HIWIN Linear Guideway Technical Information

HIWIN Linear Guideway

Technical Information Index

(The specifications in this catalogue are subject to change without notification.)

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 especially true when accompanied with precision ball screws

1 General Information

1-1 Advantages and Teatures of Linear Guideways

1-1-1 Advantages 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.

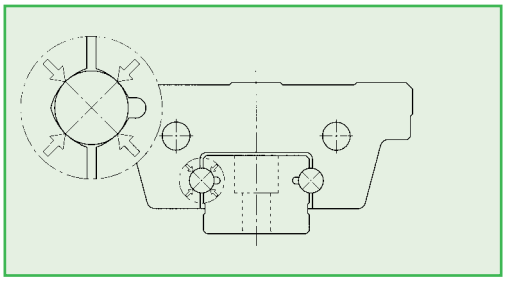
(6) Easy lubrication

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.

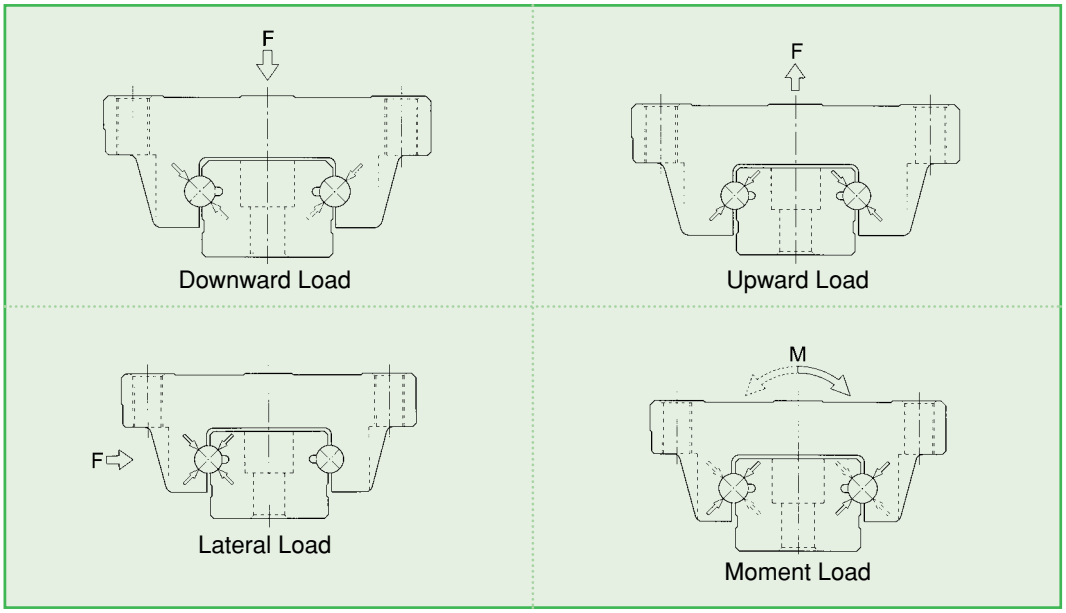
1-1-2 Features of the HIWIN Linear Guideway

(1) Gothic contact

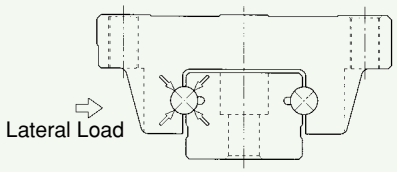
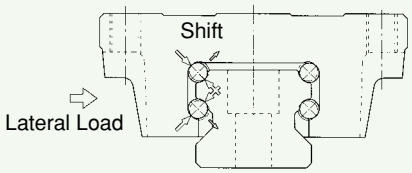
The HIWIN linear guideway has the Gothic arch contact design. Because of the special constraint design, the linear guideway can take up loads in up/down and left/right directions. Furthermore, the symmetrical four-point constraint design gives no positional deflection while the linear guideway is running. Accordingly, the rigidity and accuracy of the HIWIN linear guideway is higher than that of circular contact.



■ Table 1.1 Load Directions



■ Table 1.2 Comparison of Both Gothic Arch Contact Design and Circular Contact Design

Gothic Arch Contact	Circular Contact
	
✓ When a linear guideway is subjected a lateral load, balls will have no positional deflection because the balls are completely restrained within raceway groove. This design achieves a high running accuracy.	✗ Because there is no constraint in the perpendicular direction, a large positional deflection will occur when a lateral load is applied to this linear motion guideway. It will also have poor accuracy.
✓ For this simple two-row Gothic arch contact design, it is possible to handle loads in both the up/down and the lateral directions.	✗ Compared to a Gothic arch design, a circular design needs four circular arcs to handle the same loading condition.

(2) Interchangeability

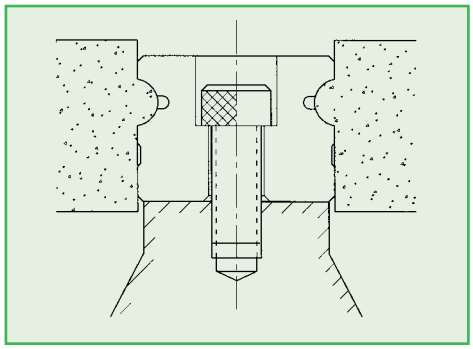
Because of restricted dimension control, the dimensional difference of linear guideways can be kept in a reasonable range, and which means that the specific series of linear guideways possess the interchangeability. For this characteristic, it is good to have the stock of rails and blocks separately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

(3) The optimum design

As for the design of circulating system, HIWIN has obtained patents from many developed countries. Enlarged ball diameter and circulating curve ratio of design makes circulation smoother as well as makes service life longer.

(4) High accuracy

As shown in the figure, both sides of raceway groove are ground simultaneously, and this ensures nearly perfect parallelism for all four surfaces. Therefore, high accuracy repetition is possible when it is installed by tightening the mounting bolts with torque wrench to a specified torque.



1-2 The Principles of Selecting Linear Guideway

Identify the condition

- Applied equipment
- Inner space limit
- Accuracy
- Stiffness
- Way of loading
- Moving distance
- Moving speed, acceleration
- Using frequency
- Using life
- Environment

Selection of series

- **LG series** - Grinding, milling, and drilling machine, lathe, machine center
- **AG series** - Automatic equipment, high speed transfer device, semiconductor equipment, wood cutting machine, precision measure equipment
- **MGN/MGW series** - Miniature device, semiconductor equipment, medical equipment

Selection of accuracy

- Classes : C, H, P, SP, UP Depends on the accuracy of equipment

Assuming the size & the number of blocks

- Depends on experiences
- Load condition
- If accompanied with a ballscrew, the size should be similar to the diameter of ballscrew.For example, if the outer diameter of the ballscrew is 35mm, then the model size of linear guideway should be LG35

Calculate the max. load of block

- Make reference to load calculation examples, and calculate the max load
  Be sure that the static safety factor of selected guideway is bigger than that in the table of static safety factor

Choosing preload

- Depends on the stiffness requirement and accuracy of mounting surface

Identify stiffness

- Calculate the deformation (δ) by using the table of stiffness values, choosing heavier preload and bigger size linear guideway to enhance the stiffness

Calculating service life

- Calculate the life time requirement by using the moving speed and frequency
  Make reference to the life calculation example

Selection of lubrication

- Grease supplied by grease nipple
  Oil supplied by piping joint

Completion of selection

1-3 Basic Load Rating of Linear Guideways

1-3-1 Basic Static Load Rating (C_0)

(1) Definition

A local 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 for 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 safety factor

When the Guideway system is static or under low speed motion. 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 6). The static load can be obtained by using Eq. 1.1.

■ Table 1.3 Static Safety Factor

Load Condition	f_s
Normal Load	1.0~3.0
With impacts/vibrations	3.0~5.0

$$f_s = \frac{C_o}{P} \quad \text{Equal. 1.1}$$

C_o : Static load rating
P : Working load
f_s : Static safety factor

1-3-2 Basic Dynamic Load Rating (C)

Definition

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 Equal. 1.2.

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

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.

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

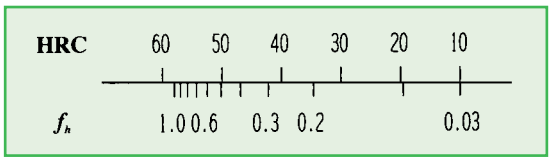
L : Nominal life
C : Basic dynamic load rating
P_c : Calculated load
f_h : Hardness factor
f_t : Temperature factor
f_w : Load factor

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.

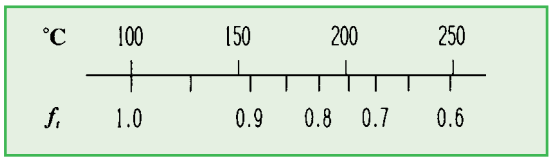
■ Raceway hardness



(2) Temperature factor (f_t)

When the temperature of a linear guideway exceeds 100 ℃, 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

■ Table 1.4 Load factor

Loading Condition	Service Speed	f_W
No impacts & vibration	Low speed V≤15 m/min	1~1.5
Normal load	Medium speed 15<V≤60 m/min	1.5~2.0
With impacts & vibration	High speed V>60 m/min	2.0~3.5

(4) Calculation of the service life time (L_h)

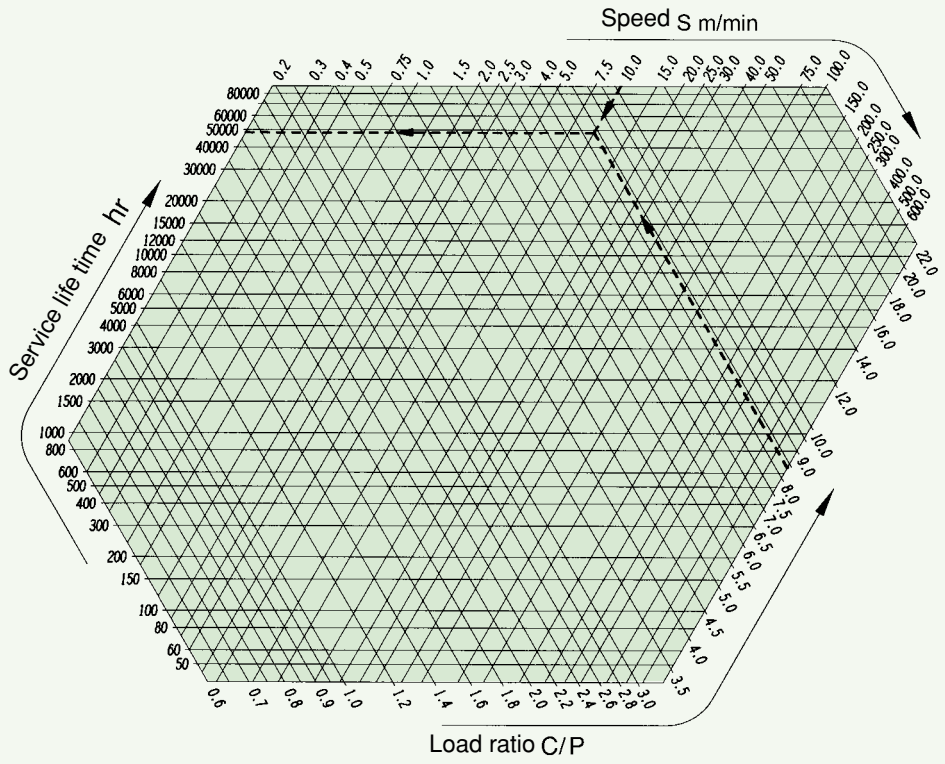
Transform the nominal life into the life time by using the speed and frequency.

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

L_h : Service life time(hr) S : Speed (m/min)
L : Nominal life (km) C/P : Load ratio

If the load ratio and speed have been calculated, the service life time can be obtained easily from the service life nomogram.

■ Table 1.5 Service life time nomogram



A surface grinding machine has a working load 2,000kgf(500kgf per block) and 10m/min feed rate. What is the service life time when the machine uses a set of HIWIN LGW35CA linear guideways?

- By checking the dimension table, the basic dynamic load rating of LGW35CA is 4,180kgf, so the load ratio is: $\frac{C}{P} = \frac{4,180}{500} = 8.36$
- Calculate the nominal life $L = \left(\frac{C}{P}\right)^3 \times 50 = (8.36)^3 \times 50 = 29,214\text{km}$
- According to the intersection of the line of load ratio and the line of speed, the service life time is 49,000hr
- Lh can also be obtained by substituting the numerical values into Eq. 1.4

$$L_h = \frac{\left(\frac{C}{P}\right)^3 \times 50 \times 10^3}{S \times 60} = \frac{(8.36)^3 \times 50 \times 10^3}{10 \times 60} = 48,690\text{hr}$$

- Assume the frequency is 50% and its service life is 11 years.

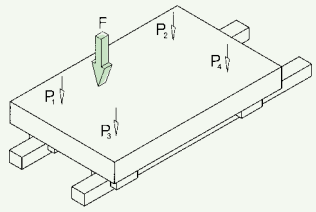
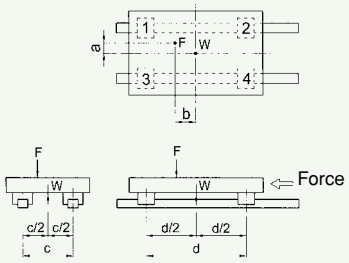
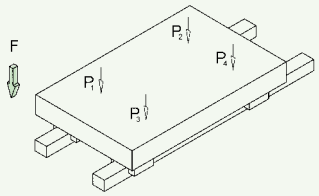
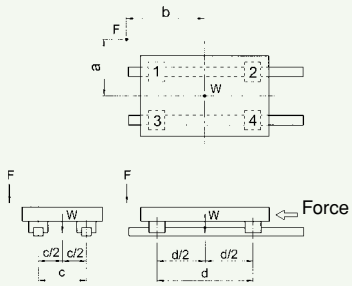
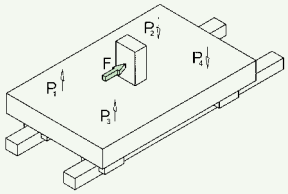
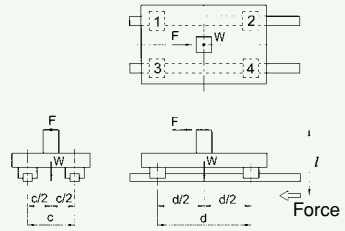
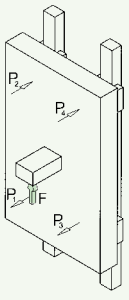
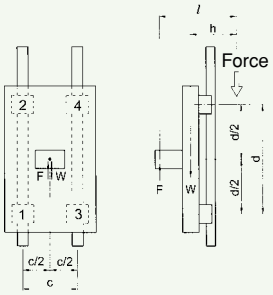
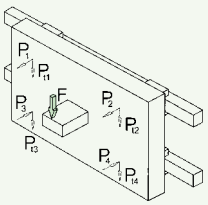
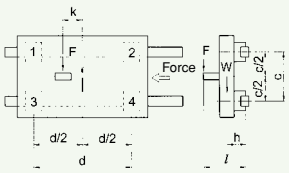
1-5 Acting Load

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 times of start and stop). To obtain the correct load value, each loading condition should be carefully taken into consideration.

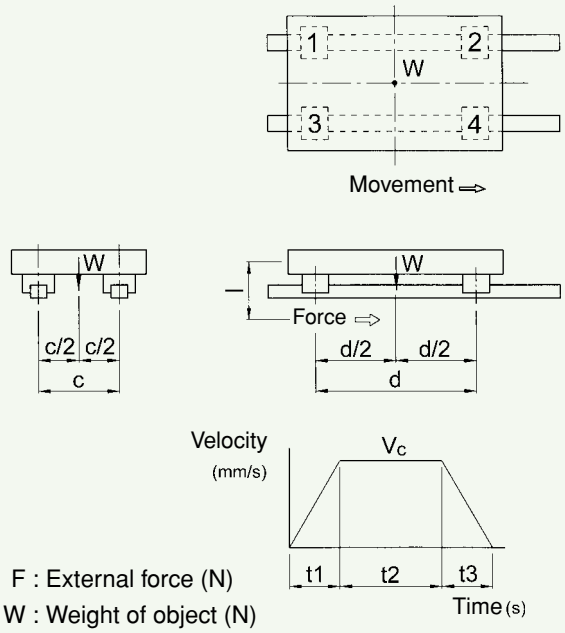
(1) Load on one block

■ Table 1-6 Calculation Examples

Patterns	Loads layout	Load on one block
		$P_1=\frac{W}{4}+\frac{F}{4}+\frac{F\times a}{2c}+\frac{F\times b}{2d}$ $P_2=\frac{W}{4}+\frac{F}{4}+\frac{F\times a}{2c}-\frac{F\times b}{2d}$ $P_3=\frac{W}{4}+\frac{F}{4}-\frac{F\times a}{2c}+\frac{F\times b}{2d}$ $P_4=\frac{W}{4}+\frac{F}{4}-\frac{F\times a}{2c}-\frac{F\times b}{2d}$
		$P_1=\frac{W}{4}+\frac{F}{4}+\frac{F\times a}{2c}+\frac{F\times b}{2d}$ $P_2=\frac{W}{4}+\frac{F}{4}+\frac{F\times a}{2c}-\frac{F\times b}{2d}$ $P_3=\frac{W}{4}+\frac{F}{4}-\frac{F\times a}{2c}+\frac{F\times b}{2d}$ $P_4=\frac{W}{4}+\frac{F}{4}-\frac{F\times a}{2c}-\frac{F\times b}{2d}$
		$P_1=P_3=-\frac{W}{4}+\frac{F\times l}{2d}$ $P_2=P_4=\frac{W}{4}+\frac{F\times l}{2d}$
		$P_1\sim P_4=-\frac{W\times h}{2d}+\frac{F\times l}{2d}$
		$P_1\sim P_4=\frac{W\times h}{2c}+\frac{F\times l}{2c}$ $P_{t1}=P_{t3}=\frac{W}{4}+\frac{F}{4}+\frac{F\times k}{2d}$ $P_{t2}=P_{t4}=\frac{W}{4}+\frac{F}{4}-\frac{F\times k}{2d}$

(2) Loads with inertia forces

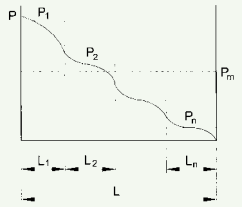
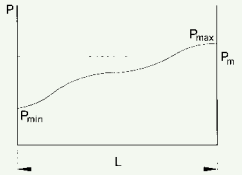
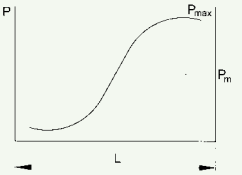
■ Table 1.7 Calculation examples for loads with inertia forces

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 $P_1 = P_3 = \frac{W}{4} + \frac{1}{2} \times \frac{W}{g} \times \frac{V_c}{t1} \times \frac{l}{d}$ $P_2 = P_4 = \frac{W}{4} - \frac{1}{2} \times \frac{W}{g} \times \frac{V_c}{t1} \times \frac{l}{d}$ ➠ Deceleration $P_1 = P_3 = \frac{W}{4} - \frac{1}{2} \times \frac{W}{g} \times \frac{V_c}{t3} \times \frac{l}{d}$ $P_2 = P_4 = \frac{W}{4} + \frac{1}{2} \times \frac{W}{g} \times \frac{V_c}{t3} \times \frac{l}{d}$

1-5-2 Calculation of the Mean Load for Fluctuating Loads

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 1.1.

■ Table 1.8. Calculation examples for mean load (P_m)

Operation Condition	Mean load
Variation in steps 	$P_m = \sqrt[3]{\frac{1}{L}\left(P_1^3 \times L_1 + P_2^3 \times L_2 + ... + P_n^3 \times L_n\right)}$ P_m : Mean load P_n : Fluctuating load L : Total running distance L_n : Running distance under load P_n
Simple fluctuating 	$P_m = \frac{1}{3}\left(P_{\min} + 2 \times P_{\max}\right)$ P_m : Mean load P_{min} : Min. load P_{max} : Max. load
Sin curve fluctuating 	$P_m = 0.65 \times P_{\max}$ P_m : Mean fluctuating load P_{max} : Max. fluctuating load

1-5-3 Calculation for Bidirectional Equivalent Loads

When bidirectional loads applied to the linear guideway, the equivalent load can be obtained by using the following formulas

When $F_s > F_l$ $\quad P_e = F_s + 0.5 \times F_l$ ····· Equal. 1.5

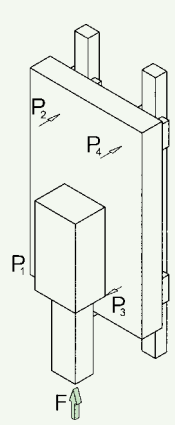
When $F_l > F_s$ $\quad P_e = F_l + 0.5 \times F_s$ ····· Equal. 1.6

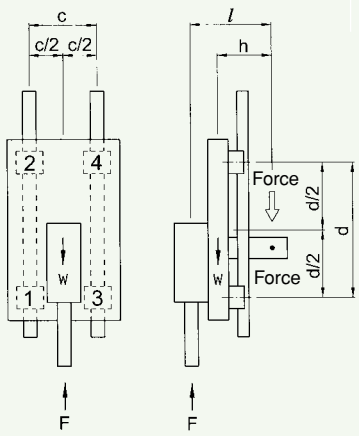
P_e : Equivalent load
F_s : Perpendicular
F_l : Lateral load

1-5-4 Calculation Example for Service Life

Besides the experiences, 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 1.9 Calculation example for service life





Type of Linear Guideway	Dimension of device	Operating condition
Type : LGH 30 CA	d:600 mm	Weight of object(W) :400 kgf
C : 3,380 kgf	c:400 mm	Acting force(F) :100 kgf
C_0 : 5,460 kgf	h:200 mm	Temperature :normal temperature
force : Z2	l:250 mm	Load status :normal load

➠ Calculation of acting loads $P_1 \sim P_4 = \frac{W \times h}{2d} - \frac{F \times l}{2d} = \frac{400 \times 200}{2 \times 600} - \frac{100 \times 250}{2 \times 600} = 45.9\text{kgf}$

$P_{max} = 45.9\text{kgf}$

➠ PC is equal to the sum of P_{max} and preload

$P_c = P_{max} + P_z = 45.9 + (3,380 \times 0.05) = 214.9\text{kgf}$

➠ Calculation for life L

$L = \left(\frac{f_h \times f_t \times C}{f_w \times P_c} \right)^3 \times 50 = \left(\frac{1 \times 1 \times 3,380}{2 \times 214.9} \right)^3 \times 50 = 24,317\text{km}$

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, more or less differentiate from different series.

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

$$F = \mu \times W + f \quad \text{Equal. 1.7}$$

F : friction (kgf) μ : Coefficient of friction
f : friction resistance (kgf) W : 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 been installed, we recommended that the replenishment should be held every 100km. It is possible to carry out the lubrication by piping the grease nipple. Generally, the grease is suitable for the running speed not over 60 m/min or the cooling function is not important.

$$T = \frac{100 \times 1000}{S \times 60} \text{hr} \quad \text{Equal. 1.8}$$

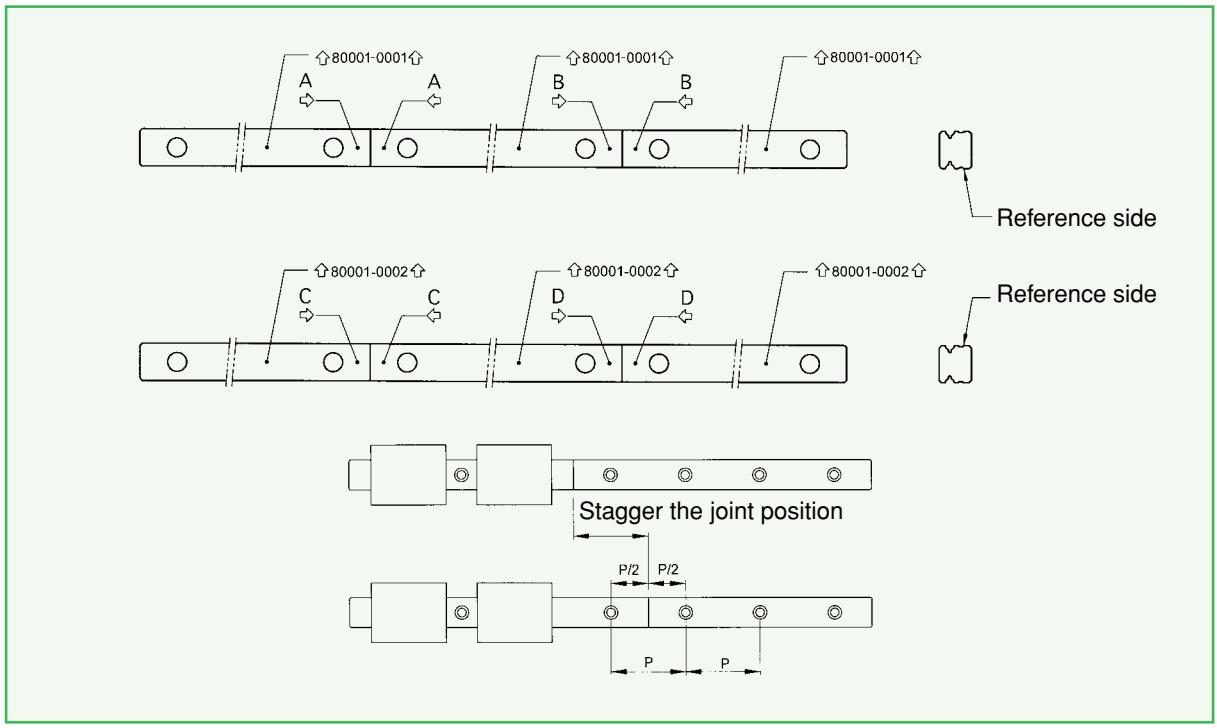
T : Feeding frequency of oil(hour)
S : speed(m/min)

1-7-2 Oil

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

Since the oil is easier to evaporate than the grease, the recommended oil feeding rate is about 0.3cm3/hr.

