

**HIWIN®**



## Linear Guideways

Linear Guideways  
Accessories



## Linear guideways

### Linear guideways & accessories

A linear guideway makes it possible to move in a linear motion with rolling elements. The use of balls and rollers between the rail and block in a linear guideway makes precise linear movements possible. Compared with a standard sliding guide, the friction coefficient here is just one fiftieth. The high efficiency and zero backlash mean that the linear guideway can be used in various ways.



### Assembly instructions and catalogue for download

Here you can download the corresponding assembly instructions and the current catalogue as PDF files.

# Linear guideways

Contents

---

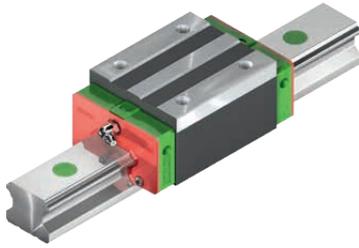
## Contents

<b>1</b>	<b>Product overview</b> .....	<b>6</b>
<b>2</b>	<b>General information</b> .....	<b>8</b>
2.1	Properties and advantages	8
2.2	Selection principles	9
2.3	Load ratings	10
2.4	Service life calculation	11
2.5	Operating load	13
2.6	Friction and lubrication	15
2.7	Installation position	16
2.8	Assembly	17
2.9	Sealing systems	22
2.10	SynchMotion™ technology	24
2.11	Heat-resistant linear guideways	25
2.12	HIWIN coating for linear guideways	26
<b>3</b>	<b>Linear guideways: Series</b> .....	<b>30</b>
3.1	HG/QH series	30
3.2	CG series	48
3.3	EG/QE series	66
3.4	WE/QW series	80
3.5	MG series	92
3.6	RG/QR series	106
3.7	CRG series	124
3.8	PG series	140
<b>4</b>	<b>Accessories</b> .....	<b>148</b>
4.1	Lubrication adapter	148
4.2	HIWIN grease guns and lubricants	149

# Linear guideways

## Product overview

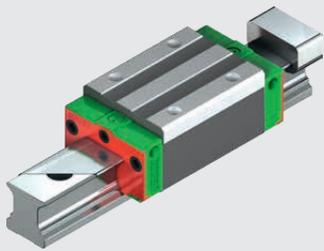
### 1. Product overview



Linear guideway of HG and QH series

Page 30

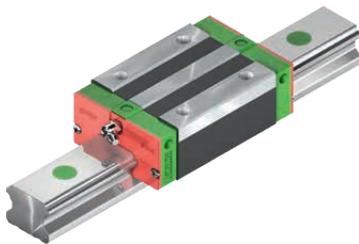
- Standard series in X arrangement
- Block with SynchMotion™ technology (QH series)



Linear guideway CG series

Page 48

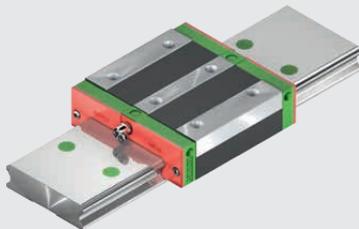
- Standard series in O arrangement
- Optional: Rail with cover strip



Linear guideway of EG and QE series

Page 66

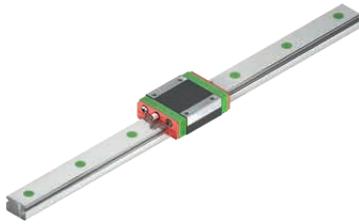
- Flat type
- Especially for applications with limited installation space
- Block with SynchMotion™ technology (QE series)



Linear guideway of WE and QW series

Page 80

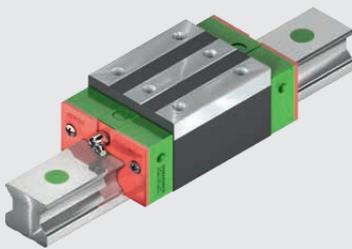
- Wide type
- For maximum torque loads
- Block with SynchMotion™ technology (QW series)



## Linear guideway MG series

Page 92

- Thin and wide design
- Miniature type for the most compact applications
- Dual-row linear guideways



## Linear guideway of RG and QR series

Page 106

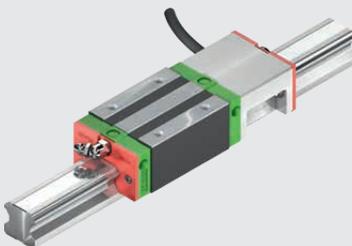
- Roller guides for heavy-duty applications
- With maximum requirements on load ratings and torque capacity
- Block with SynchMotion™ technology (QR series)



## Linear guideway CRG series

Page 124

- Roller guides for heavy-duty applications
- With maximum requirements on load ratings and torque capacity
- Rail with cover strip



## Linear guideway PG series

Page 140

- HG, QH, CG series with integrated positioning measuring system
- Contactless positioning measurement
- Signal output in real time

## Accessories

Page 148

- Lubricating nipple
- Lubrication adapter
- Push-in fittings

# Linear guideways

## General information

---

### 2. General information

#### 2.1 Properties and advantages

##### 1. High positioning accuracy

A carriage supported by a linear guideway only has to overcome rolling friction. The difference between static and dynamic rolling friction is very small, which means that the breakaway force is only slightly higher than the moving force. No stick-slip effects occur.

##### 2. Long service life with particularly precise movement

With a sliding guide, errors in accuracy can occur due to different lubricant film thicknesses. Due to the sliding friction and frequent lack of lubrication, high wear and thus decreasing accuracy occurs. In contrast, the linear guideway has the advantage of very low rolling friction, combined with extremely low wear. The guideway accuracy remains almost constant over the entire service life.

##### 3. High velocity with low drive force

Due to the low friction coefficient, only low drive forces are required. The required drive power remains low even with reversing movements.

##### 4. Equal load capacity in all directions

Due to the design-related forced guidance, a linear guideway can absorb forces in vertical and horizontal directions.

##### 5. Simple installation and interchangeability

Installing a linear guideway is simple. With a milled or ground mounting surface, high accuracy is achieved when assembly instructions are followed. Conventional sliding guides require considerably more assembly work due to scraping of the sliding surfaces. Replacing individual components is not possible without scraping. However, linear guideways can be replaced without further effort.

##### 6. Simple lubrication

With sliding guides, insufficient lubrication leads to destruction of the sliding surfaces. The lubricant must be supplied to the sliding surfaces at many points. The linear guideway requires only minimum lubrication, which is produced by a simple supply line to the block. As a variant, HIWIN also supplies blocks with an integrated and replaceable long-term lubrication unit, which ensures long-term lubrication.

##### 7. Corrosion protection

Blocks and profile rails can be supplied with various coatings to achieve optimum corrosion protection. The individual processes are selected depending on the application. For optimal selection of the coating, data on the environmental conditions and the corrosive substances is needed. The MG miniature linear guideway is manufactured in stainless steel.

## 2.2 Selection principles

### Determine the selection conditions

- Machine base
- Maximum installation space
- Desired accuracy
- Required rigidity
- Load type
- Travel path
- Travel speed, acceleration
- Frequency of use
- Service life
- Environmental conditions



### Select the series

- HG and CG series – grinding, milling, drilling machines, lathes, machining centres, woodworking
- EG series – automation technology, high-speed transport, semiconductor assembly, precision measuring equipment
- WE series – single axes with high torque loads  $M_x$
- MG series – miniature technology, semiconductor assembly, medical technology
- RG series – machining centres, injection moulding machines, machines and systems with high rigidity



### Select the accuracy class

- Classes: C, H, P, SP, UP, depending on the required accuracy



### Determine the size and number of blocks

- Depending on empirical values
- Depending on type of load
- If a ballscrew is used, the nominal size of the linear guideways and the ballscrew should be similar, e.g. 32 mm ballscrew and 35 mm profile rail.



### Calculate the maximum block load

- Calculate the maximum block load using the example calculations (see section 2.5). Make sure that the static support stability factor of the selected linear guideway is higher than the corresponding value in the static support stability factor table.



### Determine the preload

- The preload depends on the stiffness requirements and the accuracy of the mounting surface.



### Determine the rigidity

- Calculate the deformation ( $\delta$ ) using the stiffness table in the respective chapter; the stiffness increases with higher preload and with larger guideway dimensions.



### Calculation of service life

- Determine the required service life taking into account the travel speed and frequency; use the example calculations as a guide (see section 2.4).



### Select the type of lubrication

- Grease lubrication via lubricating nipple
- Oil lubrication via connection line



### Selection finished



# Linear guideways

## General information

### 2.3 Load ratings

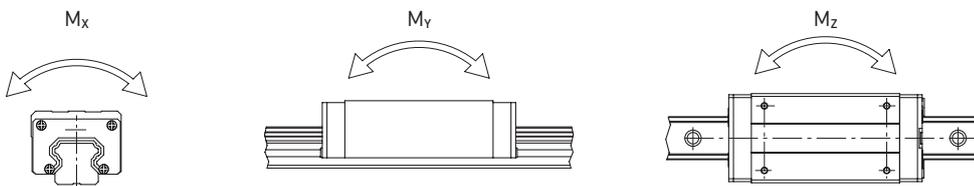
#### 2.3.1 Static load rating $C_0$

If a linear guideway system is subjected to excessive loads or impacts during movement or at a standstill, localised permanent deformation occurs between the track and balls. As soon as this permanent deformation exceeds a certain level, it affects smooth operation of the guideway. According to its basic definition, the static load rating corresponds to a static load that causes permanent deformation of  $0.0001 \times$  ball diameter at the contact point that is loaded the most. The values are given in the

tables for each linear guideway system. Using these tables, the designer can select a suitable linear guideway system. The maximum static load to which a linear guideway system is subjected must not exceed the static load rating.

#### 2.3.2 Permissible static moment $M_0$

The permissible static moment is the moment which, in a defined direction and size, corresponds to the maximum possible load on the moving parts by the basic static load rating. The permissible static moment is defined for linear motion systems for three directions:  $M_x$ ,  $M_y$  and  $M_z$ .



#### 2.3.3 Static support stability

For profile rail systems at rest and slow motion, the static support stability must be taken into account, which depends on the environmental and operating conditions. Increased support stability is particularly important for guideways that are subjected to impact loads, see Table 2.1. The static support stability can be calculated according to F 2.1.

#### F 2.1

$$f_{SL} = \frac{C_0}{P} ; f_{SM} = \frac{M_0}{M}$$

- $f_{SL}$  Static support stability
- $f_{SM}$  Static support stability for torque load
- $C_0$  Static load rating [N]
- $M_0$  Permissible static moment [Nm]
- $P$  Static equivalent load [N]
- $M$  Static equivalent moment [Nm]

**Note:** The linear guideway's load-bearing capacity is often restricted – not by its load-bearing strength, but by the screw connection. We therefore recommend checking the screw connection's maximum permissible load-bearing capacity in accordance with VDI 2230.

Table 2.1 Static support stability	
Load	$f_{SL}; f_{SM}$ [min.]
Normal load	1.25 – 3.00
With jolting and vibration	3.00 – 5.00

#### 2.3.4 Dynamic load rating $C_{dyn}$

The dynamic load rating is the load, defined in terms of direction and size, at which a linear guideway achieves a nominal service life of a 50 km<sup>1)</sup> (HG, QH, EG, QE, CG, WE, QW, MG) or 100 km<sup>1)</sup> (RG, QR) travel path. The dynamic load rating is specified for each guideway in the dimension tables. It can be used to calculate the service life of a particular guideway.

<sup>1)</sup> The dynamic load rating of linear guideways is specified for a service life of a 50 or 100 km travel path, depending on the manufacturer. The following factors can be used to convert the basic dynamic load rating:  $C_{dyn} 50 \text{ km} = 1.26 \times C_{dyn} 100 \text{ km}$  (HG, QH, EG, QE, CG, WE, QW, MG series)  
 $C_{dyn} 50 \text{ km} = 1.23 \times C_{dyn} 100 \text{ km}$  (RG, QR series)

## 2.4 Service life calculation

### 2.4.1 Definition of service life

The constant and repeated loading of tracks and balls of a linear guideway causes fatigue on the track surface. In the end, so-called pitting formation occurs.

The service life of a linear guideway is defined as the total travel distance covered until pitting occurs on the surface of the track or balls.

### 2.4.2 Nominal service life (L)

The service life can be very different even if linear guideways are manufactured in the same way and used under the same movement conditions. Therefore, the nominal service life is taken as a reference value for estimating the service life of a linear guideway.

The nominal service life corresponds to the total travel path achieved without failure by 90% of a group of identical linear guideways used under the same conditions.

#### 2.4.2.1 Calculation of the nominal service life

The actual load influences the nominal service life of a linear guideway. Using the selected dynamic load rating and the equivalent dynamic load, the nominal service life can be calculated using the formulas F 2.2 and F 2.3.

