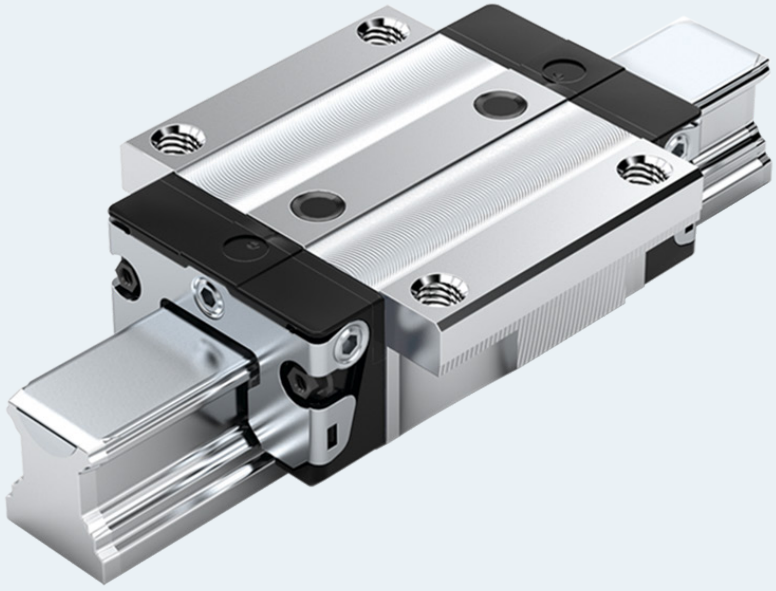
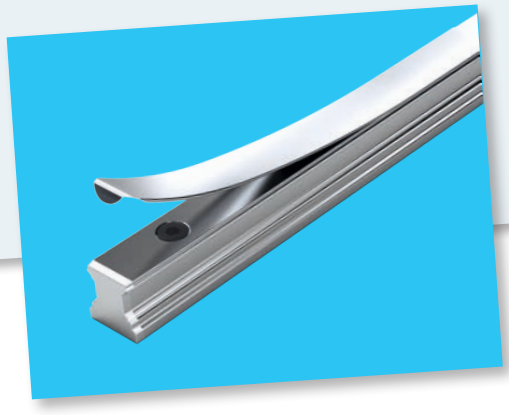
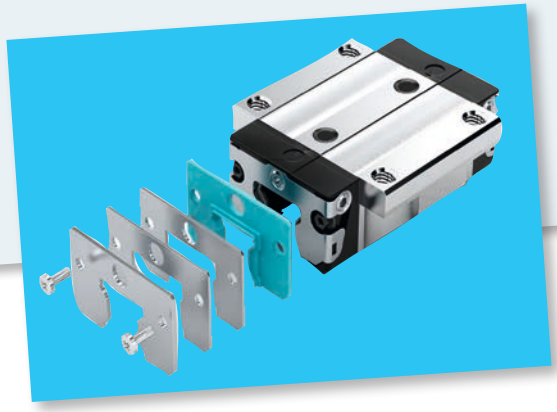
rexroth
A Bosch Company

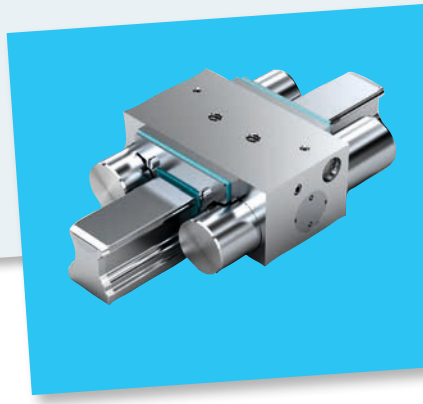
Ball rail systems

ball runner blocks, ball guide rails, accessories



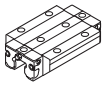
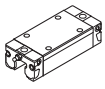
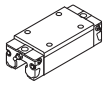






www.boschrexroth.com

Product overview ball runner blocks with load ratings and load moments

Ball runner blocks			**Page**		**Size**		**15**	**20**	**25**	**30**	**35**	**45**	**55**	**65**
							Load ratings (N) and **load moments** (Nm)							
Standard, heavy duty, ball runner blocks[7] made of steel[3] **Resist NR[4]** **Resist CR[6]**		**FNS** **R1651[3][6]** **R2001[4]**	**48[3]** **99[4]**	**106[6]**	**C**	**1)**	**9860**	**23400**	**28600**	**36500**	**51800**	**86400**	**109000**	**172000**
					C	2)	8 850	22 200	26 700	34 800	49 400	82 400	–	–
					C_0	**1)**	**12700**	**29800**	**35900**	**48100**	**80900**	**132000**	**174000**	**280000**
					C_0	2)	10 800	27 700	32 300	44 700	75 200	123 000	–	–
		**SNS** **R1622[3][6]** **R2011[4]**	**54[3]** **99[4]**	**106[6]**	**M_t**	**1)**	**95**	**300**	**410**	**630**	**1110**	**2330**	**3480**	**6810**
					M_t	2)	85	280	380	600	1060	2 220	–	–
					M_{t0}	**1)**	**120**	**380**	**510**	**830**	**1740**	**3560**	**5550**	**11100**
					M_{t0}	2)	100	350	460	780	1 620	3 320	–	–
		**SNH** **R1621[3][6]**	**60[3]**		**M_L**	**1)**	**68**	**200**	**290**	**440**	**720**	**1540**	**2320**	**4560**
					M_L	2)	62	190	270	420	700	1 480	–	–
					M_{L0}	**1)**	**87**	**260**	**360**	**580**	**1130**	**2350**	**3690**	**7400**
					M_{L0}	2)	76	240	330	540	1060	2 210	–	–
		**FLS** **R1653[3][6]** **R2002[4]**	**50[3]** **99[4]**	**106[6]**	**C**	**1)**	**12800**	**29600**	**37300**	**46000**	**66700**	**111000**	**139000**	**223000**
					C	2)	11 500	28 200	34 800	43 800	63 600	106 000	–	–
					C_0	**1)**	**18400**	**41800**	**52500**	**66900**	**116000**	**190000**	**245000**	**404000**
					C_0	2)	15 600	38 800	47 300	62 200	108 000	177 000	–	–
		**SLS** **R1623[3][6]** **R2012[4]**	**56[3]** **99[4]**	**106[6]**	**M_t**	**1)**	**120**	**380**	**530**	**800**	**1440**	**3010**	**4410**	**8810**
					M_t	2)	110	360	500	760	1 370	2 870	–	–
					M_{t0}	**1)**	**180**	**540**	**750**	**1160**	**2500**	**5120**	**7780**	**16000**
					M_{t0}	2)	150	500	670	1080	2320	4 770	–	–
		**SLH** **R1624[3][6]**	**62[3]**	**106[6]**	**M_L**	**1)**	**120**	**340**	**530**	**740**	**1290**	**2730**	**3960**	**8160**
					M_L	2)	110	330	500	710	1 230	2 630	–	–
					M_{L0}	**1)**	**180**	**490**	**740**	**1080**	**2240**	**4660**	**6990**	**14800**
					M_{L0}	2)	150	460	670	1010	2 090	4 370	–	–
Standard ball runner block [7] made of steel[3] **Resist NR[4]** **Resist CR[6]**		**FKS** **R1665[3]** **R2000[4]**	**52[3]** **99[4]**	**106**	**C**	**1)**	**6720**	**15400**	**19800**	**25600**	**36600**	**–**	**–**	**–**
					C	2)	6 030	14 700	18 500	24400	34 900	–	–	–
					C_0	**1)**	**7340**	**16500**	**21200**	**28900**	**49300**	**–**	**–**	**–**
					C_0	2)	6 230	15 300	19 100	26 900	45 800	–	–	–
		**SKS** **R1666[3]** **R2010[4]**	**58[3]** **99[4]**	**106**	**M_t**	**1)**	**65**	**200**	**280**	**440**	**790**	**–**	**–**	**–**
					M_t	2)	58	190	260	420	750	–	–	–
					M_{t0}	**1)**	**71**	**210**	**300**	**500**	**1060**	**–**	**–**	**–**
					M_{t0}	2)	60	200	270	470	980	–	–	–
					M_L	**1)**	**29**	**83**	**130**	**200**	**340**	**–**	**–**	**–**
					M_L	2)	27	81	120	200	330	–	–	–
					M_{L0}	**1)**	**32**	**89**	**140**	**230**	**460**	**–**	**–**	**–**
					M_{L0}	2)	28	84	130	220	430	–	–	–
		**FNN** **R1693[3][6][8]**	**64[3]**	**106[6]**	**C**	**1)**	**–**	**14500**	**28600**	**–**	**–**	**–**	**–**	**–**
					C_0	**1)**	–	**24400**	**35900**	**–**	**–**	**–**	**–**	**–**
		**SNN** **R1694[3][6][8]**	**68[3]**	**106[6]**	**M_t**	**1)**	**–**	**190**	**410**	**–**	**–**	**–**	**–**	**–**
					M_{t0}	**1)**	–	**310**	**510**	**–**	**–**	**–**	**–**	**–**
					M_L	**1)**	**–**	**100**	**290**	**–**	**–**	**–**	**–**	**–**
					M_{L0}	**1)**	–	**165**	**360**	**–**	**–**	**–**	**–**	**–**
		**FKN** **R1663[3][6][8]**	**66[3]**	**106[6]**	**C**	**1)**	**–**	**9600**	**19800**	**–**	**–**	**–**	**–**	**–**
					C_0	**1)**	–	**13600**	**21200**	**–**	**–**	**–**	**–**	**–**
		**SKN** **R1664[3][6][8]**	**70[3]**	**106[6]**	**M_t**	**1)**	**–**	**120**	**280**	**–**	**–**	**–**	**–**	**–**
					M_{t0}	**1)**	–	**170**	**300**	**–**	**–**	**–**	**–**	**–**
					M_L	**1)**	**–**	**40**	**130**	**–**	**–**	**–**	**–**	**–**
					M_{L0}	**1)**	–	**58**	**140**	**–**	**–**	**–**	**–**	**–**
Super Ball Runner Block made of steel[3] **Resist CR[6]**		**FKS** **1661[3][6]**	**88[3]**	**107[6]**	**C**	**1)**	**3900**	**10100**	**11400**	**15800**	**21100**	**–**	**–**	**–**
					F_{max}	**1)**	**1500**	**3900**	**4400**	**6100**	**8100**	**–**	**–**	**–**
		**SKS** **1662[3][6]**	**90[3]**	**107[6]**	**M_t**	**1)**	**39**	**130**	**170**	**270**	**450**	**–**	**–**	**–**
					M_{tmax}	**1)**	**15**	**50**	**65**	**105**	**175**	**–**	**–**	**–**

