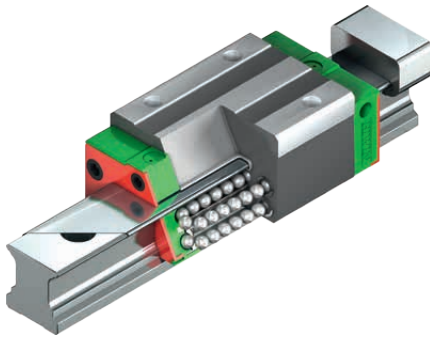


### 3.3.1 Properties of the linear guideways, series CG

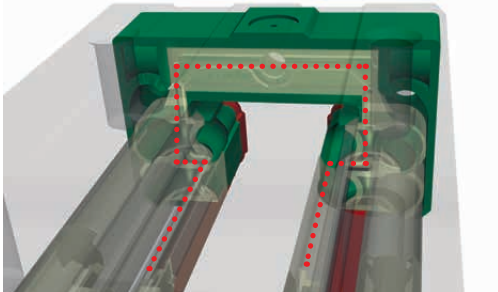
The HIWIN linear guideways of the CG series with 0-arrangement of the ball tracks guarantee high torque loading capacity, especially in the  $M_x$  direction. The modified track geometry ensures high load ratings. The new flexible end seal automatically adjusts itself to the rail contour and ensures a high, permanent dust protection. To protect the end seal against mechanical damage, the CG series is equipped with a sheet metal scraper in front of the end seal as standard.

### 3.3.2 Design of the CG series

Free of play 4-row recirculation ball bearing guide with best dust protection already in the standard version.



Optimized lubrication concept for long relubrication intervals and short stroke applications.



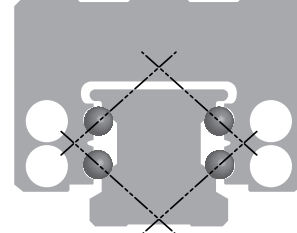
Optionally, a cover strip is available – the entry of dust and wear of the sealing lip are thus permanently reduced to a minimum. With the help of a mounting tool the cover strip is installed in a few easy steps.

For optimum lubricant distribution the block has an additional lubrication path which leads the lubricant into the middle of the carrying zone. This ensures long relubrication intervals and a significant advantage especially in short stroke applications.

Easy mounting, better protection against entry of dust and against wear of the end seal due to cover strip.



0-arrangement and optimized geometry of ball bearing guide for high torque loading capacity and high load ratings.



#### Advantages:

- Free of play
- Interchangeable
- High accuracy
- High torque loading capacity, especially rolling moment  $M_x$
- Optional with cover strip

