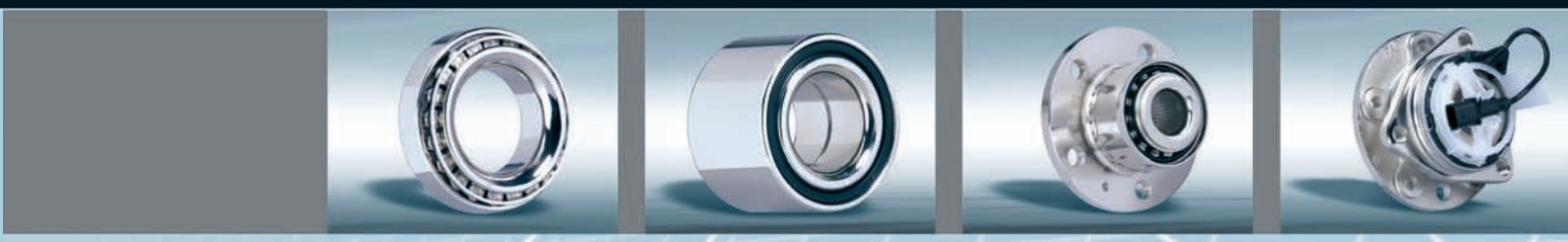
Failure Diagnosis

Guide to troubleshooting wheel bearing failures and malfunctions



Passenger Cars

FAG

Content

General remarks

Rolling bearing damage
Causes of failure

Wheel bearings are designed to achieve a mileage of at least 1,000,000 km without a problem. However, a rolling bearing can be damaged by unusual causes which has a detrimental effect on its service life.

- 70% of failures are due to poor lubrication: too little or excessive lubrication, inappropriate lubricant etc.
- 18% are caused by contamination: intrusion of fluids or solids. This shows the importance of an effective sealing, as a damaged seal will allow lubricant to leak and contaminants to intrude.
- 10% are due to incorrect fitting: bearing forced into position, excessive heat, wrong adjustment and incorrect play, tapered sleeve overtightened etc.

General types of rolling bearing damage

- Overheating
- Fracture of the outer ring
- Tipping
- Tight fitting
- Fatigue
- Rolling body indentations
- Contamination by dirt
- Incorrect lubrication
- Corrosion
- Lip fracture
- Scoring effect damage
- Wrong load direction

Diagnosing wheel bearing failures

Rolling bearings are machine elements found in a wide range of applications. They work reliably even under the most challenging conditions and premature failure is very rare. The first sign of rolling bearing damage is typically an unusual operating behaviour of the bearing.
The inspection of faulty bearings reveal a wide and varied range of damages. Examination of the bearings alone is generally not enough to pinpoint the cause of damage, but rather the inspection of the ambient parts, the lubrication and sealing as well as the operating and environmental conditions. An examination procedure facilitates the determination of the failure cause.

Unusual operating behaviour as signs of damage

Gradual deterioration of the operating behaviour is typically the first sign of bearing damage. Spontaneous damage caused, for example, by fitting errors or lack of lubrication and resulting in immediate failure rarely occurs. Depending on the operating conditions, a few minutes or, under some circumstances, even a few months may pass from the time damage begins to the moment the bearing actually fails.

Operating behaviour	Possible causes	Examples
Uneven running	Damaged ring members or rolling bodies	Increased wheel wobble Increased tilting clearance Vibration in the steering system
	Contamination	Intensifying vibrations
	Excessive bearing play	Intensifying knocks
Unusual running noise		
• Squealing or whistling sound	Insufficient bearing play	
• Rumbling or irregular noise	Excessive bearing play Damaged rolling contact surface Contamination Inappropriate lubricant	
• Gradual change in running noise	Temperature-induced change in bearing play Damaged raceway	

General remarks

Causes of bearing damages and corrective measures

Wheel bearings are among the critical components of a motor vehicle. They make a major contribution to safe and comfortable vehicle handling.

Wheel bearings are subject to a wide variety of stress factors, such as high wheel speeds, hard knocks resulting from bumpy roads, dispersed dirt particles and extreme temperatures.

These may impair the functioning of the wheel bearing causing the bearing to fail or seize under unfavourable conditions.

A seized wheel bearing while driving can lead to dangerous situations and/or accidents.

Failure diagnosis: Oval deformation of the wheel bearing

1. Dismount the wheel bearing from the locating bore.

2. Check the surface of the wheel bearing outer ring for two dark spots located opposite each other. Examine, whether the two areas located at 90° of the spots are not damaged. If this is the case, the locating bore is deformed and the steering knuckle must be replaced.

3. Disassemble the wheel bearing to make sure the ball raceways of the outer ring are not polished. First remove the seal (e.g. using special pliers), then dismount the assembly consisting of outer and inner ring, cage and balls.

4. Clean the raceways of the outer ring and check for craters corresponding to the dark spots on the outer ring outside. These craters confirm the oval deformation of the steering knuckle.

In general observe the following:

Problem	Cause	Remedy
The wheel bearing emits loud noises (rattling) after being fitted and put into operation.	One of the inner rings is damaged: 1. The wheel hub is off centre because it was too tightly fitted.	Replace wheel bearing and hub.
	2. The inner ring was tilted during mounting on the wheel hub – wrong tool used – wedge or sleeve between the pressure plunger and bearing ring abutment area not parallel.	Replace complete wheel bearing.
	3. Excessive oval deformation of the locating bore reduces the radial play of the wheel bearing in the narrow areas of the ovally deformed locating bore.	Replace steering knuckle and wheel bearing.
	4. Locating bore in steering knuckle damaged.	Remove minor defects on the wheel hub (e.g. by polishing) or replace wheel hub and bearing.
	5. Deep scores and indents on both the wheel hub and wheel bearing caused by wrong dismounting technique.	Remove minor defects on the wheel hub (e.g. by polishing) or replace wheel hub and bearing.
Wheel bearings with little mileage emit noise (500-3.000 km).	Medium oval deformation of steering knuckle locating bore limits the wheel bearing radial play and causes the aforementioned damage.	Replace steering knuckle and wheel bearing.
Excessive heat generation during starting phase.	1. Too little axial play of the wheel bearing between wheel hub and steering knuckle. Incorrect adjustment and/or mounting of the components.	Check the settings of the steering knuckle and wheel hub and re-adjust if required.
	2. Resulting from incorrect mounting of the wheel bearing into the locating bore, the snap rings are missing in the locating bore causing gradual axial misalignment of the wheel bearing and the hub. The rotating hub rubs against the fixed wheel bearing seat. This generates high friction causing the temperature to rise in the wheel bearing environment. The grease burns and the bearing fails.	Dismount wheel bearing and make sure that the snap rings are mounted, replace wheel bearing if required.

Overheating

Cause

- Extreme heat from an external source
- Insufficient heat dissipation
- Insufficient cooling or lubrication

Impact

- Discolouration of rings, rolling bodies and cages with colours ranging from yellow to blue
- Temperatures exceeding 200 °C detrimentally affect the hardness and resistance of the material and can cause the bearing to fail
- In extreme cases the bearing components will be distorted
- High temperatures can deteriorate or destroy the lubricant

Remedy

- Temperature or overload monitoring
- Sufficient heat dissipation

Fracture of the outer ring

Cause

- Poor support of the rings in the bearing housing
- Axial preload due to incorrect bearing play at high operating temperatures

Impact

- Typically, the crack spreads evenly in circumferential direction often in conjunction with fractured pieces
- With axial loads, these fractions normally occur a little beyond the middle of the raceway
- The outer ring external surface displays an irregular wear pattern

Remedy

- Improve the mounting of the bearing.
- Ensure correct bearing play
- Adhere to the fitting instructions of the manufacturer

Tipping

Cause

- Bent shafts
- Burrs and dirt on the shaft or housing shoulders
- Shaft threads not located axially parallel to the bearing seat
- Shaft nuts with end faces not matching the thread axle

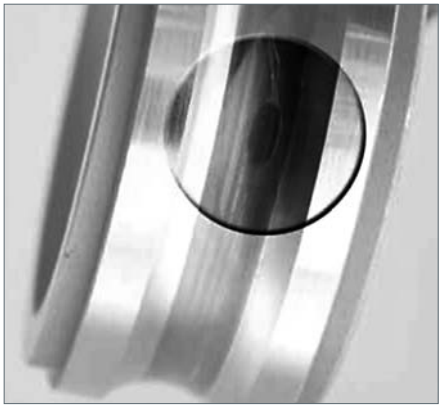
Impact

- Wear marks running angularly to the raceway edges of the standing ring

Remedy

- Examine shafts and housing for run-outs at the shoulders and bearing seats
- Machine the thread and bearing seat using a clamp
- Use precise shaft nuts

Fit too tight



Cause

- Circumferential running marks on the raceways

Impact

- Continuous operation under heavy load, poor lubrication and insufficient bearing play cause premature wear and fatigue

Remedy

- Correct the setting of the bearing play and/ or of the wheel bearing

Fatigue

Cause

- Use of wrong bearing (possibly inner design is not matched to the application – not perceptible from the outside)

Impact

- The so-called flaking is caused by fractures in the running surface and continued abrasion of small particles from the inner and outer ring or the rolling bodies.
- Flaking does not stop, but will, once started, spread further due to continuous operation.
- Is always accompanied by noticeable increase of noise emissions

Remedy

- Replace the bearing

Rolling body indentations

Cause

- Static overload of the bearing
- Heavy impacts on the bearing
- Use of a hammer during mounting
- Bearing or assembled units have been dropped prior to installation
- The bearing has been fitted onto the shaft by applying force on the outer ring

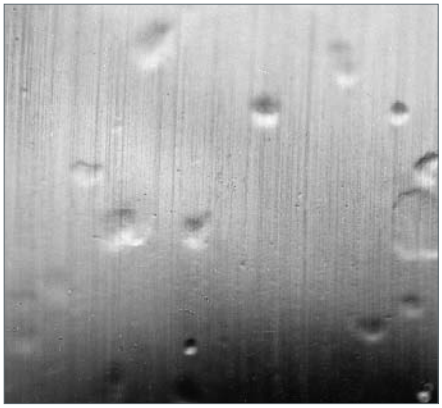
Impact

- Indentations on the raceways caused by the rolling bodies lead to intensified bearing vibration (noise)
- Advanced indentation can lead to premature failure of the bearing

Remedy

- Use appropriate tool to mount and dismount the bearing
- Always apply force only to the ring with fixed seating

Contamination



Cause

- Unsettled dust, dirt or abrasive substances from dirty work stations
- Dirty hands or tools
- Foreign additives in lubricants or detergents

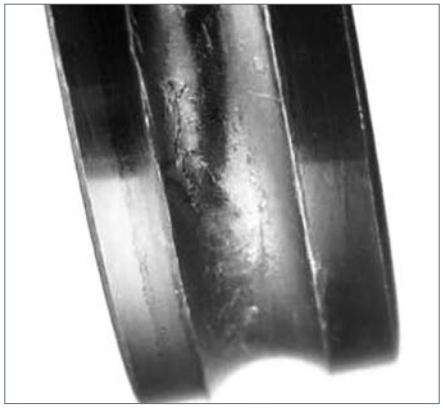
Impact

- Indentation on rolling bodies and raceways cause vibrations

Remedy

- Clean work stations, tools, objects and hands reduce contamination risk
- No grinding in the vicinity of the bearing mounting station
- Keep bearing in the sealed original packaging until fitting it
- Seal bearing mounting station against dirty environment
- Cover open, mounted bearings when interrupting repair work

Incorrect lubrication



Cause

- Insufficient lubrication
- Excessive temperatures

Impact

- Discoloured rolling bodies (blue/brown) and rolling body running marks
- Excessive wear of the rolling bodies, ring members and cages are caused by overheating and total failure of the lubrication

Remedy

- Use correct lubricant in the right amount
- Check preload to reduce bearing temperature

Corrosion

Cause

- Bearings have been exposed to corrosive fluids or environments
- Faulty seals or inappropriate lubricant

Impact

- Red/brownish discolouration or deposits on rolling bodies, raceways and cage
- Increased vibrations followed by extensive wear
- Increased radial play or loss of preload

Remedy

- Avoid use of corrosive fluids in the bearing's vicinity
- Use appropriate lubricant with required specifications

Lip fractures

Cause

- Axial load exceeds admissible limits, lip insufficiently supported
- Axial shock load
- Incorrect mounting/dismounting

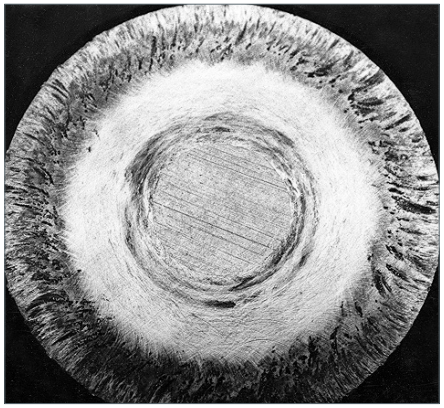
Impact

- Supporting lips are partially or completely broken off or fractured

Remedy

- Keep load within admissible limits
- Observe mounting instructions and procedures

Scoring damage



Cause

- Bearing poorly lubricated and put under heavy load
- Amount or consistence of lubricant inadequate
- Lack of hydrodynamic lubricant film between roller face area and lip
- Excessive preload due to thermal expansion
- Off-set position of the rollers caused by worn raceway or tilted ring

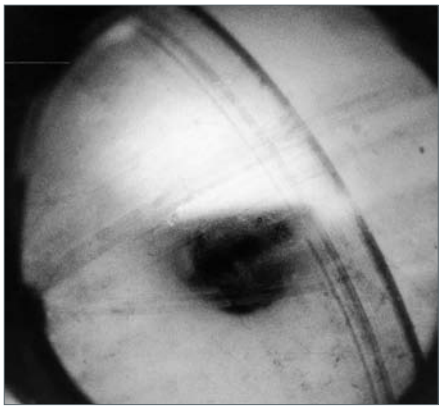
Impact

- Partial or large area welding and deep scratches in the lips and roller face areas
- Lubricant coking in this area

Remedy

- Use appropriate lubricant with required specifications
- Ensure correct bearing preload

Wrong load direction



Cause

- Angular contact ball bearings are designed to support loads from just one direction
- If load is applied in reverse direction, the elliptic contact area is cut off by the low shoulder
- This results in very high loads and temperatures, followed by intensifying vibrations and premature failing

Impact

- The balls show a strapped groove wear pattern caused by the balls rotating over the raceway edge

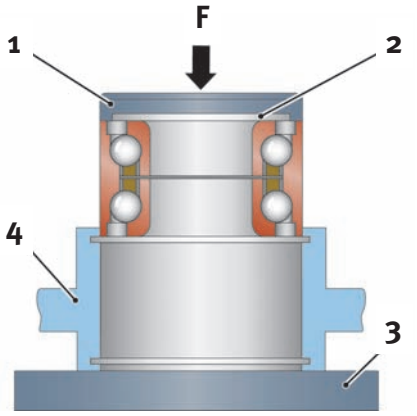
Remedy

- Ensure the correct fitting of the angular contact ball bearing

Mounting of the Wheel Bearing into the Steering Knuckle

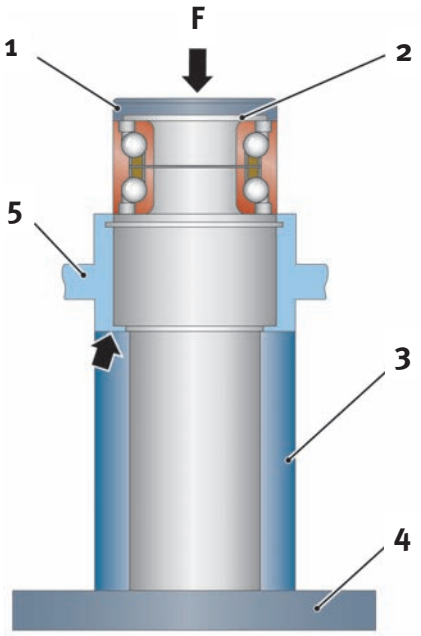
First the complete wheel bearing unit is mounted into the locating bore of the steering knuckle as described below:

1. Mount the wheel bearing into the locating bore of the steering knuckle (**4**) by exerting pressure to the bearing's outer ring only. Pressure is exerted via a shim (**1**) with recess (**2**) enabling the pressure force (**F**) to be uniformly transferred to the outer ring. The steering knuckle rests on the base plate (**3**) of the press.



2. Mount the wheel bearing into the locating bore of the steering knuckle (**5**) by applying force to the bearing's outer ring. In order to do so, the steering knuckle flange side must be located centrally on the support sleeve (**3**) (**arrow**). The bearing is pressed into the knuckle in precise alignment by means of a pressure shim (**1**) with recess (**2**).

4 = press base plate
F = pressure force



3. Finally, use special pliers to mount a snap ring on the groove in the steering knuckle to secure the wheel bearing in axial direction.
4. When mounting the wheel bearing into the locating bore the bevel on one side of the bearing is to be observed. This bevel must be oriented in mounting direction as to avoid tilting of the bearing when pressed into the bore.

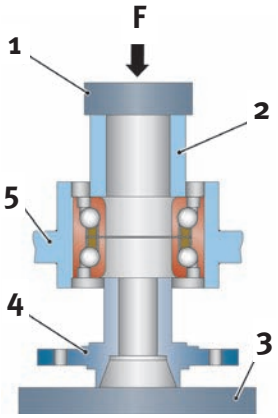
Important: Under no circumstances must the pressure force (**F**) be transferred to the balls in the bearing, as this would cause indentations in the raceways and damage the bearing!

Mounting of the Wheel Hub

1. Place the wheel hub (**4**) on the base plate (**3**) of a press.
   The in the steering knuckle (**5**) pre-assembled wheel bearing is pressed onto the hub using a mounting sleeve.

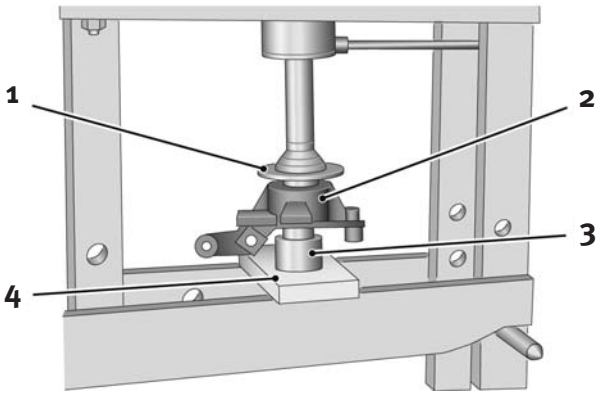
Important: The sleeve must be positioned only on the face side of the inner ring!

1 = pressure shim
F = pressure force



Note: On some vehicles, the parts are mounted in reverse order. The steering knuckle rests on the base plate while the wheel hub is pressed in from above.

1 = wheel hub
2 = steering knuckle
3 = mounting sleeve
4 = base plate



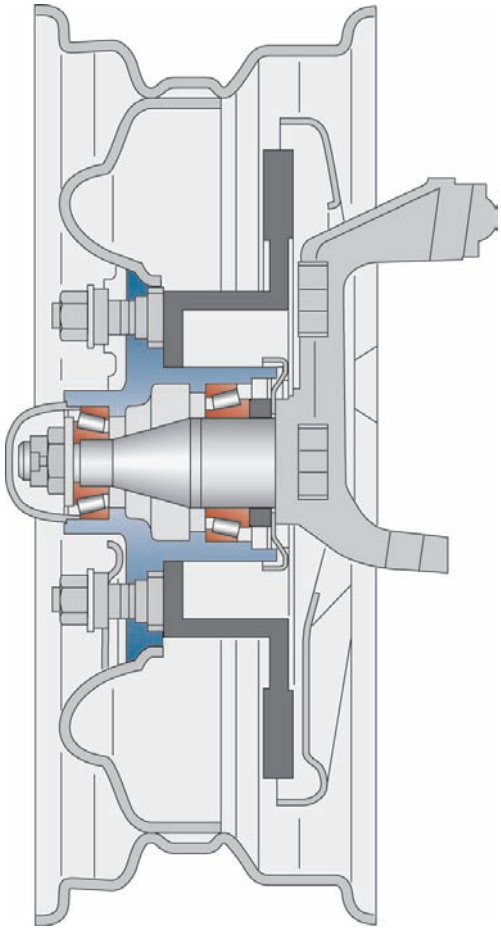
Important: Do not forget to apply the support sleeve! It supports the inner ring when pressed in and thus prevents grooving of the ball raceways of the bearing outer ring.

2. Torque down the fixing nut of the wheel bearing with the tightening torque specified by the manufacturer. The correct tightening torque of the nut is important not only to ensure the wheel is securely fitted, it also ensures that the wheel bearing is running with optimal play. It is strongly recommended to use a torque wrench to make sure the correct tightening torque is applied.
   Note: You must not tilt the wheel bearing during assembly, neither in the locating bore, nor on the wheel hub, as this can entail severe damage to the wheel bearing. Wheel bearings with factory-fitted seals are already lubricated. They do not require additional lubrication and must not be cleaned using solvents. Using solvents can cause the bearing to fail prematurely.

Installation and Adjustment of Tapered Roller Bearings in Motor Vehicle Wheel Hubs

Note: Disassembling and mounting tapered roller bearings can be different from one manufacturer to another. In general you should always adhere to the instructions given by the vehicle manufacturer.

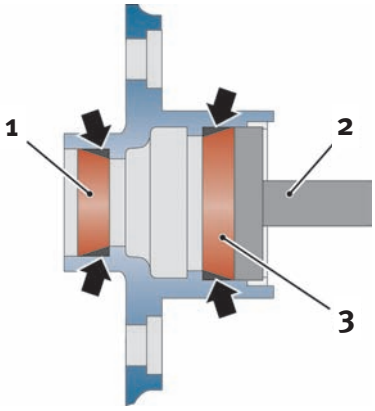
Passenger car mountings with adjusted tapered roller bearings (non-driven axle).



1. Clean wheel hub body.

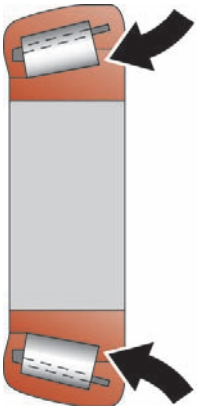
2. Slightly oil outer ring seating positions (**arrows**). Use a plunger (**2**) to press in both outer rings (**1**) and (**3**).

Important: The plunger must be positioned on the outer ring face side only! Ensure flush mounting of the outer ring with the housing shoulders!



3. Lubricate the inner ring of the inner bearing generously.

Important: Squeeze lubricant also between cage, inner ring and rollers (**arrows**)!

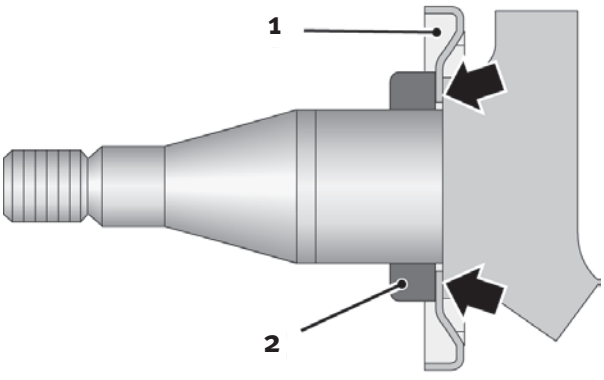


4. Mount inner ring into the hub.
5. Mount shaft seal ring into the hub.

Important: Sealing lip must face the bearing!

6. Apply protective cover (**1**) and intermediate ring (**2**) on steering knuckle.

Important: The protective cover must fit tightly on the entire circumference of the steering knuckle application point (**arrows**).



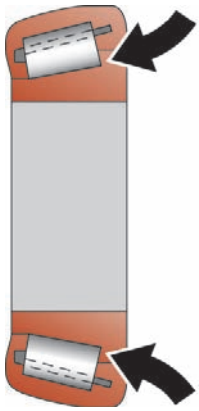
Installation and Adjustment of Tapered Roller Bearings in Motor Vehicle Wheel Hubs

7. Position wheel hub on steering knuckle.

Important: Make sure not to damage the shaft seal ring!

8. Lubricate the inner ring of the outer bearing generously.

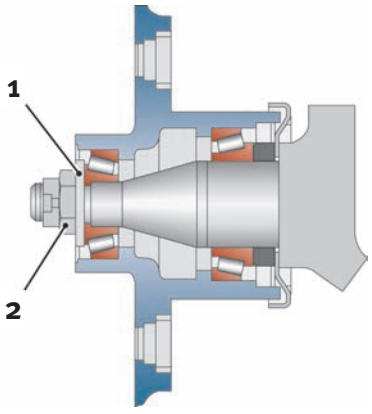
Important: Squeeze lubricant also between cage, inner ring and rollers (**arrows**)!



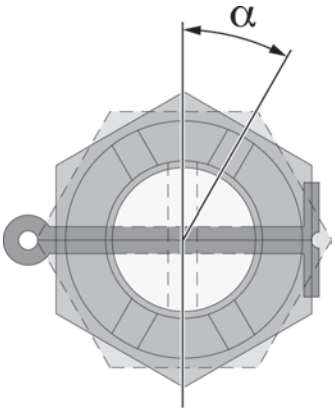
9. Position inner ring of the outer bearing on steering knuckle.

10. Position shock washer (**1**).
11. Bolt on slotted castle nut (**2**).
12. Torque down castle nut while rotating the wheel hub, until a rotating resistance is noticeable.

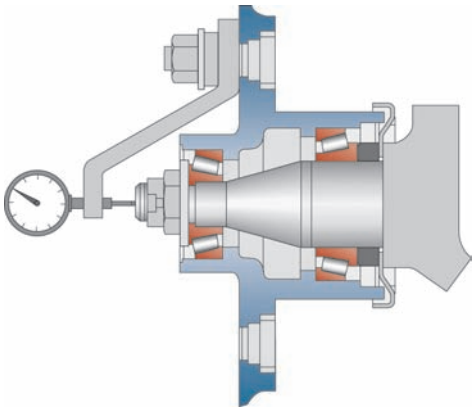
Important: Use torque wrench and observe the manufacturer's repair instructions!



13. Loosen castle nut for not more than 1/12 of a revolution until in line with the next split pin hole and secure with a cotter pin.



14. Check for mounting and tilting clearance.
    Note: The wheel bearing must rotate easily without seizing.
    No tilting clearance must be noticeable on the rim.
    If required, replace shock washer or nut.
    If available, use measuring device to check the axial play of the bearing.



15. Remount the cover.
16. Perform a test run to check whether the mounting play has changed. Re-adjust the bearing if required.

Mounting Tool Kit

FAG
Mounting Tool Kit

The FAG mounting tool kit allows for a cost-effective and safe mounting of rolling bearings with bore diameters of up to 50 mm. It can also be used to fit sleeves, intermediate rings, seals and similar parts.

Use a suitable mounting sleeve and hit with a hammer to drive tightly fitting inner rings onto the shaft or outer rings into the housing bore. Using a mounting sleeve helps to prevent mounting forces being transferred via the rolling bodies and raceways which could damage the parts severely.

The FITTING.TOOL.ALU.SET10-50 comprises mounting sleeves made from aluminium and mounting rings made from plastic. The tools are easy to handle and available at low cost.

FITTING.TOOL.ALU.SET10-50
Part no. 400 6001 10

Contents of:
FITTING.TOOL.ALU.SET10-50
33 mounting rings
for bore diameters of 10-50 mm
and outer diameters of up to 110 mm
3 mounting sleeves
Nonrecoil hammer, 1 kg
Suitcase dimensions: 440~350~95 mm
Overall weight of the set: 4.5 kg
Components also available as individual parts.

Socket Wrench for Mounting and Disassembling

FAG
Socket Wrenches

For locknuts KM0 to KM20. The socket wrenches FAG LOCKNUT.SOCKET... allow for a simple tightening and loosening of locknut on shafts, adapter and extraction sleeves.

They require less space on the locknut circumference than hook wrenches and enable ratchets and torque wrenches to be used. For increased work safety, socket wrenches should be secured using a locking pin or rubber washer. FAG socket wrenches therefore have a bore to apply the locking pin and a groove to attach the rubber washer. Locking pin and rubber washer are included with the socket wrench.

Ordering example for an FAG socket wrench suitable for locknut KM5:

LOCKNUT.SOCKET.KM5
Part no. 400 6063 10

Hook and Pin Wrenches for Mounting and Disassembling

FAG Flexible Head Hook Wrench

For locknuts KM0 to KM40 and precision nuts ZM06 to ZM150 and ZMA15/33 to ZMA 100/140.

The FAG flexible head hook wrenches of the LOCKNUT.FLEXI-HOOK... series allow for the tightening and loosening of locknuts (precision nuts) on shafts and adapter and extractor sleeves if no torque is specified. The flexible head hook wrench of the series LOCKNUT.FLEXI-HOOK allows for the mounting and dismounting of locknuts with different diameters.

Ordering example for an FAG flexible head hook wrench suitable for locknuts KM14 to KM24:

LOCKNUT.FLEXI-HOOK.KM14-24
Part no. 400 6089 10

FAG Flexible Head Pin Wrench

For precision locknuts AM15 to AM90.

The FAG flexible head pin wrenches of the LOCKNUT.FLEXI-PIN... series allow for the tightening and loosening of precision nuts on shafts if no torque is specified. Using FAG flexible head pin wrenches allows for the mounting of small bearings onto tapered shaft seats. The bearings are tightened via radially arranged holes.

Ordering example for an FAG flexible head pin wrench suitable for locknuts AM35 to AM60:

LOCKNUT.FLEXI-PIN.AM35-60
Part no. 400 6094 10

FAG Flexible Head Face Pin Wrench

For precision locknuts LNP017 to LNP170.

The FAG flexible head face pin wrenches of the LOCKNUT.FACE-PIN... series allow for the tightening and loosening of precision nuts on shafts if no torque is specified. Using FAG flexible head face pin wrenches allows for the mounting of small bearings onto tapered shaft seats. The bearings are tightened via axially arranged holes.

Ordering example for an FAG flexible head face pin wrench suitable for locknuts LNP017 to LPN025:

LOCKNUT.FACE-PIN.LNP17-25
Part no. 400 6079 10

Hook and Pin Wrenches for Mounting and Disassembling

FAG Double Hook Wrench Kit

This service kit includes a service-case containing a double hook wrench, a torque wrench and a user manual. The torque wrench allows for the precise definition of the initial mounting position at a defined tightening torque.

LOCKNUT.DOUBLEHOOK.KM5.KIT
Part no. 400 6107 10
LOCKNUT.DOUBLEHOOK.KM13.KIT
Part no. 400 6106 10

FAG Double Hook Wrench Sets

(former FAG designation 173556 and 173557). The sets include four or five double-hook wrenches. The remaining items in the case are identical to the kit.

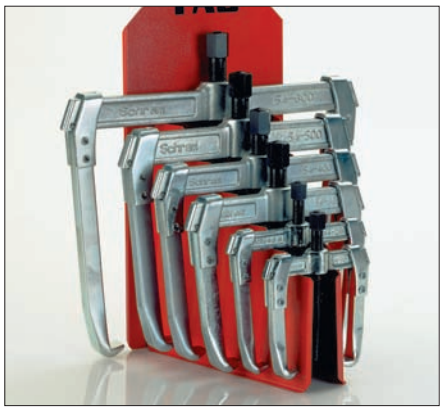
LOCKNUT.DOUBLEHOOK.KM5-8.SET
Part no. 400 6096 10
LOCKNUT.DOUBLEHOOK.KM9-13.SET
Part no. 400 6097 10

Individual Double Hook Wrenches

(former FAG designation DHN5 to DHN13). Double-hook wrenches are also available individually. Each double hook wrench is engraved with the torsion angles for the self-aligning ball bearings to be mounted using this particular wrench, so that the sliding distance and reduction in radial clearance can be precisely set.

LOCKNUT.DOUBLEHOOK.KM13
Part no. 400 6115 10

Mechanical Extractors



Mechanical Extractors

Mechanical extractors are used to dismount small rolling bearings with bore diameters of up to 100 mm that are tightly fitted on the shaft or in the housing.

The bearing can be dismounted gently if the extractor grips onto the tightly fitted bearing ring.

With mechanical FAG extractors, the dismounting force is generally applied via threaded spindles.

Alongside two-arm, three-arm and four-arm devices and a hydraulic pressure device, FAG also offers special extractors.

Two-Arm Extractors

- Allow for the dismounting of complete rolling bearings with tightly fitted inner rings and other parts, such as ring gears.
- Span: 80-350 mm, depth: 100-250 mm; available in a set (stand with 6 extractors) or as individual extractors.

ABZIEHER54.SET
Part no. 400 6118 10
ABZIEHER54.100
Part no. 400 6119 10
ABZIEHER54.200
Part no. 400 6120 10
ABZIEHER54.300
Part no. 400 6121 10
ABZIEHER54.400
Part no. 400 6122 10
ABZIEHER54.500
Part no. 400 6123 10

Mechanical Extractors

Three-Arm Extractors

- For the dismounting of complete rolling bearings or tightly fitting inner rings
- Span: 85-640 mm, depth 65-300 mm

ABZIEHER52.085
Part no. 400 6126 10
ABZIEHER52.130
Part no. 400 6127 10
ABZIEHER52.230
Part no. 400 6128 10
ABZIEHER52.295
Part no. 400 6129 10

Hydraulic Pressure Tools

- Used together with mechanical extractors to loosen tightly fitting parts
- The tool considerably facilitates bearing extraction as it provides axial forces of 80 or 150 kN; the larger tool has a hydraulic return mechanism

ABZIEHER44.080
Part no. 400 6130 10
ABZIEHER44.150
Part no. 400 6131 10

Extractors for Ball Bearings

- For dismounting complete radial ball bearings
- For tightly fitting outer ring
- For bearing without radial access
- Three kits with different sets of claws available

ABZIEHER56.020.SET
Part no. 400 6132 10
ABZIEHER56.120.SET
Part no. 400 6133 10
ABZIEHER56.220.SET
Part no. 400 6134 10

Mechanical Extractors

Special Extractors for Bearings

- For radial bearings (deep groove ball bearings, self-aligning ball bearings, cylindrical, tapered and self-aligning roller bearings); indicate bearing manufacturer
- For tightly fitting inner and/or outer ring

ABZIEHER64.400
Part no. 400 6135 10
ABZIEHER64.500
Part no. 400 6136 10
ABZIEHER64.600
Part no. 400 6137 10
ABZIEHER64.700
Part no. 400 6138 10
ABZIEHER64A..., ~64B..., ~64C..., ~64D
Part no. 400 6139 10

Extracting Devices

- For all types of rolling bearings. For the dismounting of complete rolling bearings or tightly fitting inner rings. The extracting and separating devices are available in 5 different sizes with spans of up to 210 mm.
- Especially suitable when the bearing inner ring is adjacent to a shoulder on the shaft without extraction slots. Good radial access to the bearing location is required.

ABZIEHER49.100.060
Part no. 400 6150 10
ABZIEHER49.100.075
Part no. 400 6151 10
ABZIEHER49.200.115
Part no. 400 6152 10
ABZIEHER49.300.150
Part no. 400 6153 10
ABZIEHER49.400.210
Part no. 400 6154 10

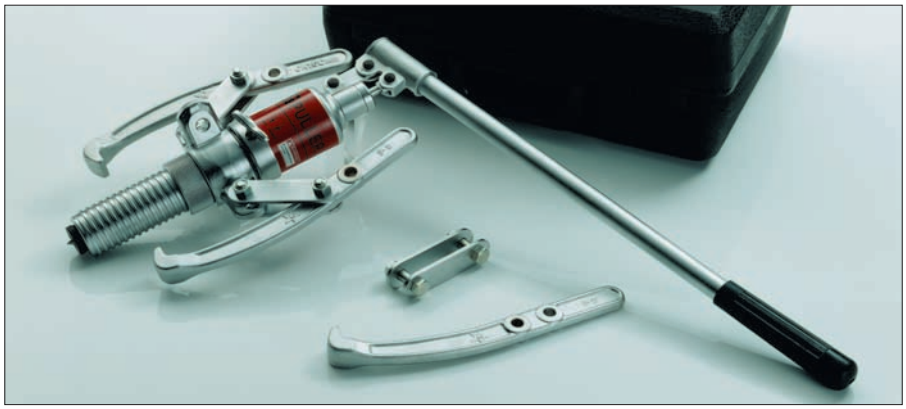
Internal Extractor Set

- For deep groove ball bearings and angular contact ball bearings. The internal extractor set includes nine extractors and can be used on bearing holes with diameters of 5-70 mm.
- For tightly fitting outer ring
- The inner ring hole must be freely accessible.

ABZIEHER62.SET
Part no. 400 6140 10
ABZIEHER62.100.005
Part no. 400 6141 10
ABZIEHER62.100.007
Part no. 400 6142 10
ABZIEHER62.100.010
Part no. 400 6143 10
ABZIEHER62.100.014
Part no. 400 6144 10
ABZIEHER62.100.020
Part no. 400 6145 10
ABZIEHER62.100.030
Part no. 400 6146 10
ABZIEHER62.200.040
Part no. 400 6147 10
ABZIEHER62.200.050
Part no. 400 6148 10
ABZIEHER62.200.060
Part no. 400 6149 10

Mechanical Extractors

Hydraulic Extractors



Internal Extractor Set

- For standard deep groove ball bearings. The set consisting of six sets of extracting jaws and two threaded spindles can be used on bore diameters of 10-100 mm.
- For tightly fitting outer ring
- No dismounting of the shaft required

PULLER.INTERNAL.SET10-100
Part no. 400 6155 10
PULLER.INTERNAL.ARM-A1
Part no. 400 6156 10
PULLER.INTERNAL.ARM-A2
Part no. 400 6157 10
PULLER.INTERNAL.ARM-A3
Part no. 400 6158 10
PULLER.INTERNAL.ARM-A4
Part no. 400 6159 10
PULLER.INTERNAL.ARM-A5
Part no. 400 6160 10
PULLER.INTERNAL.ARM-A6
Part no. 400 6161 10
PULLER.INTERNAL.SPINDEL.M12
Part no. 400 6162 10
PULLER.INTERNAL.SPINDEL.M16
Part no. 400 6163 10
PULLER.INTERNAL.SUITCASE
Part no. 400 6164 10
PULLER.INTERNAL.INLAY
Part no. 400 6165 10

Hydraulic Standard Extractor with Integrated Hand Pump

Compact extractors generating dismounting forces of up to 80kN.
Supplied with safety net in a sturdy case.

Ordering designation Extractor	Extracting force kN	Span mm	Depth mm	Lift mm	Weight kg
400 6166 10	40	150	152	55	4,5
400 6167 10 JAW					
400 6168 10	60	200	152 (190*)	82	4,9
400 6169 10 XL					
400 6170 10 JAW					
400 6171 10 Long JAW					
400 6172 10	80	250	190 (229*)	82	6,6
400 6173 10 XL					
400 6174 10 JAW					
400 6175 10 Long JAW					

* optionally with longer extracting arms; spare parts available individually

Three-Section Extraction Plate

Electrical Heating Plate

Induction Heating Device

FAG Three-Section Extraction Plate

For hydraulic and mechanical extractors.

They facilitate the dismounting of bearings, tightly fitting inner rings and other parts.

Its load carrying capacity and extraction force generation are precisely synchronised. The SPIDER extraction hooks are attached right behind the extractor tie bolts and allow for evenly applied extraction forces.

This prevents deformation or tilting of even the most tightly fitting parts. The high extraction forces are solely applied to e.g. the bearing inner ring. Normally, bearing and shaft remain intact and can be re-used.

The field-proven extractors can be mounted with little effort behind the bearing.

PULLER.TRISECTION50
Part no. 400 6176 10
PULLER.TRISECTION100
Part no. 400 6177 10

FAG Electric Heating Plate

Cylindrical bearing seats meant to fit tightly on the shaft must be heated prior to mounting. Sufficient thermal expansion is achieved at 80 to 100 °C. Temperature must not under no circumstances exceed 120 °C to make sure that the material structure and hardness characteristics do not change.

The FAG heating plate HEATER.PLATE with controlled temperature can be used to heat rolling bearings. Cover the bearing with a metal sheet and turn it regularly to ensure the bearing is uniformly heated.

Alongside rolling bearings (max. 120 °C), the heating plates are also suitable to heat labyrinth, shrink and seal rings.

HEATER.PLATE
Part no. 400 6179 10

FAG Induction Heating Device

Many rolling bearings and other rotationally symmetric steel parts are tightly fitted on the shaft. Especially larger parts can be fitted much easier if they are heated prior to mounting.

The quick and clean process of induction heating is superior to the traditional methods and is therefore particularly well suited for the use in volume mounting. Induction heating can be used on complete bearings, rings of cylindrical roller bearings or needle bearings, and rotationally symmetric steel parts, such as labyrinth rings, roll couplings, wraps etc.

Advantages

- Fast, energy-saving working
- Suitable for rolling bearings and other ring-shaped steel parts
- Advanced safety
- Environmentally friendly, oil-free
- Uniform, controlled heating
- Simple handling
- Automatic demagnetisation
- Improved efficiency, as the best suitable size can be selected for every application

HEATER10
Part no. 400 6178 10

Gloves

FAG Heat-Insulated Gloves

The FAG heat-insulated gloves are particularly well suited for the handling of rolling bearings or other parts heated prior to mounting or dismounting.

The outside material is hard-wearing polyester, heat resistant to temperatures up to 150°C.

The inside material is non-irritant cotton.

Special characteristics:

- Resistant to temperatures up to 150°C
- Lint-free
- Non-asbestos
- Comfortable
- Cut-resistant

HANDSCHUH1
Part no. 400 6180 10

Heat and Oil Resistant Gloves

The FAG heat and oil resistant gloves are particularly well suited for the handling of rolling bearings or other parts heated and lubricated prior to mounting or dismounting.

Their outstanding properties derive from a multiple-layer structure made of different fibres.

Special characteristics:

- Resistant to temperatures up to 250°C
- Not flammable
- Heat resistant even when wet
- Admitted for protection against mechanical (DIN EN 388) and thermal (DIN EN 407) influences
- Cotton-free
- Cut-resistant

HANDSCHUH2
Part no. 400 6181 10

Feeler Gauges

FAG Feeler Gauges

Feeler gauges are used to measure the radial bearing clearance, especially when mounted on tapered shaft seats and adapter and extracting sleeves.

FEELER.GAUGE100
Part no. 400 6182 10
FEELER.GAUGE300
Part no. 400 6183 10

Mounting Paste

FAG
Mounting Paste

This mounting and multiple-purpose paste has proven especially valuable for the mounting of rolling bearings. It facilitates the mounting of bearing rings and prevents stick-slip, scoring marks, wear and fretting corrosion. In addition, the mounting paste protects the bearing against corrosion.

It is pale in colour and does not soil. The mounting paste is applied in a thin layer so that the metallic lustre turns slightly dull. The admissible operating temperature ranges between -30°C and +150°C. The paste is resistant to water, steam and a variety of alkaline and acid agents.

Product range:
70g tube
250g tube
400g cartridge
1kg can

ARCA.MOUNTINGPASTE.70G
Part no. 400 6194 10
ARCA.MOUNTINGPASTE.250G*10
Part no. 400 6195 10

Anti-Corrosion Oil

FAG
Anti-Corrosion Oil

The anti-corrosion oil is particularly well suited for unpacked rolling bearings. But it can also be applied to bare metal surfaces of equipment, machines and machine components stored indoors to provide long-term protection against corrosion.

Normally, it is not necessary to wash anti-corrosion oil out of rolling bearings, as the oil behaves neutrally towards all conventional rolling bearing greases and oils. It can easily and reliably be removed using alkaline solvents or neutral cleaning agents.

Product range:
0.4l spray can with ozone-safe propellant CO_2.

ARCA.ANTICORROSIONOIL.400G*12
Part no. 400 6193 10

Rolling Bearing Greases 1.5 kg and 10 kg Containers

Grease Gun

Arcanol MULTITOP

DIN 51825	**KPSN-40**
Thickener	Lithium soap with EP additives
Base oil	Mineral oil + ester
Base oil viscosity at 40°C	**85** [mm^2/s]
Consistence (NLGI class)	**2**
Operating temperature (°C)	-40 to +150
Max. long-term operation temperature (°C)	80
Typical fields of application	Universal grease **for ball and roller bearings** used in rolling mills, construction machines, motor vehicles, splining and grinding spindles which are subject to increased speeds, high loads, high and low temperatures
Low temperatures	**Extremely suitable**
High temperatures	**Suitable**
Low friction	**Very suitable**
High speeds	**Very suitable**
High loads	**Very suitable**
Low speeds	**Very suitable**
Vibration	**Very suitable**
Support for seals	**Suitable**
Re-lubrication	**Extremely suitable**

		Part no.
ARCA.GREASE.MULTITOP.1KG	1 kg	400 6188 10
ARCA.GREASE.MULTITOP.5KG	5 kg	400 6189 10
ARCA.GREASE.MULTITOP.10KG	10 kg	400 6190 10

FAG Grease Gun with Armoured Hose

Under challenging operating conditions or in harsh environments, rolling bearings often require re-lubrication via grease nipples. This work can be performed easily, cleanly and quickly using the FAG grease gun with attached armoured hose. All parts comply with DIN 1283.

Grease Gun

Reservoir diameter: 56 mm, overall length of the gun: 390mm, delivery capacity: 2 cm^3/stroke, pressure: max. 800 bar. The gun is filled with either bulk grease or a cartridge according to DIN 1284.

- Reservoir capacity for bulk grease: 500 cm^3
- 400g cartridge as per DIN 1284 (diameter 53.5 mm, length 235mm), connection thread: GB/i, weight: approx. 1.5 kg

ARCA.GREASE-GUN
Part no. 400 6191 10

Armoured Hose

Length: 300 mm, connection thread: GB/i, equipped with hydraulic grip coupling for tapered lubrication nipples according to DIN 71412. Instead of the hydraulic grip coupling, sliding couplings for button head lubricating nipples according to DIN 3404 or other nozzles can be used. These connectors are available in specialist retail stores.

ARCA.GREASE-GUN.HOSE
Part no. 400 6192 10

Temperature Measuring Devices

FAG Infrared Thermometer TempCheck PLUS

The FAG infrared thermometer TempCheck PLUS measures the infrared radiation emitted by an object and uses this to calculate the surface temperature. The contact-free process allows for the temperature measurement of objects which are difficult to reach or that are moving.

The device is very light (it only weighs 150 g) and can therefore be taken practically anywhere it is needed. The FAG infrared thermometer TempCheck PLUS covers a measuring range of -32°C to +530°C. It can be used for thermal monitoring of machine components.

Summary of the advantages of the TempCheck PLUS:

- Quick and precise temperature measurement
- State-of-the-art infrared measurement technology
- Easy to handle
- Reduction of unplanned down-time periods
- Low purchase cost

TEMP.CHECK.PLUS
Part no. 400 6186 10

Contains: measuring device with battery, strap, user manual and carrying case

Digital Hand Tachometer

FAG Digital Hand Tachometer

The tachometer provides for two operation modes:

- Direct speed measurement with adapter, track wheel and measuring tips
- Contact-free optical measurement using a reflecting mark

Direct speed measurement

Plug on the adapter supplied with the measuring device. Through contact with the component, the rubber tip measures the rotational speed or the tracking wheel the surface speed.

TACHOMETER
Part no. 400 6184 10 contains:

Digital hand tachometer, adapter for direct 1:1 measurement, tracking wheel 1/10 mm, tracking wheel 6in, rubber tip, 10 reflecting marks, user manual, carrying case

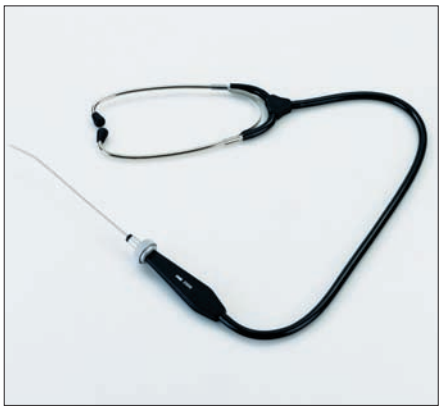
Contact-free speed measurement

Apply a reflecting mark on the machine component to be measured. This mark is detected by photoelectric means using visible red light. The device displays the revolutions per minute.

TACHOMETER.REFLEX.MARKS
Part no. 400 6185 10

Contains: 10 reflecting marks

Sonar Device



FAG Sonar Device

The sonar device allows for the quick, easy and reliable control of rolling bearing noise. Changes in noise caused by wear, pitting formation or distortion of the bearing can thus be detected at an early stage if inspection is carried out regularly. This helps to avoid unexpected interruptions in operation and more serious machine damage. The device works like a doctor's stethoscope.

The tips of the earpiece are placed in the ear channels to provide insulation against background noise. The insulating grip is held like a pencil between thumb and index finger and the sensing tip is placed firmly on the part to be measured. If a noise is heard, the sensor is moved until the noise reaches its maximum volume.

SOUND.CHECK
Part no. 400 6187 10

	✓	✓	✓	✓	✓
	✓	✓			
	✓	✓	✓	✓	
	✓	✓	✓	✓	
	✓	✓			
	✓	✓	✓	✓	
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