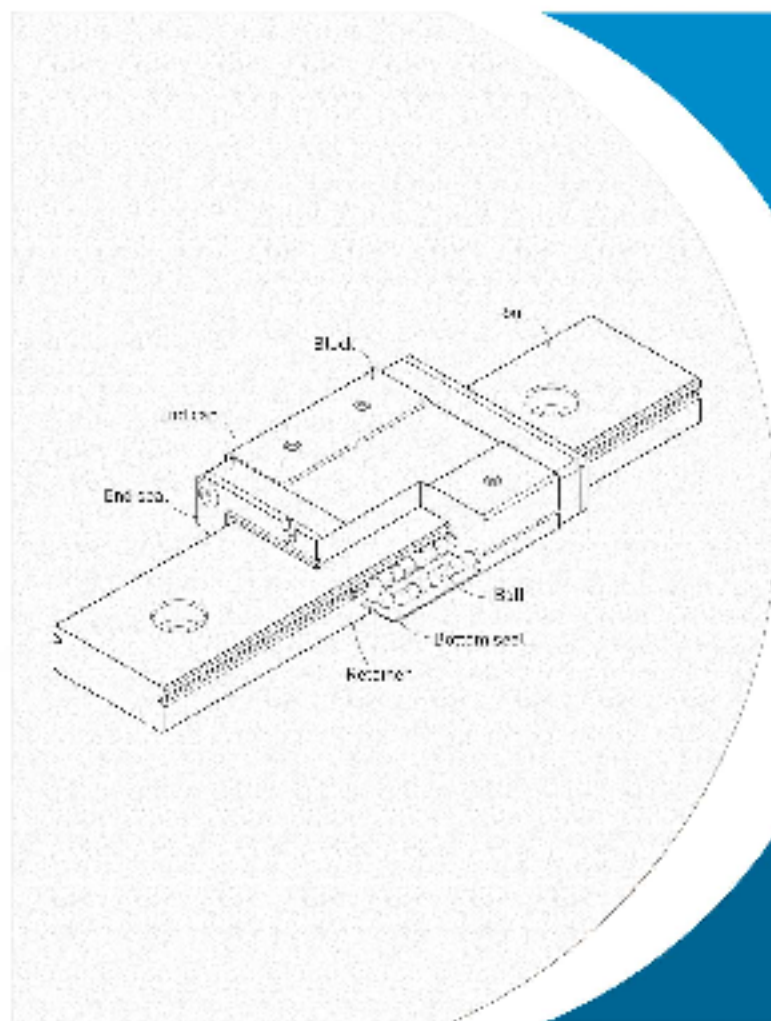




Auto Linear Motion

## Linear Guideways



# **ALM Intelligent Technology (Suzhou) Co., Limited**

Add: No 1998 Jinfeng south road, Wuzhong district, Suzhou city, China

E-mail: [sales@autolinearmotion.com](mailto:sales@autolinearmotion.com)

Tel: +8618962406535

Web: [www.autolinearmotion.com](http://www.autolinearmotion.com)



# Linear Guideways

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## 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 1/50th. 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 precision ballscrews.

# 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 is rolling contact. The coefficient of friction is only 1/50th 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 a 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.

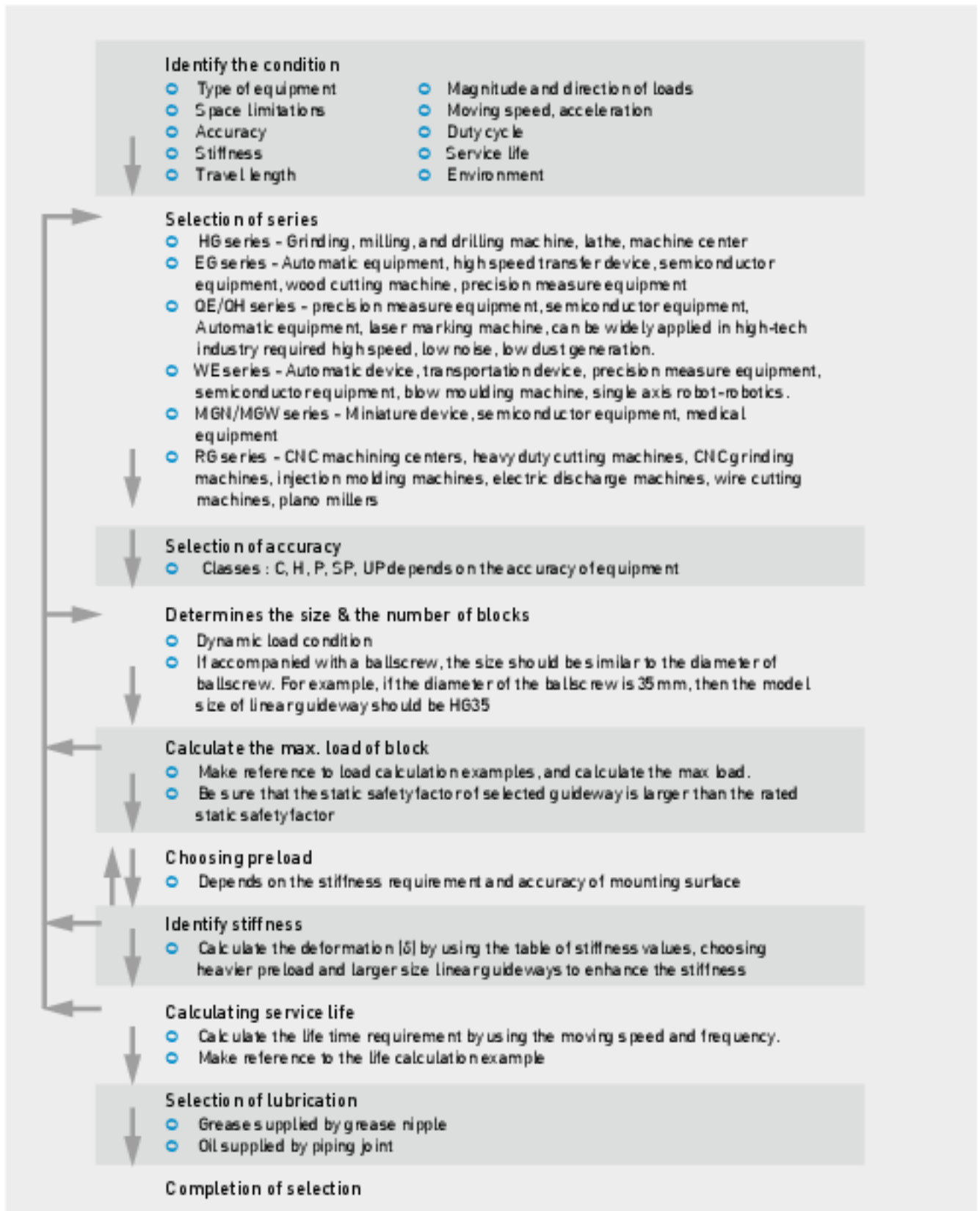
### [7] Interchangeability

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.

# Linear Guideways

## General Information

### 1-2 Selecting Linear Guideways



## 1-3 Basic Load Ratings of Linear Guideways

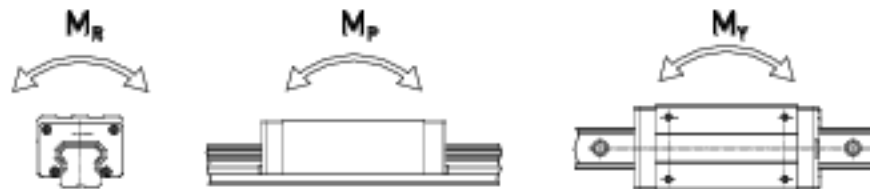
### 1-3-1 Basic Static Load

#### [1] Static load rating [C<sub>0</sub>]

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<sub>0</sub>]

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<sub>0</sub>, M<sub>P</sub> and M<sub>V</sub>.



#### [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

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

- $f_{SL}$  : 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 linear guideway [100km for roller type]. 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.

# Linear Guideways

## General Information

### 1-4 Service Life of Linear Guideways

#### 1-4-1 Service Life

When the raceway and the rolling elements of a linear guideway are continuously subjected to repeated stresses, the raceway surface shows fatigue. Flaking will eventually occur. This is called fatigue flaking. The life of a linear guideway is defined as the total distance traveled until fatigue flaking appears on the surface of the raceway or rolling elements.

#### 1-4-2 Nominal Life (L)

The service life varies greatly even when the linear motion guideways are manufactured in the same way or operated under the same motion conditions. For this reason, nominal life is used as the criteria for predicting the service life of a linear motion guideway. The nominal life is the total distance that 90% of a group of identical linear motion guideways, operated under identical conditions, can travel without flaking. When the basic dynamic rated load is applied to a linear motion guideway, the nominal life is 50 km.

#### 1-4-3 Calculation of Nominal Life

The acting load will affect the nominal life of a linear guideway. Based on the selected basic dynamic rated load and the actual load, the nominal life can be calculated by using Eq. 1.2.

$$L = \left(\frac{C}{P}\right)^3 \cdot 50 \text{ km} = \left(\frac{C}{P}\right)^3 \cdot 31 \text{ mile} \quad \text{Eq.1.2}$$

- L : Nominal life
- C : Basic dynamic load rating
- P : Actual load

If the environmental factors are taken into consideration, the nominal life is influenced greatly by the motion conditions, the hardness of the raceway, and the temperature of the linear guideway. The relationship between these factors is expressed in Eq. 1.3.

$$L = \left(\frac{f_h \cdot f_t \cdot C}{f_w \cdot P_c}\right)^3 \cdot 50 \text{ km} = \left(\frac{f_h \cdot f_t \cdot C}{f_w \cdot P_c}\right)^3 \cdot 31 \text{ mile} \quad \text{Eq.1.3}$$

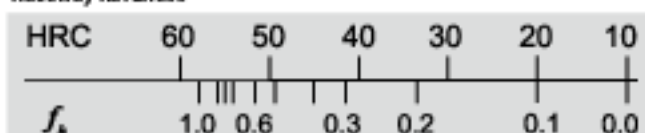
- L : Nominal life
- $f_h$  : Hardness factor
- C : Basic dynamic load rating
- $f_t$  : Temperature factor
- $P_c$  : Calculated load
- $f_w$  : Load factor

#### 1-4-4 Factors of Normal Life

##### (1) Hardness factor ( $f_h$ )

In general, the raceway surface in contact with the rolling elements must have the hardness of HRC 56–62 to an appropriate depth. When the specified hardness is not obtained, the permissible load is reduced and the nominal life is decreased. In this situation, the basic dynamic load rating and the basic static load rating must be multiplied by the hardness factor for calculation.

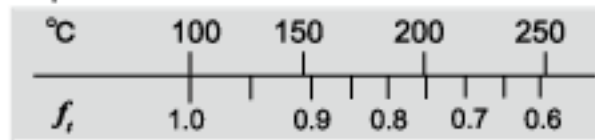
Raceway hardness



### [2] Temperature factor [ $f_t$ ]

Due to the temperature will affect the material of linear guide, therefore the permissible load will be reduced and the nominal service life will be decreased when over 100°C. Therefore, the basic dynamic and static load rating must be multiplied by the temperature factor. As some accessories are plastic which can't resist high temperature, the working environment is recommended to be lower than 100°C.

Temperature



### [3] Load factor [ $f_w$ ]

The loads acting on a linear guideway include the weight of slide, the inertia load at the times of start and stop, and the moment loads caused by overhanging. These load factors are especially difficult to estimate because of mechanical vibrations and impacts. Therefore, the load on a linear guideway should be divided by the empirical factor.

Table 1-2 Load factor

Loading Condition	Service Speed	$f_w$
No impacts & vibration	$V \leq 15$ m/min	1 - 1.2
Small impacts	$15$ m/min < $V \leq 60$ m/min	1.2 - 1.5
Normal load	$60$ m/min < $V \leq 120$ m/min	1.5 - 2.0
With impacts & vibration	$V > 120$ m/min	2.0 - 3.5

## 1-4-5 Calculation of Service Life ( $L_h$ )

Transform the nominal life into the service life time by using speed and frequency.

$$L_h = \frac{L \cdot 10^3}{V_e \cdot 60} = \frac{\left(\frac{C}{P}\right)^3 \cdot 50 \cdot 10^3}{V_e \cdot 60} \text{ hr} \quad \dots\dots\dots \text{Eq.1.4}$$

- $L_h$  : Service life [hr]
- $L$  : Nominal life [km]
- $V_e$  : Speed [m/min]
- $C/P$  : Load factor

## 1-5 Applied Loads

### 1-5-1 Calculation of Load

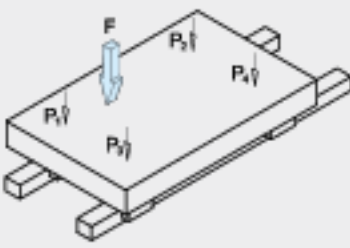
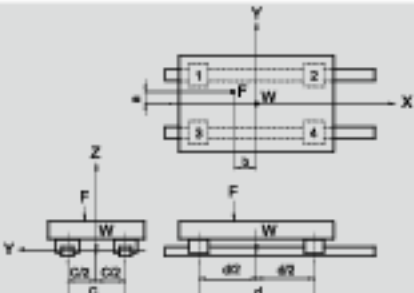
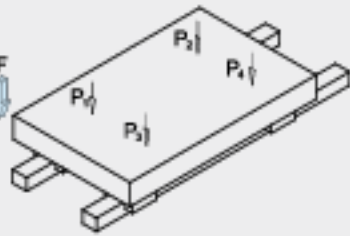
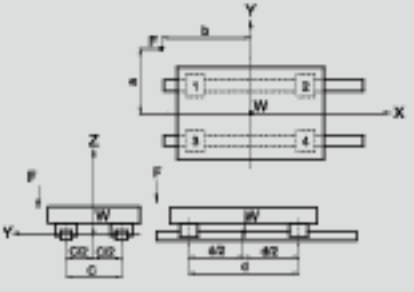
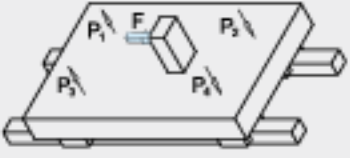
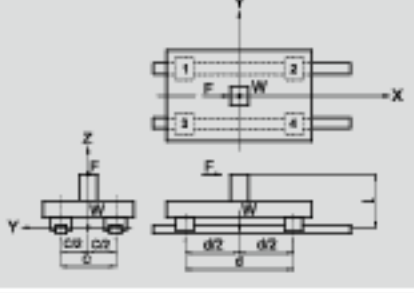
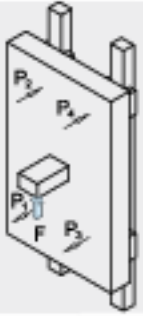
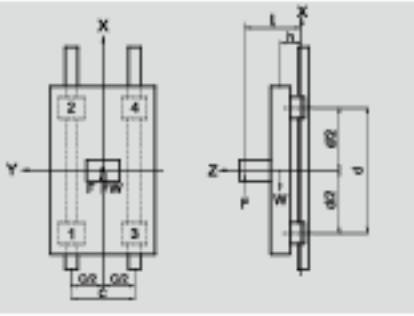
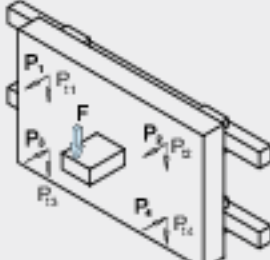
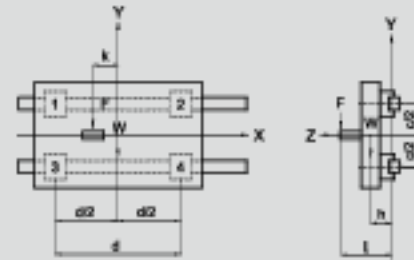
Several factors affect the calculation of loads acting on a linear guideway (such as the position of the object's center of gravity, the thrust position, and the inertial forces at the time of start and stop). To obtain the correct load value, each load condition should be carefully considered.

# Linear Guideways

## General Information

### [1] Load on one block

Table 1-3 Calculation example of loads on block

Patterns	Leads layout	Load on one block
		$P_1 = \frac{W}{4} + \frac{F}{4} + \frac{F \cdot a}{2c} + \frac{F \cdot b}{2d}$ $P_2 = \frac{W}{4} + \frac{F}{4} + \frac{F \cdot a}{2c} - \frac{F \cdot b}{2d}$ $P_3 = \frac{W}{4} + \frac{F}{4} - \frac{F \cdot a}{2c} + \frac{F \cdot b}{2d}$ $P_4 = \frac{W}{4} + \frac{F}{4} - \frac{F \cdot a}{2c} - \frac{F \cdot b}{2d}$
		$P_1 = \frac{W}{4} + \frac{F}{4} + \frac{F \cdot a}{2c} + \frac{F \cdot b}{2d}$ $P_2 = \frac{W}{4} + \frac{F}{4} + \frac{F \cdot a}{2c} - \frac{F \cdot b}{2d}$ $P_3 = \frac{W}{4} + \frac{F}{4} - \frac{F \cdot a}{2c} + \frac{F \cdot b}{2d}$ $P_4 = \frac{W}{4} + \frac{F}{4} - \frac{F \cdot a}{2c} - \frac{F \cdot b}{2d}$
		$P_1 = P_2 = \frac{W}{4} - \frac{F \cdot l}{2d}$ $P_3 = P_4 = \frac{W}{4} + \frac{F \cdot l}{2d}$
		$P_1 = P_2 = \frac{W \cdot h}{2c} + \frac{F \cdot l}{2d}$
		$P_1 = P_2 = \frac{W \cdot h}{2c} - \frac{F \cdot l}{2c}$ $P_1 = P_3 = \frac{W}{4} + \frac{F}{4} + \frac{F \cdot k}{2d}$ $P_2 = P_4 = \frac{W}{4} + \frac{F}{4} - \frac{F \cdot k}{2d}$

W: Applied weight  
 l: Distance from external force to driver  
 c: Rails spacing

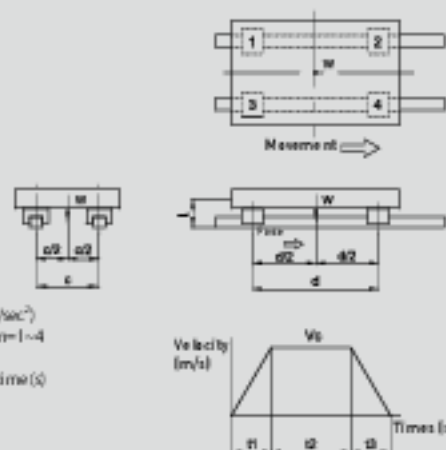
P<sub>n</sub>: Load (radial, reverse radial), n=1~4  
 F: External force  
 d: Block spacing

a, b, k: Distance from external force to geometric center  
 P<sub>n</sub>: Load (lateral), n=1~4  
 h, l: Distance from center of gravity to driver



## [2] Loads with inertia forces

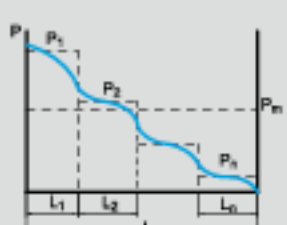
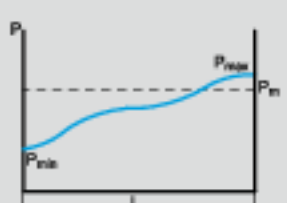
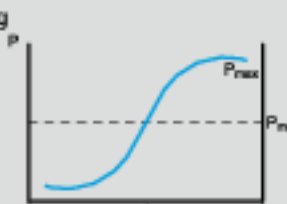
Table 1-4 Calculation Examples for Loads with Inertia Forces

Considering the acceleration and deceleration	Load on one block
 <p> <math>W</math>: Weight of object (N)  <math>g</math>: Gravitational acceleration (9.8m/sec<sup>2</sup>)  <math>P_1</math>: Load (radial, reverse radial) (N), <math>m=1\sim 4</math>  <math>V_c</math>: Maximum speed (m/sec)  <math>t1(t3)</math>: Acceleration (deceleration) time (s)  <math>t2</math>: Constant speed time (s)  <math>c</math>: Rail spacing (m)  <math>d</math>: Block spacing (m)  <math>l</math>: Distance from center of gravity to driver (m)         </p>	<ul style="list-style-type: none"> <li>Constant velocity  <math>P_1 \sim P_4 = \frac{W}{4}</math> </li> <li>Acceleration  <math>P_1 = P_2 = \frac{W}{4} + \frac{1}{2} \cdot \frac{W}{g} \cdot \frac{V_c}{t1} \cdot \frac{l}{d}</math>  <math>P_3 = P_4 = \frac{W}{4} - \frac{1}{2} \cdot \frac{W}{g} \cdot \frac{V_c}{t1} \cdot \frac{l}{d}</math> </li> <li>Deceleration  <math>P_1 = P_2 = \frac{W}{4} - \frac{1}{2} \cdot \frac{W}{g} \cdot \frac{V_c}{t3} \cdot \frac{l}{d}</math>  <math>P_3 = P_4 = \frac{W}{4} + \frac{1}{2} \cdot \frac{W}{g} \cdot \frac{V_c}{t3} \cdot \frac{l}{d}</math> </li> </ul>

### 1-5-2 Calculation of The Mean Load for Variable Loading

When the load on a linear guideway fluctuates greatly, the variable load condition must be considered in the life calculation. The definition of the mean load is the load equal to the bearing fatigue load under the variable loading conditions. It can be calculated by using table 1-5.

Table 1-5 Calculation Examples for Mean Load ( $P_m$ )

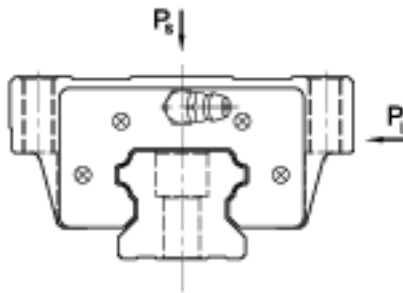
Operation Condition	Mean load
<p>Step load</p> 	$P_m = \sqrt[3]{1/L(P_1^3 \cdot L_1 + P_2^3 \cdot L_2 + \dots + P_n^3 \cdot L_n)}$ <p> <math>P_m</math>: Mean load  <math>P_n</math>: Stepping  <math>L</math>: Total running distance  <math>L_n</math>: Running distance under load <math>P_n</math> </p>
<p>Linear variation</p> 	$P_m = 1/3 (P_{min} + 2 \cdot P_{max})$ <p> <math>P_m</math>: Mean load  <math>P_{min}</math>: Min. Load  <math>P_{max}</math>: Max. Load         </p>
<p>Sinusoidal loading</p> 	$P_m = 0.65 \cdot P_{max}$ <p> <math>P_m</math>: Mean load  <math>P_{max}</math>: Max. Load         </p>

# Linear Guideways

## General Information

### 1-5-3 Calculation for Bidirectional Equivalent Loads

ALM linear guideways can accept loads in several directions simultaneously. To calculate the service life of the guideway when the loads appear in multiple directions, calculate the equivalent load ( $P_e$ ) by using the equations below.



HG/EG/QH/QE/WE/RG Series

$$P_e = P_s + P_l \quad \dots\dots\dots \text{Eq.1.5}$$

MG Series

$$\text{when } P_s > P_l \quad P_e = P_s + 0.5 \cdot P_l \quad \dots\dots\dots \text{Eq.1.6}$$

$$\text{when } P_l > P_s \quad P_e = P_l + 0.5 \cdot P_s \quad \dots\dots\dots \text{Eq.1.7}$$

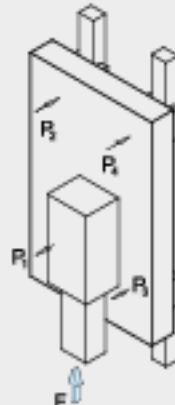
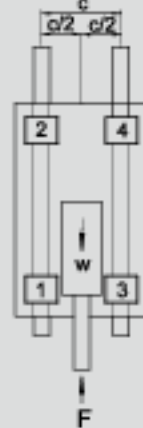
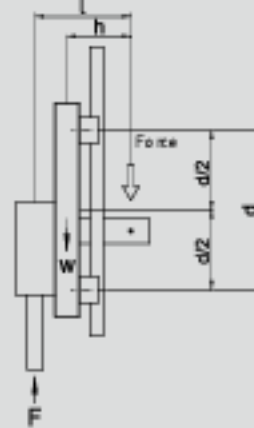
### 1-5-4 Calculation Example for Service Life

A suitable linear guideway should be selected based on the acting load. The service life is calculated from the ratio of the working load and the basic dynamic load rating.

Table 1-6 Calculation Example for Service Life

Type of Linear Guideway	Dimension of device	Operating condition
Type: HGH 30 CA	d : 600 mm	Weight (W) : 15 kN
C : 38.74 kN	c : 400 mm	Acting force (F) : 1 kN
C <sub>2</sub> : 52.19 kN	h : 200 mm	Temperature: normal temperature
Preload: 20	l : 250 mm	Load status: normal load

- Calculation of acting loads
 
$$P_1 = P_4 = \frac{W \times h}{2d} + \frac{F \times l}{2d} = \frac{15 \times 200}{2 \times 600} + \frac{1 \times 250}{2 \times 600} = 2.29 \text{ (kN)}$$

$$P_{max} = |P_1 - P_4| = 2.29 \text{ (kN)}$$
- Because preload is 20,  $P_c = P_{max} = 2.29 \text{ (kN)}$   
 Note: The larger preload (ZA, AB) will increase the rigidity, but decrease the nominal life of guideway.
- Calculation for life L
 
$$L = \left( \frac{f_h \times f_v \times C}{f_w \times P_c} \right)^3 \times 50 = \left( \frac{1 \times 1 \times 38.74}{2 \times 2.29} \right)^3 \times 50 = 38,258 \text{ (km)}$$

## 1-6 Friction

As mentioned in the preface, a linear guideway allows a type of rolling motion, which is achieved by using balls. The coefficient of friction for a linear guideway can be as little as 1/50th of a traditional slide. Generally, the coefficient of friction of linear guideway is about 0.004.

When a load is 10% or less than the basic static load rate, the most of the resistance comes from the grease viscosity and frictional resistance between balls. In contrast, if the load is more than the basic static load rating, the resistance will mainly come from the load.

$$F = \mu \cdot W + S \quad \dots \dots \dots \text{Eq.1.8}$$

- F: Friction [kN]
- S: Friction resistance [kN]
- μ: Coefficient of friction
- W: Normal loads [kN]

# Linear Guideways

## General Information

### 1-7 Lubrication

Supplying insufficient lubrication to the guideway will greatly reduce the service life due to an increase in rolling friction. The lubricant provides the following functions;

- Reduces the rolling friction between the contact surfaces to avoid abrasion and surface burning of the guideway.
- Generates a lubricant film between the rolling surfaces and decreases fatigue.
- Anti-corrosion.