#### Formulas for calculation of the nominal service life

HG, QH, EG, QE, CG, WE, QW, MG series:

##### F 2.2

$$L = \left( \frac{C_{dyn}}{P} \right)^3 \times 50 \text{ km}$$

L Nominal service life [km]  
 $C_{dyn}$  Dynamic load rating [N]  
 P Dynamic equivalent load [N]

RG, QR series:

##### F 2.3

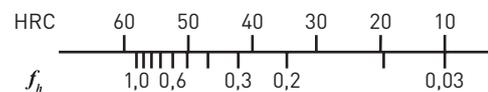
$$L = \left( \frac{C_{dyn}}{P} \right)^{10/3} \times 100 \text{ km}$$

#### 2.4.2.2 Factors of nominal service life

The type of load, the hardness of the track and the temperature of the guideway have a considerable influence on the nominal service life. The relationship between these factors are shown by formulas F 2.4 and F 2.5.

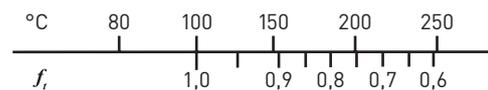
#### Hardness factor ( $f_h$ )

The tracks of the linear guideways have a hardness of 58 HRC. A hardness factor of 1.0 therefore applies. If the hardness differs, the hardness factor according to the adjacent figure must be taken into account. If the specified hardness is not achieved, the permissible load is reduced. In this case, the dynamic load rating and the static load rating must be multiplied by the hardness factor.



#### Temperature factor ( $f_t$ )

The application range of the standard profile rails is between -10 and 80 °C ambient temperature. For ambient temperatures up to 150 °C, the use of linear guideways with steel deflection system is required (marked with the suffix "SE" in the order code). Short-term ambient temperatures of up to 180 °C are possible. However, we recommend consulting our technical support for this. If the temperature of a linear guideway exceeds 100 °C, the permissible load and the service life are reduced. That is why the dynamic load rating and the static load rating must be multiplied by the temperature factor.



# Linear guideways

## General information

### Load factor ( $f_w$ )

To take into account external influences on the service life of the profile rails which are not directly included in the calculation (e.g. vibrations, jolting and high speed), the dynamic equivalent load is multiplied by the load factor according to Table 2.2. For short-stroke applications (stroke < 2 × block lengths), the calculated load factor must be doubled.

Type of load	Travel speed	$f_w$
No jolting and vibration	At 15 m/min	1.0 – 1.2
Normal load	15 m/min – 60 m/min	1.2 – 1.5
Minor jolting	60 m/min – 120 m/min	1.5 – 2.0
With jolting and vibration	Greater than 120 m/min	2.0 – 3.5

### Formulas for calculation of the nominal service life (considering all factors)

HG, QH, EG, QE, CG, WE, QW, MG series:

$$F 2.4 \quad L = \left( \frac{f_h \times f_t \times C_{dyn}}{f_w \times P} \right)^3 \times 50 \text{ km}$$

L Nominal service life [km]  
 $f_h$  Hardness factor  
 $C_{dyn}$  Dynamic load rating [N]  
 $f_t$  Temperature factor  
 P Dynamic equivalent load [N]  
 $f_w$  Load factor

RG, QR series:

$$F 2.5 \quad L = \left( \frac{f_h \times f_t \times C_{dyn}}{f_w \times P} \right)^{10/3} \times 100 \text{ km}$$

### 2.4.3 Service life ( $L_h$ )

The service life in hours is calculated from the nominal service life with the aid of the travel speed and movement frequency.

### Formulas for calculation of the service life ( $L_h$ )

HG, QH, EG, QE, CG, WE, QW, MG series:

$$F 2.6 \quad L_h = \frac{L}{v \times 60} = \frac{\left( \frac{C_{dyn}}{P} \right)^3 \times 50.000}{v \times 60}$$

$L_h$  Service life [h]  
 L Nominal service life [m]  
 v Velocity [m/min]  
 $C_{dyn}/P$  Load rating/Load ratio

RG, QR series:

$$F 2.7 \quad L_h = \frac{L}{v \times 60} = \frac{\left( \frac{C_{dyn}}{P} \right)^{10/3} \times 100.000}{v \times 60}$$

## 2.5 Operating load

### 2.5.1 Calculation of load

When calculating the loads acting on a linear guideway, various factors must be taken into account, e.g. the centre of gravity of the load, the approach of the movement force and the mass inertia at the beginning and end of the movement. To obtain a correct value, each parameter must be taken into account.

#### Load on a block

Table 2.3 Examples of the calculation of the load on a block		
Typical examples	Load distribution	Load on a block
		$P_1 = \frac{W}{4} + \frac{F}{4} + \frac{F \times a}{2c} + \frac{F \times b}{2d}$ $P_2 = \frac{W}{4} + \frac{F}{4} + \frac{F \times a}{2c} - \frac{F \times b}{2d}$ $P_3 = \frac{W}{4} + \frac{F}{4} - \frac{F \times a}{2c} + \frac{F \times b}{2d}$ $P_4 = \frac{W}{4} + \frac{F}{4} - \frac{F \times a}{2c} - \frac{F \times b}{2d}$
		$P_1 = P_3 = \frac{F \times l}{2d}$ $P_2 = P_4 = \frac{W}{4} + \frac{F \times l}{2d}$
		$P_1 = P_2 = P_3 = P_4 = -\frac{W \times h}{2d} + \frac{F \times l}{2d}$
		$P_1 = P_2 = -\frac{W \times h}{2c} - \frac{F \times l}{2c}$ $P_3 = P_4 = \frac{W \times h}{2c} + \frac{F \times l}{2c}$ $P_{11} = P_{13} = \frac{W}{4} + \frac{F}{4} + \frac{F \times k}{2d}$ $P_{12} = P_{14} = \frac{W}{4} + \frac{F}{4} - \frac{F \times k}{2d}$

$P_1 \dots P_4$  Load on a single block

W Weight of load

F Movement force; additionally occurring force

l Lever arm F

c Rail distance

d Block distance

a, b, k Distance to centre of gravity

h Lever arm centre of gravity W

# Linear guideways

## General information

### Load and mass inertia

Table 2.4 Examples of the calculation of load and mass inertia	
<p><b>Consideration of acceleration and braking</b></p>	<p><b>Load on a block</b></p> <ul style="list-style-type: none"> <li>○ Constant velocity           <math display="block">P_1 \dots P_4 = \frac{W}{4}</math> </li> <li>○ Acceleration           <math display="block">P_1 = P_3 = \frac{W}{4} + \frac{1}{2} \times \frac{W}{g} \times \frac{v_c}{t_1} \times \frac{l}{d}</math> <math display="block">P_2 = P_4 = \frac{W}{4} - \frac{1}{2} \times \frac{W}{g} \times \frac{v_c}{t_1} \times \frac{l}{d}</math> </li> <li>○ Braking           <math display="block">P_1 = P_3 = \frac{W}{4} - \frac{1}{2} \times \frac{W}{g} \times \frac{v_c}{t_3} \times \frac{l}{d}</math> <math display="block">P_2 = P_4 = \frac{W}{4} + \frac{1}{2} \times \frac{W}{g} \times \frac{v_c}{t_3} \times \frac{l}{d}</math> </li> </ul>

$P_1 \dots P_4$  Load on a single block [N]

W Weight of load [N]

F Movement force

$F_A$  Reaction force

g Gravitational acceleration [ $m/s^2$ ]

$v_c$  Velocity [m/s]

$t_1$  Acceleration time [s]

$t_2$  Constant travel time [s]

$t_3$  Braking time [s]

c Rail distance [m]

d Block distance [m]

l Distance to underside of rail – travel block centre of gravity [m]

### 2.5.2 Calculation of the equivalent load for variable loads

If the load on a linear guideway varies greatly, an equivalent load must be included in the calculation of the service life. The equivalent load is defined as the load that causes the same wear on the bearings as the variable loads. It can be calculated according to Table 2.5.

Table 2.5 Examples of the calculation of the equivalent load ( $P_m$ )		
<p><b>Step-wise change</b></p>	<p><b>Uniform change</b></p>	<p><b>Sinusoidal change</b></p>
$P_m = \sqrt[3]{\frac{1}{L} (P_1^3 \times L_1 + P_2^3 \times L_2 + \dots + P_n^3 \times L_n)}$	$P_m = \frac{1}{3} (P_{min} + 2 \times P_{max})$	$P_m = 0,65 \times P_{max}$

$P_m$  Equivalent load

$P_n$  Variable load

$P_{min}$  Smallest load

$P_{max}$  Largest load

L Total travel path

$L_n$  Travel path with load  $P_n$

## 2.6 Friction and lubrication

### 2.6.1 Frictional resistance

The use of rolling elements in the linear guideway essentially reduces the friction to the rolling friction of the rolling elements. The friction coefficient of linear guideways is thus very small, up to one fiftieth of the value of traditional sliding guides. In general, the friction coefficient is about 0.004, depending on the series. If the load is only 10% or less of the basic dynamic load rating, most of the frictional resistance is

**F 2.8**  $F = \mu \times W + S$

generated by the wipers and by the grease and friction between the rolling elements. If the operating load becomes greater than 10% of the dynamic load rating, the load provides most of the frictional resistance.

F	Frictional force [N]
S	Frictional resistance [N]
$\mu$	Friction coefficient
W	Load [N]

### 2.6.2 Lubrication

The linear guideways, like all rolling bearings, require adequate lubrication. Both grease and oil may be used in general. The lubricant is a constructional element and should be taken into consideration when designing a machine. The lubricants reduce wear, protect against dirt, reduce corrosion and lengthen service life. Dirt can settle and solidify on unprotected profile rails. This dirt must be removed on a regular basis.

For wall mounting, we generally recommend grease or low-viscosity lubricant; for oil lubrication, we generally ask that you consult us, as insufficient lubrication may occur depending on the installation position.

HIWIN offers greases for different requirements:

- HIWIN G01: Heavy-duty applications
- HIWIN G02: Clean room and vacuum applications
- HIWIN G03: Clean room and vacuum applications with high velocities
- HIWIN G04: Applications with high speeds
- HIWIN G05: Standard applications
- HIWIN G06: Short stroke and high frequency applications
- HIWIN G07: Applications at low temperatures

Information on HIWIN lubricants can be found in the Accessories chapter on Page 149. Detailed information on HIWIN lubricants and lubrication of the linear guideways can be found in the **"Linear guideways"** assembly instructions at [www.hiwin.de](http://www.hiwin.de).

### 2.6.3 Long-term lubrication unit

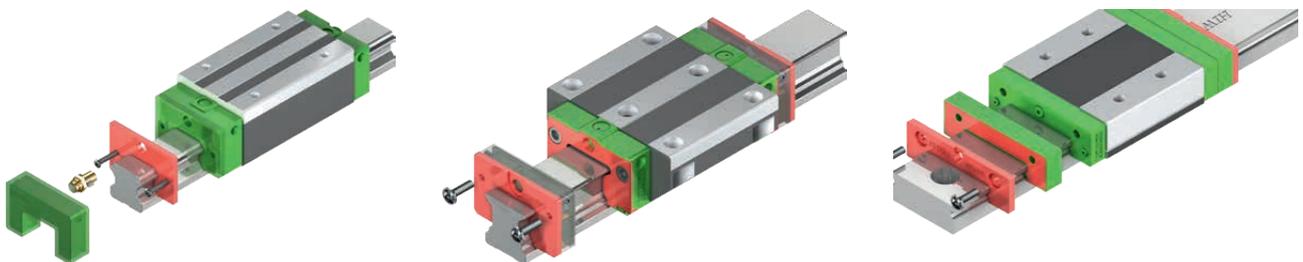
The long-time lubrication unit considerably increases lubrication intervals. Depending on the application and ambient conditions, it can achieve lifetime lubrication.

It also considerably reduces lubricant consumption, as only the required quantity of lubricant is applied.

The compact construction and special design allows the block to be fitted in any position without impairing the lubrication function.

The long-time lubrication unit can be used at ambient temperatures of  $-10\text{ }^{\circ}\text{C}$  to  $+60\text{ }^{\circ}\text{C}$ .

The long-time lubrication units are available for the HG/QH, CG, EG/QE, MG and RG series. The corresponding dimensions and the running performance can be found in the chapter of the corresponding series. HG/QH series: Page 30, CG series: Page 48, EG/QE series: Page 66, MG series: Page 92, RG series: Page 106.



#### Applications

- Machine tools
- Production machines: Injection moulding machines, paper industry, textile machines, food industry, woodworking machines
- Electronics industry: Semiconductor industry, robotics, cross tables, measuring and testing machines
- Other areas: Medical equipment, automation, handling technology

# Linear guideways

## General information

### 2.7 Installation position

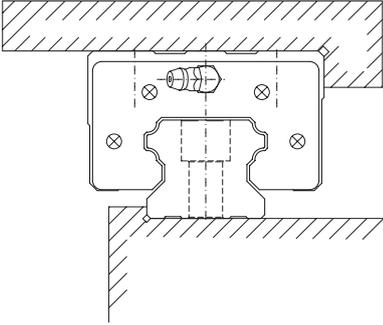
#### 2.7.1 Examples of typical installation positions

A linear guideway can take loads up/down and to the right/left. The installation position depends on the requirements of the machine and the load direction. The accuracy of the profile rail is determined by how straight and level the contact surfaces are because the profile rail is pressed against them when the screws are tightened. Profile

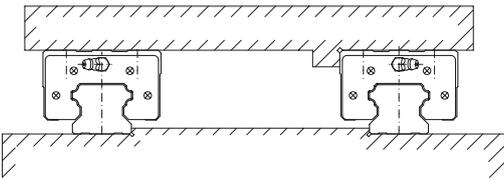
rails that are not pressed against a contact surface may have greater tolerances in terms of straightness. The typical installation positions are shown below: Information on mounting tolerances is given in the chapters of the individual series.