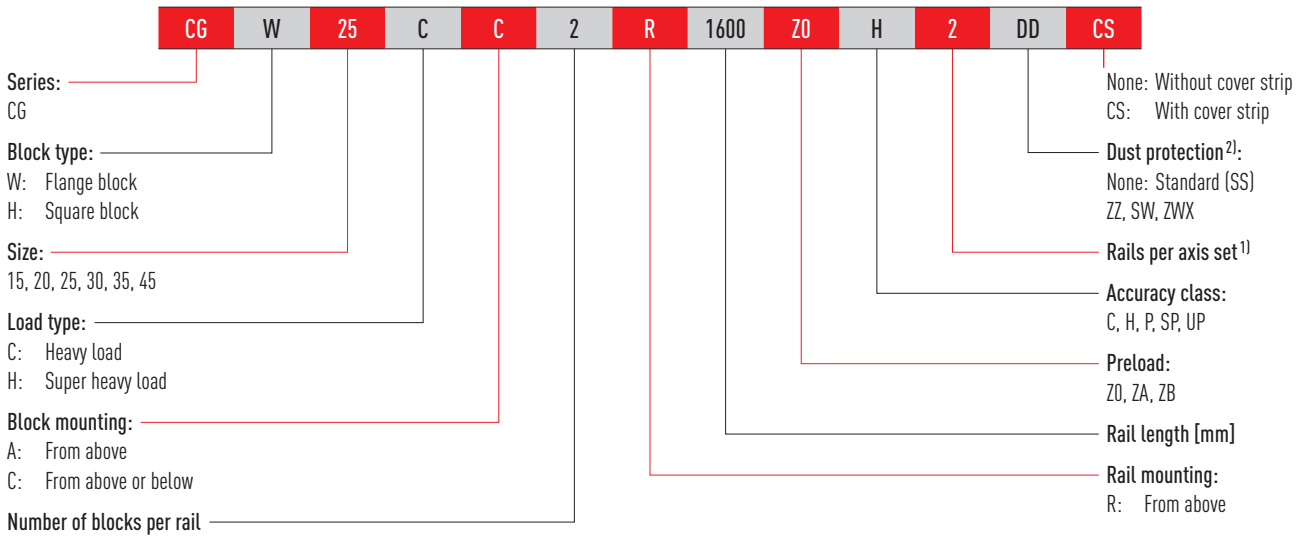
### 3.3.3 Order codes for the CG series

For CG linear guideways, a distinction is made between interchangeable and non-interchangeable models. The dimensions of both models are the same. The main difference is that the block and rail in the interchangeable models can be freely interchanged. Block and rail can be ordered separately and fitted by the customer. Their accuracy extends to class P.

Given their stringent dimensional accuracy check, the interchangeable models are a good choice for customers who do not use rails in pairs on one axis. Non-interchangeable linear guideways are always supplied preassembled. The order codes of the series include the dimensions, model, accuracy class, preload etc.

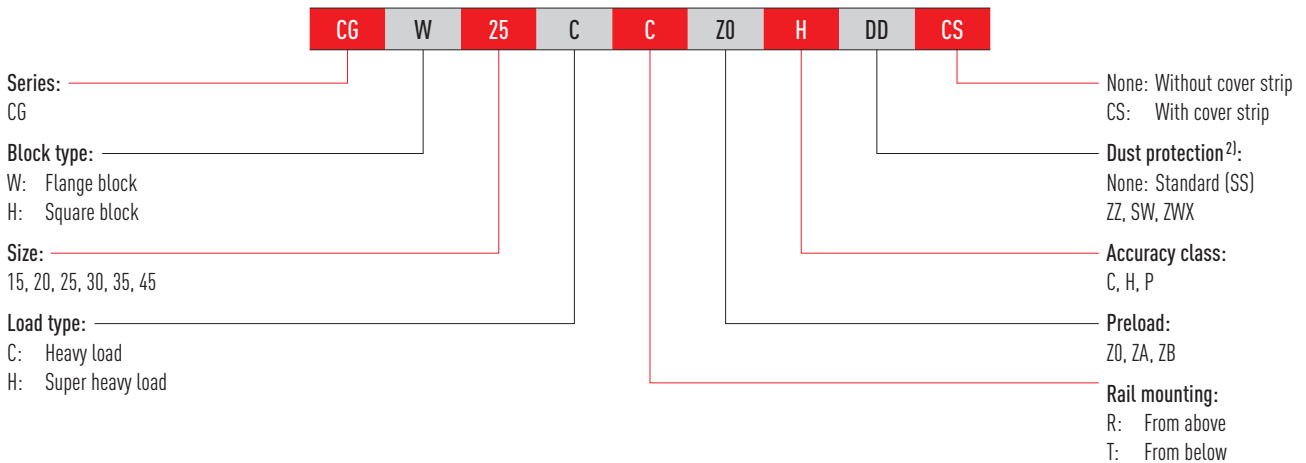
**Non-interchangeable models (custom-assembled)**

○ Order code for the fully assembled linear guideway

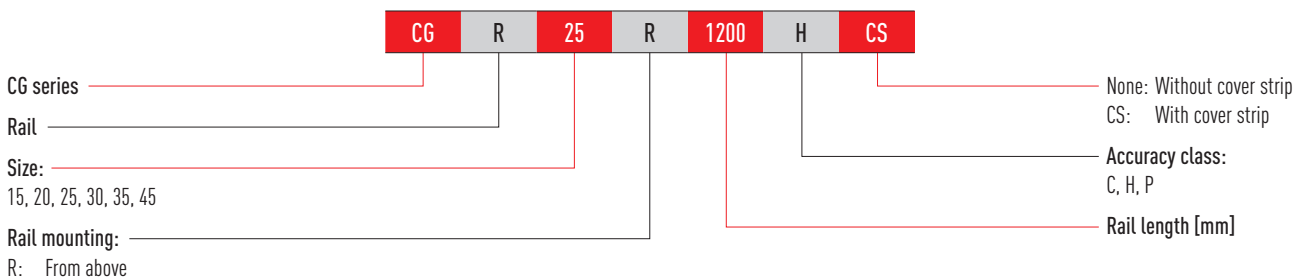


**Interchangeable models**

○ Order code for CG block



○ Order code for CG rail



Note:

<sup>1)</sup> The figure 2 is also a quantity, i.e. one item of the above-mentioned article consists of a pair of rails. No number is specified for individual rails.

