

2018

KOELLMANN
GEAR

**Operating
Instructions for
UNEX Extruder
Gears**



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1. Basic Notes

The operating instructions (BA) are named for all types of gear drives, hereinafter referred to as gears, of Koellmann Gear Thielenhaus Technologies GmbH, hereinafter referred to as Koellmann Gear. These BA shall remain valid until new ones are published.

For information or descriptions that depend on the respective gear type, note the technical data sheet, the dimensions sheet or the spare parts drawing.

The precise observation of the BA is a requirement for the operational safety of the gear. Therefore, it is necessary that it is completely read, understood and observed by all persons who are responsible for transport, storage, mounting, commissioning and operation.

The safety notes are introduced by signal words that express the scope of danger.

Comply with the safety notes and act with care to avoid accidents, injury and property damage.

⚠ DANGER

This signal word points to an immediate danger resulting in grave injuries or even death.

⚠ WARNING

This signal word points to a possible danger resulting in grave injuries or even death.

⚠ CAUTION

This signal word points to a possible danger resulting in light to grave injuries.

NOTICE

This signal word points to technical directives for avoiding damage to and functional errors at the gearbox.

A note without a signal word points to recommendations to the user or very important information.

NOTICE

During the warranty period, the gear must only be opened by employees of Koellmann Gear or by qualified staff with our written consent. Otherwise, we shall be released from any obligation to warranty services. Furthermore, we shall not assume any liability for damage resulting from the non-observation of the operating instructions.

The gear is designed for the data specified in the technical data sheet.

NOTICE

If operation is to deviate from the data indicated in the data sheet, coordination with us is required first since technical clarification is once again necessary.

The copyright of these BA shall be with Koellmann Gear.

These BA must not be used for purposes of competition wholly or in part, reproduced or used without authorisation or provided to third parties.

Our BA may be used as part of a customer's BA upon our written approval.

If you have any technical questions, contact the following address under indication of the gear type and gear no. indicated on the rating plate:

Koellmann Gear	
Thielenhaus Technologies GmbH	
Schwesterstraße 50	Postfach 20 18 55
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We reserve the right to technical improvements at the gearbox or the documentation. This Operating Instruction must be handed out and be made known to all concerned persons. Delivery according to our terms of sales and delivery.

2. Safety notes

Precise observation of these BA and all safety notes in them is a prerequisite for proper operation of the gear and serves to avoid injury and property damage.

The operation, maintenance and servicing of the gear must only be performed by persons who have been instructed in this work and are trained accordingly (qualified staff).

All work must only be performed with the gear shut down. It must be ensured that inadvertent activation of the drive motor by third parties is avoided. Work at the gear must be recognisable by a notice sign at the switch of the drive motor.

During operation, the gear may reach a surface temperature of up to 80°C. When touching the gear with unprotected body parts, extreme care is required during and after operation for a time appropriate to the degree of heating.

All rotating parts, such as the input shaft, coupling, pulley with V-belts and drive shaft must be protected against inadvertent contact.

The rating plate and all other notice signs in the gear must be well legible at all times and must not be covered by anything.

If any atypical gear noise occurs during regular operation or if the gear temperature increases atypically, the plant must be shut down at once to avoid further damage.

Unless agreed on differently in the contract, our gears shall be delivered without oil filling. Filling according to chapter 7.2, before the first start-up of the gear, is therefore mandatory to prevent destruction of the gear and loss of the warranty.

During oil change the gearbox must not be pressurized in order to speed up the oil flow. The waste oil must be collected with a suitable vessel and disposed of according to the applicable environmental protection provisions.

The cleaning of the gearbox from outside must not be carried out by a high-pressure cleaner as otherwise the sealing lip of the shaft seal might be damaged and water might enter the air filter.

3. Technical Data

Since these BA apply to all types of toothed gears delivered by Koellmann Gear, all technical data shall be on the respective specific data sheet.

This contains the following information:

- Gear type
- Dimension sheet no.
- Spare parts list
- Customer name
- Customer order no. for initial designation
- Order no. for initial designation
- Build - construction position - execution

The gear must only be used in the construction positions listed here. Coordination is required when any changes are performed.