#### 1-7-1 Grease

Each linear guideway is lubricated with lithium soap based grease before shipment. After the linear guideway is installed, we recommend that the guideway be re-lubricated every 100 km. It is possible to carry out the lubrication through the grease nipple. Generally, grease is applied for speeds that do not exceed 60 m/min faster speeds will require high-viscosity oil as a lubricant.

$$T = \frac{100 \cdot 1000}{V_s \cdot 60} \text{ hr} \quad \dots\dots\dots \text{Eq.1.9}$$

T : Feeding frequency of oil [hour]  
 V<sub>s</sub> : speed [m/min]

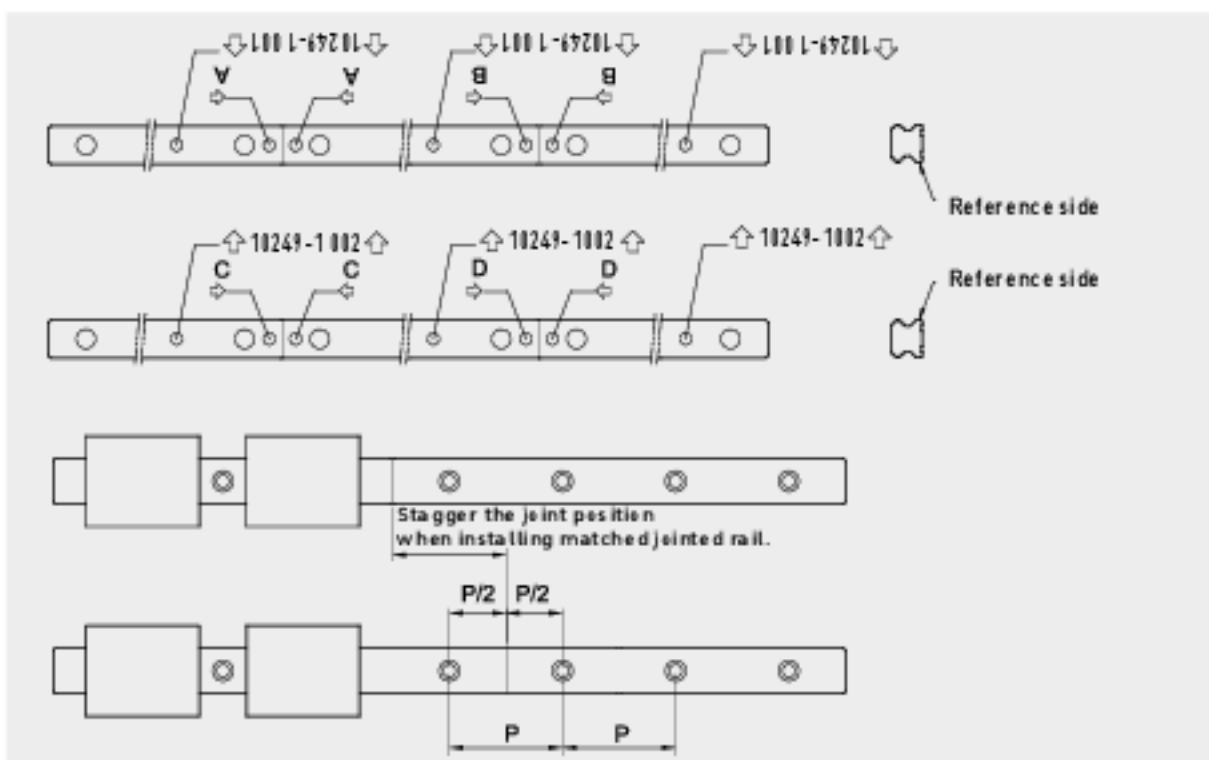
#### 1-7-2 Oil

The recommended viscosity of oil is about 32-150cSt. The standard grease nipple may be replaced by an oil piping joint for oil lubrication. Since oil evaporates quicker than grease, the recommended oil feed rate is approximate 0.3cm<sup>2</sup>/hr.

### 1-8 Jointed Rail

Jointed rail should be installed by following the arrow sign and ordinal number which is marked on the surface of each rail.

For matched pair, jointed rails, the jointed positions should be staggered. This will avoid accuracy problems due to discrepancies between the 2 rails (see figure).

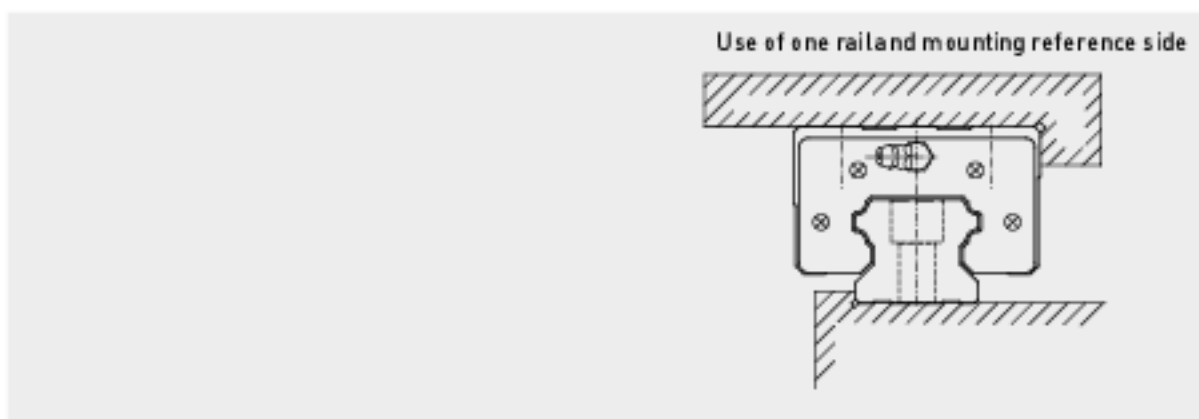


## 1-9 Mounting Configurations

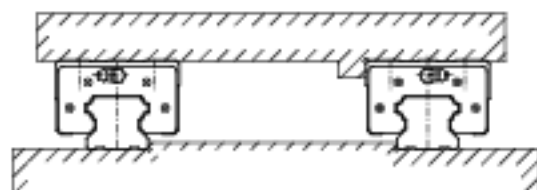
Linear guideways have equal load ratings in the radial, reverse radial and lateral directions.

The application depends on the machine requirements and load directions.

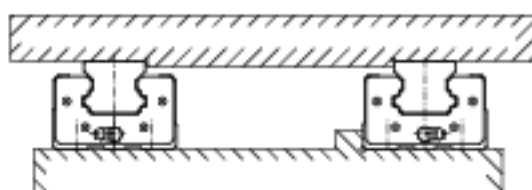
Typical layouts for linear guideways are shown below:



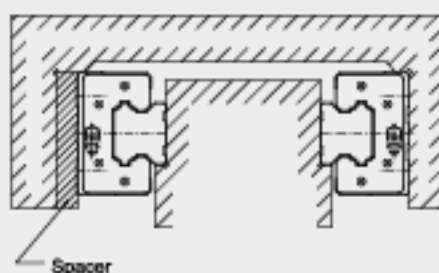
use of two rails (block movement)



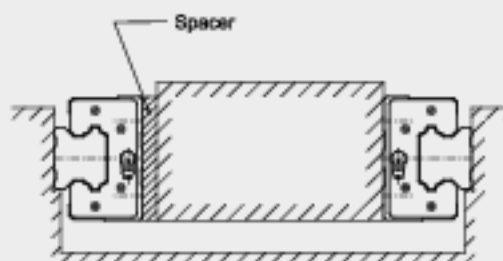
use of two rails (block fixed)



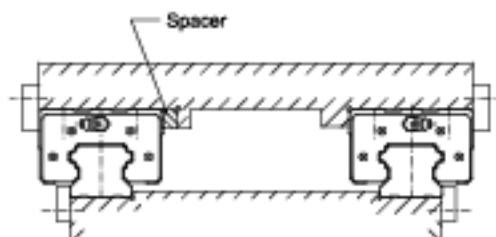
use of two external rails



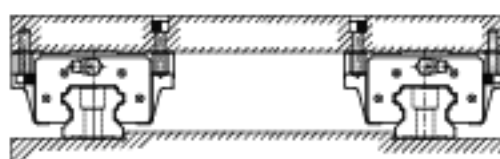
use of two internal rails



total surface fixed installation



HGW type block with mounting holes in different directions.



# Linear Guideways

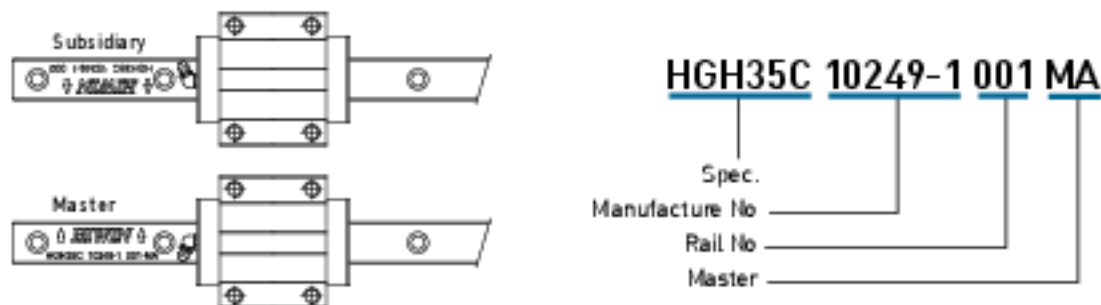
## General Information

### 1-10 Mounting Procedures

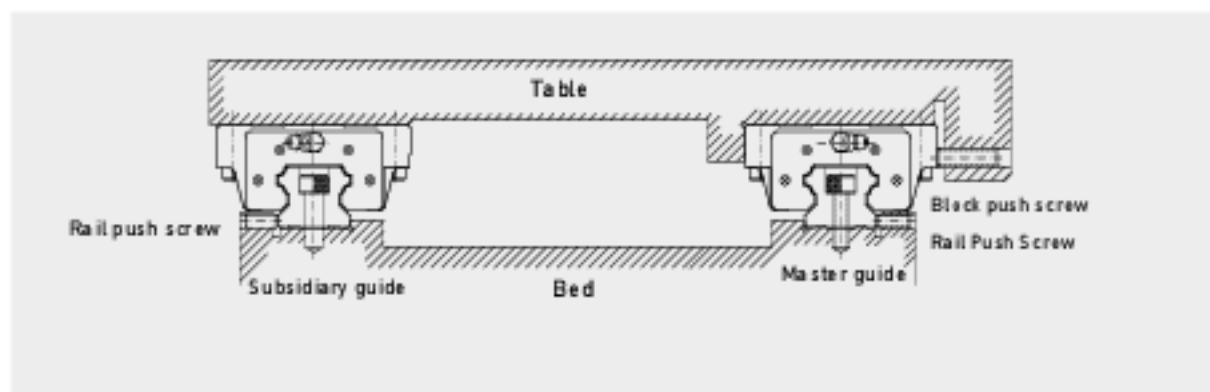
Three installation methods are recommended based on the required running accuracy and the degree of impacts and vibrations.

#### 1-10-1 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.

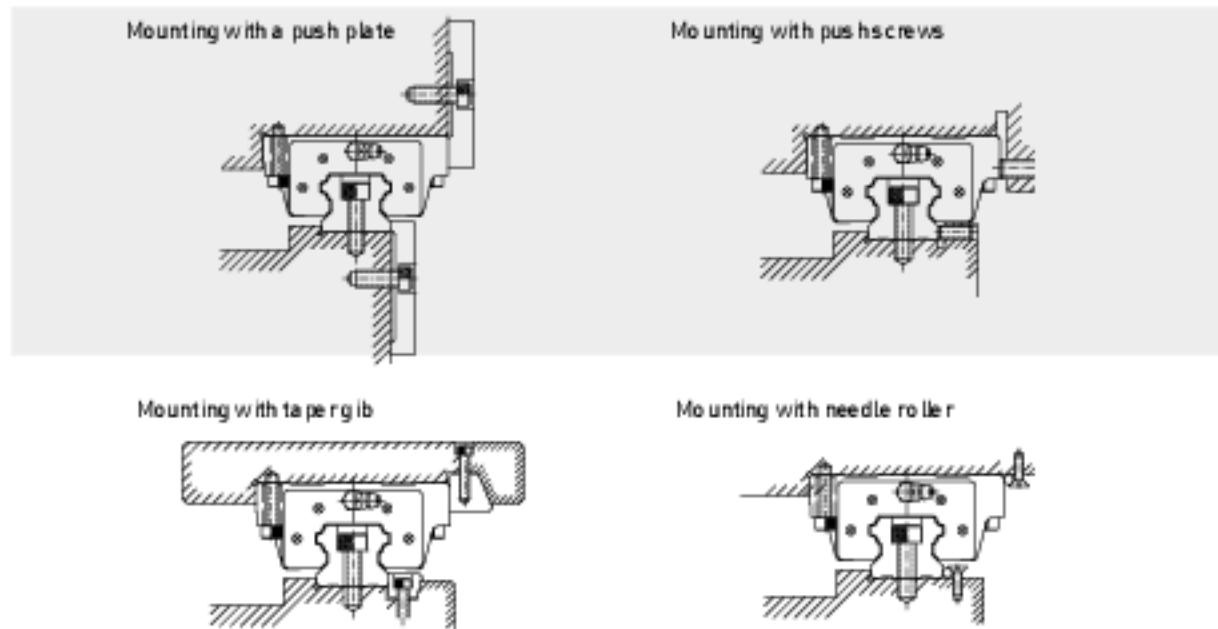


#### 1-10-2 Installation to Achieve High Accuracy and Rigidity



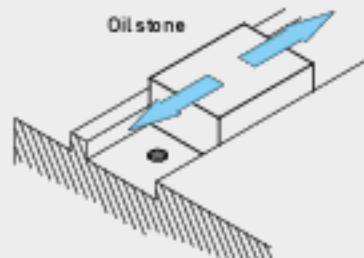
### [1] Mounting methods

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.

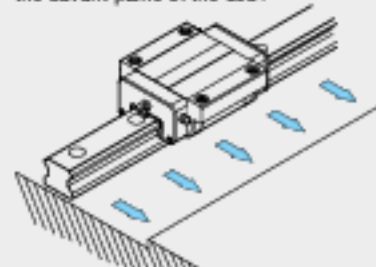


### [2] Procedure of rail installation

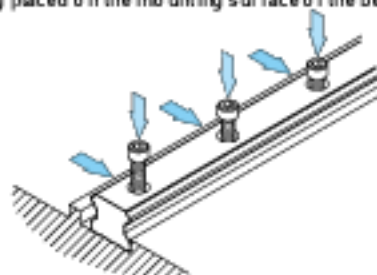
- 1 Before starting, remove all dirt from the mounting surface of the machine.



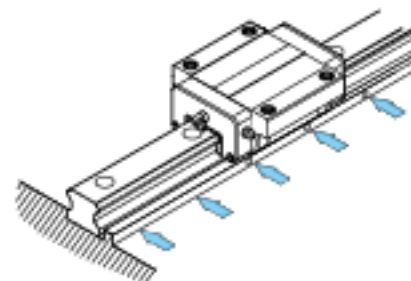
- 2 Place the linear guideway gently on the bed. Bring the guideway into close contact with the datum plane of the bed.



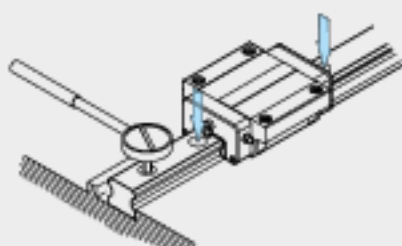
- 3 Check for correct thread engagement when inserting a bolt into the mounting hole while the rail is being placed on the mounting surface of the bed.



- 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.

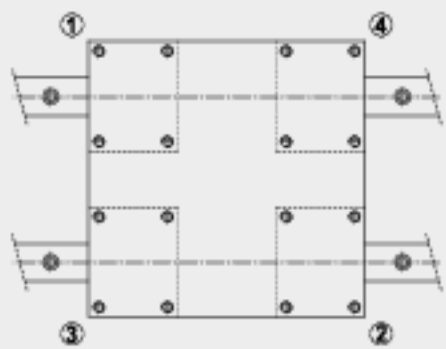


- 6 Install the remaining linear guideway in the same way.

# Linear Guideways

## General Information

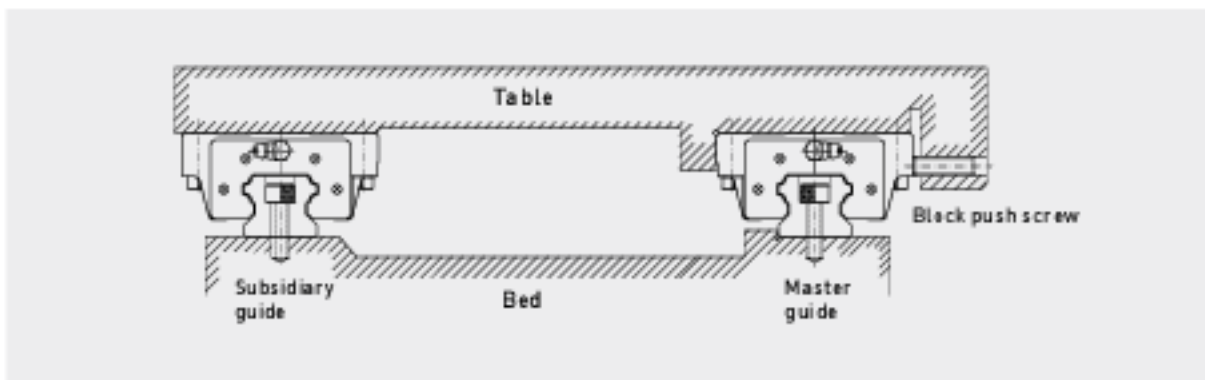
### [3] Procedure of block installation



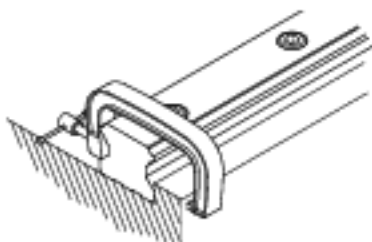
- Place the table gently on the blocks. Next, tighten the block mounting bolts temporarily.
- Push the blocks against the datum plane of the table and position the table by tightening the push screws.
- The table can be fixed uniformly by tightening the mounting bolts on master guide side and subsidiary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

### 1-10-3 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.



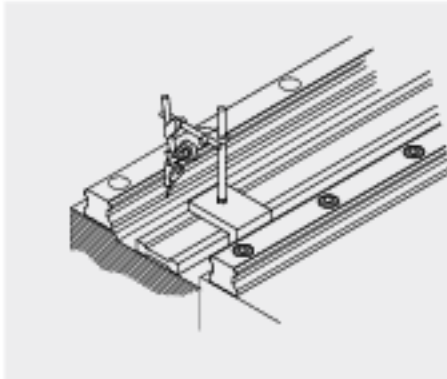
#### [1] Installation of the rail on the subsidiary guide side



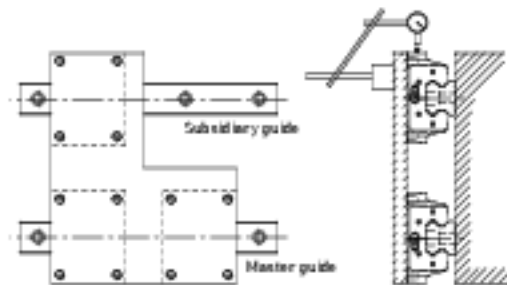
- Using a vice  
Place the rail into the mounting plane of the bed. Tighten the mounting bolts temporarily; then use a vice to push the rail against the side datum plane of the bed. Tighten the mounting bolts in sequence to the specified torque.



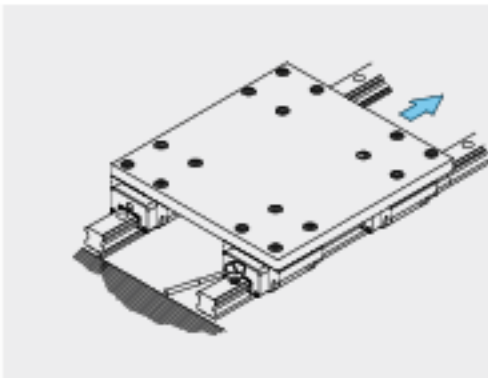
## [2] Installation of the rail on the subsidiary guide side



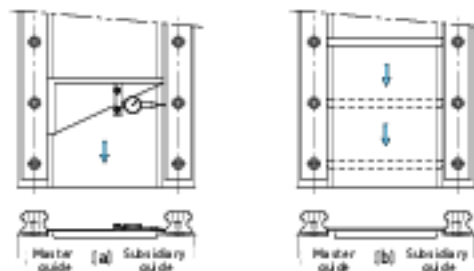
- Method with use of a straight edge  
Set a straight edge between the rails parallel to the side datum plane of the rail on the master guide side by using a dial gauge. Use the dial gauge to obtain the straight alignment of the rail on the subsidiary guide side. When the rail on the subsidiary guide 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.



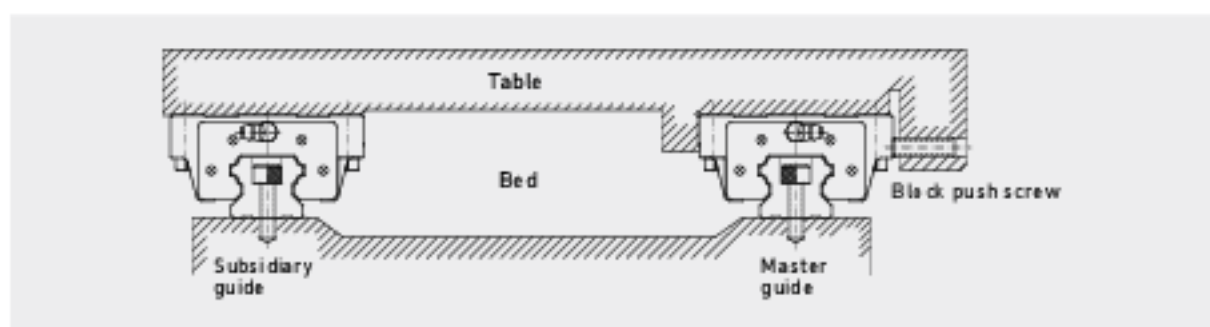
- Method with use of a jig  
Use a special jig to ensure the rail position on the subsidiary guide side. Tighten the mounting bolts to the specified torque in sequence.

## Linear Guideways

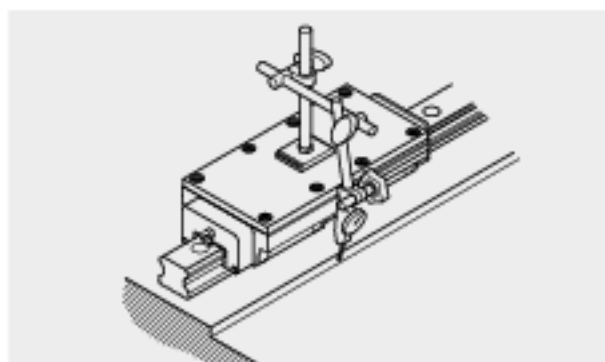
### General Information

#### 1-10-4 When There Is No Side Surface of The Bed On The Master Guide Side

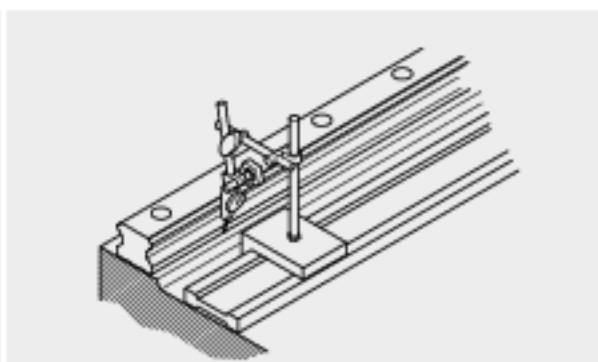
To ensure parallelism between the subsidiary guide and the master guide when there is no side surface, the following rail installation method is recommended. The installation of the blocks is the same as mentioned previously.



##### [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.



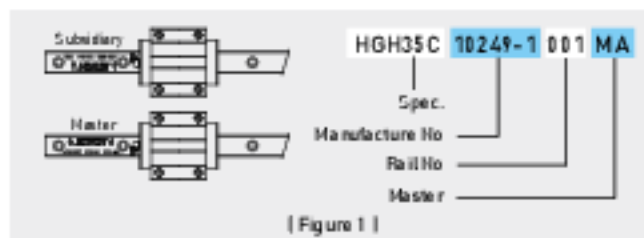
- Method with use of a straight edge  
Use a dial gauge and a straight edge to confirm the straightness of the side datum plane of the rail from one end to the other. Make sure the mounting bolts are tightened securely in sequence.

##### [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.

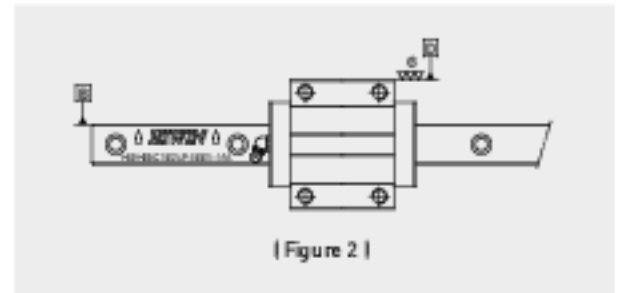
#### 1-10-5 Linear Guideway Mounting Instructions

- ALM guideways are supplied with a coating of anti-corrosion oil before being shipped. Please clean the oil before moving or running the blocks.
- Recognition of master and subsidiary rails: For non-interchangeable type linear guideways, there are some differences between the master rail and subsidiary rail. The accuracy of the master rail'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. Check for the correct order before starting the installation. The rail number of master is an odd number and the rail number of subsidiary is an even number. Please install the rails according to the indication and carry on the installation according to the order for multi-rails installment (e.g.: 001 pairs 002 ; 003 pairs 004 etc.)

