



Preface

A linear guideway allows a type of linear motion that utilizes rolling elements such as balls or rollers. By using recirculating rolling elements between the rail and the block, a linear guideway can achieve high precision linear motion. Compared to a traditional slide, the coefficient of friction for a linear guideway is only 1/50. Because of the restraint effect between the rails and the blocks, linear guideways can take up loads in both the up/down and the left/right directions. With these features, linear guideways can greatly enhance moving accuracy, especially, when accompanied with precise ball screws.

1.General Information

1-1 Advantages and Features of Linear Guideways

(1) High positional accuracy

When a load is driven by a linear motion guideway, the frictional contact between the load and the bed desk is rolling contact. The coefficient of friction is only 1/50 of traditional contact, and the difference between the dynamic and the static coefficient of friction is small. Therefore, there would be no slippage while the load is moving.

(2) Long life with high motion accuracy

With a traditional slide, errors in accuracy are caused by the counter flow of the oil film. Insufficient lubrication causes wear between the contact surfaces, which become increasingly inaccurate. In contrast, rolling contact has little wear; therefore, machines can achieve a long life with highly accurate motion.

(3) High speed motion is possible with a low driving force

Because linear guideways have little friction resistance, only a small driving force is needed to move a load. This results in greater power savings, especially in the moving parts of a system. This is especially true for the reciprocating parts.

(4) Equal loading capacity in all directions

With this special design, these linear guideways can take loads in either the vertical or horizontal directions. Conventional linear slides can only take small loads in the direction parallel to the contact surface. They are also more likely to become inaccurate when they are subjected to these loads.

(5) Easy installation

Installing a linear guideway is fairly easy. Grinding or milling the machine surface, following the recommended installation procedure, and tightening the bolts to their specified torque can achieve highly accurate linear motion.

(6) Easy lubrication

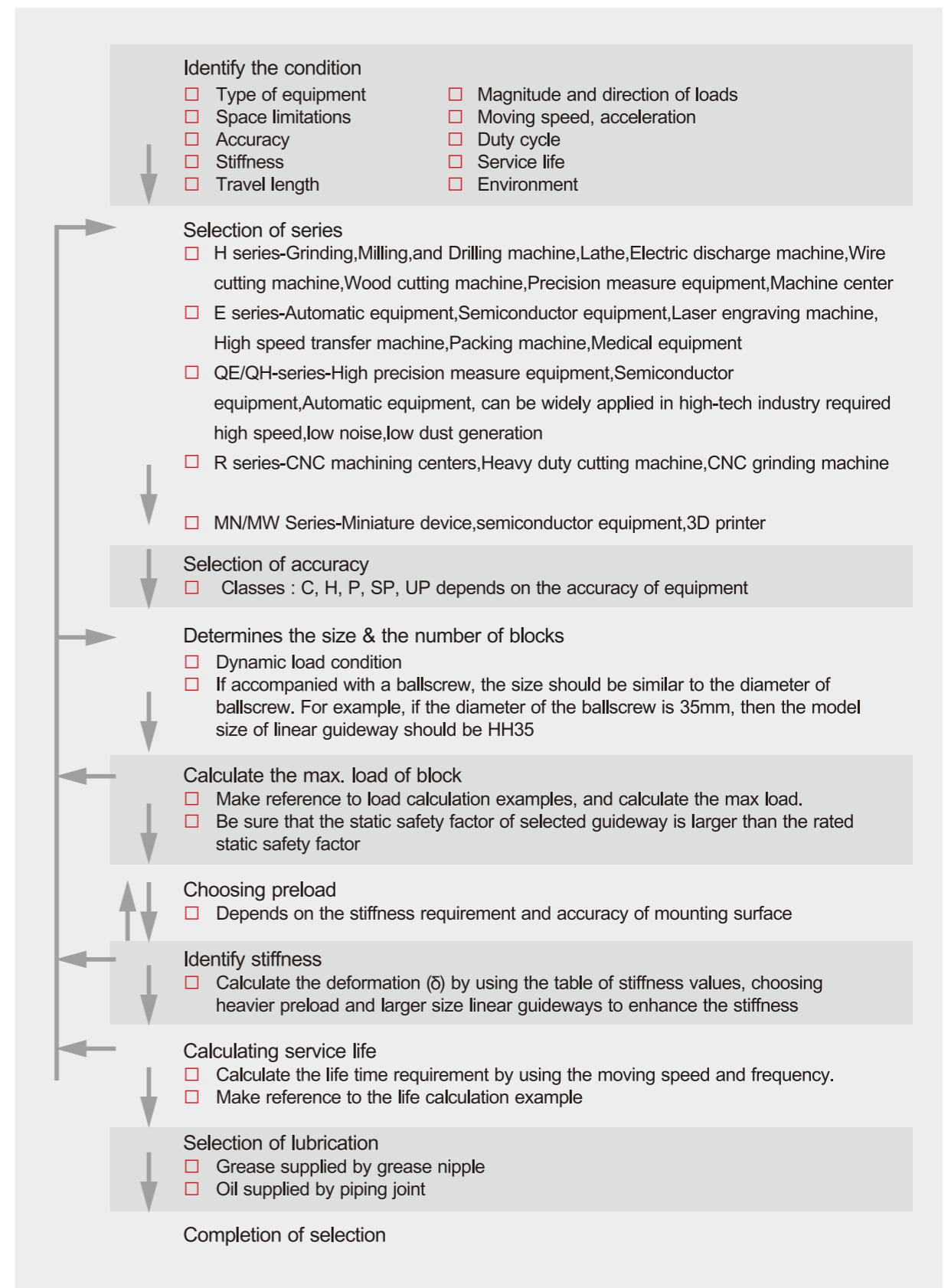
With a traditional sliding system, insufficient lubrication causes wear on the contact surfaces. Also, it can be quite difficult to supply sufficient lubrication to the contact surfaces because finding an appropriate lubrication point is not very easy. With a linear motion guideway, grease can be easily supplied through the grease nipple on the linear guideway block. It is also possible to utilize a centralized oil lubrication system by piping the lubrication oil to the piping joint.

(7) Interchangeability

Compared with traditional boxways or v-groove slides, linear guideways can be easily replaced should any damage occur. For high precision grades consider ordering a matched, non-interchangeable, assembly of a block and rail.



1-2 Selecting Linear Guideways





1-3 Basic Load Ratings of Linear Guideways

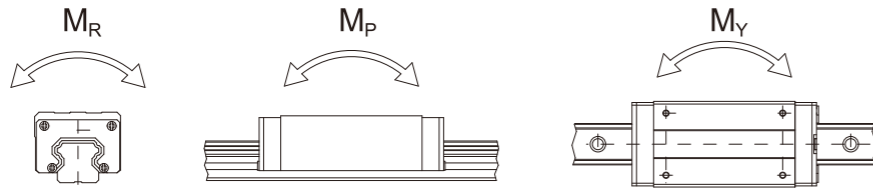
1-3-1 Basic Static Load

(1) Static load rating (C_0)

Localized permanent deformation will be caused between the raceway surface and the rolling elements when a linear guideway is subjected to an excessively large load or an impact load while either at rest or in motion. If the amount of this permanent deformation exceeds a certain limit, it becomes an obstacle to the smooth operation of the linear guideway. Generally, the definition of the basic static load rating is a static load of constant magnitude and direction resulting in a total permanent deformation of 0.0001 times the diameter of the rolling element and the raceway at the contact point subjected to the largest stress. The value is described in the dimension tables for each linear guideway. A designer can select a suitable linear guideway by referring to these tables. The maximum static load applied to a linear guideway must not exceed the basic static load rating.

(2) Static permissible moment (M_0)

The static permissible moment refers to a moment in a given direction and magnitude when the largest stress of the rolling elements in an applied system equals the stress induced by the Static Load Rating. The static permissible moment in linear motion systems is defined for three directions: M_R , M_P and M_Y .



(3) Static safety factor

This condition applies when the guideway system is static or under low speed motion. The static safety factor, which depends on environmental and operating conditions, must be taken into consideration. A larger safety factor is especially important for guideways subject to impact loads (See Table 1-1). The static load can be obtained by using Eq. 1.1

Table 1-1 Static Safety Factor

Load Condition	f_{SL}, f_{SM} (Min.)
Normal Load	1.0~3.0
With impacts/vibrations	3.0~5.0

$$f_{SL} = \frac{C_0}{P} \text{ or } f_{SM} = \frac{M_0}{M} \quad \text{Eq.1.1}$$

- f_{SL} : Static safety factor for simple load
- f_{SM} : Static safety factor for moment
- C_0 : Static load rating (kN)
- M_0 : Static permissible moment (kN · mm)
- P : Calculated working load (kN)
- M : Calculated applying moment (kN · mm)

1-3-2 Basic Dynamic Load

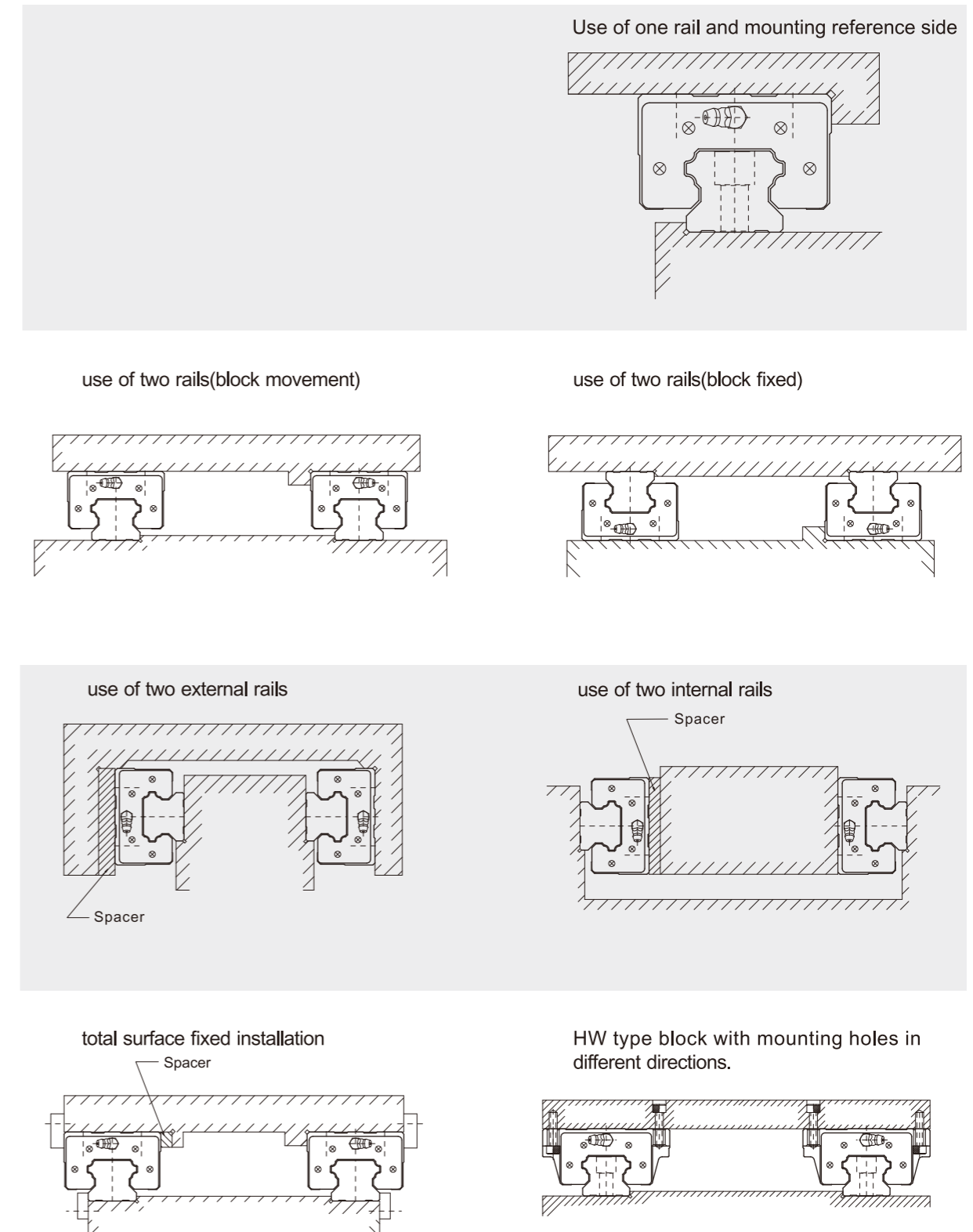
(1) Dynamic load rating (C)

The basic dynamic load rating is an important factor used for calculation of service life of linear guideway. It is defined as the maximum load when the load that does not change in direction or magnitude and results in a nominal life of 50km of operation for a ball type linear guideway and 100km for a roller type linear guideway. The values for the basic dynamic load rating of each guideway are shown in dimension tables. They can be used to predict the service life for a selected linear guideway.



1-4 Mounting Conigurations

Linear guideways have equal load ratings in the radial, reverse radial and lateral directions. The application depends on the machine requirements and load directions. Typical layouts for linear guideways are shown below:



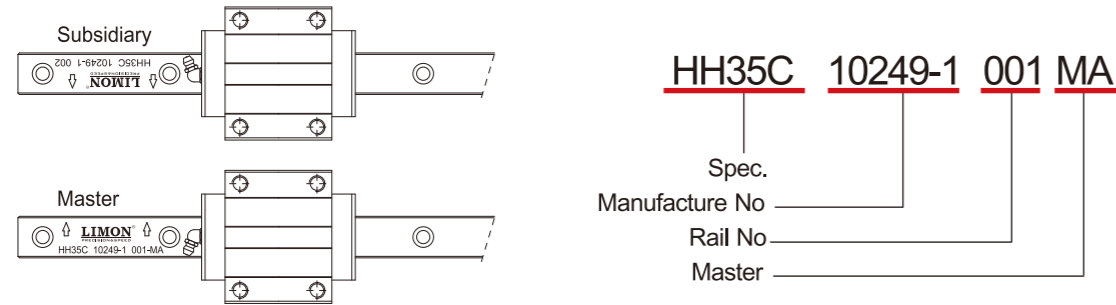


1-5 Mounting Procedures

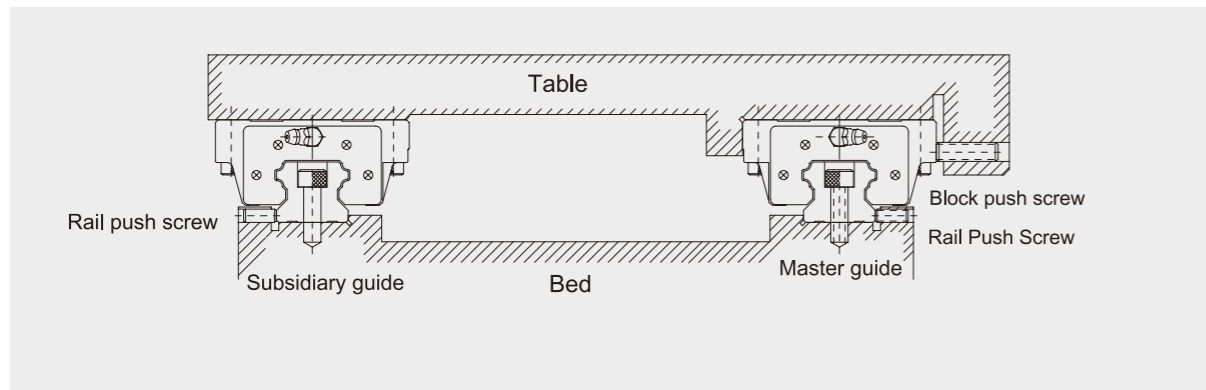
Three installation methods are recommended based on the required running accuracy and the degree of impacts and vibrations.

1-5-1 Master and Subsidiary Guide

For non-interchangeable type Linear Guideways, there are some differences between the master guide and subsidiary guide. The accuracy of the master guide's datum plane is better than the subsidiary's and it can be a reference side for installation. There is a mark "MA" printed on the rail, as shown in the figure below.

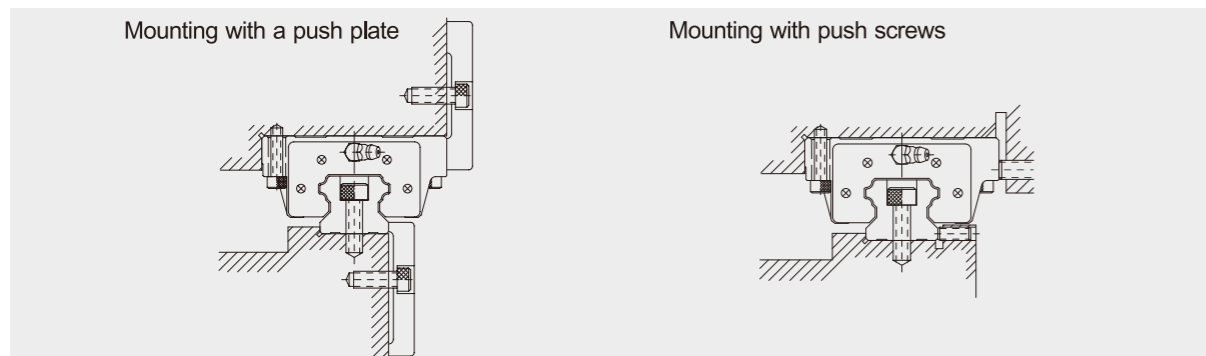


1-5-2 Installation to Achieve High Accuracy and Rigidity

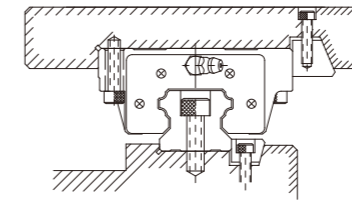


(1) Mounting methods

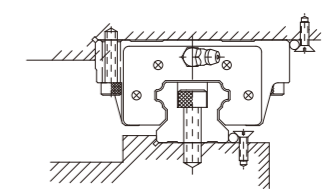
It is possible that the rails and the blocks will be displaced when the machine is subjected to vibrations and impacts. To eliminate these difficulties and achieve high running accuracy, the following four methods are recommended for fixing.



Mounting with taper gib

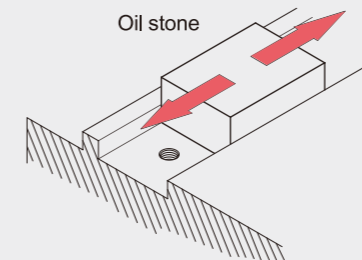


Mounting with needle roller

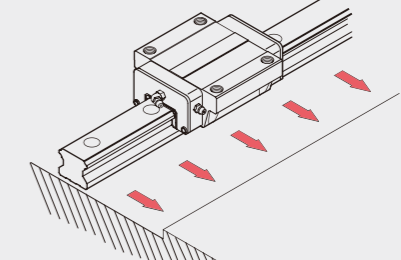


(2) Procedure of rail installation

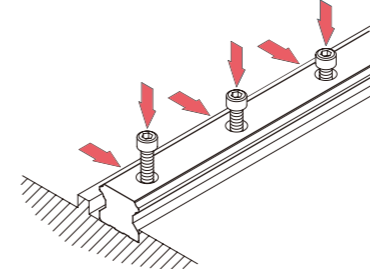
1 Before starting, remove all dirt from the mounting surface of the machine.



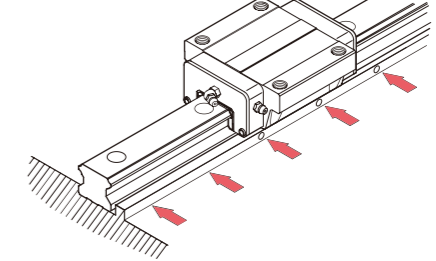
2 Place the linear guideway gently on the bed. Bring the guideway into close contact with the datum plane of the bed.



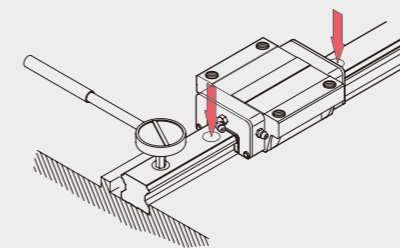
3 Check for correct thread engagement when inserting a bolt into the mounting hole while the rail is being placed on the mounting surface of the bed.



4 Tighten the push screws sequentially to ensure close contact between the rail and the side datum plane.

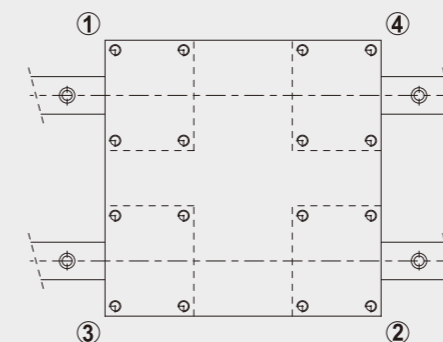


5 Tighten the mounting bolts with a torque wrench to the specified torque.



6 Install the remaining linear guideway in the same way.

(3) Procedure of block installation

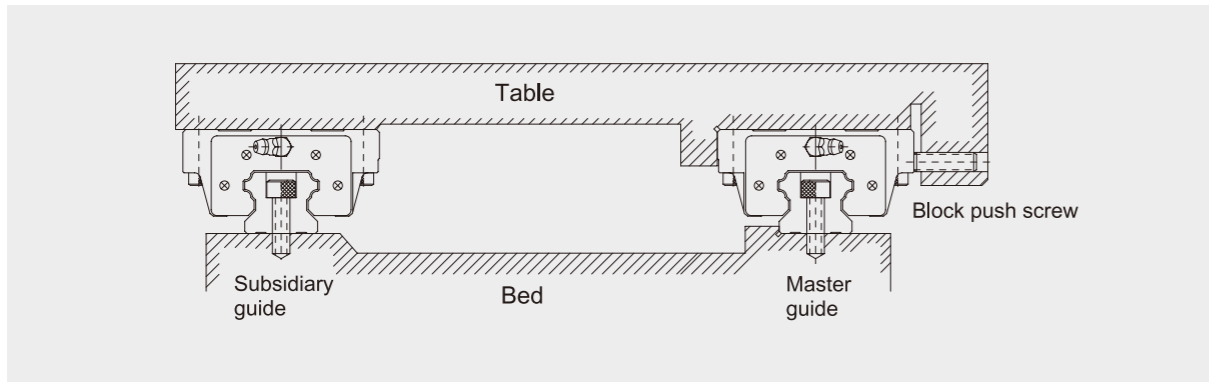


- Place the table gently on the blocks. Next, tighten the block mounting bolts temporarily.
- Push the blocks against the datum plane of the table and position the table by tightening the push screws.
- The table can be fixed uniformly by tightening the mounting bolts on master guide side and subsidiary side in 1 to 4 sequences.

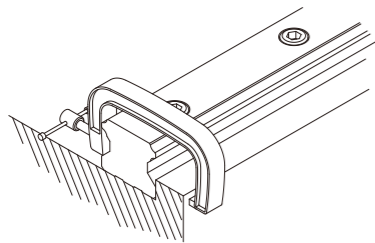


1-5-3 Installation of the Master Guide without Push Screws

To ensure parallelism between the subsidiary guide and the master guide without push screws, the following rail installation methods are recommended. The block installation is the same as mentioned previously.

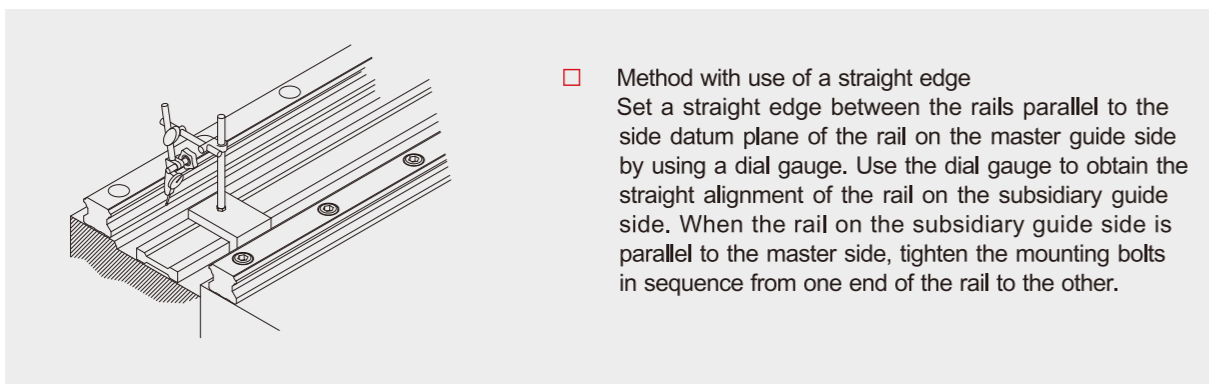


(1) Installation of the rail on the subsidiary guide side

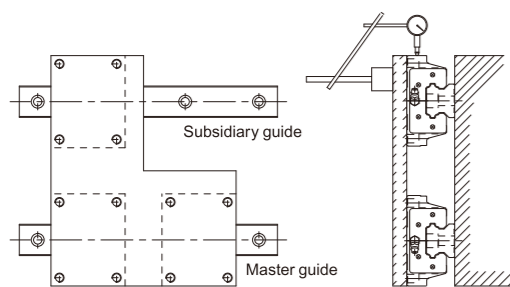


- Using a vice
Place the rail into the mounting plane of the bed. Tighten the mounting bolts temporarily; then use a vice to push the rail against the side datum plane of the bed. Tighten the mounting bolts in sequence to the specified torque.

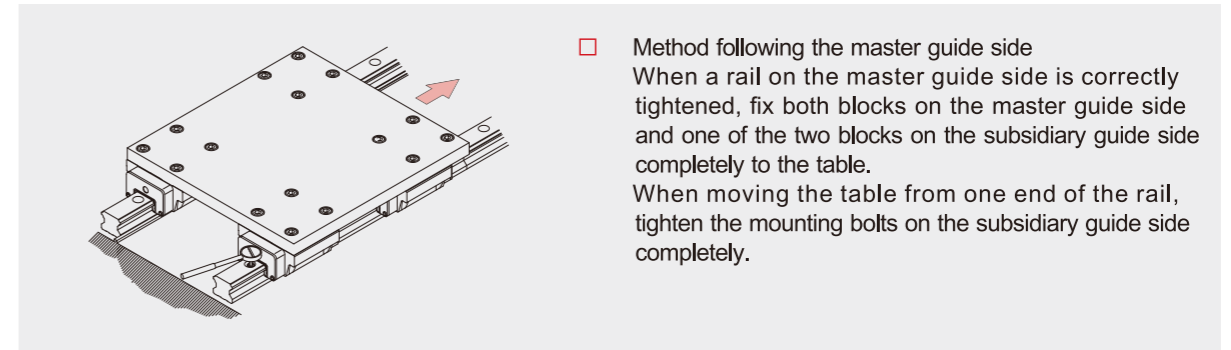
(2) Installation of the rail on the subsidiary guide side



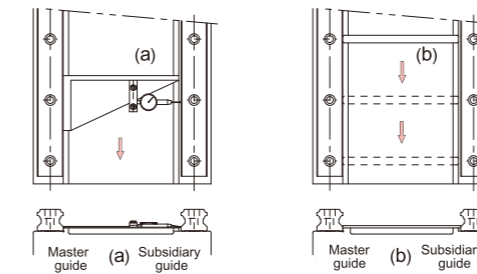
- Method with use of a straight edge
Set a straight edge between the rails parallel to the side datum plane of the rail on the master guide side by using a dial gauge. Use the dial gauge to obtain the straight alignment of the rail on the subsidiary guide side. When the rail on the subsidiary guide side is parallel to the master side, tighten the mounting bolts in sequence from one end of the rail to the other.



- Method with use of a table
Fix two blocks on the master guide side to the table. Temporarily fix the rail and one block on the subsidiary guide side to the bed and the table. Fix a dial gauge stand on the table surface and bring it into contact with the side of the block on the subsidiary guide side. Move the table from one end of the rail to the other. While aligning the rail on the subsidiary side parallel to the rail on the master guide side, tighten the bolts in sequence.



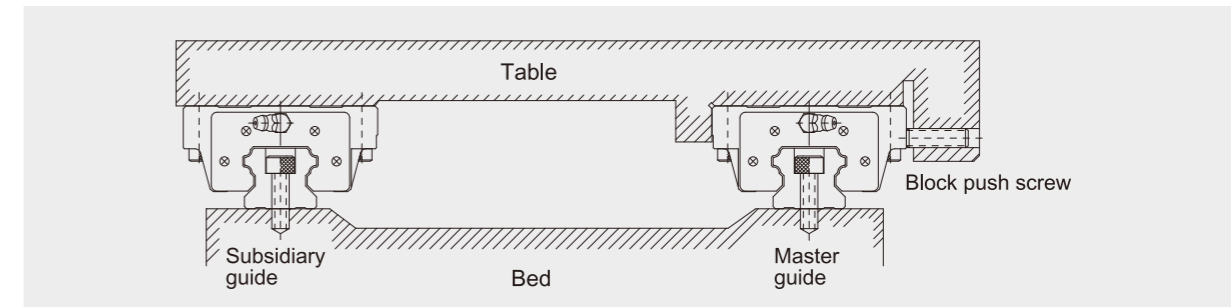
- Method following the master guide side
When a rail on the master guide side is correctly tightened, fix both blocks on the master guide side and one of the two blocks on the subsidiary guide side completely to the table. When moving the table from one end of the rail, tighten the mounting bolts on the subsidiary guide side completely.



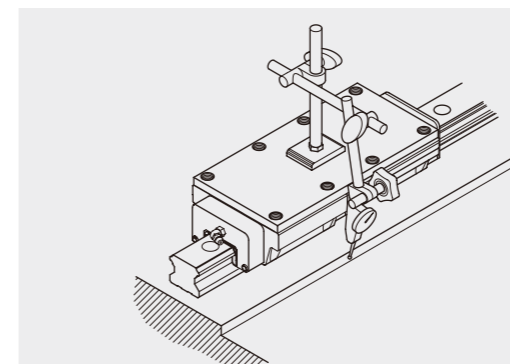
- Method with use of a jig
Use a special jig to ensure the rail position on the subsidiary guide side. Tighten the mounting bolts to the specified torque in sequence.

1-5-4 When there is no Side Surface of the Bed on the Master Guide Side

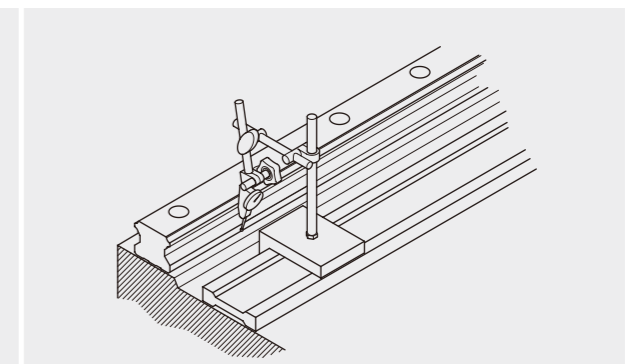
To ensure parallelism between the subsidiary guide and the master guide when there is no side surface, the following rail installation method is recommended. The installation of the blocks is the same as mentioned previously.



(1) Installation of the rail on the master guide side



- Using a provisional datum plane
Two blocks are fixed in close contact by the measuring plate. A datum plane provided on the bed is used for straight alignment of the rail from one end to the other. Move the blocks and tighten the mounting bolts to the specified torque in sequence.



- Method with use of a straight edge
Use a dial gauge and a straight edge to confirm the straightness of the side datum plane of the rail from one end to the other. Make sure the mounting bolts are tightened securely in sequence.

(2) Installation of the rail on the subsidiary guide side

The method of installation for the rail on the subsidiary guide side is the same as the case without push screws.



2. LIMON Linear Guideway Classification

In an effort to meet customer's requirement and service needs LIMON offers several different types of guides. We supply the H series which is suitable for CNC machineries, the E series for automation industries, the R series for high rigidity applications, and the miniature series MN/MW for medical devices and semiconductor equipment, also for high technology industries, LIMON has developed the H and E series with high speed and quiet characteristics.

