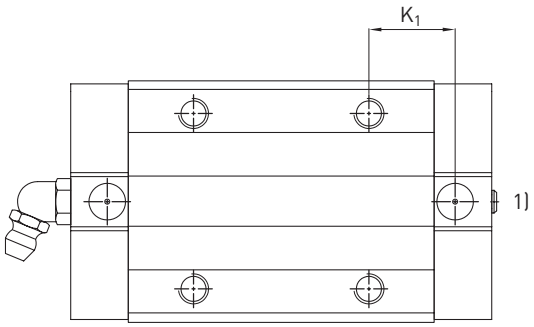
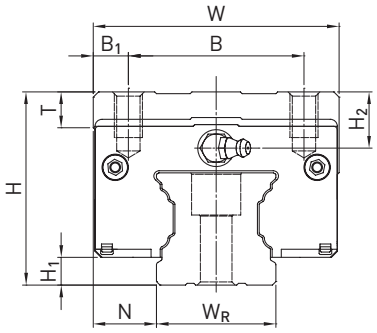
3.2.9 Dimensions of the CG blocks

3.2.9.1 CGH





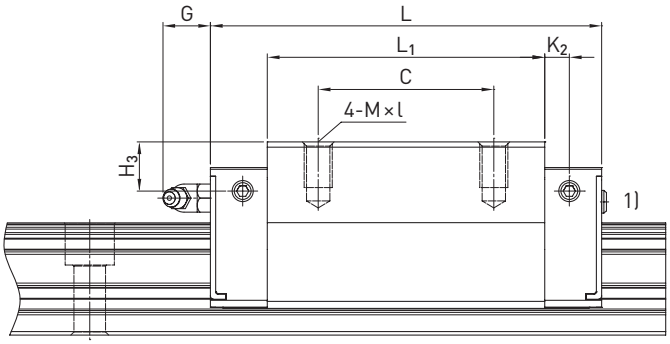


Table 3.24 **Dimensions of the block**

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	K_1	K_2	G	M × l	T	H_2	H_3	C_{dyn}	C_0	
CGH15CA	28	4.1	9.5	34	26	4.0	26	39.6	58.2	10.8	4.25	6.0	M4 × 6	6.0	7.8	7.8	14,700	19,520	0.15
CGH20CA	30	4.6	12.0	44	32	6.0	36	52.5	74.9	12.45	5.50	6.0	M5 × 6	8.0	3.7	3.5	23,700	30,510	0.25
CGH20HA							50	68.5	90.9	13.45							28,600	39,900	0.33
CGH25CA	40	6.1	12.5	48	35	6.5	35	61.0	84.0	17.4	5.00	12.0	M6 × 8	8.0	10.0	9.5	34,960	43,940	0.46
CGH25HA							50	78.4	101.4	18.6							40,500	54,080	0.59
CGH30CA	45	7.0	16.0	60	40	10.0	40	69.0	97.4	19.75	8.70	12.0	M8 × 10	9.5	9.7	10.0	46,000	55,190	0.71
CGH30HA							60	91.5	119.9	21							58,590	78,180	0.94
CGH35CA	55	7.6	18.0	70	50	10.0	50	79.0	111.4	22.6	7.00	12.0	M8 × 13	10.2	16.0	14.0	61,170	79,300	1.24
CGH35HA							72	103.4	135.8	23.8							77,900	112,340	1.62
CGH45CA	70	9.7	20.5	86	60	13.0	60	97.2	137.6	23	8.70	12.9	M10 × 17	16.0	18.5	18.2	98,430	112,660	2.38
CGH45HA							80	133.6	174.0	31.2							125,580	159,600	3.01

For dimensions of the rail, see Page 56, for standard as well as optional lubrication adapter, see Page 148.

[1] Flat head screw protrudes 1 mm in all sizes.

3.2.9.2 CGL

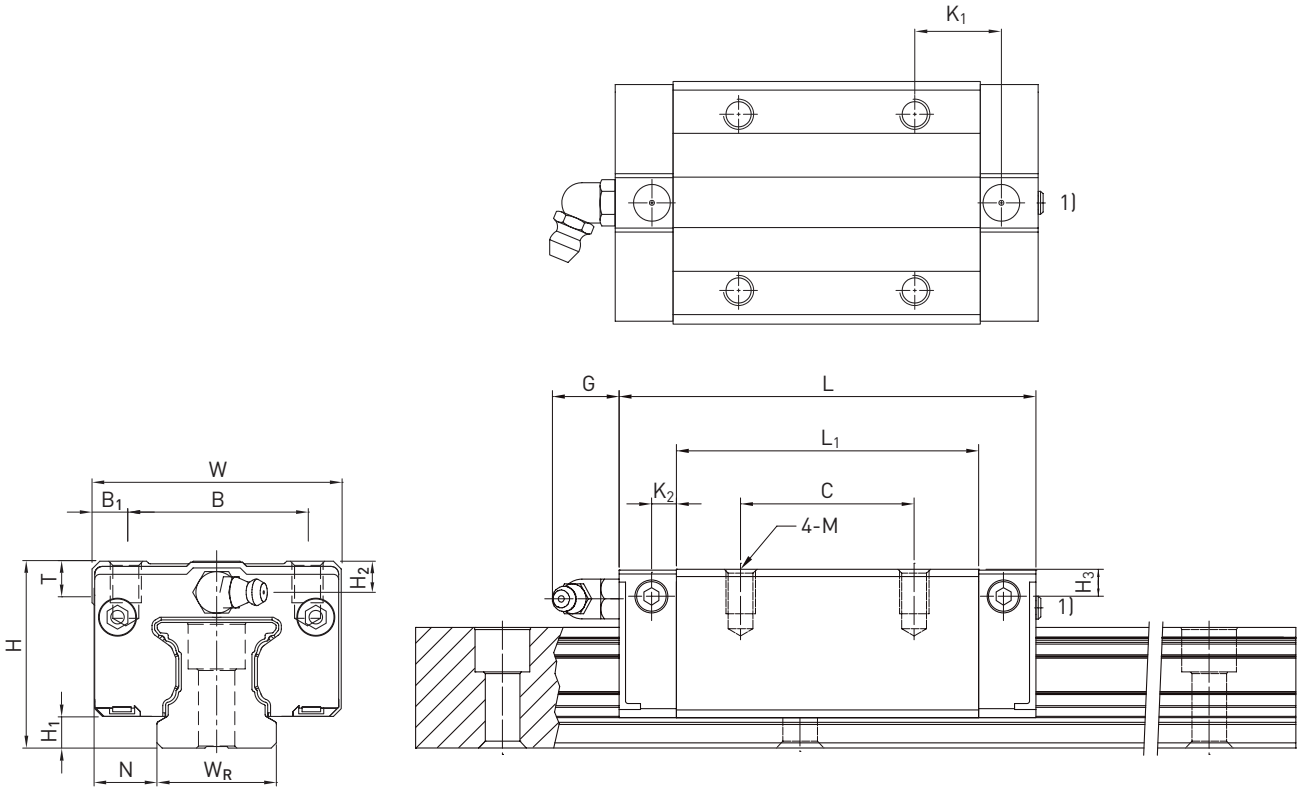


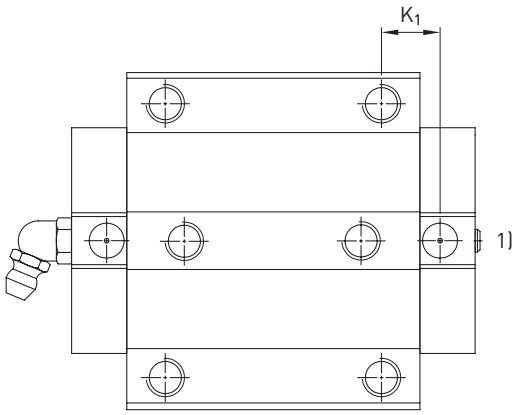
Table 3.25 **Dimensions of the block**

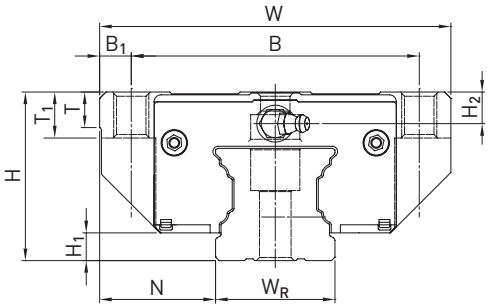
Series/size	Installation dimensions [mm]			Dimensions of the block [mm]													Load ratings [N]		Weight [kg]
	H	H_1	N	W	B	B_1	C	L_1	L	K_1	K_2	G	M × l	T	H_2	H_3	C_{dyn}	C_0	
CGL15CA	24	4.1	9.5	34	26	4.0	26	39.6	58.2	10.8	4.25	6.0	M4 × 6	6.0	3.8	3.8	14,700	19,520	0.11
CGL25CA	36	6.1	12.5	48	35	6.5	35	61.0	84.0	17.4	5.00	12.0	M6 × 8	8.0	6.0	5.5	34,960	43,940	0.37
CGL25HA							50	78.4	101.4	18.6							40,500	54,080	0.47
CGL30CA	42	7.0	16.0	60	40	10.0	40	69.0	97.4	19.75	8.70	12.0	M8 × 10	9.5	6.7	7.0	46,000	55,190	0.61
CGL30HA							60	91.5	119.9	21.0							58,590	78,180	0.82
CGL35CA	48	7.6	18.0	70	50	10.0	50	79.0	111.4	22.6	7.00	12.0	M8 × 13	10.2	9.0	7.0	61,170	79,300	0.93
CGL35HA							72	103.4	135.8	23.8							77,900	112,340	1.22
CGL45CA	60	9.7	20.5	86	60	13.0	60	97.2	137.6	23.0	8.70	12.9	M10 × 17	16.0	8.5	8.1	98,430	112,660	1.72
CGL45HA							80	133.6	174.0	31.2							125,580	159,600	2.39

For dimensions of the rail, see Page 56, for standard as well as optional lubrication adapter, see Page 148.

[1] Flat head screw protrudes 1 mm in all sizes.

