ATLANTA High Thrust Linear Actuator with rotating ball-screw spindle

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The operating and maintenance instructions are to be strictly observed in order to ensure the proper functioning of the equipment and the acceptance of possible claims under warranty.
Therefore you should carefully read these instructions before starting work with the High Thrust Linear Actuator!

The instructions contain important information regarding the maintenance and should therefore always be kept near the High Thrust Linear Actuator.

1. Product description

The High Thrust Linear Actuator with rotating ball-screw spindle consists of the following components: planetary gear unit (EH2) or multistage cylindrical gear unit (EH4, EH6, EH8), ball-screw spindle, ball-screw nut, electronically controlled lubricator, and three-phase AC braking motor.
Depending upon type, it further comprises fixing lugs or a link rod head, a safety grip nut with cut-off, bellows between gearbox and nut, bellows between nut and mating bearing flange, and a mating bearing flange for the spindle end.

Due to customer-specific modifications the composition of components may vary.

2. General technical data:

Gear series		**EH2**	**EH4**	**EH6**	**EH8**
Ratios		4; 8; 12; 20	5.96; 7.06; 7.93; 8.92; 10.07; 12.19; 15.73	5.64; 6.90; 8.56; 10.85; 14.18	5.64; 6.90; 8.56; 10.85; 14.18
Axial force of spindle	[kN]	15-50	30-60	50-100	60-160
Type of load		Push and pull (pull is only possible if separately guided)			
Duty cycle		Up to 40%			
Max. output torque of gear unit	[Nm]	100	200	400	600
Max. static load	[kN]	100	100	200	200
Ball-screw spindle		KG 40x20 KG 50x10 KG 50x20	KG 40x20 KG 50x10 KG 50x20 KG 63x10	KG 63x20	KG 80x20
Travelling speed	[mm/s]	12 - 233	15 - 157	33 - 165	33 – 165
Motor power at 1400 rpm	[kW]	1.5 – 3.0	1.5 – 4.0	2.2 – 7.5	7.5 – 11.0
Motor power at 2800 rpm	[kW]	2.2 – 4.0	2.2 – 5.5	3.0 – 11.0	7.5 – 11.0

Installation, connection, start-up as well as maintenance and repair work may be carried out only by qualified personnel and with due regard to

- these instructions
- the warning and information signs on the lifting unit
- any other project information, start-up instructions and circuit diagrams
- the unit-specific instructions and requirements
- the applicable national / regional regulations.

3. Painting

The High Thrust Linear Actuator is supplied painted in accordance with RAL 5012 (blue). If painting by the customer is arranged, make sure to cover the contact surfaces of the radial shaft seals before painting the gear unit. The shaft seals are located on both sides of the output sleeve in which the spindle is installed and in the driving flange to which the motor is to be attached.
Spindle and nut have to be covered carefully. The race of the spindle must remain free from any paint!

4. Mounting

Before mounting the gear unit, please check the radial eccentricity tolerance of the spindle to avoid damage during shipment!
Proceed as described under point „11. Replacement of spindle, radial eccentricity check“.

The attachment must be stress-free and free from transverse forces. Avoid any misalignments. Attach the nut in such a way that no transverse forces act upon it. Due to the very low friction these are hardly noticeable even when rotating it by hand. For this reason it is very important to ensure accurate alignment. For mounting the gripping nut please refer to the respective mounting instructions BWL 108e. The working surface of the ball screw must be carefully greased before starting up the unit.
A T L A N T A suggestion: Klüber Microlube GB 0.

4.1. Mounting the ball-screw nut

Depending upon the construction of the lifting device it may be necessary to disassemble the ball-screw nut before mounting the gear unit. Therefore a mounting sleeve is supplied with the unit to be used for the first assembly and which should be kept for later maintenance work.

