HIWIN®

HG Linear Guideway

Technical Information

Preface

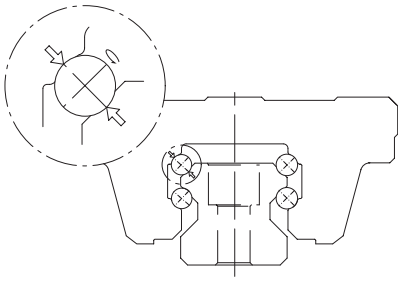
HIWIN HG series four-row super heavy load linear guideway are designed on load capacity and rigidity over 30% higher than other similar products by circular-arc groove and structure optimization. It features the same load in four directions (up/down and right/left) and self-aligning capability to absorb installation-error. HIWIN HG series four-row super heavy load linear guideway can achieve a long life with high speed and accuracy and smooth linear motion.

1. General Information

1-1 Advantages and Fearures

(1) Circular-arc contact

The HIWIN HG linear guideway has the circular-arc contact design. Because of the special constraint design, the linear guideway can take up loads in up/down and left/right directions. Furthermore, the circular-arc shaped groove approximating the ball diameter which provide a wide contact width between the balls and the groove raceway can obtain large permissible load, high rigidity and smooth linear motion.



(2) Simple Installation with accuracy and smoothness

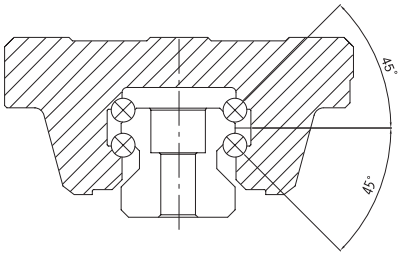
By the design of circular-arc shaped groove with contact points in 45 degree, HIWIN HG linear guideway can mostly absorb the error of installation surface and provide smooth linear motion through the elastic deformation of balls and the shift of contact points. That is, with self-aligning capability, high accuracy and smoothness can be obtained with simple installation.

(3) High permissible load and rigidity

By optimized circular-arc shaped groove and structure design, HIWIN HG linear guideway features over 30% higher load capacity and rigidity than other similar products. Thus, HG linear guideway can achieve a long life with high speed, highly accurate and smooth linear motion.

(4) HG product types

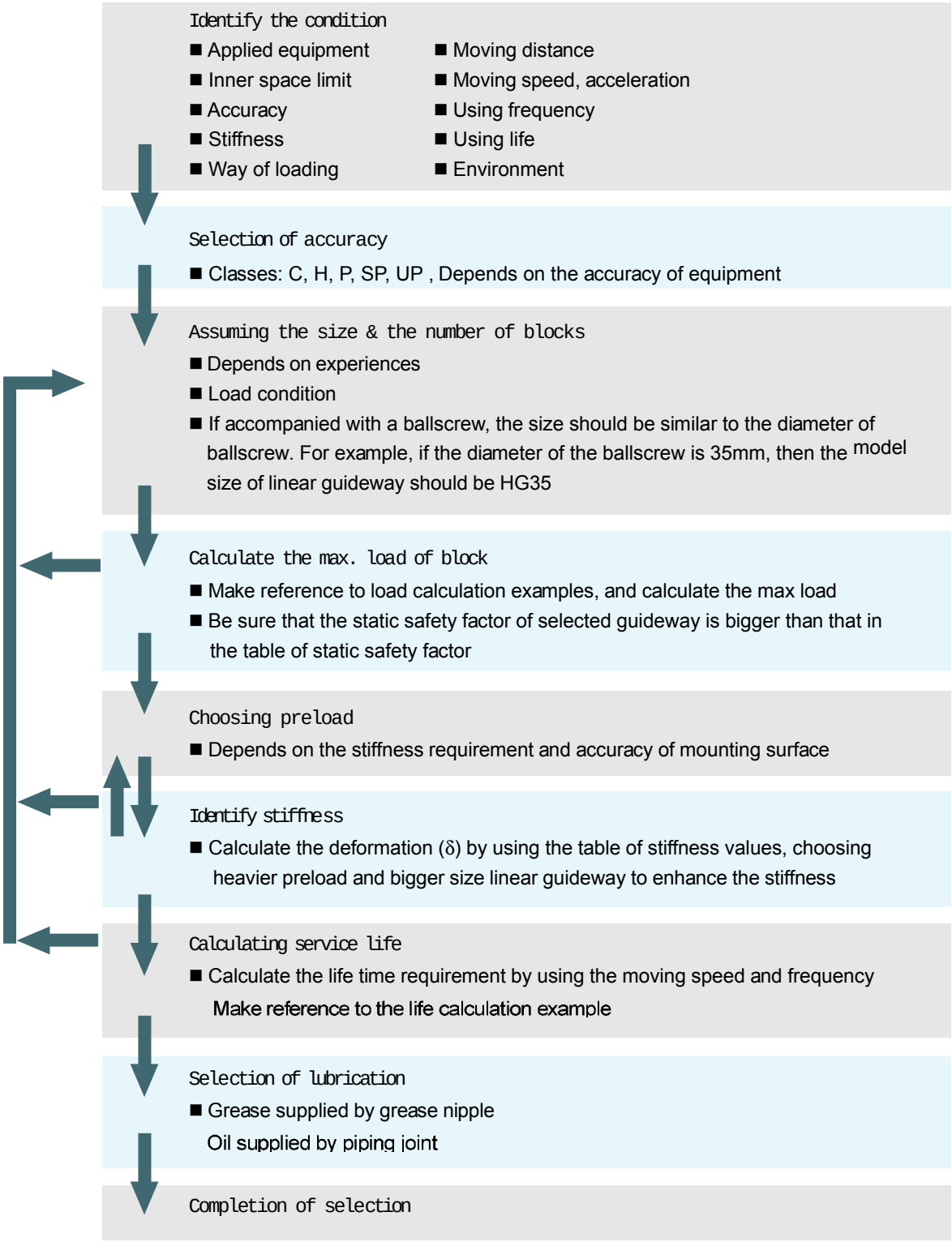
For satisfying various needs of customers, HIWIN has developed HG series for machine tools, automation equipments and material handling equipments which require linear motion with smooth, high accuracy and rigidity.



(5) 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 recommanded to have the stock of rails and blocks separately for saving the space of warehouse.

1-2 The Principles of Selecting Linear Guideway



1-3 Basic Load Rating of Linear Guideways

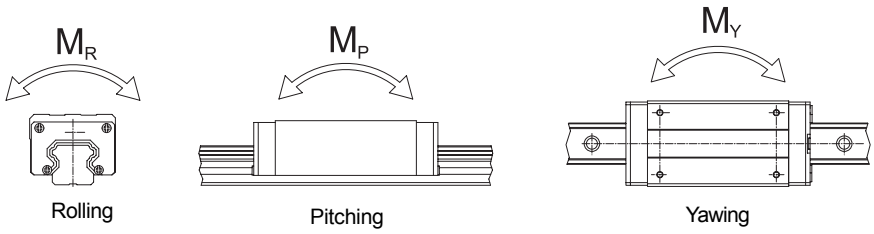
1-3-1 Basic Static Load

(1) Static load rating (C_0)

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 in a linear guideway must be not exceed the basic static load rating.

(2) Static permissible moment (M_0)

The static permissible moment refers to a moment in a given direction and magnitude such as the largest stress of the rolling elements in applied system equals to the stress induced by the Static Load Rating described in 4.1.1. The static permissible moment in linear motion systems is defined for three directions: M_P, M_Y and M_R respectively.



(3) Static safety factor

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 2). The static load can be obtained by using Eq. 1.

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

f_{SL} : Static safety factor for simple load
f_{SM} : Static safety factor for moment
C_0 : Static load rating (N)
M_0 : Static permissible moment (N.mm)
P : Calculated working load (N)
M : Calculated appling moment (N.mm)

Table 1.1 Static Safety Factor

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

1-3-2 Basic dynamic load

(1) Dynamic load rating (C)

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

1-4 The Service Life of Linear Guideways

1-4-1 Service life

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

1-4-2 Nominal life (L)

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

1-4-3 Calculation of nominal life

The acting load will affect the nominal life of a linear guideway. Based on the selected basic dynamic rated load and the actual load, the nominal life can be calculated by using Equal. 2.

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

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

If the environmental factors are taken into consideration, the nominal life will be 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. 3.

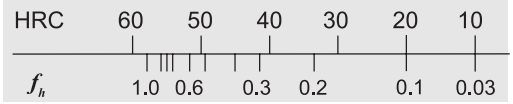
$$L=\left(\frac{f_h\times f_t\times C}{f_w\times P_c}\right)^{3}\times 50\text{km}=\left(\frac{f_h\times f_t\times C}{f_w\times P_c}\right)^{3}\times 31\text{mile} \qquad \text{Eq. 1.3}$$

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

1-4-4 Factors of normal life

(1) Hardness factor (f_h)

In general, the contact surface of the raceway with the balls must have the hardness of H_RC 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.



(2) Temperature factor (f_t)

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

°C	100	150	200	250
f_t	1.0	0.9	0.8	0.7	0.6

(3) Load factor (f_w)

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

Table 1.2 Load Factor

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

1-4-5 Calculation of the service life time (L_h)

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

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

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

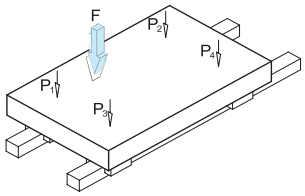
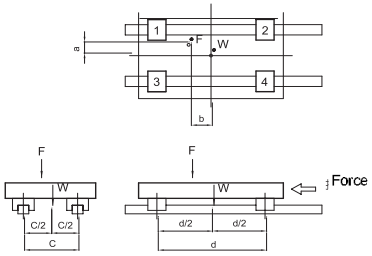
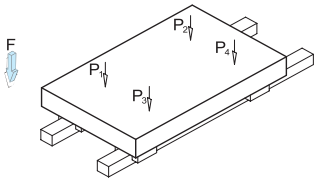
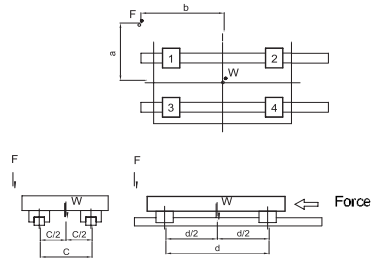
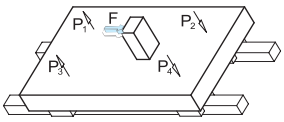
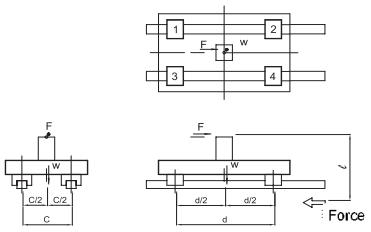
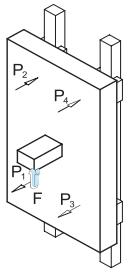
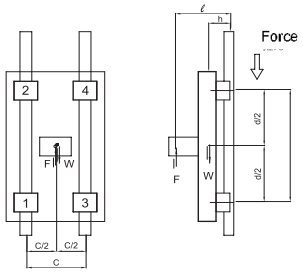
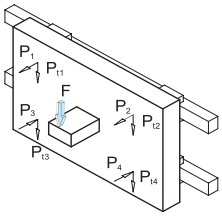
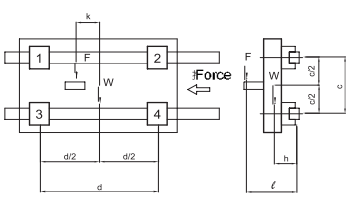
1-5 Acting Load

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.

