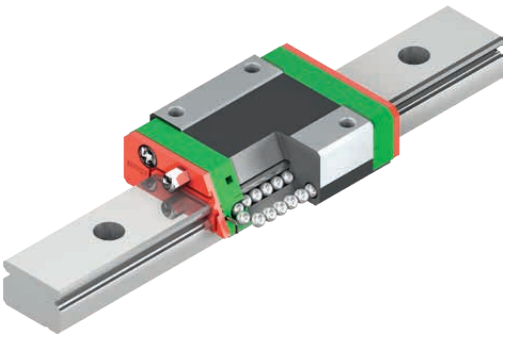
3.5 MG series

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



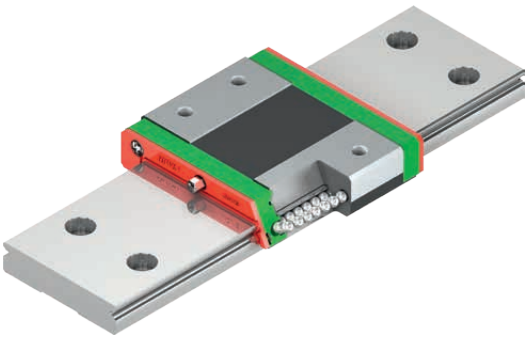
Layout of MGN series

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

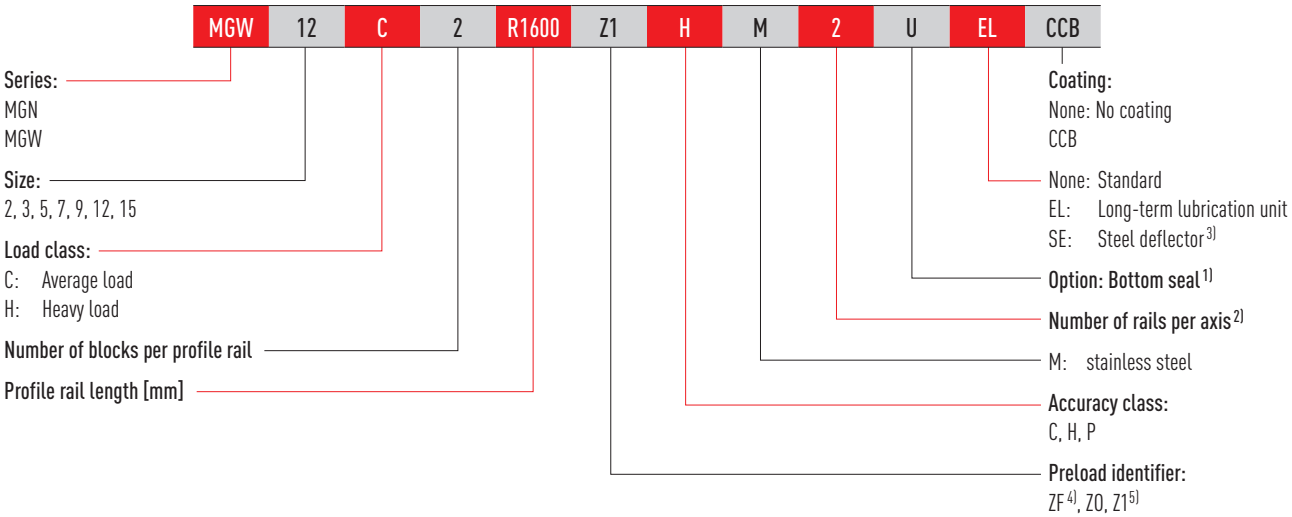
3.5.5 Applications of MG series

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.