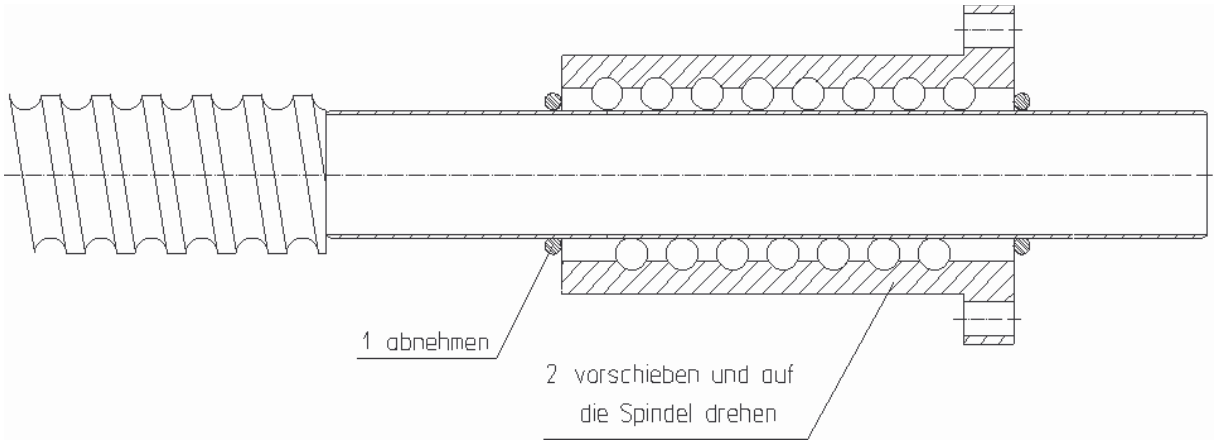
Disassembly of nut from spindle:

1. Remove one o-ring from the mounting sleeve.
2. Hold the mounting sleeve with this side against the spindle end.
3. Screw the nut from the spindle onto the mounting sleeve. Be careful to hold the mounting sleeve well against the spindle end in order to prevent balls from falling out.
4. When the nut fully sits on the mounting sleeve move it slightly towards the centre and slide the o-ring on again.

Re-assembly of nut on spindle:

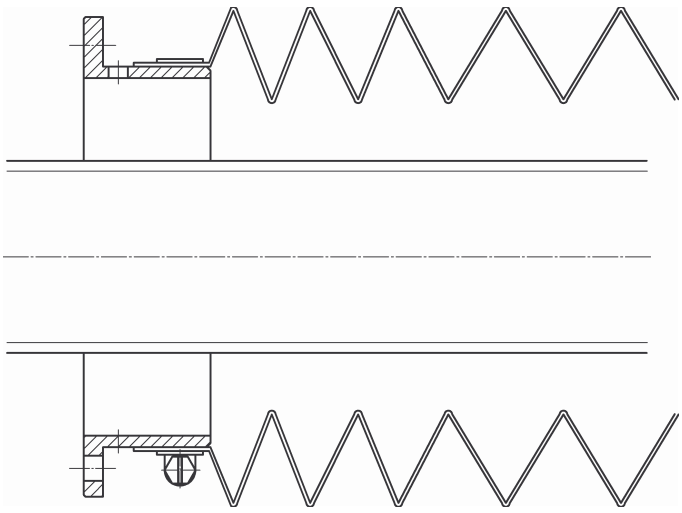
1. Remove one o-ring from the mounting sleeve. Be careful that the nut does not slip from the mounting sleeve.
2. Hold the mounting sleeve with this side against the spindle end.
3. Slide the nut onto the sleeve till the end of the spindle.
4. Screw the nut onto the spindle and hold the mounting sleeve closely to the spindle end so that no balls can fall out.

5. After screwing the nut onto the spindle, remove the mounting sleeve and replace the o-ring.
6. Keep the mounting sleeve for future maintenance work.



4.2. Mounting the bellows

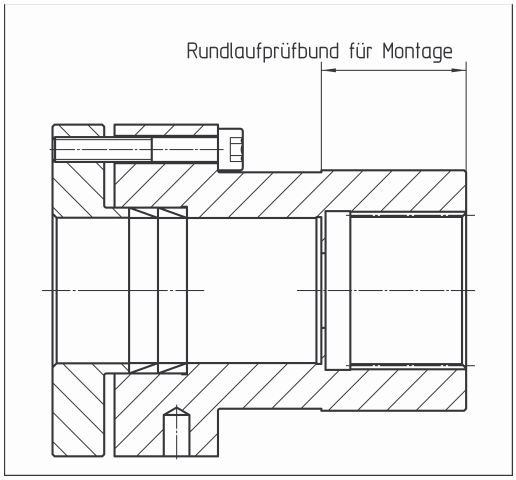
The bellows must always be carefully aerated and vented. For this purpose our bellows adapters are provided with 2 cross-bores each. Do not push the bellows right up to the stop but only about 20 mm so that the vents remain unobstructed.