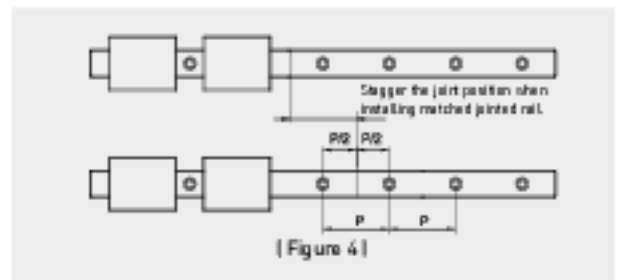
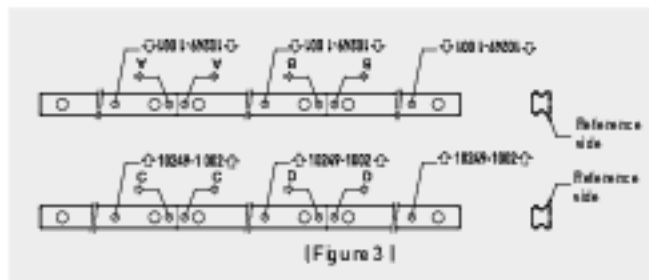


[ Figure 1 ]

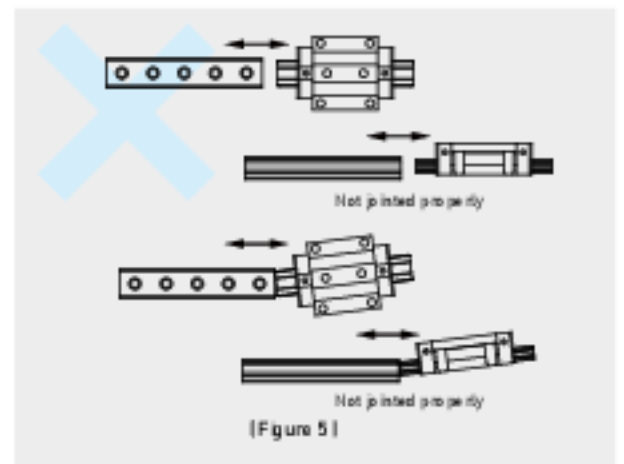
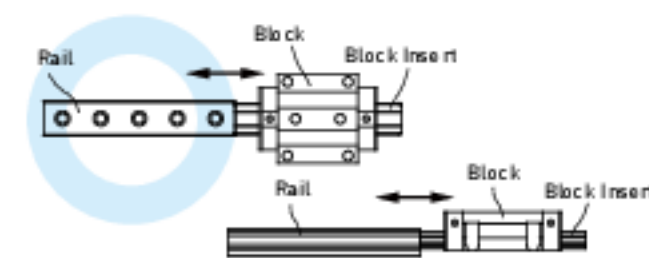
3. Recognition of datum plane: The datum plane [B] of rail is the side indicated by the arrow, which is marked on the top surface of the rail. The datum plane of block is smooth ground surface which shows as D in Figure 2.



4. Butt-joint rail: Butt-joint rail should be installed by following the arrow sign and ordinal number which is marked on the surface of each rail as shown in the figure 3. To avoid accuracy problems due to discrepencies between the 2 rails such as for matched pair, butt-joint rails, the jointed positions should be staggered as shown in figure 4.



5. Do not remove blocks from rails when assembling the guideways in machines as far as possible. Please use block inserts (please see Figure 5) if it is necessary to remove/ mount block from/ onto rail.



6. Please ~~do not~~ randomly mix block units and rails for non interchangeable type to avoid any installation problem.

7. To ensure the straightness of rail, please tighten the mounting bolts sequentially with a torque wrench to the specified torque. [Refer to ALM Technical Information].

## 1-10-6 Linear Guideway Usage Instructions

1. Standard guideways are enclosed with high-quality lubricants (lubricant oil or lithium-soap-base grease). Please re-lubricate the blocks after assembling the guideways in machines. The same soap-base lubricants should be used.
2. The blocks are composed of various plastic parts; please avoid prolonged exposure of the plastic parts with any organic solvent when cleaning the blocks so that the product damage can be prevented.
3. Please avoid any foreign object getting into the blocks since this could be one of the causes for breakdown or damage.
4. Please do not disassemble the parts arbitrarily, the incautious actions of disassembly may bring the foreign objects into the block and diminish the precision of guideways.
5. When handling the guideways please hold it horizontally. The improper oblique posture of guideways will cause the blocks falling from the rail.
6. Please avoid the inappropriate falling or clash on the blocks, which will damage the function of guideways.
7. The maximum tolerant temperature of E2 type [Self lubricant kit] is in the range of  $-10^{\circ}\text{C}$ – $60^{\circ}\text{C}$ . and for Q1 types [Quiet linear guideway] is in the range of  $-10^{\circ}\text{C}$ – $80^{\circ}\text{C}$ . The maximum service temperature of SE type [Metallic end cap] is  $150^{\circ}\text{C}$  and for other standard types is  $100^{\circ}\text{C}$ .
8. Please refer to ALM technical information for more detailed instructions. Please do not hesitate to contact ALM if there are further questions related to the application.

Note: For Q1 type guideways (QH & QE), please pay attention for the following instructions:

1. When assemble and disassemble the Q1 blocks, please use the block insert as enclosed and do not take it off the block. (one block insert is equipped per block).
2. Special accessories are used in the Q1 type guideways, any impermissible adjustment on the preload is prohibited.

# Linear Guideways

## HG Series

### 2-1 HG Series - Heavy Load Ball Type Linear Guideway

HG 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, ALM HG series linear guideways can achieve a long life with high speed, high accuracy and smooth linear motion.

#### 2-1-1 Features of HG Series

##### (1) Self-aligning capability

By design, the circular-arc groove has contact points at 45 degrees. HG 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.

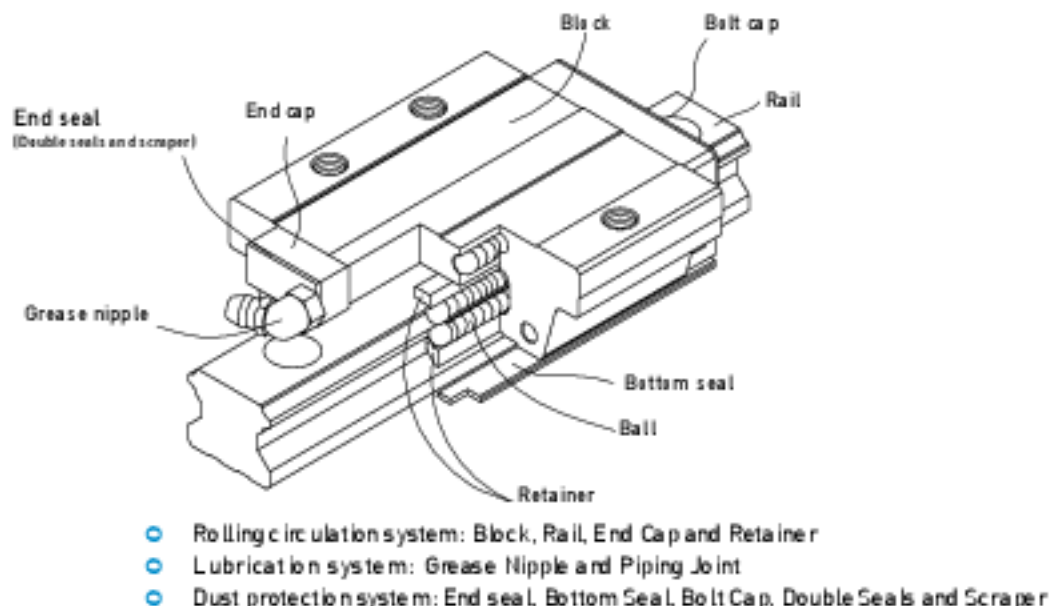
##### (2) Interchangeability

Because of precision dimensional control, the dimensional tolerance of HG 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 HG 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.

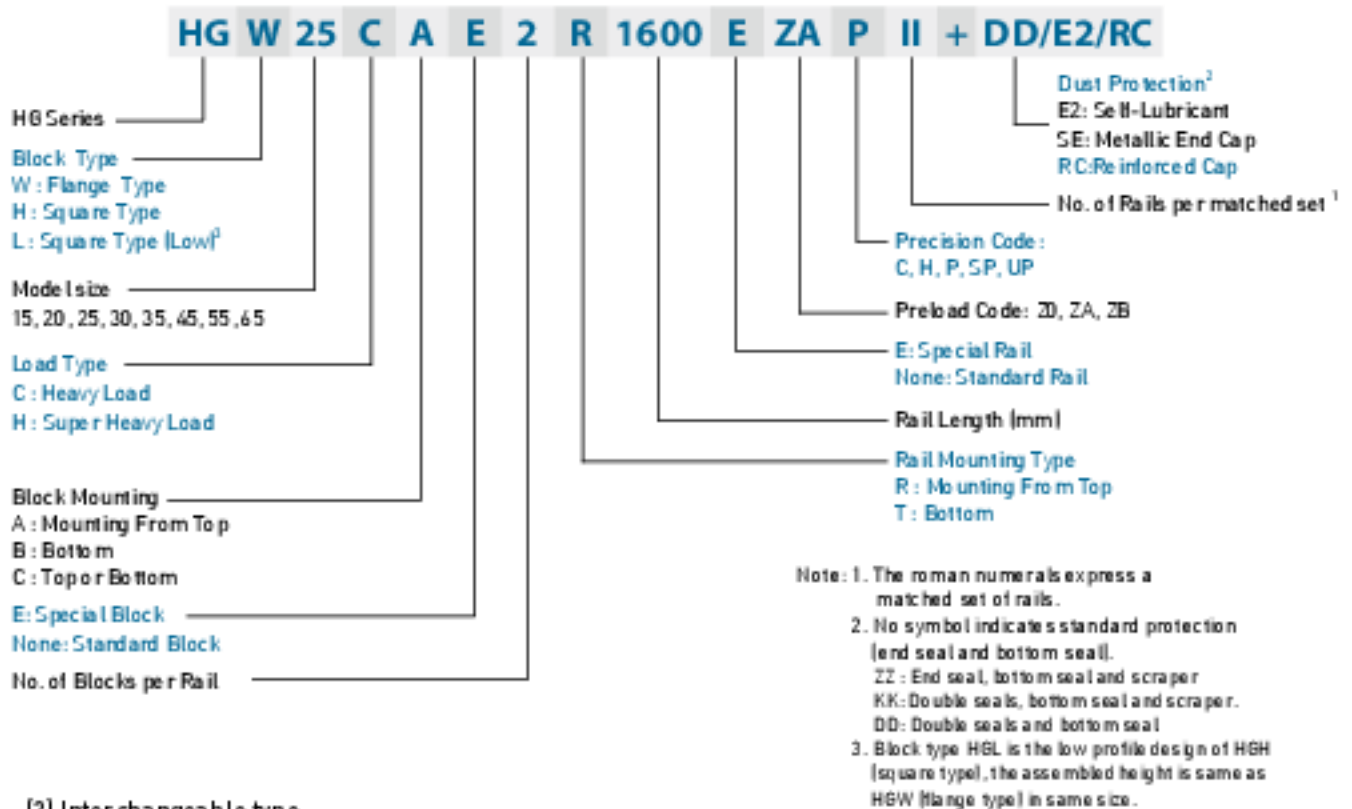
#### 2-1-2 Construction of HG Series



#### 2-1-3 Model Number of HG Series

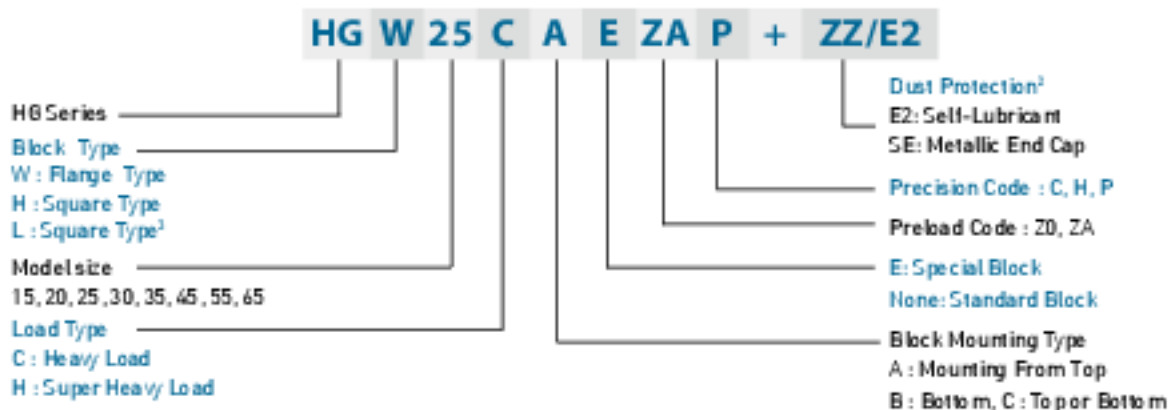
HG series guideways can be classified into non-interchangeable and interchangeable types. The sizes are identical. The only difference between the two types is that the interchangeable type of blocks and rails can be freely exchanged, and their accuracy can reach up to P class. The model number of HG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

(1) Non-interchangeable type

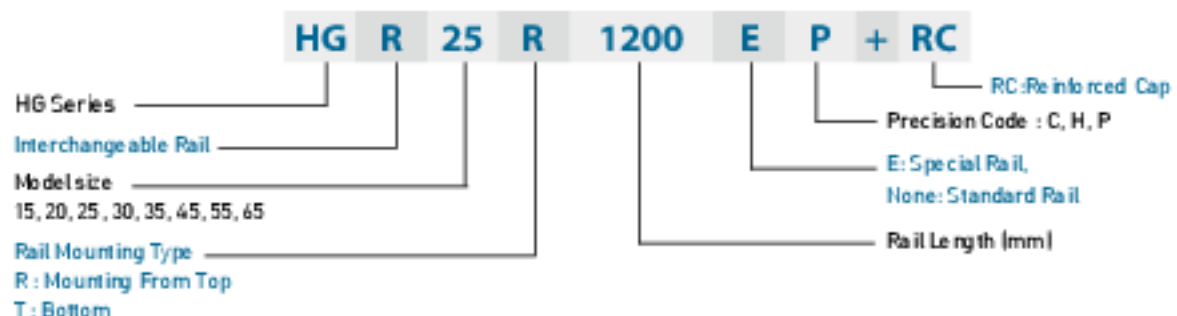


(2) Interchangeable type

- Model Number of HG Block



- Model Number of HG Rail



# Linear Guideways

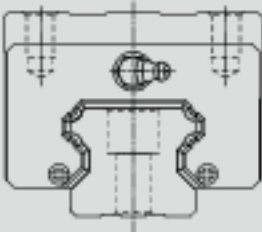
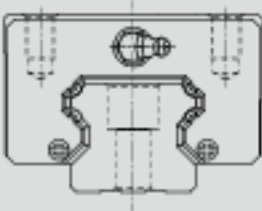
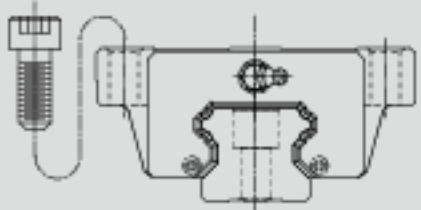
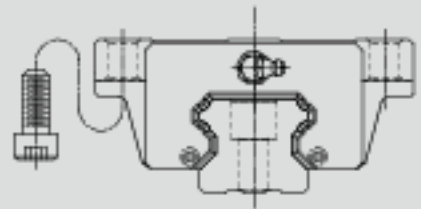
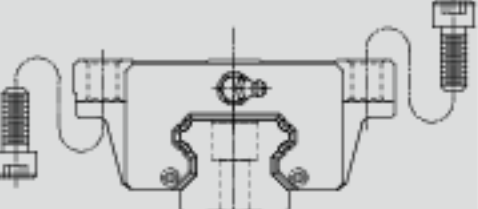
## HG Series

### 2-1-4 Types

#### (1) Block types

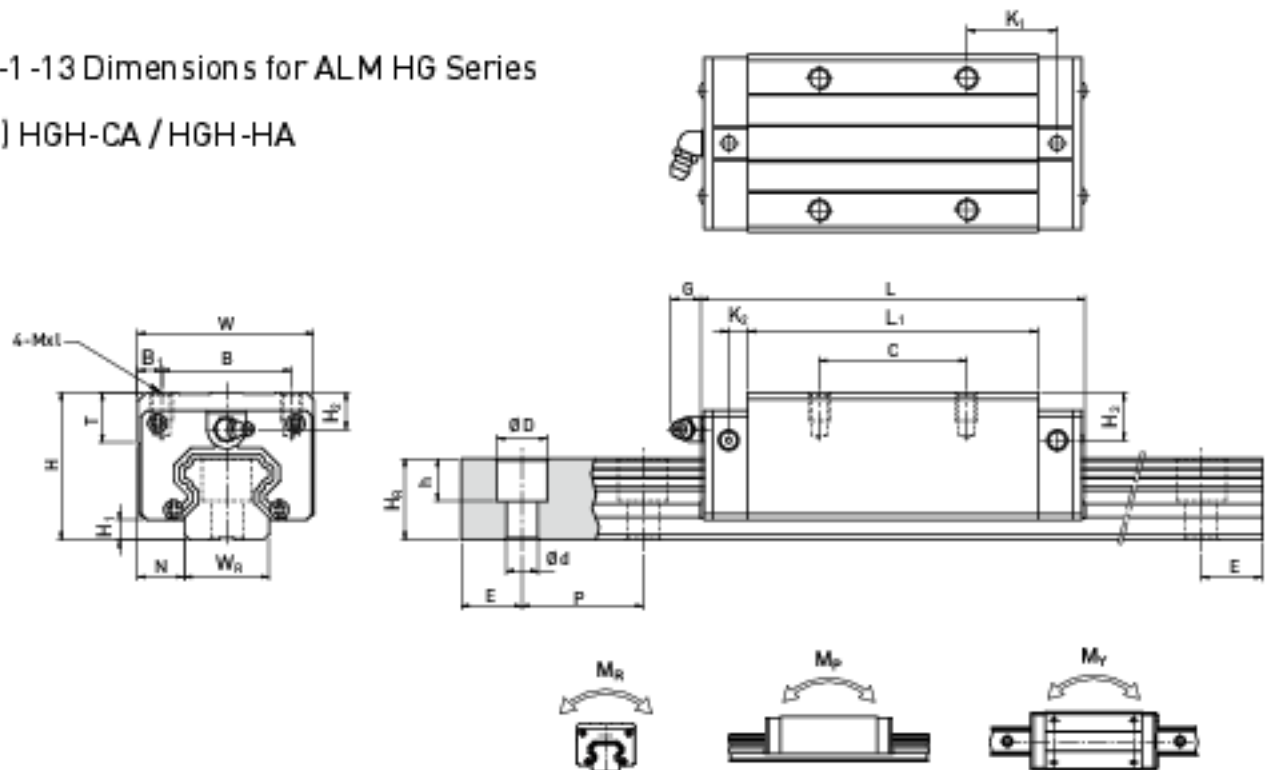
ALM offers two types of linear guideway which are flange and square types. Because of the low assembly height and larger mounting surface, the flange type is suitable for heavy moment load application.

Table 2-1-1 BlockTypes

Type	Model	Shape	Height [mm]	Rail Length [mm]	Main Application
Square	HGH-CA HGH-HA		28 ↓ 90	100 ↓ 4000	<ul style="list-style-type: none"> <li>○ Machine Centers</li> <li>○ NC Lathes</li> <li>○ Grinding Machines</li> <li>○ Precision Machining Machines</li> <li>○ Heavy Cutting Machines</li> <li>○ Automation Devices</li> <li>○ Transportation Equipment</li> <li>○ Measuring Equipment</li> <li>○ Devices Requiring High Positional Accuracy</li> </ul>
	HGL-CA HGL-HA		24 ↓ 70	100 ↓ 4000	
Flange	HGW-CA HGW-HA		24 ↓ 90	100 ↓ 4000	
	HGW-CB HGW-HB		24 ↓ 90	100 ↓ 4000	
	HGW-CC HGW-HC		24 ↓ 90	100 ↓ 4000	

## 2-1 -13 Dimensions for ALM HG Series

### (1) HGH-CA / HGH-HA



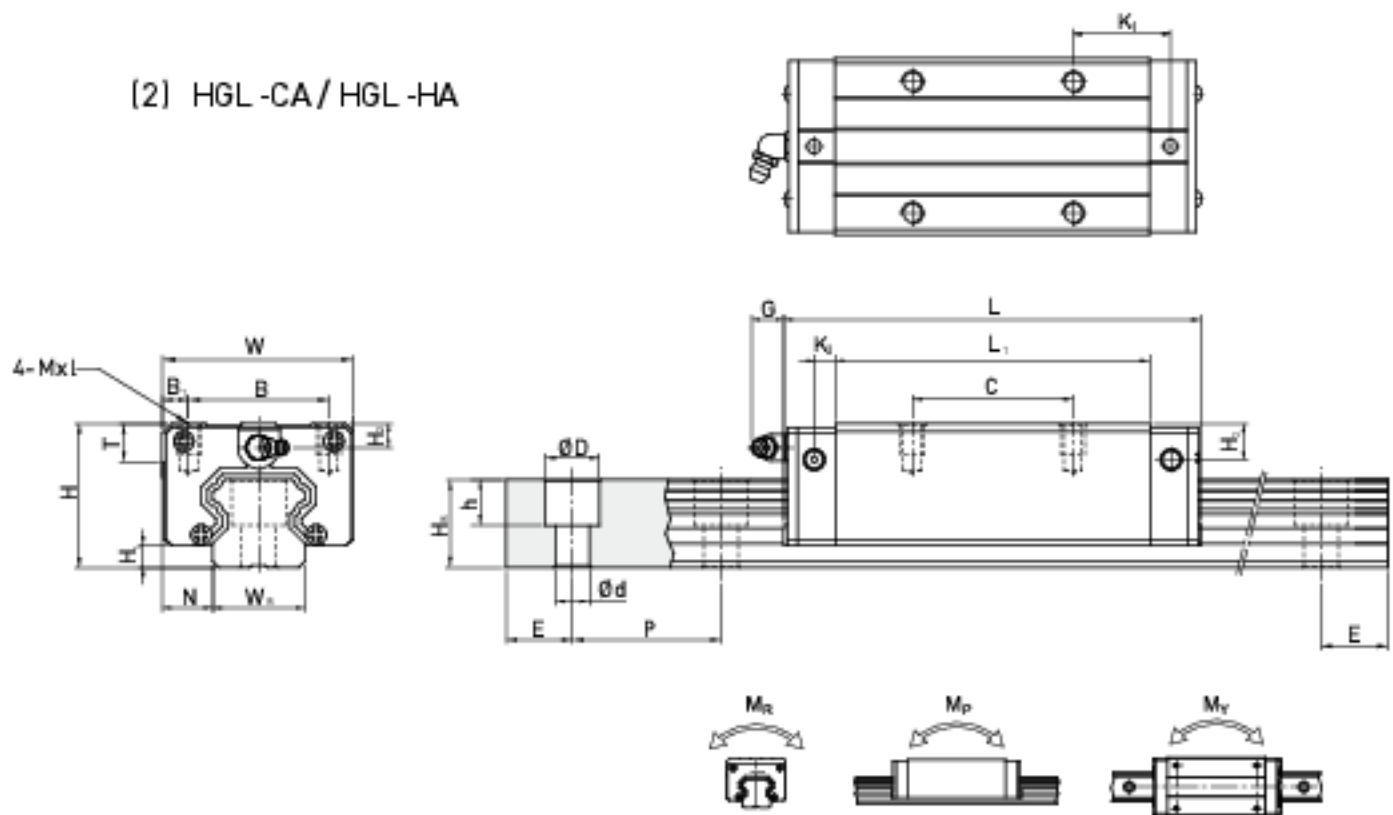
Model No.	Dimensions of Assembly (mm)		Dimensions of Block (mm)													Dimensions of Rail (mm)		Mounting Bolt for Rail	Basic Dynamic Lead Rating	Basic Static Lead Rating	Static Rated Moment			Weight							
	H	H <sub>1</sub>	N	W	B	B <sub>1</sub>	C	L <sub>1</sub>	L	K <sub>1</sub>	K <sub>2</sub>	G	MxL	T	H <sub>2</sub>	H <sub>3</sub>	W <sub>R</sub>				H <sub>4</sub>	D	h	d	P	E	C <sub>0</sub> (kN)	C <sub>1</sub> (kN)	M <sub>x</sub>	M <sub>y</sub>	M <sub>z</sub>
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
HGH15CA	28	4.3	9.5	34	26	4	26	39.4	41.4	10	4.85	5.3	M4x5	4	7.95	7.7	15	15	7.5	5.3	4.5	40	20	M4x16	11.38	14.97	0.12	0.10	0.10	0.18	1.45
HGH20CA	30	4.4	12	44	32	4	34	50.5	72.5	12.25	4	12	M5x4	8	4	4	20	17.5	9.5	8.5	4	40	20	M5x16	17.75	27.76	0.27	0.20	0.20	0.30	2.21
HGH20HA							50	45.2	92.2	12.4															21.18	35.90	0.35	0.35	0.35	0.39	
HGH25CA	40	5.5	12.5	48	35	4.5	35	58	84	14.8	4	12	M6x8	8	10	9	25	22	11	9	7	40	20	M6x20	26.48	34.49	0.42	0.33	0.33	0.51	3.21
HGH25HA							50	78.4	104.4	19.4															32.75	49.44	0.56	0.57	0.57	0.69	
HGH30CA	45	4	16	40	40	10	40	70	97.4	20.25	4	12	M8x10	8.5	9.5	13.8	28	24	14	12	9	80	20	M8x25	38.74	52.19	0.44	0.53	0.53	0.88	4.47
HGH30HA							40	93	120.4	21.75															472.7	49.14	0.88	0.92	0.92	1.36	
HGH35CA	55	7.5	18	70	50	10	50	80	112.4	20.4	7	12	M8x12	10.2	14	19.4	34	29	14	12	9	80	20	M8x25	49.52	49.14	1.14	0.81	0.81	1.45	6.30
HGH35HA							70	105.8	138.2	22.5															48.21	91.43	1.54	1.40	1.40	1.92	
HGH45CA	70	9.5	20.5	84	40	13	40	97	139.4	23	10	12.9	M10x17	14	18.5	30.5	45	38	20	17	14	105	22.5	M12x35	77.57	102.71	1.98	1.55	1.55	2.73	10.4
HGH45HA							80	128.8	171.2	28.9															94.54	136.44	2.43	2.48	2.48	3.41	
HGH55CA	80	13	23.5	100	75	12.5	75	112.7	164.7	27.35	11	12.9	M12x18	17.5	22	29	53	44	23	20	14	120	30	M14x45	114.44	148.33	3.49	2.44	2.44	4.17	15.08
HGH55HA							95	155.8	204.8	34.4															139.35	194.20	4.88	4.57	4.57	5.49	
HGH65CA	90	15	31.5	124	76	25	70	144.2	200.2	43.1	14	12.9	M16x20	25	15	15	43	53	24	2.2	18	150	35	M16x50	143.43	215.33	4.45	4.27	4.27	7.00	21.18
HGH65HA							120	203.4	259.4	47.8															208.34	303.13	9.38	7.38	7.38	9.82	

