HIWIN®

Linear Guideway

Technical Information Index

Preface

A linear guideway allows a type of linear motion that utilizes rolling balls. By using circulating balls 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, it is true when accompanied with precision ball screws.

1. General Information

1-1 Advantages and Features of Linear Guideways

(1) High positional accuracy

When a loaded plate is driven by a linear motion guideway, the frictional contact between the loaded plate 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 table is moving.

(2) Long life with highly accurate motion

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, machine can achieve a long life with highly accurate motion.

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

Because the linear guideway has little friction resistance, only a small driving force is needed for moving the loaded table. The result of this fact is the power savings. This is especially true for the reciprocating parts.

(4) Equal loading capacity in all directions

Because of its special constraint design, a linear guideway can take up loads in either the up/down or left/right directions. Conventional linear slides can only take up 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 and interchangeability

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 high accuracy linear motion. However, a traditional slide takes more time to scrape the tracks. If any errors in accuracy arise, the surface must be scraped again. In contrast, linear guideways are interchangeable.

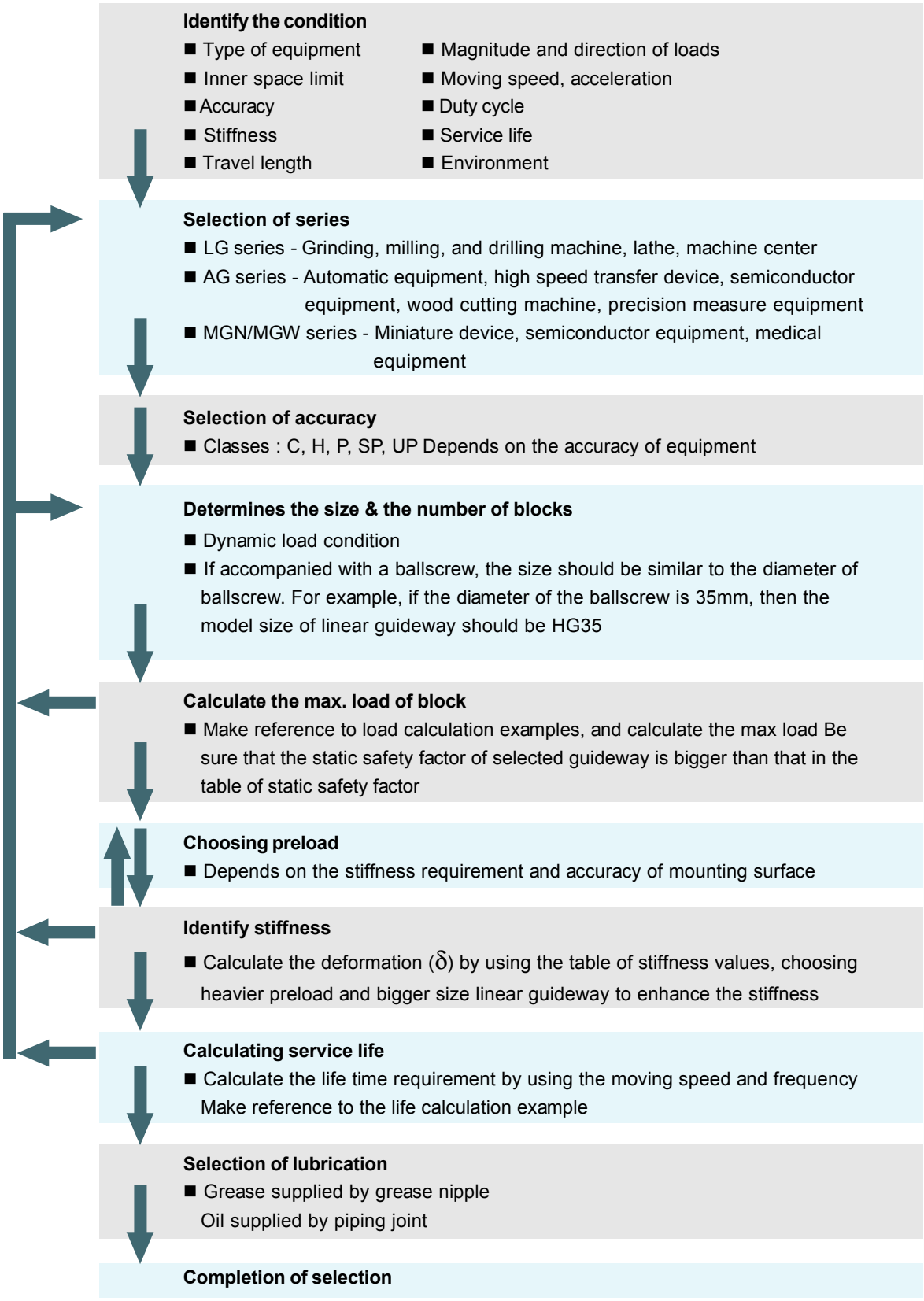
(6) Easy lubrication

With a traditional sliding system, insufficient lubrication wears out 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 piping joint.

(7) Interchangeability

Because of restricted dimension control, the dimensional difference of linear guideways can be kept in a reasonable range, and which means that the specific series of linear guideways possess the interchangeability. For this characteristic, it is good to have the stock of rails and blocks separately for saving the space of warehouse.

1-2 The Principles of Selecting Linear Guideway



1-3 Basic Load Ratings of Linear Guideways

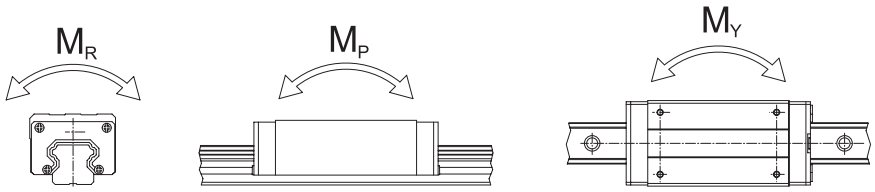
1-3-1 Basic Static Load

(1) Static load rating (C_0)

Localized permanent deformation will be caused between the raceway surface and the rolling balls 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, which results in a total permanent deformation of 0.0001 times the diameter of the rolling ball and the raceway at the contact point subjected to the largest stress. The value is described in the dimension tables for each linear guideway. A designer can select a suitable linear guideway by referring to these tables. The maximum static load applied to a linear guideway must not exceed the basic static load rating.

(2) Static permissible moment (M_0)

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



(3) Static safety factor

This condition applys when the guideway system is static or under low speed motion. The static safety factor which depend 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.

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

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

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 appling moment (kN·mm)

1-3-2 Basic Dynamic Load

(1) Dynamic load rating (C)

The basic dynamic load rating is the load that does not change in direction or magnitude and results in a nominal life of 50km of operation for a linear guideway. The values for the basic dynamic load rating of each guideway are shown in dimension tables. They can be used to predict the service life for a selected linear guideway.

1-4 The Service Life of Linear Guideways

1-4-1 Service Life

When the raceway and the rolling balls 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 the fatigue flaking appears at the surface of raceway or rolling balls.

1-4-2 Nominal Life (L)

The service life varies widely 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 50km.

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.

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

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

If the environmental factors are taken into consideration, the nominal life is influenced widely 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.

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

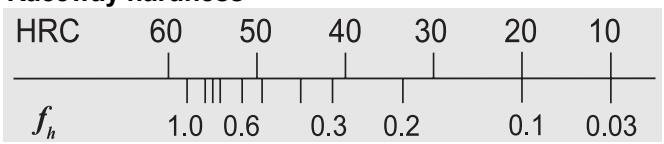
L : Nominal life
C : Basic dynamic load rating
P_c : Calculated load
f_h : Hardness factor
f_t : Temperature factor
f_w : Load factor

1-4-4 Factors of Normal Life

(1) Hardness factor (f_h)

In general, the raceway surface in contact with the balls must have the hardness of HRC 58~64 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)

When the temperature of a linear guideway exceeds 100°C, the permissible load is reduced and the nominal life is decreased. Therefore, the basic dynamic load rating and the basic static load rating must be multiplied by the temperature factor.

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 linear guideway should be divided by the empircal factor.

Table 1.4 Load factor

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

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Loading Condition	Service Speed	f_w
No impacts & vibration	V ≦ 15 m/min	1~1.5
Normal load	15m/min < V ≦ 60 m/min	1.5~ 2.0
With impacts & vibration	V > 60 m/min	2.0~ 3.5

1-4-5 Calculation of the Service Life Time (L_h)

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

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

L_h : Service life time(hr) V_e : Speed (m/min)

L : Nominal life (km) C/P : Load ratio

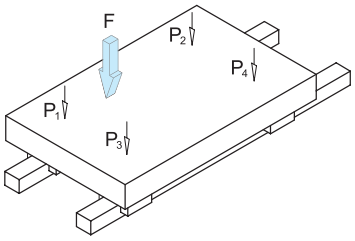
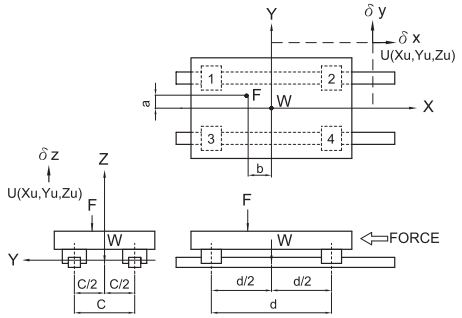
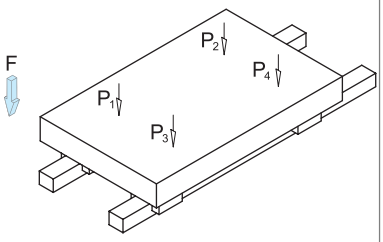
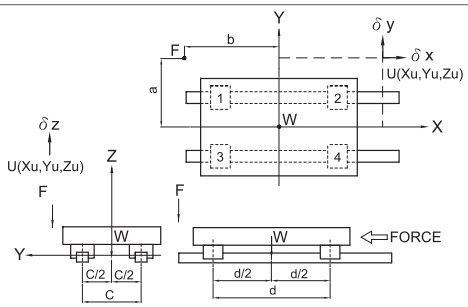
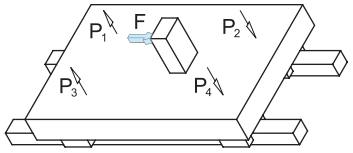
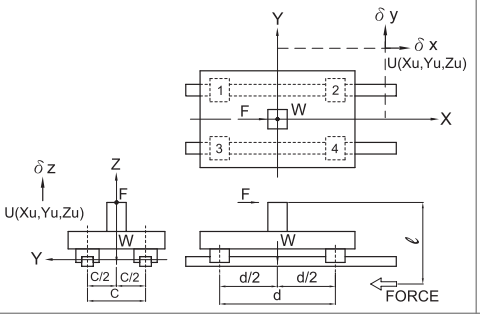
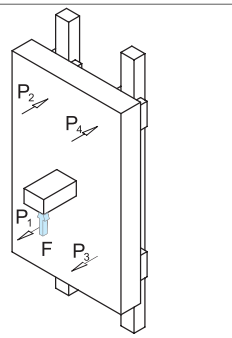
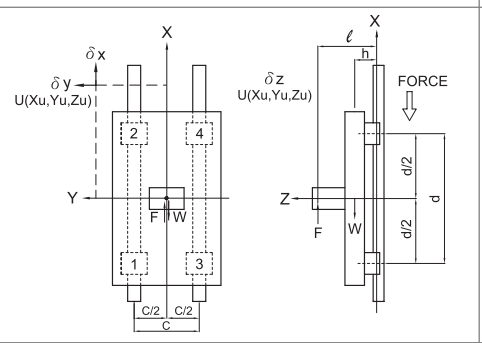
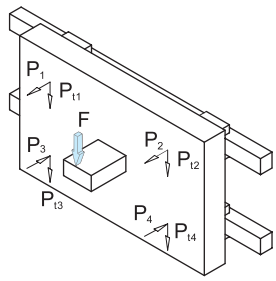
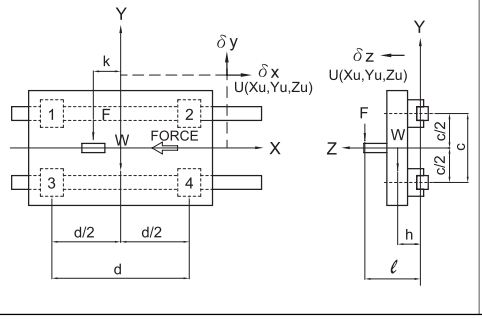
1-5 Applied Loads

1-5-1 Calculation of Load

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

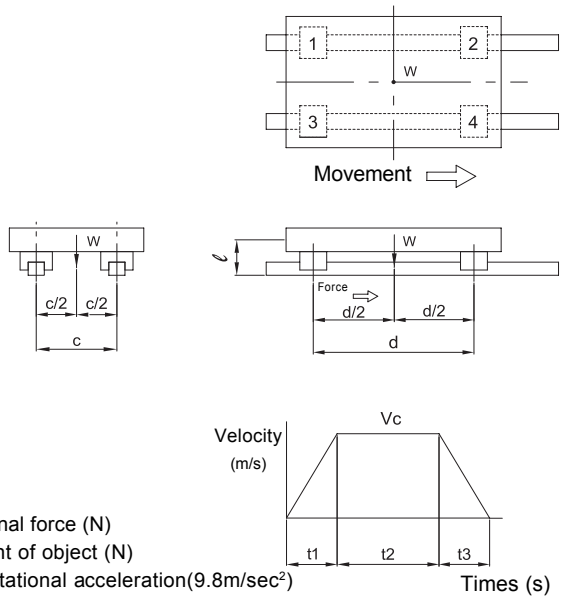
(1) Load on one block

Table 1.3 Caculation example of loads on block

Patterns	Loads layout	Load on the block and displacement of point U
		$P_1 \quad \frac{W}{4} + \frac{F}{4} + \frac{F \times a}{2c} + \frac{F \times b}{2d}$ $P_2 \quad \frac{W}{4} + \frac{F}{4} + \frac{F \times a}{2c} - \frac{F \times b}{2d}$ $P_3 \quad \frac{W}{4} + \frac{F}{4} - \frac{F \times a}{2c} + \frac{F \times b}{2d}$ $P_4 \quad \frac{W}{4} + \frac{F}{4} - \frac{F \times a}{2c} - \frac{F \times b}{2d}$ $\delta_X \quad -Z_U \times \frac{P_1 - P_2}{d \times K}, \quad \delta_Y \quad -Z_U \times \frac{P_1 - P_3}{c \times K}$ $\delta_Z \quad -\frac{F}{4 \times K} - X_U \times \frac{P_1 - P_2}{d \times K} - Y_U \times \frac{P_1 - P_3}{c \times K}$
		$P_1 \quad \frac{W}{4} + \frac{F}{4} + \frac{F \times a}{2c} + \frac{F \times b}{2d}$ $P_2 \quad \frac{W}{4} + \frac{F}{4} + \frac{F \times a}{2c} - \frac{F \times b}{2d}$ $P_3 \quad \frac{W}{4} + \frac{F}{4} - \frac{F \times a}{2c} + \frac{F \times b}{2d}$ $P_4 \quad \frac{W}{4} + \frac{F}{4} - \frac{F \times a}{2c} - \frac{F \times b}{2d}$ $\delta_X \quad -Z_U \times \frac{P_1 - P_2}{d \times K}, \quad \delta_Y \quad -Z_U \times \frac{P_1 - P_3}{c \times K}$ $\delta_Z \quad -\frac{F}{4 \times K} - X_U \times \frac{P_1 - P_2}{d \times K} - Y_U \times \frac{P_1 - P_3}{c \times K}$
		$P_1 \quad P_3 \quad \frac{W}{4} + \frac{F \times \ell}{2d}$ $P_2 \quad P_4 \quad \frac{W}{4} + \frac{F \times \ell}{2d}$ $\delta_X \quad -Z_U \times \frac{P_1 + P_2}{d \times K}$ $\delta_Y \quad 0$ $\delta_Z \quad -X_U \times \frac{P_1 + P_2}{d \times K}$
		$P_1 \sim P_4 \quad -\frac{W \times h}{2d} + \frac{F \times \ell}{2d}$ $\delta_X \quad -Z_U \times \frac{P_1 + P_2}{d \times K}$ $\delta_Y \quad 0$ $\delta_Z \quad -X_U \times \frac{P_1 + P_2}{d \times K}$
		$P_1 \sim P_4 \quad -\frac{W \times h}{2c} + \frac{F \times \ell}{2c}$ $P_{t1} \quad P_{t3} \quad \frac{W}{4} + \frac{F}{4} + \frac{F \times k}{2d}$ $P_{t2} \quad P_{t4} \quad \frac{W}{4} + \frac{F}{4} + \frac{F \times k}{2d}$ $\delta_X \quad -Y_U \times \frac{P_{t1} - P_{t2}}{d \times K}$ $\delta_Y \quad -\frac{F}{4 \times K} - X_U \times \frac{P_{t1} - P_{t2}}{d \times K} - Z_U \times \frac{P_1 + P_3}{c \times K}$ $\delta_Z \quad -Y_U \times \frac{P_1 + P_3}{c \times K}$

(2) Loads with inertia forces

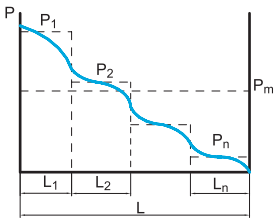
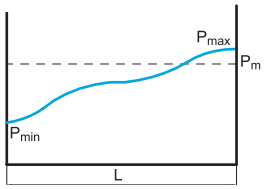
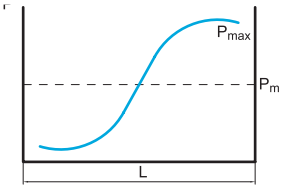
Table 1.4 Calculation Examples for Loads with Inertia Forces

Considering the acceleration and deceleration	Load on one block
 F : External force (N) W : Weight of object (N) g : Gravitational acceleration(9.8m/sec²)	▸ Constant velocity $P_1 \sim P_4 = \frac{W}{4}$ ▸ Acceleration $P_1 = P_3 = \frac{W}{4} + \frac{1}{2} \times \frac{W}{g} \times \frac{V_c}{t1} \times \frac{\ell}{d}$ $P_2 = P_4 = \frac{W}{4} - \frac{1}{2} \times \frac{W}{g} \times \frac{V_c}{t1} \times \frac{\ell}{d}$ ▸ Deceleration $P_1 = P_3 = \frac{W}{4} - \frac{1}{2} \times \frac{W}{g} \times \frac{V_c}{t3} \times \frac{\ell}{d}$ $P_2 = P_4 = \frac{W}{4} + \frac{1}{2} \times \frac{W}{g} \times \frac{V_c}{t3} \times \frac{\ell}{d}$

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

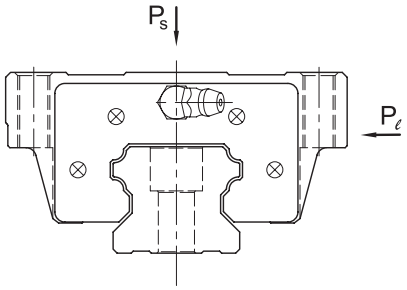
When the load on a linear guideway fluctuates greatly, the variable load condition must be considered in the life calculation. The definition of the mean load is the load equal to the bearing fatigue load under the variable loading conditions. It can be calculated by using table 1.5.

Table 1.5 Calculation Examples for Mean Load (P_m)

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

1-5-3 Calculation for Bidirectional Equivalent Loads

HIWIN linear guideway can accept loads in several directions simultaneously. To calculatethe service life of the guideway when the loads appear in multiple directions, we need to calculate the equivalent load (P_e) by using equations below.



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$$P_e = P_s + P_\ell \quad \text{Eq. 1.5}$$

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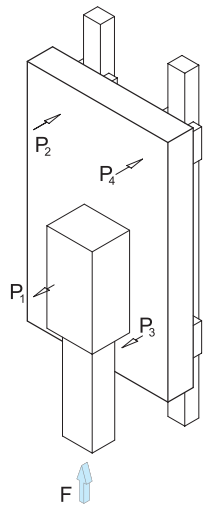
When $P_s > P_\ell$ $\quad P_e = P_s + 0.5 \times P_\ell$ Eq. 1.6

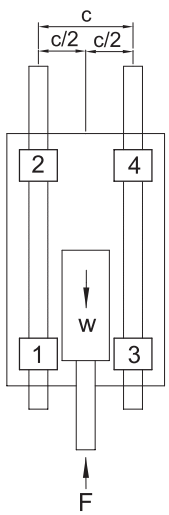
When $P_\ell > P_s$ $\quad P_e = P_\ell + 0.5 \times P_s$ Eq. 1.7

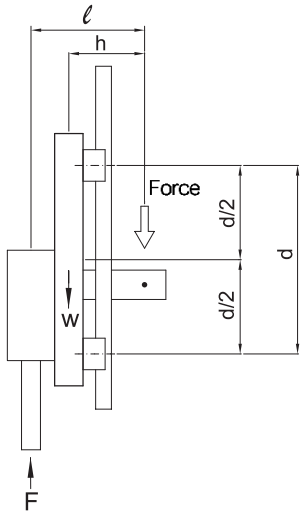
1-5-4 Calculation Example for Service Life

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) : 4 kN
C : 38.74 kN	c : 400 mm	Acting force (F) : 1 kN
C_0 : 83.06 kN	h : 200 mm	Temperature: normal temperature
Preload: ZA	ℓ : 250 mm	Load status: normal load

▸ Calculation of acting loads

$$P_1 \sim P_4 = \frac{W \times h}{2d} - \frac{F \times \ell}{2d} = \frac{4 \times 200}{2 \times 600} - \frac{1 \times 250}{2 \times 600} = 0.458\ (\text{kN})$$

$$P_{max} = 0.458\ (\text{kN})$$

▸ P_C is equal to the sum of P_{max} and preload

$$P_c = P_{max} + P_z = 0.458 + (38.74 \times 0.07) = 3.17\ (\text{kN})$$

▸ Calculation for life L

$$L = \left(\frac{f_h \times f_t \times C}{f_w \times P_c}\right)^3 \times 50 = \left(\frac{1 \times 1 \times 38.74}{2 \times 3.17}\right)^3 \times 50 = 11{,}400\ (\text{km})$$

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.

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

F : Friction (kgf)
S : Friction resistance (kgf)
μ : Coefficient of friction
W : Normal loads (kgf)

1-7 Lubrication

1-7-1 Grease

Each linear guideway is lubricated with lithium soap base grease No. 2 before shipment. After the linear guideway being installed, we recommended that the replenishment should be held every 100 km. It is possible to carry out the lubrication by piping the grease nipple. Generally, the grease is applied for the running speed not over 60 m/min or the cooling function is not important.

$$T = \frac{100 \times 1000}{V_e \times 60} \text{ hr} \quad \text{Eq. 1.9}$$

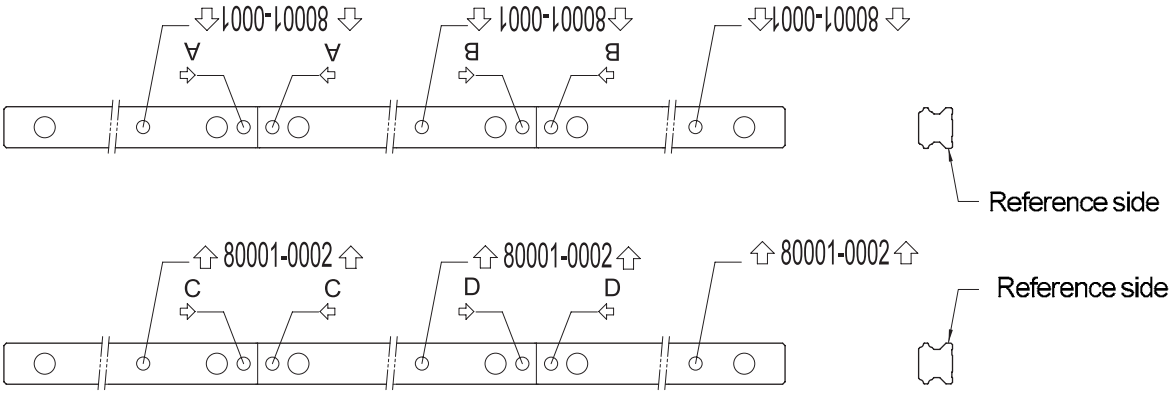
T : Feeding frequency of oil(hour)
V_e : speed(m/min)

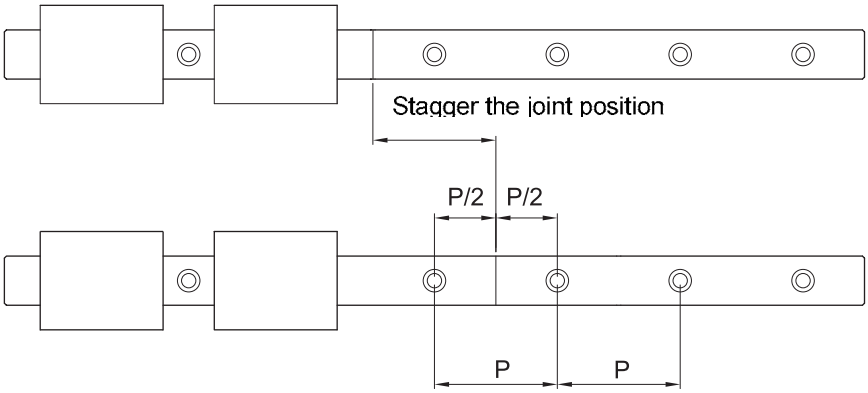
1-7-2 Oil

The recommended viscosity of oil is about 30~150cst. The standard grease nipple may be optionally be replaced by an oil piping joint for oil type lubrication.

Since the oil evaporates quicker than the grease, the recommended oil feeding rate is approximate 0.3cm^3/hr.

1-8 The Butt-joint Rail





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

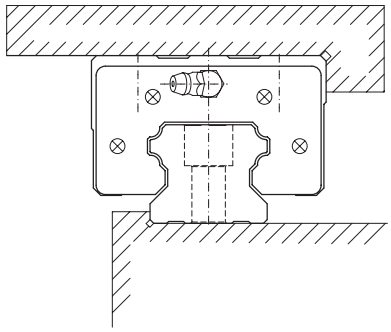
For paired butt-joint rails, the jointed position should be interlaced for avoiding the accuracy problem due to the discrepancies between 2 rails (see figure).

1-9 Mounting Configurations

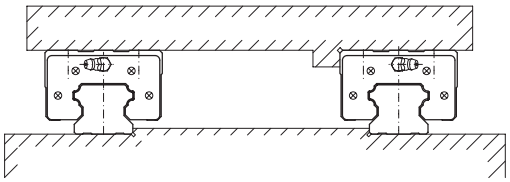
The linear guideway has equal load ratings in the radial, reverse radial and lateral directions. The application depends on the machine requirements and load directions.