4.3. Mounting the coupling on the shaft of a servomotor without keyway:

The coupling is supplied pre-assembled.

- Clean all contact surfaces and apply an oil film before mounting the coupling on the motor shaft.
- Slide the coupling onto the motor shaft right up to the stop (shoulder or retaining ring).
- Slightly tighten the clamping screws.
- Check the coupling at the reference diameter for true running (f_r < 0.04 mm).
- Tighten screws uniformly by turning them alternately crosswise.
- Use the tightening torque figures shown in the table below.
- The gap between coupling and pressure surface must remain even.
- Check for true running at the reference diameter again.



Rundlaufprüfbund für Montage = reference diameter for true running

Gearbox	Tightening torque
EH 2	10 Nm
EH 4	10 Nm
EH 6	10 Nm
EH 8	10 Nm

*) Use only calibrated torque wrenches! If the tightening torque of the screws is too low, the required torque will not be transmitted. If the tightening torque is too high, the screws will be overstrained and unusable.

⟨Ex⟩ When used in areas with explosion hazard, improper installation may lead to inadmissibly high temperatures. Double check the true running after 10 hours running with operation conditions.

4.4. Mounting the servomotor:

- Slide the motor with coupling mounted onto the gearing of the input drive shaft and into the gear centering piece so that the plane surfaces touch.
- If necessary, rotate the motor around the motor axle until the coupling and the input shaft gearings match.

⊠ The motor must <u>easily</u> slide on.

⊠ There must not be any gap between the motor and the gearbox flange.

- Screw motor and gearbox together using the specified torque (see table).

ⓘ The motor can be optimally centered with the input shaft standing vertically upright.

ⓘ Use screws with an effective length of at least 1.2 x the thread diameter.

Screw size	Depth of thread	Streng class of screws	Tightening torque*)
M 8	10 mm	8.8	23 Nm
M 10	14 mm	8.8	46 Nm
M 12	19 mm	8.8	80 Nm

*) Use only calibrated torque wrenches! If the tightening torque of the screws is too low, the required torque will not be transmitted. If the tightening torque is too high, the screws will be overstrained and unusable. Secure screws against loosening (e.g. Loctite 243).

5. Mechanical start-up

High Thrust Linear Actuators are generally designed for intermittent operation. It is therefore important that the specific cycle times according to design are observed when starting up the unit for the first time and also during operation. These are defined in the order-specific operating and maintenance instructions for the gear unit.
The electronically controlled lubricator must be started up in accordance with the special instructions supplied. Lubrication is ensured only when the connecting hose is completely filled with grease all the way up and right into the nut.
For test runs of the uninstalled gear unit it is necessary to support the torque at the spindle by suitable measures.

6. Electrical start-up

All electrical components are to be connected only by specially trained skilled personnel. The attached operating and maintenance instructions of the motor and the brake and the technical data sheets of the limit switch must be strictly observed.

Connect the limit switch at the break contacts 11 and 12 in order to ensure the forced mechanical disconnection of the break contacts.
The power and brake connections for direct mains operation are shown on the enclosed connecting diagram.
In order to protect the brake control from disturbing influences the brake lines must not be installed together with clock-pulse controlled power lines in one cable.
In order to protect the motor protection devices (temperature sensors, coil thermostats) from disturbing influences unshielded supply lines must not be installed together with clock-pulse controlled power lines in one cable.

It must be ensured that an overload protection device limits the motor torque to 150 % of the motor torque required for lifting the nominal load.

In the case of motors powered by frequency converters it is absolutely necessary to observe the frequency converter manufacturer's operating and maintenance instructions as well as the wiring instructions.
We strongly recommend to provide S-shaped ramps at the converter.

