

## TRANSLATION OF THE ORIGINAL INSTRUCTIONS

### Contents:

- 1. Products this manual applies to**
- 2. General instructions**
  - 2.1 Introduction
  - 2.2 Proper use of gear units
  - 2.3 Marking
- 3. Safety instructions**
  - 3.1 Explanation of symbols and instructions
  - 3.2 Instructions for safety at work
- 4. Gear unit condition at delivery**
  - 4.1 General
  - 4.2 External coating
  - 4.3 Internal coating
  - 4.4 External preservation
  - 4.5 Internal preservation
- 5. Transport and storage**
  - 5.1 Packing
  - 5.2 Transport
  - 5.3 Storage
  - 5.4 Scope of delivery
- 6. Installation**
  - 6.1 General instructions
  - 6.2 Gear unit installation
    - 6.2.1 General
    - 6.2.2 Solid shaft gear unit
    - 6.2.3 Hollow shaft gear unit
  - 6.3 Attachment of couplings, toothed wheels, etc.
  - 6.4 Other add-on and built-in components
  - 6.5 Oil pumps
  - 6.6 Oil cooling system
    - 6.6.1 Oil/water cooler
    - 6.6.2 Oil/air cooler
  - 6.7 Oil warm-up
  - 6.8 Safety measures
- 7. Putting the gear unit into operation**
  - 7.1 Scavenging the gear unit
  - 7.2 Oil filling
  - 7.3 Greasing bearings and seals
  - 7.4 First start-up

- 8. Operation**
  - 8.1 Operating data
  - 8.2 Operating temperature of gear oil
  - 8.3 What to do in case of defect
  - 8.4 Re-start after defect
  - 8.5 Standstill
  - 8.6 Re-start after standstill
- 9. Reasons for and elimination of defects**
  - 9.1 General
  - 9.2 Possible defects
- 10. Maintenance**
  - 10.1 Inspections / Maintenance
    - 10.1.1 Inspection list
    - 10.1.2 Maintenance list
  - 10.2 Oils
    - 10.2.1 Oil specification
    - 10.2.2 Intervals of oil change
    - 10.2.3 Visual inspection of oil condition
    - 10.2.4 Danger through water
    - 10.2.5 How to change oil
  - 10.3 Bearing greases
    - 10.3.1 Grease specification
    - 10.3.2 Relubrication and regreasing intervals
- 11. Stockkeeping of spare parts**
- 12. Service addresses**

### Attachment

- Table of lubricants
- Form for used oil analysis

## **1. Products this manual applies to**

This operating manual is part and parcel of our delivery and applies to the following gear units, unless no order-specific or product-specific regulation has been issued:

- EISENBEISS spur gear units
- EISENBEISS bevel gear units
- EISENBEISS bevel and spur gear units
- EISENBEISS planetary gear units
- EISENBEISS worm gear units
- EISENBEISS extrusion gear units
- EISENBEISS custom-made gear units

## **2. General instructions**

### **2.1 Introduction**

This operating manual contains instructions for the set-up, operation, lubrication and maintenance of EISENBEISS gear units.

It has been compiled for our customers' skilled and trained technical personnel.

When customised plant or operating manuals are issued, the instructions of this operating manual have to be complied with.

Please read through this operating manual carefully before installing the gear unit. Long and trouble-free machine service life is guaranteed only if this manual's instructions are complied with exactly.

EISENBEISS cannot assume any liability/warranty for any damage and/or operation failures caused by non-observance of this operating manual.

During the guarantee period the gear unit must not be opened without our authorization; otherwise all claims to guarantee will lapse.

### **2.2 Proper use of gear units**

The gear unit must not be used for applications other than specified in its technical data sheet.

The essential identification and operating data of the gear unit are to be taken from the data plate attached to the gear unit.

Should the operating conditions change at a later point in time, they must be checked and confirmed by EISENBEISS.

### **2.3 Marking**

For any questions concerning gear units supplied by EISENBEISS, the following information must always be submitted:

- Order confirmation no./serial no.
- Year of construction
- Gear unit type
- Gear ratio

Please read this information on the data plate attached to the gear unit.

### 3. Safety instructions

#### 3.1 Explanation of symbols and instructions



In this operating manual the general danger sign stands for danger that may be caused to humans if instructions are not complied with.

#### **Important!**

This „IMPORTANT!“ sign stands for damage and/or destruction of the machine and/or other plant components in the event that instructions of this manual are not complied with.

#### 3.2 Instructions for safety at work

- The gear unit is designed and constructed according to the state of the art. Nevertheless, it may be dangerous if handled improperly and by untrained staff.
- The gear unit must only and exclusively be used for applications specified in its technical data sheet. All fields of application other than these will be considered as improper use.
- Proper use of the gear unit also includes compliance with the installation, start-up, operation, and maintenance instructions specified by the supplier.
- Every person in charge of the installation, handling and maintenance of the gear unit must have studied and understood the entire operating instructions and documentation.
- The gear unit must only and exclusively be set up, handled, maintained and repaired by authorised, trained and instructed staff.
- Please abstain from any working method that may impair the safety of humans and/or the gear unit.
- The gear unit and its additional equipment must in no case be operated if they are defective.
- Unauthorised changes in design by the customer or a company appointed by them, which may impair the gear unit's operational reliability are not permitted.
- Any maintenance or repair work on the gear unit must only be carried out when the unit is at a standstill.
- Before work on the gear unit is started, its motors and additional equipment must be secured against unintentional switch-on or start-up.
- Protecting devices must not be removed unless the gear unit is at a standstill and locked.
- Before re-starting the gear unit after maintenance please check carefully whether all protecting devices have been re-installed.
- Oil drains have to be carried out strictly subject to and in line with environmental protection regulations.
- The hoisting gears to be installed and used have to correspond to the total weight of the gear unit (incl. all additional equipment) and have to comply with the relevant safety regulations for hoisting gears.
- The gear unit's operation is subject to the local safety and accident regulations.

#### **4. Gear unit condition at delivery**

##### **4.1 General**

Prior to dispatch, all gear units are subjected to a test run, checked and approved. Test run and approval are carried out in accordance with the processing instructions and work standards laid down at EISENBEISS.

The gear units are dispatched ready for operation, but without oil filling. Lubrication points are filled with grease.

The positions of breathers, oil filling points, oil level gauge and sight glass, lubrication points and oil drain appear on the dimensional drawing. These positions are marked in red on the gear unit.

##### **4.2 External coating**

The gear unit's external coat consists of a primer based on synthetic resin and zinc phosphate, colour: grey-green (RAL 6019) and a finish coat based on synthetic resin (epoxy resin), colour: blue (RAL 5015).

The external coat is resistant to weak acids and alkaline substances as well as oils and solvents and are heat-proof up to 150°C.

Any high-grade epoxy or polyurethane varnish can be applied on top of the exterior coat.

#### **Attention!**

Before painting the gearbox cover all seals and their roller paths with form rubber gasket or similar items.

##### **4.3 Internal coating**

The gear unit's interior coat is resistant to mineral oils and synthetic oils based on polyalphaolifines (PAO).

##### **4.4 External preservation**

All shaft ends as well as hollow shaft borings are protected with a rust-inhibitive coat resistant to salt water and tropical climate conditions. This coat guarantees protection for one year. After one year the coat must be renewed.

##### **4.5 Internal preservation**

If the gear unit is stored in a dry area, its internal coat is effective up to a period of 6 months.

#### **5. Transport and storage**

##### **5.1 Packing**

The gear units are packed as instructed on the customer's order or else as agreed in our order confirmation.

If not ordered otherwise, the gear units are packed on pallets or wooden boards for dispatch.

##### **5.2 Transport**

For transporting the gear units standardised lifting lugs, cams or threads for eye bolts have to be used.

#### **Important!**

Never lift the gear units at their shafts!

Additional equipment and piping attached to the gear unit must be handled with special care. In some cases it may be better to remove pressure gauges, thermometers, etc. before transport. No foreign matter must get into the gear unit's system.

Damage due to use of force or careless loading and unloading must be avoided.

### 5.3 Storage

The gear unit must be stored in a manner that makes sure that the unit's exterior cannot be damaged.

Never store the gear unit near vibrating machines in order to avoid vibration wear of the bearings.

The gear units' standard preservation is sufficient for standard transport conditions, storage in dry areas and a period of six months.

If the customer demands long-term preservation in his order, the company standard test run is carried out with a test run oil with VCI additives, through which a preservation of 24 months is achieved in dry areas. All openings of the gear unit are closed and the breather is replaced by a plug screw.

NOTICE:

Important! Gear unit has been long-term preserved and must not be opened. Before taking gear unit into operation, fill it with oil as recommended in operating manual and replace plug screw by breather.
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If the gear unit must be stored longer than can be assured by the preservation agreed in the contract, please proceed as per section 8.5.

### 5.4 Scope of delivery

The delivery contents are listed in the transport documents. Please check whether delivery is complete on arrival. If parts are damaged from transport or missing, this must be reported to EISENBEISS immediately in writing.

## 6. Installation

### 6.1 General

We recommend having the gear unit installed by authorised technical staff only. We do not assume any liability for damage due to careless or improper installation.

### 6.2 Gear unit installation

#### 6.2.1 General

The gear unit must be set up on a flat, stiff and torsion-resistant foundation (frame). The foundation's dimensions must be calculated from the loads it will have to bear. It is essential that impermissible vibrations during operation are avoided.

Please ensure that sufficient space around the gear unit is left, so that maintenance and repair work as well as inspections can be carried out without hindrance.

It must be possible to fill the gear unit with oil and to drain it via the drain hole without difficulty. If there is not enough space, oil filling screw and oil drain hole must be moved to easily accessible locations by means of appropriately mounted piping systems.

The gear unit must be exactly aligned with the driving and the driven machine without any longitudinal or transversal inclination nor any axial offset. Gear units in inclined position are only permissible if expressly agreed in the order.

Gear units subject to severe conditions of dirt, dust, water, heat or other adverse ambient factors must be protected by a cladding, which, however, must not impair free air circulation.

**Important!** Gear units with backstop, must at their set-up be brought into synchronised run with the motor. The rotation direction arrow on the gear unit's input shaft must correspond to the motor's direction of rotation.

If gear units are cooled via ventilation, air circulation at the intake and pressure sides must not be impaired.

### 6.2.2 Solid shaft gear units

After precise alignment the gear unit must be secured in position. For fixing, bolts of appropriate size for the through holes must be used. It is essential that the tightening torques specified for the bolts are observed.

Bolt size	M12	M16	M20	M24	M30	M36	M42	M48
Tightening torque [Nm]	78	190	370	640	1280	2220	3560	5370

If external forces are exerted on the gear unit, secure it to its foundation by means of stud bolts or else secure it against shifting by fitting stop elements.

### 6.2.3 Hollow shafts gear units

In the case of shaft-mounted gear units provision is to be made that the reaction torque can be absorbed between gear unit (gear torque arm) and foundation without any force – e.g. by installing self-aligning plain bearings.

In the case of shaft-mounted gear units, the torque transmission from gear unit to machine shaft is effected in accordance with the order agreements by means of shrinking disks, fitting keys or other transmission elements.



The hollow shaft boreholes are treated with a preservation coat. Please remove this anti-corrosion coat with nitro thinner or another suitable solvent.

Please clean all hollow shaft boreholes and machine shafts thoroughly before you fit the shaft-mounted gear unit and slightly grease shaft as well as borehole at the fitting key connection and/or the shaft seat opposite the shrinking disk.

When installing the gear unit onto the machine, align it exactly with the machine shaft or install it with the help of suitable installation devices (disk with threaded spindle). The gear unit must not be mounted or removed unless this is done at the hollow shaft.

**Important!** Do not push or pull the gear unit housing, as this may cause damage to the bearings at the output side.

After having installed the gear unit, secure it against axial shifting by means of a retaining disk.

Please follow the installation instructions for frictional tension connections between machine shaft and hollow shaft (e.g. connection via shrinking disk) exactly.

### 6.3 Installation of couplings, toothed wheels, etc.



The shaft ends are treated with a preservation coat. Remove this coat with a suitable solvent before mounting any couplings.

The gear unit is designed to be coupled directly to the driving and the driven machine.

Couplings and coupling flanges must be aligned exactly, and it is essential to follow the coupling manufacturer's instructions.

The installation of chain sprockets, toothed wheels, pulleys, etc. is not permissible unless expressly agreed in the order.

If a gear unit incorporates chain sprockets, toothed wheels or pulleys at its output shaft, it must be installed in such a manner that it is pressed against its foundation.

If a toothed wheel is mounted at the gear unit's output shaft or if an external bearing is installed, exact alignment is of uttermost importance.

All shaft extensions have a tapped hole at their faces. Couplings, chain sprockets, toothed wheels and pulley, etc. have to be installed by means of thrust plates and screws (or other suitable installation devices) at these tapped face holes.

**Important!** The installation of any parts by hitting or pushing the machine is not permissible, as this may cause damage to internal parts of the gear unit.

As a rule, boreholes within the tolerance range of ISO H7 and keyways according to DIN 6885/1 are required for fixing components. Any other fixing methods are subject to the agreements made in the order.

Please secure all components that are attached to the gear against axial shifting by means of retaining disks or other retaining devices.

#### 6.4 Other add-on and built-in components

In the case of gear units with add-on or built-in components other than mentioned above, such as

- central oil lubrication systems
- backstops
- brakes
- multiple-disk clutches
- etc.

please follow the respective operation instructions, if these components have to be installed and maintained according to specific regulations.

#### 6.5 Oil pumps

Oil pumps become necessary where due to high circumferential speeds a forced feed lubrication system is required to lubricate gear teeth, bearings and/or to cool the entire gear unit.

All toothed components as well as bearings and sealings situated above the oil bath are lubricated by oil that is force-fed by an oil pump.

Either a pump mechanically driven by a gear shaft or a motor-driven pump is used.

**Important!** The oil pumps will not work correctly unless they run in the direction of rotation shown by the arrow they are marked with.

Standard oil pressure should be 1 bar to 3.5 bar in hot-running state and depending on the pressure gauge's location.

An oil pressure control switch is incorporated in the gear unit. This switch responds if oil pressure drops below a pre-set limit (e.g. 1 bar). We recommend linking the switch electrically to a visual or acoustic warning system.

If motor-driven pumps are installed, pressure and flow control valves must be incorporated in the electric circuit of the main motor to make sure that the main motor will not start before the motor of the oil pump has begun to work and the pre-set minimum oil pressure and/or minimum flow volume has been achieved. Contact pressure gauges and/or pressure control valves must be installed in such a manner that they are free of vibration.

It is essential that for the installation of pumps and setting oil pressure and flow volume the instructions of the manufacturers of pumps and monitoring systems as well as our instructions are followed

#### 6.6 Oil cooling

##### 6.6.1 Oil/water cooler

Gear units with cooling element or oil/water cooler require water supply. This must be provided by the customer on site and checked whether it is leak-proof.

**Important!** Cooling water pressure must not exceed 8 bar.

Please use fresh water with minimum lime content. Oil/water coolers for water types other than this must correspond with the order agreements.

For the water amount (in l/min) required for the gear unit cooling system please turn to the technical data sheet.

If there is any risk of frost and/or if the gear unit is at a standstill for a longer period the cooling water has to be drained off and any water residue has to be blown out of the unit with compressed air.

The water flow direction in an integrated cooling element is optional. In separate Oil/water coolers, the water flow direction must match a counterflow cooling system. In this case it is essential to follow the special operation instructions of the oil cooler.

#### 6.6.2 Oil/air cooler:

Oil/air cooler must be arranged in such manner that cooling air can circulate without disturbance.

Electrical terminals have to be established by the customer on site in accordance with the voltages available.

For installation, commissioning, maintenance and cleaning of the oil/air cooler please follow the special operating instructions.

#### 6.7 Oil heating

The gear units do not incorporate oil heating systems unless these are expressly ordered.

As a rule, oil should be heated prior to the gear unit being put into operation in such cases where high oil viscosity prevents faultless lubrication (in particular when the unit is started up).

In most cases heating is provided by electrical heating bars with replaceable heating elements located below oil level. If other heating systems are required, they must be agreed upon in the order and/or handled as per their special operating instructions.

If an oil heating system is attached to the gear unit, the oil must be heated to the specified minimum temperature before the gear unit is started up.

Lubricant	mineral oil / synthetic oil					
ISO-VG	100	150	220	320	460	680
min. temperature [°C]	5	10	15	20	25	30

All electrical terminals have to be provided by the customer according to ruling regulations.

#### 6.8 Safety measures

All moving and rotating machine parts must be shielded against contact in accordance with the ruling provisions of local law.

## **7. Putting the gear unit into operation**

### **7.1 Scavenging the gear unit**

Scavenging serves to reduce the residues of previous lubricants and/or preservatives to a minimum.

When the gear unit is commissioned for the first time and if it has been preserved for a longer period, we recommend scavenging it with its operating oil.

Scavenging is effected by filling the gear unit with scavenging oil up to the oil level marking and then letting it idle for about 30 to 60 minutes at half speed under no-load conditions. After this, drain the oil off via the oil drain hole.

### **7.2 Oil filling**

After scavenging the gear unit, fill it with oil as specified (see section 10.2) through the inspection hole or an especially marked infill hole by using a hair sieve or a filter, up to the marking on the oil level indicator.

Components such as pumps, piping elements, pressure gauges, etc., which are supplied separately, must be attached to the gear unit before it is put into operation. Please make sure that all pipes, pumps and coolers are filled with oil.

Only the oil level markings on the oil level sight glass or the oil dipstick are relevant for filling oil into the gear unit.

**Important!** Specifications printed on the unit or on the data plate serve merely as reference information.

As a rule, oil level dipsticks have two markings. Please fill oil in until you reach the upper marking in order to guarantee faultless functioning.

If a separate oil container is used, the marking of its sight glass or on its oil dipstick is relevant.

### **7.3 Greasing bearings and seals**

Grease-lubricated bearings and seals must be filled with grease when the gear unit is delivered and are to be greased regularly according to the requirements of the sub-supplier.

### **7.4 First start-up**

Before starting up the gear unit for the first time, please check carefully that it has been correctly secured and that all instructions given in above paragraphs as well as on notices fixed to the gear unit and additional equipment have been followed.

Gear units with force-fed oil lubrication systems have to be checked immediately after commissioning as to whether the specified oil pressure is maintained in the oil pipes.

Ideally the gear unit should run idle until steady-state temperature is reached.

If no faults occur, the load can be increased at appropriate intervals until the gear unit runs at full load.

For some gear units regulations demand a controlled run-in period. Please follow the commissioning rules that are handed over separately for these gear units.

## 8. Operation

### 8.1 Operating data

In order to ensure flawless functioning of the gear unit, please maintain the operational data of the technical data.

Apart from usual maintenance work, lubrication is the most important basis of a smoothly operating of the gear unit.

**Important!** The oil level must, under no condition, drop below the marking specified. Therefore it must be checked from time to time when the gear unit is at a standstill and cooled down.

### 8.2 Operating temperature of gear oil

As a rule and in order to guarantee sufficient lubrication, operating temperatures of gear oil are as follows, depending on the operational loads and durations to which the the unit is subjected: between +10°C ... +20°C and +50°C ... +80°C.

The following table can be used as reference information for the maximum operational temperatures of gear oils, depending on the type of lubricant and lubrication system:

Lubricant		Oil temperatures [°C]											
		mineral oil						synthetic oil					
ISO-VG		100	150	220	320	460	680	100	150	220	320	460	680
Min.	Splash lubrication:	- 20	- 15	- 10	- 10	- 5	0	- 40	- 35	- 30	- 25	- 25	- 20
	Force-feed lubrication:	-5	0	5	10	15	20	- 15	-10	- 5	0	5	10
Max.	Permanent operation:	70	80	90	90	90	90	80	90	100	100	100	100
	Short-term operation:	100						110					

### 8.3 What to do in case of defect



Irrespective of the following instructions, the gear unit operation is at all events subject to the local safety regulations in force.

Always monitor the gear unit during operation in order to recognise possible irregularities early and to take preventive measures.

If irregularities occur (unusual noise, vibrations, etc.) or if the gear unit's operational values change, the reason must be detected without delay. If it cannot be found even with the help of the troubleshooting list (see section 9.2), please contact the supplier of the plant or EISENBEISS.

#### 8.4 Re-start after defect

Please strictly follow the instructions of chapter 7 – „putting the gear unit into operation“.

#### 8.5 Standstill

If longer periods of standstill occur between operation times, the gear unit must run idle at nominal speed every four weeks for a short time (at least one hour). If this is not possible, suitable preservation has to be carried out (see below).

##### a) Standstill / Storage up to 12 months:

For preservation of up to 12 months the gear unit must be filled with preservation oil up to the oil level marking. To make sure that all smooth surfaces in the gear unit are covered with preservation oil, the shafts of the gear unit must be rotated several times. If possible, the interior parts of the gear unit should be sprinkled with preservation oil or the gear unit itself should be turned several times.

Afterwards the gear unit has to be air-sealed (replace the breather with a plug screw) and the greasing points as well as shaft seals have to be filled with grease. Smooth metallic surfaces must be treated with non-hygroscopic rust protection.

Store the gear unit in a dry area.

##### b) Standstill / Storage up to 24 months:

For preserving the gear unit between 12 and 24 months it has to be filled with Castrol Alpha SP 220S up to the oil level marking and its shafts have to be turned for about 20 minutes. Afterwards the gear unit has to be air-sealed (replace the breather with a plug screw) and the greasing points as well as shaft seals have to be filled with grease. Smooth metallic surfaces must be treated with non-hygroscopic rust protection.

Store the gear unit in a dry area.

After two years of storage at the most the gear unit has to be filled again with Castrol Alpha SP 220S and the same procedure as under 8.5.b) must be repeated.

#### 8.6 Re-start after standstill

Please strictly follow the instructions of chapter 7 – „putting the gear unit into operation“.

### **9. Reasons for and elimination of defects**

#### 9.1 General

The irregularities described hereunder can merely serve as rough guidelines for troubleshooting.

Please, when looking for reasons of defects, do not only check the gear unit itself, but also driving and driven machines.

If the reasons for defects cannot be found or clearly stated, we recommend contacting EISENBEISS specialists.

Please refer to chapter 12 for our service addresses.

9.2 Possible defects

Item	defect	possible reason	what to do
1	sudden change in noise level, vibrations	- fracture or part fracture of tooth (if noise occurs periodically)	Stop plant immediately. Carry out a tooth inspection. Inform EISENBEISS.
		- bearing damage - coupling damage	Check alignment. Change bearing/coupling. Check bearing end clearance and tooth contact pattern.
2	increased temperature at the bearing points	- bearing damage	Check alignment. Change bearing end clearance and tooth contact pattern.
3	oil temperature too high  oil entry temperature too high	- cooling system not switched on or defect - not enough cooling water - cooling water too warm - cooling system fouled - air pocket in cooling system	Remedy defect cause.
4	oil level too low	- oil temperature too high - leakage points at gear unit housing - oil foams (in tank)	as no. 3 above Fill in oil. Repair leakage points.  Check whether water has penetrated in oil tank.
5	water in oil	- cooling coil or water-oil cooler defective - machine room ventilator blows cold air onto gear unit so that water condenses	Repair or if necessary replace cooling coil or cooling system. Shield gear unit housing with thermal cladding. Close or relocate air outlet.
6	oil exit temperature too high	- not enough circulating oil - gear unit is overloaded - operating speed is exceeded - damage to teeth, bearings or seals	Remedy defect cause.  as no. 1 above
7	oil pressure too low	- pump intake line clogged or leaking - oil pump defective - oil level too low - oil filter fouled - oil temperature too high - oil viscosity too low - pressure relief valve is set at too low a value	Remedy defect cause.  as no. 4 above Clean oil filter. as no. 3 above see section 8.2 Check setting value of pressure relief valve and re-set valve if necessary.
8	oil pressure too high	- injection nozzles clogged - oil filter clogged - oil viscosity too high - temperature too low	Clean injection nozzles. Clean or exchange oil filter. see section 8.2

**10. Maintenance**

10.1 Inspections / Maintenance



Before starting any maintenance, repair or other work at the gear unit, the operator of the plant has to make sure that the driving motor is secured against unintentional switching-on or starting. In addition to the following instructions, the respective local rules for the prevention of accidents apply.

10.1.1 Inspection list

We recommend you make inspection recordings in order to be able to recognise any changes in the individual components checked easier and earlier.

Item	component checked	inspection intervals	notes
1	oil temperature	daily, at least weekly	If there are deviations from earlier checks that cannot be explained, please shorten the inspection intervals and check whether the irregularity spreads or not. (Please make regular inspection recordings.)
2	bearing temperature		
3	oil pressure		
4	oil filter pollution indicator		
5	leakages		
6	oil level		
7	noises, vibrations		
8	fixture of unit	weekly, at least monthly	
9	venting filter		
10	exterior condition of gear unit (dirt, oil residues)		
11	state of gear unit oil	visual check: weekly sample check: every six months, at least yearly	see section 10.2.2
12	Condition of tooth flanks	at every oil change	Check the surface condition and tooth contact pattern of tooth flanks.
13	functioning of oil circulation system and of monitoring devices		
14	interior condition and functioning of gear unit and of oil circulation system	every year, at least every two years	

10.1.2 Maintenance list

Item	Maintenance work	Maintenance intervals	Notes
1	repair of defects stated during inspections	permanently	
2	cleaning of oil filter	for first commissioning after 50 operating hours; afterwards at longer intervals	
3	change of gear unit filling	depending on load and operating hours of unit	see section 10.2.2
4	regreasing of greased bearings	after 1000 to 4000 operating hours	after nine months at the very latest
5	cleaning of the interior of the gear unit and of the oil circulation system	at every oil change or every year/every two years	

10.2 Oils

10.2.1 Oil specification

Only use untapped trade-marked gear unit oils. Refer to our table of lubricants attached to this manual for different gear unit oils that can be used according to the recommendations of some oil companies. It is, however, also possible to fill in equivalent trade-marked oil types of companies other than those figuring in this table providing that the following specifications are fulfilled.

In order to prevent misunderstandings, we point out that our recommendations are no guarantee for the quality of the lubrication oil supplied by the lubricant supplier. Every lubricant producer must guarantee the quality of his product himself.

The oils serving as gear unit lubricants are classified into oil classes (ISO-VG, AGMA no.) and have to fulfill the following minimum specifications:

<b>ISO-VG</b> DIN 51519 / ISO 3448	100	150	220	320	460	680
<b>AGMA-Nr.</b> ANSI/AGMA 9005-D94	3EP	4EP	5EP	6EP	7EP	8EP
minimum requirements	CLP - DIN 51517 - part 3					
FZG test	load stage > 12					
(A/8,3/90) – DIN 51354						
micro-pitting test	load stage 10					
(C/8,3/90) – FVA-Nr. 54						

The oil viscosity (ISO-VG) of the oil to be used is indicated on the data plate of the gear unit. This oil viscosity applies to the temperature agreed upon in the order.

If no special agreements were made in the order, the oil viscosity values on the data plate as a rule apply to standard operating conditions and an ambient temperature of +5°C to +30°C. If ambient temperatures range from +30°C to +50°C, it might be necessary to use the oil type given on the data plate, but with a higher viscosity class. For ambient temperatures below +5°C and beyond +50°C as well as in cases of extreme fluctuations in temperature or if the gear unit is heated up by another plant, it is essential to contact EISENBEISS before putting the unit into operation.

The use of synthetic oils can also be recommended because of their slower ageing and the wide range of temperatures at which they can be used. Synthetic oils on a polyAlphaolifine basis may without any risk be used as lubricants for our gear units. Their viscosity class can correspond to or be lower than that of mineral oils.

**Important!** The use of polyglycol oils is not permitted.

### 10.2.2 Intervals of oil change

It depends on the different loads and ambient influences how long the same oil filling can be used as lubricant in a gear unit.

The oil filling (oil sample test  $\geq 1$  litre) should therefore be examined by the technical service of the oil company responsible for the respective oil and released by them for further use.

Attached please find a form to be used for the analysis of used gear unit oils. We recommend to attach this form, filled in with the respective data, to the oil sample as accompanying information.

If no oil sample test is made, the following tables give a rough overview of oil change intervals:

#### a) intervals for the change of mineral oils

1 <sup>st</sup> oil change	changes necessary		max. period of use
	at oil temperat.	after	
after	70°C	8000 op.h.	12 to 18 months
300 to 500	80°C	4000 op.h.	
operating hours	90°C	2000 op.h.	
(op.h.)	100°C	1000 op.h.	

#### b) intervals for the change of synthetic oils

1 <sup>st</sup> oil change	changes necessary		max. period of use
	at oil temperat.	after	
after	70°C	16000 op.h.	24 to 36 months
300 to 500	80°C	8000 op.h.	
operating hours	90°C	4000 op.h.	
(op.h.)	100°C	2000 op.h.	

### 10.2.3 Visual inspection of oil condition

The visual and olfactory assessment of oil can give important clues to the extent to which the oil can be used further as well as to the causes of pollutions and changes in consistency stated.

Item	findings	possible cause	remedial action
1	strong dark colour	overheating, oil change neglected	scavenge the gear unit, change oil
2	milky muddiness	invasion of water or air	find out and remedy defect cause, change oil
3	air bubbles	invasion of air as a result of oil shortage or leaking intake lines	find out and remedy defect cause
4	floating or settled pollutions	abrasion, wear, pollution, oil ageing	check toothing and bearings; scavenge gear unit; change oil
5	smell of burnt oil	overheating, e.g. by oil warming devices	check/replace oil-warming devices; scavenge gear unit; change oil

### 10.2.4 Danger through water

Water in lubricating oils is particularly dangerous, as even the smallest amount of water will cause pitting at the gear unit teeth.

In order to prevent moisture condensation during operation and in particular during standstill the gear unit must be ventilated.

After switching off the unit, please make sure that no machine room ventilators blow their air onto the gear unit. This applies in particular to climatic zones where there is a considerable difference in temperature between day and night.

### 10.2.5 How to change oil

Only change oil when the gear unit is completely switched off and in hot-running state.

Make sure that the oil is completely drained off the gear unit.

Before you fill in new oil check whether there are deposits and residues in the gear unit interior.

After this inspection it has to be decided locally whether the gear unit needs scavenging/cleaning.

For cleaning the gear unit on the occasion of an oil change the operating oil or an oil with lower viscosity has to be used.

Oil pipes and oil pumps have to be flushed through, if necessary, and blown through with pressurised air. Oil filters have to be cleaned and replaced, if necessary.

Existing permanent magnets fixed at plug screws of the oil drain hole, at the oil level plunger or other locations, as well as dirty oil inspection glasses have to be cleaned thoroughly.

Before re-filling the gear unit with oil, please close the oil drain tap and fix the plug screw.

Afterwards the gear unit has to be filled up with suitable oil as specified up to the marking at the oil level indicator (see section 10.2). It may be filled either through the inspection hole or through a specifically marked filling borehole.

It is essential that no pollution particles penetrate into the gear unit.

### 10.3 Greases for bearings

#### 10.3.1 Grease specification

Only use trade-marked greases for bearings. Some greases that correspond to recommendations of lubricant suppliers can be found in our table of lubricants.

In order to prevent misunderstandings, we point out that our recommendations are no guarantee for the quality of the lubrication oil supplied by the lubricant supplier. Every lubricant producer must guarantee for the quality of his product himself.

For greasing bearings and seals we use lithium-saponified fats with an operating temperature range of  $-20^{\circ}\text{C}$  to  $+120^{\circ}\text{C}$ .

Mixing greases of different soap bases is not permitted.

#### 10.3.2 Relubrication and regreasing intervals

Relubrication of bearings will become necessary after 1000 to 4000 operating hours. Please attach forced-feed lubrication nipples to the bearings. Details on relubrication and regreasing intervals may be fixed according to recommendations of bearing suppliers. The intervals must, however, never exceed nine months.



When the grease filling is renewed, the bearings have to be rinsed with dry-cleaning spirit carefully. Afterwards, the cavities have to be re-filled with unused trade-marked grease.

In order to prevent overheating, only one third of the gear unit housing space must be filled with grease. If shafts, however, turn slowly with torques below 60 rpm, the entire gear unit housing case should be filled with grease.

### **11. Stockkeeping of spare parts**

Keeping the most important spare parts and wear parts in stock at the place of installation of the gear unit is an essential precondition for its operation.

The information required for ordering spare parts, such as:

- order no. / serial number
- year of construction
- part no.
- quantity in numbers/units

can be found in the spare parts list attached.

### **12. Service addresses**

If you have any inquiries on our products, please call:

**EISENBEISS GmbH**

Lauriacumstraße 2

A-4470 Enns, AUSTRIA

Tel.: (0043) 7223 / 896 – 0

Fax: (0043) 7223 / 896 – 78

Internet: [www.eisenbeiss.at](http://www.eisenbeiss.at)

lubricant specification	ISO – VG DIN 51519	Table of lubricants							
		BP	CASTROL	CASTROL	CASTROL	KLÜBER	MOBIL	OMV	SHELL
gear unit oil on mineral oil basis CLP – DIN 51517 part 3	<b>100</b>		ALPHA SP 100	Optigear BM 100	Tribol 1100 100	Klüberoil GEM1-100N	Mobilgear XMP 100	OMV gear HST 100	Omala 100
	<b>150</b>	Energol GR-XP 150	ALPHA SP 150	Optigear BM 150	Tribol 1100 150	Klüberoil GEM1-150 N	Mobilgear XMP 150	OMV gear HST 150	Omala 150
	<b>220</b>	Energol GR-XP 220	ALPHA SP 220	Optigear BM 220	Tribol 1100 220	Klüberoil GEM1-220N	Mobilgear XMP 220	OMV gear HST 220	Omala 220 F
	<b>320</b>	Energol GR-XP 320	ALPHA SP 320	Optigear BM 320	Tribol 1100 320	Klüberoil GEM1-320N	Mobilgear XMP 320	OMV gear HST 320	Omala 320 F
	<b>460</b>	Energol GR-XP 460	ALPHA SP 460	Optigear BM 460	Tribol 1100 460	Klüberoil GEM1-460N	Mobilgear XMP 460	OMV gear HST 460	Omala 460 F
	<b>680</b>	Energol GR-XP 680	ALPHA SP 680	Optigear BM 680	Tribol 1100 680	Klüberoil GEM1-680N	Mobilgear XMP 680	OMV gear HST 680	Omala 680
synthetic oil on PAO basis CLP HC – DIN 51517 part 3	<b>100</b>		Alphasyn EP 100					OMV gear SHG 100	
	<b>150</b>	Enersyn HTX 175	Alphasyn EP 150			Klübersynth GEM4 -150N	Mobilgear SHC XMP 150		Omala HD 150
	<b>220</b>	Enersyn HTX 220	Alphasyn EP 220	Optigear Synthetic X 220	Tribol 1710 220	Klübersynth GEM4 -220N	Mobilgear SHC XMP 220	OMV gear SHG 220	Omala HD 220
	<b>320</b>	Enersyn HTX 320	Alphasyn EP 320	Optigear Synthetic X 320	Tribol 1710 320	Klübersynth GEM4 -320N	Mobilgear SHC XMP 320	OMV gear SHG 320	Omala HD 320
	<b>460</b>	Enersyn HTX 460	Alphasyn EP 460	Optigear Synthetic X 460	Tribol 1710 460	Klübersynth GEM4 -460N	Mobilgear SHC XMP 460		Omala HD 460
	<b>680</b>		Alphasyn EP 680			Klübersynth GEM4 -680N	Mobilgear SHC XMP 680		Omala HD 680
bearing greases K2K-20 – DIN 51502		Energol LS EP 2	Grease LMX	Longtime PD 2	4020/220-2	Centoplex 2	Mobilux EP 2	Signum L2	Alvania Grease RL 2

Form for used oil analysis					
1. General information:					
order no.:	gear unit design:	gear unit type:	field of application:		
oil type:	oil volume in the system:	operating hours:	last oil change:	oil operating temperature	
		[op.h]	[op.h]		[°C]
sample from: gear unit circulation system	sample was taken: at standstill during operation	sample was tapped: from oil drain hole from 1/3 filling level	notes:		
2. Tests:					
property or characteristic code	test method or test standard	unit	analysis result of used oil	data of new oil	
colour, appearance, odour	visual	---			
density at +15°C	DIN 51757	g / ml			
kinematic viscosity at +40°C	DIN 51562	mm <sup>2</sup> / s			
neutralization number	DIN 51588-part 1	mg KOH / g			
water contents	DIN 51777	ppm			
contents of unsolved particles	DIN 51592	%			
contents of additives	element spectroscopy	ppm			
wearing metals (Fe, Cr, Si, ...)	element spectroscopy	ppm			
2.1 Additional tests:					
dearaeration capacity	DIN 51381	min			
foam	DIN E 51566	ml / ml			
2.2 Remarks:					
3. Results:					
property to be assessed	total assessment in comparison with new oil				
	as new oil	low	medium	strong	very strong
ageing / wear and tear					
degree of pollution					
result and/or recommendations:					
4. Testing agency/laboratory:					
test date	testing agency/laboratory		testing inspector (signature)		