The typical layouts for linear guideway are shown below:

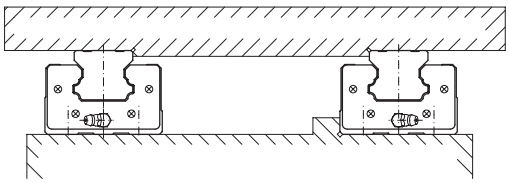
▸ Use of one rail and mounting reference side



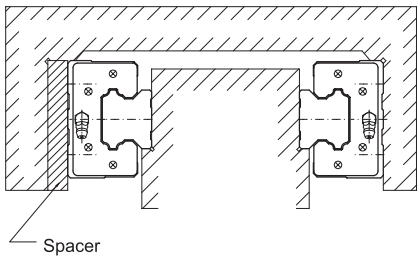
▸ Use of two rails(block movement)



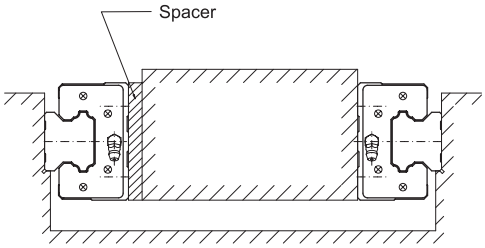
▸ Use of two rails(block fixed)



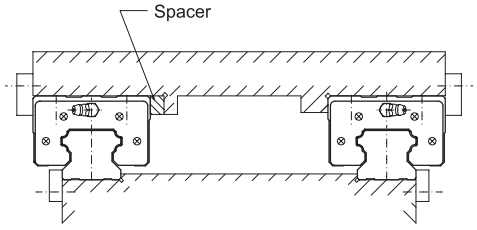
▸ Use of two external rails



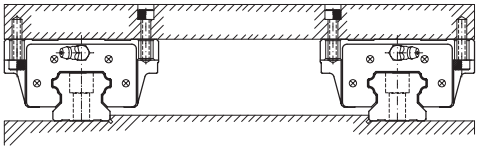
▸ Use of two internal rails



▸ Total surface fixed installation



▸ HGW type block with mounting holes in different directions.

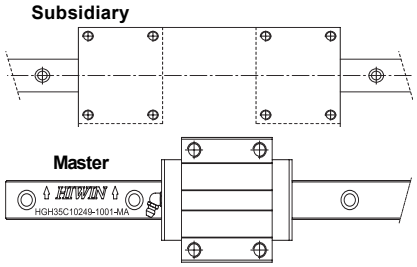


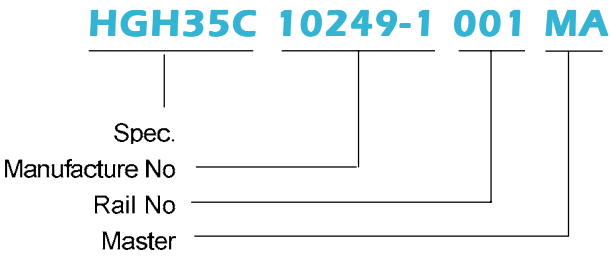
1-10 Mounting Procedures

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

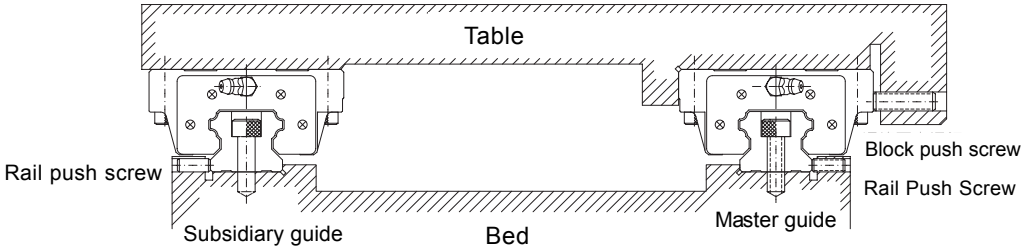
1-10-1 Master and Subsidiary Guide

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





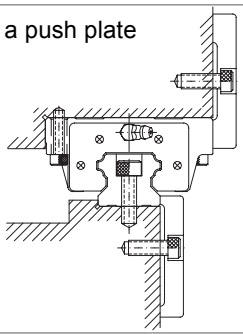
1-10-2 Rigidity and High Accuracy Are Required When The Machine Is Subjected to Vibrations and Impacts



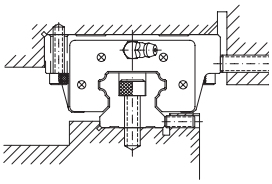
(1) Fixing methods

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.

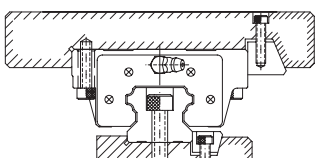
▸ Fixing with a push plate



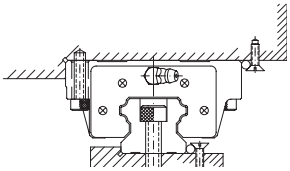
▸ Fixing with push screws



▸ Fixing with taper gib

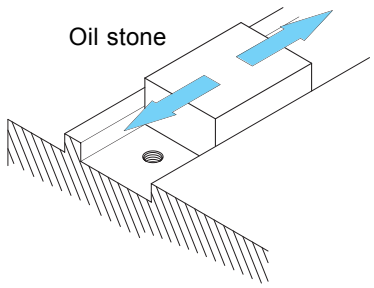


▸ Fixing with needle roller



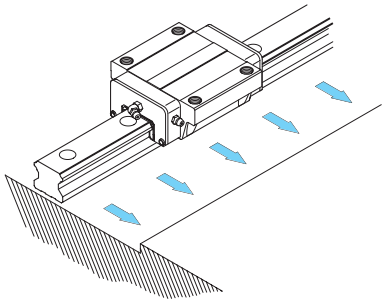
(2) Procedure of rail installation

1



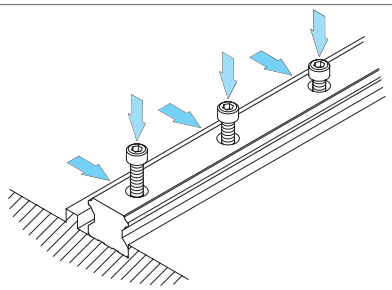
Before starting, remove all dirt from the mounting surface of the machine.

2



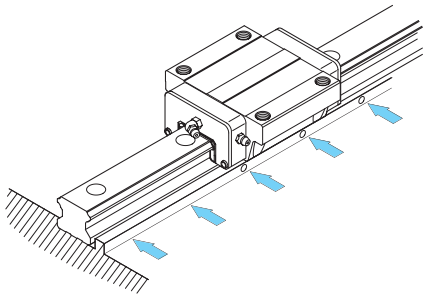
Place the linear guideway gently on the bed. Bring the guideway into close contact with the datum plane of the bed.

3



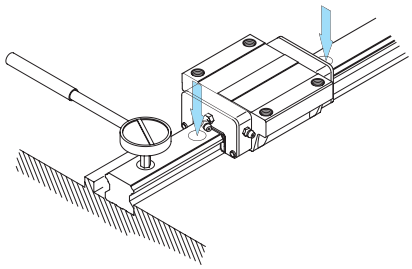
Check for correct thread engagement when inserting a bolt into the mounting hole while the rail is being placed on the mounting surface of the bed.

4



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

5

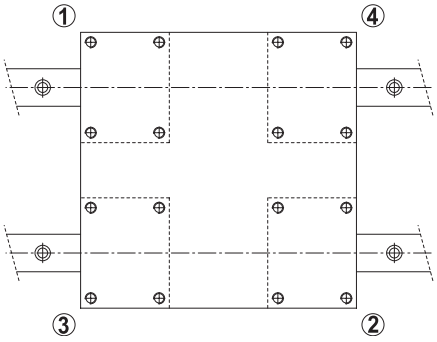


Tighten the mounting bolts with a torque wrench to the specified torque.

6

Install the remaining linear guideway in the same way.

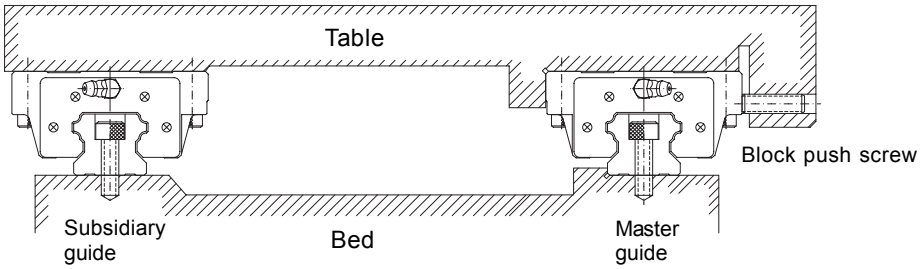
(3) Procedure of block installation



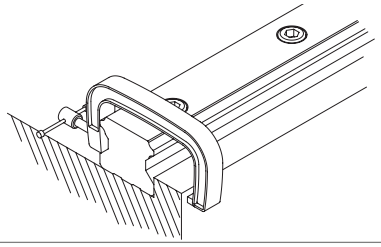
1. Place the table gently on the blocks. Next, tighten the block mounting bolts temporarily.
2. Push the blocks against the datum plane of the table and position the table by tightening the push screws.
3. The table can be fixed uniformly by tightening the mounting bolts on master guide side and subsidiary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

1-10-3 Installation Demonstration for The Case When A Rail On The Master Side Has No Push Screws

To ensure the 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 which mentioned previously.



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

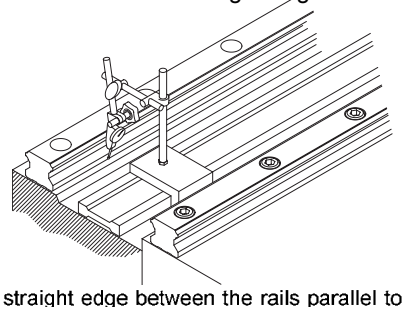


▶ Using a vice

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.

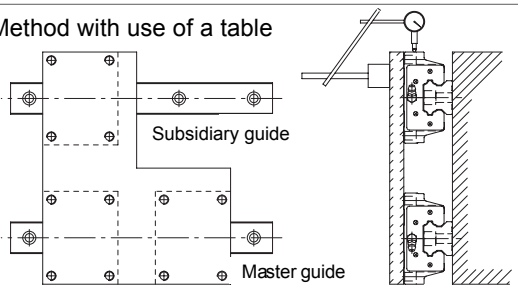
(2) Installation of the rail on the subsidiary guide side

▶Method with use of a straight edge



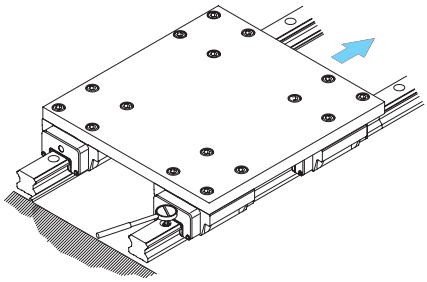
Set a straight edge between the rails parallel to the side datum plane of the rail on the master guide side by using a dial gauge. Use the dial gauge to obtain the straight alignment of the rail on the subsidiary guide side. When the rail on the subsidiary guide side is parallel to the master side, tighten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

▶Method with use of a table



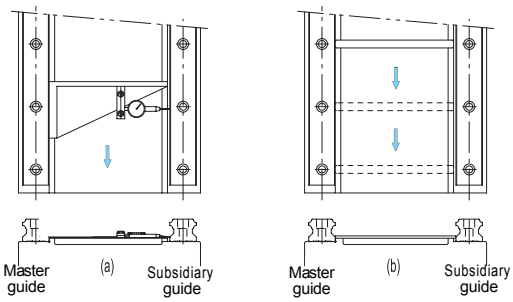
Fix two blocks on the master guide side to the table. Temporarily fix the rail and one block on the subsidiary guide side to the bed and the table. Fixed a dial gauge stand on the table surface and bring it into contact with the side of the block on the subsidiary guide side. Move the table from one 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 on the table. When moving the table from one end of the rail, tighten the mounting bolts on the subsidiary guide side completely.

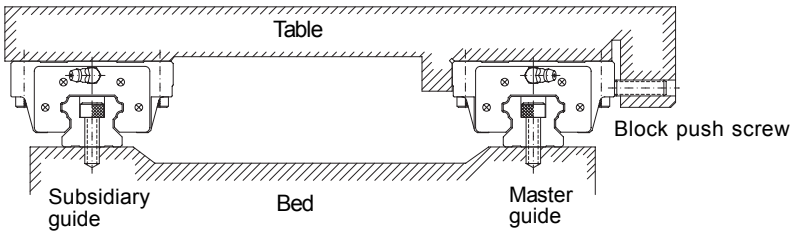
▶Method with use of a jig



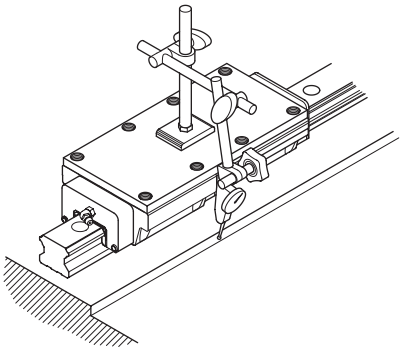
Use a special jig to ensure the rail position on the subsidiary guide side. Tighten the mounting bolts to the specified torque in sequence.

1-10-4 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 which mentioned previously.

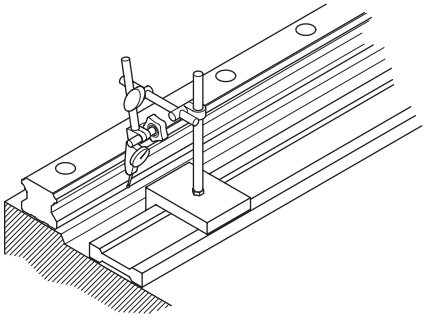


(1) Installation of the rail on the master guide side



▸ 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 blots are tightened securely in sequence.

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

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

2. HIWIN Linear Guideway Product Series

Hiwin has developed manifold products to satisfy various needs of customers. HG series is four-row heavy load capability type for machine tools which requires high accuracy and rigidity; the AG series is low profile type for automation industry which requires high speed and smooth motion; and the MG Series is miniature type for semiconductor equipment and other miniature equipment.

(1) Types & series

Table 2.1 Types & Series

Series	Assembly Height	Load	Square Tap hole	Flange		
				Tap hole	Drilled hole	Combination
HG	High	Heavy Load	HGH-CA	-	-	-
		Super Heavy Load	HGH-HA	-	-	-
	Low	Heavy Load	-	HGW-CA	HGW-CB	HGW-CC
		Super Heavy Load	-	HGW-HA	HGW-HB	HGW-HC
AG	Low	Medium Load	AGH-SA	AGW-SA	AGW-SB	-
		Heavy Load	AGH-CA	AGW-CA	AGW-CB	-
MGN	-	Standard	MGN-C	-	-	-
		Long	MGN-H	-	-	-
MGW	-	Standard	MGW-C	-	-	-
		Long	MGW-H	-	-	-

(2) Accuracy classes

Table 2.2 Accuracy Classes

Series	Assembly Type					Interchangeable Type		
	Normal (C)	High (H)	Precision (P)	Super Precision (SP)	Ultra Precision (UP)	Normal (C)	High (H)	Precision (P)
HG	●	●	●	●	●	●	●	●
AG	●	●	●	●	●	●	●	●
MGN	●	●	●	-	-	●	●	●
MGW	●	●	●	-	-	-	-	-

(3) Classification of preload

Table 2.3 Preload

Four-row Type	Non-interchangeable Type			Interchangeable Type	
	Light preload (Z0)	Medium Preload (ZA)	Heavy Preload (ZB)	Light preload (Z0)	Medium Preload (ZA)
HG	●	●	●	●	●

Four-row Type	Non-interchangeable Type					Interchangeable Type		
	Light Clearance (ZF)	Very Light Preload (Z0)	Light Preload (Z1)	Medium Preload (Z2)	Heavy Preload (Z3)	Light Clearance (ZF)	Very Light Preload (Z0)	Light Preload (Z1)
AG	●	●	●	●	●	●	●	●
MGN	●	●	●	-	-	●	●	●
MGW	●	●	●	-	-	-	-	-

2-1 HG-Series Four-Row Super Heavy Load Linear Guideway

HG series linear guideway 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, HIWIN HG series linear guideway 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 shaped groove has contact point at 45 degrees. HG series can absorb most of the installation - error due to the surface and provide smooth linear motion through the elastic deformation of balls and the shift of contact points. That is, with self-aligning capability, high accuracy and smoothness can be obtained with an easy installation.

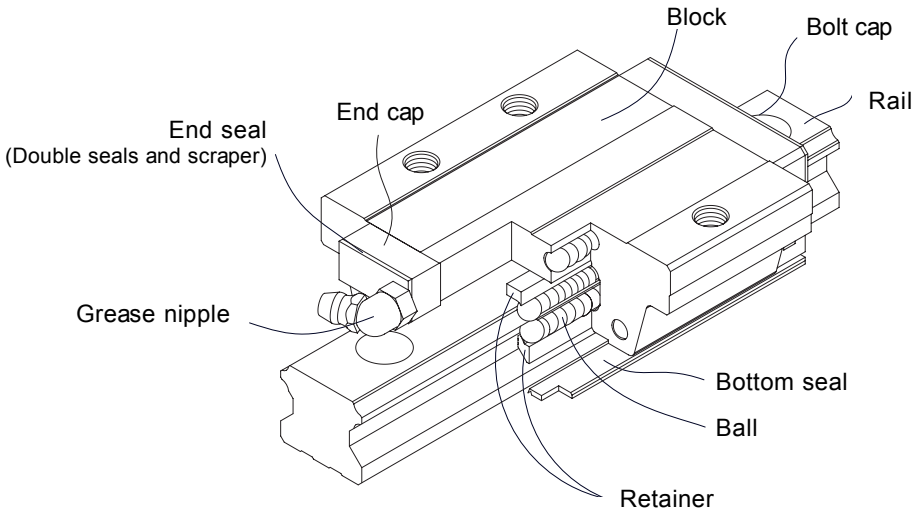
(2) Interchangeability –

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 designed for avoiding 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 shaped groove provides a wide-contact width between the balls and the groove raceway which makes large permissible loading, high rigidity.

2-1-2 Construction of HG Series

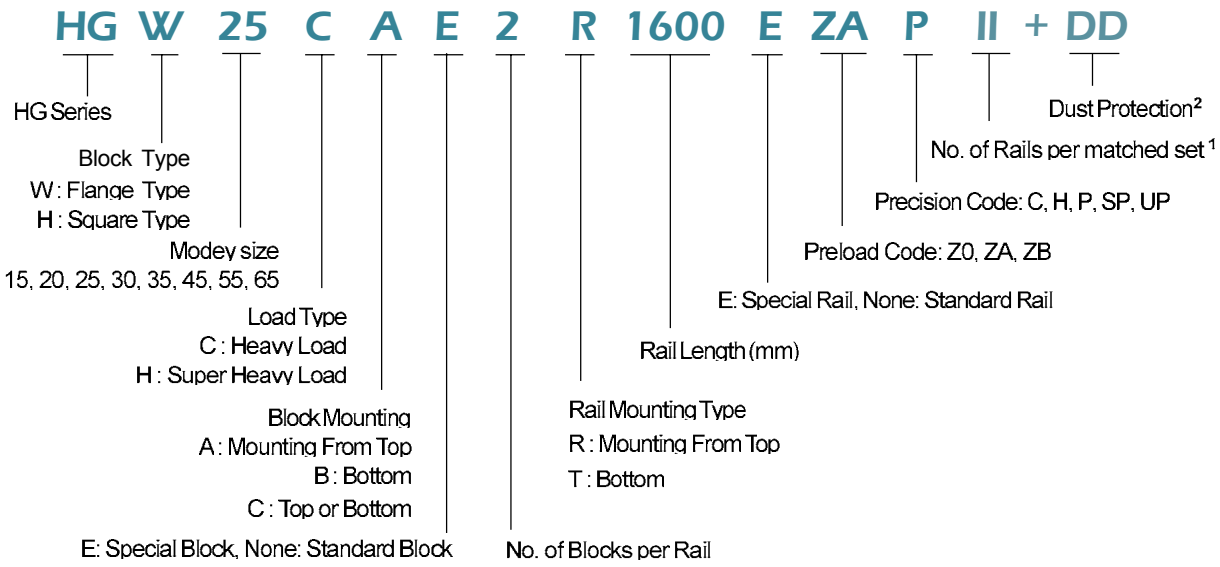


- Rolling circulation system: Block, Rail, End Cap and Retainer
- Lubrication system: Grease Nipple and Piping Joint
- Dust protection system: End seal, Bottom Seal, Bolt Cap, Double Seals and Scraper

2-1-3 Model Number of HG Series

HG series guideway can be classified into non-interchangeable and interchangeable types. The size of two types are identical. The only difference between two types are that the interchangeable type of blocks and rails can be freely exchanged, and their accuracy can reach up to P class. Because of precision dimensional control, the interchangeable type of linear guideway is a wise choice for customer. The model number of HG series contains the size, type, accuracy class, preload class, etc..

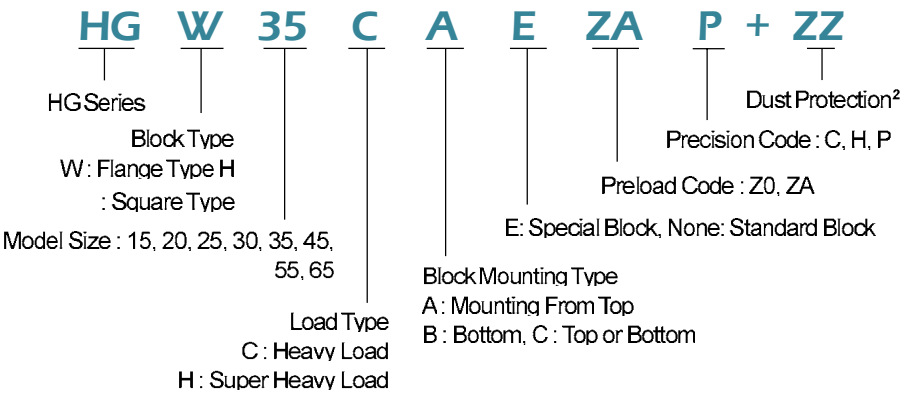
(1)Non-interchangeable type



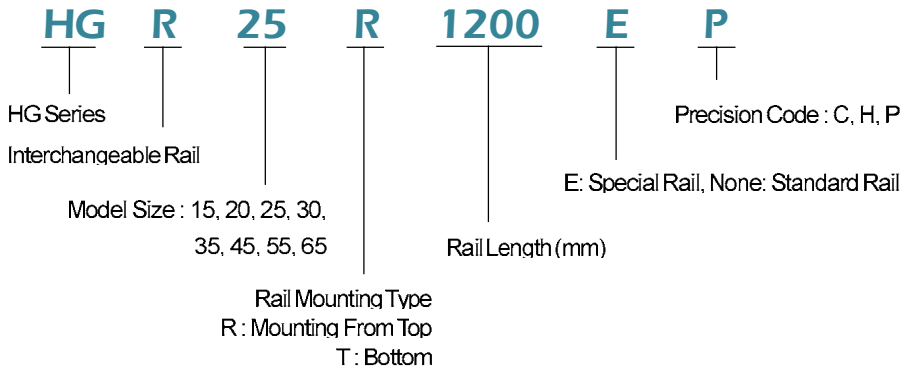
Note: 1. The roman numerals express a matched set of rails.
2. No symbol indicates standard protection (end seal and bottom seal).
ZZ : End seal, bottom seal and scraper
KK: Double seals, bottom seal and scraper.
DD: Double seals and bottom seal

(2)Interchangeable type

▸ **Model Number of HG Block**



▸ **Model Number of HG Rail**

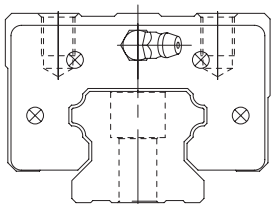
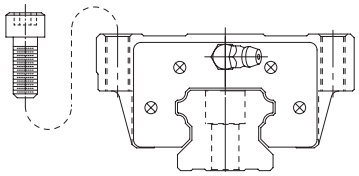
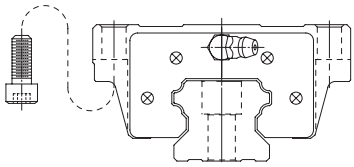
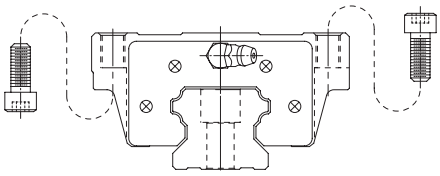


2-1-4 Types

(1)Block types

HIWIN 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.

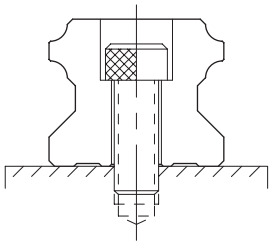
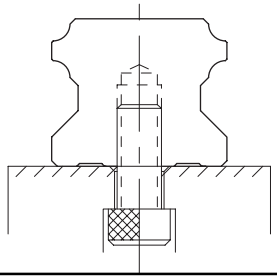
Table 2.4 Block Types

Type	Model	Shape	Height (mm)	Rail Length (mm)	Main Application
Square	HGH-CA HGH-HA		26 ↓ 76	100 ↓ 4000	• Machine Centers • NC Lathes • Grinding Machines • Precision Machining Machines • Heavy Cutting Machines • Automation Devices • Transportation Equipment • Measuring Equipment • Devices Requiring High Positional Accuracy
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)Rail types

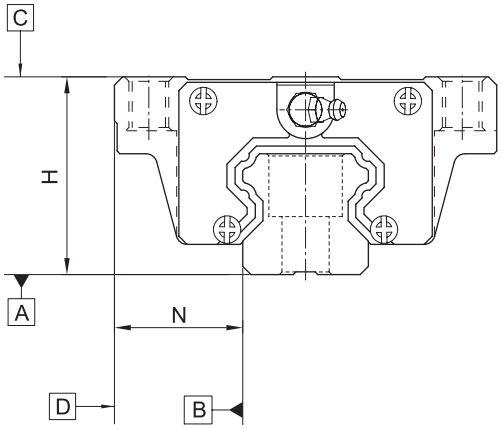
Besides the standard top mounting type, HIWIN also offers the bottom mounting type of rails to customers.

Table 2.5 Rail Types

Mounting from Top	Mounting from bottom
	

2-1-5 Accuracy Classes

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



(1)Accuracy of non-interchangeable

Table 2.6 Accuracy Standards

Unit: mm

Item	HG - 15, 20				
Accuracy Classes	Normal (C)	High (H)	Precision (P)	Super Precision (SP)	Ultra Precision (UP)
Dimensional tolerance of height H	± 0.1	± 0.03	0 - 0.03	0 - 0.015	0 - 0.008
Dimensional tolerance of width N	± 0.1	± 0.03	0 - 0.03	0 - 0.015	0 - 0.008
Variation of height H	0.02	0.01	0.006	0.004	0.003
Variation of width N	0.02	0.01	0.006	0.004	0.003
Running parallelism of block surface C to surface A	See Table 2.8				
Running parallelism of block surface D to surface B	See Table 2.8				

Item	HG - 25, 30, 35				
Accuracy Classes	Normal (C)	High (H)	Precision (P)	Super Precision (SP)	Ultra Precision (UP)
Dimensional tolerance of height H	± 0.1	± 0.04	0 - 0.04	0 - 0.02	0 - 0.01
Dimensional tolerance of width N	± 0.1	± 0.04	0 - 0.04	0 - 0.02	0 - 0.01
Variation of height H	0.02	0.015	0.007	0.005	0.003
Variation of width N	0.03	0.015	0.007	0.005	0.003
Running parallelism of block surface C to surface A	See Table 2.8				
Running parallelism of block surface D to surface B	See Table 2.8				

Item	HG - 45, 55				
Accuracy Classes	Normal (C)	High (H)	Precision (P)	Super Precision (SP)	Ultra Precision (UP)
Dimensional tolerance of height H	± 0.1	± 0.05	0 - 0.05	0 - 0.03	0 - 0.02
Dimensional tolerance of width N	± 0.1	± 0.05	0 - 0.05	0 - 0.03	0 - 0.02
Variation of height H	0.03	0.015	0.007	0.005	0.003
Variation of width N	0.03	0.02	0.01	0.007	0.005
Running parallelism of block surface C to surface A	See Table 2.8				
Running parallelism of block surface D to surface B	See Table 2.8				

Item	HG - 65				
Accuracy Classes	Normal (C)	High (H)	Precision (P)	Super Precision (SP)	Ultra Precision (UP)
Dimensional tolerance of height H	± 0.1	± 0.07	0 - 0.07	0 - 0.05	0 - 0.03
Dimensional tolerance of width N	± 0.1	± 0.07	0 - 0.07	0 - 0.05	0 - 0.03
Variation of height H	0.03	0.02	0.01	0.007	0.005
Variation of width N	0.03	0.025	0.015	0.01	0.007
Running parallelism of block surface C to surface A	See Table 2.8				
Running parallelism of block surface D to surface B	See Table 2.8				

(2)Accuracy of interchangeable

Table 2.7 Accuracy Standards

Unit: mm

Item	HG - 15, 20		
Accuracy Classes	Normal(C)	High(H)	Precision(P)
Dimensional tolerance of height H	± 0.1	± 0.03	± 0.015
Dimensional tolerance of width N	± 0.1	± 0.03	± 0.015
Variation of height H	0.02	0.01	0.006
Variation of width N	0.02	0.01	0.006
Running parallelism of block surface C to surface A	See Table 2.8		
Running parallelism of block surface D to surface B	See Table 2.8		

Item	HG - 25, 30, 35		
Accuracy Classes	Normal(C)	High(H)	Precision(P)
Dimensional tolerance of height H	± 0.1	± 0.04	± 0.02
Dimensional tolerance of width N	± 0.1	± 0.04	± 0.02
Variation of height H	0.02	0.015	0.007
Variation of width N	0.03	0.015	0.007
Running parallelism of block surface C to surface A	See Table 2.8		
Running parallelism of block surface D to surface B	See Table 2.8		

Item	HG - 45, 55		
Accuracy Classes	Normal(C)	High(H)	Precision(P)
Dimensional tolerance of height H	± 0.1	± 0.05	± 0.025
Dimensional tolerance of width N	± 0.1	± 0.05	± 0.025
Variation of height H	0.03	0.015	0.007
Variation of width N	0.03	0.02	0.01
Running parallelism of block surface C to surface A	See Table 2.8		
Running parallelism of block surface D to surface B	See Table 2.8		

Item	HG - 65		
Accuracy Classes	Normal(C)	High(H)	Precision(P)
Dimensional tolerance of height H	± 0.1	± 0.07	± 0.035
Dimensional tolerance of width N	± 0.1	± 0.07	± 0.035
Variation of height H	0.03	0.02	0.01
Variation of width N	0.03	0.025	0.015
Running parallelism of block surface C to surface A	See Table 2.8		
Running parallelism of block surface D to surface B	See Table 2.8		

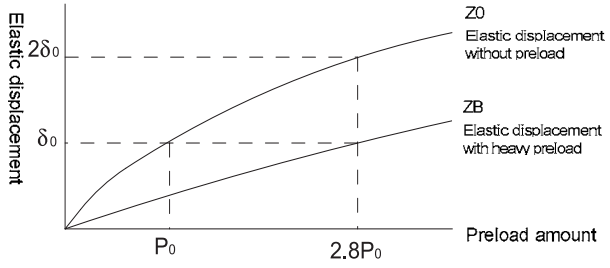
(3)Accuracy of running parallelism

Table 2.8 Accuracy of Running Parallelism

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

2-1-6 Preload

(1)Definition



A preload can be applied to each guideway. Oversized balls are used. Generally, a linear motion guideway has a negative clearance between groove and balls in order to improve stiffness and maintain high precision. The figure shows the load is multiplied by the preload, the rigidity is doubled and the deflection is reduced by one half. The preload not larger than ZA would be recommended for the model size under HG20 to avoid over-perload affecting the guideway's life.

(2)Preload classes

HIWIN offers three classes standard preload for various applications and conditions.

Table 2.9 Preload Classes

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

Note : 1. The C in preload column means basic dynamic load rating.
2. Preload Classes of Interchangeable Guideway: **Z0, ZA.**
Preload Classes of Non-Interchangeable Guideway: **Z0, ZA, ZB**

2-1-7 Stiffness

To determine if the rigidity will affect the accuracy, check the value of rigidity corresponding to the preload amount.

$$\delta = \frac{P}{k} \ \mu m \qquad \text{Eq. 2.1}$$

δ : Deflection
P : Working load (kN)
k : Value of rigidity

Table 2.10 Value of Rigidity

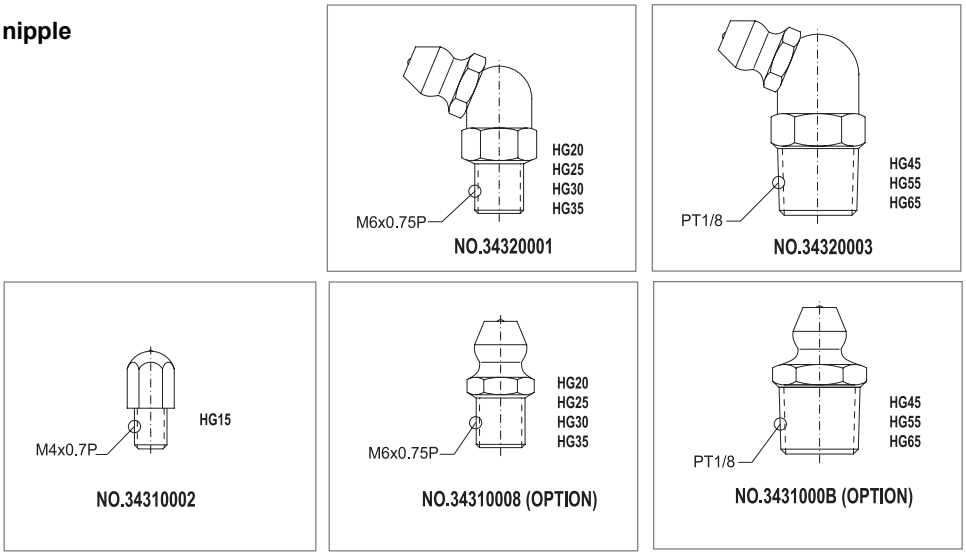
Type	Size	Z0 kN/μm	ZA kN/μm	ZB kN/μm
Heavy load	HG 15C	0.38	0.46	0.51
	HG 20C	0.46	0.54	0.62
	HG 25C	0.52	0.63	0.73
	HG 30C	0.63	0.77	0.90
	HG 35C	0.68	0.83	0.98
	HG 45C	0.80	0.94	1.09
	HG 55C	0.95	1.08	1.23
	HG 65C	1.08	1.21	1.34
Super heavy load	HG 20H	0.56	0.67	0.77
	HG 25H	0.67	0.81	0.95
	HG 30H	0.80	0.97	1.15
	HG 35H	0.86	1.06	1.26
	HG 45H	1.02	1.20	1.40
	HG 55H	1.21	1.38	1.57
	HG 65H	1.46	1.62	1.80

Note: 1kgf = 9.81N

2-1-8 Lubrication

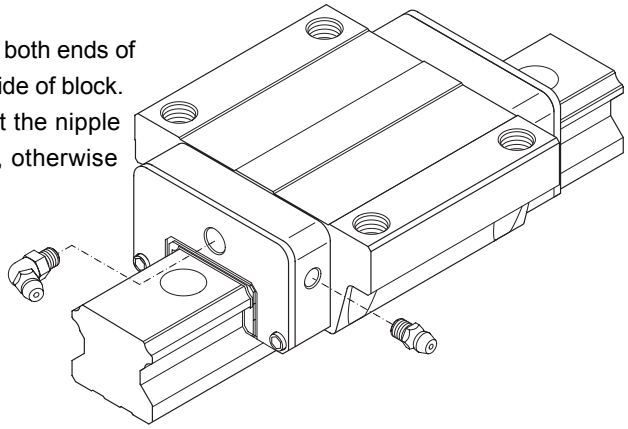
(1) Grease

▸ **Grease nipple**



▸ **Mounting location**

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



▸ **The lubricant amount for a block filled with grease**

Table 2.11 The lubricant Amount for a Block Filled with Grease

Size	Heavy load (cm^3)	Super heavy load (cm^3)	Size	Heavy load (cm^3)	Super heavy load (cm^3)
HG 15	1	-	HG 35	10	12
HG 20	2	3	HG 45	17	21
HG 25	5	6	HG 55	26	33
HG 30	7	8	HG 65	50	61

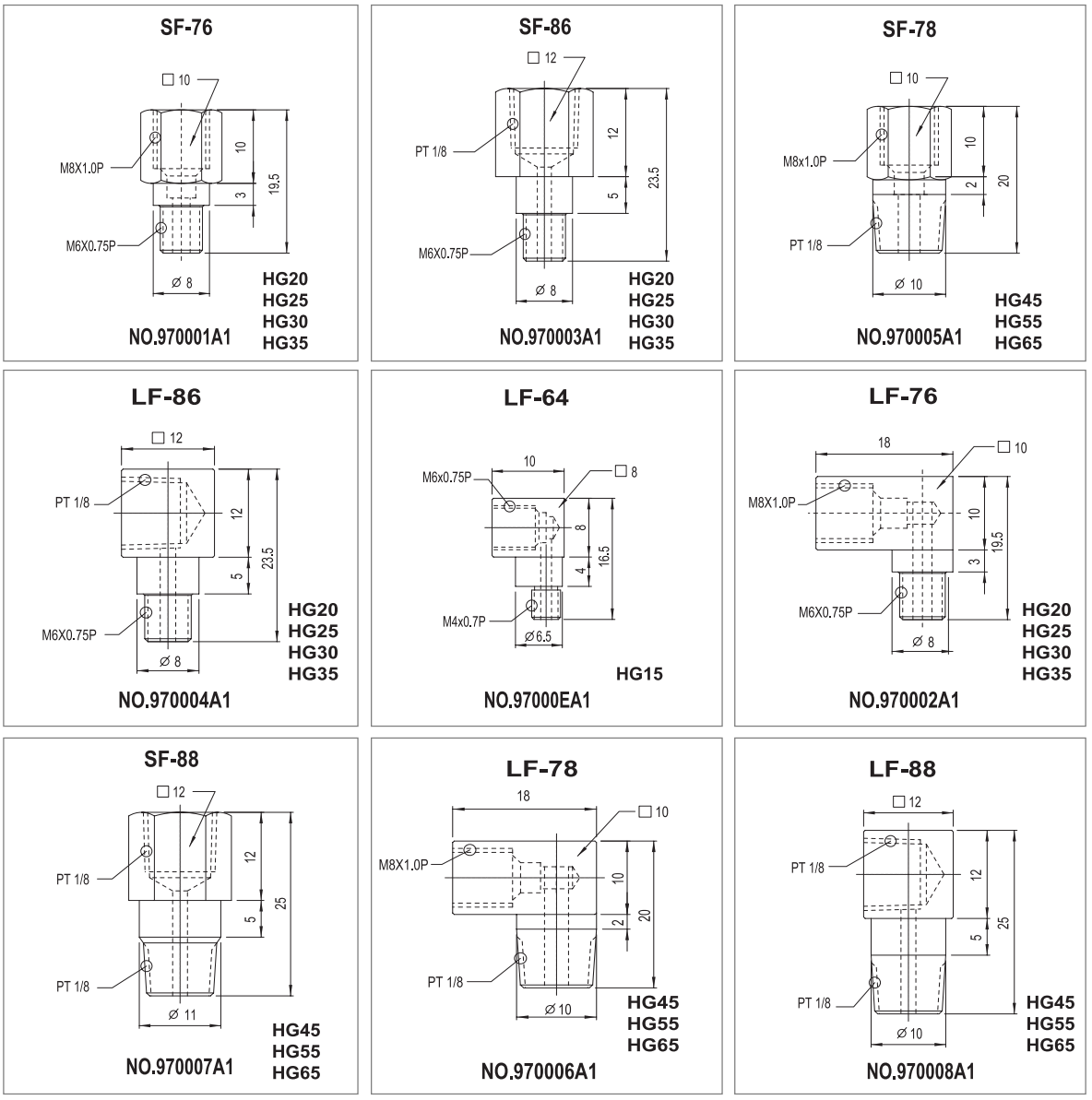
▸ **Frequency of replenishment**

Replenishing the lubricant every 100km.

(2) Oil

The recommended viscosity of oil is about 30~150cSt. If customers need to use the oil-type lubrication, please inform us, and the block will not be prelubricated with grease before shipment.

▸ **Types of oil piping joint**



▸ Oil refilling rate

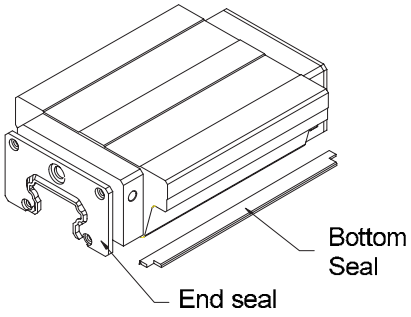
Table 2.12

Size	Refilling rate (cm^3/hr)	Size	Refilling rate (cm^3/hr)
HG15	0.2	HG35	0.3
HG20	0.2	HG45	0.4
HG25	0.3	HG55	0.5
HG30	0.3	HG65	0.6

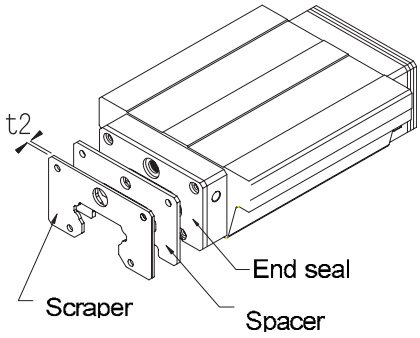
2-1-9 Dust Proof Accessories

(1) Codes of accessories

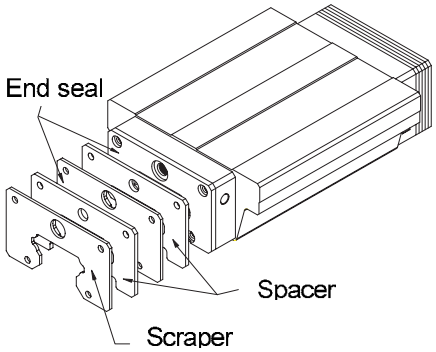
If the following accessories are needed, please add the code followed by the model number.



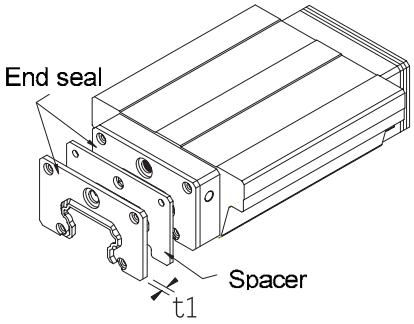
No symbol: Standard Protection
(End seal + Bottom Seal)



ZZ (End seal + Bottom Seal + Scraper)



KK (Double seals + Bottom Seal + Scraper)



DD (Double seals + Bottom Seal)

(2)End seal and bottom seal

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

(3)Double seals

Enhancing the wiping effect, the foreign matters can be completely wiped off.

Table 2.13 Order number of end seal

Size	Part No.	Thickness (t1) mm	Size	Part No.	Thickness (t1) mm
HG15	920019A1	3	HG35	920015A1	3.2
HG20	920018A1	3	HG45	92001AA1	4.5
HG25	920017A1	3	HG55	92001BA1	5
HG30	920016A1	3.2	HG65	92001CA1	5

(4) Scraper

The scraper has the ability of isolating the high-temp. iron chips and removing the big foreign objects.

Table 2.14 Order number of scraper

Size	Part No.	Thickness (t2) mm	Size	Part No.	Thickness (t2) mm
HG15	98000HA1	1.5	HG35	98000LA1	1.5
HG20	98000IA1	1.5	HG45	98000MA1	1.5
HG25	98000JA1	1.5	HG55	98000NA1	1.7
HG30	98000KA1	1.5	HG65	98000PA1	1.7

(5)Caps for rail mounting holes

The caps are used to cover the mounting holes to prevent chips or other foreign objects entering the holes. The caps will be enclosed in each rail packing

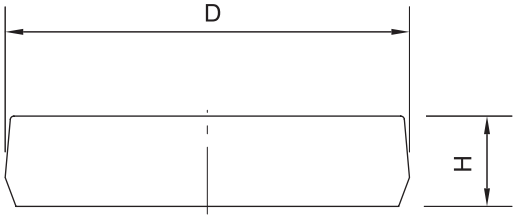


Table 2.15 Caps for Rail Mounting Holes

Rail size	Bolt size	Part No.	Diameter(D) mm	Thickness(H) mm
HGR15	M4	950002C1	7.7	1.1
HGR20	M5	950003C1	9.7	2.2
HGR25	M6	950004C1	11.3	2.5
HGR30	M8	950005C1	14.3	3.3
HGR35	M8	950005C1	14.3	3.3
HGR45	M12	950007C1	20.3	4.6
HGR55	M14	950008A1	23.5	5.5
HGR65	M16	950009A1	26.6	5.5

2-1-10 Friction

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

Table 2.16 Seal Resistance

Size	Resistance (kgf)	Size	Resistance (kgf)
HG 15	0.12	HG 35	0.31
HG 20	0.16	HG 45	0.39
HG 25	0.20	HG 55	0.47
HG 30	0.27	HG 65	0.59

2-1-11 The Accuracy Tolerance of Mounting Surface

(1) The accuracy tolerance of rail-mounting surface

Because of the Circular-arc contact design, the HG linear guideway can stand the surface-error of installation and obtain smooth linear motion.

As long as following the accuracy requirements of mounting surface, the high accuracy and rigidity of linear motion guideway should be obtained without any difficulty. In order to satisfy the needs of fast installation and smooth movement, HIWIN offers the normal clearance type of preload to customers for its high absorption ability for the deviation of mounting surface accuracy.

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

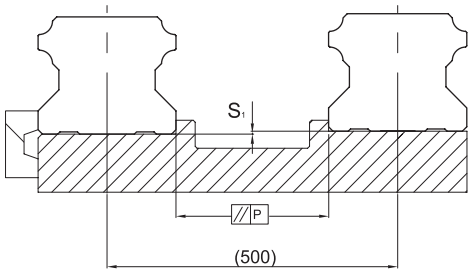


Table 2.17 Max. Parallelism Tolerance (P)

unit: μm

Size	Preload classes		
	Z0	ZA	ZB
HG 15	25	18	-
HG 20	25	20	18
HG 25	30	22	20
HG 30	40	30	27
HG 35	50	35	30
HG 45	60	40	35
HG 55	70	50	45
HG 65	80	60	55

(3)The accuracy tolerance of reference surface height

Table 2.18 Max. Tolerance of Reference Surface Height (S_1)

unit: μm

Size	Preload classes		
	Z0	ZA	ZB
HG 15	130	85	-
HG 20	130	85	50
HG 25	130	85	70
HG 30	170	110	90
HG 35	210	150	120
HG 45	250	170	140
HG 55	300	210	170
HG 65	350	250	200

2-1-12 Cautions for Installation

(1)Shoulder heights and fillets

The improper shoulder heights and fillets of mounting surfaces will cause the deviation of accuracy and the interference with the chamfered part of the rail or block.

As long as the recommended shoulder heights and fillets are followed, the accuracy problem of installation should be eliminated.

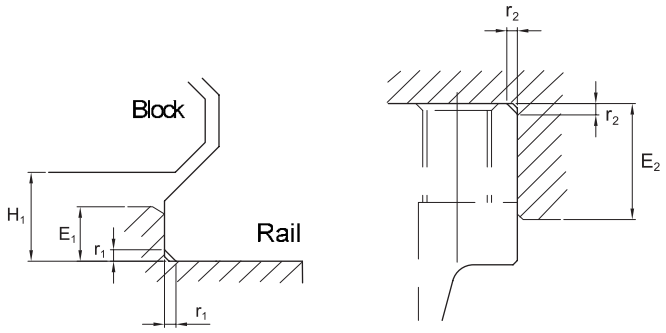


Table 2.19 Shoulder Heights and Fillets

Size	Max. radius of fillets r_1 (mm)	Max. radius of fillets r_2 (mm)	Shoulder height of the rail E_1 (mm)	Shoulder height of the block E_2 (mm)	Clearance under block H_1 (mm)
HG15	0.5	0.5	3	4	4.3
HG20	0.5	0.5	3.5	5	4.6
HG25	1.0	1	5	5	5.5
HG30	1.0	1	5	5	6
HG35	1.0	1	6	6	7.5
HG45	1.0	1	8	8	9.5
HG55	1.5	1.5	10	10	13
HG65	1.5	1.5	10	10	15

(2)Tightening Torque of Bolts for Installation

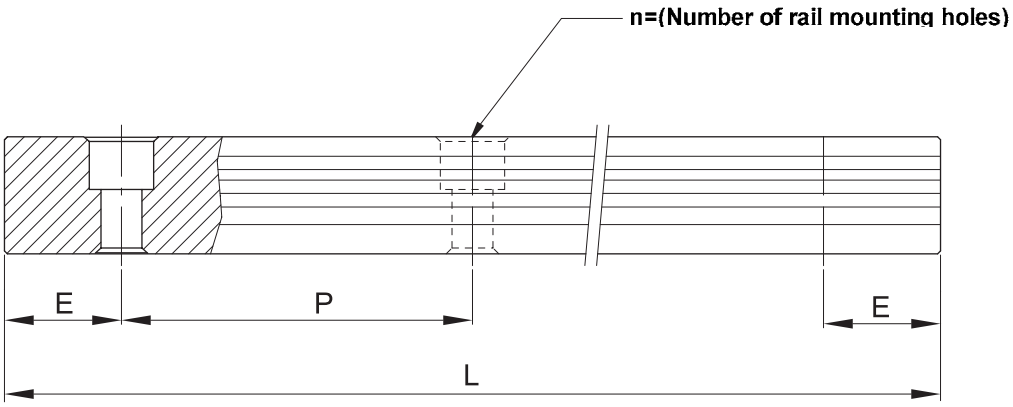
The improper tightening of bolts will influence the accuracy of Linear Guideway seriously, so that the following tightening torque for different sizes of bolt is recommended.

