

General instructions

en

## **Slewing bearing**

**Installation**

**Lubrication**

**Maintenance**



DB\_GWL\_001

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# **LIEBHERR**

## **Document ID**

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## **Product ID**

**Product type:** Slewing bearing  
Installation  
Lubrication  
Maintenance

## **Manufacturer**

Liebherr-Components Biberach GmbH  
Hans-Liebherr-Straße 45  
88400 Biberach/Riß  
Germany

# Revision history

Version	Comment	Issue date
00	First version	9/29/2020



# Preface

## Basic instructions

This manual contains important instructions on how to safely, properly and economically operate the product.

Observing this manual will help reduce hazards and damage, minimize repair costs and downtime, and increase the reliability and service life of the product.

This manual does not replace the data, instructions and technical properties that can be found in the pertinent technical documents.

If you have received further information for the product, such as technical information (TI) or service information (SI), this information must also be observed and included with the manual.

Keep this manual available in the vicinity of the product at all times.

This manual must be read by and used by everyone involved with operating or working on the product.

Print this manual only in color to emphasize important details in the graphics.


Figures in this manual may deviate from the delivered type of product and serve as examples.

Upon delivery of the product as a spare part, the machine manufacturer must be contacted for installation, lubrication, and maintenance.

As soon as specific instructions are created for the product, the general instructions lose their validity.




## User guidance

### Warning notices




	The warning notice warns of potential hazards. Follow all of the measures labeled with this warning sign to prevent injury or death.
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The gradation of the warnings is defined by the following signal words:

- **DANGER**
- **WARNING**
- **CAUTION**
- **ATTENTION**







Symbol	Signal word	Meaning
	<b>DANGER</b>	Identifies an immediately hazardous situation that will lead to death or serious injury if it is not avoided.
	<b>WARNING</b>	Identifies a hazardous situation that could lead to death or serious injury if it is not avoided.
	<b>CAUTION</b>	Identifies a hazardous situation that could lead to minor or moderate injury if it is not avoided.
	<b>ATTENTION</b>	Identifies a hazardous situation that could lead to property damage if it is not avoided.

### Other symbols



Symbol	Meaning
	<b>Note</b> Useful information and tips.
	<b>Request for action</b> Perform action step.
	<b>Prerequisite</b> Prerequisite for subsequent action steps.

Symbol	Meaning
	<b>Result</b> Results of one or more action steps.
-	<b>Enumeration</b> Individual points of a list.








### Prohibition signs

Symbol	Meaning
	Access for unauthorized persons prohibited.
	No access for people with pacemakers or implanted defibrillators.
	Do not touch.
	No heavy loads.
	No access for persons with metal implants.
	Entering the area is prohibited.



### Warning plates

Symbol	Meaning
	Warning against explosive substances
	Warning against magnetic field


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Symbol	Meaning
	Warning against obstacles on the ground
	Warning against electrical voltage
	Warning against suspended load
	Warning against hot surface
	Warning against automatic startup
	Warning against sharp object
	Warning against hand injuries








## Instructional signs

Symbol	Meaning
	Observe the instructions for use.
	Ground before use.

## Protective equipment

Symbol	Protective equipment	Use case
	Hearing protection	Noise



Symbol	Protective equipment	Use case
	Eye protection	Splinters, splashes, compressed air, aerosols
	Face protection	Splinters, splashes, compressed air, aerosols
	Head protection	Falling and flying parts
	Hand protection	Dirt, splinters, splashes, aerosols, hazardous substances, hot and cold parts, sharp edges
	Foot protection	All activities
	Breathing protection	Vapors, aerosols, dust
	Protective clothing	Dirt, splinters, splashes, aerosols, hazardous substances, hot and cold parts
	Hair net	All activities

## Contact

Further information on the product can be obtained from:

Liebherr-Components Biberach GmbH

Postfach 1664

88386 Biberach/Riß

Tel.: +49 73 51 41-49 99

E-mail: [CustomerService.cob@liebherr.com](mailto:CustomerService.cob@liebherr.com)

<https://www.liebherr.com>

### Information for the purchase of spare parts:

- Information from the identification plate of the product
- Article code and designation of spare part

### Information in case of faults:

- Information from the identification plate of the product
- Working hours of the product
- Operating conditions of the product
- Type and degree of fault
- Possible cause of the fault
- Point in time and circumstances of the fault
- Maintenance work performed on the product
- Optional: Reports for the tilting clearance test or lowering measurement
- Optional: Reports for the grease analysis

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# 1 Safety

## 1.1 Intended use

The product is intended exclusively for installation and operation as a slewing bearing.

All other uses or conversion of the product is prohibited.

For intended use, observe the following points:

- Information in these instructions
- Relevant standards, guidelines and regulations
- Recognized rules of sound engineering practice

Only use the product for the agreed technical purpose for which it was designed. Do **not** operate the product with outputs, torques, speeds or external loads that exceed the mechanical design. Have all activities on the product performed only by qualified professional personnel.

The manufacturer is not liable for damage caused by **improper** use.

## 1.2 Qualification of personnel

### 1.2.1 Personnel requirements

- Have reached the legally required minimum age.
- Are physically and mentally able to safely work on the product:
  - Sufficient eyesight
  - Sufficient hearing ability
  - Quick reaction time
  - Are able to assess distance, height, and spacing.
- Are **not** subject to any physical or mental impairments that diminish any of the prescribed requirements.
- Are **not** under the influence of alcohol.
- Are **not** under the influence of drugs.
- Are **not** under the influence of medication.

### 1.2.2 Responsibilities of personnel

- Wear personal protective equipment.
- Regular cleaning and care of the protective equipment
- Immediate replacement of damaged parts of protective equipment

### 1.2.3 Definition of personnel

Personnel	Definition	Symbols in the maintenance plan	Service level
Maintenance personnel	Maintenance personnel are people who have been instructed and trained in the assigned tasks, possible dangers, necessary guards and protective measures.	■ ● ✦	SL1
Mechanical specialist	Mechanical specialists are people who, due to their qualifications, experience and knowledge of the relevant standards, regulations and provisions, are able to work on the product and independently recognize and avoid possible dangers.		
Qualified electrician	Qualified electricians are people who, due to their qualifications, experience and knowledge of the relevant standards, regulations and provisions, are able to work on the product and independently recognize and avoid possible dangers. Electricians must be qualified to handle electrical voltage, high voltage and control and automation systems.		
Authorized professional personnel	Authorized professional personnel are people trained and authorized by Liebherr-Components Biberach GmbH to work on the product. (For more information see: <a href="#">Contact, page 10.</a> )	□ ○ ✦	SL2

Tab. 1: Definition of personnel

## 1.3 Avoiding dangers

- Observe national and regional regulations on safety and accident prevention.
- Observe the technical data.
- Ensure the personnel have the required qualifications.
- Only qualified electricians perform electrical work in accordance with applicable safety regulations and rules.
- Assemble labeling permanently and visibly.
- Observe plating.
- Use protective equipment.
- Observe the servicing intervals.
- Only test and operate the product with guards.
- Tighten screws with the permissible pretension force or permissible tightening torque.
- Use only permissible tools.
- Only use operating and auxiliary materials approved by Liebherr-Components Biberach GmbH.
- Observe the manufacturer's instructions for the operating materials and lubricants.
- Hoist components over 10 kg (22.05 lb) only using suitable load suspension devices and lifting gear.
- Observe the manufacturer's instructions for the load suspension devices and lifting gear.
- All load suspension devices and lifting gear must be tested and used in an undamaged state only.
- Warranty claims are only valid if original parts are used.
- Only allow personnel with appropriate qualifications to work on the product.



- Use hearing protection during operation of the product.
- Transport the product properly.
- Record all maintenance.
- Retain all records.
- Observe applicable guidelines of the insurance company.
- Any work methods that could endanger safety are prohibited.
- Do **not** remove protective covers.
- Do **not** touch live components.
- Do **not** touch hot surfaces.
- Observe the following when cleaning:
  - Use lint-free cleaning rags.
  - Do **not** use a high-pressure cleaner or steam jet.
  - Do **not** damage seals with cleaning agents.
  - Make sure that water or cleaning agent does **not** enter into the bearing raceway.
- Do **not** touch rotating components.

Avoiding dangers

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# 2 Transport and storage

## 2.1 Delivery

### 2.1.1 Delivery condition

#### Bearing raceways

The bearing raceways of the slewing bearing are filled with lubricating grease in the delivery condition by default.

The lubricating grease used can be found in the installation drawing.

#### Corrosion protection

Slewing bearings are preserved with temporary corrosion protection by default.

The gear teeth of the slewing bearing are not greased in the delivery condition. Gear teeth are treated with corrosion protection oil at the factory.

### 2.1.2 Checking the product after delivery

- ▶ Check the delivery for completeness.

If the delivery is incomplete:

- ▶ Report missing parts to Liebherr-Components Biberach GmbH.
- ▶ Check the delivery for transport damage.

If transport damage is present:

- ▶ Report any transport damage to Liebherr-Components Biberach GmbH.

## 2.2 Transport

### 2.2.1 Preparing for transport

- ▶ Observe the legal regulations.
- ▶ Observe the weight, dimensions and center of gravity of the product.
- ▶ Observe the manufacturer's instructions for the load suspension devices and lifting gear.
- ▶ Observe the maximum load capacity when selecting load suspension devices and lifting gear.
- ▶ All load suspension devices and lifting gear must be tested and used in an undamaged state only.
- ▶ Hoist the product only at permissible slinging points.
- ▶ Ensure a suitable transport route for the product.
- ▶ Protect the product against moisture during transport.
- ▶ Avoid radial impacts.

If multiple slewing bearings are transported stacked on top of each other:

- ▶ Make sure that no additional raceway load acts on lower slewing bearings.

### 2.2.2 Transporting the slewing bearing



#### **DANGER**

Falling load!  
Death, bodily injury.

- ▶ Remain only outside the danger zone.
- ▶ Use suitable load suspension devices and lifting gear.
- ▶ Hoist the product only at permissible slinging points.
- ▶ Observe the center of gravity of the product.



#### **WARNING**

Improper setting down of the product!  
Death, bodily injury.

- ▶ Make sure that persons are not injured.

#### **NOTICE**

Exceeding of the towing capacity!  
Damage to the product.

- ▶ Hoist the product only at slinging points.

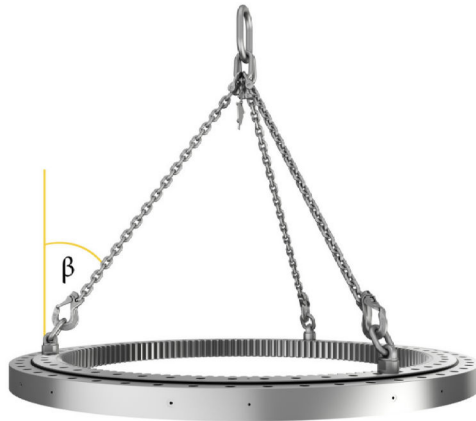


Fig. 3: Slewing bearing suspension

$\beta$  Angle of inclination

- ▶ Check the slinging points, suitable load suspension devices and lifting gear for damage.
- ▶ Take the quantity and position of the slinging points from the drawing.
- ▶ Observe the provisions of the respective load suspension device.
- ▶ Screw in the load suspension devices completely at all slinging points.
- ▶ Ensure that load suspension devices rest flat on the contact surface.
- ▶ Assemble lifting gear to all load suspension devices.
- ▶ Ensure that the angle of inclination  $\beta$  is  $\leq 45^\circ$ . Select chain lengths accordingly.
- ▶ Transport the slewing bearing.
- ▶ Set down the slewing bearing.

### 2.2.3 Returning the slewing bearing

- ▶ Return the slewing bearing only upon agreement with Liebherr-Components Biberach GmbH.



#### WARNING

Improper use of cleaning agents!  
Death, bodily injury.

- ▶ Observe the manufacturer's instructions for the cleaning agent used.
- ▶ Make sure that only specialists carry out cleaning work.
- ▶ Use protective equipment. (For more information see: [Protective equipment, page 8.](#))

If a return has been agreed upon:

- ▶ Clean the slewing bearing.
- ▶ Dry the slewing bearing.



#### WARNING

Improper use of corrosion protection agents!  
Death, bodily injury.

- ▶ Use protective equipment. (For more information see: [Protective equipment, page 8.](#))
- ▶ Observe the manufacturer's instructions for the corrosion protection agent used.

## Transport

- ▶ Treat bare surfaces with corrosion protection agent. Use protective equipment. ([For more information see: User guidance, page 6.](#))
- ▶ Pack the slewing bearing.
- ▶ Return the slewing bearing.

## 2.3 Storage

### 2.3.1 Storing the slewing bearing with standard packaging

Slewing bearings are treated with corrosion protection agents by default. Preservation with corrosion protection agents enables storage of up to six months in covered spaces.

In enclosed spaces with a temperature greater than 12 °C (54 °F), the storage time is approximately twelve months.

Storage outdoors is not permissible.

- ▶ Make sure that the slewing bearing is always stored horizontally.

### 2.3.2 Storing the slewing bearing with long-term packaging

Long-term storage is when the slewing bearing is stored for more than twelve months. Special packaging is required for long-term storage.

- ▶ Coordinate the special packaging and special measures for long-term storage with Liebherr-Components Biberach GmbH.
- ▶ Coordinate the maximum storage period with Liebherr-Components Biberach GmbH.

Storage

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# 3 Installation

## 3.1 Preparing for installation

Make sure that the following prerequisites have been met:

- The slewing bearing is only installed by professional personnel in accordance with applicable safety regulations and rules.
- Connecting surfaces are free of lubricating grease, oil, paint, welding beads and other contaminants and unevenness.
- The slewing bearing is undamaged.
- The connection construction is designed for slewing bearing.
- The connection construction is as torsion-resistant as possible.
- The slewing bearing is completely supported by the connection construction.
- The hole patterns of the connecting surfaces and slewing bearings are congruent.
- Lubricating points and grease extraction points of the slewing bearing are easily accessible in installed condition.
- Tightening and clamping of the fastening bolts with permissible tools is possible without hindrance during installation and in later operation.
- Plating is permanently and visibly attached.
- The flatness tolerance is **not** exceeded in unloaded condition. (see: [tab. 2, page 26](#)) (see: [tab. 3, page 26](#))
- The maximum value of the flatness deviation occurs only once on a sector of 180°. The progression may only rise or fall evenly.
- The connection construction is dimensionally stable after welding work.
- Connecting surfaces are neither damaged nor deformed by subsequent machining processes.

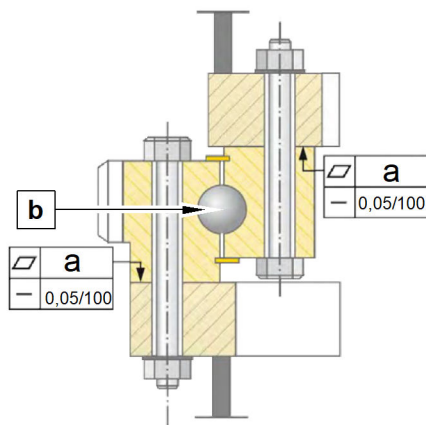


Fig. 4: Checking the flatness of connecting surfaces

**a** Flatness tolerance according to the table      **b** Raceway diameter

The flatness may not exceed 0.05 mm (0.00197 in) over a measuring length of 100 mm (3.937 in), measured at any point of the bearing surface.

Raceway diameter (b)	Flatness tolerance (a) according to DIN EN ISO 1101
Up to 1000 mm (3.28 ft)	0.15 mm 0.0059 in
Over 1000 (3.28) to 1500 mm (4.92 ft)	0.20 mm 0.0079 in
Over 1500 (4.92) to 2000 mm (6.56 ft)	0.23 mm 0.0091 in
Over 2000 (6.56) to 2500 mm (8.2 ft)	0.25 mm 0.0098 in
Over 2500 (8.2) to 3500 mm (11.48 ft)	0.30 mm 0.0118 in
Over 3500 (11.48) to 4500 mm (14.76 ft)	0.35 mm 0.0138 in
Over 4500 (14.76) to 6000 mm (19.69 ft)	0.40 mm 0.0157 in
Over 6000 (19.69) to 8000 mm (26.25 ft)	0.50 mm 0.0197 in

Tab. 2: Flatness tolerance for four point bearing

Raceway diameter (b)	Flatness tolerance (a) according to DIN EN ISO 1101
Up to 1000 mm (3.28 ft)	0.10 mm 0.0039 in
Over 1000 (3.28) to 1500 mm (4.92 ft)	0.13 mm 0.0051 in
Over 1500 (4.92) to 2000 mm (6.56 ft)	0.15 mm 0.0059 in
Over 2000 (6.56) to 2500 mm (8.2 ft)	0.18 mm 0.0071 in
Over 2500 (8.2) to 3500 mm (11.48 ft)	0.21 mm 0.0083 in
Over 3500 (11.48) to 4500 mm (14.76 ft)	0.25 mm 0.0098 in
Over 4500 (14.76) to 6000 mm (19.69 ft)	0.30 mm 0.0118 in
Over 6000 (19.69) to 8000 mm (26.25 ft)	0.40 mm 0.0157 in

Tab. 3: Flatness tolerance for roller bearing

## 3.2 Cleaning the bearing surfaces



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**WARNING**

Improper use of cleaning agents!  
Death, bodily injury.

- ▶ Observe the manufacturer's instructions for the cleaning agent used.
  - ▶ Make sure that only specialists carry out cleaning work.
  - ▶ Use protective equipment. ([For more information see: Protective equipment, page 8.](#))
- 



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**CAUTION**

Improper removal of preservative!  
Bodily injuries.

- ▶ Use protective equipment.
  - ▶ Observe the manufacturer's instructions for the preserving agent used.
- 



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**Note**

Liebherr-Components Biberach GmbH recommends cleaning bearing surfaces with acetone mixtures.

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- ▶ Make sure that no cleaning agent gets onto the seals or into the bearing raceways.
- ▶ Remove corrosion protection on the bearing surfaces of the slewing bearing before assembly.

### 3.3 Attaching and aligning the slewing bearing

Make sure that the following prerequisite has been met:

- ❑ Bearing surfaces of the slewing bearing and the connection construction are cleaned of oil, operating materials, soiling and care products. Do not use aggressive cleaning agents. Use lint-free cleaning rags.



#### DANGER

Falling load!  
Death, bodily injury.

- ▶ Remain only outside the danger zone.
- ▶ Use suitable load suspension devices and lifting gear.
- ▶ Hoist the product only at permissible slinging points.
- ▶ Observe the center of gravity of the product.



#### WARNING

Improper setting down of the product!  
Death, bodily injury.

- ▶ Make sure that persons are not injured.
- ▶ Observe the provisions for the suspension of the slewing bearing. (For more information see: [2.2.2 Transporting the slewing bearing, page 20.](#))

Due to the manufacturing process, there is a small unhardened zone, the hardness slip, in the inductive hardening of the rolling element raceway. The hardness slip is marked with the symbol **S** on the front of the slewing bearing.

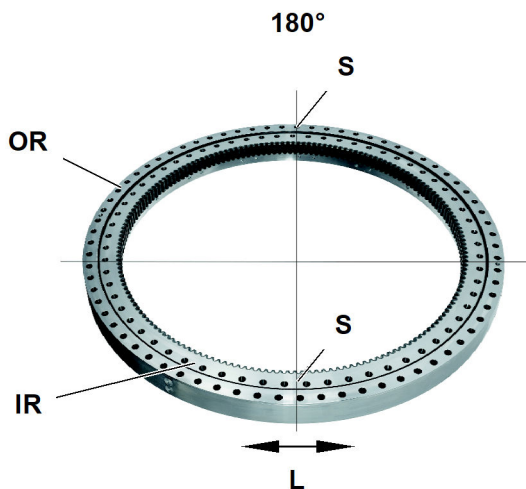


Fig. 5: Example representation of the arrangement of slip points

<b>OR</b>	Outer ring	<b>L</b>	Load direction
<b>IR</b>	Inner ring	<b>S</b>	Hardness slip

Figure (see: [fig. 5, page 28](#)) shows an example of the common arrangement of slip points.

- ▶ Position the slip point on the bearing ring with the point load outside the main load zone.

If the main load zone is known for a bearing ring with a circumferential load:

- ▶ Position the slip point outside the main load zone.

If the slewing bearing is set on a connection construction:

- ▶ Check the proper support of the slewing bearing in unloaded condition with a feeler gauge.

### 3.4 Bolted joint

Make sure that the following prerequisites have been met:

- The required tightening tools are available.
- Uncoated bearing surfaces of the connection construction and slewing bearing are metallicly bright and free of grease.
- Coated bearing surfaces of the connection construction and slewing bearing are cleaned of corrosion protection agent.
- The specified quantity of screws are available.
- The screws correspond to specified diameters.

Unless otherwise agreed, screws with a strength rating of 10.9 are used.



**DANGER**

Improper tightening of screws!  
The bolted joint loosens.  
Death, bodily injury.

- ▶ Use a calibrated tool.
- ▶ Tighten screws crosswise with the permissible tightening torque or preload force.
- ▶ Make sure that the component is pressed evenly against the connection construction.
- ▶ Check the bolted joint at regular intervals.

Screw strength rating		Minimum screw depth					
		8.8	8.8	10.9	10.9	12.9	12.9
Thread fineness d/P		< 9	≥ 9	< 9	≥ 9	< 9	≥ 9
Connection construction / nut material	S235	1.0 x d	1.25 x d				
	S355, C45N	0.9 x d	1.0 x d		1.2 x d		1.4 x d
	42CrMo4+QT, C45V	0.8 x d	0.9 x d		1.0 x d		1.1 x d

Tab. 4: Minimum screw depth for threads for medium tolerance class after calculation according to VDI 2230 sheet 1

d = outside diameter of thread in mm for screws with ISO standard metric thread

P = thread pitch in mm

- ▶ Insert all screws in corresponding borings.
- ▶ Screw the screws into the threaded holes, taking into account the minimum screw depth.

Liebherr-Components Biberach GmbH recommends a clamping length of more than 5 x d.

If the screws cannot be screwed in smoothly over the entire screw depth:

- ▶ Clean or trim the thread.

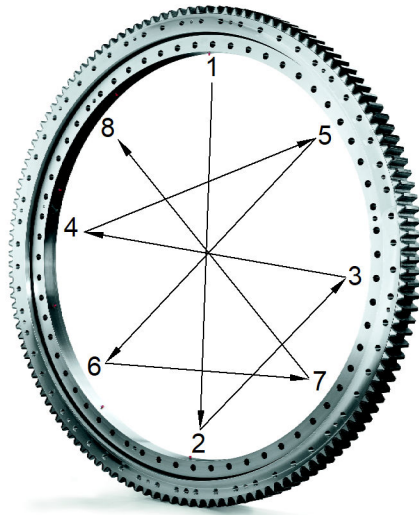


Fig. 6: Tightening the screws

The table in the appendix provides reference values for tightening torque and preload force. (For more information see: 6.1.1 Shaft bolts, page 55.) The specified values apply to a friction coefficient of  $\mu = 0.14$  in the thread and  $\mu = 0.14$  between the head support and connecting surface. Depending on the lubrication, the actual values can deviate significantly from the table values.

When using clamping cylinders, Liebherr-Components Biberach GmbH recommends threads with large play in accordance with DIN 2510-2, since threads with small play can cause the nut to stick during unscrewing.

The preload forces and tightening torques for the assembly of the slewing bearing to the connection construction are to be specified by the machine manufacturer.

- ▶ Tighten the first 8 screws crosswise to the required tightening torque.
- ▶ Tighten remaining screws circumferentially to the required tightening torques.

The pretension of the screws tightened first is influenced by the tightening of the other screws.

- ▶ Tighten the screws in the second round to the required tightening torques.

The interface pressure is roughly calculated according to VDI 2230:

$$\delta = 1.1 \cdot F_M / A_p$$

$F_M$  = assembly preload force

$A_p$  = screw head bearing surface or nut bearing surface

Bearing surface  $A_p$  is dependent on the type of selected screw.

- ▶ Calculate the interface pressure.
- ▶ Compare the interface pressure with the “Interface pressure for screw head supports” table. (see: tab. 5, page 31)

Bearing surface material	Interface pressure [N/mm <sup>2</sup> ]
S235	490
S355	760
42CrMo4+QT	1070 (Based on R <sub>m</sub> , LN 180)
Cq45	770

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Bolted joint

Bearing surface material	Interface pressure [N/mm <sup>2</sup> ]
GJS 400	600

Tab. 5: Interface pressures for screw head supports (reference values according to VDI 2230 sheet 1)

If the interface pressure is exceeded:

- Increase the screw head bearing surface. Use washers.



### 3.5 Setting the tooth flank backlash



**WARNING**

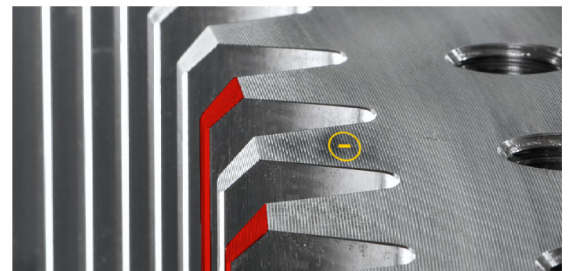
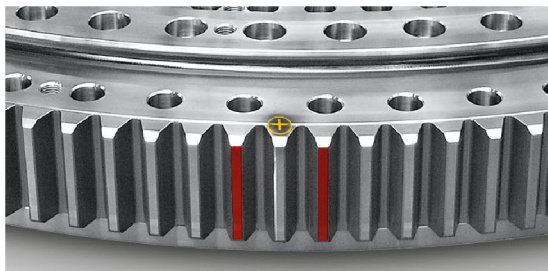
Exposed gear teeth!  
Death, bodily injuries.

If the product is turned:

- ▶ Do **not** reach into the effective area of the gear teeth.

When the bearing is mounted, the tooth flank backlash should not fall below the minimum value of **0.03 x module** or exceed the maximum value of **0.06 x module** at the point of the greatest eccentricity of the gear teeth.

The point of the greatest eccentricity is marked with a “+” or “-” symbol.



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Fig. 7: Stamping of the slewing bearing

+ Symbol with external teeth

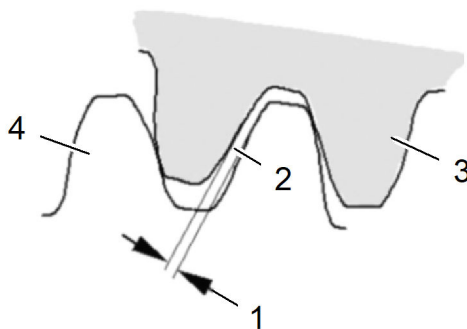
- Symbol with internal teeth

With external teeth, the symbol + marks the point of the smallest play of the gear teeth.

With internal teeth, the symbol - marks the point of the smallest play of the gear teeth.

The teeth to the left and right of the point of the greatest eccentricity are marked with red color.

- ▶ Set the tooth flank backlash on the teeth marked “red”.
- ▶ Then rotate the slewing bearing by 360°.



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Fig. 8: Checking the tooth flank backlash

1 Tooth flank backlash

2 Center of the tooth mesh

3 Slewing bearing

4 Driving pinion

5 Feeler gauge

- ▶ Check the tooth flank backlash at the point of the greatest eccentricity.

## Setting the tooth flank backlash

- ▶ Position the driving pinion **4** and slewing bearing **3** according to the figure “Checking the tooth flank backlash” (see: [fig. 8, page 33](#)).
- ▶ Check the tooth flank backlash **1** in the center of the tooth mesh **2** with the feeler gauge **5**.
- ▶ Increase the thickness of the feeler gauge **5** until the feeler gauge **5** just fits into the gap.

## 3.6 Preparing for commissioning

### 3.6.1 Greasing the gear teeth

The gear teeth of the slewing bearing are not greased in the delivery condition.

The gear teeth must be carefully lubricated with high-quality lubricating grease suitable for the respective application before commissioning. Suitable lubricating greases are listed in the appendix. (For more information see: 6.3.1 Lubricating greases, page 60.)

- ▶ Coat or spray the gear teeth with sufficient lubricating grease.
- ▶ Remove excess lubricating grease with a suitable tool or device.
  - ▷ Contact surfaces on the tooth flanks of the gear teeth have a thin, uniform film of lubricant everywhere.

### 3.6.2 Greasing the bearing raceways

In the delivery condition, the bearing raceways of the slewing bearing are filled with high-quality lubricating grease suitable for the respective application by default. The lubricating grease used can be found in the installation drawing.



Fig. 9: Closed grease collar on bearing seal

- ▶ Before commissioning, regrease the slewing bearing at all lubricating points with fresh lubricating grease while turning it slowly until fresh lubricating grease escapes.

If the slewing bearing was stored for a longer period or an alternative lubricating grease is used:

- ▶ Lubricate the bearing raceways with lubricating grease. Suitable lubricating greases are listed in the appendix. (For more information see: 6.3.1 Lubricating greases, page 60.)
- ▶ Fill the slewing bearing at all lubricating points with fresh lubricating grease while turning it slowly until the lubricating grease is completely replaced.
  - ▷ Fresh lubricating grease escapes at the lip-type seals, evenly distributed around the periphery.
  - ▷ Fresh lubricating grease forms a closed grease collar.

### 3.6.3 Releasing the lip-type seal

After a longer storage period, the lip-type seals can be sucked in, which increases the frictional torque.

To reduce the frictional torque to the normal value:

- ▶ Carefully lift the lip-type seal slightly with a blunt object along the entire periphery.
- ▶ Turn the slewing bearing several times 360° to the left and right.

### 3.6.4 Measuring reference values for tilting clearance measurement or lowering measurement

- ▶ Permanently mark the first measuring point on the periphery of a bearing ring.
- ▶ Mark the three additional measuring points on the periphery of the bearing ring. Shift each of the markings 90°.
- ▶ During commissioning, measure the reference values for the tilting clearance measurement ([For more information see: 4.3.7 Performing the tilting clearance measurement, page 44.](#)) or lowering measurement ([For more information see: 4.3.8 Performing the lowering measurement, page 46.](#)) .

# 4 Maintenance

## 4.1 Preparing for maintenance

Make sure that the following prerequisites have been met:

- The slewing bearing is only maintained by professional personnel in accordance with applicable safety regulations and rules.
- Danger from moving and rotating parts is excluded.

## 4.2 Maintenance plan

### Abbreviations:

h = operating hours

---

### NOTICE

Negative ambient conditions, such as vibrations, temperature fluctuations, wetness and dusty air!  
Damage to the product.

- ▶ Shorten the maintenance intervals after consultation with Liebherr-Components Biberach GmbH.
- 



### Note

Regreasing intervals are not included in the maintenance schedule.

Regreasing intervals are to be established by the maintenance personnel according to the application. (For more information see: [4.3.1 Determining the regreasing quantity and regreasing intervals, page 40.](#))

---

Customer:..... Machine type:..... Serial no.:..... Operating hours:..... Date:.....

intervals (the earlier date is decisive)	Tasks to be performed		Confirm tasks	See page
	By maintenance staff	By authorized specialist staff		
	<ul style="list-style-type: none"> <li>■ Once-only activity</li> <li>● Repeat interval</li> <li>✦ If necessary</li> <li>✳ Annually before the winter</li> </ul>	<ul style="list-style-type: none"> <li>□ Once-only activity</li> <li>○ Repeat interval</li> <li>✧ If necessary</li> </ul>		
<b>Bearing raceways</b>				
	● Annually	Checking the wear of the bearing raceways		44
	✦	Taking a grease sample		41
<b>Gear teeth</b>				
	● Annually	Checking the wear of the gear teeth		48
<b>Seals</b>				
	● Every six months	Checking the seals		50
<b>Bolted joint</b>				
■ 500 h	● Annually	Checking the fastening bolts		51

## 4.3 Bearing raceways



### WARNING

Improper handling of hazardous substances!  
Death, bodily injury.

- ▶ Observe the manufacturer's instructions for the hazardous substances used.
- ▶ Use protective equipment. (For more information see: [User guidance, page 6.](#))

### NOTICE

Improper handling of hazardous substances!  
Environmental damage.

- ▶ Observe legal regulations for disposal.

### 4.3.1 Determining the regreasing quantity and regreasing intervals

**The goal of regreasing is to replace the lubricating grease, which has aged due to the operation of the slewing bearing and which has mixed with water, with new lubricating grease.**

The regreasing quantity recommended by Liebherr-Components Biberach GmbH can be found in the installation drawing.

The regreasing quantity and regreasing intervals depend on the following factors:

- Operating conditions
  - Environmental influences
  - Bearing type
  - Type of seal
- ▶ Have the lubrication condition of the raceways checked by maintenance personnel.
  - ▶ Have maintenance personnel establish the individual regreasing quantities and regreasing intervals depending on the lubrication condition.
  - ▶ Have maintenance personnel check the grease collar.
  - ▶ Remove grease collar from old grease regularly.

### 4.3.2 Regreasing the bearing raceways

- ▶ Remove grease collar from old grease.

If bearing raceways are greaseproof on both sides:

- ▶ Open the relief holes.



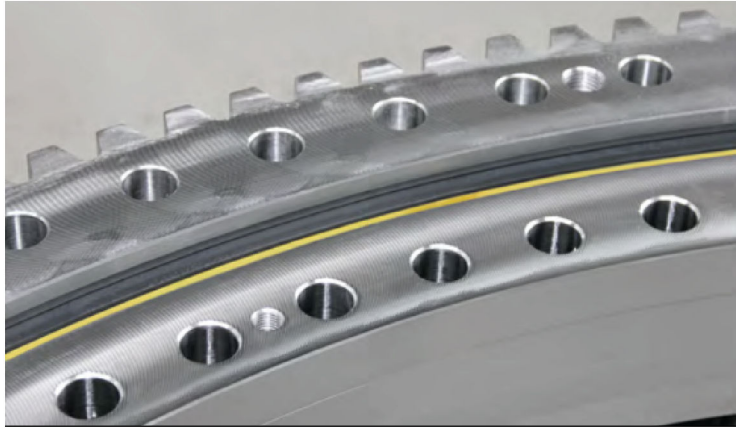


Fig. 10: Closed grease collar on bearing seal

- ▶ Fill the slewing bearing uniformly with fresh lubricating grease at all lubricating points until fresh lubricating grease emerges from under the lip-type seals and forms a closed grease collar.
- ▶ Turn the slewing bearing 90° four times in order to evenly distribute the lubricating grease.
- ▶ Check the grease collar on the seal.
  - ▷ The grease collar has a maximum thickness of 1 cm (0.39 in) everywhere.

### 4.3.3 Unscheduled regreasing

Unscheduled regreasing of the slewing bearing must take place in the following circumstances:

- Before longer breaks in operation or downtimes of more than 2 months
- After longer breaks in operation or downtimes of more than 2 months
- If there is a particularly high amount of moisture, for example due to splash water or gushing water
- ▶ Regrease the bearing raceways. (For more information see: [4.3.2 Regreasing the bearing raceways, page 40.](#))

### 4.3.4 Automatic regreasing

If the bearing raceway is automatically regreased with a central lubricating device:

- ▶ Have maintenance personnel check the function.
- ▶ Have maintenance personnel check the dosing quantity.

### 4.3.5 Taking a grease sample

By analyzing grease samples, wear and bearing damage can be detected early and a quality analysis of the lubricating grease is possible.

Liebherr-Components Biberach GmbH recommends taking grease samples at regular intervals.

Liebherr-Components Biberach GmbH recommends the Liebherr grease analysis kit (article code 12693519) for taking the grease samples.

For slewing bearings with a grease extraction hole, Liebherr-Components Biberach GmbH recommends taking the grease sample with a syringe. For slewing bearings without a grease extraction hole, the grease sample can be taken with a spatula.



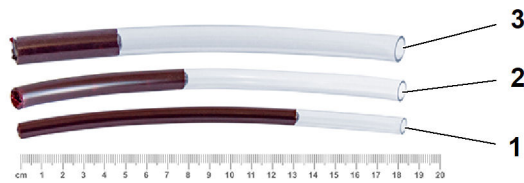


Fig. 12: Recommended filling quantity

- |  |   |
|--|---|
| <p><b>1</b> Hose <math>\varnothing</math> 8 (0.31)x 1 mm (0.04 in)</p> <p><b>2</b> Hose <math>\varnothing</math> 10 (0.39)x 1 mm (0.04 in)</p> | <p><b>3</b> Hose <math>\varnothing</math> 14 (0.55)x 2 mm (0.08 in)</p> |
|--|---|

- ▶ Draw up the syringe until grease has reached recommended filling quantity. Make sure that the grease sample does **not** contain too much air.
- ▶ Remove the hose.
- ▶ Bend the hose in the middle.
- ▶ Put the hose with the bend upwards into a sealable container.

## Taking a grease sample with a spatula



### Note

Only take a grease sample with a spatula if sampling with a syringe is not possible.

Make sure that the following tools are available:

- Spatula
- Lint-free cleaning cloth
- Sealable sample container

### NOTICE

Improper cleaning!  
Damage to the product.

- ▶ Clean only with a rounded cleaning tool.
- ▶ Remove highly contaminated grease on the outside of the lip-type seal.
- ▶ Clean the area around the extraction point with a lint-free cleaning cloth.
- ▶ Lift the lip-type seal with the spatula.

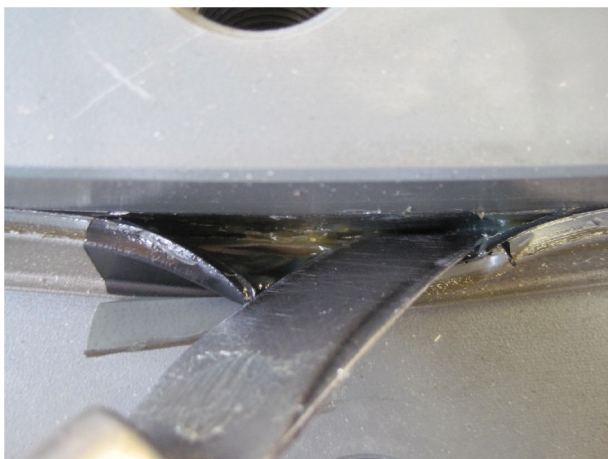


Fig. 13: Grease extraction with spatula

Mix grease for an ideal reference sample.

- ▶ Remove grease with a spatula while rotating the slewing bearing slowly.
- ▶ By visual inspection, ensure that only grease that is to be analyzed is removed.
- ▶ Wipe grease on the spatula off on the bottle neck of the sample container or on the lid.

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### 4.3.6 Checking the wear of the bearing raceways

The wear of the bearing raceways can be checked with a tilting clearance measurement or lowering measurement.

For slewing bearings mainly loaded with tilting moments, for example cranes, Liebherr-Components Biberach GmbH recommends a tilting clearance measurement. (For more information see: [4.3.7 Performing the tilting clearance measurement, page 44.](#))

With primarily axial bearing loads, Liebherr-Components Biberach GmbH recommends the lowering measurement. (For more information see: [4.3.8 Performing the lowering measurement, page 46.](#))

Also carry out a lowering measurement if a measurement of the tilting clearance is not possible.

### 4.3.7 Performing the tilting clearance measurement

Make sure that the following prerequisites have been met:

- Measuring points are established. (For more information see: [3.6.4 Measuring reference values for tilting clearance measurement or lowering measurement, page 36.](#))
- The same conditions as during the measurement of the reference values are present.

Measure the tilting clearance between the lower connection construction and the bearing ring bolted to the upper connection construction.

To minimize the influence of elastic deformation of the connection construction, measure the tilting clearance close to the raceway system.

- ▶ Provide a dial gauge with an accuracy of 0.01 mm.

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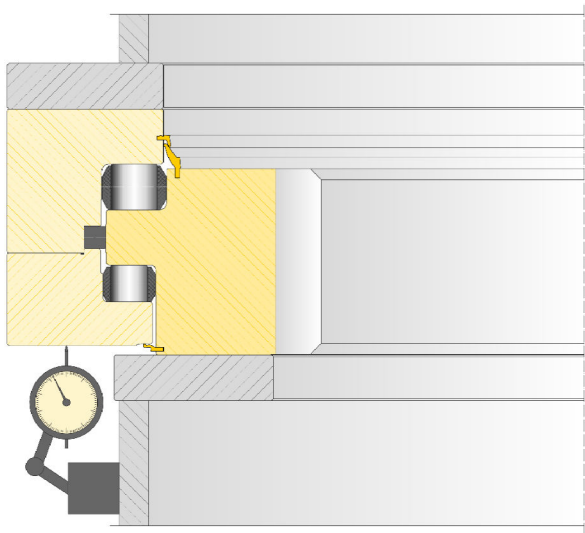


Fig. 14: Positioning the dial gauge

- ▶ Fasten the dial gauge carrying device near the bearing raceway.
- If fastening the dial gauge to the bearing rings is not possible:
- ▶ Position the dial gauge on the connection construction near the bearing rings.
  - ▶ Place the measuring tip of the dial gauge at the first measuring point.

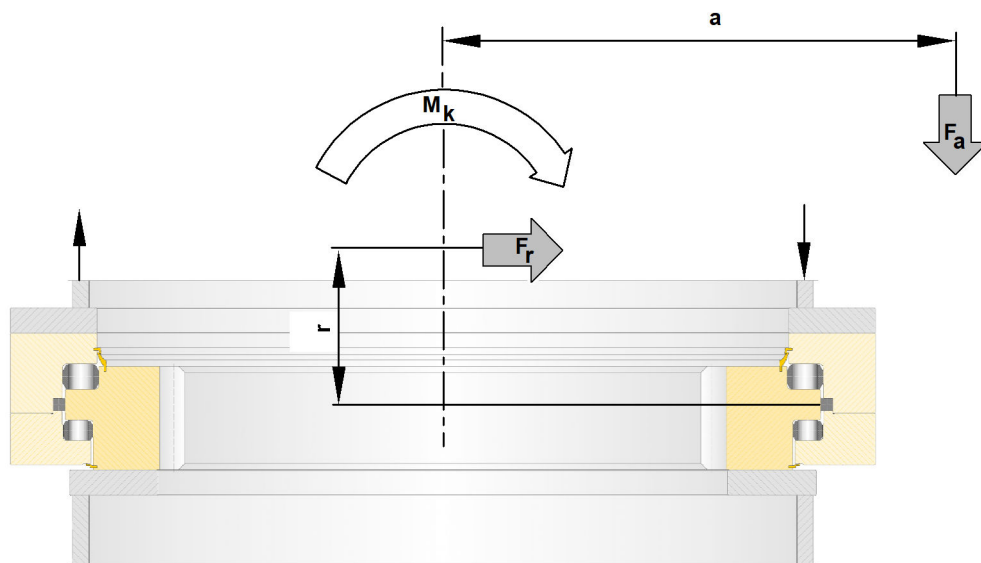


Fig. 15: Load principle of the tilting clearance measurement

- ▶ Initiate maximum reverse torque.
- ▶ Set the dial gauge to zero.
- ▶ Initiate forward tilting torque.
- ▶ Read the maximum tilting clearance on the dial gauge.
- ▶ Document the maximum tilting clearance.
- ▶ Swivel the connection construction.
- ▶ Repeat the measurement at the remaining three marked measuring points.

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If the measurement is being performed for the first time:

- ▶ Document the measured values as reference values.

Proceed as follows for all additional measurements:

- ▶ Subtract the reference value from the measured value.
- ▶ Compare the differential value with the maximum permissible bearing play increase. (For more information see: [6.2 Maximum permissible increase of the bearing play, page 57.](#))

If the permissible bearing play increase is exceeded:

- ▶ Replace the slewing bearing.

### 4.3.8 Performing the lowering measurement

Make sure that the following prerequisites have been met:

- Measuring points are established. (For more information see: [3.6.4 Measuring reference values for tilting clearance measurement or lowering measurement, page 36.](#))
- The same conditions as during the measurement of the reference values are present.

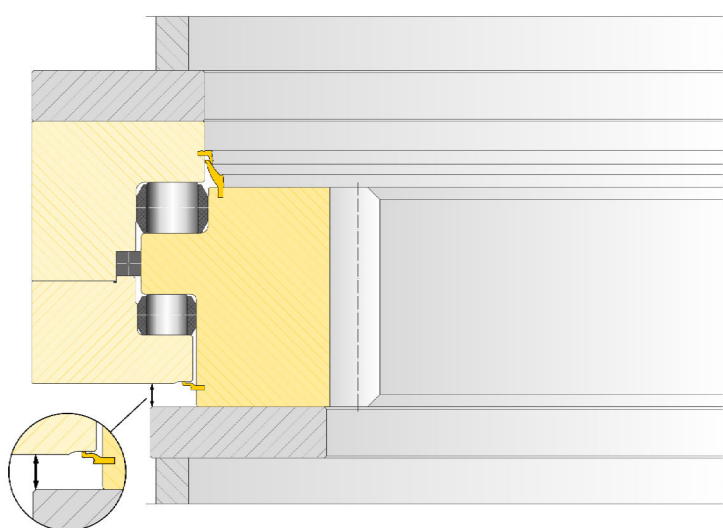
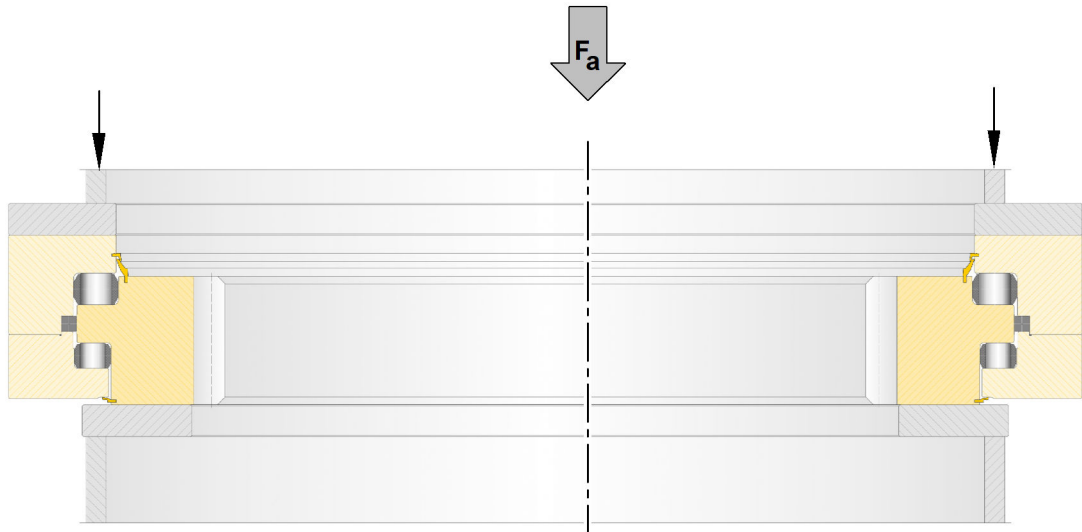


Fig. 16: Design of the lowering measurement

- ▶ Measure the lowering measurement between the lower connection construction and the bearing ring bolted to the upper connection construction.

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Fig. 17: Load principle of the lowering measurement

$F_a$  = axial force

- ▶ Initiate axial force at the first measuring point according to the “Load principle of the lowering measurement” (see: [fig. 17, page 47](#)) diagram.
- ▶ Document the recorded measured values.
- ▶ Swivel the connection construction.
- ▶ Repeat the measurement at the remaining three marked measuring points.

If the measurement is being performed for the first time:

- ▶ Document the measured values as reference values.

Proceed as follows for all additional measurements:

- ▶ Subtract the reference value from the measured value.
- ▶ Compare the differential value with the maximum permissible bearing play increase. (For more information see: [6.2 Maximum permissible increase of the bearing play, page 57.](#))

If the permissible bearing play increase is exceeded:

- ▶ Replace the slewing bearing.

## 4.4 Gear teeth

### 4.4.1 Regreasing the gear teeth



#### WARNING

Improper handling of hazardous substances!  
Death, bodily injury.

- ▶ Observe the manufacturer's instructions for the hazardous substances used.
- ▶ Use protective equipment. (For more information see: [User guidance, page 6.](#))

#### NOTICE

Improper handling of hazardous substances!  
Environmental damage.

- ▶ Observe legal regulations for disposal.

- ▶ Make sure that the contact surfaces of the tooth flanks of the gear teeth always have a sufficient film of lubricant.
- ▶ Coat or spray the tooth flanks with a thin and even layer of lubricating grease.
- ▶ Remove excess lubricating grease with a suitable tool or device again.
- ▶ Check the consistency of the lubricating film.

If the gear teeth are automatically regreased with a central lubricating device:

- ▶ Check the function.
- ▶ Check the dosing quantity.

### 4.4.2 Checking the wear of the gear teeth

The gear teeth can wear during operation. Permissible limit values for the wear depend on the application.

The wear limit can be up to  $0.1 \times \text{module}$ .

- ▶ Check the tooth flank backlash at the point of the greatest eccentricity.

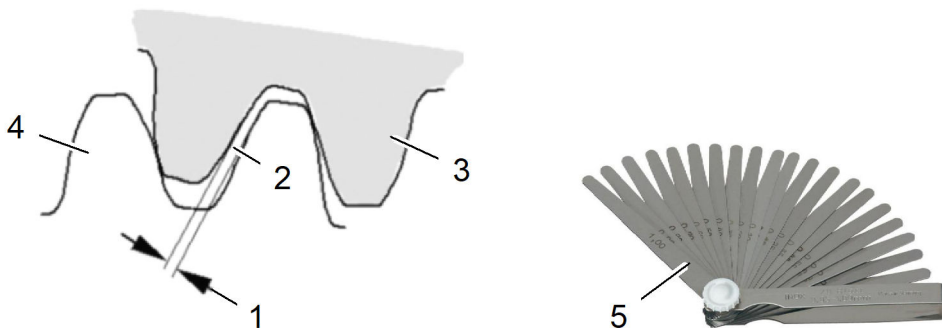


Fig. 18: Checking the tooth flank backlash

1 Tooth flank backlash

[See next page for continuation of the image legend](#)

4 Driving pinion



**2** Center of the tooth mesh

**5** Feeler gauge

**3** Slewing bearing

- ▶ Position the driving pinion **4** and slewing bearing **3** according to the figure.
- ▶ Check the tooth flank backlash **1** in the center of the tooth mesh **2** with the feeler gauge **5**.
- ▶ Increase the thickness of the feeler gauge **5** until the feeler gauge **5** just fits into the gap.

If the tooth flank backlash exceeds the wear limit:

- ▶ Replace the slewing bearing.

## 4.5 Seals

### 4.5.1 Checking the seals

- ▶ Check the seals for damage every 6 months.
- ▶ Replace damaged seals.

## 4.6 Bolted joint

### 4.6.1 Checking the fastening bolts



---

**DANGER**

Improper tightening of screws!  
The bolted joint loosens.  
Death, bodily injury.

- ▶ Use a calibrated tool.
  - ▶ Tighten screws crosswise with the permissible tightening torque or preload force.
  - ▶ Make sure that the component is pressed evenly against the connection construction.
  - ▶ Check the bolted joint at regular intervals.
- 

- ▶ Make sure that the required preload force of the screws is maintained over the entire service life of the product.
- ▶ Check the fastening bolts for signs of settling.

If the required preload does not exist:

- ▶ Tighten the fastening bolts to the required preload using a suitable method.

Bolted joint

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# 5 Decommissioning

## 5.1 Disposal



---

### WARNING

Improper handling of hazardous substances!  
Death, bodily injury.

- ▶ Observe the manufacturer's instructions for the hazardous substances used.
  - ▶ Use protective equipment. ([For more information see: User guidance, page 6.](#))
- 

### NOTICE

Improper handling of hazardous substances!  
Environmental damage.

- ▶ Observe legal regulations for disposal.
- 



### Note

Environmentally friendly recycling and reuse of components through professional disposal.

If there is any ambiguity regarding the materials used, Liebherr-Components Biberach GmbH will be glad to provide information. ([For more information see: Contact, page 10.](#))

---

- ▶ Have the packaging disposed of by a qualified specialized company.
- ▶ Clean components of operating fluids and lubricants.
- ▶ Have components disposed of by a qualified specialized company.
- ▶ Collect operating fluids and lubricants in permissible receptacles.
- ▶ Have operating fluids and lubricants disposed of by a qualified specialized company.



# 6 Appendix

## 6.1 Tightening torques

### 6.1.1 Shaft bolts

Assembly preload forces and tightening torques for shaft bolts according to VDI 2230 sheet 1						
Thread	Preload force [kN] for $\mu_g = 0.14$			Tightening torque [Nm] for $\mu_k = \mu_g = 0.14$		
	Strength rating			Strength rating		
	8.8	10.9	12.9	8.8	10.9	12.9
M10	29	42	49	54	79	93
M12	42	62	72	93	137	160
M14	58	84	99	148	218	255
M16	79	116	135	230	338	395
M18	99	141	165	329	469	549
M20	127	181	212	464	661	773
M22	158	225	264	634	904	1057
M24	183	260	305	798	1136	1329
M27	240	342	400	1176	1674	1959
M30	292	416	487	1597	2274	2662
M33	363	517	605	2161	3076	3601
M36	427	608	711	2778	3957	4631
M39	512	729	853	3597	5123	5994
M42	587	836	979	4445 <sup>A)</sup>	6331 <sup>A)</sup>	7409 <sup>A)</sup>
M45	686	978	1144	5551 <sup>A)</sup>	7906 <sup>A)</sup>	9251 <sup>A)</sup>
M48	773	1101	1288	6715 <sup>A)</sup>	9565 <sup>A)</sup>	11193 <sup>A)</sup>
M52	926	1319	1543	8628 <sup>A)</sup>	12289 <sup>A)</sup>	14381 <sup>A)</sup>
M56	1068	1522	1781	10750 <sup>A)</sup>	15311 <sup>A)</sup>	17918 <sup>A)</sup>
M60	1247	1776	2078	13334 <sup>A)</sup>	18991 <sup>A)</sup>	22224 <sup>A)</sup>
M64	1411	2010	2352	16058 <sup>A)</sup>	22871 <sup>A)</sup>	26764 <sup>A)</sup>

Tab. 6: Assembly preload forces and tightening torques for shaft bolts according to VDI 2230 sheet 1

## Tightening torques

- A) For screw sizes as of M42, the values must be verified through a strain measurement of the screw.

Values in the table "Assembly preload forces and tightening torques for shaft bolts according to VDI 2230 sheet 1" (see: [tab. 6, page 55](#)) relate to the following conditions:

- Assembly preload forces  $F_M$  and tightening torques  $M_A$  at a utilization factor of  $v = 0.9$  for shaft bolts with standard metric thread according to DIN ISO 724, DIN 13-19.
- Head dimensions of hexagon bolts according to DIN EN ISO 4014 to DIN EN ISO 4018.
- Screws with hexalobular heads according to DIN 34800 or cylinder screws according to DIN EN ISO 4762 and "medium" hole according to DIN EN 20273.
- Friction coefficients  $\mu_k = \mu_G = 0.14$  at the thread and bearing surfaces.

## 6.1.2 Screw plugs

Overview of tightening torques of screw plugs according to LN 524-1		
Thread	Width across flats	Tightening torque [Nm]
M10 x 1	5	10
M12 x 1.5	6	20
M14 x 1.5	6	40
M16 x 1.5	8	40
M18 x 1.5	8	40
M20 x 1.5	10	50
M22 x 1.5	10	80
M26 x 1.5	12	80
M27 x 2	12	90
M33 x 2	17	120
M42 x 2	22	200

Tab. 7: Tightening torques of screw plugs



## 6.2 Maximum permissible increase of the bearing play

Raceway diameter [mm]	Ball diameter [mm]										
	20	22	25	30	35	40	45	50	55	60	70
1000	1.5	1.5	1.5	1.6	1.8	2.0	2.2	2.6	2.6		
1250	1.5	1.6	1.6	1.7	1.8	2.1	2.3	2.7	2.7	2.8	
1500	1.6	1.7	1.7	1.8	1.8	2.1	2.4	2.7	2.8	2.9	3.0
1750			1.8	1.8	1.9	2.2	2.4	2.8	2.9	3.0	3.1
2000			1.8	1.9	2.0	2.3	2.5	2.9	2.9	3.0	3.2
2250			1.9	2.0	2.1	2.4	2.6	3.0	3.0	3.1	3.3
2500			1.9	2.0	2.1	2.4	2.7	3.0	3.1	3.2	3.3
2750			2.0	2.1	2.2	2.5	2.7	3.1	3.2	3.3	3.4
3000					2.3	2.6	2.7	3.2		3.3	3.5
3250					2.4	2.7	2.9	3.3		3.4	3.6
3500						2.8	3.0	3.3		3.5	3.6
3750						2.9	3.1	3.4		3.6	3.7
4000						3.0		3.4		3.7	3.8
4500								3.6		3.9	4.0
5000								3.8		4.1	4.2
5500								4.0		4.3	4.4
6000								4.2		4.6	4.7
6500										4.7	4.8
7000										4.9	5.0
7500											5.1
8000											5.4
> 8000	Upon request										

Tab. 8: Maximum permissible increase of the bearing play for single row and double row four point bearings

Maximum permissible increase of the bearing play

Raceway diameter [mm]	Ball diameter [mm]										
	18	20	22	25	30	35	40	45	50	60	70
1000	1.9	1.9	2.0	2.0	2.1	2.2	2.6	2.9			
1250	2.0	2.0	2.1	2.1	2.2	2.3	2.7	3.0	3.5	3.7	
1500		2.0	2.2	2.2	2.3	2.4	2.7	3.0	3.5	3.7	
1750			2.3	2.3	2.4	2.5	2.9	3.1	3.6	3.8	4.1
2000				2.4	2.5	2.6	3.0	3.3	3.8	3.9	4.2
2250					2.6	2.7	3.1	3.4	3.9	4.0	4.3
2500						2.8	3.2	3.5	4.0	4.2	4.4
2750						2.9	3.3	3.6	4.1	4.3	4.5
3000							3.4	3.7	4.2	4.4	4.6
3250							3.5	3.8	4.3	4.5	4.7
3500							3.6	3.9	4.4	4.6	4.8
3750							3.6	3.9	4.5	4.7	4.9
4000								4.1	4.6	4.8	5.1
4500									5.0	5.2	5.5
5500									5.2	5.4	5.6
6000									5.4	5.6	5.8
6500										5.8	6.0
7000										6.0	6.2
7500											6.4
8000											6.6
> 8000	Upon request										

Tab. 9: Maximum permissible increase of the bearing play for double row ball slewing rings

Raceway diameter (retaining track) [mm]	Roller diameter [mm]										
	16	21	24	26	32	36	40	50	60	70	80
400	0.20	0.22	0.23	0.24							
500	0.21	0.23	0.24	0.25	0.28						
630	0.26	0.28	0.29	0.30	0.34	0.37	0.39				
800	0.26	0.28	0.29	0.30	0.34	0.37	0.39				
1000	0.31	0.33	0.34	0.35	0.39	0.42	0.44				
1250	0.41	0.43	0.44	0.45	0.49	0.52	0.54	0.61			
1500	0.51	0.53	0.54	0.55	0.59	0.62	0.64	0.71			
2000	0.60	0.63	0.64	0.65	0.69	0.72	0.74	0.81	0.91		
2500	0.66	0.70	0.72	0.74	0.79	0.82	0.84	0.91	1.01	1.11	1.21
3150	0.76	0.80		0.84	0.89	0.92	0.94	1.01	1.11	1.21	1.31
4000				0.94	0.99	1.02	1.04	1.11	1.21	1.31	1.41
5000					1.09		1.13	1.21	1.31		
6000					1.19		1.24	1.31	1.41		
7000								1.41	1.50		
8000									1.61		
> 8000	Upon request										

Tab. 10: Maximum permissible increase of the bearing play for three row roller slewing rings

## 6.3 Lubricants and operating materials

### 6.3.1 Lubricating greases

The type of lubricating grease is specified on the technical drawing.

The lubricating grease listed is approved for the slewing bearings by Liebherr-Components Biberach GmbH. The lubricating grease has been tested by Liebherr-Components Biberach GmbH for compatibility with the anti-friction bearing installation elements.

Liebherr-Components Biberach GmbH recommends using Liebherr lubricating greases for slewing bearings.

Manufacturer	Rolling contact (KPF 2 N-25 or KPFHC 1 N-60)	Gear teeth contact (OGPF 2 S-30)
Liebherr	<b>Universal grease 9900</b> 248 K to 423 K -25 °C (-13 °F) to 150 °C (302 °F)	<b>Universal grease 9900</b> 248 K to 423 K -25 °C (-13 °F) to 150 °C (302 °F)
	<b>Universal grease arctic</b> 213 K to 413 K -60 °C (-76 °F) to 140 °C (284 °F)	
	<b>Special grease 9610 Plus</b> 265 K to 295 K -20 °C (-4 °F) to 120 °C (248 °F)	<b>Special grease 9610 Plus</b> 265 K to 295 K -20 °C (-4 °F) to 120 °C (248 °F)

Tab. 11: Liebherr lubricating greases for slewing bearings

The lubricating greases in the table (see: tab. 11, page 60) can be mixed together.

If it is not possible to obtain the Liebherr lubricating grease, lubricating greases from the following table (see: tab. 12, page 60) can be used as an alternative.

The suitability and use of lubricating greases not supplied by Liebherr-Components Biberach GmbH are based on the recommendation of the respective manufacturer.

Manufacturer	Rolling contact (KPF 2 N-25 or KPFHC 1 N-60)	Gear teeth contact (OGPF 2 S-30)
Aral	Aralub HLP2 243 K to 393 K (-30 °C (-22 °F) to 120 °C (248 °F))	Castrol Molub Alloy OG 936 SF Heavy 243 K to 373 K (-30 °C (-22 °F) to 100 °C (212 °F))
Castrol	Spheerol EPL 2 253 K to 413 K (-20 °C (-4 °F) to 140 °C (284 °F))	Castrol Molub-Alloy OG 9790/2500-0 263 K to 353 K (-20 °C (-4 °F) to 90 °C (194 °F))
Klober	Centoplex EP 2 253 K to 403 K (-20 °C (-4 °F) to 130 °C (266 °F))	Grafloscon C-SG 0 ultra 243 K to 473 K (-30 °C (-22 °F) to 200 °C (392 °F))

Manufacturer	Rolling contact (KPF 2 N-25 or KPFHC 1 N-60)	Gear teeth contact (OGPF 2 S-30)
Lubritech	Lagermeister EP-2 253 K to 403 K (-20 °C (-4 °F) to 130 °C (266 °F))	Ceplattyn KG 10 HMF 263 K to 413 K (-10 °C (14 °F) to 140 °C (284 °F))
Mobil	Mobilux EP 2 253 K to 393 K (-20 °C (-4 °F) to 120 °C (248 °F))	Mobilgear OGL 461 253 K to 393 K (-20 °C (-4 °F) to 120 °C (248 °F))
Shell	Gadus S2 248 K to 403 K (-25 °C (-13 °F) to 130 °C (266 °F))	Gadus S2 OGH NLGI 0/00 263 K to 473 K (-10 °C (14 °F) to 200 °C (392 °F))
Total	Multis EP 2 248 K to 393 K (-25 °C (-13 °F) to 120 °C (248 °F))	Copal OGL 0 248 K to 423 K (-25 °C (-13 °F) to 150 °C (302 °F))

Tab. 12: Alternative lubricating greases for slewing bearings

If other lubricating greases are to be used to lubricate the raceway, Liebherr-Components Biberach GmbH recommends lubricating greases with the following properties:

- Sufficient application temperature range
- Sufficient lubricating ability of the base oil
- Sufficient corrosion protection properties according to DIN 51802
- Low tendency to absorb water according to DIN 51807
- Sufficient adhesive properties
- Good aging resistance

When using other lubricating greases, their suitability must be clarified with the grease manufacturer. Compatibility with the material used by Liebherr-Components Biberach GmbH must be ensured. Special lubricating greases are required for low temperature applications.

If other lubricating greases are to be used to lubricate the gear teeth, the same requirements apply as for the bearing raceways. Liebherr-Components Biberach GmbH also recommends using lubricating greases with EP (extreme pressure) additives.