1-8 The Butt-joint Rail

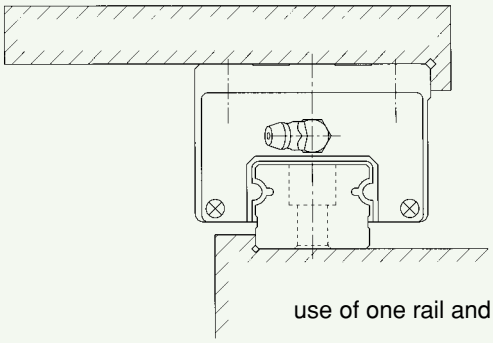


The butt-joint rail should be installled by following the arrow sign and ordinal number which is marked on the surface of each rail.For paired butt-joint rails, the jointed position should be interlaced for avoiding the accuracy problem due to the difference between different rails.(see figure)

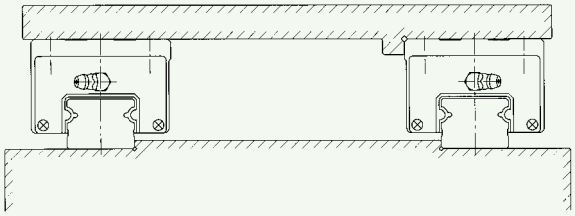
1-9 Layout Method

The linear guideway can take up loads in up/down, left/right direction. The application depends on the machine requirements and load directions.

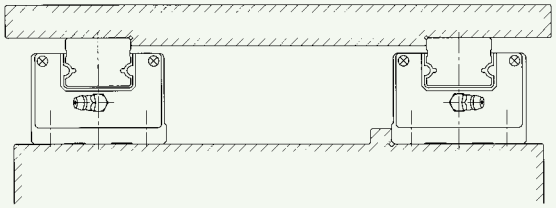
The typical layouts for linear guideway are shown below:



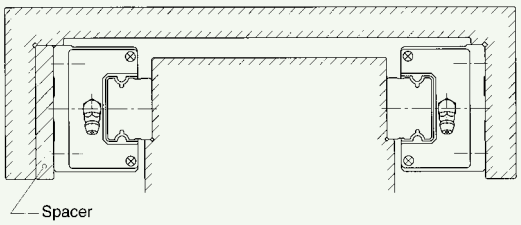
use of one rail and mounting reference side



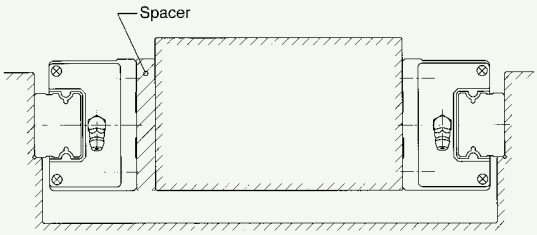
use of two rails(block movement)



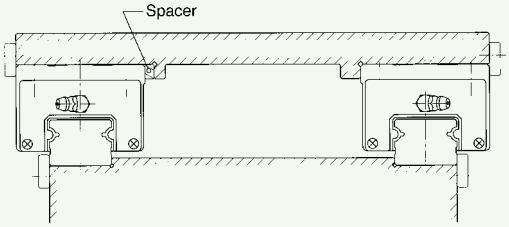
use of two rails(block fixed)



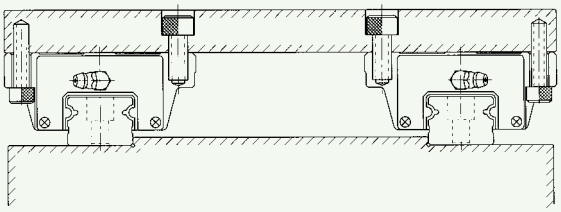
use of two external rails



use of two internal rails



total surface fixed installation



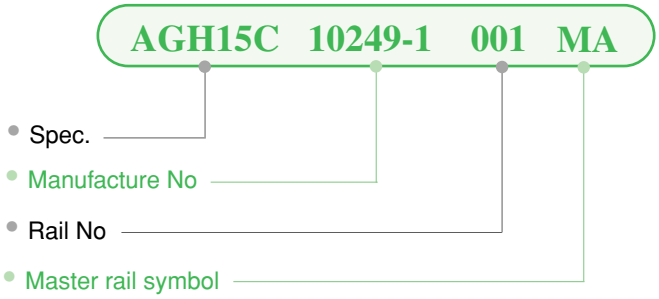
LGW type block with mounting holes in different directions.

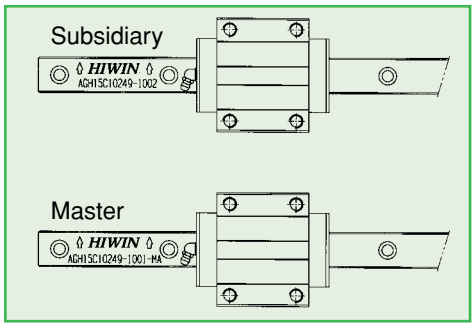
1-10 Installation of Linear Guideway

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

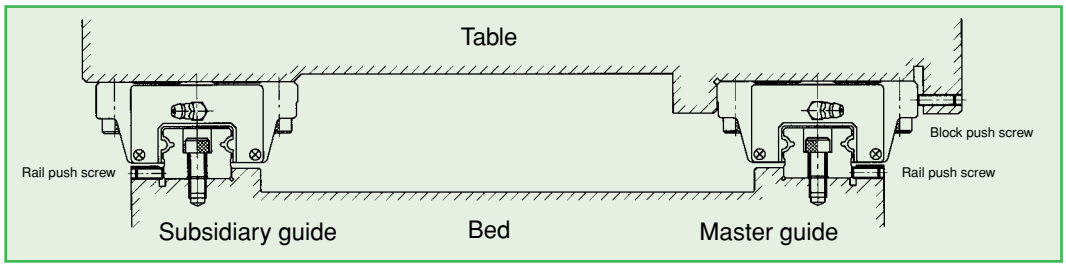
■ Master and Subsidiary Guide

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 referance side for installation。There is a mark "MA" printed on the rail, show as the figure.



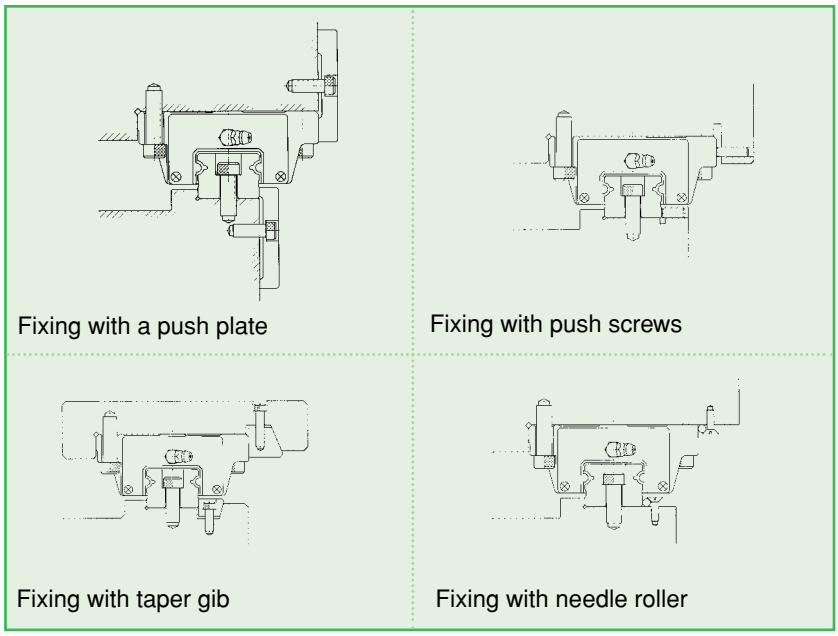


1-10-1 Installation Example for Highly Required in Rigidity and Accuracy when Vibration and Impacts

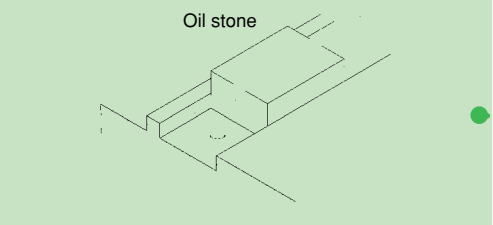


(1) Fixing methods

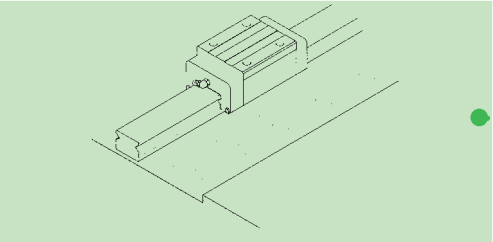
It is possible that the rails and the blocks will be displaced when the machine is subjected to vibrations and impacts. To eliminate these difficulties and achieve high running accuracy, the following four methods are recommended for fixing.



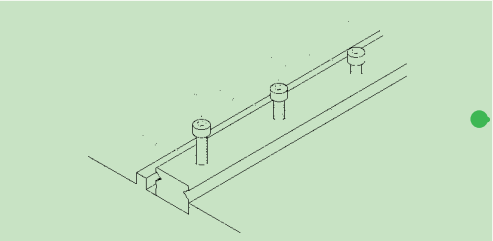
(2) Installation procedure of the rail



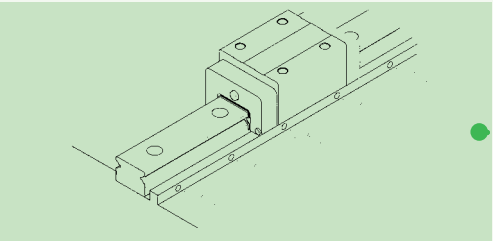
1. Before starting, remove all dirt from the mounting surface of the machine.



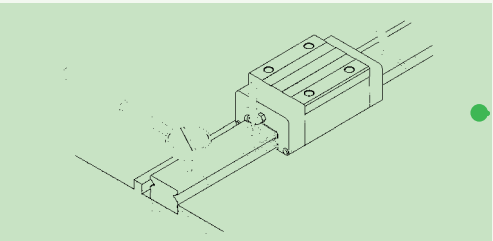
2. Place the linear guideway gently on the bed. Bring the guideway into close contact with the datum plane of the bed.



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.

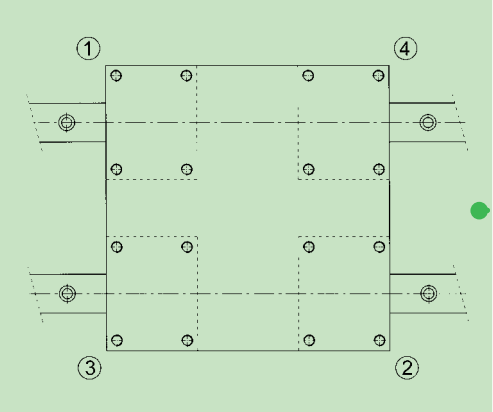


4. Tighten the push screws sequentially to ensure close contact between the rail and the side datum plane.



5. Tighten the mounting bolts with a torque wrench to the specified torque. (Refer to table 1.9)
6. Install the remaining linear guideway in the same way.

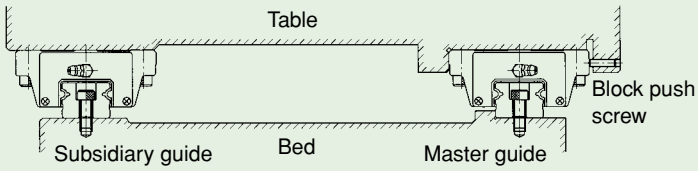
(3) Installation procedure of the block



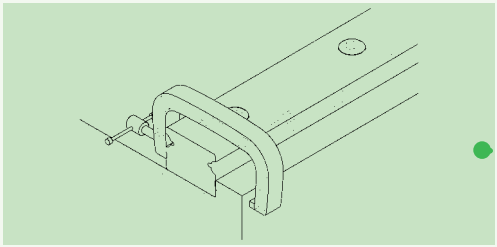
1. Place the table gently on the blocks. Next, tighten the block mounting bolts temporarily.
2. Push the blocks against the datum plane of the table and position the table by tightening the push screws.
3. The table can be fixed uniformly by tightening the mounting bolts on master guide side and subsidiary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

1-10-2 Installation Example 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.



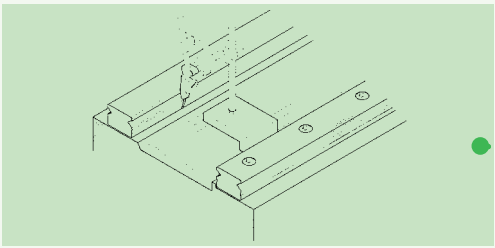
(1) Installation of the rail on the master guide side



▲ Using a vice

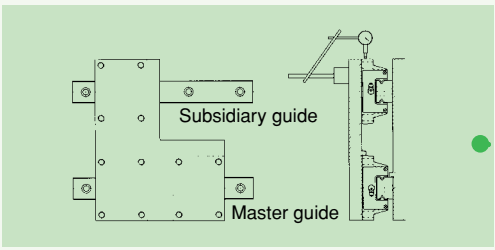
Place the rail into the mounting plane of the bed. Tighten the mounting bolts temporarily; then use a vice to push the rail against the side datum plane of the bed. Tighten the mounting bolts in sequence to the specified torque.

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



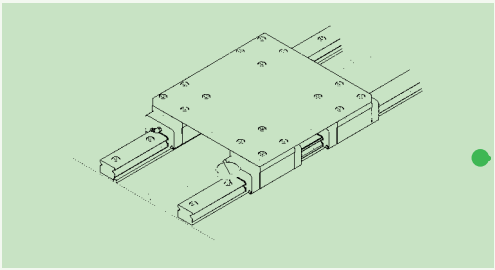
▲ Method with use of a straight edge

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.



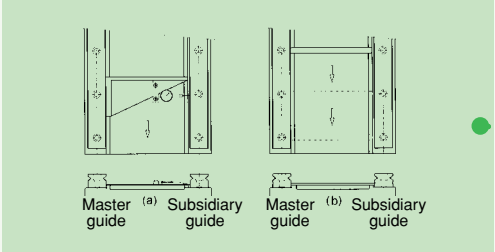
▲ Method with use of a table

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

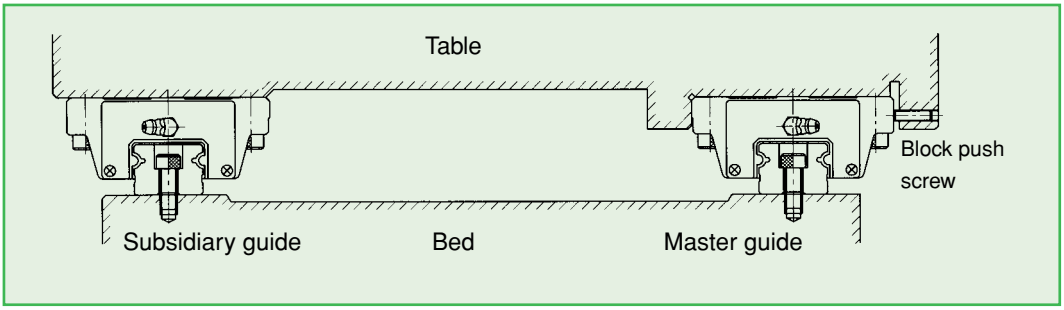
When a rail on the master guide side is correctly tightened, fix both blocks on the master guide side and one of the two blocks on the subsidiary guide side completely on the table. When moving the table from one end of the rail, tighten the mounting bolts on the subsidiary guide side completely.



▲ Method with use of a jig

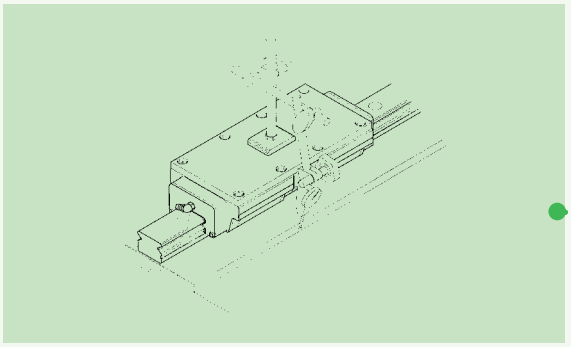
Use a special jig to ensure the rail position on the subsidiary guide side. Tighten the mounting bolts to the specified torque in sequence.

1-10-3 IInstallation Example When There Is No Side Surface of The Bed on The Master Guide Side



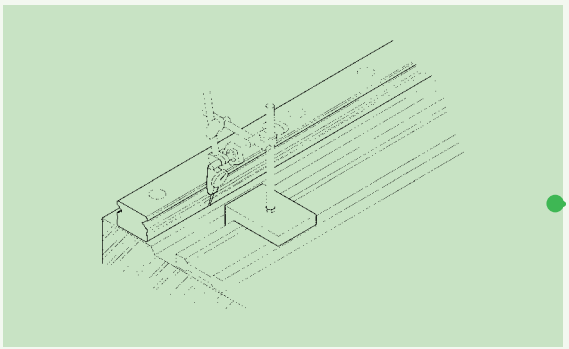
To ensure parallelism between the subsidiary guide and the master guide when there is no side surface, the following rail installation method is recommended. The installation of the blocks is the same as which mentioned previously.

(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

(1) Types & Series

For satisfying various needs of customers, HIWIN has developed many products: LG series for machine tools which require high accuracy and rigidity; the low profile AG series for automation industry; and the miniature MGN/MGW series.

■ Table 2.1 Types & Series

Series	Assembly Height	Load	Square	Flange		
			Tap hole	Tap hole	Drilled hole	Combination
LG	▲ High	**Heavy Load**	LGH - CA	-	-	-
		Super Heavy Load	LGH - HA	-	-	-
	▼ Low	**Heavy Load**	-	LGW - CA	LGW - CB	LGW - CC
		Super Heavy Load	-	LGW - HA	LGW - HB	LGW - CC
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)
LG	●	●	●	●	●	●	●	●
AG	●	●	●	●	●	●	●	●
MGN	●	●	●	-	-	●	●	●
MGW	●	●	●	-	-	-	-	-

(3) Classification of Preload

■ Table 2.3 Preload

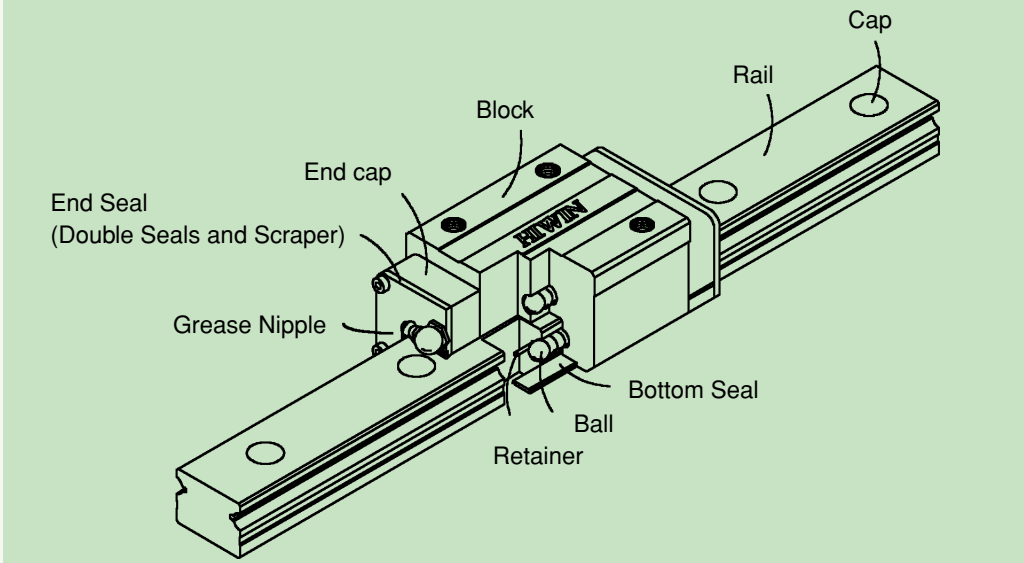
Series	**Assembly Type**						**Interchangeable Type**		
	C Light Clearance (ZF)	C~UP Very Light (Z0)	C~UP Light (Z1)	H~UP Medium (Z2)	H~UP Heavy (Z3)	H~UP Super Heavy (Z4)	C Light Clearance (ZF)	C~UP Very Light (Z0)	C~P Light (Z1)
LG	●	●	●	●	●	●	●	●	●
AG	●	●	●	●	●	-	●	●	●
MGN	●	●	●	-	-	-	●	●	●
MGW	●	●	●	-	-	-	-	-	-

2-1 LG Series

2-1-1 Features of The LG Series Linear Guideway

The enlarged ball diameter design has increased the stiffness and the loading capacity, and this makes the LG series guideway especially suitable for the application with heavy working load. Besides, the optimum design of circulating system makes the movement smooth.The retainer is designed for avoiding the balls fall out, even if the blocks are removed from the rail while installing.

2-1-2 Construction of LG Series

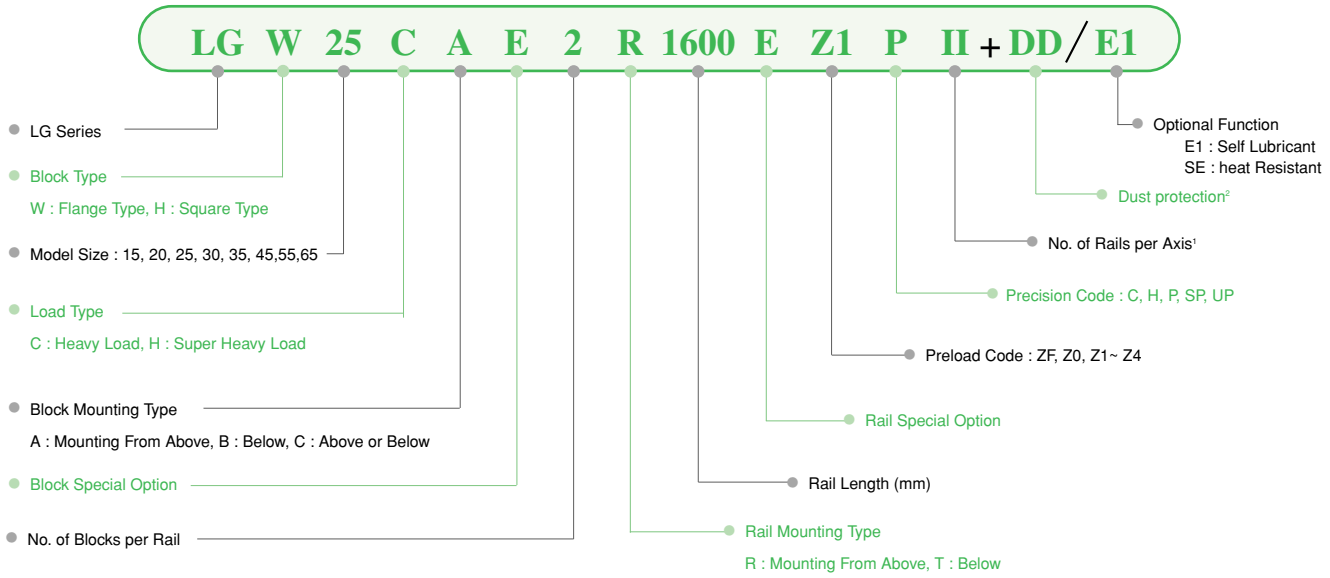


- Rolling Circulation System ➠Block, rail, end plate and retainer.
- Lubrication System ➠Grease nipple and piping joint.
- Dust Protection System ➠End seal, bottom seal, cap, double seals and scraper.

2-1-3 Model Number of LG Series

LG 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 LG series contains the size, type, accuracy class, preload class, etc.