General technical data and calculations

Dynamic equivalent load on bearing

The determination of the dynamic equivalent load on bearing F_m for the calculation of the service life is implemented according to track ratios q_m according to formula (9).

$$(9)\quad F_m = \sqrt[3]{(F_{eff\,1})^3 \cdot \frac{q_{s1}}{100\ \%} + (F_{eff\,2})^3 \cdot \frac{q_{s2}}{100\ \%} + \ldots + (F_{eff\,n})^3 \cdot \frac{q_{sn}}{100\ \%}}$$

Equivalent static load on bearing

With a combined vertical and horizontal external static load in conjunction with a static torsional or longitudinal moment, calculate the static equivalent load on bearing $F_{0\,comb}$ according to formula (10).

$$(10)\quad F_{0\,comb} = |F_{0y}| + |F_{0z}| + C_0 \cdot \frac{|M_{0x}|}{M_{t0}} + C_0 \cdot \frac{|M_{0y}|}{M_{L0}} + C_0 \cdot \frac{|M_{0z}|}{M_{L0}}$$

Notes

The static equivalent load on bearing $F_{0\,comb}$ must not exceed the static load capacity C_0. Formula (10) only applies when using a single ball guide rail. Reduce an external load that affects the ball runner block at any angle to F_{0y} and F_{0z} and insert the amounts into formula (10).

Definitions and calculation for dynamic and static load ratios

Using the ratio of load rating to load of the ball runner blocks, you can make a preselection of the guideway. The dynamic loading ratio C/F_{max} and the static loading ratio $C_0/F_{0\,max}$ should be selected according to the application. The necessary load ratings are calculated from this. The load rating overview yields the corresponding dimensions and format.

Recommended values for load ratios

The table below contains guideline values for the load ratios. The values are offered merely as a rough guide reflecting typical customer requirements (e.g. service life, accuracy, rigidity) by sector and application.

Case 1: Static load $F_{0\,max} > F_{max}$:

$$\text{Dynamic ratio} = \frac{C}{F_{max}}$$

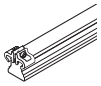
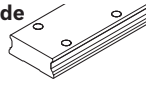
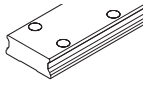
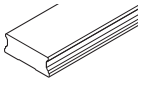
$$\text{Static ratio} = \frac{C_0}{F_{0\,max}}$$

Case 2: Static load $F_{0\,max} < F_{max}$:

$$\text{Static ratio} = \frac{C_0}{F_{max}}$$

Machine type/sector	Application example	C/Fmax	$C_0/F_{0\,max}$
Machine tools	**General**	6 ... 9	> 4
	Turning	6 ... 7	> 4
	Milling	6 ... 7	> 4
	Grinding	9 ... 10	> 4
	Engraving	5	> 3
Rubber and plastics processing machinery	**Injection molding**	8	> 2
Woodworking and wood processing machines	**Sawing, milling**	5	> 3
Area of mounting/handling technology and industrial robots	**Handling**	5	> 3
Oil hydraulics and pneumatics	**Lifting/lowering**	6	> 4

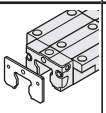
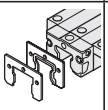
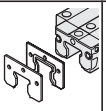
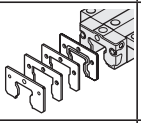
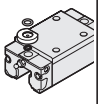
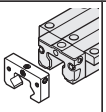
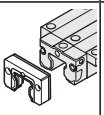
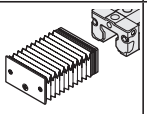
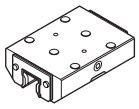
Design and version