Note : 1 kgf = 9.81 N

# Linear Guideways

## HG Series

### [2] HGL-CA/ HGL-HA

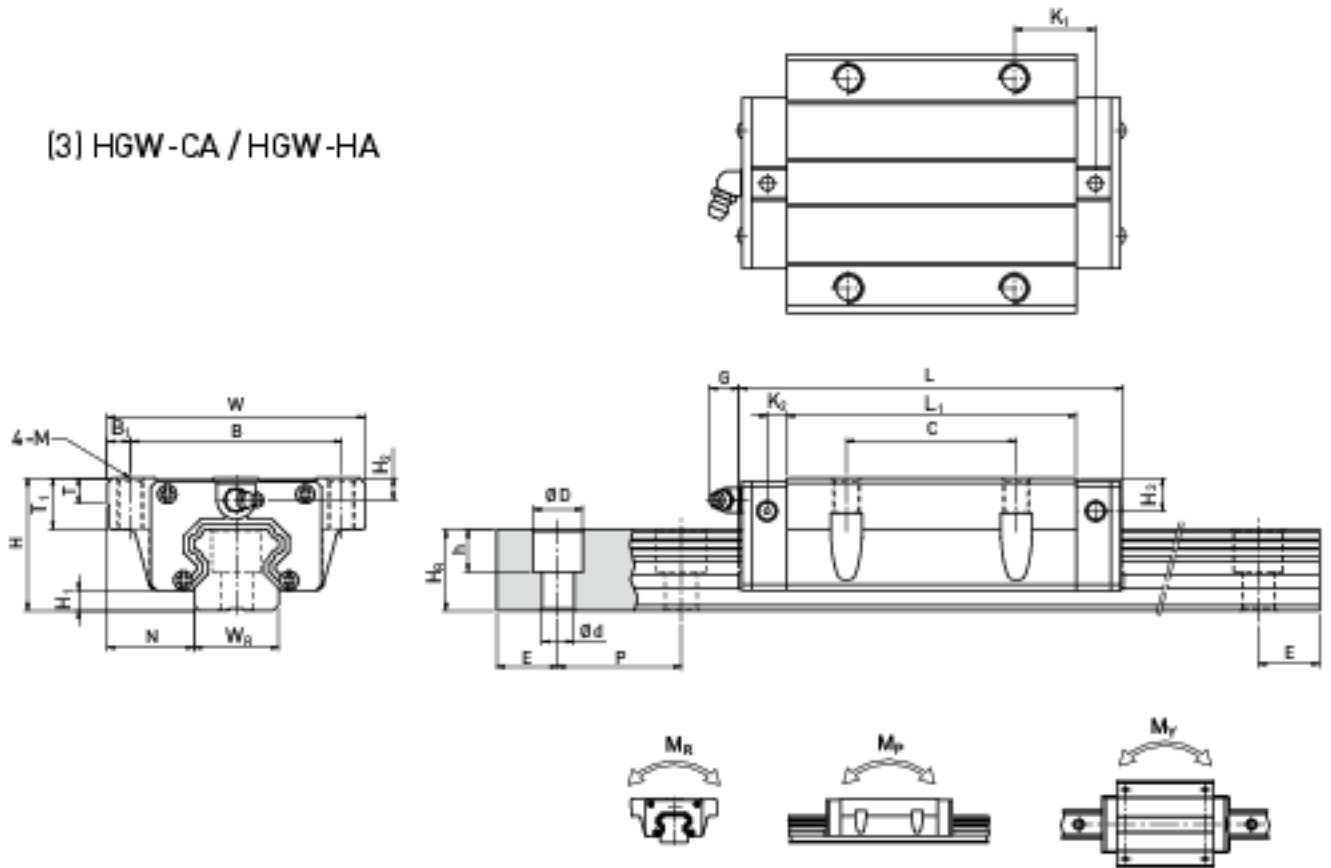


Model No.	Dimensions of Assembly (mm)		Dimensions of Block (mm)													Dimensions of Rail (mm)					Mounting Bolt for Rail (mm)	Basic Dynamic Load Rating C <sub>0</sub> (kN)	Basic Static Load Rating C <sub>1</sub> (kN)	Static Rated Moment			Weight					
	H	H <sub>1</sub>	N	W	B	B <sub>1</sub>	C	L <sub>1</sub>	L	K <sub>1</sub>	K <sub>2</sub>	G	MxL	T	H <sub>2</sub>	H <sub>3</sub>	W <sub>1</sub>	H <sub>4</sub>	D	h				d	P	E	M <sub>x</sub>	M <sub>y</sub>	M <sub>z</sub>	Block kg	Rail kg/m	
HGL15CA	24	4.3	9.5	34	24	4	26	39.4	41.4	10	48.5	5.3	M6x6	6	3.95	3.7	15	15	75	5.3	4.5	40	20	M6x16	11.38	14.97	0.12	0.10	0.10	0.14	1.45	
HGL25 CA	34	5.5	12.5	48	35	6.5	35	58	84	15.7	6	12	M6x6	8	4	5	2.3	2.2	11	9	7	40	20	M6x20	24.48	34.49	0.42	0.33	0.33	0.42	3.21	
HGL25 HA							50	78.4	104.6	18.5															32.75	49.44	0.56	0.57	0.57	0.57		
HGL30CA	42	6	16	40	40	10	40	70	97.4	20.25	6	12	M8x10	8.5	6.5	10.8	2.8	2.4	14	14	12	9	80	20	M8x25	38.74	52.19	0.44	0.53	0.53	0.78	4.47
HGL30 HA							40	93	120.4	21.75																47.27	69.14	0.88	0.92	0.92	1.03	
HGL35 CA	48	7.5	18	70	50	10	50	80	112.4	20.4	7	12	M8x12	10.2	9	12.4	3.4	2.9	14	12	9	80	20	M8x25	48.52	69.14	1.14	0.81	0.81	1.14	6.38	
HGL35 HA							72	105.8	138.2	22.5															48.21	91.43	1.54	1.40	1.40	1.52		
HGL45CA	48	9.5	20.5	84	40	13	40	97	139.4	2.3	10	12.9	M10x17	16	8.5	20.5	4.5	3.8	20	17	14	105	22.5	M12x35	77.57	102.71	1.98	1.55	1.55	2.08	10.4	
HGL45 HA							80	128.8	171.2	28.9															94.54	134.44	2.43	2.48	2.48	2.75		
HGL55 CA	70	13	23.5	100	75	12.5	75	117.7	144.7	2.235	11	12.9	M12x18	17.5	12	19	5.3	4.4	23	20	16	120	30	M14x45	114.44	148.33	3.49	2.44	2.44	3.25	15.08	
HGL55 HA							95	155.8	204.8	3.44															139.35	194.20	4.88	4.57	4.57	4.27		

Note : 1 kgf = 9.81 N



[3] HGW-CA / HGW-HA



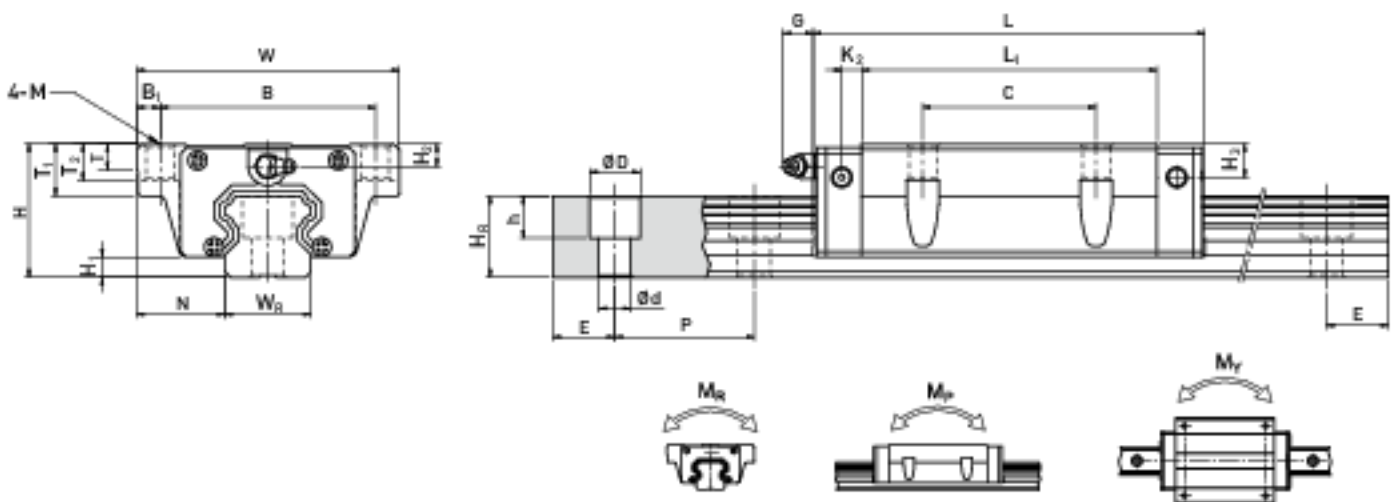
Model No.	Dimensions of Assembly (mm)		Dimensions of Block (mm)														Dimensions of Rail (mm)		Mounting Bolt for Rail	Basic Dynamic Lead Rating C <sub>d</sub> (kN)	Basic Static Lead Rating C <sub>s</sub> (kN)	Static Rated Moment			Weight										
	H	H <sub>1</sub>	N	W	B	B <sub>1</sub>	C	L <sub>1</sub>	L	K <sub>1</sub>	K <sub>2</sub>	G	M	T	T <sub>1</sub>	H <sub>2</sub>	H <sub>3</sub>	W <sub>0</sub>				H <sub>0</sub>	D	h	d	P	E	M <sub>x</sub>	M <sub>y</sub>	M <sub>z</sub>	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)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	
HGW 15CA	24	43	16	47	38	4.5	30	39.4	41.4	8	4.855	5.3	M5	4	8.9	3.95	3.7	15	15	25	5.3	4.5	40	20	M6x16	11.38	14.97	0.12	0.10	0.10	0.17	1.45			
HGW 20 CA	30	44	21.5	43	53	5	40	50.5	77.5	10.25	6	12	M6	8	10	6	6	20	17.5	4.5	6.5	6	40	20	M6x16	17.75	22.74	0.27	0.20	0.20	0.40	2.21			
HGW 20 HA								45.2	92.2	12.6																									
HGW 25 CA	36	55	23.5	70	57	6.5	45	58	84	11.8	6	12	M8	8	14	6	5	2.3	22	11	9	7	40	20	M6x20	24.48	34.49	0.42	0.33	0.33	0.59	3.21			
HGW 25 HA								70.4	104.6	22.1																									
HGW 30 CA	42	6	31	90	72	9	52	70	97.4	14.25	6	12	M10	8.5	16	6.5	10.8	2.8	26	14	12	9	80	20	M8x25	38.74	52.19	0.66	0.53	0.53	1.09	4.47			
HGW 30 HA								93	120.4	25.75																									
HGW 35 CA	48	25	33	100	82	9	62	80	112.4	14.6	7	12	M10	10.1	18	9	12.4	3.4	29	14	12	9	80	20	M8x25	49.52	69.16	1.16	0.81	0.81	1.56	6.30			
HGW 35 HA								105.8	138.2	27.5																									
HGW 45CA	60	9.5	37.5	120	100	10	80	97	139.4	13	10	12.9	M12	15.1	22	8.5	20.5	4.5	38	20	17	14	105	22.5	M12x35	72.57	102.71	1.98	1.55	1.55	2.79	10.41			
HGW 45HA								128.8	171.2	28.9																									
HGW 55CA	70	13	43.5	140	114	12	95	112.7	164.7	17.35	11	12.9	M14	17.5	24.5	12	19	5.3	44	23	20	16	120	30	M14x45	114.66	148.33	3.49	2.64	2.64	4.52	15.00			
HGW 55HA								155.8	204.8	34.4																									
HGW 45CA	90	15	53.5	170	142	14	110	144.2	200.2	23.1	14	12.9	M16	25	32.5	15	15	6.3	53	26	22	18	150	35	M16x50	163.63	215.33	6.45	4.27	4.27	9.17	21.18			
HGW 45HA								203.6	259.6	32.8																									

Note : 1 kgf = 9.81 N

# Linear Guideways

## HG Series

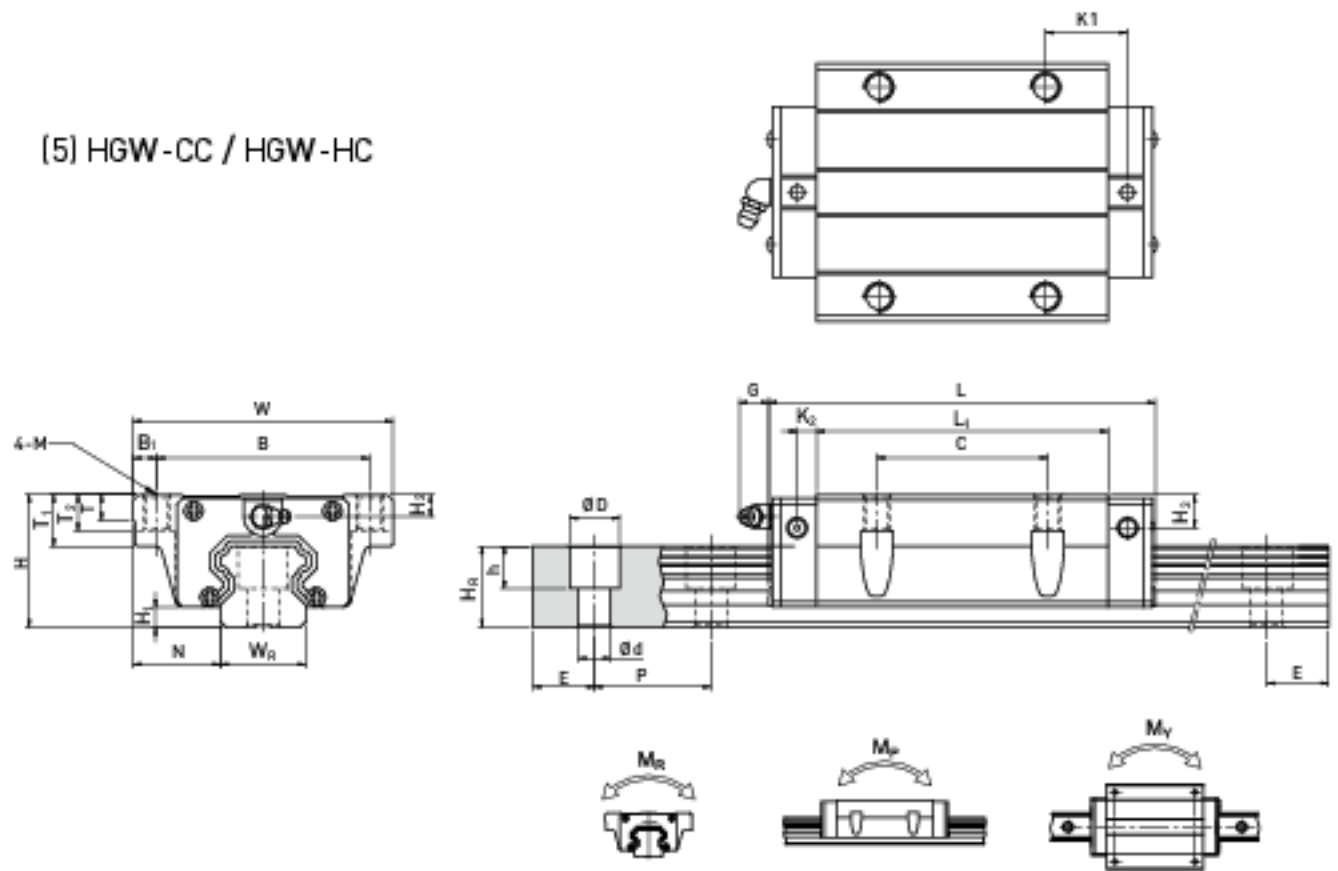
### [4] HGW-CB/HGW-HB



Model No.	Dimensions of Assembly (mm)		Dimensions of Block (mm)														Dimensions of Rail (mm)										Mounting Bolt for Rail	Basic Dynamic Lead Rating	Basic Static Lead Rating	Static Rated Moment			Weight				
	H	H1	N	W	B	B1	C	L1	L	K1	K2	G	M	T	T1	T2	H2	H3	W2	H4	D	h	d	P	E	C1 (kN)				C2 (kN)	Mx (kN-m)	My (kN-m)	Mz (kN-m)	Block (kg)	Rail (kg/m)		
																																				C (kN)	C1 (kN)
HGW 15CB	24	4.3	16	47	38	4.5	30	39.4	41.4	8	4.85	5.3	Ø6.5	4	8.9	6.95	3.95	3.7	15	15	7.5	5.3	4.5	40	20	M6x6	11.38	16.97	0.02	0.10	0.10	0.17	1.45				
HGW 20CB	30	4.6	21.5	43	53	5	40	50.5	77.5	10.25	6	12	Ø8	8	10	9.5	4	4	20	125	9.5	8.5	4	40	20	M5x16	17.75	27.76	0.27	0.20	0.20	0.60	2.21				
HGW 20HB								45.2	42.2	17.4																											
HGW 25CB	34	5.5	23.5	70	57	4.5	45	58	84	11.8	6	12	Ø7	8	14	10	4	5	23	22	11	9	7	40	20	M6x20	24.48	36.49	0.42	0.33	0.33	0.59	3.21				
HGW 25HB								78.4	104.4	22.1																											
HGW 30CB	42	6	31	90	72	9	52	70	97.4	14.25	6	12	Ø9	8.5	14	10	4.5	10.8	28	24	14	12	9	60	20	M8x25	38.76	52.19	0.66	0.53	0.53	1.09	4.47				
HGW 30HB								93	120.4	25.75																											
HGW 35CB	48	7.5	33	100	82	9	62	80	112.4	14.4	7	12	Ø9	10.1	18	13	9	12.4	34	29	14	12	9	60	20	M8x25	49.52	69.16	1.16	0.81	0.81	1.56	6.30				
HGW 35HB								105.8	138.2	2.75																											
HGW 45CB	60	9.5	37.5	120	100	10	80	97	139.4	13	10	12.9	Ø11	15.1	22	15	8.5	20.5	45	38	20	17	14	105	22.5	M12x35	72.57	102.71	1.98	1.55	1.55	2.79	10.41				
HGW 45HB								128.8	171.2	2.89																											
HGW 55CB	70	13	43.5	140	114	12	95	112.7	146.7	17.35	11	12.9	Ø14	17.5	24.5	17	12	19	53	44	23	20	14	Ø20	30	M14x45	114.44	148.33	3.49	2.64	2.64	4.52	15.06				
HGW 55HB								155.8	204.8	3.64																											
HGW 65CB	90	15	53.5	170	142	14	110	144.2	200.2	23.1	14	12.9	Ø16	25	37.5	23	15	15	43	53	24	22	18	Ø30	35	M16x50	163.43	215.33	4.45	4.27	4.27	9.17	21.18				
HGW 65HB								203.4	259.4	5.28																											

Note : 1 kgf = 9.81 N

[5] HGW-CC / HGW-HC



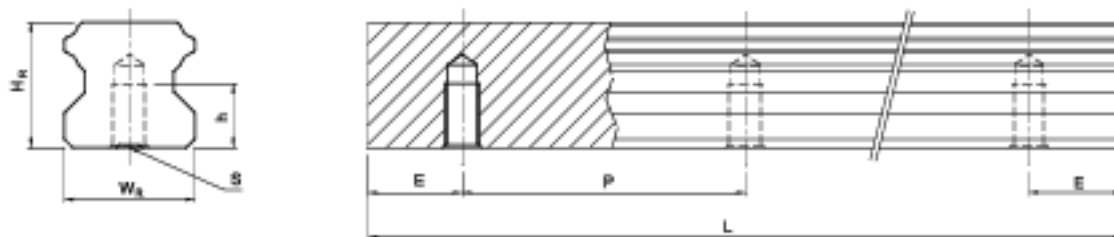
Model No.	Dimensions of Assembly (mm)		Dimensions of Block (mm)													Dimensions of Rail (mm)					Mounting Bolt for Rail	Basic Dynamic Load Rating	Basic Static Load Rating	Static Rated Moment			Weight								
	H	H <sub>1</sub>	N	W	B	B <sub>1</sub>	C	L <sub>1</sub>	L	K <sub>1</sub>	K <sub>2</sub>	G	M	T	T <sub>1</sub>	T <sub>2</sub>	H <sub>2</sub>	H <sub>3</sub>	W <sub>1</sub>	H <sub>4</sub>				D	h	d	P	E	C <sub>1</sub> (kN)	C <sub>2</sub> (kN)	M <sub>x</sub>	M <sub>y</sub>	M <sub>z</sub>	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	mm	mm	mm	mm	mm	mm	mm	mm
HGW 16 CC	24	4.3	16	47	38	4.5	30	39.4	41.4	8	4.85	5.3	M5	6	8.9	6.95	3.95	3.7	15	15	25	5.3	4.5	40	20	M6x16	11.38	14.97	0.12	0.10	0.10	0.17	1.45		
HGW 20 CC	30	4.4	21.5	43	53	5	40	50.5	77.5	18.25	6	12	M6	8	10	9.5	6	6	2.0	175	9.5	8.5	6	40	20	M6x16	12.75	27.76	0.27	0.20	0.20	0.40	2.21		
HGW 20 HC								45.2	92.2	17.6																	21.18	35.90	0.35	0.35	0.35	0.52			
HGW 25 CC	36	5.5	23.5	70	57	4.5	45	58	84	11.8	6	12	M8	8	14	10	6	5	2.3	22	11	9	7	40	20	M6x20	26.48	36.49	0.42	0.33	0.33	0.59	3.21		
HGW 25 HC								76.4	104.6	22.1																	32.75	49.44	0.54	0.57	0.57	0.80			
HGW 30 CC	42	6	31	90	72	9	52	70	97.4	14.25	6	12	M10	8.5	16	10	6.5	10.8	2.8	26	14	12	9	80	20	M6x25	38.74	52.99	0.44	0.53	0.53	1.09	4.47		
HGW 30 HC								93	120.4	25.75																	47.27	69.16	0.88	0.92	0.92	1.44			
HGW 35 CC	48	7.5	33	100	82	9	62	80	112.4	14.6	7	12	M10	10.1	18	13	9	12.4	3.4	29	14	12	9	80	20	M6x25	49.52	69.16	1.14	0.81	0.81	1.54	6.38		
HGW 35 HC								105.8	138.2	27.5																	48.21	91.43	1.54	1.48	1.48	2.04			
HGW 45 CC	60	9.5	37.5	120	100	10	80	97	139.4	13	10	12.9	M12	15.1	22	15	8.5	20.5	4.5	38	20	17	14	105	22.5	M12x35	77.57	102.71	1.98	1.55	1.55	2.79	18.41		
HGW 45 HC								128.8	171.2	28.9																	94.54	136.46	2.43	2.48	2.48	3.49			
HGW 55 CC	70	13	43.5	140	114	12	95	117.7	164.7	17.35	11	12.9	M14	17.5	26.5	17	12	19	5.3	44	23	20	16	120	30	M14x45	114.44	148.33	3.49	2.44	2.44	4.52	15.88		
HGW 55 HC								155.8	204.8	36.4																	139.35	196.28	4.88	4.57	4.57	5.94			
HGW 65 CC	90	15	53.5	170	142	14	110	144.2	200.2	23.1	14	12.9	M16	25	37.5	23	15	6.3	53	24	22	18	150	35	M16x50	163.43	215.33	4.45	4.27	4.27	9.17	21.18			
HGW 65 HC								203.4	259.4	52.8																208.34	283.13	9.38	7.38	7.38	12.89				

Note : 1 kgf = 9.81 N

## Linear Guideways

### HG Series

#### (6) Dimensions for HGR-T (Rail Mounting from Below)



Model No.	Dimensions of Rail (mm)						Weight (kg/m)
	W <sub>g</sub>	H <sub>g</sub>	S	h	P	E	
HGR15T	15	15	M5 x 0.8P	8	40	20	1.48
HGR20T	20	17.5	M6 x 1P	10	40	20	2.29
HGR25T	25	22	M6 x 1P	12	40	20	3.35
HGR30T	28	24	M8 x 1.25P	15	80	20	4.47
HGR35T	34	29	M8 x 1.25P	17	80	20	6.51
HGR45T	45	38	M12 x 1.75P	24	105	22.5	10.87
HGR55T	53	44	M14 x 2P	24	120	30	15.47
HGR65T	63	53	M20 x 2.5P	30	150	35	21.73

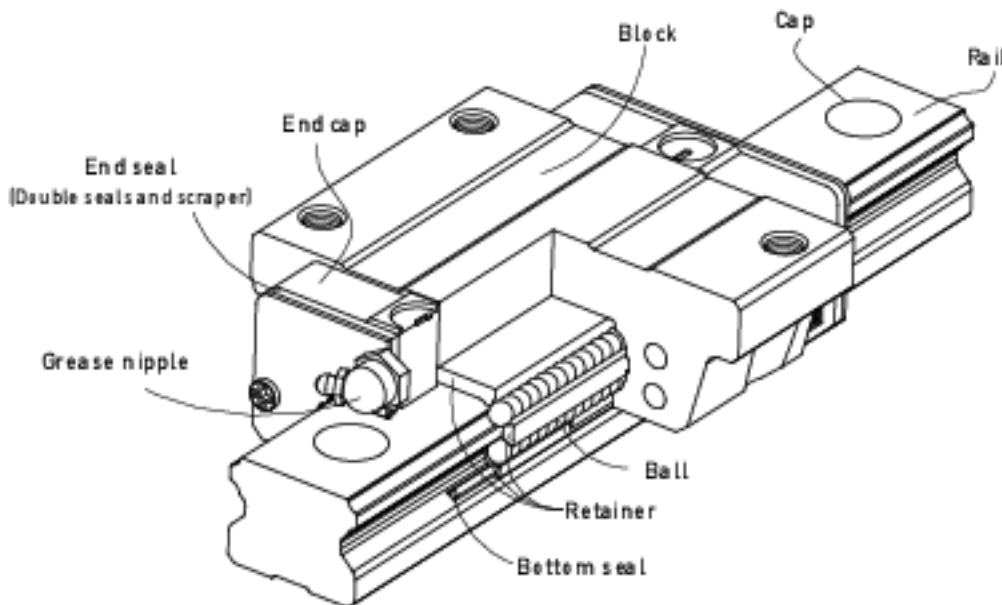
## 2-2 EG Series - Low Profile Ball Type Linear Guideway

### 2-2-1 Features of the EG Series Linear Guideway

The design of the EG 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 EG 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 EG 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

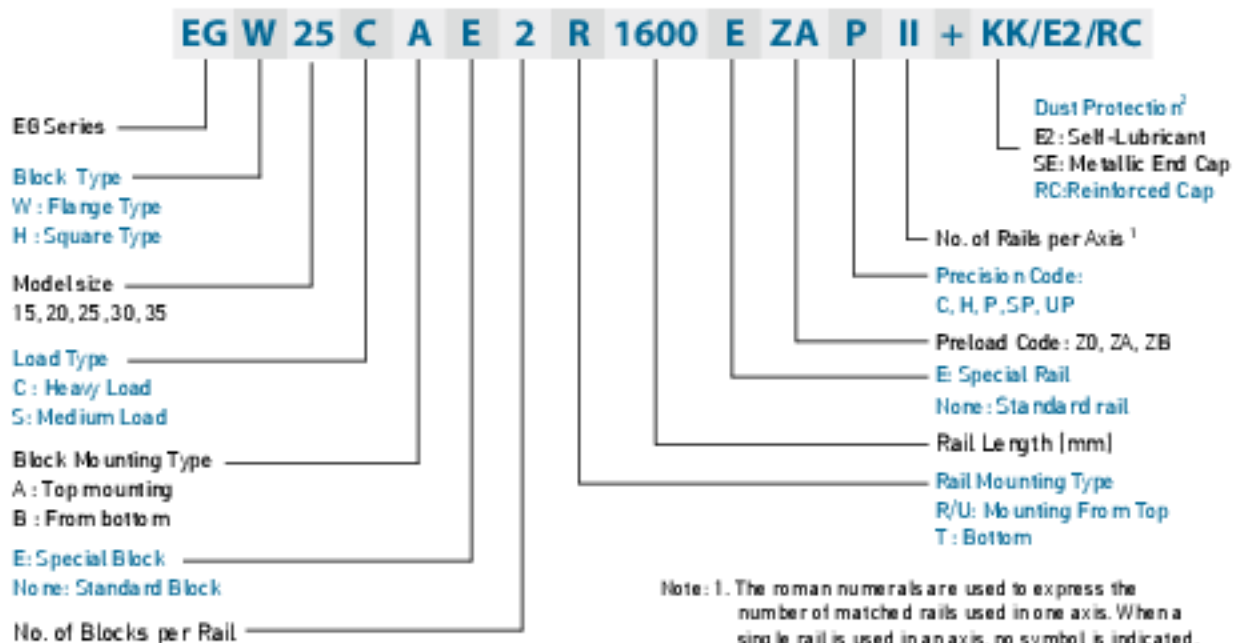
### 2-2-3 Model Number of EG Series

EG 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 EG series identifies the size, type, accuracy class, preload class, etc.

# Linear Guideways

## EG Series

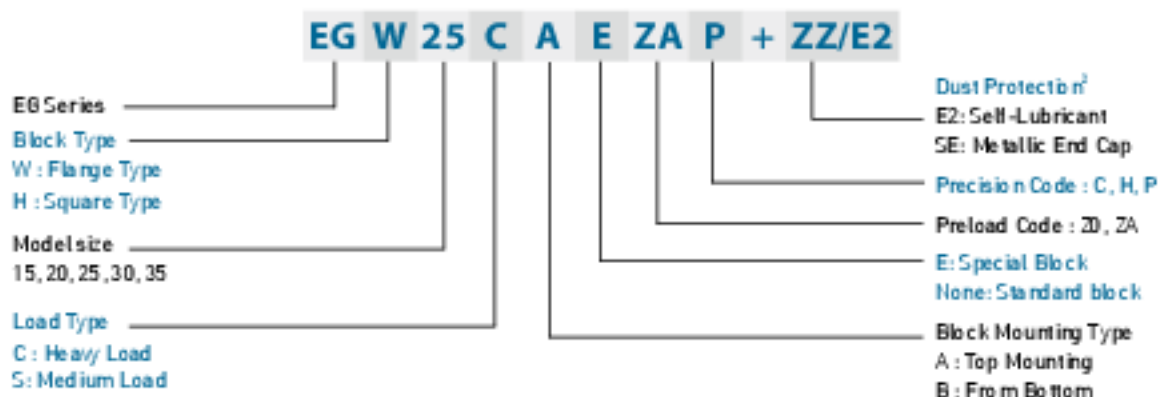
### [1] Non-interchangeable type



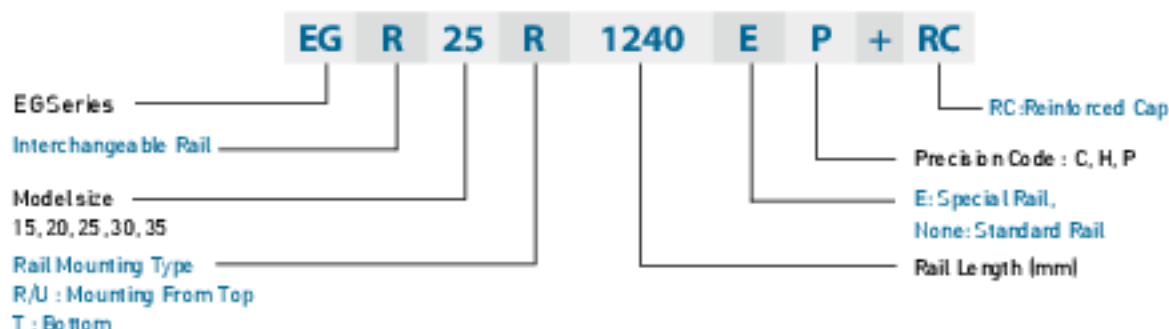
Note: 1. The roman numerals are used to express the number of matched rails used in one axis. When a single rail is used in an axis, no symbol is indicated.  
2. No symbol indicates standard protection (end seal and bottom seal).  
ZZ : End seal, bottom seal and scraper  
KK: Double seals, bottom seal and scraper.  
DD: Double seals and bottom seal

### [2] Interchangeable type

#### Model Number of EG Block



#### Model Number of EG Rail

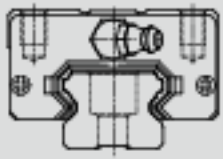
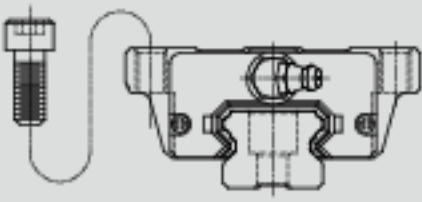
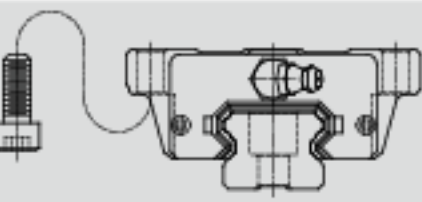


## 2-2-4 Types

### [1] Block types

ALM offers two types of linear guideways, flanged and square types.

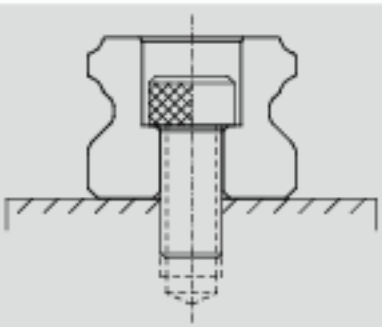
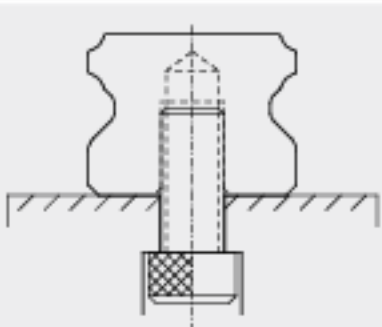
Table 2-2-1 Block Types

Type	Model	Shape	Height [mm]	Rail Length [mm]	Main Applications
Square	EGH-GA EGH-CA		24	100	<ul style="list-style-type: none"> <li>○ Automation devices</li> <li>○ High-speed transportation equipment</li> <li>○ Precision measuring equipment</li> </ul>
			↓	↓	
			48	4000	
Flange	EGW-GA EGW-CA		24	100	<ul style="list-style-type: none"> <li>○ Semiconductor manufacturing equipment</li> <li>○ Woodworking machinery</li> </ul>
			↓	↓	
			48	4000	
	EGW-SB EGW-CB		24	100	
			↓	↓	
			48	4000	

### [2] Rail types

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

Table 2-2-2 Rail Types

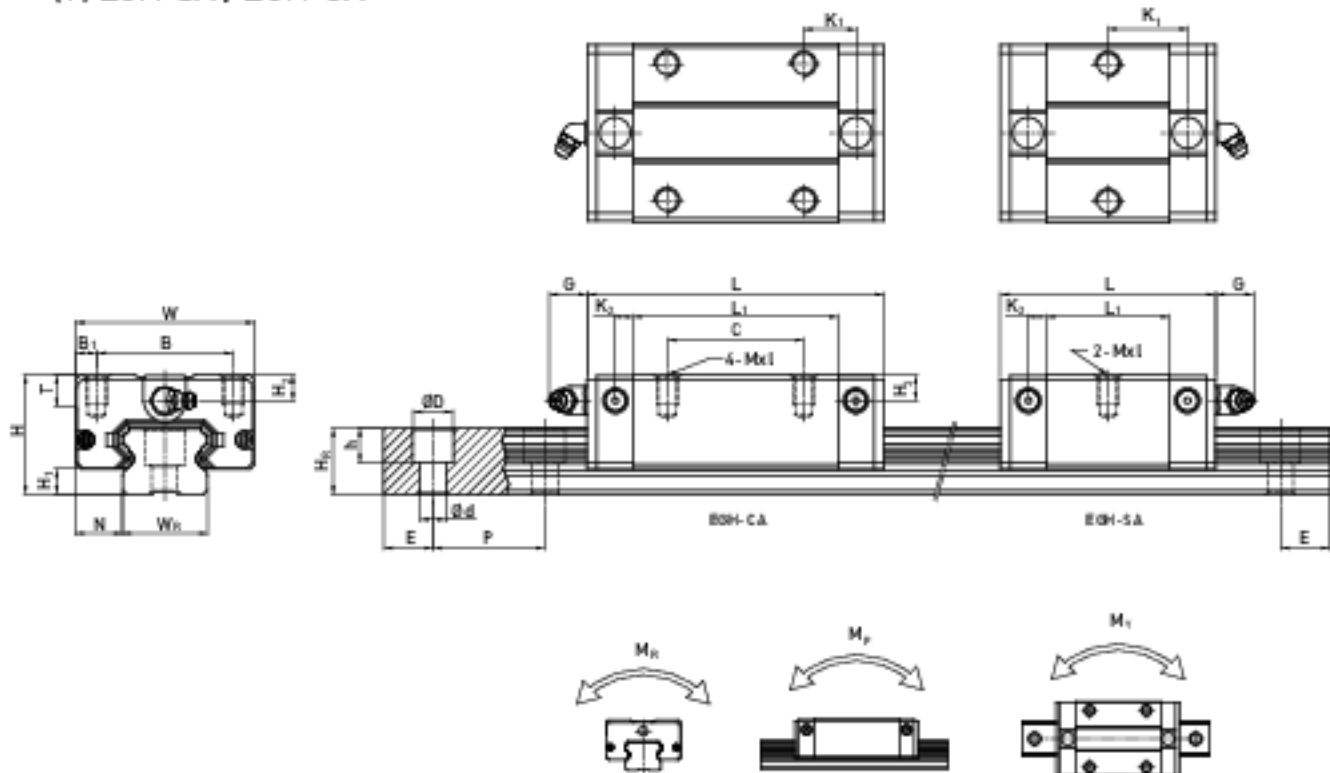
Mounting from Above	Mounting from Below
	

# Linear Guideways

## EG Series

### 2-2-13 Dimensions for ALM EG Series

#### (1) EGH-SA/EGH-CA

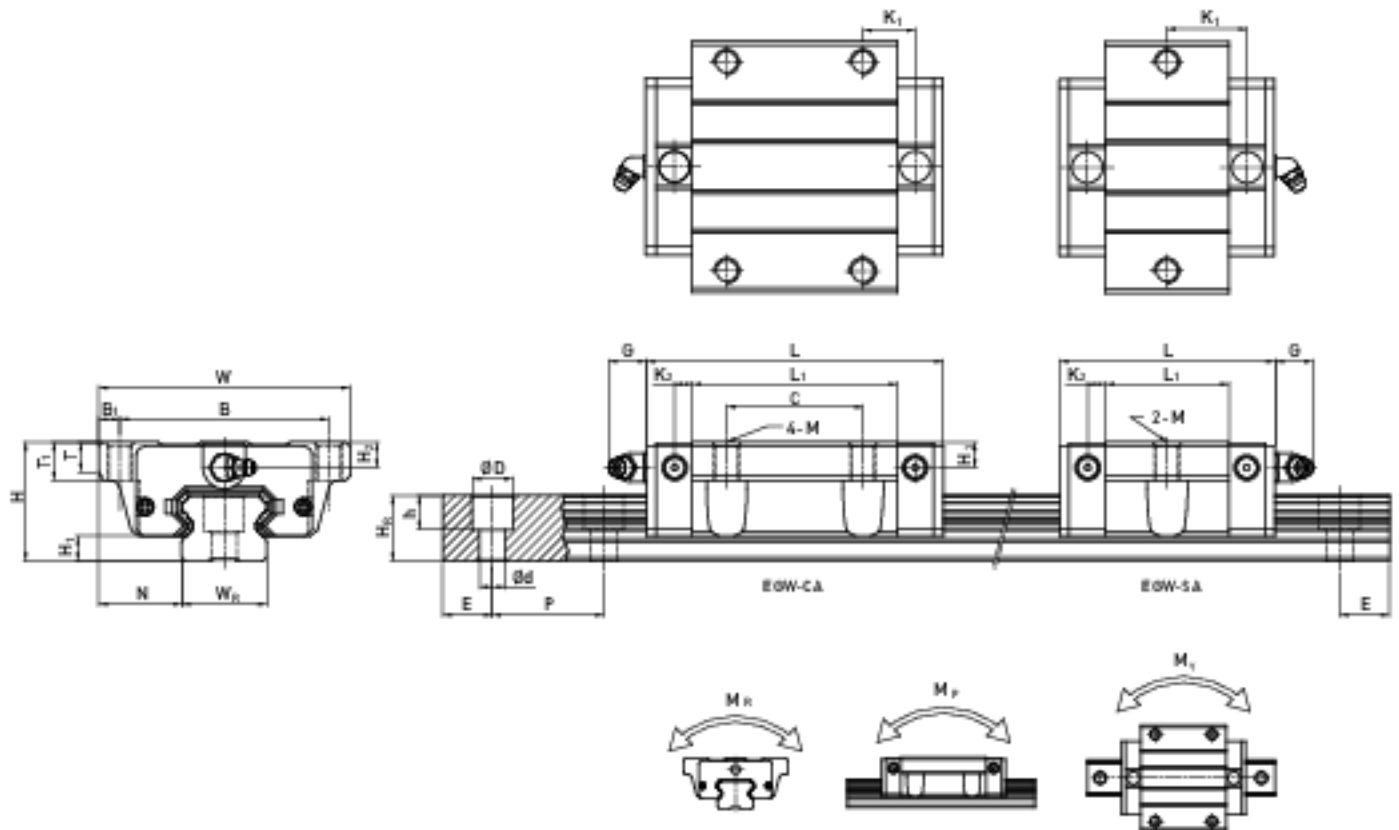


Model No.	Dimensions of Assembly (mm)		Dimensions of Block (mm)													Dimensions of Rail (mm)					Mounting Bolt for Rail (mm)	Basic Dynamic Load Rating C (kN)	Basic Static Load Rating C <sub>0</sub> (kN)	Static Rated Moment			Weight							
	H	H <sub>1</sub>	N	W	B	B <sub>1</sub>	C	L <sub>1</sub>	L	K <sub>1</sub>	K <sub>2</sub>	G	Mx1	T	H <sub>2</sub>	H <sub>3</sub>	W <sub>2</sub>	H <sub>4</sub>	D	h				d	P	E	C <sub>1</sub> (kN)	C <sub>2</sub> (kN)	M <sub>x</sub> (kN-m)	M <sub>y</sub> (kN-m)	M <sub>z</sub> (kN-m)	Block (kg)	Rail (kg/m)	
EGH15SA	24	4.5	9.5	3.4	2.4	4	-	23.1	40.1	14.8	3.5	5.7	Max6	6	5.5	6	15	12.5	6	4.5	3.5	40	20	M3x16	5.35	9.40	0.08	0.04	0.04	0.09	1.25			
EGH15CA							26	39.8	54.8	10.15																								
EGH20SA	28	6	11	4.2	3.2	5	-	29	50	18.75	4.15	12	M5x7	7.5	6	6	20	15.5	9.5	8.5	6	40	20	M5x16	7.23	12.74	0.13	0.06	0.06	0.15	2.08			
EGH20CA							32	48.1	69.1	12.3																								
EGH25SA	33	7	12.5	4.8	3.5	6.5	-	35.5	59.1	21.9	4.55	12	Max9	8	8	8	23	18	11	9	7	40	20	Max20	11.40	19.50	0.23	0.12	0.12	0.25	2.67			
EGH25CA							35	59	82.6	16.15																								
EGH30SA	42	10	16	6.0	4.0	10	-	41.5	69.5	26.75	6	12	M6x12	9	8	9	28	23	11	9	7	80	20	Max25	16.42	28.10	0.40	0.21	0.21	0.45	4.35			
EGH30CA							40	70.1	98.1	21.05																								
EGH35SA	48	11	18	7.0	5.0	10	-	45	75	28.5	7	12	M6x12	10	8.5	8.5	34	27.5	14	12	9	80	20	M6x25	22.44	37.38	0.54	0.31	0.31	0.66	6.14			
EGH35CA							50	78	108	20																								

Note : 1 kgf = 9.81 N



[2] EGW-SA/EGW-CA



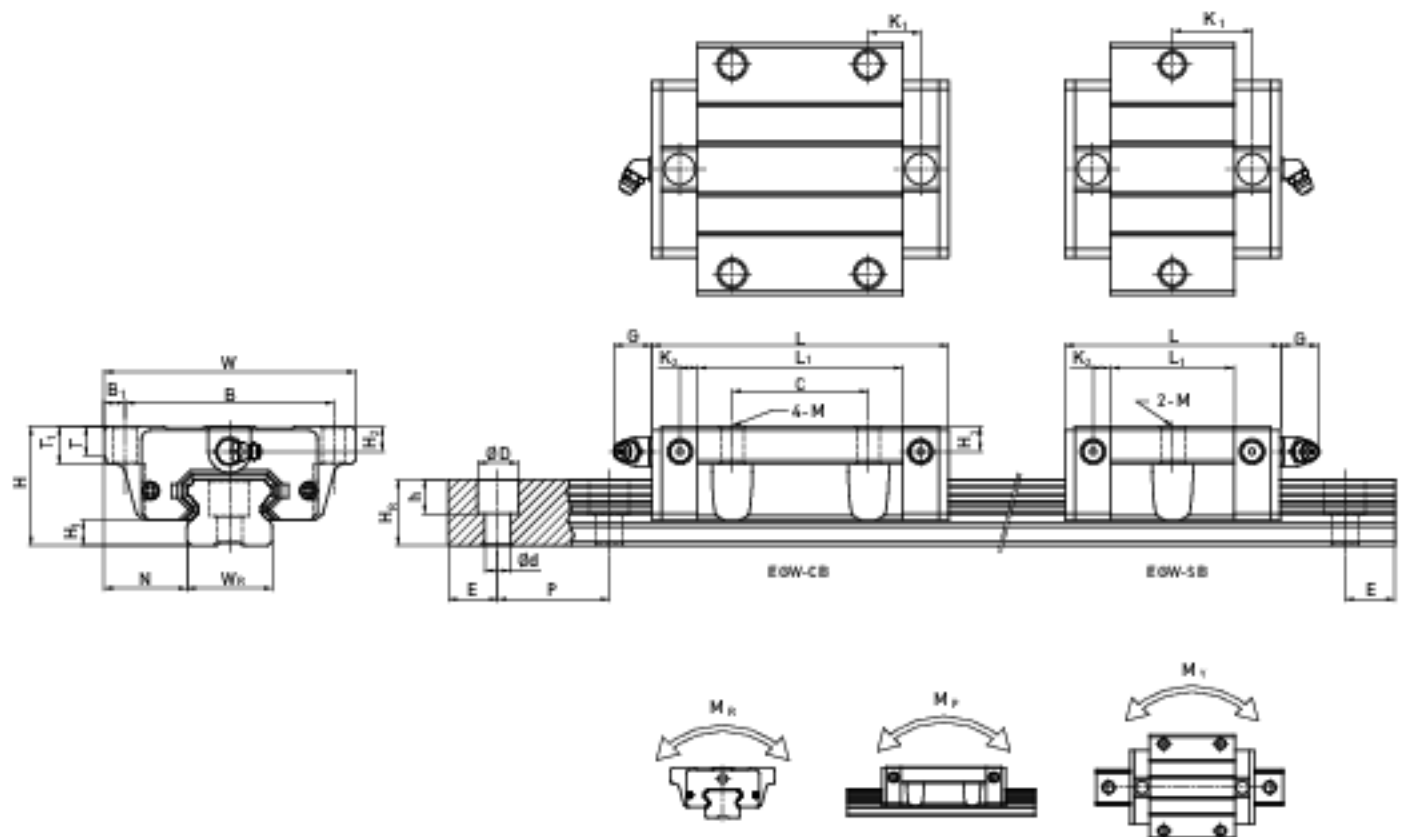
Model No.	Dimensions of Assembly (mm)		Dimensions of Block (mm)														Mounting Bolt for Rail (mm)	Basic Dynamic Load Rating C (kN)	Basic Static Load Rating C <sub>0</sub> (kN)	Static Rated Moment			Weight											
	H	H <sub>1</sub>	N	W	B	B <sub>1</sub>	C	L <sub>1</sub>	L	K <sub>1</sub>	K <sub>2</sub>	G	M	T	T <sub>1</sub>	H <sub>2</sub>				H <sub>3</sub>	W <sub>1</sub>	H <sub>4</sub>	D	h	d	P	E	M <sub>x</sub> (kN-m)	M <sub>y</sub> (kN-m)	M <sub>z</sub> (kN-m)	Block (kg)	Rail (kg/m)		
	EGW 15SA	24	4.5	18.5	52	41	5.5	-	23.1	40.1	14.8		3.5	5.7	M5	5				7	5.5	6	15	12.5	6	4.5	3.5	40	20	M3x16	5.35	9.40	0.06	0.04
EGW 15CA							26	39.8	54.8	10.15																								
EGW 20SA	28	6	19.5	59	49	5	-	29	50	18.75		6.15	12	M6	7	9	6	6	20	15.5	9.5	8.5	6	40	20	M5x16	7.23	12.76	0.13	0.06	0.06	0.19	208	
EGW 20CA							32	48.1	64.1	12.3																								
EGW 25SA	33	7	25	75	60	6.5	-	35.5	59.1	21.9		6.55	12	M8	7.5	10	8	8	23	18	11	9	7	40	20	M6x20	11.40	19.50	0.23	0.12	0.12	0.35	247	
EGW 25CA							35	59	82.4	14.15																								
EGW 30SA	42	10	31	90	72	9	-	41.5	64.5	26.75		6	12	M10	7	10	8	9	28	23	11	9	7	80	20	M6x25	16.42	28.10	0.40	0.21	0.21	0.62	435	
EGW 30CA							40	70.1	96.1	21.05																								
EGW35SA	48	11	33	100	82	9	-	45	75	28.5		7	12	M10	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	614	
EGW35CA							50	78	108	20																								

Note : 1 kgf = 9.81 N

# Linear Guideways

## EG Series

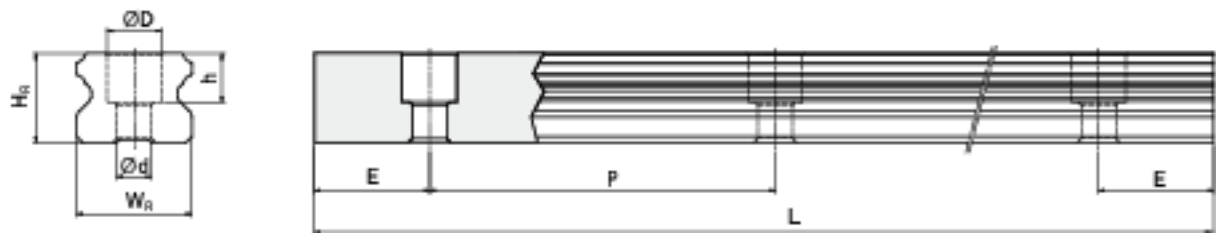
### [3] EGW-SB / EGW-CB



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 <sub>0</sub> (kN)	Static Rated Moment			Weight									
	H	H <sub>1</sub>	N	W	B	B <sub>1</sub>	C	L <sub>1</sub>	L	K <sub>1</sub>	K <sub>2</sub>	G	M	T	T <sub>1</sub>	H <sub>2</sub>	H <sub>3</sub>	W <sub>4</sub>	H <sub>4</sub>	D				h	d	P	E	M <sub>x</sub>	M <sub>y</sub>	M <sub>z</sub>	Block kg	Rail kg/m				
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm				mm	mm	mm	mm	mm	mm	mm	mm	mm				
EGW 15SB	24	4.5	19.5	52	41	5.5	-	23.1	40.1	14.8	-	3.5	5.7	04.5	5	7	5.5	4	15	12.5	4	4.5	3.5	4.0	2.0	M3x16	5.35	9.40	0.08	0.04	0.04	0.12	1.25			
EGW 15CB							2.4	39.8	54.8	10.15																										
EGW 20SB	28	6	19.5	59	49	5	-	29	50	18.75	-	4.15	12	05.5	7	9	6	6	20	15.5	9.5	8.5	6	4.0	2.0	M5x16	7.25	12.74	0.13	0.06	0.06	0.19	2.06			
EGW 20CB							3.2	48.1	69.1	12.3																										
EGW 25SB	33	7	25	73	60	6.5	-	35.5	59.1	21.9	-	4.55	12	07	7.5	10	8	8	23	18	11	9	7	4.0	2.0	M6x20	11.40	19.50	0.23	0.12	0.12	0.35	2.47			
EGW 25CB							3.5	59	82.4	16.15																										
EGW 30SB	42	10	31	90	72	9	-	41.5	69.5	24.75	-	6	12	09	7	10	8	9	28	23	11	9	7	8.0	2.0	M6x25	16.42	28.10	0.40	0.21	0.21	0.62	4.35			
EGW 30CB							4.0	70.1	98.1	21.85																										
EGW 35SB	48	11	33	100	82	9	-	45	75	28.5	-	7	12	09	10	13	8.5	8.5	34	27.5	14	12	9	8.0	2.0	M8x25	22.44	37.38	0.56	0.31	0.31	0.84	6.14			
EGW 35CB							5.0	78	106	20																										

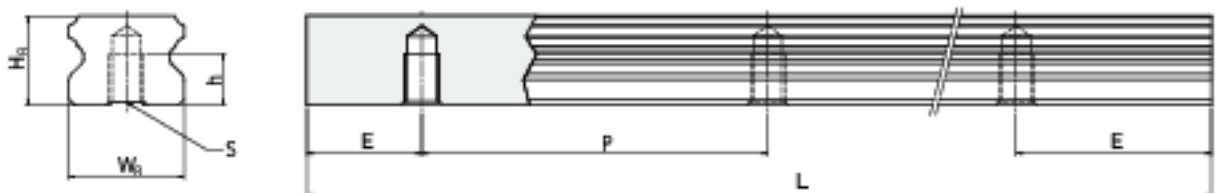
Note : 1 kgf = 9.81 N

[4] Dimensions for EGR-U (large mounting hole, rail mounting from top)



Model No.	Mounting Bolt for Rail (mm)	Dimensions of Rail (mm)							Weight (kg/m)
		$W_R$	$H_R$	$D$	$h$	$d$	$P$	$E$	
EGR15U	M6x6	15	12.5	25	5.3	4.5	40	20	1.23
EGR20U	M8x25	20	23	14	12	9	60	20	4.23

[5] Dimensions for EGR-T (rail mounting from bottom)



Model No.	Dimensions of Rail (mm)							Weight (kg/m)
	$W_R$	$H_R$	$S$	$h$	$P$	$E$		
EGR15T	15	12.5	M6 x 0.8P	7	40	20	1.26	
EGR20T	20	15.5	M8 x 1P	9	40	20	2.15	
EGR25T	25	18	M8 x 1P	10	40	20	2.79	
EGR30T	28	23	M8 x 1.25P	14	60	20	4.42	
EGR35T	34	27.5	M8 x 1.25P	17	60	20	6.34	

# Linear Guideways

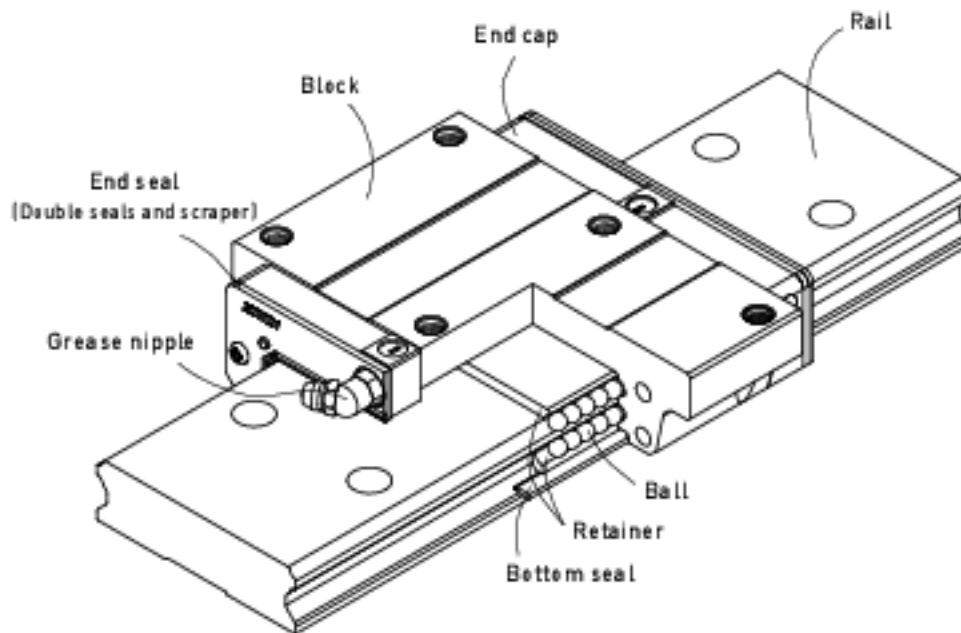
## WE Series

### 2-5 WE Type – Four-Row Wide Rail Linear Guideway

#### 2-5-1 Construction

The WE series features equal load ratings in the radial, reverse radial and the lateral direction with contact points at 45 degrees. This along with the wide rail, allows the guide way to be rated for high loads, moments and rigidity. By design, it has a self-aligning capacity that can absorb most installation errors and can meet high accuracy standards. The ability to use a single rail and to have the low profile with a low center of gravity is ideal where space is limited and/or high moments are required.

#### 2-5-2 Construction of WE Series

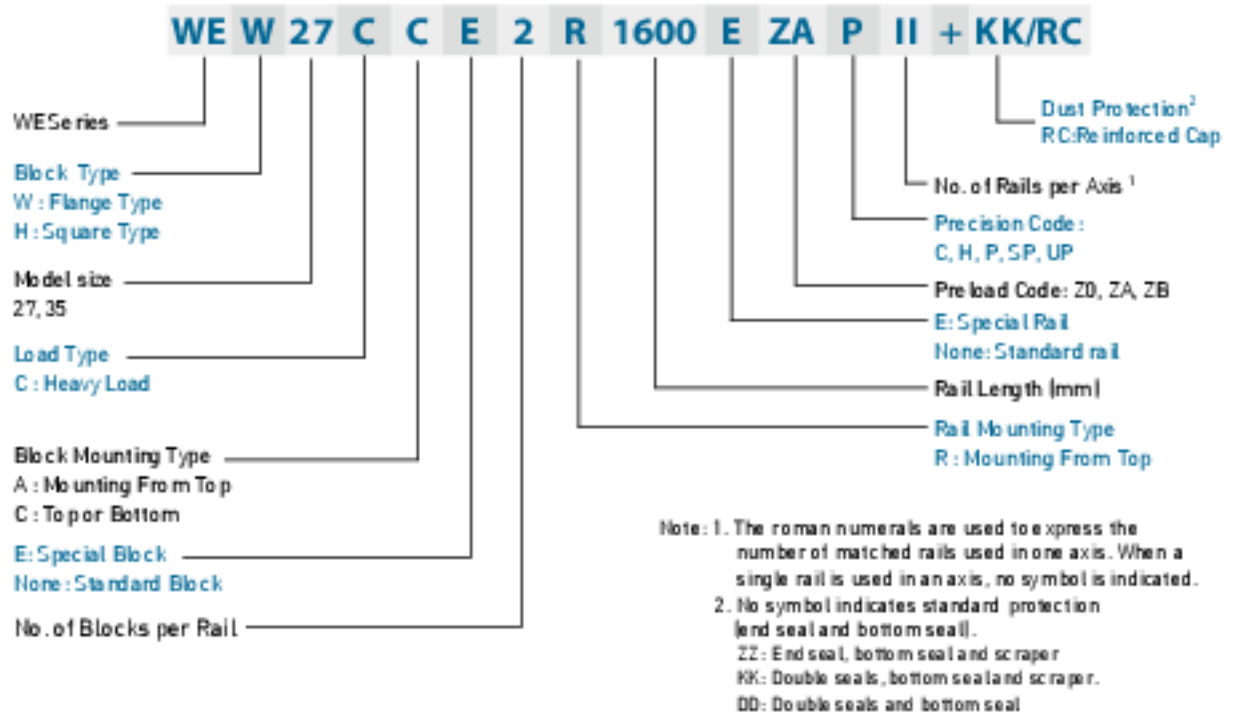


- Rolling circulation system: Block, rail, end cap and retainer
- Lubrication system: Grease nipple and piping joint
- Dust protection system: End seal, bottom seal, cap and scraper

#### 2-5-3 Model Number of WE Series

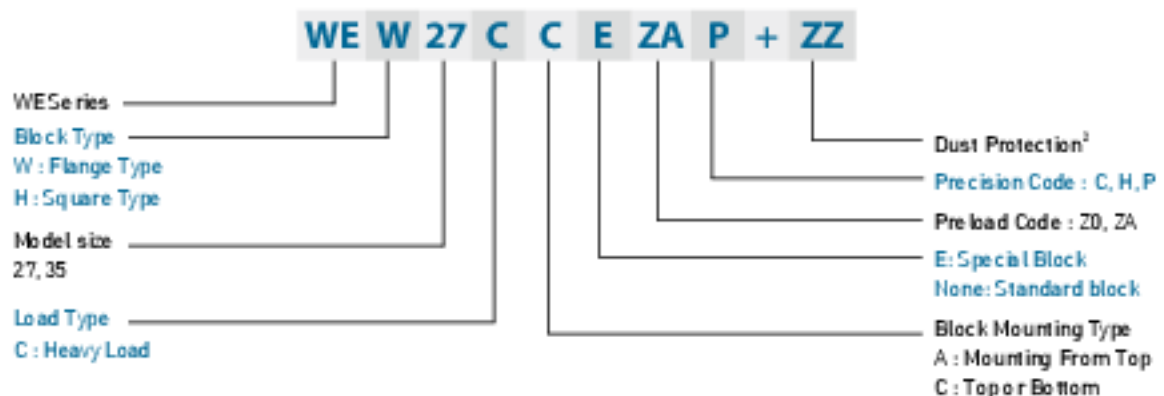
WE series linear guideways are classified into non-interchangeable and interchangeable types. The sizes of these two types are the same as one another. The main difference is that the interchangeable type of blocks and rails can be freely exchanged and they can maintain P-class accuracy. Because of strict 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 WE series identifies the size, type, accuracy class, preload class, etc.

[1] Non-interchangeable type

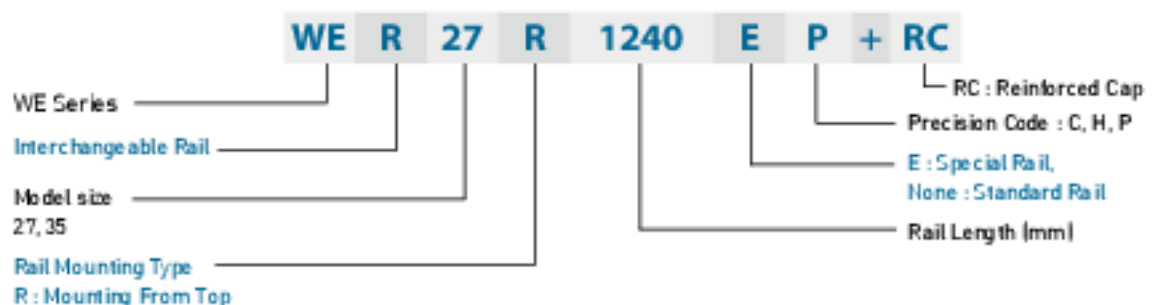


[2] Interchangeable type

○ Model Number of WE Block

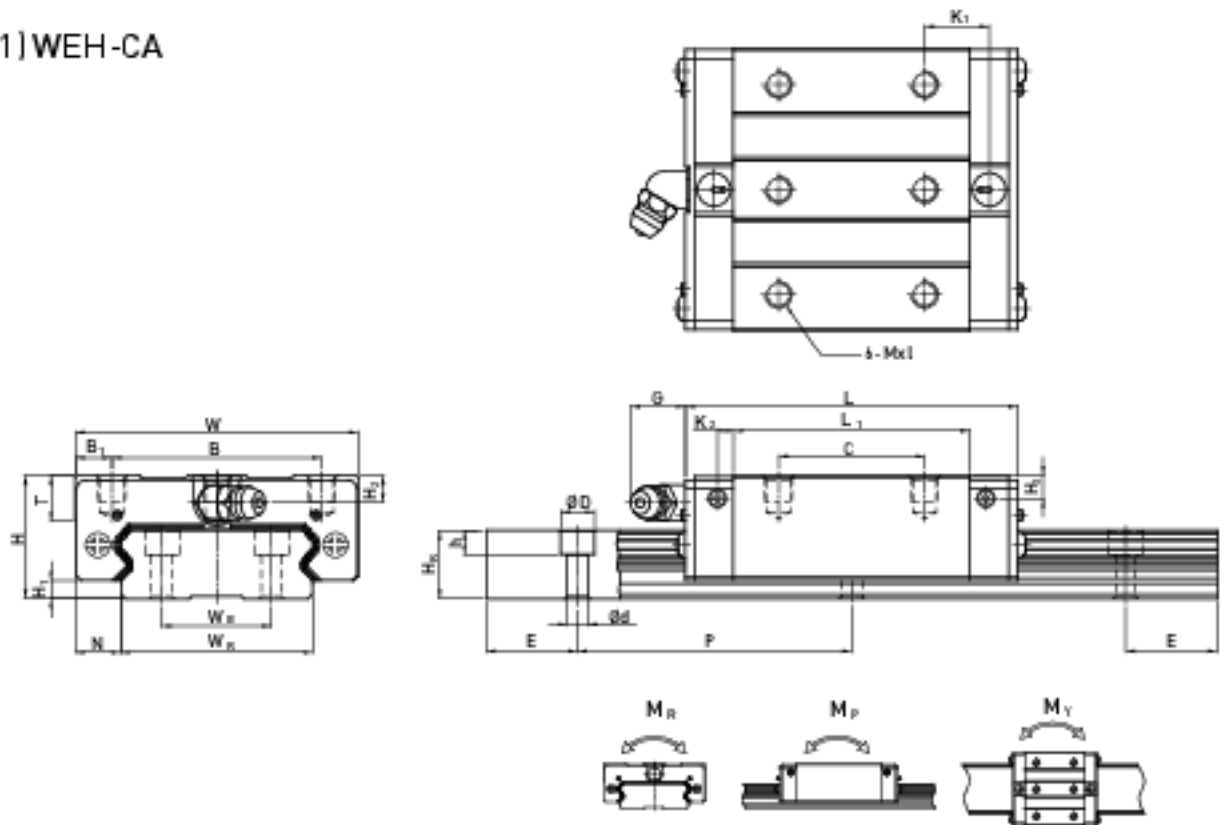


○ Model Number of WE Rail



## 2-5-13 Dimensions for ALM WE Series

### (1) WEH-CA



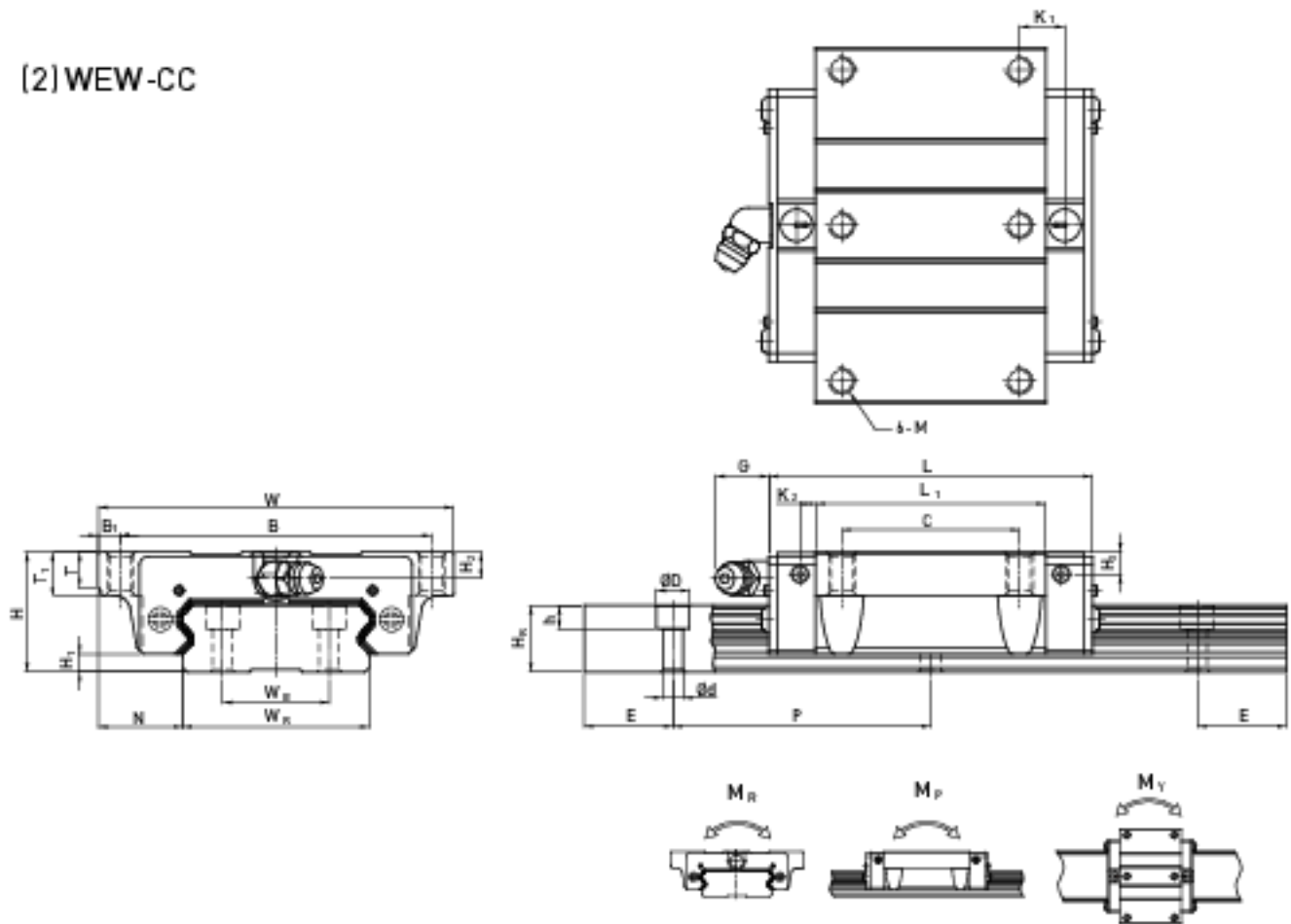
Model No.	Dimensions of Assembly (mm)		Dimensions of Block (mm)											Dimensions of Rail (mm)					Mounting Bolt for Rail	Basic Dynamic Load Rating	Basic Static Load Rating	Static Rated Moment			Weight							
	H	H <sub>1</sub>	N	W	B	B <sub>1</sub>	C	L	L <sub>1</sub>	K <sub>1</sub>	K <sub>2</sub>	G	MxL	T	H <sub>2</sub>	H <sub>3</sub>	W <sub>1</sub>	W <sub>2</sub>				H <sub>4</sub>	D	h	d	P	E	C <sub>1</sub> (kN)	C <sub>2</sub> (kN)	M <sub>x</sub>	M <sub>y</sub>	M <sub>z</sub>
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
WEH27CA	27	4	10	62	46	8	32	51.8	72.8	14.15	3.5	12	M6x6	10	4	5	42	24	15	25	5.3	4.5	40	20	M6x16	12.4	21.4	0.47	0.17	0.17	0.35	4.8
WEH35CA	35	4	15.5	100	78	12	50	77.6	102.4	18.1	5.25	12	M8x8	13	8	6.5	49	40	19	11	9	7	80	20	M8x20	29.8	49.4	1.6	0.67	0.67	1.1	9.9

Note : 1 kgf = 9.81 N

# Linear Guideways

## WE Series

[2] WEW-CC



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 C0 (kN)	Static Rated Moment			Weight				
	H	H1	N	W	B	B1	C	L	L1	K1	K2	G	M	T	T1	H2	H3	W4	W5	H6	D	h				d	P	E	Mx	My	Mz	Block	Rail
	kg	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm				mm	mm	mm	kg	kg	kg	kg	kg/m
WEW170C	27	4	19	80	70	5	40	51.8	72.8	10.15	3.5	12	M6	8	10	6	5	42	24	15	25	5.3	4.5	40	20	M6x16	12.4	21.6	0.47	0.17	0.17	0.43	4.8
WEW350C	35	4	25.5	120	107	6.5	40	77.4	102.4	13.35	5.25	12	M8	11.2	14	8	6.5	49	40	19	11	9	7	80	20	M8x20	29.8	49.4	1.4	0.47	0.47	1.26	9.9

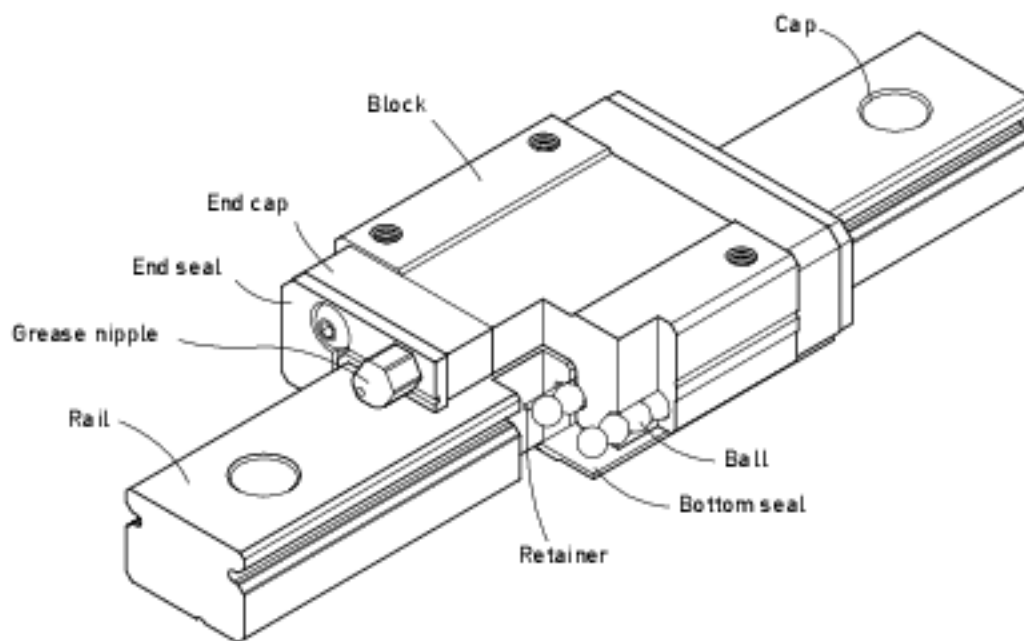
Note : 1 kgf = 9.81 N

## 2-6 MG Series - Miniature Linear Guideway

### 2-6-1 Features of MGN Series

1. Tiny and light weight, suitable for miniature equipment.
2. All materials for block and rail are in special grade of stainless steel which including steel ball, ball retainer for anti-corrosion purpose.
3. Gothic arch contact design can sustain the load from all directions and offer high rigidity and high accuracy.
4. Steel balls will be held by miniature retainer to avoid the balls from falling out even when the blocks are removed from the rail installation.
5. Interchangeable types are available in certain precision grades.

### 2-6-2 Construction of MGN Series



- Rolling circulation system: Block, rail, end cap and retainer
- Lubrication system: The grease nipple is available for MGN15, grease gun can be used for lubricating.
- Dust protection system: End seal, bottom seal (optional size 9, 12, 15), cap (size 12, 15)



## Linear Guideways

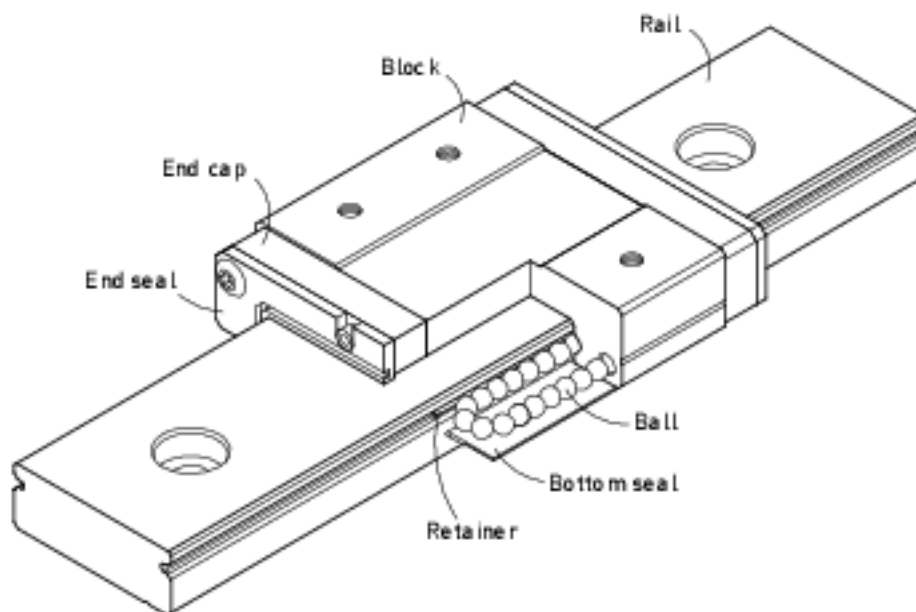
### MG Series

#### 2-6-3 Feature of MGW Series

The design feature of wide type miniature guideway-MGW:

1. The design of enlarged width has increased the capacity of moment load.
2. Gothic arch contact design has high rigidity characteristic in all directions.
3. Steel balls will be held by miniature retainer to avoid the balls from falling out even when the block are removed from the rail installation.
4. All metallic components are made of stainless steel for anti-corrosion purpose.

#### 2-6-4 Configuration of MGW Series



- Rolling circulation system: Block, rail, end cap and retainer
- Lubrication system: The grease nipple is available for MGW15, grease gun can be used for lubricating.
- Dust protection system: End seal, bottom seal (optional size 9,12,15), cap (size 12,15)

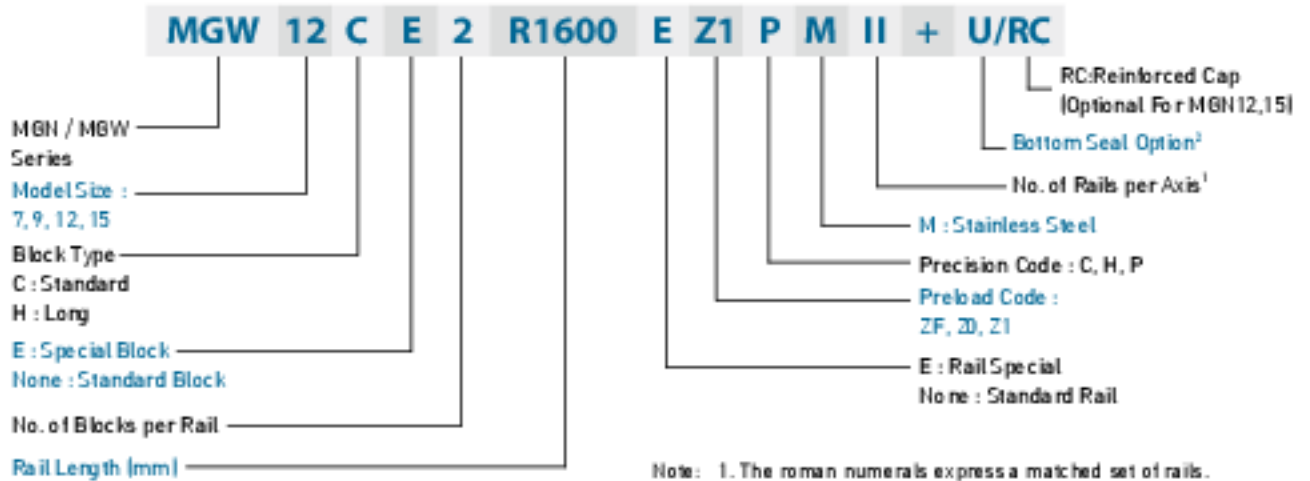
#### 2-6-5 Application

MGN/MGW series can be used in many fields, such as semiconductor equipment, PCB assembly equipment, medical equipment, robotics, measuring equipment, office automation equipment, and other miniature sliding machinery.

