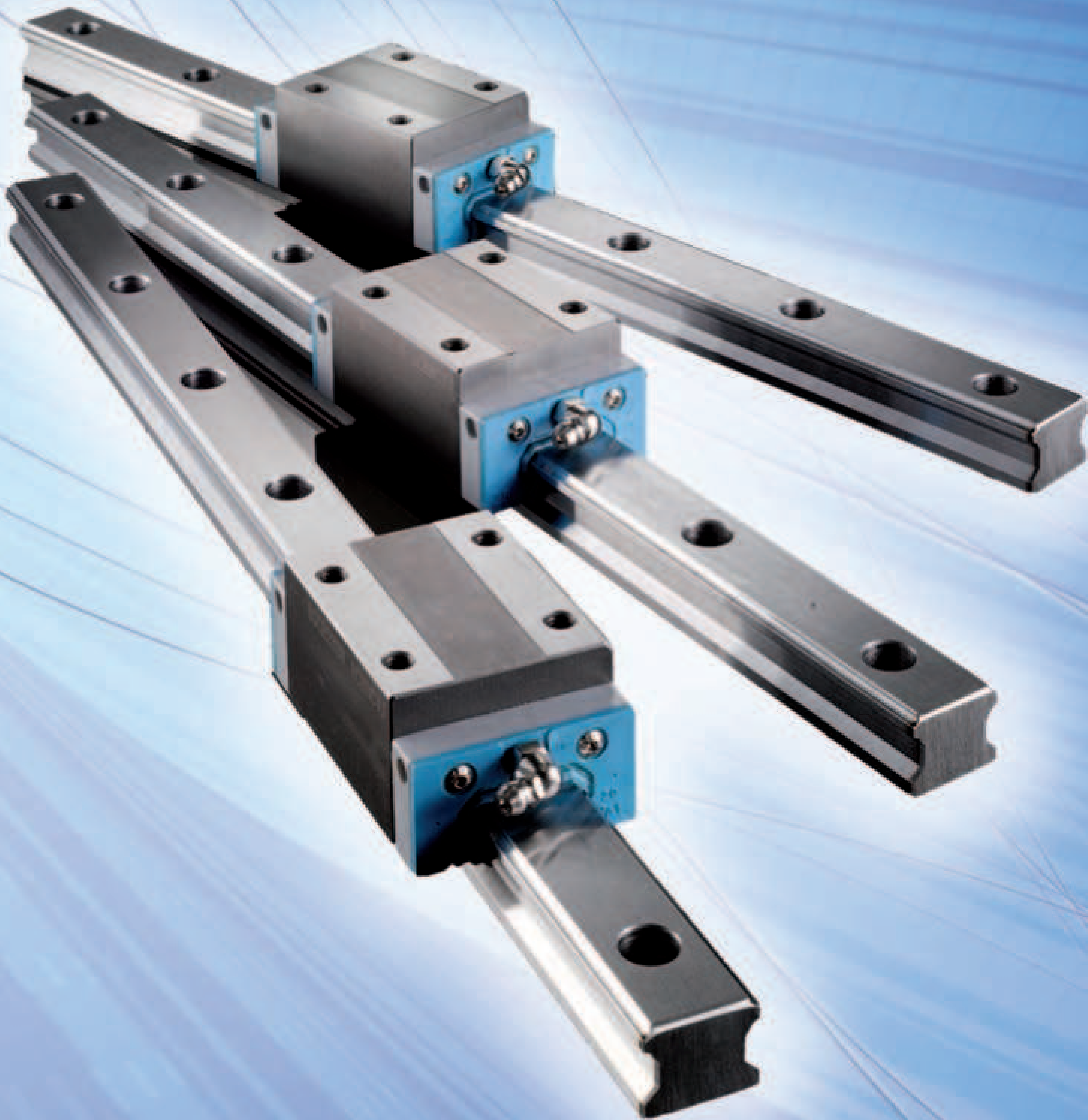
SNR : We get you moving!



Industry

SNR – WE GET YOU MOVING...

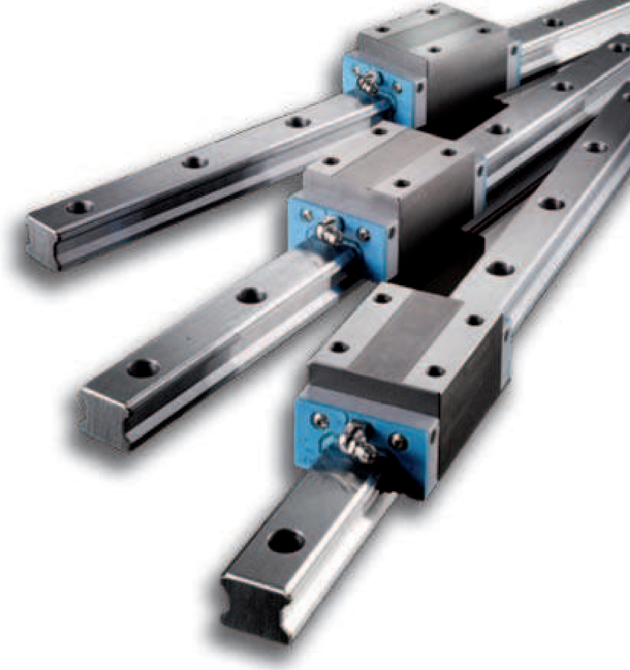
SNR is one of the leading European roller bearing manufacturers and has been one of the most innovative companies in this sector for decades. Following the merger with the Japanese company NTN, we are the third-largest roller bearing manufacturer in the world. This position allows us to provide our customers with a high level of added value regarding service, quality and product range. As a result, we have been able to build a strong image as a competent partner for our customers. Our companies are characterised by global presence and a consistent quality system.

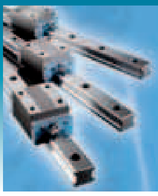
SNR has been established in the linear technology market since 1985 and strives to offer a complete and competitive product range. This catalogue provides an overview of our profile rail range. This innovative range is based on a patented ball chain system and a broad product range. Our external long-term tests prove that our production strictly adheres to the high SNR quality standards. We also provide a wide range of technical innovations.

Our sales support and applications engineers are always on hand to you to offer you optimal support. All over Europe! Supplies from our Bielefeld plant and our European central store in Lyon ensure fast delivery.

Rail guides are used in a variety of applications such as: machine tool construction, packaging and printing machine construction, building of general and special machines, aeronautical construction, automation and assembly lines, the timber and semiconductor industries, medical technology and many others. Our consulting and planning service is based on many years of interdisciplinary experience.

This technical catalogue forms the basis of our discussions with you. Our sales and applications engineers will gladly help you with their expertise. We are looking forward to your enquiries. Our goal is to achieve joint, constructive solutions. Product quality, economic efficiency and high user benefits are the basis of a strategic partnership between NTN-SNR and you – our customer.





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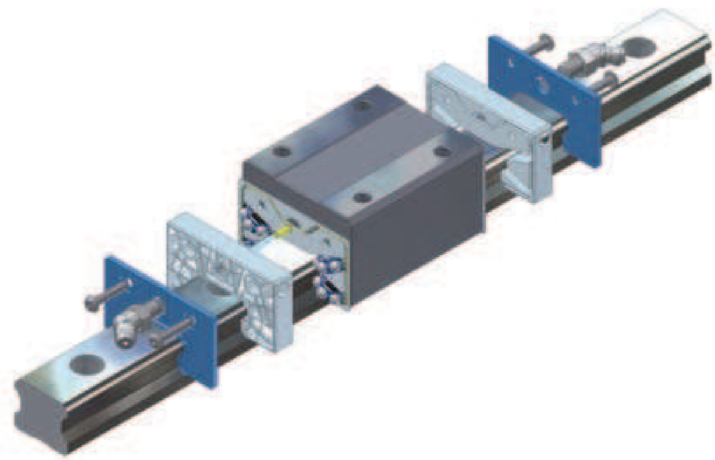
1. Basics of linear guides

Man has moved heavy loads since ancient times using rotation and linear movement or a combination of both. These movements are still found in many machines. The friction bearings initially used have mostly been replaced by roller bearings. Rolling elements in machines were established more than a hundred years ago, while rolling elements for linear movements have only become common in the last few decades.

Figure 1.1 SNR profile rail guides



1.1 Design principles

High surface pressure results when a ball touches a flat surface at one point (Figure 1.2). Grooves in modern profile rail guides are manufactured with a defined radius to increase the contact area. The ratio of the groove radius to the ball radius in percent is called osculation. This significantly increases the carrying capacity, service life and rigidity of the balls for equal surface pressure.

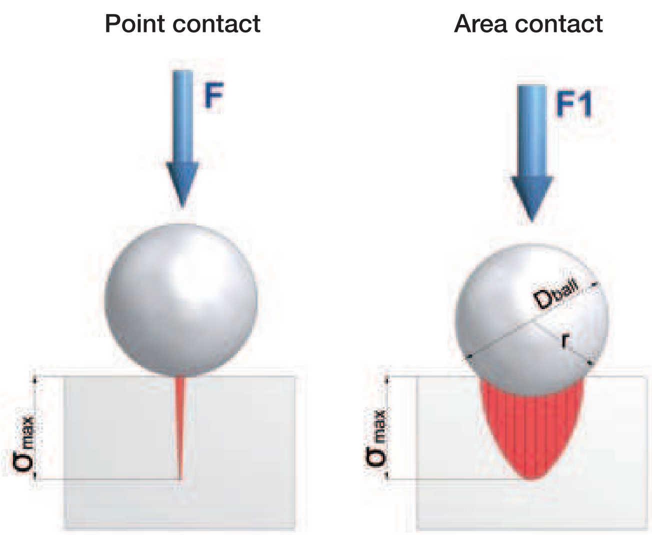


Figure 1.2 Point and area contact

There are two basic design principles for profile rail guides with balls as rolling elements – circular arc grooves and Gothic arc grooves (Figure 1.3).

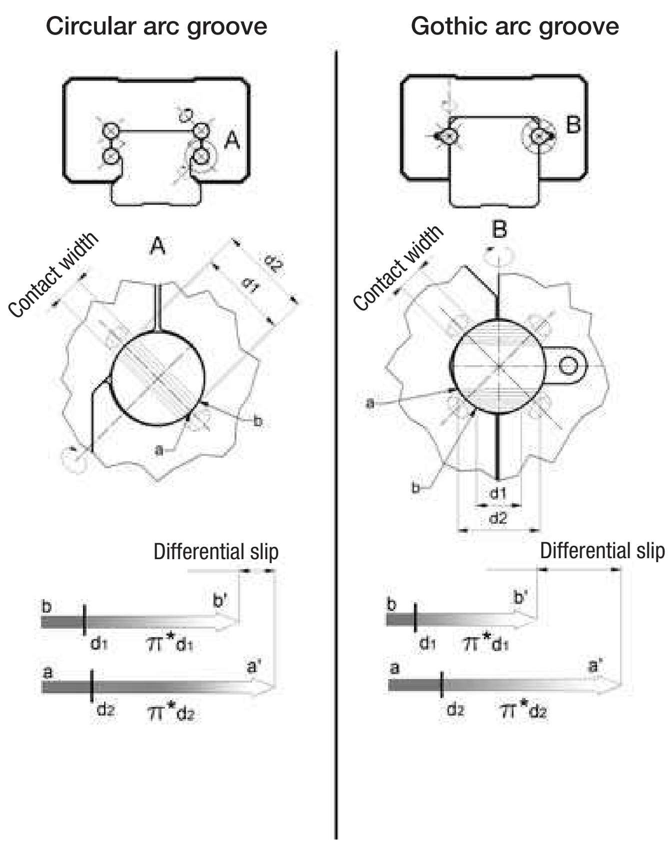
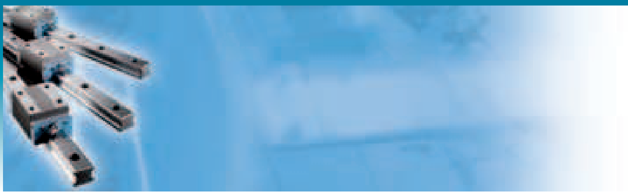
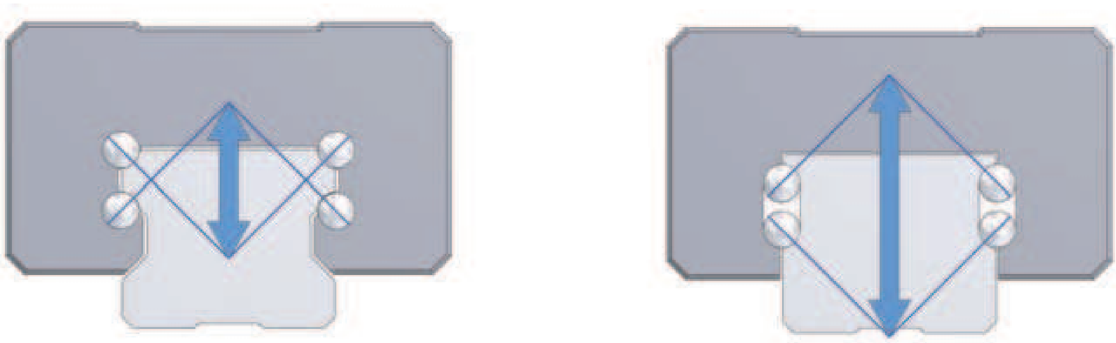


Figure 1.3 Groove geometry



Circular arc grooves have one track on the profile rail and one on the runner block. This creates 2-point contact. The special shape of the Gothic-arc groove creates two tracks on the profile rail and two on the runner block, resulting in 4-point contact with the rolling element. A detailed view of the rolling elements shows that differential slip results from the difference between contact diameters s1 and d2. The differential slip is significantly greater for arrangements with Gothic arc grooves than for circular arc grooves. This leads to a higher friction coefficient, higher movement resistance, higher wear and higher energy consumption. The standard profile rail guides by SNR therefore all have circular arc grooves. The geometry of the Gothic arc groove is only used for miniature profile rail guides, for the compactness of its design.

The track arrangement is another characteristic of profile rail guides. The following alternatives are used: X-arrangement and O-arrangement of the tracks, corresponding to the terms used for roller bearing systems (Figure 1.4).



Profile rail guide with X-arrangement **Profile rail guide with O-arrangement**

Figure 1.4 X- and O-arrangement

Profile rail guide systems can be exposed to torque stress resulting from installation faults (Figure 1.5). When the distance between the active points is low, the resulting internal stress is low as well. The SNR profile rail guides are therefore produced using the X-arrangement.

Profile rail guide with X-arrangement

Profile rail guide with O-arrangement

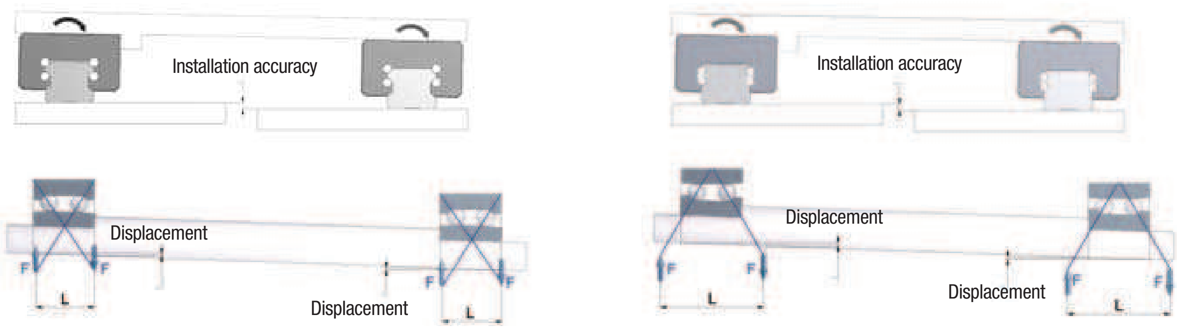


Figure 1.5 Internal forces for X- and O-arrangement

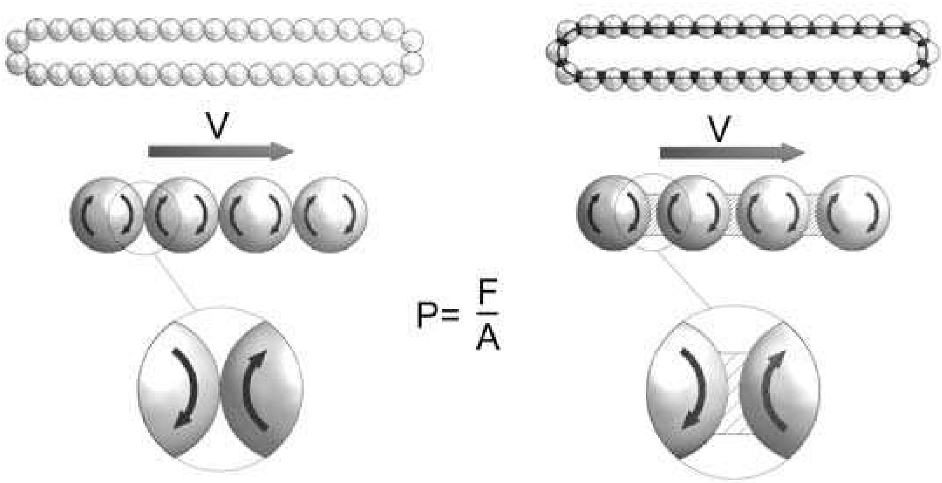
The most important characteristics of SNR profile rail guides are therefore:

> Wider permitted installation tolerances
> Very good self-adjustment properties
> Lower costs for manufacture and preparation of the mounting surfaces

1.2 Ball chain technology

Cages for guiding the rolling elements, which have been used for over 100 years in roller bearings, are also part of the newly developed profile rail guides. Profile rail guides with ball chains differ from conventional series in the following characteristics:

> Higher maximum speeds
> Less heat generation
> Less noise generation
> Very smooth running
> Optimised lubrication system
> Even load distribution
> Longer service life



P = Surface pressure **F = Force between balls** **A = Contact area**

Figure 1.6 Schematic view of the contact surfaces

The rotating balls in conventional profile rail guides have point contact between each other (Figure 1.6). The rotation speed at the contact point is double that of the speed of the balls. The contact area (A) is so small that the surface pressure (P) tends towards infinity. This leads to heating and wear of the balls and the profile rail guide system. The chain in profile rail guides with ball chains has the function of a cage. Contact between the balls is prevented (Figure 1.6). The ball and the chain also have a relatively large contact area (A) that significantly reduces the surface pressure (P). The rotation speeds at the contact surfaces of ball and chain correspond. The ball chain is further used to transport the lubricant and to create a lubrication film on the balls. The design of the runner block allows effective supply with lubricant from the lubricant connection to the circulation areas of the ball chains (Figure 1.7).

Conventional profile rail guides allow contact between the balls during operation, which may lead to increased lubricant consumption, higher friction, noise and heat. Profile rail guides with ball chain minimise these effects.

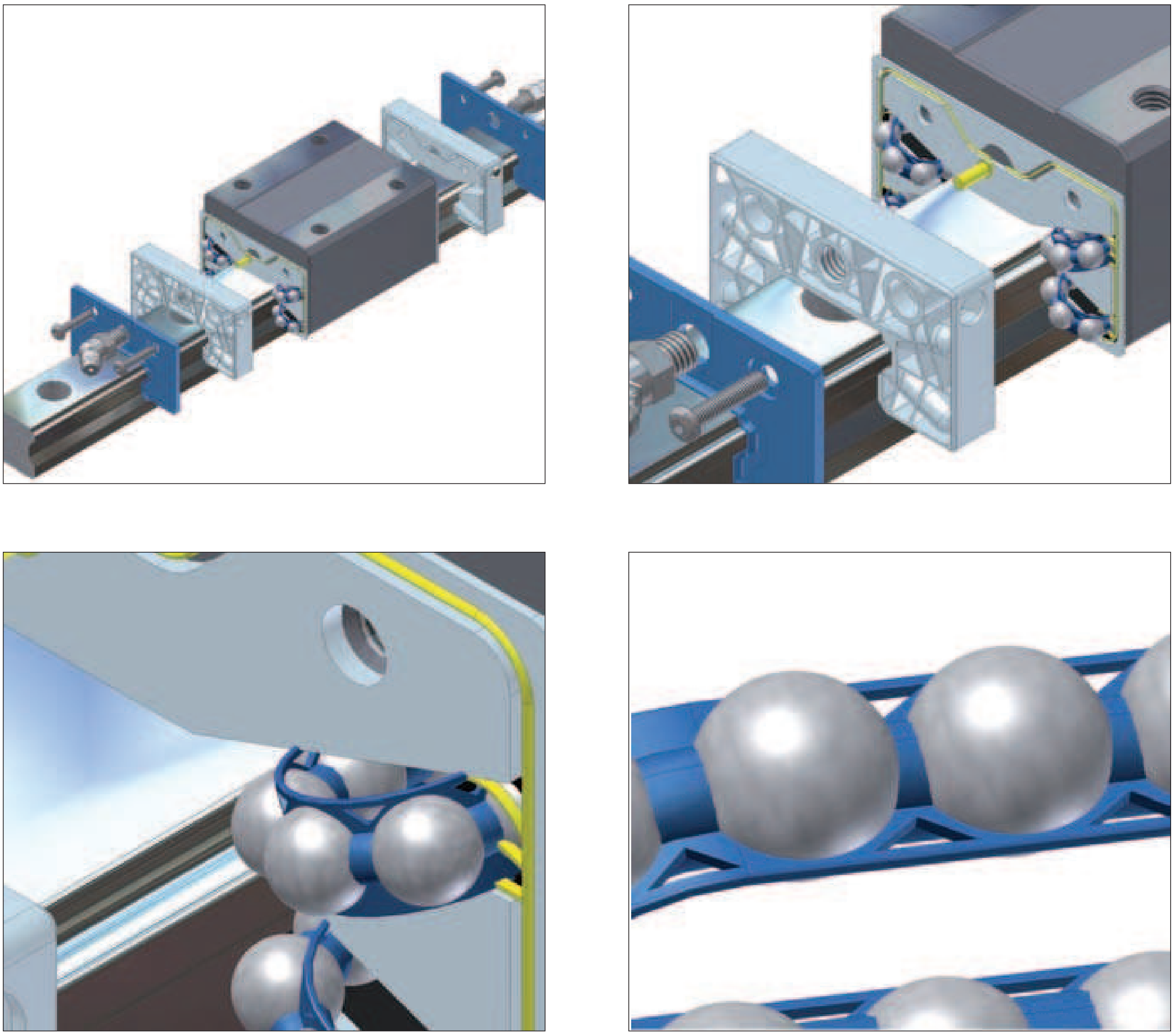


Figure 1.7 Profile rail guides with ball chains

The noise generation of profile rail guides is mainly determined by their design. Direct knocking of balls against each other is the main reason for increased noise generation in conventional models. In addition, the contact of the balls with the surfaces of the re-circulating hole affects noise generation (Figure 1.8).
These effects are significantly reduced by the use of ball chains. The patented structure of the ball chain further contains gaps for lubricant depots. The combination of the flexibility of the ball chain and the lubricant acts like a buffer and significantly reduces the noise level (Figure 1.9).

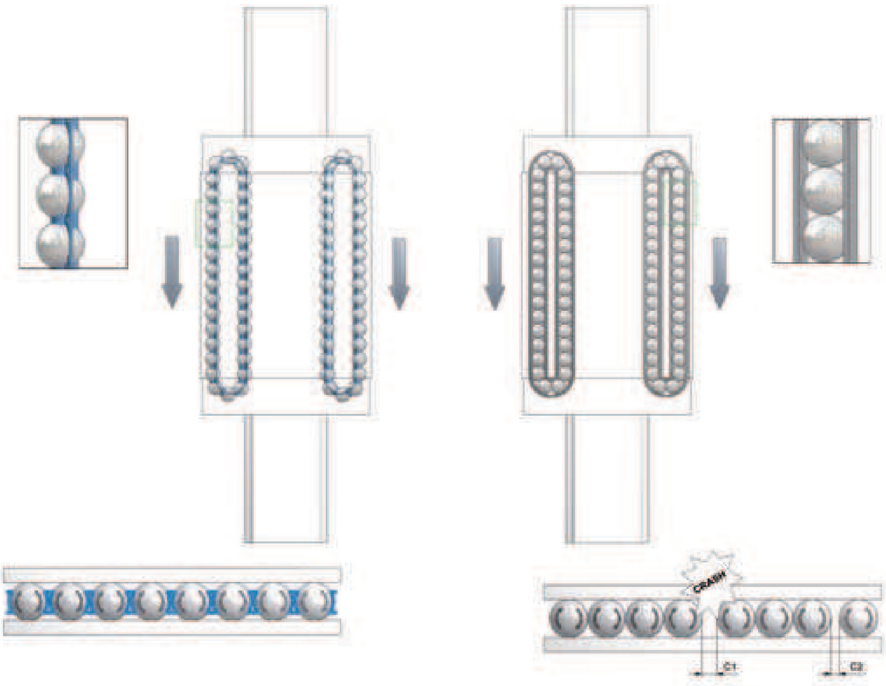


Figure 1.8 Comparison of the designs of profile rail guides

At the same time, the balls are continuously supplied with lubricant, which reduces wear of the metal. This significantly extends the service life of the lubricant and the maintenance intervals.

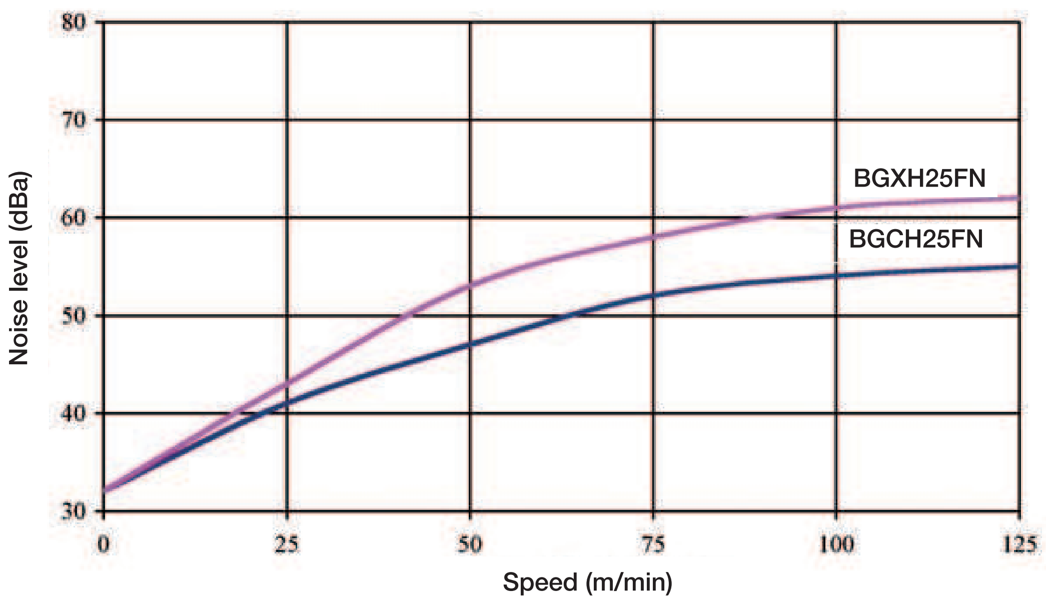


Figure 1.9 Noise generation of profile rail guides of Design Size 25

It is not possible to keep the distance of the balls (C1, C2) constant in conventional profile rail guides (Figure 1.8). These irregular distances between the balls lead to uneven running behaviour.

The chain in profile rail guides with ball chain has the function of a cage. It holds the balls at a constant distance from each other and controls their circulation. The structure of the runner blocks makes it impossible to implement a closed ball chain circulation. At the end of the ball chains, a space of about 1 ball diameter remains. The design of the ends of the SNR ball chain and the use of a spacer ball compensate for this space (Figure 1.10).

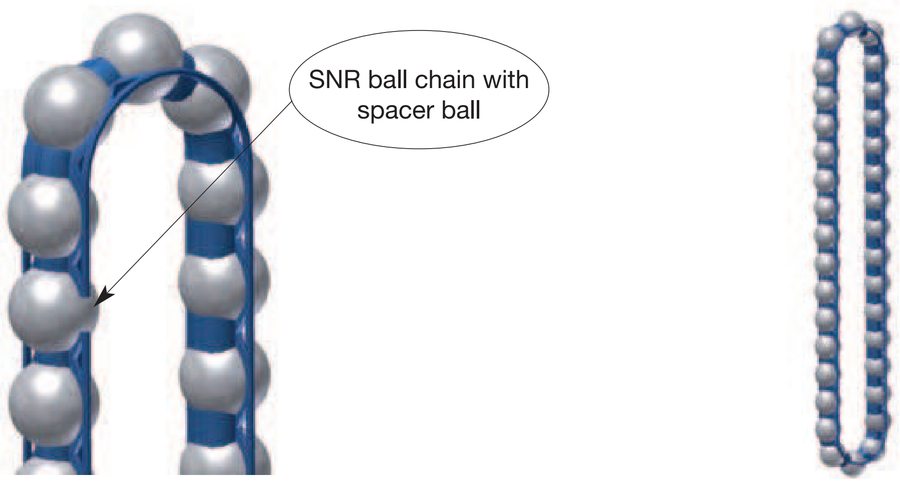


Figure 1.10 SNR ball chain

This design of the ball chain ends in connection with the spacer ball closes the circulation and makes the movement of the runner block smooth and quiet. (Figure 1.11).

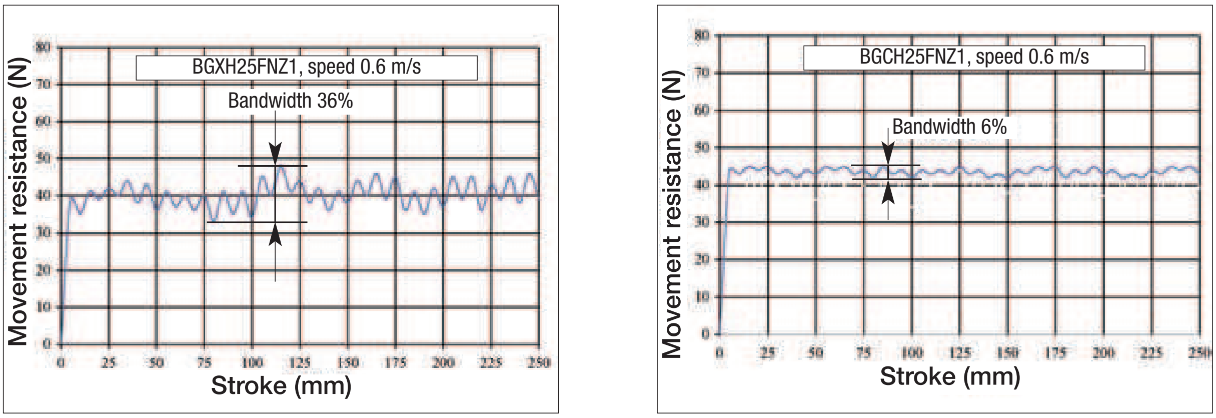
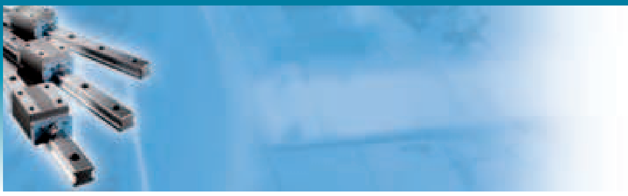
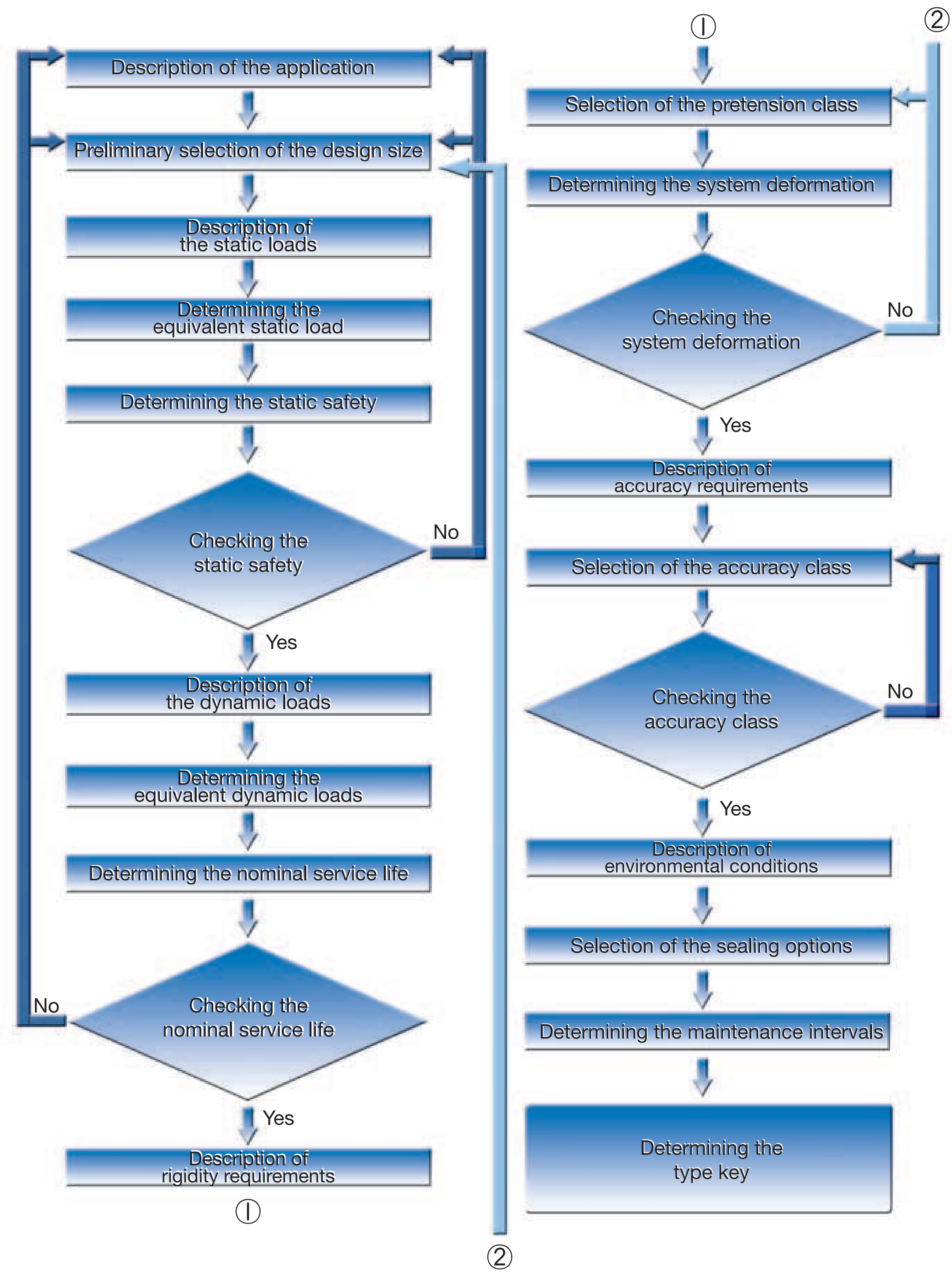


Figure 1.11 Movement resistance



1.3 Selection criteria



2 System technology

2.1 Definitions

Service life
The service life L is the running distance that a component can handle before the first signs of material fatigue become apparent on the tracks or the rolling elements.