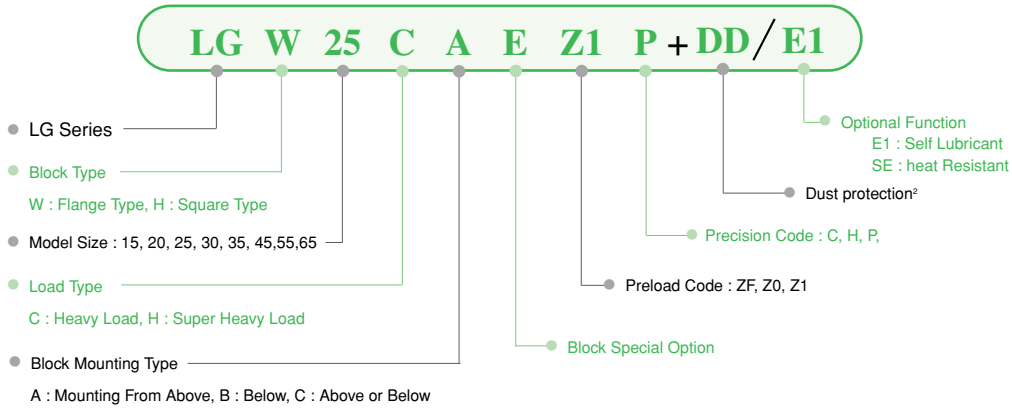
(1) Non-interchangeable type



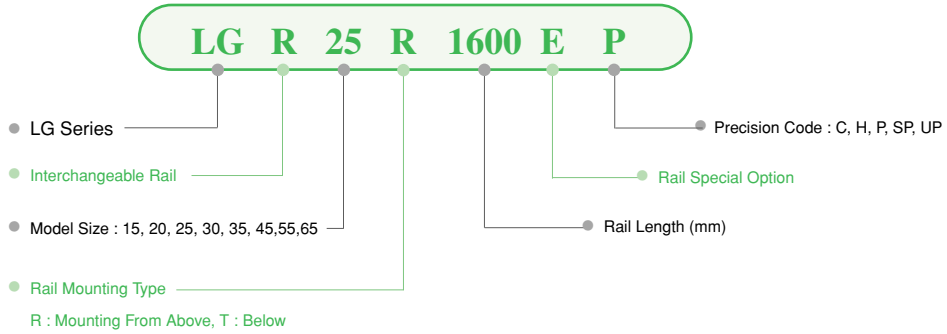
Note: 1. The Roman numerals used to express the number of rails used in one axis. As for the single rail in an axis, it shows no symbol.
2. For dust protection, it is no symbol if it is standard(end seal and bottom seal).
ZZ : End seal, bottom seal and scraper
KK: Double seals, bottom seal and scraper.
DD: Double seals and bottom seal

(2) Interchangeable type

◆ Model Number of LG Block



◆ Model Number of LG Rail

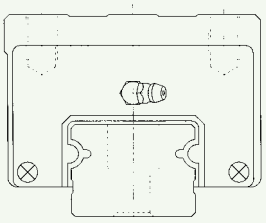
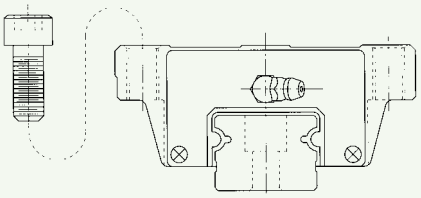
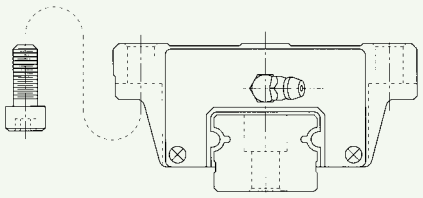
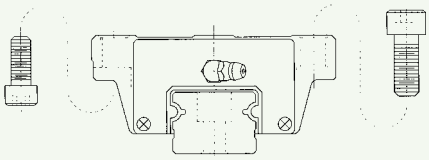


2-1-4 LG Types

(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 good for heavy moment load application.

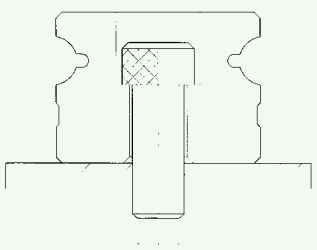
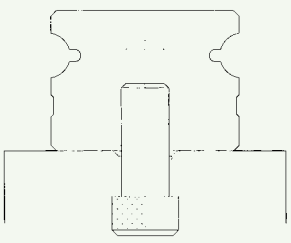
■ Table 2.4 Block Types

Type	Model	Shape	Height (mm)	**Rail Length** (mm)	Main Application
Square	LGH-CA LGH-HA		28 ↓ 90	100 ↓ 4000	•Machine Center •NC Lathe •Grinding Machine •Precision Machining Machine •Heavy Cutting Machine •Automation Device •Transportation Equipment •Measuring Equipment •Devices Required High Positional Accuracy
Flange	LGW-CA LGW-HA		24 ↓ 90	100 ↓ 4000	
	LGW-CB LGW-HB		24 ↓ 90	100 ↓ 4000	
	LGW-CC LGW-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.

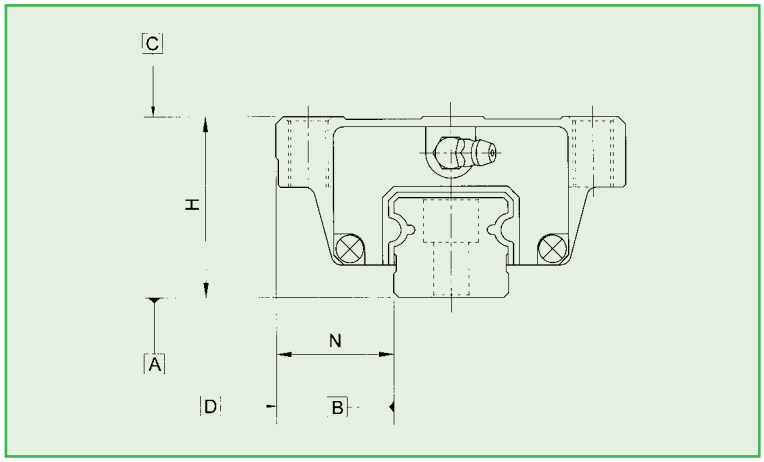
■ Table 2.5 Rail Types

Mounting from Above	Mounting from below
	

2-1-5 Accuracy Classes

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

(1) Accuracy of non-interchangeable LG



■ Table 2.6 Accuracy Standards

Unit mm		LG - 15, 20				
Item		Normal (C)	High (H)	Precision (P)	Super Precision (SP)	Ultra Precision (UP)
Dimension tolerance of height H		± 0.1	± 0.03	0 - 0.03	0 - 0.015	0 - 0.008
Dimension 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 2.14				
Running parallelism of block surface D to surface B		See Table 2.14				

■ Table 2.7 Accuracy Standards

Unit mm		LG - 25, 30, 35				
Item		Normal (C)	High (H)	Precision (P)	Super Precision (SP)	Ultra Precision (UP)
Dimension tolerance of height H		± 0.1	± 0.04	0 - 0.04	0 - 0.02	0 - 0.01
Dimension 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 ~ Z4			
Running parallelism of block surface C to surface A		See Table 2.14				
Running parallelism of block surface D to surface B		See Table 2.14				

■ Table 2.8 Accuracy Standards

Unit mm		LG - 45, 55				
Item		Normal (C)	High (H)	Precision (P)	Super Precision (SP)	Ultra Precision (UP)
Dimension tolerance of height H		± 0.1	± 0.05	0 - 0.05	0 - 0.03	0 - 0.02
Dimension tolerance of width N		± 0.1	± 0.05	0 - 0.05	0 - 0.03	0 - 0.02
Pair	Variation of height H	0.03	0.015	0.007	0.005	0.003
	Variation of width N (Master Rail)	0.03	0.02	0.01	0.007	0.005
Preload classes		ZF, Z0, Z1	Z0 ~ Z4			
Running parallelism of block surface C to surface A		See Table 2.14				
Running parallelism of block surface D to surface B		See Table 2.14				

■ Table 2.9 Accuracy Standards

Unit mm		LG - 65				
Item		Normal (C)	High (H)	Precision (P)	Super Precision (SP)	Ultra Precision (UP)
Dimension tolerance of height H		± 0.1	± 0.07	0 - 0.07	0 - 0.05	0 - 0.03
Dimension tolerance of width N		± 0.1	± 0.07	0 - 0.07	0 - 0.05	0 - 0.03
Pair	Variation of height H	0.03	0.02	0.01	0.007	0.005
	Variation of width N (Master Rail)	0.03	0.025	0.015	0.01	0.007
Preload classes		ZF, Z0, Z1	Z0 ~ Z4			
Running parallelism of block surface C to surface A		See Table 2.14				
Running parallelism of block surface D to surface B		See Table 2.14				

(2) Accuracy of interchangeable LG

■ Table 2.10 Accuracy Standards

Unit mm		LG - 15, 20		
Item		Normal (C)	High (H)	Precision (P)
Dimension tolerance of height H		± 0.1	± 0.03	± 0.015
Dimension 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 2.14		
Running parallelism of block surface D to surface B		See Table 2.14		

■ Table 2.11 Accuracy Standards

Unit mm		LG - 25, 30, 35		
Item		Normal (C)	High (H)	Precision (P)
Dimension tolerance of height H		± 0.1	± 0.04	± 0.02
Dimension 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 2.14		
Running parallelism of block surface D to surface B		See Table 2.14		

■ Table 2.12 Accuracy Standards

Unit mm		LG - 45, 55		
Item		Normal (C)	High (H)	Precision (P)
Dimension tolerance of height H		± 0.1	± 0.05	± 0.025
Dimension tolerance of width N		± 0.1	± 0.05	± 0.025
Pair	Variation of height H	0.03	0.015	0.007
	Variation of width N	0.03	0.02	0.01
Pair variation of height H (multi sets)		0.07	0.045	0.027
Preload classes		ZF, Z0, Z1	Z0, Z1	
Running parallelism of block surface C to surface A		See Table 2.14		
Running parallelism of block surface D to surface B		See Table 2.14		

■ Table 2.13 Accuracy Standards

Unit mm		LG - 65		
Item		Normal (C)	High (H)	Precision (P)
Dimension tolerance of height H		± 0.1	± 0.07	± 0.035
Dimension tolerance of width N		± 0.1	± 0.07	± 0.035
Pair	Variation of height H	0.03	0.02	0.01
	Variation of width N	0.03	0.025	0.015
Pair variation of height H (multi sets)		0.07	0.05	0.03
Preload classes		ZF, Z0, Z1	Z0, Z1	
Running parallelism of block surface C to surface A		See Table 2.14		
Running parallelism of block surface D to surface B		See Table 2.14		

(3) Accuracy of Running Parallelism

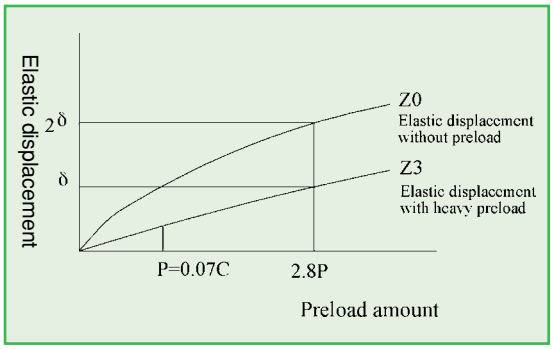
■ Table 2.14 Accuracy of running parallelism

Rail Length (mm)	Accuracy (μm)				
	C	H	P	SP	UP
100以下	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. Figure shows that rigidity is doubled at the point where the load is 2√2 times the preload and the deflection is one half.



(2) Preload classes

HIWIN offers six standard preloads for various applications and conditions.

■ Table 2.15 Preload Classes

Class	Code	Preload	Accuracy	Examples of Application
Light Clearance	ZF	Clearance 4~10 μ m	C	Automation industry
Very Light Preload	Z0	0	C~UP	Transportation devices, auto-packing machines
Light Preload	Z1	0.02C	C~UP	X-Y axis for general industrial machines, welding machines, welders
Medium Preload	Z2	0.05C	H~UP	Z axis for general industrial machines, EDM, NC lathes, Precision X-Y tables, measuring equipment
Heavy Preload	Z3	0.07C	H~UP	Machining centers, grinding machines, NC lathes, horizontal and vertical milling machines, Z axis of machine tools
Super Heavy Preload	Z4	0.13C	H~UP	Heavy cutting machines

NOTE ： The C in preload column means basic dynamic load rating.

2-1-7 Stiffness

To confirm the impact on accuracy, Table 2.16 could be used to calculate the deflection of linear guideway.

$$\delta = \frac{P}{k}\mu m \quad \text{Equal. 2.1}$$

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

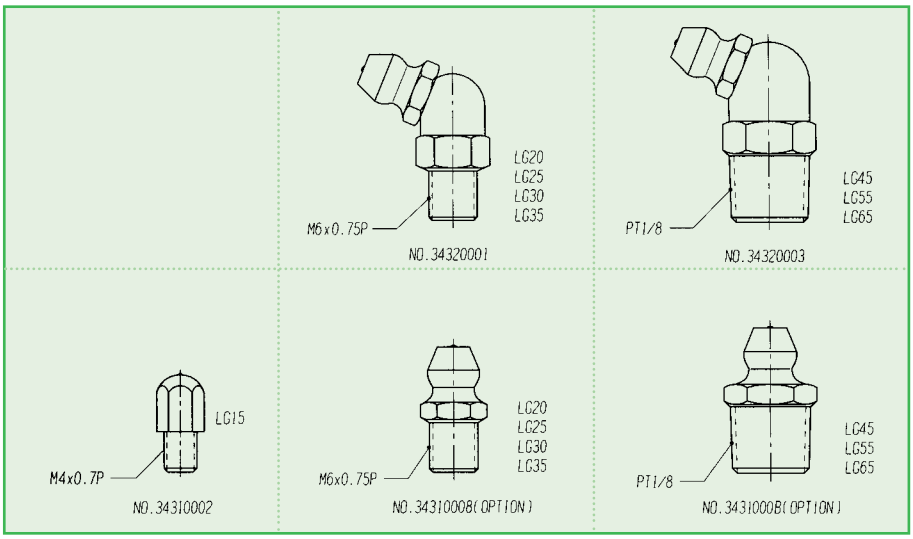
■ Table 2.16 Value of rigidity

Type	Size	Z0 kgf/μm	Z1 kgf/μm	Z2 kgf/μm	Z3 kgf/μm	Z4 kgf/μm
Heavy load	LG 15C	19	24	28	30	-
	LG 20C	26	33	38	41	-
	LG 25C	28	36	42	45	52
	LG 30C	35	45	52	56	65
	LG 35C	41	52	60	65	74
	LG 45C	50	64	74	79	92
	LG 55C	58	74	86	92	106
	LG 65C	70	89	104	111	128
Super heavy load	LG 20H	32	41	47	51	-
	LG 25H	37	47	54	58	67
	LG 30H	45	57	66	70	81
	LG 35H	51	65	76	81	94
	LG 45H	65	83	96	103	118
	LG 55H	75	96	111	119	137
	LG 65H	92	117	135	145	167

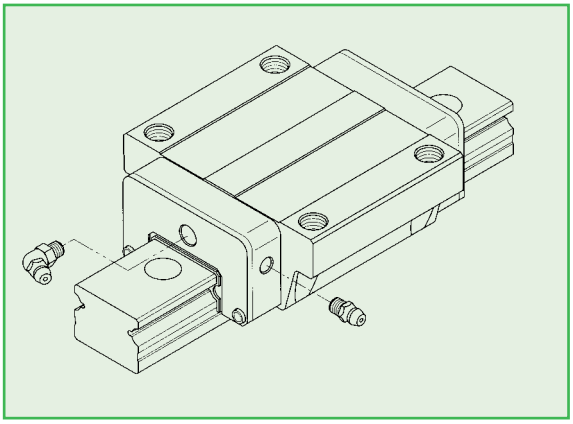
2-1-8 Lubrication

(1) Grease

◆ 1 Grease Nipple



◆ 2 Mounting Location



The standard location of the grease fitting is at both ends of the block, but the nipple may optionally be mounted in the 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 oil-piping joint.

◆ 3 The Oil Amount for a Block Full with Grease

■ Table 2.17 The Oil Amount for a Block Full with Grease

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

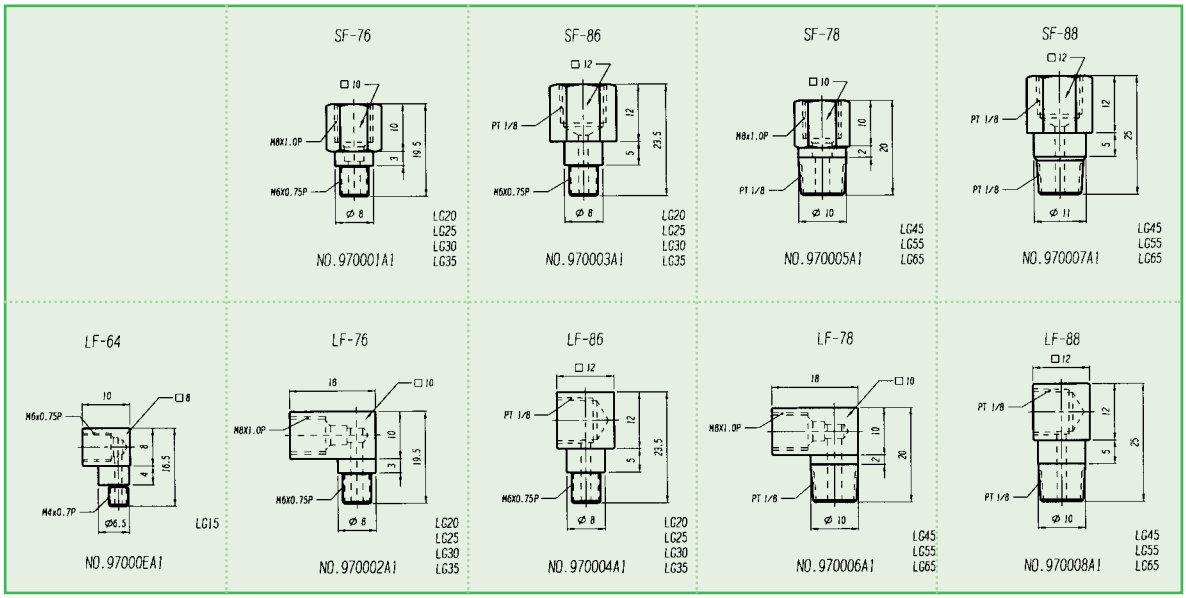
◆ 4 Frequency of Replenishment

Replenishing the oil 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.

◆ 1 Types of Oil Piping Joint.



◆ 2 Oil Feeding Rate

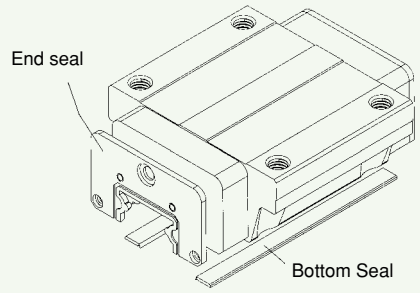
■ Table 2.18

Size	Feeding rate (cm^3/hr)	Size	Feeding rate (cm^3/hr)
LG15	0.2	LG35	0.3
LG20	0.2	LG45	0.4
LG25	0.3	LG55	0.5
LG30	0.3	LG65	0.6

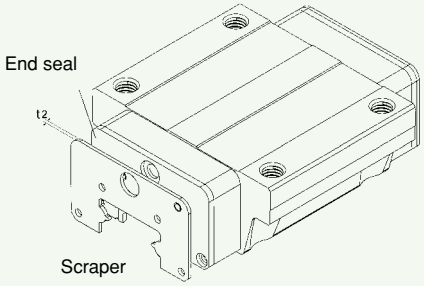
2-1-9 Dust Protection Equipment

(1) Code of equipment

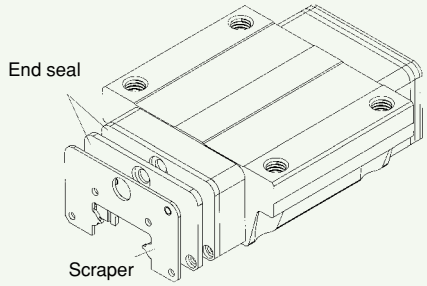
If the following equipment is needed, please add the code followed by the model number.



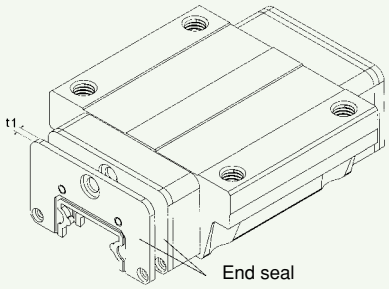
No code: Standard equipment (End seal + Bottom Seal)



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 from the groove surface damaged by iron chips or dust entering the block.

(3) Double seals

Enhancing the wiping effect, the foreign matters can be completely wiped out of block.

■ Table 2.19 Order number of End seal

Size	Part No.	Thickness(t1) mm	Size	Part No.	Thickness(t1) mm
LG15	920001A1	1.8	LG35	920005A1	2.8
LG20	920002A1	2	LG45	920006A1	2.5
LG25	920003A1	2.5	LG55	920007A1	5
LG30	920004A1	2.8	LG65	920008A1	5

(4) Scraper

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

Table 2.20 Order number of Scraper

Size	Part No.	Thickness(t1) mm	Size	Part No.	Thickness(t1) mm
LG15	980001A1	1.5	LG35	980005A1	1.5
LG20	980002A1	1.5	LG45	980006A1	1.5
LG25	980003A1	1.5	LG55	980007A1	1.7
LG30	980004A1	1.5	LG65	980008A1	1.7

(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

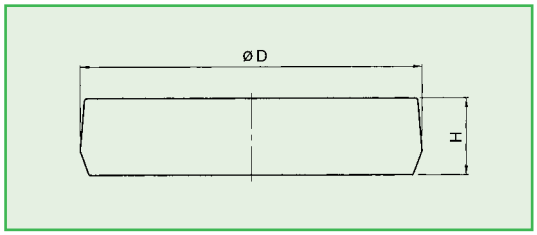


Table 2.21 Caps for rail mounting holes

Rail size	Bolt size	Part No.	Diameter(D)mm	Thickness(H)mm
LGR15	M4	950002C1	7.7	1.1
LGR20	M5	950003C1	9.7	2.2
LGR25	M6	950004C1	11.3	2.5
LGR30	M8	950005C1	14.3	3.3
LGR35	M8	950005C1	14.3	3.3
LGR45	M12	950007C1	20.3	4.6
LGR55	M14	950008A1	23.5	5.5
LGR65	M16	950009A1	26.6	5.5

2-1-10 Friction

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

Table 2.22 Seal resistance

Size	Resistance (kgf)	Size	Resistance (kgf)
LG 15	0.3	LG 35	0.8
LG 20	0.4	LG 45	1
LG 25	0.5	LG 55	1.2
LG 30	0.7	LG 65	1.5

2-1-11 The Accuracy Tolerance of Mounting Surface

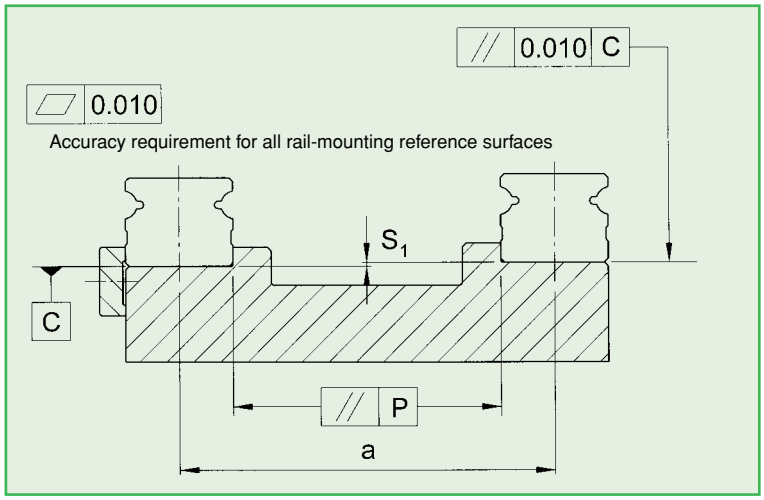
(1) The accuracy tolerance of rail-mounting surface

Because of the Gothic contact design, the linear guideway is possessed 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 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.