3.2.9.3 CGW





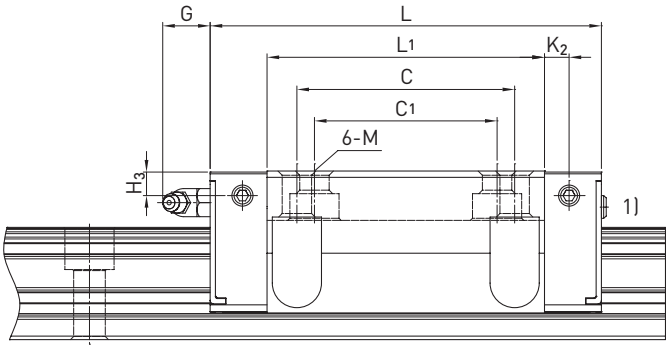


Table 3.26 **Dimensions of the block**

Series/size	Installation dimensions [mm]			Dimensions of the block [mm]															Load ratings [N]		Weight [kg]
	H	H_1	N	W	B	B_1	C	C_1	L_1	L	K_1	K_2	G	M	T	T_1	H_2	H_3	C_{dyn}	C_0	
CGW15CC	24	4.1	16.0	47	38	4.5	30	26	39.6	58.2	8.8	4.25	6.0	M5	6.0	6.5	3.8	3.8	14,700	19,520	0.14
CGW20CC	30	4.6	21.5	63	53	5.0	40	35	52.5	74.9	10.45	5.50	6.0	M6	6.5	7.7	3.7	3.5	23,700	30,510	0.36
CGW20HC									68.5	90.9	18.45								28,600	39,900	0.47
CGW25CC	36	6.1	23.5	70	57	6.5	45	40	61.0	84.0	12.4	5.00	12.0	M8	7.0	9.3	6.0	5.5	34,960	43,940	0.53
CGW25HC									78.4	101.4	21.1								40,500	54,080	0.68
CGW30CC	42	7.0	31.0	90	72	9.0	52	44	69.0	97.4	13.75	8.70	12.0	M10	10.5	12.0	6.7	7.0	46,000	55,190	0.90
CGW30HC									91.5	119.9	25.0								58,590	78,180	1.19
CGW35CC	48	7.6	33.0	100	82	9.0	62	52	79.0	111.4	16.6	7.00	12.0	M10	10.1	13.1	9.0	7.0	61,170	79,300	1.37
CGW35HC									103.4	135.8	28.8								77,900	112,340	1.79
CGW45CC	60	9.7	37.5	120	100	10.0	80	60	97.2	137.6	13.0	8.70	12.9	M12	15.1	15.0	8.5	8.1	98,430	112,660	2.45
CGW45HC									133.6	174.0	31.2								125,580	159,600	3.00

For dimensions of the rail, see Page 56, for standard as well as optional lubrication adapter, see Page 148.

[1] Flat head screw protrudes 1 mm in all sizes.

3.2.10 Dimensions of the CG rail

3.2.10.1 Dimensions CGR_R

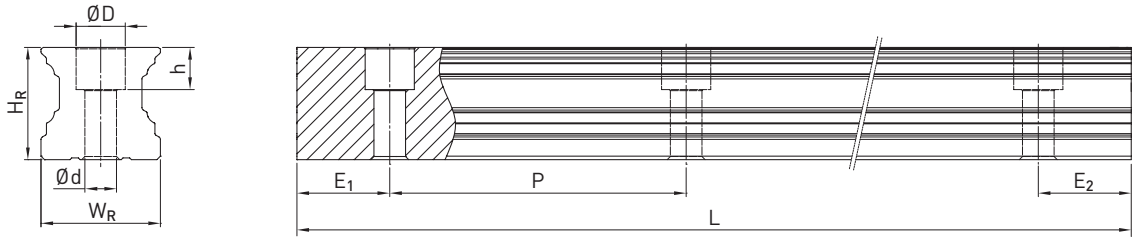


Table 3.27 **Dimensions of profile rail CGR_R**

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][1]	$E_{1/2}$ min [mm][2]	$E_{1/2}$ max [mm]	Weight [kg/m]
		W_R	H_R	D	h	d	P							
CGR15R	M4 × 20	15	16.20	7.5	5.9	4.5	60	4,000	3,900	72	6	14	54	1.58
CGR20R	M5 × 25	20	20.55	9.5	8.5	6.0	60	4,000	3,900	74	7	16	53	2.48
CGR25R	M6 × 30	23	24.25	11.0	9.0	7.0	60	4,000	3,900	76	8	17	52	3.38
CGR30R	M8 × 35	28	28.35	14.0	12.4	9.0	80	4,000	3,920	98	9	18	71	5.10
CGR35R	M8 × 40	34	31.85	14.0	12.0	9.0	80	4,000	3,920	98	9	24	71	7.14
CGR45R	M12 × 50	45	39.85	20.0	17.0	14.0	105	4,000	3,885	129	12	27	93	11.51

[1] $E_{1/2}$ min without cover strip and with cover strip (clamp: steel clamp)
[2] $E_{1/2}$ min with cover strip (clamp: front clamping screw)

3.2.10.2 Dimensions CGR_T

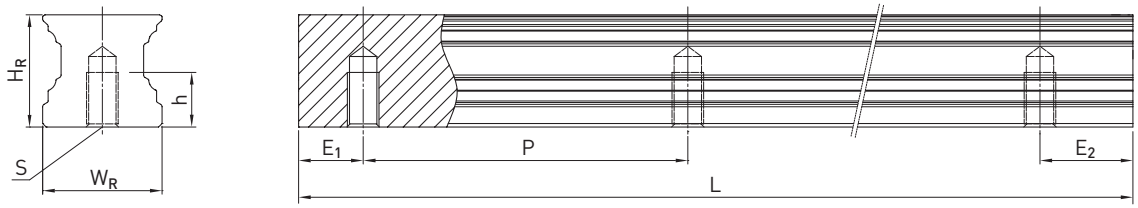


Table 3.28 **Dimensions of profile rail CGR_T**

Series/size	Dimensions of the rail [mm]					Max. length [mm]	Max. length $E_1 = E_2$ [mm]	Min. length [mm]	$E_{1/2}$ min [mm][1]	$E_{1/2}$ min [mm][2]	$E_{1/2}$ max [mm]	Weight [kg/m]
	W_R	H_R	S	h	P							
CGR15T	15	16.20	M5	8	60	4,000	3,900	72	6	14	54	1.58
CGR20T	20	20.55	M6	10	60	4,000	3,900	74	7	15	53	2.48
CGR25T	23	24.25	M6	12	60	4,000	3,900	76	8	15	52	3.38
CGR30T	28	28.35	M8	15	80	4,000	3,920	98	9	16	71	5.10
CGR35T	34	31.85	M8	17	80	4,000	3,920	98	9	22	71	7.14
CGR45T	45	39.85	M12	24	105	4,000	3,885	129	12	24	93	11.51

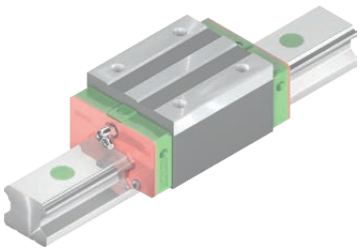
[1] $E_{1/2}$ min without cover strip and with cover strip (clamp: steel clamp)
[2] $E_{1/2}$ min with cover strip (clamp: front clamping screw)

Note:
1. The tolerance for E is +0,5 to −1 mm for standard, for joint connections 0 to −0.3 mm.
2. If no information is provided on the $E_{1/2}$ dimensions, the maximum number of mounting holes is determined taking into account $E_{1/2}$ min.
3. The rails are shortened to the desired length. If no information on the $E_{1/2}$ dimensions is provided, then the rails are manufactured symmetrically.

Linear guideways

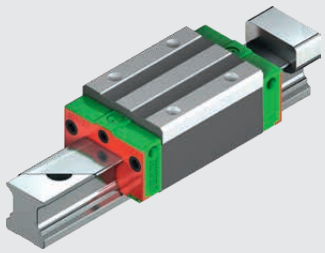
Product overview

1. Product overview



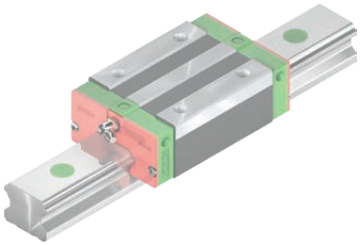
Linear guideway of HG and QH series Page 30

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



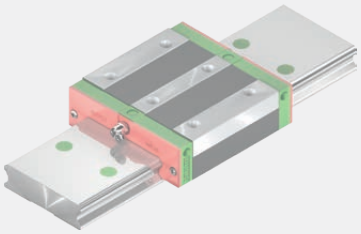
Linear guideway CG series Page 48

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



Linear guideway of EG and QE series Page 66

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



Linear guideway of WE and QW series Page 80

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

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

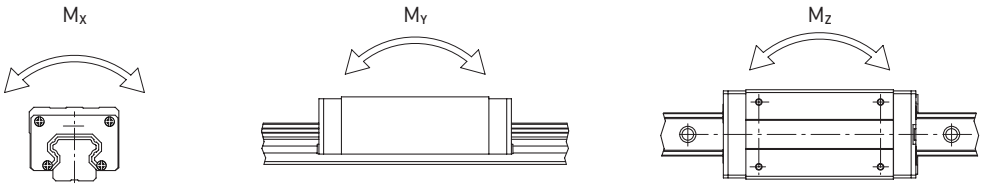
2.3 Load ratings

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

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

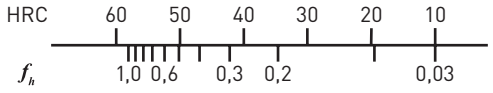
L	Nominal service life [km]
C_{dyn}	Dynamic load rating [N]
P	Dynamic equivalent load [N]

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.

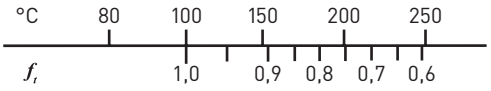
Hardness factor (f_h)

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.



