Lubrication

 \triangle Do not use greases containing solid particles (e.g. graphite or MoS₂)!

If other 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.

A If your application makes greater environmental demands (i.e. cleanroom, vacuum, foodstuff application, strong or aggressive metalworking fluids, or extreme temperatures) please contact us, since a special test, and possibly a special lubricant, will be required. Please have all information about your application to hand.

When using in other sectors, e.g.: food industry, clean room, vacuum etc. or at extreme temperatures, or if the lubrication is exposed to process media, the standard initial lubrication and anti-corrosion agents used prior to shipment may not be suitable, or they may be incompatible with the relubrication lubricant. In this case, please consult us in advance!

Even under normal operating conditions, the system must be relubricated at the latest after 2 years due to aging of the grease. Please note the reduced load ratings according to the technical notes.

Recommendation:

In general, you should not apply the lubricant all in one go; rather, apply several smaller amounts.

In the case of a short stroke, (stroke \leq nut length, L), it is advisable to carry out a lubricating stroke more often. In this case, there is a risk, amongst other things, that low-viscosity lubricants drop out.

Please note the information about reducing the load rating in ""Technical notes"" on page 141.

Please consult our regional centers regarding short stroke applications.

You can find your local contact person at: www.boschrexroth.com/contact

Grease lubrication With a grease gun or a progressive lubrication system in the case of Ball Screw Assemblies > Ø 12 mm

Lubricating grease

We recommend using **Dynalub 510** with the following properties:

- NLGI grade 2 lithium-based highperformance grease as per DIN 51818 (KP2K-20 according to DIN 51825)
- Good water resistance
- Corrosion protection
- Temperature range: -20 to +80 °C

Initial lubrication of the Ball Screw Assemblies (basic lubrication)

Fully assembled BASAs with a diameter greater than 12 mm are prelubricated at the factory with Dynalub 510.

Under conventional environmental conditions, this ground-fiber, homogeneous grease is ideally suited for the lubrication of linear elements:

- For loads of up to 50% C
- For short-stroke applications \geq 1 mm
- For the permissible speed range of Ball Screw Assemblies

You can download product and safety data sheets from our website at: www.boschrexroth.de.

Please also observe the information on page 170.

- Material numbers for Dynalub 510:
- R3416 037 00 (cartridge 400 g)
- R3416 035 0 0 (hobbock 25 kg)

When individual parts are supplied (nut on mounting arbor) or with versions without basic lubrication at the factory, you must apply double the quantity of lubricant stated in the "Lubricant quantities - Relubrication" table via the nut's lube hole before commissioning. The positioning and traversing instructions (see figure below) must be complied with.

When using progressive lubrication systems, ensure that all the lines and distributors (including the connection to the BASA nut unit) are filled before carrying out basic lubrication or relubrication.

Positioning and traversing instructions





- 1 Position of the nut during lubrication
- 2 Flange with lube port (if installed horizontally, the port should be at the top if possible)
- 3 Direction of travel after lubrication. Traversing path should be at least 3x the nut length.

Relubricating the Ball Screw Assemblies

If the relubrication interval according to the diagram on page 159 has been reached, relubricate the amount stated in Table "Amount of lubricant for relubrication" on page 160.

In this connection, you must comply with the nut position and traversing path shown in the "Positioning and traversing instructions" illustration.

Load-dependent re-greasing intervals in the case of grease lubrication with a grease gun or a progressive lubrication system in the case of Ball Screw Assemblies > Ø 12 mm ("dry axes")

This applies to the following conditions:

- Dynalub 510 grease or, alternatively, Castrol Longtime PD 2, Elkalub GLS 135/N2 grease
- No exposure to media
- Standard seals
- Driven screws
- Not mission critical operation
- Ambient temperature: T = 20 to 30 °C
- s = relubrication interval

		in millions of revolutions	(106	revolutions)
С	=	dynamic load rating		(N)
F_{m}	=	average load		(N)
d_0	=	nominal diameter		(mm)

Conversion of the relubrication interval s from millions of revolutions to kilometers:





Example:

s in kilometers =	50 · 10 ⁶ (revs) · 16 (mm)	— 8 00 km
	10 ⁶	- — 0,00 km

Notes

The load ratio F_m/C is the quotient of the average load F_m and the dynamic load rating C (see "Calculation").