By default multi-part rails are delivered with staggered butt joints.

<sup>2)</sup> You will find an overview of the individual sealing systems on [Page 22](#)

### 3.3.4 Block types

HIWIN provides square and flange blocks for its linear guideways. Given their low height and larger mounting surface, flange blocks are better suited to large loads.

Type	Series/size	Structure	Height [mm]	Rail length [mm]	Typical application
Square type	CGH-CA CGH-HA		28 – 70	250 – 4,000	<ul style="list-style-type: none"> <li>○ Woodworking</li> <li>○ Machining centres</li> <li>○ NC lathes</li> <li>○ Grinding machines</li> <li>○ Precision milling machines</li> <li>○ High-performance cutting machines</li> <li>○ Automation technology</li> <li>○ Transport technology</li> <li>○ Measuring technology</li> <li>○ Machines and equipment requiring high positioning accuracy</li> </ul>
Flange type	CGW-CA CGW-HA		24 – 60		

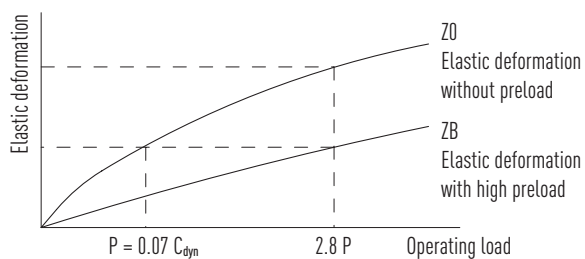
### 3.3.5 Rail types

Fastening from above
CGR_R

### 3.3.6 Preload

#### Definition

Every rail type can be preloaded based on the size of the balls. The curve shows that the rigidity doubles at higher preload. The CG series offers three standard preload classes for various applications and conditions.



Preload ID

Table 3.45 Preload ID

ID	Preload		Application	Sample applications
ZO	Light preload	0 – 0.02 C <sub>dyn</sub>	Constant load direction, little vibration, lower accuracy needed	<ul style="list-style-type: none"> <li>○ Transport technology</li> <li>○ Automatic packaging machines</li> <li>○ X-Y axis in industrial machines</li> <li>○ Welding machines</li> </ul>
ZA	Medium preload	0.05 – 0.07 C <sub>dyn</sub>	High accuracy needed	<ul style="list-style-type: none"> <li>○ Machining centres</li> <li>○ Z axes for industrial machines</li> <li>○ Eroding machines</li> <li>○ NC lathes</li> <li>○ Precision X-Y tables</li> <li>○ Measuring technology</li> </ul>
ZB	High preload	above 0.1 C <sub>dyn</sub>	High rigidity needed, vibration and impact	<ul style="list-style-type: none"> <li>○ Machining centres</li> <li>○ Grinding machines</li> <li>○ NC lathes</li> <li>○ Horizontal and vertical milling machines</li> <li>○ Z axis of machine tools</li> <li>○ High-performance cutting machines</li> </ul>

3.3.7 Load ratings and torques

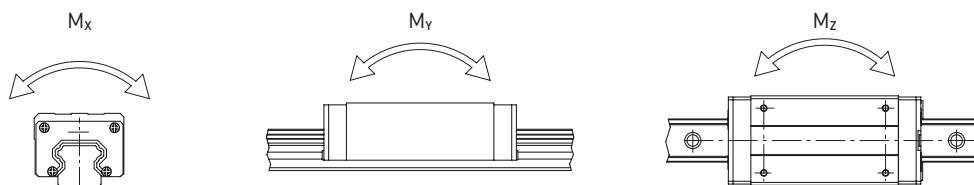


Table 3.46 Load ratings and torques for series CG

Series/size	Dynamic load rating C <sub>dyn</sub> [N] <sup>1)</sup>	Static load rating C <sub>0</sub> [N]	Dynamic moment [Nm]			Static moment [Nm]		
			M <sub>x</sub>	M <sub>y</sub>	M <sub>z</sub>	M <sub>0x</sub>	M <sub>0y</sub>	M <sub>0z</sub>
CG_20C	23,700	30,510	287.4	217.5	217.5	370	280	280
CG_25C	34,960	43,940	477.4	389.9	389.9	600	490	490
CG_30C	46,000	55,190	791.8	583.4	583.4	950	700	700
CG_35C	61,170	79,300	1,334.5	840.8	840.8	1,730	1,090	1,090

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

3.3.8 Rigidity

Rigidity depends on preload. Formula F 3.5 can be used to determine deformation depending on rigidity.