Linear guideways

General information

Load factor (f_w)

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

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

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

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

RG, QR series:

F 2.7

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

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:

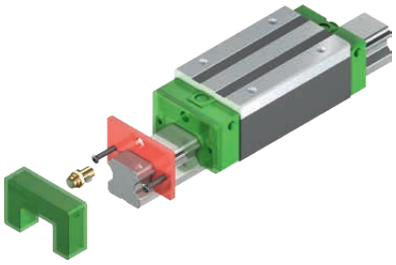
- HIWIN G01: Heavy-duty applications
- HIWIN G02: Clean room and vacuum applications
- HIWIN G03 Clean room and vacuum applications with high velocities
- HIWIN G04: Applications with high speeds
- HIWIN G05: Standard applications
- HIWIN G06: Short stroke and high frequency applications
- HIWIN G07: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

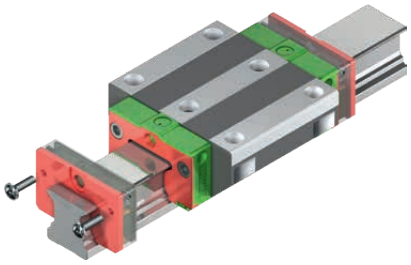
Information on HIWIN lubricants can be found in the Accessories chapter on Page 149. Detailed information on HIWIN lubricants and lubrication of the linear guideways can be found in the **"Linear guideways"** assembly instructions at www.hiwin.de.

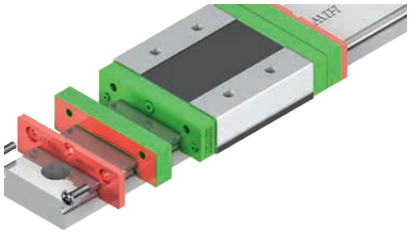
2.6.3 Long-term lubrication unit

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

2.12 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.

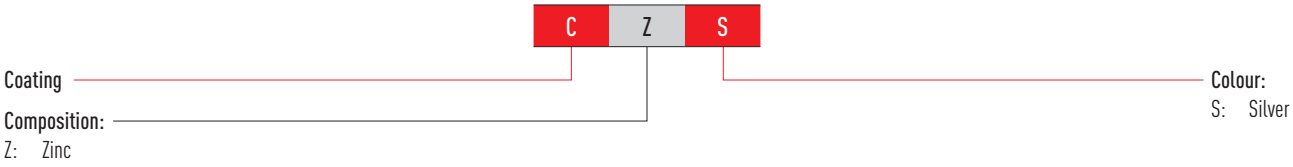
Specific features:

- 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.

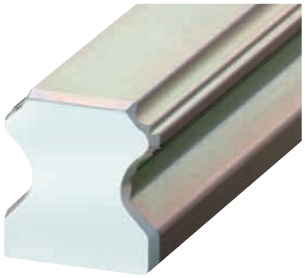


Fig. 2.1 **Rail end preserved with zinc spray**

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.

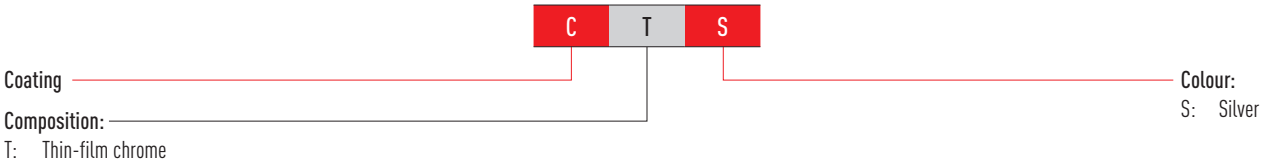
Specific features:

- 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.

Linear guideways

CG series

3.2 CG series

3.2.1 Properties of the CG series linear guideway

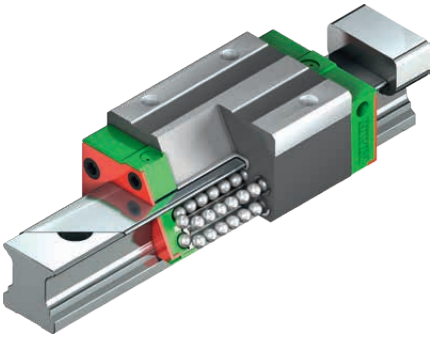
Standard series in O arrangement. The HIWIN linear guideways of the CG series with O-arrangement of the ball tracks guarantee high torque capacity, especially in the M_x direction. The modified track geometry ensures high load ratings. The new flexible end seal automatically adapts to the rail contour and ensures strong, durable dust protection. To protect against mechanical damage to the end seal, the blocks of the CG series are already equipped with a scraper in front of the end seal in the standard version.

A cover strip is available as an option – dirt ingress and wear of the sealing lip are thus permanently reduced to a minimum. Thanks to the mounting aid, the cover strip can be installed in just a few steps.

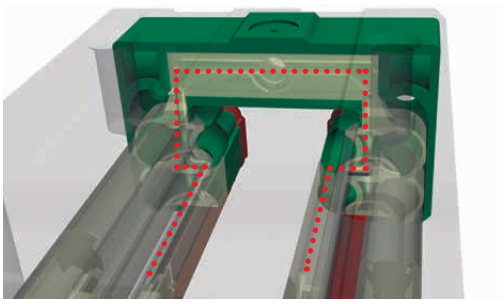
For optimum lubricant distribution, the block has an additional channel that introduces the lubricant into the centre of the load-bearing zone. This ensures long relubrication intervals and offers a clear advantage, especially in short-stroke applications.

3.2.2 Layout of CG series

Backlash-free, four-row recirculating ball bearing guide with optimum dust protection even in the standard version.

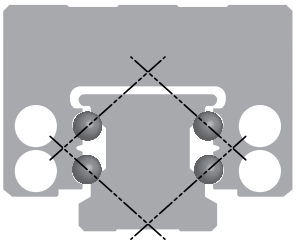


Optimised lubrication concept for long relubrication intervals and short-stroke applications.



Easy installation, better protection against dirt ingress and wear of the end seals with cover strip.

O-arrangement with changed track geometry for high torque load and load ratings.



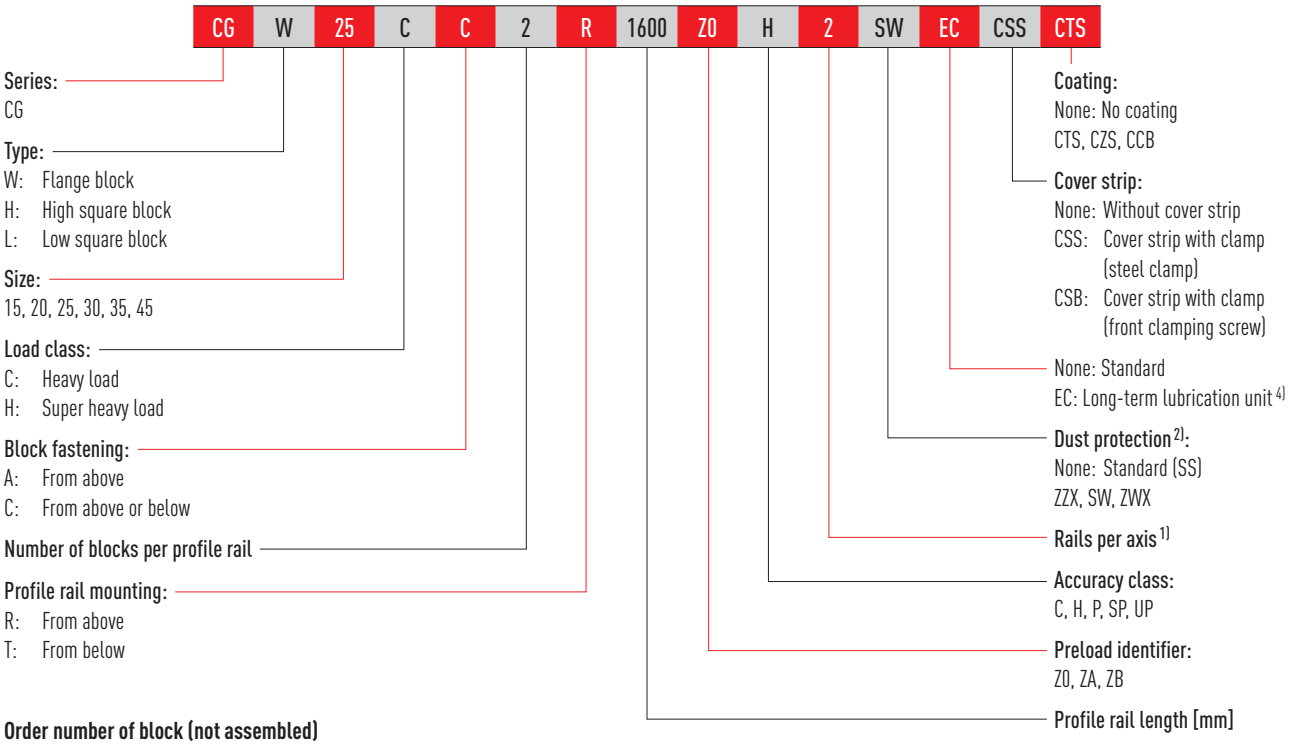
Advantages:

- Backlash-free
- Exchangeable
- High accuracy
- High torque capacity, special roll torque M_x
- Optionally with cover strip

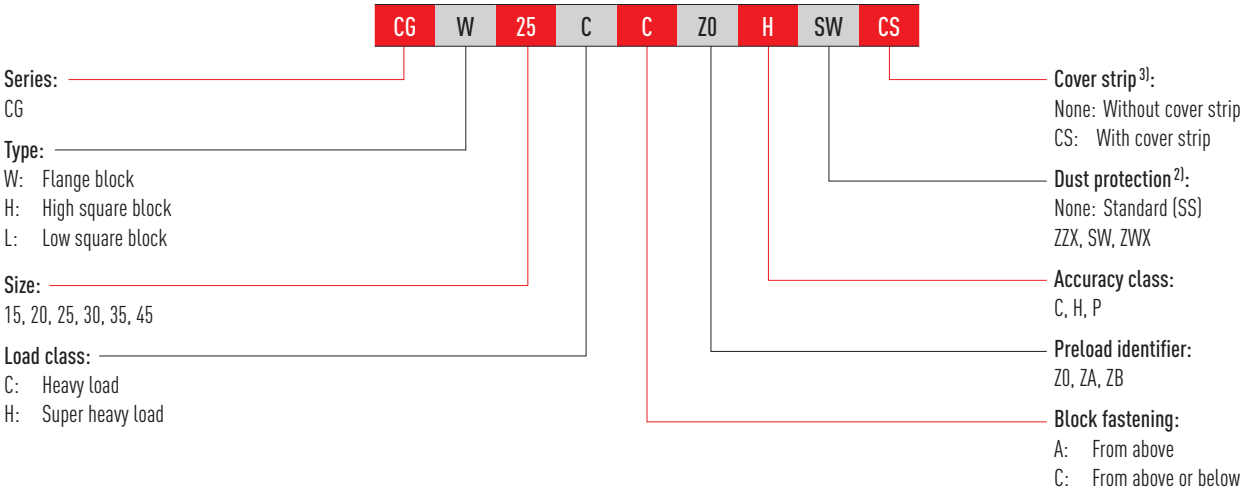
3.2.3 Order codes of CG series

For CG 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. Their accuracy reaches class P.

