Maintenance for DriveSets

Notes for preventive maintenance of kinematics and Xemo controllers

systec Elektronik und Software GmbH

Systec Elektronik und Software GmbH
Nottulner Landweg 90
48161 Münster-Roxel
Germany

Telefon: +49 / 25 34 / 80 01-70
Telefon: +49-700-SYSTEC-DE
Telefax: +49 / 25 34 / 80 01-77

internet: www.systec.de
eMail: info@systec.de

Maintenance for DriveSets
Docu-No.: 699-41-20.1
Latest revision date: 05 2017
Translation of the original manual

Content

1 Understanding the system set-up and functionality

1.1 System philosophy

DriveSets are systems with kinematics (with linear axes and rotary modules) and complete controller electronics.
They can be operated either autonomously or as intelligent subsystems together with a master computer.
The systems have been constructed according to the newest state of the art, with strong emphasis on high reliability and low maintenance.
The systems and components are subjected to extensive and strict single tests, so they require only minimum maintenance when properly installed and operated within the warranted parameters
DriveSets are divided into four parts:

- linear axes or rotary modules
- motors
- wiring
- a Xemo controller

1.2 Linear axes, rotary modules

The linear axes or rotary modules constitute the mechanical structure with which corresponding motions can be carried out. The linear axes can be driven either by a spindle or a cogged V-belt. In addition, linear motors are also used. Rotary modules, designed as turntables, consist in as a rule of a plate and a gearbox with motor. Inductive proximity switches or roll-switches for trajectory limitation and reference-point determination are attached to the linear axes. As a rule, two end switches and a reference switch are located on each axis. In addition, optional drag chains can be attached.

1.3 Motors

1.3.1 Motors on Xemo R/S Compact Controllers

On DriveSets with Xemo R/S Compact Controllers 2-phase stepping motors are deployed. These are connected to the linear axes directly by couplers or by way of cogged V-belts or other gearboxes.
The stepping motors are distinguished by:

- torque
- revolutions per minute
- number of terminals (50 or 100)
- operating voltage (24 V/48 V)
- mechanical dimensions

1.3.2 Motors on Xemo P Controllers

On DriveSets with Xemo P Controllers, hybrid stepping motors are deployed. These are connected to the linear axes directly by couplers or by way of cogged V-belts or other gearboxes.
The stepping motors are distinguished by:

- torque
- revolutions per minute
- operating voltage (70 V to 325 V)
- mechanical dimensions

1.4 Wiring

1.4.1 Wiring on Xemo Compact Controllers

The wiring of the motors and switches of an axis is done via adapter plugs and special hybrid cables which meet EMF requirements. The cables are cropped to specific lengths. At the opposite ends of the cables, 10-pole bolt and nut clamps are attached for direct connection to the Xemo controllers. These cables may be cropped by qualified technical personal, provided that the EMF regulations are met.

1.4.2 Wiring on Xemo P Controllers

The wiring of the motors and switches of an axis is done via special hybrid cables which meet EMF requirements. The cables are cropped to specific lengths. The cables are attached to the motors by means of plug connectors. On the switching cabinet end, the attachment varies according to model. In most cases, the motor cables are LED directly to the power electronics. In individual cases, an adapter plug system can be used. As a rule, the cables of the end and reference switches are LED to terminal blocks. From there, the internal wiring proceeds further to the digital inputs of the power electronics. These cables may be cropped by qualified technical personal, provided that the EMF regulations are met.

1.5 Xemo controllers

A distinction is made between the Xemo R/S Compact Controllers and the Xemo P Controllers which are built into a switch cabinet (comfort version) or onto a control board (eco version).

1.5.1 Xemo R/S Compact Controllers

The Xemo controllers contain the complete electronics and operational software for running the linear axes. They are fitted with the appropriate drive components for the specific axis and motor types. Depending on the Xemo S Controller model, the user must additionally provide 24 or 48 VDC.

In addition to running the axes, the controllers can also capture and/or issue digital and analog signals.
The controllers are equipped with a standard security concept which provides emergency-stop functionality.

1.5.2 Xemo P Controllers

The Xemo controllers contain the complete electronics and operational software for running the linear axes. They are fitted with the appropriate power electronics for the specific axis and motor types.
The Xemo P Controller is offered in the variants “comfort” and “eco”. In the “comfort” version, the controller is built into a switch cabinet. At the cabinet’s front, operational elements are attached. As a rule, the controller is ready for connection to the power supply and then ready for operation. In the “eco” version, the controller is delivered on a control board. Likewise, there are no control elements. Depending on the order, you must provide a 24 V DC direct current supply.

2 General notes on maintenance and service

DriveSets and – especially – the Xemo controllers may be maintained only by qualified or trained personnel and repaired only by qualified technical personal.

2.1 Important symbols in this manual

DANGER

indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.

NOTICE

indicates a property damage message.

Remark

Please read passages, which are marked with this symbol, definitely. Get important information about dealing with these instructions and conditions or limits for the use of the Maintenance for DriveSets.

Tip

Learn addition facts and practical tips in sections, which are marked with this symbol.

➔ Identifies an instruction.

2.2 Warning and safety information

Before installing and putting the DriveSets into service, please pay attention to the following warning and safety information. By doing so, you will avoid possible defects and malfunctions resulting from improper handling.

⚠ DANGER

Danger of crushing! Shock hazard!
Depending on the specification of DriveSets in speed and load you hurt yourself serious if an accidentally switch-on occurres during the work.
Carry out all assembly and installation work on DriveSets only when the equipment is completely free of any electrical current.
Before starting the work, make sure that the connection plugs for the power supply of all the power supplies to your application have been unplugged.

⚠ DANGER

Danger from flying away of parts!
Ensure that no tools or other materials are lying in the trajectory area or on the axes.

NOTICE

Malfunctions or even destruction of the Xemo controller or the connected components.
Do not plug or unplug cable connections within the DriveSets when the attached supply voltage is connected or turned on.
When re-plugging cables, ensure that they are re-plugged according to the proper allocation of the cables on the device's connector assembly.

NOTICE

Endangering of the high dimensional stability of the axis!
Do not apply higher forces during mechanical work.

In case damages result from incorrect installation, no claims to free-of-charge repairs exist, even if the warranty period is still in effect.

3 Life expectancy

3.1 Kinematics

DriveSets are subject to normal mechanical wear and tear. According to axle type, i.e. spindle or cogged V-belt drive, different running times can be reached. This applies however only when used in accordance to the warranted characteristics as well as regularly performed maintenance. To make sure of an even distribution of the lubrication in the linear axes, the trajectory paths must be greater than the carriage length.

3.2 Motors

Both stepping motors and hybrid stepping motors work without collectors; their life expectancy is limited mainly by bearing deterioration.

3.3 Hybrid cables

Through constant motion, the cables are subject to wear and tear, especially those in drag chains. The operating life of bending radii with a 10-fold size of the cable diameter (8 mm) amounts to more than 2 million cycles. Smaller bending radii (minimum 5-fold size of the cable diameter) this amount declines. In the case of non-moving hybrid cables, bending radii which are smaller than the 2-fold size of the cable diameter are not permissible.

3.4 Xemo controllers

The Xemo controllers have a life expectancy of about 8 years. Once this period is exceeded, problems can arise because of aged condensers in the power supply and the final stages.
The electromechanical components with moving switch contacts have a life span of more than 50,000 switching cycles. This includes on/off switches, feelers and probes, emergency stop switches, sliding gates and relays (operational elements vary according to the type of controller.
Membrane keyboard keys have a life span of more than 1,000,000 hits.
The hand wheel works optically and is correspondingly virtually void of wear and tear. The override-POT can make more than 20,000 adjustments without aging problems

4 Regular checks

4.1 Wiring

All plug connectors should be clamped or screwed together. The cables deployed from the Xemo controllers' motors to their power stages are compatible with drag chains and have long life spans. However, these life spans can only be reached if the cables can move freely within the drag chains and without being pinched by others cables, air line hoses etc. For that reason, you should check the drag chains at regular intervals and, if necessary, rearrange the other cables, lines, etc.

4.2 Dust deposits

At least once per year, Xemo controllers should be checked for dust deposits which can occur through normal convection. If there are obvious dust deposits, these must be removed by blowing-out or vacuuming the unit. If a pressed-air pistol is used for this purpose, the pressed-air stream should not be directed at the system from close proximity, otherwise some parts might be damaged. A thick layer of dust prevents heat convection from integrated performance components, and in extreme cases can lead to electrical short circuits.
Because of their forced convection, Xemo R Controllers must be checked more frequently. In case you suspect stronger dust deposits in the interior, the device should be completely.

5 Preventive maintenance

5.1 Linear axes

Linear axes require preventative maintenance. This depends on the kind of linear axis and determines to a large degree the functional quality as well as the life span of the entire DriveSet.

5.2 Guide shafts

The guide shafts inserted sideways into the aluminium profiles should be lubricated once a month when regularly used.

5.3 Castors

The lubricating points of units with EL100 and EL125 profiles should be lubricated with bearing lubricant every 1000 operating hours or every 6 months.