◆ 1 The parallelism tolerance of reference surface (P)



■ Table 2.23 Max. Parallelism Tolerance(P)

Unit : mm

Size	Preload classes					
	ZF	Z0	Z1	Z2	Z3	Z4
LG 15	0.023	0.014	0.010	0.007	0.005	—
LG 20	0.026	0.016	0.011	0.008	0.006	0.005
LG 25	0.028	0.017	0.012	0.009	0.007	0.006
LG 30	0.032	0.021	0.015	0.012	0.009	0.007
LG 35	0.035	0.023	0.017	0.014	0.011	0.008
LG 45	0.040	0.027	0.020	0.016	0.013	0.010
LG 55	0.050	0.036	0.026	0.020	0.017	0.012
LG 65	0.060	0.045	0.032	0.025	0.021	0.015

◆ 2 The accuracy tolerance of reference surface height (S_1)

$$S_1 = a \times K \quad \text{Equal. 2.2}$$

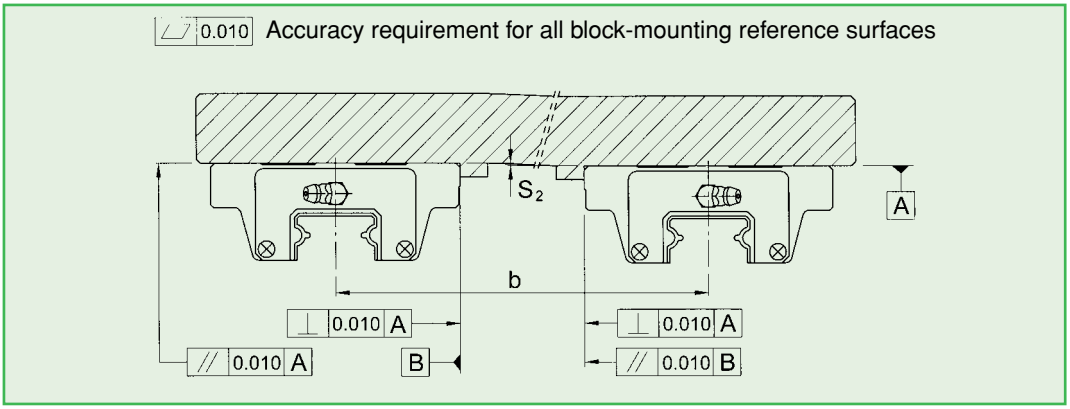
S_1 : Max. tolerance of height
a : distance between paired rails
K : coefficient of tolerance of height

■ Table 2.24 Max. Tolerance of Height

Size	Preload classes					
	ZF	Z0	Z1	Z2	Z3	Z4
K	5.5×10^{-4}	4.1×10^{-4}	2.7×10^{-4}	2.2×10^{-4}	1.7×10^{-4}	1.2×10^{-4}

(2) The accuracy tolerance of block-mounting surface

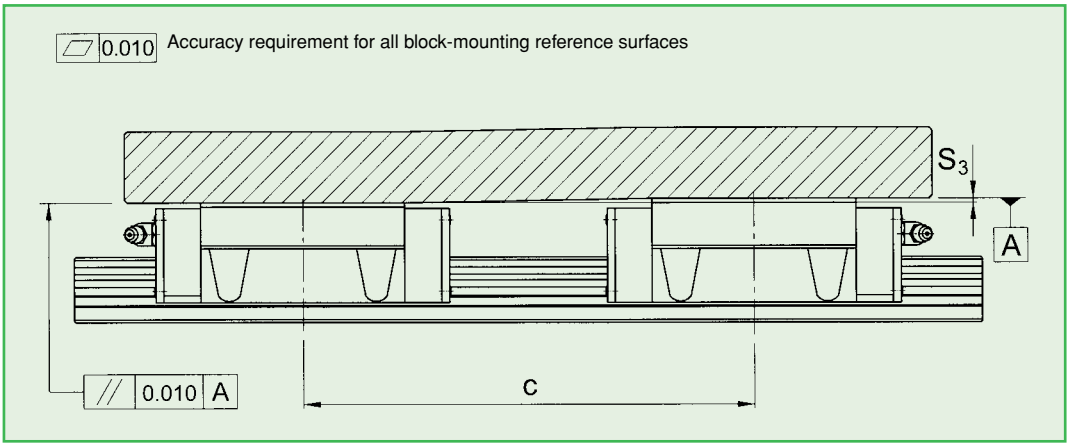
◆ 1 The tolerance of the height of reference surface when two or more pieces are used in parallel (S_2)



$$S_2 = b \times 4.2 \times 10^{-5} \quad \text{Equal. 2.3}$$

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

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

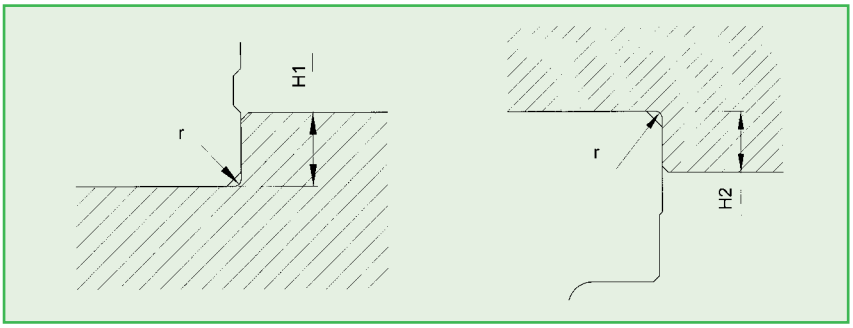


$$S_3 = c \times 4.2 \times 10^{-5} \quad \text{Equal. 2.4}$$

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

2-1-12 Cautions for Installationfillets

(1) Shoulder heights and fillets



■ Table 2.25 Shoulder Heights and Fillets

Size	Max. radius of fillets r (mm)	Shoulder height of the rail H1 (mm)	Shoulder height of the block H2 (mm)
LG15	0.3	3	4
LG20	0.3	4	5
LG25	0.5	5	5
LG30	0.5	5	5
LG35	0.5	6	6
LG45	1	8	6
LG55	1.5	10	10
LG65	1.5	10	10

(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 2.26 Torque

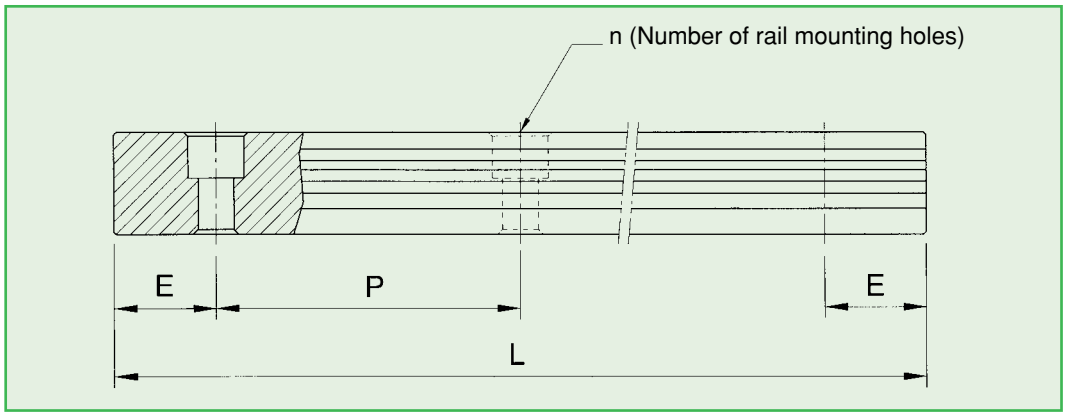
Size	Bolt size	Torque (kgf-cm)	Size	Bolt size	Torque (kgf-cm)
LG 15	M4x0.7Px16L	40	LG 35	M8x1.25Px25L	310
LG 20	M5x0.8Px16L	90	LG 45	M12x1.75Px35L	1,200
LG 25	M6x1Px20L	140	LG 55	M14 × 2P × 45L	1,600
LG 30	M8x1.25Px25L	310	LG 65	M16 × 2P × 50L	2,000

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 Emin due to the break of mounting hole.

$$L = (n-1) \times P + 2 \times E \quad \text{Equal. 2.5}$$

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)



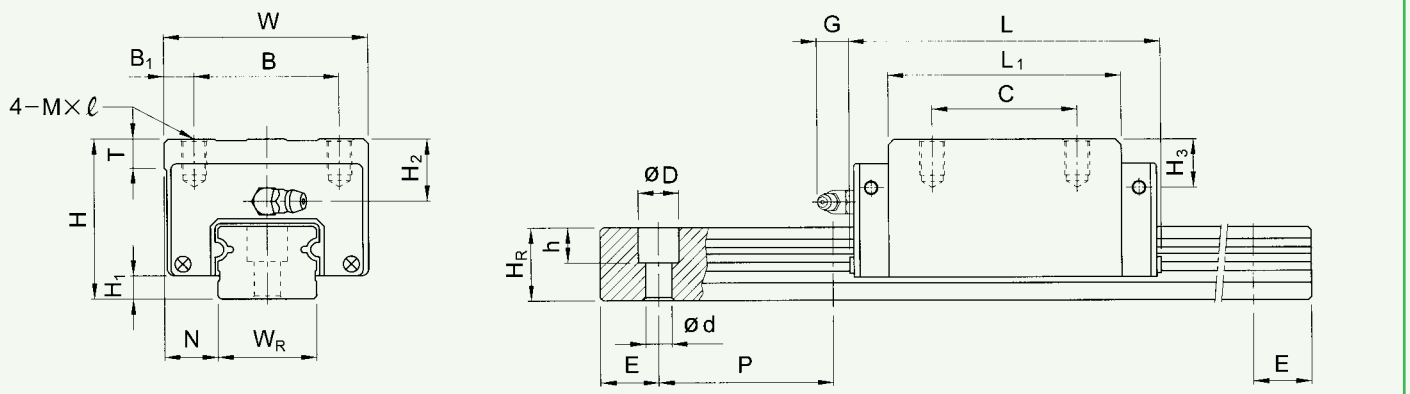
■ Table 2.27

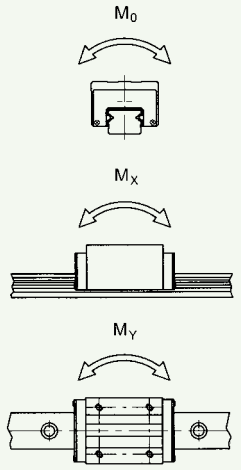
Item	LG15	LG20	LG25	LG30	LG35	LG45	LG55	LG65
Standard Length	160(3)	220(4)	220(4)	280(4)	280(4)	570(6)	780(7)	1,270(9)
	220(4)	280(5)	280(5)	440(6)	440(6)	885(9)	1,020(9)	1,570(11)
	280(5)	340(6)	340(6)	600(8)	600(8)	1,200(12)	1,260(11)	2,020(14)
	340(6)	460(8)	460(8)	760(10)	760(10)	1,620(16)	1,500(13)	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
Min Distance to End(E_{min})	5	6	7	8	8	11	13	14
Max. Standard Length	1960(33)	2980(50)	4,000(67)	3,960(50)	3,960(50)	3,930(38)	3,540(30)	3,540(24)
Max. Length	2000	3000	4,000	4000	4000	4000	3,550	3550

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 side

2-1-14 Dimensions for HIWIN LG Series

(1). LGH-CA / LGH-HA

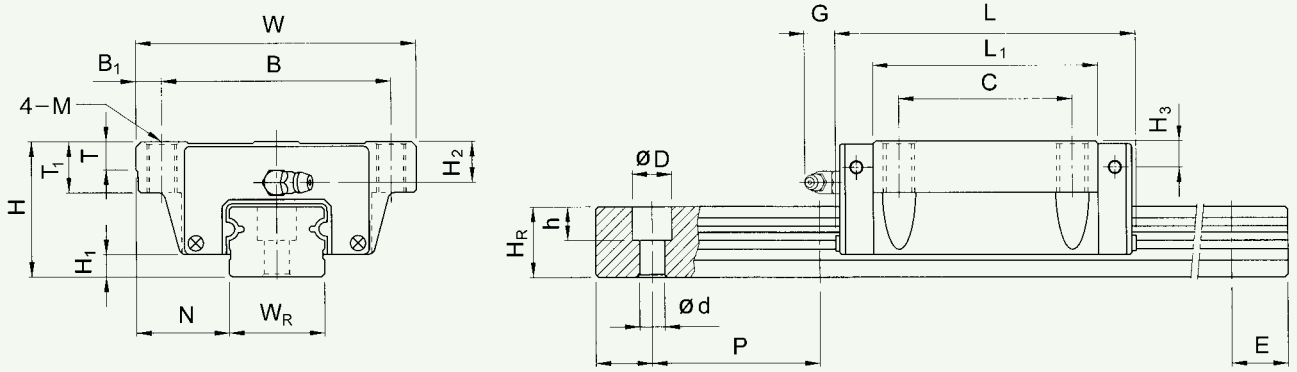


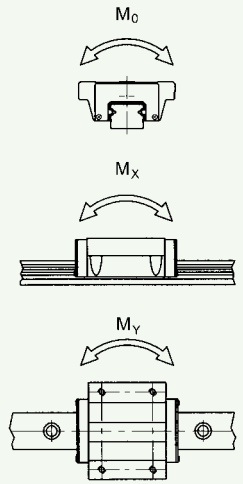


Model No.	Dimensions of Assembly (mm)			Dimensions of Block (mm)										Dimensions of Rail (mm)							Mounting Bolt for Rail (mm)	Basic Dynamic Load Rating C (kgf)	Basic Static Load Rating C0 (kgf)	Static Rated Moment			Weight	
	H	H1	N	W	B	B1	C	L1	L	G	Mx ℓ	T	H2	WR	HR	D	h	d	P	E				M0 (kgf-m)	MX (kgf-m)	MY (kgf-m)	Block (kg)	Rail (kg/m)
LGH 15CA	28	4.5	9.5	34	26	4	26	39.6	60.6	5.3	M4×5	6	8.5	15	14	7.5	5.3	4.5	60	20	M4×16	1,040	1,680	13.5	11.0	11.0	0.21	1.47
LGH 20CA	30	5	12	44	32	6	36	52.7	77.3	12	M5×6	8	7.1	20	15	9.5	8.5	6	60	20	M5×16	1,650	2,670	28.1	22.8	22.8	0.37	2.08
LGH 20HA							50	67	91.6													2,100	3,400	35.7	35.9	35.9	0.46	
LGH 25CA	40	6.5	12.5	48	35	6.5	35	57.6	85.6	12	M6×8	8	11.2	23	20	11	9	7	60	20	M6×20	2,410	3,880	46.6	37.2	37.2	0.59	3.15
LGH 25HA							50	76.6	104.6													3,210	5,180	62.2	63.6	63.6	0.78	
LGH 30CA	45	7	16	60	40	10	40	72	104.4	12	M8×10	8	10.5	28	23	14	12	9	80	20	M8×25	3,380	5,460	79.3	61.2	61.2	1.04	4.41
LGH 30HA							60	93	125.4													4,400	7,100	103.0	100.4	100.4	1.33	
LGH 35CA	55	8	18	70	50	10	50	82	118.4	12	M8×12	10	15	34	25	14	12	9	80	20	M8×25	4,180	6,740	118.1	84.4	84.4	1.72	5.93
LGH 35HA							72	105.8	142.2													5,430	8,770	153.5	138.4	138.4	2.24	
LGH 45CA	70	10	20.5	86	60	13	60	99.6	139.2	12.9	M10×17	15	21	45	32	20	17	14	105	22.5	M12×35	6,020	9,710	223.5	141.3	141.3	3.16	10.01
LGH 45HA							80	133	172.6													8,430	13,600	312.8	259.2	259.2	4.28	
LGH 55CA	80	13	23.5	100	75	12.5	75	115.8	164.8	12.9	M12×18	17	22	53	40	23	20	16	120	30	M14×45	9,740	13,220	384.9	280.9	280.9	5.30	14.82
LGH 55HA							95	154.7	203.7													11,810	18,510	489.8	442.7	442.7	6.40	
LGH 65CA	90	19	31.5	126	76	25	70	138.6	197.6	12.9	M16×20	25	20	63	48	26	22	18	150	35	M16×50	14,940	20,990	738.8	579.0	579.0	7.30	21.26
LGH 65HA							120	187.6	246.6													18,290	27,290	1007.5	1040.8	1040.8	9.30	

Above listed dimensions of rail are dimensions of LGR-R (Bolt hole, mounting from above), and dimensions of LGR-T (Tapped hole, mounting from below) refer to Page 37.

(2). LGW-CA / LGW-HA

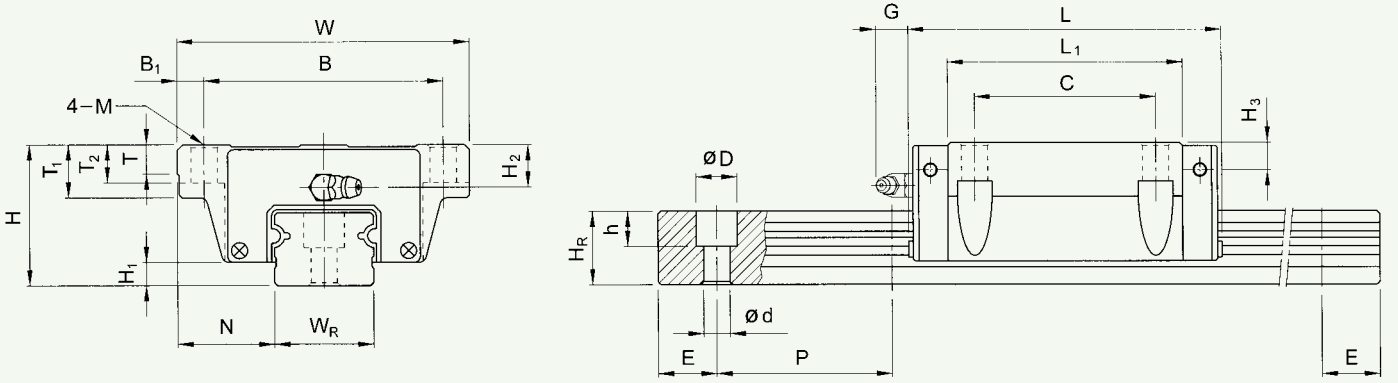


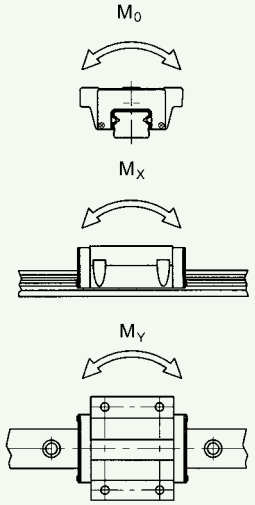


Model No.	Dimensions of Assembly (mm)			Dimensions of Block (mm)												Dimensions of Rail (mm)							Mounting Bolt for Rail (mm)	Basic Dynamic Load Rating C (kgf)	Basic Static Load Rating C0 (kgf)	Static Rated Moment			Weight	
	H	H1	N	W	B	B1	C	L1	L	G	M	T	T1	H2	H3	WR	HR	D	h	d	P	E				M0 (kgf-m)	MX (kgf-m)	MY (kgf-m)	Block (kg)	Rail (kg/m)
LGW 15CA	24	4.5	16	47	38	4.5	30	39.6	60.6	5.3	M5	6	9	4.5	3.6	15	14	7.5	5.3	4.5	60	20	M4x16	1,040	1,680	13.5	11.0	11.0	0.20	1.47
LGW 20CA	30	5	21.5	63	53	5	40	52.7	77.3	12	M6	8	10	8.4	7.1	20	15	9.5	8.5	6	60	20	M5x16	1,650	2,670	28.1	22.8	22.8	0.46	2.08
LGW 20HA								67	91.6															2,100	3,400	35.7	35.9	35.9	0.58	
LGW 25CA	36	6.5	23.5	70	57	6.5	45	57.6	85.6	12	M8	8	14	8.8	7	23	20	11	9	7	60	20	M6x20	2,410	3,880	46.6	37.2	37.2	0.64	3.15
LGW 25HA								76.6	104.6															3,210	5,180	62.2	63.6	63.6	0.86	
LGW 30CA	42	7	31	90	72	9	52	72	104.4	12	M10	8	16	11	7.5	28	23	14	12	9	80	20	M8x25	3,380	5,460	79.3	61.2	61.2	1.20	4.41
LGW 30HA								93	125.5															4,400	7,100	103.0	100.4	100.4	1.56	
LGW 35CA	48	8	33	100	82	9	62	82	118.4	12	M10	10	18	14.4	9	34	25	14	12	9	80	20	M8x25	4,180	6,740	118.1	84.4	84.4	1.78	5.93
LGW 35HA								105.8	142.2															5,430	8,770	153.5	138.4	138.4	2.34	
LGW 45CA	60	10	37.5	120	100	10	80	99.6	139.2	12.9	M12	15	22	18.2	11	45	32	20	17	14	105	22.5	M12x35	6,020	9,710	223.5	141.3	141.3	3.13	10.01
LGW 45HA								133	172.6															8,430	13,600	312.8	259.2	259.2	4.27	
LGW 55CA	70	13	43.5	140	116	12	95	115.8	164.8	12.9	M14	17	26	12	12	53	40	23	20	16	120	30	M14x45	9,740	13,220	384.9	280.9	280.9	5.50	14.82
LGW 55HA								154.7	203.7															11,810	18,510	489.8	442.7	442.7	6.70	
LGW 65CA	90	19	53.5	170	142	14	110	138.6	197.6	12.9	M16	23	37	20	20	63	48	26	22	18	150	35	M16x50	14,940	20,990	738.8	579.0	579.0	8.50	21.26
LGW 65HA								187.6	246.6															18,290	27,290	1007.5	1040.8	1040.8	10.70	

Above listed dimensions of rail are dimensions of LGR-R (Bolt hole, mounting from above), and dimensions of LGR-T (Tapped hole, mounting from below) refer to Page 37.

(3). LGW-CB / LGW-HB

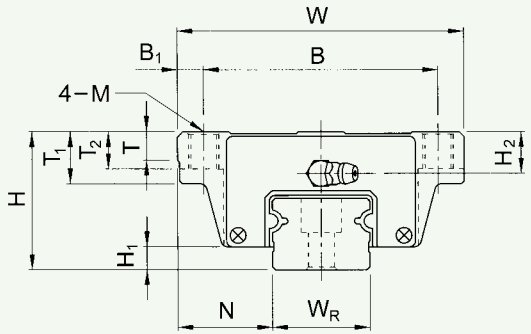


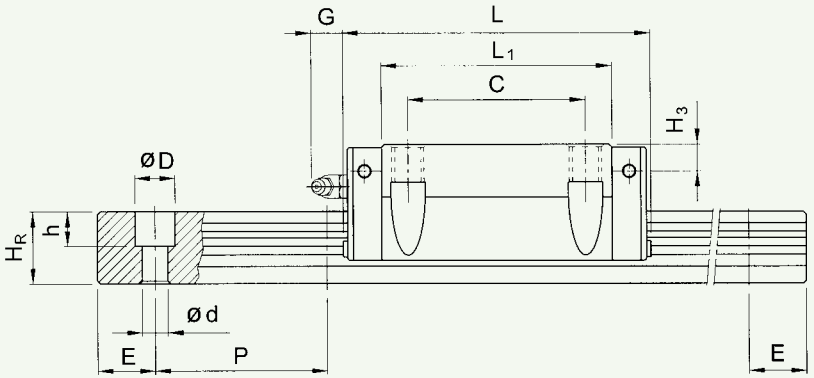


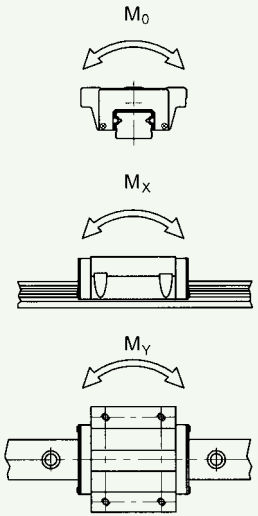
Model No.	Dimensions of Assembly (mm)			Dimensions of Block (mm)													Dimensions of Rail (mm)							Mounting Bolt for Rail (mm)	Basic Dynamic Load Rating C (kgf)	Basic Static Load Rating C0 (kgf)	Static Rated Moment			Weight	
	H	H1	N	W	B	B1	C	L1	L	G	M	T	T1	T2	H2	H3	WR	HR	D	h	d	P	E				M0 (kgf-m)	MX (kgf-m)	MY (kgf-m)	Block (kg)	Rail (kg/m)
LGW 15CB	24	4.5	16	47	38	4.5	30	39.6	60.6	5.3	ø4.5	6	9	7	4.5	3.6	15	14	7.5	5.3	4.5	60	20	M4x—16	1,040	1,680	13.5	11.0	11.0	0.20	1.47
LGW 20CB	30	5	21.5	63	53	5	40	52.7	77.3	12	ø6	8	10	10	8.4	7.1	20	15	9.5	8.5	6	60	20	M5x—16	1,650	2,670	28.1	22.8	22.8	0.46	2.08
LGW 20HB								67	91.6																2,100	3,400	35.7	35.9	35.9	0.58	
LGW 25CB	36	6.5	23.5	70	57	6.5	45	57.6	85.6	12	ø7	8	14	10	8.8	7	23	20	11	9	7	60	20	M6x—20	2,410	3,880	46.6	37.2	37.2	0.64	3.15
LGW 25HB								76.6	104.6																3,210	5,180	62.2	63.6	63.6	0.86	
LGW 30CB	42	7	31	90	72	9	52	72	104.4	12	ø9	8	16	10	11	7.5	28	23	14	12	9	80	20	M8x—25	3,380	5,460	79.3	61.2	61.2	1.20	4.41
LGW 30HB								93	125.5																4,400	7,100	103.0	100.4	100.4	1.56	
LGW 35CB	48	8	33	100	82	9	62	82	118.4	12	ø9	10	18	13	14.4	9	34	25	14	12	9	80	20	M8x—25	4,180	6,740	118.1	84.4	84.4	1.78	5.93
LGW 35HB								105.8	142.2																5,430	8,770	153.5	138.4	138.4	2.34	
LGW 45CB	60	10	37.5	120	100	10	80	99.6	139.2	12.9	ø11	15	22	15	18.2	11	45	32	20	17	14	105	22.5	M12x—35	6,020	9,710	223.5	141.3	141.3	3.13	10.01
LGW 45HB								133	172.6																8,430	13,600	312.8	259.2	259.2	4.27	
LGW 55CB	70	13	43.5	140	116	12	95	115.8	164.8	12.9	ø14	17	26	17	12	12	53	40	23	20	16	120	30	M14x—45	9,740	13,220	384.9	280.9	280.9	5.50	14.82
LGW 55HB								154.7	203.7																11,810	18,510	489.8	442.7	442.7	6.70	
LGW 65CB	90	19	53.5	170	142	14	110	138.6	197.6	12.9	ø16	23	37	23	20	20	63	48	26	22	18	150	35	M16x—50	14,940	20,990	738.8	579.0	579.0	8.50	21.26
LGW 65HB								187.6	246.6																18,290	27,290	1007.5	1040.8	1040.8	10.70	

Above listed dimensions of rail are dimensions of LGR-R (Bolt hole, mounting from above), and dimensions of LGR-T (Tapped hole, mounting from below) refer to Page 37.