#### A profile edge at a reference edge:

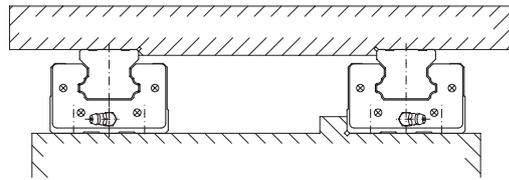
The reference edge is marked by arrows on the top of the rail. For very short rail sections, the marking is on the front side of the rail.



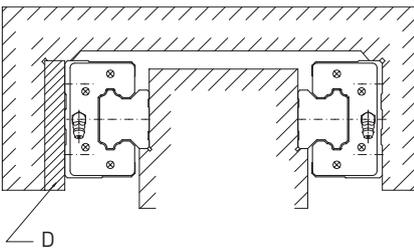
#### Two profile rails with moving block:



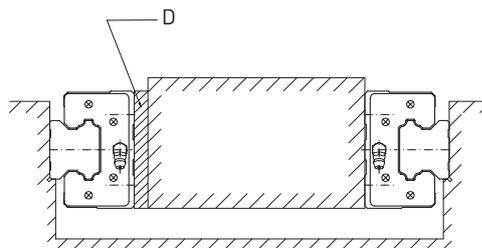
#### Two profile rails with fixed block:



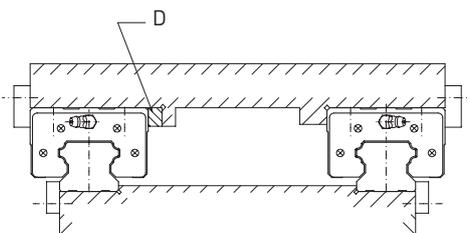
#### Two external blocks:



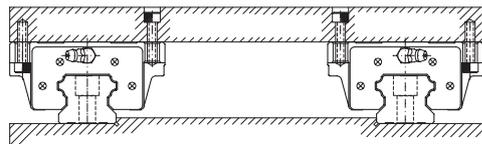
#### Two internal blocks:



#### Structure with assembled surface:



#### Block model HGW\_C with different mounting directions:



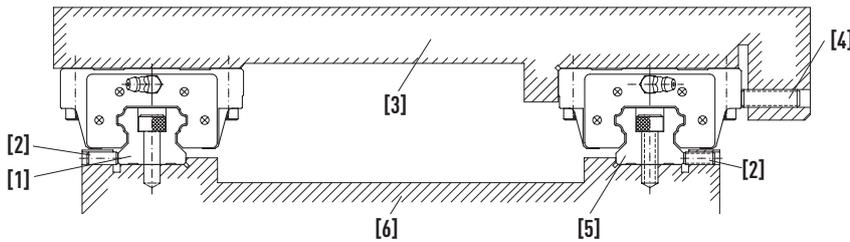
D Spacer

## 2.8 Assembly

Depending on the required accuracy as well as the load on the linear guideway caused by jolting and vibrations, the following three mounting methods are recommended.

### 2.8.1 Mounting the profile rails with reference edge and clamps

If the machine is subjected to strong vibrations, jolting or lateral forces, guideways and blocks may shift. To avoid this problem and to achieve high rigidity and guiding accuracy, mounting the linear guideway with reference edges and clamps on both sides is recommended.

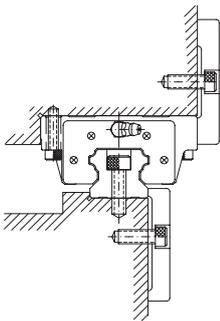


- [1] Follow-on side
- [2] Guide clamping screw
- [3] Carriage
- [4] Block clamping screw
- [5] Reference side
- [6] Machine bed

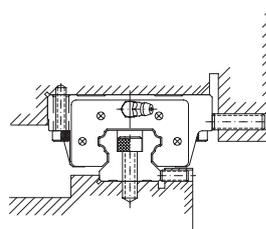
#### 2.8.1.1 Mounting types

The following four mounting types are recommended.

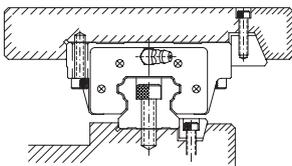
##### Mounting with a clamping plate:



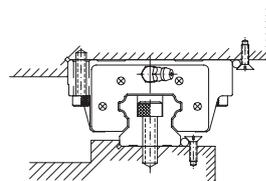
##### Mounting with clamping screws:



##### Mounting with terminal blocks:



##### Mounting with needle rollers:

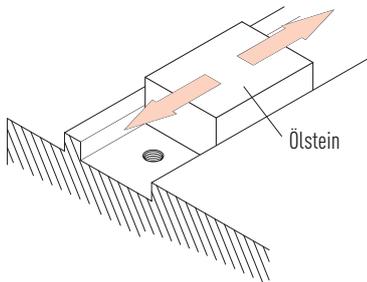


# Linear guideways

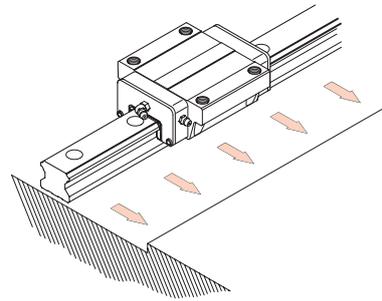
## General information

### 2.8.1.2 Assembly of the profile rails

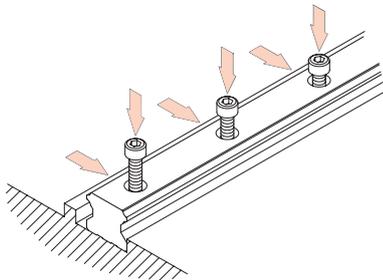
1) Before starting, remove all dirt from the surface of the machine



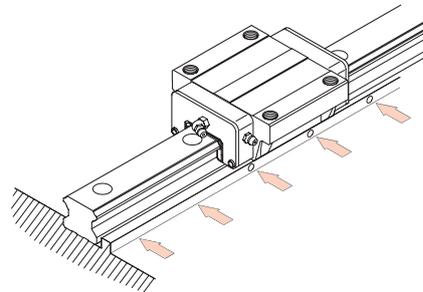
2) Carefully place the profile rail on the bed and hold it firmly against the reference edge



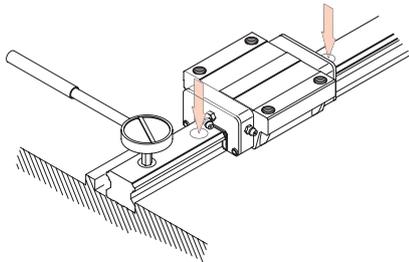
3) When aligning the profile rail on the bed, check whether the threads of the inserted screws engage



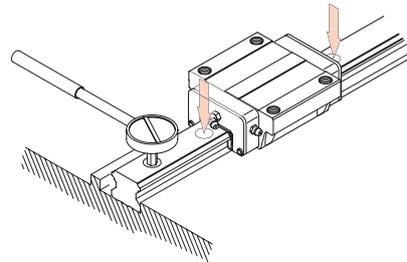
4) Tighten clamping screws one after the other to ensure good contact between the profile rail and the reference edge



5) Working in three steps, tighten all rail fixing screws to the specified tightening torque using a torque spanner

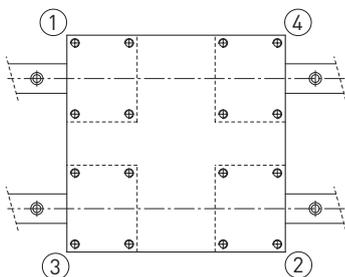


6) Mount the second profile rail in the same way



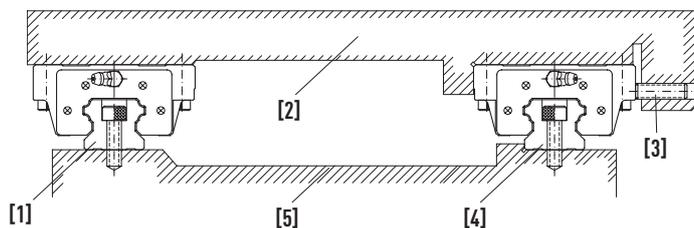
### 2.8.1.3 Mounting the block

- Carefully place carriage on the block. Then temporarily tighten the carriage fixing screws.
- Press the block against the reference edge of the carriage and align the carriage by tightening the clamping screws.
- To mount the carriage evenly, tighten the fixing screws on the reference side and the follow-on side in four passes.



## 2.8.2 Mounting the profile rails with reference edge and without clamps

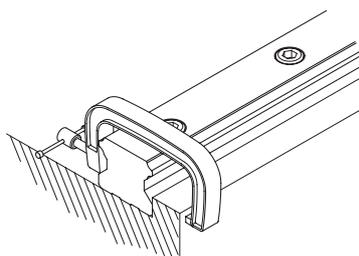
To ensure parallelism between the reference and follow-on rail without clamping screws, the following methods are recommended for mounting. The installation of the block remains as previously described.



- [1] Follow-on rail
- [2] Carriage
- [3] Block clamping screw
- [4] Reference rail
- [5] Machine bed

### 2.8.2.1 Mounting the profile rail on the reference side

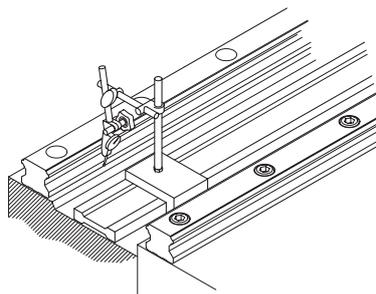
Place the guideway on the mounting surface of the machine bed. Lightly tighten the fixing screws and then press the guideway against the reference edge of the machine bed using a screw clamp. Then tighten the fixing screws one after the other to the specified torque.



### 2.8.2.2 Mounting the profile rail on the follow-on side

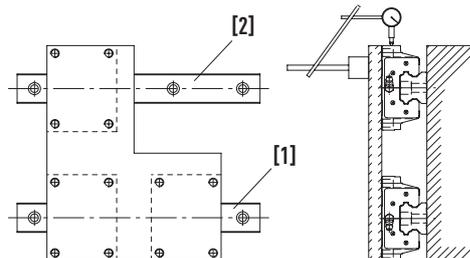
#### Align to a ruler:

Place the ruler between the guideways and align it parallel to the reference edge on the reference side using a dial gauge. When the guideway on the follow-on side is aligned parallel to the reference side, tighten the fixing screws one after the other, working from one end of the guideway to the other.



#### With the help of a plate:

Mount a plate on two blocks on the reference rail. Loosely attach a block to the plate to the follow-on rail. Then attach a dial gauge to the plate and place the sensor on the side of the block of the follow-on rail. Then move the plate from one end to the other and align the follow-on rail parallel to the reference rail. Then tighten the fixing screws one after the other.



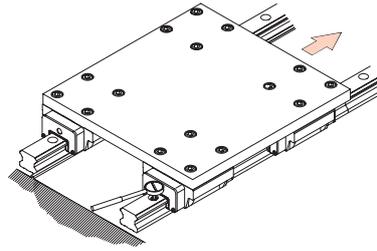
- [1] Reference rail
- [2] Follow-on rail

# Linear guideways

## General information

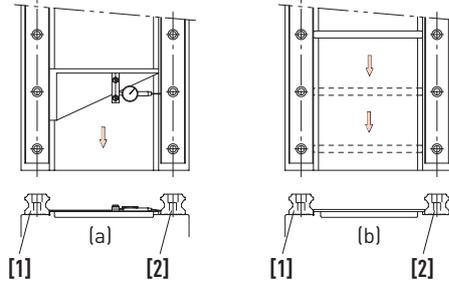
### Alignment on the reference rail:

When the reference rail is correctly installed, mount one plate firmly on two blocks on the reference rail and one of the two blocks on the follow-on rail. Then move the plate from one end of the rails to the other, tightening the fixing screws of the follow-on rail.



### With the help of a gauge:

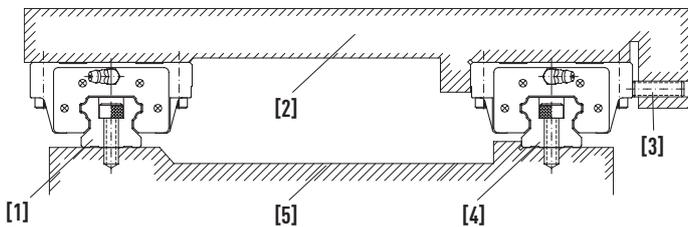
Determine the position of the follow-on rail using a special gauge and tighten the fixing screws with the specified torque.



- [1] Reference rail
- [2] Follow-on rail

### 2.8.3 Mounting the profile rails without reference edge and without clamps

To ensure parallelism of the reference and follow-on rail even without a reference edge on the reference side, the following type of mounting is recommended. Mounting of the block remains as previously described.