7. Lubricating Instructions

The rolling friction prevailing between the ball-screw spindle, ball-screw nut and the balls makes it necessary to ensure sufficient lubrication. Without adequate lubrication there will be excessive wear and tear leading to the destruction of the parts.
The electronically controlled lubricator is to be put into operation as described in the enclosed instruction.
The ball-screw spindle is supplied with an initial lubrication.
For putting the unit into operation, the hose should be filled before mounting by means of a grease gun.
Proper lubrication is ensured only when the connecting hose is completely filled with grease right into the nut.
For pressure build-up observe the times indicated in the lubricator operating instructions.
Quickest pressure build-up: all switches „ON". Pressure build-up within 6-8 hours.
Type of lubricant: Microlube GB0 (Klüber) ATLANTA no. for 1kg: 65 90 002.
Based upon our tests, we recommend to set an emptying time of 12 months after start-up and pressure buildup. During the first days and weeks the lubricant supply should be checked at regular intervals and the emptying time should be adjusted to the application. The spindle surface must always be covered with a uniform, thin grease film.

Grease accumulations at the end of the travelling surface of the ball-screw nut or under the bellows are an indication for excessive lubricant supply. Screeching noises between spindle and nut are an indication for insufficient lubrication.

The lubricant level in the lubricator should be checked regularly. We recommend to include this check in a maintenance plan.
When the lubricator is completely empty it can be used again after refilling. Only the pressure chamber where the gas generation takes place and which is available as a spare part must be replaced. A permanent signal lamp powered by two commercially available 1.5 V batteries shows that the lubricator is ready for use.
Please ask for our relevant refilling instructions BKI 103e.
When refilling the lubricator with Microlube GB0 from Klüber carefully watch that no air bubbles are trapped in the lubricator. They lead to insufficient lubrication when they are transported through the hose to the lubricating spot.

8. Maintenance of the gear unit

The spindle can be lubricated by hand or with the electronic lubricator which has to be operated in accordance with the respective instructions. When the lubricator is empty it can be refilled and used again. Spindle and nut should be regularly cleaned (recommendation: once per year) from old grease and then be greased again. Grease deposits in the bellows must be removed.

When greasing the spindle by hand, the following values shall serve as reference values. The lower values are to be used for higher loads and speeds. They also help to determine the emptying time of the lubricator.

Reference values for lubrication intervals and quantities for ball-screw nuts:

Ball-screw drive	Lubricant quantities in g	Lubricating intervals in km
KG 40x20	10	300 – 500
KG 50x10	24	150 – 250
KG 50x20	25	300 – 500
KG 63x10	30	150 – 250
KG 63x20	30	300 – 500
KG 80x20	50	300 – 500

The applicable travelling distances per year can be seen from the order-specific operating instructions.

Type of lubricant: Microlube GB 0 (Klüber) ATLANTA-No. for the 1kg can: 65 90 002

Example for the determination of the lubricator emptying time:

Ball-screw drive	KG 50x20
Travelling distance per year:	1500 km
Relubrication quantity :	25 g per 300 km (in upper speed and load range)
Lubricant requirement/year	125 g (= 1500 km / 300 km * 25 g)
Lubricator capacity:	125 ccm (approx. 125 g)
Emptying time:	12 months

Oil change:

The gearbox is filled with oil. It should be regularly checked for leakage at the seam and the seals. If there are no leaks, it is sufficient to change the oil every 3 years.

Gear unit	EH 2	EH 4	EH 6	EH 8
Oil quantity in litres	0.2	0.7	1.1	

A T L A N T A suggestion: Tivela WB from Shell.

9. Maintenance of safety-relevant components

Good and durable lubrication provided, the spindle drive is designed for the service life stated in the operating instructions of the gear unit. Wear, if any, usually occurs at first at the ball-screw nut or the balls. **Spindle and nut should therefore be included in the annual expert inspection.**

For checking the wear of the spindle, clean the spindle threads with a rag and inspect them for traces of wear. Other signs of wear are increased noise and/or hard-moving drive unit and consequently increased current consumption. We recommend to measure the power consumption after the start-up of the unit and to note this value as a reference value.

Power consumption after start-up: _____ A

The motor brake linings are subject to wear. They should therefore be inspected and, if necessary, readjusted at least once every year.