Nominal service life L_{10}
This is the calculated service life of a single profile rail guide system or of a group of equivalent profile rail guide systems operating under equal conditions that can be reached with a probability of 90%, assuming the use of currently common materials of average manufacturing quality and common operating conditions.

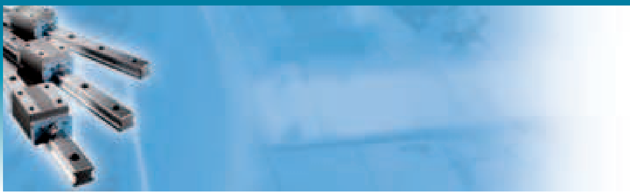
Dynamic load rating C
The size and direction of a constant, radial load that a linear roller bearing can theoretically withstand for a nominal service life of $5x10^4$ m travelled distance (according to ISO 14728-1). When the calculation of the dynamic load rating is based on a nominal service life of 10^5 m, the dynamic load rating for a nominal service life of $5x10^4$ m is multiplied by the conversion factor 1.26.

Static load rating C_0
Static, radial load that corresponds to the middle of the highest-stressed contact area between rolling element and track of a calculated Hertz-type compression. The Hertz-type compression for the profile rail guide is, according to ISO 14728-1, between 4200 MPa and 4600 MPa and depends on the ball diameter and the lubrication.
This stress leads to a permanent, total deformation of the rolling element that corresponds to a 0.0001 part of the rolling element diameter (according to ISO 14728-1).

2.2 Standards used

DIN 645-1 Roller bearings - profile rail roller guides – Part 1: Dimensions for Series 1 to 3
DIN 645-2 Roller bearings - profile rail roller guides – Part 2: Dimensions for Series 4
DIN ISO 14728-1 Roller bearings - Linear roller bearings – Part 1: Dynamic load ratings and nominal service life (ISO 14728-1: 2004)
DIN ISO 14728-2 Roller bearings – Linear roller bearings – Part 2: Static load ratings (ISO 14728-2: 2004)

The SNR profile rail guides comply with the RoHS Directive (EU Directive 2002/95/EC). SNR profile rail guides are not listed in the Machine Directive 2006/42/EC and are therefore not affected by this directive.



2.3 Co-ordinate system

The profile rail guides can be stressed by forces or torques. The co-ordinate system (Figure 2.1) shows the forces acting in the main load directions, the torques as well as the six degrees of freedom.

Forces in the main load directions:
F_X Movement force (X-direction)
F_Y Tangential load (Y-direction)
F_Z Radial load (Z-direction)

Torques:
M_X Torque in roll direction (rotation around the X-axis)
M_Y Torque in pitch direction (rotation around the Y-axis)
M_Z Torque in yaw direction (rotation around the Z-axis)

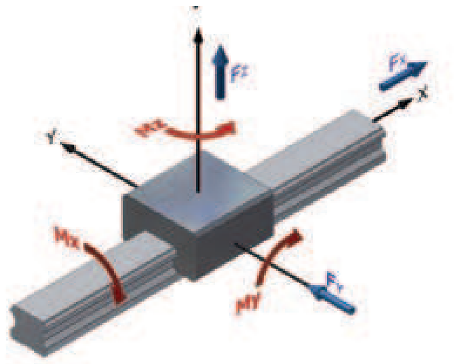


Figure 2.1 Co-ordinate system

Only five degrees of freedom are relevant for the profile rail guide. The X-direction is the movement direction of the guide, which defines the following accuracy values:

> Lateral movement (Y-direction)
> Height movement (Z-direction)
> Rolling (rotation around the X-axis)
> Pitching (rotation around the Y-axis)
> Yawing (rotation around the Z-axis)

2.4 Static safety

The design of profile rail guides must consider unexpected and unforeseeable forces and/or torques that are caused by vibration or shocks or short start/stop cycles (short strokes) during operation or standstill as well as overhanging loads. A safety factor is particularly important in such cases. The static structural safety factor fS is intended to prevent unacceptable, permanent deformation of the tracks and the rolling elements. It is the ratio of the static load rating C0 to the maximum occurring force F0max. The highest amplitude is relevant, even when it occurs only for a very short time.

$$f_S = \frac{C_0}{F_{0\max}} \qquad [2.1]$$

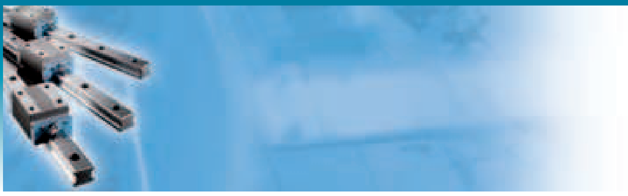
f_S static structural safety factor / static structural safety
C_0 static load rating [N]
F_{0max} maximum static load [N]

The static structural safety factor should be greater than 2 for normal operating conditions. The recommended values listed below should be used for the factor f_S under special operating conditions.

Table 2.1 Values of the static safety factor

Operating conditions	f_S
Normal operating conditions	~ 2
With less shock exposure and vibration	2 ... 4
With moderate shock exposure and vibration	3 ... 5
With strong shock exposure and vibration	4 ... 8
With partially unknown load parameters	> 8

We recommend that you contact our SNR application engineers when the loads are partially unknown or difficult to estimate.



2.5 Service life calculation

The nominal service life of a profile rail guide in m is calculated with the following equation:

$$L_{10} = \left(\frac{C}{F}\right)^3 \cdot 5 \cdot 10^4 \qquad [2.2]$$

L_{10} Nominal service life [m]
C Dynamic load rating [N]
F Dynamic load [N]

The service life in operating hours can be determined when the stroke length and the stroke frequency remain constant during the service life.

$$L_h = \frac{L_{10}}{2 \cdot S \cdot n \cdot 60} \qquad [2.3]$$

L_{10} Nominal service life [m]
L_h Service live in hours [h]
S Stroke length [m]
n Stroke frequency (double-strokes per minute) [min^{-1}]

It is very difficult to determine the active load for the service life calculation. The profile rail guide systems are usually exposed to oscillations or vibrations resulting from the process or drive forces. Shocks can damage machine elements when the load peaks are higher than the maximum additional load. This applies to the dynamic as well as the static state of the total system. The service life also depends on parameters such as the surface hardness of the roller bearings, the tracks and the temperature of the system. The modified service life calculation takes the abovementioned conditions into consideration.

$$L_{10} = \left(\frac{C}{F} \cdot \frac{f_H \cdot f_T \cdot f_C}{f_W}\right)^3 \cdot 5 \cdot 10^4 \qquad [2.4]$$

L_{10} Nominal service life [m]
C Dynamic load rating [N]
F Dynamic load [N]
f_H Hardness factor
f_T Temperature factor
f_C Contact factor
f_W Load factor

2.5.1 Influencing factors

Hardness factor for shaft hardness f_H

The hardness of the rolling elements and the tracks must be between 58 HRC and 60 HRC. This value ensures optimal running properties and the best possible functional properties of the profile rail guide.

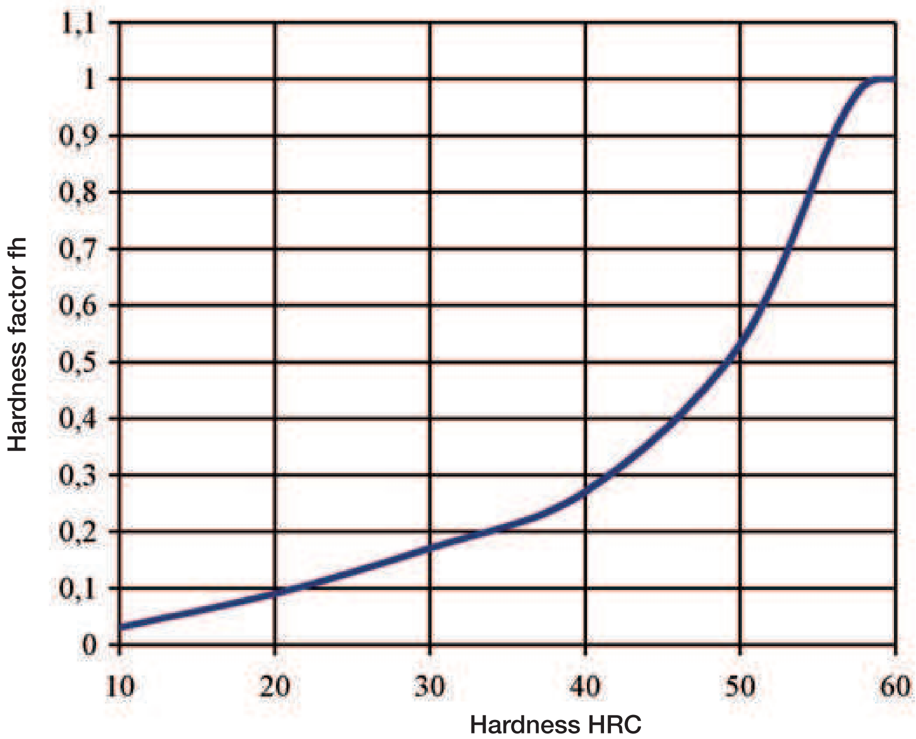
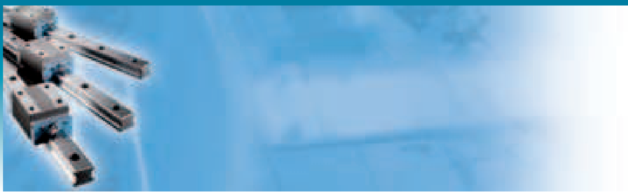


Figure 2.2 Hardness factor f_H

The SNR profile rail guides comply with the conditions stipulated above. Therefore, the hardness factor does not need to be considered (fH=1). The hardness corrections (Figure 2.2) are only required when a special version made of customer-specific material with a hardness below 58 HRC is used.



Temperature factor f_T

Corrections to the service life calculations (Figure 2.3) must be made when the environmental temperature of the profile rail guide exceeds 100°C during operation.

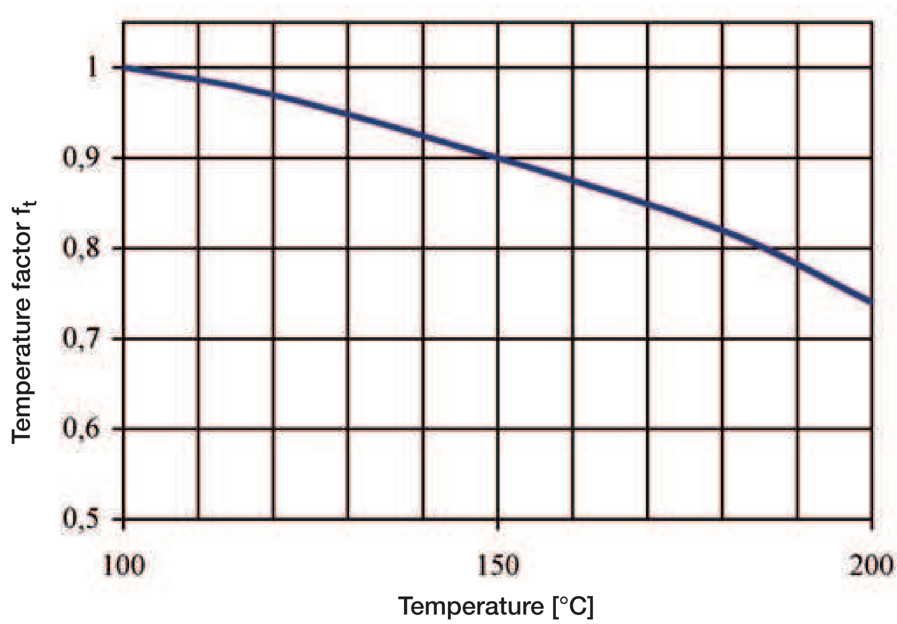


Figure 2.3 Temperature factor f_T

The standard version of the SNR profile rail guides can be used up to a maximum temperature of 80°C. When the limit of 80°C is exceeded, seals and end caps made of a temperature-resistant material must be used. We recommend that you contact our SNR application engineers when operation at higher temperatures is required.

Contact factor f_C

When two or more runner blocks are installed very close to each other, the running movement is affected by torques, installation accuracy and other factors, so that an even load distribution is hard to achieve.. Under such conditions, an appropriate contact factor (Table 2.2) must be taken into account.

Table 2.2 Contact factor

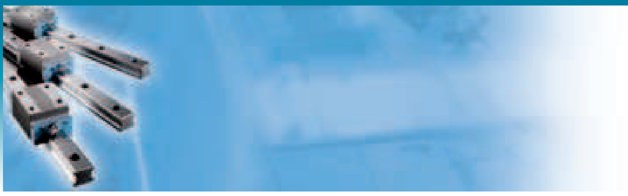
Number of closely spaced runner blocks	f_C
1	1,00
2	0,81
3	0,72
4	0,66
5	0,61

Load factor f_W

Vibrations and shocks that may occur during operation, for example as a result of high speeds, repeated starting and stopping, process forces or sudden loads, can have a significant effect on the total calculation. It is in some cases very difficult to determine their effects. Empirically determined load factors (Table 2.3) must be used when the actual loads on the profile rail guide cannot be measured or can be significantly higher than calculated.

Table 2.3 Load factor

Operating conditions, speed V	f_w
Normal operating conditions without vibrations/shocks $V \leq 0{,}25$ m/s	1,0…1,5
Normal operating conditions with weak vibrations/shocks $0{,}25 < V \leq 1{,}0$ m/s	1,5…2,0
Normal operating conditions with strong vibrations/shocks $V > 1{,}0$ m/s	2,0…3,5



2.5.2 Active load - equivalence factors

One-axis application

Profile rail guides are often only used with one runner block or several runner blocks with little distance between them when the installation space is tight. The service life of the profile rail guide can be shortened in such cases, due to the increased wear at the runner block ends. Under such operating conditions, the torques must be multiplied by appropriate equivalence factors (Table 2.4 and Table 2.5). The equivalent load is determined as follows:

$$F_{\ddot{A}q} = k \cdot M \qquad [2.5]$$

$F_{\ddot{A}q}$ Equivalent load per guide [N]
k Equivalence factors (Table 2.4 and Table 2.5)
M corresponds to the active torque [N•m]

Table 2.4 Equivalence factors for 1 runner block (Typ BGX..)

Series		Equivalence factor m^{-1} kx	ky	kz
BGXH15	FN	145,4	166,3	166,3
BGXH15	FL	144,6	140,4	140,4
BGXH20	FN	107,0	138,0	138,0
BGXH20	FL	106,8	109,5	109,5
BGXH25	FN	93,3	116,7	116,7
BGXH25	FL	93,1	92,9	92,9
BGXH25	FE	93,1	77,2	77,2
BGXH30	FN	77,2	99,0	99,0
BGXH30	FL	77,2	85,0	85,0
BGXH30	FE	77,2	64,8	64,8
BGXH35	FN	63,2	83,4	83,4
BGXH35	FL	63,2	72,6	72,6
BGXH35	FE	63,2	54,8	54,8
BGXH45	FN	47,3	71,4	71,4
BGXH45	FL	47,3	61,0	61,0
BGXH45	FE	47,3	48,3	48,3
BGXH55	FN	40,4	57,9	57,9
BGXH55	FL	40,4	43,6	43,6
BGXH55	FE	40,4	39,2	39,2
BGXH15	BN	145,4	166,3	166,3
BGXH20	BN	107,0	138,0	138,0
BGXH20	BL	106,8	109,5	109,5
BGXH25	BN	93,3	116,7	116,7
BGXH25	BL	93,1	92,9	92,9
BGXH25	BE	93,1	77,2	77,2
BGXH30	BN	77,2	99,0	99,0
BGXH30	BL	77,2	85,0	85,0
BGXH30	BE	77,2	64,8	64,8
BGXH35	BN	63,2	83,4	83,4
BGXH35	BL	63,2	72,6	72,6
BGXH35	BE	63,2	54,8	54,8
BGXH45	BN	47,3	71,4	71,4
BGXH45	BL	47,3	61,0	61,0
BGXH45	BE	47,3	48,3	48,3
BGXH55	BN	40,4	57,9	57,9
BGXH55	BL	40,4	43,6	43,6
BGXH55	BE	40,4	39,2	39,2

Series		Equivalence factor m^{-1} kx	ky	kz
BGXS15	BS	143,6	305,2	305,2
BGXS15	BN	145,4	166,3	166,3
BGXS15	BL	144,6	140,4	140,4
BGXS20	BS	107,5	241,4	241,4
BGXS20	BN	107,0	138,0	138,0
BGXS25	BS	92,9	207,9	207,9
BGXS25	BN	93,3	116,7	116,7
BGXX25	BN	93,3	116,7	116,7
BGXX25	BL	93,1	92,9	92,9
BGXX25	BE	93,1	77,2	77,2
BGXS30	BS	77,3	180,3	180,3
BGXS30	BN	77,2	99,0	99,0
BGXS30	BL	77,2	85,0	85,0
BGXS30	BE	77,2	64,8	64,8
BGXS35	BS	63,2	150,8	150,8
BGXS35	BN	63,2	83,4	83,4
BGXS35	BL	63,2	72,6	72,6
BGXS35	BE	63,2	54,8	54,8
BGXS45	BN	47,3	71,4	71,4
BGXS45	BL	47,3	61,0	61,0
BGXS45	BE	47,3	48,3	48,3
BGXS55	BN	40,4	57,9	57,9
BGXS55	BL	40,4	43,6	43,6
BGXS55	BE	40,4	39,2	39,2
MBX09	SN	216,83	270,71	270,71
MBX12	SN	152,09	292,48	292,48
MBX15	SN	142,60	219,22	219,22
MBX09	WN	105,75	237,94	204,81
MBX12	WN	80,32	202,22	202,22
MBX15	WN	48,83	167,60	167,60

kx Equivalence factor for 1 runner block in Mx-direction
ky Equivalence factor for 1 runner block in My-direction
kz Equivalence factor for 1 runner block in Mz-direction

Table 2.5 Equivalence factors for 1 runner block (Typ BGC..)

Series		Equivalence factor m^{-1} kx	ky	kz
BGCH15	FN	145,4	166,3	166,3
BGCH15	FL	144,6	140,4	140,4
BGCH20	FN	107,0	138,0	138,0
BGCH20	FL	106,8	109,5	109,5
BGCH25	FN	93,3	116,7	116,7
BGCH25	FL	93,1	92,9	92,9
BGCH25	FE	93,1	77,2	77,2
BGCH30	FN	77,2	99,0	99,0
BGCH30	FL	77,2	85,0	85,0
BGCH30	FE	77,2	64,8	64,8
BGCH35	FN	63,2	83,4	83,4
BGCH35	FL	63,2	72,6	72,6
BGCH35	FE	63,2	54,8	54,8
BGCH45	FN	47,3	71,4	71,4
BGCH45	FL	47,3	61,0	61,0
BGCH45	FE	47,3	48,3	48,3
BGCH55	FN	40,4	57,9	57,9
BGCH55	FL	40,4	43,6	43,6
BGCH55	FE	40,4	39,2	39,2
BGCH15	BN	145,4	166,3	166,3
BGCH20	BN	107,0	138,0	138,0
BGCH20	BL	106,8	109,5	109,5
BGCH25	BN	93,3	116,7	116,7
BGCH25	BL	93,1	92,9	92,9
BGCH25	BE	93,1	77,2	77,2
BGCH30	BN	77,2	99,0	99,0
BGCH30	BL	77,2	85,0	85,0
BGCH30	BE	77,2	64,8	64,8
BGCH35	BN	63,2	83,4	83,4
BGCH35	BL	63,2	72,6	72,6
BGCH35	BE	63,2	54,8	54,8
BGCH45	BN	47,3	71,4	71,4
BGCH45	BL	47,3	61,0	61,0
BGCH45	BE	47,3	48,3	48,3
BGCH55	BN	40,4	57,9	57,9
BGCH55	BL	40,4	43,6	43,6
BGCH55	BE	40,4	39,2	39,2

Series		Equivalence factor m^{-1} kx	ky	kz
BGCS15	BS	143,6	305,2	305,2
BGCS15	BN	145,4	166,3	166,3
BGCS15	BL	144,6	140,4	140,4
BGCS20	BS	107,5	241,4	241,4
BGCS20	BN	107,0	138,0	138,0
BGCS25	BS	92,9	207,9	207,9
BGCS25	BN	93,3	116,7	116,7
BGCX25	BN	93,3	116,7	116,7
BGCX25	BL	93,1	92,9	92,9
BGCX25	BE	93,1	77,2	77,2
BGCS30	BS	77,3	180,3	180,3
BGCS30	BN	77,2	99,0	99,0
BGCS30	BL	77,2	85,0	85,0
BGCS30	BE	77,2	64,8	64,8
BGCS35	BS	63,2	150,8	150,8
BGCS35	BN	63,2	83,4	83,4
BGCS35	BL	63,2	72,6	72,6
BGCS35	BE	63,2	54,8	54,8
BGCS45	BN	47,3	71,4	71,4
BGCS45	BL	47,3	61,0	61,0
BGCS45	BE	47,3	48,3	48,3
BGCS55	BN	40,4	57,9	57,9
BGCS55	BL	40,4	43,6	43,6
BGCS55	BE	40,4	39,2	39,2
MBC09	SN	216,83	270,71	270,71
MBC12	SN	152,09	292,48	292,48
MBC15	SN	142,60	219,22	219,22
MBC09	WN	105,75	237,94	204,81
MBC12	WN	80,32	202,22	202,22
MBC15	WN	48,83	167,60	167,60

k_x Equivalence factor for 1 runner block in Mx-direction
k_y Equivalence factor for 1 runner block in My-direction
k_z Equivalence factor for 1 runner block in Mz-direction

Two-axis application

The following requirements and operating conditions (Figure 2.4) must be defined for calculating the service life:

> Stroke length S [mm]
> Speed diagram (Figure 2.5)
> Speed V [m/s]
> Acceleration/deceleration a [m/s²]
> Movement cycles, number of double-strokes per minute n [min⁻¹]
> Arrangement of the profile rail guide (number of rails and runner blocks l_0, l_1, [mm]
> Installation position (horizontal, vertical, diagonal, wall installation, tilted by 180°)
> Mass m [kg]
> Direction of the outer forces
> Positions of the centres of gravity l_2, l_3, l_4, [mm]
> Position of the drive l_5, l_6, [mm]
> Required service life L [km] or [h]

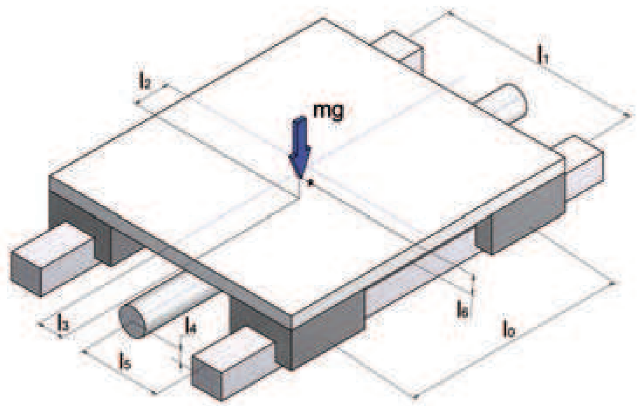


Figure 2.4 Definition of the conditions

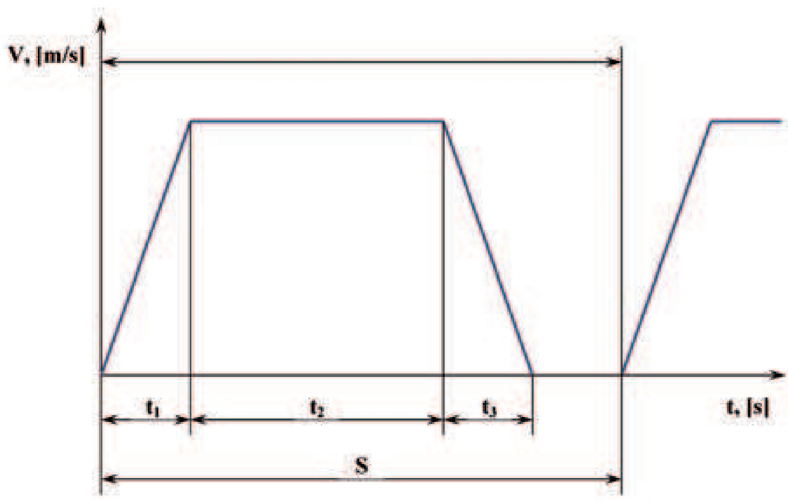


Figure 2.5 Speed/time diagram

2.5.3 Equivalent loads

The (radial and tangential) loads as well as torque loads may act on the profile rail guide from different directions at the same time (Figure 2.6). In this case, the service life is calculated by using the equivalent load, which includes the radial, tangential and other loads.

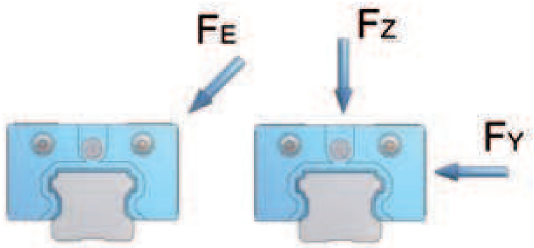


Figure 2.6 Equivalent load F_E

$$F_E = |F_Y| + |F_Z| \qquad [2.6]$$

F_E – Equivalent load [N]
F_Y - Tangential load [N]
F_Z - Radial load [N]

The calculation of the equivalent load FE considers that the SNR profile rail guides have the same load-carrying capacity in all main directions. The SNR miniature profile rail guides have minimal varying load-carrying capacities in the different load directions.

Dynamic equivalent load

It is common that different, varying process forces affect the total system during operation. The profile rail guides are, for example, exposed to changing loads during upward and downward movements for picking and placing applications. Where such varying loads occur, they must be considered in the service life calculations. The calculation of the dynamically equivalent load determines the load on a runner block for each individual movement phase n1, n2...nn (see Chapter 2.4.2) and is summarised in a resulting load for the total cycle. The load change can take place in various ways:

> Stepwise (Figure 2.7)
> Linear (Figure 2.8)
> Sinusoidal (Figure 2.9 and 2.10)

Stepwise load change

$$F_m = \sqrt[3]{\frac{1}{S}\left(F_1^3 \cdot S_1 + F_2^3 \cdot S_2 + \ldots + F_n^3 \cdot S_n\right)} \qquad [2.7]$$

F_m Dynamic equivalent load [N]
F_n Load change [N]
S Total travel [mm]
S_n Travel during load change Fn [mm]

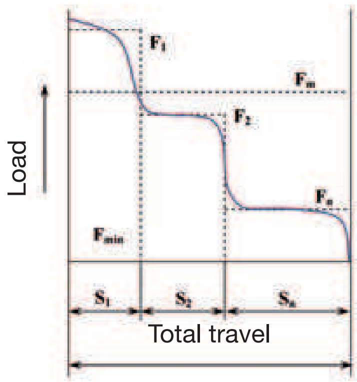


Figure 2.7 Stepwise load change

Linear load change

$$F_m \cong \frac{1}{3}(F_{MIN} + 2 \cdot F_{MAX}) \qquad [2.8]$$

F_{MIN} Minimum load [N]
F_{MAX} Maximum load [N]

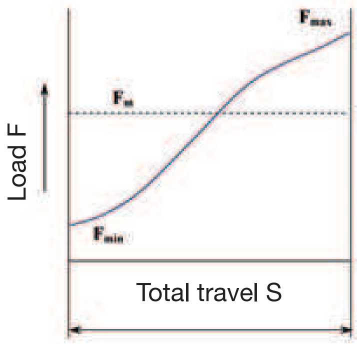


Figure 2.8 Linear load change

Sinusoidal load change

$$F_m \cong 0{,}65 * F_{MAX}$$ [2.9]

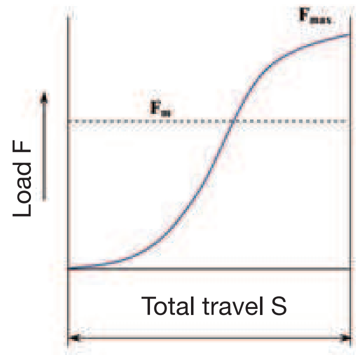


Figure 2.9 Sinusoidal load change (a)

Sinusoidal load change

$$F_m \cong 0{,}75 \cdot F_{MAX}$$ [2.10]

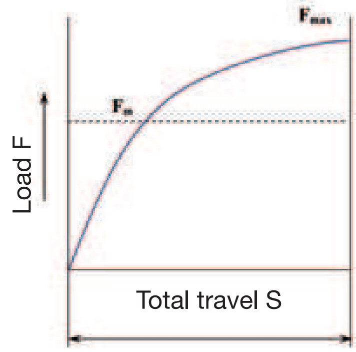
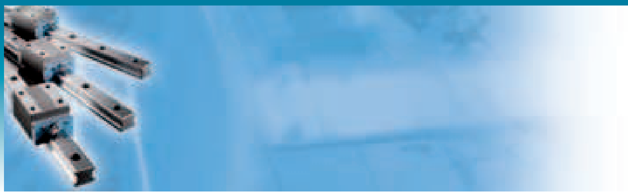


Figure 2.10 Sinusoidal load change (b)



2.5.4 Calculation examples

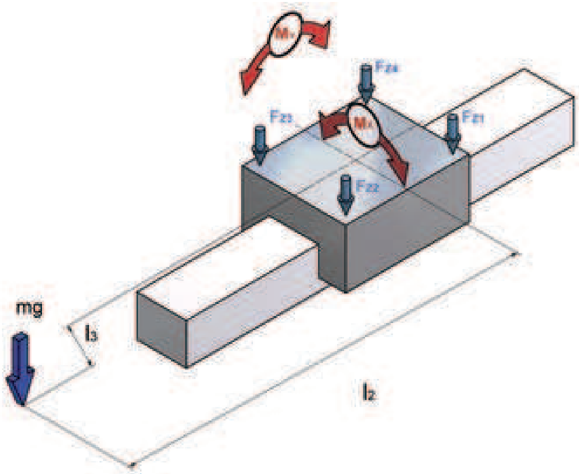


Figure 2.11 Calculation example 1

Example 1

Horizontal installation position with overhanging load
One runner block is used
BGCH20FN series
Acceleration due to gravity=9.8 m/s²
Mass m=10 kg
l_2=200 mm, l_3=100 mm
C=17,71 kN
C_0=30,50 kN
Normal operating conditions without vibrations f_w=1,5

Calculation:

The equivalent load for the linear guide is calculated, taking the formula [2.5] and the equivalence factors (Table 2.5) into account.

$$Fz_1 = mg - k_X * mg * l_3 - k_Y * mg * l_2 = 10 * 9{,}8 - 107 * 10 * 9{,}8 * 0{,}1 - 138 * 10 * 9{,}8 * 0{,}2 = -3.655{,}4$$

$$Fz_2 = mg - k_X * mg * l_3 + k_Y * mg * l_2 = 10 * 9{,}8 - 107 * 10 * 9{,}8 * 0{,}1 + 138 * 10 * 9{,}8 * 0{,}2 = 1.754{,}2$$

$$Fz_3 = mg + k_X * mg * l_3 - k_Y * mg * l_2 = 10 * 9{,}8 - 107 * 10 * 9{,}8 * 0{,}1 - 138 * 10 * 9{,}8 * 0{,}2 = 3.851{,}4$$

$$Fz_4 = mg + k_X * mg * l_3 - k_Y * mg * l_2 = 10 * 9{,}8 + 107 * 10 * 9{,}8 * 0{,}1 - 138 * 10 * 9{,}8 * 0{,}2 = -1.558{,}2$$

The static safety factor for the maximum load of 3,547.6 N is calculated according to [2.1]..

$$f_S = \frac{C_0}{F_{0MAX}} = \frac{30.500}{3.851{,}4} = 7{,}9$$

The nominal service for the maximum load 3,547.6 N is calculated according to [2.4].

$$Fz_2 = mg - k_X * mg * l_3 + k_Y * mg * l_2 = 10 * 9{,}8 - 107 * 10 * 9{,}8 * 0{,}1 + 138 * 10 * 9{,}8 * 0{,}2 = 1.754{,}2$$

Example 2

Horizontal installation position with overhanging load and 2 rails arranged in parallel. Two runner blocks per rail, arrangement with mobile table
BGCH30FN series
Acceleration due to gravity=9.8 m/s²
Mass m=400 kg
l_0=600 mm, l_1=450 mm, l_2=400 mm, l_3=350 mm
C=36,71 kN
C_0=54,570 kN
Normal operating conditions without vibrations f_w=1,5

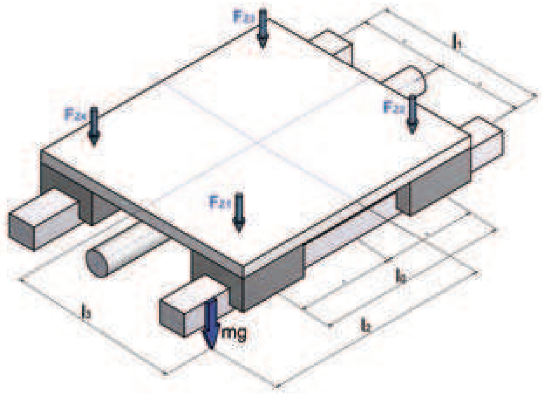


Figure 2.12 Calculation example 2

Calculation:

a) The active radial load per runner block at constant speed is calculated as follows:

$$F_{Z1} = \frac{mg}{4} + \frac{mg \cdot l_2}{2 \cdot l_0} + \frac{mg \cdot l_3}{2 \cdot l_1} = \frac{400 \cdot 9{,}8}{4} + \frac{400 \cdot 9{,}8 \cdot 400}{2 \cdot 600} + \frac{400 \cdot 9{,}8 \cdot 350}{2 \cdot 450} = 3.811{,}11\ [N]$$

$$F_{Z2} = \frac{mg}{4} - \frac{mg \cdot l_2}{2 \cdot l_0} + \frac{mg \cdot l_3}{2 \cdot l_1} = \frac{400 \cdot 9{,}8}{4} - \frac{400 \cdot 9{,}8 \cdot 400}{2 \cdot 600} + \frac{400 \cdot 9{,}8 \cdot 350}{2 \cdot 450} = 1.197{,}77\ [N]$$

$$F_{Z3} = \frac{mg}{4} - \frac{mg \cdot l_2}{2 \cdot l_0} - \frac{mg \cdot l_3}{2 \cdot l_1} = \frac{400 \cdot 9{,}8}{4} - \frac{400 \cdot 9{,}8 \cdot 400}{2 \cdot 600} - \frac{400 \cdot 9{,}8 \cdot 350}{2 \cdot 450} = -1.851{,}11\ [N]$$

$$F_{Z4} = \frac{mg}{4} + \frac{mg \cdot l_2}{2 \cdot l_0} - \frac{mg \cdot l_3}{2 \cdot l_1} = \frac{400 \cdot 9{,}8}{4} + \frac{400 \cdot 9{,}8 \cdot 400}{2 \cdot 600} - \frac{400 \cdot 9{,}8 \cdot 350}{2 \cdot 450} = 762{,}23\ [N]$$

b) The statistical safety factor is calculated for runner block 1 according to [2.1] for a maximum load of 3,811.11 N.

$$f_S = \frac{C_0}{F_{0MAX}} = \frac{54.570}{3.811{,}11} = 14{,}0$$

c) The service life of the four runner blocks is calculated according to [2.4]

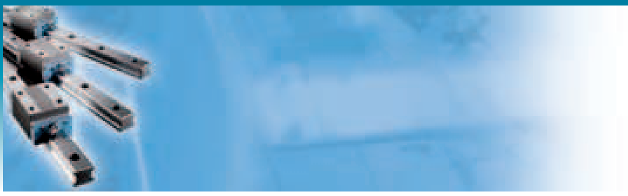
$$L_1 = \left(\frac{C}{F_{Z1}} \cdot \frac{f_H \cdot f_T \cdot f_C}{f_W}\right)^3 \cdot 5 \cdot 10^4 = \left(\frac{36.710}{3.811{,}11} \cdot \frac{1}{1{,}5}\right)^3 \cdot 5 \cdot 10^4 = 13.240.211\ [m] = 13.240\ [km]$$

$$L_2 = \left(\frac{C}{F_{Z2}} \cdot \frac{f_H \cdot f_T \cdot f_C}{f_W}\right)^3 \cdot 5 \cdot 10^4 = \left(\frac{36.710}{1.197{,}77} \cdot \frac{1}{1{,}5}\right)^3 \cdot 5 \cdot 10^4 = 426.509.871\ [m] = 426.510\ [km]$$

$$L_3 = \left(\frac{C}{F_{Z3}} \cdot \frac{f_H \cdot f_T \cdot f_C}{f_W}\right)^3 \cdot 5 \cdot 10^4 = \left(\frac{36.710}{1.851{,}11} \cdot \frac{1}{1{,}5}\right)^3 \cdot 5 \cdot 10^4 = 115.545.411\ [m] = 115.545\ [km]$$

$$L_4 = \left(\frac{C}{F_{Z4}} \cdot \frac{f_H \cdot f_T \cdot f_C}{f_W}\right)^3 \cdot 5 \cdot 10^4 = \left(\frac{36.710}{762{,}23} \cdot \frac{1}{1{,}5}\right)^3 \cdot 5 \cdot 10^4 = 1.654.974.350\ [m] = 1.654.974\ [km]$$

The nominal service life for the most highly stressed runner block 1 corresponds to the service life of the total system for the application described above and is 13,240 km.