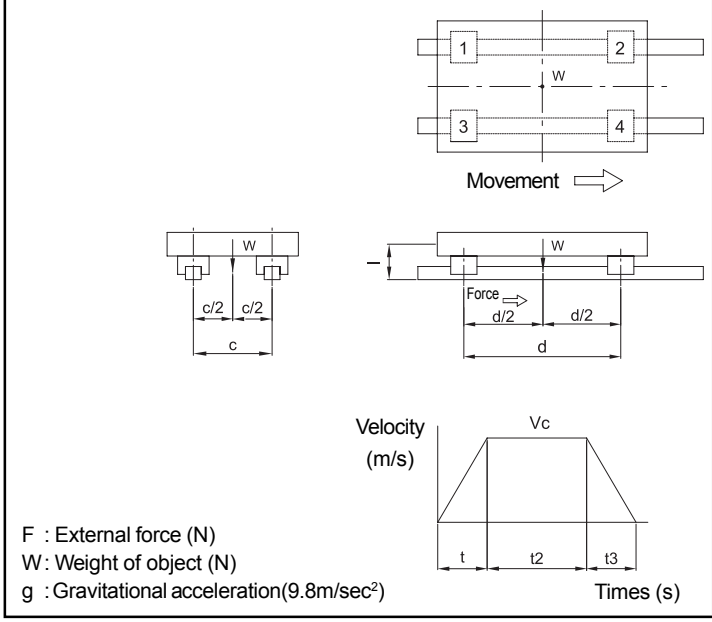
(1) Load on one block

Table 1.3 Caculation example of loads on block

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

(2) Loads with inertia forces

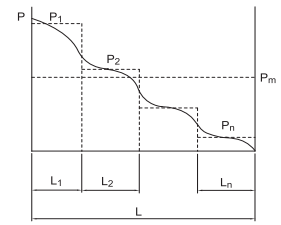
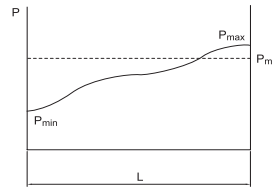
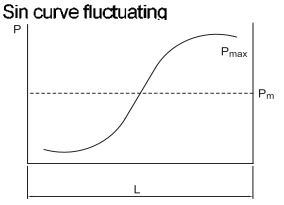
Table 1.4 Calculation Examples for Loads with Inertia Forces

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

1-5-2 Calculation of the mean loadfor 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 1.5.

Table 1.5 Calculation Examples for Mean Load (P_m)

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

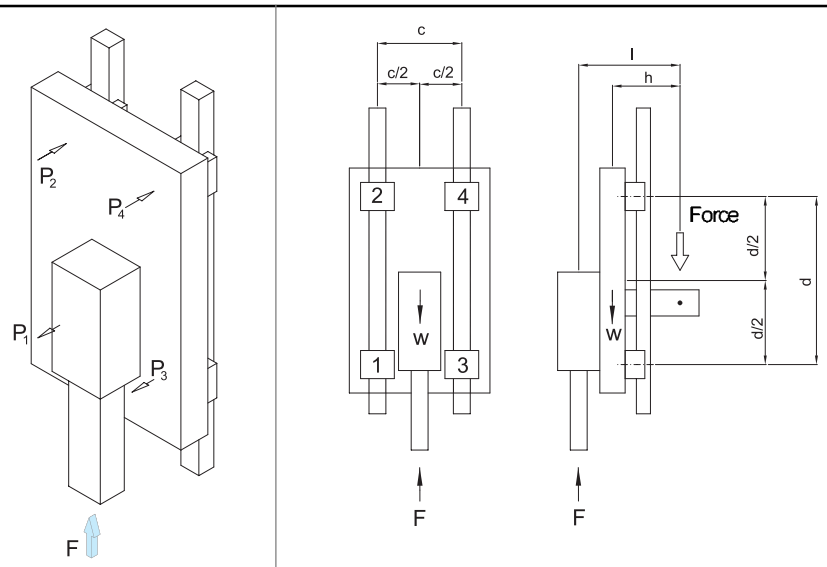
$$P_e = F_s + F_\ell \quad \text{Eq. 1.5}$$

P_e : Equivalent load
F_s : Perpendicular Load
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 1.6 Calculation Example for Service Life



Type of Linear Guideway	Dimension of device	Operating condition
Type: HGH 30 CA	d : 600 mm	Weight (W) : 400 kgf
C : 38.71 kN	c : 400 mm	Acting force (F) : 100 kgf
C_0 : 83.01 kN	h : 200 mm	Temperature: normal temperature
Preload: ZA	l : 250 mm	Load status: normal load

▸ Calculation of acting loads

$$P_1 \sim P_4 = \frac{W \times h}{2d} - \frac{F \times \ell}{2d} = \frac{400 \times 200}{2 \times 600} - \frac{1000 \times 250}{2 \times 600} = 458\ (\mathrm{N})$$

$$P_{max} = 458\ \mathrm{N}$$

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

$$P_c = P_{max} + P_z = 458 + (38{,}710 \times 0.05) = 2393.5\ (\mathrm{N})$$

▸ Calculation for life L

$$L = \left(\frac{f_h \times f_t \times C}{f_w \times P_c}\right)^3 \times 50 = \left(\frac{1 \times 1 \times 38{,}710}{2 \times 2393.5}\right)^3 \times 50 = 26{,}439\ (\mathrm{km})$$

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 come form the grease resistance and frictional resistance between balls. In contrast, if the load is more than the basic static load rate, the resistance will mainly come from the load.

$$F = \mu \times W + S \quad \text{Eq. 1.6}$$

F : friction (kN)
S : friction resistance (kN)
μ : Coefficient of friction
W : Loads (kN)

1-7 Lubrication

1-7-1 Grease

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

$$T = \frac{100 \times 1000}{S \times 60} \text{hr} \quad \text{Eq. 1.7}$$

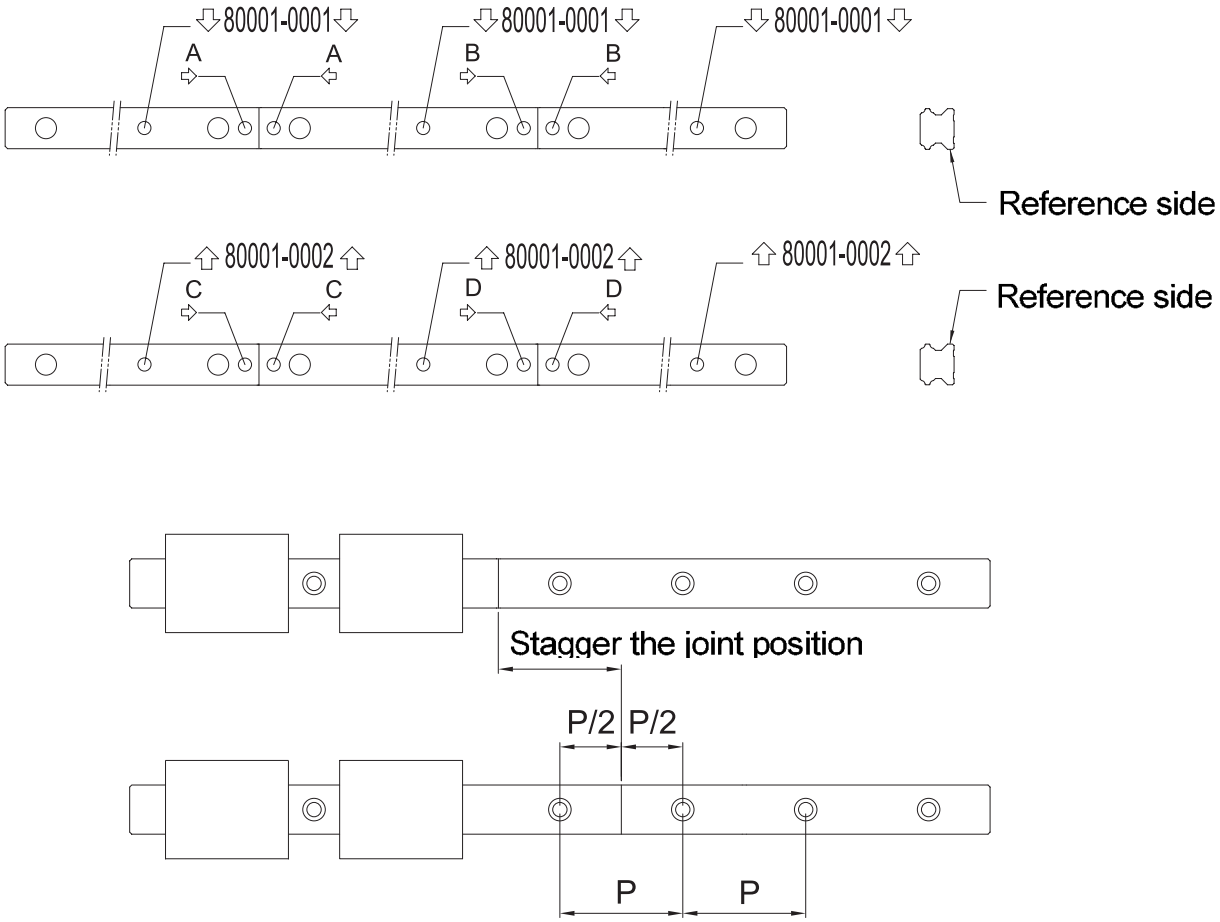
T : Feeding frequency of oil (hour)
S : speed (m/min)

1-7-2 Oil

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

Since the oil is easier to be evaporated than the grease, the recommended oil feeding rate is approximate 0.3cm^3/hr.

