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 (cm³)		Partial quantity (cm³)		
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 (cm³)		Partial quantity per port (cm³)		
	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

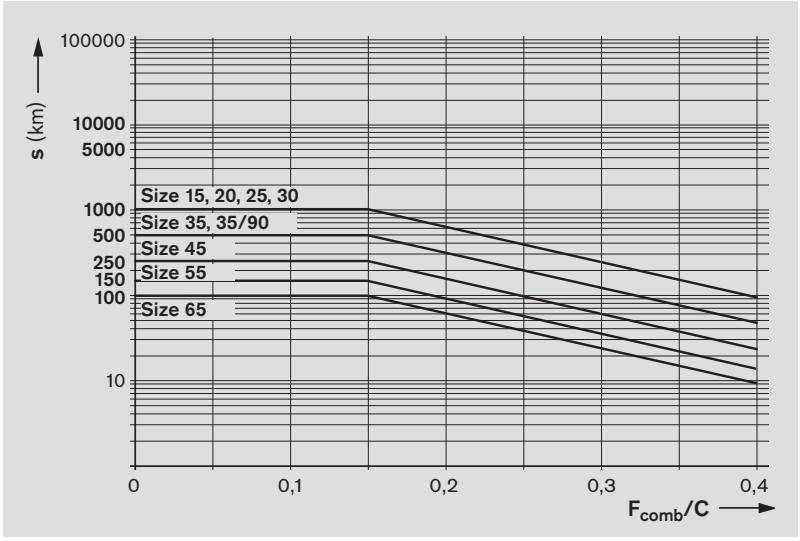
Key to graphs

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.

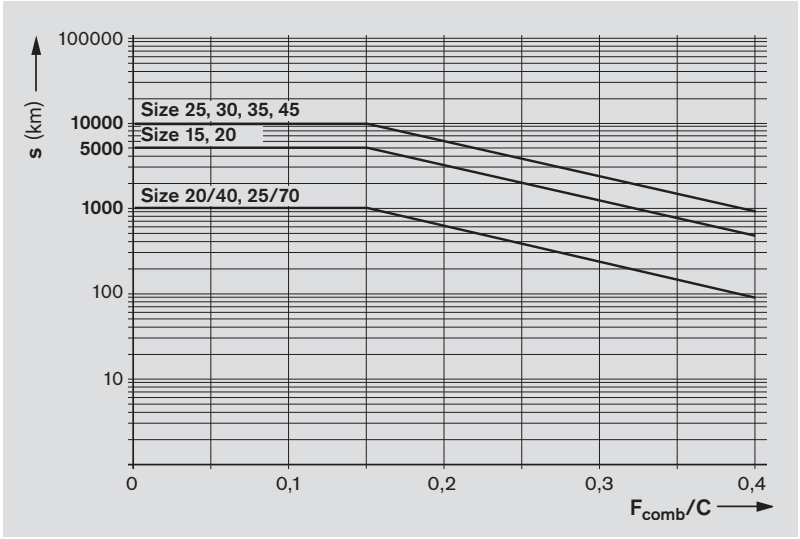
Please consult us regarding the relubrication intervals in the following cases:
- exposure to metalworking fluids
- use of double-lipped seals (DS)
- use of standard seals (SS) in combination with end seals or FKM seals or seal kits

⚠ **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 (cm³)		Partial quantity (cm³)		
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 (cm³)			Partial quantity per port (cm³)		
	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

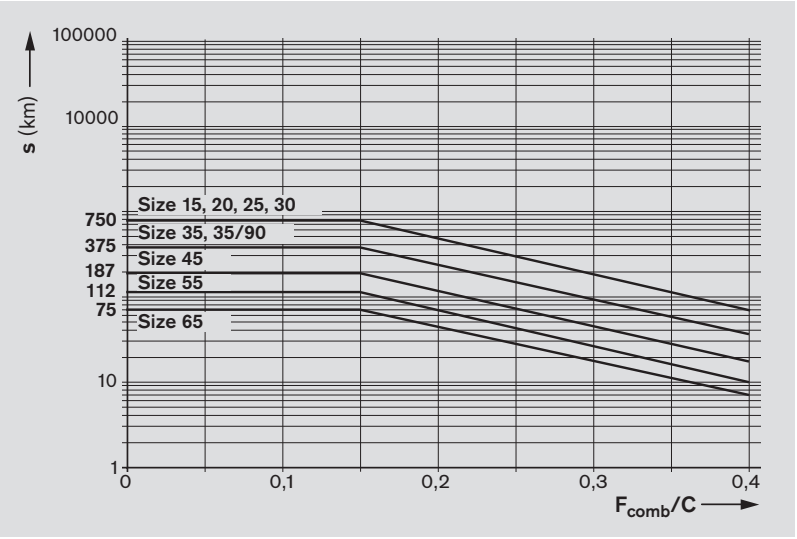
Key to graphs

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.

