HIWIN®

Linear Guideways

Linear Guideways
Accessories

www.hiwin.de

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

Note:
The technical data in this catalogue may
be changed without prior notice.

Linear guideways

Linear guideways & accessories

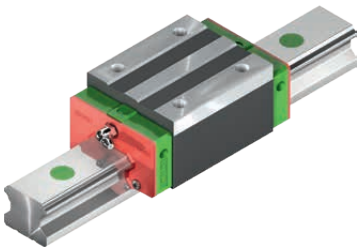
A linear guideway makes it possible to move in a linear motion with rolling elements. The use of balls and rollers between the rail and block in a linear guideway makes precise linear movements possible. Compared with a standard sliding guide, the friction coefficient here is just one fiftieth. The high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

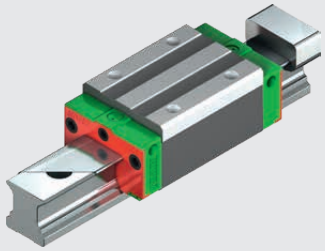
Contents

1. Product overview



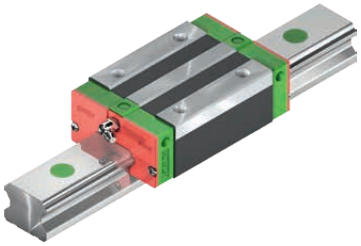
Linear guideway of HG and QH series Page 30

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



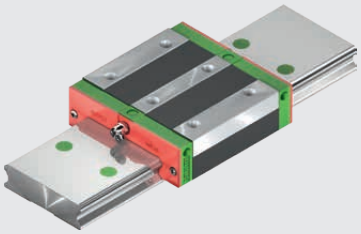
Linear guideway CG series Page 48

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



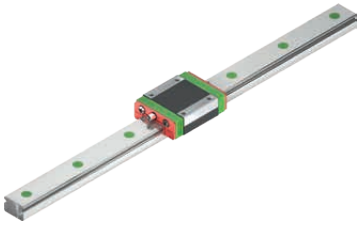
Linear guideway of EG and QE series Page 66

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



Linear guideway of WE and QW series Page 80

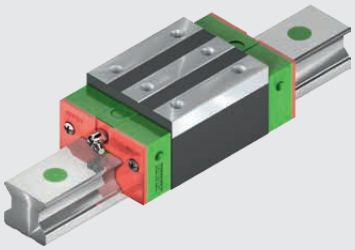
- Wide type
- For maximum torque loads
- Block with SynchMotion™ technology (QW series)



Linear guideway MG series

Page 92

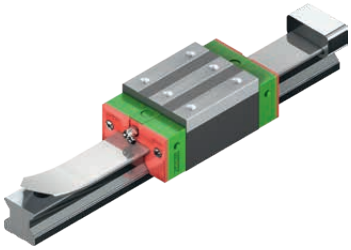
- Thin and wide design
- Miniature type for the most compact applications
- Dual-row linear guideways



Linear guideway of RG and QR series

Page 106

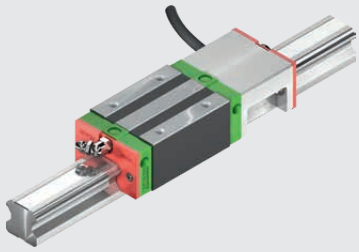
- Roller guides for heavy-duty applications
- With maximum requirements on load ratings and torque capacity
- Block with SynchMotion™ technology (QR series)



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

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 (δ) 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

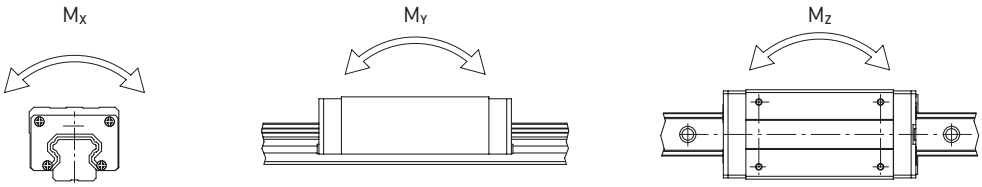
2.3 Load ratings

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 × 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

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

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 [1] (HG, QH, EG, QE, CG, WE, QW, MG) or 100 km [1] (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.

[1] 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 km = 1.26 × C_{dyn} 100 km (HG, QH, EG, QE, CG, WE, QW, MG series)
C_{dyn} 50 km = 1.23 × C_{dyn} 100 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

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

RG, QR series:

F 2.3

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

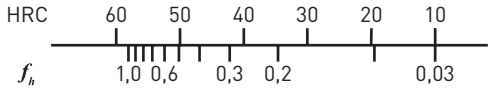
L	Nominal service life [km]
C_{dyn}	Dynamic load rating [N]
P	Dynamic equivalent load [N]

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.

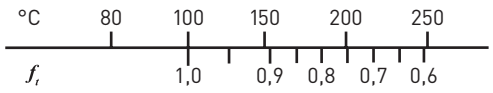
Hardness factor (f_h)

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.



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.

Table 2.2 **Load factor**

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

RG, QR series:

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

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

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

RG, QR series:

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

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

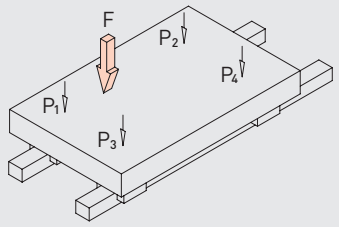
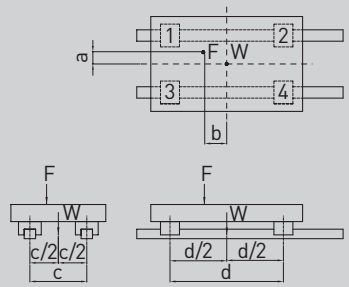
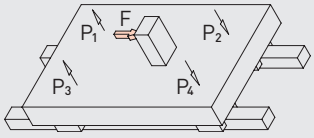
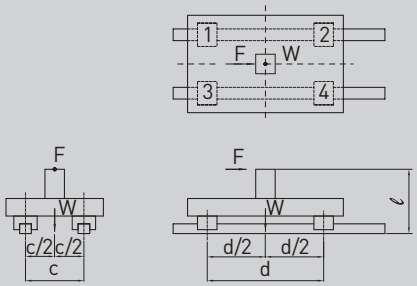
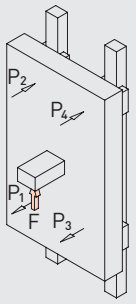
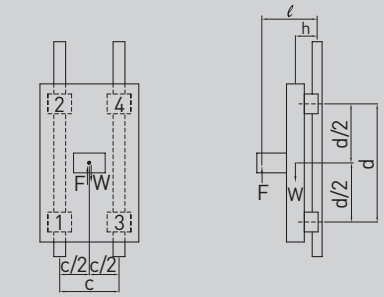
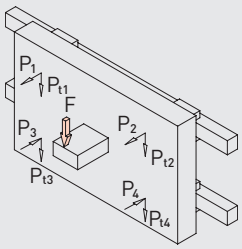
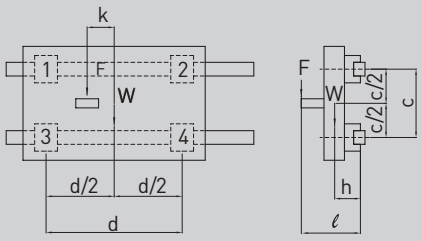
2.5 Operating load

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

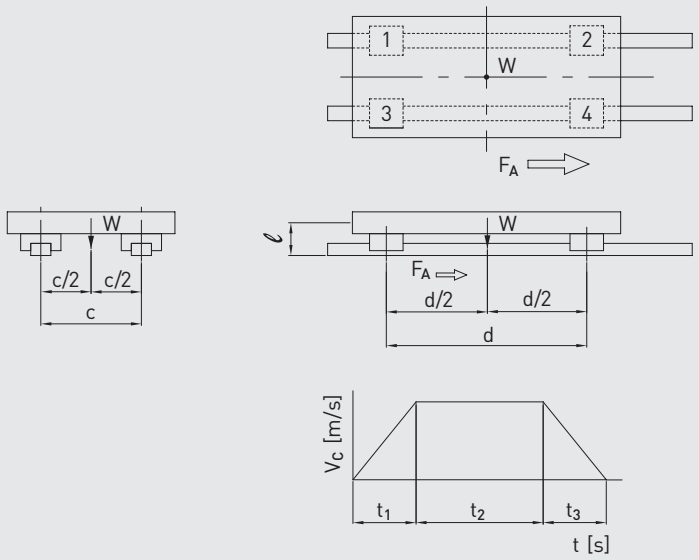
Table 2.3 **Examples of the calculation of the load on a block**