1-8 The Butt-joint Rail



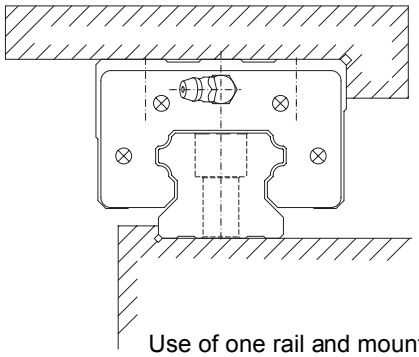
The butt-joint rail should be installed by following the arrow sign and ordinal number which is marked on the surface of each rail.

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

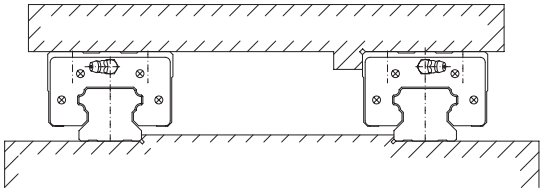
1-9 Layout Method

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

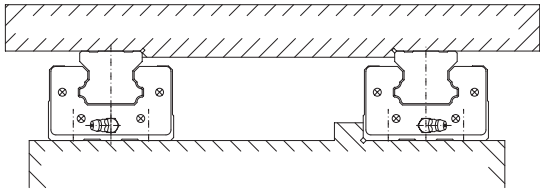
The typical layouts for linear guideway are shown below:



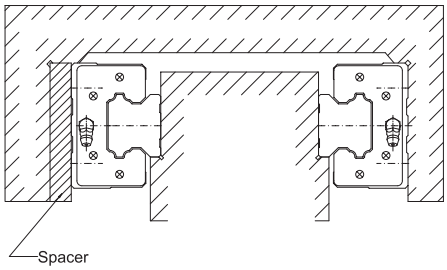
Use of one rail and mounting reference side



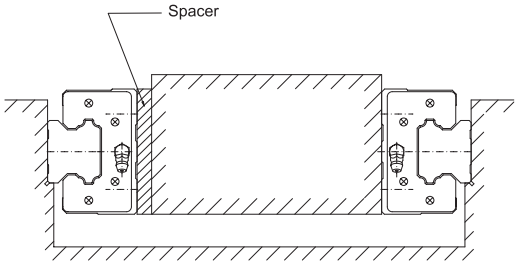
Use of two rails(block movement)



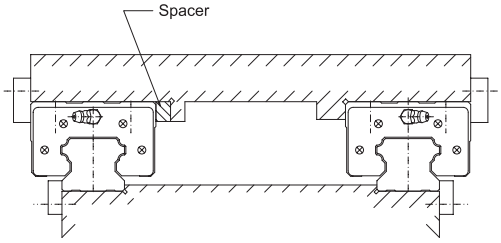
Use of two rails(block fixed)



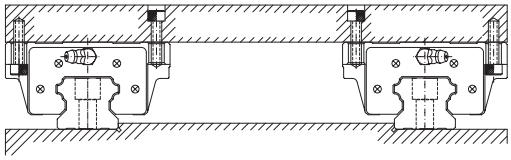
Use of two external rails



Use of two internal rails



Total surface fixed installation



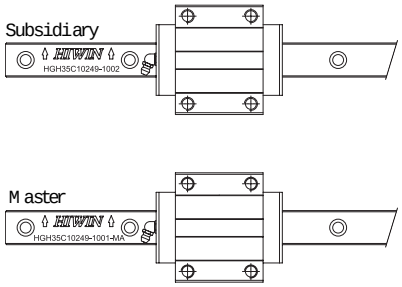
HGW type block with mounting holes in different directions.

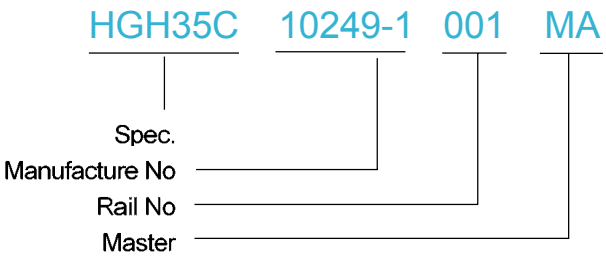
1-10 Installation of Linear Guideway

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

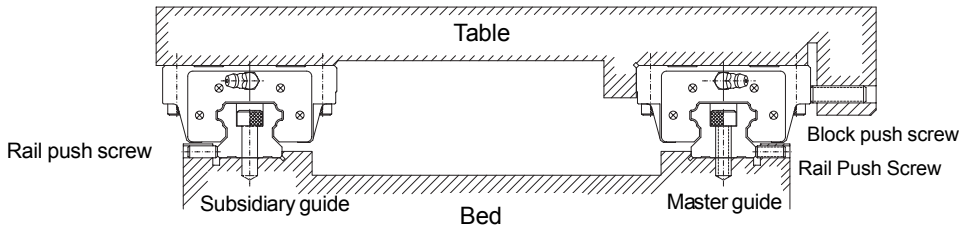
1-10-1 Master and subsidiary guide

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



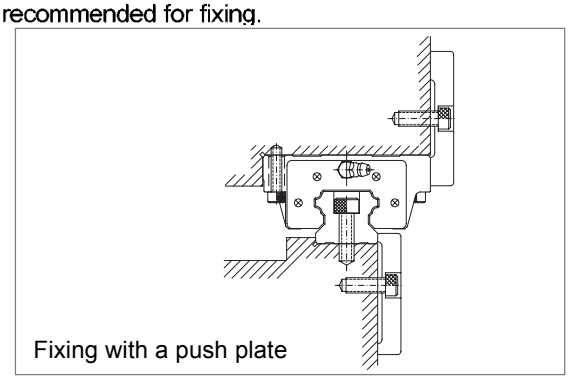


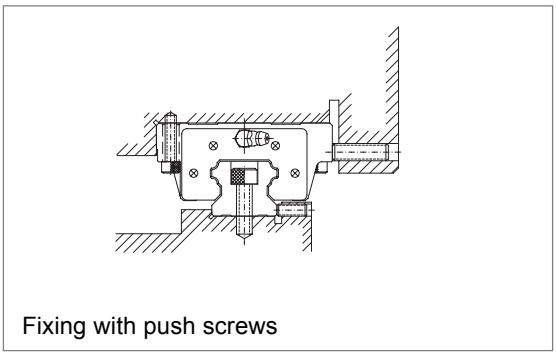
1-10-2 Rigidity and high accuracy are required when the machine is subjected to vibrations and impacts

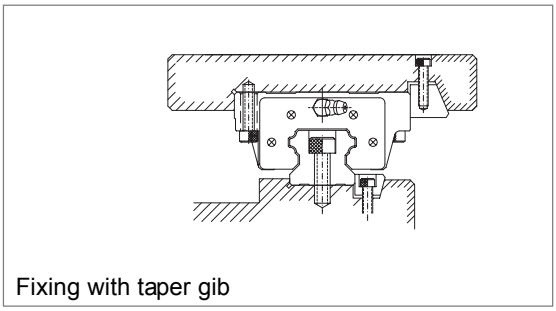


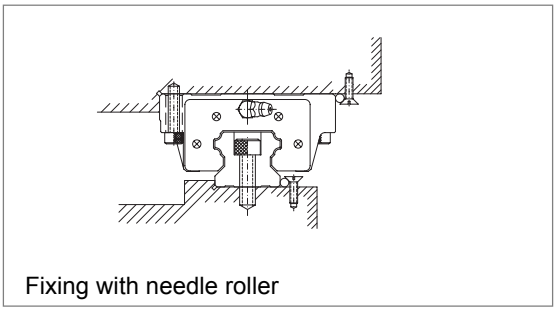
(1) Fixing methods

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


Fixing with a push plate

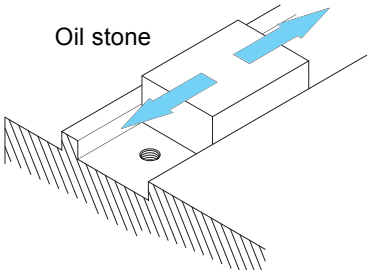

Fixing with push screws


Fixing with taper gib


Fixing with needle roller

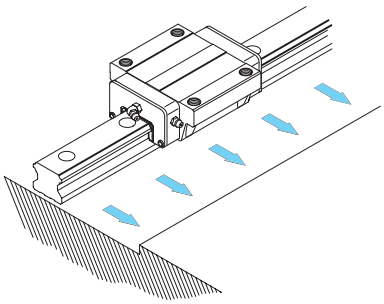
(2) Procedure of rail installation

1



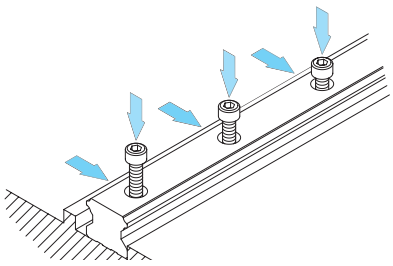
Before starting, remove all dirt from the mounting surface of the machine.

2



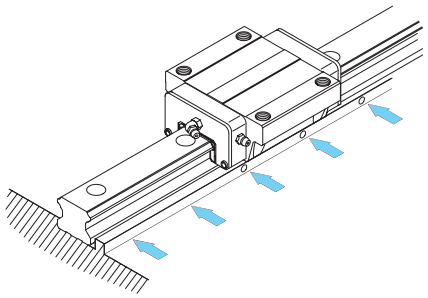
Place the linear guideway gently on the bed. Bring the guideway into close contact with the datum plane of the bed.

3



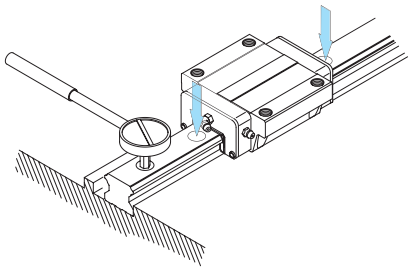
Check for correct thread engagement when inserting a bolt into the mounting hole while the rail is being placed on the mounting surface of the bed.

4



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

5

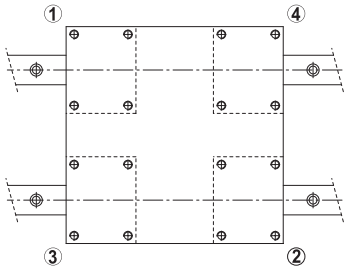


Tighten the mounting bolts with a torque wrench to the specified torque.

6

Install the remaining linear guideway in the same way.