If there are frequent switching operations they should be inspected at shorter intervals; we recommend quarterly inspections. See operating and maintenance instructions of motor and brake. As soon as the maximum permissible wear indicated in these instructions is reached, the linings must be replaced.

10. Safety instructions

The gear unit may only be operated within the permissible limits according to design. Avoid any bodily contact with rotating parts. Maintenance work should only be carried out when the gearbox is at a standstill and has cooled off. The motor must be disconnected.

The ball-screw spindle is a safety-relevant component. The removal and installation in the gear unit may only be carried out only by specially trained skilled personnel in accordance with the special mounting instructions below.

We recommend to return the unit to our factory for replacement.

The gear oil Shell Tivela WB used in the gear unit at the time of delivery, for which a safety data sheet is available, has the waste code 544 01 (synthetic coolants/lubricants).
The grease Klüber Microlube GB 0 contained in the lubricator at the time of delivery, for which a safety data sheet is available, has the waste code 542 02 (lubricating greases).

11. Spindle replacement:

The ball-screw spindle is a safety-relevant component. The spindle transfers both the axial force and the torque to the gear unit via the shrink plate.
For reasons of operating safety, only specially trained personnel may dismantle and install the spindle in the gear unit. We recommend to have the spindle replaced in our factory.

1. For replacing the spindle loosen the screws in the shrink plate until the plate can be easily moved. Then screw out the spindle from the gear unit in counterclockwise direction.
2. Preparation of the new spindle to be installed:
   - Clean diameters d1 Durchmesser d1 and d2 as well as the thread of the spindle.
   - **Coat the diameter d1 with a thin oil film. Never use grease or MoS_2 oil paste in this area.**
   - Coat diameter d2 and thread with special grease against fretting corrosion.
     ATLANTA recommendation: Klüber paste 46 MR 401 from KLÜBER
     Ordering number for 750 g can: 990 04 015
3. Preparation of the output bushing:
   - Clean inside diameters d1 and d2 and also the thread of the output bushing and inspect the holes for damage and fretting corrosion: Polish, if necessary. Whenever you are in doubt, please contact us or send in the gear unit.
   - **Coat diameter d1 with a thin oil film. Never use grease or MoS_2 oil paste in this area.**
   - Coat diameter d2 and thread with special grease against fretting corrosion.
     ATLANTA recommendation: Klüber paste 46 MR 401 from KLÜBER.
4. Insert the spindle into the gearbox and screw it in manually up to the stop.
5. Now slide on the shrink plate on the right side up to the stop.
6. **Create the transverse pressure connection by uniformly tightening the clamping crews. Use an indicating torque wrench for tightening the screws. Tighten the screws one after the other (not crosswise!) in several passes.**

Gear unit	Tightening torque
EH2, EH4	12 Nm
EH6, EH8	30 Nm

It is not permissible to tighten the clamp screws of the shrink plate without using a torque wrench. Even if the shrink plate is overstrained only once, it may become inoperative.

If the spindle is not properly fastened and secured, the lock screws may come loose causing the spindle to be pulled out of the gearbox and the table to collapse.

Concentricity check at spindle:

After installing the new spindle, check the concentricity. For this purpose clamp the gear unit on the bench. Release the brake at the motor or remove the motor. If the motor is removed, rotate at the input pinion, otherwise at the hexagon hole of the output sleeve. Place the dial gauge onto an even base on the workbench. Rotate the spindle at the input pinion or the output bushing by hand.