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

$P_1 \ldots P_4$ 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

Load and mass inertia

Table 2.4 **Examples of the calculation of load and mass inertia**

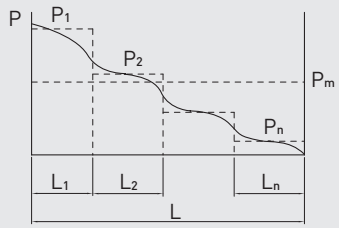
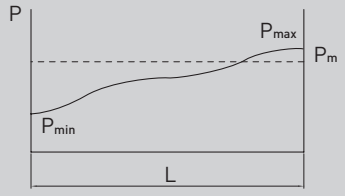
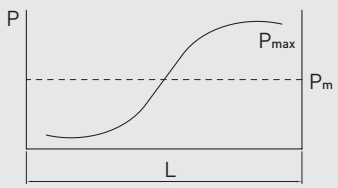
Consideration of acceleration and braking	Load on a block
	○ Constant velocity $P_1 \ldots P_4 = \frac{W}{4}$ ○ Acceleration $P_1 = P_3 = \frac{W}{4} + \frac{1}{2} \times \frac{W}{g} \times \frac{v_c}{t_1} \times \frac{l}{d}$ $P_2 = P_4 = \frac{W}{4} - \frac{1}{2} \times \frac{W}{g} \times \frac{v_c}{t_1} \times \frac{l}{d}$ ○ Braking $P_1 = P_3 = \frac{W}{4} - \frac{1}{2} \times \frac{W}{g} \times \frac{v_c}{t_3} \times \frac{l}{d}$ $P_2 = P_4 = \frac{W}{4} + \frac{1}{2} \times \frac{W}{g} \times \frac{v_c}{t_3} \times \frac{l}{d}$

$P_1 \ldots P_4$ Load on a single block [N]
W Weight of load [N]
F Movement force
F_A Reaction force
g Gravitational acceleration [m/s²]
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)**

Step-wise change	Uniform change	Sinusoidal change
		
$P_m = \sqrt[3]{\frac{1}{L}\left(P_1^3 \times L_1 + P_2^3 \times L_2 + \ldots + P_n^3 \times L_n\right)}$	$P_m = \frac{1}{3}\left(P_{min} + 2 \times P_{max}\right)$	$P_m = 0{,}65 \times P_{max}$

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 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 2.8

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

F	Frictional force [N]
S	Frictional resistance [N]
μ	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:

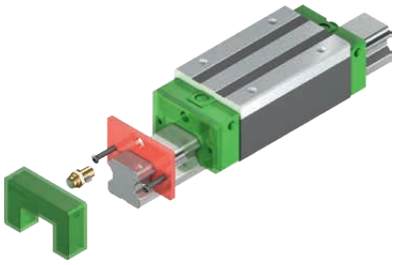
- HIWIN G01: Heavy-duty applications
- HIWIN G02: Clean room and vacuum applications
- HIWIN G03 Clean room and vacuum applications with high velocities
- HIWIN G04: Applications with high speeds
- HIWIN G05: Standard applications
- HIWIN G06: Short stroke and high frequency applications
- HIWIN G07: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

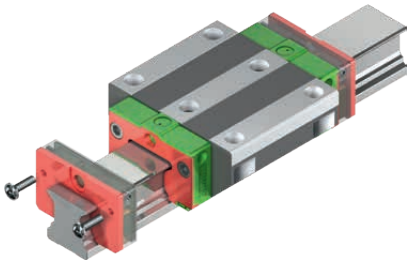
Information on HIWIN lubricants can be found in the Accessories chapter on Page 149. Detailed information on HIWIN lubricants and lubrication of the linear guideways can be found in the **"Linear guideways"** assembly instructions at www.hiwin.de.

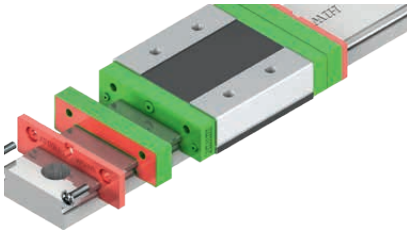
2.6.3 Long-term lubrication unit

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 °C to +60 °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

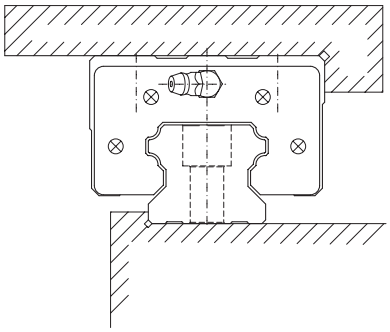
- Machine tools
- Production machines: Injection moulding machines, paper industry, textile machines, food industry, woodworking machines
- Electronics industry: Semiconductor industry, robotics, cross tables, measuring and testing machines
- Other areas: Medical equipment, automation, handling technology

2.7 Installation position

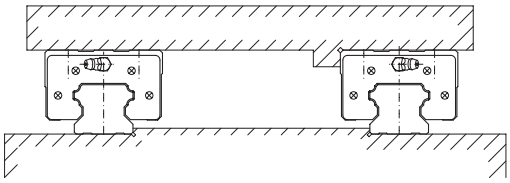
2.7.1 Examples of typical installation positions

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.

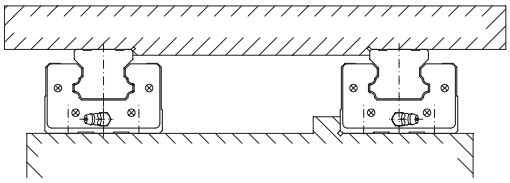
A profile edge at a reference edge:
The reference edge is marked by arrows on the top of the rail. For very short rail sections, the marking is on the front side of the rail.



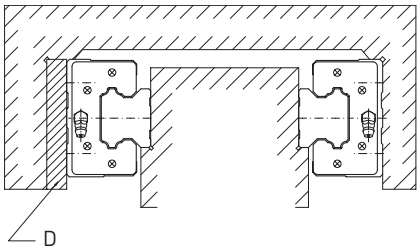
Two profile rails with moving block:



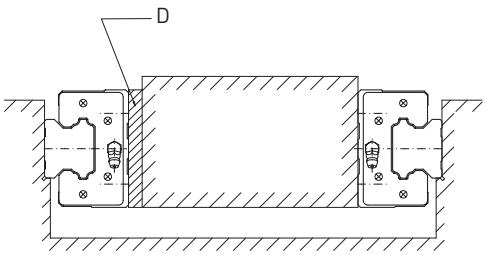
Two profile rails with fixed block:



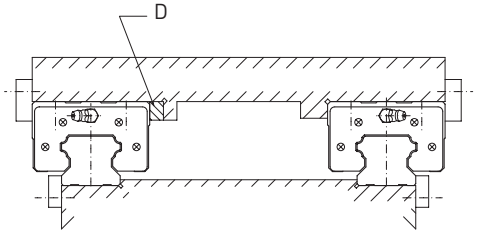
Two external blocks:



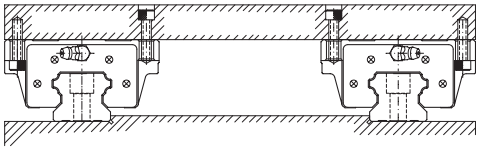
Two internal blocks:



Structure with assembled surface:



Block model HGW_C with different mounting directions:



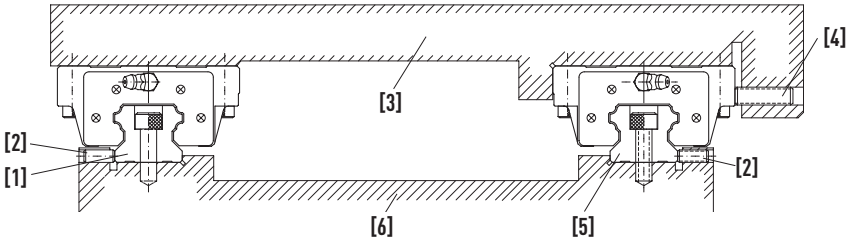
D Spacer

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.

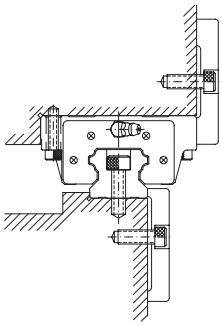


[1] Follow-on side
[2] Guide clamping screw
[3] Carriage
[4] Block clamping screw
[5] Reference side
[6] Machine bed

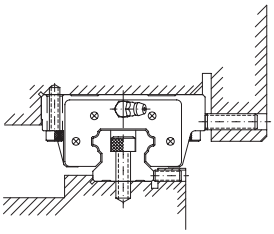
2.8.1.1 Mounting types

The following four mounting types are recommended.

