Electric Drives and Controls | Hydraulics | Linear Motion and Assembly Technologies | Pneumatics | Service

Rexroth
Bosch Group

Ball Rail Systems

R310EN 2202 (2009.06)

The Drive & Control Company

Contents

General Product Description

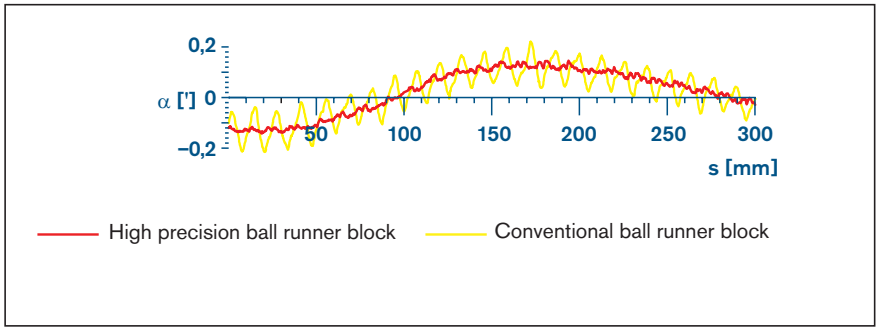
New Features at a Glance

Double-Lipped Seal (DS) for Ball Runner Blocks
For applications where the Ball Rail Systems are exposed to high levels of contamination such as metal chips, wood dust, metalworking fluids, etc.

For details, ☞ 29

High precision ball runner blocks, steel version
Ball runner blocks now with even better travel accuracy.
Frictional drag variation and frictional drag levels have been reduced still further.

For details, ☞ 72



Super Ball Runner Blocks, steel version, with new recirculation geometry
Available in design styles:
– FKS – Flanged, short, standard height
– SKS – Slimline, short, standard height

For details, ☞ 88

Ball Guide Rails for use on cast mineral parts
Ball guide rails with flat bases make it easier to position the ball guide rail on mounting bases made of cast and ground mineral materials with cast-in metallic threaded anchors.
A 50 percent larger contact area results in a lower surface pressure between the ball guide rail and the shaped contact surface of the cast mineral part.
These rails can also be used in standard applications.
Sizes 25 – 45 available on request.

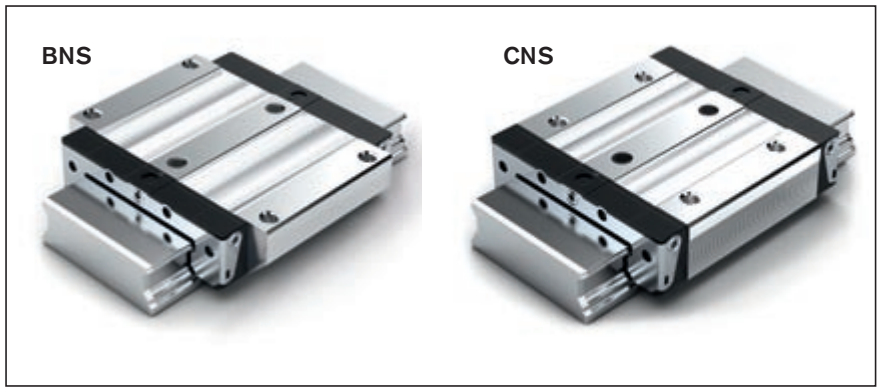
For details, ☞ 122 – 127

V-Guide Rails for simplified mounting
The V-guide rail has no mounting holes. It is installed by press-fitting it into mounting base.
The mating cavity for the rail can be produced using a standard contour milling machine. It is not necessary to drill any holes.

For details, ☞ 136

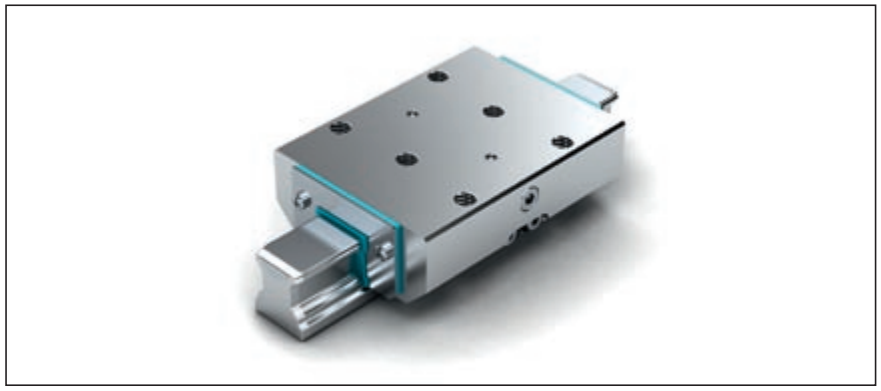
Wide Runner Blocks BNS and CNS with new recirculation geometry and with optional ball chain
Available in sizes:
– 20/40
– 25/70

For details, ☞ 140



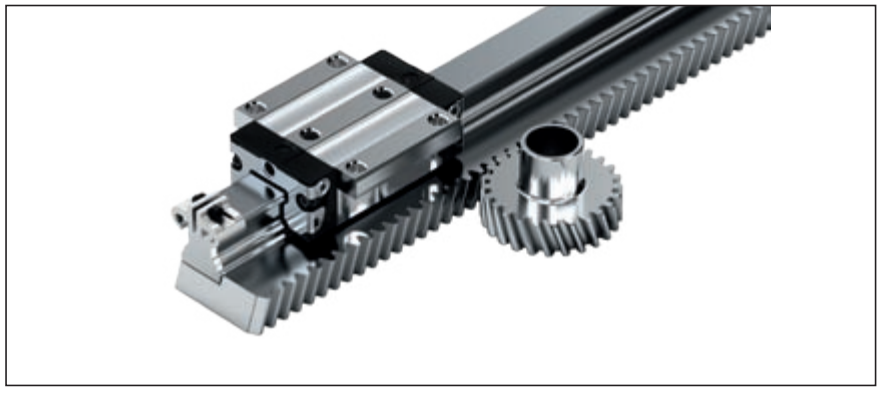
Clamping and Braking Units

For details, ☞ 182



Rack and pinion drives for Ball Runner Blocks

For details, ☞ 218



General Product Description

Product Description

Characteristic features

Make up your own compact linear motion guideways from interchangeable standard stock elements...

Rexroth manufactures its ball guide rails and ball runner blocks with such high precision, especially in the running track zone, that each individual component element can be replaced by another at any time.
This makes infinite combinations possible within each accuracy class.
And it enables a high standard of logistics that are unique worldwide.
Each element can be individually ordered and separately stocked. Both sides of the guide rail can be used as reference edges.

Highlights

- Same load capability in all four main load directions
- Very low noise level and best travel performance
- Excellent dynamic characteristics:
  Travel speed: v_{max} up to 10 m/s
  Acceleration: $a_{max} = 500$ m/s^{22}
- Long-term lubrication, up to several years
- Minimum quantity lubrication system with integrated reservoir for oil lubrication[1)]
- Lube ports with metal threads on all sides[1)]
- Limitless interchangeability; all guide rail versions can be combined with all runner block versions
- Optimum system rigidity through preloaded O-arrangement
- Optimum installation error compensation with Super runner block
- 60% weight saving with aluminum runner block (compared to the steel version)

Further highlights

- Interchangeability with Rexroth's Roller Rail Systems and eLINE Ball Rail Systems
- Integrated, inductive and wear-free measuring system as an option
- Extensive range of accessories
- Attachments can be bolted to ball runner blocks from above or below[1)]
- Improved rigidity under lift-off and side loading conditions when additional mounting screws are used in the two holes provided at the center of the runner block[1)]
- Mounting threads provided on end faces for fixing of all add-on elements
- High rigidity in all load directions – permits applications with just one runner block per rail
- Integrated all-round sealing
- High torque load capacity
- Optimized entry-zone geometry and high number of balls per track minimizes variation in elastic deflection
- Smooth, light running thanks to optimized ball recirculation and ball or ball chain guidance
- Various preload classes

Corrosion protection (optional)[1)]
- Resist NR: Ball runner block body made of corrosion-resistant steel per EN 10088
- Resist NR II: Ball runner block body, ball guide rail and all steel parts made from corrosion-resistant steel per EN 10088
- Resist CR: Ball runner block body and ball guide rail made of steel with matte-silver hard-chrome plated corrosion-resistant coating

1) depends on type

Codes for design styles of all the available ball runner blocks and ball guide rails

FNS = Flanged, normal, standard height
FLS = Flanged, long, standard height
FKS = Flanged, short, standard height
FNN = Flanged, normal, low profile
FKN = Flanged, short, low profile

SNS = Slimline, normal, standard height
SLS = Slimline, long, standard height
SKS = Slimline, short, standard height
SNH = Slimline, normal, high
SLH = Slimline, long, high
SNN = Slimline, normal, low profile
SKN = Slimline, short, low profile

BNS = Wide, normal, standard height
CNS = Compact, normal, standard height

Definition Ball Runner Block design style[2)]		Code (example) F	N	S
Width	**F**langed	**F**		
	Slimline			
	Wide			
	Compact			
Length	**N**ormal		**N**	
	Long			
	Short			
Height	**S**tandard height			**S**
	High			
	Low			

2) For each ball runner block and ball guide rail type, any design styles that are not available will be indicated in gray lettering.

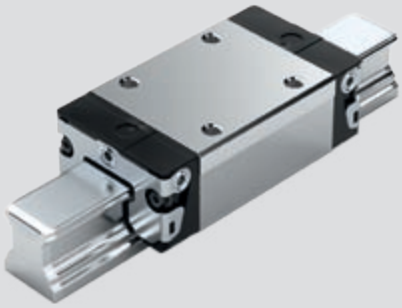
Definition Ball Guide Rail design style[2)]		Code (example) S	N	S
Width	**S**limline	**S**		
	Wide			
Length	**N**ormal		**N**	
Height	**S**tandard height			**S**

Design style examples

Standard Ball Rail System

FNS – Flanged, normal, standard height

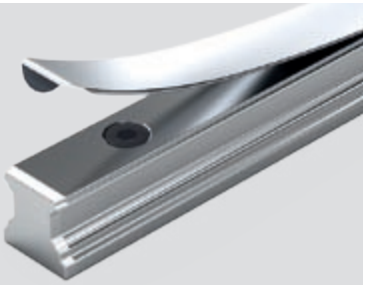
SNS – Slimline, normal, standard height



Wide Ball Rail System

BNS – Wide, normal, standard height

CNS – Compact, normal, standard height

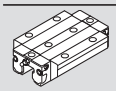
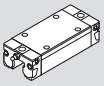
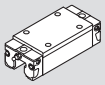


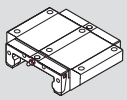
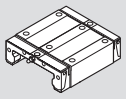
Proven cover strip for ball guide rail mounting holes
- A single cover for all holes – saves time and money
- Made of corrosion-resistant spring steel per EN 10088
- Easy to fit – simply clip on and secure

Ball chain (optional)
- Optimizes noise levels

General Product Description

Product Overview, Ball Runner Blocks with Load Capacities and Moments

Ball runner blocks		Page	Size		15	20	25	30	35	45	55	65
					Load capacities (N) and load moments (Nm)							
Standard, Heavy Duty, High Precision Ball Runner Blocks made of steel[3] Resist NR[4] Resist CR[6]	 **FNS R1651[3)6)] R2001[4)]**	36 101	**C**	1)	**7 800**	**18 800**	**22 800**	**31 700**	**41 900**	**68 100**	**98 200**	**123 000**
			C	2)	7 280	17 400	21 300	29 300	41 900	63 300	–	–
			C_0	1)	**13 500**	**24 400**	**30 400**	**41 300**	**54 000**	**85 700**	**121 400**	**192 700**
			C_0	2)	12 100	21 700	27 300	37 200	54 000	77 100	–	–
	 **SNS R1622[3)6)] R2011[4)]**	42 102	**M_t**	1)	**74**	**240**	**320**	**540**	**890**	**1 830**	**3 100**	**4 850**
			M_t	2)	69	220	300	500	890	1 700	–	–
			M_{t0}	1)	**130**	**310**	**430**	**720**	**1 160**	**2 310**	**3 860**	**7 610**
			M_{t0}	2)	120	285	400	665	1 160	2 145	–	–
	 **SNH R1621[3)6)]**	48	**M_L**	1)	**40**	**130**	**180**	**290**	**440**	**890**	**1 540**	**2 430**
			M_L	2)	37	120	170	270	440	825	–	–
			M_{L0}	1)	**71**	**165**	**240**	**380**	**565**	**1 130**	**1 905**	**3 815**
			M_{L0}	2)	66	155	225	350	565	1 050	–	–
	 **FLS R1653[3)6)] R2002[4)]**	38 101	**C**	1)	**10 000**	**24 400**	**30 400**	**40 000**	**55 600**	**90 400**	**124 200**	**163 000**
			C	2)	9 000	23 100	27 500	38 000	53 000	81 900	–	–
			C_0	1)	**20 200**	**35 200**	**45 500**	**57 800**	**81 000**	**128 500**	**170 000**	**289 000**
			C_0	2)	17 500	32 500	39 500	53 700	75 600	111 400	–	–
	 **SLS R1623[3)6)] R2012[4)]**	44 103	**M_t**	1)	**96**	**310**	**430**	**690**	**1 200**	**2 440**	**3 950**	**6 440**
			M_t	2)	86	295	390	655	1 145	2 210	–	–
			M_{t0}	1)	**190**	**450**	**650**	**1 000**	**1 740**	**3 470**	**5 400**	**11 420**
			M_{t0}	2)	170	425	590	950	1 660	3 145	–	–
	 **SLH R1624[3)6)]**	50	**M_L**	1)	**75**	**225**	**345**	**495**	**830**	**1 700**	**2 630**	**4 620**
			M_L	2)	68	215	310	470	790	1 540	–	–
			M_{L0}	1)	**150**	**330**	**510**	**715**	**1 215**	**2 425**	**3 600**	**8 190**
			M_{L0}	2)	135	310	460	680	1 160	2 195	–	–
Standard Ball Runner Blocks made of steel[3] Resist NR[4] Resist CR[6]	 **FKS R1665[3)6)] R2000[4)]**	40 102	**C**	1)	**5 400**	**12 400**	**15 900**	**22 100**	**29 300**	**–**	**–**	**–**
			C	2)	4 600	12 400	14 000	22 100	29 300	–	–	–
			C_0	1)	**8 100**	**13 600**	**18 200**	**24 800**	**32 400**	**–**	**–**	**–**
			C_0	2)	6 700	13 600	15 200	24 800	32 400	–	–	–
	 **SKS R1666[3)6)] R2010[4)]**	46 103	**M_t**	1)	**52**	**150**	**230**	**380**	**640**	**–**	**–**	**–**
			M_t	2)	44	150	205	380	640	–	–	–
			M_{t0}	1)	**80**	**170**	**260**	**430**	**700**	**–**	**–**	**–**
			M_{t0}	2)	70	170	230	430	700	–	–	–
			M_L	1)	**19**	**52**	**82**	**133**	**200**	**–**	**–**	**–**
			M_L	2)	16	52	72	133	200	–	–	–
			M_{L0}	1)	**28**	**58**	**94**	**150**	**220**	**–**	**–**	**–**
			M_{L0}	2)	24	58	83	150	220	–	–	–
	 **FNN R1693[3)6)]**	52	**C**	1)	**–**	**14 500**	**22 800**	**–**	**–**	**–**	**–**	**–**
			C_0	1)	**–**	**24 400**	**30 400**	**–**	**–**	**–**	**–**	**–**
	 **SNN R1694[3)6)]**	56	**M_t**	1)	**–**	**190**	**320**	**–**	**–**	**–**	**–**	**–**
			M_{t0}	1)	**–**	**310**	**430**	**–**	**–**	**–**	**–**	**–**
			M_L	1)	**–**	**100**	**180**	**–**	**–**	**–**	**–**	**–**
			M_{L0}	1)	**–**	**165**	**240**	**–**	**–**	**–**	**–**	**–**
	 **FKN R1663[3)6)]**	54	**C**	1)	**–**	**9 600**	**15 900**	**–**	**–**	**–**	**–**	**–**
			C_0	1)	**–**	**13 600**	**18 200**	**–**	**–**	**–**	**–**	**–**
	 **SKN R1664[3)6)]**	58	**M_t**	1)	**–**	**120**	**230**	**–**	**–**	**–**	**–**	**–**
			M_{t0}	1)	**–**	**170**	**260**	**–**	**–**	**–**	**–**	**–**
			M_L	1)	**–**	**40**	**82**	**–**	**–**	**–**	**–**	**–**
			M_{L0}	1)	**–**	**58**	**94**	**–**	**–**	**–**	**–**	**–**
Super Ball Runner Blocks made of steel[3] Resist CR[6]	 **FKS 1661[3)6)]**	90	**C**	1)	**3 900**	**10 100**	**11 400**	**15 800**	**21 100**	**–**	**–**	**–**
			F_{max}	1)	**1 500**	**3 900**	**4 400**	**6 100**	**8 100**	**–**	**–**	**–**
	 **SKS 1662[3)6)]**	92	**M_t**	1)	**39**	**130**	**170**	**270**	**450**	**–**	**–**	**–**
			M_{tmax}	1)	**15**	**50**	**65**	**105**	**175**	**–**	**–**	**–**

Ball runner blocks		Page	Size		15	20 20/40	25 25/70	30	35 35/90	45	55	65
					Load capacities (N) and load moments (Nm)							
High-Speed Ball Runner Blocks made of steel	 **FNS R2001 … 9.**	**86**	**C**	1)	**5 300**	**12 700**	**15 500**	**21 500**	**28 500**	–	–	–
			C_0	1)	**9 100**	**16 500**	**20 600**	**28 000**	**36 700**	–	–	–
	 **SNS R2011 … 9.**	**87**	**M_t**	1)	**50**	**160**	**210**	**360**	**600**	–	–	–
			M_{t0}	1)	**88**	**210**	**290**	**490**	**780**	–	–	–
			M_L	1)	**27**	**88**	**120**	**190**	**300**	–	–	–
			M_{L0}	1)	**48**	**110**	**160**	**250**	**380**	–	–	–
Ball Runner Blocks made of aluminum	 **FNS R1631**	**96**	**C**	1)	**7 800**	**18 800**	**22 800**	**31 700**	**41 900**	–	–	–
			C	2)	7 280	17 400	21 300	29 300	41 900	–	–	–
			F_{max}	1) 2)	**3 000**	**7 200**	**8 800**	**12 200**	**16 200**	–	–	–
	 **SNS R1632**	**98**	**M_t**	1)	**74**	**240**	**320**	**540**	**890**	–	–	–
			M_t	2)	69	220	300	500	890	–	–	–
			M_{tmax}	1) 2)	**29**	**92**	**125**	**210**	**345**	–	–	–
			M_L	1)	**40**	**130**	**180**	**290**	**440**	–	–	–
			M_L	2)	37	120	170	270	440	–	–	–
			M_{Lmax}	1) 2)	**16**	**50**	**70**	**110**	**170**	–	–	–
Ball Runner Block Resist NR II[5]	 **FNS R2001 … 0.**	**106**	**C**	1)	**5 100**	**12 300**	**15 000**	**20 800**	**27 600**	–	–	–
			C	2)	4 700	11 400	14 000	19 300	27 600	–	–	–
			C_0	1)	**9 300**	**16 900**	**21 000**	**28 700**	**37 500**	–	–	–
			C_0	2)	8 400	15 000	18 900	25 800	37 500	–	–	–
	 **SNS R2011 … 0.**	**107**	**M_t**	1)	**63**	**205**	**270**	**460**	**760**	–	–	–
			M_t	2)	58	190	250	425	760	–	–	–
			M_{t0}	1)	**90**	**215**	**295**	**500**	**805**	–	–	–
			M_{t0}	2)	81	190	265	450	805	–	–	–
			M_L	1)	**34**	**110**	**150**	**245**	**375**	–	–	–
			M_L	2)	31	100	140	225	375	–	–	–
			M_{L0}	1)	**49**	**115**	**165**	**265**	**390**	–	–	–
			M_{L0}	2)	44	100	150	240	390	–	–	–
Wide Ball Runner Blocks made of steel[3] Resist CR[6]	 **BNS R1671[3)6)]**	**142**	**C**	1)	**–**	**13 650**	**29 000**	**–**	**58 200**	–	–	–
			C	2)	–	12 850	27 550	–	–	–	–	–
			C_0	1)	**–**	**19 675**	**42 500**	**–**	**86 300**	–	–	–
			C_0	2)	–	18 050	39 450	–	–	–	–	–
	 **CNS R1672[3)6]**	**146**	**M_t**	1)	**–**	**310**	**1 080**	**–**	**2 880**	–	–	–
			M_t	2)	–	290	1 025	–	–	–	–	–
			M_{t0}	1)	**–**	**450**	**1 580**	**–**	**4 270**	–	–	–
			M_{t0}	2)	–	415	1 465	–	–	–	–	–
			M_L	1)	**–**	**95**	**305**	**–**	**920**	–	–	–
			M_L	2)	–	90	290	–	–	–	–	–
			M_{L0}	1)	**–**	**135**	**450**	**–**	**1 370**	–	–	–
			M_{L0}	2)	–	125	420	–	–	–	–	–

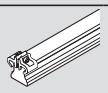
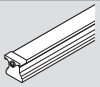
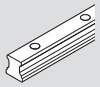
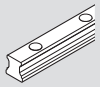
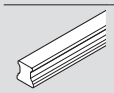
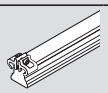
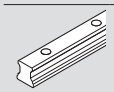
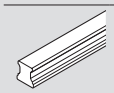
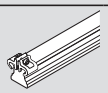
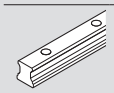
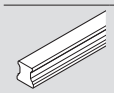
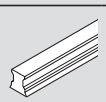
Determination of the dynamic load capacities and moments is based on a travel life of 100,000 m per ISO 14728-1.
Often only 50,000 m are actually stipulated. For comparison: Multiply values **C**, $\mathbf{M_t}$ and $\mathbf{M_L}$ from the table by 1.26.

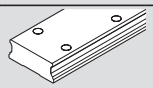
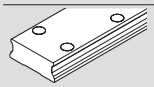
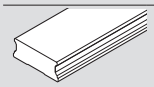
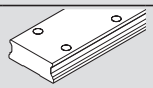
1) Load capacities for Ball Runner Block **without** ball chain.
2) Load capacities for Ball Runner Block **with** ball chain.
3) Steel: All steel parts made of carbon steel.
4) Resist NR size 15 – 35: Ball runner block body made of corrosion-resistant steel per EN 10088.
5) Resist NR II: All steel parts made of corrosion-resistant steel per EN 10088.
6) Resist CR: Ball runner block body made of steel with matte-silver hard-chrome plated corrosion-resistant coating.

For design style codes, ☞ 6

General Product Description

Product Overview, Ball Guide Rails with Rail Lengths

Ball guide rails			Page	Size							
				15	20	25	30	35	45	55	65
				Rail length (mm)							
Standard Ball Guide Rails made of steel[3]		**SNS** **R1605 .3. .. / R1605 .B. ..** For mounting from above, with cover strip and strip clamps	**122**	3 836	3 836	3 836	3 836	3 836	3 776	3 836	3 746
		**SNS** **R1605 .6. .. / R1605 .D. ..** For mounting from above, with cover strip and screw-down protective caps	**124**	3 836	3 836	3 836	3 836	3 836	3 776	3 836	3 746
		**SNS** **R1605 .0. .. / R1605 .C. ..** For mounting from above, with plastic mounting hole plugs	**126**	3 836	3 836	3 836	3 836	3 836	3 776	3 836	3 746
		**SNS** **R1606 .5. ..** For mounting from above, for steel mounting hole plugs	**128**	–	–	3 836	3 836	3 836	3 776	3 836	3 746
		**SNS** **R1607 .0. ..** For mounting from below	**130**	3 836	3 836	3 836	3 836	3 836	3 776	3 836	3 746
Standard Ball Guide Rails Resist NR II[1]		**SNS** **R2045 .3. ..** For mounting from above, with cover strip and strip clamps	**132**	1 856	3 836	3 836	3 836	3 836	–	–	–
		**SNS** **R2045 .0. ..** For mounting from above, with plastic mounting hole plugs	**133**	1 856	3 836	3 836	3 836	3 836	–	–	–
		**SNS** **R2047 .0. ..** For mounting from below	**133**	1 856	3 836	3 836	3 836	3 836	–	–	–
Standard Ball Guide Rails Resist CR[2]		**SNS** **R1645 .3. ..** For mounting from above, with cover strip and strip clamps	**134**	3 836	3 836	3 836	3 836	3 836	3 776	3 836	3 746
		**SNS** **R1645 .0. ..** For mounting from above, with plastic mounting hole plugs	**135**	3 836	3 836	3 836	3 836	3 836	3 776	3 836	3 746
		**SNS** **R1647 .0. ..** For mounting from below	**135**	3 836	3 836	3 836	3 836	3 836	3 776	3 836	3 746
V-Guide Rails		**SNS** **R1608 .1. ..** Without mounting holes, for press-fitting	**137**	3 836	3 836	3 836	–	–	–	–	–

Ball guide rails			Page	Size		
				20/40	25/70	35/90
				Rail length (mm)		
Wide Ball Guide Rails made of steel		**BNS R1675 .0. ..** For mounting from above, with plastic mounting hole plugs	**150**	3 836	3 836	3 836
		**BNS R1676 .5. ..** For mounting from above, for steel mounting hole plugs	**152**	–	3 836	3 836
		**BNS R1677 .0. ..** For mounting from below	**153**	3 836	3 836	3 836
Wide Ball Guide Rails Resist CR[2)]		**BNS R1673 .0. ..** For mounting from above, with plastic mounting hole plugs	**150**	3 836	3 836	3 836

1) Resist NR II: Guide rail made of corrosion-resistant steel per EN 10088
2) Resist CR: Ball guide rail made of steel with matte-silver hard-chrome plated corrosion-resistant coating
3) Sizes 20 and 25: Length up to 5816 mm (one-piece) available upon request
   Sizes 30 and 35: Length up to 5836 mm (one-piece) available upon request
   Size 45: Length up to 5771 mm (one-piece) available upon request

For design style codes, ☞ 6

General Product Description

General Technical Data and Calculations

General notes

The general technical data and calculations apply to all Ball Rail Systems, i.e., to all ball runner blocks and ball guide rails.

Specific technical data relating to the individual ball runner blocks and ball guide rails is given separately.

Preload classes

To cover the widest possible range of applications, Rexroth ball runner blocks are available in different preload classes.

So as not to reduce the service life, the preload should not exceed 1/3 of the load on bearing F.

In general, the rigidity of the ball runner block rises with increasing preload. If vibrations are expected, an appropriately high preload (≥ 8% C) should be selected.

Guide systems with parallel rails

For the selected preload class, also comply with the permissible parallelism offset of the rails (“Selection Criteria, Accuracy Classes” ☞ 26).
The following preload classes are available:

- Ball runner block without preload (preload class C0)
- Ball runner block with 2% C preload (preload class C1)
- Ball runner block with 8% C preload (preload class C2)
- Ball runner block with 13% C preload (preload class C3)

When specifying ball rail systems of accuracy class N, we recommend preload class C0 or C1 to avoid distortive stresses due to the tolerances.

Travel speed

v_{max} : 3 – 10 m/s

For exact values, refer to the individual ball runner blocks.

Acceleration

a_{max} : 250 – 500 m/s²

For exact values, refer to the individual ball runner blocks.
(If $F_{comb} > 2.8 \cdot F_{pr}$: $a_{max} = 50$ m/s²)

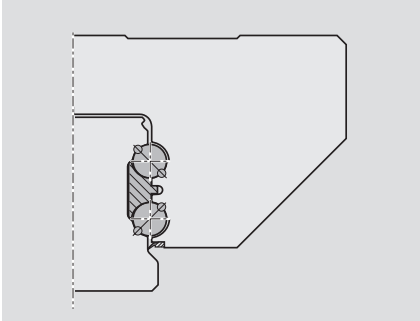
Operating temperature range

t : 0 – 80 °C

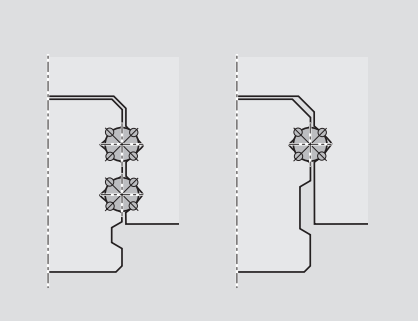
Brief peaks up to 100 °C are permitted.
For sub-zero temperatures, please consult us.
For ball runner blocks without ball chain: lower limit = –10 °C.

Friction

The friction coefficient μ of Rexroth Ball Rail Systems is approx. 0.002 to 0.003 (without friction of the seals).



Rexroth's special design with 4 ball circuits ensures that the balls make **contact at two points** regardless of the direction of loading.
This reduces the friction to a minimum.



Other ball rail systems with 2 or 4 ball circuits with **4-point contact** have multiple friction: in the Gothic-arch raceway profile, the differential slip at side loading, as well as with comparable preload without load, causes higher friction (depending on the conformity and load, this may be up to approx. 5 times the frictional value).
This high friction leads to correspondingly greater heat.

Seals

The purpose of seals is to prevent dirt, chips, metalworking fluids, etc. from entering the ball runner block and thus shortening its service life.

Standard seals (SS)

Universal seals are incorporated as standard in Rexroth ball runner blocks. They provide equal sealing performance on ball guide rails with and without cover strip.
Low friction combined with a good sealing effect was an important factor during design.

Suitable for applications requiring good sealing.

For details, ☞🗎 29

Low-friction (LS) and double-lipped (DS) seals

LS: For applications requiring especially smooth running.
DS: For frequent exposure to fluids.

Available as alternatives.

For details, ☞🗎 29

End seals

For use in environments with fine dirt or metal particles and cooling or cutting fluids.
Replaceable.

End seals can be ordered separately as accessories for mounting by the customer.

FKM seals

For extreme use in environments with coarse dirt or metal particles or where cooling or cutting fluids are used intensively.
Replaceable.

FKM end seals can be ordered separately as accessories for mounting by the customer.

Scraper plates

For use in environments subject to coarse dirt or chips.

Scraper plates can be ordered separately as accessories for mounting by the customer.

General Product Description

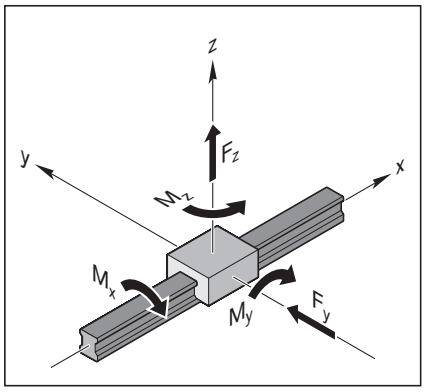
General Technical Data and Calculations

Definitions of forces and load moments

In Rexroth Ball Rail Systems the raceways are arranged at a contact angle of 45°. This results in the same load capacity of the entire system in all four major planes of load application.
The ball runner blocks may be subjected to both forces and load moments.

Forces in the four major planes of load application
- Pull F_z (positive z-direction)
- Push $-F_z$ (negative z-direction)
- Side load F_y (positive y-direction)
- Side load $-F_y$ (negative y-direction)

Moments
- Torsional moment M_x (about the x-axis)
- Longitudinal moment M_y (about the y-axis)
- Longitudinal moment M_z (about the z-axis)



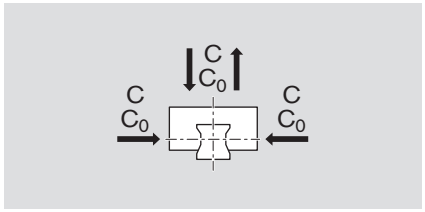
Definition of load capacities

Dynamic load capacity C
The radial loading of constant magnitude and direction which a linear rolling bearing can theoretically endure for a nominal life of 10^5 meters distance traveled (as per ISO 14728 Part 1).

Note:
The dynamic load capacities given in the tables are 20% above the ISO values. These values have been confirmed in tests.

Basic static load capacity C_0
Static load in the load direction that corresponds to a calculated load in the center of the contact point with the greatest load between the rolling element (ball) and track zone (guide rail) of 4200 MPa.

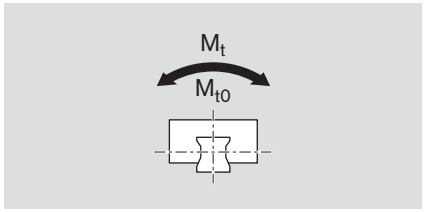
Note:
With this load on the contact point, a permanent overall deformation of the rolling element and track zone occurs, corresponding to around 0.0001 times the ball diameter (as per ISO 14 728-1).



Definition of moment load capacities

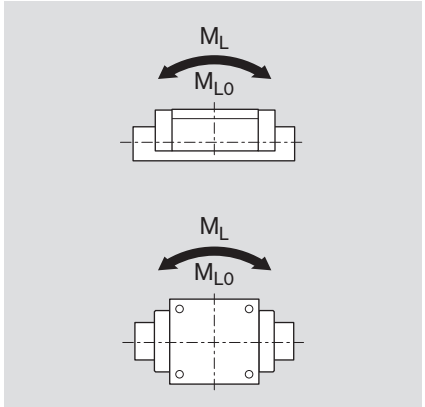
Dynamic torsional moment load capacity M_t
Comparative dynamic moment about the X-axis which causes a load equivalent to the dynamic load capacity C.

Static torsional moment load capacity M_{t0}
Comparative static moment about the X-axis which causes a load equivalent to the static load capacity C_0.



Dynamic longitudinal moment load capacity M_L
Comparative dynamic moment about the Y-axis or the Z-axis which causes a load equivalent to the dynamic load capacity C.

Static longitudinal moment load capacity M_{L0}
Comparative static moment about the Y-axis or the Z-axis which causes a load equivalent to the static load capacity C_0.



Definition and calculation of the nominal life

The calculated service life which an individual linear rolling bearing, or a group of apparently identical rolling element bearings operating under the same conditions, can attain with a 90% probability, with contemporary, commonly used materials and manufacturing quality under conventional operating conditions (as per ISO 14728-1).

Nominal life at constant speed

If the speed is constant, calculate the nominal life L_{10} in meters or $L_{h\,10}$ in hours according to formula (1) or (2):

$$(1)\quad L_{10} = \left(\frac{C}{F_m}\right)^3 \cdot 10^5\ \text{m}$$

$$(2)\quad L_{h\,10} = \frac{L_{10}}{2 \cdot s \cdot n \cdot 60}$$

L_{10} = nominal life (m)
$L_{h\,10}$ = nominal life (h)
C = dynamic load capacity (N)
F_m = equivalent dynamic load on bearing of ball runner block (N)
s = stroke length[1] (m)
n = stroke repetition rate (full cycles) (min^{-1})

1) At a stroke length < 2 · ball runner block length B_1 (see dimension drawings) the load capacities will be reduced. Please consult us.

Nominal life at variable speed

If the speed varies, calculate the nominal life $L_{h\,10}$ in hours according to formula (3) and, if necessary, formula (4):

$$(3)\quad L_{h\,10} = \frac{L_{10}}{60 \cdot v_m}$$

$$(4)\quad v_m = \frac{|v_1| \cdot q_{t1} + |v_2| \cdot q_{t2} + \ldots + |v_n| \cdot q_{tn}}{100\ \%}$$

L_{10} = nominal life (m)
$L_{h\,10}$ = nominal life (h)
v_m = average travel speed (m/min)
$v_1, \ldots v_n$ = travel speed in phases 1 ... n (m/min)
$q_{t1}, \ldots q_{tn}$ = discrete time steps for $v_1, \ldots v_n$ in phases 1 ... n (%)

Modified life expectancy calculation

If 90% probability is not sufficient, the nominal life values must be reduced by the factor a_1 as given in the table.

Probability of survival (%)	L_{na}	a_1
90	L_{10a}	1
95	L_{5a}	0.62
96	L_{4a}	0.53
97	L_{3a}	0.44
98	L_{2a}	0.33
99	L_{1a}	0.21

$$L_{na} = a_1 \cdot \left(\frac{C}{F}\right)^3 \cdot 10^5\ \text{m}$$

$$L_{ha} = \frac{L_{na}}{2 \cdot s \cdot n \cdot 60}$$

L_{na} = modified life expectancy (m)
L_{ha} = modified life expectancy (h)
C = dynamic load rating (N)
F = load on bearing for ball runner block (N)
a_1 = life expectancy factor (–)

General Product Description

General Technical Data and Calculations

Equivalent dynamic load on bearing for calculation of service life

Equivalent dynamic load with variable load on bearing
If the bearing is subject to variable loads, the equivalent dynamic load F_m must be calculated according to formula (5).

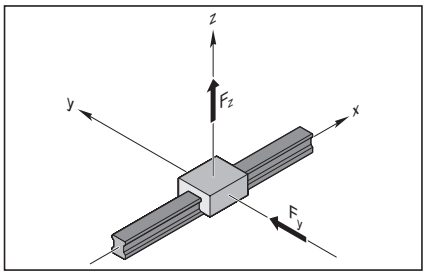
$$(5)\quad F_m = \sqrt[3]{(F_{eff\,1})^3 \cdot \frac{q_{s1}}{100\,\%} + (F_{eff\,2})^3 \cdot \frac{q_{s2}}{100\,\%} + \ldots + (F_{eff\,n})^3 \cdot \frac{q_{sn}}{100\,\%}}$$

F_m = equivalent dynamic load on bearing for ball runner block (N)
$F_{eff\,1} \ldots F_{eff\,n}$ = effective equivalent load on bearing for runner block in phases 1 ... n (N)
$q_{s1} \ldots q_{sn}$ = discrete travel steps for $F_{eff\,1} \ldots F_{eff\,n}$ (%)

Equivalent dynamic load with combined load on bearing
The dynamic equivalent load on bearing F_{comb} resulting from combined vertical and horizontal external loads is calculated according to formula (6).

Note
The structure of the Ball Rail System permits this simplified calculation.

$$(6)\quad F_{comb} = |F_y| + |F_z|$$



F_{comb} = combined equivalent dynamic load on bearing (N)
F_y = external load due to a resulting force in the y-direction (N)
F_z = external load due to a resulting force in the z-direction (N)

Note
If F_y and F_z involve different load levels, F_y and F_z must be calculated separately using formula (5). An external load acting at an angle on the ball runner block is to be broken down into its positive and negative F_y and F_z components, and these values are then to be used in formula (6).

Equivalent dynamic load with combined load on bearing in conjunction with a torsional and/or longitudinal moment

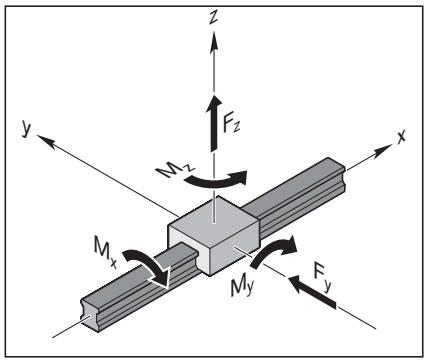
The combined equivalent load on bearing F_{comb} resulting from combined vertical and horizontal external loads in conjunction with a torsional and/or longitudinal moment is calculated according to formula (7).

Note
Formula (7) applies only when using a single guide rail with a single ball runner block. The formula is simpler for other combinations.

$$(7)\quad F_{comb} = |F_y| + |F_z| + C \cdot \frac{|M_x|}{M_t} + C \cdot \frac{|M_y|}{M_L} + C \cdot \frac{|M_z|}{M_L}$$

F_{comb} = combined equivalent dynamic load on bearing (N)
F_y = external load due to a resulting force in the y-direction (N)
F_z = external load due to a resulting force in the z-direction (N)
C = dynamic load capacity[1] (N)
M_t = dyn. torsional moment load[1] (Nm)
M_L = dyn. longitudinal moment load[1] (Nm)
1) Refer to the load capacities and moments for the individual ball runner blocks

M_x = load due to a resulting dynamic torsional moment about the X-axis (Nm)
M_y = load due to a resulting dynamic longitudinal moment about the Y-axis (Nm)
M_z = load due to a resulting dynamic longitudinal moment about the Z-axis (Nm)

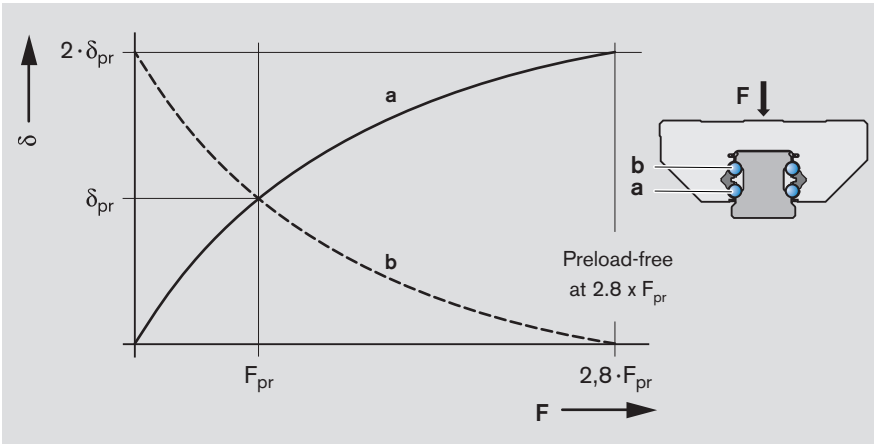


Note
If F_y and F_z involve different load levels, F_y and F_z must be calculated separately using formula (5). An external load acting at an angle on the ball runner block is to be broken down into its positive and negative F_y and F_z components, and these values are then to be used in formula (7).

Equivalent dynamic load on bearing taking account of internal preload force F_{pr}

To increase the rigidity and accuracy of the guide system preloaded runner blocks should be used (see also "Selection Criteria, System Preload" ☞ 24).

For preload classes C2 and C3, the internal preload force must be taken into account since the two rows of balls a and b are designed to be oversized and are therefore preloaded against each other with an internal preload force F_{pr} which causes them to deform by the amount δ_{pr} (see chart).



a = loaded (lower) row of balls
b = non-loaded (upper) row of balls
δ = deformation at rolling contact point at F (–)
δ_{pr} = deformation at rolling contact point at F_{pr} (–)
F = load on the runner block (N)
F_{pr} = internal preload force (N)

Effective equivalent load on bearing

When an external load reaches 2.8 times the internal preload force F_{pr}, one row of balls becomes preload-free.

Note
For highly dynamic load cases, the combined equivalent load on the bearings should be $F_{comb} < 2.8 \cdot F_{pr}$ in order to avoid damage to the rolling bearings due to slip.
In this case, the effective equivalent load on bearing F_{eff} is not calculated according to formula (6) or (7), but according to formula (9).

Two different cases should be considered:

Case 1: $F_{comb} > 2.8 \cdot F_{pr}$

In case 1, the internal preload force F_{pr} has no effect on the service life:

$$(8)\quad F_{eff} = F_{comb}$$

F_{comb} = combined equivalent dynamic load on bearing (N)
F_{eff} = effective equivalent load on bearing (N)

Case 2: $F_{comb} \leq 2.8 \cdot F_{pr}$

In case 2 the preload force F_{pr} is factored into the calculation of the effective equivalent load on bearing:

$$(9)\quad F_{eff} = \left(\frac{F_{comb}}{2.8 \cdot F_{pr}} + 1\right)^{\frac{3}{2}} \cdot F_{pr}$$

F_{pr} = internal preload force (N)
F_{pr} = 8% C (0.08 C) (at preload class C2)
F_{pr} = 13% C (0.13 C) (at preload class C3)

Equivalent static load on bearing

Combined external static load resulting from vertical and horizontal external loads in conjunction with a static torsional and/or longitudinal moment

Calculate the equivalent static load $F_{0\,comb}$ according to formula (10).

Note
The equivalent static load $F_{0\,comb}$ must not exceed the static load capacity C_0.

Formula (10) applies only when using a single guide rail with a single ball runner block. The formula is simpler for other combinations.

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

$F_{0\,comb}$ = static combined equivalent load on bearing (N)
F_{0y} = external static load due to a resulting force in the y-direction (N)
F_{0z} = external static load due to a resulting force in the z-direction (N)
C_0 = static load capacity[1] (N)
M_{t0} = static torsional moment load capacity[1] (Nm)
M_{L0} = static longitudinal moment load capacity[1] (Nm)
M_{0x} = load due to a static resulting torsional moment load about the X-axis (Nm)
M_{0y} = load due to a static resulting longitudinal moment load about the Y-axis (Nm)
M_{0z} = load due to a static resulting longitudinal moment load about the Z-axis (Nm)

1) Refer to the load capacities and moments for the individual ball runner blocks

Note
An external load acting at an angle on the ball runner block is to be broken down into its positive and negative F_{0y} and F_{0z} components, and these values are then to be used in formula (10).

General Product Description

General Technical Data and Calculations

Definitions and calculation for dynamic and static load ratios

The ratio between the load capacity of the ball runner block and the load applied to it can be used to pre-select the type of linear guide. The dynamic load ratio C/F_{max} and the static load ratio $C_0/F_{0\,max}$ should be chosen as appropriate for the application.

This permits calculation of the required load capacity and selection of the rail guide size and runner block design style using the load capacity tables.

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

C = dynamic load rating (N)
F_{max} = maximum dynamic load on bearing of the most highly loaded ball runner block (N)

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

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

C_0 = static load capacity (N)
$F_{0\,max}$ = maximum static load on bearing of the most highly loaded ball runner block (N)
F_{max} = maximum dynamic load on bearing of the most highly loaded ball runner block (N)

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

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

Recommended values for load ratios

The table below contains recommendations for 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.

Machine type/sector		C/F_{max}	$C_0/F_{0\,max}$
	Application example		
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
Assembly/handling technology and industrial robots	Handling	5	> 3
Oil hydraulics and pneumatics	Raising/lowering	6	> 4

Definitions and calculation of the static load safety factor S_0

The static load safety factor S_0 is required in order to avoid any inadmissible permanent deformations of the raceways and balls. It is the ratio of the static load capacity C_0 to the maximum load occurring, $F_{0\,max}$ and is always determined using the highest amplitude, even if this is only very short-lived.

(11) $$S_0 = \frac{C_0}{F_{0\,max}}$$

S_0	=	static load safety factor	(–)
C_0	=	static load capacity	(N)
$F_{0\,max}$	=	maximum static load on bearing of the most highly loaded ball runner block	(N)

Recommendations for the static load safety factor under different conditions of use

Conditions of use	S_0
Normal conditions of use	1 ... 2
Low impact loads and vibrations	2 ... 4
Moderate impact loads and vibrations	3 ... 5
Heavy impact loads and vibrations	4 ... 6
Unknown load parameters	6 ... 15

Irrespective of the static load safety factor, it must be ensured that the maximum permissible loads, as indicated for some Ball Rail Systems, are not exceeded in service.

⚠ **The load-bearing capability of the threaded connections must also be checked. These are frequently weaker than the bearings themselves. The load-bearing capability of linear motion technology components is such that the screws used could be over-stressed.**
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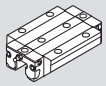
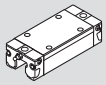
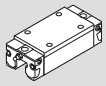
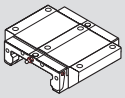
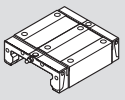
More technical data and details can be found in the “Linear Motion Technology Handbook” R310EN 2017“

Selection Criteria

Design Styles and Versions

Ball runner blocks			Application area	Load capacity	Special feature
Standard Ball Runner Blocks made of steel		**FNS** **R1651**[1)2)5)] **R2001**[3)4)]	For high rigidity requirements	High	For mounting from above and below
		**FLS** **R1653**[1)2)5)] **R2002**[3)]	For very high rigidity requirements	Very high	For mounting from above and below
		**FKS** **R1665** **R2000**[3)]	For restricted space in the longitudinal direction	Medium	For mounting from above and below Supplementary to DIN 645-1
		**SNS** **R1622**[1)2)5)] **R2011**[3)4)]	For restricted space in the transverse direction	High	For mounting from above
		**SLS** **R1623**[1)2)5)] **R2012**[3)]	For restricted space in the transverse direction	Very high	For mounting from above
		**SKS** **R1666** **R2010**[3)]	For restricted space in the longitudinal and transverse direction	Medium	For mounting from above
		**SNH** **R1621**[1)2)5)]	For restricted space in the transverse direction and high rigidity requirements	High	Higher rigidity than SNS
		**SLH** **R1624**[1)2)5)]	For restricted space in the transverse direction and high rigidity requirements	Very high	Higher rigidity than SLS
Standard Ball Runner Blocks made of steel with Resist CR		**FNN** **R1693**	For restricted space in the vertical direction	High	Lower rigidity than FNS Not defined in DIN 645-1
		**FKN** **R1663**	For restricted space in the vertical and longitudinal direction	Medium	Lower rigidity than FKS Not defined in DIN 645-1
		**SNN** **R1694**	For restricted space in the vertical and transverse direction	High	Lower rigidity than SNS Not defined in DIN 645-1
		**SKN** **R1664**	For restricted space in the vertical, longitudinal and transverse direction	Medium	Lower rigidity than SKS Not defined in DIN 645-1

1) Heavy Duty Ball Runner Blocks
2) High Precision Ball Runner Blocks
3) Resist NR
4) Resist NR II
5) Resist CR

Ball runner blocks		Application area	Load capacity	Special feature
Super Ball Runner Blocks made of steel with Resist CR	 **FKS R1661**	For compensating large tolerances in the adjoining structure	Medium	At least 2 ball runner blocks per rail required
	 **SKS R1662**	For compensating large tolerances in the adjoining structure	Medium	At least 2 ball runner blocks per rail required
Ball Runner Blocks made of aluminum	 **FNS R1631**	For lightweight constructions For compensating slight tolerances in the adjoining structure	High	For mounting from above and below
	 **SNS R1632**	For lightweight constructions For compensating slight tolerances in the adjoining structure	High	For mounting from above
High-Speed Ball Runner Blocks made of steel	 **FNS R2001 ... 9.**	For very high travel speeds (up to 10 m/s)	High	For mounting from above and below
	 **SNS R2011 ... 9.**	For very high travel speeds (up to 10 m/s)	High	For mounting from above
Wide Ball Runner Blocks made of steel with Resist CR	 **BNS R1671**	For high torsional moments in one-rail applications	Very high	For mounting from above and below
	 **CNS R1672**	For high torsional moments in one-rail applications where space is limited at the sides	Very high	For mounting from above

Codes for design styles of all the available runner blocks

FNS = Flanged, normal, standard height
FLS = Flanged, long, standard height
FKS = Flanged, short, standard height
FNN = Flanged, normal, low profile
FKN = Flanged, short, low profile

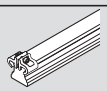
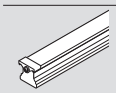
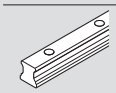
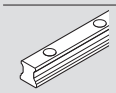
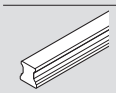
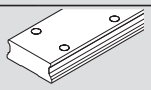
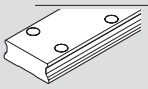
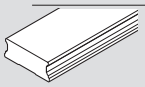
SNS = Slimline, normal, standard height
SLS = Slimline, long, standard height
SKS = Slimline, short, standard height
SNH = Slimline, normal, high
SLH = Slimline, long, high
SNN = Slimline, normal, low profile
SKN = Slimline, short, low profile

BNS = Wide, normal, standard height
CNS = Compact, normal, standard height

Definition Ball Runner Block design style		Code (example) F	N	S
Width	**F**langed	**F**		
	Slimline			
	Wide			
	Compact			
Length	**N**ormal		**N**	
	Long			
	Short			
Height	**S**tandard height			**S**
	High			
	Low			

Selection Criteria

Design Styles and Versions

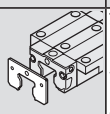
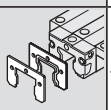
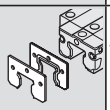
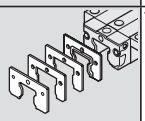
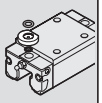
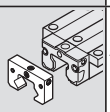
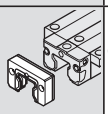
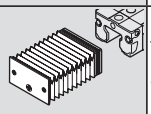
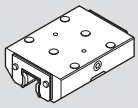
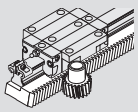
Ball guide rails		Application area	Mounting method	Special feature
Standard Ball Guide Rails made of steel	 **SNS R1605 .3. .. R1605 .B. .. R1645 .3. ..[2] R2045 .3. ..[1]**	Standard version Very harsh environments Robust cover strip fastening	For mounting from above	With cover strip and strip clamps. A single cover for all holes. No holes required in end face for fastening of cover strip.
	 **SNS R1605 .6. .. R1605 .D. ..**	Harsh environments Compact cover strip fastening	For mounting from above	With cover strip and protective end caps. A single cover for all holes.
	 **SNS R1605 .0. .. R1605 .C. .. R1645 .0. ..[2] R2045 .0. ..[1]**	Economical	For mounting from above	With plastic mounting hole plugs. No extra space needed at rail ends.
	 **SNS R1606 .5. ..**	More resistant to mechanical stressing (e.g. impacts) Very harsh environments	For mounting from above	With steel mounting hole plugs. No extra space needed at rail ends.
	 **SNS R1607 .0. .. R1647 .0. ..[2] R2047 .0. ..[1]**	Easy access to mounting base underside Best sealing action of end seals	For mounting from below	Larger screw fasteners than for mounting from above. Greater side loads permitted. No extra space needed at rail ends.
V-Guide Rails made of steel	 **SNS R1608 .1. ..**	Reduced geometric variation in travel characteristics Single-rail applications (mounting in AL profile)	No mounting holes	Installed by press-fitting into mounting base. Economical mounting method.
Wide Ball Guide Rails made of steel	 **BNS R1675 .0. .. R1673 .0. ..[2]**	High moment load capacity	For mounting from above	With plastic mounting hole plugs. No extra space needed at rail ends.
	 **BNS R1676 .5. ..**	High moment load capacity More resistant to mechanical stressing (e.g. impacts) Very harsh environments	For mounting from above	With steel mounting hole plugs. No extra space needed at rail ends.
	 **BNS R1677 .0. ..**	High moment load capacity Best sealing action of end seals	For mounting from below	Larger screw fasteners than for mounting from above. Greater side loads permitted than single-row series. No extra space needed at rail ends.

1) Resist NR II
2) Resist CR

Codes for design styles of all the available ball guide rails

SNS = Slimline, normal, standard height
BNS = Wide, normal, standard height

Definition Ball guide rail design style		Code (example) S	N	S
Width	Slimline	**S**		
	Wide			
Length	Normal		**N**	
Height	Standard height			**S**

Accessories Add-on elements are available as options for the ball runner blocks.	Application area
Scraper Plate 	The scraper plate serves to remove coarse particles or dirt that has become encrusted on the ball guide rail. When making your selection, consider whether the ball guide rail is to be used with or without a cover strip.
End Seal two-piece 	External end seals provide effective protection for the ball runner block, preventing dirt, small particles and liquids from working their way in. This further improves the sealing performance. The two-piece end seal can be retrofitted over the ball guide rail.
FKM Seal one-piece and two-piece 	Better sealing performance than the end seal, but with higher friction. For use in environments with high contamination levels, metalworking fluids or aggressive media. Resistant to chemicals and high temperatures.
Seal Kit 	The seal kit is recommended in cases where both a scraper plate and end seal are required.
Lubrication Adapter 	For oil and grease lubrication from above for SNH and SLH ball runner blocks (high versions).
Lube Plate 	Enables further variations for lubrication of ball runner blocks. Available in designs with metric threads or pipe threads.
Front Lube Unit 	For applications requiring very long relubrication intervals. Under normal loads, they allow travel distances of up to 10,000 km without relubrication. The function is only assured where there is no exposure to liquids and little contamination. The maximum operating temperature is 60 °C.
Bellows 	Bellows come in a variety of designs, e.g. with or without lubricating plate. The heat-resistant versions are metallized on one side, making them non-combustible, non-flammable and resistant to sparks, welding splatter or hot shavings. They can withstand temperatures of up to 200 °C for brief periods and operating temperatures of 80 °C.
Clamping and Braking Units 	The clamping units serve to prevent the Ball Rail System from moving when they are at rest. The braking units can be used to bring moving Ball Rail Systems to a standstill and keep them stationary during rest phases. The following versions are available: hydraulic, pneumatic and manual clamping units.
Rack and pinion 	Gear racks and pinions are space-saving solutions for driving linear motion guides. For transmission of high forces within a small space and with low noise generation. All attachments such as gear reducers, motors and controllers are also available.

Selection Criteria

System Preload

Definition of the preload class

Preloading force relative to the dynamic load capacity C of the respective ball runner block.

Example
- Ball Runner Block FNS R1651 314 20
- Preload class C1
- Dynamic load capacity C = 41,900 N (☞ 37, size 35, load capacity C)

Calculation:
C1 = 2% C
= 838 N

This runner block is mounted with an internal preload force F_{pr} of 838 N.

Selection of the preload class

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

Code	Preload	Application area
C0	**Without preload**	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	**2% C**	For precise guide systems with low external loads and high demands on overall rigidity.
C2	**8% C**	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	**13% C**	For highly rigid guide systems such as precision machine tools, etc. Above average loads and moments can be absorbed with the least possible elastic deflection. Ball runner blocks with preload C3 available only in accuracy classes UP, SP and XP; heavy duty ball runner blocks only in UP, SP and P.

Elastic deflection dependent on the preload class and the runner block

Example
Ball Runner Block FNS
Flanged, normal, standard height

Size 35:
a) Ball Runner Block R1651 31. 20 with preload C1 (2% C)
b) Ball Runner Block R1651 32. 20 with preload C2 (8% C)
c) Ball Runner Block R1651 33. 20 with preload C3 (13% C)

Example
Ball Runner Block FLS
Flanged, long, standard height

Size 35:
a) Ball Runner Block R1653 31. 20 with preload C1 (2% C)
b) Ball Runner Block R1653 32. 20 with preload C2 (8% C)
c) Ball Runner Block R1653 33. 20 with preload C3 (13% C)

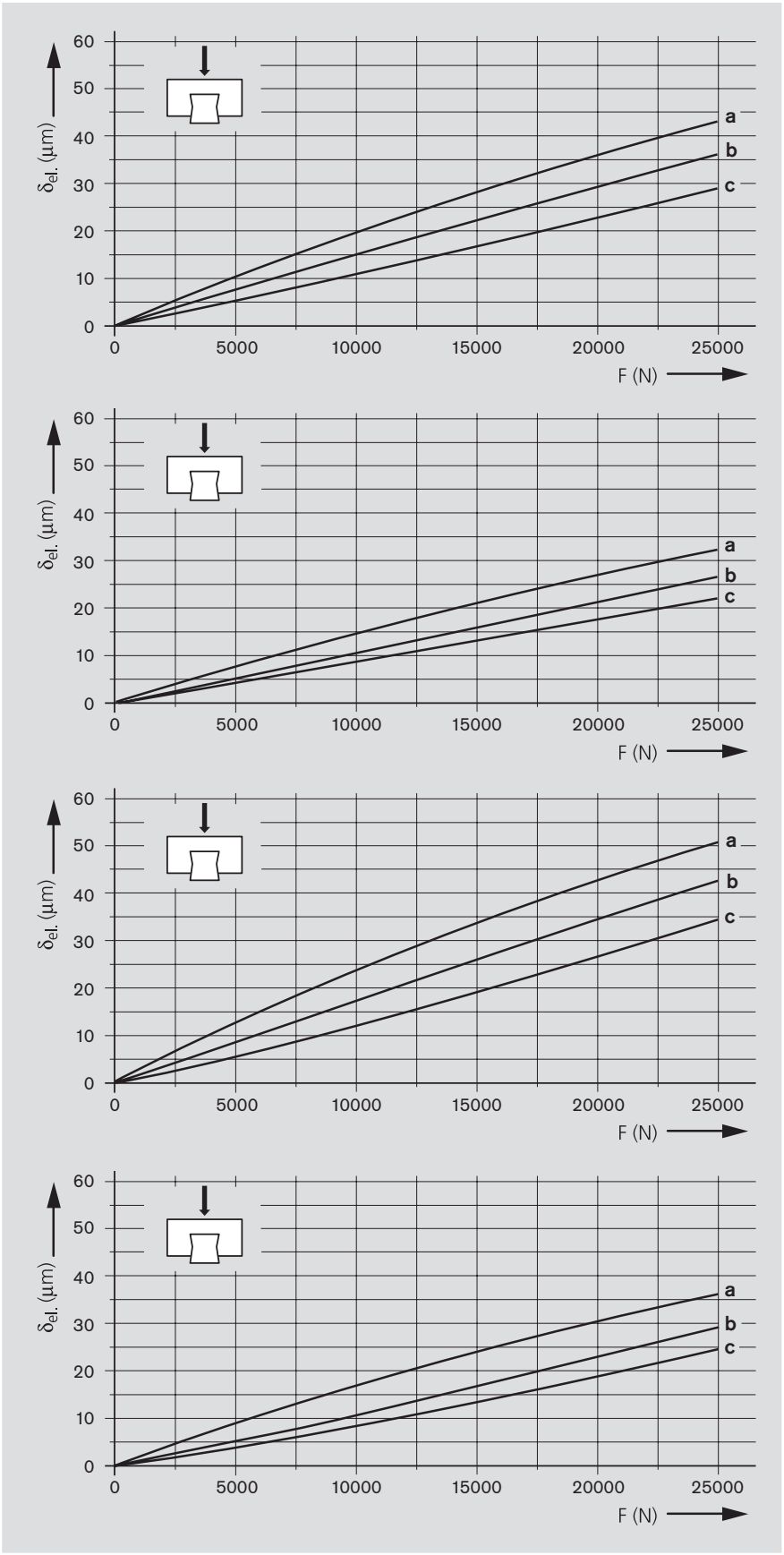
Example
Ball Runner Block SNS
Slimline, normal, standard height

Size 35:
a) Ball Runner Block R1622 31. 20 with preload C1 (2% C)
b) Ball Runner Block R1622 32. 20 with preload C2 (8% C)
c) Ball Runner Block R1622 33. 20 with preload C3 (13% C)

Example
Ball Runner Block SLS
Slimline, long, standard height

Size 35:
a) Ball Runner Block R1623 31. 20 with preload C1 (2% C)
b) Ball Runner Block R1623 32. 20 with preload C2 (8% C)
c) Ball Runner Block R1623 33. 20 with preload C3 (13% C)

Key to illustration
δ_{el} = elastic deflection (µm)
F = load (N)



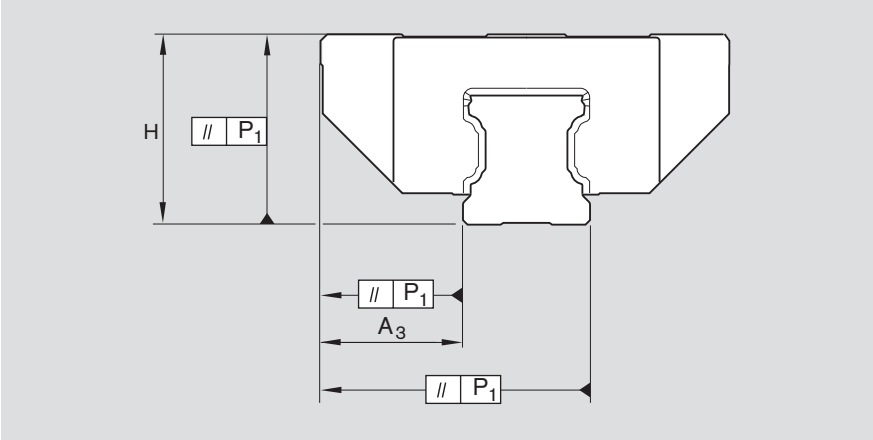
Selection Criteria

Accuracy Classes

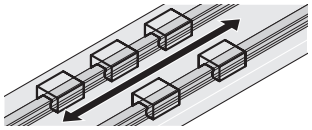
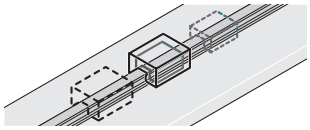
Accuracy classes and their tolerances

In Ball Rail Systems, the runner blocks are available in six accuracy classes and the guide rails in five accuracy classes.

For details of the available runner blocks and guide rails, see the “Part numbers” tables.



Built-in interchangeability through precision machining
Rexroth manufactures its ball guide rails and ball runner blocks with such high precision, especially in the ball track zone, that each individual component element can be replaced by another at any time.
For example, a runner block can be used without problems on various guide rails of the same size.
Similarly, different ball runner blocks can also be used on one and the same ball guide rail.

	H	A_3	$\Delta H, \Delta A_3$
			
Measured at middle of runner block	For any ball runner block/rail combination at any position on rail		For different ball runner blocks at same position on rail

Ball Rail System made of steel, aluminum, Resist NR and Resist NRII

Accuracy classes	Dimensional tolerances (µm)		Max. difference in dimensions H and A_3 on the same rail (µm)
	H	A_3	$\Delta H, \Delta A_3$
N	±100	±40	30
H	±40	±20	15
P	±20	±10	7
XP[1)]	±11	±8	7
SP	±10	±7	5
UP	±5	±5	3

1) Ball runner block in accuracy class XP, ball guide rail with accuracy class SP

Ball Rail System, Resist CR, matte-silver hard chrome plated

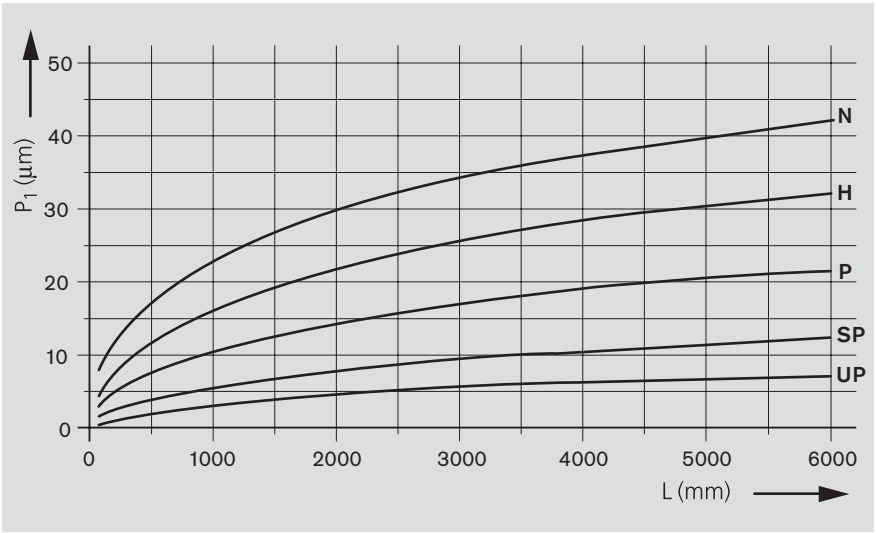
Accuracy classes	Dimensional tolerances (µm)				Max. difference in dimensions H and A_3 on the same rail (µm)	
	H		A_3		$\Delta H, \Delta A_3$	
	Runner block/ Guide rail	Guide rail	Runner block/ Guide rail	Guide rail	Runner block/ Guide rail	Guide rail
H	+47 –38	+44 –39	±23	+19 –24	18	15

Key to illustration

H	=	height tolerance	(µm)
A_3	=	lateral tolerance	(µm)
P_1	=	parallelism offset	(µm)
L	=	rail length	(mm)

Parallelism offset P_1 of the ball rail system in service

Values measured at middle of runner block for ball rail systems without surface coating
For hard chrome plated ball guide rails Resist CR, the values may increase by up to 2 µm.



Tolerances for combination of accuracy classes

Ball Runner Blocks			Ball Guide Rails N (µm)	H (µm)	P (µm)	SP (µm)	UP (µm)
N	Tolerance dimension H	(µm)	**±100**	**±48**	±32	±23	±19
	Tolerance dimension A_3	(µm)	**±40**	**±28**	±22	±20	±19
	Max. difference in dimensions H and A_3 on one rail	(µm)	**30**	**30**	30	30	30
H	Tolerance dimension H	(µm)	**±92**	**±40**	**±24**	±15	±11
	Tolerance dimension A_3	(µm)	**±32**	**±20**	**±14**	±12	±11
	Max. difference in dimensions H and A_3 on one rail	(µm)	**15**	**15**	**15**	15	15
P	Tolerance dimension H	(µm)	±88	**±36**	**±20**	**±11**	±7
	Tolerance dimension A_3	(µm)	±28	**±16**	**±10**	**±8**	±7
	Max. difference in dimensions H and A_3 on one rail	(µm)	7	**7**	**7**	**7**	7
XP	Tolerance dimension H	(µm)	±88	**±36**	**±20**	**±11**	±7
	Tolerance dimension A_3	(µm)	±28	**±16**	**±10**	**±8**	±7
	Max. difference in dimensions H and A_3 on one rail	(µm)	7	**7**	**7**	**7**	7
SP	Tolerance dimension H	(µm)	±87	±35	**±19**	**±10**	**±6**
	Tolerance dimension A_3	(µm)	±27	±15	**±9**	**±7**	**±6**
	Max. difference in dimensions H and A_3 on one rail	(µm)	5	5	**5**	**5**	**5**
UP	Tolerance dimension H	(µm)	±86	±34	±18	**±9**	**±5**
	Tolerance dimension A_3	(µm)	±26	±14	±8	**±6**	**±5**
	Max. difference in dimensions H and A_3 on one rail	(µm)	3	3	3	**3**	**3**

Recommendations for combining accuracy classes

Recommended for **wide runner block spacing** and **long strokes**:
Ball guide rail in higher accuracy class than ball runner blocks.

Recommended for **close runner block spacing** and **short strokes**:
Ball runner blocks in higher accuracy class than ball guide rail.

Selection criterion Travel accuracy

Perfected ball entry and exit zones in the runner blocks and optimized spacing of the mounting holes in the guide rails provide very high travel accuracy with very low pulsation.

These high accuracy systems are especially suitable for high-precision machining processes, measurement systems, high-precision scanners, EDM equipment, etc.
(See also “High Precision Ball Runner Blocks” ☞ 72)

Selection criteria

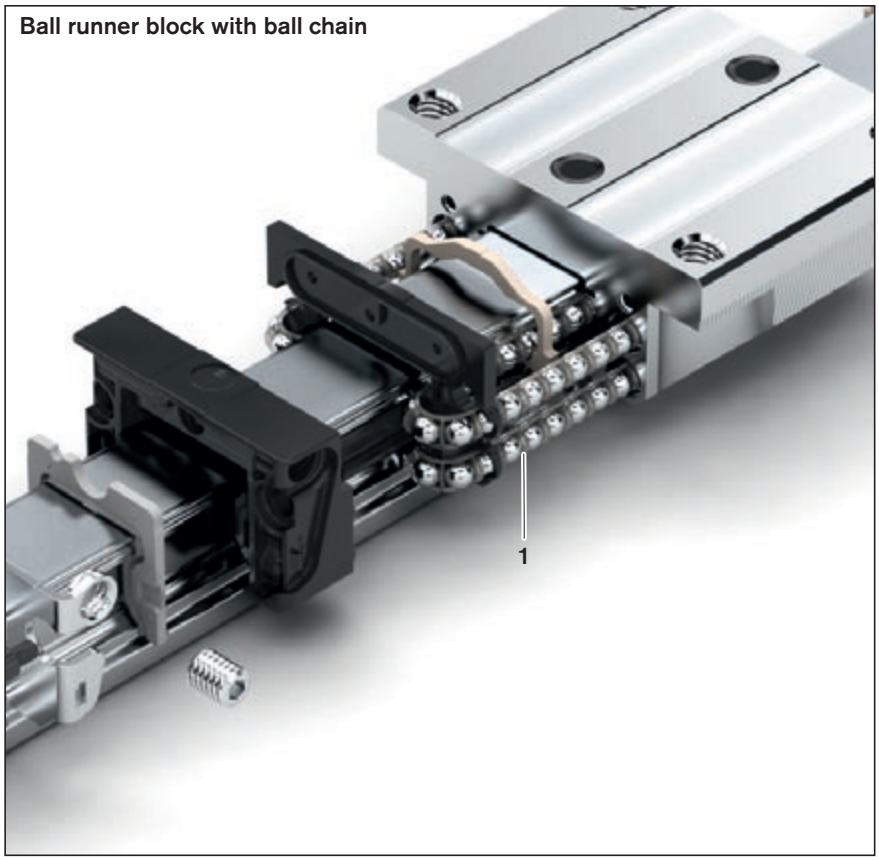
Ball Chain

Ball chain

Rexroth recommends using a ball chain particularly in applications calling for low noise levels.

Ball runner blocks can be equipped with a ball chain (1) as an option. The ball chain prevents the balls from bumping into each other and ensures smoother travel. This reduces the noise level. Runner blocks with ball chains have fewer load-bearing balls, which may result in lower load and load moment capacities (“Product Overview, with Load Capacities and Load Moments” ☞ 8).

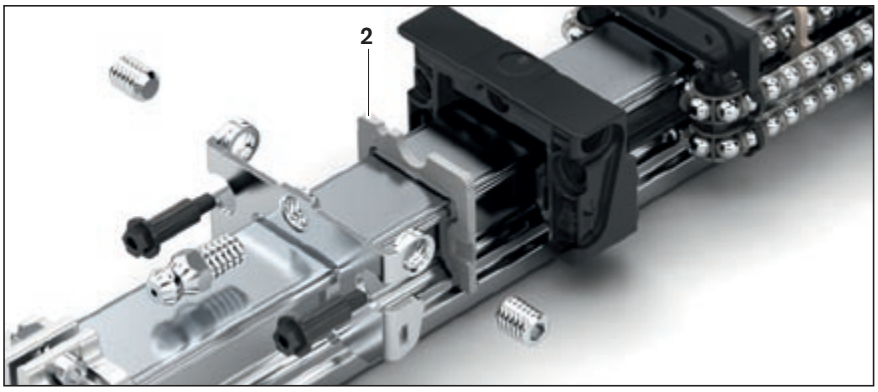
Ball runner block with ball chain



Seals

Wiper seals

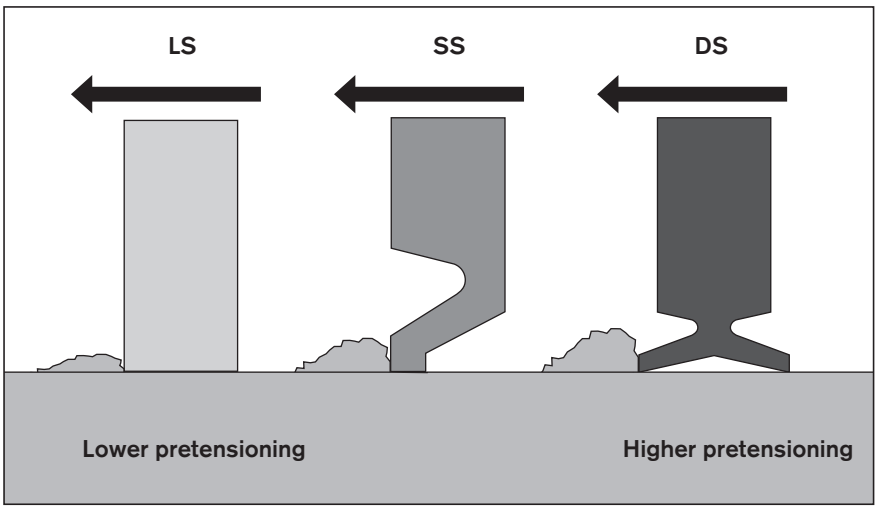
The sealing plate (2) on the end face protects the runner block internals from dirt particles, shavings and liquids. It also reduces lubricant drag-out. Optimized sealing lip geometry results in minimal friction. Sealing plates are available with black standard seals (SS), beige low-friction seals (LS), or green double-lipped seals (DS).



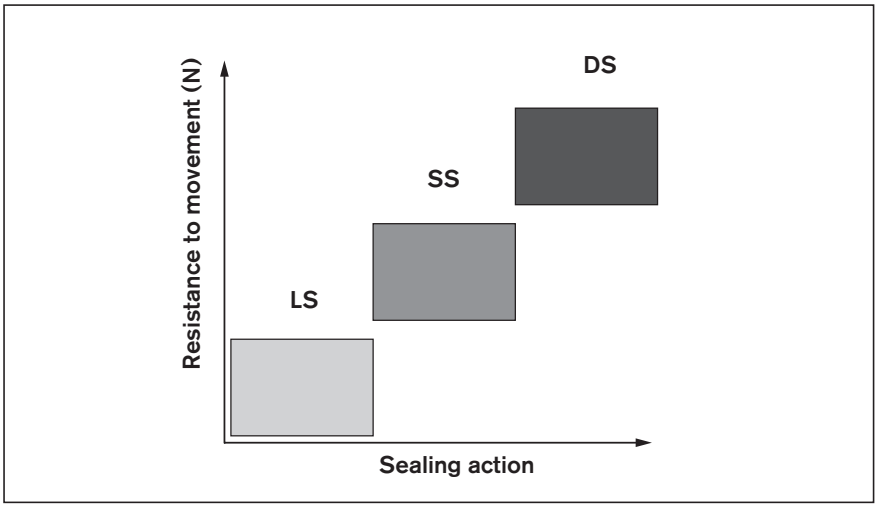
Low-friction seal (LS)
The low-friction seal was developed for applications requiring especially smooth running with minimal lubricant drag-out. It consists of an open-pored polyurethane foam and has only limited wiping action.

Standard seal (SS)
The standard seal is sufficient for most applications. It offers good wiping action while still permitting long relubrication intervals.

Double-lipped seal (DS)
Rexroth recommends using the double-lipped seal for applications where the rail guide is exposed to high levels of contamination such as metal chips, wood dust, metalworking fluids, etc. This seal provides excellent wiping action, but friction levels will be higher and the relubrication intervals are shorter.



Sealing action and resistance to movement
The resistance to movement is influenced by the seal's geometry and the material it is made of.
The chart at right shows the sealing action and resistance to movement in relation to the seal design.



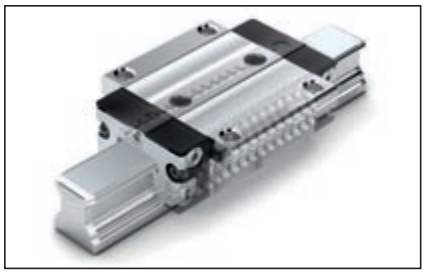
Key to illustration
LS = Low-friction seal
SS = Standard seal, universal seal with good sealing action
DS = Double-lipped seal, seal with very good sealing action

Selection Criteria

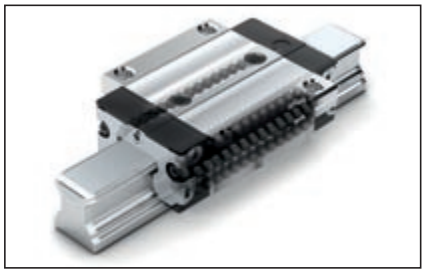
Materials

Rexroth offers Ball Runner Blocks in a variety of materials to meet the requirements of different applications.

A Standard Ball Runner Block made of steel
The most commonly used version, made of carbon steel.
An economical solution, but provides no protection against corrosion.
It is, however, sufficient for most industrial machinery applications.

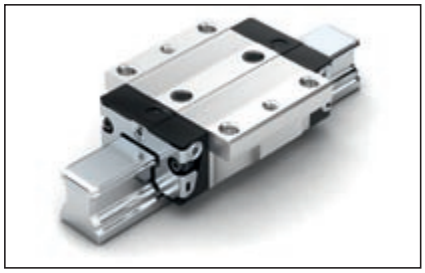


B High-Speed Ball Runner Block made of steel
Basically the same as the standard steel runner block, but with ceramic balls instead of steel ones. Since the ceramic material is less dense than steel, the forces in the recirculation zones of the ball circuits remain the same even at the higher permissible travel speed.
As a result, there is no reduction in life expectancy, even when the system is operated at speeds of up to 10 m/s. The load capacities and moments are slightly lower than those of the standard version.



Ball Runner Blocks with limited corrosion resistance

C Ball Runner Block made of aluminum
The ball runner block body is made of a wrought aluminum alloy. The balls, steel inserts, and the mounting screws at the end face are made of carbon steel. The runner blocks have the same load capacities as the standard version. Since the yield point of aluminum is lower than that of steel, the load-bearing capability of the aluminum runner blocks is limited by F_{max} and M_{max}.
An economical alternative offering limited corrosion protection.



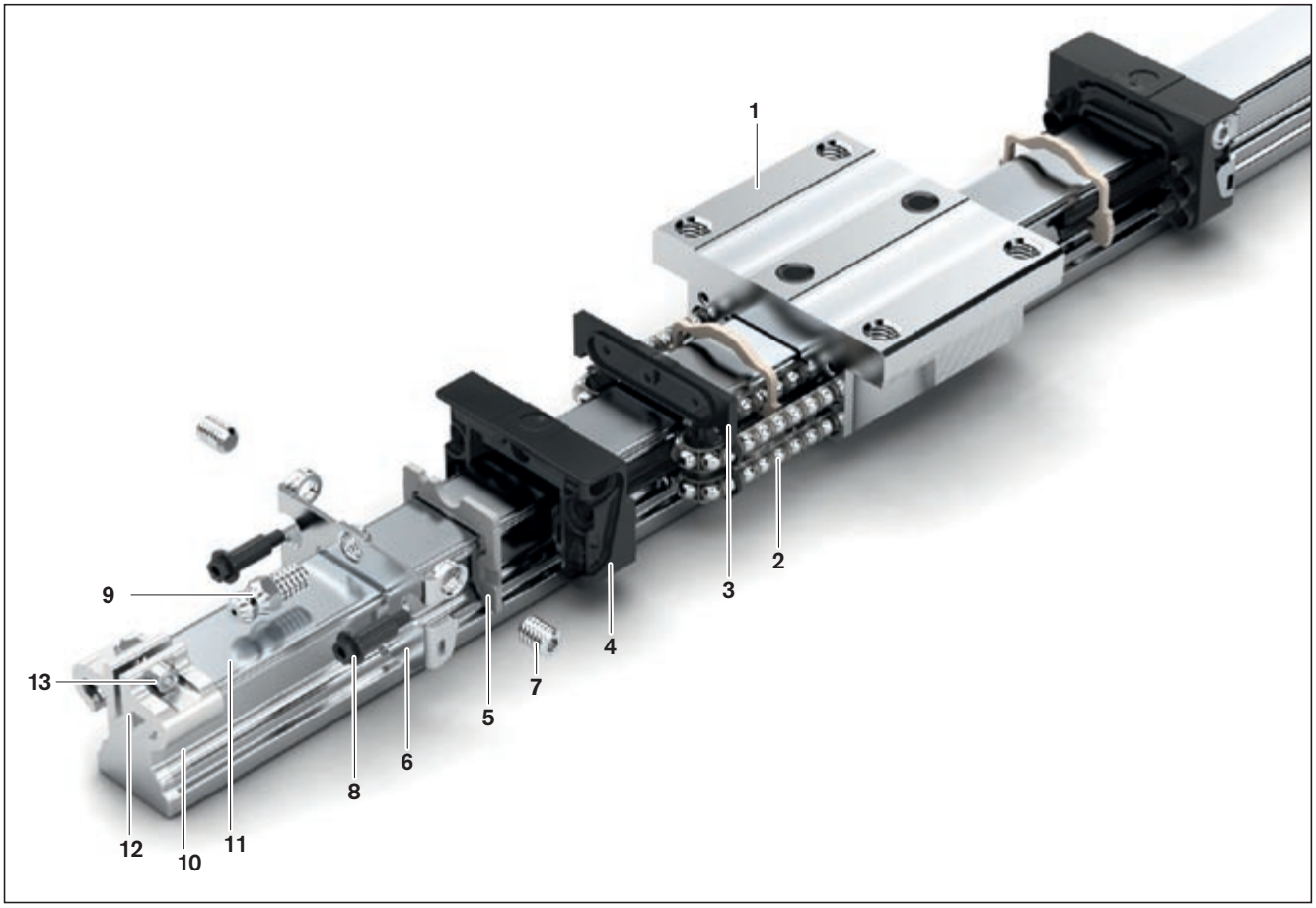
Corrosion-Resistant Ball Runner Blocks

D Resist NR
The ball runner block body is made of a corrosion-resistant material. Offers limited corrosion protection. The balls, steel inserts, and the mounting screws at the end face are made of carbon steel. The runner blocks have the same load capacities and moments as the standard versions.
Rexroth recommends this version for applications requiring corrosion protection.
Fast delivery.

E Resist NR II
All of the ball runner block parts are made of a corrosion-resistant material.
These runner blocks offer the greatest possible protection against corrosion with only a slight reduction in load capacities and moments.

F Resist CR
The ball runner block body is provided with a corrosion-resistant matte-silver hard chrome-plated coating. The balls, steel inserts, and the mounting screws at the end face are made of carbon steel. The runner blocks have the same load capacities and moments as the standard versions.
An alternative when the NR version is not available.

Material specifications



Item	Part	Ball runner block					
		A Steel	B Steel (high-speed)	C Aluminium	D Resist NR	E Resist NR II	F Resist CR
1	Ball runner block body	Heat-treated steel	Heat-treated steel	Wrought aluminum alloy	Corrosion-resistant steel 1.4122	Corrosion-resistant steel 1.4122	Heat-treated steel, chrome-plated
2	Balls	Antifriction bearing steel	Si_3N_4	Antifriction bearing steel	Antifriction bearing steel	Corrosion-resistant steel 1.4112	Antifriction bearing steel
3	Recirculation plate	Plastic TEE-E					
4	Ball guide	Plastic POM (PA6.6)					
5	Sealing plate	Plastic TEE-E					
6	Threaded plate	Corrosion-resistant steel 1.4306					
7	Set screw	Corrosion-resistant steel 1.4301					
8	Flanged screws	Carbon steel				Corrosion-resistant steel 1.4303	Carbon steel
9	Lube nipple					Corrosion-resistant steel 1.4305	
Item	**Part**	**Ball guide rail**					
10	Ball guide rail	Heat-treated steel				Corrosion-resistant steel 1.4116	Heat-treated steel
11	Cover strip	Corrosion-resistant steel 1.4310					
12	Strip clamp	Anodized aluminum					
13	Clamping screw with nut	Corrosion-resistant steel 1.4301					

Standard Ball Runner Blocks made of steel

Product Description

Characteristic features

- Same load capability in all four main load directions
- Low noise level and outstanding travel performance
- Excellent dynamic characteristics:
  Travel speed: $v_{max} = 5$ m/s
  Acceleration: $a_{max} = 500$ m/s^2
- Long-term lubrication, up to several years
- Minimum quantity lubrication system with integrated reservoir for oil lubrication[1)]
- Lube ports with metal threads on all sides[1)]
- Limitless interchangeability; all ball guide rail versions can be combined at will with all ball runner block versions within each accuracy class
- Optimum system rigidity through preloaded O-arrangement
- Integrated, inductive and wear-free measuring system as an option
- Top logistics that are unique worldwide due to interchangeability of components within each accuracy class
- Attachments can be bolted to ball runner blocks from above or below[1)]
- Improved rigidity under lift-off and side loading conditions when additional mounting screws are used in the two holes provided at the center of the runner block[1)]
- Extensive range of accessories
- Mounting threads provided on end faces for fixing of all add-on elements

Further highlights

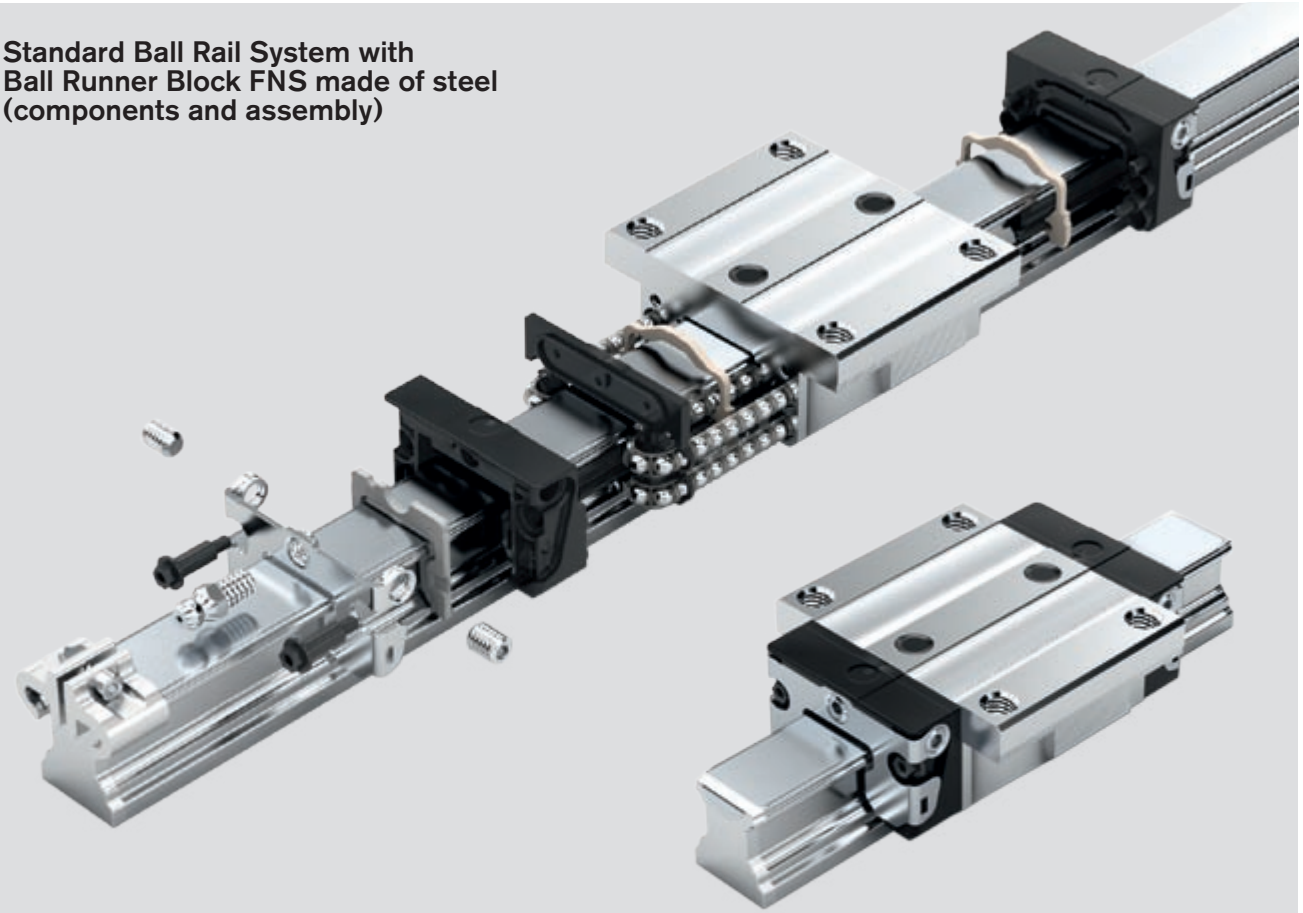
- High rigidity in all load directions – permits applications with just one runner block per rail
- Integrated all-round sealing
- High torque load capacity
- Optimized entry-zone geometry and high number of balls per track minimizes variation in elastic deflection
- Smooth, light running thanks to optimized ball recirculation and ball or ball chain guidance
- Various preload classes
- Ball runner blocks pre-lubricated in factory[1)]
- Available with ball chain as an option[1)]

Corrosion protection (optional)[1)]

- Resist NR:
  Ball runner block body made of corrosion-resistant steel per EN 10088
- Resist NR II:
  Ball runner block body, ball guide rail and all steel parts made from corrosion-resistant steel per EN 10088
- Resist CR:
  Ball runner block body and ball guide rail made of steel with matte-silver hard-chrome plated corrosion-resistant coating

1) depends on type

Standard Ball Rail System with Ball Runner Block FNS made of steel (components and assembly)



Standard Ball Runner Blocks made of steel

Product Description

Overview of Standard and Heavy Duty Ball Runner Block models made of steel

Standard Ball Runner Blocks[1] up to size 45

FNS

FLS

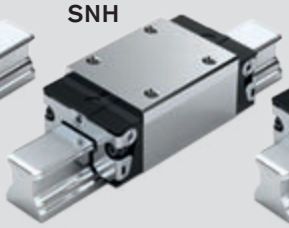
FKS

SNS

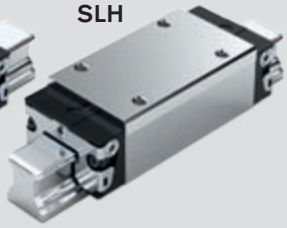
SLS

SKS

SNH



SLH



FNN[2]

FKN[2]

SNN[2]

SKN[2]

Heavy Duty Ball Runner Blocks[2] from size 55

FNS

FLS

SNS

SLS

SNH

SLH

1) With ball chain
2) Without ball chain

Ball chain (optional)
– Optimizes noise levels

Ordering Example

Ordering of Ball Runner Blocks

The part number is composed of the code numbers for the individual options Each option (grey background) has its own code number (white background).

The following ordering example applies to all ball runner blocks.

Explanation of the option "Ball runner block with size"
The design style of the ball runner block – in this example, a Standard Ball Runner Block FNS – is specified on the respective product page.

Coding in the part number:

R1651 7
Design style Size

Ordering example
Options:
- Ball Runner Block FNS
- Size 30
- Preload class C1
- Accuracy class H
- With standard seal, without ball chain

Part number: R1651 713 20

Size	Ball runner block with size	Preload class			Accuracy class			Seal for ball runner block					
								without ball chain			with ball chain		
		C0	C1	C2	N	H	P	SS	LS[1]	DS	SS	LS[1]	DS
15	R1651 1	9			4	3	–	20	21	–	22	23	–
			1		4	3	2	20	21	–	22	23	–
				2	–	3	2	20	–	–	22	–	–
20	R1651 8	9			4	3	–	20	21	–	22	23	–
			1		4	3	2	20	21	2Z	22	23	2Y
				2	–	3	2	20	–	2Z	22	–	2Y
25	R1651 2	9			4	3	–	20	21	–	22	23	–
			1		4	3	2	20	21	2Z	22	23	2Y
				2	–	3	2	20	–	2Z	22	–	2Y
30	R1651 7	9			4	3	–	20	21	–	22	23	–
			1		4	3	2	20	21	2Z	22	23	2Y
				2	–	3	2	20	–	2Z	22	–	2Y
35	R1651 3	9			4	3	–	20	21	–	22	23	–
			1		4	3	2	20	21	2Z	22	23	2Y
				2	–	3	2	20	–	2Z	22	–	2Y
45	R1651 4	9			4	3	–	20	–	–	22	–	–
			1		4	3	2	20	–	2Z	22	–	2Y
				2	–	3	2	20	–	2Z	22	–	2Y
e.g.	R1651 7		1			3		20					

1) Only with accuracy classes N and H

Preload classes
C0 = without preload
C1 = preload 2% C
C2 = preload 8% C

Seals
SS = standard seal
LS = low-friction seal
DS = double-lipped seal

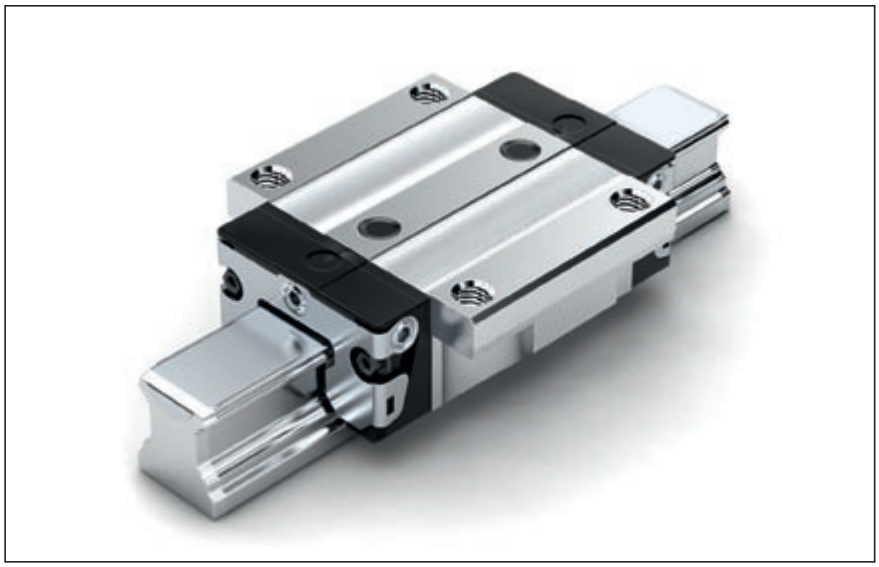
Key to table
Gray numbers
= version/combination not preferred
(longer delivery times in some cases)

Definition Ball Runner Block design style		Code (example) F	N	S
Width	**F**langed	F		
	Slimline			
	Wide			
	Compact			
Length	**N**ormal		N	
	Long			
	Short			
Height	**S**tandard height			S
	High			
	Low			

Standard Ball Runner Blocks made of steel

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

Further Ball Runner Blocks FNS
– Heavy Duty Ball Runner Blocks made of steel, size 55 and 65 ☞ 60
– High Precision Ball Runner Blocks made of steel ☞ 72
– High-Speed Ball Runner Blocks made of steel ☞ 84
– Ball Runner Blocks made of aluminum ☞ 94
– Corrosion-resistant Ball Runner Blocks
Resist NR ☞ 100
Resist NR II ☞ 104
Resist CR ☞ 108

Note
Can be used on all Ball Guide Rails SNS.

Ordering example
Options:
– Ball Runner Block FNS
– Size 30
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R1651 713 20

Options and part numbers

Size	Ball runner block with size	Preload class			Accuracy class			Seal for ball runner block					
								without ball chain			with ball chain		
		C0	C1	C2	N	H	P	SS	LS[1)]	DS	SS	LS[1)]	DS
15	R1651 1	9			4	3	–	20	21	–	22	23	–
			1		4	3	2	20	21	–	22	23	–
				2	–	3	2	20	–	–	22	–	–
20	R1651 8	9			4	3	–	20	21	–	22	23	–
			1		4	3	2	20	21	2Z	22	23	2Y
				2	–	3	2	20	–	2Z	22	–	2Y
25	R1651 2	9			4	3	–	20	21	–	22	23	–
			1		4	3	2	20	21	2Z	22	23	2Y
				2	–	3	2	20	–	2Z	22	–	2Y
30	R1651 7	9			4	3	–	20	21	–	22	23	–
			1		4	3	2	20	21	2Z	22	23	2Y
				2	–	3	2	20	–	2Z	22	–	2Y
35	R1651 3	9			4	3	–	20	21	–	22	23	–
			1		4	3	2	20	21	2Z	22	23	2Y
				2	–	3	2	20	–	2Z	22	–	2Y
45	R1651 4	9			4	3	–	20	–	–	22	–	–
			1		4	3	2	20	–	2Z	22	–	2Y
				2	–	3	2	20	–	2Z	22	–	2Y
e.g.	R1651 7		1			3		20					

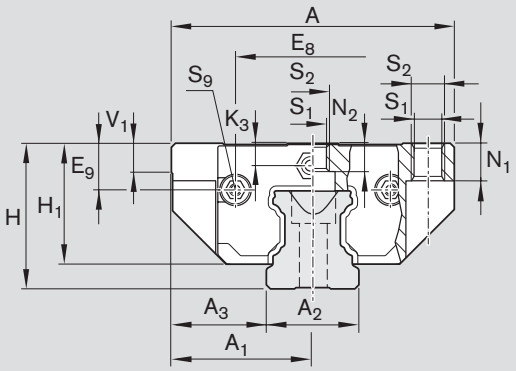
1) Only with accuracy classes N and H

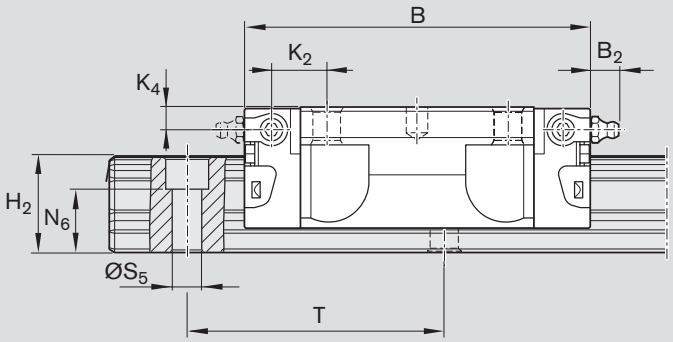
Preload classes
C0 = without preload
C1 = preload 2% C
C2 = preload 8% C

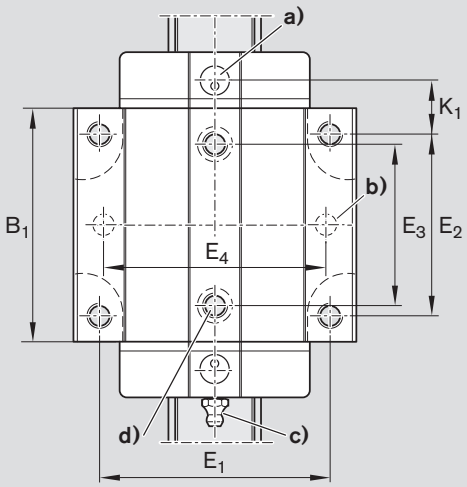
Seals
SS = standard seal
LS = low-friction seal
DS = double-lipped seal

Key to table
Gray numbers
= version/combination not preferred
(longer delivery times in some cases)

Ball Runner Blocks FNS







a) For O-ring
Size 15: Ø 4 · 1.0 (mm)
Size 20 - 45: Ø 5 · 1.0 (mm)
Open lube bore as required (☞ 258).

b) Recommended position for pin holes (dimensions E_4 ☞ 235).
Due to manufacturing reasons, there may be rough-drilled holes at the recommended positions. These may be bored open to accommodate the locating pins.

c) Lube nipple, size 15 - 20:
Funnel-type lube nipple DIN 3405-A M3x5, B_2 = 1.6 mm
If another lube nipple is used: observe the screw-in depth of 5 mm!
Lube nipple, size 25 - 45:
Hydraulic-type lube nipple DIN 71412-B M6x8, B_2 = 9.5 mm
If another lube nipple is used: observe the screw-in depth of 8 mm!
Lube nipples are provided (unmounted). Connection possible at all sides.

d) For manufacturing reasons, there may be plugs at these positions.
These must be removed before mounting.

Size	Dimensions (mm)																		
	A	A_1	A_2	A_3	B	B_1	E_1	E_2	E_3	E_8	E_9	H	H_1	H_2 1)	H_2 2)	K_1	K_2	K_3	K_4
15	47	23.5	15	16.0	58.2	39.2	38	30	26	24.55	6.70	24	19.90	16.30	16.20	8.00	9.6	3.20	3.20
20	63	31.5	20	21.5	75.0	49.6	53	40	35	32.50	7.30	30	25.35	20.75	20.55	11.80	11.8	3.35	3.35
25	70	35.0	23	23.5	86.2	57.8	57	45	40	38.30	11.50	36	29.90	24.45	24.25	12.45	13.6	5.50	5.50
30	90	45.0	28	31.0	97.7	67.4	72	52	44	48.40	14.60	42	35.35	28.55	28.35	14.00	15.7	6.05	6.05
35	100	50.0	34	33.0	110.5	77.0	82	62	52	58.00	17.35	48	40.40	32.15	31.85	14.50	16.0	6.90	6.90
45	120	60.0	45	37.5	137.6	97.0	100	80	60	69.80	20.90	60	50.30	40.15	39.85	17.30	19.3	8.20	8.20

Size	Dimensions (mm)									Weight (kg)	Load capacities 3) (N)		Load moments 3) (Nm)			
	N_1	N_2	$N_6^{\pm 0.5}$	S_1	S_2	S_5	S_9	T	V_1		C	C_0	M_t	M_{t0}	M_L	M_{L0}
15	5.2	4.40	10.3	4.3	M5	4.4	M2.5x3.5	60	5.0	0.20	7 800	13 500	74	130	40	71
20	7.7	5.20	13.2	5.3	M6	6.0	M3x5	60	6.0	0.45	18 800	24 400	240	310	130	165
25	9.3	7.00	15.2	6.7	M8	7.0	M3x5	60	7.5	0.65	22 800	30 400	320	430	180	240
30	11.0	7.90	17.0	8.5	M10	9.0	M3x5	80	7.0	1.10	31 700	41 300	540	720	290	380
35	12.0	10.15	20.5	8.5	M10	9.0	M3x5	80	8.0	1.60	41 900	54 000	890	1 160	440	565
45	15.0	12.40	23.5	10.4	M12	14.0	M4x7	105	10.0	3.00	68 100	85 700	1 830	2 310	890	1 130

1) Dimension H_2 with cover strip
2) Dimension H_2 without cover strip
3) Load capacities and moments for Ball Runner Block **without** ball chain. Load capacities and moments for Ball Runner Block **with** ball chain ☞ 8.
Determination of the dynamic load capacities and moments is based on a travel life of 100,000 m per ISO 14728-1. Often only 50,000 m are actually stipulated. For comparison: Multiply values **C**, $\mathbf{M_t}$ and $\mathbf{M_L}$ from the table by 1.26.

Standard Ball Runner Blocks made of steel

FLS – Flanged, long, standard height

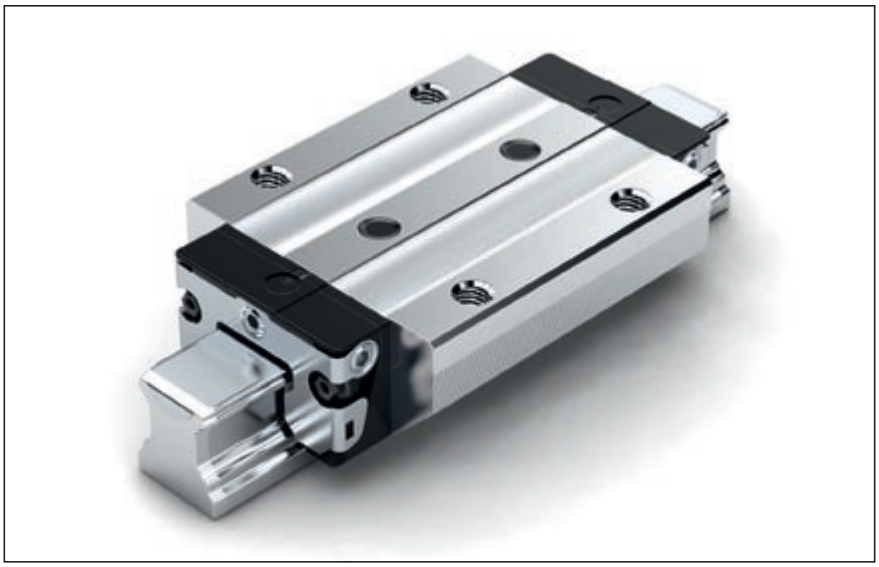
R1653 … 2.

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

Further Ball Runner Blocks FLS
– Heavy Duty Ball Runner Blocks made of steel, size 55 and 65 ☞ 62
– High Precision Ball Runner Blocks made of steel ☞ 72
– Corrosion-resistant Ball Runner Blocks
Resist NR ☞ 100
Resist CR ☞ 108

Note
Can be used on all Ball Guide Rails SNS.



Options and part numbers

Size	Ball runner block with size	Preload class			Accuracy class			Seal for ball runner block					
								without ball chain			with ball chain		
		C0	C1	C2	N	H	P	SS	LS[1)]	DS	SS	LS[1)]	DS
15	R1653 1	9			4	3	–	20	21	–	22	23	–
			1		4	3	2	20	21	–	22	23	–
				2	–	3	2	20	–	–	22	–	–
20	R1653 8	9			4	3	–	20	21	–	22	23	–
			1		4	3	2	20	21	2Z	22	23	2Y
				2	–	3	2	20	–	2Z	22	–	2Y
25	R1653 2	9			4	3	–	20	21	–	22	23	–
			1		4	3	2	20	21	2Z	22	23	2Y
				2	–	3	2	20	–	2Z	22	–	2Y
30	R1653 7	9			4	3	–	20	21	–	22	23	–
			1		4	3	2	20	21	2Z	22	23	2Y
				2	–	3	2	20	–	2Z	22	–	2Y
35	R1653 3	9			4	3	–	20	21	–	22	23	–
			1		4	3	2	20	21	2Z	22	23	2Y
				2	–	3	2	20	–	2Z	22	–	2Y
45	R1653 4	9			4	3	–	20	–	–	22	–	–
			1		4	3	2	20	–	2Z	22	–	2Y
				2	–	3	2	20	–	2Z	22	–	2Y
e.g.	R1653 7		1			3		20					

1) Only with accuracy classes N and H

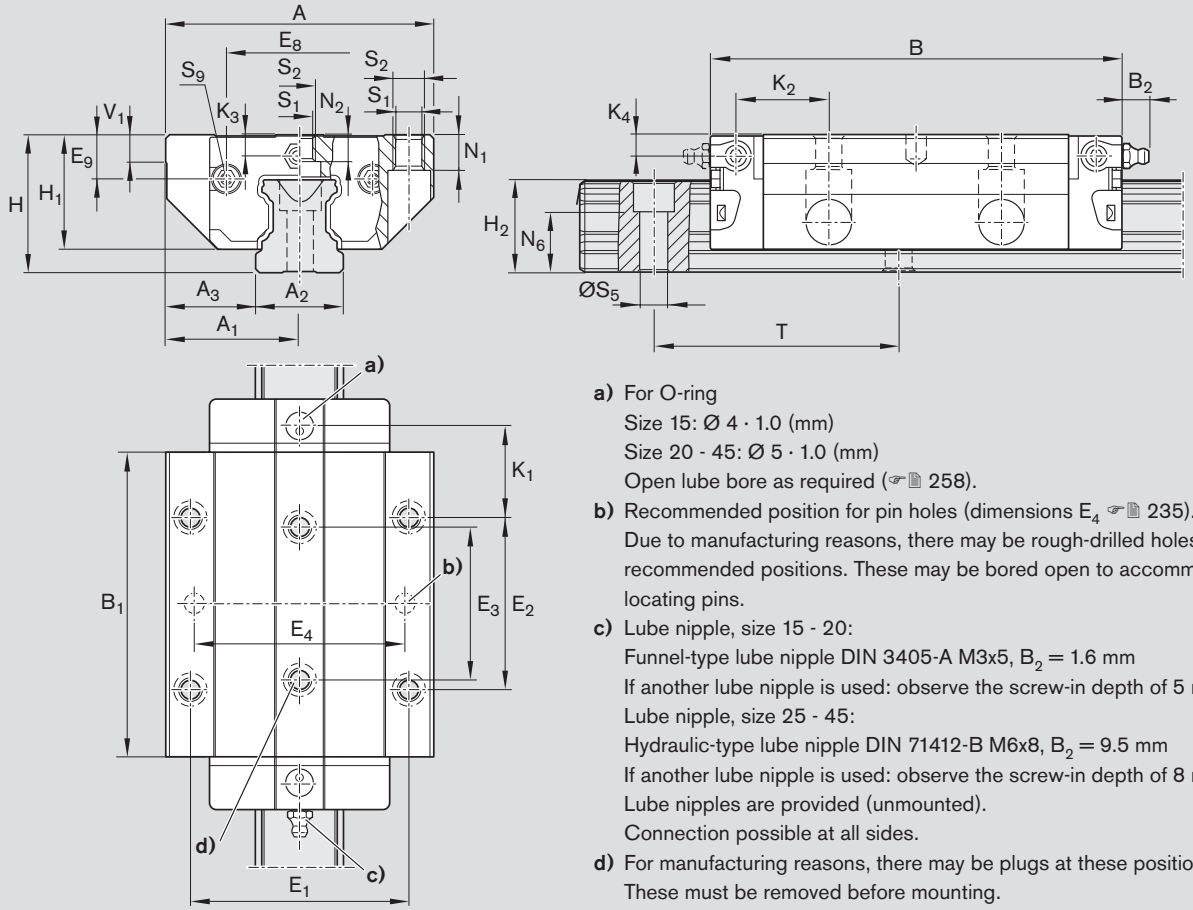
Ordering example
Options:
– Ball Runner Block FLS
– Size 30
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R1653 713 20

Preload classes
C0 = without preload
C1 = preload 2% C
C2 = preload 8% C

Seals
SS = standard seal
LS = low-friction seal
DS = double-lipped seal

Key to table
Gray numbers
= version/combination not preferred
(longer delivery times in some cases)

Ball Runner Blocks FLS



a) For O-ring
Size 15: Ø 4 · 1.0 (mm)
Size 20 - 45: Ø 5 · 1.0 (mm)
Open lube bore as required (☞ 258).

b) Recommended position for pin holes (dimensions E_4 ☞ 235).
Due to manufacturing reasons, there may be rough-drilled holes at the recommended positions. These may be bored open to accommodate the locating pins.

c) Lube nipple, size 15 - 20:
Funnel-type lube nipple DIN 3405-A M3x5, $B_2 = 1.6$ mm
If another lube nipple is used: observe the screw-in depth of 5 mm!
Lube nipple, size 25 - 45:
Hydraulic-type lube nipple DIN 71412-B M6x8, $B_2 = 9.5$ mm
If another lube nipple is used: observe the screw-in depth of 8 mm!
Lube nipples are provided (unmounted).
Connection possible at all sides.

d) For manufacturing reasons, there may be plugs at these positions.
These must be removed before mounting.