5.4 Spindles

The lubricant on linear axes with spindles must be distributed regularly. For this purpose, the normal trajectory paths should be traversed at regular intervals in order to spread accumulations of lubricant into the trajectory area. Re-lubrication of the spindles should be done every 500 to 1000 operating hours. According to axle type, this is done by way of the lubrication points or – in the case of EL30 and EL40 axes with trapeze spindles – by lubrication with a brush.

5.5 Motors

Stepping motors require no preventative maintenance. The motors have ball bearings with long-term lubrication and, at normal temperatures, have a life span of at least 40,000 hours.

5.6 Xemo controllers

5.6.1 General comments

According to ambient conditions (exposure to dust), the controllers should be cleaned at least once every two years. Compressed air must not be used to blow out a controller, as this can lead to the destruction of structural components.

5.6.2 Xemo R/S Compact Controllers

The Xemo R Controllers have built-in cooling ventilators. The controllers must be installed in such a way that the ventilators can draw in fresh air through the slits in the floor plate and blow it out at the backside unhampered. At installation, however, sufficient cooling (normal convection or forced convection through ventilators) within the control cabinet must be assured. Never install Xemo R Controllers directly on the floor of a control cabinet or directly over heat-emitting drawers. Otherwise the necessary cooling is not assured. The air taken in should be dust-free.
Xemo S Controllers require no preventive maintenance.

5.6.3 Xemo P Controllers

Xemo P Controllers in the "comfort" version require no preventive maintenance. If you are using the "eco" version, (i.e. the controller mounted on a mounting plate,) you must be careful when installing it into your switch cabinet that any ventilators built into the switch cabined do not direct their air currents directly into the ventilation slits of the controller's components.

6 Maintenance of linear axes

6.1 Cleaning axis type DuoLine

The cover (3) must be opened for cleaning and to remove any dirt present. After cleaning, ensure that the cover is tightly sealed.
If a toothed belt change should be necessary, removing the cover simplifies the threading in of the belt.

Fig. 1 Removing the cover

Clean outer surfaces of the linear unit with a clean, lint-free cloth.

NOTICE

Cleaning agents containing solvent attack the material and can damage it.

➔ Do not use cleaning agent containing solvent.

6.2 Exchanging cover bands EL_ 100, 125

➔ Remove the cylinder screws (1) on one side of the carriage.
➔ Shove the pull-back cap (4) to the side.
➔ Unscrew the set screws (2), shove the carriage (5) to the side.
➔ Loosed the set screws (3) on both bearings.
➔ Pull the cover band (6) out.
➔ Insert a new cover band and clamp it to the bearing (7) with a threaded pin (3).
➔ At the other bearing, stretch the cover band with pliers and fasten down with the set screw (3).
➔ Attach the carriage (5) with the set screws (2). Secure the with locking device (medium tight).
➔ Attach the pull-back cap (4) with cylinder-head screws (1) to the carriage (5).

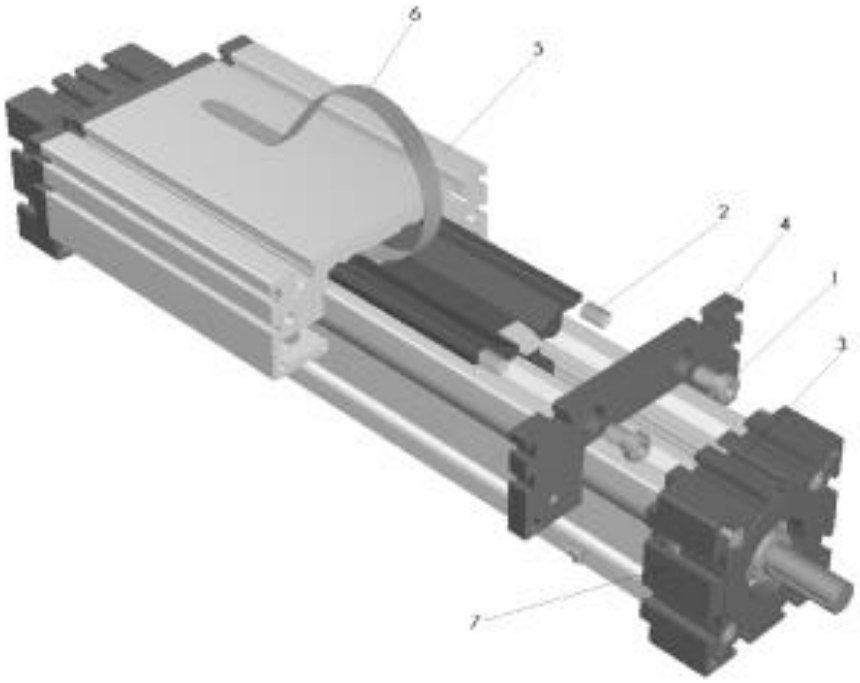


Fig. 2 Cover bands axis type EL_ 100, 125

Install only undamaged masking tape. Kinks, cracks, or waves in the cover band require an exchange. The band of your linear drive unit is defined by its length on your linear unit. A faultless functioning can only be guaranteed by an optimal length of cover band.

6.3 Belt exchange

6.3.1 Axis type ELZ

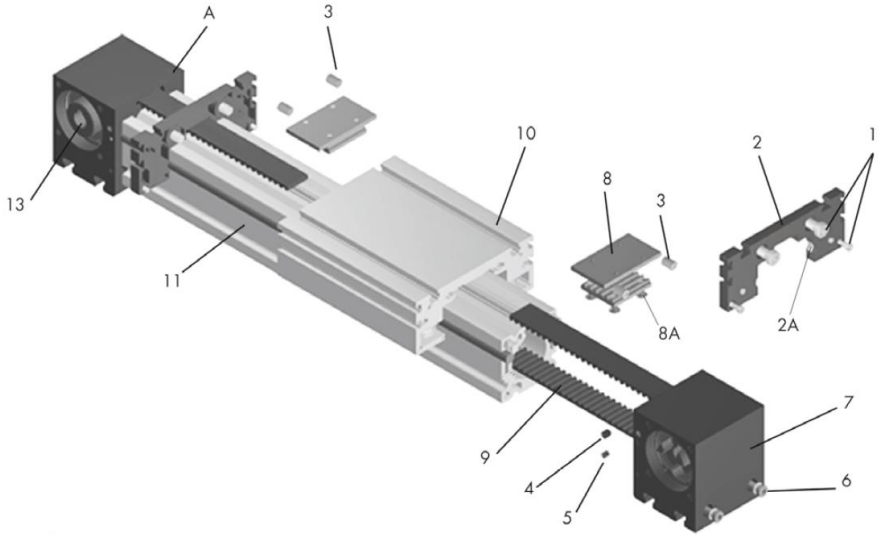


Fig. 3 Belt exchange

Follow these steps for a belt exchange:

- ➔ Unscrew cylindric screws (1) and dismount wiper end plates (2) on both sides of the carriage,
- ➔ Take care, that the felt wipers (2A) don`t drop out!
- ➔ The belt adjusters are fixed by grub screws (3) in the carriage (10); to reach the right belt tension measure the distance between the edge of the carriage and the head of the grub screws. (Notice: the distance must be the same on both sides in axial direction.)
- ➔ Unscrew the grub screws (3) and dismount the belt adjusters (8-8A).
- ➔ Unscrew the grub screws (4+5) and the cylindric screws (6) and separate the bearing-block (7) from the unit.
- ➔ Pull out the toothed belt (9). In most cases it is not necessary to separate both bearing blocks for inserting the new belt.

The reconstruction of the unit takes place in opposite order.

- ➔ Shorten the new belt to the length of the old one.
- ➔ Insert the toothed belt with the toothed side to the profile (11) into the not dismounted pulley block (A); rotate the toothed pulley (13) until the toothed belt (9) appears at the end of the profile (11) and pull the belt through the dismounted pulley block (7).
- ➔ Mount the pulley block (7) on the profile (12) and tighten the grub screws (4+5) and the cylindrical screws (6).
- ➔ Mount the belt adjusters (8-8A) on the ends of the toothed belt and secure the countersunk screws by bonding!!!
- ➔ Insert the belt adjusters into the carriage (10) and secure the grub screws (3) by bonding!!!
- ➔ Tension the belt as per description above and finally mount the wiper end plates (2) on the carriage.

Tip

The easiest way for mounting the wiper end plates is to secure the wipers with a rubberband while mounting.