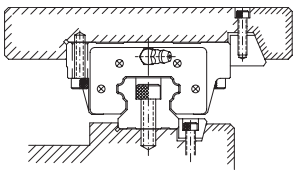
Mounting with a clamping plate:



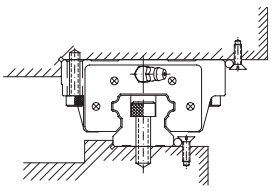
Mounting with clamping screws:



Mounting with terminal blocks:

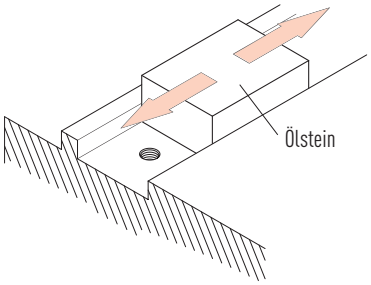


Mounting with needle rollers:

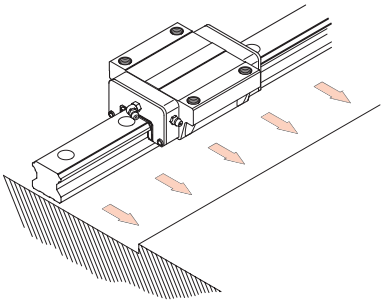


2.8.1.2 Assembly of the profile rails

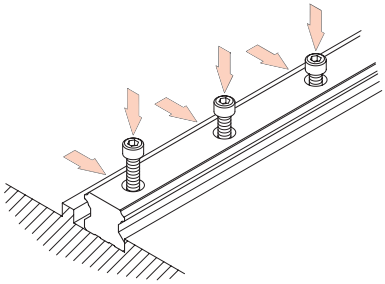
1) Before starting, remove all dirt from the surface of the machine



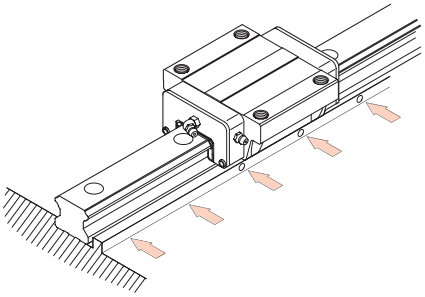
2) Carefully place the profile rail on the bed and hold it firmly against the reference edge



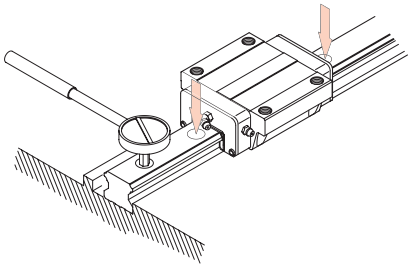
3) When aligning the profile rail on the bed, check whether the threads of the inserted screws engage



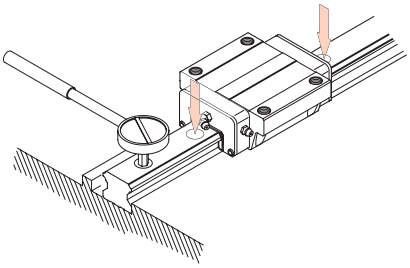
4) Tighten clamping screws one after the other to ensure good contact between the profile rail and the reference edge



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

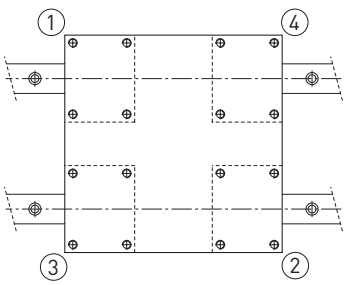


6) Mount the second profile rail in the same way



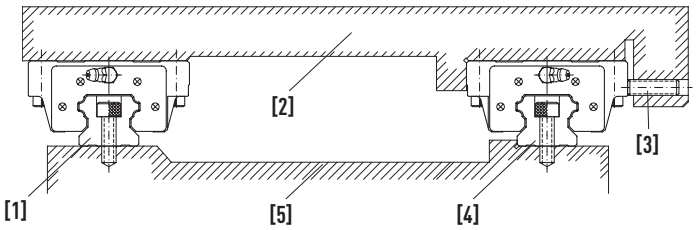
2.8.1.3 Mounting the block

- 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

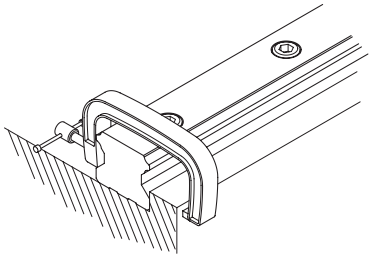
To ensure parallelism between the reference and follow-on rail without clamping screws, the following methods are recommended for mounting. The installation of the block remains as previously described.



[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

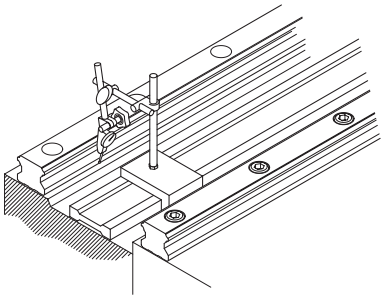
Place the guideway on the mounting surface of the machine bed. Lightly tighten the fixing screws and then press the guideway against the reference edge of the machine bed using a screw clamp. Then tighten the fixing screws one after the other to the specified torque.



2.8.2.2 Mounting the profile rail on the follow-on side

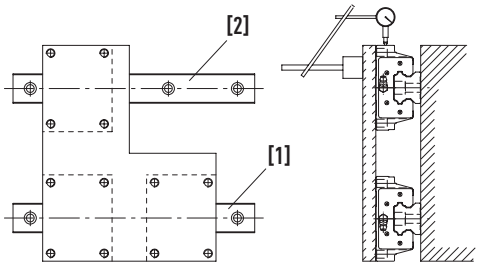
Align to a ruler:

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.



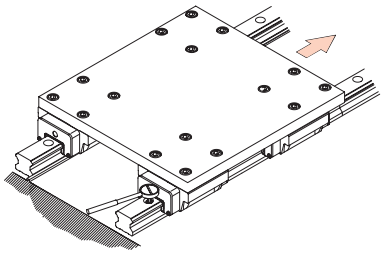
With the help of a plate:

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.

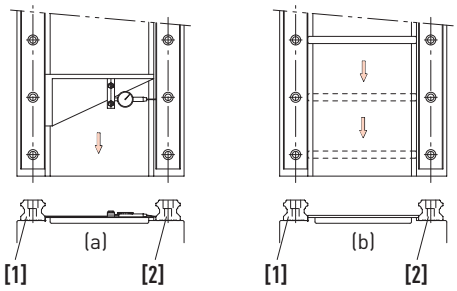


[1] Reference rail
[2] Follow-on rail

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.

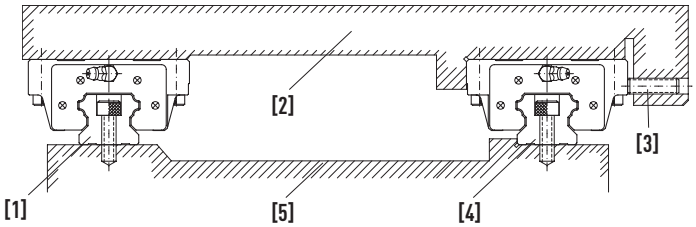


With the help of a gauge:
Determine the position of the follow-on rail using a special gauge and tighten the fixing screws with the specified torque.



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

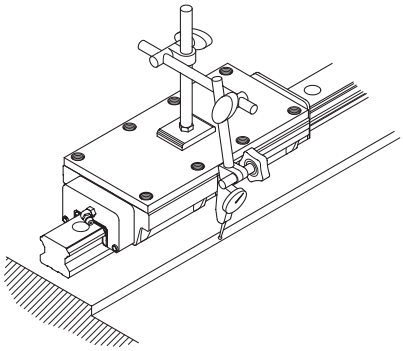
2.8.3 Mounting the profile rails without reference edge and without clamps
To ensure parallelism of the reference and follow-on rail even without a reference edge on the reference side, the following type of mounting is recommended. Mounting of the block remains as previously described.



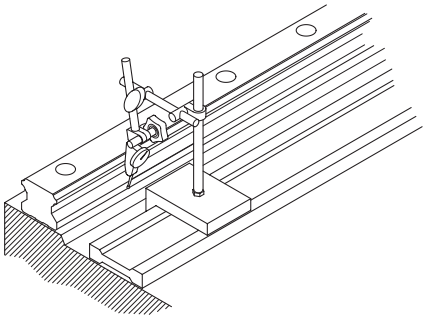
[1] Follow-on rail
[2] Carriage
[3] Block clamping screw
[4] Reference rail
[5] Machine bed

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.

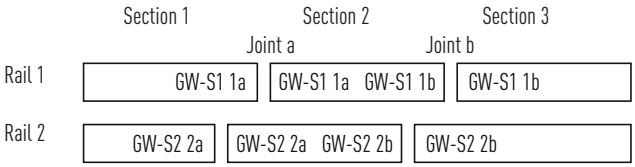


Align to a ruler:
Align the rail from end to end using a dial gauge on a ruler. Make sure to tighten the fixing screws firmly one after the other.
The assembly of the follow-on rail corresponds to the procedure of section 2.8.2.2, "Mounting the profile rail on the follow-on side".