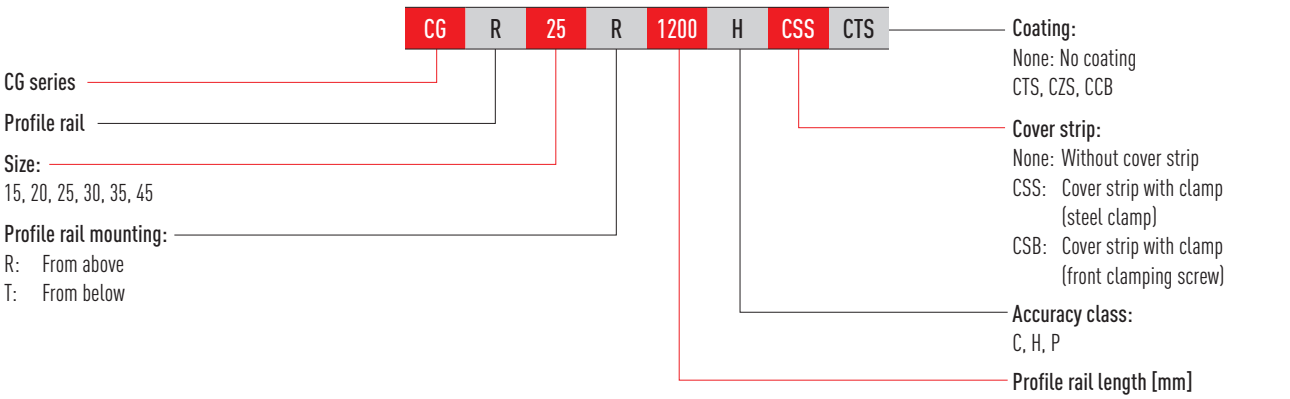
Order code for linear guideway (assembled)



Order number of block (not assembled)



Order number of profile rail (not assembled)



Note:

1) 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.

2) An overview of the individual sealing systems can be found on Page 22

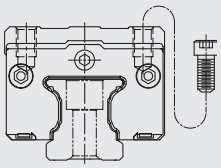
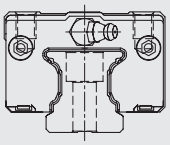
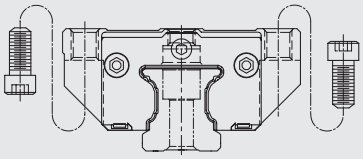
3) The standard dust protection (SS) can be used for profile rails with and without cover strip.

4) Only available for sizes 15, 20 and 25.

3.2.4 Block types

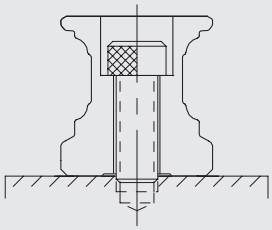
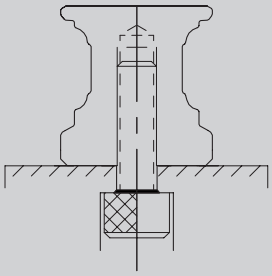
HIWIN offers block and flange blocks for its linear guideways. Due to the low installation height and the larger mounting surface, flange blocks are better suited for large loads.

Table 3.19 **Block types**

Type	Series/size	Layout	Height [mm]	Typical applications
High square type	CGH-CA CGH-HA		28 – 70	○ Woodworking ○ Machining centres ○ NC lathes ○ Grinding machines ○ Precision milling machines ○ High performance cutting machines ○ Automation technology ○ Transport technology ○ Measuring technology ○ Machines and devices with high required positioning accuracy
Low square type	CGL-CA CGL-HA		25 – 60	
Flange type	CGW-CA CGW-HA		24 – 60	

3.2.5 Profile rail types

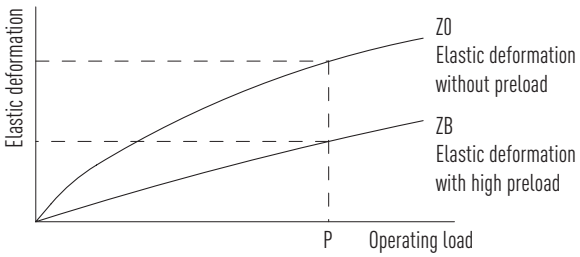
Table 3.20 **Profile rail types**

Fastening from above	Fastening from below
	
CGR_R	CGR_T

3.2.6 Preload

Definition

Each linear guideway can be preloaded via the ball size. The curve shows that the rigidity doubles at high preload. The CG series of linear guideways offers three standard preloads for different applications and conditions.



Preload identifier

Table 3.21 **Preload identifier**

Identifier	Preload		Application	Example applications
ZO	Slight preload	0 – 0.02 C_{dyn}	Constant load direction, little vibration, less accuracy required	○ Transport technology ○ Automatic packaging machines ○ X-Y axis in industrial machines ○ Welding machines
ZA	Medium preload	0.05 – 0.07 C_{dyn}	High accuracy required	○ Machining centres ○ Z axes in industrial machines ○ Eroding machines ○ NC lathes ○ Precision X-Y table ○ Measuring technology
ZB	High preload	Over 0.1 C_{dyn}	High rigidity required, vibration and jolting	○ Machining centres ○ Grinding machines ○ NC lathes ○ Horizontal and vertical milling machines ○ Z-axis of machine tools ○ High performance cutting machines

3.2.7 Load ratings and torques

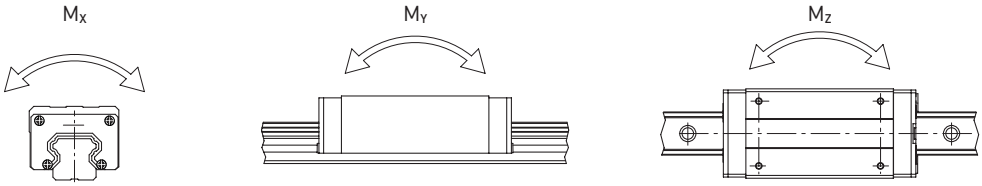


Table 3.22 **Load ratings and torques for CG series**

Series/Size	Dynamic load rating C_{dyn} [N] [1]	Static load rating C_0 [N]	Static moment [Nm]		
			M_{0X}	M_{0Y}	M_{0Z}
CG_15C	14,700	19,520	190	140	140
CG_20C	23,700	30,510	370	280	280
CG_20H	28,600	39,900	480	480	480
CG_25C	34,960	43,940	600	490	490
CG_25H	40,500	54,080	740	730	730
CG_30C	46,000	55,190	950	700	700
CG_30H	58,590	78,180	1,350	1,230	1,230
CG_35C	61,170	79,300	1,730	1,090	1,090
CG_35H	77,900	112,340	2,460	2,020	2,020
CG_45C	98,430	112,660	3,560	2,350	2,350
CG_45H	125,580	159,600	5,050	4,450	4,450

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

3.2.8 Rigidity

The rigidity depends on the preload. With the formula F 3.4, the deformation can be calculated depending on the rigidity.

F 3.4

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

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

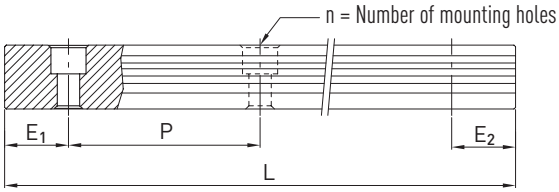
Table 3.23 **Radial rigidity of CG series**

Load type	Series/ Size	Rigidity depending on the preload		
		Z0	**ZA**	**ZB**
Heavy load	**CG_15C**	240	290	330
	CG_20C	270	420	480
	CG_25C	340	440	570
	CG_30C	440	550	760
	CG_35C	470	610	800
	CG_45C	550	720	820
Super heavy load	**CG_20H**	360	470	530
	CG_25H	410	540	620
	CG_30H	490	640	730
	CG_35H	570	730	840
	CG_45H	740	960	1,100

Unit: N/µm

3.2.10.3 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 3.5

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

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].

3.2.10.4 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 3.29 **Cover caps for mounting holes of profile rails**

Rail	Screw	Article number			Ø D [mm]	Height H [mm]
		Plastic (200 units)	Brass [1]	Steel [1]		
CGR15R	M4	5-002218	5-001344	–	7.5	1.2
CGR20R	M5	5-002220	5-001350	5-001352	9.5	2.5
CGR25R	M6	5-002221	5-001355	5-001357	11.0	2.8
CGR30R	M8	5-002222	5-001360	5-001362	14.0	3.5
CGR35R	M8	5-002222	5-001360	5-001362	14.0	3.5
CGR45R	M12	5-002223	5-001324	5-001327	20.0	4.0

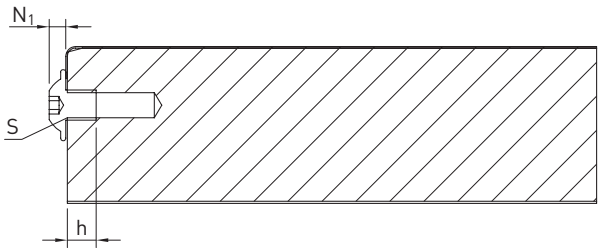
[1] Not recommended for coated rails.