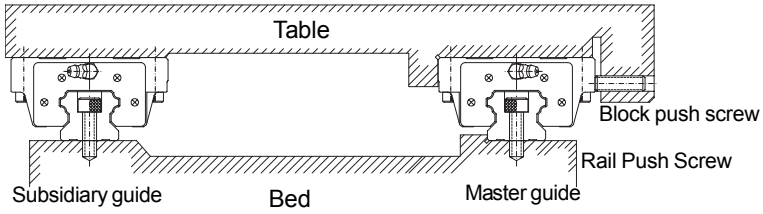
(3) Procedure of block installation



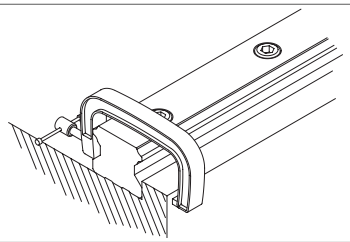
1. Place the table gently on the blocks. Next, tighten the block mounting bolts temporarily.
2. Push the blocks against the datum plane of the table and position the table by tightening the push screws.
3. The table can be fixed uniformly by tightening the mounting bolts on master guide side and subsidiary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

1-10-3 Installation 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.



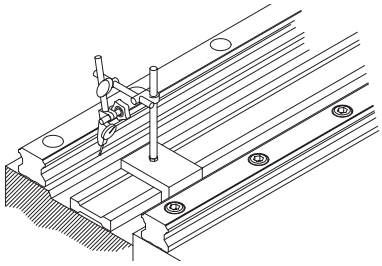
(1) Installation of the rail on the subsidiary guide side



▶ Using a vice

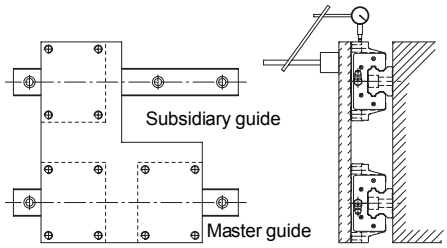
Place the rail into the mounting plane of the bed. Tighten the mounting bolts temporarily; then use a vice to push the rail against the side datum plane of the bed. Tighten the mounting bolts in sequence to the specified torque.

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



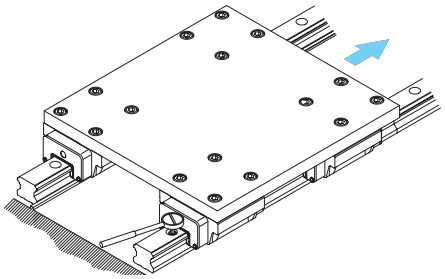
▶Method with use of a straight edge

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



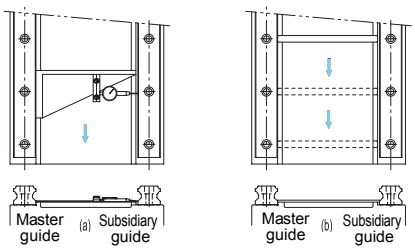
▶Method with use of a table

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



▶Method following the master guide side

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

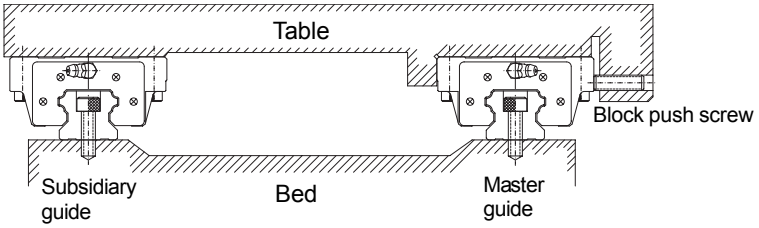


▶Method with use of a jig

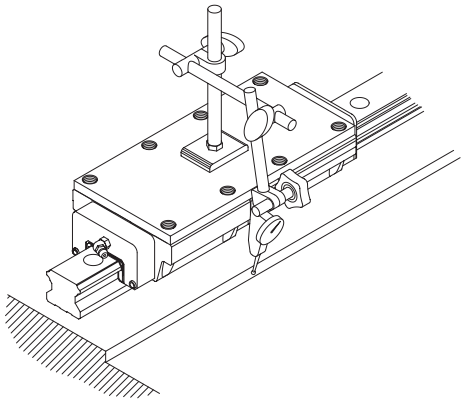
Use a special jig to ensure the rail position on the subsidiary guide side. Tighten the mounting bolts to the specified torque in sequence.

1-10-4 When there is no side surface of the bed on the master guide side

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

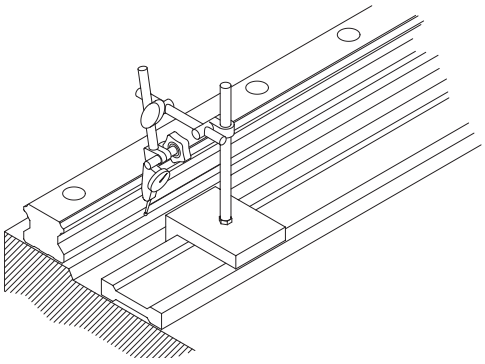


(1) Installation of the rail on the master guide side



▸ Using a provisional datum plane

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



▸ Method with use of a straight edge

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

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

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

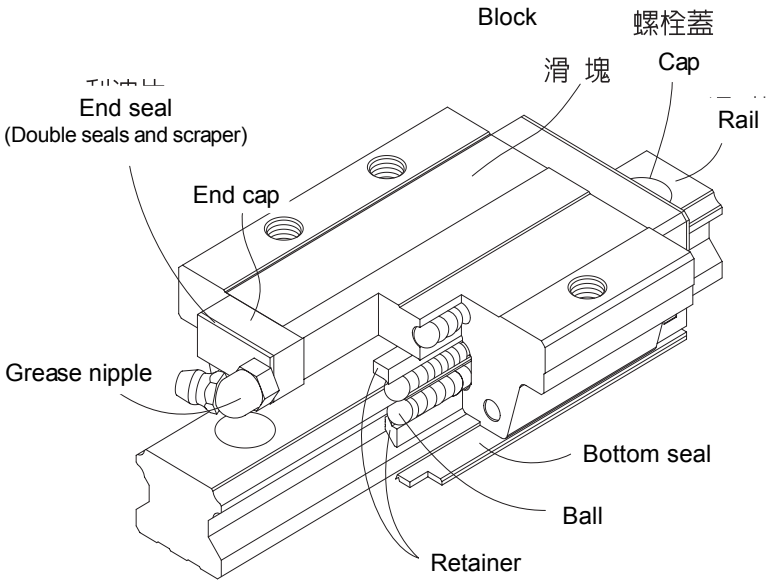
2. HG Series Linear Guideway

2-1 Features of the HG Series Linear Guideway

HG series four-row super heavy load linear guideway are designed on load capacity and rigidity over 30% higher than other similar products by circular-arc groove and structure optimization. Moreover, the optimum design of circulating system makes the movement smooth.

The retainer is designed for avoiding the balls fall out even the blocks are removed from the rail while installing.

2-2 Construction of HG Series

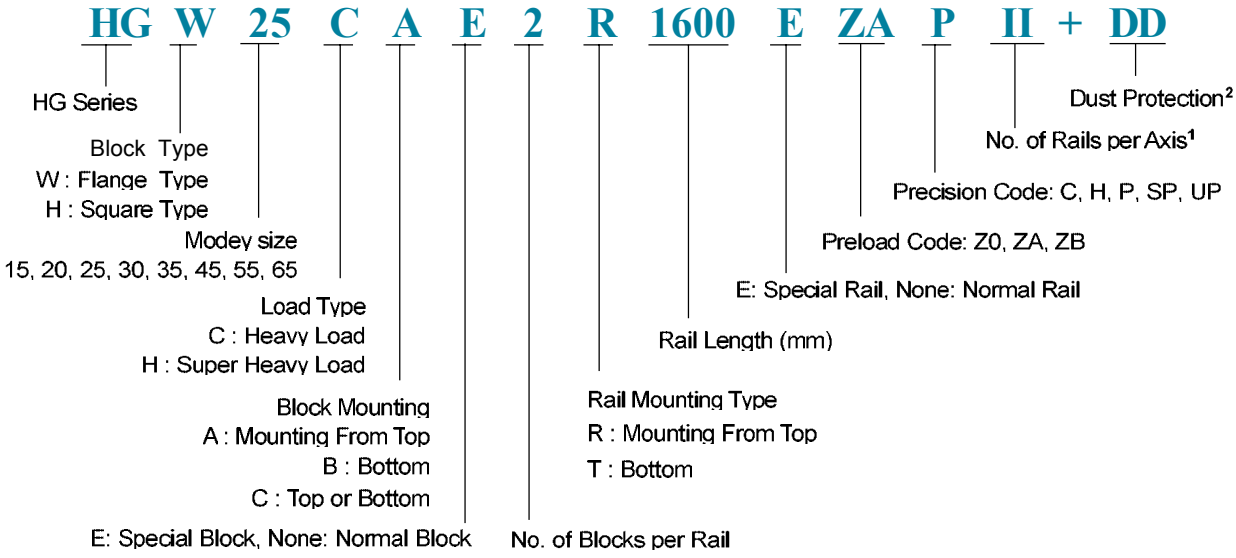


- Rolling Circulation System: Block, Rail, End plate and Retainer
- Lubrication System: Grease Nipple and piping joint
- Dust Protection System: End seal, Bottom seal, Cap, Double Seals and Scraper

2-3 Model Number of HG Series

HG 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 restrict-edly dimensional control, the interchangeable type linear guideway is a wise choice for customer when rails do not need to be paired for an axis. The model number of HG series contains the size, type, accuracy class, preload class, etc..

2-3-1 Non-interchangeable type



Note: 1. The roman numerals it is shown in no symbol 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).

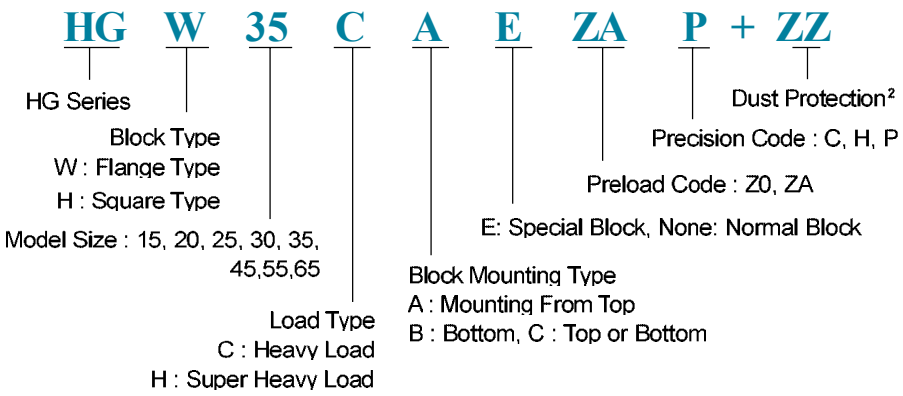
ZZ : End seal, bottom seal and scraper

KK: Double seals, bottom seal and scraper.

