 20
Variation of H (All ball slides on a set of rails)	3	5	7
Mounting width W_2 or W_3	± 15	± 15	± 25
Variation of W_2 or W_3 (All ball slides on reference rail)	3	7	10
Running parallelism of face C to face A Running parallelism of face D to face B	Refer to Table 1 and Fig. 7		

3. Assembled accuracy

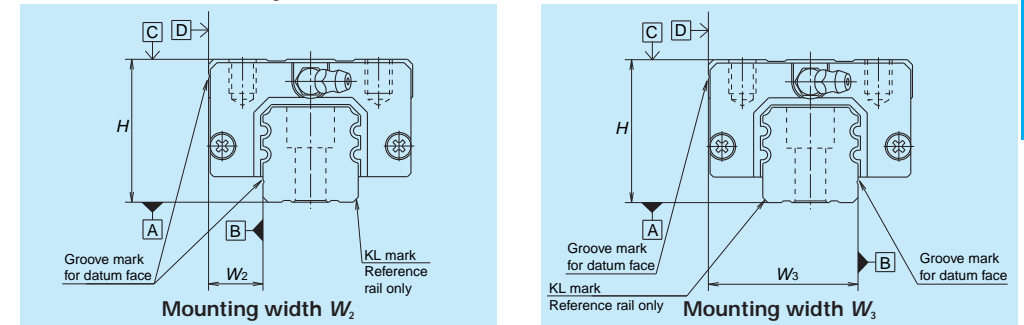


Fig. 7

4. Preload and rigidity

Slight preload Z1 and medium preload Z3 are available for preload, which can be selected for specific applications.

Table 3

Model No	Preload (N)		Rigidity (N/ μm)	
	Slight preload (Z1)	Medium preload (Z3)	Slight preload (Z1)	Medium preload (Z3)
HA25	735	2 990	635	1 030
HA30	1 030	4 400	880	1 270
HA35	1 470	6 100	1 030	1 620
HA45	1 960	8 150	1 230	2 060
HA55	3 150	13 100	1 520	2 450

(4) Available length of rail

Table 4 shows the limitations of rail length (maximum length). However, the limitations vary by accuracy grade.

Table 4 Unit: mm

Series	Size	25	30	35	45	55
HA		3960	4000	4000	3990	3960

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

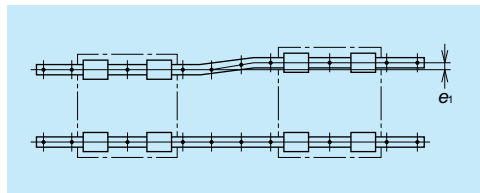


Fig. 8

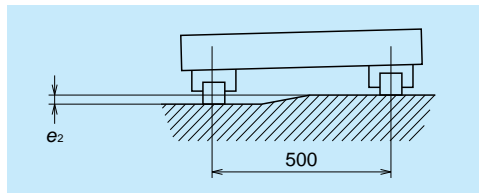


Fig. 9

Table 5

Unit: μm

Value	Preload	Model No.				
		HA25	HA30	HA35	HA45	HA55
Permissible values of parallelism in two rails e_1	Z1	20	20	23	26	34
	Z3	15	14	17	19	25
Permissible values of parallelism (height) in two rails e_2	Z1,Z3	250 μm /500 mm				

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

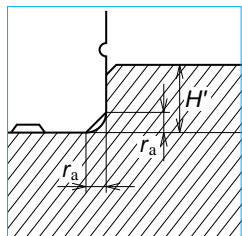


Fig. 10 Shoulder for the rail datum face

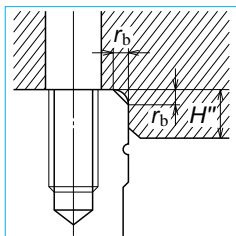


Fig. 11 Shoulder for the ball slide datum face

Table 6

Unit: mm

Model No.	Corner radius (maximum)		Shoulder height	
	r_a	r_b	H'	H''
HA25	0.5	0.5	5	5
HA30	0.5	0.5	6	6
HA35	0.5	0.5	6	6
HA45	0.7	0.7	8	8
HA55	0.7	0.7	10	10

(6) Lubrication components

Refer to Page A38 and D13 for linear guide lubrication.

1. Types of lubrication accessories

Figure 12 and Table 7 show grease fittings and tube fittings.

We provide lubrication accessories with extended thread body length (L) for the addition of dust proof accessories such as NSK K1 lubrication unit, double seal and protector.