If you are using a progressive lubrication system, please take into account the minimum metering quantity of 0.03 cm³.

In this connection, please note the general lubrication information on page 157.

Grease lubrication With a grease gun or a progressive lubrication system in the case of Ball Screw Assemblies > Ø 12 mm

Amount of lubricant for relubrication

Size	Amount of lubricant for relubrication (cm ³)			
		EAD_B_C1)	ZEV-E-S	EDM-E-C / EDM-E-S
	CEM-E-C / CEM-E-C / TEM-E-C / TEM-E-K / TEM-E-A	FAR-D-3"	220-2-3	FDWI-E-C / FDWI-E-S
16x5Dx2 - 2	SEMI-E-C/ SEMI-E-S/ ZEMI-E-S/ ZEMI-E-K/ ZEMI-E-A		0.0	
16x5D/Lv2 4	- 0.70	-	0.9	1.75
10x3R/LX3 - 4	0.70	-	-	1.75
16x10RX3 - 3	0.85	-	1.10	-
10X 10RX3 - 2	0.95	-	-	-
10x 10Rx3 - 3	1.20	-	-	
16X 16RX3 - 6	1.35	-	-	-
20x5R/Lx3 - 4	1.00	-	1.30	2.95
20x5Rx3 - 5	1.15	-	-	-
20x10Rx3 - 4	1.50	-	-	-
20x20Rx3.5 - 2	1.85	-	-	-
20x20Rx3.5 - 3	2.40	-	-	-
20x20Rx3.5 - 6	2.50	-	-	-
20x40Rx3.5 - 4	1.75	-	-	-
25x5R/Lx3 - 4	1.50	-	-	3.50
25x5Rx3 - 7	-	-	1.95	-
25x10Rx3 - 4	1.85	-	-	4.15
25x10Rx3 - 5	-	-	2.05	-
25x25Rx3.5 - 2	2.65	-	-	-
25x25Rx3.5 - 3	3.45	-	-	-
25x25Rx3.5 - 4.8	1.65	-	-	-
25x25Rx3.5 - 6	3.90	-	-	-
32x5Lx3.5 - 4	2.50	-	-	-
32x5Rx3.5 - 4	2.15	-	-	4.90
32x5Rx3.5 - 5	-	-	2.40	-
32x10Rx3.969 - 5	3.05	3.5	3.25	6.65
32x20Rx3.969 - 2	2.80	-	-	-
32x20Rx3.969 - 3	3.55	4.0	-	-
32x20Rx3.969 - 6	3.70	-	-	-
32x32Rx3.969 - 2	4.05	-	-	-
32x32Rx3.969 - 3	5.45	6.0	-	-
32x32Rx3.969 - 4.8	2.85	-	-	-
32x32Rx3.969 - 6	6.20	-	-	-
32x64Rx3.969 - 4	3.35	-	-	-
40x5Lx3.5 - 5	3.35	-	-	-
40x5Rx3.5 - 5	2.95	-	-	7.60
40x10Lx6 - 4	6.50	-	-	-
40x10Rx6 - 4	6.65	-	-	16.75
40x10Rx6 - 5	7.70	8.4	-	-
40x10Rx6 - 6	8.15	-	-	19.70
40x12Rx6 - 4	6.75	-	-	-
40x16Rx6 - 4	9.15	-	-	21.35
40x20Rx6 - 3	8.70	9.8	-	20.55
40x20Rx6 - 8	9.35	-	_	_
40x25Rx6 - 4	10.84	-	-	-
40x25Rx6 - 8	10.99	-	-	
40x30Rx6 - 4	11.95	-	-	-
40x30Rx6 - 8	12.29	_	-	
40x40Rx6 - 2	10.40	-	_	_
40x40Rx6 - 3	14.30	16.1	_	_
40x40Rx6 - 6	15.00	-	-	-