Size	Dimensions (mm)																		
	A	A_1	A_2	A_3	B	B_1	E_1	E_2	E_3	E_8	E_9	H	H_1	H_2 1)	H_2 2)	K_1	K_2	K_3	K_4
15	47	23.5	15	16.0	72.6	53.6	38	30	26	24.55	6.70	24	19.90	16.30	16.20	15.20	16.80	3.20	3.20
20	63	31.5	20	21.5	91.0	65.6	53	40	35	32.50	7.30	30	25.35	20.75	20.55	19.80	19.80	3.35	3.35
25	70	35.0	23	23.5	107.9	79.5	57	45	40	38.30	11.50	36	29.90	24.45	24.25	23.30	24.45	5.50	5.50
30	90	45.0	28	31.0	119.7	89.4	72	52	44	48.40	14.60	42	35.35	28.55	28.35	25.00	26.70	6.05	6.05
35	100	50.0	34	33.0	139.0	105.5	82	62	52	58.00	17.35	48	40.40	32.15	31.85	28.75	30.25	6.90	6.90
45	120	60.0	45	37.5	174.1	133.5	100	80	60	69.80	20.90	60	50.30	40.15	39.85	35.50	37.50	8.20	8.20

Size	Dimensions (mm)									Weight (kg)	Load capacities 3) (N)		Load moments 3) (Nm)			
	N_1	N_2	$N_6^{\pm 0.5}$	S_1	S_2	S_5	S_9	T	V_1		C	C_0	M_t	M_{t0}	M_L	M_{L0}
15	5.2	4.40	10.3	4.3	M5	4.4	M2.5x3.5	60	5.0	0.30	10 000	20 200	96	190	75	150
20	7.7	5.20	13.2	5.3	M6	6.0	M3x5	60	6.0	0.55	24 400	35 200	310	450	225	330
25	9.3	7.00	15.2	6.7	M8	7.0	M3x5	60	7.5	0.90	30 400	45 500	430	650	345	510
30	11.0	7.90	17.0	8.5	M10	9.0	M3x5	80	7.0	1.50	40 000	57 800	690	1 000	495	715
35	12.0	10.15	20.5	8.5	M10	9.0	M3x5	80	8.0	2.25	55 600	81 000	1 200	1 740	830	1 215
45	15.0	12.40	23.5	10.4	M12	14.0	M4x7	105	10.0	4.30	90 400	128 500	2 440	3 470	1 700	2 425

1) Dimension H_2 with cover strip

2) Dimension H_2 without cover strip

3) Load capacities and moments for Ball Runner Block **without** ball chain. Load capacities and moments for Ball Runner Block **with** ball chain ☞ 8.
Determination of the dynamic load capacities and moments is based on a travel life of 100,000 m per ISO 14728-1. Often only 50,000 m are actually stipulated. For comparison: Multiply values **C**, $\mathbf{M_t}$ and $\mathbf{M_L}$ from the table by 1.26.

Standard Ball Runner Blocks made of steel

FKS – Flanged, short, standard height

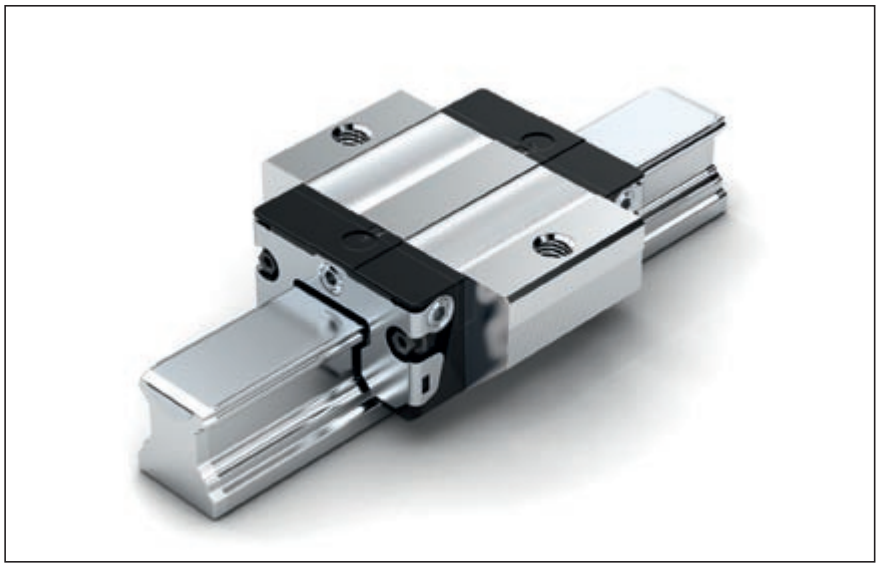
R1665 … 2.

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

Further Ball Runner Blocks FKS
– Super Ball Runner Blocks made of steel ☞ 88
– Corrosion-resistant Ball Runner Blocks
Resist NR ☞ 100
Resist CR ☞ 108

Note
Can be used on all Ball Guide Rails SNS.



Options and part numbers

Size	Ball runner block with size	Preload class		Accuracy class		Seal for ball runner block					
						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	–	22	23	–
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					

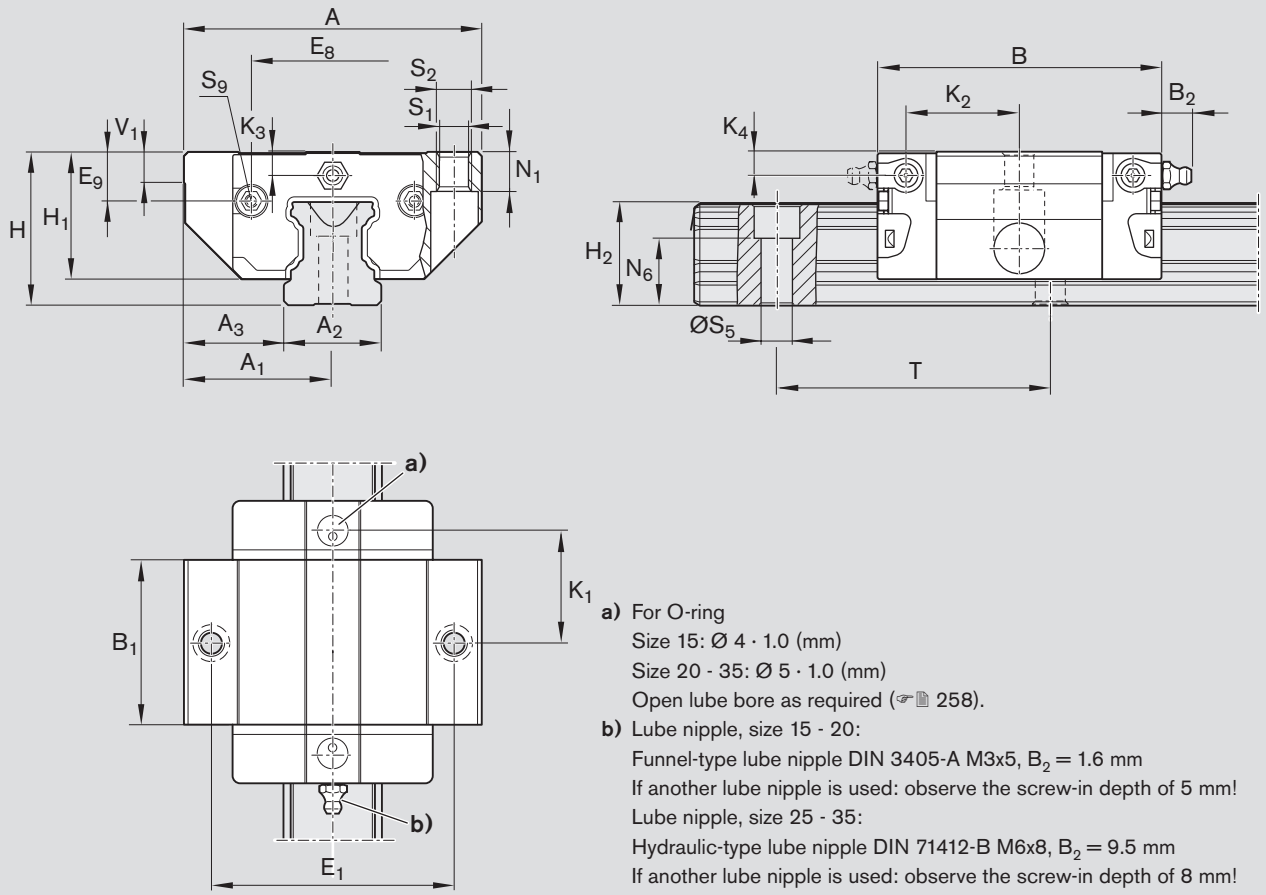
Ordering example
Options:
– Ball Runner Block FKS
– Size 30
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R1665 713 20

Preload classes
C0 = without preload
C1 = preload 2% C

Seals
SS = standard seal
LS = low-friction seal
DS = double-lipped seal

Key to table
Gray numbers
= version/combination not preferred
(longer delivery times in some cases)

Ball Runner Blocks FKS



a) For O-ring
Size 15: Ø 4 · 1.0 (mm)
Size 20 - 35: Ø 5 · 1.0 (mm)
Open lube bore as required (☞ 258).

b) Lube nipple, size 15 - 20:
Funnel-type lube nipple DIN 3405-A M3x5, $B_2 = 1.6$ mm
If another lube nipple is used: observe the screw-in depth of 5 mm!
Lube nipple, size 25 - 35:
Hydraulic-type lube nipple DIN 71412-B M6x8, $B_2 = 9.5$ mm
If another lube nipple is used: observe the screw-in depth of 8 mm!
Lube nipples are provided (unmounted).
Connection possible at all sides.

Size	Dimensions (mm)																
	A	A_1	A_2	A_3	B	B_1	E_1	E_8	E_9	H	H_1	H_2 1)	H_2 2)	K_1	K_2	K_3	K_4
15	47	23.5	15	16.0	44.7	25.7	38	24.55	6.70	24	19.90	16.30	16.20	16.25	17.85	3.20	3.20
20	63	31.5	20	21.5	57.3	31.9	53	32.50	7.30	30	25.35	20.75	20.55	22.95	22.95	3.35	3.35
25	70	35.0	23	23.5	67.0	38.6	57	38.30	11.50	36	29.90	24.45	24.25	25.35	26.50	5.50	5.50
30	90	45.0	28	31.0	75.3	45.0	72	48.40	14.60	42	35.35	28.55	28.35	28.80	30.50	6.05	6.05
35	100	50.0	34	33.0	84.9	51.4	82	58.00	17.35	48	40.40	32.15	31.85	32.70	34.20	6.90	6.90

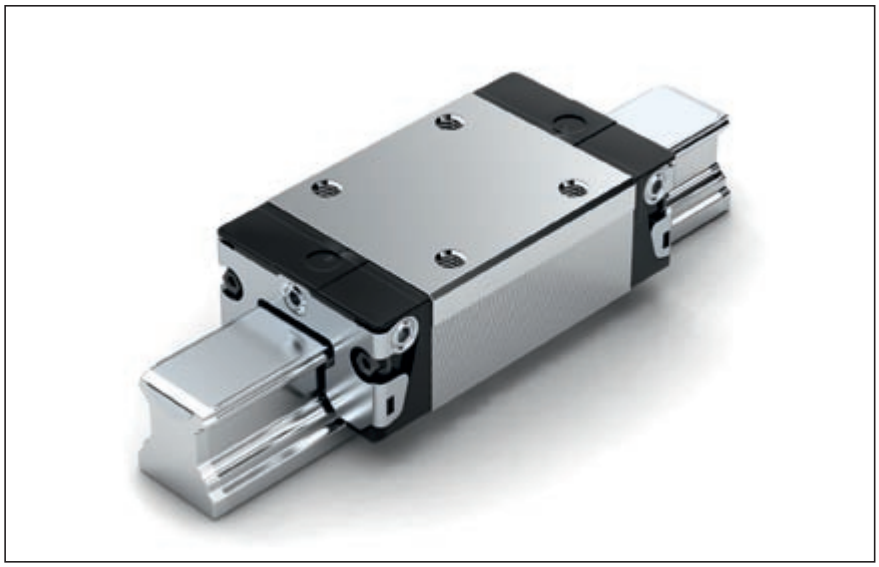
Size	Dimensions (mm)								Weight (kg)	Load capacities 3) (N)		Load moments 3) (Nm)			
	N_1	$N_6^{\pm 0.5}$	S_1	S_2	S_5	S_9	T	V_1		C	C_0	M_t	M_{t0}	M_L	M_{L0}
15	5.2	10.3	4.3	M5	4.4	M2.5x3.5	60	5.0	0.15	5 400	8 100	52	80	19	28
20	7.7	13.2	5.3	M6	6.0	M3x5	60	6.0	0.30	12 400	13 600	150	170	52	58
25	9.3	15.2	6.7	M8	7.0	M3x5	60	7.5	0.50	15 900	18 200	230	260	82	94
30	11.0	17.0	8.5	M10	9.0	M3x5	80	7.0	0.80	22 100	24 800	380	430	133	150
35	12.0	20.5	8.5	M10	9.0	M3x5	80	8.0	1.20	29 300	32 400	640	700	200	220

1) Dimension H_2 with cover strip
2) Dimension H_2 without cover strip
3) Load capacities and moments for Ball Runner Block **without** ball chain. Load capacities and moments for Ball Runner Block **with** ball chain ☞ 8. Determination of the dynamic load capacities and moments is based on a travel life of 100,000 m per ISO 14728-1. Often only 50,000 m are actually stipulated. For comparison: Multiply values **C**, $\mathbf{M_t}$ and $\mathbf{M_L}$ from the table by 1.26.

Standard Ball Runner Blocks made of steel

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

Further Ball Runner Blocks SNS
– Heavy Duty Ball Runner Blocks made of steel, size 55 and 65 ☞ 64
– High Precision Ball Runner Blocks made of steel ☞ 72
– High-Speed Ball Runner Blocks made of steel ☞ 84
– Ball Runner Blocks made of aluminum ☞ 94
– Corrosion-resistant Ball Runner Blocks
Resist NR ☞ 100
Resist NR II ☞ 104
Resist CR ☞ 108

Note
Can be used on all Ball Guide Rails SNS.

Ordering example
Options:
– Ball Runner Block SNS
– Size 30
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R1622 713 20

Options and part numbers

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

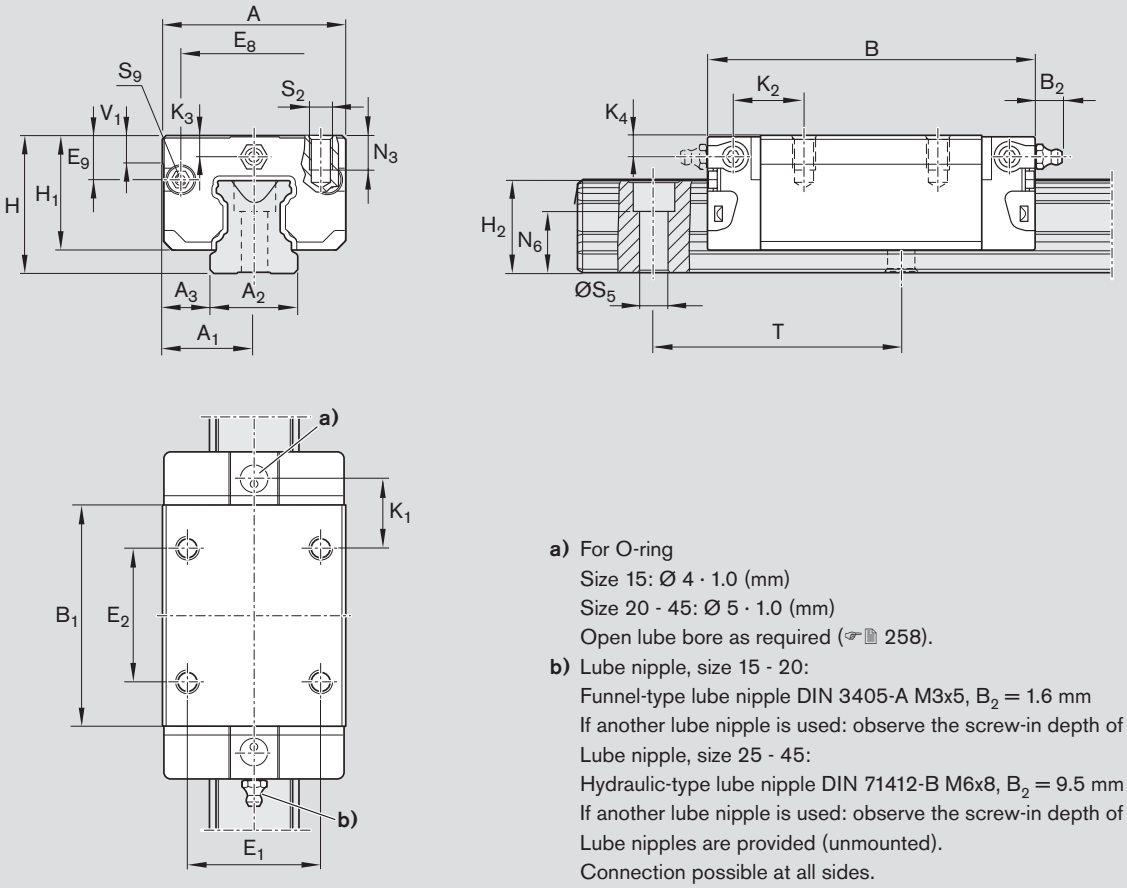
1) Only with accuracy classes N and H

Preload classes
C0 = without preload
C1 = preload 2% C
C2 = preload 8% C

Seals
SS = standard seal
LS = low-friction seal
DS = double-lipped seal

Key to table
Gray numbers
= version/combination not preferred
(longer delivery times in some cases)

Ball Runner Blocks SNS



a) For O-ring
Size 15: Ø 4 · 1.0 (mm)
Size 20 - 45: Ø 5 · 1.0 (mm)
Open lube bore as required (☞ 258).

b) Lube nipple, size 15 - 20:
Funnel-type lube nipple DIN 3405-A M3x5, B_2 = 1.6 mm
If another lube nipple is used: observe the screw-in depth of 5 mm!
Lube nipple, size 25 - 45:
Hydraulic-type lube nipple DIN 71412-B M6x8, B_2 = 9.5 mm
If another lube nipple is used: observe the screw-in depth of 8 mm!
Lube nipples are provided (unmounted).
Connection possible at all sides.

Size	Dimensions (mm)																	
	A	A_1	A_2	A_3	B	B_1	E_1	E_2	E_8	E_9	H	H_1	H_2 1)	H_2 2)	K_1	K_2	K_3	K_4
15	34	17	15	9.5	58.2	39.2	26	26	24.55	6.70	24	19.90	16.30	16.20	10.00	11.60	3.20	3.20
20	44	22	20	12.0	75.0	49.6	32	36	32.50	7.30	30	25.35	20.75	20.55	13.80	13.80	3.35	3.35
25	48	24	23	12.5	86.2	57.8	35	35	38.30	11.50	36	29.90	24.45	24.25	17.45	18.60	5.50	5.50
30	60	30	28	16.0	97.7	67.4	40	40	48.40	14.60	42	35.35	28.55	28.35	20.00	21.70	6.05	6.05
35	70	35	34	18.0	110.5	77.0	50	50	58.00	17.35	48	40.40	32.15	31.85	20.50	22.00	6.90	6.90
45	86	43	45	20.5	137.6	97.0	60	60	69.80	20.90	60	50.30	40.15	39.85	27.30	29.30	8.20	8.20

Size	Dimensions (mm)							Weight (kg)	Load capacities 3) (N)		Load moments 3) (Nm)			
	N_3	$N_6^{\pm 0.5}$	S_2	S_5	S_9	T	V_1		C	C_0	M_t	M_{t0}	M_L	M_{L0}
15	6.0	10.3	M4	4.4	M2.5x3.5	60	5.0	0.15	7 800	13 500	74	130	40	71
20	7.5	13.2	M5	6.0	M3x5	60	6.0	0.35	18 800	24 400	240	310	130	165
25	9.0	15.2	M6	7.0	M3x5	60	7.5	0.50	22 800	30 400	320	430	180	240
30	12.0	17.0	M8	9.0	M3x5	80	7.0	0.85	31 700	41 300	540	720	290	380
35	13.0	20.5	M8	9.0	M3x5	80	8.0	1.25	41 900	54 000	890	1 160	440	565
45	18.0	23.5	M10	14.0	M4x7	105	10.0	2.40	68 100	85 700	1 830	2 310	890	1 130

1) Dimension H_2 with cover strip
2) Dimension H_2 without cover strip
3) Load capacities and moments for Ball Runner Block **without** ball chain. Load capacities and moments for Ball Runner Block **with** ball chain ☞ 8. Determination of the dynamic load capacities and moments is based on a travel life of 100,000 m per ISO 14728-1. Often only 50,000 m are actually stipulated. For comparison: Multiply values **C**, $\mathbf{M_t}$ and $\mathbf{M_L}$ from the table by 1.26.

Standard Ball Runner Blocks made of steel

SLS – Slimline, long, standard height

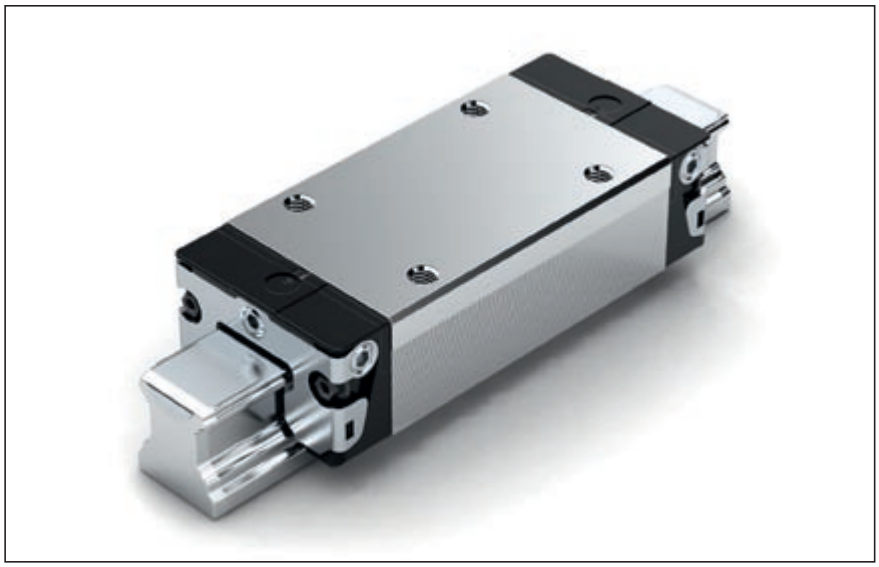
R1623 … 2.

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

Further Ball Runner Blocks SLS
– Heavy Duty Ball Runner Blocks made of steel, size 55 and 65 ☞ 66
– High Precision Ball Runner Blocks made of steel ☞ 72
– Corrosion-resistant Ball Runner Blocks
Resist NR ☞ 100
Resist CR ☞ 108

Note
Can be used on all Ball Guide Rails SNS.



Options and part numbers

Size	Ball runner block with size	Preload class			Accuracy class			Seal for ball runner block					
								without ball chain			with ball chain		
		C0	C1	C2	N	H	P	SS	LS[1)]	DS	SS	LS[1)]	DS
15	R1623 1	9			4	3	–	20	21	–	22	23	–
			1		4	3	2	20	21	–	22	23	–
				2	–	3	2	20	–	–	22	–	–
20	R1623 8	9			4	3	–	20	21	–	22	23	–
			1		4	3	2	20	21	2Z	22	23	2Y
				2	–	3	2	20	–	2Z	22	–	2Y
25	R1623 2	9			4	3	–	20	21	–	22	23	–
			1		4	3	2	20	21	2Z	22	23	2Y
				2	–	3	2	20	–	2Z	22	–	2Y
30	R1623 7	9			4	3	–	20	21	–	22	23	–
			1		4	3	2	20	21	2Z	22	23	2Y
				2	–	3	2	20	–	2Z	22	–	2Y
35	R1623 3	9			4	3	–	20	21	–	22	23	–
			1		4	3	2	20	21	2Z	22	23	2Y
				2	–	3	2	20	–	2Z	22	–	2Y
45	R1623 4	9			4	3	–	20	–	–	22	–	–
			1		4	3	2	20	–	2Z	22	–	2Y
				2	–	3	2	20	–	2Z	22	–	2Y
e.g.	R1623 7		1			3		20					

1) Only with accuracy classes N and H

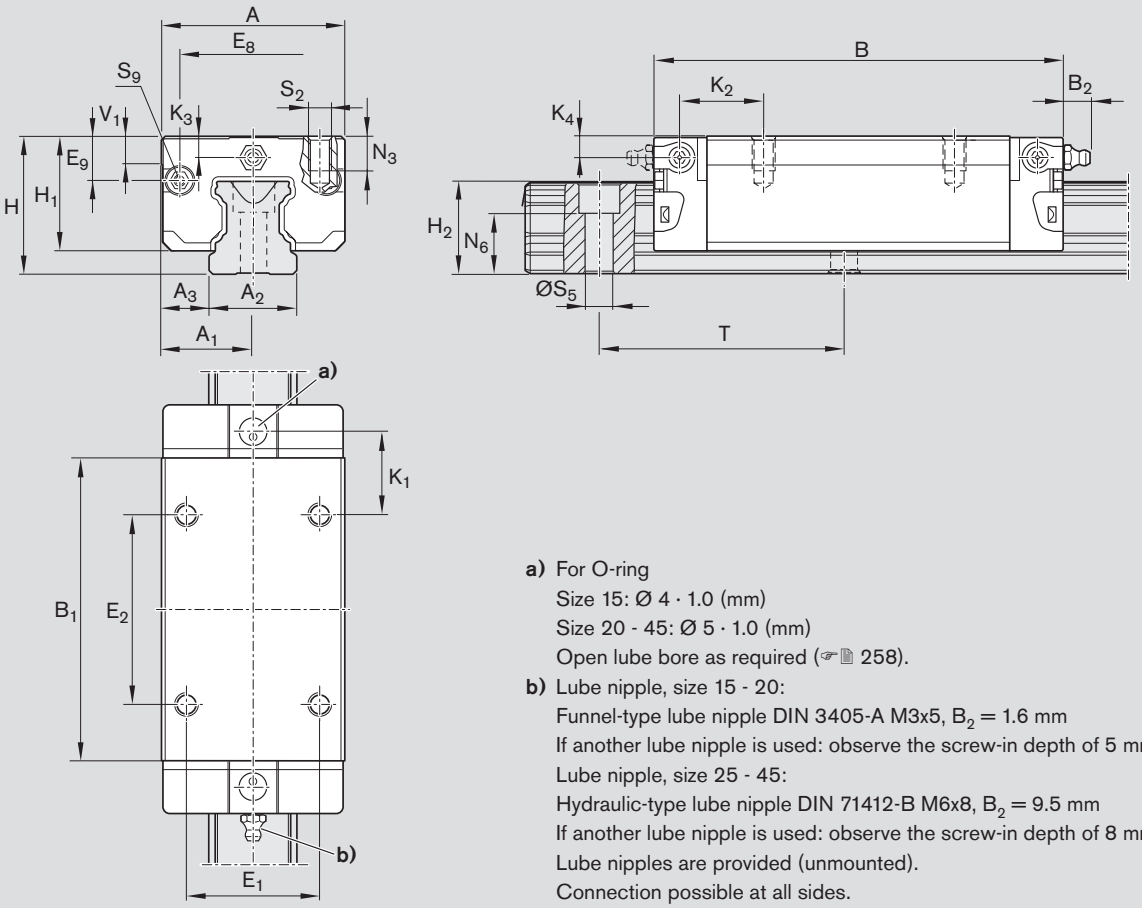
Ordering example
Options:
– Ball Runner Block SLS
– Size 30
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R1623 713 20

Preload classes
C0 = without preload
C1 = preload 2% C
C2 = preload 8% C

Seals
SS = standard seal
LS = low-friction seal
DS = double-lipped seal

Key to table
Gray numbers
= version/combination not preferred
(longer delivery times in some cases)

Ball Runner Blocks SLS



a) For O-ring
Size 15: Ø 4 · 1.0 (mm)
Size 20 - 45: Ø 5 · 1.0 (mm)
Open lube bore as required (☞ 258).

b) Lube nipple, size 15 - 20:
Funnel-type lube nipple DIN 3405-A M3x5, B_2 = 1.6 mm
If another lube nipple is used: observe the screw-in depth of 5 mm!
Lube nipple, size 25 - 45:
Hydraulic-type lube nipple DIN 71412-B M6x8, B_2 = 9.5 mm
If another lube nipple is used: observe the screw-in depth of 8 mm!
Lube nipples are provided (unmounted).
Connection possible at all sides.

Size	Dimensions (mm)																	
	A	A_1	A_2	A_3	B	B_1	E_1	E_2	E_8	E_9	H	H_1	H_2 1)	H_2 2)	K_1	K_2	K_3	K_4
15	34	17	15	9.5	72.6	53.6	26	26	24.55	6.70	24	19.90	16.30	16.20	17.20	18.80	3.20	3.20
20	44	22	20	12.0	91.0	65.6	32	50	32.50	7.30	30	25.35	20.75	20.55	14.80	14.80	3.35	3.35
25	48	24	23	12.5	107.9	79.5	35	50	38.30	11.50	36	29.90	24.45	24.25	20.80	21.95	5.50	5.50
30	60	30	28	16.0	119.7	89.4	40	60	48.40	14.60	42	35.35	28.55	28.35	21.00	22.70	6.05	6.05
35	70	35	34	18.0	139.0	105.5	50	72	58.00	17.35	48	40.40	32.15	31.85	23.75	25.25	6.90	6.90
45	86	43	45	20.5	174.1	133.5	60	80	69.80	20.90	60	50.30	40.15	39.85	35.50	37.50	8.20	8.20

Size	Dimensions (mm)							Weight (kg)	Load capacities 3) (N)		Load moments 3) (Nm)			
	N_3	$N_6^{\pm 0.5}$	S_2	S_5	S_9	T	V_1		C	C_0	M_t	M_{t0}	M_L	M_{L0}
15	6.0	10.3	M4	4.4	M2.5x3.5	60	5.0	0.20	10 000	20 200	96	190	75	150
20	7.5	13.2	M5	6.0	M3x5	60	6.0	0.45	24 400	35 200	310	450	225	330
25	9.0	15.2	M6	7.0	M3x5	60	7.5	0.65	30 400	45 500	430	650	345	510
30	12.0	17.0	M8	9.0	M3x5	80	7.0	1.10	40 000	57 800	690	1 000	495	715
35	13.0	20.5	M8	9.0	M3x5	80	8.0	1.70	55 600	81 000	1 200	1 740	830	1 215
45	18.0	23.5	M10	14.0	M4x7	105	10.0	3.20	90 400	128 500	2 440	3 470	1 700	2 425

1) Dimension H_2 with cover strip

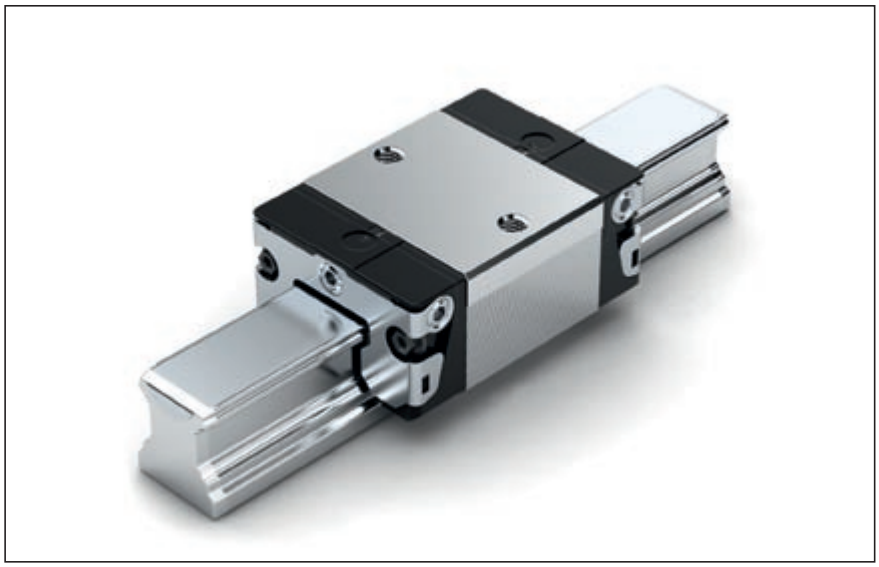
2) Dimension H_2 without cover strip

3) Load capacities and moments for Ball Runner Block **without** ball chain. Load capacities and moments for Ball Runner Block **with** ball chain ☞ 8. Determination of the dynamic load capacities and moments is based on a travel life of 100,000 m per ISO 14728-1. Often only 50,000 m are actually stipulated. For comparison: Multiply values **C**, $\mathbf{M_t}$ and $\mathbf{M_L}$ from the table by 1.26.

Standard Ball Runner Blocks made of steel

SKS – Slimline, short, standard height

R1666 … 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

Further Ball Runner Blocks SKS
– Super Ball Runner Blocks made of steel ☞ 88
– Corrosion-resistant Ball Runner Blocks
Resist NR ☞ 100
Resist CR ☞ 108

Note
Can be used on all Ball Guide Rails SNS.

Options and part numbers

Size	Ball runner block with size	Preload class		Accuracy class		Seal for ball runner block					
						without ball chain			with ball chain		
		C0	C1	N	H	SS	LS	DS	SS	LS	DS
15	R1666 1	9		4	3	20	21	–	22	23	–
			1	4	3	20	21	–	22	23	–
20	R1666 8	9		4	3	20	21	–	22	23	–
			1	4	3	20	21	2Z	22	23	2Y
25	R1666 2	9		4	3	20	21	–	22	23	–
			1	4	3	20	21	2Z	22	23	2Y
30	R1666 7	9		4	3	20	21	–	22	23	–
			1	4	3	20	21	2Z	22	23	2Y
35	R1666 3	9		4	3	20	21	–	22	23	–
			1	4	3	20	21	2Z	22	23	2Y
e.g.	R1666 7		1		3	20					

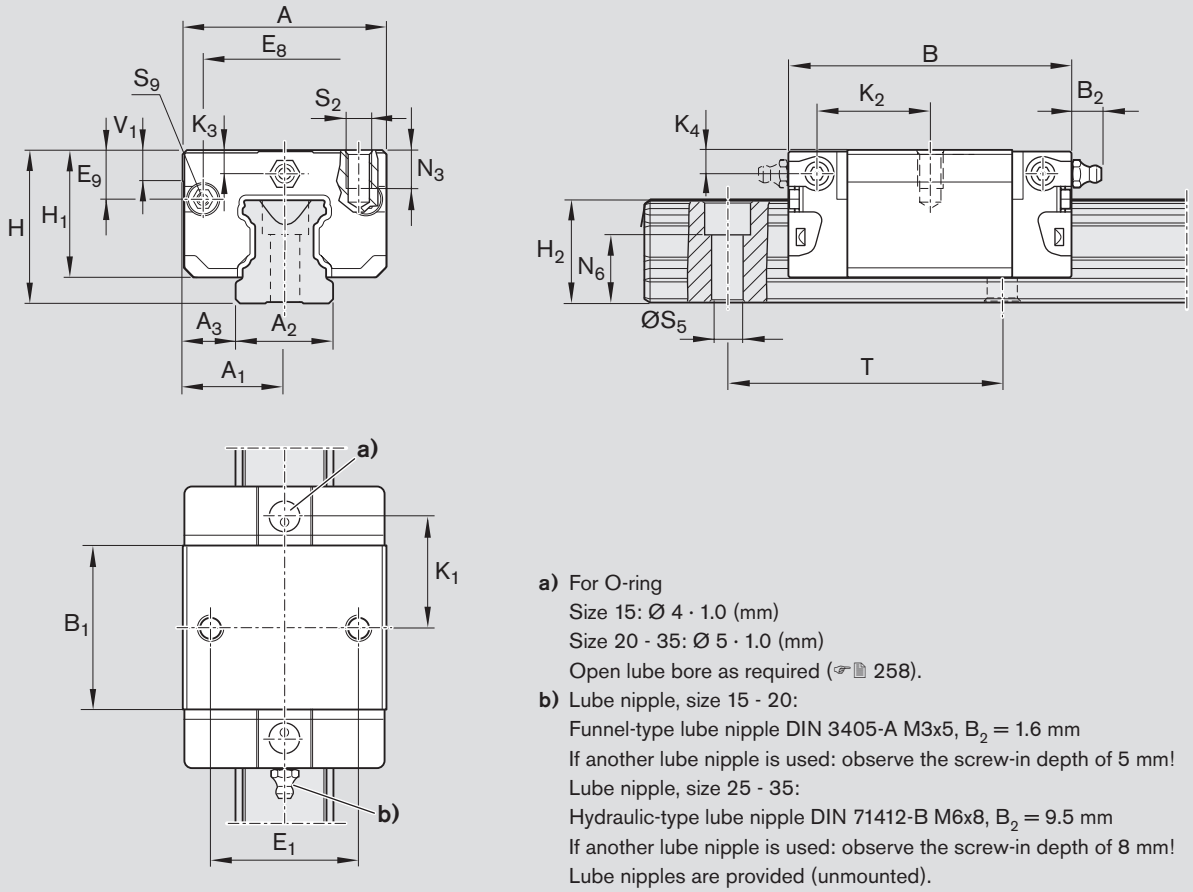
Ordering example
Options:
– Ball Runner Block SKS
– Size 30
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R1666 713 20

Preload classes
C0 = without preload
C1 = preload 2% C

Seals
SS = standard seal
LS = low-friction seal
DS = double-lipped seal

Key to table
Gray numbers
= version/combination not preferred
(longer delivery times in some cases)

Ball Runner Blocks SKS



a) For O-ring
Size 15: Ø 4 · 1.0 (mm)
Size 20 - 35: Ø 5 · 1.0 (mm)
Open lube bore as required (☞ 258).

b) Lube nipple, size 15 - 20:
Funnel-type lube nipple DIN 3405-A M3x5, B_2 = 1.6 mm
If another lube nipple is used: observe the screw-in depth of 5 mm!
Lube nipple, size 25 - 35:
Hydraulic-type lube nipple DIN 71412-B M6x8, B_2 = 9.5 mm
If another lube nipple is used: observe the screw-in depth of 8 mm!
Lube nipples are provided (unmounted).
Connection possible at all sides.

Size	Dimensions (mm)																
	A	A_1	A_2	A_3	B	B_1	E_1	E_8	E_9	H	H_1	H_2 1)	H_2 2)	K_1	K_2	K_3	K_4
15	34	17	15	9.5	44.7	25.7	26	24.55	6.70	24	19.90	16.30	16.20	16.25	17.85	3.20	3.20
20	44	22	20	12.0	57.3	31.9	32	32.50	7.30	30	25.35	20.75	20.55	22.95	22.95	3.35	3.35
25	48	24	23	12.5	67.0	38.6	35	38.30	11.50	36	29.90	24.45	24.25	25.35	26.50	5.50	5.50
30	60	30	28	16.0	75.3	45.0	40	48.40	14.60	42	35.35	28.55	28.35	28.80	30.50	6.05	6.05
35	70	35	34	18.0	84.9	51.4	50	58.00	17.35	48	40.40	32.15	31.85	32.70	34.20	6.90	6.90

Size	Dimensions (mm)							Weight (kg)	Load capacities 3) (N)		Load moments 3) (Nm)			
	N_3	$N_6^{\pm 0.5}$	S_2	S_5	S_9	T	V_1		C	C_0	M_t	M_{t0}	M_L	M_{L0}
15	6.0	10.3	M4	4.4	M2.5x3.5	60	5.0	0.10	5 400	8 100	52	80	19	28
20	7.5	13.2	M5	6.0	M3x5	60	6.0	0.25	12 400	13 600	150	170	52	58
25	9.0	15.2	M6	7.0	M3x5	60	7.5	0.35	15 900	18 200	230	260	82	94
30	12.0	17.0	M8	9.0	M3x5	80	7.0	0.60	22 100	24 800	380	430	133	150
35	13.0	20.5	M8	9.0	M3x5	80	8.0	0.90	29 300	32 400	640	700	200	220

1) Dimension H_2 with cover strip
2) Dimension H_2 without cover strip
3) Load capacities and moments for Ball Runner Block **without** ball chain. Load capacities and moments for Ball Runner Block **with** ball chain ☞ 8. Determination of the dynamic load capacities and moments is based on a travel life of 100,000 m per ISO 14728-1. Often only 50,000 m are actually stipulated. For comparison: Multiply values **C**, $\mathbf{M}_t$ and $\mathbf{M}_L$ from the table by 1.26.

Standard Ball Runner Blocks made of steel

SNH – Slimline, normal, high

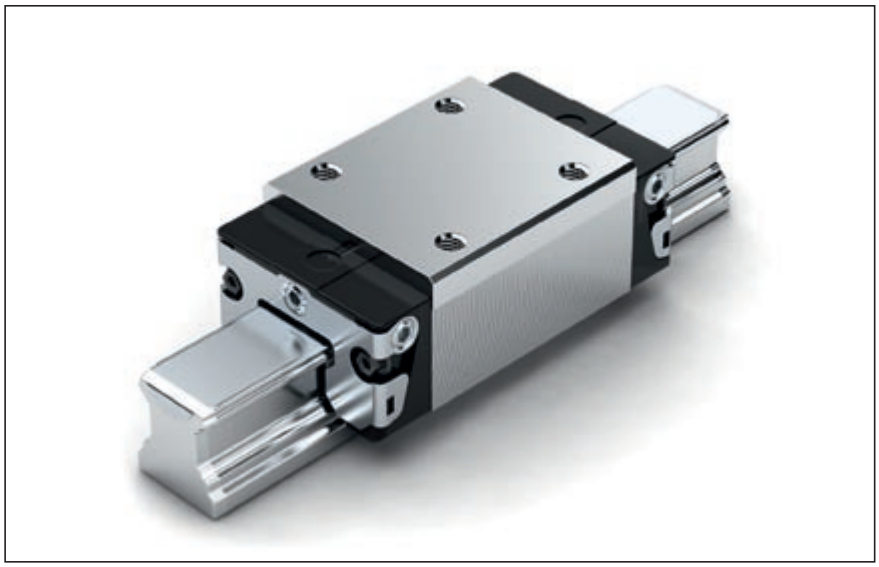
R1621 ... 2.

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

Further Ball Runner Blocks SNH
– Heavy Duty Ball Runner Blocks made of steel, size 55 ☞ 68
– High Precision Ball Runner Blocks made of steel ☞ 72
– Corrosion-resistant Ball Runner Blocks Resist CR ☞ 108

Note
Can be used on all Ball Guide Rails SNS.



Options and part numbers

Size	Ball runner block with size	Preload class			Accuracy class			Seal for ball runner block					
								without ball chain			with ball chain		
		C0	C1	C2	N	H	P	SS	LS[1)]	DS	SS	LS[1)]	DS
15	R1621 1	9			4	3	–	20	21	–	22	23	–
			1		4	3	2	20	21	–	22	23	–
				2	–	3	2	20	–	–	22	–	–
25	R1621 2	9			4	3	–	20	21	–	22	23	–
			1		4	3	2	20	21	2Z	22	23	2Y
				2	–	3	2	20	–	2Z	22	–	2Y
30	R1621 7	9			4	3	–	20	21	–	22	23	–
			1		4	3	2	20	21	2Z	22	23	2Y
				2	–	3	2	20	–	2Z	22	–	2Y
35	R1621 3	9			4	3	–	20	21	–	22	23	–
			1		4	3	2	20	21	2Z	22	23	2Y
				2	–	3	2	20	–	2Z	22	–	2Y
45	R1621 4	9			4	3	–	20	–	–	22	–	–
			1		4	3	2	20	–	2Z	22	–	2Y
				2	–	3	2	20	–	2Z	22	–	2Y
e.g.	R1621 7		1			3		20					

1) Only with accuracy classes N and H

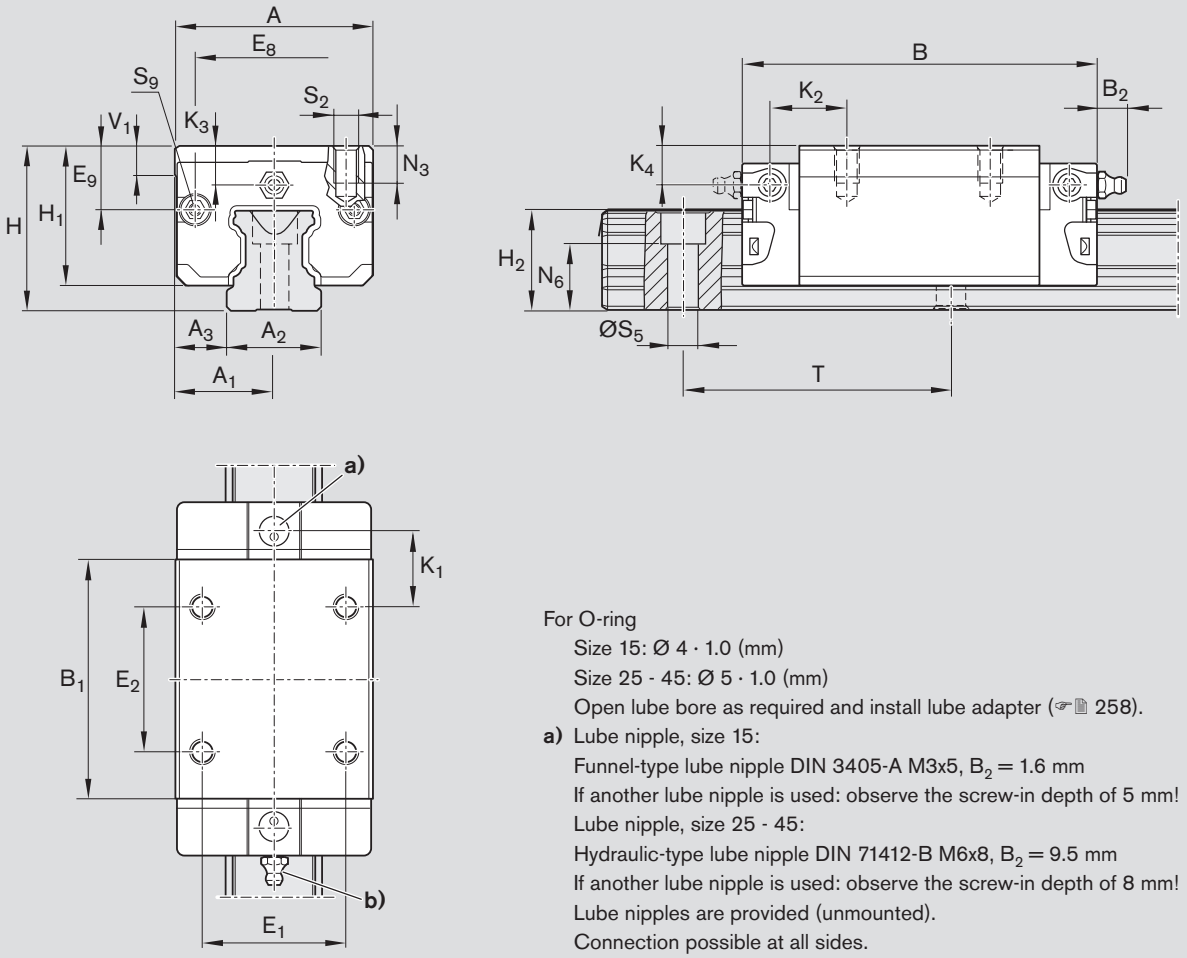
Ordering example
Options:
– Ball Runner Block SNH
– Size 30
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R1621 713 20

Preload classes
C0 = without preload
C1 = preload 2% C
C2 = preload 8% C

Seals
SS = standard seal
LS = low-friction seal
DS = double-lipped seal

Key to table
Gray numbers
= version/combination not preferred
(longer delivery times in some cases)

Ball Runner Blocks SNH



For O-ring
Size 15: Ø 4 · 1.0 (mm)
Size 25 - 45: Ø 5 · 1.0 (mm)
Open lube bore as required and install lube adapter (☞ 258).

a) Lube nipple, size 15:
Funnel-type lube nipple DIN 3405-A M3x5, $B_2 = 1.6$ mm
If another lube nipple is used: observe the screw-in depth of 5 mm!
Lube nipple, size 25 - 45:
Hydraulic-type lube nipple DIN 71412-B M6x8, $B_2 = 9.5$ mm
If another lube nipple is used: observe the screw-in depth of 8 mm!
Lube nipples are provided (unmounted).
Connection possible at all sides.

Size	Dimensions (mm)																	
	A	A_1	A_2	A_3	B	B_1	E_1	E_2	E_8	E_9	H	H_1	H_2 1)	H_2 2)	K_1	K_2	K_3	K_4
15	34	17	15	9.5	58.2	39.2	26	26	24.55	10.70	28	23.90	16.30	16.20	10.00	11.60	7.20	7.20
25	48	24	23	12.5	86.2	57.8	35	35	38.30	15.50	40	33.90	24.45	24.25	17.45	18.60	9.50	9.50
30	60	30	28	16.0	97.7	67.4	40	40	48.40	17.60	45	38.35	28.55	28.35	20.00	21.70	9.05	9.05
35	70	35	34	18.0	110.5	77.0	50	50	58.00	24.35	55	47.40	32.15	31.85	20.50	22.00	13.90	13.90
45	86	43	45	20.5	137.6	97.0	60	60	69.80	30.90	70	60.30	40.15	39.85	27.30	29.30	18.20	18.20

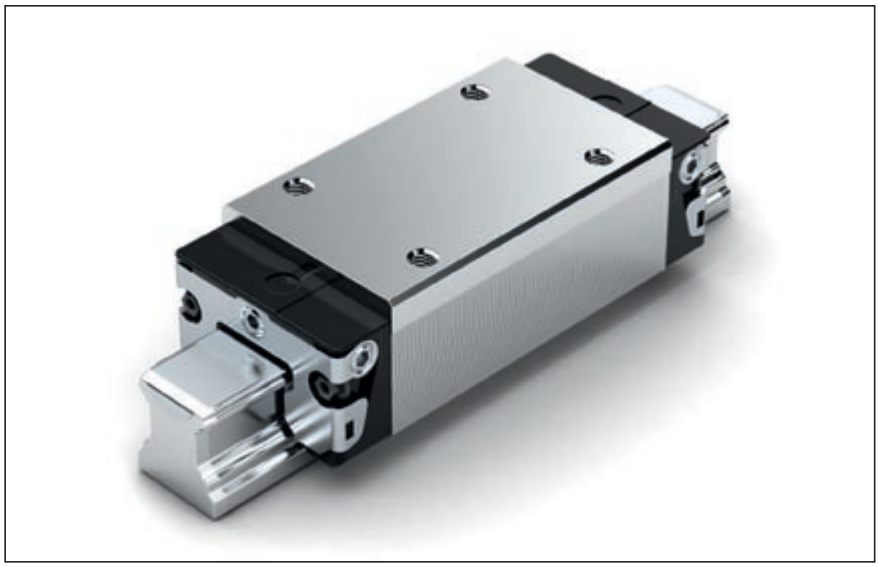
Size	Dimensions (mm)							Weight (kg)	Load capacities 3) (N)		Load moments 3) (Nm)			
	N_3	$N_6^{\pm 0.5}$	S_2	S_5	S_9	T	V_1		C	C_0	M_t	M_{t0}	M_L	M_{L0}
15	6.0	10.3	M4	4.4	M2.5x3.5	60	5.0	0.20	7 800	13 500	74	130	40	71
25	9.0	15.2	M6	7.0	M3x5	60	7.5	0.60	22 800	30 400	320	430	180	240
30	12.0	17.0	M8	9.0	M3x5	80	7.0	0.95	31 700	41 300	540	720	290	380
35	13.0	20.5	M8	9.0	M3x5	80	8.0	1.55	41 900	54 000	890	1 160	440	565
45	18.0	23.5	M10	14.0	M4x7	105	10.0	3.00	68 100	85 700	1 830	2 310	890	1 130

1) Dimension H_2 with cover strip
2) Dimension H_2 without cover strip
3) Load capacities and moments for Ball Runner Block **without** ball chain. Load capacities and moments for Ball Runner Block **with** ball chain ☞ 8. Determination of the dynamic load capacities and moments is based on a travel life of 100,000 m per ISO 14728-1. Often only 50,000 m are actually stipulated. For comparison: Multiply values **C**, $\mathbf{M_t}$ and $\mathbf{M_L}$ from the table by 1.26.

Standard Ball Runner Blocks made of steel

SLH – Slimline, long, high

R1624 ... 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

Further Ball Runner Blocks SLH
– Heavy Duty Ball Runner Blocks made of steel, size 55 ☞ 70
– High Precision Ball Runner Blocks made of steel ☞ 72
– Corrosion-resistant Ball Runner Blocks Resist CR ☞ 108

Note
Can be used on all Ball Guide Rails SNS.

Ordering example
Options:
– Ball Runner Block SLH
– Size 30
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R1624 713 20

Options and part numbers

Size	Ball runner block with size	Preload class			Accuracy class			Seal for ball runner block					
								without ball chain			with ball chain		
		C0	C1	C2	N	H	P	SS	LS[1)]	DS	SS	LS[1)]	DS
25	R1624 2	9			4	3	–	20	21	–	22	23	–
			1		4	3	2	20	21	2Z	22	23	2Y
				2	–	3	2	20	–	2Z	22	–	2Y
30	R1624 7	9			4	3	–	20	21	–	22	23	–
			1		4	3	2	20	21	2Z	22	23	2Y
				2	–	3	2	20	–	2Z	22	–	2Y
35	R1624 3	9			4	3	–	20	21	–	22	23	–
			1		4	3	2	20	21	2Z	22	23	2Y
				2	–	3	2	20	–	2Z	22	–	2Y
45	R1624 4	9			4	3	–	20	–	–	22	–	–
			1		4	3	2	20	–	2Z	22	–	2Y
				2	–	3	2	20	–	2Z	22	–	2Y
e.g.	R1624 7		1			3		20					

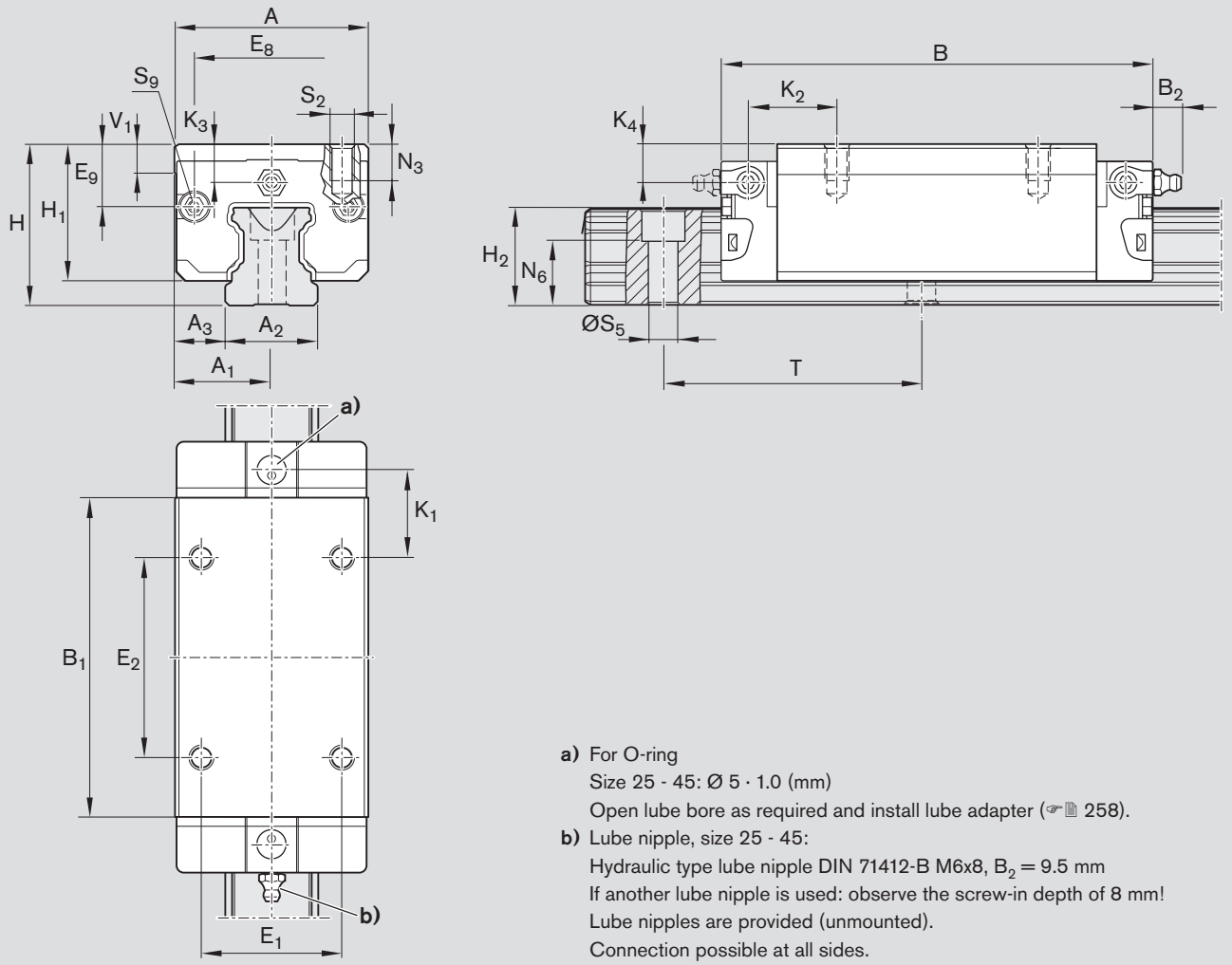
1) Only with accuracy classes N and H

Preload classes
C0 = without preload
C1 = preload 2% C
C2 = preload 8% C

Seals
SS = standard seal
LS = low-friction seal
DS = double-lipped seal

Key to table
Gray numbers
= version/combination not preferred
(longer delivery times in some cases)

Ball Runner Blocks SLH



a) For O-ring
Size 25 - 45: Ø 5 · 1.0 (mm)
Open lube bore as required and install lube adapter (☞ 258).

b) Lube nipple, size 25 - 45:
Hydraulic type lube nipple DIN 71412-B M6x8, B_2 = 9.5 mm
If another lube nipple is used: observe the screw-in depth of 8 mm!
Lube nipples are provided (unmounted).
Connection possible at all sides.

Size	Dimensions (mm)																	
	A	A_1	A_2	A_3	B	B_1	E_1	E_2	E_8	E_9	H	H_1	H_2 1)	H_2 2)	K_1	K_2	K_3	K_4
25	48	24	23	12.5	107.9	79.5	35	50	38.30	15.50	40	33.90	24.45	24.25	20.80	21.95	9.50	9.50
30	60	30	28	16.0	119.7	89.4	40	60	48.40	17.60	45	38.35	28.55	28.35	21.00	22.70	9.05	9.05
35	70	35	34	18.0	139.0	105.5	50	72	58.00	24.35	55	47.40	32.15	31.85	23.75	25.25	13.90	13.90
45	86	43	45	20.5	174.1	133.5	60	80	69.80	30.90	70	60.30	40.15	39.85	35.50	37.50	18.20	18.20

Size	Dimensions (mm)							Weight (kg)	Load capacities 3) (N)		Load moments 3) (Nm)			
	N_3	$N_6^{\pm 0.5}$	S_2	S_5	S_9	T	V_1		C	C_0	M_t	M_{t0}	M_L	M_{L0}
25	9.0	15.2	M6	7.0	M3x5	60	7.5	0.80	30 400	45 500	430	650	345	510
30	12.0	17.0	M8	9.0	M3x5	80	7.0	1.20	40 000	57 800	690	1 000	495	715
35	13.0	20.5	M8	9.0	M3x5	80	8.0	2.10	55 600	81 000	1 200	1 740	830	1 215
45	18.0	23.5	M10	14.0	M4x7	105	10.0	4.10	90 400	128 500	2 440	3 470	1 700	2 425

1) Dimension H_2 with cover strip

2) Dimension H_2 without cover strip

3) Load capacities and moments for Ball Runner Block **without** ball chain. Load capacities and moments for Ball Runner Block **with** ball chain ☞ 8. Determination of the dynamic load capacities and moments is based on a travel life of 100,000 m per ISO 14728-1. Often only 50,000 m are actually stipulated. For comparison: Multiply values **C**, $\mathbf{M_t}$ and $\mathbf{M_L}$ from the table by 1.26.

Standard Ball Runner Blocks made of steel

FNN – Flanged, normal, low profile

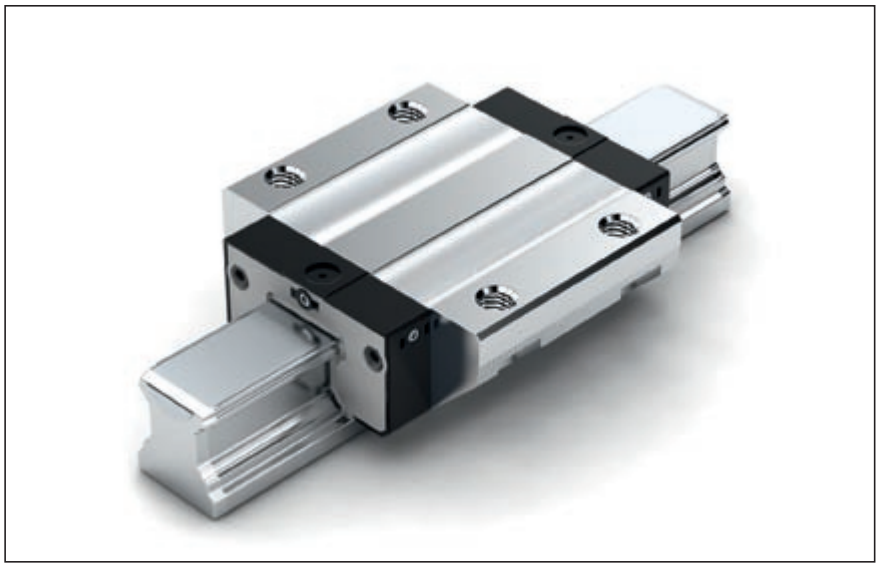
R1693 … 1.

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
– Not pre-lubricated

Further Ball Runner Blocks FNN
– Corrosion-resistant Ball Runner Blocks
Resist CR ☞ 108

Note
Can be used on all Ball Guide Rails SNS.



Ordering example
Options:
– Ball Runner Block FNN
– Size 20
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R1693 813 10

Options and part numbers

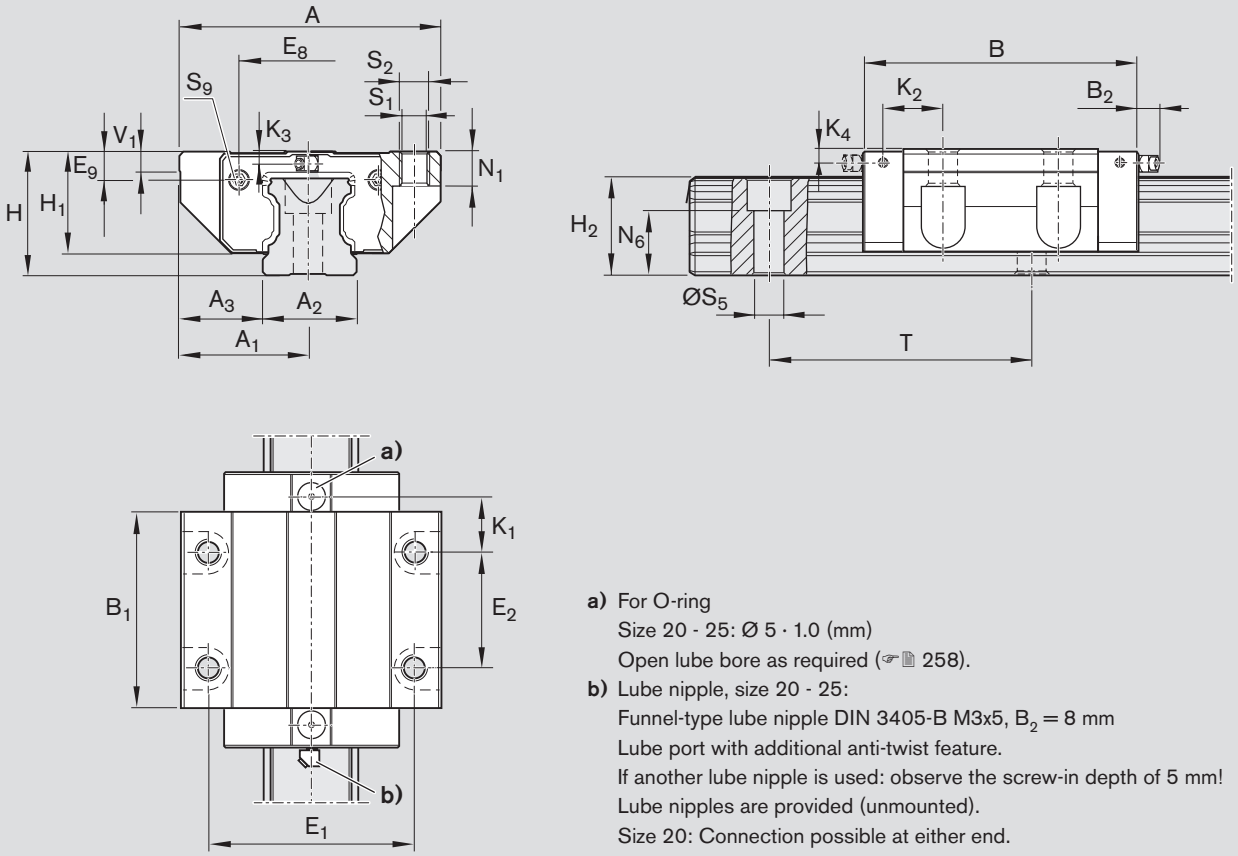
Size	Ball runner block with size	Preload class		Accuracy class		Seal for ball runner block without ball chain	
		C0	C1	N	H	SS	LS
20	R1693 8	9	1	4	3	10	11
25	R1693 2	9	1	4	3	10	11
e.g.	R1693 8		1		3	10	

Preload classes
C0 = without preload
C1 = preload 2% C

Seals
SS = standard seal
LS = low-friction seal

Key to table
Gray numbers
= version/combination not preferred (longer delivery times in some cases)

Ball Runner Blocks FNN



a) For O-ring
Size 20 - 25: Ø 5 · 1.0 (mm)
Open lube bore as required (☞ 258).

b) Lube nipple, size 20 - 25:
Funnel-type lube nipple DIN 3405-B M3x5, $B_2 = 8$ mm
Lube port with additional anti-twist feature.
If another lube nipple is used: observe the screw-in depth of 5 mm!
Lube nipples are provided (unmounted).
Size 20: Connection possible at either end.
Size 25: Connection possible at all sides.

Size	Dimensions (mm)																	
	A	A_1	A_2	A_3	B	B_1	E_1	E_2	E_8	E_9	H	H_1	H_2 1)	H_2 2)	K_1	K_2	K_3	K_4
20	59	29.5	20	19.5	72.5	49.6	49	32	30.5	5.6	28	23.0	20.75	20.55	13.0	–	3.6	–
25	73	36.5	23	25.0	81.0	57.8	60	35	38.3	8.5	33	26.5	24.45	24.25	16.6	17.0	4.1	4.1

Size	Dimensions (mm)								Weight (kg)	Load capacities 3) (N)		Load moments 3) (Nm)			
	N_1	$N_6^{\pm 0.5}$	S_1	S_2	S_5	S_9	T	V_1		C	C_0	M_t	M_{t0}	M_L	M_{L0}
20	7.7	13.2	5.3	M6	6.0	M3x5	60	6.0	0.40	14 500	24 400	190	310	100	165
25	9.3	15.2	6.7	M8	7.0	M3x5	60	7.5	0.60	22 800	30 400	320	430	180	240

1) Dimension H_2 with cover strip
2) Dimension H_2 without cover strip
3) Load capacities and moments for Ball Runner Block **without** ball chain.
Determination of the dynamic load capacities and moments is based on a travel life of 100,000 m per ISO 14728-1. Often only 50,000 m are actually stipulated. For comparison: Multiply values **C**, $\mathbf{M}_t$ and $\mathbf{M}_L$ from the table by 1.26.

Standard Ball Runner Blocks made of steel

FKN – Flanged, short, low profile

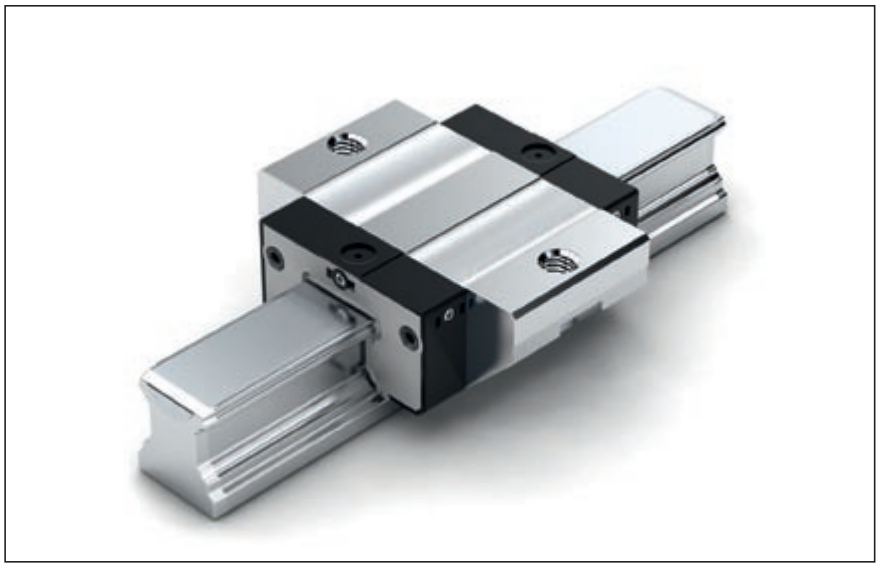
R1663 ... 1.

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
– Not pre-lubricated

Further Ball Runner Blocks FKN
– Corrosion-resistant Ball Runner Blocks
Resist CR ☞ 108

Note
Can be used on all Ball Guide Rails SNS.



Ordering example
Options:
– Ball Runner Block FKN
– Size 20
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R1663 813 10

Options and part numbers

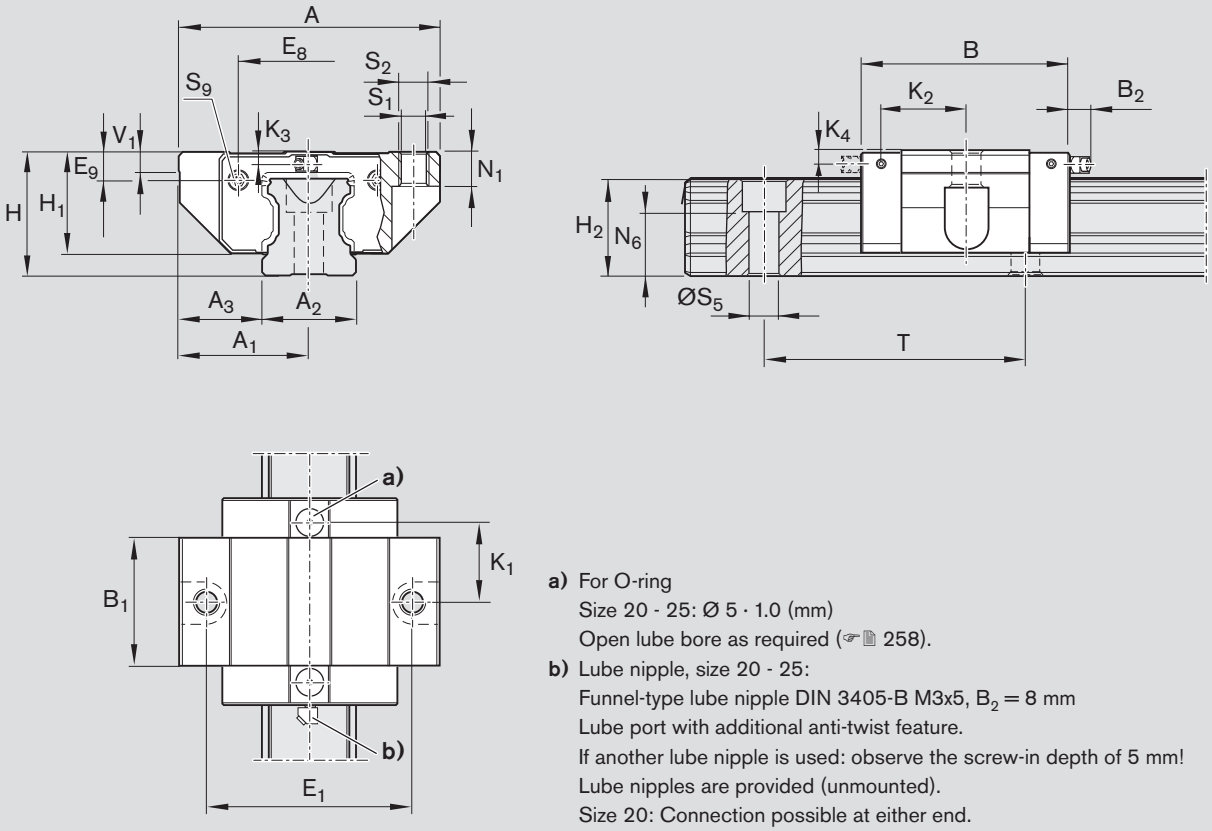
Size	Ball runner block with size	Preload class		Accuracy class		Seal for ball runner block without ball chain	
		C0	C1	N	H	SS	LS
20	R1663 8	9	1	4	3	10	11
25	R1663 2	9	1	4	3	10	11
e.g.	R1663 8		1		3	10	

Preload classes
C0 = without preload
C1 = preload 2% C

Seals
SS = standard seal
LS = low-friction seal

Key to table
Gray numbers
= version/combination not preferred (longer delivery times in some cases)

Ball Runner Blocks FKN



a) For O-ring
Size 20 - 25: Ø 5 · 1.0 (mm)
Open lube bore as required (☞ 258).

b) Lube nipple, size 20 - 25:
Funnel-type lube nipple DIN 3405-B M3x5, $B_2 = 8$ mm
Lube port with additional anti-twist feature.
If another lube nipple is used: observe the screw-in depth of 5 mm!
Lube nipples are provided (unmounted).
Size 20: Connection possible at either end.
Size 25: Connection possible at all sides.

Size	Dimensions (mm)																
	A	A_1	A_2	A_3	B	B_1	E_1	E_8	E_9	H	H_1	H_2 1)	H_2 2)	K_1	K_2	K_3	K_4
20	59	29.5	20	19.5	55	31.9	49	30.5	5.6	28	23.0	20.75	20.55	20.1	–	3.6	–
25	73	36.5	23	25.0	62	38.6	60	38.3	8.5	33	26.5	24.45	24.25	24.5	25.0	4.1	4.1

Size	Dimensions (mm)								Weight (kg)	Load capacities 3) (N)		Load moments 3) (Nm)			
	N_1	$N_6^{\pm 0.5}$	S_1	S_2	S_5	S_9	T	V_1		C	C_0	M_t	M_{t0}	M_L	M_{L0}
20	7.7	13.2	5.3	M6	6.0	M3x5	60	6.0	0.25	9 600	13 600	120	170	40	58
25	9.3	15.2	6.7	M8	7.0	M3x5	60	7.5	0.45	15 900	18 200	230	260	82	94

1) Dimension H_2 with cover strip
2) Dimension H_2 without cover strip
3) Load capacities and moments for Ball Runner Block **without** ball chain.
Determination of the dynamic load capacities and moments is based on a travel life of 100,000 m per ISO 14728-1. Often only 50,000 m are actually stipulated. For comparison: Multiply values **C**, $\mathbf{M_t}$ and $\mathbf{M_L}$ from the table by 1.26.

Standard Ball Runner Blocks made of steel

SNN – Slimline, normal, low profile

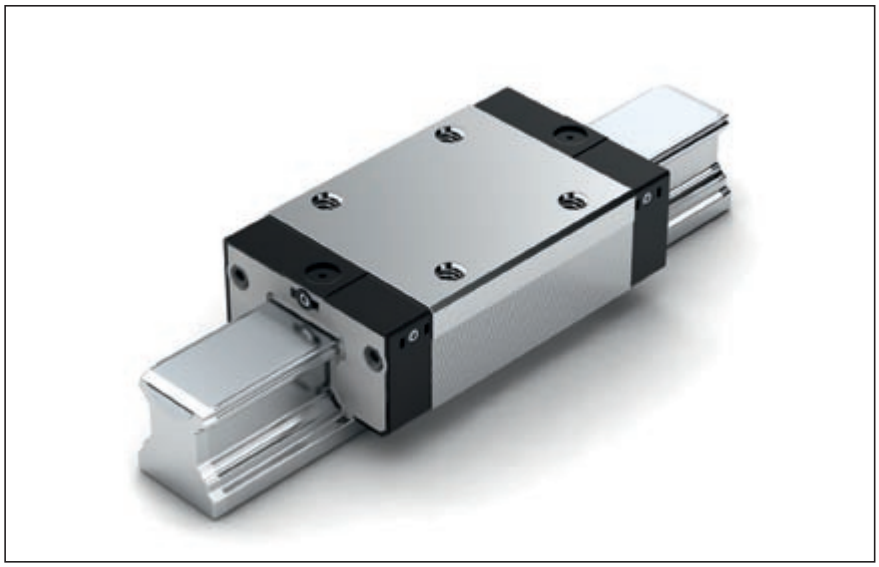
R1694 … 1.

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
– Not pre-lubricated

Further Ball Runner Blocks SNN
– Corrosion-resistant Ball Runner Blocks
Resist CR ☞ 108

Note
Can be used on all Ball Guide Rails SNS.



Ordering example
Options:
– Ball Runner Block SNN
– Size 20
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R1694 813 10

Options and part numbers

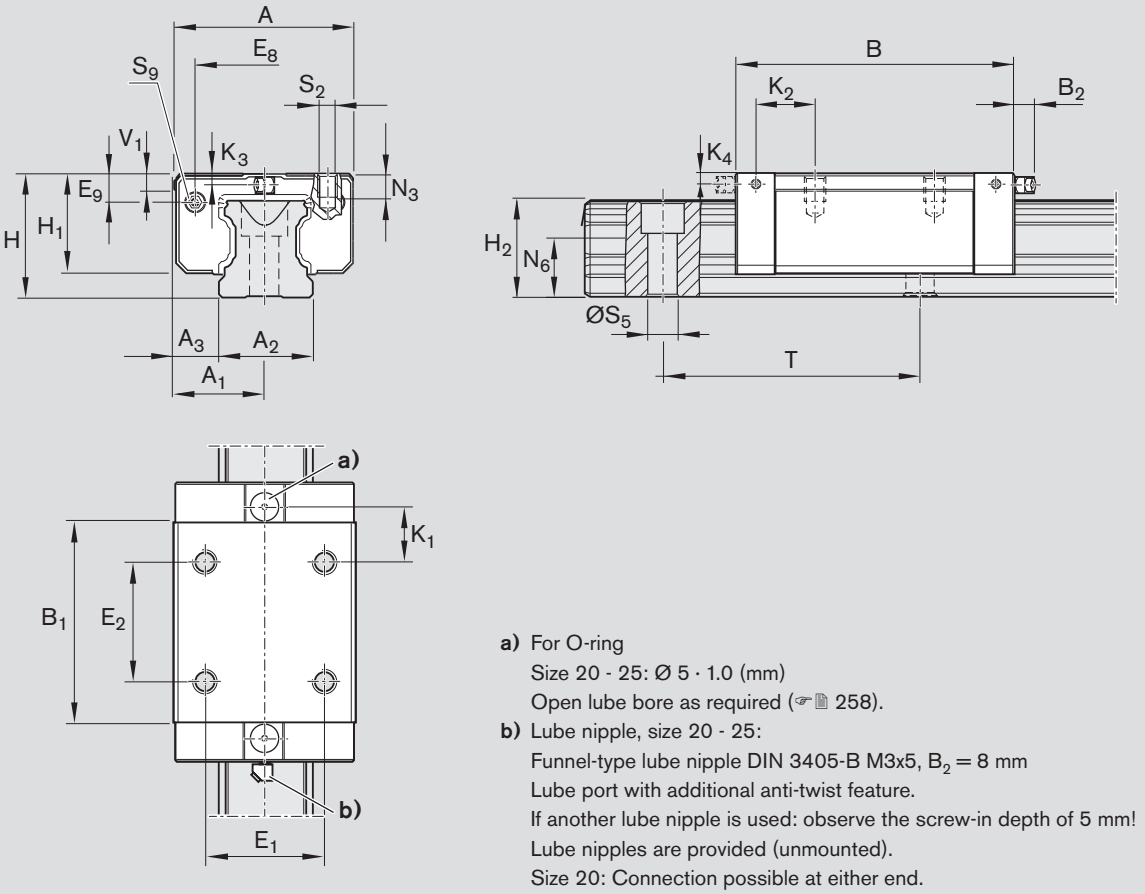
Size	Ball runner block with size	Preload class		Accuracy class		Seal for ball runner block without ball chain	
		C0	C1	N	H	SS	LS
20	R1694 8	9	1	4	3	10	11
25	R1694 2	9	1	4	3	10	11
e.g.	R1694 8		1		3	10	

Preload classes
C0 = without preload
C1 = preload 2% C

Seals
SS = standard seal
LS = low-friction seal

Key to table
Gray numbers
= version/combination not preferred (longer delivery times in some cases)

Ball Runner Blocks SNN



a) For O-ring
Size 20 - 25: Ø 5 · 1.0 (mm)
Open lube bore as required (☞ 258).

b) Lube nipple, size 20 - 25:
Funnel-type lube nipple DIN 3405-B M3x5, $B_2 = 8$ mm
Lube port with additional anti-twist feature.
If another lube nipple is used: observe the screw-in depth of 5 mm!
Lube nipples are provided (unmounted).
Size 20: Connection possible at either end.
Size 25: Connection possible at all sides.

Size	Dimensions (mm)																	
	A	A_1	A_2	A_3	B	B_1	E_1	E_2	E_8	E_9	H	H_1	H_2 1)	H_2 2)	K_1	K_2	K_3	K_4
20	42	21	20	11.0	72.5	49.6	32	32	30.5	5.6	28	23.0	20.75	20.55	13.0	–	3.6	–
25	48	24	23	12.5	81.0	57.8	35	35	38.3	8.5	33	26.5	24.45	24.25	16.6	17.0	4.1	4.1

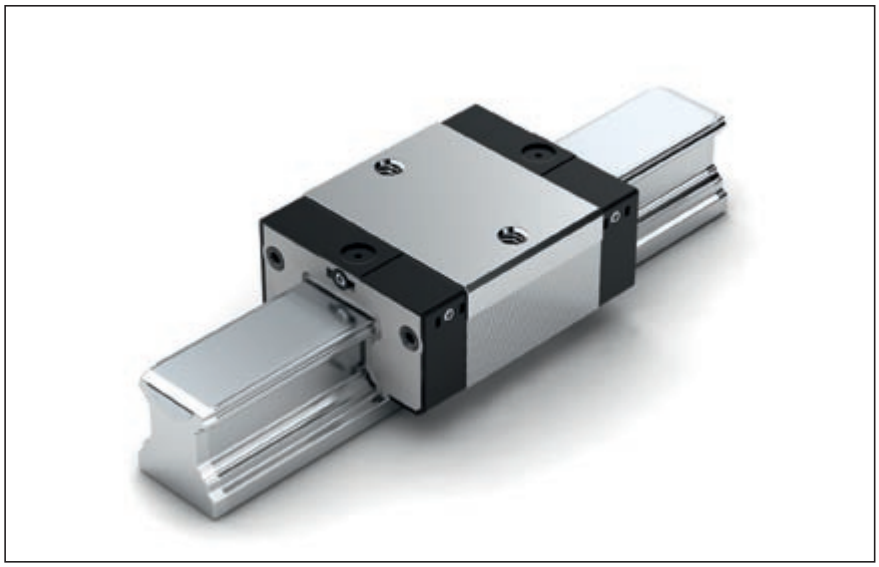
Size	Dimensions (mm)							Weight (kg)	Load capacities 3) (N)		Load moments 3) (Nm)			
	N_3	$N_6^{\pm 0.5}$	S_2	S_5	S_9	T	V_1		C	C_0	M_t	M_{t0}	M_L	M_{L0}
20	6.3	13.2	M5	6.0	M3x5	60	6.0	0.30	14 500	24 400	190	310	100	165
25	7.0	15.2	M6	7.0	M3x5	60	7.5	0.45	22 800	30 400	320	430	180	240

1) Dimension H_2 with cover strip
2) Dimension H_2 without cover strip
3) Load capacities and moments for Ball Runner Block **without** ball chain.
Determination of the dynamic load capacities and moments is based on a travel life of 100,000 m per ISO 14728-1. Often only 50,000 m are actually stipulated. For comparison: Multiply values **C**, $\mathbf{M}_t$ and $\mathbf{M}_L$ from the table by 1.26.

Standard Ball Runner Blocks made of steel

SKN – Slimline, short, low profile

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
– Not pre-lubricated

Further Ball Runner Blocks SKN
– Corrosion-resistant Ball Runner Blocks
Resist CR ☞ 108

Note
Can be used on all Ball Guide Rails SNS.

Ordering example
Options:
– Ball Runner Block SKN
– Size 20
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R1664 813 10

Options and part numbers

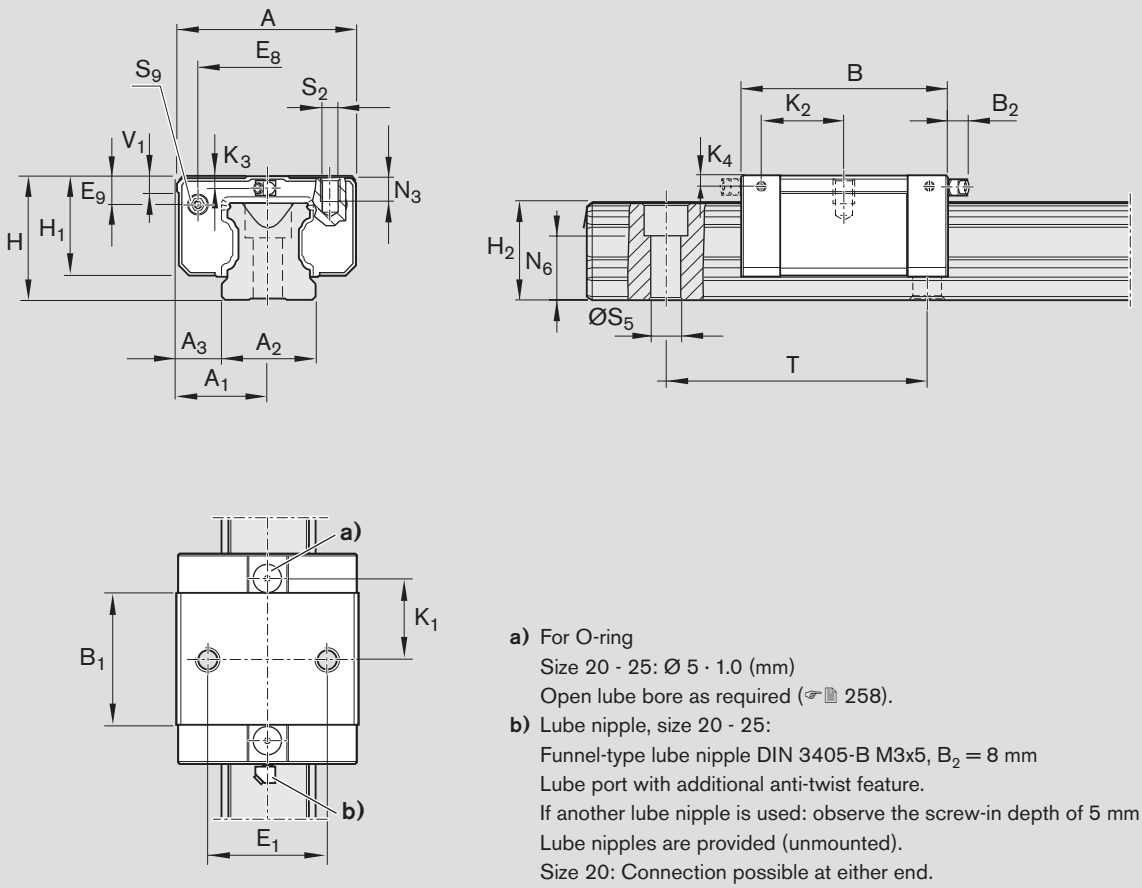
Size	Ball runner block with size	Preload class		Accuracy class		Seal for ball runner block without ball chain	
		C0	C1	N	H	SS	LS
20	R1664 8	9	1	4	3	10	11
25	R1664 2	9	1	4	3	10	11
e.g.	R1664 8		1		3	10	

Preload classes
C0 = without preload
C1 = preload 2% C

Seals
SS = standard seal
LS = low-friction seal

Key to table
Gray numbers
= version/combination not preferred (longer delivery times in some cases)

Ball Runner Blocks SKN



a) For O-ring
Size 20 - 25: Ø 5 · 1.0 (mm)
Open lube bore as required (☞ 258).

b) Lube nipple, size 20 - 25:
Funnel-type lube nipple DIN 3405-B M3x5, B_2 = 8 mm
Lube port with additional anti-twist feature.
If another lube nipple is used: observe the screw-in depth of 5 mm!
Lube nipples are provided (unmounted).
Size 20: Connection possible at either end.
Size 25: Connection possible at all sides.

Size	Dimensions (mm)																
	A	A_1	A_2	A_3	B	B_1	E_1	E_8	E_9	H	H_1	H_2 1)	H_2 2)	K_1	K_2	K_3	K_4
20	42	21	20	11.0	55	31.9	32	30.5	5.6	28	23.0	20.75	20.55	20.1	–	3.6	–
25	48	24	23	12.5	62	38.6	35	38.3	8.5	33	26.5	24.45	24.25	24.5	25.0	4.1	4.1

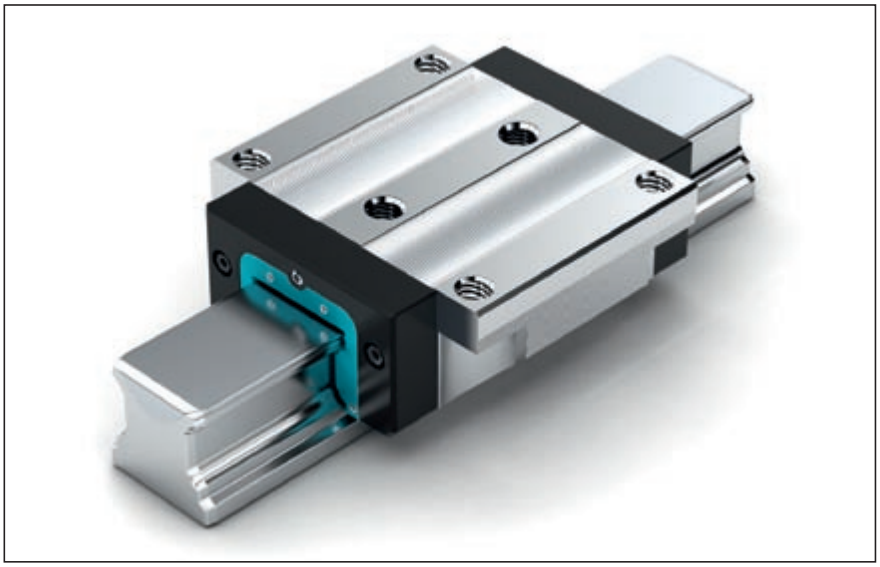
Size	Dimensions (mm)							Weight (kg)	Load capacities 3) (N)		Load moments 3) (Nm)			
	N_3	$N_6^{\pm 0.5}$	S_2	S_5	S_9	T	V_1		C	C_0	M_t	M_{t0}	M_L	M_{L0}
20	6.3	13.2	M5	6.0	M3x5	60	6.0	0.20	9 600	13 600	120	170	40	58
25	7.0	15.2	M6	7.0	M3x5	60	7.5	0.30	15 900	18 200	230	260	82	94

1) Dimension H_2 with cover strip
2) Dimension H_2 without cover strip
3) Load capacities and moments for Ball Runner Block **without** ball chain.
Determination of the dynamic load capacities and moments is based on a travel life of 100,000 m per ISO 14728-1. Often only 50,000 m are actually stipulated. For comparison: Multiply values **C**, $\mathbf{M}_t$ and $\mathbf{M}_L$ from the table by 1.26.

Heavy Duty Ball Runner Blocks made of steel

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
– Not pre-lubricated

Further Heavy Duty Runner Blocks FNS
– Corrosion-resistant Ball Runner Blocks
Resist CR ☞ 108

Note
Can be used on all Ball Guide Rails SNS.

Options and part numbers

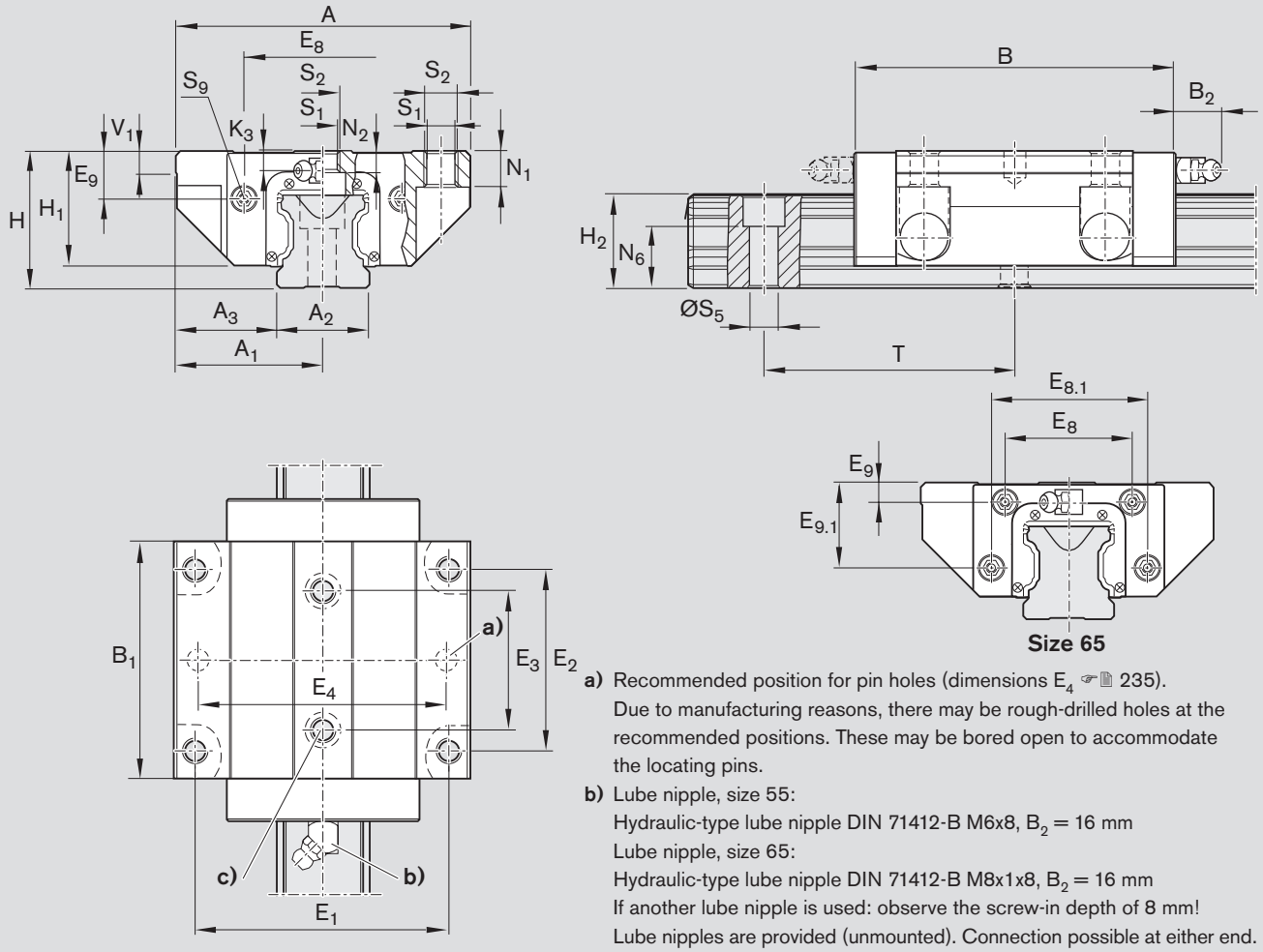
Size	Ball runner block with size	Preload class				Accuracy class					Seal for ball runner block without ball chain
		C0	C1	C2	C3	N	H	P	SP	UP	SS
55	R1651 5	9				4	3	–	–	–	10
			1			4	3	2	1	9	10
				2		–	3	2	1	9	10
					3	–	–	2	1	9	10
65	R1651 6	9				4	3	–	–	–	10
			1			4	3	2	1	9	10
				2		–	3	2	1	9	10
					3	–	–	2	1	9	10
e.g.	R1651 5		1				3				10

Ordering example
Options:
– Ball Runner Block FNS
– Size 55
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R1651 513 10

Preload classes
C0 = without preload
C1 = preload 2% C
C2 = preload 8% C
C3 = preload 13% C

Seals
SS = standard seal

Ball Runner Blocks FNS



a) Recommended position for pin holes (dimensions E_4 ☞ 235).
Due to manufacturing reasons, there may be rough-drilled holes at the recommended positions. These may be bored open to accommodate the locating pins.

b) Lube nipple, size 55:
Hydraulic-type lube nipple DIN 71412-B M6x8, $B_2 = 16$ mm
Lube nipple, size 65:
Hydraulic-type lube nipple DIN 71412-B M8x1x8, $B_2 = 16$ mm
If another lube nipple is used: observe the screw-in depth of 8 mm!
Lube nipples are provided (unmounted). Connection possible at either end.

c) For manufacturing reasons, there may be plugs at these positions.
These must be removed before mounting.

Size	Dimensions (mm)																
	A	A_1	A_2	A_3	B	B_1	E_1	E_2	E_3	E_8	$E_{8.1}$	E_9	$E_{9.1}$	H	H_1	H_2 1)	H_2 2)
55	140	70	53	43.5	159	115.5	116	95	70	80	–	22.3	–	70	57	48.15	47.85
65	170	85	63	53.5	188	139.6	142	110	82	76	100	11.0	53.5	90	76	60.15	59.85

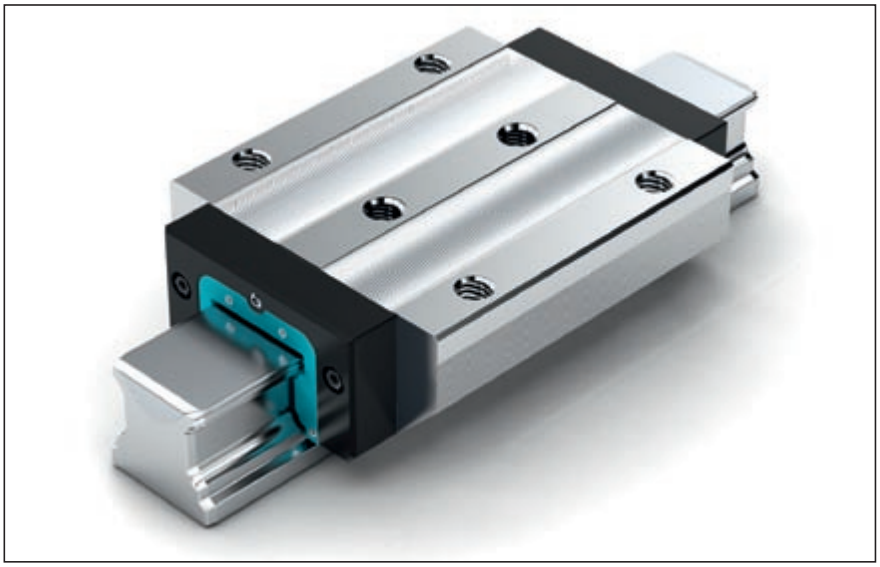
Size	Dimensions (mm)										Weight (kg)	Load capacities 3) (N)		Load moments 3) (Nm)			
	K_3	N_1	N_2	$N_6^{\pm 0.5}$	S_1	S_2	S_5	S_9	T	V_1		C	C_0	M_t	M_{t0}	M_L	M_{L0}
55	9	18	13.5	29.0	12.4	M14	16	M5x8	120	12	5.20	98 200	121 400	3 100	3 860	1 540	1 905
65	16	23	14.0	38.5	14.6	M16	18	M4x7	150	15	10.25	123 000	192 700	4 850	7 610	2 430	3 815

1) Dimension H_2 with cover strip
2) Dimension H_2 without cover strip
3) Load capacities and moments for Ball Runner Block **without** ball chain.
Determination of the dynamic load capacities and moments is based on a travel life of 100,000 m per ISO 14728-1. Often only 50,000 m are actually stipulated. For comparison: Multiply values **C**, $\mathbf{M_t}$ and $\mathbf{M_L}$ from the table by 1.26.

Heavy Duty Ball Runner Blocks made of steel

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
– Not pre-lubricated

Further Heavy Duty Runner Blocks FLS
– Corrosion-resistant Ball Runner Blocks
Resist CR ☞ 108

Note
Can be used on all Ball Guide Rails SNS.

Options and part numbers

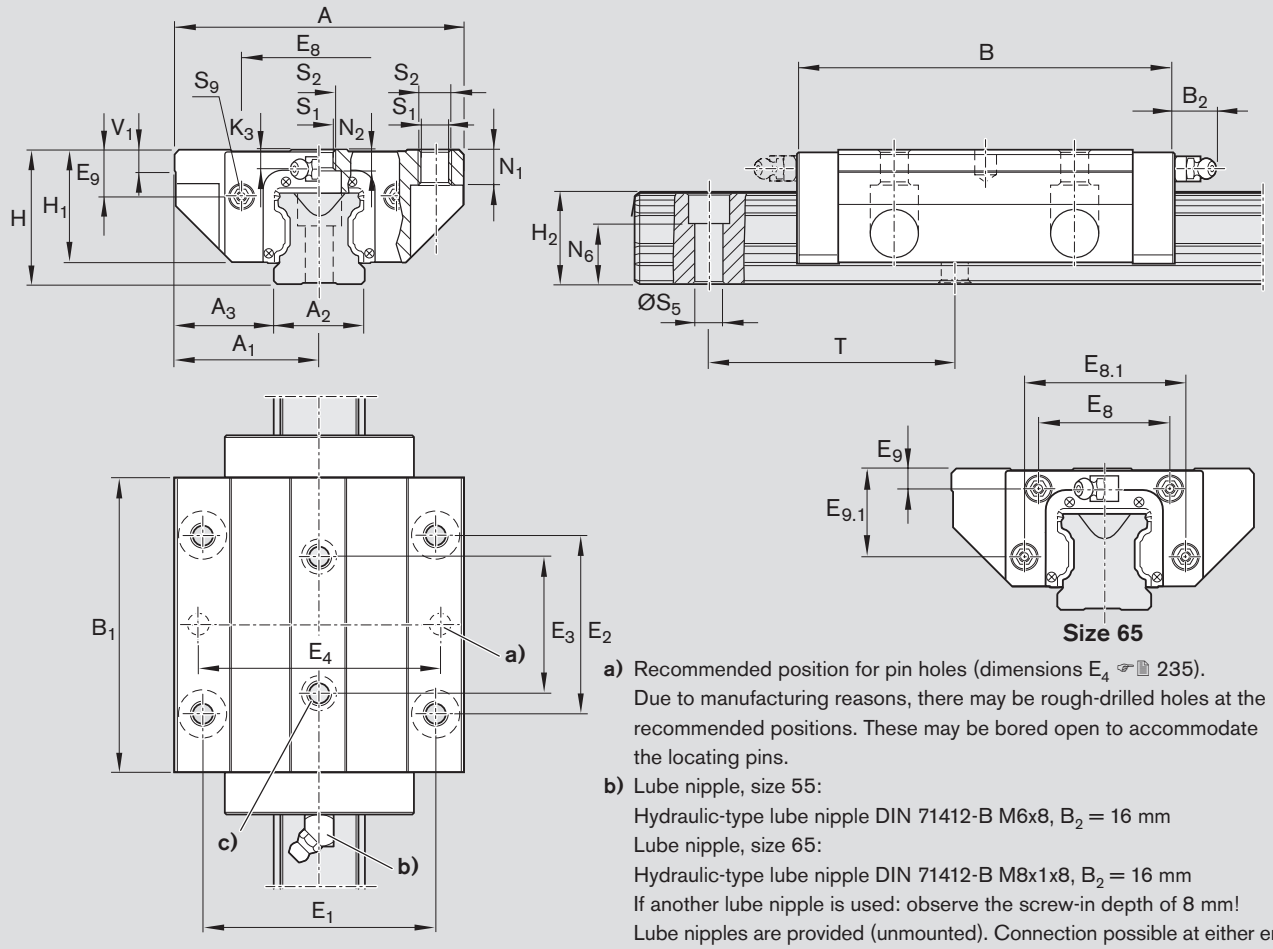
Size	Ball runner block with size	Preload class				Accuracy class					Seal for ball runner block without ball chain
		C0	C1	C2	C3	N	H	P	SP	UP	SS
55	R1653 5	9				4	3	–	–	–	10
			1			4	3	2	1	9	10
				2		–	3	2	1	9	10
					3	–	–	2	1	9	10
65	R1653 6	9				4	3	–	–	–	10
			1			4	3	2	1	9	10
				2		–	3	2	1	9	10
					3	–	–	2	1	9	10
e.g.	R1653 5		1				3				10

Ordering example
Options:
– Ball Runner Block FLS
– Size 55
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R1653 513 10

Preload classes
C0 = without preload
C1 = preload 2% C
C2 = preload 8% C
C3 = preload 13% C

Seals
SS = standard seal

Ball Runner Blocks FLS



Size 65

a) Recommended position for pin holes (dimensions E_4 ☞ 235).
Due to manufacturing reasons, there may be rough-drilled holes at the recommended positions. These may be bored open to accommodate the locating pins.

b) Lube nipple, size 55:
Hydraulic-type lube nipple DIN 71412-B M6x8, $B_2 = 16$ mm
Lube nipple, size 65:
Hydraulic-type lube nipple DIN 71412-B M8x1x8, $B_2 = 16$ mm
If another lube nipple is used: observe the screw-in depth of 8 mm!
Lube nipples are provided (unmounted). Connection possible at either end.

c) For manufacturing reasons, there may be plugs at these positions.
These must be removed before mounting.

Size	Dimensions (mm)																
	A	A_1	A_2	A_3	B	B_1	E_1	E_2	E_3	E_8	$E_{8.1}$	E_9	$E_{9.1}$	H	H_1	H_2 1)	H_2 2)
55	140	70	53	43.5	200	155.5	116	95	70	80	–	22.3	–	70	57	48.15	47.85
65	170	85	63	53.5	243	194.6	142	110	82	76	100	11.0	53.5	90	76	60.15	59.85

Size	Dimensions (mm)										Weight (kg)	Load capacities 3) (N)		Load moments 3) (Nm)			
	K_3	N_1	N_2	$N_6^{\pm 0.5}$	S_1	S_2	S_5	S_9	T	V_1		C	C_0	M_t	M_{t0}	M_L	M_{L0}
55	9	18	13.5	29.0	12.4	M14	16	M5x8	120	12	7.50	124 200	170 000	3 950	5 400	2 630	3 600
65	16	23	14.0	38.5	14.6	M16	18	M4x7	150	15	14.15	163 000	289 000	6 440	11 420	4 620	8 190

1) Dimension H_2 with cover strip

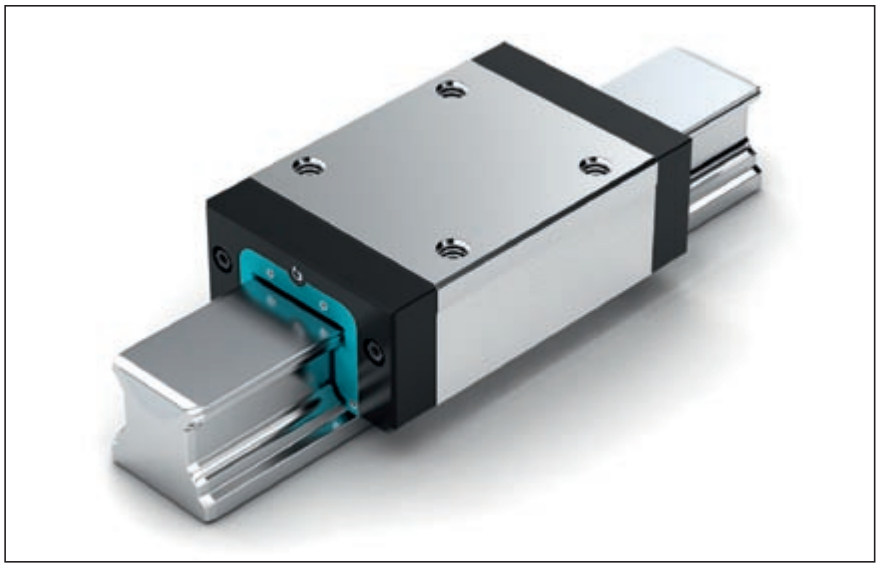
2) Dimension H_2 without cover strip

3) Load capacities and moments for Ball Runner Block **without** ball chain.
Determination of the dynamic load capacities and moments is based on a travel life of 100,000 m per ISO 14728-1. Often only 50,000 m are actually stipulated. For comparison: Multiply values **C**, $\mathbf{M}_t$ and $\mathbf{M}_L$ from the table by 1.26.

Heavy Duty Ball Runner Blocks made of steel

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
– Not pre-lubricated

Further Heavy Duty Runner Blocks SNS
– Corrosion-resistant Ball Runner Blocks
Resist CR ☞ 108

Note
Can be used on all Ball Guide Rails SNS.