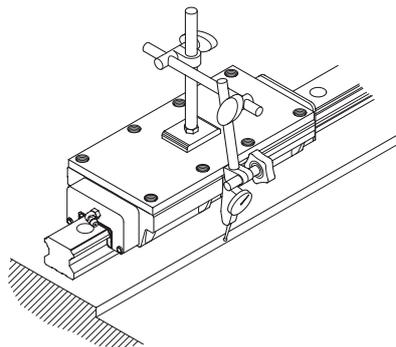


- [1] Follow-on rail
- [2] Carriage
- [3] Block clamping screw
- [4] Reference rail
- [5] Machine bed

#### 2.8.3.1 Mounting the profile rail on the reference side

##### Alignment at a provisional reference edge:

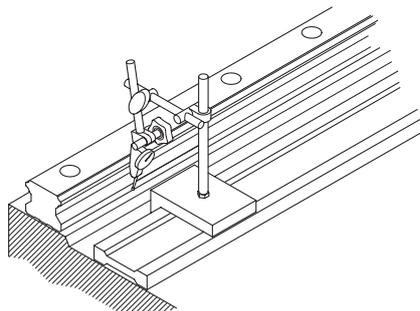
Connect two blocks close together with a plate. Use an edge on the machine bed to align the rail from one end to the other. Move the block to test and then tighten the fixing screws one after the other to the specified torque.



##### Align to a ruler:

Align the rail from end to end using a dial gauge on a ruler. Make sure to tighten the fixing screws firmly one after the other.

The assembly of the follow-on rail corresponds to the procedure of section 2.8.2.2, "Mounting the profile rail on the follow-on side".

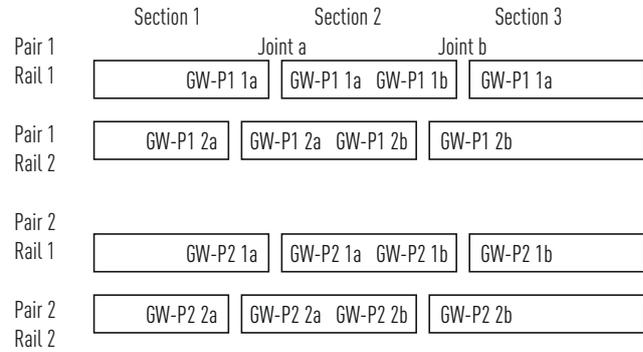
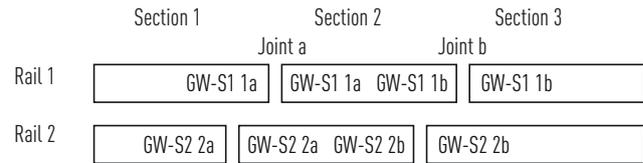


## 2.8.4 Attached profile rails

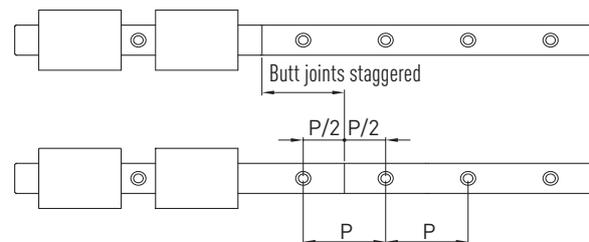
Attached (multi-part) rails must be mounted according to the applied markings. The joints on each section are marked consecutively in alphabetical order and with the rail or pair number so that each rail section can be clearly assigned.

Each joint is labelled on the top of the rail. The label serves as an aid for initial assembly and can be removed at any time without leaving any residue.

Note: After initial assembly of the profile rails, the labels must be removed.



With paired multi-part rails, it is recommended that the butt joints be mounted with an offset.



## 2.8.5 Tightening torques of the fixing screws

Insufficient tightening of the fixing screws severely affects the accuracy of the linear guideway; the tightening torques of the fastening screws according to ISO 4762-12.9 can be taken from the assembly instructions.

# Linear guideways

## General information

### 2.9 Sealing systems

On the one hand, the HIWIN end seals prevent the ingress of foreign substances such as dust particles, chips or liquid into the ball tracks of the block; on the other hand, they reduce lubricant loss. HIWIN offers various sealing systems for the different environmental conditions of your application. The effectiveness of the end seal has a direct influence on the service life of the linear guideway and should therefore be taken into account at the design stage and selected to suit the environmental conditions of your application.

Table 2.6 Overview of sealing systems

	Smooth running seal Good sealing effect, minimum displacement resistance	Standard end seal Very good sealing effect, minor displacement resistance	Double standard end seal Improved sealing effect, average displacement resistance	Optimised end seal Optimal protection against finest dusts and liquids, increased displacement resistance
<b>Scrapper</b> (Air gap 0.1 – 0.2 mm)	ZZX	KKX	ZWX	
<b>Scrapper</b> (Air gap 0.4 – 0.5 mm)	ZZ	KK	ZW	
<b>Without scrapper</b>	SSL	SS <sup>1)</sup>	DD	SW

**Sealing effect and displacement resistance higher**

<sup>1)</sup> Standard

Note: The sealing systems available in each case can be found in the chapter of the series in the Sealing systems section.

Table 2.7 Selection guide for sealing systems

	<p><b>ZZX</b> See SS, additionally sharp-edged particles, possibly also hot particles or particles adhering to the rail <math>\geq 0.2</math> mm, e.g. chips, welding beads</p> <p>Typical applications:</p> <ul style="list-style-type: none"> <li>○ Turning, milling, drilling</li> <li>○ Welding applications</li> </ul>	<p><b>KKX</b> See DD, additionally sharp-edged particles, possibly also hot particles or particles adhering to the rail <math>\geq 0.2</math> mm, e.g. chips, welding beads</p> <p>Typical applications:</p> <ul style="list-style-type: none"> <li>○ See ZWX</li> </ul>	<p><b>ZWX</b> See SW, additionally sharp-edged particles, possibly also hot particles or particles adhering to the rail <math>\geq 0.2</math> mm, e.g. chips, welding beads</p> <p>Typical applications:</p> <ul style="list-style-type: none"> <li>○ CNC machining centre</li> <li>○ Woodworking (e.g. MDF)</li> </ul>
	<p><b>ZZ</b> See SS, additionally sharp-edged particles, possibly also hot particles or particles adhering to the rail <math>\geq 0.4</math> mm, e.g. chips, welding beads</p> <p>Typical applications:</p> <ul style="list-style-type: none"> <li>○ Turning, milling, drilling</li> <li>○ Welding applications</li> </ul>	<p><b>KK</b> See DD, additionally sharp-edged particles, possibly also hot particles or particles adhering to the rail <math>\geq 0.4</math> mm, e.g. chips, welding beads</p> <p>Typical applications:</p> <ul style="list-style-type: none"> <li>○ See ZW</li> </ul>	<p><b>ZW</b> See SW, additionally sharp-edged particles, possibly also hot particles or particles adhering to the rail <math>\geq 0.4</math> mm, e.g. chips, welding beads</p> <p>Typical applications:</p> <ul style="list-style-type: none"> <li>○ Turning, milling, drilling (with cooling lubricants)</li> <li>○ Solid wood processing with coarse chips</li> </ul>
<p><b>SSL</b> For applications with very low dirt and dust exposure</p> <p>Typical applications:</p> <ul style="list-style-type: none"> <li>○ Measuring technology</li> <li>○ Testing technology</li> </ul>	<p><b>SS (standard variants)</b> For applications with low dirt and dust exposure</p> <p>Typical applications:</p> <ul style="list-style-type: none"> <li>○ Automation technology</li> <li>○ Pick &amp; place</li> <li>○ Handling</li> </ul>	<p><b>DD</b> For applications with heavy dirt and dust exposure (alternatively if SW is not available)</p> <p>Typical applications:</p> <ul style="list-style-type: none"> <li>○ See SW</li> </ul>	<p><b>SW</b> For applications with heavy dirt and dust exposure, especially very fine dust and cooling lubricants</p> <p>Typical applications:</p> <ul style="list-style-type: none"> <li>○ Wood, stone, glass processing</li> <li>○ Grinding machines</li> </ul>

# Linear guideways

## General information

### 2.10 SynchMotion™ technology

The innovative SynchMotion™ technology reduces contact between the rolling elements and the block. Similar to the ball cage of a standard ball bearing, the rolling elements are kept at a defined distance from each other by SynchMotion™ technology. Counter-rotating friction, as occurs in conventional linear guideways, is thus prevented and synchronisation fluctuations are significantly reduced. Even at high speeds, no uncontrolled ball movements occur. SynchMotion™ technology also improves lubricant transport within the block and lubricant storage.

#### Advantages:

- Improved synchronous performance
- Optimised for high travel speeds
- Improved lubrication properties
- Reduced running noise
- Higher dynamic load rating

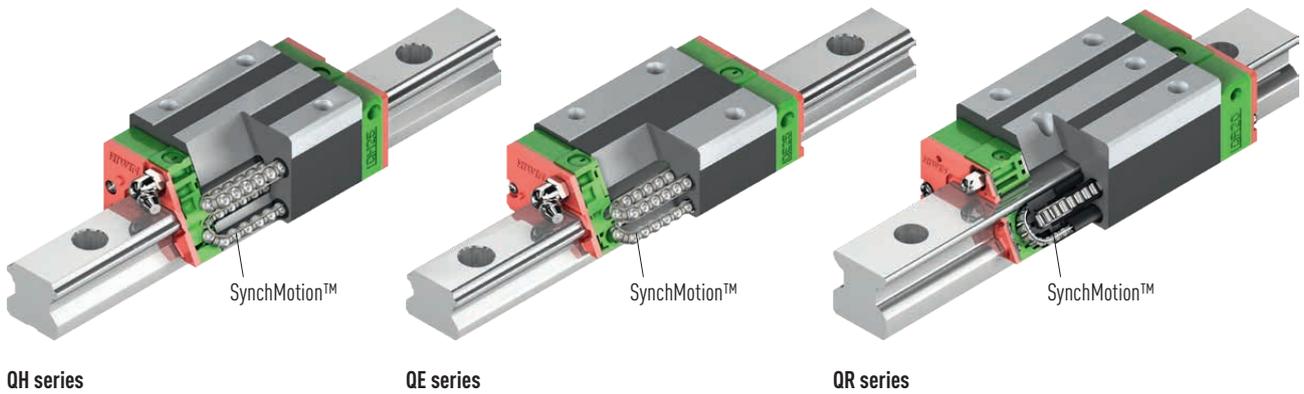


Table 2.8 Availability of SynchMotion™ technology for HIWIN linear guideways

Series	Sizes									
	15	20	21	25	27	30	35	45	55	65
QH	●	●	—	●	—	●	●	●	—	—
QE	●	●	—	●	—	●	●	—	—	—
QW	—	—	●	—	●	—	●	—	—	—
QR	—	—	—	●	—	●	●	●	—	—

Dimensionally identical and compatible with the HG, EG, WE and RG blocks, the blocks with SynchMotion™ technology are mounted on the standard rail and are therefore very easy to exchange.

## 2.11 Heat-resistant linear guideways

For continuous operation at temperatures above 80 °C, "solid steel" blocks with steel deflection systems are used. The standard end seals are replaced by heat-resistant end seals and the plastic cover caps of the profile rail by brass cover caps.

### Special properties:

- Good temperature resistance
- Operating temperature up to 150 °C
- Temperature peaks of up to 180 °C.

### Application areas:

- Devices for heat treatment
- Welding devices
- Devices for glass production
- Devices for use in a vacuum.



Table 2.9 Series with available steel deflection system option

Series	Size
HG	15, 20, 25, 30, 35, 45, 55, 65
EG	20, 25
MGN	7, 9, 12, 15
MGW	12, 15

**Article number:** For the steel deflection system option, add identifier "/SE" to the order code. See the structure of the order code in the chapter on the individual series.  
 HG: from Page 30, EG: from Page 66, MG: from Page 93

Order example:

**HG** **W** **25** **C** **C** **ZA** **H** **ZZ** **SE**

Note: Heat-resistant linear guideways with steel deflector generally have poorer running properties than comparable standard linear guideways with plastic deflector and are always supplied assembled as linear guideways.

# Linear guideways

## General information

### 2.12 HIWIN coating for linear guideways

#### 2.12.1 HIWIN coating HICOAT CZS

##### 2.12.1.1 Features and properties

HICOAT CZS is a very thin zinc coating that provides very good corrosion protection, even in radii and chamfers. Smaller bare spots remain protected against corrosion by the cathodic protection effect. This results in a significantly longer service life compared to uncoated parts. CZS coating available for the HG, EG, CG and WE series. Note: Not for series RG, MG, PG, QH, QE, QR and QW.

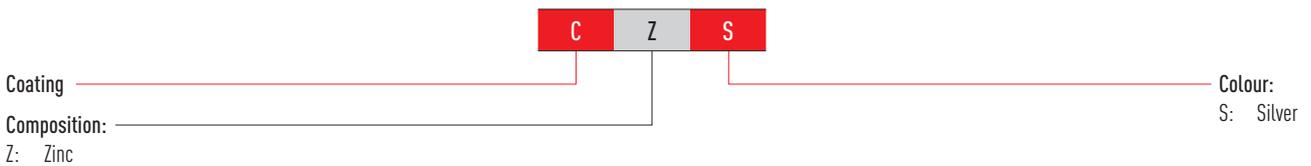
##### Specific features:

- Very good corrosion protection
- Cr(VI)-free
- One-piece and multi-piece rails available from stock
- End preservation with zinc spray (see below)
- Possible interaction between coating, ambient medium and lubricant should be checked on a case-by-case basis

##### Technical data:

- Salt spray test according to DIN EN ISO 9227 (with unloaded rail): 300 hours
- Salt spray test according to DIN EN ISO 9227 (with loaded rail): 99 hours
- Maximum rail length (one-piece): 4.0 meters

#### 2.12.1.2 Order code for CZS coatings



#### 2.12.1.3 Corrosion test

CZS-coated profile rails were tested in comparison with an uncoated profile rail.



New rail in CZS coating



Rail with CZS coating – after 6 months of outdoor storage



Rail (unloaded) with CZS coating – after 99 hours of salt spray test (according to DIN EN ISO 9227)



Uncoated rail – after 4 hours of salt spray test

#### 2.12.1.4 Rail end

The rail ends are preserved with zinc spray. In order to achieve reliable corrosion protection at the uncoated rail ends as well, a high-quality zinc spray (zinc content 99%) is used. The rail ends of single-piece rails and the outer ends of multi-piece rails are preserved with zinc spray approx. 2 mm beyond the cut edge as shown in Fig. 2.1. Rail ends at joints are supplied with a greased, uncoated cut edge (see Fig. 2.2).

**Note:** The mounting holes and the process-related contact points on the underside of the rail may have lower coating thicknesses or isolated bare spots. The inner side of the block is generally not coated.

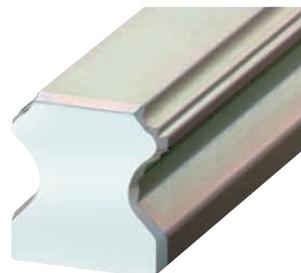


Fig. 2.1 Rail end preserved with zinc spray



Fig. 2.2 Joint uncoated spray

## 2.12.2 HIWIN coating HICOAT CTS

### 2.12.2.1 Features and properties

HICOAT CTS is a thin film chromium plating that provides good corrosion protection and very good wear protection. The high wear resistance results from the very high hardness of the coating. The CTS coating is Cr(VI)-free and food safe. It is available for the HG, EG, CG and WE series.

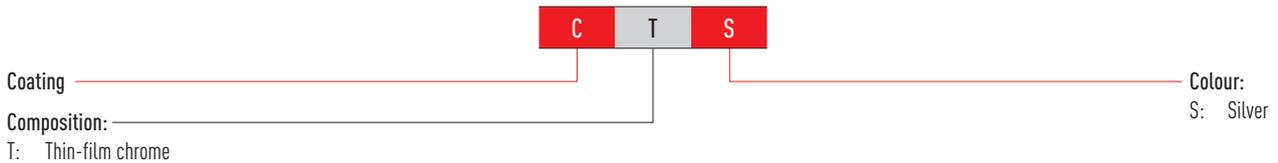
#### Specific features:

- Very good wear protection
- Good corrosion protection
- Cr(VI)-free
- One-piece rails available from stock (end preservation with zinc spray, see below)
- Multi-piece rails are delivered including coated ends (longer delivery time)
- Food safe

#### Technical data:

- Salt spray test according to DIN EN ISO 9227 (with unloaded rail): 96 hours
- Salt spray test according to DIN EN ISO 9227 (with loaded rail): 22 hours
- Maximum rail length (one-piece): 4.0 meters

### 2.12.2.2 Order code for CTS coatings



### 2.12.2.3 Corrosion test

CTS-coated profile rails were tested in comparison with an uncoated profile rail.



New rail in CTS coating



Rail with CTS coating - after 1 month of outdoor storage



Rail (unloaded) with CTS coating - after 22 hours of salt spray test (according to DIN EN ISO 9227)



Uncoated rail - after 4 hours of salt spray test

### 2.12.2.4 Rail end

For one-piece rails, the rail ends are preserved with zinc spray as shown in the adjacent figure. In order to achieve reliable corrosion protection at the uncoated rail ends as well, a high-quality, food-safe zinc spray (zinc content 99%) is used. Multi-piece rails are delivered with coated rail ends (longer delivery time).

**Note:** The mounting holes may have lower coating thicknesses or isolated bare spots. The inner side of the block is generally not coated.



# Linear guideways

## General information

---

### 2.12.3 HIWIN coating HICOAT CCB

#### 2.12.3.1 Features and properties

HICOAT CCB is a very thin chromium oxide layer with a cured synthetic resin coating. It is characterised by good corrosion protection combined with very good running properties. The very thin layer thickness enables use with all HIWIN linear guideways, especially with the MG and RG series.

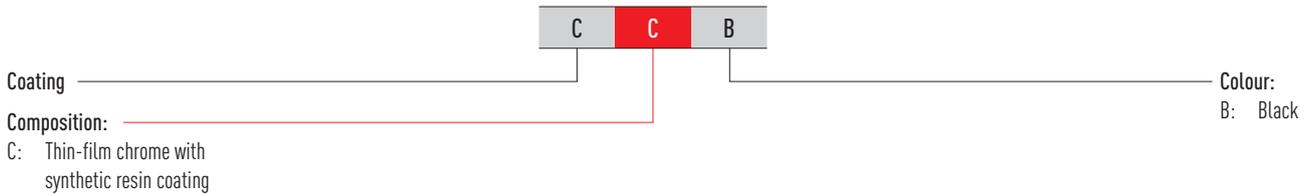
#### Specific features:

- Very thin layer thickness
- Very good running properties
- Good corrosion protection
- Cr(VI)-free
- Including coated rail end
- Available from Taiwan stock

#### Technical data:

- Salt spray test according to DIN EN ISO 9227 (with unloaded rail): 24 hours
- Maximum rail length (one-piece): 4.0 meters

#### 2.12.3.2 Order code for CCB coatings



#### 2.12.3.3 Corrosion test

CCB-coated profile rails were tested in comparison with an uncoated profile rail.



New rail in CCB coating



Rail (unloaded) with CCB coating - after 24 hours of salt spray test (according to DIN EN ISO 9227)



Uncoated rail – after 4 hours of salt spray test

# Linear guideways

## MG series

---

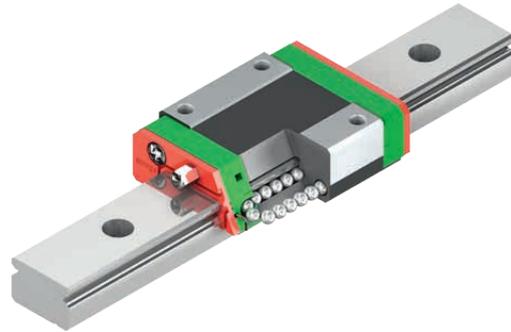
### 3.5 MG series

#### 3.5.1 Properties of the MGN series linear guideway

Miniature type for the most compact applications. The HIWIN linear guideway of the MGN series is based on proven HIWIN technology. The Gothic arch contact design absorbs loads in all directions and is particularly rigid and precise. Given its compact and lightweight design, it is particularly suited to use in small devices.

#### 3.5.2 Layout of MGN series

- Dual-row linear guideways
- Gothic arch contact design
- Block and balls made of stainless steel
- Rails made of stainless steel
- Compact and light design
- Balls are secured in the block by retaining wire
- Lubricating nipple available for MGN15
- End seal
- Interchangeable models are available in defined accuracy classes



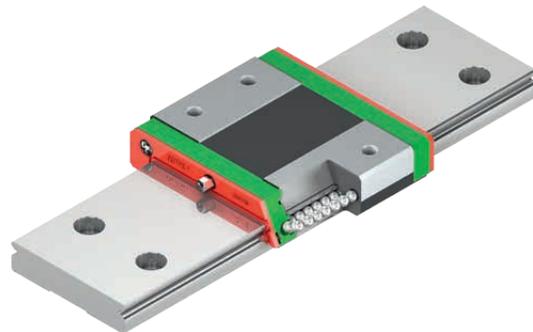
Layout of MGN series

#### 3.5.3 Properties of the MGW series linear guideway

The HIWIN linear guideway of the MGW series is based on proven HIWIN technology. The Gothic arch contact design absorbs loads in all directions and is particularly rigid and precise. Due to the wider rail, compared to the MGN series, the MGW series can absorb significantly higher load moments.

#### 3.5.4 Layout of MGW series

- Dual-row linear guideways
- Gothic arch contact design
- Block and balls made of stainless steel
- Rails made of stainless steel
- Compact and light design
- Balls are secured in the block by retaining wire
- Lubricating nipple available for MGW15
- End seal
- Interchangeable models are available in defined accuracy classes



Layout of MGW series

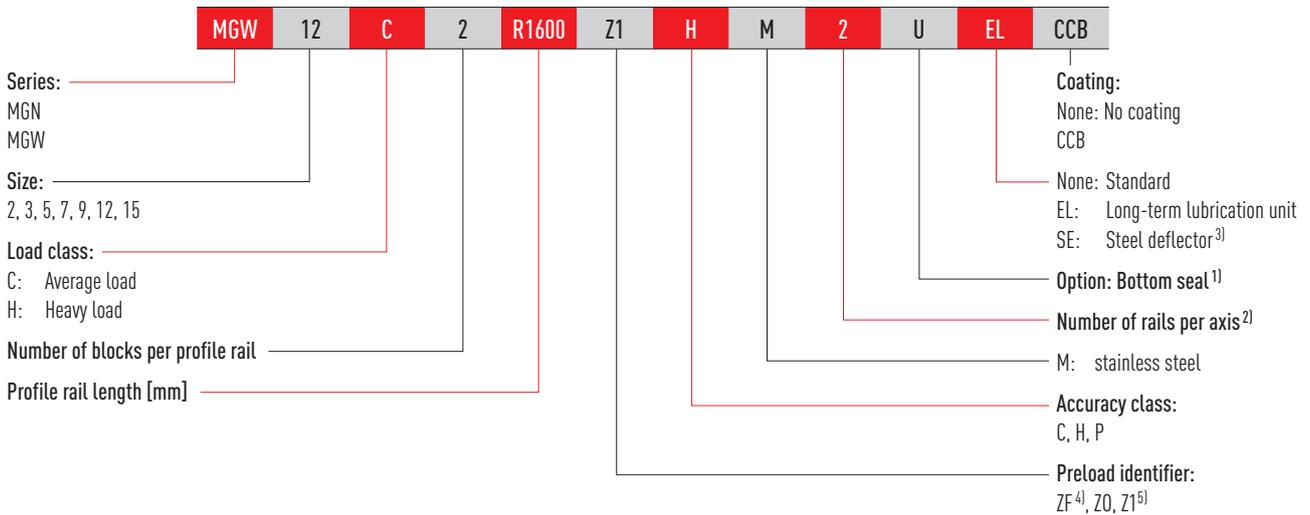
#### 3.5.5 Applications of MG series

The MGN and MGW series can be used in a wide range of applications including the semiconductor industry, PCB assembly, medical technology, robotics, instrumentation, office automation, and other applications requiring miniature guides.

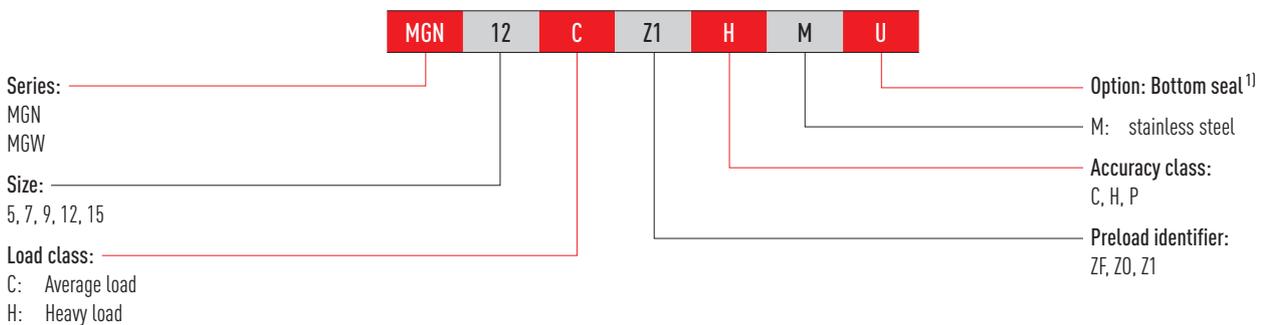
### 3.5.6 Order codes of MG series

For MGN and MGW linear guideways, there is a distinction made between assembled and non-assembled models. The dimensions of both models are the same. The main difference is that, in the unassembled models, blocks and profile rails can be freely interchanged. Block and profile rail can be ordered separately and mounted by the customer.

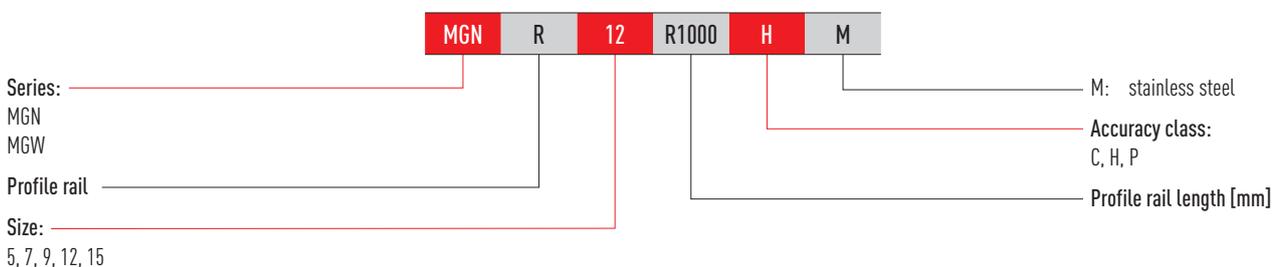
#### Order code for linear guideway (assembled)



#### Order number of block (not assembled)



#### Order number of profile rail (not assembled)



Note:

<sup>1)</sup> Available for MGN and MGW series in sizes 12 and 15.

<sup>2)</sup> The number 2 is also a quantity indication, i.e. one piece of the article described above consists of one pair of rails. No number is given for single profile rails. In the case of multi-part rails, the joint is offset as standard.

<sup>3)</sup> Available for MGN07, 09, 12, 15 and MGW12, 15.

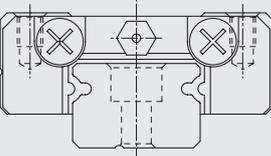
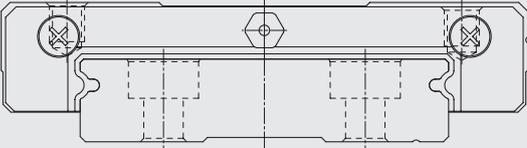
<sup>4)</sup> Not available for paired rails and MG05.

<sup>5)</sup> Not available for MG02 and MG03.

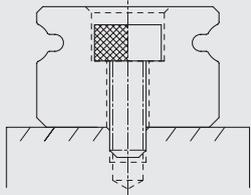
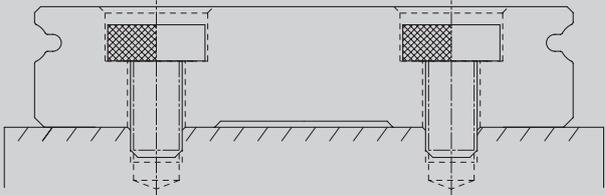
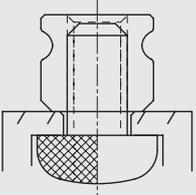
# Linear guideways

## MG series

### 3.5.7 Block types

Type	Series/size	Layout	Height [mm]	Typical applications
Narrow type	MGN-C MGN-H		3,2 – 16	<ul style="list-style-type: none"> <li>○ Printers</li> <li>○ Robots</li> <li>○ Precision measuring equipment</li> <li>○ Semiconductor industry</li> </ul>
Wide type	MGW-C MGW-H		4 – 16	

### 3.5.8 Profile rail types

<b>Fastening from above</b>	
	
MGN_R	MGW_R
<b>Fastening from below</b>	
	
MGN_R 02/03	

### 3.5.9 Preload

The MGN/MGW series of linear guideways offers three standard preload classes for different applications.

Table 3.75 Preload identifier

Identifier	Preload	Accuracy class
ZF <sup>1)</sup>	Slight backlash: 4 – 10 µm	C, H
Z0	Reduced play to very light preload: 0 – 3 µm	C – P
Z1 <sup>2)</sup>	Light preload: 0 – 0.02 C <sub>dyn</sub>	C – P

<sup>1)</sup> Not available for size 5

<sup>2)</sup> Not available for size 2 and 3

### 3.5.10 Load ratings and torques

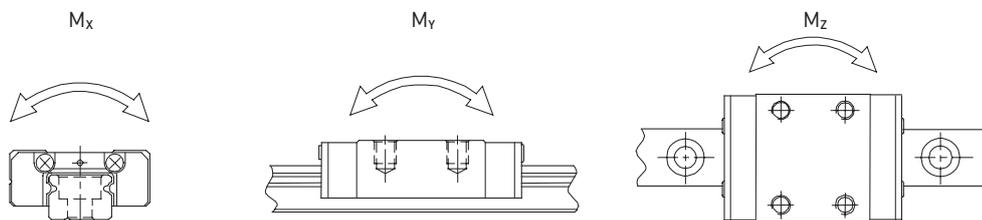


Table 3.76 Load ratings and torques for MG series

Series/Size	Dynamic load rating C <sub>dyn</sub> [N] <sup>1)</sup>	Static load rating C <sub>0</sub> [N]	Static moment [Nm]		
			M <sub>0x</sub>	M <sub>0y</sub>	M <sub>0z</sub>
MGN02C	220	400	0.4	0.6	0.6
MGN03C	290	440	0.7	0.5	0.5
MGN03H	390	680	1.0	1.3	1.3
MGN05C	540	840	2.0	1.3	1.3
MGN05H	670	1,080	2.6	2.3	2.3
MGN07C	980	1,245	4.7	2.8	2.8
MGN07H	1,370	1,960	7.6	4.8	4.8
MGN09C	1,860	2,550	11.8	7.4	7.4
MGN09H	2,550	4,020	19.6	18.6	18.6
MGN12C	2,840	3,920	25.5	13.7	13.7
MGN12H	3,720	5,880	38.2	36.3	36.3
MGN15C	4,610	5,590	45.1	21.6	21.6
MGN15H	6,370	9,110	73.5	57.8	57.8
MGW02C	410	730	1.1	2.2	2.2
MGW03C	540	840	2.3	1.3	1.3
MGW03H	680	1180	3.3	2.7	2.7
MGW05C	680	1,180	5.5	2.7	2.7
MGW07C	1,370	2,060	15.7	7.1	7.1
MGW07H	1,770	3,140	23.5	15.5	15.5
MGW09C	2,750	4,120	40.1	18.0	18.0
MGW09H	3,430	5,890	54.5	34.0	34.0
MGW12C	3,920	5,590	70.3	27.8	27.8
MGW12H	5,100	8,240	102.7	57.4	57.4
MGW15C	6,770	9,220	199.3	56.7	56.7
MGW15H	8,930	13,380	299.0	122.6	122.6

<sup>1)</sup> Dynamic load rating for 50,000 m travel path

# Linear guideways

## MG series

### 3.5.11 Rigidity

The rigidity depends on the preload. With the formula F 3.15, the deformation can be calculated depending on the rigidity.

F 3.15

$$\delta = \frac{P}{k}$$

$\delta$  Deformation [ $\mu\text{m}$ ]  
 $P$  Operating load [N]  
 $k$  Rigidity value [N/ $\mu\text{m}$ ]

Table 3.77 Radial rigidity of MGN series

Load type	Series/ Size	Rigidity depending on the preload	
		Z0	Z1
Average load	MGN07C	26	33
	MGN09C	37	48
	MGN12C	44	56
	MGN15C	57	74
Heavy load	MGN07H	39	51
	MGN09H	56	73
	MGN12H	63	81
	MGN15H	87	113

Unit: N/ $\mu\text{m}$

Table 3.78 Radial rigidity of MGW series

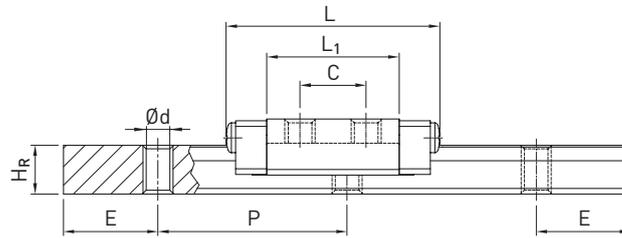
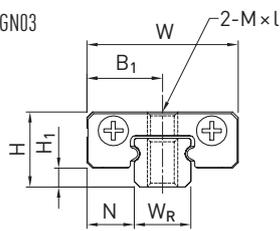
Load type	Series/ Size	Rigidity depending on the preload	
		Z0	Z1
Average load	MGW07C	38	49
	MGW09C	55	71
	MGW12C	63	81
	MGW15C	78	101
Heavy load	MGW07H	54	70
	MGW09H	74	95
	MGW12H	89	114
	MGW15H	113	145

Unit: N/ $\mu\text{m}$

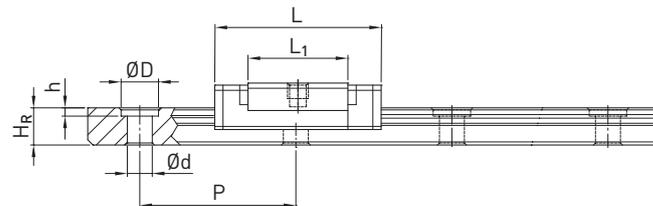
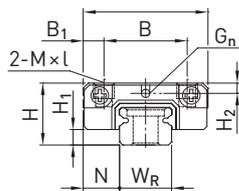
## 3.5.12 Dimensions of the MG blocks

### 3.5.12.1 MGN

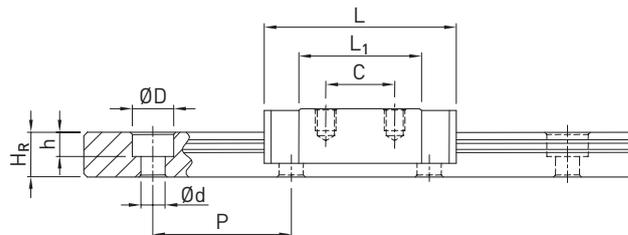
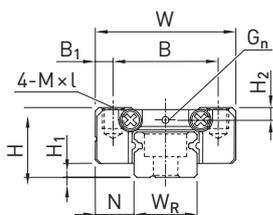
MGN02, MGN03



MGN05



MGN07, MGN09, MGN12



MGN15

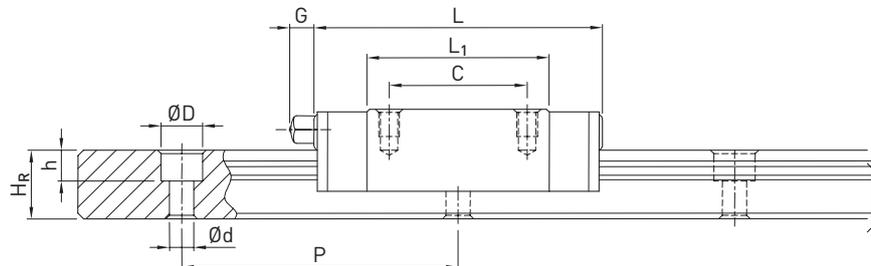
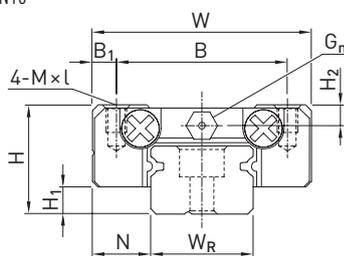


Table 3.79 Dimensions of the block

Series/size	Installation dimensions [mm]			Dimensions of the block [mm]										Load ratings [N]		Weight [kg]
	H	H <sub>1</sub>	N	W	B	B <sub>1</sub>	C	L <sub>1</sub>	L	G	G <sub>n</sub>	M × l	H <sub>2</sub>	C <sub>dyn</sub>	C <sub>0</sub>	
MGN02C	3,2	0,7	2,0	6	—	3	4,0	9,4	12,5	—	—	M1,4	—	220	400	0,001
MGN03C	4,0	1,0	2,5	8	—	4	3,5	7,0	11,3	—	—	M1,6	—	290	440	0,001
MGN03H							5,5	11	15,3			M2		390	680	0,002
MGN05C	6	1,5	3,5	12	8	2,0	—	9,6	16,0	—	Ø 0,8	M2 × 1,0	1,0	540	840	0,008
MGN05H							—	12,6	19,0	—		1,5		670	1,080	0,010
MGN07C	8	1,5	5,0	17	12	2,5	8	13,5	22,5	—	Ø 1,2	M2 × 2,5	1,5	980	1,245	0,010
MGN07H							13	21,8	30,8					1,372	1,960	0,020
MGN09C	10	2,0	5,5	20	15	2,5	10	18,9	28,9	—	Ø 1,4	M3 × 3	1,8	1,860	2,550	0,020
MGN09H							16	29,9	39,9					2,550	4,020	0,030
MGN12C	13	3,0	7,5	27	20	3,5	15	21,7	34,7	—	Ø 2	M3 × 3,5	2,5	2,840	3,920	0,030
MGN12H							20	32,4	45,4					3,720	5,880	0,050
MGN15C	16	4,0	8,5	32	25	3,5	20	26,7	42,1	4,5	M3	M3 × 4	3,0	4,610	5,590	0,060
MGN15H							25	43,4	58,8					6,370	9,110	0,090

For dimensions of the rail, see Page 99, for standard as well as optional lubrication adapter, see Page 148.

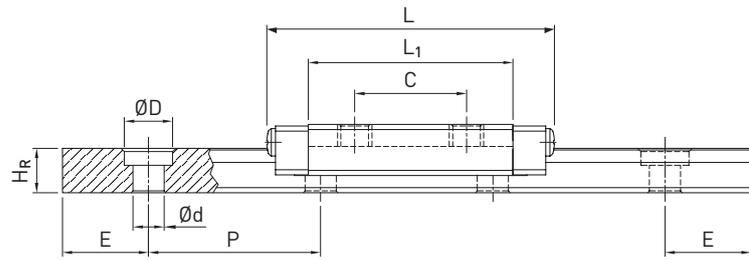
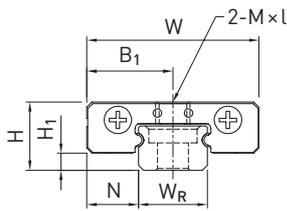
The size MGN02 and MGN03 blocks are only available mounted on the profile rail.

# Linear guideways

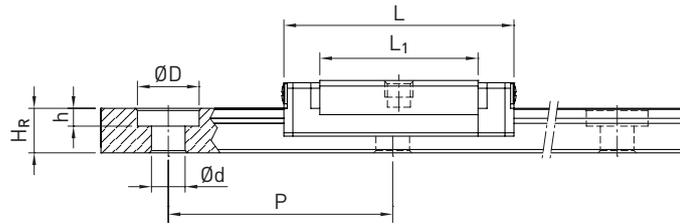
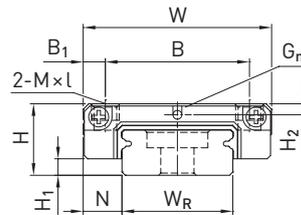
## MG series

### 3.5.12.2 MGW

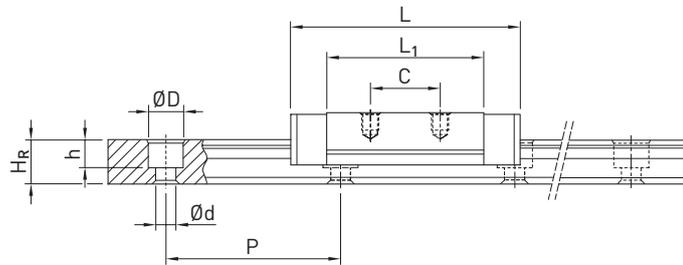
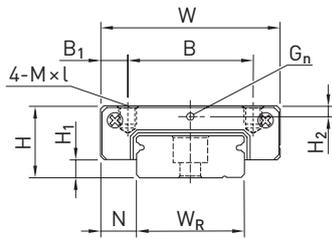
MGW02



MGW05



MGW03, MGW07, MGW09, MGW12



MGW15

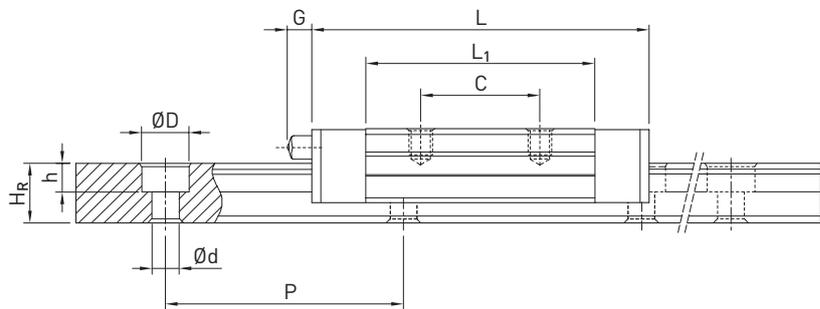
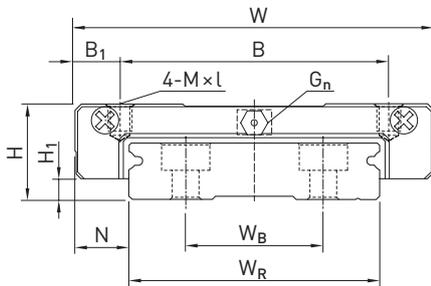


Table 3.80 Dimensions of the block

Series/size	Installation dimensions [mm]			Dimensions of the block [mm]										Load ratings [N]		Weight [kg]
	H	H <sub>1</sub>	N	W	B	B <sub>1</sub>	C	L <sub>1</sub>	L	G	G <sub>n</sub>	M × l	H <sub>2</sub>	C <sub>dyn</sub>	C <sub>0</sub>	
MGW02C	4,0	1	3	10	—	5	6,5	11,9	16,7	—	—	M2	—	410	730	0,002
MGW03C	4,5	1	3	12	—	6	4,5	9,60	15,0	—	Ø0,5	M2	0,65	540	840	0,003
MGW03H							8,0	14,2	19,6					680	1.180	0,004
MGW05C	6,5	1,5	3,5	17	13	2,0	—	14,1	20,5	—	Ø0,8	M2,5 × 1,5	1,00	680	1,180	0,02
MGW07C	9,0	1,9	5,5	25	19	3,0	10	21,0	31,2	—	Ø1,2	M3 × 3	1,85	1,370	2,060	0,02
MGW07H							19	30,8	41,0					1,770	3,140	0,03
MGW09C	12,0	2,9	6,0	30	21	4,5	12	27,5	39,3	—	Ø1,4	M3 × 3	2,40	2,750	4,120	0,04
MGW09H							23	35,5	50,7					3,430	5,890	0,06
MGW12C	14,0	3,4	8,0	40	28	6,0	15	31,3	46,1	—	Ø2	M3 × 3,6	2,80	3,920	5,590	0,07
MGW12H							28	45,6	60,4					5,100	8,240	0,10
MGW15C	16,0	3,4	9,0	60	45	7,5	20	38,0	54,8	5,2	M3	M4 × 4,2	3,20	6,770	9,220	0,14
MGW15H							35	57,0	73,8					8,930	13,380	0,22

For dimensions of the rail, see Page 99, for standard as well as optional lubrication adapter, see Page 148.

The size MG02 and MG03 blocks are only available mounted on the profile rail.

### 3.5.13 Dimensions of the MG profile rail

#### 3.5.13.1 Dimensions MGN\_R

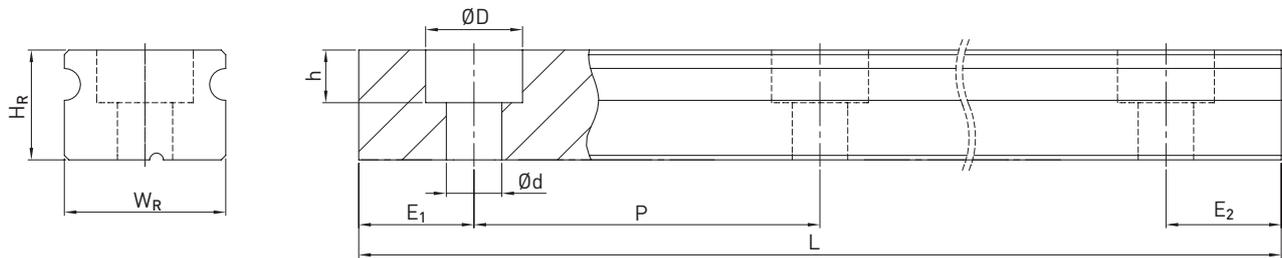


Table 3.81 Dimensions of profile rail MGN\_R

Series/size	Assembly screw for rail [mm]	Dimensions of the rail [mm]						Max. length [mm]	Max. length $E_1 = E_2$ [mm]	Min. length [mm]	$E_{1/2}$ min [mm]	$E_{1/2}$ max [mm]	Weight [kg/m]
		$W_R$	$H_R$	D	h	d	P						
MGNR02R	M1	2	2,0		M1		8	250	240	12	2	6	0,03
MGNR03R	M1,6	3	2,6		M1,6		10	250	240	14	2	8	0,05
MGNR05R	M2 × 6 <sup>1)</sup>	5	3,6	3,6	0,8	2,4	15	250	225	23	4	11	0,15
MGNR07R	M2 × 8	7	4,8	4,2	2,3	2,4	15	600	585	25	5	12	0,22
MGNR09R	M3 × 10	9	6,5	6,0	3,5	3,5	20	1,200	1,180	30	5	15	0,38
MGNR12R	M3 × 10	12	8,0	6,0	4,5	3,5	25	2,000	1,975	35	5	20	0,65
MGNR15R	M3 × 12	15	10,0	6,0	4,5	3,5	40	2,000	1,960	52	6	34	1,06

<sup>1)</sup> Special screw (Art.No. 20-000004)

#### 3.5.13.2 Dimensions MGW\_R

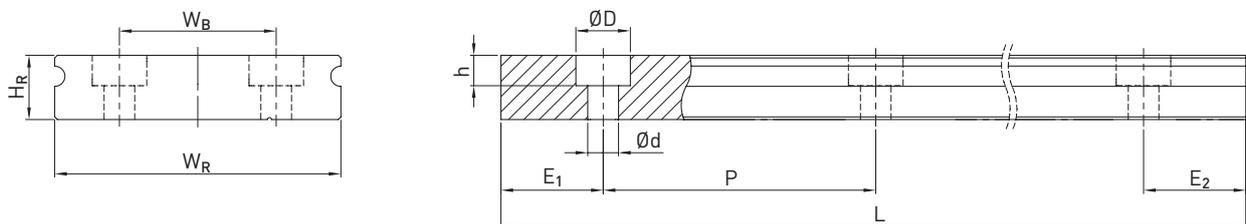


Table 3.82 Dimensions of profile rail MGW\_R

Series/size	Assembly screw for rail [mm]	Dimensions of the rail [mm]							Max. length [mm]	Max. length $E_1 = E_2$ [mm]	Min. length [mm]	$E_{1/2}$ min [mm]	$E_{1/2}$ max [mm]	Weight [kg/m]
		$W_R$	$H_R$	$W_B$	D	h	d	P						
MGWR02R	M1,6 <sup>3)</sup>	4	2,6	—	2,8	1,0	1,8	10	250	240	16	3	7	0,70
MGWR03R	M2	6	2,9	—	3,6	1,5	2,4	15	250	225	23	4	11	0,13
MGWR05R	M2,5 × 7 <sup>2)</sup>	10	4,0	—	5,5	1,6	3,0	20	250	220	30	5	11	0,34
MGWR07R	M3 × 8	14	5,2	—	6,0	3,2	3,5	30	600	570	40	5	24	0,51
MGWR09R	M3 × 10	18	7,0	—	6,0	4,5	3,5	30	2,000	1,950	40	5	24	0,91
MGWR12R	M4 × 12	24	8,5	—	8,0	4,5	4,5	40	2,000	1,960	52	6	32	1,49
MGWR15R	M4 × 16	42	9,5	23	8,0	4,5	4,5	40	2,000	1,960	52	6	32	2,86

<sup>2)</sup> Special screw (Art.No. 20-001741)

<sup>3)</sup> Special screw

Note:

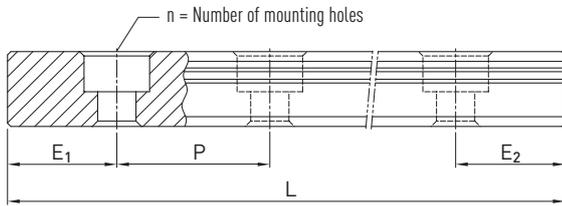
1. The tolerance for E is +0,5 to -1 mm for standard, for joint connections 0 to -0,3 mm.
2. If no information is provided on the  $E_{1/2}$  dimensions, the maximum number of mounting holes is determined taking into account  $E_{1/2}$  min.
3. The rails are shortened to the desired length. If no information on the  $E_{1/2}$  dimensions is provided, then the rails are manufactured symmetrically.

# Linear guideways

## MG series

### 3.5.13.3 Calculation of the length of profile rails

HIWIN offers profile rails in customised lengths. To make sure the end of the profile rail does not become unstable, the value E should not exceed half the distance between the mounting holes (P). At the same time, the value  $E_{1/2}$  should be between  $E_{1/2}$  min and  $E_{1/2}$  max so that the mounting hole does not break out.



F.3.16

$$L = (n - 1) \times P + E_1 + E_2$$

- L Total length of the profile rail [mm]
- n Number of mounting holes
- P Distance between two mounting holes [mm]
- $E_{1/2}$  Distance from the centre of the last mounting hole to the end of the profile rail [mm].

### 3.5.13.4 Cover caps for mounting holes of profile rails

The cover caps are used to keep the mounting holes free of chips and dirt. The standard plastic cover caps accompany each profile rail. Optional cover caps have to be ordered separately.

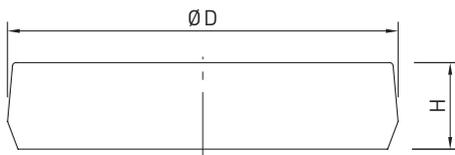


Table 3.83 Cover caps for mounting holes of profile rails

Rail	Screw	Article number		Ø D [mm]	Height H [mm]
		Plastic (200 units)	Brass <sup>2)</sup>		
MGNR09R	M3	5-002217 <sup>1)</sup>	5-001340 <sup>1)</sup>	6	1.2
MGNR12R	M3	5-002217	5-001340	6	1.2
MGNR15R	M3	5-002217	5-001340	6	1.2
MGWR09R	M3	5-002217	5-001340	6	1.2
MGWR12R	M4	5-002219	—	8	1.2
MGWR15R	M4	5-002219	—	8	1.2

<sup>1)</sup> Only possible with cylinder head screws with low head acc. to DIN 7984

<sup>2)</sup> Not recommended for coated rails.