Size	Amount of lubricant for relubrication (cm ³)			
	FED-E-B / FEM-E-B / FEM-E-C / FEM-E-S / FEP-E-S	FAR-B-S ¹⁾	ZEV-E-S	FDM-E-C / FDM-E-S
d ₀ x P x D _w - i	SEM-E-C / SEM-E-S / ZEM-E-S / ZEM-E-K / ZEM-E-A			
50x5Rx3.5 - 5	4.65	-	-	11.70
50x10Rx6 - 4	-	-	-	21.90
50x10Rx6 - 6	10.75	12.2	-	25.55
50x12Rx6 - 6	11.60	-	-	-
50x16Rx6 - 6	16.15	-	-	-
50x20Rx6.5 - 3	12.65	-	-	-
50x20Rx6.5 - 5	17.35	19.5	-	34.75
50x20Rx6.5 - 8	9.90	-	-	-
50x30Rx6.5 - 4	14.73	-	-	-
50x30Rx6.5 - 8	14.81	-	-	
50x25Rx6.5 - 6	10.45	-	-	-
50x40Rx6.5 - 2	15.45	-	-	-
50x40Rx6.5 - 3	20.65	23.3	-	-
50x40Rx6.5 - 6	19.15	-	-	-
63x10Rx6 - 4	-	-	-	25.55
63x10Rx6 - 6	12.15	13.8	-	30.00
63x20Rx6.5 - 3	15.45	-	-	-
63x20Rx6.5 - 5	21.35	24.0	-	43.75
63x20Rx6.5 - 8	14.35	-	-	-
63x40Rx6.5 - 2	18.90	-	-	-
63x40Rx6.5 - 3	25.40	28.7	-	-
63x40Rx6.5 - 6	26.95	-	_	-
80x10Rx6.5 - 6	19.10	-	-	66.00
80x20Rx12.7 - 6	65.50	-	-	132.75

 Grease can be applied to the driven nut via the outer ring of the angular-contact thrust ball bearing. The only thing to observe is that the nut must stand still during the lubrication process. The nut may be positioned anywhere on the screw during this process. This easily solves the problem of a rotating lube fitting on the nut. Two lube fittings (M6) with radial or axial access are provided. Condition on delivery: both sealed by setscrews. The desired lube port can be opened by removing the set screw.

Note: The sizes that are listed in the table are not available for all nut types. You can find the respective size range in the chapter entitled "Nuns" from page 24 onward.

Liquid grease lubrication with a single-line piston distributor system and Liquid grease lubrication with Ball Screw Assemblies ≤ 0 12 mm

Lubricating grease

We recommend using **Dynalub 520** with the following properties:

- Lithium-based, high-performance grease of NLGI grade 00 according to DIN 51818 (GP00K-20 according to DIN 51826)
- Good water resistance
- Corrosion protection
- Temperature range: -20 to +80 °C
- R3416 042 00 (bucket 5 kg)

R0419 090 01 (5 ml maintenance kit)
Initial lubrication of the Ball Screw
Assemblies (basic lubrication)

Fully assembled BASAs with a diameter less than or equal to 12 mm are prelubricated at the factory with Dynalub 520. Under conventional environmental conditions, this ground-fiber, homogeneous grease is ideally suited for the lubrication of linear elements:

- In single-line one-point lubrication systems
- For loads of up to 50% C
- For short-stroke applications \geq 1 mm
- For the permissible speed range of Ball Screw Assemblies

When individual parts are supplied (nut on mounting arbor) or with versions without basic lubrication at the factory, you must apply double the quantity of lubricant stated in table "Amount of lubricant for relubrication" on page 164 via the nut's lube hole before commissioning. With miniature versions

You can download product and safety data sheets from our website at: www.boschrexroth.de. Please also observe the information on page 170.

Material numbers for Dynalub 520: - R3416 043 00 (cartridge 400 g)

The positioning and traversing instructions in the illustration below must be complied with. When using single-line distributor systems, care should be taken that all lines and the piston distributors (including the connection to the BASA nut) are filled before performing basic lubrication or relubrication. In the case of Ball Screw Assemblies $\leq \emptyset$ 12 mm, it is advisable to use the maintenance set.

Positioning and traversing instructions





- 1 Position of the nut during lubrication
- 2 Flange with lube port (if installed horizontally, the port should be at the top if possible)
- 3 Direction of travel after lubrication. Traversing path should be at least 3x the nut length.

Relubricating the Ball Screw Assemblies

Apply the relubrication quantity according to Table "Amount of lubricant for relubrication" on page 164 to the lube port until the specified relubrication interval shown in the diagram on page 163 has been reached. The pulse count that is needed for this is the integer quotient of the relubrication amount according to table "Amount of lubricant for relubrication" on page 164 and the piston distributor size.

In this connection, you must ensure that the smallest piston distributor size of 0.03 cm³ is not fallen short of.

The lubricant cycle time can then be obtained by dividing the relubrication interval by the calculated pulse count. In this connection, you must comply with the nut position and traversing path shown in the "Positioning and traversing instructions" illustration. load-dependent re-greasing intervals in the case of a single-line piston distributor system and liquid grease lubrication with Ball Screw Assemblies $\leq Ø$ 12 mm ("dry axes")

This applies to the following conditions:

- Dynalub 520 grease or, alternatively, Castrol Longtime PD 00, Elkalub GLS 135/N00 grease
- No exposure to media
- Standard seals
- Driven screws
- Not mission critical operation
- Ambient temperature: T = 20 to 30 °C



s in kilometers = $\frac{s \text{ in millions (of revs)} \cdot \text{lead P (mm)}}{10^6}$

Example:

$$\frac{37,5 \cdot 10^6 \text{ (revs)} \cdot 16 \text{ (mm)}}{10^6} = 600$$

0.2

0.3

km

Notes

The load ratio F_m/C is the quotient of the average load F_m and the dynamic load rating C (see "Calculation").

When using a single-line distributor system, you must ensure that the smallest piston distributor size of 0.03 cm³ is not fallen short of.

(M revolutions)

 $d_0 \leq \emptyset 40 \text{ mm}$

 $d_0 > 040$ mm

0.1

s

100.0

37.5

7.5

1.0

0

We recommend using piston distributors from SKF. They should be installed as close as possible to the lube ports of the Ball Screw Assembly nut.

Long lines and small line diameters should be avoided, and the lines should be laid on an upward slant. If other consumers are connected to the single-line centralized lubrication system, the weakest link in the chain determines the lubrication cycle time.

Pumping or storage tanks for the lubricant should be fitted either with a stirrer or a follower piston to guarantee the flow of lubricant (to avoid funneling in the tank).

In this connection, please note the general lubrication information on page 157.

F_m/C

0.4

164 **Screw Assemblies** | Ball Screw Assemblies BASA Lubrication

Amount of lubricant for relubrication

Size	Amount of lubricant for relubrication (cm ³)			
	FED-E-B / FEM-E-B / FEM-E-C / FEM-E-S / FEP-E-S	ZEV-E-S	FDM-E-C / FDM-E-S	
d _o x P x D _w - i	SEM-E-C / SEM-E-S / ZEM-E-S / ZEM-E-K / ZEM-E-A			
6x1Rx0.8-3	0.05	-	_	
6x2Rx0.8-3	0.05	-	_	
8x1Rx0.8-4	0.06	-	_	
8x2Rx1.2-4	0.07	-	_	
8x2.5Rx1.588-3	0.11	-	_	
8x5Rx1.588-3	0.12	-	_	
12x2Rx1.2-4	0.17	_	_	
12x5Rx2-3	0.33	0.33	_	
12x10Rx2-2	0.33	0.33	_	
16x5Rx3-3	-	0.90	_	
16x5R/Lx3-4	0.70	-	1.75	
16x10Rx3-3	0.85	1.10	_	
16x16Rx3-2	0.95	_	_	
16x16Rx3-3	1.20	_	_	
16x16Rx3-6	1.35	_	_	
20x5R/Lx3-4	1.00	1.30	2.95	
20x5Rx3-5	1.15	_	-	
20x10Rx3-4	1.50	_	_	
20x20Rx3.5-2	1.85	_	_	
20x20Rx3.5-3	2.40	_	_	
20x20Rx3.5-6	2.50	_	_	
20x40Rx3.5-4	1.75	_	-	
25x5R/Lx3-4	1.50	_	3.50	
25x5Rx3-7	-	1.95	_	
25x10Rx3-4	1.85	_	4.15	
25x10Rx3-5	-	2.05	_	
25x25Rx3.5-2	2.65	-	_	
25x25Rx3.5-3	3.45	-	-	
25x25Rx3.5-4.8	1.65	-	_	
25x25Rx3.5-6	3.90	-	_	
32x5Lx3.5-4	2.50	-	_	
32x5Rx3.5-4	2.15	-	4.90	
32x5Rx3.5-5	-	2.40	_	
32x10Rx3.969-5	3.05	3.25	6.65	
32x20Rx3.969-2	2.80	-	-	
32x20Rx3.969-3	3.55	-	-	
32x20Rx3.969-6	3.70	_		
32x32Rx3.969-2	4.05		_	
32x32Rx3.969-3	5.45		_	
32x32Rx3.969-4.8	2.85			
32x32Rx3.969-6	6.20			
32x64Rx3.969-4	3.35		_	
40x5Lx3.5-5	3.35	_	-	
40x5Rx3.5-5	2.95		7.60	
40x10Lx6-4	6.50	_	-	
40x10Rx0-4	0.00		16.75	
40x10Rx6-5	7.70	_	-	
40x10Rx6-6	8.15	-	19.70	
40x12KX0-4	0.75	-	-	
40X10KX0-4	9.10		21.30	
40x20Kx0-3	0.25		20.55	
40x20Fx0-8	9.30			
40x20RX0-0	10.00			
40130100-8	12.20	-		

Size	Amount of lubricant for relubrication (cm ³)	ZEV-E-S	FDM-F-C / FDM-F-S
d ₀ x P x D _w - i	SEM-E-C / SEM-E-S / ZEM-E-S / ZEM-E-K / ZEM-E-A		
40x40Rx6-2	10.40	-	-
40x40Rx6-3	14.30	_	_
40x40Rx6-6	15.00	-	_
50x5Rx3.5-5	4.65	-	11.70
50x10Rx6-4	_	-	21.90
50x10Rx6-6	10.75	_	25.55
50x12Rx6-6	11.60	_	_
50x16Rx6-6	16.15	-	_
50x20Rx6.5-3	12.65	_	_
50x20Rx6.5-5	17.35	_	34.75
50x20Rx6.5-8	9.90	-	_
50x25Rx6.5-6	10.45	-	_
50x30Rx6.5-6	14.80	-	_
50x40Rx6.5-2	15.45	-	_
50x40Rx6.5-3	20.65	_	_
50x40Rx6.5-6	19.15	-	_
63x10Rx6-4	-	-	25.55
63x10Rx6-6	12.15	-	30.00
63x20Rx6.5-3	15.45	-	_
63x20Rx6.5-5	21.35	-	43.75
63x20Rx6.5-8	14.35	-	_
63x40Rx6.5-2	18.90	-	_
63x40Rx6.5-3	25.40	-	_
63x40Rx6.5-6	26.95	-	_
80x10Rx6.5-6	19.10	-	66.00
80x20Rx12.7-6	65.50	-	132.75

Note: The sizes that are listed in the table are not available for all nut types. You can find the respective size range in the chapter entitled "Nuns" from page 24 onward.

Oil lubrication with a single-line piston distributor system

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

Initial lubrication of the Ball Screw Assemblies (basic lubrication)

Fully assembled BASAs with a diameter less than or equal to 12 mm are prelubricated at the factory with Dynalub 520.

Fully assembled BASAs with a diameter greater than 12 mm are prelubricated at the factory with Dynalub 510.

When individual parts are supplied (nut on mounting arbor) or in the case of special designs without basic lubrication at the factory, you must apply double the quantity of lubricant stated in table "Amount of lubricant for oil lubrication" on page 167 via the nut's lube hole before commissioning. The positioning and traversing instructions in the illustration below must be complied with. When using single-line distributor systems, care should be taken that all lines and the piston distributors (including the connection to the BASA nut) are filled before performing basic lubrication or relubrication.

Positioning and traversing instructions



1 Position of the nut during lubrication

2 Flange with lube port (if installed horizontally, the port should be at the top if possible)

3 Direction of travel after lubrication. Traversing path should be at least 3x the nut length.

Relubricating the Ball Screw Assemblies

Apply the relubrication quantity according to Table "Amount of lubricant for oil lubrication" on page 167 to the lube port until the specified relubrication interval in the diagrams on page 167 has been reached. The pulse count that is needed for this is the integer quotient of the relubrication amount according to table "Amount of lubricant for oil lubrication" on page 167 and the piston distributor size.

In this connection, you must ensure that the smallest piston distributor size of 0.03 $\rm cm^3$ is not fallen short of.

The lubricant cycle time can then be obtained by dividing the relubrication interval by the calculated pulse count.

In this connection, you must comply with the nut position and traversing path shown in the "Positioning and traversing instructions" illustration.

Amount of lubricant for oil lubrication

Note:

In the case of double-threaded FED-E-B single flange nuts and oil lubrication, the values in the tables do not apply! Please consult with us!

Nominal diameter	Initial lubrication	Nominal dia
d ₀ (mm)	V _e (cm ³)	
6/8/12/16	0.3	6 /
20 / 25 / 32	0.6	2
40	2.0	
50 / 63	4.0	
80	8.0	

Iominal diameter	Relubrication
d ₀ (mm)	V _n (cm ³)
6 / 8 / 12 / 16	0.03
20 / 25 / 32	0.06
40	0.40
50 / 63	0.80
80	1.60

Load-dependent lubrication in the case of oil lubrication with single-line piston distributor systems ("dry axes")

This applies to the following conditions:

- Lubricating oil is Shell Tonna S 220
- No exposure to media
- Standard seals
- Driven screws
- Not mission critical operation
- Ambient temperature: T = 20 to 30 °C

S	=	relubrication interval in millions of revolutions or hours	10 ⁶ rev. (h)
С	=	dynamic load rating	(N)
Fm	=	average load	(N)

Notes

The load ratio F_m/C is the quotient of the average load F_m and the dynamic load rating C (see "Calculation").

The relubrication interval **s** is defined either by the number of revolutions in millions or the operating time in **h**.

The value that is reached first defines the lubrication interval.

Conversion of the relubrication interval s from millions of revolutions to kilometers:







Example:

s in kilometers = $\frac{1.3 \cdot 10^6 \text{ (revs)} \cdot 16 \text{ (mm)}}{10^6} = 20.8 \text{ km}$

Oil lubrication with a single-line piston distributor system

Notes

When using a single-line distributor system, you must ensure that the smallest piston distributor size of 0.03 cm³ is not fallen short of.

We recommend using piston distributors from SKF. They should be installed as close as possible to the lube ports of the Ball Screw Assembly nut.

Long lines and small line diameters should be avoided, and the lines should be laid on an upward slant.

If other consumers are connected to the single-line centralized lubrication system, the weakest link in the chain determines the lubrication cycle time.

In this connection, please note the general lubrication information on page 157.

Design example of lubrication a typical two-axis application using central lubrication X axis

Component or characteristic value	Specifications
Ball Screw Assembly	FEM-E-S 32x10Rx3.969-5; C = 38000 N; Part no.: R 1512 340 13 (page 34)
Average load.	F _m = 9 510 N
Stroke	1,000 mm
Average speed	n _m = 1,000 rpm
Ambient temperature	20 to 30 °C
Mounting orientation	Horizontal
Lubrication	Single-line distributor system for all axes with Shell Tonna S 220 oil
Exposure	No exposure to media, chips, dust

Design sizes	Design	Sources of information	
1. Normal stroke or short stroke	Normal stroke: Stroke > nut length L; 1,000 mm > 77 mm!	For short stroke information, see page 141, for L	
	i.e. normal stroke applies!	see page 34	
2. Initial lubrication amount	Initial lubrication amount:	See basic lubrication on page page 160	
	At the factory with Dynalub 510		
3. Relubrication amount	Relubrication amount: 0.06 cm ³	Relubrication amount from table page 160	
4. Mounting orientation	Pay attention to the positioning and traversing instructions	see "Positioning and traversing instructions" on page 158	
	for the horizontal mounting orientation!		
5. Piston distributor size	Permitted piston distributor size: 0.03 cm ³	see page 159	
6. Number of pulses	Number of pulses -0.06 cm^3	Relubrication amount	
	Number of pulses $-\frac{1}{0.03 \text{ cm}^3}$ - 2	Permissible piston distributor size	
7. Load ratio	9,510 N 9,510 N	F _m	
	$=\frac{1}{38,000 \text{ N}} = 0.25$	Load ratio = C	
		F _m and C from specifications	
8. Relubrication interval	Relubrication interval: 0.38 · 10 ⁶ revs or every 3.8 h	From diagram on page 159 167 with a load ratio of 0.25	
9. Effective relubrication interval	Since at $n_m = 1,000$ rpm the $0.38 \cdot 10^6$ revs is only	n _m from specifications is the effective relubrication	
	reached after 6.33 h, the read-off 3.8 h is effective as the	interval, see the "Note" on page 165	
	lubrication interval.		
10. Lube cycle	Lube cycle $-\frac{4h}{2}$	Eff. Relubrication interval	
	2	Number of pulses	

Interim result (X-axis) In the case of the X-axis, the system must supply the nut of the Ball Screw Assembly with a minimum amount of 0.03 cm³ of Shell Tonna S 220 every two hours.

Y axis

Component or characteristic value	Specifications			
Ball Screw Assembly	FEM-E-C 16x16Rx3-3; C = 11,200 N; Part no.: R 1502 060 65 (page 36)			
Average load. F _m = 1,200 N				
Stroke	500 mm			
Average speed	n _m = 1,500 rpm			
Ambient temperature	20 to 30 °C			
Mounting orientation	Horizontal			
Lubrication	Single-line distributor system for all axes with Shell Tonna	S 220 oil		
Exposure	No exposure to media, chips, dust			
Design sizes	Design	Sources of information		
1. Normal stroke or short stroke?	Normal stroke: Stroke > nut length L; 500 mm > 61 mm!	For short stroke information, see page 141, for L see		
	i.e. normal stroke applies!	page 36		
2. Initial lubrication amount	Initial lubrication amount:	See basic lubrication on page page 164		
	At the factory with Dynalub 510			
3. Relubrication amount	Relubrication amount: 0.03 cm ³	Relubrication amount from table page 167		
4. Mounting orientation	Pay attention to the positioning and traversing instruc-	see "Positioning and traversing instructions" on page 166		
	tions for the horizontal mounting orientation!			
5. Piston distributor size	Permitted piston distributor size: 0.03 cm ³	see page 164		
6. Number of pulses	Number of pulses $=\frac{0.03 \text{ cm}^3}{1000000000000000000000000000000000000$	Number of pulses - Relubrication amount		
	0.03 cm ³	Permissible piston distributor size		
7. Load ratio	Load ratio $= \frac{1,200 \text{ N}}{11,200 \text{ N}} = 0.11$	Load ratio $= \frac{F_m}{C}$		
		F _m and C from specifications		
8. Relubrication interval	Relubrication interval: 1.3 · 10 ⁶ revs or every 10 h	From diagram on page 167 with a load ratio of 0.11		
9. Effective relubrication interval Since at $n_m = 1,500$ rpm the $1.3 \cdot 10^6$ revs is only		n _m from specifications is the effective relubrication inter-		
	reached after 14.4 h, the read-off 10 h is effective as the	val, see the "Note" on page page 165		
	lubrication interval.			
10. Lube cycle	Lube cycle = $\frac{10 \text{ h}}{10 \text{ m}}$ 10 h	Eff. relubrication interval		
		Number of pulses		

Interim result (Y-axis)

In the case of the Y-axis, the system must supply the nut of the Ball Screw Assembly with a minimum amount of 0.03 $\rm cm^3$ of Shell Tonna S 220 every ten hours.

Final result (Two-axis lubrication) Since the axes in this example are both to be supplied by a single-line distributor system, the X-axis – with its lower (two-hour) lubrication cycle – determines the overall lubrication cycle of the system, i.e. the Y-axis is lubricated every two hours too.

Lubricants

Dynalub high-performance lubricant for linear motion technology

(Approved in the countries of the EU only; not approved outside of the EU)

Product description of Dynalub 510

Part number	Packaging unit
R3416 037 00	1 x 400 g
R3416 035 00	Hobbock 25 kg

Dynalub 510 is a lithium-based high-performance grease of NLGI grade 2 that has been specially designed for linear motion technology applications. It is characterized by its good water resistance and corrosion protection properties and can be used at temperatures ranging from -20 °C to +80 °C.

Application area

Under conventional environmental conditions, this ground-fiber, homogeneous grease is ideally suited for the lubrication of linear elements:

- At loads of up to 0.5 C_{dyn}
- Also with short-stroke applications ≥ 1 (mm)

Technical data

For additional information, see the "Dynalub 510 safety data sheet" R310DE 2052 (2004.04)

Mineral base oil, special lithium soap, active ingredients		
KP2K-20	DIN 51 825	
Light brown-beige, ground-fiber		
-20 °C to +80 °C		
2		
265-295 1/10 mm	DIN ISO 2137	
0-60, 1-90	DIN 51 807 T1	
> 165	DIN ISO 2176	
> 200 base oil	DIN ISO 2592	
100 mm ² /s 40 °C	DIN 51 562	
10 mm ² /s 100 °C		
< 1,400 hPa	DIN 51 805	
0/0	DIN 51 802	
Approx. 0.92 g/cm ³	DIN 51 757	
2 (24 h/120 °C)	DIN 51 811	
> 2,000 N	DIN 51 350 T4	
0.93 (400 N, 1 h)	DIN 51 350, part 5	
2 years		
	Mineral base oil, special lithium soap KP2K-20 Light brown-beige, ground-fiber -20 °C to +80 °C 2 265-295 1/10 mm 0-60, 1-90 > 165 > 200 base oil 100 mm ² /s 40 °C 10 mm ² /s 40 °C 10 mm ² /s 100 °C < 1,400 hPa 0/0 Approx. 0.92 g/cm ³ 2 (24 h/120 °C) > 2,000 N 0.93 (400 N, 1 h) 2 years	

Product description of Dynalub 520

Part number	Packaging unit
R3416 043 00	1 x 400 g
R3416 042 00	Bucket 5 kg
R0419 090 01	5 ml maintenance kit

Technical data

For additional information, see the "Dynalub 520 safety data sheet" R310DE 2053 (2004.04) Dynalub 520 is a lithium-based high-performance grease of NLGI grade 00 that has been specially designed for linear motion technology applications. It is characterized by its good water resistance and corrosion protection properties and can be used at temperatures ranging from -20 °C to +80 °C.

Application area

Under conventional environmental conditions, this ground-fiber, homogeneous grease is ideally suited for the lubrication of linear elements in miniature versions and for use in central lubrication systems.

Chemical composition	Mineral base oil, special lithium soap, active ingredients		
Identification	KP00K-20	DIN 51 825	
Appearance	Light brown-beige, ground-fiber		
Service temperature range	-20 °C to +80 °C		
NLGI grade	00		
Worked penetration	400-430 1/10 mm	DIN ISO 2137	
Water resistance	1-90	DIN 51 807 T1	
Melting point in °C	> 160	DIN ISO 2176	
Flash point in °C	> 200 base oil	DIN ISO 2592	
Basic oil viscosity	100 mm²/s 40 °C	DIN 51 562	
	10 mm²/s 100 °C		
Flow pressure at −20 °C	< 700 hPa	DIN 51 805	
EMCOR test	0	DIN 51 802	
Density at +25 °C	Approx. 0.92 g/cm ³	DIN 51 757	
Copper corrosion	0-1 (24 h/100 °C)	DIN 51 811	
Four ball tester welding load	1,800 N	DIN 51 350 T4	
Four ball tester impression diameter	0.80 (400 N, 1 h)	DIN 51 350 T5	
Shelf life in container	2 years		