Table 2.20 Mounting Torque

Size	Bolt size	Torque N-cm (kgf-cm)	Size	Bolt size	Torque N-cm (kgf-cm)
HG 15	M4 x 0.7P x 16L	392(40)	HG 35	M8 x 1.25P x 25L	3,041(310)
HG 20	M5 x 0.8P x 16L	883(90)	HG 45	M12 x 1.75P x 35L	11,772(1,200)
HG 25	M6 x 1P x 20L	1373(140)	HG 55	M14 x 2P x 45L	15,696(1,600)
HG 30	M8 x 1.25P x 25L	3041(310)	HG 65	M16 x 2P x 50L	19,620(2,000)

2-1-13 Standard Length and Max. Length of Rail

HIWIN has offered the standard length of rails for customer needs. As for the non-standard E value, to avoid the unstable end part of rail, it is recommended the E value should not be over 1/2 of pitch (P). On the other hand, the E value should not be less than the E_{min} due to the breaking of mounting hole.



$$L = (n - 1) \times P + 2 \times E \quad \text{Eq. 2.2}$$

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 2.21 Rail Standard Length and Max. Length

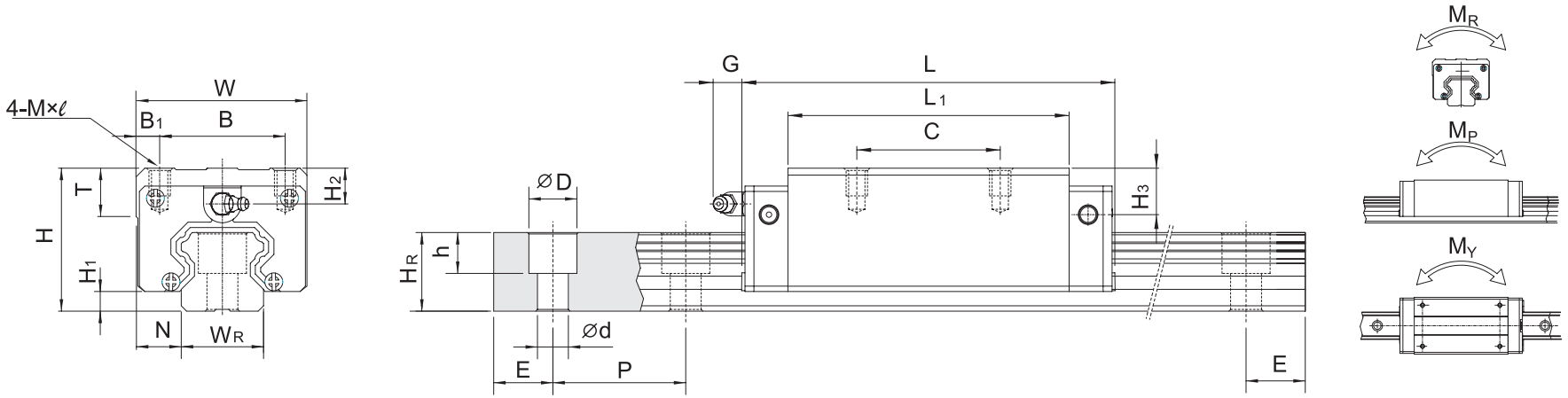
Unit : mm

Item	HG15	HG20	HG25	HG30	HG35	HG45	HG55	HG65
Standard Length L(n)	160(3)	220(4)	220(4)	280(4)	280(4)	570(6)	780(7)	1,270(9)
	220(4)	280(5)	280(5)	440(6)	440(6)	885(9)	1,020(9)	1,570(11)
	280(5)	340(6)	340(6)	600(8)	600(8)	1,200(12)	1,260(11)	2,020(14)
	340(6)	460(8)	460(8)	760(10)	760(10)	1,620(16)	1,500(13)	2,620(18)
	460(8)	640(11)	640(11)	1,000(13)	1,000(13)	2,040(20)	1,980(17)	
	640(11)	820(14)	820(14)	1,640(21)	1,640(21)	2,460(24)	2,580(22)	
	820(14)	1,000(17)	1,000(17)	2,040(26)	2,040(26)	2,985(29)	2,940(25)	
		1,240(21)	1,240(21)	2,520(32)	2,520(32)			
			1,600(27)	3,000(38)	3,000(38)			
Pitch (P)	60	60	60	80	80	105	120	150
Distance to End (E_s)	20	20	20	20	20	22.5	30	35
Max. Standard Length	1,960(33)	4,000(67)	4,000(67)	3,960(50)	3,960(50)	3,930(38)	3,900(32)	3,970(26)
Max. Length	2,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000

Note : 1. Tolerance of E value for standard rail is 0.5~-0.5 mm. Tolerance of E value for butt-joint is 0~-0.3 mm.
2. Maximum standard length means the max. rail length with standard E value on both sides.
3. If different E value is needed, please contact HIWIN.

2-1-14 Dimensions for HIWIN HG Series

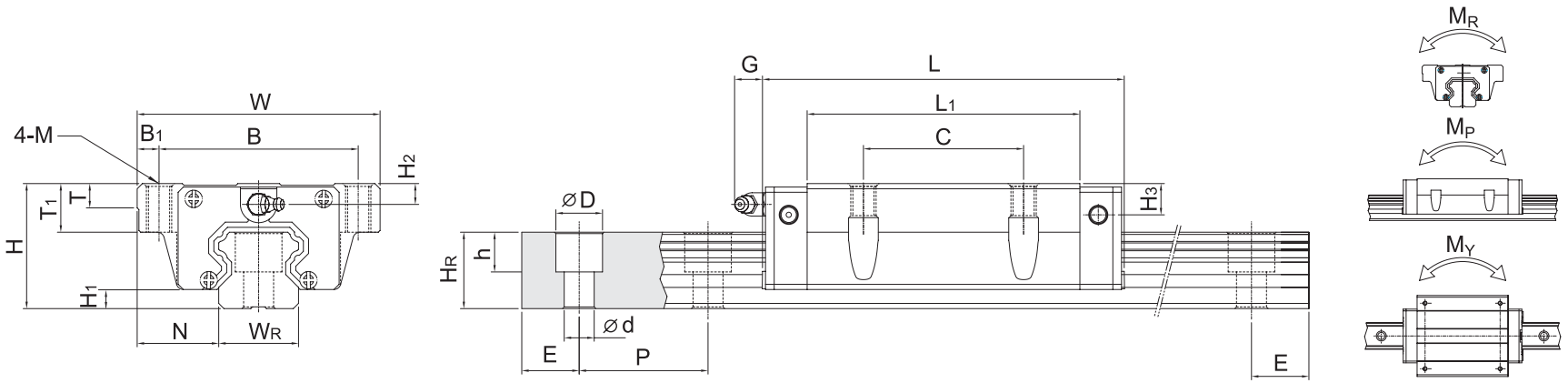
(1) HGH-CA / HGH-HA



Model No.	Dimensions of Assembly (mm)			Dimensions of Block (mm)											Dimensions of Rail (mm)							Mounting Bolt for Rail (mm)	Basic Dynamic Load Rating C (kN)	Basic Static Load Rating C_0 (kN)	Static Rated Moment			Weight	
	H	H_1	N	W	B	B_1	C	L_1	L	G	M x ℓ	T	H_2	H_3	W_R	H_R	D	h	d	P	E				M_R (kN-m)	M_P (kN-m)	M_Y (kN-m)	Block (kg)	Rail (kg/m)
HGH 15CA	28	4.3	9.5	34	26	4	26	39.4	61.4	5.3	M4x5	6	8.5	9.5	15	15	7.5	5.3	4.5	60	20	M4x16	11.38	25.31	0.17	0.15	0.15	0.18	1.45
HGH 20CA	30	4.6	12	44	32	6	36	50.5	75.6	12	M5x6	8	6	7	20	17.5	9.5	8.5	6	60	20	M5x16	17.75	37.84	0.38	0.27	0.27	0.30	2.21
HGH 20HA							50	65.2	90.3														21.18	48.84	0.48	0.47	0.47	0.39	
HGH 25CA	40	5.5	12.5	48	35	6.5	35	58	83	12	M6x8	8	10	13	23	22	11	9	7	60	20	M6x20	26.48	56.19	0.64	0.51	0.51	0.51	3.21
HGH 25HA							50	78.6	103.6														32.75	76.00	0.87	0.88	0.88	0.69	
HGH 30CA	45	6	16	60	40	10	40	70	97.4	12	M8x10	8.5	9.5	13.8	28	26	14	12	9	80	20	M8x25	38.74	83.06	1.06	0.85	0.85	0.88	4.47
HGH 30HA							60	93	120.4														47.27	110.13	1.40	1.47	1.47	1.16	
HGH 35CA	55	7.5	18	70	50	10	50	80	112.4	12	M8x12	10.2	16	19.6	34	29	14	12	9	80	20	M8x25	49.52	102.87	1.73	1.20	1.20	1.45	6.30
HGH 35HA							72	105.8	138.2														60.21	136.31	2.29	2.08	2.08	1.92	
HGH 45CA	70	9.5	20.5	86	60	13	60	97	138	12.9	M10x17	16	18.5	30.5	45	38	20	17	14	105	22.5	M12x35	77.57	155.93	3.01	2.35	2.35	2.73	10.41
HGH 45HA							80	128.8	169.8														94.54	207.12	4.00	4.07	4.07	3.61	
HGH 55CA	80	13	23.5	100	75	12.5	75	117.7	165.7	12.9	M12x18	17.5	22	29	53	44	23	20	16	120	30	M14x45	114.44	227.81	5.66	4.06	4.06	4.17	15.08
HGH 55HA							95	155.8	203.8														139.35	301.26	7.49	7.01	7.01	5.49	
HGH 65CA	90	15	31.5	126	76	25	70	144.2	198.2	12.9	M16x20	25	15	15	63	53	26	22	18	150	35	M16x50	163.63	324.71	10.02	6.44	6.44	7.00	21.18
HGH 65HA							120	203.6	257.6														208.36	457.15	14.15	11.12	11.12	9.82	

Note : 1 kgf = 9.81 N

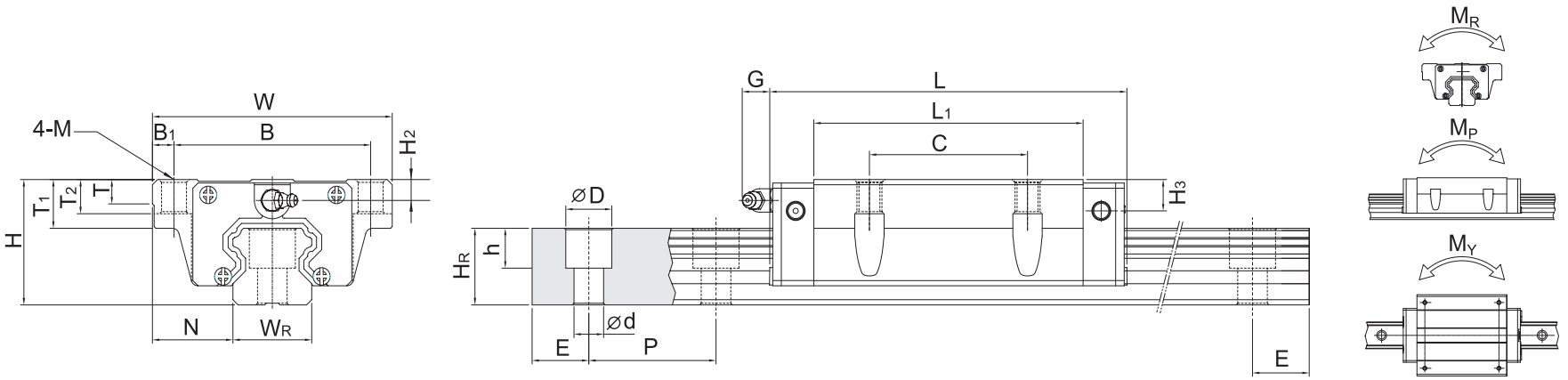
(2) HGW-CA / HGW-HA



Model No.	Dimensions of Assembly (mm)			Dimensions of Block (mm)												Dimensions of Rail (mm)							Mounting Bolt for Rail (mm)	Basic Dynamic Load Rating C (kN)	Basic Static Load Rating C_0 (kN)	Static Rated Moment			Weight	
	H	H_1	N	W	B	B_1	C	L_1	L	G	M	T	T_1	H_2	H_3	W_R	H_R	D	h	d	P	E				M_R (kN-m)	M_P (kN-m)	M_Y (kN-m)	Block (kg)	Rail (kg/m)
HGW 15CA	24	4.3	16	47	38	4.5	30	39.4	61.4	5.3	M5	6	8.9	4.5	5.5	15	15	7.5	5.3	4.5	60	20	M4x16	11.38	25.31	0.17	0.15	0.15	0.17	1.45
HGW 20CA	30	4.6	21.5	63	53	5	40	50.5	75.6	12	M6	8	10	6	7	20	17.5	9.5	8.5	6	60	20	M5x16	17.75	37.84	0.38	0.27	0.27	0.40	2.21
HGW 20HA								65.2	90.3															21.18	48.84	0.48	0.47	0.47	0.52	
HGW 25CA	36	5.5	23.5	70	57	6.5	45	58	83	12	M8	8	14	6	9	23	22	11	9	7	60	20	M6x20	26.48	56.19	0.64	0.51	0.51	0.59	3.21
HGW 25HA								78.6	103.6															32.75	76.00	0.87	0.88	0.88	0.80	
HGW 30CA	42	6	31	90	72	9	52	70	97.4	12	M10	8.5	16	6.5	10.8	28	26	14	12	9	80	20	M8x25	38.74	83.06	1.06	0.85	0.85	1.09	4.47
HGW 30HA								93	120.4															47.27	110.13	1.40	1.47	1.47	1.44	
HGW 35CA	48	7.5	33	100	82	9	62	80	112.4	12	M10	10.1	18	9	12.6	34	29	14	12	9	80	20	M8x25	49.52	102.87	1.73	1.20	1.20	1.56	6.30
HGW 35HA								105.8	138.2															60.21	136.31	2.29	2.08	2.08	2.06	
HGW 45CA	60	9.5	37.5	120	100	10	80	97	138	12.9	M12	15.1	22	8.5	20.5	45	38	20	17	14	105	22.5	M12x35	77.57	155.93	3.01	2.35	2.35	2.79	10.41
HGW 45HA								128.8	169.8															94.54	207.12	4.00	4.07	4.07	3.69	
HGW 55CA	70	13	43.5	140	116	12	95	117.7	165.7	12.9	M14	17.5	26.5	12	19	53	44	23	20	16	120	30	M14x45	114.44	227.81	5.66	4.06	4.06	4.52	15.08
HGW 55HA								155.8	203.8															139.35	301.26	7.49	7.01	7.01	5.96	
HGW 65CA	90	15	53.5	170	142	14	110	144.2	198.2	12.9	M16	25	37.5	15	15	63	53	26	22	18	150	35	M16x50	163.63	324.71	10.02	6.44	6.44	9.17	21.18
HGW 65HA								203.6	257.6															208.36	457.15	14.15	11.12	11.12	12.89	

Note : 1 kgf = 9.81 N

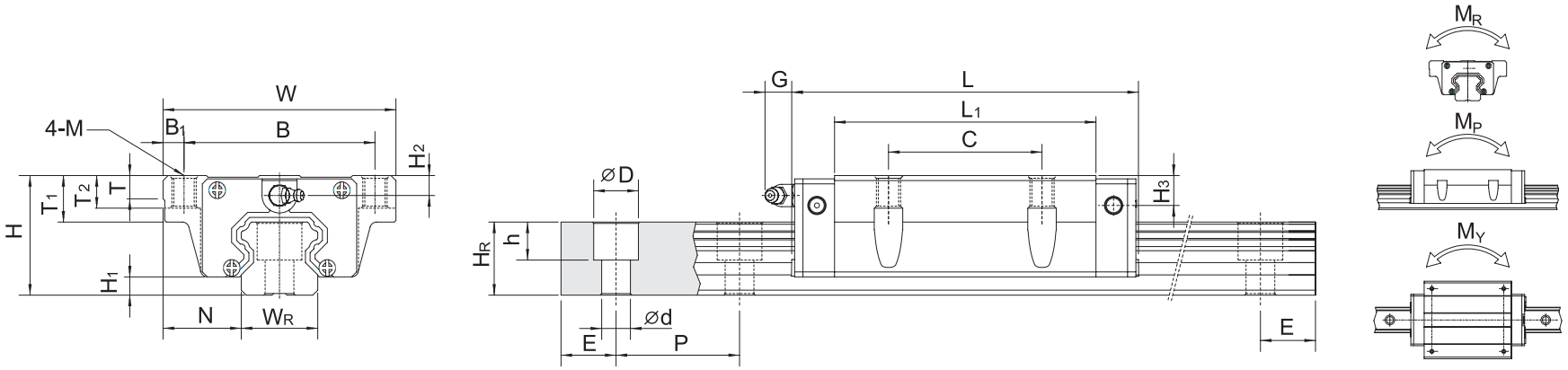
(3) HGW-CB / HGW-HB



Model No.	Dimensions of Assembly (mm)			Dimensions of Block (mm)													Dimensions of Rail (mm)							Mounting Bolt for Rail (mm)	Basic Dynamic Load Rating C (kN)	Basic Static Load Rating C_0 (kN)	Static Rated Moment			Weight	
	H	H_1	N	W	B	B_1	C	L_1	L	G	M	T	T_1	T_2	H_2	H_3	W_R	H_R	D	h	d	P	E				M_R (kN-m)	M_P (kN-m)	M_Y (kN-m)	Block (kg)	Rail (kg/m)
HGW 15CB	24	4.3	16	47	38	4.5	30	39.4	61.4	5.3	ø4.5	6	8.9	6.95	4.5	5.5	15	15	7.5	5.3	4.5	60	20	M4x16	11.38	25.31	0.17	0.15	0.15	0.17	1.45
HGW 20CB	30	4.6	21.5	63	53	5	40	50.5	75.6	12	ø6	8	10	9.5	6	7	20	17.5	9.5	8.5	6	60	20	M5x16	17.75	37.84	0.38	0.27	0.27	0.40	2.21
HGW 20HB								65.2	90.3																21.18	48.84	0.48	0.47	0.47	0.52	
HGW 25CB	36	5.5	23.5	70	57	6.5	45	58	83	12	ø7	8	14	10	6	9	23	22	11	9	7	60	20	M6x20	26.48	56.19	0.64	0.51	0.51	0.59	3.21
HGW 25HB								78.6	103.6																32.75	76.00	0.87	0.88	0.88	0.80	
HGW 30CB	42	6	31	90	72	9	52	70	97.4	12	ø9	8.5	16	10	6.5	10.8	28	26	14	12	9	80	20	M8x25	38.74	83.06	1.06	0.85	0.85	1.09	4.47
HGW 30HB								93	120.4																47.27	110.13	1.40	1.47	1.47	1.44	
HGW 35CB	48	7.5	33	100	82	9	62	80	112.4	12	ø9	10.1	18	13	9	12.6	34	29	14	12	9	80	20	M8x25	49.52	102.87	1.73	1.20	1.20	1.56	6.30
HGW 35HB								105.8	138.2																60.21	136.31	2.29	2.08	2.08	2.06	
HGW 45CB	60	9.5	37.5	120	100	10	80	97	138	12.9	ø11	15.1	22	15	8.5	20.5	45	38	20	17	14	105	22.5	M12x35	77.57	155.93	3.01	2.35	2.35	2.79	10.41
HGW 45HB								128.8	169.8																94.54	207.12	4.00	4.07	4.07	3.69	
HGW 55CB	70	13	43.5	140	116	12	95	117.7	165.7	12.9	ø14	17.5	26.5	17	12	19	53	44	23	20	16	120	30	M14x45	114.44	227.81	5.66	4.06	4.06	4.52	15.08
HGW 55HB								155.8	203.8																139.35	301.26	7.49	7.01	7.01	5.96	
HGW 65CB	90	15	53.5	170	142	14	110	144.2	198.2	12.9	ø16	25	37.5	23	15	15	63	53	26	22	18	150	35	M16x50	163.63	324.71	10.02	6.44	6.44	9.17	21.18
HGW 65HB								203.6	257.6																208.36	457.15	14.15	11.12	11.12	12.89	

Note : 1 kgf = 9.81 N

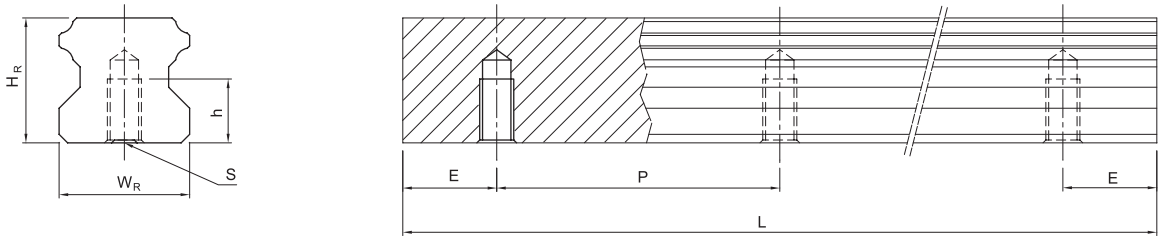
(4) HGW-CC / HGW-HC



Model No.	Dimensions of Assembly (mm)			Dimensions of Block (mm)													Dimensions of Rail (mm)							Mounting Bolt for Rail (mm)	Basic Dynamic Load Rating C (kN)	Basic Static Load Rating C_0 (kN)	Static Rated Moment			Weight	
	H	H_1	N	W	B	B_1	C	L_1	L	G	M	T	T_1	T_2	H_2	H_3	W_R	H_R	D	h	d	P	E				M_R (kN-m)	M_P (kN-m)	M_Y (kN-m)	Block (kg)	Rail (kg/m)
HGW 15CC	24	4.3	16	47	38	4.5	30	39.4	61.4	5.3	M5	6	8.9	6.95	4.5	5.5	15	15	7.5	5.3	4.5	60	20	M4x16	11.38	25.31	0.17	0.15	0.15	0.17	1.45
HGW 20CC	30	4.6	21.5	63	53	5	40	50.5	75.6	12	M6	8	10	9.5	6	7	20	17.5	9.5	8.5	6	60	20	M5x16	17.75	37.84	0.38	0.27	0.27	0.40	2.21
HGW 20HC								65.2	90.3																21.18	48.84	0.48	0.47	0.47	0.52	
HGW 25CC	36	5.5	23.5	70	57	6.5	45	58	83	12	M8	8	14	10	6	9	23	22	11	9	7	60	20	M6x20	26.48	56.19	0.64	0.51	0.51	0.59	3.21
HGW 25HC								78.6	103.6																32.75	76.00	0.87	0.88	0.88	0.80	
HGW 30CC	42	6	31	90	72	9	52	70	97.4	12	M10	8.5	16	10	6.5	10.8	28	26	14	12	9	80	20	M8x25	38.74	83.06	1.06	0.85	0.85	1.09	4.47
HGW 30HC								93	120.4																47.27	110.13	1.40	1.47	1.47	1.44	
HGW 35CC	48	7.5	33	100	82	9	62	80	112.4	12	M10	10.1	18	13	9	12.6	34	29	14	12	9	80	20	M8x25	49.52	102.87	1.73	1.20	1.20	1.56	6.30
HGW 35HC								105.8	138.2																60.21	136.31	2.29	2.08	2.08	2.06	
HGW 45CC	60	9.5	37.5	120	100	10	80	97	138	12.9	M12	15.1	22	15	8.5	20.5	45	38	20	17	14	105	22.5	M12x35	77.57	155.93	3.01	2.35	2.35	2.79	10.41
HGW 45HC								128.8	169.8																94.54	207.12	4.00	4.07	4.07	3.69	
HGW 55CC	70	13	43.5	140	116	12	95	117.7	165.7	12.9	M14	17.5	26.5	17	12	19	53	44	23	20	16	120	30	M14x45	114.44	227.81	5.66	4.06	4.06	4.52	15.08
HGW 55HC								155.8	203.8																139.35	301.26	7.49	7.01	7.01	5.96	
HGW 65CC	90	15	53.5	170	142	14	110	144.2	198.2	12.9	M16	25	37.5	23	15	15	63	53	26	22	18	150	35	M16x50	163.63	324.71	10.02	6.44	6.44	9.17	21.18
HGW 65HC								203.6	257.6																208.36	457.15	14.15	11.12	11.12	12.89	

Note : 1 kgf = 9.81 N

(5) Dimesions for HGR-T (Rail Mounting from Below)



Model No.	Dimensions of Rail (mm)						Weight (kg/m)
	W_R	H_R	S	h	P	E	
HGR15T	15	15	M5 x 0.8P	8	60	20	1.48
HGR20T	20	17.5	M6 x 1P	10	60	20	2.29
HGR25T	23	22	M6 x 1P	12	60	20	3.35
HGR30T	28	26	M8 x 1.25P	15	80	20	4.67
HGR35T	34	29	M8x1.25P	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	15.67
HGR65T	63	53	M20 x 2.5P	30	150	35	21.73

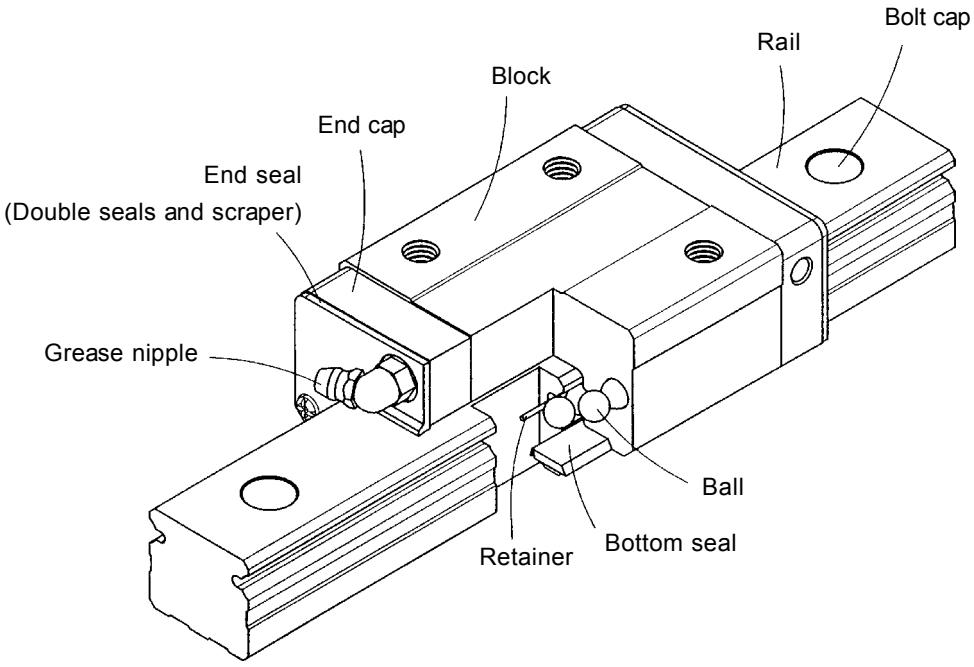
2-2 AG Series

2-2-1 Features of The AG Series

Because of enlarged balls and Gothic contact design, AG series is possessed with high stiffness, accuracy, and loading capacity. Besides these characteristics, the lower assembly height and the shorter length make the AG series more suitable for the high- speed automation machines and the applications where space limit is considered.

Moreover, the optimum design of circulating system makes the AG series move smoothly and quietly even under the high-speed condition.

