Service Manual
Rear Axle

wagner
A Division of Allied Systems Company

80-1213
Rev: 08/2024

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Preface

Axles, gearboxes, wheel gears and wheel ends produced by Kessler & Co. GmbH & Co.KG (hereinafter referred to as KESSLER) are designed and produced according to the current state of the art and generally recognized safety regulations.

The documentation describes the state of the art at the time when the documentation was written. It was written to the best of the author's knowledge, KESSLER accepts no liability, however, for possible errors regarding illustrations and descriptions.

This documentation is not subject to revision. Subject to change without notice.

Due to the constant further development and technical improvements of our products, the illustrations may differ in the following work steps or vary from the actual product/components. Drawings, graphics and photos are often not true to scale.

Claims for damage and consequential costs due to work carried out unprofessionally or improperly by third parties are ruled out.

For repair and modification works spare parts only manufactured by KESSLER may be used. Prescribed standards must be complied with in general.

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SIGNAL WORD

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Consequences if ignored

➢ Measure

1.2 Explanation of the usual warning notices and symbols

⚠ DANGER	
	**Indicates a direct danger.** If not avoided, death or serious injury will result.

⚠ WARNING	
	**Indicates a possibly dangerous situation.** If not avoided, death or serious injury may possibly result.

⚠ CAUTION	
	**Indicates a possibly dangerous situation.** If not avoided, injury may possibly result.

NOTICE	
	Indicates situations where material damage can occur.

NOTE
Indicates important information, application tips, and useful notes for proper working practices.

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General warning sign that draws attention to potential dangers.

Warning against danger of burns or cut injuries. Protective gloves must be worn.

1.3 Basic safety instructions

The following safety instructions must be read and observed before work is started on KESSLER products.

Product safety

Axles, gearboxes, drive assemblies, wheel gears, and wheel ends produced by KESSLER (referred to as KESSLER products in the following) are developed, designed and manufactured according to German and European technical regulations.

Work on Kessler products may only be carried out in compliance with the technical rules and safety regulations valid at the operating site.

- Valid health, work, and fire-protection regulations
- Laws, directives, and safety regulations

Organizational and personnel matters

Fundamental principles: axles, gearboxes, drive assemblies, wheel gears, and wheel ends produced by KESSLER may only be put into operation in a technically fault-free condition, when used as intended and being mindful of safety and danger while observing the instructions. Remove defects immediately, especially those which might adversely affect safety. The operation of defective and improperly maintained, repaired or retrofitted axles, gearboxes, drive assemblies, wheel gears and wheel ends is not permitted under any circumstances! Carry out all activities in a responsible and safety-oriented manner. Furthermore, all markings and labels on axles, gearboxes, wheel gears, and wheel ends of KESSLER must be legible.

Scope of validity: The documentation is valid for all persons who work on KESSLER products. Before work is carried out on the vehicle, the documentation must be read completely and closely observed. If there are questions or something cannot be understood, KESSLER must be consulted.
The documentation should be stored near the KESSLER products and be accessible for the personnel at any time. The documentation is part of the KESSLER products and must be available in its entirety during the entire service life.

Competences: Work on KESSLER products may only be carried out by trained technicians such as motor vehicle mechanics or persons with comparable vocational training.

Product-specific dangers

Transport, installation, maintenance, repair, and conversion work: Activities between or on moving subassemblies must be avoided as there is a danger of crushing or shearing.

The unpredictable own weight of KESSLER products or individual parts can cause them to fall or tip over unexpectedly.

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- Employ only suitable, undamaged, and approved cranes and slinging means for the load in question.
- Do not stand under suspended loads.
- Secure parts with tension belts and/or suitable supports.
- Wear safety shoes.

All maintenance specifications in KESSLER's documentation must be observed.

All work must be carried out at a clean workplace.

The instructions in this documentation assume that the KESSLER product has been disassembled and is fixed onto a device for further processing. Read the vehicle manufacturer's instructions on how to dismantle the KESSLER products from the vehicle.

Work on a KESSLER product may only be carried out when permissible by the temperature of the respective component.

- Make sure that oil has cooled down before draining it.
- Make sure that rotating parts have cooled down before starting disassembly.
- Wear fire-proof gloves.

Brake: When working on the brake it must be ensured that no unintended machine movement can occur when the brake mechanism is disengaged.

The brake is a safety component of the first order; improper work on it may cause the brake to fail.

Rim and tire: Never stand directly in front of the rim when air is released or during inflation. Parts may suddenly come loose and be ejected due to the inner pressure of the tire.

The air needs to be released completely from the tire beforehand when disassembling versions with clamped rim fixation. Be sure to observe the tightening torques and maintenance of the wheel nuts and clamps.

Lubricants and auxiliary materials: Be sure to observe the manufacturer's safety data sheets when handling lubricants and auxiliary materials (e.g. oils and greases).

Oils and greases can trigger allergic reactions on skin. For this reason, appropriate protective clothing must be worn.

Loose-fitting clothing and long loose hair is prohibited when working on KESSLER products!

When metal parts are being machined where there is a risk of shattering (grinding, deburring, cleaning with compressed air, etc.), bits of metal may be flung out that can injure the eyes. For this reason, safety goggles must always be worn.

KESSLER offers customer service tools that make working on axles, gearboxes, wheel gears, and wheel ends easier and safer.

Repair welding is only permitted after consultation with KESSLER!

Before reassembling used parts, they must be checked for damage, fault-free contact surfaces and wear. In particular, check that there are no chips or other foreign bodies in the axles, gearboxes, wheel gears, and wheel ends.

After carrying out maintenance and repair work, check that the product functions properly.

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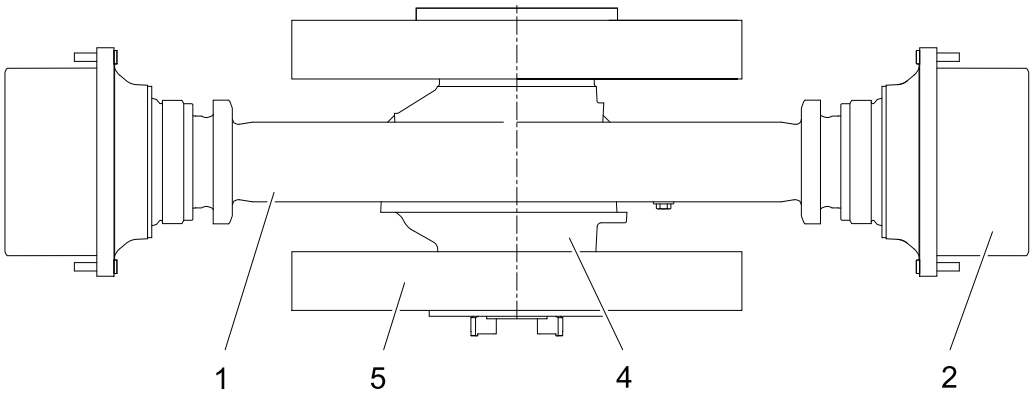
2 Axle Overview

L490 4WD-Logstacker

Axle 101.2591.3



1 Axle housing

2 Hub assembly

3 --

4 Drive assembly

5 Axle bracket

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3 Repair

After working on axles, gearboxes, wheel gears and wheel ends all assembly groups need to be checked for leaks.

The display of components in the following images is simplified!
Deviations may occur in

- form
- scale
- position of add-on parts, connections and holes
- number of bearings, disks, etc.

3.1 Correct disassembly

- Drain oil before disassembly and check for metal particles.
- Before disassembly, always mark the matching parts.
- Never use a hard object to loosen tightly inter-fitted parts. Use suitable extractor devices to disassemble rolling bearings, drive flanges and similar.
- Before disassembly, check the bearings for damages and replace them if necessary.
- During disassembly, always replace all sealing rings.
- Clean or replace corroded components.
- Do not place parts on soiled surfaces.

3.2 Correct assembly

- Clean parts before assembly.
- Lubricate bearings running in oil during assembly.
- When assembling radial seal rings, ensure sufficient coverage in the housing hole. Ensure that the radial seal ring lies flat. Loctite may not come into contact with the sealing lip!
- Fill radial seal rings, especially sealing rings with a dust lip, with grease.
- Do not use force to hammer in universal joints and axle shafts. They must remain adjustable.
- Preserve sealing ring contact surfaces on flanges, shafts etc. with Castrol Rustilo DWX 32 before installation.
- Fill in oil after assembly!

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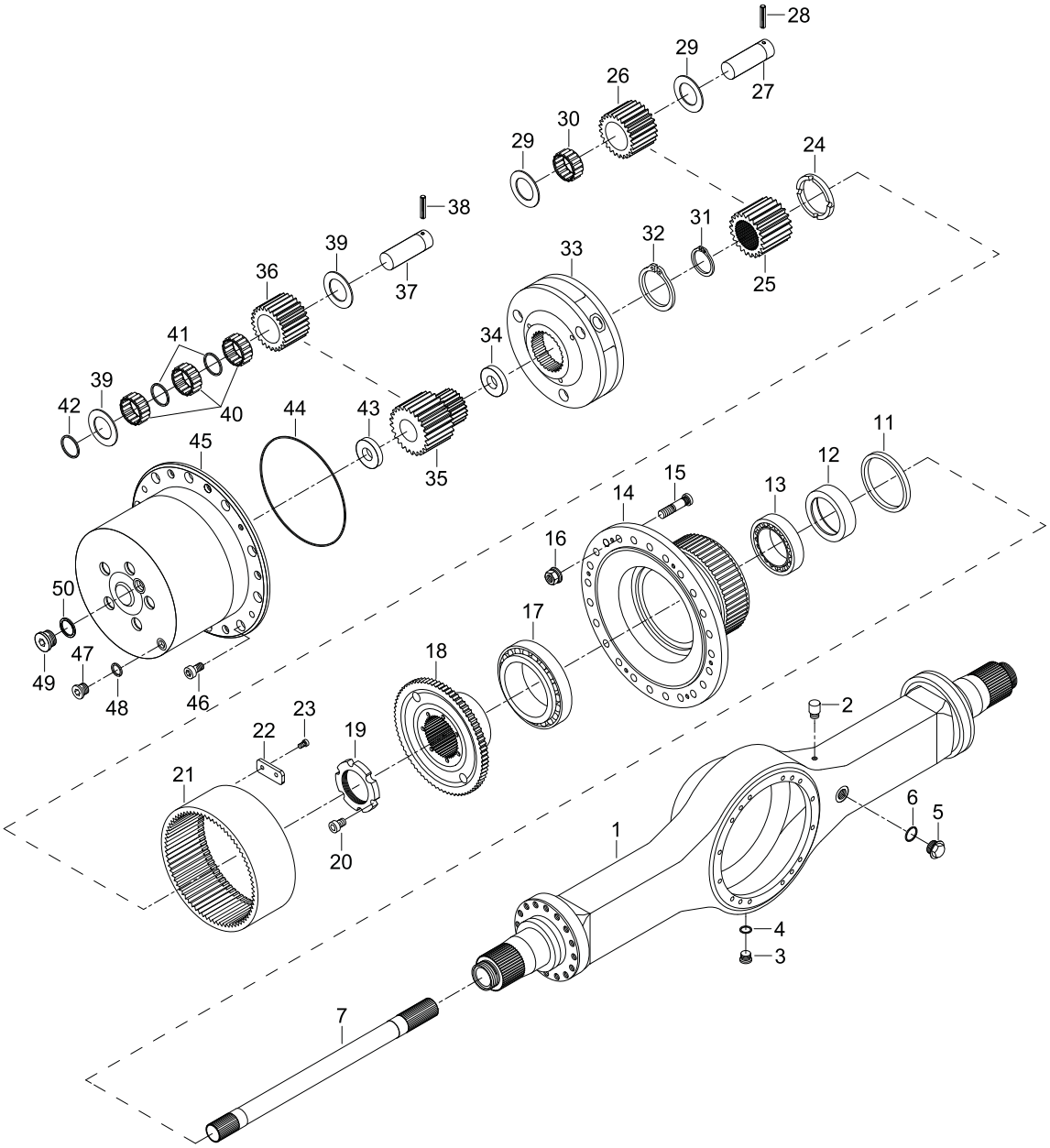
3.3 Hub assembly

3.3.1 Preconditions

- The axle has been disassembled from the vehicle.
- Before disassembly of the hub assembly, the oil must be drained. See Oil change on page 51
- The disassembly sequence must be observed.

3.3.2 Overview of parts



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1 Axle housing
2 Breather
3 Screw plug
4 Sealing ring
5 Screw plug
6 Sealing ring
7 Axle shaft
8 --
9 --
10 --
11 Radial seal ring
12 Spacer ring
13 Tapered roller bearing
14 Wheel hub
15 Wheel stud
16 Wheel nut
17 Tapered roller bearing
18 Ring gear carrier
19 Wheel bearing adjustment nut
20 Screw
21 Ring gear
22 Lock plate
23 Screw
24 Thrust ring
25 Sun gear
26 Planetary gear
27 Planetary pin
28 Spring-type straight pin
29 Disk
30 Needle bearing
31 Circlip
32 Circlip
33 Planetary carrier
34 Thrust disk
35 Sun gear
36 Planetary gear
37 Planetary pin
38 Spring-type straight pin
39 Disk
40 Needle bearing
41 Ring
42 O-ring
43 Thrust disk
44 O-ring
45 Planetary housing
46 Screw
47 Screw plug
48 Sealing ring
49 Screw plug
50 Sealing ring

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3.3.3 Customer service tools hub assembly

Seal ring sleeve driver for seal ring within the wheel hub

Order number: 260033
(Seal ring dimension 220x250x16)

Wrench for wheel bearing adjustment nut

- If needed three more bolts can be pressed in.

Order number: 596633

3.3.4 Disassembly hub assembly

1. Disassembly planetary gear
   see as well "Dismantling planetary gear"
2. Disassembly axle shaft
3. Disassembly ring gear carrier unit
4. Disassembly wheel hub
5. Disassembly spacer ring (if necessary)
6. Disassembly thrust ring (if necessary)

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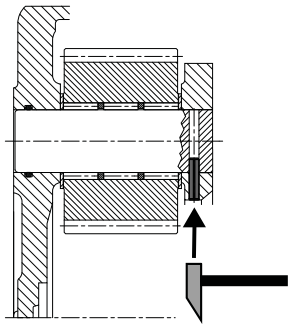
3.3.4.1 Dismantling planetary unit



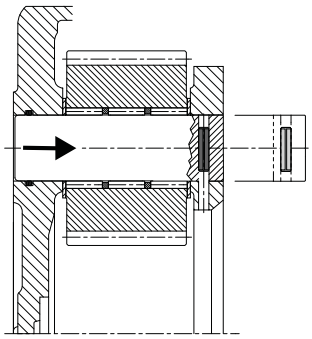
1. Knock through the dowel pin inwards until it lies in the planetary pin completely.

NOTICE

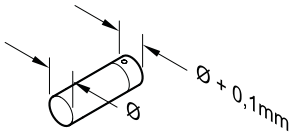
Diameter difference of 0.1 mm at the planetary pin

The drill hole in the planetary housing will be destructed as a result of incorrect disassembly.

- The planetary pin may only be pressed through in the direction of the arrow.
- Observe the position of the locking drill hole.



2. Press out the planetary pin in the direction of the arrow.



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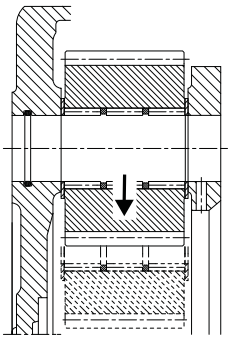
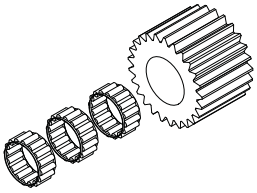


3. Take out the planetary gears with thrust washers and bearings.
4. Remove O-rings from planetary housing.



5. Push the needle bearing out of the planetary gear.

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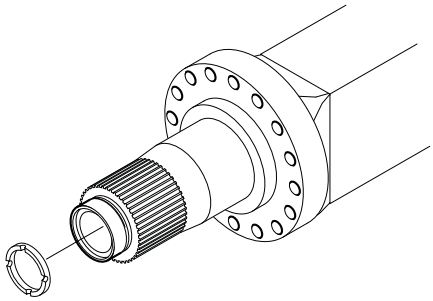
3.3.5 Assembly hub assembly

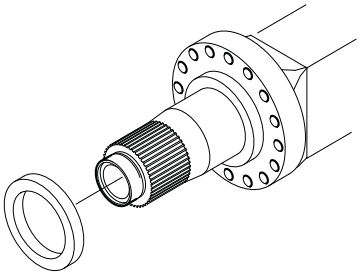
3.3.5.1 Assembly thrust ring



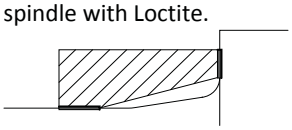
1. Press the thrust ring into the axle spindle.
   - ➢ Loctite 270

3.3.5.2 Assembly spacer ring

⚠ CAUTION	
	**Hot spacer ring** Risk of burning ➢ Wear heat resistant gloves



1. Corrosion check at the seat of the spacer ring.
   - ➢ Corrosion at the axle spindle is not allowed.
2. Coat the seat of the spacer ring on the axle spindle with Loctite.



   - ➢ Loctite 572
3. Uniformly heat the spacer ring in an oven to approximately 100°C and push it up to the contact surface on the axle spindle.
4. Remove Loctite residues after cool-down.
5. Coat the sealing ring running area on the spacer ring with oil before assembly.

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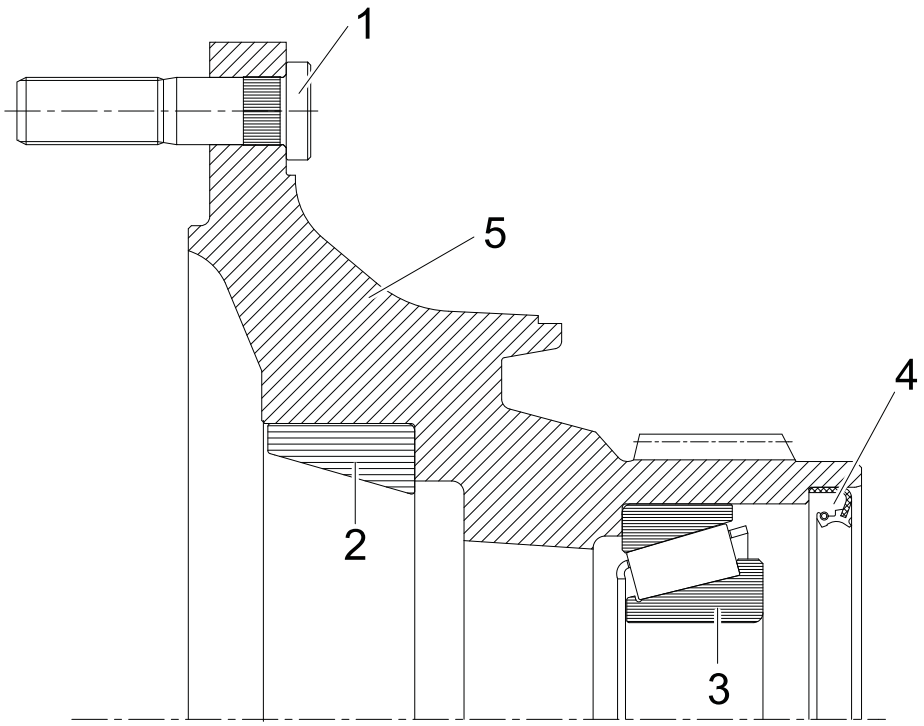
3.3.5.3 Preparation wheel hub unit

NOTICE	
	**Incorrect installation of the radial seal ring** Sealing of the oil cavity is not guaranteed. ➢ Observe the installation position of the sealing lips of the radial seal ring! ➢ Do not damage the sealing lip of the radial seal ring. ➢ Use the special tool - sealing ring sleeve driver



1. Install the wheel studs (1).
2. Press in bearing shells (2+3).
   - ➢ Do not knock them in!
3. Insert the bearing (3).
4. Coat radial seal ring (4) with Loctite.
   - ➢ **Steeled outer sheath:** Loctite 270
5. Press the radial seal ring (4) into the wheel hub (5).
   - ➢ Observe the installation position!
   - ➢ Customer service tool: Seal ring sleeve driver
6. Fill the radial seal ring (4) 2/3 full with roller bearing grease.

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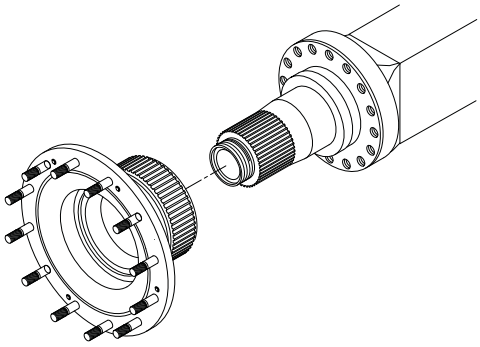
3.3.5.4 Assembly wheel hub unit

⚠ CAUTION	
	**After assembly of the wheel hub unit it can tip over uncontrolled under its own weight and fall down.** Risk of squashing ➢ Safeguard the wheel hub unit, also after assembly, with suitable lifting tackle against falling down, until the wheel bearing adjustment nut has been tightened.

NOTICE	
	**Careless sliding on of the wheel hub unit damages the radial seal rings.** In case of damage to the radial seal rings sealing of the oil cavity is not guaranteed. ➢ Slide on the wheel hub unit parallel and very carefully.



1. Push the prepared wheel hub onto the axle with suitable lifting equipment.
2. Secure the wheel hub in this position until the wheel bearing adjustment nut has been tightened.

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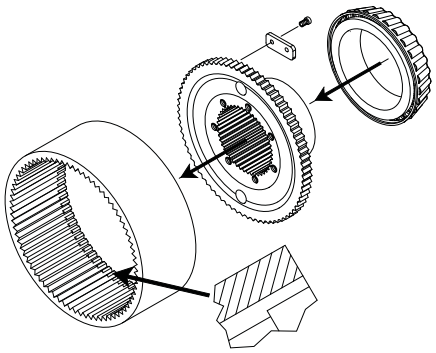
3.3.5.5 Preparation ring gear carrier unit

⚠ CAUTION	
	**Sharp edges on the teeth** Risk of cutting ➢ Wear protective gloves

NOTICE	
	**Due to a milled tooth system in the ring gear, there is only one installation direction.** The toothing system of the ring gear and the ring gear carrier will be damaged as a result of incorrect assembly. ➢ The ring gear and the ring gear carrier may only be assembled as shown.



1. Heat the tapered roller bearing inner ring to approximately 100°C and slide onto the ring gear carrier up to the contact point.
2. Allow to cool down.
3. Place the ring gear on the ring gear carrier.
4. Fasten all lock plates with screws.
   - ➢ Loctite 270
   - ➢ Tightening torque: see Tightening torque for screw plugs on page 70

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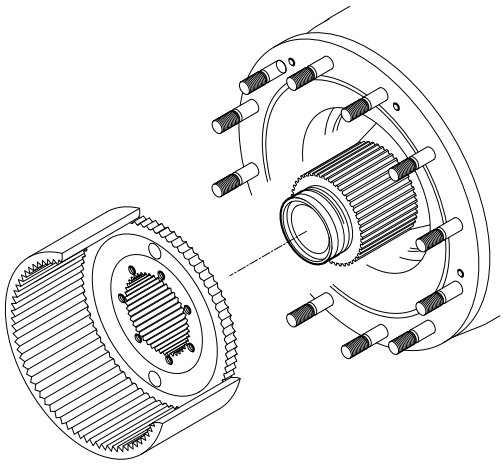
3.3.5.6 Assembly ring gear carrier unit

⚠ CAUTION	
	**After assembly of the ring gear carrier unit it can tip over uncontrolled under its own weight and fall down.** Risk of squashing ➢ Safeguard the ring gear carrier unit, also after assembly, with suitable lifting tackle against falling down, until the wheel bearing adjustment nut has been tightened.



1. Slide on the prepared ring gear carrier onto the axle spindle.
   ➢ Seen from the axle assembly side, one of the oil compensation drill holes must be at the bottom.

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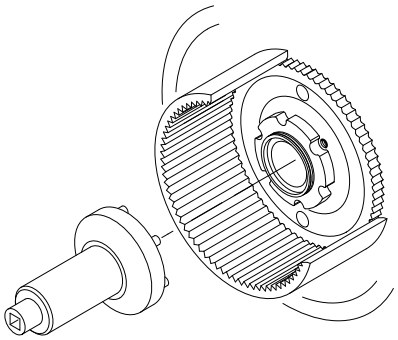
3.3.5.7 Wheel bearing adjustment

⚠ DANGER	
	**Faulty mounting and incorrect securing of the wheel bearing adjustment nut** The wheel along with the complete hub assembly comes off of the axle. ➢ In any case, tighten and secure the wheel bearing adjustment nut as described!



Assembly wheel bearing adjustment nut:

1. Completely coat the contact surface and the thread of the wheel bearing adjustment nut with assembly paste.
   - ➢ Assembly paste with solid lubricants
2. Screw on the wheel bearing adjustment nut and tighten with 1.5 to 2 times of the specified tightening torque (see below).
   - ➢ Customer service tool: Wrench for wheel bearing adjustment nut
   - ➢ Lightly knock on the wheel hub with a plastic hammer and turn it several times during tightening.
3. Loosen the wheel bearing adjustment nut again (loose it approximately 180°).
4. Tighten the wheel bearing adjustment nut.
   - ➢ Turn the wheel hub repeatedly during tightening.
   - ➢ Tightening torque for new bearings: 750 Nm
   - ➢ Tightening torque for used bearings: 600-650 Nm
   - ➢ If it is not possible to lock in this position, the wheel bearing adjustment nut must turned forward to the next possible locking position.

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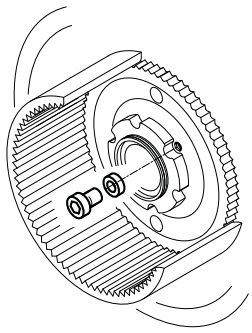
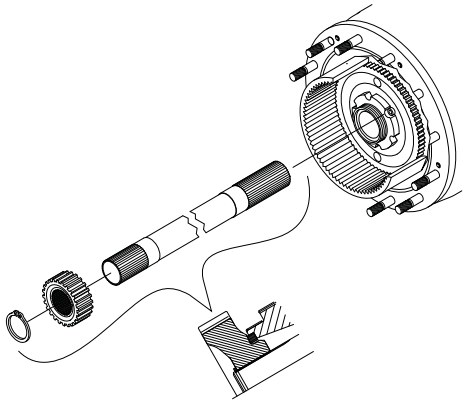


Locking wheel bearing adjustment nut:

5. Lock the wheel bearing adjustment nut with a screw.
   - Hexagon socket screw
   - Screw locking: Loctite 270
   - Tightening torque: 72 Nm

3.3.5.8 Preparation and assembly axle shaft



1. Slide the axle shaft into the axle spindle.
   - It must be possible to easily slide the axle shaft (by hand) in the inner profile of the differential.
2. Mount the sun gear of the inner planetary unit onto the axle shaft.
3. Mount the circlip.
4. Slide the axle shaft into the axle spindle until the sun gear is in contact with the circlip and the thrust washer.

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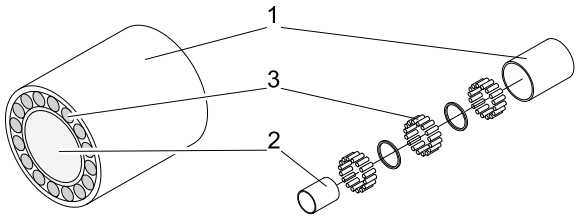
3.3.5.9 Preparation planetary gear drive

Assembly procedure of full complement roller set cageless

Full complement needle bearings are available in versions with cage and without cage.

In version without a cage the individual needles are not held and will fall out due to incorrect assembly. Therefore observe on the special assembly process, as described below.

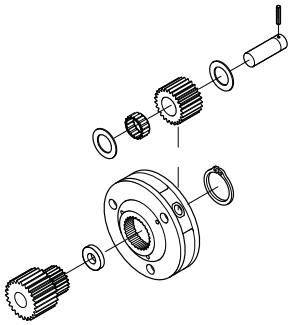


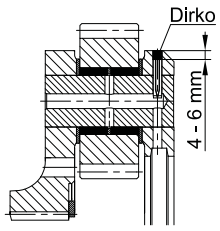
1 Outer mounting bushing

2 Inner mounting bushing

3 Needles/Full complement roller set

1. Install the needle bearing with mounting bushings into the planetary gear.
   - ➢ Thereby the outer mounting bushing is pressed out.
2. Insert the planetary gear with thrust disks into the planetary housing.
3. Align and press in the planetary pin.
   - ➢ Thereby the inner mounting bushing is pressed out.





Preparation inner planetary gear drive assembly:

1. Assembly planetary gear bearing.
   - ➢ When full complement roller set regard correct mounting.
2. Assemble the planetary gears with aligned planetary pins (position of the security hole) in the planetary housing.
3. Secure every planetary pin with a dowel pin.
   - ➢ The dowel pins have to pressed in 4-6mm.
4. On the outside seal the drilling for the dowel pins with DIRKO grey.
5. Press the thrust ring into the sun gear.
   - ➢ Loctite 270
6. Install the sun gear of the outer planetary gear drive assembly into the inner planetary gear drive assembly.
7. Secure the sun gear with the circlip.

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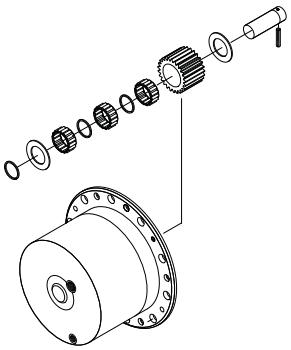
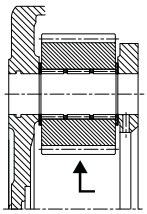




Preparation outer planetary gear drive assembly:

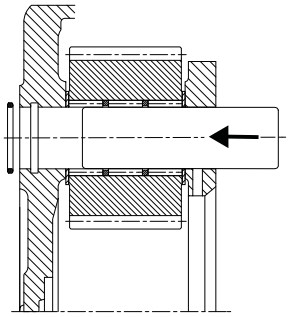
8. Assembly planetary gear bearing.
   - ➢ When full complement roller set regard correct mounting.
9. Position the planetary housing horizontally.
10. Insert the bottom thrust washer.
11. Place the planetary gear together with bearing on the bottom thrust washer.
12. Push in the top thrust washer.

NOTICE

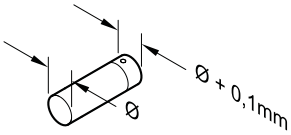
Difference of 0.1 mm at the planetary pin.

The drill hole in the planetary housing will be destructed as a result of incorrect disassembly.

- ➢ The planetary pin may only be pressed in in the direction of the arrow.
- ➢ Observe the position of the locking drill hole.



13. Lightly oil the O-ring and insert it in the groove of the planetary housing.
14. Press in the planetary pin in the direction of the arrow.



- ➢ Ensure a lined-up position of the locking drill hole in the planetary pin and in the planetary housing (see arrow).

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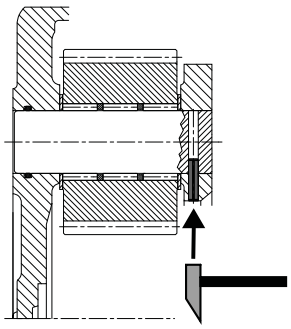
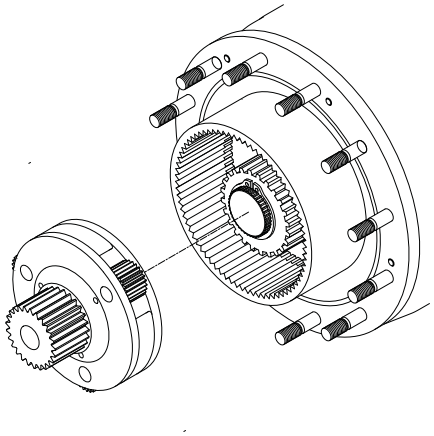


15. Lock the planetary pin with the dowel pin after pressing it in.

Thoroughly clean the outside of the planetary housing after assembly of the axle in order to prevent apparent leakage.

3.3.5.10 Assembly inner planetary gear drive assembly



1. Push the inner planetary gear drive assembly into the ring gear and onto the sun gear.
   - **Tip:** Turning the drive flange eases the assembly of the planetary gear drive onto the sun gear.

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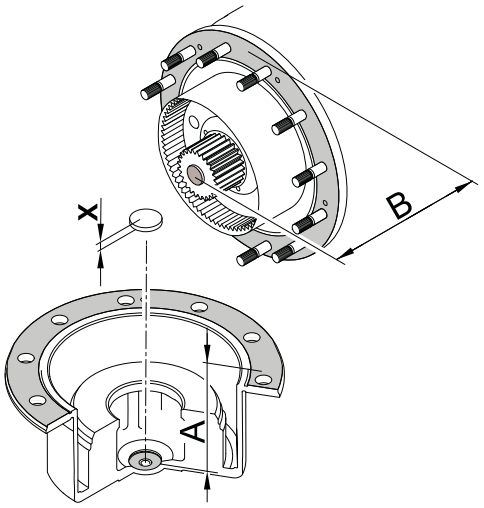
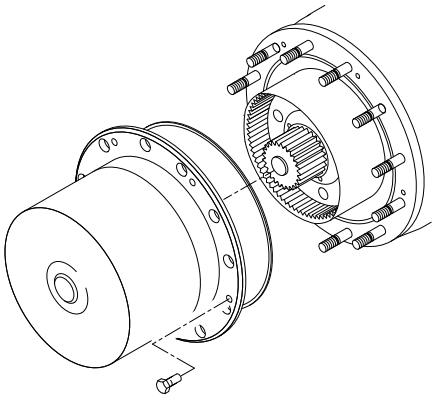
3.3.5.11 Adjustment axial play



The axial clearance between axle shaft resp. universal joint and thrust washer in the planetary housing must be 0.5 - 0.9 mm.

1. Measure distances.
   - ➢ Dimension A = … (see grey areas)
   - ➢ Dimension B = … (see grey areas)
2. Calculate the required thickness of the thrust washer.
   - ➢ Required thickness X = A - B - axial clearance (0.5 - 0.9 mm)
3. Mount the correctly dimensioned thrust washer into the planetary housing.
   - ➢ Loctite 270

3.3.5.12 Assembly outer planetary gear drive assembly



1. Insert O-ring in the groove of the planetary housing.
2. Align the planetary housing so that it lines up with the relevant drill holes in the wheel hub.
   - ➢ The oil drainage screw must be in the lower position!
3. Push the prepared planetary unit over the wheel studs.
4. Screw down the planetary unit on the wheel hub.
   - ➢ Loctite 243
   - ➢ Tightening torque: **see Tightening torques for standard metric threads on page 68**

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3.4 Differential and carrier assembly

3.4.1 Preconditions

- The differential and carrier assembly needs only to be disassembled from the axle housing for repair and modification work. For work on the hub assembly of an axle, the differential and carrier assembly can remain assembled in the axle housing.
- The oil of the complete axle must be drained before the differential and carrier assembly is disassembled.
- Mark the position of the differential and carrier assembly relative to the axle housing before disassembly.
- The axle shaft/universal joint must be disassembled in order to be able to disassemble the differential and carrier assembly from the axle. The measures required to do this are described in "Repair hub assembly".
- In the following description it is assumed that the differential and carrier assembly has been disassembled and mounted on a device for performing further work.

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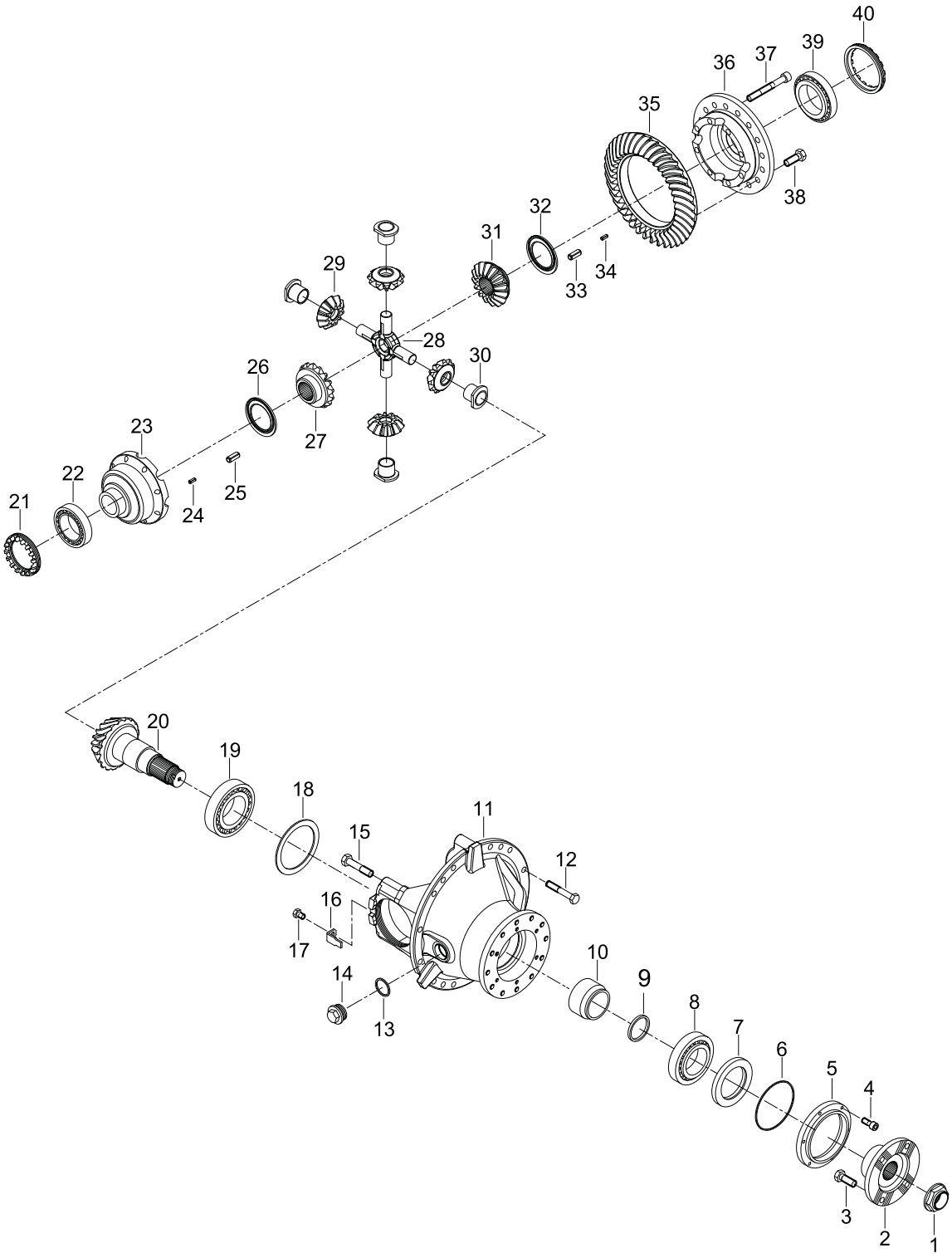
3.4.2 Overview of parts



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1 Lock nut
2 Drive flange
3 Hexagon screw
4 Screw
5 Cover
6 O-ring
7 Radial seal ring
8 Tapered roller bearing
9 Spacer ring
10 Bushing
11 Differential carrier
12 Hexagon screw
13 Sealing ring
14 Plug screw
15 Hexagon screw
16 Lock plate
17 Hexagon screw
18 Adjustment disk
19 Tapered roller bearing
20 Drive pinion
21 Bearing adjustment ring
22 Tapered roller bearing
23 Differential housing
24 Spring-type straight pin
25 Spring-type straight pin
26 Disk
27 Differential side gear
28 Differential spider
29 Differential pinion
30 Bushing
31 Differential side gear
32 Disk
33 Spring-type straigth pin
34 Spring-type straight pin
35 Ring gear
36 Differential housing
37 Screw
38 Screw
39 Tapered roller bearing
40 Bearing adjustment ring

3.4.3 Customer service tools drive

The following tool list is an overview of required service tools for disassembly and assembly. It does not claim to be completely.

On request, you will receive a complete list when ordering the spare part list.

Spanner for bearing adjustment ring (differential bearing)

Order number: 261592
(thread M127 / M130 / M132)

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Seal ring sleeve driver

Order number: 261754

3.4.4 Disassembly differential and carrier assembly

Removal and disassembly is carried out in the reverse order to assembly. This is described in detail and is also valid for disassembly.

Observe the safety instructions!

The sequence below describes the disassembly of the above assembly unit.

1. Disassembly differential and carrier assembly
2. Disassembly differential
3. Loosening the lock nut on the drive flange
   see thereto "Loosening the lock nut"
4. Disassembly drive flange
5. Disassembly drive pinion
6. Disassembly radial seal ring on the drive flange
7. Disassembly tapered roller bearing, bearing shells and disks from the differential carrier
8. Disassembly ring gear
9. Disassemble differential

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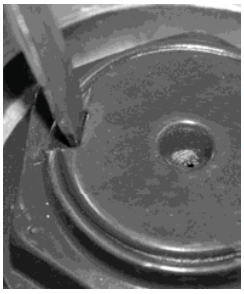
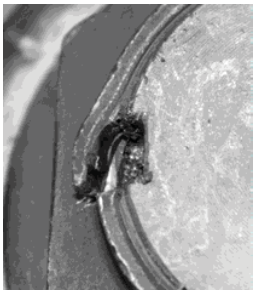
3.4.4.1 Loosening the lock nut

NOTICE	
	**An improperly loosened safety dog of the lock nut can damage the thread of the drive pinion during unscrewing.** If the thread of the drive pinion has been damaged, a new lock nut cannot be screwed on again and the differential and carrier assembly must be disassembled completely. ➢ Bend the safety dog completely upwards

1. Locked lock nut





2. Apply a suitable flat chisel to the groove between the pinion and the locking plate and open the lock nut lock.
3. Bend the safety dog completely upwards.

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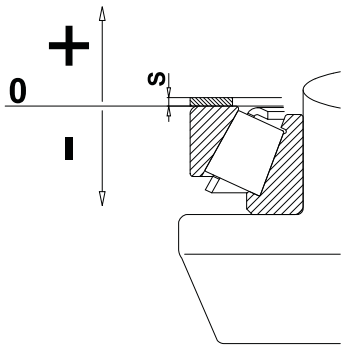
3.4.5 Assembly differential and carrier assembly

3.4.5.1 Adjustment of drive pinion space



In order to achieve the correct flank contact, the axial position of the drive pinion must be adjusted with the aid of the adjustment disk. The required thickness for the initial installation is determined by means of measurement (see table with examples of calculation).

Decrease or increase the thickness of the adjustment disk accordingly, so that the deviation is compensated.

0 = theoretical zero

S = adjustment disk thickness

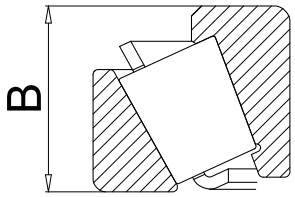
+ = devaiting dimension

- = devaiting dimension

Differential and carrier assembly	**A 81**
Theoretical adjustment disk thickness S	3.2
theoretically B	45

The dimensions in the table are theoretical dimensions.

The final thickness of the adjustment disk can only be observed when the contact pattern in the assembled differential and carrier assembly is checked.



B = width of the tapered roller bearing

Note down the deviation from the required dimension

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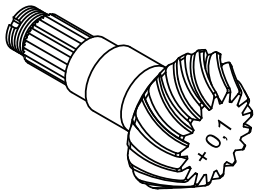
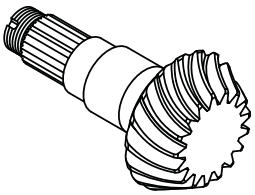
Different manufacturing procedures of drive pinions result in version 1 or version 2.

It is only possible to achieve an optimal contact pattern, if the different versions get regarded.

Version 1	Version 2
With production numbers • on drive pinion (marked on the end face) • on ring gear (marked on the face of the ring gear)	**No production numbers** • on drive pinion • on ring gear
• The production numbers of the drive pinion and ring gear **must** match ➢ **only mount in pairs!**	• **indiscriminate** use of drive pinion and ring gear is possible ➢ **no pairing necessary!**

Version 1	Version 2
	
Deviating dimension (determined during manufacture) is marked on the face of the drive pinion. It specifies the deviation from the required dimension. Here the deviation is +0.1 mm	Without any marking on the face of the drive pinion, the deviation from the required dimension is 0.

The distance between the drive pinion and the ring gear, and thereby the contact pattern, is determined by the adjustment disk. The adjustment disk equals the dimensional tolerance of the bearing and the manufacturing tolerance of the drive pinion. Therefore the exact disk thickness must always be calculated, based on the relevant dimensions.

- In case of an over-size of the bearing, the over-size is subtracted from the theoretical disk thickness.
- In case of an under-size of the bearing, the under-size is added to the theoretical disk thickness.
- In case of an over-size of the drive pinion, the over-size is subtracted from the theoretical disk thickness.
- In case of an under-size of the drive pinion, the under-size is added to the theoretical disk thickness.

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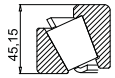
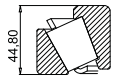
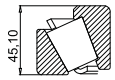
Dimensions in mm

theor. Adjusting disk thickness S	Measured bearing width	Deviation on the drive pinion	Calculation of the required adjusting disk thickness	Required adjusting disk thickness S
3,20		Version 1 	theor. Disk thickness - Deviation of the bearing + Deviation of the drive pinion = Required disk thickness	3,20
	Deviation from the theoretical dimension Over-size = +0.15	Deviation from the theoretical dimension Under-size = -0.15	3.2 - 0.15 + 0.15 = 3.2	
3,20		Version 1 	theor. Disk thickness + Deviation of the bearing + Deviation of the drive pinion = Required disk thickness	3,55
	Deviation from the theoretical dimension Under-size = -0.20	Deviation from the theoretical dimension Under-size = -0.15	3.2 + 0.20 + 0.15 = 3.55	
3,20		Version 1 	theor. Disk thickness - Deviation of the bearing - Deviation of the drive pinion = Required disk thickness	3,0
	Deviation from the theoretical dimension Over-size = +0.10	Deviation from the theoretical dimension Over-size = +0.10	3.2 - 0.1 - 0.1 = 3.0	

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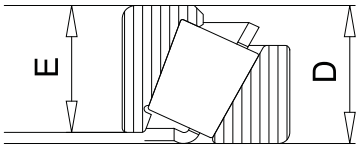
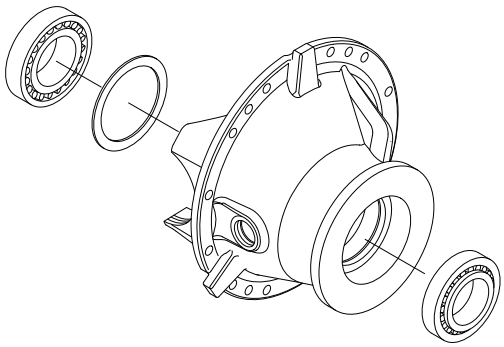
3.4.5.2 Assembly of drive pinion bearing

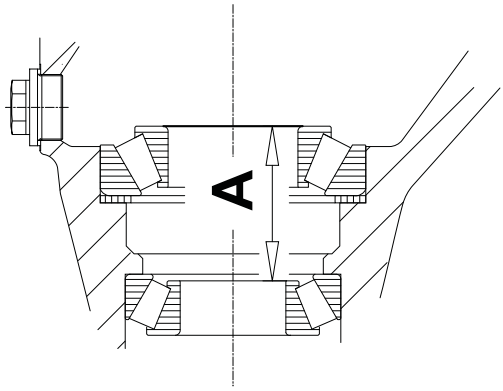


1. Measure and record the dimensions D and E from the flange-side tapered roller bearing.

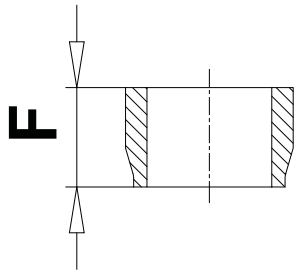


2. Evenly seat the inner bearing ring of the tapered roller bearing with the aid of a seater without tilting it.
3. Insert the adjustment disk with the theoretically determined thickness S into the differential carrier.
4. Evenly seat the inner bearing ring of the tapered roller bearing with the aid of a seater without tilting it.

5. Calculate the required thickness of the spacer ring, dimension C.



- Place the two inner rings of the taper roller bearings in their outer rings.
- Measure and record dimension A.



- Measure and record dimension F of the bushing.

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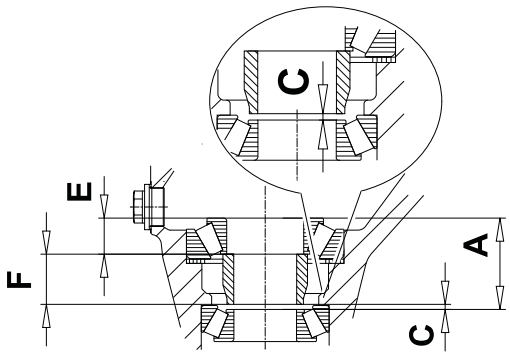
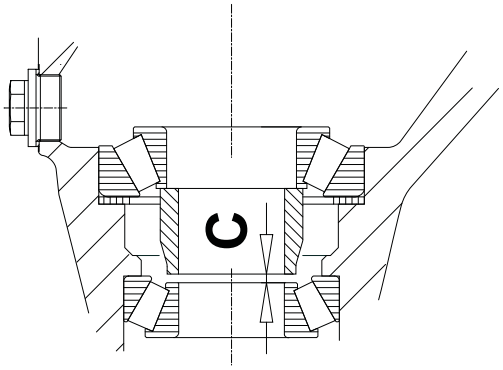


- Overview of all required components.



- The required thickness of the spacer ring results from:

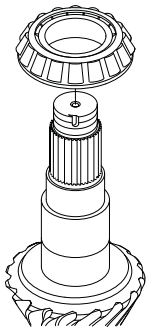
C = A – E – F

⚠ CAUTION

Sharp edges on the teeth

Risk of cutting

➢ Wear protective gloves



6. Drive the inner ring with the tapered roller bearing roller cage onto the drive pinion up to the stop using a sleeve.
7. Push the drive pinion with the assembled tapered roller bearing into the differential carrier.
8. Secure the drive pinion with a supporting device.

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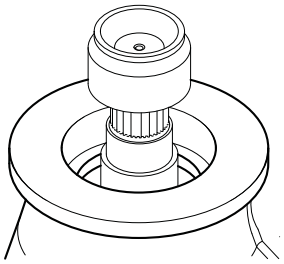
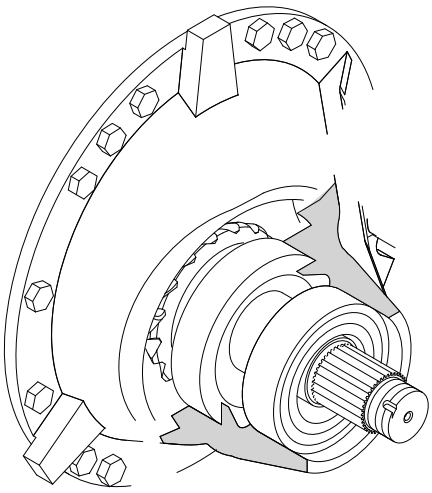
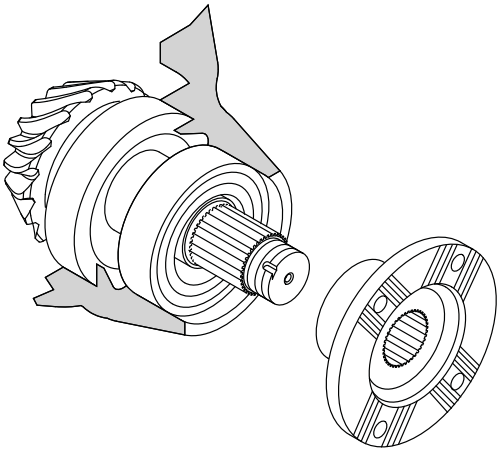


9. Assemble the bushing onto the drive pinion.

10. Place a spacer ring with the calculated thickness C on the drive pinion.



11. Drive the inner ring with the tapered roller bearing roller cage onto the drive pinion up to the stop using a sleeve.



12. Push the drive flange onto the drive pinion.

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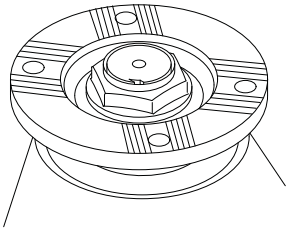
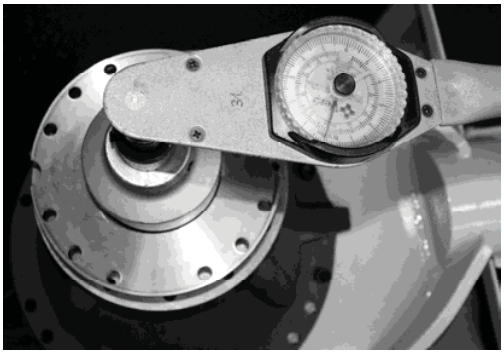


13. Screw on the lock nut and tighten it.
    - ➢ Tightening torque: 850 Nm



14. Secure the differential carrier on a suitable device.
15. Loosen the support on the drive pinion so that the drive pinion can turn freely.
16. Measure the bearing pre-load with a torque wrench with a drag indicator.
    - ➢ The bearing pre-load must be 1.0 – 1.5 Nm.
    - ➢ In case of a deviation of the bearing pre-load: correct the bearing pre-load by changing the thickness C of the spacer ring. For example: if the bearing pre-load is too low, reduce the ring thickness C marginally (in the range of hundredth mm).
    - ➢ If the bearing pre-load is correct: tighten the support device on the drive pinion.
17. Loosen the lock nut and pull off the drive flange.

3.4.5.3 Assembly of radial seal ring into the cover to the drive flange

NOTICE	
	**Incorrect installation of the radial seal ring** Sealing of the oil cavity is not guaranteed. ➢ Observe the installation position of the sealing lips of the radial seal ring! ➢ Do not damage the sealing lip of the radial seal ring. ➢ Use the special tool - sealing ring sleeve driver

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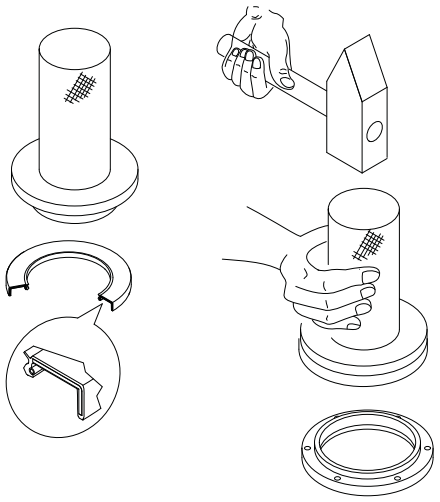
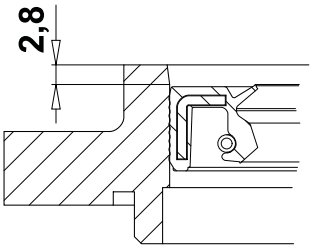
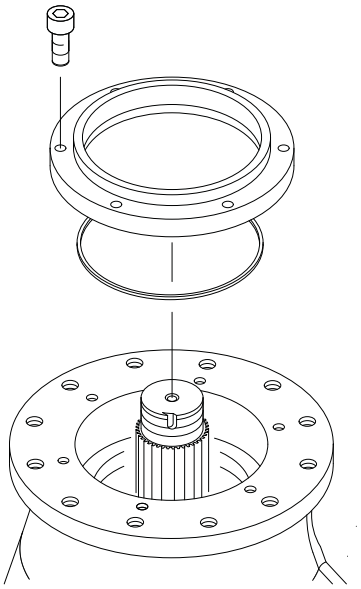


1. Coat radial seal ring with Loctite.
   - ➢ Loctite 572
2. Place the prepared radial seal ring onto the sealing ring sleeve driver.
   - ➢ Customer service tool: Sealing ring sleeve driver
3. Evenly knock in the radial seal ring up to a position of 2,8 mm below the surface of the cover without tilting it.
4. Fill the new radial seal ring with grease up to 2/3.
   - ➢ Multi-purpose grease



3.4.5.4 Assembly of the cover to the drive flange



5. Insert the O-Ring into the slot of the cover.
6. Place the cover, screw it down and tighten.
   - ➢ Loctite 262
   - ➢ Tightening torque: **see Tightening torques for standard metric threads on page 68**

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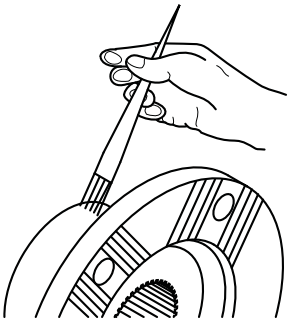
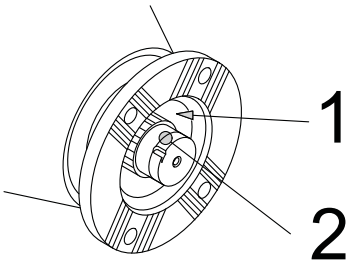
3.4.5.5 Assembly drive flange

NOTICE	
	**Assembly of a damaged or soiled drive flange** If the running surface of the drive flange is not perfect, the sealing lip of the radial seal ring will be damaged. Sealing of the oil cavity is then not guaranteed. ➢ Precise control of the running surface of the drive flange. It must be undamaged and clean.



1. Lightly cover the surface of the drive flange with clean oil.
   - ➢ Oil type: same as the transmission oil that is being used.
2. Mount the drive flange with light turning movements.

3.4.5.6 Assembly lock nut



1. Seal the contact surface between the lock nut and the drive flange 1 with sealant.
   - ➢ Sealant: Dirko grey
2. Coat the thread 2 of the drive pinion with assembly paste.
   - ➢ Assembly paste: assembly paste with MoS_2
3. Screw on the lock nut and tighten it.
   - ➢ Tightening torque: 850 Nm

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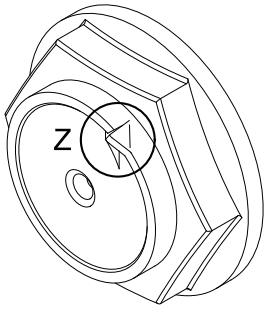
3.4.5.7 Securing of the lock nut

NOTICE	
	**An improperly secured lock nut can open independently.** Drive flange dissolves ➢ Bended safety dog must fully rest on the bottom of the groove.

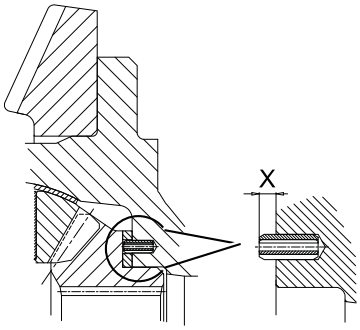


Extension Z

1. Bend the corner of the lock nut on the slot ground.
   - ➢ Pay attention to the loosing direction of the lock nut!
   - ➢ The brim of the striking nut has to be sheared only along the slot flank.

3.4.5.8 Assembly of the Differential

NOTICE	
	**Insufficient lubrication inside the differential on the tooth system and internal parts** Tooth system and disks run dry. ➢ All bevel wheels and thrust washers must be thoroughly oiled during assembly.



1. Pay attention of the standout of the spring-type straight pins.
   - ➢ X = 3.7 - 4.0 mm

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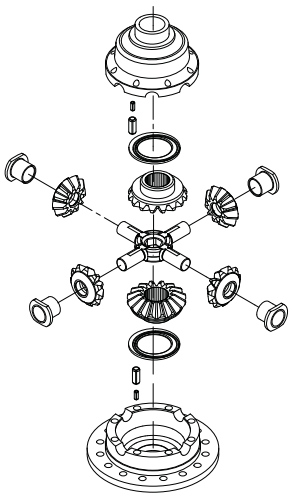
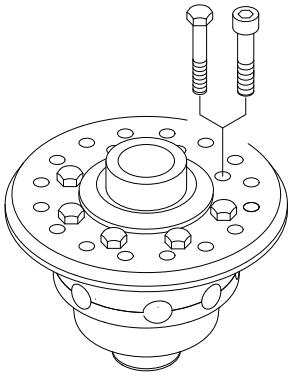


2. Mount in both differential housings the spring-type straight pins.
   - ➢ small spring-type straight pin into large spring-type straight pin
   - ➢ The slot of the outer spring-type straight pin must point radially outwards.
3. Insert the side gear and disk into the differential housing.
4. Install the spider with threaded differential pinion and bushings.
5. Install the other differential side gear and disk.



6. Position the differential housing.
   - ➢ Observe the marking, if it is existing.
7. Screw down the differential housing halves and tighten.
   - ➢ Clamp the differential housing in a suitable device for tightening the screws.
   - ➢ Loctite 262
   - ➢ Anzugsmoment: **see Tightening torques for standard metric threads on page 68**
8. Test the differential side gears for smooth running.

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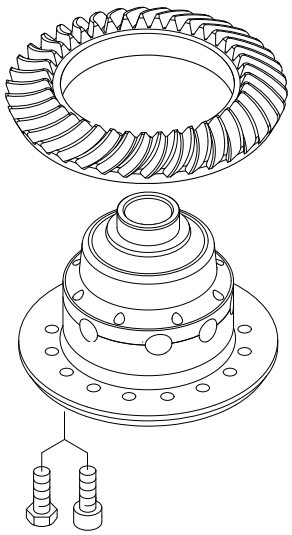
3.4.5.9 Assembly ring gear

⚠ CAUTION	
	**Sharp edges on the teeth** Risk of cutting ➢ Wear protective gloves

Version 1	Version 2
With production numbers • on drive pinion (marked on the end face) • on ring gear (marked on the face of the ring gear)	**No production numbers** • on drive pinion • on ring gear
• The production numbers of the drive pinion and ring gear **must** match ➢ **only mount in pairs!**	• **indiscriminate** use of drive pinion and ring gear is possible ➢ **no pairing necessary!**



1. Place the ring gear on the differential housing and drive it in with light hammer blows around the circumference.
   ➢ Locking the ring gear
2. Fasten the ring gear to the differential housing from the opposite side of the ring gear teeth with two screws, against falling down .

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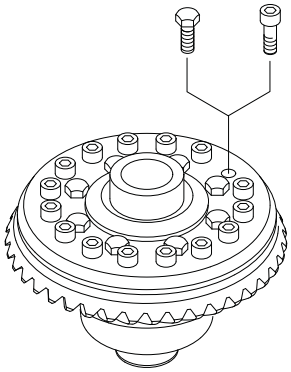
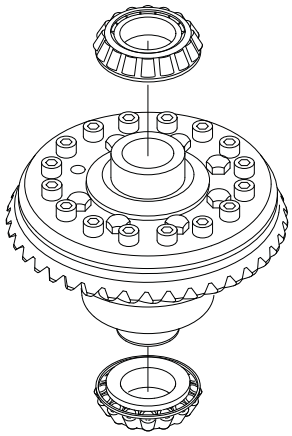


3. Turn the differential.
4. Coat the screws, inclusive securing screws, with Loctite.
   - ➢ Loctite 262
   - ➢ First tighten two diagonally opposite screws.
5. Torque down the ring gear to the differential housing halve.
   - ➢ Tightening torque: **see Tightening torques for standard metric threads on page 68**
   - ➢ Clamp the differential housing in a suitable device for tightening the screws. Do not damage the teeth of the gear wheel in the process.

3.4.5.10 Assembly tapered roller bearing onto differential housing



1. Press both tapered roller bearings onto the differential housing.

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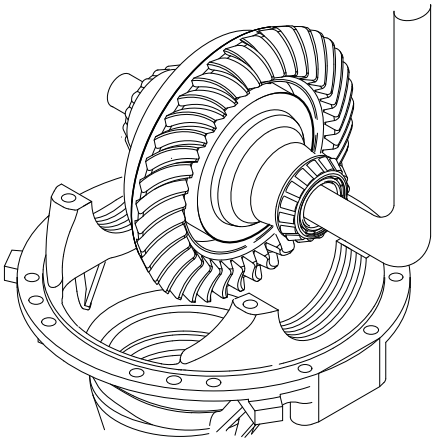
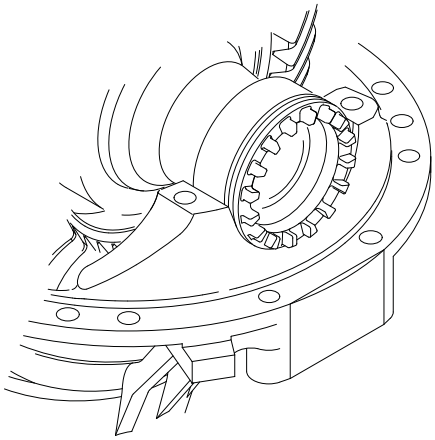
3.4.5.11 Installation of the pre-assembled differential

⚠ CAUTION	
	**Moving and dropping down of parts** Risk of injury ➢ Attach the part securely to the lifting device. ➢ Move the parts carefully and slowly. ➢ Do not perform a jerky and premature release of the lifting device.



1. Carefully place the differential into the upright differential carrier with a suitable device.
   - ➢ Important: The tapered roller bearings must not be damaged in the process.



2. Push the outer bearing rings onto the assembled tapered roller bearings on the differential.
3. Carefully insert the bearing adjustment rings into the thread from above.
   - ➢ Important: The bearing adjustment rings must not be seated skew.
4. Position the differential by turning the bearing adjustment rings in such a way, that no tooth flank play remains at the narrowest position between the ring gear and the drive pinion.
   - ➢ The bearing adjustment rings must only slightly touch the drive pinion and must not press against the tapered roller bearings.

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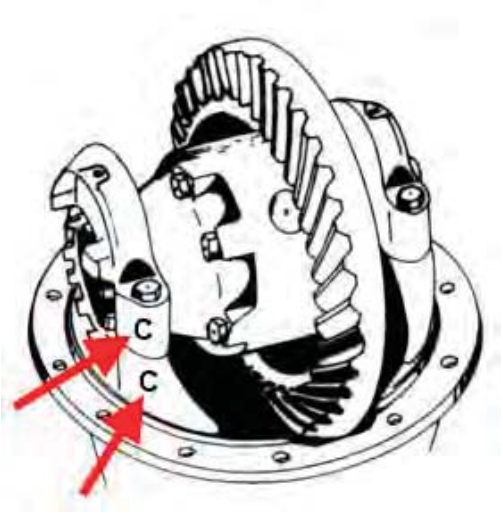
3.4.5.12 Fastening bearing caps

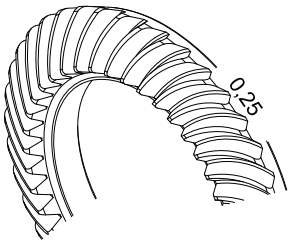
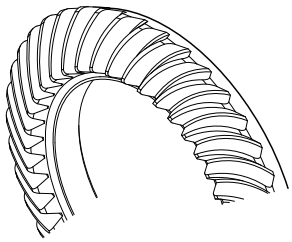


1. Place the bearing caps on the differential carrier.
   - ➢ Do not interchange the bearing caps.
   - ➢ Observe the markings of the bearing caps relative to the differential carrier.
   - ➢ The bearing caps must not be mounted skew.
2. Align the bearing caps with the bearing adjustment rings.
3. Screw down the bearing caps hand-tight.
   - ➢ Loctite 262

3.4.5.13 Dimension of backlash

It must absolutely be checked, which version of drive pinion and ring gear is on hand.

Tooth flank play values which must be attained:

Version 1	**Version 2**
The smallest allowed value is marked on the circumference of the ring gear. 	If no value is marked on the circumference of the ring gear, the tooth flank play is determined by the diameter of the ring gear (see table below). 

Drive designation	**Ring gear diameter**	**Tooth flank play**
Drive 81	< 360	0.35

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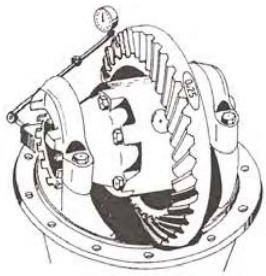
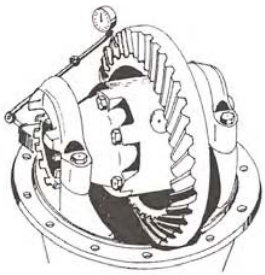
Version 1	Version 2
	

1. Adjust the tooth flank play whit the bearing adjustment rings.
   - ➢ Hold down the drive pinion at the drive flange.
2. Fasten the dial gage to the differential carrier and position it against the ring gear.
3. Measure the tooth flank play between the ring gear and the drive pinion by carefully turning the ring gear forwards and backwards.
4. The tooth flank play must be measured at every second tooth and for two rotations of the ring gear, because the play may not be less than the minimum value at any place.

3.4.5.14 Adjustment differential

1. Measure the rear centering diameter of the differential and carrier assembly before adjusting the rolling resistance of the tapered roller bearings.
   - ➢ Starting value of the dimension of the bearing caps must be between ø339.8 mm – ø339.9 mm.

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- ➢ Continuously check the tooth flank play with the dial gage.

2. Adjust the rolling resistance of the tapered roller bearings and the tooth flank play at the differential by means of reciprocal tightening of the bearing adjustment rings.
   - ➢ Customer service tool: Spanner for bearing adjustment ring
3. The tooth flank play must be measured at every second tooth and for two rotations of the ring gear, because the play may not be less than the minimum value at any place.
   - ➢ The tooth flank play must now correspond to the minimum allowed value at the narrowest position.

4. The bearing pre-load must be increased by reciprocal tightening of the bearing adjustment rings until the bearing cap dimension has increased by 0.2 mm.
   - ➢ The maximum permissible value of ø340.0 mm and ø340.1 mm must not be exceeded.

3.4.5.15 Contact pattern adjustment for bevel wheel tooth system

It must absolutely be checked, which version of drive pinion and ring gear is on hand.

Version 1	Version 2
With production numbers • on drive pinion (marked on the end face) • on ring gear (marked on the face of the ring gear)	**No production numbers** • on drive pinion • on ring gear
• The production numbers of the drive pinion and ring gear **must** match ➢ **only mount in pairs!**	• **indiscriminate** use of drive pinion and ring gear is possible ➢ **no pairing necessary!**

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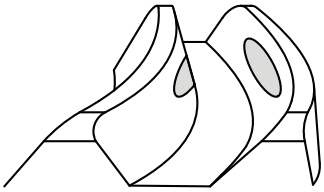
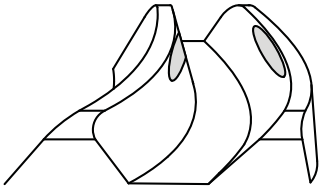
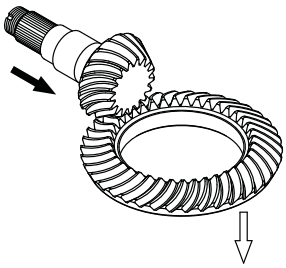
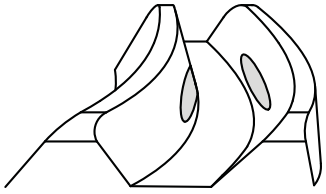
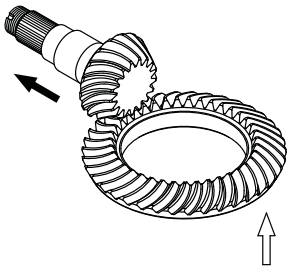
Contact pattern adjustment of the tooth system:

1. Coat the teeth of the ring gear on both sides with contact paste.
2. Then turn repeatedly until contact points of the drive pinion with the coated teeth become evident.
3. Compare contact pattern / pressure points with the illustrations in the following table.
4. If the **contact pattern is not correct**, the drive - pinion distance must be changed with a different adjustment disk. See **"Adjustment of drive pinion space" on page 27**.
   - ➢ Then repeat all of the following steps until the contact pattern is correct.
   - ➢ After changing, observe the rolling resistance, see **"Adjustment of drive pinion space" on page 27**.

	**Contact pattern perfect**	
	**Too high contact pattern** Reduce the drive pinion distance by means of decreasing the thickness of the adjustment disk. Re-adjust the tooth flank play by moving the ring gear away.	
	**Too low contact pattern** Increase the drive pinion distance by means of increasing the thickness of the adjustment disk. Re-adjust the tooth flank play by moving the ring gear in.	

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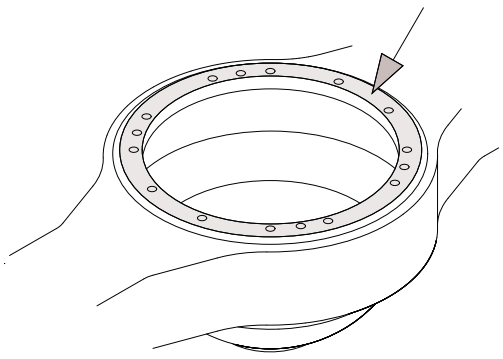
3.4.5.16 Locking the bearing adjustment rings

1. Coat the hexagon screw with Loctite.
   - ➢ Loctite 262
2. Fasten the lock plate with the hexagon screw to the bearing cap.
3. Tighten the hexagon screws.
   - ➢ Tightening torque: 25 Nm
4. Bend the lock plate towards the bearing adjustment ring.
5. Torque down the screws on the bearing caps.
   - ➢ Tightening torque: see Tightening torques for standard metric threads on page 68

3.4.5.17 Preparation axle housing

NOTICE	
	**Metal shavings in the axle housing** Damage to the tooth system of the differential and carrier assembly ➢ Completely remove shavings in the axle housing.

NOTICE	
	**Dirt particles, grease or damage to the sealing surface of the axle housing.** Leak in the differential and carrier assembly, oil will discharge. ➢ Clean and carefully inspect the sealing surface.



1. Clean sealing surfaces on the axle housing and on the differential and carrier assembly.

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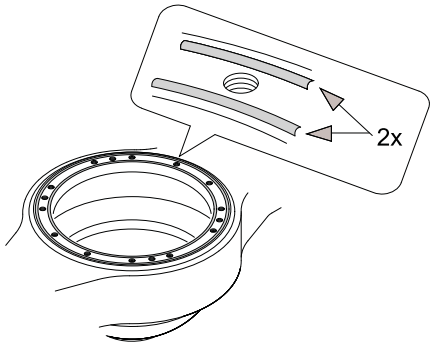
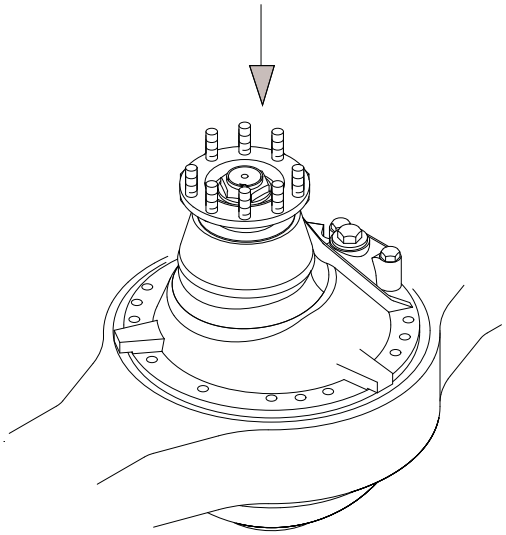
3.4.5.18 Assembly of the differential and carrier assembly onto the axle housing





1. Apply 2 beads Loctite on sealing surface of the axle housing directly before assembly.
   - ➢ Loctite 5926 resp. 209 125
2. Mount the complete drive assembly with axle housing being placed in a horizontal position, screw in and tighten.
   - ➢ It may be necessary to activate the differential lock for assembly the differential and carrier assembly.
   - ➢ Loctite 262
   - ➢ Tightening torque: **see Tightening torques for standard metric threads on page 68**

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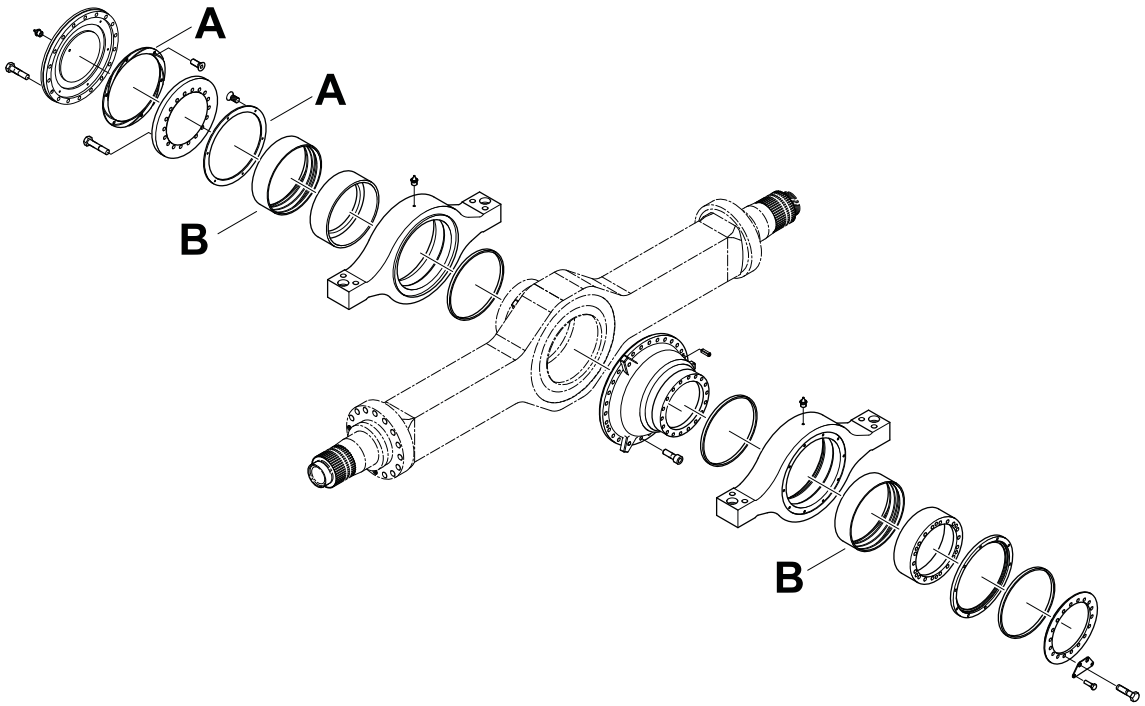
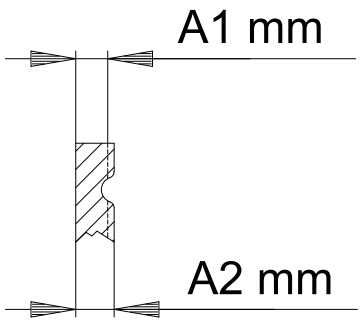
3.5 Wear dimension of oscillation (housing) fixation

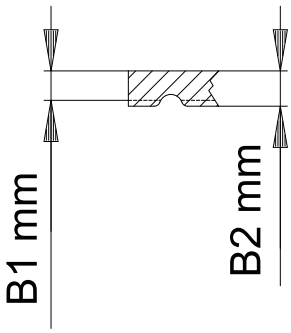
Wear dimension of the thickness of the parts A and B amount 1 mm.





A1 = worn parts = 5 mm

A2 = new condition = 6 mm



B1 = worn parts = 5 mm

B2 = new condition = 6 mm

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4 Maintenance

4.1 Lubricants and lubrication intervals

Lube point	Lubricant	Remarks	Lubrication intervals (The value that is reached first is always valid.)				
			every 50 hours of operation	at least 1 x per week	after 100 hours of-operation 1000 km	every 1000 hours of-operation 10,000 km	at least 1 x per year
Differential and carrier assembly	Hypoid gear oil acc. to MIL-L2105 B/API GL5 Hypoid gear oil in multi-grade characteristic acc. to MIL-L2105 C/D/API GL5 SAE 90 o. multi-grade oils with normal outdoor temperatures SAE 75 W - 90; SAE 75 W - 85 at outdoor temperatures under -10 °C SAE 140 o. multi-grade oils with outdoor temperatures over +30 °C	Oil change monthly oil level check by overflow measurement			+	+	+
Wheel hub – planetary gear					+	+	+
Interaxle differential					+	+	+
Drop gear assembly / Gearbox					+	+	+
Wheel bearing oil-lubricated					+	+	+
oscillation fixation	Multi-purpose grease, lithium soap-based – worked penetration in accordance with NLGI 2 e.g. Fuchs Renolit MP 150	central greasing system recommended	+ *)	+ *)			

*) Required interval is denpendent on the application and environmental conditions. Shorter intervals are necessary in severe conditons.

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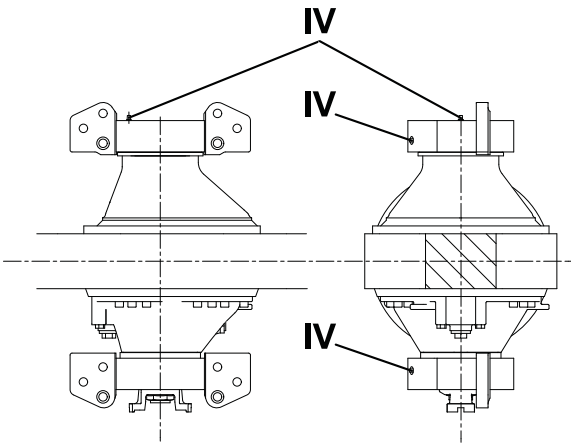
4.2 Lubricating the oscillation fixation

The precise position of the lube point can deviate from the illustration. The relevant lube point can be found on the KESSLER product on hand.

IV = grease nipple



1. Take the load off the axle.
2. Clean lube points and grease nipples.
3. Press grease into the grease nipple with the grease gun until grease seeps out.
   - ➢ Roller bearing grease, see "Lubricants and lubrication intervals" on page 48.

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4.3 Oils

4.3.1 Recommended types of hypoid gear oil

For KESSLER axles, gear oil types with the specification MIL-L 2105 B/API GL 5 or MIL-L 2105 C/D/API GL 5 have to be used!

- ADDINOL - gear oil GH 85 W 90
- AGIP - Rotra MP / Rotra MP DB
- ARAL - gear oil Hyp 90
- AVIA - gear oil Hypoid 90 EP
- BP - multipurpose gear oil EP SAE 90
- ELF - Tranself type B 90 / Tranself type B 80 W - 90
- ESSO - gear oil GX - D 90
- FINA - Pontonic MP SAE 85 W - 90
- FUCHS - Renogear Hypoid 90
- MOBIL - HD 90 - A
- SHELL - Spirax MB 90 / HD 90
- TEXACO - Multigear EP SAE 85 W / 90

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4.4 Oil change

During changing the oil, always follow the stated measures:

- Place vehicle in horizontal position so that complete draining of oil is possible and clean oil can be filled to the correct level.
- Make sure that oil has cooled down before draining it.
- Always replace gaskets of the screw plugs with new gaskets. The gaskets are mostly copper rings.
- Pay attention to the specific notes.
- The precise position of the lube point can deviate from the illustration. The relevant lube point can be found on the KESSLER product on hand.
- Pay attention to the given activity sequence.

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4.4.1 Inspection of screw plugs with magnet

Each oil change requires a check of the magnetic screw plugs. After opening the oil drain plug, the adherent material must be assessed and acted on the information listed below.

During the first operating hours, a larger build-up of metal particles is normal for reasons of the running-in period of new parts. The information below is valid from the 3rd oil change.

Rating 1

Black mud/paste - fine, not shining metallic powder <u>without</u> chips and metal fractions

- Normal wear
- No indication of a problem
- Clean magnet / continue oil change / component can return to operation

Rating 2

Fine chips and coarser metallic powder - slightly shiny

- Check the wheel bearing for play
- A close monitoring with regular oil change is necessary
- Optionally determine the trend with oil analyses
- Clean magnet / oil change is absolutely necessary

Rating 3

Larger shiny chips and splitters

- Check the bearings and gear parts for damages
- Check the parts before continue operation

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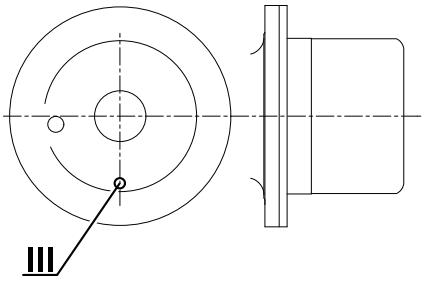
4.4.2 Oil drain

⚠ CAUTION	
	**Hot oil** Burn hazard ➢ Make sure that oil has cooled down before draining it.

The axle has a total oil space.

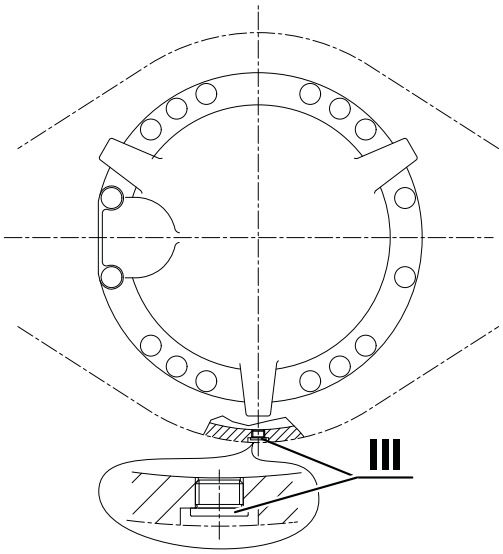
Oil drain has to take place at the complete axle.

III = oil drain point



Oil drain, hub assembly:

1. Clean drainage point and oil drain plug.
2. Rotate the hub assembly until the oil drain plug is at the bottom position (6 o'clock position).
3. Open the oil drain plug and allow oil to drain.
   - ➢ Collect the oil in a suitable container.
   - ➢ Dispose of the oil in an environmentally friendly manner.
4. Clean borehole and oil drain plug.
5. Screw oil drain plug back in.
   - ➢ Tightening torque: see " Tightening torque for screw plugs" on page 70



Oil drain, differential and carrier assembly/axle housing:

1. Clean drainage point and oil drain plug.
2. Open the oil drain plug and allow oil to drain.
   - ➢ Collect the oil in a suitable container.
   - ➢ Dispose of the oil in an environmentally friendly manner.
3. Clean borehole and oil drain plug.
4. Screw oil drain plug back in.
   - ➢ Tightening torque: see " Tightening torque for screw plugs" on page 70

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4.4.3 Oil filling and filling level

The axle has a total oil space.

All oil drain plugs have to be closed before filling with oil.

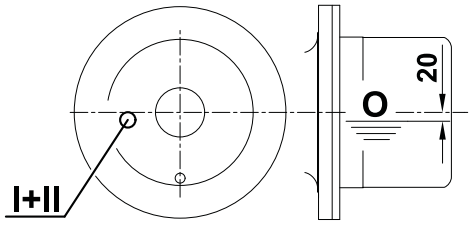
The whole axle is filled with oil from the hub assembly and differential and carrier assembly / axle housing together.

The oil level is specified at the respective component (hub assembly – differential and carrier assembly / axle housing).

I = oil filling point

II = oil level inspection point

O = oil level



Oil filling and oil level on hub assembly:

1. Clean filling point and oil filling plug.
2. Turn hub assembly into position.
   - ➢ The oil drain plug has to be at the bottom.
3. Open the oil filling plug.
4. Fill hub assembly with clean oil until the oil level reaches the filling bore (= inspection bore).
   - ➢ Overflow check
   - ➢ Oil in accordance with the specified lubricants. see "Lubricants and lubrication intervals" on page 48
5. After a few minutes, check the oil level again at the filling bores.
   - ➢ Keep filling the hub assembly with oil until the oil level remains constant.
6. Clean borehole and oil filling plug.
7. Screw oil filling plug back in.
   - ➢ Tightening torque: see " Tightening torque for screw plugs" on page 70

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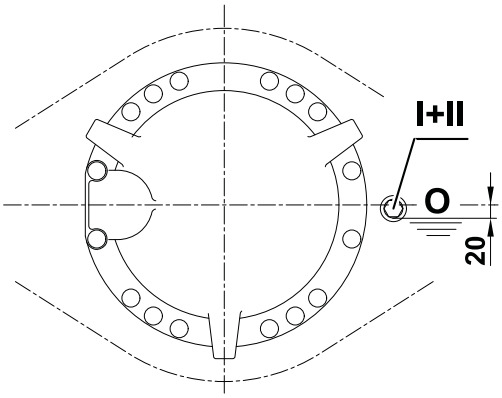

Oil filling and oil level on differential and carrier assembly/axle housing:

1. Clean filling point and oil filling plug.
2. Open oil filling plug.
3. Fill axle and differential and carrier assembly with clean oil until the oil level reaches the filling bore (= inspection bore).
   - ➢ Overflow check
   - ➢ Oil in accordance with the specified lubricants. **See "Lubricants and lubrication intervals" on page 48.**
4. After a few minutes, check the oil level again at the filling bores.
   - ➢ Keep filling the axle until the oil level remains constant.
5. Clean borehole and oil filling plug.
6. Screw oil filling plug back in.
   - ➢ Tightening torque: **see " Tightening torque for screw plugs" on page 70**

Recheck the oil level of the KESSLER product after driving the first time.

4.5 Checking the screwed connections, safeguards, and formation of corrosion

- **Screws at housing connections, steering assembly parts, and brake parts:** If the screws can be retightened, the Loctite connection breaks. Remounting is necessary then! Secure screwed connections and join connections according to specifications, in case of any doubt, please consult KESSLER.
- **Corrosion and cracks** on load-bearing components (e.g. axle spindle) are not permissible for reasons of operational reliability and sealing.
  Replace any load-bearing components with cracks!
- **Cracks on steering assembly parts** are not permissible for reasons of operational reliability.
  Replace any steering assembly components with cracks!

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4.6 Maintenance intervals

Inspection and maintenance-points	Remarks	Maintenance intervals (The value that is reached first is always valid.)				
		after 50 hours of-operation 500 km	after 100 hours of-operation 1000 km	every 500 hours of-operation 5000 km	every 1000 hours of-operation 10000 km	at least 1 x per year
Wheel bearing	Check and readjust		+			+
Wheel nuts	Check and retighten with torque wrench (following a tire change, after about 50 km and about 200 km)	+	+	+		
Nuts / Axle bracket-screws	Check and retighten (check for firm fit)	+	+	+		+
Screwed-connections (e.g. differential and carrier assembly)	Check			+		
Gaskets	Check sealing points for leaks	monthly				
Screws / Drive flange	Check and retighten (check for firm fit)	+	+	+		+

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4.7 Wheel bearing adjustment

⚠ DANGER	
	**Faulty mounting and incorrect securing of the wheel bearing adjustment nut** The wheel along with the complete hub assembly comes off of the axle. ➢ In any case, tighten and secure the wheel bearing adjustment nut as described!

⚠ CAUTION	
	**When loosening the threaded connection, the planetary gear can tip over uncontrolled due to its own weight and fall down.** Danger of being crushed ➢ Secure the planetary gear against falling with suitable lashing gear during disassembly.

The wheel bearing is checked by retightening the wheel bearing adjustment nut.

- On oil-filled hub assemblies the oil must be drained off.
- On hub assemblies with drum brake the brake drum must be disassembled/mounted if necessary. See supplier's requirements.
- On hub assemblies with planetary gears, the planetary gear and, if necessary, the sun gear are disassembled/mounted.
- On hub assemblies without planetary gears, these steps are omitted. Only the cover is disassembled/mounted.
- The steps loosening / checking / retightening / securing the wheel bearing adjustment nut always remain the same, regardless of the axle type.

Wrench for wheel bearing adjustment nut

➢ If needed three more bolts can be pressed in.

Order number: 031.072.0-2

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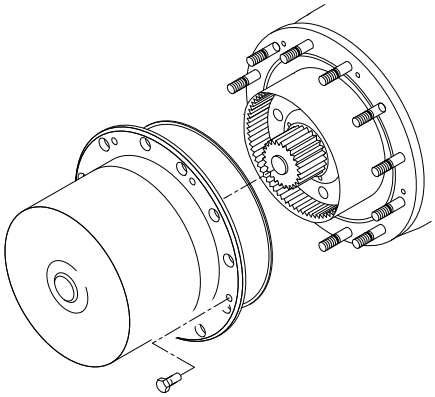
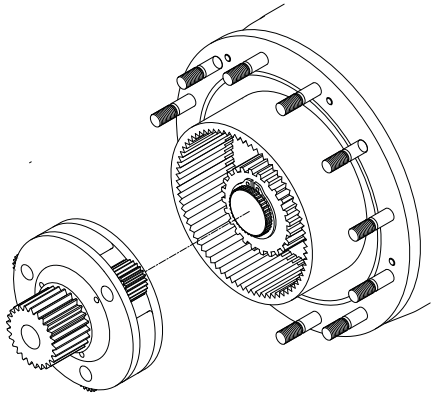
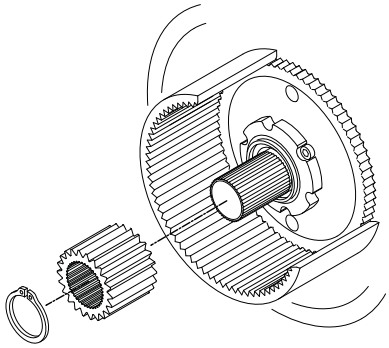


Disassembly of planetary gear:

1. Drain the oil.
   - ➢ See **"Oil change" on page 51.**
2. Loosen and remove mounting screws.
3. Carefully pull off planetary pot/cover.

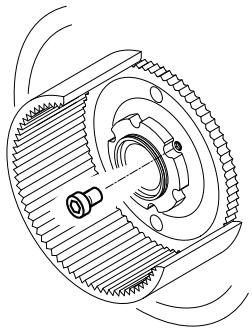


4. Take out inner planetary stage.



Disassembly of sun gear:

5. Remove circlip.
6. Pull sun gear from the universal joint or the axle shaft.



Loosening the wheel bearing adjustment nut:

7. Loosen the securing screw of the wheel bearing adjustment nut, clean it and deposit safely.

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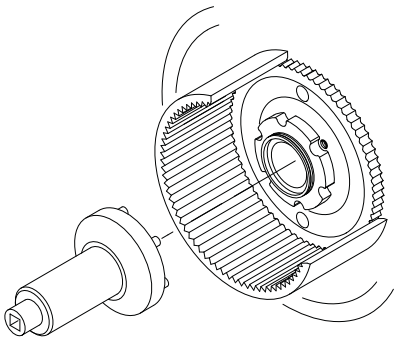
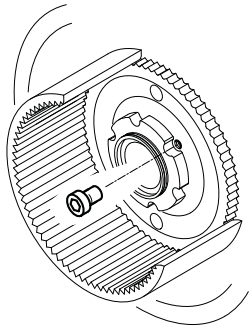


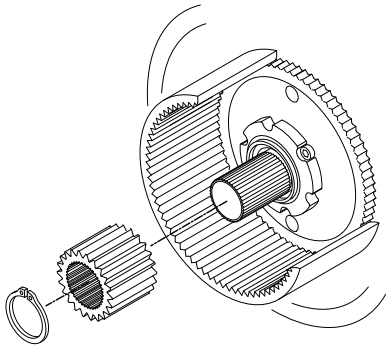
Checking/Retightening the wheel bearing adjustment nut:

8. Put the customer service tool on the wheel bearing adjustment nut and tighten to the specified tightening torque.
   - Customer service tool: Wrench for wheel bearing adjustment nut (see above)
   - Tightening torque for <u>used</u> bearings: 600-650 Nm
   - Rotate the wheel hub several times while tightening.
   - If it is not possible to secure at this position, the wheel bearing adjustment nut needs to be turned <u>forward</u> to the next possible position for securing.



Securing the wheel bearing adjustment nut:

9. Secure the wheel bearing adjustment nut with a screw.
   - Hexagon socket screw
   - Screw securing: Loctite 270
   - Tightening torque: 72 Nm



Assembly of sun gear:

10. Slide sun gear onto the universal joint or the axle shaft.
    - Bevel of the sun gear is in sliding direction.
11. Mount the circlip.
12. Slide the universal joint or the axle shaft to the inside until circlip contacts the sun gear and the sun gear contacts the thrust ring.
13. Rotate the hub assembly until one of the oil compensating holes of the ring gear carrier is at the bottom position!

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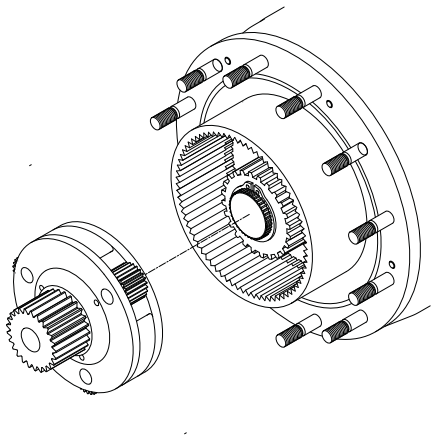
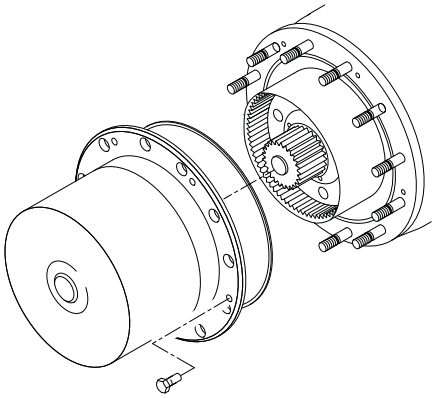


Assembly of planetary gear:

14. Push the inner planetary gear drive assembly into the ring gear and onto the sun gear.



15. Insert O-ring into groove of the planetary housing.
    - ➢ Sealing of the contact surface between planetary housing and wheel hub
    - ➢ Multi-purpose grease prevents the O-ring from falling out during assembly.
16. Align planetary housing so that it aligns with the corresponding boreholes in the wheel hub.
    - ➢ The oil drain plug has to be at the bottom!
17. Slide the planetary unit over the wheel studs.
18. Screw the planetary unit to the wheel hub.
    - ➢ Loctite 243
    - ➢ Tightening torque: See **"Tightening torques for standard metric threads" on page 68.**
19. Top up with oil.
    - ➢ See **"Oil change" on page 51.**

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5 Ordering spare parts

5.1 Guarantee

KESSLER provides a warranty only for the supplied original spare parts.
Please note that use of spare parts that are not original may negatively modify the specified design characteristics of the axles, gearboxes, drive assemblies, wheel gears, and wheel ends and thus adversely affect the safety.

KESSLER accepts no liability for damage caused by use of non-original spare parts and accessories. Please note that special manufacturing and supply specifications exist for proprietary and third-party parts and that we always offer spare parts according to the latest statutory standards.

5.2 Required specifications for ordering spare parts

The following specifications are needed for ordering KESSLER spare parts:

- Part number (no. of the installation drawing) >>see type plate
- Serial number >>see type plate
- Manufacturer of the vehicle
- Name of the spare part
- Spare part number (drawing or DIN no.)
- Quantity
- Shipping mode

5.3 Type plate

The type plate is usually located near the differential and carrier assembly on the side of the oil filling plug.

The axle serial number is imprinted additionally on the axle housing next to the type plate.

5.4 Necessary consultation with KESSLER

- In the event of uncertainty, contact KESSLER.
- In the event of major repairs or overhauls, it would be appropriate to send the entire axle to KESSLER.

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6 Storage

6.1 Standard conservation

Standard conservation of the delivered KESSLER products is sufficient for:

- 18 months - with dry storage in closed rooms
- 12 months - with storage without water ingress
- 3 months - with storage in the open air (breather has to be closed)

6.2 Conditions for storage with standard conservation

Inadmissible and necessary conditions for storage of KESSLER products with standard conservation:

- Open air storage is not permissible in harbor areas (salt water)!
- If the packaging is damaged, renew the packaging!

6.3 Measures for longer storage periods

The following measures are necessary for longer storage periods:

- Oil leaks and water ingress are not permissible; the breather needs to be replaced by a screw plug with sealant.
- Fill units and multiple disk brake with oil.
- Filling volume: 80% of the axle housing volume / hub assembly volume / brake volume / drive assembly volume / gearbox volume.
- Oils to be used:
  - Axle housing / Hub assembly / Drive Assembly / Gearbox: Hypoid gear oil SAE 90 API GL5
  - Multiple disk brake: Shell SPIRAX TXM (Donax TD)

  Attention: Do not overfill due to build-up of pressure during temperature fluctuations.
- Apply additional corrosion protection onto uncoated surfaces (for example: rim unit, steering cylinders, brake disks, drive flange, …).

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6.4 Measures before startup after storage

The following measures need to be taken prior to startup of the KESSLER product:

- Remove storage oil and fill KESSLER product with suitable oil to correct oil level.
  Refer to "Oil change" on page 51.
- Check running surfaces of the sealing rings for corrosion. Check sealing points for leaks immediately after startup. If this is not ensured, replace the sealing rings as well.
- Remove corrosion protection completely from uncoated surfaces at startup (e.g. rim unit, steering cylinder, brake disks, drive flanges, …).
- The rim unit needs to be clean and grease-free so that frictional adhesion to the rim is ensured and loosening of rims is avoided.
- Check load-bearing components for corrosion, in particular if stored over several years.

6.5 Responsibility during storage

- The operator has the responsibility for proper storage of KESSLER products and, if applicable, additional necessary corrosion protection measures.

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7 Disposal

KESSLER products consist of various materials that can be reused after disposal and must be disposed of separately. The following steps have to be taken.

- Put the vehicle out of operation before starting disassembly.
- Secure the steering assembly parts so that movements are no longer possible.
- Depressurize pressure connections.
- Drain and remove all operating fluids (coolants, lubricants) and dispose of properly.
  See "Oil change" on page 51.
- Attach KESSLER product to a suitable hoisting device and disassemble from vehicle.
- Dismantle KESSLER product into individual subassemblies and components.
  NOTICE! Dismantling of spring applied subassemblies (e.g. brakes) is not permitted. For this process, the respective safety regulations of the manufacturer must be observed.
- Separate individual parts according to type of material and dispose of according to national and local ordinances as well as valid regulations for the protection of the environment.

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8 Important information

8.1 Auxiliary materials: Adhesives, sealing compounds, grease, and assembly pastes

If a screw is used covering with a securing (for example: Precote covering), more Loctite must not apply.

8.1.1 Use of auxiliary materials

Type	Application	Product	Type	Color
Adhesive	Screw securing light	LOCTITE	243	Blue
Adhesive	Screw securing medium	LOCTITE	262	Red
Adhesive	Screw securing very tight	LOCTITE	270	Green
Adhesive	Friction increase in joint faces	LOCTITE	270	Green
Adhesive	Surface sealing	LOCTITE	510	Orange
Adhesive	Special sealing	LOCTITE	572	White
Adhesive	Sealing with wide gap	LOCTITE	638	Light green
Adhesive	Surface sealing	LOCTITE	5926 or 209 125	Blue
Sealing compound	Elastic sealing	Dirko	Grey	Gray
Assembly paste with MoS_2	Prevents stick-slip	LIQUI MOLY	LM 48	Gray
Multi-purpose grease	Adhesive lubricant	FUCHS	RENOLIT AS	Yellow transparent
Multi-purpose grease lithium soap-based	Bearing lubrication - worked penetration in accordance with NLGI 2	FUCHS	RENOLIT MP150	Yellow transparent
Special grease	Gear-shifting	Klüber	Mircolube GL261	yellow, almost transparent
Assembly-Gel	Elastomer components	Klüber	S06-100	transparent

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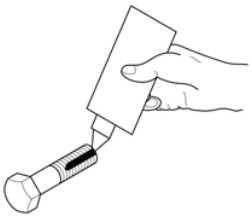
8.1.2 Handling auxiliary materials

Handling of Loctite 243 / 262 / 270 / 510 / 572 / 638

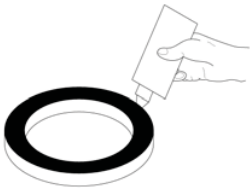
- The surfaces or screws and threaded boreholes to be cemented need to be free of paint, grease, and oil (washed).
- The Loctite adhesives applied cure under the following conditions:
  - Absence of air
  - Metal contact
  - Warmth
- Only a short time may pass between pre-assembly and controlled tightening (5 - 10 minutes).
- Parts prepared with Loctite intended for cementing can be exposed to air for up to 1 hour.
  Exception: Parts made of nonferrous metal may rest for no more than one minute.
- Allow loaded connections to cure for at least 24 hours.

Loctite amount:

For screws: 1 bead



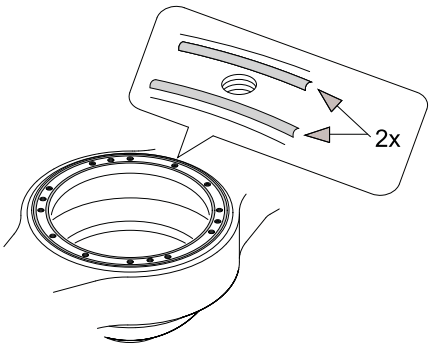
sealing surface: ensure sufficient coating



Handling of Loctite 5926

- The surfaces or screws and threaded boreholes to be cemented need to be free of paint, grease, and oil (washed).
- The Loctite adhesives applied cure under the following conditions:
  - moisture curing begins immediately after the product is exposed to the atmosphere
- Parts to be assembled should be mated within a few minutes after the product is dispensed.

Loctite amount:



on sealing surface: 2 beads

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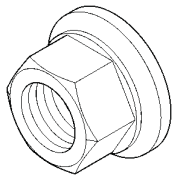
8.2 Tightening torques

Friction: μ = 0.14

The tolerance of the tightening torques is ±5 %
(provided that a manual torque wrench is used).

8.2.1 Tightening torque wheel nut

Wheel nut with flat washer	Size	- Phosphor blackened -
	M 22 x 1.5	650 Nm

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8.2.2 Tightening torques for standard metric threads

Thread size	Screw	Nut	Screw	Nut	Screw	Nut
	8.8	8	10.9	10	12.9	12
M 4	3.0 Nm		4.4 Nm		5.1 Nm	
M 5	5.9 Nm		8.7 Nm		10 Nm	
M 6	10 Nm		15 Nm		18 Nm	
M 8	25 Nm		36 Nm		43 Nm	
M 10	49 Nm		72 Nm		84 Nm	
M 12	85 Nm		125 Nm		145 Nm	
M 14	135 Nm		200 Nm		235 Nm	
M 16	210 Nm		310 Nm		365 Nm	
M 18	300 Nm		430 Nm		500 Nm	
M 20	425 Nm		610 Nm		710 Nm	
M 22	580 Nm		830 Nm		970 Nm	
M 24	730 Nm		1050 Nm		1220 Nm	
M 27	1100 Nm		1550 Nm		1800 Nm	
M 30	1450 Nm		2100 Nm		2450 Nm	

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8.2.3 Tightening torques for metric fine threads

Thread size	Screw	Nut	Screw	Nut	Screw	Nut
	8.8	8	10.9	10	12.9	12
M 8 x 1	27 Nm		39 Nm		46 Nm	
M 10 x 1	55 Nm		81 Nm		95 Nm	
M 10 x 1.25	52 Nm		76 Nm		90 Nm	
M 12 x 1.25	93 Nm		135 Nm		160 Nm	
M 12 x 1.5	89 Nm		130 Nm		155 Nm	
M 14 x 1.5	145 Nm		215 Nm		255 Nm	
M 16 x 1.5	225 Nm		330 Nm		390 Nm	
M 18 x 1.5	340 Nm		485 Nm		570 Nm	
M 20 x 1.5	475 Nm		680 Nm		790 Nm	
M 22 x 1.5	650 Nm		920 Nm		1050 Nm	

8.2.4 Tightening torques for galvanized screws and nuts

Observe the reduced tightening torques for galvanized screws and nuts!

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8.2.5 Tightening torque for screw plugs

Thread size	Tightening torque (reference values for screws with copper ring)	Tightening torque (sealing plug with O-ring)
M 14 x 1.5	approx. 45 Nm (33 lbf x ft)	45 Nm (33 lbf x ft)
M 16 x 1.5	approx. 60 Nm (44 lbf x ft)	--
M 22 x 1.5	approx. 100 Nm (74 lbf x ft)	100 Nm (74 lbf x ft)
M 24 x 1.5	approx. 120 Nm (89 lbf x ft)	--
M 30 x 1.5	approx. 160 Nm (118 lbf x ft)	--
M 42 x 1.5	approx. 260 Nm (192 lbf x ft)	--
M 45 x 1.5	approx. 280 Nm (207 lbf x ft)	--
9/16-18 UN(F)	--	34 Nm (25 lbf x ft)

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8.3 Units

Conversion table

25.40 mm	=	1 in. (inch)
1 mm	=	0.0394 in. (inch)
1 kg (kilogram)	=	2.205 lbs (pounds)
9.81 Nm (1 kpm)	=	7.233 lbf x ft (pound force foot)
1.356 Nm (0.138 kpm)	=	1 lbf x ft (pound force foot)
1 bar (1.02 kp/cm^2)	=	14.5 psi (pound force per square inch lbf/in^2)
0.070 bar (0.071 kp/cm^2)	=	1 psi (lbf/in^2)
1 liter	=	0.264 gallon (imp.)
4.456 liters	=	1 gallon (imp.)
1 liter	=	0.220 gallon (US)
3.785 liters	=	1 gallon (US)
1609.344 m	=	1 mile (land mile)
0°C (Celsius)	=	+32°F (Fahrenheit)
1°C (Celsius)	=	+33,8°F (Fahrenheit)
0°C (Celsius)	=	273.15 Kelvin
1°C (Celsius)	=	274.15 Kelvin

Description of the legal units

Term	Symbol	New	Old	Conversion	Remarks
Moment of torque	T	Nm (Newton meter)	kpm	1 kpm = 9.81 Nm	T (Nm) = F (N) x r (m)
Moment of force	M	Nm (Newton meter)	kpm	1 kpm = 9.81 Nm	M (Nm) = F (N) x r (m)
Pressure	p	bar	atm (gauge)	1.02 atm = 1.02 kp/cm = 1 bar = 750 torr	---

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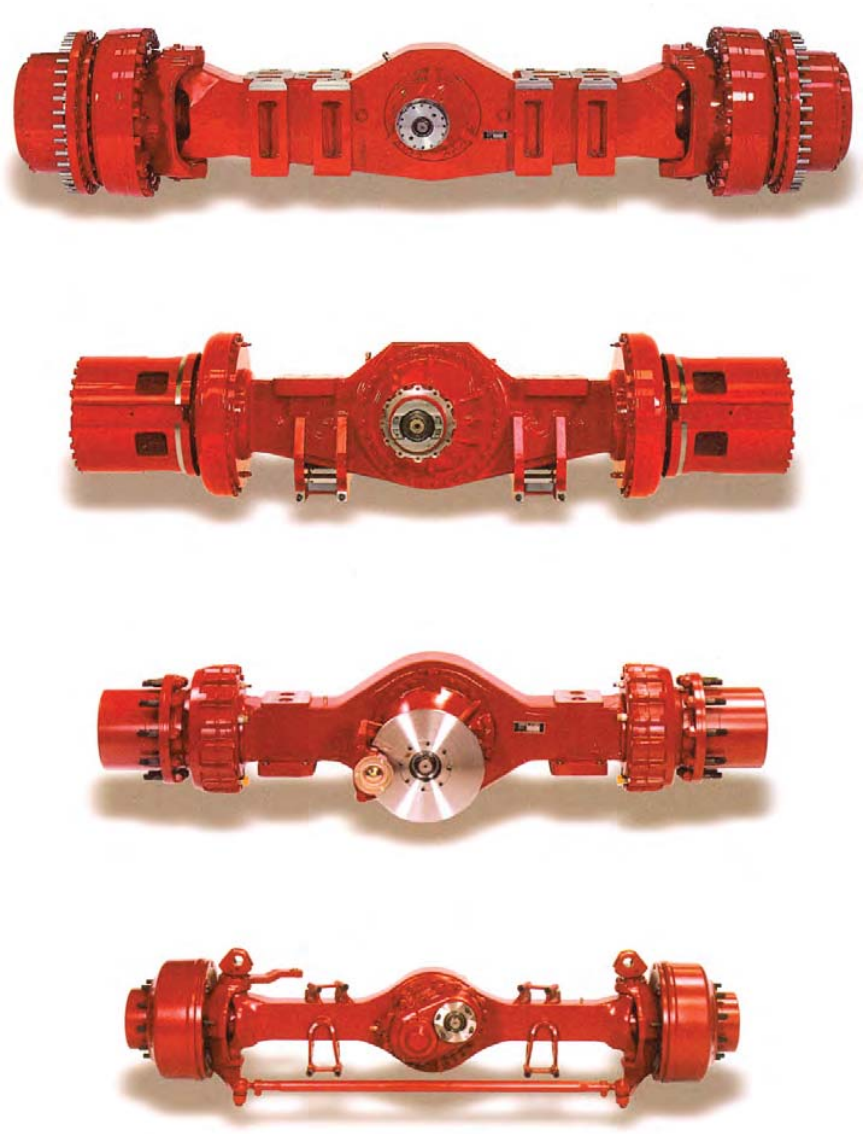

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