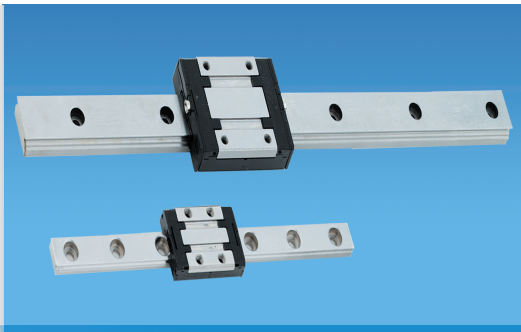
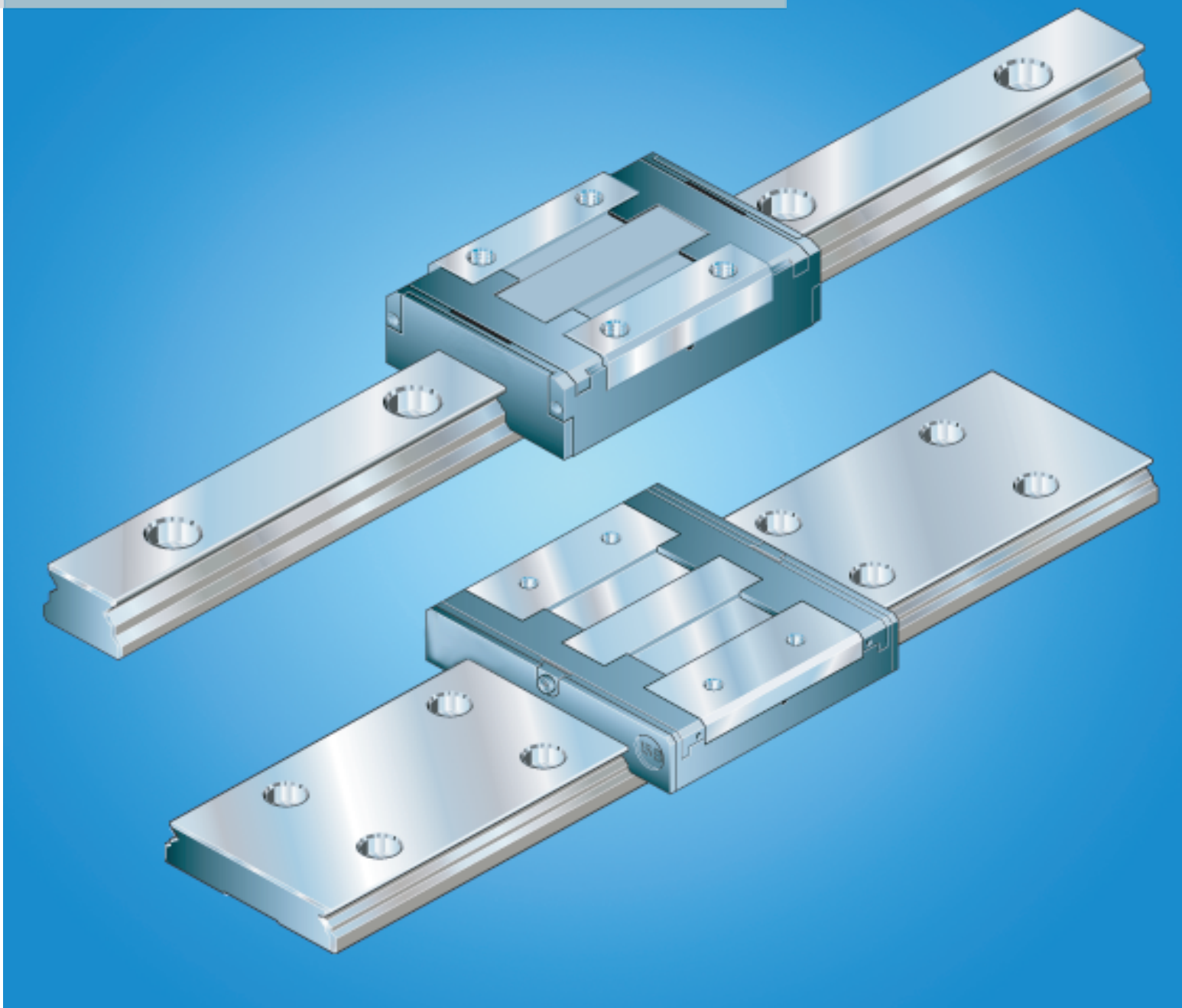
Rexroth
Bosch Group

Miniature Ball Rail® Systems



The Drive and Control Company



Linear Motion Technology

Ball Rail® Systems	Standard Ball Rail® Systems	
	Ball Rail® Systems with Aluminum Runner Blocks	
	Super Ball Rail® Systems	
	Wide Ball Rail® Systems	
	Accessories	
	Miniature Ball Rail® Systems	
	Cam Roller Guides	
Roller Rail™ Systems		
Linear Bushings and Shafts	Linear Bushings	
	Linear Sets	
	Shafts	
	Shaft Support Rails	
	Shaft Support Blocks	
	Ball Transfer Units	
	Other Engineering Components	
Screw Drives	Precision Ball Screw	
	Miniature Ball Screw	
	End Bearings and Housings	
Linear Motion Systems	Linear Motion Slides	• Ball Screw Drive • Toothed Belt Drive
	Linear Modules	• Ball Screw Drive • Toothed Belt Drive • Rack and Pinion Drive • Pneumatic Drive • Linear Motor
	Compact Modules	• Ball Screw Drive
	Precision Modules	• Ball Screw Drive
	Ball Rail Tables	• Ball Screw Drive • Linear Motor
	Controllers, Motors, Electrical Accessories	
	Linear Actuators	

Miniature Ball Rail® Systems

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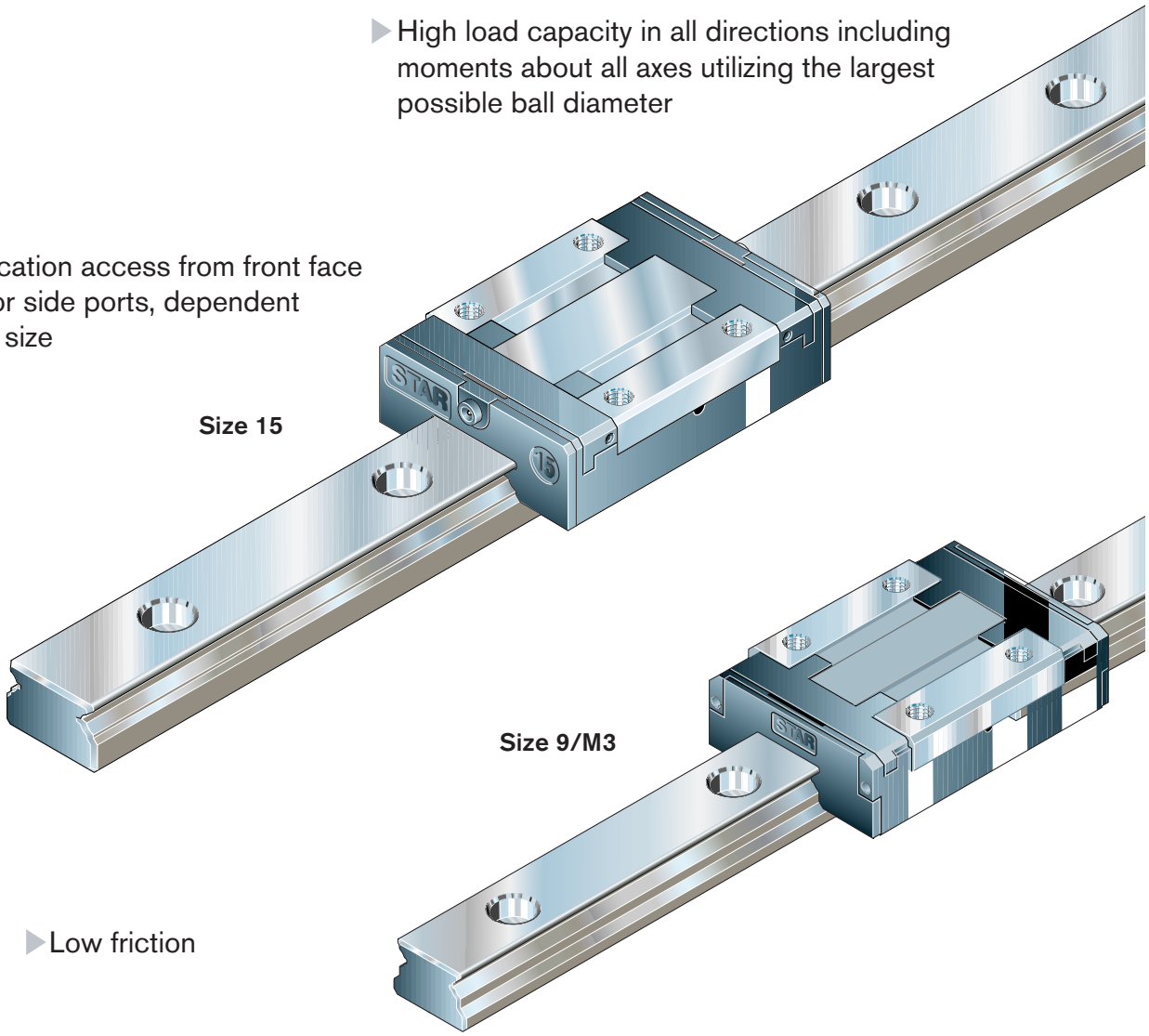
Miniature Ball Rail® Systems
Product Overview

The Miniature version of our Ball Rail® Systems has been developed specifically for the precision engineering sector, i.e. for the production of optical or electronic data processing devices, where rolling-element linear motion guideways of extremely compact dimensions and high load capacity are required.