6.4 Checking and adjusting belt tension

6.4.1 Belt tension ELZ

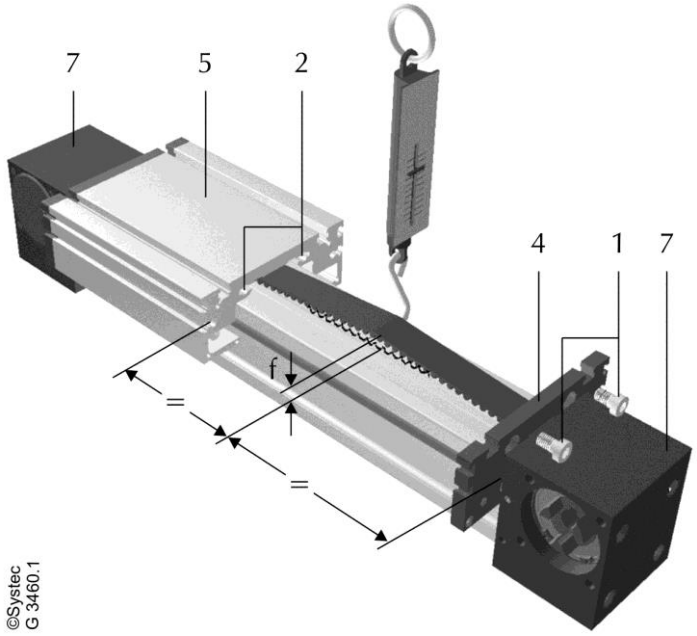


Fig. 4 Belt tension axis type ELZ

A timing-belt tensioning device is attached at the ends of the toothed belt and is fastened in the axis carriage (5) as well. The cogged-belt tensioning device is set by stud screws which are recessed into the threaded holes (2). By screwing the stud screws in, the timing belt is stretched. By unscrewing them, the tension is slackened. In this way, it is easy to adjust the timing belt.

Check the belt tension

It is not necessary to disassemble the axis or the carriage to check belt tension:

- ➔ Shove the carriage (5) in front of a bearing (7) so that the maximum belt length is freed up at the other side.
- ➔ Exert the prescribed force (see table) a tension spring balance in the middle of belt.
- ➔ Compare the resulting “sag” (f) with the slackened belt.

Once you have ascertained the “sag”, please compare your measured value with the recommended value which you obtain from the diagram. The recommended values in the diagram are displayed according to the scale and the traverse path (hub) of the axis.
If your value diverges from the default, you must stretch or slacken the belt. The following section describes how this is done.

Check and adjust belt tension

- ➔ Shove the carriage (5) in front of a bearing (7) so that the maximum belt length is freed up at the other side.

- ➔ Screw out the cylinder-head screws (1) of the pull-back cap (4). If a contact flange for inductive proximity switches is attached to the carriage, dismantle that beforehand.
- ➔ Shove the pull-back cap (4) to another bearing (7).
- ➔ Exert the prescribed force (see table) a tension spring balance in the middle of belt. - Compare the resulting “sag” (f) with the slackened belt.
- ➔ Compare the value with the diagram, and if necessary stretch or slacken the belt.
- ➔ Adjust the stud screws (2) with a hex. socket screw wrench.
- ➔ The stud screws (2) must be bonded with the locking device.
- ➔ Both screws (2) must be screwed in equally deep. Check with a steel tape.
- ➔ Screw on the pull-back cap (4) again.

Axis-scale	spring balance applied force
ELZ 30	20 N
ELZ 40	20 N
ELZ 60	30 N
ELZ 80	50 N
ELZ 100	50 N
ELZ 125	50 N

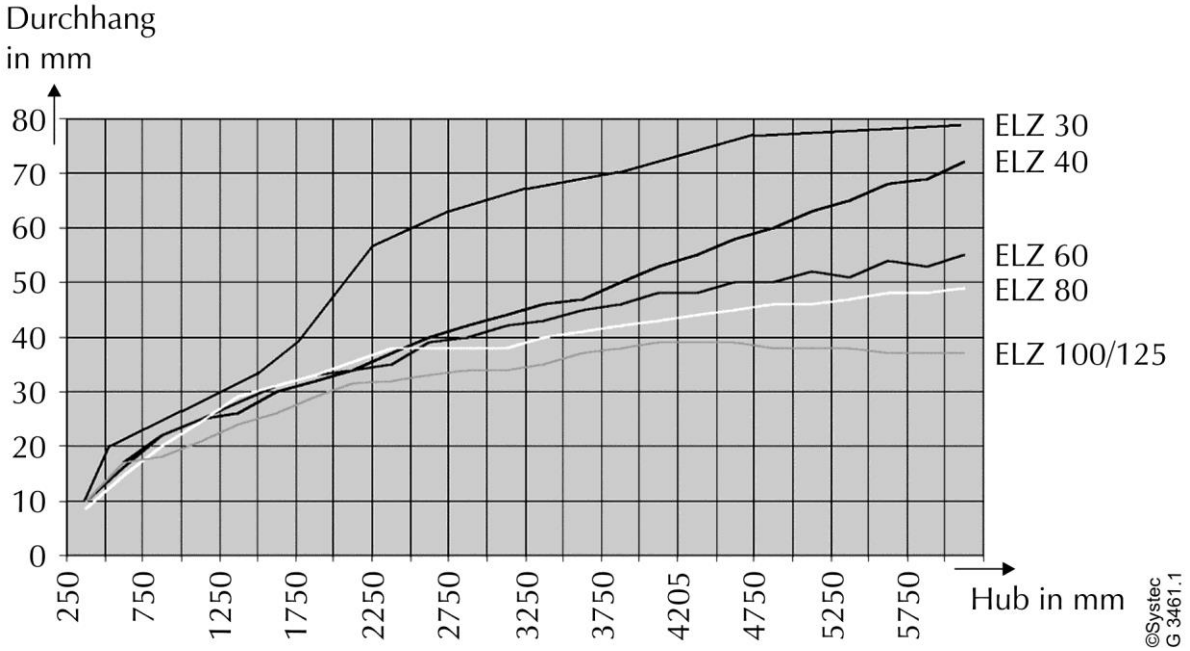


Fig. 5 Sag of belt (Durchhang) plotted against stroke (Hub)

6.4.2 Tooth belt tension axis type DuoLine Z

The toothed belt tension is set correctly ex works. A correction is unnecessary in normal operation.

All toothed belts in linear units need tension, which is required to guarantee safe engaging of the teeth.
The required pretensioning of the toothed belt must be checked with a pretensioning measurement appliance.
The specific pre-tensioning values for the different types of linear unit are dependent on environmental parameters, such as the length of the unit, acceleration and loads to be moved and can be queried with RK Rose+Krieger GmbH for special cases.

Tension the toothed belt with the belt tensioning kit.
Tension the toothed belt (1) by steadily tightening the tensioning screw (2) on the front of the slide (3) clockwise.

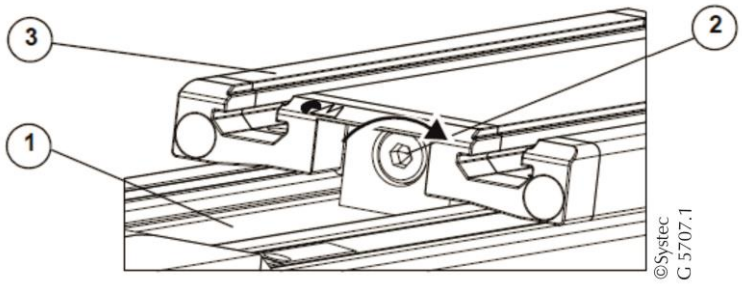


Fig. 6 Screws to adjust the belt tension

Remark

The toothed belt of the linear unit must be replaced every 8 years irrespective of the amount of use and the environmental influences.

6.4.2.1 Belt tension axis type MZK

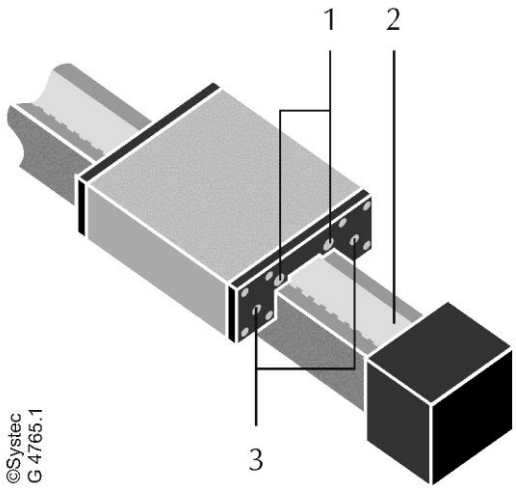


Fig. 7 Structure linear axis MZK

➔ Set screws (1) are attached to both sides of the carriage for tensioning the toothed belt (2).
➔ Push the carriage to an end position.

➔ Turn the two screws (1) in a clockwise direction. You have to turn both screws an equal number of turns!
➔ Check the tension of the belt (2). Tighten the belt so that you can easily move the carriage by hand.

Maintenance interval Annual review and if necessary adjust.