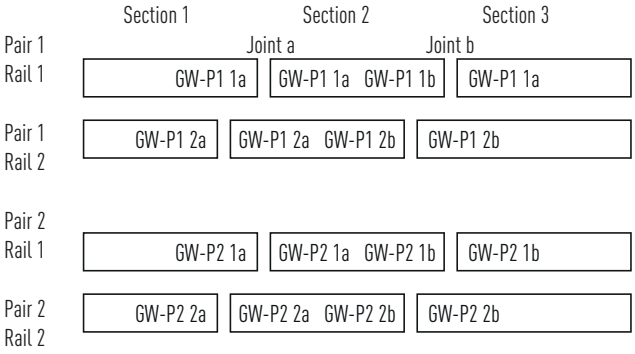
2.8.4 Attached profile rails

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.

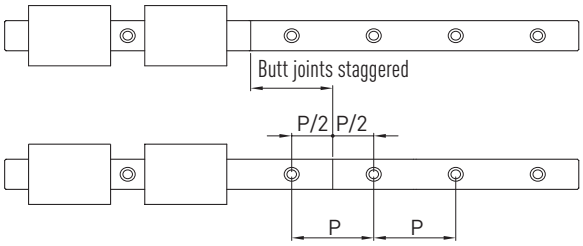


Each joint is labelled on the top of the rail. The label serves as an aid for initial assembly and can be removed at any time without leaving any residue.

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.



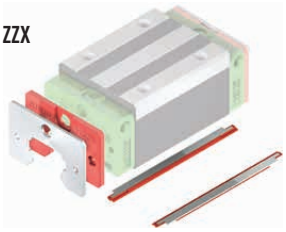
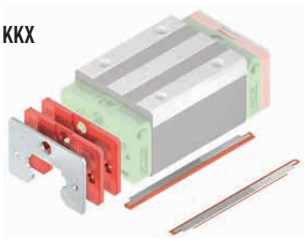
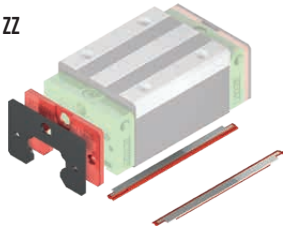
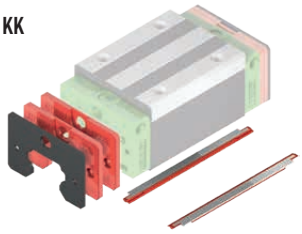
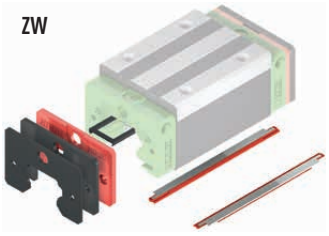
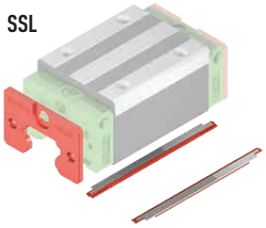
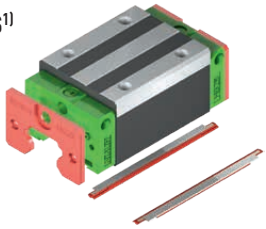
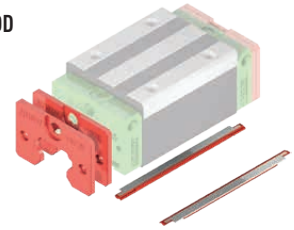
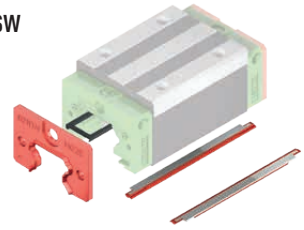
2.8.5 Tightening torques of the fixing screws

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.

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
Scraper (Air gap 0.1 – 0.2 mm)		**ZZX** 	**KKX** 	**ZWX** 
Scraper (Air gap 0.4 – 0.5 mm)		**ZZ** 	**KK** 	**ZW** 
Without scraper	**SSL** 	**SS**[1] 	**DD** 	**SW** 

Protection of the end seal from mechanical damage

Sealing effect and displacement resistance higher

[1] 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**

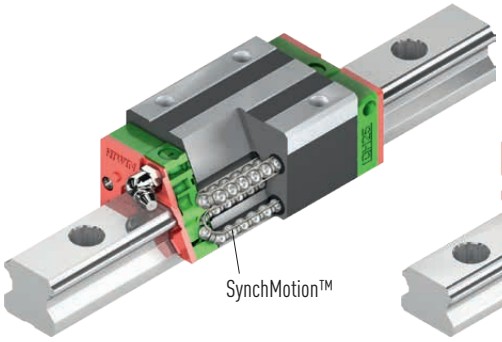
	ZZX See SS, additionally sharp-edged particles, possibly also hot particles or particles adhering to the rail ≥ 0.2 mm, e.g. chips, welding beads Typical applications: ○ Turning, milling, drilling ○ Welding applications	**KKX** See DD, additionally sharp-edged particles, possibly also hot particles or particles adhering to the rail ≥ 0.2 mm, e.g. chips, welding beads Typical applications: ○ See ZWX	**ZWX** See SW, additionally sharp-edged particles, possibly also hot particles or particles adhering to the rail ≥ 0.2 mm, e.g. chips, welding beads Typical applications: ○ CNC machining centre ○ Woodworking (e.g. MDF)
	ZZ See SS, additionally sharp-edged particles, possibly also hot particles or particles adhering to the rail ≥ 0.4 mm, e.g. chips, welding beads Typical applications: ○ Turning, milling, drilling ○ Welding applications	**KK** See DD, additionally sharp-edged particles, possibly also hot particles or particles adhering to the rail ≥ 0.4 mm, e.g. chips, welding beads Typical applications: ○ See ZW	**ZW** See SW, additionally sharp-edged particles, possibly also hot particles or particles adhering to the rail ≥ 0.4 mm, e.g. chips, welding beads Typical applications: ○ Turning, milling, drilling (with cooling lubricants) ○ Solid wood processing with coarse chips
SSL For applications with very low dirt and dust exposure Typical applications: ○ Measuring technology ○ Testing technology	**SS (standard variants)** For applications with low dirt and dust exposure Typical applications: ○ Automation technology ○ Pick & place ○ Handling	**DD** For applications with heavy dirt and dust exposure (alternatively if SW is not available) Typical applications: ○ See SW	**SW** For applications with heavy dirt and dust exposure, especially very fine dust and cooling lubricants Typical applications: ○ Wood, stone, glass processing ○ Grinding machines

2.10 SynchMotion™ technology

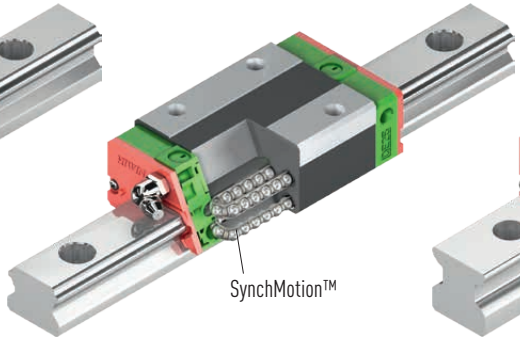
The innovative SynchMotion™ technology reduces contact between the rolling elements and the block. Similar to the ball cage of a standard ball bearing, the rolling elements are kept at a defined distance from each other by SynchMotion™ technology. Counter-rotating friction, as occurs in conventional 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:

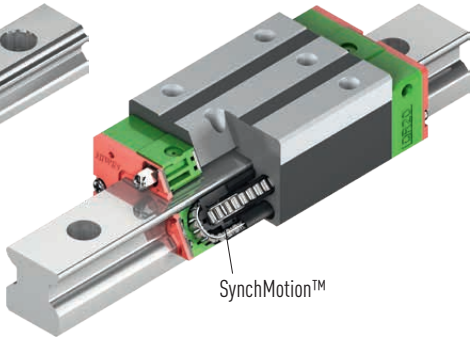
- Improved synchronous performance
- Optimised for high travel speeds
- Improved lubrication properties
- Reduced running noise
- Higher dynamic load rating



QH series



QE series



QR series

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.

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.

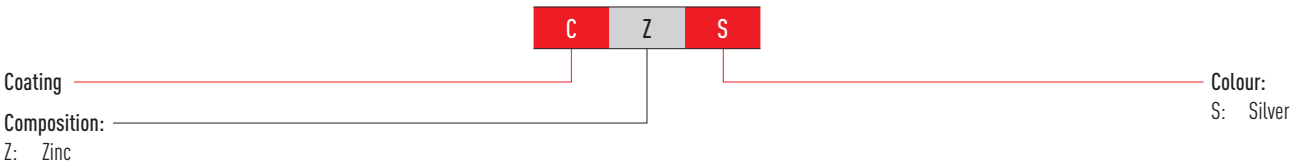
Specific features:

- 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.

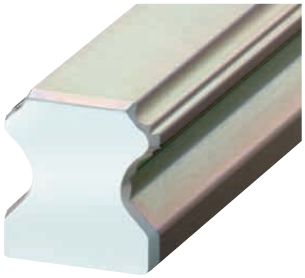


Fig. 2.1 **Rail end preserved with zinc spray**

Fig. 2.2 **Joint uncoated**

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.