The linear motion guideways have equal load capacities in all four major directions of load application.

▶ High load capacity in all directions including moments about all axes utilizing the largest possible ball diameter

▶ Lubrication access from front face and/or side ports, dependent upon size



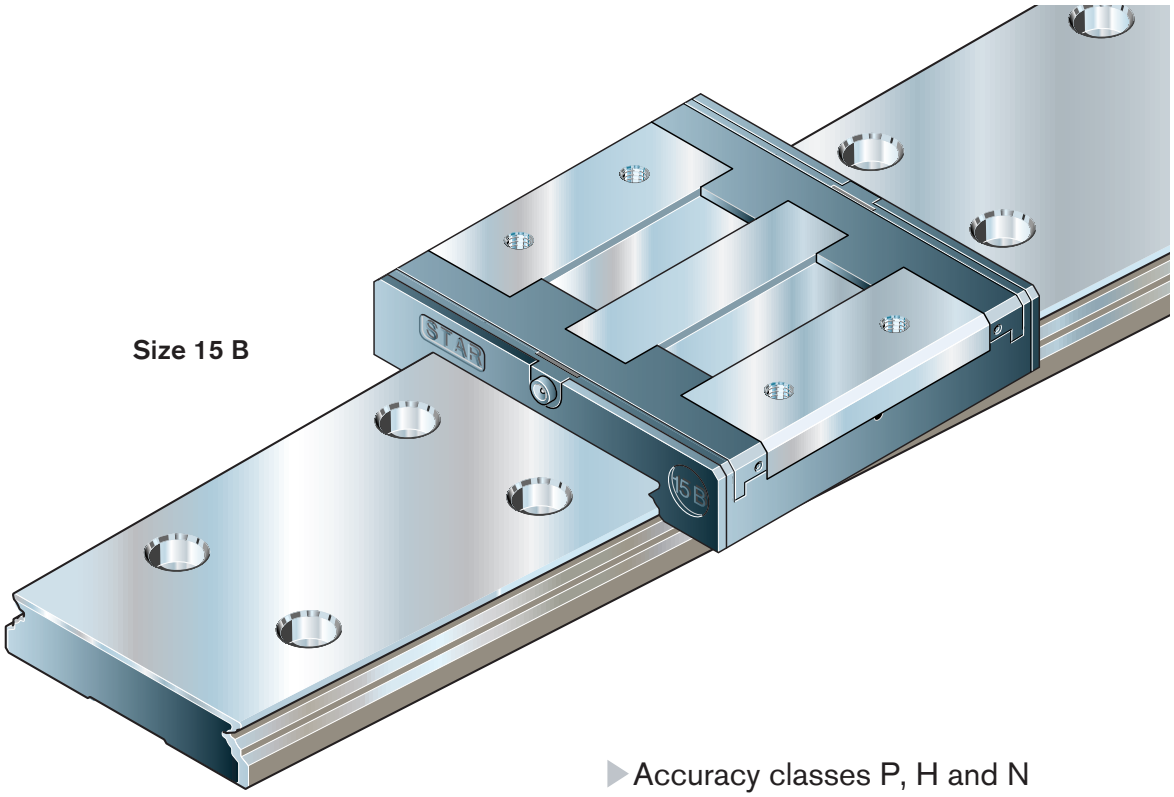
Size 15

Size 9/M3

▶ Low friction

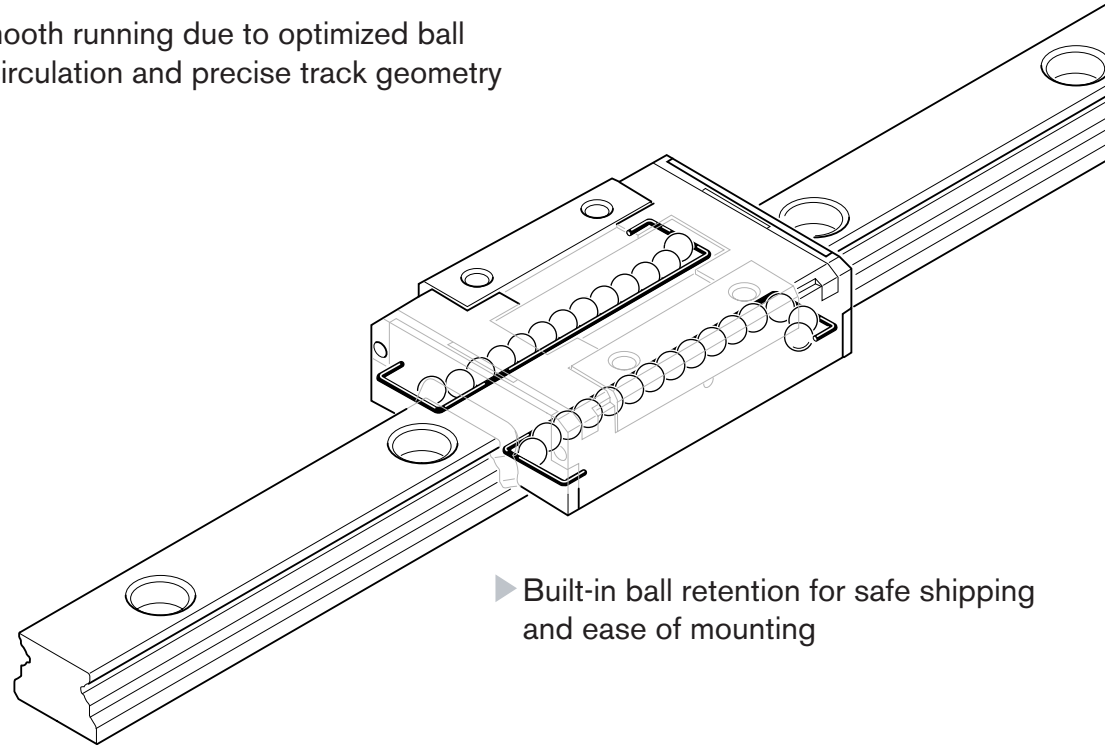
▶ All steel parts made of corrosion and acid resistant material similar to DIN 17230 /EN10088

CAD files available.



Size 15 B

- Accuracy classes P, H and N
- Built-in lube ports
- Smooth running due to optimized ball recirculation and precise track geometry



- Built-in ball retention for safe shipping and ease of mounting

Miniature Ball Rail® Systems
General Technical Data and Calculations

Definition of dynamic load capacity

The radial loading of constant magnitude and direction which a linear rolling bearing can theoretically endure for a nominal life of 10^5m meters distance traveled (to DIN 636 Part 2).

Definition of static load capacity

The static loading in the direction of load which corresponds to a calculated stress of 4200 MPa at the center of the most heavily loaded rolling-element/raceway (rail) contact with a ball conformity of $\leq$ 0.52, and 4600 MPa with a ball conformity of 0.6.

Note:
With this contact stress, a permanent total deformation of the rolling element and the raceway will occur at the contact point corresponding to approx. 0.0001 times the rolling element diameter (to DIN 636 Part 2).

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 (to DIN 636 Part 2).

Nominal life with constant speed

Calculate the nominal life L or L_h according to formulas (1), (2) or (3):

(1) $$L = \left(\frac{C}{F}\right)^3 \cdot 10^5$$

(2) $$L_h = \frac{L}{2 \cdot s \cdot n \cdot 60}$$

L	=	nominal life	(m)
L_h	=	nominal life	(h)
C	=	dynamic load capacity	(N)
F	=	equivalent load	(N)
s	=	length of stroke	(m)
n	=	stroke repetition rate (complete cycles/min.)	(min^{-1})

Nominal life with variable speed

(3) $$L_h = \frac{L}{60 \cdot v_m}$$

(4) $$v_m = \frac{t_1 \cdot v_1 + t_2 \cdot v_2 + \ldots + t_n \cdot v_n}{100}$$

L	=	nominal life	(m)
L_h	=	nominal life	(h)
v_m	=	average speed	(m/min)
$v_1, v_2 \ldots v_n$	=	discrete speed steps	(m/min)
$t_1, t_2 \ldots t_n$	=	percentage of stroke covered at $v_1, v_2 \ldots v_n$	(%)

Equivalent dynamic load on bearing for calculation of service life

- with variable load on bearing

If the bearing is subject to variable loads, the equivalent dynamic load F must be calculated according to formula (5):

(5) $$F_1 = \sqrt[3]{F_1^3 \cdot \frac{q_1}{100} + F_2^3 \cdot \frac{q_2}{100} + \ldots + F_n^3 \cdot \frac{q_n}{100}}$$

F	=	equivalent load	(N)
$F_1, F_2 \ldots F_n$	=	discrete load steps	(N)
$q_1, q_2 \ldots q_n$	=	percentage of stroke covered under $F_1, F_2 \ldots F_n$	(%)

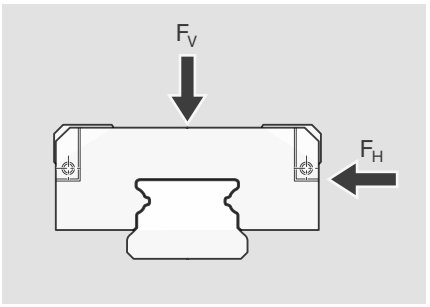
– with combined load on bearing

The equivalent dynamic load F resulting from combined vertical and horizontal loads is calculated according to formula (6):

(6) $$F = |F_V| + |F_H|$$

F	=	equivalent dynamic load	(N)
F_V	=	external dynamic load, vertical	(N)
F_H	=	external dynamic load, horizontal	(N)

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



Note

If F_V and F_H involve several different load levels, they have to be calculated separately using formula (5).