F 3.5

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

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

Table 3.47 Radial rigidity for series CG

Load class	Series/size	Rigidity depending on preload		
		ZO	ZA	ZB
Heavy load	CG_20C	271	415	483
	CG_25C	338	440	574
	CG_30C	447	553	757
	CG_35C	468	610	800

Unit: N/µm

## 3.3.9 Dimensions of the CG blocks

### 3.3.9.1 CGH

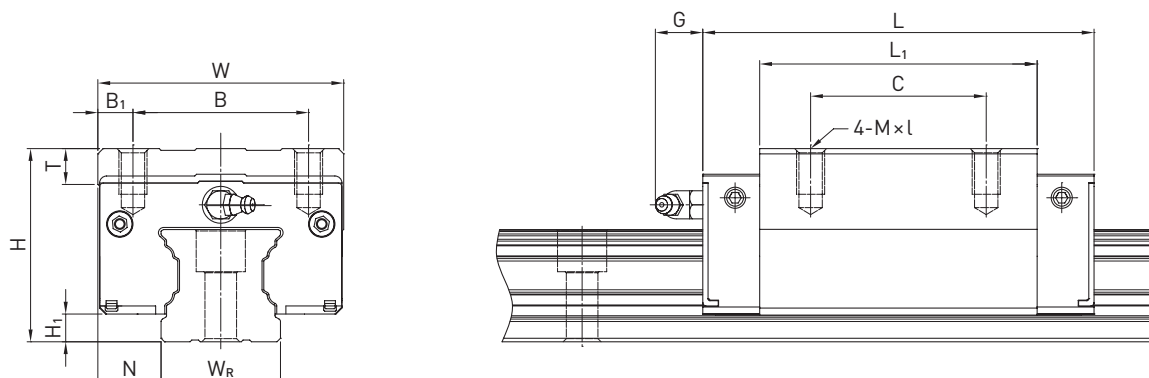


Table 3.48 Dimensions of the block

Series/ size	Installation dimensions [mm]			Dimensions of the block [mm]									Load ratings [N]	
	H	H <sub>1</sub>	N	W	B	B <sub>1</sub>	C	L <sub>1</sub>	L	G	M × l	T	C <sub>dyn</sub>	C <sub>0</sub>
CGH15CA <sup>1)</sup>	28	4.1	9.5	34	26	4.0	26	39.2	58.2	6.0	M4 × 5	6.0	13,800	18,020
CGH15HA <sup>1)</sup>							26	53.6	72.6				17,600	25,530
CGH20CA	30	4.6	12.0	44	32	6.0	36	52.5	74.9	6.0	M5 × 6	8.0	23,700	30,510
CGH20HA <sup>1)</sup>							50	68.5	90.9				28,600	39,900
CGH25CA	40	6.1	12.5	48	35	6.5	35	61.0	84.0	12.0	M6 × 8	8.0	34,960	43,940
CGH25HA <sup>1)</sup>							50	78.6	104.6				42,180	57,460
CGH30CA	45	7.0	16.0	60	40	10.0	40	69.0	97.4	12.0	M8 × 10	9.5	46,000	55,190
CGH30HA <sup>1)</sup>							60	92.3	118.9				58,590	78,180
CGH35CA	55	7.6	18.0	70	50	10.0	50	79.0	111.4	12.0	M8 × 13	10.2	61,170	79,300
CGH35HA <sup>1)</sup>							72	105.0	137.4				77,900	112,340
CGH45CA <sup>1)</sup>	70	9.7	20.5	86	60	13.0	60	97.8	137.8	12.9	M10 × 17	16.0	97,630	133,000
CGH45HA <sup>1)</sup>							80	132.3	172.3				124,430	217,200

<sup>1)</sup> Availability on request

For dimensions of rail, see [Page 68](#). for standard and optional lubrication adapter, see [Page 124](#).