2-2-2 Configuration of AG Series

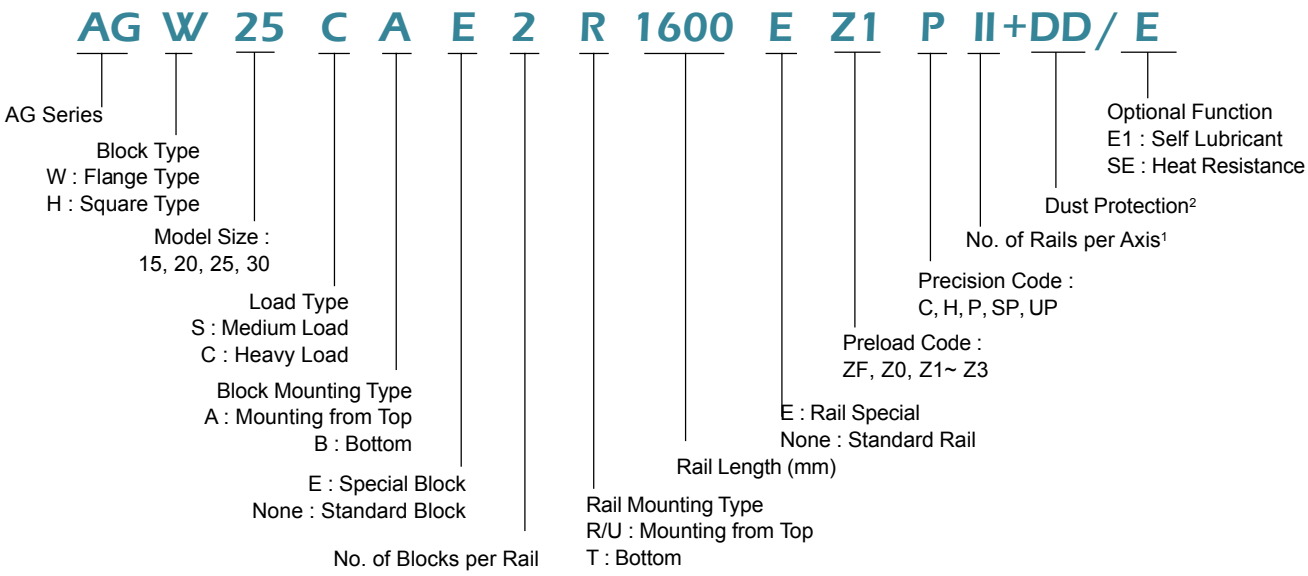


- Rolling circulation system: Block, Rail, End Cap and Retainer
- Lubrication system: Grease Nipple and Piping Joint
- Dust protection system: End seal, Bottom Seal, Bolt Cap, Double Seals and Scraper

2-2-3 Model Number of AG Series

AG series guideway can be classified into non-interchangeable and interchangeable types. The size of two types is same as each other. The main difference between two types is that the interchangeable type of blocks and rails can be freely exchanged, and their accuracy can reach up to P class. Because of the restrictedly dimensional control, the interchangeable type linear guideway is a smart choice for customer when rails don't need to be paired for an axis. The model number of AG series contains the size, type, accuracy class, preload class, etc..

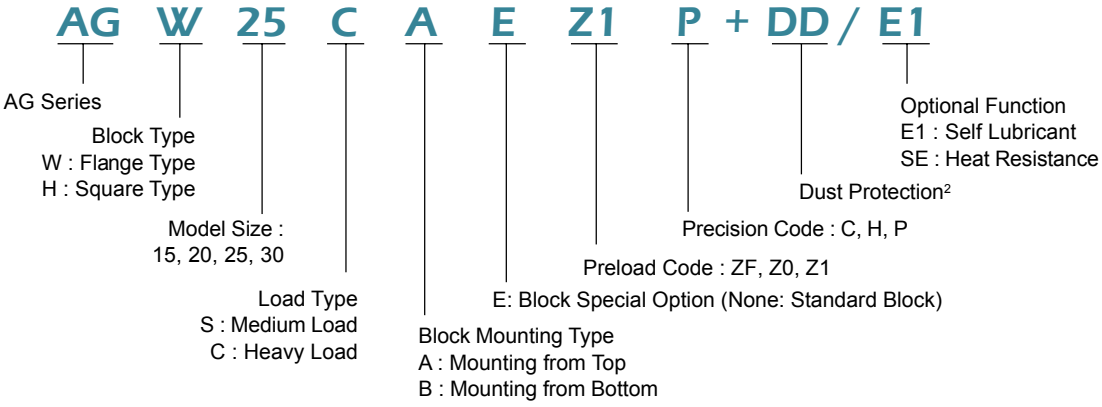
(1) Non-interchangeable type



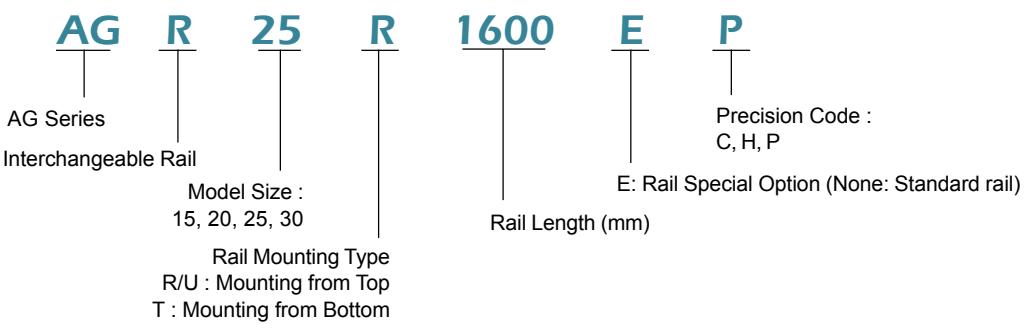
Note: 1. The roman numerals express the number of rails used in one axis. None: single rail, II: 2 rails...
2. For dust protection: None: standard (end seal and bottom seal).
ZZ : End seal, bottom seal and scraper
KK: Double seals, bottom seal and scraper.
DD: Double seals and bottom seal

(2) Interchangeable type

▸ Model number of AG block



▸ Model number of AG rail

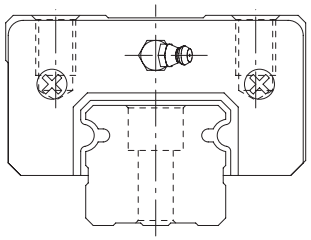
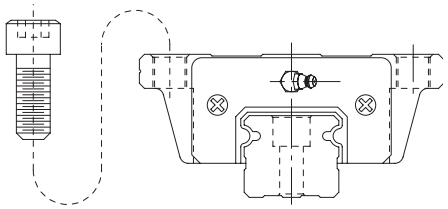
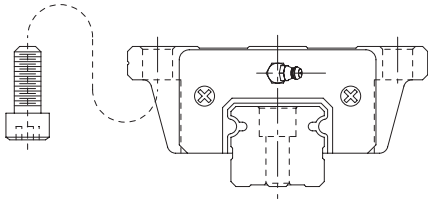


2-2-4 Types

(1) Block types

HIWIN offers two types of linear guideway: flange and square. Because of the characteristics of lower assembly height and larger mounting surface, it is especially suitable for the moment loading application

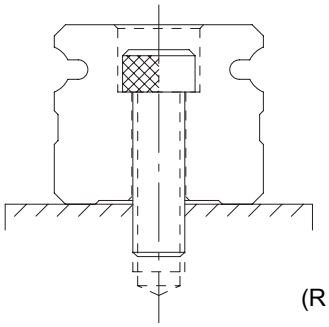
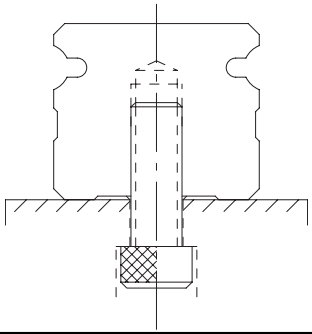
Table 2.22 Block Type

Type	Model	Shape	Height (mm)	Rail Length (mm)	Main Application
Square	AGH-SA AGH-CA		24 ↓ 42	100 ↓ 4000	• Automation equipment • High speed transportation equipment • Precision measuring equipment • Semiconductor equipment • Wood working machinery
Flange	AGW-SA AGW-CA		24 ↓ 42	100 ↓ 4000	
	AGW-SB AGW-CB		24 ↓ 42	100 ↓ 4000	

(2) Rail types

Besides the standard top-mounting type, HIWIN also offers the bottom-mounting type of rails to customers.

Table 2.23 Rail Types

Top-mounting type (Mounting from top)	Bottom-mounting type (Mounting from bottom)
 (R or U Type)	 (T Type)

2-2-5 Accuracy Classes

The accuracy of AG series can be classified into five classes: normal (C), high (H), precision (P), super precision (SP), ultra precision (UP). Customers can select the proper linear guideway by the accuracy the application required.

(1) Accuracy of non-interchangeable AG

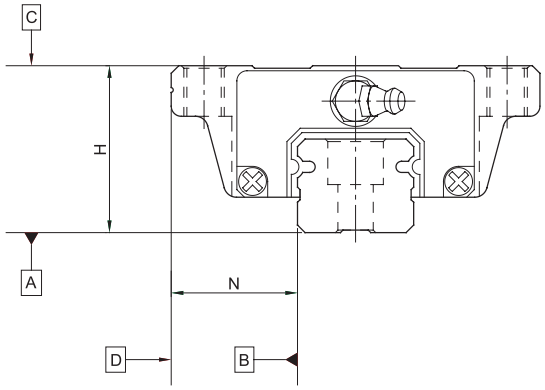


Table 2.24 Accuracy Standards

Unit mm		AG - 15, 20				
Item		Normal (C)	High (H)	Precision (P)	Super Precision (SP)	Ultra Precision (UP)
Dimensional tolerance of height H		± 0.1	± 0.03	0 - 0.03	0 - 0.015	0 - 0.008
Dimensional tolerance of width N		± 0.1	± 0.03	0 - 0.03	0 - 0.015	0 - 0.008
Pair	Variation of height H	0.02	0.01	0.006	0.004	0.003
	Variation of width N (Master Rail)	0.02	0.01	0.006	0.004	0.003
Preload classes		ZF, Z0, Z1	Z0 ~ Z3			
Running parallelism of block surface C to surface A		See Table 2.28				
Running parallelism of block surface D to surface B		See Table 2.28				

Table 2.25 Accuracy Standards

Unit mm		AG - 25, 30				
Item		Normal (C)	High (H)	Precision (P)	Super Precision (SP)	Ultra Precision (UP)
Dimensional tolerance of height H		± 0.1	± 0.04	0 - 0.04	0 - 0.02	0 - 0.01
Dimensional tolerance of width N		± 0.1	± 0.04	0 - 0.04	0 - 0.02	0 - 0.01
Pair	Variation of height H	0.02	0.015	0.007	0.005	0.003
	Variation of width N (Master Rail)	0.03	0.015	0.007	0.005	0.003
Preload classes		ZF, Z0, Z1	Z0 ~ Z3			
Running parallelism of block surface C to surface A		See Table 2.28				
Running parallelism of block surface D to surface B		See Table 2.28				

(2) Accuracy of interchangeable AG

Table 2.26 Accuracy Standards

Unit mm		AG - 15, 20		
Item		Normal (C)	High (H)	Precision (P)
Dimensional tolerance of height H		± 0.1	± 0.03	± 0.015
Dimensional tolerance of width N		± 0.1	± 0.03	± 0.015
Pair	Variation of height H	0.02	0.01	0.006
	Variation of width N	0.02	0.01	0.006
Pair variation of height H (multi sets)		0.06	0.04	0.026
Preload classes		ZF, Z0, Z1	Z0, Z1	
Running parallelism of block surface C to surface A		See Table 2.28		
Running parallelism of block surface D to surface B		See Table 2.28		

Table 2.27 Accuracy Standards

Unit mm		AG - 25, 30		
Item		Normal (C)	High (H)	Precision (P)
Dimensional tolerance of height H		± 0.1	± 0.04	± 0.02
Dimensional tolerance of width N		± 0.1	± 0.04	± 0.02
Pair	Variation of height H	0.02	0.015	0.007
	Variation of width N	0.03	0.015	0.007
Pair variation of height H (multi sets)		0.06	0.045	0.027
Preload classes		ZF, Z0, Z1	Z0, Z1	
Running parallelism of block surface C to surface A		See Table 2.28		
Running parallelism of block surface D to surface B		See Table 2.28		

(3) Accuracy of running parallelism

Table 2.28 Accuracy of Running Parallelism

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

2-2-6 Preload

AG series provides five standard preloads for various applications. Although increasing the preload is a good way to get higher stiffness, for avoiding the reduction of service life, we suggest the preload of AG 15,20 should not exceed medium class.

Table 2.29 Preload Classes

Class	Code	Preload	Accuracy
Light clearance	ZF	Clearance 4~10μm	C
Very light preload	Z0	0	C~UP
Light preload	Z1	0.02C	C~UP
Medium preload	Z2	0.05C	H~UP
Heavy preload	Z3	0.07C	H~UP

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

2-2-7 Stiffness

To confirm that whether the rigidity will affect the accuracy or not, the customers can calculate the Deflection by the equation 2.6.

$$\delta = \frac{P}{k} \quad \text{Eq. 2.6}$$

δ : Deflection(μm)
P : Working load (kgf)
k : Value of rigidity

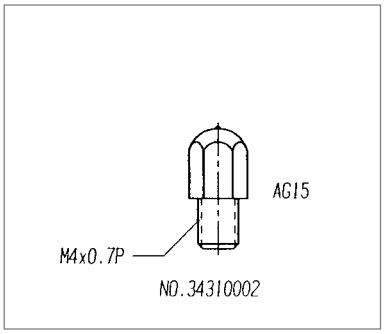
Table 2.30 Value of Rigidity

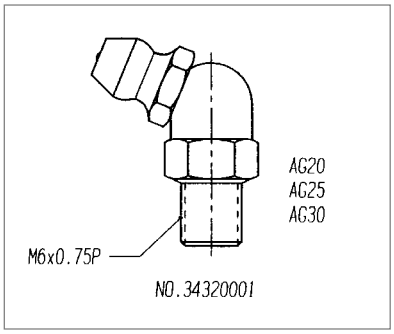
Type	Size	Z0 kgf/μm	Z1 kgf/μm	Z2 kgf/μm	Z3 kgf/μm
Medium load	AG15S	10	13	15	16
	AG20S	11	14	16	17
	AG25S	14	17	20	22
	AG30S	16	20	23	24
Heavy load	AG15C	16	20	24	25
	AG20C	19	24	28	29
	AG25C	25	31	36	39
	AG30C	28	36	41	44

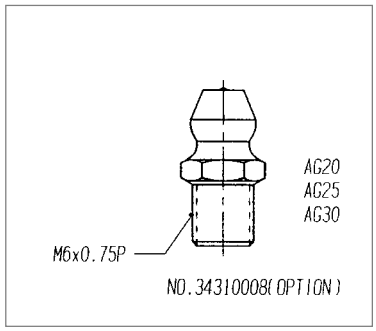
2-2-8 Lubrication

(1) Grease

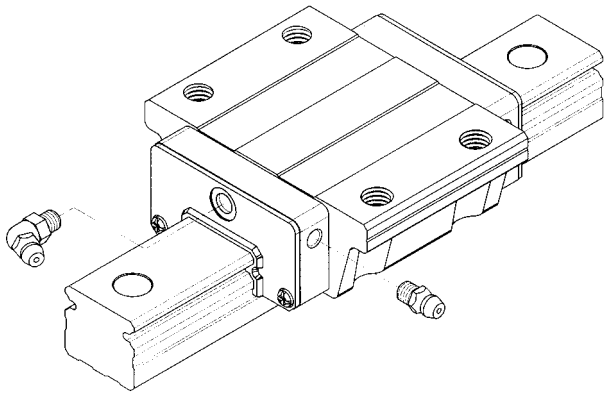
▸ Grease nipple







▸ Mounting location



The standard location of the grease fitting is at both ends of the block, but the nipple may optionally be mounted each side of block. As for the lateral installation, we recommended that the nipple should be mounted at the non-reference side, otherwise please contact us. It is possible to carry out the lubrication by using the oilpiping joint.

▸ The lubricant amount for a block filled with grease

Table 2.31 The Lubricant Amount for a Block Filled with Grease

Size	Medium load (cm^3)	Heavy load (cm^3)	Size	Medium load (cm^3)	Heavy load (cm^3)
AG 15	0.5	0.6	AG 25	1.7	2.1
AG 20	0.9	1.1	AG30	3.8	4.4

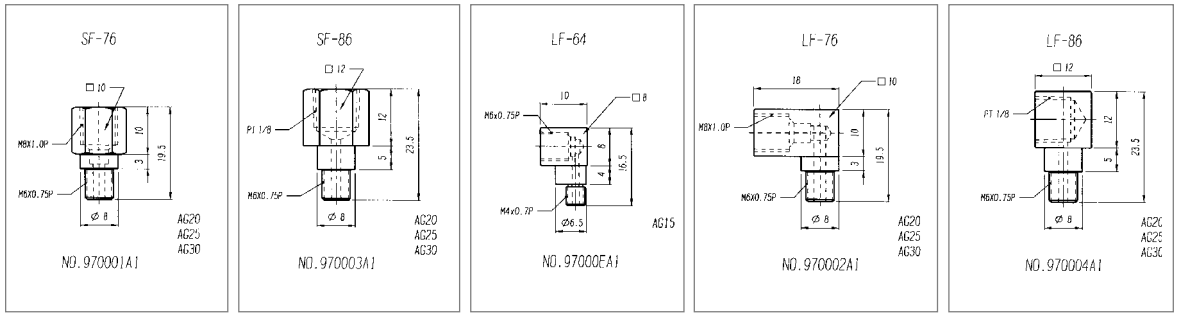
▸ Frequency of replenishment

Replenishing the lubricant every 100km

(2) Oil

The recommended viscosity of oil is about 30~150cst. If customers need to use the oil-type lubrication, please inform us. The block will not be prelubricated with grease before shipment.

▸ Types of oil piping joint.



▸ Oil refilling rate

Table 2.32

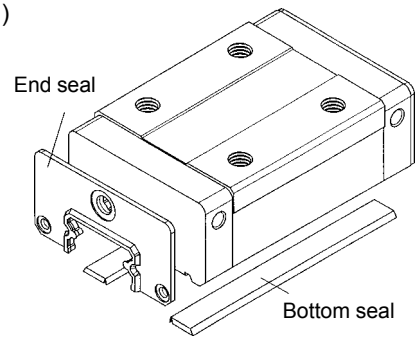
Size	Refilling rate (cm^3/hr)	Size	Refilling rate (cm^3/hr)
AG15	0.2	AG25	0.3
AG20	0.2	AG30	0.3

2-2-9 Dust Proof Accessories

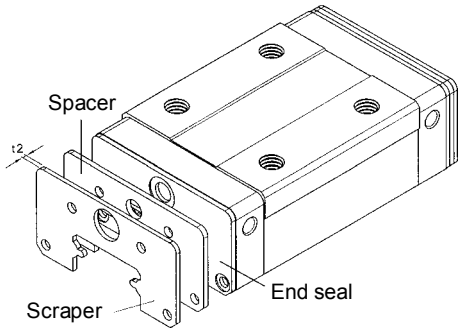
(1) Code of accessories

If the following devices are needed, please add the code to the model number.

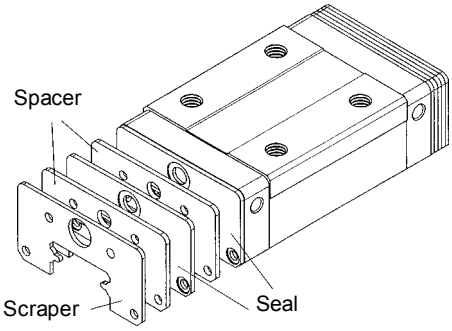
No code: Standard protection (End seal + Bottom seal)



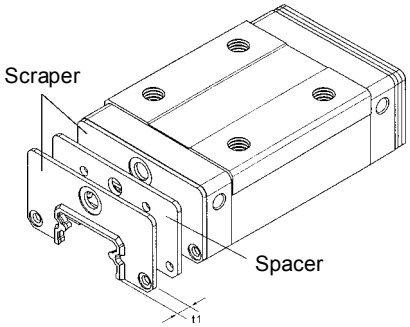
ZZ (End seal + Bottom seal + Scraper)



KK (Double seals + Bottom seal + Scraper)



DD (Double seals + Bottom seal)



(2) End seal and bottom seal

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

(3) Double seals

Enhancing the wiping effect, the foreign matters can be completely wiped off.

Table 2.33 Order Number of End Seal

Size	Part No.	Thickness (t1) mm	Size	Part No.	Thickness (t1) mm
AG15	92000FA1	2.6	AG25	92000HA1	3
AG20	92000GA1	2.6	AG30	92000IA1	3.2

(4) Scraper

The scraper has the ability of isolating the high-temp. iron chips and removing the bigger foreign matters.

Table 2.34 Order Number of End Seal

Size	Part No.	Thickness (t2) mm	Size	Part No.	Thickness (t2) mm
AG15	92000FA1	2.6	AG25	92000HA1	3
AG20	92000GA1	2.6	AG30	92000IA1	3.2

(5) Caps for rail mounting holes

The caps are used to cover the mounting holes to prevent chips or other foreign matters from entering the holes. The caps will be enclosed in each rail packing

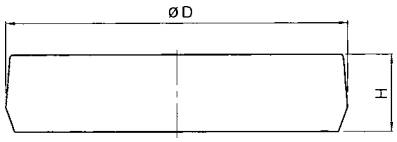


Table 2.35 Caps for Rail Mounting Holes

Rail size	Bolt size	Part No.	Diameter (D) mm	Thickness (H) mm
AGR15R	M3	950001A1	6.3	1.2
AGR20R	M5	950003C1	9.7	2.2
AGR25R	M6	950004C1	11.3	2.5
AGR30R	M6	950004C1	11.3	2.5
AGR15U	M4	950002C1	7.7	1.1
AGR30U	M8	950005C1	14.3	3.3

2-2-10 Friction

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

Table 2.36 Seal Resistance

Size	Resistance (kgf)	Size	Resistance (kgf)
AG 15	0.1	AG 25	0.2
AG 20	0.2	AG 30	0.5

2-2-11 The Accuracy Tolerance of Mounting Surface

(1) The accuracy tolerance of rail-mounting surface

Because of the Gothic contact design, the linear guideway is with high rigidity. As for this characteristic, any unreasonable deviation will not only increase the friction resistance, but also reduce the life.

As long as the following accuracy requirements of mounting surface can be met, the high accuracy and rigidity of linear guideway should be obtained without any difficulty. In order to satisfy the needs of fast installation and smooth movement, HIWIN offers the normal clearance type of preload to customers for its high absorption ability for deviation of mounting surface accuracy.

▸ The parallelism tolerance of reference surface (P)

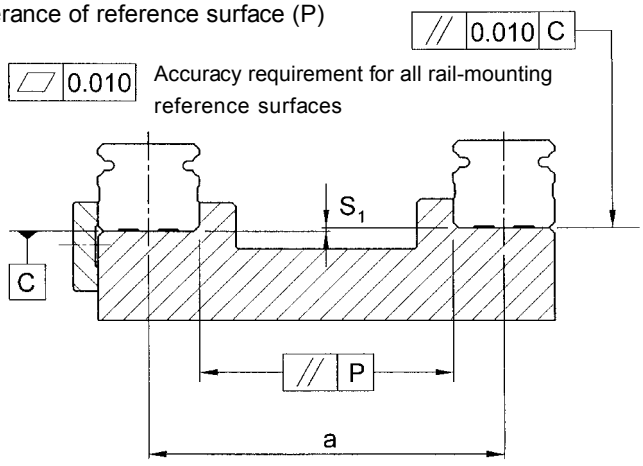


Table 2.37 Max. Parallelism Tolerance(P)

Unit : mm

Size	Preload classes				
	ZF	Z0	Z1	Z2	Z3
AG 15	0.030	0.020	0.016	0.013	0.010
AG 20	0.035	0.025	0.020	0.017	0.015
AG 25	0.040	0.030	0.023	0.020	0.018
AG 30	0.045	0.034	0.028	0.025	0.020

▸ The accuracy tolerance of reference surface height (S_1)

$$S_1 = a \times K \quad \text{Eq. 2.7}$$

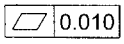
S_1 : Max. tolerance of height
a : Distance between paired rails
K : Coefficient of tolerance of height

Table 2.38 Max. Tolerance of Height

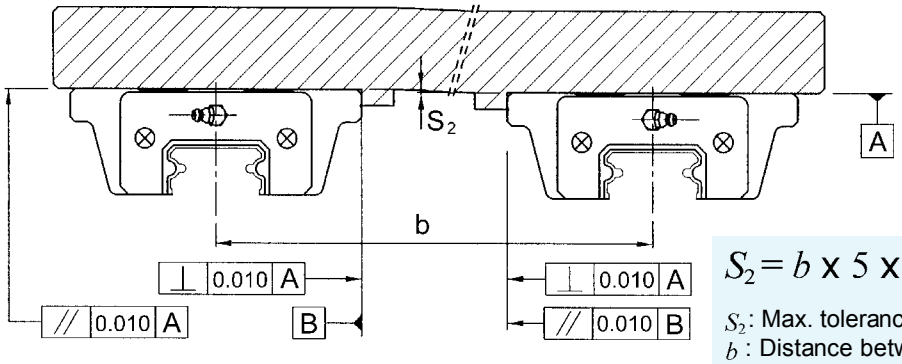
Size	Preload classes				
	ZF	Z0	Z1	Z2	Z3
K	6.6×10^{-4}	4.9×10^{-4}	3.2×10^{-4}	2.6×10^{-4}	2×10^{-4}

(2) The accuracy tolerance of block-mounting surface

▸ The tolerance of the height of reference surface when two or more pieces are used in parallel (S_2)



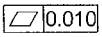
Accuracy requirement for all block-mounting reference surfaces



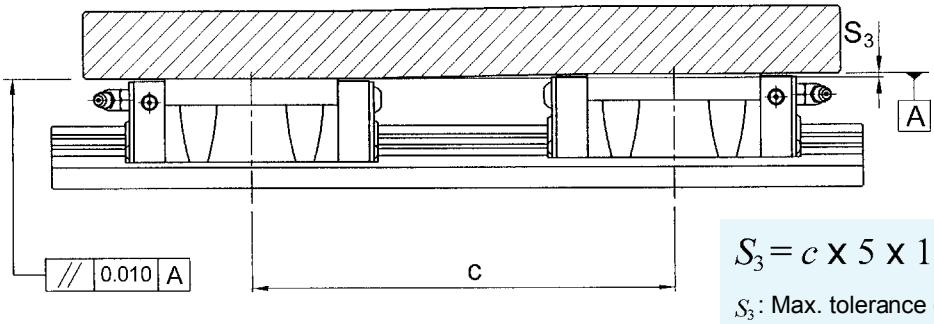
$$S_2 = b \times 5 \times 10^{-5} \quad \text{Eq. 2.8}$$

S_2: Max. tolerance of height
b : Distance between paired blocks

▸ The accuracy tolerance of mounting reference surface for paired blocks at the rail (S_3)



Accuracy requirement for all block-mounting reference surfaces



$$S_3 = c \times 5 \times 10^{-5} \quad \text{Eq. 2.9}$$

S_3: Max. tolerance of height
c : Distance between paired blocks

2-2-12 Cautions for Installation

(1) Shoulder heights and fillets

The improper shoulder heights and fillets of mounting surfaces will cause the deviation of accuracy and the interference with the chamfered part of the rail or block. As long as the following recommended shoulder heights and fillets can be adapted, the accuracy problem of installation should be eliminated.