6.5 Adjusting roller castor

6.5.1 Adjusting roller castor axis type LLZ60

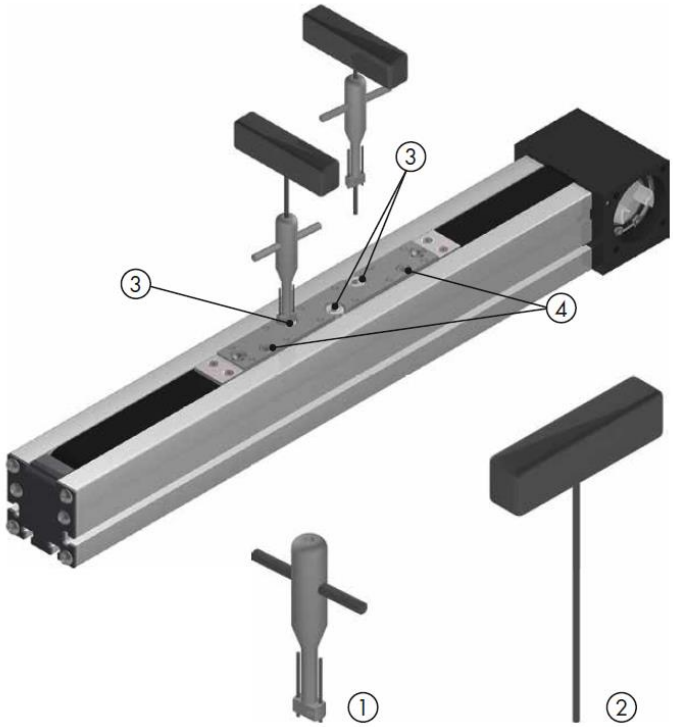


Fig. 8 Adjusting the roller castor for axis type LLZ60

1 Eccentric key for tightening the 2-hole counternut.
2 Hexagon socket for adjusting the eccentric.
3 Adjustable roller castors
4 Non adjustable roller castors

➔ Loose the 2-hole counter nut with the eccentric key (1).
➔ Try to turn the eccentric with the hexagon socket (2). The eccentric must be movable.
➔ Turn the eccentric with the hexagon socket closly and delicately to the right, until the eccentric is playless.
➔ Now fix the eccentric with the hexagon socket (2) and tighten the 2-hole nut by a turn to the right.

6.5.2 Adjusting roller castor axis type QL_ 60, 80, 100

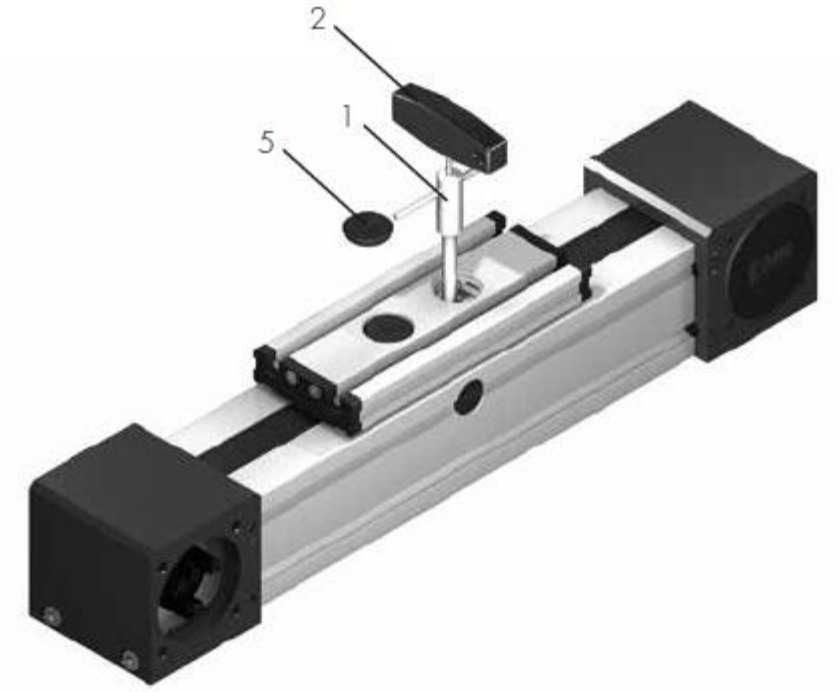


Fig. 9 Adjusting the roller castor for axis type QL_

1 Screw key
2 hexagon socket screw key
5 Cover cap

➔ Dismount cover cap (5) from servicing hole
➔ Fasten eccentric bolt with screw key (1)
➔ Release screws with hexagon socket screw key (2) until the eccentric bolt can be turned.
➔ Turn the eccentric bolts to adjust the carriage free of play (without initial tension)
➔ Ensure that the eccentric bolts are adjusted to the right.

6.6 Lubrication amounts

Bearing grease based on DIN 51825: K2K / KP2K
Consistency class based on DIN 51818: NLGI 2

Type	Gewinde/ Pitch	Nachfettung/ Regreasing	Type	Gewinde/ Pitch	Nachfettung/ Regreasing
30	Kg 08 x 2,5	0,01 g	**60**	Kg 20 x 05	3,00 g
40	Kg 16 x 05	1,33 g	**80**	Kg 25 x 25	3,00 g
40	Kg 16 x 10	0,84 g	**80 / 100**	Kg 32 x 05	3,00 g
60	Kg 25 x 05	2,00 g	**80 / 100**	Kg 32 x 10	4,00 g
60	Kg 25 x 10	3,00 g	**100**	Kg 32 x 32	4,00 g
60	Kg 20 x 20	3,00 g	**125**	Kg 40 x 10	4,00 g

6.7 Lubrication of axes with castors

6.7.1 Trapeze spindle scale EL 30, 40

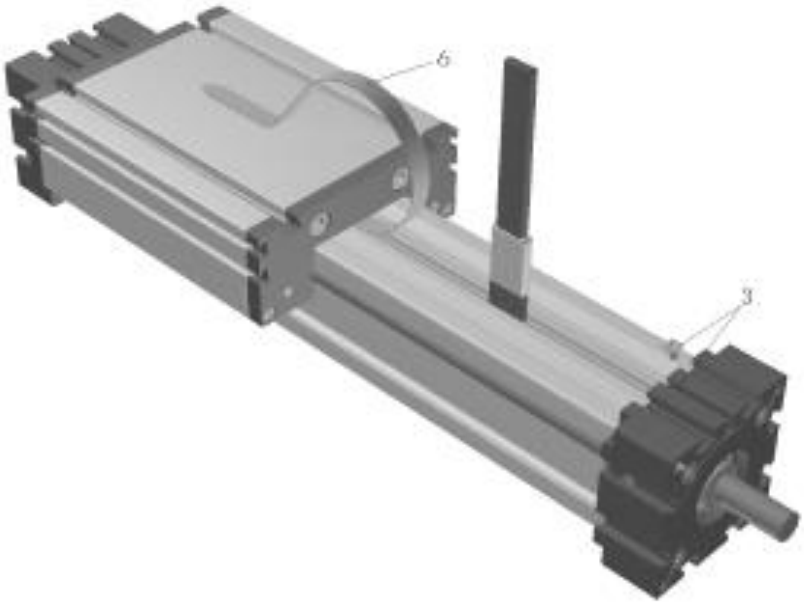


Fig. 10 Linear axis ELT 30, 40

Run the carriage on one side,
Loosen the set screws (3), remove the cover band (6).
Lubricate the spindle with a thin brush. Lubricants see chap. 6.6.

6.7.2 Ball screw spindle scale EL 30, 40

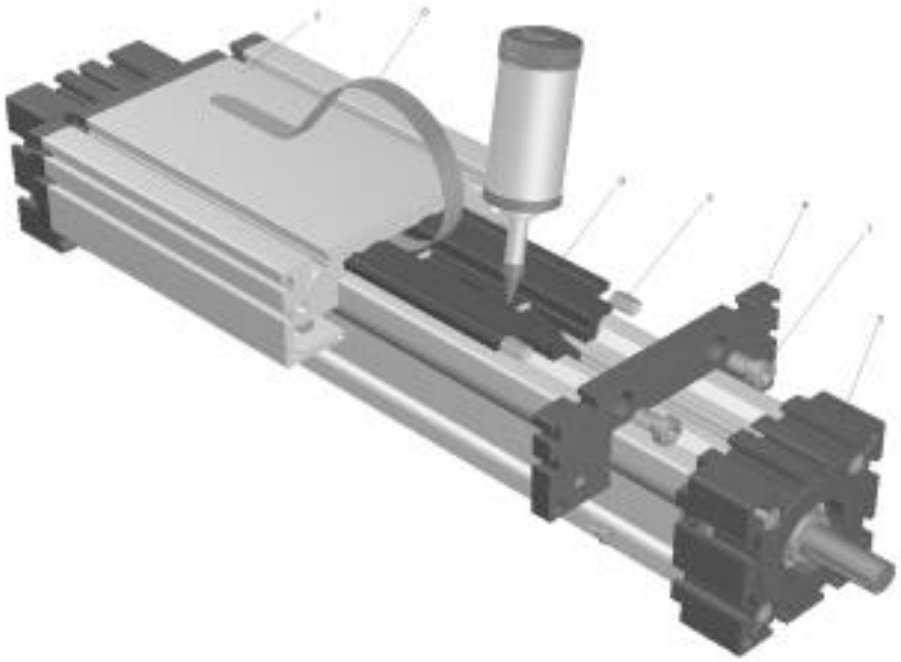


Fig. 11 Linear axis ELK30, ELK40

➔ Loosen the cylinder screws (1, shove the pull-back cap (4) to the side,
➔ unscrew the set screws (2), shove the carriage (5) to the side,
➔ Loosen the set screws (3), pull out and remove the cover band (6), lubrication hole is now visible in the slide-nut recess (9).
➔ Lubricate it with a grease gun. Lubricants see chap. 6.6.