3.2.10.5 Cover strip clamp

The optional cover strip is supplied with a steel clamp to secure the strip. Alternatively, the clamp can also be secured with a clamping screw on the front side. The stroke is shortened when the clamping screw is used on the front side, see assembly instructions

Fig. 3.1 **Clamp: Steel**

Fig. 3.2 **Clamp: Front-side clamping screw**



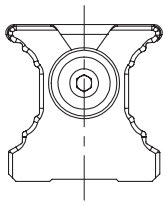


Table 3.30 **Dimensions of profile rail with front-side clamping screw**

Series/Size	S [mm]	h [mm]	N_1 [mm]
CG_15	M3	5	1.65
CG_20	M4	5	2.20
CG_25	M4	5	2.20
CG_30	M4	5	2.20
CG_35	M6	9	3.30
CG_45	M6	9	3.30

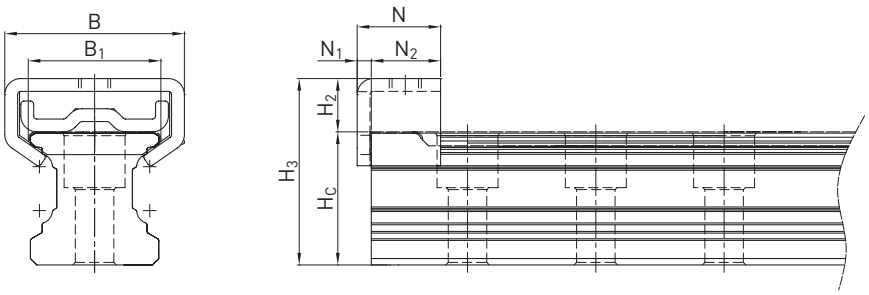


Table 3.32 **Dimensions of profile rail with steel clamp**

Series/Size	H_3 [mm]	H_C [mm]	H_2 [mm]	N [mm]	N_1 [mm]	N_2 [mm]	B [mm]	B_1 [mm]
CG_15	20.09	16.70	3.9	15	2.2	12.8	21.0	15.8
CG_20	29.05	20.75	8.3	13	2.2	10.8	28.0	20.7
CG_25	34.42	24.45	10.0	15	2.2	12.8	30.6	23.9
CG_30	37.80	28.55	9.3	12	2.2	9.8	34.0	28.9
CG_35	43.20	30.40	13.0	18	2.2	15.8	35.4	34.8
CG_45	52.66	39.85	13.7	18	2.2	15.8	53.6	45.6

3.2.11 Sealing systems

Different sealing systems are available for HIWIN blocks. You can find an overview on Page 22. The following table shows the total length of the blocks with different sealing systems. Appropriate sealing systems are available for these sizes.

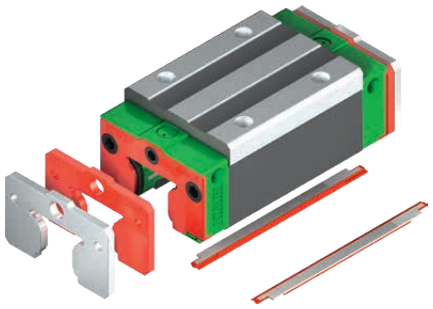


Table 3.31 **Total length of block with different sealing systems**

Series/size	Total length L (including screws)			
	SS	**ZZX**	**SW**	**ZWX**
CG15C	58.2	61.2	63.2	66.2
CG20C	74.9	77.9	79.9	82.9
CG20H	90.9	93.9	95.9	98.9
CG25C	84.0	90.0	89.0	95.0
CG25H	101.4	107.4	106.4	112.4
CG30C	97.4	103.4	102.8	108.8
CG30H	119.9	125.9	125.3	131.3
CG35C	111.4	117.4	116.8	122.8
CG35H	135.8	141.8	141.2	147.2
CG45C	137.6	143.6	143.0	149.0
CG45H	174.0	180.0	179.4	185.4

Unit: mm

3.2.12 Long-term lubrication unit

Further information on the lubrication unit can be found in the general information in section "Long-term lubrication unit" on Page 15. The following drawing shows the dimension (L) for a single-sided lubrication unit. The dimension for a double-sided lubrication unit results from the dimension L + T. The EC lubrication unit is available with the sealing systems named in the table.

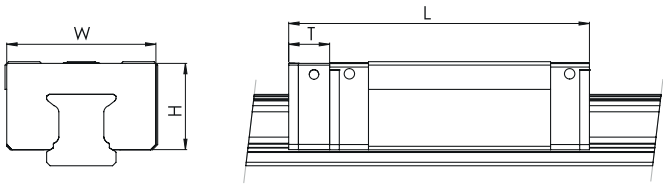


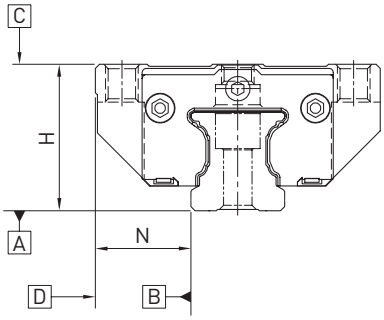
Table 3.33 **Dimensions of the block with lubrication unit EC**

Model	Dimensions of the block [mm]				Max. running performance [2] [km] EC single-sided	Max. running performance [2] [km] EC double-sided
	W	H	T	$L_{SS/SW}$ [1]		
CG_15C	33.4	19.35	10.8	69.0	10,000	20,000
CG_20C	43.0	24.85	11.8	86.7	10,000	20,000
CG_20H	43.0	24.85	11.8	102.7	10,000	20,000
CG_25C	47.0	28.90	12.5	96.5	10,000	20,000
CG_25H	47.0	28.90	12.5	113.9	10,000	20,000

[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

3.2.13 Tolerances depending on the accuracy class

The CG series are available in five 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.



3.2.12.1 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 3.34 **Tolerance of parallelism between block and profile rail**

Rail length [mm]	Accuracy class				
	C	H	P	SP	UP
– 100	12	7	3	2	2
100 – 200	14	9	4	2	2
200 – 300	15	10	5	3	2
300 – 500	17	12	6	3	2
500 – 700	20	13	7	4	2
700 – 900	22	15	8	5	3
900 – 1100	24	16	9	6	3
1100 – 1500	26	18	11	7	4
1500 – 1900	28	20	13	8	4
1900 – 2500	31	22	15	10	5
2500 – 3100	33	25	18	11	6
3100 – 3600	36	27	20	14	7
3600 – 4000	37	28	21	15	7

Unit: µm

3.2.13.1 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 3.35 **Tolerances of width and height**

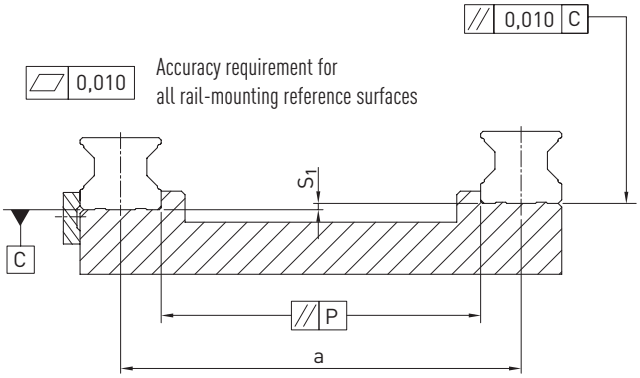
Series/size	Accuracy class	Height tolerance of H (T_H)	Width tolerance of N	Height variance of H	Width variance of N
CG_15, 20	C (Normal)	± 0.1	± 0.1	0.02	0.02
	H (high)	± 0.03	± 0.03	0.01	0.01
	P (precision)	0/– 0.03 [1] ± 0.015 [2]	0/– 0.03 [1] ± 0.015 [2]	0.006	0.006
	SP (super precision)	0/– 0.015	0/– 0.015	0.004	0.004
	UP (ultra precision)	0/– 0.008	0/– 0.008	0.003	0.003
CG_25, 30, 35	C (Normal)	± 0.1	± 0.1	0.02	0.03
	H (high)	± 0.04	± 0.04	0.015	0.015
	P (precision)	0/– 0.04 [1] ± 0.02 [2]	0/– 0.04 [1] ± 0.02 [2]	0.007	0.007
	SP (super precision)	0/– 0.02	0/– 0.02	0.005	0.005
	UP (ultra precision)	0/– 0.01	0/– 0.01	0.003	0.003
CG_45	C (Normal)	± 0.1	± 0.1	0.03	0.03
	H (high)	± 0.05	± 0.05	0.015	0.02
	P (precision)	0/– 0.05 [1] ± 0.025 [2]	0/– 0.05 [1] ± 0.025 [2]	0.007	0.01
	SP (super precision)	0/– 0.03	0/– 0.03	0.005	0.007
	UP (ultra precision)	0/– 0.02	0/– 0.02	0.003	0.005

Unit: mm

[1] Assembled linear guideway
[2] Unassembled linear guideway

3.2.13.2 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 CG series linear guideways are achieved.