Options and part numbers

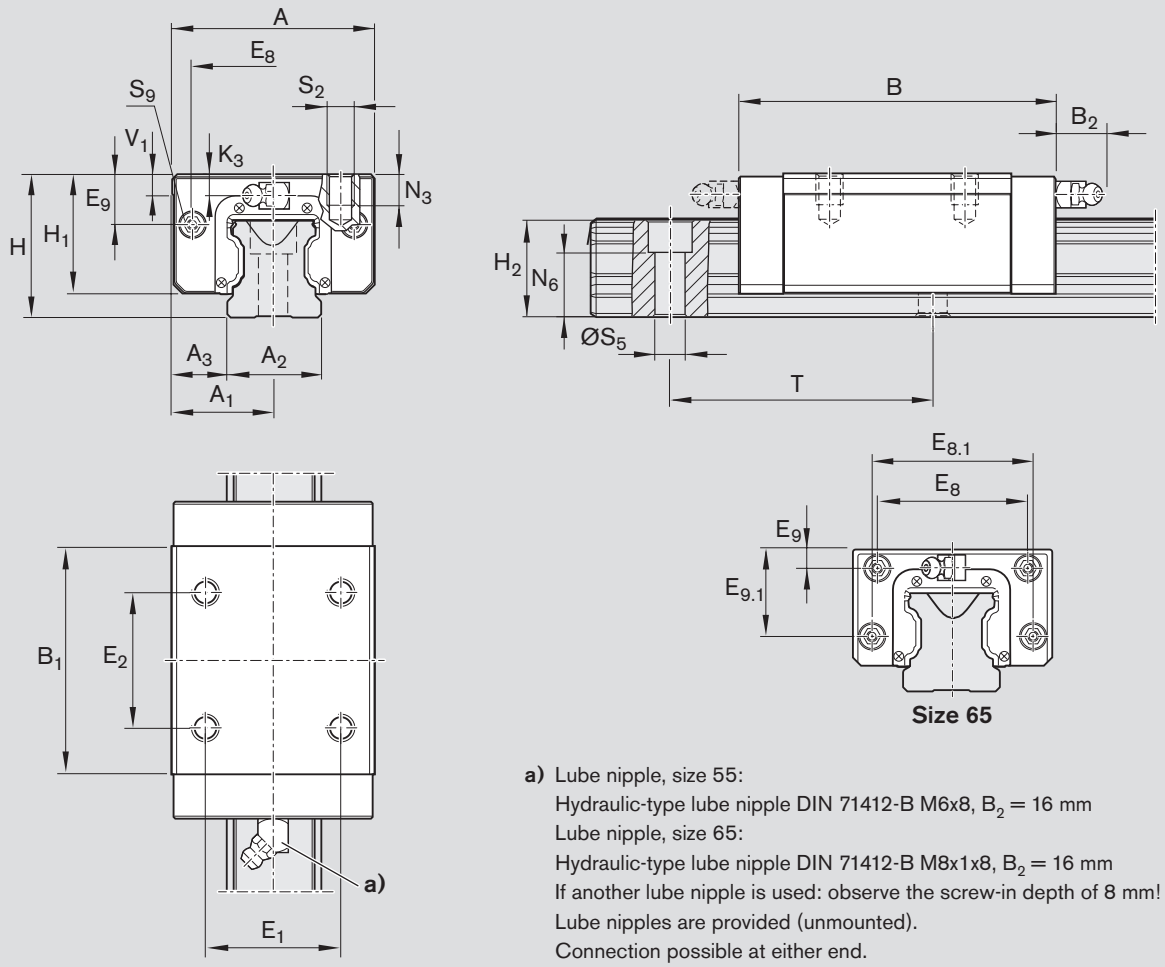
Size	Ball runner block with size	Preload class				Accuracy class			Seal for ball runner block without ball chain
		C0	C1	C2	C3	N	H	P	SS
55	R1622 5	9				4	3	–	10
			1			4	3	2	10
				2		–	3	2	10
					3	–	–	2	10
65	R1622 6	9				4	3	–	10
			1			4	3	2	10
				2		–	3	2	10
					3	–	–	2	10
e.g.	R1622 5		1				3		10

Ordering example
Options:
– Ball Runner Block SNS
– Size 55
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R1622 513 10

Preload classes
C0 = without preload
C1 = preload 2% C
C2 = preload 8% C
C3 = preload 13% C

Seals
SS = standard seal

Ball Runner Blocks SNS



a) Lube nipple, size 55:
Hydraulic-type lube nipple DIN 71412-B M6x8, $B_2 = 16$ mm
Lube nipple, size 65:
Hydraulic-type lube nipple DIN 71412-B M8x1x8, $B_2 = 16$ mm
If another lube nipple is used: observe the screw-in depth of 8 mm!
Lube nipples are provided (unmounted).
Connection possible at either end.

Size	Dimensions (mm)															
	A	A_1	A_2	A_3	B	B_1	E_1	E_2	E_8	$E_{8.1}$	E_9	$E_{9.1}$	H	H_1	H_2 1)	H_2 2)
55	100	50	53	23.5	159	115.5	75	75	80	–	22.3	–	70	57	48.15	47.85
65	126	63	63	31.5	188	139.6	76	70	76	100	11.0	53.5	90	76	60.15	59.85

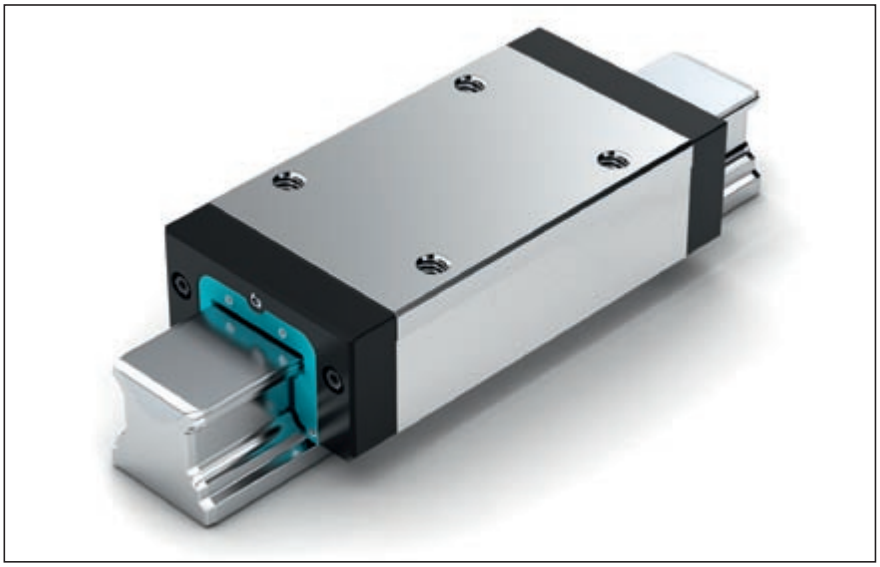
Size	Dimensions (mm)								Weight (kg)	Load capacities 3) (N)		Load moments 3) (Nm)			
	K_3	N_3	$N_6^{\pm 0.5}$	S_2	S_5	S_9	T	V_1		C	C_0	M_t	M_{t0}	M_L	M_{L0}
55	9	19	29.0	M12	16	M5x8	120	12	3.80	98 200	121 400	3 100	3 860	1 540	1 905
65	16	21	38.5	M16	18	M4x7	150	15	6.90	123 000	192 700	4 850	7 610	2 430	3 815

1) Dimension H_2 with cover strip
2) Dimension H_2 without cover strip
3) Load capacities and moments for Ball Runner Block **without** ball chain.
Determination of the dynamic load capacities and moments is based on a travel life of 100,000 m per ISO 14728-1. Often only 50,000 m are actually stipulated. For comparison: Multiply values **C**, $\mathbf{M}_t$ and $\mathbf{M}_L$ from the table by 1.26.

Heavy Duty Ball Runner Blocks made of steel

SLS – Slimline, long, standard height

R1623 ...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
– Not pre-lubricated

Further Heavy Duty Runner Blocks SLS
– Corrosion-resistant Ball Runner Blocks
Resist CR ☞ 108

Note
Can be used on all Ball Guide Rails SNS.

Options and part numbers

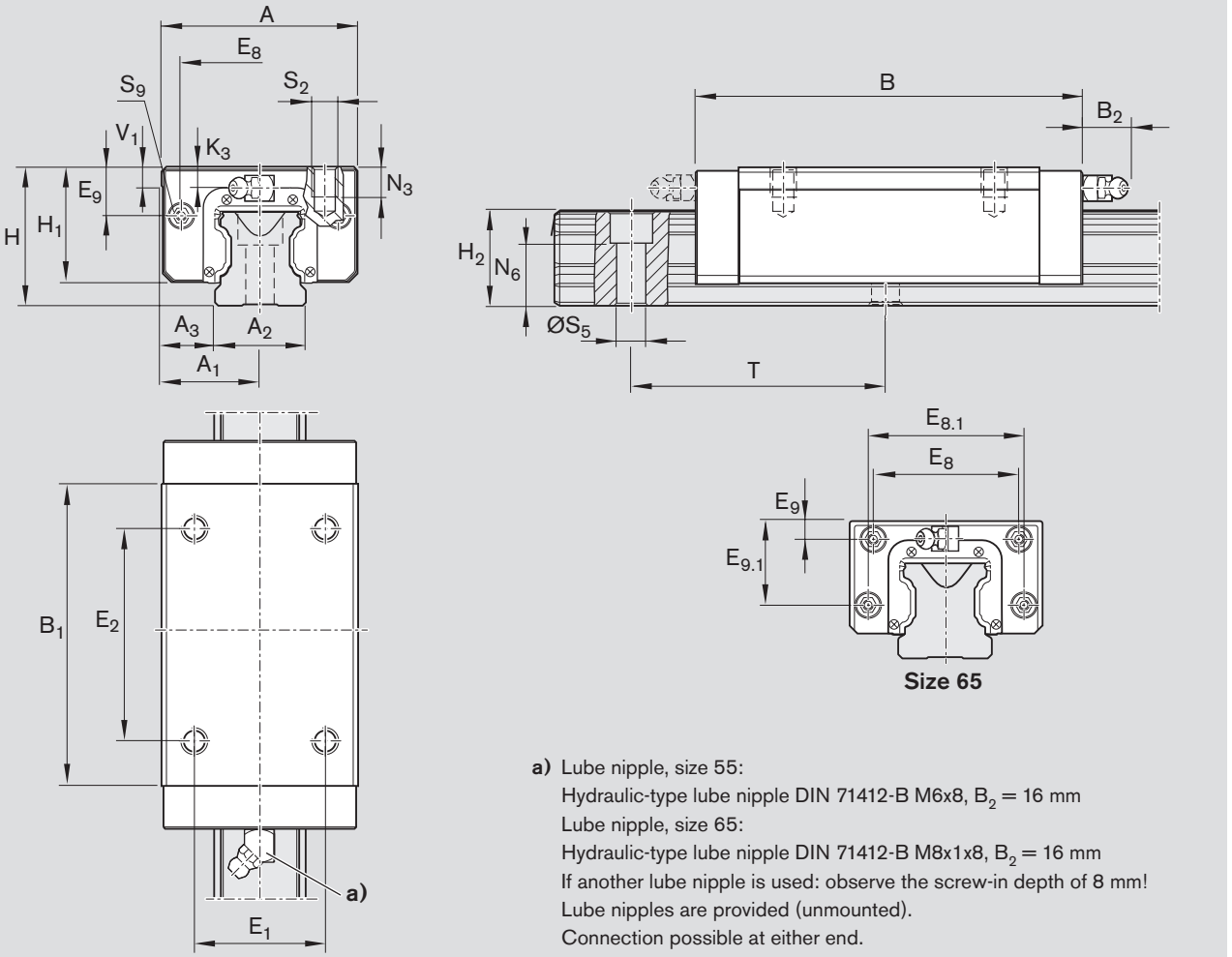
Size	Ball runner block with size	Preload class				Accuracy class			Seal for ball runner block without ball chain
		C0	C1	C2	C3	N	H	P	SS
55	R1623 5	9				4	3	–	10
			1			4	3	2	10
				2		–	3	2	10
					3	–	–	2	10
65	R1623 6	9				4	3	–	10
			1			4	3	2	10
				2		–	3	2	10
					3	–	–	2	10
e.g.	R1623 5		1				3		10

Ordering example
Options:
– Ball Runner Block SLS
– Size 55
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R1623 513 10

Preload classes
C0 = without preload
C1 = preload 2% C
C2 = preload 8% C
C3 = preload 13% C

Seals
SS = standard seal

Ball Runner Blocks SLS



a) Lube nipple, size 55:
Hydraulic-type lube nipple DIN 71412-B M6x8, $B_2 = 16$ mm
Lube nipple, size 65:
Hydraulic-type lube nipple DIN 71412-B M8x1x8, $B_2 = 16$ mm
If another lube nipple is used: observe the screw-in depth of 8 mm!
Lube nipples are provided (unmounted).
Connection possible at either end.

Size	Dimensions (mm)															
	A	A_1	A_2	A_3	B	B_1	E_1	E_2	E_8	$E_{8.1}$	E_9	$E_{9.1}$	H	H_1	H_2 1)	H_2 2)
55	100	50	53	23.5	200	155.5	75	95	80	–	22.3	–	70	57	48.15	47.85
65	126	63	63	31.5	243	194.6	76	120	76	100	11.0	53.5	90	76	60.15	59.85

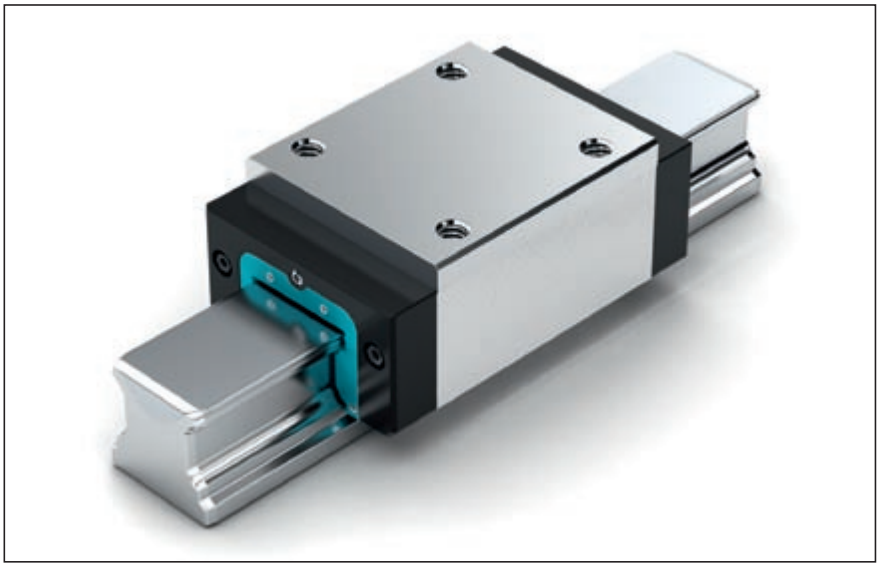
Size	Dimensions (mm)								Weight (kg)	Load capacities 3) (N)		Load moments 3) (Nm)			
	K_3	N_3	$N_6^{\pm 0.5}$	S_2	S_5	S_9	T	V_1		C	C_0	M_t	M_{t0}	M_L	M_{L0}
55	9	19	29.0	M12	16	M5x8	120	12	4.8	124 200	170 000	3 950	5 400	2 630	3 600
65	16	21	38.5	M16	18	M4x7	150	15	9.8	163 000	289 000	6 440	11 420	4 620	8 190

1) Dimension H_2 with cover strip
2) Dimension H_2 without cover strip
3) Load capacities and moments for Ball Runner Block **without** ball chain.
Determination of the dynamic load capacities and moments is based on a travel life of 100,000 m per ISO 14728-1. Often only 50,000 m are actually stipulated. For comparison: Multiply values **C**, $\mathbf{M_t}$ and $\mathbf{M_L}$ from the table by 1.26.

Heavy Duty Ball Runner Blocks made of steel

SNH – Slimline, normal, high

R1621 ... 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
– Not pre-lubricated

Further Heavy Duty Runner Blocks SNH
– Corrosion-resistant Ball Runner Blocks
Resist CR ☞ 108

Note
Can be used on all Ball Guide Rails SNS.

Ordering example
Options:
– Ball Runner Block SNH
– Size 55
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R1621 513 10

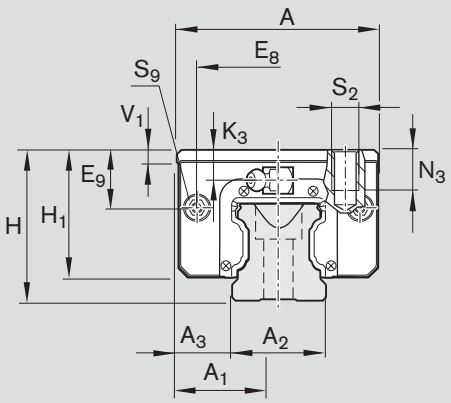
Options and part numbers

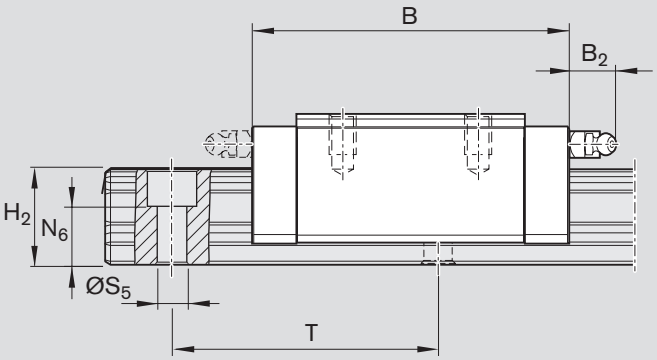
Size	Ball runner block with size	Preload class				Accuracy class			Seal for ball runner block without ball chain
		C0	C1	C2	C3	N	H	P	SS
55	R1621 5	9				4	3	–	10
			1			4	3	2	10
				2		–	3	2	10
					3	–	–	2	10
e.g.	R1621 5		1				3		10

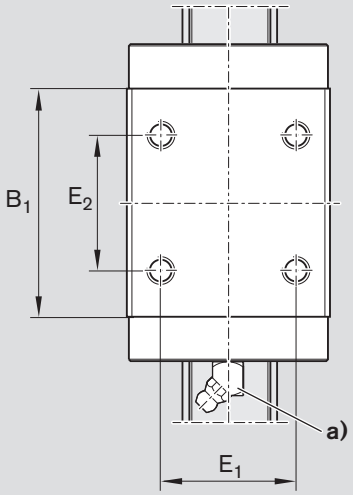
Preload classes
C0 = without preload
C1 = preload 2% C
C2 = preload 8% C
C3 = preload 13% C

Seals
SS = standard seal

Ball Runner Blocks SNH







a) Lube nipple, size 55:
Hydraulic-type lube nipple DIN 71412-B M6x8, B_2 = 16 mm
If another lube nipple is used: observe the screw-in depth of 8 mm!
Lube nipples are provided (unmounted).
Connection possible at either end.

Size	Dimensions (mm)													
	A	A_1	A_2	A_3	B	B_1	E_1	E_2	E_8	E_9	H	H_1	H_2 [1]	H_2 [2]
55	100	50	53	23.5	159	115.5	75	75	80	32.3	80	67	48.15	47.85

Size	Dimensions (mm)								Weight (kg)	Load capacities [3] (N)		Load moments [3] (Nm)			
	K_3	N_3	$N_6^{\pm 0.5}$	S_2	S_5	S_9	T	V_1		C	C_0	M_t	M_{t0}	M_L	M_{L0}
55	19	19	29	M12	16	M5x8	120	12	4.70	98 200	121 400	3 100	3 860	1 540	1 905

1) Dimension H_2 with cover strip
2) Dimension H_2 without cover strip
3) Load capacities and moments for Ball Runner Block **without** ball chain.
Determination of the dynamic load capacities and moments is based on a travel life of 100,000 m per ISO 14728-1. Often only 50,000 m are actually stipulated. For comparison: Multiply values **C**, $\mathbf{M}_t$ and $\mathbf{M}_L$ from the table by 1.26.

Heavy Duty Ball Runner Blocks made of steel

SLH – Slimline, long, high

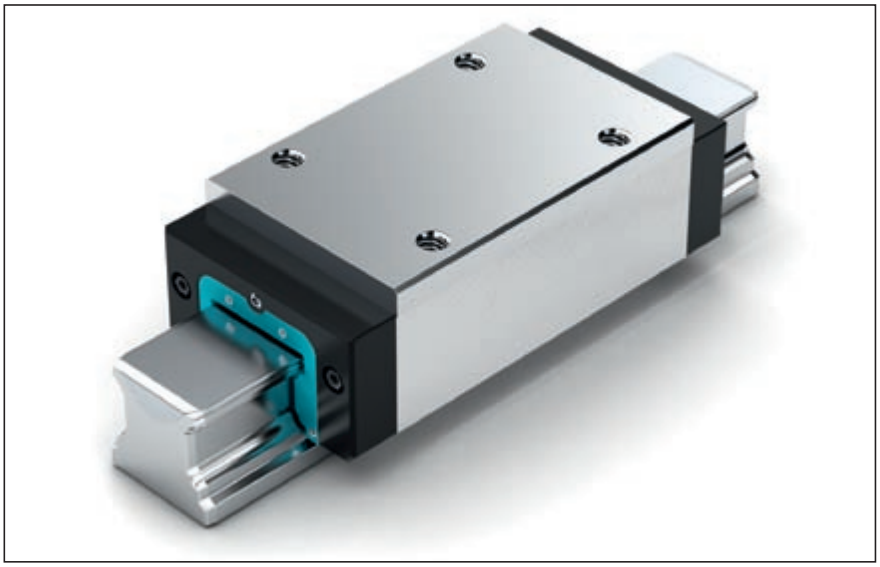
R1624 ... 1.

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
– Not pre-lubricated

Further Heavy Duty Runner Blocks SLH
– Corrosion-resistant Ball Runner Blocks
Resist CR ☞ 108

Note
Can be used on all Ball Guide Rails SNS.



Options and part numbers

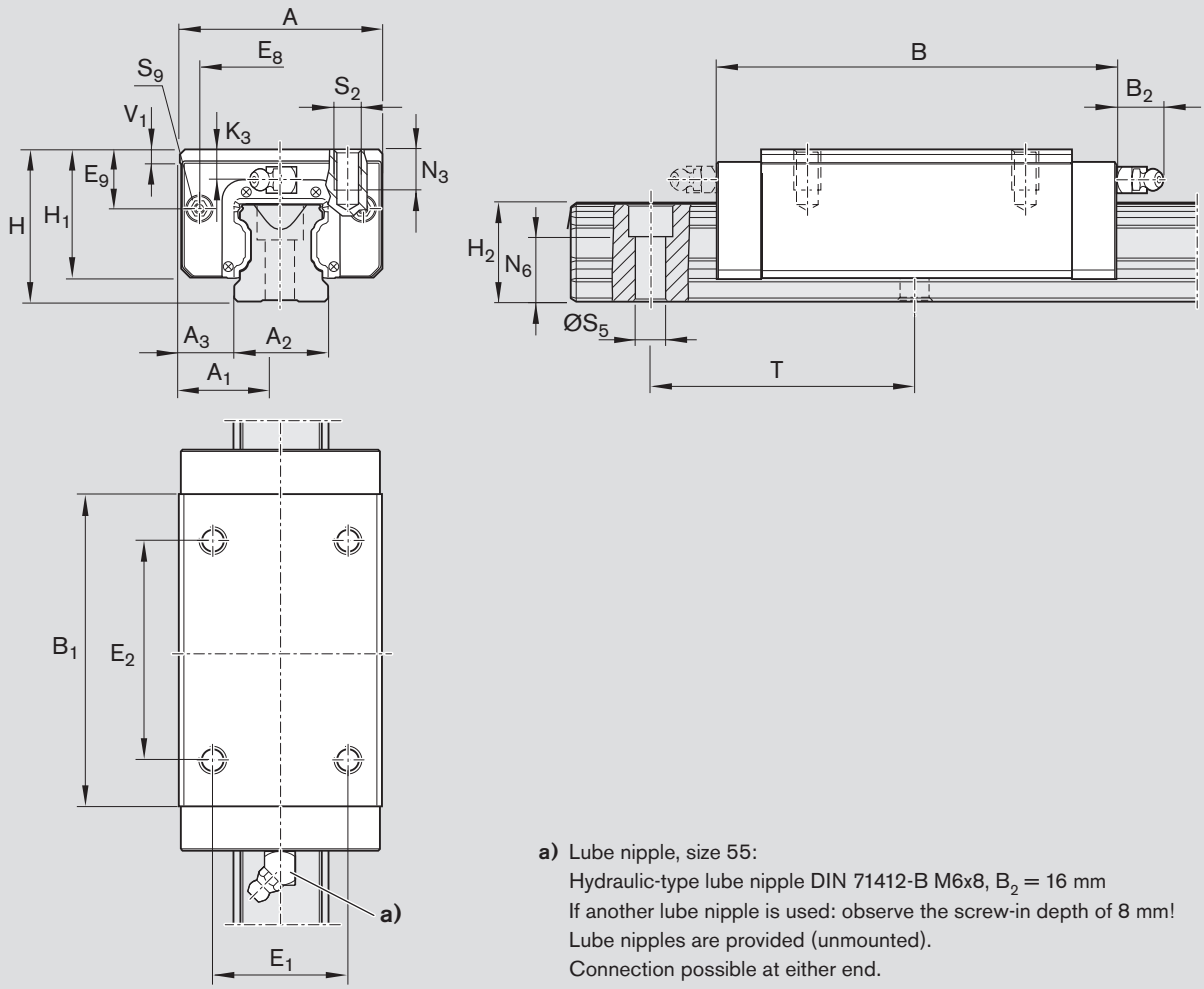
Size	Ball runner block with size	Preload class				Accuracy class			Seal for ball runner block without ball chain
		C0	C1	C2	C3	N	H	P	SS
55	R1624 5	9				4	3	–	10
			1			4	3	2	10
				2		–	3	2	10
					3	–	–	2	10
e.g.	R1624 5		1				3		10

Ordering example
Options:
– Ball Runner Block SLH
– Size 55
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R1624 513 10

Preload classes
C0 = without preload
C1 = preload 2% C
C2 = preload 8% C
C3 = preload 13% C

Seals
SS = standard seal

Ball Runner Blocks SLH



a) Lube nipple, size 55:
Hydraulic-type lube nipple DIN 71412-B M6x8, B_2 = 16 mm
If another lube nipple is used: observe the screw-in depth of 8 mm!
Lube nipples are provided (unmounted).
Connection possible at either end.

Size	Dimensions (mm)													
	A	A_1	A_2	A_3	B	B_1	E_1	E_2	E_8	E_9	H	H_1	H_2 [1]	H_2 [2]
55	100	50	53	23.5	200	155.5	75	95	80	32.3	80	67	48.15	47.85

Size	Dimensions (mm)								Weight (kg)	Load capacities [3] (N)		Load moments [3] (Nm)			
	K_3	N_3	$N_6^{\pm 0.5}$	S_2	S_5	S_9	T	V_1		C	C_0	M_t	M_{t0}	M_L	M_{L0}
55	19	19	29	M12	16	M5x8	120	12	6.00	124 200	170 000	3 950	5 400	2 630	3 600

1) Dimension H_2 with cover strip
2) Dimension H_2 without cover strip
3) Load capacities and moments for Ball Runner Block **without** ball chain.
Determination of the dynamic load capacities and moments is based on a travel life of 100,000 m per ISO 14728-1. Often only 50,000 m are actually stipulated. For comparison: Multiply values **C**, $\mathbf{M}_t$ and $\mathbf{M}_L$ from the table by 1.26.

High Precision Ball Runner Blocks made of steel

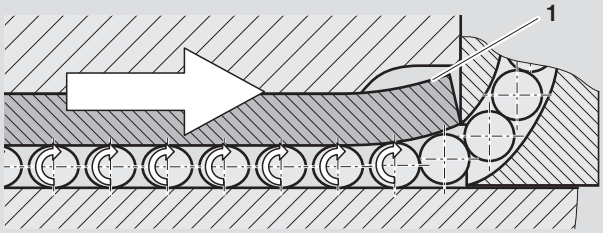
Product Description

Highlights versus existing precision range

- Travel accuracy again further improved by a factor of up to six
- Significantly reduced frictional drag variations and low frictional drag, especially under an applied external load
- Highest precision
- Superior quality
- Extremely low impact on surrounding environment due to minimal oil preservation
- Patented entry zone design enhances travel accuracy
- Plus all further advantages of Rexroth Precision Ball Runner Blocks

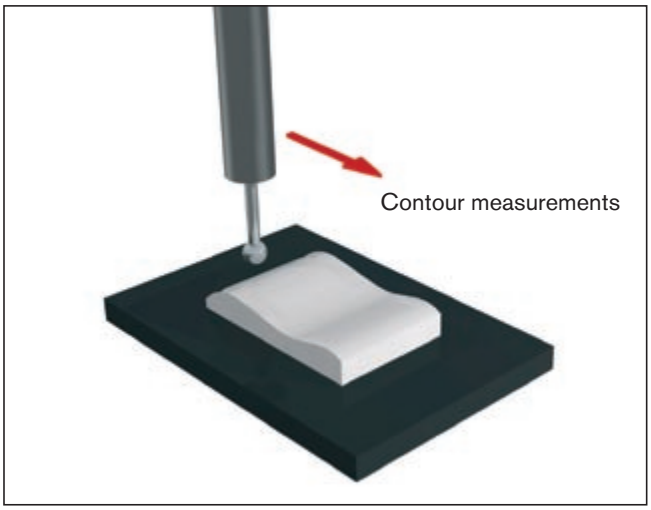
High precision through innovation:

- New entry zone geometry for ball runner blocks:
  The load-dependent entry zone (1) from Rexroth.



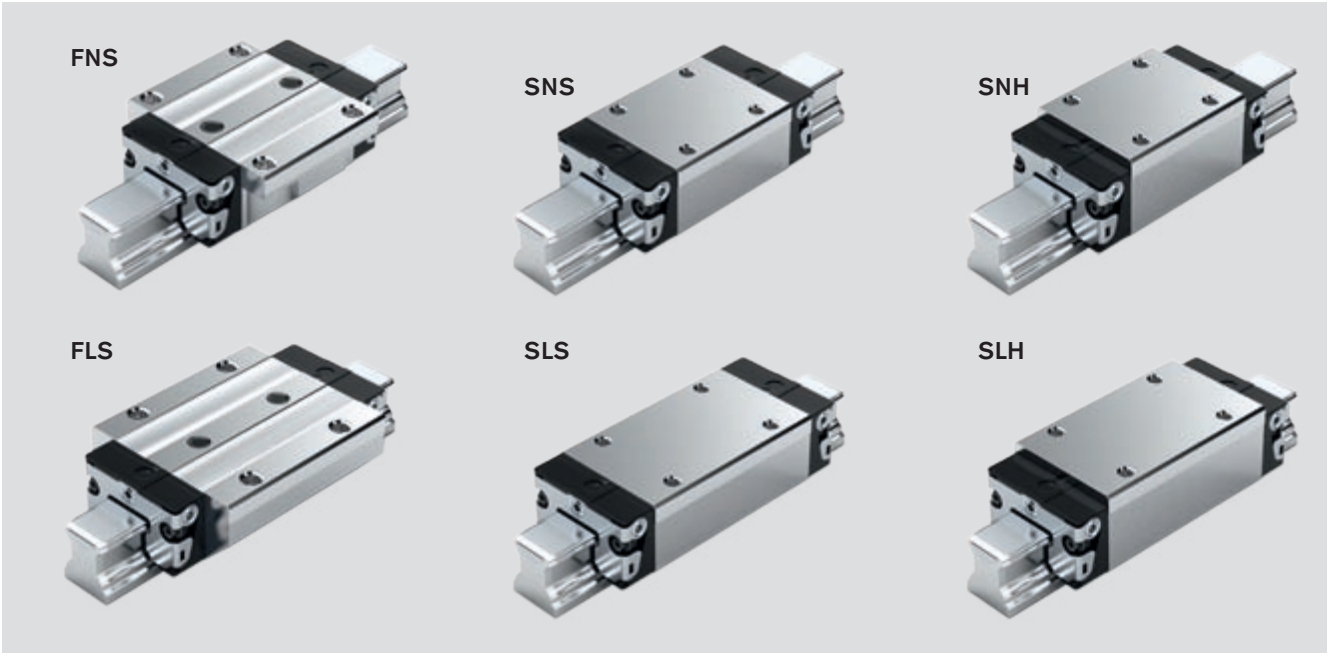
Application example

Further application examples ☞ 83



3D coordinate measuring machine

Overview of High Precision Steel Ball Runner Block models



Ball chain (optional)
– Optimizes noise levels

Definition Ball Runner Block design style		Code (example) F	N	S
Width	**F**langed	**F**		
	Slimline			
	Wide			
	Compact			
Length	**N**ormal		**N**	
	Long			
	Short			
Height	**S**tandard height			**S**
	High			
	Low			

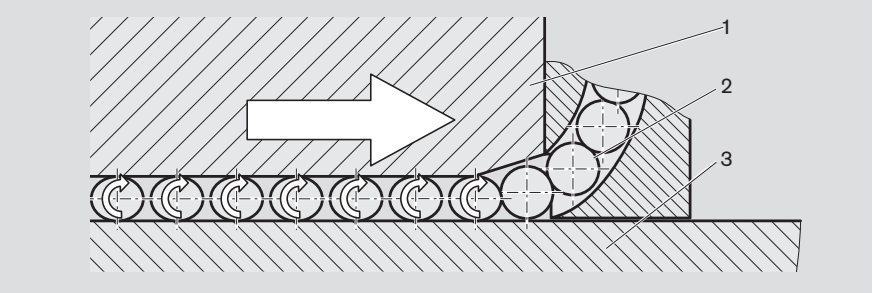
High Precision Ball Runner Blocks made of steel

Comparison

Conventional Ball Runner Blocks

Entry zone geometry for conventional ball runner blocks

If the ball runner block has a conventional entry zone, this can only be designed for a specific load point.



1 Ball runner block
2 Ball
3 Ball guide rail

Ball entry

- The balls are guided to the beginning of the entry zone by the ball recirculation track.
- When the distance between the ball runner block (1) and the ball guide rail (3) becomes smaller than the ball diameter, the ball (2) is subjected to loading (preload) in a series of pulses.
- The preload increases in the entry zone and reaches a maximum in the load-bearing zone. The ball transmits the force from the runner block to the rail.
- The kinematic and geometric conditions cause spaces to develop between the balls.

Entry zone

Conventional runner blocks have a fixed entry zone. The depth of the entry zone must be designed to withstand high loading, since smooth ball entry must be assured even under very high loads.

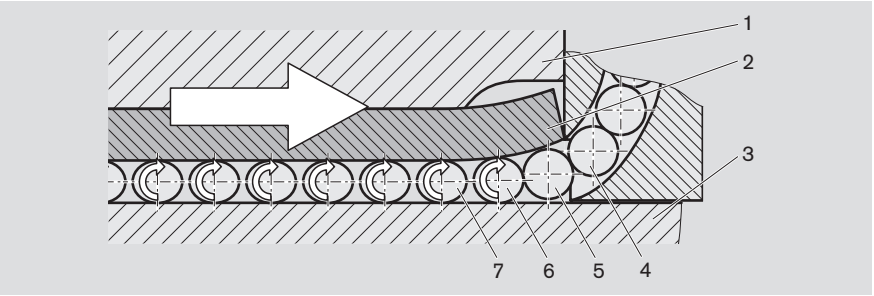
- On the one hand, there should be as many load-bearing balls as possible at any one time in the runner block to ensure optimal load capacity of the linear bearing.
  ➠ shortest possible entry zone
- On the other hand, the increase in loading of the balls upon entry should be as slow and smooth as possible, in order to maximize the geometrical travel accuracy.
  ➠ shallowest (longest) possible entry zone

These are conflicting aims (short versus long entry zone).

High Precision Ball Runner Blocks

New entry zone geometry for high precision ball runner blocks

High precision ball runner blocks have an innovative entry zone. The ends of the steel segments are not supported by the runner block body and can therefore deflect elastically. This entry zone adjusts individually to the actual operating load of the ball runner block. The balls enter the load-bearing zone very smoothly, i.e. without any load pulsation.



1 Ball runner block
2 Steel segment
3 Ball guide rail
4 – 7 Balls

Ball entry

- The balls (4) are guided to the beginning of the entry zone by the ball recirculation track.
- The ball (5) enters the zone load-free.
- The ball (6) causes the end of the steel segment to deflect elastically. This deflection is the sum of the compliance of the ball itself and the compliance of the unsupported end of the steel segment.
- As the distance between the steel segment and the rail becomes smaller than the ball diameter, the ball is gradually and uniformly subjected to loading (preload).
- The preload is thus smoothly increased until the ball (7) has reached its maximum preload.

Innovative solution from Rexroth: ➠ the load-dependent entry zone

The functionality of the entry zone is key. The steel segments are manufactured with such precision that they deflect to the right degree in response to the actual load. This results in especially smooth ball entry behavior.
A ball deflects the precision-manufactured steel segment only as far as necessary to allow the following ball to enter load-free. The ball is no longer guided into the load-bearing zone in pulses by a rigid entry channel but by a very smooth flexing curve, which ideally transitions tangentially into the load-bearing zone.
The extremely smooth ball entry behavior and the continuous adjustment of the entry zone in response to the actual load are the great advantages of these high precision ball runner blocks.

Characteristic features

1 Highest travel accuracy
2 Minimal frictional drag variation
3 The conflicting aims are resolved

High Precision Ball Runner Blocks made of steel

Frictional Drag Variations

Definition

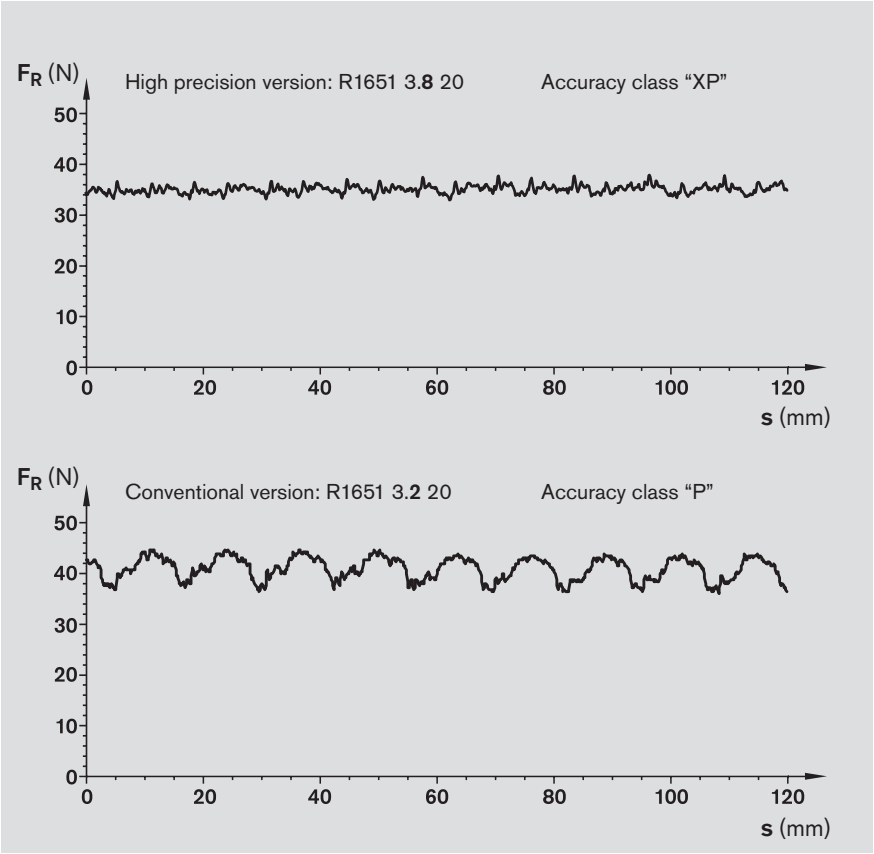
The total frictional drag of a runner block is composed of the following components:

1 Ball friction
2 Seal friction
3 Friction in the ball recirculation elements and recirculation tracks

Variations in frictional drag can be especially troublesome in certain operating environments.

These variations are mainly due to the following fact:
The balls have to transition from the load-free zone to the load-bearing zone. Through its innovative design, the smooth ball entry zone minimizes the variations, which also permits better control of the linear drive.

Frictional drag comparison for a size 35 ball runner block with an external load of 10,000 N



➠ Reduced frictional drag
➠ Significantly reduced frictional drag variation

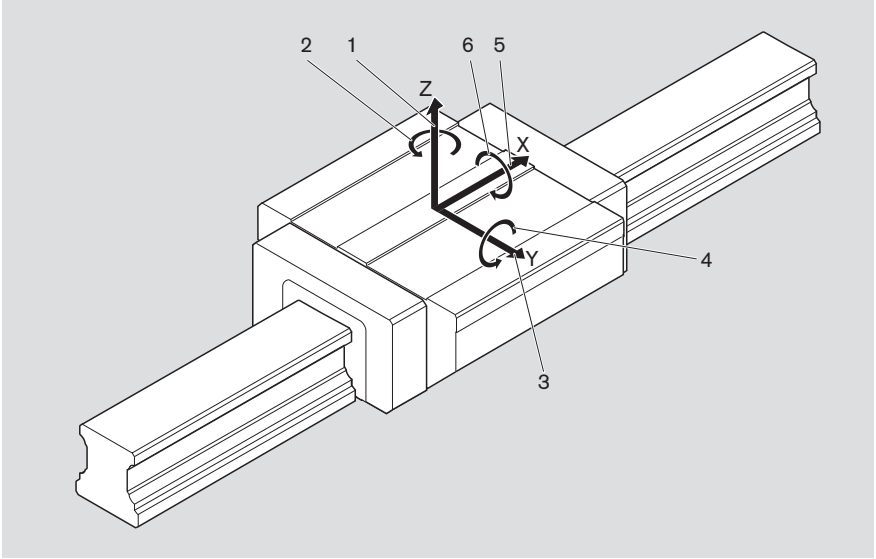
Travel accuracy

Definition

Ideally, the ball runner block should move in a straight line along the guide rail in the direction of the X-axis. In practice, however, deviations occur in all six degrees of freedom. Travel accuracy is the term used to describe the closeness of the movement to the ideal straight line.

The six different degrees of freedom

1 Vertical deviation
(linear deviation in the Z-direction)
2 Yawing (rotation about the Z-axis)
3 Lateral deviation
(linear deviation in the Y direction)
4 Pitching (rotation about the Y-axis)
5 Translation
(linear motion in the X-direction)
6 Rolling (rotation about the X-axis)



Causes of travel inaccuracy

Travel accuracy is influenced by the following parameters:
1 The finish of the mounting base to which the rail fastened.
2 Parallelism errors between the contact surfaces of the rail and the ball running tracks.
3 Elastic deformations of the rail under the mounting screws.
4 Variations in accuracy as balls enter and exit the load-bearing zone.

Optimization potential

Re 1 Machine the mounting base for the guide rail with the greatest possible precision (beyond the control of Rexroth).

Re 2 The deviation can be influenced by choosing an appropriate accuracy class for the rail.

Re 3 Reduce the tightening torque. The tightening torque for the fastening screws has a proportional effect. Reducing the torque will lessen the compression of the rail material.
➠ Reduced geometric variation in travel characteristics

⚠ **CAUTION: This may result in a decrease in the transmittable forces and moments.**

Re 4 – The patented, innovative entry zone design of the Rexroth high precision ball runner blocks minimizes these accuracy deviations.

Potential further improvements:
– Use of long runner blocks
– Installation of additional runner blocks per rail

High Precision Ball Runner Blocks made of steel

Travel accuracy

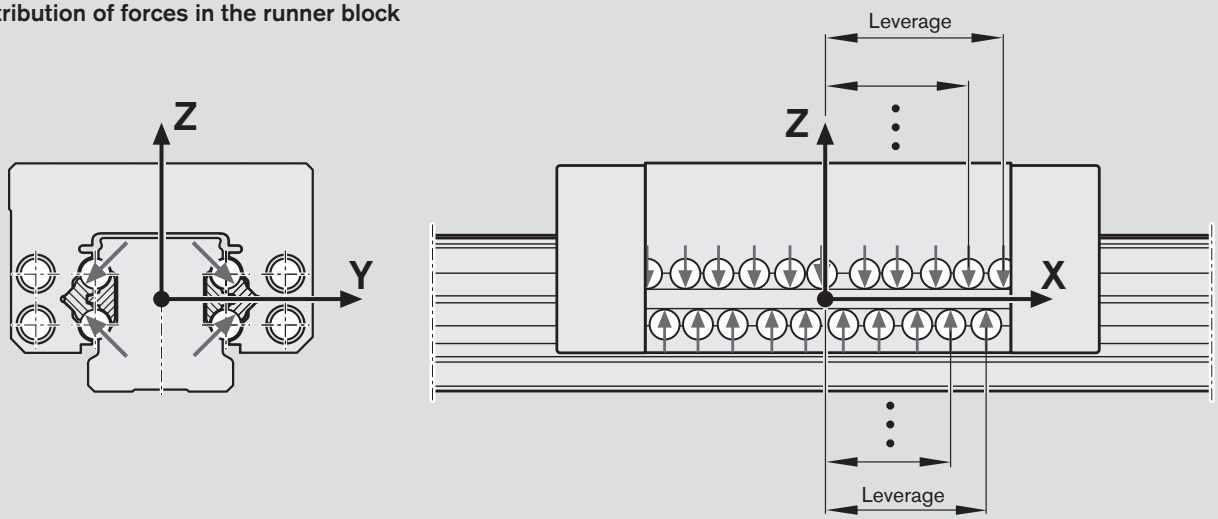
The deviations measured are due to the following phenomenon

A ball circuit contains a number n of load-bearing balls. When the ball runner block is moved in the direction of travel, a new ball engages in the entry zone. Now there are n+1 load-bearing balls. This creates an imbalance between the four rows of load-bearing balls. Because the balls enter the load-bearing zones randomly, the runner block begins to rotate in an attempt to restore the balance. As the runner block moves further on, a ball leaves the load-bearing part of the circuit through the run-out zone. This again creates an imbalance between the four load-bearing ball circuits, which the runner block again attempts to correct by rotating.
This effect is clearly shown in the diagram at right.

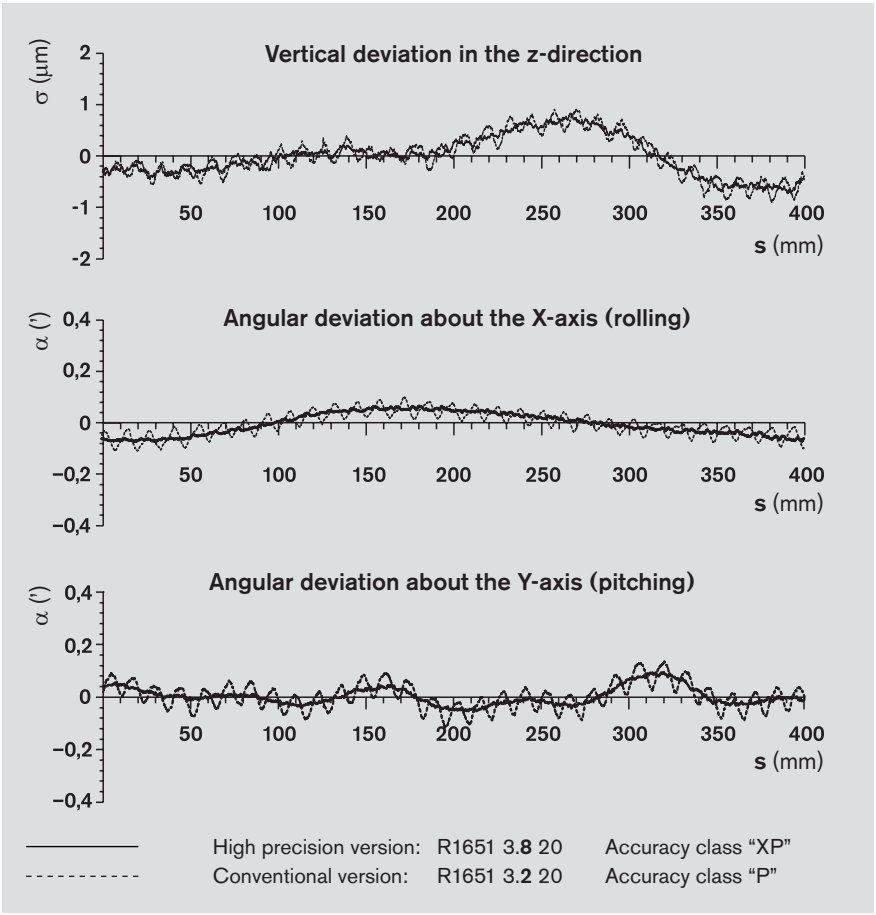
As demonstrated in practical applications, the shortwave inaccuracies have a period equivalent to approximately twice the ball diameter.

The remaining long-wave deviation is the result of the causes 1, 2 and 3 described earlier (mounting base finish, parallelism error, and elastic deformation of the rail under the fastening screws).

Distribution of forces in the runner block



Direct comparison of the travel accuracy of two ball runner blocks
The graph clearly shows that the short-wave inaccuracies (dashed line) can be very significantly reduced by the new, innovative design of the entry zone (continuous line).

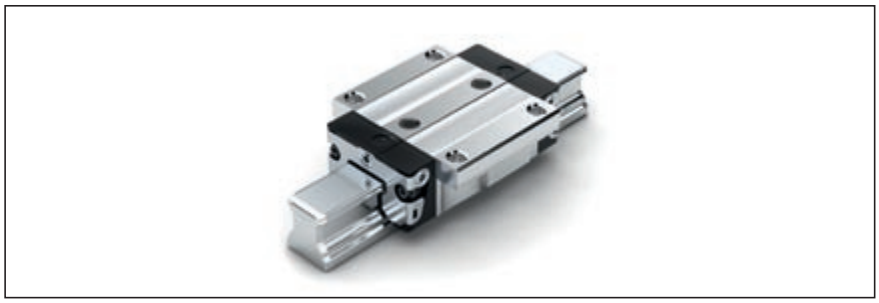


High Precision Ball Runner Blocks made of steel

FNS, FLS

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 Ball Guide Rails SNS.

Dimension drawing, dimensions and technical data ☞ 37.

Ordering example
Options:
– Ball Runner Block FNS
– Size 30
– Preload class C1
– Accuracy class XP
– With standard seal, without ball chain
Part number: R1651 718 20

Options and part numbers

Size	Ball runner block with size	Preload class			Accuracy class			Seal for ball runner block					
								without ball chain			with ball chain		
		C1	C2	C3	XP	SP	UP	SS	LS[1)]	DS	SS	LS[1)]	DS
15	R1651 1	1	2	3	8	1	9	20	21	–	22	23	–
20	R1651 8	1	2	3	8	1	9	20	21	2Z	22	23	2Y
25	R1651 2	1	2	3	8	1	9	20	21	2Z	22	23	2Y
30	R1651 7	1	2	3	8	1	9	20	21	2Z	22	23	2Y
35	R1651 3	1	2	3	8	1	9	20	21	2Z	22	23	2Y
45	R1651 4	1	2	3	8	1	9	20	–	2Z	22	–	2Y
e.g.	R1651 7	1			8			20					

FLS – Flanged, long, standard height

R1653 ... 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 Ball Guide Rails SNS.

Dimension drawing, dimensions and technical data ☞ 39.

Ordering example
Options:
– Ball Runner Block FLS
– Size 30
– Preload class C1
– Accuracy class XP
– With standard seal, without ball chain
Part number: R1653 718 20

Options and part numbers

Size	Ball runner block with size	Preload class			Accuracy classe			Seal for ball runner block					
								without ball chain			with ball chain		
		C1	C2	C3	XP	SP	UP	SS	LS[1)]	DS	SS	LS[1)]	DS
15	R1653 1	1	2	3	8	1	9	20	21	–	22	23	–
20	R1653 8	1	2	3	8	1	9	20	21	2Z	22	23	2Y
25	R1653 2	1	2	3	8	1	9	20	21	2Z	22	23	2Y
30	R1653 7	1	2	3	8	1	9	20	21	2Z	22	23	2Y
35	R1653 3	1	2	3	8	1	9	20	21	2Z	22	23	2Y
45	R1653 4	1	2	3	8	1	9	20	–	2Z	22	–	2Y
e.g.	R1653 7	1			8			20					

1) Low-friction seal available for preload C1 (only for accuracy class XP)

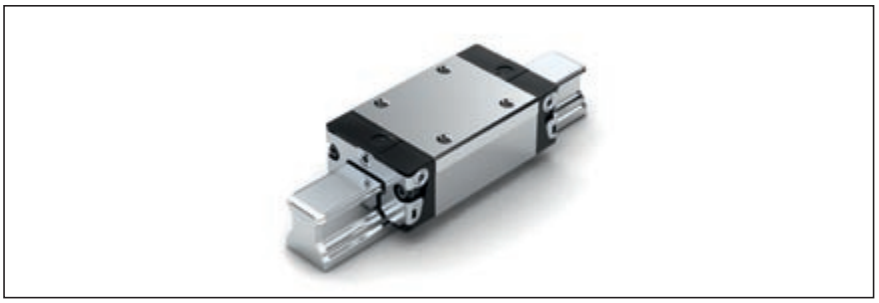
Preload classes
C1 = preload 2% C
C2 = preload 8% C
C3 = preload 13% C

Seals
SS = standard seal
LS = low-friction seal
DS = double-lipped seal

Key to table
Gray numbers
= version/combination not preferred
(longer delivery times in some cases)

SNS, SLS

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 Ball Guide Rails SNS.

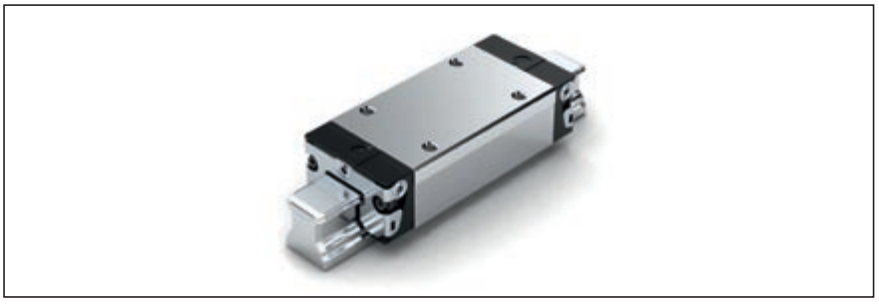
Dimension drawing, dimensions and technical data ☞ 43.

Ordering example
Options:
– Ball Runner Block SNS
– Size 30
– Preload class C1
– Accuracy class XP
– With standard seal, without ball chain
Part number: R1622 718 20

Options and part numbers

Size	Ball runner block with size	Preload class C1	C2	C3	Accuracy class XP	Seal for ball runner block without ball chain SS	LS[1)]	DS	with ball chain SS	LS[1)]	DS
15	R1622 1	1	2	3	8	20	21	–	22	23	–
20	R1622 8	1	2	3	8	20	21	2Z	22	23	2Y
25	R1622 2	1	2	3	8	20	21	2Z	22	23	2Y
30	R1622 7	1	2	3	8	20	21	2Z	22	23	2Y
35	R1622 3	1	2	3	8	20	21	2Z	22	23	2Y
45	R1622 4	1	2	3	8	20	–	2Z	22	–	2Y
e.g.	R1622 7	1			8	20					

SLS – Slimline, long, standard height
R1623 … 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 Ball Guide Rails SNS.

Dimension drawing, dimensions and technical data ☞ 45.

Ordering example
Options:
– Ball Runner Block SLS
– Size 30
– Preload class C1
– Accuracy class XP
– With standard seal, without ball chain
Part number: R1623 718 20

Options and part numbers

Size	Ball runner block with size	Preload class C1	C2	C3	Accuracy class XP	Seal for ball runner block without ball chain SS	LS[1)]	DS	with ball chain SS	LS[1)]	DS
15	R1623 1	1	2	3	8	20	21	–	22	23	–
20	R1623 8	1	2	3	8	20	21	2Z	22	23	2Y
25	R1623 2	1	2	3	8	20	21	2Z	22	23	2Y
30	R1623 7	1	2	3	8	20	21	2Z	22	23	2Y
35	R1623 3	1	2	3	8	20	21	2Z	22	23	2Y
45	R1623 4	1	2	3	8	20	–	2Z	22	–	2Y
e.g.	R1623 7	1			8	20					

1) Low-friction seal available for preload C1

Preload classes
C1 = preload 2% C
C2 = preload 8% C
C3 = preload 13% C

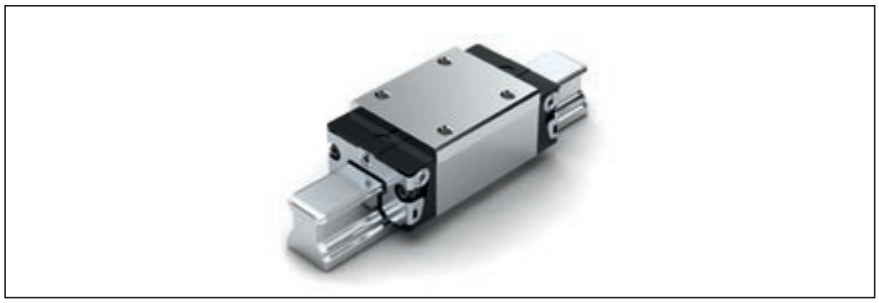
Seals
SS = standard seal
LS = low-friction seal
DS = double-lipped seal

Key to table
Gray numbers
= version/combination not preferred
(longer delivery times in some cases)

High Precision Ball Runner Blocks made of steel

SNH, SLH

SNH – Slimline, normal, high
R1621 … 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 Ball Guide Rails SNS.

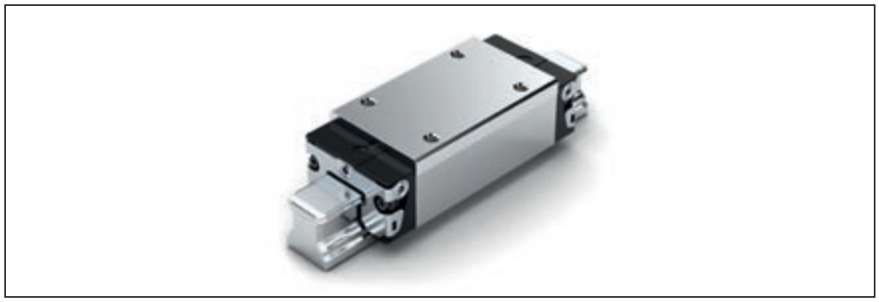
Dimension drawing, dimensions and technical data ☞ 49.

Ordering example
Options:
– Ball Runner Block SNH
– Size 30
– Preload class C1
– Accuracy class XP
– With standard seal, without ball chain
Part number: R1621 718 20

Options and part numbers

Size	Ball runner block with size	Preload class			Accuracy class	Seal for ball runner block					
						without ball chain			with ball chain		
		C1	C2	C3	XP	SS	LS[1]	DS	SS	LS[1]	DS
15	R1621 1	1	2	3	8	20	21	–	22	23	–
25	R1621 2	1	2	3	8	20	21	2Z	22	23	2Y
30	R1621 7	1	2	3	8	20	21	2Z	22	23	2Y
35	R1621 3	1	2	3	8	20	21	2Z	22	23	2Y
45	R1621 4	1	2	3	8	20	–	2Z	22	–	2Y
e.g.	R1621 7	1			8	20					

SLH – Slimline, long, high
R1624 … 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 Ball Guide Rails SNS.

Dimension drawing, dimensions and technical data ☞ 51.

Ordering example
Options:
– Ball Runner Block SLH
– Size 30
– Preload class C1
– Accuracy class XP
– With standard seal, without ball chain
Part number: R1624 718 20

Options and part numbers

Size	Ball runner block with size	Preload class			Accuracy class	Seal for ball runner block					
						without ball chain			with ball chain		
		C1	C2	C3	XP	SS	LS[1]	DS	SS	LS[1]	DS
25	R1624 2	1	2	3	8	20	21	2Z	22	23	2Y
30	R1624 7	1	2	3	8	20	21	2Z	22	23	2Y
35	R1624 3	1	2	3	8	20	21	2Z	22	23	2Y
45	R1624 4	1	2	3	8	20	–	2Z	22	–	2Y
e.g.	R1624 7	1			8	20					

1) Low-friction seal available for preload C1

Preload classes
C1 = preload 2% C
C2 = preload 8% C
C3 = preload 13% C

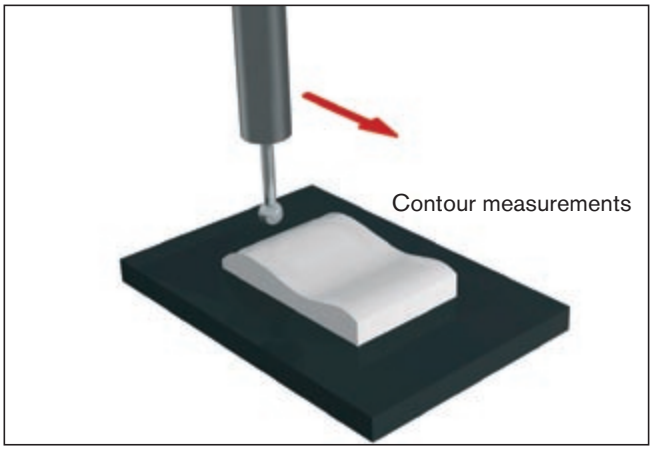
Seals
SS = standard seal
LS = low-friction seal
DS = double-lipped seal

Key to table
Gray numbers
= version/combination not preferred
(longer delivery times in some cases)

Application Examples

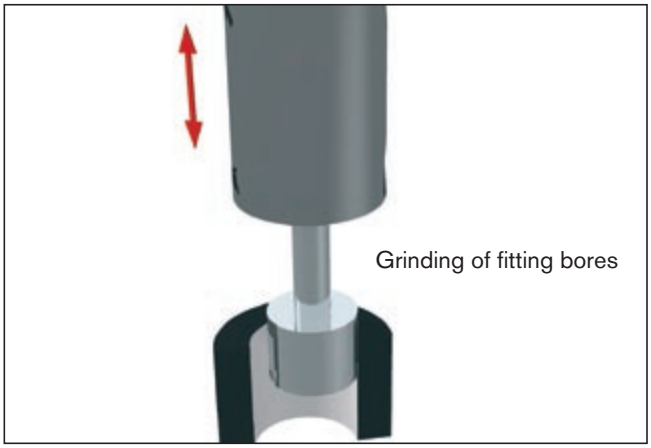
Rexroth High Precision Ball Runner Blocks are especially suited for the following applications:

1 Measuring



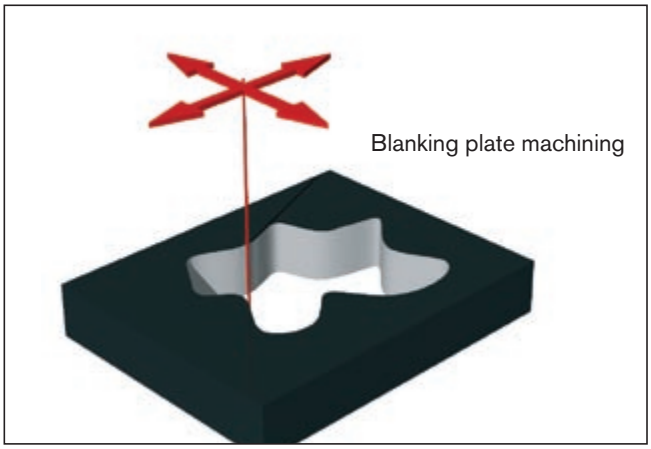
3D coordinate measuring machine

2 Grinding



Internal cylindrical grinding

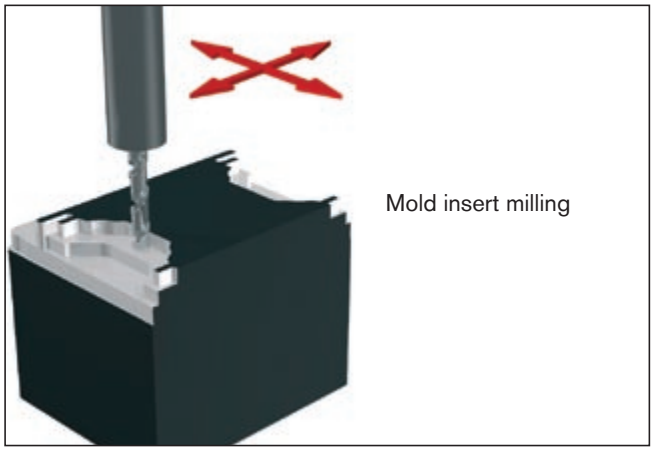
3 Electrical discharge machining (EDM)



Wire EDM

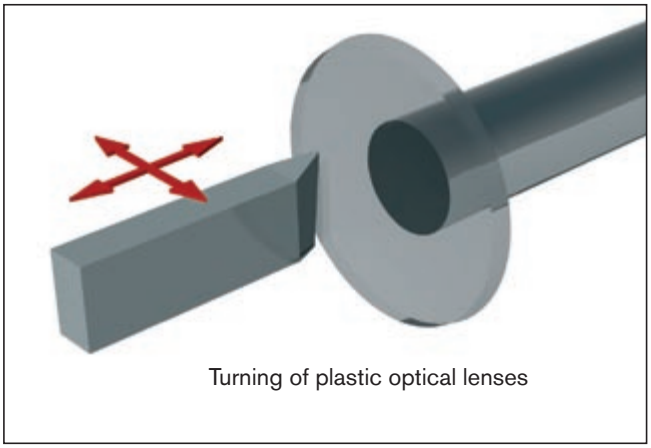
These are just a few examples of the many possible applications. Simply ask us. We'll find the right solution for your needs.

4 Milling



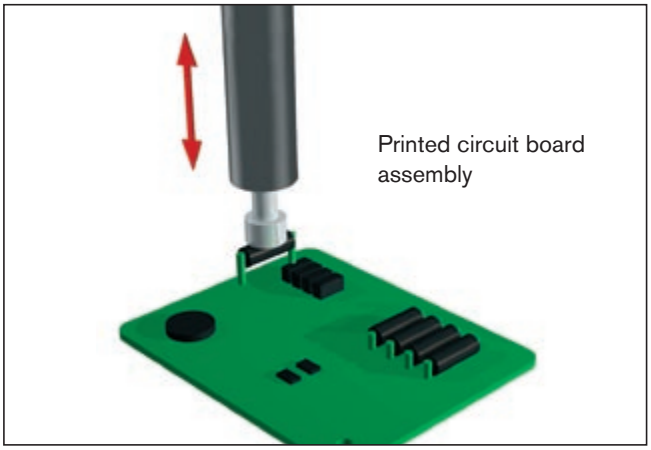
Hard milling

5 Turning



High precision turning

6 Microelectronics



PCB assembly machines

High-Speed Ball Runner Blocks made of steel

Product Description

Characteristic features

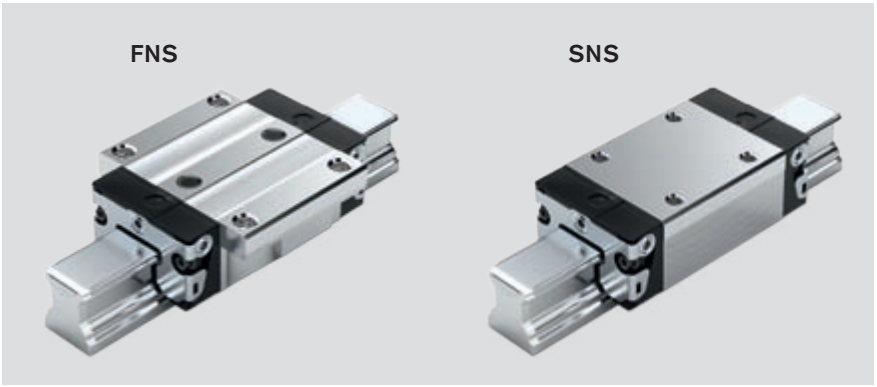
- Excellent dynamic characteristics:
  Travel speed: $v_{max} = 10$ m/s
  Acceleration: $a_{max} = 500$ m/s^2
- Same load capability in all four main load directions
- Long-term lubrication, up to several years
- Minimum quantity lubrication system with integrated reservoir for oil lubrication
- Lube ports with metal threads on all sides
- Limitless interchangeability; all ball guide rail versions can be combined at will with all ball runner block versions within each accuracy class
- Optimum system rigidity through preloaded O-arrangement
- Electrically insulating due to the use of ceramic balls
- Existing range of accessories fully utilizable
- Top logistics that are unique worldwide

Further highlights:

- High travel speed thanks to low mass of ceramic balls
- Attachments can be bolted to the ball runner blocks from above or below[1)]
- Improved rigidity under lift-off and side loading conditions when additional mounting screws are used in the two holes provided at the center of the runner block
- Mounting threads provided on end faces for fixing of all add-on elements
- High rigidity in all load directions – permits applications with just one runner block per rail
- Integrated all-round sealing
- High torque load capacity
- Optimized entry-zone geometry and high number of balls per track minimizes variation in elastic deflection
- Smooth running thanks to optimized ball recirculation and guidance
- Available in five common sizes
- Ball runner blocks pre-lubricated in factory

1) depends on type

Overview of High-Speed Ball Runner Blocks made of steel



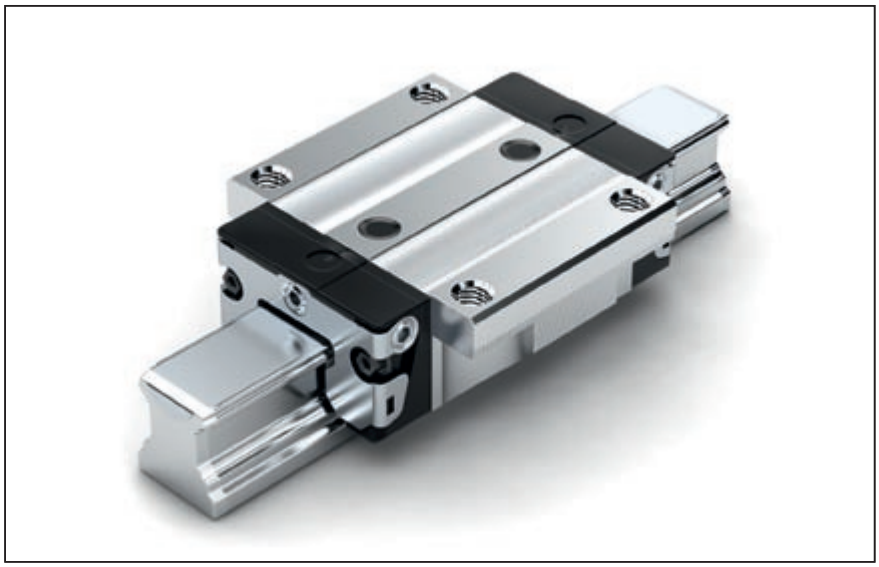
Ceramic balls
– Permit very high speeds

Definition Ball Runner Block design style		Code (example) F	N	S
Width	**F**langed	**F**		
	Slimline			
	Wide			
	Compact			
Length	**N**ormal		**N**	
	Long			
	Short			
Height	**S**tandard height			**S**
	High			
	Low			

High-Speed Ball Runner Blocks made of steel

FNS – Flanged, normal, standard height

R2001 ... 9.



Dynamic characteristics
Travel speed: $v_{max} = 10$ 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 Ball Guide Rails SNS.

Dimension drawing and dimensions
☞ 37.

Ordering example
Options:
– Ball Runner Block FNS
– Size 30
– Preload class C2
– Accuracy class H
– With standard seal, without ball chain
Part number: R2001 723 90

Options and part numbers

Size	Ball runner block with size	Preload class	Accuracy class		Seal for ball runner block without ball chain
		C2	H	P	SS
15	R2001 1	2	3	2	90
20	R2001 8	2	3	2	90
25	R2001 2	2	3	2	90
30	R2001 7	2	3	2	90
35	R2001 3	2	3	2	90
e.g.	R2001 7	2	3		90

Size	Load capacities[1] (N)		Load moments[1] (Nm)				Weight (kg)
	C	C_0	M_t	M_{t0}	M_L	M_{L0}	
15	5 300	9 100	50	88	27	48	0.20
20	12 700	16 500	160	210	88	110	0.45
25	15 500	20 600	210	290	120	160	0.60
30	21 500	28 000	360	490	190	250	1.05
35	28 500	36 700	600	780	300	380	1.50

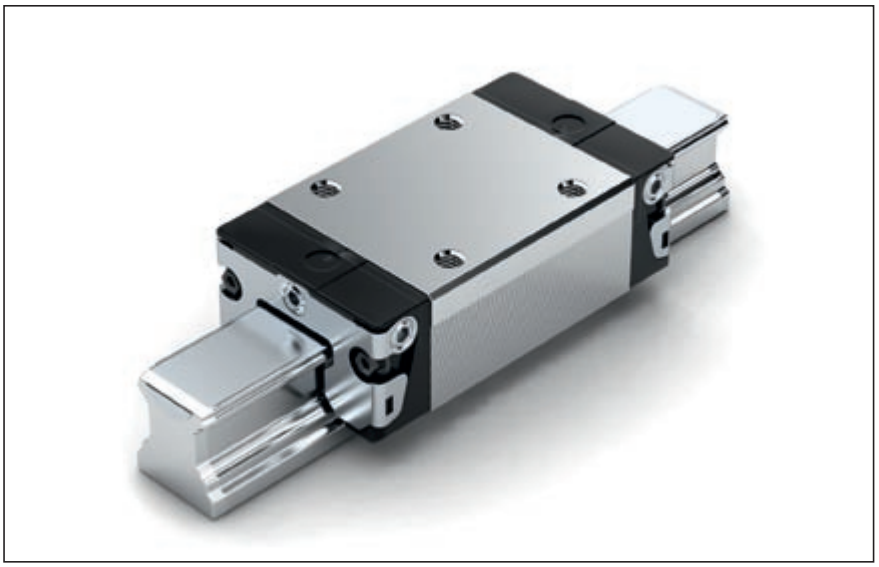
1) Load capacities and moments for Ball Runner Block **without** ball chain.
Determination of the dynamic load capacities and moments is based on a travel life of 100,000 m per ISO 14728-1. Often only 50,000 m are actually stipulated. For comparison: Multiply values **C**, $\mathbf{M_t}$ and $\mathbf{M_L}$ from the table by 1.26.

Preload classes
C2 = preload 8% C

Seals
SS = standard seal

SNS – Slimline, normal, standard height

R2011 ... 9.



Dynamic characteristics
Travel speed: $v_{max} = 10$ 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 Ball Guide Rails SNS.

Dimension drawing and dimensions
☞ 43.

Ordering example
Options:
– Ball Runner Block SNS
– Size 30
– Preload class C2
– Accuracy class H
– With standard seal, without ball chain
Part number: R2011 723 90

Options and part numbers

Size	Ball runner block with size	Preload class	Accuracy class		Seal for ball runner block without ball chain
		C2	H	P	SS
15	R2011 1	2	3	2	90
20	R2011 8	2	3	2	90
25	R2011 2	2	3	2	90
30	R2011 7	2	3	2	90
35	R2011 3	2	3	2	90
e.g.	R2011 7	2	3		90

Size	Load capacities[1] (N)		Load moments[1] (Nm)				Weight (kg)
	C	C_0	M_t	M_{t0}	M_L	M_{L0}	
15	5 300	9 100	50	88	27	48	0.15
20	12 700	16 500	160	210	88	110	0.35
25	15 500	20 600	210	290	120	160	0.45
30	21 500	28 000	360	490	190	250	0.80
35	28 500	36 700	600	780	300	380	1.15

1) Load capacities and moments for Ball Runner Block **without** ball chain.
Determination of the dynamic load capacities and moments is based on a travel life of 100,000 m per ISO 14728-1. Often only 50,000 m are actually stipulated. For comparison: Multiply values **C**, $\mathbf{M}_t$ and $\mathbf{M}_L$ from the table by 1.26.

Preload classes
C2 = preload 8% C

Seals
SS = standard seal

Super Ball Runner Blocks made of steel

Product Description

Characteristic features

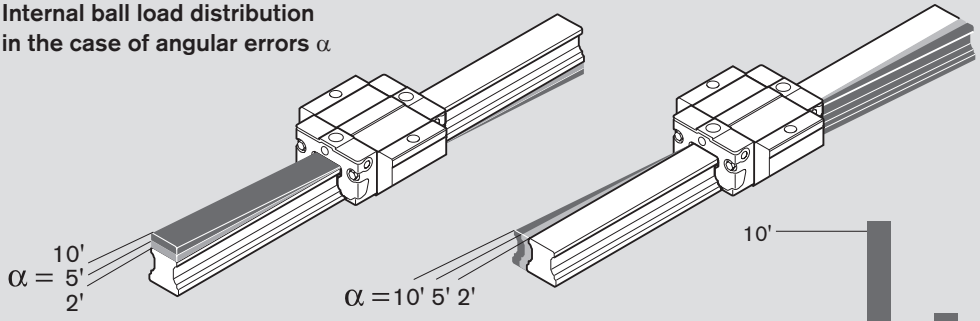
- Automatically compensates for errors in alignment (of up to 10' arc about two axes)
- Extra-compact design
- Same load capability in all four main load directions
- Wider permissible tolerances for parallelism and height offsets of the mounting surfaces
- Accuracy classes H and N
- Preload classes:
  C0 (without preload)
  C1 (preload 2% C)
- Smooth running due to optimized ball recirculation and entry zone geometry
- Low noise level and outstanding travel performance
- Excellent dynamic characteristics:
  Travel speed: $v_{max} = 5$ m/s
  Acceleration: $a_{max} = 500$ m/s^2
- Minimum quantity lubrication system with integrated reservoir for oil lubrication
- Lube ports with metal threads on all sides
- Ball runner blocks pre-lubricated in factory
- Limitless interchangeability; all ball guide rail versions can be combined at will with all ball runner block versions within each accuracy class

Self-alignment

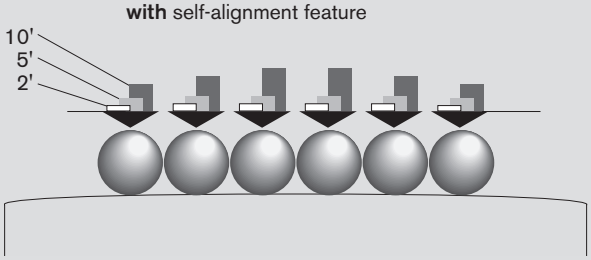
Rexroth's Super Ball Runner Blocks with self-aligning feature automatically compensate for errors in alignment to 10' of arc. There is no load capacity reduction through compression across the edges. The centers of the mating surfaces supporting the steel load bearing plates serve as a rocking fulcrum.
Therefore slight errors in alignment between runner block and guide rail do not cause problems. Also, inaccuracies in machining, mounting errors or guide rail flex will automatically be corrected.
The self-aligning feature assures that the balls enter the load-bearing zone smoothly and that the load is distributed evenly across the entire row of balls.
The result is extra-smooth running and considerably longer service life.

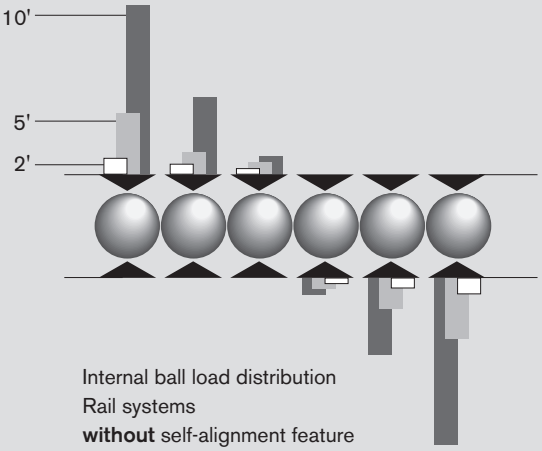
With two Super runner blocks on one guide rail, it is also possible to produce tilt-free Ball Rail Systems with a high load capacity, particularly for handling applications.

Internal ball load distribution in the case of angular errors α



Internal ball load distribution
Rexroth Ball Rail System
with self-alignment feature





Internal ball load distribution
Rail systems
without self-alignment feature

Overview of Super Ball Runner Blocks models made of steel

FKS

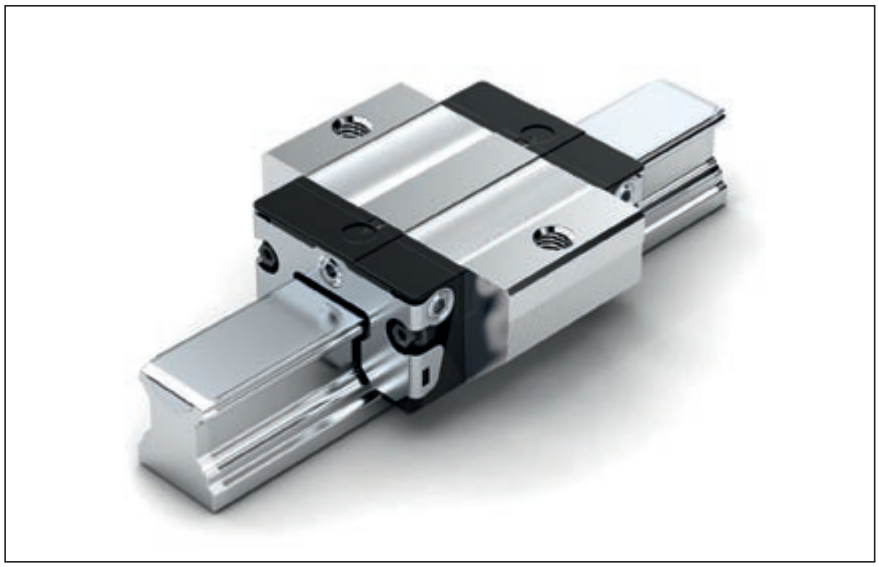
SKS

Definition Ball Runner Block design style		Code (example)		
		F	N	S
Width	**F**langed	**F**		
	Slimline			
	Wide			
	Compact			
Length	Normal		**N**	
	Long			
	Short			
Height	**S**tandard height			**S**
	High			
	Low			

Super Ball Runner Blocks made of steel

FKS – Flanged, short, standard height

R1661 … 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

Further Super Ball Runner Blocks FKS
– Corrosion-resistant Ball Runner Blocks
Resist CR ☞ 108

Note
Can be used on all Ball Guide Rails SNS.

Ordering example
Options:
– Ball Runner Block FKS
– Size 30
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain

Part number: R1661 713 20

Options and part numbers

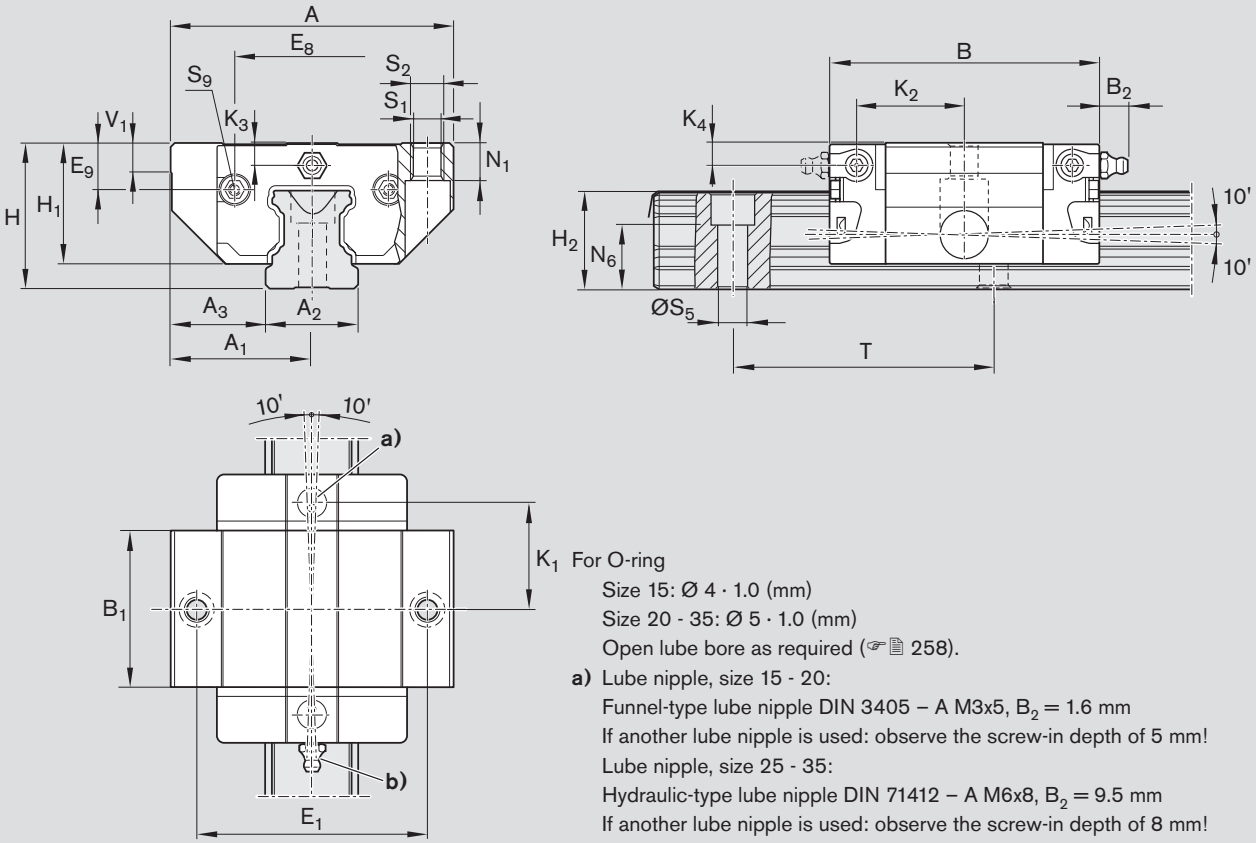
Size	Ball runner block with size	Preload class		Accuracy class		Seal for ball runner block without ball chain	
		C0	C1	N	H	SS	LS
15	R1661 1	9	1	4	3	20	21
20	R1661 8	9	1	4	3	20	21
25	R1661 2	9	1	4	3	20	21
30	R1661 7	9	1	4	3	20	21
35	R1661 3	9	1	4	3	20	21
e.g.	R1661 7		1		3	20	

Preload classes
C0 = without preload
C1 = preload 2% C

Seals
SS = standard seal
LS = low-friction seal

Key to table
Gray numbers
= version/combination not preferred (longer delivery times in some cases)

Ball Runner Blocks FKS



K_1 For O-ring
Size 15: Ø 4 · 1.0 (mm)
Size 20 - 35: Ø 5 · 1.0 (mm)
Open lube bore as required (☞ 258).

a) Lube nipple, size 15 - 20:
Funnel-type lube nipple DIN 3405 – A M3x5, B_2 = 1.6 mm
If another lube nipple is used: observe the screw-in depth of 5 mm!
Lube nipple, size 25 - 35:
Hydraulic-type lube nipple DIN 71412 – A M6x8, B_2 = 9.5 mm
If another lube nipple is used: observe the screw-in depth of 8 mm!
Lube nipples are provided (unmounted).
Connection possible at all sides.

Size	Dimensions (mm)																
	A	A_1	A_2	A_3	B	B_1	E_1	E_8	E_9	H	H_1	H_2 1)	H_2 2)	K_1	K_2	K_3	K_4
15	47	23.5	15	16.0	44.7	25.7	38	24.55	6.70	24	19.90	16.30	16.20	16.25	17.85	3.20	3.20
20	63	31.5	20	21.5	57.3	31.9	53	32.50	7.30	30	25.35	20.75	20.55	22.95	22.95	3.35	3.35
25	70	35.0	23	23.5	67.0	38.6	57	38.30	11.50	36	29.90	24.45	24.25	25.35	26.50	5.50	5.50
30	90	45.0	28	31.0	75.3	45.0	72	48.40	14.60	42	35.35	28.55	28.35	28.80	30.50	6.05	6.05
35	100	50.0	34	33.0	84.9	51.4	82	58.00	17.35	48	40.40	32.15	31.85	32.70	34.20	6.90	6.90

Size	Dimensions (mm)								Weight (kg)	Load capacities 3) (N)	Permissible load (N)	Load moments 3) (Nm)	
	N_1	$N_6^{\pm 0.5}$	S_1	S_2	S_5	S_9	T	V_1		C	F_{max}	M_t	$M_{t\,max}$
15	5.2	10.3	4.3	M5	4.4	M2.5x3.5	60	5.0	0.15	3 900	1 500	39	15
20	7.7	13.2	5.3	M6	6.0	M3x5	60	6.0	0.30	10 100	3 900	130	50
25	9.3	15.2	6.7	M8	7.0	M3x5	60	7.5	0.50	11 400	4 400	170	65
30	11.0	17.0	8.5	M10	9.0	M3x5	80	7.0	0.80	15 800	6 100	270	105
35	12.0	20.5	8.5	M10	9.0	M3x5	80	8.0	1.20	21 100	8 100	450	175

1) Dimension H_2 with cover strip
2) Dimension H_2 without cover strip

Load capacities and moments for Ball Runner Block **without** ball chain.

Determination of the dynamic load capacities and moments is based on a travel life of 100,000 m per ISO 14728-1. Often only 50,000 m are actually stipulated. For comparison: Multiply values **C** and $\mathbf{M}_t$ from the table by 1.26.

Super Ball Runner Blocks made of steel

SKS – Slimline, short, standard height

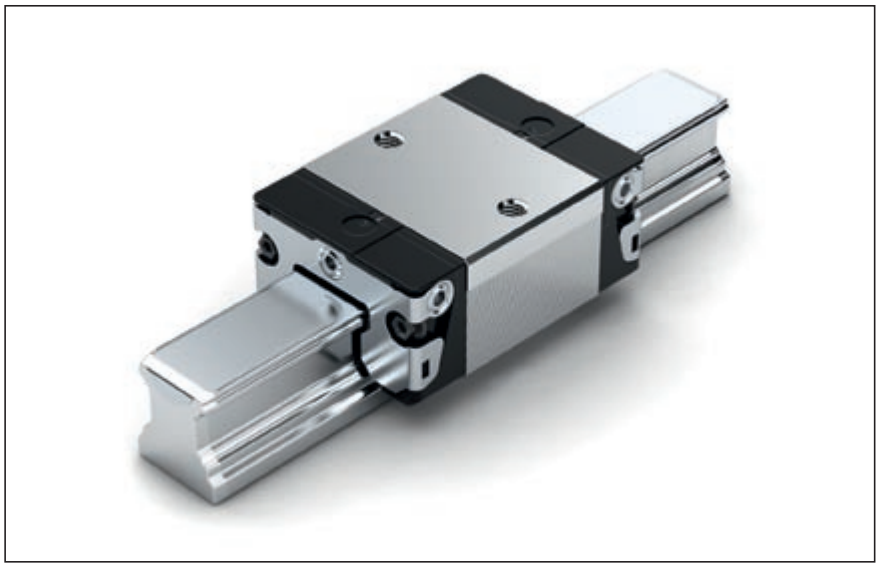
R1662 ... 2.

Dynamic characteristics
Travel speed: $v_{max} = 5$ m/s
Acceleration: $a_{max} = 500$ m/s^2
(If $F_{comb} > 2.8 \cdot F_{pr}$: $a_{max} = 50$ m/s^2)

Note on lubrication
– Pre-lubricated

Further Super Ball Runner Blocks SKS
– Corrosion-resistant Ball Runner Blocks
Resist CR ☞ 108

Note
Can be used on all Ball Guide Rails SNS.



Options and part numbers

Size	Ball runner block with size	Preload class		Accuracy class		Seal for ball runner block without ball chain	
		C0	C1	N	H	SS	LS
15	R1662 1	9	1	4	3	20	21
20	R1662 8	9	1	4	3	20	21
25	R1662 2	9	1	4	3	20	21
30	R1662 7	9	1	4	3	20	21
35	R1662 3	9	1	4	3	20	21
e.g.	R1662 7		1		3	20	

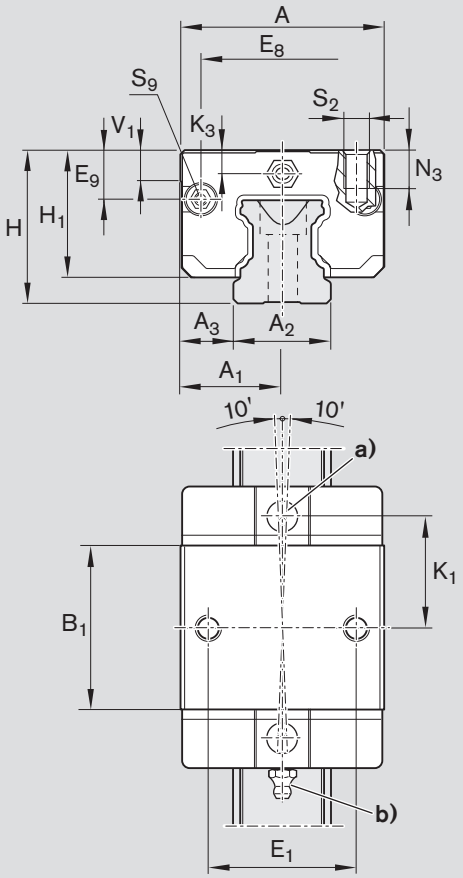
Ordering example
Options:
– Ball Runner Block SKS
– Size 30
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R1662 713 20

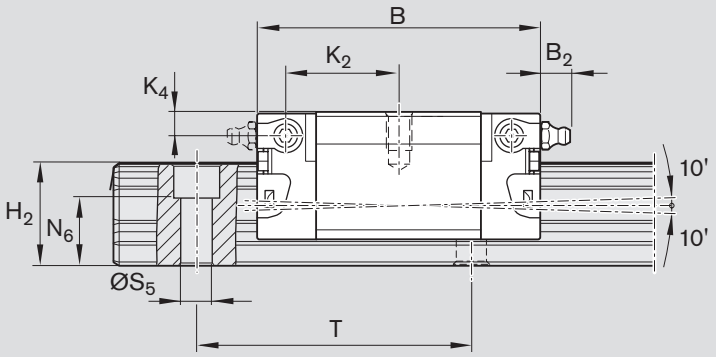
Preload classes
C0 = without preload
C1 = preload 2% C

Seals
SS = standard seal
LS = low-friction seal

Key to table
Gray numbers
= version/combination not preferred (longer delivery times in some cases)

Ball Runner Blocks SKS





a) For O-ring
Size 15: Ø 4 · 1.0 (mm)
Size 20 - 35: Ø 5 · 1.0 (mm)
Open lube bore as required (☞ 256).

b) Lube nipple, size 15 - 20:
Funnel-type lube nipple DIN 3405 – A M3x5, B_2 = 1.6 mm
If another lube nipple is used: observe the screw-in depth of 5 mm!
Lube nipple, size 25 - 35:
Hydraulic-type lube nipple DIN 71412 – A M6x8, B_2 = 9.5 mm
If another lube nipple is used: observe the screw-in depth of 8 mm!
Lube nipples are provided (unmounted).
Connection possible at all sides.

Size	Dimensions (mm)																
	A	A_1	A_2	A_3	B	B_1	E_1	E_8	E_9	H	H_1	H_2 1)	H_2 2)	K_1	K_2	K_3	K_4
15	34	17	15	9.5	44.7	25.7	26	24.55	6.70	24	19.90	16.30	16.20	16.25	17.85	3.20	3.20
20	44	22	20	12.0	57.3	31.9	32	32.50	7.30	30	25.35	20.75	20.55	22.95	22.95	3.35	3.35
25	48	24	23	12.5	67.0	38.6	35	38.30	11.50	36	29.90	24.45	24.25	25.35	26.50	5.50	5.50
30	60	30	28	16.0	75.3	45.0	40	48.40	14.60	42	35.35	28.55	28.35	28.80	30.50	6.05	6.05
35	70	35	34	18.0	84.9	51.4	50	58.00	17.35	48	40.40	32.15	31.85	32.70	34.20	6.90	6.90

Size	Dimensions (mm)							Weight (kg)	Load capacities 3) (N)	Permissible load (N)	Load moments 3) (Nm)	
	N_3	$N_6^{\pm 0.5}$	S_2	S_5	S_9	T	V_1		C	F_{max}	M_t	$M_{t\,max}$
15	6.0	10.3	M4	4.4	M2.5x3.5	60	5.0	0.10	3900	1500	39	15
20	7.5	13.2	M5	6.0	M3x5	60	6.0	0.25	10100	3900	130	50
25	9.0	15.2	M6	7.0	M3x5	60	7.5	0.35	11400	4400	170	65
30	12.0	17.0	M8	9.0	M3x5	80	7.0	0.60	15800	6100	270	105
35	13.0	20.5	M8	9.0	M3x5	80	8.0	0.90	21100	8100	450	175

1) Dimension H_2 with cover strip
2) Dimension H_2 without cover strip
3) Load capacities and moments for Ball Runner Block **without** ball chain.
Determination of the dynamic load capacities and moments is based on a travel life of 100,000 m per ISO 14728-1. Often only 50,000 m are actually stipulated. For comparison: Multiply values **C** and $\mathbf{M}_t$ from the table by 1.26.

Ball Runner Blocks made of aluminum

Product Description

Characteristic features

Rexroth Ball Rail Systems with aluminum runner blocks were specifically developed for use in industrial robots and general purpose machines calling for compact, lightweight rolling-element linear motion guideways. They are available in various accuracy classes, each with high load capacity. These highly compact and weight-saving assemblies are available in five common sizes and offer the same load capacities in all four main load directions.

Highlights

- High torque load capacity
- Optimized entry-zone geometry and high number of balls per track minimizes variation in elastic deflection
- Very low weight: 60% lighter than the equivalent steel runner blocks
- Limitless interchangeability; all ball guide rail versions can be combined at will with all ball runner block versions within each accuracy class

Further highlights

- Low noise level and outstanding travel performance
- Excellent dynamic characteristics:
  Travel speed: $v_{max} = 5$ m/s
  Acceleration: $a_{max} = 500$ m/s^2
- Long-term lubrication, up to several years
- Minimum quantity lubrication system with integrated reservoir for oil lubrication
- Wider permissible tolerances for parallelism and height offsets of the mounting surfaces
- Accuracy classes H and N can be combined with any of the rails in each accuracy class
- Lube ports with metal threads on all sides
- Mounting threads provided on end faces for fixing of all add-on elements
- Ball guide rails in accuracy class H also available with surface protection Resist CR (matte-silver hard chrome plated)
- Smooth, light running thanks to optimized ball recirculation and ball or ball chain guidance
- Improved rigidity under lift-off and side loading conditions when additional mounting screws are used in the two holes provided at the center of the runner block[1)]
- Attachments can be bolted to the ball runner blocks from above or below[1)]
- Predrilled locating pin holes in the runner blocks
- Available with ball chain as an option
- Ball runner blocks pre-lubricated in factory

1) depends on type

Overview of Ball Runner Block models made of aluminum

FNS

SNS

Ball chain (optional)
– Optimizes noise levels

Definition Ball Runner Block design style		Code (example) F	N	S
Width	**F**langed	**F**		
	Slimline			
	Wide			
	Compact			
Length	**N**ormal		**N**	
	Long			
	Short			
Height	**S**tandard height			**S**
	High			
	Low			

Ball Runner Blocks made of aluminum

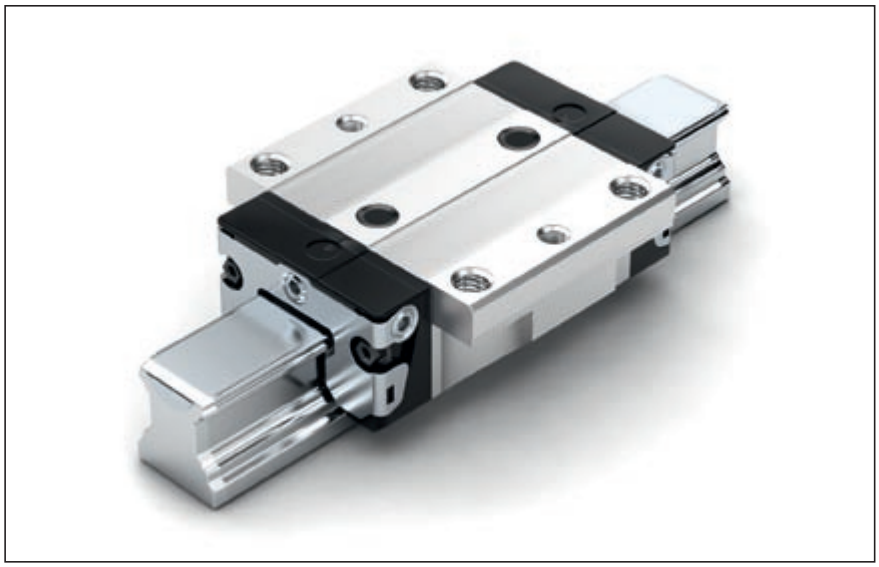
FNS – Flanged, normal, standard height

R1631 ... 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 Ball Guide Rails SNS.



Options and part numbers

Size	Ball runner block with size	Preload class		Accuracy class		Seal for ball runner block			
						without ball chain		with ball chain	
		C0	C1	N	H	SS	LS	SS	LS
15	R1631 1	9	1	4	3	20	21	22	23
20	R1631 8	9	1	4	3	20	21	22	23
25	R1631 2	9	1	4	3	20	21	22	23
30	R1631 7	9	1	4	3	20	21	22	23
35	R1631 3	9	1	4	3	20	21	22	23
e.g.	R1631 7		1		3	20			

Ordering example
Options:
– Ball Runner Block FNS
– Size 30
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R1631 713 20

Size	Load capacities[1] (N)	Permissible load (N)	Load moments[1] (Nm)			
	C	F_{max}	M_t	$M_{t\,max}$	M_L	$M_{L\,max}$
15	7 800	3 000	74	29	40	16
20	18 800	7 200	240	92	130	50
25	22 800	8 800	320	125	180	70
30	31 700	12 200	540	210	290	110
35	41 900	16 200	890	345	440	170

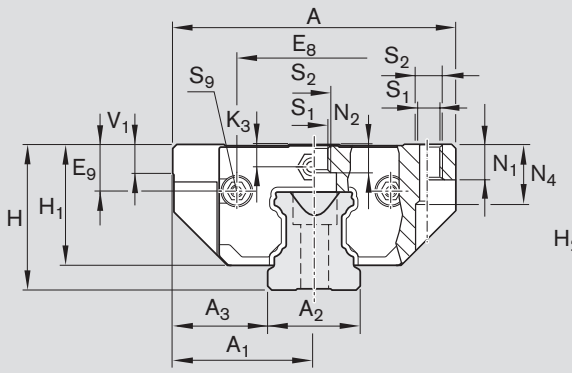
1) Load capacities and moments for Ball Runner Block **without** ball chain.
Load capacities and moments for Ball Runner Block **with** ball chain ☞ 8.
Determination of the dynamic load capacities and moments is based on a travel life of 100,000 m per ISO 14728-1. Often only 50,000 m are actually stipulated. For comparison: Multiply values **C**, $\mathbf{M_t}$ and $\mathbf{M_L}$ from the table by 1.26.

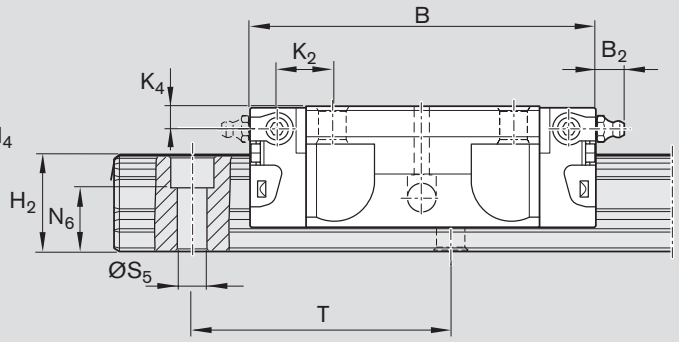
Preload classes
C0 = without preload
C1 = preload 2% C

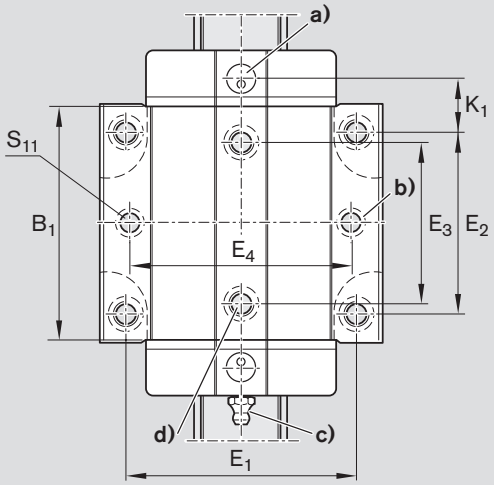
Seals
SS = standard seal
LS = low-friction seal

Key to table
Gray numbers
= version/combination not preferred (longer delivery times in some cases)

Ball Runner Blocks FNS







a) For O-ring
Size 15: Ø 4 · 1.0 (mm)
Size 20 - 35: Ø 5 · 1.0 (mm)
Open lube bore as required (☞ 258).

b) Pin holes are already predrilled as illustrated (dimensions E_4 ☞ 235).

c) Lube nipple, size 15 - 20:
Funnel-type lube nipple DIN 3405-A M3x5, B_2 = 1.6 mm
If another lube nipple is used: observe the screw-in depth of 5 mm!
Lube nipple, size 25 - 35:
Hydraulic-type lube nipple DIN 71412-B M6x8, B_2 = 9.5 mm
If another lube nipple is used: observe the screw-in depth of 8 mm!
Lube nipples are provided (unmounted).
Connection possible at all sides.

d) For manufacturing reasons, there may be plugs at these positions.
These must be removed before mounting.

Size	Dimensions (mm)																		
	A	A_1	A_2	A_3	B	B_1	E_1	E_2	E_3	E_8	E_9	H	H_1	H_2 1)	H_2 2)	K_1	K_2	K_3	K_4
15	47	23.5	15	16.0	58.2	39.2	38	30	26	24.55	6.70	24	19.90	16.30	16.20	8.00	9.6	3.20	3.20
20	63	31.5	20	21.5	75.0	49.6	53	40	35	32.50	7.30	30	25.35	20.75	20.55	11.80	11.8	3.35	3.35
25	70	35.0	23	23.5	86.2	57.8	57	45	40	38.30	11.50	36	29.90	24.45	24.25	12.45	13.6	5.50	5.50
30	90	45.0	28	31.0	97.7	67.4	72	52	44	48.40	14.60	42	35.35	28.55	28.35	14.00	15.7	6.05	6.05
35	100	50.0	34	33.0	110.5	77.0	82	62	52	58.00	17.35	48	40.40	32.15	31.85	14.50	16.0	6.90	6.90

Size	Dimensions (mm)										Weight
	N_1	N_2	N_4	$N_6^{\pm 0.5}$	S_1	S_2	S_5	S_9	S_{11}	T	V_1	(kg)
15	5.2	4.40	10.3	10.3	4.3	M5	4.4	M2.5x3.5	3.7	60	5.0	0.10
20	7.7	5.20	13.5	13.2	5.3	M6	6.0	M3x5	4.7	60	6.0	0.24
25	9.3	7.00	17.8	15.2	6.7	M8	7.0	M3x5	5.7	60	7.5	0.30
30	11.0	7.90	20.5	17.0	8.5	M10	9.0	M3x5	7.7	80	7.0	0.55
35	12.0	10.15	24.0	20.5	8.5	M10	9.0	M3x5	7.7	80	8.0	0.75

1) Dimension H_2 with cover strip

2) Dimension H_2 without cover strip

Ball Runner Blocks made of aluminum

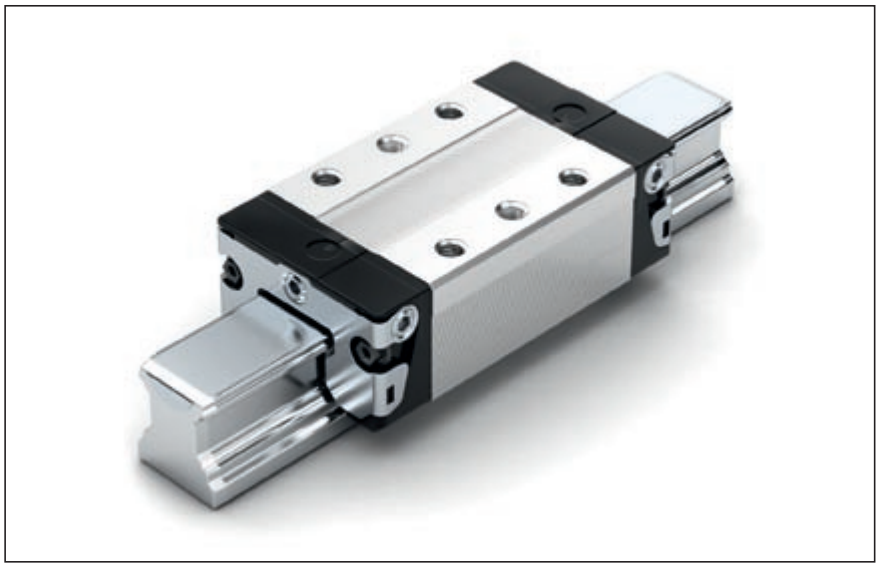
SNS – Slimline, normal, standard height

R1632 … 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 Ball Guide Rails SNS.



Options and part numbers

Size	Ball runner block with size	Preload class		Accuracy class		Seal for ball runner block			
						without ball chain		with ball chain	
		C0	C1	N	H	SS	LS	SS	LS
15	R1632 1	9	1	4	3	20	21	22	23
20	R1632 8	9	1	4	3	20	21	22	23
25	R1632 2	9	1	4	3	20	21	22	23
30	R1632 7	9	1	4	3	20	21	22	23
35	R1632 3	9	1	4	3	20	21	22	23
e.g.	R1632 7		1		3	20			

Ordering example
Options:
– Ball Runner Block SNS
– Size 30
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R1632 713 20

Size	Load capacities[1] (N)	Permissible load (N)	Load moments[1] (Nm)			
	C	F_{max}	M_t	$M_{t\,max}$	M_L	$M_{L\,max}$
15	7 800	3 000	74	29	40	16
20	18 800	7 200	240	92	130	50
25	22 800	8 800	320	125	180	70
30	31 700	12 200	540	210	290	110
35	41 900	16 200	890	345	440	170

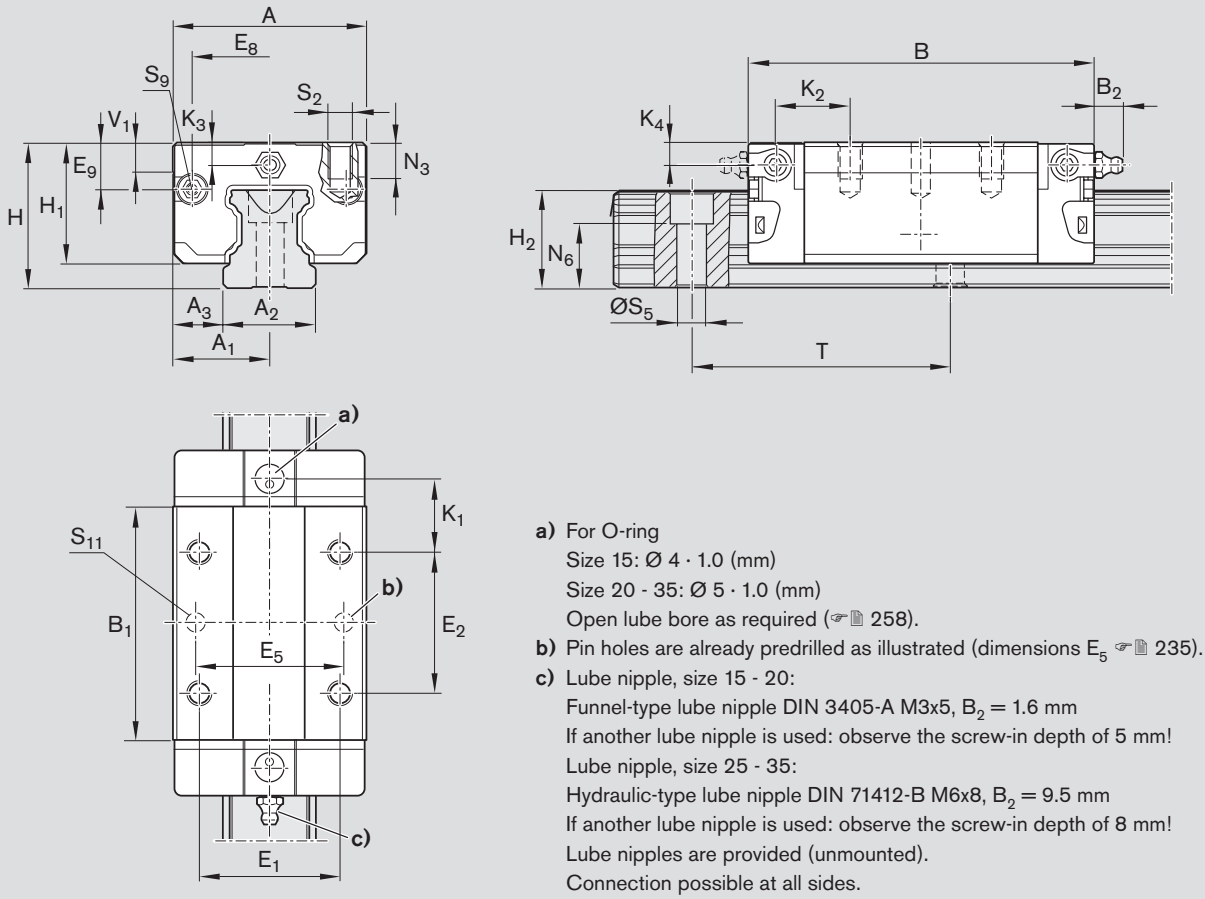
1) Load capacities and moments for Ball Runner Block **without** ball chain.
Load capacities and moments for Ball Runner Block **with** ball chain ☞ 8.
Determination of the dynamic load capacities and moments is based on a travel life of 100,000 m per ISO 14728-1. Often only 50,000 m are actually stipulated. For comparison: Multiply values **C**, $\mathbf{M}_t$ and $\mathbf{M}_L$ from the table by 1.26.