6.7.3 Spindle scale EL 60, 80 100, 125

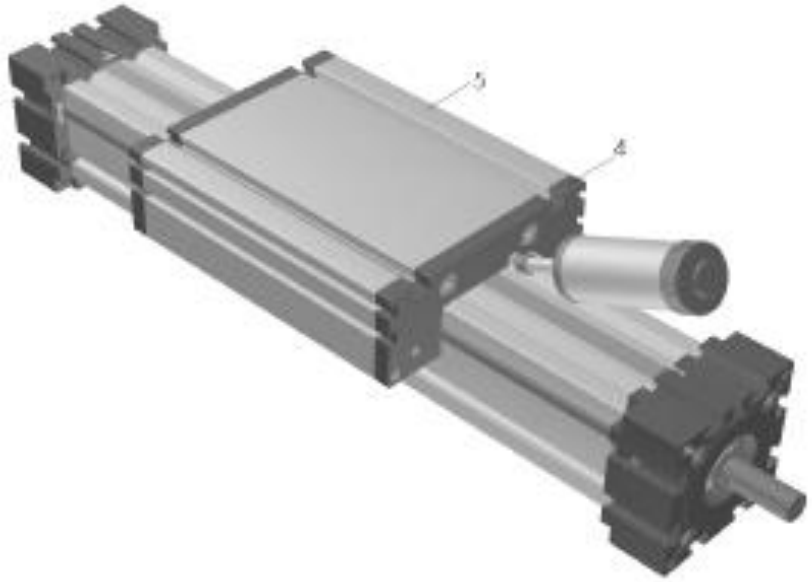


Fig. 12 Linear axis EL_ 60, 80, 100, 125

Lubricate the spindle every 500 – 1000 operating hours.
The lubrication point is located in the protective cap (4) on one side of the carriage (5).
Lubricant see chap. 6.6.

6.7.4 Castors scale EL 100, 125

Fig. 13 Lubrication of roller castors

Lubricate every 1.000 operating hours or every 6 months from the underside of the carriage at the eccentrics. Lubricants see chap. 6.6.

6.7.5 Lubrication roller castors axis type LLZ 60

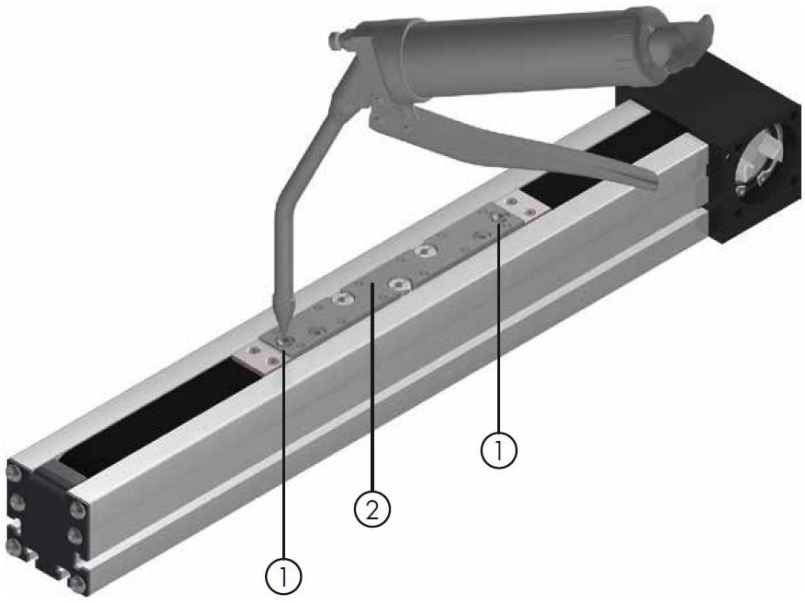


Fig. 14 Lubrication of roller castors

Rods will be greased by the strippers of carriage.
There are 2 oil nipples (1) in the carriage (2), where the tanks for the strippers can be filled with an oil gun.

Lubricant Viscosity of oil: 200 mm^2/s, T= 40° C.

Lubrication interval Interval of greasing depends on environmental conditions, min. once a month. Minimum stroke: length of slide.

6.7.6 Guide shaft EL

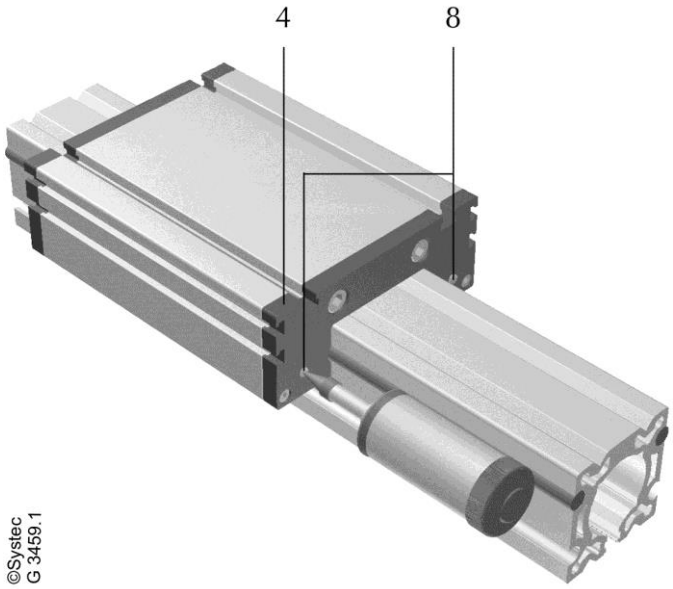


Fig. 15 Linear axis EL_

The lubrication of the side guide shaft is done with lubricated felt inserts, which are located in the pull-back cap (4) of the carriage. The felt inserts can be saturated through their lubrication points (8).
We recommend the use of lubricants with a viscosity of about 200 mm^2/s at T= 40° C. The necessary lubrication interval is dependent on the environmental influences: use once a month as a guide. To guarantee sufficient lubrication of the guide shaft, the minimum traverse path of the carriage must be equal to the carriage length.

6.7.7 Lubrication guiding rods axis type DL_ und QL_

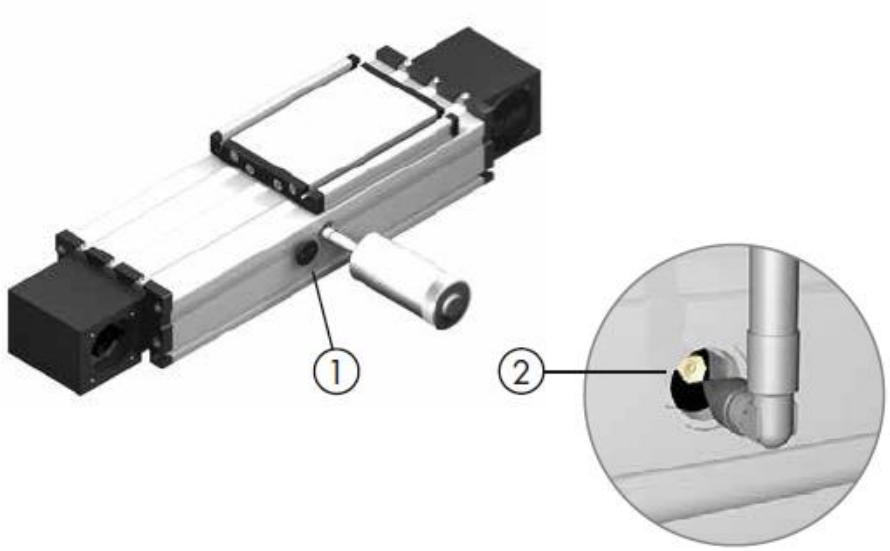


Fig. 16 Linear axis DL_ and QL_

1 Cover cap
2 Lubricating nipple

Lubrication is effected by an oiled felt insert. The felt can be re-oiled through lubrication nipples attached laterally to the ends of the roller packs.

- ➔ Dismount cover cap (1).
- ➔ Drive the carriage through the service position until you can see the first lubricating nipple (2) in the lubrication hole.
- ➔ Re-oiled felt now with an oil gun.
- ➔ Move the carriage to the second lubricating nipple and re-oiled here as well.

Lubricant Viscosity of oil: 200 mm^2/s, T= 40° C.

Lubrication interval Interval of greasing depends on environmental conditions, min. once a month. Minimum stroke: length of slide.

6.7.8 Lubrication leading nut axis type DLT und DLK

6.7.8.1 Axis type DLT/DLK 120, 200

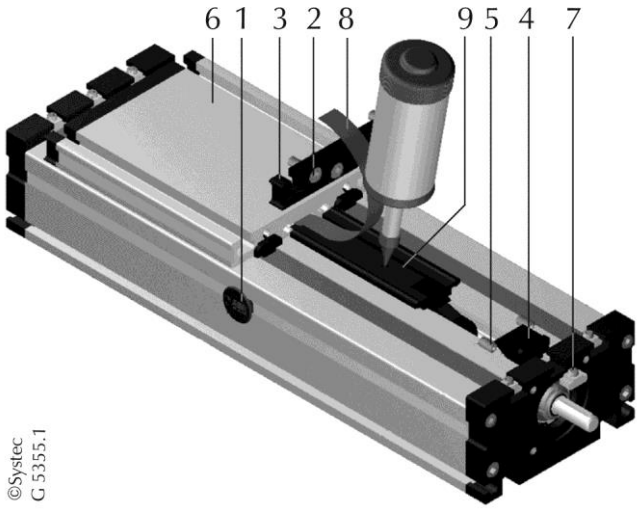


Fig. 17 Lubrication leading nut

- ➔ Drive the carriage to the service position (1).
- ➔ Remove the fi llister head screws (2) and dismount cover cap (3).
- ➔ Remove the middle slider (4) and unscrew set screws (5).
- ➔ Push carriage (6) to the side.
- ➔ Release the set screw (7) and remove it using the sliding nut.
- ➔ Pull out and lift the cover band (8), now the lubrication hole is visible in the leading-nut receptacle (9).
- ➔ Regrease with grease gun. For the quantity of grease see table in Chap. 6.7.8.3.