An external load acting at an angle on the runner block is to be broken down into its F_V and F_H components and these values then used in formula (6).

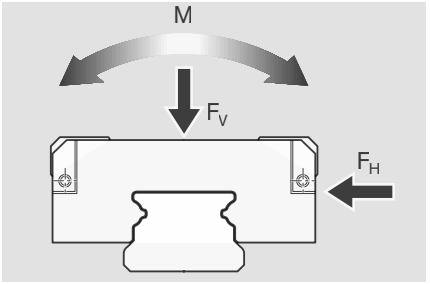
- with combined load in combination with a moment

With a combined external load - vertical and horizontal - in conjunction with a moment, calculate the equivalent dynamic load F according to formula (7):

Formula (7) applies only when using a single rail.

(7) $$F = |F_V| + |F_H| + C \cdot \frac{|M|}{M_t}$$

F	=	equivalent dynamic load	(N)
F_V, F_H	=	external dynamic loads	(N)
M	=	dynamic moment	(Nm)
C	=	dynamic load capacity *	(N)
M_t	=	permissible dyn. moment *	(Nm)
		* see tables	



Note

If F_V and F_H involve several different load levels, they have to be calculated separately using formula (5).

An external load acting at an angle on the runner block is to be broken down into its F_V and F_H components and these values then used in formula (7).

Equivalent static load on bearing

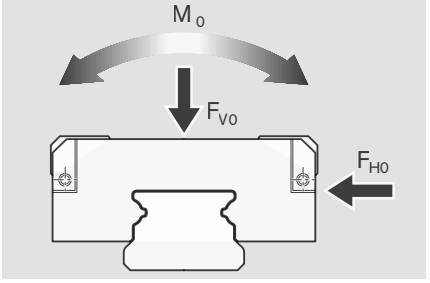
With a combined external static load - vertical and horizontal - in conjunction with a static moment, calculate the equivalent static load F_0 according to formula (8):

The equivalent static load F_0 must not exceed the static load capacity C_0

Formula (8) applies only when using a single rail.

(8) $$F_0 = |F_{V0}| + |F_{H0}| + C_0 \cdot \frac{|M_0|}{M_{t0}}$$

F_0	=	equivalent static load	(N)
F_{V0}, F_{H0}	=	external static loads	(N)
M_0	=	static moment	(Nm)
C_0	=	static load capacity *	(N)
M_{t0}	=	permissible static moment *	(Nm)
		* see tables	



Note

An external load acting at an angle on the runner block is to be broken down into its F_{V0} and F_{H0} components and these values then used in formula (8).

Miniature Ball Rail® Systems
Technical Data

Speed

$v_{max} = 3$ m/s

Speeds of up to 5 m/s are possible. Service life is limited by wear of plastic parts.

Acceleration

$a_{max} = 250$ m/s²

Only with preloaded systems

With non-preloaded systems:

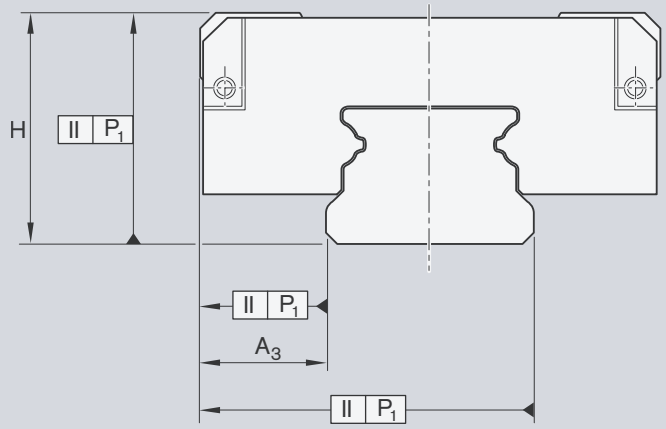
$a_{max} = 50$ m/s²

Temperature resistance

$t_{max} = 100$ °C

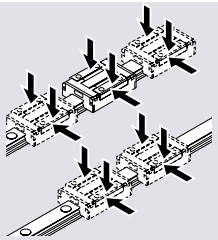
Accuracy classes and their tolerances (µm)

Ball Rail® Systems in miniature version are offered in three different accuracy classes.

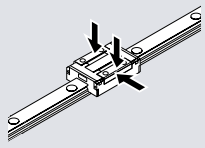


Accuracy classes	Dimensional tolerance (µm) H	A_3	Max. difference in dimensions H and A_3 on the same rail ΔH, ΔA_3 (µm)
P	± 10	± 10	7
H	± 20	± 20	15
N	± 30	± 30	20

Measured at middle of runner block [1]:



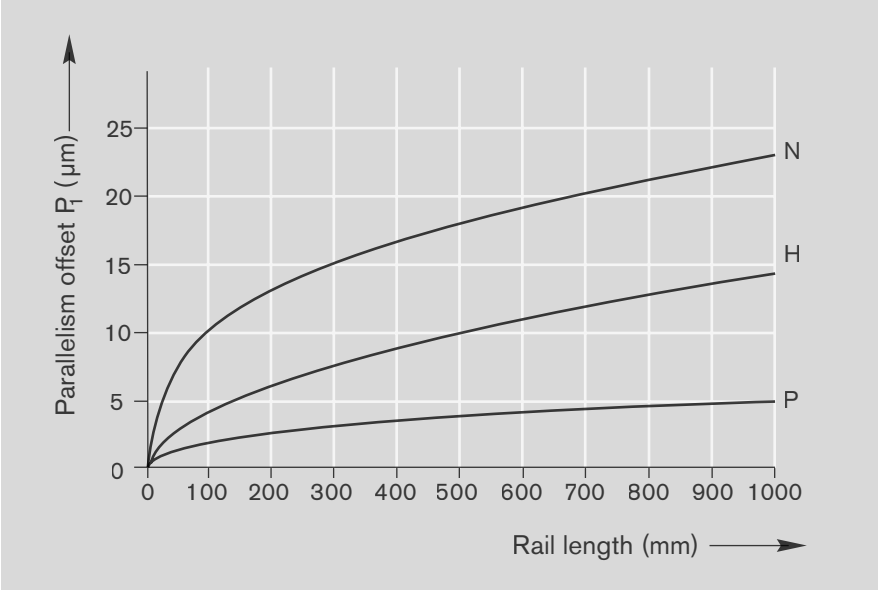
For any block/rail combination at any position on rail



For different runner blocks at same position on rail

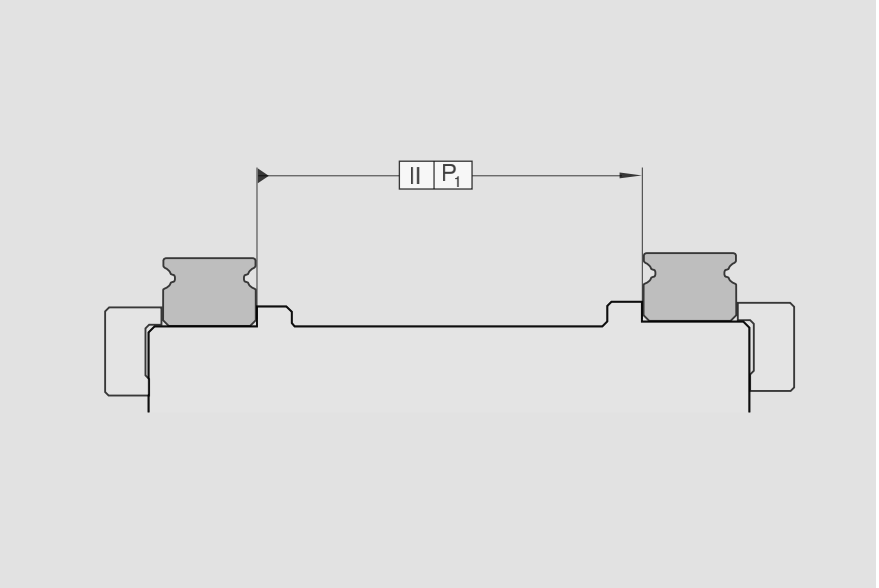
1) In dimensions H and ΔH, the middle of the runner block is calculated from the mean of the two measuring points shown.