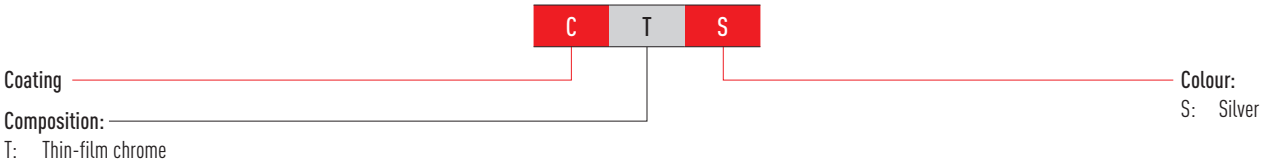
Specific features:

- 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.

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.

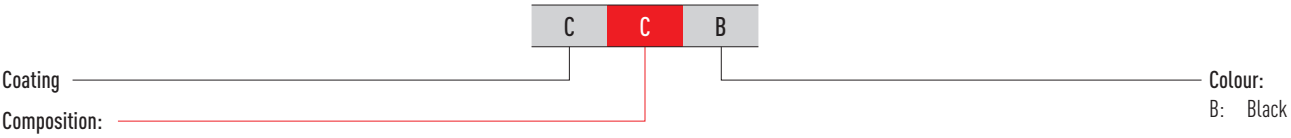
Specific features:

- 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

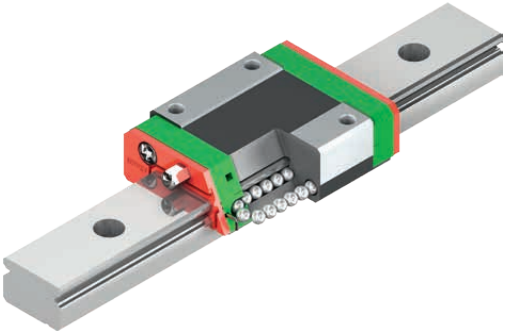
3.5 MG series

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



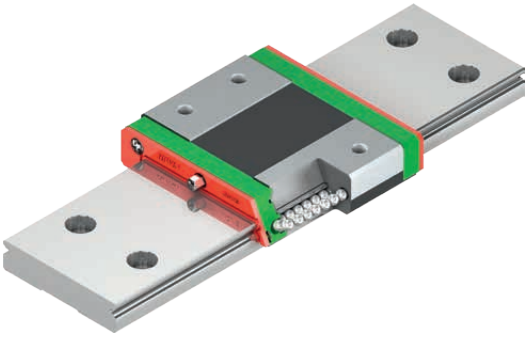
Layout of MGN series

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

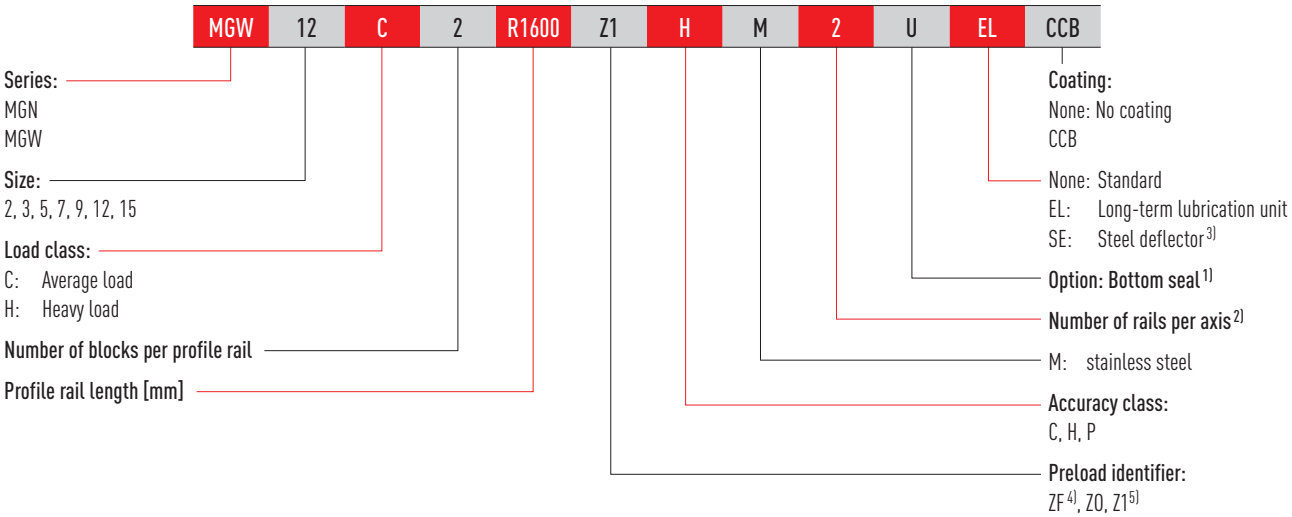
3.5.5 Applications of MG series

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.

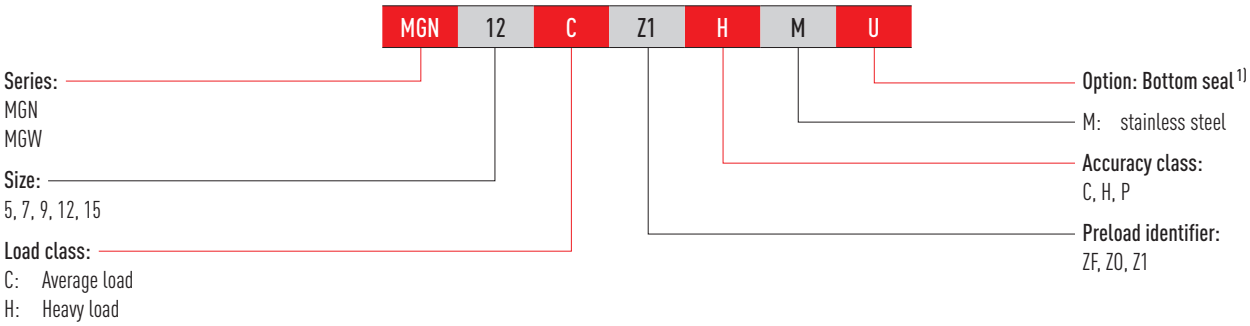
3.5.6 Order codes of MG series

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.

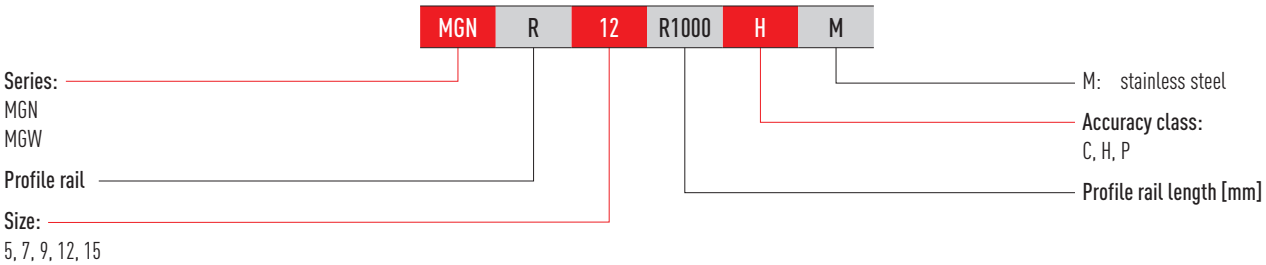
Order code for linear guideway (assembled)



Order number of block (not assembled)



Order number of profile rail (not assembled)



Note:

1) Available for MGN and MGW series in sizes 12 and 15.

2) 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.

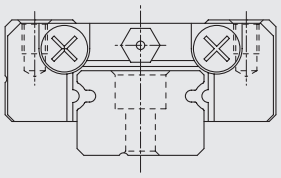
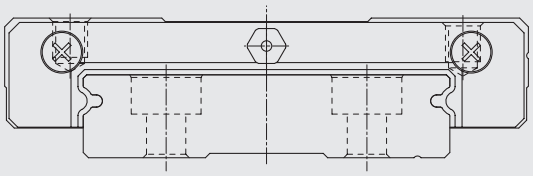
3) Available for MGN07, 09, 12, 15 and MGW12, 15.

4) Not available for paired rails and MG05.

5) Not available for MG02 and MG03.