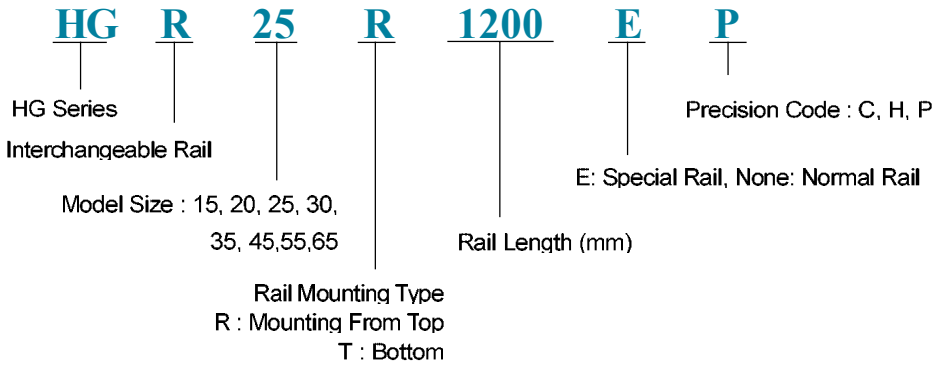
DD: Double seals and bottom seal

2-3-2 Interchangeable type

Model Number of HG Block



Model Number of HG Rail

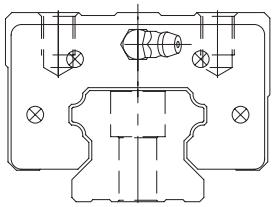
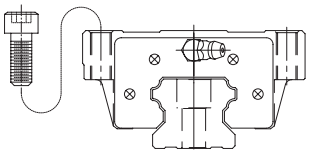
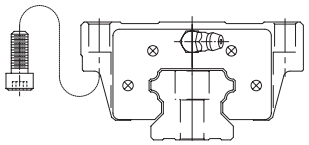
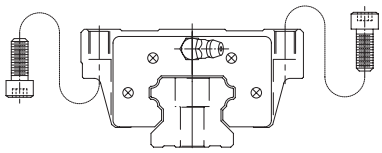


2-4 Types

2-4-1 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.

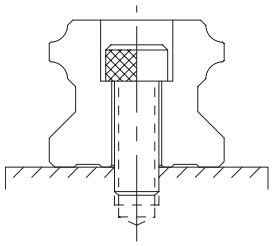
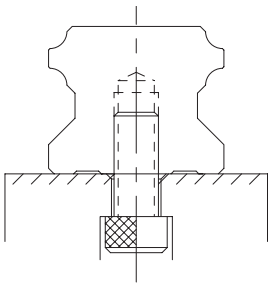
Table 2.1 Block Types

Type	Model	Shape	Height (mm)	Rail Length (mm)	Main Application
Square	HGH-CA HGH-HA		26 ↓ 76	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	HGW-CA HGW-HA		24 ↓ 90	100 ↓ 4000	
	HGW-CB HGW-HB		24 ↓ 90	100 ↓ 4000	
	HGW-CC HGW-HC		24 ↓ 90	100 ↓ 4000	

2-4-2 Rail types

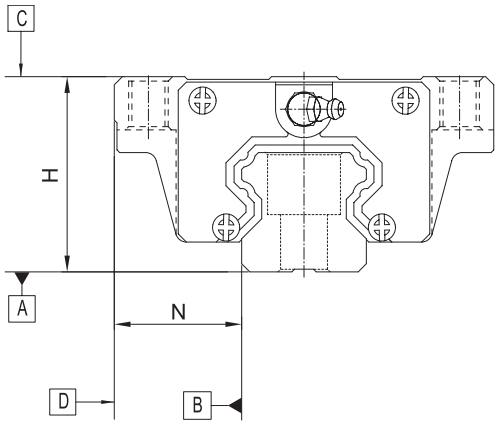
Besides the standard top mounting type, HIWIN also offers the bottom mounting type of rails to customers.

Table 2.2 Rail Types

Mounting from Above	Mounting from below
	

2-5 Accuracy Classes

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



2-5-1 Accuracy of non-interchangeable

Table 2.3 Accuracy Standards

Unit: mm

Item	HG - 15, 20				
Accuracy Classes	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
Variation of height H	0.02	0.01	0.006	0.004	0.003
Variation of width N	0.02	0.01	0.006	0.004	0.003
Running parallelism of block surface C to surface A	See Table 2-5				
Running parallelism of block surface D to surface B	See Table 2-5				

Item	**HG - 25, 30, 35**				
Accuracy Classes	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
Variation of height H	0.02	0.015	0.007	0.005	0.003
Variation of width N	0.03	0.015	0.007	0.005	0.003
Running parallelism of block surface C to surface A	See Table 2-5				
Running parallelism of block surface D to surface B	See Table 2-5				

Item	HG - 45, 55				
Accuracy Classes	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
Variation of height H	0.03	0.015	0.007	0.005	0.003
Variation of width N	0.03	0.02	0.01	0.007	0.005
Running parallelism of block surface C to surface A	See Table 2-5				
Running parallelism of block surface D to surface B	See Table 2-5				

Item	HG - 65				
Accuracy Classes	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
Variation of height H	0.03	0.02	0.01	0.007	0.005
Variation of width N	0.03	0.025	0.015	0.01	0.007
Running parallelism of block surface C to surface A	See Table 2-5				
Running parallelism of block surface D to surface B	See Table 2-5				

2-5-2 Accuracy of interchangeable

Table 2.4 Accuracy Standards

Unit: mm

Item	HG - 15, 20		
Accuracy Classes	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
Variation of height H	0.02	0.01	0.006
Variation of width N	0.02	0.01	0.006
Running parallelism of block surface C to surface A	See Table 2-5		
Running parallelism of block surface D to surface B	See Table 2-5		

Item	HG - 25, 30, 35		
Accuracy Classes	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
Variation of height H	0.02	0.015	0.007
Variation of width N	0.03	0.015	0.007
Running parallelism of block surface C to surface A	See Table 2-5		
Running parallelism of block surface D to surface B	See Table 2-5		

Item	HG - 45, 55		
Accuracy Classes	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
Variation of height H	0.03	0.015	0.007
Variation of width N	0.03	0.02	0.01
Running parallelism of block surface C to surface A	See Table 2-5		
Running parallelism of block surface D to surface B	See Table 2-5		

Item	HG - 65		
Accuracy Classes	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
Variation of height H	0.03	0.02	0.01
Variation of width N	0.03	0.025	0.015
Running parallelism of block surface C to surface A	See Table 2-5		
Running parallelism of block surface D to surface B	See Table 2-5		

2-5-3 Accuracy of running parallelism

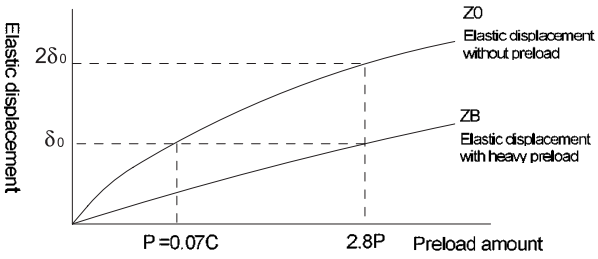
Table 2.5 Accuracy of Running Parallelism

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

2-6 Preload

2-6-1 Definition

A preload can be applied to each guideway. Over-sized balls are used. Generally, a linear motion guide-way 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 times the preload and the deflection is one half. The preload not over than ZA would be recommended for the model size under HG20 to avoid over-perload affecting guideway's life.



2-6-2 Preload classes

HIWIN offers six standard preloads for various applications and conditions.

Table 2.6 Preload Classes

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

Note : 1. The C in preload column means basic dynamic load rating.

2. Preload Classes of Interchangeable Guideway: **Z0, ZA.** Preload Classes of Non-Interchangeable Guideway: **Z0, ZA, ZB**

2-7 Stiffness

To confirm that whether the rigidity will affect the accuracy or not, the rigidity corresponds to the preload amount.

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

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

Table 2.7 Value of Rigidity

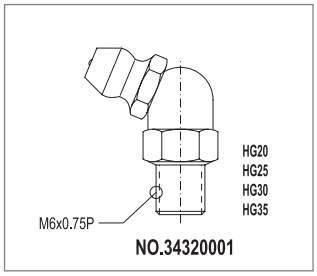
Type	Size	Z0 kN/μm	ZA kN/μm	ZB kN/μm
Heavy load	HG 15C	0.38	0.46	0.51
	HG 20C	0.46	0.54	0.62
	HG 25C	0.52	0.63	0.73
	HG 30C	0.63	0.77	0.90
	HG 35C	0.68	0.83	0.98
	HG 45C	0.80	0.94	1.09
	HG 55C	0.95	1.08	1.23
	HG 65C	1.08	1.21	1.34
Super heavy load	HG 20H	0.56	0.67	0.77
	HG 25H	0.67	0.81	0.95
	HG 30H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

Note: 1kgf = 9.81N

2-8 Lubrication

2-8-1 Grease

(1) Grease nipple



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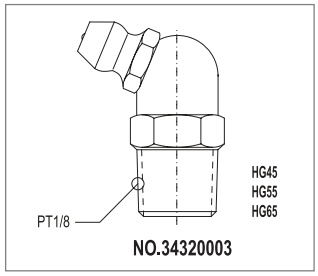

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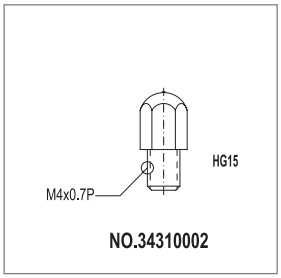