Preload classes
C0 = without preload
C1 = preload 2% C

Seals
SS = standard seal
LS = low-friction seal

Key to table
Gray numbers
= version/combination not preferred (longer delivery times in some cases)

Ball Runner Blocks SNS



a) For O-ring
Size 15: Ø 4 · 1.0 (mm)
Size 20 - 35: Ø 5 · 1.0 (mm)
Open lube bore as required (☞ 258).

b) Pin holes are already predrilled as illustrated (dimensions E_5 ☞ 235).

c) Lube nipple, size 15 - 20:
Funnel-type lube nipple DIN 3405-A M3x5, B_2 = 1.6 mm
If another lube nipple is used: observe the screw-in depth of 5 mm!
Lube nipple, size 25 - 35:
Hydraulic-type lube nipple DIN 71412-B M6x8, B_2 = 9.5 mm
If another lube nipple is used: observe the screw-in depth of 8 mm!
Lube nipples are provided (unmounted).
Connection possible at all sides.

Size	Dimensions (mm)																	
	A	A_1	A_2	A_3	B	B_1	E_1	E_2	E_8	E_9	H	H_1	H_2 1)	H_2 2)	K_1	K_2	K_3	K_4
15	34	17	15	9.5	58.2	39.2	26	26	24.55	6.70	24	19.90	16.30	16.20	10.00	11.60	3.20	3.20
20	44	22	20	12.0	75.0	49.6	32	36	32.50	7.30	30	25.35	20.75	20.55	13.80	13.80	3.35	3.35
25	48	24	23	12.5	86.2	57.8	35	35	38.30	11.50	36	29.90	24.45	24.25	17.45	18.60	5.50	5.50
30	60	30	28	16.0	97.7	67.4	40	40	48.40	14.60	42	35.35	28.55	28.35	20.00	21.70	6.05	6.05
35	70	35	34	18.0	110.5	77.0	50	50	58.00	17.35	48	40.40	32.15	31.85	20.50	22.00	6.90	6.90

Size	Dimensions (mm)								Weight
	N_3	$N_6^{\pm 0.5}$	S_2	S_5	S_9	S_{11}	T	V_1	(kg)
15	6.0	10.3	M4	4.4	M2.5x3.5	3.7	60	5.0	0.10
20	7.5	13.2	M5	6.0	M3x5	4.7	60	6.0	0.20
25	9.0	15.2	M6	7.0	M3x5	5.7	60	7.5	0.35
30	12.0	17.0	M8	9.0	M3x5	7.7	80	7.0	0.45
35	13.0	20.5	M8	9.0	M3x5	7.7	80	8.0	0.65

1) Dimension H_2 with cover strip
2) Dimension H_2 without cover strip

Corrosion-Resistant Ball Runner Blocks

Product Description, Resist NR

General notes on Ball Runner Blocks in Resist NR

For part numbers, see the following pages. For dimensions, dynamic characteristics, load capacities, rigidity and moment loads, see the corresponding Standard Ball Runner Blocks ☞ 36 – 47.

Corrosion-resistant Ball Runner Block body, Resist NR

Ball runner block body made of corrosion-resistant steel per EN 10088. Rexroth recommends this version for applications requiring corrosion protection. Fast delivery.

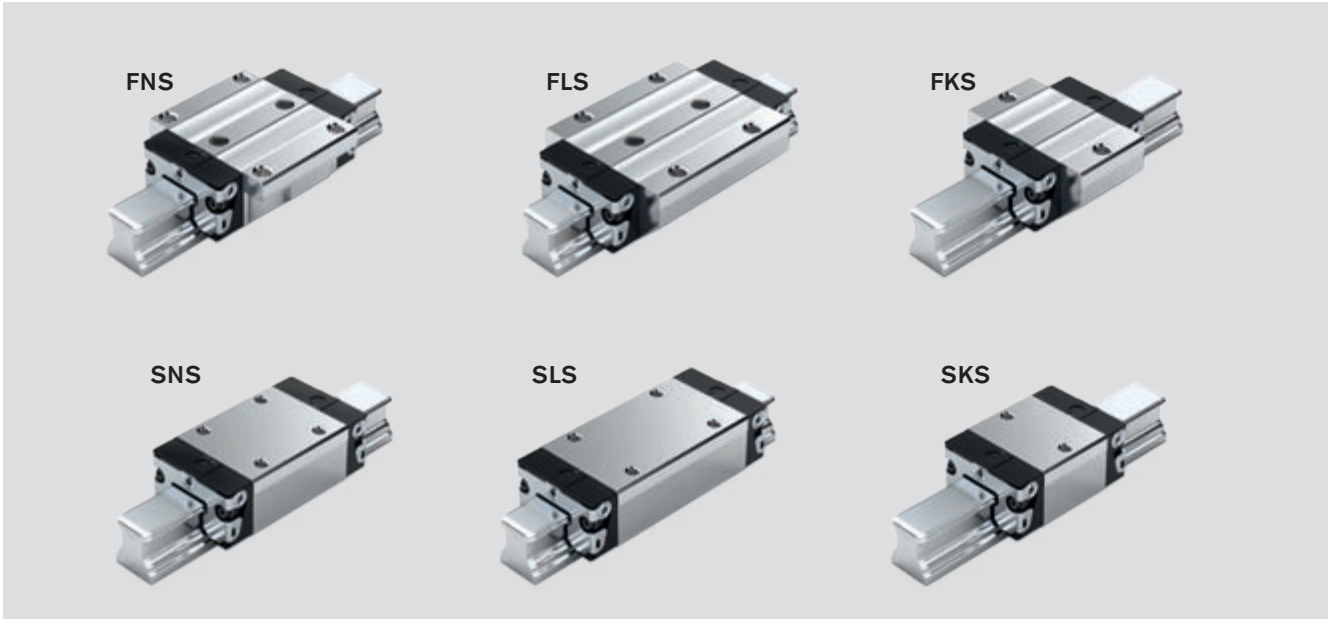
Tolerances as for Standard runner blocks made of steel

Since the Resist NR version does not involve a coating, all the dimensions and tolerances are identical to those of the Standard steel version (“Accuracy classes and their tolerances” ☞ 26).

Preload classes for Resist NR

C0 = without preload
C1 = preload 2% C

Overview of Standard Ball Runner Block models in Resist NR

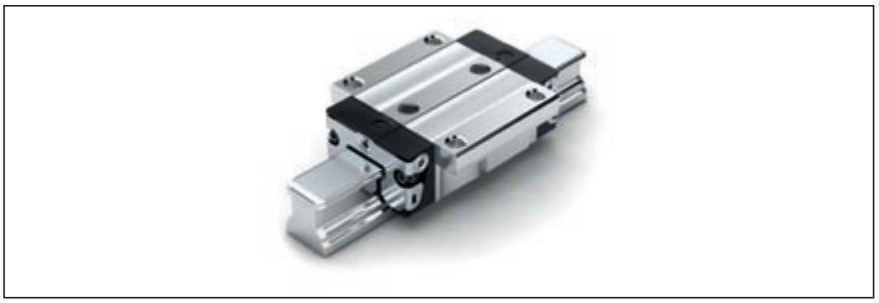


Ball chain (optional)
– Optimizes noise levels

Definition Ball Runner Block design style		Code (example) F	N	S
Width	**F**langed	**F**		
	Slimline			
	Wide			
	Compact			
Length	**N**ormal		**N**	
	Long			
	Short			
Height	**S**tandard height			**S**
	High			
	Low			

Standard Ball Runner Blocks, Resist NR

FNS – Flanged, normal, standard height
R2001 … 3.



Note on lubrication
– Pre-lubricated

Note
Can be used on all Ball Guide Rails SNS.

Dimension drawing, dimensions and technical data ☞ 37.

Ordering example
Options:
– Ball Runner Block NR, FNS
– Size 30
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R2001 713 30

Options and part numbers

Size	Ball runner block with size	Preload class C0	Preload class C1	Accuracy class H	Seal for ball runner block without ball chain SS	without ball chain LS	without ball chain DS	with ball chain SS	with ball chain LS	with ball chain DS
15	R2001 1	9	–	3	30	31	–	32	33	–
20	R2001 8	9	–	3	30	31	–	32	33	–
25	R2001 2	9	–	3	30	31	–	32	33	–
30	R2001 7	9		3	30	31	–	32	33	–
			1	3	30	31	3Z	32	33	3Y
35	R2001 3	9		3	30	31	–	32	33	–
			1	3	30	31	3Z	32	33	3Y
e.g.	R2001 7		1	3	30					

FLS – Flanged, long, standard height
R2002 … 3.

Note on lubrication
– Pre-lubricated

Note
Can be used on all Ball Guide Rails SNS.

Dimension drawing, dimensions and technical data ☞ 39.

Ordering example
Options:
– Ball Runner Block NR, FLS
– Size 30
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R2002 713 30

Options and part numbers

Size	Ball runner block with size	Preload class C0	Preload class C1	Accuracy class H	Seal for ball runner block without ball chain SS	without ball chain LS	without ball chain DS	with ball chain SS	with ball chain LS	with ball chain DS
15	R2002 1	9	–	3	30	31	–	32	33	–
20	R2002 8	9	–	3	30	31	–	32	33	–
25	R2002 2	9	–	3	30	31	–	32	33	–
30	R2002 7	9		3	30	31	–	32	33	–
			1	3	30	31	3Z	32	33	3Y
35	R2002 3	9		3	30	31	–	32	33	–
			1	3	30	31	3Z	32	33	3Y
e.g.	R2002 7		1	3	30					

Preload classes
C0 = without preload
C1 = preload 2% C

Seals
SS = standard seal
LS = low-friction seal
DS = double-lipped seal

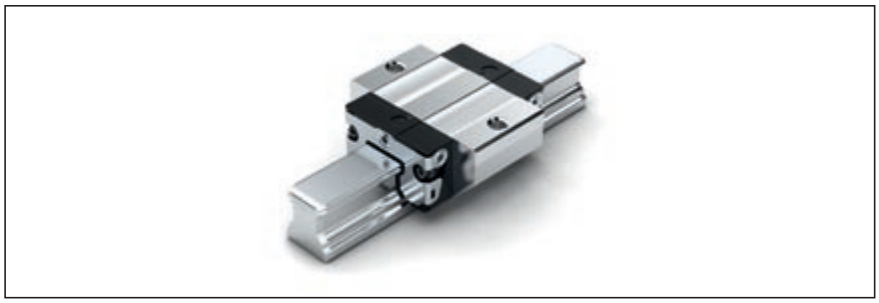
Key to table
Gray numbers
= version/combination not preferred (longer delivery times in some cases)

Corrosion-Resistant Ball Runner Blocks

Standard Ball Runner Blocks, Resist NR

FKS – Flanged, short, standard height

R2000 ... 3.



Note on lubrication
– Pre-lubricated

Note
Can be used on all Ball Guide Rails SNS.

Dimension drawing, dimensions and technical data ☞ 41.

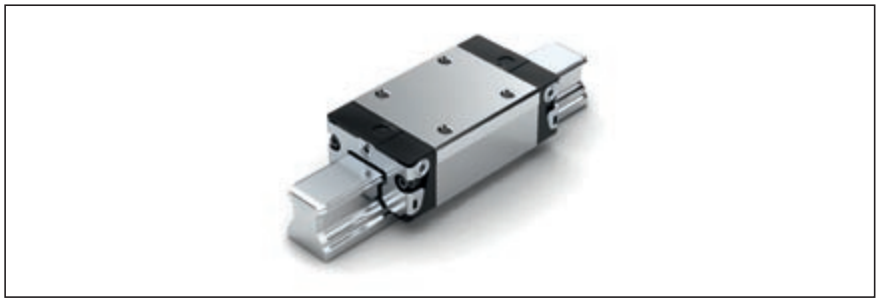
Ordering example
Options:
– Ball Runner Block NR, FKS
– Size 30
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R2000 713 30

Options and part numbers

Size	Ball runner block with size	Preload class C0	Preload class C1	Accuracy class H	Seal for ball runner block without ball chain SS	without ball chain LS	without ball chain DS	with ball chain SS	with ball chain LS	with ball chain DS
15	R2000 1	9	–	3	30	31	–	32	33	–
20	R2000 8	9	–	3	30	31	–	32	33	–
25	R2000 2	9	–	3	30	31	–	32	33	–
30	R2000 7	9		3	30	31	–	32	33	–
			1	3	30	31	3Z	32	33	3Y
35	R2000 3	9		3	30	31	–	32	33	–
			1	3	30	31	3Z	32	33	3Y
e.g.	R2000 7		1	3	30					

SNS – Slimline, normal, standard height

R2011 ... 3.



Note on lubrication
– Pre-lubricated

Note
Can be used on all Ball Guide Rails SNS.

Dimension drawing, dimensions and technical data ☞ 43.

Ordering example
Options:
– Ball Runner Block NR, SNS
– Size 30
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R2011 713 30

Options and part numbers

Size	Ball runner block with size	Preload class C0	Preload class C1	Accuracy class H	Seal for ball runner block without ball chain SS	without ball chain LS	without ball chain DS	with ball chain SS	with ball chain LS	with ball chain DS
15	R2011 1	9	–	3	30	31	–	32	33	–
20	R2011 8	9	–	3	30	31	–	32	33	–
25	R2011 2	9	–	3	30	31	–	32	33	–
30	R2011 7	9		3	30	31	–	32	33	–
			1	3	30	31	3Z	32	33	3Y
35	R2011 3	9		3	30	31	–	32	33	–
			1	3	30	31	3Z	32	33	3Y
e.g.	R2011 7		1	3	30					

Preload classes
C0 = without preload
C1 = preload 2% C

Seals
SS = standard seal
LS = low-friction seal
DS = double-lipped seal

Key to table
Gray numbers
= version/combination not preferred

(longer delivery times in some cases)

Standard Ball Runner Blocks, Resist NR

SLS – Slimline, long, standard height
R2012 ... 3.

Note on lubrication
– Pre-lubricated

Note
Can be used on all Ball Guide Rails SNS.

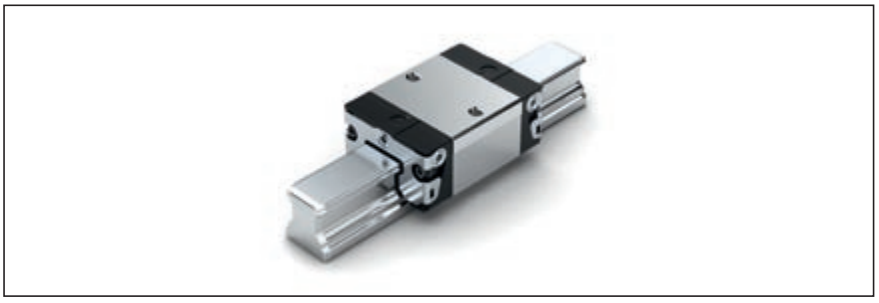
Dimension drawing, dimensions and technical data ☞ 45.

Ordering example
Options:
– Ball Runner Block NR, SLS
– Size 30
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R2012 713 30

Options and part numbers

Size	Ball runner block with size	Preload class C0	Preload class C1	Accuracy class H	Seal for ball runner block without ball chain SS	without ball chain LS	without ball chain DS	with ball chain SS	with ball chain LS	with ball chain DS
15	R2012 1	9		3	30	31	–	32	33	–
20	R2012 8	9		3	30	31	–	32	33	–
25	R2012 2	9		3	30	31	–	32	33	–
30	R2012 7	9		3	30	31	–	32	33	–
			1	3	30	31	3Z	32	33	3Y
35	R2012 3	9		3	30	31	–	32	33	–
			1	3	30	31	3Z	32	33	3Y
e.g.	R2012 7		1	3	30					

SKS – Slimline, short, standard height
R2010 ... 3.



Note on lubrication
– Pre-lubricated

Note
Can be used on all Ball Guide Rails SNS.

Dimension drawing, dimensions and technical data ☞ 47.

Ordering example
Options:
– Ball Runner Block NR, SKS
– Size 30
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R2010 713 30

Options and part numbers

Size	Ball runner block with size	Preload class C0	Preload class C1	Accuracy class H	Seal for ball runner block without ball chain SS	without ball chain LS	without ball chain DS	with ball chain SS	with ball chain LS	with ball chain DS
15	R2010 1	9	–	3	30	31	–	32	33	–
20	R2010 8	9	–	3	30	31	–	32	33	–
25	R2010 2	9	–	3	30	31	–	32	33	–
30	R2010 7	9		3	30	31	–	32	33	–
			1	3	30	31	3Z	32	33	3Y
35	R2010 3	9		3	30	31	–	32	33	–
			1	3	30	31	3Z	32	33	3Y
e.g.	R2010 7		1	3	30					

Preload classes
C0 = without preload
C1 = preload 2% C

Seals
SS = standard seal
LS = low-friction seal
DS = double-lipped seal

Key to table
Gray numbers
= version/combination not preferred (longer delivery times in some cases)

Corrosion-Resistant Ball Runner Blocks

Product Description, Resist NR II

Characteristic features

Ball Rail Systems in Resist NR II, made of corrosion-resistant steel[1] are specifically intended for use in applications involving aqueous media, very dilute acids, alkalis or salt solutions. They are particularly suitable for environments with a relative humidity of over 70% and temperatures above 30 °C. Conditions like these are found above all in cleaning systems, galvanization and pickling lines, steam degreasing systems, and also cooling equipment.
Since they have built-in corrosion protection, Ball Rail Systems Resist NR II are also ideal for use in clean rooms and for general printed circuit board assembly. Other application areas include the pharmaceuticals and food industries.

Highlights

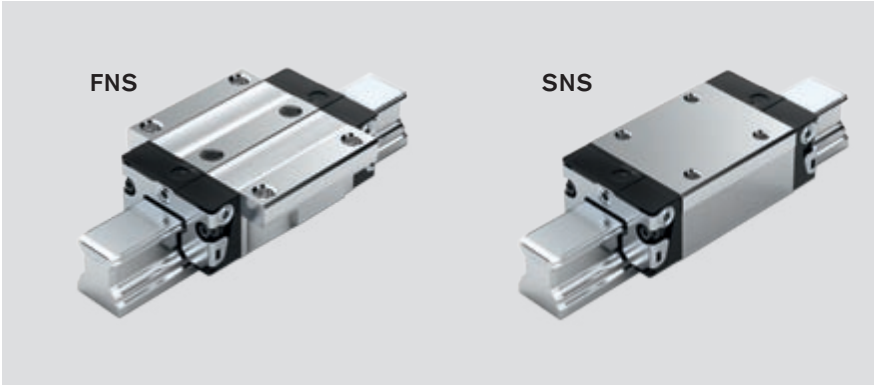
- All metal parts made of corrosion-resistant steel
- Available in five common sizes
- Excellent dynamic characteristics:
  Travel speed: $v_{max} = 5$ m/s
  Acceleration: $a_{max} = 500$ m/s^2
- Same load capacities in all four main load directions
- Available in accuracy classes N, H and P, up to preload class C2 (preload = 8% C)
- Long-term lubrication, up to several years
- Minimum quantity lubrication system with integrated reservoir for oil lubrication
- Lube ports with metal threads on all sides
- Available with ball chain as an option

Further highlights

- Limitless interchangeability; all ball guide rail versions can be combined at will with all ball runner block versions within each accuracy class (including those made of steel, aluminum, Resist NR and Resist CR)
- Optimum system rigidity through preloaded O-arrangement
- Existing range of accessories fully utilizable
- Attachments can be bolted to the ball runner blocks from above or below[2]
- Improved rigidity under lift-off and side loading conditions when additional mounting screws are used in the two holes provided at the center of the runner block[2]
- Mounting threads provided on end faces for fixing of all add-on elements
- High rigidity in all load directions – permits applications with just one runner block per rail
- Integrated all-round sealing
- Optimized entry-zone geometry and high number of balls per track minimizes variation in elastic deflection
- Smooth, light running thanks to optimized ball recirculation and ball or ball chain guidance
- Ball Guide Rails Resist NR II are available with or without cover strip and for mounting from above or below
- Ball Runner Blocks also available with chrome-plated guide rails

1) Resist NR II:
Ball runner block body, ball guide rail and all steel parts made from corrosion-resistant steel per EN 10088
2) depends on type

Overview of Standard Ball Runner Block models in Resist NR II



Ball chain (optional)
– Optimizes noise levels

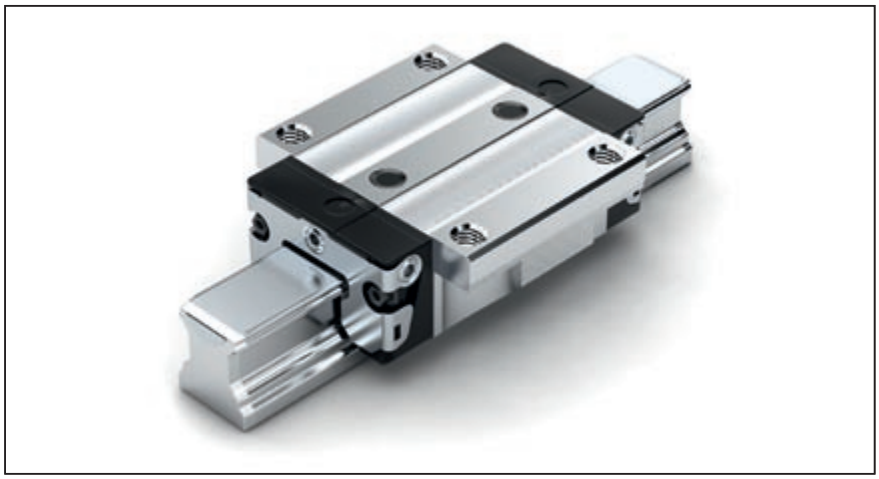
Definition Ball Runner Block design style		Code (example) F	N	S
Width	**F**langed	**F**		
	Slimline			
	Wide			
	Compact			
Length	**N**ormal		**N**	
	Long			
	Short			
Height	**S**tandard height			**S**
	High			
	Low			

Corrosion-Resistant Ball Runner Blocks

Standard Ball Runner Blocks, Resist NR II

FNS – Flanged, normal, standard height

R2001 … 0.



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

– Not pre-lubricated
– No preservative oil

Note

Can be used on all Ball Guide Rails SNS.

Dimension drawing and dimensions

☞ 37.

Ordering example

Options:
– Ball Runner Block NR, FNS
– Size 30
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain

Part number: R2001 713 04

Options and part numbers

Size	Ball runner block with size	Preload class			Accuracy class			Seal for ball runner block					
								without ball chain			with ball chain		
		C0	C1	C2	N	H	P	SS	LS[1]	DS	SS	LS[1]	DS
15	R2001 1	9			4	3	–	04	05	–	06	07	–
			1		4	3	2	04	05	–	06	07	–
				2	–	3	2	04	–	–	06	–	–
20	R2001 8	9			4	3	–	04	05	–	06	07	–
			1		4	3	2	04	05	0X	06	07	0W
				2	–	3	2	04	–	0X	06	–	0W
25	R2001 2	9			4	3	–	04	05	–	06	07	–
			1		4	3	2	04	05	0X	06	07	0W
				2	–	3	2	04	–	0X	06	–	0W
30	R2001 7	9			4	3	–	04	05	–	06	07	–
			1		4	3	2	04	05	0X	06	07	0W
				2	–	3	2	04	–	0X	06	–	0W
35	R2001 3	9			4	3	–	04	05	–	06	07	–
			1		4	3	2	04	05	0X	06	07	0W
				2	–	3	2	04	–	0X	06	–	0W
e.g.	R2001 7		1			3		04					

1) Only with accuracy classes N and H
2) Load capacities and moments for Ball Runner Block **without** ball chain.
Load capacities and moments for Ball Runner Block **with** ball chain ☞ 8.
Determination of the dynamic load capacities and moments is based on a travel life of 100,000 m per ISO 14728-1. Often only 50,000 m are actually stipulated. For comparison: Multiply values **C**, $\mathbf{M_t}$ and $\mathbf{M_L}$ from the table by 1.26.

Size	Load capacities[2] (N)		Load moments[2] (Nm)			
	C	C_0	M_t	M_{t0}	M_L	M_{L0}
15	5 100	9 300	63	90	34	49
20	12 300	16 900	205	215	110	115
25	15 000	21 000	270	295	150	165
30	20 800	28 700	460	500	245	265
35	27 600	37 500	760	805	375	390

Preload classes

C0 = without preload
C1 = preload 2% C
C2 = preload 8% C

Seals

SS = standard seal
LS = low-friction seal
DS = double-lipped seal

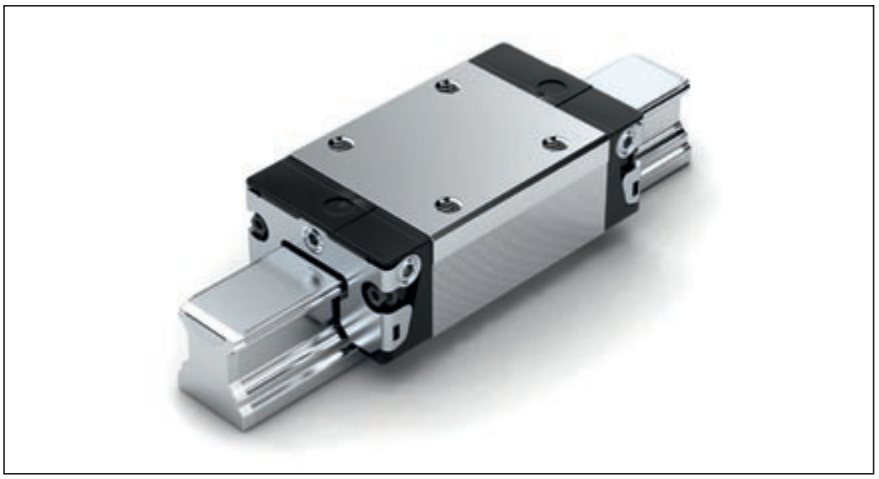
Key to table

Gray numbers
= version/combination not preferred (longer delivery times in some cases)

Standard Ball Runner Blocks, Resist NR II

SNS – Slimline, normal, standard height

R2011 … 0.



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

– Not pre-lubricated
– No preservative oil

Note

Can be used on all Ball Guide Rails SNS.

Dimension drawing and dimensions

☞ 43.

Ordering example

Options:
– Ball Runner Block NR, SNS
– Size 30
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain

Part number: R2011 713 04

Options and part numbers

Size	Ball runner block with size	Preload class			Accuracy class			Seal for ball runner block					
								without ball chain			with ball chain		
		C0	C1	C2	N	H	P	SS	LS[1]	DS	SS	LS[1]	DS
15	R2011 1	9			4	3	–	04	05	–	06	07	–
			1		4	3	2	04	05	–	06	07	–
				2	–	3	2	04	–	–	06	–	–
20	R2011 8	9			4	3	–	04	05	–	06	07	–
			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	–
			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	–
			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		4	3	2	04	05	0X	06	07	0W
				2	–	3	2	04	–	0X	06	–	0W
e.g.	R2011 7		1			3		04					

1) Only with accuracy classes N and H
2) Load capacities and moments for Ball Runner Block **without** ball chain.
Load capacities and moments for Ball Runner Block **with** ball chain ☞ 8.
Determination of the dynamic load capacities and moments is based on a travel life of 100,000 m per ISO 14728-1. Often only 50,000 m are actually stipulated. For comparison: Multiply values **C**, $\mathbf{M_t}$ and $\mathbf{M_L}$ from the table by 1.26.

Size	Load capacities[2] (N)		Load moments[2] (Nm)			
	C	C_0	M_t	M_{t0}	M_L	M_{L0}
15	5 100	9 300	63	90	34	49
20	12 300	16 900	205	215	110	115
25	15 000	21 000	270	295	150	165
30	20 800	28 700	460	500	245	265
35	27 600	37 500	760	805	375	390

Preload classes

C0 = without preload
C1 = preload 2% C
C2 = preload 8% C

Seals

SS = standard seal
LS = low-friction seal
DS = double-lipped seal

Key to table

Gray numbers
= version/combination not preferred
(longer delivery times in some cases)

Corrosion-Resistant Ball Runner Blocks

Product Description, Resist CR

General notes on Ball Runner Blocks in Resist CR

For part numbers, see the following pages. For dimensions, dynamic characteristics, load capacities, rigidity and moment loads, see the corresponding
Standard Ball Runner Blocks
☞ 36 – 59
Heavy Duty Ball Runner Blocks
☞ 60 – 71
Super Ball Runner Blocks ☞ 90 – 93

Corrosion-resistant coating Resist CR

Ball runner block body made of steel with matte-silver hard-chrome plated corrosion-resistant coating.

Different tolerances for Resist CR coating

⚠

For ball runner blocks and guide rails in Resist CR, matte-silver hard chrome plated, different tolerances apply for the dimensions H and A_3 (“Accuracy classes and their tolerances” ☞ 26).

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

Recommended Ball Runner Blocks
Sizes 15 – 65
– Accuracy class H
– **Preload class** C0 = without preload

Recommended Ball Runner Blocks
Sizes 30 – 65
– Accuracy class H
– **Preload class** C1 = 2% C

Definition Ball runner block design styles		**Code (example)**		
		F	**N**	**S**
Width	Flanged	**F**		
	Slimline			
	Wide			
Length	Normal		**N**	
	Long			
	Short			
Height	Standard height			**S**
	High			
	Low			

Overview of Standard and Heavy Duty Ball Runner Block models in Resist CR

Standard Ball Runner Blocks[1] up to size 45

FNS

FLS

Ball chain (optional)
– Optimizes noise levels

SNS

SLS

SNH

SLH

FNN[2]

FKN[2]

SNN[2]

SKN[2]

Heavy Duty Ball Runner Blocks[2] from size 55

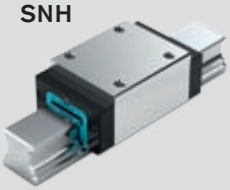
FNS

FLS

SNS

SLS

SNH



SLH

Super Ball Runner Blocks

FKS

SKS

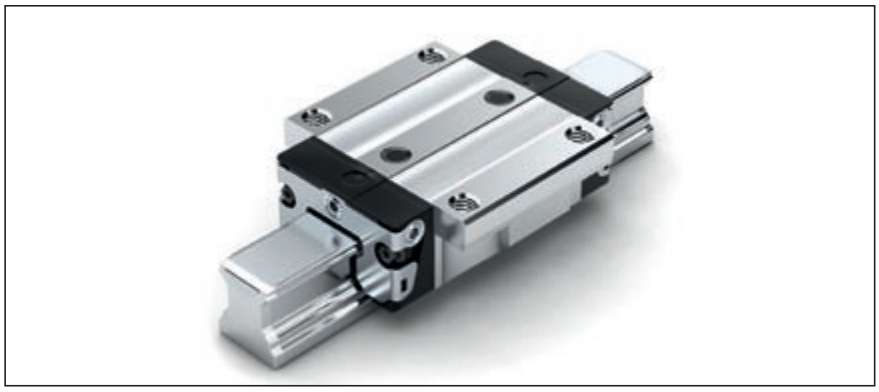
1) With ball chain
2) Without ball chain

Corrosion-Resistant Ball Runner Blocks

Standard Ball Runner Blocks, Resist CR

FNS – Flanged, normal, standard height

R1651 ... 7.



Note on lubrication
– Pre-lubricated

Note
Can be used on all Ball Guide Rails SNS.

Dimension drawing, dimensions and technical data ☞ 37.

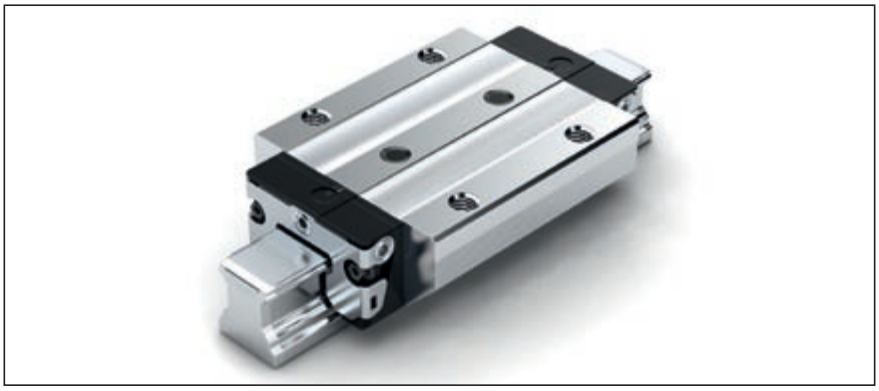
Ordering example
Options:
– Ball Runner Block CR, FNS
– Size 45
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R1651 413 70

Options and part numbers

Size	Ball runner block with size	Preload class		Accuracy class	Seal for ball runner block			
					without ball chain		with ball chain	
		C0	C1	H	SS	DS	SS	DS
45	R1651 4	9		3	70	–	72	–
			1	3	70	7Z	72	7Y
e.g.	R1651 4		1	3	70			

FLS – Flanged, long, standard height

R1653 ... 7.



Note on lubrication
– Pre-lubricated

Note
Can be used on all Ball Guide Rails SNS.

Dimension drawing, dimensions and technical data ☞ 39.

Ordering example
Options:
– Ball Runner Block CR, FLS
– Size 45
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R1653 413 70

Options and part numbers

Size	Ball runner block with size	Preload class		Accuracy class	Seal for ball runner block			
					without ball chain		with ball chain	
		C0	C1	H	SS	DS	SS	DS
45	R1653 4	9		3	70	–	72	–
			1	3	70	7Z	72	7Y
e.g.	R1653 4		1	3	70			

Preload classes
C0 = without preload
C1 = preload 2% C

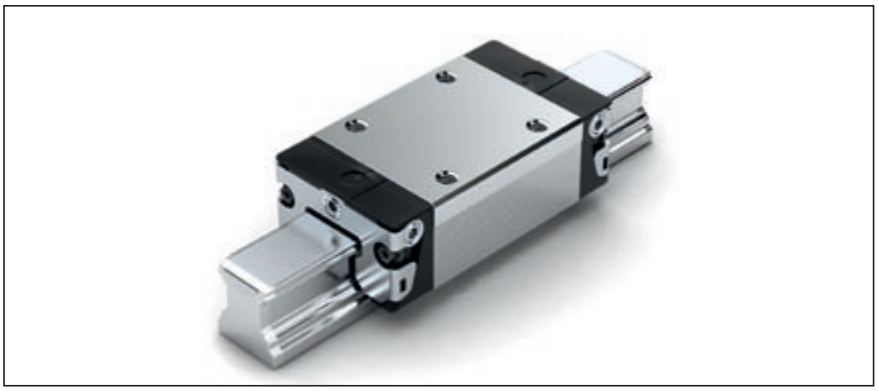
Seals
SS = standard seal
DS = double-lipped seal

Key to table
Gray numbers
= version/combination not preferred (longer delivery times in some cases)

Standard Ball Runner Blocks, Resist CR

SNS – Slimline, normal, standard height

R1622 … 7.



Note on lubrication
– Pre-lubricated

Note
Can be used on all Ball Guide Rails SNS.

Dimension drawing, dimensions and technical data ☞ 43.

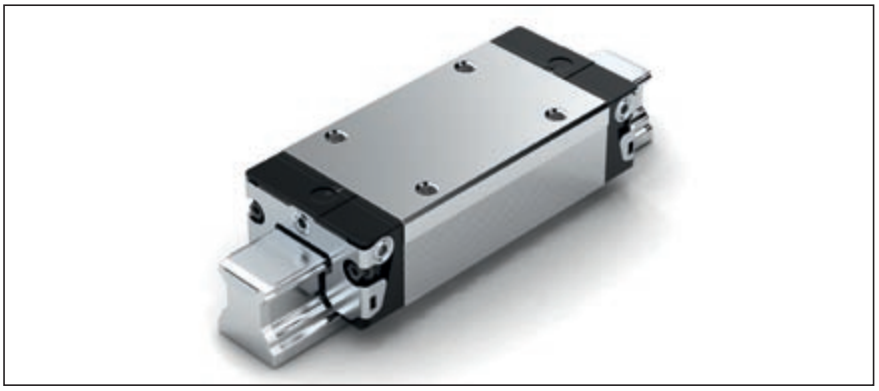
Ordering example
Options:
– Ball Runner Block CR, SNS
– Size 45
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R1622 413 70

Options and part numbers

Size	Ball runner block with size	Preload class C0	Preload class C1	Accuracy class H	Seal for ball runner block without ball chain SS	without ball chain DS	with ball chain SS	with ball chain DS
45	R1622 4	9		3	70	–	72	–
			1	3	70	7Z	72	7Y
e.g.	R1622 4		1	3	70			

SLS – Slimline, long, standard height

R1623 … 7.



Note on lubrication
– Pre-lubricated

Note
Can be used on all Ball Guide Rails SNS.

Dimension drawing, dimensions and technical data ☞ 45.

Ordering example
Options:
– Ball Runner Block CR, SLS
– Size 45
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R1623 413 70

Options and part numbers

Size	Ball runner block with size	Preload class C0	Preload class C1	Accuracy class H	Seal for ball runner block without ball chain SS	without ball chain DS	with ball chain SS	with ball chain DS
45	R1623 4	9		3	70	–	72	–
			1	3	70	7Z	72	7Y
e.g.	R1623 4		1	3	70			

Preload classes
C0 = without preload
C1 = preload 2% C

Seals
SS = standard seal
DS = double-lipped seal

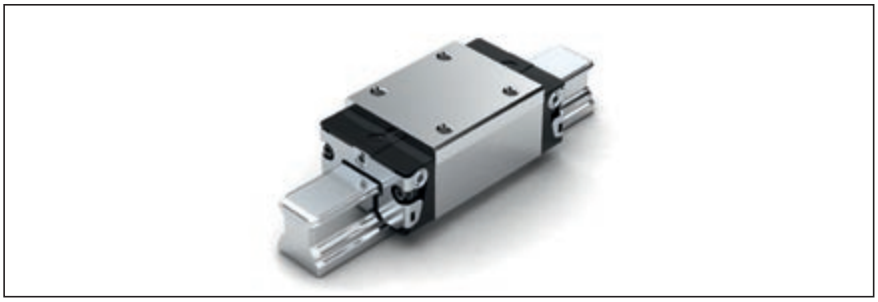
Key to table
Gray numbers
= version/combination not preferred (longer delivery times in some cases)

Corrosion-Resistant Ball Runner Blocks

Standard Ball Runner Blocks, Resist CR

SNH – Slimline, normal, high

R1621 ... 7.



Note on lubrication
– Pre-lubricated

Note
Can be used on all Ball Guide Rails SNS.

Dimension drawing, dimensions and technical data ☞ 49.

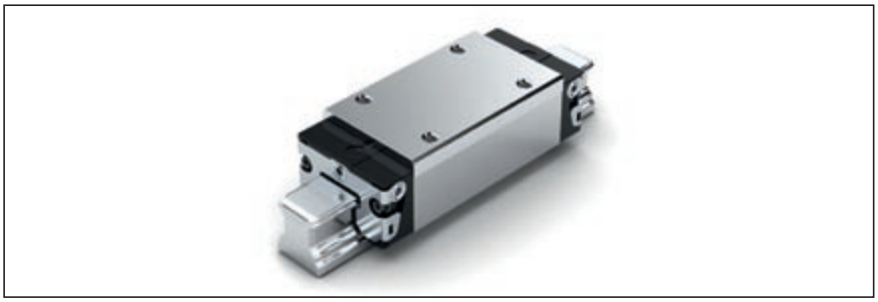
Options and part numbers

Size	Ball runner block with size	Preload class C0	Preload class C1	Accuracy class H	Seal for ball runner block without ball chain SS	without ball chain LS	without ball chain DS	with ball chain SS	with ball chain LS	with ball chain DS
15	R1621 1	9	–	3	70	71	–	72	73	–
25	R1621 2	9	–	3	70	71	–	72	73	–
30	R1621 7	9		3	70	71	–	72	73	–
			1		70	71	7Z	72	73	7Y
35	R1621 3	9		3	70	71	–	72	73	–
			1		70	71	7Z	72	73	7Y
45	R1621 4	9		3	70	–	–	72	–	–
			1		70	–	7Z	72	–	7Z
e.g.	R1621 7		1	3	70					

Ordering example
Options:
– Ball Runner Block CR, SNH
– Size 30
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R1621 713 70

SLH – Slimline, long, high

R1624 ... 7.



Note on lubrication
– Pre-lubricated

Note
Can be used on all Ball Guide Rails SNS.

Dimension drawing, dimensions and technical data ☞ 51.

Options and part numbers

Size	Ball runner block with size	Preload class C0	Preload class C1	Accuracy class H	Seal for ball runner block without ball chain SS	without ball chain LS	without ball chain DS	with ball chain SS	with ball chain LS	with ball chain DS
25	R1624 2	9	–	3	70	71	–	72	73	–
30	R1624 7	9		3	70	71	–	72	73	–
			1		70	71	7Z	72	73	7Y
35	R1624 3	9		3	70	71	–	72	73	–
			1		70	71	7Z	72	73	7Y
45	R1624 4	9		3	70	–	–	72	–	–
			1		70	–	7Z	72	–	7Z
e.g.	R1624 7		1	3	70					

Ordering example
Options:
– Ball Runner Block CR, SLH
– Size 30
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R1624 713 70

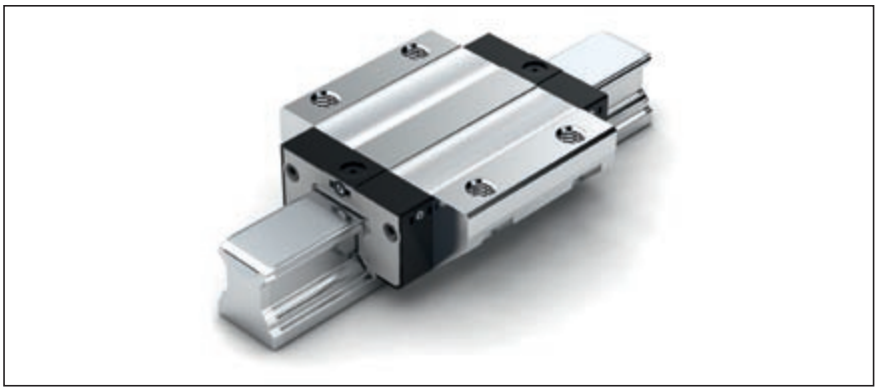
Preload classes
C0 = without preload
C1 = preload 2% C

Seals
SS = standard seal
LS = low-friction seal
DS = double-lipped seal

Key to table
Gray numbers
= version/combination not preferred
(longer delivery times in some cases)

Standard Ball Runner Blocks, Resist CR

FNN – Flanged, normal, low profile
R1693 … 6.



Note on lubrication
– Not pre-lubricated

Note
Can be used on all Ball Guide Rails SNS.

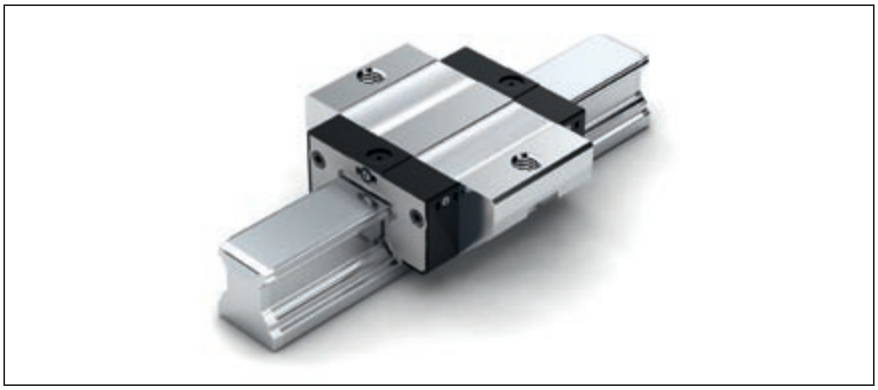
Dimension drawing, dimensions and technical data ☞ 53.

Ordering example
Options:
– Ball Runner Block CR, FNN
– Size 20
– Preload class C0
– Accuracy class H
– With standard seal, without ball chain
Part number: R1693 893 60

Options and part numbers

Size	Ball runner block with size	Preload class C0	Accuracy class H	Seal for ball runner block without ball chain SS
20	R1693 8	9	3	60
25	R1693 2	9	3	60
e.g.	R1693 8	9	3	60

FKN – Flanged, short, low profile
R1663 … 6.



Note on lubrication
– Not pre-lubricated

Note
Can be used on all Ball Guide Rails SNS.

Dimension drawing, dimensions and technical data ☞ 55.

Ordering example
Options:
– Ball Runner Block CR, FKN
– Size 20
– Preload class C0
– Accuracy class H
– With standard seal, without ball chain
Part number: R1663 893 60

Options and part numbers

Size	Ball runner block with size	Preload class C0	Accuracy class H	Seal for ball runner block without ball chain SS
20	R1663 8	9	3	60
25	R1663 2	9	3	60
e.g.	R1663 8	9	3	60

Preload classes
C0 = without preload

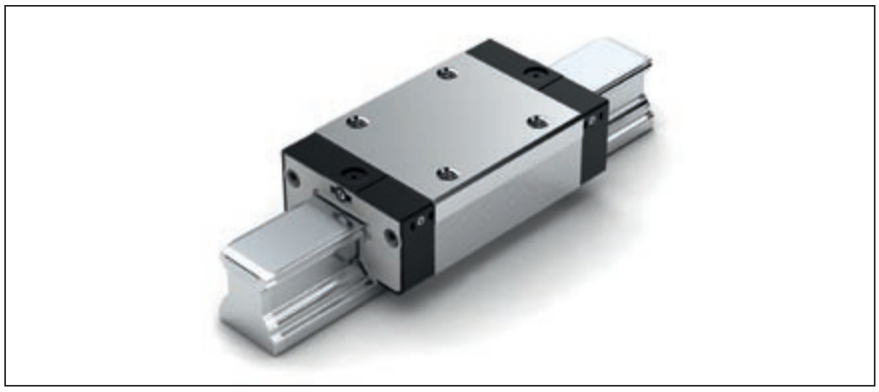
Seals
SS = standard seal

Corrosion-Resistant Ball Runner Blocks

Standard Ball Runner Blocks, Resist CR

SNN – Slimline, normal, low profile

R1694 … 6.



Note on lubrication
– Not pre-lubricated

Note
Can be used on all Ball Guide Rails SNS.

Dimension drawing, dimensions and technical data ☞ 57.

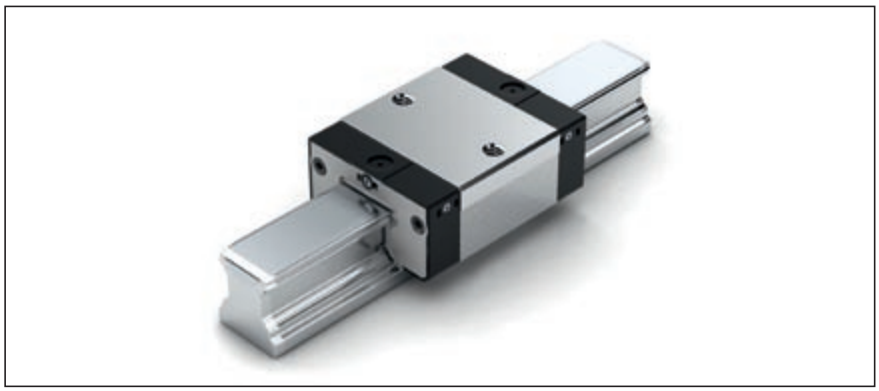
Ordering example
Options:
– Ball Runner Block CR, SNN
– Size 20
– Preload class C0
– Accuracy class H
– With standard seal, without ball chain
Part number: R1694 893 60

Options and part numbers

Size	Ball runner block with size	Preload class C0	Accuracy class H	Seal for ball runner block without ball chain SS
20	R1694 8	9	3	60
25	R1694 2	9	3	60
e.g.	R1694 8	9	3	60

SKN – Slimline, short, low profile

R1664 … 6.



Note on lubrication
– Not pre-lubricated

Note
Can be used on all Ball Guide Rails SNS.

Dimension drawing, dimensions and technical data ☞ 59.

Ordering example
Options:
– Ball Runner Block CR, SKN
– Size 20
– Preload class C0
– Accuracy class H
– With standard seal, without ball chain
Part number: R1664 893 60

Options and part numbers

Size	Ball runner block with size	Preload class C0	Accuracy class H	Seal for ball runner block without ball chain SS
20	R1664 8	9	3	60
25	R1664 2	9	3	60
e.g.	R1664 8	9	3	60

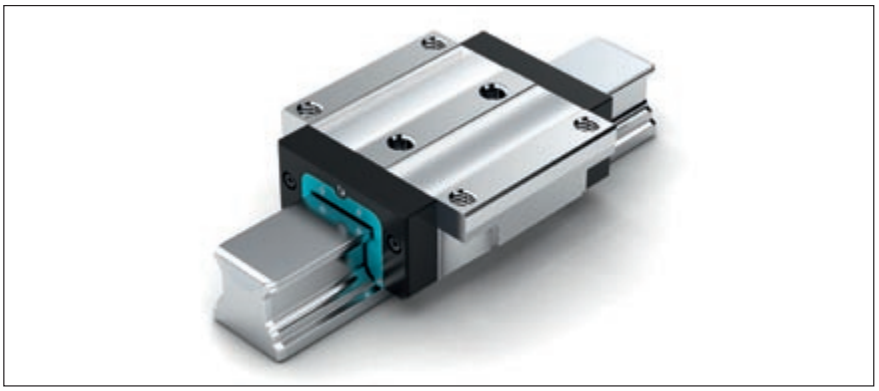
Preload classes
C0 = without preload

Seals
SS = standard seal

Heavy Duty Ball Runner Blocks, Resist CR

FNS – Flanged, normal, standard height

R1651 … 6.



Note on lubrication
– Not pre-lubricated

Note
Can be used on all Ball Guide Rails SNS.

Dimension drawing, dimensions and technical data ☞ 61.

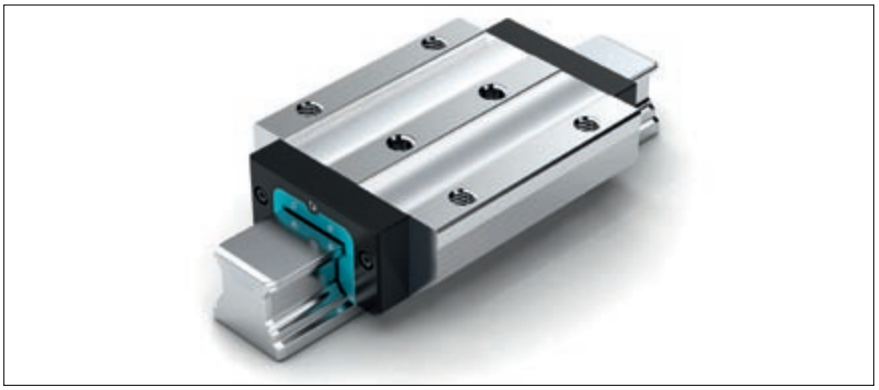
Ordering example
Options:
– Ball Runner Block CR, FNS
– Size 55
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R1651 513 60

Options and part numbers

Size	Ball runner block with size	Preload class C0	Preload class C1	Accuracy class H	Seal for ball runner block without ball chain SS
55	R1651 5	9	1	3	60
65	R1651 6	9	1	3	60
e.g.	R1651 5		1	3	60

FLS – Flanged, long, standard height

R1653 … 6.



Note on lubrication
– Not pre-lubricated

Note
Can be used on all Ball Guide Rails SNS.

Dimension drawing, dimensions and technical data ☞ 63.

Ordering example
Options:
– Ball Runner Block CR, FLS
– Size 55
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R1653 513 60

Options and part numbers

Size	Ball runner block with size	Preload class C0	Preload class C1	Accuracy class H	Seal for ball runner block without ball chain SS
55	R1653 5	9	1	3	60
65	R1653 6	9	1	3	60
e.g.	R1653 5		1	3	60

Preload classes
C0 = without preload
C1 = preload 2% C

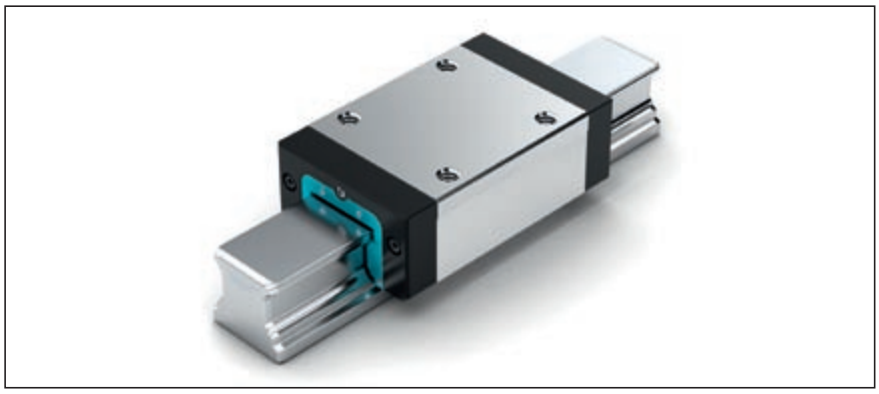
Seals
SS = standard seal

Corrosion-Resistant Ball Runner Blocks

Heavy Duty Ball Runner Blocks, Resist CR

SNS – Slimline, normal, standard height

R1622 … 6.



Note on lubrication
– Not pre-lubricated

Note
Can be used on all Ball Guide Rails SNS.

Dimension drawing, dimensions and technical data ☞ 65.

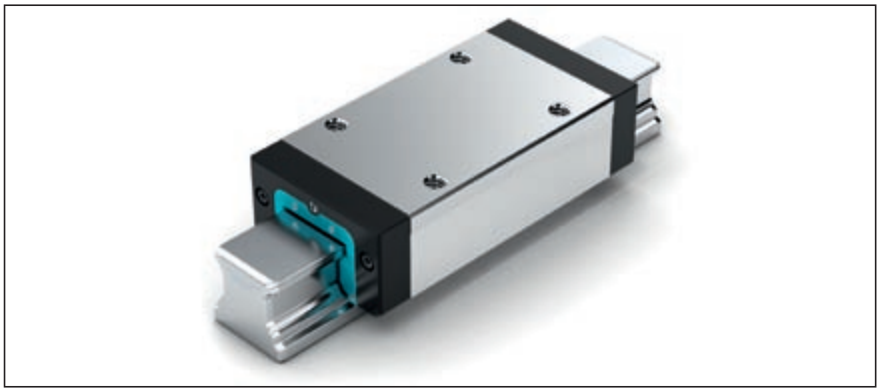
Ordering example
Options:
– Ball Runner Block CR, SNS
– Size 55
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R1622 513 60

Options and part numbers

Size	Ball runner block with size	Preload class C0	Preload class C1	Accuracy class H	Seal for ball runner block without ball chain SS
55	R1622 5	9	1	3	60
65	R1622 6	9	1	3	60
e.g.	R1622 5		1	3	60

SLS – Slimline, long, standard height

R1623 … 6.



Note on lubrication
– Not pre-lubricated

Note
Can be used on all Ball Guide Rails SNS.

Dimension drawing, dimensions and technical data ☞ 67.

Ordering example
Options:
– Ball Runner Block CR, SLS
– Size 55
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R1623 513 60

Options and part numbers

Size	Ball runner block with size	Preload class C0	Preload class C1	Accuracy class H	Seal for ball runner block without ball chain SS
55	R1623 5	9	1	3	60
65	R1623 6	9	1	3	60
e.g.	R1623 5		1	3	60

Preload classes
C0 = without preload
C1 = preload 2% C

Seals
SS = standard seal

Heavy Duty Ball Runner Blocks, Resist CR

SNH – Slimline, normal, high

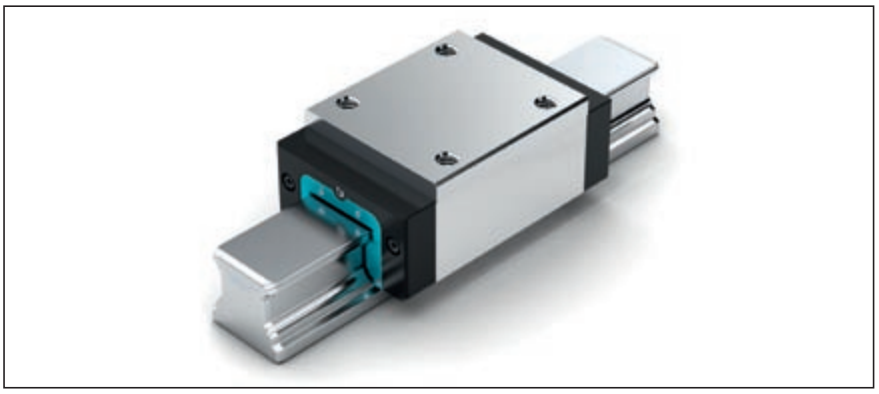
R1621 … 6.

Note on lubrication
– Not pre-lubricated

Note
Can be used on all Ball Guide Rails SNS.

Dimension drawing, dimensions and technical data ☞ 69.

Ordering example
Options:
– Ball Runner Block CR, SNH
– Size 55
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R1621 513 60



Options and part numbers

Size	Ball runner block with size	Preload class		Accuracy class	Seal for ball runner block without ball chain
		C0	C1	H	SS
55	R1621 5	9	1	3	60
e.g.	R1621 5		1	3	60

SLH – Slimline, long, high

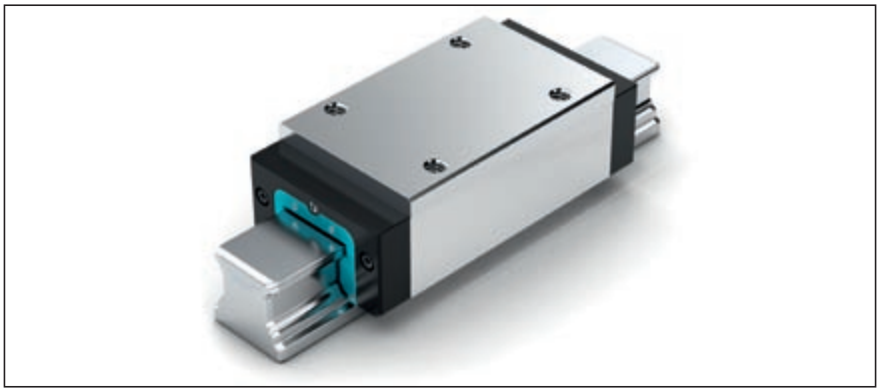
R1624 … 6.

Note on lubrication
– Not pre-lubricated

Note
Can be used on all Ball Guide Rails SNS.

Dimension drawing, dimensions and technical data ☞ 71.

Ordering example
Options:
– Ball Runner Block CR, SLH
– Size 55
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R1624 513 60



Options and part numbers

Size	Ball runner block with size	Preload class		Accuracy class	Seal for ball runner block without ball chain
		C0	C1	H	SS
55	R1624 5	9	1	3	60
e.g.	R1624 5		1	3	60

Preload classes
C0 = without preload
C1 = preload 2% C

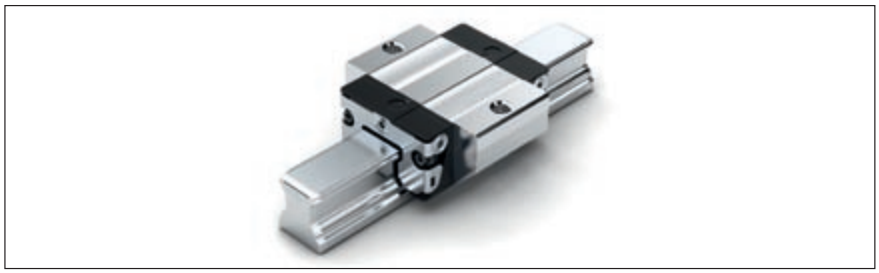
Seals
SS = standard seal

Corrosion-Resistant Ball Runner Blocks

Super Ball Runner Blocks, Resist CR

FKS – Flanged, short, standard height

R1661 … 7.



Note on lubrication
– Pre-lubricated

Note
Can be used on all Ball Guide Rails SNS.

Dimension drawing, dimensions and technical data ☞ 91.

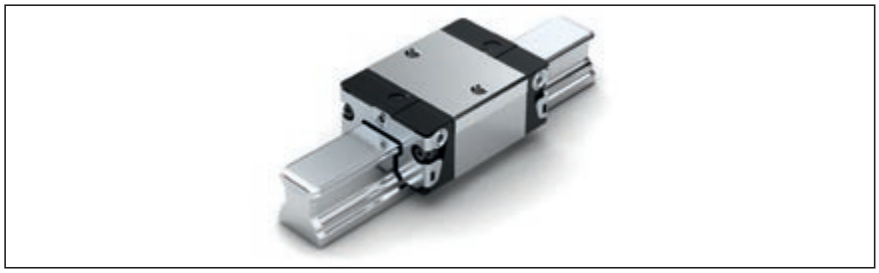
Ordering example
Options:
– Ball Runner Block CR, FKS
– Size 30
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R1661 713 70

Options and part numbers

Size	Ball runner block with size	Preload class		Accuracy class	Seal for ball runner block without ball chain		
		C0	C1	H	SS	LS	DS
15	R1661 1	9	–	3	70	71	–
20	R1661 8	9	–	3	70	71	–
25	R1661 2	9	–	3	70	71	–
30	R1661 7	9		3	70	71	–
			1	3	70	71	7Z
35	R1661 3	9		3	70	71	–
			1	3	70	71	7Z
e.g.	R1661 7		1	3	70		

SKS – Slimline, short, standard height

R1662 … 7.



Note on lubrication
– Pre-lubricated

Note
Can be used on all Ball Guide Rails SNS.

Dimension drawing, dimensions and technical data ☞ 93.

Ordering example
Options:
– Ball Runner Block CR, SKS
– Size 30
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R1662 713 70

Options and part numbers

Size	Ball runner block with size	Preload class		Accuracy class	Seal for ball runner block without ball chain		
		C0	C1	H	SS	LS	DS
15	R1662 1	9	–	3	70	71	–
20	R1662 8	9	–	3	70	71	–
25	R1662 2	9	–	3	70	71	–
30	R1662 7	9		3	70	71	–
			1	3	70	71	7Z
35	R1662 3	9		3	70	71	–
			1	3	70	71	7Z
e.g.	R1662 7		1	3	70		

Preload classes
C0 = without preload
C1 = preload 2% C

Seals
SS = standard seal
LS = low-friction seal
DS = double-lipped seal

Key to table
Gray numbers
= version/combination not preferred
(longer delivery times in some cases)

Standard Ball Guide Rails made of steel

Product Description, Ball Guide Rails SNS

Characteristic features

– Top rigidity in all load directions
– High torque load capacity

Proven cover strip for ball guide rail mounting holes
– A single cover for all holes – saves time and money
– Made of corrosion-resistant spring steel per EN 10088
– Easy, secure mounting
– Clip on and fasten

Ball guide rails with cover strip and aluminum strip clamps
– Without threaded holes at the end faces (not required)

Ball guide rails with cover strip and plastic screw-down protective end caps
– With threaded holes at the end faces

Ball guide rails with plastic mounting hole plugs

Ball guide rails with steel mounting hole plugs

Ball guide rails for mounting from below

Definition Ball guide rail design style		Code (example)		
		S	N	S
Width	Slimline	S		
	Wide			
Length	Normal		N	
Height	Standard height			S

Ordering Examples

Ordering ball guide rails in recommended lengths

The procedure shown in the following ordering examples applies to all ball guide rails. Recommended rail lengths are more cost effective.

Options and part numbers

Size	Ball guide rail with size	Accuracy class					Number of sections ., Rail length L (mm), ...		Hole spacing T (mm)	Recommended rail length according to formula $L = n_B \cdot T - 4$ mm
		N	H	P	SP	UP	One-piece	Composite		Maximum number of holes n_B
15	R1605 16	4	3	2	1	9	31, ...	3., ...	60	64
20	R1605 86	4	3	2	1	9	31, ...	3., ...	60	64
25	R1605 26	4	3	2	1	9	31, ...	3., ...	60	64
30	R1605 76	4	3	2	1	9	31, ...	3., ...	80	48
35	R1605 36	4	3	2	1	9	31, ...	3., ...	80	48
45	R1605 46	4	3	2	1	9	31, ...	3., ...	105	36
55	R1605 56	4	3	2	1	9	31, ...	3., ...	120	32
65	R1605 66	4	3	2	1	9	31, ...	3., ...	150	25
e.g.	R1605 76		3				31, 1676			

Excerpt from table with part numbers and recommended rail lengths for ordering example

From the desired length to the recommended length

$$L = \left(\frac{L_W}{T}\right)^{*} \cdot T - 4$$

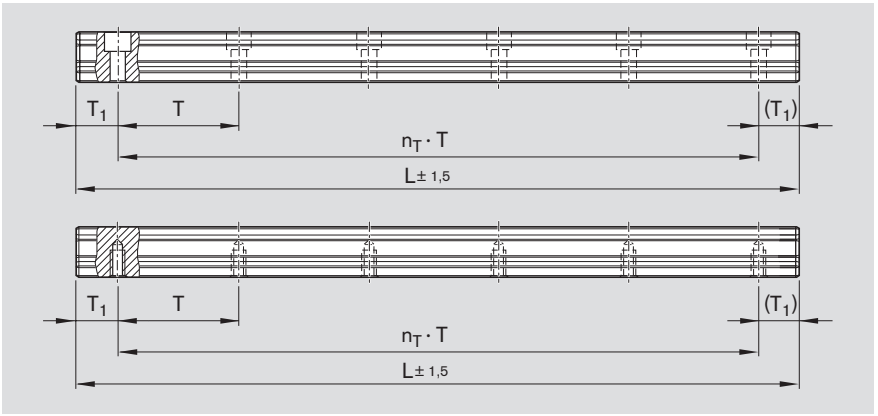
* Round up the quotient L_W/T to the next whole number.

W = desired length
T = hole spacing

Calculation example

$$L = \left(\frac{1660}{80\ \text{mm}}\right) \cdot 80\ \text{mm} - 4\ \text{mm}$$

$L = 21 \cdot 80\ \text{mm} - 4\ \text{mm}$
$L = 1676\ \text{mm}$



$$L = n_B \cdot T - 4\ \text{mm}$$

Basis: number of holes

$$L = n_T \cdot T + 2 \cdot T_{1S}$$

Basis: number of spaces between holes

L	=	recommended rail length	(mm)
L_W	=	desired rail length	(mm)
T	=	hole spacing[1)]	(mm)
T_{1S}	=	preferred dimension[1)]	(mm)
n_B	=	number of holes	(–)
n_T	=	no. of spaces between holes	(–)

1) For values, see dimensions table at dimension drawing.

Notes on ordering examples

If the preferred dimension T_{1S} cannot be used:
- Select an end space T_1 between T_{1S} and $T_{1\,min}$.
- Alternatively, select an end space between T_1 and T_{1max}.

Ordering example 1 (up to L_{max})

- Ball guide rail SNS size 30 with cover strip and strip clamps
- Accuracy class H
- Calculated rail length 1676 mm, ($20 \cdot T$, preferred dimension T_{1S} = 38 mm; number of holes $n_B = 21$)

Ordering data

Part number, rail length (mm)
T_1 / $n_T \cdot T$ / T_1 (mm)

R1605 733 31, 1676 mm
38 / 20 · 80 / 38 mm

Ordering example 2 (over L_{max})

- Ball guide rail SNS size 30 with cover strip and strip clamps
- Accuracy class H
- Calculated rail length 5116 mm, 2 sections ($63 \cdot T$, preferred dimension T_{1S} = 38 mm; number of holes $n_B = 64$)

Ordering data

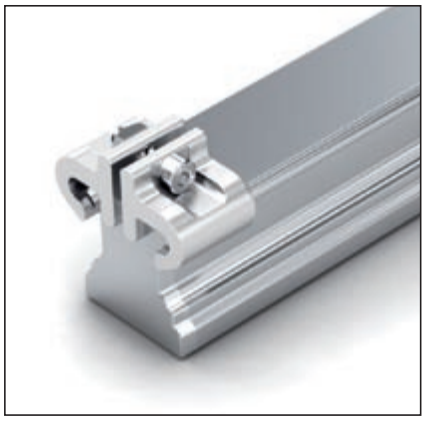
Part number and number of sections, rail length (mm)
T_1 / $n_T \cdot T$ / T_1 (mm)

R1605 733 32, 5116 mm
38 / 63 · 80 / 38 mm
For rail lengths greater than L_{max}, Rexroth provides matching rail sections for end to end mounting.

Standard Ball Guide Rails made of steel

SNS with Cover Strip and Strip Clamps

R1605 .3. ../ R1605 .B. ..



For mounting from above, with cover strip made of corrosion-resistant spring steel per EN 10088 and strip clamps made of aluminum (without threaded mounting holes on end face)

Note on installation
- Secure the cover strip!
- Strip clamps are included in the supply scope.
- Follow the mounting instructions! Send for the publications “Mounting Instructions for Ball Rail Systems” and “Mounting Instructions for the Cover Strip.”
- Composite guide rails also available.

Further Ball Guide Rails SNS and accessories
- Corrosion-resistant Ball Guide Rails Resist NR ☞🗎 132
  Resist CR ☞🗎 134
- Cover strip ☞🗎 176
- Strip clamps ☞🗎 178

Ball guide rail R1605 .B. .. with flat underside for mounting on components made of cast mineral materials
- In size 25 - 45 and accuracy class P and SP available on request.

Options and part numbers

Size	Ball guide rail with size	Accuracy class					Number of sections ., Rail length L (mm), ...		Hole spacing T (mm)	Recommended rail length according to formula $L = n_B \cdot T - 4$ mm
		N	H	P	SP	UP	One-piece	Composite		Maximum number of holes n_B
15	R1605 13	4	3	2	1	9	31, ...	3., ...	60	64
20	R1605 83	4	3	2	1	9	31, ...	3., ...	60	64
25	R1605 23	4	3	2	1	9	31, ...	3., ...	60	64
30	R1605 73	4	3	2	1	9	31, ...	3., ...	80	48
35	R1605 33	4	3	2	1	9	61, ...	6., ...	80	48
45	R1605 43	4	3	2	1	9	61, ...	6., ...	105	36
55	R1605 53	4	3	2	1	9	61, ...	6., ...	120	32
65	R1605 63	4	3	2	1	9	61, ...	6., ...	150	25
e.g.	R1605 73		3				31, 1676			

Ordering example 1:
(up to L_{max})
Options:
- Ball Guide Rail SNS
- Size 30
- Accuracy class H
- One-piece
- Rail length L = 1676 mm

Part number:
R1605 733 31, 1676 mm

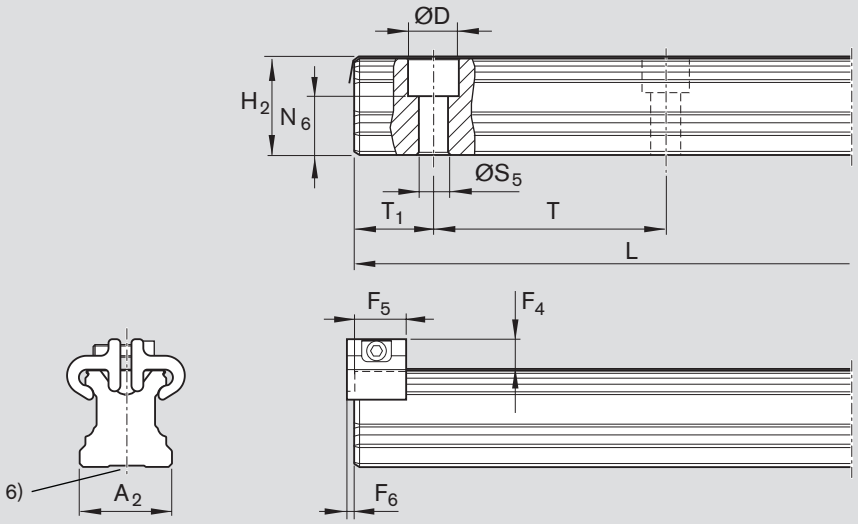
Ordering example 2:
(over L_{max})
Options:
- Ball Guide Rail SNS
- Size 30
- Accuracy class H
- **2 sections**
- Rail length L = 5116 mm

Part number:
R1605 733 3**2**, 5116 mm

Ordering example 3:
(up to L_{max}, with flat underside)
Options:
- Ball Guide Rail SNS
- Size 30
- Accuracy class H
- One-piece
- Rail length L = 1676 mm

Part number:
R1605 7**B**3 31, 1676 mm

Ball Guide Rails SNS



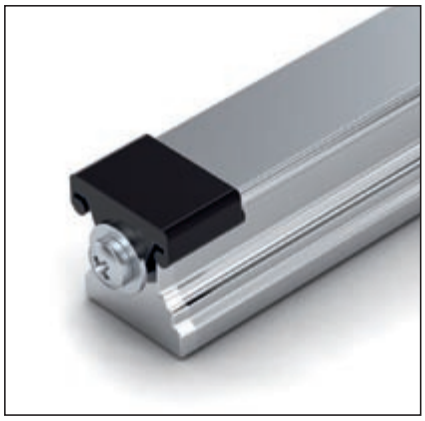
Size	Dimensions (mm)													Weight
	A_2	D	F_4 3)	F_5	F_6	H_2 1)	L_{max} 2)	$N_6^{\pm 0.5}$	S_5	T	$T_{1\ min}$ 4)	T_{1S} 5)	$T_{1\ max}$	(kg/m)
15	15	7.4	7.3	12	2.0	16.30	3 836	10.3	4.4	60	12	28.0	50	1.4
20	20	9.4	7.1	12	2.0	20.75	3 836	13.2	6.0	60	13	28.0	50	2.4
25	23	11.0	8.2	13	2.0	24.45	3 836	15.2	7.0	60	13	28.0	50	3.2
30	28	15.0	8.7	13	2.0	28.55	3 836	17.0	9.0	80	16	38.0	68	5.0
35	34	15.0	11.7	16	2.2	32.15	3 836	20.5	9.0	80	16	38.0	68	6.8
45	45	20.0	12.5	18	2.2	40.15	3 776	23.5	14.0	105	18	50.5	89	10.5
55	53	24.0	14.0	17	3.2	48.15	3 836	29.0	16.0	120	20	58.0	102	16.2
65	63	26.0	15.0	17	3.2	60.15	3 746	38.5	18.0	150	21	73.0	130	22.4

1) Dimension H_2 with cover strip
   Size 15 with 0.1 mm cover strip
   Size 20 - 30 with 0.2 mm cover strip
   Size 35 - 65 with 0.3 mm cover strip
2) For size 20 - 45 in accuracy class N, H and P, one-piece guide rails are available on request up to the following lengths:
   Size 20 - 25: up to 5816 mm
   Size 30 - 35: up to 5836 mm
   Size 45: up to 5771 mm
3) Dimension F_4 with cover strip
4) For end spaces below T_{1min}, no threaded holes in end faces possible. Cover strip fastening ☞ 178.
5) Recommended: preferred dimension T_{1S} with tolerances ± 0.75.
6) For manufacturing reasons, ball guide rails may have a flat underside (without groove).

Standard Ball Guide Rails made of steel

SNS with Cover Strip and Protective End Caps

R1605 .6. ../ R1605 .D. ..



For mounting from above, with cover strip made of corrosion-resistant spring steel per EN 10088 and screw-down plastic protective end caps (with threaded mounting holes on end face)

Note on installation
- Secure the cover strip!
- Protective caps with screws and washers included in scope of supply.
- Follow the mounting instructions!
- Send for the publications “Mounting Instructions for Ball Rail Systems” and “Mounting Instructions for the Cover Strip.”
- Composite guide rails also available.

Further Ball Guide Rails SNS and accessories
- Cover strip ☞🗎 176
- Protective caps ☞🗎 178

Ball guide rail R1605 .B. .. with flat underside for mounting on components made of cast mineral materials
- In size 25 - 45 and accuracy class P and SP available on request.

Options and part numbers

Size	Ball guide rail with size	Accuracy class					Number of sections ., Rail length L (mm), ...		Hole spacing T (mm)	Recommended rail length according to formula $L = n_B \cdot T - 4$ mm
		N	H	P	SP	UP	One-piece	Composite		Maximum number of holes n_B
15	R1605 16	4	3	2	1	9	31, ...	3., ...	60	64
20	R1605 86	4	3	2	1	9	31, ...	3., ...	60	64
25	R1605 26	4	3	2	1	9	31, ...	3., ...	60	64
30	R1605 76	4	3	2	1	9	31, ...	3., ...	80	48
35	R1605 36	4	3	2	1	9	61, ...	6., ...	80	48
45	R1605 46	4	3	2	1	9	61, ...	6., ...	105	36
55	R1605 56	4	3	2	1	9	61, ...	6., ...	120	32
65	R1605 66	4	3	2	1	9	61, ...	6., ...	150	25
e.g.	R1605 76		3				31, 1676			

Ordering example 1:
(up to L_{max})
Options:
- Ball Guide Rail SNS
- Size 30
- Accuracy class H
- One-piece
- Rail length L = 1676 mm

Part number:
R1605 763 31, 1676 mm

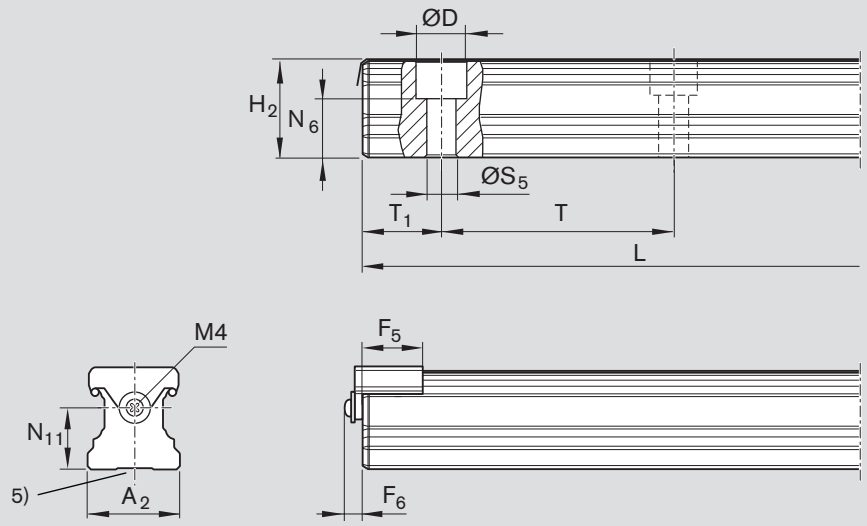
Ordering example 2:
(over L_{max})
Options:
- Ball Guide Rail SNS
- Size 30
- Accuracy class H
- **2 sections**
- Rail length L = 5116 mm

Part number:
R1605 763 3**2**, 5116 mm

Ordering example 3:
(up to L_{max}, with flat underside)
Options:
- Ball Guide Rail SNS
- Size 30
- Accuracy class H
- One-piece
- Rail length L = 1676 mm

Part number:
R1605 7**D**3 31, 1676 mm

Ball Guide Rails SNS



Size	Dimensions (mm)													Weight
	A_2	D	F_5	F_6	H_2 1)	L_{max} 2)	$N_6^{\pm 0.5}$	N_{11}	S_5	T	$T_{1\ min}$ 3)	T_{1S} 4)	$T_{1\ max}$	(kg/m)
15	15	7.4	14.0	6.5	16.30	3 836	10.3	9.8	4.4	60	12	28.0	50	1.4
20	20	9.4	14.0	6.5	20.75	3 836	13.2	13.0	6.0	60	13	28.0	50	2.4
25	23	11.0	15.2	6.5	24.45	3 836	15.2	15.0	7.0	60	13	28.0	50	3.2
30	28	15.0	15.2	7.0	28.55	3 836	17.0	18.0	9.0	80	16	38.0	68	5.0
35	34	15.0	18.0	7.0	32.15	3 836	20.5	22.0	9.0	80	16	38.0	68	6.8
45	45	20.0	20.0	7.0	40.15	3 776	23.5	30.0	14.0	105	18	50.5	89	10.5
55	53	24.0	20.0	7.0	48.15	3 836	29.0	30.0	16.0	120	20	58.0	102	16.2
65	63	26.0	20.0	7.0	60.15	3 746	38.5	40.0	18.0	150	21	73.0	130	22.4

1) Dimension H_2 with cover strip
   Size 15 with 0.1 mm cover strip
   Size 20 - 30 with 0.2 mm cover strip
   Size 35 - 65 with 0.3 mm cover strip
2) For size 20 - 45 in accuracy class N, H and P, one-piece guide rails are available on request up to the following lengths:
   Size 20 - 25: up to 5816 mm
   Size 30 - 35: up to 5836 mm
   Size 45: up to 5771 mm
3) For end spaces below T_{1min}, no threaded holes in end faces possible. Cover strip fastening ☞ 178.
4) Recommended: preferred dimension T_{1S} with tolerances ± 0.75.
5) For manufacturing reasons, ball guide rails may have a flat underside (without groove).

Standard Ball Guide Rails made of steel

SNS with Plastic Mounting Hole Plugs

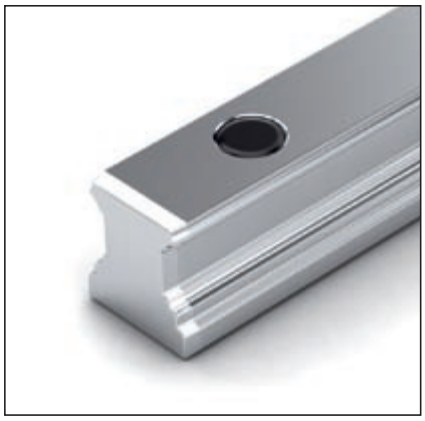
R1605 .0. ../ R1605 .C. ..

For mounting from above, with plastic mounting hole plugs

Note on installation
- Plastic mounting hole plugs included in scope of supply.
- Follow the mounting instructions!
- Send for the publication “Mounting Instructions for Ball Rail Systems.”
- Composite guide rails also available.

Further Ball Guide Rails SNS and accessories
- Corrosion-resistant Ball Guide Rails Resist NR ☞ 133
  Resist CR ☞ 135
- Plastic Mounting Hole Plugs ☞ 179

Ball guide rail R1605 .B. .. with flat underside for mounting on components made of cast mineral materials
- In size 25 - 45 and accuracy class P and SP available on request.



Options and part numbers

Size	Ball guide rail with size	Accuracy class					Number of sections ., Rail length L (mm), ...		Hole spacing T (mm)	Recommended rail length according to formula $L = n_B \cdot T - 4$ mm
		N	H	P	SP	UP	One-piece	Composite		Maximum number of holes n_B
15	R1605 10	4	3	2	1	9	31, ...	3., ...	60	64
20	R1605 80	4	3	2	1	9	31, ...	3., ...	60	64
25	R1605 20	4	3	2	1	9	31, ...	3., ...	60	64
30	R1605 70	4	3	2	1	9	31, ...	3., ...	80	48
35	R1605 30	4	3	2	1	9	31, ...	3., ...	80	48
45	R1605 40	4	3	2	1	9	31, ...	3., ...	105	36
55	R1605 50	4	3	2	1	9	31, ...	3., ...	120	32
65	R1605 60	4	3	2	1	9	31, ...	3., ...	150	25
e.g.	R1605 70		3				31, 1676			

Ordering example 1:
(up to L_{max})
Options:
- Ball Guide Rail SNS
- Size 30
- Accuracy class H
- One-piece
- Rail length L = 1676 mm

Part number:
R1605 703 31, 1676 mm

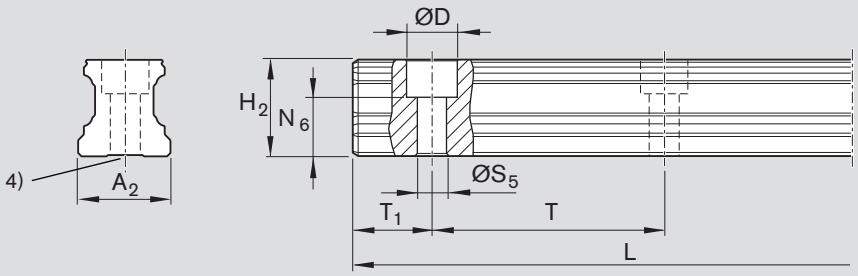
Ordering example 2:
(over L_{max})
Options:
- Ball Guide Rail SNS
- Size 30
- Accuracy class H
- **2 sections**
- Rail length L = 5116 mm

Part number:
R1605 703 3**2**, 5116 mm

Ordering example 3:
(up to L_{max}, with flat underside)
Options:
- Ball Guide Rail SNS
- Size 30
- Accuracy class H
- One-piece
- Rail length L = 1676 mm

Part number:
R1605 7**C**3 31, 1676 mm

Ball Guide Rails SNS



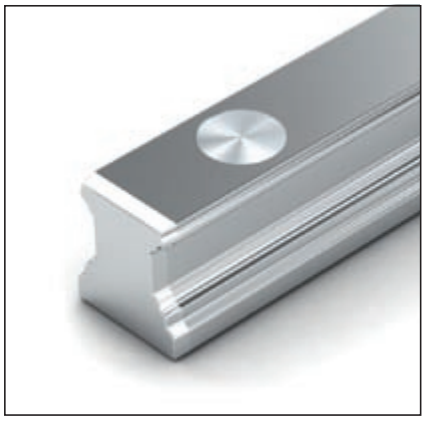
Size	Dimensions (mm)										Weight
	A_2	D	H_2 1)	L_{max} 2)	$N_6^{\pm 0.5}$	S_5	T	$T_{1\,min}$	T_{1S} 3)	$T_{1\,max}$	(kg/m)
15	15	7.4	16.20	3 836	10.3	4.4	60	10	28.0	50	1.4
20	20	9.4	20.55	3 836	13.2	6.0	60	10	28.0	50	2.4
25	23	11.0	24.25	3 836	15.2	7.0	60	10	28.0	50	3.2
30	28	15.0	28.35	3 836	17.0	9.0	80	12	38.0	68	5.0
35	34	15.0	31.85	3 836	20.5	9.0	80	12	38.0	68	6.8
45	45	20.0	39.85	3 776	23.5	14.0	105	16	50.5	89	10.5
55	53	24.0	47.85	3 836	29.0	16.0	120	18	58.0	102	16.2
65	63	26.0	59.85	3 746	38.5	18.0	150	20	73.0	130	22.4

1) Dimension H_2 without cover strip
2) For size 20 - 45 in accuracy class N, H and P, one-piece guide rails are available on request up to the following lengths:
   Size 20 - 25: up to 5816 mm
   Size 30 - 35: up to 5836 mm
   Size 45: up to 5771 mm
3) Recommended: preferred dimension T_{1S} with tolerances ± 0.75.
4) For manufacturing reasons, ball guide rails may have a flat underside (without groove).

Standard Ball Guide Rails made of steel

SNS with Steel Mounting Hole Plugs

R1606 .5. ..



For mounting from above, for steel mounting hole plugs

Note on installation
- Steel mounting hole plugs not included in scope of supply.
- Follow the mounting instructions!
- Send for the publication “Mounting Instructions for Ball Rail Systems.”
- Composite guide rails also available.

Further Ball Guide Rails SNS and accessories
- Steel mounting hole plugs ☞ 179
- Mounting tool for steel mounting hole plugs ☞ 179

Options and part numbers

Size	Ball guide rail with size	Accuracy class					Number of sections ., Rail length L (mm), ...		Hole spacing T (mm)	Recommended rail length according to formula $L = n_B \cdot T - 4$ mm
		N	H	P	SP	UP	One-piece	Composite		Maximum number of holes n_B
25	R1606 25	4	3	2	1	9	31, ...	3., ...	60	64
30	R1606 75	4	3	2	1	9	31, ...	3., ...	80	48
35	R1606 35	4	3	2	1	9	31, ...	3., ...	80	48
45	R1606 45	4	3	2	1	9	31, ...	3., ...	105	36
55	R1606 55	4	3	2	1	9	31, ...	3., ...	120	32
65	R1606 65	4	3	2	1	9	31, ...	3., ...	150	25
e.g.	R1606 75		3				31, 1676			

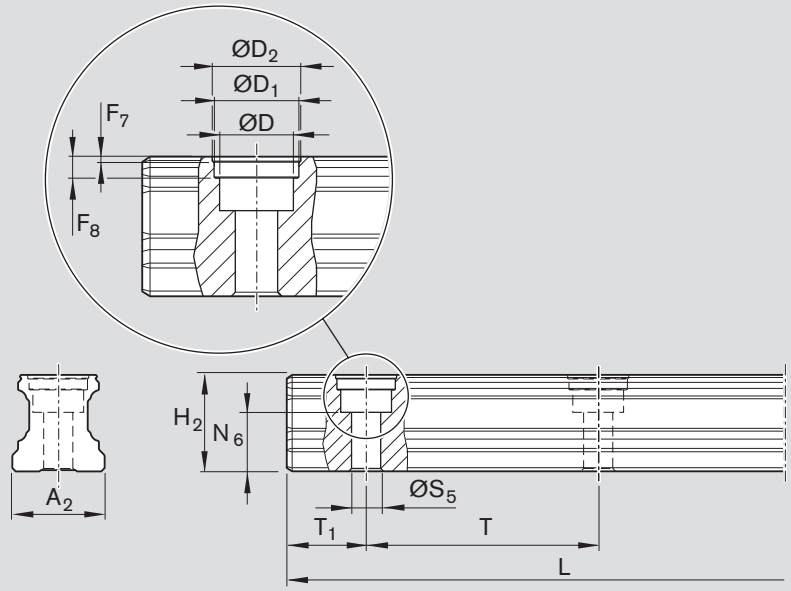
Ordering example 1: (up to L_{max})
Options:
- Ball Guide Rail SNS
- Size 30
- Accuracy class H
- One-piece
- Rail length L = 1676 mm

Part number:
R1606 753 31, 1676 mm

Ordering example 2: (over L_{max})
Options:
- Ball Guide Rail SNS
- Size 30
- Accuracy class H
- **2 sections**
- Rail length L = 5116 mm

Part number:
R1606 753 3**2**, 5116 mm

Ball Guide Rails SNS



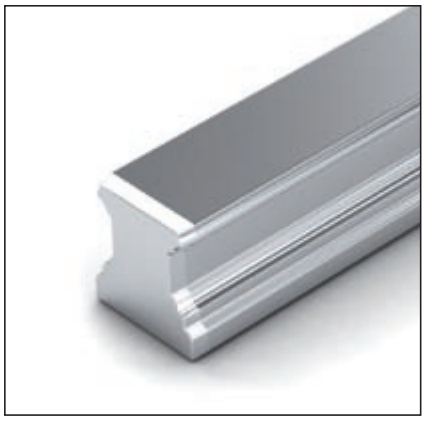
Size	Dimensions (mm)														Weight
	A_2	D	D_1	D_2	F_7	F_8	H_2 1)	L_{max} 2)	$N_6^{\pm 0.5}$	S_5	T	$T_{1\,min}$	T_{1S} 3)	$T_{1\,max}$	(kg/m)
25	23	11.0	12.55	13.0	0.90	3.7	24.25	3 836	15.2	7.0	60	13	28.0	50	3.2
30	28	15.0	17.55	18.0	0.90	3.6	28.35	3 836	17.0	9.0	80	16	38.0	68	5.0
35	34	15.0	17.55	18.0	0.90	3.6	31.85	3 836	20.5	9.0	80	16	38.0	68	6.8
45	45	20.0	22.55	23.0	1.45	8.0	39.85	3 776	23.5	14.0	105	18	50.5	89	10.5
55	53	24.0	27.55	28.0	1.45	8.0	47.85	3 836	29.0	16.0	120	20	58.0	102	16.2
65	63	26.0	29.55	30.0	1.45	8.0	59.85	3 746	38.5	18.0	150	21	73.0	130	22.4

1) Dimension H_2 without cover strip
2) For size 25 - 45 in accuracy class N, H and P, one-piece guide rails are available on request up to the following lengths:
   Size 25: up to 5816 mm
   Size 30 - 35: up to 5836 mm
   Size 45: up to 5771 mm
3) Recommended: preferred dimension T_{1S} with tolerances ± 0.75.

Standard Ball Guide Rails made of steel

SNS for mounting from below

R1607 .0. ..



For mounting from below

Note on installation
- Follow the mounting instructions!
- Send for the publication “Mounting Instructions for Ball Rail Systems.”
- Composite guide rails also available.

Further Ball Guide Rails SNS and accessories
- Corrosion-resistant Ball Guide Rails
  Resist NR ☞ 133
  Resist CR ☞ 135

Options and part numbers

Size	Ball guide rail with size	Accuracy class					Number of sections ., Rail length L (mm), ...		Hole spacing T (mm)	Recommended rail length according to formula $L = n_B \cdot T - 4$ mm
		N	H	P	SP	UP	One-piece	Composite		Maximum number of holes n_B
15	R1607 10	4	3	2	1	9	31, ...	3., ...	60	64
20	R1607 80	4	3	2	1	9	31, ...	3., ...	60	64
25	R1607 20	4	3	2	1	9	31, ...	3., ...	60	64
30	R1607 70	4	3	2	1	9	31, ...	3., ...	80	48
35	R1607 30	4	3	2	1	9	31, ...	3., ...	80	48
45	R1607 40	4	3	2	1	9	31, ...	3., ...	105	36
55	R1607 50	4	3	2	1	9	31, ...	3., ...	120	32
65	R1607 60	4	3	2	1	9	31, ...	3., ...	150	25
e.g.	R1607 70		3				31, 1676			

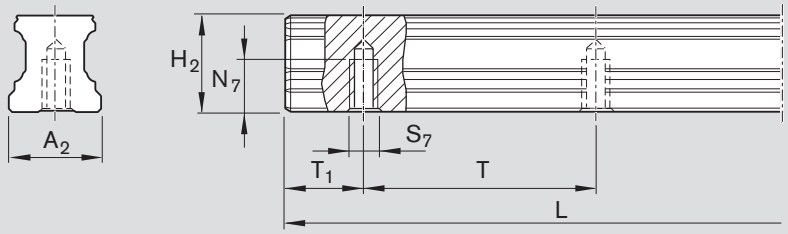
Ordering example 1:
(up to L_{max})
Options:
- Ball Guide Rail SNS
- Size 30
- Accuracy class H
- One-piece
- Rail length L = 1676 mm

Part number:
R1607 703 31, 1676 mm

Ordering example 2:
(over L_{max})
Options:
- Ball Guide Rail SNS
- Size 30
- Accuracy class H
- **2 sections**
- Rail length L = 5116 mm

Part number:
R1607 703 3**2**, 5116 mm

Ball Guide Rails SNS



Size	Dimensions (mm)									Weight
	A_2	H_2 1)	L_{max} 2)	N_7	S_7	T	T_{1min}	T_{1S} 3)	$T_{1\ max}$	(kg/m)
15	15	16.20	3 836	7.5	M5	60	10	28.0	50	1.4
20	20	20.55	3 836	9.0	M6	60	10	28.0	50	2.4
25	23	24.25	3 836	12.0	M6	60	10	28.0	50	3.2
30	28	28.35	3 836	15.0	M8	80	12	38.0	68	5.0
35	34	31.85	3 836	15.0	M8	80	12	38.0	68	6.8
45	45	39.85	3 776	19.0	M12	105	16	50.5	89	10.5
55	53	47.85	3 836	22.0	M14	120	18	58.0	102	16.2
65	63	59.85	3 746	25.0	M16	150	20	73.0	130	22.4

1) Dimension H_2 without cover strip
2) For size 20 - 45 in accuracy class N, H and P, one-piece guide rails are available on request up to the following lengths:
   Size 20 - 25: up to 5816 mm
   Size 30 - 35: up to 5836 mm
   Size 45: up to 5771 mm
3) Recommended: preferred dimension T_{1S} with tolerances ± 0.75.

Corrosion-Resistant Ball Guide Rails

Product Description, Resist NR II

General notes on Ball Guide Rails in Resist NR II

For part numbers, see the following pages. For recommended rail lengths, dimensions and weights, please refer to the corresponding standard steel guide rails ☞ 122 – 131.
Follow the mounting instructions! Send for the publications “Mounting Instructions for Ball Rail Systems” and “Mounting Instructions for the Cover Strip.”

Corrosion resistance and conditions of use

Ball Guide Rails Resist NR II and all steel parts are made of corrosion-resistant steel per EN 10088, with aluminum strip clamps. They are specifically intended for use in applications involving aqueous media, very dilute acids, alkalis or salt solutions. These guides are particularly suitable for environments with a relative humidity of over 70% and temperatures above 30 °C. Conditions like these are found above all in cleaning systems, galvanization and pickling lines, steam degreasing systems, and also cooling equipment. Since they have built-in corrosion protection, Ball Rail Systems Resist NR II are also ideal for use in clean rooms and for general printed circuit board assembly. Other application areas include the pharmaceuticals and food industries.

Recommended runner blocks for Ball Guide Rails Resist NR II

– Ball Runner Blocks, Resist NR II ☞ 104

Combinations of different accuracy classes

⚠
Combining ball guide rails and runner blocks of different accuracy classes results in different tolerances for dimensions H and A_3.
(“Accuracy classes and their tolerances” ☞ 26)

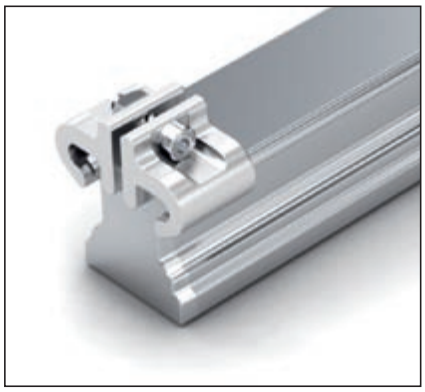
Ball Guide Rails, Resist NR II

R2045 .3. .., SNS for mounting from above, with cover strip and strip clamps

Options and part numbers

Size	Ball guide rail with size	Accuracy class			Number of sections ., Rail length L (mm), ...	
		N	H	P	One-piece	Composite
15[1)]	R2045 13	4	3	2	31, ...	3., ...
20	R2045 83	4	3	2	31, ...	3., ...
25	R2045 23	4	3	2	31, ...	3., ...
30	R2045 73	4	3	2	31, ...	3., ...
35	R2045 33	4	3	2	61, ...	6., ...
e.g.	R2045 73		3		31, 1676	

1) Maximum rail length 1856 mm, maximum number of holes n_B 30



Note on installation
- Secure the cover strip!
- Strip clamps are included in the supply scope.
- Composite guide rails also available.

Recommended rail lengths, dimension drawing, dimensions and weights
☞ 122 – 123.

Accessories
- Cover strip ☞ 176
- Strip clamps ☞ 178

Ordering example 1 (up to L_{max})
Options:
- Ball Guide Rail NR II, SNS
- Size 30
- Accuracy class H
- One-piece
- Rail length L = 1676 mm

Part number:
R2045 733 31, 1676 mm

Ordering example 2 (over L_{max})
Options:
- Ball Guide Rail NR II, SNS
- Size 30
- Accuracy class H
- **2 sections**
- Rail length L = 5116 mm

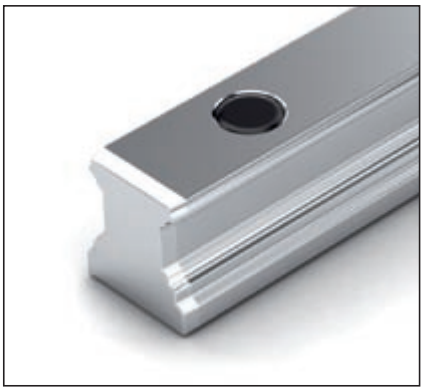
Part number:
R2045 733 3**2**, 5116 mm

Ball Guide Rails, Resist NR II

R2045 .0. .., SNS for mounting from above, with plastic mounting hole plugs

Options and part numbers

Size	Ball guide rail with size	Accuracy class			Number of sections ., Rail length L (mm), ...	
		N	H	P	One-piece	Composite
15[1)]	R2045 10	4	3	2	31, ...	3., ...
20	R2045 80	4	3	2	31, ...	3., ...
25	R2045 20	4	3	2	31, ...	3., ...
30	R2045 70	4	3	2	31, ...	3., ...
35	R2045 30	4	3	2	31, ...	3., ...
e.g.	R2045 70		3		31, 1676	



Note on installation
- Plastic mounting hole plugs included in scope of supply.
- Composite guide rails also available.

Accessories
- Plastic mounting hole plugs
☞ 179

Recommended rail lengths, dimension drawing, dimensions and weights
☞ 126 – 127.

Ordering example 1 (up to L_{max})
Options:
- Ball Guide Rail NR II, SNS
- Size 30
- Accuracy class H
- One-piece
- Rail length L = 1676 mm

Part number:
R2045 703 31, 1676 mm

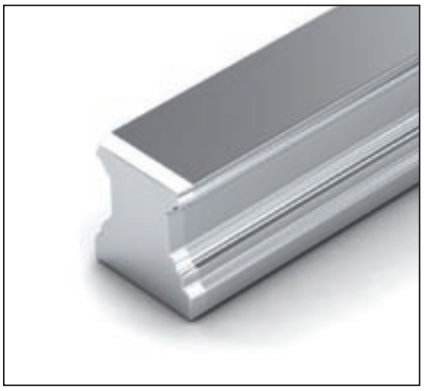
Ordering example 2 (over L_{max})
Options:
- Ball Guide Rail NR II, SNS
- Size 30
- Accuracy class H
- **2 sections**
- Rail length L = 5116 mm

Part number:
R2045 703 3**2**, 5116 mm

R2047 .0. .., SNS for mounting from below

Options and part numbers

Size	Ball guide rail with size	Accuracy class			Number of sections ., Rail length L (mm), ...	
		N	H	P	One-piece	Composite
15[1)]	R2047 10	4	3	2	31, ...	3., ...
20	R2047 80	4	3	2	31, ...	3., ...
25	R2047 20	4	3	2	31, ...	3., ...
30	R2047 70	4	3	2	31, ...	3., ...
35	R2047 30	4	3	2	31, ...	3., ...
e.g.	R2047 70		3			32, 5116



1) Maximum rail length 1856 mm, maximum number of holes n_B 30

Note on installation
- Composite guide rails also available.

Recommended rail lengths, dimension drawing, dimensions and weights
☞ 130 – 131.

Ordering example 1 (up to L_{max})
Options:
- Ball Guide Rail NR II, SNS
- Size 30
- Accuracy class H
- One-piece
- Rail length L = 1676 mm

Part number:
R2047 703 31, 1676 mm

Ordering example 2 (over L_{max})
Options:
- Ball Guide Rail NR II, SNS
- Size 30
- Accuracy class H
- **2 sections**
- Rail length L = 5116 mm

Part number:
R2047 703 3**2**, 5116 mm

Corrosion-Resistant Ball Guide Rails

Product Description, Resist CR

General notes on Ball Guide Rails in Resist CR

For part numbers, see the following pages. For recommended rail lengths, dimensions and weights, please refer to the corresponding standard steel guide rails ☞ 122 – 131.
Follow the mounting instructions! Send for the publications “Mounting Instructions for Ball Rail Systems” and “Mounting Instructions for the Cover Strip.”

Corrosion-resistant coating Resist CR

Ball guide rail made of steel with matte-silver hard-chrome plated corrosion-resistant coating.

One-piece guide rails with uncoated or coated end faces

- End faces **uncoated**

  Part numbers:
  – R16.. ... 31 or R16.. ... 61

- End faces, chamfers and end-face threads **coated**
  Part numbers:
  – R16.. ... 41 or R16.. ... 71

Composite guide rails with coated end faces

- End faces, chamfers and end-face threads coated, part numbers:
  – R16.. ... 41 or R16.. ... 71
- Composite ball guide rails are chamfered on both sides at the joints.

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

Size 15 - 65
- Accuracy class H
- **Preload class C0** = without preload

Size 30 - 65
- Accuracy class H
- **Preload class C1** = 2% C

Combinations of different accuracy classes

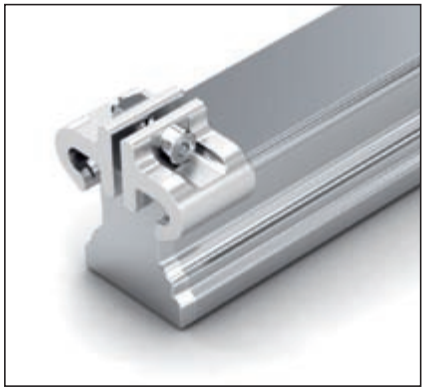
⚠
Combining ball guide rails and runner blocks of different accuracy classes results in different tolerances for dimensions H and A_3.
(“Accuracy classes and their tolerances” ☞ 26)

Ball Guide Rails, Resist CR

R1645 .3. .., SNS for mounting from above, with cover strip and strip clamps

Options and part numbers

Size	Ball guide rail with size	Accuracy class H	Number of sections ., Rail length L (mm), ... One-piece Uncoated end faces	One-piece Coated end faces	Composite Coated end faces
15	R1645 13	3	31, ...	41, ...	4., ...
20	R1645 83	3	31, ...	41, ...	4., ...
25	R1645 23	3	31, ...	41, ...	4., ...
30	R1645 73	3	31, ...	41, ...	4., ...
35	R1645 33	3	61, ...	71, ...	7., ...
45	R1645 43	3	61, ...	71, ...	7., ...
55	R1645 53	3	61, ...	71, ...	7., ...
65	R1645 63	3	61, ...	71, ...	7., ...
e.g.	R1645 73	3	31, 1676		



Note on installation
- Secure the cover strip!
- Strip clamps are included in scope of supply.
- Composite guide rails also available.

Recommended rail lengths, dimension drawing, dimensions and weights
☞ 122 – 123.

Accessories
- Cover strip ☞ 176
- Strip clamps ☞ 178

Ordering example 1 (up to L_{max})
Options:
- Ball Guide Rail CR, SNS
- Size 30
- Accuracy class H
- One-piece
- Uncoated end faces
- Rail length L = 1676 mm

Part number:
R1645 733 31, 1676 mm

Ordering example 2 (over L_{max})
Options:
- Ball Guide Rail CR, SNS
- Size 30
- Accuracy class H
- **2 sections**
- Coated end faces
- Rail length L = 5116 mm

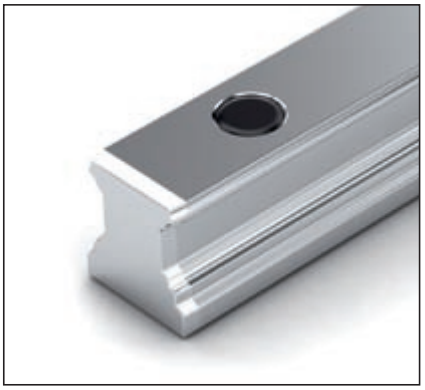
Part number:
R1645 733 4**2**, 5116 mm

Ball Guide Rails, Resist CR

R1645 .0. .., SNS for mounting from above, with plastic mounting hole plugs

Options and part numbers

Size	Ball guide rail with size	Accuracy class H	Number of sections ., Rail length L (mm), ... One-piece Uncoated end faces	One-piece Coated end faces	Composite Coated end faces
15	R1645 10	3	31, ...	41, ...	4., ...
20	R1645 80	3	31, ...	41, ...	4., ...
25	R1645 20	3	31, ...	41, ...	4., ...
30	R1645 70	3	31, ...	41, ...	4., ...
35	R1645 30	3	31, ...	41, ...	4., ...
45	R1645 40	3	31, ...	41, ...	4., ...
55	R1645 50	3	31, ...	41, ...	4., ...
65	R1645 60	3	31, ...	41, ...	4., ...
e.g.	R1645 70	3	31, 1676		



Note on installation
- Plastic mounting hole plugs included in scope of supply.
- Composite guide rails also available.

Recommended rail lengths, dimension drawing, dimensions and weights
☞ 126 – 127.

Accessories
- Plastic mounting hole plugs
☞ 179

Ordering example 1 (up to L_{max})
Options:
- Ball Guide Rail CR, SNS
- Size 30
- Accuracy class H
- One-piece
- Uncoated end faces
- Rail length L = 1676 mm

Part number:
R1645 703 31, 1676 mm

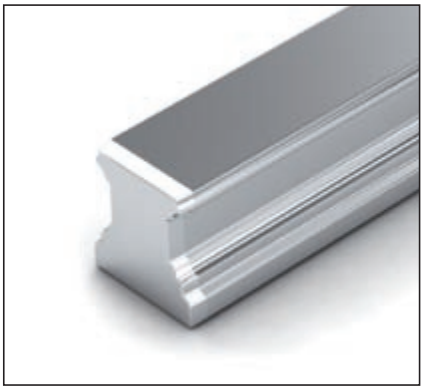
Ordering example 2 (over L_{max})
Options:
- Ball Guide Rail CR, SNS
- Size 30
- Accuracy class H
- **2 sections**
- Coated end faces
- Rail length L = 5116 mm

Part number:
R1645 703 4**2**, 5116 mm

R1647 .0. .., SNS for mounting from below

Options and part numbers

Size	Ball guide rail with size	Accuracy class H	Number of sections ., Rail length L (mm), ... One-piece Uncoated end faces	One-piece Coated end faces	Composite Coated end faces
15	R1647 10	3	31, ...	41, ...	4., ...
20	R1647 80	3	31, ...	41, ...	4., ...
25	R1647 20	3	31, ...	41, ...	4., ...
30	R1647 70	3	31, ...	41, ...	4., ...
35	R1647 30	3	31, ...	41, ...	4., ...
45	R1647 40	3	31, ...	41, ...	4., ...
55	R1647 50	3	31, ...	41, ...	4., ...
65	R1647 60	3	31, ...	41, ...	4., ...
e.g.	R1647 70	3			42, 5116



Note on installation
- Composite guide rails also available.