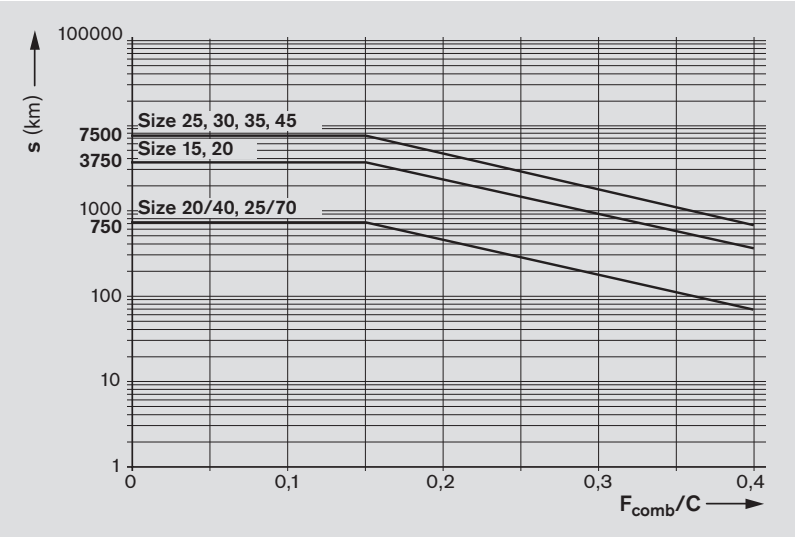
Please consult us regarding the relubrication intervals in the following cases:
- exposure to metalworking fluids
- use of double-lipped seals (DS)
- use of standard seals (SS) in combination with end seals or FKM seals or seal kits

⚠ **Refer to the Notes on Lubrication!** ☞ 244



Graph 3

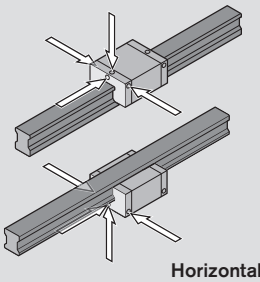
Part number		
R16.. ... 10	R16.. ... 11	R16.. ... 60



Graph 4

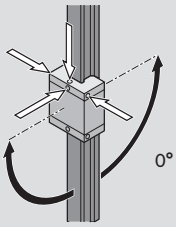
Part number				
R20.. ... 04	R16.. ... 20	R20.. ... 30	R16.. ... 70	R20.. ... 90
R20.. ... 05	R16.. ... 21	R20.. ... 31	R16.. ... 71	
R20.. ... 06	R16.. ... 22	R20.. ... 32	R16.. ... 72	
R20.. ... 07	R16.. ... 23	R20.. ... 33	R16.. ... 73	

Mounting orientation I – normal stroke
Horizontal
1 lube port at **either** of the two end caps



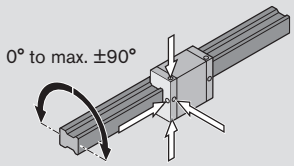
Horizontal, top-down
Same port

Mounting orientation II – normal stroke
Vertical to inclined horizontal
1 lube port at top end cap



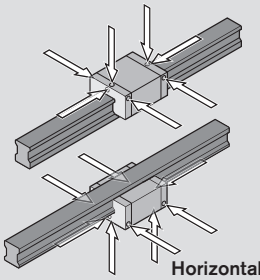
Vertical to inclined horizontal, top-down
Same port

Mounting orientation III – normal stroke
Wall mounting
1 lube port at **either** of the two end caps



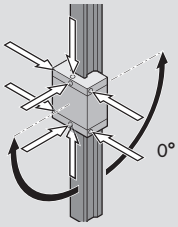
Same port

Mounting orientation IV – short stroke
Horizontal
2 lube ports, one on **each** of the two end caps



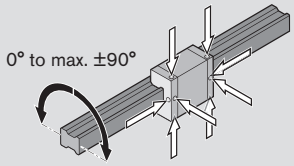
Horizontal, top-down
Same ports

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 (cm³) 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

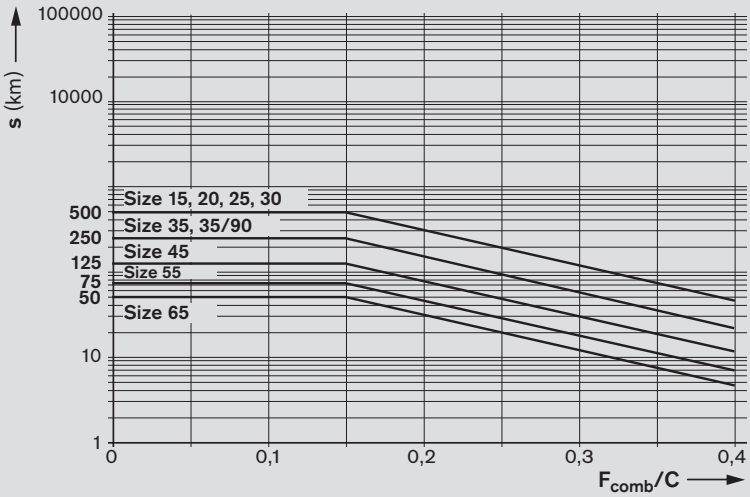
Key to graphs

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.