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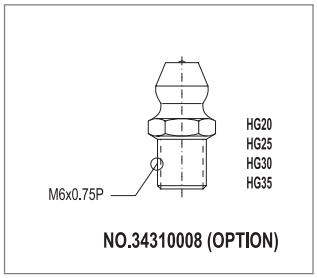
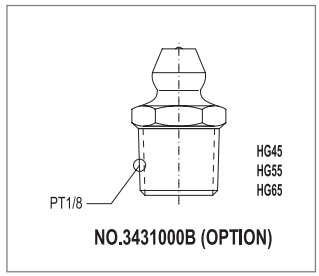
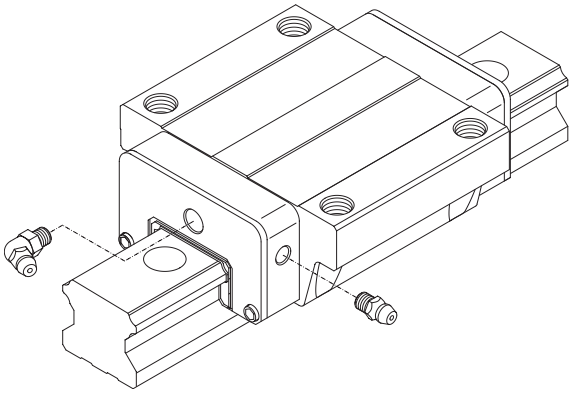


NO.34310008 (OPTION)



NO.3431000B (OPTION)

(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 recommend 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 2.8 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)
HG 15	1	-	HG 35	10	12
HG 20	2	3	HG 45	17	21
HG 25	5	6	HG 55	26	33
HG 30	7	8	HG 65	50	61

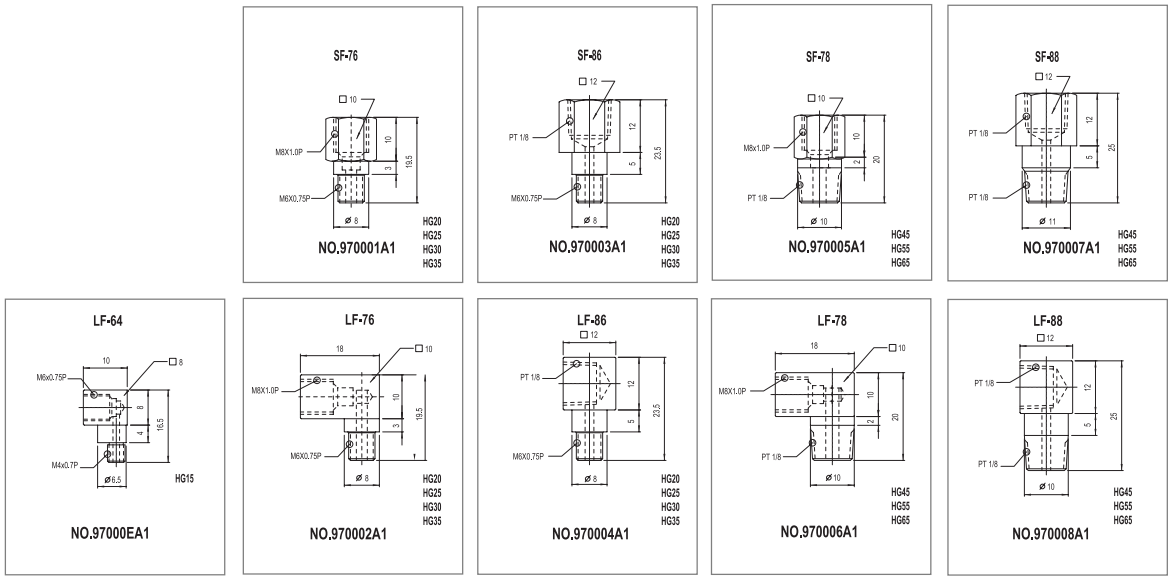
(4) Frequency of replenishment

Replenishing the oil every 100km.

2-8-2 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

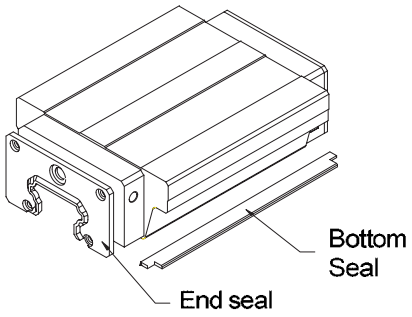
Table 2.9

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

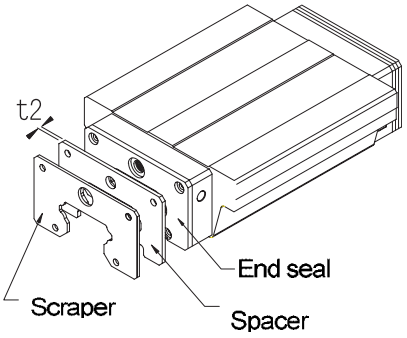
2-9 Dust Protection Equipment

2-9-1 Code of equipment

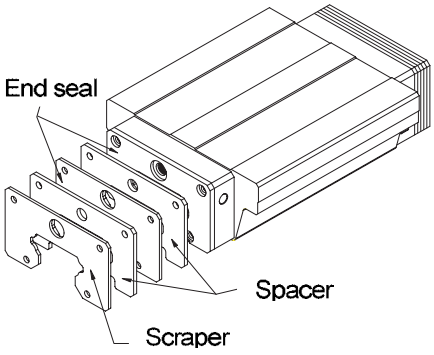
If the following equipment needed, please indicate the code followed by the model number.



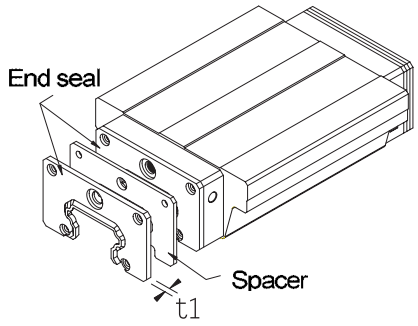
No symbol: Standard equipment
(End seal + Bottom Seal)



ZZ (End seal + Bottom Seal + Scraper)



KK (Double seals + Bottom Seal + Scraper)



DD (Double seals + Bottom Seal)

2-9-2 End seal and bottom seal

To prevent the life reduction due to the groove surface damaged by iron chips or dust entering the block.

2-9-3 Double seals

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

Table 2.10 Order Number of End Seal

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

2-9-4 Scraper

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

Table 2.11 Order Number of Scraper

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

2-9-5 Caps for rail mounting holes

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

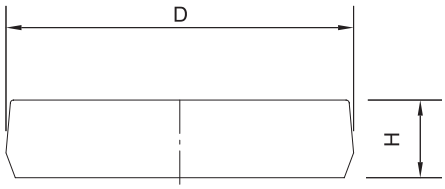


Table 2.12 Caps for Rail Mounting Holes

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

2-10 Friction

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

Table 2.13 Seal Resistance

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

2-11 The Accuracy Tolerance of Mounting Surface

(1) The accuracy tolerance of rail-mounting surface

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

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

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

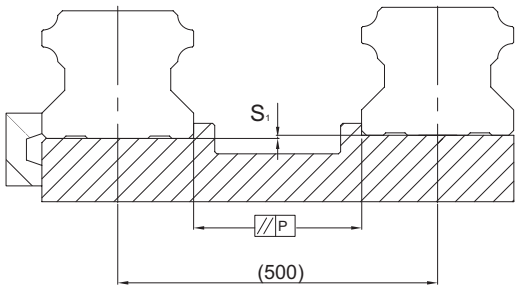


Table 2.14 Max. Parallelism Tolerance (P)

unit: μm

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

(3) The accuracy tolerance of reference surface height

Table 2.15 Max. Tolerance of Reference Surface Height (S_1)

unit: μm

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

2-12 Cautions for Installation

2-12-1 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.

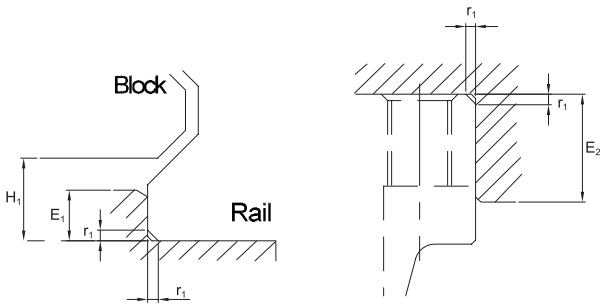


Table 2.16 Shoulder Heights and Fillets

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

2-12-2 Tightening Torque of Bolts for Installation

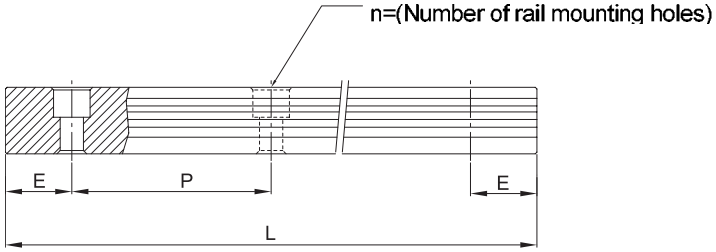
The improper tightening of bolts will influence the accuracy of Linear Guideway seriously, so that the following tightening torque for different sizes of bolt is recommended.

Table 2.17 Mounting Torque

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

2-13 Standard Length and Max. Length of Rail

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



$$L = (n - 1) \times P + 2 \times E \quad \text{Eq. 2.1}$$

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 2.18 Rail Standard Length and Max. Length