Recommended rail lengths, dimension drawing, dimensions and weights
☞ 130 – 131

Ordering example 1 (up to L_{max})
Options:
- Ball Guide Rail CR, SNS
- Size 30
- Accuracy class H
- One-piece
- Uncoated end faces
- Rail length L = 1676 mm

Part number:
R1647 703 31, 1676 mm

Ordering example 2 (over L_{max})
Options:
- Ball Guide Rail CR, SNS
- Size 30
- Accuracy class H
- **2 sections**
- Coated end faces
- Rail length L = 5116 mm

Part number:
R1647 703 4**2**, 5116 mm

V-Guide Rails

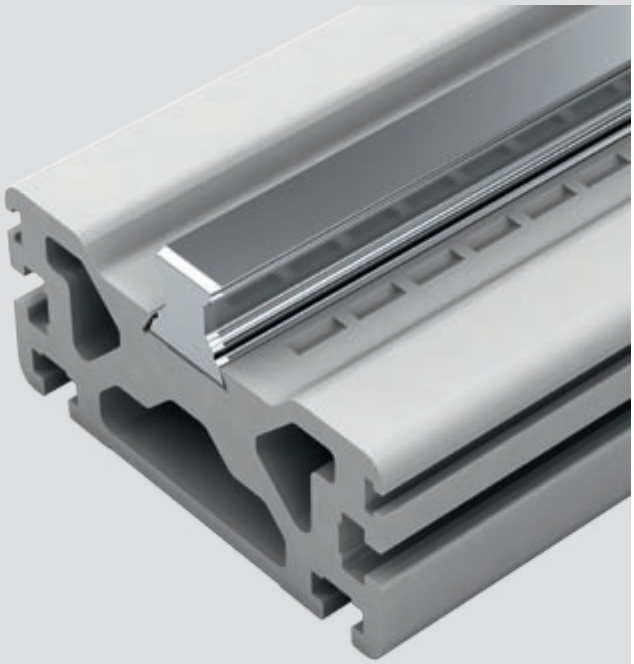
Product Description, V-Guide Rail SNS

Characteristic features

Thanks to their mounting style, V-Guide Rails for Ball Rail Systems offer the following advantages:

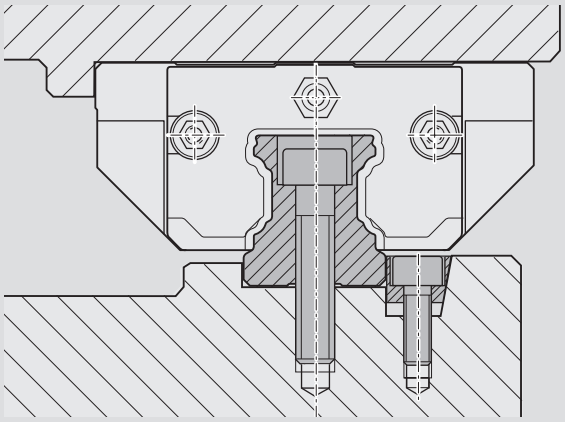
- Reduced geometric variations in runner block travel, since there are no mounting holes in the guide rail
- Freely selectable ball guide rail length (not dependent on mounting holes)
- No need to drill and tap holes in the mounting base
- V-Guide Rails are especially suited for single-rail applications (mounting in aluminum profiles)
- Rail mounting recess can be designed into aluminum profiles – no extra effort required
- Rail mounting recess can be machined with standard profile milling tools
- Improved rail straightness due to absence of mounting holes
- No need for mounting hole plugs or covers
- V-Guide Rails can be mounted at lower cost
- Smooth rail surface for optimal sealing action
- Multiple-rail applications require milling of parallel rail seating

Thanks to Rexroth's proven policy of interchangeability, the entire range of ball runner blocks and accessories can be used.

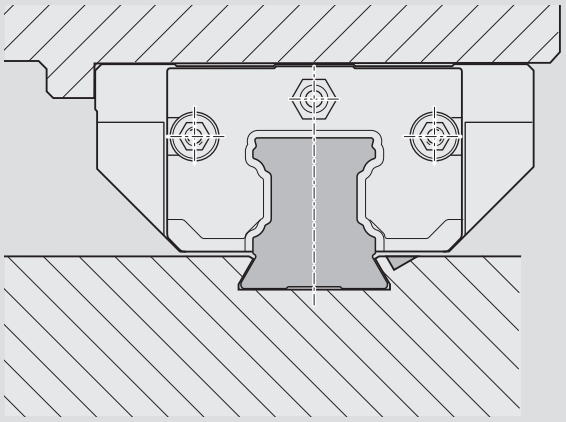


Comparison of Mounting Styles

Ball rail system with standard ball guide rail



Ball rail system with V-guide rail



Mounting of standard guide rail

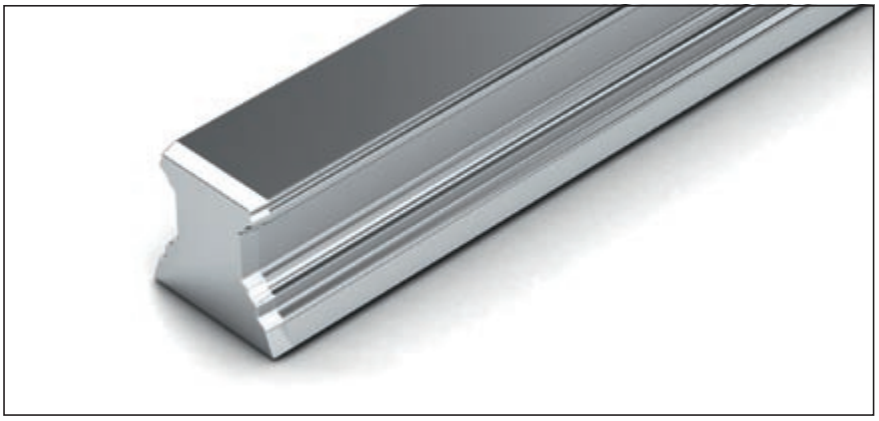
The standard guide rail is pressed against the reference edge using clamping strips or wedge profiles to align it. The rail is screwed into place from above or below. Mounting holes in the standard guide rail are closed with a cover strip or plugs.
Two rows of holes are needed in the machine bed for each standard guide rail.

Mounting of V-guide rail

The V-guide rail for ball rail systems has no mounting holes. It is installed by press-fitting it into mounting base.
The mating cavity for the rail can be produced using a standard contour milling machine.
It is not necessary to drill any holes.

SNS without Mounting Holes

R1608 .1. ..



Without mounting holes
Press-fit mounting

Note on installation
- Composite ball guide rails also available.
- Combinable with all ball runner blocks.

Options and part numbers

Size	Ball guide rail with size	Accuracy class	Number of sections ., Rail length L (mm), ...		Rail length freely selectable up to L_{max}
		N	One-piece	Composite	L_{max} (mm)
15	R1608 11	4	31, ...	3., ...	3836
20	R1608 81	4	31, ...	3., ...	3836
25	R1608 21	4	31, ...	3., ...	3836
e.g.	R1608 21	4	31, 1676		

Ordering example 1 (up to L_{max})
Options:
- Ball Guide Rail SNS
- Size 25
- Accuracy class N
- One-piece
- Rail length L = 1676 mm

Part number:
R1608 214 31, 1676 mm

Ordering example 2 (over L_{max})
Options:
- Ball Guide Rail SNS
- Size 25
- Accuracy class N
- **2 sections**
- Rail length L = 5116 mm

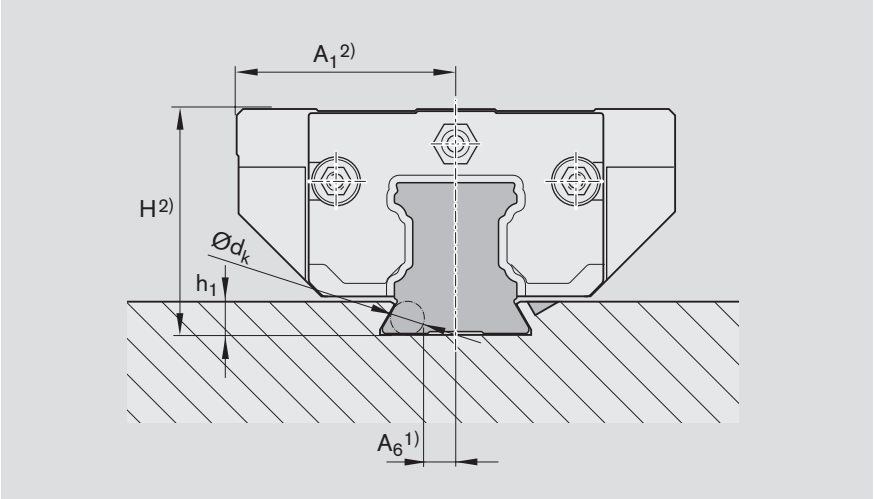
Part number:
R1608 214 3**2**, 5116 mm

V-Guide Rails

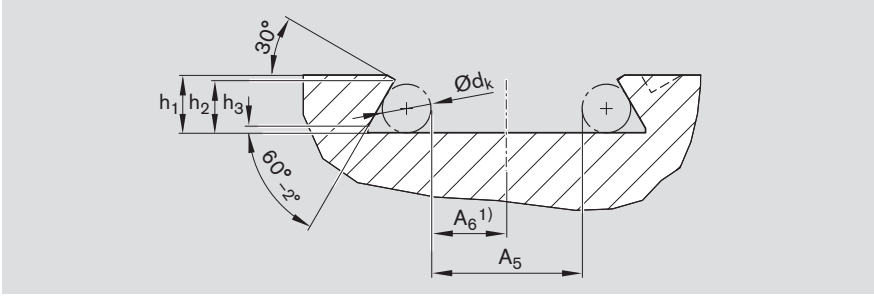
Mounting and Installation Tolerances

Single-rail applications

For details regarding straightness and parallelism of the guide rail mounting surface, ☞ 26.



Structural design of the rail mounting recess
Material recommended by Rexroth:
Wrought aluminum alloy F22 to F27

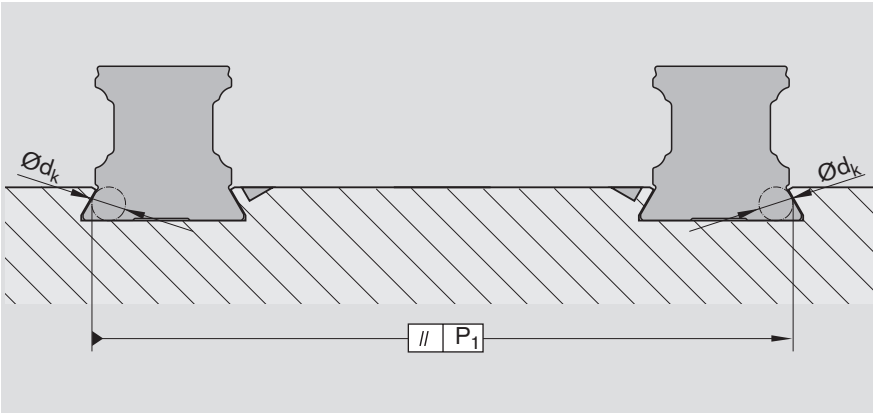


Size	Dimensions (mm)					
	$A_5^{\pm 0.2}$	A_6 1)	$h_1^{\pm 0.15}$	$h_2^{\pm 0.1}$	$h_{3-0.2}$	$Ød_k$
15	8.6	4.2	3.5	3.0	0.5	3.0
20	13.4	6.6	4.0	3.6	0.5	3.0
25	14.0	6.9	5.0	4.6	0.5	4.0

1) Tolerances of $A_6 \triangleq A_3$ ☞ 26
2) For dimensions and tolerances, see the sections on Ball Runner Blocks

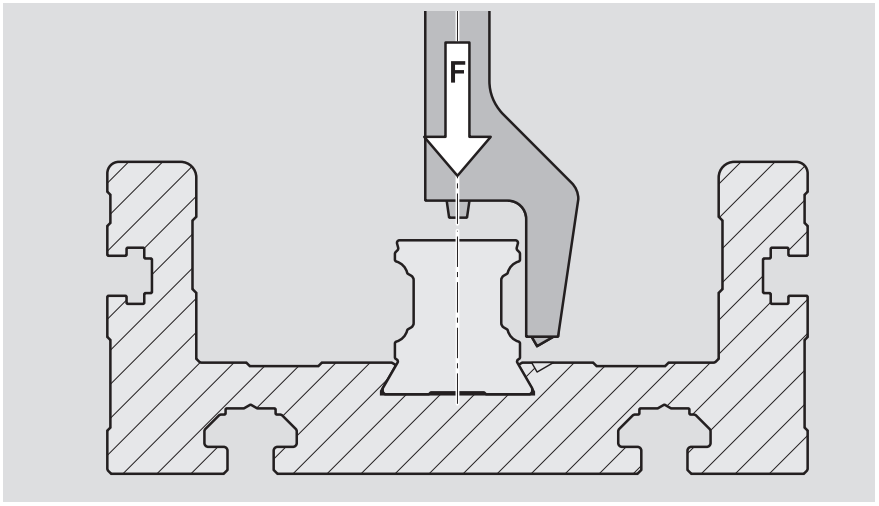
Multiple-rail applications

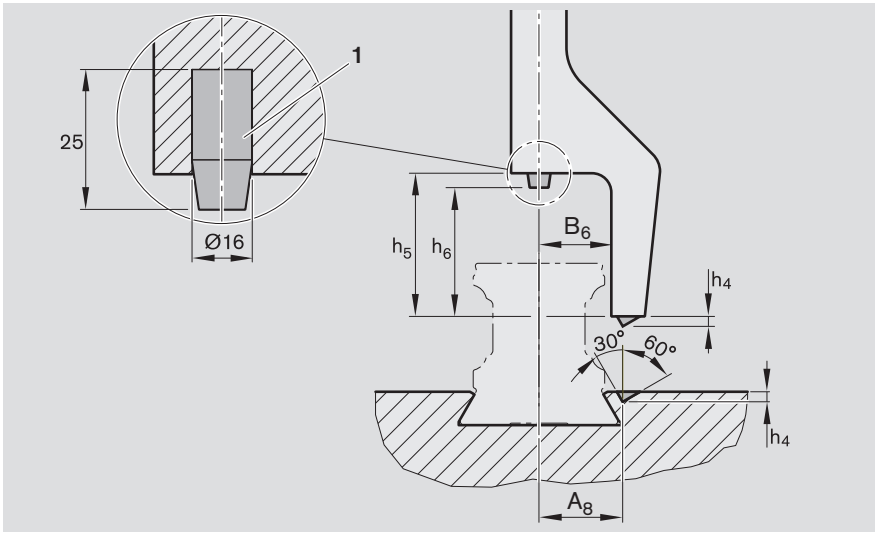
For multiple-rail applications the rail seating must be machined into the mounting base.
For details regarding vertical offset and parallelism of the guide rail mounting surfaces, ☞ 240 – 242.



Recommended installation procedure

⚠ **Do not press in manually!**

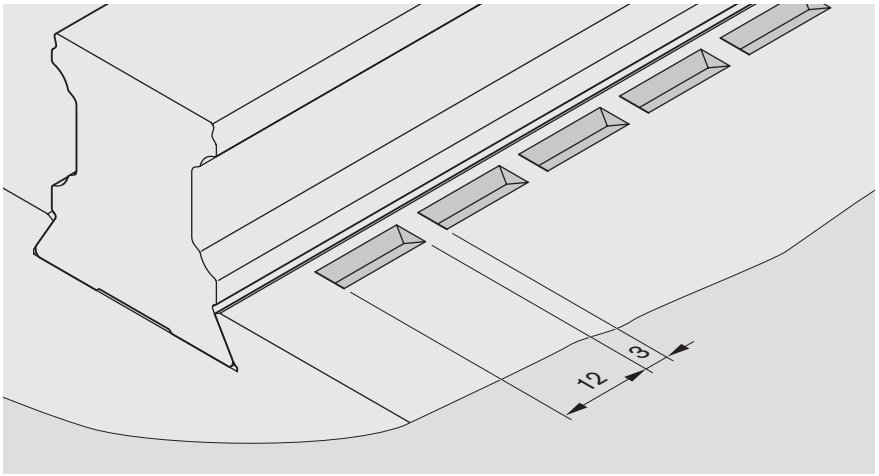




1) Example: Use rubber buffers as contact points while pressing the guide rail in.
   Material: PUR
   Hardness: 90±5 Shore A

Size	Dimensions (mm)					Pressing force
	A_8	B_6	h_4	h_5	h_6	(kN)
15	9.5	8	1.3	14	9.5	27
20	12.0	10	1.8	18	12.8	30
25	14.0	11	2.0	21	15.3	33

Recommended values for all sizes



Wide Ball Rail Systems made of steel and Resist CR

Product Description, Ball Runner Blocks BNS, CNS

Characteristic features

- Limitless interchangeability; all ball guide rail versions can be combined at will with all ball runner block versions within each accuracy class
- Due to very high torsional moment load capacity and torsional rigidity, particularly suitable for single rail applications
- High torque load capacity
- Same load capability in all four main load directions
- Integrated all-round sealing
- Low noise level and best travel performance
- Excellent dynamic characteristics:
  Travel speed: v_{max} up to 5 m/s [1)]
  Acceleration: a_{max} up to 500 m/s^2 [1)]
- Long-term lubrication, up to several years
- Minimum quantity lubrication system with integrated reservoir for oil lubrication[1)]
- Lube ports with metal threads on all sides[1)]
- Optimum system rigidity through preloaded O-arrangement
- Extensive range of accessories

Note

- Size 20/40:
  New Ball Rail Systems with different ball diameters. Not interchangeable with previous size 20/40 versions!

Further highlights

- Optimized entry-zone geometry and high number of balls per track minimizes variation in elastic deflection
- Mounting threads provided on end faces for fixing of all add-on elements
- Guide with low clearance or slight preload
- Smooth, light running thanks to optimized ball recirculation and ball or ball chain guidance[1)]
- Attachments can be bolted to ball runner blocks from above or below[1)]
- Improved rigidity under lift-off and side loading conditions when additional mounting screws are used in the two holes provided at the center of the runner block
- Ball runner blocks pre-lubricated in factory[1)]
- Available with ball chain as an option[1)]

Corrosion protection (optional)

- Resist CR:
  Ball runner block body and ball guide rail made of steel with matte-silver hard-chrome plated corrosion-resistant coating

1) depends on type

Overview of Wide Ball Runner Block models

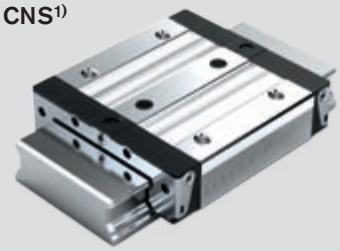
BNS[1)]

New in sizes 20/40 and 25/70:
- Now also with ball chain
- Pre-lubricated
- Further sizes in preparation

BNS

Size 35/90

CNS[1)]



New in sizes 20/40 and 25/70:
- With ball chain
- Pre-lubricated
- Further sizes in preparation

1) Ball chain (optional)
- Optimizes noise levels

Definition Ball Runner Block design style		Code (example) B	N	S
Width	Flanged			
	Slimline			
	Wide	**B**		
	Compact			
Length	**N**ormal		**N**	
	Long			
	Short			
Height	**S**tandard height			**S**
	High			
	Low			

Wide Ball Rail Systems made of steel and Resist CR

BNS – Wide, normal, standard height

Ball Runner Blocks made of steel R1671 … 2.

Dynamic characteristics
Travel speed: $v_{max} = 5$ m/s
Acceleration: $a_{max} = 500$ m/s^2
(If $F_{comb} > 2.8 \cdot F_{pr}$: $a_{max} = 50$ m/s^2)

Note on lubrication
– Pre-lubricated

Further Ball Runner Blocks BNS
– See below for corrosion-resistant ball runner blocks

Note
Can be used on all Ball Guide Rails BNS.

Options and part numbers

Size	Ball runner block with size	Preload class		Accuracy class			Seal for ball runner block			
							without ball chain		with ball chain	
		C0	C1	N	H	P	SS	DS	SS	DS
20/40[1]	R1671 5	9		4	3	–	20	–	22	–
			1	4	3	2	20	2Z	22	2Y
25/70	R1671 2	9		4	3	–	20	–	22	–
			1	4	3	2	20	2Z	22	2Y
e.g.	R1671 2		1		3		20			

Ordering example
Options:
– Ball Runner Block BNS
– Size 25/70
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R1671 213 20

Ball Runner Blocks, Resist CR R1671 … 7.

Note on lubrication
– Pre-lubricated

Note
Can be used on all Ball Guide Rails BNS.

Options and part numbers

Size	Ball runner block with size	Preload class	Accuracy class	Seal for ball runner block			
				without ball chain		with ball chain	
		C0	H	SS	DS	SS	DS
20/40[1]	R1671 5	9	3	70	7Z	72	7Y
25/70	R1671 2	9	3	70	7Z	72	7Y
e.g.	R1671 2	9	3	70			

Ordering example
Options:
– Ball Runner Block BNS
– Size 25/70
– Preload class C0
– Accuracy class H
– With standard seal, without ball chain
Part number: R1671 293 70

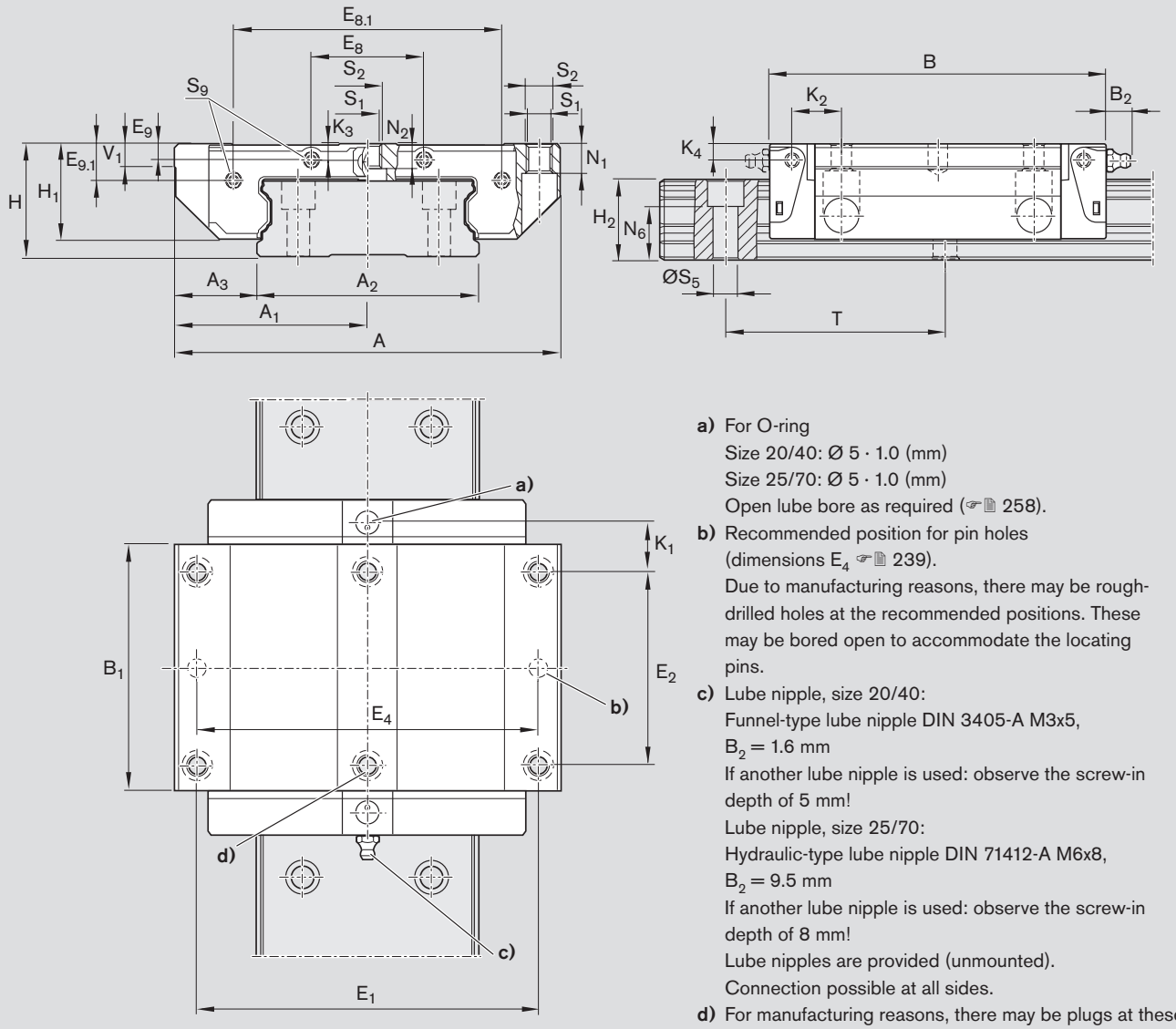
1) **Note:** New Ball Runner Block not combinable with existing Ball Guide Rail R167. 8.. ..!

Preload classes
C0 = without preload
C1 = preload 2% C

Seals
SS = standard seal
DS = double-lipped seal

Key to table
Gray numbers
= version/combination not preferred
(longer delivery times in some cases)

Ball Runner Blocks BNS



a) For O-ring
Size 20/40: Ø 5 · 1.0 (mm)
Size 25/70: Ø 5 · 1.0 (mm)
Open lube bore as required (☞ 258).

b) Recommended position for pin holes (dimensions E_4 ☞ 239).
Due to manufacturing reasons, there may be rough-drilled holes at the recommended positions. These may be bored open to accommodate the locating pins.

c) Lube nipple, size 20/40:
Funnel-type lube nipple DIN 3405-A M3x5,
$B_2 = 1.6$ mm
If another lube nipple is used: observe the screw-in depth of 5 mm!
Lube nipple, size 25/70:
Hydraulic-type lube nipple DIN 71412-A M6x8,
$B_2 = 9.5$ mm
If another lube nipple is used: observe the screw-in depth of 8 mm!
Lube nipples are provided (unmounted).
Connection possible at all sides.

d) For manufacturing reasons, there may be plugs at these positions. These must be removed before mounting.

Size	Dimensions (mm)																		
	A	A_1	A_2	A_3	B	B_1	E_1	E_2	E_8	$E_{8.1}$	E_9	$E_{9.1}$	H	H_1	H_2	K_1	K_2	K_3	K_4
20/40	80	40	42	19.0	73	51.3	70	40	18	53.4	3.4	8.1	27	22.50	18.30	10.6	11.0	3.5	3.5
25/70	120	60	69	25.5	105	76.5	107	60	35	83.5	4.9	11.3	35	29.75	23.55	14.3	15.5	5.2	5.2

Size	Dimensions (mm)									Weight (kg)	Load capacities[1] (N)		Load moments[1] (Nm)			
	N_1	N_2	$N_6^{\pm 0.5}$	S_1	S_2	S_5	S_9	T	V_1		C	C_0	M_t	M_{t0}	M_L	M_{L0}
20/40	7.70	3.70	12.5	5.3	M6	4.4	M2.5x1.5^{+3}	60	6.0	0.45	13 650	19 675	310	450	95	135
25/70	9.35	7.05	14.4	6.7	M8	7.0	M3x2$^{+4.5}$	80	7.5	1.70	29 000	42 500	1 080	1 580	305	450

1) Load capacities and moments for Ball Runner Block **without** ball chain. Load capacities and moments for Ball Runner Block **with** ball chain ☞ 8. Determination of the dynamic load capacities and moments is based on a travel life of 100,000 m per ISO 14728-1. Often only 50,000 m are actually stipulated. For comparison: Multiply values **C**, $\mathbf{M_t}$ and $\mathbf{M_L}$ from the table by 1.26.

Wide Ball Rail Systems made of steel and Resist CR

BNS – Wide, normal, standard height

Ball Runner Blocks made of steel R1671 … 1.

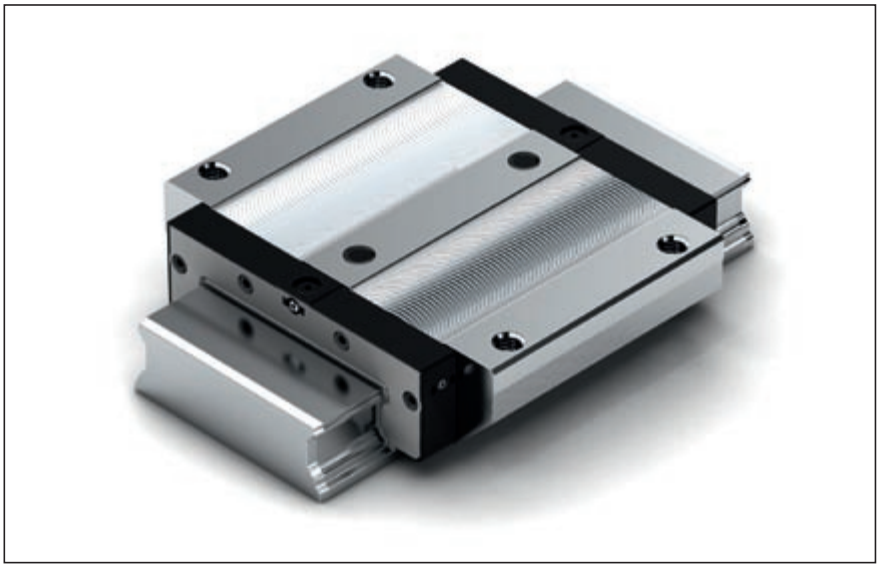
Dynamic characteristics
Travel speed: $v_{max} = 3$ m/s
Acceleration: $a_{max} = 250$ m/s^2
(If $F_{comb} > 2.8 \cdot F_{pr}$: $a_{max} = 50$ m/s^2)

Note on lubrication
– Not pre-lubricated

Further Ball Runner Blocks BNS
– See below for corrosion-resistant ball runner blocks

Note
Can be used on all Ball Guide Rails BNS.

Ordering example
Options:
– Ball Runner Block BNS
– Size 35/90
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R1671 313 10



Options and part numbers

Size	Ball runner block with size	Preload class C0	Preload class C1	Accuracy class H			Seal for ball runner block without ball chain SS
35/90	R1671 3	9		4	3	–	10
			1	4	3	2	10
e.g.	R1671 3		1		3		10

Ball Runner Blocks, Resist CR R1671 … 6.

Note on lubrication
– Not pre-lubricated

Note
Can be used on all Ball Guide Rails BNS.

Ordering example
Options:
– Ball Runner Block BNS
– Size 35/90
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R1671 313 60

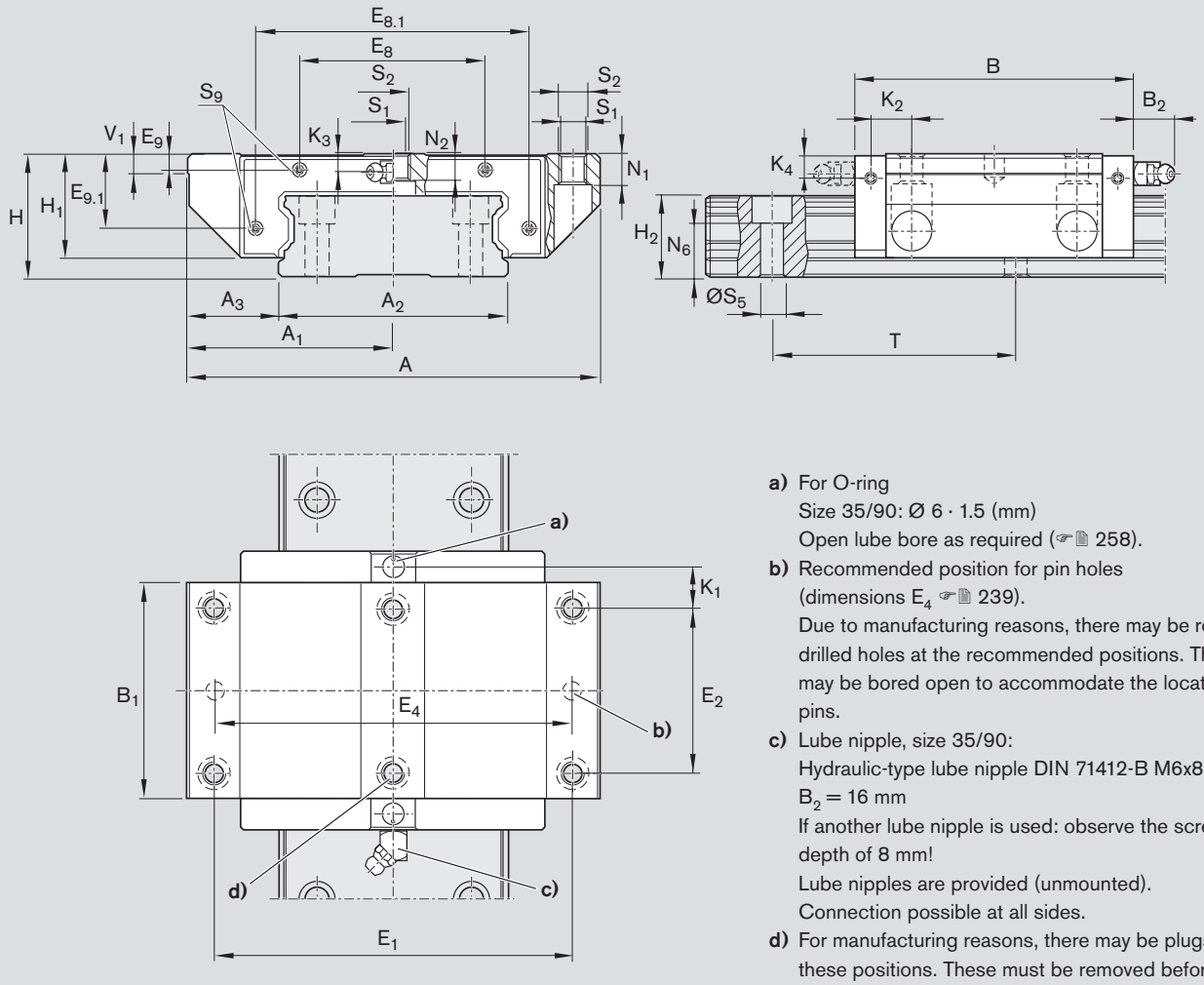
Options and part numbers

Size	Ball runner block with size	Preload class C0	Preload class C1	Accuracy class H	Seal for ball runner block without ball chain SS
35/90	R1671 3	9	1	3	60
e.g.	R1671 3		1	3	60

Preload classes
C0 = without preload
C1 = preload 2% C

Seals
SS = standard seal

Ball Runner Blocks BNS



a) For O-ring
Size 35/90: Ø 6 · 1.5 (mm)
Open lube bore as required (☞ 258).

b) Recommended position for pin holes (dimensions E_4 ☞ 239).
Due to manufacturing reasons, there may be rough-drilled holes at the recommended positions. These may be bored open to accommodate the locating pins.

c) Lube nipple, size 35/90:
Hydraulic-type lube nipple DIN 71412-B M6x8, $B_2 = 16$ mm
If another lube nipple is used: observe the screw-in depth of 8 mm!
Lube nipples are provided (unmounted).
Connection possible at all sides.

d) For manufacturing reasons, there may be plugs at these positions. These must be removed before mounting.

Size	Dimensions (mm)																
	A	A_1	A_2	A_3	B	B_1	E_1	E_2	E_8	$E_{8.1}$	E_9	$E_{9.1}$	H	H_1	H_2	K_1	K_2
35/90	162	81	90	36	142	113.6	144	80	79	116	6.8	29.9	50	42.5	31.85	22.8	24.8

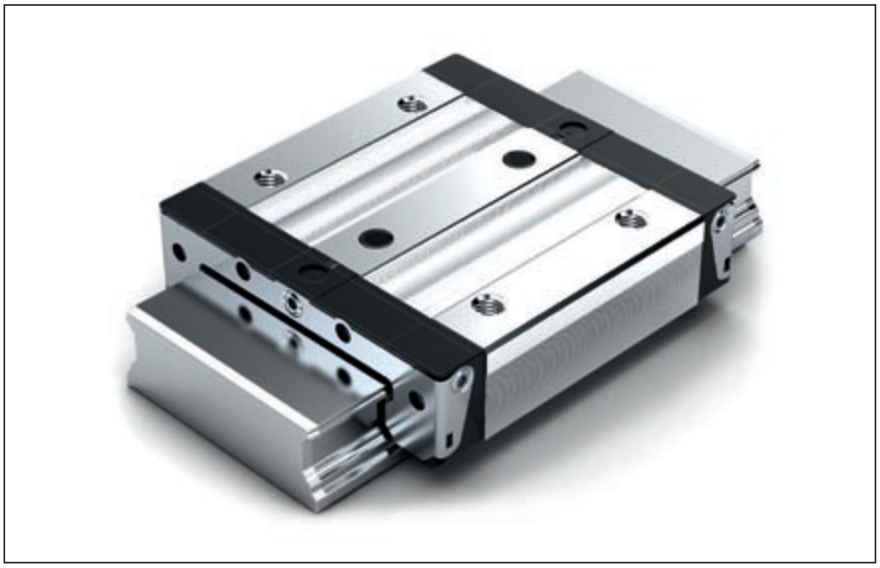
Size	Dimensions (mm)											Weight (kg)	Load capacities[1] (N)		Load moments[1] (Nm)			
	K_3	K_4	N_1	N_2	$N_6^{\pm 0.5}$	S_1	S_2	S_5	S_9	T	V_1		C	C_0	M_t	M_{t0}	M_L	M_{L0}
35/90	9	9	14	12	20.5	8.4	M10	9	M3x5	80	8.0	3.70	58 200	86 300	2 880	4 270	920	1 370

1) Load capacities and moments for Ball Runner Block **without** ball chain.
Determination of the dynamic load capacities and moments is based on a travel life of 100,000 m per ISO 14728-1. Often only 50,000 m are actually stipulated. For comparison: Multiply values **C**, $\mathbf{M}_t$ and $\mathbf{M}_L$ from the table by 1.26.

Wide Ball Rail Systems made of steel and Resist CR

CNS – Compact, normal, standard height

Ball Runner Blocks made of steel[2] R1672 … 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

Further Ball Runner Blocks CNS
– See below for corrosion-resistant ball runner blocks

Note
Can be used on all Ball Guide Rails BNS.

Ordering example
Options:
– Ball Runner Block CNS
– Size 25/70
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R1672 213 20

Options and part numbers

Size	Ball runner block with size	Preload class		Accuracy class			Seal for ball runner block			
							without ball chain		with ball chain	
		C0	C1	N	H	P	SS	DS	SS	DS
20/40[1]	R1672 5	9		4	3	–	20	–	22	–
			1	4	3	–	20	2Z	22	2Y
25/70	R1672 2	9		4	3	–	20	–	22	–
			1	4	3	–	20	2Z	22	2Y
e.g.	R1672 2		1		3		20			

Ball Runner Blocks, Resist CR[2] R1672 … 7.

Note on lubrication
– Pre-lubricated

Note
Can be used on all Ball Guide Rails BNS.

Ordering example
Options:
– Ball Runner Block CNS
– Size 25/70
– Preload class C0
– Accuracy class H
– With standard seal, without ball chain
Part number: R1672 293 70

Options and part numbers

Size	Ball runner block with size	Preload class	Accuracy class	Seal for ball runner block			
				without ball chain		with ball chain	
		C0	H	SS	DS	SS	DS
20/40[1]	R1672 5	9	3	70	7Z	72	7Y
25/70	R1672 2	9	3	70	7Z	72	7Y
e.g.	R1672 2	9	3	70			

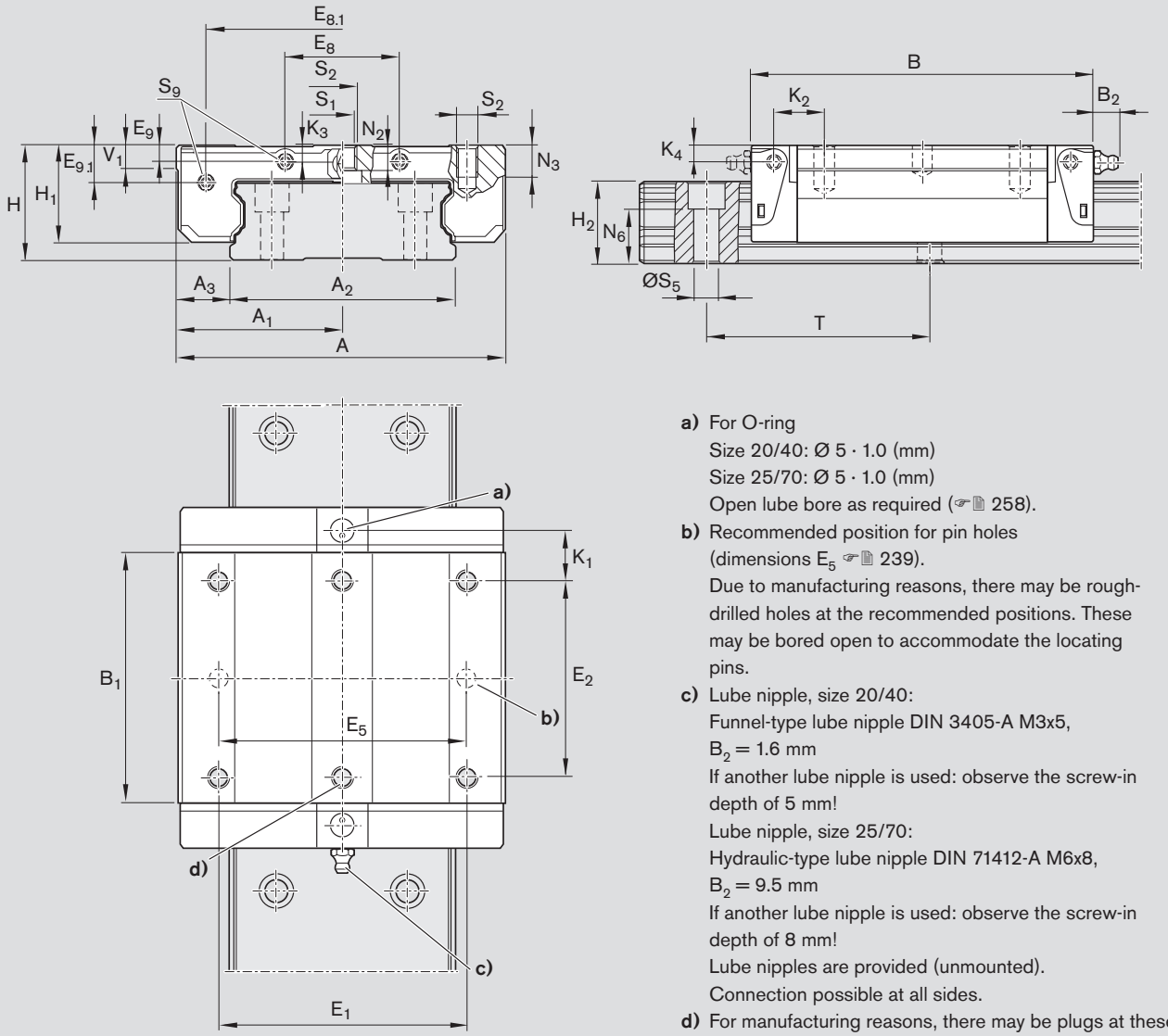
1) **Note:** New Ball Runner Block not combinable with existing Ball Guide Rail R167. 8.. ..!
2) In preparation

Preload classes
C0 = without preload
C1 = preload 2% C

Seals
SS = standard seal
DS = double-lipped seal

Key to table
Gray numbers
= version/combination not preferred (longer delivery times in some cases)

Ball Runner Blocks CNS



a) For O-ring
Size 20/40: Ø 5 · 1.0 (mm)
Size 25/70: Ø 5 · 1.0 (mm)
Open lube bore as required (☞ 258).

b) Recommended position for pin holes (dimensions E_5 ☞ 239).
Due to manufacturing reasons, there may be rough-drilled holes at the recommended positions. These may be bored open to accommodate the locating pins.

c) Lube nipple, size 20/40:
Funnel-type lube nipple DIN 3405-A M3x5,
$B_2 = 1.6$ mm
If another lube nipple is used: observe the screw-in depth of 5 mm!
Lube nipple, size 25/70:
Hydraulic-type lube nipple DIN 71412-A M6x8,
$B_2 = 9.5$ mm
If another lube nipple is used: observe the screw-in depth of 8 mm!
Lube nipples are provided (unmounted).
Connection possible at all sides.

d) For manufacturing reasons, there may be plugs at these positions. These must be removed before mounting.

Size	Dimensions (mm)																		
	A	A_1	A_2	A_3	B	B_1	E_1	E_2	E_8	$E_{8.1}$	E_9	$E_{9.1}$	H	H_1	H_2	K_1	K_2	K_3	K_4
20/40	62	31	42	10.0	73.0	51.3	46	32	18	53.4	3.4	8.1	27	22.50	18.30	14.6	15.00	3.5	3.5
25/70	100	50	69	15.5	104.7	76.5	76	50	35	83.5	4.9	11.3	35	29.75	23.55	19.3	20.45	5.2	5.2

Size	Dimensions (mm)									Weight (kg)	Load capacities[1] (N)		Load moments[1] (Nm)			
	N_2	N_3	$N_6^{\pm 0.5}$	S_1	S_2	S_5	S_9	T	V_1		C	C_0	M_t	M_{t0}	M_L	M_{L0}
20/40	3.70	6	12.5	5.3	M6	4.4	M2.5x1.5^{+3}	60	6.0	0.35	13 650	19 675	310	450	95	135
25/70	7.05	8	14.4	6.7	M8	7.0	M3x2$^{+4.5}$	80	7.5	1.50	29 000	42 500	1 080	1 580	305	450

1) Load capacities and moments for Ball Runner Block **without** ball chain. Load capacities and moments for Ball Runner Block **with** ball chain ☞ 8. Determination of the dynamic load capacities and moments is based on a travel life of 100,000 m per ISO 14728-1. Often only 50,000 m are actually stipulated. For comparison: Multiply values **C**, $\mathbf{M_t}$ and $\mathbf{M_L}$ from the table by 1.26.

Wide Ball Rail Systems made of steel and Resist CR

Product Description, Ball Guide Rails BNS

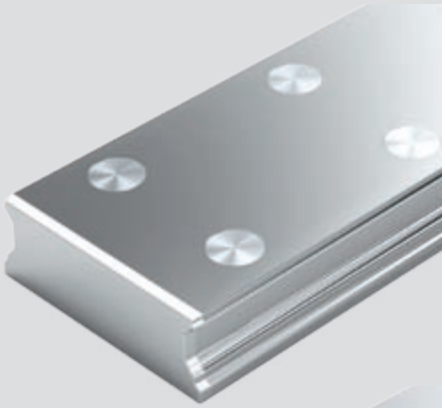
Characteristic features

- Top rigidity in all load directions
- Top torque load capacity

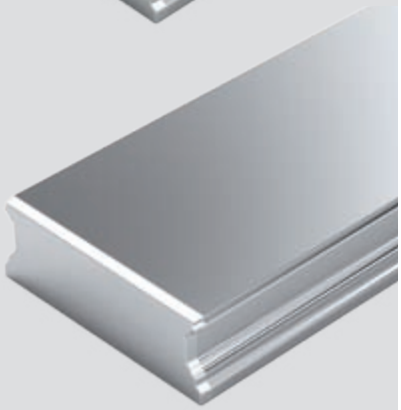
Corrosion protection (optional)
- Resist CR:
  Ball guide rail made of steel with matte-silver hard-chrome plated corrosion-resistant coating in accuracy class H

Ball guide rails with plastic mounting hole plugs

Ball guide rails with steel mounting hole plugs



Ball guide rails for mounting from below



Note
- Size 20/40:
  New Ball Rail Systems with different ball diameters. Not interchangeable with previous size 20/40 versions!

Definition Ball guide rail design style		Code (example)		
		B	N	S
Width	Slimline			
	Wide	B		
Length	Normal		N	
Height	Standard height			S

Ordering Examples

Ordering ball guide rails in recommended lengths

The procedure shown in the following ordering examples applies to all ball guide rails. Recommended rail lengths are more cost effective.

Options and part numbers

Size	Ball guide rail with size	Accuracy class			Number of sections ., Rail length L (mm), ...		Hole spacing T (mm)	Recommended rail length according to formula $L = n_B \cdot T - 4$ mm
		N	H	P	One-piece	Composite		Maximum number of holes per row n_B
20/40[1)]	R1675 50	4	3	2	31, ...	3., ...	60	64
25/70	R1675 20	4	3	2	31, ...	3., ...	80	48
35/90	R1675 30	4	3	2	31, ...	3., ...	80	48
e.g.	R1675 30		3		31, 1676			

Excerpt from table with part numbers and recommended rail lengths for ordering example

From the desired length to the recommended length

$$L = \left(\frac{L_W}{T}\right)^{*} \cdot T - 4$$

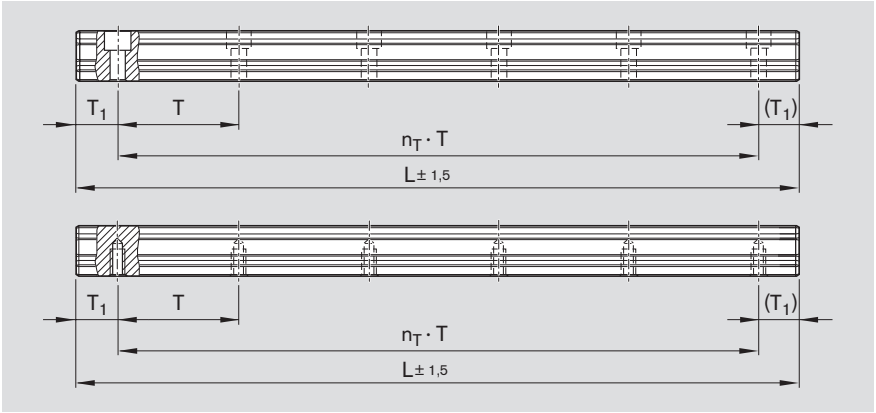
* Round up the quotient L_W/T to the next whole number.

W = desired length
T = hole spacing

Calculation example

$$L = \left(\frac{1660\ \text{mm}}{80\ \text{mm}}\right) \cdot 80\ \text{mm} - 4\ \text{mm}$$

$L = 21 \cdot 80\ \text{mm} - 4\ \text{mm}$
$L = 1676\ \text{mm}$



$$L = n_B \cdot T - 4$$

Basis: number of holes per row

$$L = n_T \cdot T + 2 \cdot T_{1S}$$

Basis: number of spaces between holes

L	=	recommended rail length	(mm)
L_W	=	desired rail length	(mm)
T	=	hole spacing[1)]	(mm)
T_{1S}	=	preferred dimension[1)]	(mm)
n_B	=	number of holes per row	(–)
n_T	=	no. of spaces between holes	(–)

1) For values, see dimensions table at dimension drawing.

Notes on ordering examples

If the preferred dimension T_{1S} cannot be used:
- Select an end space T_1 between T_{1S} and $T_{1\ min}$.
- Alternatively, select an end space between T_1 and T_{1max}.

Ordering example 1 (up to L_{max})

- Ball guide rail BNS size 35/90 with plastic mounting hole plugs
- Accuracy class H
- Calculated rail length 1676 mm, (20 · T, preferred dimension $T_{1S} = 38$ mm; number of holes per row $n_B = 21$)

Ordering data
Part number, rail length (mm)
T_1 / $n_T \cdot T$ / T_1 (mm)

R1675 303 31, 1676 mm
38 / 20 · 80 / 38 mm

Ordering example 2 (over L_{max})

- Ball guide rail BNS size 35/90 with plastic mounting hole plugs
- Accuracy class H
- Calculated rail length 5116 mm, 2 sections (63 · T, preferred dimension $T_{1S} = 38$ mm; number of holes per row $n_B = 64$)

Ordering data
Part number and number of sections, rail length (mm)
T_1 / $n_T \cdot T$ / T_1 (mm)

R1675 303 32, 5116 mm
38 / 63 · 80 / 38 mm

Rail lengths greater than L_{max} are made up of matching rail sections mounted end to end.

Wide Ball Rail Systems made of steel and Resist CR

BNS with Plastic Mounting Hole Plugs

Ball Guide Rails made of steel R1675 .0. ..

With two-row mounting hole pattern, for mounting from above, with plastic mounting hole plugs

Notes for mounting
- Plastic mounting hole plugs included in scope of supply.
- Follow the mounting instructions!
- Send for the publication “Mounting Instructions for Ball Rail Systems.”
- Composite guide rails also available.

Further Ball Guide Rails BNS and accessories
- See below for corrosion-resistant ball guide rails
- Plastic Mounting Hole Plugs, part numbers ☞ 179

Options and part numbers

Size	Ball guide rail with size	Accuracy class			Number of sections ., Rail length L (mm), ...		Hole spacing T (mm)	Recommended rail length according to formula $L = n_B \cdot T - 4$ mm
		N	H	P	One-piece	Composite		Maximum number of holes per row n_B
20/40[1]	R1675 50	4	3	2	31, ...	3., ...	60	64
25/70	R1675 20	4	3	2	31, ...	3., ...	80	48
35/90	R1675 30	4	3	2	31, ...	3., ...	80	48
e.g.	R1675 30		3		31, 1676			

Ball Guide Rails, Resist CR R1673 .0. ..

With two-row mounting hole pattern, for mounting from above, with plastic mounting hole plugs

Options and part numbers

Size	Ball guide rail with size	Accuracy class	Number of sections ., Rail length L (mm), ...			Hole spacing T (mm)	Recommended rail length according to formula $L = n_B \cdot T - 4$ mm
			One-piece		Composite		
		H	Uncoated end faces	Coated end faces	Coated end faces		Maximum number of holes per row n_B
20/40[1]	R1673 50	3	31, ...	41, ...	4., ...	60	64
25/70	R1673 20	3	31, ...	41, ...	4., ...	80	48
35/90	R1673 30	3	31, ...	41, ...	4., ...	80	48
e.g.	R1673 30	3			42, 5116		

1) **Note:** New Ball Guide Rail not combinable with existing Ball Runner Block R1671. 8.. ..!

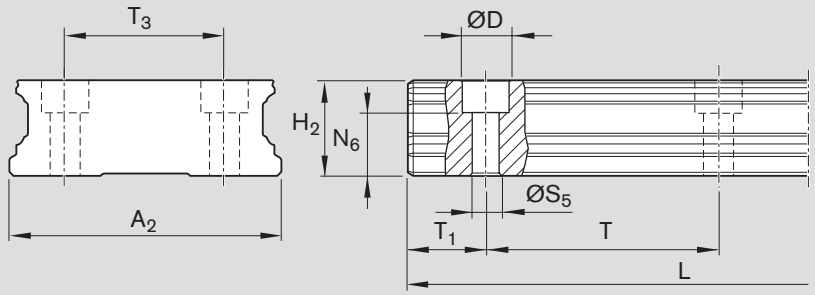
Ordering example 1 (up to L_{max})
Options:
- Ball Guide Rail BNS
- Size 35/90
- Accuracy class H
- One-piece
- Uncoated end faces
- Rail length L = 1676 mm

Part number:
R1675 303 31, 1676 mm

Ordering example 2 (over L_{max})
Options:
- Ball Guide Rail CR, BNS
- Size 35/90
- Accuracy class H
- **2 sections**
- Coated end faces
- Rail length L = 5116 mm

Part number:
R1673 303 4**2**, 5116 mm

Ball Guide Rails BNS



Size	Dimensions (mm)										Weight
	A_2	D	H_2 1)	L_{max}	$N_6^{\pm 0.5}$	S_5	T	$T_{1\ min}$	T_{1S} 2)	$T_{1\ max}$	T_3	(kg/m)
20/40	42	7.4	18.30	3 836	12.45	4.4	60	10	28	50	24	5.3
25/70	69	11.0	23.55	3 836	14.50	7.0	80	10	38	70	40	11.6
35/90	90	15.0	31.85	3 836	20.50	9.0	80	12	38	68	60	21.0

1) Dimension H_2 without cover strip

2) Recommended: preferred dimension T_{1S} with tolerances ±0.75.

Wide Ball Rail Systems made of steel and Resist CR

BNS with Steel Mounting Hole Plugs

Ball Guide Rails made of steel R1676 .5. ..

With two-row mounting hole pattern, for mounting from above, with steel mounting hole plugs

Notes for mounting
- Steel mounting hole plugs not included in scope of supply.
- Follow the mounting instructions!
- Send for the publication “Mounting Instructions for Ball Rail Systems.”
- Composite guide rails also available.

Accessories
- Steel mounting hole plugs ☞ 179
- Mounting tool for steel mounting hole plugs ☞ 179

Options and part numbers

Size	Ball guide rail with size	Accuracy class			Number of sections ., Rail length L (mm), ...		Hole spacing T (mm)	Recommended rail length according to formula $L = n_B \cdot T - 4$ mm
		N	H	P	One-piece	Composite		
25/70	R1676 25	4	3	2	31, ...	3., ...	80	48
35/90	R1676 35	4	3	2	31, ...	3., ...	80	48
e.g.	R1676 35		3		31, 1676			

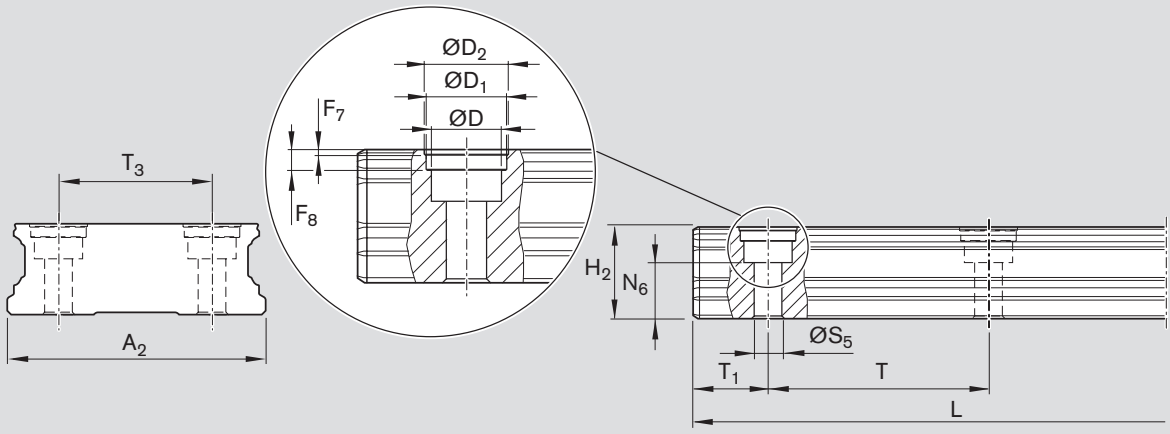
Ordering example 1 (up to L_{max})
Options:
- Ball Guide Rail BNS
- Size 35/90
- Accuracy class H
- One-piece
- Rail length L = 1676 mm

Part number:
R1676 353 31, 1676 mm

Ordering example 2 (over L_{max})
Options:
- Ball Guide Rail BNS
- Size 35/90
- Accuracy class H
- **2 sections**
- Rail length L = 5116 mm

Part number:
R1676 353 **32**, 5116 mm

Ball Guide Rails BNS



Size	Dimensions (mm)															Weight
	A_2	D	D_1	D_2	F_7	F_8	H_2 1)	L_{max}	$N_6^{\pm 0.5}$	S_5	T	$T_{1\,min}$	T_{1S} 2)	$T_{1\,max}$	T_3	(kg/m)
25/70	69	11.0	12.55	13	0.9	3.7	23.55	3 836	14.5	7.0	80	10	38	70	40	11.6
35/90	90	15.0	17.55	18	0.9	3.6	31.85	3 836	20.5	9.0	80	12	38	68	60	21.0

1) Dimension H_2 without cover strip

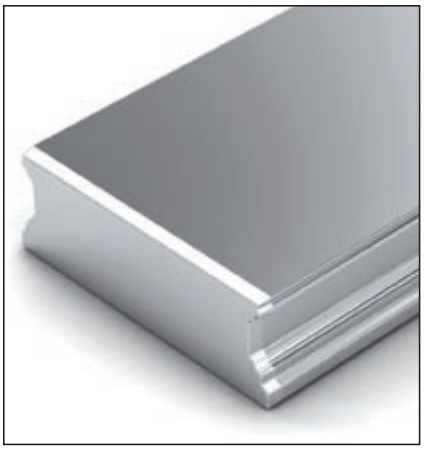
2) Recommended: preferred dimension T_{1S} with tolerances ±0.75.

BNS for mounting from below

Ball Guide Rails made of steel R1677 .0. ..

With two-row mounting hole pattern, for mounting from below

Notes for mounting
- Follow the mounting instructions! Send for the publication “Mounting Instructions for Ball Rail Systems.”
- Composite guide rails also available.



Options and part numbers

Size	Ball guide rail with size	Accuracy class			Number of sections ., Rail length L (mm), ...		Hole spacing T (mm)	Recommended rail length according to formula $L = n_B \cdot T - 4$ mm
		N	H	P	One-piece	Composite		
20/40[1)]	R1677 50	4	3	2	31, ...	3., ...	60	64
25/70	R1677 20	4	3	2	31, ...	3., ...	80	48
35/90	R1677 30	4	3	2	31, ...	3., ...	80	48
e.g.	R1677 30		3		31, 1676			

1) **Note**: New Ball Guide Rail not combinable with existing Ball Runner Block R1671. 8.. ..!

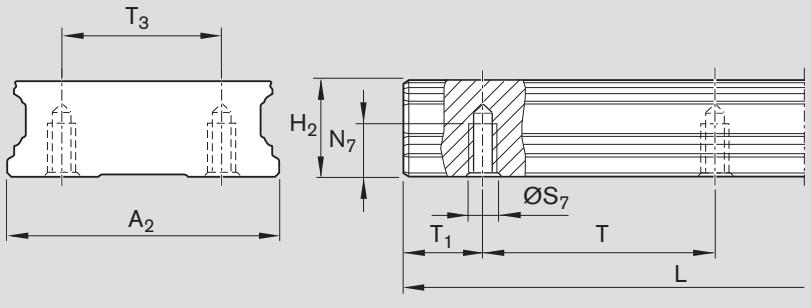
Ordering example 1 (up to L_{max})
Options:
- Ball Guide Rail BNS
- Size 35/90
- Accuracy class H
- One-piece
- Rail length L = 1676 mm

Part number:
R1677 303 31, 1676 mm

Ordering example 2 (over L_{max})
Options:
- Ball Guide Rail BNS
- Size 35/90
- Accuracy class H
- **2 sections**
- Rail length L = 5116 mm

Part number:
R1677 303 **32**, 5116 mm

Ball Guide Rails BNS



Size	Dimensions (mm)										Weight
	A_2	H_2[1)]	L_{max}	N_7	S_7	T	$T_{1\,min}$	T_{1S}[2)]	$T_{1\,max}$	T_3	(kg/m)
20/40	42	18.30	3 836	7.5	M5	60	10	28	50	24	5.3
25/70	69	23.55	3 836	12.0	M6	80	10	38	70	40	11.6
35/90	90	31.85	3 836	15.0	M8	80	12	38	68	60	21.0

1) Dimension H_2 without cover strip
2) Recommended: preferred dimension T_{1S} with tolerances ±0.75.

Accessories for Ball Runner Blocks and Ball Guide Rails

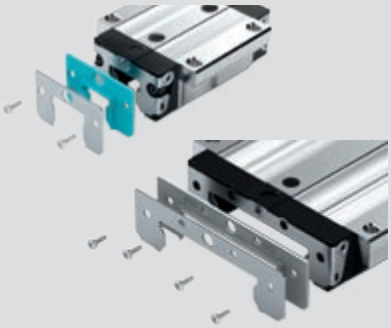
Product Description, Accessories for Ball Runner Blocks

Rexroth offers limitless interchangeability as all ball runner block versions can be combined at will with all accessories within each size.
The entire range is perfectly geared to provide top performance and to meet all special requirements.

Overview of Accessories for Ball Runner Blocks

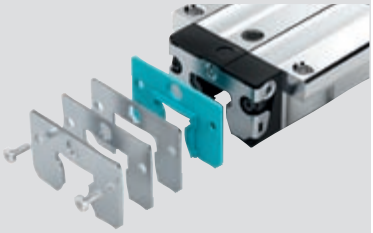
Scraper Plates ☞ 155

Two-piece End Seal[1)] ☞ 156



FKM Seal, one-piece and two-piece[1)] ☞ 157

Seal Kit[1)] ☞ 158



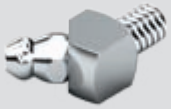
Lube Adapter, only for existing systems with high Ball Runner Blocks SNH or SLH[1)] ☞ 159

Lube Plate[1)] ☞ 160

Front Lube Unit ☞ 162

Bellows ☞ 166

Lube Nipples ☞ 170



Plastic Hose for lube fittings ☞ 171

O-rings ☞ 171

Lube fittings ☞ 172

- Reducers
- Extension pieces
- Connectors
- Swivel fittings
- Push-in fittings for plastic tubes

1) Not available for Ball Runner Blocks F.N (flanged, ..., low profile) and S.N (slimline, ..., low profile)

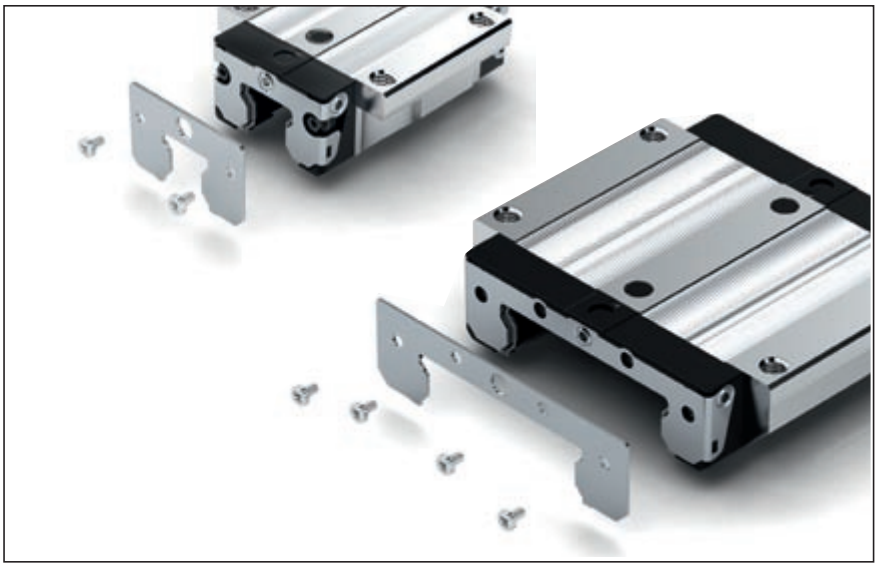
Accessories for Ball Runner Blocks

Scraper Plates R16.0 .10 ..

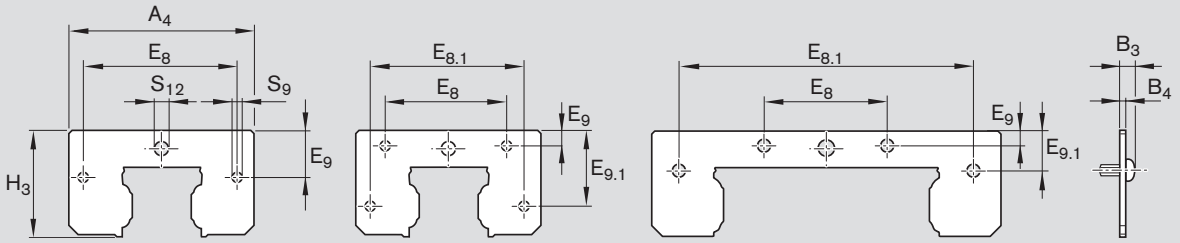
– Material: corrosion-resistant steel per EN 10088
– Specification: bright
– Precision version with 0.1 to 0.3 mm maximum gap dimension

Notes for mounting

• When combining with two-piece end seals, use seal kit: Part numbers R1619 .20 40/50 ☞ 158
– Comes complete with mounting screws.
• When mounting, make sure there is a uniform gap between the guide rail and the scraper.
• For end-face lubrication, consider minimum screw-in depth.
– Follow the mounting instructions.



Mounting screw shown as an example



Scraper plate, size 65

Scraper plate, wide version

Size	Part number for ball guide rail with cover strip	Dimensions (mm) A_4	B_3	B_4	E_8	$E_{8.1}$	E_9	$E_{9.1}$	H_3	S_9	S_{12}	Weight (g)
15	R1620 110 30	33.0	3.1	1.0	24.55	–	6.30	–	19.2	3.5	4.6	5
20	R1620 810 30	42.0	3.4	1.0	32.40	–	6.80	–	24.8	4.0	5.1	6
	R1620 810 35[3]	41.0	3.4	1.0	30.50	–	5.10	–	22.8	4.0	4.0	5
25	R1620 210 30	47.0	3.4	1.0	38.30	–	11.00	–	29.5	4.0	7.0	8
	R1620 210 35[3]	47.0	3.4	1.0	38.30	–	8.00	–	26.5	4.0	4.0	7
30	R1620 710 30	59.0	3.4	1.0	48.40	–	14.10	–	34.7	4.0	7.0	12
35	R1620 310 40[1]	69.0	3.4	1.0	58.00	–	17.00	–	40.1	4.0	7.0	16
45	R1620 410 40[1]	85.0	5.1	2.0	69.80	–	20.50	–	50.0	5.0	7.0	50
55	R1620 510 40[1]	98.0	5.7	2.0	80.00	–	21.80	–	56.4	6.0	7.0	65
65	R1620 610 40[1]	124.0	5.6	2.5	76.00	100.0	10.00	52.50	74.7	5.0	9.0	140
20/40[4][5]	R1670 510 00[2]	60.0	3.1	1.0	18.00	53.4	2.65	7.35	21.7	3.5	4.0	7
25/70[4]	R1670 210 10[2]	101.0	3.4	1.0	35.00	83.5	4.35	10.75	29.1	4.0	7.0	14
35/90[4]	R1670 310 10[2]	129.0	3.4	1.0	79.00	116.0	5.60	28.70	40.8	4.0	7.0	25

1) Part number for ball guide rail **without** cover strip: R1620 .10 30
2) Ball guide rail **without** cover strip
3) For ball runner blocks F.N (flanged, ..., low profile) and S.N (slimline, ..., low profile)
4) Wide Ball Rail System
5) Note: New scraper plate not combinable with existing Ball Guide Rail R167. 8.. ..!

Accessories for Ball Runner Blocks and Ball Guide Rails

Accessories for Ball Runner Blocks

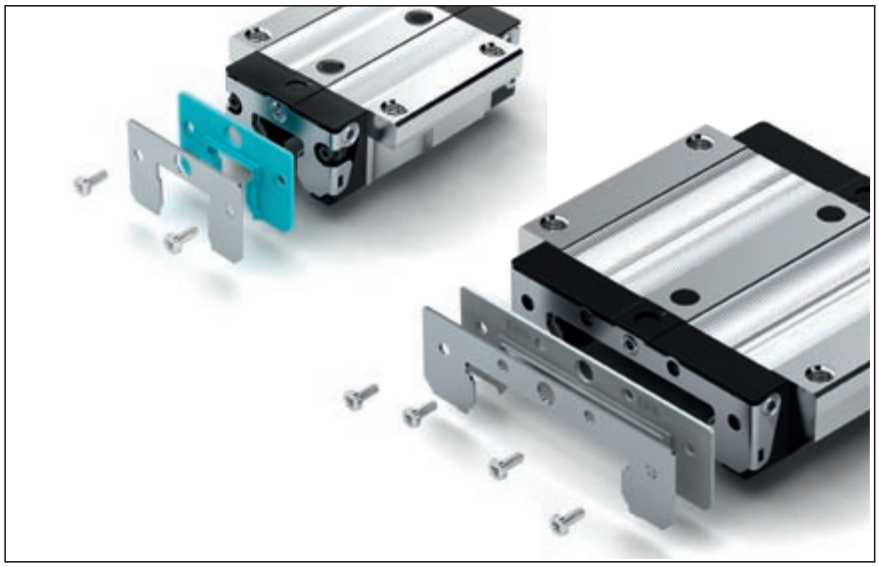
End Seal R1619 .2. .0

Two-piece

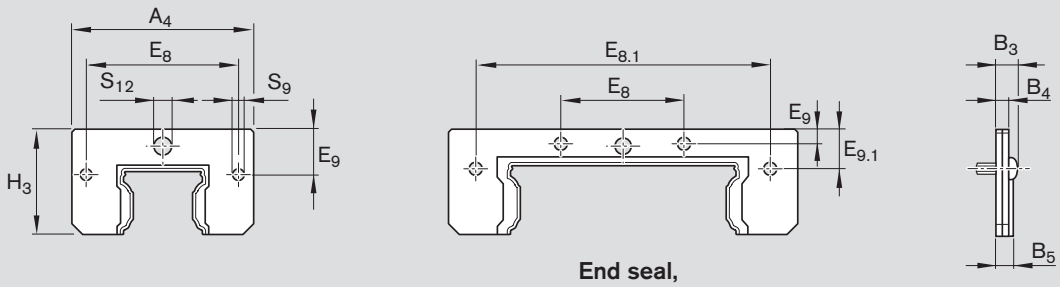
- Material: corrosion-resistant steel per EN 10088 with polymer seal
- Specification: bright

Notes for mounting

- Comes complete with mounting screws.
- For end-face lubrication, consider minimum screw-in depth.
- Follow the mounting instructions.



Mounting screw shown as an example



End seal, wide version

Size	Part number	Dimensions (mm)											Weight
		A_4	B_3	B_4	B_5	E_8	$E_{8.1}$	E_9	$E_{9.1}$	H_3	S_9	S_{12}	(g)
15	R1619 121 20	32.0	4.3	2.2	3.0	24.55	–	6.30	–	19.0	3.5	4.3	6.0
20[1)]	R1619 821 20	42.0	4.9	2.5	3.3	32.40	–	6.80	–	24.3	4.0	5.1	8.0
25[1)]	R1619 221 30	47.0	4.9	2.5	3.3	38.30	–	11.00	–	29.0	4.0	7.0	10.0
30	R1619 721 30	59.0	5.7	3.3	4.5	48.40	–	14.10	–	34.5	4.0	7.0	18.0
35	R1619 321 30	69.0	5.7	3.3	4.5	58.00	–	17.00	–	39.5	4.0	7.0	25.0
45	R1619 421 30	85.0	7.1	4.0	5.5	69.80	–	20.50	–	49.5	5.0	7.0	55.0
55	R1619 521 30	98.0	7.7	4.0	5.5	80.00	–	21.50	–	56.0	6.0	7.0	65.0
20/40[2)3)]	R1619 522 20	60.0	4.6	2.5	3.3	18.00	53.4	2.65	7.35	21.7	3.5	4.0	7.5
25/70[2)]	R1619 222 20	99.0	4.9	2.5	3.3	35.00	83.5	4.30	10.70	28.6	4.0	7.3	14.5
35/90[2)]	R1619 322 20	128.6	5.7	3.3	4.5	79.00	116.0	5.80	28.90	41.0	4.0	7.0	40.0

1) **Not** for ball runner blocks F.N (flanged, ..., low profile) and S.N (slimline, ..., low profile)

2) Wide Ball Rail System

3) **Note**: New end seal not combinable with existing Ball Guide Rail R167. 8.. ..!

Accessories for Ball Runner Blocks

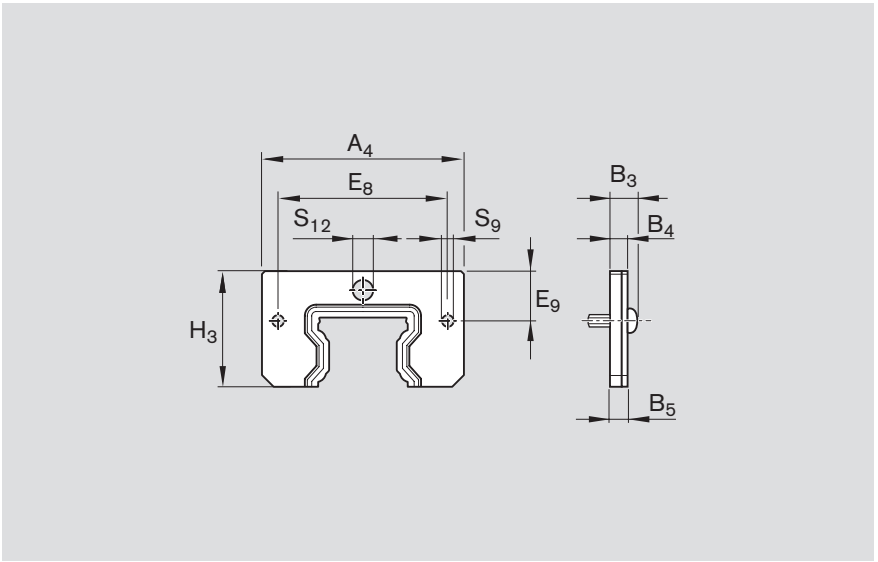
FKM Seal R1619 . 20 30

Two-piece

– Material: corrosion-resistant steel per EN 10088 and seal made of FKM
– For application areas and resistance ☞ 23

Special feature
Easy mounting and removal even when guide rail is screwed down.

Notes for mounting
– Comes complete with mounting screws.
• For end-face lubrication, consider minimum screw-in depth.
– Follow the mounting instructions.

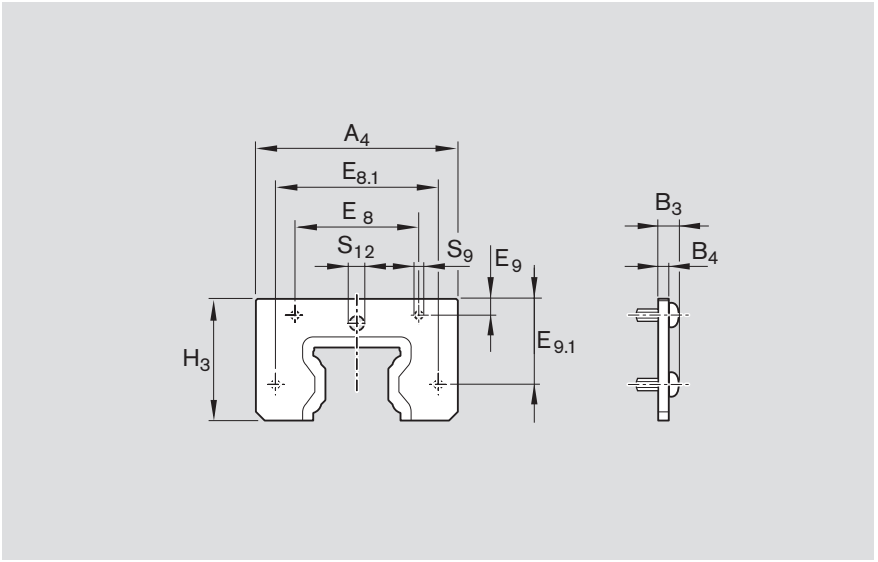


Size	Part number	Dimensions (mm)									Weight
		A_4	B_3	B_4	B_5	E_8	E_9	H_3	S_9	S_{12}	(g)
35	R1619 320 30	69	8.4	4	6	58.0	17.0	39.5	4	7	39.0
45	R1619 420 30	85	9.1	4	6	69.8	20.5	49.5	5	7	61.0
55	R1619 520 30	98	9.7	4	6	80.0	21.8	56.4	6	7	80.5

One-piece

– Material: corrosion-resistant steel per EN 10088 and seal made of FKM

Notes for mounting
– Comes complete with mounting screws.
• For end-face lubrication, consider minimum screw-in depth.
– Follow the mounting instructions.



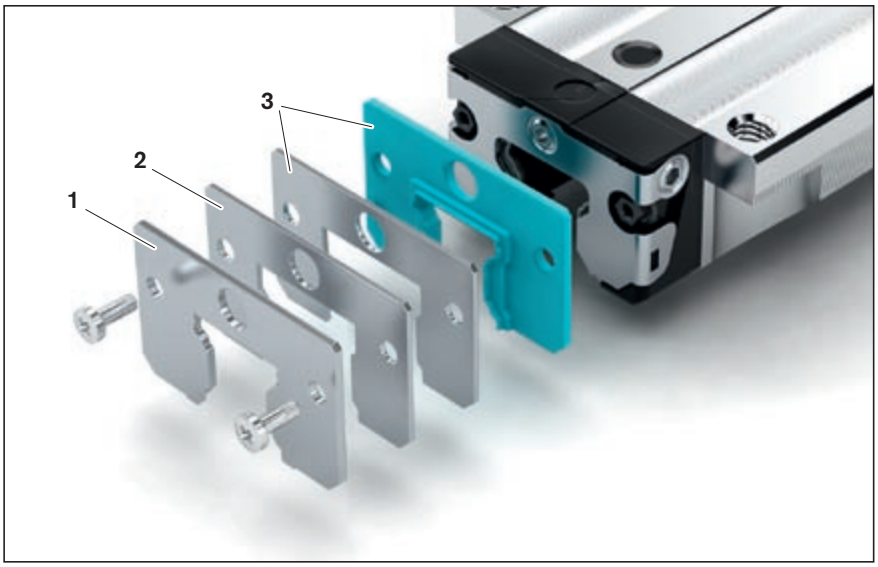
Size	Part number	Dimensions (mm)									Weight
		A_4	B_3	B_4	E_8	$E_{8.1}$	E_9	$E_{9.1}$	H_3	S_9	S_{12}	(g)
65	R1619 620 30	124	9.6	6.5	76	100	10	52.5	74.7	5	9	146

Accessories for Ball Runner Blocks and Ball Guide Rails

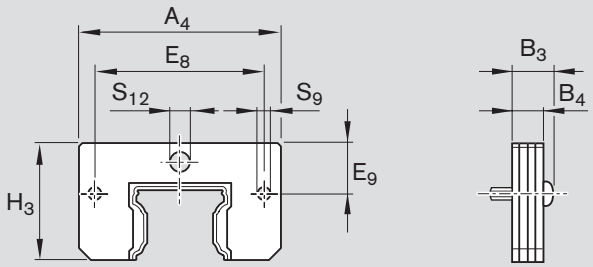
Accessories for Ball Runner Blocks

Seal Kit R1619 .20 .0

1 Scraper plate
2 Supporting plate
3 Two-piece end seal



Notes for mounting
- The seal kit is recommended in cases where both a scraper plate and a two-piece end seal are required.
- Comes complete with mounting screws.
- For end-face lubrication, consider minimum screw-in depth.
- Follow the mounting instructions.



Size	Part number for ball guide rail		Dimensions (mm)								Weight
	without cover strip	with cover strip	A_4	B_3	B_4	E_8	E_9	H_3	S_9	S_{12}	(g)
15	R1619 120 50	R1619 120 50	32.0	6.3	4.2	24.55	6.30	19.0	3.5	4.3	16
20[1)]	R1619 820 50	R1619 820 50	42.0	6.9	4.5	32.40	6.80	24.3	4.0	5.1	20
25[1)]	R1619 220 50	R1619 220 50	47.0	6.9	4.5	38.30	11.00	29.0	4.0	7.0	26
30	R1619 720 50	R1619 720 50	59.0	8.2	5.8	48.40	14.10	34.5	4.0	7.0	42
35	R1619 320 40	R1619 320 50	69.0	8.2	5.8	58.00	17.00	39.5	4.0	7.0	57
45	R1619 420 40	R1619 420 50	85.0	11.1	8.0	69.80	20.50	49.5	5.0	7.0	155
55	R1619 520 40	R1619 520 50	98.0	11.7	8.0	80.00	21.50	56.0	6.0	7.0	195

1) **Not** for ball runner blocks F.N (flanged, ..., low profile) and S.N (slimline, ..., low profile)

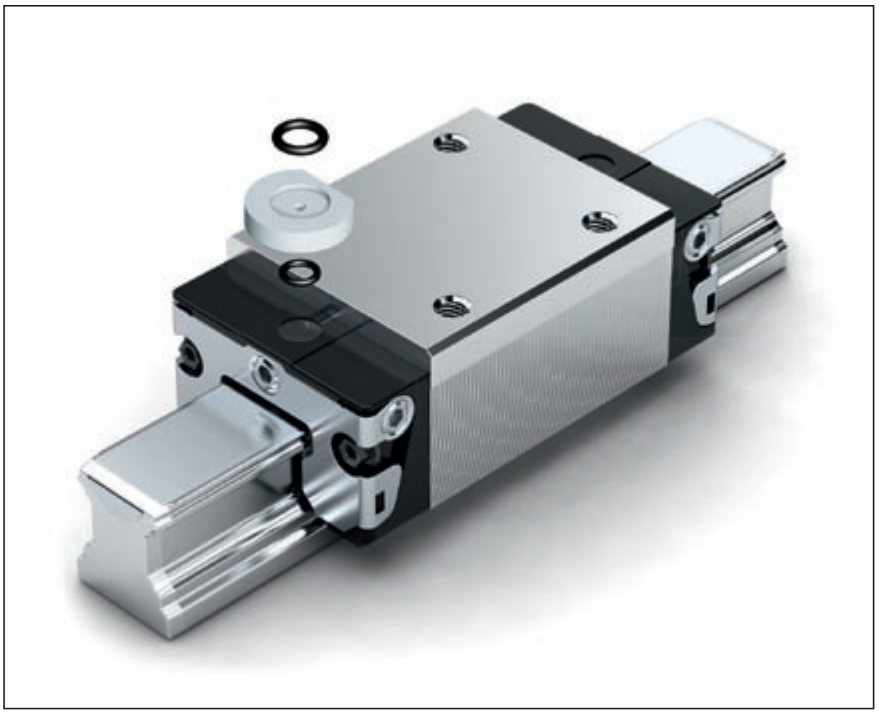
Accessories for Ball Runner Blocks

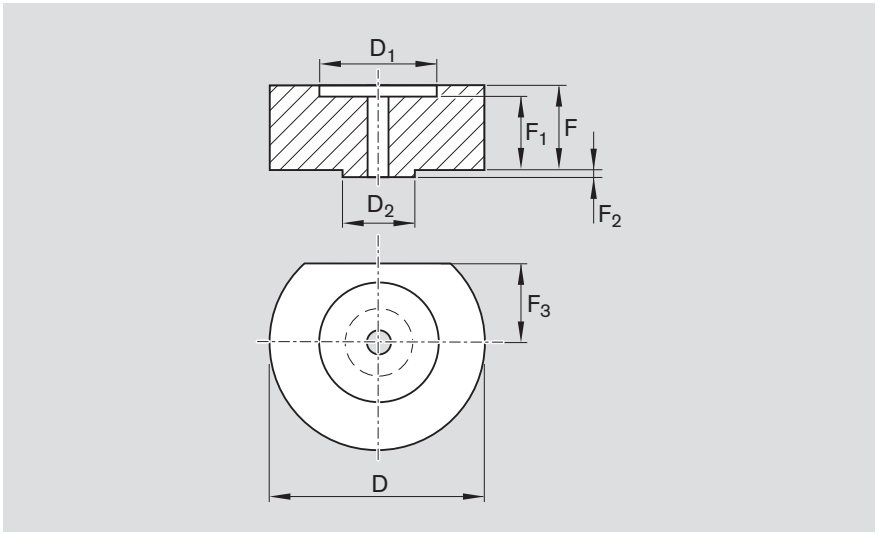
Lube Adapter R1621 .00 05

For oil and grease lubrication from above, only for high ball runner blocks SNH R1621 or SLH R1624

- Material: plastic
- Quantity per pack: 1 pc.

Notes for mounting
- O-rings are provided.
- Before mounting, use a heated pointed metal tool to open the lube bore on the ball runner block (do not use a drill).
- For details, ☞ 258.





Size	Part number	Dimensions (mm)							Weight
		D	D_1	D_2	F	F_1	F_2	F_3	(g)
15	R1621 100 05	12	6.2	3.4	3.7	3.1	0.5	3.20	0.5
25	R1621 200 05	15	7.2	4.4	3.8	3.2	0.5	5.85	0.9
30	R1621 700 05	16	7.2	4.4	2.8	2.2	0.5	6.10	0.7
35	R1621 300 05	18	7.2	4.4	6.8	6.2	0.5	6.80	2.2
45	R1621 400 05	20	7.2	4.4	9.8	9.2	0.5	8.30	4.1

Accessories for Ball Runner Blocks and Ball Guide Rails

Accessories for Ball Runner Blocks

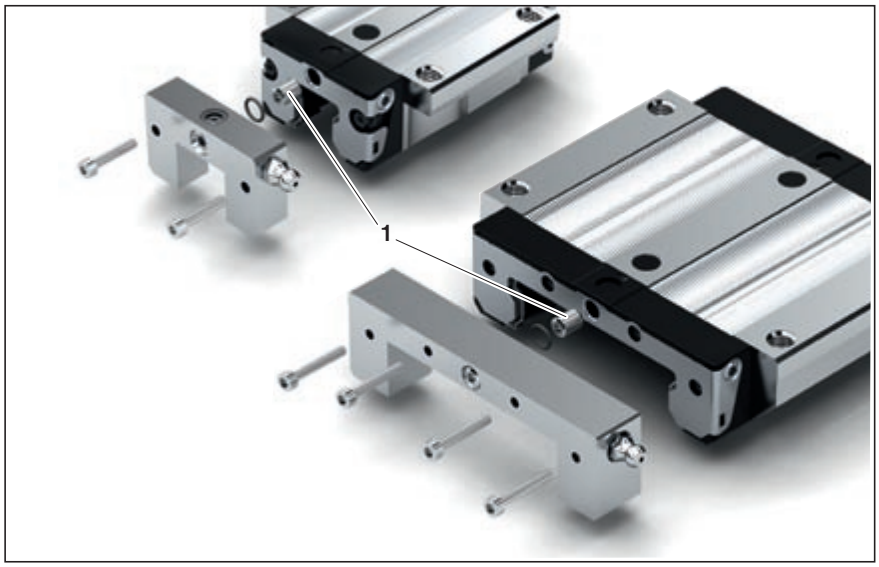
Lubrication Plate R1620 .11 20

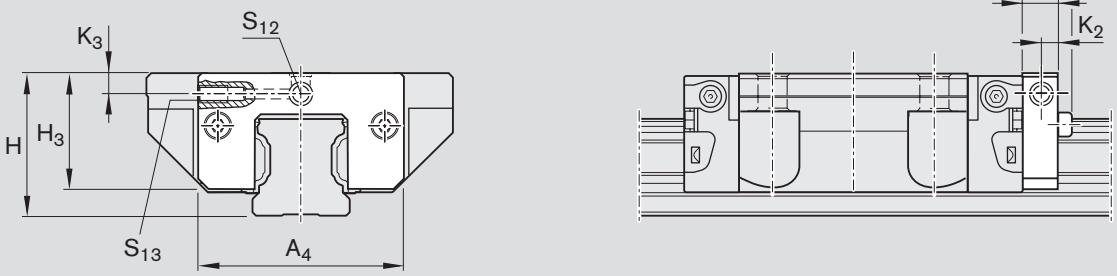
For standard lube nipples

– Material: aluminum

Notes for mounting
– Comes complete with all necessary parts for mounting.
– Sizes 15 - 20:
A funnel-type lube nipple with a knock-in spigot is supplied ready for insertion.
– Sizes 25 - 65:
The runner block lube nipple can be used.
– Follow the mounting instructions.

⚠ **The lube pin (1) must be mounted between the lubrication plate and the ball runner block! (The pin contains a lube bore.)**





Size	Part number	Dimensions (mm)									Weight
		A_4	B_3	B_4	H	H_3 2)	K_2	K_3 2)	S_{12}	S_{13}	(g)
15	R1620 111 20	32	13.1	11	24 28 3)	19.0	5.5	3.4 7.4 3)	M3	Ø3	15
20 1)	R1620 811 20	42	15.0	12	30	24.8	6.0	3.5	M3	Ø3	25
25 1)	R1620 211 20	47	15.0	12	36 40 3)	28.3	6.0	6.0 10.0 3)	M6	M6	30
30	R1620 711 20	59	15.0	12	42 45 3)	33.8	6.0	8.0 11.0 3)	M6	M6	45
35	R1620 311 20	69	15.0	12	48 55 3)	39.1	6.0	8.0 15.0 3)	M6	M6	60
45	R1620 411 20	85	16.0	12	60 70 3)	48.5	6.0	8.0 18.0 3)	M6	M6	85
55	R1620 511 20	98	17.0	12	70 80 3)	56.0	6.0	9.0 19.0 3)	M6	M6	115
65	R1620 611 20	124	18.0	14	90	75.7	7.0	18.0	M8x1	M8x1	250

1) Not for ball runner blocks F.N (flanged, ..., low profile) and S.N (slimline, ..., low profile)

2) Referred to the runner block mounting face

3) For ball runner blocks S.H (slimline, ..., high)

Accessories for Ball Runner Blocks

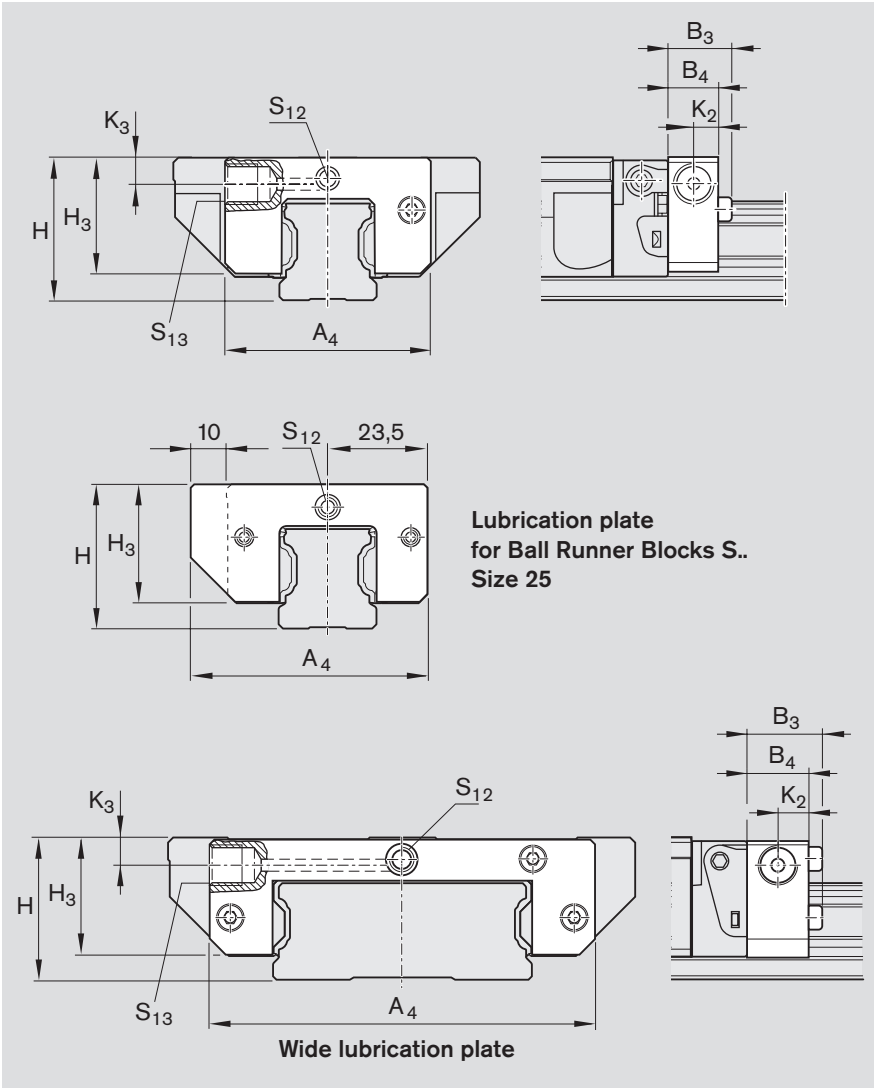
Lubrication Plate G 1/8 R1620 .11 30

For lube nipple G 1/8

– Material: aluminum

Notes for mounting

– Comes complete with all necessary parts for mounting.
• Ball runner block S.. (slimline ... ...) Size 25: remember that the lubrication plate will project at the side.
– Follow the mounting instructions.



Size	Part number	Dimensions (mm)									Weight
		A_4	B_3	B_4	H	H_3 2)	K_2	K_3 2)	S_{12}	S_{13}	(g)
25 1)	R1620 211 30	57	19.0	16	36 40 3)	28.3	8	7.0 11.0 3)	M6	G 1/8x8	40
30	R1620 711 30	59	19.0	16	42 45 3)	33.8	8	7.0 10.0 3)	M6	G 1/8x8	59
35	R1620 311 30	69	19.0	16	48 55 3)	39.1	8	8.0 15.0 3)	M6	G 1/8x8	79
45	R1620 411 30	85	20.0	16	60 70 3)	48.5	8	8.0 18.0 3)	M6	G 1/8x8	112
55	R1620 511 30	98	21.0	16	70 80 3)	56.0	8	9.0 19.0 3)	M6	G 1/8x8	152
65	R1620 611 30	124	20.0	16	90	75.7	8	18.0	M6	G 1/8x8	285
25/70 4)	R1670 211 40	99	19.0	16	35	29.6	8	8.4	M6	G 1/8x8	65
35/90 4)	R1670 311 30	129	19.0	16	50	42.0	8	9.5	M6	G 1/8x8	120

1) Not for ball runner blocks F.N (flanged, ..., low profile) and S.N (slimline, ..., low profile)
2) Referred to the runner block mounting face
3) For ball runner blocks S.H (slimline, ..., high)
4) Wide Ball Rail System

Accessories for Ball Runner Blocks

Front Lube Unit

For travel up to 10,000 km without relubrication

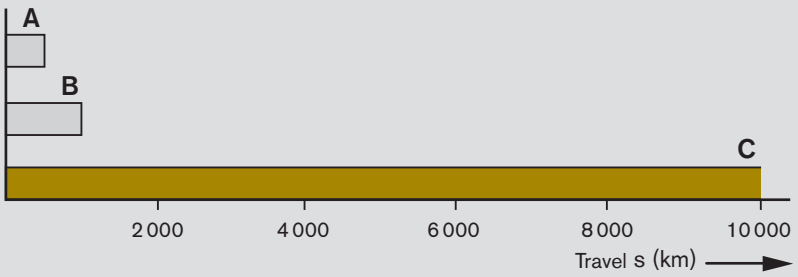
Advantages during mounting and service

- Up to 10,000 km travel without relubrication
- Only initial lubrication (with grease) of the runner block necessary
- Front lube units at both runner block ends
- Minimal lubricant loss
- Reduced oil consumption
- No lube lines
- Max. operating temperature 60 °C
- In-service refilling possible using lube nipple on end face or at side
- Lube port on end face of the front lube unit suitable for lubricating runner block with grease

Standard Ball Runner Block with two Front Lube Units

Size	Possible travel s with front lube units (km)
15	10 000
20	10 000
25	10 000
30	10 000
35	10 000
45	10 000
55	1 500
65	1 000

Table 1



Previous travel s

A With oil lubrication: up to 500 km

B With grease lubrication: up to 1,000 km

Possible travel s

C With front lube units: up to 10,000 km

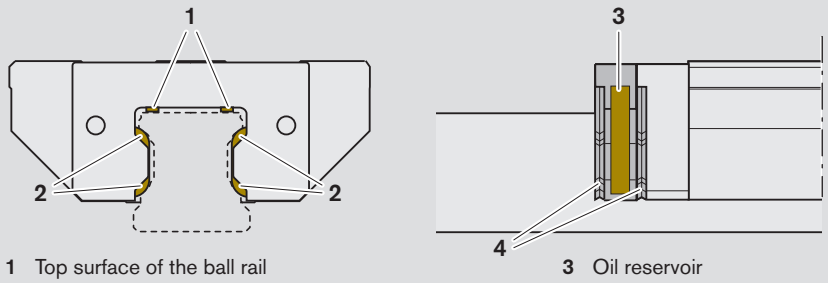
Oil consumption comparison for size 25

Front lube units	Lubricant quantity per lubrication cycle (cm^3)	Travel s (km)	Lubricant consumption absolute (cm^3/km)	Lubricant consumption comparative (%)
without	1.2	20	0.06	100.00
with	**5.2**	**5 000**	**0.00104**	**1.73**

For part numbers, dimension drawing, dimensions and technical data, see next page.

Lubricant distribution

Specially designed lube distribution ducts ensure that the lubricant is applied only where needed: directly to the race-ways and to the guide rail top surface.



1 Top surface of the ball rail

2 Raceways of the ball rail guide

3 Oil reservoir

4 Seals

Front Lube Unit R1619 .2. 00

Material: special plastic

Front lube units R1619 .2. 00 are supplied ready-filled with oil (Mobil SHC 639) and can be mounted immediately after greasing the runner block.

Front Lube Unit R1619 .2. 10

Material: special plastic

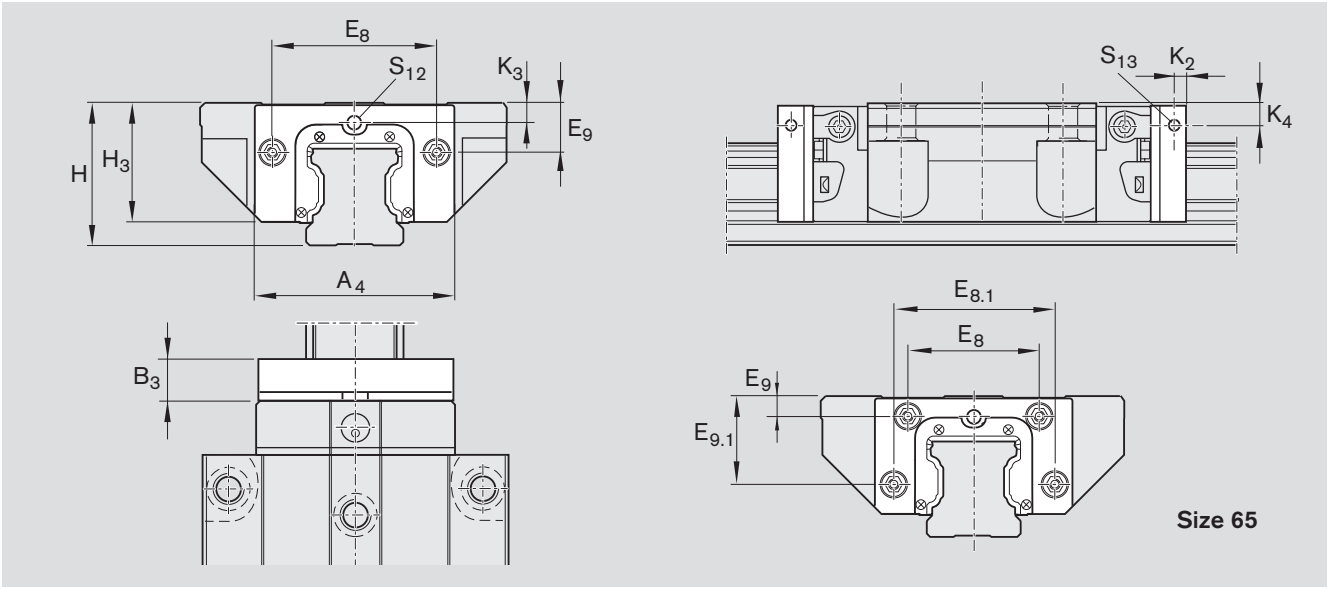
Front lube units R1619 .2. 10 are supplied unfilled.

Recommended oil lubricant for initial filling:

– Mobil SHC 639
(viscosity 1000 mm²/s at 40 °C)

⚠ **Before mounting the front lube units, always lubricate the runner blocks first using grease!**
☞ 245

⚠ **If other types of oil are used, please check the compatibility of the lubricants and the possible travel!**



Size 65

Size	Part number	Dimensions (mm)												Oil	Weight
		A_4	B_3	E_8	$E_{8.1}$	E_9 2)	$E_{9.1}$ 2)	H	H_3 2)	K_2	K_3 2)/K_4 2)	S_{12}	S_{13}	(cm^3)	(g)
15	R1619 125 00	31.8	11.5	24.55	–	6.70 10.70 3)	–	24 28 3)	19.40 23.40 3)	5	3.35 7.35 3)	M3	M3	1.00	15
20	R1619 825 00	43.0	12.5	32.50	–	7.30	–	30	24.90	5	3.70	M3	M3	2.20	20
	R1619 826 00 1)	41.0	12.5	30.50	–	5.60	–	28	22.90	–	3.10	–	M3	1.80	20
25	R1619 225 00	47.0	13.0	38.30	–	11.50 15.50 3)	–	36 40 3)	29.30 33.30 3)	5	5.50 9.50 3)	M6	M6	2.60	25
	R1619 226 00 1)	47.0	13.0	38.30	–	8.50	–	33	26.30	5	4.10	M3	M3	2.50	25
30	R1619 725 00	58.8	14.5	48.40	–	14.60 17.60 3)	–	42 45 3)	35.05 38.05 3)	6	6.05 9.05 3)	M6	M6	3.85	35
35	R1619 325 00	69.0	16.0	58.00	–	17.35 24.35 3)	–	48 55 3)	39.85 46.85 3)	6	6.90 13.90 3)	M6	M6	5.70	50
45	R1619 425 00	84.0	17.0	69.80	–	20.90 30.90 3)	–	60 70 3)	49.80 59.80 3)	7	8.20 18.20 3)	M6	M6	9.60	70
55	R1619 525 00	99.0	18.0	80.00	–	22.30 32.30 3)	–	70 80 3)	57.05 67.05 3)	8	8.90 18.90 3)	M6	M6	14.50	90
65	R1619 625 00	124.2	19.0	76.00	100	11.00	53.5	90	75.70	8	16.00	M8	M8	30.00	130

1) For ball runner blocks F.N (flanged, ..., low profile) and S.N (slimline, ..., low profile)
2) Referred to the runner block mounting face
3) For ball runner blocks S.H (slimline, ..., high)

Accessories for Ball Runner Blocks

Initial filling of a front lube unit shipped without oil

- Remove the set screw from the lube hole (Fig. 1, item 1) and keep it ready for later use.
- Screw in lube nipple (**2**).
- Lay the front lube unit (**3**) down flat and fill with the oil quantity specified in Table 2. Leave to settle for approx. 36 hours.
- Check whether the lube insert is completely soaked with oil.
- If necessary, add oil.
- Remove lube nipple.
- Screw in the set screw.

- For size 20 low profile: Stand the front lube unit in 10 mm of oil for approx. 36 hours (see Fig. 2)

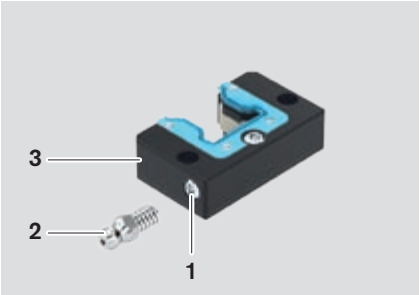


Fig. 1

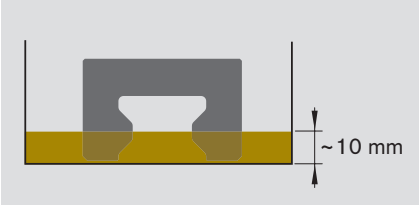


Fig. 2

Size	Oil quantity for initial filling of an unfilled front lube unit (cm^3)
15	0.90
20	2.00
25	2.40
30	3.85
35	5.70
45	9.60
55	14.50
65	30.00

Table 2

Relubrication of front lube units

- When the relubrication interval according to Graph 1 has been reached, add the relubrication quantity according to Table 2.
- The units can be relubricated through the lube port at the side.
- The size 20 low-profile front lube unit **cannot** be refilled through the lube port (see Fig. 2).

Note
Rexroth recommends replacing the front lube units every 3 years at the latest and regreasing the runner blocks before mounting the new front lube units.

Relubrication of runner blocks

In clean operating environments, the runner blocks can be relubricated with grease (Dynalub 510) from the end face.

⚠ **Relubrication of ball runner blocks with grease lubricant.** ☞ 246

⚠ **If other types of lubricants are used, this may lead to a reduction in the relubrication intervals, the achievable travel in short-stroke applications, and the load capacities. Possible chemical interactions between the plastic materials, lubricants and preservative oils must also be taken into account.**

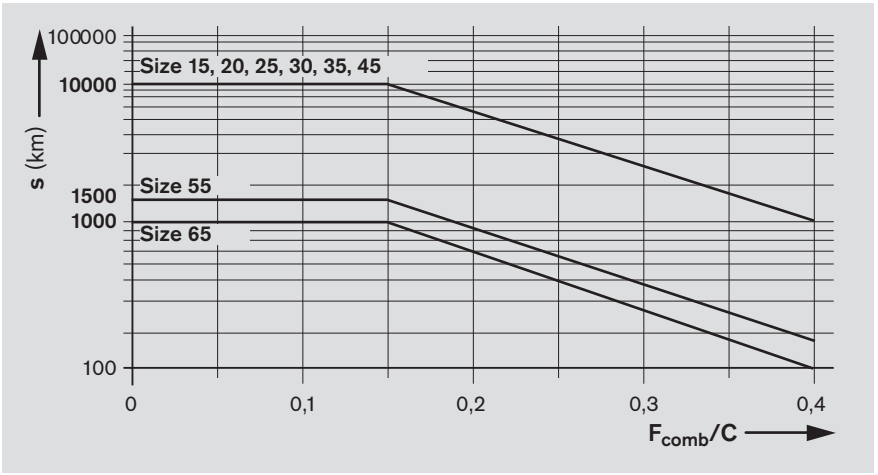
⚠ **The recommended in-service lubrication intervals depend on environmental factors, load and type of loading.**
Typical environmental factors include fine metal particles, mineral and similar abraded material, solvents, and temperature. Load types include vibrations, impacts and tilting.

⚠ **The service conditions are unknown to the manufacturer. Users can only determine the in-service lubrication intervals with certainty by conducting their own in-house tests or by close observation.**

⚠ **Do not allow ball guide rails or runner blocks to come into contact with water-based metalworking fluids!**

Load-dependent relubrication intervals for ball runner blocks with front lube units

The following conditions apply:
- Lubricants for runner blocks: Dynalub 510 (grease NLGI 2) or alternatively Castrol Longtime PD 2 (grease NLGI 2)
- Lubricant for front lube units: Mobil SHC 639 (synthetic oil)
- Maximum speed: v_{max} = 2 m/s
- No exposure to metalworking fluids
- Standard seals
- Ambient temperature: T = 20 – 30 °C



Graph 1

Key to graph

C	=	dynamic load capacity	(N)
F_{comb}	=	combined equivalent dynamic load on bearing	(N)
F_{comb}/C	=	load ratio	(–)
s	=	relubrication interval expressed as travel	(km)

Definition of F_{comb}/C

The load ratio F_{comb}/C is the quotient of the equivalent dynamic load on the bearing at the combined load on the bearing F_{comb} (taking account of the internal preload force F_{pr}) divided by the dynamic load capacity C ☞ 8 – 9.

Mounting of front lube units

Notes for mounting

All required mounting accessories (coated screws, seals and lube nipples) are supplied along with the units.

⚠ **Mount a front lube unit at each end of the ball runner block (Fig. 3, item 3)!**

⚠ Do not remove the runner block from the rail!

Ball runner blocks up to size 45 (Fig. 3a):

⚠ **The lube pin (2) must be mounted between the lubrication plate and the ball runner block! (The pin contains a lube bore.)**
- Remove set screw (1).
- Screw in lube pin (2).
- Push on front lube unit (3).
- Insert O-ring (5) between runner block and front lube unit.
- Tighten screws (4) with tightening torque M_A (see Table 3).

Ball runner blocks from size 55 (Fig. 3b):
- Push on front lube unit (3).
- Remove set screw (1) and insert O-ring (5) between runner block and front lube unit.
- Tighten screws (4) with tightening torque M_A (see Table 3).