(4). LGW-CC / LGW-HC



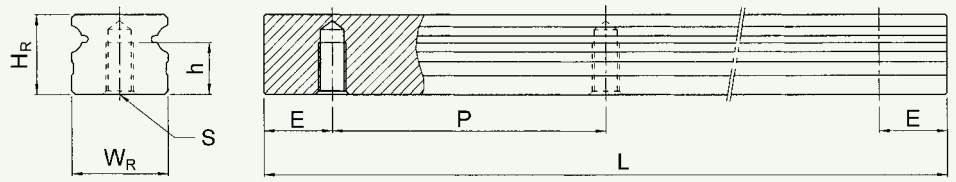




Model No.	Dimensions of Assembly (mm)			Dimensions of Block (mm)													Dimensions of Rail (mm)							Mounting Bolt for Rail (mm)	Basic Dynamic Load Rating C (kgf)	Basic Static Load Rating C0 (kgf)	Static Rated Moment			Weight	
	H	H1	N	W	B	B1	C	L1	L	G	M	T	T1	T2	H2	H3	WR	HR	D	h	d	P	E				M0 (kgf-m)	MX (kgf-m)	MY (kgf-m)	Block (kg)	Rail (kg/m)
LGW 15CC	24	4.5	16	47	38	4.5	30	39.6	60.6	5.3	M5	6	9	7	4.5	3.6	15	14	7.5	5.3	4.5	60	20	M4x16	1,040	1,680	13.5	11.0	11.0	0.20	1.47
LGW 25CC	36	6.5	23.5	70	57	6.5	45	57.6	85.6	12	M8	8	14	10	8.8	7	23	20	11	9	7	60	20	M6x20	2,410	3,880	46.6	37.2	37.2	0.64	3.15
LGW 25HC								76.6	104.6																3,210	5,180	62.2	63.6	63.6	0.86	
LGW 30CC	42	7	31	90	72	9	52	72	104.4	12	M10	8	16	10	11	7.5	28	23	14	12	9	80	20	M8x25	3,380	5,460	79.3	61.2	61.2	1.20	4.41
LGW 30HC								93	125.5																4,400	7,100	103.0	100.4	100.4	1.56	
LGW 35CC	48	8	33	100	82	9	62	82	118.4	12	M10	10	18	13	14.4	9	34	25	14	12	9	80	20	M8x25	4,180	6,740	118.1	84.4	84.4	1.78	5.93
LGW 35HC								105.8	142.2																5,430	8,770	153.5	138.4	138.4	2.34	
LGW 45CC	60	10	37.5	120	100	10	80	99.6	139.2	12.9	M12	15	22	15	18.2	11	45	32	20	17	14	105	22.5	M12x35	6,020	9,710	223.5	141.3	141.3	3.13	10.01
LGW 45HC								133	172.6																8,430	13,600	312.8	259.2	259.2	4.27	
LGW 55CC	70	13	43.5	140	116	12	95	115.8	164.8	12.9	M14	17	26	18	12	12	53	40	23	20	16	120	30	M14x45	9,740	13,220	384.9	280.9	280.9	5.50	14.82
LGW 55HC								154.7	203.7																11,810	18,510	489.8	442.7	442.7	6.70	
LGW 65CC	90	19	53.5	170	142	14	110	138.6	197.6	12.9	M16	23	37	23	20	20	63	48	26	22	18	150	35	M16x50	14,940	20,990	738.8	579.0	579.0	8.50	21.26
LGW 65HC								187.6	246.6																18,290	27,290	1007.5	1040.8	1040.8	10.70	

Above listed dimensions of rail are dimensions of LGR-R (Bolt hole, mounting from above), and dimensions of LGR-T (Tapped hole, mounting from below) refer to Page 37.

(5). Dimensions for LGR-T (Rail Mounting from Below)



Model No.	Dimensions of Rail (mm)						Weight (kg/m)
	W_R	H_R	S	h	P	E	
LGR15T	15	14	M5x0.8P	7.5	60	20	1.59
LGR20T	20	15	M6x1P	8	60	20	2.26
LGR25T	23	20	M6x1P	12	60	20	3.41
LGR30T	28	23	M8x1.25P	15	80	20	4.76
LGR35T	34	25	M8x1.25P	16	80	20	6.31
LGR45T	45	32	M12x1.75P	20	105	22.5	10.70
LGR55T	53	40	M14x2P	24	120	30	15.52
LGR65T	63	48	M20x2.5P	30	150	35	21.82

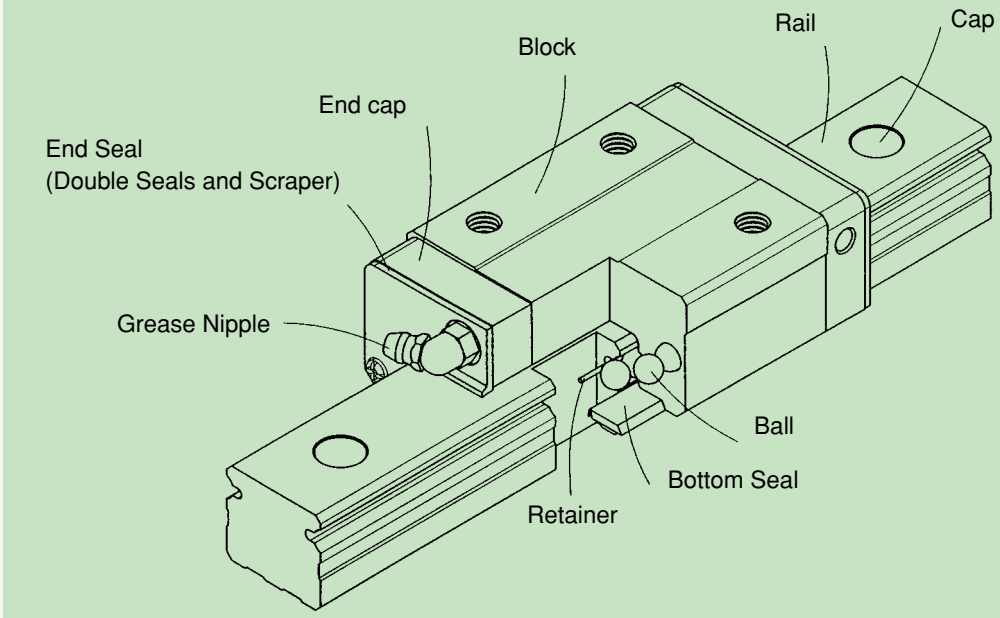
2-2 AG Series

2-2-1 Features of the AG Series Linear Guideway

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 automatic machines and the applications where space limit is considered.

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

2-2-2. Construction of AG Series

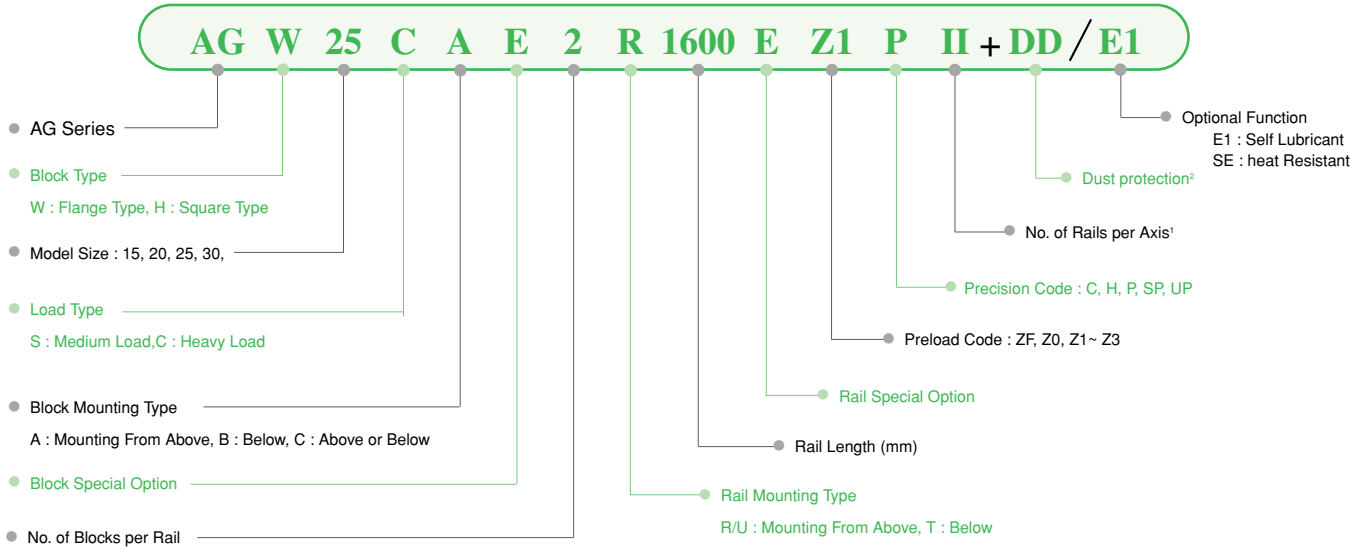


- Rolling Circulation System ➠Block, rail, end plate and retainer.
- Lubrication System ➠Grease nipple and piping joint.
- Dust Protection System ➠End seal, bottom seal, cap, double seals and scraper.

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..

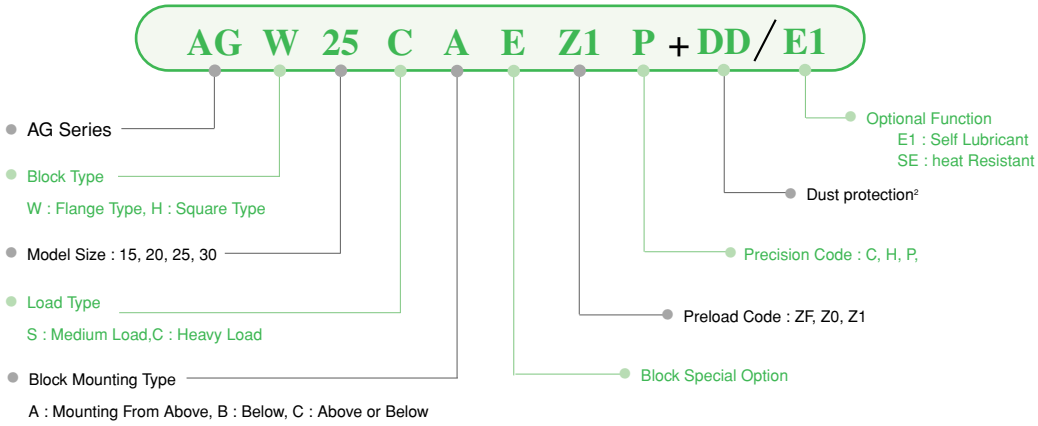
(1) Non-interchangeable type



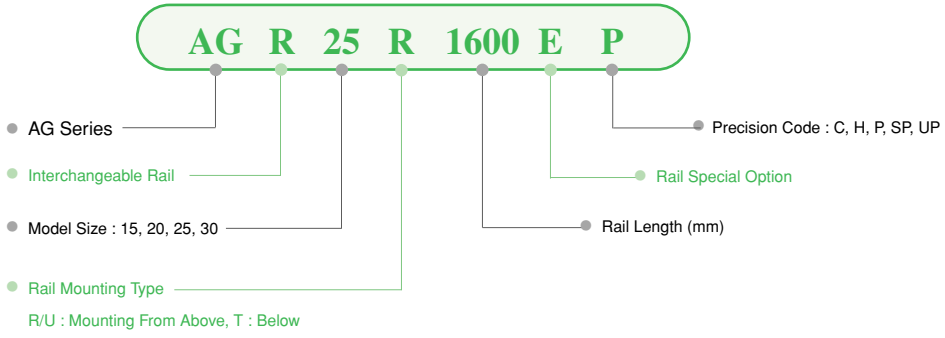
Note: 1. The Roman numerals used to express the number of rails used in one axis. As for the single rail in an axis, it shows no symbol.
2. For dust protection, it is no symbol if it is standard(end seal and bottom seal).
ZZ : End seal, bottom seal and scraper
KK: Double seals, bottom seal and scraper.
DD: Double seals and bottom seal

(2) Interchangeable type

◆ Model Number of LG Block



◆ Model Number of LG Rail

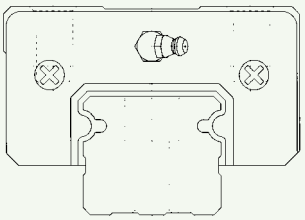
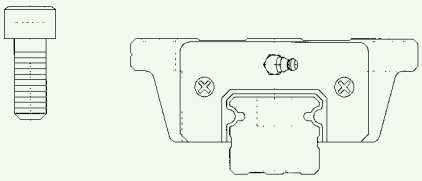
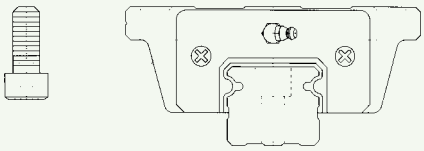


2-2-4. Types

(1) Block types

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

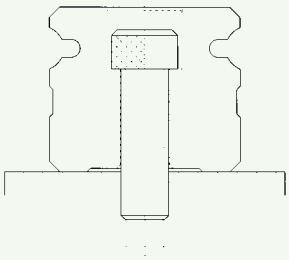
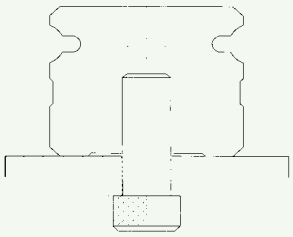
Table 2.28 Block Types

Type	Model	Shape	Height (mm)	Rail Length (mm)	Main Application
Square	AGH-SA AGH-CA		24 ↓ 42	100 ↓ 4000	1.Automatic device 2.High speed transportation equipment 3.Precious measuring equipment 4.Semiconductor equipment 5.Wood cutting machine
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.

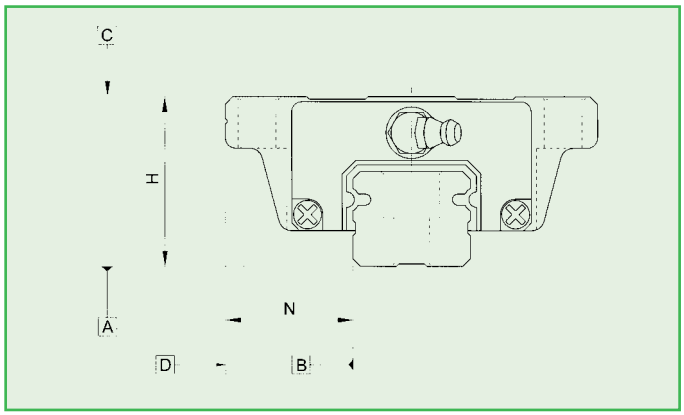
Table 2.29 Rail Types

Mounting from Above(R or U Type)	Mounting from below(T Type)
	

2-2-5 Accuracy Classes

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

(1) Accuracy of non-interchangeable AG



■ Table 2.30 Accuracy Standards

Unit mm		AG - 15, 20				
Item		Normal (C)	High (H)	Precision (P)	Super Precision (SP)	Ultra Precision (UP)
Dimension tolerance of height H		± 0.1	± 0.03	0 - 0.03	0 - 0.015	0 - 0.008
Dimension 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 2.34				
Running parallelism of block surface D to surface B		See Table 2.34				

■ Table 2.31 Accuracy Standards

Unit mm		AG - 25, 30,				
Item		Normal (C)	High (H)	Precision (P)	Super Precision (SP)	Ultra Precision (UP)
Dimension tolerance of height H		± 0.1	± 0.04	0 - 0.04	0 - 0.02	0 - 0.01
Dimension 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 2.34				
Running parallelism of block surface D to surface B		See Table 2.34				

(2) Accuracy of interchangeable AG

Table 2.32 Accuracy Standards

Unit mm		AG - 15, 20		
Item		Normal (C)	High (H)	Precision (P)
Dimension tolerance of height H		± 0.1	± 0.03	± 0.015
Dimension 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 2.34		
Running parallelism of block surface D to surface B		See Table 2.34		

Table 2.33 Accuracy Standards

Unit mm		AG - 25, 30		
Item		Normal (C)	High (H)	Precision (P)
Dimension tolerance of height H		± 0.1	± 0.04	± 0.02
Dimension 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 2.34		
Running parallelism of block surface D to surface B		See Table 2.34		

(3) Accuracy of Running Parallelism

Table 2.34 Accuracy of Running Parallelism

Rail Length (mm)	Accuracy (μm)				
	C	H	P	SP	UP
100以下	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 over medium class.

■ Table 2.35 Preload Classes

Class	Code	Preload	Accuracy
Light Clearance	ZF	Clearance 4~10 μ m	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 ： The C in preload column means basic dynamic load rating.

2-2-7 Stiffness

To confirm that whether the rigidity will affect the accuracy or not, the rigidity corresponding to the pre-load amount.

$$\delta = \frac{P}{k}\mu m \qquad \text{Equal. 2.6}$$

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

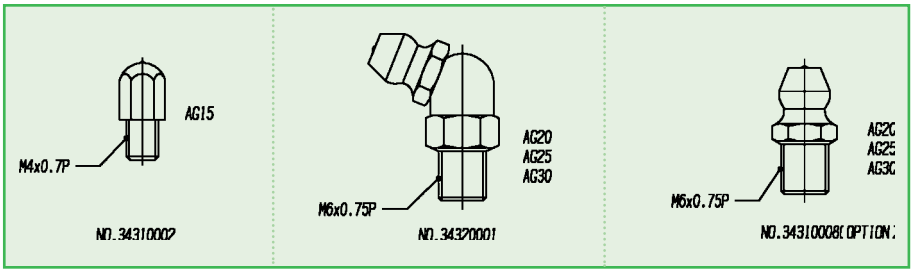
■ Table 2.36 Value of rigidity

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

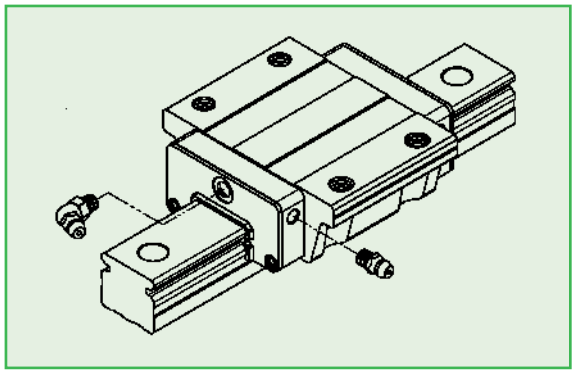
2-2-8 Lubrication

(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 in the 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 oil-piping joint.

◆ The Oil Amount for a Block Full with Grease

■ Table 2.37 The Oil Amount for a Block Full with Grease

Size	Medium load (cm3)	Heavy load (cm3)
AG15	0.5	0.6
AG20	0.9	1.1

Size	Medium load (cm3)	Heavy load (cm3)
AG25	1.7	2.1
AG30	3.8	4.4

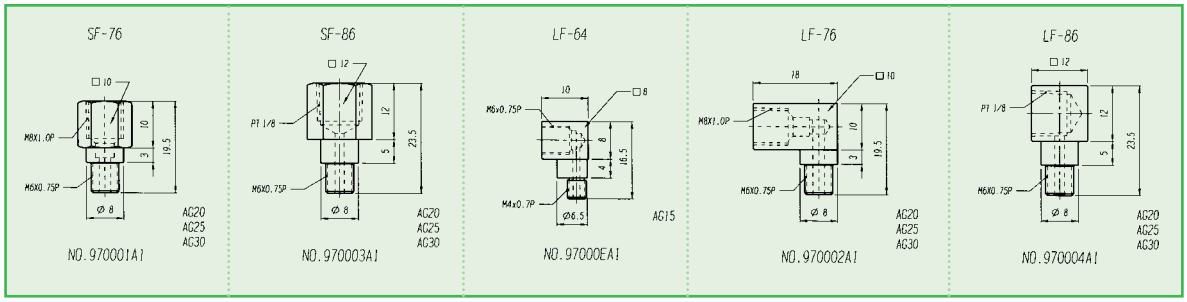
◆ Frequency of Replenishment

Replenishing the oil 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 Feeding Rate

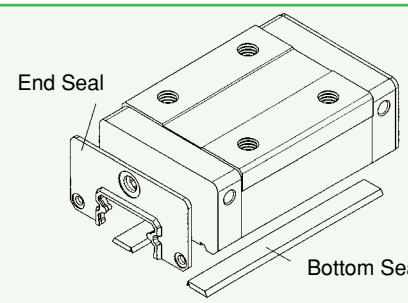
■ Table 2.38

Size	Feeding rate (cm³/hr)
AG15	0.2
AG20	0.2
AG25	0.3
AG30	0.3

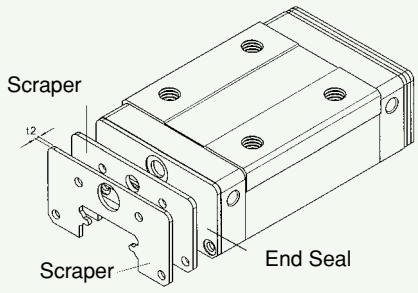
2-2-9 Dust Protection Equipment

(1) Code of equipment

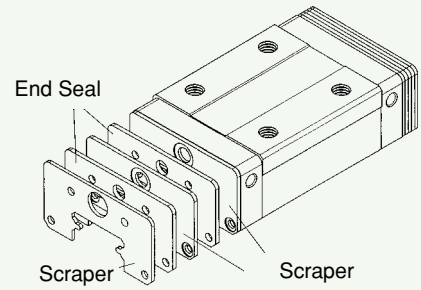
If the following equipment needed, please add the code followed by model number.



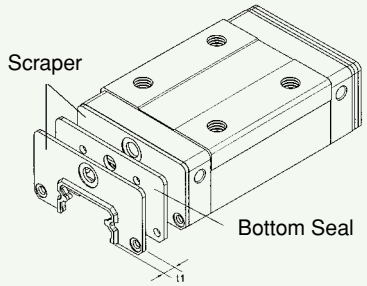
No code: Standard equipment(End seal + Bottom Seal)



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 the groove surface damaged by iron chips or dust entering the block

(3) Double seals

Enhancing the wiping effect, the foreign matters can be completely wiped out of block.

■ Table 2.39 Order number of End seal

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

(4) Scraper

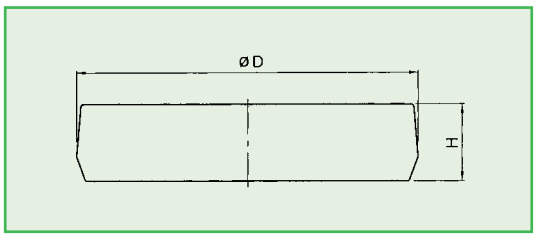
The scraper has the ability of isolating the high-temp. iron chips and removing the bigger foreign matters.

■ Table 2.40 Order number of Scraper

Size	Part No.	Thickness (t2)mm
AG15	980009A1	1.5
AG20	98000AA1	1.5
AG25	98000BA1	1.5
AG30	98000CA1	1.5

(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 2.41 Caps for rail mounting holes

Model No.	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 2.42 Seal resistance

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

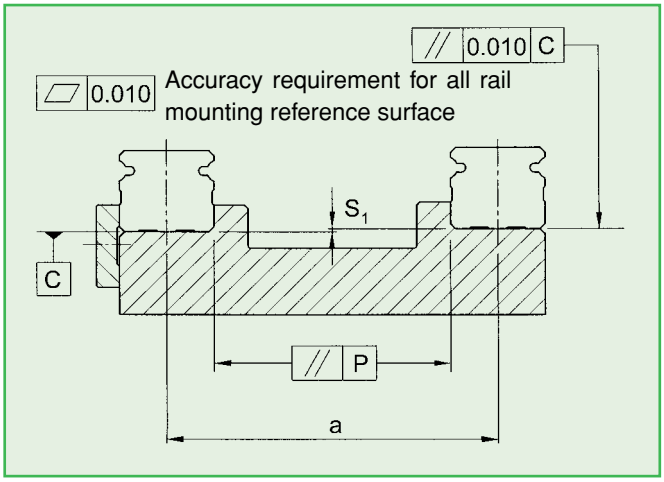
2-2-11 The Accuracy Tolerance of Mounting Surface

(1) The accuracy tolerance of rail-mounting surface

Because of the Gothic contact design, the linear guideway is possessed 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 following the accuracy requirements of mounting surface, 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 2.43 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 (S1)

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

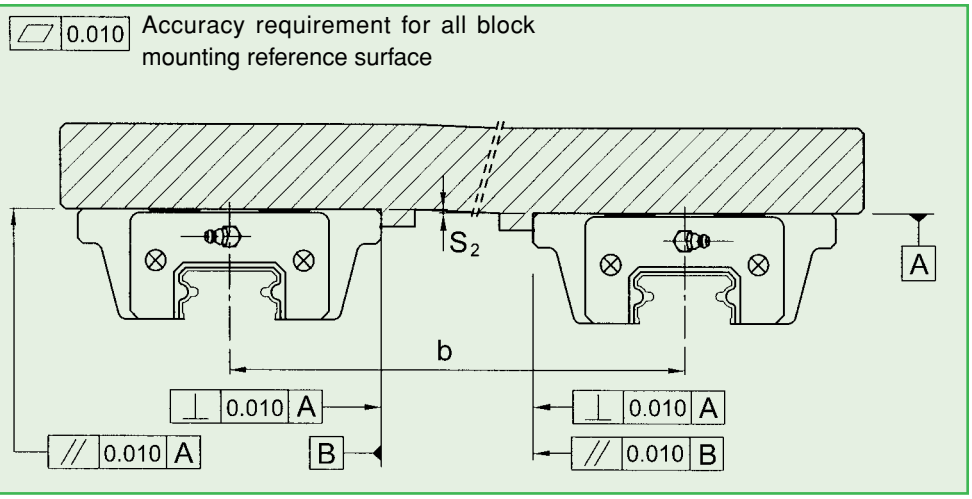
S_1 : Max. tolerance of height
a : distance between paired rails
K : coefficient of tolerance of height

■ Table 2.44 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

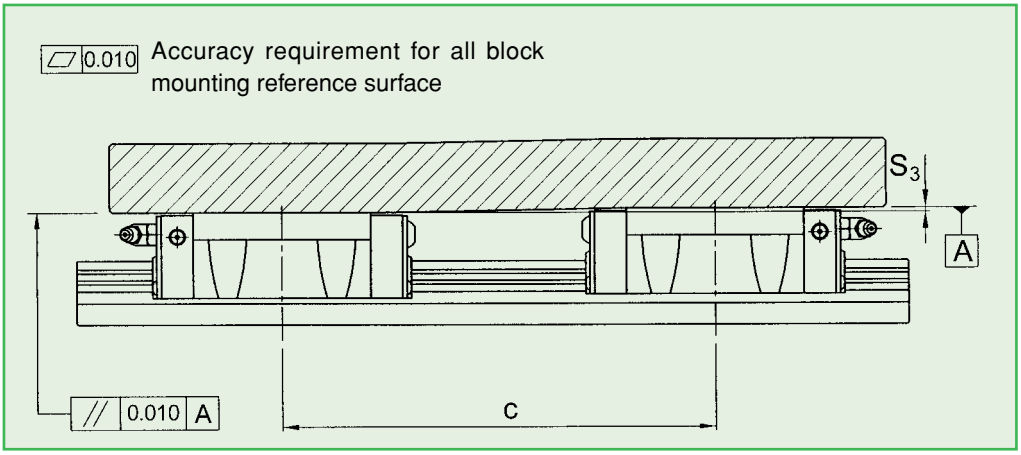
◆ the tolerance of the height of reference surface when two or more pieces are used in parallel (S2)



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

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

◆ the accuracy tolerance of mounting reference surface for paired blocks at the rail (S3)



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

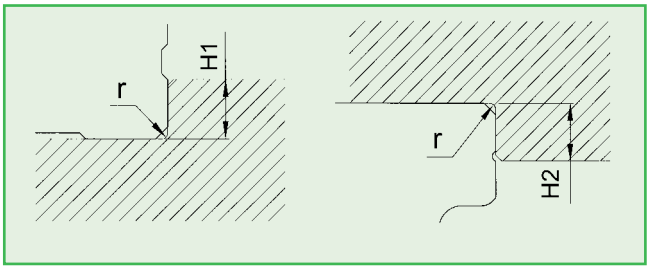
S_3 : Max. tolerance of height
c : distance between paired blocks

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 following the recommended shoulder heights and fillets, the accuracy problem of installation should be eliminated.