3.5.7 Block types

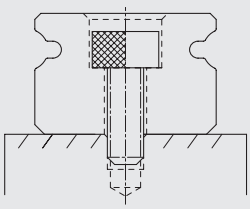
Table 3.73 **Block types**

Type	Series/size	Layout	Height [mm]	Typical applications
Narrow type	MGN-C MGN-H		3,2 – 16	○ Printers ○ Robots ○ Precision measuring equipment ○ Semiconductor industry
Wide type	MGW-C MGW-H		4 – 16	

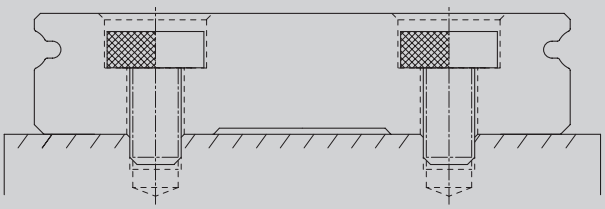
3.5.8 Profile rail types

Table 3.74 **Profile rail types**

Fastening from above

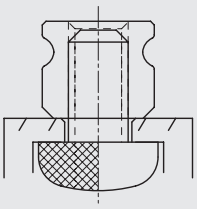


MGN_R



MGW_R

Fastening from below



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 [1]	Slight backlash: 4 – 10 µm	C, H
Z0	Reduced play to very light preload: 0 – 3 µm	C – P
Z1 [2]	Light preload: 0 – 0.02 C_{dyn}	C – P

[1] Not available for size 5
[2] Not available for size 2 and 3

3.5.10 Load ratings and torques

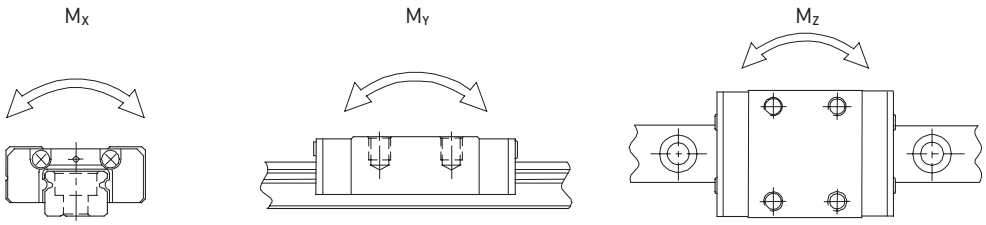


Table 3.76 **Load ratings and torques for MG series**

Series/Size	Dynamic load rating C_{dyn} [N] [1]	Static load rating C_0 [N]	Static moment [Nm]		
			M_{0X}	M_{0Y}	M_{0Z}
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

[1] Dynamic load rating for 50,000 m travel path

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

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

- δ Deformation [µm]
- P Operating load [N]
- k Rigidity value [N/µm]

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/µm

Table 3.78 **Radial rigidity of MGW series**

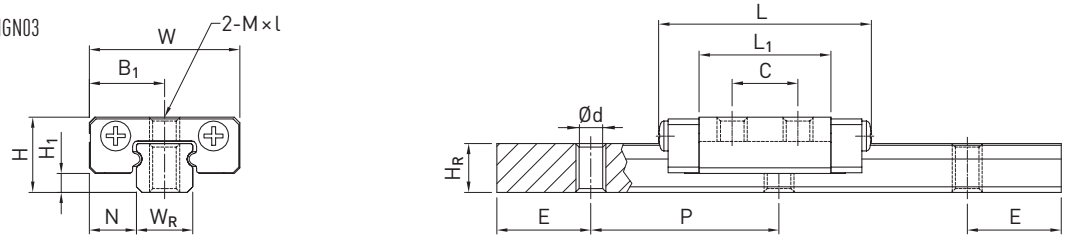
Load type	Series/ Size	Rigidity depending on the preload	
		Z0	**Z1**
Average load	**MGW07C**	38	49
	MGW09C	55	71
	MGW12C	63	81
	MGW15C	78	101
Heavy load	**MGW07H**	54	70
	MGW09H	74	95
	MGW12H	89	114
	MGW15H	113	145

Unit: N/µm

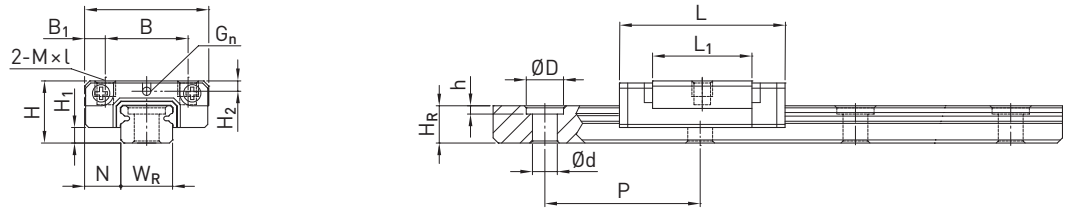
3.5.12 Dimensions of the MG blocks

3.5.12.1 MGN

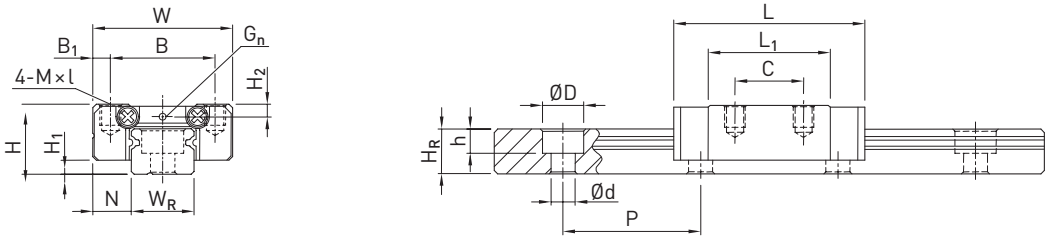
MGN02, MGN03



MGN05



MGN07, MGN09, MGN12



MGN15

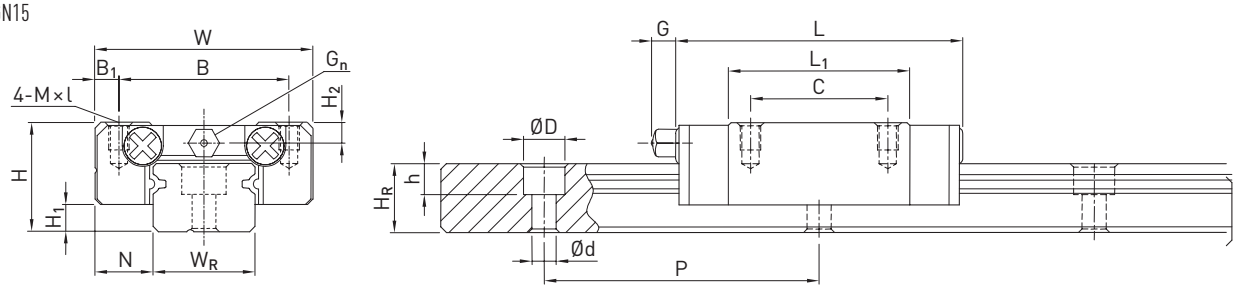


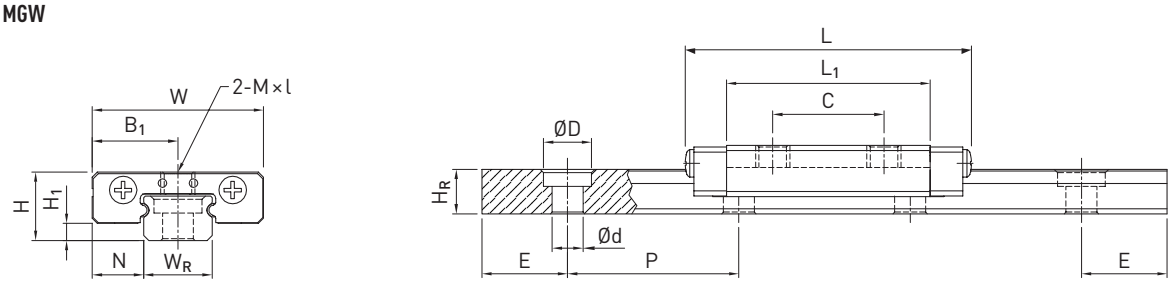
Table 3.79 **Dimensions of the block**

Series/size	Installation dimensions [mm]			Dimensions of the block [mm]										Load ratings [N]		Weight [kg]
	H	H_1	N	W	B	B_1	C	L_1	L	G	G_n	M × l	H_2	C_{dyn}	C_0	
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	—	Ø0.8	M2 × 1.5	1.0	540	840	0.008
MGN05H							—	12.6	19.0	—				670	1,080	0.010
MGN07C	8	1.5	5.0	17	12	2.5	8	13.5	22.5	—	Ø1.2	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	—	Ø1.4	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	—	Ø2	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

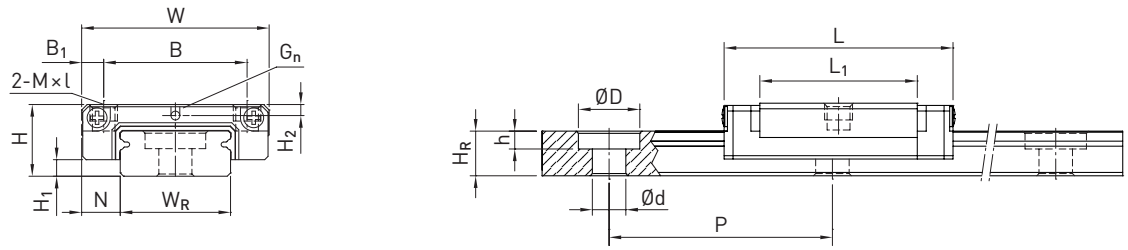
For dimensions of the rail, see Page 99, for standard as well as optional lubrication adapter, see Page 148.
The size MG02 and MG03 blocks are only available mounted on the profile rail.