Ball guide rails			Application area	Fastening type	Special feature
Standard ball guide rail made of steel		**SNS / SNO** **R1605 .3. ..** **R1605 .B. ..** **R1645 .3. ..**[2] **R2045 .3. ..**[1]	Standard version Very harsh environments Robust strip clamp	For mounting from above	With cover strip and strip clamp. A single cover for all holes. No end-face hole required for strip clamp.
		**SNS / SNO** **R1605 .6. ..** **R1605 .D. ..**	Harsh environments Compact strip clamp	For mounting from above	With cover strip and protective cap. A single cover for all holes.
		**SNS / SNO** **R1605 .0. ..** **R1605 .C. ..** **R1645 .0. ..**[2] **R2045 .0. ..**[1]	Inexpensive	For mounting from above	With plastic mounting hole plugs. No extra space required at rail ends.
		**SNS** **R1606 .5. ..**	More resistant to mechanical influences (e.g. shocks) Very harsh environments	For mounting from above	With steel mounting hole plugs. No extra space required at rail ends.
		**SNS** **R1607 .0. ..** **R1647 .0. ..**[2] **R2047 .0. ..**[1]	Easy access to the mounting base underside, best sealing action of end seals	For mounting from below	Use of larger screws than for mounting from above. Greater side loads permitted. No extra space required at rail ends.
Wide ball guide rails made of steel		**BNS** **R1675 .0. ..** **R1673 .0. ..**[2]	High moment rigidity	For mounting from above	With plastic mounting hole plugs. No extra space required at rail ends.
		**BNS** **R1676 .5. ..**	More moment rigidity, more resistant to mechanical influences (e.g. shocks) Very harsh environments	For mounting from above	With steel mounting hole plugs. No extra space required at rail ends.
		**BNS** **R1677 .0. ..**	High moment rigidity Best sealing action of end seals	For mounting from below	Use of larger screws than for mounting from above. Larger side loads are permitted than for the single-row series. No extra space required at rail ends.

1) Resist NR II
2) Resist CR

For short product names of the design styles, see the product description

Accessories

Accessories **Connection elements are available as options for the ball runner blocks**	**Application area**
Cover plate wiper 	The cover plate wiper is an additional element for wiping off coarse particles or dealing with contamination that has been deposited on the ball guide rail. When making your selection, please note whether the ball guide rail is used with or without cover strips.
Front seal Two-piece 	The front seal effectively prevents dirt, liquid or small particles from entering the ball runner block. This means that the sealing effect is improved even more. The two-part front seal can also be retrofitted via the ball guide rail.
FKM seal One and two-piece 	Better sealing effect than front seal but higher friction. Used for very heavy contamination, cooling lubricants or aggressive media. Chemical and temperature resistant.
Seal kit 	When using cover plate wiper and front seal simultaneously, the seal kit is recommended.
Lubrication adapter 	For oil and grease lubrication from above for SNH and SLH ball runner blocks (high versions).
Lubrication plate 	Enables further variations for lubrication of ball runner blocks; Available for lube connection with metric thread or pipe thread.
Front lube unit 	For applications requiring very long relubrication intervals. They allow travel distances of up to 25,000 km without relubrication under normal loads. The function is only assured where there is no exposure to liquids and little contamination. The maximum operating temperature is 60 °C.
Bellows 	Bellows are available in various versions, with or without lubrication plate. Bellows in heat-resistant design are metalized on one side and are therefore not flammable, resistant to sparks, welding spatter or hot chips. Temperature stability briefly up to 200 °C and operating temperature of 80 °C possible.
Clamping and braking units 	Clamping elements can be used to secure the ball rail system against displacement in the static state. With braking units, the ball rail system can be braked in the dynamic state and secured against displacement in the resting state. The following versions are available: Hydraulic, pneumatic and manual clamping units.

System preload

Definition of preload

Ball Runner Blocks can be preloaded to increase rigidity. The internal preload forces that occur in this connection must be considered in the life expectancy calculation. You can choose the preload class to match the area of application. Refer to the table for preload force F_{pr} .

Example

- Area of application: Precise guide systems with low external load and high overall rigidity requirements. This results in preload class C1.
- Selected ball runner block FNS R1651 314 20
- The selected ball runner block yields a preload force F_{pr} according to the table.
- It is installed at 840 N internal preload force F_{pr}.

Code	Preload	Application area
C0[1)]	**Without preload (clearance)**	For particularly smooth-running guide systems with the lowest possible friction for applications with large installation tolerances. Clearance versions are available only in accuracy classes N and H.
C1	**Moderate preload**	For precise guide systems with low external loads and high demands on overall rigidity.
C2	**Medium preload**	For precise guide systems with both high external loading and high demands on overall rigidity; also recommended for single-rail systems. Above average moment loads can be absorbed without significant elastic deflection. Further improved overall rigidity with only medium moment loads.
C3	**High preload**	For highly rigid guide systems, e.g. precision tooling machines etc. Above-average loads and moments are caught with the lowest possible elastic deformation. Ball runner blocks with preload C3 only available in accuracy classes UP, SP and XP, heavy duty ball runner blocks only available in UP, SP and P.

1) In the case of ball runner blocks without preload (preload class C0), there is a clearance between the ball runner block and the rail of 1 to 10 μm. When using two rails and more than one ball runner block per guide rail, this clearance is usually equalized by parallelism tolerances.

Highlights of the ball runner blocks BSHP

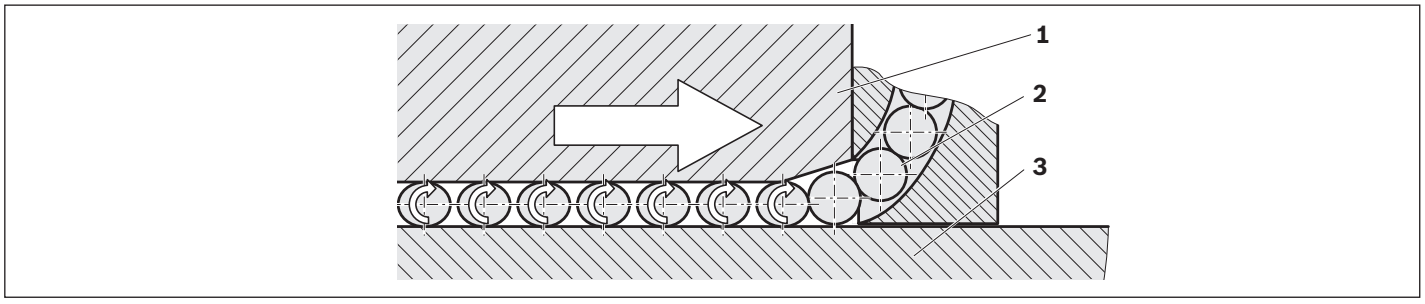
- Further increased travel accuracy up to a factor of six
- Significantly reduced frictional oscillations and low friction force level, particularly under external load
- Maximum precision
- Selected qualities
- Minimum quantity preservation in the accuracy classes XP; SP; UP.
  (Impairment of the environment is reduced by the preserving agent)
- Patented entry zone increases the sequence accuracy
- All other advantages of Rexroth precision ball runner blocks integrated

Comparison

Conventional ball runner blocks

If the ball runner block comprises of a conventional entry zone, this may only be designed for a specific load point.

Entry-zone geometry for conventional ball runner blocks



1) Ball runner blocks **2)** Ball **3)** Ball guide rail

Ball entry

- The balls are guided up to the start of the entry zone via the roller deflection.
- If the distance between the ball runner block (1) and the ball guide rail (3) is smaller than the ball diameter, the ball (2) is put under load (preload) in pulses.
- The preload is increased in the entry zone and reaches its maximum in the load bearing zone. By doing so, the ball transmits its force from the ball runner block to the ball guide rail.
- Due to the kinematic and geometric relations, a distance between the individual balls is set.

Entry zone

The conventional ball runner blocks comprise of a fix entry zone. The depth of the entry zone shall be suitable for a high load, since a fault-free ball entry is to be guaranteed under very high loads, as well.