Example 3

Vertical installation position (e.g. transport lift, Z-axis of a lifting device) with inertia forces, 2 rails arranged in parallel, 2 runner blocks per rail, BGCH20FN series.

V=1 m/s
a=0,5 m/s²
S_1=1000 mm
S_2=2000 mm
S_3=1000 mm
Mass m=100 kg

Acceleration due to gravity=9.8 m/s²
l_0=300 mm, l_1=500 mm, l_5=250 mm, l_6=280 mm
C=17,71 kN
C_0=30,50 kN
f_w=2,0 (according to Table 2.3)

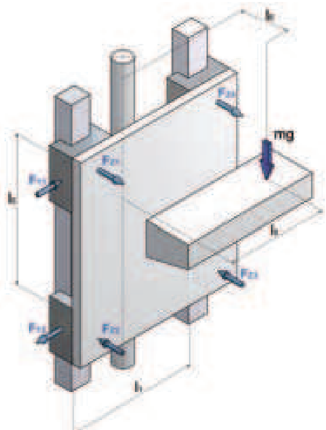


Figure 2.13 Calculation example 3

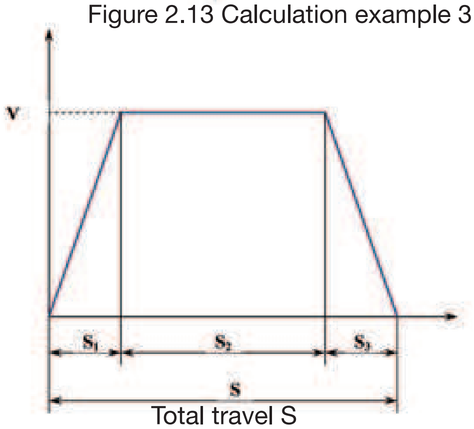


Figure 2.16 Speed/distance diagram

Calculation:

a) The active loads are calculated per runner block

During the acceleration phase
Radial loads

$$F_{BeschZ1} = \frac{m(g+a)\cdot l_6}{2\cdot l_0} = \frac{100\cdot(9{,}8+0{,}5)\cdot 280}{2\cdot 300} = 480{,}67\,[N]$$

$$F_{BeschZ2} = -\frac{m(g+a)\cdot l_6}{2\cdot l_0} = -\frac{100\cdot(9{,}8+0{,}5)\cdot 280}{2\cdot 300} = -480{,}67\,[N]$$

$$F_{BeschZ3} = -\frac{m(g+a)\cdot l_6}{2\cdot l_0} = -\frac{100\cdot(9{,}8+0{,}5)\cdot 280}{2\cdot 300} = -480{,}67\,[N]$$

$$F_{BeschZ4} = \frac{m(g+a)\cdot l_6}{2\cdot l_0} = \frac{100\cdot(9{,}8+0{,}5)\cdot 280}{2\cdot 300} = 480{,}67\,[N]$$

Tangential loads

$$F_{BeschY1} = \frac{m(g+a)\cdot l_5}{2\cdot l_0} = \frac{100\cdot(9{,}8+0{,}5)\cdot 250}{2\cdot 300} = 429{,}17\,[N]$$

$$F_{BeschY2} = -\frac{m(g+a)\cdot l_5}{2\cdot l_0} = -\frac{100\cdot(9{,}8+0{,}5)\cdot 250}{2\cdot 300} = -429{,}17\,[N]$$

$$F_{BeschY3} = -\frac{m(g+a)\cdot l_5}{2\cdot l_0} = -\frac{100\cdot(9{,}8+0{,}5)\cdot 250}{2\cdot 300} = -429{,}17\,[N]$$

$$F_{BeschY4} = \frac{m(g+a)\cdot l_5}{2\cdot l_0} = \frac{100\cdot(9{,}8+0{,}5)\cdot 250}{2\cdot 300} = 429{,}17\,[N]$$

At constant speed
Radial loads

$$F_{KonstZ1} = \frac{mg\cdot l_6}{2\cdot l_0} = \frac{100\cdot 9{,}8\cdot 280}{2\cdot 300} = 457{,}33\,[N]$$

$$F_{KonstZ2} = -\frac{mg\cdot l_6}{2\cdot l_0} = -\frac{100\cdot 9{,}8\cdot 280}{2\cdot 300} = -457{,}33\,[N]$$

$$F_{KonstZ3} = -\frac{mg\cdot l_6}{2\cdot l_0} = -\frac{100\cdot 9{,}8\cdot 280}{2\cdot 300} = -457{,}33\,[N]$$

$$F_{KonstZ4} = \frac{mg\cdot l_6}{2\cdot l_0} = \frac{100\cdot 9{,}8\cdot 280}{2\cdot 300} = 457{,}33\,[N]$$

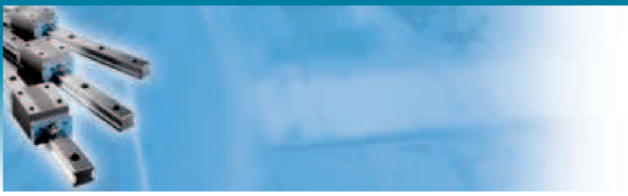
Tangential loads

$$F_{KonstY1} = \frac{mg\cdot l_5}{2\cdot l_0} = \frac{100\cdot 9{,}8\cdot 250}{2\cdot 300} = 429{,}17\,[N]$$

$$F_{KonstY2} = -\frac{mg\cdot l_5}{2\cdot l_0} = -\frac{100\cdot 9{,}8\cdot 250}{2\cdot 300} = -429{,}17\,[N]$$

$$F_{KonstY3} = -\frac{mg\cdot l_5}{2\cdot l_0} = -\frac{100\cdot 9{,}8\cdot 250}{2\cdot 300} = -429{,}17\,[N]$$

$$F_{KonstY4} = \frac{mg\cdot l_5}{2\cdot l_0} = \frac{100\cdot 9{,}8\cdot 250}{2\cdot 300} = 429{,}17\,[N]$$



During the deceleration phase
Radial loads

$$F_{VerzZ1} = \frac{m(g-a)\cdot l_6}{2\cdot l_0} = \frac{100\cdot(9{,}8-0{,}5)\cdot 280}{2\cdot 300} = 434\,[N]$$

$$F_{VerzZ2} = -\frac{m(g-a)\cdot l_6}{2\cdot l_0} = -\frac{100\cdot(9{,}8-0{,}5)\cdot 280}{2\cdot 300} = -434\,[N]$$

$$F_{VerzZ3} = -\frac{m(g-a)\cdot l_6}{2\cdot l_0} = -\frac{100\cdot(9{,}8-0{,}5)\cdot 280}{2\cdot 300} = -434\,[N]$$

$$F_{VerzZ4} = \frac{m(g-a)\cdot l_6}{2\cdot l_0} = \frac{100\cdot(9{,}8-0{,}5)\cdot 280}{2\cdot 300} = 434\,[N]$$

Tangential loads

$$F_{VerzY1} = \frac{m(g-a)\cdot l_5}{2\cdot l_0} = \frac{100\cdot(9{,}8-0{,}5)\cdot 250}{2\cdot 300} = 387{,}50\,[N]$$

$$F_{VerzY2} = -\frac{m(g-a)\cdot l_5}{2\cdot l_0} = -\frac{100\cdot(9{,}8-0{,}5)\cdot 250}{2\cdot 300} = -387{,}50\,[N]$$

$$F_{VerzY3} = -\frac{m(g-a)\cdot l_5}{2\cdot l_0} = -\frac{100\cdot(9{,}8-0{,}5)\cdot 250}{2\cdot 300} = -387{,}50\,[N]$$

$$F_{VerzY4} = \frac{m(g-a)\cdot l_5}{2\cdot l_0} = \frac{100\cdot(9{,}8-0{,}5)\cdot 250}{2\cdot 300} = 387{,}50\,[N]$$

b) The combined radial and tangential loads are calculated per runner block according to [2.6].
During the acceleration phase

$$F_{BeschE1} = |F_{BeschZ1}| + |F_{BeschY1}| = 909{,}84\,[N]$$

$$F_{BeschE2} = |F_{BeschZ2}| + |F_{BeschY2}| = 909{,}84\,[N]$$

$$F_{BeschE3} = |F_{BeschZ3}| + |F_{BeschY3}| = 909{,}84\,[N]$$

$$F_{BeschE4} = |F_{BeschZ4}| + |F_{BeschY4}| = 909{,}84\,[N]$$

At constant speed

$$F_{KonstE1} = |F_{KonstZ1}| + |F_{KonstY1}| = 886{,}47\ [N]$$

$$F_{KonstE2} = |F_{KonstZ2}| + |F_{KonstY2}| = 886{,}47\ [N]$$

$$F_{KonstE3} = |F_{KonstZ3}| + |F_{KonstY3}| = 886{,}47\ [N]$$

$$F_{KonstE4} = |F_{KonstZ4}| + |F_{KonstY4}| = 886{,}47\ [N]$$

During the deceleration phase

$$F_{VerzE1} = |F_{VerzZ1}| + |F_{VerzY1}| = 821{,}50\ [N]$$

$$F_{VerzE2} = |F_{VerzZ2}| + |F_{VerzY2}| = 821{,}50\ [N]$$

$$F_{VerzE3} = |F_{VerzZ3}| + |F_{VerzY3}| = 821{,}50\ [N]$$

$$F_{VerzE4} = |F_{VerzZ4}| + |F_{VerzY4}| = 821{,}50\ [N]$$

c) The static safety factor for the maximum load on the linear guide during the acceleration phase is calculated according to [2.1].

$$f_S = \frac{C_0}{F_{0MAX}} = \frac{30.500}{909{,}84} = 33{,}5$$

d) The active, dynamic, equivalent load is calculated according to [2.7].

$$F_{m1} = \sqrt[3]{\frac{1}{4.000}\left(F^3_{BeschE1} \cdot S_1 + F^3_{KonstE1} \cdot S_2 + F^3_{VerzE1} \cdot S_3\right)} =$$

$$= \sqrt[3]{\frac{1}{4.000} \cdot \left(909{,}84^3 \cdot 1.000 + 886{,}47^3 \cdot 2.000 + 821{,}50^3 \cdot 1.000\right)} = 877{,}29\ [N]$$

$$F_{m2} = \sqrt[3]{\frac{1}{4.000}\left(F^3_{BeschE2} \cdot S_1 + F^3_{KonstE2} \cdot S_2 + F^3_{VerzE2} \cdot S_3\right)} =$$

$$= \sqrt[3]{\frac{1}{4.000} \cdot \left(909{,}84^3 \cdot 1.000 + 886{,}47^3 \cdot 2.000 + 821{,}50^3 \cdot 1.000\right)} = 877{,}29\ [N]$$

$$F_{m3} = \sqrt[3]{\frac{1}{4.000}\left(F^3_{BeschE3} \cdot S_1 + F^3_{KonstE3} \cdot S_2 + F^3_{VerzE3} \cdot S_3\right)} =$$

$$= \sqrt[3]{\frac{1}{4.000} \cdot \left(909{,}84^3 \cdot 1.000 + 886{,}47^3 \cdot 2.000 + 821{,}50^3 \cdot 1.000\right)} = 877{,}29\ [N]$$

$$F_{m4} = \sqrt[3]{\frac{1}{4.000}\left(F^3_{BeschE4} \cdot S_1 + F^3_{KonstE4} \cdot S_2 + F^3_{VerzE4} \cdot S_3\right)} =$$

$$= \sqrt[3]{\frac{1}{4.000} \cdot \left(909{,}84^3 \cdot 1.000 + 886{,}47^3 \cdot 2.000 + 821{,}50^3 \cdot 1.000\right)} = 877{,}29\,[N]$$

e) The nominal service life is calculated according to [2.4].

$$L_1 = \left(\frac{C}{F_{m1}} \cdot \frac{f_H \cdot f_T \cdot f_C}{f_W}\right)^3 \cdot 5 \cdot 10^4 = \left(\frac{17.710}{877{,}29} \cdot \frac{1}{2{,}0}\right)^3 \cdot 5 \cdot 10^4 = 51.416.933\,[m] = 51.417\,[km]$$

Example 4

Horizontal installation position (e.g. transport frame) with inertial forces, 2 rails arranged in parallel, 2 runner blocks per rail, BGCH25FN series
V=1 m/s
t_1=1 s
t_2=2 s
t_3=1 s
S=1450 mm
Mass m=150 kg
Acceleration due to gravity=9,8 m/s²
l_0=600 mm, l_1=400 mm, l_5=150 mm, l_6=500mm
C=24,85 kN
C_0=47,07 kN
f_w=2,0 (according to Table 2.3)

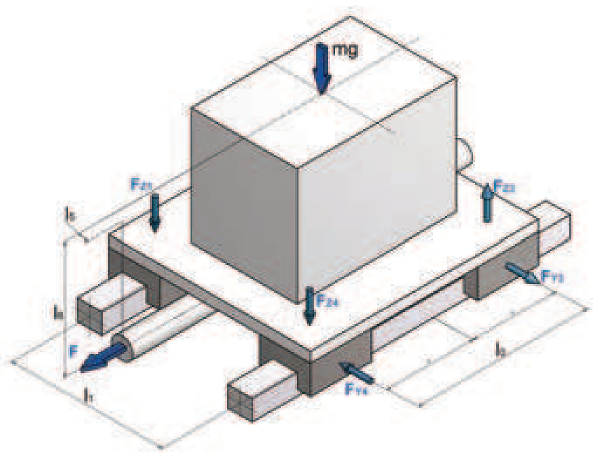


Figure 2.15 Calculation example 4

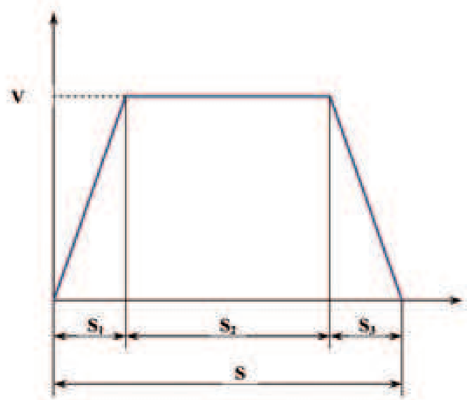


Figure 2.16 Speed/distance diagram

Calculation:

a) Distance and acceleration calculation

Acceleration phase: $a_1 = \frac{V}{t_1} = \frac{1}{1} = 1 \left[m/s^2\right]$

Deceleration phase $a_3 = \frac{V}{t_3} = \frac{1}{1} = 1 \left[m/s^2\right]$

b) The active loads are calculated per runner block

During the acceleration phase
Radial loads

$$F_{BeschZ1} = F_{BeschZ4} = \frac{mg}{4} - \frac{m \cdot a_1 \cdot l_6}{2 \cdot l_0} = \frac{150 \cdot 9{,}8}{4} - \frac{150 \cdot 1 \cdot 500}{2 \cdot 600} = 305 \left[N\right]$$

$$F_{BeschZ3} = F_{BeschZ2} = \frac{mg}{4} + \frac{m \cdot a_1 \cdot l_6}{2 \cdot l_0} = \frac{150 \cdot 9{,}8}{4} + \frac{150 \cdot 1 \cdot 500}{2 \cdot 600} = 430 \left[N\right]$$

Tangential loads

$$F_{BeschY1} = F_{BeschY2} = F_{BeschY3} = F_{BeschY4} = \frac{m \cdot a_1 \cdot l_5}{2 \cdot l_0} = \frac{150 \cdot 1 \cdot 150}{2 \cdot 600} = 18{,}75 \left[N\right]$$

At constant speed
Radial loads

$$F_{KonstZ1} = F_{KonstZ2} = F_{KonstZ3} = F_{KonstZ4} = \frac{mg}{4} = \frac{150 \cdot 9{,}8}{4} = 367{,}5 \left[N\right]$$

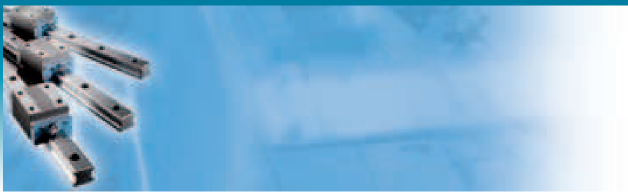
During the deceleration phase
Radial loads

$$F_{VerzZ1} = F_{VerzZ4} = \frac{mg}{4} + \frac{m \cdot a_3 \cdot l_6}{2 \cdot l_0} = \frac{150 \cdot 9{,}8}{4} + \frac{150 \cdot 1 \cdot 500}{2 \cdot 600} = 430 \left[N\right]$$

$$F_{VerzZ2} = F_{VerzZ3} = \frac{mg}{4} - \frac{m \cdot a_3 \cdot l_6}{2 \cdot l_0} = \frac{150 \cdot 9{,}8}{4} - \frac{150 \cdot 1 \cdot 500}{2 \cdot 600} = 305 \left[N\right]$$

Tangential loads

$$F_{VerzY1} = F_{VerzY2} = F_{VerzY3} = F_{VerzY4} = \frac{m \cdot a_3 \cdot l_5}{2 \cdot l_0} = \frac{150 \cdot 1 \cdot 150}{2 \cdot 600} = 18{,}75 \left[N\right]$$



c) The equivalent radial and tangential loads are calculated per runner block according to [2.6].

During the acceleration phase

$$F_{BeschE1} = F_{BeschE4} = \left|F_{BeschZ1}\right| + \left|F_{BeschY1}\right| = 323{,}75\,[N]$$

$$F_{BeschE2} = F_{BeschE3} = \left|F_{BeschZ2}\right| + \left|F_{BeschY2}\right| = 448{,}75\,[N]$$

At constant speed

$$F_{KonstE1} = F_{KonstE2} = F_{KonstE3} = F_{KonstE4} = 367{,}5\,[N]$$

During the deceleration phase

$$F_{VerzE1} = F_{verzE4} = \left|F_{VerzZ1}\right| + \left|F_{VerzY1}\right| = 448{,}75\,[N]$$

$$F_{VerzE2} = F_{verzE3} = \left|F_{VerzZ2}\right| + \left|F_{VerzY2}\right| = 323{,}75\,[N]$$

d) The static safety factor for the maximum load on the linear guide during the acceleration and deceleration phase is calculated according to [2.1].

$$f_S = \frac{C_0}{F_{0MAX}} = \frac{47.070}{448{,}75} = 104{,}8$$

e) The active, dynamic, equivalent load is calculated according to [2.7].

$$F_{m1} = F_{m4} = \sqrt[3]{\frac{1}{4.000}\left(F^3_{BeschE1}\cdot S_1 + F^3_{KonstE1}\cdot S_2 + F^3_{VerzE1}\cdot S_3\right)} =$$

$$= \sqrt[3]{\frac{1}{4.000}\cdot\left(323{,}75^3\cdot 1.000 + 367{,}5^3\cdot 2.000 + 448{,}75^3\cdot 1.000\right)} = 382\,[N]$$

$$F_{m2} = F_{m3} = \sqrt[3]{\frac{1}{4.000}\left(F^3_{BeschE2}\cdot S_1 + F^3_{KonstE2}\cdot S_2 + F^3_{VerzE2}\cdot S_3\right)} =$$

$$= \sqrt[3]{\frac{1}{4.000}\cdot\left(448{,}75^3\cdot 1.000 + 367{,}5^3\cdot 2.000 + 323{,}75^3\cdot 1.000\right)} = 382\,[N]$$

f) The service life of the four runner blocks is calculated according to [2.4].

$$L = \left(\frac{C}{F_{m1}}\cdot\frac{f_H\cdot f_T\cdot f_C}{f_W}\right)^3\cdot 5\cdot 10^4 = \left(\frac{24.850}{382}\cdot\frac{1}{2{,}0}\right)^3\cdot 5\cdot 10^4 = 1.720.557.170\,[m] = 1.720.557\,[km]$$

2.6 Preload/rigidity

2.6.1 Preload classes

Profile rail guides can be preloaded to increase the rigidity of the system or to improve the spring compression behaviour of the total system. The elastic deformation of the tracks and the balls under load is smaller for preloaded runner blocks than in non-preloaded ones. The disadvantages of preloaded systems are: increased displacement resistance and a resulting reduction in service life. The preload is not considered in the normal service life calculation when it is within the ranges specified in Table 2.6. The preload in a profile rail guide system is achieved by using rolling elements (balls) that are oversized by a specific factor (Figure 2.17). The preload is defined by the radial play resulting from the over sizing of the balls.

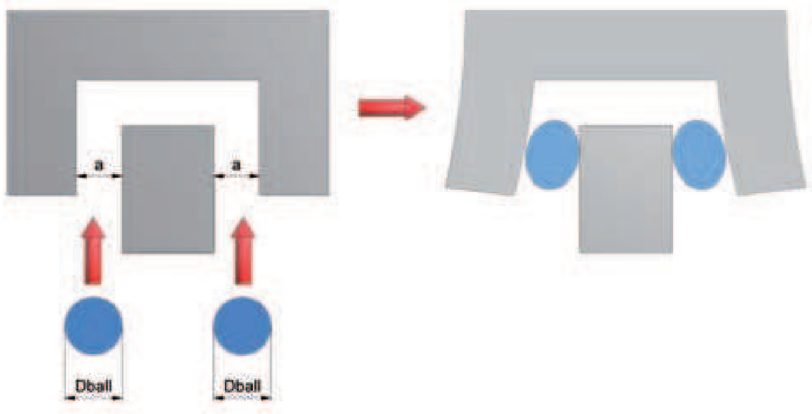


Figure 2.17 Preloading by over sizing of the balls

SNR profile rail guides are produced in different pretension classes (Table 2.6). The individual pretension classes correspond to a pretension of the rolling elements that is defined by a proportion of the dynamic load rating C.

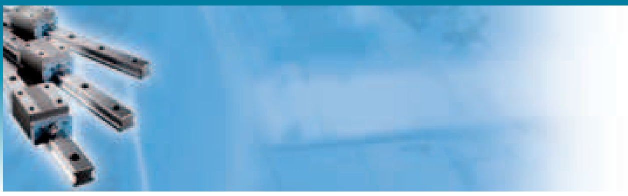


Table 2.6 Preload class

	Description	Preload class factor
No preload	Z0	0
Low preload	Z1	up to 2% of C
Medium preload	Z2	up to 5% of C
High preload	Z3	up to 7% of C

Table 2.7 can be used to define the preload class. The preload for the individual types are provided in Table 2.8.

Table 2.7 Application areas for different preload classes

	Without preload (Z0)	Low preload (Z1)	Medium and high preload (Z2/Z3)
Application conditions	> Two-rail system > Weak external effects > Low load > Low friction > Low accuracy	> One-rail system > Light load > High accuracy > Self-supporting design > High dynamics	> Strong vibrations > High-performance processing > Strong external effects
Applications	> Welding machines > Cutting machines > Feeding systems > Tool changer > X and Y axes for general industrial applications > Packaging machines	> NC lathes > Precision coordinate tables > Manipulators > Z-axes for general industrial applications > Measuring devices > PC-board drilling machines	> Processing centres > NC lathes > Milling machines > Grinding machines

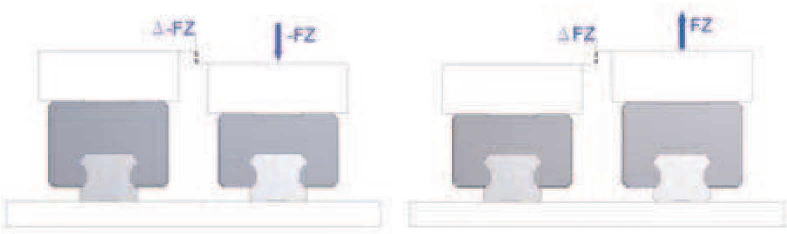
Table 2.8 Radial play of profile rail guides [μm]

	Z0	Z1	Z2	Z3
MB...9	-2 to +2	-3 to 0	-	-
MB...12	-3 to +3	-6 to 0	-	-
MB...15	-5 to +5	-10 to 0	-	-
BG...15	-3 to +3	-8 to -4	-13 to -9	-18 to -14
BG...20	-3 to +3	-8 to -4	-14 to -9	-19 to -14
BG...25	-4 to +4	-10 to -5	-17 to -11	-23 to -18
BG...30	-4 to +4	-11 to -5	-18 to -12	-25 to -19
BG...35	-5 to +5	-12 to -6	-20 to -13	-27 to -20
BG...45	-6 to +6	-15 to -7	-23 to -15	-32 to -24
BG...55	-7 to +7	-19 to -8	-29 to -20	-38 to -30

We recommend that you contact our SNR application engineers to select the optimal preload.

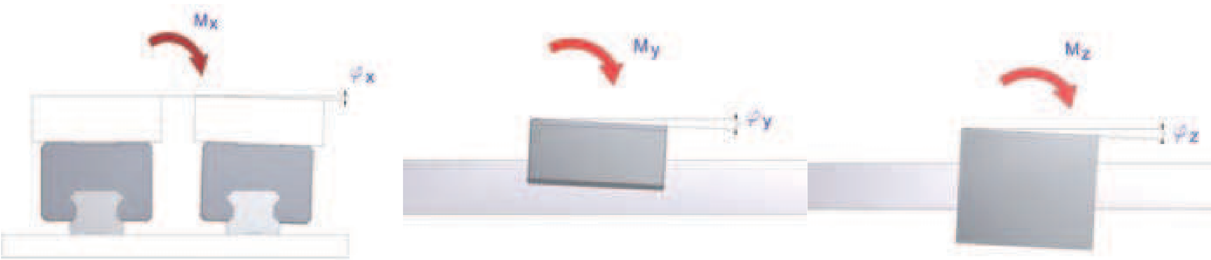
2.6.2 Rigidity

The rigidity of a runner block is defined by the relationship between the external load and the resulting elastic deformation in the load direction. The rigidity is an important parameter for the selection of the system, as the rigidity values vary according to the type and version of the SNR profile rail guide systems. The rigidity values discriminate between deformation due to load in the main load directions (Figure 2.18) and angular deformation due to torque load (Figure 2.19).



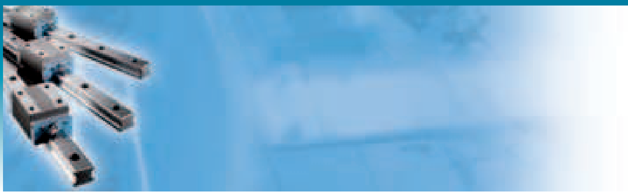
a) Radial load / pressure   b) Radial load / tension   c) Tangential load / lateral load

Figure 2.18 Deformation due to load in the main load directions



a) Rolling   b) Pitching   c) Yawing

Figure 2.19 Angular deformation due to torque load



2.7. Precision

2.7.1 Precision grades

SNR profile rail guides are produced in various precision classes. Each precision class has a maximum deviation for running parallelism and maximum dimensional deviations. (Figure 2.20).

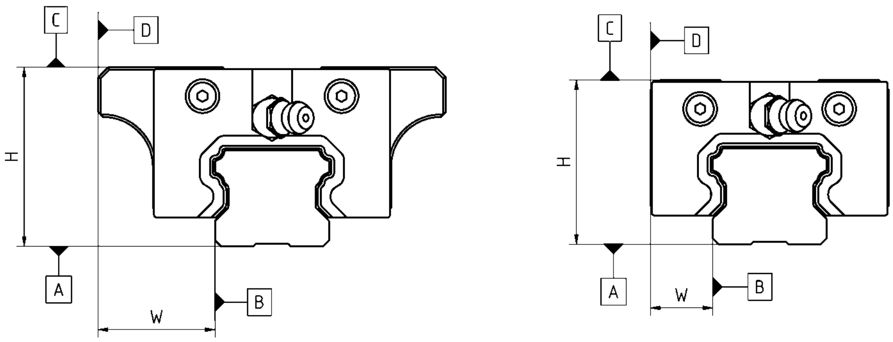


Figure 2.20 Accuracy classes

The running parallelism ΔC describes the maximum parallelism deviation between the top of the runner block and the bottom of the rail, relative to the length of the rail. ΔD is the the maximum parallelism deviation between the lateral reference surface of the runner block and the rail, relative to the length of the rail. The height tolerance is the maximum dimensional deviation of the height measurement H in the z-direction between the top of the runner block and the bottom of the rail. The maximum dimensional deviation between the lateral reference surface of the runner block and the rail in y-direction is the tolerance of the value W. The values for the individual precision classes are provided in Table 2.9 for the standard profile rail guides and in Table 2.10 for the miniature profile rail guides.

Table 2.9 Precision grades of the standard profile rail guides

	Normal grade	Highly accurate grade (H)	Precision grade (P)	Super-precision grade (SP)	Ultra-precision grade (UP)
Height tolerance (H)	± 0,1	± 0,04	0 -0,04	0 -0,02	0 -0,01
Width tolerance (W)	± 0,1	± 0,04	0 -0.04	0 -0,02	0 -0.01
Height difference (ΔH) *	0,03	0,02	0,01	0,005	0,003
Width difference (ΔW) *	0,03	0,02	0,01	0,005	0,003
Running parallelism between runner block surface C and surface A	ΔC as a function of rail length as shown in Figure 2.21.				
Running parallelism between the runner block reference surface D and the rail reference surface B	ΔD as a function of rail length as shown in Figure 2.21				

* between two runner blocks

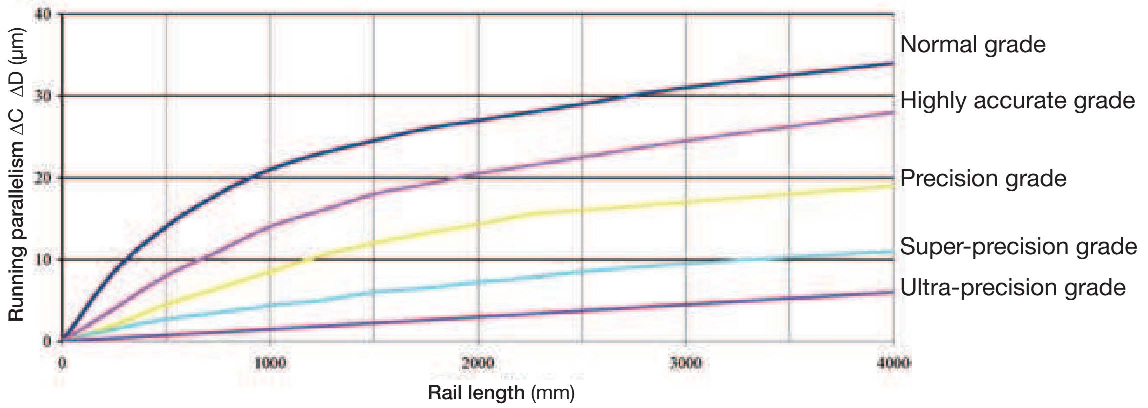


Figure 2.21 Running parallelism of the standard profile rail guides

Table 2.10 Precision classes of the miniature profile rail guides

	Normal grade	Highly accurate grade (H)	Precision grade (P)
Height tolerance (H)	± 0,04	± 0,02	± 0,01
Height tolerance (W)	± 0,04	± 0,025	± 0,015
Height difference (ΔH) *	0,03	0,015	0,007
Width difference (ΔW) *	0,03	0,02	0,01
Running parallelism between the runner block surface C and surface A	ΔC as a function of rail length as shown in Figure 2.22.		
Running parallelism between the runner block reference surface D and the rail reference surface B	ΔD as a function of rail length as shown in Figure 2.22.		