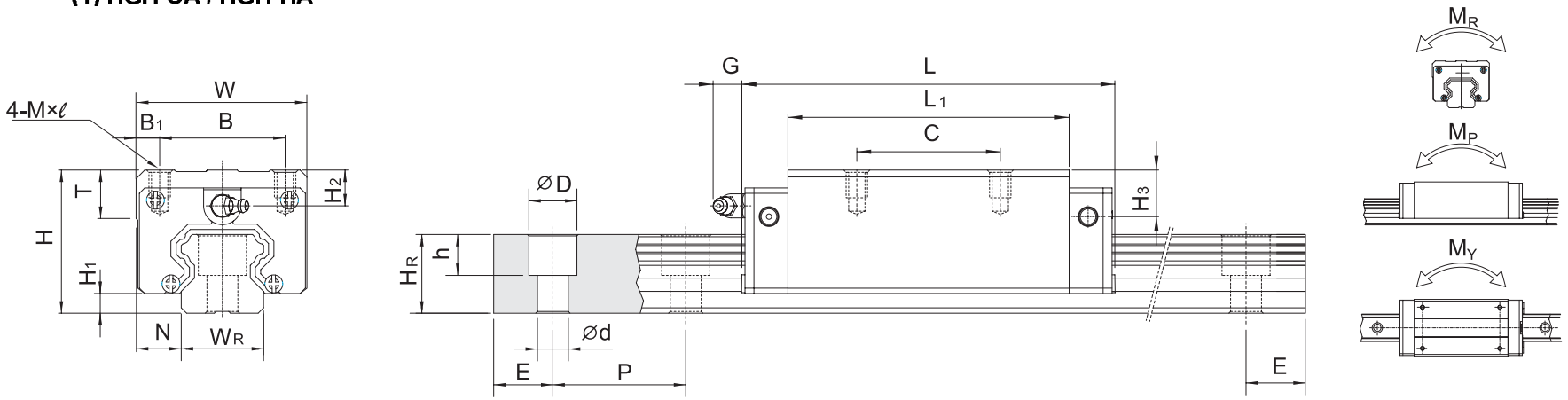
Unit : mm

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

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

2-14 Dimesions for HG Series

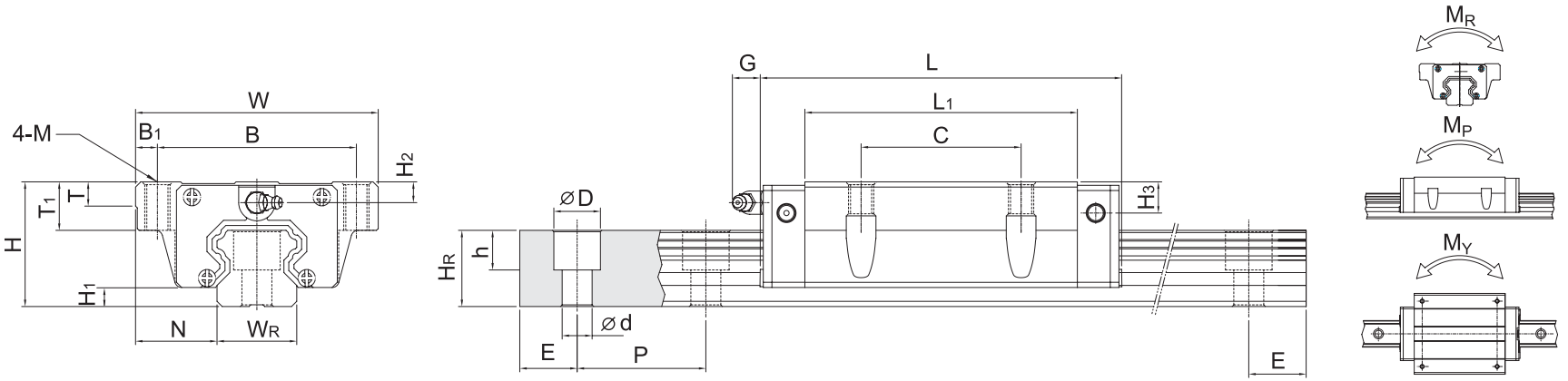
(1) HGH-CA / HGH-HA



Model No.	Dimensions of Assembly (mm)			Dimensions of Block (mm)											Dimensions of Rail (mm)							Mounting Bolt for Rail (mm)	Basic Dynamic Load Rating C (kN)	Basic Static Load Rating C_0 (kN)	Static Rated Moment			Weight	
	H	H_1	N	W	B	B_1	C	L_1	L	G	M x ℓ	T	H_2	H_3	W_R	H_R	D	h	d	P	E				M_R (kN-m)	M_P (kN-m)	M_Y (kN-m)	Block (kg)	Rail (kg/m)
HGH 15CA	28	4.3	9.5	34	26	4	26	39.4	61.4	5.3	M4x5	6	8.5	9.5	15	15	7.5	5.3	4.5	60	20	M4x16	11.38	25.31	0.17	0.15	0.15	0.18	1.45
HGH 20CA	30	4.6	12	44	32	6	36	50.5	75.6	12	M5x6	8	6	7	20	17.5	9.5	8.5	6	60	20	M5x16	17.75	37.84	0.38	0.27	0.27	0.38	2.21
HGH 20HA							50	65.2	90.3														21.18	48.84	0.48	0.47	0.47	0.39	
HGH 25CA	40	5.5	12.5	48	35	6.5	35	58	83	12	M6x8	8	10	13	23	22	11	9	7	60	20	M6x20	26.48	56.19	0.64	0.51	0.51	0.67	3.21
HGH 25HA							50	78.6	103.6														32.75	76.00	0.87	0.88	0.88	0.69	
HGH 30CA	45	6	16	60	40	10	40	70	97.4	12	M8x10	8.5	9.5	13.8	28	26	14	12	9	80	20	M8x25	38.74	83.06	1.06	0.85	0.85	1.14	4.47
HGH 30HA							60	93	120.4														47.27	110.13	1.40	1.47	1.47	1.16	
HGH 35CA	55	7.5	18	70	50	10	50	80	112.4	12	M8x12	10.2	16	19.6	34	29	14	12	9	80	20	M8x25	49.52	102.87	1.73	1.20	1.20	1.88	6.3
HGH 35HA							72	105.8	138.2														60.21	136.31	2.29	2.08	2.08	1.92	
HGH 45CA	70	9.5	20.5	86	60	13	60	97	138	12.9	M10x17	16	18.5	30.5	45	38	20	17	14	105	22.5	M12x35	77.57	155.93	3.01	2.35	2.35	3.54	10.41
HGH 45HA							80	128.8	169.8														94.54	207.12	4.00	4.07	4.07	3.61	
HGH 55CA	80	13	23.5	100	75	12.5	75	117.7	165.7	12.9	M12x18	17.5	22	29	53	44	23	20	16	120	30	M14x45	114.44	227.81	5.66	4.06	4.06	5.38	15.08
HGH 55HA							95	155.8	203.8														139.35	301.26	7.49	7.01	7.01	5.49	
HGH 65CA	90	15	31.5	126	76	25	70	144.2	198.2	12.9	M16x20	25	15	15	63	53	26	22	18	150	35	M16x50	163.63	324.71	10.02	6.44	6.44	7.00	21.18
HGH 65HA							120	203.6	257.6														208.36	457.15	14.15	11.12	11.12	9.82	

Note : 1 kgf = 9.81 N

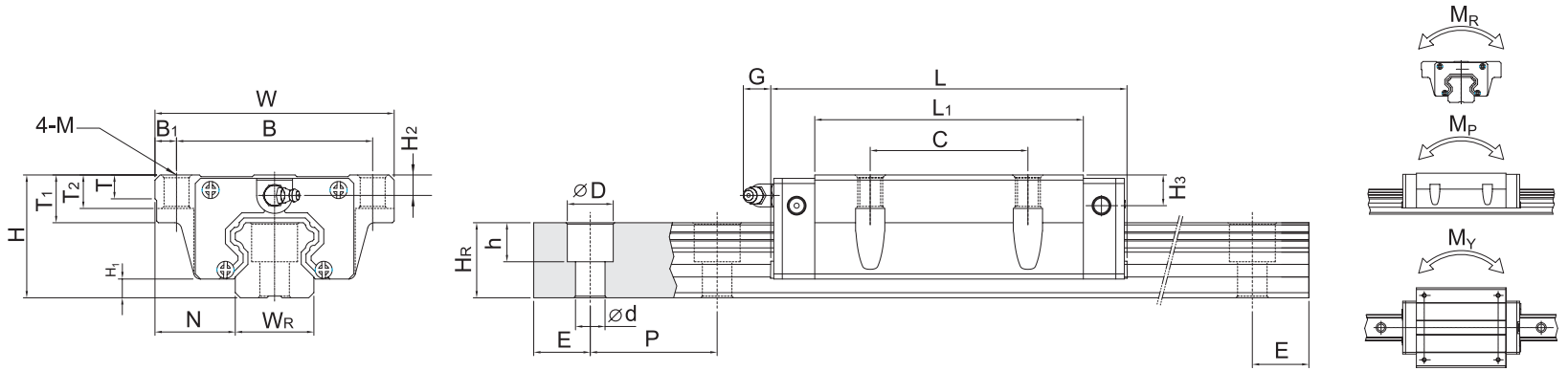
(2) HGW-CA / HGW-HA



Model No.	Dimensions of Assembly (mm)			Dimensions of Block (mm)												Dimensions of Rail (mm)							Mounting Bolt for Rail (mm)	Basic Dynamic Load Rating C (kN)	Basic Static Load Rating C_0 (kN)	Static Rated Moment			Weight	
	H	H_1	N	W	B	B_1	C	L_1	L	G	M	T	T_1	H_2	H_3	W_R	H_R	D	h	d	P	E				M_R (kN-m)	M_P (kN-m)	M_Y (kN-m)	Block (kg)	Rail (kg/m)
HGW 15CA	24	4.3	16	47	38	4.5	30	39.4	61.4	5.3	M5	6	8.9	4.5	5.5	15	15	7.5	5.3	4.5	60	20	M4x16	11.38	25.31	0.17	0.15	0.15	0.17	1.45
HGW 20CA	30	4.6	21.5	63	53	5	40	50.5	75.6	12	M6	8	10	6	7	20	17.5	9.5	8.5	6	60	20	M5x16	17.75	37.84	0.38	0.27	0.27	0.51	2.21
HGW 20HA								65.2	90.3															21.18	48.84	0.48	0.47	0.47	0.52	
HGW 25CA	36	5.5	23.5	70	57	6.5	45	58	83	12	M8	8	14	6	9	23	22	11	9	7	60	20	M6x20	26.48	56.19	0.64	0.51	0.51	0.78	3.21
HGW 25HA								78.6	103.6															32.75	76.00	0.87	0.88	0.88	0.80	
HGW 30CA	42	6	31	90	72	9	52	70	97.4	12	M10	8.5	16	6.5	10.8	28	26	14	12	9	80	20	M8x25	38.74	83.06	1.06	0.85	0.85	1.42	4.47
HGW 30HA								93	120.4															47.27	110.13	1.40	1.47	1.47	1.44	
HGW 35CA	48	7.5	33	100	80	9	62	80	112.4	12	M10	10.1	18	9	12.6	34	29	14	12	9	80	20	M8x25	49.52	102.87	1.73	1.20	1.20	2.03	6.3
HGW 35HA								105.8	138.2															60.21	136.31	2.29	2.08	2.08	2.06	
HGW 45CA	60	9.5	37.5	120	100	10	80	97	138	12.9	M12	15.1	22	8.5	20.5	45	38	20	17	14	105	22.5	M12x35	77.57	155.93	3.01	2.35	2.35	3.54	10.41
HGW 45HA								128.8	169.8															94.54	207.12	4.00	4.07	4.07	3.69	
HGW 55CA	70	13	43.5	140	116	12	95	117.7	165.7	12.9	M14	17.5	26.5	12	19	53	44	23	20	16	120	30	M14x45	114.44	227.81	5.66	4.06	4.06	5.38	15.08
HGW 55HA								155.8	203.8															139.35	301.26	7.49	7.01	7.01	5.96	
HGW 65CA	90	15	53.5	170	142	14	110	144.2	198.2	12.9	M16	25	37.5	15	15	63	53	26	22	18	150	35	M16x50	163.63	324.71	10.02	6.44	6.44	9.17	21.18
HGW 65HA								203.6	257.6															208.36	457.15	14.15	11.12	11.12	12.89	