We provide a suitable lubrication accessory for the special requirement on dust proof accessories.

Consult NSK for a lubrication accessory with extended length of thread body for your convenience of replenishing lubricant.

Please ask NSK for stainless lubrication accessories.

2. Mounting position of lubrication accessories

The standard position of grease fittings is the end face of ball slide. We mount them on a side of end cap for an option.

Please consult NSK for installation of grease or tube fittings to the ball slide body or side of end cap.

When using a piping unit with thread of M6 \times 1, you require a connector to connect to a grease fitting mounting hole with M6 \times 0.75. The connector is available from NSK.

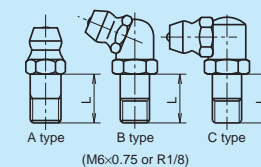
Table 7

Unit: mm

Model No.	Dust-proof specification	Grease fitting	Tube fitting
		Thread body length L	Thread body length L
HA25	Standard	5	6*
	With NSK K1	14	13*
	Double seal	10	9*
	Protector	10	9*
HA30	Standard	5	6
	With NSK K1	14	13
	Double seal	12	11
	Protector	12	11
HA35	Standard	5	6
	With NSK K1	14	13
	Double seal	12	11
	Protector	12	11
HA45	Standard	8	17
	With NSK K1	18	21.5
	Double seal	14	17
	Protector	14	17
HA55	Standard	8	17
	With NSK K1	18	21.5
	Double seal	14	17
	Protector	14	17

*) The ball slide shape is only for AN.

Grease fitting



Tube fitting

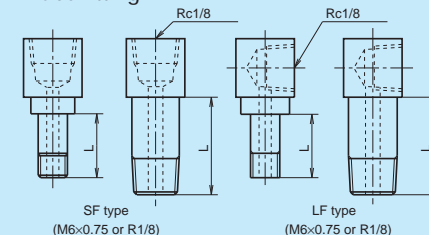


Fig. 12 Grease fitting and tube fitting

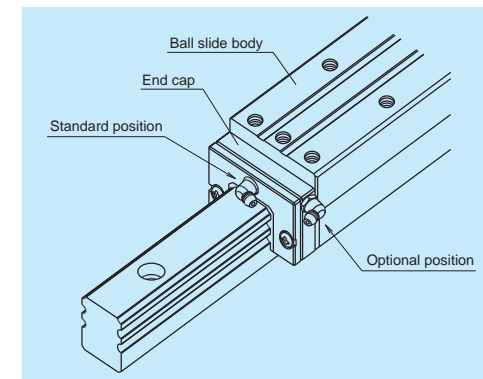


Fig. 13 Mounting position of lubrication accessories

(7) Dust proof components

1. Standard Specification

To keep foreign matters from entering inside the ball slide, HA Series has an end seal on both ends, bottom seals at the bottom, and an inner seal in inside.

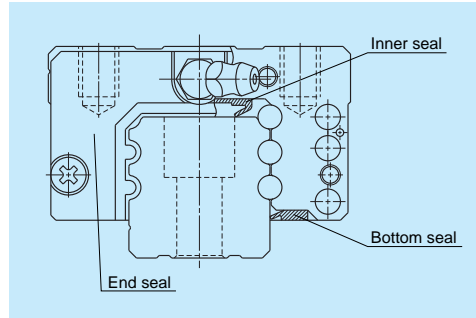


Fig. 14

Table 8 Seal friction per ball slide (maximum value)

		Unit: N				
Series	Size	25	30	35	45	55
HA		17	17	19	21	22

2. NSK K1™

• Table 9 shows the dimensions of linear guides equipped with the NSK K1.

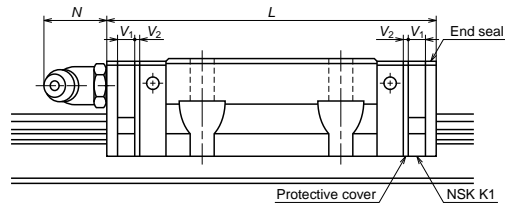


Table 9

Unit: mm

Model No.	Ball slide model	Standard ball slide length	Ball slide length installed with two NSK K1 L	Per NSK K1 thickness V ₁	Protective cover thickness V ₂	Protruding area of the grease fitting N
HA25	AN, EM	147.8	159.8	5.0	1.0	(14)
HA30	AN, EM	177.2	190.2	5.5	1.0	(14)
HA35	AN, AL, EM	203.6	216.6	5.5	1.0	(14)
HA45	AN, AL, EM	233.4	248.4	6.5	1.0	(15)
HA55	AN,AL, EM	284.4	299.4	6.5	1.0	(15)

Note: Ball slide length equipped with NSK K1 = (Standard ball slide length) + (Thickness of NSK K1, V₁ × Number of NSK K1) + (Thickness of the protective cover V₂ × 2)

3. Double seal and protector

For HA series, double seal and protector can be installed only before shipping from the factory. Please consult with NSK.