■ Table 2.45 Shoulder Heights and Fillets

Size	Max. radius of fillets r (mm)	Shoulder height of the rail H1 (mm)	Shoulder height of the block H2 (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 the following tightening torque for different sizes of bolt is recommended.

■ Table 2.46 Torque

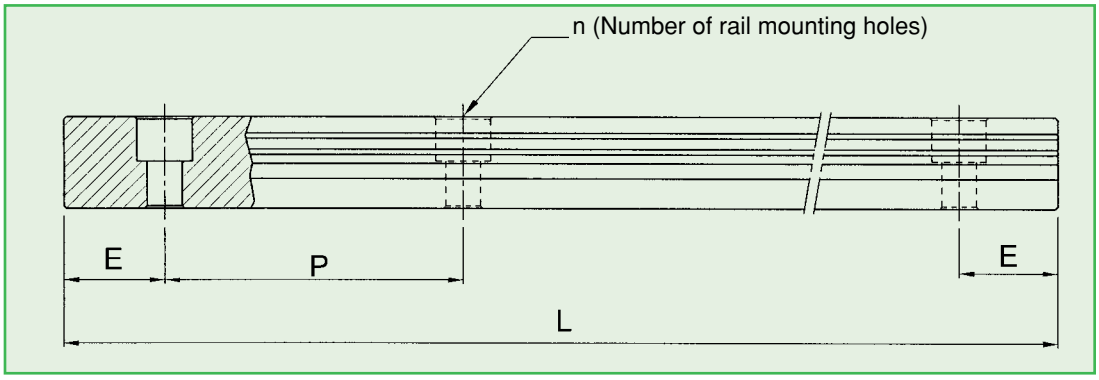
Size	Bolt size	Torque (kgf-cm)
AG 15	M3x0.5Px16L	19
AG 20	M5x0.8Px16L	90
AG 25	M6x1Px20L	140
AG 30	M6x1Px25L	140

2-2-13 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 Emin due to the break of mounting hole.

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

L : Total length of rail
n : Number of mounting holes
P : Distance between any two holes
E : Distance from the center of the last hole to the edge



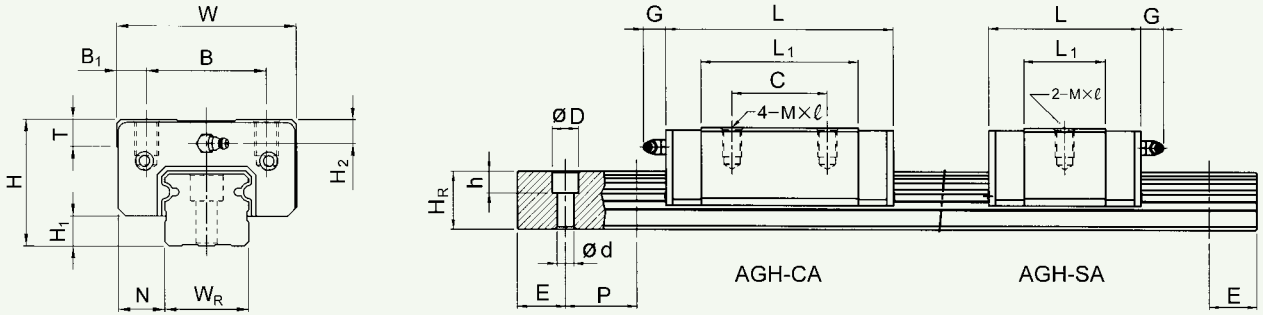
■ Table 2.47

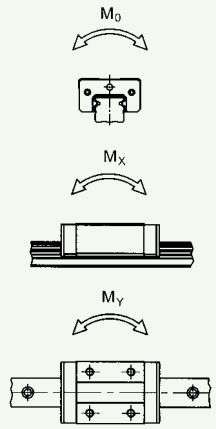
Item	AGR15	AGR20	AGR25	AGR30
Standard Length L(n)	160 (3)	220 (4)	220 (4)	280 (4)
	220 (4)	280 (5)	280 (5)	440 (6)
	280 (5)	340 (6)	340 (6)	600 (8)
	340 (6)	460 (8)	460 (8)	760 (10)
	460 (8)	640 (11)	640 (11)	1,000 (13)
	640 (11)	820 (14)	820 (14)	1,640 (21)
	820 (14)	1,000 (17)	1,000 (17)	2,040 (26)
		1,240 (21)	1,240 (21)	2,520 (32)
			1,600 (27)	3,000 (38)
Pitch(P)	60	60	60	80
Distance to End (E_s)	20	20	20	20
Min Distance to End (E_{min})	5	6	7	8
Max. Standard Length	1960(33)	2980(50)	4000(67)	3960(50)
Max. Length	2000	3000	4000	4000

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 side.

2-2-14 Dimensions for HIWIN AG Series

(1). AGH-SA / AGH-CA

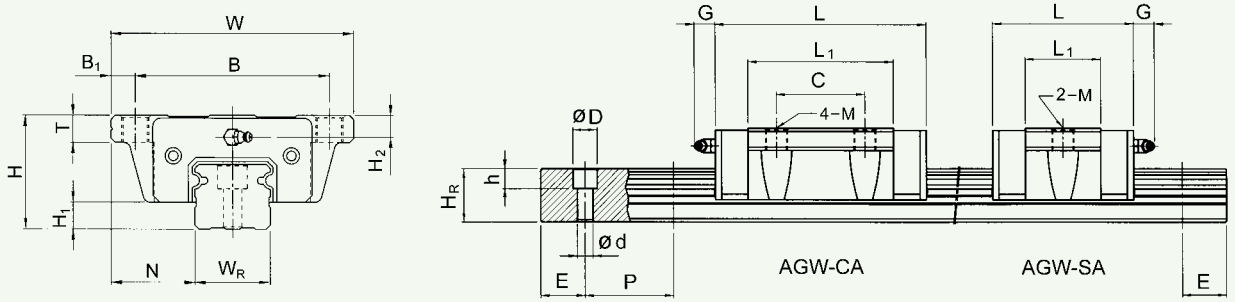


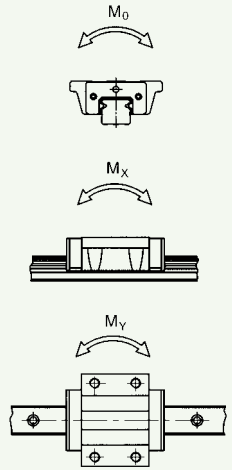


Model No.	Dimensions of Assembly (mm)			Dimensions of Block (mm)										Dimensions of Rail (mm)							Mounting Bolt for Rail (mm)	Basic Dynamic Load Rating C (kgf)	Basic Static Load Rating C0 (kgf)	Static Rated Moment			Weight	
	H	H1	N	W	B	B1	C	L1	L	G	Mx ℓ	T	H2	WR	HR	D	h	d	P	E				M0 (kgf-m)	MX (kgf-m)	MY (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	

Above listed dimensions of rail are dimensions of AGR-R (Bolt hole, mounting from above), dimensions of AGR-U (Large bolt hole, mounting from above) refer to Page 53, and dimensions of AGR-T (Tapped hole, mounting from below) refer to Page 53.

(2). AGW-SA / AGW-CA

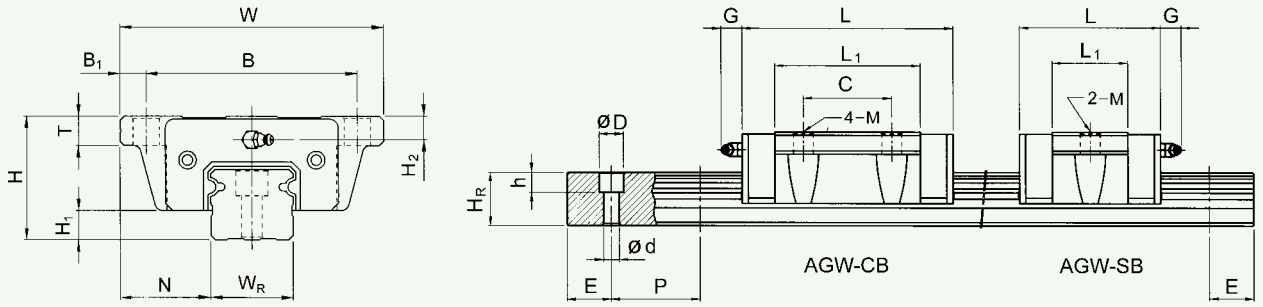


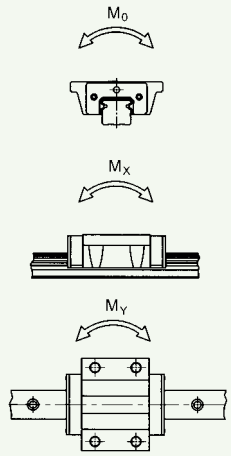


Model No.	Dimensions of Assembly (mm)			Dimensions of Block (mm)										Dimensions of Rail (mm)							Mounting Bolt for Rail (mm)	Basic Dynamic Load Rating C (kgf)	Basic Static Load Rating C_0 (kgf)	Static Rated Moment			Weight	
	H	H_1	N	W	B	B_1	C	L_1	L	G	M	T	H_2	W_R	H_R	D	h	d	P	E				M_0 (kgf-m)	M_X (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	

Above listed dimensions of rail are dimensions of AGR-R (Bolt hole, mounting from above), dimensions of AGR-U (Large bolt hole, mounting from above) refer to Page 53, and dimensions of AGR-T (Tapped hole, mounting from below) refer to Page 53.

(3). AGW-SB / AGW-CB

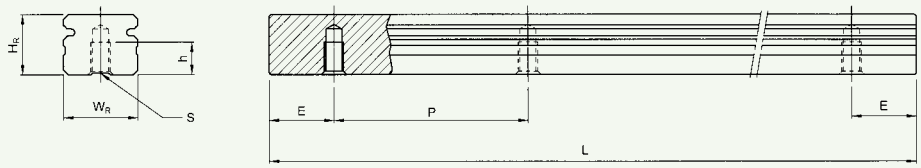




Model No.	Dimensions of Assembly (mm)			Dimensions of Block (mm)										Dimensions of Rail (mm)							Mounting Bolt for Rail (mm)	Basic Dynamic Load Rating C (kgf)	Basic Static Load Rating C_0 (kgf)	Static Rated Moment			Weight	
	H	H_1	N	W	B	B_1	C	L_1	L	G	M	T	H_2	W_R	H_R	D	h	d	P	E				M_0 (kgf-m)	M_X (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	ψ 4.5	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	ψ 5.5	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	ψ 7	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	ψ 9	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	

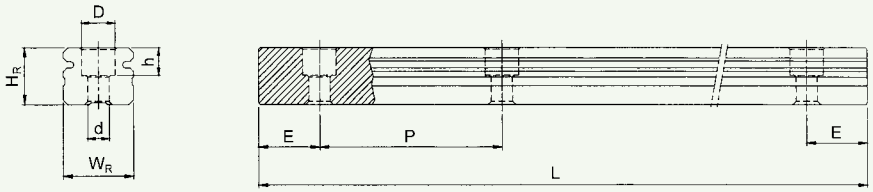
Above listed dimensions of rail are dimensions of AGR-R (Bolt hole, mounting from above), dimensions of AGR-U (Large bolt hole, mounting from above) refer to Page 53, and dimensions of AGR-T (Tapped hole, mounting from below) refer to Page 53.

(4). Dimensions for AGR-T (Rail Mounting from Below)



Model No.	Dimensions of Rail (mm)						Weight Rail (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)



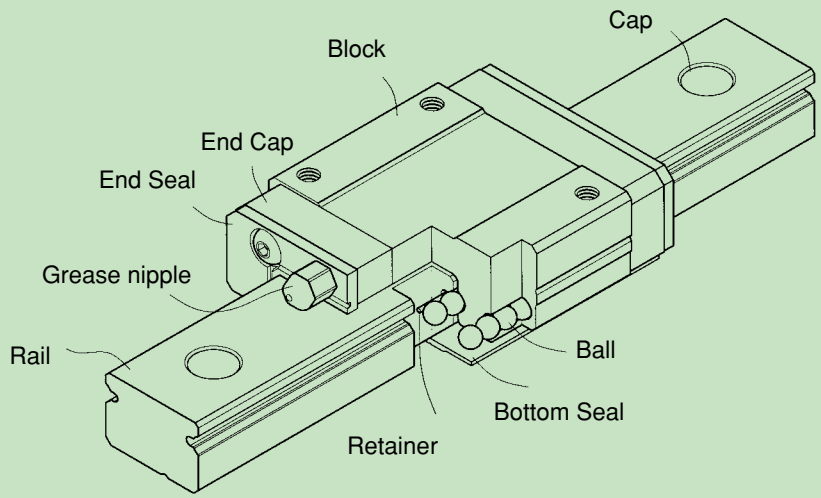
Model No.	Mounting Bolt for Rail (mm)	Dimensions of Rail (mm)							Weight Rail (kg/m)
		W_R	H_R	S	h	d	P	E	
AGR15U	M4x16	15	13.5	7.5	5.3	4.5	60	20	1.41
AGR30U	M8x25	28	24	14	12	9	80	20	4.65

2-3 Miniature MGN/MGW Series

2-3-1. Features of MGN Series

1. Tiny and light weight, suitable for miniature equipment.
2. All material are special grade of stainless steel for anti-corrosion ability. Size 9,12 also provide alloy steel type.
3. Gothic arch contact design has high rigidity and accuracy characteristic in all directions.
4. Steel balls are constrained by miniature retainer so without loosing balls when remove the block away from the rail.
5. Interchangeable type are available with certain precision class.

2-3-2. Construction of MGN Series



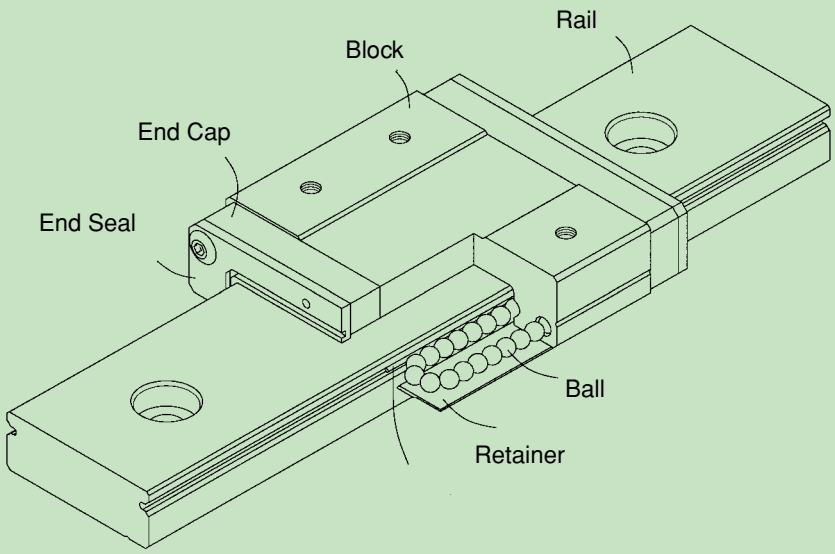
- Rolling Circulation System ➠ Block, rail, end cap, ball, retainer
- Lubrication ➠ The grease nipple is available for MGN15, grease gun can be used for lubricanting. Other sizes, syringe can be used to apply oil into the oil hole on end cap.
- Dust Protection ➠ End seal, bottom seal(size12,15 option), 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 are constrained by miniature retainer so without loosing balls when removing the block away from the rail.
4. All metal components are made of stainless steel for anti-corrosion ability.

2-3-4. Construction of MGW Series



- Rolling Circulation System ➠ Block, rail, end cap, ball, retainer
- Lubrication ➠ The grease nipple is available for MGW15, grease gun can be used for lubricanting. Other sizes, syringe can be used to apply oil into the oil hole on end cap.
- Dust Protection ➠ End seal, bottom seal(size12,15 option)

2-3-5 Application

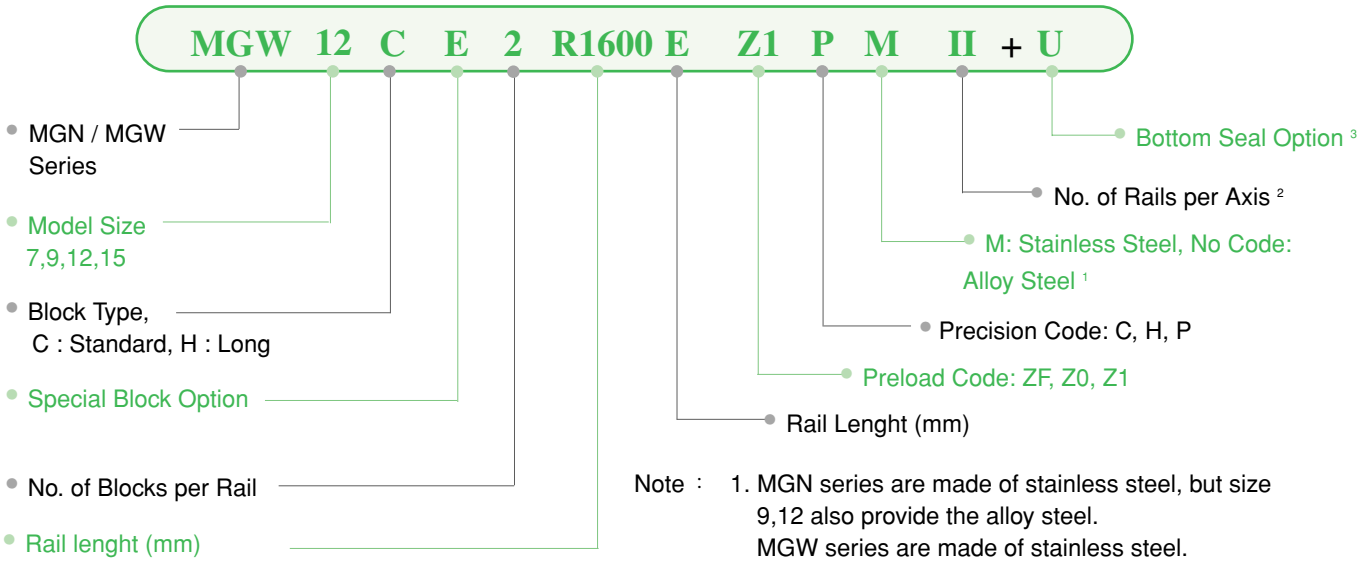
MGN/MGW series can be used in many fields, such like:

Semiconductor equipment, PCB assembly equipment, medical equipment, robots, measuring equipment,office automation equipment, and other miniature sliding mechanism.

2-3-6 Model Number of MGN/MGW Series

Linear 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 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 size, type, accuracy class, preload class, etc..

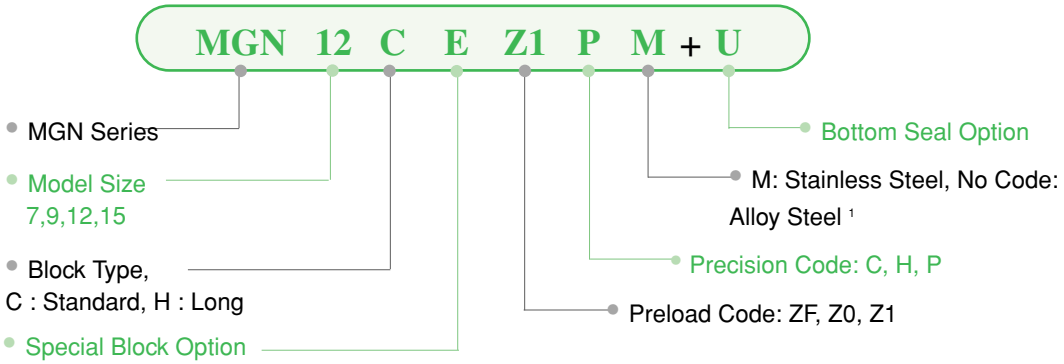
(1) Non-interchangeable type



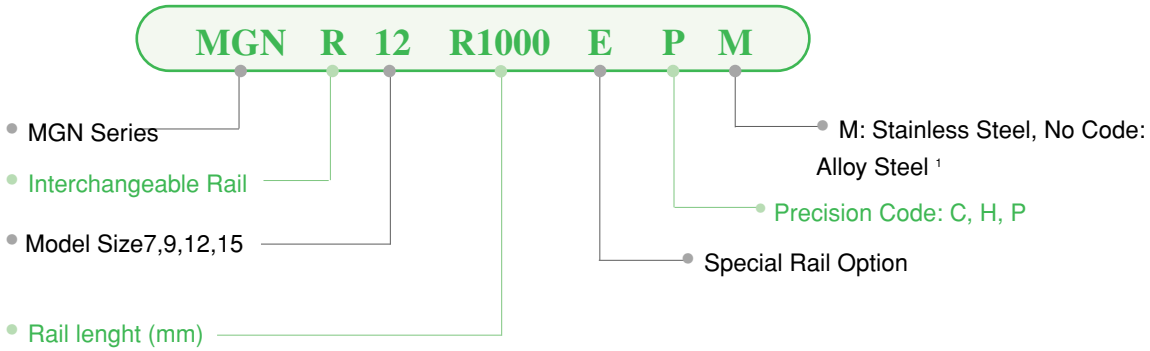
Note :
1. MGN series are made of stainless steel, but size 9,12 also provide the alloy steel. MGW series are made of stainless steel.
2. The Roman numerals used to express the number of rails used in one axis. As for the single rail in an axis, it shows no symbol.
3. Size of MGN/MGW12,15providethe bottom seal.

(2) Interchangeable type

◆ Interchangeable Block



◆ Interchangeable Rail

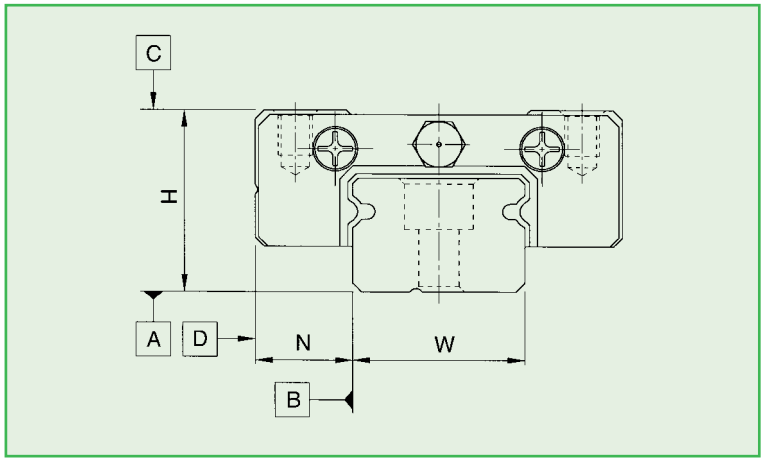


2-3-7 Accuracy Standards

The accuracy of MGN/MGW series can be classified into normal(C), high(H), precision(P) three classes. Choosing the class by referencing the accuracy of applied equipment.