* between two runner blocks

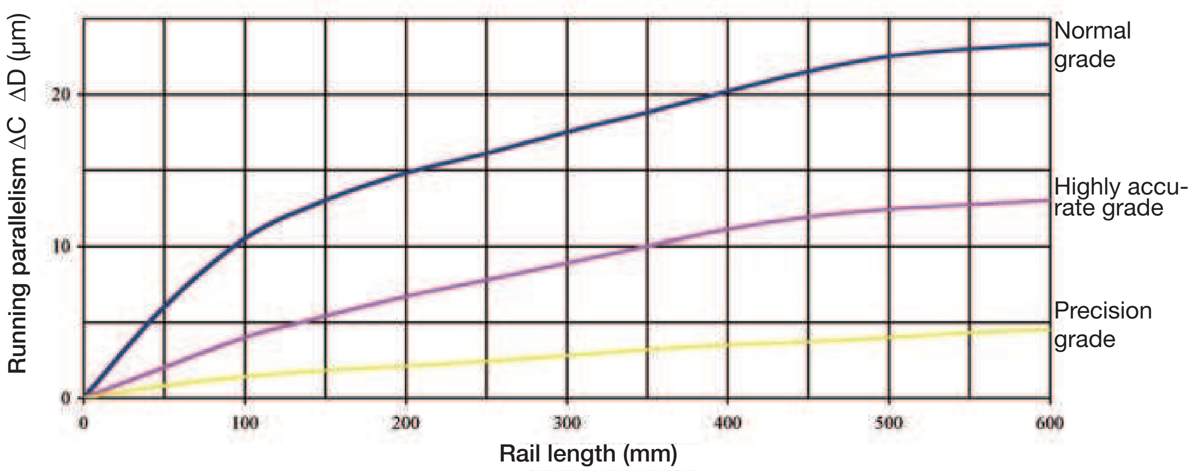
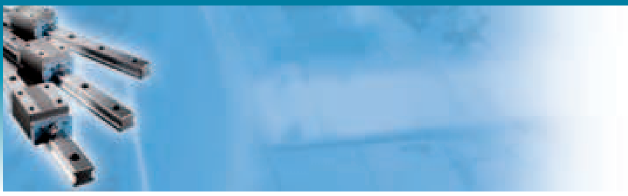


Figure 2.22 Running parallelism of the miniature profile rail guides



2.7.2 Interchangeability

It is not possible to make the SNR profile rail guides in all precision and preload classes interchangeable, as this would interfere with our goal of ensuring top quality. High precision and preload classes are therefore only available as sets consisting of rails and runner blocks. Table 2.11 contains an overview of the exchange options.

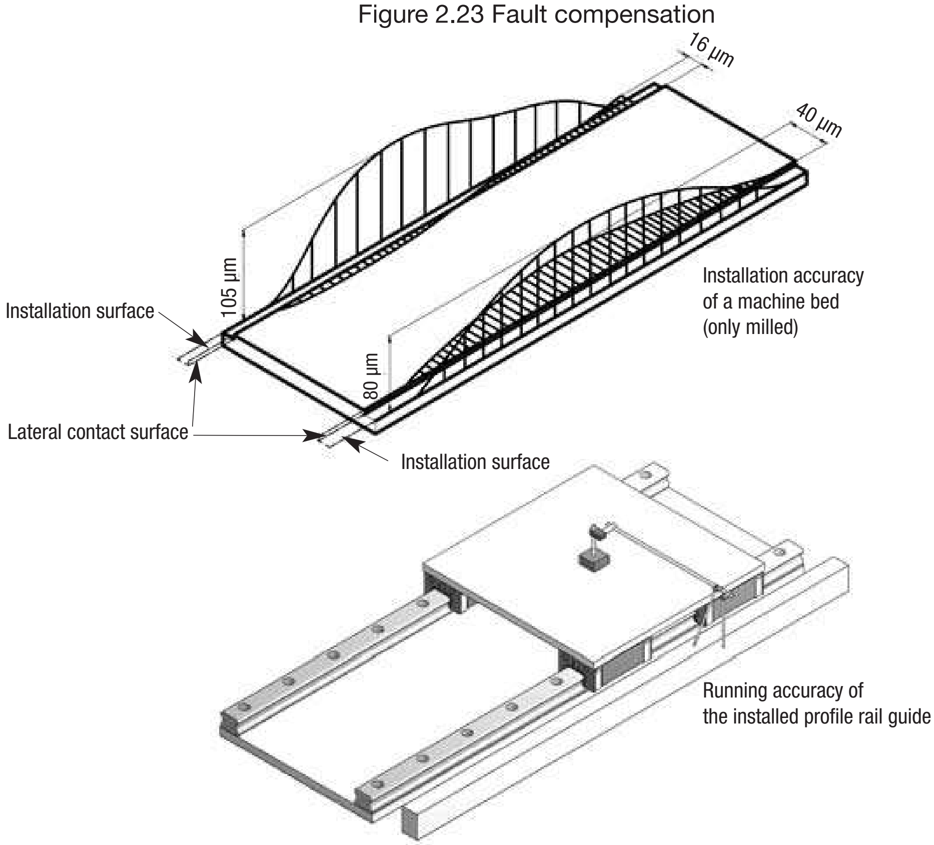
Table 2.11 Interchangeability of profile rail guides

	Interchangeable		Not interchangeable				
Precision grade	N	H	N	H	P	SP	UP
Pretension	Z0	Z0	-	-	Z0	-	-
	Z1	Z1	-	-	Z1	Z1	Z1
	Z2	Z2	-	-	Z2	Z2	Z2
	-	-	Z3	Z3	Z3	Z3	Z3

2.7.3 Fault compensation

Each component and each support structure on which profile rail guides are to be mounted has straightness, evenness and parallelism variance. Inaccuracies also occur as a result of installation faults. A significant number of these errors can be compensated for by the special track geometry of the SNR profile rail guides, as long as the supporting structure is sufficiently rigid (Figure 2.23). The fault compensation effect usually improves the running accuracy of a machine table by more than 80% compared with the initial surfaces.

Figure 2.23 Fault compensation



2.8 Drive power

2.8.1 Friction

Profile rail guides basically consist of a runner block a rail and rolling elements that move between the tracks of the runner block and the rail. A friction force FR occurs, as with any movement (Figure 2.24). The friction coefficient (µ) is mainly affected by the following factors:

- Load (F)
- Pretension
- Osculation
- Design principle (circular arc groove or Gothic arc groove)
- Rolling element shape
- Material combinations in the runner block
- Lubricant

The sticking/slipping effect at start-up, so familiar with sliding guides, hardly occurs.

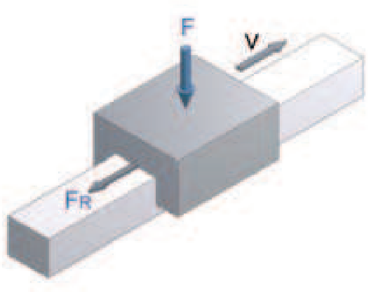


Figure 2.24 Friction force

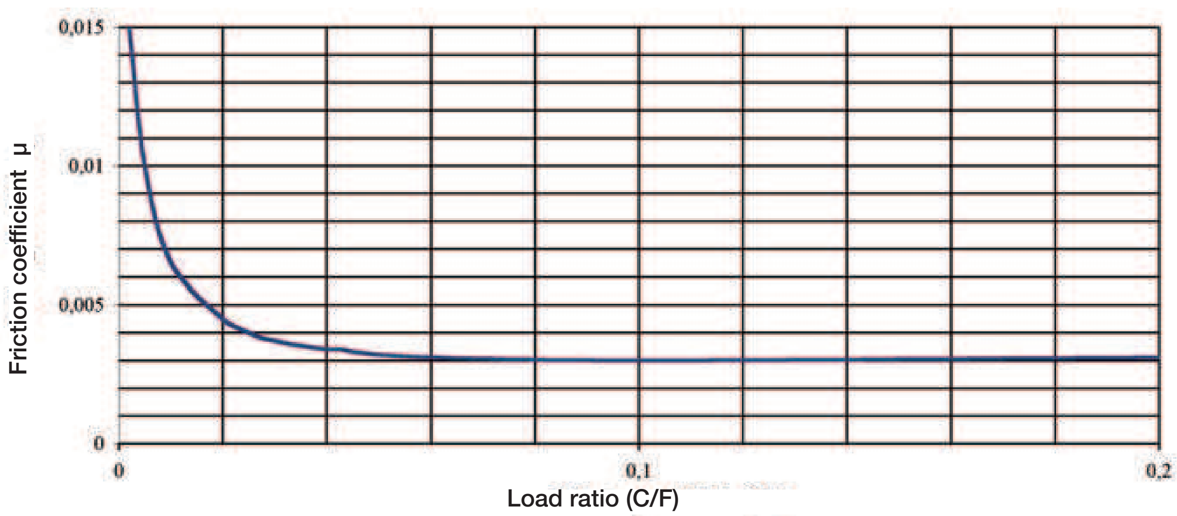
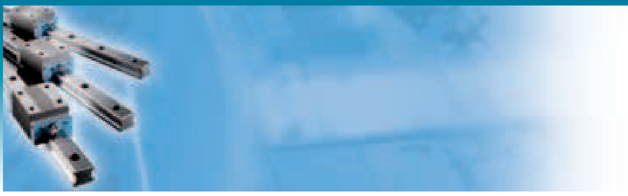


Figure 2.25 Ratio of load / friction coefficient of profile rail guides with balls



SNR profile rail guides with balls as rolling elements have a friction coefficient (μ) of approx. 0.003 (Figure 2.25). The forces acting on the system include internal as well as external forces. The external forces may be weight forces, process forces (e.g. milling forces) and dynamic forces (e.g. acceleration forces). Internal forces result from pretension, assembly tolerances and installation faults.

The friction caused by the lubricant strongly depends on the properties of the lubricant used. Immediately after relubrication, the friction forces of a profile rail guide increase for a short time. After some rolling movements of the balls, the optimal grease distribution of the system is again reached and the friction force drops to its normal value.

2.8.2 Displacement resistance

The displacement resistance of a profile rail guide consists of the friction force and the sealing resistance (Figure 2.26).

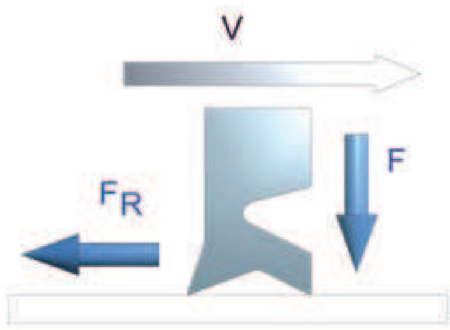


Figure 2.26 Friction force of a two-lip seal

The seal resistance is in turn dependent on the respective combination of seals used. The standard configuration of SNR profile rail guides includes an internal seal, two lateral seals and two end seals. All seals are implemented as two-lip seals. The maximum sealing resistances are shown in Table 2.12.

Table 2.12 Maximum sealing resistances

Typ	Sealing resistance	Typ	Sealing resistance
BGC..15	2,5 N	BGX..15	2,5 N
BGC..20	3,5 N	BGX..20	3,5 N
BGC..25	5,0 N	BGX..25	5,0 N
BGC..30	10,0 N	BGX..30	10,0 N
BGC..35	12,0 N	BGX..35	12,0 N
BGC..45	20,0 N	BGX..45	20,0 N
BGC..55	22,0 N	BGX..55	22,0 N
MBC09S	0,15 N	MBX09S	0,15 N
MBC12S	0,40 N	MBX12S	0,40 N
MBC15S	0,85 N	MBX15S	0,85 N
MBC09W	0,80 N	MBX09W	0,80 N
MBC12W	1,05 N	MBX12W	1,05 N
MBC15W	1,30 N	MBX15W	1,30 N

2.8.3 Driving force

The driving force for a profile rail guide system (Figure 2.27) is calculated according to the following formula:

$$F_a = \mu \cdot F + n \cdot f \qquad [2.11]$$

F_a:	Driving force [N]
μ:	Friction value
F:	Load [N]
n:	Number of runner blocks
f:	Specific movement resistance of a runner block [N]

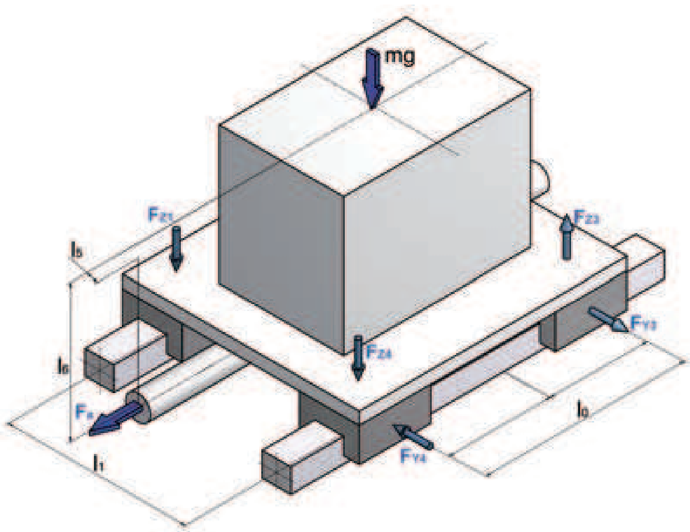


Figure 2.27 Driving force calculation

The maximum movement resistances shown in Table 2.13 result for SNR profile rail guides with standard sealing and greasing at room temperature and without load. This value may vary considerably when different sealing options or grease types are chosen.

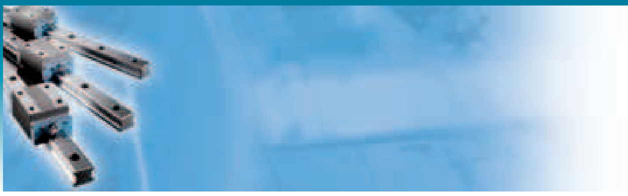


Table 2.13 Movement resistances

		Z0	Z1	Z2	Z3
		[N]	[N]	[N]	[N]
BGC_15	BS	3,0	3,5	4,9	6,0
	BN, FN	3,5	4,0	5,4	6,5
	BL, FL	4,2	4,7	6,1	7,2
BGC_20	BS	3,5	4,0	6,4	8,4
	BN, FN	4,3	4,8	6,4	8,4
	BL, FL	5,4	5,9	7,9	10,4
BGC_25	BS	5,0	5,5	8,0	9,4
	BN, FN	6,0	6,5	9,0	10,4
	BL, FL	7,4	7,9	10,4	11,8
	BE, FE	8,9	9,4	11,9	14,8
BGC_30	BS	10,7	11,5	14,9	18,9
	BN, FN	12,2	13,0	16,4	20,4
	BL, FL	13,6	14,4	17,8	21,8
	BE, FE	15,1	15,9	19,3	23,7
BGC_35	BS	13,0	14,0	18,4	23,8
	BN, FN	14,9	15,9	20,3	25,7
	BL, FL	16,9	17,9	22,3	27,7
	BE, FE	18,8	19,8	25,2	30,6
BGC_45	BN, FN	24,5	25,8	31,7	37,6
	BL, FL	26,5	27,8	33,7	39,6
	BE, FE	28,5	29,8	36,7	43,5
MBC09S		0,18	0,20	0,30	--
MBC12S		0,45	0,50	0,70	--
MBC15S		1,00	1,10	1,40	--
MBC09W		0,90	0,95	1,15	--
MBC12W		1,20	1,30	1,65	--
MBC15W		1,50	1,70	2,30	--

		Z0	Z1	Z2	Z3
		[N]	[N]	[N]	[N]
BGX_15	BS	1,5	2,0	3,4	4,5
	BN, FN	2,0	2,5	3,9	5,0
	BL, FL	2,7	3,2	4,6	5,7
BGX_20	BS	2,0	2,5	4,9	6,9
	BN, FN	2,8	3,3	4,9	6,9
	BL, FL	3,9	4,4	6,4	8,9
BGX_25	BS	3,0	3,5	6,0	7,4
	BN, FN	4,0	4,5	7,0	8,4
	BL, FL	5,4	5,9	8,4	9,8
	BE, FE	6,9	7,4	9,9	12,8
BGX_30	BS	5,2	6,0	9,4	13,4
	BN, FN	6,7	7,5	10,9	14,9
	BL, FL	8,1	8,9	12,3	16,3
	BE, FE	9,6	10,4	13,8	18,2
BGX_35	BS	6,0	7,0	11,4	16,8
	BN, FN	7,9	8,9	13,3	18,7
	BL, FL	9,9	10,9	15,3	20,7
	BE, FE	11,8	12,8	18,2	23,6
BGX_45	BN, FN	17,5	18,8	24,7	30,6
	BL, FL	19,5	20,8	26,7	32,6
	BE, FE	21,5	22,8	29,7	36,5
MBX09S		0,18	0,20	0,30	--
MBX12S		0,45	0,50	0,70	--
MBX15S		1,00	1,10	1,40	--
MBX09W		0,90	0,95	1,15	--
MBX12W		1,20	1,30	1,65	--
MBX15W		1,50	1,70	2,30	--

3 Installation

3.1 Arrangement of the installation surface

The installation of profile rail guides usually involves two guide rails arranged in parallel with one or several runner blocks per rail guide. The example shown is a common application, in which the rail guides are fastened at a specific distance to each other on an even support surface (e.g. a machine bed) and in which a machine table is attached to the runner block (Figure 3.10).

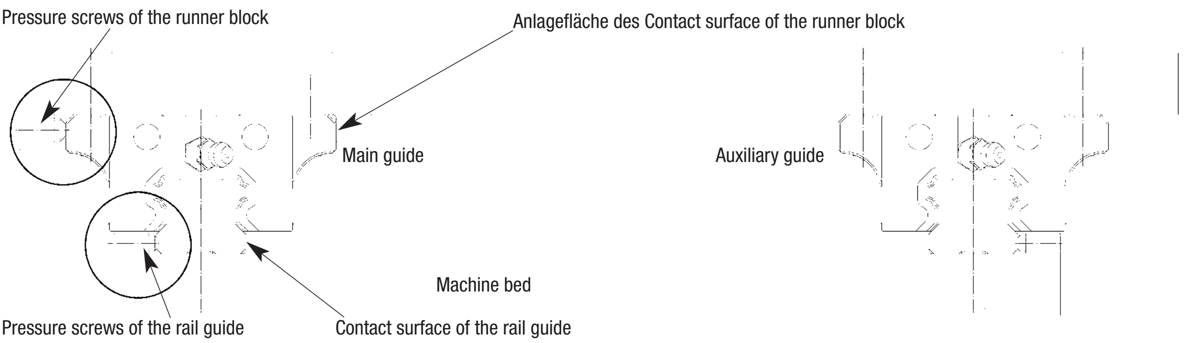


Figure 3.1 Installation for application with two profile rail guides arranged in parallel.

The locating edges are used to achieve accurate positioning during installation. The locating edges also make the installation of the whole system easier. The information about the height of the locating edge Hr for the rail guide (Figure 3.2) and the height of the locating edge Hs for the runner block (Figure 3.3) is provided in Table 3.1 and Table 3.2.

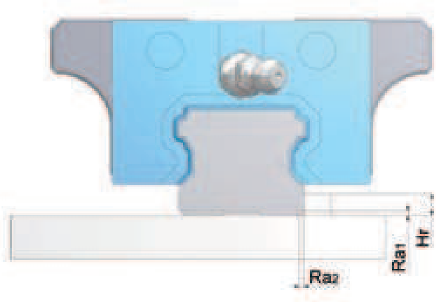


Figure 3.2. Locating edge of the rail guide

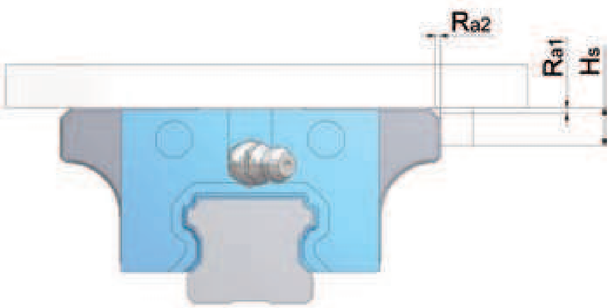


Figure 3.3. Locating edge of the rail guide

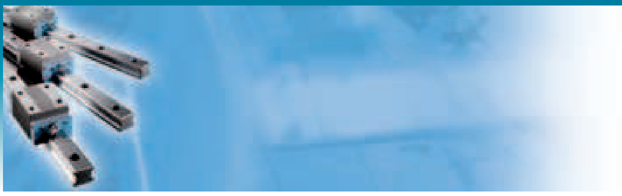


Table 3.1 Alignment edges and edge radius for the BG series.

	Edge radius Ra1=Ra2 [mm]	Alignment edge HR [mm]	Alignment edge HW [mm]	Fastening screws*
BG…15	0,6	2,8	5	M4x16
BG…20	0,9	4,3	6	M5x20
BG…25	1,1	5,6	7	M6x25
BG…30	1,4	6.8	8	M8x30
BG…35	1,4	7,3	9	M8x30
BG…45	1,6	8,7	12	M12x35

* Minimum screw length

Table 3.2 Alignment edges and edge radius for the MB series.

	Edge radius Ra1 [mm]	Edge radius Ra2 [mm]	Alignment edge HR [mm]	Alignment edge HW [mm]	Fastening screws*
MB…9SN	0,1	0,3	0,5	4,9	M3x6
MB…9WN	0,1	0,5	2,5	4,9	M3x6
MB…12SN	0,3	0,2	1,5	5,7	M3x6
MB…12WN	0,3	0,3	2,5	5,7	M3x8
MB…15SN	0,3	0,4	2,2	6,5	M3x8
MB…15WN	0,3	0,3	2,2	6,5	M3x8

* Minimum screw length

3.2 Identification of profile rail guides

The profile rail guides that are installed in one plane (main guide and auxiliary guide) are all marked with the same production code and have no special markers to identify the main guide (Figure 3.4).

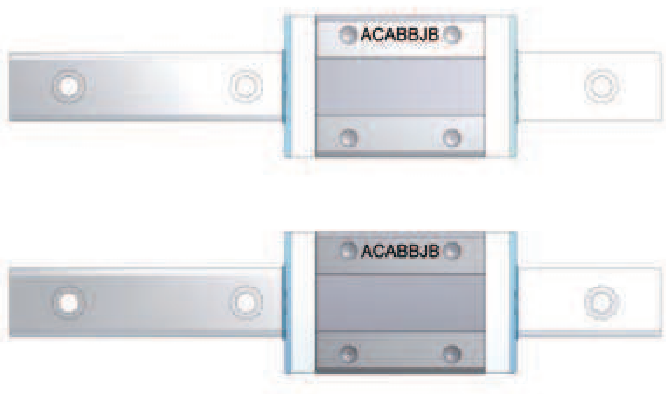


Figure 3.4 Marking the main and auxiliary guide

The reference surfaces of the runner blocks are located on the side that is opposite the SNR logo and the production code. The same side has the marker lines that mark the reference surface of the rail guides (Figure 3.5).

We recommend that you contact our SNR application engineers when a different arrangement of the reference surfaces is required.

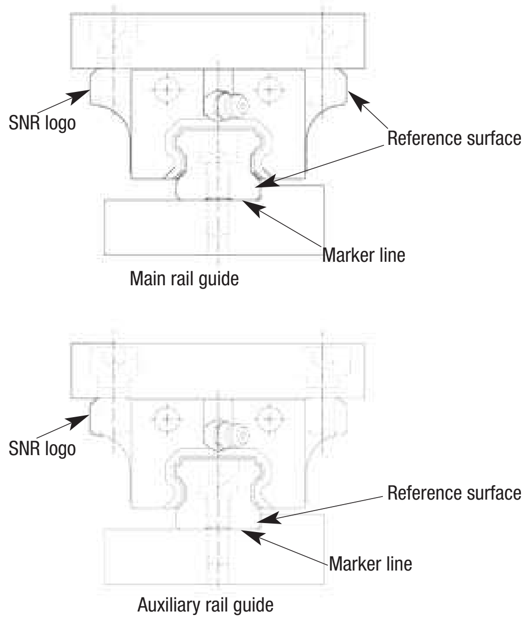


Figure 3.5 Marking the reference surfaces

The rail guides are delivered in one piece up to a standard length of 4000 mm. Longer rail guides are provided in several sections with butt joints. The butt joints are marked (Figure 3.6) and the profile rail guides must be mounted accordingly.

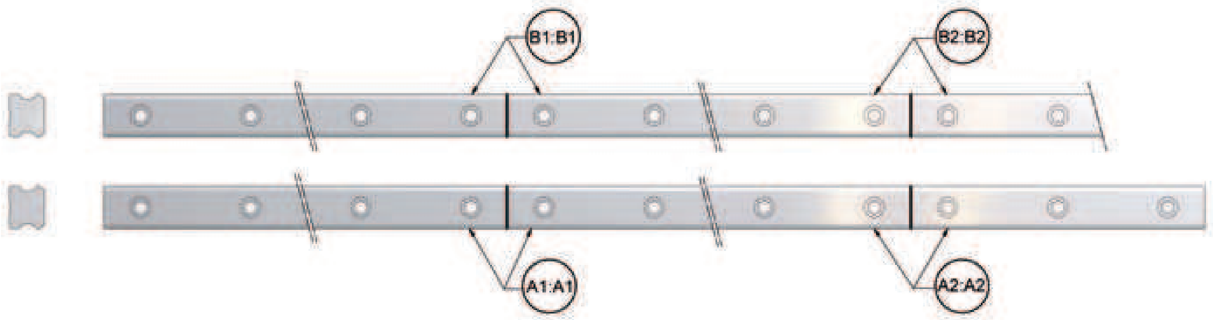
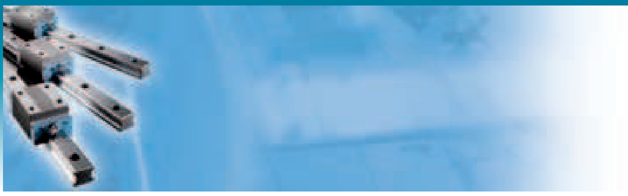
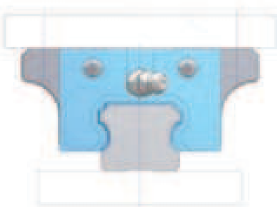


Figure 3.6 Identification of profile rail guides

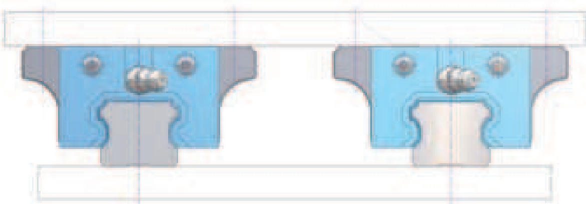


3.3 Arrangement of profile rail guides

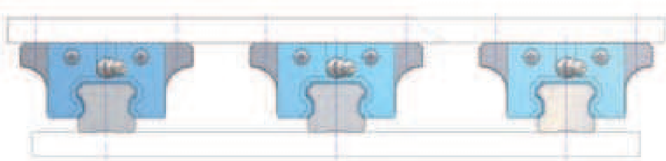
The following examples show some basic arrangements of profile rail guides that are most commonly used in practical applications (Figure 3.7).



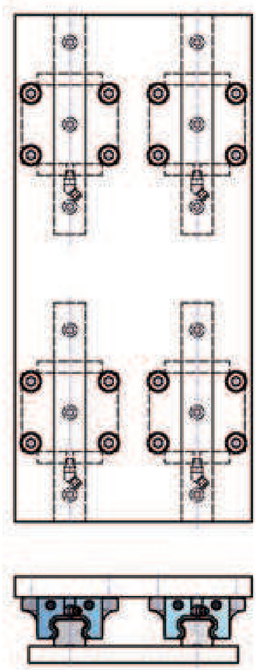
One-rail arrangement



Two-rail arrangement (II)



Three-rail arrangement (III)



Four-rail arrangement (IV)

Figure 3.7 Examples for the arrangement of profile rail guides

The number of profile rail guides and the runner blocks in a total system has an impact on the rigidity, load-carrying capacity and dimensions of the device. The arrangement of the profile rail guides also determines the requirements for the accuracy of the installation surfaces. The actual arrangement of profile rail guides strongly depends on the application and may therefore vary accordingly.

3.4 Installation position of a profile rail guide

The installation position of the profile rail guide system (runner block and rail guide) is defined by the basic concept of the machine/device (Figure 3.8). The lubrication process (lubricants, lubrication intervals, supply with lubricant) must be adapted to the installation position selected.

Rotation around the X-axis

Rotation around the Y-axis

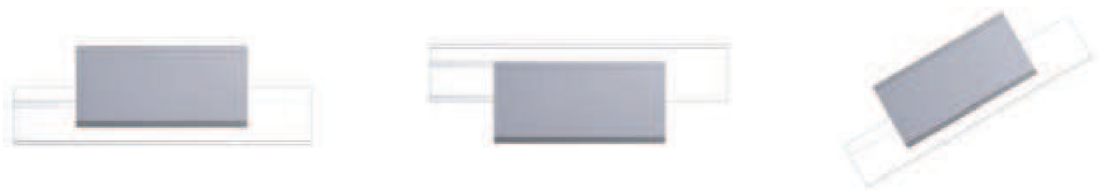


Figure 3.8 Installation positions of a profile rail guide

3.5 Installation instructions

The conditions specified below must be fulfilled during the installation of SNR profile rail guides to ensure that the components can be installed and combined with other parts without affecting the health and safety of personnel.

> The work steps may only be performed in the sequence specified.
> The installation may only be performed with suitable tools and support equipment.
> The installation may only be performed by trained personnel.
> The installation of profile rail guides must be performed with cotton gloves, when the parts are dry-preserved. This prevents corrosion caused by sweaty hands
> The installation of runner blocks on the guide rails should not be performed with a pre-installed machine table.

Step 1 Cleaning the installation surface

Unevenness, burrs and dirt can be removed from the installation surface with an oilstone. In addition, all the SNR profile rails must be cleaned. All profile rail guides receive a standard treatment with corrosion protection oil when no customer-specific or special requirements are specified. This corrosion protection oil must be removed, e.g. with a cotton cloth.

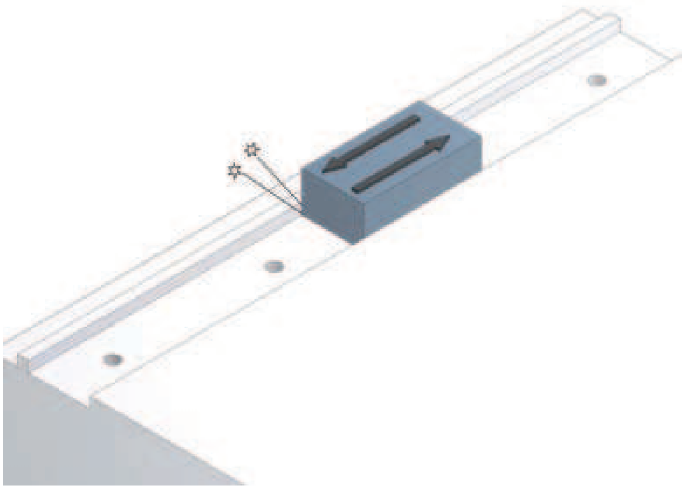


Figure 3.9 Preparation of the installation surface

Step 2 Alignment of the rail guide on the installation surface

Carefully place the rail guide onto the installation surface and fasten it gently with the appropriate screws, so that the rail guide touches the installation surface. The side of the rail guide that is marked with a line (reference surface) must be aligned towards the shoulder edge of the installation surface.

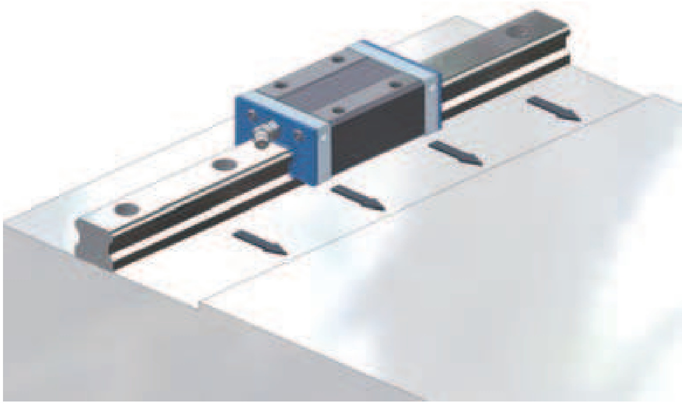


Figure 3.10 Aligning the rail guide

Step 3 Pre-installing the rail guide

The screws are gently and temporarily fastened. The fastening holes in the rail guide must be aligned with the holes in the installation surface).

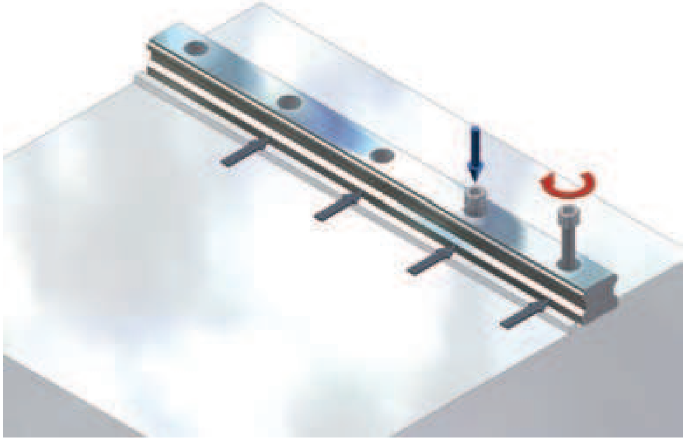


Figure 3.11 Pre-installing the rail guide

Step 4 Fastening the pressure screws

The pressure screws at the rail guide must be fastened to achieve tight contact with the lateral contact surface.

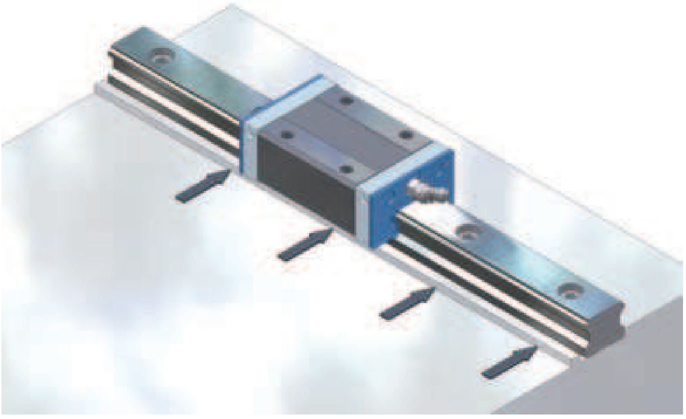


Figure 3.12 Positioning the rail

Step 5 Fastening the fastening screws with a torque spanner

The fastening screws should be fastened with a torque spanner by applying the appropriate torque (Chapter 3.7). The fastening screws should be fastened in sequence, starting at the centre and proceeding towards the ends of the rail guides.

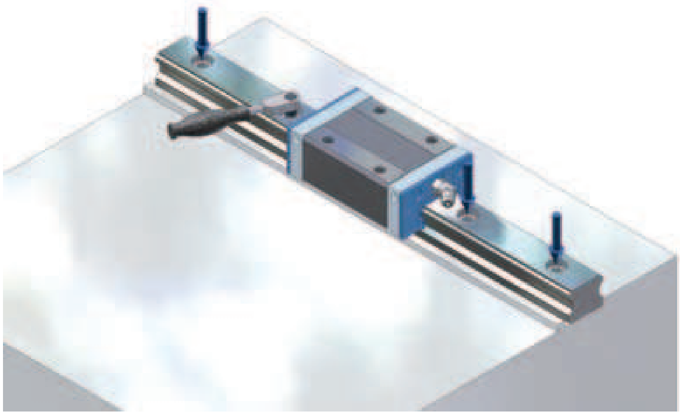


Figure 3.13 Final installation of the rail guide

Step 6 Installation of additional rail guides

Additional rail guides must be installed in the same order (Steps 1 to 5).

Step 7 Installation of the machine table

The table is carefully placed onto the runner block and gently and temporarily fastened with the fastening screws. The pressure screws at the runner block (Figure 3.14) position the table by pressing against the shoulder edge of the table. The fastening screws of the machine table are to be fastened in the order specified (crosswise), starting at the main rail guide side. After installation, low-viscosity oil should be used to treat and protect the system.

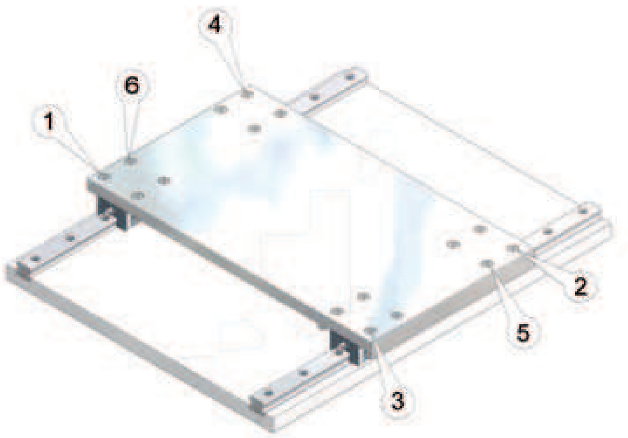


Figure 3.14 Fastening sequence for machine table installation

3.6 Permitted installation tolerances

The service life of the profile rail guide system under normal operating conditions is not affected when the installation tolerances specified are not exceeded..

Parallelism tolerance between two rail guides

The parallelism tolerance between two rail guides (Figure 3.15) depends on the profile rail guide series used and the accuracy of the machine required. The maximum parallelism tolerances are provided in Table 3.3 and Table 3.4.

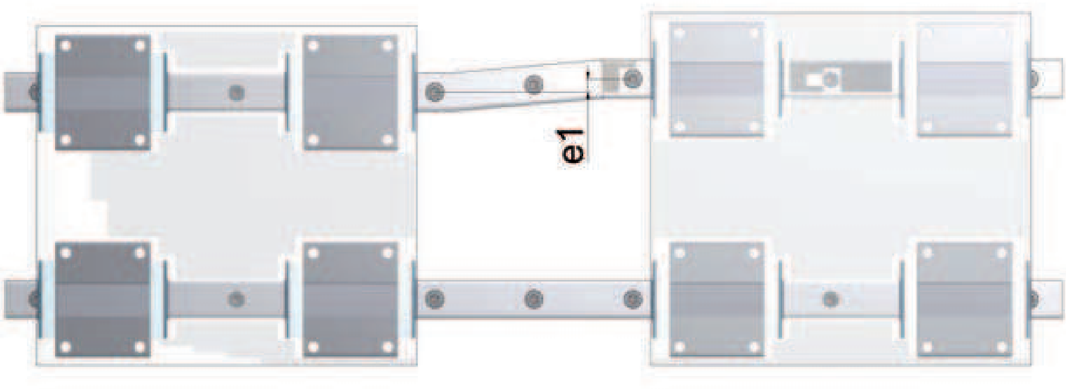


Figure 3.15 Parallelism tolerance between two rail guides e_1

Table 3.3 Parallelism tolerance e1 for the BG series …,[µm]

	e_1			
	Z0	Z1	Z2	Z3
BG…15	25	20	-	-
BG…20	25	20	18	15
BG…25	30	22	20	15
BG…30	40	30	27	20
BG…35	50	35	30	22
BG…45	60	40	35	25
BG…55	70	50	45	30

Table 3.4 Parallelism tolerance e1 for the MB …,[µm]

	e_1	
	Z0	Z1
MB…9	4	3
MB…12	9	5
MB…15	10	6

Height tolerance between two rail guides

The values for the height tolerances (Figure 3.16) depend on the distance between the rail guides and are calculated using the conversion factor x (Table 3.5 and Table 3.6) and Formula [3.1]..

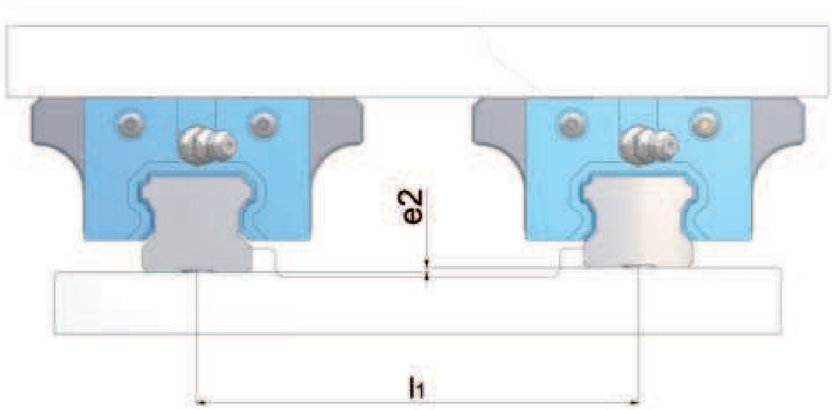
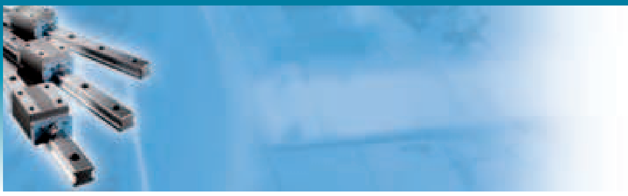


Figure 3.16 Height tolerance between two rail guides e_2



$$e_2 = l_1 * x \qquad [3.1]$$

e_2 Height tolerance in a longitudinal direction [µm]
l_1 Distance between the runner blocks [mm]
x Calculation factors

Table 3.5 Calculation factors x for the BG series …,[µm]

	Z0	Z1	Z2	Z3
BG…15	0,26	0,17	0,10	-
BG…20	0,26	0,17	0,10	0,08
BG…25	0,26	0,17	0,14	0,12
BG…30	0,34	0,22	0,18	0,16
BG…35	0,42	0,30	0,24	0,20
BG…45	0,50	0,34	0,28	0,22
BG…55	0,60	0,50	0,41	0,32

Table 3.6 Calculation factors x for the MB series …,[µm]

	e_1	
	Z0	Z1
MB…9	0,18	0,03
MB…12	0,25	0,06
MB…15	0,30	0,10

Height tolerance in a longitudinal direction between two rail guides

The values for the height tolerances in a longitudinal direction (Figure 3.17) of the runner blocks are calculated using the conversion factor y (Tables 3.7 and 3.8) and Formula [3.2].

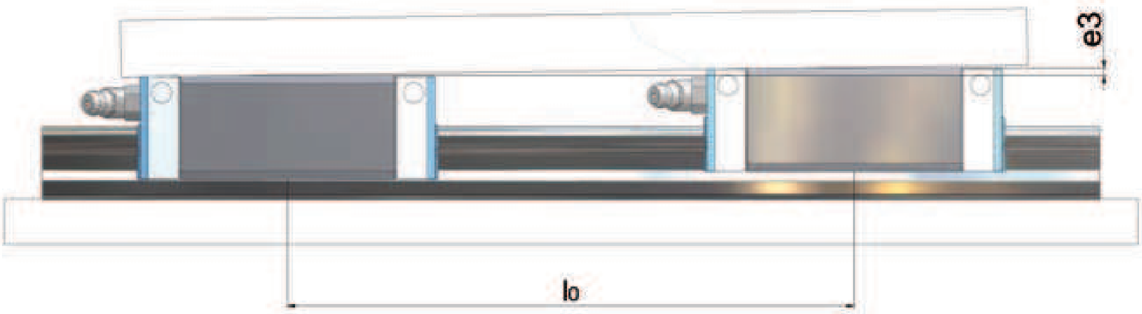


Figure 3.17 Height tolerance in longitudinal e_3

$$e_3 = l_0 * y \qquad [3.2]$$

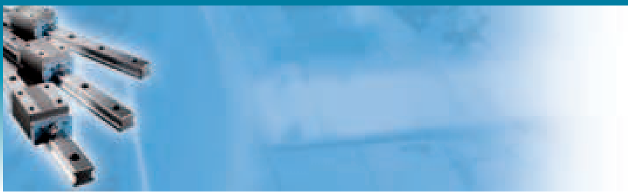
e_3	Height tolerance in a longitudinal [µm]
l_0	Distance between the runner blocks [mm]
y	Calculation factors

Table 3.7 Calculation factors y for the BG series …,[µm]

	…BS/	…BN/ …FN	…BL/ …FL	…BE/ …FE
Z0	0,35	0,30	0,27	0,25
Z1	0,30	0,25	0,23	0,21
Z2	0,25	0,20	0,17	0,15
Z3	0,15	0,10	0,07	0,05

Table 3.8 Calculation factors y for the MB …,[µm]

	MB…9	MB…12	MB…15
Z0	0,05	0,07	0,10
Z1	0,03	0,05	0,08



3.7 Fastening torques

The specific fastening torque strongly depends on the friction values. Different surfaces and lubrication conditions create a wide range of friction values. The mean friction value for black-finished, non-lubricated screws is 0.14. The recommended fastening torques for fastening screws of the Strength Classes 10.9 and 12.9 are provided in Table 3.9.

Table 3.9 Fastening torques for fastening screws (for μ=0,14)

	Fastening torque [Nm]	
	Strength Grade 10.9	Strength Grade 12.9
M2	0,5	0,6
M2,5	1,0	1,2
M3	1,8	2,2
M4	4,4	5,1
M5	8,7	10
M6	15	18
M8	36	43
M10	72	84
M12	125	145
M14	200	235
M16	310	365

Screws of Strength Grade 12.9 should always be used for high dynamics, overhead installations or installations without a locating edge.

4 Lubrication

4.1. General information

Sufficient lubrication is essential for reliable function of the linear guide system. The rolling elements and tracks are separated by the formation of an even grease film on the tracks. This reduces the stress and increases the service life. In addition, the metallic surfaces are protected from corrosion. The lubricant film further facilitates jerk-free gliding of the seals over the surfaces and also reduces wear in these areas.

Insufficient lubrication not only increases wear but also significantly shortens the service life.
The selection of the optimal lubricant has a significant effect on the function and service life of the profile rail guide system. Appropriate lubrication for the environmental temperature and the specific requirements must be determined to ensure that the function of the system is not restricted and remains available for a prolonged period

Examples of such environmental conditions and influencing factors are:

- High and low temperatures
- Condensed and splash water effects
- Radiation stress
- High vibration stress
- Use in vacuum and/or clean rooms
- Exposure to special media (e.g. fumes, acids, etc.)
- High accelerations and speeds
- Continuous, small stroke movements (< 2 x runner-block length)
- Dirt and dust effects

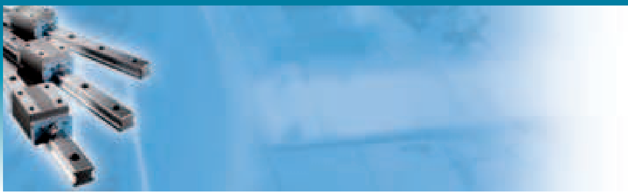
4.2 Lubricants

Lubrication oil, low-viscosity or other greases can be selected for the lubrication of profile rail guide systems.

The optimal lubricant must have the following properties:

- Reduce the friction of the profile rail guides
- Ensure minimum start-up momentum
- Protect the profile rail guide from wear and tear
- Protect the profile rail guides from corrosion
- Dampen noise

Lubricants with solid additives such as graphite PTFE or MoS_2 are not suitable for the lubrication of profile rail guide systems. SNR provides a range of high-performance lubricants for different environmental conditions and influencing factors.



4.2.1 Preservation oils

Preservation oils are used to protect the profile rail guides against corrosion during storage and transport. Preservation oils are not suitable for lubricating profile rail guides during operation. Compatibility with the planned lubricant must always be checked before relubrication and initial operation.

SNR profile rail guides are delivered with the preservation oil “Contrakor Fluid H1”. “Contrakor Fluid H1” is compatible with the SNR standard lubricant “LUB Heavy Duty” Preservation may be omitted by agreement for special applications with special lubricants.

4.2.2 Lubrication oils

Oil lubrication is usually applied in connection with central lubrication systems. The advantage of an automated, central oil lubrication is that of operator-independent, continuous lubricant supply to all lubrication points. Lubrication oils also conduct friction heat very well. This is balanced against a very high construction and installation effort for lubrication lines. Lubrication oil also leaks more often from the runner block and is thus lost to the system. Oil lubrication requires that the lubrication channels in the end caps are adapted to the installation position to ensure safe supply of all tracks of the profile rail guides. The installation positions are to be defined according to the information in Chapter 3.4. Appropriate lubrication oils for use in SNR profile rail guides are summarised in Table 4.1.

Table 4.1 Lubrication oils

Description	Oil type	Kinematic viscosity according to DIN 51562 at 40°C [mm²/s]	Density [g/cm³]	Temp. range [°C]	Properties	Application area
Klüberoil GEM 1-100N	Mineral oil	100	880	-5....+100°C	Good corrosion and wear protection	allgemeiner Maschinenbau
Klüberoil 4 UH1-68N	Poly-alpha olefin	680	860	-25....+120°C	Good ageing and wear protection, NDF H1Good corrosion and wear protection registered*	• Foodprocessing industry • Pharmaceutical industry

** This lubricant has been registered as an H1 product, i.e. it was developed for occasional, technically unavoidable contact with food. Experience has shown that the lubricant can also be used for appropriate applications in the pharmaceutical and cosmetic industry when the conditions in the product information are adhered to. However, no specific test results that might be required for applications in the pharmaceutical industry, e.g. bio-compatibility, are available. The systems manufacturer and operator should therefore perform appropriate risk analyses before applications in this area. Measures to exclude health risks and injuries have to be taken, where required. (Source: Klüber Lubrication)*

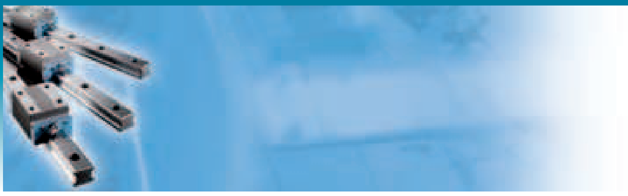
4.2.3 Low-viscosity greases

The conditions that apply to the use of lubrication oils also apply to the use of low-viscosity greases. However, it is not necessary to define the installation position, as low-viscosity greases do not run off easily, due to their viscosity. Appropriate low-viscosity greases for use in SNR profile rail guides are summarised in Table 4.2

Table 4.2 Low-viscosity greases

Descrip-tion	Oil type Consi-stency compo-nent	NLGI-class DIN51818	Worked penetra-tion DIN ISO 2137 at 25°C [0,1mm]	Basic oil viscosity DIN51562 at 40°C [mm²/s]	Density [g/cm³]	Temp. range [°C]	Properties	Application area
Isoflex Topas NCA 5051	Synthetic hydrocar-bon oil, special calcium soap	0/00	385...415	30	800	-50...+140°C	Low friction Easy running	General machine construction
Microlub GB 0	Mineral oil	0	355...385	400	900	-20...+90°C	Good wearing protection Particularly pressure-resistant	General machine con-struction High load Short-stroke applications Vibrations
Klüber-synth UH1 14-1600	Synthetic hydrocar-bon oil, special cal-cium soap Aluminium-complex soap	0/00	370...430	ca. 160	850	-45...+120°C	Good ageing and wear protection approval according to USDA H11*	• Food-proces-sing industry • Pharmaceuti-cal industry

** This lubricant has been registered as an H1 product, i.e. it was developed for occasional, technically unavoidable contact with food. Experience has shown that the lubricant can also be used for appropriate applications in the pharmaceutical and cosmetic industry when the conditions in the product information are adhered to. However, no specific test results that might be required for applications in the pharmaceutical industry, e.g. bio-compatibility, are available. The systems manufacturer and operator should therefore perform appropriate risk analyses before applications in this area. Measures to exclude health risks and injuries have to be taken, where required. (Source: Klüber Lubrication)*



4.2.4 Lubrication greases

Most applications are based on profile rail guides with grease lubrication. The use of greases provides better noise damping and also better emergency running properties and requires less constructive effort than lubrication oils and low-viscosity greases. Lithium soap greases with the Classification KP2-K according to DIN 51825 and NLGI Class 2 according to DIN 51818 with EP additives are to be used for applications under normal conditions. Suitable lubricants must be selected for specific applications under special environmental conditions. It must always be checked whether the different lubricants used are compatible with each other or with the preservation agent.

Table 4.3 contains an overview of the lubricants used in SNR profile rail guides.

Table 4.3 Greases

Description	Oil type Consistency agent	NLGI-Class DIN 51818	Worked penetration DIN ISO 2137 at 25°C [0,1mm]	Basic oil viscosity DIN ISO 51562 at 40°C [mm²/s]	Density [kg/m³]	Temp. range [°C]	Properties	Application area
SNR LUB Heavy Duty	Paraffin-type mineral oil / special lithium soap	2	285	ca. 105	890	-30...+110°C	Low friction Easy running	General machine construction
SNR LUB GV+	Synthetic hydrocarbon oil / ester oil / special lithium soap	2	265..295	24	900	-50...+120°C	Very good adhesion properties Very good water resistance	High speeds
SNR LUB HIGH TEMP	Synthetic hydrocarbon oil / mineral oil / polyurea	2	265...295	160	900	-40...+160°C	High temperature resistance Good corrosion protection High oxidation resistance	High temperature range
SNR LUB FOOD	Paraffin-type mineral oil / aluminium complex soap	2	265...295	ca. 240	920	-30...+110°C	Good corrosion protection Very good adhesion properties High water resistance NSF H1 registered *	Food processing industry
Microlub GL261	Mineral oil / special lithium-calcium soap	1	310...340	280	890	-30...+140°C	Good wearing protection Particularly pressure-resistant Additive against tribo-corrosion	• General machine construction • High load • Short-stroke applications • Vibrations
Klübersynth BEM34-32	Synthetic hydrocarbon oil / special calcium soap	2	265...295	ca. 30	890	-30...+140°C	Particularly pressure-resistant Good wearing protection Good ageing resistance Low starting torque	Clean-room applications
Klübersynth UH1 14-151	Synthetic hydrocarbon oil / ester oil Aluminium complex soap	1	310...340	ca.150	920	-45....+120°C	Good corrosion protection Good ageing resistance High water resistance NSF H1 registered *	• Pharmaceutical industry • Food- processing industry

** This lubricant has been registered as an H1 product, i.e. it was developed for occasional, technically unavoidable contact with food. Experience has shown that the lubricant can also be used for appropriate applications in the pharmaceutical and cosmetic industry when the conditions in the product information are adhered to. However, no specific test results that might be required for applications in the pharmaceutical industry, e.g. bio-compatibility, are available. The systems manufacturer and operator should therefore perform appropriate risk analyses before applications in this area. Measures to exclude health risks and injuries have to be taken, where required. (Source: Klüber Lubrication)*

4.3. Lubrication methods

SNR profile rails can be supplied with lubricant by manual grease guns (Figure 4.1), automated lubricant dispensers (Figure 4.2) or central lubrication systems (Figure 4.3). The runner blocks are relubricated through the installed lubrication cups (nipples) (Chapter 4.4.1) when manual grease presses (Chapter 4.4.4) are used.

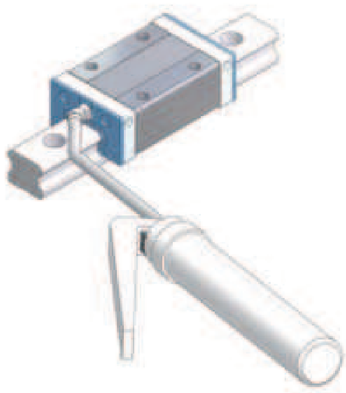


Figure 4.1 Lubrication with manual grease press

Automated lubricant dispensers (Figure 4.2) ensure the supply of the runner blocks with lubricant for a definable period. The lubricant dispensers can be connected by a hose to the installed lubrication adaptors (see Chapter 4.4.2), depending on the space available. Care should be taken that each lubrication point has a separate lubrication dispenser and that a maximum pipe length of 500 mm is not exceeded.

Figure 4.2 Automated lubricant dispenser

Central lubrication systems can be manually operated or automatically controlled. Manual central lubrication systems have a pump that is operated with a manual lever and supplies all lubrication points with lubricant. Automated central lubrication systems ensure a regular supply of all lubrication points with the amount of lubricant required. These systems can also be implemented as oil-spray lubrication systems under special environmental conditions. Oil is nebulised by compressed air and transported to the lubrication points. Oil mist lubrication systems ensure continuous supply of the lubrication points with the minimum amount of lubricant required and optimal conduction of friction heat. The permanent overpressure in the system also prevents the penetration of foreign particles such as dust or cooling lubricant into the runner blocks.

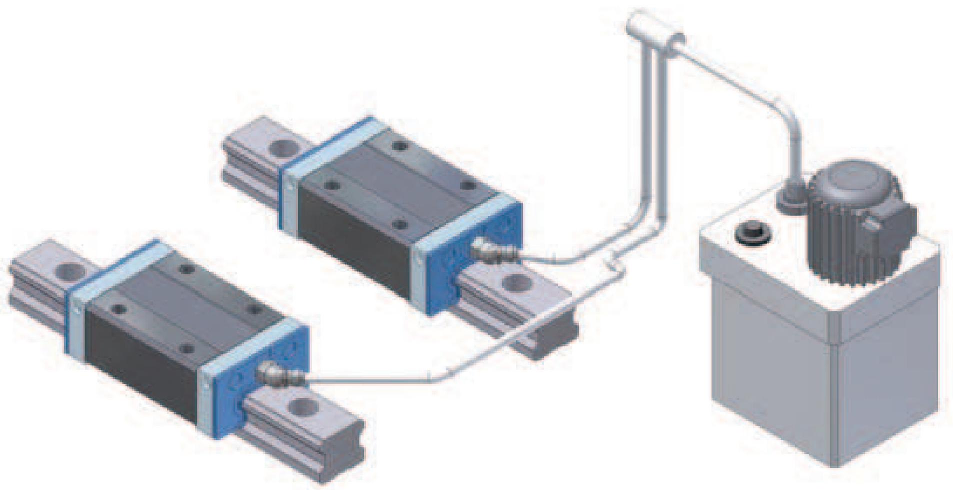


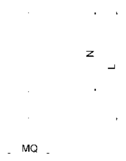
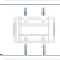
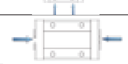
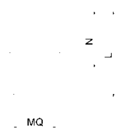
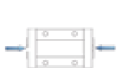
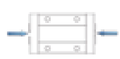
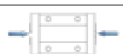
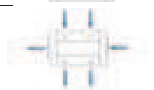
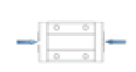
Figure 4.3 Central lubrication systems

4.4 Accessories

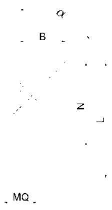
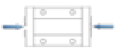
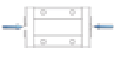
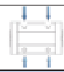
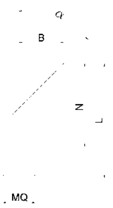
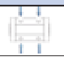
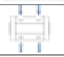
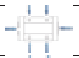
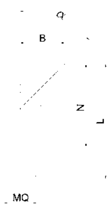
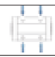
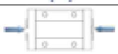
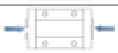
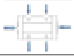
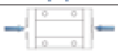
4.4.1 Lubrication cups

A range of lubrication cups is available for lubrication of profile rail guides with manual grease presses. Table 4.4 contains an overview of the lubrication cups used by SNR.

Table 4.4 Lubrication cups

Standard type	Description	MQ	L [mm]	N [mm]	Profile rail guides	Installation position	Comments
	Ball lubrication cup NGS00	M3	9,7	4,5	MB...15SN MB...15WN		
	Ball lubrication cup NGS01	M4	9,5	6	BG...15		
	Ball lubrication cup NGS02		13,0	7,0			
	Ball lubrication cup NGS03		15,0	7,0			For double-seal, for double-seal + scraper
Typ H1	**Bezeichnung**	**MQ**	**L [mm]**	**N [mm]**	**Profilschienen-führungen**	**Einbaulage**	**Bemerkungen**
	Cone lubrication cup Type A, M6x1,0 DIN 71412	M6	15,0	9,5	BG...20,25		
			17,3	9,5	BG...30,35		
					BG...20...35		For BF...20,25 also for double seals
			24,0	10,0	BG...30,35		For double-seal, for double-seal + scraper
					BG...20,25		For double-seal + scraper
	Cone lubrication cup Type A, M8x1,25 DIN 71412	M8	18,2	10,2	BG...45,55		
			22,2				For double-seal, for double-seal + scraper

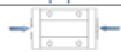
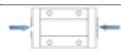
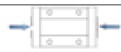
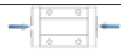
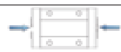
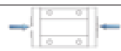
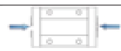
Tab. 4.4 (Continuation) Lubrication cup

Type	Description	MQ	α [°]	L [mm]	N [mm]	B [mm]	Profile rail guides	Installation position	Comments
	Cone lubrication cup Type B, M6x1,0 DIN 71412	M6	45	23,5	18,0	10,5	BG...20...35		
							BG...20...35		For double seal, for double seal + scraper in combination with LE-M6-M6 extension
							BG...45,55		For double seal, for double seal + scraper in combination with LE-M6-M6 extension
	Cone lubrication cup Type B, M8x1,25 DIN 71412	M8	45	23,5	18,0	10,5	BG...45,55		
Standard type	**Description**	**MQ**	**α [°]**	**L [mm]**	**N [mm]**	**B [mm]**	**Profile rail guides**	**Installation position**	**Comments**
	Cone lubrication cup Type B, M6x1,0	M6	67,5	18,5	13,5	11,4	BG...20,25		
				21,5			BG...20...35		For BG...20,25 also for double seals
							BG...30,35		
				25,5			BG...20...35		For double-seal + scraper
							BG...30,35		For double-seal
	Cone lubrication cup Type B, M8x1,25	M8	67,5	21,3	13,3	12,3	BG...45,55		
				25,3					For double-seal, for double-seal + scraper
Type H3	**Description**	**MQ**	**α [°]**	**L [mm]**	**N [mm]**	**B [mm]**	**Profile rail guides**	**Installation position**	**Comments**
	Cone lubrication cup Type C, M6x1,0 DIN 71412	M6	90	19,7	14,7	10,5	BG...20,25		
				22,7			BG...30,35		
							BG...20...35		For BG...20,25 also for double seals
				26,7			BG...20...35		For double-seal + scraper
							BG...30,35		For double-seal
	Cone lubrication cup Type C, M8x1,25 DIN 71412	M8	90	23,5	18,0	10,5	BG...45,55		
				23,5			BG...45,55		For double-seal, for double-seal + scraper

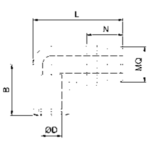
4.4.2 Lubrication adaptors

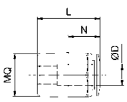
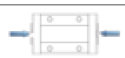
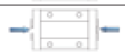
The use of central lubrication systems or the arrangement of lubrication cups in more accessible positions require a lubricant supply to the runner blocks via hoses or pipes. For this purpose, Table 4.5 shows grease adaptors that can be mounted on SNR profile rail guides.

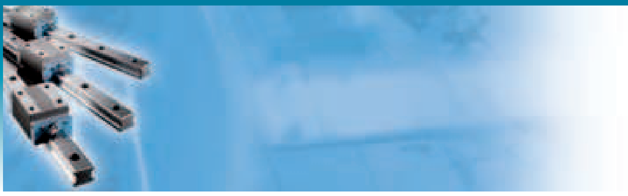
Table 4.5 Lubrication adaptor

	Description	N [mm]	L [mm]	MQ	Mq	Profile rail guides	Installation position	Comments
	Verlängerung LE-MQ-MqxL	9,4	15,4	M6	M6	BG...20,25		
			18,4			BG...30,35		
						BG...20...35		
			22,4			BG...20...35		For double-seal For double-seal + scraper
			18,4	M8		BG...45,55		
			22,4					For double-seal For double-seal + scraper
			15,4	M6	M8	BG...20,25		
			18,4			BG...30,35		
						BG...20...35		
			22,4			BG...20...35		For double-seal For double-seal + scraper
			18,4	M8		BG...45,55		
			22,4					For double-seal For double-seal + scraper

	Description	N [mm]	L [mm]	B [mm]	MQ	Mq	Profile rail guides	Installation position	Comments
	Schwenkver-schraubung LS-MQ-Mq	21,5	29,5	17,0	M6	M6 M8x1	BG...20...35		Can be used for BG...45 and 55 in connection with the LE-M8-M6 extension

	Description	N [mm]	L [mm]	MQ	Ø D [mm]	Profile rail guides	Installation position	Comments
	Schlauch-anschluss LH-M6S	12	16	M6	6	BG...20...35		
						BG...20...35		Can be used in connection with Extension LE-M6-M6
						BG...45,55		Can be used in connection with Extension LE-M8-M6

	Description	N [mm]	L [mm]	B [mm]	MQ	Ø D [mm]	Profile rail guides	Installation position	Comments
	Schlauch-anschluss LH-M6A	14,0	18,0	16,0	M6	6	BG...20...35		
							BG...20...35		Can be used in connection with Extension LE-M6-M6
							BG...45,55		Can be used in connection with Extension LE-M8-M6



4.4.3 Grease presses

Manual maintenance of profile rail guides can be performed with SNR grease presses

Technical data:

- > Weight: 1.130 g
- > Operating pressure: 180 bar
- > Maximum pressure: 360 bar
- > Transported volume: 0,8 cm³ / stroke
- > Suitable for 400 g cartridges and can also be filled with loose grease
- > Various adaptors

Figure 4.4 SNR grease press

4.4.4 Automated lubricant dispenser

Automated lubricant dispensers supplied by SNR are available with different oil or grease types. The lubricant is transported with a maximum pressure of 6 bar. Automated lubricant dispensers are intended for operation in a temperature range from -20°C to +60°C in all operating positions. The protection class is IP 65. It is not sensible to use lubricant dispensers for profile rail guides with design sizes below 35. Our SNR application engineers will gladly provide you with more information.

4.5 Lubricant volumes

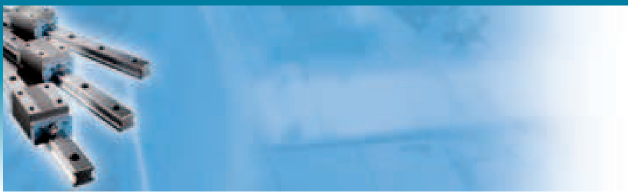
Maintenance of profile rail guides may involve:

- Initial lubrication
- Lubrication during initial operation
- Re-lubrication

The respective minimum lubricant amounts are defined as a function of the type and design size of the profile rail guide. SNR profile rail guides with ball chains are initially lubricated with lithium soap grease KP2-K according to DIN 51825 and NGLI Class 2 at the time of delivery. Double the minimum amount of lubricant for the initial operation is placed into the runner blocks during initial lubrication. Table 4.6 shows the minimum amounts of lubrication that have to be provided to SNR profile rail guides for initial operation.

Table 4.6 Minimum amounts of lubricant for initial operation

Design size	Runner block type	Grease lubrication	Low-viscosity grease lubrication	Oil lubrication
		[cm³]	[ml]	[ml]
BG_15	BS	0,7	0,2	
	BN, FN	0,9	0,2	
	BL, FL	1,0	0,2	
BG_20	BS	1,1	0,3	
	BN, FN	1,5	0,4	
	BL, FL	1,8	0,4	
BG_25	BS	1,6	0,4	
	BN, FN	2,3	0,5	
	BL, FL	2,6	0,6	
	BE, FE	3,1	0,7	
BG_30	BS	2,8	0,7	
	BN, FN	3,7	0,9	
	BL, FL	4,0	1,0	
	BE, FE	5,0	1,2	
BG_35	BS	3,9	0,9	
	BN, FN	5,7	1,4	
	BL, FL	6,3	1,5	
	BE, FE	7,5	1,8	
BG_45	BN, FN	7,0	2,0	
	BL, FL	9,0	2,3	
	BE, FE	10,0	2,8	
BG_55	BN, FN	13,0	3,5	
	BL, FL	17,0	4,5	
	BE, FE	19,0	5,5	
MB_09	SN	0,15	-	
	WN	0,20	-	
MB_12	SN	0,30	-	
	WN	0,40	-	
MB_15	SN	0,60	-	
	WN	0,80	-	



While the operation of the profile rail guides the demand of lubricant amount is reduced. In Tab. 4.7 are the mimimal lubricant amount arranged.