Parallelism offset P_1 of the Ball Rail® System in service



Parallelism of the installed rails

measured on the guide rails and on the runner blocks



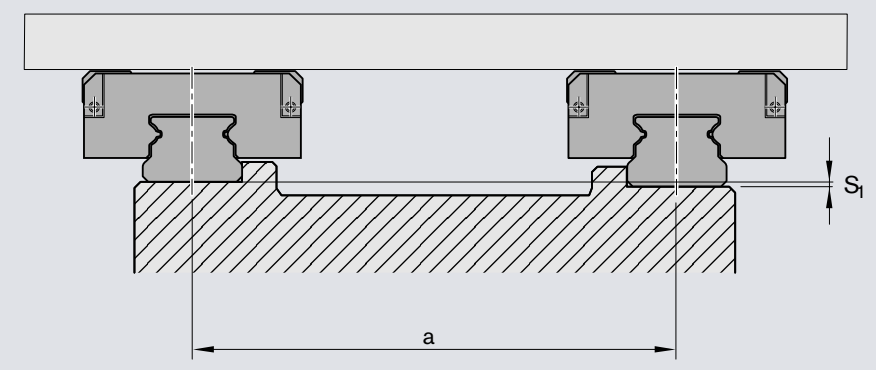
Size	Parallelism offset P_1 (mm)	
	Clearance	Preload
7	0.004	0.002
9/M3	0.005	0.002
9/M2	0.005	0.002
12	0.008	0.004
15	0.017	0.008
20	0.025	0.016
9/M3 B	0.010	0.004
12 B	0.014	0.006
15 B	0.018	0.011

Miniature Ball Rail® Systems
Technical Data

Vertical offset

Permissible vertical offset in transverse direction S_1

The permissible vertical offset S_1 includes the tolerance for dimension H (see accuracy classes).



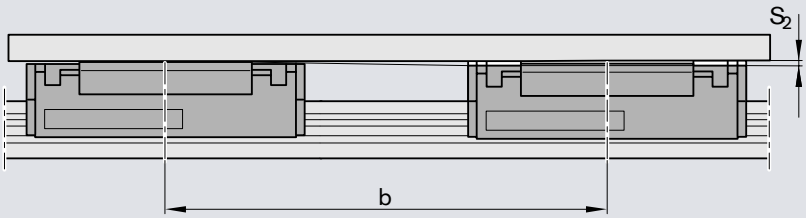
$$S_1 = a \cdot Y$$

S_1 = Permissible vertical offset (mm)
a = Distance between guide rails (mm)
Y = Design factor

Design factor	Preload class	
	Clearance	Preload
Y	$3.0 \cdot 10^{-4}$	$1.5 \cdot 10^{-4}$

Permissible vertical offset in longitudinal direction S_2

The permissible vertical offset S_2 includes the tolerance "max difference of dimension H on the same rail"Δ H (see accuracy classes).



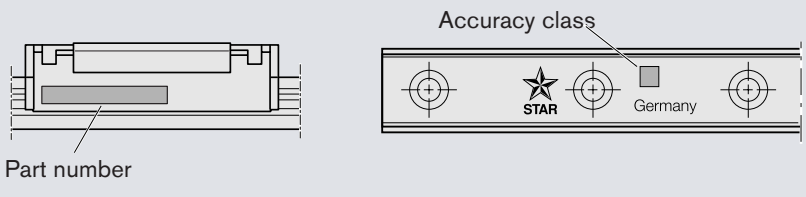
$$S_2 = b \cdot 7 \cdot 10^{-5}$$

S_2 = Permissible vertical offset (mm)
b = Distance between runner blocks (mm)

Preloading and clearance

	Accuracy class			
	P	H		N
Preload class	1	1	9	9
Preload and clearance	~0 to moderate preload	~0 to moderate preload	~0 to moderate clearance	Moderate clearance to moderate preload

Markings on runner block and guide rail



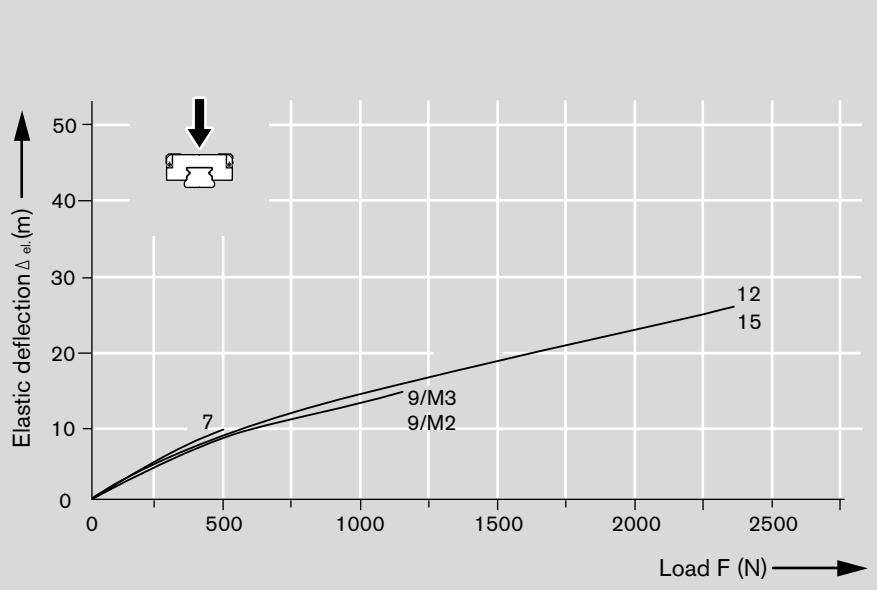
Rigidity of the Miniature Ball Rail® System when preloaded

Runner Block 0442-

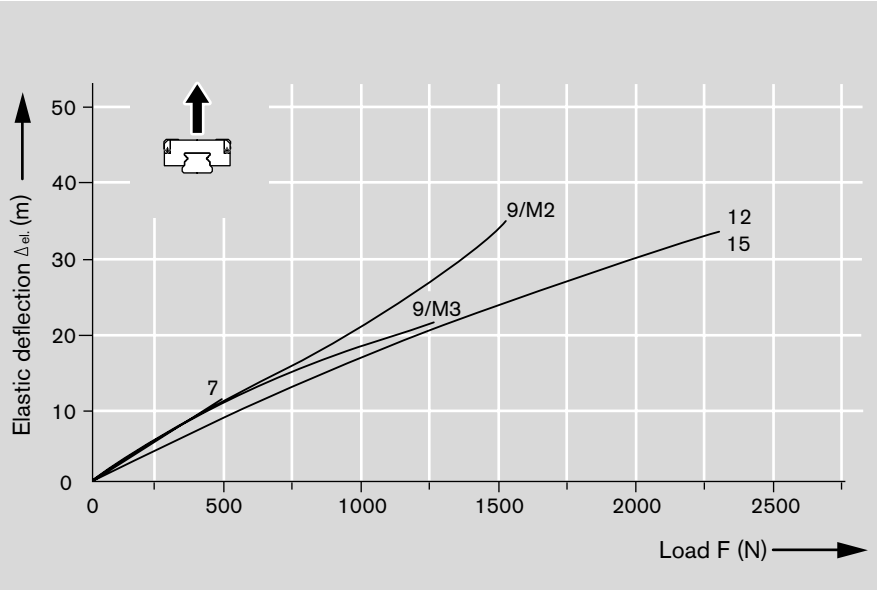
Standard

Runner block mounted with 4 screws, screw strength class 12.9

1. Down load



2. Lift-off load



Miniature Ball Rail® Systems
Technical Data

Friction and seals

The total frictional drag of the runner block is the sum of the frictional drag of the runner block and the frictional drag of the seals (see tables on right).

The runner blocks are equipped with low-friction seals as standard.
Part numbers: 044.-...**-01**
(see "Part numbers for runner blocks" tables)

Special versions:
Runner blocks are also available with N seals (excellent wiping action)
Part numbers: 044.-...**-01**
(otherwise as in "Part numbers for runner blocks" tables)

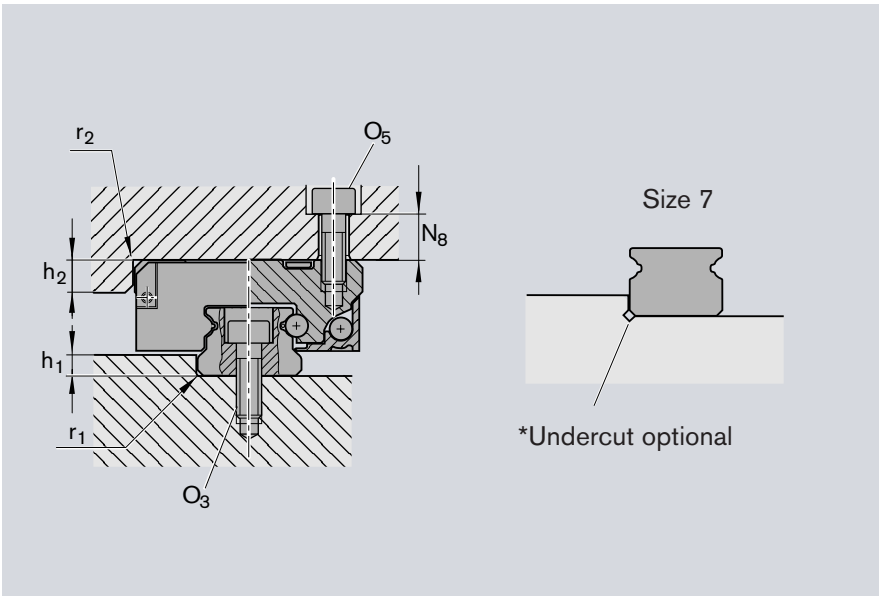
Sizes 15, 20, 9/M3 B, 12 B and 15 B have additional longitudinal seals for full sealing.

Size	Frictional drag of runner blocks (without seals)	
	with clearance (N)	with preload (N)
7	< 0.1	< 0.1
9/M3	< 0.1	< 0.1
9/M2	< 0.1	< 0.1
12	< 0.1	< 0.2
15	< 0.2	< 0.3
20	< 0.2	< 0.3
9/M3 B	< 0.2	< 0.3
12 B	< 0.2	< 0.3
15 B	< 0.2	< 0.3

Size	Frictional drag of seals	
	Low-friction seal (-01) (N)	N seal (-00) (N)
7	~0	0.1
9/M3	~0	0.5
9/M2	~0	0.5
12	~0	0.9
15	~0	1.2
20	~0	1.5
9/M3 B	~0	1.5
12 B	~0	1.5
15 B	~0	1.5

Mounting Instructions

Reference edges, corner radii, screw sizes and tightening torques



Size	h_1 (mm)	r_1 max. (mm)	h_2 (mm)	r_2 max. (mm)	O_5 ISO 4762[1] 4 pcs.	O_3 ISO 4762[1] (rail)	N_8 (mm)
7	1.2 -0.1	0.1*	2.2	0.3	M2x5	M2x5	3.0
9/M3	1.5 -0.2	0.3	2.5	0.3	M3x8	M3x8	5.0
9/M2	1.5 -0.2	0.3	2.5	0.3	M2x6	M2x6	4.0
12	2.5 -0.5	0.3	3.5	0.5	M3x8	M3x8	5.0
15	2.8 -0.5	0.5	4.5	0.5	M3x8	M3x10	4.5
20	6.3 -0.5	0.5	6.5	0.5	M4x12	M5x14	6.5
9/M3 B	1.8 -0.2	0.3	2.5	0.3	M3x8	M3x8	5.5
12 B	2.8 -0.5	0.5	3.0	0.4	M3x8	M4x10	4.5
15 B	2.8 -0.5	0.5	4.5	0.5	M4x10	M4x12	6.0

[1] Formerly DIN 912

Tightening torques of the mounting screws

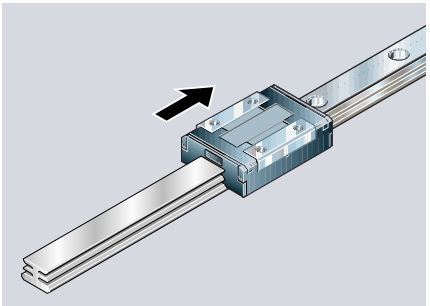
		M2	M3	M4	M5
Nm	A2-70	0.35	1.1	2.0	3.9
	12.9	0.50	2.1	4.6	9.5

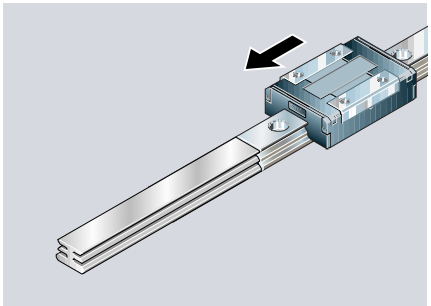
Note on assembly

The runner block is supplied on a plastic mandrel.

- Position the runner block complete with mandrel at the head of the rail and push on: the mandrel will thus be pushed out of the runner block.

When removing the runner block, carry out the above operations in reverse sequence.



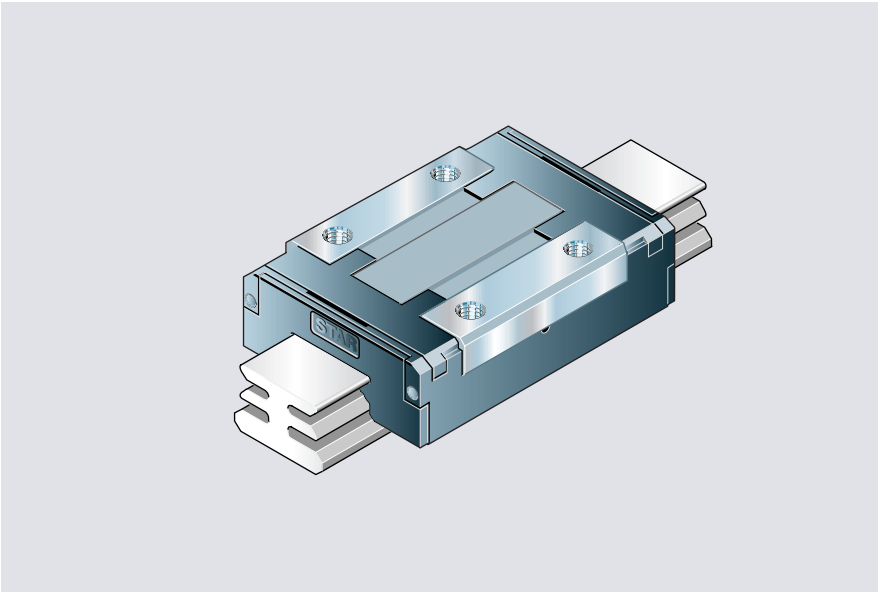


Miniature Ball Rail® Systems
Runner Blocks

Miniature runner blocks
0442-

All steel parts are made of corrosion and acid resistant material similar to DIN 17230 / EN 10088.

Runner blocks are supplied on mandrels.



Part numbers for runner blocks

Standard seals: low-friction seals.
Part numbers: 0442-...**-01** (see table)

Special versions:
Runner blocks are also available:

- with N seals
  (excellent wiping action).
  Sizes 15 and 20 have additional longitudinal seals for full sealing.
  Part numbers: 0442-...**-00**
  (otherwise as per table)
- without basic lubrication for individual lubrication.
  - with N seals and longitudinal seals
    Part numbers: 0442-...**40**
    (otherwise as per table)
  - with low-friction seals
    Part numbers: 0442-...**-41**
    (otherwise as per table)

Take frictional drag of the respective seals into account.
See chapter "Technical Data", section "Friction and seals".

Size	Accuracy class	Part numbers for runner blocks	
		Clearance 9	Preload 1
7	P	-	0442-712-01
	H	0442-793-01	0442-713-01
	N	0442-794-01	-
9/M3	P	-	0442-812-01
	H	0442-893-01	0442-813-01
	N	0442-894-01	-
9/M2	P	-	0442-912-01
	H	0442-993-01	0442-913-01
	N	0442-994-01	-
12	P	-	0442-212-01
	H	0442-293-01	0442-213-01
	N	0442-294-01	-
15	P	-	0442-512-01
	H	0442-593-01	0442-513-01
	N	0442-594-01	-
20	P	-	0442-012-01
	H	0442-093-01	0442-013-01
	N	0442-094-01	-

Note on dynamic load capacities and moments (see table)

The dynamic load capacities and moments are based on 100,000 m travel. However, a travel of just 50,000 m is often taken as a basis. If this is the case, for comparison purposes:
Multiply values C, M_t and M_L from the STAR table by 1.26.

Ordering example 1:

Runner block size 12, accuracy class P, preloaded, standard seals

Ordering data: 0442-212-01

Ordering example 2:

Runner block size 7, accuracy class H, clearance, N seals

Ordering data: 0442-793-00

Ordering example 3:

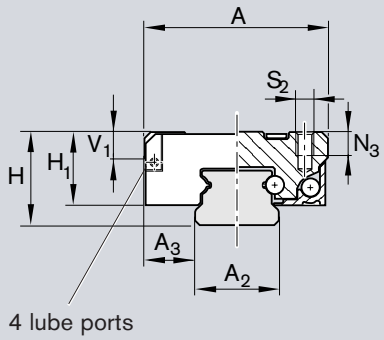
Runner block size 15, accuracy class H, preloaded, N seals and longitudinal sealsno basic lubrication

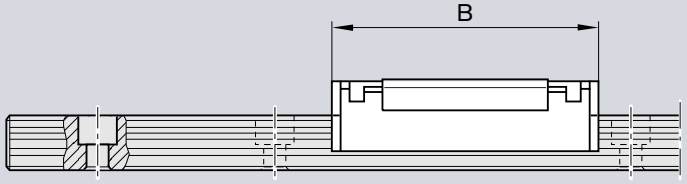
Ordering data: 0442-513-40

Ordering example 4:

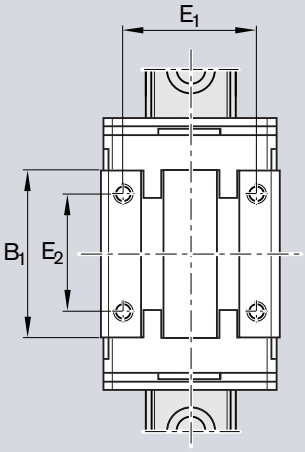
Runner block size 9/M3, accuracy class N, clearance, standard seals, no basic lubrication

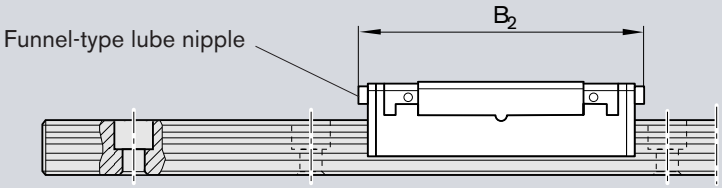
Ordering data: 0442-894-41





Size 7 to 12





Size 15, 20

Size	Dimensions (mm)												
	A	A_2	A_3	B	B_1	B_2	H	H_1	V_1	E_1	E_2	N_3	S_2
7	17	7	5.0	24.0	14.5	Ð	8	6.5	2.0	12	8	2.5	M2
9/M3	20	9	5.5	31.0	20.7	Ð	10	8.0	2.8	15	10	3.5	M3
9/M2	20	9	5.5	31.0	20.7	Ð	10	8.0	2.8	15	13	2.5	M2
12	27	12	7.5	34.8	21.6	Ð	13	10.0	3.3	20	15	3.5	M3
15	32	15	8.5	43.0	27.2	46	16	12.0	4.7	25	20	4.0	M3
20	46	20	13.0	66.0	45.1	69	25	17.5	7.0	38	38	6.0	M4

Size	Weight	Load capacities (N)		Moments (Nm)			
	Runner blocks	C[1]	C_0[1]	M_t[2]	M_{t0}[2]	M_L[2]	M_{L0}[2]
	(g)	dyn.	stat.	dyn.	stat.	dyn.	stat.
7	9	860	1400	3.1	5.1	1.9	3.2
9/M3	16	1180	2100	5.4	9.6	3.6	6.4
9/M2	16	1180	2100	5.4	9.6	3.6	6.4
12	33	2310	3470	13.7	20.6	7.9	11.8
15	47	4200	6260	31.2	46.3	18.3	27.0
20	177	7900	12230	81.4	126.0	51.7	80.0

[1] Calculated values conforming to DIN 636 Part 2
[2] Calculated values (based on C, C_0)

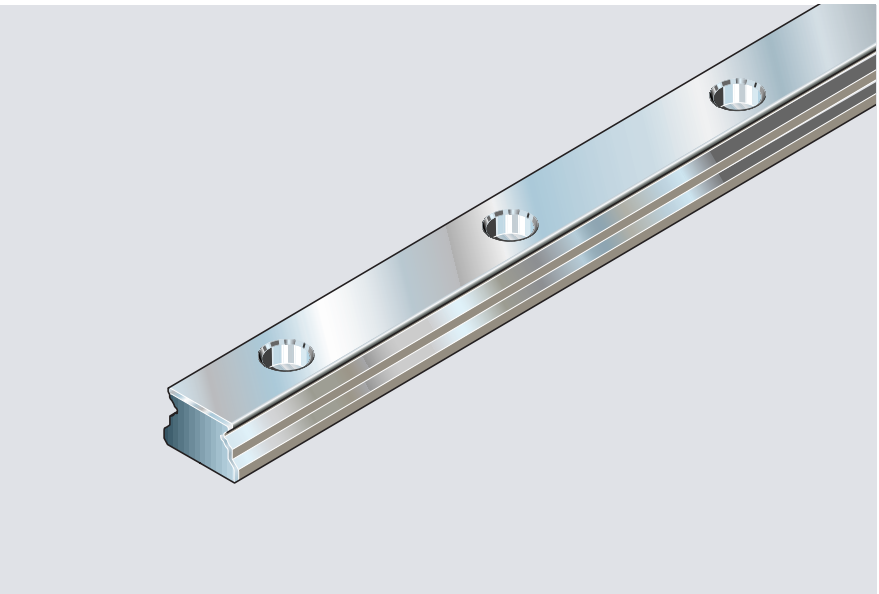
Miniature Ball Rail® Systems
Guide Rails

Miniature guide rails 0445-

Guide rails are made of corrosion and acid resistant material similar to DIN 17230 /EN 10088.

Special versions:
Guide rails size 9/M3 to 20 are also available with Rail Seal® cover strip.
Part numbers:

0445-6.-..
(otherwise as per table)



Part numbers for guide rails

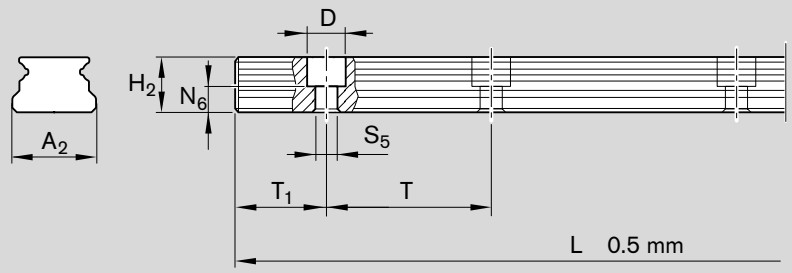
Size	Accuracy class	Part numbers for guide rails Part number, Length L (mm)
7	P	0445-702-31,....
	H	0445-703-31,....
	N	0445-704-31,....
9/M3	P	0445-802-31,....
	H	0445-803-31,....
	N	0445-804-31,....
9/M2	P	0445-902-31,....
	H	0445-903-31,....
	N	0445-904-31,....
12	P	0445-202-31,....
	H	0445-203-31,....
	N	0445-204-31,....
15	P	0445-502-31,....
	H	0445-503-31,....
	N	0445-504-31,....
20	P	0445-002-31,....
	H	0445-003-31,....
	N	0445-004-31,....

Recommended rail lengths

$$L = n_B \bullet T - 4$$

L = rail length (mm)
T = hole spacing (mm)
n_B = number of holes

Dimensions and weights



Guide rail:

Position tolerance of the mounting holes for

- rail length up to 500 mm ⊕ Ø 0.3
- rail length up to 1000 mm ⊕ Ø up to 0.6, increasing in linear proportion

Size	Dimensions (mm)								Weight
	A_2	H_2	N_6	D	S_5	T_{1min}	T	L_{max} [1)]	g/100 mm
7	7	4.7	2.2	4.3	2.5	3.5	15	1000	22
9/M3	9	5.5	2.2	6.0	3.5	4.5	20	1000	33
9/M2	9	5.5	2.5	4.5	2.5	3.5	20	1000	33
12	12	7.8	3.0	6.0	3.5	4.5	25	1000	61
15	15	9.5	4.7	6.0	3.5	4.5	40	1000	97
20	20	15.0	6.5	9.5	6.0	6.5	60	1100	211

[1)] For rail lengths longer than L_{max} factory-made mating sections are joined end-to-end.

Ordering examples

• If no T_1 is specified by the customer, both ends of the guide rail will be identical.

The rail lengths were calculated using the formula for recommended rail lengths.

Example 1 (up to L_{max}):

Guide rail size 12, accuracy class P, recommended rail length 771 mm (30 • T, number of holes $n_B = 31$, T_1 is identical at both ends of the guide rail)

Ordering data: 0445-202-31,771 mm

Example 2 (up to L_{max} with cover strip):

Guide rail size 12 with cover strip, accuracy class P, recommended rail length 771 mm (30 • T, number of holes $n_B = 31$, T_1 at one end of guide rail = 3.5 mm)

Ordering data:
0445-2**6**2-31,771 mm, $T_1 = 3.5$mm)
(At the other end of the guide rail $T_1 = 17.5$ mm for production reasons.)

Example 3 (over L_{max}):

Guide rail size 12, accuracy class N, recommended rail length 1271 mm, **2** sections
(50 • T, number of holes $n_B = 51$, T_1 is identical at both ends of the composite guide rail)

Ordering data: 0445-204-3**2**,1271 mm

Number of sections

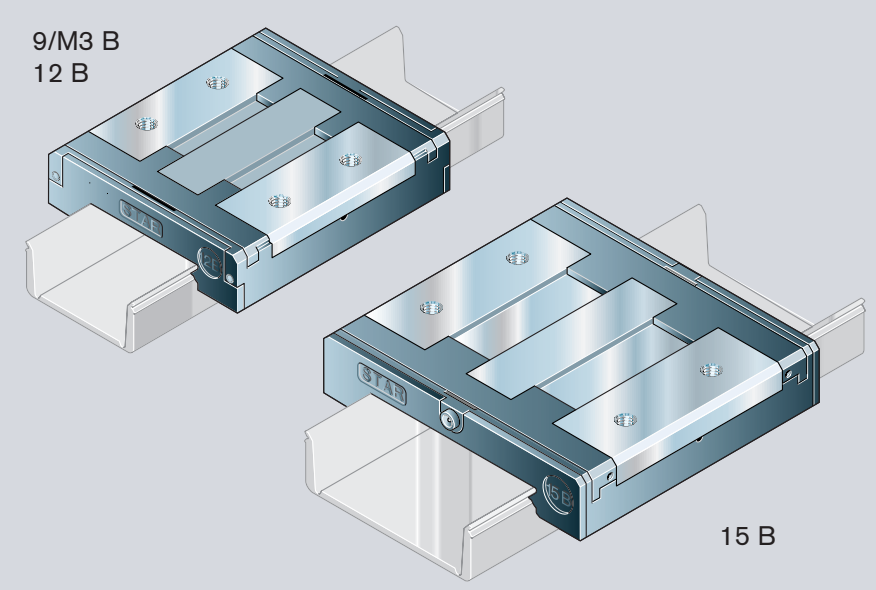
Miniature Ball Rail® Systems
Guide Rails

Miniature runner blocks 0443-

wide

All steel parts are made of corrosion and acid resistant material similar to DIN 17230 / EN 10088.

Runner blocks are supplied on mandrels



Part numbers for runner blocks

Standard seals: low-friction seals.
Part numbers: 0443-...-**01** (see table)

Special versions:
Runner blocks are also available:

- with N seals
  (excellent wiping action) and additional longitudinal seals for full sealing.
  Part numbers: 0443-...-**00**
  (otherwise as per table)
- without basic lubrication for individual lubrication.
  - with N seals and longitudinal seals
    Part numbers: 0443-...-**40**
    (otherwise as per table)
  - with low-friction seals
    Part numbers: 0443-...-**41**
    (otherwise as per table)

Take frictional drag of the respective seals into account.
See chapter "Technical Data", section "Friction and seals".

Size	Accuracy class	Part numbers for runner blocks	
		Clearance 9	Preload 1
9/M3 B	P	-	0443-812-01
	H	0443-893-01	0443-813-01
	N	0443-894-01	-
12 B	P	-	0443-212-01
	H	0443-293-01	0443-213-01
	N	0443-294-01	-
15 B	P	-	0443-512-01
	H	0443-593-01	0443-513-01
	N	0443-594-01	-

1)

Note on dynamic load capacities and moments (see table)

The dynamic load capacities and moments are based on 100,000 m travel. travel. However, a travel of just 50,000 m is often taken as a basis.
If this is the case, for comparison purposes:
Multiply values **C** , $\mathbf{M}_t$ and $\mathbf{M}_L$ from the STAR table by 1.26.

Ordering example 1:

Runner block size 12 B, accuracy class P, preloaded, standard seals

Ordering data: 0443-212-01

Ordering example 2:

Runner block size 12 B, accuracy class H, clearance, N seals

Ordering data: 0443-293-00

Ordering example 3:

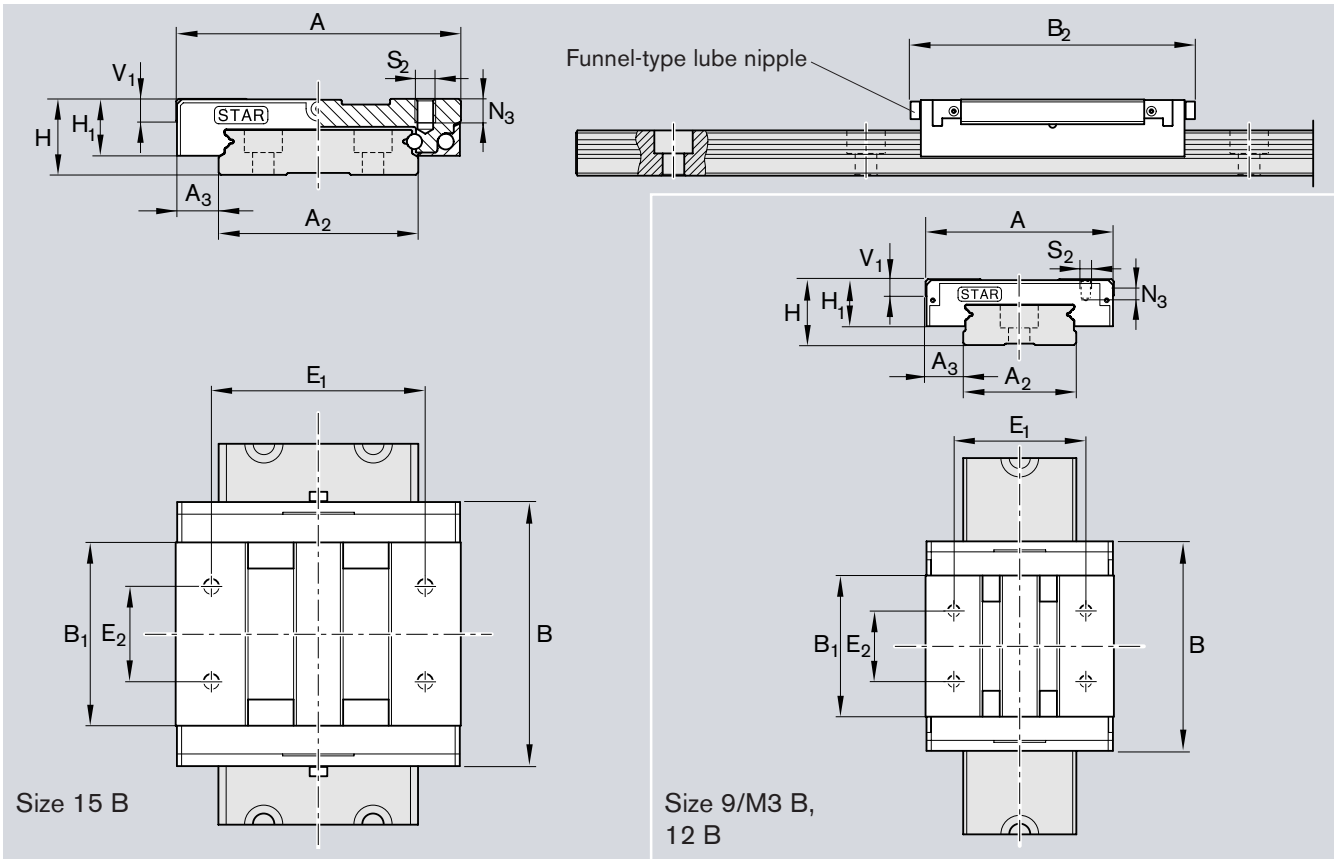
Runner block size 15 B, accuracy class H, preloaded, N seals and longitudinal seals, no basic lubrication

Ordering data: 0443-513-40

Ordering example 4:

Runner block size 9/M3 B, accuracy class N, clearance, standard seals, no basic lubrication

Ordering data: 0443-894-41



Size	Dimensions (mm)												
	A	A_2	A_3	B	B_1	B_2	H	H_1	V_1	E_1	E_2	N_3	S_2
9/M3 B	30	18	6.0	39.0	26.0	-	12	9.0	2.8	21	12	3.2	M3
12 B	40	24	8.0	44.5	30.0	-	14	10.0	3.3	28	15	4.0	M3
15 B	60	42	9.0	55.5	38.6	58.5	16	12.0	4.7	45	20	4.5	M4

Size	Weight	Load capacities (N)		Moments (Nm)			
	Runner blocks	C[1]	C_0[1]	M_t[2]	M_{t0}[2]	M_L[2]	M_{L0}[2]
	(g)	dyn.	stat.	dyn.	stat.	dyn.	stat.
9/M3 B	26	1920	3330	15.9	27.6	7.4	12.9
12 B	51	3200	5340	37.9	63.2	14.3	23.9
15 B	110	5285	8610	107.0	174.0	30.0	49.0

[1] Calculated values conforming to DIN 636 Part 2
[2] Calculated values (based on C, C_0)

Miniature Ball Rail® Systems
Wide guide Rails

Miniature guide rails
0455-

wide

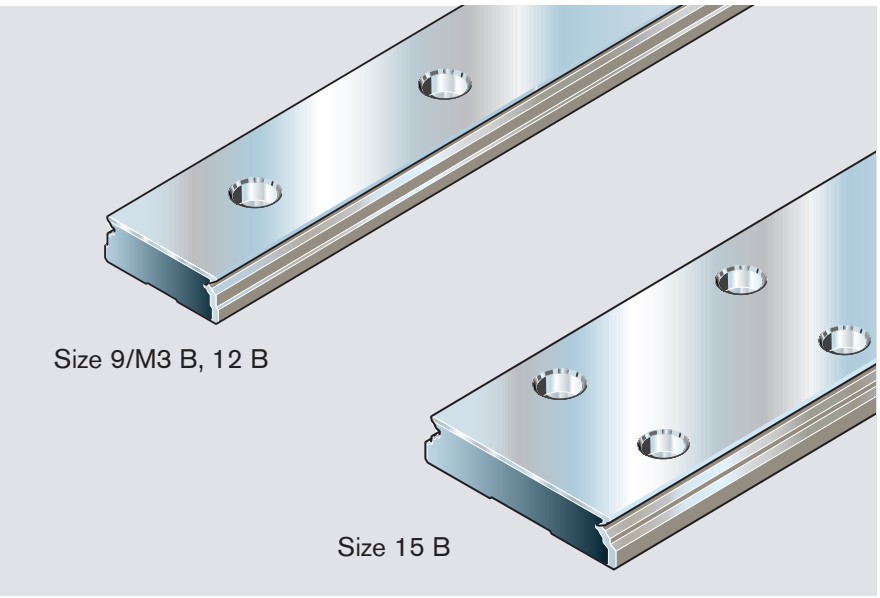
Mounting hole pattern size 9/M3 B, 12 B:
- single row

Mounting hole pattern size 15 B:
- double row

Guide rails are made of corrosion and acid resistant material similar to DIN 17230 / EN 10088.

Special version:
All wide guide rails are also available with Rail Seal® cover strip.
Part numbers:

0455-6.-..
(otherwise as per table)



Part numbers

Size	Accuracy class	Part numbers for wide guide rails Part number, Length L (mm)
9/M3 B	P	0455-802-31,....
	H	0455-803-31,....
	N	0455-804-31,....
12 B	P	0455-202-31,....
	H	0455-203-31,....
	N	0455-204-31,....
15 B	P	0455-502-31,....
	H	0455-503-31,....
	N	0455-504-31,....

Recommended rail lengths

$L = n_B \cdot T - 4$

L = rail length (mm)
T = hole spacing (mm)
n_B = number of holes per row

Ordering examples

• If no T_1 is specified by the customer, both ends of the guide rail will be identical.

The rail lengths were calculated using the formula for recommended rail lengths.

Example 1 (up to L_{max}):

Guide rail size 12 B, accuracy class P, recommended rail length 836 mm (20 • T, number of holes $n_B = 21$, T_1 is identical at both ends of the guide rail)

Ordering data:
0455-202-31, 836 mm

Example 2 (up to L_{max} with cover strip):

Guide rail size 9/M3 B, accuracy class H, recommended rail length 926 mm (30 • T, number of holes $n_B = 31$, at one end of guide rail = 4.5 mm)

Ordering data:
0455-8**6**3-31, 926 mm, $T_1 = 4.5$ mm

(At the other end of the guide rail $T_1 = 21.5$ mm for production reasons.)

Example 3 (over L_{max}):

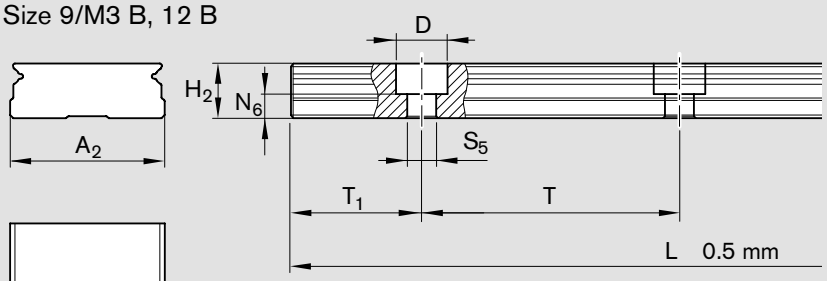
Guide rail size 15 B, accuracy class N, recommended rail length 1436 mm, **2** sections
(35 • T, number of holes $n_B = 36$ per row, T_1 is identical at both ends of the composite guide rail)

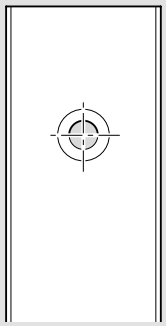
Ordering data: 0455-504-3**2**, 1436 mm

Number of sections

Dimensions and weights

Size 9/M3 B, 12 B





Guide rail:

Position tolerance of the mounting holes for

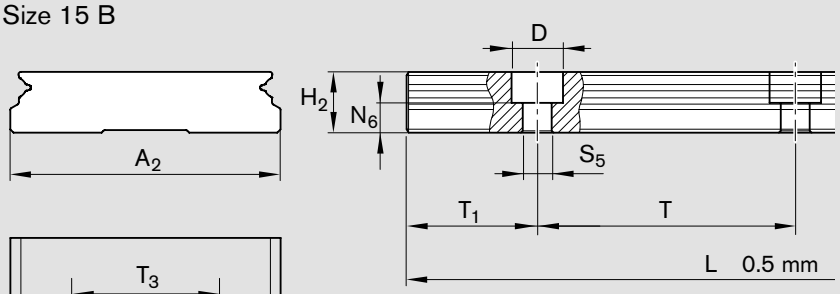
- rail length up to 500 mm

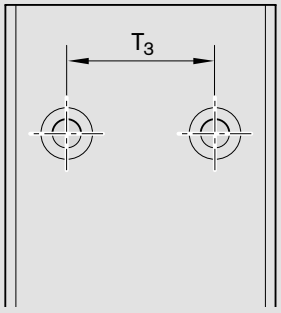
⊕ | Ø 0.3

- rail length up to 1000 mm

⊕ | Ø up to 0.6, increasing in linear proportion

Size 15 B





Guide rail:

Position tolerance of the mounting holes for

- rail length up to 500 mm

⊕ | Ø 0.3

- rail length up to 1000 mm

⊕ | Ø up to 0.6, increasing in linear proportion

Size	Dimensions (mm)									Weight
	A_2	H_2	N_6	D	S_5	T_{1min}	T	T_3	L_{max} [1]	g/100 mm
9/M3 B	18	7.5	2.7	6.0	3.5	4.5	30	-	1000	92
12 B	24	8.5	3.7	8.0	4.5	5.5	40	-	1000	145
15 B	42	9.5	4.7	8.0	4.5	5.5	40	23	1000	286

[1] For rail lengths longer than L_{max} factory-made mating sections are joined end-to-end.

Start-up

Initial lubrication of runner blocks is necessary before our Miniature Ball Rail® Systems are put into service.

Runner blocks are available:

- prelubricated with a lithium soap grease, consistency class NLGI 00
- without initial lubrication for individual grease or oil lubrication

Initial grease lubrication

We recommend a grease lubricant to DIN 51825:

- Lithium soap grease, consistency class NLGI 00 to DIN 51818

Please observe the manufacturer's instructions.

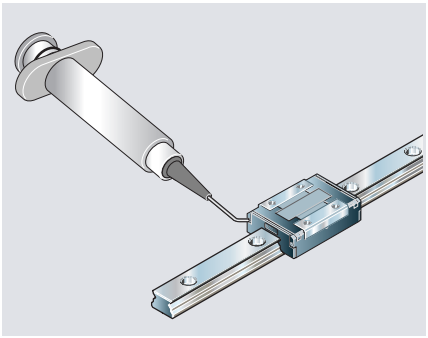
This grease is available in a complete service kit including a syringe.

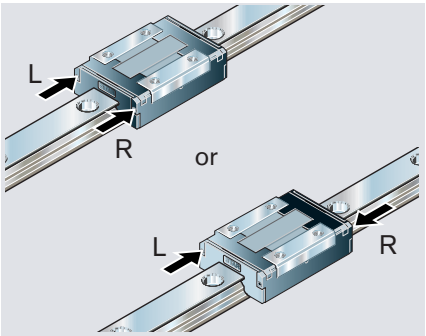
Order number: 0419-090-01

Lubrication methods and quantities for size 7 to 12, 9/M3 B and 12 B

A special syringe is used to apply lubricant to the lube ports on the runner block end faces.

Size	Initial lubrication with grease	
	Partial amount per side (L/R) (cm^3)	Total amount (L+R) (cm^3)
7	0.025	0.05
9/M3	0.030	0.06
9/M2	0.030	0.06
12	0.075	0.15
9/M3 B	0.040	0.08
12 B	0.075	0.15



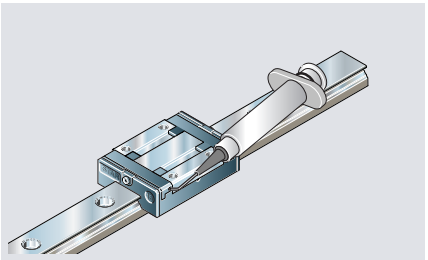


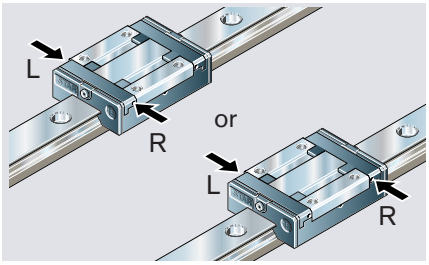
- Grease the runner block per table.
- Move the runner block toward the lube port used to distribute the grease evenly.
- Make sure there is a visible film of grease on the guide rail.

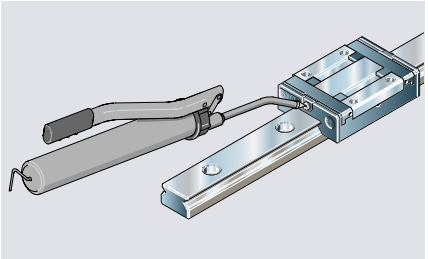
Lubrication methods and quantities for size 15, 20 and 15 B

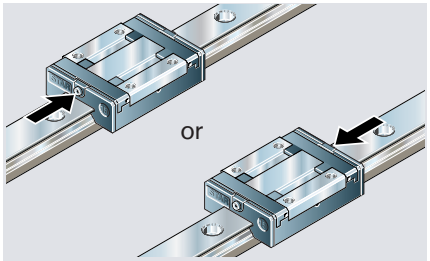
A special syringe is used to apply lubricant to the lube ports at the sides of the runner block. If the funnel-type lube nipples on the runner block end faces are preferred, use a grease gun instead.

Size	Initial lubrication with grease		
	Partial amount per side (L/R) (cm^3)	or	Total amount via end nipple (cm^3)
15	0.040		0.08
20	0.045		0.09
15 B	0.045		0.09









Initial lubrication with oil

We recommend the use of oils meeting the minimum requirements for CLP lubricant oils (DIN 51517, Part 3) or HLP hydraulic oils (DIN 51524, Part 2). The oil must have a viscosity of 100 mm^2/s at 40 C.

- Observe the manufacturer's instructions.
- It is essential to check that the lubricant will reach all rolling bearings in the installed condition (orientation).
- Apply oil until excess emerges.

⚠ Add the entire oil quantity initially!

Maintenance

The maintenance intervals depend on the application and the ambient conditions.

Under normal conditions no in-service lubrication is required.

Cleaning

Dirt can settle and adhere on the guide rails, especially when not enclosed.

This dirt must be removed to protect the seals.

- Always run a cleaning cycle before shutting down the machine.

In-service lubrication

Initial lubrication (long-term lubrication) is sufficient for 5,000 km travel where

- $F < 0.1$ C
- $V_m = 0.65$ m/s
- 90 mm stroke
- low-friction seals

- For in-service lubrication with grease or oil, follow instructions as for initial lubrication.

⚠ The in-service lubrication intervals depend on ambient conditions, loading and type of load!

Ambient conditions include: swarf, metallic and other abrasion, solvents and temperature.
Types of load 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 in-house tests or by careful observation.

⚠ Do not allow guide rails or runner blocks to come into contact with water-based coolants!

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