(1) 1. Non-interchangeable

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



■ Table 2.48 Accuracy standard of non-interchangeable type

Unit:mm

Item	Normal (C)	High (H)	Precision (P)
Dimension tolerance of height H	±0.04	±0.02	±0.01
Dimension 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 2.50		
Running parallelism of block surface D to surface B	According to Table 2.50		

(2) Interchangeable

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

■ Table 2.49 Accuracy standard of interchangeable type

Unit:mm

Item		Normal (C)	High (H)	Precision (P)
Dimension tolerance of height H		±0.04	±0.02	±0.01
Dimension 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 2.50		
Running parallelism of block surface D to surface B		According to Table 2.50		

(3). Accuracy of running parallelism

The running parallelism C to A and D to B are with relation to rail length

■ Table 2.50 Accuracy of Running Parallelism

Rail Length mm	Accuracy		
	C	H	P
50以下	12	6	2
50~80	13	7	3
80~125	14	8	4
125~200	15	9	4
200~250	16	10	5
250~315	17	11	5
315~400	18	11	6
400~500	19	12	6
500~630	20	13	7
630~800	22	14	8
800~1000	23	16	9
1000~1200	25	18	11

2-3-8 Preload

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

■ Table 2.51 Preload Classes

Class	Code	Preload	Accuracy
Light clearance	ZF	Clearance4~10 μm	C
Very Light Preload	Z0	0	C~P
Light	Z1	0.02C	C~P

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

2-3-9 Dust Protection Equipment

End seals are standard equipment which fixed on both side of block to prevent the accuracy and life reduction due to dust enter the block. Bottom seals are fixed under the skirt portion of block to prevent dust entering. Customer can order bottom seals by add the mark “+U” follow by the model number. Size 12,15 provides bottom seals for option, but size 7,9 doesn’t provides because of the space limit of H1. If the Linear Guideway is equipped with bottom seal, the lateral mounting surface of rail must not exceed H1.

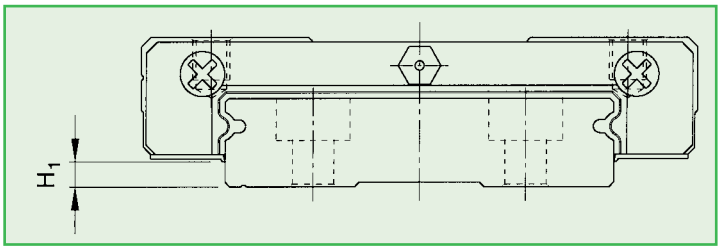


Table 2.52

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

2-3-10 Shoulder Heights and Fillets

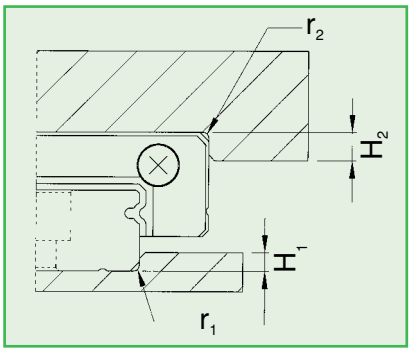


Table 2.53 Shoulder heights and fillets

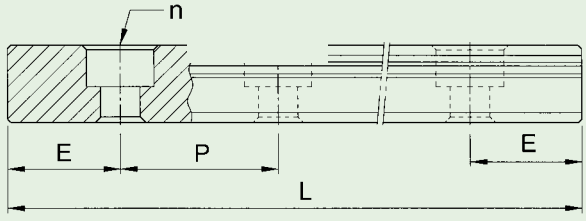
SIZE	Max. radius of fillets		Shoulder height H_1 (mm)	Shoulder height H_2 (mm)
	R_1(mm)	R_2(mm)		
MGN7	0.2	0.2	1.2	3
MGN9	0.2	0.3	1.7	3
MGN12	0.3	0.4	1.7	4
MGN15	0.5	0.5	2.5	5
MGW 7	0.2	0.2	1.7	3
MGW 9	0.3	0.3	2.5	3
MGW 12	0.4	0.4	3	4
MGW 15	0.4	0.8	3	5

2-3-11 Standard Length and Maximum Length of Linear Guideways

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 Emin due to the break of mounting hole.

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

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 2.54 Rail length

Unit : mm

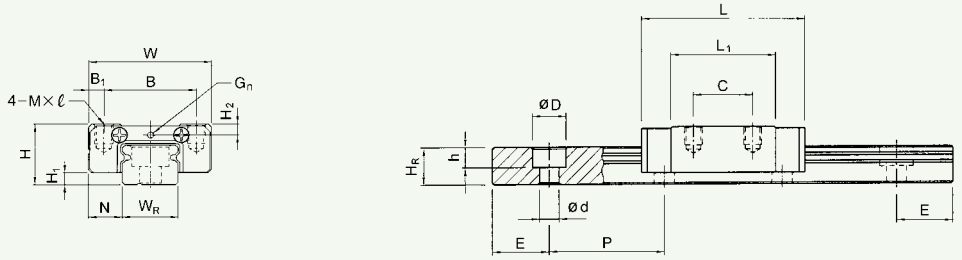
Item	MGNR 7M	MGNR 9M	MGNR 9	MGNR 12M	MGNR 12	MGNR 15M	MGWR 7M	MGWR 9M	MGWR 12M	MGWR 15M
Standard Length L(n)	40 (3)	55 (3)		70 (3)		70 (2)	80 (3)	80 (3)	110 (3)	110 (3)
	55 (4)	75(4)		95 (4)		110 (3)	110 (4)	110 (4)	150 (4)	150 (4)
	70 (5)	95 (5)		120 (5)		150 (4)	140 (5)	140 (5)	190 (5)	190 (5)
	85 (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)			590 (15)	590 (15)
				470 (19)		550 (14)			750 (19)	750 (19)
				570 (23)		670 (17)			910 (23)	910 (23)
						870 (22)				
Pitch (P)	15	20		25		40	30	30	40	40
Distance to End (E_s)	5	7.5		10		15	10	10	15	15
Min Distance to End (E_{min})	3	4		4		4	4	4	4	4
Max. Standard Length	295	595	995	995	1195	990	590	590	990	990
Max. Length	300	600	1000	1000	1200	1000	600	600	1000	1000

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 side.
3. The specification with "M" mark are stainless steel and without "M" mark are alloy steel.

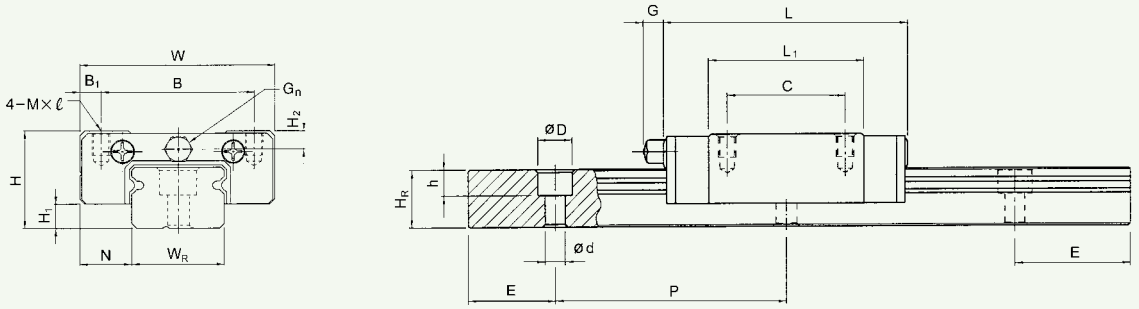
2-3-12 Dimensions for HIWIN MGN/MGW Series

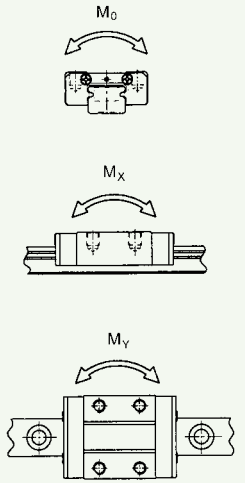
(1). MGN-C / MGN-H

MGN 7,
MGN 9,
MGN 12



MGN 15

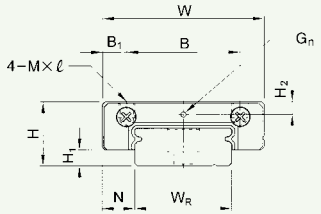


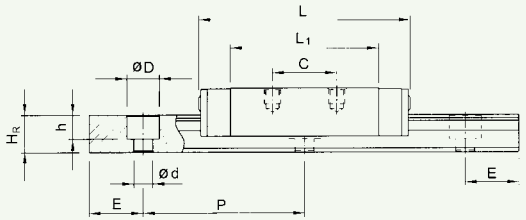


Model No.	Dimensions of Assembly (mm)			Dimensions of Block (mm)									Dimensions of Rail (mm)							Mounting Bolt for Rail (mm)	Basic Dynamic Load Rating C (kgf)	Basic Static Load Rating C0 (kgf)	Static Rated Moment			Weight	
	H	H1	N	W	B	B1	C	L1	L	G	T	MX ℓ	H2	WR	HR	D	h	d	P	E				M0 (kgf-m)	MX (kgf-m)	MY (kgf-m)	Block (kg)	Rail (kg/m)
MGN 7C	8	1.5	5	17	12	2.5	8	13.5	22.5	-	ø 0.8	M2x2.5	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	-	ø 0.8	M3X3	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	
MGN12C	13	3	7.5	27	20	3.5	15	21.7	34.7	-	ø 0.8	M3X3.5	2.5	12	8	6	4.5	3.5	25	10	M3x8	290	400	2.6	1.4	1.4	34	0.65
MGN12H							20	32.4	45.4													380	600	3.9	3.7	3.7	54	
MGN15C	16	4	8.5	32	25	3.5	20	26.7	42.1	4.5	GN3S	M3X4	3	15	10	6	4.5	3.5	40	15	M3x10	470	570	4.6	2.2	2.2	59	1.06
MGN15H							25	43.4	58.8													650	930	7.5	5.9	5.9	92	

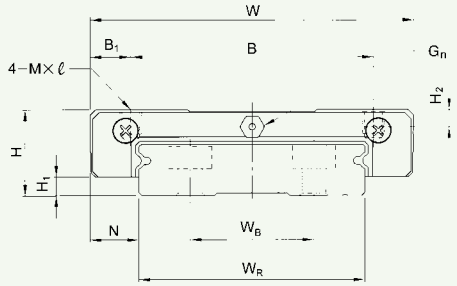
(2). MGW-C / MGW-H

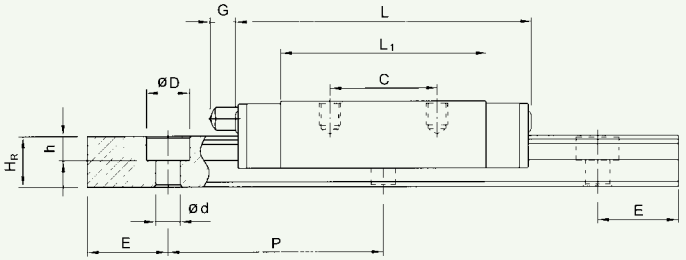
MGW 7, MGW 9, MGW 12

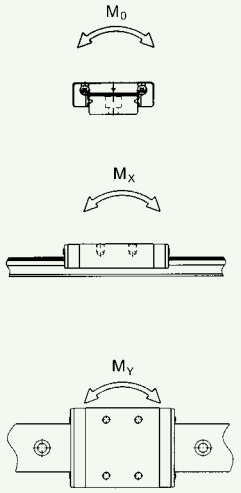




MGW 15





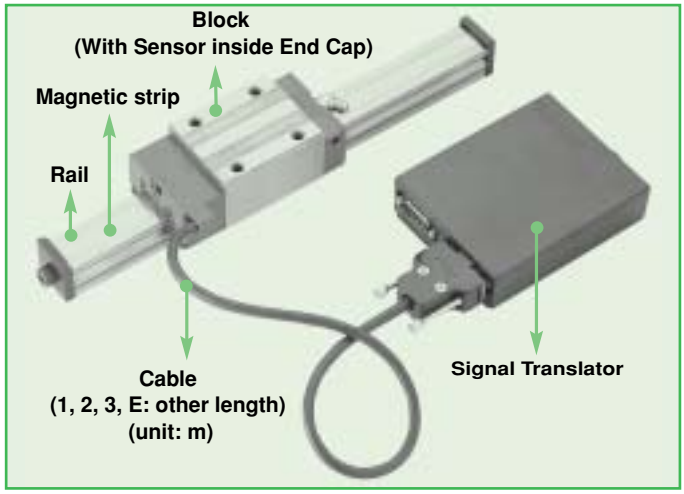


Model No.	Dimensions of Assembly (mm)			Dimensions of Block (mm)										Dimensions of Rail (mm)								Mounting Bolt for Rail (mm)	Basic Dynamic Load Rating C (kgf)	Basic Static Load Rating C0 (kgf)	Static Rated Moment			Weight	
	H	H1	N	W	B	B1	C	L1	L	G	T	Mx ℓ	H2	WR	WB	HR	D	h	d	P	E				M0 (kgf-m)	MX (kgf-m)	MY (kgf-m)	Block (kg)	Rail (kg/m)
MGW 7C	9	1.9	5.5	25	19	3	10	21	31.2	-	ø 0.9	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	-	ø 1.0	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	
MGW12C	14	3.4	8	40	28	6	15	31.3	46.1	-	ø 1.0	M3x3.6	2.8	24	_	8.5	8	4.5	4.5	40	15	M4x	400	570	7.17	2.83	2.83	71	1.49
MGW12H							28	45.6	60.4														520	840	10.47	5.85	5.85	103	
MGW15C	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
MGW15H							35	57	73.8														910	1410	30.48	12.5	12.5	215	

2-4 IG Series

■ Features :

1. Integrating the Linear Guideway with magnetic encoder save the installation space greatly.
2. Holding high rigidity and high accuracy concurrently from Linear Guideway and magnetic encoder.
3. Hiding type of sensor and magnetic strip without damage from external material.
4. Non-contact position measurement sensor can achieve Long life performance
5. Long distance measurement is possible (Magnetic Strip up to 32 m)
6. Works reliably in the worst conditions such as moisture, oil, grease, or dirt, even the vibration, high temperature environment.
7. High resolution
8. Easy to install



2-4-1 Model Number of IG

IGL W 25 C A E 1 / 2 T 1600 E Z1 P I / II / E1+KK+M10 - 0 - 3 +MD

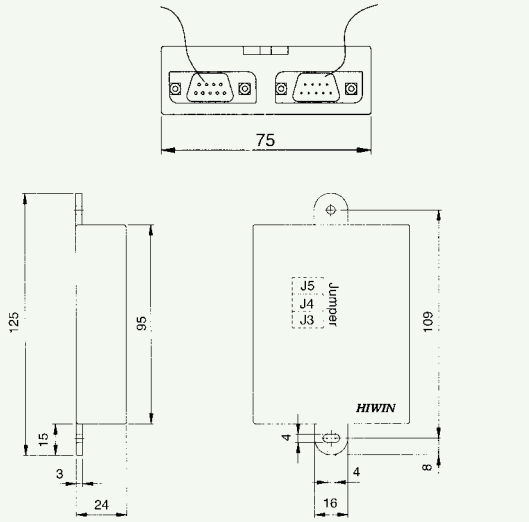
- Intelligent Guideway Series: IGL, IGA
- Block Type : W: Flange Type H: Square Type
- Model size: 20,25,30,35,45,55
- Load Type: S: Medium Load C: Heavy Load H: Super Heavy Load
- Block Mounting Type: A: from Above B: from Bottom C: Above or Bottom
- E: Special Block Option Blank: no Special Option
- Total No. of Blocks with Sensor for all Axis
- No. of Blocks per Axis
- Rail Mounting Type: R: from Above T: from Bottom
- Rail Length (mm)
- E: Special Rail Option Blank: no Special
- Preload Code: ZF, Z0, Z1~Z3
- Precision Code: C, H, P
- No. of Rails with Magnetic Strip
- No. of Rails per Axis
- E1: Self Lubricaant Block Blank: general Block
- Dustproof: DD, ZZ, KK
- Sensor Type: 5, 10, 50, 100, 500, 1000 μm
- Power Input and Output Signal :
  - 0: 5V Power Input, TTLOutput
  - 1: 12V Power Input, TTLOutput
  - 2: 12V Power Input, HTLOutput
  - 3: 15V Power Input, TTLOutput
  - 4: 15V Power Input, HTLOutput
  - 5: 24V Power Input, TTLOutput
  - 6: 24V Power Input, HTLOutput
- Cable Length 0.5, 1, 2, 3, 5,10m
- Display (Option)

2-4-2 Technical Data of HIWIN Intelligent Linear Guideway (IG)

Item	Specifications
Resolution (μm)	5, 10, 50, 100, 500, 1000
Accuracy (μm)	±(25+20xL), L: Strip Length (m)
Max. Speed (m/min)	80 (for 5μm resolution)
Power Supply (V)	5, 12, 15, 24 ±10%
Power Consumption	2 ~ 3 Watt
Output Signals (Pulse)	A ` B `$\bar{A}$ `$\bar{B}$ Phase Difference 90˚±10%; Output Currcnt per Channel (Select): 5V TTL—20 mA; HTL—5 mA
Working Temperature	Magnetic Strip: 0~70˚C, Sensor: 0~70˚C, Translator:0~50˚C
Storage Temperature	-5˚C ~ 70˚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 $\bar{A}$
- Pin8 = Channel $\bar{B}$

D-Type 9 Pin (Female) D-Type 9 Pin (male)



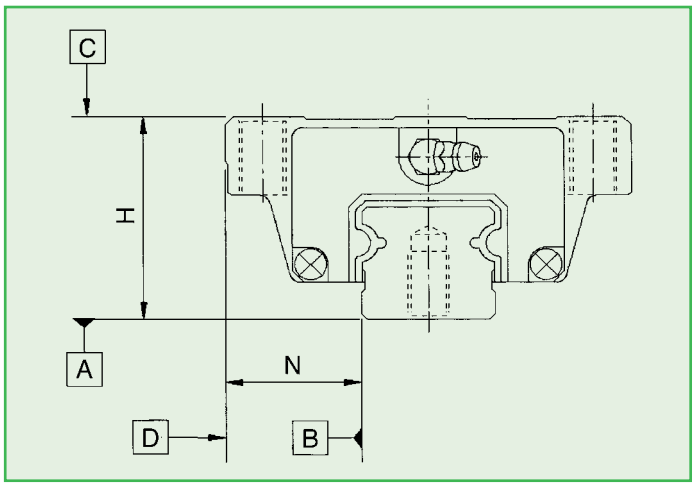
2-4-3 Accuracy Classes

for example: IGL/IGA 25, 30, 35

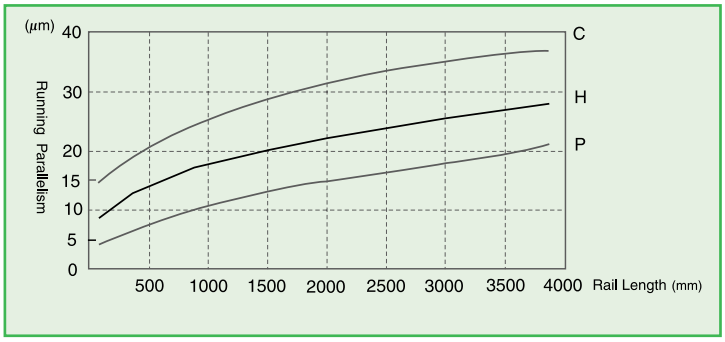
Unit : mm

Item	Normal (C)	High (H)	Precision (P)
Dimension Tolerance of Height (H)	± 0.1	± 0.04	0 -0.04
Dimension 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 Fig. 1		
Running Parallelism of Block Surface **D** to Surface **B**	See Fig. 1		

Note: If more detail information is needed, please refer to ***HIWIN*** linear guideway technical information.



◆ Running parallelism of the Guideway



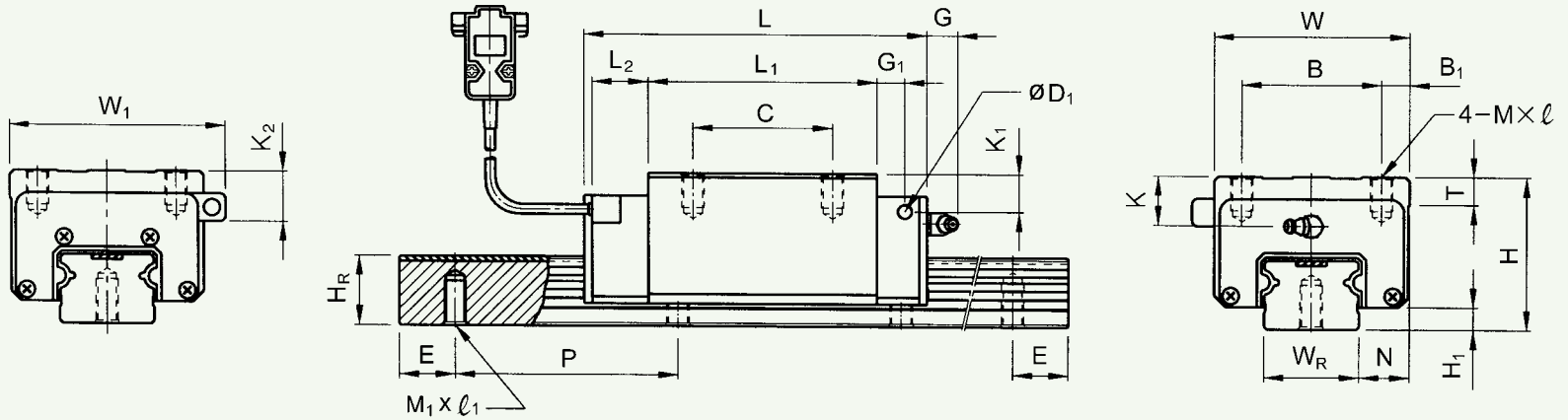
2-4-4 Preload

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

Note: The C in Preload column means basic dynamic load rating.

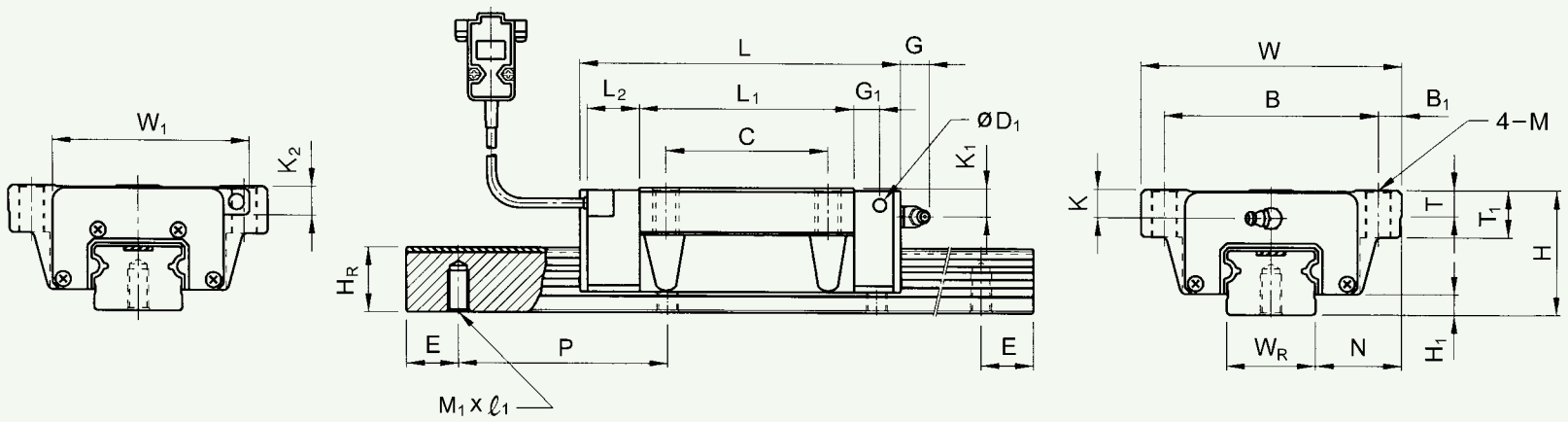
2-4-5 Dimensions for HIWIN IG Series

(1). IGLH CA / HA Type



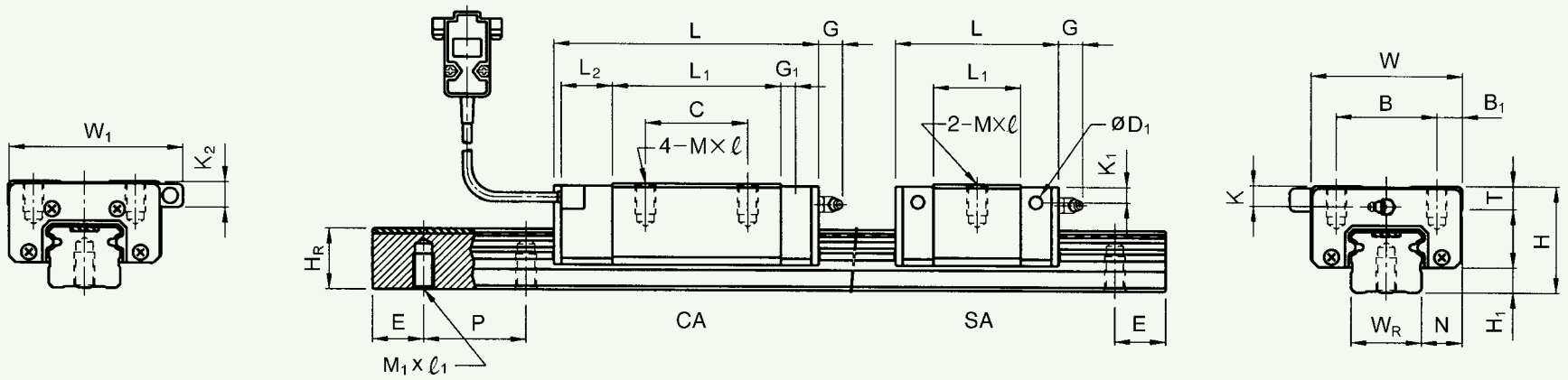
Model No.	Dimensions of Assembly (mm)			Dimensions of Block (mm)																Dimensions of Rail (mm)					Basic Dynamic Load Rating C (kgf)	Basic Static Load Rating C_0 (kgf)	Weight	
	H	H_1	N	W	W_1	L	B	B_1	C	L_1	L_2	G	K	D_1	G_1	K_1	K_2	M x ℓ	T	W_R	H_R	M1 x ℓ1	P	E			Block (kg)	Rail (kg/m)
IGLH 20CA	30	5	12	44	51.5	88.3	32	6	36	52.7	20.5	12	7.1	5	5.3	7.1	11	M5x6	8	20	15	M6x8	60	20	1,650	2,670	0.37	2.08
IGLH 20HA						102.6			50	67															2,100	3,400	0.46	
IGLH 25CA	40	6.5	12.5	48	56.9	95.1	35	6.5	35	57.6	20.5	12	11.2	5	6.8	11	15	M6x8	8	23	20	M6x12	60	20	2,410	3,880	0.59	3.15
IGLH 25HA						114.1			50	76.6															3,210	5,180	0.78	
IGLH 30CA	45	7	16	60	68	111.9	40	10	40	72	20.5	12	10.5	5	7.8	10.5	14	M8x10	8	28	23	M8x15	80	20	3,380	5,460	1.04	4.41
IGLH 30HA						132.9			60	93															4,400	7,100	1.33	
IGLH 35CA	55	8	18	70	77	123.9	50	10	50	82	20.5	12	15	5	8.8	16	17	M8x12	10	34	25	M8x16	80	20	4,180	6,740	1.72	5.93
IGLH 35HA						147.7			72	105.8															5,430	8,770	2.24	
IGLH 45CA	70	10	20.5	86	92.3	143.7	60	13	60	99.6	20.5	12.9	21	8.5	10	21	22	M10x17	15	45	32	M12x20	105	22.5	6,020	9,710	3.16	10.01
IGLH 45HA						177.1			80	133															8,430	13,600	4.28	
IGLH 55CA	80	13	23.5	100	107	166.3	75	12.5	75	115.8	20.5	12.9	22	8.5	11	22	22	M12x18	17	53	40	M14x24	120	30	9,740	13,220	5.30	14.82
IGLH 55HA						205.2			95	154.7															11,810	18,510	6.40	

(2). IGLW CA / HA Type



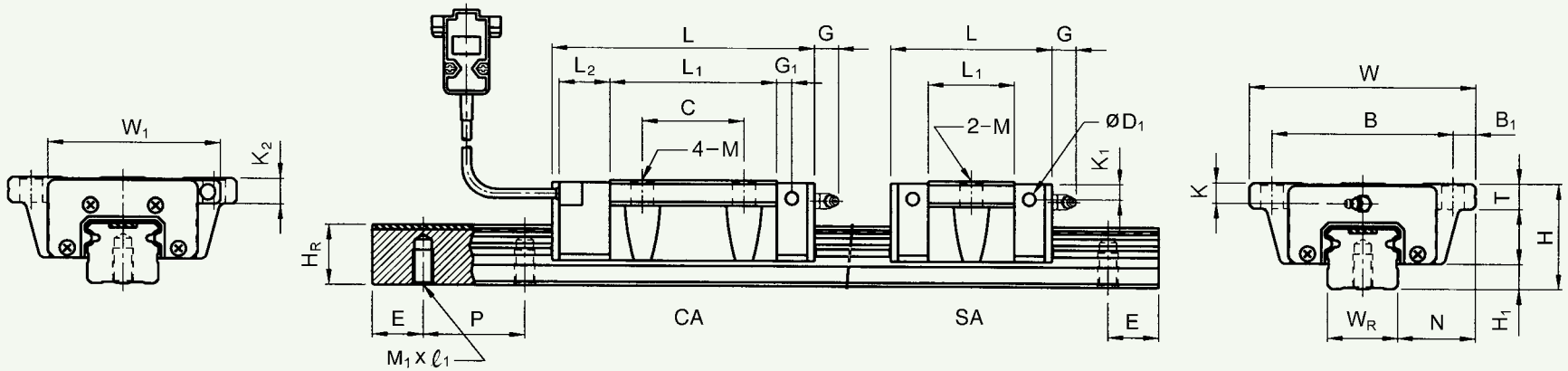
Model No.	Dimensions of Assembly (mm)			Dimensions of Block (mm)																Dimensions of Rail (mm)					Basic Dynamic Load Rating C (kgf)	Basic Static Load Rating C_0 (kgf)	Weight	
	H	H_1	N	W	W_1	L	B	B_1	C	L_1	L_2	G	K	M	D_1	G_1	K_1	K_2	T	T_1	W_R	H_R	$M_1 x \ell_1$	P	E			Block (kg)	Rail (kg/m)
IGLW 20CA	30	5	21.5	63	61	88.3	53	5	40	52.7	20.5	12	7.1	M6	5	5.3	7.1	11	8	10	20	15	M6x8	60	20	1,650	2,670	0.46	2.08
IGLW 20HA						102.6				67																2,100	3,400	0.58	
IGLW 25CA	36	6.5	23.5	70	67.5	95.1	57	6.5	45	57.6	20.5	12	7.2	M8	5	6.8	7	11	8	14	23	20	M6x12	60	20	2,410	3,880	0.64	3.15
IGLW 25HA						114.1				76.6																3,210	5,180	0.86	
IGLW 30CA	42	7	31	90	83	111.9	72	9	52	72	20.5	12	7.5	M10	5	7.8	7.5	11	8	16	28	23	M8x15	80	20	3,380	5,460	1.20	4.41
IGLW 30HA						132.9				93																4,400	7,100	1.56	
IGLW 35CA	48	8	33	100	92	123.9	82	9	62	82	20.5	12	8	M10	5	8.8	9	10	10	18	34	25	M8x16	80	20	4,180	6,740	1.78	5.93
IGLW 35HA						147.7				105.8																5,430	8,770	2.34	
IGLW 45CA	60	10	37.5	120	109.3	143.7	100	10	80	99.6	20.5	12.9	11	M12	8.5	10	11	12	15	22	45	32	M12x20	105	22.5	6,020	9,710	3.13	10.01
IGLW 45HA						177.1				133																8,430	13,600	4.27	
IGLW 55CA	70	13	43.5	140	127	166.3	116	12	95	115.8	20.5	12.9	12	M14	8.5	11	12	12	17	26	53	40	M14x24	120	30	9,740	13,220	5.50	14.82
IGLW 55HA						205.2				154.7																11,810	18,510	6.70	

(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	M×ℓ	T	W_R	H_R	M_1×$ℓ_1$	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	M5x8	7.5	20	15.5	M5x16	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	M6x9	8	23	18.5	M6x20	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	M8x12	9	28	24	M6x25	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

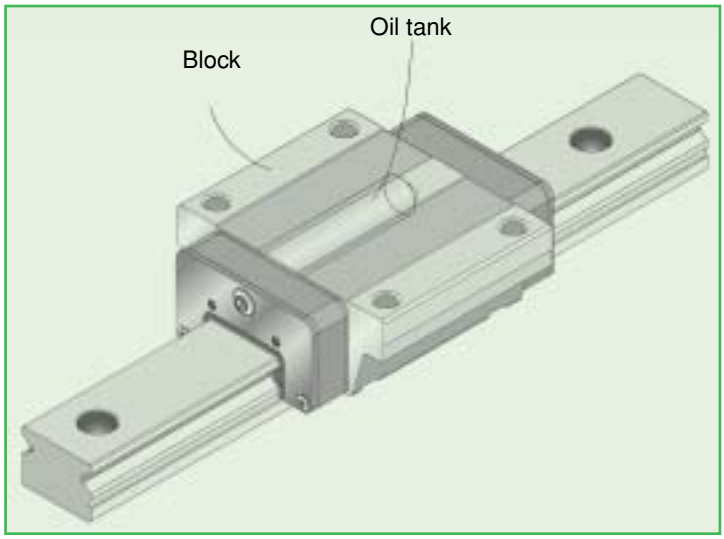


Model No.	Dimensions of Assembly (mm)			Dimensions of Block (mm)																Dimensions of Rail (mm)					Basic Dynamic Load Rating C (kgf)	Basic Static Load Rating C_0 (kgf)	Weight	
	H	H_1	N	W	W_1	L	B	B_1	C	L_1	L_2	G	K	D_1	G_1	K_1	K_2	M x ℓ	T	W_R	H_R	M_1 x $ℓ_1$	P	E			Block (kg)	Rail (kg/m)
IGAW 20SA	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	M5x16	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	M6x20	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	M6x25	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 EI Series

2-5-1 Structure of E1 Linear Guideway :

The construction of E1 Linear Guideway is shown in the figure, the Block with self-lubricant apparatus. The lubricant oil will be feed directly on the running ball by capillarity.



2-5-2 Feature of E1 Linear Guideway :

(1). Cost reduction: Saving cost from equipping the lubricant device and purchasing the oil.

■ Example LG35C

Item	Force lubricant	E1 (Self-lubricant) Block
Lubricant device	$ XXX	-
Design and installation of lubricant device	$ XXX	-
Cost of oil purchase	0.3cc/hr × 8hrs/day × 280days/year × 5year = 3360 cc × cost/cc = $ XXX	17 cc(5 years10000km) × cost/cc = $ XX
Cost of change oil	3~5hrs/time × 3~5times/year × 5year × cost/time= $ XXX	-
Waste oil disposal	3~5 times/year × 5year × cost/time = $ XXX	-

(2).Clean and environmental :

No worry about the pollution caused from oil leaking, therefor, it is suitable for high request clean environment.

(3). Maintenance free for long period using :

Self-lubricant Block is maintained free for general application. The lubricant oil will be feed directly on the rolling balls, so it can be used lastingly without wear.

(3). Save installation space :

There is nothing change for the length, accuracy, preload, rated static load and rated dynamic load of Block, so it's no need for incrcasing the driven power.

(4). Used in special environment :

The outstanding lubricating ability can be achieved by combining with use of grease, so it is suitable for dusty, worse weather and watery environment.

2-5-3 Application :

- Machine tool
- Manufacture machine : Plastic injection, printing, paper making, textile machine, food processing machine, wood working machine etc.
- Electronic machine : Semi conductor equipment, robot, X-Y table, measuring and inspecting equipment.
- Others : Medical equipment, transporting device, housing equipment

2-5-4 Specification :

- Add "/E1" after the specification of Linear Guideway.
  - Ex. LGW25CCE2R1600EZ1PII+ZZ/E1
  - Ex. AGW30CAE2R1600EZ1PII+ZZ/E1

Appplicable Specification

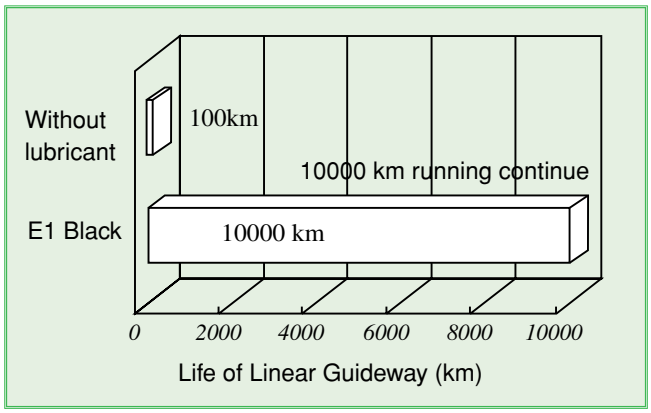
Series	Load type	Square type	Flange type		
		Tap hole	Tap hole	Drilled hole	Combination
LG	Heavy Load	LGH - CA	-	-	LGW - CC
	Super Heavy Load	LGH - HA	-	-	LGW - HC
AG	Medium Load	AGH - SA	AGW - SA	-	-
	Heavy Load	AGH - CA	AGW - CA	-	-

2-5-5 Lubrication Capability of E1 Linear Guideway :

- Life testing with light Load :

Test condition :

- Model No : LGW35CC
- Speed : 80m/min
- Stroke : 1500mm
- Load : 500kgf



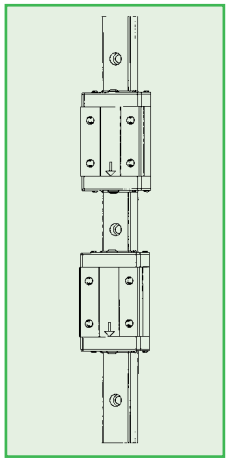
※ Note: the test was carried out without combining the use of grease.

- Characteristic of lubricant oil

1. Synthetic base oil with stable characteristic.
2. Range of oil operation temperature -15~240 ℃, include the most condition of Linear Guideway.
3. Reduce friction and anti-abrasion
4. Against corrosion and rust.
5. Non-toxic

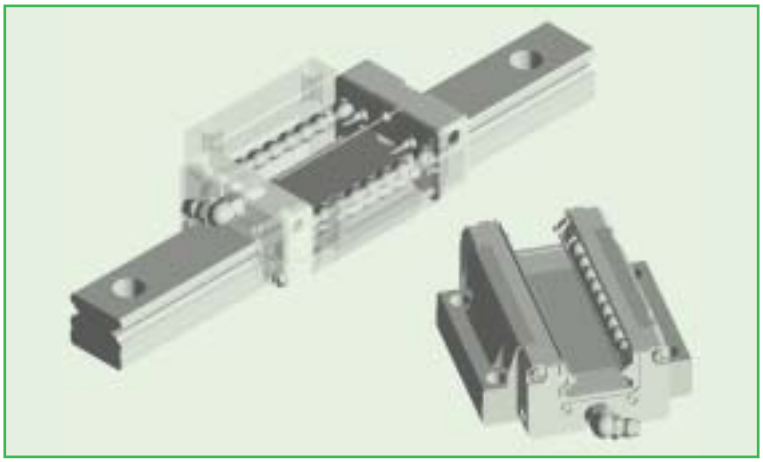
2-5-6 Installation

Becareful when using in vertical axis, the arrow mark on block must toward the ground. If inverse the block direction then the self-lubricant function can not work and demage will occur soon.



2-6 QI Series

This HIWIN Q1 series linear guideway adapt the special resin-made ball spacer which not only working as a damper but also as an oil retainer. The spacer absorbs the vibration through contact and lubricant releasing on the area working with the balls.



Application Issues:

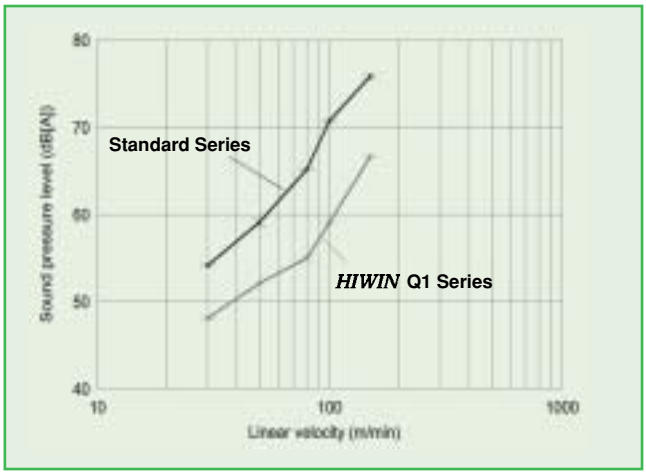
- Low noise demanding system especially under higher working speed.
- Short-stroke motion and/or higher loading situation (cooperated with E1 series is suggested)

Features :

(1) Lower Noise

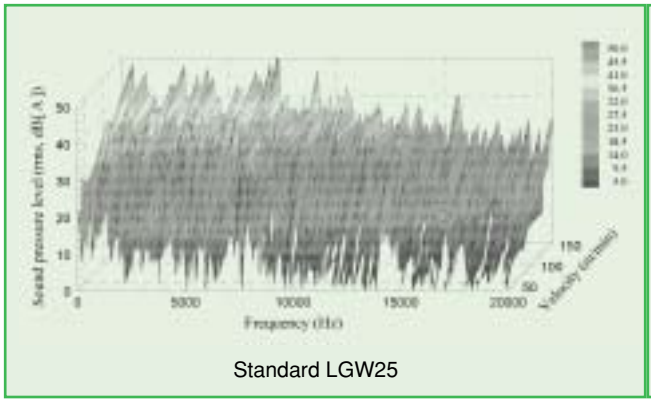
The spacer can significantly reduce the sound pressure level (SPL) of the standard guideway especially under a higher moving velocity.

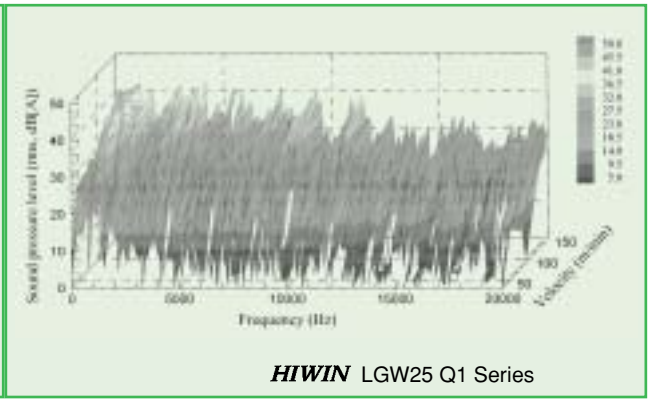
Test Type: LGW25 (light preload)	
Lubrication	Grease (AV2)
Stroke	700 mm
Position of Condenser Microphone	500 mm above the test specimen



(2) Softer Tone

Some noise tone can be eliminated even at a higher velocity. HIWIN Q1 Series is more friendly to the user's ears.


Standard LGW25

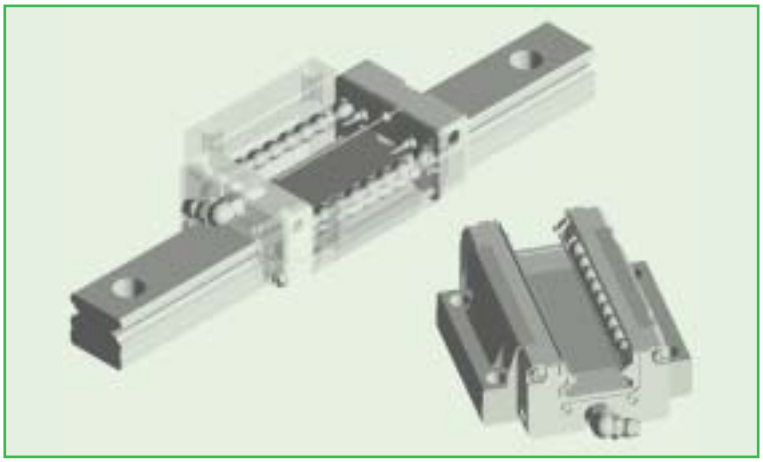

HIWIN LGW25 Q1 Series

(3) Higher reliability

The constant lubricant-releasing mechanism makes it possible to obtain a more reliable working condition and a more economical maintenance.

2-6 QI Series

This HIWIN Q1 series linear guideway adapt the special resin-made ball spacer which not only working as a damper but also as an oil retainer. The spacer absorbs the vibration through contact and lubricant releasing on the area working with the balls.



Application Issues:

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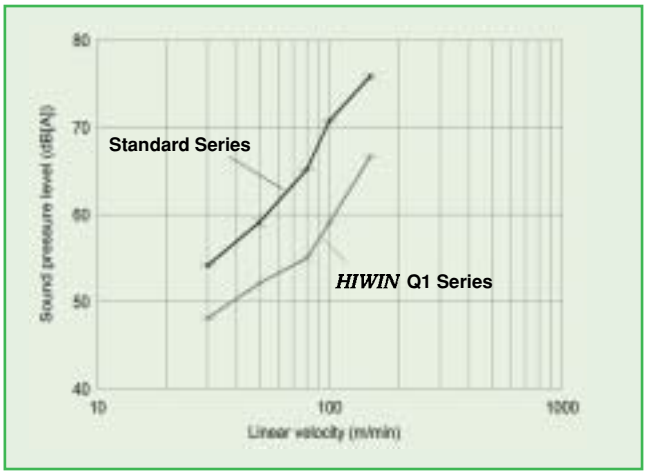
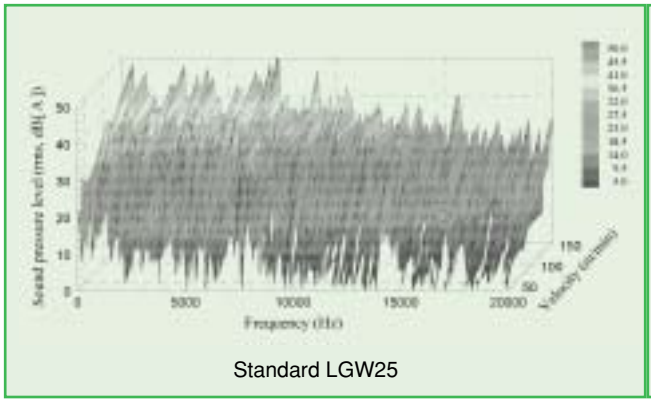
The spacer can significantly reduce the sound pressure level (SPL) of the standard guideway especially under a higher moving velocity.

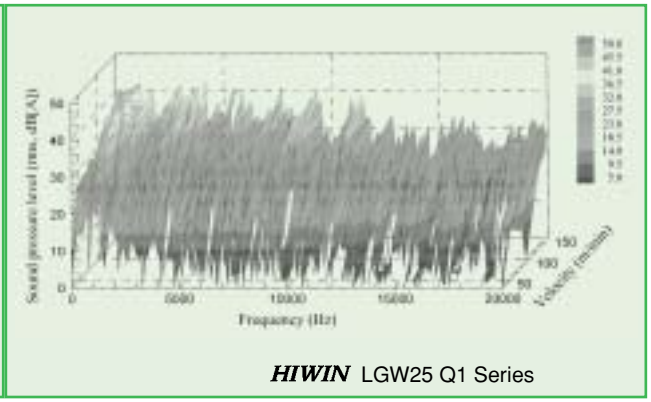
Test Type: LGW25 (light preload)	
Lubrication	Grease (AV2)
Stroke	700 mm
Position of Condenser Microphone	500 mm above the test specimen



(2) Softer Tone

Some noise tone can be eliminated even at a higher velocity. HIWIN Q1 Series is more friendly to the user's ears.


Standard LGW25


HIWIN LGW25 Q1 Series

(3) Higher reliability

The constant lubricant-releasing mechanism makes it possible to obtain a more reliable working condition and a more economical maintenance.

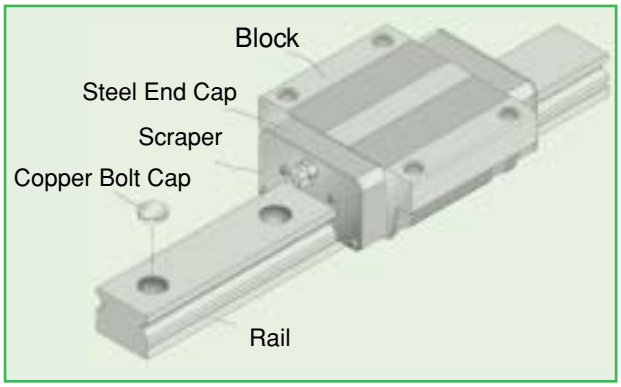
2-7 Option Function

◆ Metallic End Cap Type :

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

(1) Feature : Well temperature resistant ability. Service temperature under 150˚C , and instance temperature can up to 200˚C

(2) Application : Heat treatment equipment, welding machine, glass manufacturing equipment and vacuum using equipment (without vapor dispersion from plastic or rubber at high temperature)



(3) Applicable Series :

Series	Model No.
LG	15、20、25、30、35、45、55
AG	15、20、25、30
MGN	9、12、15

(4) Specification Number ：

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

- Ex ： LGW25CA2R1000Z0PII/SE
- Ex ： AGW25CA2R1000Z0PII/SE
- Ex ： MGN15C2R1000Z0PII/SE

(5) Copper Bolt Cap Dimension :

Cap code	Bolt Size	Cap Diameter mm	Cap Thickness mm	Model No. of Linear Guideway
C3	M3	6.15	1.2	AGR15R MGN12/15R
C4	M4	7.65	1.2	LGR15R
C5	M5	9.65	2.8	LGR20R AGR20R
C6	M6	11.15	2.8	LGR25R AGR25/30R
C8	M8	14.15	3.5	LGR30/35R
C12	M12	20.15	4	LGR45R
C14	M14	23.15	4	LGR55R

Note: The use of the catalogue should be combined with the Lineat Guideway technical information.
(The specifications in this catalogue are subject to change without notification.)

MEMO

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