Tolerance of parallelism of reference surface (P)

Table 3.36 **Maximum tolerance for parallelism (P)**

Series/Size	Preload class		
	Z0	**ZA**	**ZB**
CG_15	9	5	4
CG_20	11	7	5
CG_25	12	8	6
CG_30	14	9	7
CG_35	15	11	8
CG_45	19	12	10

Unit: μm

Tolerance of height of reference surface (S_1)

F 3.6

$$S_1 = a \times K - T_H$$

- S_1 Maximum height tolerance [mm]
- a Distance between rails [mm]
- K Coefficient of height tolerance
- T_H Tolerance of height according to Table 3.35

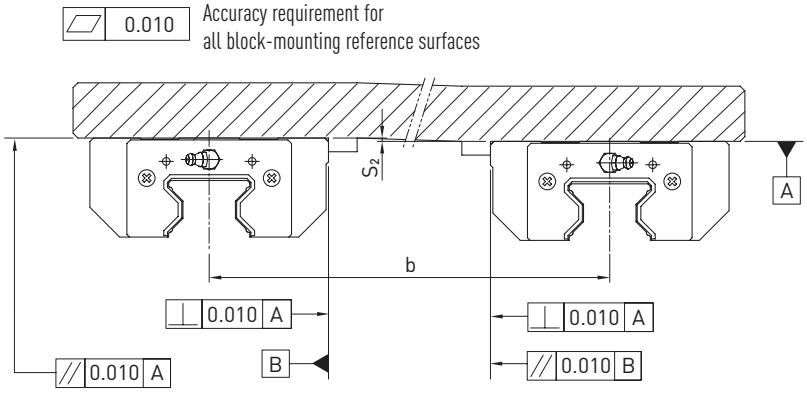
Table 3.37 **Coefficient of height tolerance (K)**

Series/Size	Preload class		
	Z0	**ZA**	**ZB**
CG_15 – CG_45	2.8×10^{-4}	1.7×10^{-4}	1.2×10^{-4}

Note: If $S_1 < 0$, select another tolerance class!

Height tolerance for mounting surface on block

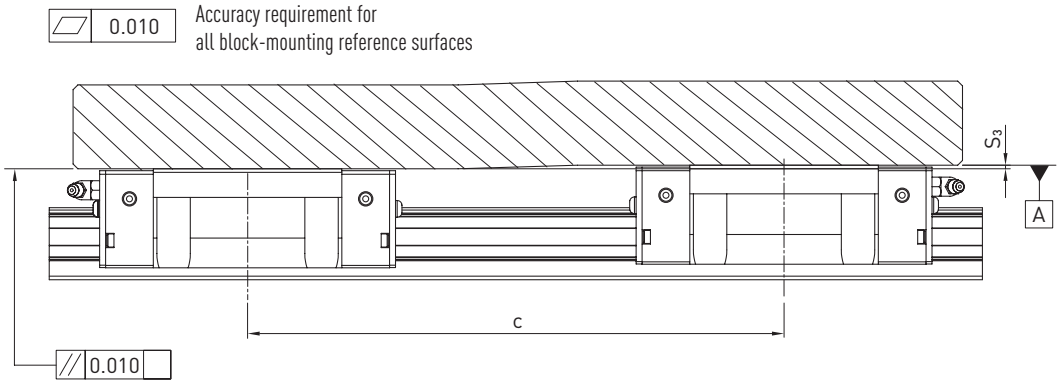
- The height tolerance of the reference surface when two or more blocks are used in parallel (S_2)



F 3.7 $S_2 = b \times K$

S_2 Maximum height tolerance [mm]
b Distance between blocks [mm]
K Coefficient of height tolerance

- The height tolerance of the reference surface when two or more blocks are used in parallel (S_3)



F 3.8 $S_3 = c \times K$

S_3 Maximum height tolerance [mm]
c Distance between blocks [mm]
K Coefficient of height tolerance

Table 3.38 **Coefficient of height tolerance (K)**

Series/Size	Load type	
	CG_C	**CG_H**
CG_15 – CG_45	4.2×10^{-5}	3.0×10^{-5}

Linear guideways

PG series

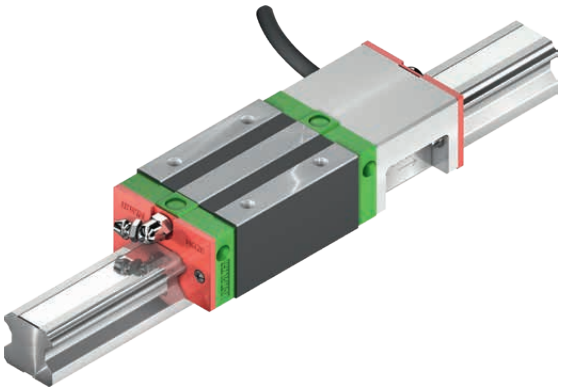
3.8 PG series

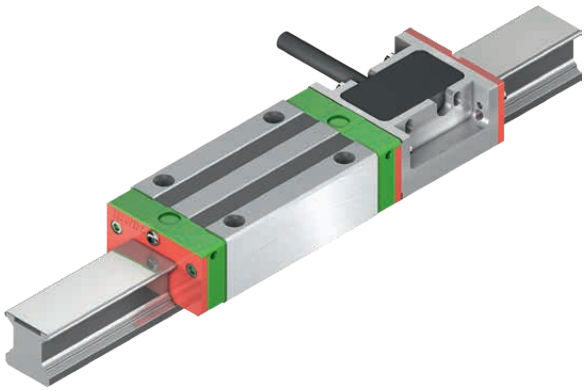
3.8.1 Properties of the PG series linear guideways

The HIWIN linear guideways of the PG series are a special version of the HG/QH/CG series with integrated MAGIC magnetic position measuring system. The magnetic positioning measuring systems of the MAGIC series are optimised for measuring the distances travelled in linear movements and particularly on linear motor axes. The measuring system consists of a magnetic measurement strip on a stainless steel carrier strip and an encoder unit. The rugged housing with excellent electrical shielding and signal output in real time make the HIWIN MAGIC series the positioning measuring systems of choice for demanding applications.
In the PG series, the encoder is mounted directly on the block of the HG/QH/CG series. The magnetic tape is integrated in an additional groove in the HGR/CGR profile rails. The MAGIC positioning measuring system is also available in a version independent of the profile rail. The position of the magnetic tape and encoder can then be specified at a suitable location to suit the customer. For details, please refer to the "Linear motors & positioning measuring systems" catalogue.

3.8.2 Layout of PG series

- Blocks of HG/QH/CG series
- Profile rail of the HG/CG series with additional groove for the measuring tape
- Encoder can be mounted on blocks of sizes HG_20, HG_25, QH_20,QH_25, CG_20, CG_25, CG_30, CG_35 and CG_45
- Mounting direction: When facing the reference edge of the block, the encoder is located on the left side by default. The line of the encoder is also located on the side of the reference edge

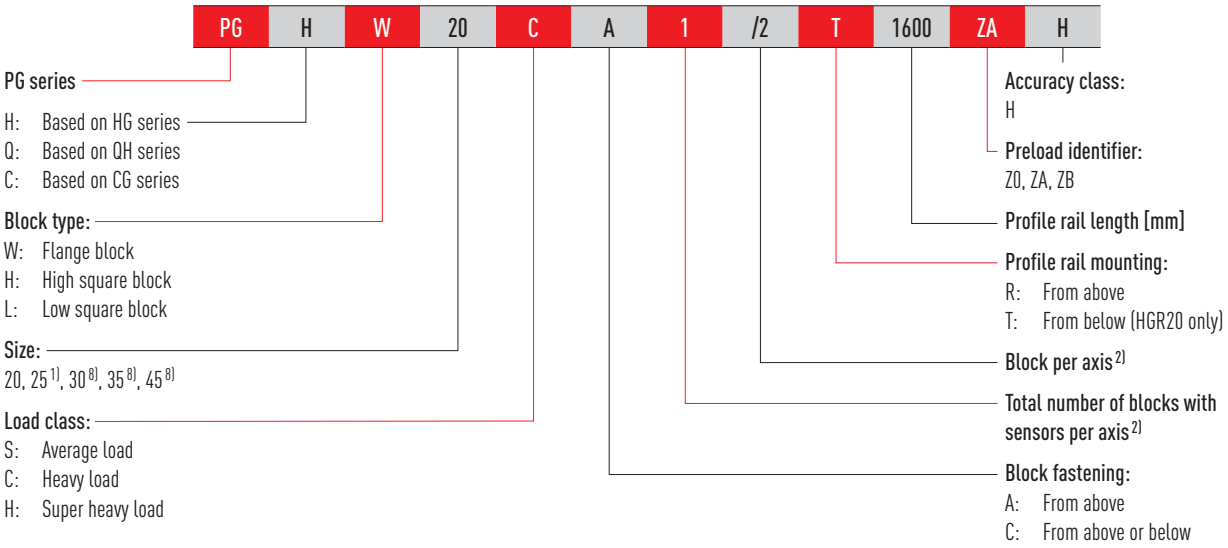




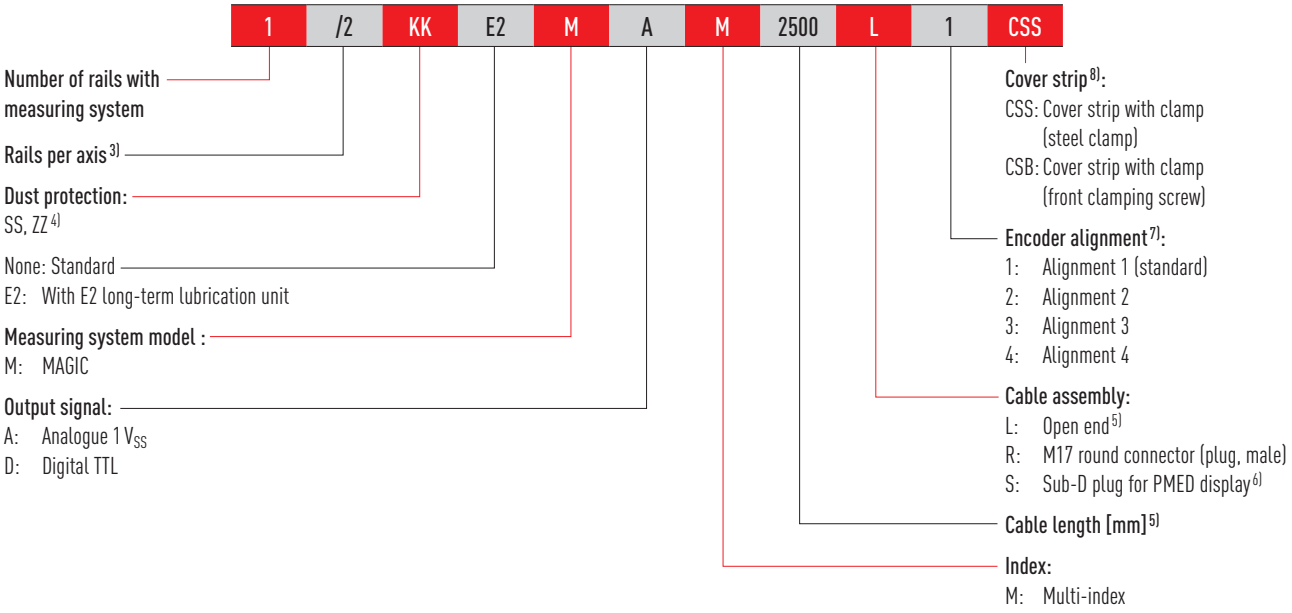
Properties:

- Zero contact measurement with 1 V_{SS} or digital output
- Digital resolution 1 µm
- Encoder and housing are resistant to dust, humidity, oil and chips
- Encoder with metal housing and IP67 protection mode
- Simple assembly and adjustment
- Signal output in real time
- Special housing for EMC optimisation

3.8.3 Order code of PG series



Continuation of order codes of PG series



1) PGH, PGQ: not identical in construction with standard rail HGR25R without groove. Mounting screw M5 instead of M6
2) For the PG series, the total number of blocks per axis is specified (all blocks of the ordered item)
3) 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.
4) If not specified, the block is supplied with standard dust protection (standard end seal and lower sealing strip). For an overview of the different sealing systems, see Page 22
5) For open ends, select cable length 1,000 by default (max. length PGH, PGQ: 5,000 mm; PGC: 1,000 mm)
6) The display must be ordered separately
7) See section 3.8.6
8) Only available for PGC

3.8.4 Dimensions of the PG blocks

The following figure shows an HGH20CA/HGH25CA block. It is also possible to attach to the other versions of the HG_20, HG_25, QH_20, QH_25, CG_20 and CG_25:and CG_25 sizes. The overall dimensions then change accordingly. The dimensions of all block sizes are listed in Table 3.125.

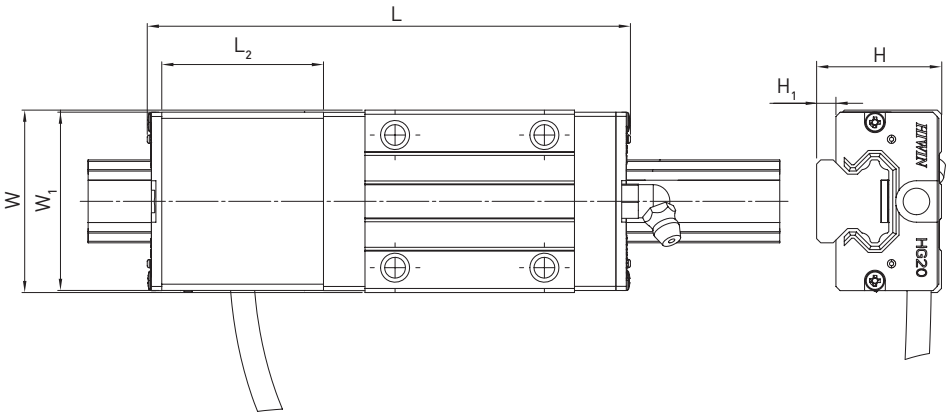


Table 3.125 **Dimensions of the blocks including MAGIC-PG housing**

Series/Size	L [mm]	L_2 [mm]	W [mm]	W_1 [mm]	H [mm]	H1 [mm]
HG_20C	118.0	40.5	44	43.0	30	4.6
HG_20H	132.7	40.5	44	43.0	30	4.6
HG_25C	124.5	40.5	48	46.4	40	5.5
HG_25H	145.1	40.5	48	46.4	40	5.5
QH_20C	117.2	40.5	44	43.0	30	4.6
QH_20H	131.9	40.5	44	43.0	30	4.6
QH_25C	123.9	40.5	48	46.4	40	5.5
QH_25H	144.5	40.5	48	46.4	40	5.5
CG_20C	121.4	44.0	44	43.0	30	4.6
CG_20H	137.4	44.0	44	43.0	30	4.6
CG_25C	130.5	44.0	48	47.0	40	6.1
CG_25H	147.9	44.0	48	47.0	40	6.1
CG_30C	144.1	44.0	60	58.0	45	7.0
CG_30H	166.6	44.0	60	58.0	45	7.0
CG_35C	158.1	44.0	70	69.0	55	7.6
CG_35H	182.5	44.0	70	69.0	55	7.6
CG_45C	184.3	45.0	86	84.0	70	9.7
CG_45H	220.7	45.0	86	84.0	70	9.7

3.8.5 Dimensions of the PG rails

3.8.5.1 Profile rail with groove, mounting from above (HG/QH series)

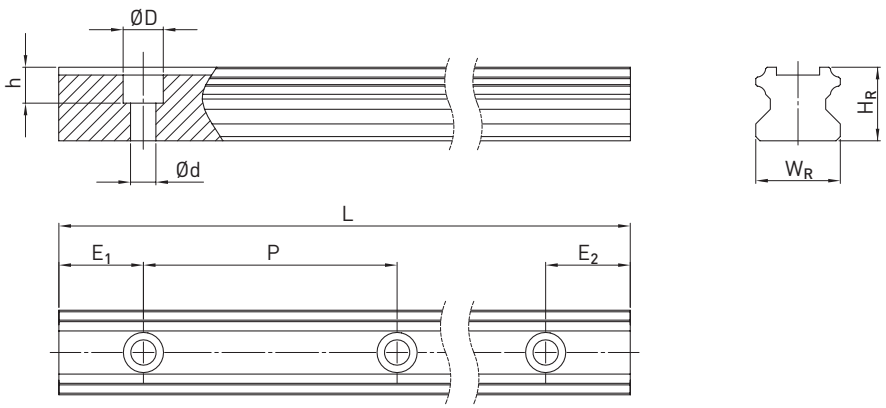


Table 3.126 **Dimensions HGR_R G1**

Series/size	Dimensions of the rail [mm]						Max. length [mm]	Max. length $E_1 = E_2$ [mm]	$E_{1/2}$ min [mm]	$E_{1/2}$ max [mm]	Weight [kg/m]
	W_R	H_R	D	h	d	P					
HGR20R G1	20	17.5	9.5	8.5	6.0	60	4,000	3,900	7	53	2.05
HGR25R G1C	23	22.0	9.5	8.5	6.0	60	4,000	3,900	7	53	3.05

3.8.5.2 Profile rail with groove, mounting from below (HG/QH series)

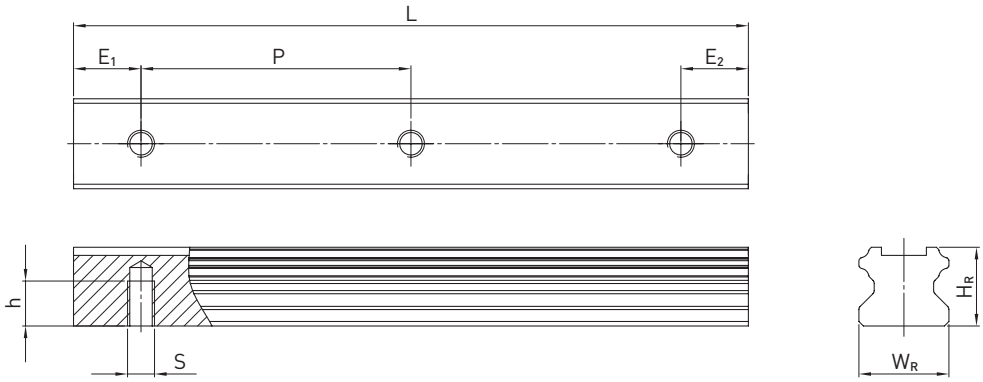


Table 3.127 **Dimensions HGR_T G1**

Series/size	Dimensions of the rail [mm]					Max. length [mm]	Max. length $E_1 = E_2$ [mm]	$E_{1/2}$ min [mm]	$E_{1/2}$ max [mm]	Weight [kg/m]
	W_R	H_R	S	h	P					
HGR20T G1	20	17.5	M6	10	60	4,000	3,900	7	53	2.13

3.8.5.3 Profile rail with groove, mounting from above (CG series)

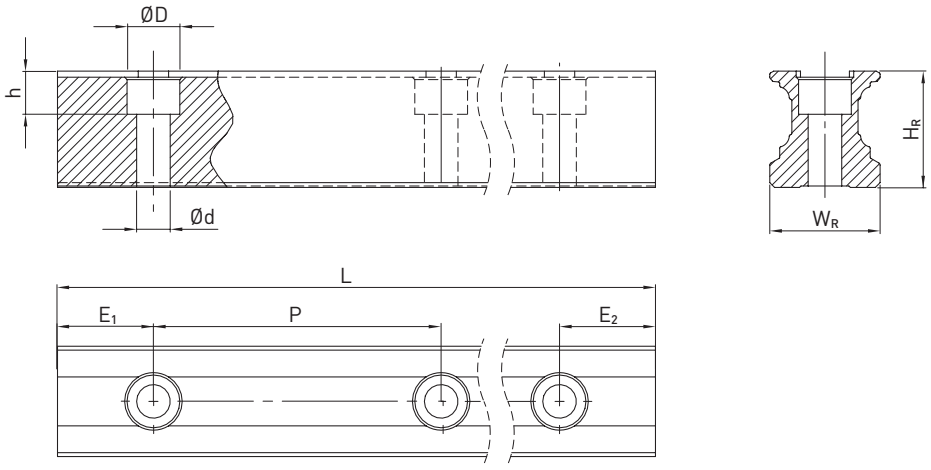


Table 3.128 **Dimensions CGR_R G1**

Series/size	Dimensions of the rail [mm]						Max. length [mm]	Max. length $E_1 = E_2$ [mm]	$E_{1/2}$ min [mm] [1]	$E_{1/2}$ min [mm] [2]	$E_{1/2}$ max [mm]	Weight [kg/m]
	W_R	H_R	D	h	d	P						
CGR20R G1	20	20.55	9.5	8.5	6.0	60	4,000	3,900	7	16	53	2.05
CGR25R G1	23	24.25	11.0	9.0	7.0	60	4,000	3,900	8	17	52	3.05
CGR30R G1	28	28.35	14.0	12.4	9.0	80	4,000	3,920	9	18	71	5.10
CGR35R G1	34	31.85	14.0	12.0	9.0	80	4,000	3,920	9	24	71	7.14
CGR45R G1	45	39.85	20.0	17.0	14.0	105	4,000	3,885	12	27	93	11.51

[1] $E_{1/2}$ min with cover strip (clamp: steel clamp)
[2] $E_{1/2}$ min with cover strip (clamp: front clamping screw)

Note: The PGC types always requires the cover strip of the rail to clamp the magnetic tape.