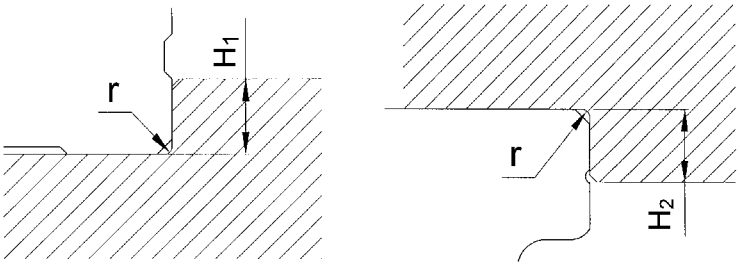


Table 2.39 Shoulder Heights and Fillets

Size	Max. radius of fillets r (mm)	Shoulder height of the rail H_1 (mm)	Shoulder height of the block H_2 (mm)
AG15	0.5	3	4
AG20	0.5	4	5
AG25	1	5	6
AG30	1	6	6

(2) Tightening torque of bolts for installation

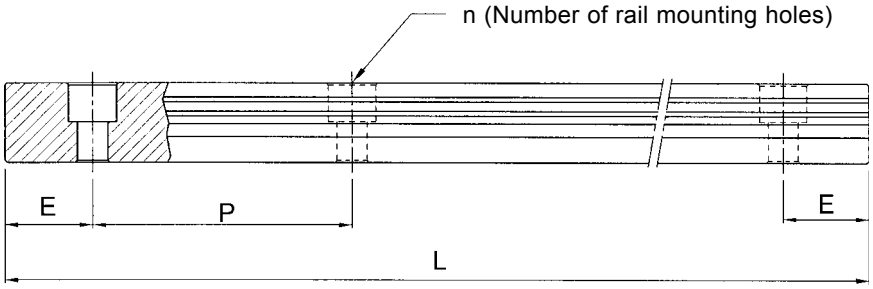
The improper tightening of bolts will influence the accuracy of Linear Guideway seriously, so that to reach the following tightening torque for different sizes of bolt is recommended.

Table 2.40 Torque

Size	Bolt size	Torque (kgf-cm)	Size	Bolt size	Torque (kgf-cm)
AG 15	M3 x 0.5P x 16L	19	AG 25	M6 x 1P x 20L	140
AG 20	M5 x 0.8P x 16L	90	AG 30	M6 x 1P x 25L	140

2-2-13 Standard Length and Max. Length of Rail

HIWIN has stock for standard length of rails. If non-standard length is required, it is recommended the E value should not be over 1/2 of pitch (P) to avoid instability on the end part of rail, and not be less than E_{min} due to the possibility of the mounting hold broken.



$$L = (n - 1) \times P + 2 \times E \quad \text{Eq. 2.10}$$

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)

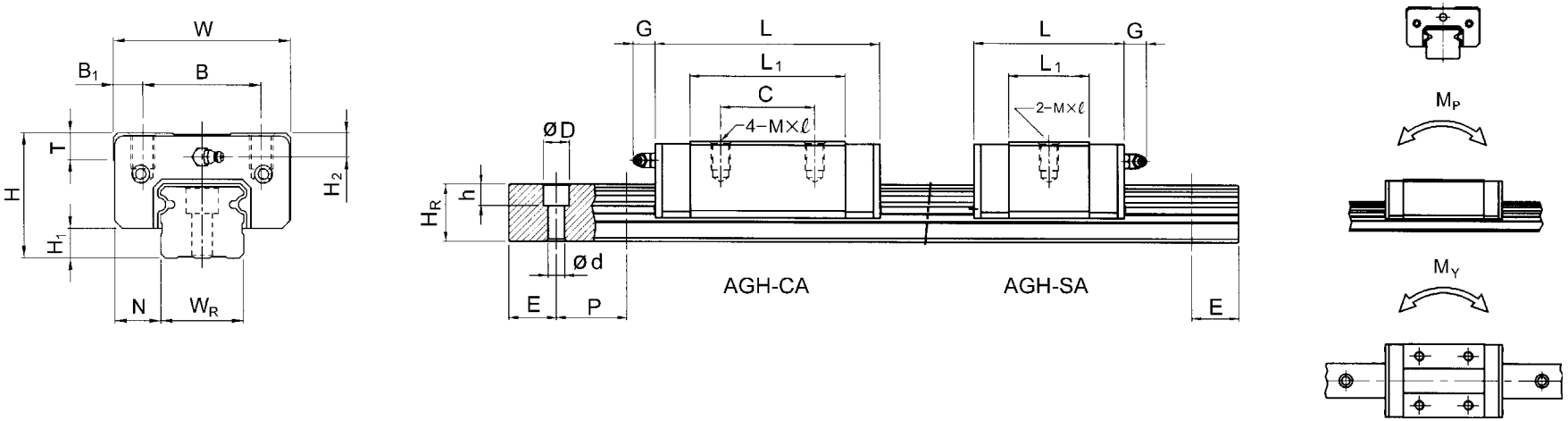
Table 2.41

Item	AG15	AG20	AG25	AG30
Standard Length L(n)	160(3)	220(4)	220(4)	280(4)
	220(4)	280(5)	280(5)	440(6)
	280(5)	340(6)	340(6)	600(8)
	340(6)	460(8)	460(8)	760(10)
	460(8)	640(11)	640(11)	1,000(13)
	640(11)	820(14)	820(14)	1,640(21)
	820(14)	1,000(17)	1,000(17)	2,040(26)
		1,240(21)	1,240(21)	2,520(32)
		1,600(27)	1,600(27)	3,000(38)
Pitch (P)	60	60	60	80
Distance to End (E_s)	20	20	20	20
Max. Standard Length	1,960(33)	4,000(67)	4,000(67)	3,960(50)
Max. Length	2,000	4,000	4,000	4,000

Note: 1. Tolerance of E value for standard rail is 0.5~-0.5 mm. Tolerance of E value for butt-joint is 0~-0.3 mm.
2. Maximum standard length means the max. rail length with standard E value on both sides.
3. If smaller E value is needed, please contact HIWIN.

2-2-14 Dimensions for AG Series

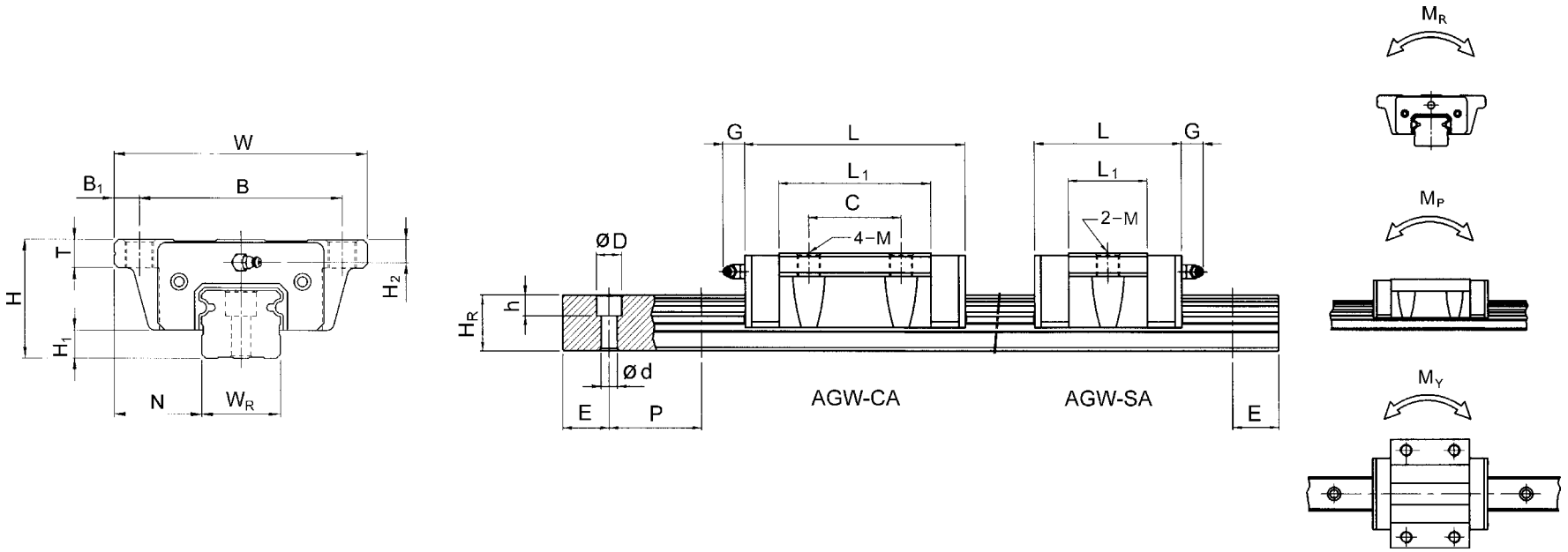
(1) AGH-SA / AGH-CA



Model No.	Dimensions of Assembly (mm)			Dimensions of Block (mm)										Dimensions of Rail (mm)							Mounting Bolt for Rail (mm)	Basic Dynamic Load Rating C (kgf)	Basic Static Load Rating C_0 (kgf)	Static Rated Moment			Weight	
	H	H_1	N	W	B	B_1	C	L_1	L	G	M x ℓ	T	H_2	W_R	H_R	D	h	d	P	E				M_R (kgf-m)	M_P (kgf-m)	M_Y (kgf-m)	Block (kg)	Rail (kg/m)
AGH15SA	24	5	9.5	34	26	4	-	22.8	41	5.7	M4X7	6	5.5	15	13.5	6	4.5	3.5	60	20	M3X16	440	590	4.8	2.3	2.3	0.12	1.43
AGH15CA							26	38.7	56.9													640	1,010	8.3	6.3	6.3	0.17	
AGH20SA	28	6	11	42	32	5	-	26.2	48	12	M5X8	7.5	6	20	15.5	9.5	8.5	6	60	20	M5X16	650	920	10.1	4.5	4.5	0.2	2.16
AGH20CA							32	44.1	65.9													970	1,450	15.9	10.4	10.4	0.29	
AGH25SA	33	7	12.5	48	35	6.5	-	34.5	58.7	12	M6X9	8	7	23	18.5	11	9	7	60	20	M6X20	1,080	1,330	16.7	7.8	7.8	0.34	2.95
AGH25CA							35	58.3	82.5													1,550	2,290	28.7	21.1	21.1	0.51	
AGH30SA	42	10	16	60	40	10	-	36.6	66.4	12	M8X12	9	8	28	24	11	9	7	80	20	M6X25	1,550	2,030	30.8	14.0	14.0	0.57	4.76
AGH30CA							40	65.2	95													2,470	3,390	51.3	35.5	35.5	0.88	

Listed dimensions of rail are for AGR-R (bolt hole, mounting from top). For dimension of AGR-U (ILarge bolt hole, mounting from top) and AGR-T (tapped hole, mounting from bottom) please refer to page 53.

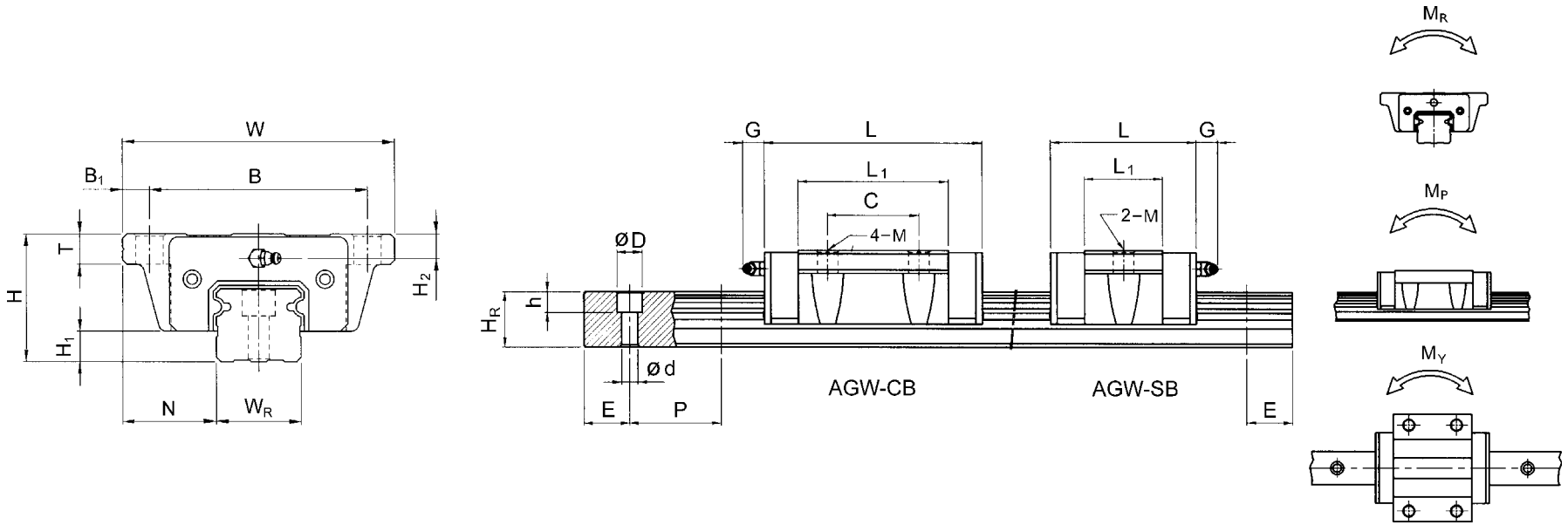
(2) AGW-SA / AGW-CA



Model No.	Dimensions of Assembly (mm)			Dimensions of Block (mm)										Dimensions of Rail (mm)							Mounting Bolt for Rail (mm)	Basic Dynamic Load Rating C (kgf)	Basic Static Load Rating C_0 (kgf)	Static Rated Moment			Weight	
	H	H_1	N	W	B	B_1	C	L_1	L	G	M	T	H_2	W_R	H_R	D	h	d	P	E				M_R (kgf-m)	M_P (kgf-m)	M_Y (kgf-m)	Block (kg)	Rail (kg/m)
AGW15SA	24	5	18.5	52	41	5.5	-	22.8	41	5.7	M5	7	5.5	15	13.5	6	4.5	3.5	60	20	M3X16	440	590	4.8	2.3	2.3	0.15	1.43
AGW15CA							26	38.7	56.9													640	1,010	8.3	6.3	6.3	0.23	
AGW20SA	28	6	19.5	59	49	5	-	26.2	48	12	M6	9	6	20	15.5	9.5	8.5	6	60	20	M5X16	650	920	10.1	4.5	4.5	0.24	2.16
AGW20CA							32	44.1	65.9													970	1,450	15.9	10.4	10.4	0.36	
AGW25SA	33	7	25	73	60	6.5	-	34.5	58.7	12	M8	10	7	23	18.5	11	9	7	60	20	M6X20	1,080	1,330	16.7	7.8	7.8	0.44	2.95
AGW25CA							35	58.3	82.5													1,550	2,290	28.7	21.1	21.1	0.68	
AGW30SA	42	10	31	90	72	9	-	36.6	66.4	12	M10	10	8	28	24	11	9	7	80	20	M6X25	1,550	2,030	30.8	14.0	14.0	0.72	4.76
AGW30CA							40	65.2	95													2,470	3,390	51.3	35.5	35.5	1.16	

Listed dimensions of rail are for AGR-R (bolt hole, mounting from top). For dimension of AGR-U (lLarge bolt hole, mounting from top) and AGR-T (tapped hole, mounting from bottom) please refer to page 53.

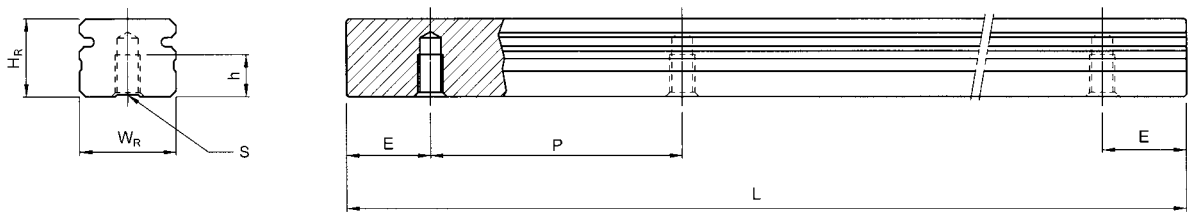
(3) AGW-SB / AGW-CB



Model No.	Dimensions of Assembly (mm)			Dimensions of Block (mm)										Dimensions of Rail (mm)							Mounting Bolt for Rail (mm)	Basic Dynamic Load Rating C (kgf)	Basic Static Load Rating C_0 (kgf)	Static Rated Moment			Weight	
	H	H_1	N	W	B	B_1	C	L_1	L	G	M	T	H_2	W_R	H_R	D	h	d	P	E				M_R (kgf-m)	M_P (kgf-m)	M_Y (kgf-m)	Block (kg)	Rail (kg/m)
AGW15SB	24	5	18.5	52	41	5.5	-	22.8	41	5.7	ø4.5	7	5.5	15	13.5	6	4.5	3.5	60	20	M3X16	440	590	4.8	2.3	2.3	0.15	1.43
AGW15CB							26	38.7	56.9													640	1,010	8.3	6.3	6.3	0.23	
AGW20SB	28	6	19.5	59	49	5	-	26.2	48	12	ø5.5	9	6	20	15.5	9.5	8.5	6	60	20	M5X16	650	920	10.1	4.5	4.5	0.24	2.16
AGW20CB							32	44.1	65.9													970	1,450	15.9	10.4	10.4	0.36	
AGW25SB	33	7	25	73	60	6.5	-	34.5	58.7	12	ø7	10	7	23	18.5	11	9	7	60	20	M6X20	1,080	1,330	16.7	7.8	7.8	0.44	2.95
AGW25CB							35	58.3	82.5													1,550	2,290	28.7	21.1	21.1	0.68	
AGW30SB	42	10	31	90	72	9	-	36.6	66.4	12	ø9	10	8	28	24	11	9	7	80	20	M6X25	1,550	2,030	30.8	14.0	14.0	0.72	4.76
AGW30CB							40	65.2	95													2,470	3,390	51.3	35.5	35.5	1.16	

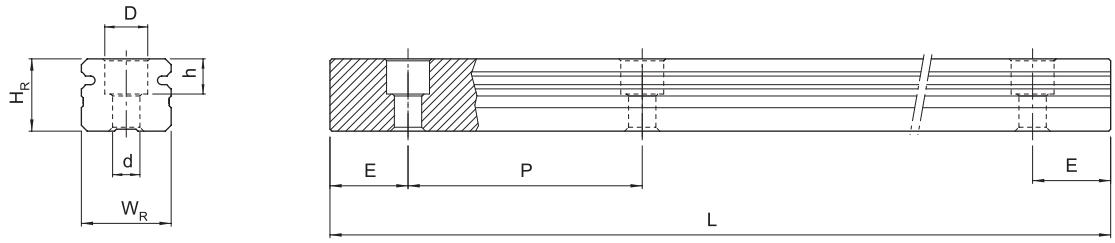
Listed dimensions of rail are for AGR-R (bolt hole, mounting from top). For dimension of AGR-U (ILarge bolt hole, mounting from top) and AGR-T (tapped hole, mounting from bottom) please refer to page 53.

(4) Dimensions for AGR-T (rail mounting from bottom)



Model No.	Dimensions of Rail (mm)						Weight (kg/m)
	W_R	H_R	S	h	P	E	
AGR15T	15	13.5	M5x0.8P	7	60	20	1.44
AGR20T	20	15.5	M6x1P	9	60	20	2.23
AGR25T	23	18.5	M6x1P	10	60	20	3.06
AGR30T	28	24	M8x1.25P	14	80	20	4.83

(5) Dimensions for AGR-U (large mounting hole)



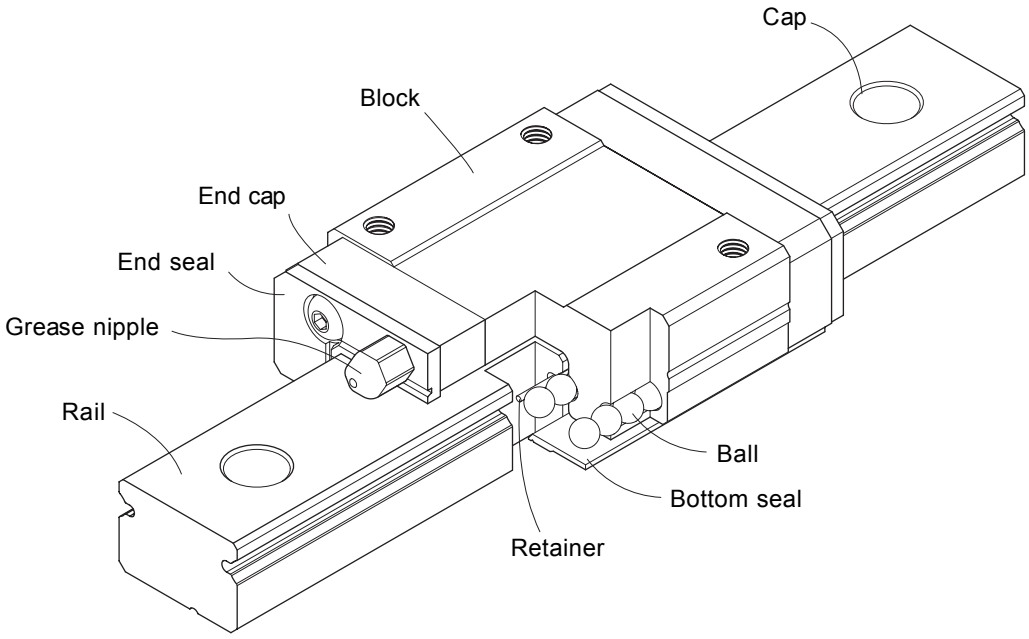
Model No.	Mounting Bolt for Rail (mm)	Dimensions of Rail (mm)							Weight (kg/m)
		W_R	H_R	D	h	d	P	E	
AGR15U	M4x16	15	13.5	7.5	5.3	4.5	60	20	1.41
AGR30U	M8x25	28	24	14	12	9	80	20	4.65

2-3 Miniature MGN/MGW Series

2-3-1 Features of MGN Series

1. Tiny and light weight, suitable for miniature equipment.
2. All materials in special grade of stainless steel for anti-corrosion size 9 and 12 are also auatlable in alloy steel.
3. Gothic arch contact design can sustain the load from all directions and possess the characteristic of High rigidity and high accuracy.
4. Steel balls will be held by miniature retainer to avoid the balls from falling out even when the block are removed form the rail installation.
5. Interchangeable type are available in certain precision grade.

2-3-2 Construction of MGN Series



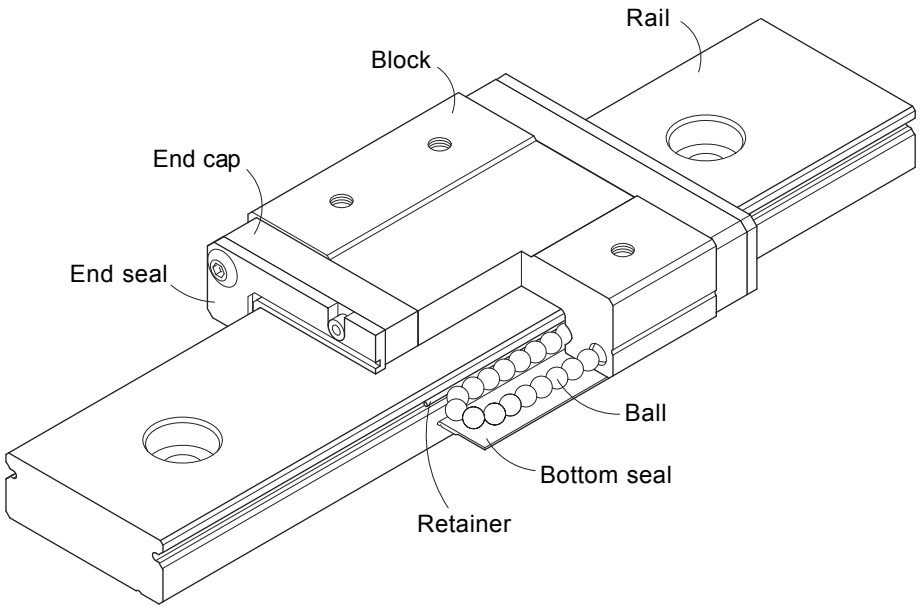
- Rolling Circulation System: Block, rail, end cap, ball, retainer.
- Lubrication System: The grease nipple is available for MGN15, grease gun can be used for lubricanting.
- Dust Protection System: End seal, bottom seal (optional size12,15), cap (size12,15).

2-3-3 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 form the rail installation.
4. All metallic components are made of stainless steel for anti-corrosion purpose.

2-3-4 Configuration of MGW Series



- Rolling circulation system: Block, rail, end cap, ball, retainer.
- Lubrication system: The grease nipple is available for MGW15, grease gun can be used for lubricanting.
- Dust protection system: End seal, bottom seal (optional size12,15), cap(size12,15).

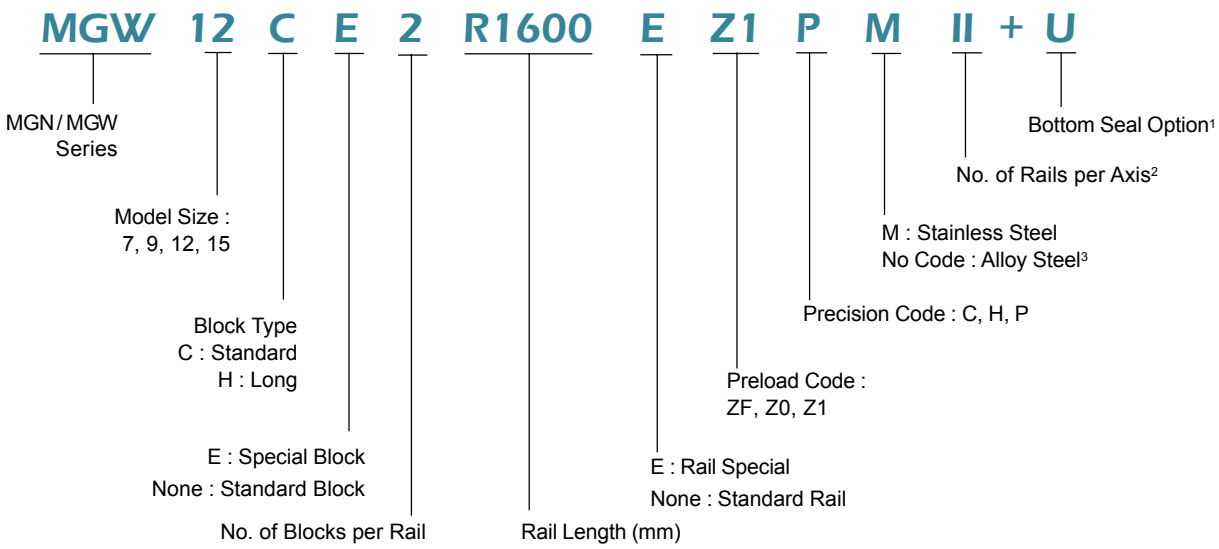
2-3-5 Application

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 mechinery.