Table 4.7 Minimum amounts of lubricant for relubrication

<table>
<tr><th rowspan="2">Design size</th><th rowspan="2">Runner block type</th><th>Grease lubrication</th><th>Low-viscosity grease lubrication</th><th>Oil lubrication</th></tr>
<tr><th>[cm³]</th><th>[ml]</th><th>[ml]</th></tr>
<tr><td rowspan="3">BG_15</td><td>BS</td><td>0,3</td><td colspan="2">0,1</td></tr>
<tr><td>BN, FN</td><td>0,4</td><td colspan="2">0,1</td></tr>
<tr><td>BL, FL</td><td>0,5</td><td colspan="2">0,1</td></tr>
<tr><td rowspan="3">BG_20</td><td>BS</td><td>0,6</td><td colspan="2">0,1</td></tr>
<tr><td>BN, FN</td><td>0,8</td><td colspan="2">0,2</td></tr>
<tr><td>BL, FL</td><td>0,9</td><td colspan="2">0,2</td></tr>
<tr><td rowspan="4">BG_25</td><td>BS</td><td>0,8</td><td colspan="2">0,1</td></tr>
<tr><td>BN, FN</td><td>1,2</td><td colspan="2">0,2</td></tr>
<tr><td>BL, FL</td><td>1,4</td><td colspan="2">0,2</td></tr>
<tr><td>BE, FE</td><td>1,7</td><td colspan="2">0,3</td></tr>
<tr><td rowspan="4">BG_30</td><td>BS</td><td>1,4</td><td colspan="2">0,2</td></tr>
<tr><td>BN, FN</td><td>2,0</td><td colspan="2">0,2</td></tr>
<tr><td>BL, FL</td><td>2,2</td><td colspan="2">0,3</td></tr>
<tr><td>BE, FE</td><td>2,8</td><td colspan="2">0,3</td></tr>
<tr><td rowspan="4">BG_35</td><td>BS</td><td>2,0</td><td colspan="2">0,2</td></tr>
<tr><td>BN, FN</td><td>3,1</td><td colspan="2">0,3</td></tr>
<tr><td>BL, FL</td><td>3,5</td><td colspan="2">0,3</td></tr>
<tr><td>BE, FE</td><td>4,1</td><td colspan="2">0,4</td></tr>
<tr><td rowspan="3">BG_45</td><td>BN, FN</td><td>4,0</td><td colspan="2">0,5</td></tr>
<tr><td>BL, FL</td><td>4,5</td><td colspan="2">0,5</td></tr>
<tr><td>BE, FE</td><td>5,0</td><td colspan="2">0,6</td></tr>
<tr><td rowspan="3">BG_55</td><td>BN, FN</td><td>6,0</td><td colspan="2">0,6</td></tr>
<tr><td>BL, FL</td><td>8,0</td><td colspan="2">0,6</td></tr>
<tr><td>BE, FE</td><td>9,0</td><td colspan="2">0,7</td></tr>
<tr><td rowspan="2">MB_09</td><td>SN</td><td>0,10</td><td colspan="2">-</td></tr>
<tr><td>WN</td><td>0,08</td><td colspan="2">-</td></tr>
<tr><td rowspan="2">MB_12</td><td>SN</td><td>0,15</td><td colspan="2">-</td></tr>
<tr><td>WN</td><td>0,20</td><td colspan="2">-</td></tr>
<tr><td rowspan="2">MB_15</td><td>SN</td><td>0,30</td><td colspan="2">-</td></tr>
<tr><td>WN</td><td>0,40</td><td colspan="2">-</td></tr>
</table>

4.6 Lubrication intervals

SNR profile rail guides of the BGX and MBM series are packed with preservation oil at the time of delivery. The runner blocks of these series require initial lubrication after installation. Double the amount of lubricant specified in Table 4.6 is to be deposited into the runner blocks. The runner blocks of the BGC and MBC series are already provided with initial lubrication at the time of delivery. The runner blocks must be lubricated with the amounts specified in Table 4.6 after the installation. Thereafter, the runner blocks should be moved several times with long strokes to achieve optimal distribution of the lubricant in the system.
The runner blocks also require initial lubrication before a prolonged shut-down and before re-operation. The mixing compatibility of the lubricants must be checked when the lubricant make is to be changed during operation of a system.

The relubrication intervals are affected by several factors (Chapter 4.1). Load and pollution usually have the strongest effect. Accurate relubrication intervals for a specific system can only be determined after the actual operating conditions have been assessed for a sufficiently long period.

The reference value for adjusting central oil lubrication systems is one lubrication pulse per runner block every 20 minutes, using the amount of lubricant specified in Table 4.7. Central lubrication systems with low-viscosity grease should be set to a lubrication interval of 60 minutes.

The reference value for relubrication with grease for conventional guide systems (BGX, MBX series) under normal operating conditions is every six months or after 100 km travel. This value can be adjusted upwards or downwards under special environmental conditions. The lubrication interval should not be longer than 2 years or 500 km travel, even under optimal environmental conditions, without pollution and little load. The amounts specified in Table 4.7 should be used for relubrication.

These values significantly improve for the same conditions when guide systems with integrated ball chain (BCG, MBC series) are used. The reference value for SNR profile rail guides with ball chains under normal operating conditions is lubrication once per year or after 500 km of travel. This value may have to be adjusted upwards or downwards under special environmental conditions. A travel performance of several thousand kilometres between maintenance steps is possible when the environmental conditions are good and the load is low. The maximum usage time of the lubricant must be considered when the lubrication cycles are very long. Our SNR application engineers will gladly help you to determine the maintenance intervals.

5. Seals

5.1 Sealing Options

5.1.1 Marking

Profile rail guides are exposed to a variety of pollution types during operation. Pollution can be caused by solid or liquid foreign particles. The purpose of the sealing system is:

- To prevent penetration of foreign particles of any kind
- To distribute the lubricant evenly over the tracks
- To minimise the loss of lubricant

SNR profile rail guides can be combined with a multitude of sealing options to provide an optimal sealing system for various applications. The following sealing elements are available for these combinations:

- End seals
- Lateral seals
- Internal seals
- Metal scrapers

The end seals are always mounted on the end caps of the runner blocks. These seals provide a good level of protection under normal environmental conditions. The internal seals of the runner blocks slide on top of the rail and seal the inside of the runner block against holes in the rail. Pollution that may penetrate from the bottom into the runner block is kept out by the lateral seals that slide on the base of the rail. All seals described above are implemented as two-lip seals. All SNR standard profile rail guides are equipped with internal, lateral and end seals. SNR standard profile rail guides can be equipped with metal scrapers as additional protection against coarse dirt and chips. Metal scrapers are mounted at the face side before the end seals and do no touch the rail. Metal scrapers are not suitable for use without other sealing methods.

5.1.2 Combination options

Table 5.1 provides a summary of the various dealing options for SNR- profile rail guides.

Table 5.1 Sealing options

Description	Dichtungsaufbau
SS	End seals on both sides, internal and lateral seals (standard sealing) (Figure 5.1)
AA	No seals
UU	End seals on both sides (Figure 5.2)
BB	End seals on both sides, lateral seals
EE	Double end seals on both sides, internal and lateral seals (Figure 5.3)
FF	End seals on both sides, internal and lateral seals, metal scrapers on both sides
GG	Double end seals on both sides, internal and lateral seals, metal scrapers on both sides (Figure 5.4)
ES	Double end seals on one side, internal and lateral seals
FS	End seals on one side, internal and lateral seals, metal scrapers on one side
GS	Double end seals on one side, internal and lateral seals, metal scraper on one side
XX	Special sealing options (description of customer specifications required)

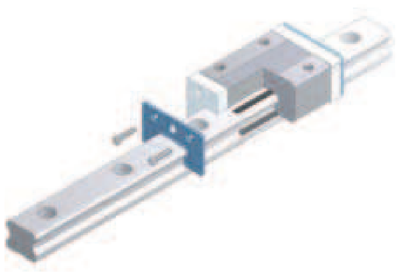


Figure 5.1 Sealing option SS

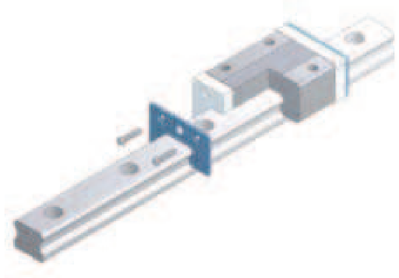


Figure 5.2 Sealing option UU

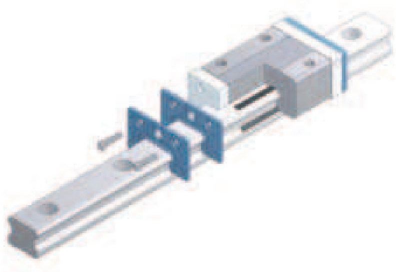


Figure 5.3 Sealing option EE

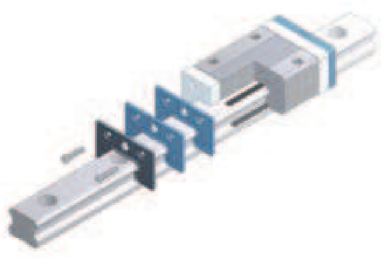
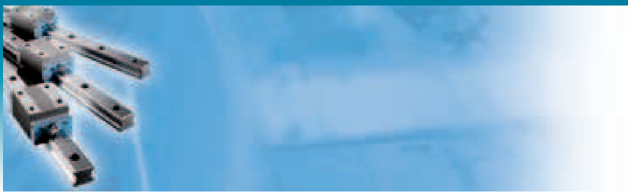


Figure 5.4 Sealing option GG



5.1.3 Dimensions

The length L of the runner block varies according to the sealing option selected. The respective lengths are summarised in Table 5.2.

Table 5.2 Runner block length with sealing options [mm]

Design size	SS	UU	AA	BB	EE	FF	GG	ES	FS	GS
BG_15_S	40,6	40,6	36,7	40,6	46,0	42,0	47,4	43,3	41,3	44,0
BG_15_N	58,6	58,6	54,7	58,6	64,0	60,0	65,4	61,3	59,3	62,0
BG_15_L	66,1	66,1	62,2	66,1	71,5	67,5	72,9	68,8	66,8	69,5
BG_20_S	48,3	48,3	43,3	48,3	54,3	50,3	56,3	51,3	49,3	52,3
BG_20_N	69,3	69,3	64,3	69,3	75,3	71,3	77,3	72,3	70,3	73,3
BG_20_L	82,1	82,1	77,1	82,1	88,1	84,1	90,1	85,1	83,1	86,1
BG_25_S	54,5	54,5	48,7	54,5	61,5	56,5	63,5	58,0	55,5	59,0
BG_25_N	79,7	79,7	73,9	79,7	86,7	81,7	88,7	83,2	80,7	84,2
BG_25_L	94,4	94,4	88,6	94,4	101,4	96,4	103,4	97,9	95,4	98,9
BG_25_E	109,1	109,1	103,3	109,1	116,1	111,1	118,1	112,6	110,1	113,6
BG_30_S	64,2	64,2	57,2	64,2	72,2	66,2	74,2	68,2	65,2	69,2
BG_30_N	94,8	94,8	87,8	94,8	102,8	96,8	104,8	98,8	95,8	99,8
BG_30_L	105,0	105,0	98,0	105,0	113,0	107,0	115,0	109,0	106,0	110,0
BG_30_E	130,5	130,5	123,5	130,5	138,5	132,5	140,5	134,5	131,5	135,5
BG_35_S	75,5	75,5	68,5	75,5	84,5	77,5	86,5	80,0	76,5	81,0
BG_35_N	111,5	111,5	104,5	111,5	120,5	113,5	122,5	116,0	112,5	117,0
BG_35_L	123,5	123,5	116,5	123,5	132,5	125,5	134,5	128,0	124,5	129,0
BG_35_E	153,5	153,5	146,5	153,5	162,5	155,5	164,5	158,0	154,5	159,0
BG_45_N	129,0	129,0	120,0	129,0	139,0	131,0	141,0	134,0	130,0	135,0
BG_45_L	145,0	145,0	136,0	145,0	155,0	147,0	157,0	150,0	146,0	151,0
BG_45_E	174,0	174,0	165,0	174,0	184,0	176,0	186,0	179,0	175,0	180,0
BG_55_N	155,0	155,0	144,0	155,0	167,0	157,0	169,0	161,0	156,0	162,0
BG_55_L	193,0	193,0	182,0	193,0	205,0	195,0	207,0	199,0	194,0	200,0
BG_55_E	210,0	210,0	199,0	210,0	222,0	212,0	224,0	216,0	211,0	217,0
MB_09SN	30,8	30,8	27,8	-	-	-	-	-	-	-
MB_12SN	34,0	34,0	31,0	-	-	-	-	-	-	-
MB_15SN	42,0	42,0	39,0	-	-	-	-	-	-	-
MB_09WN	39,0	39,0	36,0	-	-	-	-	-	-	-
MB_12WN	44,5	44,5	41,5	-	-	-	-	-	-	-
MB_15WN	55,5	55,5	52,5	-	-	-	-	-	-	-

5.2 Sealing caps

Foreign particles may reach the inside of the runner block through the fastening holes in the guide rail and cause damage. We recommend that you close the holes in the rail with sealing caps to prevent this. These caps consist of oil-resistant plastic. Sealing caps made of brass may be used when the pollution is very strong or when direct mechanical forces act on the guide rails. Table 5.3 contains an overview of the sealing caps available.

Table 5.3 Sealing caps

Design size	Locking cap	
	Plastic	Brass
BG_15	CAP4	CAP4B
BG_20	CAP5	CAP5B
BG_25	CAP6	CAP6B
BG_30	CAP8	CAP8B
BG_35	CAP8	CAP8B
BG_45	CAP12	CAP12B
BG_55	CAP14	CAP14B

5.3 Bellows

It is recommended to protect the profile rail guides with special bellows when they are subject to strong pollution due to chips, dust or weld spatters. Bellows for SNR profile rail guides can be ordered to fit specific applications. Our SNR application engineers will gladly help you to select suitable bellows.

6. Corrosion protection

SNR profile rail guides can be provided in the following versions when special requirements for corrosion protection apply:

> Raydent® coating
This electrochemical method ensures that the oxide-ceramic layer (approx. 1 µm thickness) penetrates into the material and connects with it. Coating takes place at 0°C, so that the basic parts are not deformed. This version is resistant against acids, bases and solvents. Colour of the coating: black

> Chemical nickel coating (Durni-Coat® coating)
This method offers good corrosion resistance, good abrasion resistance, good chemical resistance and high material hardness. Colour of the coating: metallic black

We recommend contacting our SNR application engineers to select a suitable corrosion protection.

7. Type key

Order examples for standard systems without options:

Profile rail guide system:

BG	C	H	25	B	N	2	SS	L	01600	N	Z1	II	–	0	-20.0	N
1	2	3	4	5	6	7	8	9	10	11	12	13		14	15	16

Profile rail:

BG	R	25	L	01600	N	II	–	0	-20.0	N
1	2	4	9	10	11	13		14	15	16

Runner block:

BG	C	H	25	B	N	SS	N	Z1	–	N
1	2	3	4	5	6	8	11	12		16

1	BG	Series BG: Standard profile rail guide MB: Miniature profile rail guide	
2	C	Version C: Profile rail guide with ball chain X: Conventional profile rail guide R: Profile rail	W: Miniature profile rail guide, broad S: Miniature profile rail guide, narrow
3	H	Design height H: Normal design height	S/X: Design heigh, flat
4	25	Design size	
5	B	Design type of runner block B: Runner block, block design M: Miniature runner block, narrow	F: Runner block, flange design W: Miniature runner block, broad
6	N	Length of the runner block S: Runner block, short L: Runner block, long	N: Runner block, normal E: Runner block, extra long
7	2	Number of runner blocks	
8	N	Seals SS: Internal, end and lateral seals (standard sealing) BB: End and lateral seals EE: Internal, double-end and lateral seals GG: Internal, double-end and lateral seals and metal scrapers Additional sealing options see Chapter 5.1.2	
9	L	Fastening method for the profile rail L: Rail with through-holes C: Rail with tapped, blind holes to screw down the rails from below	
10	01600	Profile rail length 5-digit specification in [mm]	
11	N	Precision class N: Normal class P: Precision class UP: Ultra-precision class	H: High-precision class SP: Super-precision class
12	Z1	Pretension class Z0: No pretension Z2: Medium pretension	Z1: Low pretension Z3: High pretension

Order example for standard system with options:

Profile rail guide system:

BG	C	H	25	B	N	2	SS	L	01600	N	Z1	II	–	0	-20.0	S	-03	02	3	1	-	3	1
1	2	3	4	5	6	7	8	9	10	11	12	13		14	15	16	17	18	19	20		21	22

Profile rail:

BG	R	25	L	01600	N	I	–	0	-20.0	S-	3	1
1	2	4	9	10	11	13		14	15	16	21	22

Runner block:

BG	C	H	25	B	N	SS	N	Z1	–	S -	03	02	3	1
1	2	3	4	5	6	8	11	12		16	17	18	19	20

13	II	Profile rail arrangement Without: No information concerning rail arrangement II: Two rails in parallel III: Three rails in parallel IV: Four connected rails
14	0	Profile rail segmentation 0: One-segment rail 1: Rail with arbitrary segments 2: Rail segmentation according to drawing
15	20.0	Starting measure G1 of the profile rail segmentation Definition see Chapter 8.12
16	N	Special version of the profile rails N: Standard S: Special version, index follows
17...22		Index for special versions
17	03	Greases see Table 7.2 and Chapter 4.3.2
18	02	Lubrication connections see Table 7.1 and Chapter 4.4.1, 4.4.2
19	3	Material / coatings of the runner blocks see Table 7.3 and Chapter 6
20	1	Special versions of the runner blocks 0: Standard 1: Special version, explanation as text
21	3	Material / coatings of the profile rails see Table 7.3 and Chapter 6
22	1	Special version of the profile rails 0: Standard 1: Special version, explanation as text

Table 7.1 Index of lubrication connections

Index	Lubrication connections (see Chapter 4.4
00	**End face, standard lubrication cup, 67° / locking screw**
01	End face, 2 locking screws
02	End face, lubrication cup, straight / locking screw
03	End face, lubrication cup, 45° / locking screw
04	End face, lubrication cup, 90° / locking screw
05	End face, lubrication connection, straight / locking screw
06	End face, lubrication connection, 90° / locking screw
07	End face, hose connection, straight / locking screw
08	End face, hose connection, 90° / locking screw
10	Lateral on reference side, standard lubrication cup, 67° / locking screw
11	Lateral on reference side, 2 locking screws
12	Lateral on reference side, lubrication cup, straight / locking screw
13	Lateral on reference side, lubrication cup, 45° / locking screw
14	Lateral on reference side, lubrication cup, 90° / locking screw
15	Lateral on reference side, lubrication connection, straight / locking screw
16	Lateral on reference side, lubrication connection, 90° / locking screw
17	Lateral on reference side, hose connection, straight / locking screw
18	Lateral on reference side, hose connection, 90° / locking screw
20	Lateral opposite reference side, standard lubrication cup, 67° / locking screw
21	Lateral opposite reference side, 2 locking screws
22	Lateral opposite reference side, lubrication cup, straight / locking screw
23	Lateral opposite reference side, lubrication cup, 45° / locking screw
24	Lateral opposite reference side, lubrication cup, 90° / locking screw
25	Lateral opposite reference side, lubrication connection, straight / locking screw
26	Lateral opposite reference side, lubrication connection, 90° / locking screw
27	Lateral opposite reference side, hose connection, straight / locking screw
28	Lateral opposite reference side, hose connection, 90° / locking screw
99	Lubrication connections according to customer drawing

Table 7.2 Index of lubrication greases

Index	Manufacturer	Grease description (see Chapter 4.2.4)
00	**SNR**	**SNR LUB Heavy Duty (standard grease)**
01	Klüber	Without grease, only with Contrakor Fluid H1 preservation oil
02	SNR	SNR LUB GV+
03	SNR	SNR LUB HIGH TEMP
04	SNR	SNR LUB FOOD
05	Klüber	Microlub GL261
06	Klüber	Klübersynth BEM34-32
07	Klüber	Klübersynth UH1 14-151
99		Special grease according to customer specifications

Table 7.3 Index of materials / coatings

Index	Description (see Chapter 6)
0	**Standard material**
2	Raydent - coating
3	Durni – Coat - coating

8. SNR profile rail guides

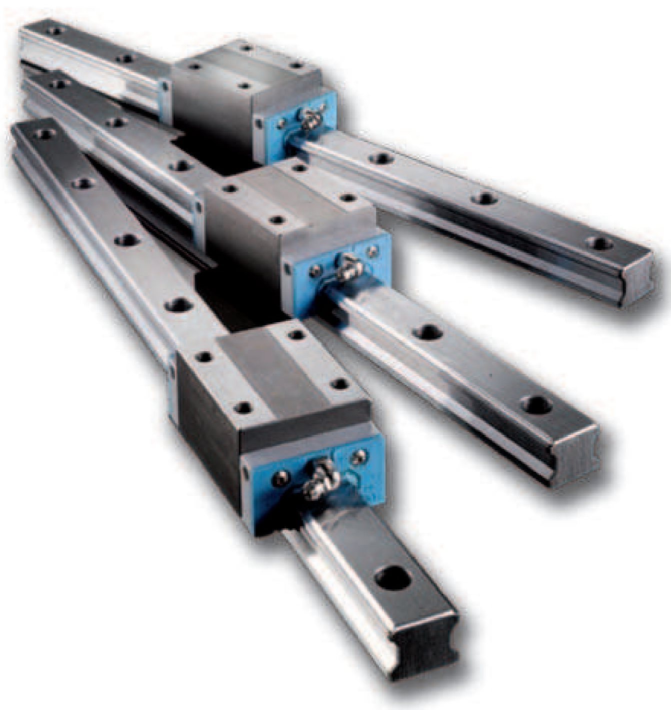
8.1 Overview

SNR profile rail guides are high-quality precision parts. They combine customer-orientated product development and high quality requirements. They offer the customer a wide product range for various applications in all areas of industry.

The most important characteristics are:

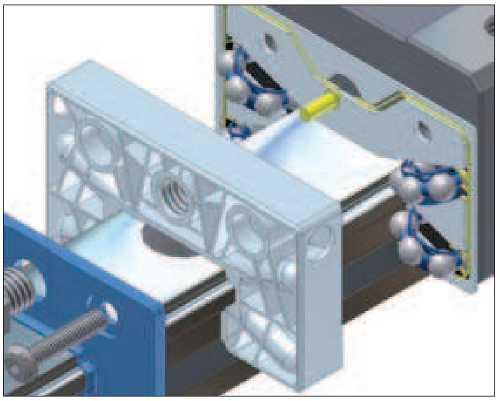
SNR standard profile rail guides

> Arrangement of the tracks at a 45° angle which results in equal load ratings in all main directions
> Low system friction with a maximum friction coefficient, μ of 0.003 due to circular arc grooves
> High tolerance compensation and fault compensation capability due to X-arrangement of the tracks
> Multitude of lubrication connections can be mounted on all sides of the runner block
> Flange runner block allows screw connection from the top and the bottom
> All seals in two-lip versions for optimal protection of the runner block against liquid and solid foreign particles
> Range of sealing options for special applications
> Profile rail guides with ball chain and conventional forms on a guide rail
> Dimensions according to DIN 645-1 and DIN 645-2.



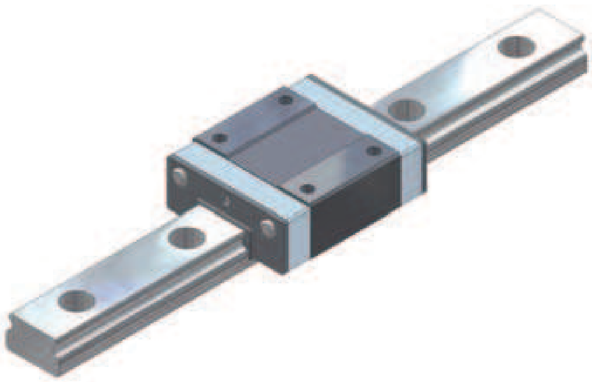
SNR standard profile rail guides with ball chains

> Low noise level
> Very quiet running due to additional spacer ball at the chain ends
> Low heat generation
> Speeds of up to 5 m/s
> Accelerations of up to 50 m/s²
> Long-term zero maintenance
> Long service life
> Patented ball chain with integrated lubrication reservoirs



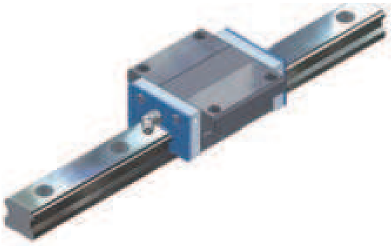
SNR miniature profile rail guides

> Compact design
> Guide rail and runner block made of corrosion-resistant material
> Available in narrow and wide rail versions
> With ball chain and in conventional form available

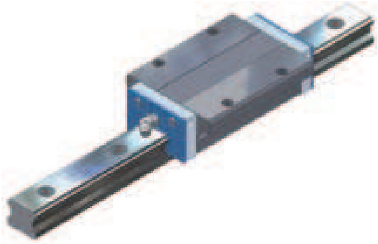


Profile rail guide with ball chain

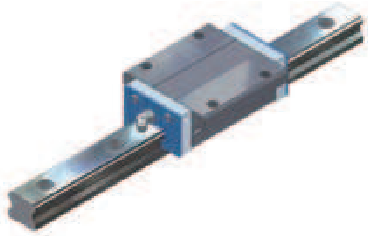
Runner block with flange (p.82)



BGCH…FN (standard)

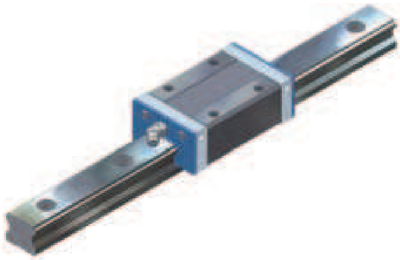


BGCH…FE (extra long)

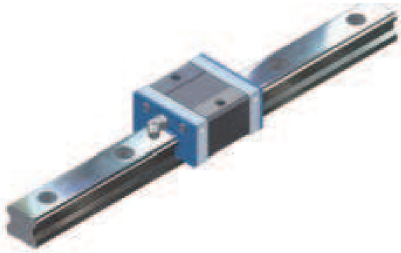


BGCH…FL (long)

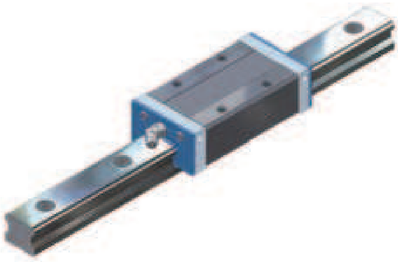
Runner block, block design, flat (p.84)



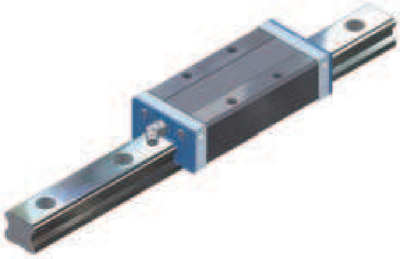
BGCS…BN (standard)



BGCS…BS (short)

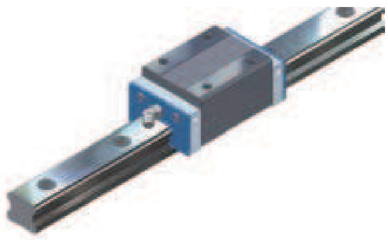


BGCS…BL (long)

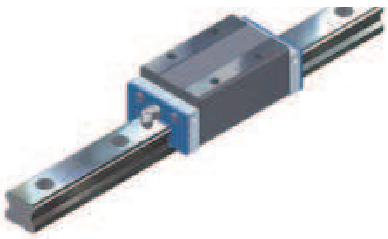


BGCS…BE (extra long)

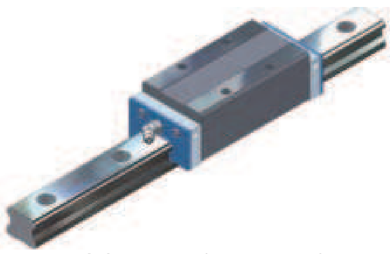
Runner block, block design, high (p.86)



BGCH…BN (standard)

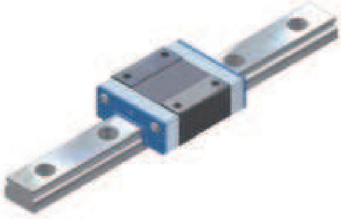


BGCH…BL (long)

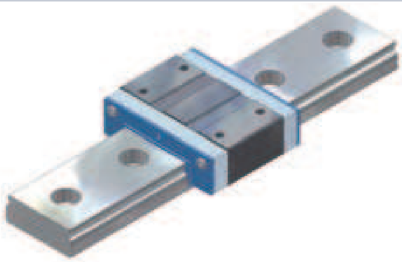


BGCH…BE (extra long)

Miniature (p.94)



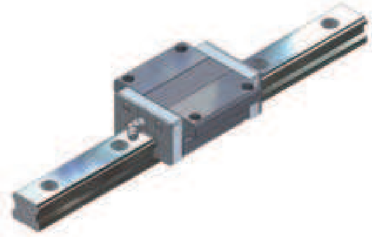
MBC…SN (narrow version)



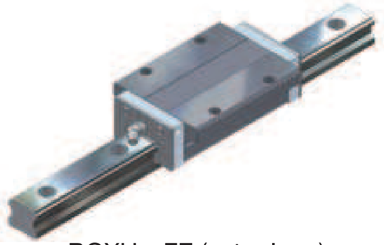
MBC….WN (wide version)

Profile rail guide without ball chain

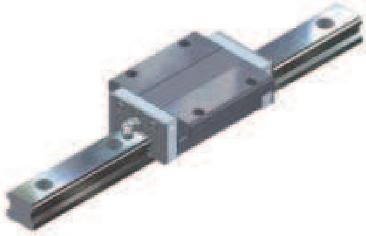
Runner block with flange (p.88)



BGXH…FN (standard)

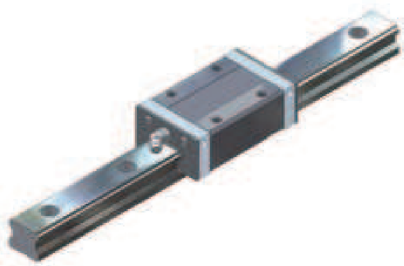


BGXH…FE (extra long)

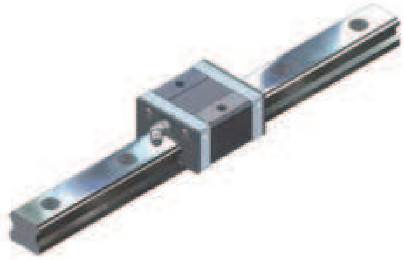


BGXH…FL (long)

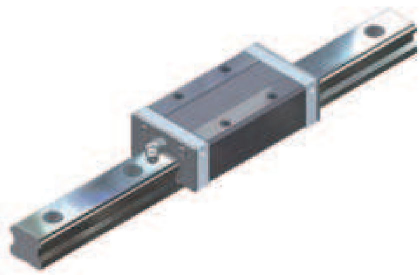
Runner block, block design, flat (p.90)



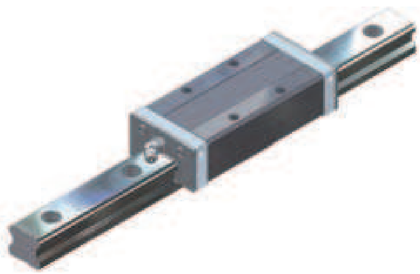
BGXS…BN (standard)



BGXS…BS (short)

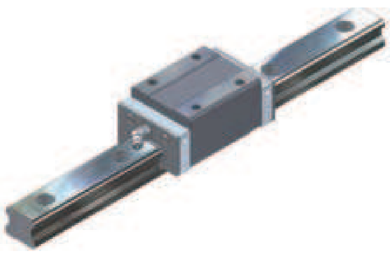


BGXS…BL (long)

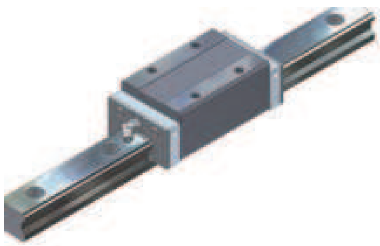


BGXS…BE (extra long)

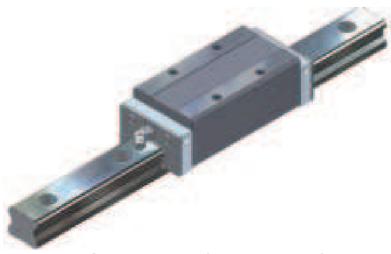
Runner block, block design, high (p.92)



BGXH…BN (standard)

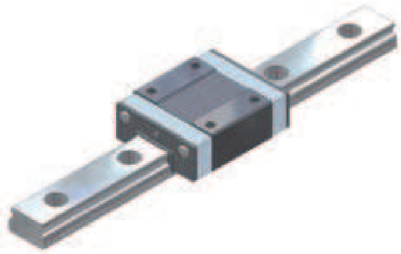


BGXH…BL (long)

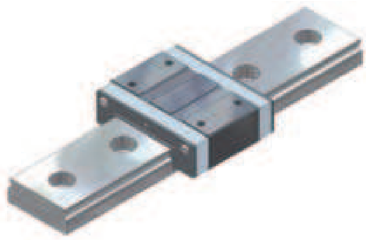


BGXH…BE (extra long)

Miniature (p.96)



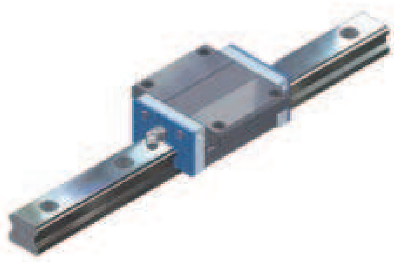
MBX…SN (narrow version)



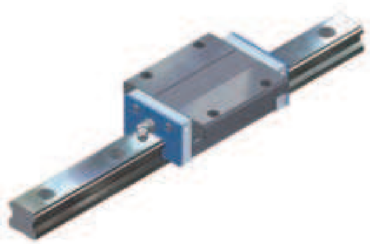
MBX….WN (wide version)

BGCH...F

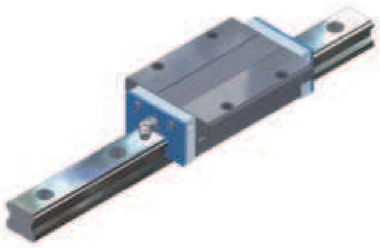
Profile rail guide with ball chain, runner block with flange



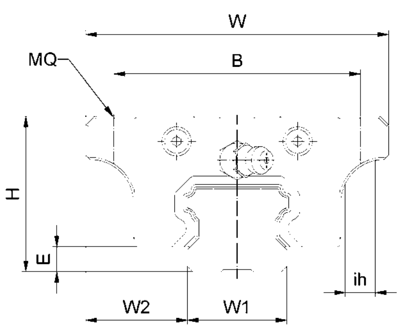
BGCH…FN, standard



BGCH…FL, long



BGCH…FE, extra long

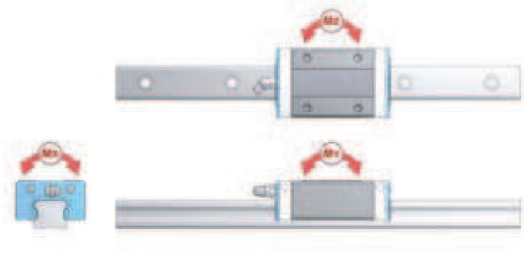


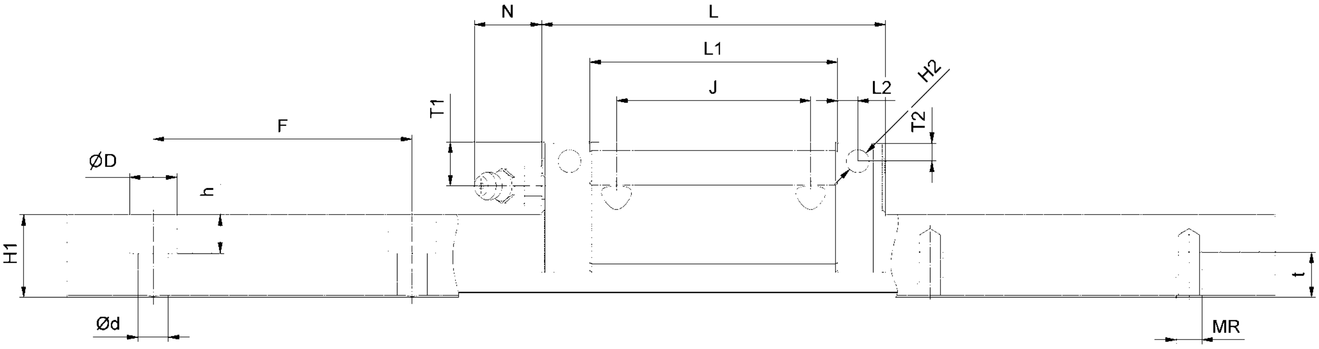
		System [mm]					Runner block [mm]											
		H	W	W2	E	L	B	J	MQ	ih	I	L1	Oil H	T1	N	T2	L2	H2
BGCH15	FN	24	47	16,0	3,0	58,6	38	30	M5	4,4	8,0	40,2	M4 x 0,7	5,5	5,0	4,5	4,2	Ø 3,0
	FL					66,1						47,7						
BGCH20	FN	30	63	21,5	4,5	69,3		40	M 6	5,4	9,0	48,5	M 6 x 1,0	7,1	15,6	6,3	4,25	Ø 5,3
	FL					82,1						61,3						
BGCH25	FN	36	70	23,5	5,8	79,7	57	45	M 8	7,0	10,0	57,5	M 6 x 1,0	10,2	15,6	9,4	4,65	Ø 5,3
	FL					94,4						72,2						
	FE					109,1						86,9						
BGCH30	FN	42	90	31,0	7,0	94,8	72	52	M 10	8,6	11,0	67,8	M 6 x 1,0	10,0	15,6	5,5	6,0	Ø 5,0
	FL					105,0						78,0						
	FE					130,5						103,5						
BGCH35	FN	48	100	33,0	7,5	111,5	82	62	M 10	8,6	12,0	80,5	M 6 x 1,0	8,0	16,0	6,5	7,25	Ø 5,0
	FL					123,5						92,5						
	FE					153,5						122,5						
BGCH45	FN	60	120	37,5	8,9	129,0	100	80	M 12	10,6	15,5	94,0	M 8 x 1,25	14,4	16,0	14,5	8,0	Ø 6,8
	FL					145,0						110,0						
	FE					174,0						139,0						
BGCH55	FN	70	140	43,5	12,7	155,0	116	95	M 14	12,6	18,5	116,0	M 8 x 1,25	14,0	16,0	14,5	10,0	Ø 7,0
	FL					193,0						154,0						
	FE					210,0						171,0						

Example of order drawing

BGCH 25 FN 2 SS L 02000 N Z1 II -0 0 -00000 -00*

**Explanation to type key in Chapter 7*

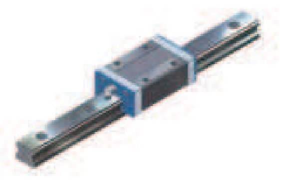




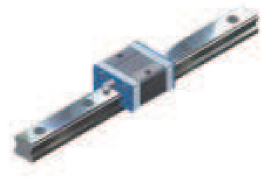
Rail								Load ratings					Mass			
			Version L			Version C		[kN]		[kNm]			[kg]	[kg/m]		
W1	H1	F	d	D	h	MR	t	C	C0	MX	MY	MZ	LW	Rail		
15	13	60	4,5	7,5	6,0	M 5	8,0	11,51	19,62	0,135	0,118	0,118	0,21	1,28	BGCH15	FN
								13,93	23,72	0,164	0,169	0,169	0,23			FL
20	16,3	60	6,0	9,5	8,5	M 6	10,0	17,71	30,50	0,285	0,221	0,221	0,40	2,15	BGCH20	FN
								22,96	39,52	0,370	0,361	0,361	0,46			FL
23	19,2	60	7,0	11,0	9,0	M 6	12,0	24,85	41,07	0,440	0,352	0,352	0,57	2,88	BGCH25	FN
								31,93	52,79	0,567	0,568	0,568	0,72			FL
								36,00	63,29	0,680	0,820	0,820	0,89			FE
28	22,8	80	9,0	14,0	12,0	M 8	15,0	36,71	54,57	0,707	0,551	0,551	1,10	4,45	BGCH30	FN
								47,54	70,68	0,915	0,822	0,822	1,34			FL
								52,93	86,71	1,123	1,338	1,338	1,66			FE
34	26,0	80	9,0	14,0	12,0	M 8	17,0	52,32	81,12	1,283	0,973	0,973	1,50	6,25	BGCH35	FN
								65,37	101,36	1,603	1,397	1,397	1,90			FL
								71,92	125,30	1,982	2,287	2,287	2,54			FE
45	31,1	105	14,0	20,0	17,0	M 12	24,0	71,57	108,90	2,302	1,525	1,525	2,27	9,60	BGCH45	FN
								85,12	129,54	2,738	2,123	2,123	2,68			FL
								98,36	163,28	3,451	3,381	3,381	3,42			FE
53	38,0	120	16,0	23,0	20,0	M 14	24,0	86,19	133,42	3,306	2,306	2,306	3,42	13,80	BGCH55	FN
								116,31	178,85	4,432	4,104	4,104	4,57			FL
								157,65	253,62	6,284	6,462	6,462	5,08			FE

BGCS...B

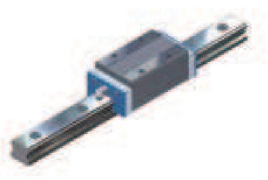
Profile rail guide with ball chain, block-type runner block, flat



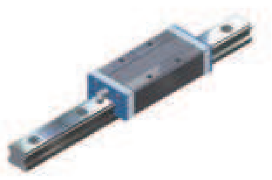
BGCS…BN, standard



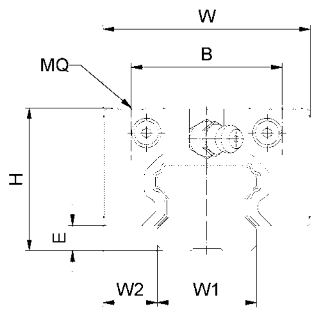
BGCS…BS, short



BGCS…BL, long



BGCS…BE, extra long

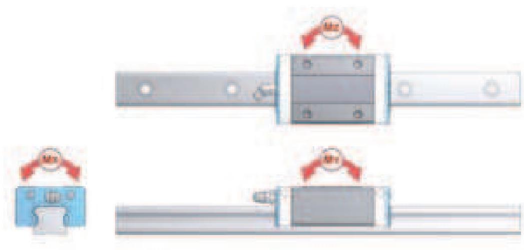


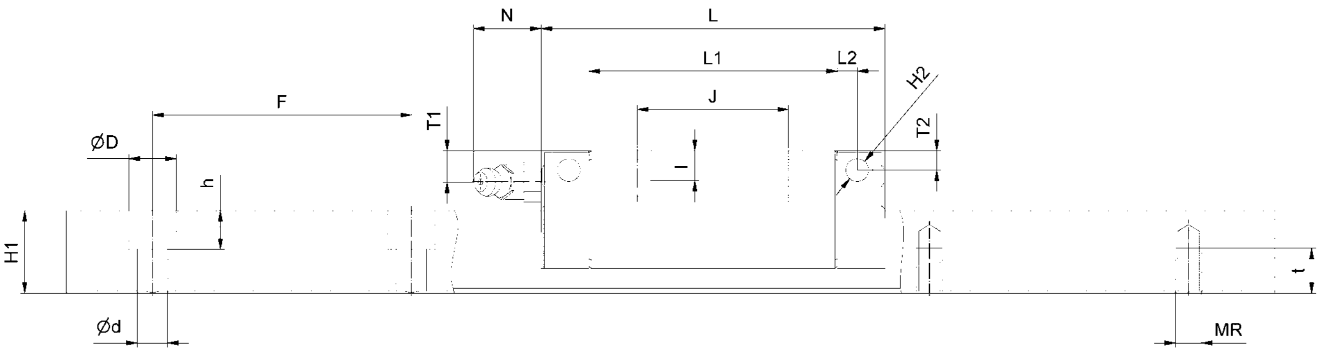
		System [mm]					Runner block [mm]										
		H	W	W2	E	L	B	J	MQ	I	L1	Oil H	T1	N	T2	L2	H2
BGCS15	BS	24	34	9,5	3,0	40,6	26	-	M 4	4,8	22,2	M 4 x 0,7	5,5	5,0	4,5	4,2	Ø 3,0
	BN					58,6		26			40,2						
	BL					66,1					47,7						
BGCS20	BS	28	42	11,0	4,5	48,3	32	-	M 5	5,5	27,5	M 6 x 1,0	5,1	15,6	4,3	4,25	Ø 5,3
	BN					69,3		32			48,5						
BGCS25	BS	33	48	12,5	5,8	54,5	35	-	M 6	6,8	32,3	M 6 x 1,0	7,2	15,6	6,4	4,65	Ø 5,3
	BN					79,7		35			57,5						
BGCX25	BN	36				79,7				9,0	57,5		10,2		9,4		
	BL					94,4					72,2						
	BE					109,1		50			86,9						
BGCS30	BS	42	60	16,0	7,0	64,2	40	-	M 8	10,0	37,2	M 6 x 1,0	10,0	15,6	5,5	6,0	Ø 5,0
	BN					94,8		40			67,8						
	BL					105,0					78,0						
	BE					130,5		60			103,5						
BGCS35	BS	48	70	18,0	7,5	75,5	50	-	M 8	10,0	44,5	M 6 x 1,0	8,0	15,6	6,5	7,25	Ø 5,0
	BN					111,5		50			80,5						
	BL					123,5					92,5						
	BE					153,5		72			122,5						
BGCS45	BN	60	86	20,5	8,9	129,0	60	60	M 10	15,5	94,0	M 8 x 1,25	14,4	16,0	14,5	8,0	Ø 6,8
	BL					145,0					110,0						
	BE					174,0		80			139,0						
BGCS55	BN	70	100	23,5	12,7	155,0	75	75	M 12	22,0	116,0	M 8 x 1,25	14,0	16,0	14,5	10,0	Ø 7,0
	BL					193,0					154,0						
	BE					210,0		95			171,0						

Example for order drawing

BGCS 25 BN 2 SS L 02000 N Z1 II -0 0 -00000 -00*

Explanation to type key in Chapter 7

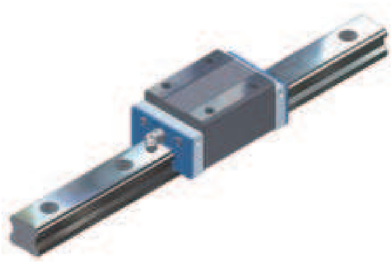




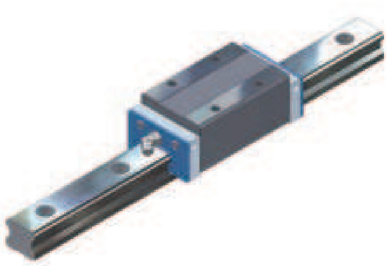
Rail [mm]								Load ratings					Mass			
			Version L			Version C		[kN]		[kNm]			[kg]	[kg/m]		
W1	H1	F	d	D	h	MR	t	C	C0	MX	MY	MZ	LW	Rail		
15	13,0	60	4,5	7,5	6,0	M 5	8,0	5,73	9,77	0,068	0,032	0,032	0,10	1,28	BGCS15	BS
								11,51	19,62	0,135	0,118	0,118	0,17			BN
								13,93	23,72	0,164	0,169	0,169	0,18			BL
20	16,3	60	6,0	9,5	8,5	M 6	10,0	9,11	15,69	0,146	0,065	0,065	0,17	2,15	BGCS20	BS
								17,71	30,50	0,285	0,221	0,221	0,26			BN
23	19,2	60	7,0	11,0	9,0	M 6	12,0	12,67	21,00	0,226	0,101	0,101	0,21	2,88	BGCS25	BS
								24,85	41,07	0,440	0,352	0,352	0,38			BN
								24,85	41,07	0,440	0,352	0,352	0,40		BGCX25	BN
								31,93	52,79	0,567	0,568	0,568	0,54			BL
								36,00	63,29	0,680	0,820	0,820	0,67			BE
28	22,8	80	9,0	14,0	12,0	M 8	15,0	18,19	27,05	0,350	0,150	0,150	0,50	4,45	BGCS30	BS
								36,71	54,57	0,707	0,551	0,551	0,80			BN
								47,54	70,68	0,915	0,822	0,822	0,94			BL
								52,93	86,71	1,123	1,338	1,338	1,16			BE
34	26,0	80	9,0	14,0	12,0	M 8	17,0	26,22	40,66	0,643	0,270	0,270	0,80	6,25	BGCS35	BS
								52,32	81,12	1,283	0,973	0,973	1,20			BN
								65,37	101,36	1,603	1,397	1,397	1,40			BL
								71,92	125,30	1,982	2,287	2,287	1,84			BE
45	31,1	105	14,0	20,0	17,0	M 12	24,0	71,57	108,90	2,302	1,525	1,525	1,64	9,60	BGCS45	BN
								85,12	129,54	2,738	2,123	2,123	1,93			BL
								98,36	163,28	3,451	3,381	3,381	2,42			BE
53	38,0	120	16,0	23,0	20,0	M 14	24,0	86,19	133,42	3,306	2,306	2,306	3,42	13,80	BGCS55	BN
								116,31	178,85	4,432	4,104	4,104	4,57			BL
								157,65	253,62	6,284	6,462	6,462	5,08			BE

BGCH...B

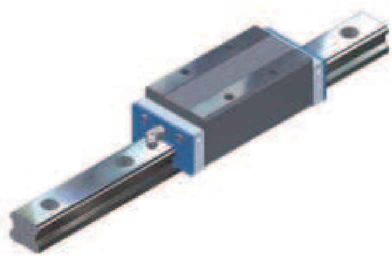
Profile rail guide with ball chain, block-type runner block, high



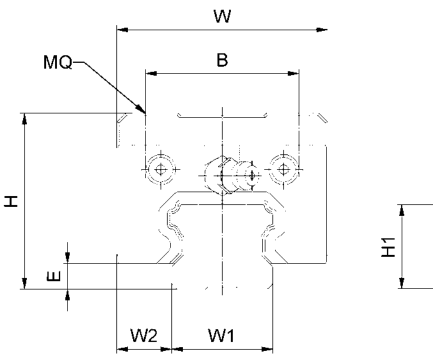
BGCH…BN, standard



BGCH…BL, long



BGCH…BE, extra long

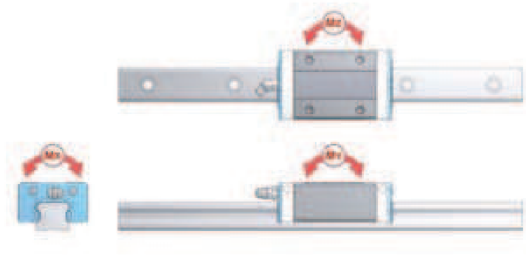


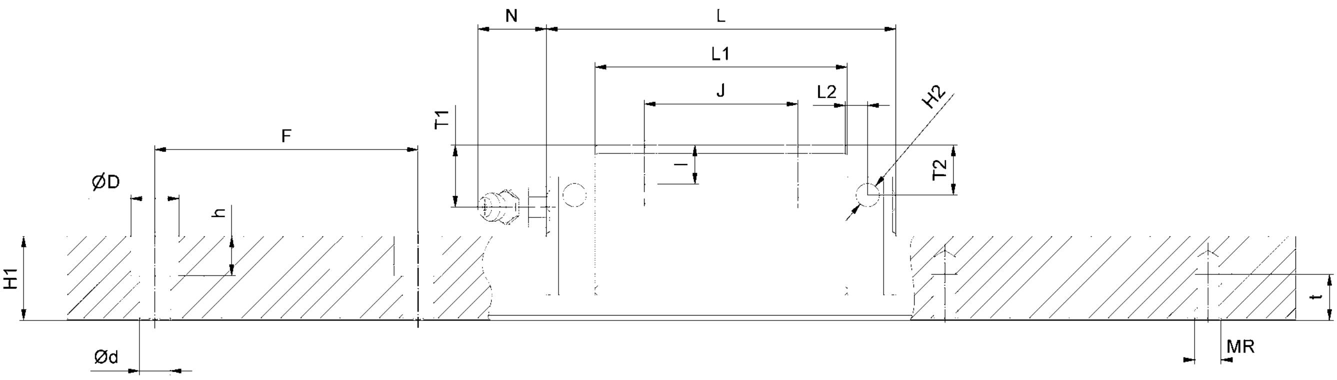
		System [mm]					Runner block [mm]										
		H	W	W2	E	L	B	J	MQ	I	L1	Oil H	T1	N	T2	L2	H2
BGCH15	BN	28	34	9,5	3,0	58,6	26	26	M 4	6,0	40,2	M 4 x 0,7	9,5	5,0	8,5	4,2	Ø 3,0
BGCH20	BN	30	44	12,0	4,5	69,3	32	36	M 5	6,5	48,5	M 6 x 1,0	7,1	15,6	6,3	4,25	Ø 5,3
	BL					82,1					61,3						
	BN					79,7		35			57,5						
BGCH25	BL	40	48	12,5	5,8	94,4	35		M 6	9,0	72,2	M 6 x 1,0	14,2	15,6	13,4	4,65	Ø 5,3
	BE					109,1		50			86,9						
	BN					94,8		40			67,8						
BGCH30	BL	45	60	16,0	7,0	105,0	40		M 8	12,0	78,0	M 6 x 1,0	9,0	15,6	8,5	6,0	Ø 5,0
	BE					130,5		60			103,5						
	BN					111,5		50			80,5						
BGCH35	BL	55	70	18,0	7,5	123,5	50		M 8	12,0	92,5	M 6 x 1,0	15,0	15,6	13,5	7,25	Ø 5,0
	BE					153,5		72			122,5						
	BN					129,0		60			94,0						
BGCH45	BL	70	86	20,5	8,9	145,0	60		M 10	18,0	110,0	M 8 x 1,25	24,5	16,0	24,5	8,0	Ø 6,8
	BE					174,0		80			139,0						
	BN					155,0		75			116,0						
BGCH55	BL	80	100	23,5	12,7	193,0	75		M 12	22,0	154,0	M 8 x 1,25	24,0	16,0	24,5	10,0	Ø 7,0
	BE					210,0		95			171,0						

Example of order drawing

BGCH 25 BN 2 SS L 02000 N Z1 II -0 0 -00000 -00*

**Explanation to type key in Chapter 7*

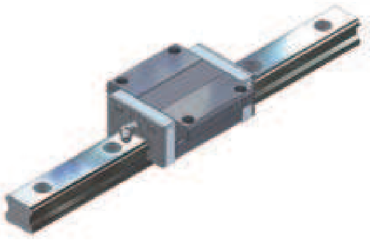




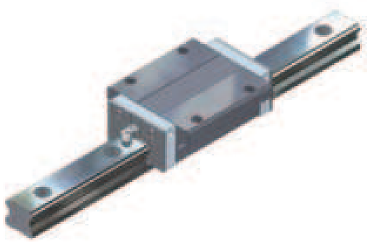
Rail [mm]								Load ratings					Mass			
			Version L			Version C		[kN]		kNm			[kg]	[kg/m]		
W1	H1	F	d	D	h	MR	t	C	C0	MX	MY	MZ	LW	Rail		
15	13,0	60	4,5	7,5	6,0	M 5	8,0	11,51	19,62	0,135	0,118	0,118	0,19	1,28	BGCH15	BN
20	16,3	60	6,0	9,5	8,5	M 6	10,0	17,71	30,50	0,285	0,221	0,221	0,31	2,15	BGCH20	BN
								22,96	39,52	0,370	0,361	0,361	0,36			BL
23	19,2	60	7,0	11,0	9,0	M 6	12,0	24,85	41,07	0,440	0,352	0,352	0,45	2,88	BGCH25	BN
								31,93	52,79	0,567	0,568	0,568	0,66			BL
								36,00	63,29	0,680	0,820	0,820	0,80			BE
28	22.8	80	9,0	14,0	12,0	M 8	15,0	36,71	54,57	0,707	0,551	0,551	0,91	4,45	BGCH30	BN
								47,54	70,68	0,915	0,822	0,822	1,04			BL
								52,93	86,71	1,123	1,338	1,338	1,36			BE
34	26,0	80	9,0	14,0	12,0	M 8	17,0	52,32	81,12	1,283	0,973	0,973	1,50	6,25	BGCH35	BN
								65,37	101,36	1,603	1,397	1,397	1,80			BL
								71,92	125,30	1,982	2,287	2,287	2,34			BE
45	31,1	105	14,0	20,0	17,0	M 12	24,0	71,57	108,90	2,302	1,525	1,525	2,28	9,60	BGCH45	BN
								85,12	129,54	2,738	2,123	2,123	2,67			BL
								98,36	163,28	3,451	3,381	3,381	3,35			BE
53	38,0	120	16,0	23,0	20,0	M 14	24,0	86,19	133,42	3,306	2,306	2,306	3,42	13,80	BGCH55	BN
								116,31	178,85	4,432	4,104	4,104	4,57			BL
								157,65	253,62	6,284	6,462	6,462	5,08			BE

BGXH...F

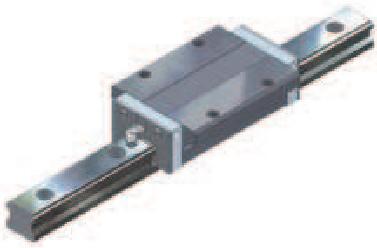
Profile rail guide without ball chain, runner block with flange



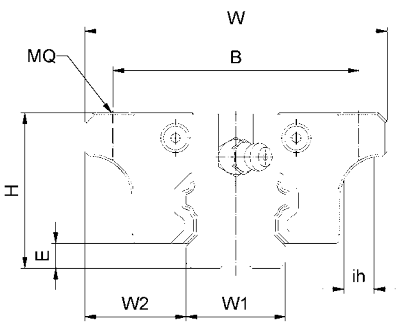
BGXH…FN, standard



BGXH…FL, long



BGXH…FE, extra long

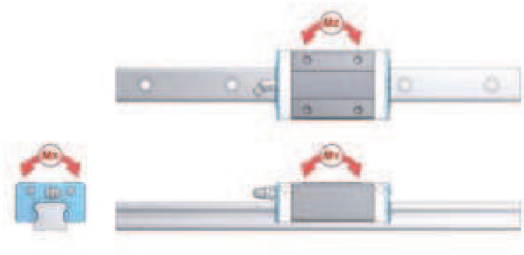


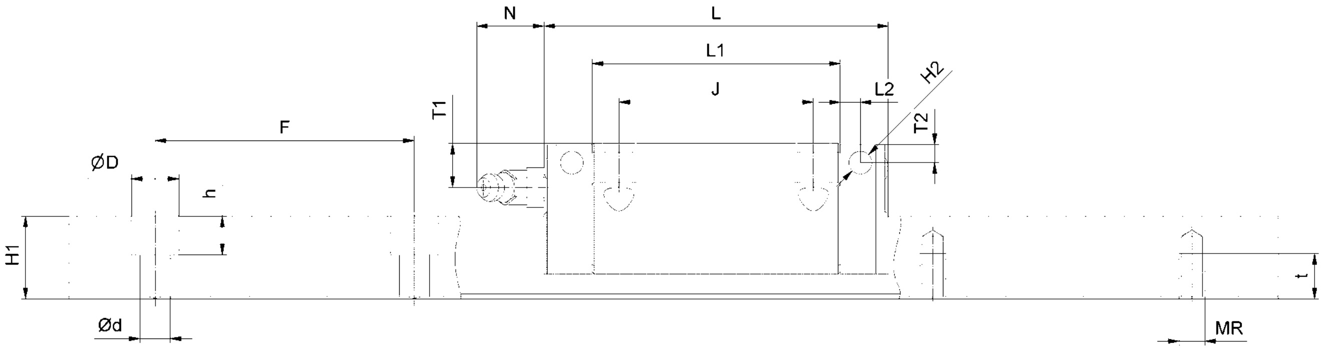
		System [mm]					Runner block [mm]											
		H	W	W2	E	L	B	J	MQ	ih	I	L1	Oil H	T1	N	T2	L2	H2
BGXH15	FN	24	47	16,0	3,0	58,6	38	30	M 5	4,4	8,0	40,2	M 4 x 0,7	5,5	5,0	4,5	4,2	Ø 3,0
	FL					66,1						47,7						
BGXH20	FN	30	63	21,5	4,5	69,3	53	40	M 6	5,4	9,0	48,5	M 6 x 1,0	7,1	15,6	6,3	4,25	Ø 5,3
	FL					82,1						61,3						
BGXH25	FN	36	70	23,5	5,8	79,7	57	45	M 8	7,0	10,0	57,5	M 6 x 1,0	10,2	15,6	9,4	4,65	Ø 5,3
	FL					94,4						72,2						
	FE					109,1						86,9						
BGXH30	FN	42	90	31,0	7,0	94,8	72	52	M 10	8,6	11,0	67,8	M 6 x 1,0	10,0	15,6	5,5	6,0	Ø 5,0
	FL					105,0						78,0						
	FE					130,5						103,5						
BGXH35	FN	48	100	33,0	7,5	111,5	82	62	M 10	8,6	12,0	80,5	M 6 x 1,0	8,0	16,0	6,5	7,25	Ø 5,0
	FL					123,5						92,5						
	FE					153,5						122,5						
BGXH45	FN	60	120	37,5	8,9	129,0	100	80	M 12	10,6	15,5	94,0	M 8 x 1,25	14,4	16,0	14,5	8,0	Ø 6,8
	FL					145,0						110,0						
	FE					174,0						139,0						
BGXH55	FN	70	140	43,5	12,7	155,0	116	95	M 14	12,6	18,5	116,0	M 8 x 1,25	14,0	16,0	14,5	10,0	Ø 7,0
	FL					193,0						154,0						
	FE					210,0						171,0						

Example of order drawing

BGXH 25 FN 2 SS L 02000 N Z1 II -0 0 -00000 -00*

**Explanation of type key in Chapter 7*

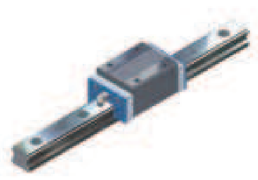




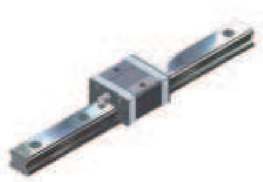
Rail [mm]								Load ratings					Mass			
			Version L			Version C		[kN]		[kNm]			[kg]	[kg/m]		
W1	H1	F	d	D	h	MR	t	C	C0	MX	MY	MZ	LW	Rail		
15	13	60	4,5	7,5	6,0	M 5	8,0	9,33	19,62	0,135	0,118	0,118	0,21	1,28	BGXH15	FN
								11,23	23,72	0,164	0,169	0,169	0,23			FL
20	16.3	60	6,0	9,5	8,5	M 6	10,0	7,38	30,50	0,285	0,221	0,221	0,40	2,15	BGXH20	FN
								14,35	39,52	0,370	0,361	0,361	0,46			FL
23	19.2	60	7,0	11,0	9,0	M 6	12,0	20,12	41,07	0,440	0,352	0,352	0,57	2,88	BGXH25	FN
								25,87	52,79	0,567	0,568	0,568	0,72			FL
								29,16	63,29	0,680	0,820	0,820	0,89			FE
28	22.8	80	9,0	14,0	12,0	M 8	15,0	29,73	54,57	0,707	0,551	0,551	1,10	4,45	BGXH30	FN
								38,51	70,68	0,915	0,822	0,822	1,34			FL
								42,87	86,71	1,123	1,338	1,338	1,66			FE
34	26,0	80	9,0	14,0	12,0	M 8	17,0	43,37	81,12	1,283	0,973	0,973	1,50	6,25	BGXH35	FN
								52,95	101,36	1,603	1,397	1,397	1,90			FL
								58,26	125,30	1,982	2,287	2,287	2,54			FE
45	31,1	105	14,0	20,0	17,0	M 12	24,0	57,97	108,90	2,302	1,525	1,525	2,27	9,60	BGXH45	FN
								68,95	129,54	2,738	2,123	2,123	2,68			FL
								79,67	163,28	3,451	3,381	3,381	3,42			FE
53	38,0	120	16,0	23,0	20,0	M 14	24,0	69,81	133,42	3,306	2,306	2,306	3,42	13,80	BGXH55	FN
								94,20	178,85	4,432	4,104	4,104	4,57			FL
								127,70	253,62	6,284	6,462	6,462	5,08			FE

BGXS...B

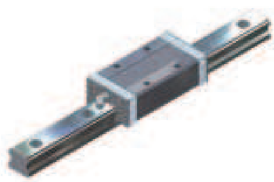
Profile rail guide without ball chain
Runner block, block design, flat



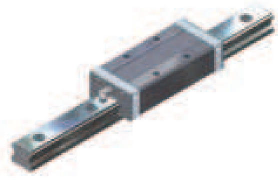
BGXS…BN, standard



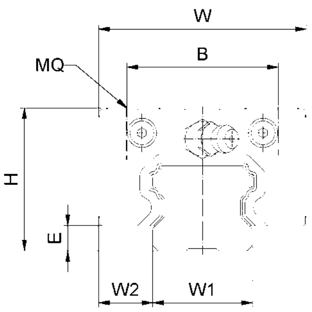
BGXS…BS, short



BGXS…BL, long



BGXS…BE, extra long

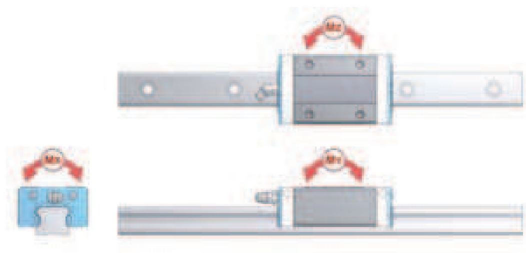


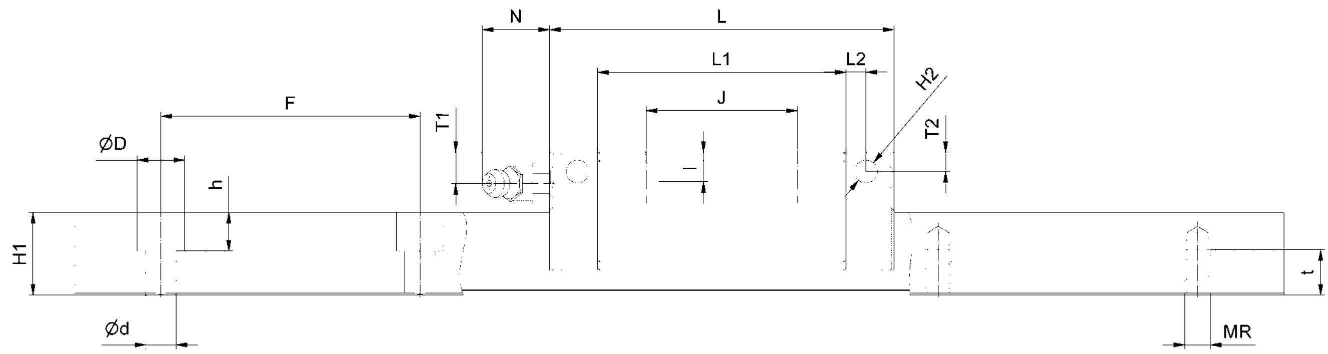
		System [mm]					Runner block [mm]										
		H	W	W2	E	L	B	J	MQ	I	L1	Oil H	T1	N	T2	L2	H2
	BS					40,6		-			22,2						
BGXS15	BN	24	34	9,5	3,0	58,6	26	26	M 4	4,8	40,2	M 4 x 0,7	5,5	5,0	4,5	4,2	Ø 3,0
	BL					66,1					47,7						
BGXS20	BS	28	42	11,0	4,5	48,3	32	-	M 5	5,5	27,5	M 6 x 1,0	5,1	15,6	4,3	4,25	Ø 5,3
	BN					69,3		32			48,5						
BGXS25	BS	33				54,5		-		6,8	32,3		7,2		6,4		
	BN					79,7					57,5						
	BN		48	12,5	5,8	79,7	35	35	M 6		57,5	M 6 x 1,0		15,6		4,65	Ø 5,3
BGXX25	BL	36				94,4				9,0	72,2		10,2		9,4		
	BE					109,1		50			86,9						
	BS					64,2		-			37,2						
BGXS30	BN	42	60	16,0	7,0	94,8	40	40	M 8	10,0	67,8	M 6 x 1,0	10,0	15,6	5,5	6,0	Ø 5,0
	BL					105,0					78,0						
	BE					130,5		60			103,5						
	BS					75,5		-			44,5						
BGXS35	BN	48	70	18,0	7,5	111,5	50	50	M 8	10,0	80,5	M 6 x 1,0	8,0	15,6	6,5	7,25	Ø 5,0
	BL					123,5					92,5						
	BE					153,5		72			122,5						
	BN					129,0		60			94,0						
BGXS45	BL	60	86	20,5	8,9	145,0	60		M 10	15,5	110,0	M 8 x 1,25	14,4	16,0	14,5	8,0	Ø 6,8
	BE					174,0		80			139,0						
	BN					155,0		75			116,0						
BGXS55	BL	70	100	23,5	12,7	193,0	75		M 12	22,0	154,0	M 8 x 1,25	14,0	16,0	14,5	10,0	Ø 7,0
	BE					210,0		95			171,0						