- Rated output (motor output)
- Input speed
- Output speed
- Transmission
- Admissible drive torque*
- Admissible start-up torque*
- Admissible radial force, applied to the middle of the input pin
- Weight
- Gearbox Oil to be Used, Oil viscosity and oil volume

The indication of the oil volume in the data sheet and on the rating plate solely serves to procure oil. The oil level display at the gear is binding (also see chapter 7.2, Commissioning)

- External cooling via cooling loop or external cooling unit
- Maximum water temperature and water flow rate
- Special features

* The permissible output torque with which the extruder is operated in permanent operation always considers an additional application factor. If the application factor is not listed separately in the data sheet, it is 1.25 (according to DIN 3990, part 1).

NOTICE

****Severe damage at incorrect commissioning!**

At incorrect commissioning, there may be severe damage to the extruder.

Therefore:

The extruder must only be taken into operation if the material in the screw is melted up before start-up.

4. Technical Description

4.1. General Description

The gears described in the chapter are spur gears in single and multiple-stage designs for the drive of a single-screw extruder system. The special feature of the gears is the axial pressure bearing integrated in the housing which takes up the axial forces occurring during extrusion.

Depending on the gear type, the gears can be used in different builds and construction positions. This can be taken from the data sheet and dimensions sheet (see chapter 3).

The test run of each gear that takes place in the factory ensures proper function of all components used for the gear.

4.2. Rotating Direction

NOTICE

Destruction or inability to operate at wrong operating direction!

To avoid destruction or inability to operate the gear, the rotating direction of the output shaft must be clockwise when viewed towards the cylinder connection.

4.3. Housing

The housings are produced in single- or two-stage design depending on gear type. They are designed particularly stiffly due to the occurring high axial forces. The cast construction used has a dampening effect on the overall system.

4.4. Interlock

The optimised diagonal teeth are hardened for use and ground. This ensures a high power transfer at low running noise.

4.5. Shaft Bearing

All shafts are suspended on roller bearings. The type of bearing depends on the gear type.

4.6. Seals

The input and output shafts are sealed by radial shaft sealing rings. Radial shaft sealing rings are subject to wear that depends on factors such as rotating speed, temperature, lubricant quality and ambient cleanliness. Timely exchange prevents run-in tracks on the shafts. Notes on technical renewal can be taken from the assembly instructions of renowned sealing manufacturers, such as www.simrit.com.

4.7. Cooling

Gear cooling is necessary to ensure suitability for use of the machine elements depending on the activation duration, load, rotating speed and ambient temperature. See also chapter 9.

4.7.1 Cooling by Convection

Gear cooling solely by convection causes heat generated in operation to be emitted through the housing to the ambient temperature. It must be ensured that the air circulation is not impaired by customer attachment, sound protection hoods or other covers here.

4.7.2 Cooling with a Cooling Loop

If the gear is equipped with a cooling loop, it must be professionally connected to a water circuit. The required parameters, such as water entrance temperature and water flow volume, can also be taken from the data sheet. If the gear is operated with other than the performance data indicated in the data sheet, coordination with us is required to avoid insufficient cooling.

This type of cooling also requires convection to achieve heat dissipation through the housing walls and thus an even better cooling.

4.7.3 Cooling with a Pump and a Cooler

If the output of a cooling loop is insufficient, a pump with cooler increases the cooling output. This can be either mechanically or electrically operated, e.g. by the connection with the interim shaft or use of a pump with electrical motor on a separate plate (external oil supply unit).

4.7.4 Water Quality

The content of free flowing particles must be less than 10 mg/l. The particle size must not exceed 0,5 mm (spherical). Filamentary particles quickly lead to an increase of pressure loss.

The maximum allowable operating pressure is 10 bar, test pressure is 15 bar.

The following ions are not corrosive under normal conditions:
Iron, Potassium, Manganese, Natrium, Nitrate, Nitrite, Phosphate.