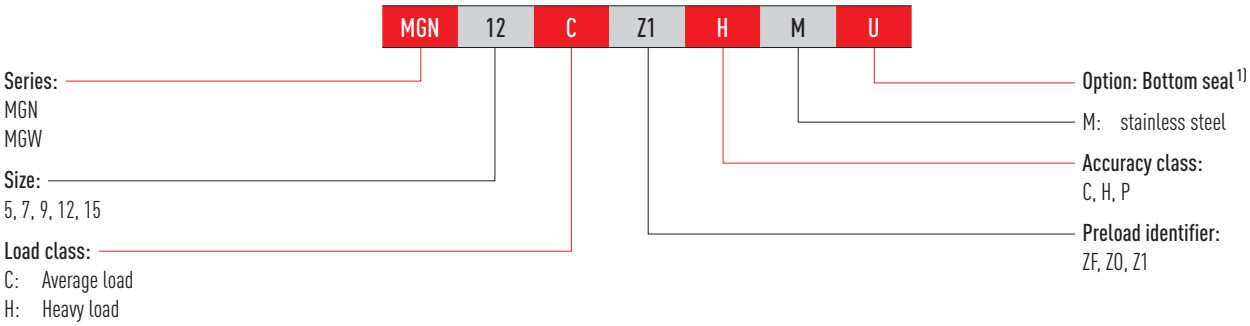
3.5.6 Order codes of MG series

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.

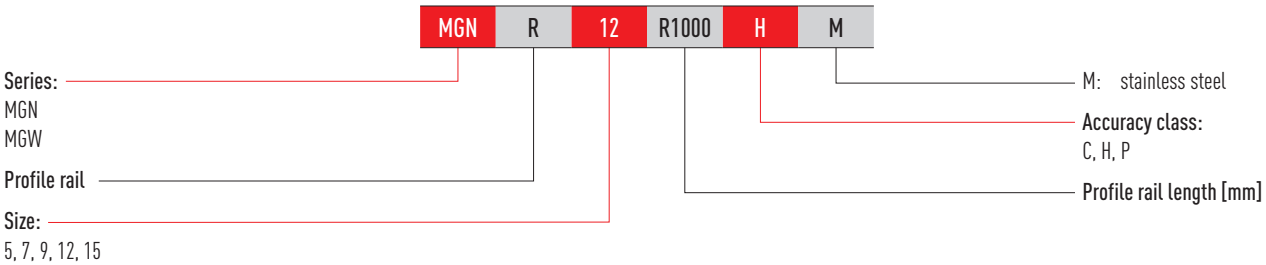
Order code for linear guideway (assembled)



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.

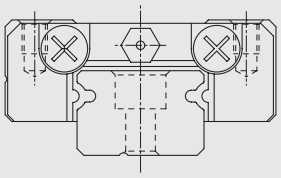
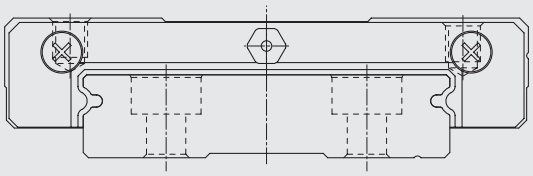
3) Available for MGN07, 09, 12, 15 and MGW12, 15.

4) Not available for paired rails and MG05.

5) Not available for MG02 and MG03.

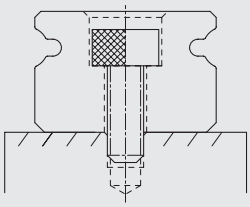
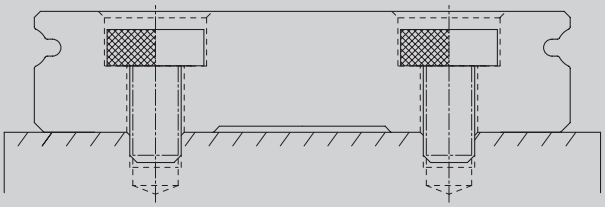
3.5.7 Block types

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

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

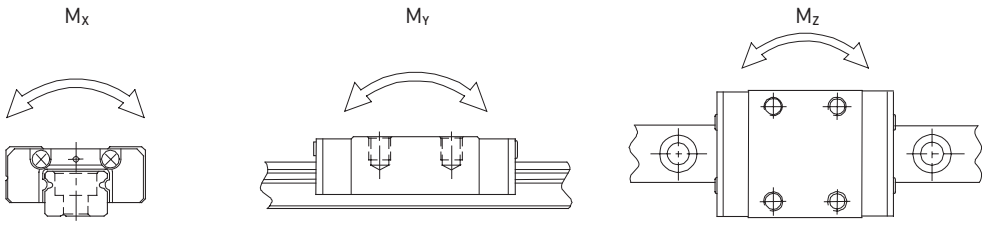


Table 3.76 **Load ratings and torques for MG series**

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**

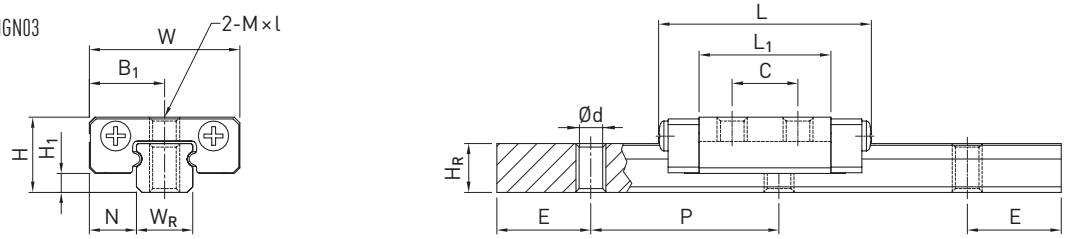
Load type	Series/ Size	Rigidity depending on the preload	
		Z0	**Z1**
Average load	**MGW07C**	38	49
	MGW09C	55	71
	MGW12C	63	81
	MGW15C	78	101
Heavy load	**MGW07H**	54	70
	MGW09H	74	95
	MGW12H	89	114
	MGW15H	113	145