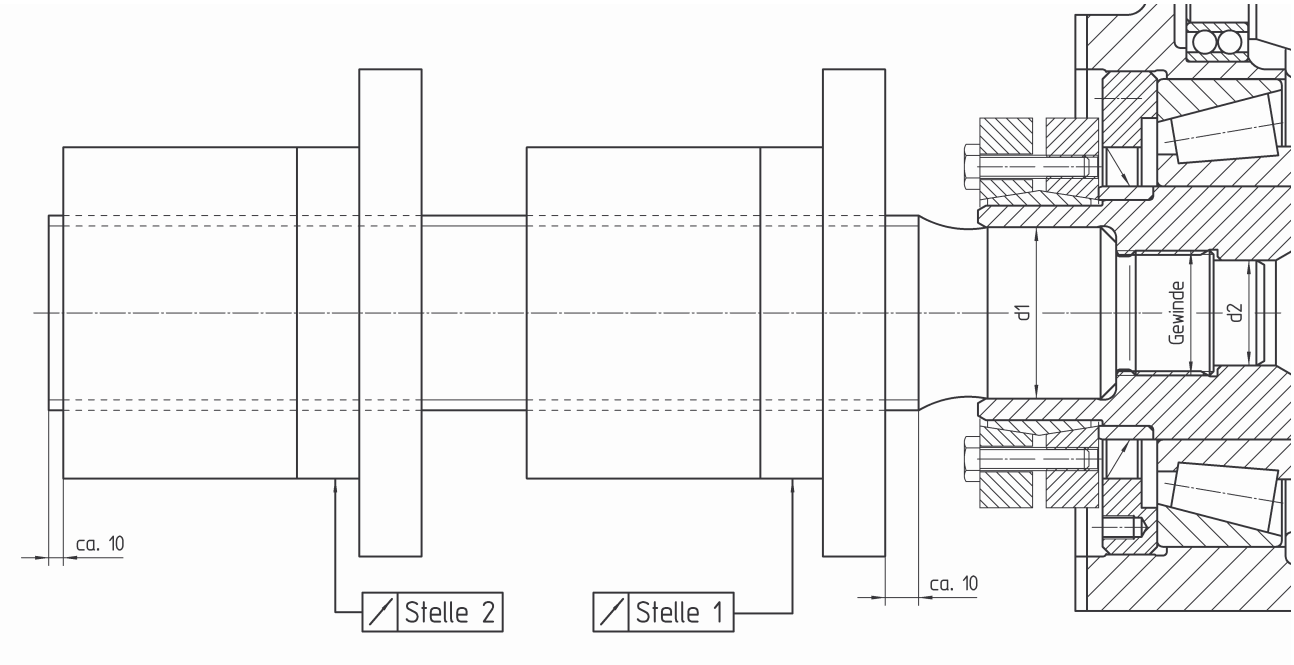
Measuring point 1:
Permissible eccentricity (=reading at the dial gauge): 0,1 mm

Measuring point 2:
Permissible eccentricity (=reading at the dial gauge) dependent on the length of the spindle measured from the front edge of the gear unit.

Length of spindle	Radial eccentricity
Up to 500 mm	0.25 mm
500-1000 mm	0.5 mm
1000-1500 mm	0.8 mm

If the radial eccentricity tolerance is exceeded, please contact us.

Concentricity check at spindle:



The nonobservance of these instructions makes the warranty void.

12. Troubleshooting

The following information shall help you in the case of problems with your gear unit.

Problem	Cause	Remedy
Ball-screw spindle has running marks		Send gear unit to ATLANTA for replacement of spindle and nut.
	Excessive load on spindle.	Check specified loads and forces.
	Load not in axial direction. Nut not aligned with spindle.	Check mounting and alignment of gear unit and nut in the lifting table or the plant and correct, if necessary
	Lubricator empty	Refill lubricator, replace pressure chamber, replace battery.
Ball-screw nut is hard-moving.	Balls destroyed.	See „ball-screw spindle has running marks“.
Motor power consumption increases.	Excessive load on spindle.	Check whether load on the lifting table or the plant or the distribution of the load on the lifting table or in the plant has changed.
		Check moving parts and bearings of the lifting table or the plant for changes.
		Check if all parts move freely or are jammed.
Gear unit switches off.	Limit switch is actuated.	See point "limit switch at grip nut"
	Motor switched off.	See point "motor power consumption increases".
Limit switch at gripping nut is actuated	There are no balls in the nut and the grip nut is engaged.	Send gear unit to ATLANTA for replacement of supporting nut.