2-3-6 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 same. The interchangeable type is more convenient due to rails can be replaced. However, its precision is less than non-interchangeable type. Because of the strictly dimensional control, the interchangeable type linear guideway is a smart choice for customer when rails don't need to be paired for an axis. The model number contains the information of the size, type, accuracy class, preload class, and more.

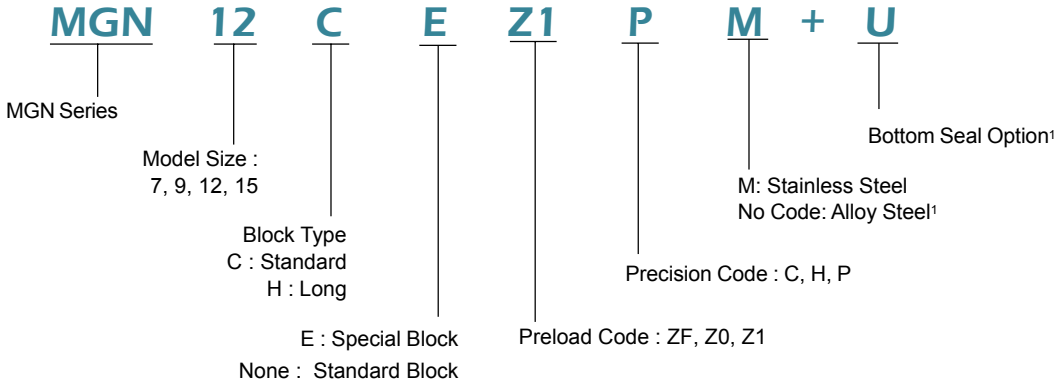
(1) Non-interchangeable type



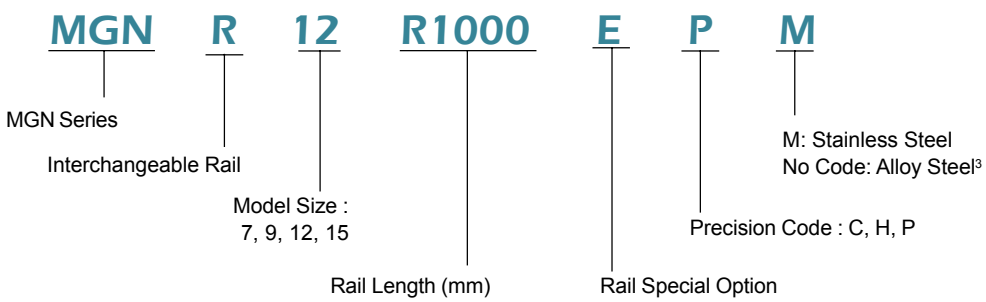
Note: 1. The bottom seal is available for MGN & MGW 12, 15.
2. The roman numerals express the number of rails used in one axis. No symbol indicates single rail in an axis.
3. MGN series are made of stainless steel, but alloy steel is optional for size 9 & 12.
MGW series are made of stainless steel.

(2) Interchangeable type

▸ Interchangeable block

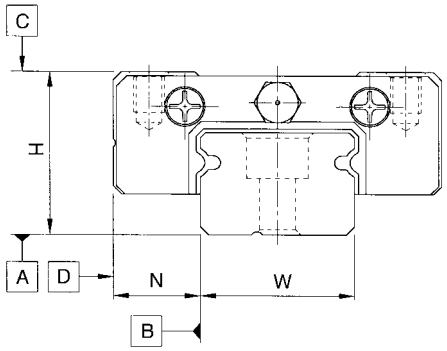


▸ Interchangeable rail



2-3-7 Accuracy Classes

The accuracy of MGN/MGW series can be classified into three classes: normal (C), high (H), precision (P), super precision (SP), ultra precision (UP). Customers can select the proper linear guideway by the accuracy the application required.



(1) Non-interchangeable

The accuracy values are the means of measurements taken at the central part of each block.

Table 2.42 Accuracy Standard of Non-interchangeable Type

Item	Normal (C)	High (H)	Precision (P)
Dimensional tolerance of height H	± 0.04	± 0.02	± 0.01
Dimensional tolerance of width N	± 0.04	± 0.025	± 0.015
Pair Variation of height H	0.03	0.015	0.007
Pair Variation of width N (Master Rail)	0.03	0.02	0.01
Running parallelism of block surface C to surface A	According to Table 2.44		
Running parallelism of block surface D to surface B	According to Table 2.44		

(2) Interchangeable

The multi sets pair variation of height has few difference between the interchangeable type and non-interchangeable type.

Table 2.43 Accuracy Standard of Interchangeable Type

Item		Normal (C)	High (H)	Precision (P)
Dimensional tolerance of height H		± 0.04	± 0.02	± 0.01
Dimensional tolerance of width N		± 0.04	± 0.025	± 0.015
One Set	Pair Variation of height H	0.03	0.015	0.007
	Pair Variation of width N	0.03	0.02	0.01
Pair variation of height H (Multi Sets)		0.07	0.04	0.02
Running parallelism of block surface C to surface A		According to Table 2.44		
Running parallelism of block surface D to surface B		According to Table 2.44		

(3) Accuracy of running parallelism

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

Table 2.44 Accuracy of Running Parallelism

Rail Length (mm)	Accuracy (μm)			Rail Length (mm)	Accuracy (μm)		
	C	H	P		C	H	P
50 & under	12	6	2	315 ~ 400	18	11	6
50 ~ 80	13	7	3	400 ~ 500	19	12	6
80 ~ 125	14	8	3.5	500 ~ 630	20	13	7
125 ~ 200	15	9	4	630 ~ 800	22	14	8
200 ~ 250	16	10	5	800 ~ 1,000	23	16	9
250 ~ 315	17	11	5	1,000 ~ 1,200	25	18	11

2-3-8 Preload

MGN/MGW series provides three preload levels for various applications.

Table 2.45 Preload Classes

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

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

2-3-9 Dust Proof Accessories

End seals and standard accessories fixed on both sides of block can prevent dust entering the block, so the accuracy and service life of linear guideway can be maintained. Bottom seals are fixed under the skirt portion of block to prevent dust entering. Customer can order bottom seals by adding the mark “+U” followed by the model number. Size 12,15 provides bottom seals for option, but size 7, 9 doesn’t provide because of the space limit of H_1. If the linear guideway is equipped with bottom seal, the lateral mounting surface of rail must not exceed H_1.

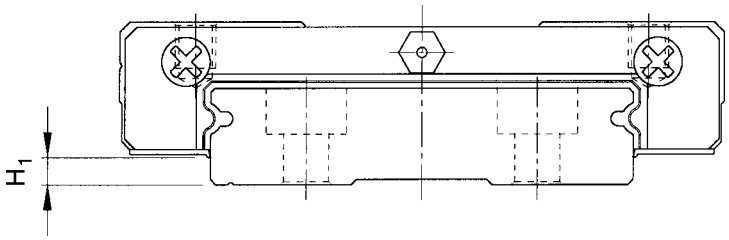


Table 2.46

Size	Bottom seal	H_1 mm	Size	Bottom seal	H_1 mm
MGN7	-	-	MGW 7	-	-
MGN9	-	-	MGW 9	-	-
MGN12	●	2	MGW12	●	2.6
MGN15	●	3	MGW15	●	2.6

2-3-10 Cautions for Installation

▸ Shoulder Heights and Fillets

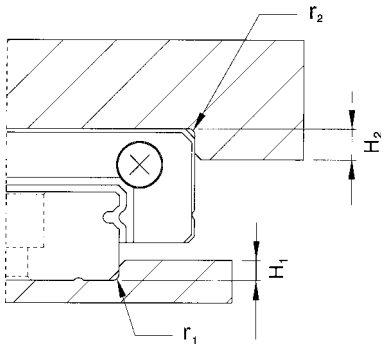


Table 2.47 Shoulder Heights and Fillets

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

▶ Tightening torque of bolts for installation

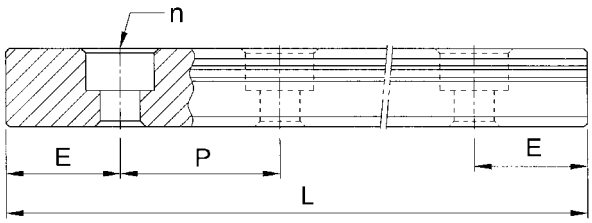
The improper tightening of bolts will influence the accuracy of linear guideway seriously, so that to reach the following tightening torque for different size of bolt is required.

Table 2.48 Tightening Torque

Size	Bolt size	Torque (kgf-cm)	Size	Bolt size	Torque (kgf-cm)
MGN7	M2	5.9	MGW7	M3	19
MGN9	M3	19	MGW9	M3	19
MGN12	M3	19	MGW12	M4	40
MGN15	M3	19	MGW15	M4	40

2-3-11 Standard Length and Max. Length of Rail

HIWIN has stock for standard length of rails. If non-standard length is required, it is recommended the E value should not be over 1/2 of pitch (P) to avoid instability on the end part of rail, and not be less than E_{min} due to the possibility of the mounting hold broken.



$$L = (n - 1) \times P + 2 \times E \quad \text{Eq. 2.11}$$

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 2.49

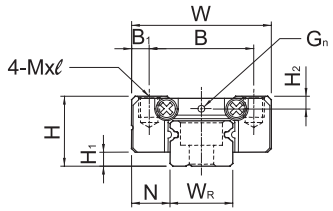
Item	MGNR 7M	MGNR 9M	MGNR 12M	MGNR 15M	MGWR 7M	MGWR 9M	MGWR 12M	MGWR 15M
Standard Length L (n)	40(3)	55(3)	70(3)	70(2)	80(3)	80(3)	110(3)	110(3)
	55(4)	75(4)	95(4)	110(3)	110(4)	110(4)	150(4)	150(4)
	70(5)	95(5)	120(5)	150(4)	140(5)	140(5)	190(5)	190(5)
	85(6)	115(6)	145(6)	190(5)	170(6)	170(6)	230(6)	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_0)	5	7.5	10	15	10	10	15	15
Max. Standard Length	595(40)	995(40)	995(40)	990(25)	590(20)	980(33)	1150(29)	1150(29)
Max. Length	600	1000	1000	1000	1000	1000	1200	1200

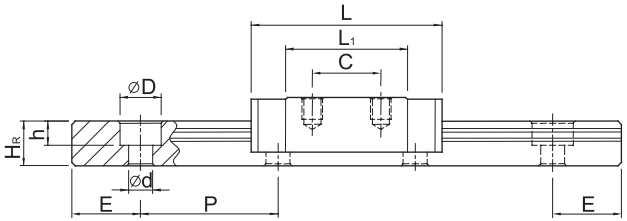
Note: 1. Tolerance of E value for standard rail is 0.5~-0.5 mm. Tolerance of E value for butt-joint is 0~-0.3 mm.
2. Maximum standard length means the max. rail length with standard E value on both sides.
3. The specification with “M” mark are stainless steel and without “M” mark are alloy steel.
4. If smaller E value is needed, please contact HIWIN.

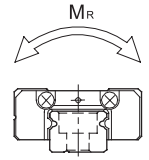
2-3-12 Dimensions for MGN/MGW Series

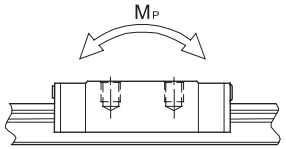
(1) MGN-C / MGN-H

▸MGN 7, MGN 9, MGN 12

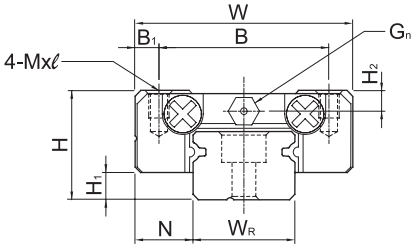


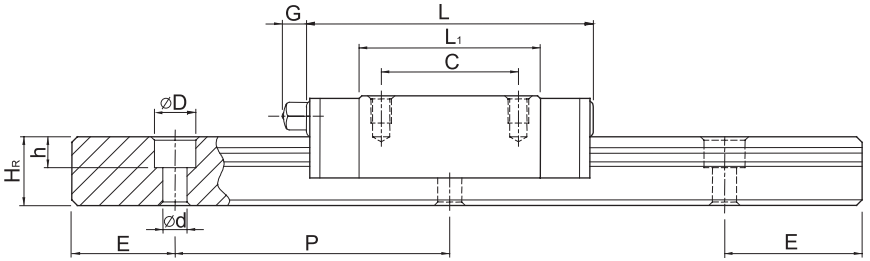


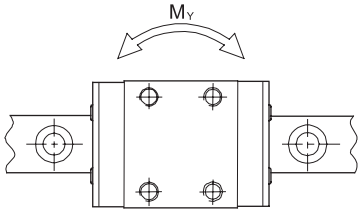




▸MGN 15



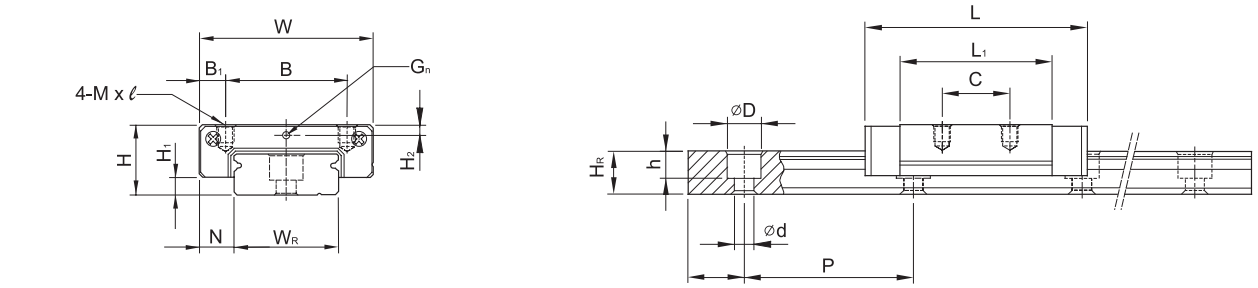




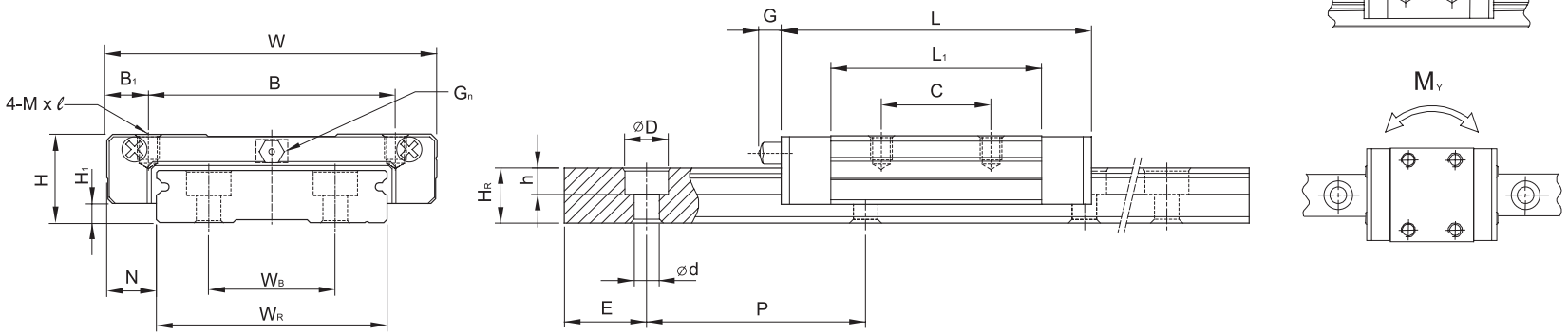
Model No.	Dimensions of Assembly (mm)			Dimensions of Block (mm)										Dimensions of Rail (mm)							Mounting Bolt for Rail (mm)	Basic Dynamic Load Rating C (kgf)	Basic Static Load Rating C_0 (kgf)	Static Rated Moment			Weight	
	H	H_1	N	W	B	B_1	C	L_1	L	G	G_n	M x ℓ	H_2	W_R	H_R	D	h	d	P	E				M_R (kgf-m)	M_P (kgf-m)	M_Y (kgf-m)	Block (g)	Rail (kg/m)
MGN 7C	8	1.5	5	17	12	2.5	8	13.5	22.5	-	ø0.8	M2 x 2.5	1.5	7	4.8	4.2	2.3	2.4	15	5	M2x6	100	127	0.48	0.29	0.29	10	0.22
MGN 7H							13	21.8	30.8													140	200	0.78	0.49	0.49	15	
MGN 9C	10	2	5.5	20	15	2.5	10	18.9	28.9	-	ø0.8	M3 x 3	1.8	9	6.5	6	3.5	3.5	20	7.5	M3x8	190	260	1.2	0.75	0.75	16	0.38
MGN 9H							16	29.9	39.9													260	410	2	1.9	1.9	26	
MGN 12C	13	3	7.5	27	20	3.5	15	21.7	34.7	-	ø0.8	M3 x 3.5	2.5	12	8	6	4.5	3.5	25	10	M3x8	290	400	2.6	1.4	1.4	34	0.65
MGN 12H							20	32.4	45.4													380	600	3.9	3.7	3.7	54	
MGN 15C	16	4	8.5	32	25	3.5	20	26.7	42.1	4.5	GN3S	M3 x 4	3	15	10	6	4.5	3.5	40	15	M3x10	470	570	4.6	2.2	2.2	59	1.06
MGN 15H							25	43.4	58.8													650	930	7.5	5.9	5.9	92	

(2) MGW-C / MGW-H

▸ MGW 7, MGW 9, MGW 12



▸ MGW 15

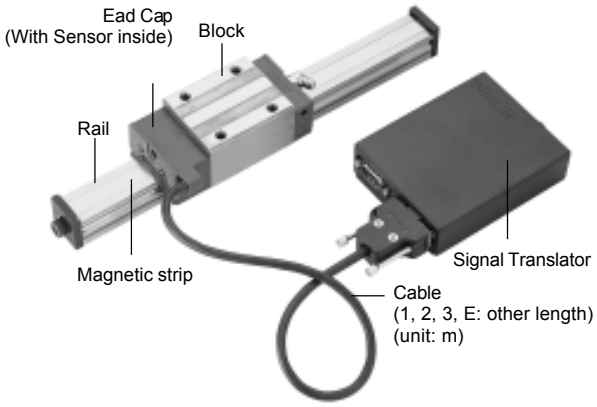


Model No.	Dimensions of Assembly (mm)			Dimensions of Block (mm)										Dimensions of Rail (mm)								Mounting Bolt for Rail (mm)	Basic Dynamic Load Rating C (kgf)	Basic Static Load Rating C_0 (kgf)	Static Rated Moment			Weight	
	H	H_1	N	W	B	B_1	C	L_1	L	G	G_n	M x ℓ	H_2	W_R	W_B	H_R	D	h	d	P	E				M_R (kgf-m)	M_P (kgf-m)	M_Y (kgf-m)	Block (g)	Rail (kg/m)
MGW 7C	9	1.9	5.5	25	19	3	10	21	31.2	-	ø0.9	M3x3	1.85	14	_	5.2	6	3.2	3.5	30	10	M3x6	140	210	1.6	0.73	0.73	20	0.51
MGW 7H							19	30.8	41														180	320	2.39	1.58	1.58	29	
MGW 9C	12	2.9	6	30	21	4.5	12	27.5	39.3	-	ø1.0	M3x3	2.4	18	-	7	6	4.5	3.5	30	10	M3x8	280	420	4.09	1.93	1.93	40	0.91
MGW 9H					23	3.5	24	38.5	50.7														350	600	5.56	3.47	3.47	57	
MGW 12C	14	3.4	8	40	28	6	15	31.3	46.1	-	ø1.8	M3x3.6	2.8	24	-	8.5	8	4.5	4.5	40	15	M4x8	400	570	7.17	2.83	2.83	71	1.49
MGW 12H							28	45.6	60.4														520	840	10.47	5.85	5.85	103	
MGW 15C	16	3.4	9	60	45	7.5	20	38	54.8	5.2	GN3S	M4x4.2	3.2	42	23	9.5	8	4.5	4.5	40	15	M4x10	690	940	20.32	5.78	5.78	143	2.86
MGW 15H							35	57	73.8														910	1410	30.48	12.5	12.5	215	

2-4 IG-Series Intelligent Linear Guideway

(1)Construction of IG series

IG is a Linear Guideway assembly integrated with a position measurement magnetic encoder.



(2)HIWIN IG Features

1. The additional components are completely internal, thus saving installation space.
2. Maintains high rigidity as well as high accuracy.
3. Both sensor and magnetic strip are protected from externally harmful extremities such as dust, iron chips, etc.
4. Non-contact measuring sensor can achieve longer life.
5. Can measure distances up to 32 m.
6. Can withstand humid, and high-temperature environments in oily, dusty, and high vibration applications.
7. High resolution
8. Easy to install

2-4-1 Model Number of IG series

IGH W 25 C A E 1/2 T 1600 E ZA P I/II/E1+KK+03+□□

- IGH: Intelligent Guideway Series : IGA, IGH
- W: Block Type : W : Flange Type, H : Square Type
- 25: Model Size : 20, 25, 30, 35, 45, 55
- C: Load Type : S : Medium Load, C : Heavy Load, H : Super Heavy Load
- A: Block Mounting Type : A : From Top, B : From Bottom, C : Top or Bottom
- E: E : Special Block, None : Standard Block
- 1/2: Total No. of Blocks with Sensor for all Axes
- T: No. of Blocks per Axis
- 1600: Rail Length (mm)
- E: Rail Mounting Type : R : From Top, T : From Bottom
- ZA: E : Special Rail, None : Standard Rail
- P: Preload Code : IGA : ZF, Z0, Z1~Z3; IGH : Z0, ZA, ZB
- I/II: Precision Code : C, H, P
- E1: No. of Rails with Magnetic Strip
- KK: No. of Rails per Axis
- 03: E1 : Self Lubricant Block, Blank: Standard Block
- □□: Dustproof : DD, ZZ, KK
- Cable Length : 01=1m; 02=2m; 03=3m; 10=10m
- Resolution: 1=5μ, 2=10μ
- Output Signal Type: 1:5V input, TTL output; 2:10V input, O.C. output
- D P = Display (Option)
- 1 2 = Signal Translator

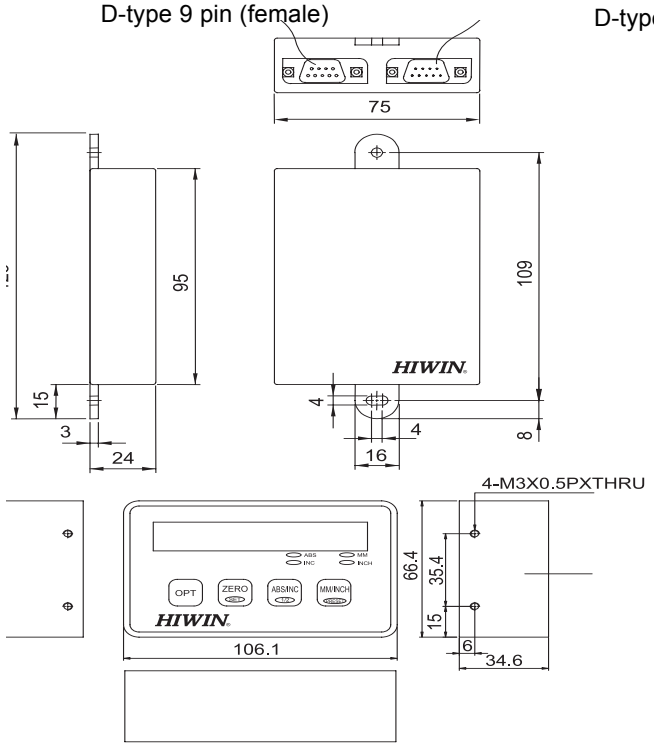
2-4-2 Technical Data of IG series

Item	Specifications
Resolution (μm)	5, 10, 50, 100, 500, 1000
Accuracy (μm)	± (80 + 15 x L), L: Strip Length (m)
Max. Speed (m/min)	80 (for 5μm resolution)
Power Supply (V)	5, 24V ± 10%
Power Consumption	2 Watt
Output Signals (Pulse)	A, B, $\overline{A}$, $\overline{B}$ Phase Difference 90° ± 10%; Output : 5V TTL or O.C. 40 mA / 30VDC
Working Temperature	Magnetic Strip: 0~50°C, Sensor: 0~70°C, Translator: 0~50°C
Storage Temperature	-5°C ~ 50°C
Max. Rail Length	4m (Max. 32m for Butt-joint Rail)
Recommended Magnetic Strip Length	Stroke of Rail + 25mm Each Side
Expansion Coefficient of Strip	$16x10^{-6}$ (mm/°C)
Protection Class	Magnetic Strip: IP 66, Sensor: IP 66, Translator: IP 43

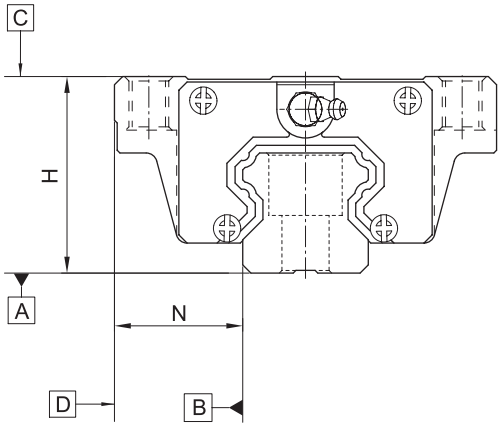
▸ D-type 9 pin layout:
Pin1 = 0V
Pin2 = 5V/DC
Pin3 = channel A
Pin4 = channel B
Pin7 = channel $\overline{B}$
Pin8 = channel $\overline{A}$

D-type 9 pin (female)

D-type 9 pin (male)



2-4-3 Accuracy Classes

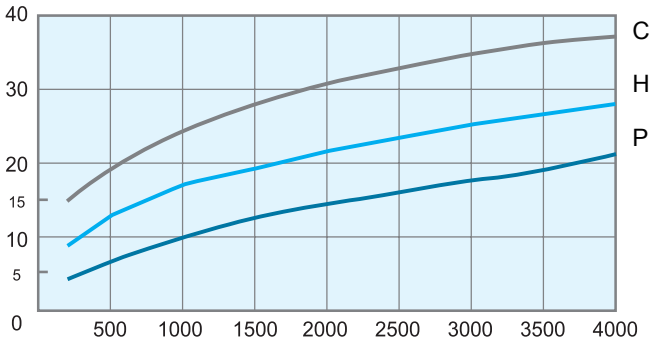


For example: IGA 25, 30, 35

Unit: mm

Item	Normal (C)	High (H)	Precision (P)
Dimensional tolerance of height H	± 0.1	± 0.04	0 -0.04
Dimensional tolerance of width N	± 0.1	± 0.04	0 -0.04
Pair Variation of height H	0.02	0.015	0.007
Pair Variation of width N (Master Rail)	0.03	0.015	0.007
Running parallelism of block surface C to surface A	See chart below		
Running parallelism of block surface D to surface B	See chart below		

▸ Running parallelism of the guideway



2-4-4 Preload

IGH-series

Class	Preload	Remark
Light Preload	0 ~ 0.02C	Z0
Medium Preload	0.05C ~ 0.07C	ZA
Heavy Preload	0.10C ~ 0.12C	ZB

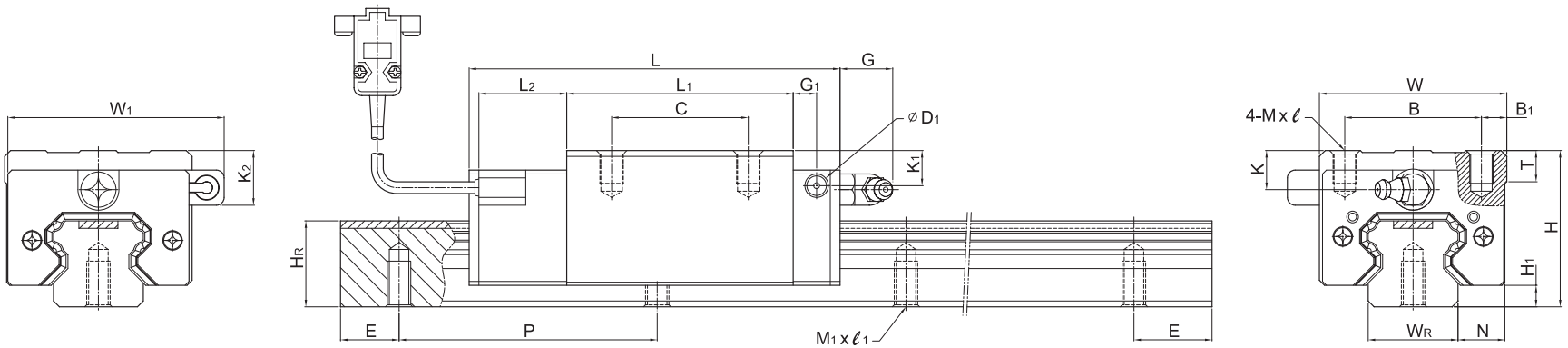
Note: “C” in column preload means basic dynamic load rating.