Size	Item 4	Tightening torque M_A (Nm)
15	M2.5 x 12	0.3
20	M3 x 14	0.6
25	M3 x 14	0.6
30	M3 x 14	1.2
35	M3 x 16	1.2
45	M4 x 18	1.6
55	M5 x 18	2.0
65	M4 x 20	1.6

Table 3

Fig. 3a (up to size **45**)

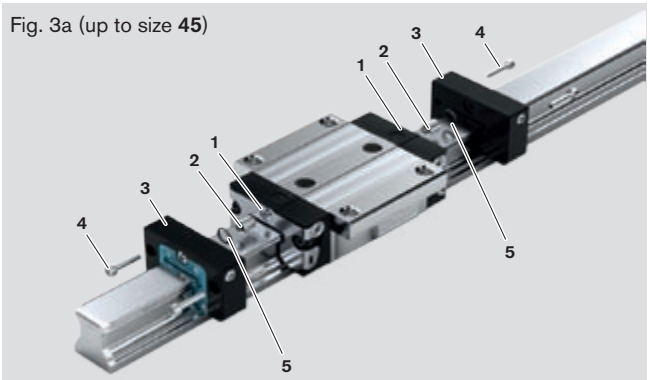
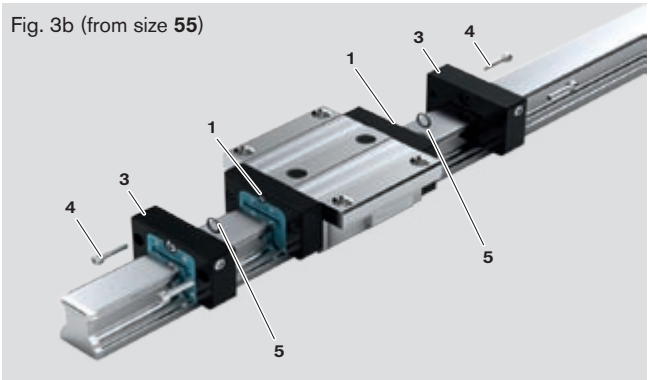


Fig. 3b (from size **55**)



Accessories for Ball Runner Blocks and Ball Guide Rails

Accessories for Ball Runner Blocks

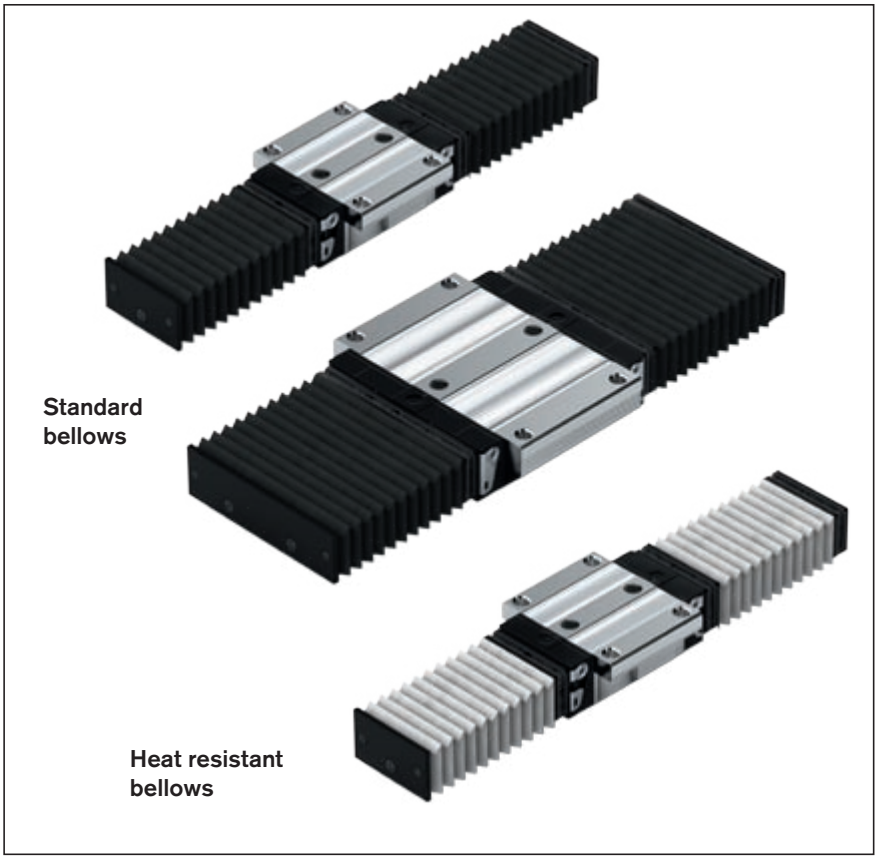
Standard bellows R1620 .0. 00

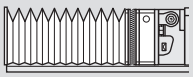
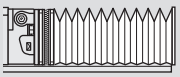
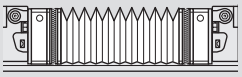
– Material: polyurethane-coated polyester fabric
– Aluminum lube plate

Heat resistant bellows R1620 .5. 00

– Material: Nomex fabric, metallized on both sides

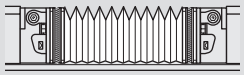
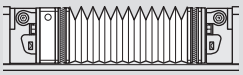
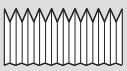
Temperature resistance
– Non combustible, non flammable
– Resistant to sparks, welding spatter and hot chips.
– The protective metal coating can withstand peak temperatures of up to 200 °C.
– Operating temperature for the entire bellows: max. 80 °C.



Size	Part number, no. of folds		
	 Type 1: with lubrication plate[1] and end plate Type 6: with VSE[2] and end plate	 Type 2: with mounting frame and end plate	 Type 3: with 2 lubrication plates[1] Type 7: with 2 VSE[2]
	Standard bellows		
15	R1620 10. 00, ...	R1620 102 00, ...	R1620 10. 00, ...
20	R1620 80. 00, ...	R1620 802 00, ...	R1620 80. 00, ...
25	R1620 20. 00, ...	R1620 202 00, ...	R1620 20. 00, ...
30	R1620 70. 00, ...	R1620 702 00, ...	R1620 70. 00, ...
35	R1620 30. 00, ...	R1620 302 00, ...	R1620 30. 00, ...
45	R1620 40. 00, ...	R1620 402 00, ...	R1620 40. 00, ...
55	R1620 50. 00, ...	R1620 502 00, ...	R1620 50. 00, ...
65	R1620 60. 00, ...	R1620 602 00, ...	R1620 60. 00, ...
20/40[3]	–	R1670 502 00, ...	–
25/70[3]	–	R1670 202 00, ...	–
35/90[3]	–	R1670 302 00, ...	–
	Heat resistant bellows		
25	R1620 25. 00, ...	R1620 252 00, ...	R1620 25. 00, ...
30	R1620 75. 00, ...	R1620 752 00, ...	R1620 75. 00, ...
35	R1620 35. 00, ...	R1620 352 00, ...	R1620 35. 00, ...
45	R1620 45. 00, ...	R1620 452 00, ...	R1620 45. 00, ...
55	R1620 55. 00, ...	R1620 552 00, ...	R1620 55. 00, ...
65	R1620 65. 00, ...	R1620 652 00, ...	R1620 65. 00, ...

Weight on request

1) Lubrication plate **not required** for ball runner blocks with side lube ports
2) VSE = front lube unit
3) Wide Ball Rail System

Size	Part number, no. of folds		
	 Type 4: with 2 mounting frames	 Type 5: with lubrication plate[1] and mounting frame Type 8: with VSE[2] and mounting frame	 Type 9: loose supply (spare part)
	Standard bellows		
15	R1620 104 00, ...	R1620 10. 00, ...	R1600 109 00, ...
20	R1620 804 00, ...	R1620 80. 00, ...	R1600 809 00, ...
25	R1620 204 00, ...	R1620 20. 00, ...	R1600 209 00, ...
30	R1620 704 00, ...	R1620 70. 00, ...	R1600 709 00, ...
35	R1620 304 00, ...	R1620 30. 00, ...	R1600 309 00, ...
45	R1620 404 00, ...	R1620 40. 00, ...	R1600 409 00, ...
55	R1620 504 00, ...	R1620 50. 00, ...	R1600 509 00, ...
65	R1620 604 00, ...	R1620 60. 00, ...	R1600 609 00, ...
20/40[3]	R1670 504 00, ...	–	R1670 509 00, ...
25/70[3]	R1670 204 00, ...	–	R1670 209 00, ...
35/90[3]	R1670 304 00, ...	–	R1670 309 00, ...
	Heat resistant bellows		
25	R1620 254 00, ...	R1620 25. 00, ...	R1600 259 00, ...
30	R1620 754 00, ...	R1620 75. 00, ...	R1600 759 00, ...
35	R1620 354 00, ...	R1620 35. 00, ...	R1600 359 00, ...
45	R1620 454 00, ...	R1620 45. 00, ...	R1600 459 00, ...
55	R1620 554 00, ...	R1620 55. 00, ...	R1600 559 00, ...
65	R1620 654 00, ...	R1620 65. 00, ...	R1600 659 00, ...

Weight on request

1) Lubrication plate **not required** for ball runner blocks with side lube ports

2) VSE = front lube unit

3) Wide Ball Rail System

Ordering example:

- Bellows
- Size 35
- Standard
- Type 6: with FLU and end plate
- number of folds: 36

Example: R1620 3 0 6 00, 36 folds

Standard	= 0
Heat resistant	= 5
Type 1 - 9	

Accessories for Ball Runner Blocks and Ball Guide Rails

Accessories for Ball Runner Blocks

Bellows

Notes for mounting

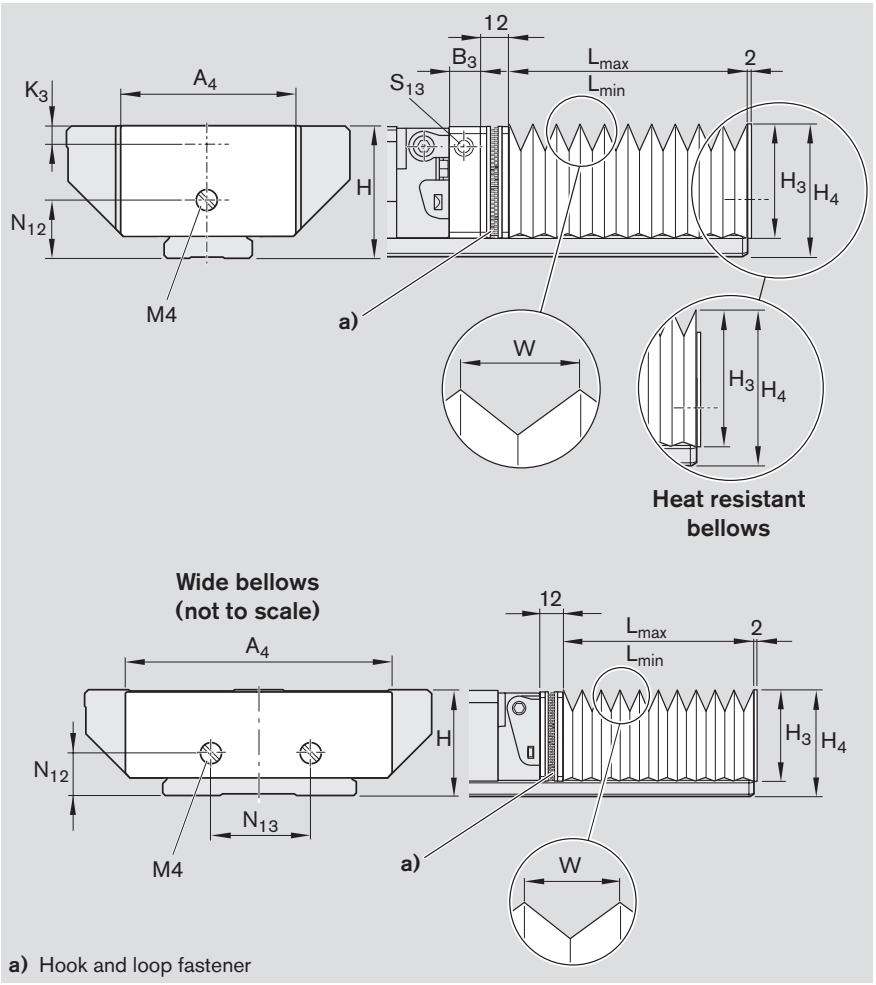
– The bellows are delivered pre-assembled.
– The assembly comes complete with mounting screws.

– Bellows with lube plate (Type 1, 3 - 5)
Sizes 15 - 20:
A funnel-type lube nipple with knock-in spigot is supplied.

Sizes 25 - 65 and wide version:
The runner block lube nipple can be used.

• For types 1 and 2, thread size M4 x 10 mm deep and countersunk 2 x 45° must be tapped in each end face of the SNS ball guide rail.
For ball guide rail BNS:
tap two threads at each end face.

– Follow the mounting instructions.



a) Hook and loop fastener

Standard bellows

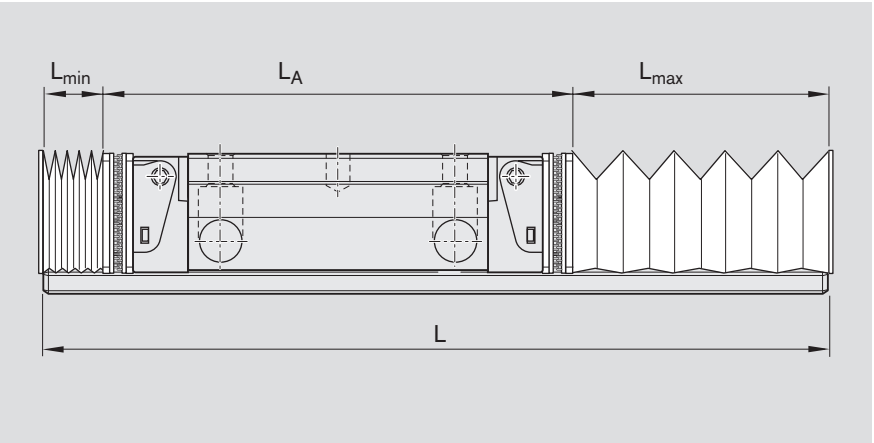
Size	Dimensions (mm)										Factor
	A_4	B_3	H	H_3	H_4	K_3	N_{12}	N_{13}	S_{13}	W	U
15	45	11	24	26.5	31.5	3.4	11.0	–	M3	19.9	1.18
20	42	12	30	24.0	29.2	3.5	13.0	–	M3	10.3	1.33
25	45	12	36	28.5	35.0	6.0	15.0	–	M3	12.9	1.32
30	55	12	42	34.0	41.0	8.0	18.0	–	M6	15.4	1.25
35	64	12	48	39.0	47.0	8.0	22.0	–	M6	19.9	1.18
45	83	12	60	49.0	59.0	8.0	30.0	–	M6	26.9	1.13
55	96	12	70	56.0	69.0	9.0	30.0	–	M6	29.9	1.12
65	120	14	90	75.0	89.0	18.0	40.0	–	M8x1	40.4	1.08
20/40[1]	73	–	27	31.0	35.0	–	11.5	–	–	19.9	1.12
25/70[1]	101	–	35	29.0	35.0	–	14.0	26	–	12.9	1.25
35/90[1]	128	–	50	42.0	49.0	–	21.5	40	–	19.9	1.18

Heat resistant bellows

Size	Dimensions (mm)										Factor
	A_4	B_3	H	H_3	H_4	K_3	N_{12}	N_{13}	S_{13}	W	U
25	62	12	36	39.0	44.5	6.0	15	–	M6	25.9	1.25
30	67	12	42	42.0	47.5	8.0	18	–	M6	25.9	1.25
35	74	12	48	47.0	54.0	8.0	22	–	M6	29.9	1.21
45	88	12	60	55.0	64.0	8.0	30	–	M6	32.9	1.18
55	102	12	70	63.0	75.0	9.0	30	–	M6	37.9	1.16
65	134	14	90	86.0	99.0	18.0	40	–	M8x1	52.4	1.11

1) Wide Ball Rail System

Calculations



Bellows

$$L_{max} = (\text{stroke} + 30) \cdot U$$

$$L_{min} = L_{max} - \text{stroke}$$

$$\text{Number of folds} = \frac{L_{max}}{W} + 2$$

Ball guide rail length

$$L = L_{min} + L_{max} + L_A$$

L_{max}	=	bellows extended	(mm)
L_{min}	=	bellows compressed	(mm)
Stroke	=	stroke	(mm)
U	=	calculation factor	(–)
W	=	maximum extension	(mm)
L	=	rail length	(mm)
L_A	=	length of runner block with mounting frame	(mm)

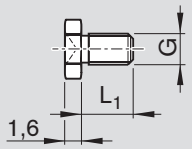
Accessories for Ball Runner Blocks and Ball Guide Rails

Accessories for Ball Runner Blocks

Lube Nipples

Funnel-type lube nipple per DIN 3405

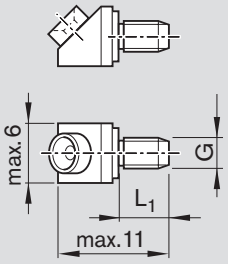
Form A



Part number	Dimensions (mm) G	L_1	Weight (g)
R3417 029 09	M3	5	0.3
R3417 032 09[1)]			

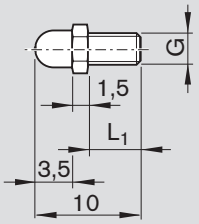
1) Lube nipple Resist NR II
made of corrosion-resistant steel per EN 10088

Form B



Part number	Dimensions (mm) G	L_1	Weight (g)
R3417 004 09	M3	5	1.5

Ball-type lube nipple

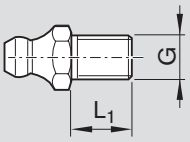


Part number	Dimensions (mm) G	L_1	Weight (g)
R3417 005 01[2)]	M3	5	0.5

2) Material: brass

Hydraulic-type lube nipple per DIN 71412

Form A

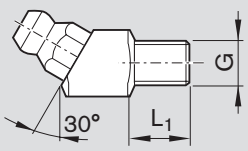


Part number	Dimensions (mm) G	L_1	Weight (g)
R3417 008 02	M6	8	2.6
R3417 016 02[1)]			

1) Lube nipple Resist NR II
made of corrosion-resistant steel per EN 10088

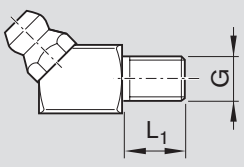
Hydraulic-type lube nipple per DIN 71412

30°



Part number	Dimensions (mm) G	L_1	Weight (g)
R3417 023 02	M6	8	7.4

Form B



Part number	Dimensions (mm) G	L_1	Weight (g)
R3417 007 02	M6	8	7.4
R3417 006 02	M8x1	8	8.0

Lube Fittings

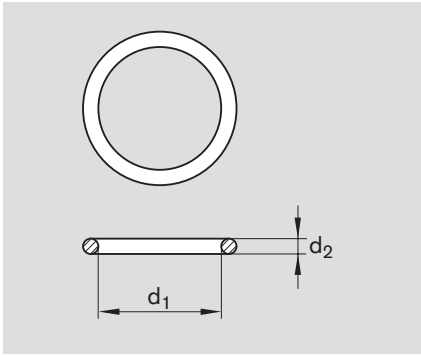
Plastic Hose for lube fittings

Plastic hose Ø 3 mm

Part number	Dimensions			Weight
	Outside Ø (mm)	**Inside Ø** (mm)	**Length** (m)	(kg)
R3499 287 00	3	1.7	50	0.4

O-rings

Part number	d_1 x d_2 (mm)	Weight (g)
R3411 130 01	4 x 1.0	0.01
R3411 131 01	5 x 1.0	0.01
R3411 003 01	6 x 1.5	0.03

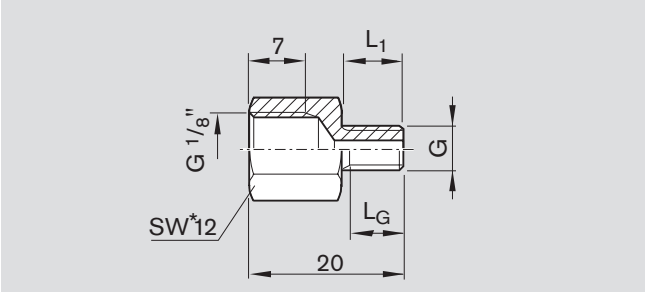


Accessories for Ball Runner Blocks and Ball Guide Rails

Accessories for Ball Runner Blocks

Lube Fittings

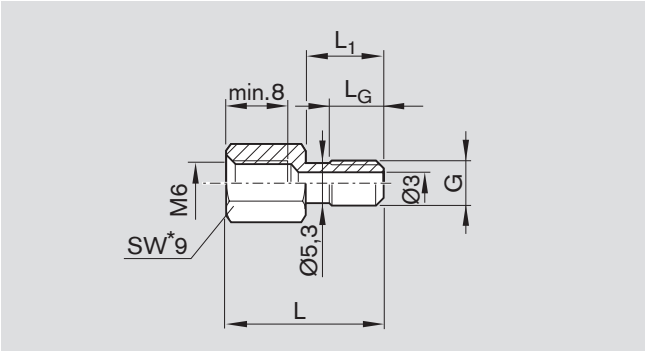
Reducers



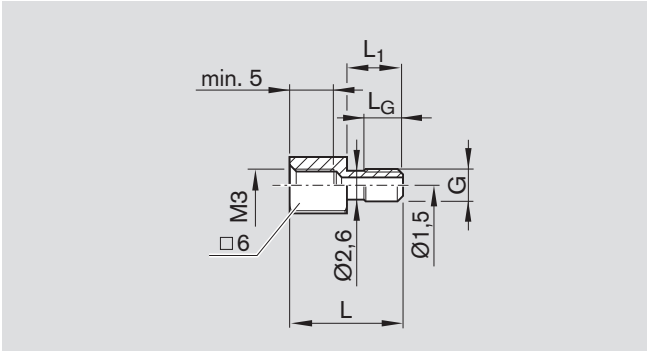
* SW = width across flats

Part number	Dimensions (mm)			Weight
	G	L_1	L_G	(g)
R3455 030 34	M6	8	6.5	7.5

Extension pieces

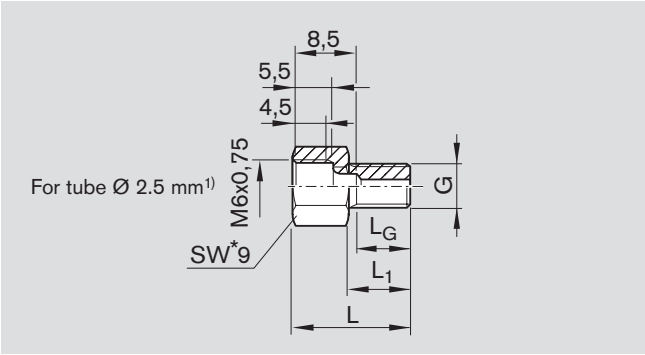


Part number	Dimensions (mm)				Weight
	G	L	L_1	L_G	(g)
R3455 030 69	M6	21.0	10.5	7	5.0
R3455 030 87	M6	25.0	14.5	8	5.5
R3455 030 85	M6	26.5	16.0	7	5.0

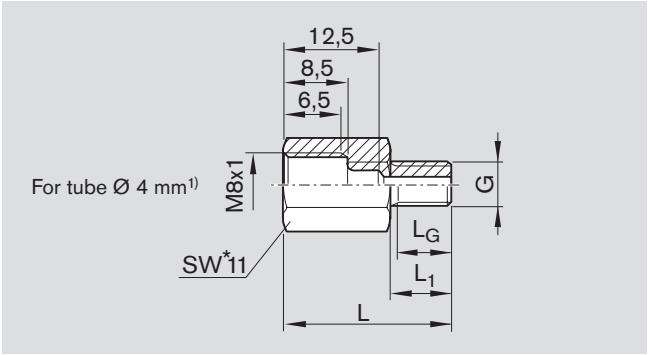


Part number	Dimensions (mm)				Weight
	G	L	L_1	L_G	(g)
R3455 030 78	M3	16.5	8.5	6	2.5

Connectors



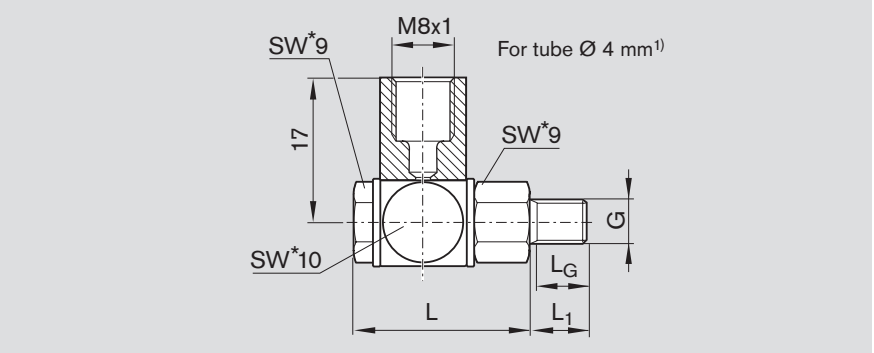
Part number	Dimensions (mm)				Weight
	G	L	L_1	L_G	(g)
R3455 030 38	M6	15.5	8	6.5	4.1



Part number	Dimensions (mm)				Weight
	G	L	L_1	L_G	(g)
R3455 030 37	M6	22	8	6.5	8.8

1) For connections as per DIN 2353 (solderless tube fittings)

Swivel fittings



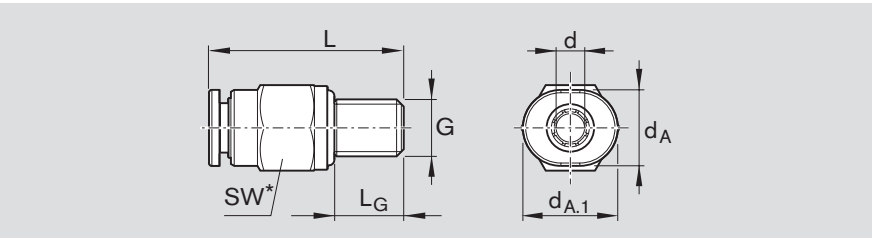
Part number	Dimensions (mm)				Weight
	G	L	L_1	L_G	(g)
R3417 018 09	M6	21.5	8	6.5	18.6

1) For connections as per DIN 2353 (solderless tube fittings)

Push-in fittings for plastic and metal tubes

⚠ **Not permitted for ball runner blocks with accessories attached to end face.**

Straight connectors

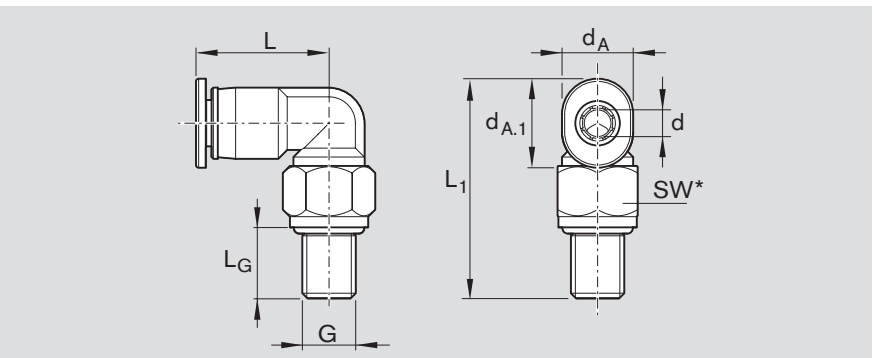


Part number	Dimensions (mm)							Weight
	d_A	$d_{A.1}$	d±0.1	G	L	L_G	SW*	(g)
R3417 033 09	6.0	7	3	M3	15.5	5	6[1)]	1.4
R3417 034 09	8.0	9	3	M5	18.0	5	8	3.5
R3417 035 09	8.5	10	4	M6	20.5	8	9	4.6
R3417 036 09	10.0	12	6	M6	21.5	8	10	4.8

1) Maximum tightening torque: $M_A = 0.5$ Nm

* SW = width across flats

Elbow couplings, rotatable[1)]



Part number	Dimensions (mm)								Weight
	d_A	$d_{A.1}$	d±0.1	G	L	L_1	L_G	SW*	(g)
R3417 037 09	6.0	7	3	M3	13.7	18.0	5	6[2)]	1.7
R3417 038 09	8.0	10	4	M6	19.5	24.7	8	9	5.1
R3417 039 09	10.5	12	6	M6	20.0	25.0	8	9	6.1

1) Maximum lubricant pressure: 30 bar (exerting slow pressure with manual grease gun)

2) Maximum tightening torque: $M_A = 0.5$ Nm

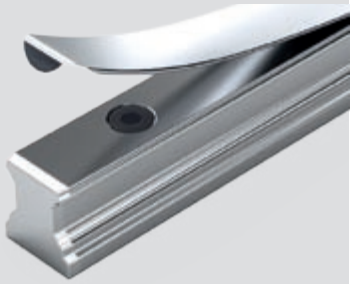
Accessories for Ball Runner Blocks and Ball Guide Rails

Product Description, Accessories for Ball Guide Rails

Rexroth offers limitless interchangeability as all ball guide rail versions can be combined at will with all accessories within each size.
The entire range is perfectly geared to provide top performance and to meet all special requirements.

Overview of Accessories for Ball Guide Rails

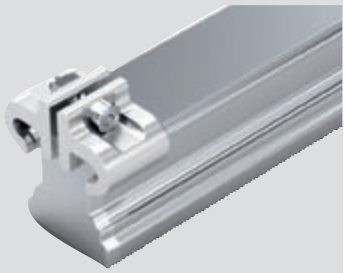
Cover strip, separate ☞ 176



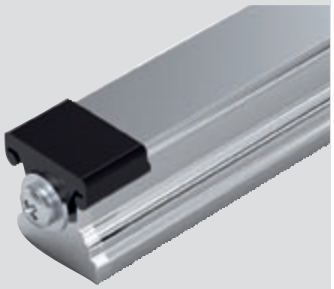
Expanding tool ☞ 177

Mounting kit for cover strip with mounting tool and lifting plate ☞ 177

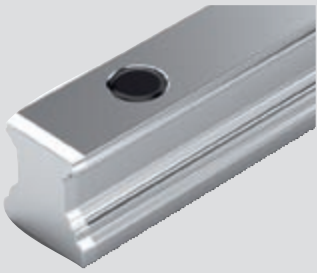
Aluminum strip clamp ☞ 178



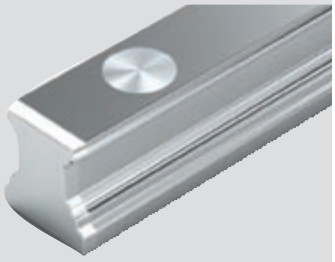
Plastic protective cap ☞ 178



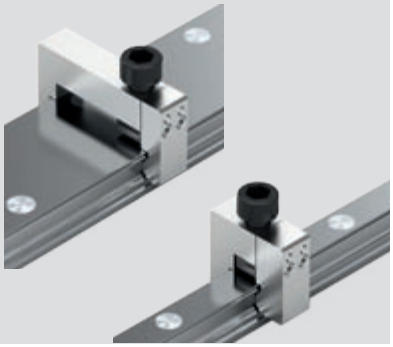
Plastic mounting hole plug ☞ 179



Steel mounting hole plug ☞ 179



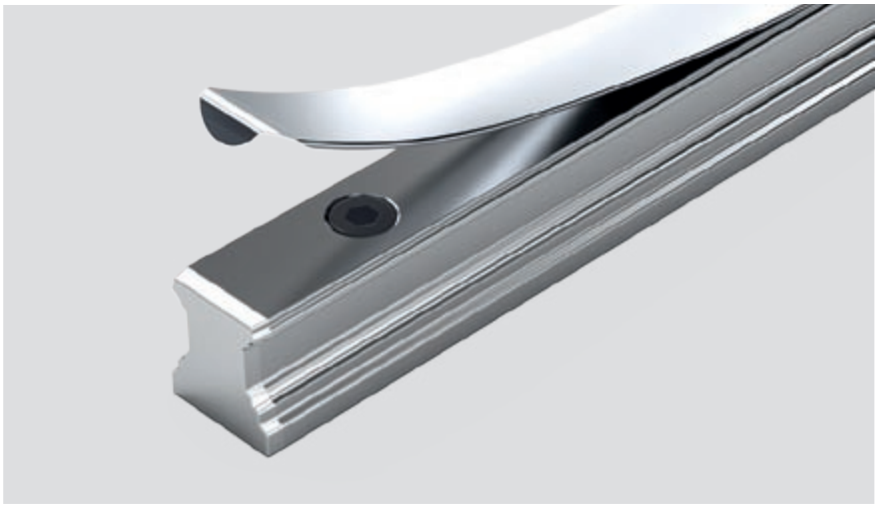
Two-piece mounting tool for steel mounting hole plugs ☞ 179



Wedge profile (not for BNS) ☞ 180

Accessories for Ball Guide Rails

Mounting instructions for rail cover strip



⚠ **Secure the cover strip!**

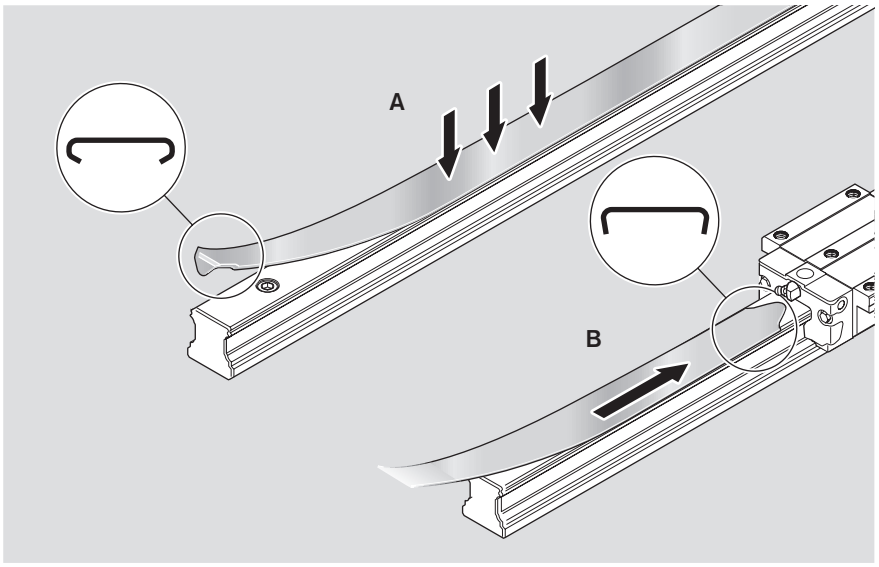
☞ 178

– Follow the mounting instructions! Send for the “Mounting Instructions for the Cover Strip.”

Advantages

The cover strip is easy to clip on and remove.

– This considerably facilitates and speeds up the mounting process:
  – no need to plug each single hole.
  – no time delay while waiting for adhesive to harden when using adhesive tape.
– The cover strip and be mounted and removed (up to 4 times).

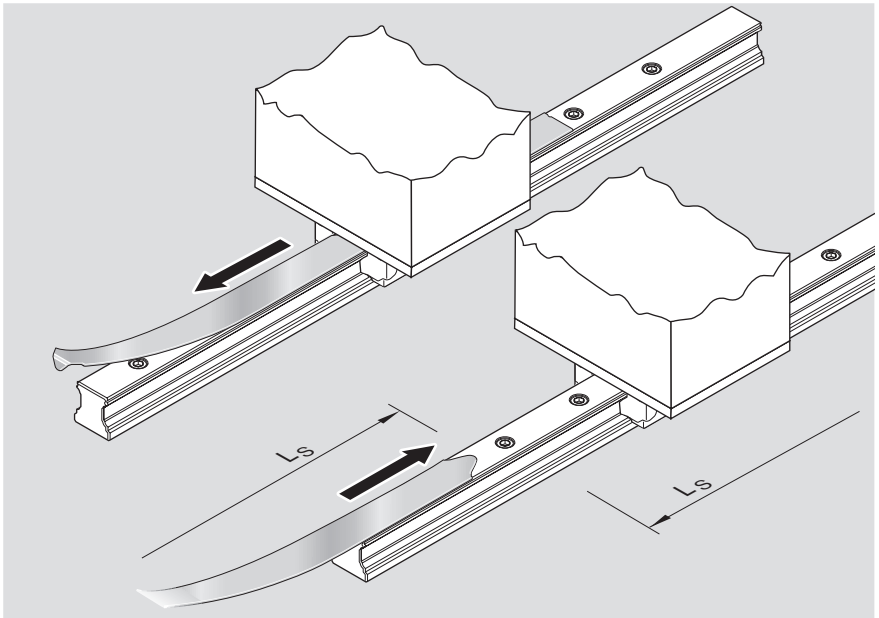


Versions and functions

A Snap-fit cover strip (standard)
  – The cover strip is clipped on before the runner blocks are mounted and fits tightly.

B Sliding-fit cover strip
  – For mounting or replacing a cover strip when the runner blocks or adjoining structure cannot be removed.
  – A section of the snap-fit cover strip is very slightly widened and can then be easily slid under the runner blocks.

A special expanding tool can be used to create the sliding fit after a cover strip has been installed.
The main advantage is that the length L_S of the sliding fit can be optimized to suit the installation conditions.



⚠ **The cover strip is a precision-machined part that must be handled with great care. It must on no account be bent.**
Risk of injury at the edges and ends of the cover strip! Wear gloves!

For part numbers, dimension drawing, dimensions and weights, see the following pages.

Accessories for Ball Runner Blocks and Ball Guide Rails

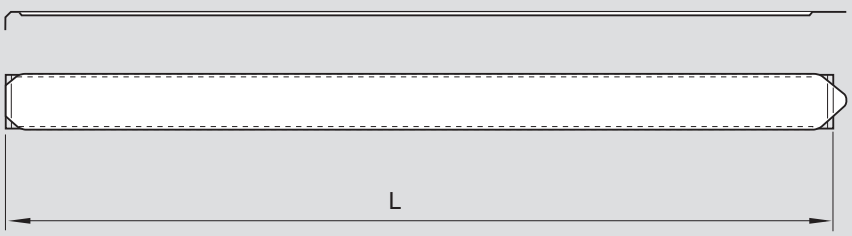
Accessories for Ball Guide Rails

Cover Strip, Separate

For initial mounting, as spare part or as replacement part

Note
A matching cover strip (sliding or snap fit) can be supplied for each ball guide rail SNS.

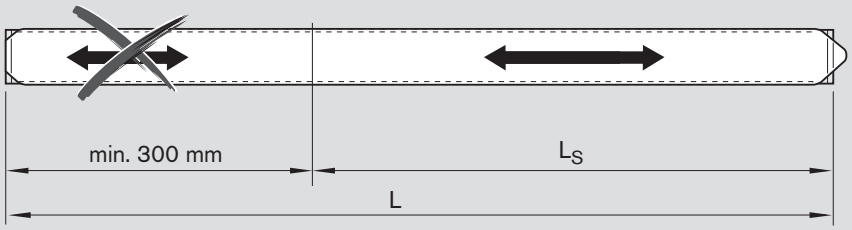
Standard snap-fit cover strip



Ordering example 1
(Standard snap-fit cover strip)
– Ball Guide Rail SNS
– Size 35
– Rail length L = 2696 mm
Part number:
R1619 330 20, 2696 mm

Size	Standard snap-fit cover strip Part number, rail length L (mm)	Weight (g/m)
15	R1619 130 00, ...	10
20	R1619 830 00, ...	29
25	R1619 230 00, ...	32
30	R1619 730 00, ...	40
35	R1619 330 20, ...	80
45	R1619 430 20, ...	100
55	R1619 530 20, ...	120
65	R1619 630 20, ...	148

Sliding-fit cover strip



L_S = sliding fit length (mm)
L = rail length (mm)

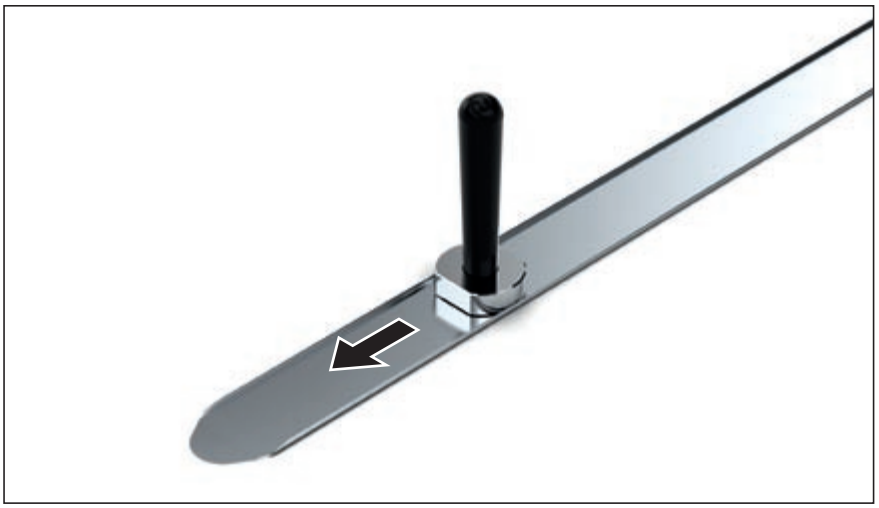
Ordering example 2
(Sliding-fit cover strip)
– Ball Guide Rail SNS
– Size 35
– Rail length L = 2696 mm
– Sliding fit length
L_S = 1200 mm
Part number:
R1619 330 30, 2696, 1200 mm

Size	Sliding-fit cover strip Part number, rail length L (mm), Sliding fit length L_S (mm)	Weight (g/m)
15	R1619 130 10, ...	10
20	R1619 830 10, ...	29
25	R1619 230 10, ...	32
30	R1619 730 10, ...	40
35	R1619 330 30, ...	80
45	R1619 430 30, ...	100
55	R1619 530 30, ...	120
65	R1619 630 30, ...	148

– Follow the mounting instructions!
– Send for the “Mounting Instructions for the Cover Strip.”

Expanding Tool

For creating a sliding fit in the cover strip



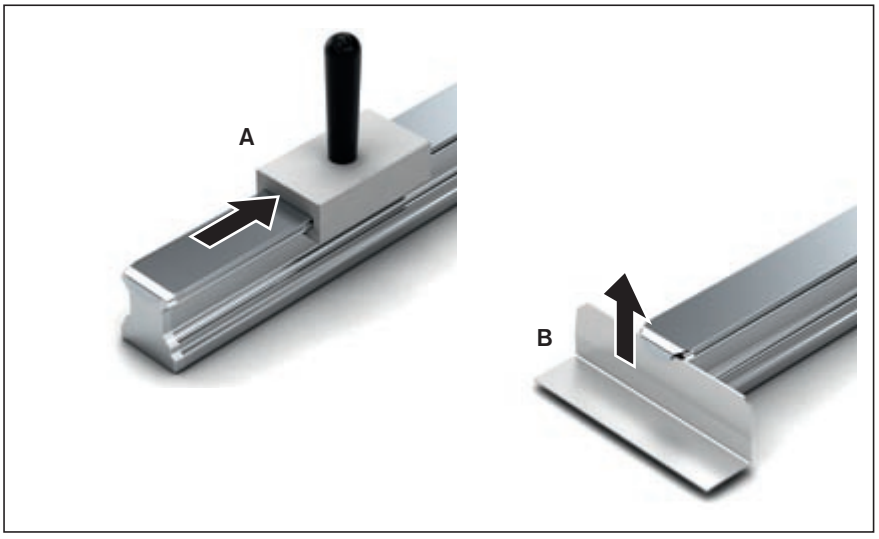
Size	Part number	Weight (g)
15	R1619 115 10	40
20	R1619 815 10	50
25	R1619 215 10	80
30	R1619 715 10	100
35	R1619 315 30	100
45	R1619 415 30	130
55	R1619 515 30	210
65	R1619 615 30	270

Cover Strip Mounting Kit

Mounting tool and lifting plate

Notes for mounting

– The kit comprises a mounting tool (A) for clipping on the cover strip and a lifting plate (B) for removing the cover strip.



Size	Part number	Weight (g)
25	R1619 210 80	170
30	R1619 710 80	200
35	R1619 310 60	200
45	R1619 410 60	210
55	R1619 510 60	210
65	R1619 610 60	280

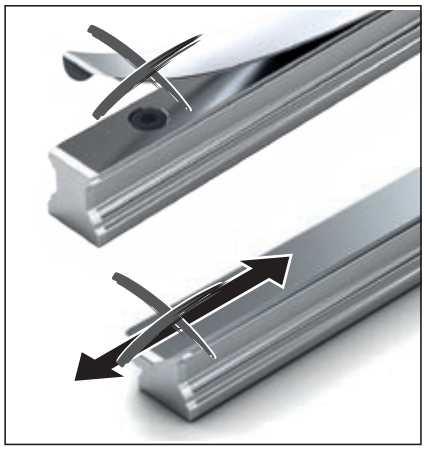
– Follow the mounting instructions!
– Send for the “Mounting Instructions for the Cover Strip.”

Accessories for Ball Runner Blocks and Ball Guide Rails

Accessories for Ball Guide Rails

Parts for securing the cover strip

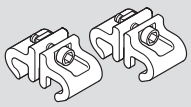
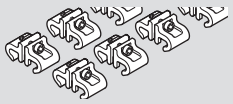
Notes for mounting
- Rexroth recommends the use of strip clamps to:
- prevent unintentional lifting of the strip and penetration of dirt,
- fix the cover strip in place.



Strip clamps

For ball guide rails without threaded holes at the end faces

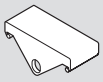
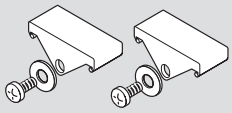
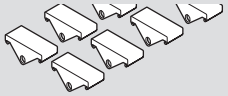
Material:
- Strip clamp made of anodized aluminum
- Clamping screw and nut made of corrosion-resistant steel per EN 10088

Size	Set (2 pieces per unit) 		Bulk pack (100 per unit) 	
	Part number (unit)	Weight (g)	Part number (unit)	Weight (kg)
15	R1619 139 50	11	R1619 139 60	1.1
20	R1619 839 50	13	R1619 839 60	1.3
25	R1619 239 50	14	R1619 239 60	1.4
30	R1619 739 50	22	R1619 739 60	2.2
35	R1619 339 50	30	R1619 339 60	3.0
45	R1619 439 50	56	R1619 439 60	5.6
55	R1619 539 50	62	R1619 539 60	6.2
65	R1619 639 50	84	R1619 639 60	8.4

Protective end caps

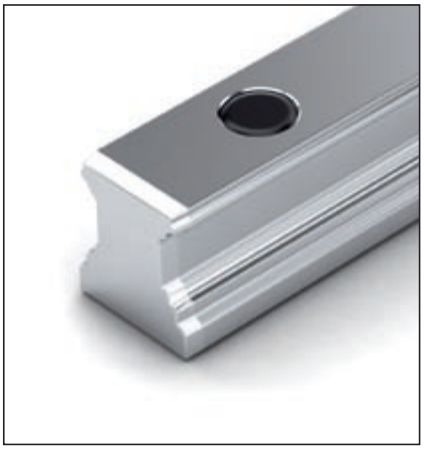
For ball guide rails with threaded holes at the end faces

Material:
- Plastic protective cap, color black
- Screw made of corrosion-resistant steel per EN 10088
- Washer made of galvanized steel

Size	Single cap 		Set (2 pieces per unit with screws) 		Bulk pack 	
	Part number (without screws)	Weight (g)	Part number (unit)	Weight (g)	Part number/qty (without screws)	Weight (kg)
15	R1619 139 00	0.8	R1619 139 20	5.5	R1619 139 01 / 1000	0.8
20	R1619 839 00	0.9	R1619 839 20	6.0	R1619 839 01 / 1000	0.9
25	R1619 239 00	1.0	R1619 239 20	7.0	R1619 239 01 / 1000	1.3
30	R1619 739 00	1.7	R1619 739 20	9.0	R1619 739 01 / 1000	1.7
35	R1619 339 10	2.0	R1619 339 30	10.0	R1619 339 01 / 1000	2.5
45	R1619 439 00	4.0	R1619 439 20	13.0	R1619 439 01 / 700	2.6
55	R1619 539 00	4.0	R1619 539 20	20.0	R1619 539 01 / 500	2.1
65	R1619 639 00	6.0	R1619 639 20	20.0	R1619 639 01 / 300	1.7

Accessories for Ball Guide Rails

Plastic Mounting Hole Plugs

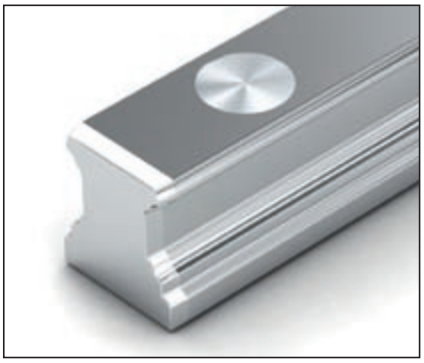


Size	Single plug	
	Part number	Weight (g)
15	R1605 100 80	0.05
20	R1605 800 80	0.10
25	R1605 200 80	0.30
30	R1605 300 80	0.60
35	R1605 300 80	0.60
45	R1605 400 80	1.00
55	R1605 500 80	1.70
65	R1605 600 90	2.10
20/40	R1605 100 80	0.05
25/70	R1605 200 80	0.30
35/90	R1605 300 80	0.60

Notes for mounting

– Follow the mounting instructions! Send for the publication “Mounting Instructions for Ball Rail Systems.”

Steel Mounting Hole Plugs



Size	Single plug made of machining steel	
	Part number	Weight (g)
25	R1606 200 75	2
30	R1606 300 75	3
35	R1606 300 75	3
45	R1606 400 75	6
55	R1606 500 75	8
65	R1606 600 75	9
25/70	R1606 200 75	2
35/90	R1606 300 75	3

Notes on delivery and mounting

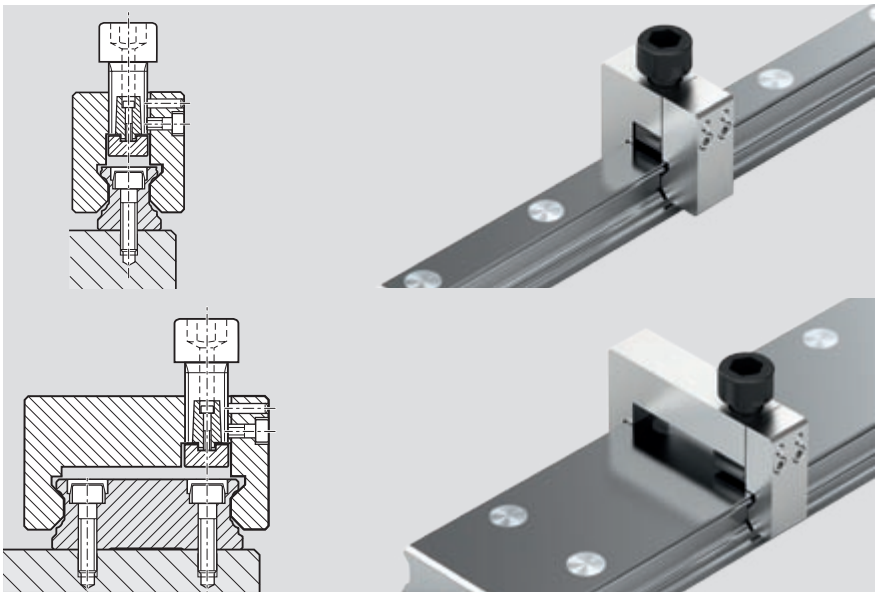
– Steel mounting hole plugs are not supplied with the guide rails.

- **Order the mounting tool along with the plugs!**

– Follow the mounting instructions! Send for the publication “Mounting Instructions for Ball Rail Systems.”

Mounting tool for steel mounting hole plugs

Two-piece, with instruction leaflet
The two-piece mounting tool is suitable for mounting plugs to a screwed down guide rail.



Size	Part number	Weight (kg)
25	R1619 210 00[1)]	0.37
30	R1619 710 00[1)]	0.37
35	R1619 310 10	0.57
45	R1619 410 10	0.85
55	R1619 510 10	1.50
65	R1619 610 00[1)]	1.85
25/70	R1619 210 40	0.75
35/90	R1619 310 40	1.05

1) Only available as a one-piece unit

Accessories for Ball Runner Blocks and Ball Guide Rails

Accessories for Ball Guide Rails

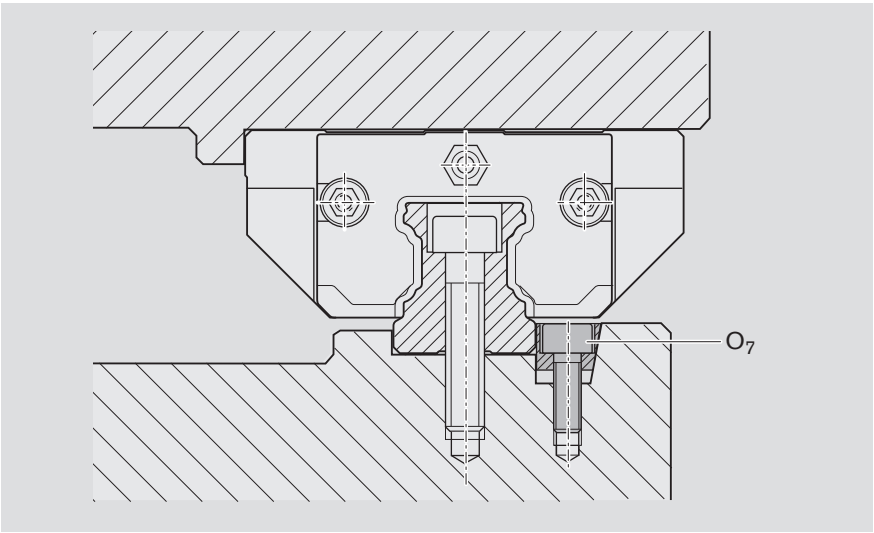
Wedge Profile

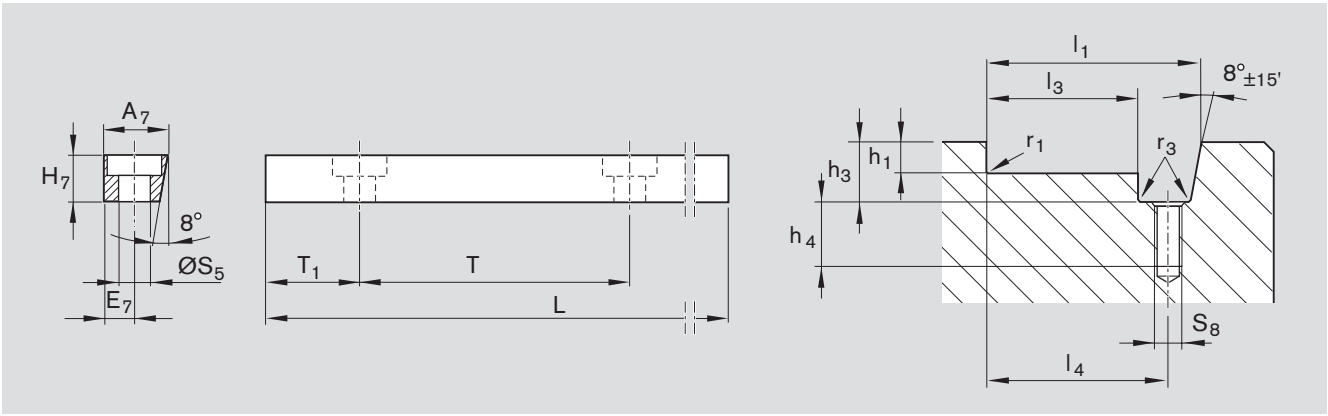
Lateral retention for Ball Guide Rails

- Material: steel
- Specification: black finished

Notes for mounting

- Follow the mounting instructions! Send for the publication “Mounting Instructions for Ball Rail Systems.”





Wedge profile

Size	Part number	Dimensions (mm)								Weight
		A_7	E_7	H_7	L	O_7 1)	S_5	T	T_1	(kg)
15	**R1619 200 01**	12.0	6	10	957	M5x20	6.0	60	28.5	0.8
20										
25										
30										
35										
45	**R1619 400 01**	19.0	9	16	942	M8x25	9.0	105	51.0	2.0
55										
65										

1) Screw O_7 to DIN 6912

Wedge profile groove

Size	Dimensions (mm)								
	$h_{1\ -0.2}$	$h_3{}^{+1}$	$h_4{}^{+2}$	$l_1{}^{\pm0.05}$	$l_3{}^{-0.1}$	$l_4{}^{\pm0.1}$	$r_{1\ max}$	$r_{3\ max}$	S_8
15	3.5	12.5	15	27	14.9	21	0.4	0.5	M5
20	4.0	12.5	15	32	19.9	26	0.5	0.5	M5
25	4.0	12.5	15	35	22.9	29	0.8	0.5	M5
30	5.0	12.5	15	40	12.9	34	0.8	0.5	M5
35	6.0	12.5	15	46	33.9	40	0.8	0.5	M5
45	8.0	19.0	16	64	44.9	54	0.8	0.5	M8
55	10.0	19.0	16	72	52.9	62	1.2	0.5	M8
65	10.0	19.0	16	82	62.9	72	1.2	0.5	M8

Product Description, Accessories, Hydraulic Clamping and Braking Units

Application areas

Clamping
- During installation work and while machine is stopped, **with** power when using KBH
- During installation work and while machine is stopped, **without** power when using KBHS
- Clamping of heavy handling systems
- Clamping of machine tables in heavy duty machining centers

Braking
- Auxiliary brake for linear motors
- Braking of heavy handling systems

Characteristic features

- Very high axial holding forces
- Dynamic and static stabilization in the axis travel direction
- Heavy duty brake with spring energy accumulator

⚠ **Follow the safety notes for Clamping and Braking Units.** ☞ 187

Further highlights

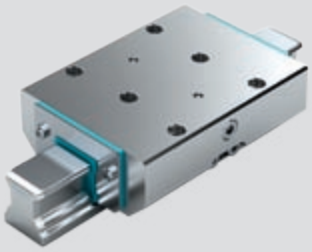
- Up to 1 million clamping cycles
- Up to 2,000 emergency braking operations
- Threaded ports on both sides for connection of hydraulic circuit
- Solid, rigid steel housing, catalytically nickel-plated
- High positioning accuracy
- Release pressure 150 bar
- Integrated all-round sealing
- Special pressure diaphragm for high functional reliability without pressure losses or leakage
- Brake shoes with integrated contour-locking, large-surface contact profiles for maximum axial stiffness
- Super heavy duty model

Special features of KBH:
- Low oil displacement volume
- Compact design, compatible with DIN 645

Special features of KBHS:
- Clamping and braking in the event of a power failure
- Clamping and braking in the event of a pressure drop
- Reinforcing the E-Stop function
- Successor model to the KBH series
- To be used for new-build designs

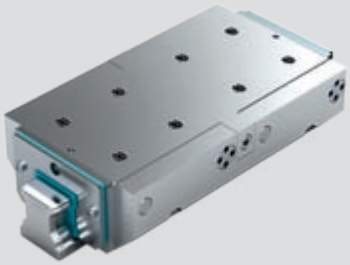
Model overview, Accessories, Hydraulic Clamping and Braking Units

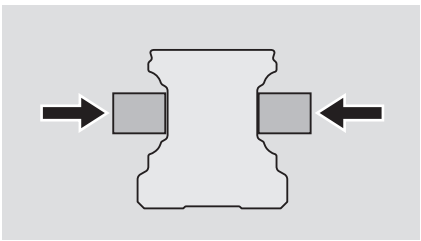
KBH, FLS ☞ 184



KBH, SLS ☞ 185

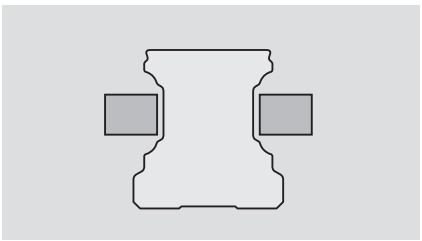
KBHS ☞ 186





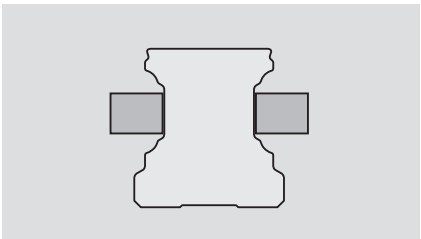
Hydraulic pressure: 50 - 150 bar (KBH)

Clamping and braking by pressure application
The large-surface clamping profiles are pressed directly against the free surfaces of the ball guide rail by the piston-type action of a hydraulic oil circuit.



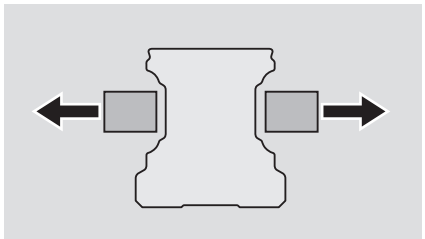
Hydraulic pressure: 0 bar (KBH)

Release by spring action
A preloaded return spring provides quick release.



Hydraulic pressure: 0 bar (KBHS)

Clamping and braking by spring action
In the event of a power failure or pressure drop in the 3/2-way directional valve, the pre-tensioned spring plates force the oil out of the piston.
As the pressure drops, the expansion bolts integrated in the sides of the unit pull the brake shoes against the ball guide rail, thus initiating the braking process. A fast-acting 3/2-way directional valve (with spring return) ensures short braking distances.



Hydraulic pressure: 150 bar (KBHS)

Release by pressure application
With an applied pressure of 150 bar, the piston located in the upper part of the unit housing presses the spring plates downwards. This forces the brake shoes away from the guide rail.

Accessories, Clamping and Braking Units

Hydraulic Clamping and Braking Units KBH

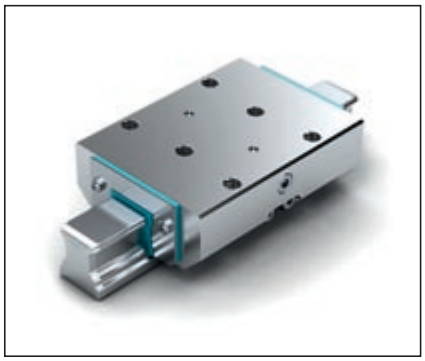
FLS
Flanged, long, standard height
R1619 .40 21

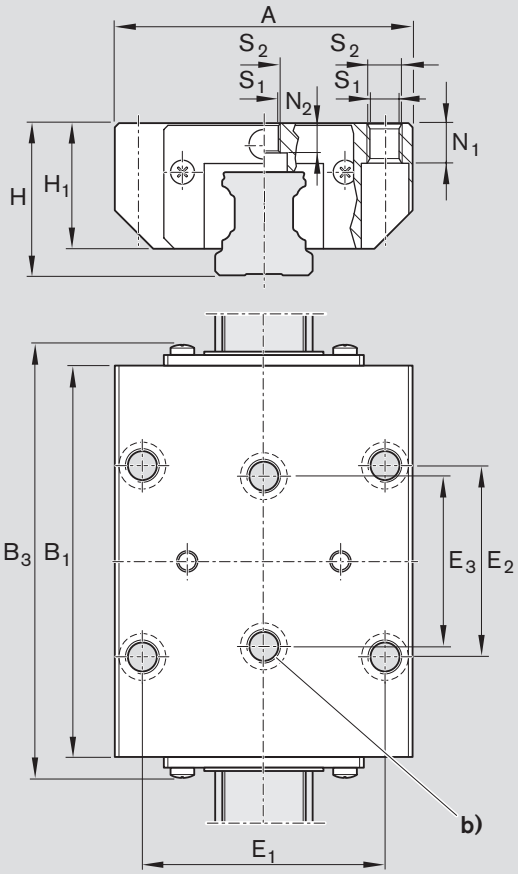
Note
Can be used on all Ball Guide Rails SNS.

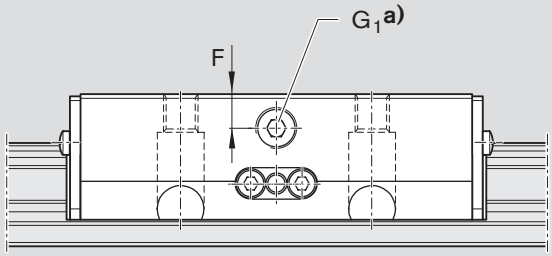
Clamping and braking by pressure application
- Max. hydraulic operating pressure:
  - Size 25: 100 bar
  - Size 35 - 65: 150 bar
- Operating temperature range t: 0 - 70 °C

Lubrication notes
- First filling with hydraulic oil HLP46.
- If other oils are used, check the compatibility.

⚠ **Follow the safety notes for Clamping and Braking Units.** ☞ 187







Notes for mounting
- Both sides may be used as reference surfaces.
- Make sure the adjoining structure is sufficiently rigid.
- Read the mounting instructions before start-up.
- Check that the sealing lips of the end seals sit evenly all around the guide rail. Re-align if necessary.

a) Hydraulic port*) G_1 on both sides
b) The two mounting holes at the center must be used in addition!
*) Only one port required.
All ports are plugged for shipment.

Size	Part number	Holding force[1] (N)	Dimensions (mm)														Displacement[6] (cm^3)	Weight (kg)
			A	B_1	$B_{3\,max}$	H	H_1	E_1	E_2	E_3	F	G_1	N_1[4]	N_2[5]	S_1	S_2		
25	R1619 240 21	2 200[2]	70	92.0	102.3	36	29.5	57	45	40	8	1/8"	9	7.0	6.8	M8	0.6	1.10
35	R1619 340 21	5 700[3]	100	120.5	141.0	48	40.0	82	62	52	12	1/8"	12	10.2	8.6	M10	1.1	2.69
45	R1619 440 21	9 900[3]	120	155.0	178.0	60	50.0	100	80	60	15	1/8"	15	12.4	10.5	M12	1.8	5.20
55	R1619 540 21	13 700[3]	140	184.0	209.0	70	57.0	116	95	70	16	1/8"	18	13.5	12.5	M14	2.4	8.40
65	R1619 640 21	22 700[3]	170	227.0	264.0	90	76.0	142	110	82	20	1/4"	23	14.0	14.5	M16	3.8	17.30

1) Testing is performed in the installed condition with a film of lubricating oil (ISO VG 68).
2) At 100 bar
3) At 150 bar
4) For mounting from below with ISO 4762
5) For mounting from below with DIN 7984
6) Per clamping cycle

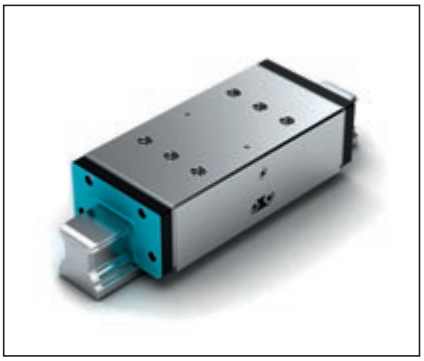
SLS
Slimline, long, standard height
R1619 .40 20

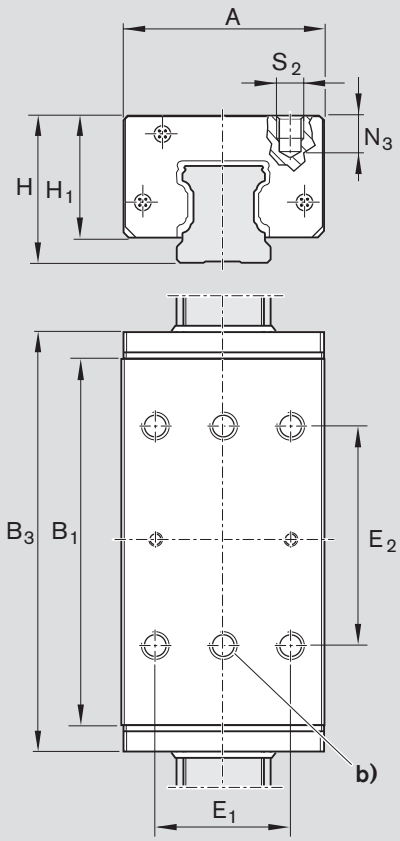
Note
Can be used on all Ball Guide Rails SNS.

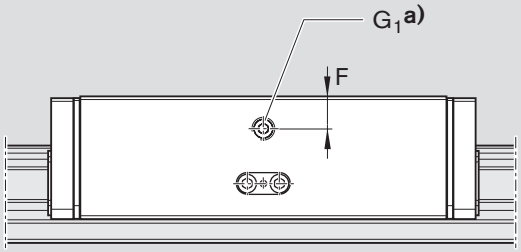
Clamping and braking by pressure application
- Max. hydraulic operating pressure:
  - Size 65: 150 bar
- Operating temperature range t:
  0 - 70 °C

Lubrication notes
- First filling with hydraulic oil HLP46.
- If other oils are used, check the compatibility.

⚠ **Follow the safety notes for Clamping and Braking Units.** ☞ 187







Notes for mounting
- Both sides may be used as reference surfaces.
- Make sure the adjoining structure is sufficiently rigid.
- Read the mounting instructions before start-up.
- Check that the sealing lips of the end seals sit evenly all around the guide rail.
  Re-align if necessary.

a) Hydraulic port*) G_1 on both sides
b) The two mounting holes at the center must be used in addition!
*) Only one port required.
All ports are plugged for shipment.

Size	Part number	Holding force[1] (N)	Dimensions (mm)											Displacement[3] (cm^3)	Weight (kg)
			A	B_1	$B_{3\,max}$	H	H_1	E_1	E_2	F	G_1	N_3	S_2		
65	R1619 640 20	22 700[2]	126	227	264	90	76	76	120	20	1/4"	21	M16	3.8	14.40

1) Testing is performed in the installed condition with a film of lubricating oil (ISO VG 68).
2) At 150 bar
3) Per clamping cycle

Accessories, Clamping and Braking Units

Hydraulic Clamping and Braking Units KBHS

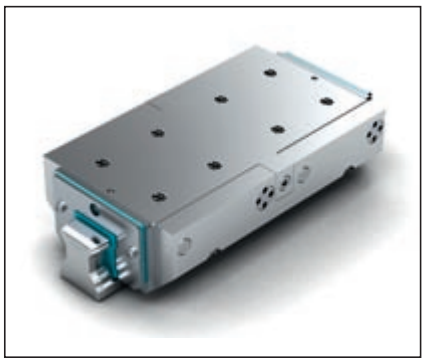
FLS
Flanged, long, standard height
R1619 .42 21

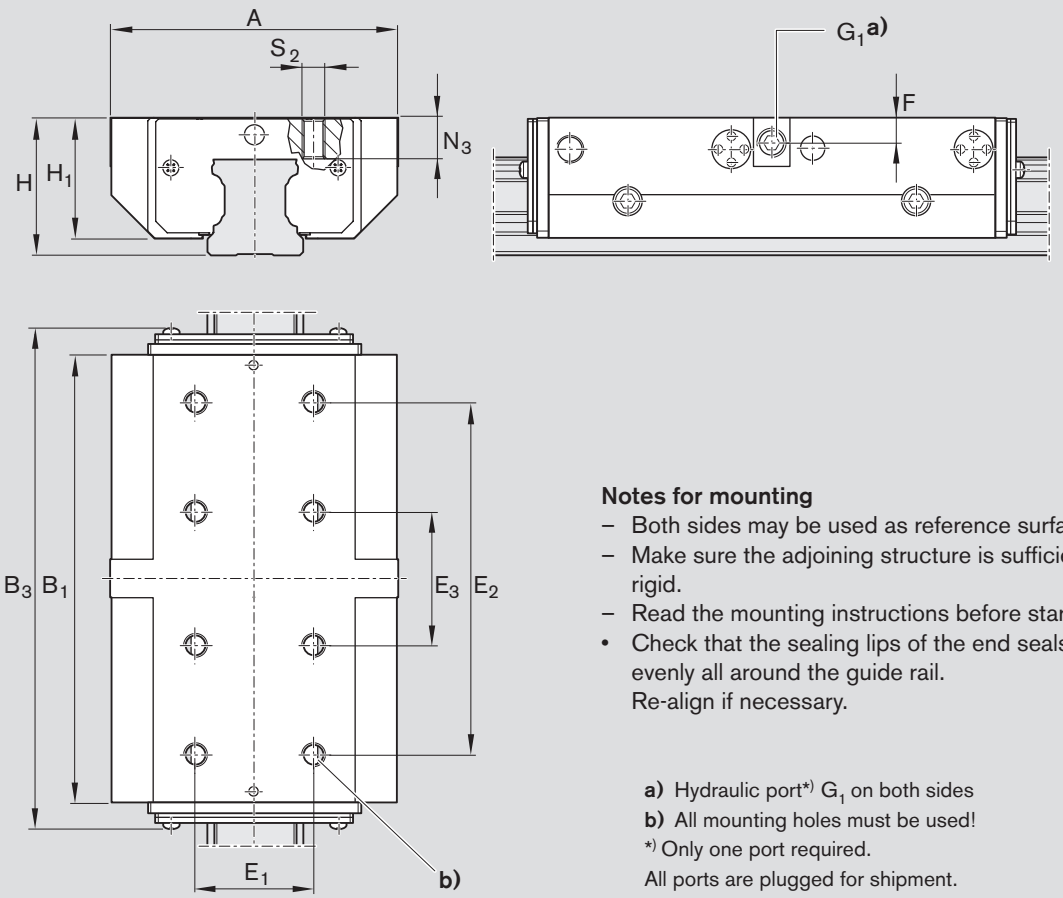
Note
Can be used on all Ball Guide Rails SNS.

Pressureless clamping and braking (spring energy)
- Release pressure and max. hydraulic operating pressure:
  - Size 35: 160 bar
- Operating temperature range t: 0 - 70 °C

Lubrication notes
- First filling with hydraulic oil HLP46.
- If other oils are used, check the compatibility.

⚠ **Follow the safety notes for Clamping and Braking Units.** ☞ 187





Notes for mounting
- Both sides may be used as reference surfaces.
- Make sure the adjoining structure is sufficiently rigid.
- Read the mounting instructions before start-up.
- Check that the sealing lips of the end seals sit evenly all around the guide rail. Re-align if necessary.

a) Hydraulic port*) G_1 on both sides
b) All mounting holes must be used!
*) Only one port required.
All ports are plugged for shipment.

Size	Part number	Holding force Spring energy[1] (N)	Dimensions (mm) A	B_1	$B_{3\,max}$	H	H_1	E_1	E_2	E_3	F	G_1	N_3	S_2	Displacement[3] (cm^3)	Weight (kg)
35[4]	R1619 342 21	7 500[2]	100	155	175.4	48	42	41	122	46	9	1/8"	15	M8	5.0	3.80

1) Holding force achieved by spring energy. Testing is performed in the installed condition with a film of lubricating oil (ISO VG 68).
2) At 150 bar
3) Per release cycle
4) In preparation

Notes on Clamping and Braking Units

General safety notes

⚠ **When working with Clamping Units, always follow all applicable mechanical and electrical accident prevention regulations (e.g. UVV, VDE) and safety procedures!**

⚠ **For hydraulic Clamping and Braking Units, the return pressure in the tank line must be lower than 1.5 bar!**

⚠ **Consider the response times of the Clamping and Braking Units!**

⚠ **The Clamping Unit is not intended for securing suspended loads!**

⚠ **Do not remove the cover of the safety clamping unit – spring under tension!**

⚠ **The transport safety arbor may only be removed when:**
- The hydraulic port has been pressurized with the operating pressure according to instructions.
- The air port has been pressurized with compressed air to at least 4.5 (MBPS) or 5.5 bar (TKPS, UBPS, MKS, LCPS) according to instructions.

The Clamping Unit may only be depressurized when the appropriate guide rail or transport safety arbor is in position between the contact profiles!

⚠ **The use of Clamping and Braking Units is not permitted on guide rails with Integrated Measuring Systems!**

Additional notes for Clamping and Braking Units

⚠ **Use as a safety device only after testing and certification by authorized experts examining the machine as a whole!**

Additional notes for Clamping Units

⚠ **The unit may not be used as a braking unit! For use only when the axis is at a standstill.**

⚠ **Pressure may only be applied when the unit is properly mounted on the guide rail!**

Product Description, Accessories, Hydraulic Clamping Units

Application areas

- Clamping of heavy handling systems
- Clamping of machine tables in heavy duty machining centers

Characteristic features

- Very high axial holding forces
- Compact design, compatible with DIN 645
- Dynamic and static stabilization in the axis travel direction

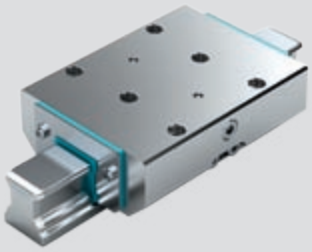
Further highlights

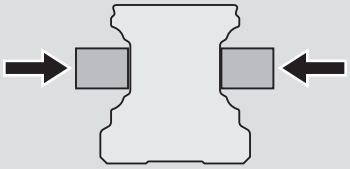
- Threaded ports on both sides for connection of hydraulic circuit
- Solid, rigid steel housing, catalytically nickel-plated
- High positioning accuracy
- Steplessly adjustable pressure from 50 to 150 bar
- Integrated all-round sealing
- Special pressure diaphragm for high functional reliability without pressure losses or leakage
- Integrated contour-locking, large-surface contact profiles for maximum axial stiffness

⚠ **Follow the safety notes for Clamping and Braking Units.** ☞ 187

Model overview, Accessories, Hydraulic Clamping Units

KWH, FLS ☞ 191

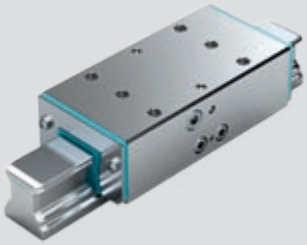


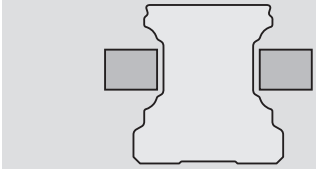


Hydraulic pressure: 50 - 150 bar

Clamping by pressure application
The large-surface clamping profiles are pressed directly against the free surfaces of the ball guide rail by the piston-type action of a hydraulic oil circuit.

KWH, SLS ☞ 192





Hydraulic pressure: 0 bar

Release by spring action
A preloaded return spring provides quick release.

KWH, SLH ☞ 193

Accessories, Clamping and Braking Units

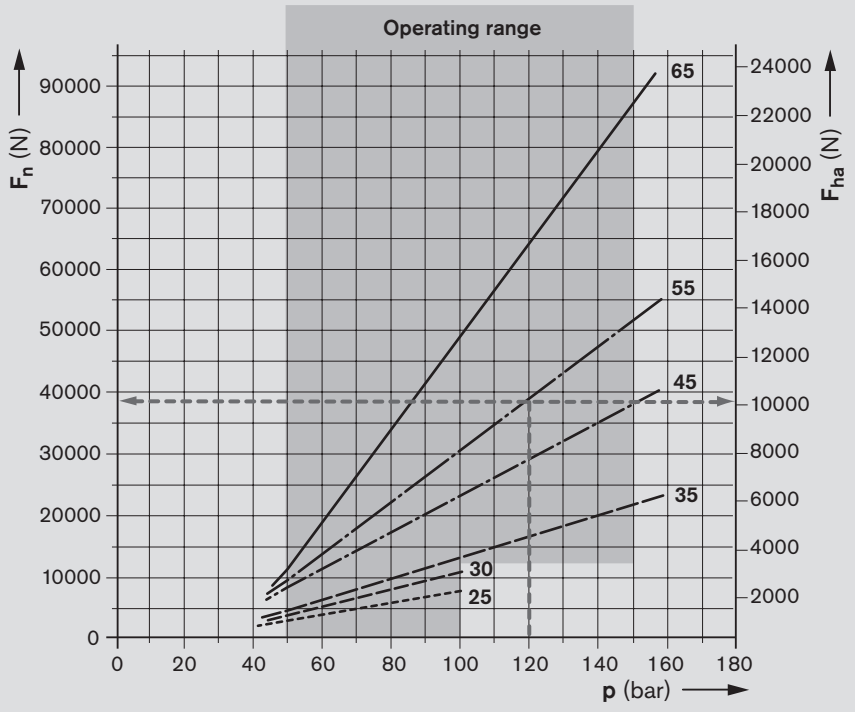
Technical Data and Calculations

Normal forces and holding forces

Measured values for hydraulic Clamping Unit KWH, FLS – flanged, long, standard height, size 25 - 65

Max. hydraulic operating pressure:
- Size 25 - 30: 100 bar
- Size 35 - 65: 150 bar

Normal and holding forces for hydraulic clamping units



Calculation of holding force

Holding force for hydraulic clamping units

$$F_{ha} = F_n \cdot 2 \cdot \mu_0$$

Normal force (measured): F_n see graph
Stiction coefficient: μ_0 = 0.13 (approx.) for steel/steel, oiled, referred to guide rail

Calculation example: Clamping Unit KWH size 55

Pressure:	p	= 120 bar
Normal force:	F_n	= 38,500 N (as per graph)
Holding force:	F_{ha}	= 38,500 N · 2 · 0.13
		= 10,010 N

Permissible holding force for hydraulic clamping units

$$F_{ha,\,perm} = F_{ha} / f_S$$

The safety factor f_S depends on:
- vibrations
- force surges
- application-specific requirements, etc.

Example: Clamping Unit KWH size 55

Holding force:	F_{ha}	= 10,010 N (see calculation example)
Safety factor:	f_S	= 1.25 (assumed)
Permissible holding force:	$F_{ha,\,perm}$	= 10,010 N / 1.25
		≈ 8,000 N

f_S	=	safety factor	(-)
F_{ha}	=	holding force (at μ_0 = 0.13)	(N)
$F_{ha,\,perm}$	=	permissible holding force	(N)
F_n	=	normal force	(N)
μ_0	=	stiction coefficient	(-)
p	=	pressure	(bar)

Hydraulic Clamping Units KWH

FLS
Flanged, long, standard height
R1619 .42 11

Note

Can be used on all Ball Guide Rails SNS.

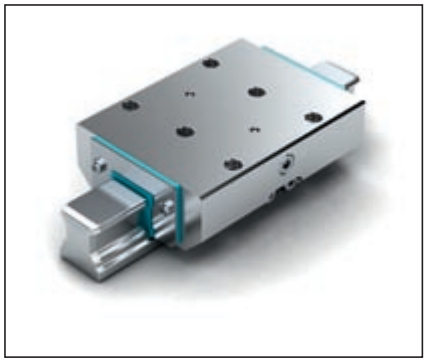
Clamping by pressure application

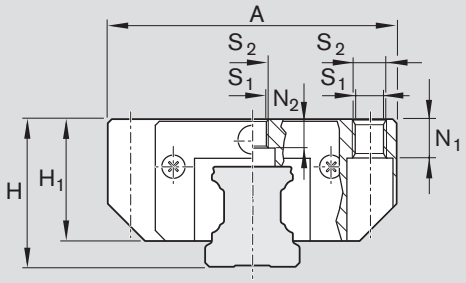
- Max. hydraulic operating pressure:
  - Size 25 - 30: 100 bar
  - Size 35 - 65: 150 bar
- Operating temperature range t: 0 - 70 °C

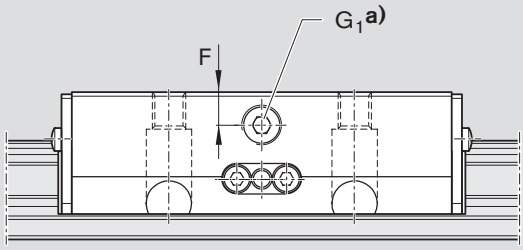
Lubrication notes

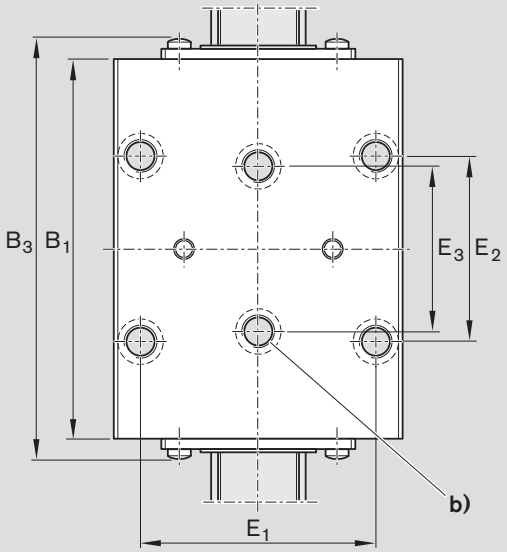
- First filling with hydraulic oil HLP46.
- If other oils are used, check the compatibility.

⚠ **Follow the safety notes for Clamping and Braking Units.** ☞ 187









Notes for mounting

- Both sides may be used as reference surfaces.
- Make sure the adjoining structure is sufficiently rigid.
- Read the mounting instructions before start-up.
- Check that the sealing lips of the end seals sit evenly all around the guide rail. Re-align if necessary.

a) Hydraulic port*) G_1 on both sides

b) The two mounting holes at the center must be used in addition!

*) Only one port required.

All ports are plugged for shipment.

Size	Part number	Holding force[1] (N)	Dimensions (mm) A	B_1	$B_{3\,max}$	H	H_1	E_1	E_2	E_3	F	G_1	N_1[4]	N_2[5]	S_1	S_2	Displacement[6] (cm^3)	Weight (kg)
25	R1619 242 11	2 200[2]	70	92.0	102.3	36	29.5	57	45	40	8.0	1/8"	9	7.0	6.8	M8	0.6	1.22
30	R1619 742 11	3 000[2]	90	103.5	115.4	42	35.0	72	52	44	10.5	1/8"	11	8.0	8.6	M10	0.7	2.09
35	R1619 342 11	5 700[3]	100	120.5	133.0	48	40.0	82	62	52	12.0	1/8"	12	10.2	8.6	M10	1.1	2.69
45	R1619 442 11	9 900[3]	120	155.0	170.0	60	50.0	100	80	60	15.0	1/8"	15	12.4	10.5	M12	1.8	5.32
55	R1619 542 11	13 700[3]	140	184.0	201.0	70	57.0	116	95	70	16.0	1/8"	18	13.5	12.5	M14	2.4	8.40
65	R1619 642 11	22 700[3]	170	227.0	256.0	90	76.0	142	110	82	20.0	1/4"	23	14.0	14.5	M16	3.8	17.30

1) Testing is performed in the installed condition with a film of lubricating oil (ISO VG 68). Permissible holding force ☞ 190

2) At 100 bar

3) At 150 bar

4) For mounting from below with ISO 4762

5) For mounting from below with DIN 7984

6) Per clamping cycle

Accessories, Clamping and Braking Units

Hydraulic Clamping Units KWH

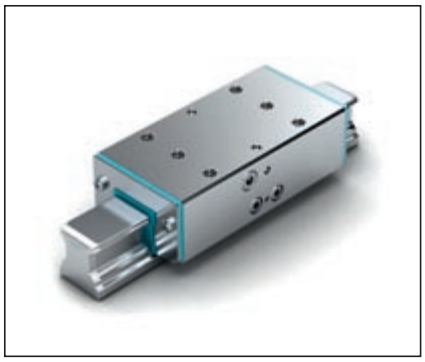
SLS
Slimline, long, standard height
R1619 .42 51

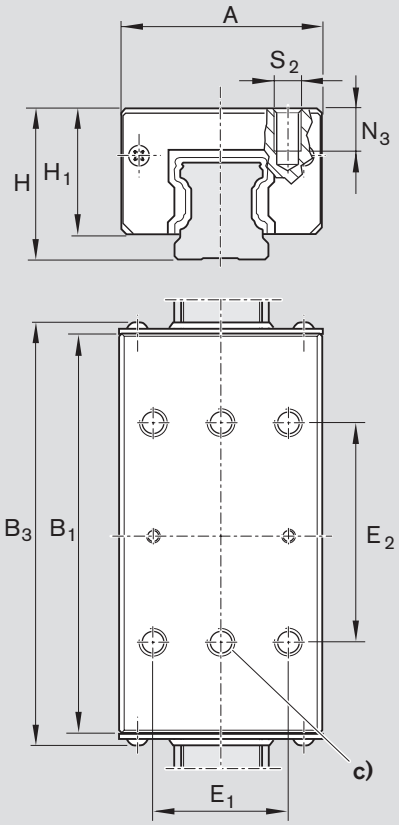
Note
Can be used on all Ball Guide Rails SNS.

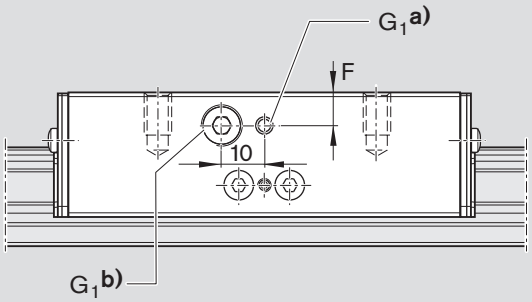
Clamping by pressure application
- Max. hydraulic operating pressure:
  - Size 25 - 30: 100 bar
  - Size 35, 55, 65: 150 bar
  - Size 45: 110 bar
- Operating temperature range t: 0 - 70 °C

Lubrication notes
- First filling with hydraulic oil HLP46.
- If other oils are used, check the compatibility.

⚠ **Follow the safety notes for Clamping and Braking Units.** ☞ 187







Notes for mounting
- Both sides may be used as reference surfaces.
- Make sure the adjoining structure is sufficiently rigid.
- Read the mounting instructions before start-up.
- Check that the sealing lips of the end seals sit evenly all around the guide rail. Re-align if necessary.

a) Hydraulic port*) G_1 on both sides
b) Hydraulic port*) G_1 on both sides in size 25 - 30
c) The two mounting holes at the center must be used in addition!
*) Only one port required.
All ports are plugged for shipment.

Size	Part number	Holding force[1] (N)	Dimensions (mm) A	B_1	$B_{3\,max}$	H	H_1	E_1	E_2	F	G_1	N_3	S_2	Displacement[4] (cm^3)	Weight (kg)
25	R1619 242 51	1 600[2]	48	92.0	102.3	36	29.5	35	50	8	1/8"	8	M6	0.6	1.22
30	R1619 742 51	3 000[2]	60	103.5	115.4	42	35.0	40	60	9	1/8"	8	M8	0.7	2.09
35	R1619 342 51	3 500[2]	70	120.5	134.0	48	40.0	50	72	12	1/8"	13	M8	1.1	2.02
45	R1619 442 51	7 400[2]	86	155.0	170.0	60	50.0	60	80	15	1/8"	15	M10	1.8	4.00
55	R1619 542-51	13 700[3]	100	184.0	201.0	70	57.0	75	95	16	1/8"	18	M12	2.4	6.10
65	R1619 642 51	22 700[3]	126	227.0	256.0	90	76.0	76	120	20	1/4"	21	M16	3.8	14.40

1) Testing is performed in the installed condition with a film of lubricating oil (ISO VG 68). Permissible holding force ☞ 190
2) At 100 bar
3) At 150 bar
4) Per clamping cycle

SLH
Slimline, long, high
R1619 .42 31

Note

Can be used on all Ball Guide Rails SNS.

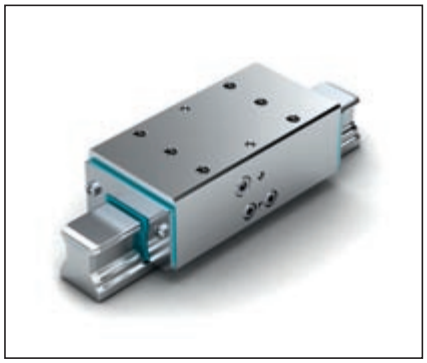
Clamping by pressure application

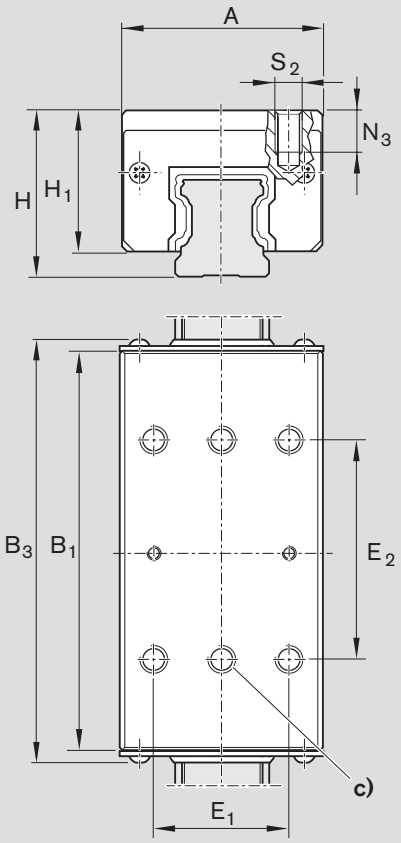
- Max. hydraulic operating pressure:
  - Size 25 - 30: 100 bar
  - Size 35, 55, 65: 150 bar
  - Size 45: 110 bar
- Operating temperature range t: 0 - 70 °C

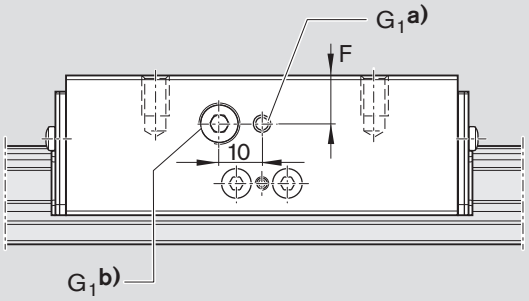
Lubrication notes

- First filling with hydraulic oil HLP46.
- If other oils are used, check the compatibility.

⚠ **Follow the safety notes for Clamping and Braking Units.** ☞ 187







Notes for mounting

- Both sides may be used as reference surfaces.
- Make sure the adjoining structure is sufficiently rigid.
- Read the mounting instructions before start-up.
- Check that the sealing lips of the end seals sit evenly all around the guide rail. Re-align if necessary.

a) Hydraulic port*) G_1 on both sides
b) Hydraulic port*) G_1 on both sides in size 25 - 30
c) The two mounting holes at the center must be used in addition!
*) Only one port required.
All ports are plugged for shipment.

Size	Part number	Holding force[1] (N)	Dimensions (mm) A	B_1	$B_{3\,max}$	H	H_1	E_1	E_2	F	G_1	N_3	S_2	Displacement[4] (cm^3)	Weight (kg)
25	R1619 242 31	1 600[2]	48	92.0	102.3	40	33.5	35	50	12	1/8"	12	M6	0.6	1.10
30	R1619 742 31	3 000[2]	60	103.5	115.4	45	38.0	40	60	12	1/8"	11	M8	0.7	1.90
35	R1619 342 31	3 500[2]	70	120.5	134.0	55	47.0	50	72	18	1/8"	13	M8	1.1	2.46
45	R1619 442 31	7 400[2]	86	155.0	170.0	70	60.0	60	80	24	1/8"	18	M10	1.8	4.95
55	R1619 542 31	13 700[3]	100	184.0	201.0	80	67.0	75	95	26	1/8"	19	M12	2.4	7.90

1) Testing is performed in the installed condition with a film of lubricating oil (ISO VG 68). Permissible holding force ☞ 190
2) At 100 bar
3) At 150 bar
4) Per clamping cycle

Product Description, Accessories, Pneumatic Clamping and Braking units

Application areas

Clamping
- In the event of a pressure drop
- During installation work and while machine is stopped, without power
- Clamping of axes in machining centers
- Clamping of Z-axes in rest positions

Braking
- In the event of a power failure
- In the event of a pressure drop
- Reinforcing the E-Stop function
- Auxiliary brake for linear motors

Characteristic features

- Clamping and braking by spring energy accumulator
- Integrated contour-locking contact profiles for maximum axial and horizontal stiffness, providing excellent braking action
- Dynamic and static stabilization in the axis travel direction

Further highlights

- Up to 1 million clamping cycles
- Up to 2,000 emergency braking operations
- Integrated all-round sealing
- High continuous performance
- High positioning accuracy
- Tapered valve mechanism
- Solid, rigid steel housing, catalytically nickel-plated
- Low air consumption
- Zero maintenance

Special features of MBPS:
- Clamping and braking unit in compact, short design
- Add-ons with three pistons connected in series combined with strong springs result in holding forces up to 3,800 N at just 4.5 bar release pressure

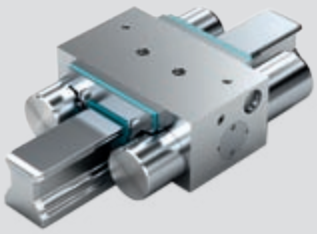
Special features of TKPS:
- Very high axial holding forces up to 4,800 N at 5.5 bar release pressure due to add-on module and strong spring energy accumulators
- Holding force can be increased to 6,700 N through additional pressurization with compressed air at the air-plus port
- Extremely low air consumption
- Compact design, compatible with DIN 645

Special features of UBPS:
- Very high axial holding forces up to 2,800 N at 5,5 bar release pressure due to strong spring energy accumulators
- Holding force can be increased to 3,800 N through additional pressurization with compressed air at the air-plus port
- Extremely low air consumption
- Compact design, compatible with DIN 645
- Successor model to the TKPS series
- To be used for new-build designs

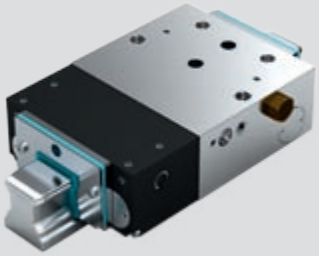
⚠ **Follow the safety notes for Clamping and Braking Units.** ☞ 187

Model overview, Accessories, Pneumatic Clamping and Braking Units

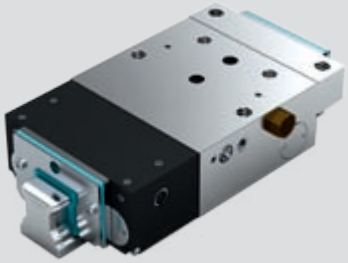
MBPS ☞🗎 196



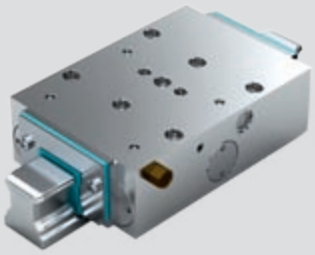
TKPS without adapter plate ☞🗎 198

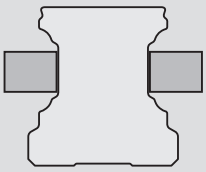


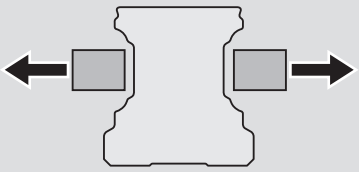
TKPS with adapter plate ☞🗎 200



UBPS ☞🗎 202







Air pressure: 0 bar

Clamping and braking by spring action
In the event of a pressure drop, braking or clamping is achieved by a dual-action tapered slide valve mechanism with two spring assemblies (spring energy accumulators).
An integrated quick venting valve in the MBPS, TKPS, and UBPS models ensures fast response.

Air pressure: 4.5 - 8 bar (MBPS)
5.5 - 8 bar (TKPS)
5.5 - 8 bar (UBPS)

Release by air pressure
The clamping profiles are held apart by compressed air.
– Allows free movement

Accessories, Clamping and Braking Units

Pneumatic Clamping and Braking Units MBPS

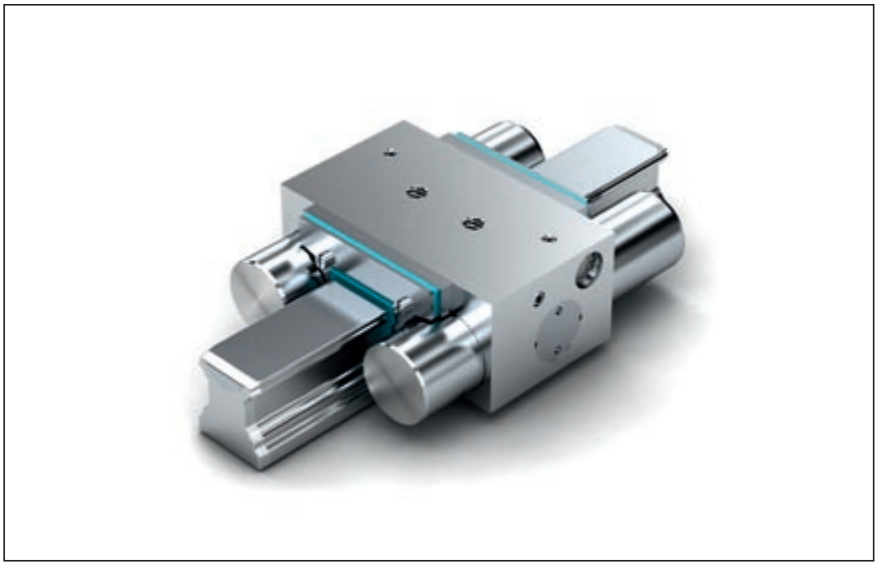
R1619 .40 31

Note
Can be used on all Ball Guide Rails SNS.

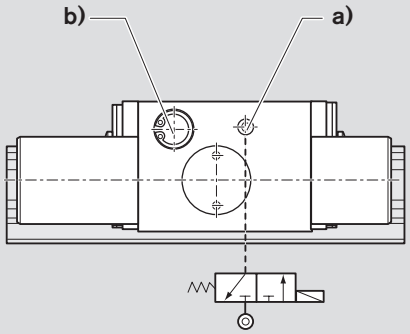
Pressureless clamping and braking (spring energy)
- Release pressure min. 4.5 bar
- Max. pneumatic operating pressure: 8 bar
- Operating temperature range t: 0 - 70 °C

Notes for mounting
- Make sure the adjoining structure is sufficiently rigid.
- Use only filtered and lubricated air. The specified filter mesh size is 25 µm.
- Read the mounting instructions before start-up.
- Check that the sealing lips of the end seals sit evenly all around the guide rail. Re-align if necessary.

⚠ **Follow the safety notes for Clamping and Braking Units.** ☞ 187



Circuitry[1)]
for standard air port

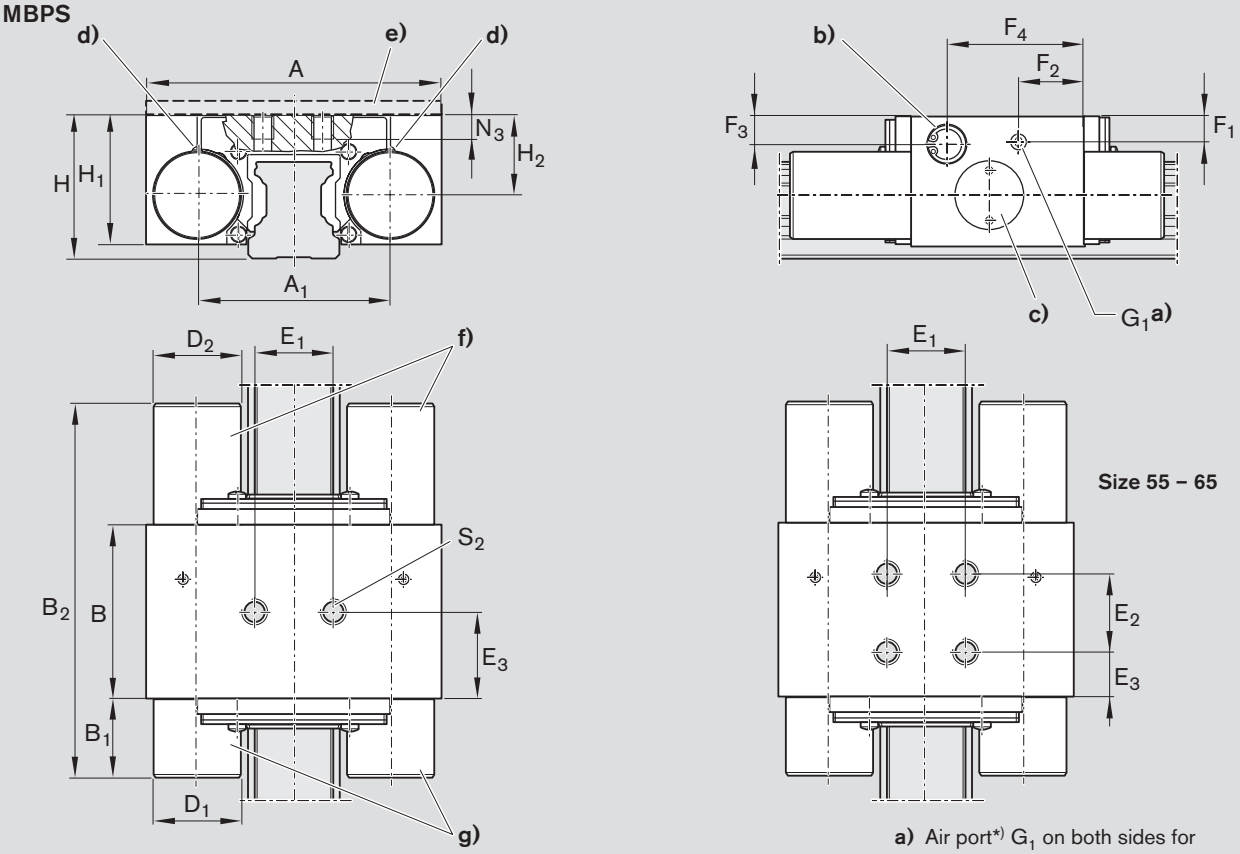


a) Air port
b) Quick venting valve
Nominal diameter: min. 6 mm

Size	Part number	Holding force Spring energy[1)] (N)	Air consumption (normalized) Air port (dm^3/stroke)
20	R1619 840 31	750	0.034
25	R1619 240 31	1 300	0.048
30	R1619 740 31	2 000	0.065
35	R1619 340 31	2 600	0.093
45	R1619 440 31	3 800	0.099
55	R1619 540 31	4 700	0.244
65	R1619 640 31	4 700	0.244

1) Holding force achieved by spring energy at 6 bar. Testing is performed in the installed condition with a film of lubricating oil (ISO VG 68).

MBPS



a) Air port*) G_1 on both sides for release pressure
b) Quick venting valve on both sides
c) Adjusting screw on both sides
d) Venting on both sides
e) Spacer plate (accessory)
f) Piston
g) Spring accumulator
*) Only one port required.
All ports are plugged for shipment.

Size	Dimensions (mm)																			Weight
	A	A_1	B	B_1	$B_{2\,max}$	D_1	D_2	E_1	E_2	E_3	F_1	F_2	F_3	F_4	G_1	H	H_1 1)	H_2	N_3	S_2	(kg)
20	66	45.7	44	19.0	94.5	16	18	20	-	22.0	5.5	15.5	6.0	35.5	M5	30	25.8	16.2	8.6	M6	0.7
25	75	49.0	44	20.2	95.5	22	22	20	-	22.0	6.5	16.5	7.0	34.7	M5	36	32.5	20.0	8.0	M6	1.0
30	90	58.0	47	29.0	107.5	25	25	22	-	23.0	7.2	30.5	7.2	40.0	M5	42	38.5	24.0	9.0	M8	1.8
35	100	68.0	46	27.7	106.2	28	28	24	-	24.5	9.0	19.0	9.5	38.0	G1/8"	48	42.0	26.5	10.0	M8	1.9
45	120	78.8	49	32.2	113.7	30	30	26	-	24.5	15.0	31.1	12.2	41.6	G1/8"	60	52.0	35.5	15.0	M10	2.3
55	140	97.0	62	41.0	145.0	39	39	38	38	12.0	11.0	23.0	11.0	40.0	M5	70	59.0	38.0	18.0	M10	3.7
65	150	106.0	62	41.0	145.0	39	38	38	38	12.0	16.0	23.0	16.0	40.0	M5	90	75.5	53.5	18.0	M10	4.2

1) For Ball Runner Block .H. (..., high, ...), a spacer plate is needed. Available on request.

Accessories, Clamping and Braking Units

Pneumatic Clamping and Braking Units TKPS

R1619 .40 11

With add-on module without adapter plate for mounting from above

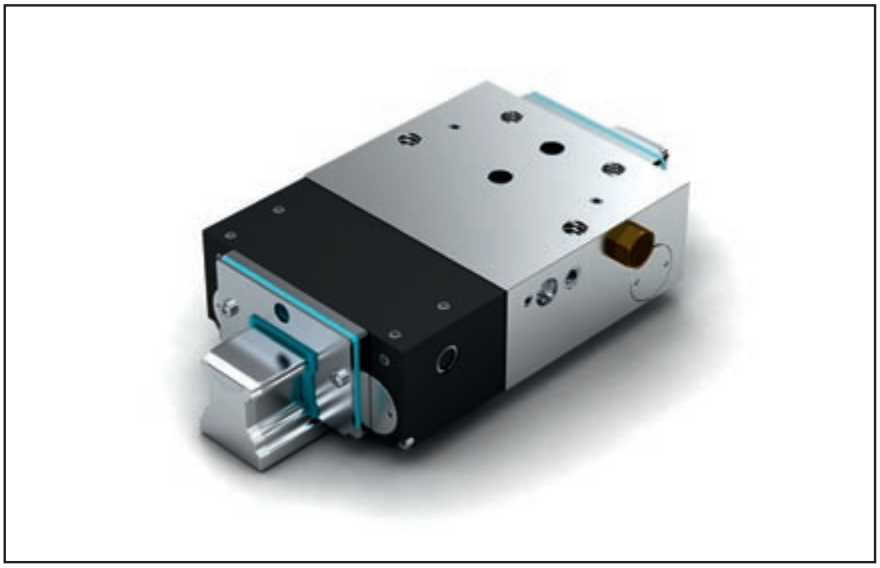
Very high axial holding forces due to add-on module and strong spring energy accumulators; increased holding force thanks to additional pressure through the air-plus port

Note
Can be used on all Ball Guide Rails SNS.

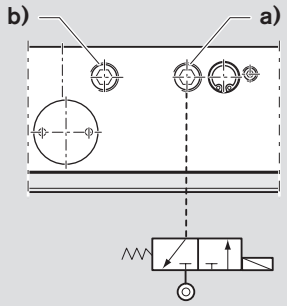
Pressureless clamping and braking (spring energy)
- Release pressure min. 5.5 bar
- Max. pneumatic operating pressure: 8 bar
- Operating temperature range t: 0 - 70 °C

Notes for mounting
- Both sides may be used as reference surfaces.
- Make sure the adjoining structure is sufficiently rigid.
- Use only filtered and lubricated air. The specified filter mesh size is 25 µm.
- Read the mounting instructions before start-up.
- Check that the sealing lips of the end seals sit evenly all around the guide rail. Re-align if necessary.

⚠ **Follow the safety notes for Clamping and Braking Units.** ☞ 187

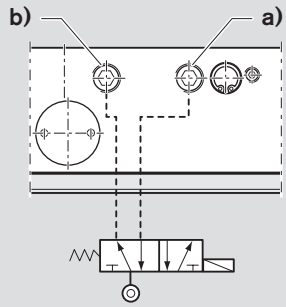


Circuitry[1] for standard air port



a) Air port
b) Air filter
Nominal diameter: min. 6 mm

Circuitry[2] for air-plus port

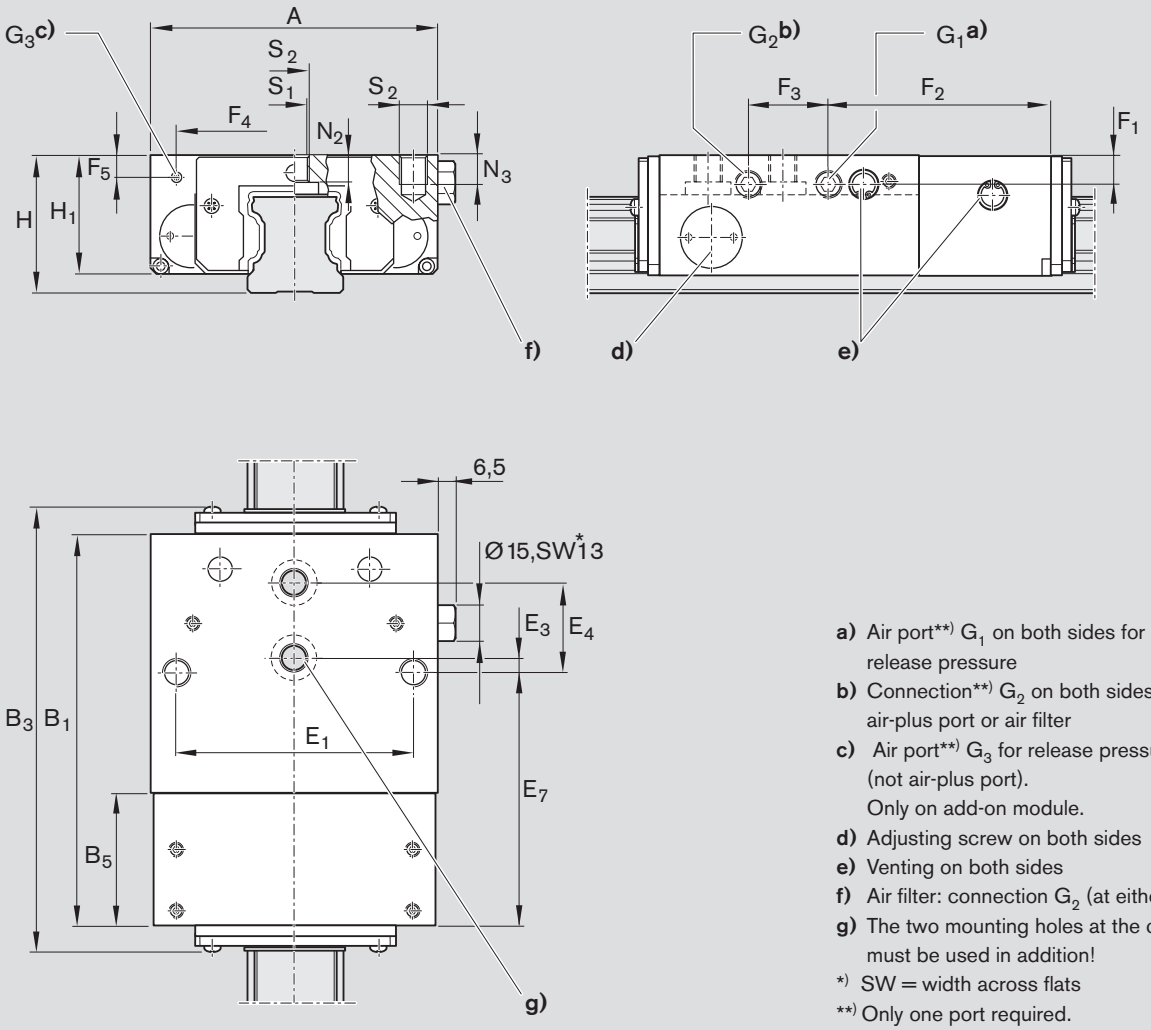


a) Air port
b) Air-plus port
Nominal diameter: min. 6 mm

Size	Part number	Holding force		Air consumption (normalized)	
		Spring energy[1] (N)	with air-plus port[2] (N)	Air port (dm^3/stroke)	Air-plus port (dm^3/stroke)
35	R1619 340 11	2 200	3 200	0.150	0.335
45	R1619 440 11	3 800	5 000	0.243	0.542
55	R1619 540 11	4 800	6 700	0.318	1.062

1) Holding force achieved by spring energy. Testing is performed in the installed condition with a film of lubricating oil (ISO VG 68).
2) Increased holding force through additional pressurization with 5.5 bar compressed air at the air-plus port. Switching via 5/2 or 5/3-way directional control valve.

TKPS with add-on module without adapter plate



a) Air port**) G_1 on both sides for release pressure
b) Connection**) G_2 on both sides for air-plus port or air filter
c) Air port**) G_3 for release pressure (not air-plus port). Only on add-on module.
d) Adjusting screw on both sides
e) Venting on both sides
f) Air filter: connection G_2 (at either side)
g) The two mounting holes at the center must be used in addition!
*) SW = width across flats
**) Only one port required.
All ports are plugged for shipment.

Size	Dimensions (mm)												
	A	B_1	$B_{3\ max}$	B_5	E_1	E_3	E_4	E_7	F_1	F_2	F_3	F_4	F_5
35	100	136	156.4	46	82	5.0	31.0	88.0	10.0	77	28	82	8.0
45	120	152	174.0	48	100	10.0	40.0	88.0	9.0	100	18	96	9.0
55	140	183	208.0	48	116	12.5	47.5	100.5	8.5	65	70	110	8.5

Size	Dimensions (mm)									Weight
	G_1	G_2	G_3	H	H_1 1)	N_2 2)	N_3	S_1	S_2	(kg)
35	G1/8"	G1/8"	M5	48	42	9.5	10.0	8.6	M10	2.60
45	G1/8"	G1/8"	M5	60	52	12.4	15.0	10.5	M12	4.65
55	G1/8"	G1/8"	G1/8"	70	59	12.5	12.5	12.2	M14	6.60

1) Consider the height!
2) For mounting from below with DIN 7984

Accessories, Clamping and Braking Units

Pneumatic Clamping and Braking Units TKPS

R1619 .40 10

With add-on module and adapter plate for mounting from above or below

Very high axial holding forces due to add-on module and strong spring energy accumulators; increased holding force thanks to additional pressure through the air-plus port

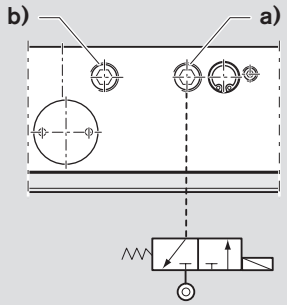
Note
Can be used on all Ball Guide Rails SNS.

Pressureless clamping and braking (spring energy)
- Release pressure min. 5.5 bar
- Max. pneumatic operating pressure: 8 bar
- Operating temperature range t: 0 - 70 °C

Notes for mounting
- Both sides may be used as reference surfaces.
- Make sure the adjoining structure is sufficiently rigid.
- Use only filtered and lubricated air. The specified filter mesh size is 25 µm.
- Read the mounting instructions before start-up.
- Check that the sealing lips of the end seals sit evenly all around the guide rail. Re-align if necessary.

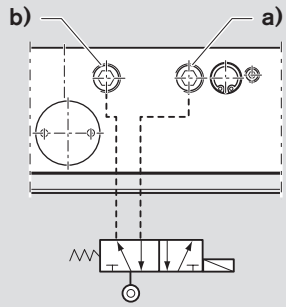
⚠ **Follow the safety notes for Clamping and Braking Units.** ☞ 187

Circuitry[1] for standard air port



a) Air port
b) Air filter
Nominal diameter: min. 6 mm

Circuitry[2] for air-plus port

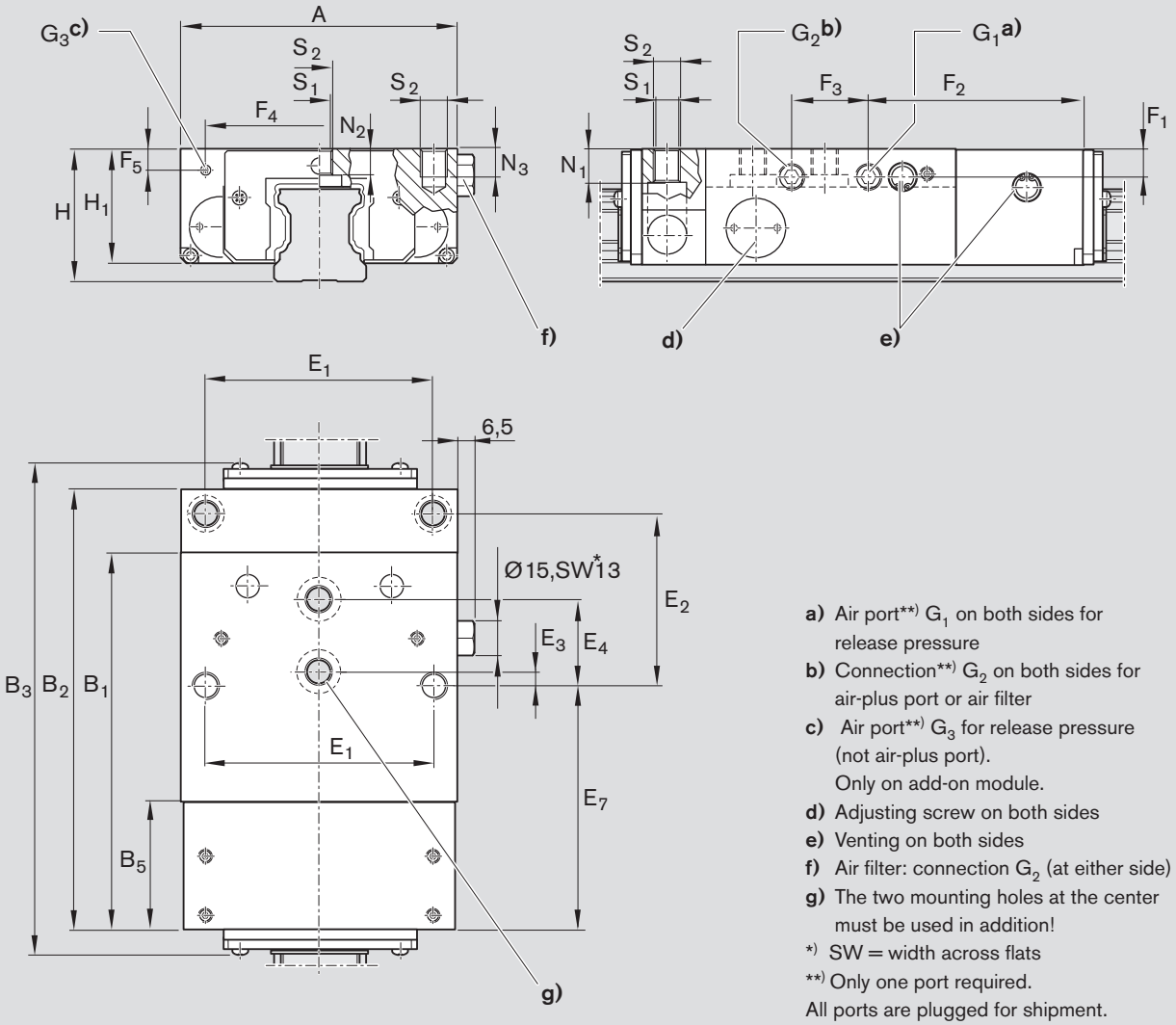


a) Air port
b) Air-plus port
Nominal diameter: min. 6 mm

Size	Part number	Holding force		Air consumption (normalized)	
		Spring energy[1] (N)	with air-plus port[2] (N)	Air port (dm^3/stroke)	Air-plus port (dm^3/stroke)
35	R1619 340 10	2 200	3 200	0.150	0.335
45	R1619 440 10	3 800	5 000	0.243	0.542
55	R1619 540 10	4 800	6 700	0.318	1.062

1) Holding force achieved by spring energy. Testing is performed in the installed condition with a film of lubricating oil (ISO VG 68).
2) Increased holding force through additional pressurization with 5.5 bar compressed air at the air-plus port. Switching via 5/2 or 5/3-way directional control valve.

TKPS with add-on module and adapter plate



a) Air port**) G_1 on both sides for release pressure
b) Connection**) G_2 on both sides for air-plus port or air filter
c) Air port**) G_3 for release pressure (not air-plus port). Only on add-on module.
d) Adjusting screw on both sides
e) Venting on both sides
f) Air filter: connection G_2 (at either side)
g) The two mounting holes at the center must be used in addition!
*) SW = width across flats
**) Only one port required.
All ports are plugged for shipment.

Size	Dimensions (mm)														
	A	B_1	B_2	$B_{3\,max}$	B_5	E_1	E_2	E_3	E_4	E_7	F_1	F_2	F_3	F_4	F_5
35	100	136	159.0	179	46	82	62.0	5.0	31.0	88.0	10.0	77	28	82	8.0
45	120	152	177.5	199	48	100	80.0	10.0	40.0	88.0	9.0	100	18	96	9.0
55	140	183	207.5	232	48	116	95.0	12.5	47.5	100.5	8.5	65	70	110	8.5

Size	Dimensions (mm)									Weight
	G_1	G_2	G_3	H	H_1 1)	N_1 2)	N_2 3)	N_3	S_1	S_2	(kg)
35	G1/8"	G1/8"	M5	48	42	14	9.5	10.0	8.6	M10	2.90
45	G1/8"	G1/8"	M5	60	52	18	12.4	15.0	10.5	M12	5.10
55	G1/8"	G1/8"	G1/8"	70	59	18	12.5	12.5	12.2	M14	7.30

1) Consider the height!
2) For mounting from below with ISO 4762
3) For mounting from below with DIN 7984

Accessories, Clamping and Braking Units

Pneumatic Clamping and Braking Units UBPS

R1619 .40 51

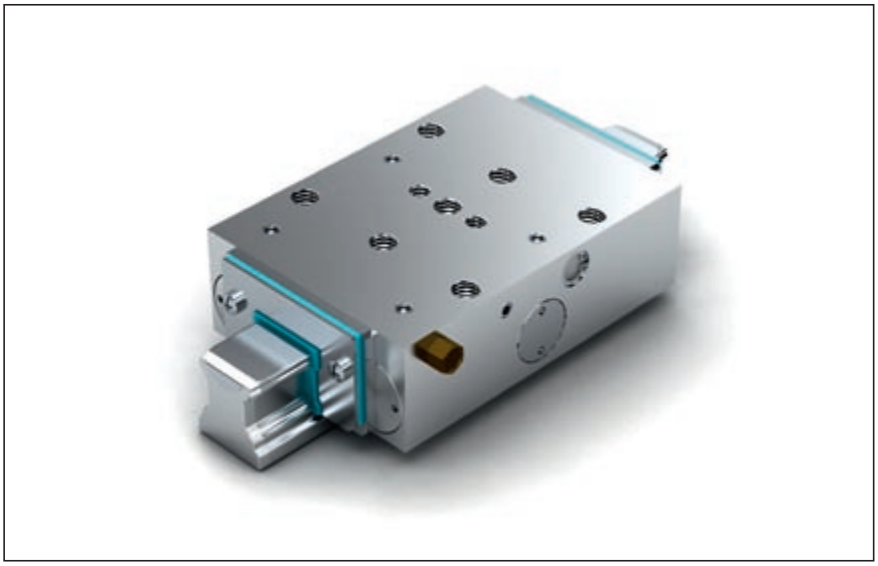
Very high axial holding forces due to three pistons connected in series combined with strong spring energy accumulator; increased holding force thanks to additional pressure through the air-plus port

Note
Can be used on all Ball Guide Rails SNS.

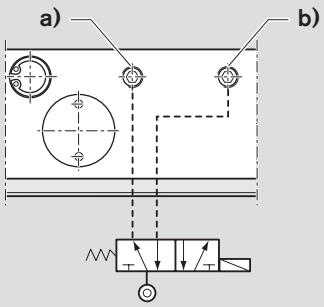
Pressureless clamping and braking (spring energy)
- Release pressure min. 5.5 bar
- Max. pneumatic operating pressure: 8 bar
- Operating temperature range t: 0 - 70 °C

Notes for mounting
- Both sides may be used as reference surfaces.
- Make sure the adjoining structure is sufficiently rigid.
- Use only filtered and lubricated air. The specified filter mesh size is 25 µm.
- Read the mounting instructions before start-up.
- Check that the sealing lips of the end seals sit evenly all around the guide rail. Re-align if necessary.

⚠ **Follow the safety notes for Clamping and Braking Units.** ☞ 187

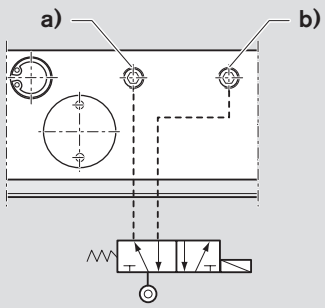


Circuitry[1] for standard air port



a) Air port
b) Air filter
Nominal diameter: min. 6 mm

Circuitry[2] for air-plus port

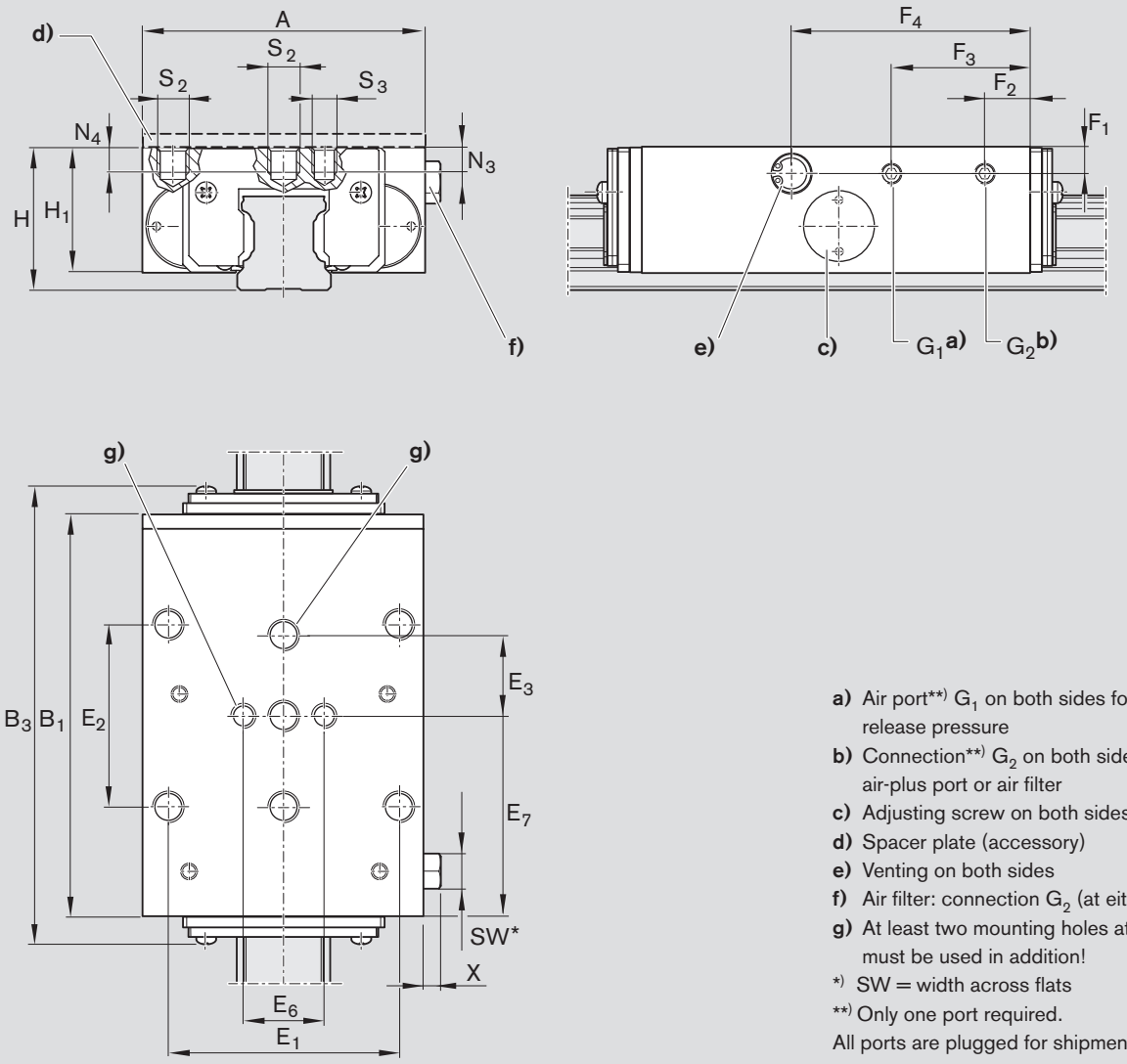


a) Air port
b) Air-plus port
Nominal diameter: min. 6 mm

Size	Part number	Holding force		Air consumption (normalized)	
		Spring energy[1] (N)	with air-plus port[2] (N)	Air port (dm^3/stroke)	Air-plus port (dm^3/stroke)
25	R1619 240 51	1 850	2 650	0.080	0.165
30	R1619 740 51	2 500	3 300	0.111	0.274
35	R1619 340 51	2 800	3 800	0.139	0.303

1) Holding force achieved by spring energy. Testing is performed in the installed condition with a film of lubricating oil (ISO VG 68).
2) Increased holding force through additional pressurization with 6.0 bar compressed air at the air-plus port. Switching via 5/2 or 5/3-way directional control valve.
3) Type tested according to the EU Machinery Directive 98/37/EC (in force until Dec. 28, 2009) and 2006/42/EC (effective beginning Dec. 29, 2009).

UBPS



a) Air port**) G_1 on both sides for release pressure
b) Connection**) G_2 on both sides for air-plus port or air filter
c) Adjusting screw on both sides
d) Spacer plate (accessory)
e) Venting on both sides
f) Air filter: connection G_2 (at either side)
g) At least two mounting holes at the center must be used in addition!
*) SW = width across flats
**) Only one port required.
All ports are plugged for shipment.

Size	Dimensions (mm)											
	A	B_1	$B_{3\,max}$	E_1	E_2	E_3	E_6	E_7	F_1	F_2	F_3	F_4
25	70	99	115.1	57	45	20	20	49.5	6.5	11	34.3	59.0
30	90	109	128.7	72	52	22	22	54.5	6.5	11	40.8	66.5
35	100	109	131.0	82	62	26	24	54.5	8.0	11	40.8	66.5

Size	Dimensions (mm)										Weight
	G_1	G_2	H	H_1 1)	N_3	N_4	S_2	S_3	X	SW 2)	(kg)
25	M5	M5	36	31	7	7	M8	M6	5.5	Ø8. SW7	1.20
30	M5	M5	42	37	8	8	M10	M8	5.5	Ø8. SW7	1.80
35	G1/8"	G1/8"	48	42	10	10	M10	M8	6.5	Ø15. SW13	2.25

1) For Ball Runner Block .H. (..., high, ...), a spacer plate is needed. Available on request.
2) SW = width across flats

Product Description, Accessories, Pneumatic Clamping Units

Application areas

- Pneumatic clamping of machine axes
- Table crossbars in the woodworking industry
- Positioning of hoists

Characteristic features

- High axial holding forces within a very short span
- Dynamic and static stabilization in the axis travel direction
- Simple mechanical gripping principle in LCP and LCPS with good price/performance ratio

Further highlights

- Easy to mount
- Steel housing, catalytically nickel-plated
- High axial and horizontal stiffness
- Precise positioning

Special features of MK:
- Clamping by pressure (pneumatic) via a dual-action tapered slide valve mechanism.
- Steplessly adjustable pressure from 4 to 8 bar
- Quick release

Special features of MKS:
- Pressureless clamping (by spring action) via the dual-action tapered slide valve mechanism with two spring assemblies
- Release pressure 5.5 - 8 bar (pneumatic)
- Increased holding force through air-plus port

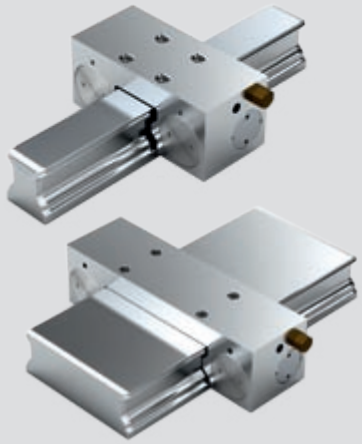
Special features of LCP:
- Clamping by pressure application (pneumatic) through mechanical gripping
- Steplessly adjustable pressure from 5.5 to 8 bar
- Quick release

Special features of LCPS:
- Pressureless clamping (by spring action) via mechanical gripping with one spring assembly
- Release pressure 5.5 - 8 bar (pneumatic)
- Increased holding force through air-plus port

⚠ **Follow the safety notes for Clamping and Braking Units.** ☞ 187

Model overview, Accessories, Pneumatic Clamping Units

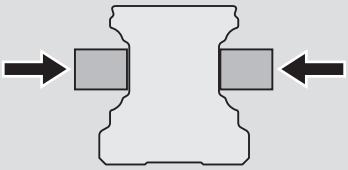
MK ☞ 206



MKS ☞ 208

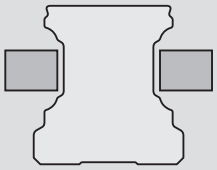
LCP ☞ 210

LCPS ☞ 212



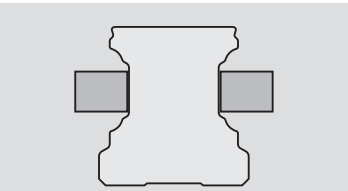
Air pressure: 4.0 - 8 bar (MK)
5.5 - 8 bar (LCP)

Clamping by air pressure
In the MK, the clamping profiles are pressed against the web surfaces of the guide rail by pneumatic pressure acting through a dual-action tapered slide valve mechanism. The LCP achieves its clamping effect through mechanical gripping.



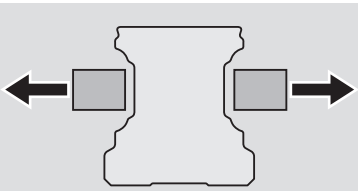
Air pressure: 0 bar (MK/LCP)

Release by spring action
A preloaded return spring provides quick release.



Air pressure: 0 bar (MKS/LCPS)

Clamping by spring action
In the event of a pressure drop, the MKS clamps via a dual-action tapered slide valve mechanism with two spring assemblies (spring energy accumulators). An integrated quick venting valve ensures fast response. The LCPS achieves its clamping effect through mechanical gripping with just one spring assembly (spring energy accumulator).



Air pressure: 5.5 - 8 bar (MKS/ LCPS)

Release by air pressure
The clamping profiles are held apart by compressed air.
– Allows free movement

Accessories, Clamping and Braking Units

Pneumatic Clamping Units MK

R1619 .42 60

Note
Can be used on all Ball Guide Rails SNS.

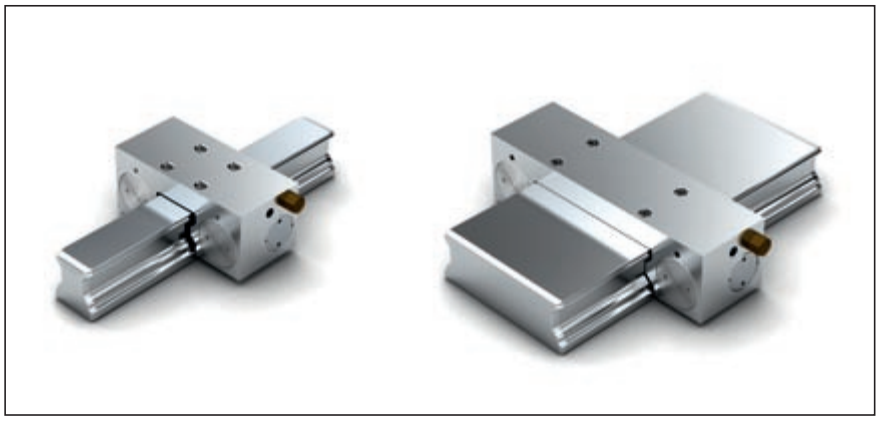
R1619 .42 62

Note
Can be used on all Ball Guide Rails BNS.

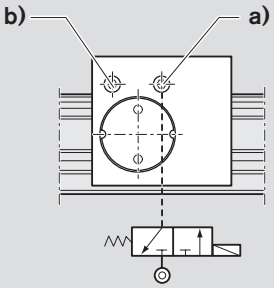
Clamping by pressure application
- Max. pneumatic operating pressure: 8 bar
- Operating temperature range t: 0 - 70 °C

Notes for mounting
- Make sure the adjoining structure is sufficiently rigid.
- Use only filtered and lubricated air. The specified filter mesh size is 25 µm.
- Read the mounting instructions before start-up.

⚠ **Follow the safety notes for Clamping and Braking Units.** ☞ 187



Circuitry[1)]
for standard air port

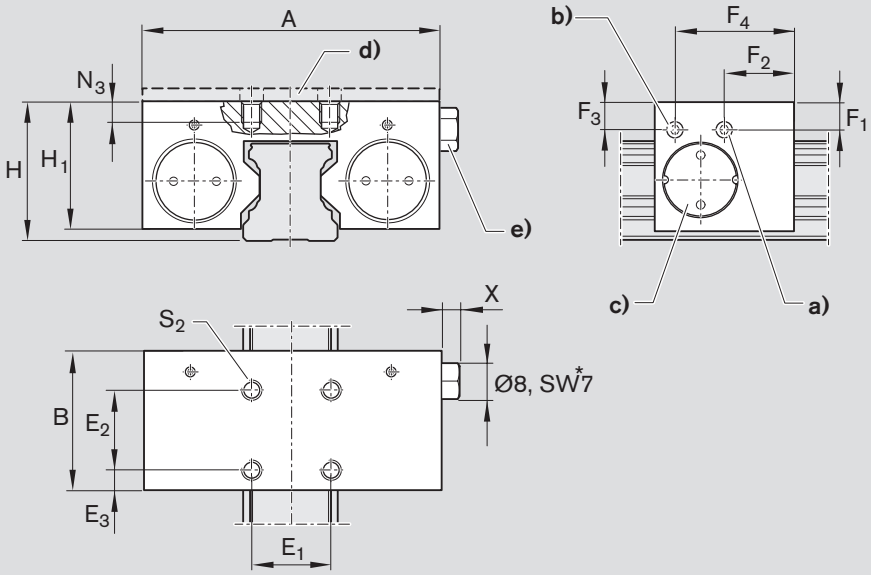


a) Air port
b) Air filter
Nominal diameter
- Size 15 - 20: min. 4 mm
- Size 25 - 65: min. 6 mm

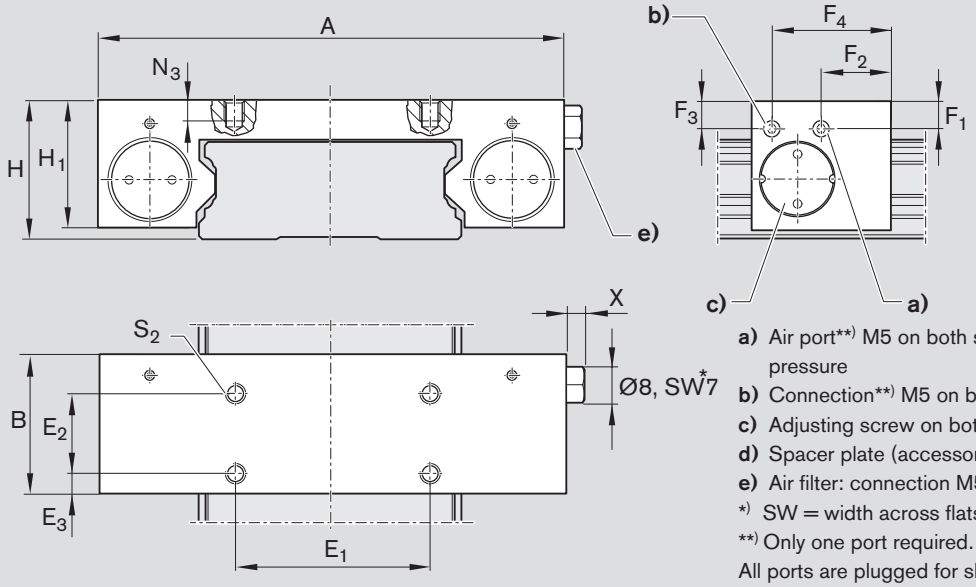
Size	Part number	Holding force Pneumatic[1)] (N)	Air consumption (normalized) Air port (dm^3/stroke)
15	R1619 142 60	650	0.011
20	R1619 842 60	1 000	0.019
25	R1619 242 60	1 200	0.021
30	R1619 742 60	1 750	0.031
35	R1619 342 60	2 000	0.031
45	R1619 442 60	2 250	0.041
55	R1619 542 60	2 250	0.041
65	R1619 642 60	2 250	0.041
20/40	R1619 842 62	650	0.019
25/70	R1619 242 62	1 200	0.021
35/90	R1619 342 62	2 000	0.031

1) Holding force at 6 bar. Testing is performed in the installed condition with a film of lubricating oil (ISO VG 68).

MK



MK wide



a) Air port**) M5 on both sides for release pressure
b) Connection**) M5 on both sides for air filter
c) Adjusting screw on both sides
d) Spacer plate (accessory) for MK
e) Air filter: connection M5 (at either side)
*) SW = width across flats
**) Only one port required.
All ports are plugged for shipment.

Size	Dimensions (mm)														Weight
	A	B	E_1	E_2	E_3	F_1	F_2	F_3	F_4	H	H_1 1)	N_3	S_2	X	(kg)
15	55	39	15	15	15.5	5.6	34.0	16.1	34.0	24	20.8	4.5	M4	6.5	0.25
20	66	39	20	20	9.0	4.5	17.3	6.0	34.5	30	27.0	6.0	M6	5.5	0.36
25	75	35	20	20	5.0	7.0	17.5	7.0	30.0	36	32.5	8.0	M6	5.5	0.45
30	90	39	22	22	8.5	8.5	15.0	10.3	24.5	42	38.5	9.0	M8	5.5	0.72
35	100	39	24	24	7.5	11.0	14.5	12.0	24.5	48	44.0	10.0	M8	5.5	0.88
45	120	49	26	26	11.5	14.5	19.5	14.5	29.5	60	52.0	15.0	M10	5.5	1.70
55	128	49	30	30	9.5	17.0	19.5	17.0	29.5	70	57.0	15.0	M10	5.5	1.95
65	138	49	30	30	9.5	14.5	19.5	14.5	29.5	90	73.5	20.0	M10	5.5	2.68
20/40	80	39	20	20	15.5	5.0	4.5	5.0	31.0	27	23.5	4.5	M4	5.5	0.37
25/70	120	35	50	20	5.0	7.0	17.5	9.0	30.0	35	32.5	8.0	M6	5.5	0.62
35/90	156	42	60	20	9.5	11.5	18.0	14.0	36.5	50	45.5	10.0	M10	5.5	0.88

1) For Ball Runner Block .H. (..., high, ...), a spacer plate is needed ☞ 217

Accessories, Clamping and Braking Units

Pneumatic Clamping Units MKS

R1619 .40 60

Note
Can be used on all Ball Guide Rails SNS.

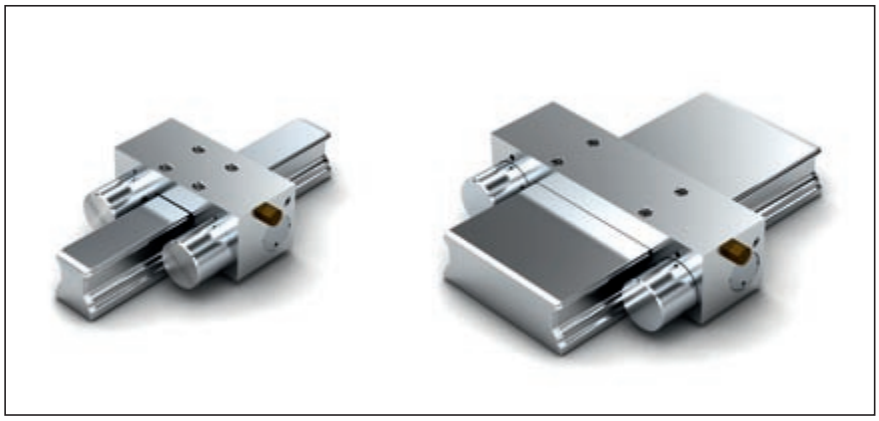
R1619 .40 62

Note
Can be used on all Ball Guide Rails BNS.

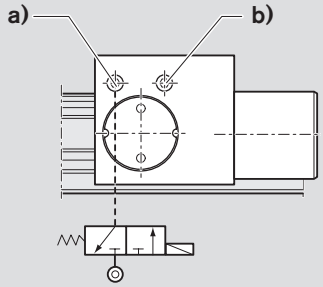
Clamps without pressurization (spring energy)
- Release pressure min. 5.5 bar
- Max. pneumatic operating pressure: 8 bar
- Operating temperature range t: 0 - 70 °C

Notes for mounting
- Make sure the adjoining structure is sufficiently rigid.
- Use only filtered and lubricated air. The specified filter mesh size is 25 µm.
- Read the mounting instructions before start-up.

⚠ **Follow the safety notes for Clamping and Braking Units.** ☞ 187

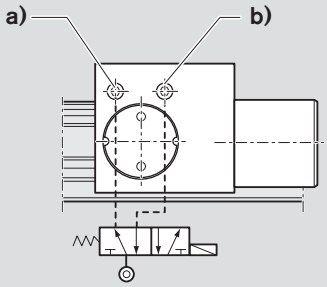


Circuitry[1] for standard air port



a) Air port
b) Air filter
Nominal diameter
- Size 15 - 20: min. 4 mm
- Size 25 - 65: min. 6 mm

Circuitry[2] for air-plus port

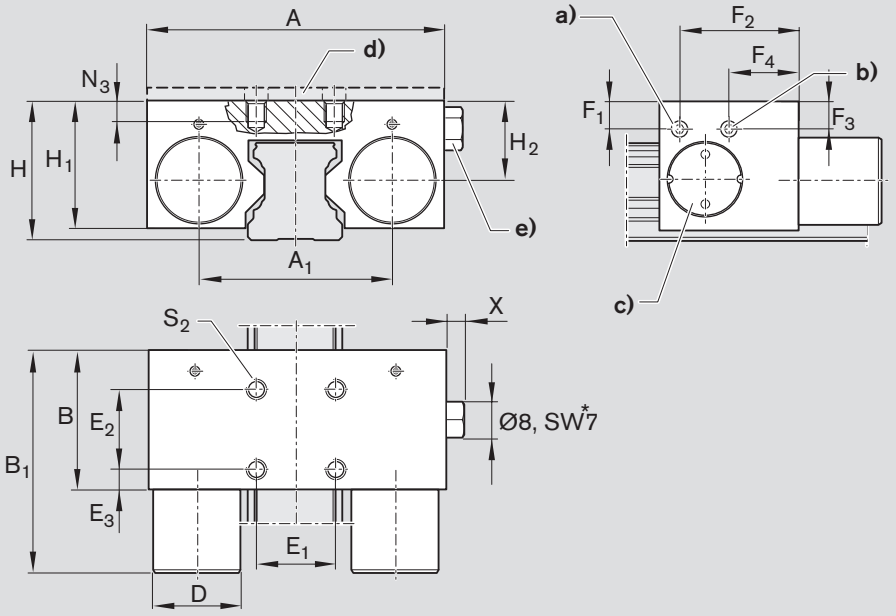


a) Air port
b) Air-plus port
Nominal diameter
- Size 15 - 20: min. 4 mm
- Size 25 - 65: min. 6 mm

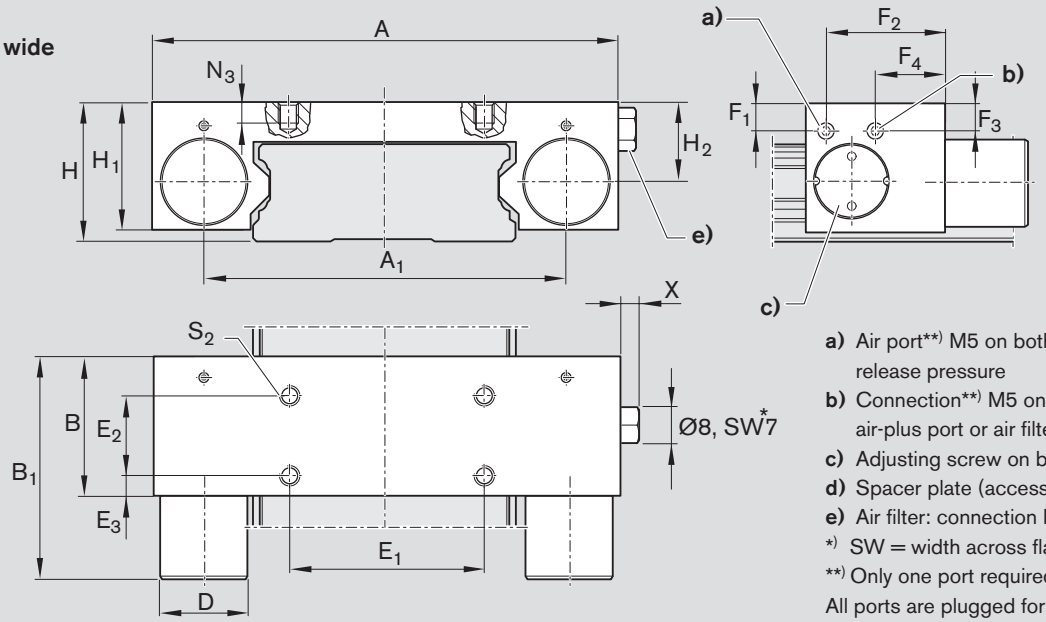
Size	Part number	Holding force		Air consumption (normalized)	
		Spring energy[1]	with air-plus port[2]	Air port	Air-plus port
		(N)	(N)	(dm^3/stroke)	(dm^3/stroke)
15	R1619 140 60	400	1 050	0.011	0.035
20	R1619 840 60	600	1 300	0.019	0.063
25	R1619 240 60	750	1 500	0.021	0.068
30	R1619 740 60	1 050	2 600	0.031	0.121
35	R1619 340 60	1 250	3 250	0.031	0.129
45	R1619 440 60	1 450	3 300	0.041	0.175
55	R1619 540 60	1 450	3 300	0.041	0.175
65	R1619 640 60	1 450	3 300	0.041	0.175
20/40	R1619 840 62	400	1 050	0.019	0.063
25/70	R1619 240 62	750	1 950	0.021	0.068
35/90	R1619 340 62	1 250	3 250	0.031	0.129

1) Holding force achieved by spring energy. Testing is performed in the installed condition with a film of lubricating oil (ISO VG 68).
2) Increased holding force through additional pressurization with 6.0 bar compressed air at the air-plus port. Switching via 5/2 or 5/3-way directional control valve.

MKS



MKS wide



a) Air port**) M5 on both sides for release pressure
b) Connection**) M5 on both sides for air-plus port or air filter
c) Adjusting screw on both sides
d) Spacer plate (accessory) for MKS
e) Air filter: connection M5 (at either side)
*) SW = width across flats
**) Only one port required.
All ports are plugged for shipment.

Size	Dimensions (mm)																		Weight
	A	A_1	B	$B_{1\,max}$	D	E_1	E_2	E_3	F_1	F_2	F_3	F_4	H	H_1 1)	H_2	N_3	S_2	X	(kg)
15	55	34.0	39	58.5	16	15	15	15.5	16.1	34.0	5.6	34.0	24	20.8	11.6	4.5	M4	6.5	0.29
20	66	43.0	39	61.5	20	20	20	9.0	6.0	34.5	4.5	17.3	30	27.0	15.5	6.0	M6	5.5	0.41
25	75	49.0	35	56.5	22	20	20	5.0	7.0	30.0	7.0	17.5	36	32.5	20.0	8.0	M6	5.5	0.50
30	90	58.0	39	68.5	25	22	22	8.5	10.3	24.5	8.5	15.0	42	38.5	24.0	9.0	M8	5.5	0.81
35	100	68.0	39	67.5	28	24	24	7.5	12.0	24.5	11.0	14.5	48	44.0	28.0	10.0	M8	5.5	1.00
45	120	78.8	49	82.5	30	26	26	11.5	14.5	29.5	14.5	19.5	60	52.0	35.5	15.0	M10	5.5	1.84
55	128	86.8	49	82.5	30	30	30	9.5	17.0	29.5	17.0	19.5	70	57.0	40.0	15.0	M10	5.5	2.08
65	138	96.8	49	82.5	30	30	30	9.5	14.5	29.5	14.5	19.5	90	73.5	55.0	20.0	M10	5.5	2.86
20/40	80	59.0	39	58.5	16	20	20	15.5	5.0	31.0	5.0	4.5	27	23.5	14.0	4.5	M4	5.5	0.39
25/70	120	94.0	35	56.5	22	50	20	5.0	9.0	30.0	7.0	17.5	35	32.5	20.0	8.0	M6	5.5	0.68
35/90	156	124.0	42	70.5	28	60	20	9.5	14.0	36.5	11.5	18.0	50	45.5	30.0	10.0	M10	5.5	0.89

1) For Ball Runner Block .H. (..., high, ...), a spacer plate is needed ☞ 217

Accessories, Clamping and Braking Units

Pneumatic Clamping Units LCP

R1619 .42 73

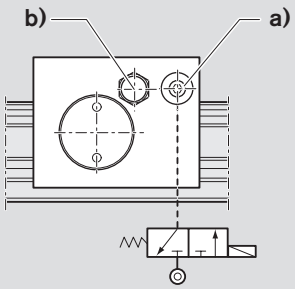
Note
Can be used on all Ball Guide Rails SNS.

Clamping by pressure application
- Max. pneumatic operating pressure: 8 bar
- Operating temperature range t: 0 - 60 °C

Notes for mounting
- Make sure the adjoining structure is sufficiently rigid.
- Use only filtered and lubricated air. The specified filter mesh size is 25 µm.
- Read the mounting instructions before start-up.

⚠ **Follow the safety notes for Clamping and Braking Units.** ☞ 187

Circuitry[1)]
for standard air port

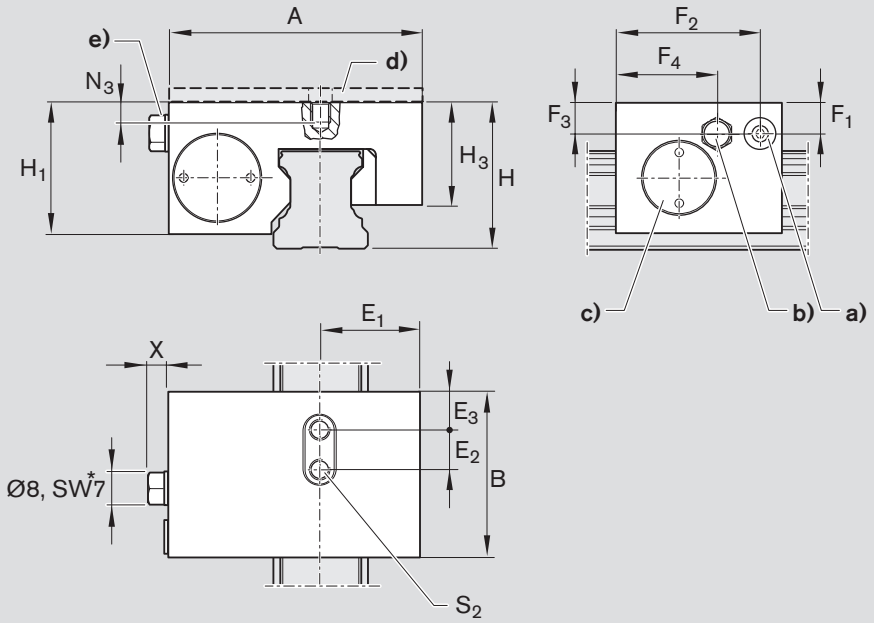


a) Air port
b) Air filter
Nominal diameter
- Sizes 15 - 20: min. 4 mm
- Sizes 25 - 65: min. 6 mm

Size	Part number	Holding force Pneumatic[1)] (N)	Air consumption (normalized) Air port (dm^3/stroke)
25	R1619 242 73	850	0.015

1) Holding force at 6 bar. Testing is performed in the installed condition with a film of lubricating oil (ISO VG 68).

LCP



a) Air port**) M5 on both sides for release pressure
b) Connection**) M5 on both sides for air filter
c) Adjusting screw on both sides
d) Spacer plate (accessory)
e) Air filter: connection M5 (at either side)
*) SW = width across flats
**) Only one port required.
All ports are plugged for shipment.

Size	Dimensions (mm)															Weight
	A	B	E_1	E_2	E_3	F_1	F_2	F_3	F_4	H	H_1 1)	H_3	N_3	S_2	X	(kg)
25	61.4	41	23.9	9.5	9.75	6.5	36.0	6.5	24.5	36.0	32.5	24.55	7.7	M5	6.5	0.27

1) For Ball Runner Block .H. (..., high, ...), a spacer plate is needed. Available on request.

Accessories, Clamping and Braking Units

Pneumatic Clamping Units LCPS

R1619 .40 70

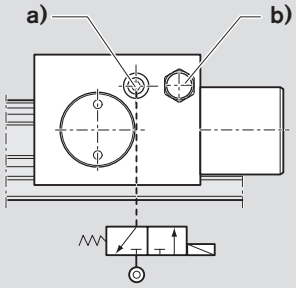
Note
Can be used on all Ball Guide Rails SNS.

Clamps without pressurization (spring energy)
- Release pressure min. 5.5 bar
- Max. pneumatic operating pressure: 8 bar
- Operating temperature range t: 0 - 60 °C

Notes for mounting
- Make sure the adjoining structure is sufficiently rigid.
- Use only filtered and lubricated air. The specified filter mesh size is 25 µm.
- Read the mounting instructions before start-up.

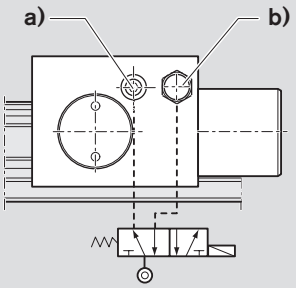
⚠ **Follow the safety notes for Clamping and Braking Units.** ☞ 187

Circuitry[1] for standard air port



a) Air port
b) Air filter
Nominal diameter
- Sizes 15 - 20: min. 4 mm
- Sizes 25 - 65: min. 6 mm

Circuitry[2] for air-plus port

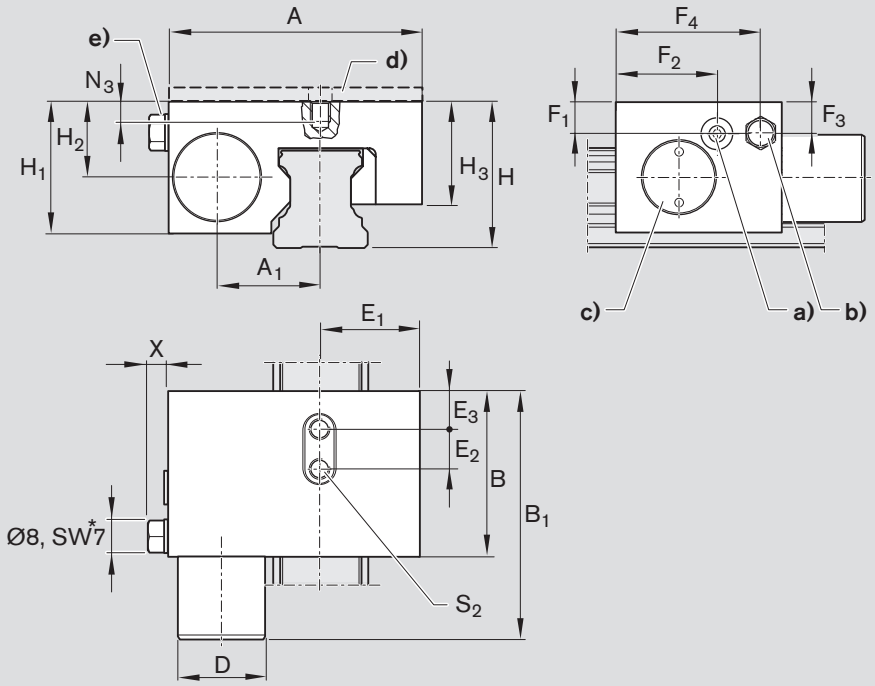


a) Air port
b) Air-plus port
Nominal diameter
- Sizes 15 - 20: min. 4 mm
- Sizes 25 - 65: min. 6 mm

Size	Part number	Holding force		Air consumption (normalized)	
		Spring energy[1]	with air-plus port[2]	Air port	Air-plus port
		(N)	(N)	(dm^3/stroke)	(dm^3/stroke)
25	R1619 240 70	650	1 050	0.015	0.082

1) Holding force achieved by spring energy. Testing is performed in the installed condition with a film of lubricating oil (ISO VG 68).
2) Increased holding force through additional pressurization with 6.0 bar compressed air at the air-plus port. Switching via 5/2 or 5/3-way directional control valve.

LCPS



a) Air port**) M5 on both sides for release pressure
b) Connection**) M5 on both sides for air-plus port or air filter
c) Adjusting screw on both sides
d) Spacer plate (accessory)
e) Air filter: connection M5 (at either side)
*) SW = width across flats
**) Only one port required.
All ports are plugged for shipment.

Size	Dimensions (mm)																			Weight
	A	A_1	B	B_{1max}	D	E_1	E_2	E_3	F_1	F_2	F_3	F_4	H	H_1[1)]	H_2	H_3	N_3	S_2	X	(kg)
25	61.4	24.5	41	62.5	22	23.9	9.5	9.75	6.5	24.5	6.5	36.0	36	32.5	20.0	24.55	7.7	M5	6.5	0.35

1) For Ball Runner Block .H. (..., high, ...), a spacer plate is needed. Available on request.

Accessories, Clamping and Braking Units

Product Description, Accessories, Manual Clamping Units, Spacer Plate

Application areas

- Table crossbars and slides
- Width adjustment
- Mechanical stops
- Positioning on optical instruments and measuring tables

Characteristic features

- Simple, reliable construction in compact design
- Manually operated clamping element without auxiliary power

Further highlights

- Freely adjustable hand lever
- Symmetrical force application to ball guide rail via floating contact profile
- Precise positioning
- Holding forces up to 2,000 N

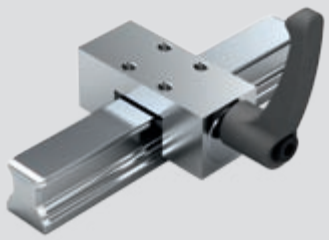
Spacer Plate

For assembly with Ball Runner Blocks, high version, SNH R1621 or SLH R1624.

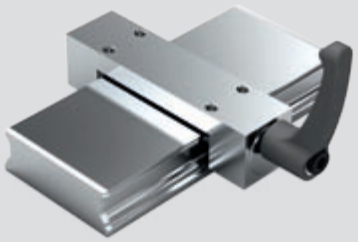
⚠ **Follow the safety notes for Clamping and Braking Units.** ☞ 187

Model overview, Accessories, Manual Clamping Units, Spacer Plate

HK ☞ 215

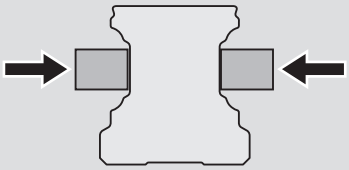


HK ☞ 216



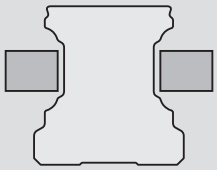
Spacer Plate ☞ 217

For Clamping Units MK, MKS and HK



Pressure applied by hand lever

Clamping by manual pressure
The clamping profiles are pressed against the web surfaces of the guide rail by the action of the hand lever.



Hand lever disengaged

Manual Clamping Units HK

R1619 .42 82

Note
Can be used on all Ball Guide Rails SNS.

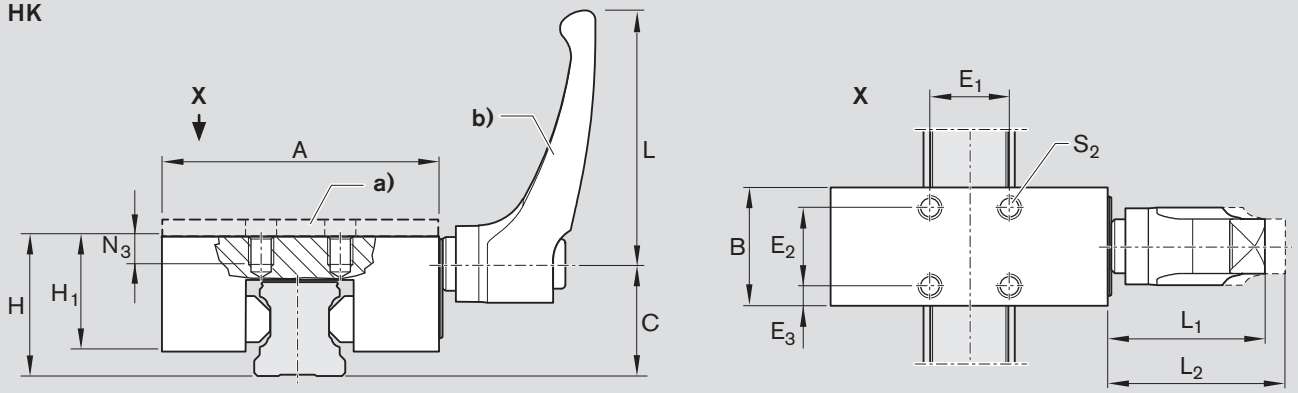
Manual clamping
– Operating temperature range t: 0 - 70 °C

Notes for mounting
– Make sure the adjoining structure is sufficiently rigid.
– Read the mounting instructions before start-up.

⚠ **Follow the safety notes for Clamping and Braking Units.** ☞ 187

Size	Part number	Holding force[1] (N)	Tightening torque (Nm)
15	R1619 142 82	1 200	4
20	R1619 842 82	1 200	5
25	R1619 242 82	1 200	7
30	R1619 742 82	2 000	15
35	R1619 342 82	2 000	15
45	R1619 442 82	2 000	15
55	R1619 542 82	2 000	22
65	R1619 642 82	2 000	22

HK



a) Spacer plate (accessory)
b) Position of hand lever adjustable

Size	Dimensions (mm)													Weight
	A	B	C	E_1	E_2	E_3	H	H_1[3]	L	L_1	L_2[2]	N_3	S_2	(kg)
15	47	25	19.0	17	17	4.0	24	19	44	30.0	33.0	5	M4	0.16
20	60	24	24.5	15	15	4.5	30	23	44	30.0	33.0	6	M5	0.23
25	70	30	29.3	20	20	5.0	36	29	64	38.5	41.5	7	M6	0.43
30	90	39	34.0	22	22	8.5	42	33	78	46.5	50.5	8	M6	0.82
35	100	39	38.0	24	24	7.5	48	41	78	46.5	50.5	10	M8	1.08
45	120	44	47.0	26	26	9.0	60	48	78	46.5	50.5	14	M10	1.64
55	140	49	56.5	30	30	9.5	70	51	95	56.5	61.5	14	M14	1.71
65	160	64	69.5	35	35	14.5	90	66	95	56.5	61.5	20	M16	2.84

1) Testing is performed in the installed condition with a film of lubricating oil (ISO VG 68).
2) Hand lever disengaged
3) For Ball Runner Block .H. (..., high, ...), a spacer plate is needed ☞ 217

Accessories, Clamping and Braking Units

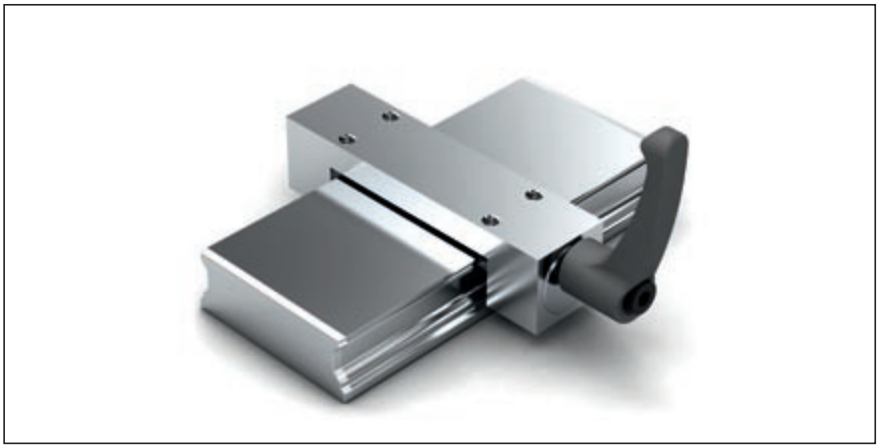
Manual Clamping Units HK

R1619 .42 83

Note
Can be used on all Ball Guide Rails BNS.

Manual clamping
– Operating temperature range t: 0 - 70 °C

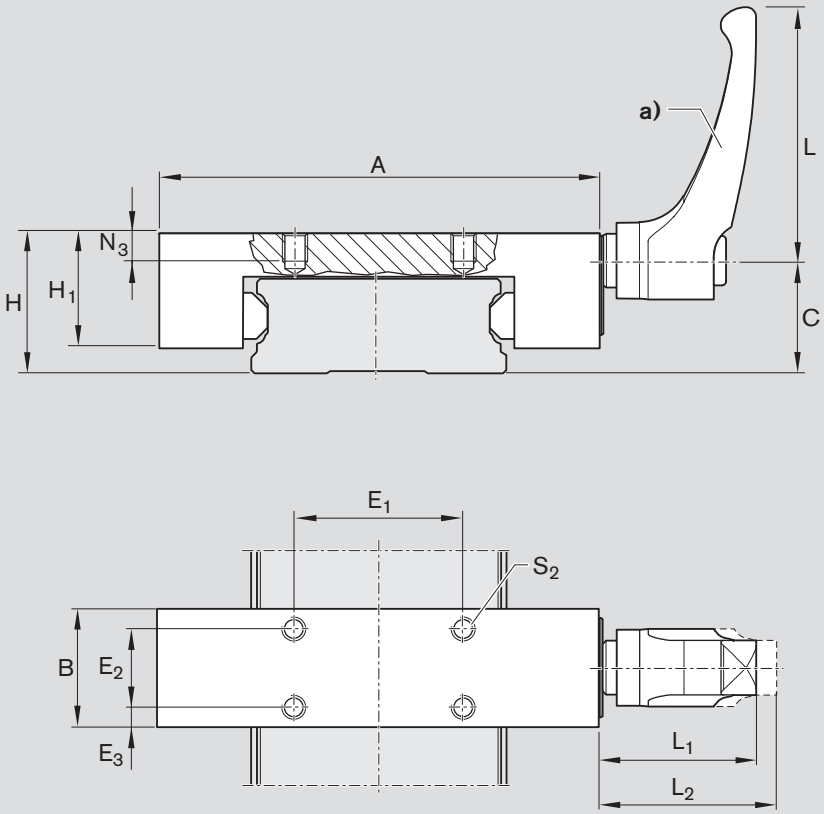
Notes for mounting
– Make sure the adjoining structure is sufficiently rigid.
– Read the mounting instructions before start-up.



⚠ **Follow the safety notes for Clamping and Braking Units.** ☞ 187

Size	Part number	Holding force[1] (N)	Tightening torque (Nm)
25/70	R1619 242 83	1 200	7
35/90	R1619 342 83	2 000	15

HK wide



a) Position of hand lever adjustable

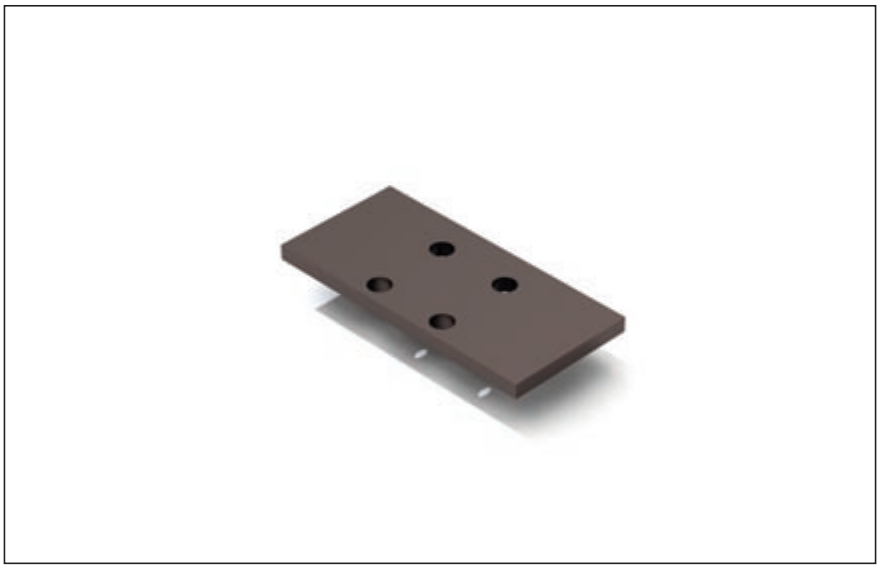
Size	Dimensions (mm)													Weight
	A	B	C	E_1	E_2	E_3	H	H_1	L	L_1	L_2[2]	N_3	S_2	(kg)
25/70	120	39	28.2	50	25	7.0	35	30	64	38.5	41.5	11	M6	0.77
35/90	145	39	38.0	60	20	9.5	50	39	78	46.5	50.5	11	M8	1.38

1) Testing is performed in the installed condition with a film of lubricating oil (ISO VG 68).
2) Hand lever disengaged

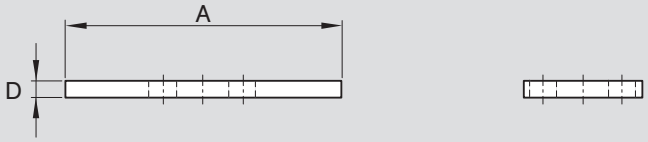
Spacer Plate

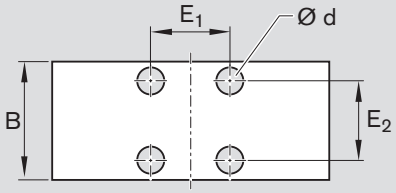
For Clamping Units MK, MKS and HK

Note
For assembly with Ball Runner Blocks, high version, SNH R1621 or SLH R1624.



Spacer Plate





R1619 .40 65

Suitable for Clamping Units:
– R1619 .42 60 (MK)
– R1619 .40 60 (MKS)

Size	Part number	Dimensions (mm)						Weight
		A	B	D	d	E_1	E_2	(kg)
15	R1619 140 65	55	39	4	4.5	15	15	0.065
25	R1619 240 65	75	35	4	6.5	20	20	0.078
30	R1619 740 65	90	39	3	8.5	22	22	0.077
35	R1619 340 65	100	39	7	8.5	24	24	0.202
45	R1619 440 65	120	49	10	10.5	26	26	0.434
55	R1619 540 65	128	49	10	10.5	30	30	0.465

R1619 .42 .5

Suitable for Clamping Units:
– R1619 .42 82 (HK)

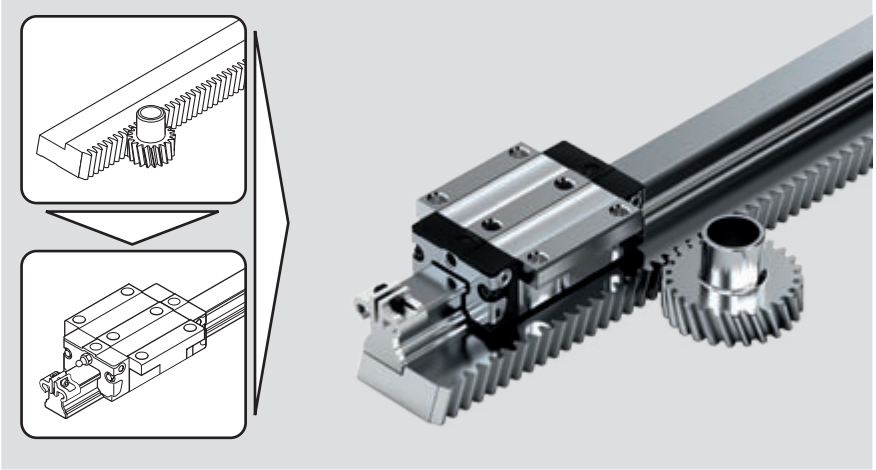
Size	Part number	Dimensions (mm)						Weight
		A	B	D	d	E_1	E_2	(kg)
15	R1619 142 85	47	25	4	4.5	17	17	0.035
25	R1619 242 85	70	30	4	6.5	20	20	0.062
30	R1619 742 85	90	39	3	6.5	22	22	0.080
35	R1619 340 65	100	39	7	8.5	24	24	0.202
45	R1619 442 85	120	44	10	10.5	26	26	0.387
55	R1619 542 85	140	49	10	14.5	30	30	0.511

Accessories, Rack and Pinion Drive

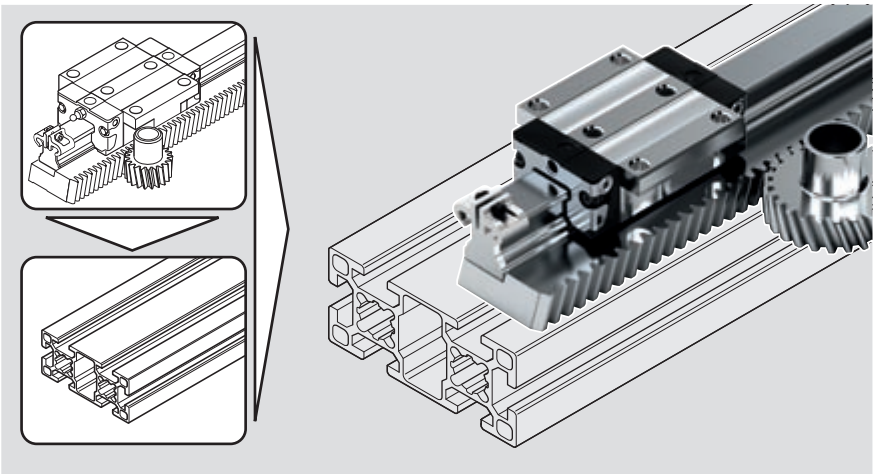
Product Description, Accessories, Rack and Pinion Drive

Gear racks with helical teeth for all ball guide rails SNS, for mounting from above, in sizes 25, 30 and 35.

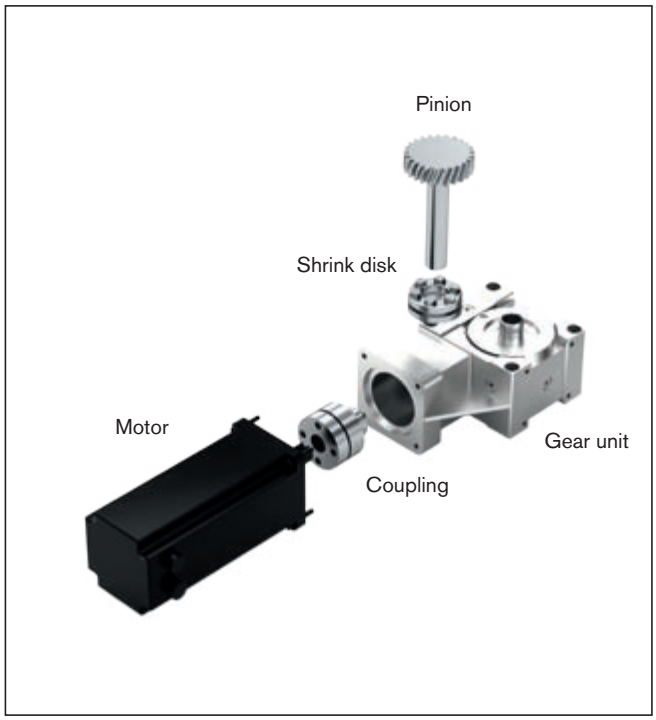
Combination of gear rack with pinion drive and Ball Rail Systems (see application examples).

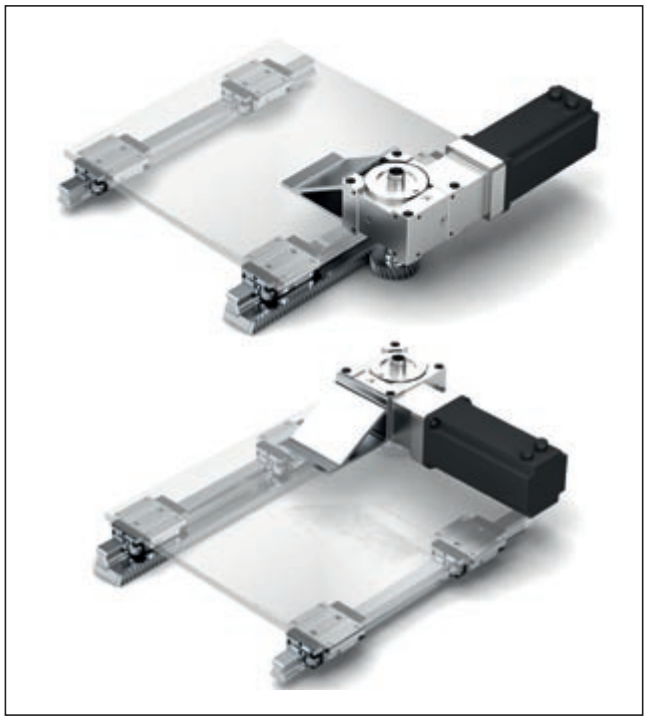


The ball rail system and gear rack can be mounted on profile framing system elements.



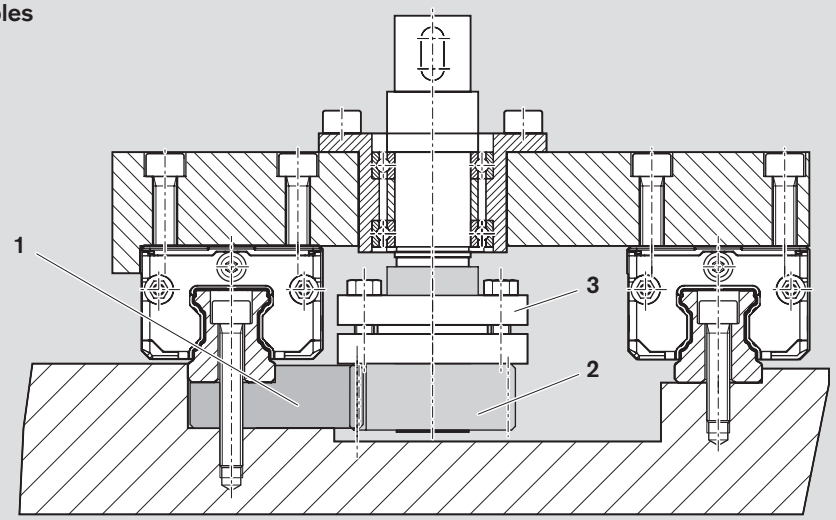
Only gear racks and ball rail systems of the same size can be combined.

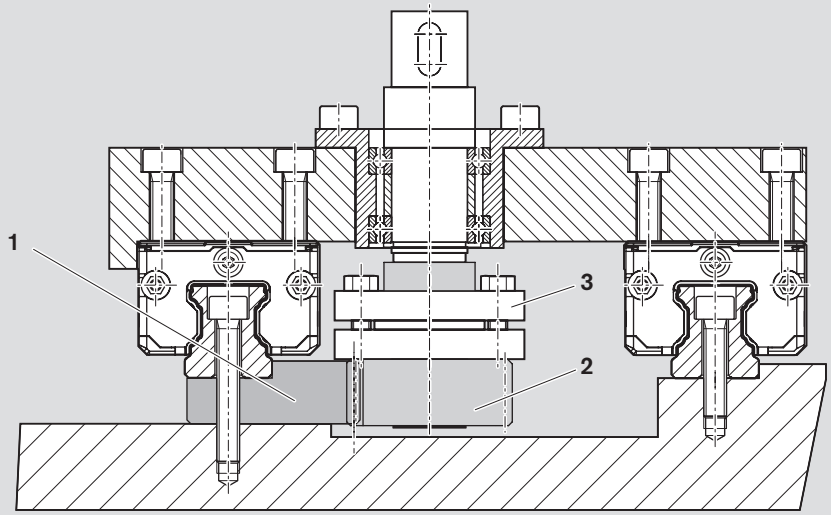


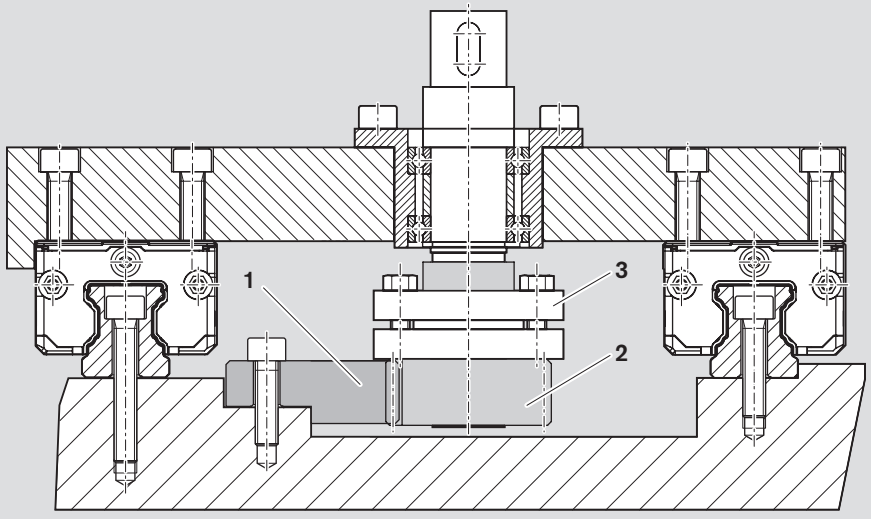


Application examples

1 Gear rack
2 Pinion
3 Shrink disk







Accessories, Rack and Pinion Drive

Combination Options

Normal module	Gear rack			Pinion		Shrink disk	
m_n (-)	Size	Length (mm)	Part number	Version	Part number	Part number	
1.5	**25**	1200	R2050 213 02	$z = 20$ $d_B = 24$	R2051 253 01	R3454 011 35 $d_1 = 24$	
		600	R2050 214 02	$z = 25$ $d_B = 24$	R2051 254 01		
		300	R2050 215 02	$z = 25$ $d_S = 25$	R2051 274 01	R3454 010 89 $d_1 = 30$	
3	**30**	1200	R2050 713 02	$z = 20$ $d_B = 36$	R2051 353 01	R3454 010 90 $d_1 = 36$	
		640	R2050 714 02	$z = 25$ $d_B = 36$	R2051 354 01		
		320	R2050 715 02	$z = 25$ $d_S = 28$	R2051 374 01		
	35	1200	R2050 313 02				
		640	R2050 314 02				
		320	R2050 315 02				

d_B = collar diameter (mm) d_1 = shrink disk (mm)
d_S = pinion shaft diameter (mm) z = number of teeth (–)
d_W = shaft diameter (mm)

	Gear unit			Coupling	Motor
	Center distance a_0 (mm)	Gear ratio i (-)	Part number	Part number	Part number
			Customer attachments e.g. shafts, bearings, side drive timing belts, gear unit, motor		
	$a_0 = 50$	i = 4.75	R3454 040 14	R3454 001 08 $d_w = 19$	R3471 095 03 MSK 061
		i = 6.75	R3454 040 04		
		i = 9.25	R3454 040 05		
		i = 14.5	R3454 040 06		
		i = 19.5	R3454 040 07		
		i = 39.0	R3454 040 08		
			Customer attachments e.g. shafts, bearings, side drive timing belts, gear unit, motor		
	$a_0 = 63$	i = 4.75	R3454 040 16	R3454 001 07 $d_w = 19$	R3471 095 03 MSK 061
		i = 6.75	R3454 040 17		
		i = 9.25	R3454 040 18		
		i = 14.5	R3454 040 19		
		i = 19.5	R3454 040 20		
		i = 39.0	R3454 040 21		
	$a_0 = 63$	i = 4.75	R3454 040 15	R3454 001 09 $d_w = 24$	R3471 093 03 MSK 076
		i = 6.75	R3454 040 09		
		i = 9.25	R3454 040 10		
		i = 14.5	R3454 040 11		
		i = 19.5	R3454 040 12		
		i = 39.0	R3454 040 13		

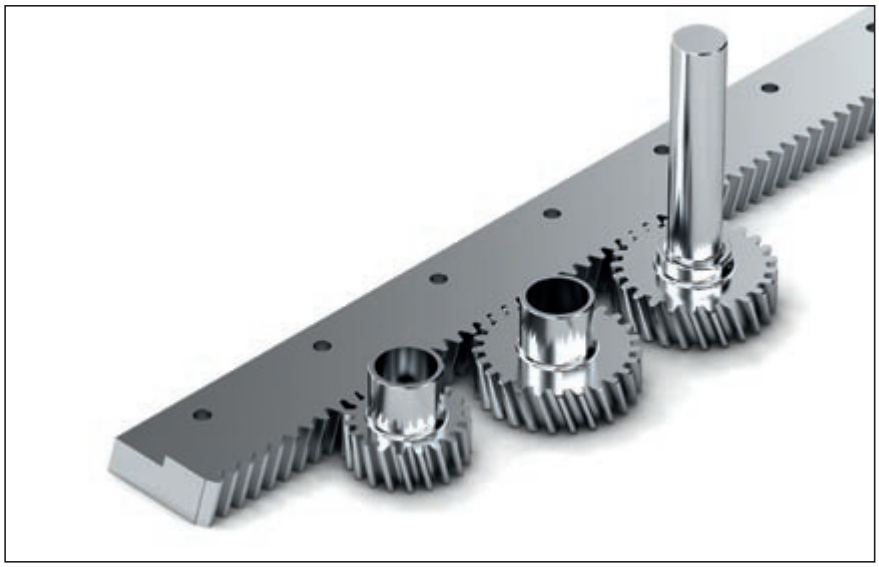
Accessories, Rack and Pinion Drive

Gear Rack with Helical Teeth

Gear Rack with Helical Teeth
- Induction hardened (HRC 54±2)
- Ground teeth, mating surface and flat surfaces
- Toothing quality grade 6h25

Pinion with helical teeth, with bore and collar
- Hardened teeth (HRC 58±2)
- Ground teeth, bore and collar
- Toothing quality grade 6h24

Pinion with helical teeth, with shaft
- Case hardened (HRC 58±2) on all sides
- Ground teeth and shaft
- Toothing quality grade 6h24



Gear rack with helical teeth

Size	Part number	Dimensions (mm)													Weight
		L	m_t	H_1	H_2	T	T_1	p_t	B_1	(B_2)	B_3	B_4	B_5	S_5	(kg)
25	R2050 213 02	1200	1.59	12	16.5	60	30	5	11.5	22.40	21.60	23.10	45.5	7	5.86
25	R2050 214 02	600	1.59	12	16.5	60	30	5	11.5	22.40	21.60	23.10	45.5	7	2.93
25	R2050 215 02	300	1.59	12	16.5	60	30	5	11.5	22.40	21.60	23.10	45.5	7	1.47
30	R2050 713 02	1200	3.18	14	19.0	80	40	10	14.0	27.50	22.47	25.47	53.0	9	7.53
30	R2050 714 02	640	3.18	14	19.0	80	40	10	14.0	27.50	22.47	25.47	53.0	9	4.02
30	R2050 715 02	320	3.18	14	19.0	80	40	10	14.0	27.50	22.47	25.47	53.0	9	2.00
35	R2050 313 02	1200	3.18	16	22.0	80	40	10	17.0	33.15	30.85	33.85	67.0	9	11.25
35	R2050 314 02	640	3.18	16	22.0	80	40	10	17.0	33.15	30.85	33.85	67.0	9	6.00
35	R2050 315 02	320	3.18	16	22.0	80	40	10	17.0	33.15	30.85	33.85	67.0	9	3.00

Pinion with helical teeth, with bore and collar
Module m_t = 1.59 mm for gear rack size 25, m_n = 1.5

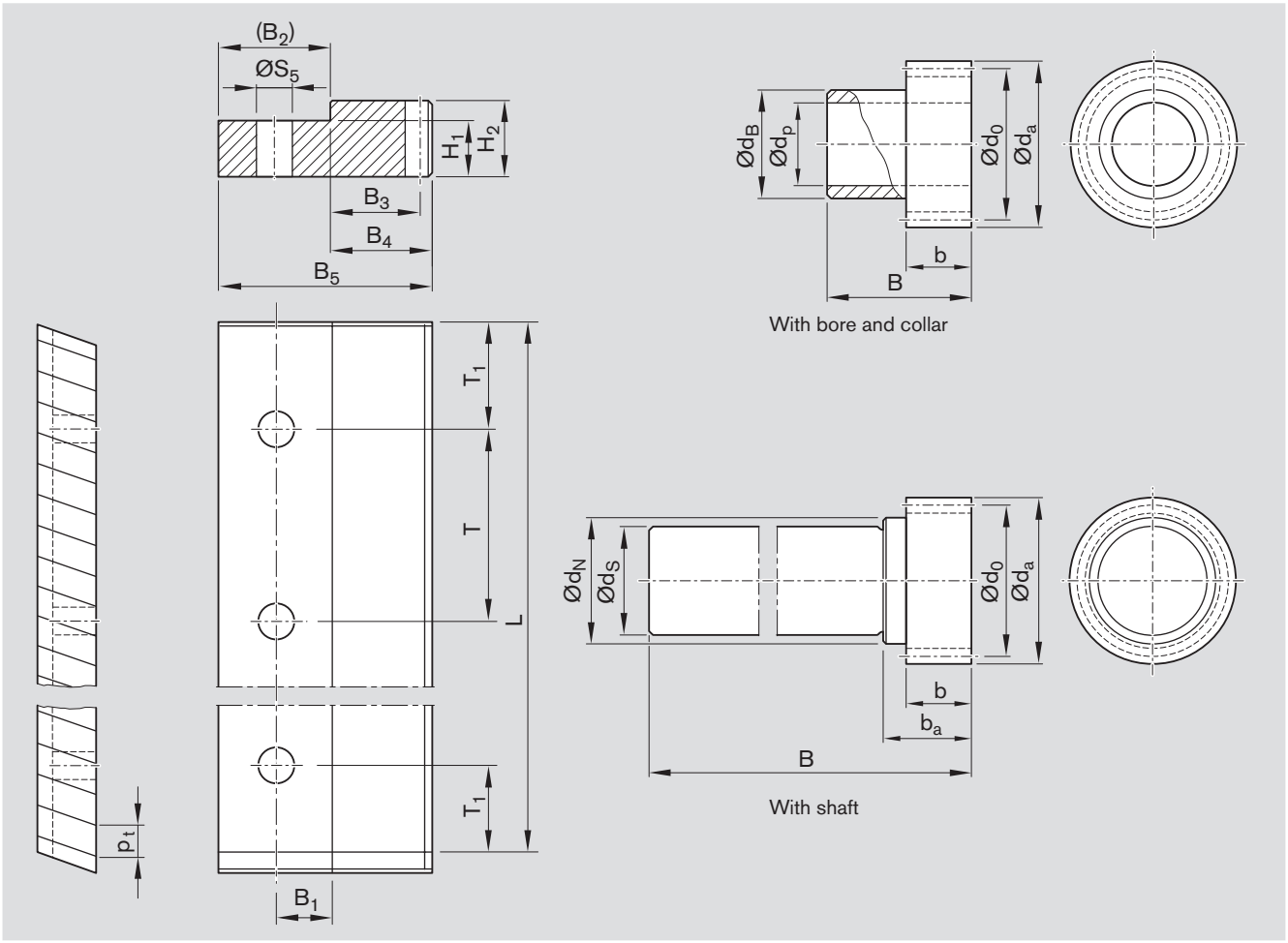
Number of teeth	Part number	Dimensions (mm)							J_p	Weight
		p_t	d_a	d_0	b	B	d_p H6	d_B h8	(10^{-5} kgm^2)	(kg)
20	R2051 253 01	5	34.8	31.831	17.5	43	19	24	1.605	0.103
25	R2051 254 01	5	42.8	39.789	17.5	43	19	24	3.601	0.164

Module m_t = 3.18 mm for gear rack size 30 - 35, m_n = 3

Number of teeth	Part number	Dimensions (mm)							J_p	Weight
		p_t	d_a	d_0	b	B	d_p H6	d_B h8	(10^{-5} kgm^2)	(kg)
20	R2051 353 01	10	69.7	63.662	23	55	30	36	2.982	0.539
25	R2051 354 01	10	85.6	79.578	23	55	30	36	7.179	0.860

Customer drive shaft for pinion version with bore and collar combined with shrink disks.

⚠ **For safe torque transmission, the clearance between the customer shaft and the bore must not be more than 0.017 mm. The shaft must be manufactured with a tolerance of j6.**



Pinion with helical teeth with shaft for worm gear unit

Module $m_t = 1.59$ mm for gear rack size 25, $m_n = 1.5$

Number of teeth	Part number	Dimensions (mm)								J_p	Weight
		p_t	d_a	d_0	b	b_a	d_S j6	B	d_N	(10^{-5} kgm²)	(kg)
25	R2051 274 01	5	42.8	39.789	17.5	25	25	130	32	7.147	0.622

Module $m_t = 3.18$ mm for gear rack size 30 - 35, $m_n = 3$

Number of teeth	Part number	Dimensions (mm)								J_p	Weight
		p_t	d_a	d_0	b	b_a	d_S j6	B	d_N	(10^{-5} kgm²)	(kg)
25	R2051 374 01	10	85.6	79.587	23	33	28	160	38	7.871	1.598

Number of teeth	Maximum transmittable torques M_{max} (Nm)		
	Module 1.59 mm Gear rack size 25 $P_t = 5$	Module 3.18 mm Gear rack size 30 $P_t = 10$	Module 3.18 mm Gear rack size 35 $P_t = 10$
20	56	270	320
25	70	330	380

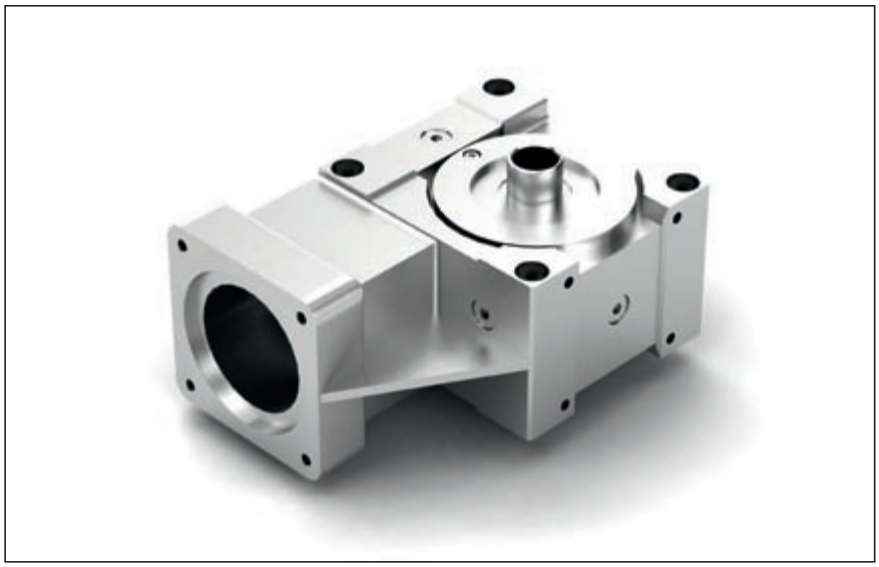
m_t = transverse module
m_n = normal module
p_t = pitch
d_0 = nominal diameter of pinion
J_p = mass moment of inertia of gear wheel

Accessories, Rack and Pinion Drive

High-Performance Servo Gear Units with Adjustable Backlash

These high performance worm gears have been specially developed for use with the latest AC and DC servo motors.

Typical features of these high-performance gear units are:
- Adjustable low-backlash gearing (backlash < 2')
- Up to 70% higher load capacities
- Casing of light metal for optimal heat dissipation
- Robust tapered-roller bearings of the hollow drive output shaft permitting greater additional forces



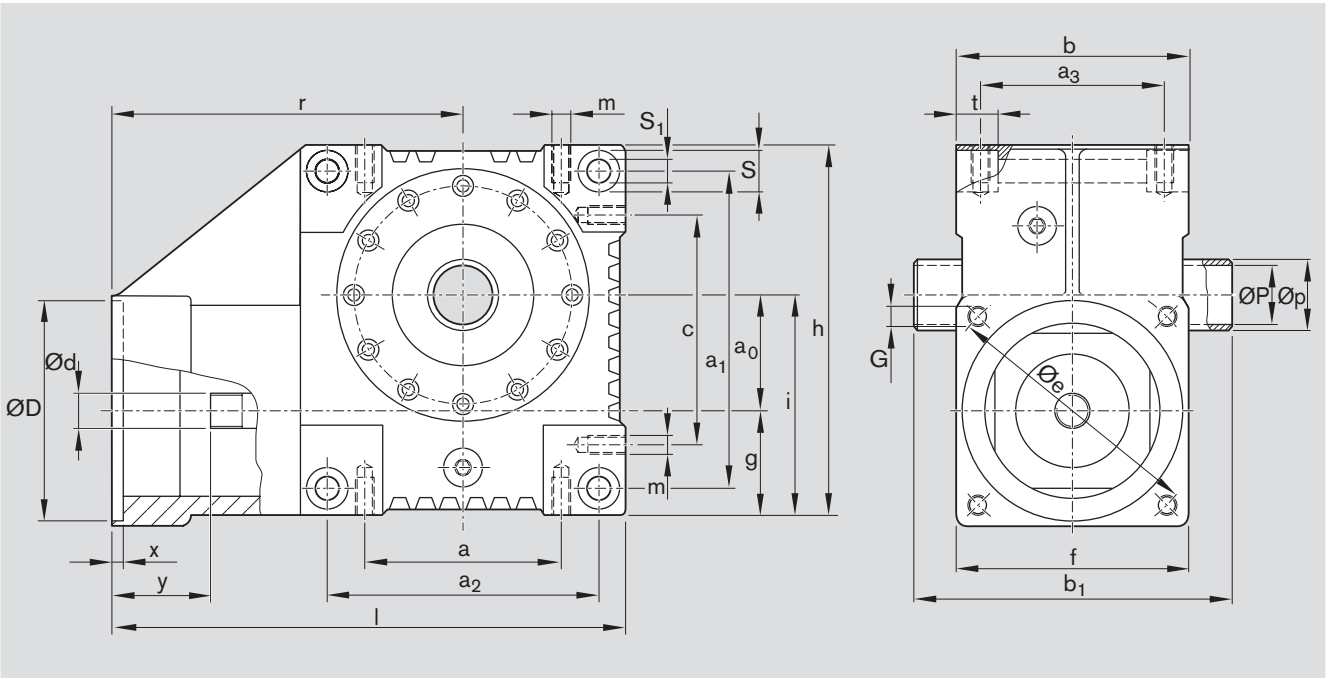
The tooth shape has been optimized to allow easy adjustment of the gear backlash by simply changing the center distance using eccentric flanges. The use of ground, right-hand worms, a worm gear made from special worm-gear bronze, and dip-feed lubrication (special synthetic oil) ensures a high degree of efficiency, smooth running in both directions of rotation, and a long service life. The casing is machined on all sides. Its many fixing bores and tapped holes permit mounting in any position.

The demand for an absolutely force-locking and virtually torsion free connection between the gear unit and the output shaft, especially in intermittent operation, is met by a new gear version designed for shrink disk fastening of the output shaft.

A special coupling ensures backlash-free power transmission from the drive motor to the servo gear. On the gear side, internal gearing meshes with the crowned splines of the drive shaft. On the motor side the smooth drive shaft is rigidly clamped by annular spring elements.

Gear ratio i	Center distance a_0 = 50 mm for servo motor MSK 061		Center distance a_0 = 63 mm for servo motor MSK 061		for servo motor MSK 076	
	Part number	J_{ge} (10^{-4} kgm^2)	Part number	J_{ge} (10^{-4} kgm^2)	Part number	J_{ge} (10^{-4} kgm^2)
4.75	R3454 040 14	0.4830	R3454 040 16	1.8560	R3454 040 15	1.8560
6.75	R3454 040 04	0.4140	R3454 040 17	1.3720	R3454 040 09	1.3720
9.25	R3454 040 05	0.3490	R3454 040 18	0.9825	R3454 040 10	0.9825
14.50	R3454 040 06	0.2800	R3454 040 19	0.9590	R3454 040 11	0.9590
19.50	R3454 040 07	0.1960	R3454 040 20	0.6940	R3454 040 12	0.6940
39.00	R3454 040 08	0.2310	R3454 040 21	1.0100	R3454 040 13	1.0100

J_{ge} = mass moment of inertia of gear



Center distance a_0 (mm)	Motor	Dimensions (mm) a	a_1	a_2	a_3	b	b_1	c	d h8	D G7	e	f	g	G
50 ±0.12	MSK 061	85	138	118	80	100	137	100	14.7	95	130	115	45	M8
63 ±0.2	MSK 061	110	175	145	105	130	168	125	24.7	95	130	115	52	M8
63 ±0.2	MSK 076	110	175	145	105	130	168	125	24.7	110	165	140	52	M10

Center distance a_0 (mm)	Motor	Dimensions (mm) h	i	l	m	p H6	P h8	r	S	S_1	t	x	y	Weight (kg)
50 ±0.12	MSK 061	160	95	238	M8x16	30	25	168	18	10	16	5	58	8.0
63 ±0.2	MSK 061	195	115	265	M10x15	36	28	180	18	11	25	5	48	12.0
63 ±0.2	MSK 076	195	115	270	M10x15	36	28	185	18	11	25	5	53	12.5

Accessories, Rack and Pinion Drive

High-Performance Servo Gear Units with Adjustable Backlash

Selection and load tables for high-performance servo gear units

The values in the table are based upon wear or maximum flank load at 12,000 h full load and on servo operation. With continuous full-load operation it may be necessary to consider temperature limits! (If in doubt, please consult us.)
Gearing efficiency ☞ 229

Drive power and transmitted torque

			For drive speed n_1													
			500 (min^{-1})		750 (min^{-1})		1000 (min^{-1})		1500 (min^{-1})		3000 (min^{-1})		4000 (min^{-1})		5000 (min^{-1})	
a_0	i	M_p	P_a	M_{te}	P_a	M_{te}	P_a	M_{te}	P_a	M_{te}	P_a	M_{te}	P_a	M_{te}	P_a	M_{te}
(mm)	(-)	(Nm)	(kW)	(Nm)	(kW)	(Nm)	(kW)	(Nm)	(kW)	(Nm)	(kW)	(Nm)	(kW)	(Nm)	(kW)	(Nm)
50	4.75	550	0.81	65	1.20	65	1.70	70	2.52	70	5.00	70	6.20	65	7.30	61
	6.75	400	0.50	56	0.77	59	1.10	63	1.75	69	3.50	69	4.40	65	5.20	61
	9.25	275	0.32	48	0.50	51	0.70	54	1.10	58	2.55	70	3.55	70	4.10	65
	14.50	350	0.26	57	0.40	60	0.50	65	0.89	70	1.82	75	2.50	75	3.15	75
	19.50	250	0.16	45	0.25	48	0.34	50	0.55	55	1.20	65	1.65	65	2.10	65
	39.00	200	0.12	53	0.17	56	0.24	60	0.37	65	0.77	75	1.00	75	1.25	75
63	4.75	1000	2.10	170	3.30	180	4.40	180	6.11	170	10.30	145	13.20	135	–	–
	6.75	750	1.50	170	2.35	180	3.10	180	4.25	170	7.20	145	9.30	135	–	–
	9.25	500	0.74	115	1.18	125	1.63	130	2.52	135	4.93	135	6.35	126	–	–
	14.50	600	0.74	165	1.19	180	1.54	180	2.45	180	4.18	170	5.25	160	–	–
	19.50	500	0.39	115	0.61	125	0.85	130	1.28	135	2.98	165	3.83	155	–	–
	39.00	450	0.30	140	0.44	150	0.61	160	0.97	175	1.88	190	2.55	190	–	–

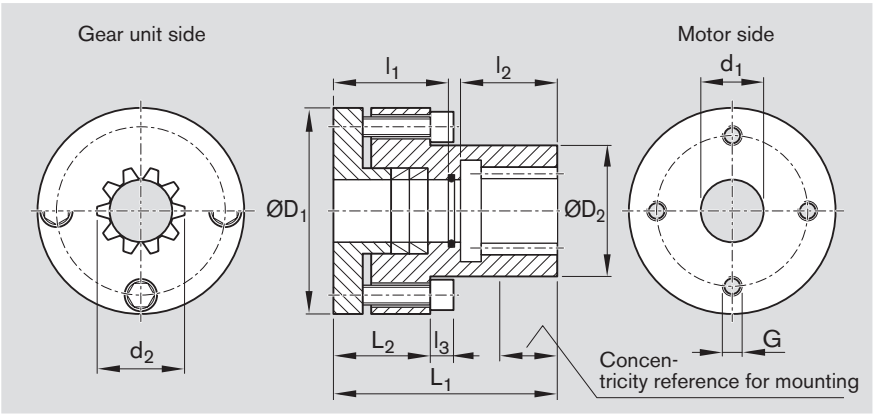
a_0 = center distance
i = gear ratio
M_p = maximum permissible drive torque
P_a = drive power
M_{te} = transmitted torque

Special couplings for motor/gear units

Rigid model, nitrided, pre-assembled for motor shafts without key

Bore on gear unit side, low-clearance internal spline similar to DIN 5480 for push-fitting

Bore on motor side with annular spring elements as clamping connection

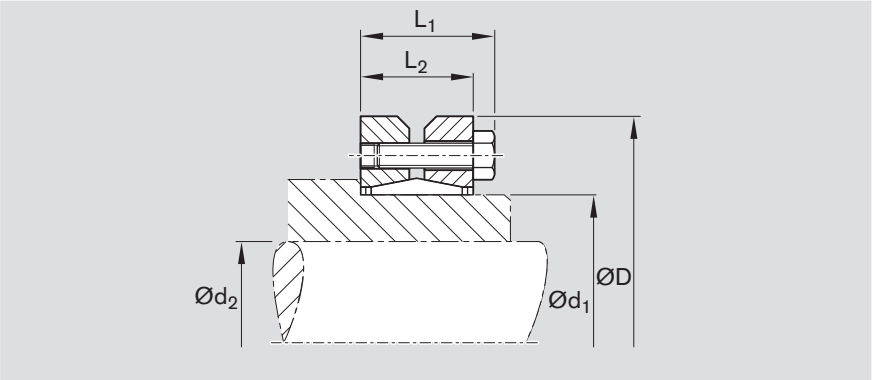


Part number	Dimensions (mm)										J_c	M_A	Weight
	d_1	d_2	D_1	D_2	l_1	l_2	l_3	L_1	L_2	G	(10^{-4} kgm^2)	(Nm)	(kg)
R3454 001 08	19	15x1.25x10	48	29	24.0	16	5	40.0	18.0	4 x M5	0.799	7	0.40
R3454 001 07	19	15x1.25x10	48	29	23.0	17	5	55.0	18.0	4 x M5	0.853	7	0.45
R3454 001 09	24	25x1.25x18	50	29	41.5	24	6	66.5	59.5	4 x M6	2.628	10	0.75

J_c = mass moment of inertia, coupling
M_A = tightening torque

Shrink disk clamping kits for output shafts

Supplied as complete kits



Part number	Dimensions (mm)						J_{sr}	M_A	Weight
	d_1	d_2	D	L_1	L_2	G	(10^{-4} kgm²)	(Nm)	(kg)
R3454 011 35	24	19	50	25.7	21.1	6xM5	1.756	5	0.20
R3454 010 89	30	25	60	26.8	23.3	7xM5	1.756	5	0.30
R3454 010 90	36	30	72	29.3	24.9	5xM6	4.029	12	0.40

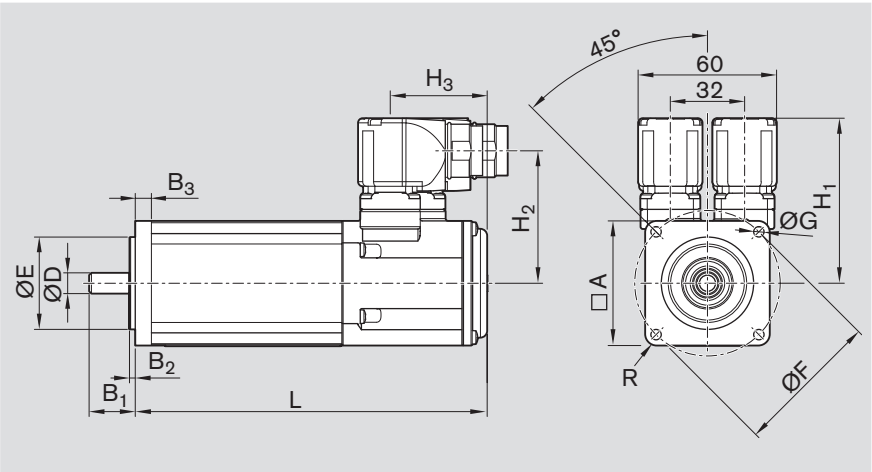
J_{sr} = mass moment of inertia of shrink disk
M_A = tightening torque

AC Servo Motors MSK

Note

– All MSK motors have an absolute multiturn encoder.

– The motors can be supplied complete with controller and control unit. For more detailed information on motors and control systems, please refer to the catalogs “ECODRIVE Cs” and “IndraDrive for Linear Motion Systems.”



	Dimensions (mm)												
	A	B_1	B_2	B_3	ØD k6	ØE j6	ØF	ØG	H_1	H_2	H_3	L with brake	R
MSK 061C	116	40	3	9.5	19	95	130	9	98	84.0	37.0	264.0	R18
MSK 076C	140	50	4	14.0	24	110	165	11	110	95.4	57.5	292.5	R12

Motor data

Description		Unit	MSK061C-0600-NN-M1-UG1-NNNN	MSK076C-0450-NN-M1-UG1-NNNN
Part number			R3471 095 03	R3471 093 03
Maximum rotary speed	n_{max}	(min^{-1})	6000	5000
Maximum perm. drive torque	M_{max}	(Nm)	32	43.5
Motor mass moment of inertia	J_m	(10^{-6}kgm²)	750	4300
Mass of motor	m_m	(kg)	8.3	13.8
Holding brake				
Brake holding torque	M_{br}	(Nm)	10.0	11.0
Brake mass moment of inertia	J_{br}	(10^{-6}kgm²)	59	360
Mass of brake	m_{br}	(kg)	0.5	1.1

Accessories, Rack and Pinion Drive

Technical Data and Calculations

Preload-dependent frictional drag F_{R1}

Ball Runner Block .N. (..., normal, ...)
on guide rail with cover strip

Size	Frictional forces for preload class (N)			
	C0 (up to approx. 10 µm)	C1 (2% C)	C2 (8% C)	C3 (13% C)
25	13.5	18.5	22.5	26.5
30	15.8	21.8	26.8	32.8
35	20.8	28.8	34.8	42.8

Ball Runner Block .L. (..., long, ...)
on guide rail with cover strip

Size	Frictional forces for preload class (N)			
	C0 (up to approx. 10 µm)	C1 (2% C)	C2 (8% C)	C3 (13% C)
25	13.5	20.5	25.5	30.5
30	15.8	23.8	29.8	36.8
35	20.8	29.8	37.8	48.8

Load-dependent friction force F_{R2}

$$F_{R2} = F_{comb} \cdot 0.003$$

Mass of the components m_{co}

$$m_{co} = m_m + m_{br} + m_c + m_{ge} + m_{sr} + m_p + m_{ca}$$

Thrust for traveling axis F_L

$$F_L = (m_{co} + m_{ex}) \cdot a + n \cdot F_{R\,1} + F_{R\,2}$$

Thrust for lifting axis F_L
(vertical mounting)

$$F_L = \pm\,(m_{co} + m_{ex}) \cdot g + (m_{co} + m_{ex}) \cdot a + n \cdot F_{R\,1} + F_{R\,2}$$

Required drive torque $M_{a\,req}$

$$M_{a\,req} = \frac{F_L \cdot d_0}{2000}$$

Maximum permissible drive torque M_p

$$M_p = \frac{M_{max}}{k_f \cdot S \cdot f_L}$$

Operating factor k_f

Drive	Operating factor k_f of the machine to be driven		
	uniform	moderate shocks	heavy shocks
Uniform	1.00	1.25	1.75
Moderate shocks	1.25	1.50	2.00
Heavy shocks	1.50	1.75	2.25

Safety factor S

$$S = 1.1 - 1.4$$

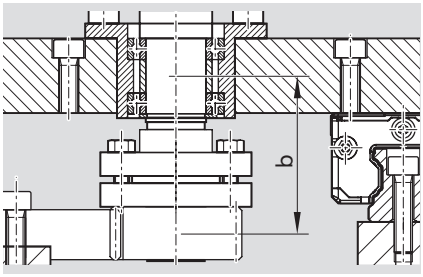
Condition

$$M_{a\,req} \leq M_p$$

a	=	acceleration	(m/s²)
d_0	=	nominal diameter of pinion	(mm)
F_{comb}	=	combined equivalent dynamic load on bearing ☞ 14	(N)
F_L	=	thrust	(N)
f_L	=	life expectancy factor	(-)
F_{R1}	=	preload-dependent frictional drag	(N)
F_{R2}	=	load-dependent friction force	(N)
g	=	gravitational acceleration 9.81	(m/s²)
i	=	gear ratio	(-)
J_{br}	=	mass moment of inertia of brake	(kgm²)
J_c	=	mass moment of inertia, coupling	(kgm²)
J_{co}	=	mass moment of inertia, components	(kgm²)
J_m	=	mass moment of inertia of motor	(kgm²)
k_f	=	operating factor	(-)
m_{co}	=	mass of components	(kg)
m_m	=	mass of motor	(kg)
m_{br}	=	mass of brake	(kg)
m_c	=	mass of coupling	(kg)
m_{ge}	=	mass of gear	(kg)
m_{sr}	=	mass of shrink disk	(kg)
m_p	=	mass of gear wheel	(kg)
m_{ca}	=	mass of carriage	(kg)
m_{ex}	=	moved external load	(kg)
$M_{a\,req}$	=	required drive torque	(Nm)
M_{max}	=	max. permissible motor torque	(Nm)
M_p	=	max. perm. drive torque	(Nm)
n	=	number of runner blocks	(-)
n_{mech}	=	maximum permissible rotary speed of mechanical system	(min⁻¹)
S	=	safety factor	(-)
v_{mech}	=	maximum permissible linear speed of mechanical system	(m/s)

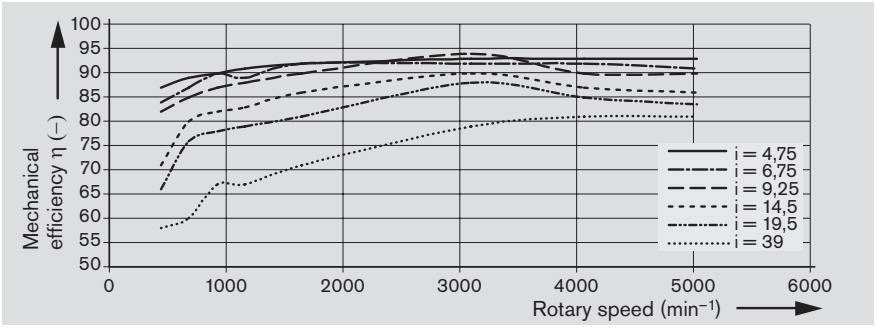
Life expectancy factor f_L

Axial distance between rotary bearing centerline and pinion tooth width centerline

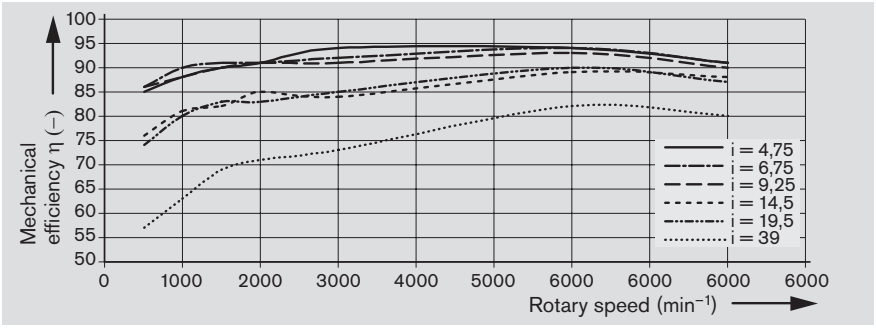


Axial bearing distance b Peripheral speed		Life expectancy factor f_L 1 x tooth width Lubrication		2 x tooth width Lubrication	
(m/s)	(m/min)	continuous	daily	continuous	daily
0.5	30	0.85	0.95	1.05	1.15
1.0	60	0.95	1.10	1.15	1.30
1.5	90	1.00	1.20	1.20	1.45
2.0	120	1.05	1.30	1.25	1.60
3.0	180	1.10	1.50	1.40	1.90
5.0	300	1.25	1.90	1.55	2.30

Gearing efficiency of servo worm gear units
with driving worm and under full load
Center distance $a_0 = 50$ mm



Center distance $a_0 = 63$ mm



Maximum permissible linear speed v_{mech} of mechanical system

$$v_{mech} = n_{mech} \cdot \frac{\pi \cdot d_0}{60 \cdot 1000 \cdot i}$$

Translatory mass moment of inertia of external load J_t referred to the drive journal

$$J_t = m_{ex} \cdot \left(\frac{d_0}{2}\right)^2 \cdot 10^{-6}$$

Mass moment of inertia of gear wheel J_p (calculation for customer-supplied pinion)

$$J_p = \sum V_{Zyl.\,i} \cdot r^2_{i} \cdot \frac{7.8}{2 \cdot 10^{12}}$$

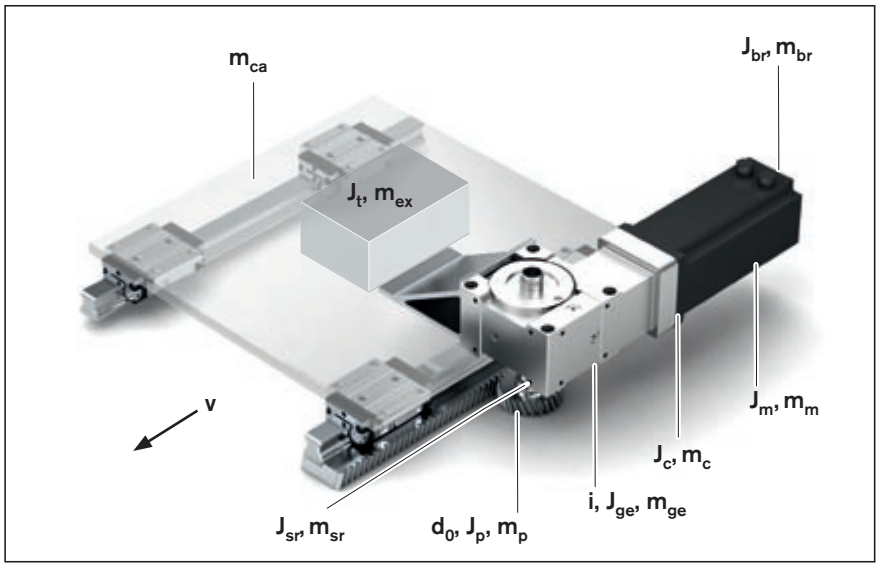
Mass moment of inertia of components J_{co}

$$J_{co} = m_{co} \cdot \left(\frac{d_0}{2}\right)^2 \cdot 10^{-6}$$

J_{ex} = mass moment of inertia of mechanical system (kgm²)
J_{ge} = mass moment of inertia of gear (kgm²)
J_p = mass moment of inertia of gear wheel (kgm²)
J_{sr} = mass moment of inertia of shrink disk (kgm²)
J_t = translatory mass moment of inertia of external load referred to the drive journal (kgm²)
$r_{Zyl.\,i}$ = radius single cylinder, gear wheel from 1 ... n (mm)
$V_{Zyl.\,i}$ = volume single cylinder, gear wheel from 1 ... n (mm³)
V = mass moment of inertia ratio (-)

Accessories, Rack and Pinion Drive

Technical Data and Calculations



Mass moment of inertia of mechanical system J_{ex}

$$J_{ex} = J_c + J_{ge} + \frac{1}{i^2} \cdot (J_{sr} + J_p + J_t + J_{co})$$

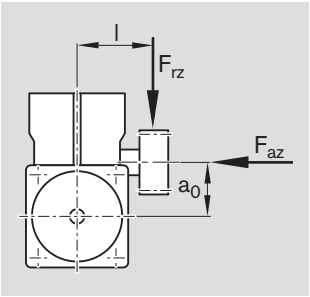
Mass moment of inertia ratio V

$$V = \frac{J_{ex} + J_{br}}{J_m} \Rightarrow 1 \leq V \leq 6$$

Application area	V
Handling	≤ 6.0
Processing	≤ 1.5

Maximum permissible additional loads on gear output

The data given are reference values. The forces arising from the choice of tooth system must also be considered.
It is assumed that the point of action of the force is the center of the shaft journal. In cases where axial forces occur in addition to high radial forces, please ask for advice.