#### 2-6-6 Model Number of MGN/MGW Series

MGN and MGW series linear guideway can be classified into non-interchangeable and interchangeable types. The sizes of two types are the same. The interchangeable type is more convenient due to rails can be replaced. However, its precision is less than non-interchangeable type. Because of strict dimensional control, the interchangeable type linear guideway is a smart choice for customers when rails don't need to be paired for another axis. The model number contains the information of the size, type, accuracy class, preload class, and so on.

[1] Non-interchangeable type



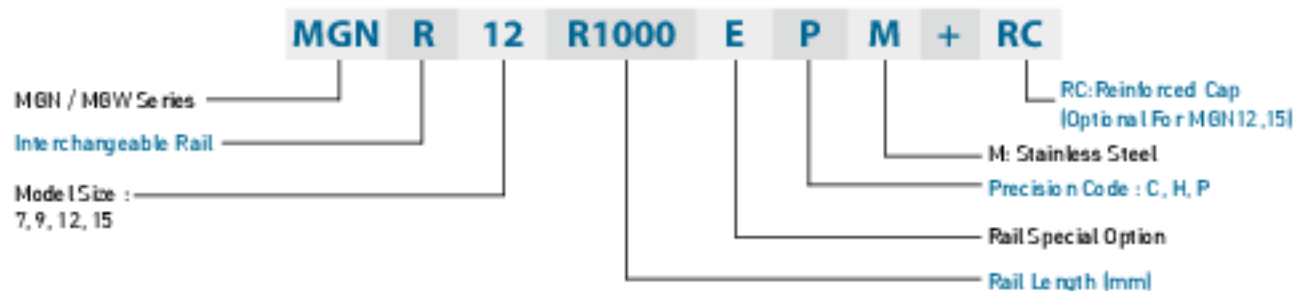
Note: 1. The roman numerals express a matched set of rails. No symbol indicates single rail in an axis.  
 2. The bottom seal is available for MGN & MBW 9, 12, 15.

[2] Interchangeable type

- Interchangeable Block



- Interchangeable Rail



# Linear Guideways

## MG Series

### 2-6-10 Cautions for Installation

- Shoulder heights and fillets

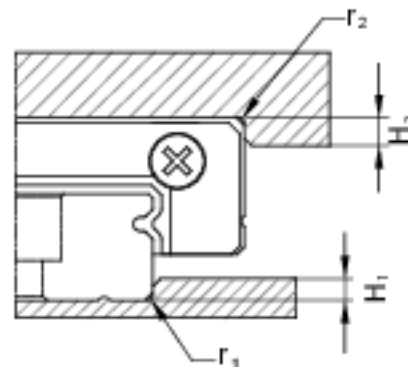


Table 2-6-6 Shoulder Heights and Fillets

Size	Max. radius of fillets $r_1$ [mm]	Max. radius of fillets $r_2$ [mm]	Shoulder height $H_1$ [mm]	Shoulder height $H_2$ [mm]
MGN 7	0.2	0.2	1.2	3
MGN 9	0.2	0.3	1.7	3
MGN 12	0.3	0.4	1.7	4
MGN 15	0.5	0.5	2.5	5
MGW 7	0.2	0.2	1.7	3
MGW 9	0.3	0.3	2.5	3
MGW 12	0.4	0.4	3	4
MGW 15	0.4	0.8	3	5

- Tightening torque of bolts for installation

Improperly tightening the rail mounting bolts will seriously affect the accuracy of the linear guideway. The following table lists the recommended tightening torque for the specific sizes of bolts.

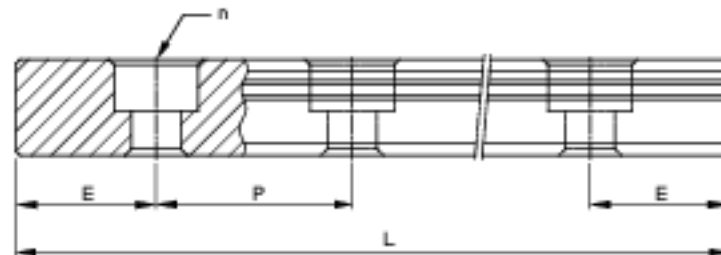
Table 2-6-7 Tightening Torque

Size	Bolt size	Torque N·cm [kgf·cm]
MGN 7	M2 × 0.4P × 6L	57 [5.9]
MGN 9	M3 × 0.5P × 8L	186 [19]
MGN 12	M3 × 0.5P × 8L	186 [19]
MGN 15	M3 × 0.5P × 10L	186 [19]
MGW 7	M3 × 0.5P × 6L	186 [19]
MGW 9	M3 × 0.5P × 8L	186 [19]
MGW 12	M4 × 0.7P × 8L	392 [40]
MGW 15	M4 × 0.7P × 10L	392 [40]

Note : 1 kgf = 9.81 N

## 2-6-11 Standard and Maximum Lengths of Rail

ALM stocks standard lengths of rail. If a non-standard length is required, it is recommended to specify the E value to be not greater than 1/2 of the pitch (P) to avoid instability at the end of the rail, and the E values should not be less than E<sub>min</sub> in order to prevent breaking the end mounting hole.



$$L = (n - 1) \times P + 2 \times E \quad \text{Eq.2.4}$$

L : Total length of rail [mm]

n : Number of mounting holes

P : Distance between any two holes [mm]

E : Distance from the center of the last hole to the edge [mm]

Table 2-6-8

unit: mm

Item	MGN R	MGN R	MGN R	MGN R	M GWR	M GWR	M GWR	M GWR
	7M	9M	12M	15M	7M	9M	12M	15M
Standard Length L(n)	40 (3)	55 (3)	70 (3)	70 (2)	80 (3)	80 (3)	110 (3)	110 (3)
	55 (4)	75 (4)	95 (4)	110 (3)	110 (4)	110 (4)	150 (4)	150 (4)
	70 (5)	95 (5)	120 (5)	150 (4)	140 (5)	140 (5)	190 (5)	190 (5)
	85 (6)	115 (6)	145 (6)	190 (5)	170 (6)	170 (6)	230 (6)	230 (6)
	100 (7)	135 (7)	170 (7)	230 (6)	200 (7)	200 (7)	270 (7)	270 (7)
	130 (9)	155 (8)	195 (8)	270 (7)	260 (9)	230 (8)	310 (8)	310 (8)
		175 (9)	220 (9)	310 (8)		260 (9)	350 (9)	350 (9)
		195 (10)	245 (10)	350 (9)		290 (10)	390 (10)	390 (10)
		275 (14)	270 (11)	390 (10)		350 (14)	430 (11)	430 (11)
		375 (19)	320 (13)	430 (11)		500 (19)	510 (13)	510 (13)
			370 (15)	470 (12)		710 (24)	590 (15)	590 (15)
			470 (19)	550 (14)		860 (29)	750 (19)	750 (19)
		570 (23)	670 (17)			910 (23)	910 (23)	
		695 (28)	870 (22)			1070 (27)	1070 (27)	
Pitch (P)	15	20	25	40	30	30	40	40
Distance to End (E <sub>1</sub> )	5	7.5	10	15	10	10	15	15
Max. Standard Length	595 (40)	995 (40)	1995 (80)	1990 (50)	590 (20)	1190 (40)	1990 (50)	1990 (50)
Max. Length	600	1000	2000	2000	600	1200	2000	2000

- Note:
1. Tolerance of E value for standard rail is 0.5- -0.5 mm. Tolerance of E value for jointed rail is 0--0.3 mm.
  2. Maximum standard length indicates the max. rail length with standard E value on both sides.
  3. The specification with "M" mark are stainless steel.
  4. If smaller E value is needed, please contact HWIN.

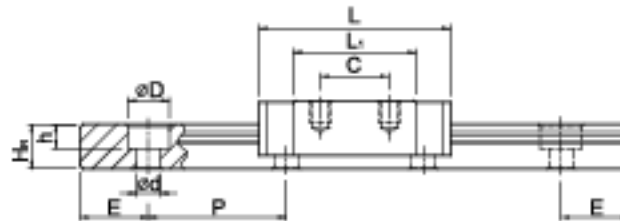
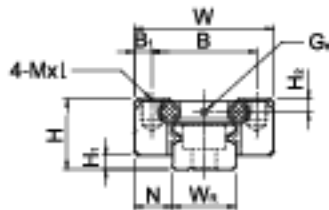
# Linear Guideways

## MG Series

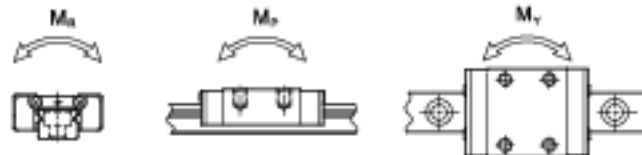
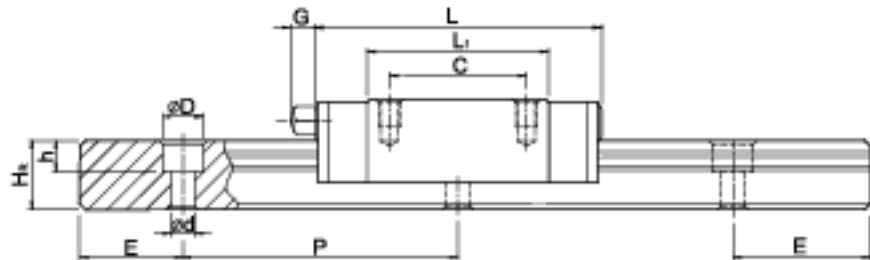
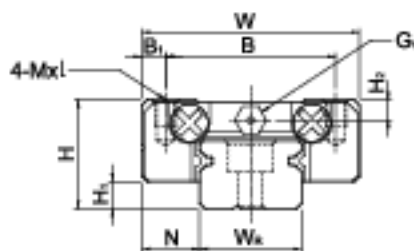
### 2-6-12 Dimensions for MGN/MGW Series

#### [1] MGN-C / MGN-H

MGN7, MGN9, MGN12



MGN15

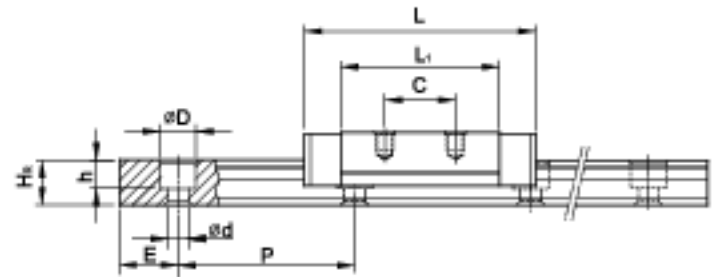
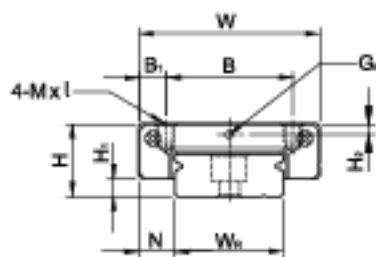


Model No.	Dimensions of Assembly (mm)				Dimensions of Block (mm)								Dimensions of Rail (mm)					Mounting Bolt for Rail (mm)	Basic Dynamic Load Rating C (kN)	Basic Static Load Rating C <sub>0</sub> (kN)	Static Rated Moment			Weight				
	H	H <sub>1</sub>	N	W	B	B <sub>1</sub>	C	L <sub>1</sub>	L	G	G <sub>1</sub>	Mxl	H <sub>2</sub>	W <sub>k</sub>	H <sub>2</sub>	D	h				d	P	E	M <sub>b</sub>	M <sub>l</sub>	M <sub>v</sub>	Block	Rail
																								(N·m)	(N·m)	(N·m)	kg	kg/m
MGN 7C	8	15	5	17	12	2.5	8	13.5	22.5	-	Ø12	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
MGN 7H							13	21.8	30.8													1.37	1.96	7.64	4.80	4.80	0.015	
MGN 9C	10	2	5.5	20	15	2.5	10	18.9	28.9	-	Ø14	M3x3	1.8	9	4.5	4	3.5	3.5	20	25	M3x8	1.86	2.55	11.76	7.55	7.55	0.014	0.38
MGN 9H							14	29.9	39.9													2.55	4.02	19.60	18.62	18.62	0.024	
MGN 12C	13	3	7.5	27	20	3.5	15	21.7	34.7	-	Ø2	M3x3.5	2.5	12	8	4	4.5	3.5	25	10	M3x8	2.84	3.92	25.48	13.72	13.72	0.034	0.45
MGN 12H							20	32.4	45.4													3.72	5.88	38.22	34.26	34.26	0.054	
MGN 15C	16	4	8.5	32	25	3.5	20	26.7	42.1	4.5	M3	M3x4	3	15	10	4	4.5	3.5	40	5	M3x10	4.41	5.59	45.88	21.54	21.54	0.059	1.06
MGN 15H							25	43.4	58.8													6.37	9.11	73.50	57.82	57.82	0.092	

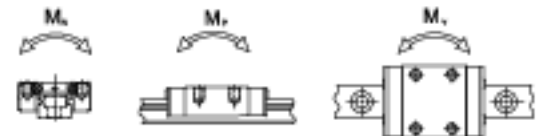
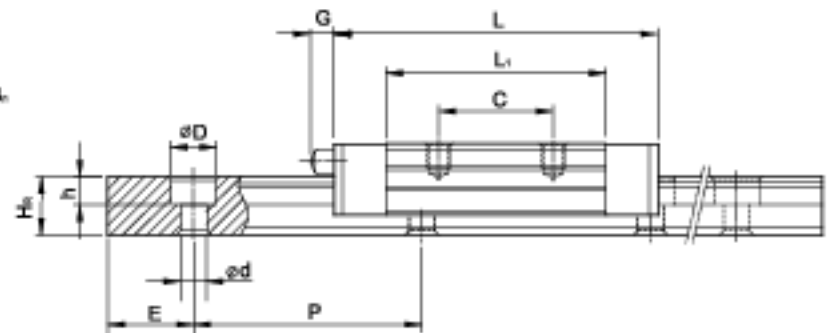
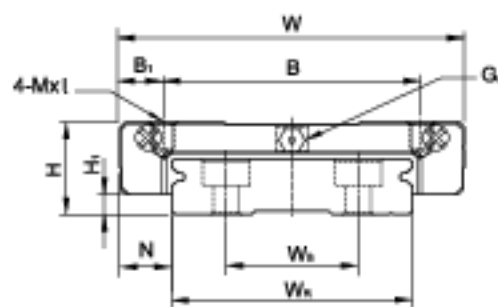
Note : 1 kgf = 9.81 N

## [2] MGW-C / MGW-H

MGW7, MGW9, MGW12



MGW15



Model No.	Dimensions of Assembly (mm)		Dimensions of Block (mm)											Dimensions of Rail (mm)						Mounting Bolt for Rail (mm)	Basic Dynamic Load Rating C <sub>1</sub> (kN)	Basic Static Load Rating C <sub>2</sub> (kN)	Static Rated Moment			Weight			
	H	H <sub>1</sub>	N	W	B	B <sub>1</sub>	C	L <sub>1</sub>	L	G	G <sub>1</sub>	Mx1	H <sub>2</sub>	W <sub>a</sub>	W <sub>b</sub>	W <sub>c</sub>	D	h	d				P	E	M <sub>1</sub>	M <sub>2</sub>	M <sub>3</sub>	Block kg	Rail kg/m
																							N-m						
MGW 7C	9	1.9	5.5	25	19	3	10	21	31.2	-	Ø1.2	M3x3	1.85	14	-	5.2	4	3.2	3.5	30	10	M3x6	1.37	2.06	15.70	7.14	7.14	0.020	0.051
MGW 7H							19	30.8	41																2.345	15.53	15.53		
MGW 9C	12	2.9	4	30	21	4.5	12	27.5	39.3	-	Ø1.2	M3x3	2.4	18	-	7	4	4.5	3.5	30	10	M3x8	2.75	4.12	40.12	18.96	18.96	0.040	0.091
MGW 9H								23	3.5																24	38.5	50.7		
MGW 12C	14	3.4	8	40	28	4	15	31.3	46.1	-	Ø1.2	M3x3.4	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	0.149
MGW 12H							28	4.54	40.4																57.37	57.37			
MGW 15C	16	3.4	9	40	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	4.77	9.22	149.34	54.44	54.44	0.143	0.284
MGW 15H							35	5.7	73.8																122.40	122.40			

Note : 1 kgf = 9.81 N

# Linear Guideways

## RG Series

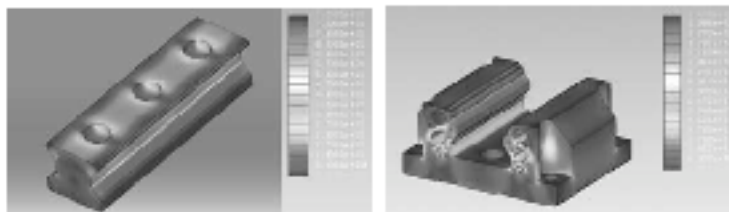
### 2-7 RG Series – High Rigidity Roller Type Linear Guideway

#### 2-7-1 Advantages and features

The new RG series from Hiwin features a roller as the rolling element instead of steel balls. The roller series offers super high rigidity and very high load capacities. The RG series is designed with a 45-degree angle of contact. Elastic deformation of the linear contact surface, during load, is greatly reduced thereby offering greater rigidity and higher load capacities in all 4 load directions. The RG series linear guideway offers high performance for high-precision manufacturing and achieving longer service life.

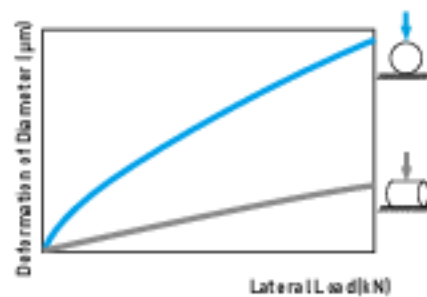
##### (1) Optimal design

FEM analysis was performed to determine the optimal structure of the block and the rail. The unique design of the circulation path allows the RG series linear guideway to offer smoother linear motion.



##### (2) Super high rigidity

The RG series is a type of linear guideway that uses rollers as the rolling elements. Rollers have a greater contact area than balls so that the roller guideway features higher load capacity and greater rigidity. The figure shows the rigidity of a roller and a ball with equal volume.



##### (3) Super high load capacity

With the four rows of rollers arranged at a contact angle of 45-degrees, the RG series linear guideway has equal load ratings in the radial, reverse radial and lateral directions. The RG series has a higher load capacity in a smaller size than conventional, ball-type linear guideways.



##### (4) Operating life increased

The basic dynamic load rating (100km rating) complies with ISO standard (ISO14728-1). The actual load will affect the nominal life of a linear guideway. Based on the selected basic dynamic rated load and the actual load, the nominal life can be calculated by using Eq.2.4. This life formula is different from that for conventional linear ball-type guideways.

$$L = \left(\frac{C}{P}\right)^{\frac{10}{3}} \cdot 100\text{km} = \left(\frac{C}{P}\right)^{\frac{10}{3}} \cdot 62\text{mile} \quad \text{Eq. 2.4}$$

If the environmental factors are taken into consideration, the nominal life will be influenced greatly by the motion conditions, the hardness of the raceway, and the temperature of the linear guideway. The relationship between these factors is expressed in Eq.2.5.

$$L = \left(\frac{f_h \cdot f_t \cdot C}{f_w \cdot P}\right)^{\frac{10}{3}} \cdot 100\text{km} = \left(\frac{f_h \cdot f_t \cdot C}{f_w \cdot P}\right)^{\frac{10}{3}} \cdot 62\text{mile} \quad \text{Eq. 2.5}$$

L : Nominal life                       $f_h$  : Hardness factor  
P : Calculated load                  $f_t$  : Temperature factor  
C : Basic dynamic load rating    $f_w$  : Load factor

Where, the hardness factor, the temperature factor and the load factor are the same as a ball-type guideway. Compared with conventional linear ball-type guideways, the RG series linear guideway has a higher load capacity that allows it to achieve a longer service life.

(5) Durability test

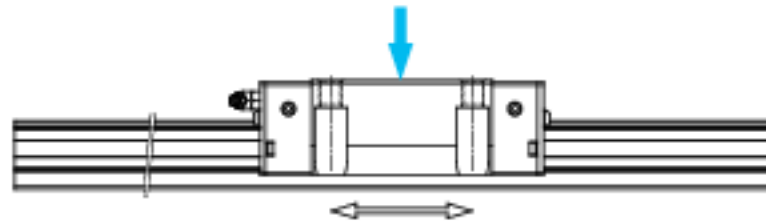
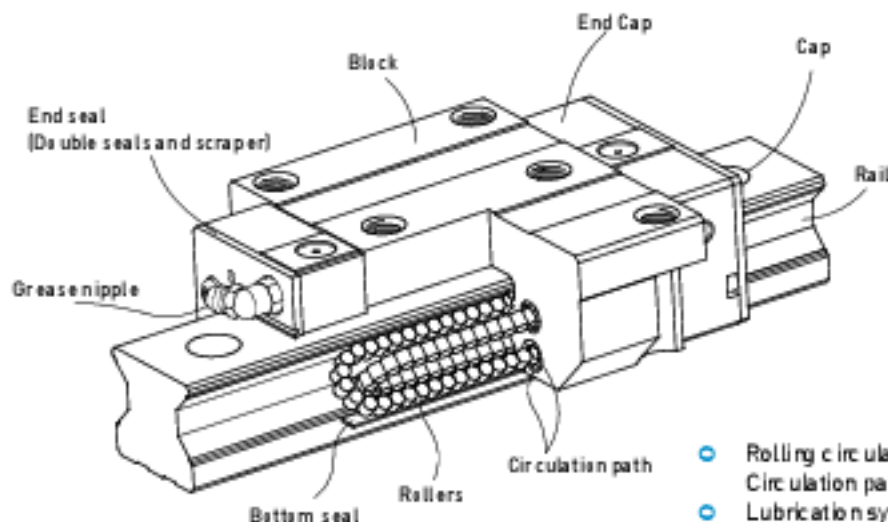


Table 2-7-1

<p><b>Tested model 1: RGH35CA</b>            Preload: ZA class            Max. Speed: 60 m/min            Acceleration: 1G            Stroke: 0.55 m            Lubrication: grease held every 100 km            External: 15 kN            Traveling distance: 1135 km</p>	<p><b>Test results:</b>            The nominal life of the model is 1000 km.            After the traveling distance, fatigue flaking did not appear on the surface of the raceway or rollers.</p> 
<p><b>Tested model 2: RGW35CC</b>            Preload: ZA class            Max. Speed: 120 m/min            Acceleration: 1G            Stroke: 2 m            Lubrication: oil feed rate: 0.3 cm<sup>3</sup>/hr            External load: 0 kN            Traveling distance: 15000 km</p>	<p><b>Test results:</b>            Fatigue flaking did not appear on the surface of the raceway or rollers after a distance of (15000 km).</p> 

Note: The data listed are from these samples.

2-7-2 Construction of RG Series



- Rolling circulation system: Block, Rail, End cap, Circulation path, rollers
- Lubrication system: Grease nipple and piping joint
- Dust protection system: End seal, Bottom seal, Cap, Double seals and Scraper



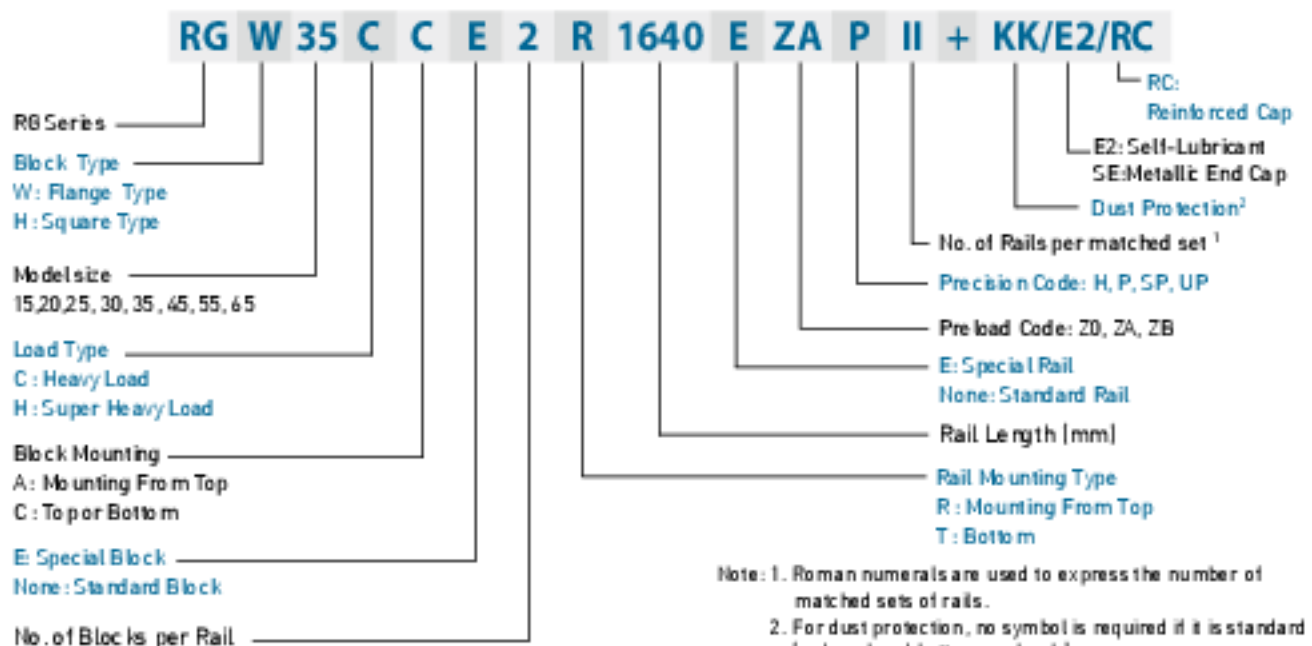
# Linear Guideways

## RG Series

### 2-7-3 Model Number of RG series

RG 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 RG series identifies the size, type, accuracy class, preload class, etc.

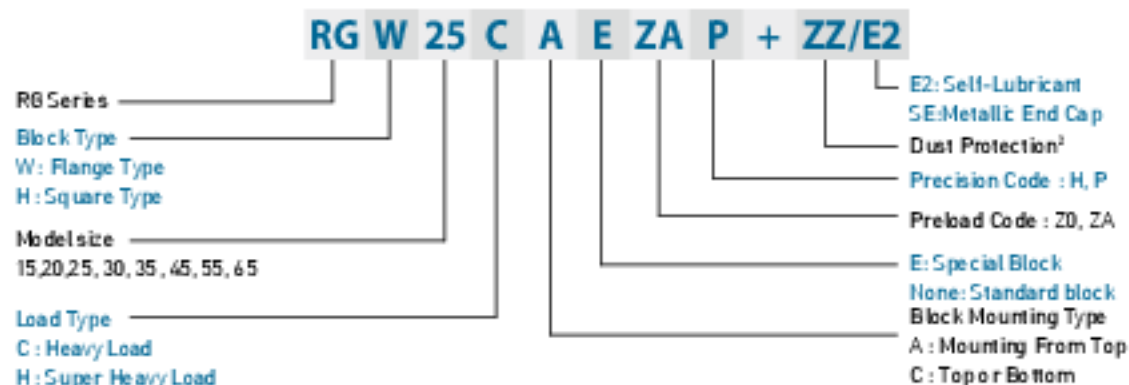
#### (1) Non-interchangeable type



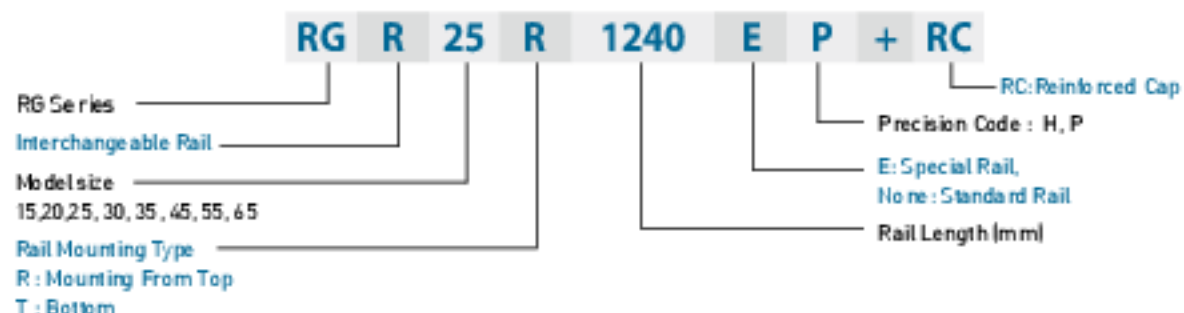
Note: 1. Roman numerals are used to express the number of matched sets of rails.  
2. For dust protection, no symbol is required if it is standard (end seal and bottom seal only).  
ZZ: End seal, bottom seal and scraper  
KK: Double seals, bottom seal and scraper  
DD: Double seals and bottom seal

#### (2) Interchangeable type

##### Model Number of RG Block



##### Model Number of RG Rail

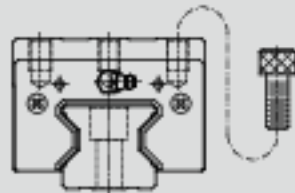
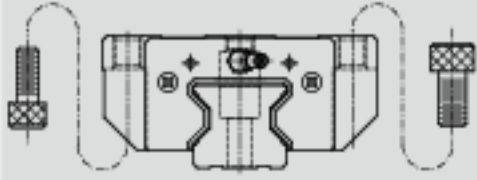


## 2-7-4 Types

### [1] Block types

ALM 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.

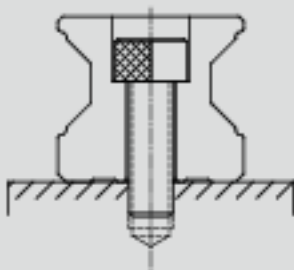
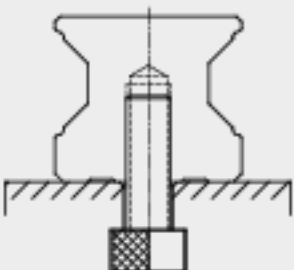
Table 2-7-2 Block Types

Type	Model	Shape	Height [mm]	Rail Length [mm]	Main Applications
Square	RGH-CA RGH-HA		28	100	<ul style="list-style-type: none"> <li>○ Automation Systems</li> <li>○ Transportation equipment</li> <li>○ CNC machining centers</li> <li>○ Heavy duty cutting machines</li> <li>○ CNC grinding machines</li> <li>○ Injection molding machines</li> <li>○ Plano millers</li> <li>○ Devices requiring high rigidity</li> <li>○ Devices requiring high load capacity</li> <li>○ Electric discharge machines</li> </ul>
			↓	↓	
Flange	RGW-CC RGW-HC		24	100	
			↓	↓	
			90	4000	

### [2] Rail types

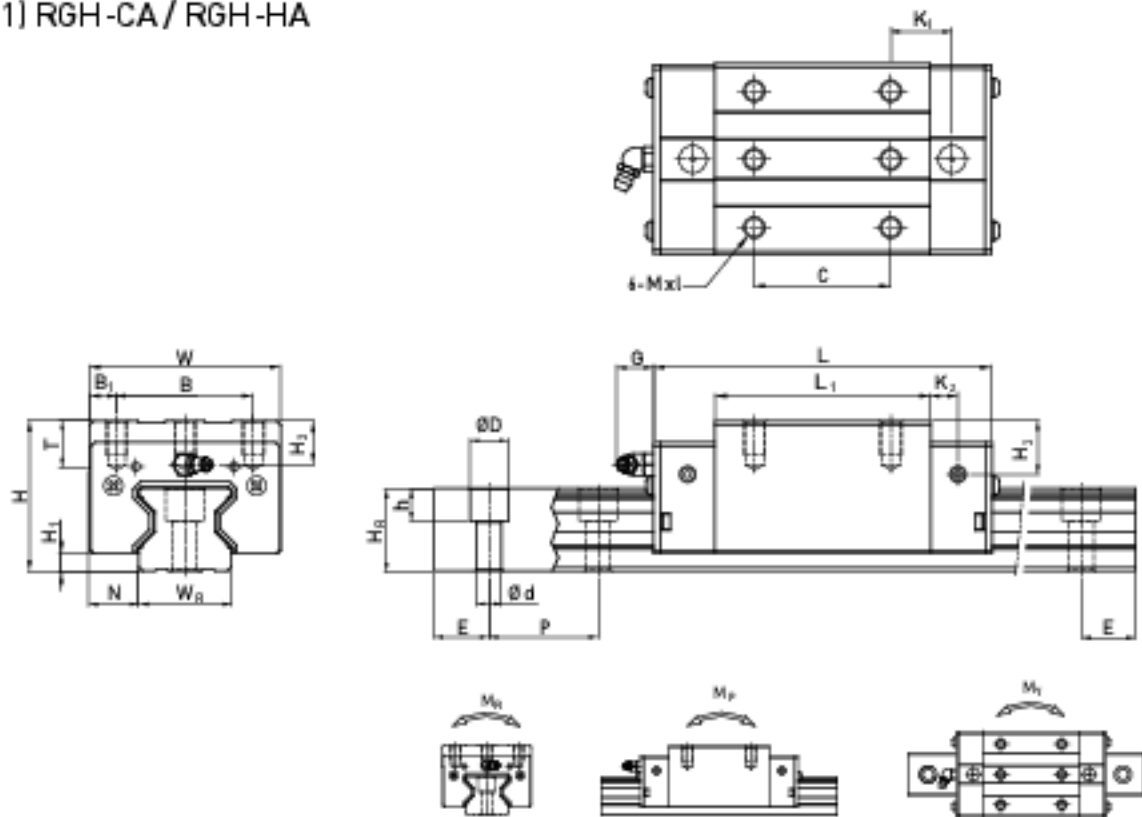
In addition to the standard top mounting type, ALM also offers the bottom mounting type of rails.

Table 2-7-3 Rail Types

Mounting from Top	Mounting from Bottom
	

## 2-7-13 Dimensions for RG series

### (1) RGH-CA/ RGH-HA



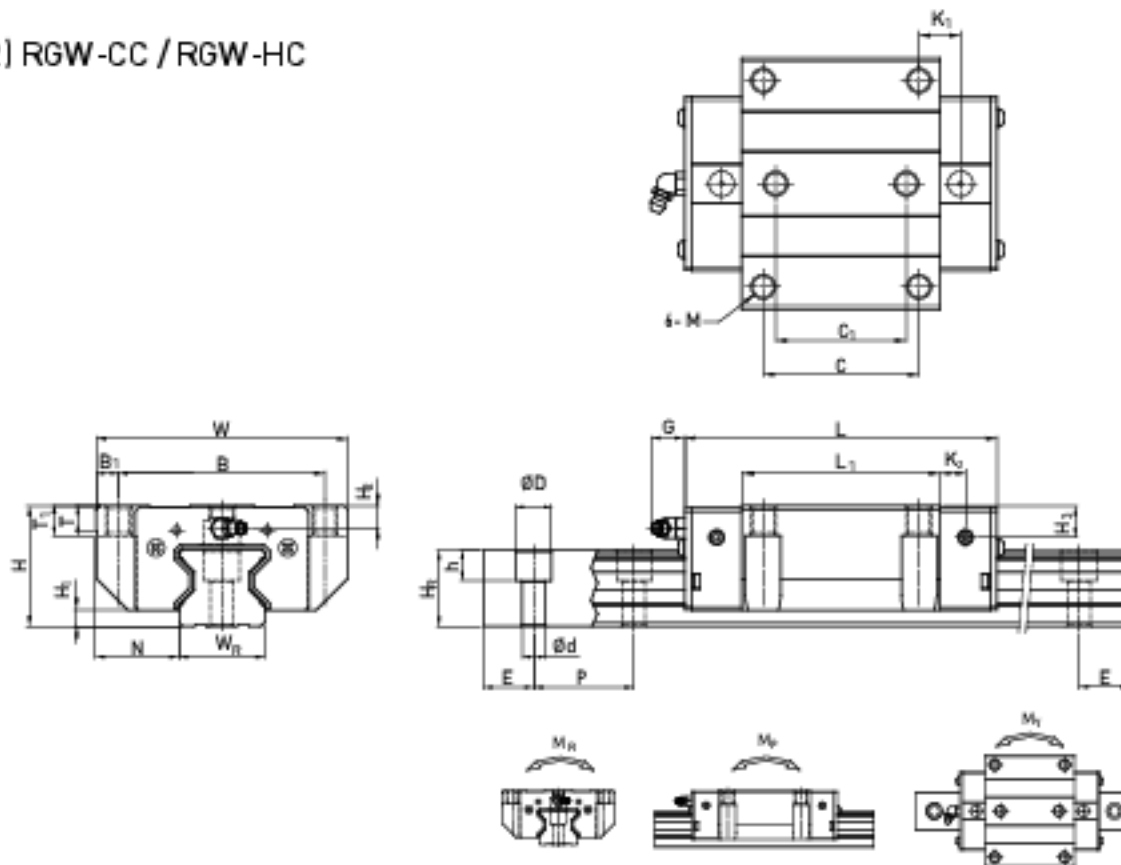
Model No.	Dimensions of A assembly (mm)		Dimensions of Block (mm)										Dimensions of Rail (mm)					Mounting Bolt for Rail (mm)	Basic Dynamic Load Rating C (kN)	Basic Static Load Rating C <sub>0</sub> (kN)	Static Rated Moment			Weight							
	H	H <sub>1</sub>	N	W	B	B <sub>1</sub>	C	L <sub>1</sub>	L	K <sub>1</sub>	K <sub>2</sub>	G	MxL	T	H <sub>2</sub>	H <sub>3</sub>	W <sub>n</sub>				H <sub>n</sub>	D	h	d	P	E	M <sub>x</sub>	M <sub>y</sub>	M <sub>z</sub>	Block kg	Rail kg/m
	kN-m			kN-m			kN-m			kg		kg/m																			
RGH15CA	28	4	9.5	34	24	4	2.4	45	48	13.4	4.7	5.3	M4x8	4	24	10.1	15	14.5	75	5.7	4.5	30	20	M4x14	11.3	24	0.311	0.173	0.173	0.22	1.8
RGH20CA	34	5	12	44	32	4	3.4	57.5	64	15.8	6	5.3	M5x8	8	8.3	8.3	20	21	9.5	8.5	4	30	20	M5x20	21.3	44.7	0.447	0.44	0.44	0.37	2.76
RGH20HA																									24.9	43	0.872	0.837	0.837	0.48	
RGH25CA	40	5.5	12.5	48	35	4.5	3.5	64.5	97.9	20.75	7.25	12	M6x8	9.5	10.2	10	23	23.4	11	9	7	30	20	M6x20	22.7	57.1	0.758	0.405	0.405	0.55	3.08
RGH25HA																									33.9	73.4	0.975	0.941	0.941	0.7	
RGH30CA	45	4	14	40	40	10	4.0	71	184.8	23.5	8	12	M8x10	9.5	9.5	10.3	28	28	14	12	9	40	20	M8x25	34.1	82.1	1.445	1.06	1.06	0.82	4.4
RGH30HA																									48.1	105	1.844	1.712	1.712	1.07	
RGH35CA	55	4.5	18	70	50	10	5.0	79	124	22.5	10	12	M8x12	12	14	19.4	34	30.2	14	12	9	40	20	M8x25	52.9	105.2	2.17	1.44	1.44	1.43	4.04
RGH35HA																									73.1	142	2.93	2.4	2.4	1.86	
RGH45CA	70	8	20.5	64	40	13	4.0	104	83.2	31	10	12.9	M10x17	14	20	24	45	38	20	17	14	52.5	22.5	M12x35	92.4	178.8	4.52	3.05	3.05	2.97	4.97
RGH45HA																									114	230.9	4.33	5.47	5.47	3.97	
RGH55CA	80	10	23.5	100	75	12.5	7.5	125.5	183.7	37.75	12.5	12.9	M12x18	17.5	2.2	27.5	53	44	2.3	20	14	40	30	M14x45	130.5	252	8.01	5.4	5.4	4.42	13.98
RGH55HA																									147.8	348	11.15	10.25	10.25	4.4	
RGH45CA	40	12	31.5	124	74	25	7.0	148	232	40.8	15.8	12.9	M14x20	25	15	15	43	53	24	22	18	75	35	M16x50	213	411.4	14.20	11.54	11.54	8.33	20.22
RGH45HA																									275.3	572.7	22.55	22.17	22.17	11.42	

Note : 1 kgf = 9.81 N

# Linear Guideways

## RG Series

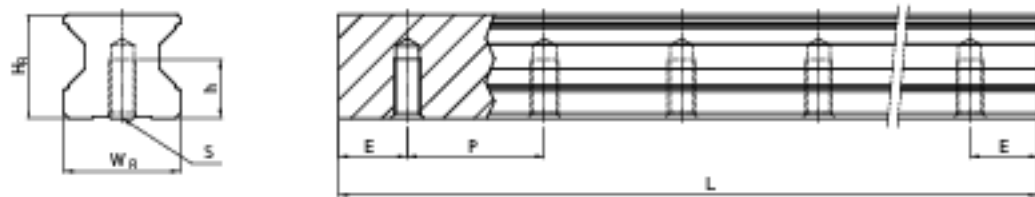
### [2] RGW-CC / RGW-HC



Model No.	Dimensions of Assembly (mm)			Dimensions of Block (mm)													Mounting Bolt for Rail	Basic Dynamic Load Rating	Basic Static Load Rating	Static Rated Moment			Weight													
	H	H1	N	W	B	B1	C	C1	L	L1	K1	K2	G	M	T	H2				Wn	Hn	D	h	d	P	E	M <sub>x</sub>	M <sub>y</sub>	M <sub>z</sub>	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)	(mm)	(mm)	(mm)	(mm)	(mm)				
RGW15CC	24	4	16	47	38	45	30	26	45	48	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	M6x16	11.3	24	0.311	0.173	0.173	0.23	1.8			
RGW20CC	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	0.447	0.46	0.46	0.44	2.76
RGW20HC									77.5	106	23.8																									
RGW25CC	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	0.67	3.08
RGW25HC									81	116.4	26																									
RGW30CC	42	6	31	90	72	9	52	44	71	109.8	175				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	1.06	4.41
RGW30HC									93	131.8	28.5																									
RGW35CC	48	6.5	33	100	82	9	62	52	79	124	165				10	12	M10	12	13	9	12.6	34	30.2	14	12	9	40	20	M8x25	52.9	105.2	2.17	1.66	1.66	1.61	6.06
RGW35HC									106.5	151.5	30.25																									
RGW45CC	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	3.22	9.97
RGW45HC									139.8	187	37.9																									
RGW55CC	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	6.01	5.4	5.4	5.18	13.98
RGW55HC									173.8	232	51.9																									
RGW65CC	90	12	53.5	170	142	14	110	82	160	232	40.8				15.8	12.9	M16	22	23	15	15	63	53	24	22	18	75	35	M16x50	213	411.6	16.20	11.59	11.59	11.06	20.22
RGW65HC									223	295	72.3																									

Note : 1 kgf = 9.81 N

[3] Dimensions for RGR-T (Rail Mounting from Bottom)



Model No.	Dimensions of Rail [mm]						Weight
	$W_R$	$H_R$	S	h	P	E	[kg/m]
RGR15T	15	16.5	M5×0.8P	8	30	20	1.86
RGR20T	20	21	M6×1P	10	30	20	2.76
RGR25T	23	23.6	M6×1P	12	30	20	3.36
RGR30T	28	28	M8×1.25P	15	40	20	4.82
RGR35T	34	30.2	M8×1.25P	17	40	20	6.48
RGR45T	45	38	M12×1.75P	24	52.5	22.5	10.83
RGR55T	53	44	M14×2P	24	60	30	15.85
RGR65T	63	53	M20×2.5P	30	75	35	21.24

# Linear Guideways

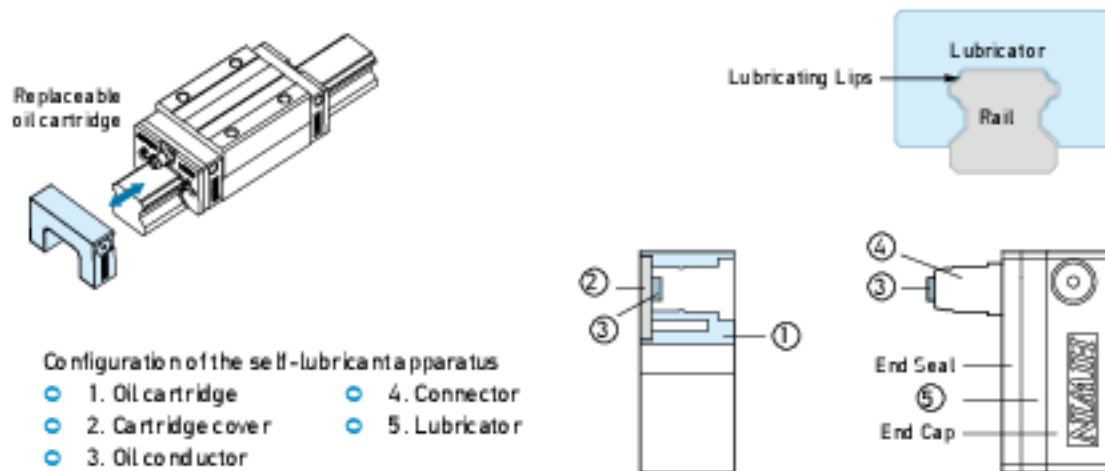
## E2 Type

### 2-8 E2 Type - Self lubrication Kit for Linear Guideways

#### 2-8-1 Construction of E2 Type

E2 self-lubricating linear guideway contains a lubricator between the end cap and end seal. Outside of the block is equipped with a replaceable oil cartridge, the configuration of which is listed below.

Lubrication oil flows from the replaceable oil cartridge to the lubricator and then lubricates grooves of rails. The Oil cartridge comprises a oil conductor with 3D structure that enables the lubricator to contact oil despite that blocs are placed at a random position, and thus the lubrication oil inside the oil cartridge can be used up via capillary action.



#### 2-8-2 Feature of E2 Type

[1] Cost reduction: Save costs by reducing oil usage and maintenance.

Table 2-8-1

Item	Standard Block	E2 (Self-lubricant) Block
Lubricant device	\$ XXX	-
Design and installation of lubricant device	\$ XXX	-
Cost of oil purchase	0.3cc / hr x 8hrs / day x 280 days / year x 5 year = 3360 cc x cost / cc = \$ XXX	10 cc (5 years / 100 000 km) x cost / cc = \$ XX
Cost of refill	3-5hrs / time x 3-5times / year x 5year x cost / time = \$ XXX	-
Waste oil disposal	3-5 times / year x 5year x cost / time = \$ XXX	-

[2] Clean and environmentally friendly: Optimized oil usage prevents leaking, making it the ideal solution for clean working environments.

[3] Long last and low maintenance: Self-lubricating block is maintenance free in most applications.

[4] No installed limitations: The linear guideway can be lubricated by E2 self-lubricating module irrespective of mounting directions.

[5] Easy to be assembled and dismantled: The cartridge can be added or removed from the block even when the guideway is installed on a machine.

[6] Different oils can be selected: The replaceable oil cartridge can be refilled with any approved lubrication oil depending on different requirements.

[7] Applications for special environments: Sealing grease into the block leads to better lubrication effects especially in dusty, dirty, or wet environments.

### 2-8-3 Applications

- (1) Machine tools
- (2) Manufacturing Machines : Plastic injection, printing, paper making, textile machines, food processing machines, wood working machines, and so on.
- (3) Electronic Machinery : Semiconductor equipment, robotics, X-Y table, measuring and inspecting equipment.
- (4) Others : Medical equipment, transporting equipment, construction equipment.

### 2-8-4 Specification

- (1) Add "/E2" after the specification of linear guideway  
Ex. HGW25CC2R1600ZAPII+ZZ/E2

### 2-8-5 Lubrication Capability

- (1) Life testing with light load

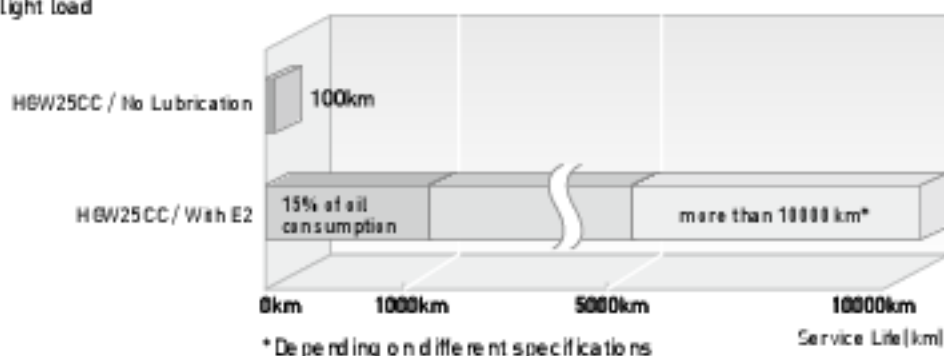


Table 2-8-2 Test condition

Model No.	HGW25CC
Speed	60m/min
Stroke	1500mm
Load	500kgf

- (2) Characteristic of lubricating oil

The standard oil filled in the oil cartridge is Mobil SHC 636, which is a fully synthetic lubricant with a main constituent, synthetic hydrocarbons (PAO). The viscosity class of the oil is 680 (ISO-VG 680). Its characteristics are as follows.

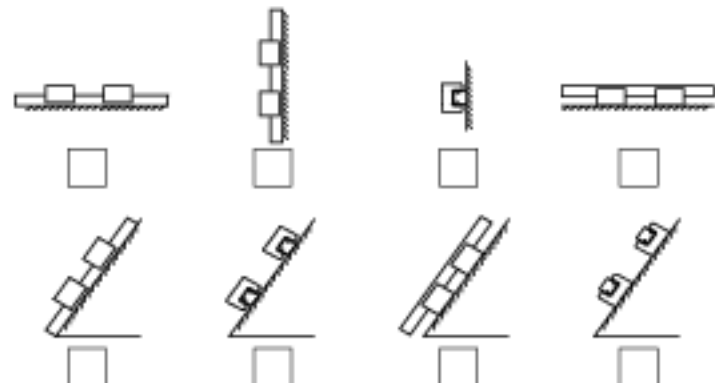
- Compatible with lubricating grease of which the base oil is synthetic hydrocarbon oil, mineral oil or ester oil.
- Synthetic oil with superb high temperature thermal/oxidation resistance.
- High viscosity index to provide outstanding performance in service applications at extremely high and low temperatures.
- Low traction coefficient to reduce power consumption.
- Anti-corrosion and rust-proof.

- \* Lubricants with the same viscosity class can also be used; however, their compatibility should be taken into consideration.

### 2-8-6 Temperature Range for Application

The application temperature for this product is -10°C - 60°C. Please contact with HIWIN for further discussion and information if the temperature is out of this range.

### 3. ALM Linear Guideway Inquiry Form

Customer:		Date:	
Tel.		Fax.	
Machine Type		Confirm by	
Axis		Drawing No.	
<input type="checkbox"/> X <input type="checkbox"/> Y <input type="checkbox"/> Z <input type="checkbox"/> Other (   )			
Install Position			
Model No.			
Rail Mounting	<input type="checkbox"/> R (from top) <input type="checkbox"/> T (from bottom) <input type="checkbox"/> U (from top with bolt hole enlarged)		
Dust Protection	<input type="checkbox"/> Double end seal + Bottom seal [DD] <input type="checkbox"/> Double end seal + Scraper + Bottom seal [KK] <input type="checkbox"/> End seal + Scraper + Bottom seal [ZZ] <input type="checkbox"/> End seal + Bottom seal [U]		
Special Option	<input type="checkbox"/> Steel end cap [SE] <input type="checkbox"/> Self Lubrication [E2]		
Lubrication	<input type="checkbox"/> Grease nipple [Grease] <input type="checkbox"/> Piping joint [Oil] <input type="checkbox"/> Other		
Butt-joint	<input type="checkbox"/> No <input type="checkbox"/> Yes		
No. of Rail Per Axis	<input type="checkbox"/> I (1) <input type="checkbox"/> II (2) <input type="checkbox"/> III (3) <input type="checkbox"/> Other		
Reference Surface and Injection Direction	<p>Please mark 'X' in the <input type="checkbox"/> to indicate the filling directions.</p> 