3.3.9.2 CGW

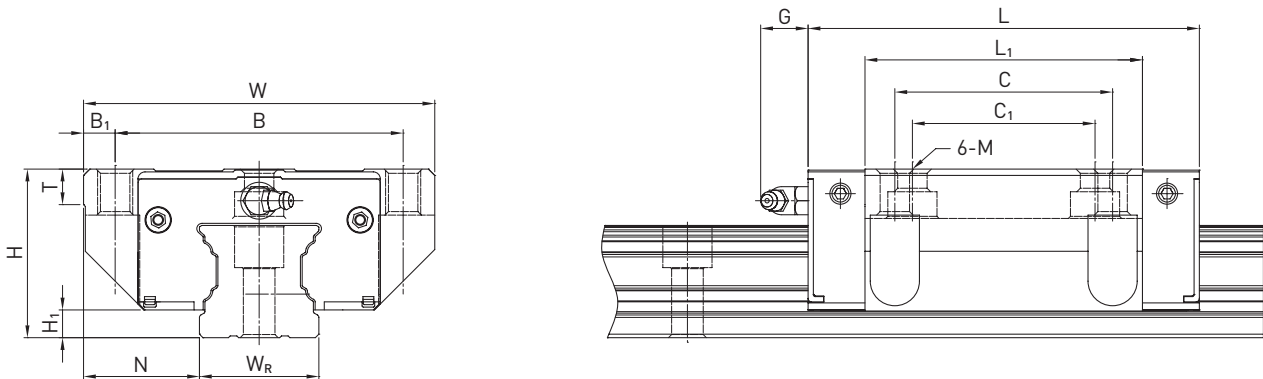


Table 3.49 Dimensions of the block

Series/ size	Installation dimensions [mm]			Dimensions of the block [mm]											Load ratings [N]	
	H	H <sub>1</sub>	N	W	B	B <sub>1</sub>	C	C <sub>1</sub>	L <sub>1</sub>	L	G	M	T	C <sub>dyn</sub>	C <sub>0</sub>	
CGW15CC <sup>1)</sup>	24	4.1	16.0	47	38	4.5	30	26	39.2	58.2	6.0	M5	6.0	13,800	18,020	
CGW15HC <sup>1)</sup>									53.6	72.6				17,600	25,530	
CGW20CC	30	4.6	21.5	63	53	5.0	40	35	52.5	74.9	6.0	M6	6.5	23,700	30,510	
CGW20HC <sup>1)</sup>									68.5	90.9				28,600	39,900	
CGW25CC	36	6.1	23.5	70	57	6.5	45	40	61.0	84.0	12.0	M8	7.0	34,960	43,940	
CGW25HC <sup>1)</sup>									78.6	104.6				42,180	57,460	
CGW30CC	42	7.0	31.0	90	72	9.0	52	44	69.0	97.4	12.0	M10	10.5	46,000	55,190	
CGW30HC <sup>1)</sup>									92.3	118.9				58,590	78,180	
CGW35CC	48	7.6	33.0	100	82	9.0	62	52	79.0	111.4	12.0	M10	10.1	61,170	79,300	
CGW35HC <sup>1)</sup>									105.0	137.4				77,900	112,340	
CGW45CC <sup>1)</sup>	60	9.7	37.5	120	100	10.0	80	60	97.8	137.8	12.9	M12	15.1	97,630	133,000	
CGW45HC <sup>1)</sup>									132.3	172.3				124,430	217,200	

<sup>1)</sup> Availability on request

For dimensions of rail, see Page 68. for standard and optional lubrication adapter, see Page 124.