Note : 1 kgf = 9.81 N

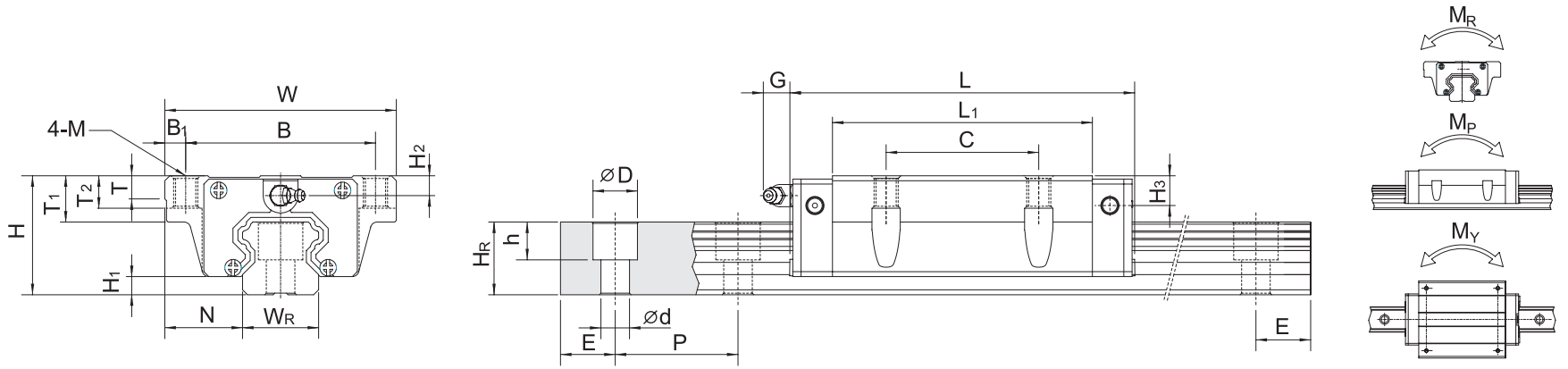
(3) HGW-CB / HGW-HB



Model No.	Dimensions of Assembly (mm)			Dimensions of Block (mm)													Dimensions of Rail (mm)							Mounting Bolt for Rail (mm)	Basic Dynamic Load Rating C (kN)	Basic Static Load Rating C_0 (kN)	Static Rated Moment			Weight	
	H	H_1	N	W	B	B_1	C	L_1	L	G	M	T	T_1	T_2	H_2	H_3	W_R	H_R	D	h	d	P	E				M_R (kN-m)	M_P (kN-m)	M_Y (kN-m)	Block (kg)	Rail (kg/m)
HGW 15CB	24	4.3	16	47	38	4.5	30	39.4	61.4	5.3	ø4.5	6	8.9	6.95	4.5	5.5	15	15	7.5	5.3	4.5	60	20	M4x16	11.38	25.31	0.17	0.15	0.15	0.17	1.45
HGW 20CB	30	4.6	21.5	63	53	5	40	50.5	75.6	12	ø6	8	10	9.5	6	7	20	17.5	9.5	8.5	6	60	20	M5x16	17.75	37.84	0.38	0.27	0.27	0.51	2.21
HGW 20HB								65.2	90.3																21.18	48.84	0.48	0.47	0.47	0.52	
HGW 25CB	36	5.5	23.5	70	57	6.5	45	58	83	12	ø7	8	14	10	6	9	23	22	11	9	7	60	20	M6x20	26.48	56.19	0.64	0.51	0.51	0.78	3.21
HGW 25HB								78.6	103.6																32.75	76.00	0.87	0.88	0.88	0.80	
HGW 30CB	42	6	31	90	72	9	52	70	97.4	12	ø9	8.5	16	10	6.5	10.8	28	26	14	12	9	80	20	M8x25	38.74	83.06	1.06	0.85	0.85	1.42	4.47
HGW 30HB								93	120.4																47.27	110.13	1.40	1.47	1.47	1.44	
HGW 35CB	48	7.5	33	100	82	9	62	82	112.4	12	ø9	10.1	18	13	9	12.6	34	29	14	12	9	80	20	M8x25	49.52	102.87	1.73	1.20	1.20	2.03	6.3
HGW 35HB								105.8	138.2																60.21	136.31	2.29	2.08	2.08	2.06	
HGW 45CB	60	9.5	37.5	120	100	10	80	97	138	12.9	ø11	15.1	22	15	8.5	20.5	45	38	20	17	14	105	22.5	M12x35	77.57	155.93	3.01	2.35	2.35	3.54	10.41
HGW 45HB								128.8	169.8																94.54	207.12	4.00	4.07	4.07	3.69	
HGW 55CB	70	13	43.5	140	116	12	95	117.7	165.7	12.9	ø14	17.5	26.5	17	12	19	53	44	23	20	16	120	30	M14x45	114.44	227.81	5.66	4.06	4.06	5.38	15.08
HGW 55HB								155.8	203.8																139.35	301.26	7.49	7.01	7.01	5.96	
HGW 65CB	90	15	53.5	170	142	14	110	142.6	196.6	12.9	ø16	25	37.5	23	15	15	63	53	26	22	18	150	35	M16x50	162.36	319.71	9.91	6.44	6.44	9.07	21.18
HGW 65HB								203.6	257.6																208.36	457.15	14.15	11.12	11.12	12.89	

Note : 1 kgf = 9.81 N

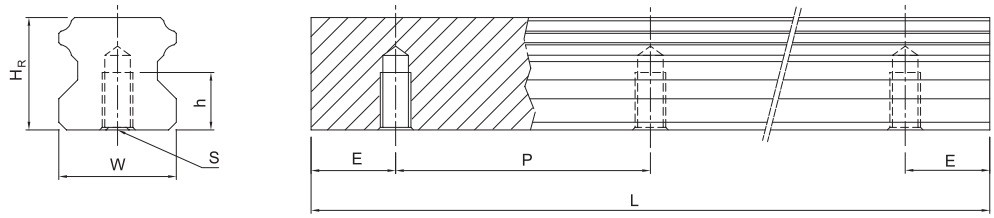
(4) HGW-CC / HGW-HC



Model No.	Dimensions of Assembly (mm)			Dimensions of Block (mm)													Dimensions of Rail (mm)							Mounting Bolt for Rail (mm)	Basic Dynamic Load Rating C (kN)	Basic Static Load Rating C_0 (kN)	Static Rated Moment			Weight	
	H	H_1	N	W	B	B_1	C	L_1	L	G	M	T	T_1	T_2	H_2	H_3	W_R	H_R	D	h	d	P	E				M_R (kN-m)	M_P (kN-m)	M_Y (kN-m)	Block (kg)	Rail (kg/m)
HGW 15CC	24	4.3	16	47	38	4.5	30	39.4	61.4	5.3	M5	6	8.9	6.95	4.5	5.5	15	15	7.5	5.3	4.5	60	20	M4x16	11.38	25.31	0.17	0.15	0.15	0.17	1.45
HGW 20CC	30	4.6	21.5	63	53	5	40	50.5	75.6	12	M6	8	10	9.5	6	7	20	17.5	9.5	8.5	6	60	20	M5x16	17.75	37.84	0.38	0.27	0.27	0.51	2.21
HGW 20HC								65.2	90.3																21.18	48.84	0.48	0.47	0.47	0.52	
HGW 25CC	36	5.5	23.5	70	57	6.5	45	58	83	12	M8	8	14	10	6	9	23	22	11	9	7	60	20	M6x20	26.48	56.19	0.64	0.51	0.51	0.78	3.21
HGW 25HC								78.6	103.6																32.75	76.00	0.87	0.88	0.88	0.80	
HGW 30CC	42	6	31	90	72	9	52	70	97.4	12	M10	8.5	16	10	6.5	10.8	28	26	14	12	9	80	20	M8x25	38.74	83.06	1.06	0.85	0.85	1.42	4.47
HGW 30HC								93	120.4																47.27	110.13	1.40	1.47	1.47	1.44	
HGW 35CC	48	7.5	33	100	82	9	62	80	112.4	12	M10	10.1	18	13	9	12.6	34	29	14	12	9	80	20	M8x25	49.52	102.87	1.73	1.20	1.20	2.03	6.3
HGW 35HC								105.8	138.2																60.21	136.31	2.29	2.08	2.08	2.06	
HGW 45CC	60	9.5	37.5	120	100	10	80	97	138	12.9	M12	15.1	22	15	8.5	20.5	45	38	20	17	14	105	22.5	M12x35	77.57	155.93	3.01	2.35	2.35	3.54	10.41
HGW 45HC								128.8	169.8																94.54	207.12	4.00	4.07	4.07	3.69	
HGW 55CC	70	13	43.5	140	116	12	95	117.7	165.7	12.9	M14	17.5	26.5	17	12	19	53	44	23	20	16	120	30	M14x45	114.44	227.81	5.66	4.06	4.06	5.38	15.08
HGW 55HC								155.8	203.8																139.35	301.26	7.49	7.01	7.01	5.96	
HGW 65CC	90	15	53.5	170	142	14	110	144.2	198.2	12.9	M16	25	37.5	23	15	15	63	53	26	22	18	150	35	M16x50	163.63	324.71	10.02	6.44	6.44	9.17	21.18
HGW 65HC								203.6	257.6																208.36	457.15	14.15	11.12	11.12	12.89	

Note : 1 kgf = 9.81 N

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



Model No.	Dimensions of Rail (mm)						Weight (kg/m)
	W_R	H_R	S	h	P	E	
HGR15T	15	15	M5 x 0.8P	8	60	20	1.48
HGR20T	20	17.5	M6 x 1P	10	60	20	2.29
HGR25T	23	22	M6 x 1P	12	60	20	3.35
HGR30T	28	26	M8 x 1.25P	15	80	20	4.67
HGR35T	34	29	M8x1.25P	17	80	20	6.51
HGR45T	45	38	M12 x 1.75P	24	105	22.5	10.87
HGR55T	53	44	M14 x 2P	24	120	30	15.67
HGR65T	63	53	M20 x 2.5P	30	150	35	21.73