3.5.12.2 MGW

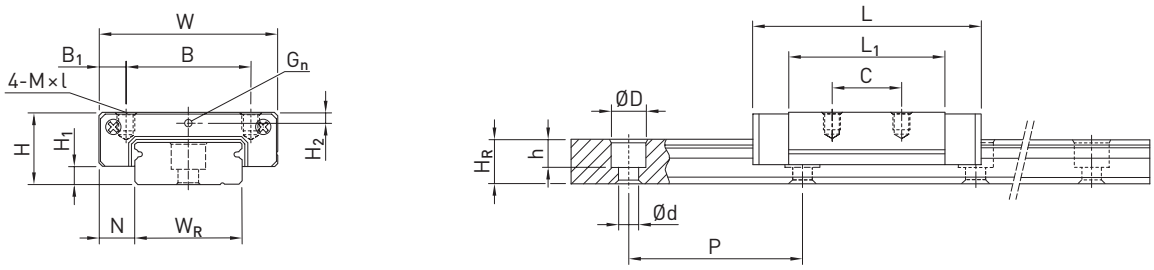
MGW02



MGW05



MGW03, MGW07, MGW09, MGW12



MGW15

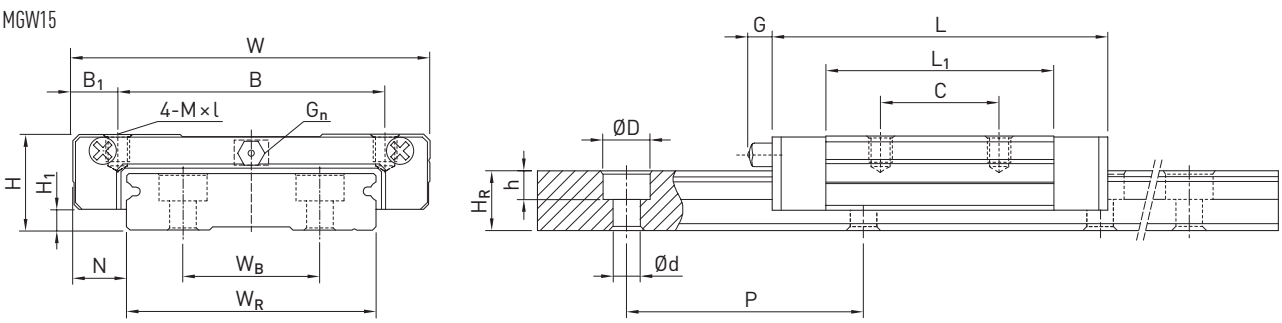


Table 3.80 **Dimensions of the block**

Series/size	Installation dimensions [mm]			Dimensions of the block [mm]										Load ratings [N]		Weight [kg]
	H	H_1	N	W	B	B_1	C	L_1	L	G	G_n	M × l	H_2	C_{dyn}	C_0	
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	3.5	24	38.5	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

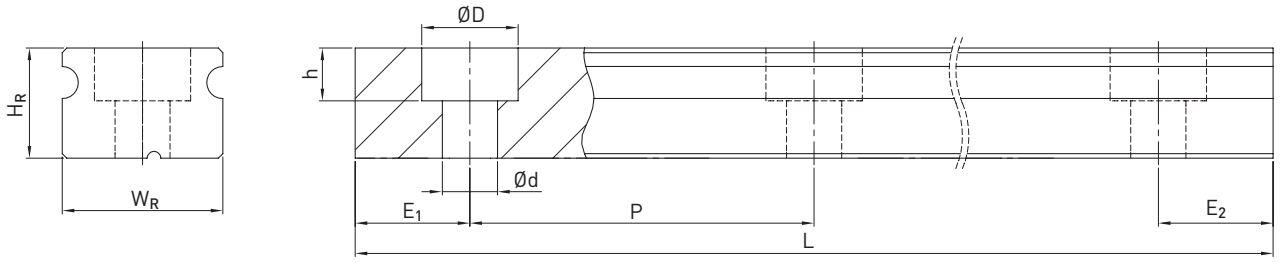


Table 3.81 **Dimensions of profile rail MGN_R**

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 [1]	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

[1] Special screw (Art.No. 20-000004)

3.5.13.2 Dimensions MGW_R

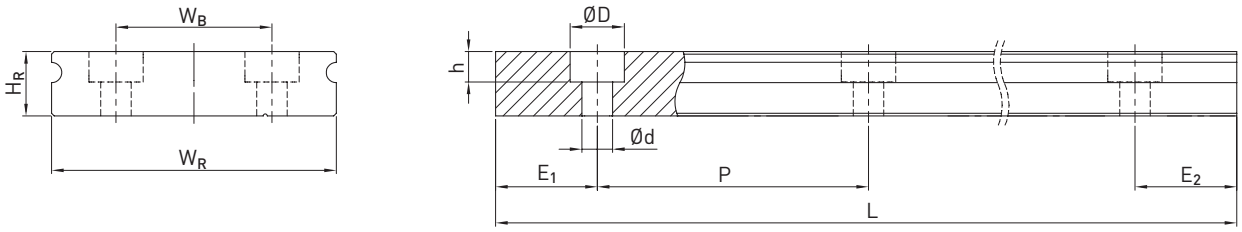


Table 3.82 **Dimensions of profile rail MGW_R**

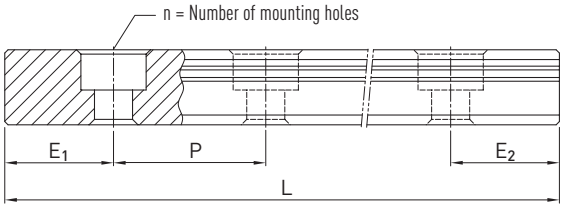
Series/size	Assembly screw for rail [mm]	Dimensions of the rail [mm]							Max. length [mm]	Max. length $E_1 = E_2$ [mm]	Min. length [mm]	$E_{1/2}$ min [mm]	$E_{1/2}$ max [mm]	Weight [kg/m]
		W_R	H_R	W_B	D	h	d	P						
MGWR02R	M1,6 [3]	4	2,6	–	2,8	1,0	1,8	10	250	240	16	3	7	0,70
MGWR03R	M2	6	2,9	–	3,6	1,5	2,4	15	250	225	23	4	11	0,13
MGWR05R	M2.5 × 7 [2]	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

[2] Special screw (Art.No. 20-001741)
[3] 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.

3.5.13.3 Calculation of the length of profile rails

HIWIN offers profile rains 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 [2]		
MGNR09R	M3	5-002217 [1]	5-001340 [1]	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

[1] Only possible with cylinder head screws with low head acc. to DIN 7984
[2] 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.

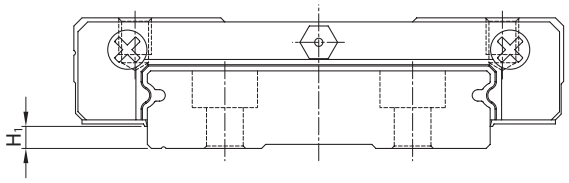


Table 3.84 **Installation space H_1**

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.

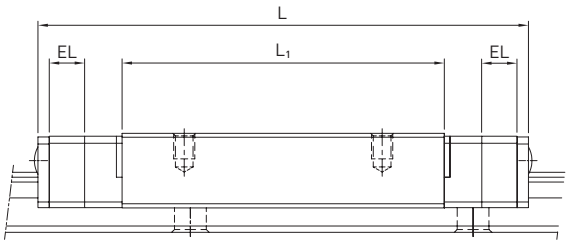


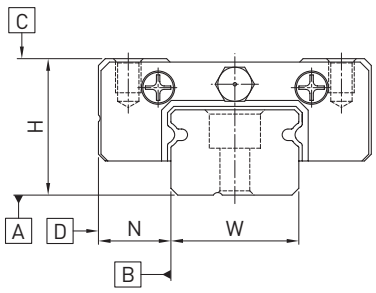
Table 3.85 **Dimensions of the block with lubrication unit EL**

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

[1] Total length with selected dust protection. SS = Standard dust protection
[2] 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.



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: µm

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.

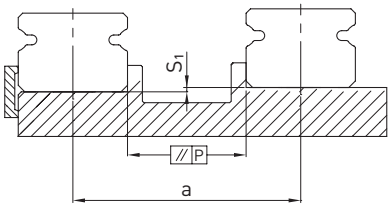
Width variance of N
Permissible deviation of width N between several blocks on one rail, measured at the same position of the rail.

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.



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: µm

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	0.4×10^{-4}	0.4×10^{-4}	0.04×10^{-4}
MG_07	0.5×10^{-4}	0.5×10^{-4}	0.06×10^{-4}
MG_09	0.7×10^{-4}	0.7×10^{-4}	0.12×10^{-4}
MG_12	1.0×10^{-4}	1.0×10^{-4}	0.24×10^{-4}
MG_15	1.2×10^{-4}	1.2×10^{-4}	0.40×10^{-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.

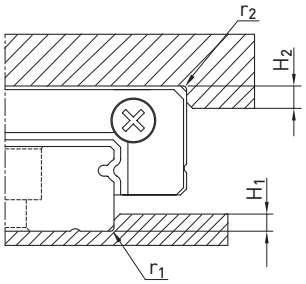
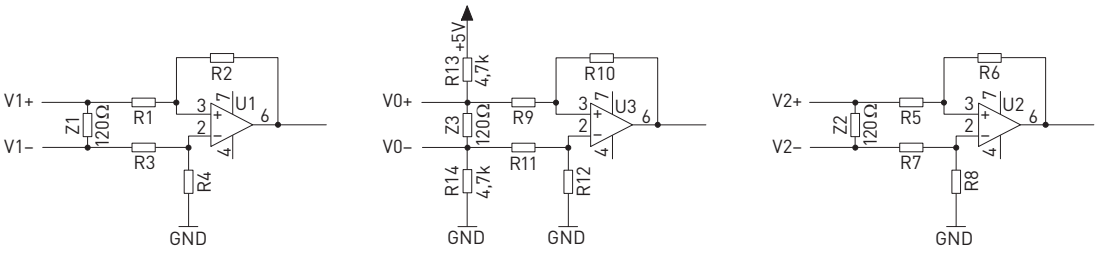


Table 3.91 **Shoulder heights and edge roundings**

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

Recommended downstream electronic circuit with sin/cos-1 V_{SS} output



A channel
V1 channel

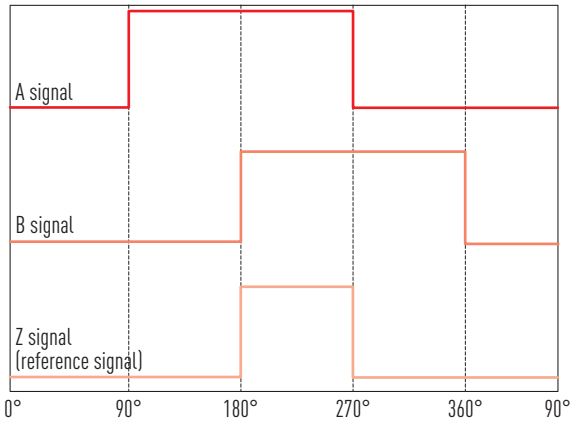
reference channel
V0 channel

B channel
V2 channel

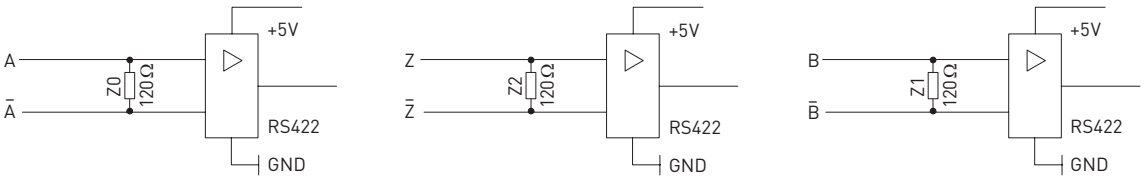
TTL output (digital)

The signals to the A and B channels phase-shifted by 90° (according to the RS-422 specifications conforming to DIN 66259). Recommended terminating resistance Z = 120 Ω. Output signals: A, $\bar{A}$, B, $\bar{B}$ and Z, $\bar{Z}$. Single reference pulse and the definition of a minimum pulse duration are possible as an option.

Signals of the MAGIC encoder (TTL version)



Recommended switching of the downstream electronic components with digital TTL output



A channel

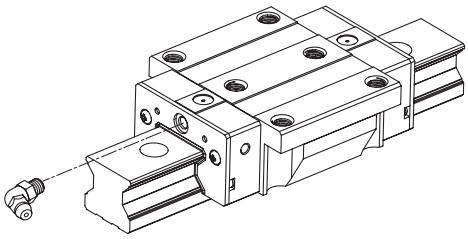
reference channel

B channel

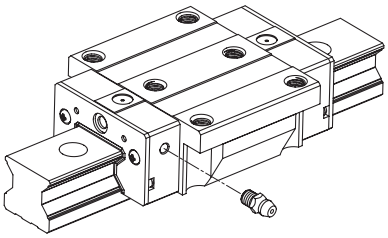
4. Accessories

4.1 Lubrication adapter

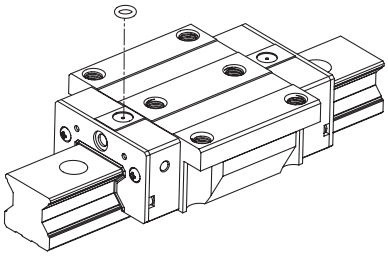
A lubricating nipple is fitted as standard on the end face of one end of the block **(1)**. The opposite side is closed with a plug screw. Alternatively, lubrication can also be supplied via the four holes **(2)** provided in the side of the deflector or from above **(3)**. Lubricating nipples, lubrication adapters or push-in fittings can be used for lubrication.



(1) Front side lubrication



(2) Side lubrication



(3) Lubrication from above

Table 4.1 **Overview of block type/thread size**

Block type	Thread size side/front
HG_15	M4
HG_20, HG_25, HG_30, HG_35	M6 × 0.75
HG_45, HG_55, HG_65	1/8 PT
QH_15	M4
QH_20, QH_25, QH_30, QH_35	M6 × 0.75
QH_45	1/8 PT
EG_15	M4
EG_20, EG_25, EG_30, EG_35	M6 × 0.75
QE_15	M4
QE_20, QE_25, QE_30, QE_35	M6 × 0.75
CG_15, CG_20	M3
CG_25, CG_30, CG_35, CG_45	M6 × 0.75
WE_17	M3
WE_21, WE_27, WE_35, QW_21, QW_27	M6 × 0.75 / M4
WE_35, QW_35	M6 × 0.75
WE_50	1/8 PT
MG_15	M3
RG_15, RG_20, CRG_15, CRG_20	M4
RG_25, RG_30, RG_35, CRG_25, CRG_30, CRG_35	M6 × 0.75
RG_45, RG_55, RG_65, CRG_45, CRG_55, CRG_65	1/8 PT
QR_25, QR_30, QR_35	M6 × 0.75
QR_45	1/8 PT

Various grease nipples, lubrication adapters and push-in fittings are available as an option.

Fig. 4.1 **Grease nipple**

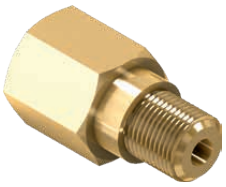


Fig. 4.2 **Lubrication adapter**

Fig. 4.3 **Push-in fitting**

Information on the suitable lubrication connector for your block depending on the sealing system (see chapter 2.9) can be found in the grease nipple configurator at www.hiwin.de.

4.2 HIWIN grease guns and lubricants

Table 4.2 **HIWIN grease guns**

Article number	Grease gun	Lubricating adaptor and nozzle set	Direct filling	Cartridge
20-000352	●	–	●	70 g
20-000332	●	●	●	70 g
20-000353	●	–	●	400 g
20-000333	●	●	●	400 g
20-000358	–	●	–	–

Table 4.3 **HIWIN greases**

Grease type	Area of application	Article number	
		Cartridge 70 g	**Cartridge 400 g**
G01	Heavy-duty applications	20-000335	20-000336
G02	Clean room applications	20-000338	20-000339
G03	Clean room applications High velocity	20-000341	20-000342
G04	Heavy velocity	20-000344	20-000345
G05	Standard grease	20-000347	20-000348
G06	Short stroke or high frequency	20-002195	20-002196
G07	Low temperatures	20-002197	20-002198

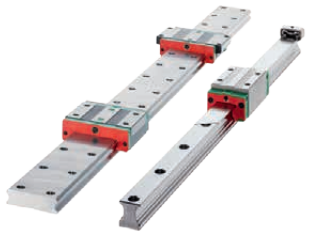
Table 4.4 **HIWIN oils**

Article number	Description	Scope	Comment
20-000350	SHC 636	1 litre bottle	Oil for filling long-term lubrication unit tank

Detailed information on HIWIN lubricants and lubrication of the linear guideways can be found in the HIWIN **"Linear guideways"** assembly instructions at www.hiwin.de.

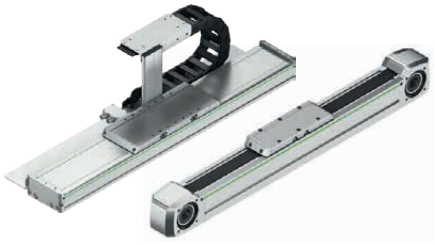
Notes

We live motion.

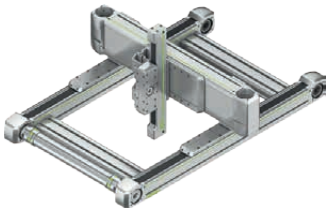


Linear Guideways

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.
Mládežnicka 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

GW-11-6-EN-2302-K