### 3.3.10 Dimensions of the CG rail

#### 3.3.10.1 Dimensions of rail CGR\_R

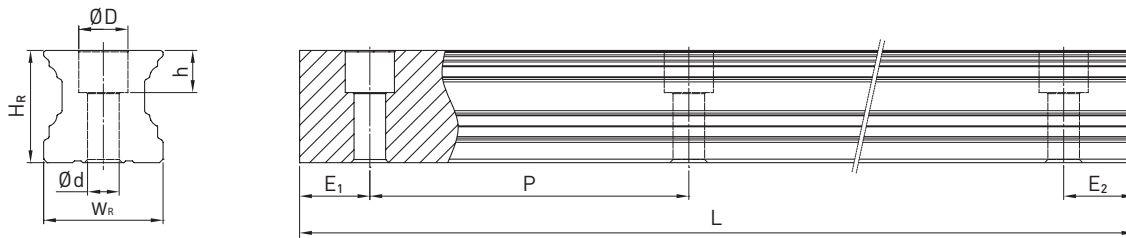


Table 3.50 Dimensions of rail CGR\_R

Series/ size	Assembly screw for rail [mm]	Dimensions of rail [mm]						Max. length [mm]	Max. length E <sub>1</sub> = E <sub>2</sub> [mm]	E <sub>1/2</sub> min [mm]	E <sub>1/2</sub> max [mm]
		W <sub>R</sub>	H <sub>R</sub>	D	h	d	P				
CGR15R <sup>1)</sup>	M4 × 16	15	16.2	7.5	5.3	4.5	60	4,000	3,900	6	54
CGR20R	M5 × 20	20	20.6	9.5	8.5	6.0	60	4,000	3,900	7	53
CGR25R	M6 × 22	23	24.3	11.0	9.0	7.0	60	4,000	3,900	8	52
CGR30R	M8 × 25	28	28.4	14.0	12.4	9.0	80	4,000	3,920	9	71
CGR35R	M8 × 30	34	31.9	14.0	12.0	9.0	80	4,000	3,920	9	71
CGR45R <sup>1)</sup>	M12 × 35	45	39.9	20.0	17.0	14.0	105	4,000	3,885	12	93

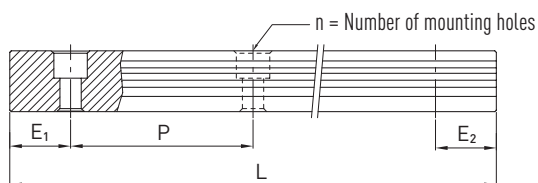
<sup>1)</sup> Availability on request

Note:

1. The tolerance for E is +0.5 to -1 mm for standard rails and 0 to -0.3 mm for joints.
2. If the E<sub>1/2</sub> dimensions are not indicated, the maximum possible number of mounting holes will be determined under consideration of E<sub>1/2</sub> min.
3. The rails are shortened to the required length. If the E<sub>1/2</sub> dimensions are not indicated, these will be carried out symmetrically.

#### 3.3.10.2 Calculating the length of rails

HIWIN offers rails in customized lengths. To prevent the risk of the end of the rail becoming unstable, the value E must not exceed half of the distance between the mounting holes (P). At the same time, the value E<sub>1/2</sub> should be between E<sub>1/2</sub> min and E<sub>1/2</sub> max so that the mounting hole does not rupture.



F 3.6

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

- L Total length of the rail [mm]
- n Number of mounting holes
- P Distance between two mounting holes [mm]
- E<sub>1/2</sub> Distance from the middle of the last mounting hole to the end of the rail [mm]

**3.3.10.3 Tightening torques for mounting bolts**

Insufficient tightening of the mounting bolts strongly compromises the precision of the linear guideway; the following tightening torques are therefore recommended for the relevant screw sizes.

Table 3.51 Tightening torques of the mounting bolts according to ISO 4762-12.9

Series/size	Screw size	Torque [Nm]	Series/size	Screw size	Torque [Nm]
CG_15	M4 × 16	4	CG_30	M10	70
CG_20	M5 × 16	9	CG_35	M8 × 25	30
CG_25	M6 × 20	13	CG_35	M10	70
CG_30	M8 × 25	30	CG_45	M12 × 35	120

**3.3.10.4 Cover caps for mounting holes of rails**

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

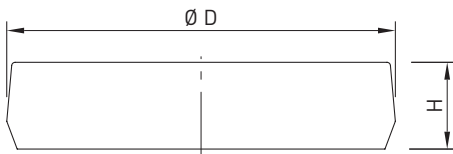


Table 3.52 Cover caps for mounting holes of rails

Rail	Screw	Article number			Ø D [mm]	Height H [mm]
		Plastic	Brass	Steel		
CGR15R	M4	5-001342	5-001344	—	7.5	1.1
CGR20R	M5	5-001348	5-001350	5-001352	9.5	2.2
CGR25R	M6	5-001353	5-001355	5-001357	11.0	2.5
CGR30R	M8	5-001358	5-001360	5-001362	14.0	3.3
CGR35R	M8	5-001358	5-001360	5-001362	14.0	3.3
CGR45R	M12	5-001322	5-001324	5-001327	20.0	4.6

**3.3.11 Sealing systems**

Various sealing systems are available for HIWIN blocks. You will find an overview on [Page 22](#). The table below shows the total length of the blocks with the different sealing systems. Sealing systems suitable for these sizes are available.