IGA-series

Class	Preload	Remark
Light Clearance	Clearance 4~10μm	ZF
Very Light Preload	0	Z0
Light Preload	0.02C	Z1
Medium Preload	0.05C	Z2
Heavy Preload	0.07C	Z3

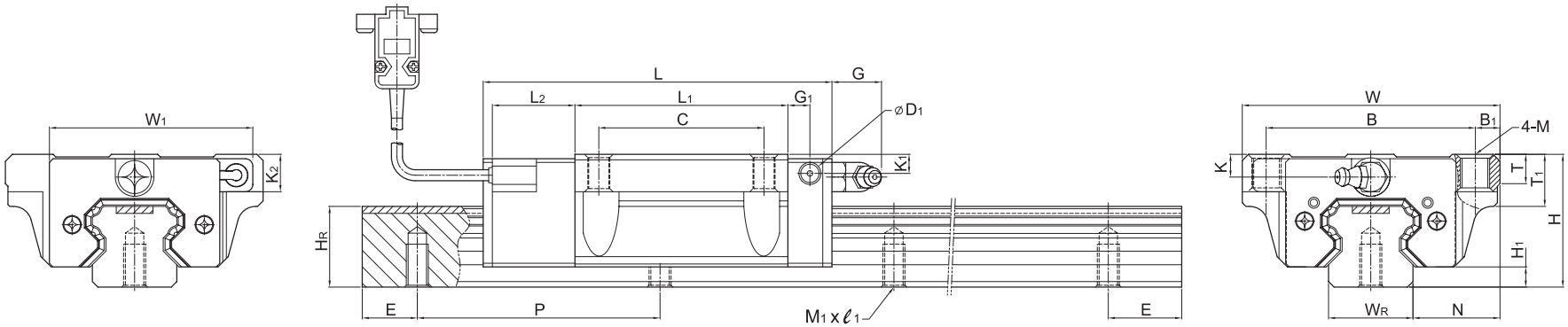
2-4-5 Dimensions for IG Series

(1) IGHH CA / HA type



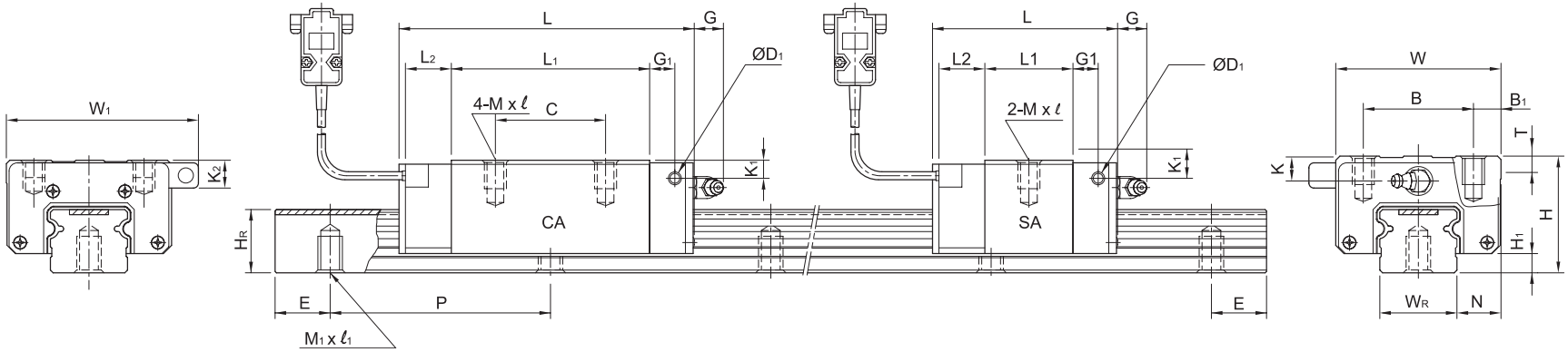
Model No.	Dimensions of Assembly (mm)			Dimensions of Block (mm)															Dimensions of Rail (mm)					Basic Dynamic Load Rating C (kN)	Basic Static Load Rating C_0 (kN)	Weight	
	H	H_1	N	W	W_1	L	B	B_1	C	L_1	L_2	G	K	D_1	G_1	K_1	K_2	M x ℓ	T	W_R	H_R	M_1 x ℓ_1	P	E			Block (kg)	Rail (kg/m)
IGHH20CA	30	4.6	12	44	52	90.5	32	6	36	50.5	25	12	6	5	6	7	11	M5x6	8	20	17.5	M6x10	60	20	17.75	37.84	0.38	2.21
IGHH20HA						105			50	65.2															21.18	48.84	0.39	
IGHH25CA	40	5.5	12.5	48	55.4	95	35	6.5	35	58	22.5	12	10	5	6	13	18	M6x8	8	23	22	M6x12	60	20	26.48	56.19	0.51	3.21
IGHH25HA						116			50	78.6															32.75	76.00	0.69	
IGHH30CA	45	6	16	60	67	110	40	10	40	70	23	12	9.5	5	6	13.8	19	M8x10	8.5	28	26	M8x15	80	20	38.74	83.06	0.88	4.47
IGHH30HA						133			60	93															47.27	110.13	1.16	
IGHH35CA	55	7.5	18	70	77	123	50	10	50	80	23.4	12	16	5	7	19.6	23.5	M8x12	10.2	34	29	M8x17	80	20	49.52	102.87	1.45	6.30
IGHH35HA						149			72	106															60.21	136.31	1.92	
IGHH45CA	70	9.5	20.5	86	91	148	60	13	60	97	26	12.9	18.5	8.5	10	30.5	30.5	M10x17	16	45	38	M12x24	105	22.5	77.57	155.93	2.73	10.41
IGHH45HA						180			80	129															94.54	207.12	3.61	
IGHH55CA	80	13	23.5	100	106	173	75	12.5	75	118	26	12.9	22	8.5	11	29	28.5	M12x18	17.5	53	44	M14x25	120	30	114.44	227.81	4.17	15.08
IGHH55HA						198			95	143															139.35	310.26	5.49	

(2) IGHW CA / HA type



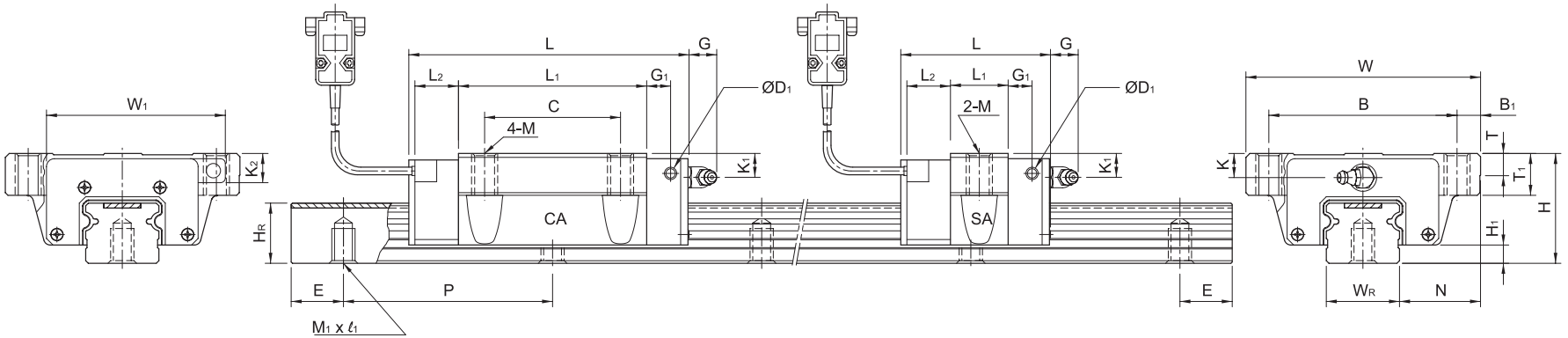
Model No.	Dimensions of Assembly (mm)			Dimensions of Block (mm)																		Dimensions of Rail (mm)					Basic Dynamic Load Rating C (kN)	Basic Static Load Rating C_0 (kN)	Weight	
	H	H_1	N	W	W_1	L	B	B_1	C	L_1	L_2	G	K	M	D_1	G_1	K_1	K_2	T	T_1	W_R	H_R	$M_1 x \ell_1$	P	E			Block (kg)	Rail (kg/m)
IGHW20CA	30	4.6	21.5	63	52	90.5	53	5	40	50.5	25	12	6	M6	5	6	7	11	8	10	20	17.5	M6x10	60	20	17.75	37.84	0.40	2.21
IGHW20HA						105				65.2																21.18	48.84	0.52	
IGHW25CA	36	5.5	23.5	70	55.4	95	57	6.5	45	58	22.5	12	6	M8	5	6	9	14	8	14	23	22	M6x12	60	20	26.48	56.19	0.59	3.21
IGHW25HA						116				78.6																32.75	76.00	0.80	
IGHW30CA	42	6	31	90	67	110	72	9	52	70	23	12	6.5	M10	5	6	10.8	16	8.5	16	28	26	M8x15	80	20	38.74	83.06	1.09	4.47
IGHW30HA						133				93																47.27	110.13	1.44	
IGHW35CA	48	7.5	33	100	77	123	82	9	62	80	23.4	12	9	M10	5	7	12.6	16.5	10.1	18	34	29	M8x17	80	20	49.52	102.87	1.56	6.30
IGHW35HA						149				106																60.21	136.31	2.06	
IGHW45CA	60	9.5	37.5	120	91	148	100	10	80	97	26	12.9	8.5	M12	8.5	10	20	20	15.1	22	45	38	M12x24	105	22.5	77.57	155.93	2.79	10.41
IGHW45HA						180				129																94.54	207.12	3.69	
IGHW55CA	70	13	43.5	140	106	173	116	12	95	118	26	12.9	12	M14	8.5	11	19	18.5	17.5	26.5	53	44	M14x25	120	30	114.44	227.81	4.52	15.08
IGHW55HA						198				143																139.35	301.26	5.96	

(3) IGAH SA / CA type



Model No.	Dimensions of Assembly (mm)			Dimensions of Block (mm)																Dimensions of Rail (mm)					Basic Dynamic Load Rating C (kgf)	Basic Static Load Rating C_0 (kgf)	Weight	
	H	H_1	N	W	W_1	L	B	B_1	C	L_1	L_2	G	K	D_1	G_1	K_1	K_2	Mx ℓ	T_1	W_R	H_R	M_1x ℓ_1	P	E			Block (kg)	Rail (kg/m)
IGAH 20SA	28	6	11	42	50	60.2	32	5	-	26.2	20.5	12	6	5	4.1	6	10	M5 x 8	7.5	20	15	M6 x 9	60	20	650	920	0.2	2.16
IGAH 20CA						78.1			32	44.1															970	1,450	0.29	
IGAH 25SA	33	7	12.5	48	56	70.1	35	6.5	-	34.5	20.5	12	7	5	4.5	7	10	M6 x 9	8	23	18.5	M6 x 10	60	20	1,080	1,330	0.34	2.95
IGAH 25CA						93.9			35	58.3															1,550	2,290	0.51	
IGAH 30SA	42	10	16	60	68	75.2	40	10	-	36.6	20.5	12	8	5	5.8	8	10	M8 x 12	9	28	24	M8 x 14	80	20	1,550	2,030	0.57	4.76
IGAH 30CA						103.8			40	65.2															2,470	3,390	0.88	

(4) IGAW SA / CA type



Model No.	Dimensions of Assembly (mm)			Dimensions of Block (mm)																Dimensions of Rail (mm)					Basic Dynamic Load Rating C (kgf)	Basic Static Load Rating C_0 (kgf)	Weight	
	H	H_1	N	W	W_1	L	B	B_1	C	L_1	L_2	G	K	D_1	G_1	K_1	K_2	Mx ℓ	T_1	W_R	H_R	M_1x ℓ_1	P	E			Block (kg)	Rail (kg/m)
IGAW 20SA	28	6	19.5	59	50	60.2	49	5	-	26.2	20.5	12	6	5	4.1	6	10	M6	9	20	15.5	M6x9	60	20	650	920	0.24	2.16
IGAW 20CA						78.1			32	44.1															970	1,450	0.36	
IGAW 25SA	33	7	25	73	56	70.1	60	6.5	-	34.5	20.5	12	7	5	4.5	7	10	M8	10	23	18.5	M6x10	60	20	1,080	1,330	0.44	2.95
IGAW 25CA						93.9			35	58.3															1,550	2,290	0.68	
IGAW 30SA	42	10	31	90	68	75.2	72	9	-	36.6	20.5	12	8	5	5.8	8	10	M10	10	28	24	M8x14	80	20	1,550	2,030	0.72	4.76
IGAW 30CA						103.8			40	65.2															2,470	3,390	1.16	

2-5 E2 Series Self-lubricant Linear Guideway

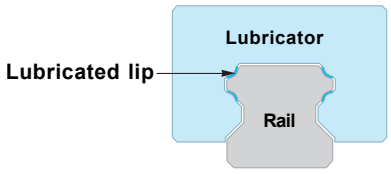
2-5-1 Construction of E2 Series

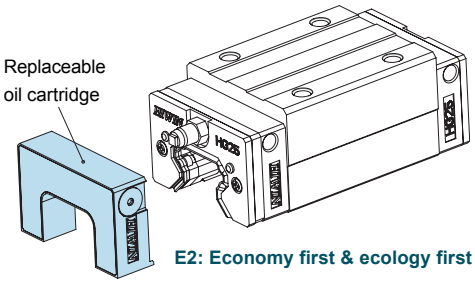
E 2 self-lubricating linear guideway contains a lubricator between the end cap and end seal, the outer side of block is equipped with a replaceable oil cartridge, the configuration of which is listed below.

Lubrication oil flows to the lubricator from the replaceable oil cartridge 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 blocks are placed at a random position or oil flow becomes less, and thus the lubrication oil inside the oil cartridge can be used up via the capillary phenomenon.

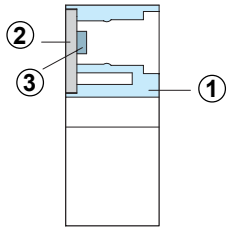
▸Configuration of the self-lubricant apparatus

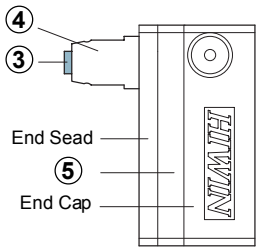
1. Oil cartridge
2. Cartridge cover
3. Oil conductor
4. Connector
5. Lubricator
6. Oil





Patent Pending





2-5-2 Feature of E2 Series

(1) Cost reduction: Saving cost by reducing oil usage and maintenance.

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 280days / year x 5year = 3360 cc x cost / cc = $ XXX	10 cc(5 years10000km) x cost/cc = $ XX
Cost of refilling	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 installation 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 assembled on and dismantled from the block easily when the guideway is installed in the machine.

(6) Different oils can be selected: The replaceable oil cartridge can be refilled with proper lubrication oils according to different application environments.

(7) Applications for special environments: To enclose grease in the block can lead to a better lubricating effect under dusty, bad-weather, and watery environments.

2-5-3 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.

2-5-4 Specification

(1) Add "/ E2" after the specification of linear guideway

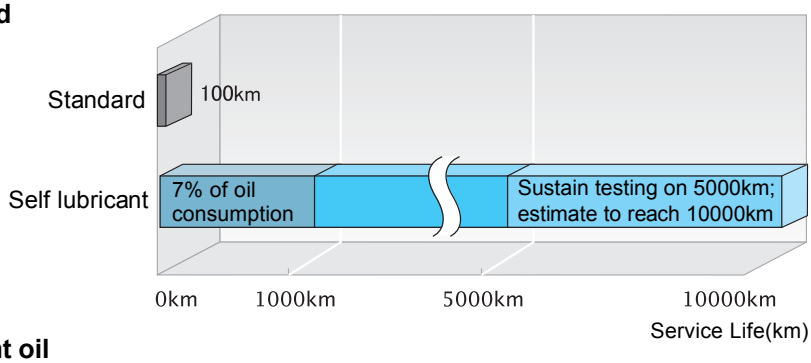
Ex. HGW25CCE2R1600EZAPII + ZZ / E2

2-5-5 Lubrication Capability

(1) Life testing with light load

▸ Test condition :

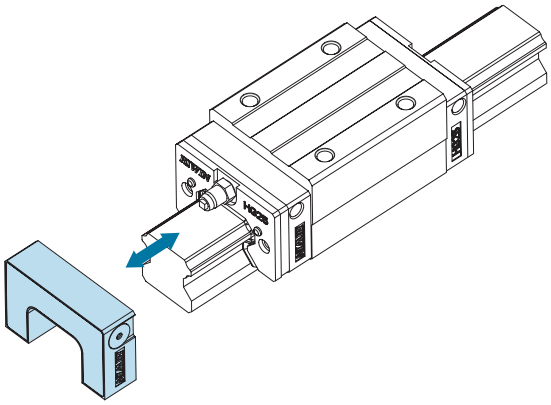
Model No.	HGW25CC
Speed	60m / min
Stroke	1500mm
Load	500kgf



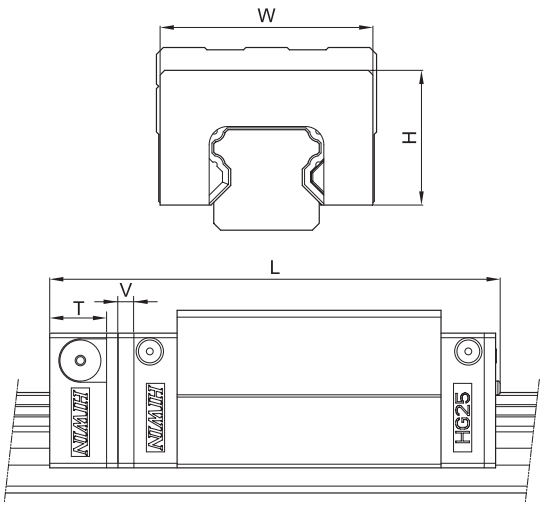
(2) Characteristic of lubricant oil

1. Synthetic oils with stable characteristics.
2. Range of oil operation temperature -15°C~240 °C, which cover most working conditions for linear guideway.
3. Reduces friction.
4. Anti-corrosion.
5. Non-toxic.

2-5-6 Demonstration of Oil Replacement



2-5-7 Dimension Table for E2 of HG Series



Model No.	E2 self-lubricating module dimensions				
	W	H	T	V	L
HG 15C	32.4	19.5	12.5	3	75.4
HG 20 C	43	24.4	13.5	3.5	93.6
HG 20 H					108.3
HG 25 C	46.4	29.5	13.5	3.5	100.5
HG 25 H					121.1
HG 30 C	58	35	13.5	3.5	112.9
HG 30 H					135.9
HG 35 C	68	38.5	13.5	3.5	127.9
HG 35 H					153.7
HG 45 C	82	49	16	4.5	157.2
HG 45 H					189
HG 55 C	97	55.5	16	4.5	183.9
HG 55 H					222
HG 65 C	121	69	16	4.5	219.7
HG 65 H					279.1

2-6 Metallic End-Cap Type (For High Temperature Environment)

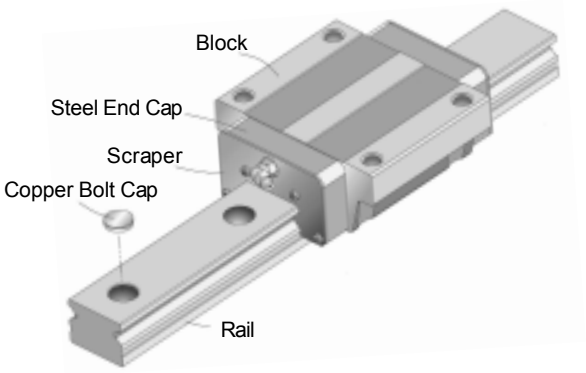
Linear Guideway with heat resistance steel end cap and copper bolt cap.

(1) Feature

Well temperature resistant ability; service temperature under 150°C; peak temperature up to 200°C.

(2) Application

Heat treatment equipment, welding equipment, glass manufacturing equipment and applications using vacuums (no vapor dispersion from plastic or rubber at high temperature)



2-6-1 Applicable

Series	Model No.
AG	15, 20, 25, 30
MGN	7, 9, 12, 15

2-6-2 Specification Number

Add the mark "/SE" after the specification number for steel end cap and copper bolt cap.

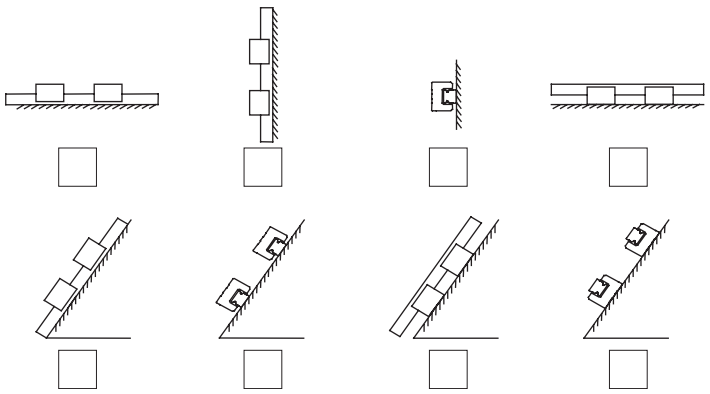
- Ex: AGW25CA2R1000Z0PII/SE
- Ex: MGN15C2R1000Z0PII/SE

2-6-3 Copper Bolt Cap Dimension

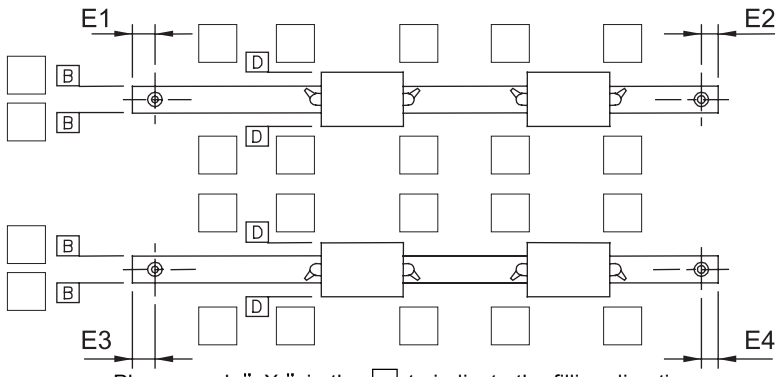
Cap code	Bolt Size	Cap Diameter mm	Cap Thickness mm
C3	M3	6.15	1.2
C4	M4	7.65	1.2
C5	M5	9.65	2.8
C6	M6	11.15	2.8
C8	M8	14.15	3.5
C12	M12	20.15	4
C14	M14	23.15	4

Note: The specifications in this catalogue are subject to change without notification.

2-7 HIWIN Linear Guideway Inquiry Form

Customer			
Tel.	Fax.		Confirm by
Machine Type			Drawing No.
Axis	☐ X ☐ Y ☐ Z ☐ Other ( )		
Install Position			
Model No.			
Rail Mounting	☐ R (from top) ☐ T (from bottom) ☐ U (from top with bolt hole enlarged)		
Dust Protection	☐ Double end seal + Bottom seal (DD) ☐ Double end seal + Scraper + Bottom seal (KK) ☐ End seal + Scraper + Bottom seal (ZZ) ☐ End seal + Bottom seal (U)		
Special Option	☐ Steel end cap (SE) ☐ Self Lubrication (E1)		
Lubrication	☐ Grease nipple (Grease) ☐ Piping joint (Oil) ☐ Other		
Butt-joint	☐ No ☐ Yes		
No. of Rail Per Axis	☐ I (1) ☐ II (2) ☐ III (3) ☐ Other		

Reference Surface and Injection Direction



Please mark " X " in the ☐ to indicate the filling directions.

E1= ☐ E2= ☐ E3= ☐ E4= ☐