- On the one hand, as many load-bearing balls as possible should be in the ball runner block in order to reach an ideal load-carrying capacity.
  ⇒ Entry zone as short as possible
- On the other hand, the load during the entry of the balls should be increased as slowly as possible and thus in a harmonic manner in order to reach the maximum of the geometric travel accuracy.
  ⇒ Entry zone which is as flat (long) as possible

There is a conflict of aims between short and long entry zones.

Product description

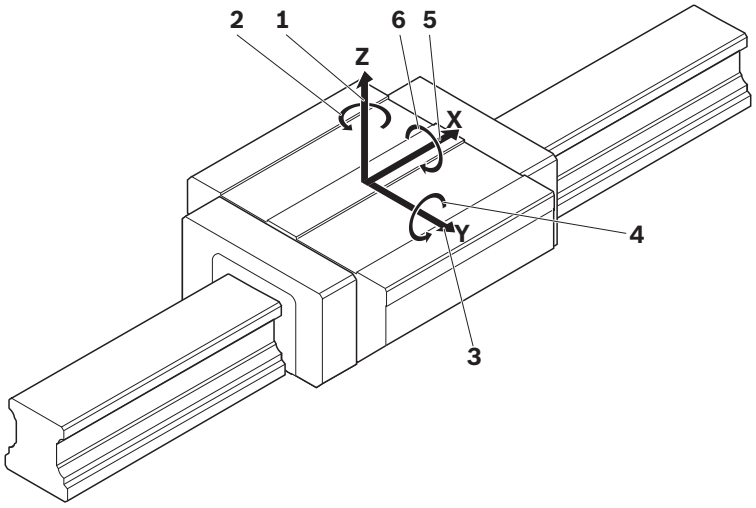
Travel accuracy

Definition

In an ideal case, a ball runner block moves transitively in relation to the x-axis over the ball guide rail. In practice, however, deviations occur in all six degrees of freedom. The term travel accuracy describes the deviation from this ideal line.

Six different degrees of freedom

1 Height deviation (linear deviation in Z)
2 Yaw (rotary motion around Z)
3 Side deviation (linear deviation in Y)
4 Pitching (rotary motion around Y)
5 Translation (linear movement in X)
6 Rollers (rotary motion around x)



Causes of travel inaccuracy

The Travel inaccuracy is impacted by the following points.
1. Inaccurate mounting base on which the ball guide rail is mounted.
2. Parallelism error between the contact areas of the ball guide rail and the running tracks.
3. Elastic deformations of the ball guide rail by the mounting screws.
4. Accuracy fluctuations caused by the balls entering and exiting.

Potential for optimization

With respect to 1: Contact surfaces of the ball guide rail should be produced as precisely as possible (outside of the scope of influence of Rexroth).
With respect to 2: Any deviation should be equalized by the selection of the accuracy class of the ball guide rail.
With respect to 3: Reduce the tightening torque. The tightening torque of the fastening screws has a proportional impact. A reduction of the tightening torque decreases the compressive strain of the rail material.
⇒ Lower geometric process fluctuations
With respect to 4: The patented, innovative entry zone of Rexroth - High-precision Ball Runner Blocks reduces the speed fluctuations to a minimum.

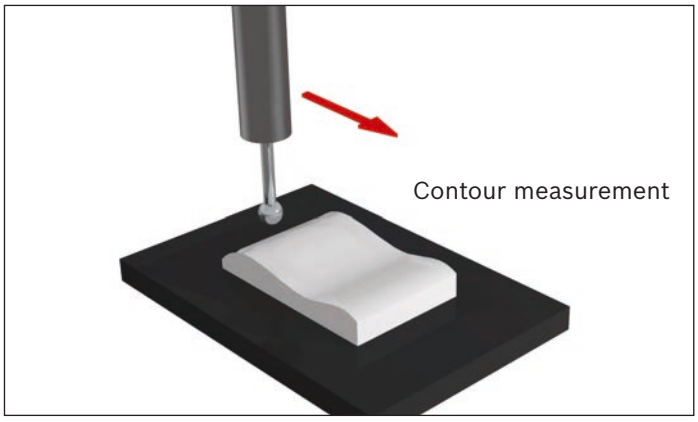
⚠ With this measure, the transferable forces and moments can be reduced.

Further potential for improvement:
- ▶ Use of long ball runner blocks
- ▶ Installation of additional ball runner blocks per ball guide rail.

Application examples

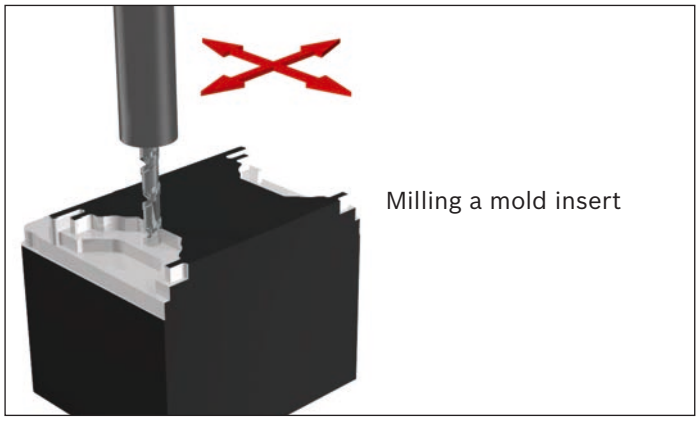
Rexroth high-precision ball runner blocks are particularly suited for the following applications:

Measuring



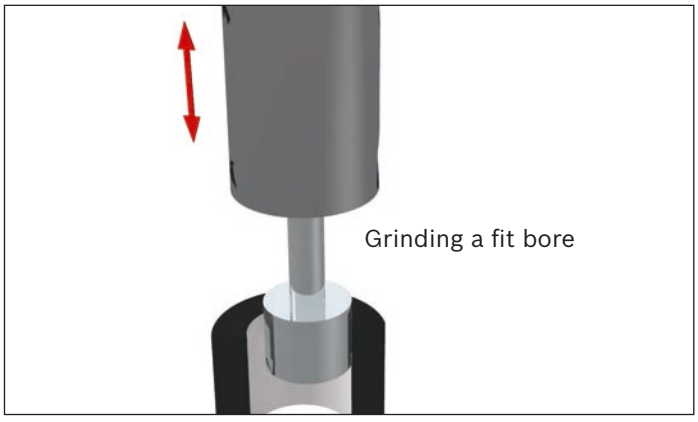
3D Coordinate Measuring Machine

Milling



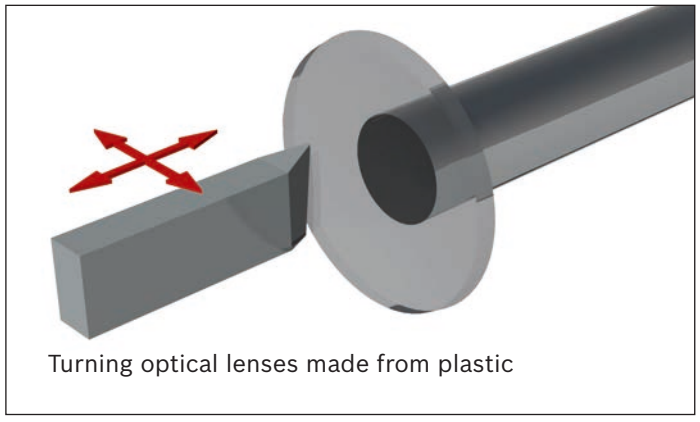
Hard milling

Grinding



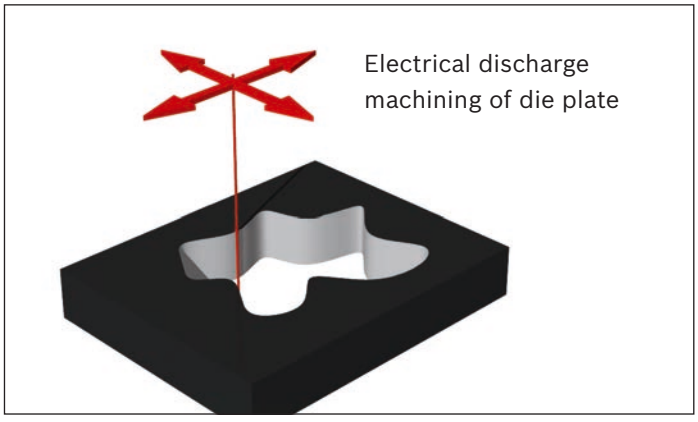
Internal cylindrical grinding

Turning



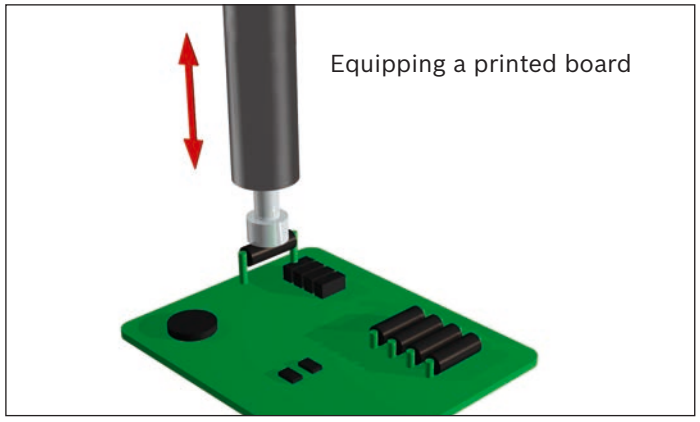
High-precision turning

Electrical discharge machining



Wire electrical discharge machining

Microelectronics



Printed board mounting machine

These are only a few examples. Naturally, other applications can be realized. Feel free to ask any questions that you may have. We have an appropriate solution.

Overview of formats

Standard ball runner blocks[1] BSHP up to size 45

FNS

FLS

FKS

SNS

SLS

SKS

SNH

SLH

FNN[2]

FKN[2]

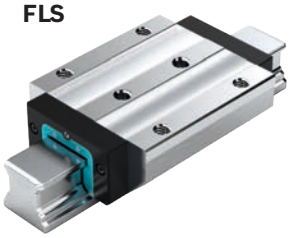
SNN[2]

SKN[2]

Heavy-duty ball runner blocks[2] BSHP from size 55

FNS

FLS



SNS

SLS

SNH

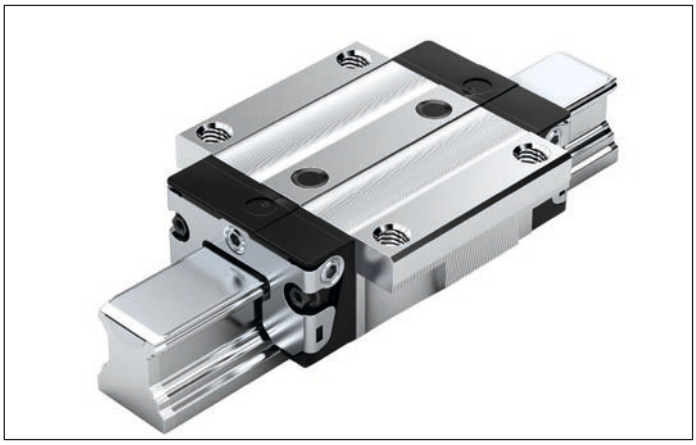
SLH

Ball chain (optional)

- Optimized noise level

1) With ball chain
2) Without ball chain

FNS – Flanged, normal, standard height R1651 ... 2.



Dynamic characteristics

Travel speed: v_{max} = 5 m/s

Acceleration: a_{max} = 500 m/s²

(If $F_{comb} > 2.8 \cdot F_{pr}$: a_{max} = 50 m/s²)

Note on lubrication

- Pre-lubricated

Note

Can be used on all SNS/SNO ball guide rails. Ball runner blocks of size 55 and size 65 can be found in chapter “Heavy-duty ball runner block BSHP made of steel” after this chapter.

Options and material numbers

Size	Ball runner blocks with size	Preload class				Accuracy class						Seals on ball runner blocks					
												without ball chain			with ball chain		
		C0	C1	C2	C3	N	H	P	XP	SP	UP	SS	LS[1)]	DS	SS	LS[1)]	DS
15	R1651 1	9				4	3	–	–	–	–	20	21	–	22	23	–
			1			4	3	2	8	1	9	20	21	2Z	22	23	2Y
				2		–	3	2	8	1	9	20	21	2Z	22	23	2Y
					3	–	–	–	8	1	9	20	21	2Z	22	23	2Y
20	R1651 8	9				4	3	–	–	–	–	20	21	–	22	23	–
			1			4	3	2	8	1	9	20	21	2Z	22	23	2Y
				2		–	3	2	8	1	9	20	21	2Z	22	23	2Y
					3	–	–	–	8	1	9	20	21	2Z	22	23	2Y
25	R1651 2	9				4	3	–	–	–	–	20	21	–	22	23	–
			1			4	3	2	8	1	9	20	21	2Z	22	23	2Y
				2		–	3	2	8	1	9	20	21	2Z	22	23	2Y
					3	–	–	–	8	1	9	20	21	2Z	22	23	2Y
30	R1651 7	9				4	3	–	–	–	–	20	21	–	22	23	–
			1			4	3	2	8	1	9	20	21	2Z	22	23	2Y
				2		–	3	2	8	1	9	20	21	2Z	22	23	2Y
					3	–	–	–	8	1	9	20	21	2Z	22	23	2Y
35	R1651 3	9				4	3	–	–	–	–	20	21	–	22	23	–
			1			4	3	2	8	1	9	20	21	2Z	22	23	2Y
				2		–	3	2	8	1	9	20	21	2Z	22	23	2Y
					3	–	–	–	8	1	9	20	21	2Z	22	23	2Y
45	R1651 4	9				4	3	–	–	–	–	20	–	–	22	–	–
			1			4	3	2	8	1	9	20	–	2Z	22	–	2Y
				2		–	3	2	8	1	9	20	–	2Z	22	–	2Y
					3	–	–	–	8	1	9	20	–	2Z	22	–	2Y
E.g.:	R1651 7		1				3					20					

1) Only for accuracy classes N and H and for XP in preload class C1.

Order example

Options:

- Ball runner blocks FNS
- Size 30
- Preload class C1
- Accuracy class H
- With standard seal, without ball chain

Material number:

R1651 713 20

Preload classes

C0 = Without preload (clearance)
C1 = Moderate preload
C2 = Average preload
C3 = High preload

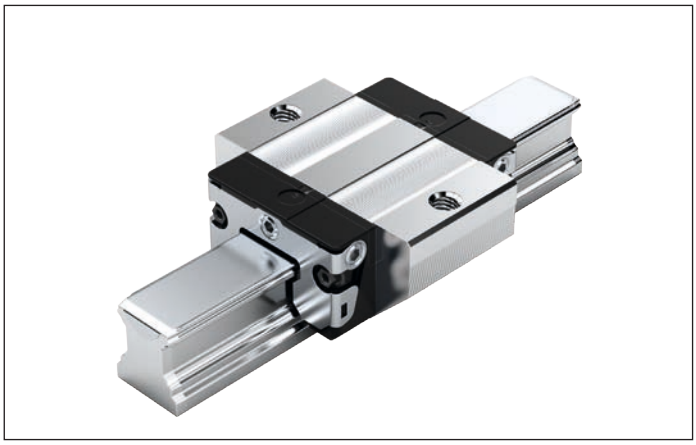
Seals

SS = Standard seal
LS = Low-friction seal
DS = Double-lip seal

Key

gray numbers
= No preferred variant / combination
(partially longer delivery times)

FKS – flange, short, standard height R1665 ... 2.



Dynamic characteristics

Travel speed: v_{max} = 5 m/s

Acceleration: a_{max} = 500 m/s²

(If $F_{comb} > 2.8 \cdot F_{pr}$: a_{max} = 50 m/s²)

Note on lubrication

- Pre-lubricated

Note

Can be used on all SNS/SNO ball guide rails.

Options and material numbers

Size	Ball runner blocks with size	Preload class		Accuracy class		Seals on ball runner blocks					
						without ball chain			with ball chain		
		C0	C1	N	H	SS	LS	DS	SS	LS	DS
15	R1665 1	9		4	3	20	21	–	22	23	–
			1	4	3	20	21	2Z	22	23	2Y
20	R1665 8	9		4	3	20	21	–	22	23	–
			1	4	3	20	21	2Z	22	23	2Y
25	R1665 2	9		4	3	20	21	–	22	23	–
			1	4	3	20	21	2Z	22	23	2Y
30	R1665 7	9		4	3	20	21	–	22	23	–
			1	4	3	20	21	2Z	22	23	2Y
35	R1665 3	9		4	3	20	21	–	22	23	–
			1	4	3	20	21	2Z	22	23	2Y
E.g.:	R1665 7		1		3	20					

Order example

Options:

- Ball runner blocks FKS
- Size 30
- Preload class C1
- Accuracy class H
- With standard seal, without ball chain

Material number:

R1665 713 20

Preload classes

C0 = Without preload (clearance)
C1 = Moderate preload

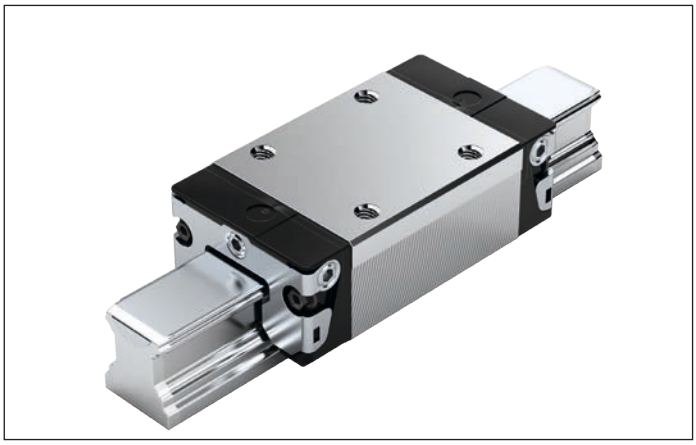
Seals

SS = Standard seal
LS = Low-friction seal
DS = Double-lip seal

Key

gray numbers
= No preferred variant / combination
(partially longer delivery times)

SNS – Slimline, normal, standard height R1622 ... 2.



Dynamic characteristics

Travel speed: v_{max} = 5 m/s

Acceleration: a_{max} = 500 m/s²

(If $F_{comb} > 2.8 \cdot F_{pr}$: a_{max} = 50 m/s²)

Note on lubrication

- Pre-lubricated

Note

Can be used on all SNS/SNO ball guide rails. Ball runner blocks of size 55 and size 65 can be found in chapter “Heavy-duty ball runner block BSHP made of steel” after this chapter.

Options and material numbers

Size	Ball runner blocks with size	Preload class				Accuracy class				Seals on ball runner blocks					
										without ball chain			with ball chain		
		C0	C1	C2	C3	N	H	P	XP	SS	LS[1)]	DS	SS	LS[1)]	DS
15	R1622 1	9				4	3	–	–	20	21	–	22	23	–
			1			4	3	2	8	20	21	2Z	22	23	2Y
				2		–	3	2	8	20	21	2Z	22	23	2Y
					3	–	–	–	8	20	21	2Z	22	23	2Y
20	R1622 8	9				4	3	–	–	20	21	–	22	23	–
			1			4	3	2	8	20	21	2Z	22	23	2Y
				2		–	3	2	8	20	21	2Z	22	23	2Y
					3	–	–	–	8	20	21	2Z	22	23	2Y
25	R1622 2	9				4	3	–	–	20	21	–	22	23	–
			1			4	3	2	8	20	21	2Z	22	23	2Y
				2		–	3	2	8	20	21	2Z	22	23	2Y
					3	–	–	–	8	20	21	2Z	22	23	2Y
30	R1622 7	9				4	3	–	–	20	21	–	22	23	–
			1			4	3	2	8	20	21	2Z	22	23	2Y
				2		–	3	2	8	20	21	2Z	22	23	2Y
					3	–	–	–	8	20	21	2Z	22	23	2Y
35	R1622 3	9				4	3	–	–	20	21	–	22	23	–
			1			4	3	2	8	20	21	2Z	22	23	2Y
				2		–	3	2	8	20	21	2Z	22	23	2Y
					3	–	–	–	8	20	21	2Z	22	23	2Y
45	R1622 4	9				4	3	–	–	20	–	–	22	–	–
			1			4	3	2	8	20	–	2Z	22	–	2Y
				2		–	3	2	8	20	–	2Z	22	–	2Y
					3	–	–	–	8	20	–	2Z	22	–	2Y
E.g.:	R1622 7		1				3			20					

1) Only for accuracy classes N and H and for XP in preload class C1.

Order example

Options:

- Ball runner blocks SNS
- Size 30
- Preload class C1
- Accuracy class H
- With standard seal, without ball chain

Material number:

R1622 713 20

Preload classes

C0 = Without preload (clearance)
C1 = Moderate preload
C2 = Average preload
C3 = High preload

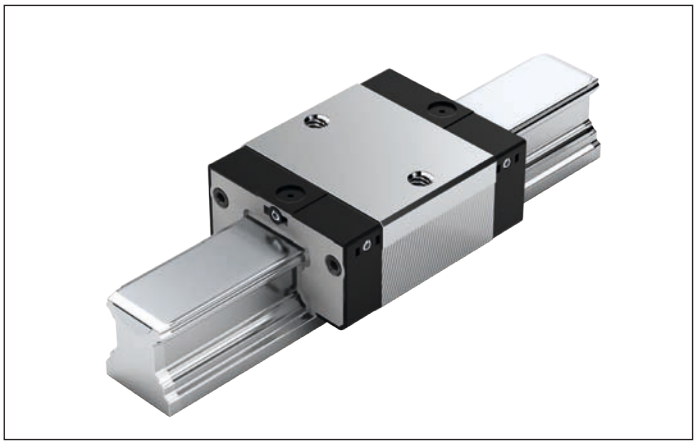
Seals

SS = Standard seal
LS = Low-friction seal
DS = Double-lip seal

Key

gray numbers
= No preferred variant / combination
(partially longer delivery times)

SKN – Slimline, short, low R1664 … 1.



Dynamic characteristics

Travel speed: v_{max} = 3 m/s

Acceleration: a_{max} = 250 m/s²

(If $F_{comb} > 2.8 \cdot F_{pr}$: a_{max} = 50 m/s²)

Note on lubrication

- No initial lubrication

Note

Can be used on all SNS/SNO ball guide rails.

Options and material numbers

Size	Ball runner blocks with size	Preload class		Accuracy class		Seals on ball runner blocks without ball chain	
		C0	C1	N	H	SS	LS
20	R1664 8	9	1	4	3	10	11
25[1)]	R1664 2	9	1	4	3	10	11
E.g.:	R1664 8		1		3	10	

1) BSHP ball runner block

Order example

Options:

- Ball runner block SKN
- Size 20
- Preload class C1
- Accuracy class H
- With standard seal, without ball chain

Material number:

R1664 813 10

Preload classes

C0 = Without preload (clearance)

C1 = Moderate preload

Seals

SS = Standard seal

LS = Low-friction seal

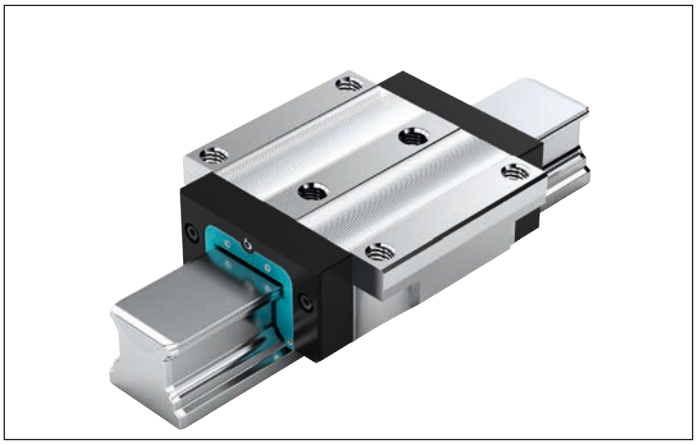
Key

gray numbers

= No preferred variant / combination

(partially longer delivery times)

FNS – flanged, normal, standard height, R1651 ... 1.



Dynamic characteristics

Travel speed: v_{max} = 3 m/s

Acceleration: a_{max} = 250 m/s²

(If $F_{comb} > 2.8 \cdot F_{pr}$: a_{max} = 50 m/s²)

Note on lubrication

- No initial lubrication

Note

Can be used on all SNS ball guide rails.

Options and material numbers

Size	Ball runner blocks with size	Preload class				Accuracy class					Seals on ball runner blocks without ball chain
		C0	C1	C2	C3	N	H	P	SP	UP	SS
55	R1651 5	9				4	3	–	–	–	10
			1			4	3	2	1	9	10
				2		–	3	2	1	9	10
					3	–	–	2	1	9	10
65	R1651 6	9				4	3	–	–	–	10
			1			4	3	2	1	9	10
				2		–	3	2	1	9	10
					3	–	–	2	1	9	10
E.g.:	R1651 5		1				3				10

Order example

Options:

- Ball runner blocks FNS
- Size 55
- Preload class C1
- Accuracy class H
- With standard seal, without ball chain

Material number:

R1651 513 10

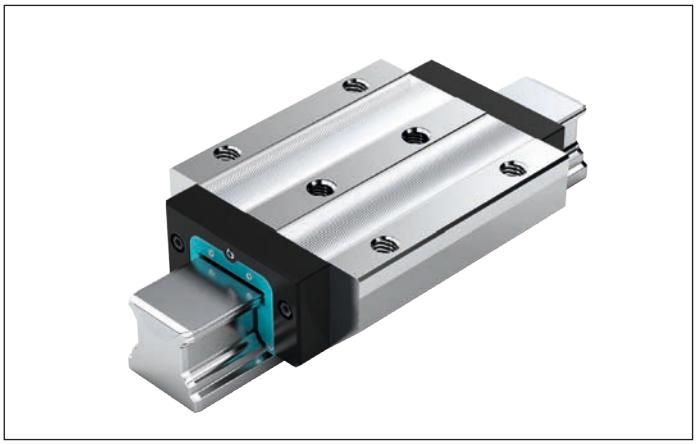
Preload classes

C0 = Without preload (clearance)
C1 = Moderate preload
C2 = Average preload
C3 = High preload

Seals

SS = Standard seal

FLS – flanged, long, standard height, R1653 ... 1.



Dynamic characteristics

Travel speed: v_{max} = 3 m/s

Acceleration: a_{max} = 250 m/s²

(If $F_{comb} > 2.8 \cdot F_{pr}$: a_{max} = 50 m/s²)

Note on lubrication

- No initial lubrication

Note

Can be used on all SNS ball guide rails.

Options and material numbers

Size	Ball runner blocks with size	Preload class				Accuracy class					Seals on ball runner blocks without ball chain
		C0	C1	C2	C3	N	H	P	SP	UP	SS
55	R1653 5	9				4	3	–	–	–	10
			1			4	3	2	1	9	10
				2		–	3	2	1	9	10
					3	–	–	2	1	9	10
65	R1653 6	9				4	3	–	–	–	10
			1			4	3	2	1	9	10
				2		–	3	2	1	9	10
					3	–	–	2	1	9	10
E.g.:	R1653 5		1				3				10

Order example

Options:

- Ball runner blocks FLS
- Size 55
- Preload class C1
- Accuracy class H
- With standard seal, without ball chain

Material number:

R1653 513 10

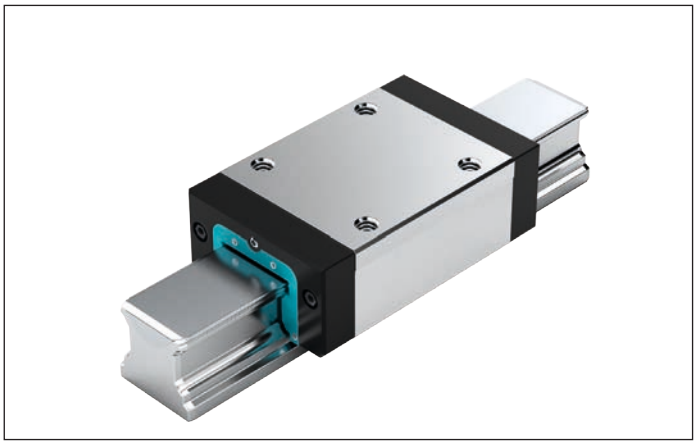
Preload classes

C0 = Without preload (clearance)
C1 = Moderate preload
C2 = Average preload
C3 = High preload

Seals

SS = Standard seal

SNS – Slimline, normal, standard height, R1622...1.



Dynamic characteristics

Travel speed: v_{max} = 3 m/s

Acceleration: a_{max} = 250 m/s²

(If $F_{comb} > 2.8 \cdot F_{pr}$: a_{max} = 50 m/s²)

Note on lubrication

- No initial lubrication

Note

Can be used on all SNS ball guide rails.

Options and material numbers

Size	Ball runner blocks with size	Preload class				Accuracy class			Seals on ball runner blocks without ball chain
		C0	C1	C2	C3	N	H	P	SS
55	R1622 5	9				4	3	–	10
			1			4	3	2	10
				2		–	3	2	10
					3	–	–	2	10
65	R1622 6	9				4	3	–	10
			1			4	3	2	10
				2		–	3	2	10
					3	–	–	2	10
E.g.:	R1622 5		1				3		10

Order example

Options:

- Ball runner blocks SNS
- Size 55
- Preload class C1
- Accuracy class H
- With standard seal, without ball chain

Material number:

R1622 513 10

Preload classes

C0 = Without preload (clearance)
C1 = Moderate preload
C2 = Average preload
C3 = High preload

Seals

SS = Standard seal

Size	Ball runner blocks with size	Preload class			Accuracy class			Seals on ball runner blocks						Mass (kg)	Load ratings[2] (N)		Load moments[2] (Nm)			
								without ball chain			with ball chain									
		C0	C1	C2	N	H	P	SS	LS[1]	DS	SS	LS[1]	DS	m	C	C_0	M_t	M_{t0}	M_L	M_{L0}
SNS																				
15	R2011 1	9			4	3	–	04	05	–	06	07	–	0.15	5100	9300	63	90	34	49
			1		4	3	2	04	05	0X	06	07	0W							
				2	–	3	2	04	–	0X	06	–	0W							
20	R2011 8	9			4	3	–	04	05	–	06	07	–	0.35	12300	16900	205	215	110	115
			1		4	3	2	04	05	0X	06	07	0W							
				2	–	3	2	04	–	0X	06	–	0W							
25	R2011 2	9			4	3	–	04	05	–	06	07	–	0.50	15000	21000	270	295	150	165
			1		4	3	2	04	05	0X	06	07	0W							
				2	–	3	2	04	–	0X	06	–	0W							
30	R2011 7	9			4	3	–	04	05	–	06	07	–	0.85	20800	28700	460	500	245	265
			1		4	3	2	04	05	0X	06	07	0W							
				2	–	3	2	04	–	0X	06	–	0W							
35	R2011 3	9			4	3	–	04	05	–	06	07	–	1.25	27600	37500	760	805	375	390
			1		4	3	2	04	05	0X	06	07	0W							
				2	–	3	2	04	–	0X	06	–	0W							
SLS																				
15	R2012 1	9			4	3	–	04	05	–	06	07	–	0.20	8500	14000	82	132	64	104
			1		4	3	2	04	05	0X	06	07	0W							
				2	–	3	2	04	–	0X	06	–	0W							
20	R2012 8	9			4	3	–	04	05	–	06	07	–	0.45	16000	24400	265	310	190	230
			1		4	3	2	04	05	0X	06	07	0W							
				2	–	3	2	04	–	0X	06	–	0W							
25	R2012 2	9			4	3	–	04	05	–	06	07	–	0.65	20000	31600	365	450	290	350
			1		4	3	2	04	05	0X	06	07	0W							
				2	–	3	2	04	–	0X	06	–	0W							
30	R2012 7	9			4	3	–	04	05	–	06	07	–	1.10	26300	40100	590	695	420	495
			1		4	3	2	04	05	0X	06	07	0W							
				2	–	3	2	04	–	0X	06	–	0W							
35	R2012 3	9			4	3	–	04	05	–	06	07	–	1.70	36500	56200	1 025	1210	710	840
			1		4	3	2	04	05	0X	06	07	0W							
				2	–	3	2	04	–	0X	06	–	0W							
SKS																				
15	R2010 1	9			4	3	–	04	05	–	06	07	–	0.10	4500	5600	44	55	16	19
			1		4	3	–	04	05	0X	06	07	0W							
				–	–	–	–	–	–	–	–	–	–							
20	R2010 8	9			4	3	–	04	05	–	06	07	–	0.25	8200	9400	125	115	45	40
			1		4	3	–	04	05	0X	06	07	0W							
				–	–	–	–	–	–	–	–	–	–							
25	R2010 2	9			4	3	–	04	05	–	06	07	–	0.35	10500	12600	195	180	70	65
			1		4	3	–	04	05	0X	06	07	0W							
				–	–	–	–	–	–	–	–	–	–							
30	R2010 7	9			4	3	–	04	05	–	06	07	–	0.60	14500	17200	320	295	110	105
			1		4	3	–	04	05	0X	06	07	0W							
				–	–	–	–	–	–	–	–	–	–							
35	R2010 3	9			4	3	–	04	05	–	06	07	–	0.90	19300	22400	545	485	170	150
			1		4	3	–	04	05	0X	06	07	0W							
				–	–	–	–	–	–	–	–	–	–							
E.g.:	R2010 7		1			3		04												

1) Only for accuracy classes N and H

2) Load ratings and load moments for ball runner block **without** ball chain. Load ratings and load moments for ball runner block **with** ball chain ☞ 14
Determination of the dynamic load capacities and load moments is based on a stroke travel of 100,000 m according to DIN ISO 14728-1. Often only 50,000 m are actually stipulated. For comparison: Multiply the values **C**, $\mathbf{M}_t$ and $\mathbf{M}_L$ by 1.26 according to the table.

Note

Dimensions, dimensional drawing see standard ball runner block BSHP

Product description

General notes on the Resist CR ball runner block

- For material numbers, please refer to the following pages.
- Dimensions, dimensional drawing, dynamic characteristics, load ratings, rigidity and moments see corresponding standard ball runner blocks made of steel
- Steel ball runner block body with corrosion resistant coating, matte-silver finish, hard chrome plated.
- Pre-lubricated

For ball runner blocks and ball guide rails Resist CR, matte-silver, hard chrome plated, deviating tolerances of the dimensions H and A_3 are to be observed (see “Accuracy classes and their tolerances”).

Recommended ball runner blocks for Resist CR ball guide rails of accuracy class H and preload class C0 and C1

Recommended ball runner blocks
Sizes 15 – 65
- Accuracy class H
- Preload class C0

Recommended ball runner blocks
Sizes 30 – 65
- Accuracy class H
- Preload class C1

Definition of the format of ball runner blocks

Criterion	Designation	Code (example)		
		F	**N**	**S**
Width	Flange **(F)**	F		
	Slimline **(S)**	S		
	Wide (B)	B		
	Compact (C)	C		
Length	Normal **(N)**		N	
	Long **(L)**		L	
	Short **(K)**		K	
Height	Standard height **(S)**			S
	High **(H)**			H
	Low **(N)**			N

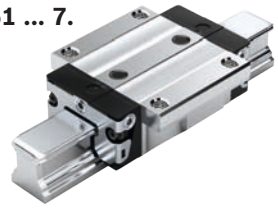
Ball chain (optional)

- Optimized noise level

Overview of formats

Standard ball runner blocks[1] BSHP up to size 45

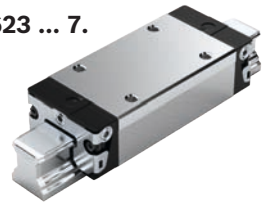
FNS
R1651 ... 7.



FLS
R1653 ... 7.

SNS
R1622 ... 7.

SLS
R1623 ... 7.



SNH
R1621 ... 7.

SLH
R1624 ... 7.

FNN
R1693 ... 6.[2]

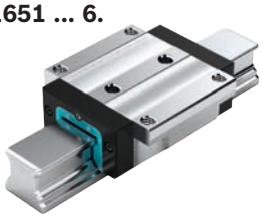
FKN
R1663 ... 6.[2]

SNN
R1694 ... 6.[2]

SKN
R1664 ... 6.[2]

Heavy-duty ball runner blocks[2] BSHP from size 55

FNS
R1651 ... 6.



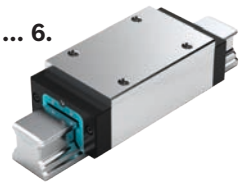
FLS
R1653 ... 6.

SNS
R1622 ... 6.

SLS
R1623 ... 6.

SNH
R1621 ... 6.

SLH
R1624 ... 6.



Super ball runner blocks[2]

FKS
R1661 ... 7.

SKS
R1662 ... 7.

1) With ball chain
2) Without ball chain