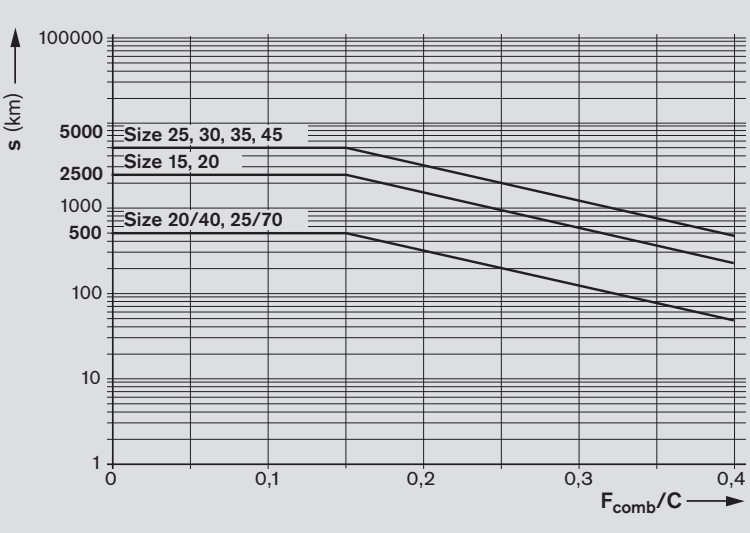
Please consult us regarding the relubrication intervals in the following cases:
- exposure to metalworking fluids
- use of double-lipped seals (DS)
- use of standard seals (SS) in combination with end seals or FKM seals or seal kits

⚠ **Refer to the Notes on Lubrication!** ☞ 244



Graph 5

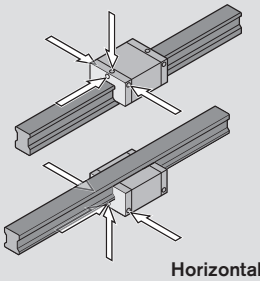
Part number		
R16.. ... 10	R16.. ... 11	R16.. ... 60



Graph 6

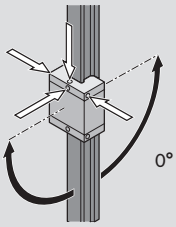
Part number				
R20.. ... 04	R16.. ... 20	R20.. ... 30	R16.. ... 70	R20.. ... 90
R20.. ... 05	R16.. ... 21	R20.. ... 31	R16.. ... 71	
R20.. ... 06	R16.. ... 22	R20.. ... 32	R16.. ... 72	
R20.. ... 07	R16.. ... 23	R20.. ... 33	R16.. ... 73	

Mounting orientation I – normal stroke
Horizontal
1 lube port at **either** of the two end caps



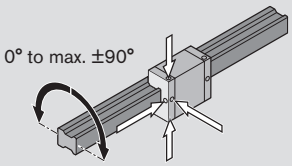
Horizontal, top-down
Same port

Mounting orientation II – normal stroke
Vertical to inclined horizontal
1 lube port at top end cap



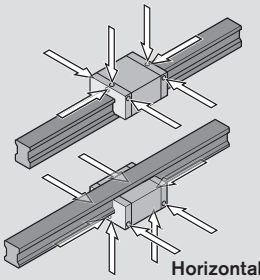
Vertical to inclined horizontal, top-down
Same port

Mounting orientation III – normal stroke
Wall mounting
1 lube port at **either** of the two end caps



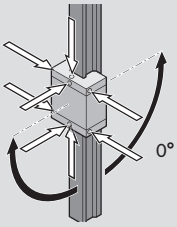
Same port

Mounting orientation IV – short stroke
Horizontal
2 lube ports, one on **each** of the two end caps



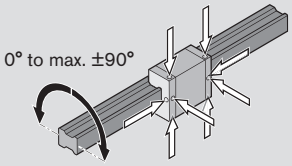
Horizontal, top-down
Same ports

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	0.60	0.60	0.60	0.60	0.60	0.60	1.50	1.50	0.30	0.30	0.60
R16.. ... 11				Vertical II, V											
R16.. ... 60				Wall mount. III, VI											
R20.. ... 04	R16.. ... 20	R20.. ... 30	R16.. ... 70	Horizontal I, IV	0.03	0.03	0.03	0.06	0.10	0.10	-		0.03	0.03	-
R20.. ... 0Z	R16.. ... 2Z	R20.. ... 3Z	R16.. ... 7Z	Vertical II, V											
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)

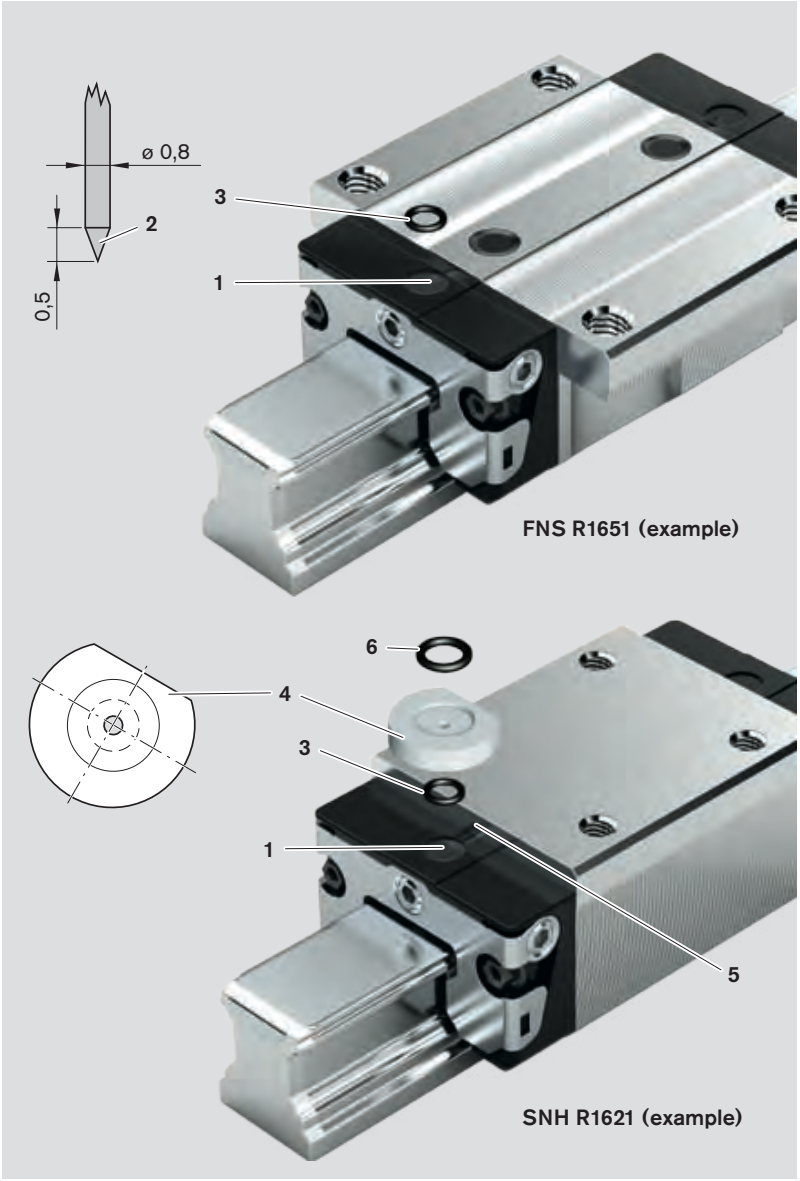
⚠ **In the O-ring recess there is a further pre-formed small recess (1). Do not use a drill to open this. Risk of contamination!**

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).

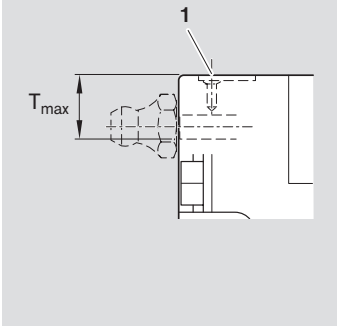
Lubrication from above with lube adapter
(Accessories for Ball Runner Blocks ☞ 159)
A lube adapter is needed for high runner blocks, if lubrication is to be performed through the carriage.

⚠ **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).



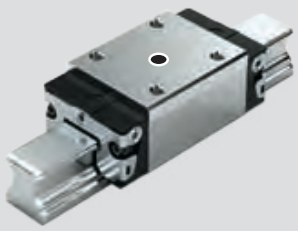
Size	Lube hole at top: Maximum permissible depth for punching open T_{max} (mm)	
	Ball runner block standard height/ high	Ball runner block low profile
15	3.6	–
20	3.9	4.4
25	3.3	4.9
30	6.6	–
35	7.5	–
45	8.8	–
20/40	4.0	–
25/70	2.1	–
35/90	7.9	–



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.