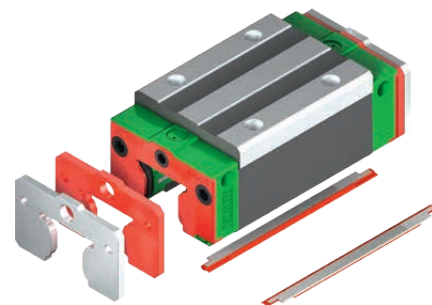


Table 3.53 Total length of blocks with different sealing systems

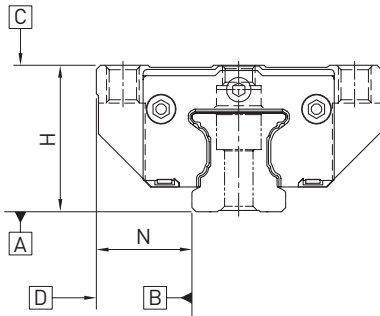
Series/size	Total length L			
	SS	ZZ	SW	ZWX
CG_20C	74.9	77.9	77.7	80.7
CG_25C	84.0	87.0	86.8	89.8
CG_30C	97.4	100.4	100.2	103.2
CG_35C	111.4	114.4	114.2	117.2

Unit: mm



### 3.3.12 Tolerances depending on accuracy class

The CG series is available in five accuracy classes depending on parallelism between block and rail, height accuracy H and accuracy of width N. The choice of accuracy class is determined by the machine requirements.



#### 3.3.12.1 Parallelism

Parallelism of stop surfaces D and B of block and rail and parallelism of top of block C to mounting surface A of rail. Ideal linear guideway installation is required, as is a measurement in the centre of the block.

Table 3.54 Tolerance of parallelism between block and 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:  $\mu\text{m}$

3.3.12.2 Accuracy – height and width

**Height tolerance of H**

Permissible absolute dimension variance of height H, measured between centre of screw-on surface C and underside of rail A, with block in any position on the rail.

**Height variance of H**

Permissible variance of height H between several blocks on a rail, measured in the same rail position.

**Width tolerance of N**

Permissible absolute dimension variance of width N, measured between centre of screw-on surfaces D and B, with block in any position on the rail.

**Width variance of N**

Permissible variance of width N between several blocks on a rail, measured in the same rail position.

Table 3.55 Height and width tolerances of non-interchangeable types

Series/size	Accuracy class	Height tolerance of 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	0 - 0.03	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	0 - 0.04	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	0 - 0.05	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

Table 3.56 Height and width tolerances of interchangeable types

Series/size	Accuracy class	Height tolerance of 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)	± 0.015	± 0.015	0.006	0.006
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)	± 0.02	± 0.02	0.007	0.007
CG_45	C (Normal)	± 0.1	± 0.1	0.03	0.03
	H (High)	± 0.05	± 0.05	0.015	0.02
	P (Precision)	± 0.025	± 0.025	0.007	0.01

Unit: mm

### 3.3.12.3 Permissible mounting surface tolerances

Once the requirements relating to the accuracy of the mounting surfaces are met, the good accuracy, rigidity and lifetime of the CG series linear guideways are achieved.

#### Tolerance for the parallelism of the reference surface (P)

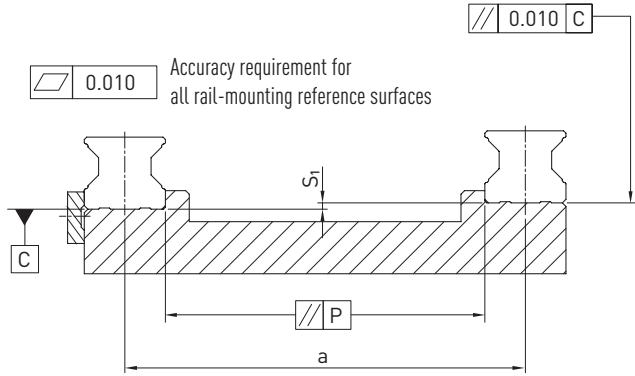


Table 3.57 Maximum tolerance for parallelism (P)

Series/size	Preload class		
	Z0	ZA	ZB
CG_20	11	7	5
CG_25	12	8	6
CG_30	14	9	7
CG_35	15	11	8

Unit:  $\mu\text{m}$

#### Tolerance for the height of the reference surface ( $S_1$ )

**F 3.7**  $S_1 = a \times K - T_H$

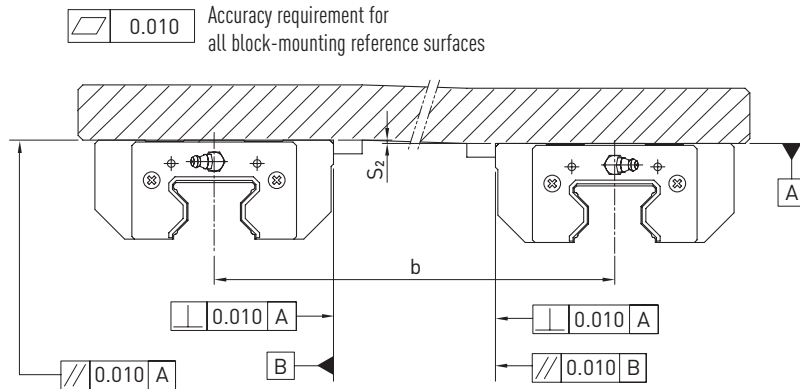
- $S_1$  Max. height tolerance [mm]
- $a$  Distance between rails [mm]
- $K$  Coefficient of the height tolerance
- $T_H$  Tolerance of height H acc. to [Table 3.55](#) and [Table 3.56](#)

Table 3.58 Coefficient of height tolerance (K)

Series/size	Preload class		
	Z0	ZA	ZB
CG_15 – CG_45	$2.8 \times 10^{-4}$	$1.7 \times 10^{-4}$	$1.2 \times 10^{-4}$

**Height tolerance of the block mounting surface**

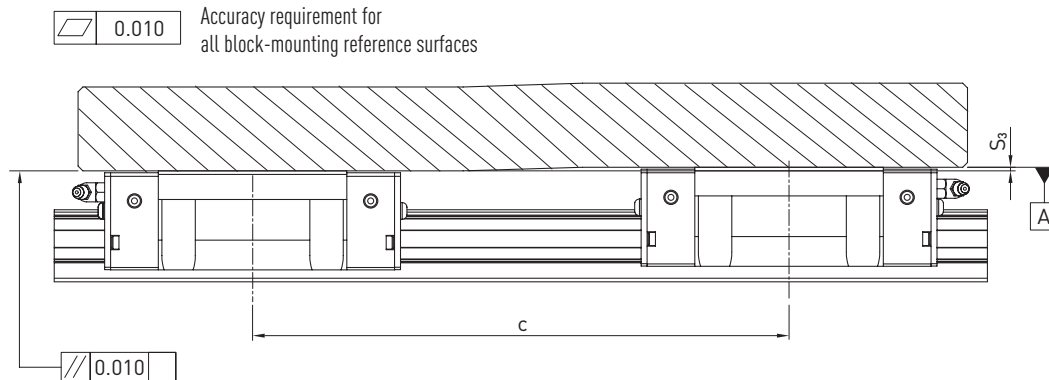
- The height tolerance of the reference surface in the parallel use of two or more blocks (S<sub>2</sub>)



**F3.8**  $S_2 = b \times K$

S<sub>2</sub> Max. height tolerance [mm]  
 b Distance between blocks [mm]  
 K Coefficient of the height tolerance

- The height tolerance of the reference surface in the parallel use of two or more blocks (S<sub>3</sub>)



**F3.9**  $S_3 = c \times K$

S<sub>3</sub> Max. height tolerance [mm]  
 c Distance between blocks [mm]  
 K Coefficient of the height tolerance

Table 3.59 **Coefficient of height tolerance (K)**

Series/size	Load type	
	CG_C	CG_H
CG_15 – CG_45	$4.2 \times 10^{-5}$	$3.0 \times 10^{-5}$

### 3.3.13 Shoulder heights and fillets

Imprecise shoulder heights and fillets of mounting surfaces compromise precision and may lead to conflicts with the block or rail profiles. The following shoulder heights and edge profiles must be observed in order to avoid assembly problems.

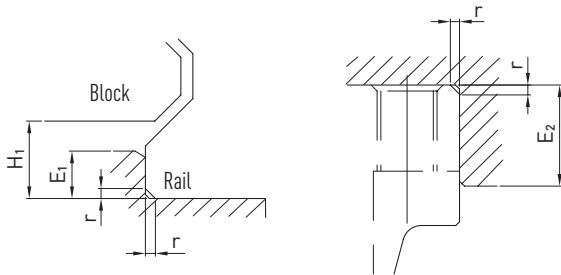


Table 3.60 Shoulder heights and fillets

Series/size	Max. edge radius $r$	Shoulder height of reference edge of rail $E_1$	Shoulder height of reference edge of block $E_2$	Clearance under block $H_1$
CG_15	0.5	3.0	4.0	4.1
CG_20	0.5	3.5	5.0	4.6
CG_25	1.0	5.0	5.0	6.1
CG_30	1.0	5.0	5.0	7.0
CG_35	1.0	6.0	6.0	7.6
CG_45	1.0	8.0	8.0	9.7

Unit: mm