Unit: N/µm

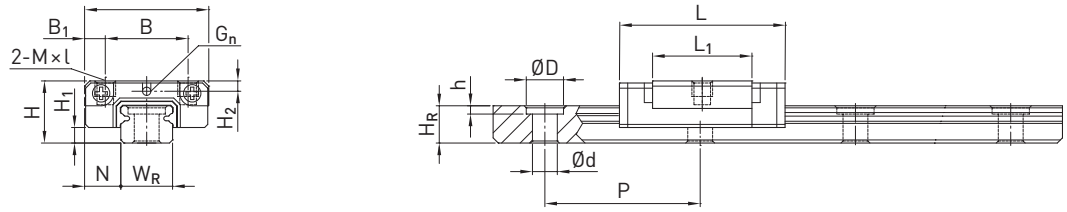
3.5.12 Dimensions of the MG blocks

3.5.12.1 MGN

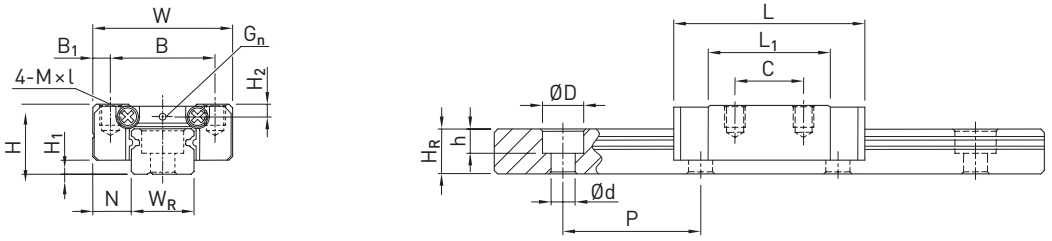
MGN02, MGN03



MGN05



MGN07, MGN09, MGN12



MGN15

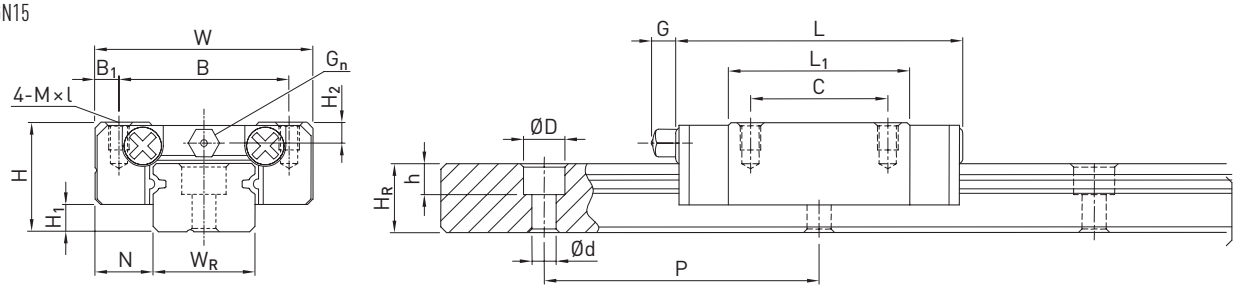


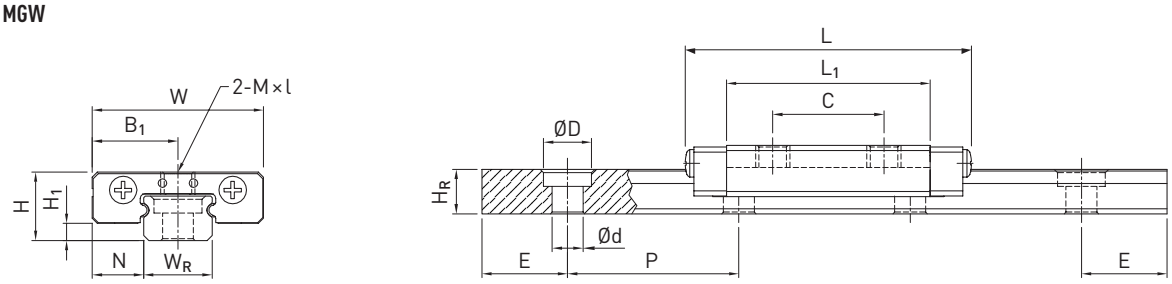
Table 3.79 **Dimensions of the block**

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

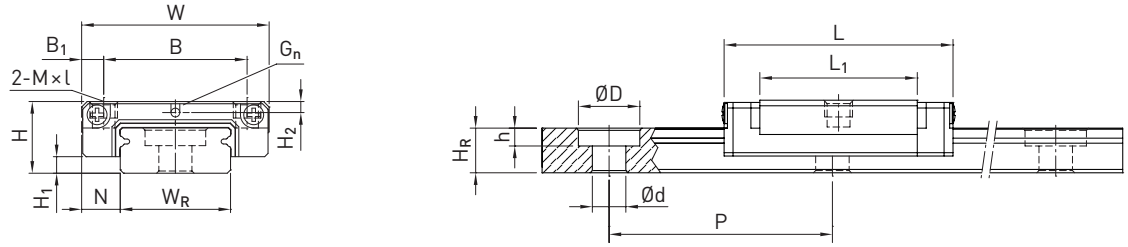
For dimensions of the rail, see Page 99, for standard as well as optional lubrication adapter, see Page 148.
The size MG02 and MG03 blocks are only available mounted on the profile rail.