### 3.5.14 Sealing system

By default, the blocks of the MG series are equipped with an end seal on both sides to protect against contamination. In addition, sealing strips for the underside of the block can be ordered by adding the code "+U" to the article number. They are optionally available for sizes 12 and 15. For sizes 5, 7 and 9, they cannot be mounted due to limited installation space  $H_1$ . When installing a bottom seal, the lateral mounting surface of the profile rail must not exceed  $H_1$ .

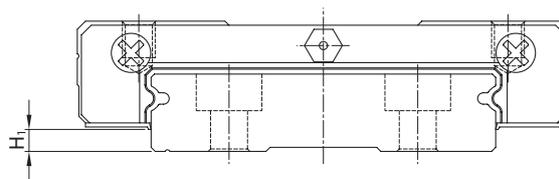


Table 3.84 Installation space  $H_1$

Series/size	Bottom seal	$H_1$	Series/size	Bottom seal	$H_1$
—	—	—	MGW02	—	—
MGN03	—	—	MGW03	—	—
MGN05	—	—	MGW05	—	—
MGN07	—	—	MGW07	—	—
MGN09	—	—	MGW09	—	—
MGN12	●	2.0	MGW12	●	2.6
MGN15	●	3.0	MGW15	●	2.6

### 3.5.15 Long-term lubrication unit

Further information on the lubrication unit can be found in the general information in the "Long-term lubrication unit" section on Page 15. The following drawing shows the dimension (L) for a two-sided lubrication unit. The lubrication unit is always mounted on both sides.

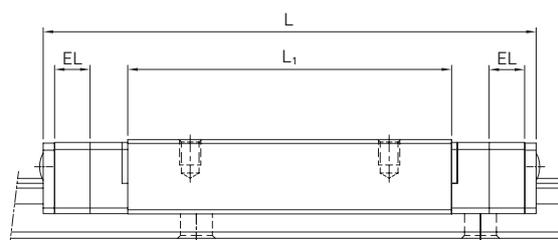


Table 3.85 Dimensions of the block with lubrication unit EL

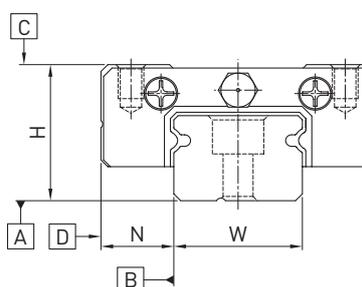
Block model	Dimensions [mm]			Max. running performance <sup>2)</sup> [km] EL on both sides
	EL	$L_1$	$L^{1)}$	
MGN07C	3,5	13,5	29,5	10.000
MGN07H		21,8	37,8	
MGN09C	5	18,9	38,9	10.000
MGN09H		29,9	49,9	
MGN12C	5	21,7	44,7	10.000
MGN12H		32,4	55,4	
MGW09C	5	27,5	49,3	10.000
MGW09H		38,5	60,7	
MGW12C	5	31,3	56,1	10.000
MGW12H		45,6	70,4	

<sup>1)</sup> Total length with selected dust protection. SS = Standard dust protection

<sup>2)</sup> Further details can be found in the assembly instructions in the "Lubrication" chapter

### 3.5.16 Tolerances depending on the accuracy class

The MG series are available in three accuracy classes according to the parallelism between block and rail, height accuracy H and width accuracy N. The selection of the accuracy class is determined by the requirements of the machine.



# Linear guideways

## MG series

### 3.5.16.1 Parallelism

Parallelism of locating surfaces D and B of the block and rail and of top block surface

C to mounting surface A of the rail. Ideal installation of the linear guideway and the measurement in the centre of the block are prerequisites.

Table 3.86 Tolerance of parallelism between block and profile rail

Rail length [mm]	Accuracy class		
	C	H	P
- 50	12	6	2.0
50 - 80	13	7	3.0
80 - 125	14	8	3.5
125 - 200	15	9	4.0
200 - 250	16	10	5.0
250 - 315	17	11	5.0
315 - 400	18	11	6.0
400 - 500	19	12	6.0
500 - 630	20	13	7.0
630 - 800	22	14	8.0
800 - 1000	23	16	9.0
1000 - 1200	25	18	11.0
1200 - 1300	25	18	11.0
1300 - 1400	26	19	12.0
1400 - 1500	27	19	12.0
1500 - 1600	28	20	13.0
1600 - 1700	29	20	14.0
1700 - 1800	30	21	14.0
1800 - 1900	30	21	15.0
1900 - 2000	31	22	15.0

Unit:  $\mu\text{m}$

**3.5.16.2 Accuracy – height and width**

**Height tolerance of H**

Permissible absolute dimension deviation of height H, measured between the centre of bolting surface C and rail underside A, with any position of the block on the rail.

**Height variance of H**

Permissible deviation of height H between several blocks on one rail, measured at the same position of the rail.

**Width tolerance of N**

Permissible absolute dimension deviation of width N, measured between the centre of bolting surfaces D and B, with any position of the block on the rail.

**Width variance of N**

Permissible deviation of width N between several blocks on one rail, measured at the same position of the rail.

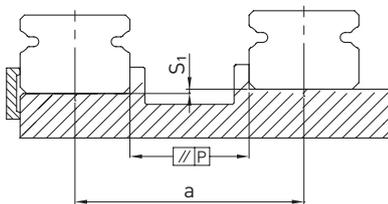
Table 3.87 Tolerances of width and height

Series/size	Accuracy class	Height tolerance of H	Width tolerance of N	Height variance of H	Width variance of N
MG_02 – MG_15	C (Normal)	± 0.04	± 0.04	0.03	0.03
	H (high)	± 0.02	± 0.025	0.015	0.02
	P (precision)	± 0.01	± 0.015	0.007	0.01

Unit: mm

**3.5.16.3 Permissible tolerances of the mounting surface**

Once the requirements for the accuracy of the mounting surfaces are met, the high accuracy, rigidity and service life of the GG series linear guideways are achieved.



# Linear guideways

## MG series

### Tolerance of parallelism of reference surface (P):

Table 3.88 Maximum tolerance for parallelism (P)

Series/Size	Preload class		
	ZF	Z0	Z1
MG_02	2	2	2
MG_03	2	2	2
MG_05	2	2	2
MG_07	3	3	3
MG_09	4	4	3
MG_12	9	9	5
MG_15	10	10	6

Unit:  $\mu\text{m}$

### Tolerance of height of reference surface ( $S_1$ ):

**F 3.17**  $S_1 = a \times K$

$S_1$  Maximum height tolerance [mm]  
 $a$  Distance between rails [mm]  
 $K$  Coefficient of height tolerance

Table 3.89 Coefficient of height tolerance (K)

Series/Size	Preload class		
	ZF	Z0	Z1
MG_05	$0.4 \times 10^{-4}$	$0.4 \times 10^{-4}$	$0.04 \times 10^{-4}$
MG_07	$0.5 \times 10^{-4}$	$0.5 \times 10^{-4}$	$0.06 \times 10^{-4}$
MG_09	$0.7 \times 10^{-4}$	$0.7 \times 10^{-4}$	$0.12 \times 10^{-4}$
MG_12	$1.0 \times 10^{-4}$	$1.0 \times 10^{-4}$	$0.24 \times 10^{-4}$
MG_15	$1.2 \times 10^{-4}$	$1.2 \times 10^{-4}$	$0.40 \times 10^{-4}$

Table 3.90 Requirements for the mounting surface

Series/Size	Required flatness of the mounting surface
MG_02	0,012/200
MG_03	0,012/200
MG_05	0.015/200
MG_07	0.025/200
MG_09	0.035/200
MG_12	0.050/200
MG_15	0.060/200

Note: The values in the table apply to preload classes ZF and Z0. For Z1 or if more than one rail is mounted on the same surface, the table values must be at least halved.

**3.5.17 Shoulder heights and edge roundings**

Inaccurate shoulder heights and edge roundings of mounting surfaces impair accuracy and may conflict with the block or rail profile. The following shoulder heights and edge profiles must be observed to avoid assembly problems.

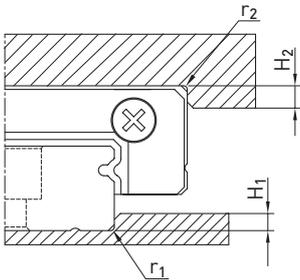
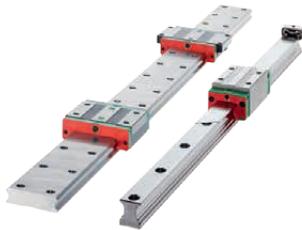


Table 3.91 Shoulder heights and edge roundings

Series/Size	Max. radius of edges $r_1$	Max. radius of edges $r_2$	Shoulder height of $H_1$	Shoulder height of $H_2$
MGN02	0,1	0,2	0,5	1,5
MGN03	0,1	0,2	0,6	1,5
MGN05	0,1	0,2	1,2	2
MGN07	0,2	0,2	1,2	3
MGN09	0,2	0,3	1,7	3
MGN12	0,3	0,4	1,7	4
MGN15	0,5	0,5	2,5	5
MGW02	0,1	0,2	0,6	2,0
MGW03	0,1	0,2	0,6	2,0
MGW05	0,1	0,2	1,2	2
MGW07	0,2	0,2	1,7	3
MGW09	0,3	0,3	2,5	3
MGW12	0,4	0,4	3,0	4
MGW15	0,4	0,8	3,0	5

Unit: mm

# We live motion.



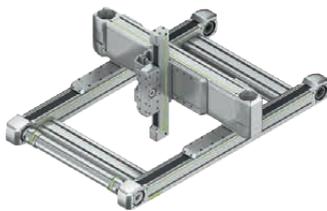
Linear Guideways



Ballscrews



Linear Axes



Linear Axis Systems



Torque Motors



Robots



Linear Motors



Rotary Tables



Drives & Servo Motors

## Germany

HIWIN GmbH  
Brücklesbünd 1  
D-77654 Offenburg  
Phone +49 (0) 7 81 9 32 78 - 0  
Fax +49 (0) 7 81 9 32 78 - 90  
info@hiwin.de  
www.hiwin.de

## Taiwan

Headquarters  
HIWIN Technologies Corp.  
No. 7, Jingke Road  
Taichung Precision Machinery Park  
Taichung 40852, Taiwan  
Phone +886-4-2359-4510  
Fax +886-4-2359-4420  
business@hiwin.tw  
www.hiwin.tw

## Taiwan

Headquarters  
HIWIN Mikrosystem Corp.  
No. 6, Jingke Central Road  
Taichung Precision Machinery Park  
Taichung 40852, Taiwan  
Phone +886-4-2355-0110  
Fax +886-4-2355-0123  
business@hiwinmikro.tw  
www.hiwinmikro.tw

## France

HIWIN GmbH  
4, Impasse Joffre  
F-67202 Wolfisheim  
Phone +33 (0) 3 88 28 84 80  
contact@hiwin.fr  
www.hiwin.fr

## Italy

HIWIN Srl  
Via Pitagora 4  
I-20861 Brugherio (MB)  
Phone +39 039 287 61 68  
Fax +39 039 287 43 73  
info@hiwin.it  
www.hiwin.it

## Poland

HIWIN GmbH  
ul. Puławska 405a  
PL-02-801 Warszawa  
Phone +48 22 544 07 07  
Fax +48 22 544 07 08  
info@hiwin.pl  
www.hiwin.pl

## Switzerland

HIWIN Schweiz GmbH  
Eichwiesstrasse 20  
CH-8645 Jona  
Phone +41 (0) 55 225 00 25  
Fax +41 (0) 55 225 00 20  
info@hiwin.ch  
www.hiwin.ch

## Slovakia

HIWIN s.r.o., o.z.z.o.  
Mládežnícka 2101  
SK-01701 Považská Bystrica  
Phone +421 424 43 47 77  
Fax +421 424 26 23 06  
info@hiwin.sk  
www.hiwin.sk

## Czech Republic

HIWIN s.r.o.  
Medkova 888/11  
CZ-62700 Brno  
Phone +42 05 48 528 238  
Fax +42 05 48 220 223  
info@hiwin.cz  
www.hiwin.cz

## Netherlands

HIWIN GmbH  
info@hiwin.nl  
www.hiwin.nl

## Austria

HIWIN GmbH  
info@hiwin.at  
www.hiwin.at

## Romania

HIWIN Srl  
info@hiwin.ro  
www.hiwin.ro

## Slovenia

HIWIN Srl  
info@hiwin.si  
www.hiwin.si

## Hungary

HIWIN GmbH  
info@hiwin.hu  
www.hiwin.hu

## Denmark

HIWIN GmbH  
info@hiwin.dk  
www.hiwin.dk

## China

HIWIN Corp.  
www.hiwin.cn

## Japan

HIWIN Corp.  
info@hiwin.co.jp  
www.hiwin.co.jp

## USA

HIWIN Corp.  
info@hiwin.com  
www.hiwin.com

## Korea

HIWIN Corp.  
www.hiwin.kr

## Singapore

HIWIN Corp.  
www.hiwin.sg