6.7.8.2 Axis type DLT/DLK 160

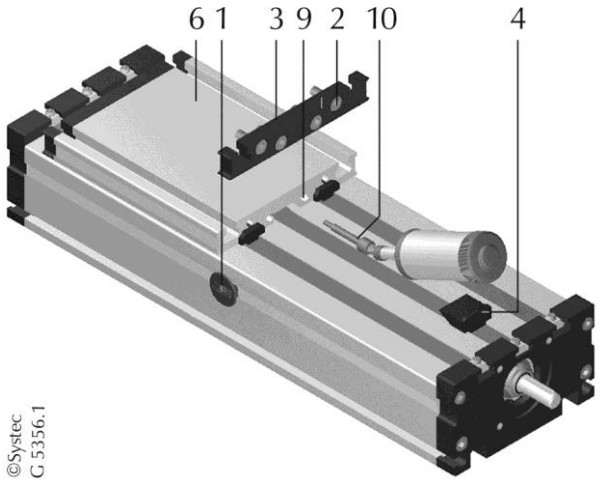


Fig. 18 Lubrication leading nut

- ➔ Drive the carriage to the service position (1).
- ➔ Remove the fillister head screws (2) and dismount cover cap (3).
- ➔ Remove the middle slider (4).

➔ Insert the regreasing adapter (A) into the lubrication hole of the leading nut receptacle.
➔ Regrease now with grease gun. For the quantity of grease see table in Chap. 6.7.8.3.

6.7.8.3 Lubricant quantities axis types DLT, DLK

Spindle greasing every 500 - 1000 working hours.

Axis type	Pitch	Lubricant quantities in g
120	16 x 05	1,33
120	16 x 10	0,84
120	16 x 16	1,00
120/160	20 x 20	3,00
120/160	25 x 05	2,00
120/160	25 x 10	3,00
120/160	25 x 25	3,00
200	32 x 05	3,00
200	32 x 10	4,00
200	32 x 20	4,00
200	32 x 32	4,00

6.7.9 Lubrication Axis type MZK

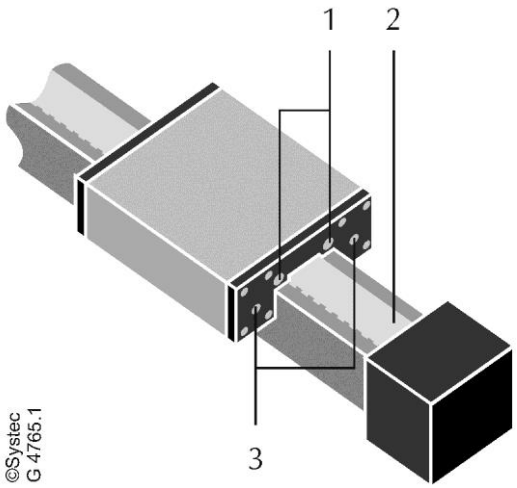


Fig. 19 Structure linear axis MKZ

Grease nipples (3) are attached to both sides of the slide. Perform lubrication with an oil press.

Lubrication interval

Wipe guide shafts weekly with oiled cloth.
Lubricate monthly.

6.7.10 Lubrication axis type DuoLine

All linear units are provided in the factory with the required lubricant quantities. The maintenance intervals are determined by the number of operating hours, loads and ambient influences. For servicing, the guide slide (1) is to be positioned centrally over the cover (2) and opened.

Fig. 20 Slide position for maintenance purposes

6.7.10.1 Guide shaft lubrication

Lubrication of the guide shaft	Oiled felt strips are for lubricating (cleaning) the guide shafts. The felt strips must be re-oiled periodically, according to the stressing, via the shaft lubrication system.
Lubrication interval	First lubrication after approx. 2000 hours run. Next interval: every 1000 hours run
Lubricant	Recommended lubricants: Oil with viscosity of approximately 200 mm^2/s at T = 40 °C E.g. SAE 90 transmission oil.

6.7.10.2 Spindle lubrication

Spindle lubrication	Clean grease and oil from the lubrication point before lubricating. Ensure that the grease gun is axially aligned with the flow direction of the funnel-type lubricating nipple. A high-pressure grease gun with a needle extrusion tip must be used to lubricate the RK DuoLine 50x50, 80x80 and 80x120(II) units. A high pressure grease gun with an extrusion tip must be used to lubricate the RK DuoLine 80, 120 and 160 units.
Lubrication interval	Lubrication every 300 km (Recommended lubricating interval taking the environmental factors and loading data specified in these assembly instructions into consideration.)
Lubricant	Recommended lubricants: Grease in accordance with DIN 51818 Viscosity class: NLGI class 1, NLGI class 00 For use in max. range: Grease in accordance with DIN 51818 Viscosity class NLGI class 2

Lubricant quantities

Version	Lubricant quantities
DuoLine 50x50	2 x 1 cm3

DuoLine 80x80	2 x 2,5 cm3
DuoLine 80 x 120	2 x 2,5 cm3
DuoLine 80x120-II	2 x 2,5 cm3
DuoLine 80	2 x 2,5 cm3
DuoLine 160	2 x 5 cm3

** Grease in two stages. After the first stage, drive the guide slides through two slide lengths and then top up with the second stage.

6.7.10.3Lubrication points

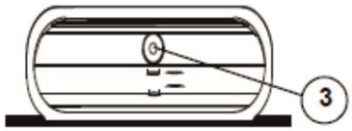
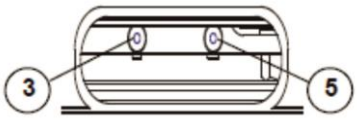
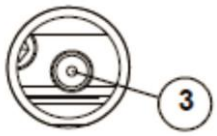
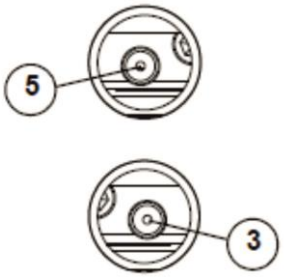
Version	**View of lubrication points**	
	Tooth belt (Z)/without drive (K)	Spindle (S)
DuoLine Z/R/S 120x80		
DuoLine Z/R/S 80x80 DuoLine Z 80x160		 To achieve both lubrication points move the guide carriage accordingly

Fig. 21 View on the lubrication points for different axis types:

- for the guide shaft (3) and

- for the spindle (5).

6.7.11 Lubrication Axis type PLS-II

All linear units are provided in the factory with the required lubricant quantities. Servicing intervals are dependent on the hours run, the stressing and environmental factors.
Lubrication occurs directly via the grease nipple. Before lubricating, clean grease and oil from the lubrication point. Ensure you align the grease gun axially with the flow direction of the nipple.

6.7.11.1Lubrication of the guide shafts

Lubrication of the guide shafts	Oiled felt strips (1) are used for lubricating (cleaning) the guidance shafts. The felt strips must be reoiled periodically, according to the stressing, via the shaft lubrication system.

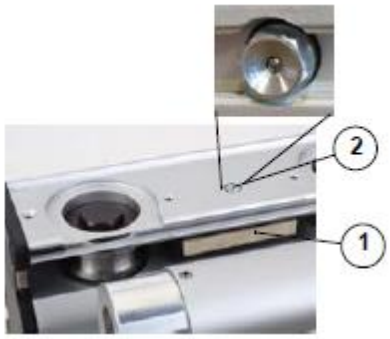


Fig. 22 Lubrication point for the Guide shaft lubrication, (1): felt strip, (2): grease nipple

Lubrication interval Initial lubrication after approx. 2000 hours run.
Next interval: Every 1000 hours run.

Lubricant Recommended lubricants:
Oil with a viscosity of approximately 200 mm^2/s at T = 40°C
e.g. SAE90 gearbox oil.

Lubricant quantities approx. 0.4-1.5 cm^3 depending on size

6.7.11.2Spindle lubrication

Spindle lubrication The spindle is lubricated via the front face of the guidance slide. To do this, the guidance slot is driven out from the drive side to the rear end position. The grease is fed via the grease nipple (1) to the grease nut (2) and distributed in small quantities on the spindle.
Grease in two stages. After the first stage, drive the guide slides through two slide lengths and then top up with the second stage.

Fig. 23 Lubrication point to the spindle lubrication, (1): nipples, (2): lubrication nut

Lubrication interval Lubrication every 300 km (Recommended lubricating interval taking the environmental factors and loading data specified in these assembly instructions into consideration.)

Lubricant Recommended lubricants:
Grease in accordance with DIN 51818, Viscosity class: NLGI class 1, NLGI class 00

	For use in max. range: Grease in accordance with DIN 51818, Viscosity class NLGI class 2
Lubricant quantities	2 sub-quantities for each 2.0 cm3

6.8 Maintenance of axes with carriages

6.8.1 Lubrication leading-nut axis type DSK and DST, QS_

6.8.1.1 Axis type DSK/DST 120, 200

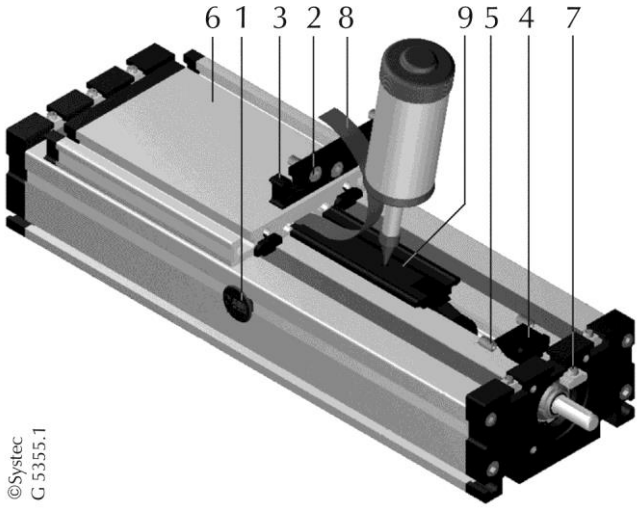


Fig. 24 Lubrication leading-nut

1 Service position
2 Fillister head screws
3 Cover cap
4 Middle slider
5 Set screws
6 Carriage
7 Set screws
8 Cover band
9 Leading-nut receptacle

➔ Drive the carriage to the service position (1).
➔ Remove the fillister head screws (2) and dismount cover cap (3).
➔ Remove the middle slider (4) and unscrew set screws (5).
➔ Push carriage (6) to the side.
➔ Release the set screw (7) and remove it using the sliding nut.
➔ Pull out and lift the cover band (8), now the lubrication hole is visible in the leading-nut receptacle (9).
➔ Regrease with grease gun. For the quantity of grease see table below.
➔ Attach the dissolved components in reverse order.

6.8.1.2 Axis type DST/DSK 160

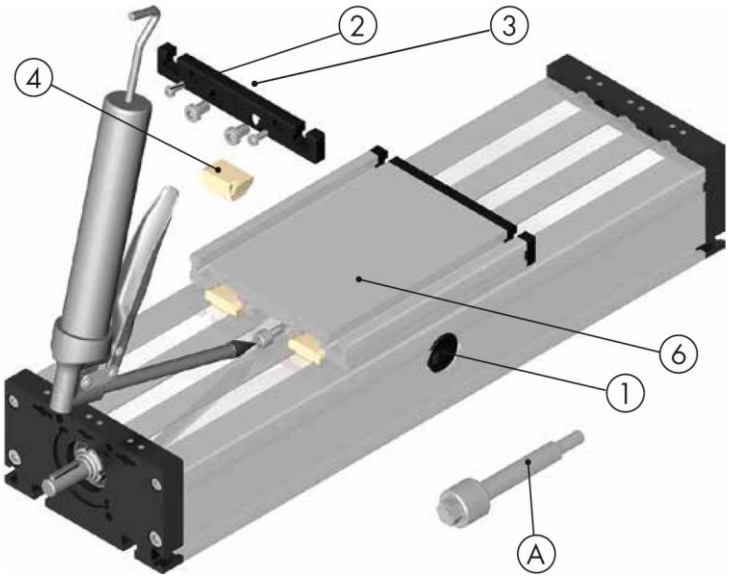


Fig. 25 Lubrication leading-nut

1	Service position
2	Fillister head screws
3	Cover cap
4	Middle slider
5	-
6	Carriage
A	Regreasing adapter

- ➔ Drive the carriage to the service position (1).
- ➔ Remove the fillister head screws (2) and dismount cover cap (3).
- ➔ Remove the middle slider (4).
- ➔ Insert the regreasing adapter (A) into the lubrication hole of the leading-nut receptacle (9).
- ➔ Regrease now with grease gun. For the quantity of grease see table below.
- ➔ Attach the dissolved components in reverse order.

6.8.1.3 Lubrication amounts for the regreasing axis type DSK, DST

Spindle greasing every 500 - 1000 working hours.

Axis size	Pitch	Regreasing [g]
120	16 x 05	1,33
120	16 x 10	0,84
120	16 x 16	1,00
120/160	20 x 20	3,00
120/160	25 x 05	2,00
120/160	25 x 10	3,00
120/160	25 x 25	3,00
200	32 x 05	3,00

200	32 x 10	4,00
200	32 x 20	4,00
200	32 x 32	4,00

6.8.1.4 Axis type QS_ 60, 80, 100

Fig. 26 Lubrication leading-nut

- ➔ Dismount cover cap (1).
- ➔ Drive the carriage through the service position until you can see the first greasing nipple (2) in the grease hole.
- ➔ Re-grease felt now with a grease gun.
- ➔ Move the carriage to the second greasing nipple and re-grease here as well.

Lubricant Bearing grease based on DIN 51825 (see Chap. 6.6).

Lubrication interval The required regreasing intervals depend on environmental conditions, the standardrecommendation is once per 1.000 km.

6.8.1.5 Lubrication amounts for the regreasing axis type QS_

Axis size	Pitch	Regreasing [g]
60	KG 16 x 05	1,33
60	KG 16 x 10	0,84
60	KG 16 x 16	1,00
80	KG 20 x 20	3,00
80	KG 25 x 05	2,00
80	KG 25 x 10	3,00
100	KG 32 x 05	3,00
100	KG 32 x 10	4,00
100	KG 32 x 32	4,00

6.8.2 Lubrication runner blocks axis type DS_ und QS_

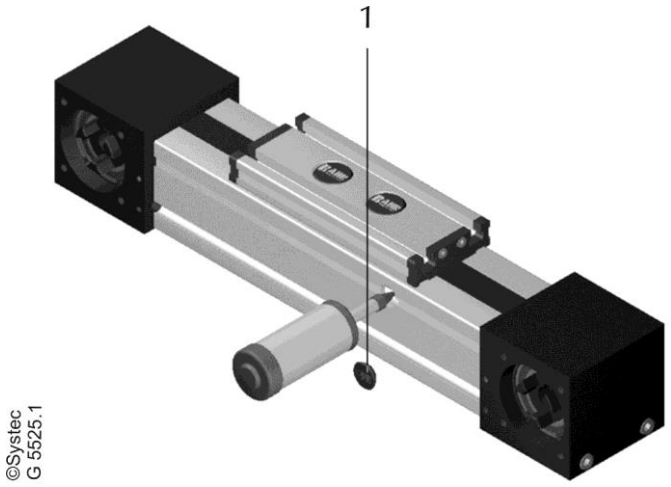


Fig. 27 Lubrication runner blocks

- ➔ Dismount cover cap (1).
- ➔ Drive the carriage through the service position until you can see the first greasing nipple in the lubrication hole.
- ➔ Re-greasing with grease gun.
- ➔ Move the carriage to the second greasing nipple and re-grease here as well.
- ➔ Remount the cover cap.

Lubricant Bearing grease based on DIN 51825 (see Chap. 6.6).

Lubrication interval The required regreasing intervals depend on environmental conditions, the standardrecommendation is once per 1.000 km.

Lubrication amounts

Axis type DS_	Axis type QS_	Quantity [ml]
DS_120	-	0,3
DS_160	QS_60	0,4
-	QS_80	0,5
DS_200	QS_100	0,8
-	QS_125	1,2

6.8.3 Lubrication carriage axis type LS_

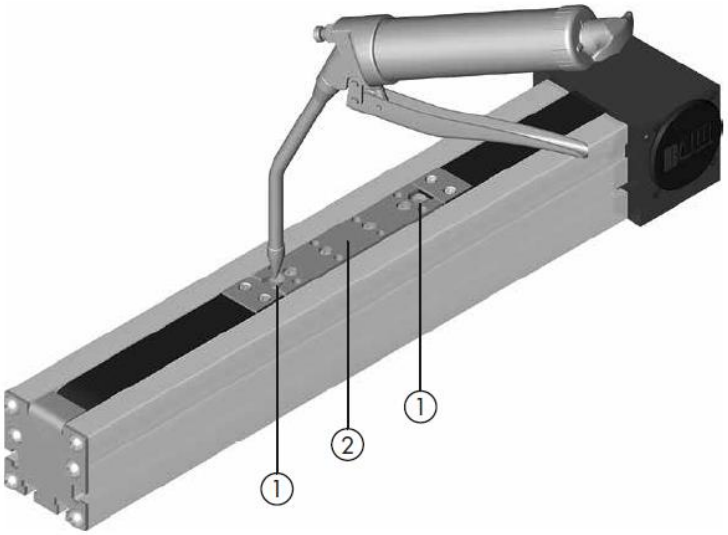


Fig. 28 Lubrication carriage

In the carriage (2) are two greasing nipples (1), where the runner blocks can be filled with a grease gun.