Adhere to the following boundary values:

pH-value	6,0-9,0	Electric conductivity	< 500 µS/cm
Cl ⁻	< 50 ppm	SO ₄ ⁻²	< 50 ppm
CaCO ₃	< 50 ppm	Fe	< 0,3 ppm
NH ₃	< 2 ppm	NO ₃	< 100 ppm
S ⁻²	unfit	SiO ₂	< 30 ppm
NH ₄ ⁺	< 0,1 ppm	free chlorine	< 0,1 ppm
CO ₃ ⁻²	< 0,4 ppm		

4.8. Lubrication

Lubrication of the gears generally takes place by submersion lubrication.

4.9. Monitoring Units

By default, an oil level display or oil level screws are attached to the gear for monitoring of the oil level.

The general monitoring can be supplemented by further components from our accessories programme.

5. Transport and Storage

5.1. Transport

The gear is packed so that safe transport according to the transport type is ensured.

⚠ WARNING

Danger to life from suspended loads!

Loads can swivel out and drop down during lifting. This may cause severe injury or even death.

Therefore:

Never step under suspended loads.

Only approved lifting gear and attachments with sufficient load carrying capacity must be used.

The load must be put down when you leave the workplace.

Ring screws for transport are attached to the gear if desired by the customer. The size of the ring screw has been chosen according to DIN 580. They must be firmly tightened against the support surface. When attaching ropes or chains, ensure that their spreading angle is max. 45°, to avoid exceeding the maximum loads of the ring screws.

⚠ WARNING

Danger to life from wrong attachment!

To avoid the danger of severe injury or even death, ring screws are only intended for lifting the gear alone and not for joint lifting of machine elements already connected to the gear.

Generally, the ring screws can be removed without replacement after transport or installation of the gear. For some gear series, the threaded bores must be sealed after removal of the ring screws, however. The corresponding note is located in the dimensions sheet.

For gears with an oil filling, the ventilation filter has been replaced with a closure screw for transport.

When transporting, observe that any attachments that are present, such as pumps, coolers, display devices or pipes are not damaged.

5.2. Storage

The gear must be stored in a vibration-free location, since vibrations may cause damage to tooth interlocks and roller bearings in standstill. The gear must be protected from direct solar radiation.

All outer blank-metal function areas are protected with adhesive tape or plastic elements. Before assembly of the customer attachments, such as coupling, pulley or cylinders, this protection must be removed without residue.

The inside of the gear is protected from surface and contact corrosion by preservation. If the gear is not immediately taken into operation, it must be stored in a dry room at a room temperature of 20°C protected against ambient influences. It must be observed that temperature fluctuations do not lead to formation of condensation in the gear. For this regular storage, the protection effect of the preservation will keep for up to 6 months.

If the gear is to be stored for more than 6 months, the ventilation filter must be removed and the gear must be completely filled with oil. We recommend using the oil viscosity according to the rating plate to prevent later mistakes.

The threaded opening must be closed with a closure screw after filling. It must be observed that some contamination may enter the gear.

Then the gear must be turned every 6 months at the input shaft enough times to run 2 to 3 times around the output shaft.

NOTICE

Before commissioning, the oil level must be lowered again and the ventilation filter must be inserted. See also chapter 7, Commissioning.

6. Assembly 6.1. General

Assembly of the gear must be performed by qualified staff.

⚠ WARNING

**Danger of injury from insufficient qualification!
Improper handling may cause considerable injury and property damage.**

Therefore:

All activity must only be performed by qualified staff; see the following table.

Activities	Persons	Instructed persons	Instructed persons with technical training	Electricians *)	Specialists*) with additional qualification in pneumatics	Specialists*) with additional qualification in hydraulics
Putting up			•			
Initial commissioning			•			
Setting			•	•		
Operation		•				
Electrical work				•		
Cleaning		•				
Packaging/transport		•				
Disposal		•				

*) A specialist shall be he who, due to his technical training, knowledge and experience, as well as due to his knowledge of the relevant provisions is able to assess the work assigned to him and recognise possible dangers.

Before installation, the notes listed in chapter 5, Transport and storage, must be read and performed accordingly.

⚠ WARNING

**Danger to life from wrong attachment!
Wrong Attachment may cause dropping of the gear.
This may cause severe injury or even death.**

Therefore:

The gear must only be attached at the ring screws. They must be firmly tightened against the support surface.