Table 10 shows the increased thickness of V₁ and V₂ when end seal and protector are installed.

Table 10

Unit: mm

Model No.	Thickness of end seal: V ₁	Thickness of protector: V ₂
HA25	3.2	3.6
HA30	4.4	4.2
HA35	4.4	4.2
HA45	5.5	4.9
HA55	5.5	4.9

4. Caps to cover the bolt hole for rail mounting

Table 12 shows size of the bolts for the each model number as well as reference number of the cap.

Table 12 Caps to cover rail bolt hole

Model No.	Bolt to secure rail	Cap reference No.	Quantity /case
HA25	M6	LG-CAP/M6	20
HA30, HA35	M8	LG-CAP/M8	20
HA45	M12	LG-CAP/M12	20
HA55	M14	LG-CAP/M14	20

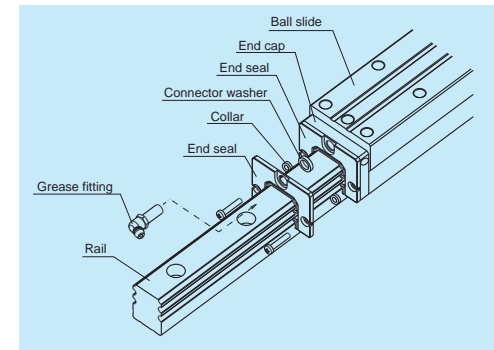


Fig. 15 Double seal

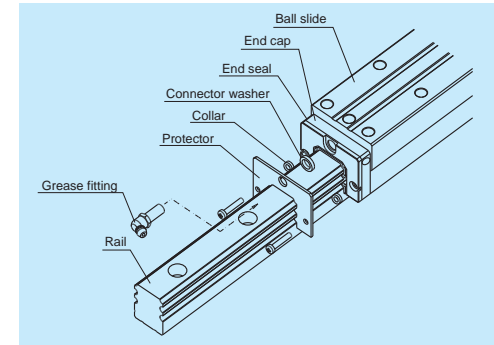


Fig. 16 Protector

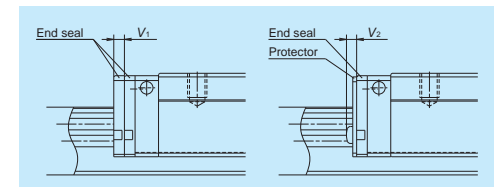


Fig. 17

(8) Reference number

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

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

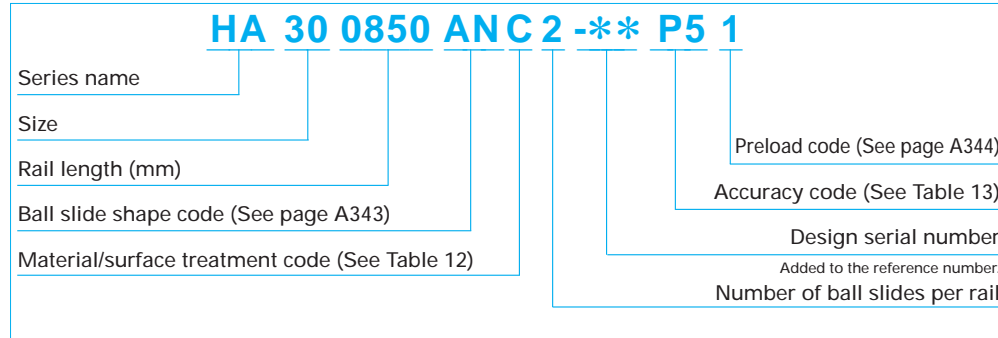


Table 12 Material/surface treatment code

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

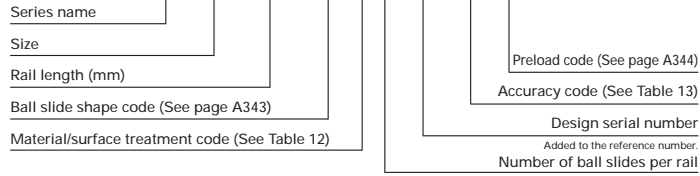
Table 13 Accuracy code

Accuracy	Standard (Without NSK K1)	With NSK K1
Ultra precision grade	P3	K3
Super precision grade	P4	K4
High precision grade	P5	K5

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

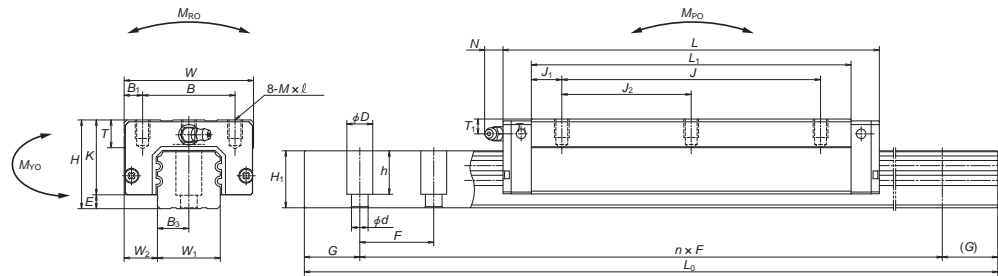
(9) Dimensions

HA 30 0850 ANC 2 - P5 1**



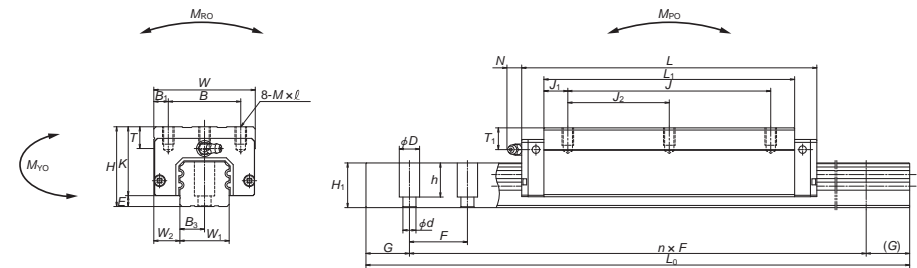
Front view of AL type

Side view of AL type



Front view of AN type

Side view of AN type



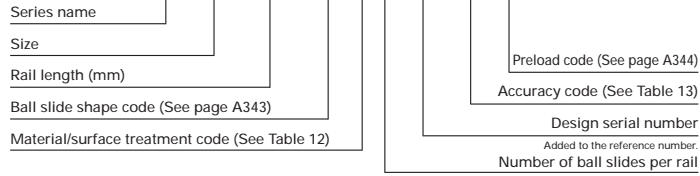
Model No.	Assembly			Ball slide													
	Height H	E	W ₂	Width W	Length L	Mounting hole							Grease fitting				
						B	J	J ₂	M x pitch x l	B ₁	L ₁	J ₁	K	T	Hole size	T ₁	N
HA25AN	40	5.5	12.5	48	147.8	35	100	50	M6x1.0x10	6.5	126	13	34.5	12	M6x0.75	10	11
HA30AN	45	7.5	16	60	177.2	40	120	60	M8x1.25x11	10	149	14.5	37.5	14	M6x0.75	9.5	11
HA35AN	55	7.5	18	70	203.6	50	140	70	M8x1.25x12 M8x1.25x10	10	173	16.5	47.5	15	M6x0.75	15	8
HA35AL	48												40.5				
HA45AN	70	10	20.5	86	233.4	60	160	80	M10x1.5x16	13	197	18.5	60	17	Rc1/8	20	10
HA45AL	60												50				
HA55AN	80	12	23.5	100	284.4	75	206	103	M12x1.75x18	12.5	245	19.5	68	18	Rc1/8	21	11
HA55AL	70												58				

Remarks: 1) HA Series does not have a ball retainer. Be aware that the balls fall out when a bearing is withdrawn from the rail.

Rail													Basic load rating					Ball dia.	Weight	
Width W ₁	Height H ₁	Pitch F	Mounting bolt hole d x D x h	B ₃	G (Reference)	Maximum length L _{0max}	Dynamic C (N)	Static C ₀ (N)	Static moment			D _w	Ball slide (kg)	Rail (kg/m)						
								M _{Ro} (N·m)	M _{Po} (N·m)	M _{Vo} (N·m)										
23	22	30	7x11x16.5	11.5	20	3 960	54 000	115 000	670	2 060	2 060	3.968	1.2	3.7						
28	28	40	9x14x21	14	20	4 000	79 500	166 000	1 140	3 550	3 550	4.762	1.8	5.8						
34	30.8	40	9x14x23.5	17	20	4 000	111 000	226 000	1 950	5 650	5 650	5.556	3.0 2.6	7.7						
45	36	52.5	14x20x27	22.5	22.5	3 990	147 000	295 000	3 700	8 450	8 450	6.350	6.0 5.0	12.0						
53	43.2	60	16x23x32.5	26.5	30	3 960	232 000	445 000	6 500	15 400	15 400	7.937	9.4 7.8	17.2						

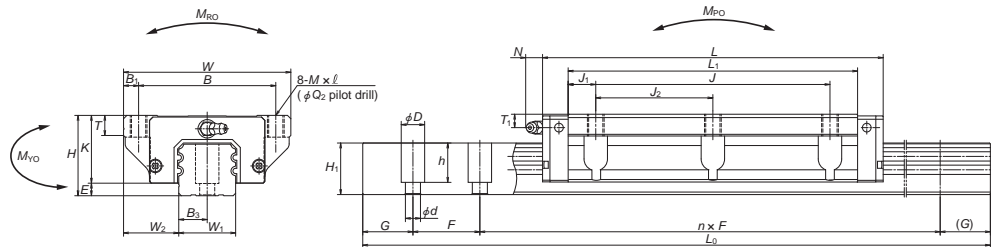
2) The basic dynamic load rating is a load that furnishes 50 km rating fatigue life; it is a vertical and constant load to the ball slide mounting surface. When converting the basic dynamic load rating C to the dynamic load rating C₁₀₀ for 100 km rating fatigue life, divide the C by 1.26.

HA 30 0850 EMC 2 - P5 1**



Front view of EM type

Side view of EM type



Model No.	Assembly			Ball slide																
	Height H	E	W ₂	Width W	Length L	Mounting hole						Q ₂	B ₁	L ₁	J ₁	K	T	Grease fitting		
						B	J	J ₂	M × pitch × l	Hole size	T ₁							N		
HA25EM	36	5.5	23.5	70	147.8	57	100	50	M8×1.25×10	6.8	6.5	126	13	30.5	11	M6×0.75	6	11		
HA30EM	42	7.5	31	90	177.2	72	120	60	M10×1.5×12	8.6	9	149	14.5	34.5	11	M6×0.75	6.5	11		
HA35EM	48	7.5	33	100	203.6	82	140	70	M10×1.5×13	8.6	9	173	16.5	40.5	12	M6×0.75	8	11		
HA45EM	60	10	37.5	120	233.4	100	160	80	M12×1.75×15	10.5	10	197	18.5	50	13	Rc1/8	10	13		
HA55EM	70	12	43.5	140	284.4	116	206	103	M14×2×18	12.5	12	245	19.5	58	15	Rc1/8	11	13		

Remarks: 1) HA Series does not have a ball retainer. Be aware that the balls fall out when a bearing is withdrawn from the rail.

Unit: mm

Rail							Basic load rating					Ball dia.	Weight	
Width W ₁	Height H ₁	Pitch F	Mounting bolt hole d × D × h	B ₃	G (Reference)	Maximum length L _{0max}	Dynamic C (N)	Static C ₀ (N)	Static moment			D _w	Ball slide (kg)	Rail (kg/m)
							M _{Ro} (N·m)	M _{Po} (N·m)	M _{Vo} (N·m)					
23	22	30	7×11×16.5	11.5	20	3 960	54 000	115 000	670	2 060	2 060	3.968	1.6	3.7
28	28	40	9×14×21	14	20	4 000	79 500	166 000	1 140	3 550	3 550	4.762	2.6	5.8
34	30.8	40	9×14×23.5	17	20	4 000	111 000	226 000	1 950	5 650	5 650	5.556	3.8	7.7
45	36	52.5	14×20×27	22.5	22.5	3 990	147 000	295 000	3 700	8 450	8 450	6.350	6.6	12.0
53	43.2	60	16×23×32.5	26.5	30	3 960	232 000	445 000	6 500	15 400	15 400	7.937	11	17.2

2) The basic dynamic load rating is a load that furnishes 50 km rating fatigue life; it is a vertical and constant load to the ball slide mounting surface. When converting the basic dynamic load rating C to the dynamic load rating C₁₀₀ for 100 km rating fatigue life, divide the C by 1.26.