Lubricant Lubricant based on DIN 51825 (see Chap. 6.6).

Lubrication interval The required regreasing intervals depend on environmental conditions, the standardrecommendation is once per 1.000 km. To ensure the function of the seal, a cleaning hub over the entire travel range should be performed after a maximum of 8 hours.

Lubricant quantities

Axis type LSZ_	Lubricant quantities [ml]
LSZ60	0,4
LSZE60	0,4

6.8.4 Lubrication Axis type KR

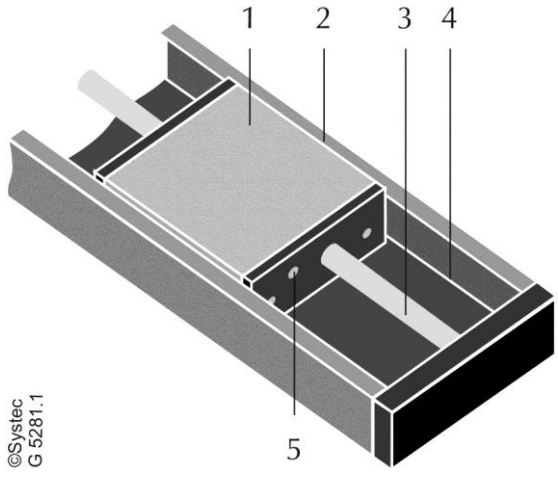


Fig. 29 Linear axis KR

A grease nipple (5) is attached to one face side of the inside vehicle (1). Perform lubrication with an oil press.

Grease passes through the grease nipple (5) in the bearing of the spindle (3), as well as in the bearing of the guides (4).

Lubrication interval Under normal use, lubricate every 100 km. For other operating conditions shorten the maintenance intervals.

6.8.5 Lubrication axis type DuoLine

All linear units are provided in the factory with the required lubricant quantities. The maintenance intervals are determined by the number of operating hours, loads and ambient influences. For servicing, the guide slide (1) is to be positioned centrally over the cover (2) and opened.

Fig. 30 Slide position for maintenance purposes

6.8.5.1 Lubrication of the section slide

Lubrication of the section slide The guide slides are lubricated directly via the grease nipples. Clean grease and oil from the lubrication point before lubricating.
Ensure that the grease gun is axially aligned with the flow direction of the funnel-type lubricating nipple.
A high-pressure grease gun with a needle extrusion tip must be used to lubricate the RK DuoLine 50x50, 80x80 and 80x120(II) units.
A high pressure grease gun with an extrusion tip must be used to lubricate the RK DuoLine 80, 120 and 160 units.

Lubrication interval Lubrication every 1000 km

Lubricant Recommended lubricants: Grease in accordance with DIN 51818 Viscosity class: NLGI class 1, NLGI class 00
For use in max. range: Grease in accordance with DIN 51818 Viscosity class NLGI class 2

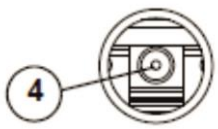
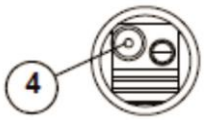
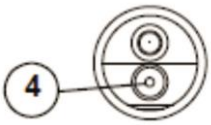
Lubricant quantities

Version	Lubricant quantities
DuoLine 50x50	2 x 0,4 cm3
DuoLine 80x80	2x1,4 cm3
DuoLine 80 x 120	2x1,4 cm3
DuoLine 80x120-II	2x1,6 cm3

DuoLine 80	2x1,4 cm3
DuoLine 160	2x2,8 cm3

* Grease in two stages. After the first stage, drive the guide slides through three slide lengths and then top up with the second stage.
Recommended lubricating interval taking the environmental factors and loading data specified in these assembly instructions into consideration.

6.8.5.2 Lubrication points

Version	**View on the lubrication points**	
	Tooth belt (Z)/without drive (K)	Spindle (S)
DuoLine Z/R/S 50x50		
DuoLine Z/R/S 80x80 DuoLine Z/R/S 120x80		
DuoLine Z/R/S 120x80-II		
DuoLine Z/S 80 DuoLine Z/S 160		
	Fig. 31 View of the lubrication points for different axis types: **- for the section slide (4) and** **- for the spindle (5).**	
Lubrication of spindle	For lubricating the spindle see Chap. 6.7.10.2.	

6.9 Maintenance of axes with bush bearings

6.9.1 Linear axis ZLW

Linear glide polymer slide-bearings are deployed on the guides for the cogged belt axis ZLW. These bearings are 100% maintenance and lubrication free. The omission of lubrication results in a low level of dirt sensitivity, since dirt particles cannot become attached to the moving parts. The polymer slide-bearings can be replaced.

6.10 Maintenance of rotary modules

6.10.1 Rotary modules with worm gears

The worm gear of the rotary modules is maintenance-free by a lifetime lubrication under normal operating conditions.

Regular maintenance is limited to a visual inspection. Check the gearbox, that there are no lubricant losses due to leaks. Relubrication is required only if a greater amount of lubricant leaks out due to leakage losses. Please contact to customer service of Systec for leakage losses.

6.10.2 Rotary modules with toothed belt gearbox

Maintenance interval For rotary modules with toothed belt gearbox check the toothed belt tension twice a year and, where appropriate, adjust it.

Measuring the tension First, screw a side cover (1).
Then expose practicing a drawbar pull of the Newton meter in the middle of the toothed belt (5), and measure the deflection from the rest position.

1: Screws side cover
2: Screws motor adapter
3: Clamping screws
4: Motor
5: Toothed belt

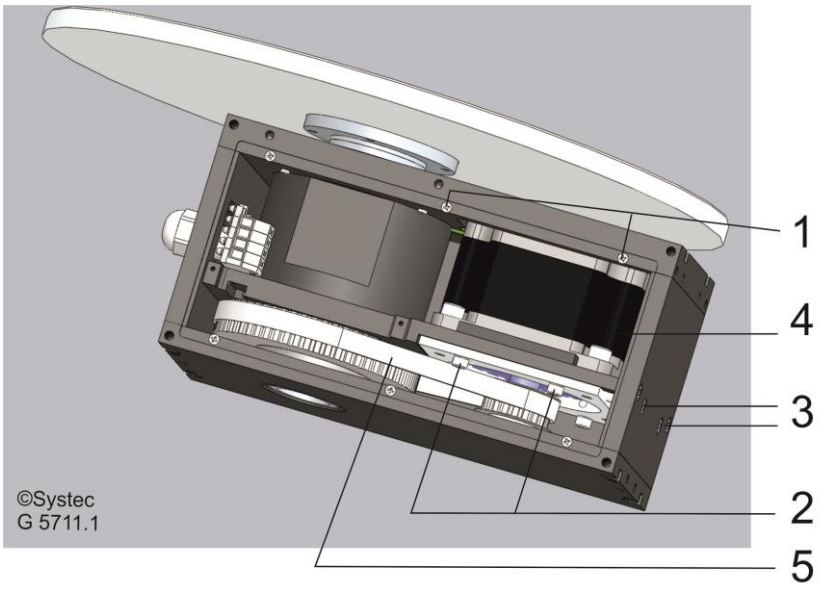


Fig. 32 Overview of a rotary module with toothed belt drive

Target value When applying a force of 20N, the deflection should be 4-7 mm.

Retension If the measured deflection deviates too much from the target value, a readjustment of the toothed belt is required.
The adjustment of the timing belt is now carried out in three steps:

Step 1 Relax screws (2) of the motor adapter a bit.

Step 2 Tighten or loose clamping screw (3) until the target value is achieved.

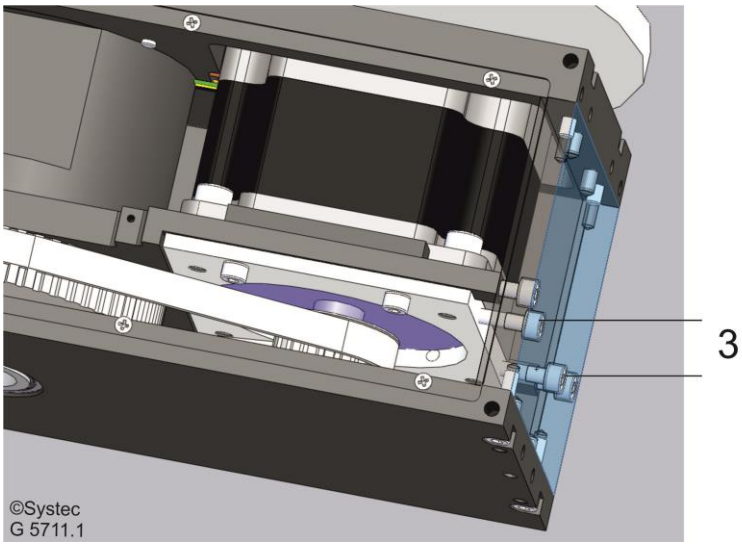


Fig. 33 Clarification of the seat of the clamping screws

Step 3

Tighten screws from the motor adapter again.
Finally screw again the side cover.

7 Index