3.8.5.4 Profile rail with groove, mounting from above (CG series)

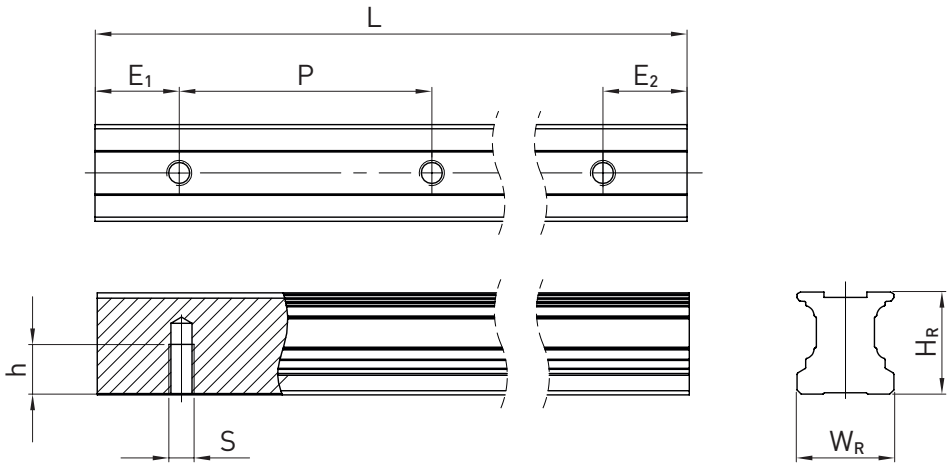


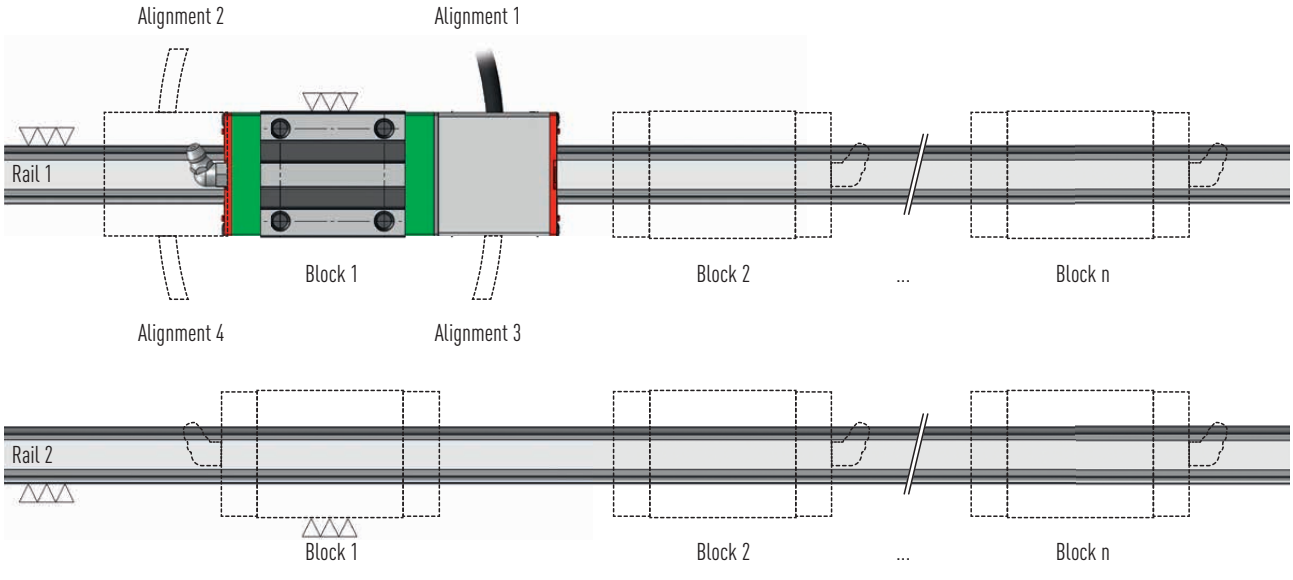
Table 3.129 **Dimensions CGR_T G1**

Series/size	Dimensions of the rail [mm]					Max. length [mm]	Max. length $E_1 = E_2$ [mm]	$E_{1/2}$ min [mm] 1)	$E_{1/2}$ min [mm] 2)	$E_{1/2}$ max [mm]	Weight [kg/m]
	W_R	H_R	S	h	P						
CGR20T G1	20	20.55	M6	10	60	4,000	3,900	10	15	53	2.48
CGR25T G1	23	24.25	M6	12	60	4,000	3,900	11	15	52	3.38
CGR30T G1	28	28.35	M8	15	80	4,000	3,920	12	16	71	5.10
CGR35T G1	34	31.85	M8	17	80	4,000	3,920	16	22	71	7.14
CGR45T G1	45	39.85	M12	24	105	4,000	3,885	19	24	93	11.51

1) $E_{1/2}$ min with cover strip (clamp: steel clamp)
2) $E_{1/2}$ min with cover strip (clamp: front clamping screw)

3.8.6 Alignment of HIWIN MAGIC-PG encoder

The HIWIN MAGIC-PG encoder can be delivered in alignments 1 to 4 according to the order code (section 3.8.3). If the alignment is not specified, the encoder is delivered with alignment 1 by default.
If there are several blocks on one rail or on a pair of rails, the encoder is mounted on block 1, rail 1 as shown in the following figure. If an alignment deviating from the standard is required, this must be defined in the MAGIC-PG project planning sheet (www.hiwin.de).



3.8.7 Specifications of the HIWIN MAGIC and HIWIN MAGIC-PG positioning measuring systems

Table 3.130 **Electrical and mechanical properties of the HIWIN MAGIC and HIWIN MAGIC-PG**

	1 V_{SS} (analogue)	TTL (digital)
Electrical properties		
Output signal specification	sin/cos, 1 V_{SS} (0.85 V_{SS} – 1.2 V_{SS})	Quadrature signals acc. to RS4-22
Resolution	Infinite, signal period 1 mm	1 µm
Repeatability bidirectional	0.003 mm	0.002 mm
Absolute accuracy	± 20 µm/m	
Reference signal [1]	Periodic index impulse at a distance of 1 mm	
Phase angle	90° ± 0.1° el	90°
DC component	2.5 V ± 0.3 V	–
Distortion factor	Typ. < 0.1 %	–
Operating voltage	5 V ± 5 %	
Power consumption	Typ. 35 mA, max. 70 mA	Typ. 70 mA, max. 120 mA
Max. measurement speed	10 m/s	5 m/s
EMC class	3, according to IEC 801	
Mechanical properties		
Housing material	High-quality aluminium alloy, encoder bottom made of stainless steel	
Max. cable length [2]	PGH/PGQ: 5,000 mm; PGC: 1,000 mm	
Min. bending radius cable	40 mm	
Protection class	IP67	
Operating temperatures	0 °C to +50 °C	
Weight of MAGIC encoder	80 g	
Weight of MAGIC-PG encoder	80 g	
MAGIC-PG suitable for blocks	HG_20, HG_25, QH_20, QH_25, CG_20, CG_25	

[1] Can be used e.g. with reference switch

[2] For use in energy chains, we recommend our pre-assembled encoder cable with a pre-mounted M17 round connector (coupling, female) on one side, which matches the optional M17 round plug connector (male) of the encoder. For details, please contact your HIWIN technician.

Table 3.131 **Magnetic tape specifications**

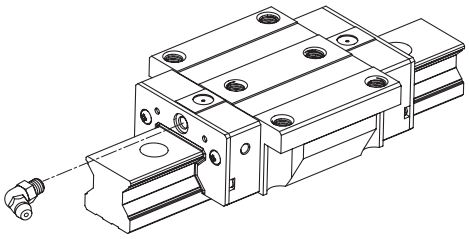
Properties	MAGIC-PG	MAGIC
Accuracy class [1]	± 20 µm/m	
Linear expansion coefficient	11.5 × 10^{-6} m/K	
Period	1 mm	
Thickness magnetic scale	1.70 ± 0.10 mm	
Thickness magnetic scale + protective cover tape	–	1.85 ± 0.15 mm
Width	10.05 ± 0.10 mm	
Maximum length	24 m	
Magnetic remanence	> 240 mT	
Pole pitch (distance north – south pole)	1 mm	
single reference marks	Optional	
Material	Elastomers, nitrile and EPDM	
Temperature range	0 °C to +50 °C	
Weight	70 g/m	

[1] At 20 °C

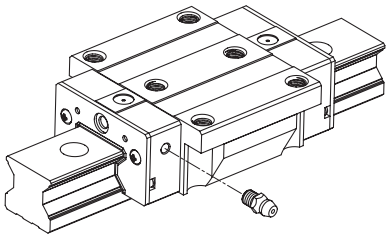
4. Accessories

4.1 Lubrication adapter

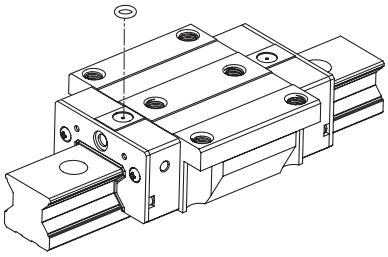
A lubricating nipple is fitted as standard on the end face of one end of the block **(1)**. The opposite side is closed with a plug screw. Alternatively, lubrication can also be supplied via the four holes **(2)** provided in the side of the deflector or from above **(3)**. Lubricating nipples, lubrication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