When planning the machine, observe that the free space around the gear is large enough to perform later maintenance, servicing work and any replacement of gears. Oil drain and oil level displays are to be easily accessible for regular inspection. Before mounting of further attachments, such as coupling, pulley, cylinder or other customer attachments, the temporary corrosion protection at the gear must be removed without residue.

NOTICE

Leaks from solvents!

When removing the corrosion protection with solvents, sealing rings may be wetted, which may cause leaks.

Therefore:

Do not use any solvents.

Couplings and belt discs must be pulled onto the input shaft with the gear centring. Only paired V-belts must be used. The balancing quality level of the V-belt pulley must be between 6.3 and 2.5 according to VDI 2060.

When installing the pulley and subsequent tensioning of the V-belts, it must be ensured that the permissible radial force indicated in the data sheet (attacking in the middle of the input pin) is not exceeded, since there would otherwise be an impermissibly high bend of the input shaft and thus an overload of the bearings and interlocks.

Offset of the two pulleys against each other is not permitted.

NOTICE

Destruction from impacts and hits!

Impacts and hits may cause damage to inner parts such as interlocks, roller bearings and safety rings.

Therefore:

Avoid impacts and hits.

If operation of a cooling loop is planned, it must be connected and its screws must be inspected for tightness. When selecting the piping cross-section, observe that the parameters listed in the technical data sheet, maximum water temperature and water flow volume are complied with.

Ventilation filter, oil level display and oil drain screw must be screwed into the intended threaded bore. The assignment depends on the construction position and must be taken from the dimension sheet.

All intended monitoring devices must be connected and reviewed (see dimensional sheet).

Carry out an equipotential bonding as described in the current directives and guidelines. These connections may solely be carried out by electrical specialists. In case there are no threaded holes at the gearbox for grounding the gear box you will have to use other appropriate means.

HINWEIS

Damages on anti-friction bearings and toothing caused by current flow!

Make sure that no current can flow through the gearbox with gearboxes used together with electrical machines (e.g. motors). Flashovers, short circuits or conductive layers of dust may cause current flow.

Hence:

Use insulators and ground the gearbox properly.

6.2. Alignment

The attachment components on the in- and output-sides are to be aligned precisely with the gear. When installing attachment components, observe the respective installation provisions of the manufacturers.

NOTICE

Destruction from defective alignment!

Defective alignment will cause impermissible forces and torques.

Therefore:

Correct alignment of gears and attachments

6.3. Final Work

Before commissioning, all screws between the gear attachment area(s) and machine frame must be inspected for tight fit again. After tightening of all screws, the alignment must be inspected for changes.

⚠ WARNING

Danger to life from inadvertent contact!

Inadvertent contact may cause contact with rotating parts, such as gear shafts, couplings, pulleys with V-belts, etc. This may cause severe injury or even death.

Therefore:

All rotating parts, such as gear shafts, couplings, pulleys with V-belts, etc. must be protected against inadvertent contact.

7. Commissioning

7.1. Flushing the Gears

If the gears are stored for more than 6 months, a gear flushing must be performed before commissioning. Flushing must take place with an oil of the corresponding operating viscosity. It also must correspond to the requirements listed in chapter 9.2.3. Flushing shall take 2 hours at load-free operation.

7.2. Initial filling with Oil

Before start-up, the gear must be filled with oil. You will find the gearbox oil to be used in the data sheet or on the type plate. The oil types recommended by us are listed in chapter 9, Maintenance and Servicing.

The degree of purity of the oil must be - / 17 / 14 according to ISO 4406.

It must be ensured that the oil level display matches the information in the dimensional sheet. See also chapter 6.1.

The oil is to be filled in through the threaded bore of the ventilation filter installed for this. For a gear with oil level screw, it must be removed before filling. While filling, it must be observed that some contamination may enter the gear.

NOTICE

The oil level display is relevant for the oil level. The indication of the oil volume in the data sheet is a reference and serves to procure oil.

When using an oil level screw, the lower edge of the threaded bore is essential for the oil level. When using an oil sight glass or any other display, the oil must reach the middle of the display.

Inspection of the correct oil level must be performed at standstill of the gear and an oil temperature of approx. 20°C. It must be observed that the oil volume enlarges as the oil - temperature rises.

Do not forget to screw the oil level screw into the corresponding threaded bore again after filling.