3.5.12.2 MGW

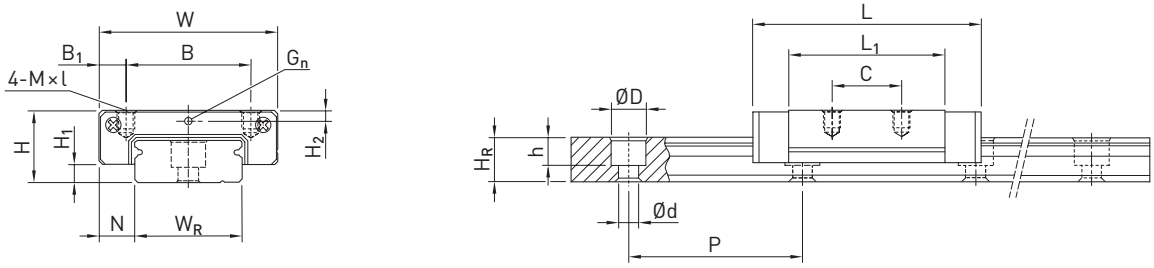
MGW02



MGW05



MGW03, MGW07, MGW09, MGW12



MGW15

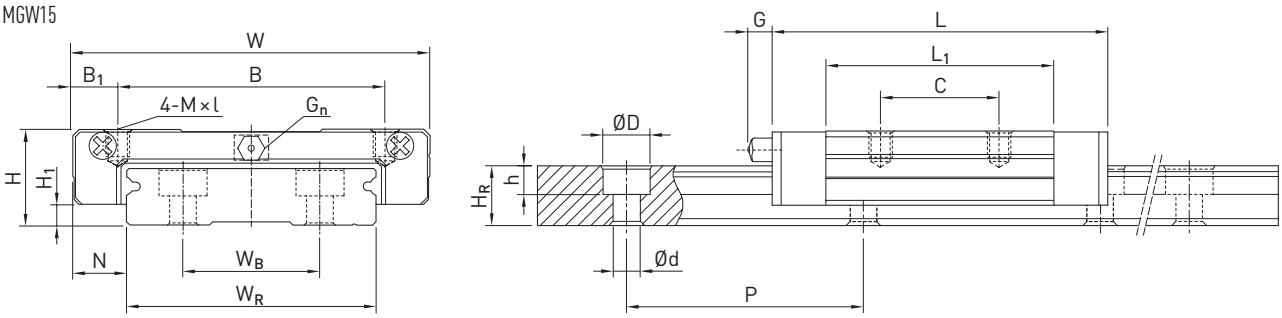


Table 3.80 **Dimensions of the block**

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

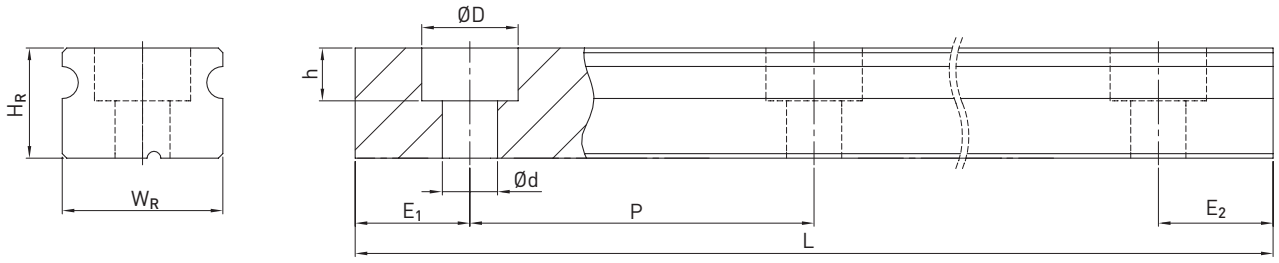


Table 3.81 **Dimensions of profile rail MGN_R**

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

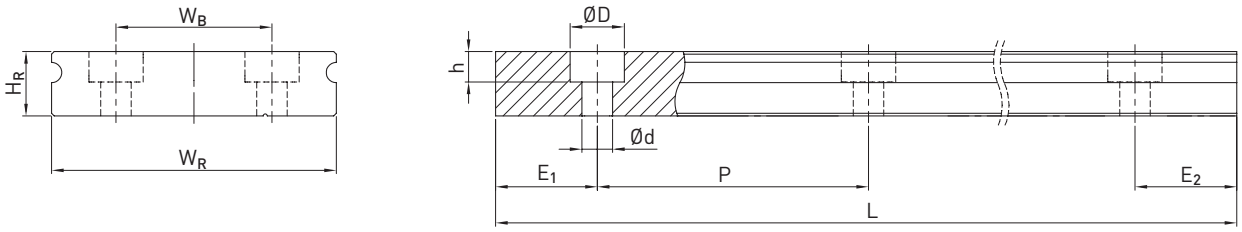


Table 3.82 **Dimensions of profile rail MGW_R**

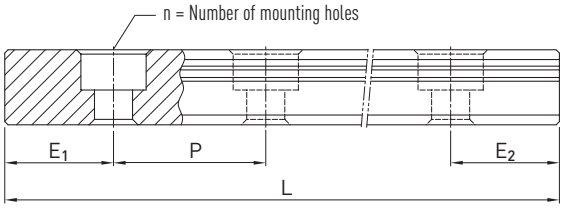
Series/size	Assembly screw for rail [mm]	Dimensions of the rail [mm]							Max. length [mm]	Max. length $E_1 = E_2$ [mm]	Min. length [mm]	$E_{1/2}$ min [mm]	$E_{1/2}$ max [mm]	Weight [kg/m]
		W_R	H_R	W_B	D	H	d	P						
MGWR02R	M1,6 [3]	4	2,6	–	2,8	1,0	1,8	10	250	240	16	3	7	0,70
MGWR03R	M2	6	2,9	–	3,6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

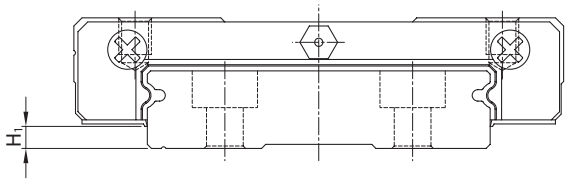


Table 3.84 **Installation space H_1**

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.

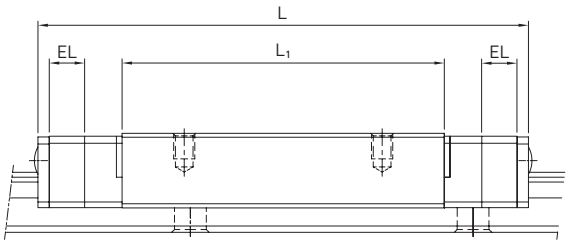


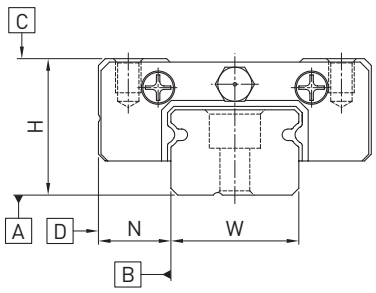
Table 3.85 **Dimensions of the block with lubrication unit EL**

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.

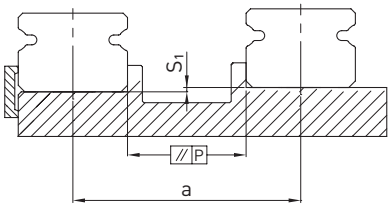
Width variance of N
Permissible deviation of width N between several blocks on one rail, measured at the same position of the rail.

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.

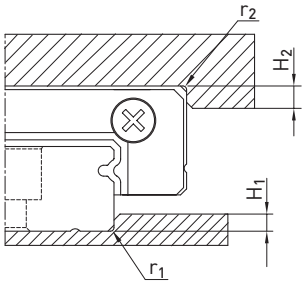


Table 3.91 **Shoulder heights and edge roundings**

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