Example of order drawing

BGXS 25 BN 2 SS L 02000 N Z1 II -0 0 -00000 -00*

**Explanation of type key in Chapter 7*

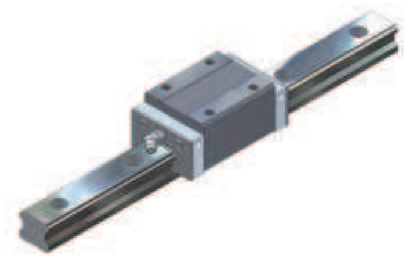




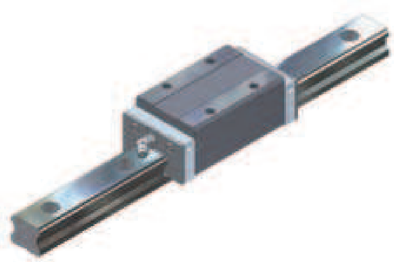
Rail [mm]								Load ratings					Mass			
			Version L			Version C		[kN]		[kNm]			[kg]	[kg/m]		
W1	H1	F	d	D	h	MR	t	C	C0	MX	MY	MZ	LW	Rail		
15	13,0	60	4,5	7,5	6,0	M 5	8,0	4,64	9,77	0,068	0,032	0,032	0,10	1,28	BGXS15	BS
								9,33	19,62	0,135	0,118	0,118	0,17			BN
								11,23	23,72	0,164	0,169	0,169	0,18			BL
20	16.3	60	6,0	9,5	8,5	M 6	10,0	7,38	15,69	0,146	0,065	0,065	0,17	2,15	BGXS20	BS
								14,35	30,50	0,285	0,221	0,221	0,26			BN
23	19.2	60	7,0	11,0	9,0	M 6	12,0	10,29	21,00	0,226	0,101	0,101	0,21	2,88	BGXS25	BS
								20,12	41,07	0,440	0,352	0,352	0,38			BN
								20,12	41,07	0,440	0,352	0,352	0,40		BGXX25	BN
								25,87	52,79	0,567	0,568	0,568	0,54			BL
								29,16	63,29	0,680	0,820	0,820	0,67			BE
28	22.8	80	9,0	14,0	12,0	M 8	15,0	14,74	27,05	0,350	0,150	0,150	0,50	4,45	BGXS30	BS
								29,73	54,57	0,707	0,551	0,551	0,80			BN
								38,51	70,68	0,915	0,822	0,822	0,94			BL
								42,87	86,71	1,123	1,338	1,338	1,16			BE
34	26,0	80	9,0	14,0	12,0	M 8	17,0	21,24	40,66	0,643	0,270	0,270	0,80	6,25	BGXS35	BS
								43,37	81,12	1,283	0,973	0,973	1,20			BN
								52,95	101,36	1,603	1,397	1,397	1,40			BL
								58,26	125,30	1,982	2,287	2,287	1,84			BE
45	31,1	105	14,0	20,0	17,0	M 12	24,0	57,97	108,90	2,302	1,525	1,525	1,64	9,60	BGXS45	BN
								68,95	129,54	2,738	2,123	2,123	1,93			BL
								79,67	163,28	3,451	3,381	3,381	2,42			BE
53	38,0	120	16,0	23,0	20,0	M 14	24,0	69,81	133,42	3,306	2,306	2,306	3,42	13,80	BGXS55	BN
								94,20	178,85	4,432	4,104	4,104	4,57			BL
								127,70	253,62	6,284	6,462	6,462	5,08			BE

BGXH...B

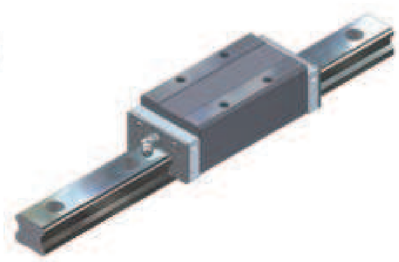
Profile rail guide without ball chain
Runner block, block design, high



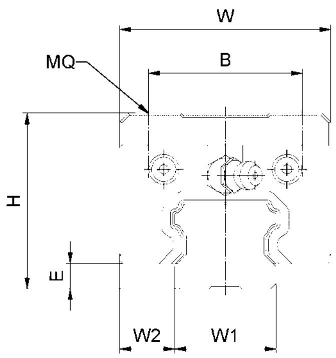
BGXH…BN, standard



BGXH…BL, long



BGXH…BE, extra long

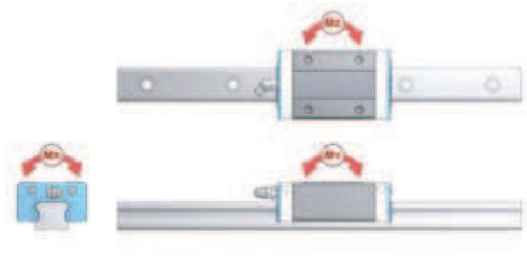


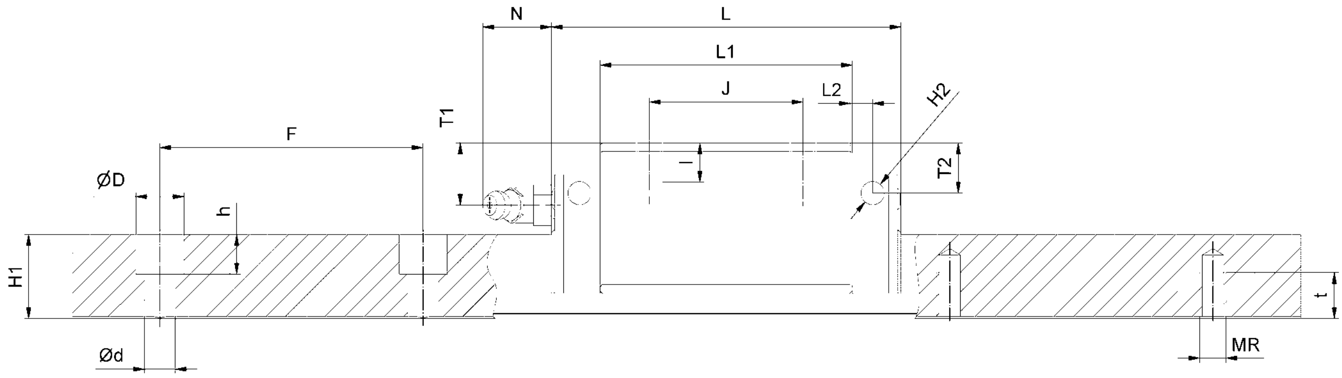
		System [mm]					Runner block [mm]										
		H	W	W2	E	L	B	J	MQ	I	L1	Oil H	T1	N	T2	L2	H2
BGXH15	BN	28	34	9,5	3,0	58,6	26	26	M 4	6,0	40,2	M 4 x 0,7	9,5	5,0	8,5	4,2	Ø 3,0
BGXH20	BN	30	44	12,0	4,5	69,3	32	36	M 5	6,5	48,5	M 6 x 1,0	7,1	15,6	6,3	4,25	Ø 5,3
	BL					82,1					61,3						
BGXH25	BN	40	48	12,5	5,8	79,7	35	35	M 6	9,0	57,5	M 6 x 1,0	14,2	15,6	13,4	4,65	Ø 5,3
	BL					94,4					72,2						
	BE					109,1		50			86,9						
BGXH30	BN	45	60	16,0	7,0	94,8	40	40	M 8	12,0	67,8	M 6 x 1,0	9,0	15,6	8,5	6,0	Ø 5,0
	BL					105,0					78,0						
	BE					130,5		60			103,5						
BGXH35	BN	55	70	18,0	7,5	111,5	50	50	M 8	12,0	80,5	M 6 x 1,0	15,0	15,6	13.5	7,25	Ø 5,0
	BL					123,5					92,5						
	BE					153,5		72			122,5						
BGXH45	BN	70	86	20,5	8,9	129,0	60	60	M 10	18,0	94,0	M 8 x 1,25	24,5	16,0	24,5	8,0	Ø 6,8
	BL					145,0					110,0						
	BE					174,0		80			139,0						
BGXH55	BN	80	100	23,5	12,7	155,0	75	75	M 12	22,0	116,0	M 8 x 1,25	24,0	16,0	24,5	10,0	Ø 7,0
	BL					193,0					154,0						
	BE					210,0		95			171,0						

Example of order drawing

BGXH 25 BN 2 SS L 02000 N Z1 II -0 0 -00000 -00*

**Explanation of type key in Chapter 7*

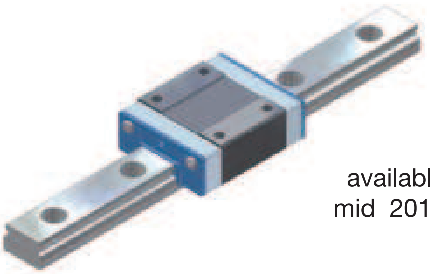




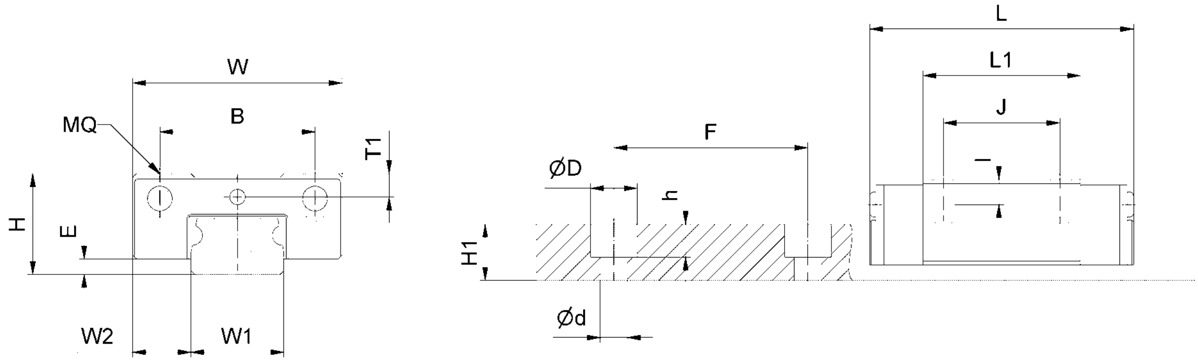
Rail [mm]								Load ratings					Mass			
			Version L			Version C		[kN]		[kNm]			[kg]	[kg/m]		
W1	H1	F	d	D	h	MR	t	C	C0	MX	MY	MZ	LW	Rail		
15	13,0	60	4,5	7,5	6,0	M 5	8,0	9,51	19,62	0,135	0,118	0,118	0,19	1,28	BGXH15	BN
20	16,3	60	6,0	9,5	8,5	M 6	10,0	14,35	30,50	0,285	0,221	0,221	0,31	2,15	BGXH20	BN
								18,59	39,52	0,370	0,361	0,361	0,36			BL
23	19,2	60	7,0	11,0	9,0	M 6	12,0	20,12	41,07	0,440	0,352	0,352	0,45	2,88	BGXH25	BN
								25,87	52,79	0,567	0,568	0,568	0,66			BL
								29,16	63,29	0,680	0,820	0,820	0,80			BE
28	22,8	80	9,0	14,0	12,0	M 8	15,0	29,73	54,57	0,707	0,551	0,551	0,91	4,45	BGXH30	BN
								38,51	70,68	0,915	0,822	0,822	1,04			BL
								42,87	86,71	1,123	1,338	1,338	1,36			BE
34	26,0	80	9,0	14,0	12,0	M 8	17,0	43,37	81,12	1,283	0,973	0,973	1,50	6,25	BGXH35	BN
								52,95	101,36	1,603	1,397	1,397	1,80			BL
								58,26	125,30	1,982	2,287	2,287	2,34			BE
45	31,1	105	14,0	20,0	17,0	M 12	24,0	57,97	108,90	2,302	1,525	1,525	2,28	9,60	BGXH45	BN
								68,95	129,54	2,738	2,123	2,123	2,67			BL
								79,67	163,28	3,451	3,381	3,381	3,35			BE
53	38,0	120	16,0	23,0	20,0	M 14	24,0	69,81	133,42	3,306	2,306	2,306	3,42	13,80	BGXH55	BN
								94,20	178,85	4,432	4,104	4,104	4,57			BL
								127,70	253,62	6,284	6,462	6,462	5,08			BE

MBC...SN

Miniature profile rail guide with ball chain narrow version



available
mid 2011



	System [mm]					Runner block [mm]							
	H	W	W2	E	L	B	J	MQ	I	L1	Oil H	T1	N
MBC09SN	10	20	5,5	2,2	30,8	15	10	M 3	2,8	19,5	ø 1,5	2,4	-
MBC12SN	13	27	7,5	2,0	34,0	20	15	M 3	3,2	20,3	ø 2,0	3,0	-
MBC15SN	16	32	8,5	4,0	42,0	25	20	M 3	3,5	25,3	M 3	3,5	5

Rail [mm]									Load ratings					Mass		
				Version L			Version C		[kN]		[kNm]			[kg]	[kg/m]	
W1	H1	F	WH	d	D	h	MR	t	C	C0	MX	MY	MZ	LW	Rail	
9	6,05	20	-	3,5	6,0	3,30	-	-	2,65	2,25	0,0104	0,0083	0,0083	0,016	0,39	MBC09SN
12	7,25	25	-	3,5	6,0	4,25	-	-	3,92	3,42	0,0225	0,0117	0,0117	0,032	0,63	MBC12SN
15	9,50	40	-	3,5	6,0	4,50	-	-	6,52	5,59	0,0392	0,0255	0,0255	0,053	1,05	MBC15SN

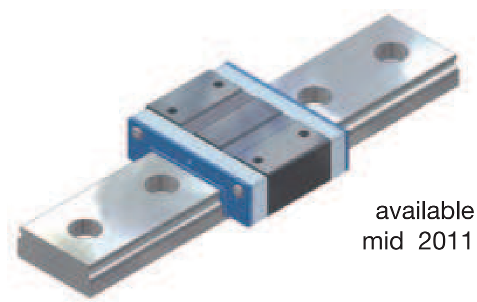
Example of order drawing

MBC 12 SN 2 UU L 00195 N Z1 II -0 0 -00000 -00*

**Explanation of type key in Chapter 7*

MBC....WN

Miniature profile rail guide with ball chain, broad version



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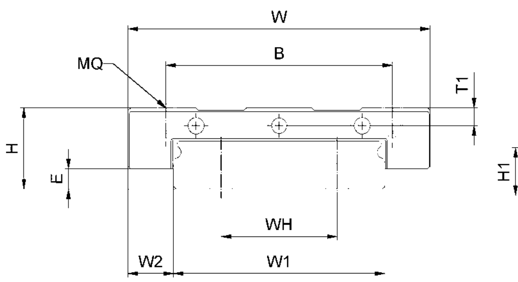
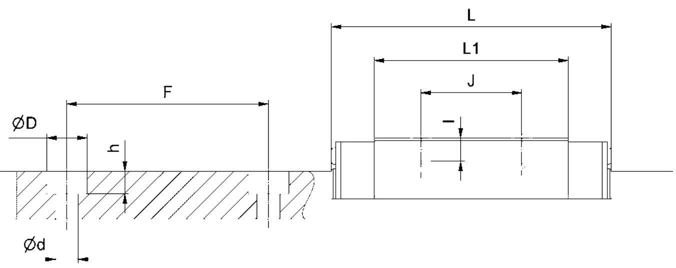




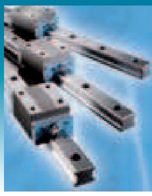
	System [mm]					Runner block [mm]							
	H	W	W2	E	L	B	J	MQ	I	L1	Oil H	T1	N
MBC09WN	12	30	6,0	4,0	39,0	21	12	M 3	2,8	26,7	ø 1,5	2,3	-
MBC12WN	14	40	8,0	3,8	44,5	28	15	M 3	3,5	30,5	ø 2,0	3,0	-
MBC15WN	16	60	9,0	4,0	55,5	45	20	M 4	4,5	38,5	M 3	3,5	5

Rail [mm]									Load ratings					Mass		
				Version L			Version C		[kN]		[kNm]			[kg]	[kg/m]	
W1	H1	F	WH	d	D	h	MR	t	C	C0	MX	MY	MZ	LW	Rail	
18	7,25	30	-	3,5	6,0	4,50	-	-	3,19	3,24	0,0306	0,0136	0,0158	0,035	0,98	MBC09WN
24	8,70	40	-	4,5	8,0	4,50	-	-	5,34	5,20	0,0647	0,0257	0,0257	0,063	1,53	MBC12WN
42	9,50	40	23	4,5	8,0	4,50	-	-	8,92	8,38	0,1716	0,0500	0,0500	0,130	2,97	MBC15WN

Example of order drawing

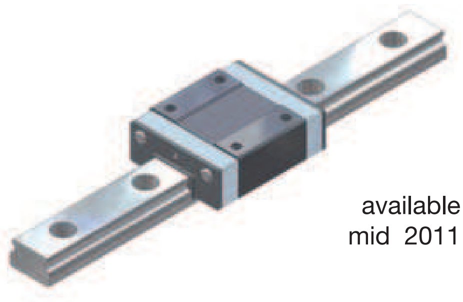
MBC 12 WN 2 UU L 00195 N Z1 II -0 0 -00000 -00*

**Explanation of type key in Chapter 7*



MBX...SN

Miniature profile rail guide with ball chain narrow version



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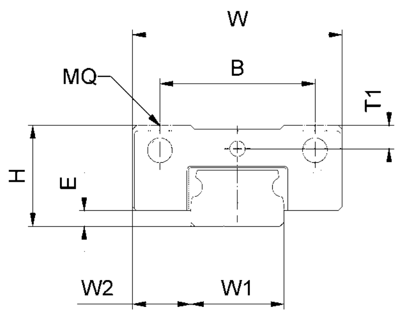
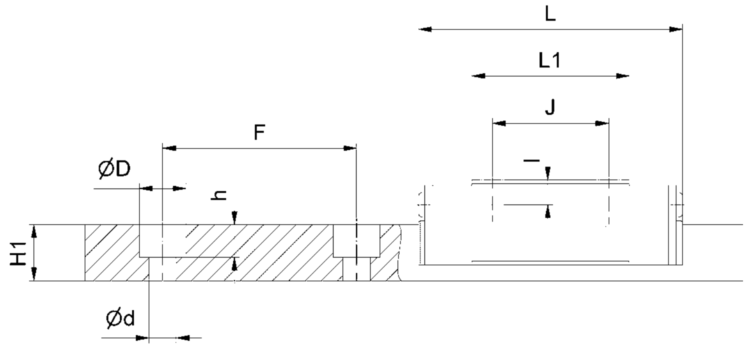




	System [mm]					Runner block [mm]							
	H	W	W2	E	L	B	J	MQ	I	L1	Oil H	T1	N
MBX09 SN	10	20	5,5	2,2	30,8	15	10	M 3	2,8	19,5	ø 1,5	2,4	-
MBX12 SN	13	27	7,5	2,0	34,0	20	15	M 3	3,2	20,3	ø 2,0	3,0	-
MBX15 SN	16	32	8,5	4,0	42,0	25	20	M 3	3,5	25,3	M 3	3,5	5

Rail [mm]									Load ratings					Mass		
				Version L			Version C		[kN]		[kNm]			[kg]	[kg/m]	
W1	H1	F	WH	d	D	h	MR	t	C	C0	MX	MY	MZ	LW	Rail	
9	6,05	20	-	3,5	6,0	3,30	-	-	2,01	2,25	0,0104	0,0083	0,0083	0,016	0,39	MBX09 SN
12	7,25	25	-	3,5	6,0	4,25	-	-	3,29	3,42	0,0225	0,0117	0,0117	0,032	0,63	MBX12SN
15	9,50	40	-	3,5	6,0	4,50	-	-	5,44	5,59	0,0392	0,0255	0,0255	0,053	1,05	MBX15SN

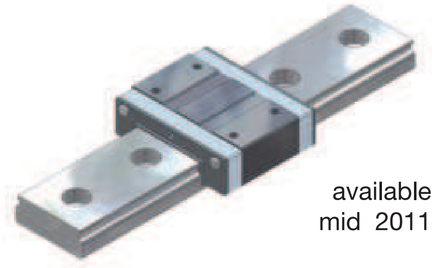
Example of order drawing

MBX 12 SN 2 UU L 00195 N Z1 II -0 0 -00000 -00*

**Explanation of type key in Chapter 7*

MBX...WN

Miniature profile rail guide without ball chain, broad version



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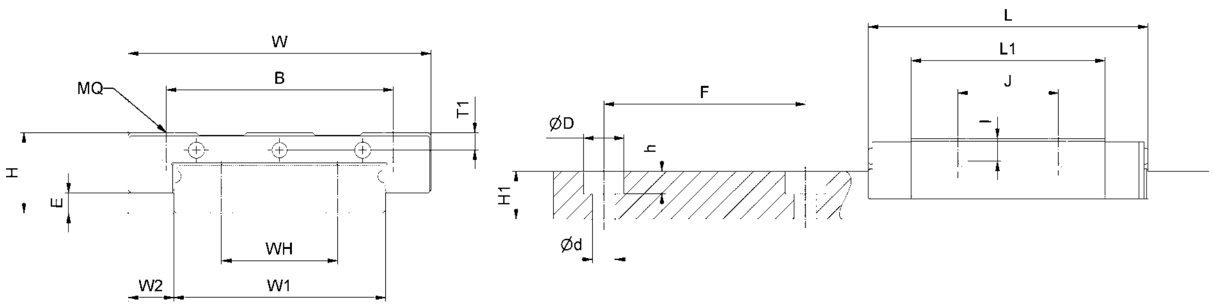


	System [mm]					Runner block [mm]							
	H	W	W2	E	L	B	J	MQ	I	L1	Oil H	T1	N
MBX09WN	12	30	6,0	4,0	39,0	21	12	M 3	2,8	26,7	ø 1,5	2,3	-
MBX12WN	14	40	8,0	3,8	44,5	28	15	M 3	3,5	30,5	ø 2,0	3,0	-
MBX15WN	16	60	9,0	4,0	55,5	45	20	M 4	4,5	38,5	M 3	3,5	5

Rail [mm]									Load ratings					Mass		
				Version L			Version C		[kN]		[kNm]			[kg]	[kg/m]	
W1	H1	F	WH	d	D	h	MR	t	C	C0	MX	MY	MZ	LW	Rail	
18	7,25	30	-	3,5	6,0	4,50	-	-	2,60	3,24	0,0306	0,0136	0,0158	0,035	0,98	MBX09WN
24	8,70	40	-	4,5	8,0	4,50	-	-	4,31	5,20	0,0647	0,0257	0,0257	0,063	1,53	MBX12WN
42	9,50	40	23	4,5	8,0	4,50	-	-	8,92	8,38	0,1716	0,0500	0,0500	0,130	2,97	MBX15WN

Example of order drawing

MBX 12 WN 2 UU L 00195 N Z1 II -0 0 -00000 -00*

*Explanation of type key in Chapter 7

Standard lengths of SNR profile rail guides

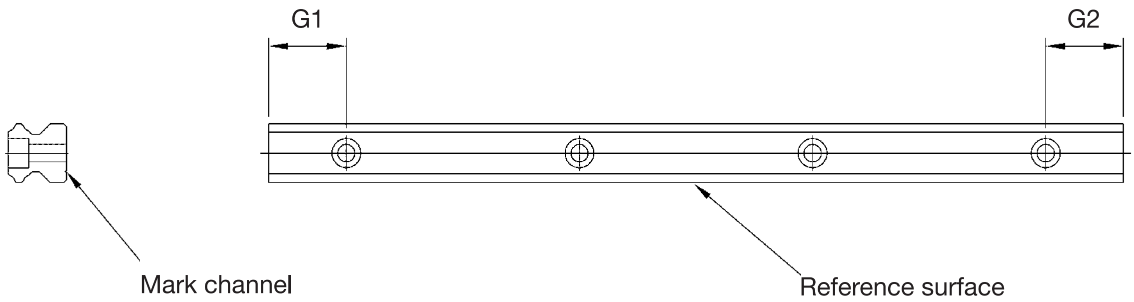
SNR profile rail guides are produced in standard lengths. Table 8.1 shows the standard length as a function of the design size.

Table 8.1 Standard length of SNR profile rails

Design size	BGC... / BGX...							MBC...SN / MBX...SN			MBC...WN / MBX...WN		
	15	20	25	30	35	45	55	09	12	15	09	12	15
Standard lengths	160	160	160	280	280	360	420	55	70	70	50	70	70
	220	220	220	360	360	465	540	75	95	110	80	110	110
	280	280	280	440	440	570	660	95	120	150	110	150	150
	340	340	340	520	520	675	780	115	145	190	140	190	190
	400	400	400	600	600	780	900	135	170	230	170	230	230
	460	460	460	680	680	885	1020	155	195	270	200	270	270
	520	520	520	760	760	990	1140	175	220	310	230	310	310
	580	580	580	840	840	1095	1260	195	245	350	260	350	350
	640	640	640	920	920	1200	1380	235	270	390	290	390	390
	700	700	700	1000	1000	1305	1500	275	295	430	320	430	430
	760	760	760	1080	1080	1410	1620	315	345	470	380	470	470
	820	820	820	1160	1160	1515	1740	355	395	510	440	550	550
	880	880	880	1240	1240	1620	1860	395	445	550	500	630	630
	940	940	940	1320	1320	1725	1980	435	495	590	560	710	710
	1000	1000	1000	1400	1400	1830	2100	475	545	630	620	790	790
	1060	1060	1060	1480	1480	1935	2220	555	595	670	680	870	870
	1120	1120	1120	1560	1560	2040	2340	635	645	750	740	950	950
	1180	1180	1180	1640	1640	2145	2460	715	695	830	800	1030	1030
	1240	1240	1240	1720	1720	2250	2580	795	745	910	860	1110	1110
	1300	1300	1300	1800	1800	2355	2700	875	795	990	920	1190	1190
	1360	1360	1360	1880	1880	2460	2820	955	845	1070		1270	1270
	1420	1420	1420	1960	1960	2565	2940		895	1150		1350	1350
	1480	1480	1480	2040	2040	2670	3060		945	1230		1430	1430
	1540	1540	1540	2200	2200	2775	3180		995	1310			
	1600	1600	1600	2360	2360	2880	3300		1095	1390			
	1720	1720	1720	2520	2520	2985	3420		1195				
	1840	1840	1840	2680	2680	3090	3540		1295				
	1960	1960	1960	2840	2840	3195	3660		1395				
	2080	2080	2080	3000	3000	3300	3780						
	2200	2200	2200	3160	3160	3405							
	2320	2320	2320	3320	3320	3510							
	2440	2440	2440	3480	3480	3615							
	2560	2560	2560	3640	3640	3720							
	2680	2680	2680	3800	3800	3825							
	2800	2800	2800										
	2920	2920	2920										
	3040	3040	3040										
	3280	3280	3280										
	3520	3520	3520										
	3760	3760	3760										
Max. length	4000							1200	2000		1200	2000	
F	60	60	60	80	80	105	120	20	25	40	30	40	40
G1 = G2	20	20	20	20	20	22,5	30	7,5	10	15	10	15	15

Specification of dimensions G1 and G2 is required to determine the position of the first and the last hole in the rail when no standard lengths are used or rails with asymmetrical hole pattern are used. Figure 8.1 shows the definition of the position of dimensions G1 and G2.

Suffixes: without / -III



Suffixes: -II / -IV

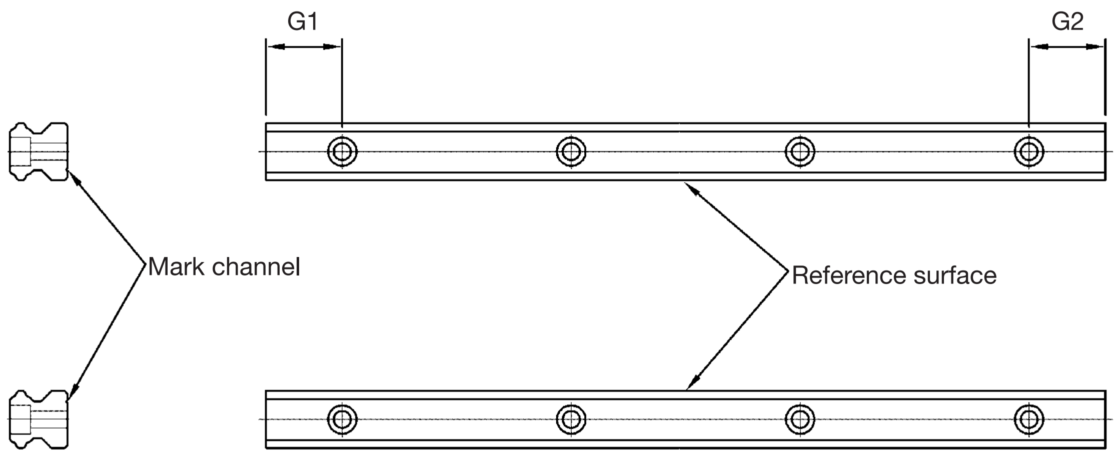


Figure 8.1 Position of dimensions G1, G2 and F

The following versions of profile rail guide systems can be ordered:

- Single-segment guide rail in standard length
- Single-segment guide rail in special length, symmetrical (G1=G2)
- Single-segment guide rail in special length, asymmetrical (G1≠G2: G1=…, G2=….)
- Arbitrarily segmented guide rail (G1=G2). Guide rails with a length that exceeds the specified maximum standard length for guide rails delivered in several sections with butt joints (see Chapter 3.2). The number of sections is defined by SNR.
- Segmented guide rail according to customer specifications. The number of sections is determined by customer specifications. The total length of the guide rail must be specified when two or several guide rail segments with butt joints are ordered.

9. Guide to queries

Date ____________________
Offer valid until ____________________

Company ____________________
City ____________________ Address ____________________
Contact person ____________________
Phone ____________________ Fax ____________________
Mail ____________________

Project description ____________________

☐ Once-off requirement Number of items ________ Preferred date ____________
☐ Series requirement Items/year ________ Preferred date for number of items ________ CW

☐ New design ☐ Technical upgrade ☐ Cost reduction

System description

Number of parallel guide rails ____________
Distance of the (outer) rails: ____________ from 4 rails onwards, distance of the inner rails: ________

Number of runner blocks: ____________
Distance of the (outer) runner blocks: ____________ from 4 runner blocks onwards,
distance of the inner runner blocks: ____________

Position of the drive:______ across (y) [mm] vertical (z) [mm] ____________

Installation position:________ Longitudinal incline g [°] Cross incline [°] ____________

Installation surface:______ machined: unmachined: ____________

For permanent temperature ____________ °C

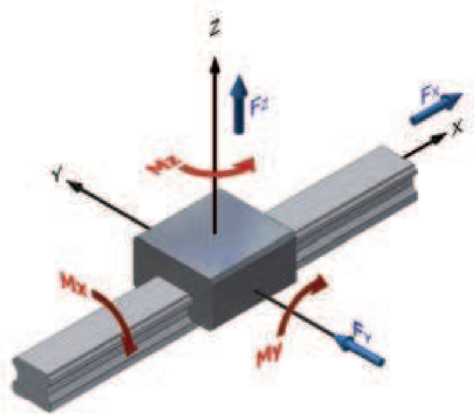
Stroke [mm]:____________

Cycle time [s]:____________

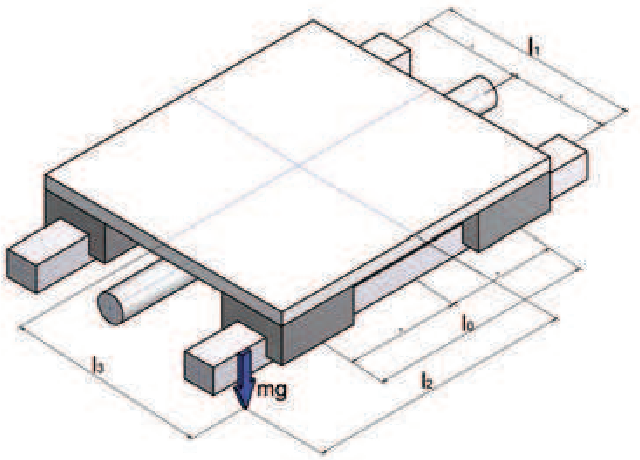
Movement speed [m/min]: ____________ Optional movement time [s]:
Acceleration [m/s]: ____________ Acceleration at emergency stop [m/s^2]

Desired service life: ____________ Cycles or ________ km or ________ hours

Coordinate system



Position of the loads



Loads

Axis description ______________________

Load		longitudinal [mm]		horizontal [mm]	vertical [mm]	Travel percentage	Comments
Centre of gravity	[kg]	xmax	xmin	y	z	[%]	
m1							
m2							
m3							
m4							
m5							
External force		longitudinal [mm]		horizontal [mm]	vertical [mm]	Travel percentage	Comments
Point of action	[N]	xmax	xmin	y	z	[%]	
Fx		omitted					
Fy				omitted			
Fz					omitted		

Drawing:

10. Index

Notes

SNR offers a variety of possible bearings for ball screw drives. We use 2-row angular contact ball bearings with a contact angle of 60°. Ball screws are usually supported by a combination of fixed and floating bearings. The fixed bearing is used on the drive side. The floating bearing is arranged opposite of the drive side. The design of the angular contact ball bearings used provides advantages that make it easier to apply them under specific load conditions. SNR offers strong, rigid, low-friction, accurate and installation-friendly bearings that usually have higher load ratings than corresponding ball screws. The option of adapting the drive minimises the design and production effort. Deep-groove ball bearings are normally used in floating-bearing units.

Our consulting service will gladly advise you.

Additional catalogue documentation

More information concerning our SNR products for linear motion is provided in our catalogues.

SNR, you guide to linear modules

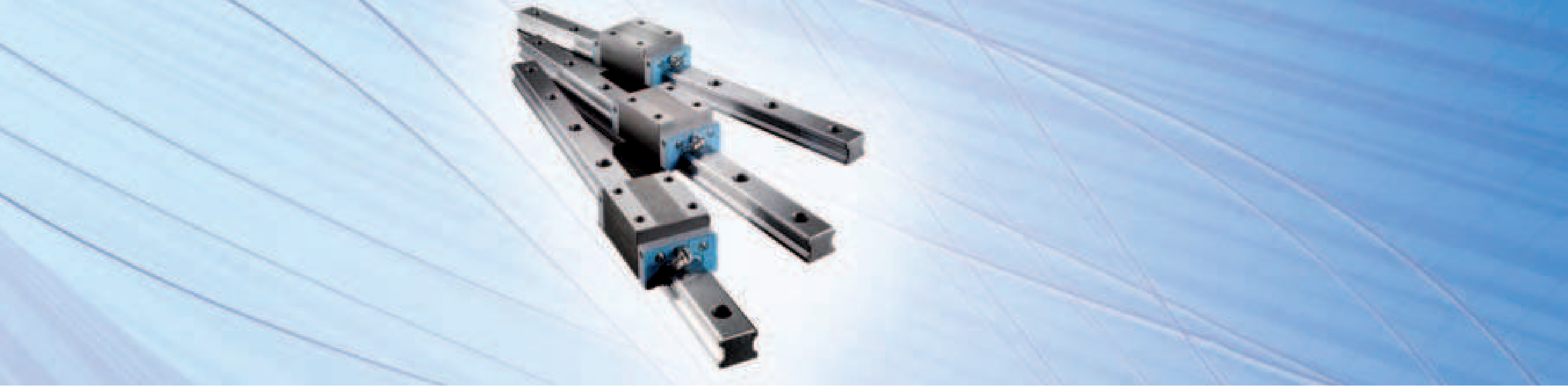
All the technical information concerning our linear axis and modules is provided here.

SNR Linear Motion: Ball screws

The complete ball screw range in one catalogue.

Linear ball bushes

Inclusive linear units, mounting rails, shaft supports and shafts.



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