7.3. Startup

NOTICE

Destruction or inability to operate at wrong operating direction!

To avoid destruction or inability to operate the gear, the rotating direction of the output shaft must be clock-wise when viewed towards the cylinder connection.

After this, start-up can be performed. It is recommended to start up the gear without load and maintain this condition for approx. 10 - 15 min. If nothing unusual is found during this time, the load can be increased to rated load.

If possible, someone should stay near the gear after the first start-up to be able to switch off the drive motor at once if any changes occur.

8. Operation

8.1. Operating Values

It must be ensured that the oil performance data and parameters indicated on the data sheet and rating plate are complied with. This is a prerequisite for high reliability and long service life of the gear.

8.2. Behaviour at Operating Interferences

Regular and careful monitoring of the gear must be performed. Only this makes it possible to recognise irregularities such as vibrations, increased temperatures, unusual running noise or leaks and to avoid larger consequential damage. If irregularities are found, it must be decided whether the system is to be shut down and the system supplier or Koellmann – Gear directly needs to be informed.

8.3. Extended Standstill

If the gear is not in operation for an extended period of time, the notes listed in chapter 5.2 must be implemented.

To avoid the danger of corrosion in the cooling loop, the cooling water should be drained.

8.3.1 Standstill up to a Time of 6 Months

The gear remains filled with oil.

8.3.2 Standstill for more than 6 Months

If the standstill time is more than 6 months, the gear must be filled with oil completely as described in chapter 5, item 2. Every 6 months, the gear must be turned at the input shaft enough times to turn the input shaft around 2 to 3 times.

8.4. Screw Extension for Extruder Gears

For a screw extension in extruder gears, a suitable screw push-out device must be used according to the specified extension direction.

It must be ensured that the flow of force runs without the output shaft since impermissible forces would otherwise act on the roller bearing.

NOTICE

Destruction from impacts and hits!

Impacts and hits on the output shaft or the screw to drive it out may cause damage to inner parts such as interlocks, roller bearings and safety rings.

Therefore:

Avoid impacts and hits.

9. Maintenance and Servicing

9.1. Maintenance and Inspection

⚠ WARNING

Danger to life from inadvertent activation!

Inadvertent activation may cause contact with rotating parts, such as gear shafts, couplings, pulleys with V-belts, etc. This may cause severe injury or even death.

Therefore:

Shutting down the machine.

The drive motor must not be activated by third parties.

Work at the gear must be recognisable by a notice sign at the switch of the drive motor.

Maintenance and inspection list

Serial no.	Work to be performed	Indication of the standard Test method	Frequency	Comments
1	Testing the fresh oil - type	DIN 51502 DIN 51517, part 3 DIN ISO 3448	Before any oil change or replenishing	For oil viscosity - class, see rating plate or data sheet
2	Check used oil	visually for discolouration and foreign substances	quarterly	Oil examination if required
3	Oil change	See chapter 9.2.1	1. Exchange: After 500 - 700 operating hours. Every further change After 5000 operating hours. (for mineral oil and synth. gear oils for food technology). Then see Chap. 9.2.1	See chapter 9.2.2
4	Oil examination - Kin. viscosity 40°C - Water content -Neutralisation figure - Solids share - Additive level	DIN 51562 DIN ISO 3733, DIN 51777 DIN 51558-2 Filter method according to manufacturer's information	after approx. 500 operating hours, at least once a year	See chapter 9.2.1 Water content below 0.02 % (200 ppm)
5	Housing temperature	max. temperature	weekly	
6	Leaks	visual	weekly	See chapter 4.6

9.2. Lubrication

9.2.1 Oil Change

The time of use of each oil depends on parameters that cannot be precisely pre-determined. It depends on the load, temperature and degree of the arising contamination. Regular oil examinations for suitability of use provide precise information on this. For this examination, approx. 1 litre of a representative average sample is needed. The operationally warm oil sample can be taken directly after standstill of the gear for draining the oil. Then the oil volume removed must be filled in again.

We recommend performing the oil changes for approved mineral oils and synthetic gear oils for food technology at the following intervals:

- 1. Oil change: After 500 - 700 operating hours.
- Every further change: After another 5000 operating hours.
no later than after 1 year
(See chapter 9.1)

80 °C are approved as average oil sump temperature,
Maximum oil sump temperature 100 °C (short term).

We recommend performing the oil changes for approved synthetic oils (PAO, PG) at the following intervals:

- 1. Oil change: After 500 - 700 operating hours.
- Every further change: After another 10,000 operating hours, no later than after 2 years (see chap. 9.1)

90 °C are approved as average oil sump temperature,
Maximum oil sump temperature 110 °C (short term).

NOTICE

Destruction of components and ineffectiveness of the lubricant!

Only polyglycol oils (PG) stated in the table together with a written permit from Koellmann Gear may be used!

NOTICE

The actual oil change intervals may be higher or lower depending on the oil temperature. Generally, a temperature increase by 10 K drops the duration of use of the lubricant by 50 %; a temperature reduction by 10 K increases the duration of use by 50 %.

The oil change takes place by draining the gear oil in operationally warm condition at the oil - drain bore. When draining, observe contaminations in the oil. Gear flushing may be required - (see chapter 9.2.2).

If the oil drain screw is applied with a magnet, it must be cleaned before re-installation.

After the oil drain screw is screwed in again or the oil drain valve closed again, the gear must be filled with fresh oil. The degree of purity of the oil must be = - / 17 / 14 according to ISO 4406.

Filling takes place through the gear bore of the ventilation filter. While filling, it must be observed that some contamination may enter the gear. At once after filling, the ventilation filter must be screwed in again.

If cooling of the gear takes place by an external cooling unit, the pump must run briefly to pump waste oil from the cooler and the pipes. After filling, the pump also must run briefly to let fresh oil enter the cooler and pipes. Then check the oil level and correct it if required.

9.2.2 Gear Flushing

Gear flushing takes place with an oil of the corresponding operating viscosity. It must correspond to the requirements listed in chapter 9.2.3. Flushing shall take 2 hours at load-free operation.

9.2.3 Lubricant Selection

This means: any oil contained in the table mineral oils and The mandatory gearbox oil can be found on the type plate. It matches the performance characteristics stated in the data sheet. Should these characteristics or data change you will need to contact us for a new recommendation regarding the oil.

Our authorised oils of petroleum origin according to DIN 51502 with the respective oil viscosity classes ISO VG according to DIN 51519, must meet the minimum requirement of DIN 51517, part 3. They can be used with operating temperatures of -10°C to +90°C, and for short periods to +100°C.

The type plate reads:

Example 1

„This gearbox contains approx. ... l oil CLP ISO VG 320.“
polyalphaolefin oils of a viscosity class 320 may be used.

Example 2

„Oil type Mobil SHC Gear 320“

You may only use the gearbox oil Mobil SHC Gear 320. Use of any other gearbox oil must be agreed by Koellmann in writing.

The following lubricants table from Koellmann Gear lists recommended mineral oils of different manufacturers.

Mineral oils

DIN 51517-3	ADDINOL	BP	Castrol	Fuchs Lubritech	Klüber	Mobil	Shell
CLP 150	ECO GEAR 150 M	Energol GR-XP 150	Alpha SP 150 Optigear BM 150	GEARMASTER CLP 150	Klüberoil GEM 1-150 N	Mobilgear 600 XP 150	Omala S2 GX 150
CLP 220	ECO GEAR 220 M	Energol GR-XP 220	Alpha SP 220 Optigear BM 220	GEARMASTER CLP 220	Klüberoil GEM 1-220 N	Mobilgear 600 XP 220	Omala S2 GX 220
CLP 320	ECO GEAR 320 M	Energol GR-XP 320	Alpha SP 320 Optigear BM 320	GEARMASTER CLP 320	Klüberoil GEM 1-320 N	Mobilgear 600 XP 320	Omala S2 GX 320
CLP 460	ECO GEAR 460 M	Energol GR-XP 460	Alpha SP 460 Optigear BM 460	GEARMASTER CLP 460	Klüberoil GEM 1-460 N	Mobilgear 600 XP 460	Omala S2 GX 460
CLP 680	ECO GEAR 680 M	Energol GR-XP 680	Alpha SP 680 Optigear BM 680	GEARMASTER CLP 680	Klüberoil GEM 1-680 N	Mobilgear 600 XP 680	Omala S2 GX 680

Synthetic oils have a viscosity index deviating from that of mineral oils. This leads to a higher temperature usage range.

The following lubricants tables from Koellmann Gear list recommended synthetic oils of different manufacturers.

Polyalphaolefine oils

DIN 51517-3	ADDINOL	Fuchs Lubritech	Klüber	Mobil	Shell
CLP HC 150				Mobil SHC Gear 150	Omala S4 GXV 150
CLP HC 220	ECO GEAR 220 S		Klübersynth GEM 4-220 N	Mobil SHC Gear 220	Omala S4 GXV 220
CLP HC 320	ECO GEAR 320 S	GEARMASTER SYN 320	Klübersynth GEM 4-320 N	Mobil SHC Gear 320	Omala S4 GXV 320
CLP HC 460	ECO GEAR 460 S	GEARMASTER SYN 460	Klübersynth GEM 4-460 N	Mobil SHC Gear 460	Omala S4 GXV 460
CLP HC 680	ECO GEAR 680 S	GEARMASTER SYN 680	Klübersynth GEM 4-680 N	Mobil SHC Gear 680	Omala S4 GXV 680

Polyglycol oils*

DIN 51517-3	ADDINOL	Klüber
CLP PG 150	Poly Gear PG 150	Klübersynth GH 6-150
CLP PG 220	Poly Gear PG 220	Klübersynth GH 6-220
CLP PG 320	Poly Gear PG 320	Klübersynth GH 6-320
CLP PG 460	Poly Gear PG 460	Klübersynth GH 6-460
CLP PG 680	Poly Gear PG 680	Klübersynth GH 6-680

NOTICE

***Destruction of components and ineffectiveness of the lubricant!
Only polyglycol oils (PG) stated in the table together with a written permit from Koellmann Gear may be used!**

Synthetic oils for the food technology (NSF H1-approval)

DIN 51517-3	Bechem	Bremer & Leguil	Fuchs	Klüber
CLP (NSF H1) 150	Berusynth 150 H1	CASSIDA GL 150 Rivolta F. L. 170	CASSIDA GL 150	Klüberoil 4 UH 1-150 N
CLP (NSF H1) 220	Berusynth 220 H1	CASSIDA GL 220 Rivolta F. L. 250	CASSIDA GL 220	Klüberoil 4 UH 1-220 N
CLP (NSF H1) 320		CASSIDA GL 320 Rivolta F. L. 400	CASSIDA GL 320	Klüberoil 4 UH 1-320 N
CLP (NSF H1) 460	Berusynth 460 H1	CASSIDA GL 460 Rivolta F. L. 500	CASSIDA GL 460	Klüberoil 4 UH 1-460 N
CLP (NSF H1) 680		CASSIDA GL 680	CASSIDA GL 680	Klüberoil 4 UH 1-680 N

NOTICE

**Destruction of components and ineffectiveness of the lubricant!
Oils of different manufacturers must never be mixed.**

The oils named in the table are recommendations, Koellmann Gear assumes no warranty for the quality of the oil used by you.

9.2.4 Grease Lubrication

Bearings and shaft sealing rings require no special lubrication. They are integrated into the lubrication circuit. In some gears, however, bearing lids are provided with two grease lubrication nipples each to relubricate the shaft sealing rings. Relubrication must be performed after 1000 to 2500 operating hours, with one nipple being removed and the other nipple being used for relubrication until fresh grease escapes from the threaded bores. Then the lubrication nipple is screwed in again.

10. Spare Parts Orders

Spare parts orders must take place according to the corresponding spare parts lists and spare parts drawings under indication of the gear type and gear no.

Any spare parts delivered by us have been inspected and released by our quality assurance. If spare parts, purchased and production parts are not ordered by us, we shall not assume any warranty for damage caused by use of these parts.

▲ WARNING

Danger of injury from the use of wrong spare parts!

Use of wrong or defective spare parts may cause danger to the staff and damage, malfunctions or total failure.

Therefore:

Only use genuine spare parts of the supplier Koellmann Gear.

Always contact the manufacturer if anything is unclear.