Center distance	Dimensions center casing/ center teeth	Max. additional load	
		radial	axial
a_0 (mm)	l (mm)	F_{rz} (N)	F_{az} (N)
50	90	3600	1800
	140	2300	1800
63	110	5000	2500
	160	3500	2500

F_{rz} = radial force on gear wheel
F_{az} = axial force on gear wheel

Lubrication and Mounting

Lubrication of the gear rack drive

The teeth of the gear rack must be lubricated with grease approx. every 8 hours. For units used in difficult operating conditions the lubrication intervals must be shortened.
Gear racks and pinions must be cleaned to remove dirt and residues of old grease.

Lubricants for gear racks

Recommended lubricants for felt gear rack lubrication:
Klüber Microlube GB 0
Klüber Structovis AHD
Other lubricants:
Rexroth Dynalub 520

Recommended lubricants for brush/ manual lubrication:
Klüber Microlube GB 0
Other lubricants:
Rexroth Dynalub 510

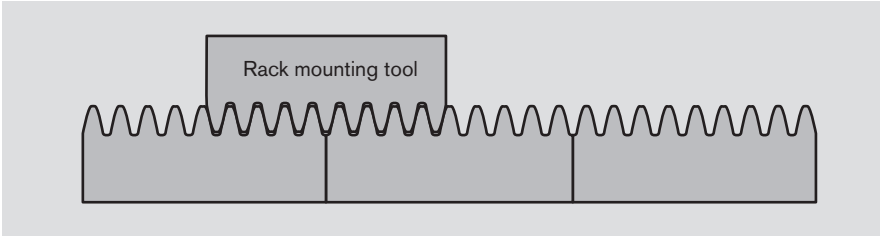
Part number	Designation acc. to		Consistency class per DIN 51818	Temperature range (°C)	Packaging unit
	Rexroth	DIN 51825			
R3416 037 00	Dynalub 510	KP2K	2	–20 to +80	1 x 400 g
R3416 043 00	Dynalub 520	GP00K	00	–20 to +80	1 x 400 g

Lubricants for runner blocks

Runner blocks are pre-lubricated with Dynalub 510 grease.
Dynalub 510 is also recommended for re-lubrication.

Mounting the gear rack

Composite gear racks are mounted with the help of a rack mounting tool.



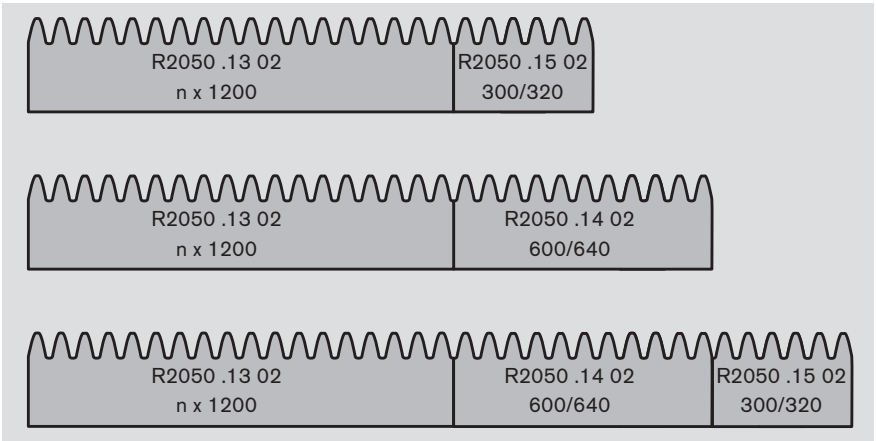
Rack mounting tools

Size	Part number	Dimensions (mm)	
		L	m_t
25	R2052 213 01	200	1.59
30	R2052 713 01	200	3.18
35	R2052 713 01	200	3.18

Tooth flank clearance:

To be adjusted according to the required level of precision. For normal applications, do not set a value smaller than 0.04 mm over the entire travel path.

Fixed length increments



⚠ **Recalculate all screw connections to check their strength!**

⚠ **For vertical applications, provide safety devices to prevent equipment from crashing down!**

Mounting Instructions, Ball Runner Blocks and Ball Guide Rails

General Notes

The following notes relating to mounting apply to all Ball Rail Systems.
However, different specifications exist with regard to the parallelism of the guide rails and to mounting the runner blocks with screws and locating pins. This information is provided separately alongside the descriptions of the individual types of Ball Rail Systems.

⚠ **During overhead (top down) or vertical assembly, damage to the runner block resulting in loss or breakage of balls may cause the runner block to come away from the rail. Secure the runner block to prevent it from falling!**
Danger to life and limb!
The use of fall arresting devices is recommended!

Rexroth Ball Rail Systems are high-grade quality products. Particular care must be taken during transportation and subsequent mounting. The same care must be taken with cover strips.
All steel parts are protected with anti-corrosion oil.
It is not necessary to remove this oil provided the recommended lubricants are used.

Mounting examples

Ball guide rails

Each guide rail has ground reference surfaces on both sides.

Possibilities for side fixing:
1 Reference edges
2 Retaining strips
3 Wedge profile retaining strips

Note
– Guide rails without side fixing have to be aligned straight and parallel when mounting, preferably using a straightedge.
– Recommended limits for side load if no additional lateral retention is provided, see the individual ball runner blocks.

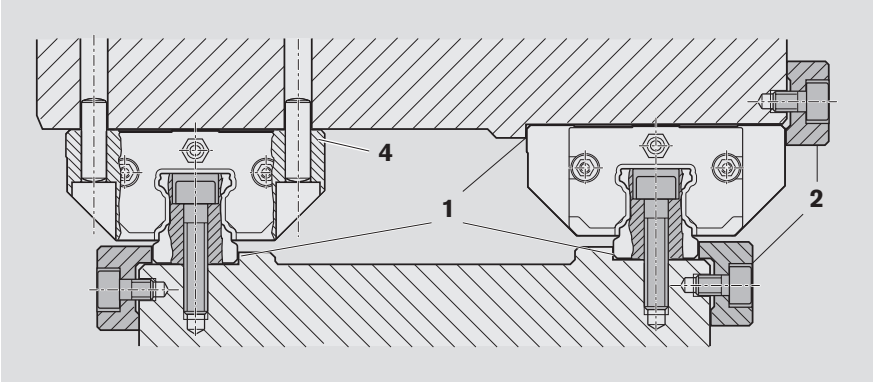
Ball runner blocks
Each runner block has a ground reference edge on one side (see dimension V_1 in the dimension drawings).

Possibilities for additional fixing:
1 Reference edges
2 Retaining strips
4 Locating pins

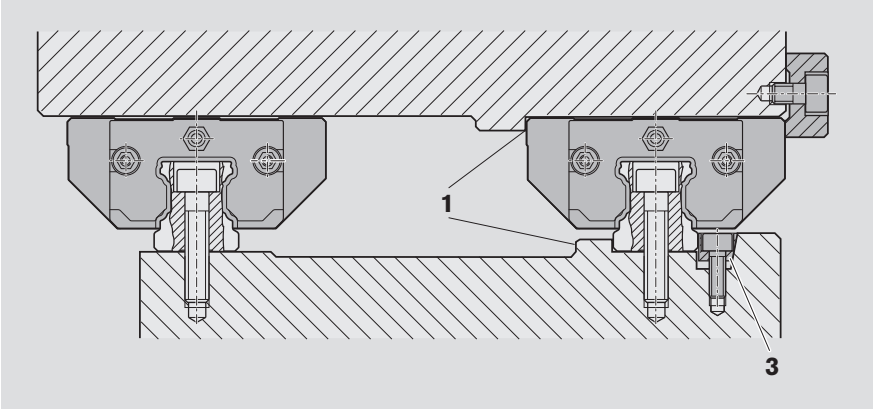
Note
– After mounting, it should be possible to move the runner block easily.

Notes for mounting
– Before installing the components, clean and degrease all mounting surfaces.
– Follow the mounting instructions! Send for the “Mounting Instructions for Ball Rail Systems.”

Mounting with fixing of both guide rails and runner blocks



Mounting with fixing of one guide rail and runner block



Mounting

Load on the screw connections between the guide rail and the mounting base

The high-performance capability of Ball Rail Systems may cause the load limits for screw connections as specified in DIN 645-1 to be exceeded. The most critical point is the screw connection between the guide rail and the mounting base.

⚠ **If the static lift-off loads F or moments M_t exceed the maximum permissible loads in the table, the screw connections must be separately recalculated (see VDI guideline 2230). Side loads must be added to the lift-off loads F, irrespective of whether there is lateral fixing or not.**
☞ 19

1) The values shown in the table apply under the following conditions:
– Mounting screws in quality 12.9 (for screws in quality 8.8, the values will be approximately 40% lower)
– Screws tightened using a torque wrench
– Screws lightly oiled
– Parts screwed down to steel or cast iron bases
– Screw-in depth at least 2 x the thread diameter

Standard Ball Rail Systems

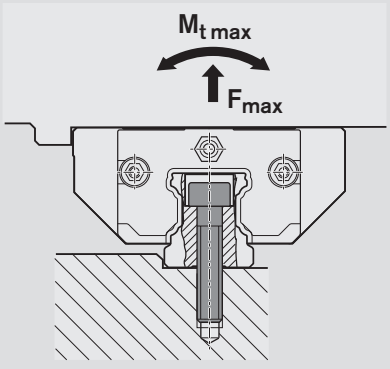
Ball guide rail	Size	Maximum permissible loads[1] Short runner block FKS R1661, FKS R1665, R2000, SKS R1662, SKS R1666, R2010, FKN R1663, SKN R1664		Normal runner block FNS R1631, FNS R1651, R2001, SNS R1622, R2011, SNS R1632, SNH R1621, FNN R1693, SNN R1694		Long runner block FLS R1653, R2002, SLS R1623, R2012, SLH R1624	
		F_{max} (N)	$M_{t\,max}$ (Nm)	F_{max} (N)	$M_{t\,max}$ (Nm)	F_{max} (N)	$M_{t\,max}$ (Nm)
R1605	15	6 040	41	7 050	47	8 060	54
R1606	20	10 000	90	11 700	106	13 400	121
R1645	25	14 600	154	17 100	180	19 500	205
R2045	30	–	360	32 400	420	37 100	480
	35	27 500	440	32 100	510	36 700	580
	45	–	–	78 100	1 680	89 300	1 920
	55	–	–	107 800	2 690	123 200	3 080
	65	–	–	152 300	4 490	174 100	5 130
R1607	15	–	67	11 600	78	13 300	89
R1647	20	–	128	16 500	149	18 900	170
R2047	25	14 300	150	16 700	170	19 100	200
	30	–	350	31 700	410	36 200	470
	35	27 100	430	31 600	500	36 200	570
	45	–	–	77 700	1 670	88 800	1 900
	55	–	–	106 800	2 670	122 100	3 050
	65	–	–	150 850	4 450	172 400	5 080

Wide Ball Rail Systems

Ball guide rail	Size	Maximum permissible loads[1] Wide runner block BNS R1671, CNS R1672	
		F_{max} (N)	$M_{t\,max}$ (Nm)
R1673	20/40	14 100	227
R1675	25/70	33 500	890
R1676	35/90	64 800	2 390
R1677	20/40	13 800	224
	25/70	33 700	900
	35/90	63 700	2 350

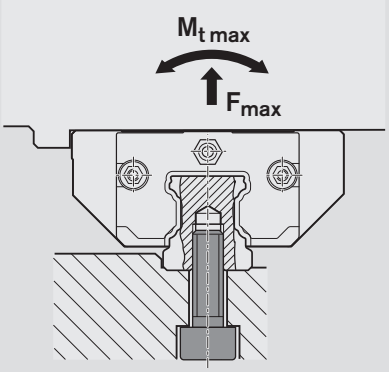
Ball guide rail for mounting from above

SNS: R1605, R1606, R1645, R2045
BNS: R1673, R1675, R1676



Ball guide rail for mounting from below

SNS: R1607, R1647, R2047
BNS: R1677



Mounting Instructions, Ball Runner Blocks and Ball Guide Rails

Mounting

Reference edges, corner radii, screw sizes and tightening torques

Note
The combinations shown here are examples. Basically, any ball runner block may be combined with any of the ball guide rail types offered.

⚠ **Always check the safety of the screws in the case of high lift-off loads!** ☞ 233

Guide rail with normal and long runner blocks

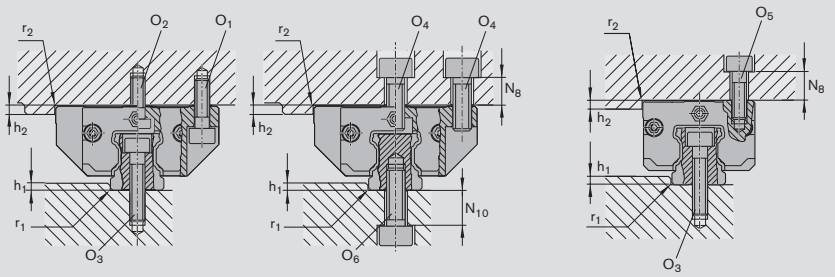
Ball runner blocks (flanged)
FNS, FLS, FNN

Ball runner blocks (slimline)
SNS, SLS, SNH, SLH, SNN

Ball guide rails
R1605, R1606, R1645, R2045
(for mounting from above)

Ball guide rails
R1607, R1647, R2047
(for mounting from below)

Ball guide rails
R1605, R1606, R1645, R2045
(for mounting from above)



Dimensions and recommended limits for side load if no additional lateral retention is provided

Size	Dimensions (mm)							Screw sizes					
								Ball runner block				Ball guide rail	
								O_1 ISO 4762	O_2[2] DIN 6912	O_4[1) 2)] ISO 4762	O_5 ISO 4762	O_3 ISO 4762	O_6 ISO 4762
	$h_{1\,min}$	$h_{1\,max}$	h_2	N_8	N_{10}	$r_{1\,max}$	$r_{2\,max}$	4 pcs	2 pcs	6 pcs	4 pcs		
15	2.5	3.5	4	6	7.0	0.4	0.6	M4x12	M4x10	M5x12	M4x12	M4x20	M5x12
20	2.5	4.0	5	9	9.5	0.6	0.6	M5x16	M5x12	M6x16	M5x16	M5x25	M6x16
				10[3]	–								
25	3.0	5.0	5	10	12.0	0.8	0.8	M6x20	M6x16	M8x20	M6x18	M6x30	M6x20
				11[3]	–								
30	3.0	5.0	6	10	9.0	0.8	0.8	M8x25	M8x16	M10x20	M8x20	M8x30	M8x20
35	3.5	6.0	6	13	13	0.8	0.8	M8x25	M8x20	M10x25	M8x25	M8x35	M8x25
45	4.5	8.0	8	14	13	0.8	0.8	M10x30	M10x25	M12x30	M10x30	M12x45	M12x30
55	7.0	10.0	10	20	23	1.2	1.0	M12x40	M12x30	M14x40	M12x35	M14x50	M14x40
65	7.0	10.0	14	22	26	1.2	1.0	M14x45	M14x35	M16x45	M16x40	M16x60	M16x45

Permissible side load
The recommended limits for permissible side loads without additional lateral retention indicate the approximate upper limits for screws in two strength classes. In other cases, the permissible side load must be calculated from the screw tension force. This can be up to about 15% less when using screws in strength class 10.9 instead of 12.9.

Screw strength class	Permissible side load without lateral retention[4]					
	Ball runner block				Ball guide rail	
	O_1	O_2[7]	O_4	O_5	O_3	O_6
8.8[5]	11% C	15% C	23% C	11% C	6% C	6% C
8.8[6]	8% C	13% C	18% C	8% C	4% C	4% C
12.9[5]	18% C	22% C	35% C	18% C	10% C	10% C
12.9[6]	14% C	18% C	26% C	14% C	7% C	7% C

1) When mounting the runner block from above using only 4 O_4 screws: Permissible side load 1/3 lower, and lower rigidity
2) For runner block mounting with 6 screws: Tighten the centerline screws with the tightening torque M_A for strength class 8.8.
3) Ball Runner Block SNN
4) Calculated with stiction coefficient $\mu = 0.12$
5) Ball Runner Blocks FNS, FNN, SNS, SNN, SNH
6) Ball Runner Blocks FLS, SLS, SLH
7) When mounting with 2 O_2 screws and 4 O_1 screws

Recommended tightening torques M_A of the fastening screws per VDI 2230
for $\mu_K = \mu_G = 0.125$

		M4	M5	M6	M8	M10	M12	M14	M16
8.8	M_A max	2.7	5.5	9.5	23	46	80	125	195
12.9	(Nm)	4.6	9.5	16.0	39	77	135	215	330

Locating pins

⚠ **If the recommended limits for permissible side loads are exceeded (see values for the individual runner block types), the runner block must be additionally fixed by means of locating pins.**

Recommended dimensions for the pin holes are indicated in the drawings and table.

Possible pin types
- Taper pin (hardened) or
- Straight pin ISO 8734

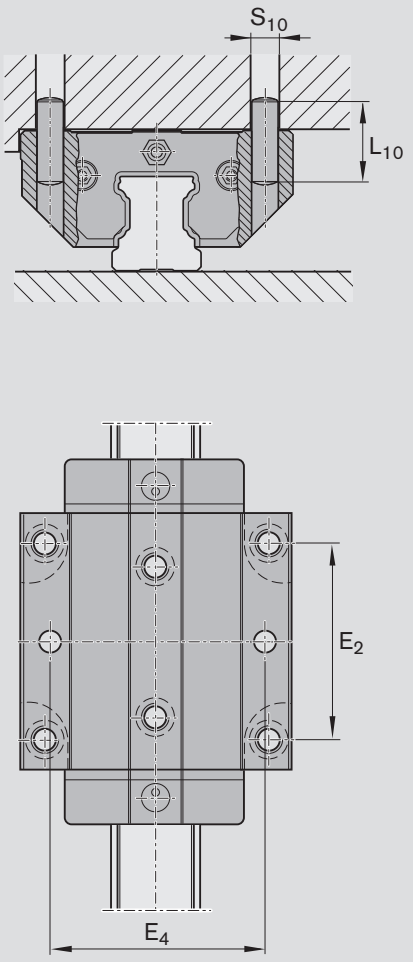
Note
- Rough-drilled holes made for production reasons may exist at the recommended pin hole positions on the runner block centerline ($Ø < S_{10}$). These may be bored open to accommodate the locating pins.

- If the locating pins have to be driven in at another point (e.g. when the lube port is central), dimension E_2 must not be exceeded in the longitudinal direction (for dimension E_2, see the tables for the individual runner block types).
  Observe dimensions E_1 and E_4!

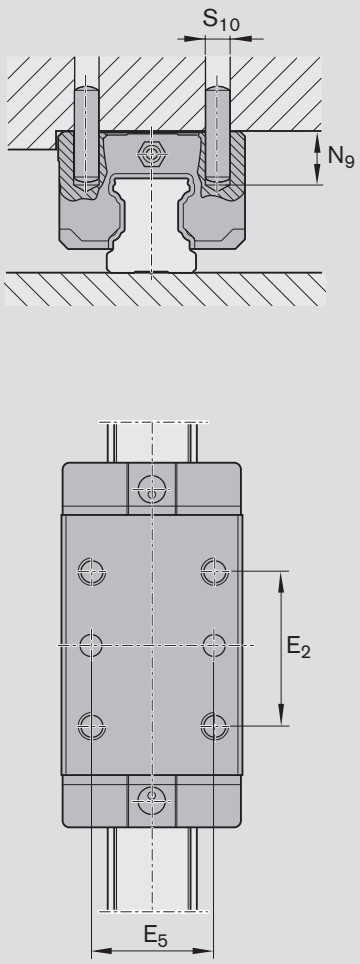
- Only prepare the pin holes after the installation is complete.

- Send for the publication “Mounting Instructions for Ball Rail Systems.”

Ball runner block (flanged)
FNS, FLS, FNN



Ball runner block (slimline)
SNS, SLS, SNH, SLH, SNN



Size	Dimensions (mm)				
	E_4	E_5	L_{10} [1)]	$N_{9\,max}$	S_{10} [1)]
15	38	26	18	6.0	4
20	53	32	24	7.5	5
	49 [2)]			6.5 [2)]	
25	55	35	32	9.0	6
	60 [2)]			7.0 [2)]	
30	70	40	36	12.0	8
35	80	50	40	13.0	8
45	98	60	50	18.0	10
55	114	45	60	19.0	12
65	140	76	60	22.0	14

1) Taper pin (hardened) or straight pin (ISO 8734)
2) Ball Runner Block FNN and SNN

Mounting Instructions, Ball Runner Blocks and Ball Guide Rails

Mounting

Reference edges, corner radii, screw sizes and tightening torques

Note
The combinations shown here are examples. Basically, any ball runner block may be combined with any of the ball guide rail types offered.

Screw mounting of runner blocks using two screws is fully sufficient up to maximum load.
(See maximum permissible force and moment loads indicated under the individual runner block types.)

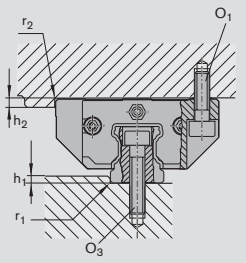
⚠ **Always check the safety of the screws in the case of high lift-off loads!** ☞ 233

Guide rail with short and super runner blocks

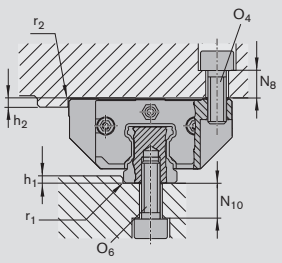
Ball runner blocks (flanged)
FKS, FKN

Ball runner blocks (slimline)
SKS, SKN

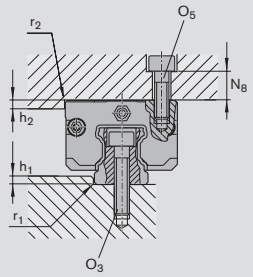
Ball guide rails
R1605, R1606, R1645
(for mounting from above)



Ball guide rails
R1607, R1647
(for mounting from below)



Ball guide rails
R1605, R1606, R1645
(for mounting from above)



Dimensions and recommended limits for side load if no additional lateral retention is provided

Size	Dimensions (mm)							Screw sizes				
								Ball runner block			Ball guide rail	
								O_1 ISO 4762	O_4 ISO 4762	O_5 ISO 4762	O_3 ISO 4762	O_6 ISO 4762
	$h_{1\,min}$	$h_{1\,max}$	h_2	N_8	N_{10}	$r_{1\,max}$	$r_{2\,max}$	2 pcs	2 pcs	2 pcs		
15	2.5	3.5	4	6	7.0	0.4	0.6	M4x12	M5x12	M4x12	M4x20	M5x12
20	2.5	4.0	5	9	9.5	0.6	0.6	M5x16	M6x16	M5x16	M5x25	M6x16
				10[1]	–							
25	3.0	5.0	5	10	12.0	0.8	0.8	M6x20	M8x20	M6x18	M6x30	M6x20
				11[1]	–							
30	3.0	5.0	6	10	9.0	0.8	0.8	M8x25	M10x20	M8x20	M8x30	M8x20
35	3.5	6.0	6	13	13.0	0.8	0.8	M8x25	M10x25	M8x25	M8x35	M8x25

Permissible side load
The recommended limits for permissible side loads without additional lateral retention indicate the approximate upper limits for screws in two strength classes. In other cases, the permissible side load must be calculated from the screw tension force. This can be up to about 15% less when using screws in strength class 10.9 instead of 12.9.

Screw strength class	Permissible side load without lateral retention[2]				
	Ball runner block			Ball guide rail	
	O_1	O_4	O_5	O_3	O_6
8.8	8% C	12% C	8% C	9% C	9% C
12.9	13% C	21% C	13% C	15% C	15% C

1) Ball runner block SKN
2) Calculated with stiction coefficient $\mu = 0.12$

Recommended tightening torques M_A of the fastening screws per VDI 2230
for $\mu_K = \mu_G = 0.125$

		M4	M5	M6	M8	M10
8.8	M_A max (Nm)	2.7	5.5	9.5	23	46
12.9		4.6	9.5	16.0	39	77

Locating pins

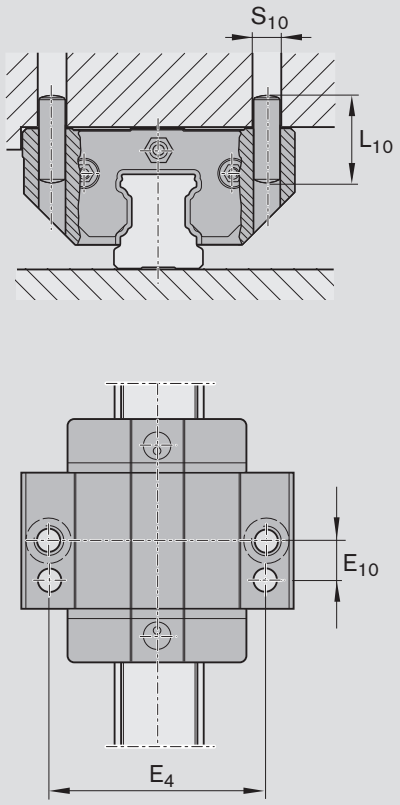
⚠ **If the recommended limits for permissible side loads are exceeded (see values for the individual runner block types), the runner block must be additionally fixed by means of locating pins**

Recommended dimensions for the pin holes are indicated in the drawings and table

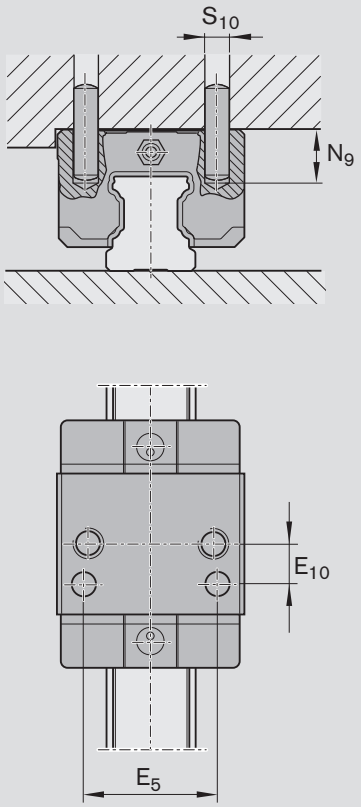
Possible pin types
- Taper pin (hardened) or
- Straight pin ISO 8734

Note
- Rough-drilled holes made for production reasons may exist at the recommended pin hole positions on the runner block centerline ($Ø < S_{10}$). These may be bored open to accommodate the locating pins. Observe dimensions E_4 and E_5!
- Only prepare the pin holes after the installation is complete.
- Send for the publication “Mounting Instructions for Ball Rail Systems.”

Ball runner block (flanged)
FKS, FKN



Ball runner block (slimline)
SKS, SKN

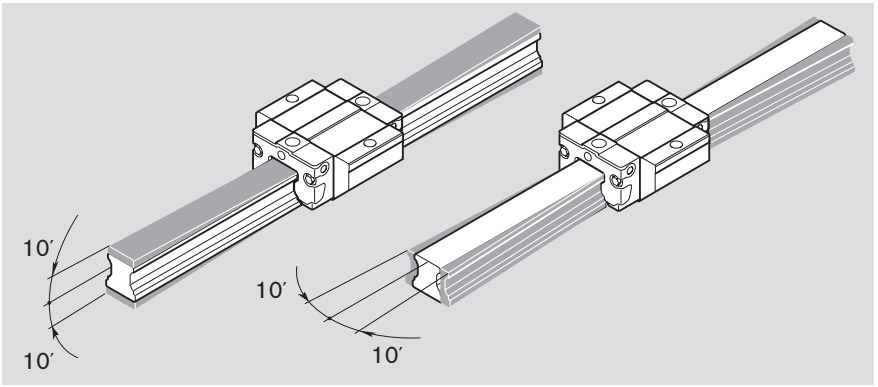


Size	Dimensions (mm)					
	E_4	E_5	E_{10}	L_{10} 1)	$N_{9\ max}$	S_{10} 1)
15	38	26	9	18	3.0	4
20	53	32	10	24	3.5	5
	49 2)				2.0 2)	
25	55	35	11	32	7.0	6
	60 2)				5.0 2)	
30	70	40	14	36	10.0	8
35	80	50	15	40	12.0	8

1) Taper pin (hardened) or straight pin (ISO 8734)
2) Ball Runner Block FKN and SKN

Permitted alignment error for Super Ball Runner Blocks

at the guide rail and at the runner block



Mounting Instructions, Ball Runner Blocks and Ball Guide Rails

Mounting

Reference edges, corner radii, screw sizes and tightening torques

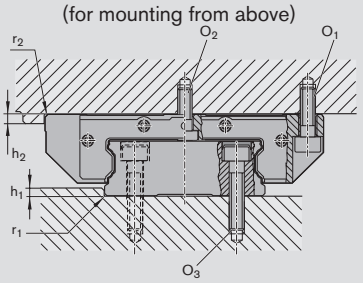
Note
The combinations shown here are examples. Basically, any ball runner block may be combined with any of the ball guide rail types offered.

⚠ **Always check the safety of the screws in the case of high lift-off loads!** ☞ 233

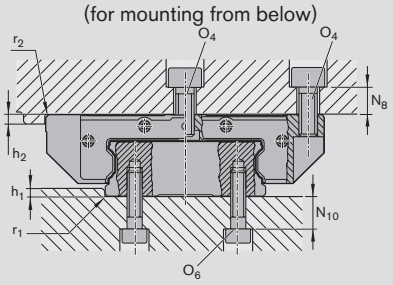
Guide rail with wide runner block

Ball runner blocks (flanged) BNS

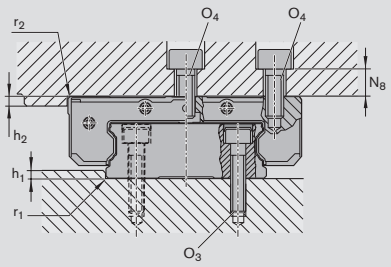
Ball guide rails
R1673, R1675, R1676
(for mounting from above)



Ball guide rails
R1677
(for mounting from below)



Ball runner blocks (compact) CNS
Ball guide rails R1673, R1675, R1676
(for mounting from above)



Dimensions and recommended limits for side load if no additional lateral retention is provided

Size	Dimensions (mm)								Screw sizes				
									Ball runner block			Ball guide rail	
									O_1 ISO 4762	O_2 [2] DIN 6912	O_4 [1] [2] ISO 4762	O_3 ISO 4762	O_6 ISO 4762
	$h_{1\,min}$	$h_{1\,max}$	h_2	N_8	N_8 [3]	N_{10}	$r_{1\,max}$	$r_{2\,max}$	4 pcs	2 pcs	6 pcs		
20/40	2.0	2.5	4	9.5	11	5.5	0.5	0.5	M5x16	M5x12	M6x16	M4x20	M5x12
25/70	3.0	4.5	5	10.0	13	9.0	0.8	0.8	M6x20	M6x16	M8x20	M6x30	M6x20
35/90	3.5	6.0	6	13.0	–	11.0	0.8	0.8	M8x25	M8x20	M10x25	M8x35	M8x25

Permissible side load
The recommended limits for permissible side loads without additional lateral retention indicate the approximate upper limits for screws in two strength classes. In other cases, the permissible side load must be calculated from the screw tension force. This can be up to about 15% less when using screws in strength class 10.9 instead of 12.9.

Screw strength class	Permissible side load without lateral retention [4]				
	Ball runner block			Ball guide rail	
	O_1	O_2 [5]	O_4	O_3	O_6
8.8	8% C	11% C [4]	16% C	8% C	8% C
12.9	13% C	16% C [4]	24% C	13% C	13% C

1) When mounting the runner block from above using only 4 O_4 screws: Permissible side load 1/3 lower, and lower rigidity
2) For runner block mounting with 6 screws: Tighten the centerline screws with the tightening torque M_A for strength class 8.8. **Centerline screws should always be used, otherwise the preload may be reduced.**
3) Ball runner blocks CNS
4) Calculated with stiction coefficient $\mu = 0.12$
5) When mounting with 2 O_2 screws and 4 O_1 screws

Recommended tightening torques M_A of the fastening screws per VDI 2230
for $\mu_K = \mu_G = 0.125$

		M4	M5	M6	M8	M10
8.8	M_A max (Nm)	2.7	5.5	9.5	23	46
12.9		4.6	9.5	16.0	39	77

Locating pins

⚠ **If the recommended limits for permissible side loads are exceeded (see values for the individual runner block types), the runner block must be additionally fixed by means of locating pins**

Recommended dimensions for the pin holes are indicated in the drawings and table

Possible pin types
- Taper pin (hardened) or
- Straight pin ISO 8734

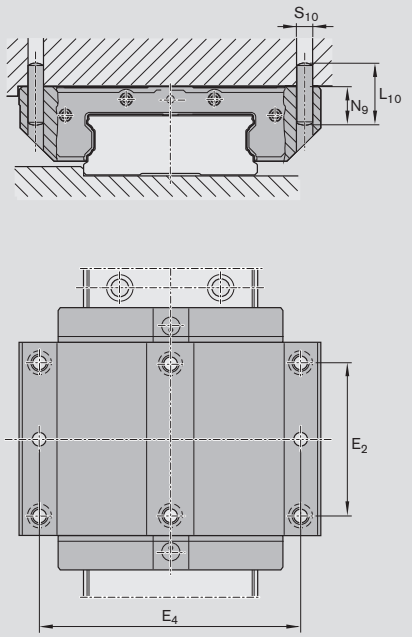
Note
- Rough-drilled holes made for production reasons may exist at the recommended pin hole positions on the runner block centerline ($Ø < S_{10}$). These may be bored open to accommodate the locating pins.

- If the locating pins have to be driven in at another point (e.g. when the lube port is central), dimension E_2 must not be exceeded in the longitudinal direction (for dimension E_2, see the tables for the individual runner block types).
  Observe dimensions E_4 and E_5!

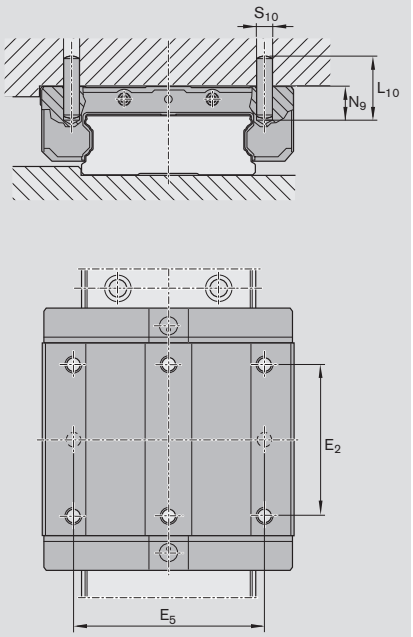
- Only prepare the pin holes after the installation is complete.

- Send for the publication “Mounting Instructions for Ball Rail Systems.”

Ball runner block (flanged)
BNS



Ball runner block (compact)
CNS



Size	Dimensions (mm)				
	E_4	E_5	L_{10} 1)	$N_{9\ max}$	S_{10} 1)
20/40	70	46	24	7	5
25/70	107	76	32	8	6
35/90	144	–	32	8	8

1) Taper pin (hardened) or straight pin (ISO 8734)

Mounting Instructions, Ball Runner Blocks and Ball Guide Rails

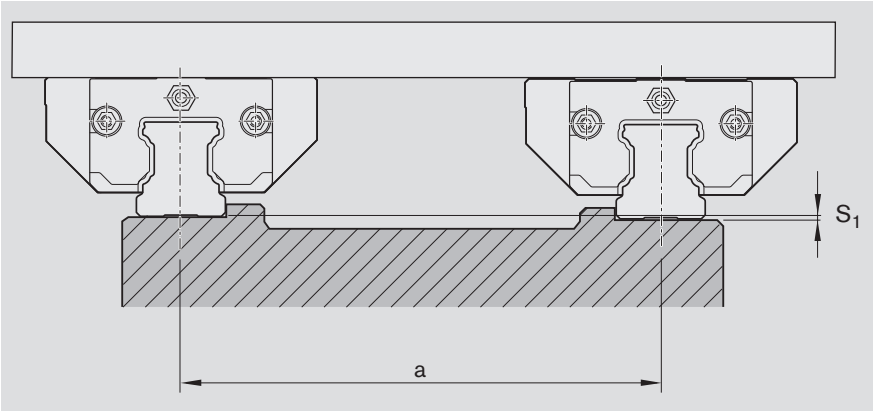
Installation Tolerances

Vertical offset

The vertical offset values S_1 and S_2 apply to all ball runner blocks of the standard range.

Provided the vertical offset is kept within the stated tolerances for S_1 and S_2, its influence on the service life can generally be neglected.

Permissible vertical offset in the transverse direction S_1



The tolerance for dimension H ("Accuracy classes and their tolerances" ☞ 26) must be ducted from the permissible vertical offset S_1.
If $S_1 < 0$, select other tolerances when combining accuracy classes ☞ 27.

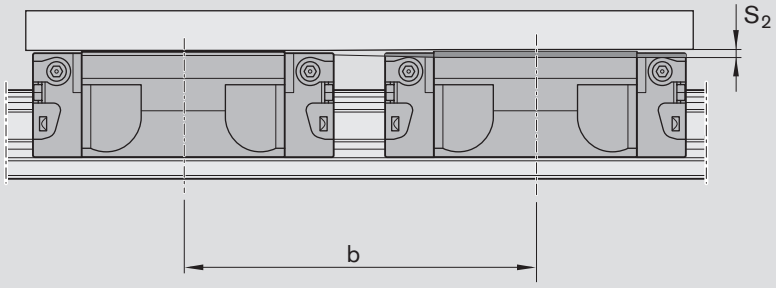
$$S_1 = a \cdot Y$$

S_1	=	permissible vertical offset of the guide rails	(mm)
a	=	distance between guide rails	(mm)
Y	=	calculation factor, transverse direction	(–)

Ball runner blocks	Calculation factor Y for preload class			
	C0	C1	C2	C3
Steel Ball Runner Blocks	$4.3 \cdot 10^{-4}$	$2.8 \cdot 10^{-4}$	$1.7 \cdot 10^{-4}$	$1.2 \cdot 10^{-4}$
Steel Ball Runner Blocks, short	$5.2 \cdot 10^{-4}$	$3.4 \cdot 10^{-4}$	–	–
Super Ball Runner Blocks	$8.0 \cdot 10^{-4}$	$6.0 \cdot 10^{-4}$	–	–
Aluminum Ball Runner Blocks	$7.0 \cdot 10^{-4}$	$5.0 \cdot 10^{-4}$	–	–

Preload classes
C0 = without preload
C1 = preload 2% C
C2 = preload 8% C
C3 = preload 13% C

Permissible vertical offset in the longitudinal direction S_2



The tolerance “max. difference of dimension H on the same rail” (“Accuracy classes and their tolerances” ☞ 26) must be deducted from the permissible vertical offset S_2 of the ball runner blocks.
If $S_2 < 0$, select other tolerances when combining accuracy classes ☞ 27.

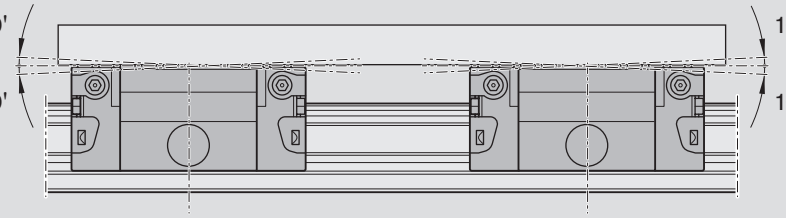
$$S_2 = b \cdot X$$

S_2	=	permissible vertical offset of the runner blocks	(mm)
b	=	distance between runner blocks	(mm)
X	=	calculation factor, longitudinal direction	(–)

Ball runner blocks	Calculation factor X for preload class		
	Short	Normal	Long
Steel Ball Runner Blocks	$6.0 \cdot 10^{-5}$	$4.3 \cdot 10^{-5}$	$3.0 \cdot 10^{-5}$
Aluminum Ball Runner Blocks	–	$6.0 \cdot 10^{-5}$	–

Permissible deviation from straightness in the longitudinal direction with two consecutive Super Ball Runner Blocks

The runner blocks can automatically compensate for longitudinal offsets of up to 10'.



Mounting Instructions, Ball Runner Blocks and Ball Guide Rails

Installation Tolerances

Parallelism of the rails after mounting

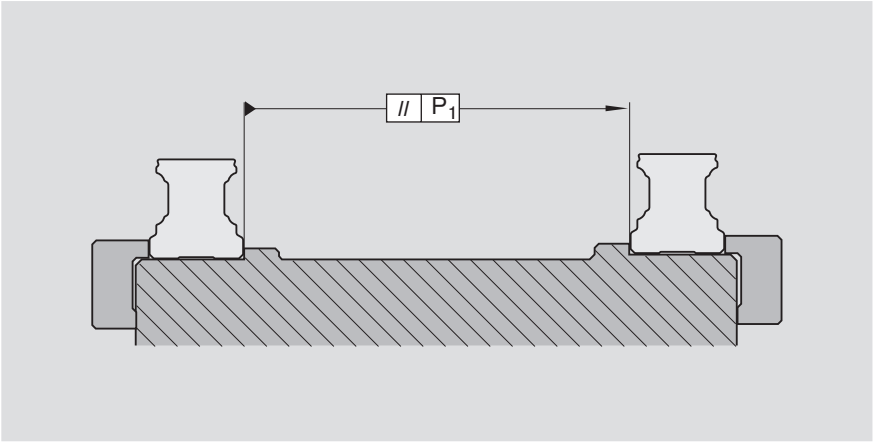
measured at the guide rails and at the runner blocks

The values for parallelism offset P_1 apply to all ball runner blocks of the standard range.

The parallelism offset P_1 causes a slight increase in preload on one side of the assembly.

Provided the parallelism offset P_1 is kept within the stated tolerances, its influence on the service life can generally be neglected.

Permissible parallelism offset P_1



Ball runner blocks	Size	Parallelism offset P_1 (mm) for preload class			
		C0	C1	C2	C3
Steel Ball Runner Blocks for precision installations [1]	**15**	0.015	0.009	0.005	0.004
	20	0.018	0.011	0.006	0.004
	25	0.019	0.012	0.007	0.005
	30	0.021	0.014	0.009	0.006
	35	0.023	0.015	0.010	0.007
	45	0.028	0.019	0.012	0.009
	55	0.035	0.025	0.016	0.011
	65	0.048	0.035	0.022	0.016
Steel Ball Runner Blocks, short	**15**	0.018	0.011	–	–
	20	0.022	0.013	–	–
	25	0.023	0.014	–	–
	30	0.025	0.017	–	–
	35	0.028	0.018	–	–
Super Ball Runner Blocks	**15**	0.025	0.017	–	–
	20	0.029	0.021	–	–
	25	0.032	0.023	–	–
	30	0.035	0.026	–	–
	35	0.040	0.030	–	–
Aluminum Ball Runner Blocks	**15**	0.021	0.014	–	–
	25	0.026	0.017	–	–
	30	0.029	0.019	–	–
	35	0.035	0.022	–	–

1) In precision installations the adjoining structures are rigid and highly accurate. In standard installations the adjoining structures are compliant, allowing parallelism offset tolerances up to **twice** those for precision installations.

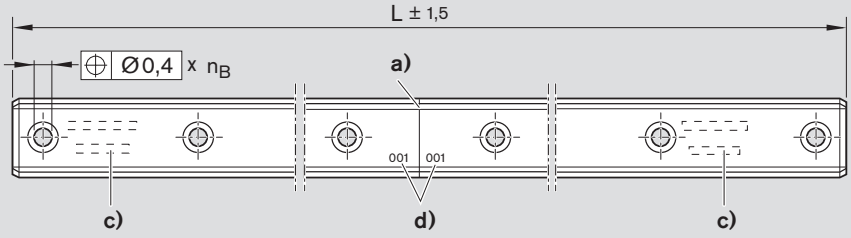
Preload classes
C0 = without preload
C1 = preload 2% C
C2 = preload 8% C
C3 = preload 13% C

Composite Ball Guide Rails

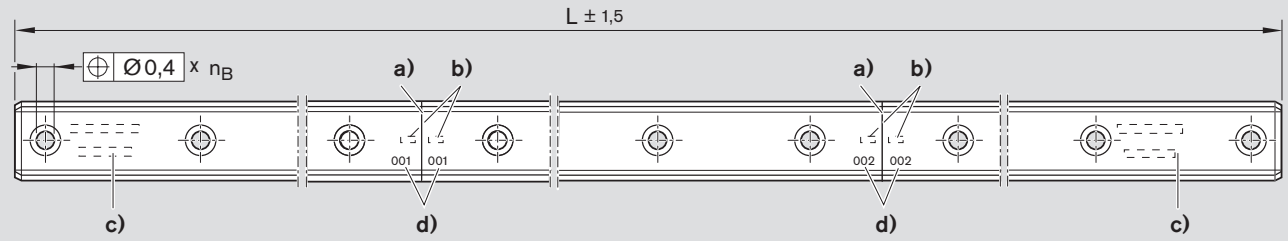
Notes on guide rails

- Matching sections of a composite guide rail are identified as such by a label on the packaging.
- All sections of the same rail have the same serial rail number.
- The numbering is marked on the top of the guide rail.

Guide rail made up of two sections



Guide rail made up of three or more sections



L = rail length (mm)
n_B = number of holes (–)

a) Joint
b) Serial rail number
c) Full rail identification code on first and last sections
d) Joint number

Note on cover strip

- For composite rails, a one-piece cover strip to cover the total length L is supplied separately.
- Secure the cover strip!

Lubrication and Maintenance

Notes on Lubrication

⚠ **When using progressive feeder systems with grease lubricants, do not go below the minimum dosing quantity for relubrication as given in Table 9 ☞ 251.**

⚠ **We recommend applying initial lubrication with a manual grease gun before connecting the equipment to the centralized lubrication system.**
When using a centralized lubrication system, it is essential that all lines and components in the circuit leading to the consumer (runner block) should be completely filled with lubricant and without any entrapped air bubbles. The pulse count can be calculated from the partial quantities and the piston distributor size.
- **For liquid grease, as per table 9 ☞ 251**
- **For oil lubrication, as per table 14 ☞ 255**

⚠ **If other lubricants than those specified are used, this may lead to a reduction in the relubrication intervals, the achievable travel in short-stroke applications, and the load capacities. Possible chemical interactions between the plastic materials, lubricants and preservative oils must also be taken into account. In addition, the suitability of the lubricant for use in single-line centralized lubrication systems must be ensured.**

⚠ **Lubricant reservoirs, with or without pumps, must be equipped with stirrers to ensure that the lubricant will be replenished smoothly (avoidance of funneling effects in the reservoir).**

⚠ **Do not use greases containing solid particles (e.g., graphite or MoS_2)!**

⚠ **If initial lubrication is performed by the manufacturer, this may be done using grease or oil.**
For subsequent relubrication, it is not possible to switch from grease to oil.

⚠ **If the system is to be exposed to metalworking fluids, always apply 2 to 5 lubricant pulses at the beginning or when the system has been at a standstill for a longer period.**
When the system is in operation, 3 to 4 pulses per hour are recommended, irrespective of the distance traveled.
If possible, apply lubricant while the system is in motion. Perform cleaning cycles.
(“Maintenance” ☞ 260)

⚠ **If the application conditions involve dirt, vibrations, impacts, etc. we recommend shortening the relubrication intervals accordingly. Even under normal operating conditions, the system must be relubricated at the latest after 2 years due to aging of the grease.**

If your application involves more demanding environmental requirements (such as clean room, vacuum, food industry applications, increased exposure to fluids or aggressive media, extreme temperatures), please consult us. Each application must be considered on its own merits in order to chose the most appropriate lubricant. Be sure to have all the information concerning your application at hand when contacting us.

Rexroth recommends using piston distributors from Vogel. These should be installed as close as possible to the lube ports of the runner blocks. Long lines and small line diameters should be avoided, and the lines should be laid on an upward slant.

A selection of possible lube fittings is given in the section “Accessories, Ball Runner Blocks” ☞ 170 (for more information, you should also consult the manufacturer of your lubrication system).

If other consumers are connected to the single-line centralized lubrication system, the weakest link in the chain will determine the lubrication cycle time.

The product specifications and safety data sheet for Dynalub can be found at www.boschrexroth.de/brl

Lubrication

Lubrication using a grease gun or a progressive feeder system

Grease type

We recommend using **Dynalub 510** with the following properties:

- High performance lithium soap grease, consistency class NLGI 2 as per DIN 51818 (KP2K-20 per DIN 51825)
- Good water resistance
- Corrosion protection
- Temperature range: –20 to +80 °C

Under conventional environmental conditions this ground-fiber, homogeneous grease is ideally suited for the lubrication of linear elements:

- At loads of up to 50% C
- For short-stroke applications > 1 mm
- For the permissible speed range of Ball Rail Systems

The product specifications and safety data sheet for Dynalub can be found at www.boschrexroth.de/brl

⚠ **Refer to the Notes on Lubrication!** ☞ 244

Part numbers for Dynalub 510:

- R3416 037 00 (cartridge 400 g)
- R3416 035 00 (hobbock 25 kg)

⚠ **Ball runner blocks must never be put into operation without initial lubrication.**

If they are pre-lubricated before shipment, no initial lubrication by the user is required.

Rexroth Ball Rail Systems are coated with anti-corrosion oil prior to shipment.

Initial lubrication of the runner blocks (basic lubrication)

Stroke ≥ 2 · runner block length B_1 (normal stroke)

- Install and lubricate one lube fitting per runner block, at **either** of the two end caps!

Initial lubrication is applied in three partial quantities as specified in Table 1:

1. Grease the runner block with the first partial quantity as per Table 1, pressing it in slowly with the help of a grease gun.
2. Slide runner block back and forth over 3 · runner block length B_1 for three full cycles.
3. Repeat steps 1. and 2. two more times.
4. Make sure there is a visible film of grease on the guide rail.

Size	Initial lubrication (normal stroke)				
	Part number (not pre-lubricated)		Part number (pre-lubricated)		
	R16.. ... 10 R16.. ... 11 R16.. ... 60	R20.. ... 04/0Z R20.. ... 05 R20.. ... 06/0Y R20.. ... 07	R16.. ... 20/2Z R16.. ... 21 R16.. ... 22/2Y R16.. ... 23	R20.. ... 30/3Z R20.. ... 31 R20.. ... 32/3Y R20.. ... 33 R20.. ... 90	R16.. ... 70/7Z R16.. ... 71 R16.. ... 72/7Y R16.. ... 73
	Partial quantity (cm^3)				
15	0.4 (3x)		Pre-lubricated with Dynalub 510 before shipment		
20	0.7 (3x)				
25	1.4 (3x)				
30	2.2 (3x)				
35	2.2 (3x)				
45	4.7 (3x)				
55	9.4 (3x)		–		
65	15.4 (3x)				
20/40	1.0 (3x)		Pre-lubricated with Dynalub 510 before shipment		
25/70	1.4 (3x)				
35/90	2.7 (3x)		–		

Table 1

Stroke < 2 · runner block length B_1 (short stroke)

- Install and lubricate two lube fittings per runner block, one on **each** of the two end caps!

Initial lubrication is applied to each fitting in three partial quantities as specified in Table 2:

1. Grease each fitting on the runner block with the first partial quantity as per Table 2, pressing it in slowly with the help of a grease gun.
2. Slide runner block back and forth over 3 · runner block length B_1 for three full cycles.
3. Repeat steps 1. and 2. two more times.
4. Make sure there is a visible film of grease on the guide rail.

Size	Initial lubrication (short stroke)					
	Part number (not pre-lubricated)		Part number (pre-lubricated)			
	R16.. ... 10 R16.. ... 11 R16.. ... 60	R20.. ... 04/0Z R20.. ... 05 R20.. ... 06/0Y R20.. ... 07	R16.. ... 20/2Z R16.. ... 21 R16.. ... 22/2Y R16.. ... 23	R20.. ... 30/3Z R20.. ... 31 R20.. ... 32/3Y R20.. ... 33 R20.. ... 90	R16.. ... 70/7Z R16.. ... 71 R16.. ... 72/7Y R16.. ... 73	
	Partial quantity per port (cm^3)					
	left	right				
15	0.4 (3x)	0.4 (3x)	Pre-lubricated with Dynalub 510 before shipment			
20	0.7 (3x)	0.7 (3x)				
25	1.4 (3x)	1.4 (3x)				
30	2.2 (3x)	2.2 (3x)				
35	2.2 (3x)	2.2 (3x)				
45	4.7 (3x)	4.7 (3x)				
55	9.4 (3x)	9.4 (3x)	–			
65	15.4 (3x)	15.4 (3x)				
20/40	1.0 (3x)	1.0 (3x)	Pre-lubricated with Dynalub 510 before shipment			
25/70	1.4 (3x)	1.4 (3x)				
35/90	2.7 (3x)	2.7 (3x)	–			

Table 2

Lubrication and Maintenance

Lubrication

Lubrication using a grease gun or a progressive feeder system (continued)

Relubrication of runner blocks

Stroke ≥ 2 · runner block length B_1 (normal stroke)

- When the relubrication interval according to Graph 1 or 2 ☞ 247 has been reached, add the relubrication quantity according to Table 3.

⚠ **Refer to the Notes on Lubrication!** ☞ 244

Size	Relubrication (normal stroke)				
	Part number		Part number		
	R16.. ... 10 R16.. ... 11 R16.. ... 60	R20.. ... 04/0Z R20.. ... 05 R20.. ... 06/0Y R20.. ... 07	R16.. ... 20/2Z R16.. ... 21 R16.. ... 22/2Y R16.. ... 23	R20.. ... 30/3Z R20.. ... 31 R20.. ... 32/3Y R20.. ... 33 R20.. ... 90	R16.. ... 70/7Z R16.. ... 71 R16.. ... 72/7Y R16.. ... 73
	Partial quantity (cm^3)		Partial quantity (cm^3)		
15	0.4 (1x)		0.4 (2x)		
20	0.7 (1x)		0.7 (2x)		
25	1.4 (1x)		1.4 (2x)		
30	2.2 (1x)		2.2 (2x)		
35	2.2 (1x)		2.2 (2x)		
45	4.7 (1x)		4.7 (2x)		
55	9.4 (1x)		–		
65	15.4 (1x)				
20/40	1.0 (1x)		1.0 (2x)		
25/70	1.4 (1x)		1.4 (2x)		
35/90	2.7 (1x)		–		

Table 3

Stroke < 2 · runner block length B_1 (short stroke)

- When the relubrication interval according to Graph 1 or 2 ☞ 247 has been reached, add the relubrication quantity **per** lube port according to Table 4.
- At each lubrication cycle the runner block should be traversed back and forth through a lubricating stroke of 3 · runner block length B_1. In any case, the lubricating stroke must never be shorter than the runner block length B_1.

⚠ **Refer to the Notes on Lubrication!** ☞ 244

Size	Relubrication (short stroke)					
	Part number			Part number		
	R16.. ... 10 R16.. ... 11 R16.. ... 60	R20.. ... 04/0Z R20.. ... 05 R20.. ... 06/0Y R20.. ... 07		R16.. ... 20/2Z R16.. ... 21 R16.. ... 22/2Y R16.. ... 23	R20.. ... 30/3Z R20.. ... 31 R20.. ... 32/3Y R20.. ... 33 R20.. ... 90	R16.. ... 70/7Z R16.. ... 71 R16.. ... 72/7Y R16.. ... 73
	Partial quantity per port (cm^3)			Partial quantity per port (cm^3)		
	left	right		left	right	
15	0.4 (1x)	0.4 (1x)		0.4 (2x)	0.4 (2x)	
20	0.7 (1x)	0.7 (1x)		0.7 (2x)	0.7 (2x)	
25	1.4 (1x)	1.4 (1x)		1.4 (2x)	1.4 (2x)	
30	2.2 (1x)	2.2 (1x)		2.2 (2x)	2.2 (2x)	
35	2.2 (1x)	2.2 (1x)		2.2 (2x)	2.2 (2x)	
45	4.7 (1x)	4.7 (1x)		4.7 (2x)	4.7 (2x)	
55	9.4 (1x)	9.4 (1x)		–		
65	15.4 (1x)	15.4 (1x)				
20/40	1.0 (1x)	1.0 (1x)		1.0 (2x)	1.0 (2x)	
25/70	1.4 (1x)	1.4 (1x)		1.4 (2x)	1.4 (2x)	
35/90	2.7 (1x)	2.7 (1x)		–		

Table 4

Load-dependent relubrication intervals for grease lubrication using grease guns or progressive feeder systems (“dry axes”)

The following conditions apply:
- Grease lubricant Dynalub 510
  or alternatively
  Castrol Longtime PD 2
- No exposure to metalworking fluids
- Standard seals
- Ambient temperature:
  T = 20 - 30 °C

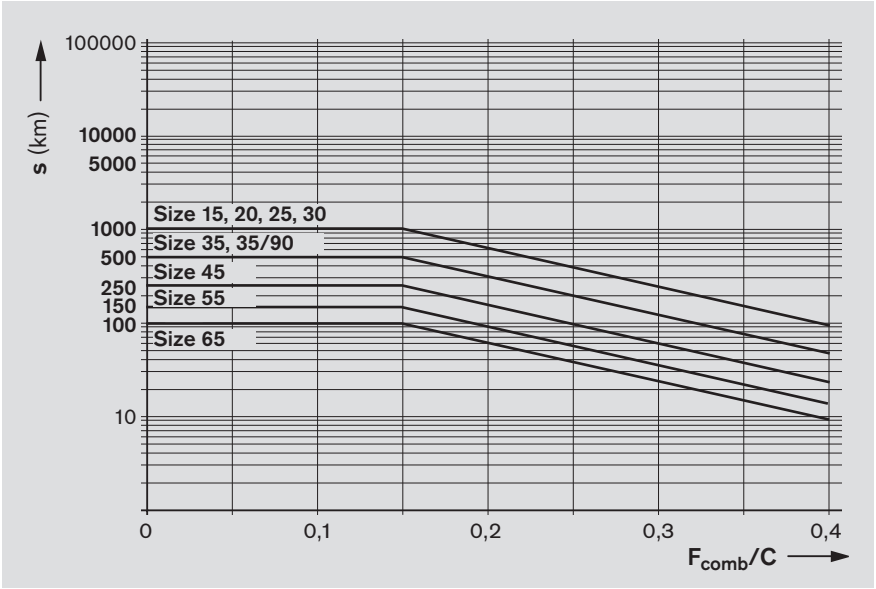
Key to graphs

C	=	dynamic load capacity	(N)
F_{comb}	=	combined equivalent dynamic load on bearing	(N)
F_{comb}/C	=	load ratio	(–)
s	=	relubrication interval expressed as travel	(km)

Definition of F_{comb}/C
The load ratio F_{comb}/C is the quotient of the equivalent dynamic load on the bearing at the combined load on the bearing F_{comb} (taking account of the internal preload force F_{pr}) divided by the dynamic load capacity C ☞ 8 – 9.

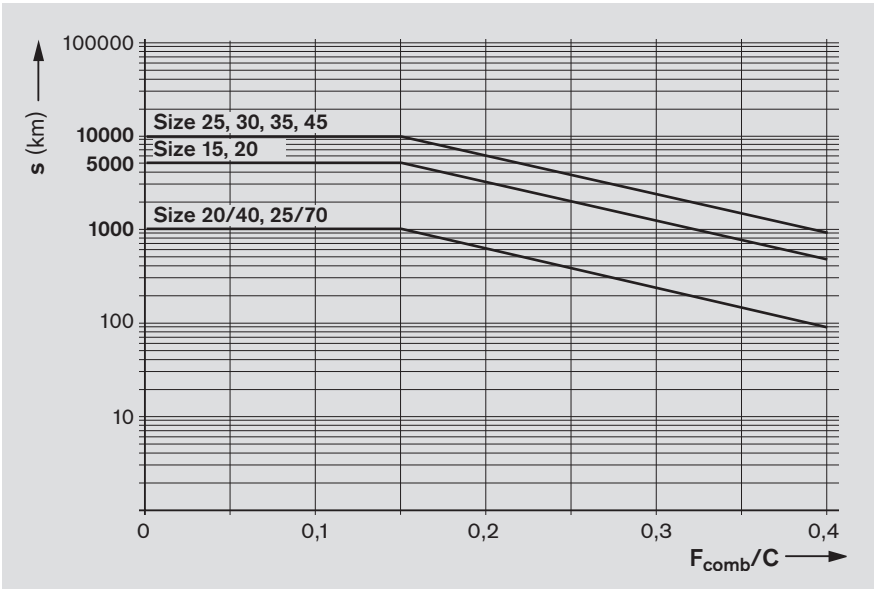
Please consult us regarding the relubrication intervals in the following cases:
- exposure to metalworking fluids
- use of double-lipped seals (DS)
- use of standard seals (SS) in combination with end seals or FKM seals or seal kits

⚠ **Refer to the Notes on Lubrication!** ☞ 244



Graph 1

Part number		
R16.. ... 10	R16.. ... 11	R16.. ... 60



Graph 2

Part number				
R20.. ... 04	R16.. ... 20	R20.. ... 30	R16.. ... 70	R20.. ... 90
R20.. ... 05	R16.. ... 21	R20.. ... 31	R16.. ... 71	
R20.. ... 06	R16.. ... 22	R20.. ... 32	R16.. ... 72	
R20.. ... 07	R16.. ... 23	R20.. ... 33	R16.. ... 73	

Lubrication and Maintenance

Lubrication

Liquid grease lubrication via single-line piston distributor systems

Liquid grease

We recommend using **Dynalub 520** with the following properties:
- High performance lithium soap grease, consistency class NLGI 00 as per DIN 51818 (GP00K-20 per DIN 51826)
- Good water resistance
- Corrosion protection
- Temperature range: –20 to +80 °C

Under conventional environmental conditions this ground-fiber, homogeneous grease is ideally suited for the lubrication of linear elements:
- In single-line centralized lubrication systems
- At loads of up to 50% C
- For short-stroke applications > 1 mm
- For the permissible speed range of Ball Rail Systems
- For miniature versions

The product specifications and safety data sheet for Dynalub can be found at www.boschrexroth.de/brl

⚠ **Refer to the Notes on Lubrication!** ☞ 244

Part numbers for Dynalub 520:
- R3416 043 00 (cartridge 400 g)
- R3416 042 00 (bucket 5 kg)

⚠ **Ball runner blocks must never be put into operation without initial lubrication.**

If they are pre-lubricated before shipment, no initial lubrication by the user is required.

Rexroth Ball Rail Systems are coated with anti-corrosion oil prior to shipment.

Initial lubrication of the runner blocks (basic lubrication)

Stroke ≥ 2 · runner block length B_1 (normal stroke)
- Install and lubricate one lube fitting per runner block, at **either** of the two end caps!

Initial lubrication is applied in three partial quantities as specified in Table 5:
1. Grease the runner block with the first partial quantity as per Table 5, pressing it in slowly with the help of a grease gun.
2. Slide runner block back and forth over 3 · runner block length B_1 for three full cycles.
3. Repeat steps 1. and 2. two more times.
4. Make sure there is a visible film of grease on the guide rail.

Size	Initial lubrication (normal stroke)				
	Part number (not pre-lubricated)		Part number (pre-lubricated)		
	R16.. ... 10 R16.. ... 11 R16.. ... 60	R20.. ... 04/0Z R20.. ... 05 R20.. ... 06/0Y R20.. ... 07	R16.. ... 20/2Z R16.. ... 21 R16.. ... 22/2Y R16.. ... 23	R20.. ... 30/3Z R20.. ... 31 R20.. ... 32/3Y R20.. ... 33 R20.. ... 90	R16.. ... 70/7Z R16.. ... 71 R16.. ... 72/7Y R16.. ... 73
	Partial quantity (cm^3)				
15	0.4 (3x)		Pre-lubricated with Dynalub 510 before shipment		
20	0.7 (3x)				
25	1.4 (3x)				
30	2.2 (3x)				
35	2.2 (3x)				
45	4.7 (3x)				
55	9.4 (3x)		–		
65	15.4 (3x)				
20/40	1.0 (3x)		Pre-lubricated with Dynalub 510 before shipment		
25/70	1.4 (3x)				
35/90	2.7 (3x)		–		

Table 5

Stroke < 2 · runner block length B_1 (short stroke)
- Install and lubricate two lube fittings per runner block, one on **each** of the two end caps!

Initial lubrication is applied to each fitting in three partial quantities as specified in Table 6:
1. Grease each fitting on the runner block with the first partial quantity as per Table 6, pressing it in slowly with the help of a grease gun.
2. Slide runner block back and forth over 3 · runner block length B_1 for three full cycles.
3. Repeat steps 1. and 2. two more times.
4. Make sure there is a visible film of grease on the guide rail.

Size	Initial lubrication (short stroke)					
	Part number (not pre-lubricated)		Part number (pre-lubricated)			
	R16.. ... 10 R16.. ... 11 R16.. ... 60	R20.. ... 04/0Z R20.. ... 05 R20.. ... 06/0Y R20.. ... 07	R16.. ... 20/2Z R16.. ... 21 R16.. ... 22/2Y R16.. ... 23	R20.. ... 30/3Z R20.. ... 31 R20.. ... 32/3Y R20.. ... 33 R20.. ... 90	R16.. ... 70/7Z R16.. ... 71 R16.. ... 72/7Y R16.. ... 73	
	Partial quantity per port (cm^3)					
	left	right				
15	0.4 (3x)	0.4 (3x)	Pre-lubricated with Dynalub 510 before shipment			
20	0.7 (3x)	0.7 (3x)				
25	1.4 (3x)	1.4 (3x)				
30	2.2 (3x)	2.2 (3x)				
35	2.2 (3x)	2.2 (3x)				
45	4.7 (3x)	4.7 (3x)				
55	9.4 (3x)	9.4 (3x)	–			
65	15.4 (3x)	15.4 (3x)				
20/40	1.0 (3x)	1.0 (3x)	Pre-lubricated with Dynalub 510 before shipment			
25/70	1.4 (3x)	1.4 (3x)				
35/90	2.7 (3x)	2.7 (3x)	–			

Table 6

Relubrication of runner blocks

Stroke ≥ 2 · runner block length B_1 (normal stroke)

- When the relubrication interval according to Graph 3 or 4 ☞ 250 has been reached, add the relubrication quantity according to Table 7.

Note

The required pulse count is the quotient (as a whole number) of the minimum relubrication quantity according to Table 7 and the smallest permissible piston distributor size (i.e. the minimum pulse quantity) according to Table 9 ☞ 251. The smallest permissible piston distributor size also depends on the mounting orientation.

The lubricant cycle time can then be obtained by dividing the relubrication interval ☞ 250 by the calculated pulse count (see design example ☞ 256).

⚠ **Refer to the Notes on Lubrication!** ☞ 244

Size	Relubrication (normal stroke)				
	Part number		Part number		
	R16.. ... 10 R16.. ... 11 R16.. ... 60	R20.. ... 04/0Z R20.. ... 05 R20.. ... 06/0Y R20.. ... 07	R16.. ... 20/2Z R16.. ... 21 R16.. ... 22/2Y R16.. ... 23	R20.. ... 30/3Z R20.. ... 31 R20.. ... 32/3Y R20.. ... 33 R20.. ... 90	R16.. ... 70/7Z R16.. ... 71 R16.. ... 72/7Y R16.. ... 73
	Partial quantity (cm^3)		Partial quantity (cm^3)		
15	0.4 (1x)		0.4 (2x)		
20	0.7 (1x)		0.7 (2x)		
25	1.4 (1x)		1.4 (2x)		
30	2.2 (1x)		2.2 (2x)		
35	2.2 (1x)		2.2 (2x)		
45	4.7 (1x)		4.7 (2x)		
55	9.4 (1x)		–		
65	15.4 (1x)				
20/40	1.0 (1x)		1.0 (2x)		
25/70	1.4 (1x)		1.4 (2x)		
35/90	2.7 (1x)		–		

Table 7

Stroke < 2 · runner block length B_1 (short stroke)

- When the relubrication interval according to Graph 3 or 4 ☞ 250 has been reached, add the relubrication quantity **per** lube port according to Table 8.

– Calculate the required pulse count and lubricant cycle time in the same way as for relubrication (normal stroke).

- At each lubrication cycle the runner block should be traversed back and forth through a lubricating stroke of 3 · runner block length B_1. In any case, the lubricating stroke must never be shorter than the runner block length B_1.

⚠ **Refer to the Notes on Lubrication!** ☞ 244

Size	Relubrication (short stroke)				
	Part number		Part number		
	R16.. ... 10 R16.. ... 11 R16.. ... 60	R20.. ... 04/0Z R20.. ... 05 R20.. ... 06/0Y R20.. ... 07	R16.. ... 20/2Z R16.. ... 21 R16.. ... 22/2Y R16.. ... 23	R20.. ... 30/3Z R20.. ... 31 R20.. ... 32/3Y R20.. ... 33 R20.. ... 90	R16.. ... 70/7Z R16.. ... 71 R16.. ... 72/7Y R16.. ... 73
	Partial quantity per port (cm^3)		Partial quantity per port (cm^3)		
	left	right	left	right	
15	0.4 (1x)	0.4 (1x)	0.4 (2x)	0.4 (2x)	
20	0.7 (1x)	0.7 (1x)	0.7 (2x)	0.7 (2x)	
25	1.4 (1x)	1.4 (1x)	1.4 (2x)	1.4 (2x)	
30	2.2 (1x)	2.2 (1x)	2.2 (2x)	2.2 (2x)	
35	2.2 (1x)	2.2 (1x)	2.2 (2x)	2.2 (2x)	
45	4.7 (1x)	4.7 (1x)	4.7 (2x)	4.7 (2x)	
55	9.4 (1x)	9.4 (1x)	–		
65	15.4 (1x)	15.4 (1x)			
20/40	1.0 (1x)	1.0 (1x)	1.0 (2x)	1.0 (2x)	
25/70	1.4 (1x)	1.4 (1x)	1.4 (2x)	1.4 (2x)	
35/90	2.7 (1x)	2.7 (1x)	–		

Table 8

Lubrication and Maintenance

Lubrication

Liquid grease lubrication via single-line piston distributor systems (continued)

Load-dependent relubrication intervals for liquid grease lubrication via single-line piston distributor systems (“dry axes”)

The following conditions apply:
- Liquid grease Dynalub 520
  or alternatively
  Castrol Longtime PD 00
- No exposure to metalworking fluids
- Standard seals
- Ambient temperature:
  T = 20 - 30 °C

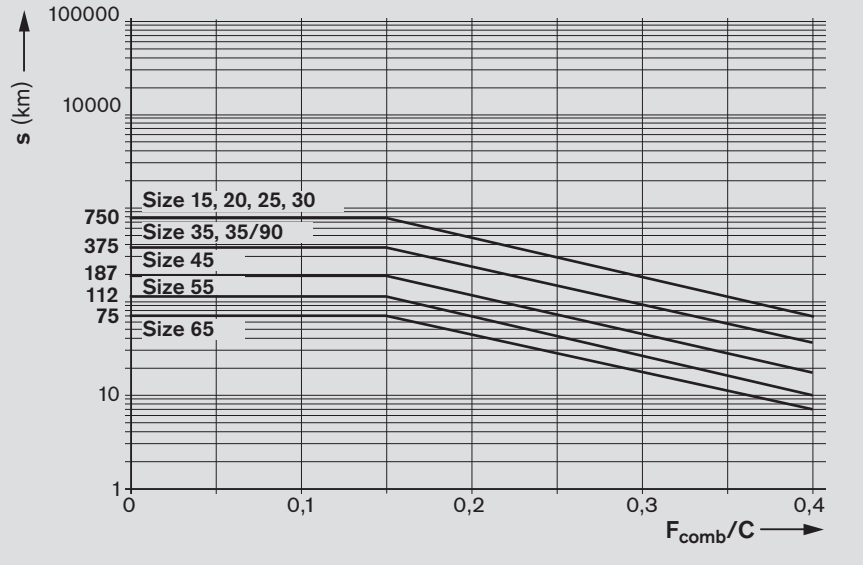
Key to graphs

C	=	dynamic load capacity	(N)
F_{comb}	=	combined equivalent dynamic load on bearing	(N)
F_{comb}/C	=	load ratio	(–)
s	=	relubrication interval expressed as travel	(km)

Definition of F_{comb}/C
The load ratio F_{comb}/C is the quotient of the equivalent dynamic load on the bearing at the combined load on the bearing F_{comb} (taking account of the internal preload force F_{pr}) divided by the dynamic load capacity C ☞ 8 - 9.

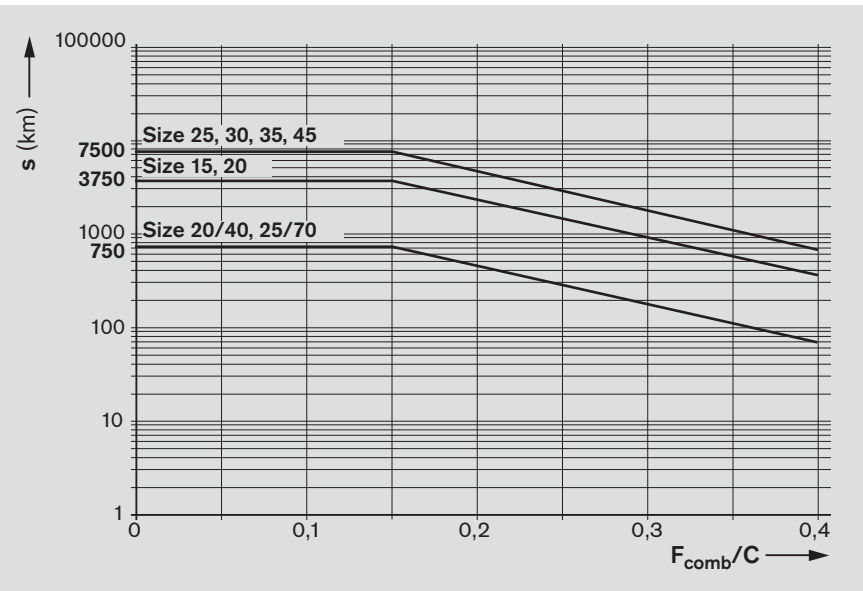
Please consult us regarding the relubrication intervals in the following cases:
- exposure to metalworking fluids
- use of double-lipped seals (DS)
- use of standard seals (SS) in combination with end seals or FKM seals or seal kits

⚠ **Refer to the Notes on Lubrication!** ☞ 244



Graph 3

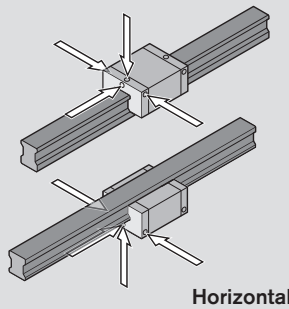
Part number		
R16.. ... 10	R16.. ... 11	R16.. ... 60



Graph 4

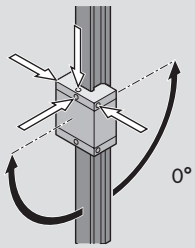
Part number				
R20.. ... 04	R16.. ... 20	R20.. ... 30	R16.. ... 70	R20.. ... 90
R20.. ... 05	R16.. ... 21	R20.. ... 31	R16.. ... 71	
R20.. ... 06	R16.. ... 22	R20.. ... 32	R16.. ... 72	
R20.. ... 07	R16.. ... 23	R20.. ... 33	R16.. ... 73	

Mounting orientation I – normal stroke
Horizontal
1 lube port at **either** of the two end caps



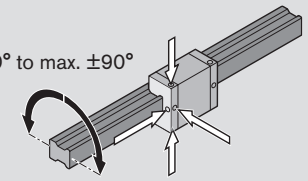
Horizontal, top-down
Same port

Mounting orientation II – normal stroke
Vertical to inclined horizontal
1 lube port at top end cap



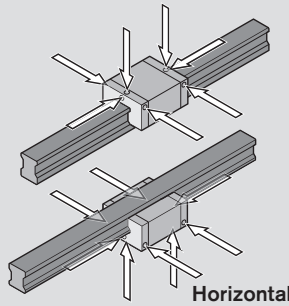
Vertical to inclined horizontal, top-down
Same port

Mounting orientation III – normal stroke
Wall mounting
1 lube port at **either** of the two end caps



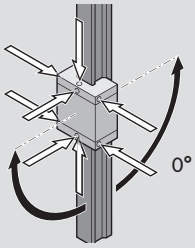
Same port

Mounting orientation IV – short stroke
Horizontal
2 lube ports, one on **each** of the two end caps



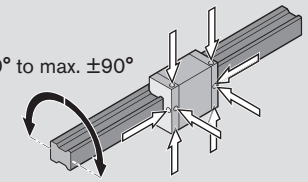
Horizontal, top-down
Same ports

Mounting orientation V – short stroke
Vertical to inclined horizontal
2 lube ports, one on **each** of the two end caps (top and bottom)



Vertical to inclined horizontal, top-down
Same ports

Mounting orientation VI – short stroke
Wall mounting
2 lube ports, one on **each** of the two end caps



Same ports

Smallest permissible piston distributor sizes for liquid grease lubrication through single-line centralized systems[1)]

Ball runner blocks					Smallest permissible piston distributor size (≙ minimum pulse quantity) per lube port (cm^3) for liquid grease, NLGI class 00										
Part number				Mounting orientations	Size 15	20	25	30	35	45	55	65	20/40	25/70	35/90
R16.. ... 10				Horizontal I, IV											
R16.. ... 11				Vertical II, V	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
R16.. ... 60				Wall mount. III, VI											
R20.. ... 04	R16.. ... 20	R20.. ... 30	R16.. ... 70	Horizontal I, IV											
R20.. ... 0Z	R16.. ... 2Z	R20.. ... 3Z	R16.. ... 7Z	Vertical II, V	0.03	0.03	0.03	0.06	010	0.10	-		0.03	0.03	-
R20.. ... 05	R16.. ... 21	R20.. ... 31	R16.. ... 71	Wall mount. III, VI		0.06	0.06	0.10	0.20	0.20			0.06	0.06	
R20.. ... 06	R16.. ... 22	R20.. ... 32	R16.. ... 72												
R20.. ... 0Y	R16.. ... 2Y	R20.. ... 3Y	R16.. ... 7Y												
R20.. ... 07	R16.. ... 23	R20.. ... 33	R16.. ... 73												
		R20.. ... 90													

Table 9

1) The following conditions apply:
- Liquid grease Dynalub 520 (or alternatively Castrol Longtime PD 00) and piston distributors from Vogel
- Lube ducts must be filled
- Ambient temperature T = 20 - 30 °C

Lubrication and Maintenance

Lubrication

Oil lubrication via single-line piston distributor systems

Oil lubricant
We recommend using **Shell Tonna S 220** with the following properties:
- Special demulsifying oil CLP or CGLP as per DIN 51517-3 for machine bed tracks and tool guides
- A blend of highly refined mineral oils and additives
- Can be used even when mixed with significant quantities of metalworking fluids

⚠ **Refer to the Notes on Lubrication!** ☞ 244

⚠ **Ball runner blocks must never be put into operation without initial lubrication.**

If they are pre-lubricated before shipment, no initial lubrication by the user is required.

Rexroth Ball Rail Systems are coated with anti-corrosion oil prior to shipment.

Initial lubrication of the runner blocks (basic lubrication)

Stroke ≥ 2 · runner block length B_1 (normal stroke)
- Install and lubricate one lube fitting per runner block, at **either** of the two end caps!

Initial lubrication is applied in two partial quantities as specified in Table 10:
1. Apply the first of the oil quantities as specified in Table 10 to the runner block.
2. Slide runner block back and forth over 3 · runner block length B_1 for three full cycles.
3. Repeat steps 1. and 2. two more times.
4. Make sure there is a visible film of lubricant on the guide rail.

Size	Initial lubrication (normal stroke)				
	Part number (not pre-lubricated)		Part number (pre-lubricated)		
	R16.. ... 10 R16.. ... 11 R16.. ... 60	R20.. ... 04/0Z R20.. ... 05 R20.. ... 06/0Y R20.. ... 07	R16.. ... 20/2Z R16.. ... 21 R16.. ... 22/2Y R16.. ... 23	R20.. ... 30/3Z R20.. ... 31 R20.. ... 32/3Y R20.. ... 33 R20.. ... 90	R16.. ... 70/7Z R16.. ... 71 R16.. ... 72/7Y R16.. ... 73
	Partial quantity (cm^3)				
15	0.4 (2x)		Pre-lubricated with Dynalub 510 before shipment		
20	0.7 (2x)				
25	1.0 (2x)				
30	1.1 (2x)				
35	1.2 (2x)				
45	2.2 (2x)				
55	3.6 (2x)		–		
65	6.0 (2x)				
20/40	0.7 (2x)		Pre-lubricated with Dynalub 510 before shipment		
25/70	1.1 (2x)				
35/90	1.8 (2x)		–		

Table 10

Stroke < 2 · runner block length B_1 (short stroke)
- Install and lubricate two lube fittings per runner block, one on **each** of the two end caps!

Initial lubrication is applied to each fitting in two partial quantities as specified in Table 11:
1. Apply the first of the oil quantities as specified in Table 11 to each fitting of the runner block.
2. Slide runner block back and forth over 3 · runner block length B_1 for three full cycles.
3. Repeat steps 1. and 2. two more times.
4. Make sure there is a visible film of lubricant on the guide rail.

Size	Initial lubrication (short stroke)					
	Part number (not pre-lubricated)		Part number (pre-lubricated)			
	R16.. ... 10 R16.. ... 11 R16.. ... 60	R20.. ... 04/0Z R20.. ... 05 R20.. ... 06/0Y R20.. ... 07	R16.. ... 20/2Z R16.. ... 21 R16.. ... 22/2Y R16.. ... 23	R20.. ... 30/3Z R20.. ... 31 R20.. ... 32/3Y R20.. ... 33 R20.. ... 90	R16.. ... 70/7Z R16.. ... 71 R16.. ... 72/7Y R16.. ... 73	
	Partial quantity per port (cm^3)					
	left	right				
15	0.4 (2x)	0.4 (2x)	Pre-lubricated with Dynalub 510 before shipment			
20	0.7 (2x)	0.7 (2x)				
25	1.0 (2x)	1.0 (2x)				
30	1.1 (2x)	1.1 (2x)				
35	1.2 (2x)	1.2 (2x)				
45	2.2 (2x)	2.2 (2x)				
55	3.6 (2x)	3.6 (2x)	–			
65	6.0 (2x)	6.0 (2x)				
20/40	0.7 (2x)	0.7 (2x)	Pre-lubricated with Dynalub 510 before shipment			
25/70	1.1 (2x)	1.1 (2x)				
35/90	1.8 (2x)	1.8 (2x)	–			

Table 11

Relubrication of runner blocks

Stroke ≥ 2 · runner block length B_1 (normal stroke)

- When the relubrication interval according to Graph 5 or 6 ☞ 254 has been reached, add the relubrication quantity according to Table 12.

Note

The required pulse count is the quotient (as a whole number) of the minimum relubrication quantity according to Table 12 and the smallest permissible piston distributor size (i.e. the minimum pulse quantity) according to Table 14 ☞ 255.

The smallest permissible piston distributor size also depends on the mounting orientation.

The lubricant cycle time can then be obtained by dividing the relubrication interval ☞ 254 by the calculated pulse count (see design example ☞ 256).

⚠ **Refer to the Notes on Lubrication!** ☞ 244

Size	Relubrication (normal stroke)				
	Part number		Part number		
	R16.. … 10 R16.. … 11 R16.. … 60	R20.. … 04/0Z R20.. … 05 R20.. … 06/0Y R20.. … 07	R16.. … 20/2Z R16.. … 21 R16.. … 22/2Y R16.. … 23	R20.. … 30/3Z R20.. … 31 R20.. … 32/3Y R20.. … 33 R20.. … 90	R16.. … 70/7Z R16.. … 71 R16.. … 72/7Y R16.. … 73
	Partial quantity (cm^3)		Partial quantity (cm^3)		
15	0.4 (1x)		0.4 (1x)		
20	0.7 (1x)		0.7 (1x)		
25	1.0 (1x)		1.0 (1x)		
30	1.1 (1x)		1.1 (1x)		
35	1.2 (1x)		1.2 (1x)		
45	2.2 (1x)		2.2 (1x)		
55	3.6 (1x)		–		
65	6.0 (1x)				
20/40	0.7 (1x)		0.7 (1x)		
25/70	1.1 (1x)		1.1 (1x)		
35/90	1.8 (1x)		–		

Table 12

Stroke < 2 · runner block length B_1 (short stroke)

- When the relubrication interval according to Graph 5 or 6 ☞ 254 has been reached, add the relubrication quantity **per** lube port according to Table 13.

– Calculate the required pulse count and lubricant cycle time in the same way as for relubrication (normal stroke).

- At each lubrication cycle the runner block should be traversed back and forth through a lubricating stroke of 3 · runner block length B_1. In any case, the lubricating stroke must never be shorter than the runner block length B_1.

⚠ **Refer to the Notes on Lubrication!** ☞ 244

Size	Relubrication (short stroke)				
	Part number		Part number		
	R16.. … 10 R16.. … 11 R16.. … 60	R20.. … 04/0Z R20.. … 05 R20.. … 06/0Y R20.. … 07	R16.. … 20/2Z R16.. … 21 R16.. … 22/2Y R16.. … 23	R20.. … 30/3Z R20.. … 31 R20.. … 32/3Y R20.. … 33 R20.. … 90	R16.. … 70/7Z R16.. … 71 R16.. … 72/7Y R16.. … 73
	Partial quantity per port (cm^3)		Partial quantity per port (cm^3)		
	left	right	left	right	
15	0.4 (1x)	0.4 (1x)	0.4 (1x)	0.4 (1x)	
20	0.7 (1x)	0.7 (1x)	0.7 (1x)	0.7 (1x)	
25	1.0 (1x)	1.0 (1x)	1.0 (1x)	1.0 (1x)	
30	1.1 (1x)	1.1 (1x)	1.1 (1x)	1.1 (1x)	
35	1.2 (1x)	1.2 (1x)	1.2 (1x)	1.2 (1x)	
45	2.2 (1x)	2.2 (1x)	2.2 (1x)	2.2 (1x)	
55	3.6 (1x)	3.6 (1x)	–		
65	6.0 (1x)	6.0 (1x)			
20/40	0.7 (1x)	0.7 (1x)	0.7 (1x)	0.7 (1x)	
25/70	1.1 (1x)	1.1 (1x)	1.1 (1x)	1.1 (1x)	
35/90	1.8 (1x)	1.8 (1x)	–		

Table 13

Lubrication and Maintenance

Lubrication

Oil lubrication via single-line piston distributor systems (continued)

Load-dependent relubrication intervals for oil lubrication via single-line piston distributor systems (“dry axes”)

The following conditions apply:
- Lube oil Shell Tonna S 220
- No exposure to metalworking fluids
- Standard seals
- Ambient temperature:
  T = 20 – 30 °C

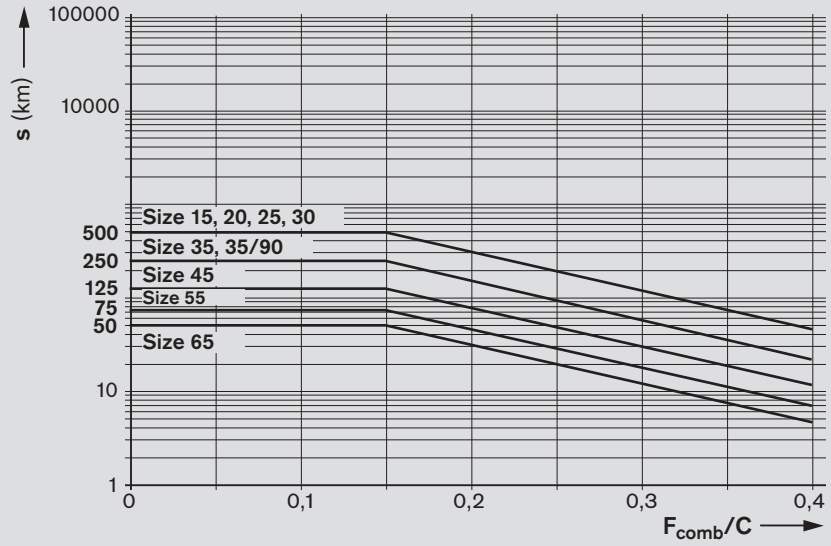
Key to graphs

C	=	dynamic load capacity	(N)
F_{comb}	=	combined equivalent dynamic load on bearing	(N)
F_{comb}/C	=	load ratio	(–)
s	=	relubrication interval expressed as travel	(km)

Definition of F_{comb}/C
The load ratio F_{comb}/C is the quotient of the equivalent dynamic load on the bearing at the combined load on the bearing F_{comb} (taking account of the internal preload force F_{pr}) divided by the dynamic load capacity C ☞ 8 – 9.

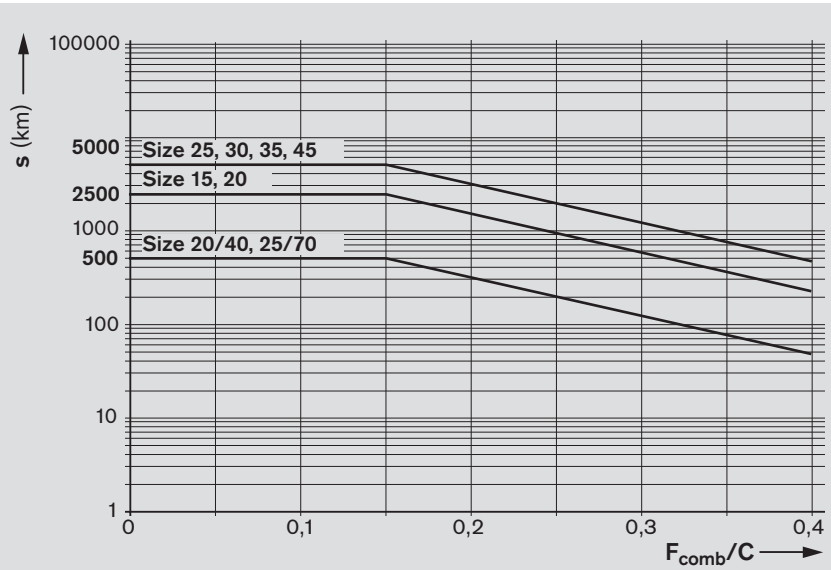
Please consult us regarding the relubrication intervals in the following cases:
- exposure to metalworking fluids
- use of double-lipped seals (DS)
- use of standard seals (SS) in combination with end seals or FKM seals or seal kits

⚠ **Refer to the Notes on Lubrication!** ☞ 244



Graph 5

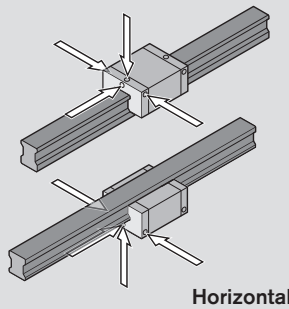
Part number		
R16.. ... 10	R16.. ... 11	R16.. ... 60



Graph 6

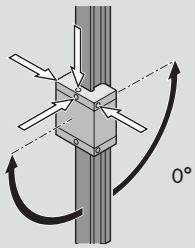
Part number				
R20.. ... 04	R16.. ... 20	R20.. ... 30	R16.. ... 70	R20.. ... 90
R20.. ... 05	R16.. ... 21	R20.. ... 31	R16.. ... 71	
R20.. ... 06	R16.. ... 22	R20.. ... 32	R16.. ... 72	
R20.. ... 07	R16.. ... 23	R20.. ... 33	R16.. ... 73	

Mounting orientation I – normal stroke
Horizontal
1 lube port at **either** of the two end caps



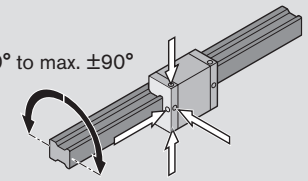
Horizontal, top-down
Same port

Mounting orientation II – normal stroke
Vertical to inclined horizontal
1 lube port at top end cap



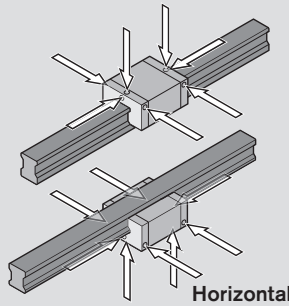
Vertical to inclined horizontal, top-down
Same port

Mounting orientation III – normal stroke
Wall mounting
1 lube port at **either** of the two end caps



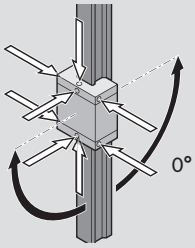
Same port

Mounting orientation IV – short stroke
Horizontal
2 lube ports, one on **each** of the two end caps



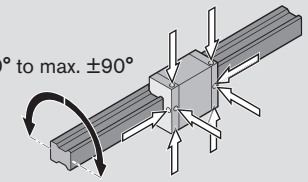
Horizontal, top-down
Same ports

Mounting orientation V – short stroke
Vertical to inclined horizontal
2 lube ports, one on **each** of the two end caps (top and bottom)



Vertical to inclined horizontal, top-down
Same ports

Mounting orientation VI – short stroke
Wall mounting
2 lube ports, one on **each** of the two end caps



Same ports

Smallest permissible piston distributor sizes for oil lubrication via single-line centralized systems[1)]

Ball runner blocks					Smallest permissible piston distributor size (≙ minimum pulse quantity) per lube port (cm^3) at oil viscosity 220 m^2/s										
Part number				Mounting orientations	Size 15	20	25	30	35	45	55	65	20/40	25/70	35/90
R16.. ... 10				Horizontal I, IV											
R16.. ... 11				Vertical II, V	0.60	0.60	0.60	0.60	0.60	0.60	1.50	1.50	0.30	0.30	0.60
R16.. ... 60				Wall mount. III, VI											
R20.. ... 04	R16.. ... 20	R20.. ... 30	R16.. ... 70	Horizontal I, IV											
R20.. ... 0Z	R16.. ... 2Z	R20.. ... 3Z	R16.. ... 7Z	Vertical II, V	0.03	0.03	0.03	0.06	0.10	0.10	-		0.03	0.03	-
R20.. ... 05	R16.. ... 21	R20.. ... 31	R16.. ... 71	Wall mount. III, VI		0.06	0.06	0.10	0.16	0.16			0.06	0.06	
R20.. ... 06	R16.. ... 22	R20.. ... 32	R16.. ... 72												
R20.. ... 0Y	R16.. ... 2Y	R20.. ... 3Y	R16.. ... 7Y												
R20.. ... 07	R16.. ... 23	R20.. ... 33	R16.. ... 73												
		R20.. ... 90													

Table 14

1) The following conditions apply:
- Lube oil Shell Tonna S 220 using piston distributors from Vogel
- Lube ducts must be filled
- Ambient temperature T = 20 - 30 °C

Lubrication and Maintenance

Lubrication

Design example for lubrication of a typical 2-axis application with centralized lubrication

X-axis

Component or parameter	Given data
Ball runner block	Size 35; 4 blocks; C = 41,900 N; part numbers: R1651 323 20 (☞ 36)
Ball guide rail	Size 35; 2 rails; L = 1,500 mm; part numbers: R1605 333 61 (☞ 122)
Combined equivalent dynamic load on bearing	F_{comb} = 12,570 N (per runner block) taking into account the preload (in this case C2 = 8% C)
Stroke	500 mm
Average linear speed	v_m = 1 m/s
Temperature	20 - 30 °C
Mounting orientation	Horizontal
Lubrication	Single-line centralized lubrication system for all axes with liquid grease Dynalub 520
Exposure to contaminants	No exposure to fluids, chips, dust

Design variables	Design input (per runner block)	Information sources
1. Normal or short-stroke?	Normal stroke: Stroke ≥ 2 · runner block length B_1 500 mm ≥ 2 · 77 mm 500 mm ≥ 154 mm i.e. normal stroke	– Normal stroke formula ☞ 248, runner block length B_1 ☞ 37
2. Initial lubrication quantity	1 lube port, initial lubrication quantity: pre-lubricated with Dynalub 510 before shipment	– Initial lubrication quantity from Table 5 ☞ 248
3. Relubrication quantity	1 lube port, relubrication quantity: 2.2 cm^3 (2x)	– Relubrication quantity from Table 7 ☞ 249
4. Mounting orientation	Mounting orientation 1 – normal stroke (horizontal)	– Mounting orientation from overview ☞ 251
5. Piston distributor size	Permissible piston distributor size: 0.1 cm^3	– Piston distributor size from Table 9 ☞ 251, for size 35, mounting orientation I (horizontal)
6. Pulse count	Pulse count $= \frac{2 \cdot 2.2\ cm^3}{0.1\ cm^3} = 44$	– Pulse count $= \frac{\text{number} \cdot \text{relubrication quantity}}{\text{perm. piston distributor size}}$
7. Load ratio	Load ratio $= \frac{12{,}570\ N}{41{,}900\ N} = 0.3$	– Load ratio = F_{comb}/C F_{comb} and C from given data
8. Relubrication interval	Relubrication interval: 1,800 km	– Relubrication interval from Graph 4 ☞ 250: Curve size 35 at load ratio 0.3
9. Lubrication cycle	Lubrication cycle $= \frac{1{,}800\ km}{44} = 41\ km$	– Lube cycle $= \frac{\text{relubrication interval}}{\text{pulse count}}$
Interim result (X-axis)	For the X-axis, a minimum quantity of 0.1 cm^3 Dynalub 520 must be supplied to each runner block every 41 km.	

Y-axis

Component or parameter	Given data
Ball runner block	Size 25; 4 blocks; C = 22,800 N; part numbers: R1651 223 20 (☞ 36)
Ball guide rail	Size 25; 2 rails; L = 1,000 mm; part numbers: R1605 232 31 (☞ 122)
Combined equivalent dynamic load on bearing	F_{comb} = 3,420 N (per runner block) taking into account the preload (in this case C2 = 8% C)
Stroke	50 mm (short stroke)
Average linear speed	v_m = 1 m/s
Temperature	20 - 30 °C
Mounting orientation	Vertical
Lubrication	Single-line centralized lubrication system for all axes with liquid grease Dynalub 520
Exposure to contaminants	No exposure to fluids, chips, dust

Design variables	Design input (per runner block)	Information sources
1. Normal or short-stroke?	Normal stroke: Stroke ≥ 2 · runner block length B_1 50 mm ≥ 2 · 57.8 mm 50 mm < 115.6 mm i.e. short stroke	– Normal stroke formula ☞ 248, runner block length B_1 ☞ 37
2. Initial lubrication quantity	2 lube ports, initial lubrication quantity per lube port: pre-lubricated with Dynalub 510 before shipment	– Initial lubrication quantity from Table 6 ☞ 248
3. Relubrication quantity	2 lube ports, relubrication quantity per port: 1.4 cm^3 (2x)	– Relubrication quantity from Table 8 ☞ 249
4. Mounting orientation	Mounting orientation V – short stroke (vertical to inclined horizontal)	Mounting orientation from overview ☞ 251
5. Piston distributor size	Permissible piston distributor size: 0.03 cm^3	– Piston distributor size from Table 9 ☞ 249, for size 25, mounting orientation V (vertical to inclined horizontal)
6. Pulse count	Pulse count = $\frac{2 \cdot 1.4\ cm^3}{0.03\ cm^3} = 94$	– Pulse count = $\frac{\text{number} \cdot \text{relubrication quantity}}{\text{perm. piston distributor size}}$
7. Load ratio	Load ratio = $\frac{3{,}420\ N}{22{,}800\ N} = 0.15$	– Load ratio = F_{comb}/C F_{comb} and C from given data
8. Relubrication interval	Relubrication interval: 7,500 km	– Relubrication interval from Graph 4 ☞ 250: Curve size 25 at load ratio 0.15
9. Lubrication cycle	Lubrication cycle = $\frac{7{,}500\ km}{94} = 80\ km$	– Lube cycle = $\frac{\text{relubrication interval}}{\text{pulse count}}$
Interim result (Y-axis)	For the Y-axis, a minimum quantity of 0.03 cm^3 Dynalub 520 must be supplied per runner block and per port every 80 km.	
End result (two-axis lubrication)	Since both the axes in this example are supplied by a single-line centralized lubrication system, the X-axis with its smaller lube cycle (41 km) determines the overall cycle of the system, i.e. the Y-axis will also be lubricated every 41 km.	**The number of ports and the minimum lubricant quantities determined for each axis remain the same.**

Lubrication and Maintenance

Lubrication

Lubrication from above

Lubrication from above without lube adapter
For all ball runner blocks prepared for lubrication from above.
(Exceptions: Ball runner blocks, high, SNH R1621 and SLH R1624)

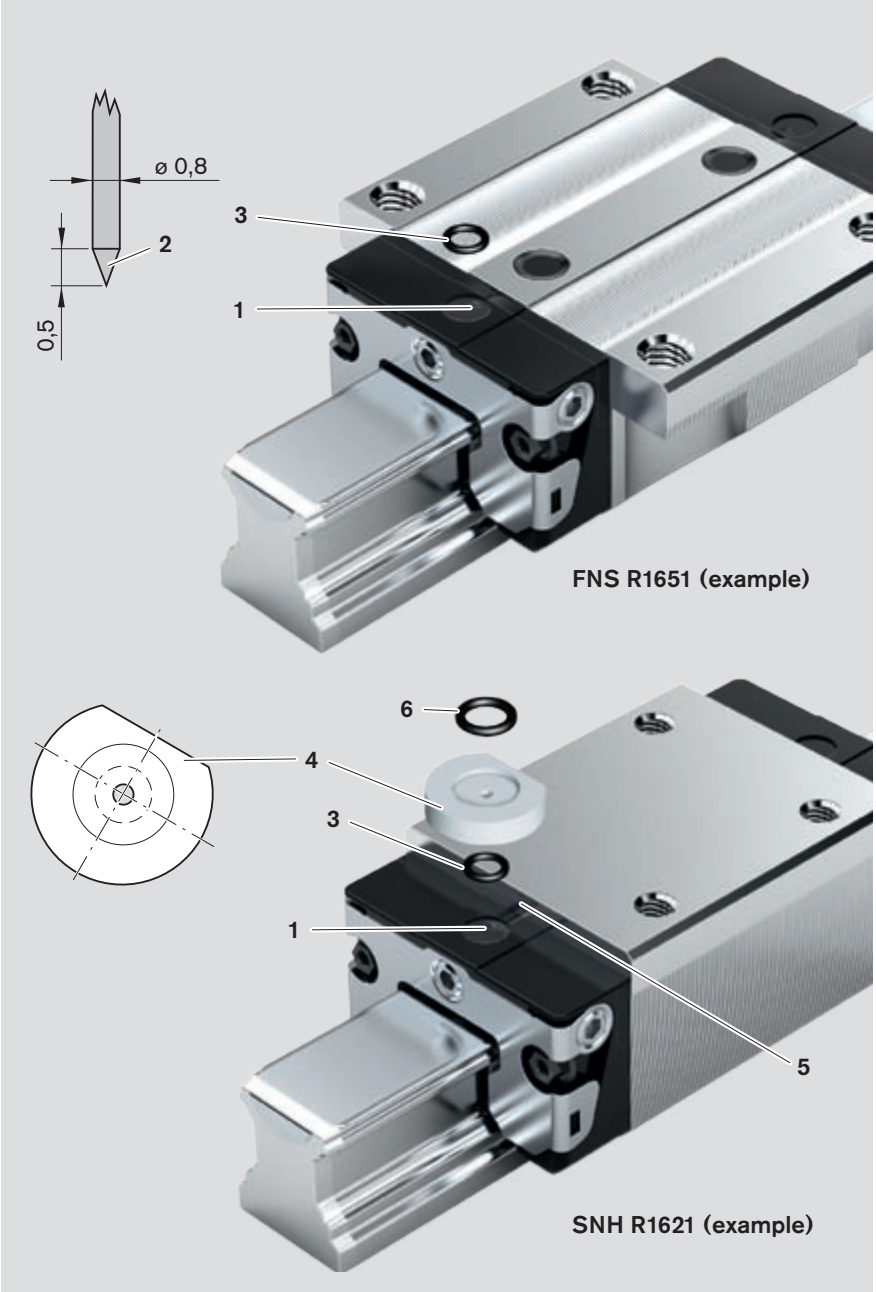
⚠ **In the O-ring recess there is a further pre-formed small recess (1). Do not use a drill to open this. Risk of contamination!**

1. Heat up a pointed metal punch (2) with diameter of 0.8 mm.
2. Carefully punch through the recess (1) to open the lube hole. Do not exceed the permissible depth T_{max} as specified in the table!
3. Insert O-ring (3) in the recess (O-ring is **not** supplied with the runner block. Accessories for Ball Runner Blocks ☞ 171).

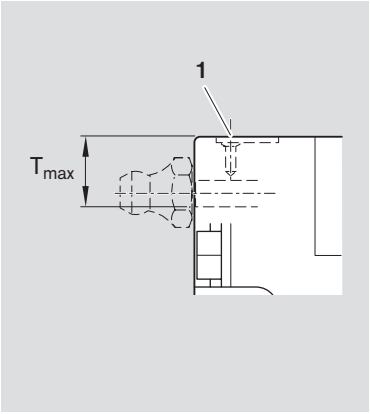
Lubrication from above with lube adapter
(Accessories for Ball Runner Blocks ☞ 159)
A lube adapter is needed for high runner blocks, if lubrication is to be performed through the carriage.

⚠ **In the O-ring recess there is a further pre-formed small recess (1). Do not use a drill to open this. Risk of contamination!**

1. Heat up a pointed metal punch (2) with diameter of 0.8 mm.
2. Carefully punch through the recess (1) to open the lube hole. Do not exceed the permissible depth T_{max} as specified in the table!
3. Insert O-ring (3) in the recess (O-ring is supplied with the lube adapter).
4. Insert the lube adapter at a slant into the recess and press the straight side (4) against the steel part (5). Use grease to fix the adapter in place.
5. Place O-ring (6) in the lube adapter (O-ring is supplied with the lube adapter).



Size	Lube hole at top: Maximum permissible depth for punching open T_{max} (mm)	
	Ball runner block standard height/ high	Ball runner block low profile
15	3.6	–
20	3.9	4.4
25	3.3	4.9
30	6.6	–
35	7.5	–
45	8.8	–
20/40	4.0	–
25/70	2.1	–
35/90	7.9	–



Special lube ports

On request, special lube ports can be provided in the ball runner block body for lubrication from above (A) or from the side (B).

A

B

Recommended grease lubricants

Manufacturer	Name	Specification NLGI grade	Part number 400 g cartridge
Bosch Rexroth	Dynalub 510	2	R3416 037 00
	Dynalub 520	00	R3416 043 00

Maintenance

Cleaning cycle

Dirt can settle and encrust on guide rails, especially when these are not enclosed.

To ensure that seals and cover strips retain their functionality, this dirt must be removed at regular intervals.

It is advisable to perform at least one full cleaning cycle over the entire installed rail length at least twice a day, but at the latest every 8 hours.

Before shutting down the machine, always perform a cleaning cycle.

Shorten the maintenance intervals for systems exposed to metalworking fluids.

Checking accessories

All accessories used for scraping or wiping the guide rails must be checked at regular intervals.

In environments with heavy contamination, it is advisable to replace all the parts directly exposed to such contamination.

We recommend checking the accessories at least once a year.

Rexroth
Bosch Group

Bosch Rexroth AG
Linear Motion and
Assembly Technologies
Ernst-Sachs-Straße 100
97424 Schweinfurt, Germany
Tel. +49 9721 937-0
Fax +49 9721 937-275
www.boschrexroth.com/brl

Australia
Bosch Rexroth Pty. Ltd.
3 Valediction Road
Kings Park, NSW 2148, Sydney
Tel. +61 2 9831 7788
Fax +61 2 9831 5553

Great Britain
Bosch Rexroth Limited
Cromwell Road
St. Neots, Huntingdon
Cambs. PE19 2ES
Tel. +44 1480 223 298
Fax +44 1480 470 789

Canada
Bosch Rexroth Canada Corp.
3426 Mainway Drive
Burlington, Ontario L7M 1A8
Tel. +1 905 335-5511
Fax +1 905 335-4184

USA
Bosch Rexroth Corporation
14001 South Lakes Drive
Charlotte, NC 28273
Tel. +1 800 REXROTH
+1 800 739 7684
Fax +1 704 583 0523

Singapore
Bosch Rexroth Pte. Ltd.
15D Tuas Road
638520 Singapore
Tel. +65 6861 8733
Fax +65 6861 1825

Your sales partner

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