(1) Types & series

Table 2-1 Types & Series

Series	Assembly Height	Load	Square	Flange	Drilled hole	Combination
			Tap hole	Tap hole		
H	High	Heavy Load	HH-CA	-	-	-
		Super Heavy Load	HH-HA	-	-	-
	Low	Heavy Load	HL-CA	HW-CA	HW-CB	HW-CC
		Super Heavy Load	HL-HA	HW-HA	HW-HB	HW-HC
E	Low	Medium Load	EH-SA	EW-SA	EW-SB	EW-SC
		Heavy Load	EH-CA	EW-CA	EW-CB	EW-CC
MN	-	Standard	MN-M-C-O	-	-	-
		Long	MN-M-H-O	-	-	-
MW	-	Standard	MW-M-C-O	-	-	-
		Long	MW-M-H-O	-	-	-
QH	High	Heavy Load	HH-CA	-	-	-
		Super Heavy Load	HH-HA	-	-	-
	Low	Heavy Load	-	QHW-CA	QHW-CB	QHW-CC
		Super Heavy Load	-	QHW-HA	QHW-HB	QHW-HC
QE	Low	Medium Load	QEH-SA	QEW-SA	QEW-SB	-
		Heavy Load	QEH-CA	QEW-CA	QEW-CB	-
R	High	Heavy Load	RH-CA	-	-	-
		Super Heavy Load	RH-HA	-	-	-
	Low	Heavy Load	RL-CA	-	-	RW-CC
		Super Heavy Load	RL-HA	-	-	RW-HC



2-1 H Series - Heavy Load Ball Type Linear Guideway

H series linear guideways are designed with load capacity and rigidity higher than other similar products with circular-arc groove and structure optimization. It features equal load ratings in the radial, reverse radial and lateral directions, and self-aligning to absorb installation-error. Thus, LIMON H series linear guideways can achieve a long life with high speed, high accuracy and smooth linear motion.

2-1-1 Features of H Series

(1) Self-aligning capability

By design, the circular-arc groove has contact points at 45 degrees. H series can absorb most installation errors due to surface irregularities and provide smooth linear motion through the elastic deformation of rolling elements and the shift of contact points. Self-aligning capability, high accuracy and smooth operation can be obtained with an easy installation.

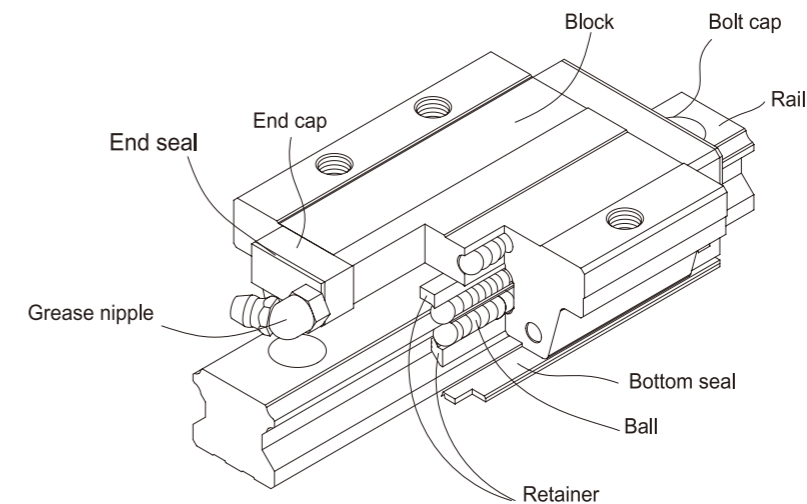
(2) Interchangeability

Because of precision dimensional control, the dimensional tolerance of H series can be kept in a reasonable range, which means that any blocks and any rails in a specific series can be used together while maintaining dimensional tolerance. And a retainer is added to prevent the balls from falling out when the blocks are removed from the rail.

(3) High rigidity in all four directions

Because of the four-row design, the H series linear guideway has equal load ratings in the radial, reverse radial and lateral directions. Furthermore, the circular-arc groove provides a wide-contact width between the balls and the groove raceway allowing large permissible loads and high rigidity.

2-1-2 Construction of H Series



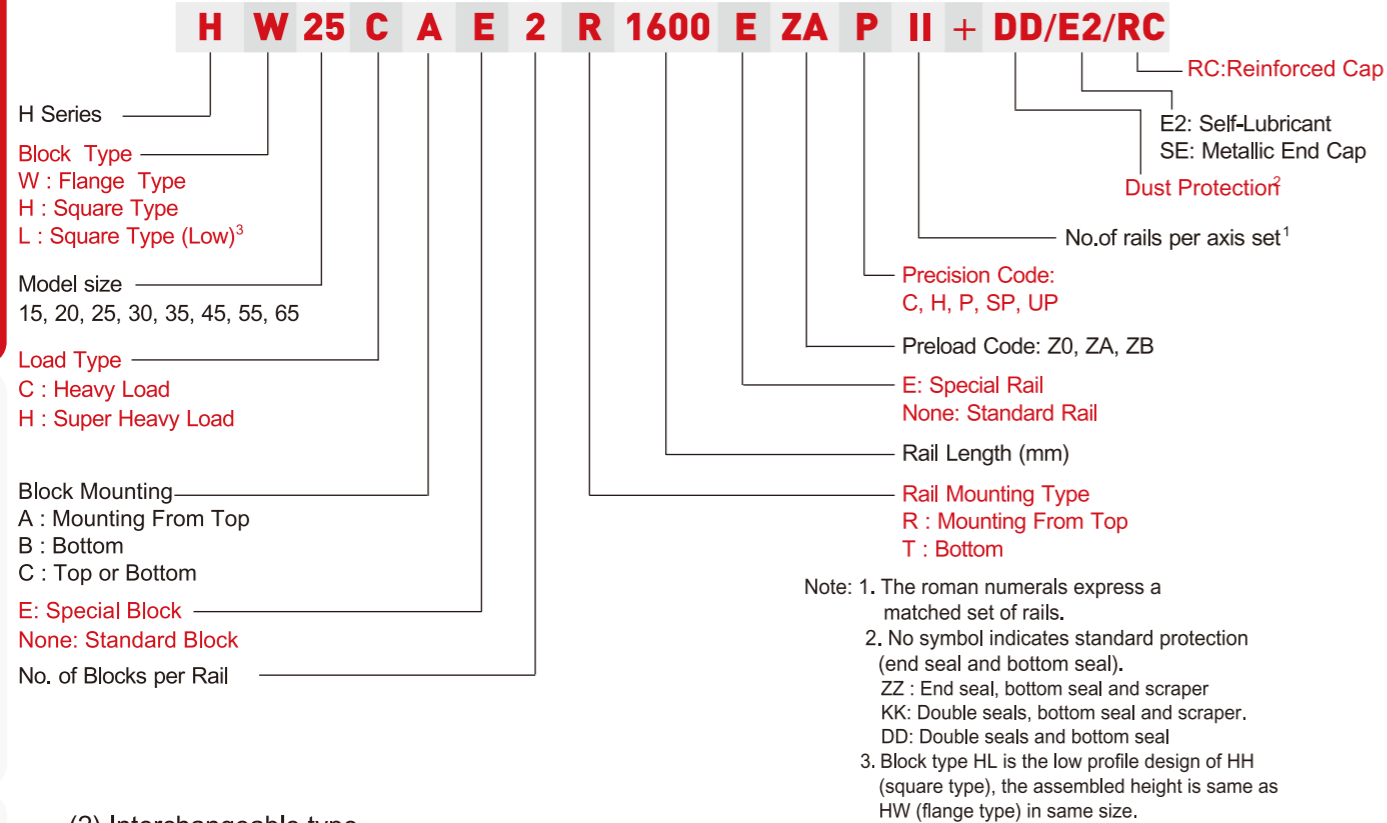
- Rolling circulation system: Block, Rail, End Cap and Retainer
- Lubrication system: Grease Nipple and Piping Joint
- Dust protection system: End seal, Bottom Seal, Bolt Cap, Double Seals and Scraper

2-1-3 Model Number of H Series

H series guideways can be classified into non-interchangeable and interchangeable types. The sizes are identical. The only difference between the two types is that the interchangeable type of blocks and rails can be freely exchanged, and their accuracy can reach up to P class. The model number of H series contains the size, type, accuracy class, preload class, etc..

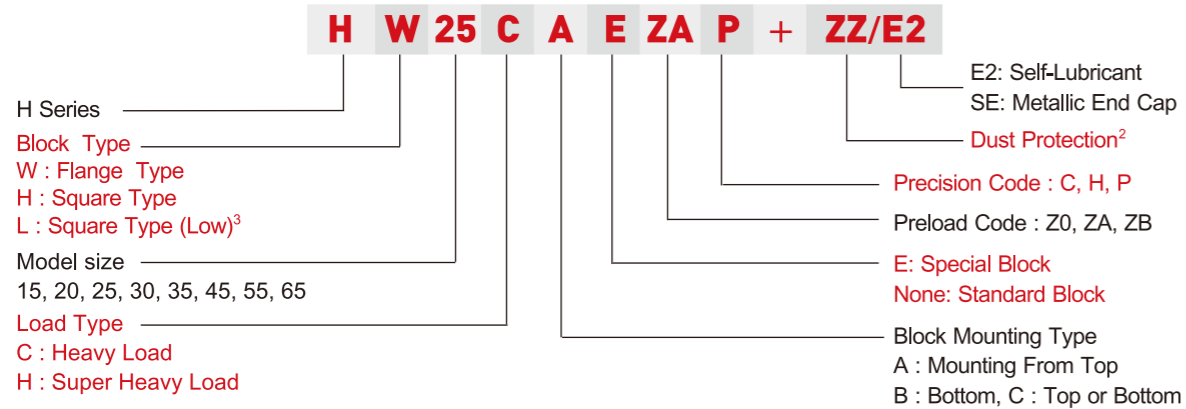


(1) Non-interchangeable type

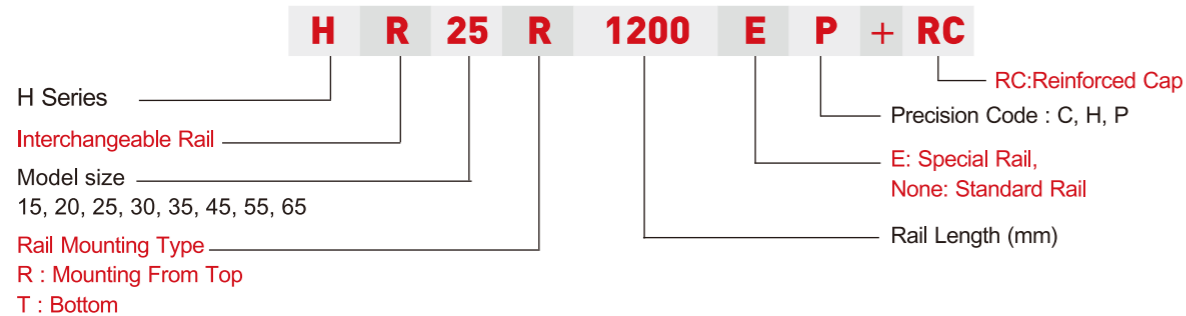


(2) Interchangeable type

□ Model Number of H Block



□ Model Number of H Rail



2-1-4 Types

(1) Block types

There're two types of blocks: flange and square. The flange type is suitable for heavy moment load application because of the lower assembly height and wider mounting surface.

Table 2-1-1 Block Types

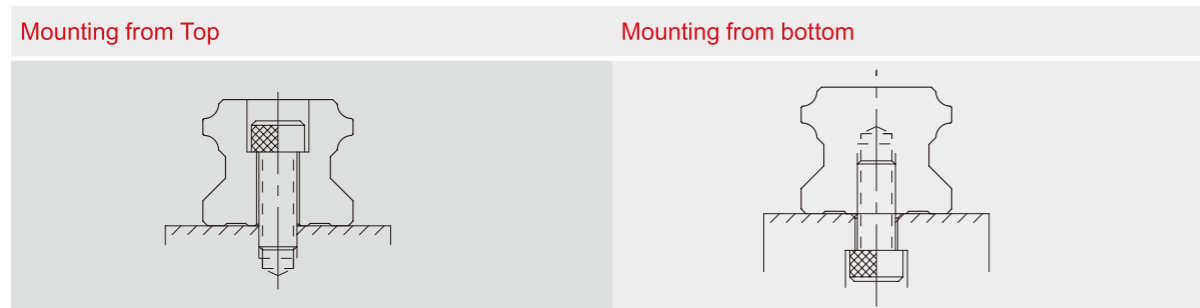
Type	Model	Shape	Height (mm)	Rail Length (mm)	Main Application
Square	HH-CA HH-HA		28	100	<ul style="list-style-type: none"> Machine Centers NC Lathes Grinding Machines Precision Machining Machines Heavy Cutting Machines Automation Devices Transportation Equipment Measuring Equipment Devices Requiring High Positional Accuracy
			90	4000	
Square	HL-CA HL-HA		24	100	
			70	4000	
Flange	HW-CA HW-HA		24	100	
			90	4000	
Flange	HW-CB HW-HB		24	100	
			90	4000	
Flange	HW-CC HW-HC		24	100	
			90	4000	



(2) Rail types

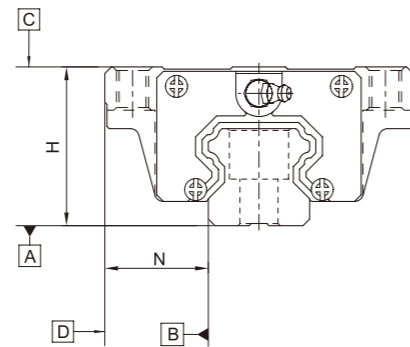
Besides the standard top mounting type, the bottom mounting type is also available.

Table 2-1-2 Rail Types



2-1-5 Accuracy

The accuracy of H series can be classified into normal (C), high (H), precision (P), super precision (SP), ultra precision (UP), five classes. Please choose the class by referring the accuracy of applied equipment.



(1) Accuracy of non-interchangeable guideways

Table 2-1-3 Accuracy Standards

Unit: mm

Item	H - 15, 20				
	Normal (C)	High (H)	Precision (P)	Super Precision (SP)	Ultra Precision (UP)
Dimensional tolerance of height H	± 0.1	± 0.03	0 -0.03	0 -0.015	0 -0.008
Dimensional tolerance of width N	± 0.1	± 0.03	0 -0.03	0 -0.015	0 -0.008
Variation of height H	0.02	0.01	0.006	0.004	0.003
Variation of width N	0.02	0.01	0.006	0.004	0.003
Running parallelism of block surface C to surface A	See Table 2-1-7				
Running parallelism of block surface D to surface B	See Table 2-1-7				

Table 2-1-4 Accuracy Standards

Unit: mm

Item	H - 25, 30, 35				
	Normal (C)	High (H)	Precision (P)	Super Precision (SP)	Ultra Precision (UP)
Dimensional tolerance of height H	± 0.1	± 0.04	0 -0.04	0 -0.02	0 -0.01
Dimensional tolerance of width N	± 0.1	± 0.04	0 -0.04	0 -0.02	0 -0.01
Variation of height H	0.02	0.015	0.007	0.005	0.003
Variation of width N	0.03	0.015	0.007	0.005	0.003
Running parallelism of block surface C to surface A	See Table 2-1-7				
Running parallelism of block surface D to surface B	See Table 2-1-7				



Table 2-1-5 Accuracy Standards

Unit: mm

Item	H - 45, 55		
	Normal (C)	High (H)	Precision (P)
Dimensional tolerance of height H	± 0.1	± 0.05	± 0.025
Dimensional tolerance of width N	± 0.1	± 0.05	± 0.025
Variation of height H	0.03	0.015	0.007
Variation of width N	0.03	0.02	0.01
Running parallelism of block surface C to surface A	See Table 2-1-7		
Running parallelism of block surface D to surface B	See Table 2-1-7		

Table 2-1-6 Accuracy Standards

Unit: mm

Item	H - 65		
	Normal (C)	High (H)	Precision (P)
Dimensional tolerance of height H	± 0.1	± 0.07	± 0.035
Dimensional tolerance of width N	± 0.1	± 0.07	± 0.035
Variation of height H	0.03	0.02	0.01
Variation of width N	0.03	0.025	0.015
Running parallelism of block surface C to surface A	See Table 2-1-7		
Running parallelism of block surface D to surface B	See Table 2-1-7		

(2) Accuracy of running parallelism

Table 2-1-7 Accuracy of Running Parallelism

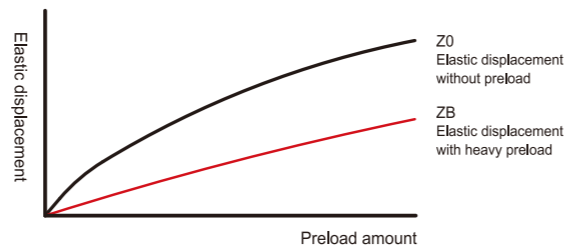
Rail Length (mm)	Accuracy (μm)				
	C	H	P	SP	UP
~ 100	12	7	3	2	2
100 ~ 200	14	9	4	2	2
200 ~ 300	15	10	5	3	2
300 ~ 500	17	12	6	3	2
500 ~ 700	20	13	7	4	2
700 ~ 900	22	15	8	5	3
900 ~ 1,100	24	16	9	6	3
1,100 ~ 1,500	26	18	11	7	4
1,500 ~ 1,900	28	20	13	8	4
1,900 ~ 2,500	31	22	15	10	5
2,500 ~ 3,100	33	25	18	11	6
3,100 ~ 3,600	36	27	20	14	7
3,600 ~ 4,000	37	28	21	15	7



2-1-6 Preload

(1) Definition

A preload can be applied to each guideway. Oversized balls are used. Generally, a linear motion guideway has a negative clearance between groove and balls in order to improve stiffness and maintain high precision. The figure shows the load is multiplied by the preload, the rigidity is doubled and the deflection is reduced by one half. The preload no larger than ZA would be recommended for the model size under H20 to avoid an over-preload affecting the guideway's life.



(2) Preload classes

LIMON offers three classes of standard preload for various applications and conditions.

Table 2-1-8 Preload Classes

Class	Code	Preload	Condition	Examples of Application
Light Preload	Z0	0~0.02C	Certain load direction, low impact, low precision required	Transportation devices, auto-packing machines, X-Y axis for general industrial machines, welding machines, welders
Medium Preload	ZA	0.05C~0.07C	High precision required	Machining centers, Z axis for general industrial machines, EDM, NC lathes, Precision X-Y tables, measuring equipment
Heavy Preload	ZB	0.10C~0.12C	High rigidity required, with vibration and impact	Machining centers, grinding machines, NC lathes, horizontal and vertical milling machines, Z axis of machine tools, Heavy cutting machines

Class	Interchangeable Guideway	Non-Interchangeable Guideway
Preload classes	Z0, ZA	Z0, ZA, ZB

Note: The "C" in the preload column denotes basic dynamic load rating.

2-1-7 Lubrication

(1) Grease

- Grease nipple



□ Mounting location

The standard location of the grease fitting is at both ends of the block, but the nipple can be mounted at each side of block. For lateral installation, we recommend that the nipple be mounted at the non-reference side, otherwise please contact us. It is possible to perform lubrication by using the oil-piping joint.

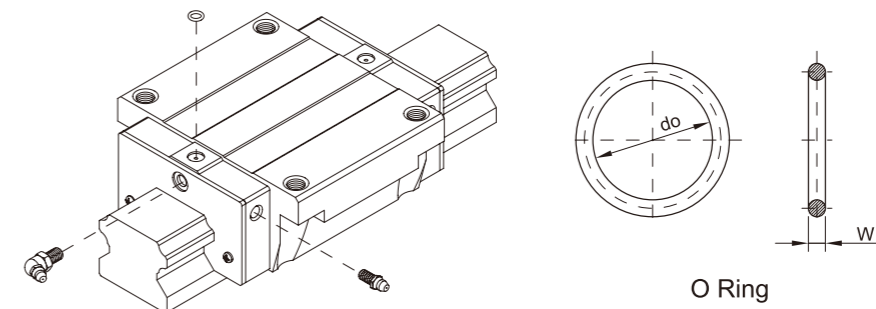
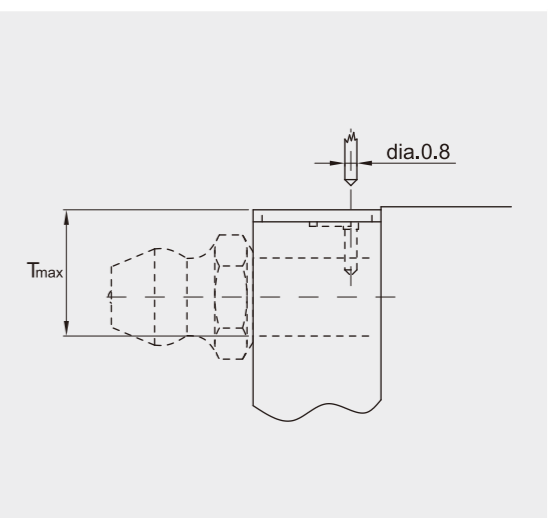


Table 2-1-9 O-Ring size and max. permissible depth for piercing

Size	O-Ring		Lube hole at top: max. permissible depth for piercing
	do (mm)	W (mm)	T _{max} (mm)
H15	2.5±0.15	1.5±0.15	3.75
H20	4.5±0.15	1.5±0.15	5.7
H25	4.5±0.15	1.5±0.15	5.8
H30	4.5±0.15	1.5±0.15	6.3
H35	4.5±0.15	1.5±0.15	8.8
H45	4.5±0.15	1.5±0.15	8.2
H55	4.5±0.15	1.5±0.15	11.8
H65	4.5±0.15	1.5±0.15	10.8



□ The lubricant amount for a block filled with grease

Table 2-1-10 The lubricant Amount for a Block Filled with Grease

Size	Heavy load (cm ³)	Super heavy load (cm ³)	Size	Heavy load (cm ³)	Super heavy load (cm ³)
H15	1	-	H35	10	12
H20	2	3	H45	17	21
H25	5	6	H55	26	33
H30	7	8	H65	50	61

□ Frequency of replenishment

Check the grease every 100 km, or every 3-6 months.



Oil refilling rate

Table 2-1-11

Size	Refilling rate (cm ³ /hr)	Size	Refilling rate (cm ³ /hr)
H15	0.2	H35	0.3
H20	0.2	H45	0.4
H25	0.3	H55	0.5
H30	0.3	H65	0.6

2-1-8 Dust Proof Accessories

(1) Codes of standard dust proof accessories

If the following accessories are needed, please add the code followed by the model number.

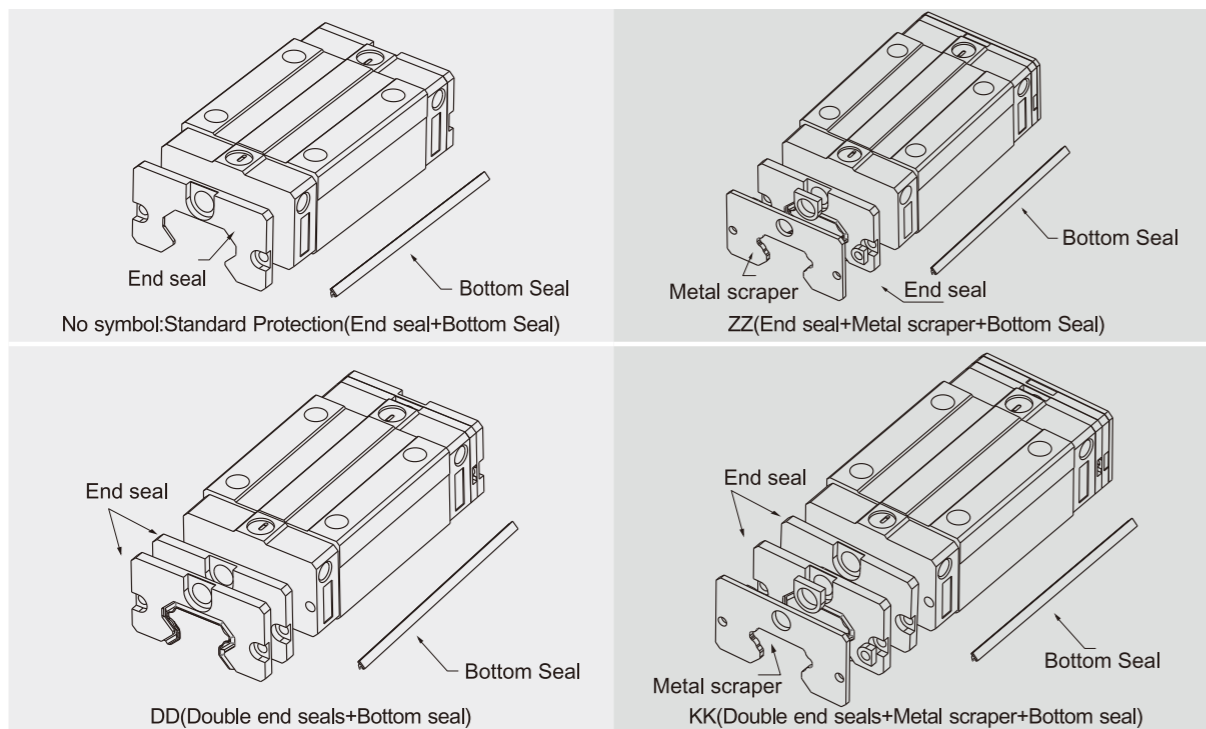


Table 2-1-12

Size	Overall block length (L)			
	SS	ZZ	DD	KK
H15C	60.5	64.1	65.5	69.1
H20C	76.7	80.3	82.5	86.1
H20H	91.4	95	97.2	100.8
H25C	84	87.6	90	93.6
H25H	104.6	108.2	110.6	114.2
H30C	98.4	102	104.6	108.2
H30H	121.4	125	127.6	131.2
H35C	112.4	116	118.8	122.4
H35H	138.2	141.8	144.6	148.2
H45C	137.4	141	145.4	149
H45H	169.2	172.8	177.2	180.8

unit:mm



(4) Function of dust proof accessories

End seal and bottom seal

To prevent life reduction caused by iron chips or dust entering the block.

Double seals

Enhances the wiping effect, foreign matter can be completely wiped off.

Table 2-1-13 Dimensions of end seal

Size	Thickness (t1) (mm)	Size	Thickness (t1) (mm)
H15 ES	3	H35 ES	3.2
H20 ES	3.5	H45 ES	4.5
H25 ES	3.5	H55 ES	4.5
H30 ES	3.2	H65 ES	6

Scraper

The scraper removes high-temperature iron chips and larger foreign objects.

Table 2-1-14 Dimensions of scraper

Size	Thickness (t2) (mm)	Size	Thickness (t2) (mm)
H15 SC	1.5	H35 SC	1.5
H20 SC	1.5	H45 SC	1.5
H25 SC	1.5	H55 SC	1.5
H30 SC	1.5	H65 SC	1.5

Top Seal

Top seal can efficiently avoid dust from the surface of rail or tapping hole getting inside the block.

Bolt caps for rail mounting holes

Caps are used to cover the mounting holes to prevent chips or other foreign objects from collecting in the holes. The caps will be enclosed in each rail package.

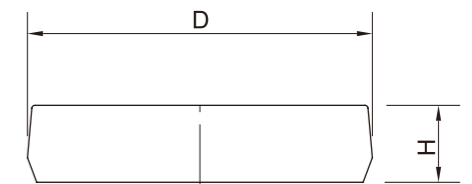


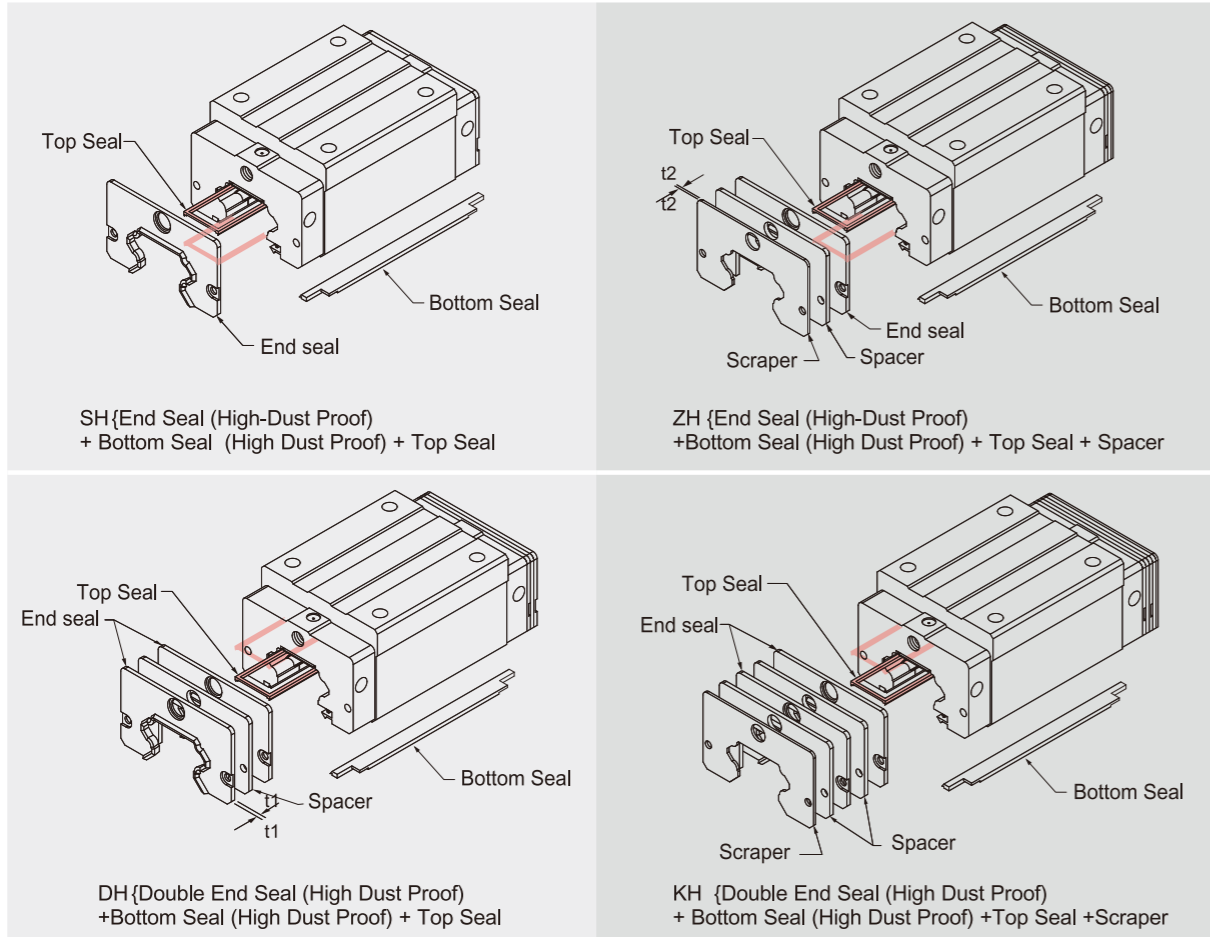
Table 2-1-15 Dimensions of Bolt Caps for Rail Mounting Holes

Rail size	Bolt size	Diameter(D) (mm)	Thickness(H) (mm)	Rail size	Bolt size	Diameter(D) (mm)	Thickness(H) (mm)
HR15	M4	7.65	1.1	HR35	M8	14.25	3.3
HR20	M5	9.65	2.2	HR45	M12	20.25	4.6
HR25	M6	11.2	2.5	HR55	M14	23.5	5.5
HR30	M8	14.25	3.3	HR65	M16	26.6	5.5



(2) Codes of high-dust proof accessories

LIMON develops many kinds of dust proof accessories for different application and working environment to avoid dust or debris. If the following accessories are needed, please add the code followed by the model number.



Note: 1. The available size for high dust proof accessories are HH20(C/H), 25(C/H), 30(C/H), 35(C/H) and 45C.
2. The value of friction force will increase 0.6~1.2 kgf.



2-1-9 Friction

The maximum value of resistance per end seal are as shown in the table.

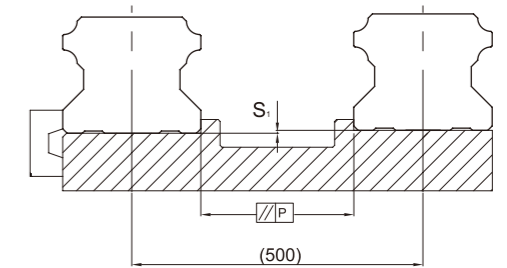
Table 2-1-16 Seal Resistance

Size	Resistance N (kgf)	Size	Resistance N (kgf)
H15	1 (0.1)	H35	3 (0.31)
H20	1.7 (0.1)	H45	4 (0.41)
H25	2 (0.2)	H55	5 (0.51)
H30	2.6 (0.27)	H65	6 (0.61)

Note: 1kgf=9.81N

2-1-10 The Accuracy Tolerance of Mounting Surface

(1) The accuracy tolerance of rail-mounting surface
Because of the Circular-arc contact design, the H linear guideway can compensate for some surface-error on installation and still maintain smooth linear motion. As long as the accuracy requirements for the mounting surface are followed, high accuracy and rigidity of linear motion of the guideway can be obtained without any difficulty. In order to satisfy the needs of fast installation and smooth movement, LIMON offers the normal clearance type of preload to customers of its high absorption ability of the deviation in mounting surface accuracy.



(2) The parallelism tolerance of reference surface (P)

Table 2-1-17 Max. Parallelism Tolerance (P)

unit: μm

Size	Preload classes		
	Z0	ZA	ZB
H15	25	18	13
H20	25	20	18
H25	30	22	20
H30	40	30	27
H35	50	35	30
H45	60	40	35
H55	70	50	45
H65	80	60	55

(3) The accuracy tolerance of reference surface height

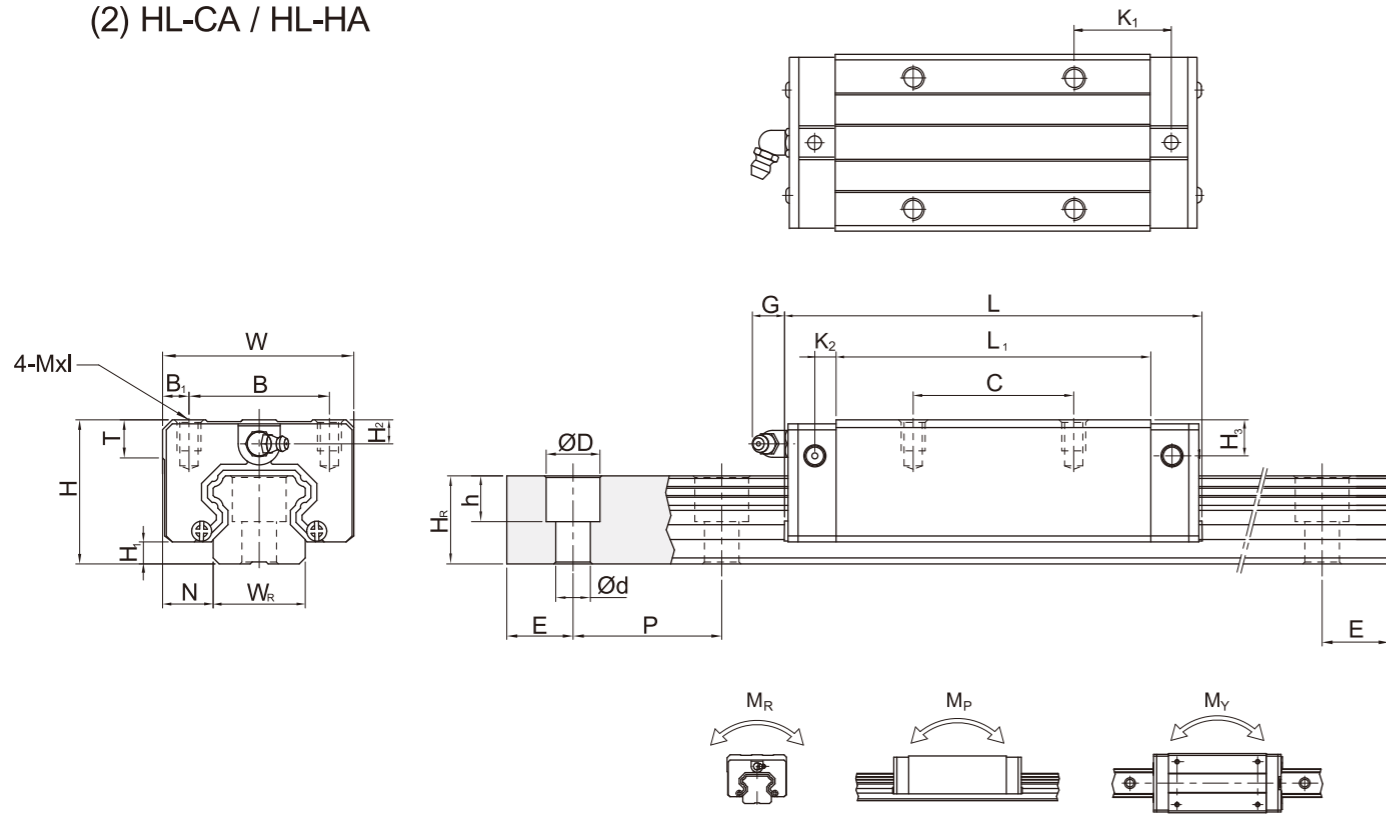
Table 2-1-18 Max. Tolerance of Reference Surface Height (S_1)

unit: μm

Size	Preload classes		
	Z0	ZA	ZB
H15	130	85	35
H20	130	85	50
H25	130	85	70
H30	170	110	90
H35	210	150	120
H45	250	170	140
H55	300	210	170
H65	350	250	200



(2) HL-CA / HL-HA

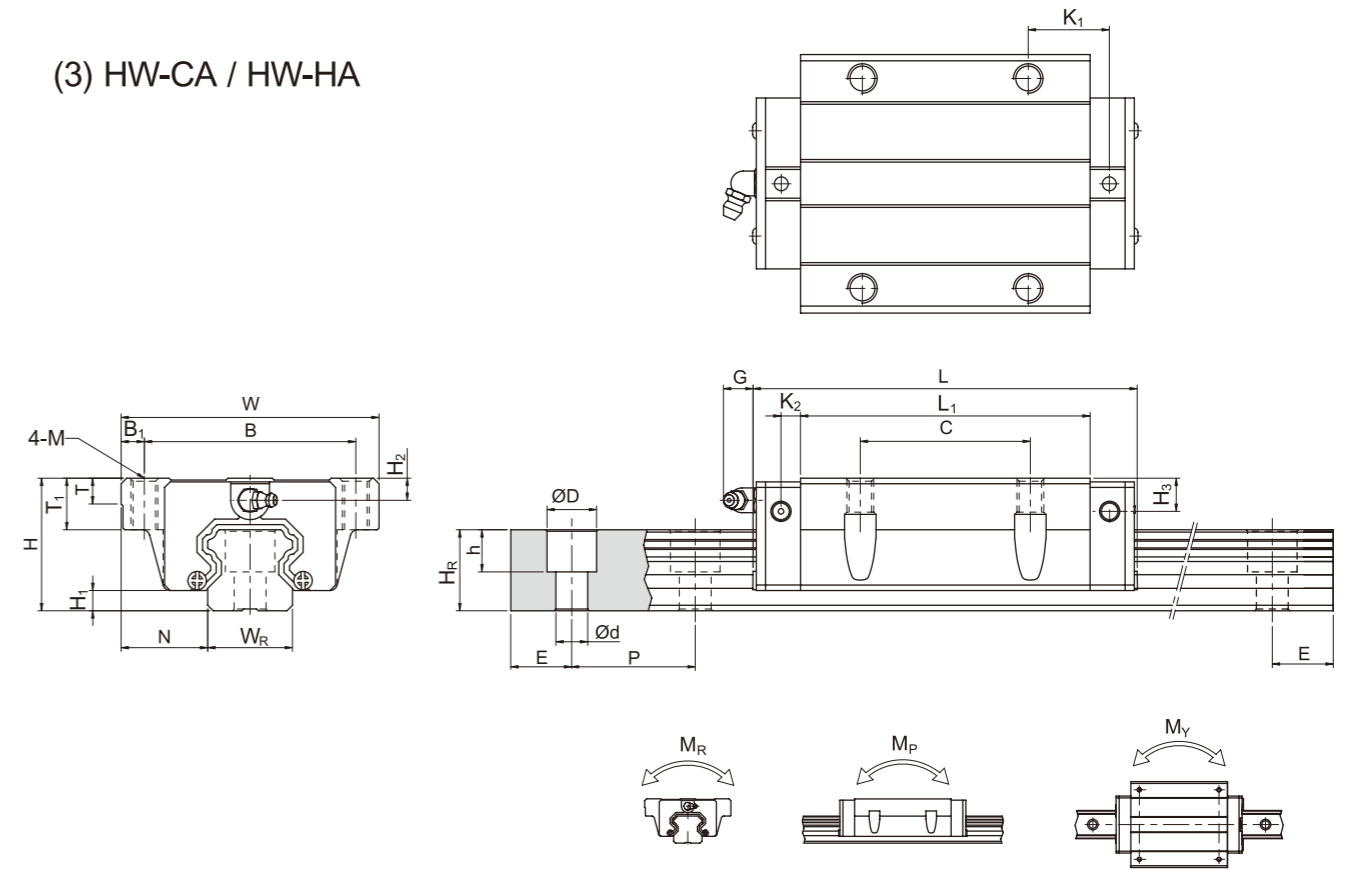


Model No.	Dimensions of Assembly (mm)		Dimensions of Block (mm)													Mounting Bolt for Rail (mm)	Basic Dynamic Load Rating C ₀ (kN)	Basic Static Load Rating C ₀ (kN)	Static Rated Moment			Weight									
	H	H ₁	N	W	B	B ₁	C	L ₁	L	K ₁	K ₂	G	MxI	T	H ₂				H ₃	W _R	H _R	D	h	d	P	E	M _R	M _P	M _Y	Block	Rail
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm				mm	mm	mm	mm	mm	mm	mm	mm	mm	kN-m	kN-m	kN-m	kg
HL15CA	24	4.3	9.5	34	26	4	26	39.4	61.4	10	4.85	5.3	M4x4	6	3.95	3.7	15	15	7.5	5.3	4.5	60	20	M4x16	14.7	23.47	0.12	0.10	0.10	0.14	1.45
HL25CA	36	5.5	12.5	48	35	6.5	35	58	84	15.7	6	12	M6x6	8	6	5	23	22	11	9	7	60	20	M6x20	34.9	52.82	0.42	0.33	0.33	0.42	3.21
HL25HA							50	78.6	104.6	18.5															42.2	69.07	0.56	0.57	0.57	0.57	
HL30CA	42	6	16	60	40	10	40	70	97.4	20.25	6	12	M8x10	8.5	6.5	10.8	28	26	14	12	9	80	20	M8x25	48.5	71.87	0.66	0.53	0.53	0.78	4.47
HL30HA							60	93	120.421.75	58.6															93.99	0.88	0.92	0.92	1.03		
HL35CA	48	7.5	18	70	50	10	50	80	112.4	20.6	7	12	M8x12	10.2	9	12.6	34	29	14	12	9	80	20	M8x25	64.6	93.88	1.16	0.81	0.81	1.14	6.30
HL35HA							72	105.8138.2	22.5	77.9															122.77	1.54	1.40	1.40	1.52		
HL45CA	60	9.5	20.5	86	60	13	60	97	139.4	23	10	12.9M	10x17	16	8.5	20.5	45	38	20	17	14	10522.5	M12x35	103.8	146.71	1.98	1.55	1.55	2.08	10.41	
HL45HA							80	128.8171.2	28.9	125.3														191.85	2.63	2.68	2.68	2.75			
HL55CA	70	13	23.5	100	75	12.5	75	117.7166.717.35	11	12.9M	12x1817.5	12	19	53	44	23	20	16	120	30	M14x45	153.2	211.23	3.69	2.64	2.64	3.25	15.08			
HL55HA							95	155.8204.8														36.4	184.9	276.23	4.88	4.57	4.57		4.27		

Note : 1 kgf = 9.81 N



(3) HW-CA / HW-HA

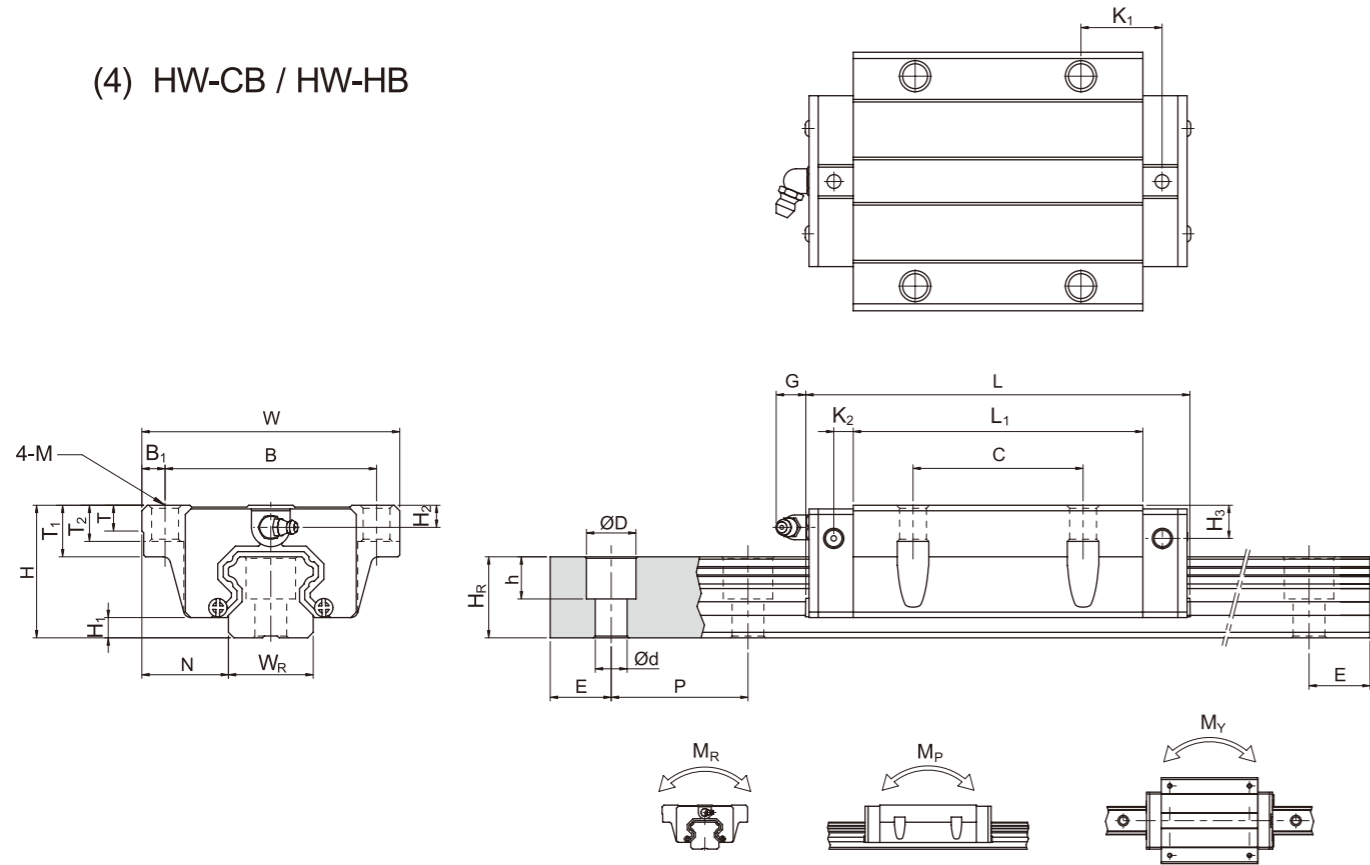


Model No.	Dimensions of Assembly (mm)		Dimensions of Block (mm)													Mounting Bolt for Rail (mm)	Basic Dynamic Load Rating C ₀ (kN)	Basic Static Load Rating C ₀ (kN)	Static Rated Moment			Weight										
	H	H ₁	N	W	B	B ₁	C	L ₁	L	K ₁	K ₂	G	M	T	T ₁				H ₂	H ₃	W _R	H _R	D	h	d	P	E	M _R	M _P	M _Y	Block	Rail
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm				mm	mm	mm	mm	mm	mm	mm	mm	mm	kN-m	kN-m	kN-m	kg	kg/m
HW15CA	24	4.3	16	47	38	4.5	30	39.4	61.4	8	4.85	5.3	M5	6	8.9	3.95	3.7	15	15	7.5	5.3	4.5	60	20	M4x16	14.7	23.47	0.12	0.10	0.10	0.17	1.45
HW20CA	30	4.6	21.5	63	53	5	40	50.5	77.5	10.25	6	12	M6	8	10	6	6	20	17.59.5	8.5	6	60	20	M5x16	27.1	36.68	0.27	0.20	0.20	0.40	2.21	
HW20HA							65.2	92.2	17.6	32.7															47.96	0.35	0.35	0.35	0.52			
HW25CA	36	5.5	23.5	70	57	6.5	45	58	84	10.7	6	12	M8	8	14	6	5	23	22	11	9	7	60	20	M6x20	34.9	52.82	0.42	0.33	0.33	0.59	3.21
HW25HA							78.6	104.6	21	42.2																69.07	0.56	0.57	0.57	0.80		
HW30CA	42	6	31	90	72	9	52	70	97.4	14.25	6	12	M10	8.5	16	6.5	10.8	28	26	14	12	9	80	20	M8x25	48.5	71.87	0.66	0.53	0.53	1.09	4.47
HW30HA							93	120.425.75	58.6	93.99																0.88	0.92	0.92	1.44			
HW35CA	48	7.5	33	100	82	9	62	80	112.4	14.6	7	12	M10	10.1	18	9	12.6	34	29	14	12	9	80	20	M8x25	64.6	93.88	1.16	0.81	0.81	1.56	6.30
HW35HA							105.8138.2	27.5	77.9	122.77																1.54	1.40	1.40	2.06			
HW45CA	60	9.5	37.5	120	100	10	80	97	139.4	13	10	12.9M	12x15.1	22	8.5	20.5	45	38	20	17	14	10522.5	M12x35	103.8	146.71	1.98	1.55	1.55	2.79	10.41		
HW45HA							128.8171.2	28.9	125.3	191.85														2.63	2.68	2.68	3.69					
HW55CA	70	13	43.5	140	116	12	95	117.7166.717.35	11	12.9M	1417.526.5	12	19	53	44	23	20	16	120	30	M14x45	153.2	211.23	3.69	2.64	2.64	4.52	15.08				
HW55HA							155.8204.8	36.4														184.9	276.23	4.88	4.57	4.57	5.96					
HW65CA	90	15	53.5	170	142	14	110	144.2200.2	23.1	14	12.9M	16	25	37.5	15	15	63	53	26	22	18	150	35	M16x50	213.2	287.48	6.65	4.27	4.27	9.17	21.18	
HW65HA							203.6259.6	52.8	277.8																420.17	9.38	7.38	7.38	12.89			

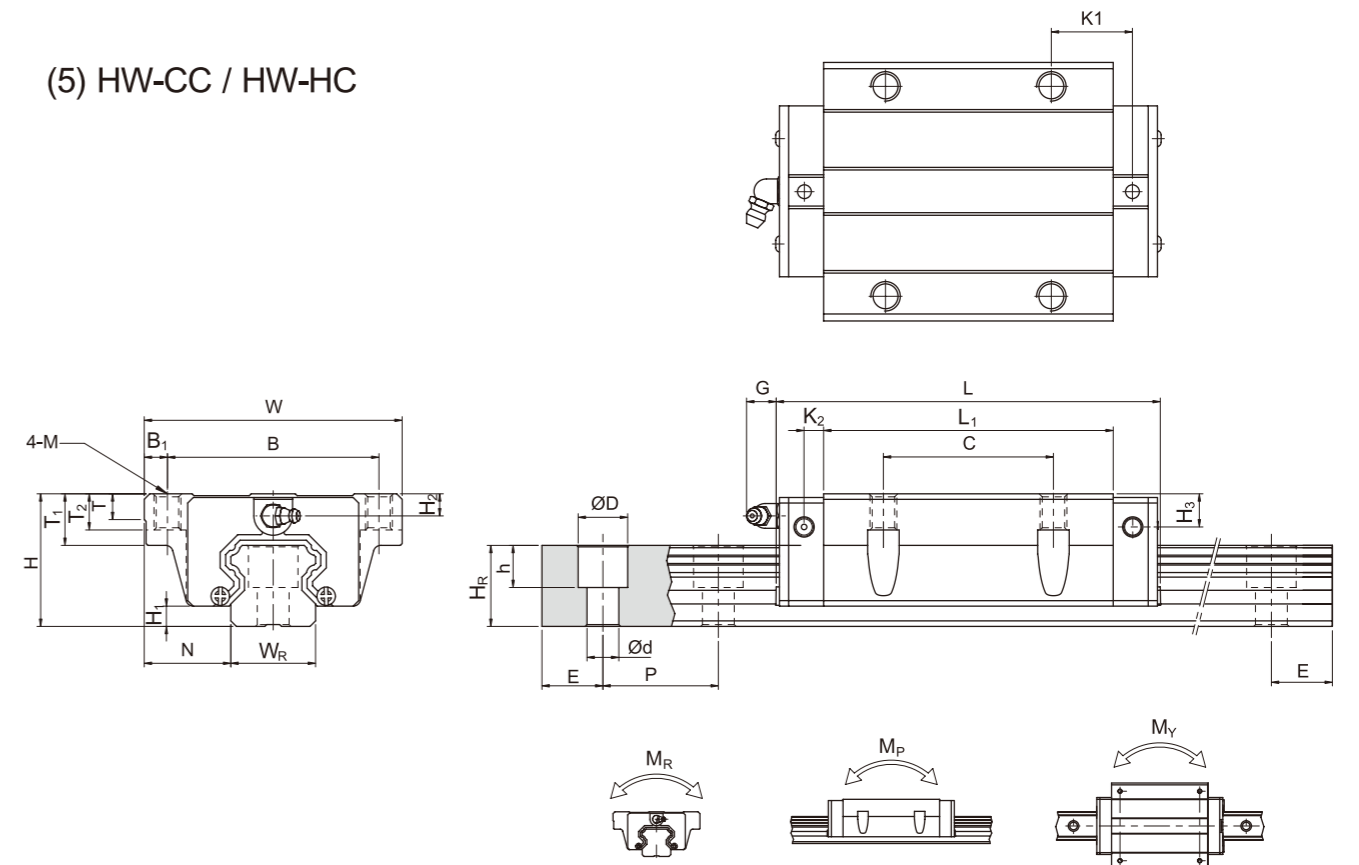
Note : 1 kgf = 9.81 N



(4) HW-CB / HW-HB



(5) HW-CC / HW-HC



Model No.	Dimensions of Assembly (mm)		Dimensions of Block (mm)														Dimensions of Rail (mm)		Mounting Bolt for Rail (mm)	Basic Dynamic Load Rating C _d (kN)	Basic Static Load Rating C ₀ (kN)	Static Rated Moment			Weight									
	H	H ₁	N	W	B	B ₁	C	L ₁	L	K ₁	K ₂	G	M	T	T ₁	T ₂	H ₂	H ₃				W _R	H _R	D	h	d	P	E	M _R	M _P	M _Y	Block	Rail	
	kg	kg/m	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg				kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg
HW15CB	24	4.3	16	47	38	4.5	30	39.4	61.4	8	4.85	5.3	Ø4.5	6	8.9	6.953	9.53	7	15	15	7.5	5.3	4.5	60	20	M4x16	14.7	23.47	0.12	0.10	0.10	0.17	1.45	
HW20CB	30	4.6	21.5	63	53	5	40	50.5	77.5	10.25	6	12	Ø6	8	10	9.5	6	6	20	17.5	9.5	8.5	6	60	20	M5x16	27.1	36.68	0.27	0.20	0.20	0.40	2.21	
HW20HB								65.2	92.2	17.6																								
HW25CB	36	5.5	23.5	70	57	6.5	45	58	84	10.7	6	12	Ø7	8	14	10	6	5	23	22	11	9	7	60	20	M6x20	34.9	52.82	0.42	0.33	0.33	0.59	3.21	
HW25HB								78.6	104.6	21																								
HW30CB	42	6	31	90	72	9	52	70	97.4	14.25	6	12	Ø9	8.5	16	10	6.5	10.8	28	26	14	12	9	80	20	M8x25	48.5	71.87	0.66	0.53	0.53	1.09	4.47	
HW30HB								93	120.425	7.5																								
HW35CB	48	7.5	33	100	82	9	62	80	112.4	14.6	7	12	Ø9	10.1	18	13	9	12.6	34	29	14	12	9	80	20	M8x25	64.6	93.88	1.16	0.81	0.81	1.56	6.30	
HW35HB								105.8	138.2	27.5																								
HW45CB	60	9.5	37.5	120	100	10	80	97	139.4	13	10	12	Ø11	11.5	22	15	8.5	20.5	45	38	20	17	14	105	22.5	M12x35	103.8	146.71	1.98	1.55	1.55	2.79	10.41	
HW45HB								128.8	171.2	28.9																								
HW55CB	70	13	43.5	140	116	12	95	117.7	166.7	17.35	11	12	Ø12	14.7	26.5	17	12	19	53	44	23	20	16	120	30	M14x45	153.2	211.23	3.69	2.64	2.64	4.52	15.08	
HW55HB								155.8	204.8	36.4																								
HW65CB	90	15	53.5	170	142	14	110	144.2	200.2	23.1	14	12	Ø16	25	37.5	23	15	15	63	53	26	22	18	150	35	M16x50	213.2	287.48	6.65	4.27	4.27	9.17	21.18	
HW65HB								203.6	259.6	52.8																								

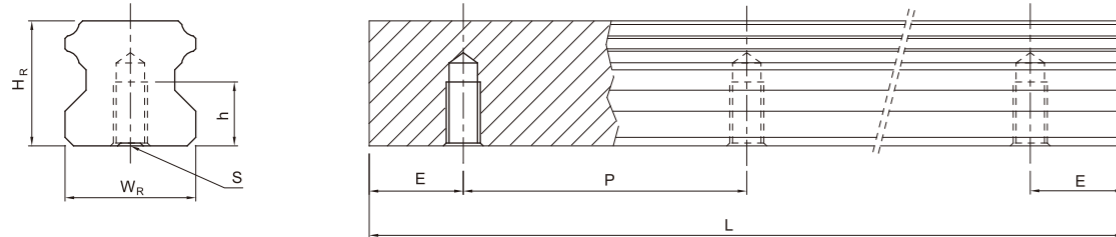
Note : 1 kgf = 9.81 N

Model No.	Dimensions of Assembly (mm)		Dimensions of Block (mm)														Dimensions of Rail (mm)		Mounting Bolt for Rail (mm)	Basic Dynamic Load Rating C _d (kN)	Basic Static Load Rating C ₀ (kN)	Static Rated Moment			Weight									
	H	H ₁	N	W	B	B ₁	C	L ₁	L	K ₁	K ₂	G	M	T	T ₁	T ₂	H ₂	H ₃				W _R	H _R	D	h	d	P	E	M _R	M _P	M _Y	Block	Rail	
	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg				kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg
HW15CC	24	4.3	16	47	38	4.5	30	39.4	61.4	8	4.85	5.3	M5	6	8.9	6.953	9.5	3.7	15	15	7.5	5.3	4.5	60	20	M4x16	14.7	23.47	0.12	0.10	0.10	0.17	1.45	
HW20CC	30	4.6	21.5	63	53	5	40	50.5	77.5	10.25	6	12	M6	8	10	9.5	6	6	20	17.5	9.5	8.5	6	60	20	M5x16	27.1	36.68	0.27	0.20	0.20	0.40	2.21	
HW20HC								65.2	92.2	17.6																								
HW25CC	36	5.5	23.5	70	57	6.5	45	58	84	10.7	6	12	M8	8	14	10	6	5	23	22	11	9	7	60	20	M6x20	34.9	52.82	0.42	0.33	0.33	0.59	3.21	
HW25HC								78.6	104.6	21																								
HW30CC	42	6	31	90	72	9	52	70	97.4	14.25	6	12	M10	8.5	16	10	6.5	10.8	28	26	14	12	9	80	20	M8x25	48.5	71.87	0.66	0.53	0.53	1.09	4.47	
HW30HC								93	120.425	7.5																								
HW35CC	48	7.5	33	100	82	9	62	80	112.4	14.6	7	12	M10	10.1	18	13	9	12.6	34	29	14	12	9	80	20	M8x25	64.6	93.88	1.16	0.81	0.81	1.56	6.30	
HW35HC								105.8	138.2	27.5																								
HW45CC	60	9.5	37.5	120	100	10	80	97	139.4	13	10	12	M12	11.5	22	15	8.5	20.5	45	38	20	17	14	105	22.5	M12x35	103.8	146.71	1.98	1.55	1.55	2.79	10.41	
HW45HC								128.8	171.2	28.9																								
HW55CC	70	13	43.5	140	116	12	95	117.7	166.7	17.35	11	12	M14	14.7	26.5	17	12	19	53	44	23	20	16	120	30	M14x45	153.2	211.23	3.69	2.64	2.64	4.52	15.08	
HW55HC								155.8	204.8	36.4																								
HW65CC	90	15	53.5	170	142	14	110	144.2	200.2	23.1	14	12	M16	25	37.5	23	15	15	63	53	26	22	18	150	35	M16x50	213.2	287.48	6.65	4.27	4.27	9.17	21.18	
HW65HC								203.6	259.6	52.8																								

Note : 1 kgf = 9.81 N



(6) Dimensions for HR-T (Rail Mounting from Bottom)



Model No.	Dimensions of Rail (mm)						Weight (kg/m)
	W_R	H_R	S	h	P	E	
HR15T	15	15	M5 x 0.8P	8	60	20	1.48
HR20T	20	17.5	M6 x 1P	10	60	20	2.29
HR25T	23	22	M6 x 1P	12	60	20	3.35
HR30T	28	26	M8 x 1.25P	15	80	20	4.67
HR35T	34	29	M8x1.25P	17	80	20	6.51
HR45T	45	38	M12 x 1.75P	24	105	22.5	10.87
HR55T	53	44	M14 x 2P	24	120	30	15.67
HR65T	63	53	M20 x 2.5P	30	150	35	21.73

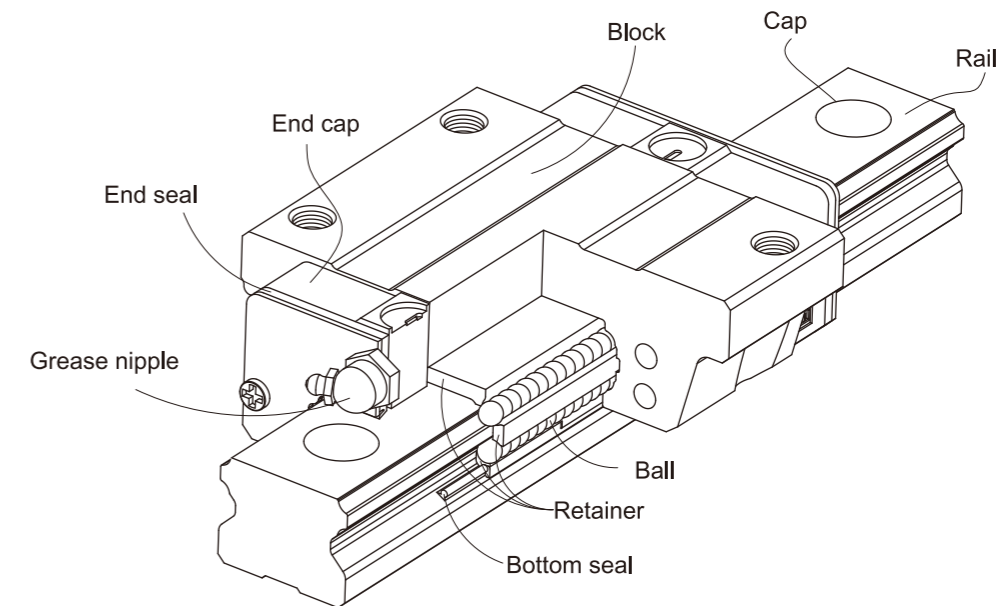


2-2 E Series – Low Profile Ball Type Linear Guideway

2-2-1 Features of E Series

The design of the E series offers a low profile, high load capacity, and high rigidity. It also features an equal load rating in all four directions and self-aligning capability to absorb installation-error, allowing for higher accuracies. Additionally, the lower assembly height and the shorter length make the E series more suitable for high-speed, automation machines and applications where space is limited. The retainer is designed to hold the balls in the block even when it is removed from the rail.

2-2-2 Construction of E Series



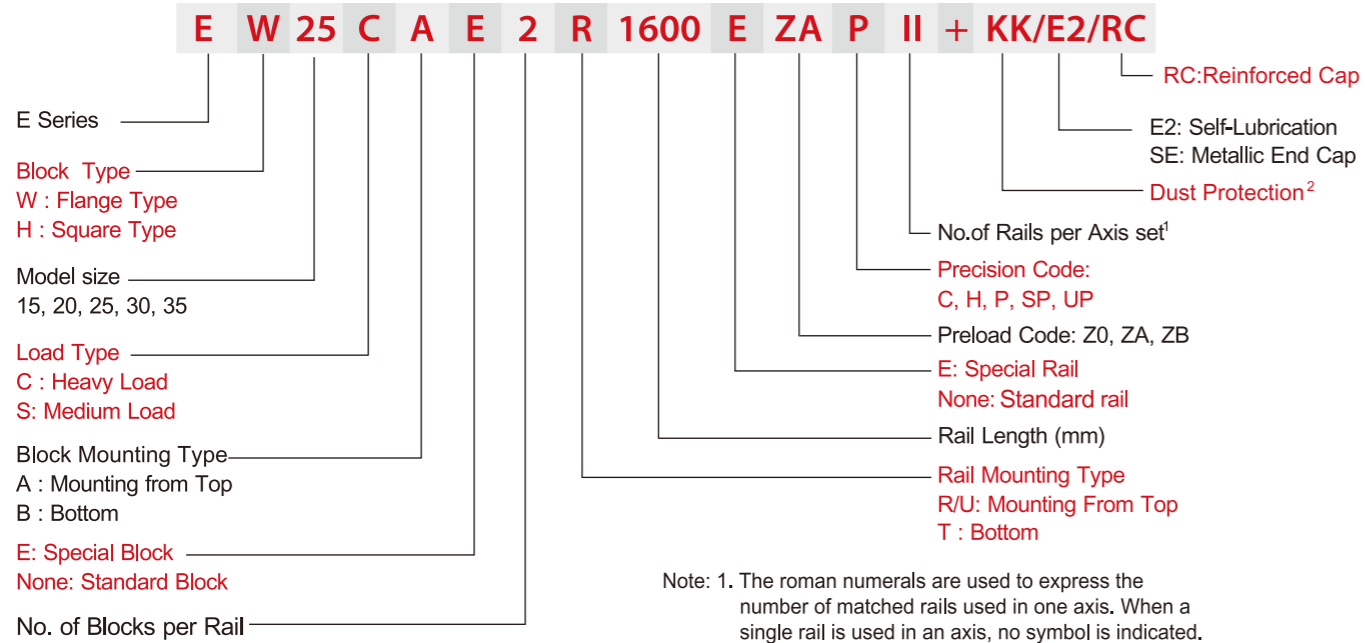
- Rolling circulation system: Block, rail, end cap and retainer
- Lubrication system: Grease nipple and piping Joint
- Dust protection system: End seal, bottom seal, cap and scraper

2-2-3 Model Number of E Series

E series linear guideways are classified into non-interchangeable and interchangeable types. The sizes of these two types are the same as one another. The main difference is that the interchangeable type of blocks and rails can be freely exchanged and they can maintain P-class accuracy. Because of strict dimensional control, the interchangeable type linear guideways are a wise choice for customers when rails do not need to be matched for an axis. The model number of the E series identifies the size, type, accuracy class, preload class, etc.

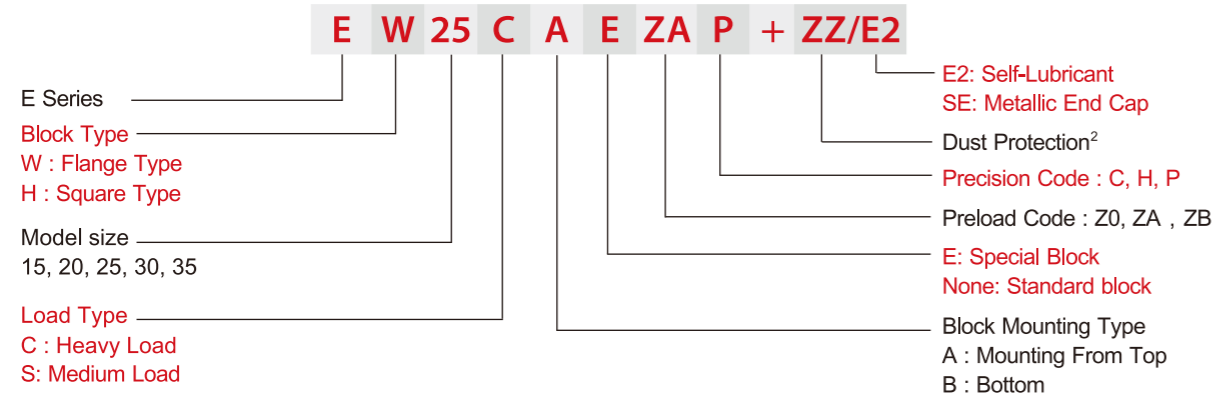


(1) Non-interchangeable type

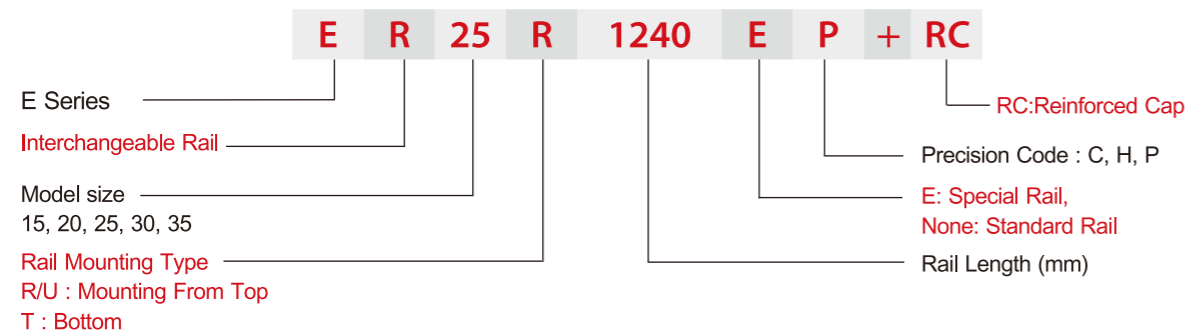


(2) Interchangeable type

□ Model Number of E Block



□ Model Number of E Rail



2-2-4 Types

(1) Block types

LIMON offers two types of linear guideways, flange and square types.

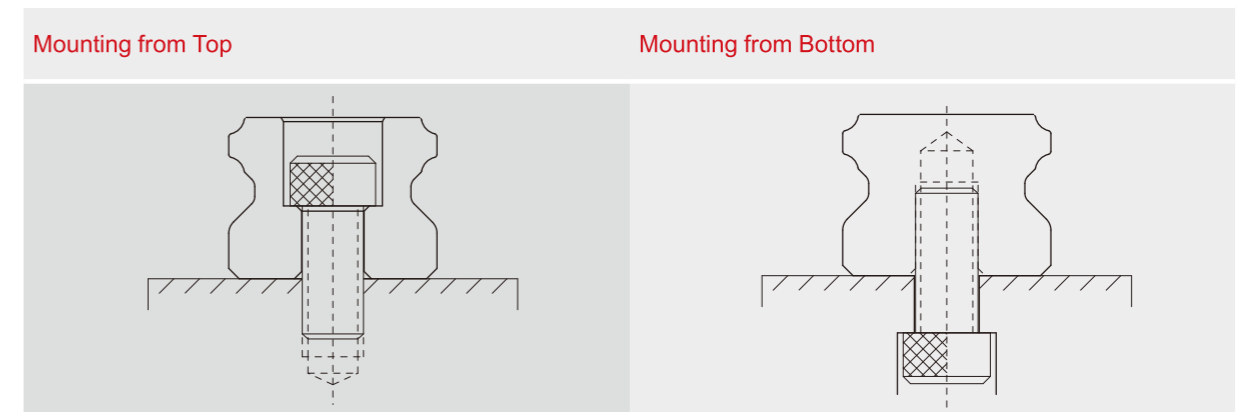
Table 2-2-1 Block Types

Type	Model	Shape	Height (mm)	Rail Length (mm)	Main Applications
Square	EH-SA EH-CA		24	100	<ul style="list-style-type: none"> Automation devices High-speed transportation equipment Precision measuring equipment Semiconductor manufacturing equipment
			48	4000	
Flange	EW-SA EW-CA		24	100	
			48	4000	
Flange	EW-SB EW-CB		24	100	
			48	4000	

(2) Rail types

Besides the standard top mounting type, LIMON also offers bottom mounting type rails.

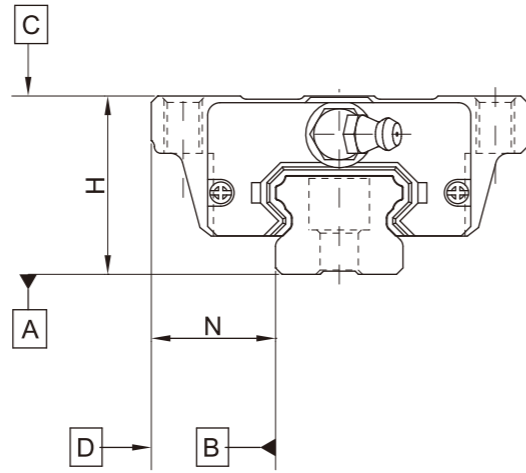
Table 2-2-2 Rail Types





2-2-5 Accuracy

The accuracy of the E series can be classified into 5 classes: normal(C), high(H), precision(P), super precision(SP), and ultra precision(UP). Choose the class by referencing the accuracy of selected equipment.



(1) Accuracy of non-interchangeable guideways

Table 2-2-3 Accuracy Standards

Unit: mm

Item	E - 15, 20				
	Normal (C)	High (H)	Precision (P)	Super Precision (SP)	Ultra Precision (UP)
Dimensional tolerance of height H	± 0.1	± 0.03	0 -0.03	0 -0.015	0 -0.008
Dimensional tolerance of width N	± 0.1	± 0.03	0 -0.03	0 -0.015	0 -0.008
Variation of height H	0.02	0.01	0.006	0.004	0.003
Variation of width N	0.02	0.01	0.006	0.004	0.003
Running parallelism of block surface C to surface A	See Table 2-2-7				
Running parallelism of block surface D to surface B	See Table 2-2-7				

Table 2-2-4 Accuracy Standards

Unit: mm

Item	E - 25, 30, 35				
	Normal (C)	High (H)	Precision (P)	Super Precision (SP)	Ultra Precision (UP)
Dimensional tolerance of height H	± 0.1	± 0.04	0 -0.04	0 -0.02	0 -0.01
Dimensional tolerance of width N	± 0.1	± 0.04	0 -0.04	0 -0.02	0 -0.01
Variation of height H	0.02	0.015	0.007	0.005	0.003
Variation of width N	0.03	0.015	0.007	0.005	0.003
Running parallelism of block surface C to surface A	See Table 2-2-7				
Running parallelism of block surface D to surface B	See Table 2-2-7				



(2) Accuracy of interchangeable guideways

Table 2-2-5 Accuracy Standards

Unit: mm

Item	E - 15, 20		
	Normal (C)	High (H)	Precision (P)
Dimensional tolerance of height H	± 0.1	± 0.03	± 0.015
Dimensional tolerance of width N	± 0.1	± 0.03	± 0.015
Variation of height H	0.02	0.01	0.006
Variation of width N	0.02	0.01	0.006
Running parallelism of block surface C to surface A	See Table 2-2-7		
Running parallelism of block surface D to surface B	See Table 2-2-7		

Table 2-2-6 Accuracy Standards

Unit: mm

Item	E - 25, 30, 35		
	Normal (C)	High (H)	Precision (P)
Dimensional tolerance of height H	± 0.1	± 0.04	± 0.02
Dimensional tolerance of width N	± 0.1	± 0.04	± 0.02
Variation of height H	0.02	0.015	0.007
Variation of width N	0.03	0.015	0.007
Running parallelism of block surface C to surface A	See Table 2-2-7		
Running parallelism of block surface D to surface B	See Table 2-2-7		

(3) Accuracy of running parallelism

Table 2-2-7 Accuracy of Running Parallelism

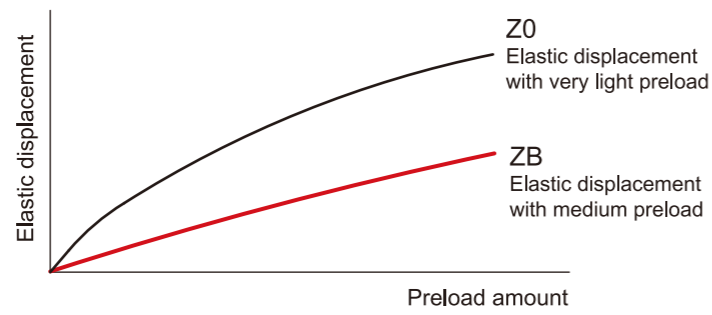
Rail Length (mm)	Accuracy (μm)				
	C	H	P	SP	UP
~ 100	12	7	3	2	2
100 ~ 200	14	9	4	2	2
200 ~ 300	15	10	5	3	2
300 ~ 500	17	12	6	3	2
500 ~ 700	20	13	7	4	2
700 ~ 900	22	15	8	5	3
900 ~ 1,100	24	16	9	6	3
1,100 ~ 1,500	26	18	11	7	4
1,500 ~ 1,900	28	20	13	8	4
1,900 ~ 2,500	31	22	15	10	5
2,500 ~ 3,100	33	25	18	11	6
3,100 ~ 3,600	36	27	20	14	7
3,600 ~ 4,000	37	28	21	15	7



2-2-6 Preload

(1) Definition

A preload can be applied to each guideway. Generally, a linear motion guideway has a negative clearance between the groove and balls in order to improve stiffness and maintain high precision. The figure shows that adding a preload can improve stiffness of the linear guideway. A preload no greater than ZA would be recommended for model sizes smaller than E20. This will avoid an over-loaded condition that would affect guideway life.



(2) Preload classes

LIMON offers three standard preloads for various applications and conditions.

Table 2-2-8 Preload Classes

Class	Code	Preload	Condition
Very Light Preload	Z0	0~ 0.02C	Certain load direction, low impact, low precision required
Light Preload	ZA	0.03C~0.05C	low load and high precision required
Medium Preload	ZB	0.06C~ 0.08C	High rigidity required, with vibration and impact

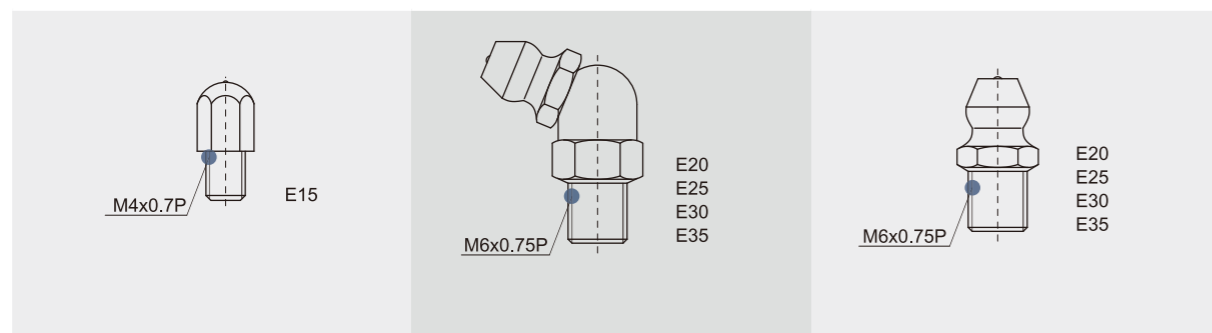
Class	Interchangeable Guideway	Non-Interchangeable Guideway
Preload classes	Z0, ZA	Z0, ZA, ZB

Note: The "C" in the preload column denotes basic dynamic load rating.

2-2-7 Lubrication

(1) Grease

□ Grease nipple



□ Mounting location

The standard location of the grease fitting is at both ends of the block, the nipple may be mounted in the side or top of the block. For lateral installation, we recommend that the nipple be mounted to the non-reference side, otherwise please contact us. When lubricating from above, in the recess for the O-ring, a smaller, preformed recess can be found. Preheat the 0.8 mm diameter metal tip. Carefully open the small recess with the metal tip and pierce through it. Insert a round sealing ring into the recess. (The round sealing ring is not supplied with the block) Do not open the small recess with a drill bit this may introduce the danger of contamination. It is possible to carry out the lubrication by using the oil-piping joint.

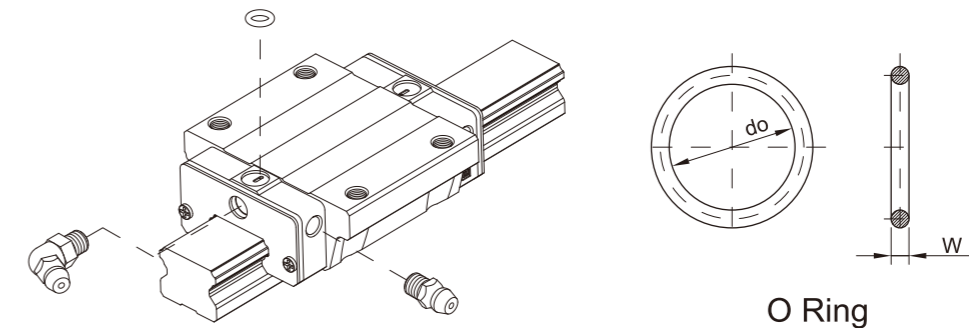


Table 2-2-9 O-Ring size and max. permissible depth for piercing

Size	O-Ring		Lube hole at top: max. permissible depth for piercing
	do(mm)	W (mm)	T _{max} (mm)
E15	2.5 ± 0.15	1.5 ± 0.15	6.9
E20	4.5 ± 0.15	1.5 ± 0.15	8.4
E25	4.5 ± 0.15	1.5 ± 0.15	10.4
E30	4.5 ± 0.15	1.5 ± 0.15	10.4
E35	4.5 ± 0.15	1.5 ± 0.15	10.8

The diagram shows a cross-section of a lube hole with a diameter of 0.8 mm and a depth labeled T_{max}.

□ The oil amount for a block filled with grease

Table 2-2-10 The oil amount for a block filled with grease

Size	Medium Load (cm ³)	Heavy Load (cm ³)
E15	0.8	1.4
E20	1.5	2.4
E25	2.8	4.6
E30	3.7	6.3
E35	5.6	6.6

Frequency of replenishment

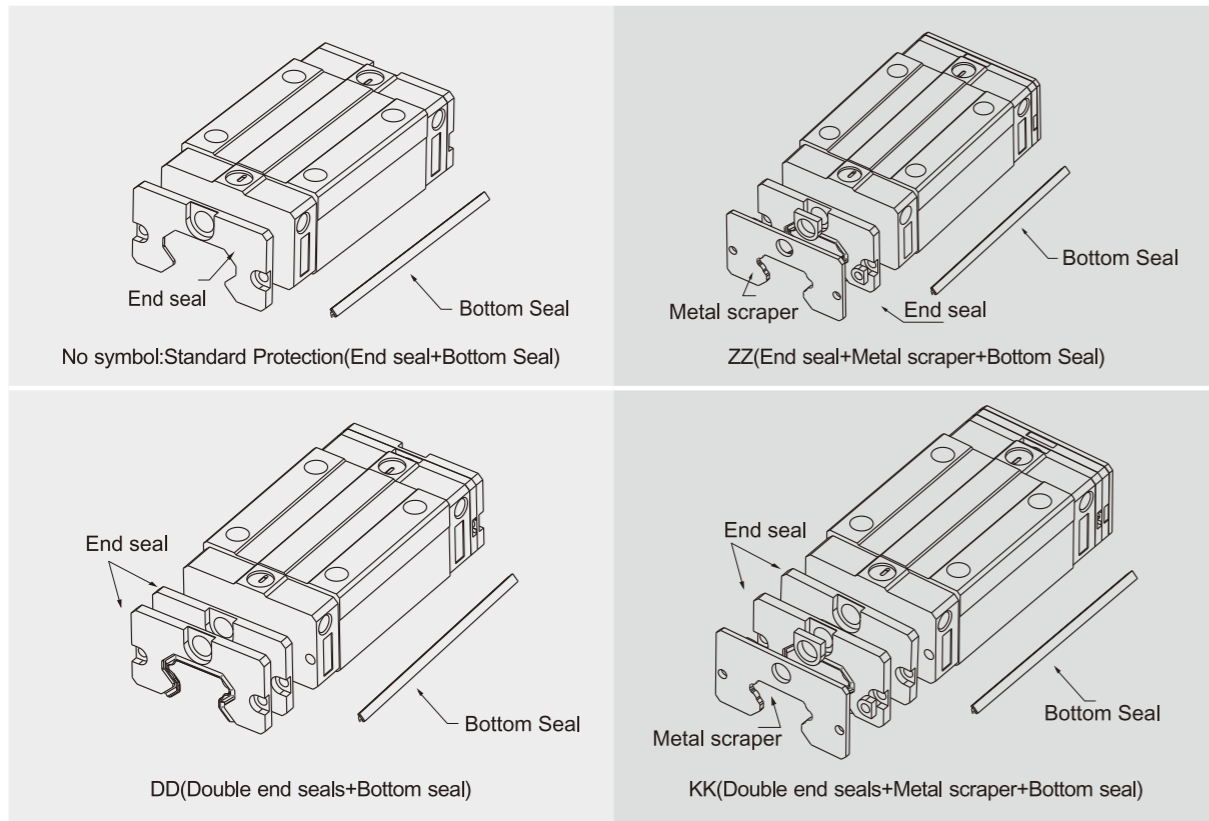
Check the grease every 100 km, or every 3-6 months.



2-2-8 Dust Proof Accessories

(1) Codes of accessories

If the following accessories is needed, please indicate the code followed by the model number.



(2) End seal and bottom seal

Protects against contaminants entering the block. Reduces potential for groove damage resulting in a reduction of life ratings.

(3) Double seals

Removing foreign matters from the rail to prevent contaminants from entering the block.

Table 2-2-11 Dimensions of end seal

Size	Thickness (t1) (mm)
E15 ES	2
E20 ES	2
E25 ES	2
E30 ES	2
E35 ES	2



(4) Scraper

Clears larger contaminants, such as weld spatter and metal cuttings, from the rail. Metal scraper protects end seals from excessive damage.

Table 2-2-12 Dimensions of Scraper

Size	Thickness (t2) (mm)
E 15 SC	0.8
E 20 SC	0.8
E 25 SC	1
E 30 SC	1
E 35 SC	1.5

(5) Bolt caps for rail mounting holes

Rail mounting hole caps prevent foreign matter from accumulating in the mounting holes. Caps are included with the rail package.

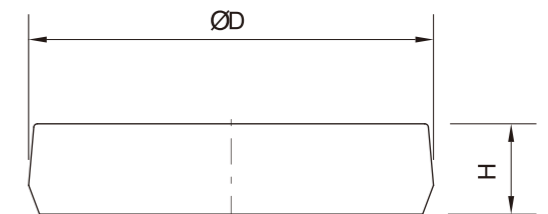


Table 2-2-13 Dimensions of Bolt Caps for Rail Mounting Holes

Rail size	Bolt size	Diameter(D) (mm)	Thickness(H) (mm)
ER15R	M3	6.15	1.2
ER20R	M5	9.65	2.5
ER25R	M6	11.15	2.5
ER30R	M6	11.15	2.5
ER35R	M8	14.20	3.5
ER15U	M4	7.65	1.1
ER30U	M8	14.20	3.5

(6) Dimensions of block equipped with the dustproof parts

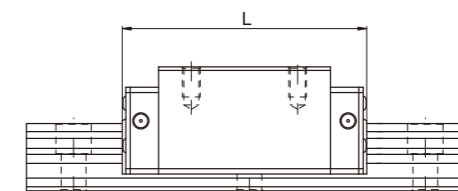


Table 2-2-14 Overall block length

Unit: mm

Size	Overall block length (L)			
	SS	ZZ	DD	KK
E15S	41.1	43.7	46.1	48.7
E15C	57.8	60.4	62.8	65.4
E20S	51.2	53.8	56.4	59
E20C	70.3	72.9	75.5	78.1
E25S	59.7	62.3	65.7	68.3
E25C	85.2	87.8	91.2	93.8
E30S	71.9	74.5	78.1	80.7
E30C	100.4	103	106.6	109.2
E35S	76	79	80	83
E35C	108	111	112	115



2-2-9 Friction

The maximum value of resistance per end seal are as shown in the table.

Table 2-2-15 Seal Resistance

Size	Resistance N (kgf)
E15	1 (0.1)
E20	1.2 (0.17)
E25	2 (0.2)
E30	2.6 (0.27)
E35	3.5 (0.36)

Note: 1kgf=9.81N

2-2-10 The Accuracy Tolerance of Mounting Surface

Because of the circular-arc contact design, the E linear guideway can withstand surface-error installation and deliver smooth linear motion. When the mounting surface meets the accuracy requirements of the installation, the high accuracy and rigidity of the guideway will be obtained without any difficulty. For faster installation and smoother movement, LIMON offers a preload with normal clearance because of its ability to absorb higher deviations in mounting surface inaccuracies.

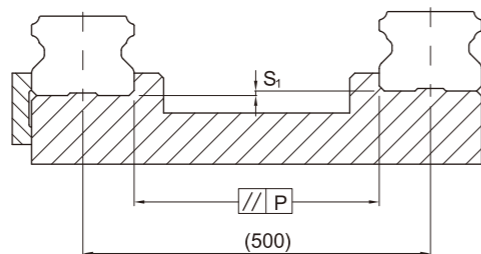


Table 2-2-16 Max. Parallelism Tolerance (P)

Size	Preload classes		
	Z0	ZA	ZB
E15	25	18	-
E20	25	20	18
E25	30	22	20
E30	40	30	27
E35	50	35	30

unit: μm

Table 2-2-17 Max. Tolerance of Reference Surface Height (S_1)

Size	Preload classes		
	Z0	ZA	ZB
E15	130	85	-
E20	130	85	50
E25	130	85	70
E30	170	110	90
E35	210	150	120

unit: μm



2-2-11 Cautions for Installation

(1) Shoulder heights and chamfers

Improper shoulder heights and chamfers of mounting surfaces will cause deviations in accuracy and rail or block interference with the chamfered part.

When recommended shoulder heights and chamfers are used, problems with installation accuracy should be eliminated.

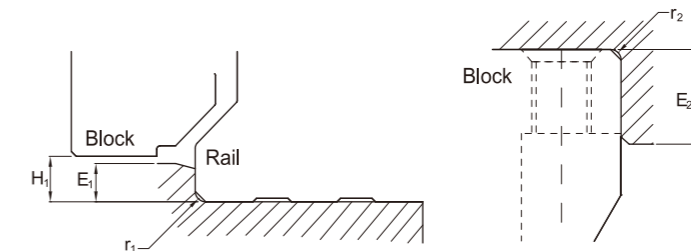


Table 2-2-18 Shoulder Heights and Chamfers

unit: mm

Size	Max. radius of fillets r_1 (mm)	Max. radius of fillets r_2 (mm)	Shoulder height of the rail E_1 (mm)	Shoulder height of the block E_2 (mm)	Clearance under block H_1 (mm)
E15	0.5	0.5	2.7	5.0	4.5
E20	0.5	0.5	5.0	7.0	6.0
E25	1.0	1.0	5.0	7.5	7.0
E30	1.0	1.0	7.0	7.0	10.0
E35	1.0	1.0	7.5	9.5	11.0

(2) Tightening Torque of Bolts for Installation

Improperly tightened mounting bolts will seriously affect the accuracy of linear guide installations. The following tightening torques for different sizes of bolts are recommended.

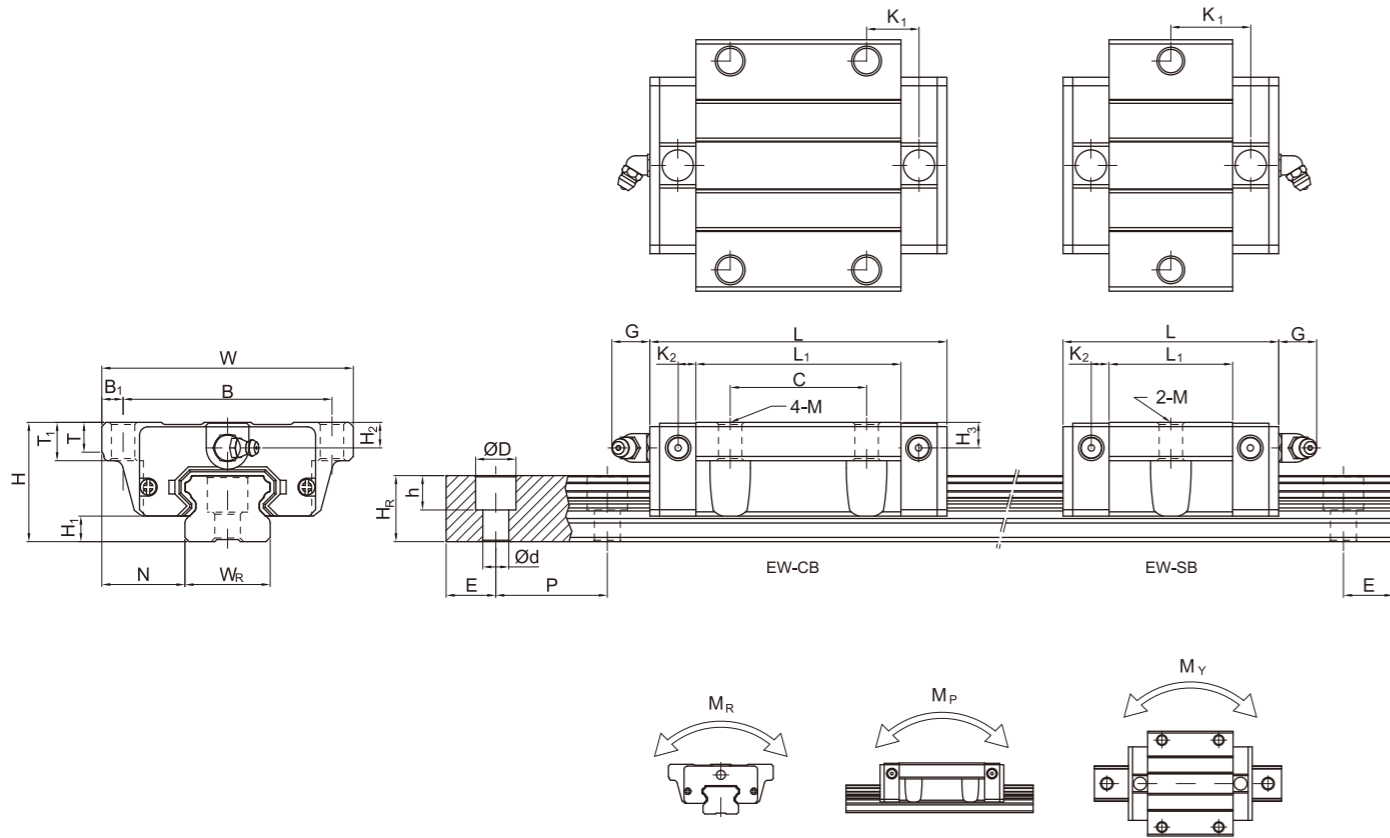
Table 2-2-19 Tightening Torque

Size	Bolt size	Torque N-cm(kgf-cm)		
		Iron	Casting	Aluminum
E15	M3×0.5P×16L	186 (19)	127 (13)	98 (10)
E20	M5×0.8P×16L	883 (90)	588 (60)	441 (45)
E25	M6×1P×20L	1373 (140)	921 (94)	686 (70)
E30	M6×1P×25L	1373 (140)	921 (94)	686 (70)
E35	M8×1.25P×25L	3041 (310)	2010 (205)	1470 (150)

Note: 1 kgf = 9.81 N



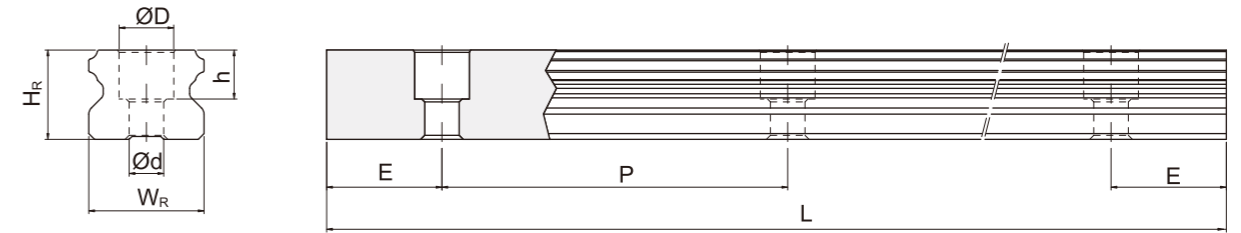
(3) EW-SB / EW-CB



Model No.	Dimensions of Assembly (mm)		Dimensions of Block (mm)														Dimensions of Rail (mm)		Mounting Bolt for Rail (mm)	Basic Dynamic Load Rating C (kN)	Basic Static Load Rating C ₀ (kN)	Static Rated Moment			Weight									
	H	H ₁	N	W	B	B ₁	C	L ₁	L	K ₁	K ₂	G	M	T	T ₁	H ₂	H ₃	W _R				H _R	D	h	d	P	E	M _R	M _P	M _Y	Block (kg)	Rail (kg/m)		
EW15SB	24	4.5	18.5	52	41	5.5	-	23.1	40.1	14.8	-	3.5	5.7	Ø4.5	5	7	5.5	6	15	12.5	6	4.5	3.5	60	20	M3x16	5.35	9.40	0.08	0.04	0.04	0.12	1.25	
EW15CB							26	39.8	56.8	10.15																								
EW20SB	28	6	19.5	59	49	5	-	29	50	18.75	-	4.15	12	Ø5.5	7	9	6	6	20	15.5	9.5	8.5	6	60	20	M5x16	7.23	12.74	0.13	0.06	0.06	0.19	2.08	
EW20CB							32	48.1	69.1	12.3																								
EW25SB	33	7	25	73	60	6.5	-	35.5	59.1	21.9	-	4.55	12	Ø7	7.5	10	8	8	23	18	11	9	7	60	20	M6x20	11.40	19.50	0.23	0.12	0.12	0.35	2.67	
EW25CB							35	59	82.6	16.15																								
EW30SB	42	10	31	90	72	9	-	41.5	69.5	26.75	-	6	12	Ø9	7	10	8	9	28	23	11	9	7	80	20	M6x25	16.42	28.10	0.40	0.21	0.21	0.62	4.35	
EW30CB							40	70.1	98.1	21.05																								
EW35SB	48	11	33	100	82	9	-	45	75	28.5	-	7	12	Ø9	10	13	8.5	8.5	34	27.5	14	12	9	80	20	M8x25	22.66	37.38	0.56	0.31	0.31	0.84	6.14	
EW35CB							50	78	108	20																								

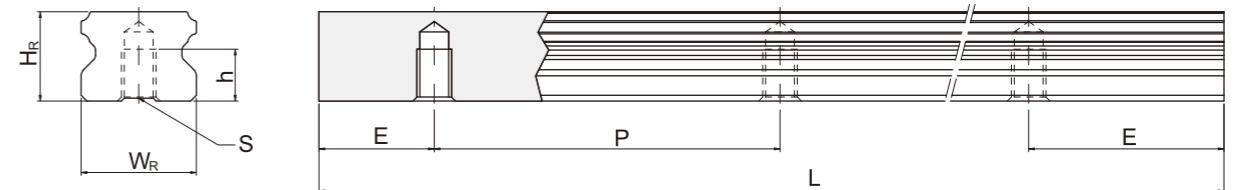
Note : 1 kgf = 9.81 N

(4) Dimensions for ER-U (large mounting hole, rail mounting from top)



Model No.	Mounting Bolt for Rail (mm)	Dimensions of Rail (mm)							Weight (kg/m)
		W _R	H _R	D	h	d	P	E	
ER15U	M4x16	15	12.5	7.5	5.3	4.5	60	20	1.23
ER30U	M8x25	28	23	14	12	9	80	20	4.23

(5) Dimensions for ER-T (rail mounting from bottom)



Model No.	Dimensions of Rail (mm)						Weight (kg/m)
	W _R	H _R	S	h	P	E	
ER15T	15	12.5	M5 x 0.8P	7	60	20	1.26
ER20T	20	15.5	M6 x 1P	9	60	20	2.15
ER25T	23	18	M6 x 1P	10	60	20	2.79
ER30T	28	23	M8 x 1.25P	14	80	20	4.42
ER35T	34	27.5	M8 x 1.25P	17	80	20	6.34



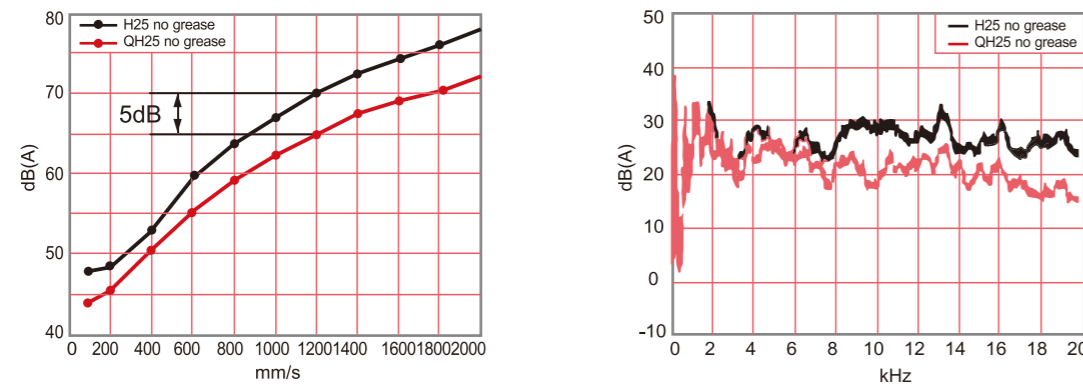
2-3 QH Series – Quiet Linear Guideway, with SynchMotion™ Technology

The development of LIMON-QH linear guideway is based on a four-row circular-arc contact. The LIMON-QH series linear guideway with SynchMotion™ Technology offers smooth movement, superior lubrication, quieter operation and longer running life. Therefore the LIMON-QH linear guideway has broad industrial applicability. In the high-tech industry where high speed, low noise, and reduced dust generation is required, the LIMON-QH series is interchangeable with the LIMON-H series.

2-3-1 Features of QH Series

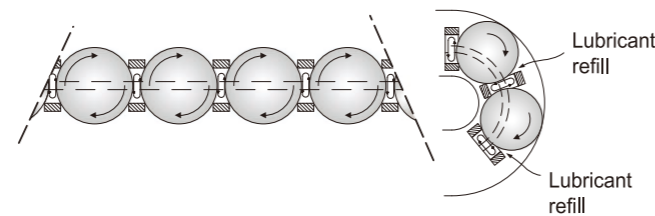
(1) Low Noise Design

With SynchMotion™ technology, rolling elements are interposed between the partitions of SynchMotion™ to provide improved circulation. Due to the elimination of contact between the rolling elements, collision noise and sound levels are drastically reduced.



(2) Self-Lubricant Design

The partition is a grouping of hollow ring-like structures formed with a through hole to facilitate circulation of the lubricant. Because of the special lubrication path design, the lubricant of the partition storage space can be refilled. Therefore, the frequency of lubricant refilling can be decreased. The QH-series linear guideway is pre-lubricated. Performance testing at a 0.2C (basic dynamic load) shows that after running 4,000km no damage was apparent to either the rolling elements or the raceway.

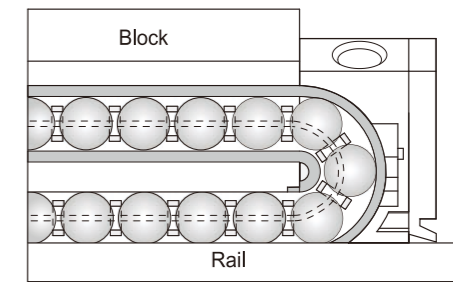


(3) Smooth Movement

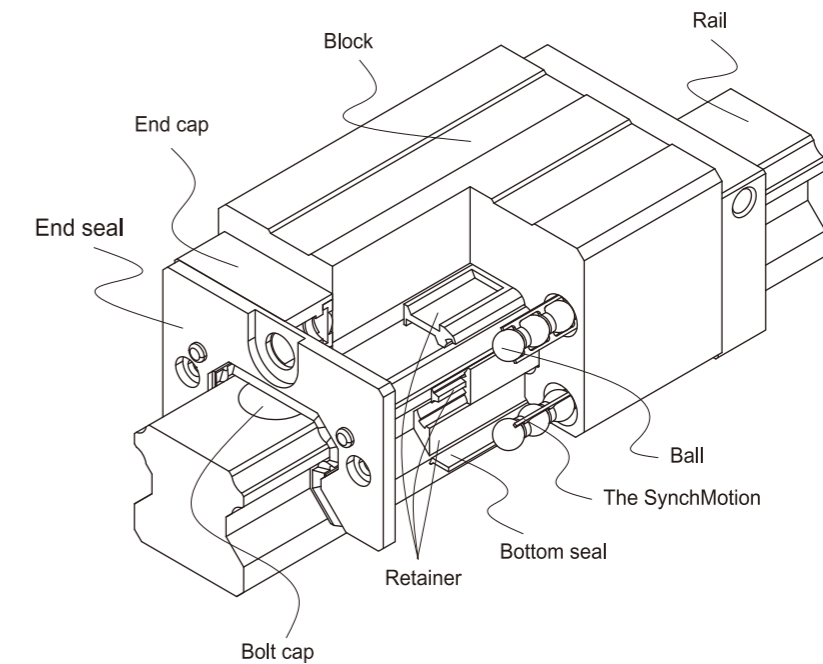
In standard linear guideways, rolling elements on the load side of the guide block begin rolling and push their way through the raceway. When they contact other rolling elements they create counter-rotational friction. This results in a great variation of rolling resistance. The QH linear guideway, with SynchMotion™ technology prevents this condition. As the block starts to move, the rolling elements begin rolling consecutively and remain separated to prevent contact with one another thus keeping the element's kinetic energy extremely stable in order to effectively reduce fluctuations in rolling resistance.

(4) High Speed Performance

The LIMON-QH series offers excellent high-speed performance due to the partitions of the SynchMotion™ structure. They are employed to separate the adjacent balls thereby resulting in low rolling traction and the metallic friction between adjacent balls is eliminated.



2-3-2 Construction of QH Series

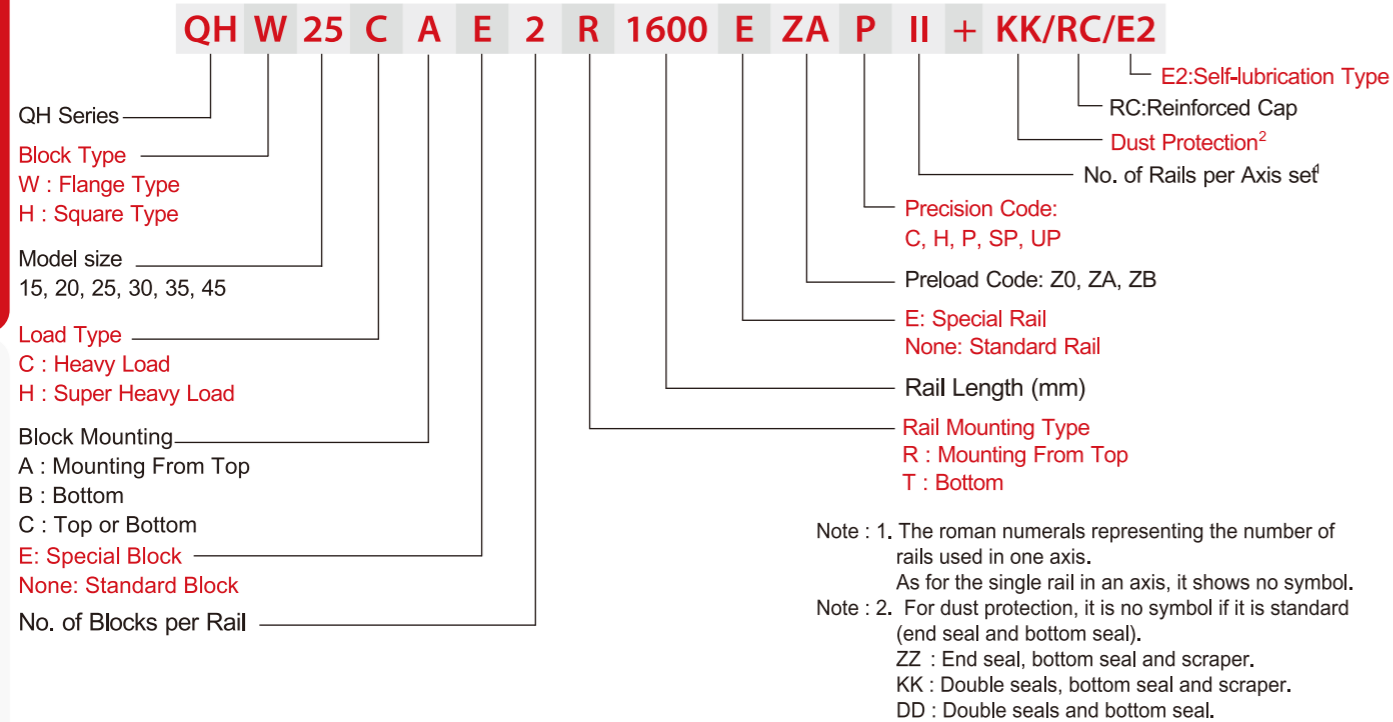


2-3-3 Model Number of QH Series

LIMON-QH series guideway can be classified into non-interchangeable and interchangeable types. The sizes are identical. The main difference is that the interchangeable blocks and rails can be freely exchanged. Because of dimensional control, the interchangeable type linear guideway is a perfect choice for the client when rails do not need to be paired for an axis. And since the QH and H share the identical rails, the customer does not need to redesign when choosing the QH series. Therefore the LIMON-QH linear guideway has increased applicability.

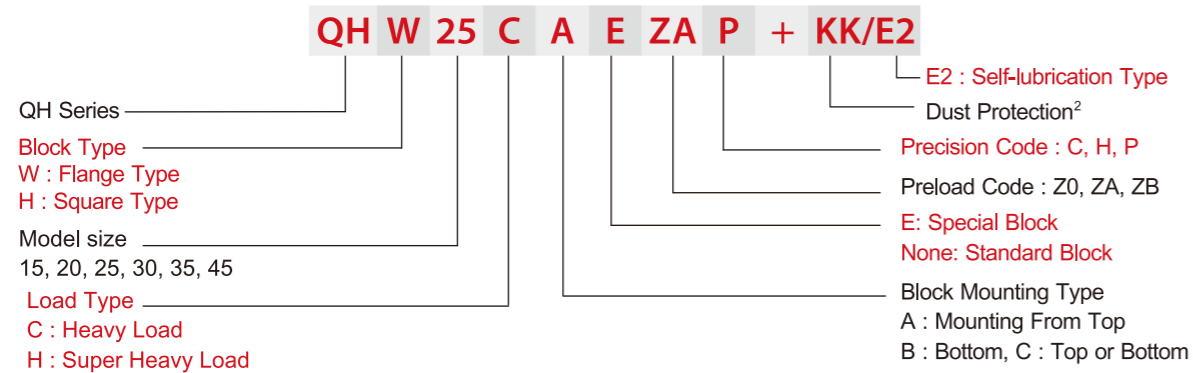


(1) Non-interchangeable type

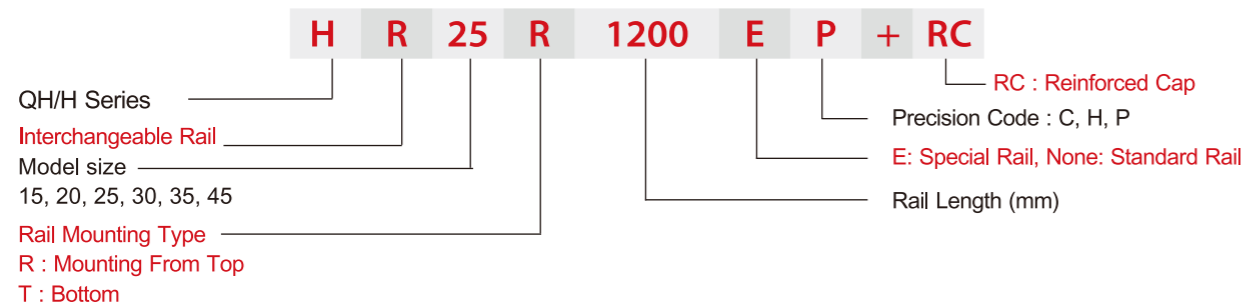


(2) Interchangeable type

□ Model Number of QH Block



□ Model Number of QH Rail (QH and H share the identical rails)



2-3-4 Types

(1) Block types

LIMON offers two types of linear guideways, flange and square types.

Table 2-3-1 Block Types

Type	Model	Shape	Height (mm)	Rail Length (mm)	Main Applications
Square	QHH-CA QHH-HA		28	100	<input type="checkbox"/> Automation devices <input type="checkbox"/> High-speed transportation equipment <input type="checkbox"/> Precision measuring equipment <input type="checkbox"/> Semiconductor manufacturing equipment
			70	4000	
Flange	QHW-CA QHW-HA		24	100	
			60	4000	
			24	100	
			60	4000	
Flange	QHW-CB QHW-HB		24	100	
			60	4000	
Flange	QHW-CC QHW-HC		24	100	
			60	4000	

(2) Rail types

Besides the standard top mounting type, the bottom mounting type is also available.

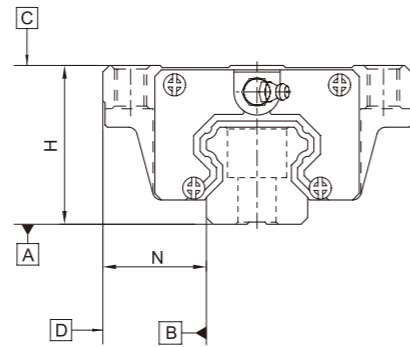
Table 2-3-2 Rail Types





2-3-5 Accuracy

The accuracy of QH series can be classified into normal (C), high (H), precision (P), super precision (SP), ultra precision (UP), five classes. Please choose the class by referring the accuracy of applied equipment.



(1) Accuracy of non-interchangeable

Table 2-3-3 Accuracy Standards

Unit: mm

Item	QH - 15, 20				
	Normal (C)	High (H)	Precision (P)	Super Precision (SP)	Ultra Precision (UP)
Dimensional tolerance of height H	± 0.1	± 0.03	0 -0.03	0 -0.015	0 -0.008
Dimensional tolerance of width N	± 0.1	± 0.03	0 -0.03	0 -0.015	0 -0.008
Variation of height H	0.02	0.01	0.006	0.004	0.003
Variation of width N	0.02	0.01	0.006	0.004	0.003
Running parallelism of block surface C to surface A	See Table 2-3-9				
Running parallelism of block surface D to surface B	See Table 2-3-9				

Table 2-3-4 Accuracy Standards

Unit: mm

Item	QH - 25, 30, 35				
	Normal (C)	High (H)	Precision (P)	Super Precision (SP)	Ultra Precision (UP)
Dimensional tolerance of height H	± 0.1	± 0.04	0 -0.04	0 -0.02	0 -0.01
Dimensional tolerance of width N	± 0.1	± 0.04	0 -0.04	0 -0.02	0 -0.01
Variation of height H	0.02	0.015	0.007	0.005	0.003
Variation of width N	0.03	0.015	0.007	0.005	0.003
Running parallelism of block surface C to surface A	See Table 2-3-9				
Running parallelism of block surface D to surface B	See Table 2-3-9				

Table 2-3-5 Accuracy Standards

Unit: mm

Item	QH - 45				
	Normal (C)	High (H)	Precision (P)	Super Precision (SP)	Ultra Precision (UP)
Dimensional tolerance of height H	± 0.1	± 0.05	0 -0.05	0 -0.03	0 -0.02
Dimensional tolerance of width N	± 0.1	± 0.05	0 -0.05	0 -0.03	0 -0.02
Variation of height H	0.03	0.015	0.007	0.005	0.003
Variation of width N	0.03	0.02	0.01	0.007	0.005
Running parallelism of block surface C to surface A	See Table 2-3-9				
Running parallelism of block surface D to surface B	See Table 2-3-9				



(2) Accuracy of interchangeable

Table 2-3-6 Accuracy Standards

Unit: mm

Item	QH - 15, 20		
	Normal (C)	High (H)	Precision (P)
Dimensional tolerance of height H	± 0.1	± 0.03	± 0.015
Dimensional tolerance of width N	± 0.1	± 0.03	± 0.015
Variation of height H	0.02	0.01	0.006
Variation of width N	0.02	0.01	0.006
Running parallelism of block surface C to surface A	See Table 2-3-9		
Running parallelism of block surface D to surface B	See Table 2-3-9		

Table 2-3-7 Accuracy Standards

Unit: mm

Item	QH - 25, 30, 35		
	Normal (C)	High (H)	Precision (P)
Dimensional tolerance of height H	± 0.1	± 0.04	± 0.02
Dimensional tolerance of width N	± 0.1	± 0.04	± 0.02
Variation of height H	0.02	0.015	0.007
Variation of width N	0.03	0.015	0.007
Running parallelism of block surface C to surface A	See Table 2-3-9		
Running parallelism of block surface D to surface B	See Table 2-3-9		

Table 2-3-8 Accuracy Standards

Unit: mm

Item	QH - 45		
	Normal (C)	High (H)	Precision (P)
Dimensional tolerance of height H	± 0.1	± 0.05	± 0.025
Dimensional tolerance of width N	± 0.1	± 0.05	± 0.025
Variation of height H	0.03	0.015	0.007
Variation of width N	0.03	0.02	0.01
Running parallelism of block surface C to surface A	See Table 2-3-9		
Running parallelism of block surface D to surface B	See Table 2-3-9		



(3) Accuracy of running parallelism

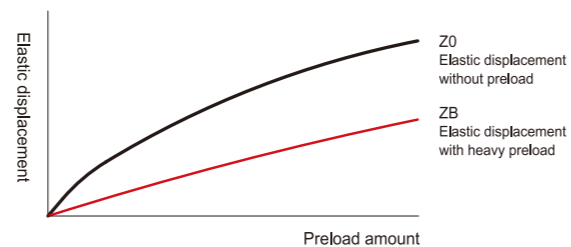
Table 2-3-9 Accuracy of Running Parallelism

Rail Length (mm)	Accuracy (μm)				
	C	H	P	SP	UP
~ 100	12	7	3	2	2
100 ~ 200	14	9	4	2	2
200 ~ 300	15	10	5	3	2
300 ~ 500	17	12	6	3	2
500 ~ 700	20	13	7	4	2
700 ~ 900	22	15	8	5	3
900 ~ 1,100	24	16	9	6	3
1,100 ~ 1,500	26	18	11	7	4
1,500 ~ 1,900	28	20	13	8	4
1,900 ~ 2,500	31	22	15	10	5
2,500 ~ 3,100	33	25	18	11	6
3,100 ~ 3,600	36	27	20	14	7
3,600 ~ 4,000	37	28	21	15	7

2-3-6 Preload

(1) Definition

A preload can be applied to each guideway. Oversized balls are used. Generally, a linear motion guideway has a negative clearance between groove and balls in order to improve stiffness and maintain high precision. The figure shows the load is multiplied by the preload, the rigidity is doubled and the deflection is reduced by one half. The preload no larger than ZA would be recommended for the model size under QH20 to avoid an over-preload affecting the guideway's life.



(2) Preload classes

LIMON offers three classes of standard preload for various applications and conditions.

Table 2-3-10 Preload Classes

Class	Code	Preload	Condition	Examples of Application
Light Preload	Z0	0~ 0.02C	Certain load direction, low impact, low precision required	Transportation devices, auto-packing machines, X-Y axis for general industrial machines, welding machines, welders
Medium Preload	ZA	0.05C~0.07C	High precision required	Machining centers, Z axis for general industrial machines, EDM, NC lathes, Precision X-Y tables, measuring equipment
Heavy Preload	ZB	0.10C~ 0.12C	High rigidity required, with vibration and impact	Machining centers, grinding machines, NC lathes, horizontal and vertical milling machines, Z axis of machine tools, Heavy cutting machines
Class	Interchangeable Guideway		Non-Interchangeable Guideway	
Preload classes	Z0, ZA		Z0, ZA, ZB	

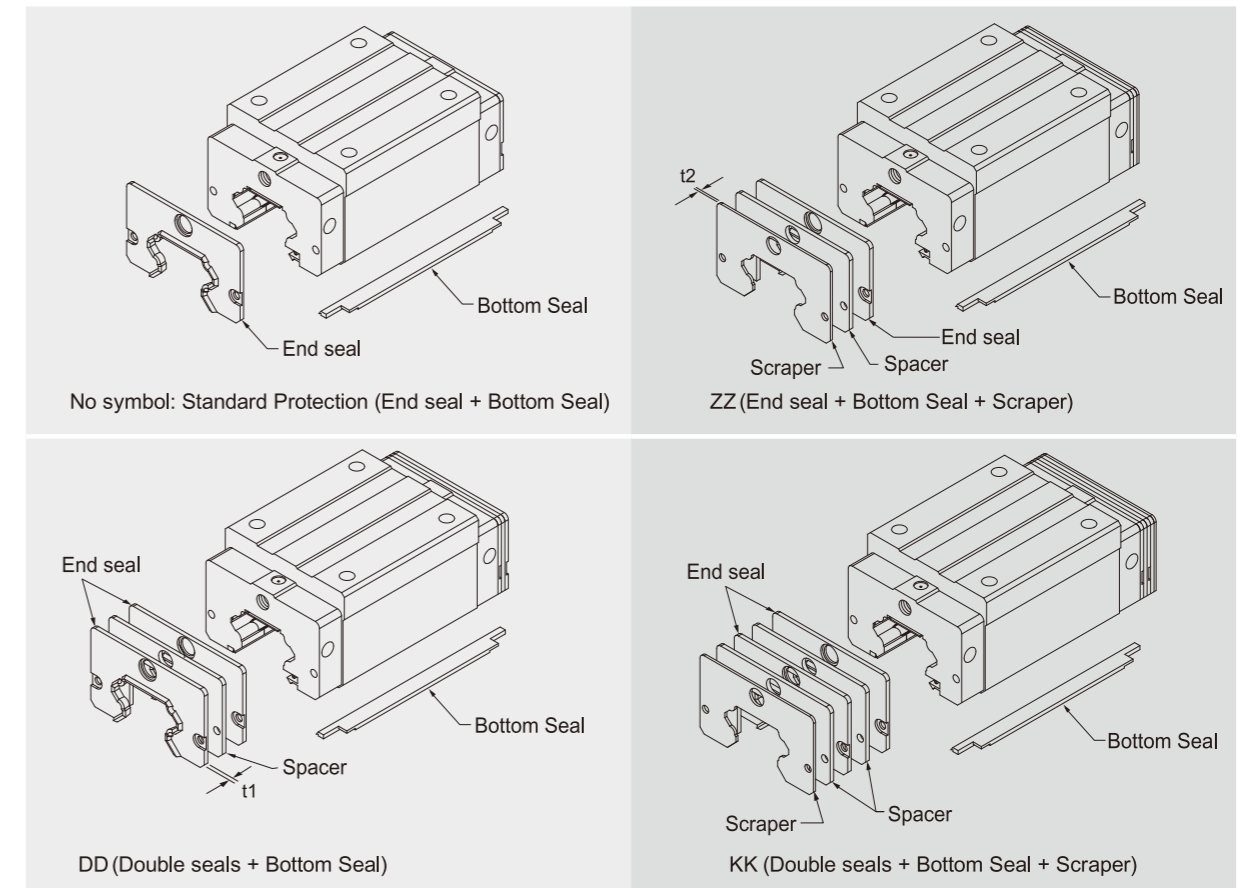
Note: The "C" in the preload column denotes basic dynamic load rating.



2-3-7 Dust Proof Accessories

(1) Codes of accessories

If the following accessories are needed, please add the code followed by the model number.



(2) End seal and bottom seal

To prevent life reduction caused by iron chips or dust entering the block.

(3) Double seals

Enhances the wiping effect, foreign matter can be completely wiped off.

Table 2-3-11 Dimensions of end seal

Size	Thickness (t1) (mm)	Size	Thickness (t1) (mm)
QH15 ES	3	QH30 ES	3.2
QH20 ES	2.5	QH35 ES	2.5
QH25 ES	2.5	QH45 ES	3.6

(4) Scraper

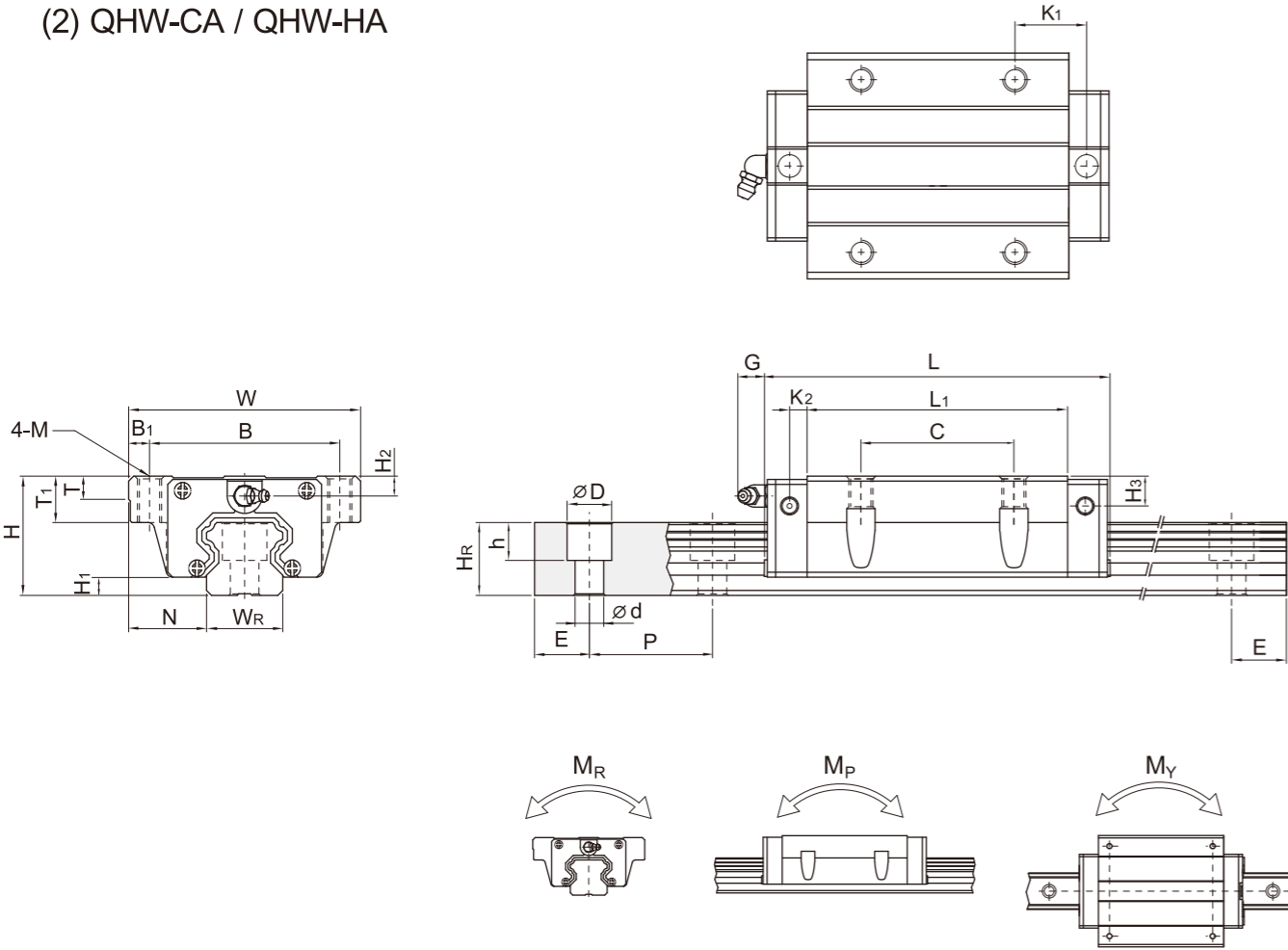
The scraper removes high-temperature iron chips and larger foreign objects.

Table 2-3-12 Dimensions of scraper

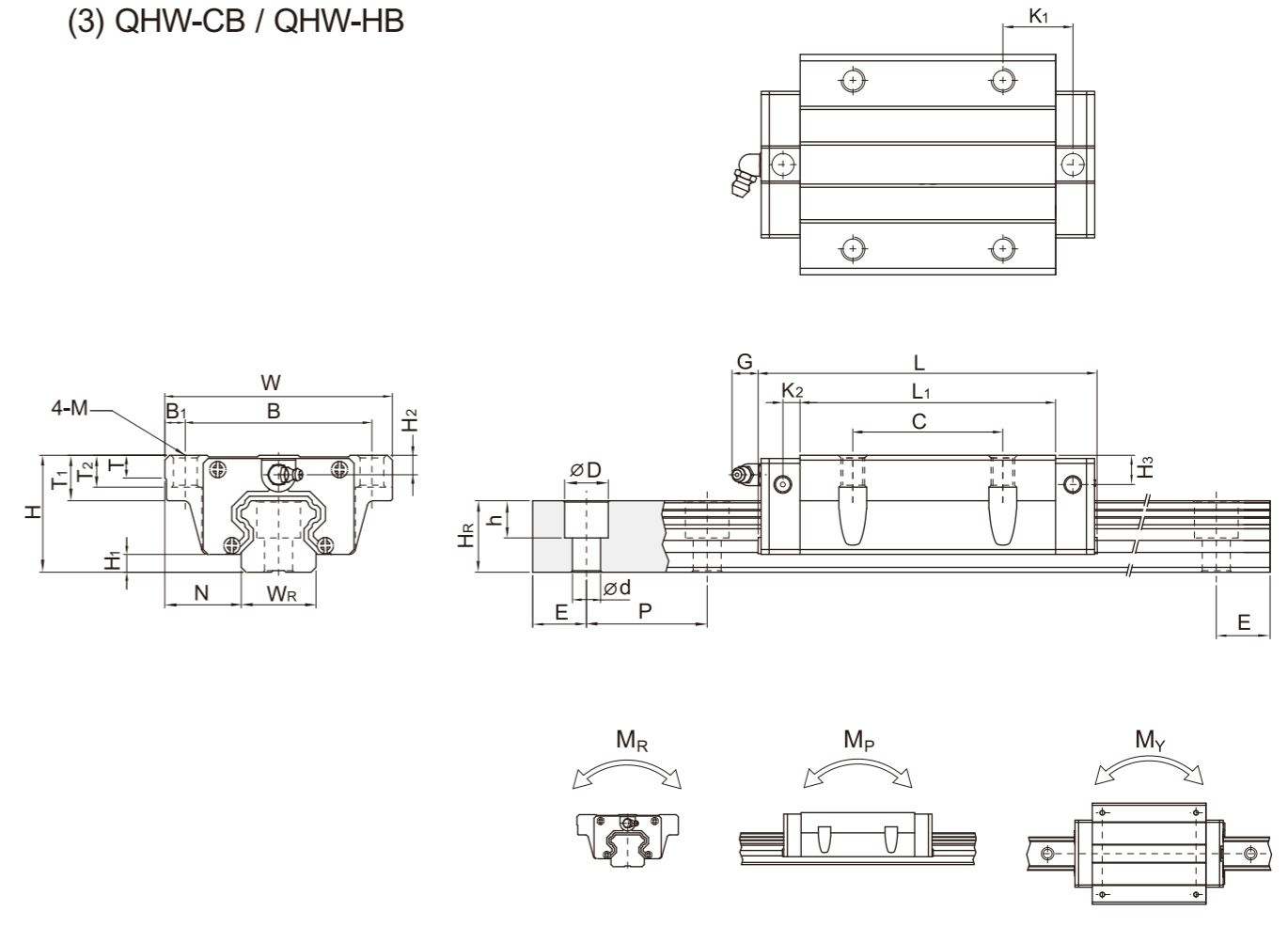
Size	Thickness (t2) (mm)	Size	Thickness (t2) (mm)
QH15 SC	1.5	QH30 SC	1.5
QH20 SC	1.5	QH35 SC	1.5
QH25 SC	1.5	QH45 SC	1.5



(2) QHW-CA / QHW-HA



(3) QHW-CB / QHW-HB



Model No.	Dimensions of Assembly (mm)		Dimensions of Block (mm)													Dimensions of Rail (mm)					Mounting Bolt for Rail (mm)	Basic Dynamic Load Rating C (kN)	Basic Static Load Rating C ₀ (kN)	Static Rated Moment			Weight						
	H	H ₁	N	W	B	B ₁	C	L ₁	L	K ₁	K ₂	G	M	T	T ₁	T ₂	H ₂	H ₃	W _R	H _R				D	h	d	P	E	M _R	M _P	M _Y	Block	Rail
	kg	kg/m	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg				kg	kg	kg	kg	kg	kg	kg	kg	kg	kg
QHW15CA	24	4	16	47	38	4.5	30	39.4	61.4	8	5	5.3	M5	6	8.93	9.5	4.2	15	15	7.5	5.3	4.5	60	20	M4x16	17.94	19.86	0.1	0.08	0.08	0.17	1.45	
QHW20CA	30	4.6	21.5	63	53	5	40	50.5	76.7	9.75	6	12	M6	8	10	6	6	20	17.5	9.5	8.5	6	60	20	M5x16	35.26	33.86	0.26	0.19	0.19	0.40	2.21	
QHW20HA	30	4.6	21.5	63	53	5	40	65.2	91.4	17.1	6	12	M6	8	10	6	6	20	17.5	9.5	8.5	6	60	20	M5x16	42.52	42.31	0.31	0.27	0.27	0.52	2.21	
QHW25CA	36	5.52	3.5	70	57	6.5	45	58	83.4	10.7	6	12	M8	8	14	6	5	23	22	11	9	7	60	20	M6x20	41.9	48.75	0.39	0.31	0.31	0.59	3.21	
QHW25HA	36	5.52	3.5	70	57	6.5	45	78.6	104	21	6	12	M8	8	14	6	5	23	22	11	9	7	60	20	M6x20	50.61	60.94	0.5	0.45	0.45	0.80	3.21	
QHW30CA	42	6	31	90	72	9	52	70	97.4	13.5	6.25	12	M10	8.5	16	6.5	6	28	26	14	12	9	80	20	M8x25	58.26	66.34	0.6	0.5	0.5	1.09	4.47	
QHW30HA	42	6	31	90	72	9	52	93	120.425	7.5	6.25	12	M10	8.5	16	6.5	6	28	26	14	12	9	80	20	M8x25	70.32	88.45	0.83	0.89	0.89	1.44	4.47	
QHW35CA	48	7.5	33	100	82	9	62	80	113.6	13	7.5	12	M10	10.1	18	8.5	6.5	34	29	14	12	9	80	30	M8x25	78.89	86.66	1.07	0.76	0.76	1.56	6.30	
QHW35HA	48	7.5	33	100	82	9	62	105.8	139.425	9	7.5	12	M10	10.1	18	8.5	6.5	34	29	14	12	9	80	30	M8x25	95.23	115.55	1.45	1.33	1.33	2.06	6.30	
QHW45CA	60	9.2	37.5	120	100	10	80	97	139.4	13	10	12.9	M12	15.1	22	8.5	10	45	38	20	17	14	105	22.5	M12x35	119.4	135.42	1.83	1.38	1.38	2.79	10.41	
QHW45HA	60	9.2	37.5	120	100	10	80	128.8	171.2	28.9	10	12.9	M12	15.1	22	8.5	10	45	38	20	17	14	105	22.5	M12x35	144.13	180.56	2.47	2.41	2.41	3.69	10.41	

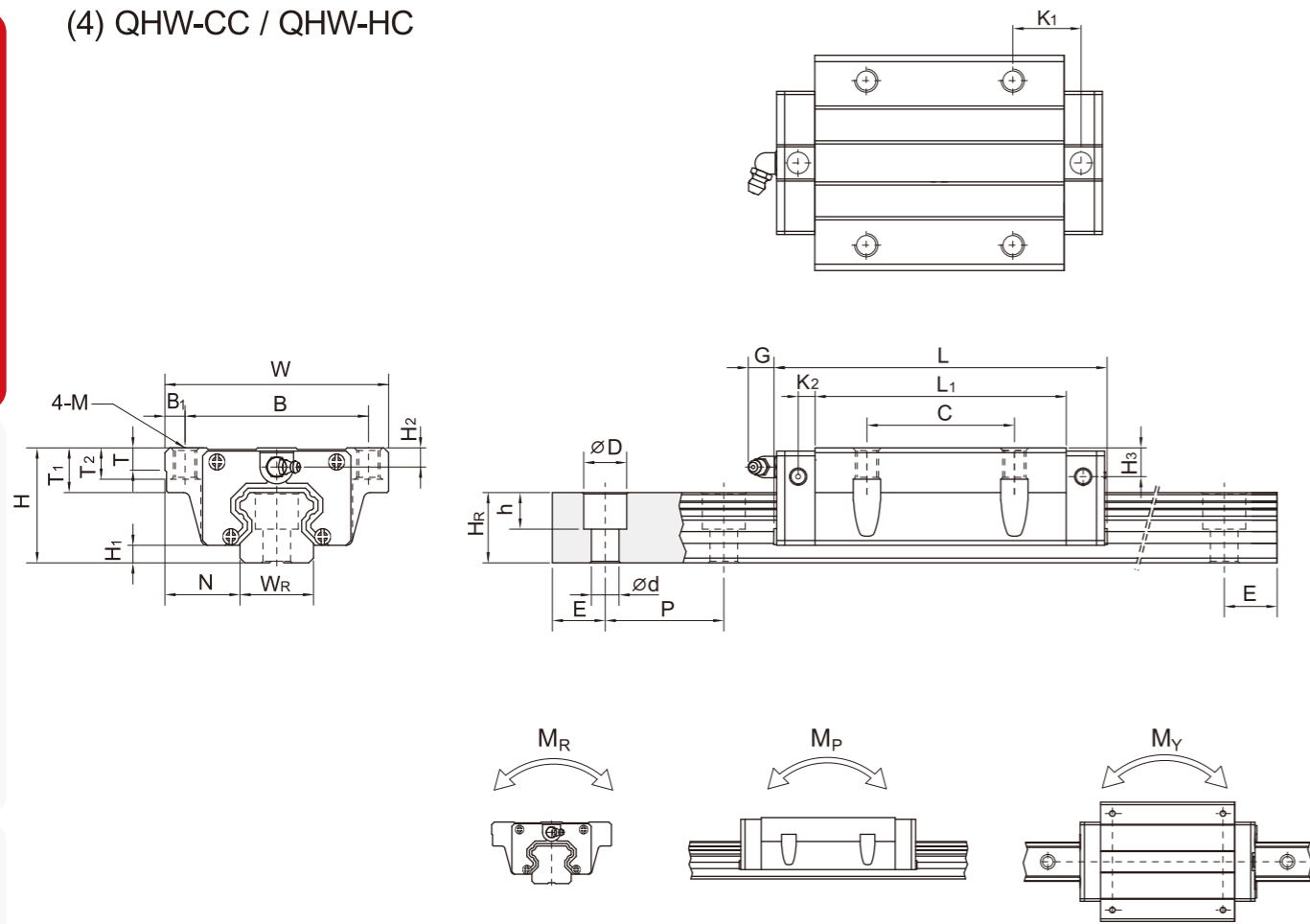
Note : 1 kgf = 9.81 N

Model No.	Dimensions of Assembly (mm)		Dimensions of Block (mm)													Dimensions of Rail (mm)					Mounting Bolt for Rail (mm)	Basic Dynamic Load Rating C (kN)	Basic Static Load Rating C ₀ (kN)	Static Rated Moment			Weight						
	H	H ₁	N	W	B	B ₁	C	L ₁	L	K ₁	K ₂	G	M	T	T ₁	T ₂	H ₂	H ₃	W _R	H _R				D	h	d	P	E	M _R	M _P	M _Y	Block	Rail
	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg				kg	kg	kg	kg	kg	kg	kg	kg	kg	kg
QHW15CB	24	4	16	47	38	4.5	30	39.4	61.4	8	5	5.3	Ø4.5	6	8.9	9.5	4.2	15	15	7.5	5.3	4.5	60	20	M4x16	17.94	19.86	0.1	0.08	0.08	0.17	1.45	
QHW20CB	30	4.6	21.5	63	53	5	40	50.5	76.7	9.75	6	12	Ø6	8	10	9.5	6	6	20	17.5	9.5	8.5	6	60	20	M5x16	35.26	33.86	0.26	0.19	0.19	0.40	2.21
QHW20HB	30	4.6	21.5	63	53	5	40	65.2	91.4	17.1	6	12	Ø6	8	10	9.5	6	6	20	17.5	9.5	8.5	6	60	20	M5x16	42.52	42.31	0.31	0.27	0.27	0.52	2.21
QHW25CB	36	5.52	3.5	70	57	6.5	45	58	83.4	10.7	6	12	Ø7	8	14	10	6	5	23	22	11	9	7	60	20	M6x20	41.9	48.75	0.39	0.31	0.31	0.59	3.21
QHW25HB	36	5.52	3.5	70	57	6.5	45	78.6	104	21	6	12	Ø7	8	14	10	6	5	23	22	11	9	7	60	20	M6x20	50.61	60.94	0.5	0.45	0.45	0.80	3.21
QHW30CB	42	6	31	90	72	9	52	70	97.4	13.5	6.25	12	Ø9	8.5	16	10	6.5	6	28	26	14	12	9	80	20	M8x25	58.26	66.34	0.6	0.5	0.5	1.09	4.47
QHW30HB	42	6	31	90	72	9	52	93	120.425	7.5	6.25	12	Ø9	8.5	16	10	6.5	6	28	26	14	12	9	80	20	M8x25	70.32	88.45	0.83	0.89	0.89	1.44	4.47
QHW35CB	48	7.5	33	100	82	9	62	80	113.6	13	7.5	12	Ø9	10.1	18	13	8.5	6.5	34	29	14	12	9	80	30	M8x25	78.89	86.66	1.07	0.76	0.76	1.56	6.30
QHW35HB	48	7.5	33	100	82	9	62	105.8	139.425	9	7.5	12	Ø9	10.1	18	13	8.5	6.5	34	29	14	12	9	80	30	M8x25	95.23	115.55	1.45	1.33	1.33	2.06	6.30
QHW45CB	60	9.2	37.5	120	100	10	80	97	139.4	13	10	12.9	Ø11	15.1	22	15	8.5	10	45	38	20	17	14	105	22.5	M12x35	119.4	135.42	1.83	1.38	1.38	2.79	10.41
QHW45HB	60	9.2	37.5	120	100	10	80	128.8	171.2	28.9	10	12.9	Ø11	15.1	22	15	8.5	10	45	38	20	17	14	105	22.5	M12x35	144.13	180.56	2.47	2.41	2.41	3.69	10.41

Note : 1 kgf = 9.81 N



(4) QHW-CC / QHW-HC



Model No.	Dimensions of Assembly (mm)			Dimensions of Block (mm)														Mounting Bolt for Rail (mm)	Basic Dynamic Load Rating C (kN)	Basic Static Load Rating Co (kN)	Static Rated Moment			Weight									
	H	H1	N	W	B	B1	C	L1	L	K1	K2	G	M	T	T1	T2	H2				H3	WR	HR	D	h	d	P	E	MR	MP	MY	Block kg	Rail kg/m
	QH15CC	24	4	16	47	38	4.5	30	39.4	61.4	8	5	5.3	M5	6	8.96	9.5				3.95	4.2	15	7.5	5.3	4.5	60	20	M4x16	17.94	19.86	0.1	0.08
QH20CC	30	4.6	21.5	63	53	5	40	50.5	76.7	9.75	6	12	M6	8	10	9.5	6	6	20	17.5	9.5	8.5	6	60	20	M5x16	35.26	33.86	0.26	0.19	0.19	0.40	2.21
QH20HC								65.2	91.4	17.1																							
QH25CC	36	5.5	23.5	70	57	6.5	45	58	83.4	10.7	6	12	M8	8	14	10	6	5	23	22	11	9	7	60	20	M6x20	41.9	48.75	0.39	0.31	0.31	0.59	3.21
QH25HC								78.6	104	21																							
QH30CC	42	6	31	90	72	9	52	70	97.4	13.5	6.25	12	M10	8.5	16	10	6.5	6	28	26	14	12	9	80	20	M8x25	58.26	66.34	0.6	0.5	0.5	1.09	4.47
QH30HC								93	120.4	25.75																							
QH35CC	48	7.5	33	100	82	9	62	80	113.6	13	7.5	12	M10	10.1	18	13	8.5	6.5	34	29	14	12	9	80	30	M8x25	78.89	86.66	1.07	0.76	0.76	1.56	6.30
QH35HC								105.8	139.4	25.9																							
QH45CC	60	9.2	37.5	120	100	10	80	97	139.4	13	10	12.9	M12	15.1	22	15	8.5	10	45	38	20	17	14	105	22.5	M12x35	119.4	135.42	1.83	1.38	1.38	2.79	10.41
QH45HC								128.8	171.2	28.9																							

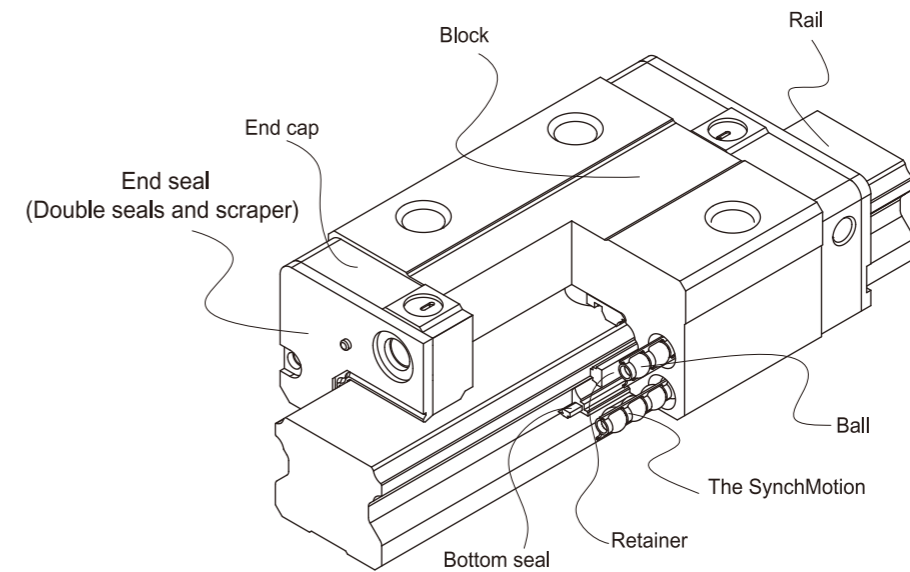
Note : 1 kgf = 9.81 N



2-4 QE Series – Low Profile Linear Guideway, with SynchMotion™ Technology

The development of LIMON-QE linear guideway is based on a four-row circular-arc contact. The LIMON-QE series linear guideway with SynchMotion™ Technology offers smooth movement, superior lubrication, quieter operation and longer running life. Therefore the LIMON-QE linear guideway has broad industrial applicability. In the high-tech industry where high speed, low noise, and reduced dust generation is required, the LIMON-QE series is interchangeable with the LIMON-E series.

2-4-1 Construction of QE Series

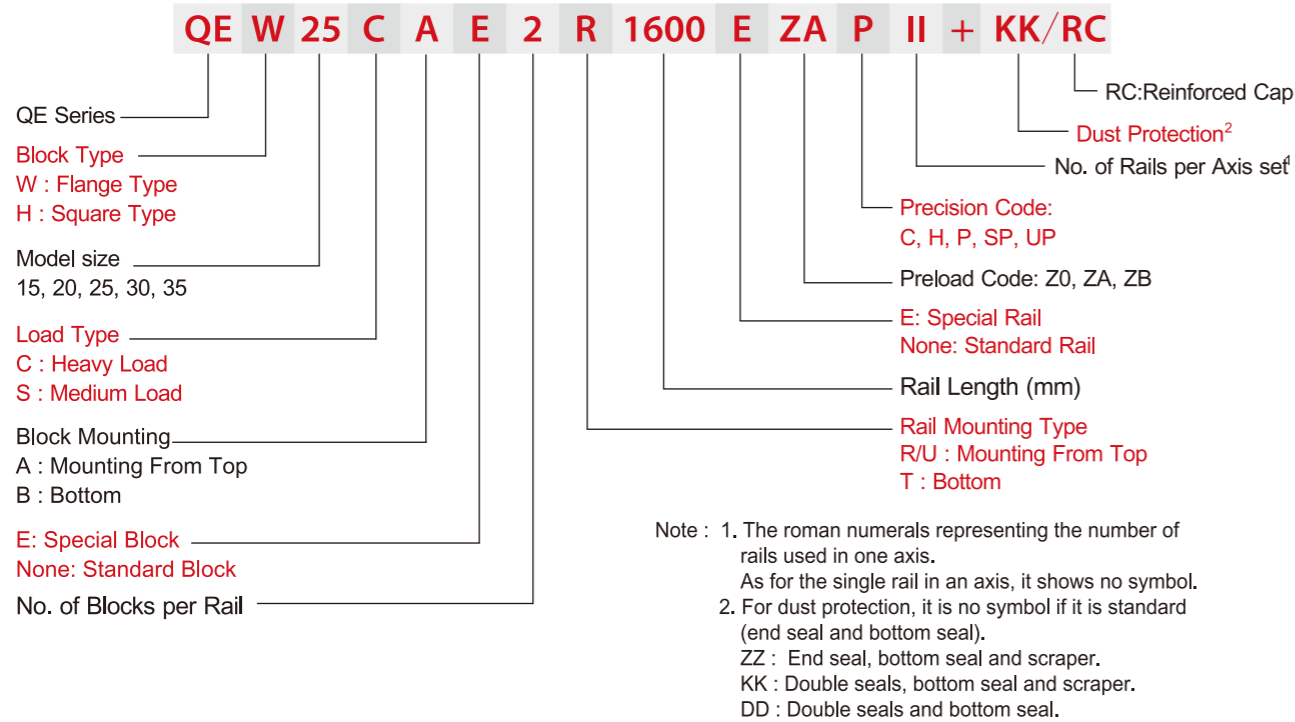


2-4-2 Model Number of QE Series

LIMON-QE series guideway can be classified into non-interchangeable and interchangeable types. The sizes are identical. The main difference is that the interchangeable blocks and rails can be freely exchanged. Because of dimensional control, the interchangeable type linear guideway is a perfect choice for the client when rails do not need to be paired for an axis. And since the QE and E share the identical rails, the customer does not need to redesign when choosing the QE series. Therefore the LIMON-QE linear guideway has increased applicability.

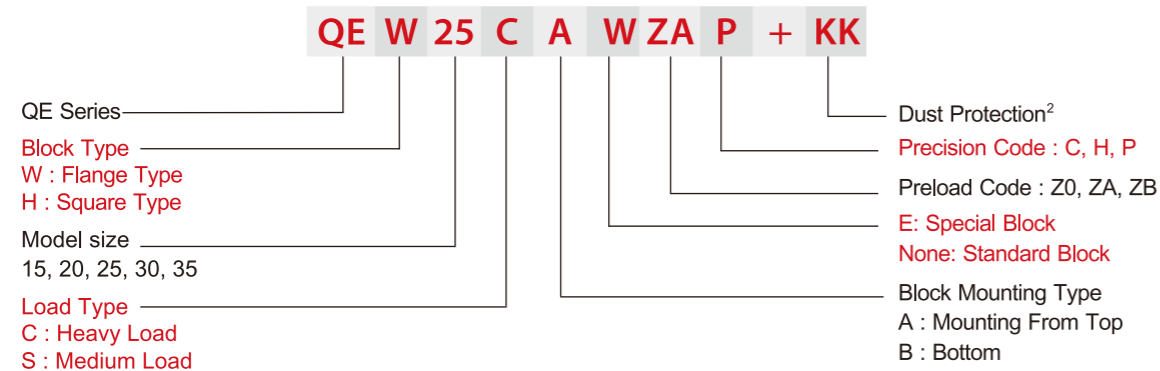


(1) Non-interchangeable type

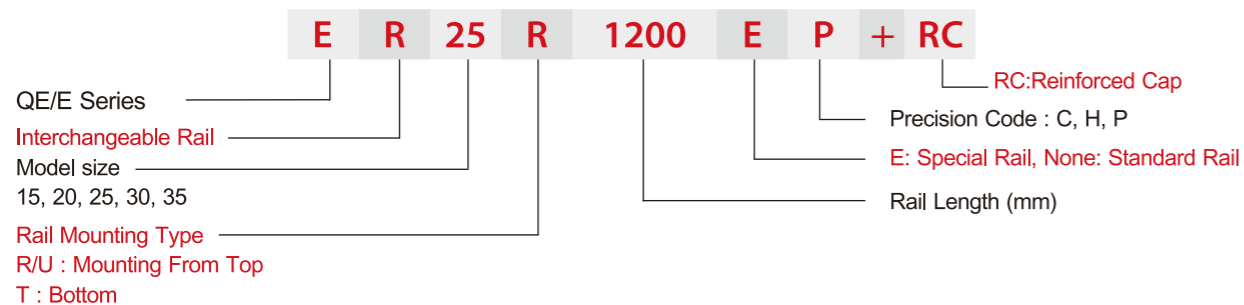


(2) Interchangeable type

□ Model Number of QE Block



□ Model Number of QE Rail (QE and E share the identical rails)



2-4-3 Types

(1) Block types

LIMON offers two types of linear guideways, flange and square types.

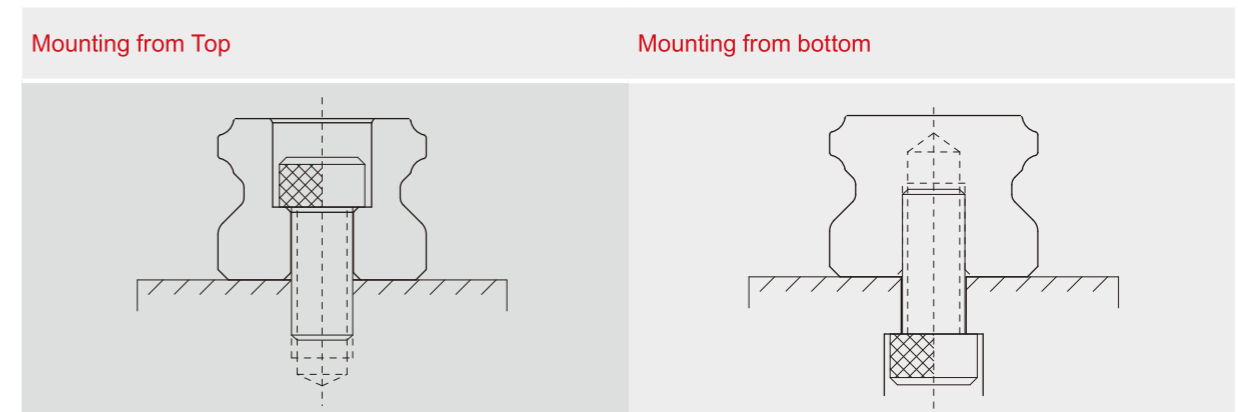
Table 2-4-1 Block Type

Type	Model	Shape	Height (mm)	Rail Length (mm)	Main Applications
Square	QEH-SA QEH-CA		24	100	<input type="checkbox"/> Automation devices <input type="checkbox"/> High-speed transportation equipment <input type="checkbox"/> Precision measuring equipment <input type="checkbox"/> Semiconductor manufacturing equipment
			↓	↓	
Flange	QEW-SA QEW-CA		24	100	
			↓	↓	
	QEW-SB QEW-CB		24	100	
			↓	↓	
48	4000				
48	4000				

(2) Rail types

Besides the standard top mounting type, the bottom mounting type is also available.

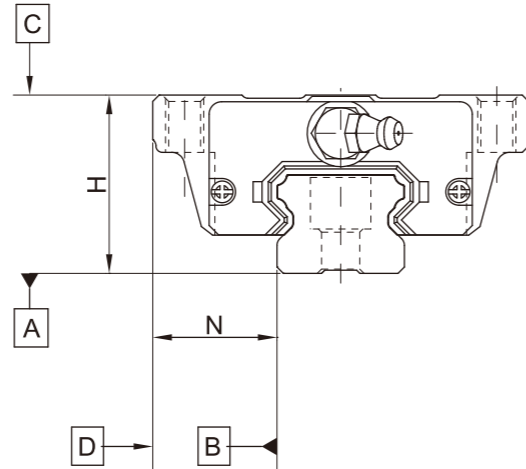
Table 2-4-2 Rail Types





2-4-4 Accuracy

The accuracy of the QE series can be classified into 5 classes: normal(C), high(H), precision(P), super precision(SP), and ultra precision(UP). Choose the class by referencing the accuracy of selected equipment.



(1) Accuracy of non-interchangeable guideways

Table 2-4-3 Accuracy Standards

Item	QE - 15, 20				
	Normal (C)	High (H)	Precision (P)	Super Precision (SP)	Ultra Precision (UP)
Dimensional tolerance of height H	± 0.1	± 0.03	0 -0.03	0 -0.015	0 -0.008
Dimensional tolerance of width N	± 0.1	± 0.03	0 -0.03	0 -0.015	0 -0.008
Variation of height H	0.02	0.01	0.006	0.004	0.003
Variation of width N	0.02	0.01	0.006	0.004	0.003
Running parallelism of block surface C to surface A	See Table 2-4-7				
Running parallelism of block surface D to surface B	See Table 2-4-7				

Table 2-4-4 Accuracy Standards

Item	QE - 25, 30, 35				
	Normal (C)	High (H)	Precision (P)	Super Precision (SP)	Ultra Precision (UP)
Dimensional tolerance of height H	± 0.1	± 0.04	0 -0.04	0 -0.02	0 -0.01
Dimensional tolerance of width N	± 0.1	± 0.04	0 -0.04	0 -0.02	0 -0.01
Variation of height H	0.02	0.015	0.007	0.005	0.003
Variation of width N	0.03	0.015	0.007	0.005	0.003
Running parallelism of block surface C to surface A	See Table 2-4-7				
Running parallelism of block surface D to surface B	See Table 2-4-7				



(2) Accuracy of interchangeable guideways

Table 2-4-5 Accuracy Standards

Item	QE - 15, 20		
	Normal (C)	High (H)	Precision (P)
Dimensional tolerance of height H	± 0.1	± 0.03	± 0.015
Dimensional tolerance of width N	± 0.1	± 0.03	± 0.015
Variation of height H	0.02	0.01	0.006
Variation of width N	0.02	0.01	0.006
Running parallelism of block surface C to surface A	See Table 2-4-7		
Running parallelism of block surface D to surface B	See Table 2-4-7		

Table 2-4-6 Accuracy Standards

Item	QE - 25, 30, 35		
	Normal (C)	High (H)	Precision (P)
Dimensional tolerance of height H	± 0.1	± 0.04	± 0.02
Dimensional tolerance of width N	± 0.1	± 0.04	± 0.02
Variation of height H	0.02	0.015	0.007
Variation of width N	0.03	0.015	0.007
Running parallelism of block surface C to surface A	See Table 2-4-7		
Running parallelism of block surface D to surface B	See Table 2-4-7		

(3) Accuracy of running parallelism

Table 2-4-7 Accuracy of Running Parallelism

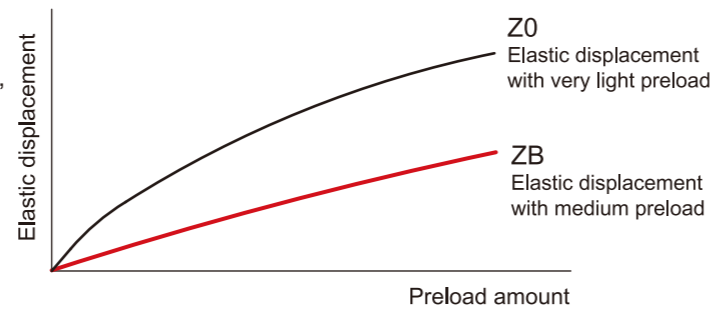
Rail Length (mm)	Accuracy (μm)				
	C	H	P	SP	UP
~ 100	12	7	3	2	2
100 ~ 200	14	9	4	2	2
200 ~ 300	15	10	5	3	2
300 ~ 500	17	12	6	3	2
500 ~ 700	20	13	7	4	2
700 ~ 900	22	15	8	5	3
900 ~ 1,100	24	16	9	6	3
1,100 ~ 1,500	26	18	11	7	4
1,500 ~ 1,900	28	20	13	8	4
1,900 ~ 2,500	31	22	15	10	5
2,500 ~ 3,100	33	25	18	11	6
3,100 ~ 3,600	36	27	20	14	7
3,600 ~ 4,000	37	28	21	15	7



2-4-5 Preload

(1) Definition

A preload can be applied to each guideway. Generally, a linear motion guideway has a negative clearance between the groove and balls in order to improve stiffness and maintain high precision. The figure shows that adding a preload can improve stiffness of the linear guideway. A preload no greater than ZA would be recommended for model sizes smaller than QE20. This will avoid an over-loaded condition that would affect guideway life.



(2) Preload classes

LIMON offers three standard preloads for various applications and conditions.

Table 2-4-8 Preload Classes

Class	Code	Preload	Condition
Very Light Preload	Z0	0~ 0.02C	Certain load direction, low impact, low precision required
Light Preload	ZA	0.03C~0.05C	low load and high precision required
Medium Preload	ZB	0.06C~ 0.08C	High rigidity required, with vibration and impact

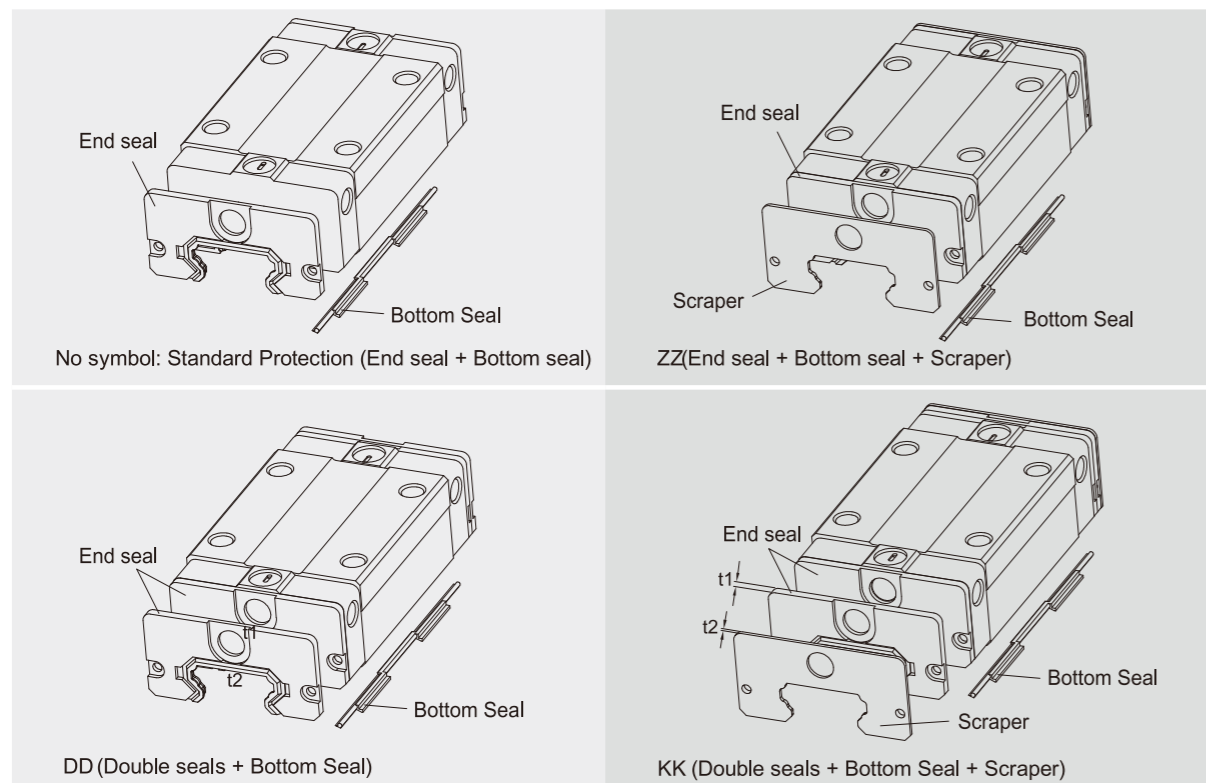
Class	Interchangeable Guideway	Non-Interchangeable Guideway
Preload classes	Z0, ZA	Z0, ZA, ZB

Note: The "C" in the preload column denotes basic dynamic load rating.

2-4-6 Dust Proof Accessories

(1) Codes of accessories

If the following accessories is needed, please indicate the code followed by the model number.



(2) End seal and bottom seal

To prevent life reduction caused by iron chips or dust entering the block

(3) Double seals

Removes foreign matter from the rail preventing contaminants from entering the block.

Table 2-4-9 Dimensions of end seal

Size	Thickness (t1) (mm)	Size	Thickness (t1) (mm)
QE15 ES	2	QE30 ES	2.5
QE20 ES	2	QE35 ES	2
QE25 ES	2.5		

(4) Scraper

Clears larger contaminants, such as weld spatter and metal cuttings, from the rail. Metal scraper protects end seals from excessive damage.

Table 2-4-10 Dimensions of Scraper

Size	Thickness (t2) (mm)
QE15 SC	1
QE20 SC	1
QE25 SC	1
QE30 SC	1
QE35 SC	1.5

(5) Dimensions of block equipped with the dustproof parts

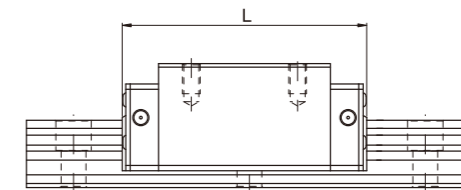


Table 2-4-11 Overall block length

unit: mm

Size	Overall block length (L)			
	SS	ZZ	DD	KK
QE15S	41.1	42.1	44.1	46.1
QE15C	56.8	57.8	60.8	62.8
QE20S	50	51.2	54	56
QE20C	69.1	71.1	73.1	75.1
QE25S	60.1	62.1	65.1	67.1
QE25C	83.6	85.6	88.6	90.6
QE30S	67.5	69.5	72.5	74.5
QE30C	96.1	98.1	101.1	103.1
QE35S	76	79	80	83
QE35C	108	111	112	115

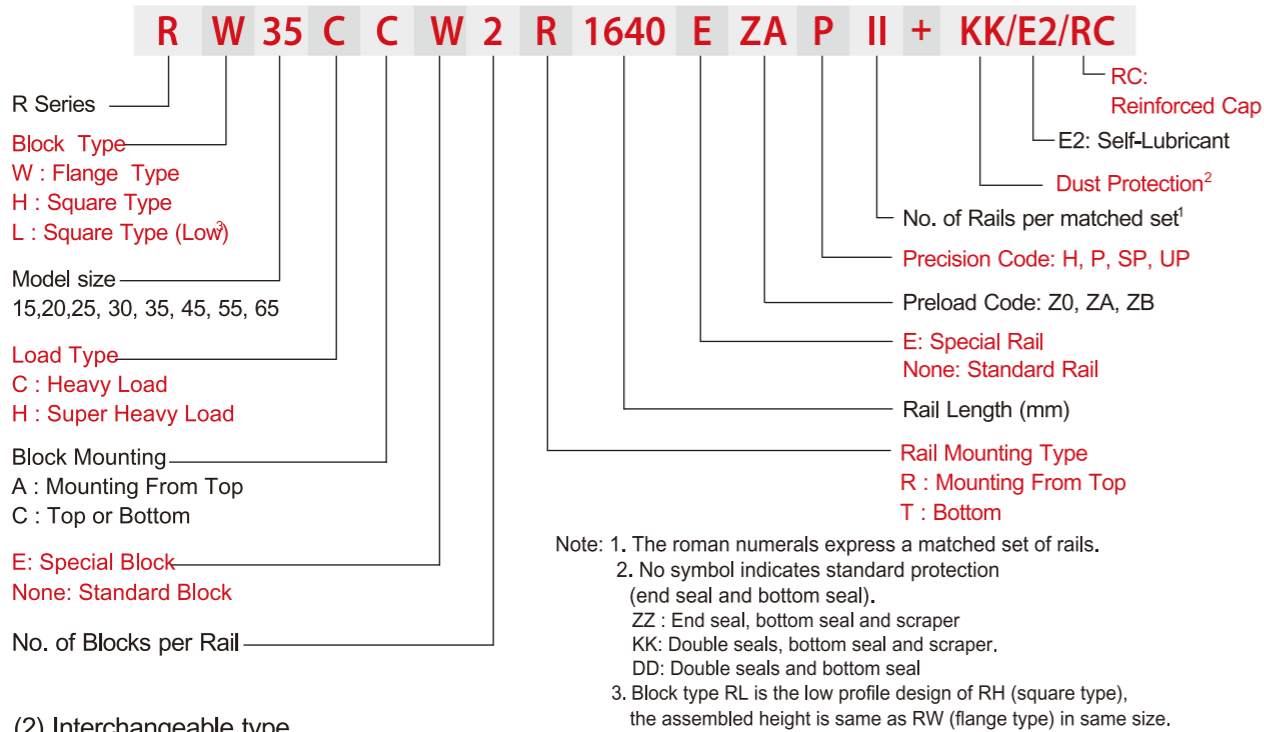
Note : The marking of "()" denotes the maximum block length with screws, lips of end seals, etc.



2-5-3 Model Number of R series

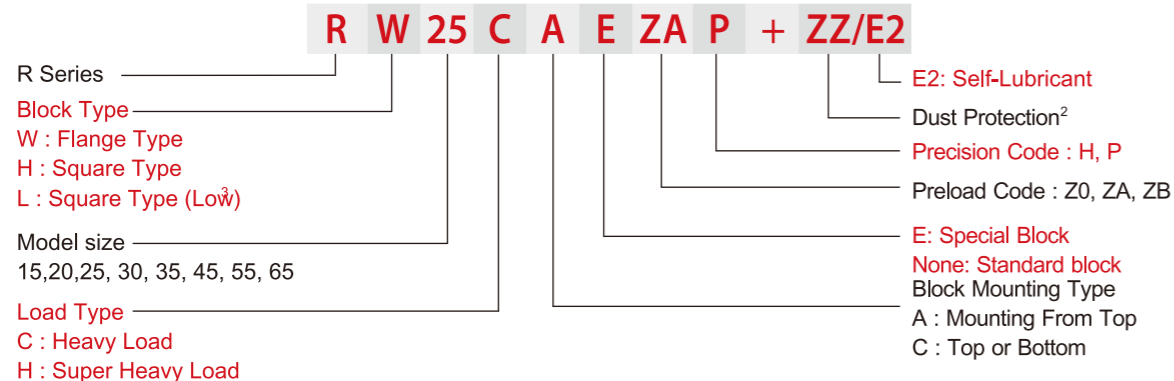
R series linear guideways are classified into non-interchangeable and interchangeable types. The sizes of these two types are the same as one another. The main difference is that the interchangeable type of blocks and rails can be freely exchanged and they can maintain P-class accuracy. Because of strict dimensional control, the interchangeable type linear guideways are a wise choice for customers when rails do not need to be matched for an axis. The model number of the R series identifies the size, type, accuracy class, preload class, etc.

(1) Non-interchangeable type

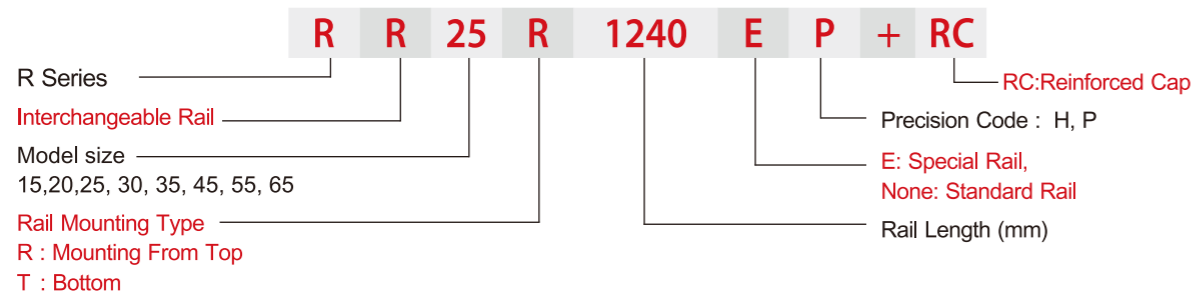


(2) Interchangeable type

□ Model Number of R Block



□ Model Number of R Rail



2-5-4 Types

(1) Block types

LIMON offers two types of guide blocks, flange and square type. Because of the low assembly height and large mounting surface, the flange type is excellent for heavy moment load applications.

Table 2-5-1 Block Types

Type	Model	Shape	Height (mm)	Rail Length (mm)	Main Applications
Square	RH-CA RH-HA		28	100	<input type="checkbox"/> Automation Systems <input type="checkbox"/> Transportation equipment <input type="checkbox"/> CNC machining centers <input type="checkbox"/> Heavy duty cutting machines <input type="checkbox"/> CNC grinding machines
			90	4000	
Square	RL-CA RL-HA		24	100	<input type="checkbox"/> Injection molding machines <input type="checkbox"/> Plano millers <input type="checkbox"/> Devices requiring high rigidity <input type="checkbox"/> Devices requiring high load capacity
			70	4000	
Flange	RW-CC RW-HC		24	100	<input type="checkbox"/> Electric discharge machines
			90	4000	

(2) Rail types

In addition to the standard top mounting type, LIMON also offers the bottom mounting type of rails.

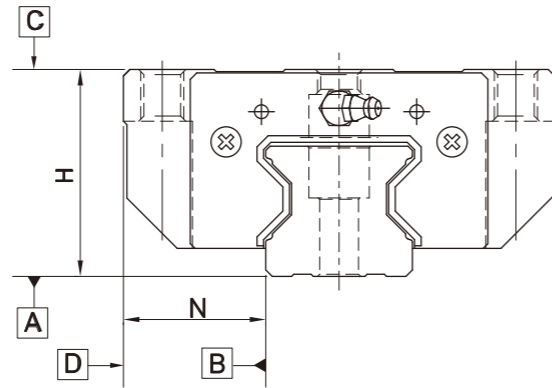
Table 2-5-2 Rail Types





2-5-5 Accuracy

The accuracy of the R series can be classified into four classes: high (H), precision (P), super precision (SP) and ultra precision (UP). Customers may choose the class by referencing the accuracy requirements of the applied equipment.



(1) Accuracy of non-interchangeable

Table 2-5-3 Accuracy Standards Unit: mm

Item	R - 15, 20			
	High (H)	Precision (P)	Super Precision (SP)	Ultra Precision (UP)
Dimensional tolerance of height H	± 0.03	0 - 0.03	0 - 0.015	0 - 0.008
Dimensional tolerance of width N	± 0.03	0 - 0.03	0 - 0.015	0 - 0.008
Variation of height H	0.01	0.006	0.004	0.003
Variation of width N	0.01	0.006	0.004	0.003
Running parallelism of block surface C to surface A	See Table 2-5-11			
Running parallelism of block surface D to surface B	See Table 2-5-11			

Table 2-5-4 Accuracy Standards Unit: mm

Item	R - 25, 30, 35			
	High (H)	Precision (P)	Super Precision (SP)	Ultra Precision (UP)
Dimensional tolerance of height H	± 0.04	0 - 0.04	0 - 0.02	0 - 0.01
Dimensional tolerance of width N	± 0.04	0 - 0.04	0 - 0.02	0 - 0.01
Variation of height H	0.015	0.007	0.005	0.003
Variation of width N	0.015	0.007	0.005	0.003
Running parallelism of block surface C to surface A	See Table 2-5-11			
Running parallelism of block surface D to surface B	See Table 2-5-11			

Table 2-5-5 Accuracy Standards Unit: mm

Item	R - 45, 55			
	High (H)	Precision (P)	Super Precision (SP)	Ultra Precision (UP)
Dimensional tolerance of height H	± 0.05	0 - 0.05	0 - 0.03	0 - 0.02
Dimensional tolerance of width N	± 0.05	0 - 0.05	0 - 0.03	0 - 0.02
Variation of height H	0.015	0.007	0.005	0.003
Variation of width N	0.02	0.01	0.007	0.005
Running parallelism of block surface C to surface A	See Table 2-5-11			
Running parallelism of block surface D to surface B	See Table 2-5-11			



Table 2-5-6 Accuracy Standards Unit: mm

Item	R - 65			
	High (H)	Precision (P)	Super Precision (SP)	Ultra Precision (UP)
Dimensional tolerance of height H	± 0.07	0 - 0.07	0 - 0.05	0 - 0.03
Dimensional tolerance of width N	± 0.07	0 - 0.07	0 - 0.05	0 - 0.03
Variation of height H	0.02	0.01	0.007	0.005
Variation of width N	0.025	0.015	0.01	0.007
Running parallelism of block surface C to surface A	See Table 2-5-11			
Running parallelism of block surface D to surface B	See Table 2-5-11			

(2) Accuracy of interchangeable

Table 2-5-7 Accuracy Standards Unit: mm

Item	R - 15, 20	
	High (H)	Precision (P)
Dimensional tolerance of height H	± 0.03	± 0.015
Dimensional tolerance of width N	± 0.03	± 0.015
Variation of height H	0.01	0.006
Variation of width N	0.01	0.006
Running parallelism of block surface C to surface A	See Table 2-5-11	
Running parallelism of block surface D to surface B	See Table 2-5-11	

Table 2-5-8 Accuracy Standards Unit: mm

Item	R - 25, 30, 35	
	High (H)	Precision (P)
Dimensional tolerance of height H	± 0.04	± 0.02
Dimensional tolerance of width N	± 0.04	± 0.02
Variation of height H	0.015	0.007
Variation of width N	0.015	0.007
Running parallelism of block surface C to surface A	See Table 2-5-11	
Running parallelism of block surface D to surface B	See Table 2-5-11	

Table 2-5-9 Accuracy Standards Unit: mm

Item	R - 45, 55	
	High (H)	Precision (P)
Dimensional tolerance of height H	± 0.05	± 0.025
Dimensional tolerance of width N	± 0.05	± 0.025
Variation of height H	0.015	0.007
Variation of width N	0.02	0.01
Running parallelism of block surface C to surface A	See Table 2-5-11	
Running parallelism of block surface D to surface B	See Table 2-5-11	



Table 2-5-10 Accuracy Standards

Item	R - 65	
	High (H)	Precision (P)
Dimensional tolerance of height H	± 0.07	± 0.035
Dimensional tolerance of width N	± 0.07	± 0.035
Variation of height H	0.02	0.01
Variation of width N	0.025	0.015
Running parallelism of block surface C to surface A	See Table 2-5-11	
Running parallelism of block surface D to surface B	See Table 2-5-11	

Unit: mm

(3) Accuracy of running parallelism

Table 2-5-11 Accuracy of Running Parallelism

Rail Length (mm)	Accuracy (μm)			
	H	P	SP	UP
~ 100	7	3	2	2
100 ~ 200	9	4	2	2
200 ~ 300	10	5	3	2
300 ~ 500	12	6	3	2
500 ~ 700	13	7	4	2
700 ~ 900	15	8	5	3
900 ~ 1,100	16	9	6	3
1,100 ~ 1,500	18	11	7	4
1,500 ~ 1,900	20	13	8	4
1,900 ~ 2,500	22	15	10	5
2,500 ~ 3,100	25	18	11	6
3,100 ~ 3,600	27	20	14	7
3,600 ~ 4,000	28	21	15	7

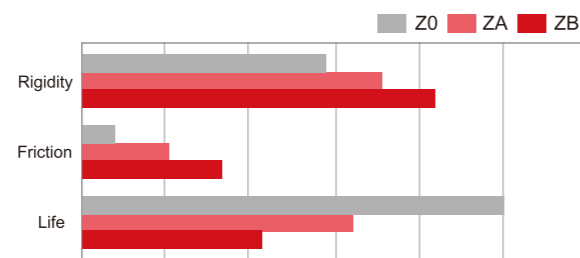
2-5-6 Preload

A preload can be applied to each guideway using oversized rollers. Generally, a linear motion guideway has negative clearance between the raceway and rollers to improve stiffness and maintain high precision. The R series linear guideway offers three standard preloads for various applications and conditions.

Table 2-5-12

Class	Code	Preload	Condition
Light Preload	Z0	0.02C~ 0.04C	Certain load direction, low impact, low precision required
Medium Preload	ZA	0.07C~0.09C	High rigidity required, high precision required
Heavy Preload	ZB	0.12C~ 0.14C	Super high rigidity required, with vibration and impact

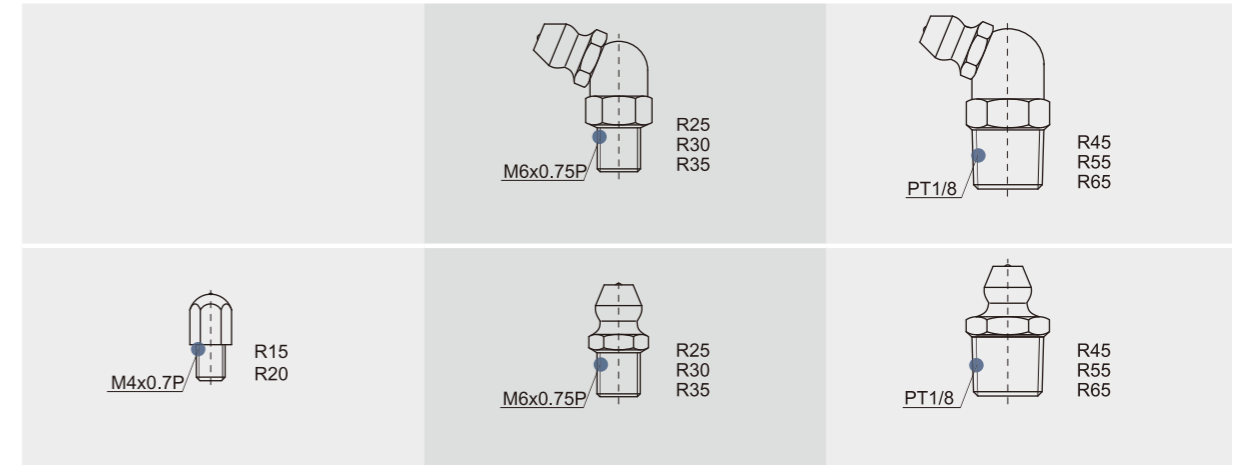
The figure shows the relationship between the rigidity, friction and nominal life. A preload no larger than ZA would be recommended for smaller model sizes to avoid over-preload affecting the life of the guideway.



2-5-7 Lubrication

(1) Grease

- Grease nipple



- Mounting location

The standard location of the grease fitting is at both ends of the block, but the nipple can be mounted in the side or the top of block. For lateral installation, we recommend that the nipple be mounted at the non-reference side, otherwise please contact us. It is possible to carry out the lubrication by using an oil-piping joint. The figure shows the locations of the grease fitting.

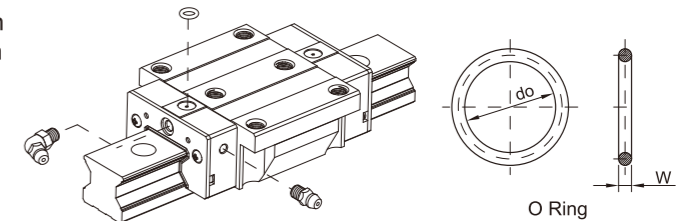


Table 2-5-13 O-Ring size and max. permissible depth for piercing

Size	O-Ring		Lube hole at top: max. permissible depth for piercing
	do (mm)	W (mm)	T _{max} (mm)
R15	2.5±0.15	1.5±0.15	3.45
R20	2.5±0.15	1.5±0.15	4
R25	7.5±0.15	1.5±0.15	5.8
R30	7.5±0.15	1.5±0.15	6.2
R35	7.5±0.15	1.5±0.15	8.65
R45	7.5±0.15	1.5±0.15	9.5
R55	7.5±0.15	1.5±0.15	11.6
R65	7.5±0.15	1.5±0.15	14.5

- The oil amount for a block filled with grease

Table 2-5-14 The oil amount for a block filled with grease

Size	Heavy Load(cm ³)	Super Heavy Load(cm ³)	Size	Heavy Load(cm ³)	Super Heavy Load(cm ³)
R15	3	-	R35	12	14
R20	5	6	R45	19	23
R25	7	8	R55	28	35
R30	9	10	R65	52	63

Frequency of replenishment

Check the grease every 100 km, or every 3-6 months.



(2) Oil

The recommended viscosity of oil is about 32~150cSt. If you need to use oil-type lubrication, please inform us.

Oil feeding rate

Table 2-5-15 oil feed rate

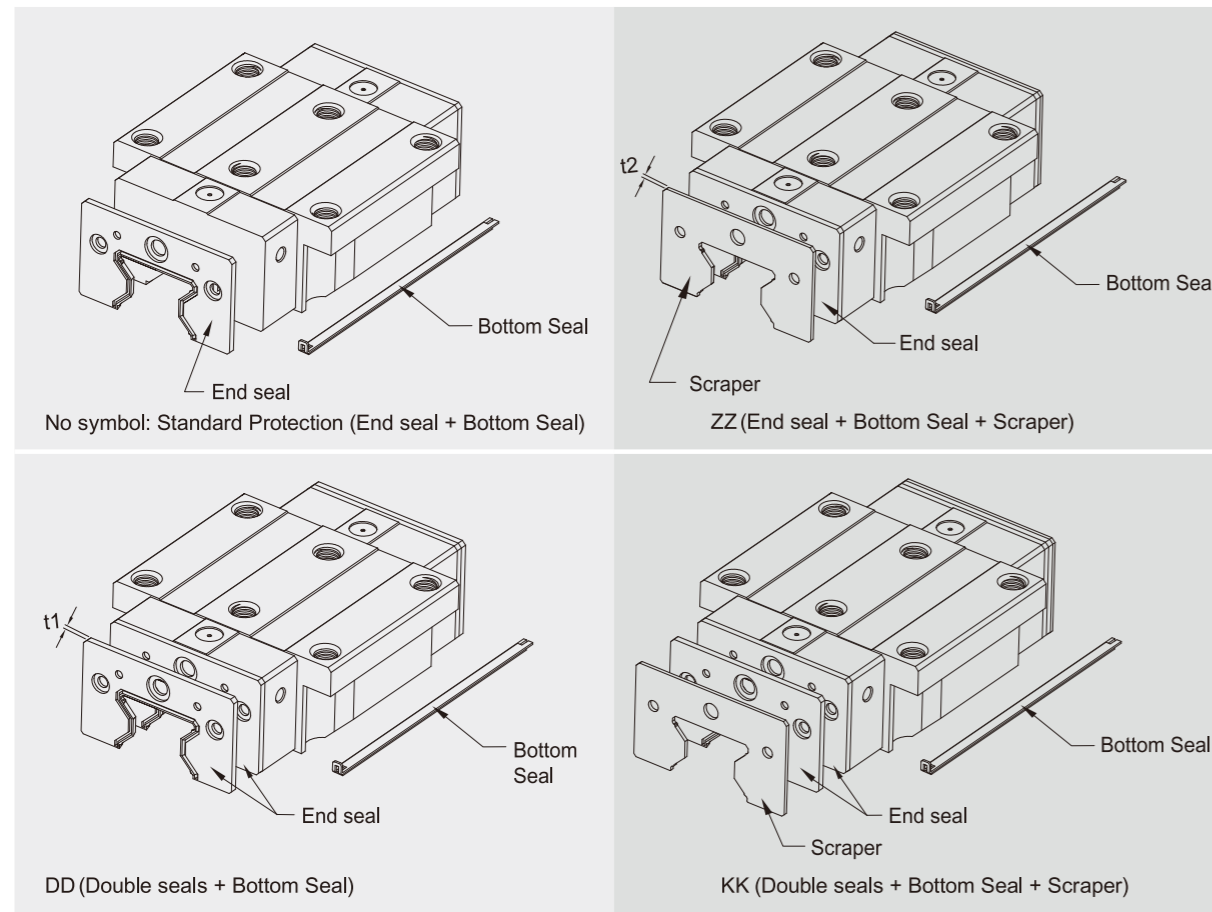
Size	Feed rate (cm ³ /hr)
R15	0.14
R20	0.14
R25	0.167
R30	0.2
R35	0.23
R45	0.3
R55	0.367
R65	0.433

2-5-8 Dust Proof Accessories

(1) Codes of accessories

If the following accessories are needed, please add the code followed by the model number.

Table 2-5-16



(2) End seal and bottom seal

To prevent life reduction caused by iron chips or dust entering the block.

(3) Double seals

Enhances the wiping effect, foreign matter can be completely wiped off.

Table 2-5-17 Dimensions of end seal

Size	Thickness (t1) (mm)	Size	Thickness (t1) (mm)
R15 ES	2.2	R35 ES	2.5
R20 ES	2.2	R45 ES	3.6
R25 ES	2.2	R55 ES	3.6
R30 ES	2.4	R65 ES	4.4

(4) Scraper

The scraper removes high-temperature iron chips and larger foreign objects.

Table 2-5-18 Dimensions of scraper

Size	Thickness (t2) (mm)	Size	Thickness (t2) (mm)
R15 SC	1.0	R35 SC	1.5
R20 SC	1.0	R45 SC	1.5
R25 SC	1.0	R55 SC	1.5
R30 SC	1.5	R65 SC	1.5

(5) Bolt caps for rail mounting holes

Caps are used to cover the mounting holes to prevent chips or other foreign objects from collecting in the holes. The caps will be enclosed in each rail package.



Table 2-5-19 Dimensions of Bolt Caps for Rail Mounting Holes

Rail size	Bolt size	Diameter(D) (mm)	Thickness(H) (mm)	Rail size	Bolt size	Diameter(D) (mm)	Thickness(H) (mm)
RR 15	M4	7.65	1.1	RR 35	M8	14.2	3.3
RR 20	M5	9.65	2.2	RR 45	M12	20.25	4.6
RR 25	M6	11.15	2.5	RR 55	M14	23.5	5.5
RR 30	M8	14.2	3.3	RR 65	M16	26.6	5.5



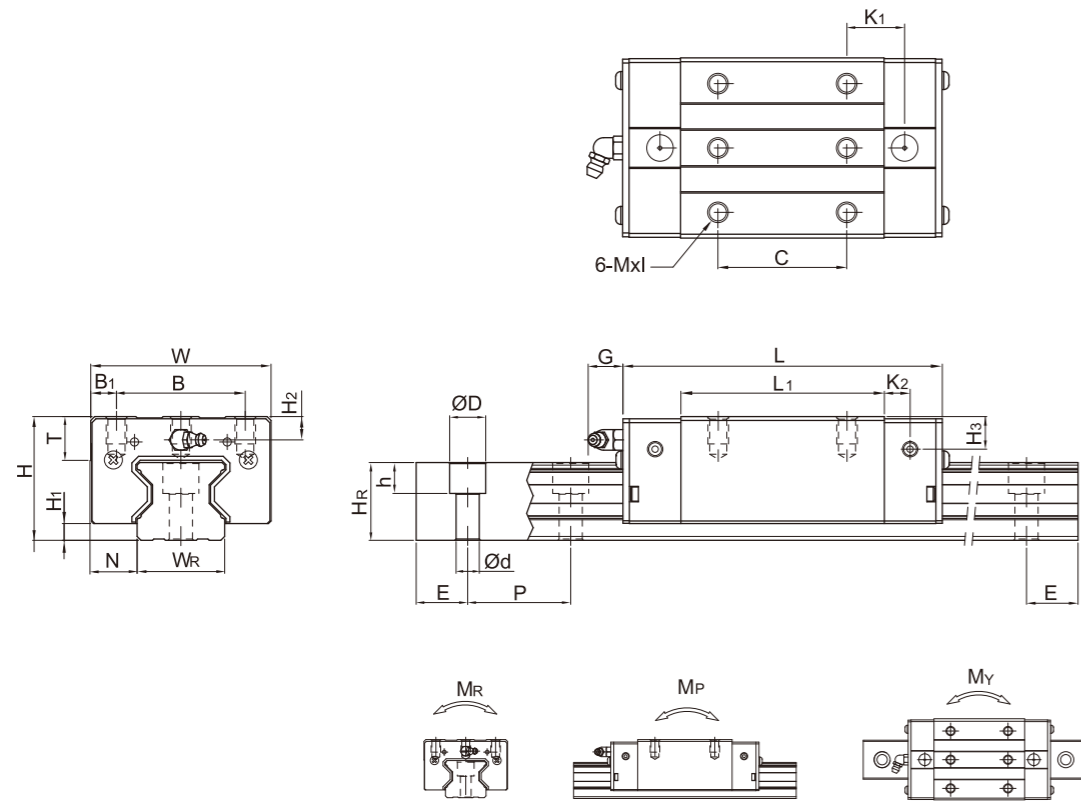
Linear Guideways

Ball Screw

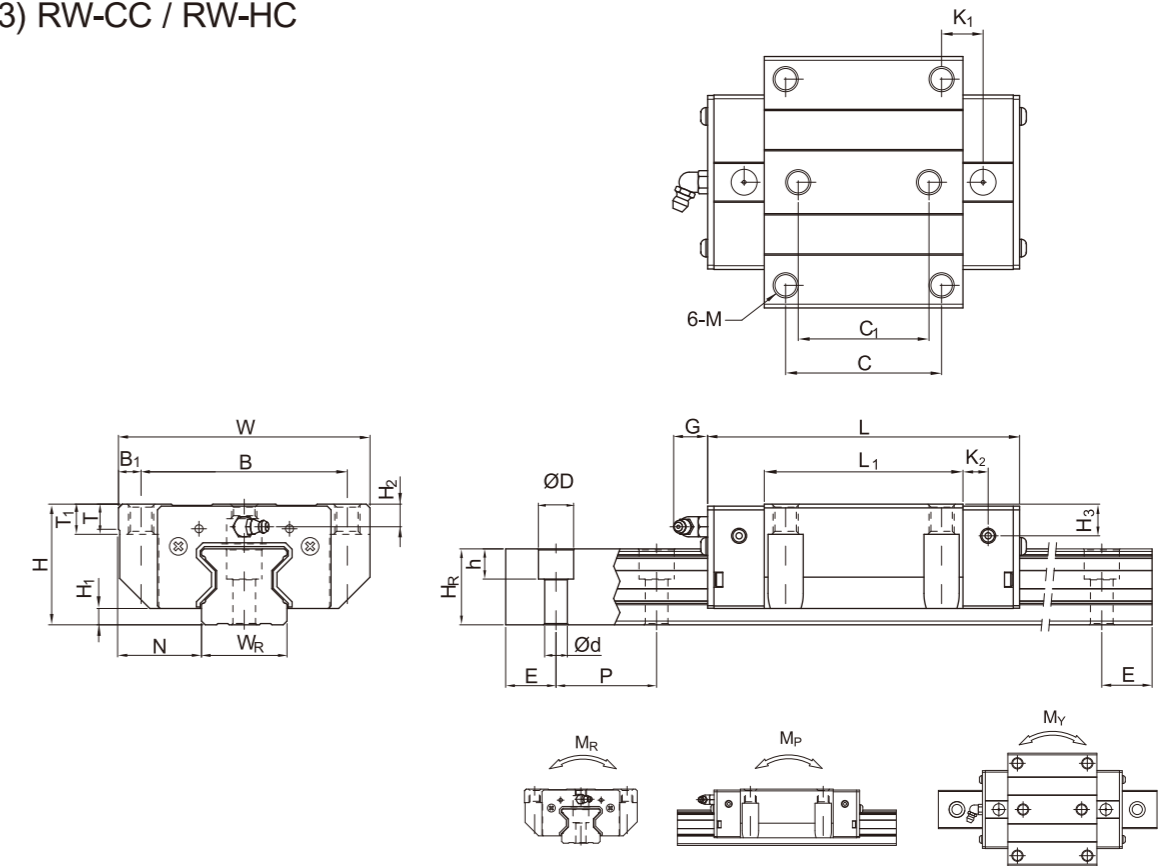
Support

Linear Bushing

(2) RL-CA / RL-HA



(3) RW-CC / RW-HC



Linear Guideways

Ball Screw

Support

Linear Bushing

Model No.	Dimensions of Assembly (mm)			Dimensions of Block (mm)													Mounting Bolt for Rail (mm)	Basic Dynamic Load Rating C ₀ (kN)	Basic Static Load Rating C ₀ (kN)	Static Rated Moment			Weight								
	H	H ₁	N	W	B	B ₁	C	L ₁	L	K ₁	K ₂	G	MxI	T	H ₂	H ₃				W _R	H _R	D	h	d	P	E	M _R	M _P	M _Y	Block kg	Rail kg/m
RL15CA	24	4	9.5	34	26	4	26	45	68	13.4	4.7	5.3	M4x5.5	6	3.6	6.1	15	16.5	7.5	5.7	4.5	30	20	M4x16	11.3	24	0.311	0.173	0.173	0.15	1.8
RL20CA	30	5	12	44	32	6	36	57.5	86	15.8	6	5.3	M5x6	8	4.3	4.3	20	21	9.5	8.5	6	30	20	M5x20	21.3	46.7	0.647	0.46	0.46	0.32	2.76
RL20HA	30	5	12	44	32	6	50	77.5	106	18.8	6	5.3	M5x6	8	4.3	4.3	20	21	9.5	8.5	6	30	20	M5x20	26.9	63	0.872	0.837	0.837	0.42	2.76
RL25CA	36	5.5	12.5	48	35	6.5	35	64.5	97.9	20.75	7.25	12	M6x8	9.5	6.2	6	23	23.6	11	9	7	30	20	M6x20	27.7	57.1	0.758	0.605	0.605	0.51	3.08
RL25HA	36	5.5	12.5	48	35	6.5	50	81	114.4	21.5	7.25	12	M6x8	9.5	6.2	6	23	23.6	11	9	7	30	20	M6x20	33.9	73.4	0.975	0.991	0.991	0.63	3.08
RL30CA	42	6	16	60	40	10	40	71	109.8	23.5	8	12	M8x10	9.5	6.5	7.3	28	28	14	12	9	40	20	M8x25	39.1	82.1	1.445	1.06	1.06	0.80	4.41
RL30HA	42	6	16	60	40	10	60	93	131.8	24.5	8	12	M8x10	9.5	6.5	7.3	28	28	14	12	9	40	20	M8x25	48.1	105	1.846	1.712	1.712	1.03	4.41
RL35CA	48	6.5	18	70	50	10	50	79	124	22.5	10	12	M8x12	12	9	12.6	34	30.2	14	12	9	40	20	M8x25	57.9	105.2	2.17	1.44	1.44	1.27	6.06
RL35HA	48	6.5	18	70	50	10	72	106.5	151.5	25.25	10	12	M8x12	12	9	12.6	34	30.2	14	12	9	40	20	M8x25	73.1	142	2.93	2.6	2.6	1.65	6.06
RL45CA	60	8	20.5	86	60	13	60	106	153.2	31	10	12.9	M10x17	16	10	14	45	38	20	17	14	52.5	22.5	M12x35	92.6	178.8	4.52	3.05	3.05	2.47	9.97
RL45HA	60	8	20.5	86	60	13	80	139.8	187	37.9	10	12.9	M10x17	16	10	14	45	38	20	17	14	52.5	22.5	M12x35	116	230.9	6.33	5.47	5.47	3.20	9.97
RL55CA	70	10	23.5	100	75	12.5	75	125.5	183.7	37.75	12.5	12.9	M12x18	17.5	12	17.5	53	44	23	20	16	60	30	M14x45	130.5	252	8.01	5.4	5.4	3.91	13.98
RL55HA	70	10	23.5	100	75	12.5	95	173.8	232	51.9	12.5	12.9	M12x18	17.5	12	17.5	53	44	23	20	16	60	30	M14x45	167.8	348	11.15	10.25	10.25	5.32	13.98

Note : 1. 1 kgf = 9.81 N
 2. The theoretical dynamic rated load is C_{100R}, if necessary C_{50R} conversion formula is as follows : C_{50R} = 1.23 x C_{100R}

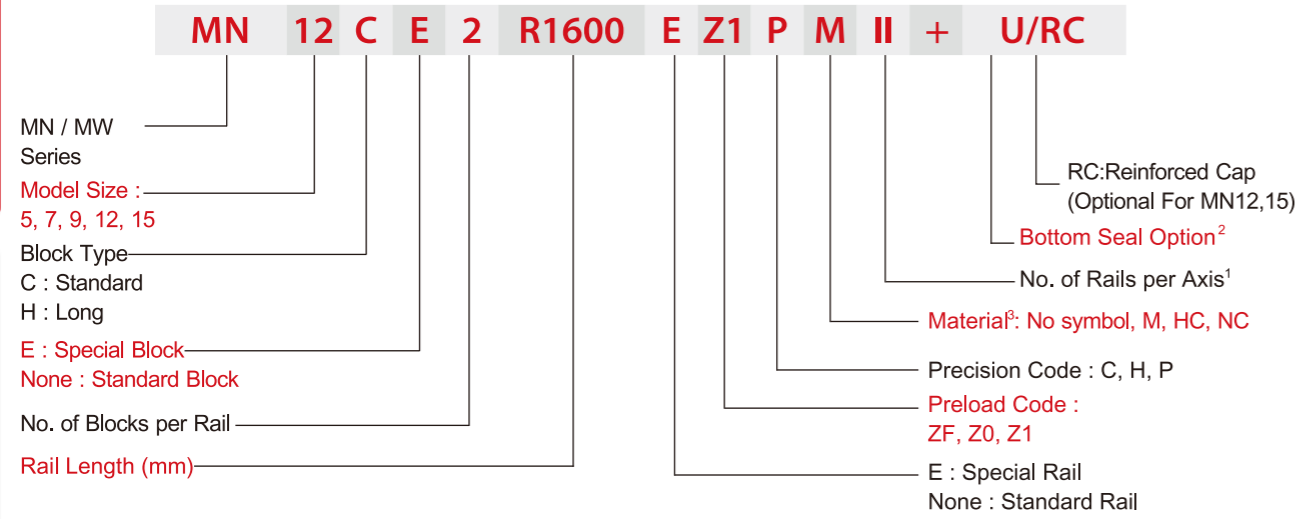
Model No.	Dimensions of Assembly (mm)			Dimensions of Block (mm)													Mounting Bolt for Rail (mm)	Basic Dynamic Load Rating C ₀ (kN)	Basic Static Load Rating C ₀ (kN)	Static Rated Moment			Weight										
	H	H ₁	N	W	B	B ₁	C	C ₁	L ₁	L	K ₁	K ₂	G	M	T	T ₁				H ₂	H ₃	W _R	H _R	D	h	d	P	E	M _R	M _P	M _Y	Block kg	Rail kg/m
RW15CC	24	4	16	47	38	4.5	30	26	45	68	11.4	4.7	5.3	M5	6	6.95	3.6	6.1	15	16.5	7.5	5.7	4.5	30	20	M4x16	11.3	24	0.311	0.173	0.173	0.22	1.8
RW20CC	30	5	21.5	63	53	5	40	35	57.5	86	13.8	6	5.3	M6	8	10	4.3	4.3	20	21	9.5	8.5	6	30	20	M5x20	21.3	46.7	0.647	0.46	0.46	0.47	2.76
RW20HC	30	5	21.5	63	53	5	40	35	77.5	106	23.8	6	5.3	M6	8	10	4.3	4.3	20	21	9.5	8.5	6	30	20	M5x20	26.9	63	0.872	0.837	0.837	0.63	2.76
RW25CC	36	5.5	23.5	70	57	6.5	45	40	64.5	97.9	15.75	7.25	12	M8	9.5	10	6.2	6	23	23.6	11	9	7	30	20	M6x20	27.7	57.1	0.758	0.605	0.605	0.72	3.08
RW25HC	36	5.5	23.5	70	57	6.5	45	40	81	114.4	24	7.25	12	M8	9.5	10	6.2	6	23	23.6	11	9	7	30	20	M6x20	33.9	73.4	0.975	0.991	0.991	0.91	3.08
RW30CC	42	6	31	90	72	9	52	44	71	109.8	17.5	8	12	M10	9.5	10	6.5	7.3	28	28	14	12	9	40	20	M8x25	39.1	82.1	1.445	1.06	1.06	1.16	4.41
RW30HC	42	6	31	90	72	9	52	44	93	131.8	28.5	8	12	M10	9.5	10	6.5	7.3	28	28	14	12	9	40	20	M8x25	48.1	105	1.846	1.712	1.712	1.52	4.41
RW35CC	48	6.5	33	100	82	9	62	52	79	124	16.5	10	12	M10	12	13	9	12.6	34	30.2	14	12	9	40	20	M8x25	57.9	105.2	2.17	1.44	1.44	1.75	6.06
RW35HC	48	6.5	33	100	82	9	62	52	106.5	151.5	30.25	10	12	M10	12	13	9	12.6	34	30.2	14	12	9	40	20	M8x25	73.1	142	2.93	2.6	2.6	2.40	6.06
RW45CC	60	8	37.5	120	100	10	80	60	106	153.2	21	10	12.9	M12	14	15	10	14	45	38	20	17	14	52.5	22.5	M12x35	92.6	178.8	4.52	3.05	3.05	3.43	9.97
RW45HC	60	8	37.5	120	100	10	80	60	139.8	187	37.9	10	12.9	M12	14	15	10	14	45	38	20	17	14	52.5	22.5	M12x35	116	230.9	6.33	5.47	5.47	4.57	9.97
RW55CC	70	10	43.5	140	116	12	95	70	125.5	183.7	27.75	12.5	12.9	M14	16	17	12	17.5	53	44	23	20	16	60	30	M14x45	130.5	252	8.01	5.4	5.4	5.43	13.98
RW55HC	70	10	43.5	140	116	12	95	70	173.8	232	51.9	12.5	12.9	M14	16	17	12	17.5	53	44	23	20	16	60	30	M14x45	167.8	348	11.15	10.25	10.25	7.61	13.98
RW 65CC	90	12	53.5	170	142	14	110	82	160	232	40.8	15.8	12.9	M16	22	23	15	15	63	53	26	22	18	75	35	M16x50	213	411.6	16.20	11.59	11.59	11.63	20.22
RW 65HC	90	12	53.5	170	142	14	110	82	223	295	72.3	15.8	12.9	M16	22	23	15	15	63	53	26	22	18	75	35	M16x50	275.3	572.7	22.55	22.17	22.17	16.58	20.22

Note : 1. 1 kgf = 9.81 N
 2. The theoretical dynamic rated load is C_{100R}, if necessary C_{50R} conversion formula is as follows : C_{50R} = 1.23 x C_{100R}

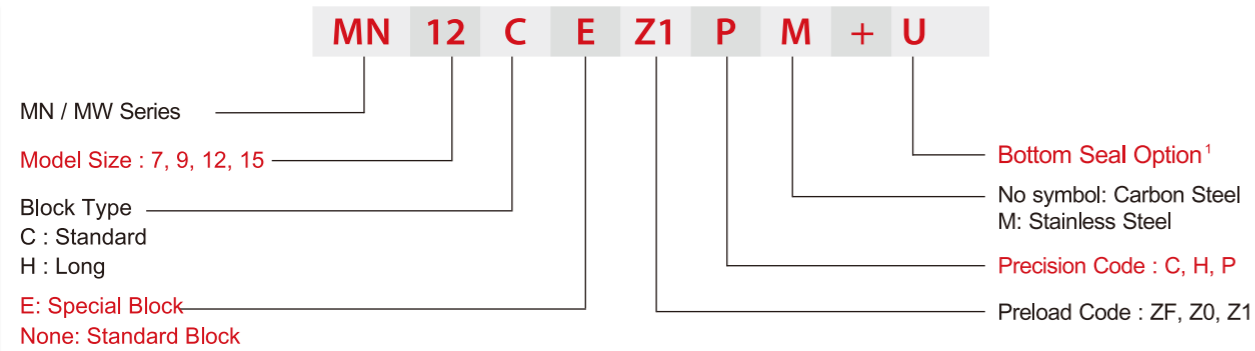


2-6 M Series - Miniature Type Linear Guideway

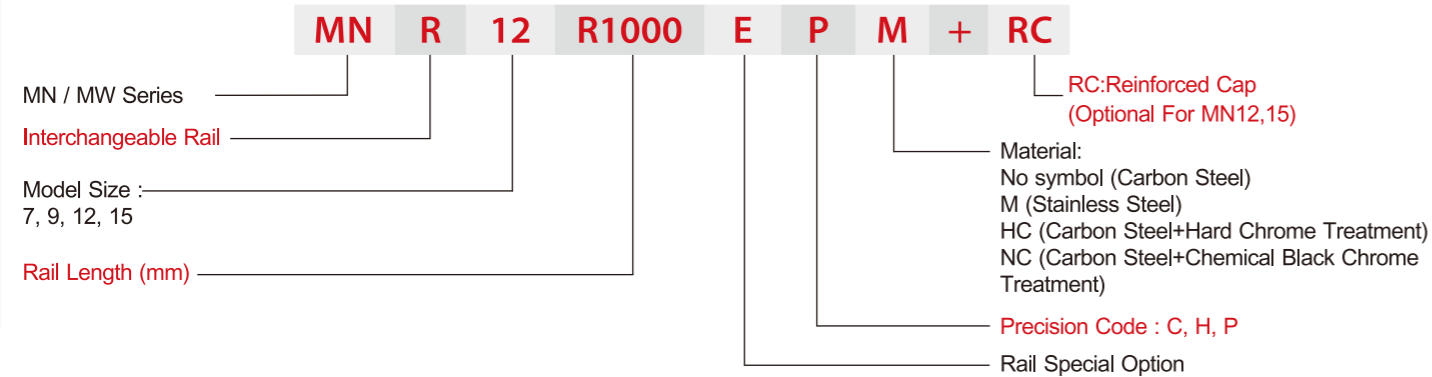
(1) Non-interchangeable type



(2) Interchangeable type
 Interchangeable Block



Interchangeable Rail



2-6-1 Types

(1) Block types

LIMON offers two types of linear guideways, standard and widen types.

Table 2-6-1 Block Types

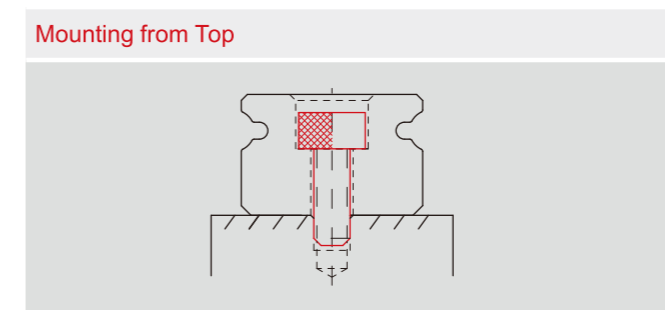
Type	Model	Shape	Height (mm)	Rail Length (mm)	Main Applications
standard	MN-C MN-H		8	100	<input type="checkbox"/> Printer <input type="checkbox"/> Robotics <input type="checkbox"/> Precision measure equipment <input type="checkbox"/> Semiconductor equipment
			↓	↓	
widen	MW-C MW-H		9	100	
			↓	↓	

*Please refer to the chapter 2-6-5 for the dimensional detail.

(2) Rail types

LIMON offers standard top mounting type.

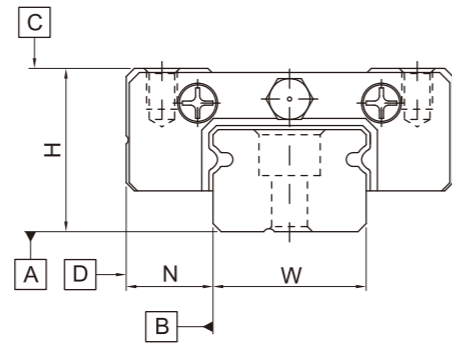
Table 2-6-2 Rail Types





2-6-2 Accuracy

The accuracy of MN/MW series can be classified into three classes: normal (C), high (H), precision (P). Choices for different accuracy classes are available according to various requirements.



(1) Accuracy of non-interchangeable guideways

Table 2-6-3 Accuracy Standard of Non-interchangeable Type

Unit: mm

Accuracy Classes	Normal (C)	High (H)	Precision (P)
Dimensional tolerance of height H	± 0.04	± 0.02	± 0.01
Dimensional tolerance of width N	± 0.04	± 0.025	± 0.015
Pair Variation of height H	0.03	0.015	0.007
Pair Variation of width N (Master Rail)	0.03	0.02	0.01
Running parallelism of block surface C to surface A	See Table 2-6-5		
Running parallelism of block surface D to surface B	See Table 2-6-5		

(2) Accuracy of interchangeable guideways

Table 2-6-4 Accuracy Standard of Interchangeable Type

Unit: mm

Accuracy Classes	Normal (C)	High (H)	Precision (P)
Dimensional tolerance of height H	± 0.04	± 0.02	± 0.01
Dimensional tolerance of width N	± 0.04	± 0.025	± 0.015
One Set	Pair Variation of height H	0.03	0.015
	Pair Variation of width N	0.03	0.02
Pair Variation of width N (Master Rail)	0.07	0.04	0.02
Running parallelism of block surface C to surface A	See Table 2-6-5		
Running parallelism of block surface D to surface B	See Table 2-6-5		



(3) Accuracy of running parallelism

The running parallelism C to A and D to B are related to the rail length.

Table 2-6-5 Accuracy of Running Parallelism

Rail Length (mm)	Accuracy (μm)			Rail Length (mm)	Accuracy (μm)		
	(C)	(H)	(P)		(C)	(H)	(P)
~ 50	12	6	2	1,000 ~ 1,200	25	18	11
50 ~ 80	13	7	3	1,200 ~ 1,300	25	18	11
80 ~ 125	14	8	3.5	1,300 ~ 1,400	26	19	12
125 ~ 200	15	9	4	1,400 ~ 1,500	27	19	12
200 ~ 250	16	10	5	1,500 ~ 1,600	28	20	13
250 ~ 315	17	11	5	1,600 ~ 1,700	29	20	14
315 ~ 400	18	11	6	1,700 ~ 1,800	30	21	14
400 ~ 500	19	12	6	1,800 ~ 1,900	30	21	15
500 ~ 630	20	13	7	1,900 ~ 2,000	31	22	15
630 ~ 800	22	14	8	2,000 ~	31	22	16
800 ~ 1,000	23	16	9				

2-6-3 Preload

MN/MW series provides three different preload levels for various applications.

Table 2-6-6 Preload Classes

Class	Code	Preload	Accuracy
Light Clearance	ZF	Clearance 4~10μm	C
Very Light Preload	Z0	0	C~P
Light Preload	Z1	0.02C	C~P

Note: "C" in column preload means basic dynamic load rating.

2-6-4 Dust Proof Accessories

End seals and standard accessories fixed on both sides of the block can prevent dust from entering the block, so the accuracy and service life of a linear guideway can be maintained. Bottom seals are fixed under the skirt portion of the block to prevent dust from entering. Customers can order bottom seals by adding the mark "+U" followed by the model number. Sizes 9, 12 and 15 provide bottom seals as an option, but size 5, 7 do not offer the option due to the space limit of H₁. Note that "H₁" would be reduced if bottom seals are attached, be aware of possible interference between block and mounting surface.

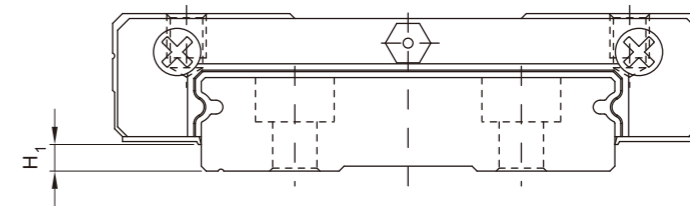


Table 2-6-7

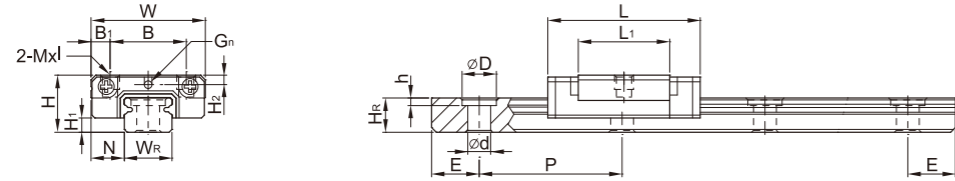
Size	Bottom seal	H ₁ mm	Size	Bottom seal	H ₁ mm
MN 5	-	-	MW 5	-	-
MN 7	-	-	MW 7	-	-
MN 9	•	1	MW 9	•	1.9
MN 12	•	2	MW 12	•	2.4
MN 15	•	3	MW 15	•	2.4



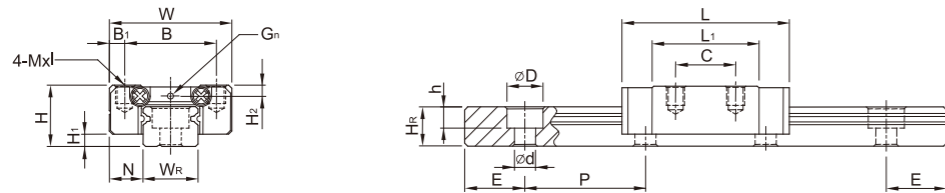
2-6-5 Dimensions for MN/MW Series

(1) MN-C / MN-H

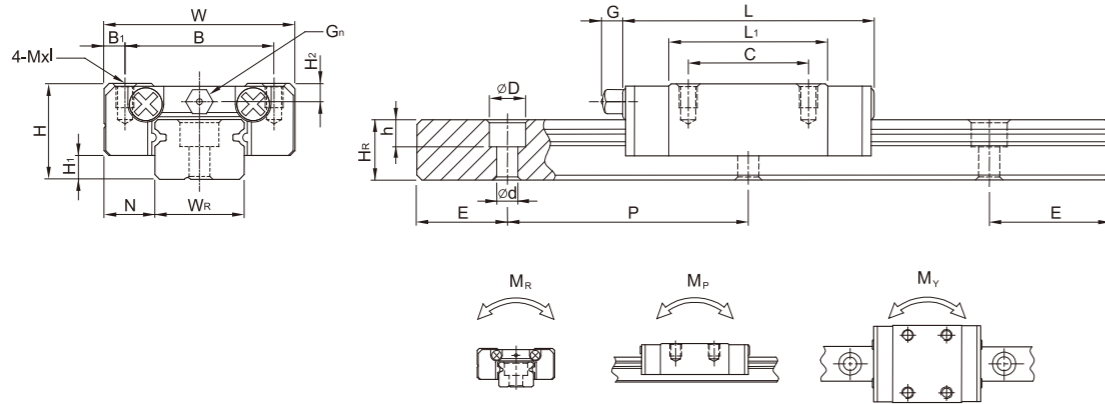
MN5



MN7, MN9, MN12

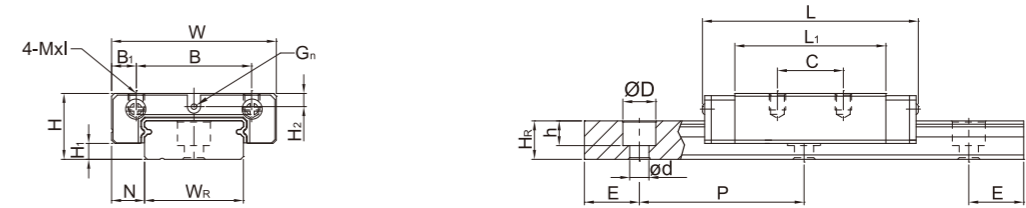


MN15

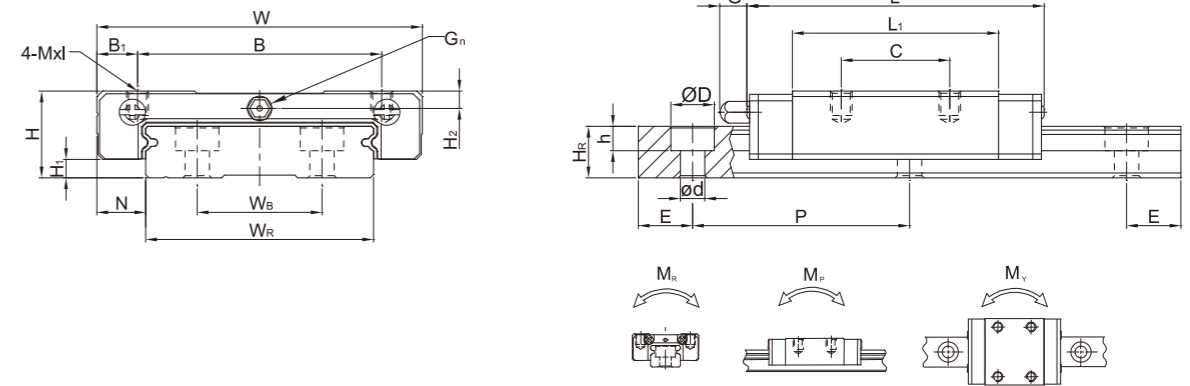


(2) MW-C / MW-H

MW7, MW9, MW12



MW15



Model No.	Dimensions of Assembly (mm)			Dimensions of Block (mm)										Dimensions of Rail (mm)					Mounting Bolt for Rail (mm)	Basic Dynamic Load Rating C ₀ (kN)	Basic Static Load Rating C ₀ (kN)	Static Rated Moment			Weight			
	H	H ₁	N	W	B	B ₁	C	L ₁	L	G	G _n	MxI	H ₂	W _R	H _R	D	h	d				P	E	M _R	M _P	M _V	Block	Rail
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm				mm	mm	mm	N-m	N-m	N-m	kg
MN5C	6	1.5	3.5	12	8	2	-	9.6	16	-	∅0.8	M2x1.5	1	5	3.6	3.6	0.8	2.4	15	5	M2x6	0.54	0.86	2	1.3	1.3	0.008	0.15
MN7C	8	1.5	5	17	12	2.5	8	13.5	22.5	-	∅1.2	M2x2.5	1.5	7	4.8	4.2	2.3	2.4	15	5	M2x6	0.98	1.24	4.70	2.84	2.84	0.010	0.22
MN7H	8	1.5	5	17	12	2.5	13	21.8	30.8	-	∅1.2	M2x2.5	1.5	7	4.8	4.2	2.3	2.4	15	5	M2x6	1.37	1.96	7.64	4.80	4.80	0.015	0.22
MN9C	10	2	5.5	20	15	2.5	10	18.9	28.9	-	∅1.4	M3x3	1.8	9	6.5	6	3.5	3.5	20	7.5	M3x8	1.86	2.55	11.76	7.35	7.35	0.016	0.38
MN9H	10	2	5.5	20	15	2.5	16	29.9	39.9	-	∅1.4	M3x3	1.8	9	6.5	6	3.5	3.5	20	7.5	M3x8	2.55	4.02	19.60	18.62	18.62	0.026	0.38
MN12C	13	3	7.5	27	20	3.5	15	21.7	34.7	-	∅2	M3x3.5	2.5	12	8	6	4.5	3.5	25	10	M3x8	2.84	3.92	25.48	13.72	13.72	0.034	0.65
MN12H	13	3	7.5	27	20	3.5	20	32.4	45.4	-	∅2	M3x3.5	2.5	12	8	6	4.5	3.5	25	10	M3x8	3.72	5.88	38.22	36.26	36.26	0.054	0.65
MN15C	16	4	8.5	32	25	3.5	20	26.7	42.1	4.5	M3	M3x4	3	15	10	6	4.5	3.5	40	15	M3x10	4.61	5.59	45.08	21.56	21.56	0.059	1.06
MN15H	16	4	8.5	32	25	3.5	25	43.4	58.8	4.5	M3	M3x4	3	15	10	6	4.5	3.5	40	15	M3x10	6.37	9.11	73.50	57.82	57.82	0.092	1.06

Note : 1 kgf = 9.81 N

Model No.	Dimensions of Assembly (mm)			Dimensions of Block (mm)										Dimensions of Rail (mm)					Mounting Bolt for Rail (mm)	Basic Dynamic Load Rating C ₀ (kN)	Basic Static Load Rating C ₀ (kN)	Static Rated Moment			Weight				
	H	H ₁	N	W	B	B ₁	C	L ₁	L	G	G _n	MxI	H ₂	W _R	H _R	D	h	d				P	E	M _R	M _P	M _V	Block	Rail	
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm				mm	mm	mm	N-m	N-m	N-m	kg	kg/m
MW7C	9	1.9	5.5	25	19	3	10	21	31.2	-	∅1.2	M3x3	1.85	14	-	5.2	6	3.2	3.5	30	10	M3x6	1.37	2.06	15.70	7.14	7.14	0.020	0.51
MW7H	9	1.9	5.5	25	19	3	19	30.8	41	-	∅1.2	M3x3	1.85	14	-	5.2	6	3.2	3.5	30	10	M3x6	1.77	3.14	23.45	15.53	15.53	0.029	0.51
MW9C	12	2.9	6	30	21	4.5	12	27.5	39.3	-	∅1.2	M3x3	2.4	18	-	7	6	4.5	3.5	30	10	M3x8	2.75	4.12	40.12	18.96	18.96	0.040	0.91
MW9H	12	2.9	6	30	23	3.5	24	38.5	50.7	-	∅1.2	M3x3	2.4	18	-	7	6	4.5	3.5	30	10	M3x8	3.43	5.89	54.54	34.00	34.00	0.057	0.91
MW12C	14	3.4	8	40	28	6	15	31.3	46.1	-	∅1.2	M3x3.6	2.8	24	-	8.5	8	4.5	4.5	40	15	M4x8	3.92	5.59	70.34	27.80	27.80	0.071	1.49
MW12H	14	3.4	8	40	28	6	28	45.6	60.4	-	∅1.2	M3x3.6	2.8	24	-	8.5	8	4.5	4.5	40	15	M4x8	5.10	8.24	102.70	57.37	57.37	0.103	1.49
MW15C	16	3.4	9	60	45	7.5	20	38	54.8	5.2	M3	M4x4.2	3.2	42	23	9.5	8	4.5	4.5	40	15	M4x10	6.77	9.22	199.34	56.66	56.66	0.143	2.86
MW15H	16	3.4	9	60	45	7.5	35	57	73.8	5.2	M3	M4x4.2	3.2	42	23	9.5	8	4.5	4.5	40	15	M4x10	8.93	13.38	299.01	122.60	122.60	0.215	2.86

Note : 1 kgf = 9.81 N