13. List of wear and spare parts:

Basic gear unit EH2

Qty.	Description	Order code	DIN	Dimensions	Code
2	Taper roller bearing	9 11 99 045	720	45x95x29	JW4549-JW4510
1	Deep groove ball bearing	9 11 01 070	625		16 007
1	Radial shaft seal	9 21 03 190	3760	75x95x10	
1	Radial shaft seal	9 21 33 131	3760	45x62x7	
1	O ring	9 23 20 091		91x2	
2	Copper seal	9 08 11 107	7603	12x17x1,5	
2	Screw plug	9 01 51 004	908	M12x1,5	
2	Maintenance-free DU plain-bearing bushing	9 13 05 025		25x28x20	

Basic gear unit EH4

Qty.	Description	Order code	DIN	Dimensions	Code
2	Taper roller bearing	9 11 40 093	720	65x120x41	33 213
1	Deep groove ball bearing	9 11 03 014	625	12x32x10	6201 2RS
1	Deep groove ball bearing	9 11 04 013	625	12x37x12	6301 2RS
1	Deep groove ball bearing	9 11 04 023	625	15x42x13	6302 2RS
1	Deep groove ball bearing	9 11 30 034	625	35x55x10	61 907
2	Angular contact ball bearing(2 rows)	9 11 16 020	628	15x35x15,9	3202

2	Radial shaft seal	9 21 03 177	3760	65x85x8	
1	Radial shaft seal	9 21 03 131	3760	45x62x8	
4	O ring	9 23 15 017		17x1,5	
1	O ring	9 23 31 240		240x3	
2	Copper seal	9 08 11 108	7603	12x15,5x1,5	
2	Screw plug	9 01 51 004	908	M12x1,5	
2	Maintenance-free DU-plain-bearing bushing	9 13 05 030		30x34x25	

Basic gear unit EH6

Qty.	Description	Order code	DIN	Dimensions	Code
2	Axial cylindrical roller bearing	9 12 57 020	722	100x150x38	81 220
2	Deep groove ball bearing	9 11 20 022	625	100x125x13	61 820
1	Deep groove ball bearing	9 11 03 053	625	25x52x15	6205 RS1
1	Deep groove ball bearing	9 11 03 043	625	20x47x14	6204 RS1
1	Deep groove ball bearing	9 11 04 050	625	25x62x17	6305
1	Cylindrical roller bearing	9 11 33 034	5412	20x52x15	NU 304
2	Taper roller bearing	9 11 44 062	720	25x62x18,25	30 305
2	Radial shaft seal	9 21 03 210	3760	100x120x10	
1	Radial shaft seal	9 21 43 084	3760	25x52x7	
1	Radial shaft seal	9 21 46 022	3760	20x47x7	
1	O ring	9 23 30 155		155x3,55	
2	Screw plug	9 01 51 514	908	M12x1,5	
2	Copper seal	9 08 11 008	7603	12x16x1,5	
2	Maintenance-free DU plain-bearing bushing	9 13 05 040		40x44x30	

Basic gear unit EH8

Qty.	Description	Order code	DIN	Dimensions	Code
2	Taper roller bearing	9 11 43 110	720	110x200x56	32 222
1	Nilos ring	9 22 43 110			32 222 AV
1	Deep groove ball bearing	9 11 02 110	625	55x90x18	6011
1	Deep groove ball bearing	9 11 04 050	625	25x62x17	6305
1	Deep groove ball bearing	9 11 05 040	625	20x72x19	6404
1	Deep groove ball bearing	9 11 04 060	625	30x72x19	6306
1	Angular contact ball bearing(2 rows)	9 11 17 006	628	30x72x30,2	3306
1	Angular contact ball bearing(2 rows)	9 11 17 037	628	35x80x34,9	3307 2RS
2	Radial shaft seal	9 21 03 218	3760	110x130x12	
1	Radial shaft seal	9 21 03 109	3760	35x72x10	
1	Radial shaft seal	9 21 03 086	3760	25x62x7	
1	O ring	9 23 50 210		210x5	
2	Screw plug	9 01 51 505	908	M12x1,5	
2	Copper seal	9 08 11 107	7603	12x17x1,5	
2	Maintenance-free DU plain-bearing bushing	9 13 05 050		50x55x50	

Lubricator 65 91 000

1 1 kg	Pressure chamber Grease: Klüber MICROLUBE GB0	65 91 001 65 90 002			

Circuit diagram: