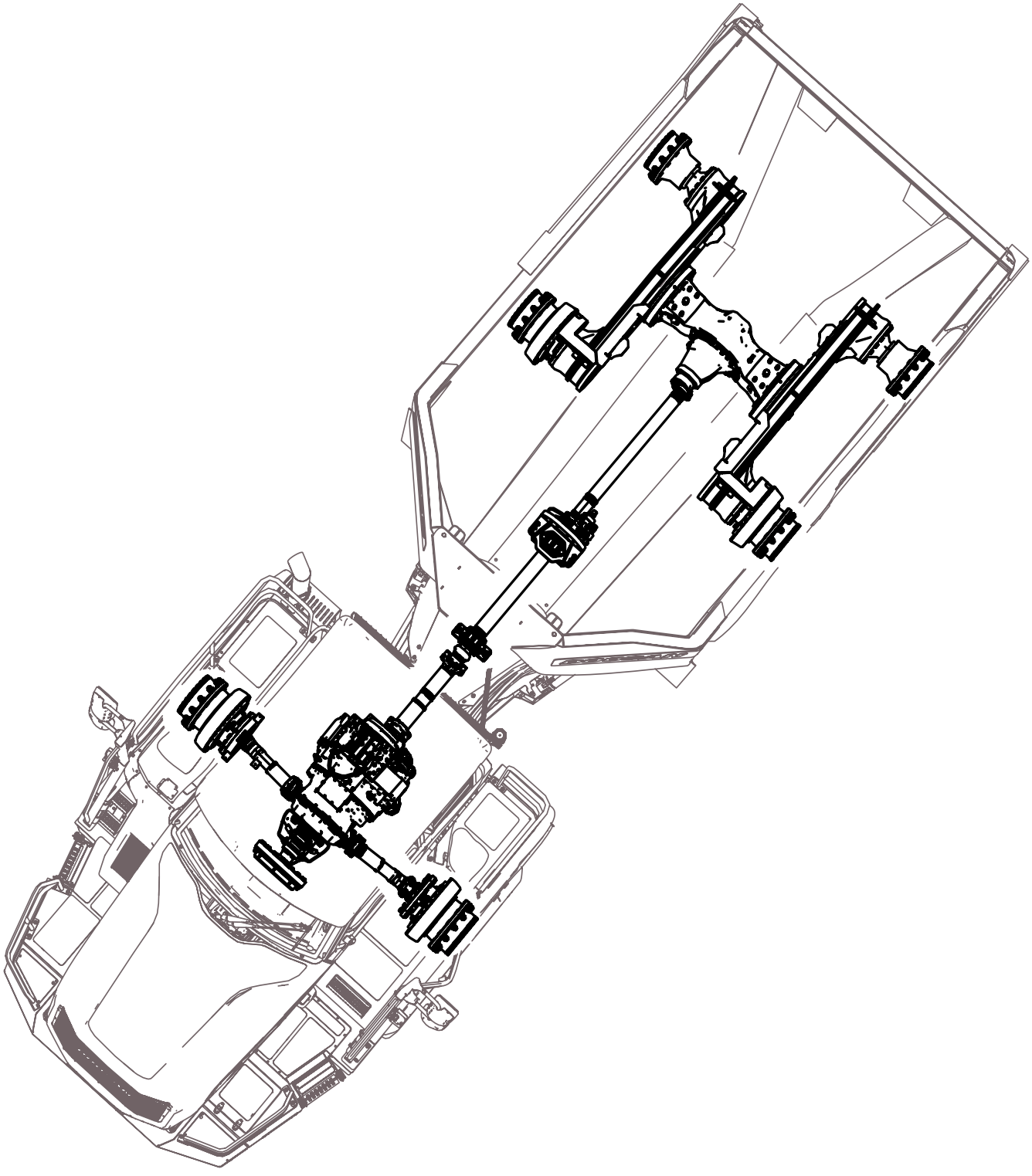
Chapter 3

Driveline



Drive line

Index

Introduction

The drive line consists of the components transferring the power from the engine to the transmission, and from the transmission to each wheel and brakes.

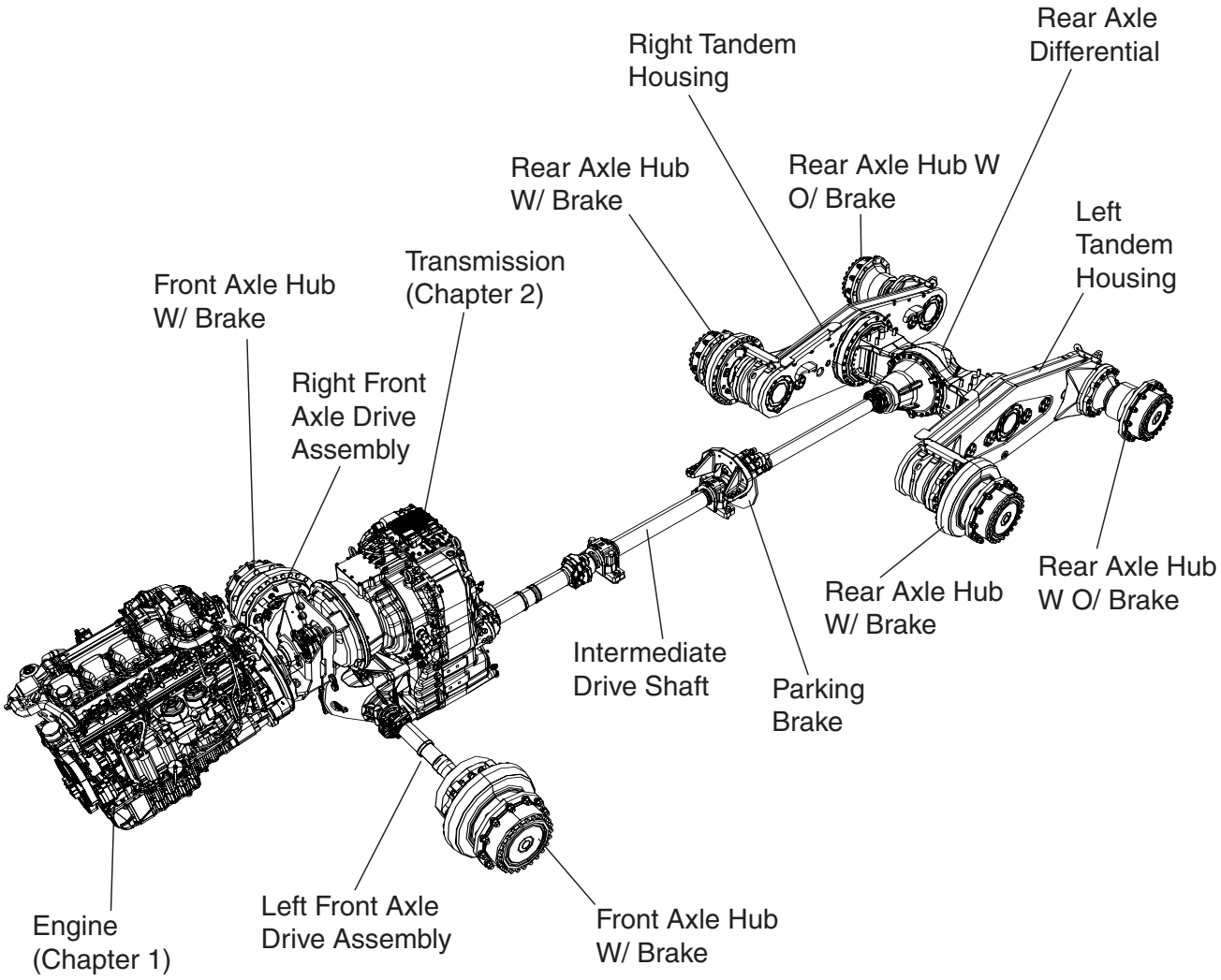


Figure 1

General

The Service Manual covers all works required for dismantling and the pertaining installation.
When repairing the transmission, ensure utmost cleanliness and that the work is carried out in an expert-like manner.
The Drive line parts should only be disassembled for renewing damaged parts. Covers and housing parts installed with seals must be loosened by slight blows with a plastic mallet after screws and nuts have been removed. For removing parts being in tight contact with the shaft such as anti friction bearings, bearing races, and similar, use suitable pulling devices.

Dismantling and mounting work must be carried out at a clean working place. Use the special tools developed for this purpose. Prior to the re-installation of the parts, clean the contact surfaces of housings and covers from the residue of old seals. Remove burrs, if any, or similar irregularities with an oil stone. Clean housings and locking covers with a suitable detergent, in particular corners and angles. Damaged parts or parts heavily worn down must be renewed. Here, the expert must assess, whether parts such as anti friction bearings, thrust washers etc. subjected to normal wear during operation, can be installed again.
Parts such as sealing rings, lock plates, split pins etc. must generally be renewed. Radial sealing rings with worn down or torn sealing lip must also be renewed. Particularly ensure that no chips or other foreign bodies remain in the housing. Lube oil bores and grooves must be checked for unhindered passage.
All bearings must be treated with operating oil prior to installing them:

REFERENCE: For heating up parts such as bearings, housings etc., only a heating furnace, oil or an electric drier is permitted to be used!

CAUTION When assembling the transmission, absolutely observe the indicated torque limits and adjustment data. Screws and nuts must be tightened according to the enclosed standard table, unless otherwise specified.
In view of the risk of functional failures in the control unit, the use of liquid sealing agents is not permitted.
By no means, Molykote is permitted to be used.

Lined plates must not be washed. They must be cleaned with a leather cloth.

DANGER When using detergents, observe the instructions given by the manufacturer regarding handling of the respective detergent.

Structure of the repair manual

The structure of this Repair Manual reflects the sequence of the working steps for completely disassembling the dismantled transmission. Dismantling and installing as well as the disassembly and assembly of a main group are always summarized in one chapter.

Special tools required for performing the respective repair works are
listed under **„Special tools“**, see (Figure 2 and Figure 3 - Kessler special tools for HA30)

Important information on industrial safety

Generally, the persons repairing Hyundai product-sets are responsible on their own for the industrial safety.

The observation of all valid safety regulations and legal impositions is the pre-condition for avoiding damage to persons and to the product during maintenance and repair works.
Persons performing repair work must familiarize themselves with these regulations.

The proper repair of these Hyundai-products requires the employment of suitably trained and skilled staff.
The repairer is obliged to perform the training.

The following safety references are used in the present Repair Manual:

Serves as **reference** to special working procedures, methods, information, the use of auxiliaries etc..

NOTE — This word is used for precautions that must be taken to avoid actions which could shorten the life of the dump truck.

CAUTION — This word denotes safety messages for hazards which could result in minor or moderate injury if the hazard is not avoided. This word might also be used for hazards where the only result could be damage to the dump truck.
Illustrations, drawings and parts do not always represent the original; the working procedure is shown. The illustrations, drawings, and parts are not drawn to scale; conclusions regarding size and weight must not be drawn (not even within one representation).
The work must be performed according to the description.

REFERENCE: Prior to starting the checks and repair work, thoroughly study the present instructions.

DANGER — This word denotes safety messages where there is a high probability of serious injury or death if the hazard is not avoided. These safety messages usually describe precautions that must be taken to avoid the hazard. Failure to avoid this hazard may result in serious damage to the dump truck.
Lack of precaution can lead to **personal injury or danger to life.**

WARNING — DANGER - this word is used on safety messages and safety labels and indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

REFERENCE: **After the repair work and the checks, the expert staff must be certain that the product is properly functioning again.**

Denomination of standard dimensions

Note: linear density in kg/m; areal density in t/m^2

Unit	Character	New	Old	Conversion	Note
Mass	m	kg (Kilogram)	kg		
Force	F	N (Newton)	kp	1 kp = 9,81 N	
Work	A	J (Joule)	kpm	0,102 kpm = 1J = 1 Nm	
Power	P	KW (Kilowatt)	PS (DIN)	1 PS = 0,7355 KW 1 KW = 1,36 PS	
Torque	T	Nm (Newtonmeter)	kpm	1 kpm = 9,81 Nm	T (Nm) = F (N) . r (m)
Moment(Force)	M	Nm (Newtonmeter)	kpm	1 kpm = 9,81 Nm	M (Nm) = F (N) . r (m)
Pressure (Overpress)	pü	bar	atü	1,02 atü = 1,02 kp/cm2 = 1 bar = 750 torr	
Speed	n	min -1			

Conversion table

25,40 mm	=	1 in (inch)
1 kg (Kilogramm)	=	2,205 lb (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 kg / cm	=	5,560 lb / in (pound per inch)
1 bar (1,02 kp/cm^2)	=	14,233 psi (pound force per squar 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 Liter	=	1 Gallon (Imp.)
1 Liter	=	0,220 Gallon (US)
3,785 Liter	=	1 Gallon (US)
1609,344 m	=	1 Mile (Landmeile)
0° C (Celsius)	=	+ 32° F (Fahrenheit)
0 ° C (Celsius)	=	273,15 Kelvin

Kessler special tools for HA30

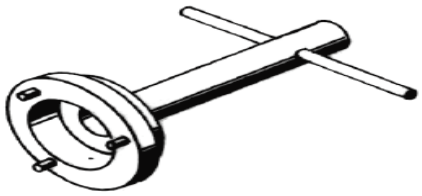
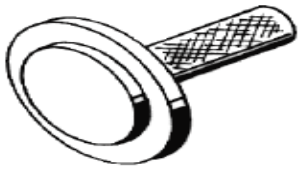
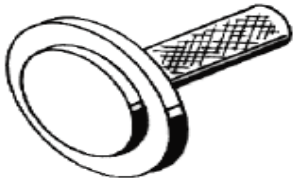
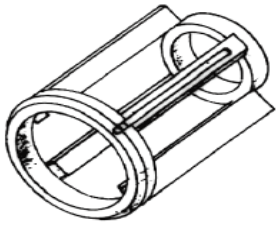
Cons No.	Figure	Designation order no.	Qty.
1		Spanner for wheel hub safety nut. MX536894	1
2		Sealing ring sleeve driver diff. MX53695	1
3		Sealing ring sleeve driver wheel hub (front). MX536896 + MX536897	1
4		Spanner for thread rings diff. bearing. MX539898	1
5		Centring tool for discs wheel hub. MX536899	1

Figure 2

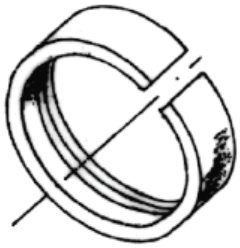
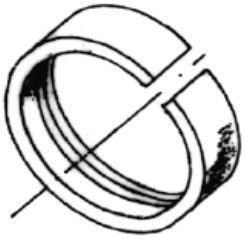
Cons. No.	Figure	Designation Order no.	Qty.
6		Installation tool for face seal hub with brake. MX536900	1
7		Installation tool for face seal hub without brake. MX536901	1
8	No picture	Hex socket wrench for diff. MX536902	1

Figure 3

Driveline components

DRIVELINE
From the inter axle differential, the torque is distributed to the front and the rear differential. The front differential, in front of the transmission, is equipped with limited slip that allows torque distribution depending on what is the friction between tyres and ground. Drive shafts will then transmit the torque to the front reduction gears and to the wheels.

The torque is distributed via 3 propeller shafts to the rear axle differential. The rear differential is equipped with limited slip. The drive shafts will then transmit the torque to the tandem housing reduction gears and to the wheels. This is to avoid wheel spin.

BRAKES
The Hyundai dump truck has 4 independent brake systems.

* Service brake
* Parking brake
* Engine brake (see chapter 1)
* Retarder (see chapter 2)

WHEELS
All 6 wheels are driven on the dump truck.

Hub assembly wheel gear front with brake

Hub assembly wheel gear

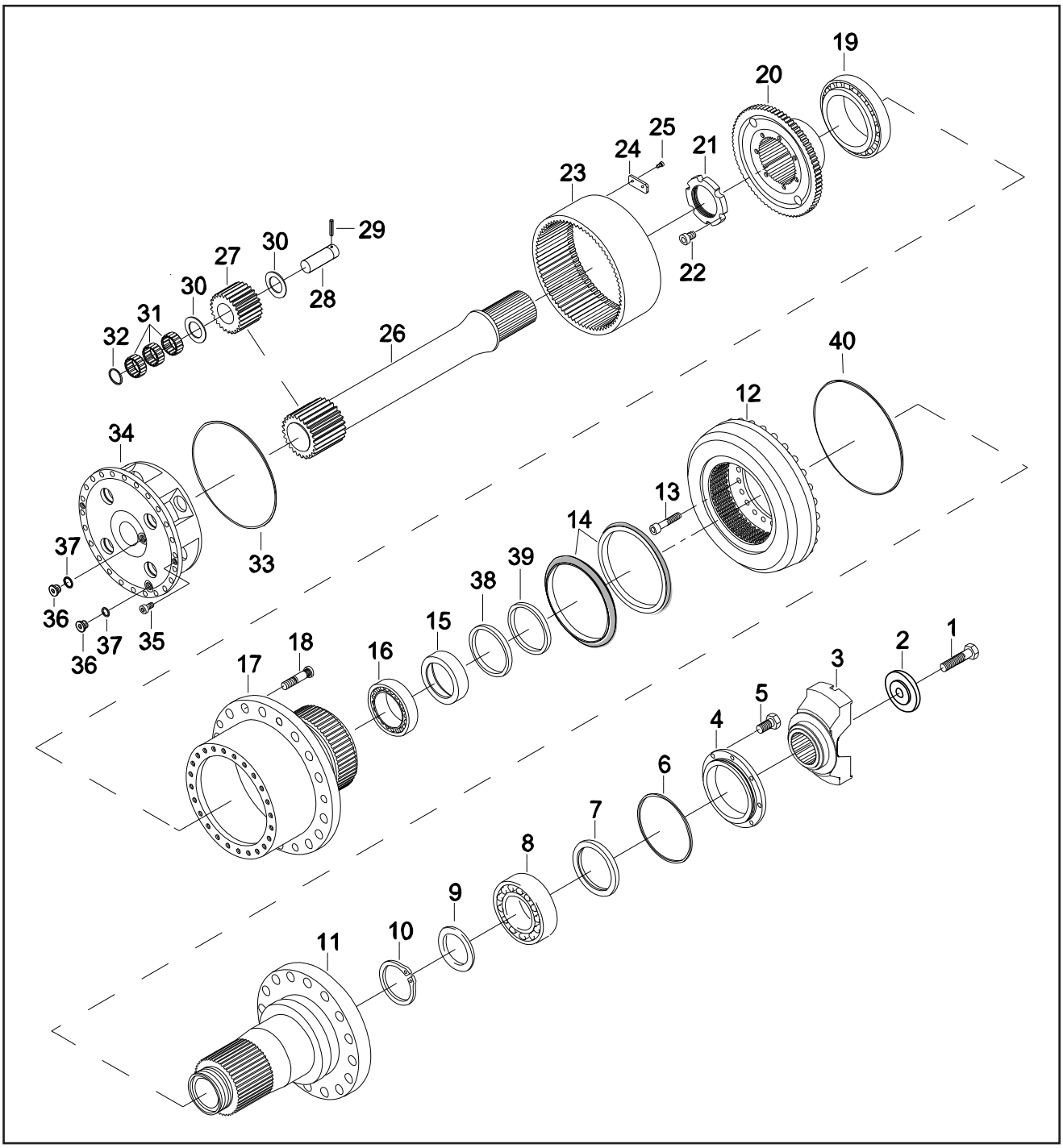


Figure 4

See the parts catalogue for parts lists.

Assembly of the hub assembly

Overwiew of parts

1 Hexagon screw
2 Disk
3 Drive flange
4 Ring
5 Hexagon screw
6 O-Ring
7 Cassette seal ring
8 Grooved ball bearing
9 Disk
10 Circlip
11 Axle spindle
12 Wet multiple disk brake
13 Hexagon socket screw
14 Face seal
15 Spacer ring
16 Tapered roller bearing
17 Wheel hub
18 Wheel stud
19 Taper roller bearing
20 Ring gear carrier
21 Wheel bearing adjustment nut
22 Hexagon socket screw
23 Ring gear
24 Lock plate
25 Hexagon screw
26 Sun gear with shaft
27 Planetary gear
28 Planetary pin
29 Spring -type straight pin
30 Disk
31 Needle bearing
32 O-Ring
33 O-Ring
34 Planetary housing
35 Hexagon socket screw
36 Screw plug
37 Sealing ring
38 Radial seal ring
39 Radial seal ring
40 O-ring

Assembly of the thrust ring

1. Press the thrust ring into the axle spindle responsible steering knuckle.

   - Use Loctite 270.

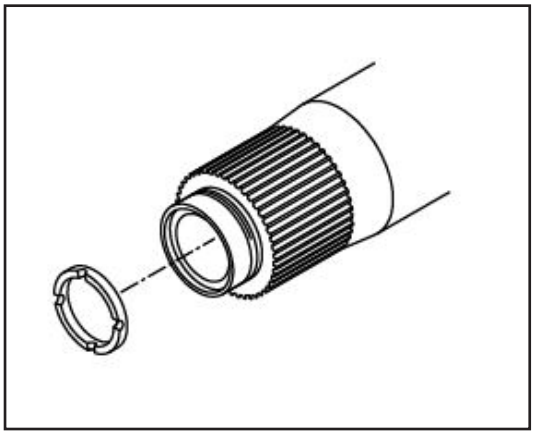


Figure 5

Assembly of the spacer ring

1. Corrosion check at the seat of the spacer ring. Corrosion at the axle spindle is not allowed.

2. Coat the contact surfaces of the spacer ring on the axle spindle with Loctite.

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.

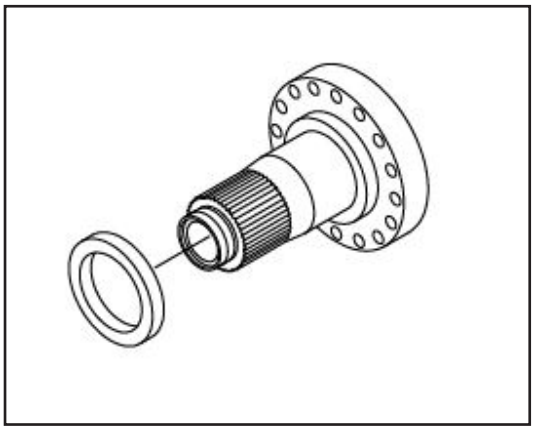


Figure 6

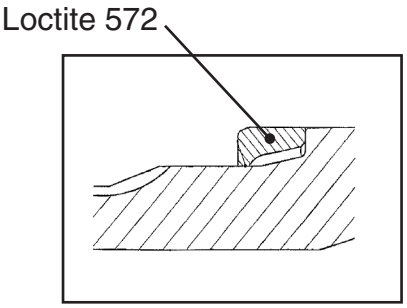


Figure 7

Assembly hub assembly

- Assembly of the spacer ring, see Figure 5.
- Install the o-rings into the axle spindle and brake. Place the brake onto the axle spindle and bolt it, secure the screws with Loctite 262.
- Prepare and mount the wheel hub, see (Figure 8).
  Attention: hold the wheel hub with a hoist till the outer bearing is mounted.
- Adjustment of the wheel bearings.
- Install the axle shaft.
- Assembly of the planetary gear drive.
- Preassemble the drive flange and mount it.
- Secure the axle shaft, secure the screws with Loctite 262.

Prepare and mount wheel hub

NOTE

The thread of the wheel stud can be damaged at the thread face through pressing in.
When the wheel stud thread has been damaged, the wheel nut cannot be assembled.
- Do not press on the thread face!

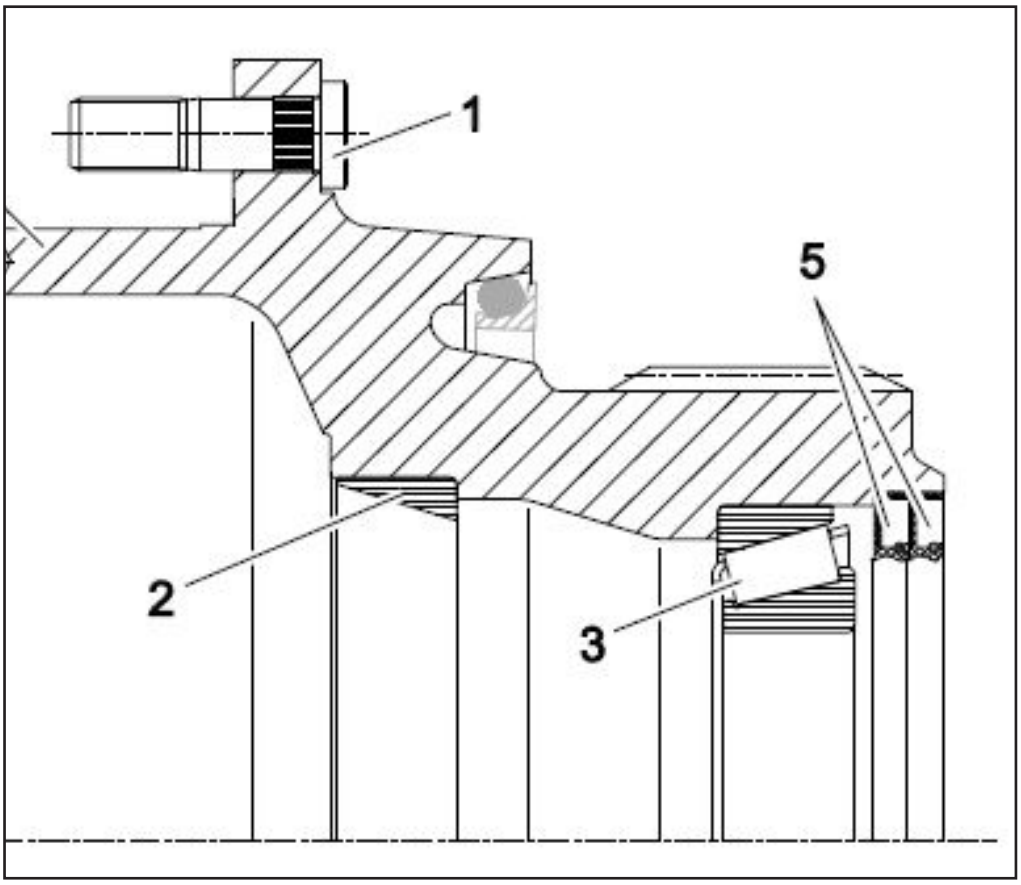


Figure 8

Prepare wheel hub

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 rings (5) with Loctite.
   - **Rubberized outer sheath:** Loctite 572.
5. Press the radial seal rings (5) into the wheel hub (4).
   - Customer service tool: Seal ring sleeve driver
6. Fill the radial seal rings (5) 2/3 full with roller bearing grease.

Assembly wheel hub

1. Coat the sealing ring running area on the spacer ring with oil before assembly.

2. Adjust the discs of the wet multiple disc brake.

   - Customer service tool: centring tool for discs.

3. Actutate the brake.

   - Fixation of the discs.

4. Slide on the pre-assembled wheel hub parallel onto the axle spindle with help of a suitable lifting equipment.

5. Fix the wheel hub in this position until assembly of the wheel bearing adjustment nut is finished.

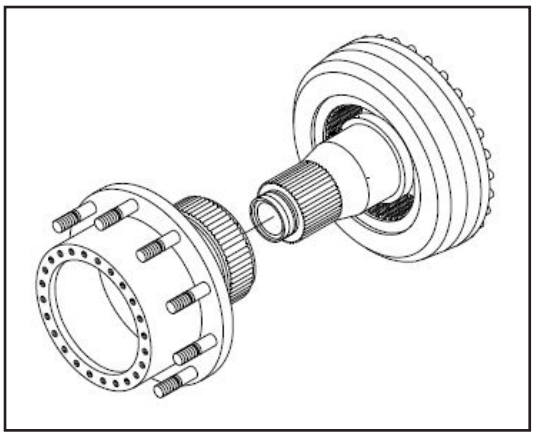


Figure 9

Adjustment of wheel bearings

WARNING

Wrong assembly and incorrect locking of the wheel bearing adjustment nut.
The wheel together with the complete hub assembly becomes detached from the axle.
The wheel bearing adjustment nut must absolutely be tightened and locked as described!

Tightening torque of wheel safety nut

Serie	Re-adjustment **used** bearings (Nm)	**New** bearings (Nm)
D91	500	600

Assembly wheel bearing adjustment nut

1. Push the thrust washer onto the steering knuckle.

2. Completely coat the contact surface and the thread of the wheel bearing adjustment nut with assembly paste.

   - Assembly paste with solid lubricants.

3. Screw on the wheel bearing adjustment nut and tighten with 1.5 to 2 times of the later tightening torque.

   - Customer service tool: Wrench for wheel bearing adjustment nut.
   - Lightly knock on the wheel hub with a plastic hammer and turn it repeatedly during tightening.

4. Loosen the wheel bearing adjustment nut again (unscrew it approximately 180 °).

5. Tighten the wheel bearing adjustment nut.

   - Turn the wheel hub repeatedly during tightening.
   - Tightening torque, see the table above.
   - If it is not possible to lock in this position, the wheel bearing adjustment nut must be tightened to the next possible locking position.

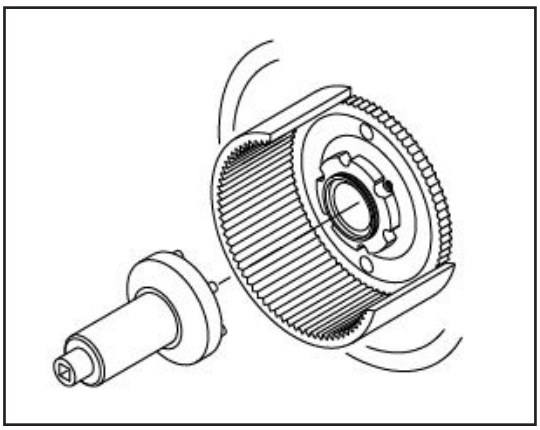


Figure 10

Locking wheel bearing adjustment nut

1. Lock the wheel bearing adjustment nut with a screw.

   - Screw locking: Loctite 270

   - Tightening torque: 72 Nm

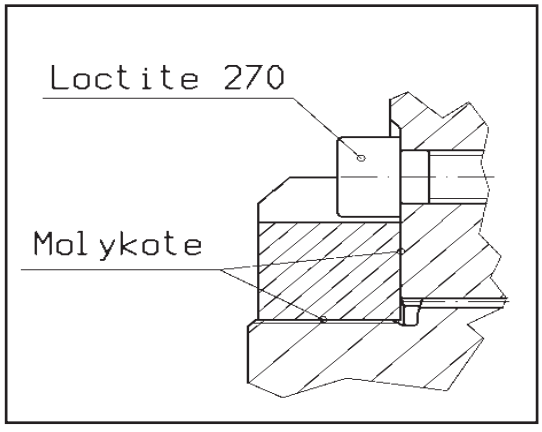


Figure 11

Disassembly of planetary gear

1. Drain the oil.
2. Loosen and remove mounting screws.
3. Carefully pull off the planetary pot/cover.

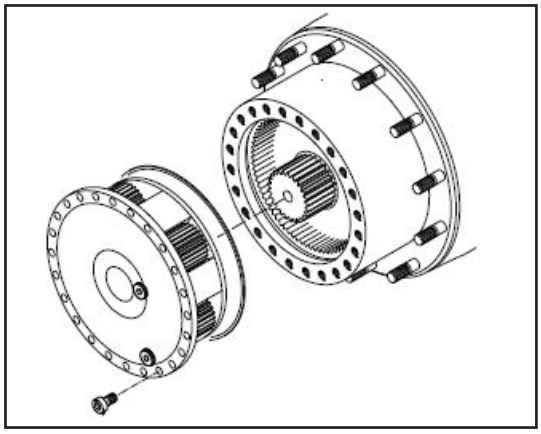


Figure 12

Disassembly of sun gear

1. Loosen screw connection.
2. Pull off the sun gear.
3. Pull off the bushing.

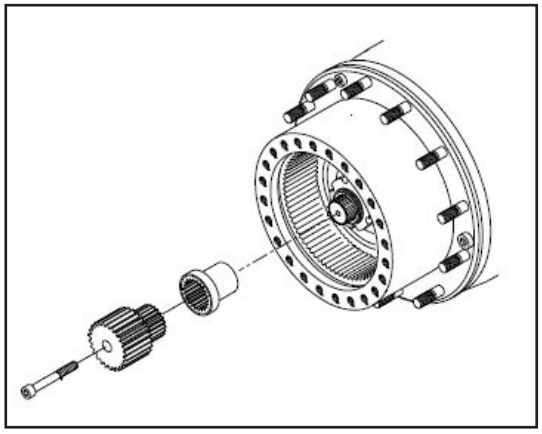


Figure 13

Loosening the wheel bearing adjustment nut

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

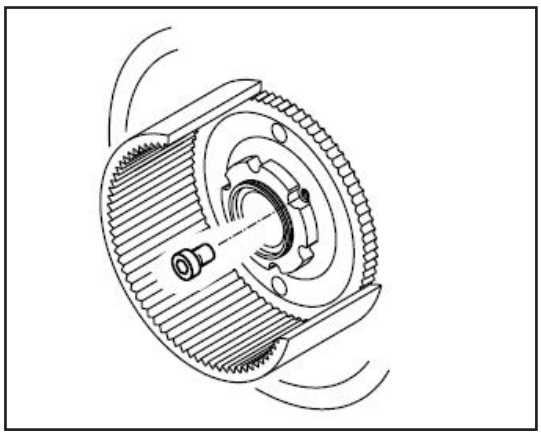


Figure 14

Checking the wheel bearing adjustment nut

1. 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.

   - Tightening torque for used bearings: 500 Nm.

   - Rotate the wheel hub several times while tightening.

   - If it is not possible to secure at this position, the wheel bearing adjustment nuts needs to be turned forward to the next possible position for securing.

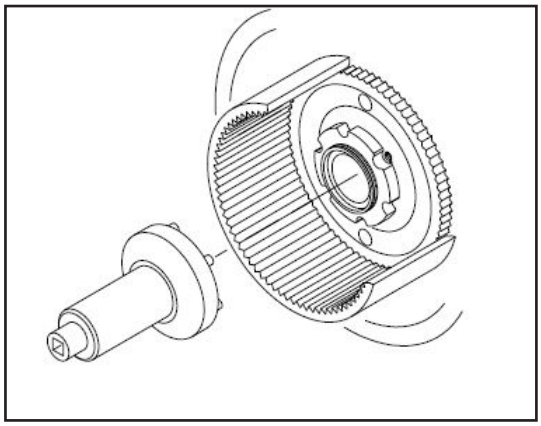


Figure 15

Assembly of the face seal

1. Seal ring
2. Rubber toric ring
3. Housing retaining lip
4. Housing ramp
5. Seal ring housing

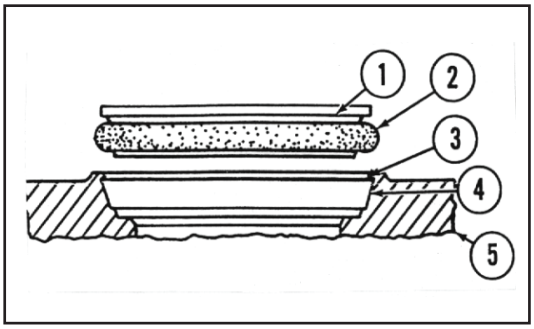


Figure 16

Seal rings, torics, and housings must be clean and free of any oil film, dust, or other foreign matter. Use a solvent that evaporates quickly, leaves no residue, and is compatible with the rubber toric rings. The recommended solvent is Isopropanol. Ring and housings should be wiped with a solvent - soaked lint free cloth or paper towel.

After all components have been wiped clean, the torics should be installed on the metal seal rings so that they rest in the radius on the tail of the metal ring. Insure that the torics are not twisted by inspecting the mold flash line on the outside diameter of the toric for true circumferential tracking around the seal. Twisted torics will cause nonuniform face load that can result in leakage of lubricant and pumping of debris past the toric. If a twist is apparent, it can be eliminated by gently pulling a section of the toric radially away from the metal seal ring and letting it “snap” back. Repeating this in several places around the ring will eliminate any twist in the toric ring.

Place the toroidal sealing ring (2) onto the sealing ring (1) so that it is flush at the bottom of the angular face (7) and the safety lip (8).

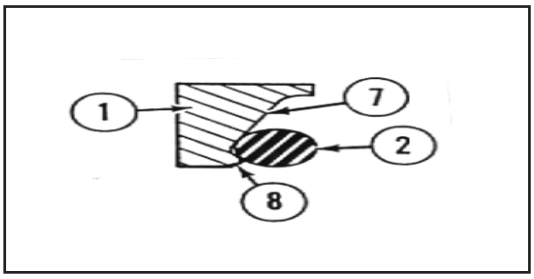


Figure 17

The toroidal sealing ring (2) may twist during insertion if it is dry, or if there are burrs on the safety lip (3) of the bearing insert (5).

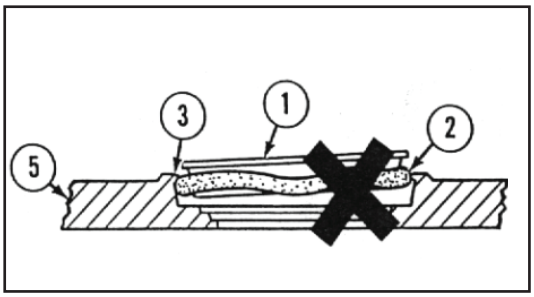


Figure 18

To prevent twisting the toroidal sealing ring (2), carefully remove a section of the sealing ring (1) and then allow it to spring back.

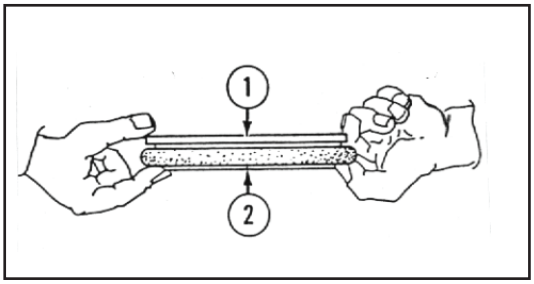


Figure 19

Place the insertion tool (9) onto the sealing ring (1) with the previously positioned toroidal sealing ring (2).

Immerse both rings together into a container filled with isopropanol until all surfaces of the toroidal sealing ring are moistened.

- Lubricating this ring with isopropanol is imperative, so that it is able to evenly glide along the safety lip and the sealing ring into the bearing insert radius.

- Insufficient lubrication may cause uneven load distribution, so that the toroidal sealing rings may twist or the sealing rings may twist.

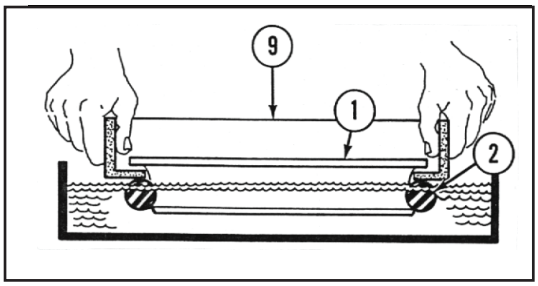


Figure 20

The toroidal sealing rings slips on the angular face of the safety lip.

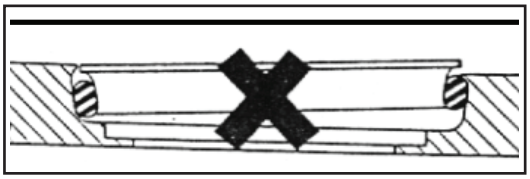


Figure 21

The toroidal sealing ring is jammed at the safety lip of the bearing insert.

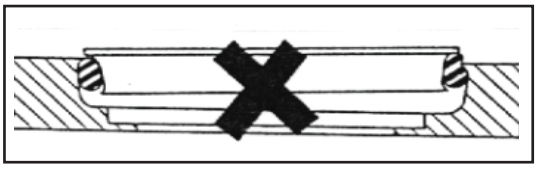


Figure 22

The toroidal sealing ring slips on the angular face of the seal.

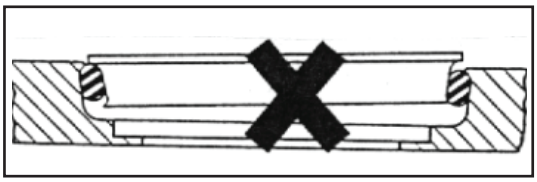


Figure 23

After moistening the surface of the toroidal sealing ring (2) with isopropanol, use the insertion tool (9) to press the sealing ring (1) and the toroidal sealing ring (2) straight against the bearing insert.

Use a rapid and even motion to press the toroidal sealing ring (2) under the safety lip (3) of the bearing insert (5).

Remove the insertion tool.

Check that the housing surface is in parallel position to the gliding surface.

- The O-ring may not undulate in the locating bore or protrude from the bore in form of a loop.

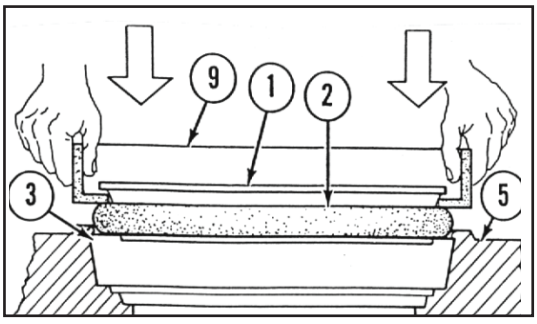


Figure 24

Wait for approximately one minute after insertion, until the isopropanol is dry.

Then bring the two sealing halves into their final installation position.

- During the waiting period, excess solvent may evaporate, so that the toroidal sealing rings roll into the bearing inserts and do not slip when the surface load is increased.

- Uneven load distribution and therefore leakage may occur while the toroidal sealing rings slip into the bearing insert.

However, the seal can be adjusted with slight manual pressure or with a home-made adjustment hook.

Press down the ring with the insertion tool (9) or remove with the hook (11).

- Do not apply direct pressure onto the sealing ring (1) if minor corrections are required.

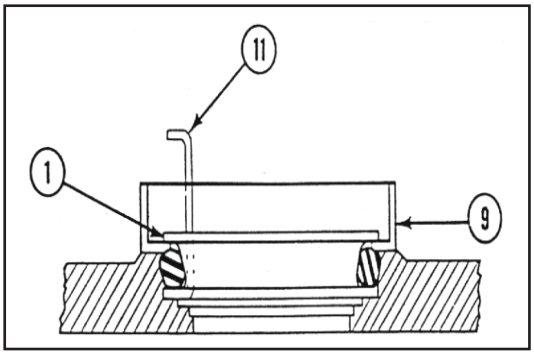


Figure 25

Before insertion, apply and evenly distribute a small amount of clean oil to the sealing surface with a spout, a disposable cloth or with clean fingers.

- Carefully ensure that no oil comes into contact with the rubber toroidal sealing ring.

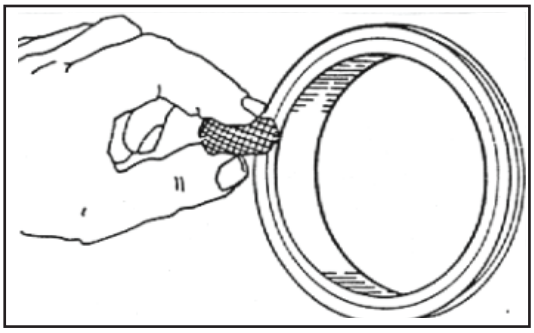


Figure 26

Ensure that there is no visible dirt on the sealing surfaces.

- Even the smallest fibers can separate the sealing surfaces and cause leaks.

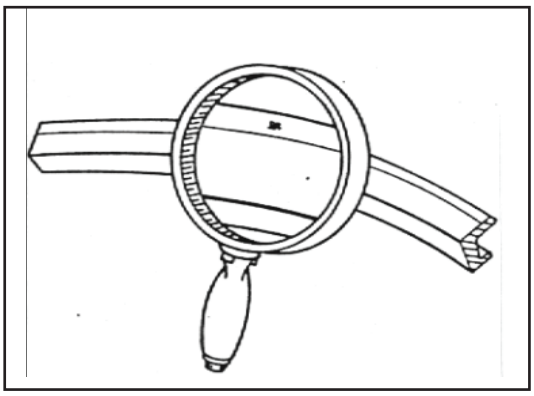


Figure 27

After successful installation, wait one minute for the Isopropanol to dry before assembling the two seal halves in the final loaded position. This delay is to allow any excess solvent to dry so that the torics roll, rather than slide in the housing as the faceload is increased. If the torics slide, a nonuniform load can be produced and result in poor seal performance.

Results of incorrect assembly :

Point “A” and point “B” remain stationary.
Points “X” and “Y” rotate 180°.
This causes high pressure at “A”/ “Y” and possible galling.
When rotated, points “B”/ “X” has low pressure and possible leakage.

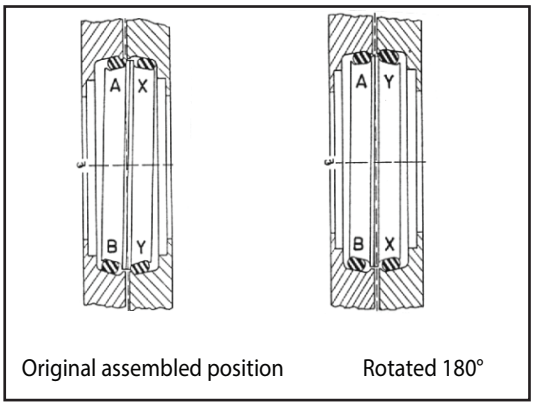


Figure 28

After the unit to be sealed is assembled, a post - assembly leakage test can be performed to insure the seal is properly installed. A vacuum check is recommended rather than a pressure check as vacuum checks are more sensitive. Many users find this an easy check to combine with a vacuum fill technique for the lubricant. It is recommended the compartment be filled to the correct level with lubricant and then rotated slowly several revolutions to seat the seals. A vacuum test will catch big seal damage such as broken seal rings or cut torics that may be caused in the last phases of assembly. The Duo - Cone seal is not designed to seal air, so some leakage can be expected using such procedure.
Following these guidelines and recommendations should insure optimum performance from the Duo - Cone - seals.

Assembly of the ring gear and ring gear carrier

NOTE

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 in Figure 29.

Prepare the ring gear and the ring gear carrier

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. Use Loctite 270.

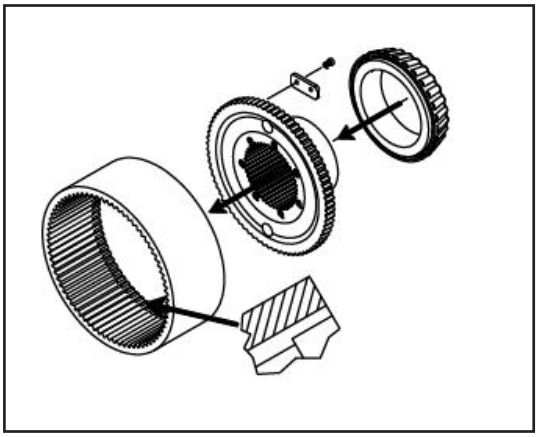


Figure 29

Assembly of the ring gear carrier

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.

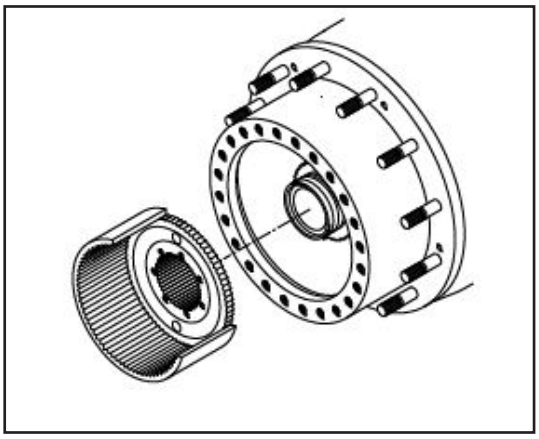


Figure 30

Assembly wheel bearing adjustment nut.

DANGER

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

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.

   - 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: 600 Nm.

   - Tightening torque for used bearings: 500 Nm

   - If it is not possible to lock in this position, the wheel bearing adjustment nut must be turned forward to the next possible locking position.

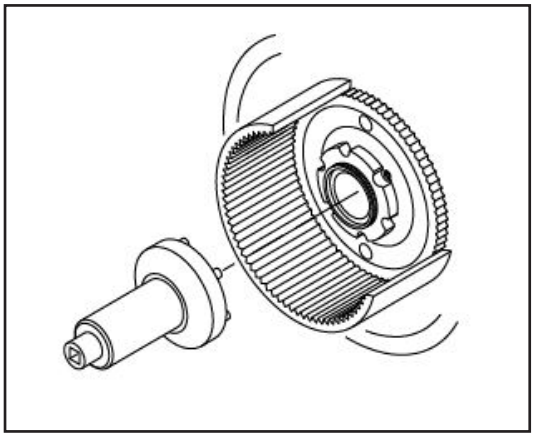


Figure 31

Locking wheel bearing adjustment nut.

1. Lock the wheel bearing adjustment nut with a screw.

   - Hexagon socket screw.

   - Screw locking: Loctite 270.

   - Tightening torque: 72 Nm.

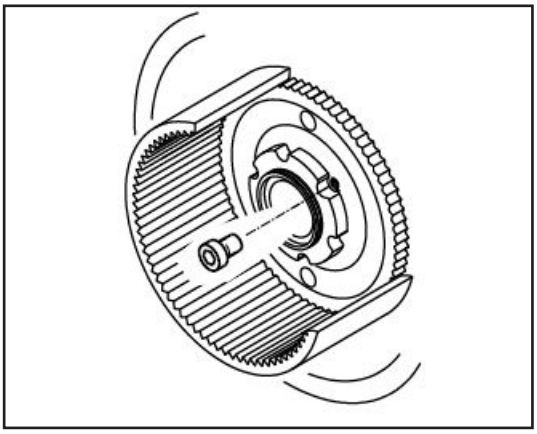


Figure 32

Preparation and assembly axle shaft.

1. Slide the bushing onto the axle shaft.

2. Slide sun gear into bushing, screw and tighten with axle shaft, do not damage the toothing of the axle shaft in the process.

   - Use Loctite 262.

   - Tightening torque: 210 Nm.

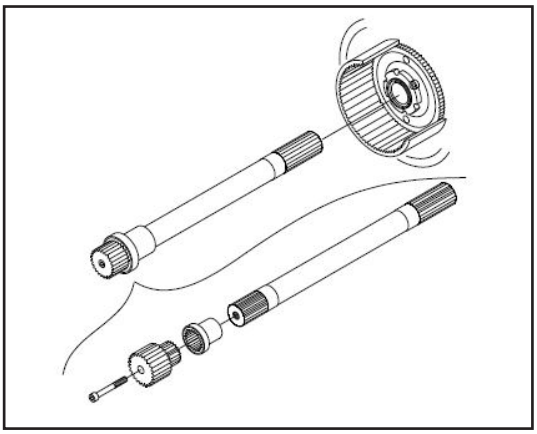


Figure 33

3. Slide the axle shaft joint to the inside until sun gear contacts the bushing and bushing contacts the thrust ring.

4. Rotate the hub assembly until one of the oil compensating holes of the ring gear carrier is at the bottom position.

Assembly of the thrust ring

Press the thrust ring (6) into the steering knuckle resp. axle spindle. Secure with Loctite 270.

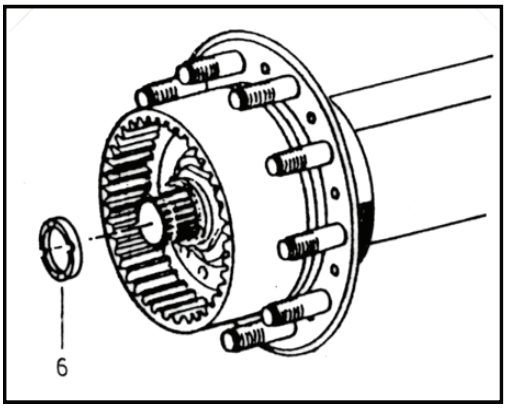


Figure 34

Assembly of the sun gear

1. Slide bushing onto axle shaft/universal joint.

   - Lifting of the axle shaft/universal joint facilitates the sliding.

2. Slide sun gear into bushing and screw with axle shaft/universal joint.

   - Use Loctite 262.

   - Tightening torque: 210 Nm.

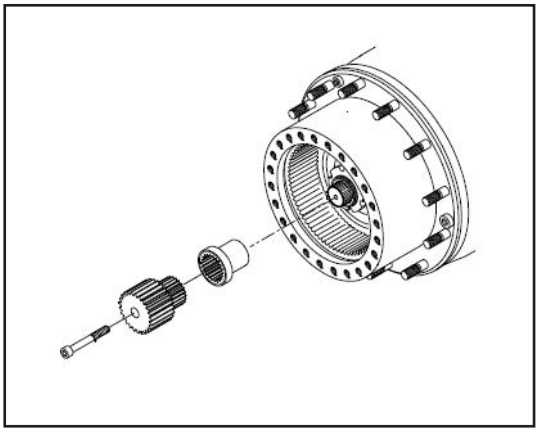


Figure 35

3. Slide the axle shaft/universal joint to the inside until sun gear contatcts the bushing and bushing contacts the thrust ring.

4. Rotate the hub assembly until one of the oil compensating holes of the ring gear carrier is at the bottom position.

Planetary gear drive

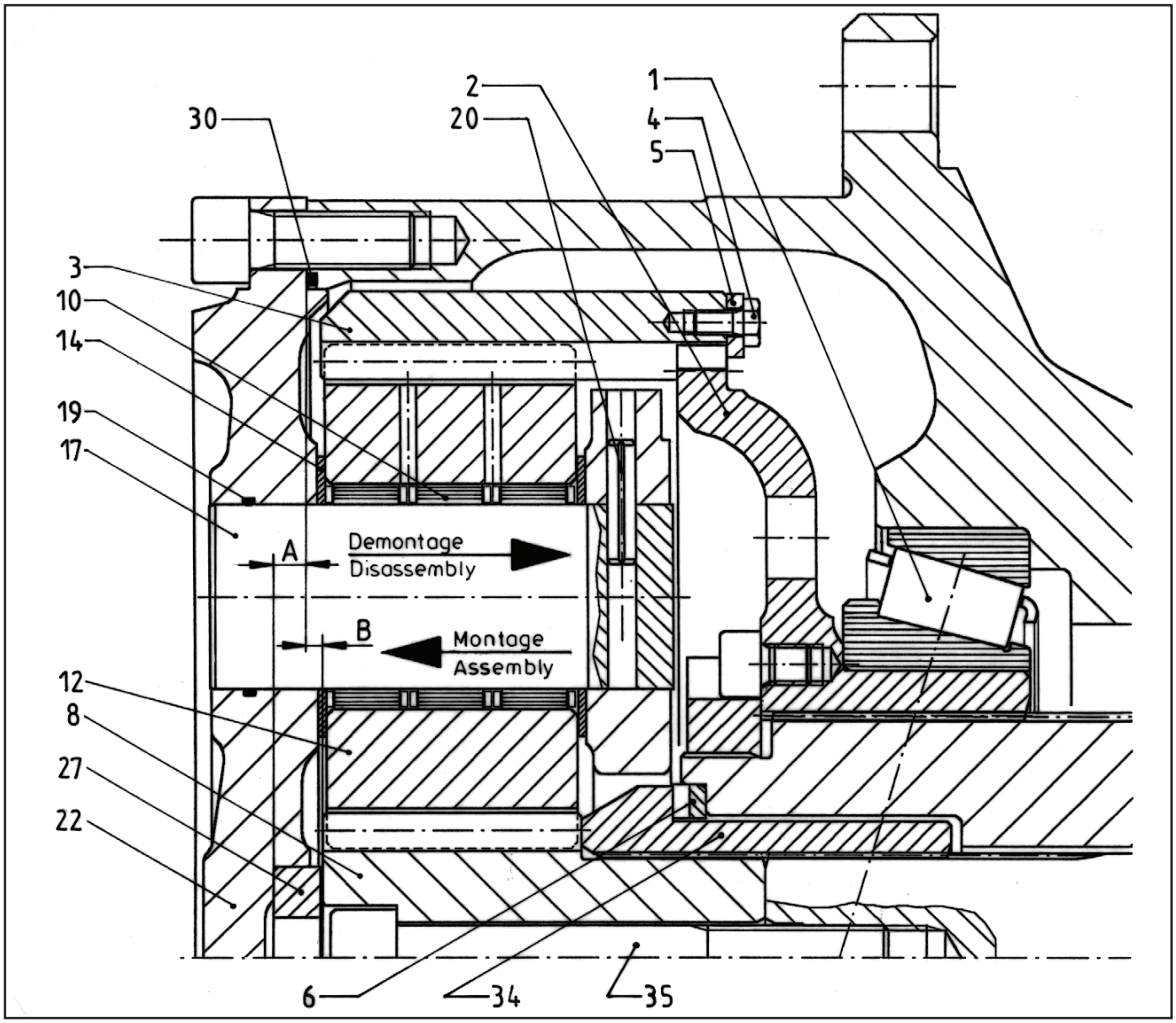


Figure 36

Assembly of planetary gear

Prepare planetary gear

Install the needle bearing (10 resp. 11) into the planetary gear (12 resp. 13).

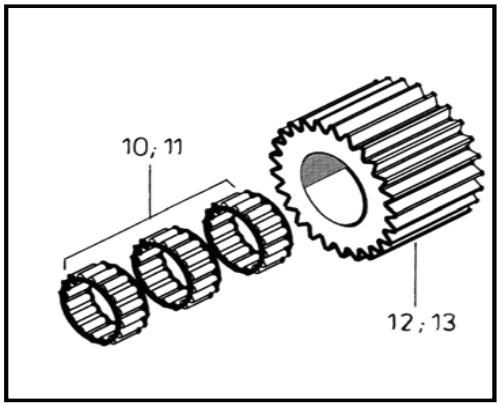


Figure 37

Insert the preassembled planetary gears (12 resp. 13) with needle bearings (10 resp. 11), rings (16) (if present) and thrust discs (14 resp. 15) into the planetary housing (22 resp. 23) (planetary housing in horizontal position).

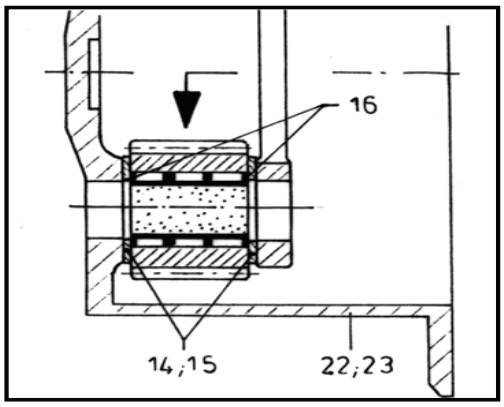


Figure 38

Place o - ring (19) into the slot of the planetary housing (22). Because of the difference of diameter of 0,1 mm press the planetary pin (17 resp. 18) in direction of arrow. Be sure that the borehole of the locking pin in the planetary pin and planetary housing are aligned. After inserting, secure the planetary pin with the locking pin (20 resp. 21).

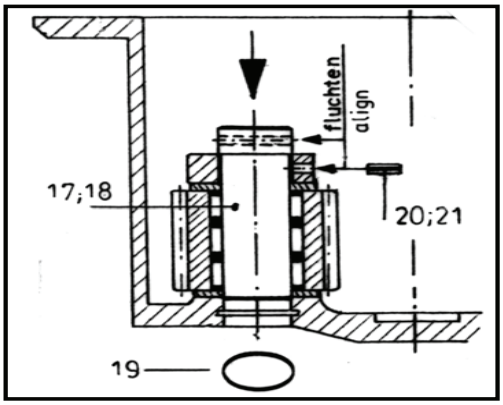


Figure 39

Assembly of the planetary housing

1. Insert the O-ring into the planetary housing.

   - Sealing of the contact surfaces between planetary housing and wheel hub.

   - Multi-purpose grease prevents the O-ring from falling out during assembly.

2. Push the prepared planetary gear into the ring gear and onto the sun gear.

3. Align the holes to each other and screw the planetary housing with the wheel hub.

   - The oil drainage screw must be in the lower position!

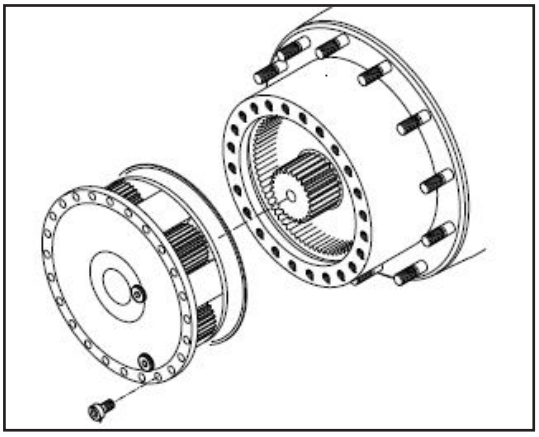


Figure 40

Disassembly of planetary gear

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

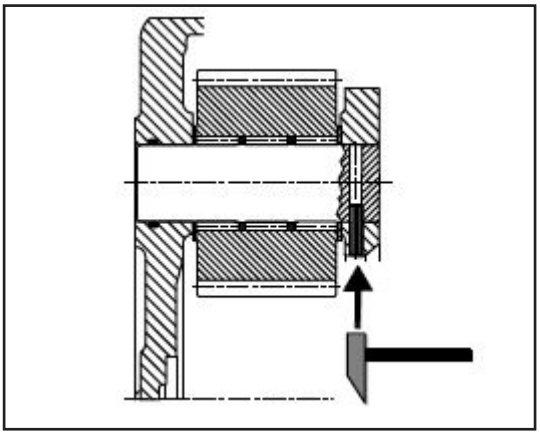


Figure 41

CAUTION

Diameter difference of 0.1mm 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.

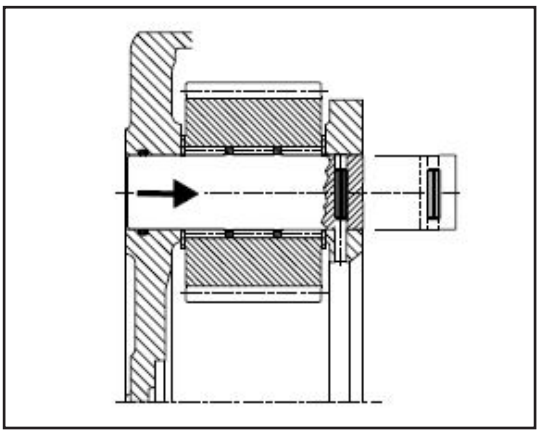


Figure 42

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.

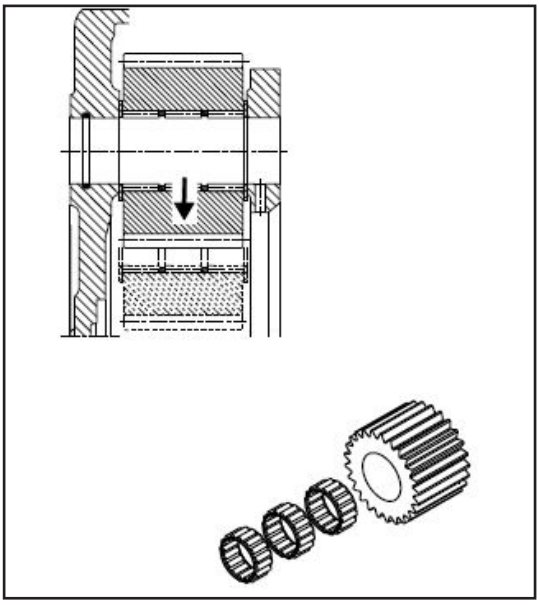


Figure 43

Assembly / disassembly of cageless needle bearing

Assembly

Version 1:

Install the needle bearing with mounting bushings into the planetary gear, thereby the outer mounting bushing will be stripping.
Insert the planetary gear with thrust discs into the planetary housing.
Press in the planetary pin, thereby the inner mounting bushing will remove.

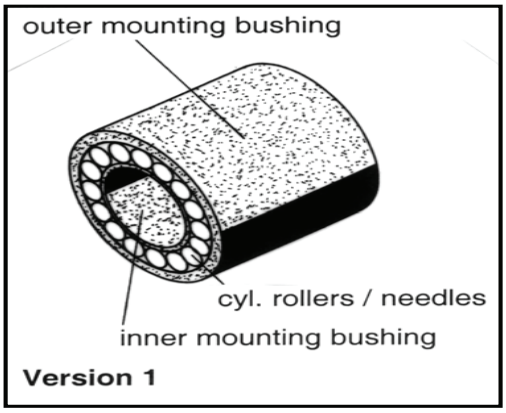


Figure 44

Version 2:

Place one thrust disc on the work bench, place on the planetary gear and insert the mounting bushing. Insert the cylindrical rollers/ needles alternately with the rings (according to the design). Insert the planetary gear with thrust discs into the planetary housing. Press in the planetary pin, thereby the mounting bushing will remove.

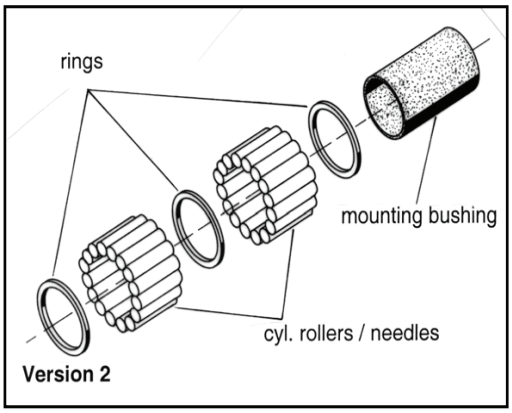


Figure 45

NOTE

Note the passage “Assembly of the planetary gear”!

Disassembly

At the disassembly of the planetary pin the cageless needle bearing will fall asunder, if not a mounting bushing will be pushing inwards at planetary pin removing.

NOTE

Note the passage “Disassembly of the planetary gear”!

Hub assembly wheel gear rear with brake

Hub assembly wheel gear

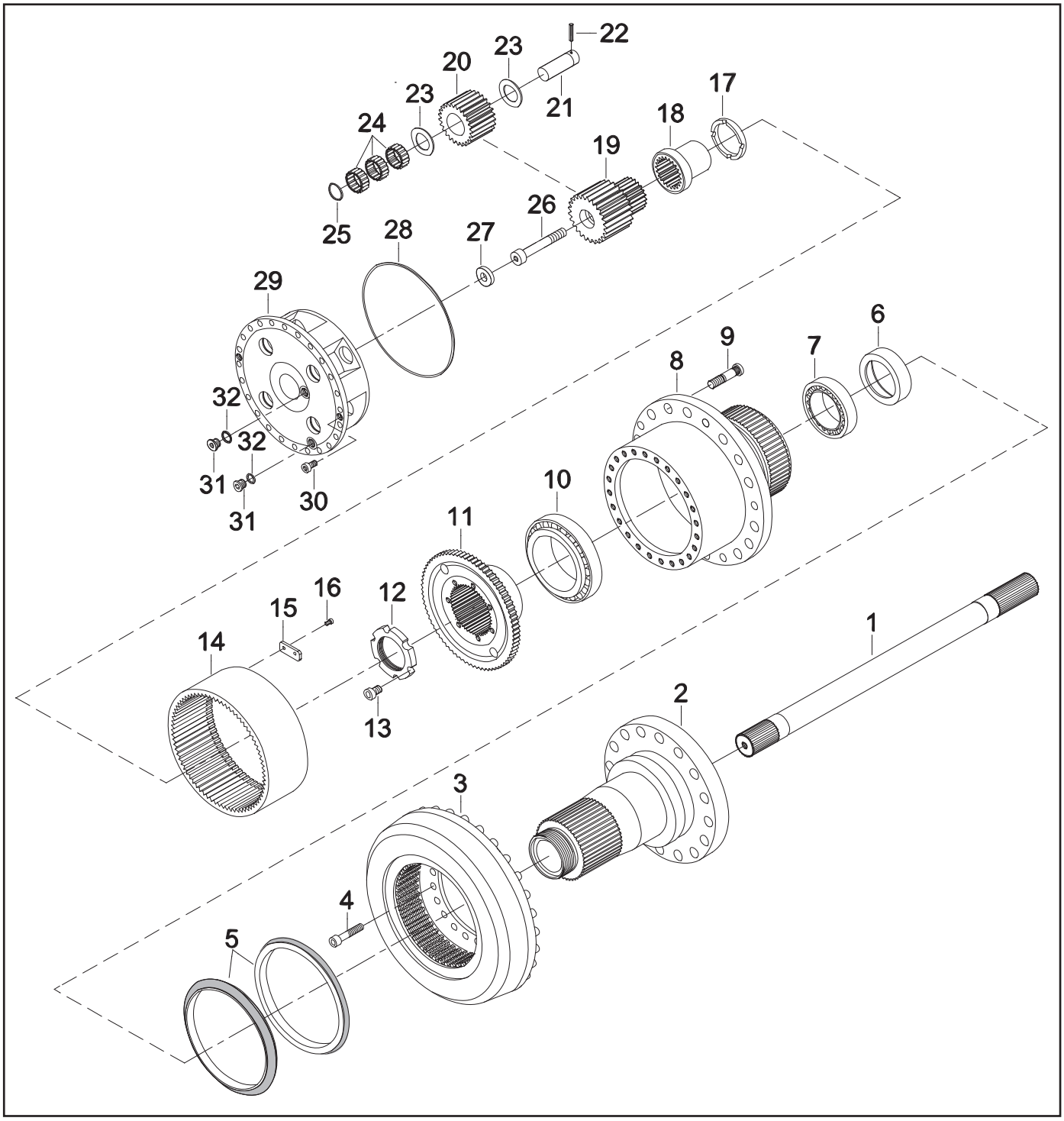


Figure 46

See the parts catalogue for parts lists.

Overview of parts

1 Axle shaft
2 Axle spindle
3 Wet multiple disc brake
4 Hexagon screw
5 Face seal
6 Spacer ring
7 Tapered roller bearing
8 Wheel hub
9 Wheel stud
10 Taper roller bearing
11 Ring gear carrier
12 Wheel bearing adjustment nut
13 Hexagon socket screw
14 Ring gear
15 Lock plate
16 Hexagon screw
17 Thrust ring
18 Bushing
19 Sun gear
20 Planetary gear
21 Planetary pin
22 Spring-type straight pin
23 Disc
24 Needle bearing
25 O-ring
26 Hexagon socket screw
27 Thrust ring
28 O-ring
29 Planetary housing
30 Hexagon socket screw
31 Screw plug
32 Sealing ring

NOTE

For details on adjustment, assembly and dismantling see “Hub assembly wheel gear front with brake”

Hub assembly wheel gear rear without brake

Hub assembly wheel gear

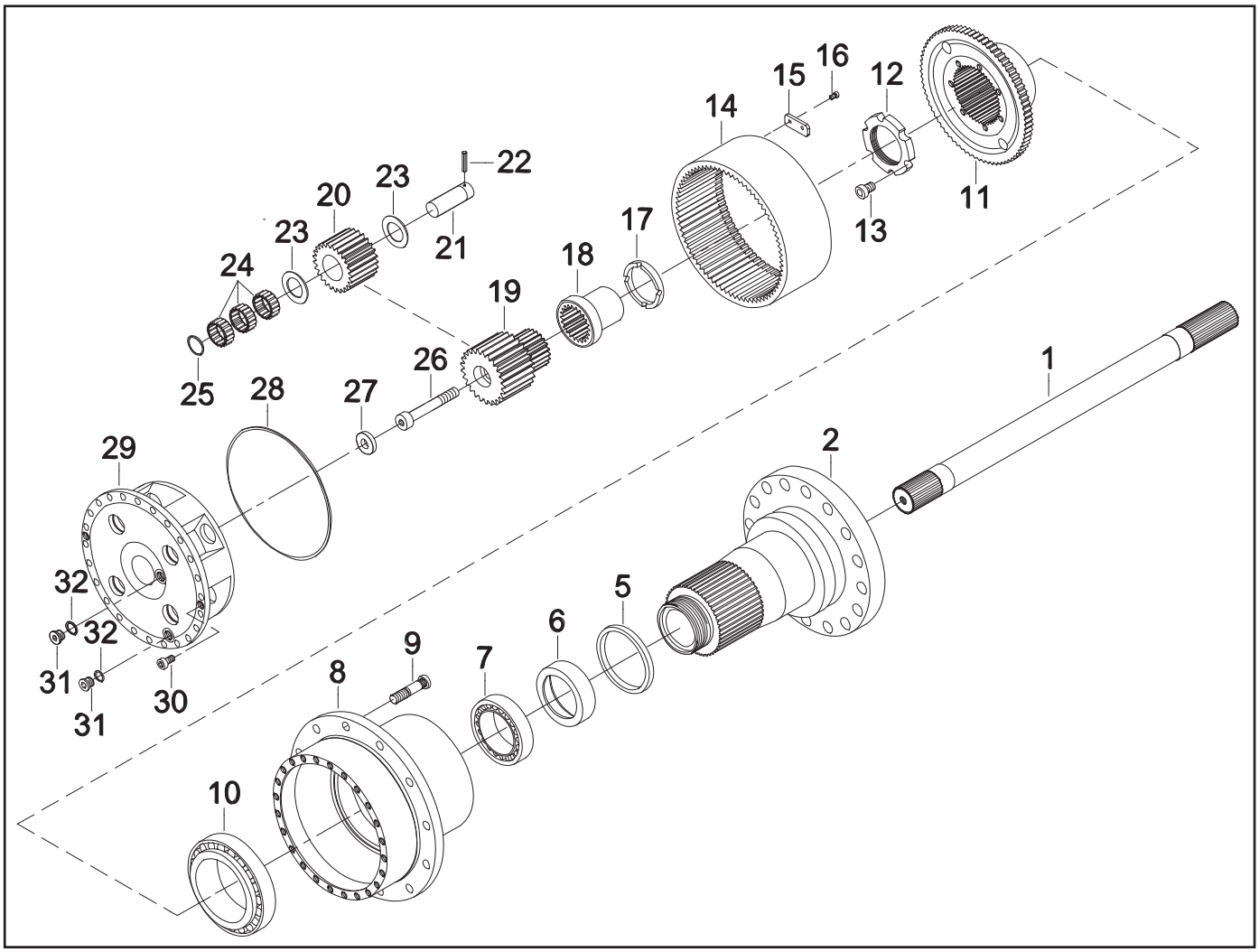


Figure 47

See the parts catalogue for parts lists.

Overview of parts

1 Axle shaft
2 Axle spindle
3 -
4 -
5 Cassette seal ring
6 Spacer ring
7 Tapered roller bearing
8 Wheel hub
9 Wheel stud
10 Taper roller bearing
11 Ring gear carrier
12 Wheel bearing adjustment nut
13 Hexagon socket screw
14 Ring gear
15 Lock plate
16 Hexagon screw
17 Thrust ring
18 Bushing
19 Sun gear
20 Planetary gear
21 Planetary pin
22 Spring-type straight pin
23 Disc
24 Needle bearing
25 O-ring
26 Hexagon socket screw
27 Thrust ring
28 O-ring
29 Planetary housing
30 Hexagon socket screw
31 Screw plug
32 Sealing ring

NOTE

For details on adjustment, assembly and dismantling see "Hub assembly wheel gear front with brake"

Wet multiple disc brake

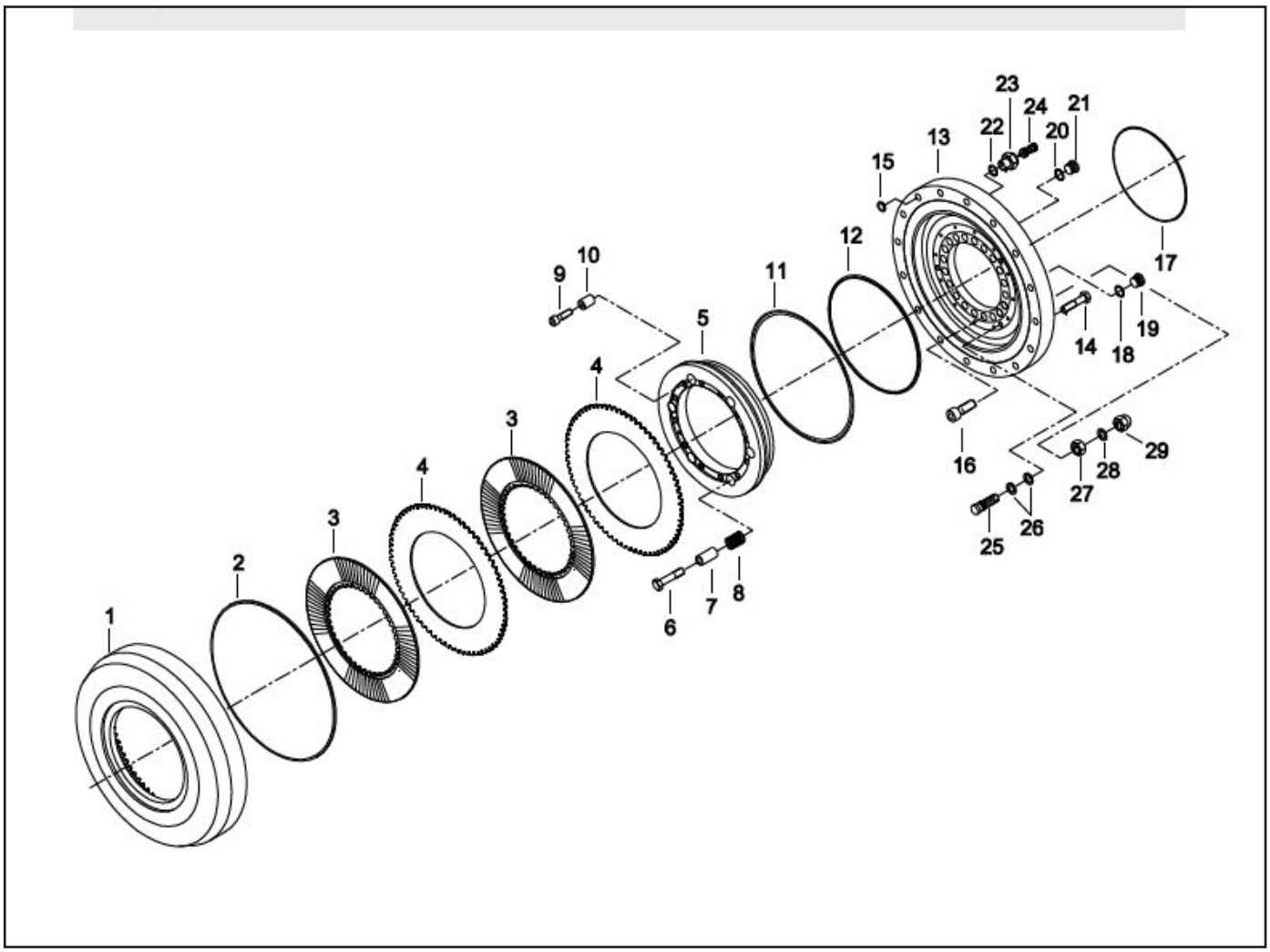


Figure 48

Position	Item	Position	Item
1	Brake carrier	15	O-ring
2	O-ring	16	Screw
3	Inner discs	17	O-ring
4	Outer discs	18	Sealing ring
5	Piston	19	Screw plug
6	Screw	20	Sealing ring
7	Pipe	21	Screw plug
8	Spring	22	Sealing ring
9	Hexagon socket screw	23	Bleeding socket
10	Bushing	24	Bleeder
11	Gasket kit	25	Bolt
12	Gasket kit	26	O-ring
13	Brake carrier	27	Nut
14	Screw	28	O-ring
		29	Cap nut

Connections wet multiple disc brake

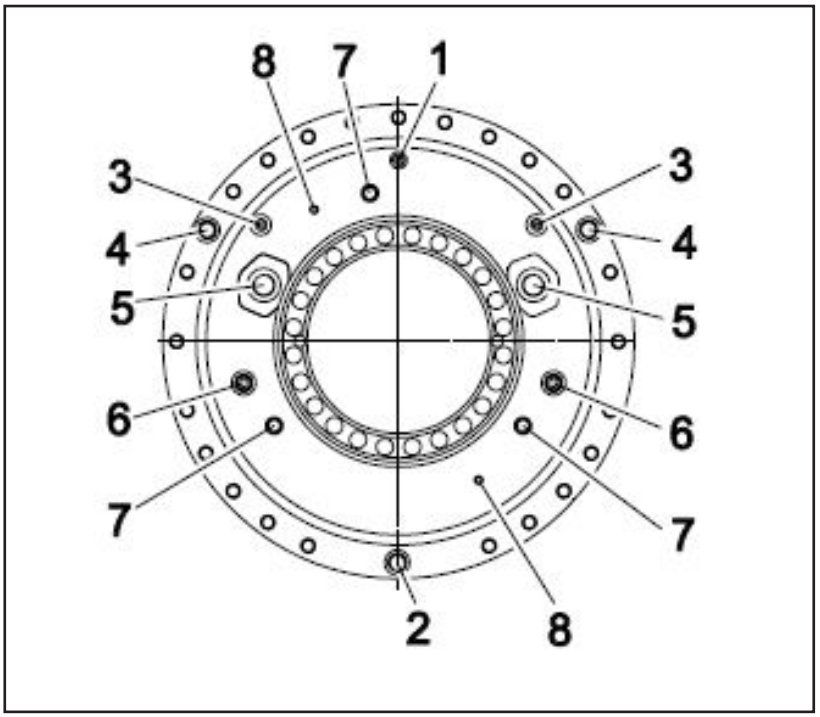


Figure 49

Position	Item
1	Bleeder
2	Oil drain plug
3	Hydraulic line “P”
4	Cooling oil inlet “C”
5	Cooling oil outlet
6	Wear inspection hole
7	Piston adjustment
8	Anti-twist device

Disassembly wet multiple disc brake

- When working on the brake make sure that no unintended machine movement happens by repealing the brake effect.
- The wear rate of the wet disc brake must be measured and recorded before disassembly.
- Before disassembly of the wet multiple disc brake, the oil must be drained.
- Dirt and wear particles may not be allowed to enter the brake or the grooves of the gaskets during disassembly of a wet multiple disc brake. All parts which are affected by the assembly, for instance the brake carrier, the brake housing must also be cleaned on the outside surfaces.
- The planetary gear drive and the wheel hub must be disassembled before disassembly of the wet multiple disc brake.

1. Remove the connections of the wet multiple disc brake.
   - If there is still the face seal within the brake, pull off carefully.
2. Mark the position of the connections relative to the axle housing.
3. Loosen the screws and pull the brake off the axle.
   - Use a suitable hoist device.
4. Disassemble brake carrier.
5. Disassemble piston.
6. Dismantling piston and gaskets.
7. Remove anti-twist device from brake carrier (if necessary).
8. Remove the discs from the housing.

Assembly wet multiple disc brake

1. Coat the top of the screw with Loctite. Use Loctite 262.

2. Push the hexagon socket screw into the bushing.

3. Screw in the anti-twist device of the piston. Tightening torque: 72Nm.

4. Lightly grease the O-ring and insert it into the groove of the brake carrier without twists and loops.

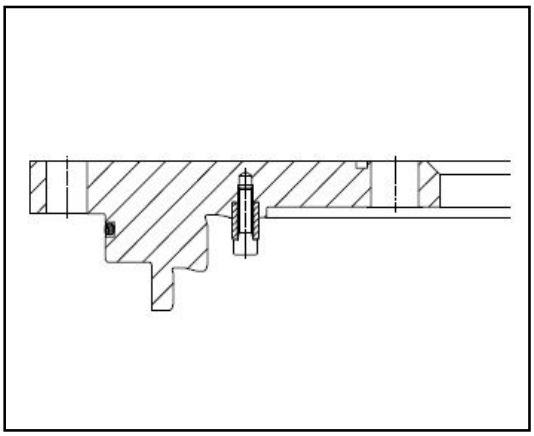


Figure 50

Preparation and installation of the piston adjustment screws:

5. The piston adjustment screws with the O-rings on must be lightly greased and placed fully into the brake carrier.

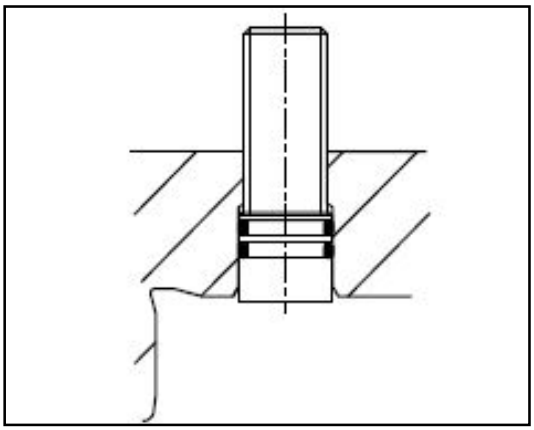


Figure 51

6. Place the piston on the flat surface of the large diameter.

7. Oil the O-rings directly before assembly. Do not reuse old O-rings!

8. Insert both gaskets (consisting of O-ring and profile ring) into the grooves of the piston.

   - When using a dual acting profile ring there is no special mounting direction.

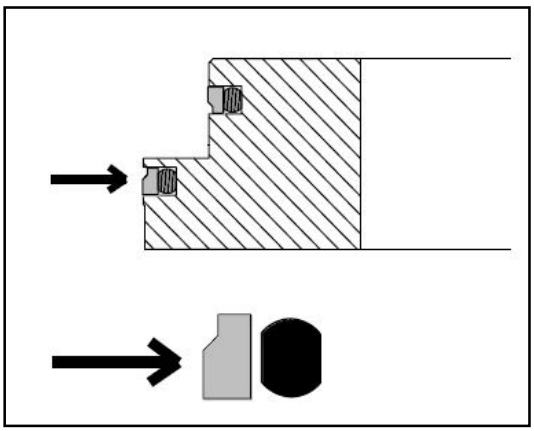


Figure 52

NOTE

Install the profile rings with small diameter to pressure side!

Piston assembly in brake carrier.

1. Screw in auxiliary screws for easier handling.
2. Coat the piston ring running area of the brake carrier with oil.
3. Coat the threads of the brake carrier with Loctite.
   Use Loctite 243.
4. Insert the piston into the brake carrier.

   - Observe the correct position of the piston relative to the brake carrier!

   - See the prior marking from disassembly.
5. Press the piston uniformly into the brake carrier without tilting.

   - Some clamps which are tightened alternately ease this procedure
6. Align the piston with the threads in the brake carrier.
7. Remove the auxiliary screws from the piston.
8. Put together hexagon screw with disc, pipe and compression spring and screw it through the piston into the brake carrier.
   Tightening torque: 18 Nm.

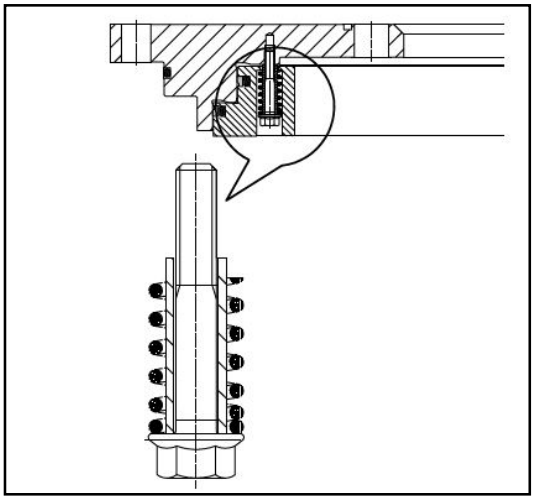


Figure 53

Prepare the brake housing:

1. Insert the discs alternatively into the brake housing, starting with the inner disc.

   - Align the toothing of the inner discs with each other.

NOTE

The last disc must always be an outer disc (the steel disc) because the piston presses against it during the braking operation.

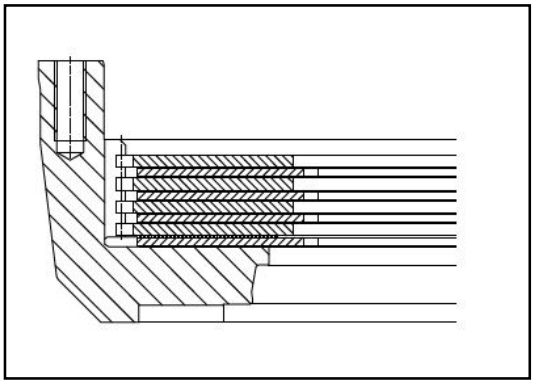


Figure 54

1. If there are countersinks at the bores of the brake carrier or brake housing, grease the countersinks and insert O-rings.

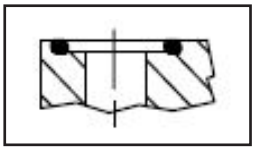


Figure 55

- O-rings stick because of the grease and are secured against falling down during assembly with the brake housing.

2. Place the brake carrier, screwed together with the piston, onto the brake housing and align it.

3. Insert the brake carrier.

   - Observe the alignment of the drill holes to each other.

   - The big O-ring in the outer diameter may not be sheared or damaged during assembly!

   - The small O-rings may not fall down!

4. Screw together both parts.

   - Seal the screws to the left and right side of the oil drain point and cooling oil inlet points “C” with Loctite 262. Tightening torque 310 Nm.

5. Screw in the bleeder with screw socket.

   - See “Connections wet multiple disc brake” on page 38.

6. Screw in the screw plugs with gaskets.

   - See “Connections wet multiple disc brake” on page 38.

7. Test the brake for leak tightness with the maximum operating pressure.

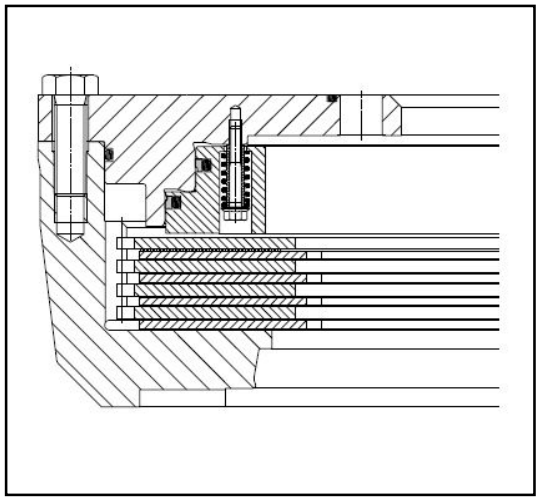


Figure 56

Air gap setting with piston adjustment

1. With the brake being applied screw in the installed piston adjustment screws (1) until contact at the piston.
2. Subsequantly screw out the piston adjustment screws (1) according to the nominal air gap and release the brake.
3. Screw on and tighten the counternuts (2).
4. Attach the O-rings (3).
5. Screw on and tighten the nuts (4). Hold the counternuts (2) while doing this.

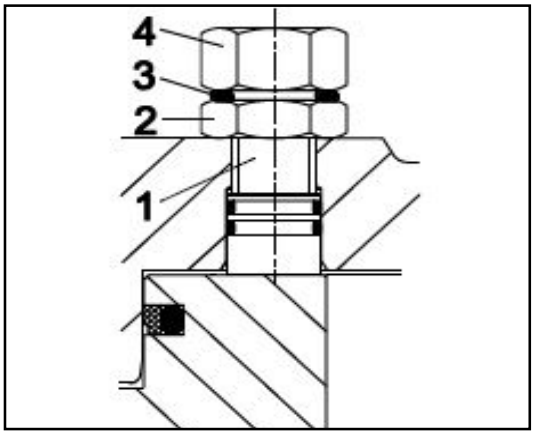


Figure 57

NOTE

The specified value for the clearance of wet multiple disc brake is 1.8 + 0.3/ -0.1.

Assembly wet multiple disc brake on the axle

1. Safeguard the brake unit against falling down until it has been screwed down to the axle housing.
2. Lightly oil the O-ring and insert it in the groove of the brake carrier/axle spindle or steering knuckle without twists and loops.
3. Push on the multiple disc brake.
   - Observe the correct position of the connections!
4. Fasten the screws on the multiple disc brake.
   - Tightening torque: see Figure 175.

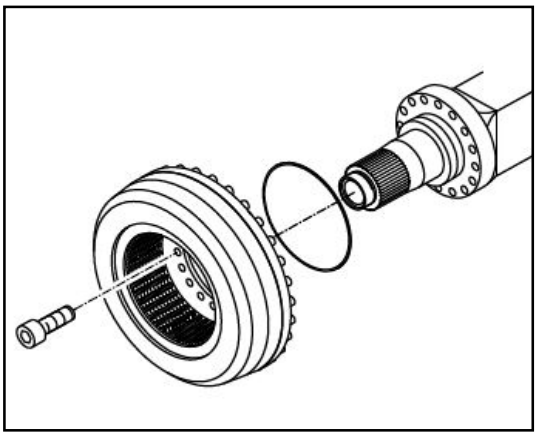


Figure 58

Test of the cooling oil chamber

Preconditions

Brake with external cooling:

- The test for leak tightness of the cooling oil chamber is only performed after assembly of the brake and the wheel hub with face seal and adjustment of the wheel bearing on the axle.
- All connections to the vehicle system are disconnected and sealed with plug screws.

Approach

1. Connect a manometer with a stopcock.
2. Apply 1.5 bar compressed air to the hub assembly.
3. Turn the hub assembly several times.
4. After 10 minutes a pressure drop of up to 0.1 bar is allowed.

   - If the pressure drop is larger, the cause must be found and, if necessary, the brake disassembled.

   - Leakage spray helps to localize the leakage point.

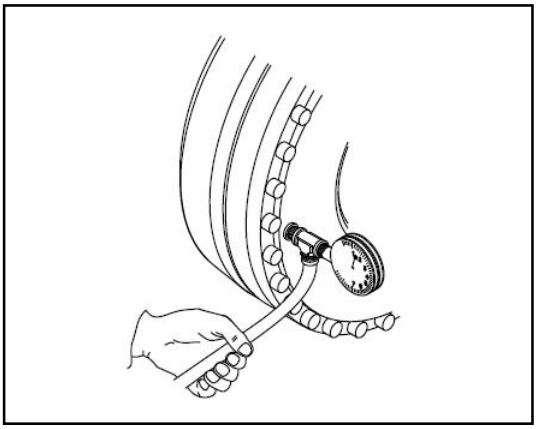


Figure 59

Bleeding the wet multiple disc brake

CAUTION

Oil and bleeder valve are pressurized.
Injury due to parts being ejected.
- Only trained technicians may bleed the brakes.

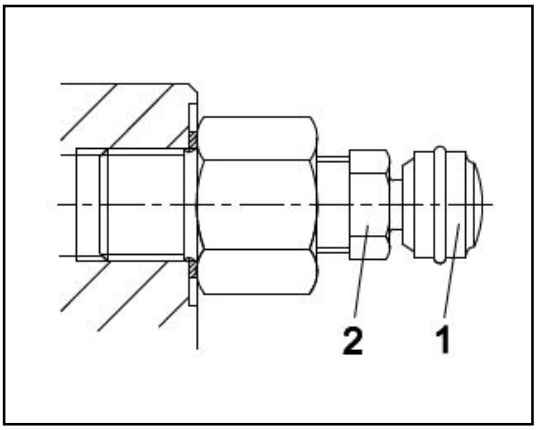


Figure 60

1. Make sure that no machine movements can take place.
2. Pressurize the brake.
   - The brake closes.
3. Remove the protection cap (1) of the bleeder valve (2).
4. Slide the hose onto the bleeder valve.
5. Open the bleeder valve slowly by no more than 1/4 of a rotation.
   - Oil-air mixture escapes through the hose.
6. Once only oil seeps out, close the bleeder valve again properly.
7. Pull the hose off.
8. Place the protection cap (1) onto the bleeder valve (2).

Final assembly

Place the brake carrier onto the brake housing and bolt it. Mount breather with connection piece and seal ring, screw plugs with seal rings.

Check brake hydraulic system for leaks.

- Before conducting the test, bleed the brake hydraulic system. The pressure drop after applying 120 bar for a period of 15 minutes must not exceed 2% (leaving 117,5 bar)
- Test medium: Motor oil SAE 10 W corresponding to MIL - L 2104.

Install O- ring (Brake carrier/ axle spindle resp. steering knuckle) free of torsion and loops.

Check the air gap (pressurized)

Measure through the check hole the distance from brake carrier to the piston end face, while non actuated brake, actuate the brake and repeat the measure operation - the difference of the measured distances gives the air gap sL (pressurized), rated size sL see table.
Measure through the check hole the distance from brake carrier to the piston end face, while actuating the brake and knock the measured value with marking punches into the brake carrier.

Install the complete brake on the axle (coat the contact surface with Loctite 270).

Mount face seal see (Figure 16 - Assembly of the face seal).

Alignment of the discs

Wet disc brake dimension X460

The alignment of the discs has to be made by a mounting device, see (Figure 2 and Figure 3 - Kessler special Tools for HA30). Clamp the discs by actuating the brake (hydraulic or air pressure).

Drive shafts

Front frame

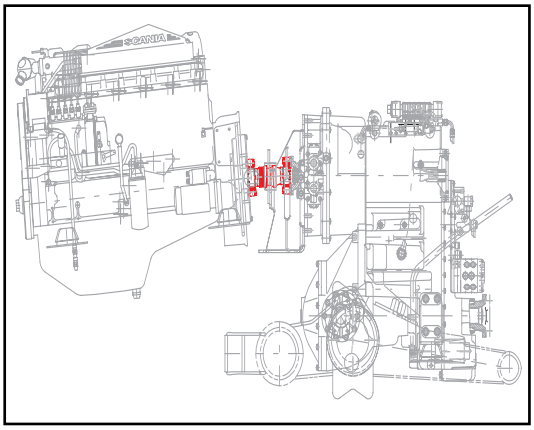


Figure 61

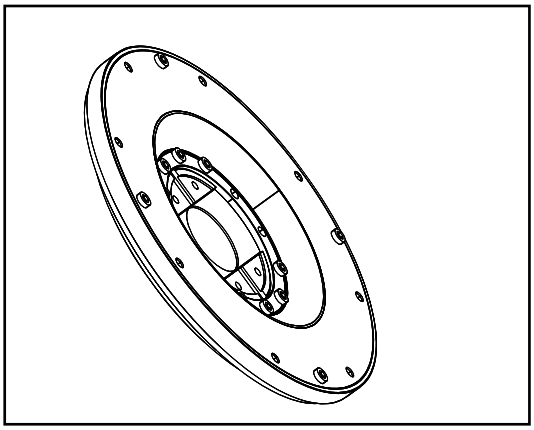


Figure 62

Cardan Shaft (LH and RH)

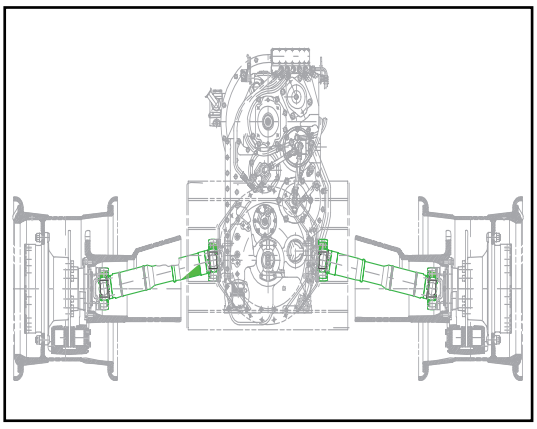


Figure 63

Rear frame

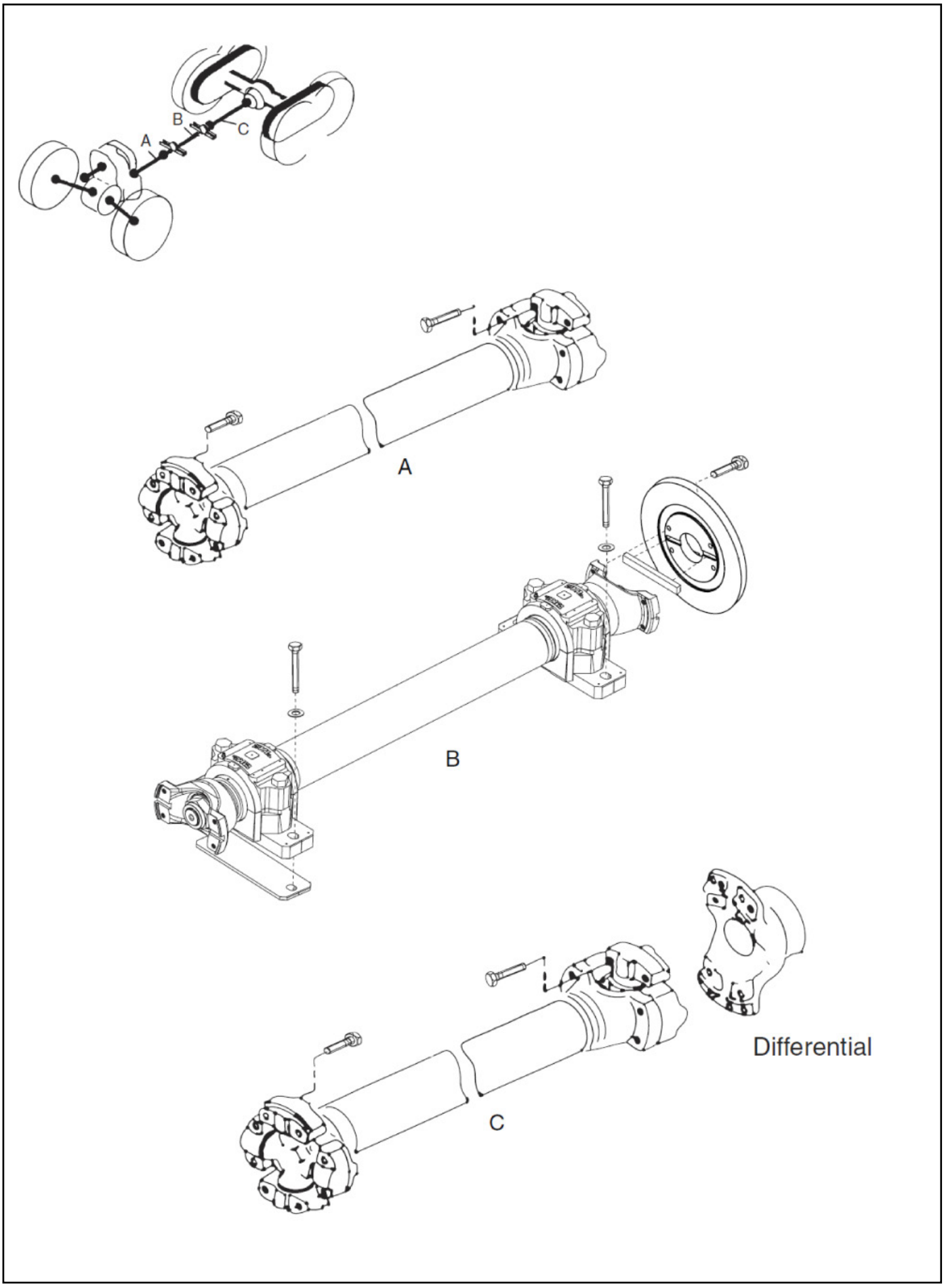


Figure 64

Mounting the bearings on the intermediate shaft (B)

Clean the ends of the intermediate shaft where the bearings will be installed.

Place the intermediate shaft in the two pieces of wood or similar, to have easy handling on the shaft.

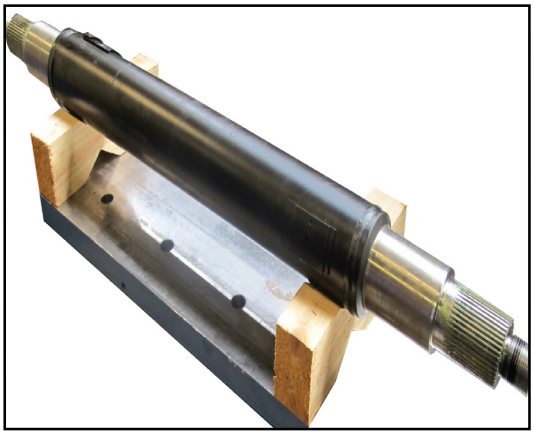


Figure 65

Heat the inner diameter of the spacer sleeve (inner) with electrical heater, hot oil or hot air blower

Temp 75 - 120°C
(167 - 248°F)

(S) Hot-air blower 230 V 504193

(S) Hot-air blower 115 V 504194

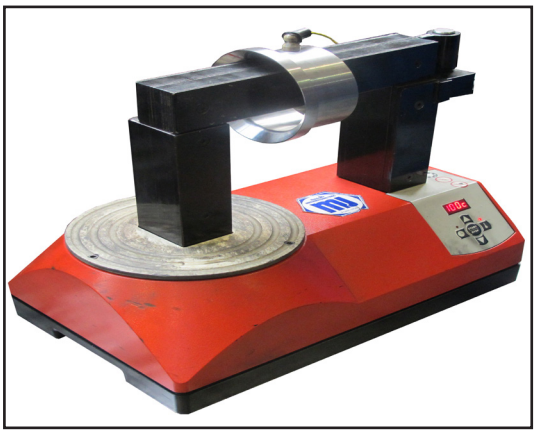


Figure 66

CAUTION

Be aware of personal injury. Use proper gloves.

Clean and check if the bearing housings are without any damage, rust or deformation.

Figure 67

Place carefully the spacer sleeve (inner) on the end of the intermediate shaft.

Try to install it aligned.

Figure 68

CAUTION

Be aware of personal injury. Use proper gloves.

Place the installation device on the end of the intermediate shaft, in front of the spacer sleeve(inner), and press it against the spacer slevee without hit on it.

Figure 69

Now, use a nylon hammer to hit the device installation against the spacer sleeve (inner) until the spacer sleeve touches the end of the machined body of the intermediate shaft.

Figure 70

Instal the rubber seal on the spacer sleeve (inner) body. Pay attention to not damaging the lips of the rubber seal.

Figure 71

Place the rubber seal on the end of the spacer sleeve (inner) body. Make sure that the lips are towards the edge of the intermediate shaft.

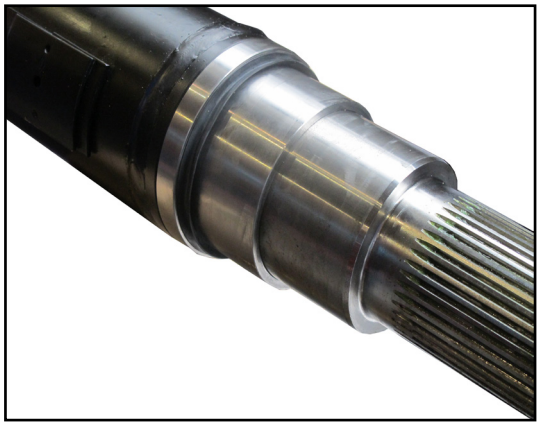


Figure 72

Instal the support ring in front of the rubber seal.

Make sure that the concave side is towards the rubber seal.

Figure 73

Place the support ring on the end of the spacer sleeve (inner), covering the rubber seal.

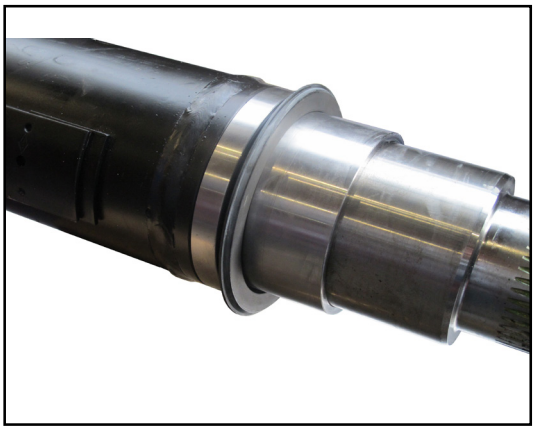


Figure 74

Heat the inner diameter of the bearing with electrical heater, hot oil or hot air blower

Temp 75 - 130°C
(167 - 248°F)

(S) Hot-air blower 230 V 504193

(S) Hot-air blower 115 V 504194

CAUTION

Be aware of personal injury. Use proper gloves.

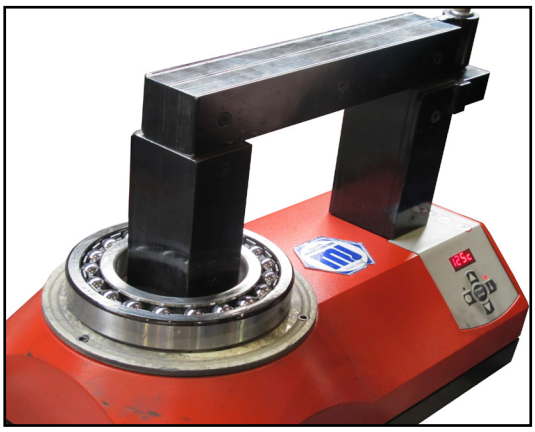


Figure 75

Place the bearing on the intermediate shaft until it touch.

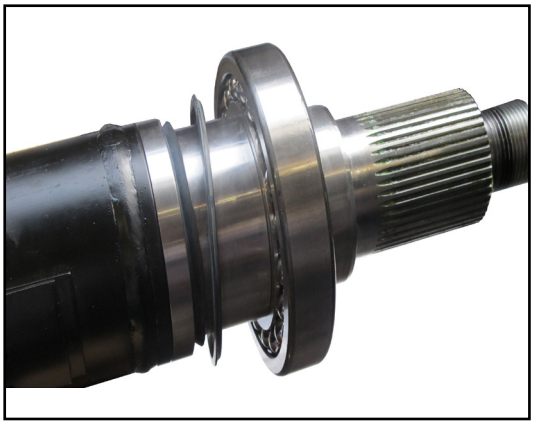


Figure 76

Heat the inner diameter of the spacer sleeve (outer) with electrical heater, hot oil or hot air blower.

Temp 75 - 120°C
(167 - 248°F)

(S) Hot-air blower 230 V 504193

(S) Hot-air blower 115 V 504194

CAUTION

Be aware of personal injury. Use proper gloves.

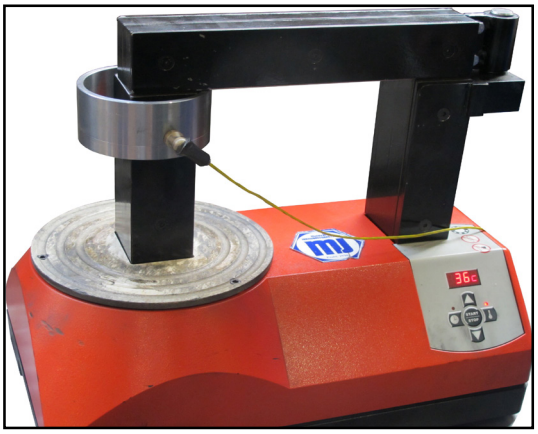


Figure 77

Place carefully the spacer sleeve (outer) on the end of the intermediate shaft.

Try to install it aligned.

CAUTION

Be aware of personal injury. Use proper gloves.

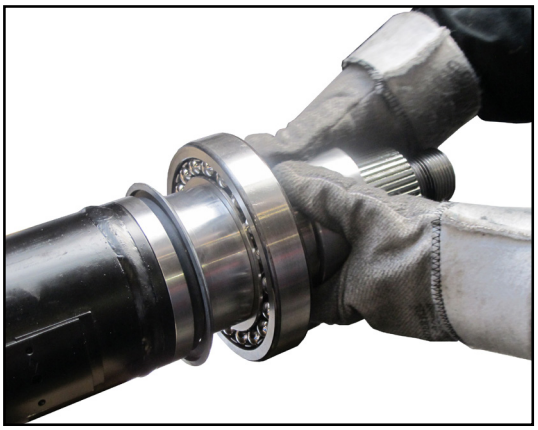


Figure 78

Now, use a nylon hammer to hit the spacer sleeve (outer) until the spacer sleeve touches the bearing.

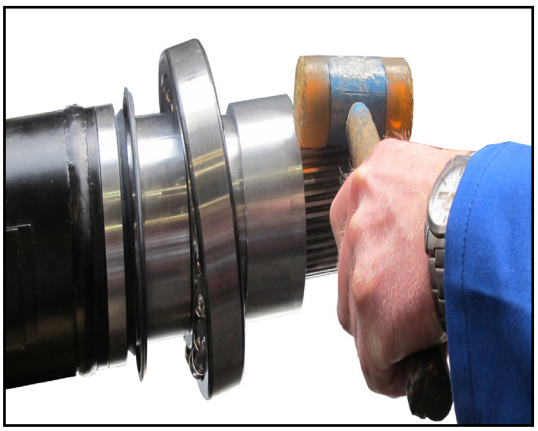


Figure 79

The inner diameter of bearing have to be tied and the rest of the bearing body must have all the movements free of friction.

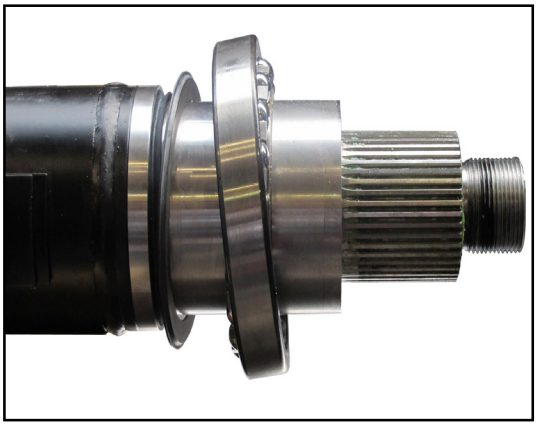


Figure 80

Place the rubber seal on the splined yoke.

Figure 81

Make sure that the lips of the rubber seal are towards to the shaft direction.

Lubricate the striated part of the splined yoke with grease.

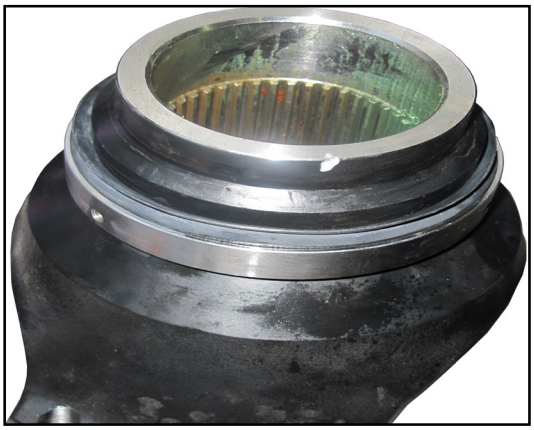


Figure 82

Lubricate the striated part of the intermediate shaft.

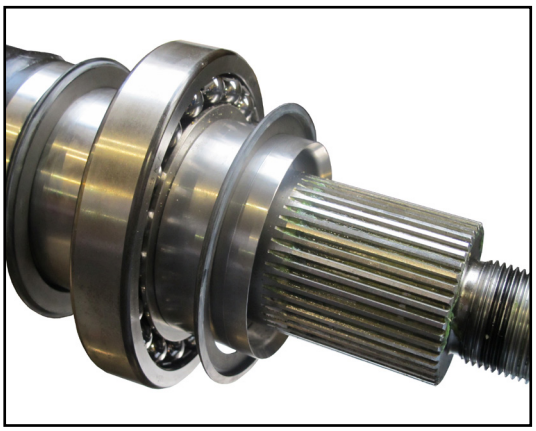


Figure 83

Check the arrow mark on the rip of the splined yoke.

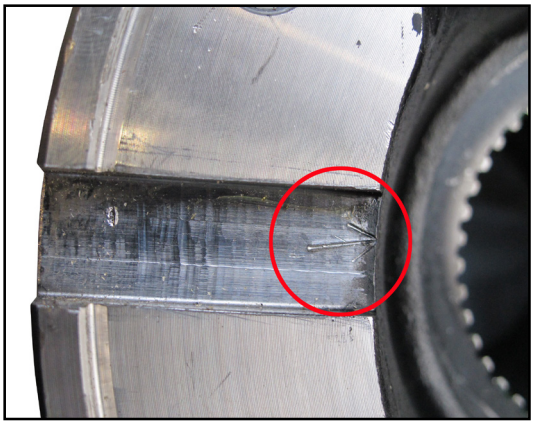


Figure 84

Align the arrow on the splined yoke with the arrow on the intermediate shaft and mount the splined yoke on the intermediate shaft.

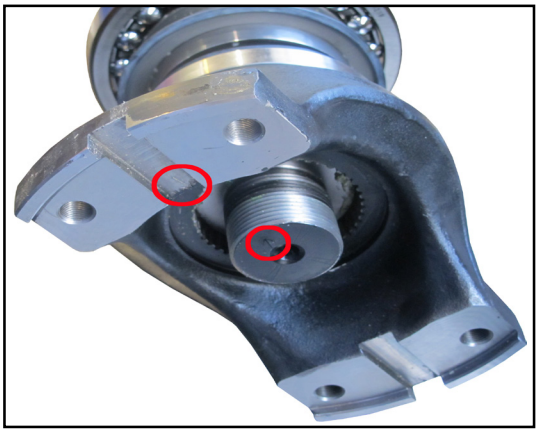


Figure 85

Check if the splined yoke is completely mounted at the end.

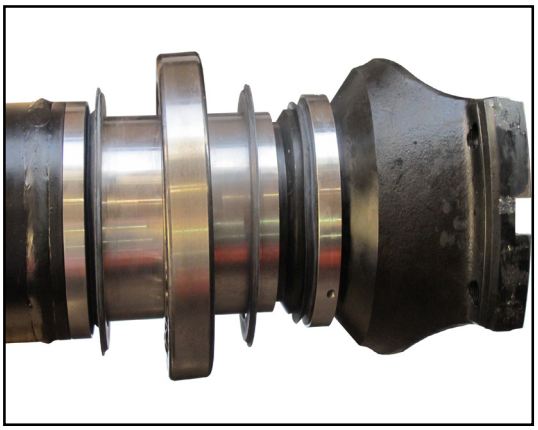


Figure 86

Tighten the nut with torque 620 + 60 Nm.

Follow the same procedures when mounting the housing on the other side of the propeler shaft.

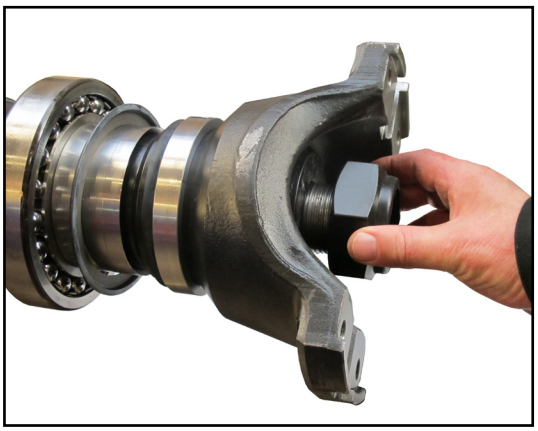


Figure 87

WARNING

The mounting and dismounting of rolling bearings involve the handling of sometimes heavy weights, the use of tools and other devices, and in some cases the use of high pressure oil. In order to avoid accidents, injuries or damage to property please follow the prescribed methods carefully.

Ensure that the environment is clean.

Determine the position of the housing. The grease nipple arranged at one side of the housing cap (for improved lubrication) should always be at the opposite to the sleeve nut. It is necessary to consider the complete housing as the base and cap will only fit together as supplied.

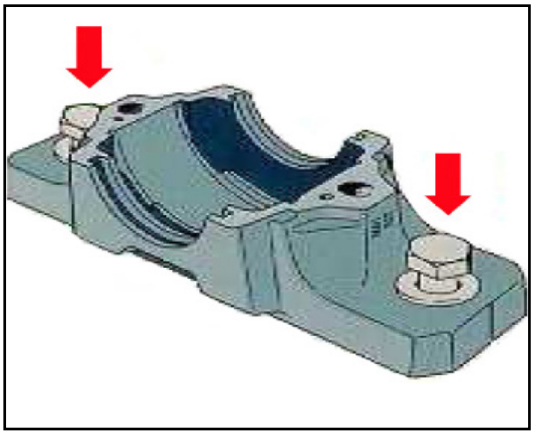


Figure 88

Position the housing on the support surface. Fit the attachment bolts but do not tighten them.

Arrange the one V-ring with sealing washer on the shaft. The V-ring should be furthest away from the bearing and seal against the washer, i.e. the lip should point inwards, towards the washer.

Mount the bearing on the shaft - either directly on a stepped shaft or using an adapter sleeve. Completely fill the bearing with grease. The remainder of the recommended grease quantity should be put in the housing base at the sides.

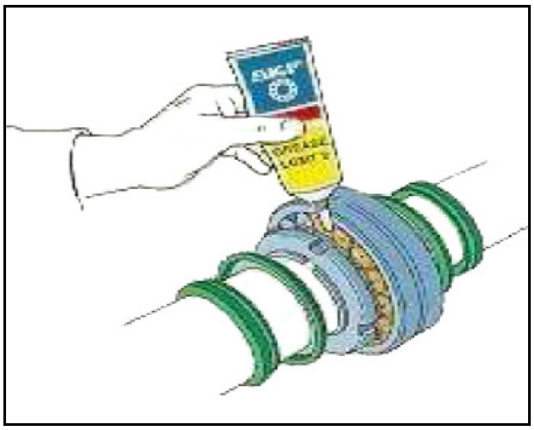


Figure 89

Arrange the second sealing washer and V-ring on the shaft at the other side of the bearing. If the housing is to be used at the end of a shaft, mount an end cover instead.

Lay the shaft with bearing and sealing washers in the housing base.

Put the locating rings (when needed) at each side of the bearing.

NB: locating rings are only used for locating bearing arrangements.

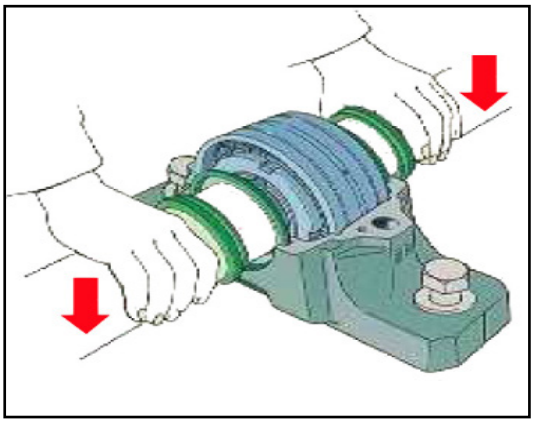


Figure 90

Carefully align the housing base. Vertical markings at the middle of the side faces and ends of the housing base can facilitate this. Then lightly tighten the attachment bolts.

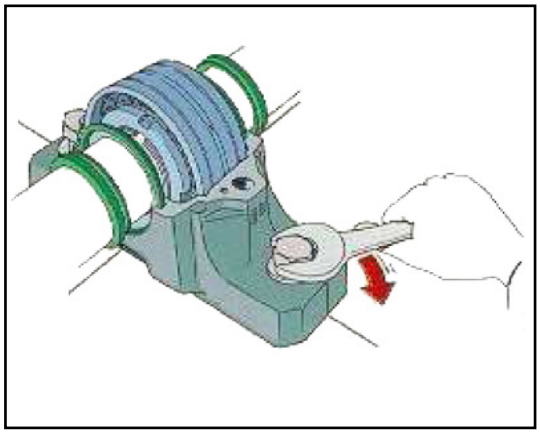


Figure 91

The housing cap should be placed over the base and the cap bolts (to join cap and base) tightened to the torque according to the torque table. The cap and base of one housing are not interchangeable with those of other housings.

The cap and base should be checked to see that they bear the same identification.

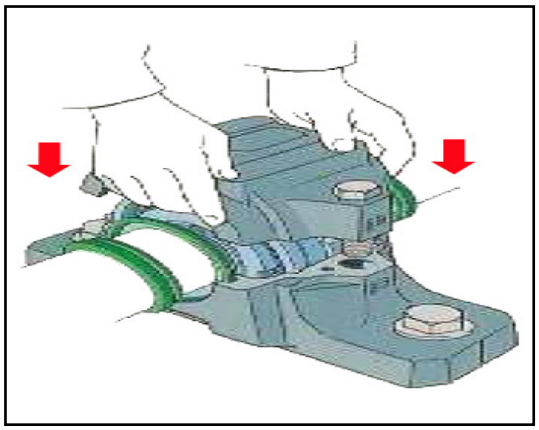


Figure 92

Check the alignment to minimise misalignment and fully tighten the attachment bolts in the housing base with help of a torque wrench.

Recommended tightening are given in the torque table.

Coat the V-rings counterfaces on the sealing washers with grease.

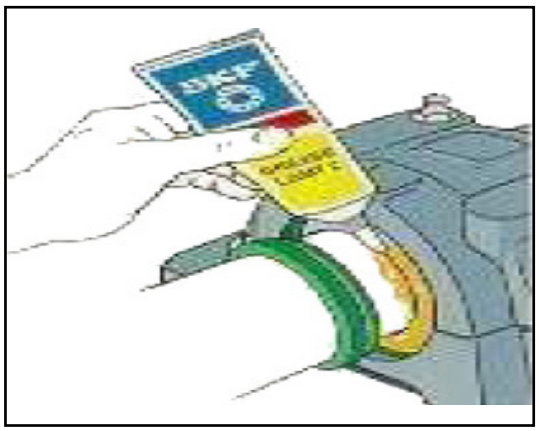


Figure 93

Finally, push the V-rings seal into their correct position.

This can be done using a screwdriver at the same time as the shaft is turned.

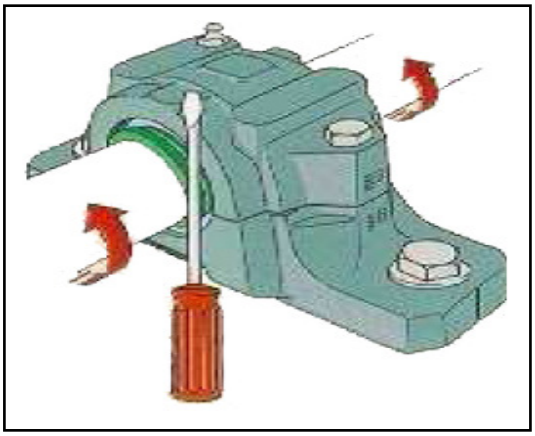


Figure 94

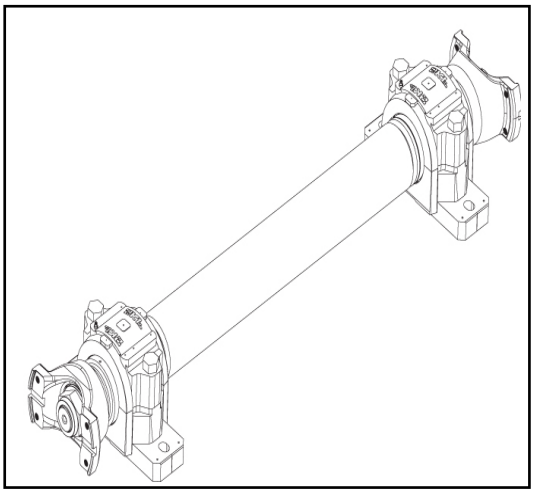


Figure 95

Front differential and transmission

Also see chapter 2.

Schematic view

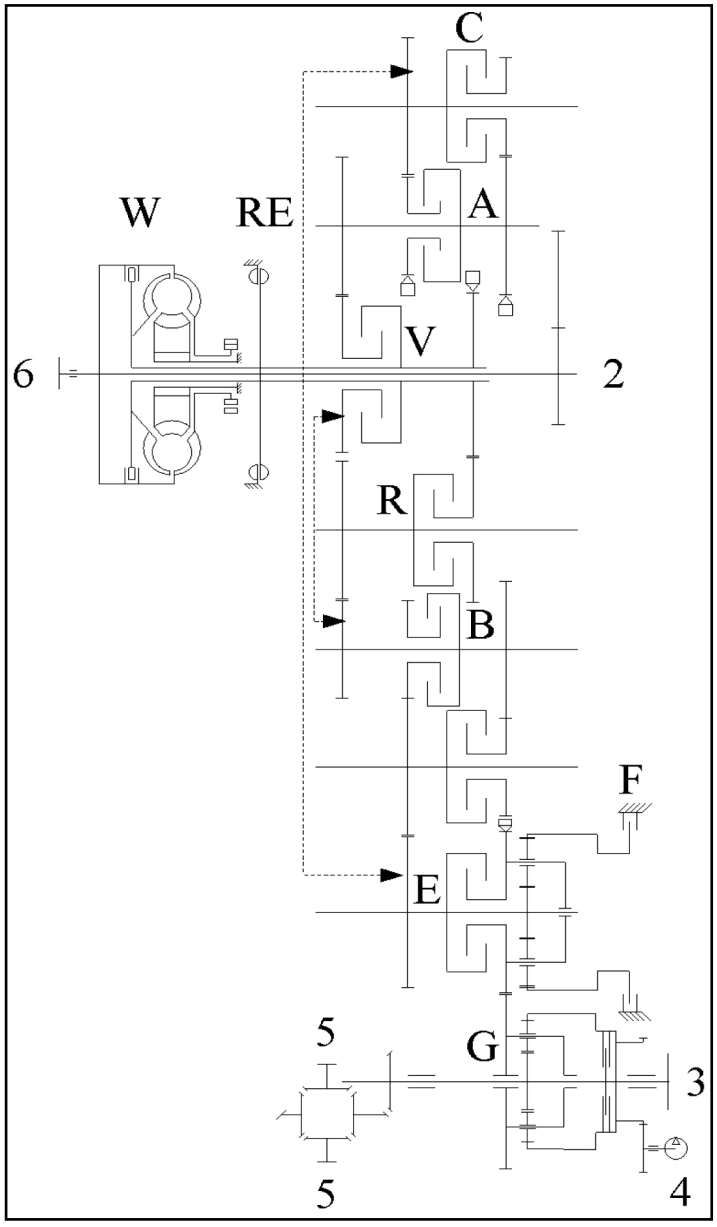


Figure 96

Legend of numbers:

2 = Engine - dependent PTO
3 = Output flange (rear axle)
4 = Emergency steering pump (option)
5 = Output flanges of LKV axle insert (front axle)
6 = Input flange

Legend of letters:

- W = converter with lock-up clutch
- RE = retarder
- Clutches = V/R/A/B/C/D/E (V=forward)
- Multi-disc brake = F
- Interaxle differential = G

FRONT DIFFERENTIAL

This differential has limited slip with 45% locking ratio. It automatically compensates for 1:2,64 grip difference between left and right front wheels. When the differential brake is activated, the drive wheel is forced to give a torque decided by the locking value.

The differential sketch is viewed from the top of the transmission

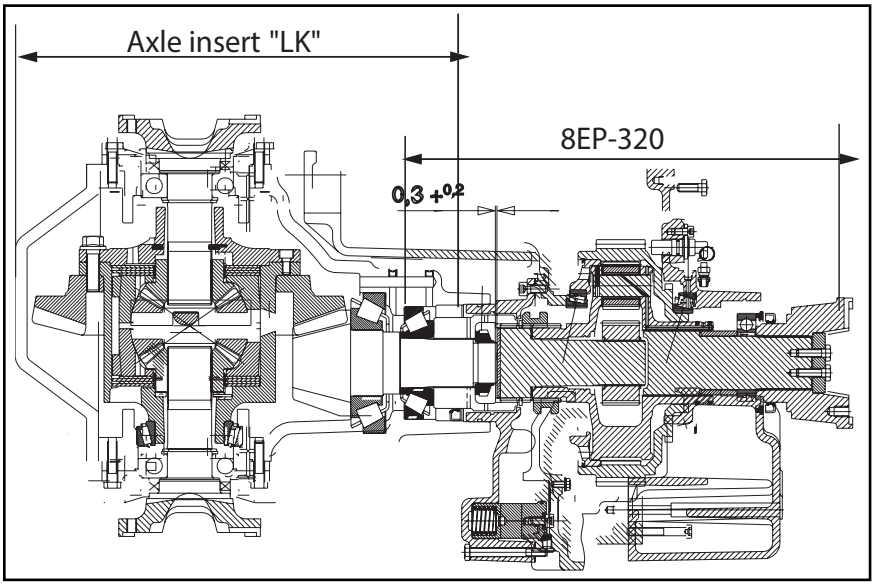


Figure 97

Brakes

Service brake

BRAKE FLUID PRESSURE

Check value in display
STANDARD VALUE:
Pump pressure (P1M): max: 280 - 286 bar
Accumulator pressure 1 (ACC1): max: 203 - 210 bar
Accumulator pressure 2 (ACC2): max: 203 - 210 bar
Accumulator pressure 3 (ACC3): max: 203 - 210 bar
Minimum charging at start for ACC1, ACC2 and ACC3: 185 - 195 bar
Break system pressure: Front break circuit 120 +/- 5 bar
Rear break circuit 120 +/- 5 bar

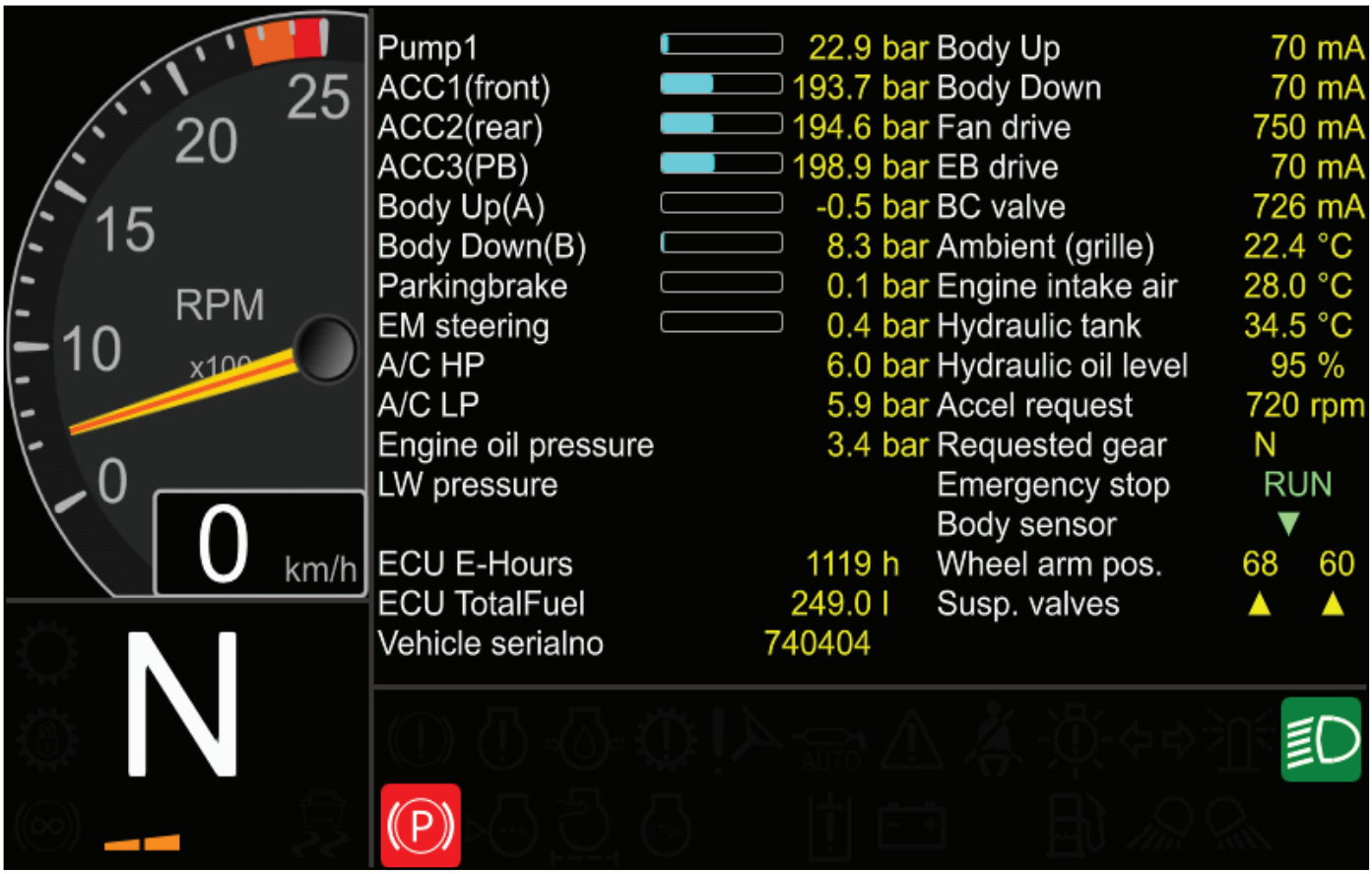


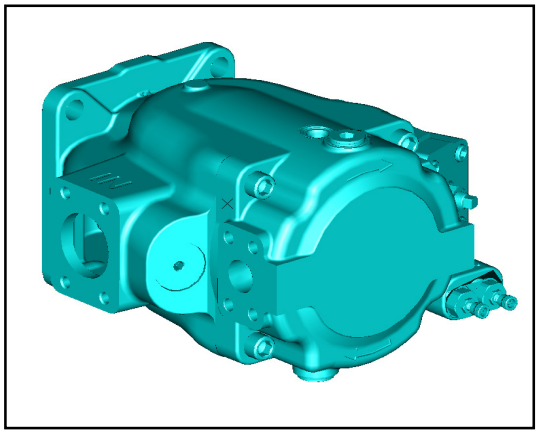
Figure 98

Service brake description

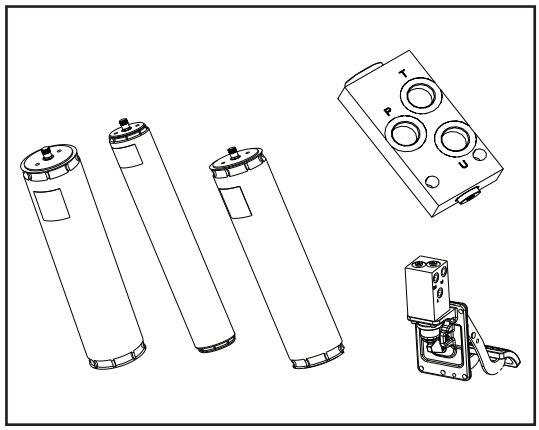
The service brake consist of:

- Hydraulic pump
- Accumulators
- Control valve
- Relay valves
- Brake pedal

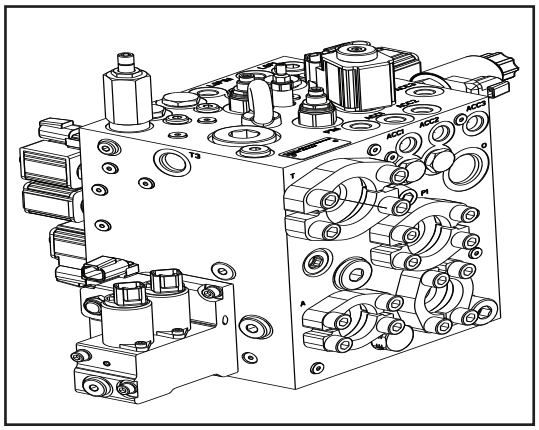
See the Shop Manual: Chapter 5



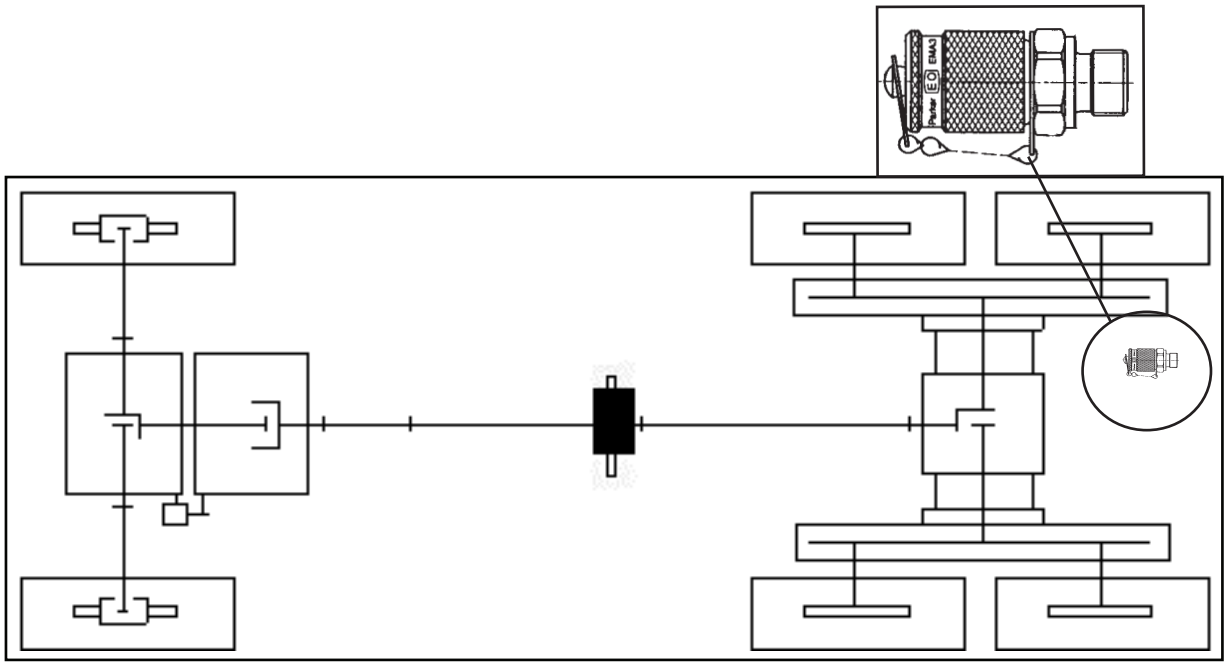
Pump
Figure 99



Accumulators, relay valve and brake pedal.
Figure 100



Control valve
Figure 101



Brakesystem sketch
Figure 102

Parking brake

Operation:

- The parking brake system is fed by a separate accumulator which is charged in the same way as the service brake system and by the same charge function (5,4,7,10).
- The parking brake pressure supply is isolated from back feeding the rest of the system by check valve (9).
- Since the parking brake has a separate accumulator, there is also a separate pressure sensor (port PB), monitoring the pressure in the accumulator which also triggers the charge function when pressure drops below a pre-set limit.
- Since the parking brake is supplied by the same brake charge pressure limitation valve (4) as the service brakes, the maximum supply pressure is the same 205 bar.
- For releasing the parking brake, a minimum pressure of 160 bar is required.
- Engagement and release of the parking brake is controlled by the operator via the parking brake switch in the cab.

Releasing the parking brake:

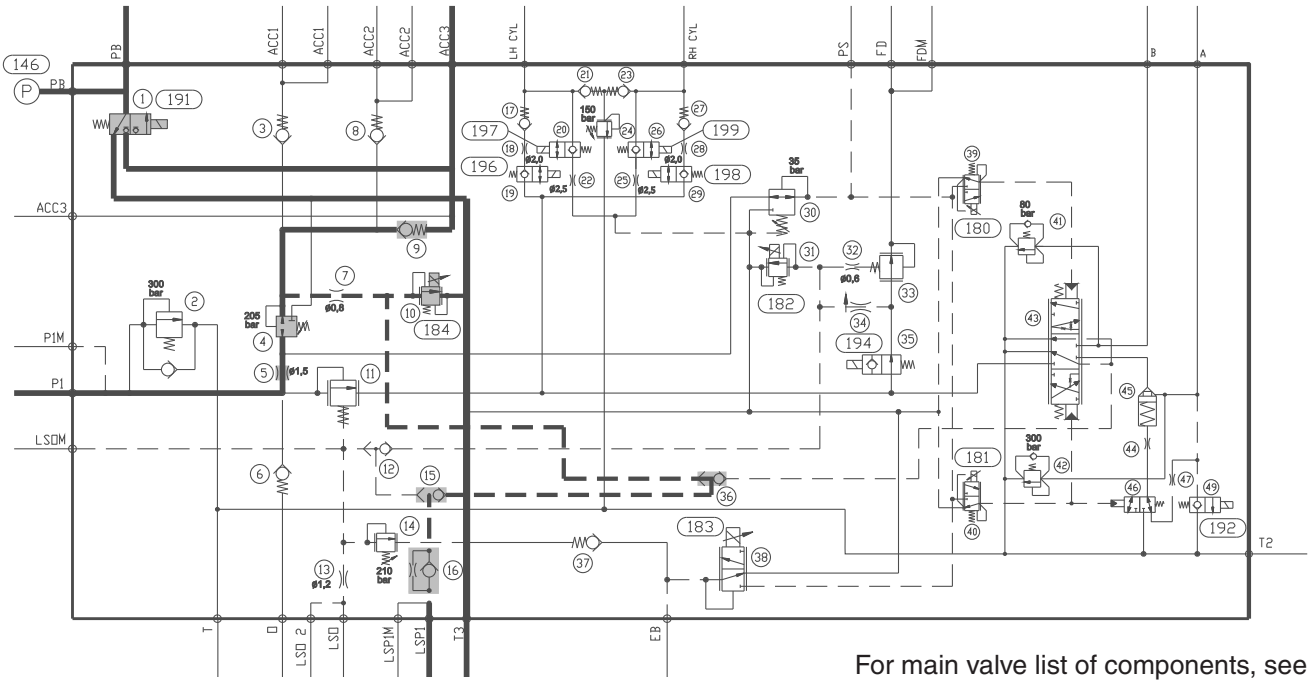
- When turning the parking brake switch - off, an electric output current supplied by the electronic controller, activates the parking brake release valve (1), a 3-way solenoid valve, which opens a connection between “ACC3” in the brake pressure supply, and port “PB” (Parking brake) for pressurising the parking brake cylinder which will counteract the cylinder spring force and release the parking brake.

Engaging the parking brake:

- When turning the parking brake - on, the electric output current for the parking brake release valve (1) is turned off. With no curren to the solenoid, the supply pressure connection will be shut off and the pressure in the parking brake cylinder will drain to tank. The praking brake cylinder return spring will then engage the parking brake.

NOTE

When the machine and the electrical system is turned off, the parking brake release valve will automatically be de-energised and the parking brake cylinder drained to tank while the return spring in the parking brake cylinder will engage the parking brake.



For main valve list of components, see chapter 5

Figure 103

Troubleshooting the park brake

Conditions:	Possible Cause(s):	What to Check :	Corrections:
À Chamber exceeds two-inch maximum stroke requirement	Incorrect initial adjustment or inoperative automatic adjuster	Check the chamber stroke after 20 brake applications.	If the air chamber still overstrokes, replace the caliper/saddle assembly. Refer to Sections 3 and 4 .
Á Brake drag	Incorrect lining-to-rotor clearance	Minimum stroke 7/8-inch (22 mm)	Replace the caliper/saddle assembly.
	Incorrect initial adjustment		Adjust the rotor to pad clearance. Refer to Section 4.
	Vehicle brake release pressure malfunction	Correct operation of the quick release valve	Repair or replace parts as required.
Â Short outboard brake pad lining life	Caliper seized or sticking on slide pins	Damaged slide-pin seals Caliper should move back and forth by hand with linings removed	Replace the caliper/saddle assembly.
Ã Short lining life	Refer to conditions Á and Â.	Refer to conditions Á and Â.	Refer to conditions Á and Â.
	Rotor surface	Cracks or heavy heat checking. Refer to Section 5.	Refer to Section 5 for disc inspection.
Ä Brake smoking	High brake temperature	Refer to conditions Á, Â and Ã.	Refer to conditions Á, Â and Ã.
	Grease, oil, etc., on the linings	Grease, oil, etc., on the linings	Check for oil leaks in the brake area. Repair as required. Clean the rotor and caliper assembly. Replace the linings. Refer to Sections 3 and 4.
Å Poor stopping power •• Long stopping distances •• Poor driver feel •• Lack of normal response	Vehicle brake release pressure malfunction	Correct operation of the quick-release valve	Have the system evaluated by a qualified brake system specialist.
	Brakes out of adjustment	Stroke exceeds two-inch requirement	Refer to condition À.
	Vehicle overload	Refer to the GAWR limitations on the vehicle I.D. plate.	Observe the vehicle manufacturer's load recommendations.
	Lining contamination	Grease, oil, etc., on the linings	Inspect for oil leaks in the brake area. Repair as required. Clean the rotor and caliper assembly. Replace the linings. Refer to Sections 3 and 4.

Torque Specification

Component	Torque
Mounting Bolts	400-500 lb-ft (544-680 N •m)
Chamber Nuts • Air Release Brakes • Hydraulic Release Brakes	 135-155 lb-ft (180-210 N •m) 30-40 lb-ft (41-54 N •m)
Adjustment Plug	8-12 lb-ft (11-17 N •m)

Brake disc runout

Use a dial indicator to measure the runout.

Detail A: shows the measurement of the brake disc's upward and downward movement in the Y-direction.

Detail B: shows the measurement of the brake disc's deviation from it's axial plane viewed from the front edge of the disc. This off-center deviation is called axial or lateral runout.

A: Upward and downward movement of the disc (Y-direction): Max 0.40 mm

B: Axial/lateral runout: Max 0.30 mm

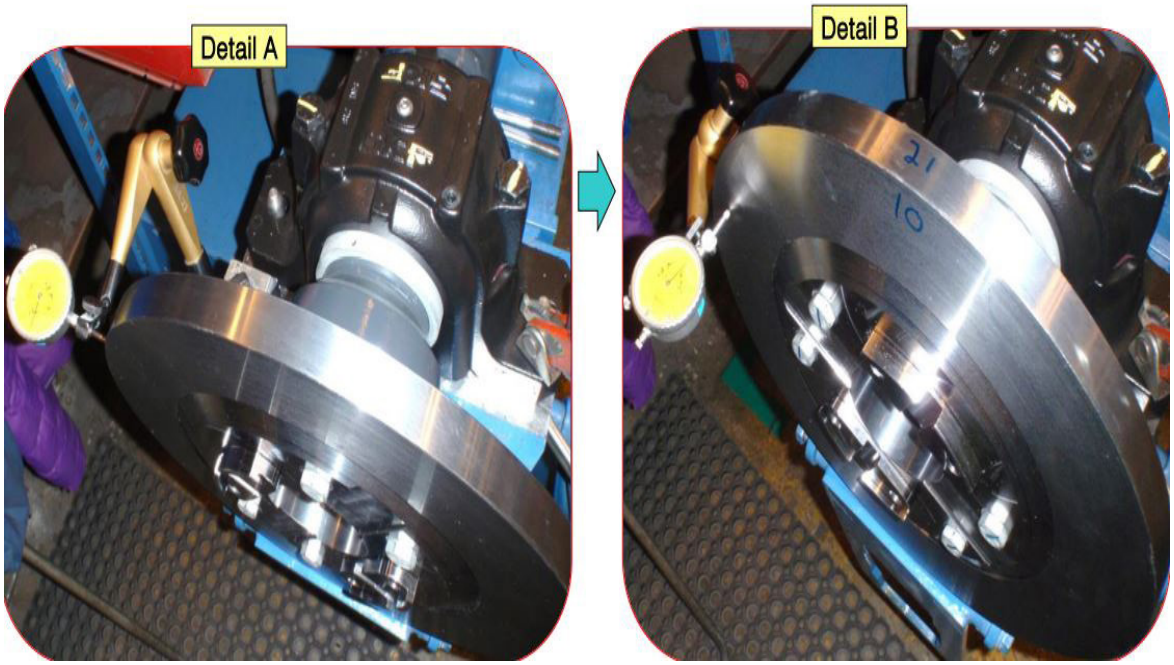


Figure 104

Testing of parking brake

1. Stop the machine on a level ground.
2. Charge brakes to specified pressure.
3. Warm up engine to 70°C, transmission oil to 80 - 95°C and hydraulic fluid to 40 - 70°C.
4. Apply parking brake.
5. Manually select 1st gear, by using the gearshift lever.
6. Slowly increase engine speed to 1300 rpm. If the truck starts to move at 1300 rpm or below, adjust the parking brake.

The park brake is able to keep a fully loaded truck parked at a inclination 25% (14°) when correctly adjusted.

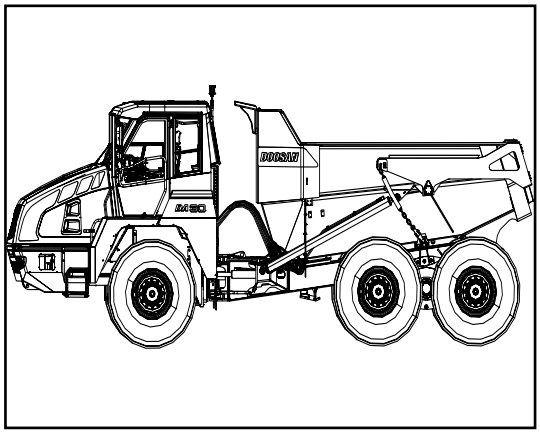


Figure 105

NOTE

Over-adjustment may result in dragging of the brake.

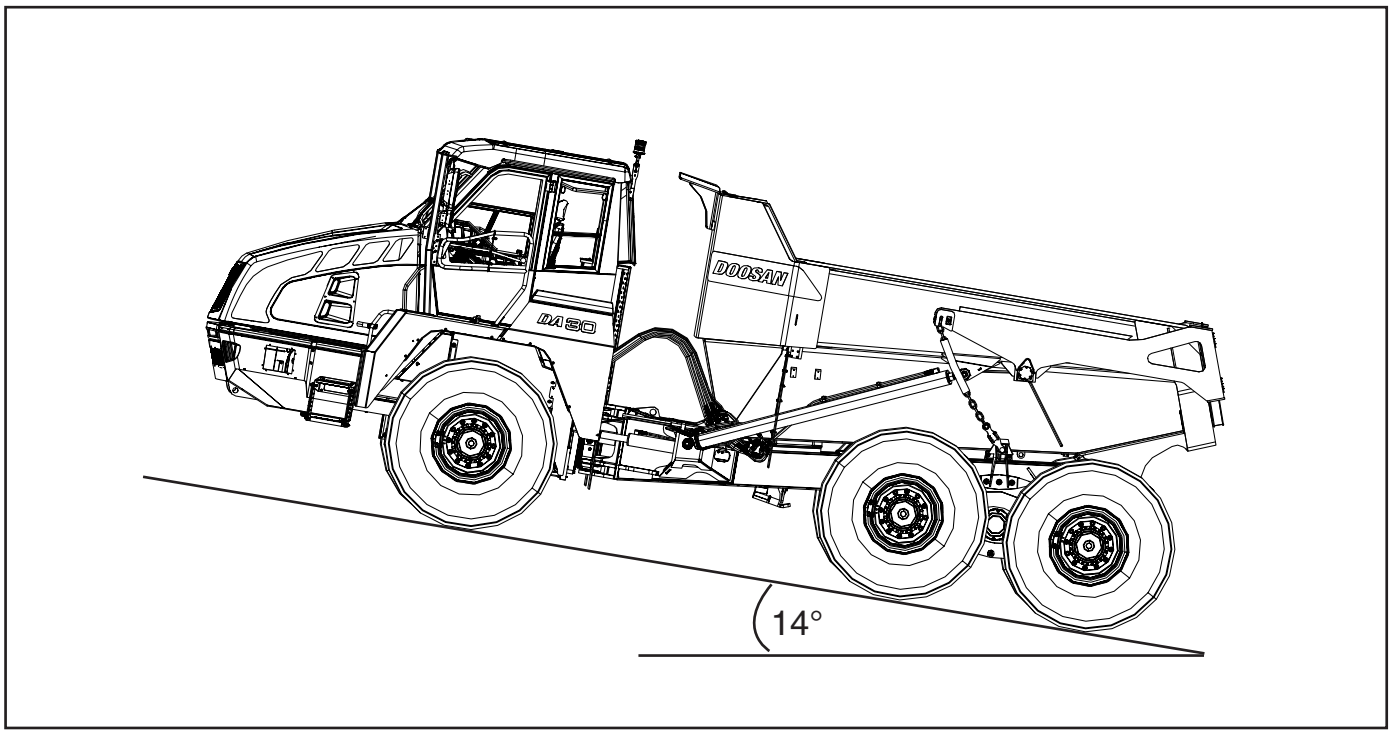


Figure 106

Removal of the linings

WARNING

To prevent serious eye injury, always use eye protection when you perform vehicle maintenance or service. Do not work under a vehicle supported only by jacks. Jacks can slip or fall over and cause serious personal injury. Support the vehicle with safety stands.

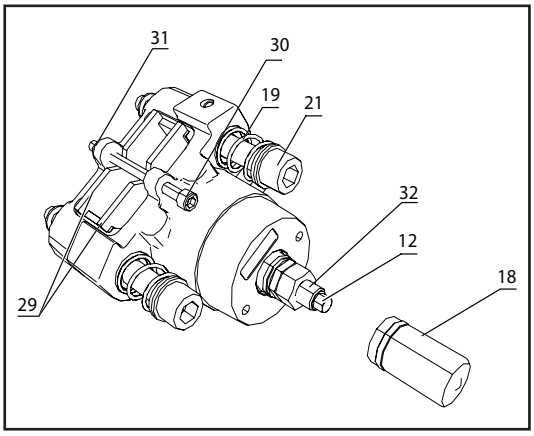


Figure 107

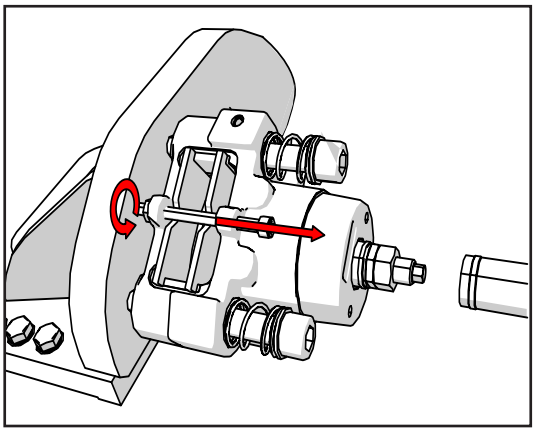


Figure 108

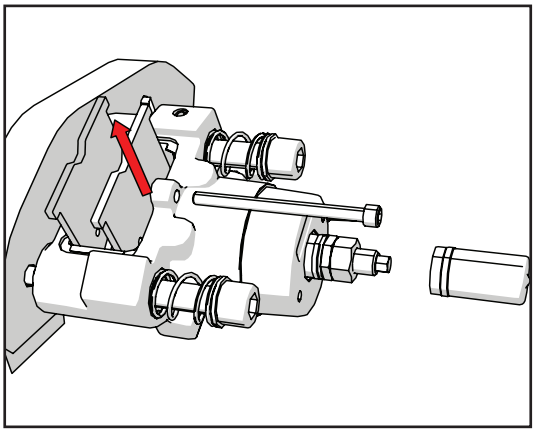


Figure 109

1. Make sure that the accumulators are charged with pressure. During operation, engine can be started to accumulate pressure.
2. Apply the parking brake.
3. Lift the body.
4. Apply the body support (see safety instructions, O&MM chapter 2).
5. Stop the engine.
6. Secure the dump truck with wheel chocks (see safety in structions, O&MM chapter 2).
7. Release the parking brake by the parking brake switch.
8. Loosen hex nut (item 31) and remove the screw (item 30).
9. Remove the cap (item 18) hold 30mm hex nut with a wrench and rotate the screw adjustment (item 12) counter clockwise, using the a M12 socket until reaching the proper space for the placing the new braking pads.
   (HA30 has single breaking pads while the HA45 has pairs.)

• After installation of new parking brake linings, do as follows:

1. Screw adjustment (item 12) clockwise, using the a M12 socket until both brake pads contact the disc and the lining (item 29 qty 2) are no longer loose. Do not exceed 13.6 Nm on the screw adjustment.
2. Rotate (back off) screw adjustment (item 12) counterclockwise (approx. 1/2 turn) to create a total gap (sum of both sides) of 0.72mm.
3. Confirm disc to brake pad clearance. The clearance should be on two sides of disc 2x 0.36.
4. With the hex nut (item 31) loose, adjust the long screw (item 30) until it needed clearance is reached (20mm from bracket).

5. Using a 0.36mm thick feeler gauge in the gap between the brake pad and the disc, adjust the long screw (item 30) until the feeler is slightly tight in the gap.

6. Torque the hex nut (item 31) to 40-47.5 Nm while preventing rotation of the screw (item 30).

7. Release hydraulic pressure and reapply. Using feeler gauge, check clearance on each side of disc. Clearance should be 0.25 - 0.46mm per side. If clearances are not within specifications , repeat steps 1-7.

8. While holding the screw adjustment (item 12) with M12 socket, torque hex nut (item 32) to 54-66 Nm.

9. Replace the cap (item 18).

10. Re-adjust the brake when running clearance reaches a total 2.82 mm.

11. Inspect the disc for wear and damage.

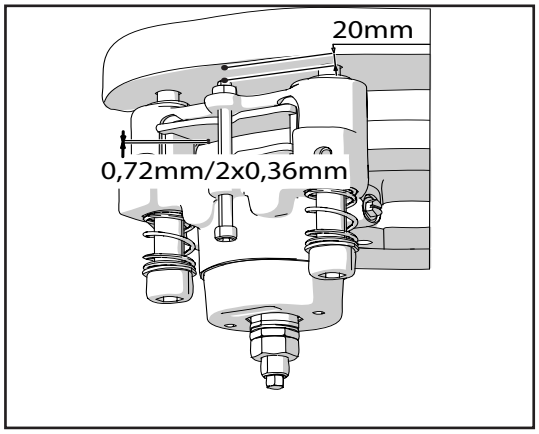


Figure 110

Removal of the park brake unit from dump truck

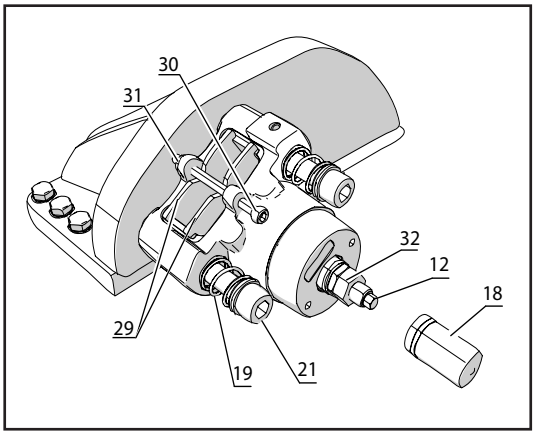


Figure 111

1. Secure the dump truck with wheel chocks so that it will not move as the parking brake is disengaged.

2. Raise the body and secure it with the body support (see safety instructions, O&MM chapter 2).

3. With pressure applied , remove the cap (item 18), then loosen hex nut (item 32) and screw adjustment (item 12) until the end of the piston (item 11) that contacts the front lining carrier is flush with the exposed end of the piston (item 9).

4. Release hydraulic pressure from the brake

NOTE

With engine NO running, release ON and OFF the park brake to the accumulator is empty.

5. Disassemble the oil hose connector from the brake unit and plug the brake line and use plastic plug threaded (item 24).

6. Rotate (item 21) (qty - 2) counter-clockwise until all threads are free from parking brake support bracket.

7. The brake assembly is now released.

8. Unfasten the bracket for parking brake.

   Screw M16x50 ISO4017-10.9 EL

   Lock washer M16 (Nord-lock)

   Assembly torque: 279 Nm

Disassembly of the park brake unit.

1. Use spanner wrench to remove cap-machined (item 16). The spring disc (item 14) will be accessible when the cap machined (item 16) is removed (Figure 112).

2. Press the piston (item 9 and 11) out of the torque plate machined (item1 from the lining & carrier assembly (item 29) side.

3. Remove piston assy (item 11) from piston (item 9) by pressing through the threaded hole

CAUTION

Only remove the cap-machined (item 16) if the brake is not pressurized and the screw-adjustment (item 12) is backed off until there is no load on the spring disc (item 14) (qty-10)

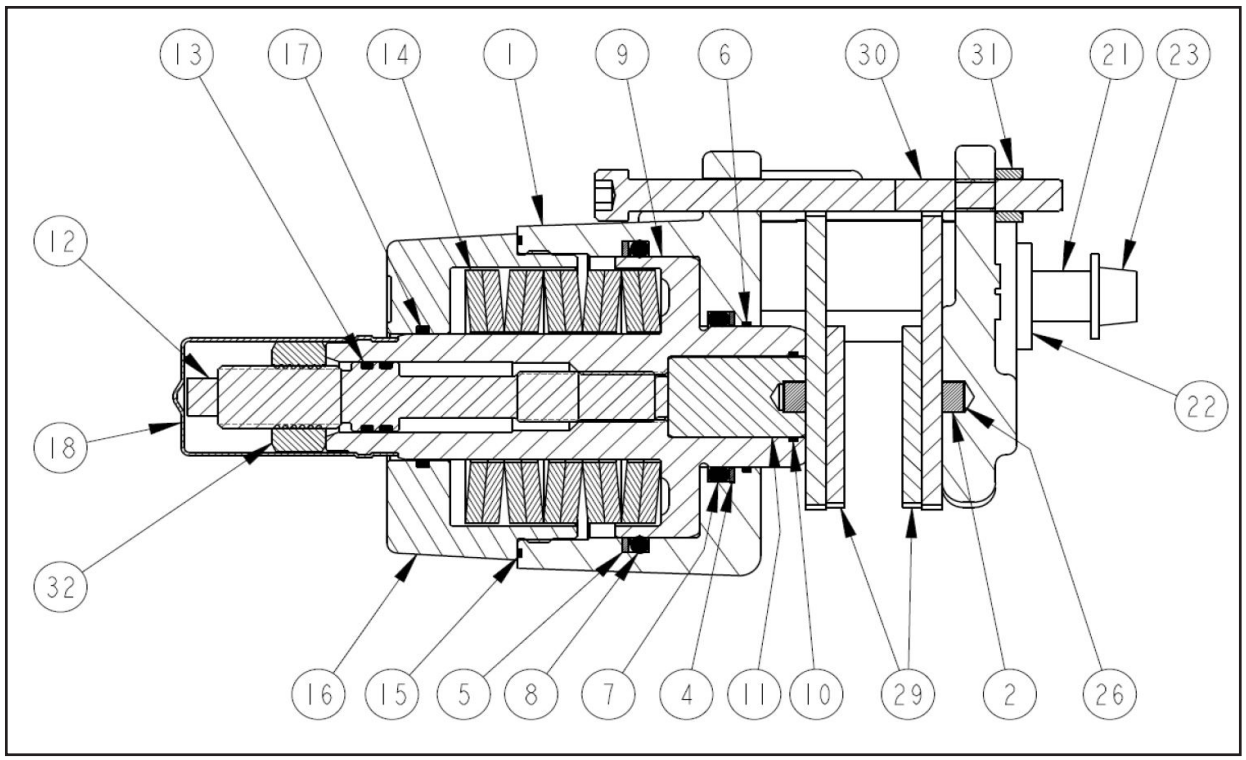


Figure 112

NOTE

New seals must be installed whenever the brake is disassembled.

Assembly of the park brake unit

1. Clean all metal parts prior to assembly.

2. Blow excess cleaning solution off of all parts and out of all fluid passages.

3. Apply a thin coat of mineral oil base fluid (suggested product : UCON LB285or hydraulic fluid, to the new seal O-rings (items 3, 6, 7, 8, 10, 15, and 17).

4. Install seal O-ring (item 10) in seal groove of piston (item 9).

5. Slide the piston assy (item 11) into the bore located in the piston (item 9) until it is flush with the bottom of the piston (item 9).

6. Install seal O-ring (item 6) in the small bore of the torque plate, machined SA10 (item 1).

7. Install seal O-ring (item 7) and back-up ring (item 4) in the other groove located in the small bore of the torque plate, machined, SA10 (item 1) in the order shown in (Figure 112).

8. Install seal O-ring (item 8) and back-up (item 5) in the larger groove of torque plate, machined , SA10 (item 1). Install in the order shown in (Figure 112).

9. Install assembled piston & piston assy (item 1 & 11) into torque plate, machined, SA10 (item 1).

10. Inspect all spring discs (item 14) for cracks and if necessary replace them with new set of ten spring discs (item 14). Stack the discs into the piston (item 9) in a alternating cupped face to cupped face (series) orientation per (Figure 112).

11. Install seal O-ring (item 17) into the internal groove on cap-machined (item 16) as shown in (Figure 112).

12. Install seal O-ring (item 15) on the end of the torque plate machined (item 1) as shown in (Figure 112)

13. Thread the cap-machined (item 16) into the torque plate (item 1) until it bottoms out on the front face and torque to 81.3 - 108.5 Nm.

14. Install both seal O-ring (item 13) into the grooves of screw-adjustment (item 12)

15. Thread screw-adjustment (item 12) into piston (item 9) until both O-ring seals are inside the bore of the piston. But not so far that the piston assy (item 11) protrudes out past the nose of piston (item 9)

16. Install cap (item 18) see (Figure 112)

17. Install seal O-ring (item 3) in grooves in the mounting bolt counter-bores of the torque plate (item 1) see (Figure 113)

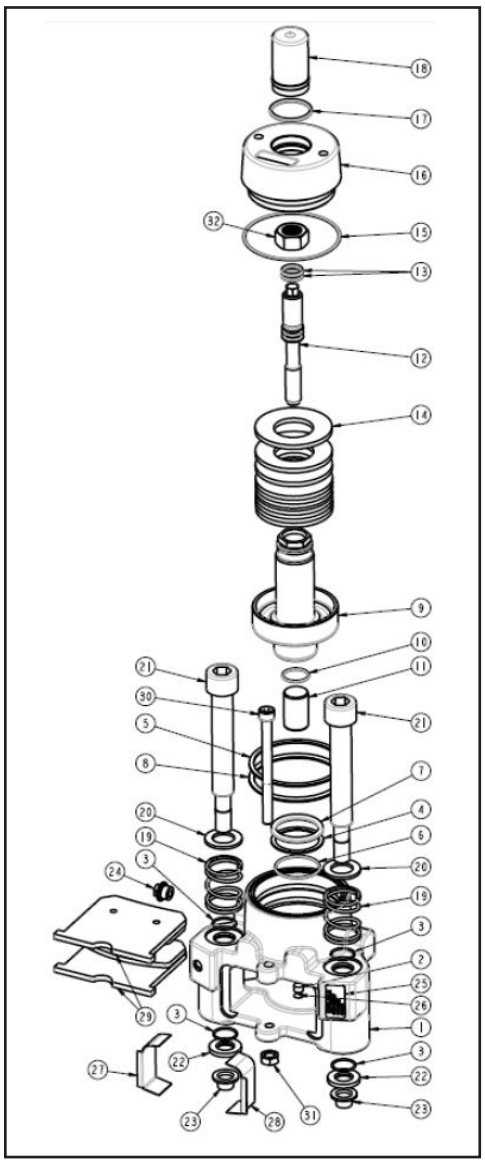


Figure 113

Assembly of the park brake

1. Mount parking brake bracket to rear frame. Use oil on screws and first hand tighten all the screws, then tighten a little more the two forward screws. (Not fully tighten until disc and bracket are aligned).

2. Use distance tool for parking brake bracket to get correct position, one on each side. When alignement is good, tighten screw's, torque 279Nm (oil).

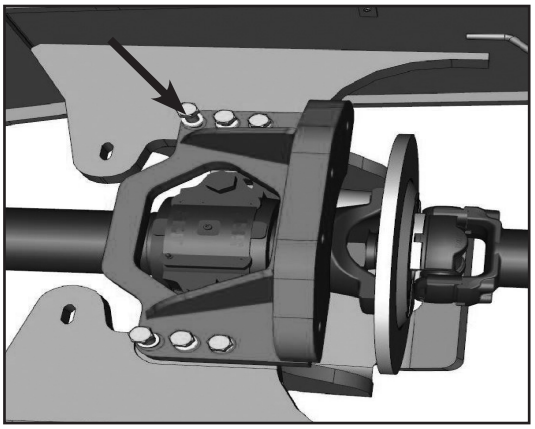


Figure 114

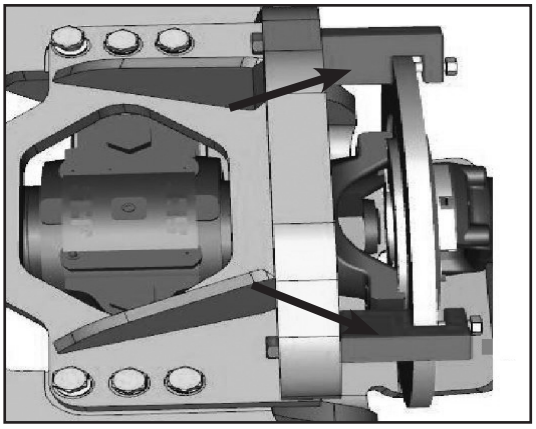


Figure 115

3. Make sure that the centering screw (item 30) does not touch the mounting surface of the bracket when tightening the mounting screws (item 21) with torque 420 Nm. Parts need to be installed with dry threads (no thread locking compound).

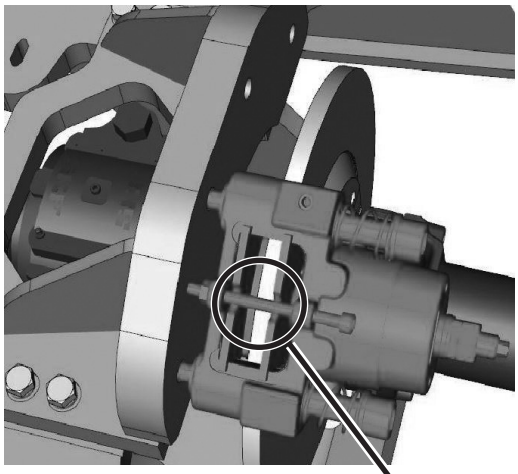


Figure 116

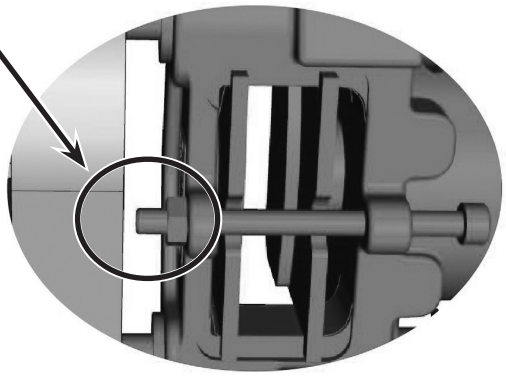


Figure 117

4. Check height clearance between disc and brake caliper.

5. After control mount all hydraulics connectors and the brake line.

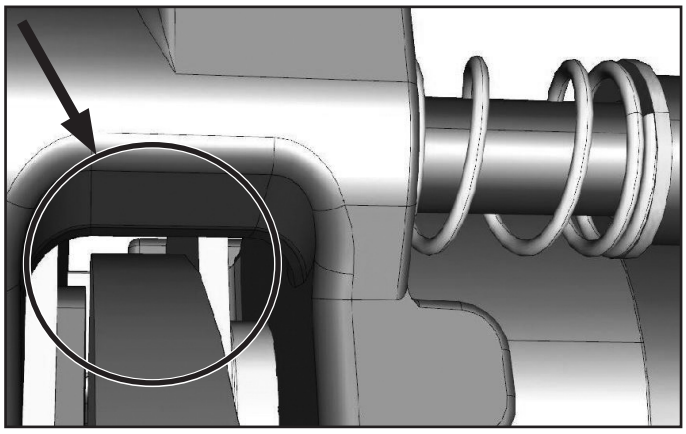


Figure 118

6. Mount connectors.

Torque Pos.1 34 Nm

Torque Pos.2 ¼ turn

Torque Pos.3 ¼ turn

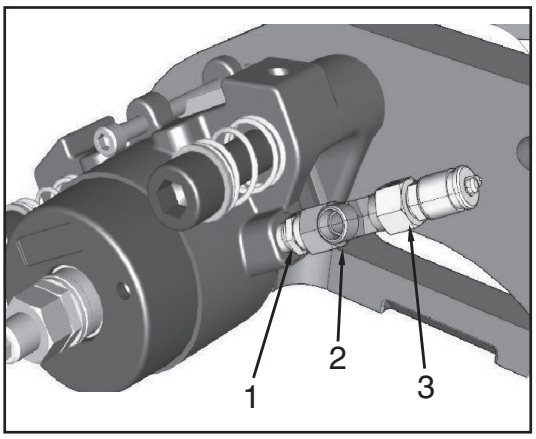


Figure 119

Adjustment of the initial caliper clearance

1. Start the engine and tilt up the body to safety support position.
2. Turn off parking brake to apply hydraulic pressure to brake and wait until PB-accumulator has reached a pressure of 186 - 207 bar.
3. Secure the dump truck with wheel chocks (see safety instructions, O&MM chapter 2).
4. Remove hose clamp [2] and protection cap [1].
5. Check for clearance between centering screw (item 30) and brake bracket.
6. Loosen Nut (item 31), rotate adjustment screw (item 12) until both brake pads contact the disc and the “lining & carrier” ass’y are no longer loose (max. 13.6Nm).
7. Rotate adjustment screw counter clockwise (approx. 1/2turn) to create a total gap of 0,72mm (sum of both sides).
8. While holding screw adjustment (item 12) with M12 socket, torque hex nut (item 32) to 54 - 66 Nm.
9. Confirm disc to brake pad clearance, the clearance should be 2x 0.36mm on both sides of the disc.
10. With the hex nut (item 31) loose, adjust the centering screw (30) until it contacts the brake bracket.
11. Use a 0,36mm feeler gauge in the gap between the brake pad and the disc, adjust until the feeler gap is slightly tight in the gap (at the tightest point).
12. Torque the hex nut (item 31) to 40 - 47,5 Nm, while preventing rotation of the centering screw (item 30).
13. Clearance on each side of the disc should be approx. equal 0,36mm.
14. With engine idle, turn on and off parking brake 20 times and wait until accumulator is charged (make sure to keep pressure, 186 - 207 bar while turning on/off and when checking clearance).
15. Check clearance on each side of disc, should be between 0,25 - 0,46mm per side. (Through and through)
16. Put on protection cap [1] and mount hose clamp [2].

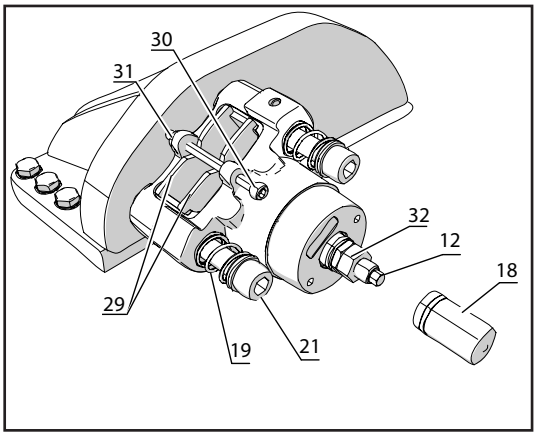


Figure 120

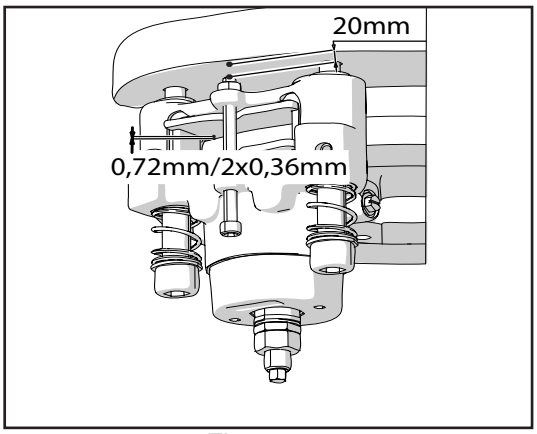


Figure 121

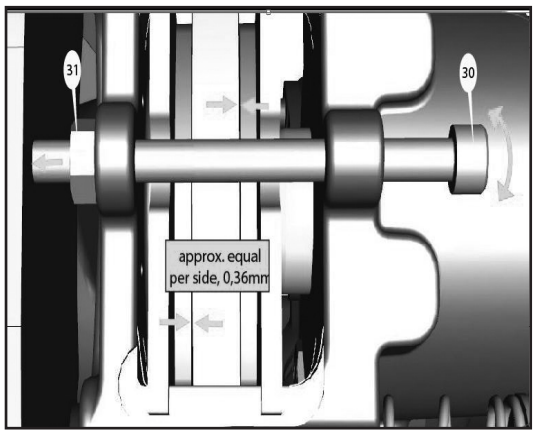


Figure 122

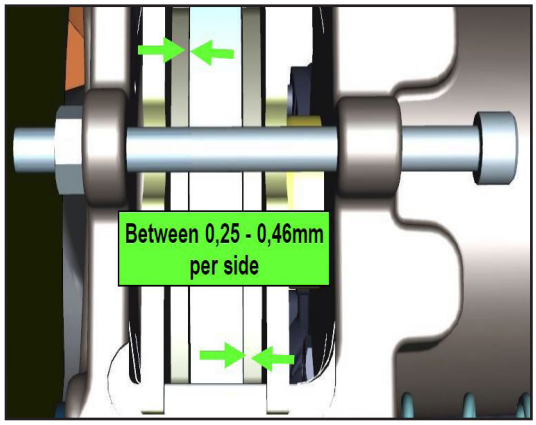


Figure 123

Inspect the Brake Components

WARNING

Use Hyundai parts only. Do not use parts manufactured by other suppliers. Use of non-Hyundai parts can cause damage, loss of braking and serious personal injury.

Lining Thickness

Lining material thickness must not be less than 0.200-inch (5.1 mm). Replace the linings before the lining material thickness reaches this specification.

Anti-Rattle Springs

1. Anti-rattle springs are attached to the linings.
   Inspect for bent, cracked or broken springs.

2. If you find damaged springs, replace both springs.

Seals

Replace the caliper if you find cracked, torn or damaged seals.

CAUTION

Install only the specified components when you service the caliper. Do not mix components from other calipers. Installing non-specified components can cause the caliper to operate incorrectly and can cause equipment damage.

Caliper

1. The caliper should slide freely on the slide pins. Slide the caliper back and forth to check for clearance between the disc and pad.

2. Check that the linings slide freely in the caliper.

3. If components are worn enough to restrict free movement of the caliper or linings, replace the caliper.

Disc

WARNING

You must always replace a damaged disc.

1. When you inspect the brakes, inspect both sides and the outer diameter of the disc for the following conditions:

   - Cracks
   - Heat checking
   - Grooves or scoring
   - Blue marks or bands

2. When you reline the brakes, you must measure the thickness of the disc.

Cracks
When a crack extends deep into a section of the disc, replace the disc.
See (Figure 124).

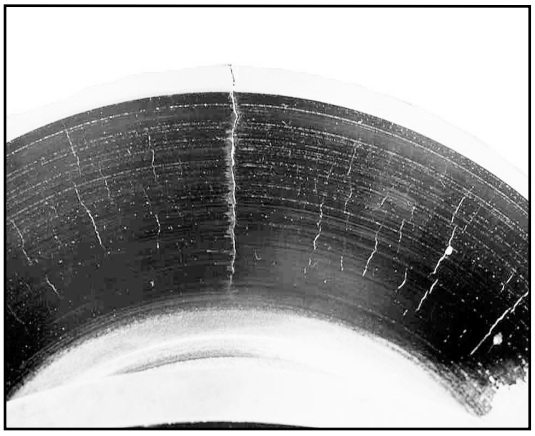


Figure 124

Heat checking
Heat checks are cracks in the surface of the disc caused by heat. Heat checking can be light or heavy.

Light heat checking
Light heat checking is very fine, tight, small cracks. Light heat checking is normal.
You can continue to use a disc with light heat checking.

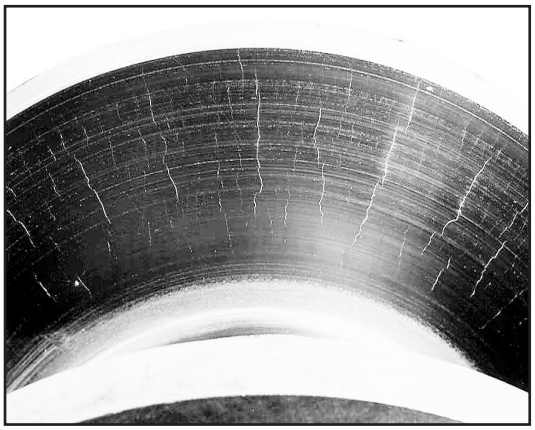


Figure 125

Heavy heat checking
Heavy heat checking is surface cracks with width and depth.
See (Figure 125).
If you find heavy heat checking,
always replace the disc.

Deep grooves or scores
Check both sides of the disc for deep grooves or scores. If the grooves or scores are not too deep, you can continue to use the disc. See (Figure 126).

Figure 126

Blue marks or bands
Blue marks or bands indicate that the disc was very hot.
If blue marks or bands are present, refer to Section 6 to find and correct the cause of the problem.
See (Figure 127).

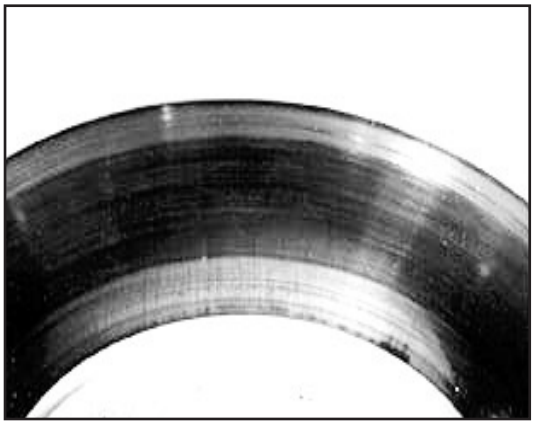
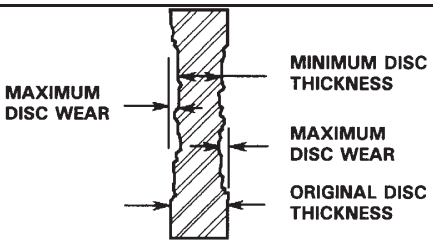


Figure 127

Measure disc thickness

Measure the thickness of the disc when you reline the brakes.
The disc must be at least 0.59-inches (15.0 mm).
See (Figure 128).
If the disc thickness is outside specification, replace the disc.



Typical section through disc showing recomended maximum wear limits.

ORIGINAL DISC THICKNESS	MAXIMUM DISC WEAR	MINIMUM DISC THICKNESS
0.62-inch (16.0 mm)	0.067-inch (0.5 mm)	0.59-inch (15.0 mm)

Figure 128

Caliper assembly

The caliper and saddle assembly are not serviceable.
Replace the brake assembly when a caliper is worn or damaged.

Cleaning

WARNING

To prevent serious eye injury, always wear eye protection when you perform vehicle maintenance or service.
Solvent cleaners can be flammable, poisonous and cause burns.
Examples of solvent cleaners are carbon tetrachloride, emulsion-type cleaners and petroleum-based cleaners.
To avoid serious personal injury when you use solvent cleaners, you must carefully follow the manufacturer's product instructions and these procedures:

- **Wear safe eye protection.**
- **Wear clothing that protects your skin.**
- **Work in a well-ventilated area.**
- **Do not use gasoline or solvents that contain gasoline. Gasoline can explode.**
- **You must use hot solution tanks or alkaline solutions correctly. Follow the instructions carefully.**

Cleaning ground or polished metal parts

- Use a cleaning solvent to clean ground or polished parts or surfaces. Kerosene or diesel fuel oil can be used for this purpose.
  NEVER USE GASOLINE.
- Be careful not to damage ground surfaces.
- **DO NOT** clean ground or polished parts in a hot solution tank, water, steam or alkaline solution.

Cleaning metal parts with rough finishes

- Parts with a rough finish can be cleaned with cleaning solvent or in a hot solution tank with a weak alkaline solution.
- Parts must remain in hot solution tanks until completely cleaned and heated.
- Parts must be washed with water until the alkaline solution is removed
- Use a wire brush to clean the threads of fasteners and fittings.

Cleaning non-metal parts

- Use soap and water to clean non-metal parts.
- Scrape away build-ups of mud and dirt on the linings. Replace all linings contaminated with oil or grease.

Drying cleaned parts

- Dry the parts immediately after cleaning and washing.
- Dry the parts with soft clean paper or rags.

Corrosion protection

Apply rust inhibiting fluid to the cleaned and dried parts that are not damaged and are to be immediately assembled. Do NOT apply fluid to the brake linings or the disc.
If you plan to store the brake parts, apply a special corrosion preventative material to all surfaces. Do NOT apply this material to brake linings or the disc.
Store the parts inside special paper or other material that prevents corrosion.

Lining wear measurement of wet multiple disk brake

WARNING

When work is being performed on the brake, its braking effect is disabled.
Rolling away of the vehicle.
- **Make sure that no machine movement can take place.**

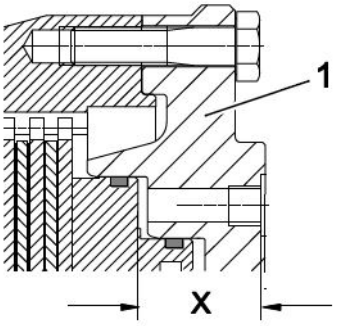
CAUTION

Hot brakes and hot cooling oil.
Burns.
- **The amount of wear rate may be measured only when the vehicle is cold.**

Checking the wear rate by comparing the imprinted value (measurement with new discs) and the value to be measured (measurement with used brake).

The reference dimension (measurement with new discs) is imprinted below the wear inspection hole.

Take contact with Hyundai service for instructions,



1. Brake Carrier

Figure 129

Rear differential

Overview of parts

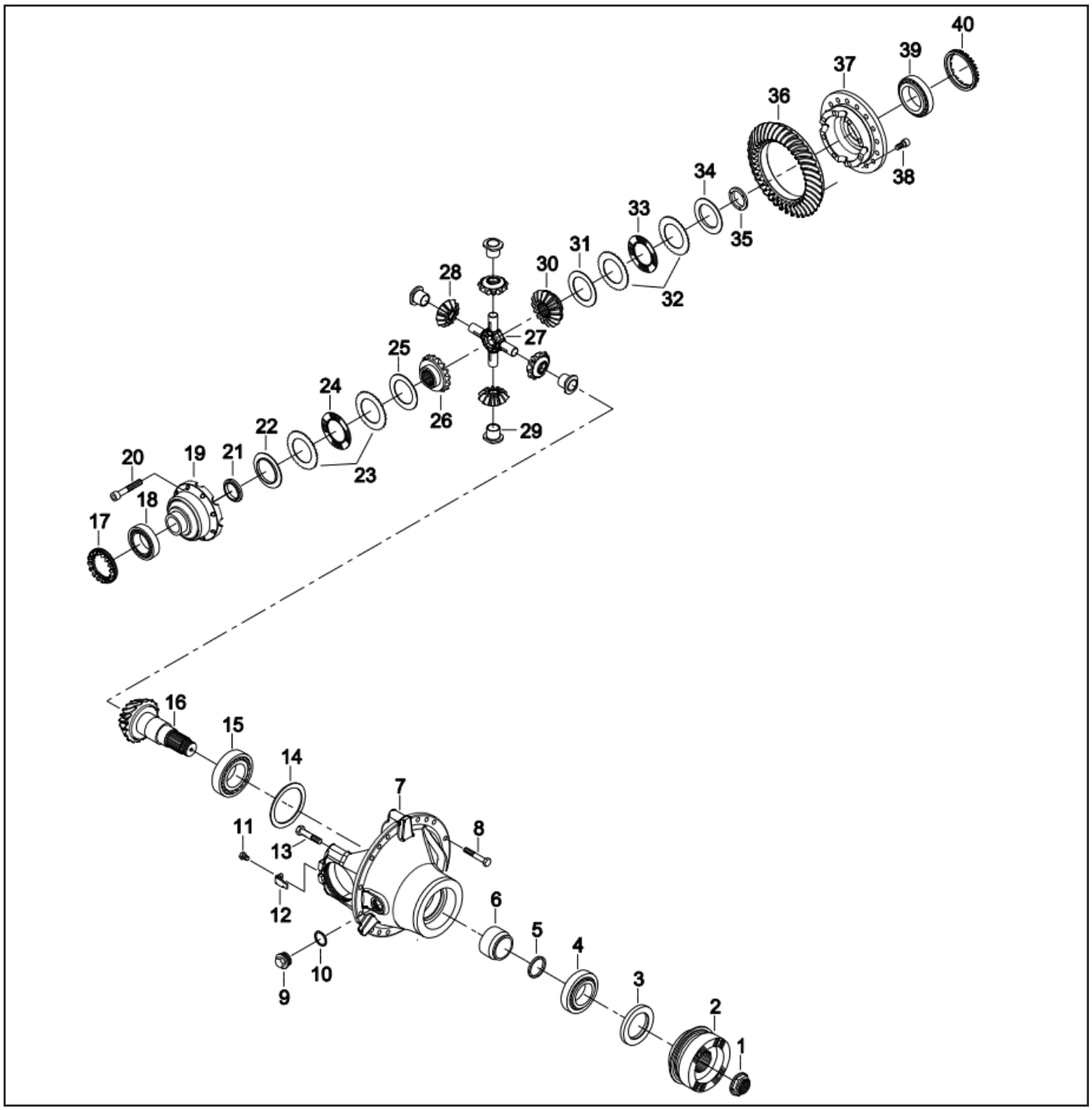


Figure 130

See the HA30 parts catalogue for parts lists.

Exchange of the complete rear differential

Safety precautions.

WARNING

Connect the articulation lock to front frame.

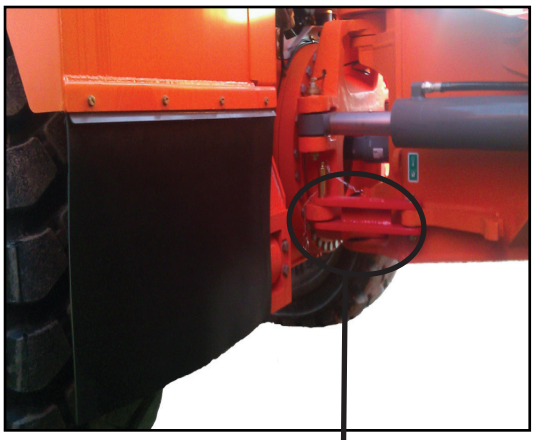


Figure 131

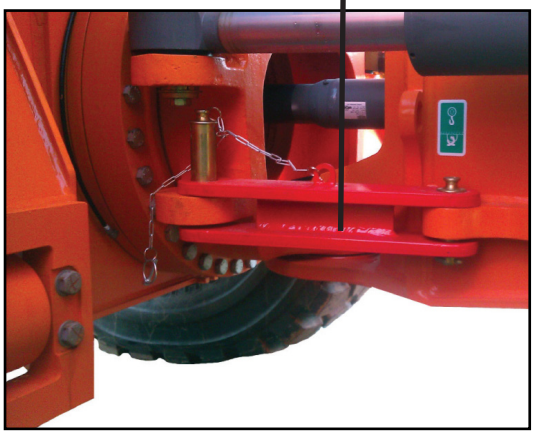


Figure 132

CAUTION

Be aware of personal injury.

WARNING

Secure the machine with wheel chocks on the front wheel.

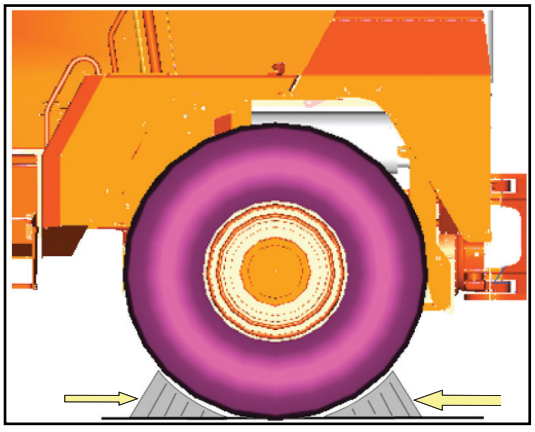


Figure 133

Disassembly

Disassemble the Brake hoses in the T- coupling, for each side of the axle housing.

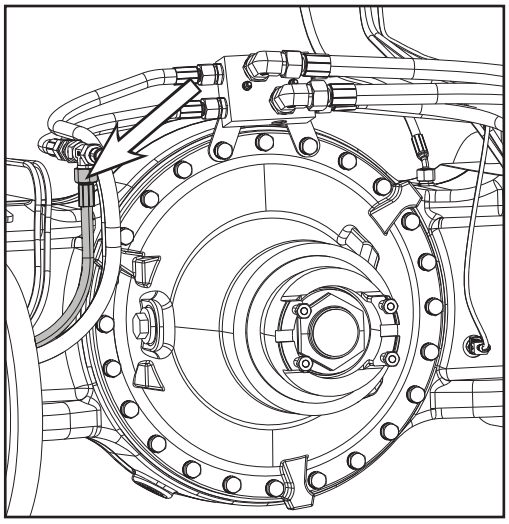


Figure 134

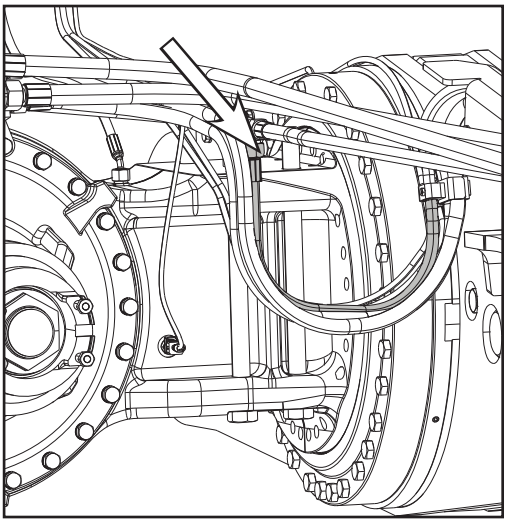


Figure 135

Disassemble the hose clamp from the cooling block bracket.

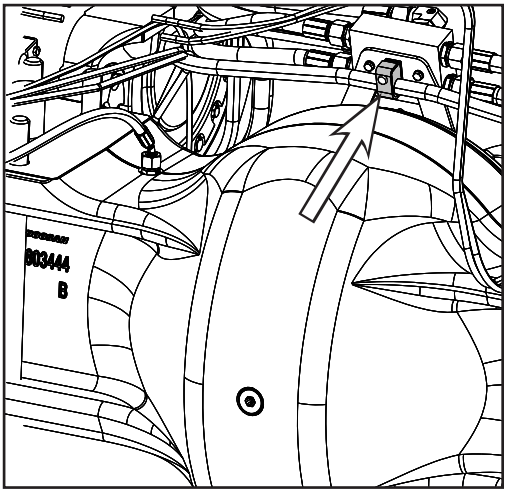


Figure 136

Disassemble the cooling hoses from rear cooling block.

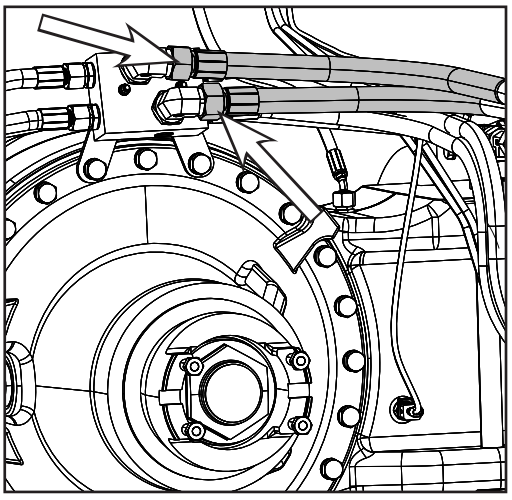


Figure 137

Disassemble the four lubrication hoses. (Two on each separate side).

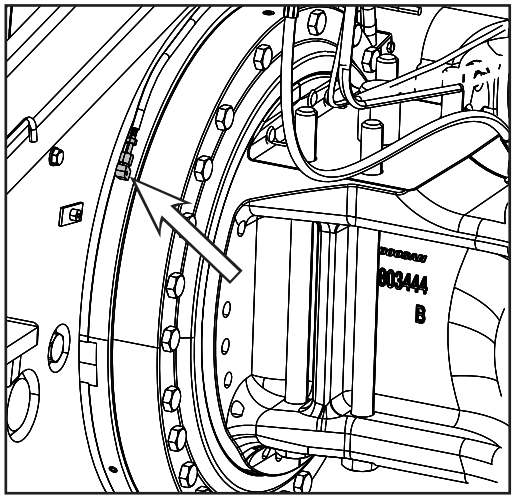


Figure 138

Disassemble the temperature sensor from axle housing.

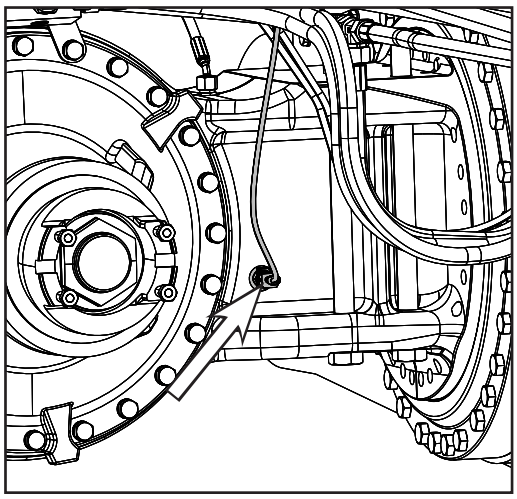


Figure 139

Disassemble the breather hose from the axle housing.

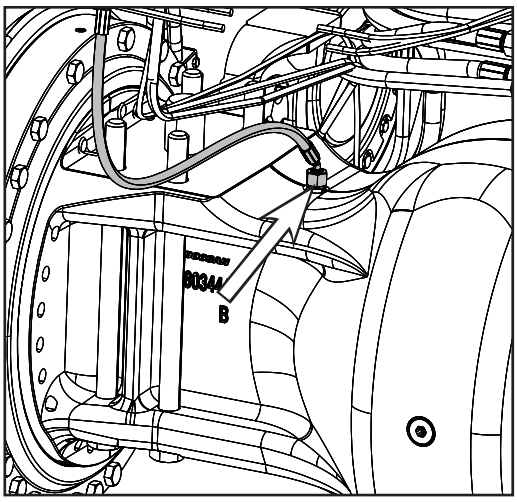


Figure 140

Disassemble the four propeller shaft screws from the differential.

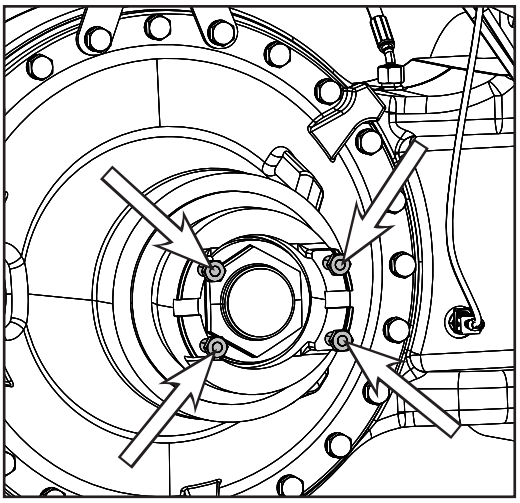


Figure 141

Disassemble the eight axle housing screws. (Four on each side)

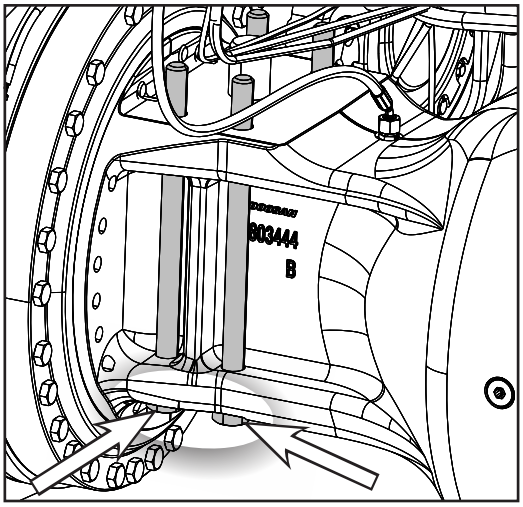


Figure 142

Complete removal of the differential

By crane:
Lift the rear frame up and move the tandem unit backwards

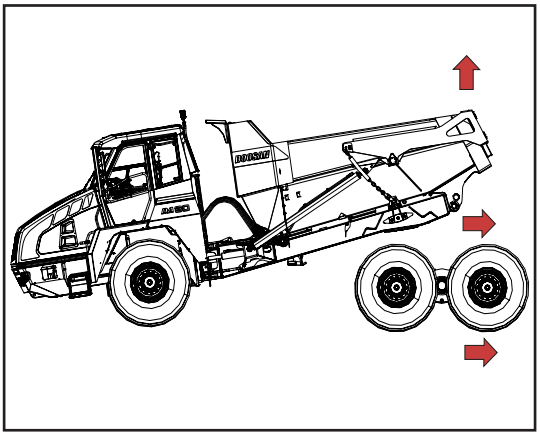


Figure 143

Remove axle complete from the vehicle and drain oil completely.

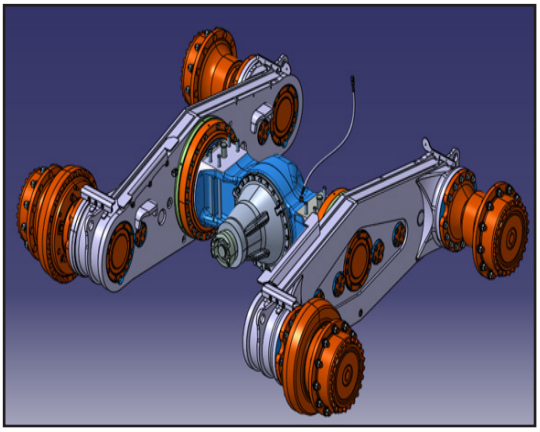


Figure 144

Place safety supports under the rear frame.
Be aware of the propeller shaft.

WARNING

Be aware of personal injury.

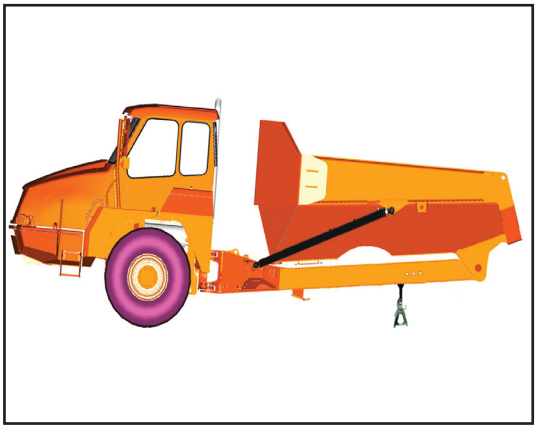


Figure 145

- Turn axle housing with differential so that differential flange is facing upwards.
- Remove the wheels.

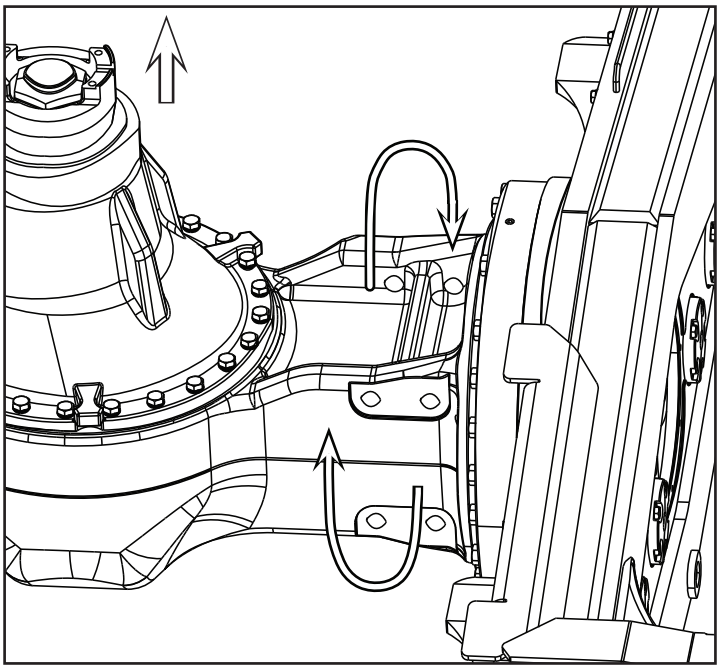


Figure 147

- Take out the center shafts.
- Unscrew the bolts on the differential, and pull it up and out of the body.

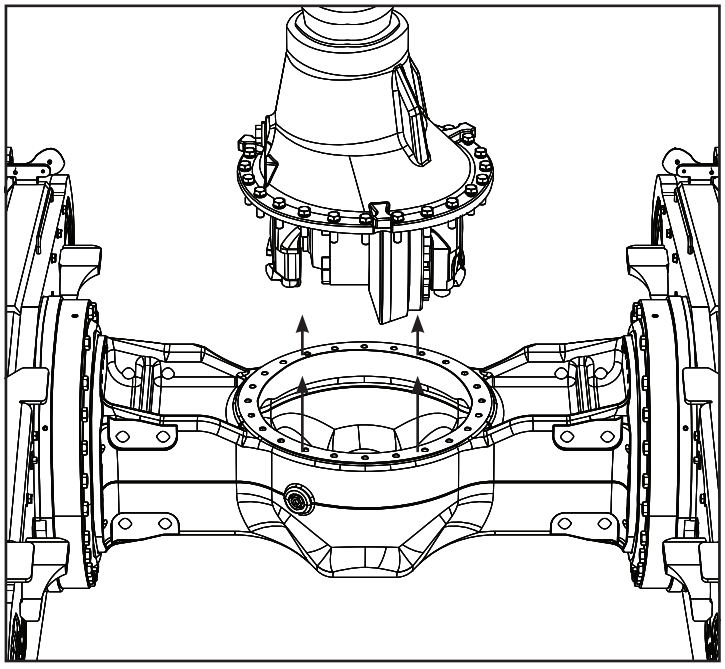


Figure 146

Disassembly of differential and carrier assembly

NOTE

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!

1. Disassembly differential and carrier assembly
2. Disassembly differential
3. Loosening the lock nut on the drive flange
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. Disassembly differential

NOTE

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.

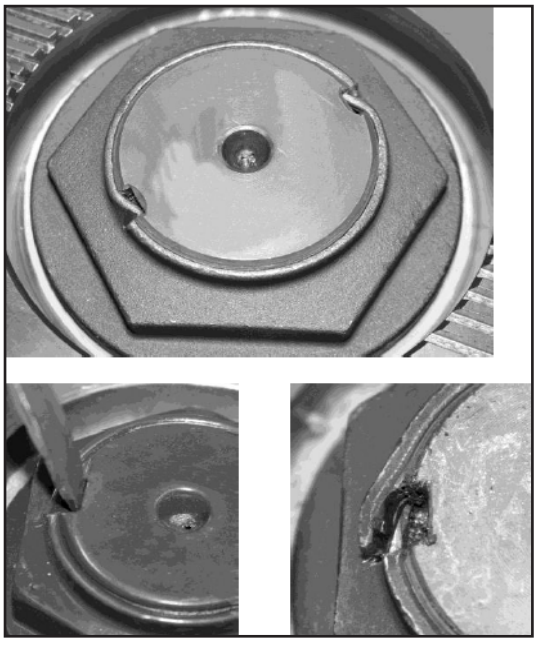


Figure 148

Assembly of differential and carrier assembly

Adjustment of drive pinion distance

In order to achieve the correct flank contact, the axial position of the drive pinion must be adjusted with the aid of the adjustment disc. 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 disc accordingly, so that the deviation is compensated.

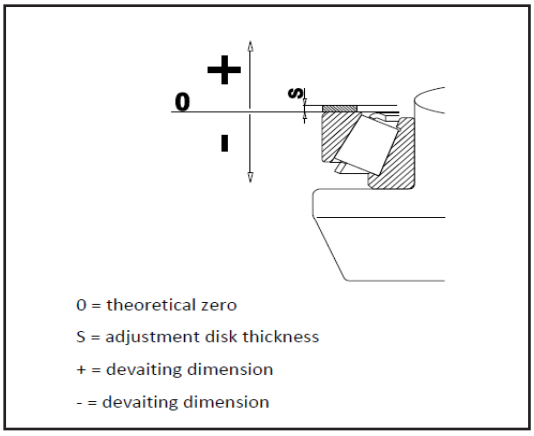


Figure 149

The dimensions in the table are theoretical dimensions.

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

Drive assembly	A 101
theoretical S	3,0
theoretical B	63,0

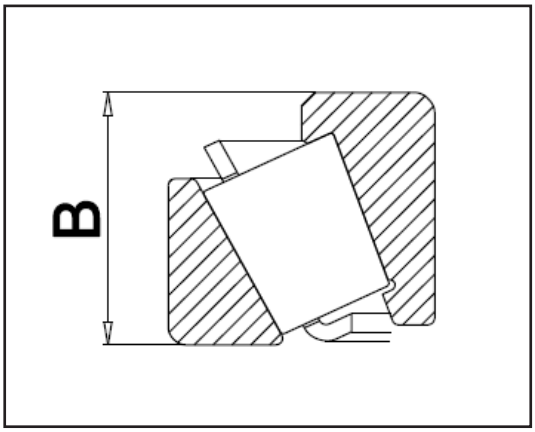


Figure 150

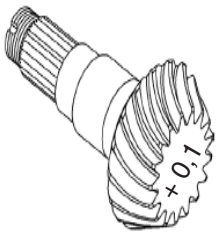
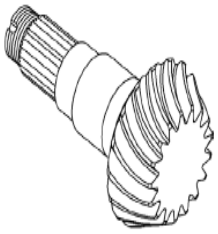
B = Measured width of the taper roller bearing.

Note down the deviation from the required dimension.

NOTE

Search for the production numbers of the drive pinion and the ring gear.

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
Adjustment dimension - A 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 	Adjustment dimension - A Without any marking on the face of the drive pinion, the deviation from the required dimension is 0. 

Sample calculations (dimensions in mm)

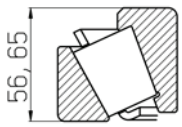
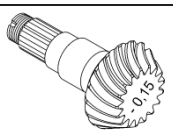
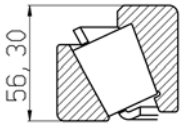
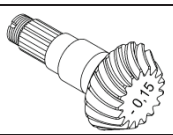
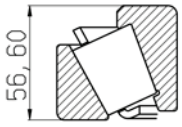
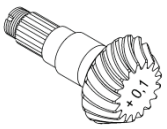
Theor. adjustment disk thickness	Measured bearing width	Tolerance at drive pinion	Calculation of the required adjustment disk thickness								**Required adjustment disk thickness**
		Version 1 	theor. disk thickness	-	deviation from bearing	+	deviation from pinion	=	required disk thickness		
	deviation from the theoretical dimension +0,15	deviation from the theoretical dimension -0,15	3,0	-	0,15	+	0,15	=	3,0		
		Version 1 	theor. disk thickness	+	deviation from bearing	+	deviation from pinion	=	required disk thickness		
	deviation from the theoretical dimension -0,20	deviation from the theoretical dimension - 0,15	3,0	+	0,20	+	0,15	=	3,35		
		Version 1 	theor. disk thickness	-	deviation from bearing	-	deviation from pinion	=	required disk thickness		
	deviation from the theoretical dimension +0,10	deviation from the theoretical dimension +0,10	3,0	-	0,1	-	0,1	=	2,8		

Figure 151

Assembly of the 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 disc 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.

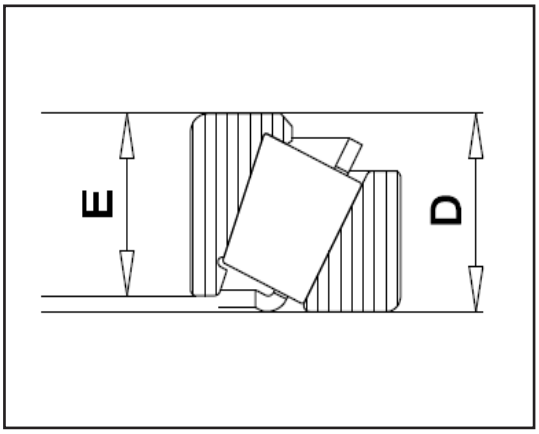


Figure 152

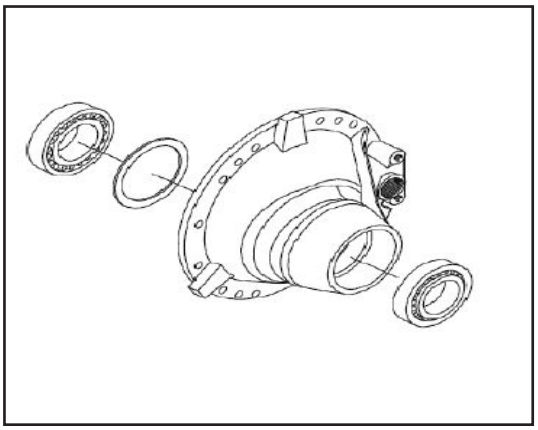


Figure 153

- Place the two inner rings of the taper roller bearings in their outer rings.

- Measure and record dimension A.

- Measure and record dimension F.

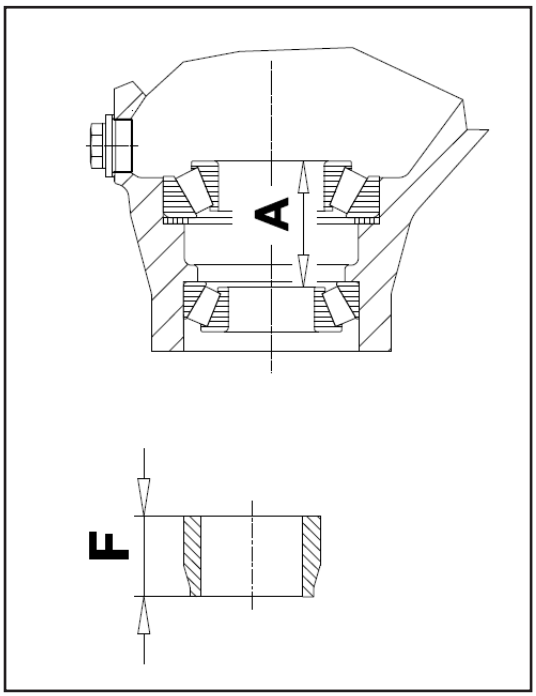


Figure 154

- Overview of all required components.

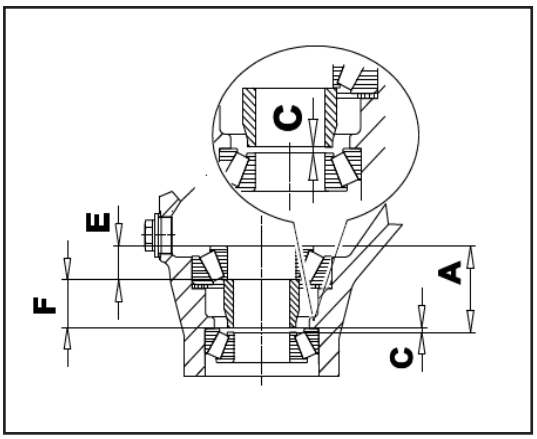


Figure 155

- The required thickness of the spacer ring results from:

  C = A - E - F

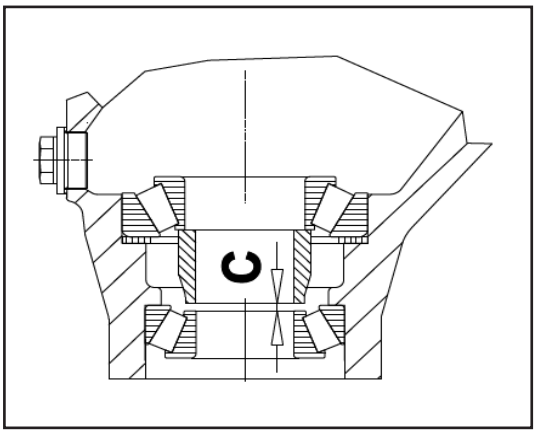


Figure 156

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.

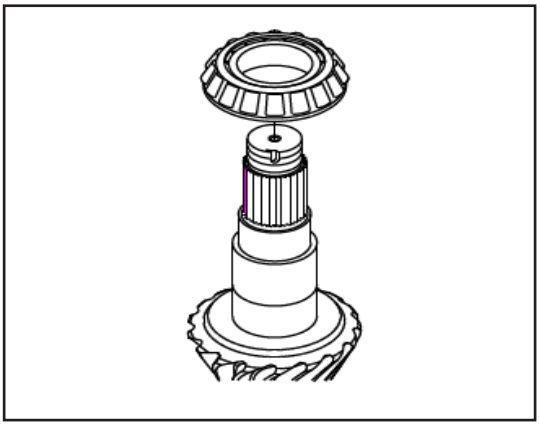


Figure 157

9. Assemble the bushing onto the drive pinion.

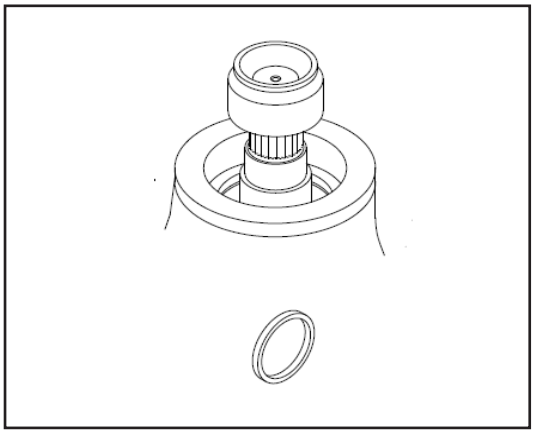


Figure 158

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

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

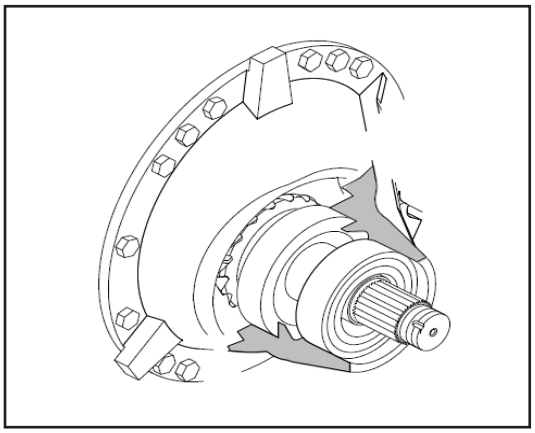


Figure 159

12. Push the drive flange onto the drive pinion.

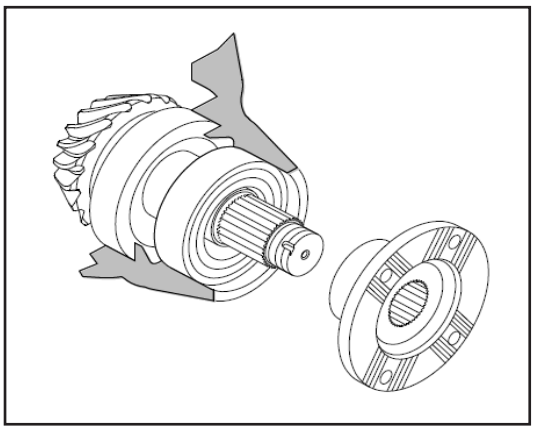


Figure 160

13. Screw on the lock nut and tighten it.
    - Tightening torque: 1050 Nm.
14. Secure the differential carrier on a suitable device.
15. Loosen the support on the drive pinion so that the drivepinion can turn freely.
16. Measure the bearing pre-load with a torque wrench with a drag indicator.
    - The bearing pre-load must be 1.5 - 2.5 Nm.
    - In case of a deviation of the bearing preload: 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 hundreth 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.

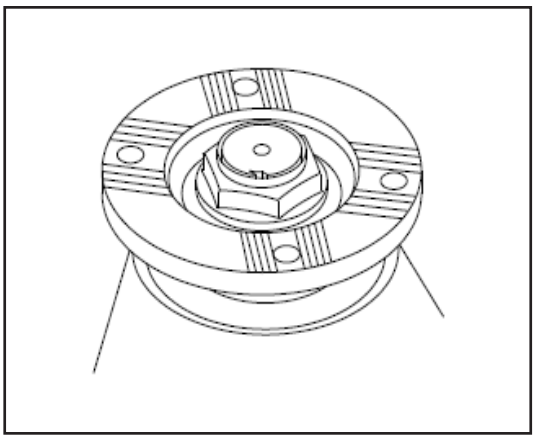


Figure 161

Figure 162

Assembly radial seal ring on the drive flange

NOTE

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. Coat radial seal ring with Loctite 572.
2. Place the prepared radial seal ring onto the sealing ring sleeve drive.
3. Evenly knock in the radial seal ring up to a position of 4 mm below the surface of the differential carrier without tilting it.
4. Fill the new radial seal ring with multi-purpose grease up to 2/3.

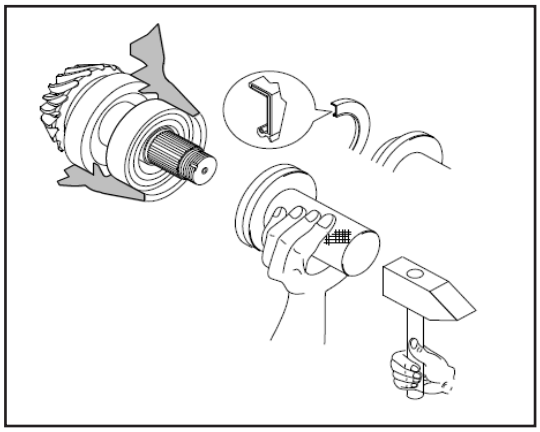


Figure 163

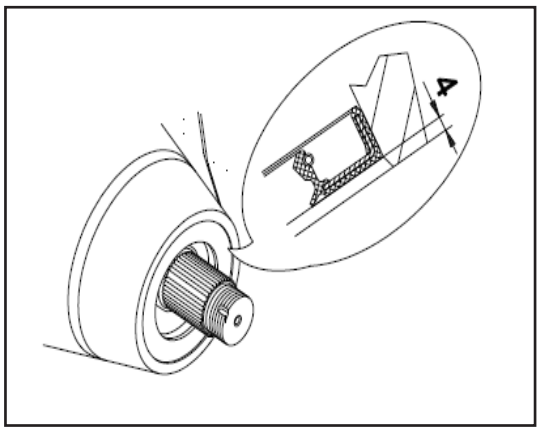


Figure 164

Assembly drive flange

NOTE

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. Use same type of oil as for the transmission.

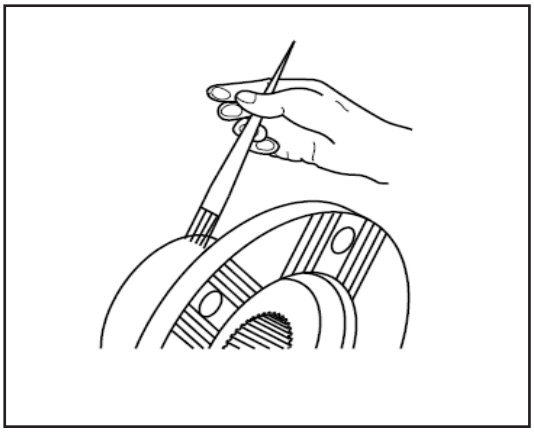


Figure 165

NOTE

The mounted cassette seal ring can be damaged inside through moving (pull and/or push). This is not detectable from outside.
Sealing of the oil cavity is not guaranteed.
- Any movement of the mounted cassette seal ring should be avoided.
- If leaking install a new cassette seal ring.

2. Place the pre-assembled cover with cassette seal ring and grooved ball bearing onto the drive flange. Using the sleeve driver, evenly knock together onto the drive flange, as the grooved roller bearing all the way to stop, without tilting both.

- Customer service tool: Sleeve driver
- The cassette seal ring is in the correct position.

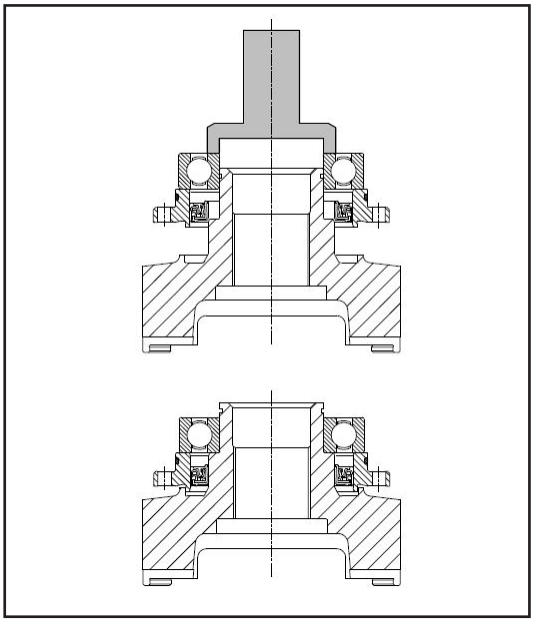


Figure 166

3. Place the disc and insert the circlip.

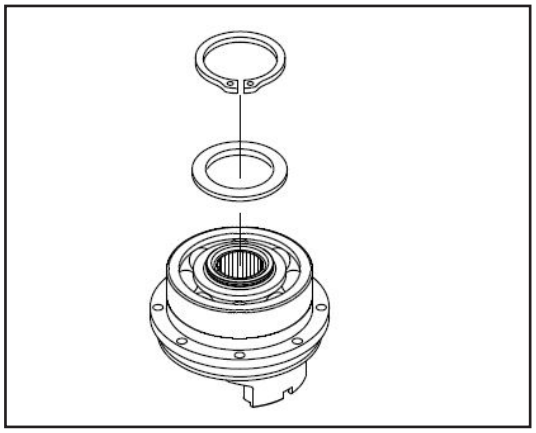


Figure 167

4. Seal the contact surface - 1 - on the axle spindle with sealant.

5. Push the drive flange onto the sun gear with shaft.

6. Screw down the cover and tighten. Tightening torque: 25 Nm.

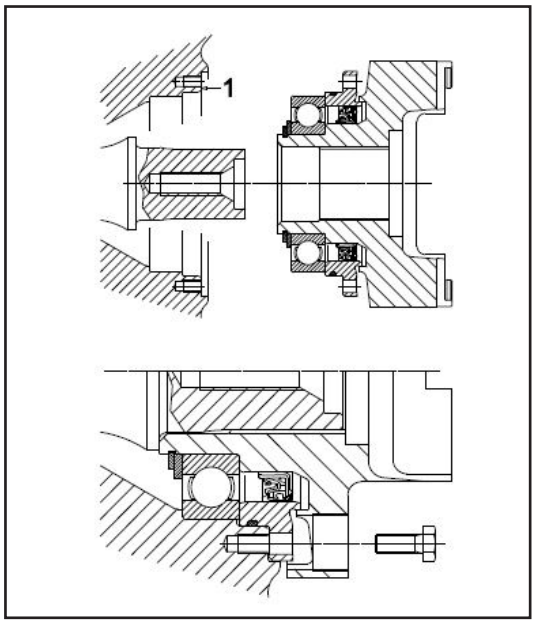


Figure 168

7. Seal the contact surface - 2 - on the sun gear with shaft with sealant. Sealant: dirko grey.

8. Apply the contact surfaces - 3 - with Loctite. Use Loctite 510.

9. Place the disc and screw it down and tighten.

   - Screw locking: Loctite 262

   - Tightening torque: 72 Nm

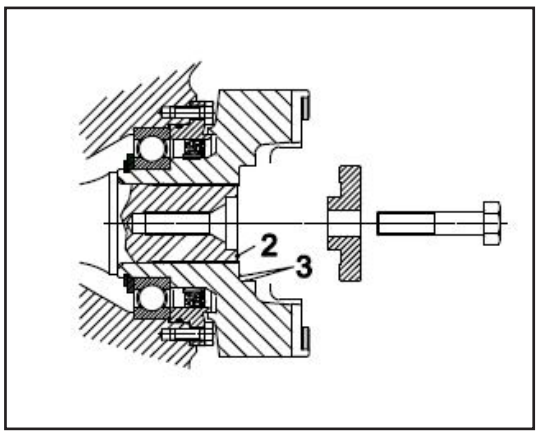


Figure 169

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 with MoS_2
3. Screw on the lock nut and tighten it. Torque 1050 Nm.

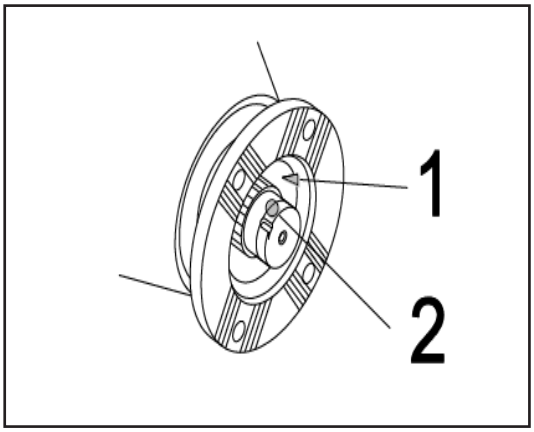


Figure 171

Securing of the lock nut

NOTE

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

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.

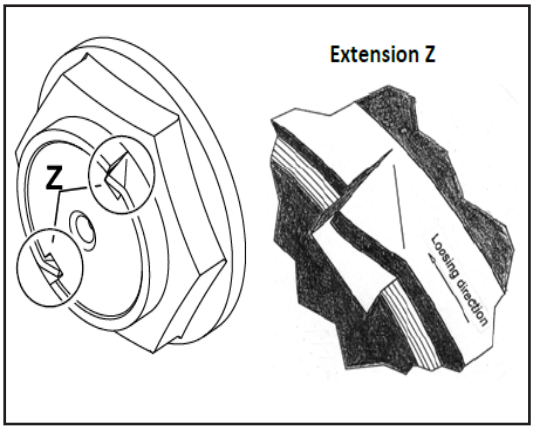


Figure 170

Limited-slip differential

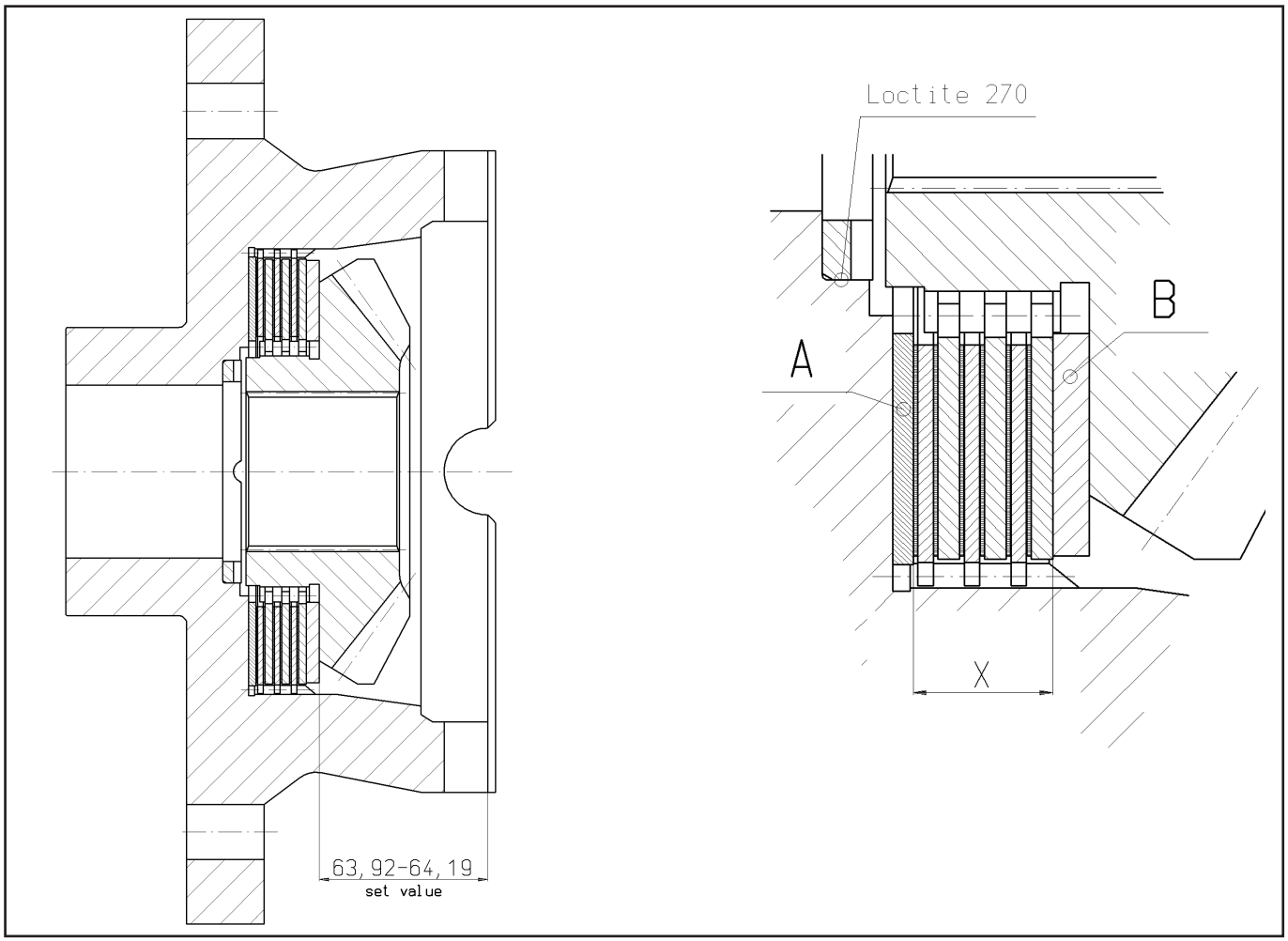


Figure 172

Disk set X	Disk A	Disk B
18,87 to 18,95	91.8502.4P.1	91.8501.4P.1
18,96 to 19,05	91.8502.4P.1	91.8501.4P.2
19,06 to 19,15	91.8502.4P.1	91.8501.4P.3
19,16 to 19,25	91.8502.4P.1	91.8501.4P.4
19,26 to 19,35	91.8502.4P.1	91.8501.4P.5
19,36 to 19,45	91.8502.4P.1	91.8501.4P.6
19,46 to 19,53	91.8502.4P.2	91.8501.4P.6

NOTE

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

Operating sequence

1. Measure dimension X of the disc set.
2. Select discs A and B according to the table.
3. Install discs A and B according to the arrangement in (Figure 172).
4. If necessary grind off 91.8502.P1 to the required thickness.
5. If necessary grind off 91.8501.P1/2/3/4/5 to the required thickness.
6. Order specific discs A and B with the required thickness.
7. Check set value (63,92 to 64,19 mm).

For your information:

Disc A	Thickness
91.8502.4P.1	3,0 mm
91.8502.4P.2	2,9 mm

Disc B	Thickness
91.8501.4P.1	5,1 mm
91.8501.4P.2	5,0 mm
91.8501.4P.3	4,9 mm
91.8501.4P.4	4,8 mm
91.8501.4P.5	4,7 mm
91.8501.4P.6	4,6 mm

Assembly ring gear

CAUTION

Sharp edges on the teeth. Risk of cutting.
- **Wear protective gloves.**
- **Search for the production numbers of the drive pinion and the ring gear.**

Version 2
No production numbers · on drive pinion · on ring gear
· **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.
2. Fasten the ring gear to the differential housing from the opposite side of the ring gear teeth with two screws.
3. Turn the differential.
4. Coat the screws, inclusive securing screws with Loctite 262. Tighten the two diagonally opposite screws first.
5. Torque down the ring gear to the differential housing halve. See (Figure 175 - Tightening torque for standard metric threads). Clamp the differential housing in a suitable device for tightening the screws. Do not damage the teeth of the gear wheel during the process.

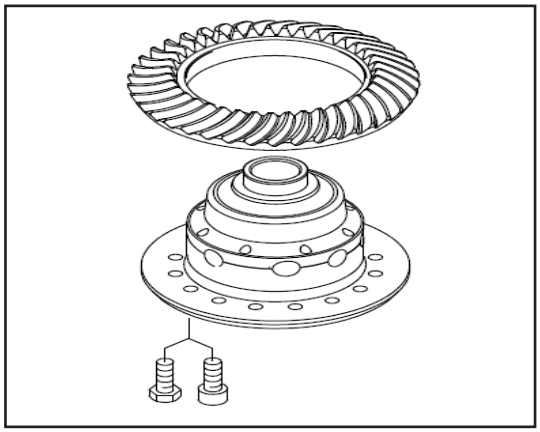


Figure 173

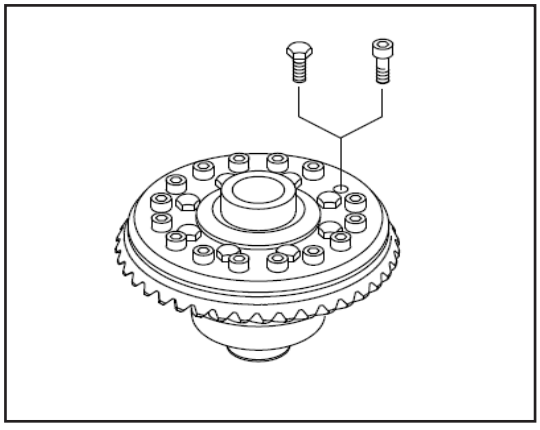


Figure 174

Tightening torque 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	

Figure 175

Assembly tapered roller bearing onto differential housing

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

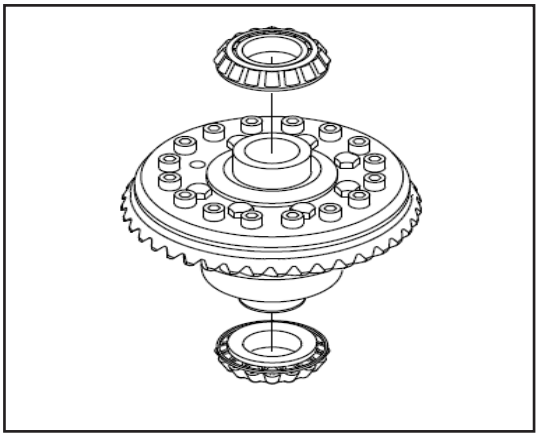


Figure 176

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.**

Installation of the pre-assembled differential

1. Carefully place the differential into the upright differential carrier with a suitable device.

   • The tapered roller bearings must not be damaged during 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.

   • The bearing adjustment rings must not be seated skew.

4. Position the differential by turning the bearing adjustment ring 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 ring must only slightly touch the drive pinion and must not press against the tapered roller bearings.

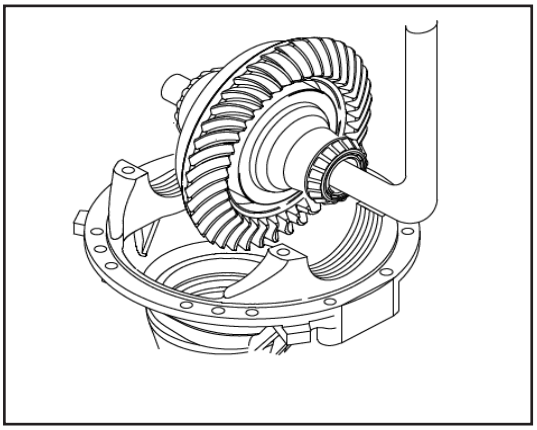


Figure 177

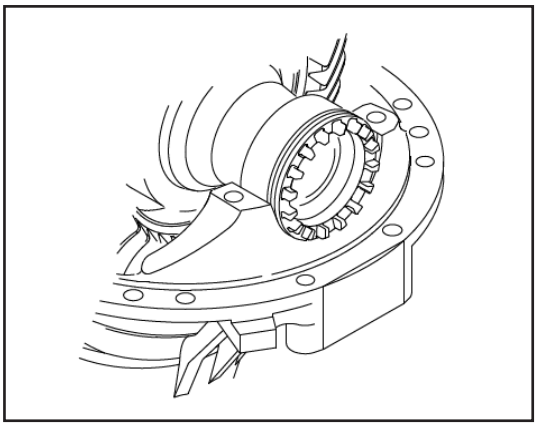


Figure 178

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 and use Loctite 262.

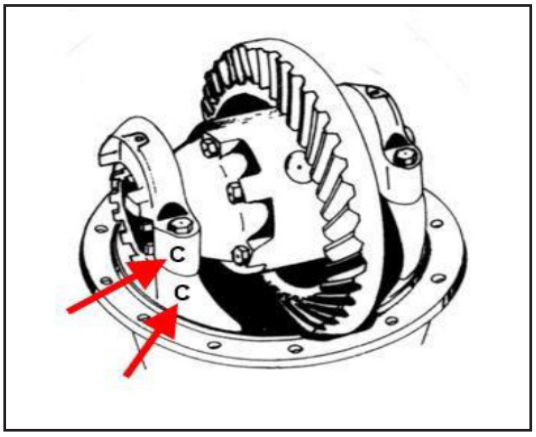


Figure 180

Dimension of backlash

Place the differential with the outer rings of the taperroller bearings on the differential carrier which is in a vertical position, with mounted drive pinion.

Mount the differential straps and align them with the thread rings.

During this operation pay attention to the alignment marks on the differential straps with respect to the differential carrier. (Do not interchange the differential straps.)

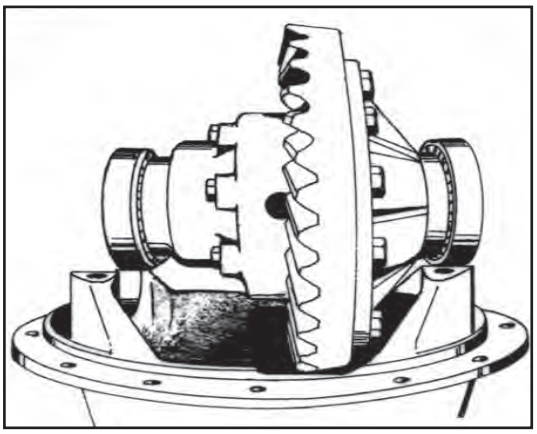
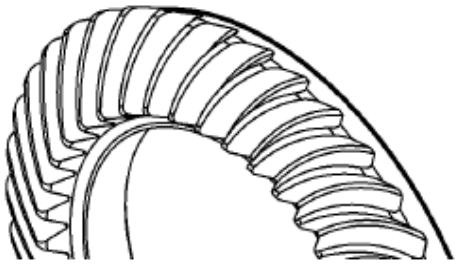


Figure 179

Version 2



If the value is not marked on the circumference of the ring gear, the backlash is then dependent on the ring gear diameter (see following table).

Drive description	Ring gear diameter	Backlash
Drive assembly 91	< 410	**0,40**

Adjustment of backlash

Version 2

Figure 181

1. Adjust the tooth flank play with 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.

Figure 182

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 ø395.8 mm - ø396.0 mm.

   - Continuosly 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. Use 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 ø396.1 mm and ø396.2 mm must not be exceeded.

Figure 183

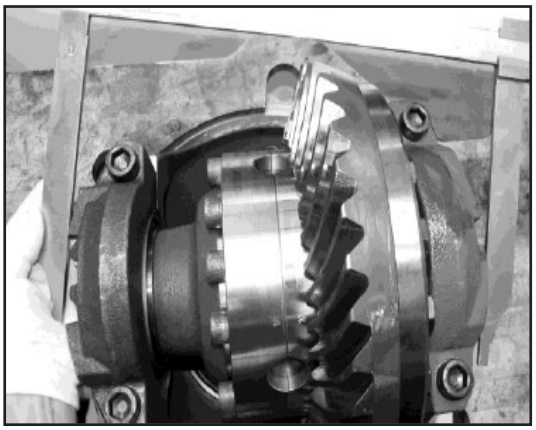


Figure 184

Checking the contact pattern of the gear teeth

Figure 185

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 incorrect, the drive pinion distance must be changed with a different adjustment disc.
   See (Figure 149 - Adjustment of drive pinion distance).

   • Then repeat all of the following steps until the contact pattern is correct.

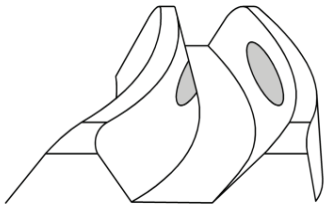
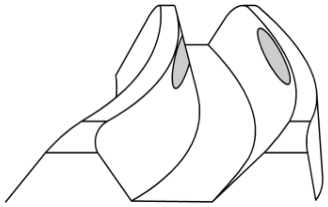
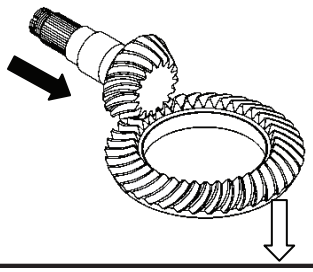
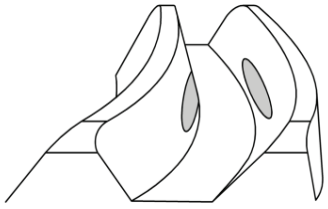
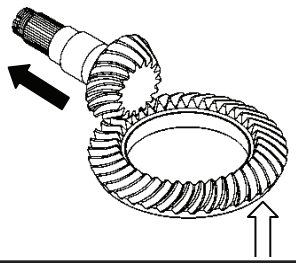
	Optimal contact pattern	
	Contact pattern too high. Reduce drive pinion distance by correcting thickness of the adjustment disk. Adjust the backlash by moving the ring gear out.	
	Contact pattern too low. Increase drive pinion distance by correcting thickness of the adjustment disk. Adjust the backlash by moving the ring gear in.	

Figure 186

Locking the bearing adjustment rings

1. Coat the hexagon screw with Loctite 262.
2. Fasten the lock plate with the hexagon screw to the bearing cap.
3. Tighten the hexagon screws. Torque 25 Nm.
4. Bend the lock plate towards the bearing adjustment ring.
5. Torque down the screws on the bearing caps.
   See (Figure 175 - Tightening torque for standard metric threads)

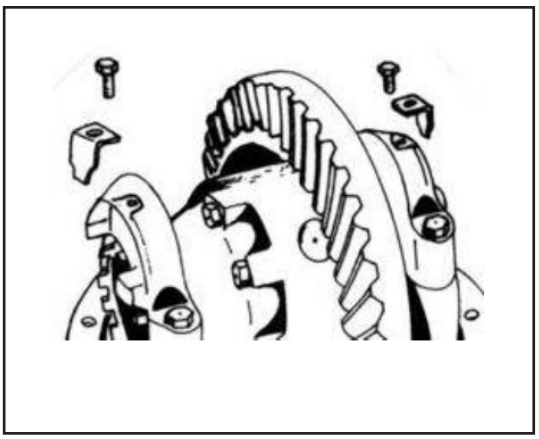


Figure 187

Assembly differential and axle house

Install differential to axle housing (oil- drain and level plug on same side)

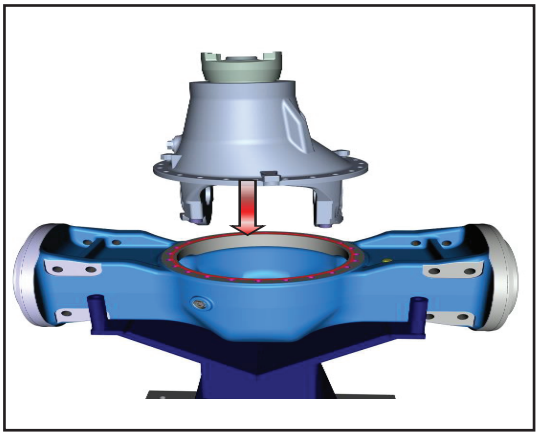


Figure 188

Do a test run before putting on seal, to see that differential and axle house fit togheter.

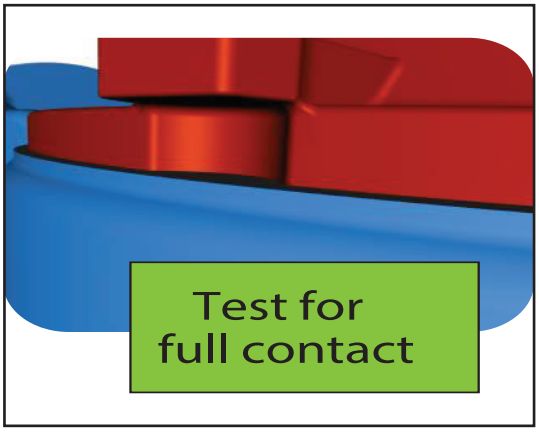


Figure 189

NOTE

Put Loctite 5188 sealant around axle housing

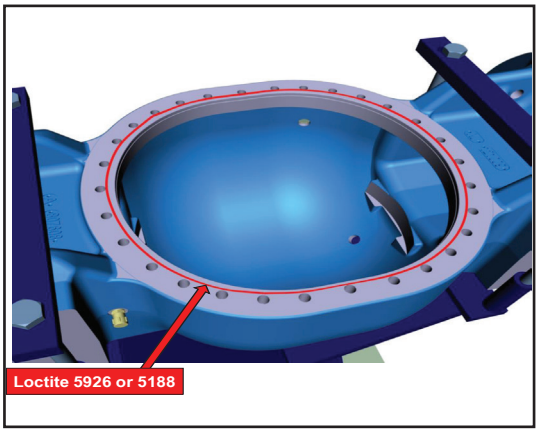


Figure 190

Mount brackets and screws, use thread sealant on both sides of the outer screws.

Torque oiled screw	**183 Nm**
Torque Loctite screw	**192 Nm**
Loctite 542	

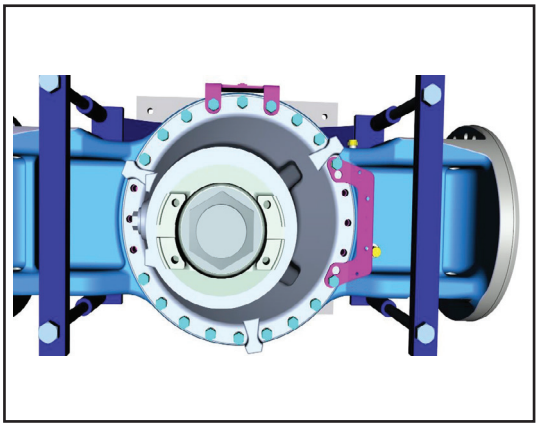


Figure 191

Assembly wear ring axle house

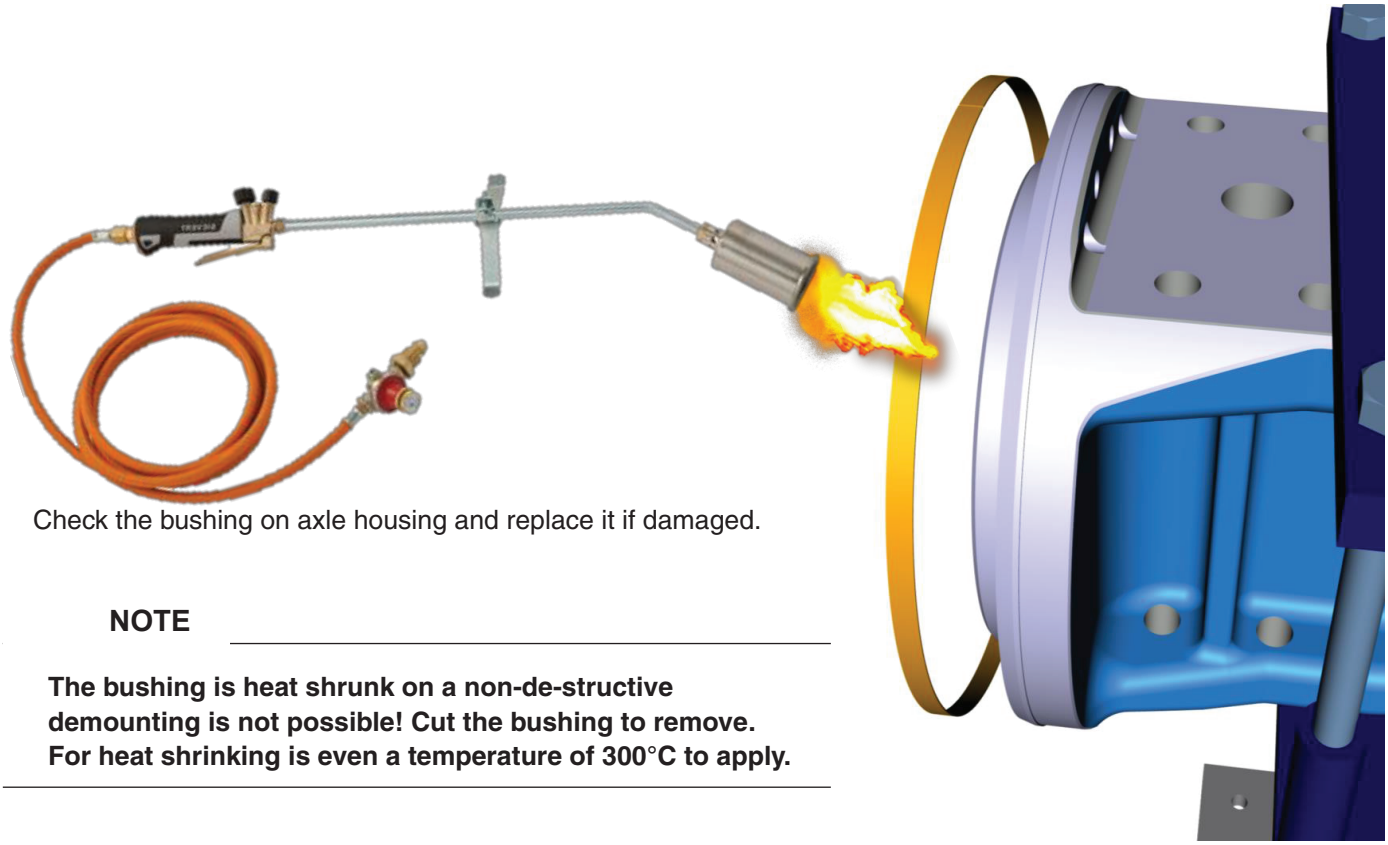


Figure 192

Check the bushing on axle housing and replace it if damaged.

NOTE

The bushing is heat shrunk on a non-de-structive demounting is not possible! Cut the bushing to remove. For heat shrinking is even a temperature of 300°C to apply.

DANGER

Hot! Use protective gear, like thick leather gloves.

NOTE

Heat up the wear ring for expansion and insert into the axle housing.

NOTE

Grind to make transition between edges smoother. Clean everything up and put grease around the wear ring.

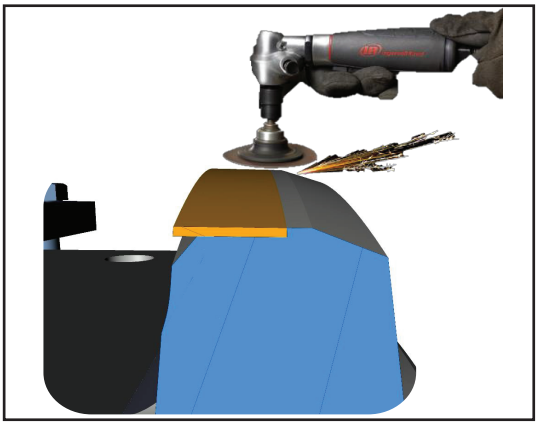


Figure 193

Assembly bearingpacks axle house

Put grease around the wear ring.

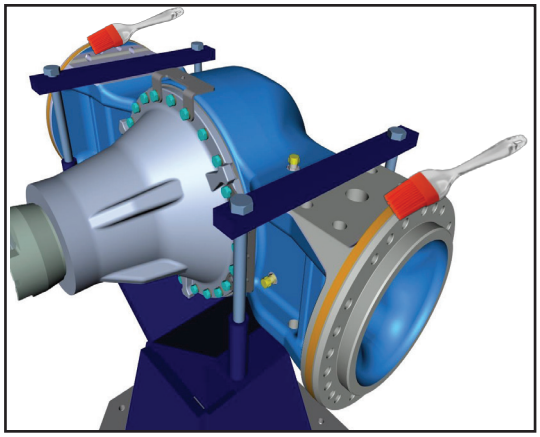


Figure 194

Mount the oil level plug.
Torque **140 Nm**

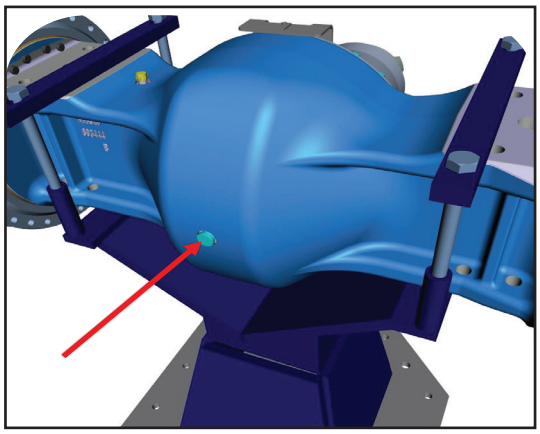


Figure 195

NOTE

Tighten crosswise and progressively to the final torque, not all in one go.

Mount bearing ass'y, marking is up! See (Figure 196).

Torque **649 Nm**
Loctite 245

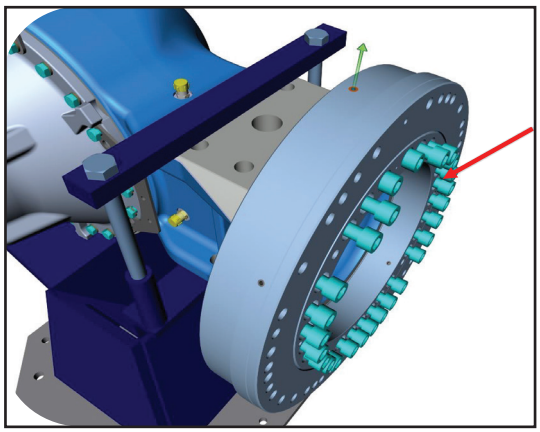


Figure 196

NOTE

Fill bearing outer ring with following procedure

A. Fill outer-ring with grease, filling upper point while checking lower point.
Approx. 15 pumps on 1st nipple,
and then 7 pumps on the 2nd nipple.

B. Plug the two lower outer holes.
Torque 15 Nm
Loctite 542

C. Fill again the outer-ring, now until it barely seeps out of the joint in the hole.
Approx. 15 pumps on 1st nipple,
and then 7 pumps on the 2nd nipple.

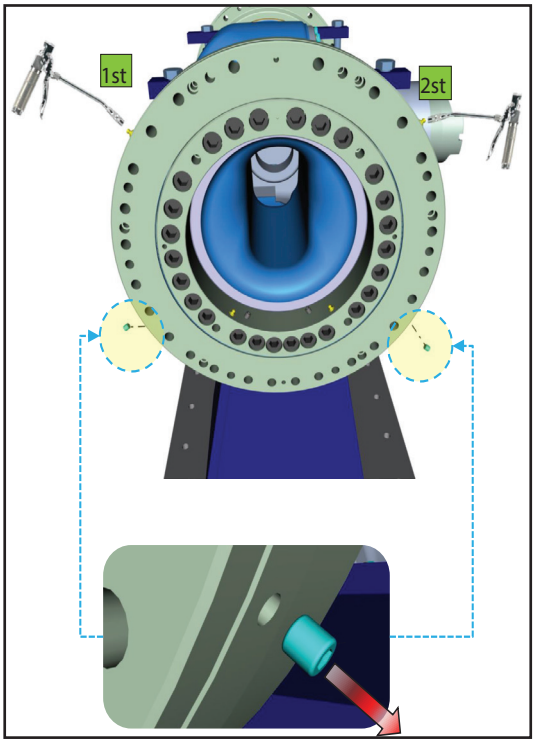


Figure 197

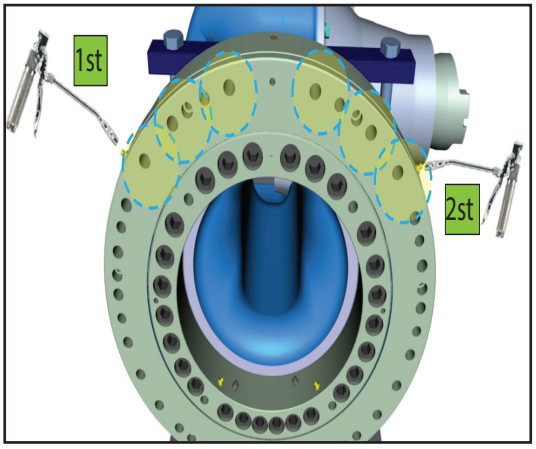


Figure 198

NOTE

Fill bearing inner ring with following procedure

D. Fill inner-ring with grease,
Approx. 1 pump on 1st nipple.
Then 1 pump to 2nd nipple.

E. Plug inner ring.
Torque 15 Nm
Loctite 542

F. Mount connectors on top of the outer ring and adjust it so it point a bit inwards.

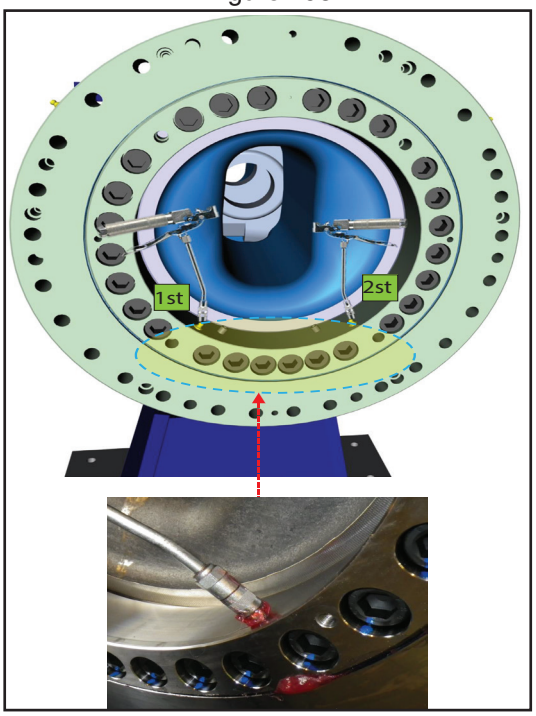


Figure 199

Tandem

Bogie housing overview

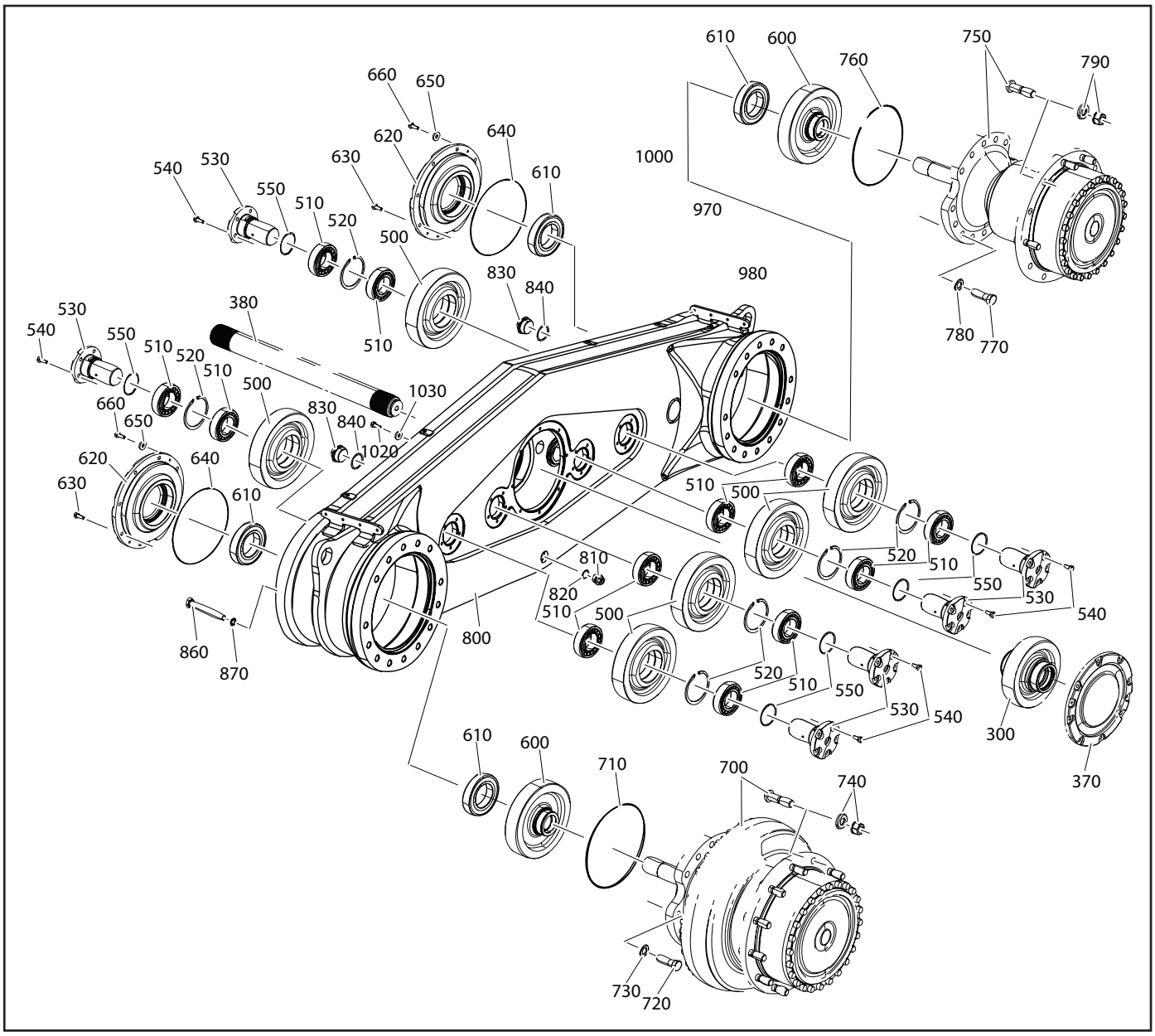


Figure 200

See the HA30 parts catalogue for parts lists.

Tandem section view

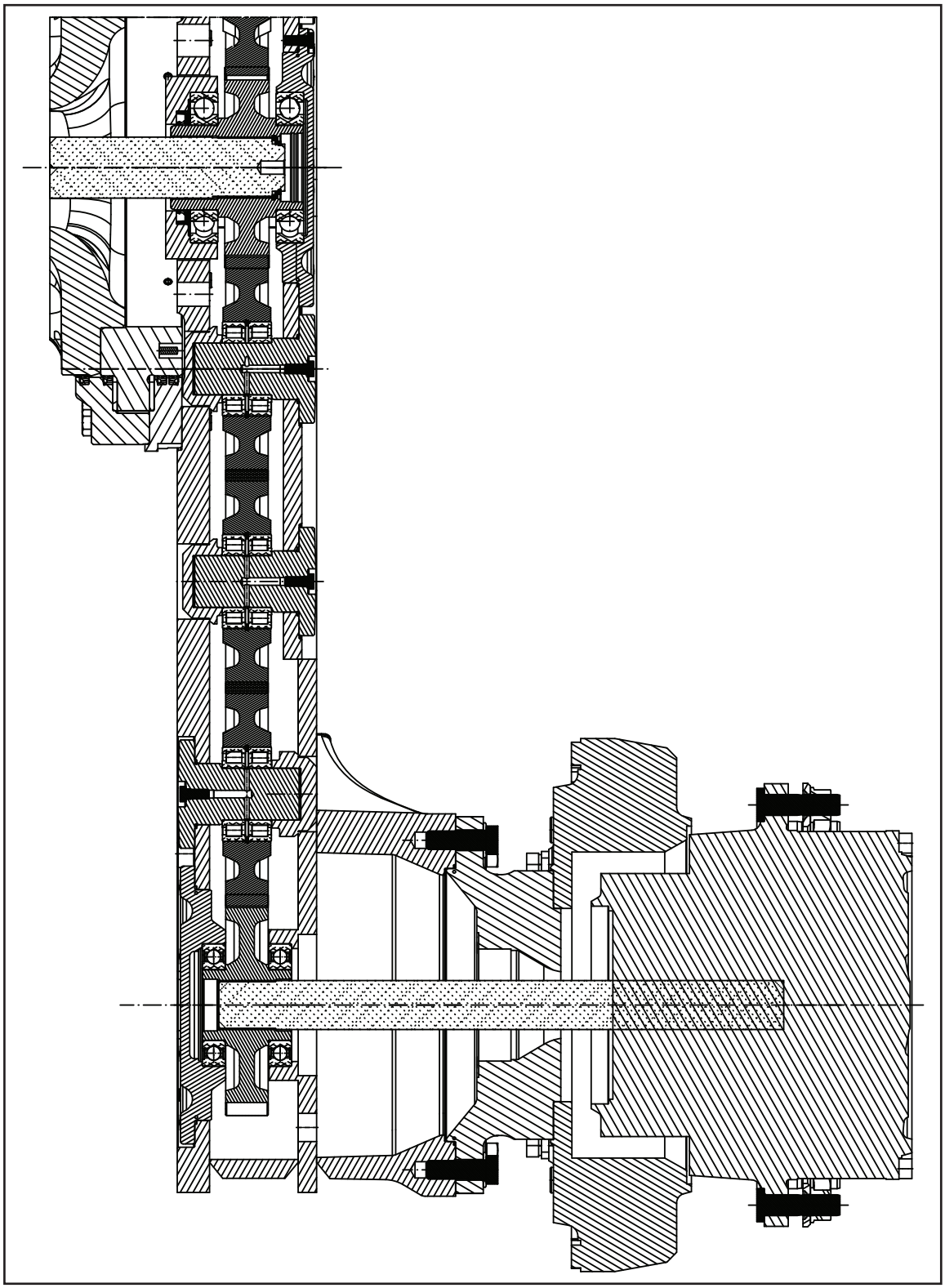


Figure 201

Assembly gearwheels

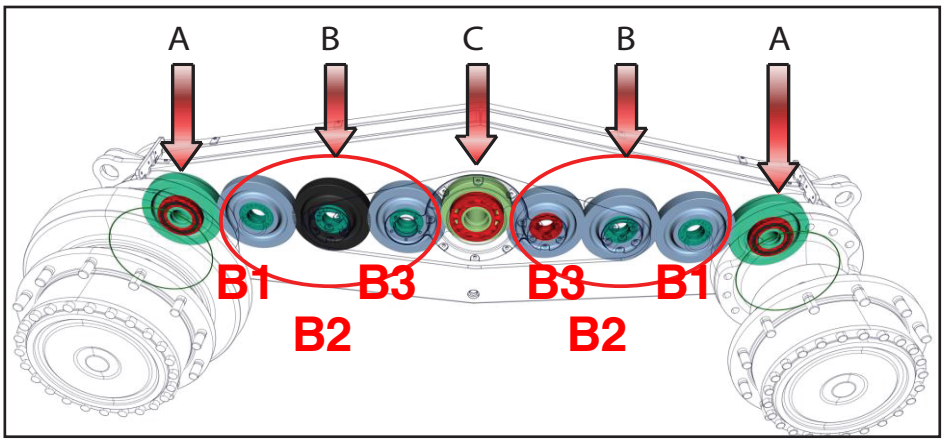


Figure 202

Clean gear-wheels before assembly

A. Insert bearing's to gearwheel.

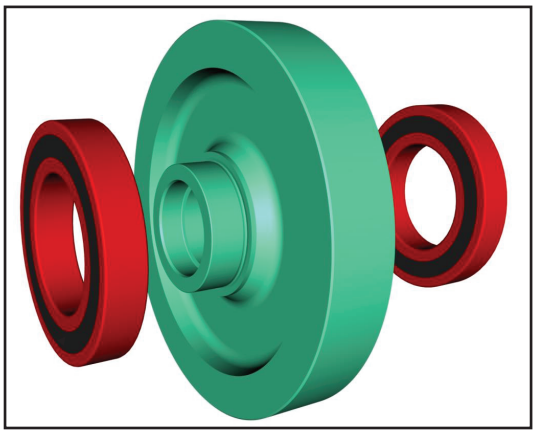


Figure 203

B1- B3. Insert snap ring to gearwheel.
Insert 1 st and 2 nd. bearing.

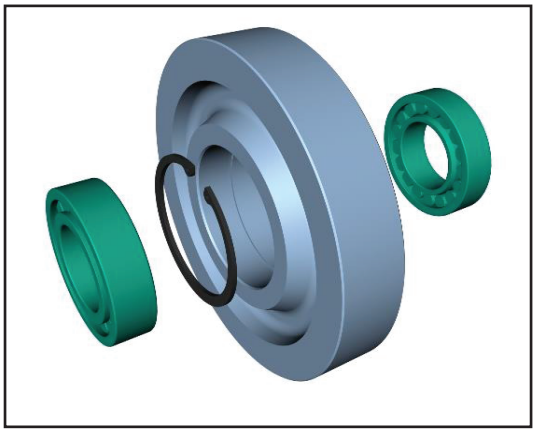


Figure 204

C. Insert bearing's to gearwheel.
Insert snap ring to the inner slot.

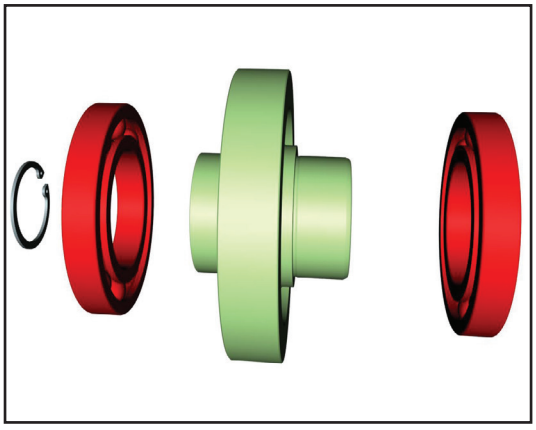


Figure 205

Installation of gearwheels “B” in tandem

B1 Insert the outer idle gears from outer end side of tandem housing.

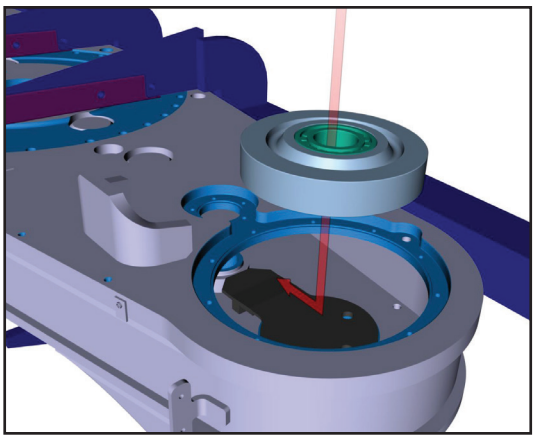


Figure 206

NOTE

For each gearwheel assembled, rotate gearwheel to check for noise and that it moves evenly.

Put O-ring on the bolt and lubricate the ring.

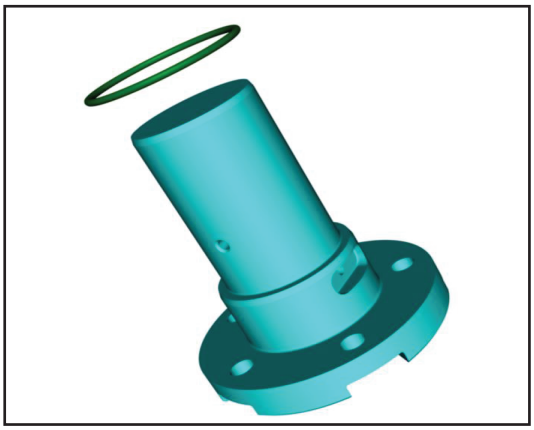


Figure 207

Insert bolt with the “lub-slot” towards top of tandemhouse.

Mount bolt with screw.

Torque **65 Nm**
Loctite 2400

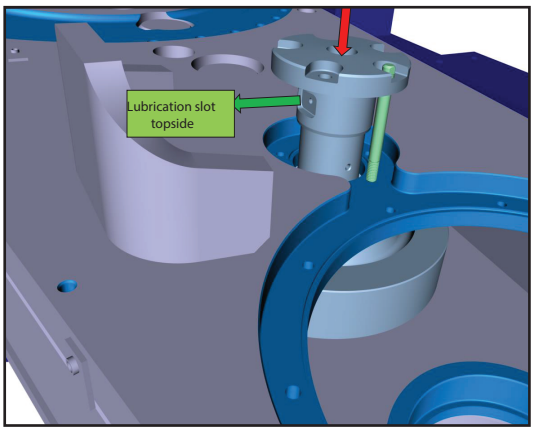


Figure 208

B2 and B3 Insert the inner idle gears from inner side, center of tandemhousing.

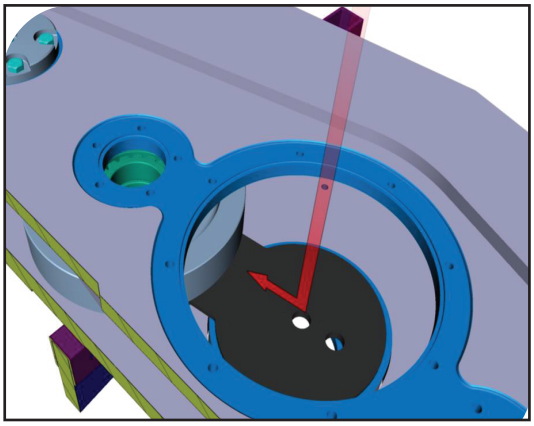


Figure 209

Installation of gearwheels “A” in tandem

A Insert the outer idle gears in end of tandemhousing.

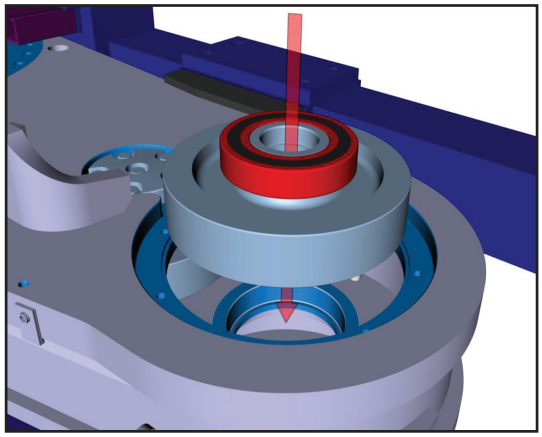


Figure 210

Mount screw with seal.

Torque **140 Nm**

No (whitout) Loctite

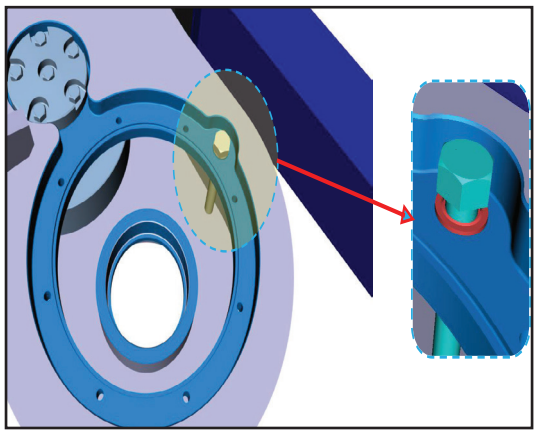


Figure 211

Put O-ring (Pos-1) on the cover for endgear and lubricate.

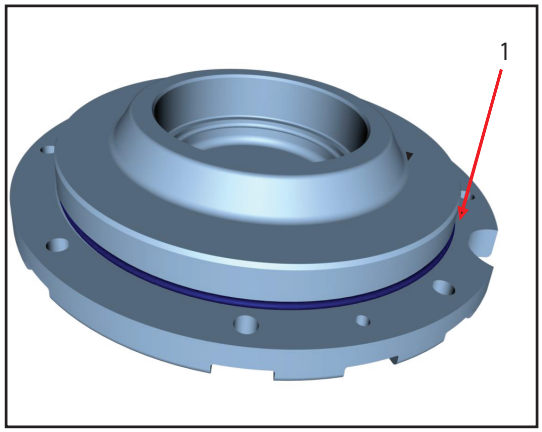


Figure 212

Mount cover for endgear.

Torque (Pos-1) M8 with Washer **24 Nm**

Torque (Pos-2) M10 **65 Nm**
Loctite 2400

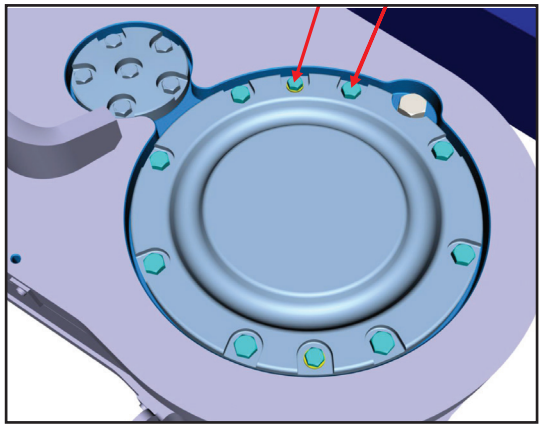


Figure 213

Installation of hub in tandem

Insert O-ring to front hub (with brake) and lubricate.

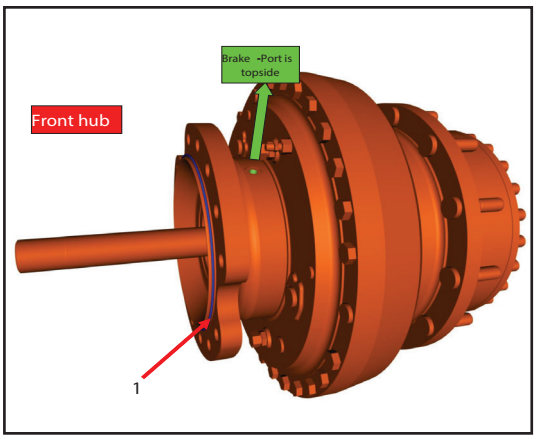


Figure 214

NOTE

Brake-port is topside.
Align hubs before inserting pinion-gear.

Insert O-ring to front hub (without brake) and lubricate.

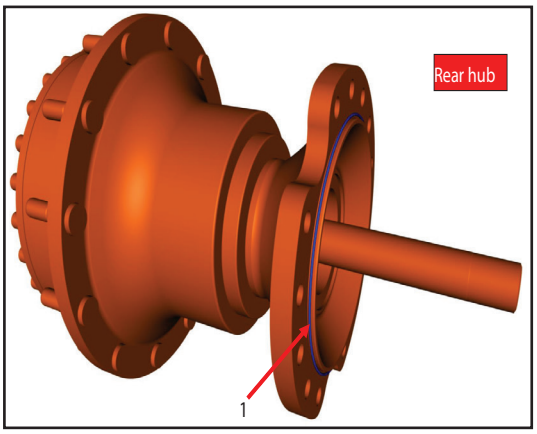


Figure 215

NOTE

Align hubs before inserting pinion-gear.

Mount hub's to the tandem housing, the hub with brake is in front.

Torque (Pos1-2) **610 Nm (±5%)**
Loctite 245

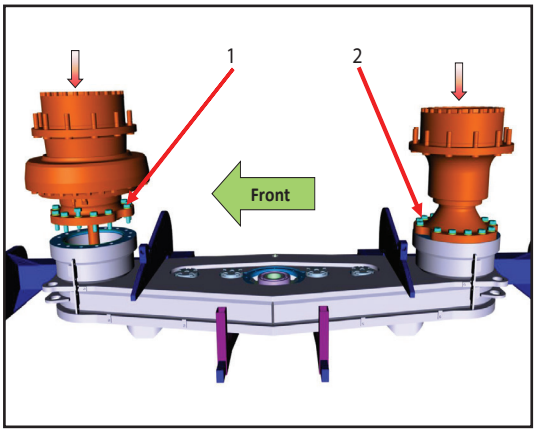


Figure 216

Hub with brake is in front.

NOTE

Both hubs on tandem should be mounted so level marking is the same

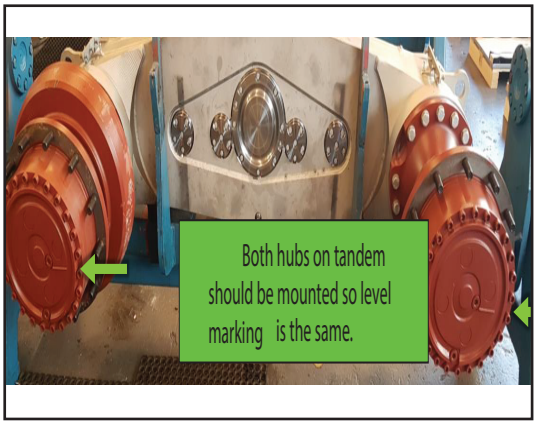


Figure 217

Installation of gearwheels “C” in tandem

Insert sealring and lubricate.

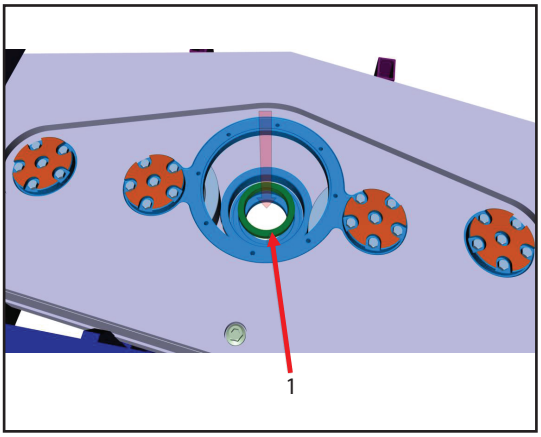


Figure 218

Insert sealring using suitable tools.
Make sure that the direction is correct.

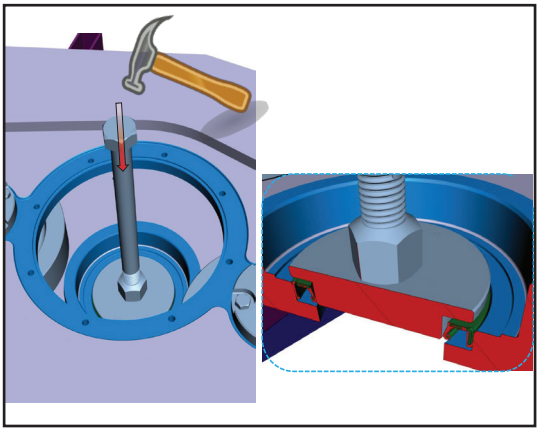


Figure 219

Mount drainplug with (Pos-1) sealring.

Torque **140 Nm**

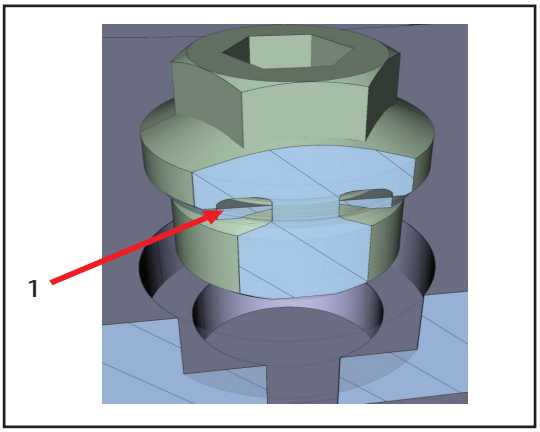


Figure 220

Insert center pinion gir assembly.

NOTE

Align hubs before inserting pinion-gear.
Check hub position.

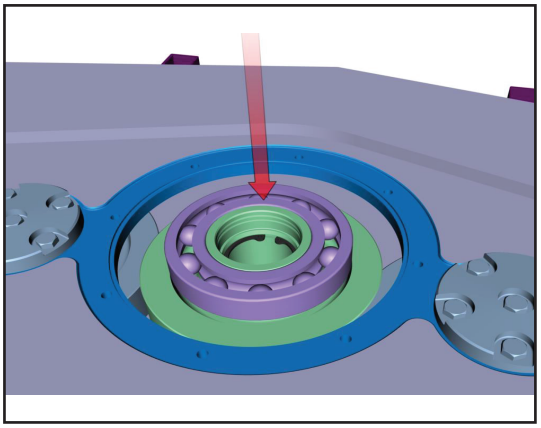


Figure 221

Insert splined shaft to center gir.

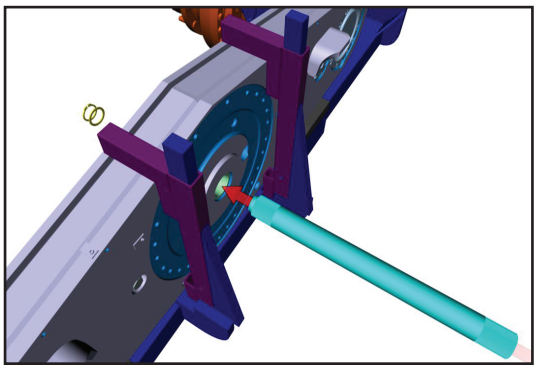


Figure 227

Insert center pinion gir assembly
Mount support washer and snap ring to the shaft.

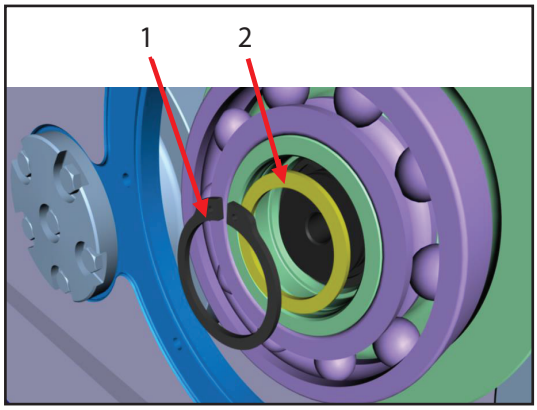


Figure 223

NOTE

Turn center gear / shaft several times and check for uneven rolling resistance and noises.
- Measure rolling resistance: Max 40 Nm

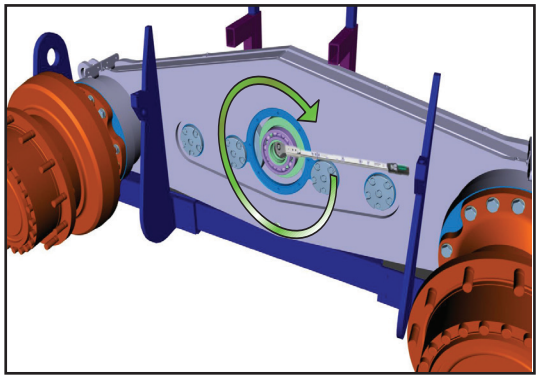


Figure 224

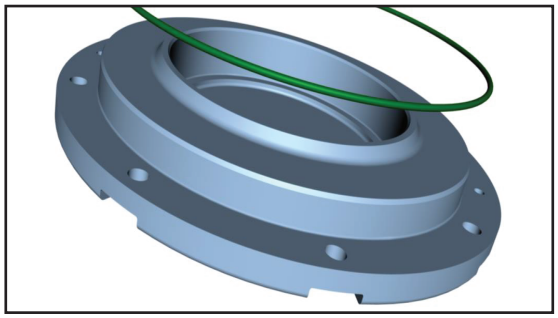


Figure 225

Insert O-ring to cover and lubricate.

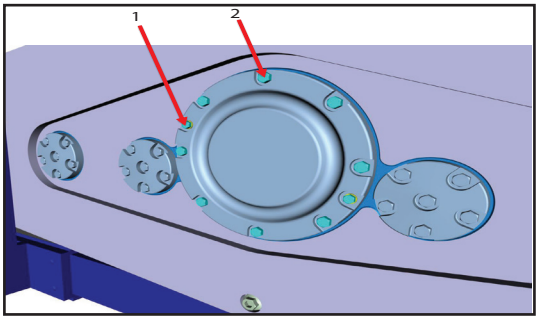


Figure 226

Mount cover to tandem housing.

Torque (Pos-1) M8 with Washer 24 Nm

Torque (Pos-2) M10 65 Nm
Loctite 2400

Checking clearance in the tandem bearing.

Check the diametric clearance.

1. Place the magnetic stand on the outer side of the frame bar.
2. Reset the indicator to zero.
3. With crane or hydraulic jack, lift one of the sides until the wheels are clear from the floor.
4. Lower the machine.
5. Read the indicator value.

Max diametric clearance: 1,50 mm

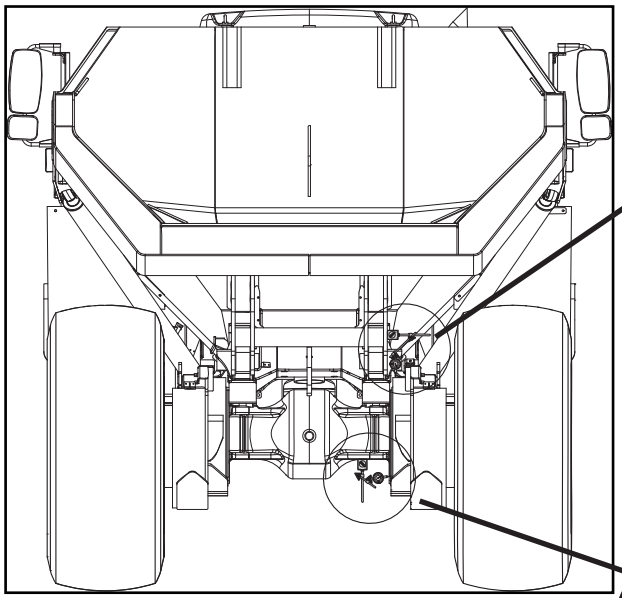
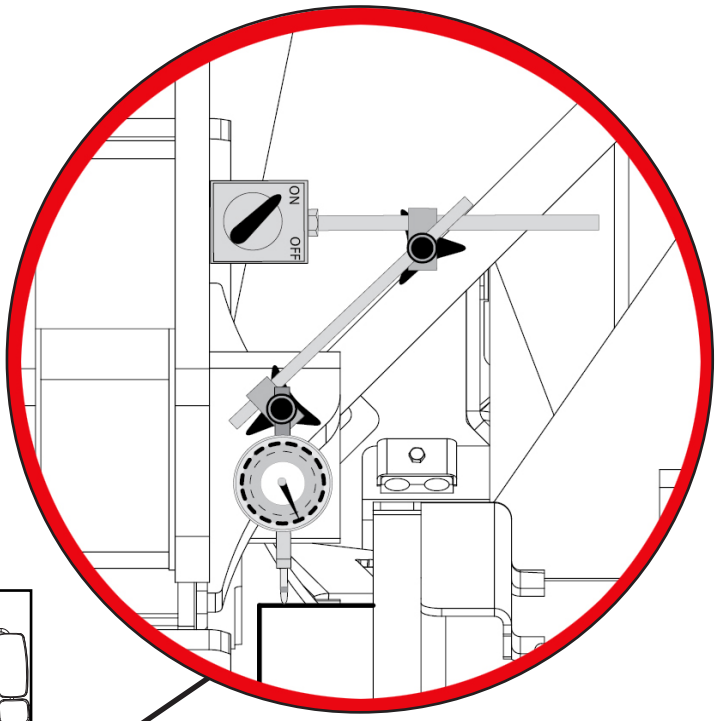
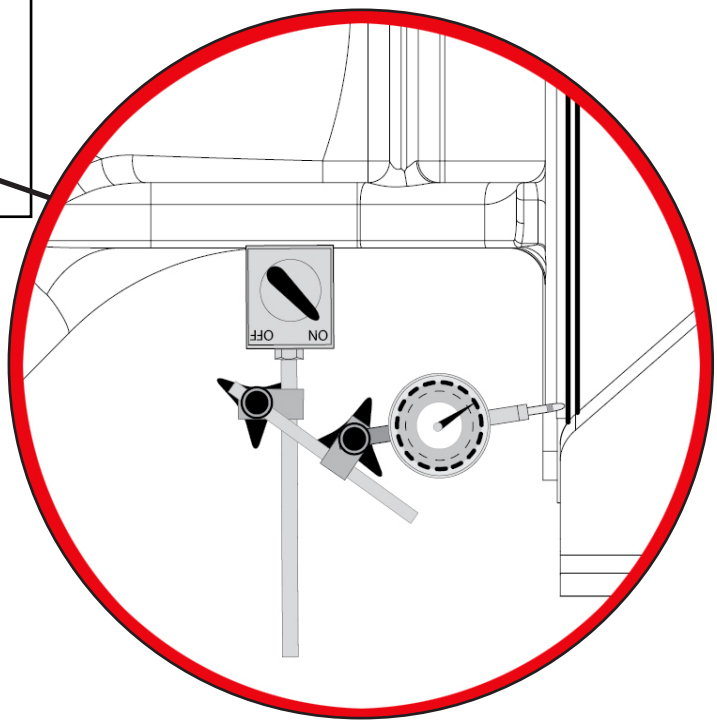


Figure 228



Tandem housing Rhs

Axle housing



Check the axial clearance.

1. Place the magnetic stand on the axle housing underside, see (Figure 228). Place the indicator tap on the articulation bearing.
2. With crane or hydraulic jack, lift one of the sides until the wheels are clear from the floor.
3. Reset the indicator to zero
4. Lower the machine.
5 Read the indicator value.

Max axial clearance: 1,50 mm

View of the tandem bearing HA30 & HA45 (up to 8x1701)

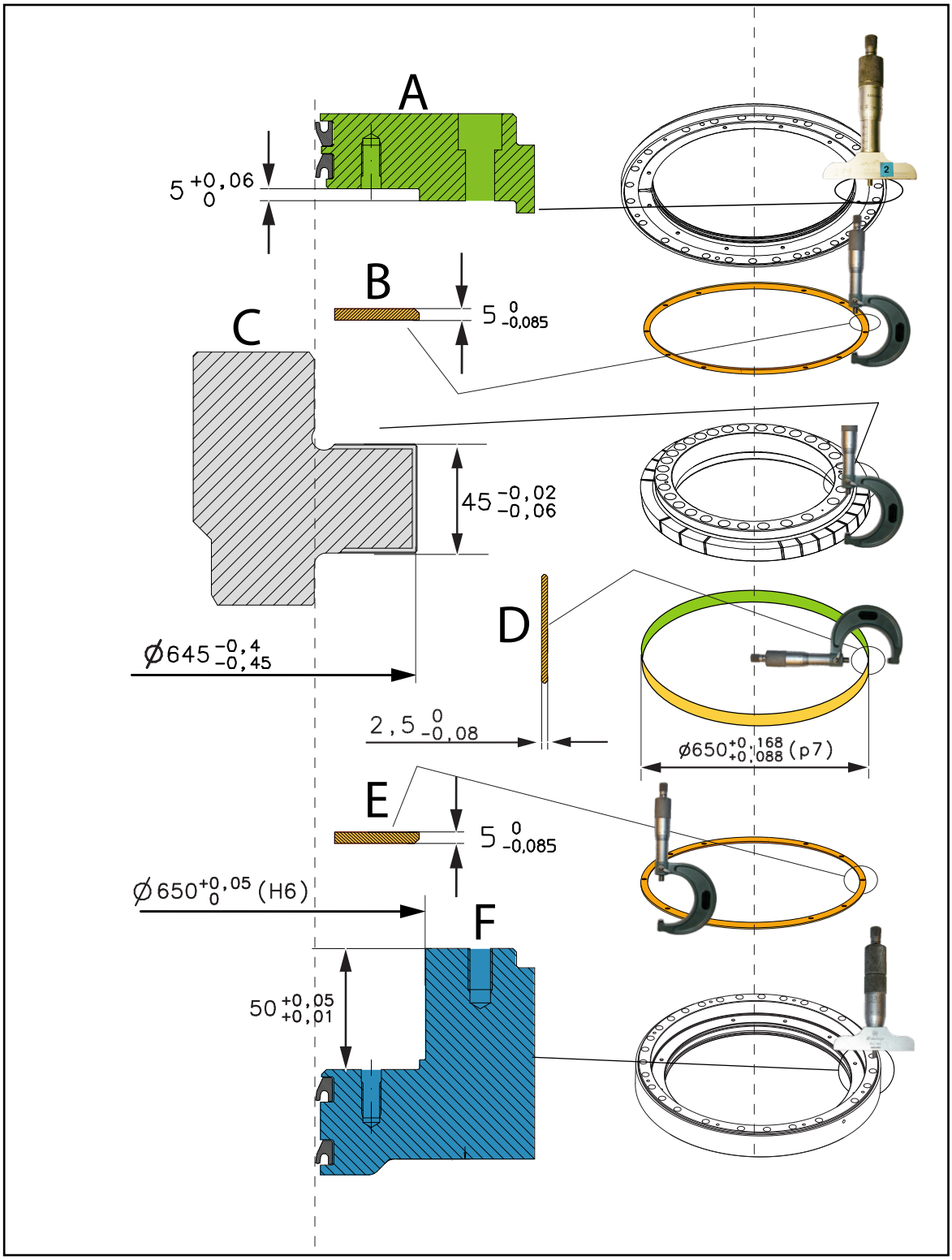
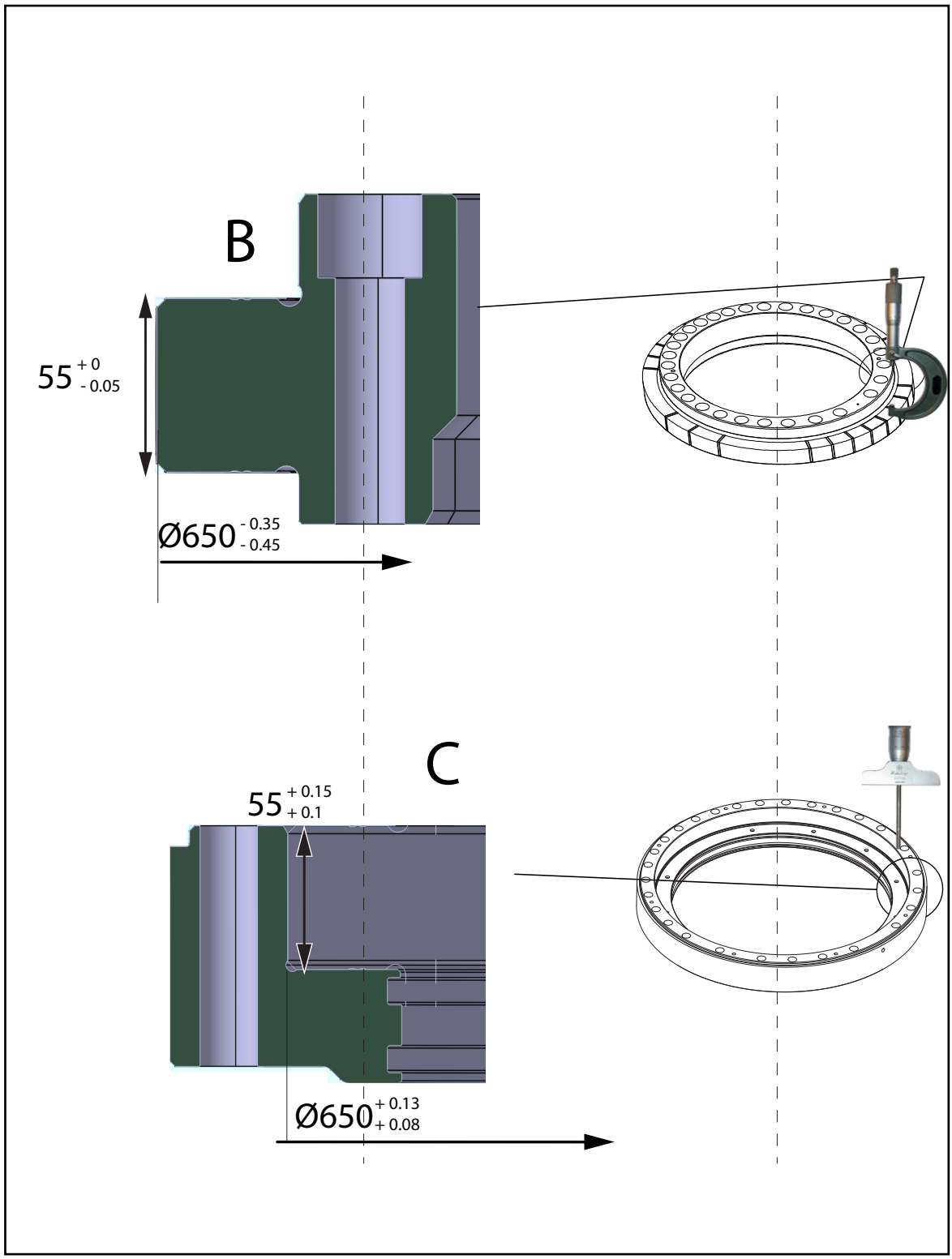


Figure 229

View of the tandem bearing HA45 (8x1702 and beyond)



Assembly bogie - tandem to diff.

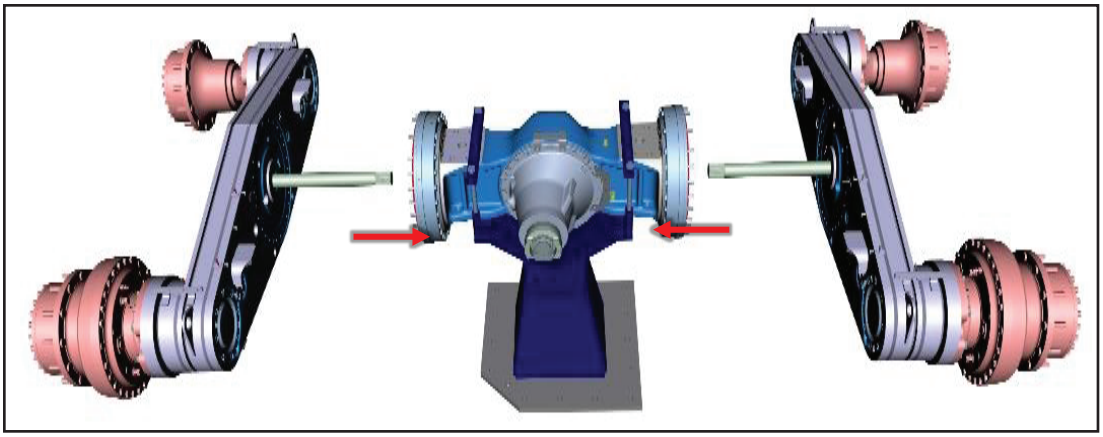


Figure 230

Place safety supports under the tandem.

WARNING

Be aware of personal injury.

A. Put Loctite 245 in threads on tandem.

B. Put sealant on bearing ass'y
Loctite 5188

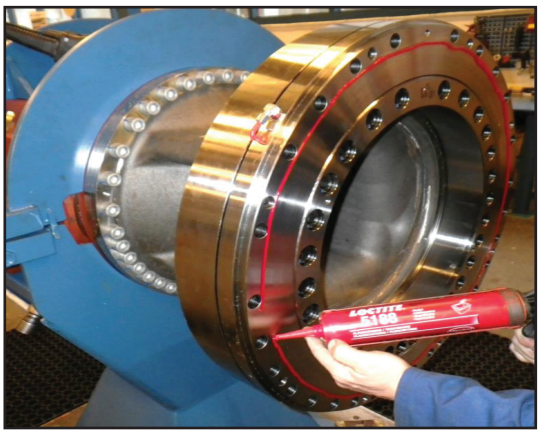


Figure 231

C. Lift tandem to diff.ass'y.
Turn shaft flange on diff to align splines on shaft.

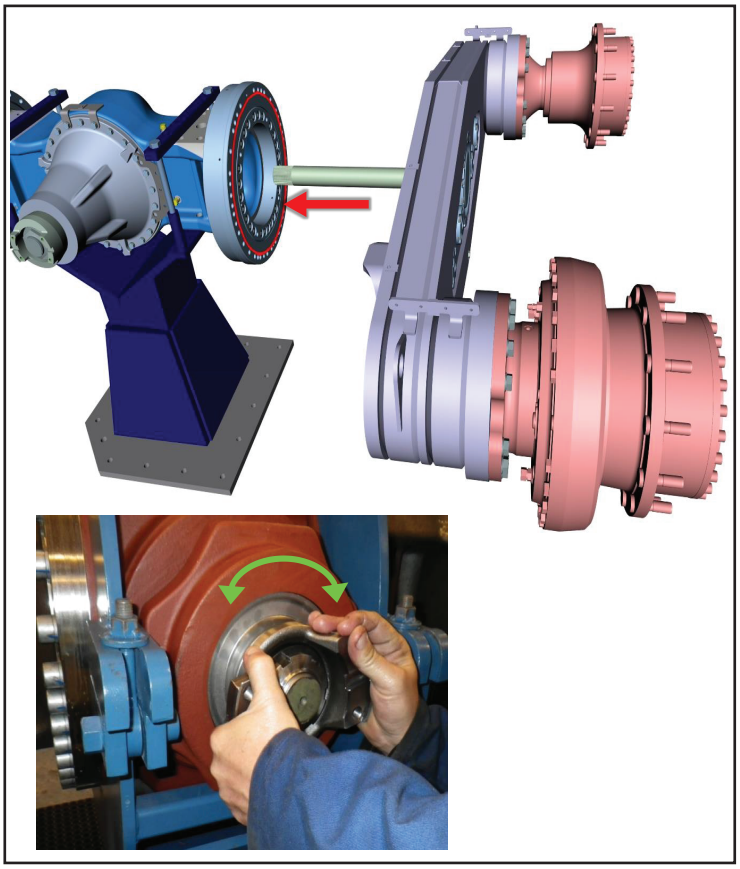


Figure 232

NOTE

Tighten crosswise and progressively to the final torque, not in one go.

Mount tandem ass'y to diff.ass'y.

Torque **277 Nm**
Loctite 245

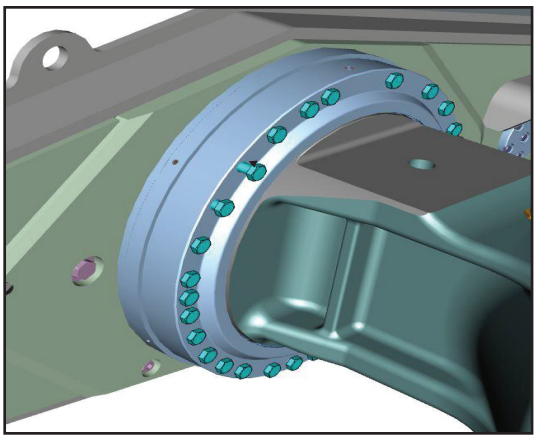


Figure 233

Install rear axle to frame bearing

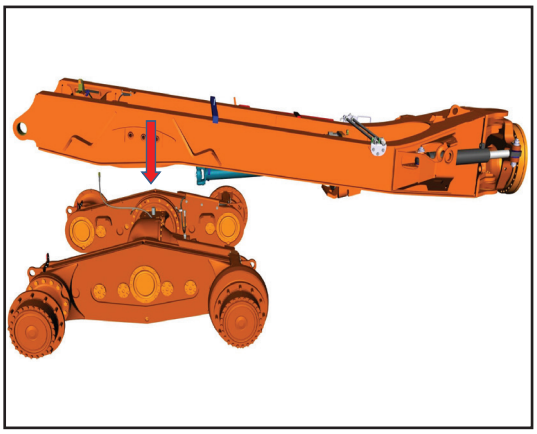


Figure 234

Insert guide pin's and install rear frame to rear axle.

Mount rear axle to rear frame with screws.

Torque **935 Nm**
Loctite 245

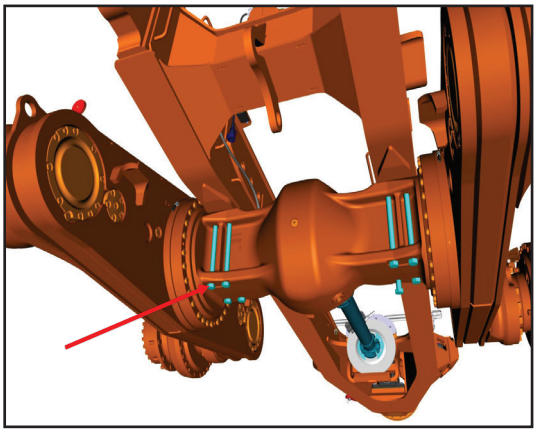


Figure 235

Mount shaft to rear axle, make sure they are completely togheter.

Torque **141Nm**
Loctite 245

Mount hoses from tandemhousing. Mount hose over axelhousing with a clamp.

Torque **47 Nm**

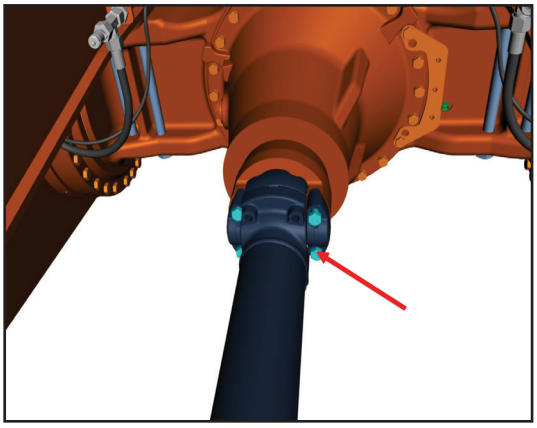


Figure 236

General information

Recommendation for repairs

Make sure you read our recommendations below carefully before starting on any repair work.

General

We recommend that the affected bearings and seals are completely replaced during any repair activity in order to ensure a long service life for the drive unit. Always replace damaged parts with NAF original parts. Before reassembly we recommend that the seals on rotating parts are renewed.

Oil

Always drain the oil before any repair operation. Ensure environmentally friendly disposal of used oil.

Cleaning

Remove major impurities before any repair or oil change. Clean all parts before assembly with a suitable cleaning agent. Make sure that parts are not scratched. All parts in the drive unit should be coated with an oil film to give long-term protection against corrosion.

O-rings

Before assembly O-rings and their installation space must be properly cleaned. Foreign particles in the groove can damage the O-ring and lead to leaks. Rolling over sharp edges, threads or grooves should be avoided so as not to damage the O-ring. Special Hyundai tools facilitate the fitting of O-rings. It is also helpful to lightly grease or oil the O-ring before fitting.

Adjusting washers

Please use our shim kit for individual adjustments in the drive unit. Always measure each individual shim/washer before use.

Bearings

When installing bearings on a shaft we recommend they are heated to a temperature of max. 120°C; when installing in a drilled hole, cool the bearing (freezing compartment). The free spaces in the bearings should then be 30-50% filled with the greases specified by us. For easier assembly, lightly oil the seats of the bearing rings. Suitably designed extractors should be used for removal of the bearings. Before bearings are installed, they and their installation spaces should be cleaned, checked and lubricated.

Radial seals

Before assembly radial rings and their installation space must be properly cleaned. When pressing in the radial seals, always use the special tools developed by Hyundai.
Never run radial seals when dry!
When assembling, therefore lightly grease or oil the shaft and radial seal.
Radial seals have a specific direction of installation and must be installed only in this direction.
In terms of direction of installation there is a differentiation between oil side and air side, see (Figure 237).

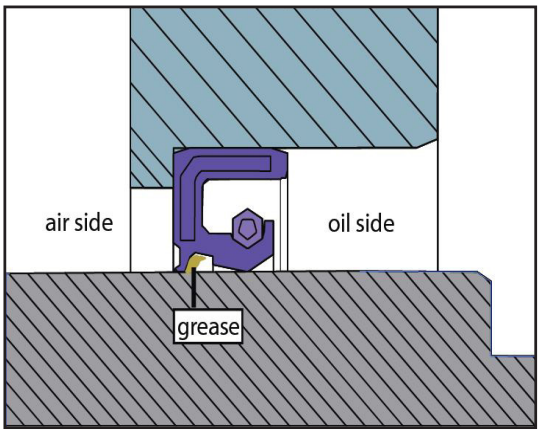


Figure 237

Oil change for tandem housing and planetary drive(hubs)

General information

NOTE

Ensure that the tandem housing is placed horizontally and the axle remains still for 30 minutes to allow oil contamination to rest.

When filling the drive unit with oil and when changing the oil, the lubricants specified by Hyundai must be used.
Check the oil level regularly!
The oil should be at working temperature prior to draining. Take care, there is a risk of scalding.

Differential + axle housing

Differential and axle housing have a common oil chamber.
Pos. 2 in (Figure 238) shows the oil level at the differential and axle housing.

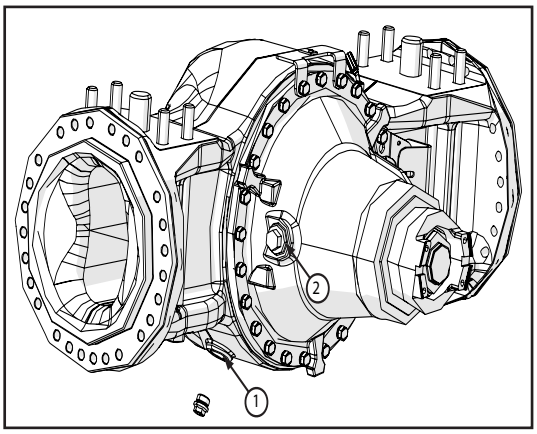


Figure 238

Oil change

- Open oil filler plug (2) and oil drain plug (1) and drain oil completely.
- Refit oil drain plug (1).
- Fill differential at oil filler plug.
- Check oil level at oil check screw (2)

Torque plug **140 Nm**

Bogie housing

NOTE

By changing the oil on the tandem you will at the same time change the oil on wheel hubs due to open oil circulation between the tandem and the wheel hubs.

Pos. (3) shows the oil level in the bogie housing section.

Torque plug **140 Nm**

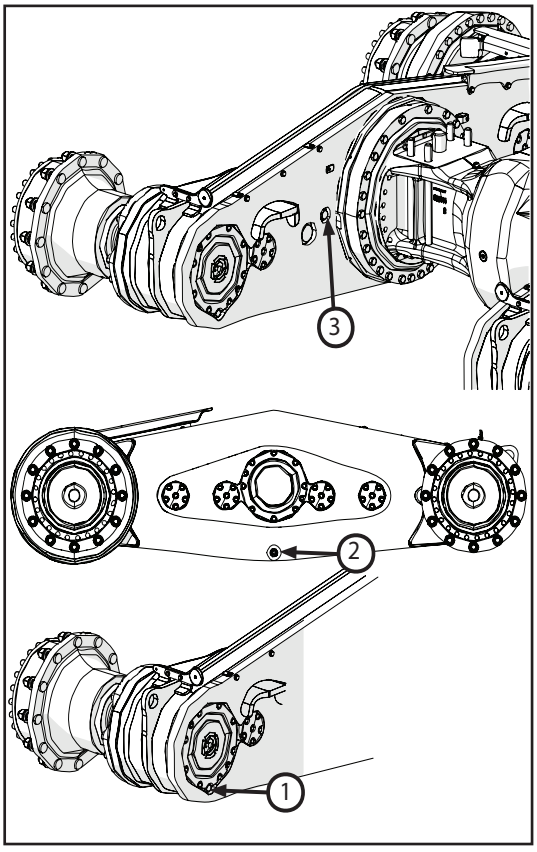


Figure 239

Oil change

- Unscrew oil filler plug (3) and oil drain plug (2) and (1) from bogie housing and drain oil completely.
- Refit oil drain plug (1) and (2).
- Fill bogie housing at oil filler plug.
- Check oil level at oil check screw (3)

Torque plug **140 Nm**.

Oil change front and rear hubs with brakes

NOTE

Turn hub assembly into position.
The oil drain plugs has to be at the bottom.

Open the oil drain plug (2 and 3) and allow oil to drain. Open the oil filling plug (1).

Plug (1 and 2) torque	**120 Nm.**
Plug (3) torque	**100 Nm**

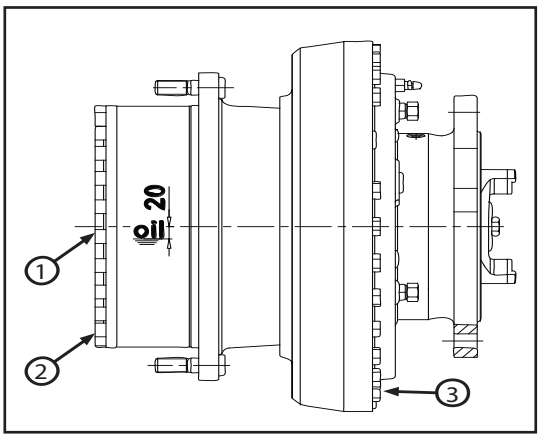


Figure 240

Oil change rear hubs without brakes

NOTE

Turn hub assembly into position.
The oil drain plugs has to be at the bottom.

Open the oil drain plug (2) and allow oil to drain. Open the oil filling plug (1).

Plug (1 and 2) torque	**120 Nm.**

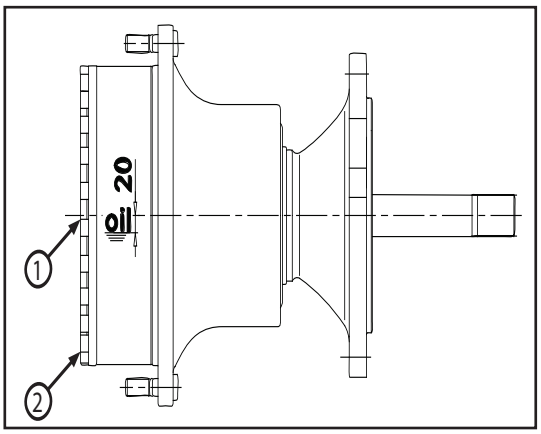


Figure 241

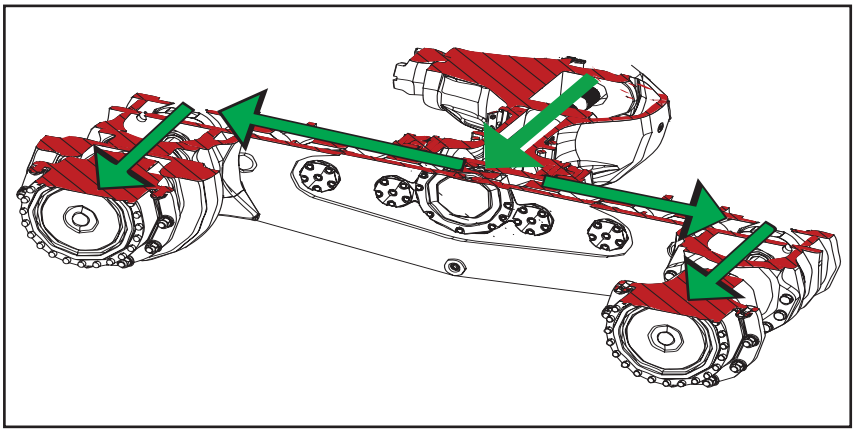


Figure 242

NOTE

By changing the oil on the tandem you will at the same time change the oil on wheel hubs due to open oil circulation between the tandem and the wheel hubs.

Fill the tandem housing,diff and hubs with oil until oil exits from the level control opening. Reinstall the level control plug and the filling plug. After test driving, check that the oil is at lower edge of the level plug.

Note: